CleanAir.

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Wheelabrator North Broward, Inc.
2600 NW 48th Street
Pompano Beach, FL 33073

RECEIVED
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BUREAU OF
AIR REGULATION

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: 10955-2
Revision 0: April 23, 2010

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
sbrown@cleanair.com
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Reviewed by,

Kevin O'Halloren, P.E.
Project Manager
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Wheelabrator North Broward Inc.
A Waste Management Company
2600 Wiles Road
Pompano Beach, FL 33073
(954) 971-8701 Tel
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April 27, 2010

UPS# 1Z26X1500394865542

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APR 27 2010
BUREAU OF
AIR REGULATION

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
2010 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 16-18 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# 1Z26X1500390744304
FDEP, Tallahassee, Bureau of Air Regulation, New Source Review Section, (with) UPS# 1Z26X1500394730124
Broward County Department of Planning and Environmental Protection, Air Quality Division (with) UPS# 1Z26X1500393811511

Chuck Faller (with)
Ram Tewari – BCWRS (without)
Tim Porter (without)
Rob French – MPI (with) UPS# 1Z26X1500392976131

WASTE MANAGEMENT

REVISION HISTORY

REPORT ON COMPLIANCE TESTING

DRAFT REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
D0a	04/15/10	All	Draft version of original document.

FINAL REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
0	04/23/10	All	Final version of original document.

CONTENTS

CONTENTS

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 8, 2010, 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 Florida Department of Environmental Protection (FDEP).

Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

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

Lee Hoefert 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
N. Hitchins
A. Obuchowski
B. Arnold

PROJECT OVERVIEW

Test Program Parameters

The sampling was conducted at the Units 1, 2 and 3 Spray Dry Absorption (SDA) Inlet, Fabric Filter (FF) Outlets, Ash Handling System and Lime Silo FF Outlet from March 16 through 18, 2010, and included the following emissions measurements:

- beryllium (Be);
- cadmium (Cd);
- lead (Pb);
- mercury (Hg);
- polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF); Unit 2 only;
- total suspended particulate (TSP);
- hydrogen chloride (HCl);
- total fluoride;
- fugitive emissions (FE);
- visual emissions (VE).

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 Number	Location	Method	Analyte	Date	Start Time	End Time
1	Unit 3 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/16/10	07:17	08:17
1	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/16/10	07:21	09:32
1	Unit 2 FF Outlet	USEPA Method 23	PCDD/F	03/16/10	08:44	13:36
2	Unit 3 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/16/10	09:04	10:04
2	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/16/10	10:00	12:14
3	Unit 3 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/16/10	10:32	11:32
1	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/16/10	11:49	13:07
3	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/16/10	12:36	14:47
2	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/16/10	13:33	14:44
3	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/16/10	15:07	16:16
1	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/17/10	06:50	09:03
1	Unit 2 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/17/10	06:54	07:54
2	Unit 2 FF Outlet	USEPA Method 23	PCDD/F	03/17/10	06:54	12:19
2	Unit 2 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/17/10	09:02	10:02
2	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/17/10	09:26	11:38
3	Unit 2 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/17/10	10:25	11:25
1	Lime Silo	USEPA Method 9	Opacity	03/17/10	10:26	11:45
1	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/17/10	11:46	12:56
3	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/17/10	11:59	14:11
3	Unit 2 FF Outlet	USEPA Method 23	PCDD/F	03/17/10	12:53	17:26
2	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/17/10	13:15	14:27
3	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/17/10	14:45	15:53
1	Unit 1 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/18/10	07:02	08:02
1	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/18/10	07:09	08:24
1	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/18/10	07:09	09:22
1	Ash Handling System	USEPA Method 22	Fugitive Emissions	03/18/10	07:22	12:20
2	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/18/10	08:56	10:10
2	Unit 1 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/18/10	09:26	10:37
2	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/18/10	09:49	12:02
3	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/18/10	10:45	12:05
3	Unit 1 SDA Inlet/FF Outlet	USEPA Method 26A	HCl	03/18/10	11:49	12:49
3	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/18/10	12:27	14:39

PROJECT OVERVIEW

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)	<0.54	1.6	0.84	25
Visual Emissions (%, by COMS)[2]	2	0	2	10
Fluoride (lb/MMBtu as HF)[3]	<0.000036	<0.000038	<0.000038	0.0040
Total PCCD/PCDF (ng/dscm @ 7% O_2)	NA	0.41	NA	30
Hydrogen Chloride (ppmdv @ 7% O_2) or	20	18	18	29
Hydrogen Chloride Removal (%)[4]	97%	96%	97%	>95
Beryllium (mg/dscm @ 7% O_2)	<0.00003	<0.00003	<0.00003	0.001
Cadmium (mg/dscm @ 7% O_2)	<0.00011	<0.00016	<0.00011	0.035
Lead (mg/dscm @ 7% O_2)	0.00062	<0.00051	0.00016	0.40
Mercury (μg/dscm @ 7% O_2)	4.7	5.2	4.6	50
Average Steam Flow (Klbs/hr)[5]	183.8	184.0	184.1	186
Average FF Inlet Temperature (^{O}F)[5]	318	320	312	NA

[1] Limits obtained from facilities Title V Permit 0112119-009-AV.
[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.

TEST PROGRAM SYNOPSIS (CONTINUED)

Table 1-3:
Subpart Cb-required Operating Data

Process Condition	
Unit 1 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.5 [2]
Unit 2 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.3
Unit 3 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.1 [3]
Unit 1 Maximum Particulate Control Device Inlet Temperature (°F)[4]	322 [2]
Unit 2 Maximum Particulate Control Device Inlet Temperature (°F)[4]	321
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 22, 2009 (Project 10735).
[3] From CleanAir Cb test report dated April 30, 2008 (Project 10455).
[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.

TEST PROGRAM SYNOPSIS (CONTINUED)

During the 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.

Raina Vicere performed the fugitive emission readings (per EPA Method 22) on the Ash Handling System and conducted the VE readings (per EPA Method 9) on the Lime Silo during one (1) entire truck unloading. Ms. Vicere's VE evaluation certificate is presented in Appendix J.

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 I. 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 meet 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 I.

The Method 23 results for all three (3) runs 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.

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 70 minutes earlier than actual Eastern Standard Time (EST). The Lime Silo opacity start and stop times are based on CEM time; however, the initial and final truck weights were recorded using EST.

TEST PROGRAM SYNOPSIS (CONTINUED)

Integrated gas samples (IGS) were collected in a vinyl sample bag from every sample train. The contents of the bag were then analyzed for oxygen (O_2) and carbon dioxide (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 and HCl to CleanAir. The analytical results of these samples are presented in Appendix I, along with each respective lab report.

The initial reporting of the high HCl audit sample was not within the required 5% of actual concentration. The lab reanalyzed all of the samples, including the audits after concluding that erroneously contaminated glassware created the high audit result. The results of the reanalysis are presented in this report and an explanation of the failed audit is presented, along with the laboratory report, in Appendix I. The reanalyzed audit was within 5% of the audit samples value.

At the request of Wheelabrator North Broward, Inc., the Unit 2 Method 23 Run 2 was paused for 42 minutes in order to accommodate a soot blow. During the delay, the probe was removed from the FF Outlet and the XAD trap was kept cold. Once the soot blow was complete, the probe was placed back in the duct and the test run was resumed.

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 (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:21	10:00	12:36	
Stop Time (approx.)		09:32	12:14	14:47	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.9	184.4	183.4	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	310	313	320	**314**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.5	9.5	9.7	**9.6**
CO_2	Carbon dioxide (dry volume %)	9.9	9.9	9.8	**9.9**
T_s	Sample temperature (°F)	293	295	301	**296**
B_w	Actual water vapor in gas (% by volume)	20.1	20.0	19.7	**20.0**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	191,586	191,421	193,814	**192,274**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,082	104,870	105,806	**105,252**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	80.55	81.15	81.55	**81.09**
%I	Isokinetic sampling (%)	98.8	99.7	99.3	**99.3**
Laboratory Data					
m_n	Net matter collected (g)	0.00049	0.00218	<0.00020	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	0.22	0.95	<0.087	**<0.42**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.26	1.2	<0.11	**<0.51**
Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	7.7629	8.8151	9.7549	
Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	3.4	3.8	4.2	**3.8**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.2	4.7	5.3	**4.7**
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)	<0.00002	<0.00002	<0.00002	**<0.00002**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00003	<0.00003	<0.00003	**<0.00003**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	0.2093	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000088	0.000091	<0.000087	**<0.000088**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00011	0.00011	<0.00011	**<0.00011**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	1.0847	1.1424	1.2738	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00048	0.00050	0.00055	**0.00051**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00058	0.00060	0.00069	**0.00062**

RESULTS

Table 2-2:
Unit 1 FF Outlet - Fluorides

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		11:46	13:15	14:45	
Stop Time (approx.)		12:56	14:27	15:53	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.0	184.0	184.1	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.6	10.1	10.0	**10.2**
CO_2	Carbon dioxide (dry volume %)	9.1	9.6	9.8	**9.5**
T_s	Sample temperature (°F)	303	302	303	**302**
B_w	Actual water vapor in gas (% by volume)	19.9	20.5	21.0	**20.5**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	205,926	207,433	198,952	**204,104**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	111,627	111,678	106,345	**109,883**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	42.7316	42.4517	41.1525	**42.1120**
%I	Isokinetic sampling (%)	100.1239	99.4233	101.2130	**100.2534**
Laboratory Data					
m_n	Total HF collected (mg)	<0.03681	<0.03385	<0.03889	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.037	<0.034	<0.040	**<0.037**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.049	<0.044	<0.051	**<0.048**
C_{sd}	HF Concentration (mg/dscm)	<0.030	<0.028	<0.033	**<0.031**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.041	<0.036	<0.042	**<0.040**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.013	<0.012	<0.013	**<0.013**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000037	<0.000033	<0.000038	**<0.000036**

RESULTS

Table 2-3:
Unit 1 FF Outlet and SDA Inlet - Hydrogen Chloride

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:02	09:26	11:49	
Stop Time (approx.)		08:02	10:37	12:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.5	184.1	182.8	**183.5**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.1	9.0	9.7	**9.3**
CO_2	Carbon dioxide (dry volume %)	10.2	10.4	9.8	**10.1**
T_s	Sample temperature (°F)	489	489	497	**492**
B_w	Actual water vapor in gas (% by volume)	17.5	16.9	16.6	**17.0**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.19	36.42	35.65	**36.76**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	789.381	879.513	662.680	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	482	563	433	**493**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	568	658	538	**588**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.9	9.7	10.1	**9.9**
CO_2	Carbon dioxide (dry volume %)	9.5	9.7	9.4	**9.5**
T_s	Sample temperature (°F)	308	309	310	**309**
B_w	Actual water vapor in gas (% by volume)	19.9	21.4	19.6	**20.3**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	41.10	40.79	40.64	**40.85**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	30.484	25.143	26.450	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	17	14	15	**16**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	22	18	19	**20**
RE	Reduction Efficiency (% Removal)	96%	97%	96%	**97%**

RESULTS

Table 2-4:
Unit 2 FF Outlet – Particulate, Metals and Mercury

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	09:49	12:27	
Stop Time (approx.)		09:22	12:02	14:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.9	182.9	183.9	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	321	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.1	9.8	9.9	**9.9**
CO_2	Carbon dioxide (dry volume %)	9.3	9.6	9.6	**9.5**
T_s	Sample temperature (°F)	307	308	308	**308**
B_w	Actual water vapor in gas (% by volume)	20.4	20.5	21.0	**20.6**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	201,928	193,105	199,217	**198,083**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	108,134	103,333	105,868	**105,778**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	84.18	79.34	82.11	**81.88**
%I	Isokinetic sampling (%)	100.3	98.9	99.9	**99.7**
Laboratory Data					
m_n	Net matter collected (g)	0.00404	0.00231	0.00252	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	1.7	1.0	1.1	**1.3**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	2.2	1.3	1.4	**1.6**
Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	9.1977	9.2740	10.1318	
Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	3.9	4.1	4.4	**4.1**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	5.0	5.1	5.5	**5.2**
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)	<0.00002	<0.00002	<0.00002	**<0.00002**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00003	<0.00003	<0.00003	**<0.00003**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.4679	<0.2000	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00020	<0.000089	<0.000086	**<0.00012**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00025	<0.00011	<0.00011	**<0.00016**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	2.4408	<0.2000	<0.2000	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.0010	<0.000089	<0.000086	**<0.00040**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.0013	<0.00011	<0.00011	**<0.00051**

RESULTS

Table 2-5:
Unit 2 FF Outlet - Fluorides

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	08:56	10:45	
Stop Time (approx.)		08:24	10:10	12:05	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.9	184.2	183.0	**183.7**
P_1	Fabric Filter Inlet Temperature (°F)	321	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.0	9.6	10.2	**9.9**
CO_2	Carbon dioxide (dry volume %)	9.3	9.6	9.1	**9.3**
T_s	Sample temperature (°F)	306	305	306	**306**
B_w	Actual water vapor in gas (% by volume)	20.7	21.1	20.3	**20.7**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	190,226	182,805	185,088	**186,040**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	101,644	97,309	99,545	**99,499**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.2069	36.8944	37.3103	**37.4705**
%I	Isokinetic sampling (%)	98.3144	99.1667	98.0324	**98.5045**
Laboratory Data					
m_n	Total HF collected (mg)	<0.03601	<0.03449	<0.03537	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.040	<0.040	<0.040	**<0.040**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.051	<0.049	<0.052	**<0.051**
C_{sd}	HF Concentration (mg/dscm)	<0.033	<0.033	<0.033	**<0.033**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.043	<0.041	<0.043	**<0.042**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.013	<0.012	<0.012	**<0.012**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000038	<0.000037	<0.000039	**<0.000038**

RESULTS

Table 2-6:
Unit 2 FF Outlet - PCDDs/PCDFs

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 17	Mar 17	
Start Time (approx.)		08:44	06:54	12:53	
Stop Time (approx.)		13:36	12:19	17:26	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.1	184.3	183.9	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	314	321	320	**319**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.7	9.7	10.3	**9.9**
CO_2	Carbon dioxide (dry volume %)	9.7	9.8	9.5	**9.7**
T_s	Sample temperature (°F)	301	307	308	**305**
B_w	Actual water vapor in gas (% by volume)	20.1	20.8	20.5	**20.5**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	198,967	214,211	203,730	**205,636**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	107,335	113,400	108,891	**109,875**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	156.06	168.82	164.13	**163.00**
%I	Isokinetic sampling (%)	98.0	100.3	101.6	**100.0**
Results (ND and EMPC = 0)					
Laboratory Data from USEPA Method 23					
m_n	Total PCDDs & PCDFs (ng)	1.2600	1.5100	1.6700	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.0168	0.0227	0.0270	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	0.29	0.32	0.36	**0.32**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	0.35	0.39	0.47	**0.41**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.15E-07	1.34E-07	1.47E-07	**1.32E-07**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	3.17E-10	3.53E-10	4.24E-10	**3.65E-10**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	0.0038	0.0047	0.0058	**0.0048**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	0.0047	0.0059	0.0076	**0.0061**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	1.53E-09	2.02E-09	2.37E-09	**1.97E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	4.23E-12	5.31E-12	6.85E-12	**5.47E-12**
Results (ND and EMPC = actual value)					
Laboratory Data from USEPA Method 23, including NDs and EMPCs					
m_n	Total PCDDs & PCDFs (ng)	1.3600	1.7700	1.8600	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.0211	0.0275	0.0305	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	0.31	0.37	0.40	**0.36**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	0.38	0.46	0.53	**0.46**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.24E-07	1.57E-07	1.63E-07	**1.48E-07**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	3.43E-10	4.14E-10	4.72E-10	**4.10E-10**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	0.0048	0.0058	0.0066	**0.0057**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	0.0059	0.0072	0.0086	**0.0072**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	1.92E-09	2.44E-09	2.68E-09	**2.35E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	5.31E-12	6.44E-12	7.74E-12	**6.50E-12**

WHEELABRATOR NORTH BROWARD, INC.
POMPANO BEACH, FL

Client Reference No:
CleanAir Project No: 10955-2

RESULTS

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

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:54	09:02	10:25	
Stop Time (approx.)		07:54	10:02	11:25	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.7	184.2	184.9	**184.6**
P_1	Fabric Filter Inlet Temperature (°F)	323	320	319	**321**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.4	9.3	8.7	**8.8**
CO_2	Carbon dioxide (dry volume %)	10.9	10.2	10.7	**10.6**
T_s	Sample temperature (°F)	510	504	502	**505**
B_w	Actual water vapor in gas (% by volume)	17.5	16.3	17.6	**17.1**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	35.88	36.43	36.20	**36.17**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	680.971	649.597	646.927	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	442	416	417	**425**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	492	498	474	**488**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.7	10.4	9.5	**9.9**
CO_2	Carbon dioxide (dry volume %)	9.7	9.1	10.0	**9.6**
T_s	Sample temperature (°F)	309	308	307	**308**
B_w	Actual water vapor in gas (% by volume)	21.1	20.3	21.5	**21.0**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	41.24	41.01	40.73	**40.99**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	29.747	21.278	23.228	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	17	12	13	**14**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	21	16	16	**18**
RE	Reduction Efficiency (% Removal)	96%	97%	97%	**96%**

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

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:50	09:26	11:59	
Stop Time (approx.)		09:03	11:38	14:11	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.2	184.2	183.5	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7	8.3	8.7	**8.6**
CO_2	Carbon dioxide (dry volume %)	10.5	10.9	10.8	**10.7**
T_s	Sample temperature (°F)	303	304	304	**304**
B_w	Actual water vapor in gas (% by volume)	22.7	22.9	22.6	**22.7**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	174,264	186,885	184,323	**181,824**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	90,897	97,143	96,346	**94,795**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	70.86	75.80	74.78	**73.81**
%I	Isokinetic sampling (%)	100.4	100.5	100.0	**100.3**
Laboratory Data					
m_n	Net matter collected (g)	0.00115	0.00130	0.00223	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	0.57	0.60	1.1	**0.74**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.65	0.67	1.2	**0.84**
Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	8.8257	8.9307	7.6261	
Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	4.4	4.2	3.6	**4.1**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	5.0	4.6	4.1	**4.6**
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)	<0.00002	<0.00002	<0.00002	**<0.00002**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00003	<0.00003	<0.00003	**<0.00003**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	<0.2000	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.00010	<0.000093	<0.000094	**<0.000096**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00011	<0.00010	<0.00011	**<0.00011**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.2760	0.2230	0.3748	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00014	0.00010	0.00018	**0.00014**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00016	0.00011	0.00020	**0.00016**

RESULTS

Table 2-9:
Unit 3 FF Outlet - Fluorides

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		11:49	13:33	15:07	
Stop Time (approx.)		13:07	14:44	16:16	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.7	183.9	184.2	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	310	310	310	**310**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.9	9.5	9.7	**9.7**
CO_2	Carbon dioxide (dry volume %)	9.7	10.0	10.0	**9.9**
T_s	Sample temperature (°F)	298	299	299	**299**
B_w	Actual water vapor in gas (% by volume)	20.9	21.4	21.6	**21.3**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,798	179,576	173,781	**175,718**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,705	96,031	92,736	**94,158**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	36.4042	36.9891	35.7340	**36.3758**
%I	Isokinetic sampling (%)	101.6122	100.7446	100.7835	**101.0467**
Laboratory Data					
m_n	Total HF collected (mg)	<0.03589	<0.03481	<0.03261	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.042	<0.040	<0.039	**<0.040**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.053	<0.049	<0.048	**<0.050**
C_{sd}	HF Concentration (mg/dscm)	<0.035	<0.033	<0.032	**<0.033**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.044	<0.041	<0.040	**<0.042**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.012	<0.012	<0.011	**<0.012**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000040	<0.000037	<0.000036	**<0.000037**

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

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:17	09:04	10:32	
Stop Time (approx.)		08:17	10:04	11:32	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.6	184.1	184.3	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	310	310	310	**310**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.6	8.2	8.1	**8.3**
CO_2	Carbon dioxide (dry volume %)	10.7	11.1	11.2	**11.0**
T_s	Sample temperature (°F)	503	510	508	**507**
B_w	Actual water vapor in gas (% by volume)	17.5	17.5	16.7	**17.3**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	35.39	35.83	34.78	**35.33**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	860.248	813.798	910.786	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	567	529	611	**569**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	640	580	661	**627**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.0	9.1	8.9	**9.0**
CO_2	Carbon dioxide (dry volume %)	10.3	10.2	10.4	**10.3**
T_s	Sample temperature (°F)	299	300	299	**300**
B_w	Actual water vapor in gas (% by volume)	20.8	21.3	21.8	**21.3**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	42.13	41.78	41.67	**41.86**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	26.091	32.864	23.884	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	14	18	13	**15**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	17	22	16	**18**
RE	Reduction Efficiency (% Removal)	97%	96%	98%	**97%**

RESULTS

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

Run No.	1	2	3	Average
Unit 1				
Date (2010)	Mar 16	Mar 16	Mar 16	
Start Time (approx.)	07:18	10:00	12:36	
Stop Time (approx.)	09:30	12:06	14:42	
Visible Emissions (%)[1]				
Average Opacity	2	2	2	**2**
Maximum Reading	2	2	2	**2**
Minimum Reading	2	2	2	**2**
Unit 2				
Date (2010)	Mar 18	Mar 18	Mar 18	
Start Time (approx.)	07:06	09:48	12:24	
Stop Time (approx.)	09:18	12:00	14:36	
Visible Emissions (%)[1]				
Average Opacity	0	0	0	**0**
Maximum Reading	0	0	0	**0**
Minimum Reading	0	0	0	**0**
Unit 3				
Date (2010)	Mar 17	Mar 17	Mar 17	
Start Time (approx.)	06:48	09:24	11:54	
Stop Time (approx.)	09:00	11:36	14:06	
Visible Emissions (%)[1]				
Average Opacity	1	1	3	**2**
Maximum Reading	2	2	4	**3**
Minimum Reading	0	0	3	**1**

[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	7:22	8:32	60	0	
Ash Unloading/Conveyor						
Visual Opacity (%)	March 12	8:43	9:54	60	0	
Rolling Door/Door to Baghouse						
Visual Opacity (%)	March 12	11:10	12:20	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 (2010)	Mar 17
Start Time (approx.)	10:26
Stop Time (approx.)	11:45
Process Conditions	
Total lime unloaded (tons)	25.36
Rate of unloading (tons/hr)	19.3
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 %	CO_2 Sample Rate (lpm)[1]	Stack Flow 2RSD (%)	Air Flow, DSCFM	Air Flow, DSCFM@ 7%O_2
1-O-M5/29-1	3/16/2010	07:21-09:32	183.9	293	191,586	9.5	9.9	0.2	11.6%	105,082	85,956
1-O-M5/29-2	3/16/2010	10:00-12:14	184.4	295	191,421	9.5	9.9	0.2	12.2%	104,870	86,310
1-O-M5/29-3	3/16/2010	12:36-14:47	183.4	301	193,814	9.7	9.8	0.2	15.3%	105,806	84,949
1-O-M13B-1	3/17/2010	11:46-12:56	184.0	303	205,926	10.6	9.1	0.4	12.1%	111,627	83,118
1-O-M13B-2	3/17/2010	13:15-14:27	184.0	302	207,433	10.1	9.6	0.4	12.9%	111,678	86,530
1-O-M13B-3	3/17/2010	14:45-15:53	184.1	303	198,952	10.0	9.8	0.4	11.0%	106,345	83,699
		Average	**184.0**	**299**	**198,189**	**9.9**	**9.7**	**NA**	**12.5%**	**107,568**	**85,094**
2-O-M5/29-1	3/18/2010	07:09-09:22	183.9	307	201,928	10.1	9.3	0.2	13.9%	108,134	84,251
2-O-M5/29-2	3/18/2010	9:49-12:02	182.9	308	193,105	9.8	9.6	0.2	10.0%	103,333	82,890
2-O-M5/29-3	3/18/2010	12:27-14:39	183.9	308	199,217	9.9	9.6	0.2	16.8%	105,806	83,856
2-O-M13B-1	3/18/2010	07:09-08:24	183.9	306	190,226	10.0	9.3	0.4	14.3%	101,644	79,560
2-O-M13B-2	3/18/2010	08:56-10:10	184.2	305	182,805	9.6	9.6	0.4	10.0%	97,309	78,827
2-O-M13B-3	3/18/2010	10:45-12:05	183.0	306	185,088	10.2	9.1	0.4	13.4%	99,545	76,986
2-O-M23-1	3/16/2010	08:44-13:36	184.1	301	198,967	9.7	9.7	0.1	8.7%	107,335	86,640
2-O-M23-2	3/17/2010	06:54-12:19	184.3	307	214,211	9.7	9.8	0.1	7.0%	113,400	91,046
2-O-M23-3	3/17/2010	12:53-17:26	183.9	308	203,730	10.3	9.5	0.1	8.8%	108,891	82,961
		Average	**183.8**	**306**	**196,586**	**9.9**	**9.5**	**NA**	**11.4%**	**105,044**	**83,002**
3-O-M5/29-1	3/17/2010	06:50-09:03	184.2	303	174,264	8.7	10.5	0.2	16.1%	90,897	79,715
3-O-M5/29-2	3/17/2010	09:26-11:38	184.2	304	186,885	8.3	10.9	0.2	9.4%	97,143	88,057
3-O-M5/29-3	3/17/2010	11:59-14:11	183.5	304	184,323	8.7	10.8	0.2	12.1%	105,806	84,424
3-O-M13B-1	3/16/2010	11:49-13:07	183.7	298	173,798	9.9	9.7	0.4	8.5%	101,644	74,155
3-O-M13B-2	3/16/2010	13:33-14:44	183.9	299	179,576	9.5	10.0	0.4	11.4%	96,031	78,552
3-O-M13B-3	3/16/2010	15:07-16:16	184.2	299	173,781	9.7	10.0	0.4	11.0%	92,736	74,589
		Average	**184.0**	**301**	**178,771**	**9.1**	**10.3**	**NA**	**11.4%**	**97,376**	**79,915**
		Facility Average	**183.9**	**302**	**191,182**	**9.7**	**9.8**	**NA**		**103,329**	**82,670**

[1] CO_2 gas sample flow rate was within 10% of initial flow rate throughout all test runs.

RESULTS

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_7679_MB001	88.6	88.9	91.1	92.8	94.1	91.2	89.2
Field Blank	86.3	89.5	90.9	96.6	94.6	92.4	91.7
Unit 2 FF Outlet Run 1	83.1	88.6	82.5	86.2	82.9	85.3	84.7
Unit 2 FF Outlet Run 2	86.3	82.9	82.1	84.3	84.4	84.1	82.8
Unit 2 FF Outlet Run 3	85.6	82.5	80	85.5	86	82.8	81.9
Reagent Blank	94.3	97.8	97.3	98.7	100	96.9	92.6

Average	87	88	87	91	90	89	87
SD	4	6	7	6	7	6	5
Min	83.1	82.5	80	84.3	82.9	82.8	81.9
Max	94.3	97.8	97.3	98.7	100	96.9	92.6
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_7679_MB001	89.1	91.1	91.7	95.6	94.2	92.9	83.4	89.9	86.2	86.9
Field Blank	88.6	92.4	93.6	94.2	92.7	91.2	83.1	91.2	88.6	89.9
Unit 2 FF Outlet Run 1	84.6	89.3	92.7	86.9	84.3	82.6	78.4	82.9	82.6	84.2
Unit 2 FF Outlet Run 2	88.6	85.4	85.2	84.3	82.7	84.9	77.9	79.7	81.6	80.2
Unit 2 FF Outlet Run 3	87.7	87.3	85.3	81.6	81.9	83.6	77.3	79.1	80	79.4
Reagent Blank	95.4	97.3	97.3	99.9	98	98.2	91.1	95.9	92.7	91

Average	89	90	91	90	89	89	82	86	85	85
SD	4	4	5	7	7	6	5	7	5	5
Min	84.6	85.4	85.2	81.6	81.9	82.6	77.3	79.1	80	79.4
Max	95.4	97.3	97.3	99.9	98	98.2	91.1	95.9	92.7	91
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_7679_MB001	98.5	101	94.8	98.9	100
Field Blank	98.1	97.9	90.9	97.6	98
Unit 2 FF Outlet Run 1	98.1	98.3	97.8	101	103
Unit 2 FF Outlet Run 2	98.4	101	100	101	98.7
Unit 2 FF Outlet Run 3	96.1	99.1	93	100	102
Reagent Blank					

Average	98	99	95	100	100
SD	1	1	4	1	2
Min	96.1	97.9	90.9	97.6	98
Max	98.5	101	100	101	103
Min within M23 QC	TRUE	TRUE	TRUE	TRUE	TRUE

RESULTS

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

RPD RESULTS

Mercury	FH	BH	A	B	C
Run Number	Front Half	H_2O_2/HNO_4	Empty Impinger	$KMnO_4$	HCl
U1 FF Outlet R1	NA	0.8%	NA	NA	NA
U1 FF Outlet R2	NA	2.5%	NA	NA	NA
U1 FF Outlet R3	NA	0.3%	NA	NA	NA
U2 FF Outlet R1	NA	1.2%	NA	NA	NA
U2 FF Outlet R2	NA	0.1%	NA	NA	NA
U2 FF Outlet R3	NA	0.6%	NA	NA	NA
U3 FF Outlet R1	NA	0.6%	NA	NA	NA
U3 FF Outlet R2	NA	0.8%	NA	NA	NA
U3 FF Outlet R3	NA	0.5%	NA	NA	NA
Field Blank	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA
3/17 Reagent Blank	NA	NA	NA	NA	NA
3/18 Reagent Blank	NA	NA	NA	NA	NA

Element	U1-FF-O-R2 RPD	U2-FF-O-R2 RPD	U3-FF-O-R2 RPD
Beryllium	NA	NA	NA
Cadmium	1.3%	NA	NA
Lead	0.1%	3.1%	6.8%

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

Sample Spike and Recovery

Mercury		FH	BH	A	B	C
Run Number		Front half	H_2O_2/HNO_4	Empty Impinger	$KMnO_4$	HCl
U1 FF Outlet R3	#1	102%	98%	93%	106%	102%
	#2	102%	96%	94%	106%	102%
U2 FF Outlet R3	#1	102%	99%	103%	88%	101%
	#2	102%	98%	102%	86%	99%
U3 FF Outlet R3	#1	103%	94%	103%	89%	96%
	#2	103%	92%	96%	91%	95%

Element	U1-FF-O-R3 Recovery	U2-FF-O-R3 Recovery	U3-FF-O-R3 Recovery
Beryllium	85%	85%	87%
Cadmium	86%	87%	88%
Lead	97%	100%	102%

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	98%	97%	98%	101%	97%
Cadmium		97%	95%	99%	94%
Lead		92%	97%	100%	94%

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
3/17 Reagent Blank	#1	< 0.5	NA	NA	NA	< 0.5	NA
	#2		NA	NA	NA	< 0.5	NA
3/18 Reagent Blank	#1	< 0.5	NA	NA	NA	< 0.5	NA
	#2		NA	NA	NA	< 0.5	NA

Element	Field Blank Total µg	Reagent Blank Total µg
	14211-10	14211-11
Beryllium	< 0.05	< 0.05
Cadmium	< 0.2	< 0.2
Lead	0.290	0.454

Method 23	0_7679_MB001 pg	Field Blank pg
2,3,7,8-TCDD	(1.46)	(1.39)
1,2,3,7,8-PeCDD	(1.79)	(1.82)
1,2,3,4,7,8-HxCDD	(2.66)	(1.83)
1,2,3,6,7,8-HxCDD	(2.48)	(1.93)
1,2,3,7,8,9-HxCDD	(2.79)	(2.08)
1,2,3,4,6,7,8-HpCDD	(2.74)	4.71
OCDD	14.1	14.8
2,3,7,8-TCDF	(1.07)	(0.973)
1,2,3,7,8-PeCDF	(1.09)	(1.07)
2,3,4,7,8-PeCDF	(1.03)	(1.02)
1,2,3,4,7,8-HxCDF	(1.78)	(1.44)
1,2,3,6,7,8-HxCDF	(1.66)	(1.36)
2,3,4,6,7,8-HxCDF	(1.78)	(1.44)
1,2,3,7,8,9-HxCDF	(2.42)	(1.93)
1,2,3,4,6,7,8-HpCDF	(1.69)	3.19
1,2,3,4,7,8,9-HpCDF	(2.53)	(2.05)
OCDF	(3.41)	6.16
ITEF TEQ (ND=0; EMPC=0)	0.0141	0.0999
ITEF TEQ (ND=0; EMPC=EMPC)	0.0141	0.0999
ITEF TEQ (ND=DL/2; EMPC=0)	2.34	2.19
ITEF TEQ (ND=DL/2; EMPC=EMPC)	2.34	2.19
ITEF TEQ (ND=DL; EMPC=EMPC)	4.67	4.28

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

Blanks	Result	
Acetone (g)	0.0008	
HCl DI H_2O (mg/l)	<0.077	
HCl 0.1 N H_2SO_4 (mg/l)	<0.077	
HF DI H_2O (mg/l)	<0.038	
Meters - Post Cal	**Result**	**Limit**
61-6	-0.6%	≤ ± 5%
61-8	-0.4%	≤ ± 5%
61-11	-0.6%	≤ ± 5%
66-6	-0.4%	≤ ± 5%
66-14	0.3%	≤ ± 5%
66-24	-0.4%	≤ ± 5%
85-2	1.2%	≤ ± 5%
85-4	-0.2%	≤ ± 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 nitrogen oxide (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.

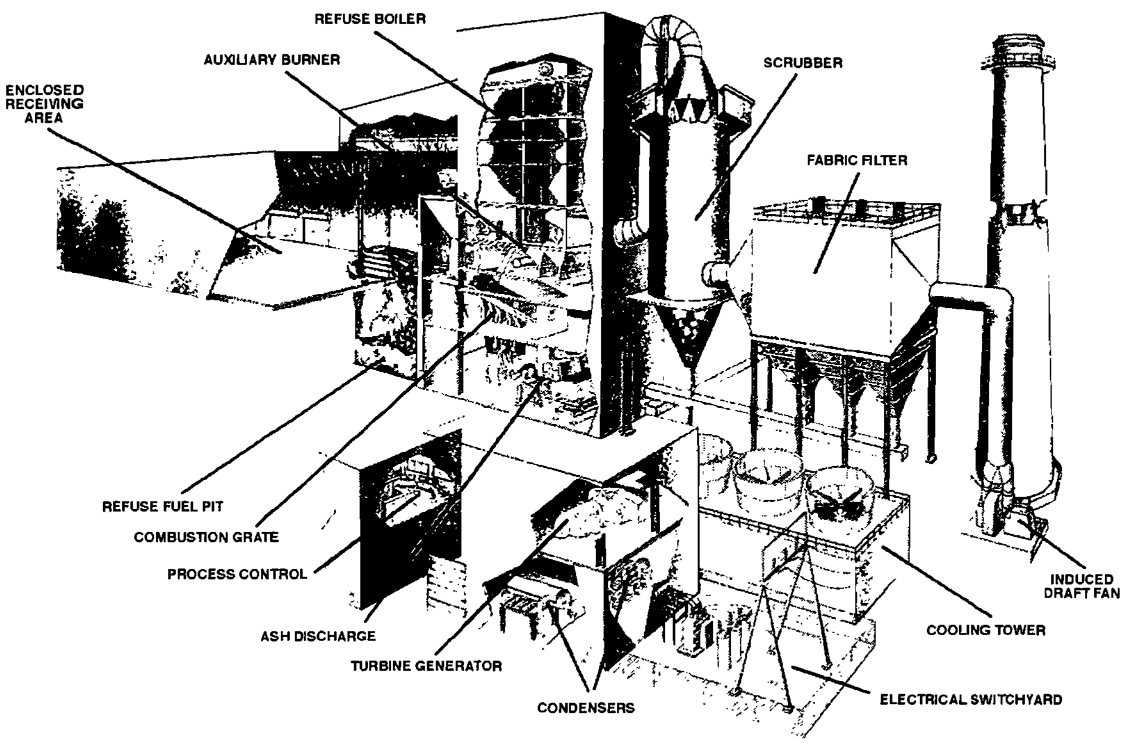


Figure 3-1: General Process Schematic

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION (CONTINUED)

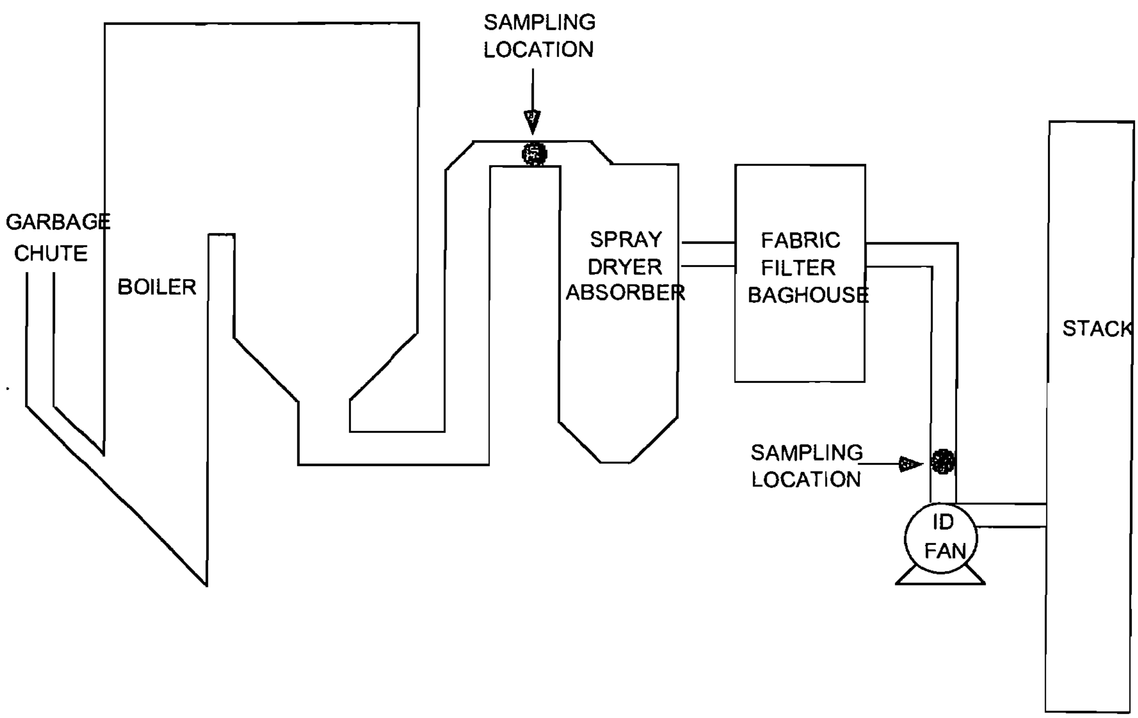


Figure 3-2: Process Schematic

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION (CONTINUED)

**Table 3-1:
Unit 1 Compliance Test Process Data**

PLANT NAME: NORTH BROWARD 2010						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 HCl	1	1	3/18/2010	07:02	08:02	183.5	320.2	6.6	510.8	38.0	30.1	7.9	13.5	1.129	1.357	641.6	All times based on CEMS time
		2	3/18/2010	09:26	10:37	184.1	320.4	5.3	510.8	37.8	28.5	9.4	15.2	1.129	1.363	765.5	
		3	3/18/2010	11:49	12:49	182.8	320.1	6.4	520.1	40.7	29.9	10.8	14.2	1.129	1.357	880.2	
					Avg	183.4	320.2	6.1	513.9	38.8	29.5	9.4	14.3	1.129	1.359	762.4	
M-29/5 Metals PM	1	1	3/16/2010	07:21	09:32	183.9	310.4	6.3	521.3	39.2	29.5	9.8	14.9	1.104	1.095	640.6	All times based on CEMS time
		2	3/16/2010	10:00	12:11	184.4	312.5	6.1	524.0	39.3	28.8	10.5	15.1	1.101	1.061	671.0	
		3	3/16/2010	12:36	14:47	183.4	320.2	6.3	529.0	40.0	32.9	7.2	14.5	1.104	1.091	468.0	
					Avg	183.9	314.4	6.2	524.8	39.5	30.4	9.1	14.8	1.103	1.082	593.2	
M-13B HF	1	1	3/17/2010	11:46	12:56	184.0	320.1	6.4	543.7	47.4	42.5	4.9	11.2	1.117	1.232	362.2	All times based on CEMS time
		2	3/17/2010	13:15	14:27	184.0	319.9	6.4	541.6	46.7	41.0	5.7	11.3	1.116	1.228	416.3	
		3	3/17/2010	14:45	15:53	184.1	319.8	6.3	539.4	45.2	39.4	5.8	11.7	1.117	1.230	425.1	
					Avg	184.0	319.9	6.4	541.6	46.4	41.0	5.4	11.4	1.117	1.230	401.2	

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION (CONTINUED)

Table 3-2:
Unit 2 Compliance Test Process Data

PLANT NAME: NORTH BROWARD 2010						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 HCl	2	1	3/17/2010	06:54	07:54	184.7	323.0	6.1	518.1	38.0	31.0	7.0	14.9	1.109	1.136	474.4	All times based on CEMS time
		2	3/17/2010	09:02	10:02	184.2	319.5	6.2	512.2	41.2	35.7	5.5	13.6	1.113	1.184	388.6	
		3	3/17/2010	10:25	11:25	184.9	319.4	6.1	509.6	38.2	34.8	3.4	14.1	1.117	1.229	249.2	
					Avg	184.6	320.6	6.1	513.3	39.1	33.9	5.3	14.2	1.113	1.183	370.7	
M-29/5 Metals PM	2	1	3/18/2010	07:09	09:22	183.9	320.0	5.2	515.0	39.3	33.2	6.1	12.3	1.128	1.354	493.1	All times based on CEMS time
		2	3/18/2010	09:49	12:02	182.9	320.2	5.4	515.2	38.6	32.8	5.9	12.4	1.129	1.361	481.0	
		3	3/18/2010	12:27	14:39	183.9	320.6	6.3	520.2	41.4	34.3	7.1	11.7	1.128	1.354	579.2	
					Avg	183.6	320.3	5.6	516.8	39.8	33.4	6.4	12.1	1.128	1.356	517.8	
M-23 dioxins	2	1	3/16/2010	08:44	13:36	184.1	314.2	6.1	505.6	37.6	30.0	7.6	15.8	1.101	1.063	487.3	All times based on CEMS time
		2	3/17/2010	06:54	12:19	184.3	321.2	6.1	513.8	39.3	34.0	5.4	14.3	1.113	1.184	380.1	
		3	3/17/2010	12:53	17:26	183.9	320.3	6.1	523.4	43.1	39.3	3.9	12.3	1.117	1.231	285.1	
					Avg	184.1	318.6	6.1	514.2	40.0	34.4	5.6	14.2	1.110	1.159	384.1	
M-13B HF	2	1	3/18/2010	07:09	08:24	183.9	320.6	5.9	514.0	39.3	32.8	6.5	12.3	1.129	1.357	530.0	All times based on CEMS time
		2	3/18/2010	08:56	10:10	184.2	319.6	3.4	512.5	37.4	31.9	5.5	12.8	1.129	1.359	448.5	
		3	3/18/2010	10:45	12:05	183.0	319.9	6.0	514.7	38.4	32.1	6.3	12.5	1.129	1.360	512.4	
					Avg	183.7	320.0	5.1	513.8	38.3	32.2	6.1	12.5	1.129	1.359	497.0	

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION (CONTINUED)

Table 3-3:
Unit 3 Compliance Test Process Data

PLANT NAME: NORTH BROWARD
2010

Test	Unit No.	Run No.	Date	Time Start	Time Stop	Data From DCS Printouts: 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	Calculated: Slurry Flow gpm	Slurry Conc. %	Lime Feed Rate: Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	3	1	3/16/2010	07:17	08:17	184.6	309.9	6.3	507.3	35.8	26.2	9.7	16.1	1.113	1.183	685.0	All times based on CEMS time
HCl		2	3/16/2010	09:04	10:04	184.1	310.1	6.3	514.4	37.4	24.2	13.3	19.1	1.100	1.051	837.4	
		3	3/16/2010	10:32	11:32	184.3	309.9	6.4	513.4	37.5	27.0	10.5	18.6	1.101	1.059	667.2	
					Avg	184.3	310.0	6.3	511.7	36.9	25.8	11.1	17.9	1.105	1.098	729.9	
M-29/5	3	1	3/17/2010	06:50	09:03	184.2	315.0	6.4	518.9	37.8	33.4	4.5	14.8	1.109	1.142	304.9	All times based on CEMS time
Metals		2	3/17/2010	09:26	11:38	184.2	314.9	6.4	518.1	37.8	33.6	4.2	14.4	1.115	1.214	303.7	
PM		3	3/17/2010	11:59	14:11	183.5	315.2	6.4	521.6	38.7	34.7	4.0	13.7	1.117	1.230	295.2	
					Avg	184.0	315.0	6.4	519.5	38.1	33.9	4.2	14.3	1.114	1.195	301.3	
M-13B	3	1	3/16/2010	11:49	13:07	183.7	310.2	6.5	517.3	38.8	28.2	10.6	15.1	1.102	1.074	684.4	All times based on CEMS time
HF		2	3/16/2010	13:33	14:44	183.9	309.6	6.4	523.8	41.3	36.1	5.2	14.0	1.105	1.098	339.3	
		3	3/16/2010	15:07	16:16	184.2	309.8	6.3	518.2	38.9	34.5	4.4	14.7	1.106	1.113	293.8	
					Avg	184.0	309.9	6.4	519.7	39.7	32.9	6.7	14.6	1.104	1.095	439.2	

DESCRIPTION OF SAMPLING LOCATIONS

Sampling point locations were determined according to EPA Method 1.

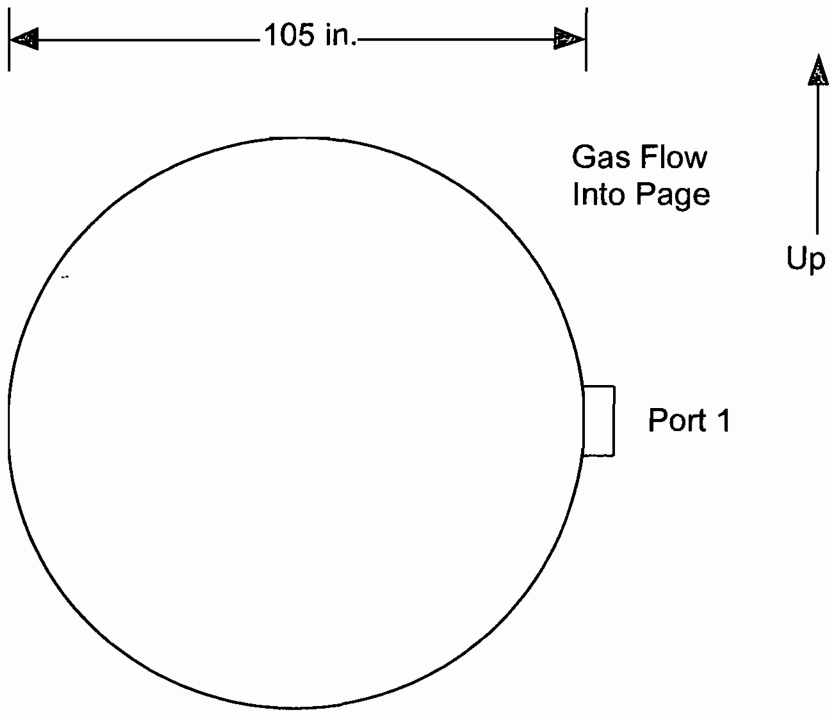
Table 3-4 outlines the sampling point configurations. Figures 3-3 and 3-4 (on pages 3-7 and 3-8) illustrate the sampling points and orientation of sampling ports for each of the sources that were tested in the program.

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 2 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 SAMPLING LOCATIONS (CONTINUED)



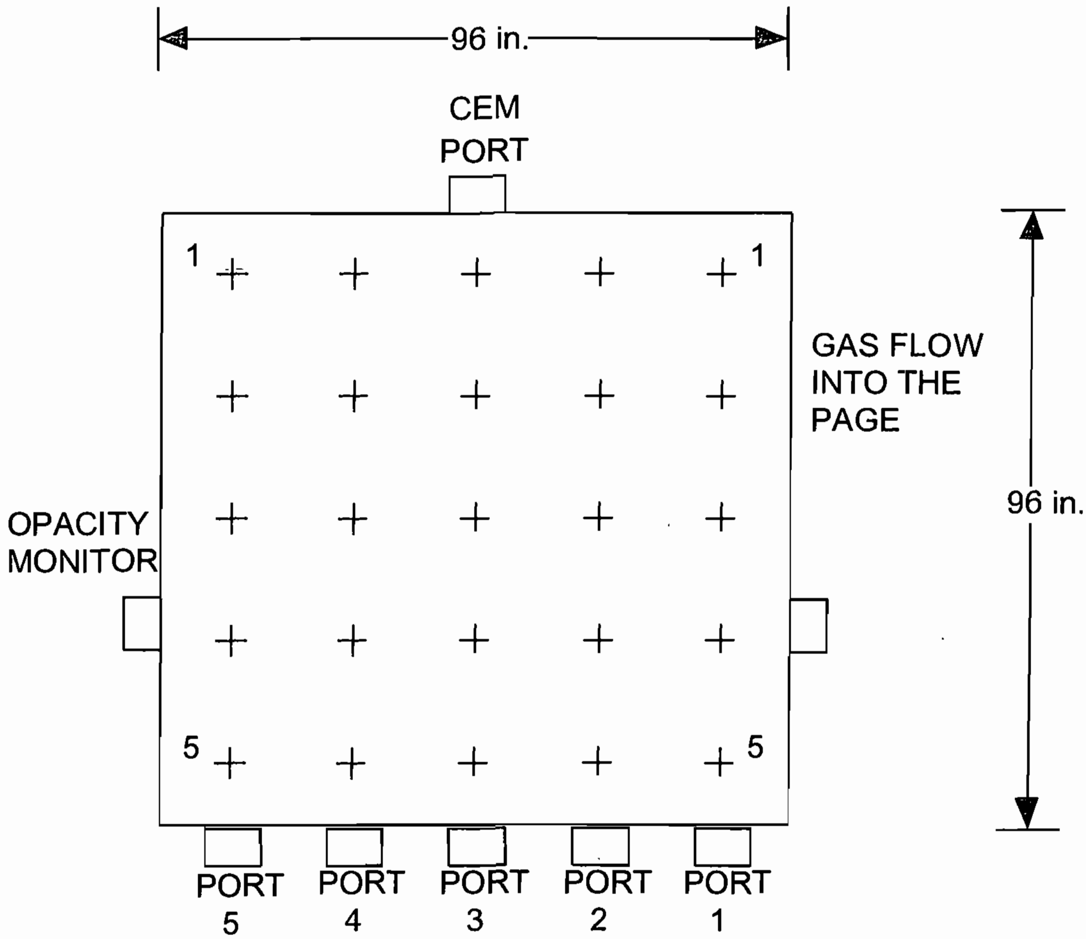
Sampling Point	Port to Point Distance (in.)
1	approximate center

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] Hydrogen chloride testing utilized a modification of EPA Method 26A (single point constant sampling rate) at the inlet and outlet sampling locations.

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

5-1

TEST METHOD SPECIFICATIONS

A

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Specification Sheet for EPA Method 5/29

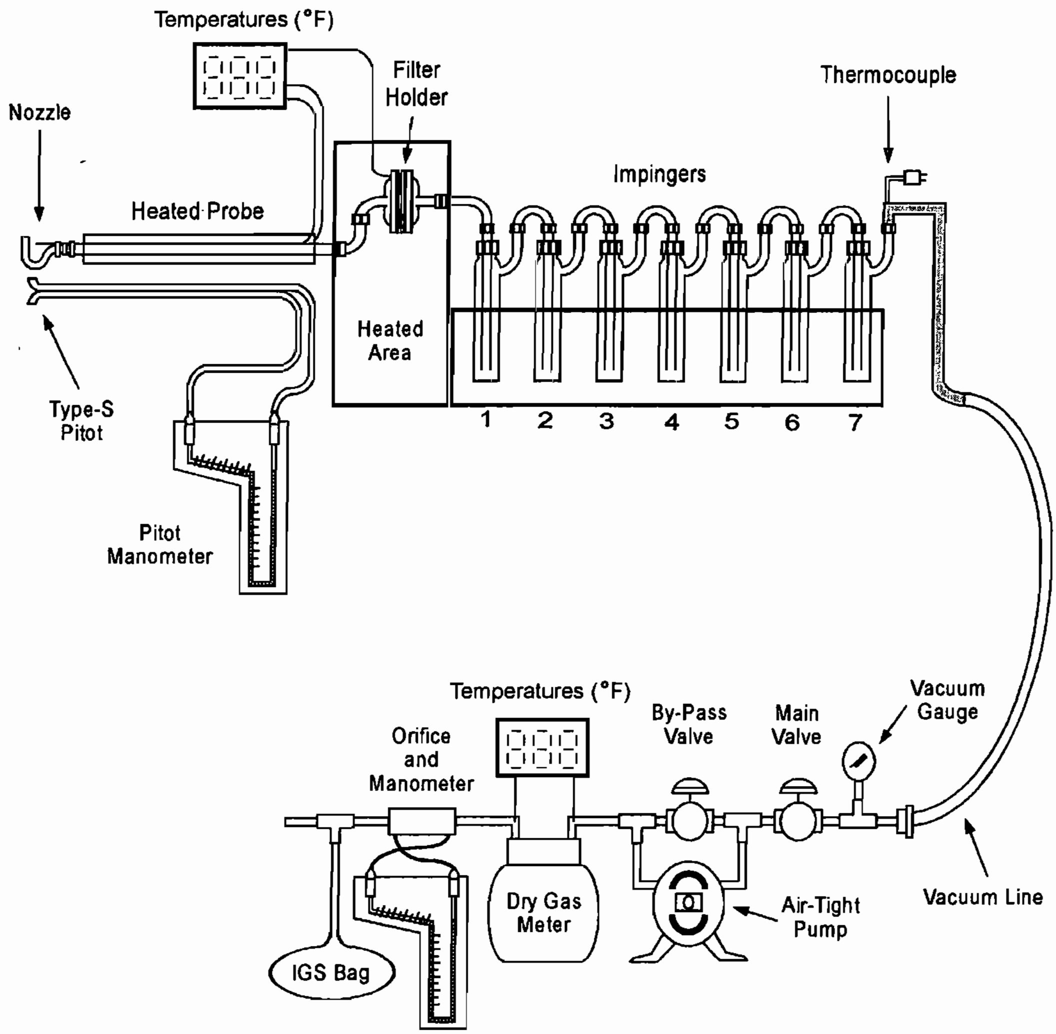
Source Location Name(s)	Units 1, 2 and 3 FF Outlets
Pollutant(s) to be Determined	Particulate Matter (PM) and Trace Metals (including Mercury)
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	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	0.805
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



<u>Impinger Contents</u>

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

Wash with soap and hot tap water

↓

Rinse 3X with hot tap water

↓

Rinse 3X with D.I. water

↓

Soak in 10% nitric acid bath for 4 hours

↓

Rinse 3X with D.I. water

↓

Rinse 3X with metals grade acetone

↓

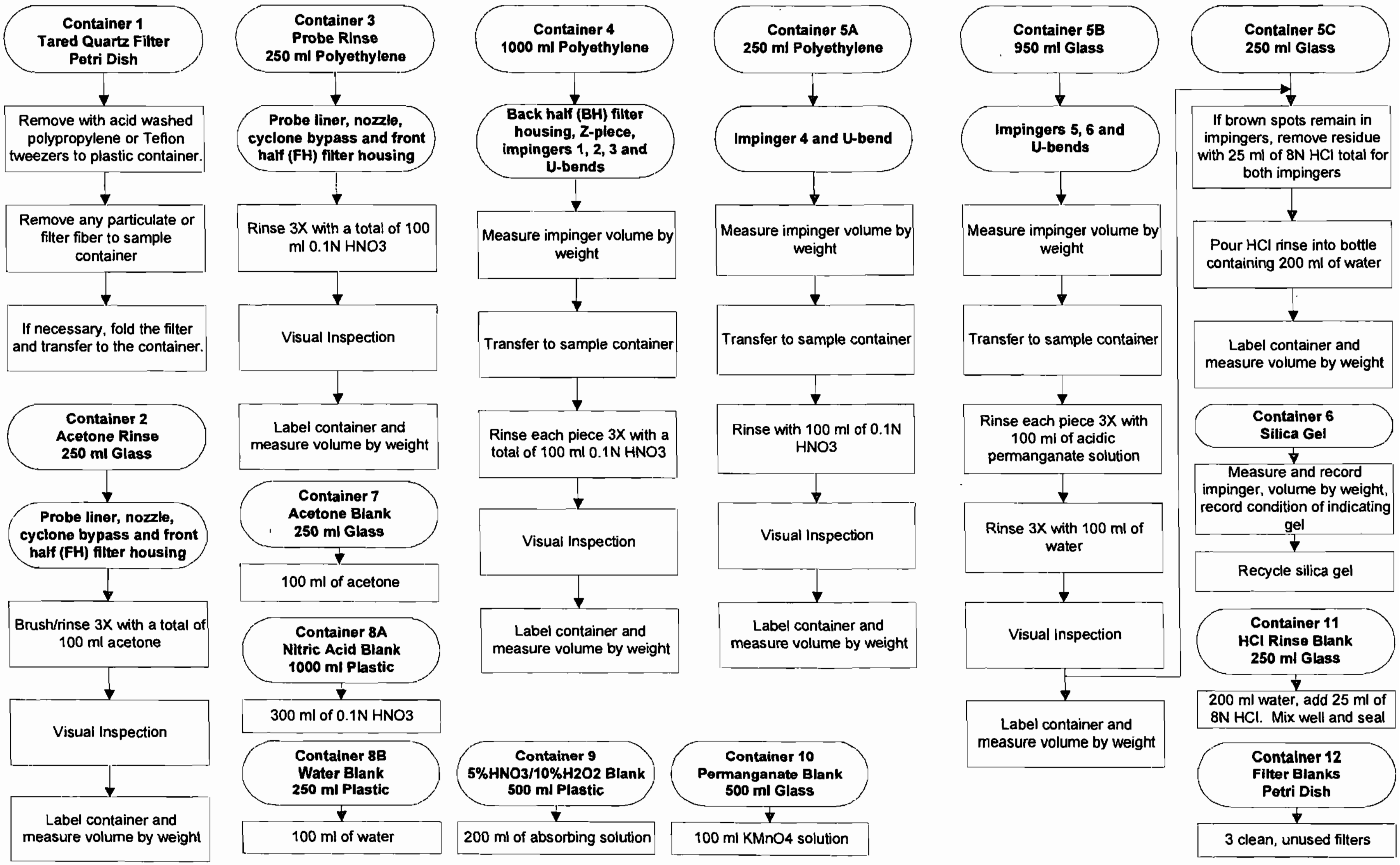
Allow to air dry

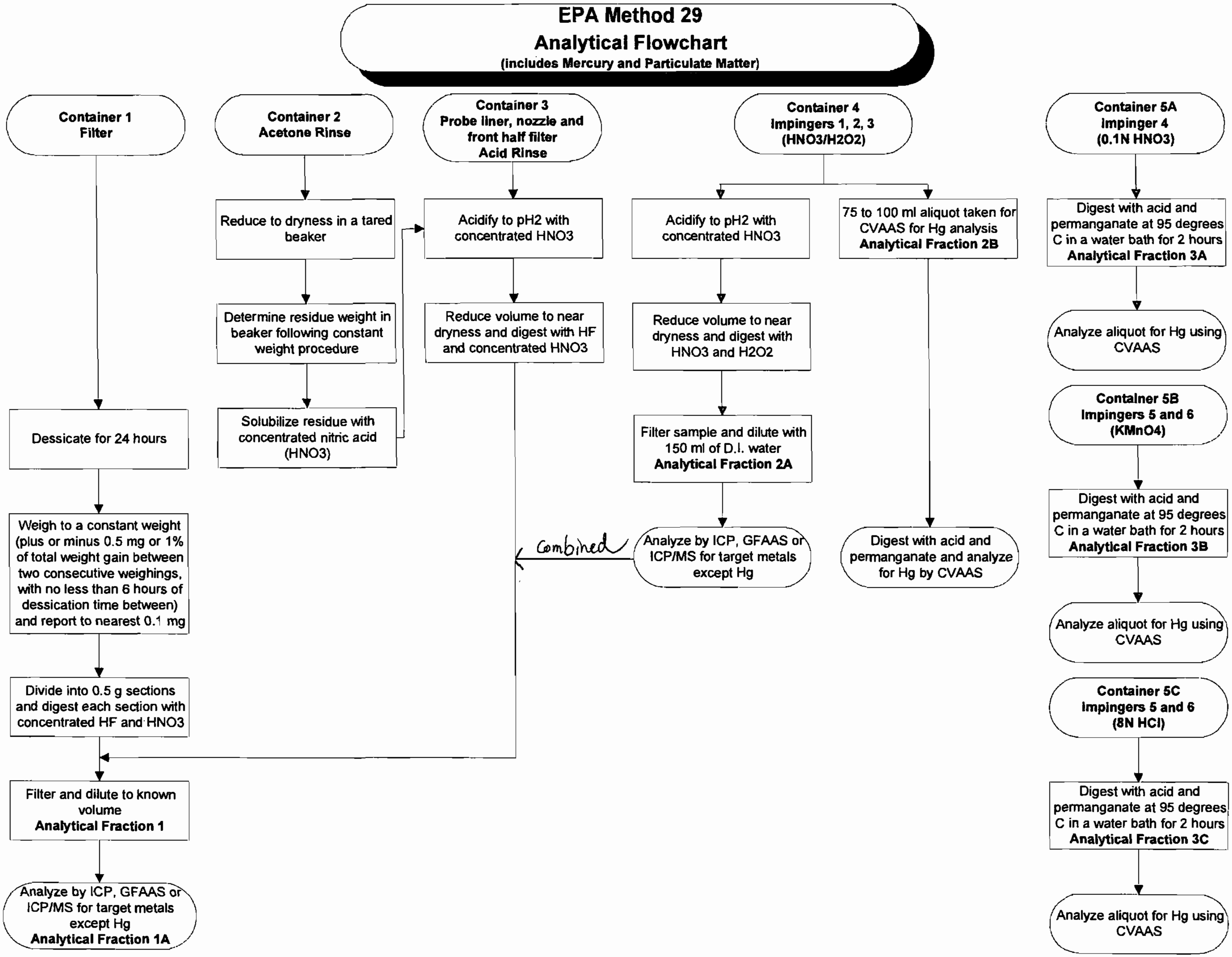
↓

Cover all openings with parafilm

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




EPA Method 29
Analytical Flowchart
(includes Mercury and Particulate Matter)
Container 1
Filter
Container 2
Acetone Rinse
Container 3
Probe liner, nozzle and front half filter
Acid Rinse
Container 4
Impingers 1, 2, 3
(HNO3/H2O2)
Container 5A
Impinger 4
(0.1N HNO3)
Reduce to dryness in a tared beaker
Acidify to pH2 with concentrated HNO3
Acidify to pH2 with concentrated HNO3
75 to 100 ml aliquot taken for CVAAS for Hg analysis
Analytical Fraction 2B
Digest with acid and permanganate at 95 degrees C in a water bath for 2 hours
Analytical Fraction 3A
Determine residue weight in beaker following constant weight procedure
Reduce volume to near dryness and digest with HF and concentrated HNO3
Reduce volume to near dryness and digest with HNO3 and H2O2
Analyze aliquot for Hg using CVAAS
Container 5B
Impingers 5 and 6
(KMnO4)
Dessicate for 24 hours
Solubilize residue with concentrated nitric acid (HNO3)
Filter sample and dilute with 150 ml of D.I. water
Analytical Fraction 2A
Digest with acid and permanganate at 95 degrees C in a water bath for 2 hours
Analytical Fraction 3B
Weigh to a constant weight (plus or minus 0.5 mg or 1% of total weight gain between two consecutive weighings, with no less than 6 hours of dessication time between) and report to nearest 0.1 mg
Combined
Analyze by ICP, GFAAS or ICP/MS for target metals except Hg
Digest with acid and permanganate and analyze for Hg by CVAAS
Analyze aliquot for Hg using CVAAS
Container 5C
Impingers 5 and 6
(8N HCl)
Divide into 0.5 g sections and digest each section with concentrated HF and HNO3
Digest with acid and permanganate at 95 degrees C in a water bath for 2 hours
Analytical Fraction 3C
Filter and dilute to known volume
Analytical Fraction 1
Analyze by ICP, GFAAS or ICP/MS for target metals except Hg
Analytical Fraction 1A
Analyze aliquot for Hg using CVAAS

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	0.812
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	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

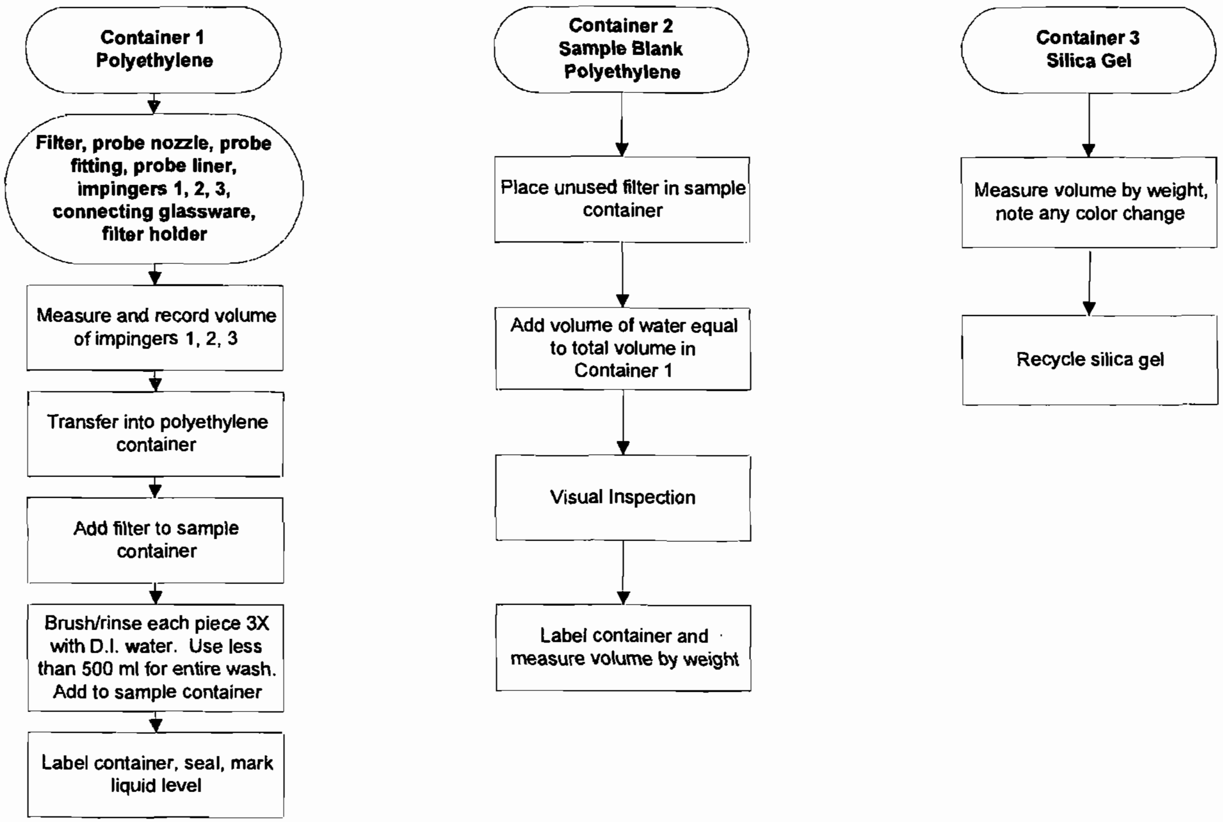
	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	4	4
Impinger Stem Types		
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
Glassware Preparation Procedures

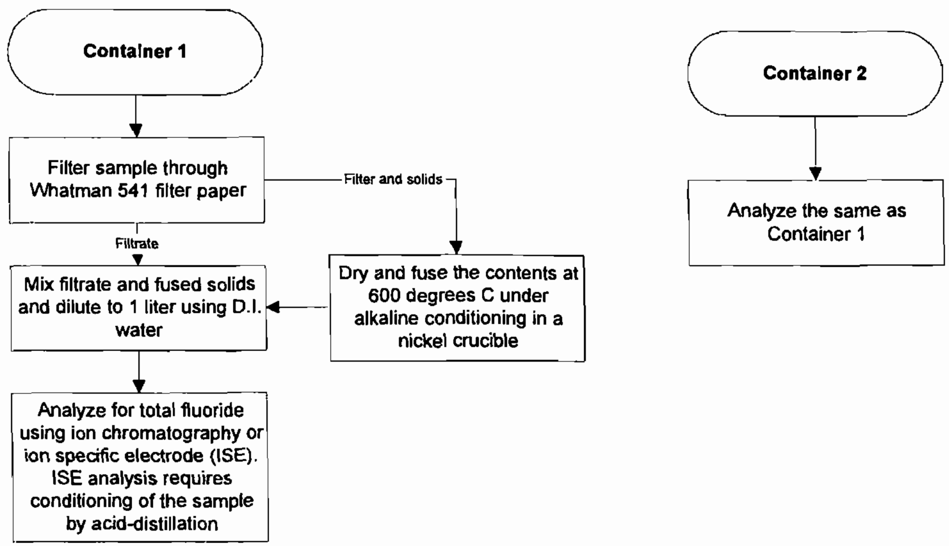
1. Wash with soap and hot tap water
2. Rinse 3X with hot tap water
3. Rinse 3X with D.I. water
4. Rinse 3X with acetone
5. Allow to air dry
6. Cap all openings with Kim Wipes

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)



EPA Method 13B
Analytical Flowchart



Specification Sheet for EPA Method 23

Source Location Name(s)	Unit 2 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	0.834
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

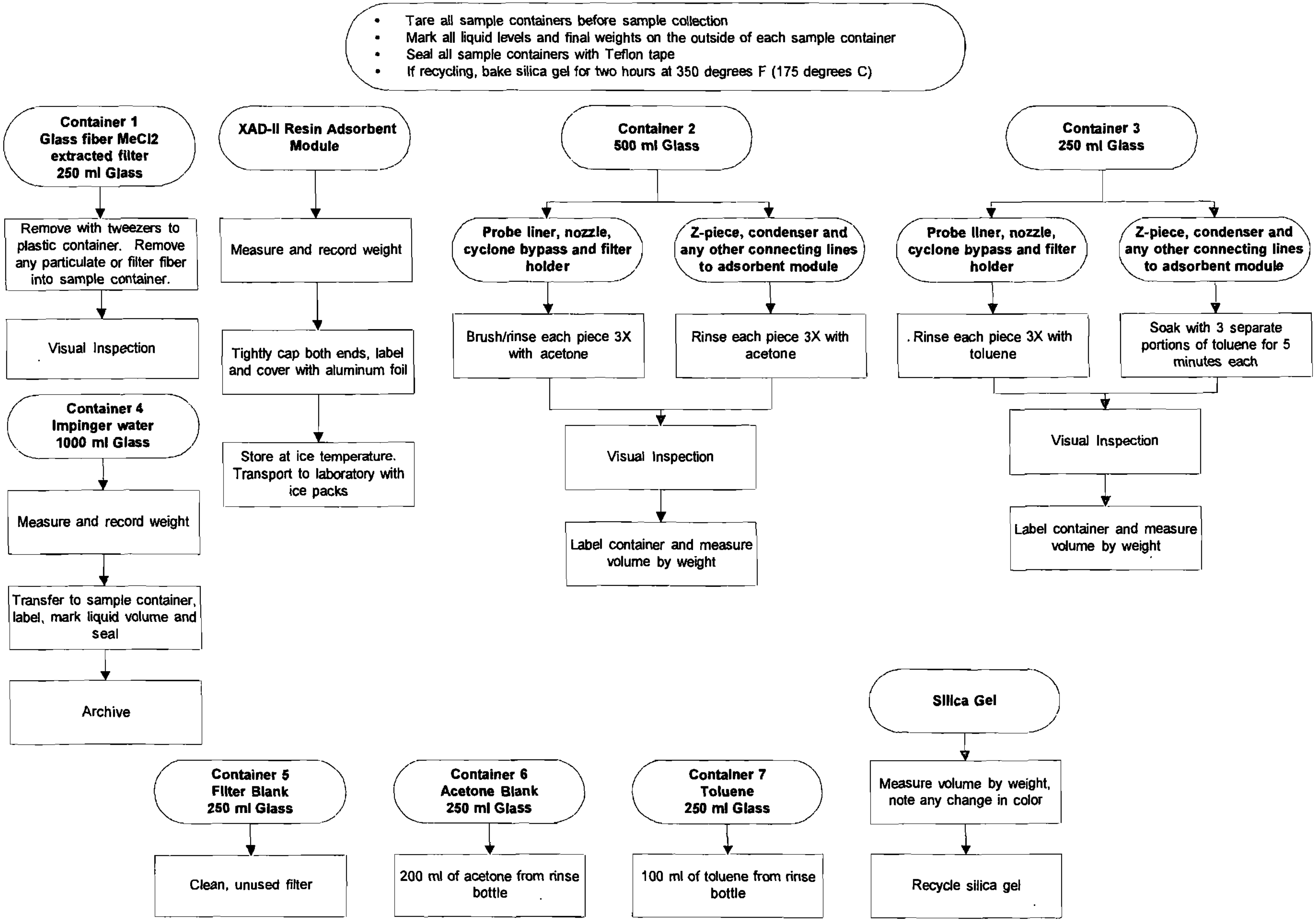
Specification Sheet for EPA Method 23

	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

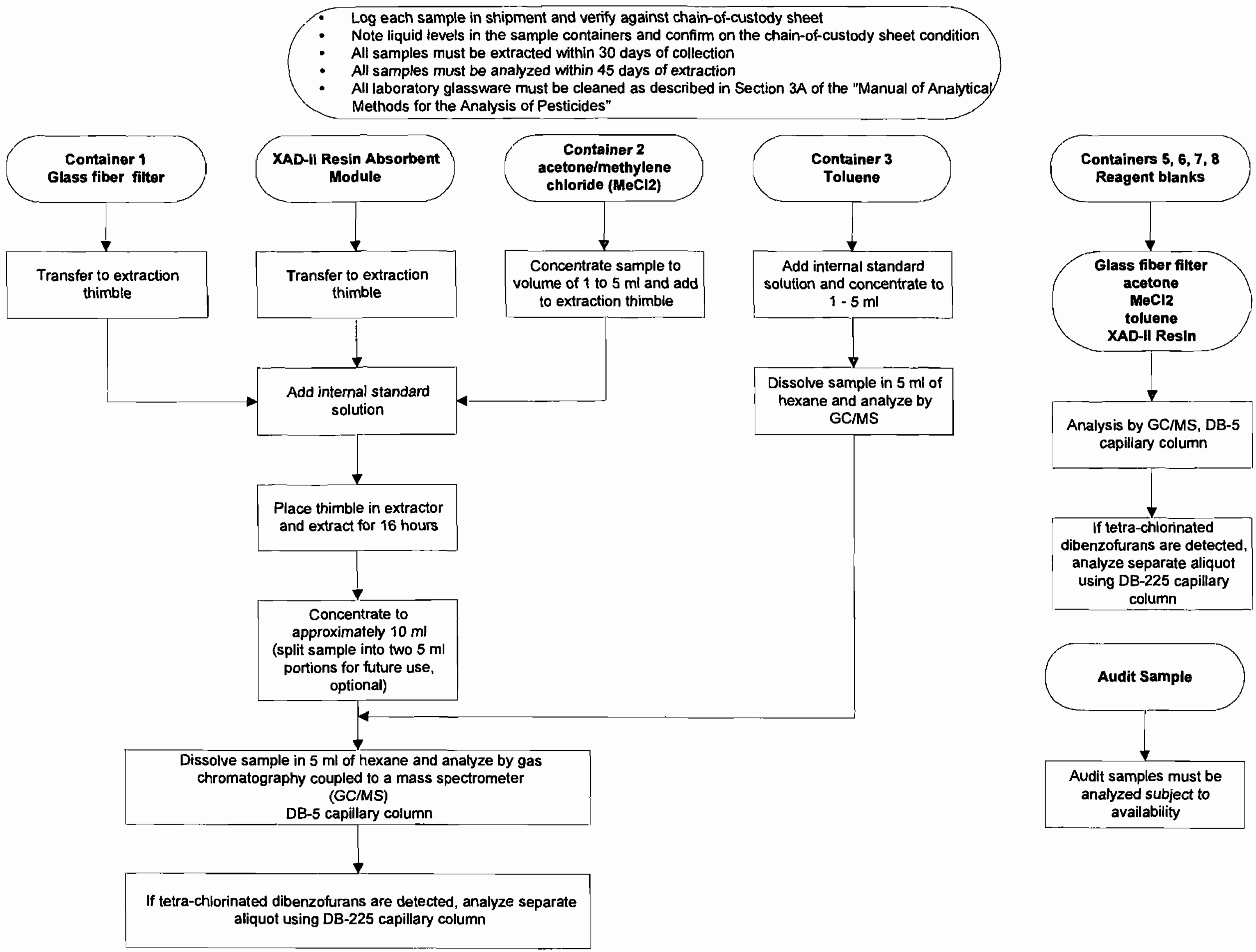
EPA Method 23
Glassware Preparation Procedures

1. Wash with soap and hot tap water
2. Rinse 3X with hot tap water
3. Rinse 3X with D.I. water
4. Oven dry at 450 degrees F for 2 hours
5. Rinse 3X with acetone
6. Rinse 3X with methylene chloride (MeCl2)
7. Allow to air dry
8. Cover all openings with MeCl2 cleaned aluminum foil

EPA Method 23
Sample Recovery Flowchart



EPA Method 23
Analytical Flowchart



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

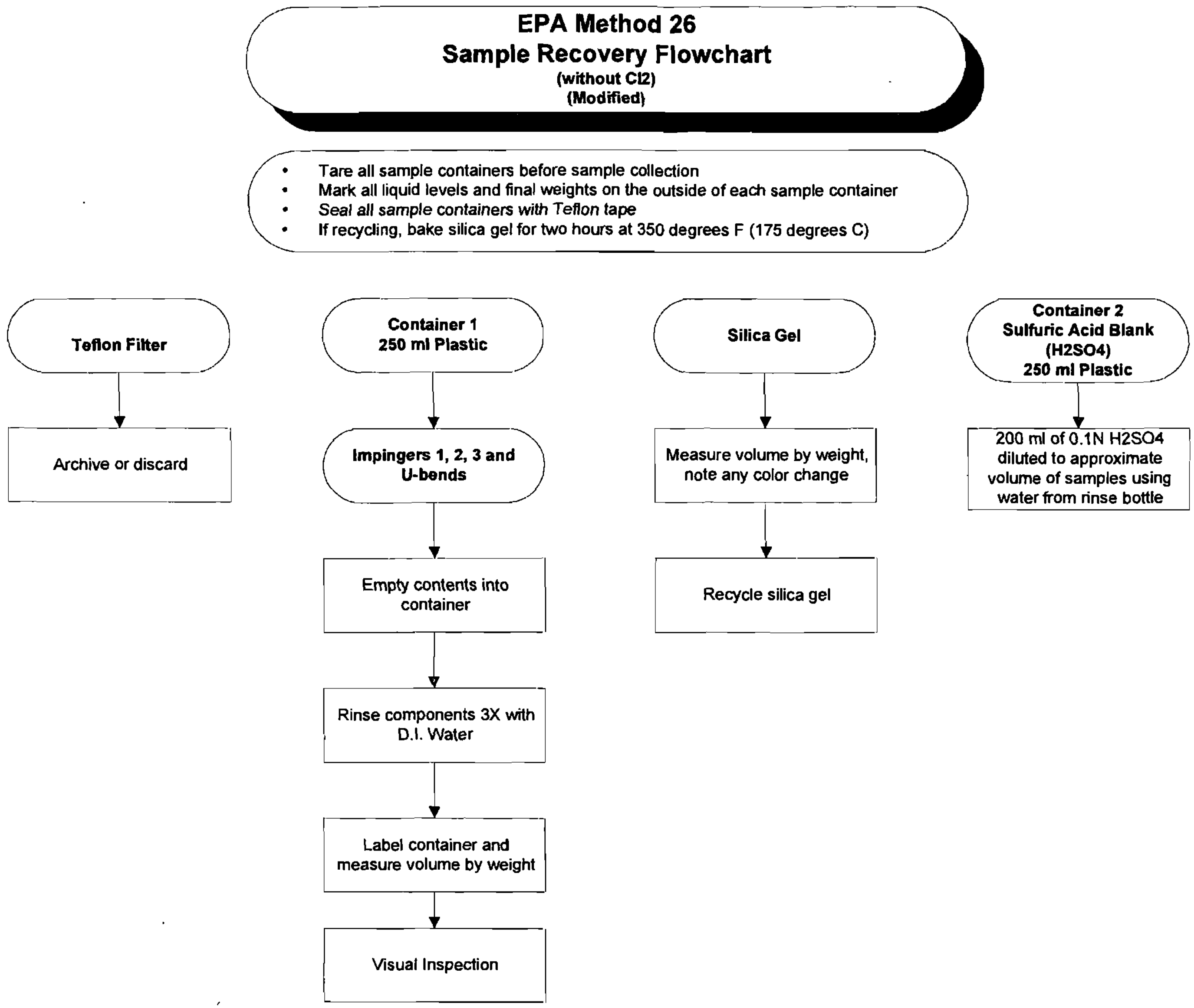
	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	60 minutes
No. of Sample Traverse Points	N/A	1
Sample Time per Point	N/A	60 minutes
Sampling Rate	Constant Rate (±10%)	Constant Rate (±10%)
Sampling Probe		
Nozzle Material	N/A	None
Nozzle Design	N/A	N/A
Probe Liner Material	Borosilicate Glass	Borosilicate Glass
Effective Probe Length	N/A	4 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

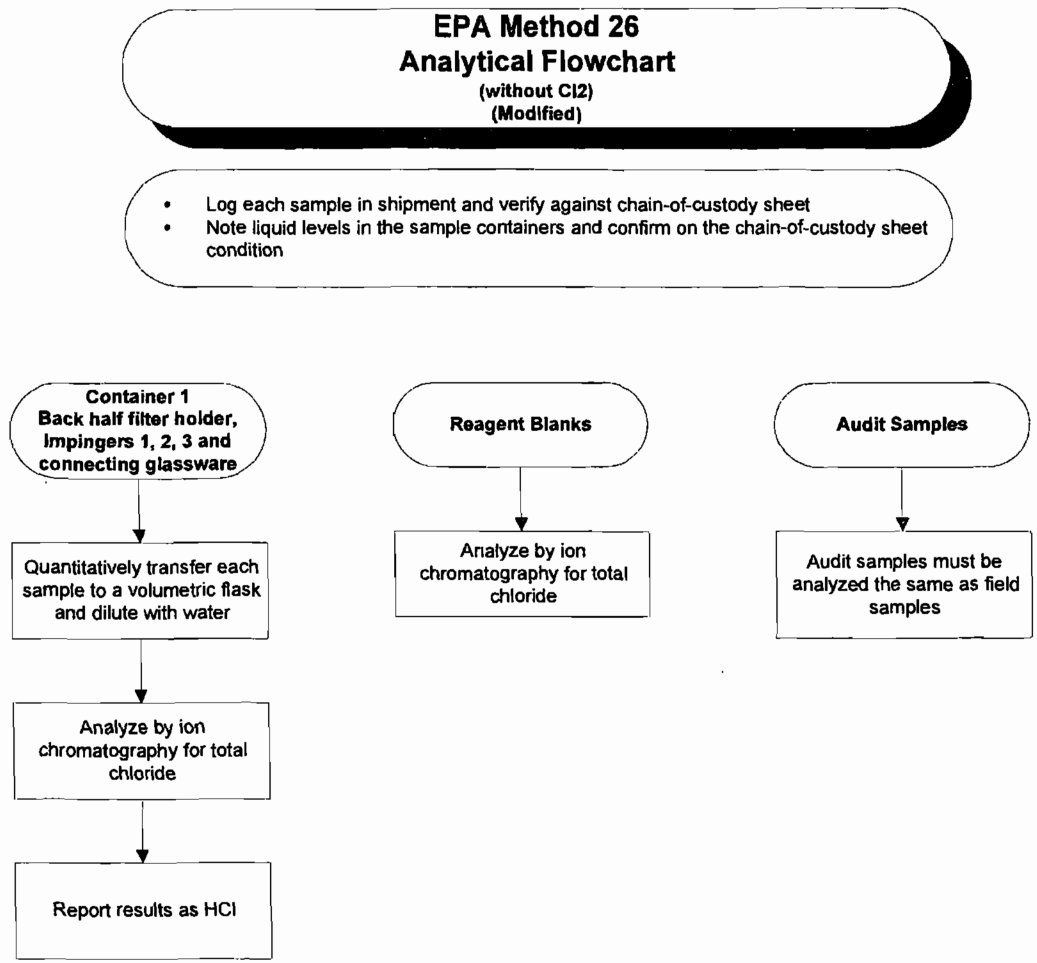
Specification Sheet for EPA Method 26A (modified)

	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

EPA Method 26A
Glassware Preparation Procedures

1. Wash with soap and hot tap water
2. Rinse 3X with hot tap water
3. Rinse 3X with D.I. water
4. Rinse 3X with acetone
5. Allow to air dry
6. Cap all openings with Kim Wipes


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)
Teflon Filter
Archive or discard
Container 1
250 ml Plastic
Impingers 1, 2, 3 and U-bends
Empty contents into container
Rinse components 3X with D.I. Water
Label container and measure volume by weight
Visual Inspection
Silica Gel
Measure volume by weight, note any color change
Recycle silica gel
Container 2
Sulfuric Acid Blank
(H2SO4)
250 ml Plastic
200 ml of 0.1N H2SO4 diluted to approximate volume of samples using water from rinse bottle


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
Container 1
Back half filter holder, Impingers 1, 2, 3 and connecting glassware
Quantitatively transfer each sample to a volumetric flask and dilute with water
Analyze by ion chromatography for total chloride
Report results as HCl
Reagent Blanks
Analyze by ion chromatography for total chloride
Audit Samples
Audit samples must be analyzed the same as field samples

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SAMPLE CALCULATIONS

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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)	=	459.4	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)	=	21.62	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)	=	30.05	in. Hg
T_m	= average dry gas meter temperature (°F)	=	69.90	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	84.67	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9904	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.46	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)	=	84.183	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)	=	30.05	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-10.60	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)	=	29.27	in. Hg

QA/QC ________
Date ________

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)	=	307.48	°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)	=	29.27	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)	=	29.27	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.27	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)	=	84.183	dscf
V_{wstd}	= *volume of water collected at standard conditions (scf)*	=	21.62	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2043	
		=	20.43	%

7. Saturated moisture content (% by volume)

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

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.27	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.27	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

QA/QC ________
Date ________

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	=	0.2043	
B_w	= actual water vapor in gas	=	0.2043	
		=	20.43	%

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 (%)	=	9.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.1	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.68	%

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 (%)	=	9.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.1	%
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)	=	29.88	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	=	0.2043	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.88	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)	=	27.45	lb/lb·mole

QA/QC ________
Date ________

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	=	0.81	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.45	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.27	in. Hg
T_s	= average sample gas temperature (°F)	=	307.48	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.782	$\sqrt{\text{in. } H_2O}$
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	52.59	ft/sec

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)	=	52.59	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	201,928	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)	=	201,928	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.27	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	307.5	°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)	=	135,904	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	=	0.2043	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	135,904	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	dscfm

QA/QC ________
Date ________

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

$$Q_{std7} = (Q_{std})\left(\frac{20.9 - O_2}{20.9 - 7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.1	%
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)	=	84,251	dscfm

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)	=	108,134	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	6,488,019	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)	=	108,134	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)	=	183,745	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)	=	183,745	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)	=	171,216	dry Nm^3/hr

20. Percent isokinetic (%)

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

Where:

D_n	= diameter of nozzle (in)	=	0.270	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2043	
P_s	= absolute sample gas pressure (in. Hg)	=	29.27	in. Hg
T_s	= average sample gas temperature (°F)	=	307.5	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	84.183	dscf
V_s	= sample gas velocity (ft/sec)	=	52.59	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 (%)	=	100.31	%

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)	=	84.67	dcf
T_m	= average dry gas meter temperature (°F)	=	69.90	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.7516	
P_{bar}	= barometric pressure (in. Hg)	=	30.05	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.460	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.88	lb/lb·mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	1.204	$\sqrt{\text{in. } H_2O}$
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	=	0.9897	

QA/QC ________
Date ________

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)	=	0.00180	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)	=	0.00180	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)	=	0.00180	g
m_{filter}	= total particulate collected on filters (g)	=	0.00180	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)	=	98.0	ml
v_{ai}	= aliquot liquid volume for solvent rinse "i" (ml)	=	98.0	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	
$r_{ai-blank}$	= blank residue for solvent "i" from gravimetric analysis (g)	=	0.00080	g
$m_{i-blank}$	= solvent rinse - blank residue (g)	=	0.00080	g

QA/QC ________
Date ________

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

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

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

Where:

			Acetone	
$m_{i\text{-blank}}$	= solvent rinse - blank residue (g)	=	0.00080	g
v_{si}	= sample liquid volume for solvent rinse "i" (ml)	=	98.0	ml
$v_{ai\text{-blank}}$	= blank liquid volume for solvent rinse "i" (ml)	=	139.0	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)	=	0.00056	g

6. Solvent rinse - net residue (g)

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

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

Where:

			Acetone	
r_{si}	= solvent rinse "i" - sample residue mass (g)	=	0.00280	g
m_{bi}	= solvent rinse "i" - maximum allowable blank correction (g)	=	0.00056	g
m_i	= solvent rinse "i" - net residue (g)	=	0.00224	g

7. Total solvent residue - (g)

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

Where:

m_1	= solvent rinse "1" - net residue (g)	=	0.00224	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)	=	0.00224	g

8. Total gravimetric result (g)

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

Where:

m_{filter}	= total particulate collected on filters (g)	=	0.00180	g
m_s	= total solvent residue (g)	=	0.00224	g
m_T	= total gravimetric result (g)	=	0.00404	g

QA/QC ________
Date ________

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)	=	0.00050	g
n_f	= number of filters in analysis	=	1	
MDL_{rinse}	= minimum detection limit for single rinse analysis (g)	=	0.00050	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)	=	0.00404	g
m_D	= total gravimetric detection limit (g)	=	0.00020	g
m_n	= total particulate matter (g)	=	0.00404	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)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
C_{sd}	= particulate concentration (lb/dscf)	=	1.0571E-07	lb/dscf

2. Particulate concentration (gr/dscf)

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

Where:

m_n	= total particulate matter (g)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
15.43	= conversion factor (gr/g)	=	15.43	gr/g
C_{sd}	= particulate concentration (gr/dscf)	=	0.00074	gr/dscf

3. Particulate concentration (mg/dscm)

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

Where:

m_n	= total particulate matter (g)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	1.69287	mg/dscm

QA/QC ________
Date ________

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)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	1.81674	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)	=	0.00074	gr/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= particulate concentration corrected to x%O_2 (gr/dscf)	=	0.00095	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)	=	0.00074	gr/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.3	%
C_{sdy}	= particulate concentration corrected to y%CO_2 (gr/dscf)	=	0.00096	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)	=	0.00074	gr/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	201,928	acfm
C_a	= particulate concentration at actual gas conditions (gr/acf)	=	0.00040	gr/acf

QA/QC ________
Date ________

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)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	108,134	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= particulate rate (lb/hr)	=	0.6859	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)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	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)	=	0.3111	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)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	108,134	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)	=	3.0041	Ton/yr

QA/QC ________
Date ________

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

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

Where:

m_n	= total particulate matter (g)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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 (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= particulate rate - F_d - based (lb/MMBtu)	=	0.00195	lb/MMBtu

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

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

Where:

m_n	= total particulate matter (g)	=	0.00404	g
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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 (%)	=	9.3	%
100	= conversion factor	=	100	
E_{Fc}	= particulate rate - F_c - based (lb/MMBtu)	=	0.00208	lb/MMBtu

QA/QC ________
Date ________

LOGIC FOR TREATING DETECTION LIMITS

(mercury only)

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

Rule	CASE 1 All 5 fractions are D.	CASE 2 1 to 4 fractions are ND	CASE 3 All 5 fractions are ND
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

Rule	CASE 1 All 5 fractions are D.	CASE 2 1 to 4 fractions are ND	CASE 3 All 5 fractions are ND
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 ($m_{T-B-allow}$)

Rule	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
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)

Rule	CASE 1 All 5 fractions are D. $m_{Total-S} - m_{T-B-allow} \geq$ MIN(MDL)	CASE 2 1 to 4 sample fractions are ND $m_{Total-S} - m_{T-B-allow} \geq$ 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)
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]

Laboratory Data

m_n	Net matter collected (g)

Filterable Particulate Results

C_{sd}	Particulate Concentration (mg/dscm)
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)

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.

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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K

1. Total blank amount (µg)

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

Where:

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

$m_{1b\text{-}S}$	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
$m_{2b\text{-}S}$	= mercury amount in sample for Fraction 2b	=	9.1977	µg
$m_{3a\text{-}S}$	= mercury amount in sample for Fraction 3a	=	<0.2000	µg
$m_{3b\text{-}S}$	= mercury amount in sample for Fraction 3b	=	<0.5000	µg
$m_{3c\text{-}S}$	= mercury amount in sample for Fraction 3c	=	<0.4000	µg
$m_{total\text{-}S}$	= total amount of mercury in sample	=	9.1977	µg

3. Allowable blank correction (µg)

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

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

Laboratory Data

m Net matter collected (g)

Filterable Particulate Results

C Particulate Concentration (mg/dscm)

C Particulate Concentration @7% O_2 (mg/dscm)

Where:

$m_{total\text{-}B}$	= total amount of mercury in blank	=	<1.4000	µg
$m_{total\text{-}S}$	= total amount of mercury in sample	=	9.1977	µg
0.05 x $m_{total\text{-}S}$	= 5% of $m_{total\text{-}S}$	=	0.4599	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{T\text{-}B\text{-}allow}$	= total allowable blank correction	=	0.0000	µg

NOTE: In this case, the second criteria applies.

QA/QC ________
Date ________

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	=	9.1977	µg
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg
m_n	= total mercury in sample corrected for allowable blank	=	9.1977	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	=	9.1977	µg
m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	9.1977	µg
m_{3a-S}	= mercury amount in sample for Fraction 3a	=	<0.2000	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	=	9.1977	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	=	9.1977	µg
m_{n-3a}	= mercury corrected for blank - prorated for Fraction 3a	=	<0.2000	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

QA/QC ________
Date ________

USEPA Method 5/29
Mercury 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_K

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)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	2.4092E-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)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= mercury concentration (µg/dscm)	=	3.8579E+00	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)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf

Laboratory Data

m Net matter collected (g)

Filterable Particulate Results

C Particulate Concentration (mg/dscm)

C Particulate Concentration @7% O_2 (mg/dscm)

35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= mercury concentration (mg/dscm)	=	3.8579E-03	mg/dscm

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SS Metals-1 Version 2006-12a

QA/QC ________
Date ________

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)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	4.1402E+00	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)	=	2.4092E-10	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= mercury concentration corrected to x% oxygen (lb/dscf)	=	3.0921E-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)	=	2.4092E-10	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.3	%
C_{sdy}	= mercury conc. corrected to y% carbon dioxide (lb/dscf)	=	3.1254E-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)	=	2.4092E-10	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	201,928	acfm
C_a	= mercury concentration at actual gas conditions (lb/acf)	=	1.2901E-10	lb/acf

QA/QC ________
Date ________

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)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	108,134	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= mercury emission rate (lb/hr)	=	1.5631E-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)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	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)	=	1.9691E-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)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	108,134	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)	=	6.8462E-03	Ton/yr

QA/QC ________
Date ________

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

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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 (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= mercury emission rate - Fd-based (lb/MMBtu)	=	4.4493E-06	lb/MMBtu

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

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	9.1977	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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 (%)	=	9.3	%
100	= conversion factor	=	100	
E_{Fc}	= mercury emission rate - Fc-based (lb/MMBtu)	=	4.7402E-06	lb/MMBtu

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Date ________

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	CASE 2
	m_{FB} = D	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	CASE 2
	$m_{FS} - m_{FB\text{-}allow} \geq$ MDL	$m_{FS} - m_{FB\text{-}allow} <$ 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	CASE 2
	m_{BB} = D	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	CASE 2
	$m_{BS} - m_{BB\text{-}allow} \geq$ MDL	$m_{BS} - m_{BB\text{-}allow} <$ 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)

Laboratory Data			
	m_n	Net matter collected (g)	
Filterable Particulate Results			
	C_{sd}	Particulate Concentration (mg/dscm)	
	C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	
	CASE 1	**CASE 2**	**CASE 3**
	Both are D	One is D, other is ND	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 summation:
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
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.

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N

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)

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

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)

Laboratory Data
m Net matter collected (g)

Filterable Particulate Results
C Particulate Concentration (mg/dscm)
C Particulate Concentration @7% O_2 (mg/dscm)

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

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

QA/QC ________
Date ________

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.

041210 140337
K_N

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)	=	84.1826	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)	=	<1.3097E-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)	=	84.1826	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= beryllium concentration (µg/dscm)	=	<2.0972E-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)	=	84.1826	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)	=	<2.0972E-05	mg/dscm

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QA/QC ________
Date ________

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)	=	84.1826	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)	=	<2.2507E-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)	=	<1.3097E-12	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= beryllium concentration corrected to x% oxygen (lb/dscf)	=	<1.6809E-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)	=	<1.3097E-12	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.3	%
C_{sdy}	= beryllium conc. corrected to y% carbon dioxide (lb/dscf)	=	<1.6990E-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)	=	<1.3097E-12	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	201,928	acfm
C_a	= beryllium concentration at actual gas conditions (lb/acf)	=	<7.0133E-13	lb/acf

QA/QC ________
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)	=	84.1826	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)	=	108,134	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= beryllium emission rate (lb/hr)	=	<8.4971E-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)	=	84.1826	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	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)	=	<1.0704E-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)	=	84.1826	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)	=	108,134	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)	=	<3.7217E-05	Ton/yr

QA/QC ________
Date ________

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)	=	84.1826	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 (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= beryllium emission rate - Fd-based (lb/MMBtu)	=	<2.4187E-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)	=	84.1826	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 (%)	=	9.3	%
100	= conversion factor	=	100	
E_{Fc}	= beryllium emission rate - Fc-based (lb/MMBtu)	=	<2.5768E-08	lb/MMBtu

QA/QC ________
Date ________

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.

041210 140523
N

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	$\mu g/in^2$
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)

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

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	=	0.4679	µg
A+1	= max combined front- & back-half blank correction criteria	=	12.46	µg
$0.05 \times m_{FS}$	= 5% of combined front- and back-half sample amount	=	0.0234	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{FB\text{-}allow}$	= 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)

Laboratory Data

m Net matter collected (g)

Filterable Particulate Results

C Particulate Concentration (mg/dscm)

C Particulate Concentration @7% O_2 (mg/dscm)

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

Where:

m_{FS}	= cadmium amount in combined front- and back-half sample	=	0.4679	µg
$m_{FB\text{-}allow}$	= allowable combined cadmium blank correction	=	0.0000	µg
m_n	= blank-corrected cadmium in combined sample	=	0.4679	µg

QA/QC ________
Date ________

USEPA Method 5/29
Cadmium 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.

041210 140541
K_N

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)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	1.2255E-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)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= cadmium concentration (µg/dscm)	=	1.9624E-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)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	1.9624E-04	mg/dscm

QA/QC ________
Date ________

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)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	2.1060E-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)	=	1.2255E-11	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= cadmium concentration corrected to x% oxygen (lb/dscf)	=	1.5729E-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)	=	1.2255E-11	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.3	%
C_{sdy}	= cadmium conc. corrected to y% carbon dioxide (lb/dscf)	=	1.5898E-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)	=	1.2255E-11	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	201,928	acfm
C_a	= cadmium concentration at actual gas conditions (lb/acf)	=	6.5625E-12	lb/acf

QA/QC ________
Date ________

8. Cadmium emission rate (lb/hr)

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

Where:

m_n	= cadmium collected in sample (total µg)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	108,134	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= cadmium emission rate (lb/hr)	=	7.9509E-05	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)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	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)	=	1.0016E-05	g/s

10. Cadmium emission rate (Ton/yr)

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

Where:

m_n	= cadmium collected in sample (total µg)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	108,134	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)	=	3.4825E-04	Ton/yr

QA/QC ________
Date ________

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

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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 (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= cadmium emission rate - Fd-based (lb/MMBtu)	=	2.2632E-07	lb/MMBtu

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

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	0.4679	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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 (%)	=	9.3	%
100	= conversion factor	=	100	
E_{Fc}	= cadmium emission rate - Fc-based (lb/MMBtu)	=	2.4112E-07	lb/MMBtu

QA/QC ________
Date ________

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.

041210 140559
N

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)

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

Where:

m_{FB}	= lead amount in combined front- and back-half blank	=	0.4541	µg
m_{FS}	= lead amount in combined front- and back-half sample	=	2.8948	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	=	0.1447	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	=	0.4541	µg

NOTE: In this case, the first criteria applies.

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

Laboratory Data
m Net matter collected (g)

Filterable Particulate Results
C Particulate Concentration (mg/dscm)
C Particulate Concentration @7% O_2 (mg/dscm)

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

Where:

m_{FS}	= lead amount in combined front- and back-half sample	=	2.8948	µg
$m_{FB-allow}$	= allowable combined lead blank correction	=	0.4541	µg
m_n	= blank-corrected lead in combined sample	=	2.4408	µg

QA/QC ________
Date ________

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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K_N

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)	=	2.4408	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	6.3931E-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)	=	2.4408	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= lead concentration (µg/dscm)	=	1.0238E+00	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)	=	2.4408	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	1.0238E-03	mg/dscm

QA/QC ________
Date ________

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)	=	2.4408	μg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	1.0987E+00	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)	=	6.3931E-11	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= lead concentration corrected to x% oxygen (lb/dscf)	=	8.2054E-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)	=	6.3931E-11	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.3	%
C_{sdy}	= lead conc. corrected to y% carbon dioxide (lb/dscf)	=	8.2937E-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)	=	6.3931E-11	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	201,928	acfm
C_a	= lead concentration at actual gas conditions (lb/acf)	=	3.4235E-11	lb/acf

QA/QC ________
Date ________

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)	=	2.4408	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	108,134	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= lead emission rate (lb/hr)	=	4.1479E-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)	=	2.4408	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	108,134	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)	=	5.2253E-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)	=	2.4408	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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)	=	108,134	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)	=	1.8168E-03	Ton/yr

QA/QC ________
Date ________

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

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	2.4408	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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 (%)	=	10.1	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= lead emission rate - Fd-based (lb/MMBtu)	=	1.1807E-06	lb/MMBtu

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

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	2.4408	µg
V_{mstd}	= volume metered, standard (dscf)	=	84.1826	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 (%)	=	9.3	%
100	= conversion factor	=	100	
E_{Fc}	= lead emission rate - Fc-based (lb/MMBtu)	=	1.2579E-06	lb/MMBtu

QA/QC ________
Date ________

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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N

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)	=	212.4	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)	=	10.00	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)	=	30.05	in. Hg
T_m	= average dry gas meter temperature (°F)	=	64.54	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	38.08	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9898	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.26	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)	=	38.207	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)	=	30.05	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-10.60	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)	=	29.27	in. Hg

QA/QC ________
Date ________

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)	=	306.24	°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)	=	29.27	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)	=	29.27	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.27	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)	=	38.207	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	10.00	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2074	
		=	20.74	%

7. Saturated moisture content (% by volume)

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

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.27	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.27	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

QA/QC ________
Date ________

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

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

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	=	0.2074	
B_w	= actual water vapor in gas	=	0.2074	
		=	20.74	%

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 (%)	=	9.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.0	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.69	%

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 (%)	=	9.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.0	%
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)	=	29.89	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	=	0.2074	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.89	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)	=	27.42	lb/lb·mole

QA/QC ________
Date ________

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	=	0.81	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.42	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.27	in. Hg
T_s	= average sample gas temperature (°F)	=	306.24	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.730	$\sqrt{\text{in. } H_2O}$
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	49.54	ft/sec

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)	=	49.54	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	190,226	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)	=	190,226	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.27	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	306.2	°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)	=	128,236	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	=	0.2074	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	128,236	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	101,644	dscfm

QA/QC ________
Date ________

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

$$Q_{std7} = (Q_{std})\left(\frac{20.9 - O_2}{20.9 - 7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	101,644	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.0	%
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)	=	79,560	dscfm

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)	=	101,644	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	6,098,652	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)	=	101,644	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)	=	172,717	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)	=	172,717	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)	=	160,941	dry Nm^3/hr

QA/QC ________
Date ________

20. Percent isokinetic (%)

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

Where:

D_n	= diameter of nozzle (in)	=	0.268	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2074	
P_s	= absolute sample gas pressure (in. Hg)	=	29.27	in. Hg
T_s	= average sample gas temperature (°F)	=	306.2	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	38.207	dscf
V_s	= sample gas velocity (ft/sec)	=	49.54	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 (%)	=	98.31	%

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)	=	38.08	dcf
T_m	= average dry gas meter temperature (°F)	=	64.54	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.7643	
P_{bar}	= barometric pressure (in. Hg)	=	30.05	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.256	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.89	lb/lb·mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	1.116	√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	=	1.0110	

QA/QC ________
Date ________

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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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)	=	<0.0380	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	900.0	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)	=	<0.0360	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)	=	<0.0380	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	900.0	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

QA/QC ________
Date ________

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

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

Where:

m_{HF}	= total HF collected in sample (mg)	=	<0.0360	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= total HF collected, corrected for blank (mg)	=	<0.0360	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	=	0.008	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	900.0	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)	=	0.0076	mg

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

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

Where:

m_{nb}	= total HF collected, corrected for blank (mg)	=	<0.0360	mg
m_{MDL}	= minimum detectable HF (mg)	=	0.0076	mg
m_n	= total HF value used in emission calculations (mg)	=	<0.0360	mg

QA/QC ________
Date ________

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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N_L

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)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	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)	=	<2.0784E-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)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	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)	=	<0.0400	ppmdv

3. HF concentration (ppmwv)

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

Where:

C_{sd}	= HF concentration (ppmdv)	=	<0.0400	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	20.7366	% v/v
100	= conversion factor (%)	=	100	%
C_w	= HF concentration (ppmwv)	=	<0.0317	ppmwv

QA/QC ________
Date ________

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)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= HF concentration (mg/dscm)	=	<0.0333	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)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	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)	=	<0.0357	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)	=	<0.0400	ppmdv
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.0	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= HF concentration corrected to x%O_2 (ppmdv)	=	<0.0512	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)	=	<0.0400	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.3	%
C_{sdy}	= HF concentration corrected to y%CO_2 (ppmdv)	=	<0.0517	ppmdv @ y%CO_2

QA/QC ________
Date ________

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)	=	<2.0784E-09	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	101,644	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	190,226	acfm
C_a	= HF concentration at actual gas conditions (lb/acf)	=	<1.1105E-09	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)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	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)	=	101,644	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= HF rate (lb/hr)	=	<0.0127	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)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	101,644	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)	=	<0.0057	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)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	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)	=	101,644	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)	=	<0.0555	Ton/yr

QA/QC ________
Date ________

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

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	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 (%)	=	10.0	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= HF rate (lb/MMBtu)	=	<3.8208E-05	lb/MMBtu

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

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0360	mg
V_{mstd}	= volume metered, standard (dscf)	=	38.2069	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 (%)	=	9.3	%
100	= conversion factor	=	100	
E_{Fc}	= HF rate (lb/MMBtu)	=	<4.0717E-05	lb/MMBtu

QA/QC ________
Date ________

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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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)	=	836.5	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)	=	39.37	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)	=	30.00	in. Hg
T_m	= average dry gas meter temperature (°F)	=	80.05	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	160.35	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9901	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.29	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)	=	156.061	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)	=	30.00	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-12.00	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)	=	29.12	in. Hg

QA/QC ________
Date ________

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)	=	300.64	°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)	=	29.12	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)	=	29.12	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.12	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)	=	156.061	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	39.37	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2014	
		=	20.14	%

7. Saturated moisture content (% by volume)

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

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.12	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.12	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

QA/QC ________
Date ________

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	=	0.2014	
B_w	= actual water vapor in gas	=	0.2014	
		=	20.14	%

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 (%)	=	9.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.58	%

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 (%)	=	9.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.6	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.95	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	=	0.2014	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.95	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 ________

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)	=	27.54	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.12	in. Hg
T_s	= average sample gas temperature (°F)	=	300.64	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.746	$\sqrt{\text{in. } H_2O}$
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	51.81	ft/sec

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)	=	51.81	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	198,967	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)	=	198,967	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.12	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	300.6	°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)	=	134,410	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	=	0.2014	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	134,410	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	107,335	dscfm

QA/QC ________
Date ________

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

$$Q_{std7} = (Q_{std})\left(\frac{20.9 - O_2}{20.9 - 7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	107,335	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
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)	=	86,640	dscfm

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)	=	107,335	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	6,440,103	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)	=	107,335	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)	=	182,388	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)	=	182,388	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)	=	169,952	dry Nm^3/hr

QA/QC ________
Date ________

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)	=	0.264	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2014	
P_s	= absolute sample gas pressure (in. Hg)	=	29.12	in. Hg
T_s	= average sample gas temperature (°F)	=	300.6	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	156.061	dscf
V_s	= sample gas velocity (ft/sec)	=	51.81	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 (%)	=	97.97	%

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)	=	160.35	dcf
T_m	= average dry gas meter temperature (°F)	=	80.05	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.7870	
P_{bar}	= barometric pressure (in. Hg)	=	30.00	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.294	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.95	lb/lb·mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	1.136	√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	=	0.9855	

QA/QC ________
Date ________

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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1. TEQ concentration (ng/dscm)

$$C_{sd} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right) \times 35.31$$

Where:

			Normal Case (ND & EMPC = 0)		Maximum Case (ND & EMPC fully counted)	
m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	1.6800E-02	ng	2.1100E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	156.0614	dscf	156.0614	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm	35.31	dscf/dscm
C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	3.8011E-03	ng/dscm	4.7740E-03	ng/dscm

2. TEQ concentration (ng/Nm3 dry)

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

Where:

			Normal Case		Maximum Case	
m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	1.6800E-02	ng	2.1100E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	156.0614	dscf	156.0614	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)	=	4.0792E-03	ng/Nm^3 dry	5.1233E-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:

			Normal Case		Maximum Case	
C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	3.8011E-03	ng/dscm	4.7740E-03	ng/dscm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscm/h)	=	182,388	dry std m^3/hr	182,388	dry std m^3/hr
Q_a	= volumetric flow rate at actual conditions (acm/h)	=	338,092	actual m^3/hr	338,092	actual m^3/hr
C_a	= PCDD/F TEQ concentration at actual gas conditions (ng/acm)	=	2.0506E-03	ng/acm	2.5754E-03	ng/acm

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Date ________

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)	=	3.8011E-03	ng/dscm	4.7740E-03	ng/dscm
x	= oxygen content of corrected gas (%)	=	7.0	%	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%	9.7	%
20.9	= oxygen content of ambient air (%)	=	20.9	%	20.9	%
C_{sdx}	= PCDD/F TEQ concentration (ng/dscm corrected to x% O_2)	=	4.7091E-03	ng/dscm @ x% O_2	5.9143E-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)	=	3.8011E-03	ng/dscm	4.7740E-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 (%)	=	9.7	%	9.7	%
C_{sdy}	= PCDD/F TEQ concentration (ng/dscm corrected to y% CO_2)	=	4.6831E-03	ng/dscm @ y% CO_2	5.8818E-03	ng/dscm @ y% CO_2

6. TEQ Emission rate (lb/hr)

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

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	1.6800E-02	ng	2.1100E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	156.0614	dscf	156.0614	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)	=	107,335	dscfm	107,335	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)	=	1.5287E-09	lb/hr	1.9199E-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)	=	1.6800E-02	ng	2.1100E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	156.0614	dscf	156.0614	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	107,335	dscfm	107,335	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)	=	1.9258E-10	g/sec	2.4187E-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)	=	1.6800E-02	ng	2.1100E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	156.0614	dscf	156.0614	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)	=	107,335	dscfm	107,335	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)	=	6.6956E-09	Ton/yr	8.4094E-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)	=	1.6800E-02	ng	2.1100E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	156.0614	dscf	156.0614	dscf
2.205×10^{-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 (%)	=	9.7	%	9.7	%
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)	=	4.2314E-12	lb/MMBtu	5.3145E-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)	=	1.6800E-02	ng	2.1100E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	156.0614	dscf	156.0614	dscf
2.205×10^{-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 (%)	=	9.7	%	9.7	%
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)	=	4.4354E-12	lb/MMBtu	5.5707E-12	lb/MMBtu

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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)	=	234.7	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)	=	11.04	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)	=	30.00	in. Hg
T_m	= average dry gas meter temperature (°F)	=	75.13	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	41.95	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9904	
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)	=	41.238	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)	=	30.00	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-12.50	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)	=	29.08	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)	=	309.42	°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)	=	29.08	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)	=	29.08	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.08	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)	=	41.238	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	11.04	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2113	
		=	21.13	%

7. Saturated moisture content (% by volume)

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

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.08	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.08	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

QA/QC ________
Date ________

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	=	0.2113	
B_w	= actual water vapor in gas	=	0.2113	
		=	21.13	%

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 (%)	=	9.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.70	%

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 (%)	=	9.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
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)	=	29.93	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	=	0.2113	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.93	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)	=	27.41	lb/lb·mole

QA/QC ________
Date ________

USEPA Method 26A
HCl Analyte Calculations

Sample data taken from Run 1

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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)

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

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)	=	32.2600	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	897.0	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)	=	29.7475	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)	=	<0.1	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	897.0	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)	=	29.7475	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= *total HCl collected, corrected for blank (mg)*	=	29.74746216	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)	=	897.0	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)	=	0.01383174	mg

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

$$m_n = MAXIMUM \; [m_{nb} \;\; or \;\; < m_{MDL}]$$

Where:

m_{nb}	= total HCl collected, corrected for blank (mg)	=	29.7475	mg
m_{MDL}	= minimum detectable HCl (mg)	=	0.01383174	mg
m_n	= total HCl value used in emission calculations (mg)	=	29.74746216	mg

QA/QC ________
Date ________

USEPA 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)	=	29.7475	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.2383	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)	=	1.5906E-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)	=	29.7475	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.2383	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)	=	16.8166	ppmdv

3. HCl concentration (ppmwv)

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

Where:

C_{sd}	= HCl concentration (ppmdv)	=	16.8166	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	21.1253	% v/v
100	= conversion factor (%)	=	100	%
C_w	= HCl concentration (ppmwv)	=	13.2641	ppmwv

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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)	=	29.7475	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.2383	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= HCl concentration (mg/dscm)	=	25.4710	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)	=	29.7475	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.2383	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)	=	27.3348	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)	=	16.8166	ppmdv
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= HCl concentration corrected to x%O_2 (ppmdv)	=	20.7779	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)	=	16.8166	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.7	%
C_{sdy}	= HCl concentration corrected to y%CO2 (ppmdv)	=	20.9119	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)	=	29.7475	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.2383	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 (%)	=	9.7	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= HCl rate (lb/MMBtu)	=	2.8279E-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)	=	29.7475	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.2383	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 (%)	=	9.7	%
100	= conversion factor	=	100	
E_{Fc}	= HCl rate (lb/MMBtu)	=	2.9999E-02	lb/MMBtu

QA/QC ________
Date ________

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PLANT DATA

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WHEELABRATOR NORTH BROWARD
TONS OF REFUSE PROCESSED PER STACK TEST RUN LOG (2010)

UNIT #1

Date	Test	Method #	Run #	Steam (Klb/hr)	Run Length (hr)	Trash Processed (tons)
3/18/2010	HCl	26A	1	183.5	1.00	34.0
3/18/2010	HCl	26A	2	184.1	1.02	34.8
3/18/2010	HCl	26A	3	182.8	1.00	33.9
3/16/2010	Particulate/Metals	5/29	1	183.9	2.18	74.2
3/16/2010	Particulate/Metals	5/29	2	184.4	2.18	74.4
3/16/2010	Particulate/Metals	5/29	3	183.4	2.18	74.0
3/17/2010	Fluorides	13B	1	184.0	1.17	39.9
3/17/2010	Fluorides	13B	2	184.0	1.20	40.9
3/17/2010	Fluorides	13B	3	184.1	1.13	38.5
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 #2

Date	Test	Method #	Run #	Steam (Klb/hr)	Run Length (hr)	Trash Processed (tons)
3/17/2010	HCl	26A	1	184.7	1.00	34.2
3/17/2010	HCl	26A	2	184.2	1.00	34.1
3/17/2010	HCl	26A	3	184.9	1.00	34.2
3/18/2010	Particulate/Metals	5/29	1	183.9	2.22	75.6
3/18/2010	Particulate/Metals	5/29	2	182.9	2.22	75.2
3/18/2010	Particulate/Metals	5/29	3	183.9	2.20	74.9
3/18/2010	Fluorides	13B	1	183.9	1.25	42.6
3/18/2010	Fluorides	13B	2	184.2	1.23	42.0
3/18/2010	Fluorides	13B	3	183.0	1.33	45.1
3/16/2010	Dioxins/Furans	23	1	184.1	4.87	166.0
3/17/2010	Dioxins/Furans	23	2	184.3	5.42	184.9
3/17/2010	Dioxins/Furans	23	3	183.9	4.55	154.9

UNIT #3

Date	Test	Method #	Run #	Steam (Klb/hr)	Run Length (hr)	Trash Processed (tons)
3/16/2010	HCl	26A	1	184.6	1.00	34.2
3/16/2010	HCl	26A	2	184.1	1.00	34.1
3/16/2010	HCl	26A	3	184.2	1.00	34.1
3/17/2010	Particulate/Metals	5/29	1	184.2	2.22	75.7
3/17/2010	Particulate/Metals	5/29	2	184.2	2.20	75.1
3/17/2010	Particulate/Metals	5/29	3	183.5	2.20	74.8
3/16/2010	Fluorides	13B	1	183.7	1.30	44.2
3/16/2010	Fluorides	13B	2	183.9	1.18	40.2
3/16/2010	Fluorides	13B	3	184.2	1.15	39.2
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 2010						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	3/18/2010	07:02	08:02	183.5	320.2	6.6	510.8	38.0	30.1	7.9	13.5	1.129	1.357	641.6	All times based on CEMS time
HCl		2	3/18/2010	09:26	10:37	184.1	320.4	5.3	510.8	37.8	28.5	9.4	15.2	1.129	1.363	765.5	
		3	3/18/2010	11:49	12:49	182.8	320.1	6.4	520.1	40.7	29.9	10.8	14.2	1.129	1.357	880.2	
					Avg	183.4	320.2	6.1	513.9	38.8	29.5	9.4	14.3	1.129	1.359	762.4	
M-29/5	1	1	3/16/2010	07:21	09:32	183.9	310.4	6.3	521.3	39.2	29.5	9.8	14.9	1.104	1.095	640.6	All times based on CEMS time
Metals		2	3/16/2010	10:00	12:11	184.4	312.5	6.1	524.0	39.3	28.8	10.5	15.1	1.101	1.061	671.0	
PM		3	3/16/2010	12:36	14:47	183.4	320.2	6.3	529.0	40.0	32.9	7.2	14.5	1.104	1.091	468.0	
					Avg	183.9	314.4	6.2	524.8	39.5	30.4	9.1	14.8	1.103	1.082	593.2	
M-13B	1	1	3/17/2010	11:46	12:56	184.0	320.1	6.4	543.7	47.4	42.5	4.9	11.2	1.117	1.232	362.2	All times based on CEMS time
HF		2	3/17/2010	13:15	14:27	184.0	319.9	6.4	541.6	46.7	41.0	5.7	11.3	1.116	1.228	416.3	
		3	3/17/2010	14:45	15:53	184.1	319.8	6.3	539.4	45.2	39.4	5.8	11.7	1.117	1.230	425.1	
					Avg	184.0	319.9	6.4	541.6	46.4	41.0	5.4	11.4	1.117	1.230	401.2	

Stack Test Process Data

PLANT NAME: NORTH BROWARD
2010

						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	3/17/2010	06:54	07:54	184.7	323.0	6.1	518.1	38.0	31.0	7.0	14.9	1.109	1.136	474.4	All times based on CEMS time
HCl		2	3/17/2010	09:02	10:02	184.2	319.5	6.2	512.2	41.2	35.7	5.5	13.6	1.113	1.184	388.6	
		3	3/17/2010	10:25	11:25	184.9	319.4	6.1	509.6	38.2	34.8	3.4	14.1	1.117	1.229	249.2	
					Avg	184.6	320.6	6.1	513.3	39.1	33.9	5.3	14.2	1.113	1.183	370.7	
M-29/5	2	1	3/18/2010	07:09	09:22	183.9	320.0	5.2	515.0	39.3	33.2	6.1	12.3	1.128	1.354	493.1	All times based on CEMS time
Metals		2	3/18/2010	09:49	12:02	182.9	320.2	5.4	515.2	38.6	32.8	5.9	12.4	1.129	1.361	481.0	
PM		3	3/18/2010	12:27	14:39	183.9	320.6	6.3	520.2	41.4	34.3	7.1	11.7	1.128	1.354	579.2	
					Avg	183.6	320.3	5.6	516.8	39.8	33.4	6.4	12.1	1.128	1.356	517.8	
M-23	2	1	3/16/2010	08:44	13:36	184.1	314.2	6.1	505.6	37.6	30.0	7.6	15.8	1.101	1.063	487.3	All times based on CEMS time
dioxins		2	3/17/2010	06:54	12:19	184.3	321.2	6.1	513.8	39.3	34.0	5.4	14.3	1.113	1.184	380.1	
		3	3/17/2010	12:53	17:26	183.9	320.3	6.1	523.4	43.1	39.3	3.9	12.3	1.117	1.231	285.1	
					Avg	184.1	318.6	6.1	514.2	40.0	34.4	5.6	14.2	1.110	1.159	384.1	
M-13B	2	1	3/18/2010	07:09	08:24	183.9	320.6	5.9	514.0	39.3	32.8	6.5	12.3	1.129	1.357	530.0	All times based on CEMS time
HF		2	3/18/2010	08:56	10:10	184.2	319.6	3.4	512.5	37.4	31.9	5.5	12.8	1.129	1.359	448.5	
		3	3/18/2010	10:45	12:05	183.0	319.9	6.0	514.7	38.4	32.1	6.3	12.5	1.129	1.360	512.4	
					Avg	183.7	320.0	5.1	513.8	38.3	32.2	6.1	12.5	1.129	1.359	497.0	

Stack Test Process Data

PLANT NAME: NORTH BROWARD 2010						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	3/16/2010	07:17	08:17	184.6	309.9	6.3	507.3	35.8	26.2	9.7	16.1	1.113	1.183	685.0	All times based on CEMS time
HCl		2	3/16/2010	09:04	10:04	184.1	310.1	6.3	514.4	37.4	24.2	13.3	19.1	1.100	1.051	837.4	
		3	3/16/2010	10:32	11:32	184.3	309.9	6.4	513.4	37.5	27.0	10.5	18.6	1.101	1.059	667.2	
					Avg	184.3	310.0	6.3	511.7	36.9	25.8	11.1	17.9	1.105	1.098	729.9	
M-29/5	3	1	3/17/2010	06:50	09:03	184.2	315.0	6.4	518.9	37.8	33.4	4.5	14.8	1.109	1.142	304.9	All times based on CEMS time
Metals		2	3/17/2010	09:26	11:38	184.2	314.9	6.4	518.1	37.8	33.6	4.2	14.4	1.115	1.214	303.7	
PM		3	3/17/2010	11:59	14:11	183.5	315.2	6.4	521.6	38.7	34.7	4.0	13.7	1.117	1.230	295.2	
					Avg	184.0	315.0	6.4	519.5	38.1	33.9	4.2	14.3	1.114	1.195	301.3	
M-13B	3	1	3/16/2010	11:49	13:07	183.7	310.2	6.5	517.3	38.8	28.2	10.6	15.1	1.102	1.074	684.4	All times based on CEMS time
HF		2	3/16/2010	13:33	14:44	183.9	309.6	6.4	523.8	41.3	36.1	5.2	14.0	1.105	1.098	339.3	
		3	3/16/2010	15:07	16:16	184.2	309.8	6.3	518.2	38.9	34.5	4.4	14.7	1.106	1.113	293.8	
					Avg	184.0	309.9	6.4	519.7	39.7	32.9	6.7	14.6	1.104	1.095	439.2	

Wheelabrator - N. Broward

2600 N.W. 48th Street
Pompano Beach, FL 33073
Tel: (954) 971-8701 Fax: (954) 971-8703

Ticket 362462

3/17/2010

In 10:55:55AM
Out 12:47:52PM

Account	623030
Customer	Chemical Lime Chemical Lime PO Box 7247-8945 Philadelphia. PA
Decal #	LIME1
Vehicle #	LIME1
Auto ID	0
Other	105949666
Product	9020 Lime
Qty	**25.36 Ton**
Origin	Wheelabrator No
Operator	Luisa Paredes

Price/Ton	0.00
Fees	0.00
Other	0.00
Total	0.00

	Pounds	Tons
Gross	78220	39.11
Tare	27500	13.75
Net	50720	25.36

Wheelabrator - N. Broward

2600 N.W. 48th Street
Pompano Beach, FL 33073
Tel: (954) 971-8701 Fax: (954) 971-8703

Ticket 362462

3/17/2010

In 10:55:55AM
Out 12:47:52PM

Account	623030
Customer	Chemical Lime Chemical Lime PO Box 7247-8945 Philadelphia. PA
Decal #	LIME1
Vehicle #	LIME1
Auto ID	0
Other	105949666
Product	9020
Qty	**25.36 Ton**
Origin	Wheelabrator No
Operator	Luisa Paredes

Price/Ton	0.00
Fees	0.00
Other	0.00
Total	0.00

	Pounds	Tons
Gross	78220	39.11
Tare	27500	13.75
Net	50720	25.36

C - 8

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 7:02:00
End Time: 8:02:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	26A run 1	510.76	320.18	37.95	30.07	7.88	13.47	302.94	6.61	-10.39	1.129
Unit 2		512.00	320.64	38.53	31.76	6.76	12.48	296.62	5.99	-10.30	1.129
Unit 3		507.30	314.96	34.59	30.80	3.79	13.84	302.13	6.31	-8.02	1.129

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	191.84	885.94	831.12	82.00	-0.10	274.45	1112.44	4.79	183.45	1.357
Unit 2	186.41	900.62	830.71	80.27	-0.05	271.41	1209.02	3.58	184.03	1.357
Unit 3	189.87	903.30	823.06	79.10	-0.16	280.70	1163.22	4.78	184.47	1.357

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 9:26:00
End Time: 10:37:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	26A run 2	510.81	320.37	37.84	28.48	9.36	15.24	304.06	5.33	-8.96	1.129
Unit 2		513.74	320.26	38.04	32.58	5.46	12.59	296.16	4.11	-8.28	1.129
Unit 3		510.56	315.30	36.15	31.78	4.37	13.20	302.72	6.43	-8.19	1.129

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.70	884.81	829.73	81.31	-0.09	274.60	1091.22	7.36	184.05	1.363
Unit 2	185.68	900.78	827.15	83.40	-0.07	271.66	1238.06	5.19	183.65	1.363
Unit 3	189.85	902.92	828.02	80.58	-0.13	280.85	1158.91	6.47	183.63	1.363

C - 10

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 11:49:00
End Time: 12:49:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	26A run 3	520.05	320.07	40.70	29.89	10.81	14.19	304.70	6.42	-10.26	1.129
Unit 2		514.98	320.02	38.86	30.53	8.33	12.32	295.38	6.22	-10.35	1.129
Unit 3		514.47	314.97	37.48	31.17	6.30	12.85	302.37	6.39	-8.11	1.129

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	190.84	883.32	824.80	85.05	-0.09	274.03	1116.84	4.01	182.82	1.357
Unit 2	185.20	899.91	827.36	85.46	-0.09	270.97	1218.88	6.14	183.00	1.357
Unit 3	189.19	902.10	825.44	82.33	-0.17	280.25	1171.85	3.18	183.84	1.357

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 7:21:00
End Time: 9:32:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	5/29 run 1	521.31	310.41	39.22	29.47	9.75	14.89	293.56	6.29	-9.58	1.104
Unit 2		503.87	309.92	39.36	25.13	14.23	15.18	287.89	6.17	0.00	1.104
Unit 3		509.95	310.16	36.61	25.48	11.13	17.69	297.89	6.37	-8.36	1.104

C - 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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.49	885.25	828.88	80.00	-0.10	274.46	1164.32	8.17	183.87	1.095
Unit 2	187.42	901.26	834.65	80.36	-0.10	271.35	1124.31	6.52	184.65	1.095
Unit 3	191.24	903.31	835.06	80.89	-0.25	280.72	1146.30	6.40	184.32	1.095

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 10:00:00
End Time: 12:11:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	5/29 run 2	524.01	312.53	39.30	28.76	10.54	15.09	294.96	6.24	-9.55	1.101
Unit 2		504.44	313.21	37.48	27.01	10.47	15.75	289.83	6.09	-0.35	1.101
Unit 3		514.03	309.93	37.81	27.42	10.39	17.56	298.21	6.40	-8.34	1.101

C - 12

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	193.41	885.00	832.09	79.86	-0.10	274.60	1158.93	10.33	184.37	1.061
Unit 2	186.98	900.95	834.63	80.57	-0.10	271.51	1129.20	8.65	183.97	1.061
Unit 3	191.07	902.88	833.00	81.15	-0.25	280.85	1159.86	6.39	184.17	1.061

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 12:36:00
End Time: 14:47:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	5/29 run 3	528.96	320.15	40.01	32.86	7.15	14.47	299.89	6.30	-9.68	1.104
Unit 2		510.02	319.33	37.13	32.36	4.77	15.60	295.73	6.02	-6.02	1.104
Unit 3		522.97	310.00	40.90	34.57	6.32	14.17	298.77	6.45	-8.59	1.104

C - 13

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.65	883.77	830.04	82.02	-0.10	274.21	1158.27	4.40	183.37	1.091
Unit 2	186.25	899.37	827.33	82.06	-0.09	271.12	1137.52	5.47	183.77	1.091
Unit 3	189.65	901.33	826.98	86.21	-0.25	280.52	1157.95	4.26	183.42	1.091

C - 14

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 11:46:00
End Time: 12:56:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	13B run 1	543.69	320.13	47.41	42.51	4.90	11.18	301.67	6.44	-10.51	1.117
Unit 2		508.83	320.28	37.75	34.56	3.19	13.98	296.67	6.16	-10.42	1.117
Unit 3		517.47	315.64	37.34	33.35	4.00	14.15	303.49	6.37	-8.13	1.117

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.13	885.22	827.80	90.17	-0.11	274.07	1180.68	3.97	183.97	1.232
Unit 2	187.20	899.07	830.60	83.77	-0.04	271.06	1189.49	6.41	184.11	1.232
Unit 3	188.46	901.48	824.60	81.19	-0.15	280.40	1201.87	3.92	182.84	1.232

C - 15

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 13:15:00
End Time: 14:27:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	13B run 2	541.60	319.91	46.69	41.04	5.65	11.34	300.84	6.39	-10.35	1.116
Unit 2		520.32	320.04	41.74	38.53	3.21	12.67	296.91	6.18	-10.80	1.116
Unit 3		523.92	314.91	39.46	35.44	4.02	13.43	303.75	6.40	-8.32	1.116

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.62	885.70	831.95	89.16	-0.08	273.84	1186.69	4.26	184.02	1.228
Unit 2	185.93	899.02	826.15	87.56	-0.05	270.76	1208.10	3.47	183.68	1.228
Unit 3	189.66	902.08	825.01	83.42	-0.14	280.14	1188.10	3.06	183.92	1.228

C - 16

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 14:45:00
End Time: 15:53:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	13B run 3	539.44	319.77	45.18	39.42	5.75	11.73	301.90	6.30	-10.15	1.117
Unit 2		524.93	320.26	43.88	39.65	4.23	12.08	296.82	6.09	-10.78	1.117
Unit 3		524.99	315.19	39.61	35.62	3.99	13.36	304.00	6.45	-8.34	1.117

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	193.20	885.11	834.55	87.28	-0.09	274.08	1185.17	3.91	184.10	1.230
Unit 2	186.47	899.02	827.51	88.63	-0.04	271.00	1223.99	3.28	183.70	1.230
Unit 3	189.03	901.99	822.61	83.28	-0.14	280.34	1182.88	4.43	183.81	1.230

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 6:54:00
End Time: 7:54:00

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	535.88	317.13	45.14	37.65	7.49	12.44	298.63	6.37	-10.19	1.109
Unit 2 26A run 1	518.13	322.96	37.99	31.03	6.97	14.90	297.57	6.10	-10.30	1.109
Unit 3	521.02	315.21	38.56	34.38	4.18	14.55	303.91	6.35	-8.29	1.109

C - 17

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	191.66	884.81	822.80	80.70	-0.10	274.50	1202.73	5.44	184.13	1.136
Unit 2	186.49	899.80	826.57	80.89	-0.09	271.45	1183.47	6.05	184.66	1.136
Unit 3	191.00	902.02	826.23	79.81	-0.20	280.81	1186.47	4.01	184.63	1.136

C - 18

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 9:02:00
End Time: 10:02:00

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	534.03	320.11	42.63	36.54	6.09	13.01	301.14	6.30	-9.94	1.113
Unit 2 26A run 2	512.17	319.50	41.18	35.71	5.47	13.58	297.17	6.16	-10.63	1.113
Unit 3	518.41	315.12	37.93	33.70	4.23	14.59	303.64	6.40	-8.17	1.113

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.53	884.80	831.67	84.47	-0.10	273.89	1188.83	3.00	183.98	1.184
Unit 2	186.92	899.26	830.47	84.64	-0.09	270.73	1190.54	3.04	184.19	1.184
Unit 3	190.46	901.58	830.67	81.69	-0.15	280.13	1187.25	4.27	183.70	1.184

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 10:25:00
End Time: 11:25:00

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	542.08	320.74	46.84	42.97	3.87	11.51	301.82	6.43	-10.43	1.117
Unit 2 26A run 3	509.60	319.41	38.21	34.83	3.38	14.13	296.25	6.06	-10.26	1.117
Unit 3	517.88	314.59	37.63	33.56	4.07	14.32	303.35	6.36	-8.01	1.117

C - 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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	191.05	884.66	827.58	89.75	-0.10	274.33	1179.78	3.84	183.08	1.229
Unit 2	188.03	899.89	833.74	82.10	-0.05	271.22	1191.69	5.26	184.88	1.229
Unit 3	191.54	902.09	829.31	80.09	-0.15	280.63	1186.79	4.16	184.83	1.229

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 7:09:00
End Time: 9:22:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		509.05	319.93	36.79	29.37	7.42	14.08	302.39	5.46	-9.12	1.128
Unit 2	5/29 run 1	515.00	320.03	39.29	33.22	6.07	12.25	296.06	5.18	-9.52	1.128
Unit 3		507.70	314.95	34.65	30.39	4.26	13.84	301.49	5.87	-7.55	1.128

C - 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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	193.02	885.92	832.20	80.02	-0.11	274.53	1106.97	5.48	184.14	1.354
Unit 2	186.20	900.86	828.46	80.78	-0.06	271.53	1215.36	4.63	183.91	1.354
Unit 3	190.06	903.31	825.39	79.10	-0.16	280.78	1164.72	6.11	184.32	1.354

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 9:49:00
End Time: 12:02:00

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	514.15	320.16	38.65	29.82	8.84	14.94	304.42	6.13	-9.82	1.129
Unit 2 5/29 run 2	515.23	320.23	38.64	32.75	5.89	12.40	295.98	5.37	-9.57	1.129
Unit 3	513.45	315.11	37.19	32.55	4.64	12.91	302.74	6.44	-8.24	1.129

C - 21

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.07	883.96	826.50	82.05	-0.09	274.39	1111.41	6.24	183.42	1.361
Unit 2	185.14	900.29	827.81	84.87	-0.09	271.37	1227.88	5.09	182.93	1.361
Unit 3	189.39	902.46	825.87	81.36	-0.14	280.61	1168.99	6.50	183.68	1.361

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 12:27:00
End Time: 14:39:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		508.26	319.44	35.25	27.72	7.53	14.86	303.24	6.29	-9.69	1.128
Unit 2	5/29 run 3	520.15	320.60	41.44	34.31	7.13	11.67	296.01	6.26	-10.60	1.128
Unit 3		512.88	317.77	36.36	29.39	6.97	13.26	304.35	6.42	-8.11	1.128

C - 22

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	170.05	877.67	827.72	79.85	-0.09	272.46	1071.96	4.29	160.11	1.354
Unit 2	186.31	898.06	827.61	86.45	-0.09	269.33	1213.56	6.30	183.88	1.354
Unit 3	190.78	900.35	829.24	80.90	-0.15	278.64	1172.09	4.00	184.17	1.354

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 7:09:00
End Time: 8:24:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		510.38	319.89	37.54	29.91	7.63	13.58	302.69	6.30	-10.04	1.129
Unit 2	13B run 1	514.02	320.58	39.26	32.75	6.51	12.25	296.75	5.91	-10.27	1.129
Unit 3		507.08	314.85	34.31	30.54	3.76	13.95	301.90	6.21	-7.90	1.129

C - 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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.79	886.09	833.76	80.97	-0.11	274.46	1111.03	3.56	184.03	1.357
Unit 2	185.73	900.53	827.22	80.47	-0.04	271.46	1210.14	2.53	183.90	1.357
Unit 3	189.92	903.17	822.15	78.90	-0.16	280.74	1165.19	3.32	184.43	1.357

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 8:56:00
End Time: 10:10:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		509.22	320.29	36.89	28.24	8.66	15.32	303.42	4.70	-8.29	1.129
Unit 2	13B run 2	512.53	319.63	37.41	31.91	5.50	12.84	295.23	3.36	-7.47	1.129
Unit 3		509.21	315.01	35.52	30.69	4.82	13.50	302.07	6.15	-7.83	1.129

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	193.21	885.22	829.71	79.99	-0.10	274.69	1096.14	7.36	184.35	1.359
Unit 2	186.57	901.15	827.25	81.84	-0.06	271.72	1238.36	6.29	184.23	1.359
Unit 3	190.29	903.19	828.86	79.76	-0.13	280.90	1164.70	7.14	183.96	1.359

C - 25

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/18/10
Start Time: 10:45:00
End Time: 12:05:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		515.91	320.26	39.20	30.38	8.82	14.75	304.56	6.41	-10.15	1.129
Unit 2	13B run 3	514.74	319.91	38.36	32.08	6.27	12.51	295.62	5.95	-10.10	1.129
Unit 3		515.33	315.17	37.92	32.88	5.04	12.69	302.68	6.42	-8.24	1.129

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	191.73	883.74	826.78	82.66	-0.09	274.29	1118.22	5.85	183.13	1.360
Unit 2	185.35	900.22	829.43	84.72	-0.10	271.23	1219.95	5.10	183.04	1.360
Unit 3	188.60	902.13	823.39	82.48	-0.15	280.50	1174.77	5.56	183.36	1.360

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 8:44:00
End Time: 13:36:00

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	525.17	314.21	39.66	29.53	10.14	14.93	296.10	6.26	-9.60	1.101
Unit 2 23 run 1	505.56	314.21	37.60	26.96	10.64	15.84	291.01	6.06	-0.38	1.101
Unit 3	515.85	310.20	38.53	28.18	10.35	17.08	298.31	6.40	-8.42	1.101

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.95	884.72	831.87	80.69	-0.10	274.50	1161.83	8.54	183.93	1.063
Unit 2	186.84	900.56	830.83	81.06	-0.09	271.41	1130.51	7.09	184.07	1.063
Unit 3	190.51	902.56	831.59	82.66	-0.25	280.78	1157.15	5.95	183.85	1.063

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 6:54:00
End Time: 12:19:00

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	537.55	319.46	44.75	39.24	5.51	12.31	300.57	6.38	-10.20	1.113
Unit 2 23 run 2	513.76	321.23	39.31	33.96	5.34	14.34	297.57	6.14	-10.46	1.113
Unit 3	517.78	314.97	37.53	33.27	4.26	14.63	303.48	6.36	-8.10	1.113

C - 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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.02	884.65	828.14	86.08	-0.10	274.09	1186.61	3.74	183.69	1.184
Unit 2	187.11	899.37	831.64	83.35	-0.07	270.99	1187.12	4.90	184.25	1.184
Unit 3	190.38	901.62	828.00	80.32	-0.16	280.38	1189.91	3.69	184.04	1.184

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 12:53:00
End Time: 17:26:00

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	540.04	319.73	45.57	39.94	5.63	11.61	301.42	6.31	-10.19	1.117
Unit 2 23 run 3	523.35	320.26	43.11	39.25	3.85	12.27	296.85	6.10	-10.77	1.117
Unit 3	525.77	315.08	39.99	35.98	4.01	13.23	304.01	6.41	-8.35	1.117

C - 28

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.65	885.16	830.70	87.67	-0.09	273.94	1185.54	4.34	183.90	1.231
Unit 2	186.18	898.94	826.74	88.04	-0.05	270.87	1220.36	3.31	183.85	1.231
Unit 3	189.26	901.76	822.33	84.26	-0.15	280.25	1185.92	3.41	183.82	1.231

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 7:17:00
End Time: 8:17:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		518.33	310.44	37.88	29.54	8.35	14.46	293.63	6.20	-9.44	1.113
Unit 2		502.44	309.96	39.18	28.80	10.38	14.08	287.71	6.06	0.00	1.113
Unit 3	26A run 1	507.32	309.94	35.80	26.15	9.64	16.07	297.73	6.29	-8.21	1.113

C - 29

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.35	885.37	827.64	78.35	-0.10	274.23	1163.29	7.06	184.15	1.183
Unit 2	187.30	901.20	836.77	80.06	-0.08	271.11	1138.53	5.37	184.38	1.183
Unit 3	191.60	903.26	835.02	79.72	-0.24	280.47	1143.29	4.76	184.60	1.183

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 9:04:00
End Time: 10:04:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		525.95	310.19	40.99	31.86	9.13	14.65	293.31	6.31	-9.71	1.100
Unit 2		501.87	309.30	37.44	24.16	13.28	16.28	287.41	6.01	-0.23	1.100
Unit 3	26A run 2	514.35	310.13	38.08	28.30	9.78	19.05	298.22	6.28	-8.36	1.100

C - 30

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	193.09	885.09	830.98	81.31	-0.10	274.51	1163.90	8.81	183.83	1.051
Unit 2	186.55	900.90	828.35	80.42	-0.10	271.39	1125.45	5.76	184.58	1.051
Unit 3	191.18	903.21	836.46	82.35	-0.25	280.77	1152.88	7.30	184.13	1.051

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 10:32:00
End Time: 11:32:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		523.86	310.23	39.31	28.74	10.57	15.07	293.75	6.18	-9.45	1.101
Unit 2		503.24	311.09	37.65	26.39	11.26	15.69	288.53	6.08	-0.35	1.101
Unit 3	26A run 3	513.38	309.94	37.45	26.95	10.49	18.57	298.15	6.43	-8.35	1.101

C - 31

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	194.13	885.14	834.99	79.61	-0.10	274.59	1163.54	10.29	184.51	1.059
Unit 2	186.43	900.78	829.96	80.32	-0.08	271.53	1132.18	9.15	184.21	1.059
Unit 3	190.76	902.66	829.05	80.58	-0.25	280.84	1163.19	5.38	184.30	1.059

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 6:50:00
End Time: 9:03:00

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
	DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1	534.58	318.05	43.74	36.83	6.91	12.81	299.11	6.34	-10.06	1.109
Unit 2	518.71	323.35	39.44	32.03	7.41	15.08	298.76	6.17	-10.51	1.109
Unit 3 5/29 run 1	518.91	315.03	37.81	33.36	4.45	14.79	303.64	6.36	-8.17	1.109

C - 32

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.27	884.55	827.85	82.80	-0.10	274.04	1191.48	4.22	183.87	1.142
Unit 2	186.97	899.39	832.88	83.43	-0.10	270.92	1186.05	4.44	183.94	1.142
Unit 3	190.42	901.53	826.69	80.32	-0.18	280.31	1187.65	3.35	184.19	1.142

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 9:26:00
End Time: 11:38:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		538.98	320.38	45.10	40.75	4.35	12.10	301.55	6.36	-10.22	1.115
Unit 2		510.42	319.55	39.10	35.25	3.85	13.93	296.48	6.09	-10.37	1.115
Unit 3	5/29 run 2	518.06	314.86	37.78	33.61	4.17	14.42	303.42	6.42	-8.13	1.115

C - 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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.25	884.64	829.15	87.64	-0.10	274.34	1186.25	3.50	183.60	1.214
Unit 2	187.04	899.30	828.44	83.26	-0.05	271.24	1194.99	4.18	184.42	1.214
Unit 3	190.81	901.62	827.89	80.87	-0.15	280.64	1191.68	3.95	184.22	1.214

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/17/10
Start Time: 11:59:00
End Time: 14:11:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		542.45	319.87	46.92	41.66	5.26	11.28	301.15	6.37	-10.39	1.117
Unit 2		515.10	320.36	40.06	36.91	3.15	13.21	296.88	6.12	-10.62	1.117
Unit 3	5/29 run 3	521.57	315.24	38.73	34.73	4.00	13.66	303.64	6.39	-8.28	1.117

C - 34

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.41	885.44	828.19	89.54	-0.10	273.89	1187.27	3.95	184.20	1.230
Unit 2	186.00	898.90	827.40	86.13	-0.04	270.84	1205.01	4.28	183.58	1.230
Unit 3	189.20	901.75	824.28	82.65	-0.15	280.21	1195.13	3.52	183.50	1.230

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 11:49:00
End Time: 13:07:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		523.69	319.94	38.04	26.97	11.06	15.40	299.79	6.28	-9.57	1.102
Unit 2		509.43	319.81	37.28	29.08	8.20	15.72	295.29	5.95	-0.35	1.102
Unit 3	13B run 1	517.27	310.20	38.84	28.22	10.62	15.08	298.31	6.45	-8.43	1.102

C - 35

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.55	884.15	829.65	80.35	-0.10	274.54	1160.56	7.44	183.80	1.074
Unit 2	186.80	900.09	829.77	81.31	-0.09	271.48	1134.29	6.89	184.23	1.074
Unit 3	190.41	902.08	829.29	83.16	-0.24	280.84	1159.55	4.54	183.71	1.074

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 13:33:00
End Time: 14:44:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		530.14	319.82	40.37	34.51	5.86	14.28	299.53	6.31	-9.70	1.105
Unit 2		510.14	319.00	37.06	33.48	3.58	15.57	295.41	5.98	-10.38	1.105
Unit 3	13B run 2	523.75	309.60	41.25	36.10	5.14	13.99	298.87	6.40	-8.54	1.105

C - 36

	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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	192.75	883.72	827.98	82.23	-0.09	274.23	1155.16	3.55	183.42	1.098
Unit 2	186.36	899.41	829.43	81.67	-0.10	271.14	1135.01	5.53	183.91	1.098
Unit 3	190.74	901.41	828.59	86.28	-0.25	280.52	1160.26	4.76	183.92	1.098

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 03/16/10
Start Time: 15:07:00
End Time: 16:16:00

		SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS	SPECIFIC GRAVITY
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O	" H2O
Unit 1		527.22	320.05	39.23	31.94	7.29	14.69	298.23	6.26	-9.48	1.106
Unit 2		511.31	314.91	38.17	33.82	4.35	14.94	292.16	5.97	-10.03	1.106
Unit 3	13B run 3	518.15	309.80	38.87	34.47	4.40	14.68	298.86	6.34	-8.26	1.106

C - 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	AVAILABLE CaO
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr	
Unit 1	193.35	883.40	826.50	80.32	-0.10	274.66	1156.16	5.75	184.19	1.113
Unit 2	186.33	898.06	824.13	81.28	-0.09	271.54	1172.85	4.37	184.17	1.113
Unit 3	190.60	900.56	827.40	82.97	-0.25	280.97	1167.53	6.07	184.24	1.113

Plant Name: NBWD
General Average Report
Reporting Period: 03/16/2010 to 03/16/2010

Site Name: UNIT1
Data Averaging Type: 6m

Time of Report: 03/18/10 13:21
Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/16/10	07:18	2
	07:24	2
	07:30	2
	07:36	2
	07:42	2
	07:48	2
	07:54	2
	08:00	2
	08:06	2
	08:12	2
	08:18	2
	08:24	2
	08:30	2
	08:36	2
	08:42	2
	08:48	2
	08:54	2
	09:00	2
	09:06	2
	09:12	2
	09:18	2
	09:24	2
	09:30	2
Average =		2
Geometric Avg. =		2
Maximum =		2
Minimum =		2
Possible Values =		23
Included Values =		23
Total =		43

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
E - 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: 03/16/2010 to 03/16/2010

Site Name: UNIT1
Data Averaging Type: 6m

Time of Report: 03/18/10 13:21
Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/16/10	10:00	2
	10:06	2
	10:12	2
	10:18	2
	10:24	2
	10:30	2
	10:36	2
	10:42	2
	10:48	2
	10:54	2
	11:00	2
	11:06	2
	11:12	2
	11:18	2
	11:24	2
	11:30	2
	11:36	2
	11:42	2
	11:48	2
	11:54	2
	12:00	2
	12:06	2

Average =	2
Geometric Avg. =	2
Maximum =	2
Minimum =	2
Possible Values =	22
Included Values =	22
Total =	40

* - 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: 03/16/2010 to 03/16/2010

Site Name: UNIT1

Data Averaging Type: 6m

Time of Report: 03/18/10 13:22

Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/16/10	12:36	2
	12:42	2
	12:48	2
	12:54	2
	13:00	2
	13:06	2
	13:12	2
	13:18	2
	13:24	2
	13:30	2
	13:36	2
	13:42	2
	13:48	2
	13:54	2
	14:00	2
	14:06	2
	14:12	2
	14:18	2
	14:24	2
	14:30	2
	14:36	2
	14:42	2

Average =	2
Geometric Avg. =	2
Maximum =	2
Minimum =	2
Possible Values =	22
Included Values =	22
Total =	42

* - 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: 03/18/2010 to 03/18/2010

Site Name: UNIT2

Data Averaging Type: 6m

Time of Report: 03/18/10 13:23

Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/18/10	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
	09:06	0
	09:12	0
	09:18	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: 03/18/2010 to 03/18/2010

Site Name: UNIT2
Data Averaging Type: 6m

Time of Report: 03/18/10 13:24
Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/18/10	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
	11:42	0
	11:48	0
	11:54	0
	12:00	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: 03/18/2010 to 03/18/2010

Site Name: UNIT2

Data Averaging Type: 6m

Time of Report: 03/18/10 14:42

Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/18/10	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
	14:18	0
	14:24	0
	14:30	0
	14:36	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

Site Name: UNIT3
Data Averaging Type: 6m

Time of Report: 03/18/10 13:22
Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/17/10	06:48	0
	06:54	0
	07:00	1
	07:06	1
	07:12	2
	07:18	2
	07:24	1
	07:30	1
	07:36	1
	07:42	1
	07:48	1
	07:54	1
	08:00	1
	08:06	1
	08:12	2
	08:18	2
	08:24	2
	08:30	2
	08:36	2
	08:42	2
	08:48	1
	08:54	1
	09:00	2

Average =	1
Geometric Avg. =	1
Maximum =	2
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	29

* - 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: 03/17/2010 to 03/17/2010

Site Name: UNIT3

Data Averaging Type: 6m

Time of Report: 03/18/10 13:23

Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/17/10	09:24	2
	09:30	2
	09:36	2
	09:42	2
	09:48	1
	09:54	1
	10:00	0
	10:06	0
	10:12	0
	10:18	0
	10:24	0
	10:30	1
	10:36	1
	10:42	1
	10:48	1
	10:54	1
	11:00	0
	11:06	0
	11:12	0
	11:18	0
	11:24	1
	11:30	1
	11:36	1

Average =	1
Geometric Avg. =	1
Maximum =	2
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	18

* - 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: 03/17/2010 to 03/17/2010

Site Name: UNIT3

Data Averaging Type: 6m

Time of Report: 03/18/10 13:23

Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/17/10	11:54	3
	12:00	3
	12:06	3
	12:12	3
	12:18	3
	12:24	3
	12:30	3
	12:36	4
	12:42	4
	12:48	4
	12:54	4
	13:00	4
	13:06	4
	13:12	4
	13:18	4
	13:24	4
	13:30	4
	13:36	4
	13:42	3
	13:48	4
	13:54	4
	14:00	3
	14:06	3

Average =	3
Geometric Avg. =	3
Maximum =	4
Minimum =	3
Possible Values =	23
Included Values =	23
Total =	80

* - 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

End of Appendix

PARAMETERS

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:21	10:00	12:36	
Stop Time (approx.)		09:32	12:14	14:47	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9900	0.9900	0.9900	
C_p	Pitot tube coefficient	0.8050	0.8050	0.8050	
P_g	Static pressure (in. H_2O)	-10.0000	-10.0000	-10.1000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.05	30.05	30.05	**30.0500**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	9.5300	9.4600	9.7400	**9.5767**
CO_2	Carbon dioxide (dry volume %)	9.8800	9.9300	9.8300	**9.8800**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.5900	80.6100	80.4300	**80.5433**
V_{lc}	Total Liquid collected (ml)	431.50	432.20	425.00	
V_m	Volume metered, meter conditions (ft^3)	80.2420	81.5000	82.9000	
T_m	Dry gas meter temperature (°F)	64.3800	68.7000	75.1800	
T_s	Sample temperature (°F)	293.2800	295.0400	300.8000	**296.3733**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2680	1.3032	1.3268	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	20.3064	20.3393	20.0005	**20.2154**
V_{mstd}	Volume metered, standard (dscf)	80.5525	81.1539	81.5531	**81.0865**
P_s	Sample gas pressure, absolute (in. Hg)	29.3147	29.3147	29.3074	**29.3123**
P_v	Vapor pressure, actual (in. Hg)	29.3147	29.3147	29.3074	**29.3123**
B_{wo}	Moisture measured in sample (% by volume)	20.1335	20.0401	19.6945	**19.9560**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	20.1335	20.0401	19.6945	**19.9560**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{\text{in. } H_2O}$)	0.7507	0.7494	0.7563	**0.7521**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9620	29.9672	29.9624	**29.9639**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5536	27.5690	27.6065	**27.5764**
V_s	Velocity of sample (ft/sec)	49.8922	49.8492	50.4724	**50.0712**
%I	Isokinetic sampling (%)	98.7688	99.7081	99.3122	**99.2630**
Q_a	Volumetric flow rate, actual (acfm)	191,586	191,421	193,814	**192,274**
Q_s	Volumetric flow rate, standard (scfm)	131,572	131,153	131,754	**131,493**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,082	104,870	105,806	**105,252**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	85,956	86,310	84,949	**85,738**
Q_a	Volumetric flow rate, actual (acf/hr)	11,495,154	11,485,251	11,628,832	**11,536,412**
Q_s	Volumetric flow rate, standard (scf/hr)	7,894,347	7,869,160	7,905,230	**7,889,579**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,304,942	6,292,173	6,348,333	**6,315,149**
Q_a	Volumetric flow rate, actual (m^3/hr)	325,550	325,269	329,335	**326,718**
Q_s	Volumetric flow rate, standard (m^3/hr)	223,573	222,859	223,881	**223,438**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	178,560	178,198	179,789	**178,849**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	146,059	146,661	144,348	**145,689**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	208,329	207,664	208,616	**208,203**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	166,385	166,048	167,530	**166,655**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	136,101	136,661	134,506	**135,756**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:21	10:00	12:36	
Stop Time (approx.)		09:32	12:14	14:47	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	184.4	183.4	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	310	313	320	**314**
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 %)	9.5300	9.4600	9.7400	**9.5767**
CO_2	Carbon dioxide (dry volume %)	9.8800	9.9300	9.8300	**9.8800**
T_s	Sample temperature (°F)	293.2800	295.0400	300.8000	**296.3733**
B_w	Actual water vapor in gas (% by volume)	20.1335	20.0401	19.6945	**19.9560**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	191,586	191,421	193,814	**192,274**
Q_s	Volumetric flow rate, standard (scfm)	131,572	131,153	131,754	**131,493**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,082	104,870	105,806	**105,252**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	85,956	86,310	84,949	**85,738**
Q_a	Volumetric flow rate, actual (acf/hr)	11,495,154	11,485,251	11,628,832	**11,536,412**
Q_s	Volumetric flow rate, standard (scf/hr)	7,894,347	7,869,160	7,905,230	**7,889,579**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,304,942	6,292,173	6,348,333	**6,315,149**
Q_a	Volumetric flow rate, actual (m^3/hr)	325,550	325,269	329,335	**326,718**
Q_s	Volumetric flow rate, standard (m^3/hr)	223,573	222,859	223,881	**223,438**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	178,560	178,198	179,789	**178,849**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	146,059	146,661	144,348	**145,689**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	208,329	207,664	208,616	**208,203**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	166,385	166,048	167,530	**166,655**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	136,101	136,661	134,506	**135,756**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	80.5525	81.1539	81.5531	**81.0865**
%I	Isokinetic sampling (%)	98.7688	99.7081	99.3122	**99.2630**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00010	0.00010	0.00010	
m_s	Matter collected in solvent rinse(s) (g)	0.00049	0.00218	0.00001	
m_n	Total particulate matter collected (g)	0.00049	0.00218	<0.00020	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	1.3509E-08	5.9287E-08	<5.4075E-09	**<2.6068E-08**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	1.6516E-08	7.2035E-08	<6.7352E-09	**<3.1762E-08**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	1.6408E-08	7.1646E-08	<6.6012E-09	**<3.1552E-08**
C_a	Particulate Concentration (lb/acf)	7.4098E-09	3.2480E-08	<2.9520E-09	**<1.4281E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.00009	0.00041	<0.00004	**<0.00018**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.00012	0.00050	<0.00005	**<0.00022**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.00011	0.00050	<0.00005	**<0.00022**
C_a	Particulate Concentration (gr/acf)	0.00005	0.00023	<0.00002	**<0.00010**
C_{sd}	Particulate Concentration (mg/dscm)	0.2163	0.9494	<0.0866	**<0.4174**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.2645	1.1535	<0.1079	**<0.5086**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	0.2628	1.1473	<0.1057	**<0.5053**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	0.1187	0.5201	<0.0473	**<0.2287**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	0.2322	1.0189	<0.0929	**<0.4480**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	0.2838	1.2380	<0.1157	**<0.5458**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	0.2820	1.2313	<0.1134	**<0.5422**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.0852	0.3730	<0.0343	**<0.1642**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.0386	0.1692	<0.0156	**<0.0745**
$E_{T/yr}$	Particulate Rate (Ton/yr)	0.3731	1.6339	<0.1504	**<0.7191**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.00024	0.0010	<0.00010	**<0.00046**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.00025	0.0011	<0.00010	**<0.00048**

<u>Comments:</u>
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:21	10:00	12:36	
Stop Time (approx.)		09:32	12:14	14:47	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	184.4	183.4	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	310	313	320	**314**
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 %)	9.5300	9.4600	9.7400	**9.5767**
CO_2	Carbon dioxide (dry volume %)	9.8800	9.9300	9.8300	**9.8800**
T_s	Sample temperature (°F)	293.2800	295.0400	300.8000	**296.3733**
B_w	Actual water vapor in gas (% by volume)	20.1335	20.0401	19.6945	**19.9560**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	191,586	191,421	193,814	**192,274**
Q_s	Volumetric flow rate, standard (scfm)	131,572	131,153	131,754	**131,493**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,082	104,870	105,806	**105,252**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	85,956	86,310	84,949	**85,738**
Q_a	Volumetric flow rate, actual (acf/hr)	11,495,154	11,485,251	11,628,832	**11,536,412**
Q_s	Volumetric flow rate, standard (scf/hr)	7,894,347	7,869,160	7,905,230	**7,889,579**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,304,942	6,292,173	6,348,333	**6,315,149**
Q_a	Volumetric flow rate, actual (m^3/hr)	325,550	325,269	329,335	**326,718**
Q_s	Volumetric flow rate, standard (m^3/hr)	223,573	222,859	223,881	**223,438**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	178,560	178,198	179,789	**178,849**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	146,059	146,661	144,348	**145,689**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	208,329	207,664	208,616	**208,203**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	166,385	166,048	167,530	**166,655**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	136,101	136,661	134,506	**135,756**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	80.5525	81.1539	81.5531	**81.0865**
%I	Isokinetic sampling (%)	98.7688	99.7081	99.3122	**99.2630**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
m_{n-2b}	Fraction 2B (µg)	7.7629	8.8151	9.7549	
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)	7.7629	8.8151	9.7549	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	2.1250E-10	2.3951E-10	2.6375E-10	**2.3859E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.5978E-10	2.9101E-10	3.2850E-10	**2.9310E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.5810E-10	2.8944E-10	3.2197E-10	**2.8984E-10**
C_a	Concentration (lb/acf)	1.1655E-10	1.3122E-10	1.4398E-10	**1.3058E-10**
C_{sd}	Concentration (µg/dscm)	3.4029E+00	3.8354E+00	4.2236E+00	**3.8206E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.1601E+00	4.6602E+00	5.2605E+00	**4.6936E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.1330E+00	4.6350E+00	5.1559E+00	**4.6413E+00**
C_{sd}	Concentration (mg/dscm)	3.4029E-03	3.8354E-03	4.2236E-03	**3.8206E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.1601E-03	4.6602E-03	5.2605E-03	**4.6936E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.1330E-03	4.6350E-03	5.1559E-03	**4.6413E-03**
C_a	Concentration (µg/m^3 (actual,wet))	1.8664E+00	2.1012E+00	2.3057E+00	**2.0911E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	3.6519E+00	4.1161E+00	4.5326E+00	**4.1002E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	4.4644E+00	5.0012E+00	5.6454E+00	**5.0370E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	4.4354E+00	4.9741E+00	5.5332E+00	**4.9809E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.3398E-03	1.5070E-03	1.6744E-03	**1.5071E-03**
$E_{g/s}$	Rate (g/s)	1.6878E-04	1.8985E-04	2.1093E-04	**1.8985E-04**
$E_{T/yr}$	Rate (Ton/yr)	5.8683E-03	6.6009E-03	7.3337E-03	**6.6009E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.7381E-06	4.1875E-06	4.7270E-06	**4.2175E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	3.9144E-06	4.3898E-06	4.8832E-06	**4.3958E-06**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:21	10:00	12:36	
Stop Time (approx.)		09:32	12:14	14:47	
Process Conditions					
R_p	Steam Production Rate (Klbs/hour)	183.9	184.4	183.4	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	310	313	320	**314**
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 %)	9.5300	9.4600	9.7400	**9.5767**
CO_2	Carbon dioxide (dry volume %)	9.8800	9.9300	9.8300	**9.8800**
T_s	Sample temperature (°F)	293.2800	295.0400	300.8000	**296.3733**
B_w	Actual water vapor in gas (% by volume)	20.1335	20.0401	19.6945	**19.9560**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	191,586	191,421	193,814	**192,274**
Q_s	Volumetric flow rate, standard (scfm)	131,572	131,153	131,754	**131,493**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,082	104,870	105,806	**105,252**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	85,956	86,310	84,949	**85,738**
Q_a	Volumetric flow rate, actual (acf/hr)	11,495,154	11,485,251	11,628,832	**11,536,412**
Q_s	Volumetric flow rate, standard (scf/hr)	7,894,347	7,869,160	7,905,230	**7,889,579**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,304,942	6,292,173	6,348,333	**6,315,149**
Q_a	Volumetric flow rate, actual (m^3/hr)	325,550	325,269	329,335	**326,718**
Q_s	Volumetric flow rate, standard (m^3/hr)	223,573	222,859	223,881	**223,438**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	178,560	178,198	179,789	**178,849**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	146,059	146,661	144,348	**145,689**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	208,329	207,664	208,616	**208,203**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	166,385	166,048	167,530	**166,655**
Q_{std7}	*Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)*	*136,101*	*136,661*	*134,506*	***135,756***
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	80.5525	81.1539	81.5531	**81.0865**
%I	*Isokinetic sampling (%)*	98.7688	99.7081	99.3122	**99.2630**
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)	<1.3687E-12	<1.3585E-12	<1.3519E-12	**<1.3597E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.6732E-12	<1.6507E-12	<1.6838E-12	**<1.6692E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.6624E-12	<1.6417E-12	<1.6503E-12	**<1.6515E-12**
C_a	Concentration (lb/acf)	<7.5070E-13	<7.4427E-13	<7.3801E-13	**<7.4433E-13**
C_{sd}	Concentration (µg/dscm)	<2.1917E-02	<2.1755E-02	<2.1648E-02	**<2.1774E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.6794E-02	<2.6433E-02	<2.6964E-02	**<2.6730E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.6620E-02	<2.6290E-02	<2.6427E-02	**<2.6446E-02**
C_{sd}	Concentration (mg/dscm)	<2.1917E-05	<2.1755E-05	<2.1648E-05	**<2.1774E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.6794E-05	<2.6433E-05	<2.6964E-05	**<2.6730E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.6620E-05	<2.6290E-05	<2.6427E-05	**<2.6446E-05**
C_a	*Concentration (µg/m^3 (actual,wet))*	<1.2021E-02	<1.1918E-02	<1.1818E-02	**<1.1919E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.3521E-02	<2.3347E-02	<2.3233E-02	**<2.3367E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.8755E-02	<2.8367E-02	<2.8937E-02	**<2.8686E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.8568E-02	<2.8214E-02	<2.8361E-02	**<2.8381E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.6294E-06	<8.5481E-06	<8.5822E-06	**<8.5866E-06**
$E_{g/s}$	Rate (g/s)	<1.0871E-06	<1.0769E-06	<1.0812E-06	**<1.0817E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.7797E-05	<3.7441E-05	<3.7590E-05	**<3.7609E-05**
E_{Fd}	*Rate - Fd-based (lb/MMBtu)*	<2.4077E-08	<2.3752E-08	<2.4229E-08	**<2.4019E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.5212E-08	<2.4900E-08	<2.5030E-08	**<2.5047E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:21	10:00	12:36	
Stop Time (approx.)		09:32	12:14	14:47	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	184.4	183.4	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	310	313	320	**314**
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 %)	9.5300	9.4600	9.7400	**9.5767**
CO_2	Carbon dioxide (dry volume %)	9.8800	9.9300	9.8300	**9.8800**
T_s	Sample temperature (°F)	293.2800	295.0400	300.8000	**296.3733**
B_w	Actual water vapor in gas (% by volume)	20.1335	20.0401	19.6945	**19.9560**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	191,586	191,421	193,814	**192,274**
Q_s	Volumetric flow rate, standard (scfm)	131,572	131,153	131,754	**131,493**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,082	104,870	105,806	**105,252**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	85,956	86,310	84,949	**85,738**
Q_a	Volumetric flow rate, actual (acf/hr)	11,495,154	11,485,251	11,628,832	**11,536,412**
Q_s	Volumetric flow rate, standard (scf/hr)	7,894,347	7,869,160	7,905,230	**7,889,579**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,304,942	6,292,173	6,348,333	**6,315,149**
Q_a	Volumetric flow rate, actual (m^3/hr)	325,550	325,269	329,335	**326,718**
Q_s	Volumetric flow rate, standard (m^3/hr)	223,573	222,859	223,881	**223,438**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	178,560	178,198	179,789	**178,849**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	146,059	146,661	144,348	**145,689**
Q_a	Volumetric flow rate, normal (Nm^3/hr)	208,329	207,664	208,616	**208,203**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	166,385	166,048	167,530	**166,655**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	136,101	136,661	134,506	**135,756**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	80.5525	81.1539	81.5531	**81.0865**
%I	Isokinetic sampling (%)	98.7688	99.7081	99.3122	**99.2630**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	0.2093	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	<5.4747E-12	5.6863E-12	<5.4075E-12	**<5.5228E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<6.6929E-12	6.9090E-12	<6.7352E-12	**<6.7790E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<6.6494E-12	6.8717E-12	<6.6012E-12	**<6.7074E-12**
C_a	Concentration (lb/acf)	<3.0028E-12	3.1152E-12	<2.9520E-12	**<3.0234E-12**
C_{sd}	Concentration (µg/dscm)	<8.7669E-02	9.1058E-02	<8.6594E-02	**<8.8440E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.0718E-01	1.1064E-01	<1.0785E-01	**<1.0856E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.0648E-01	1.1004E-01	<1.0571E-01	**<1.0741E-01**
C_{sd}	Concentration (mg/dscm)	<8.7669E-05	9.1058E-05	<8.6594E-05	**<8.8440E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.0718E-04	1.1064E-04	<1.0785E-04	**<1.0856E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.0648E-04	1.1004E-04	<1.0571E-04	**<1.0741E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<4.8086E-02	4.9886E-02	<4.7273E-02	**<4.8415E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<9.4084E-02	9.7721E-02	<9.2930E-02	**<9.4912E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.1502E-01	1.1873E-01	<1.1575E-01	**<1.1650E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.1427E-01	1.1809E-01	<1.1344E-01	**<1.1527E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.4518E-05	3.5779E-05	<3.4329E-05	**<3.4875E-05**
$E_{g/s}$	Rate (g/s)	<4.3484E-06	4.5073E-06	<4.3246E-06	**<4.3934E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.5119E-04	1.5671E-04	<1.5036E-04	**<1.5275E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<9.6307E-08	9.9417E-08	<9.6915E-08	**<9.7546E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0085E-07	1.0422E-07	<1.0012E-07	**<1.0173E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:21	10:00	12:36	
Stop Time (approx.)		09:32	12:14	14:47	
Process Conditions					
R_p	Steam Production Rate (Klbs/hour)	183.9	184.4	183.4	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	310	313	320	**314**
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 %)	9.5300	9.4600	9.7400	**9.5767**
CO_2	Carbon dioxide (dry volume %)	9.8800	9.9300	9.8300	**9.8800**
T_s	Sample temperature (°F)	293.2800	295.0400	300.8000	**296.3733**
B_w	Actual water vapor in gas (% by volume)	20.1335	20.0401	19.6945	**19.9560**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	191,586	191,421	193,814	**192,274**
Q_s	Volumetric flow rate, standard (scfm)	131,572	131,153	131,754	**131,493**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,082	104,870	105,806	**105,252**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	85,956	86,310	84,949	**85,738**
Q_a	Volumetric flow rate, actual (acf/hr)	11,495,154	11,485,251	11,628,832	**11,536,412**
Q_s	Volumetric flow rate, standard (scf/hr)	7,894,347	7,869,160	7,905,230	**7,889,579**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,304,942	6,292,173	6,348,333	**6,315,149**
Q_a	Volumetric flow rate, actual (m^3/hr)	325,550	325,269	329,335	**326,718**
Q_s	Volumetric flow rate, standard (m^3/hr)	223,573	222,859	223,881	**223,438**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	178,560	178,198	179,789	**178,849**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	146,059	146,661	144,348	**145,689**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	208,329	207,664	208,616	**208,203**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	166,385	166,048	167,530	**166,655**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	136,101	136,661	134,506	**135,756**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	80.5525	81.1539	81.5531	**81.0865**
%I	Isokinetic sampling (%)	98.7688	99.7081	99.3122	**99.2630**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	1.0847	1.1424	1.2738	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	2.9693E-11	3.1040E-11	3.4441E-11	**3.1725E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	3.6300E-11	3.7714E-11	4.2897E-11	**3.8971E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	3.6064E-11	3.7510E-11	4.2044E-11	**3.8540E-11**
C_a	Concentration (lb/acf)	1.6286E-11	1.7005E-11	1.8802E-11	**1.7364E-11**
C_{sd}	Concentration (µg/dscm)	4.7549E-01	4.9706E-01	5.5153E-01	**5.0803E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	5.8130E-01	6.0394E-01	6.8694E-01	**6.2406E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	5.7752E-01	6.0068E-01	6.7328E-01	**6.1716E-01**
C_{sd}	Concentration (mg/dscm)	4.7549E-04	4.9706E-04	5.5153E-04	**5.0803E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	5.8130E-04	6.0394E-04	6.8694E-04	**6.2406E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	5.7752E-04	6.0068E-04	6.7328E-04	**6.1718E-04**
C_a	Concentration (µg/m^3 (actual,wet))	2.6080E-01	2.7231E-01	3.0109E-01	**2.7807E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	5.1028E-01	5.3343E-01	5.9189E-01	**5.4520E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	6.2383E-01	6.4814E-01	7.3721E-01	**6.6972E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	6.1978E-01	6.4463E-01	7.2255E-01	**6.6232E-01**
$E_{lb/hr}$	Rate (lb/hr)	1.8721E-04	1.9531E-04	2.1865E-04	**2.0039E-04**
$E_{g/s}$	Rate (g/s)	2.3584E-05	2.4604E-05	2.7544E-05	**2.5244E-05**
$E_{T/yr}$	Rate (Ton/yr)	8.1999E-04	8.5545E-04	9.5767E-04	**8.7770E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	5.2234E-07	5.4269E-07	6.1727E-07	**5.6077E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	5.4698E-07	5.6891E-07	6.3767E-07	**5.8452E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

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

Run No.		1	2	3	**Average**
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		11:46	13:15	14:45	
Stop Time (approx.)		12:56	14:27	15:53	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9900	0.9900	0.9900	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-10.3000	-10.4000	-10.4000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.00	30.00	30.00	**30.0000**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	10.5500	10.1300	9.9600	**10.2133**
CO_2	Carbon dioxide (dry volume %)	9.1100	9.6200	9.8000	**9.5100**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.3400	80.2500	80.2400	**80.2767**
V_{lc}	Total Liquid collected (ml)	225.50	232.30	232.30	
V_m	Volume metered, meter conditions (ft^3)	42.9350	42.9200	41.4700	
T_m	Dry gas meter temperature (°F)	68.2800	71.6000	69.7000	
T_s	Sample temperature (°F)	302.6000	302.0400	302.6000	**302.4133**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.4560	1.4736	1.3528	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	10.6120	10.9320	10.9320	**10.8254**
V_{mstd}	Volume metered, standard (dscf)	42.7316	42.4517	41.1525	**42.1120**
P_s	Sample gas pressure, absolute (in. Hg)	29.2426	29.2353	29.2353	**29.2377**
P_v	Vapor pressure, actual (in. Hg)	29.2426	29.2353	29.2353	**29.2377**
B_{wo}	Moisture measured in sample (% by volume)	19.8937	20.4782	20.9890	**20.4536**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	19.8937	20.4782	20.9890	**20.4536**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.7935	0.7993	0.7657	**0.7862**
M_d	MW of sample gas, dry (lb/lb-mole)	29.8796	29.9444	29.9664	**29.9301**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5163	27.4984	27.4548	**27.4898**
V_s	Velocity of sample (ft/sec)	53.6266	54.0190	51.8104	**53.1520**
%I	Isokinetic sampling (%)	100.1239	99.4233	101.2130	**100.2534**
Q_a	Volumetric flow rate, actual (acfm)	205,926	207,433	198,952	**204,104**
Q_s	Volumetric flow rate, standard (scfm)	139,349	140,436	134,596	**138,127**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	111,627	111,678	106,345	**109,883**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	83,118	86,530	83,699	**84,449**
Q_a	Volumetric flow rate, actual (acf/hr)	12,355,565	12,445,974	11,937,120	**12,246,220**
Q_s	Volumetric flow rate, standard (scf/hr)	8,360,935	8,426,184	8,075,745	**8,287,621**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,697,635	6,700,653	6,380,726	**6,593,005**
Q_a	Volumetric flow rate, actual (m^3/hr)	349,917	352,477	338,066	**346,820**
Q_s	Volumetric flow rate, standard (m^3/hr)	236,787	238,634	228,710	**234,710**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	189,681	189,766	180,706	**186,718**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	141,237	147,035	142,225	**143,499**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	220,642	222,364	213,116	**218,707**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	176,748	176,828	168,385	**173,987**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	131,607	137,010	132,528	**133,715**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 13B
HF Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		11:46	13:15	14:45	
Stop Time (approx.)		12:56	14:27	15:53	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.0	184.0	184.1	**184.0**
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 %)	10.5500	10.1300	9.9600	**10.2133**
CO_2	Carbon dioxide (dry volume %)	9.1100	9.6200	9.8000	**9.5100**
T_s	Sample temperature (°F)	302.6000	302.0400	302.6000	**302.4133**
B_w	Actual water vapor in gas (% by volume)	19.8937	20.4782	20.9890	**20.4536**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	205,926	207,433	198,952	**204,104**
Q_s	Volumetric flow rate, standard (scfm)	139,349	140,436	134,596	**138,127**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	111,627	111,678	106,345	**109,883**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	83,118	86,530	83,699	**84,449**
Q_a	Volumetric flow rate, actual (acf/hr)	12,355,565	12,445,974	11,937,120	**12,246,220**
Q_s	Volumetric flow rate, standard (scf/hr)	8,360,935	8,426,184	8,075,745	**8,287,621**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,697,635	6,700,653	6,380,726	**6,593,005**
Q_a	Volumetric flow rate, actual (m^3/hr)	349,917	352,477	338,066	**346,820**
Q_s	Volumetric flow rate, standard (m^3/hr)	236,787	238,634	228,710	**234,710**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	189,681	189,766	180,706	**186,718**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	141,237	147,035	142,225	**143,499**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	220,642	222,364	213,116	**218,707**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	176,748	176,828	168,385	**173,987**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	131,607	137,010	132,528	**133,715**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	42.7316	42.4517	41.1525	**42.1120**
%I	Isokinetic sampling (%)	100.1239	99.4233	101.2130	**100.2534**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0368	<0.0339	<0.0389	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (lb/dscf)	<1.8996E-09	<1.7583E-09	<2.0840E-09	**<1.9140E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<2.5511E-09	<2.2693E-09	<2.6478E-09	**<2.4894E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<2.5022E-09	<2.1933E-09	<2.5518E-09	**<2.4158E-09**
C_a	HF Concentration (lb/acf)	<1.0297E-09	<9.4664E-10	<1.1139E-09	**<1.0301E-09**
C_{sd}	HF Concentration (ppmdv)	<0.0366	<0.0339	<0.0402	**<0.0369**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0492	<0.0437	<0.0510	**<0.0480**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0482	<0.0423	<0.0492	**<0.0465**
C_w	HF Concentration (ppmwv)	<0.0293	<0.0269	<0.0317	**<0.0293**
C_{sd}	HF Concentration (mg/dscm)	<0.0304	<0.0282	<0.0334	**<0.0306**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0409	<0.0363	<0.0424	**<0.0399**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0401	<0.0351	<0.0409	**<0.0387**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0165	<0.0152	<0.0178	**<0.0165**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0326	<0.0302	<0.0358	**<0.0329**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0438	<0.0390	<0.0455	**<0.0428**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0430	<0.0377	<0.0439	**<0.0415**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0127	<0.0118	<0.0133	**<0.0126**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0058	<0.0053	<0.0060	**<0.0057**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0557	<0.0516	<0.0582	**<0.0552**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000037	<0.000033	<0.000038	**<0.000036**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000038	<0.000033	<0.000039	**<0.000037**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:02	09:26	11:49	
Stop Time (approx.)		08:02	10:37	12:49	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0085	1.0085	1.0085	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-1.9000	-1.7000	-1.7000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.05	30.05	30.05	**30.0500**
O_2	Oxygen (dry volume %)	9.1100	9.0100	9.7000	**9.2733**
CO_2	Carbon dioxide (dry volume %)	10.2300	10.3500	9.8200	**10.1333**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6600	80.6400	80.4800	**80.5933**
V_{lc}	Total Liquid collected (ml)	172.30	157.10	150.30	
V_m	Volume metered, meter conditions (ft^3)	37.0500	35.7400	35.6000	
T_m	Dry gas meter temperature (°F)	60.1250	66.0833	75.3750	
T_s	Sample temperature (°F)	488.8333	489.0833	496.9167	**491.6111**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1917	1.2000	1.2000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	8.1084	7.3931	7.0731	**7.5249**
V_{mstd}	Volume metered, standard (dscf)	38.1913	36.4244	35.6520	**36.7559**
P_s	Sample gas pressure, absolute (in. Hg)	29.9103	29.9250	29.9250	**29.9201**
P_v	Vapor pressure, actual (in. Hg)	29.9103	29.9250	29.9250	**29.9201**
B_{wo}	Moisture measured in sample (% by volume)	17.5129	16.8725	16.5549	**16.9801**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	17.5129	16.8725	16.5549	**16.9801**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0012	30.0164	29.9592	**29.9923**
M_s	MW of sample gas, wet (lb/lb-mole)	27.8994	27.9889	27.9794	**27.9559**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:02	09:26	11:49	
Stop Time (approx.)		08:02	10:37	12:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.5	184.1	182.8	**183.5**
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 %)	9.1100	9.0100	9.7000	**9.2733**
CO_2	Carbon dioxide (dry volume %)	10.2300	10.3500	9.8200	**10.1333**
T_s	Sample temperature (°F)	488.8333	489.0833	496.9167	**491.6111**
B_w	Actual water vapor in gas (% by volume)	17.5129	16.8725	16.5549	**16.9801**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.1913	36.4244	35.6520	**36.7559**
Laboratory Data					
m_n	Total HCl collected (mg)	789.3812	879.5132	662.6796	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	4.5575E-05	5.3243E-05	4.0985E-05	**4.6601E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	5.3732E-05	6.2243E-05	5.0866E-05	**5.5614E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	5.3461E-05	6.1730E-05	5.0084E-05	**5.5092E-05**
C_{sd}	HCl Concentration (ppmdv)	481.8514	562.9118	433.3210	**492.6948**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	568.0861	658.0719	537.7823	**587.9801**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	565.2216	652.6514	529.5165	**582.4632**
C_w	HCl Concentration (ppmwv)	397.4651	467.9344	361.5850	**408.9948**
C_{sd}	HCl Concentration (mg/dscm)	729.8280	852.6048	656.3223	**746.2517**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	860.4419	996.7373	814.5428	**890.5740**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	856.1033	988.5273	802.0231	**882.2179**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	783.2301	914.9905	704.3458	**800.8555**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	923.4010	1069.6693	874.1435	**955.7379**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	918.7450	1060.8585	860.7077	**946.7704**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.7732	0.8956	0.7319	**0.8002**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.8108	0.9362	0.7596	**0.8356**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:02	09:26	11:49	
Stop Time (approx.)		08:02	10:37	12:49	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0066	1.0066	1.0066	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-11.1000	-10.9000	-11.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.05	30.05	30.05	**30.0500**
O_2	Oxygen (dry volume %)	9.8800	9.6900	10.0500	**9.8733**
CO_2	Carbon dioxide (dry volume %)	9.5000	9.6700	9.4200	**9.5300**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6200	80.6400	80.5300	**80.5967**
V_{lc}	Total Liquid collected (ml)	217.40	236.20	211.10	
V_m	Volume metered, meter conditions (ft^3)	40.1050	39.9000	40.1550	
T_m	Dry gas meter temperature (°F)	62.6250	63.7917	69.0833	
T_s	Sample temperature (°F)	307.6667	309.0833	309.9167	**308.8889**
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)	10.2308	11.1156	9.9344	**10.4269**
V_{mstd}	Volume metered, standard (dscf)	41.0960	40.7949	40.6450	**40.8453**
P_s	Sample gas pressure, absolute (in. Hg)	29.2338	29.2485	29.2412	**29.2412**
P_v	Vapor pressure, actual (in. Hg)	29.2338	29.2485	29.2412	**29.2412**
B_{wo}	Moisture measured in sample (% by volume)	19.9327	21.4130	19.6412	**20.3290**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	19.9327	21.4130	19.6412	**20.3290**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9152	29.9348	29.9092	**29.9197**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5402	27.3792	27.5701	**27.4965**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:02	09:26	11:49	
Stop Time (approx.)		08:02	10:37	12:49	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.5	184.1	182.8	**183.5**
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 %)	9.8800	9.6900	10.0500	**9.8733**
CO_2	Carbon dioxide (dry volume %)	9.5000	9.6700	9.4200	**9.5300**
T_s	Sample temperature (°F)	307.6667	309.0833	309.9167	**308.8889**
B_w	Actual water vapor in gas (% by volume)	19.9327	21.4130	19.6412	**20.3290**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	41.0960	40.7949	40.6450	**40.8453**
Laboratory Data					
m_n	Total HCl collected (mg)	30.4838	25.1430	26.4504	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	1.6356E-06	1.3590E-06	1.4349E-06	**1.4765E-06**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	2.0631E-06	1.6851E-06	1.8383E-06	**1.8622E-06**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	2.0660E-06	1.6865E-06	1.8279E-06	**1.8601E-06**
C_{sd}	HCl Concentration (ppmdv)	17.2926	14.3682	15.1710	**15.6106**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	21.8119	17.8160	19.4357	**19.6879**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	21.8432	17.8302	19.3262	**19.6665**
C_w	HCl Concentration (ppmwv)	13.8457	11.2915	12.1913	**12.4428**
C_{sd}	HCl Concentration (mg/dscm)	26.1919	21.7625	22.9786	**23.6443**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	33.0370	26.9848	29.4380	**29.8199**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	33.0845	27.0062	29.2721	**29.7876**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	28.1084	23.3549	24.6599	**25.3744**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	35.4543	28.9592	31.5920	**32.0018**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	35.5053	28.9823	31.4139	**31.9672**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0297	0.0242	0.0265	**0.0268**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0313	0.0256	0.0277	**0.0282**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	09:49	12:27	
Stop Time (approx.)		09:22	12:02	14:39	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9904	0.9904	0.9904	
C_p	Pitot tube coefficient	0.8050	0.8050	0.8050	
P_g	Static pressure (in. H_2O)	-10.6000	-10.6000	-10.7000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.05	30.05	30.05	**30.0500**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	10.0700	9.7500	9.8900	**9.9033**
CO_2	Carbon dioxide (dry volume %)	9.2500	9.6000	9.5800	**9.4767**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6800	80.6500	80.5300	**80.6200**
V_{lc}	Total Liquid collected (ml)	459.40	434.20	463.60	
V_m	Volume metered, meter conditions (ft^3)	84.6670	81.6300	85.1700	
T_m	Dry gas meter temperature (°F)	69.9000	81.9000	86.4800	
T_s	Sample temperature (°F)	307.4800	307.6000	307.7600	**307.6133**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.4596	1.3336	1.4432	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	21.6194	20.4335	21.8170	**21.2899**
V_{mstd}	Volume metered, standard (dscf)	84.1826	79.3413	82.1102	**81.8780**
P_s	Sample gas pressure, absolute (in. Hg)	29.2706	29.2706	29.2632	**29.2681**
P_v	Vapor pressure, actual (in. Hg)	29.2706	29.2706	29.2632	**29.2681**
B_{wo}	Moisture measured in sample (% by volume)	20.4338	20.4796	20.9926	**20.6353**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	20.4338	20.4796	20.9926	**20.6353**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.7819	0.7481	0.7707	**0.7669**
M_d	MW of sample gas, dry (lb/lb-mole)	29.8828	29.9260	29.9284	**29.9124**
M_s	MW of sample gas, wet (lb/lb-mole)	27.4547	27.4836	27.4243	**27.4542**
V_s	Velocity of sample (ft/sec)	52.5853	50.2877	51.8795	**51.5842**
%I	Isokinetic sampling (%)	100.3071	98.9302	99.9317	**99.7230**
Q_a	Volumetric flow rate, actual (acfm)	201,928	193,105	199,217	**198,083**
Q_s	Volumetric flow rate, standard (scfm)	135,904	129,946	133,997	**133,282**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	108,134	103,333	105,868	**105,778**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	84,251	82,890	83,856	**83,666**
Q_a	Volumetric flow rate, actual (acf/hr)	12,115,652	11,586,291	11,953,037	**11,884,993**
Q_s	Volumetric flow rate, standard (scf/hr)	8,154,240	7,796,743	8,039,841	**7,996,941**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,488,019	6,200,003	6,352,070	**6,346,697**
Q_a	Volumetric flow rate, actual (m^3/hr)	343,122	328,131	338,517	**336,590**
Q_s	Volumetric flow rate, standard (m^3/hr)	230,933	220,808	227,693	**226,478**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	183,745	175,588	179,894	**179,742**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	143,162	140,849	142,492	**142,168**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	215,187	205,753	212,169	**211,036**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	171,216	163,616	167,629	**167,487**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	133,401	131,246	132,777	**132,474**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	09:49	12:27	
Stop Time (approx.)		09:22	12:02	14:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	182.9	183.9	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	321	**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 %)	10.0700	9.7500	9.8900	**9.9033**
CO_2	Carbon dioxide (dry volume %)	9.2500	9.6000	9.5800	**9.4767**
T_s	Sample temperature (°F)	307.4800	307.6000	307.7600	**307.6133**
B_w	Actual water vapor in gas (% by volume)	20.4338	20.4796	20.9926	**20.6353**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	201,928	193,105	199,217	**198,083**
Q_s	Volumetric flow rate, standard (scfm)	135,904	129,946	133,997	**133,282**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	108,134	103,333	105,868	**105,778**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	84,251	82,890	83,856	**83,666**
Q_a	Volumetric flow rate, actual (acf/hr)	12,115,652	11,586,291	11,953,037	**11,884,993**
Q_s	Volumetric flow rate, standard (scf/hr)	8,154,240	7,796,743	8,039,841	**7,996,941**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,488,019	6,200,003	6,352,070	**6,346,697**
Q_a	Volumetric flow rate, actual (m^3/hr)	343,122	328,131	338,517	**336,590**
Q_s	Volumetric flow rate, standard (m^3/hr)	230,933	220,808	227,693	**226,478**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	183,745	175,588	179,894	**179,742**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	143,162	140,849	142,492	**142,168**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	215,187	205,753	212,169	**211,036**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	171,216	163,616	167,629	**167,487**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	133,401	131,246	132,777	**132,474**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	84.1826	79.3413	82.1102	**81.8780**
%I	Isokinetic sampling (%)	100.3071	98.9302	99.9317	**99.7230**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00180	0.00100	0.00090	
m_s	Matter collected in solvent rinse(s) (g)	0.00224	0.00131	0.00162	
m_n	Total particulate matter collected (g)	0.00404	0.00231	0.00252	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	1.0571E-07	6.4320E-08	6.7580E-08	**7.9205E-08**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	1.3568E-07	8.0184E-08	8.5319E-08	**1.0039E-07**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	1.3714E-07	8.0400E-08	8.4651E-08	**1.0073E-07**
C_a	Particulate Concentration (lb/acf)	5.6611E-08	3.4419E-08	3.5913E-08	**4.2314E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0007	0.0005	0.0005	**0.0006**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.0009	0.0006	0.0006	**0.0007**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.0010	0.0006	0.0006	**0.0007**
C_a	Particulate Concentration (gr/acf)	0.0004	0.0002	0.0003	**0.0003**
C_{sd}	Particulate Concentration (mg/dscm)	1.6929	1.0300	1.0822	**1.2684**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	2.1728	1.2840	1.3663	**1.6077**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	2.1962	1.2875	1.3556	**1.6131**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	0.9065	0.5512	0.5751	**0.6776**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	1.8167	1.1054	1.1614	**1.3612**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	2.3317	1.3780	1.4662	**1.7253**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	2.3568	1.3817	1.4548	**1.7311**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.6859	0.3988	0.4293	**0.5046**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.3111	0.1809	0.1947	**0.2289**
$E_{T/yr}$	Particulate Rate (Ton/yr)	3.0041	1.7467	1.8802	**2.2103**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0020	0.0012	0.0012	**0.0014**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.0021	0.0012	0.0013	**0.0015**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	09:49	12:27	
Stop Time (approx.)		09:22	12:02	14:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	182.9	183.9	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	321	**320.3**
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 %)	10.0700	9.7500	9.8900	**9.9033**
CO_2	Carbon dioxide (dry volume %)	9.2500	9.6000	9.5800	**9.4767**
T_s	Sample temperature (°F)	307.4800	307.6000	307.7600	**307.6133**
B_w	Actual water vapor in gas (% by volume)	20.4338	20.4796	20.9926	**20.6353**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	201,928	193,105	199,217	**198,083**
Q_s	Volumetric flow rate, standard (scfm)	135,904	129,946	133,997	**133,282**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	108,134	103,333	105,868	**105,778**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	84,251	82,890	83,856	**83,666**
Q_a	Volumetric flow rate, actual (acf/hr)	12,115,652	11,586,291	11,953,037	**11,884,993**
Q_s	Volumetric flow rate, standard (scf/hr)	8,154,240	7,796,743	8,039,841	**7,996,941**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,488,019	6,200,003	6,352,070	**6,346,697**
Q_a	Volumetric flow rate, actual (m^3/hr)	343,122	328,131	338,517	**336,590**
Q_s	Volumetric flow rate, standard (m^3/hr)	230,933	220,808	227,693	**226,478**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	183,745	175,588	179,894	**179,742**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	143,162	140,849	142,492	**142,168**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	215,187	205,753	212,169	**211,036**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	171,216	163,616	167,629	**167,487**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	133,401	131,246	132,777	**132,474**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	84.1826	79.3413	82.1102	**81.8780**
%I	Isokinetic sampling (%)	100.3071	98.9302	99.9317	**99.7230**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
m_{n-2b}	Fraction 2B (µg)	9.1977	9.2740	10.1318	
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)	9.1977	9.2740	10.1318	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	2.4092E-10	2.5774E-10	2.7208E-10	**2.5691E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	3.0921E-10	3.2131E-10	3.4350E-10	**3.2467E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	3.1254E-10	3.2217E-10	3.4081E-10	**3.2517E-10**
C_a	Concentration (lb/acf)	1.2901E-10	1.3792E-10	1.4459E-10	**1.3717E-10**
C_{sd}	Concentration (µg/dscm)	3.8579E+00	4.1273E+00	4.3570E+00	**4.1141E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.9515E+00	5.1453E+00	5.5007E+00	**5.1992E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	5.0049E+00	5.1591E+00	5.4576E+00	**5.2072E+00**
C_{sd}	Concentration (mg/dscm)	3.8579E-03	4.1273E-03	4.3570E-03	**4.1141E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.9515E-03	5.1453E-03	5.5007E-03	**5.1992E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	5.0049E-03	5.1591E-03	5.4576E-03	**5.2072E-03**
C_a	Concentration (µg/m^3 (actual,wet))	2.0659E+00	2.2086E+00	2.3154E+00	**2.1966E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	4.1402E+00	4.4293E+00	4.6758E+00	**4.4151E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	5.3138E+00	5.5217E+00	5.9032E+00	**5.5796E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	5.3711E+00	5.5366E+00	5.8570E+00	**5.5882E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.5631E-03	1.5980E-03	1.7283E-03	**1.6298E-03**
$E_{g/s}$	Rate (g/s)	1.9691E-04	2.0131E-04	2.1772E-04	**2.0531E-04**
$E_{T/yr}$	Rate (Ton/yr)	6.8462E-03	6.9991E-03	7.5699E-03	**7.1384E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	4.4493E-06	4.6234E-06	4.9428E-06	**4.6718E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.7402E-06	4.8863E-06	5.1690E-06	**4.9318E-06**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	09:49	12:27	
Stop Time (approx.)		09:22	12:02	14:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	182.9	183.9	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	321	**320.3**
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 %)	10.0700	9.7500	9.8900	**9.9033**
CO_2	Carbon dioxide (dry volume %)	9.2500	9.6000	9.5800	**9.4767**
T_s	Sample temperature (°F)	307.4800	307.6000	307.7600	**307.6133**
B_w	Actual water vapor in gas (% by volume)	20.4338	20.4796	20.9926	**20.6353**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	201,928	193,105	199,217	**198,083**
Q_s	Volumetric flow rate, standard (scfm)	135,904	129,946	133,997	**133,282**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	108,134	103,333	105,868	**105,778**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	84,251	82,890	83,856	**83,666**
Q_a	Volumetric flow rate, actual (acf/hr)	12,115,652	11,586,291	11,953,037	**11,884,993**
Q_s	Volumetric flow rate, standard (scf/hr)	8,154,240	7,796,743	8,039,841	**7,996,941**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,488,019	6,200,003	6,352,070	**6,346,697**
Q_a	Volumetric flow rate, actual (m^3/hr)	343,122	328,131	338,517	**336,590**
Q_s	Volumetric flow rate, standard (m^3/hr)	230,933	220,808	227,693	**226,478**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	183,745	175,588	179,894	**179,742**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	143,162	140,849	142,492	**142,168**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	215,187	205,753	212,169	**211,036**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	171,216	163,616	167,629	**167,487**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	133,401	131,246	132,777	**132,474**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	84.1826	79.3413	82.1102	**81.8780**
%I	Isokinetic sampling (%)	100.3071	98.9302	99.9317	**99.7230**
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)	<1.3097E-12	<1.3896E-12	<1.3427E-12	**<1.3473E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.6809E-12	<1.7323E-12	<1.6952E-12	**<1.7028E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.6990E-12	<1.7370E-12	<1.6819E-12	**<1.7060E-12**
C_a	Concentration (lb/acf)	<7.0133E-13	<7.4358E-13	<7.1354E-13	**<7.1948E-13**
C_{sd}	Concentration (µg/dscm)	<2.0972E-02	<2.2252E-02	<2.1502E-02	**<2.1575E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.6917E-02	<2.7740E-02	<2.7146E-02	**<2.7268E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.7207E-02	<2.7815E-02	<2.6933E-02	**<2.7318E-02**
C_{sd}	Concentration (mg/dscm)	<2.0972E-05	<2.2252E-05	<2.1502E-05	**<2.1575E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.6917E-05	<2.7740E-05	<2.7146E-05	**<2.7268E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.7207E-05	<2.7815E-05	<2.6933E-05	**<2.7318E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<1.1231E-02	<1.1907E-02	<1.1426E-02	**<1.1522E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.2507E-02	<2.3880E-02	<2.3075E-02	**<2.3154E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.8887E-02	<2.9770E-02	<2.9132E-02	**<2.9263E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.9198E-02	<2.9850E-02	<2.8904E-02	**<2.9317E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.4971E-06	<8.6153E-06	<8.5290E-06	**<8.5471E-06**
$E_{g/s}$	Rate (g/s)	<1.0704E-06	<1.0853E-06	<1.0744E-06	**<1.0767E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.7217E-05	<3.7735E-05	<3.7357E-05	**<3.7436E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.4187E-08	<2.4927E-08	<2.4392E-08	**<2.4502E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.5768E-08	<2.6344E-08	<2.5509E-08	**<2.5874E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	09:49	12:27	
Stop Time (approx.)		09:22	12:02	14:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	182.9	183.9	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	321	**320.3**
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 %)	10.0700	9.7500	9.8900	**9.9033**
CO_2	Carbon dioxide (dry volume %)	9.2500	9.6000	9.5800	**9.4767**
T_s	Sample temperature (°F)	307.4800	307.6000	307.7600	**307.6133**
B_w	Actual water vapor in gas (% by volume)	20.4338	20.4796	20.9926	**20.6353**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	201,928	193,105	199,217	**198,083**
Q_s	Volumetric flow rate, standard (scfm)	135,904	129,946	133,997	**133,282**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	108,134	103,333	105,868	**105,778**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	84,251	82,890	83,856	**83,666**
Q_a	Volumetric flow rate, actual (acf/hr)	12,115,652	11,586,291	11,953,037	**11,884,993**
Q_s	Volumetric flow rate, standard (scf/hr)	8,154,240	7,796,743	8,039,841	**7,996,941**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,488,019	6,200,003	6,352,070	**6,346,697**
Q_a	Volumetric flow rate, actual (m^3/hr)	343,122	328,131	338,517	**336,590**
Q_s	Volumetric flow rate, standard (m^3/hr)	230,933	220,808	227,693	**226,478**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	183,745	175,588	179,894	**179,742**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	143,162	140,849	142,492	**142,168**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	215,187	205,753	212,169	**211,036**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	171,216	163,616	167,629	**167,487**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	133,401	131,246	132,777	**132,474**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	84.1826	79.3413	82.1102	**81.8780**
%I	Isokinetic sampling (%)	100.3071	98.9302	99.9317	**99.7230**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.4679	<0.2000	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	1.2255E-11	<5.5583E-12	<5.3708E-12	**<7.7279E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	1.5729E-11	<6.9291E-12	<6.7806E-12	**<9.8128E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.5898E-11	<6.9478E-12	<6.7276E-12	**<9.8578E-12**
C_a	Concentration (lb/acf)	6.5625E-12	<2.9743E-12	<2.8542E-12	**<4.1303E-12**
C_{sd}	Concentration (µg/dscm)	1.9624E-01	<8.9008E-02	<8.6006E-02	**<1.2375E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	2.5187E-01	<1.1096E-01	<1.0858E-01	**<1.5714E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	2.5458E-01	<1.1126E-01	<1.0773E-01	**<1.5786E-01**
C_{sd}	Concentration (mg/dscm)	1.9624E-04	<8.9008E-05	<8.6006E-05	**<1.2375E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	2.5187E-04	<1.1096E-04	<1.0858E-04	**<1.5714E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	2.5458E-04	<1.1126E-04	<1.0773E-04	**<1.5786E-04**
C_a	Concentration (µg/m^3 (actual,wet))	1.0509E-01	<4.7629E-02	<4.5705E-02	**<6.6141E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	2.1060E-01	<9.5521E-02	<9.2300E-02	**<1.3281E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	2.7030E-01	<1.1908E-01	<1.1653E-01	**<1.6864E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	2.7321E-01	<1.1940E-01	<1.1562E-01	**<1.6941E-01**
$E_{lb/hr}$	Rate (lb/hr)	7.9509E-05	<3.4461E-05	<3.4116E-05	**<4.9362E-05**
$E_{g/s}$	Rate (g/s)	1.0016E-05	<4.3413E-06	<4.2978E-06	**<6.2184E-06**
$E_{T/yr}$	Rate (Ton/yr)	3.4825E-04	<1.5094E-04	<1.4943E-04	**<2.1621E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	2.2632E-07	<9.9706E-08	<9.7569E-08	**<1.4120E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	2.4112E-07	<1.0538E-07	<1.0203E-07	**<1.4951E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	09:49	12:27	
Stop Time (approx.)		09:22	12:02	14:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	182.9	183.9	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	321	**320.3**
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 %)	10.0700	9.7500	9.8900	**9.9033**
CO_2	Carbon dioxide (dry volume %)	9.2500	9.6000	9.5800	**9.4767**
T_s	Sample temperature (°F)	307.4800	307.6000	307.7600	**307.6133**
B_w	Actual water vapor in gas (% by volume)	20.4338	20.4796	20.9926	**20.6353**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	201,928	193,105	199,217	**198,083**
Q_s	Volumetric flow rate, standard (scfm)	135,904	129,946	133,997	**133,282**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	108,134	103,333	105,868	**105,778**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	84,251	82,890	83,856	**83,666**
Q_a	Volumetric flow rate, actual (acf/hr)	12,115,652	11,586,291	11,953,037	**11,884,993**
Q_s	Volumetric flow rate, standard (scf/hr)	8,154,240	7,796,743	8,039,841	**7,996,941**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,488,019	6,200,003	6,352,070	**6,346,697**
Q_a	Volumetric flow rate, actual (m^3/hr)	343,122	328,131	338,517	**336,590**
Q_s	Volumetric flow rate, standard (m^3/hr)	230,933	220,808	227,693	**226,478**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	183,745	175,588	179,894	**179,742**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	143,162	140,849	142,492	**142,168**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	215,187	205,753	212,169	**211,036**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	171,216	163,616	167,629	**167,487**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	133,401	131,246	132,777	**132,474**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	84.1826	79.3413	82.1102	**81.8780**
%I	Isokinetic sampling (%)	100.3071	98.9302	99.9317	**99.7230**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	2.4408	<0.2000	<0.2000	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	6.3931E-11	<5.5583E-12	<5.3708E-12	**<2.4953E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	8.2054E-11	<6.9291E-12	<6.7806E-12	**<3.1921E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	8.2937E-11	<6.9478E-12	<6.7276E-12	**<3.2204E-11**
C_a	Concentration (lb/acf)	3.4235E-11	<2.9743E-12	<2.8542E-12	**<1.3355E-11**
C_{sd}	Concentration (µg/dscm)	1.0238E+00	<8.9008E-02	<8.6006E-02	**<3.9959E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.3140E+00	<1.1096E-01	<1.0858E-01	**<5.1117E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.3281E+00	<1.1126E-01	<1.0773E-01	**<5.1571E-01**
C_{sd}	Concentration (mg/dscm)	1.0238E-03	<8.9008E-05	<8.6006E-05	**<3.9959E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.3140E-03	<1.1096E-04	<1.0858E-04	**<5.1117E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.3281E-03	<1.1126E-04	<1.0773E-04	**<5.1571E-04**
C_a	Concentration (µg/m^3 (actual,wet))	5.4823E-01	<4.7629E-02	<4.5705E-02	**<2.1386E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	1.0987E+00	<9.5521E-02	<9.2300E-02	**<4.2883E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.4101E+00	<1.1908E-01	<1.1653E-01	**<5.4857E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.4253E+00	<1.1940E-01	<1.1562E-01	**<5.5344E-01**
$E_{lb/hr}$	Rate (lb/hr)	4.1479E-04	<3.4461E-05	<3.4116E-05	**<1.6112E-04**
$E_{g/s}$	Rate (g/s)	5.2253E-05	<4.3413E-06	<4.2978E-06	**<2.0297E-05**
$E_{T/yr}$	Rate (Ton/yr)	1.8168E-03	<1.5094E-04	<1.4943E-04	**<7.0571E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.1807E-06	<9.9706E-08	<9.7569E-08	**<4.5933E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.2579E-06	<1.0538E-07	<1.0203E-07	**<4.8843E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	08:56	10:45	
Stop Time (approx.)		08:24	10:10	12:05	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9898	0.9898	0.9898	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-10.6000	-10.6000	-10.6000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.05	30.05	30.05	**30.0500**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	10.0200	9.6400	10.1500	**9.9367**
CO_2	Carbon dioxide (dry volume %)	9.2900	9.5800	9.1300	**9.3333**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6900	80.7800	80.7200	**80.7300**
V_{lc}	Total Liquid collected (ml)	212.40	209.90	201.60	
V_m	Volume metered, meter conditions (ft^3)	38.0800	37.3850	38.3650	
T_m	Dry gas meter temperature (°F)	64.5400	73.1600	81.1000	
T_s	Sample temperature (°F)	306.2400	305.4400	305.7200	**305.8000**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2560	1.1592	1.2068	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	9.9955	9.8779	9.4873	**9.7869**
V_{mstd}	Volume metered, standard (dscf)	38.2069	36.8944	37.3103	**37.4705**
P_s	Sample gas pressure, absolute (in. Hg)	29.2706	29.2706	29.2706	**29.2706**
P_v	Vapor pressure, actual (in. Hg)	29.2706	29.2706	29.2706	**29.2706**
B_{wo}	Moisture measured in sample (% by volume)	20.7366	21.1191	20.2730	**20.7096**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	20.7366	21.1191	20.2730	**20.7096**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.7304	0.7020	0.7114	**0.7146**
M_d	MW of sample gas, dry (lb/lb-mole)	29.8872	29.9184	29.8668	**29.8908**
M_s	MW of sample gas, wet (lb/lb-mole)	27.4222	27.4013	27.4610	**27.4282**
V_s	Velocity of sample (ft/sec)	49.5381	47.6055	48.2000	**48.4479**
%I	Isokinetic sampling (%)	98.3144	99.1667	98.0324	**98.5045**
Q_a	Volumetric flow rate, actual (acfm)	190,226	182,805	185,088	**186,040**
Q_s	Volumetric flow rate, standard (scfm)	128,236	123,362	124,857	**125,485**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	101,644	97,309	99,545	**99,499**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,560	78,827	76,986	**78,458**
Q_a	Volumetric flow rate, actual (acf/hr)	11,413,588	10,968,309	11,105,290	**11,162,396**
Q_s	Volumetric flow rate, standard (scf/hr)	7,694,159	7,401,714	7,491,412	**7,529,095**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,098,652	5,838,538	5,972,675	**5,969,955**
Q_a	Volumetric flow rate, actual (m^3/hr)	323,240	310,629	314,508	**316,126**
Q_s	Volumetric flow rate, standard (m^3/hr)	217,903	209,621	212,161	**213,228**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	172,717	165,351	169,150	**169,073**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,192	133,946	130,817	**133,318**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	203,046	195,329	197,696	**198,690**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	160,941	154,077	157,617	**157,545**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	125,974	124,813	121,898	**124,228**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 13B
HF Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 18	Mar 18	Mar 18	
Start Time (approx.)		07:09	08:56	10:45	
Stop Time (approx.)		08:24	10:10	12:05	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	184.2	183.0	**183.7**
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 %)	10.0200	9.6400	10.1500	**9.9367**
CO_2	Carbon dioxide (dry volume %)	9.2900	9.5800	9.1300	**9.3333**
T_s	Sample temperature (°F)	306.2400	305.4400	305.7200	**305.8000**
B_w	Actual water vapor in gas (% by volume)	20.7366	21.1191	20.2730	**20.7096**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	190,226	182,805	185,088	**186,040**
Q_s	Volumetric flow rate, standard (scfm)	128,236	123,362	124,857	**125,485**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	101,644	97,309	99,545	**99,499**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,560	78,827	76,986	**78,458**
Q_a	Volumetric flow rate, actual (acf/hr)	11,413,588	10,968,309	11,105,290	**11,162,396**
Q_s	Volumetric flow rate, standard (scf/hr)	7,694,159	7,401,714	7,491,412	**7,529,095**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,098,652	5,838,538	5,972,675	**5,969,955**
Q_a	Volumetric flow rate, actual (m^3/hr)	323,240	310,629	314,508	**316,126**
Q_s	Volumetric flow rate, standard (m^3/hr)	217,903	209,621	212,161	**213,228**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	172,717	165,351	169,150	**169,073**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,192	133,946	130,817	**133,318**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	203,046	195,329	197,696	**198,690**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	160,941	154,077	157,617	**157,545**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	125,974	124,813	121,898	**124,228**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	38.2069	36.8944	37.3103	**37.4705**
%I	Isokinetic sampling (%)	98.3144	99.1667	98.0324	**98.5045**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0360	<0.0345	<0.0354	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (lb/dscf)	<2.0784E-09	<2.0614E-09	<2.0905E-09	**<2.0768E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<2.6553E-09	<2.5447E-09	<2.7030E-09	**<2.6343E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<2.6846E-09	<2.5822E-09	<2.7476E-09	**<2.6715E-09**
C_a	HF Concentration (lb/acf)	<1.1105E-09	<1.0973E-09	<1.1243E-09	**<1.1107E-09**
C_{sd}	HF Concentration (ppmdv)	<0.0400	<0.0397	<0.0403	**<0.0400**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0512	<0.0490	<0.0521	**<0.0508**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0517	<0.0498	<0.0529	**<0.0515**
C_w	HF Concentration (ppmwv)	<0.0317	<0.0313	<0.0321	**<0.0317**
C_{sd}	HF Concentration (mg/dscm)	<0.0333	<0.0330	<0.0335	**<0.0333**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0425	<0.0408	<0.0433	**<0.0422**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0430	<0.0413	<0.0440	**<0.0428**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0178	<0.0176	<0.0180	**<0.0178**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0357	<0.0354	<0.0359	**<0.0357**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0456	<0.0437	<0.0465	**<0.0453**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0461	<0.0444	<0.0472	**<0.0459**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0127	<0.0120	<0.0125	**<0.0124**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0057	<0.0055	<0.0057	**<0.0056**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0555	<0.0527	<0.0547	**<0.0543**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000038	<0.000037	<0.000039	**<0.000038**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000041	<0.000039	<0.000042	**<0.000041**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 17	Mar 17	
Start Time (approx.)		08:44	06:54	12:53	
Stop Time (approx.)		13:36	12:19	17:26	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9901	0.9901	0.9904	
C_p	Pitot tube coefficient	0.8340	0.8340	0.8340	
P_g	Static pressure (in. H_2O)	-12.0000	-12.5000	-10.4000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.00	30.00	30.00	**30.0000**
D_n	Nozzle diameter (in.)	0.2640	0.2640	0.2640	
O_2	Oxygen (dry volume %)	9.6800	9.7400	10.3100	**9.9100**
CO_2	Carbon dioxide (dry volume %)	9.7400	9.8400	9.4700	**9.6833**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.5800	80.4200	80.2200	**80.4067**
V_{lc}	Total Liquid collected (ml)	836.50	943.90	896.70	
V_m	Volume metered, meter conditions (ft^3)	160.3450	171.6150	166.1550	
T_m	Dry gas meter temperature (°F)	80.0500	74.6100	72.3700	
T_s	Sample temperature (°F)	300.6400	307.4800	307.8400	**305.3200**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2940	1.5220	1.3680	
θ	Total sampling time (min)	250.0	250.0	250.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	39.3657	44.4199	42.1987	**41.9948**
V_{mstd}	Volume metered, standard (dscf)	156.0614	168.8240	164.1285	**163.0046**
P_s	Sample gas pressure, absolute (in. Hg)	29.1176	29.0809	29.2353	**29.1446**
P_v	Vapor pressure, actual (in. Hg)	29.1176	29.0809	29.2353	**29.1446**
B_{wo}	Moisture measured in sample (% by volume)	20.1434	20.8306	20.4523	**20.4754**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	20.1434	20.8306	20.4523	**20.4754**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.7462	0.7983	0.7613	**0.7686**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9456	29.9640	29.9276	**29.9457**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5393	27.4718	27.4881	**27.4998**
V_s	Velocity of sample (ft/sec)	51.8144	55.7840	53.0548	**53.5511**
%I	Isokinetic sampling (%)	97.9747	100.3189	101.5668	**99.9535**
Q_a	Volumetric flow rate, actual (acfm)	198,967	214,211	203,730	**205,636**
Q_s	Volumetric flow rate, standard (scfm)	134,410	143,237	136,888	**138,178**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	107,335	113,400	108,891	**109,875**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	86,640	91,046	82,961	**86,882**
Q_a	Volumetric flow rate, actual (acf/hr)	11,938,029	12,852,643	12,223,823	**12,338,165**
Q_s	Volumetric flow rate, standard (scf/hr)	8,064,586	8,594,197	8,213,270	**8,290,684**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,440,103	6,803,976	6,533,466	**6,592,515**
Q_a	Volumetric flow rate, actual (m^3/hr)	338,092	363,994	346,186	**349,424**
Q_s	Volumetric flow rate, standard (m^3/hr)	228,394	243,393	232,605	**234,797**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	182,388	192,693	185,032	**186,704**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	147,222	154,709	140,970	**147,634**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	212,822	226,798	216,745	**218,788**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	169,952	179,554	172,416	**173,974**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	137,184	144,160	131,359	**137,568**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 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**	**Average**
	Date (2010)	Mar 16	Mar 17	Mar 17	
	Start Time (approx.)	08:44	06:54	12:53	
	Stop Time (approx.)	13:36	12:19	17:26	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.3	183.9	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	314	321	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 %)	9.6800	9.7400	10.3100	**9.9100**
CO_2	Carbon dioxide (dry volume %)	9.7400	9.8400	9.4700	**9.6833**
T_s	Sample temperature (°F)	300.6	307.5	307.8	**305.3**
B_w	Actual water vapor in gas (% by volume)	20.1434	20.8306	20.4523	**20.4754**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	198,967	214,211	203,730	**205,636**
Q_s	Volumetric flow rate, standard (scfm)	134,410	143,237	136,888	**138,178**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	107,335	113,400	108,891	**109,875**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	86,640	91,046	82,961	**86,882**
Q_a	Volumetric flow rate, actual (acf/hr)	11,938,029	12,852,643	12,223,823	**12,338,165**
Q_s	Volumetric flow rate, standard (scf/hr)	8,064,586	8,594,197	8,213,270	**8,290,684**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,440,103	6,803,976	6,533,466	**6,592,515**
Q_a	Volumetric flow rate, actual (m^3/hr)	338,092	363,994	346,186	**349,424**
Q_s	Volumetric flow rate, standard (m^3/hr)	228,394	243,393	232,605	**234,797**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	182,388	192,693	185,032	**186,704**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	147,222	154,709	140,970	**147,634**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	212,822	226,798	216,745	**218,788**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	169,952	179,554	172,416	**173,974**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	137,184	144,160	131,359	**137,568**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	156.0614	168.8240	164.1285	**163.0048**
%I	Isokinetic sampling (%)	97.9747	100.3189	101.5668	**99.9535**
Laboratory Data from USEPA Method 23					
	Total PCDDs (ng)	0.41220	0.56920	0.59770	
	Total PCDFs (ng)	0.85458	0.95310	1.07610	
m_n	Total PCDDs & PCDFs (ng)	1.26000	1.51000	1.67000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.01660	0.02270	0.02700	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	2.8508E-01	3.1582E-01	3.5928E-01	**3.2006E-01**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	3.5318E-01	3.9336E-01	4.7157E-01	**4.0604E-01**
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/dscm)	3.5123E-01	3.8515E-01	4.5526E-01	**3.9721E-01**
C_{sd}	PCDD/F Concentration (ng/Nm^3 dry)	3.0594E-01	3.3893E-01	3.8557E-01	**3.4348E-01**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/Nm^3 dry)	3.7902E-01	4.2214E-01	5.0608E-01	**4.3575E-01**
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/Nm^3 dry)	3.7693E-01	4.1333E-01	4.8857E-01	**4.2628E-01**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.1465E-07	1.3419E-07	1.4658E-07	**1.3181E-07**
$E_{g/s}$	PCDD/F Rate (g/s)	1.4443E-08	1.6905E-08	1.8466E-08	**1.6605E-08**
$E_{T/yr}$	PCDD/F Rate (Ton/yr)	5.0217E-07	5.8774E-07	6.4204E-07	**5.7732E-07**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	3.1736E-10	3.5346E-10	4.2374E-10	**3.6486E-10**
E_{Fc}	PCDD/F Rate - F_c-based (lb/MMBtu)	3.3266E-10	3.6478E-10	4.3118E-10	**3.7621E-10**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	3.8011E-03	4.7478E-03	5.8087E-03	**4.7859E-03**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	4.7091E-03	5.9134E-03	7.6242E-03	**6.0822E-03**
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/dscm)	4.6831E-03	5.7900E-03	7.3605E-03	**5.9445E-03**
C_{sdTEQ}	TEQ Concentration (ng/Nm^3 dry)	4.0792E-03	5.0952E-03	6.2337E-03	**5.1360E-03**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/Nm^3 dry)	5.0536E-03	6.3461E-03	8.1821E-03	**6.5273E-03**
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/Nm^3 dry)	5.0258E-03	6.2136E-03	7.8991E-03	**6.3795E-03**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	1.5287E-09	2.0173E-09	2.3699E-09	**1.9720E-09**
$E_{g/sTEQ}$	TEQ Rate (g/sec)	1.9258E-10	2.5413E-10	2.9855E-10	**2.4842E-10**
$E_{T/yrTEQ}$	TEQ Rate (Ton/yr)	6.6956E-09	8.8356E-09	1.0380E-08	**8.6371E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	4.2314E-12	5.3137E-12	6.8509E-12	**5.4653E-12**
E_{FcTEQ}	TEQ Rate - F_c-based (lb/MMBtu)	4.4354E-12	5.4837E-12	6.9712E-12	**5.6301E-12**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

Max

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	Average
Date (2010)		Mar 16	Mar 17	Mar 17	
Start Time (approx.)		08:44	06:54	12:53	
Stop Time (approx.)		13:36	12:19	17:26	
Process Conditions					
R_P	Production rate - (units/hour)	184.1	184.3	183.9	**184.1**
P_1	Process data - (units)	314	321	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 %)	9.6800	9.7400	10.3100	**9.9100**
CO_2	Carbon dioxide (dry volume %)	9.7400	9.8400	9.4700	**9.6833**
T_s	Sample temperature (°F)	300.6	307.5	307.8	**305.3**
B_w	Actual water vapor in gas (% by volume)	20.1434	20.8306	20.4523	**20.4754**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	198,967	214,211	203,730	**205,636**
Q_s	Volumetric flow rate, standard (scfm)	134,410	143,237	136,888	**138,178**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	107,335	113,400	108,891	**109,875**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	86,640	91,046	82,961	**86,882**
Q_a	Volumetric flow rate, actual (acf/hr)	11,938,029	12,852,643	12,223,823	**12,338,165**
Q_s	Volumetric flow rate, standard (scf/hr)	8,064,586	8,594,197	8,213,270	**8,290,684**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,440,103	6,803,976	6,533,466	**6,592,515**
Q_a	Volumetric flow rate, actual (m^3/hr)	338,092	363,994	346,186	**349,424**
Q_s	Volumetric flow rate, standard (m^3/hr)	228,394	243,393	232,605	**234,797**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	182,388	192,693	185,032	**186,704**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	147,222	154,709	140,970	**147,634**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	212,822	226,798	216,745	**218,788**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	169,952	179,554	172,416	**173,974**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	137,184	144,160	131,359	**137,568**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	156.0614	168.8240	164.1285	**163.0046**
%I	Isokinetic sampling (%)	97.9747	100.3189	101.5668	**99.9535**
Laboratory Data from USEPA Method 23, including NDs and EMPCs					
m_n	Total PCDDs & PCDFs (ng)	1.36000	1.77000	1.86000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.02110	0.02750	0.03050	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	3.0771E-01	3.7020E-01	4.0015E-01	**3.5935E-01**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	3.8121E-01	4.6109E-01	5.2523E-01	**4.5584E-01**
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/dscm)	3.7911E-01	4.5146E-01	5.0706E-01	**4.4588E-01**
C_{sd}	PCDD/F Concentration (ng/Nm^3 dry)	3.3022E-01	3.9729E-01	4.2943E-01	**3.8565E-01**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/Nm^3 dry)	4.0910E-01	4.9483E-01	5.6366E-01	**4.8920E-01**
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/Nm^3 dry)	4.0685E-01	4.8450E-01	5.4416E-01	**4.7850E-01**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.2375E-07	1.5729E-07	1.6326E-07	**1.4810E-07**
$E_{g/s}$	PCDD/F Rate (g/s)	1.5590E-08	1.9815E-08	2.0567E-08	**1.8657E-08**
$E_{T/yr}$	PCDD/F Rate (Ton/yr)	5.4202E-07	6.8895E-07	7.1508E-07	**6.4868E-07**
E_{Fd}	PCDD/F - F_d-based (lb/MMBtu)	3.4254E-10	4.1433E-10	4.7195E-10	**4.0961E-10**
E_{Fc}	PCDD/F Rate - F_c-based (lb/MMBtu)	3.5906E-10	4.2759E-10	4.8024E-10	**4.2229E-10**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	4.7740E-03	5.7517E-03	6.5617E-03	**5.6958E-03**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	5.9143E-03	7.1639E-03	8.6126E-03	**7.2303E-03**
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/dscm)	5.8818E-03	7.0143E-03	8.3147E-03	**7.0702E-03**
C_{sdTEQ}	TEQ Concentration (ng/Nm^3 dry)	5.1233E-03	6.1726E-03	7.0418E-03	**6.1126E-03**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/Nm^3 dry)	6.3471E-03	7.6880E-03	9.2427E-03	**7.7593E-03**
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/Nm^3 dry)	6.3121E-03	7.5275E-03	8.9231E-03	**7.5876E-03**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	1.9199E-09	2.4438E-09	2.6771E-09	**2.3470E-09**
$E_{g/sTEQ}$	TEQ Rate (g/sec)	2.4187E-10	3.0786E-10	3.3725E-10	**2.9566E-10**
$E_{T/yrTEQ}$	TEQ Rate (Ton/yr)	8.4094E-09	1.0704E-08	1.1726E-08	**1.0280E-08**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	5.3145E-12	6.4373E-12	7.7390E-12	**6.4969E-12**
E_{FcTEQ}	TEQ Rate - F_c-based (lb/MMBtu)	5.5707E-12	6.6433E-12	7.8749E-12	**6.6963E-12**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:54	09:02	10:25	
Stop Time (approx.)		07:54	10:02	11:25	
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)	-1.7000	-1.9000	-1.9000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.00	30.00	30.00	**30.0000**
O_2	Oxygen (dry volume %)	8.4100	9.2900	8.6800	**8.7933**
CO_2	Carbon dioxide (dry volume %)	10.8600	10.1900	10.7400	**10.5967**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.7300	80.5200	80.5800	**80.6100**
V_{lc}	Total Liquid collected (ml)	161.80	151.20	164.00	
V_m	Volume metered, meter conditions (ft^3)	36.3250	36.4700	36.2450	
T_m	Dry gas meter temperature (°F)	72.7917	66.8333	67.0000	
T_s	Sample temperature (°F)	509.5000	503.5000	501.5833	**504.8611**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1917	1.2000	1.1917	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	7.6143	7.1155	7.7178	**7.4825**
V_{mstd}	Volume metered, standard (dscf)	35.8815	36.4329	36.1960	**36.1702**
P_s	Sample gas pressure, absolute (in. Hg)	29.8750	29.8603	29.8603	**29.8652**
P_v	Vapor pressure, actual (in. Hg)	29.8750	29.8603	29.8603	**29.8652**
B_{wo}	Moisture measured in sample (% by volume)	17.5058	16.3392	17.5750	**17.1400**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	17.5058	16.3392	17.5750	**17.1400**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0740	30.0020	30.0656	**30.0472**
M_s	MW of sample gas, wet (lb/lb-mole)	27.9603	28.0410	27.9451	**27.9821**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

USEPA Method 26A
HCl Parameters

	Run No.	1	2	3	Average
	Date (2010)	Mar 17	Mar 17	Mar 17	
	Start Time (approx.)	06:54	09:02	10:25	
	Stop Time (approx.)	07:54	10:02	11:25	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.7	184.2	184.9	**184.6**
P_1	Fabric Filter Inlet Temperature (°F)	323	320	319	**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 %)	8.4100	9.2900	8.6800	**8.7933**
CO_2	Carbon dioxide (dry volume %)	10.8600	10.1900	10.7400	**10.5967**
T_s	Sample temperature (°F)	509.5000	503.5000	501.5833	**504.8611**
B_w	Actual water vapor in gas (% by volume)	17.5058	16.3392	17.5750	**17.1400**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	35.8815	36.4329	36.1960	**36.1702**
Laboratory Data					
m_n	Total HCl collected (mg)	680.9708	649.5973	646.9267	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	4.1847E-05	3.9315E-05	3.9410E-05	**4.0191E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	4.6571E-05	4.7070E-05	4.4828E-05	**4.6156E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	4.6240E-05	4.6298E-05	4.4033E-05	**4.5524E-05**
C_{sd}	HCl Concentration (ppmdv)	442.4332	415.6619	416.6630	**424.9194**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	492.3796	497.6486	473.9456	**487.9913**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	488.8764	489.4939	465.5453	**481.3052**
C_w	HCl Concentration (ppmwv)	364.9816	347.7460	343.4346	**352.0541**
C_{sd}	HCl Concentration (mg/dscm)	670.1238	629.5752	631.0915	**643.5968**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	745.7743	753.7550	717.8536	**739.1276**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	740.4683	741.4036	705.1301	**729.0007**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	719.1573	675.6417	677.2689	**690.6893**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	800.3431	808.9078	770.3795	**793.2101**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	794.6489	795.6526	756.7250	**782.3422**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.6701	0.6773	0.6450	**0.6642**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.7013	0.7022	0.6678	**0.6904**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

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

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:54	09:02	10:25	
Stop Time (approx.)		07:54	10:02	11:25	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9904	0.9904	0.9904	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-12.5000	-12.5000	-10.4000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.00	30.00	30.00	**30.0000**
O_2	Oxygen (dry volume %)	9.6500	10.3900	9.5300	**9.8567**
CO_2	Carbon dioxide (dry volume %)	9.6500	9.1400	9.9500	**9.5800**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.7000	80.4700	80.5200	**80.5633**
V_{lc}	Total Liquid collected (ml)	234.70	222.40	236.90	
V_m	Volume metered, meter conditions (ft^3)	41.9500	42.0650	42.2400	
T_m	Dry gas meter temperature (°F)	75.1250	79.6250	85.5417	
T_s	Sample temperature (°F)	309.4167	308.0833	307.3333	**308.2778**
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)	11.0450	10.4661	11.1485	**10.8865**
V_{mstd}	Volume metered, standard (dscf)	41.2383	41.0065	40.7305	**40.9918**
P_s	Sample gas pressure, absolute (in. Hg)	29.0809	29.0809	29.2353	**29.1324**
P_v	Vapor pressure, actual (in. Hg)	29.0809	29.0809	29.2353	**29.1324**
B_{wo}	Moisture measured in sample (% by volume)	21.1253	20.3334	21.4894	**20.9827**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.1253	20.3334	21.4894	**20.9827**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9300	29.8780	29.9732	**29.9271**
M_s	MW of sample gas, wet (lb/lb-mole)	27.4098	27.4628	27.4002	**27.4243**

Comments:

Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:54	09:02	10:25	
Stop Time (approx.)		07:54	10:02	11:25	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.7	184.2	184.9	**184.6**
P_1	Fabric Filter Inlet Temperature (°F)	323	320	319	**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 %)	9.6500	10.3900	9.5300	**9.8567**
CO_2	Carbon dioxide (dry volume %)	9.6500	9.1400	9.9500	**9.5800**
T_s	Sample temperature (°F)	309.4167	308.0833	307.3333	**308.2778**
B_w	Actual water vapor in gas (% by volume)	21.1253	20.3334	21.4894	**20.9827**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	41.2383	41.0065	40.7305	**40.9918**
Laboratory Data					
m_n	Total HCl collected (mg)	29.7475	21.2780	23.2276	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	1.5906E-06	1.1442E-06	1.2575E-06	**1.3307E-06**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	1.9653E-06	1.5132E-06	1.5373E-06	**1.6719E-06**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	1.9779E-06	1.5022E-06	1.5165E-06	**1.6655E-06**
C_{sd}	HCl Concentration (ppmdv)	16.8166	12.0967	13.2946	**14.0693**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	20.7779	15.9985	16.2528	**17.6764**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	20.9119	15.8819	16.0337	**17.6092**
C_w	HCl Concentration (ppmwv)	13.2641	9.6371	10.4377	**11.1129**
C_{sd}	HCl Concentration (mg/dscm)	25.4710	18.3221	20.1364	**21.3099**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	31.4709	24.2319	24.6171	**26.7733**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	31.6738	24.0553	24.2851	**26.6714**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	27.3348	19.6627	21.6098	**22.8691**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	33.7736	26.0050	26.4183	**28.7323**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	33.9914	25.8154	26.0621	**28.6230**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0283	0.0218	0.0221	**0.0241**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0300	0.0228	0.0230	**0.0253**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:50	09:26	11:59	
Stop Time (approx.)		09:03	11:38	14:11	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9898	0.9898	0.9898	
C_p	Pitot tube coefficient	0.8050	0.8050	0.8050	
P_g	Static pressure (in. H_2O)	-11.0000	-11.0000	-10.3000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.00	30.00	30.00	**30.0000**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	8.7100	8.3000	8.7200	**8.5767**
CO_2	Carbon dioxide (dry volume %)	10.4600	10.9400	10.8400	**10.7467**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.8300	80.7600	80.4400	**80.6767**
V_{lc}	Total Liquid collected (ml)	442.10	478.40	464.40	
V_m	Volume metered, meter conditions (ft^3)	72.2900	77.9350	76.6650	
T_m	Dry gas meter temperature (°F)	75.8000	80.2200	78.5800	
T_s	Sample temperature (°F)	303.4400	304.0800	304.0000	**303.8400**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0824	1.2396	1.2104	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	20.8052	22.5135	21.8547	**21.7245**
V_{mstd}	Volume metered, standard (dscf)	70.8587	75.7961	74.7826	**73.8125**
P_s	Sample gas pressure, absolute (in. Hg)	29.1912	29.1912	29.2426	**29.2083**
P_v	Vapor pressure, actual (in. Hg)	29.1912	29.1912	29.2426	**29.2083**
B_{wo}	Moisture measured in sample (% by volume)	22.6973	22.9006	22.6151	**22.7377**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	22.6973	22.9006	22.6151	**22.7377**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6736	0.7224	0.7136	**0.7032**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0220	30.0824	30.0832	**30.0625**
M_s	MW of sample gas, wet (lb/lb-mole)	27.2933	27.3155	27.3506	**27.3198**
V_s	Velocity of sample (ft/sec)	45.3811	48.6680	48.0009	**47.3500**
%I	Isokinetic sampling (%)	100.4415	100.5326	100.0090	**100.3277**
Q_a	Volumetric flow rate, actual (acfm)	174,264	186,885	184,323	**181,824**
Q_s	Volumetric flow rate, standard (scfm)	117,586	125,997	124,502	**122,695**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	90,897	97,143	96,346	**94,795**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,715	88,057	84,424	**84,065**
Q_a	Volumetric flow rate, actual (acf/hr)	10,455,817	11,213,097	11,059,399	**10,909,438**
Q_s	Volumetric flow rate, standard (scf/hr)	7,055,162	7,559,806	7,470,113	**7,361,694**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,453,832	5,828,564	5,780,736	**5,687,711**
Q_a	Volumetric flow rate, actual (m^3/hr)	296,115	317,562	313,209	**308,962**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,806	214,098	211,558	**208,488**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	154,456	165,068	163,714	**161,079**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,454	149,630	143,456	**142,847**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,183	199,501	197,134	**194,272**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	143,925	153,814	152,552	**150,097**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,219	139,428	133,675	**133,107**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:50	09:26	11:59	
Stop Time (approx.)		09:03	11:38	14:11	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.2	184.2	183.5	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
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 %)	8.7100	8.3000	8.7200	**8.5767**
CO_2	Carbon dioxide (dry volume %)	10.4600	10.9400	10.8400	**10.7467**
T_s	Sample temperature (°F)	303.4400	304.0800	304.0000	**303.8400**
B_w	Actual water vapor in gas (% by volume)	22.6973	22.9006	22.6151	**22.7377**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	174,264	186,885	184,323	**181,824**
Q_s	Volumetric flow rate, standard (scfm)	117,586	125,997	124,502	**122,695**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	90,897	97,143	96,346	**94,795**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,715	88,057	84,424	**84,065**
Q_a	Volumetric flow rate, actual (acf/hr)	10,455,817	11,213,097	11,059,399	**10,909,438**
Q_s	Volumetric flow rate, standard (scf/hr)	7,055,162	7,559,806	7,470,113	**7,361,694**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,453,832	5,828,564	5,780,736	**5,687,711**
Q_a	Volumetric flow rate, actual (m^3/hr)	296,115	317,562	313,209	**308,962**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,806	214,098	211,558	**208,488**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	154,456	165,068	163,714	**161,079**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,454	149,630	143,456	**142,847**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,183	199,501	197,134	**194,272**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	143,925	153,814	152,552	**150,097**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,219	139,428	133,675	**133,107**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	70.8587	75.7961	74.7826	**73.8125**
%I	Isokinetic sampling (%)	100.4415	100.5326	100.0090	**100.3277**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00040	<0.00010	0.00100	
m_s	Matter collected in solvent rinse(s) (g)	0.00075	0.00130	0.00123	
m_n	Total particulate matter collected (g)	0.00115	0.00130	0.00223	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	3.5708E-08	3.7735E-08	6.5865E-08	**4.6436E-08**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	4.0717E-08	4.1628E-08	7.5166E-08	**5.2504E-08**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	4.0965E-08	4.1391E-08	7.2913E-08	**5.1756E-08**
C_a	Particulate Concentration (lb/acf)	1.8625E-08	1.9615E-08	3.4428E-08	**2.4223E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0002	0.0003	0.0005	**0.0003**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.0003	0.0003	0.0005	**0.0004**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.0003	0.0003	0.0005	**0.0004**
C_a	Particulate Concentration (gr/acf)	0.0001	0.0001	0.0002	**0.0002**
C_{sd}	Particulate Concentration (mg/dscm)	0.5718	0.6043	1.0547	**0.7436**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.6520	0.6666	1.2037	**0.8408**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	0.6560	0.6628	1.1676	**0.8288**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	0.2983	0.3141	0.5513	**0.3879**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	0.6136	0.6485	1.1319	**0.7980**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	0.6997	0.7154	1.2918	**0.9023**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	0.7040	0.7113	1.2530	**0.8895**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.1947	0.2199	0.3807	**0.2651**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.0883	0.0997	0.1727	**0.1202**
$E_{T/yr}$	Particulate Rate (Ton/yr)	0.8530	0.9633	1.6677	**1.1613**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0006	0.0006	0.0011	**0.0008**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.0006	0.0006	0.0011	**0.0008**

Comments:

Average includes 3 runs.

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Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:50	09:26	11:59	
Stop Time (approx.)		09:03	11:38	14:11	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.2	184.2	183.5	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
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 %)	8.7100	8.3000	8.7200	**8.5767**
CO_2	Carbon dioxide (dry volume %)	10.4600	10.9400	10.8400	**10.7467**
T_s	Sample temperature (°F)	303.4400	304.0800	304.0000	**303.8400**
B_w	Actual water vapor in gas (% by volume)	22.6973	22.9006	22.6151	**22.7377**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	174,264	186,885	184,323	**181,824**
Q_s	Volumetric flow rate, standard (scfm)	117,586	125,997	124,502	**122,695**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	90,897	97,143	96,346	**94,795**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,715	88,057	84,424	**84,065**
Q_a	Volumetric flow rate, actual (acf/hr)	10,455,817	11,213,097	11,059,399	**10,909,438**
Q_s	Volumetric flow rate, standard (scf/hr)	7,055,162	7,559,806	7,470,113	**7,361,694**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,453,832	5,828,564	5,780,736	**5,687,711**
Q_a	Volumetric flow rate, actual (m^3/hr)	296,115	317,562	313,209	**308,962**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,806	214,098	211,558	**208,488**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	154,456	165,068	163,714	**161,079**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,454	149,630	143,456	**142,847**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,183	199,501	197,134	**194,272**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	143,925	153,814	152,552	**150,097**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,219	139,428	133,675	**133,107**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	70.8587	75.7961	74.7826	**73.8125**
%I	Isokinetic sampling (%)	100.4415	100.5326	100.0090	**100.3277**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
m_{n-2b}	Fraction 2B (µg)	8.8257	8.9307	7.6261	
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)	8.8257	8.9307	7.6261	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	2.7464E-10	2.5980E-10	2.2486E-10	**2.5310E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	3.1317E-10	2.8661E-10	2.5661E-10	**2.8546E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	3.1507E-10	2.8498E-10	2.4892E-10	**2.8299E-10**
C_a	Concentration (lb/acf)	1.4325E-10	1.3505E-10	1.1753E-10	**1.3194E-10**
C_{sd}	Concentration (µg/dscm)	4.3980E+00	4.1604E+00	3.6008E+00	**4.0531E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	5.0149E+00	4.5897E+00	4.1093E+00	**4.5713E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	5.0455E+00	4.5635E+00	3.9861E+00	**4.5317E+00**
C_{sd}	Concentration (mg/dscm)	4.3980E-03	4.1604E-03	3.6008E-03	**4.0531E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	5.0149E-03	4.5897E-03	4.1093E-03	**4.5713E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	5.0455E-03	4.5635E-03	3.9861E-03	**4.5317E-03**
C_a	Concentration (µg/m^3 (actual,wet))	2.2940E+00	2.1626E+00	1.8821E+00	**2.1129E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	4.7198E+00	4.4648E+00	3.8643E+00	**4.3496E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	5.3819E+00	4.9255E+00	4.4100E+00	**4.9058E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	5.4147E+00	4.8974E+00	4.2778E+00	**4.8633E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.4978E-03	1.5143E-03	1.2999E-03	**1.4373E-03**
$E_{g/s}$	Rate (g/s)	1.8869E-04	1.9076E-04	1.6375E-04	**1.8107E-04**
$E_{T/yr}$	Rate (Ton/yr)	6.5605E-03	6.6326E-03	5.6934E-03	**6.2955E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	4.5063E-06	4.1241E-06	3.6925E-06	**4.1076E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.7786E-06	4.3222E-06	3.7753E-06	**4.2920E-06**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:50	09:26	11:59	
Stop Time (approx.)		09:03	11:38	14:11	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.2	184.2	183.5	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
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 %)	8.7100	8.3000	8.7200	**8.5767**
CO_2	Carbon dioxide (dry volume %)	10.4600	10.9400	10.8400	**10.7467**
T_s	Sample temperature (°F)	303.4400	304.0800	304.0000	**303.8400**
B_w	Actual water vapor in gas (% by volume)	22.6973	22.9006	22.6151	**22.7377**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	174,264	186,885	184,323	**181,824**
Q_s	Volumetric flow rate, standard (scfm)	117,586	125,997	124,502	**122,695**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	90,897	97,143	96,346	**94,795**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,715	88,057	84,424	**84,065**
Q_a	Volumetric flow rate, actual (acf/hr)	10,455,817	11,213,097	11,059,399	**10,909,438**
Q_s	Volumetric flow rate, standard (scf/hr)	7,055,162	7,559,806	7,470,113	**7,361,694**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,453,832	5,828,564	5,780,736	**5,687,711**
Q_a	Volumetric flow rate, actual (m^3/hr)	296,115	317,562	313,209	**308,962**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,806	214,098	211,558	**208,488**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	154,456	165,068	163,714	**161,079**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,454	149,630	143,456	**142,847**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,183	199,501	197,134	**194,272**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	143,925	153,814	152,552	**150,097**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,219	139,428	133,675	**133,107**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	70.8587	75.7961	74.7826	**73.8125**
%I	Isokinetic sampling (%)	100.4415	100.5326	100.0090	**100.3277**
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)	<1.5559E-12	<1.4546E-12	<1.4743E-12	**<1.4949E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7742E-12	<1.6046E-12	<1.6825E-12	**<1.6871E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7850E-12	<1.5955E-12	<1.6320E-12	**<1.6708E-12**
C_a	Concentration (lb/acf)	<8.1158E-13	<7.5608E-13	<7.7060E-13	**<7.7942E-13**
C_{sd}	Concentration (µg/dscm)	<2.4916E-02	<2.3293E-02	<2.3608E-02	**<2.3939E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.8411E-02	<2.5696E-02	<2.6942E-02	**<2.7016E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.8584E-02	<2.5550E-02	<2.6135E-02	**<2.6756E-02**
C_{sd}	Concentration (mg/dscm)	<2.4916E-05	<2.3293E-05	<2.3608E-05	**<2.3939E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.8411E-05	<2.5696E-05	<2.6942E-05	**<2.7016E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.8584E-05	<2.5550E-05	<2.6135E-05	**<2.6756E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<1.2996E-02	<1.2108E-02	<1.2340E-02	**<1.2481E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.6739E-02	<2.4997E-02	<2.5336E-02	**<2.5691E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0490E-02	<2.7576E-02	<2.8914E-02	**<2.8993E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<3.0676E-02	<2.7419E-02	<2.8047E-02	**<2.8714E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.4857E-06	<8.4780E-06	<8.5224E-06	**<8.4954E-06**
$E_{g/s}$	Rate (g/s)	<1.0690E-06	<1.0680E-06	<1.0736E-06	**<1.0702E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.7167E-05	<3.7134E-05	<3.7328E-05	**<3.7210E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5529E-08	<2.3090E-08	<2.4210E-08	**<2.4276E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.7072E-08	<2.4198E-08	<2.4753E-08	**<2.5341E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:50	09:26	11:59	
Stop Time (approx.)		09:03	11:38	14:11	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.2	184.2	183.5	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
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 %)	8.7100	8.3000	8.7200	**8.5767**
CO_2	Carbon dioxide (dry volume %)	10.4600	10.9400	10.8400	**10.7467**
T_s	Sample temperature (°F)	303.4400	304.0800	304.0000	**303.8400**
B_w	Actual water vapor in gas (% by volume)	22.6973	22.9006	22.6151	**22.7377**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	174,264	186,885	184,323	**181,824**
Q_s	Volumetric flow rate, standard (scfm)	117,586	125,997	124,502	**122,695**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	90,897	97,143	96,346	**94,795**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,715	88,057	84,424	**84,065**
Q_a	Volumetric flow rate, actual (acf/hr)	10,455,817	11,213,097	11,059,399	**10,909,438**
Q_s	Volumetric flow rate, standard (scf/hr)	7,055,162	7,559,806	7,470,113	**7,361,694**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,453,832	5,828,564	5,780,736	**5,687,711**
Q_a	Volumetric flow rate, actual (m^3/hr)	296,115	317,562	313,209	**308,962**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,806	214,098	211,558	**208,488**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	154,456	165,068	163,714	**161,079**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,454	149,630	143,456	**142,847**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,183	199,501	197,134	**194,272**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	143,925	153,814	152,552	**150,097**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,219	139,428	133,675	**133,107**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	70.8587	75.7961	74.7826	**73.8125**
%I	Isokinetic sampling (%)	100.4415	100.5326	100.0090	**100.3277**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	<0.2000	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	<6.2236E-12	<5.8182E-12	<5.8971E-12	**<5.9797E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<7.0967E-12	<6.4185E-12	<6.7299E-12	**<6.7484E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<7.1399E-12	<6.3820E-12	<6.5281E-12	**<6.6834E-12**
C_a	Concentration (lb/acf)	<3.2463E-12	<3.0243E-12	<3.0824E-12	**<3.1177E-12**
C_{sd}	Concentration (µg/dscm)	<9.9663E-02	<9.3171E-02	<9.4434E-02	**<9.5756E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.1364E-01	<1.0278E-01	<1.0777E-01	**<1.0807E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.1434E-01	<1.0220E-01	<1.0454E-01	**<1.0702E-01**
C_{sd}	Concentration (mg/dscm)	<9.9663E-05	<9.3171E-05	<9.4434E-05	**<9.5756E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.1364E-04	<1.0278E-04	<1.0777E-04	**<1.0807E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.1434E-04	<1.0220E-04	<1.0454E-04	**<1.0702E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<5.1985E-02	<4.8430E-02	<4.9360E-02	**<4.9925E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<1.0696E-01	<9.9988E-02	<1.0134E-01	**<1.0276E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.2196E-01	<1.1030E-01	<1.1565E-01	**<1.1597E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.2270E-01	<1.0968E-01	<1.1219E-01	**<1.1486E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.3943E-05	<3.3912E-05	<3.4090E-05	**<3.3981E-05**
$E_{g/s}$	Rate (g/s)	<4.2760E-06	<4.2721E-06	<4.2945E-06	**<4.2809E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.4867E-04	<1.4853E-04	<1.4931E-04	**<1.4884E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.0212E-07	<9.2359E-08	<9.6839E-08	**<9.7105E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0829E-07	<9.6793E-08	<9.9010E-08	**<1.0136E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:50	09:26	11:59	
Stop Time (approx.)		09:03	11:38	14:11	
Process Conditions					
R_p	Steam Production Rate (Klbs/hour)	184.2	184.2	183.5	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
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 %)	8.7100	8.3000	8.7200	**8.5767**
CO_2	Carbon dioxide (dry volume %)	10.4600	10.9400	10.8400	**10.7467**
T_s	Sample temperature (°F)	303.4400	304.0800	304.0000	**303.8400**
B_w	Actual water vapor in gas (% by volume)	22.6973	22.9006	22.6151	**22.7377**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	174,264	186,885	184,323	**181,824**
Q_s	Volumetric flow rate, standard (scfm)	117,586	125,997	124,502	**122,695**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	90,897	97,143	96,346	**94,795**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,715	88,057	84,424	**84,065**
Q_a	Volumetric flow rate, actual (acf/hr)	10,455,817	11,213,097	11,059,399	**10,909,438**
Q_s	Volumetric flow rate, standard (scf/hr)	7,055,162	7,559,806	7,470,113	**7,361,694**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,453,832	5,828,564	5,780,736	**5,687,711**
Q_a	Volumetric flow rate, actual (m^3/hr)	296,115	317,562	313,209	**308,962**
Q_s	Volumetric flow rate, standard (m^3/hr)	199,806	214,098	211,558	**208,488**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	154,456	165,068	163,714	**161,079**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,454	149,630	143,456	**142,847**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	186,183	199,501	197,134	**194,272**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	143,925	153,814	152,552	**150,097**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,219	139,428	133,675	**133,107**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	70.8587	75.7961	74.7826	**73.8125**
%I	Isokinetic sampling (%)	100.4415	100.5326	100.0090	**100.3277**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.2760	0.2230	0.3748	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	8.5888E-12	6.4883E-12	1.1052E-11	**8.7098E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	9.7937E-12	7.1577E-12	1.2613E-11	**9.8548E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	9.8533E-12	7.1170E-12	1.2235E-11	**9.7351E-12**
C_a	Concentration (lb/acf)	4.4800E-12	3.3726E-12	5.7769E-12	**4.5432E-12**
C_{sd}	Concentration (µg/dscm)	1.3754E-01	1.0390E-01	1.7698E-01	**1.3947E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.5683E-01	1.1462E-01	2.0198E-01	**1.5781E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.5779E-01	1.1397E-01	1.9592E-01	**1.5589E-01**
C_{sd}	Concentration (mg/dscm)	1.3754E-04	1.0390E-04	1.7698E-04	**1.3947E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.5683E-04	1.1462E-04	2.0198E-04	**1.5781E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.5779E-04	1.1397E-04	1.9592E-04	**1.5589E-04**
C_a	Concentration (µg/m^3 (actual,wet))	7.1741E-02	5.4008E-02	9.2510E-02	**7.2753E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	1.4760E-01	1.1150E-01	1.8993E-01	**1.4968E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.6831E-01	1.2301E-01	2.1676E-01	**1.6936E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.6933E-01	1.2231E-01	2.1026E-01	**1.6730E-01**
$E_{lb/hr}$	Rate (lb/hr)	4.6842E-05	3.7817E-05	6.3890E-05	**4.9516E-05**
$E_{g/s}$	Rate (g/s)	5.9010E-06	4.7641E-06	8.0486E-06	**6.2379E-06**
$E_{T/yr}$	Rate (Ton/yr)	2.0517E-04	1.6564E-04	2.7984E-04	**2.1688E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.4093E-07	1.0300E-07	1.8149E-07	**1.4180E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.4944E-07	1.0794E-07	1.8556E-07	**1.4765E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		11:49	13:33	15:07	
Stop Time (approx.)		13:07	14:44	16:16	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9898	0.9898	0.9898	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-10.6000	-10.6000	-10.6000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.05	30.05	30.05	**30.0500**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	9.9000	9.5300	9.7200	**9.7167**
CO_2	Carbon dioxide (dry volume %)	9.7100	10.0400	9.9600	**9.9033**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.3900	80.4300	80.3200	**80.3800**
V_{lc}	Total Liquid collected (ml)	204.20	213.70	209.20	
V_m	Volume metered, meter conditions (ft^3)	36.8000	37.7600	36.5800	
T_m	Dry gas meter temperature (°F)	71.8000	77.1200	78.5000	
T_s	Sample temperature (°F)	297.9600	299.4400	298.8800	**298.7600**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0948	1.1520	1.0672	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	9.6097	10.0567	9.8450	**9.8371**
V_{mstd}	Volume metered, standard (dscf)	36.4042	36.9891	35.7340	**36.3758**
P_s	Sample gas pressure, absolute (in. Hg)	29.2706	29.2706	29.2706	**29.2706**
P_v	Vapor pressure, actual (in. Hg)	29.2706	29.2706	29.2706	**29.2706**
B_{wo}	Moisture measured in sample (% by volume)	20.8842	21.3764	21.5998	**21.2868**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	20.8842	21.3764	21.5998	**21.2868**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.6713	0.6926	0.6701	**0.6780**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9496	29.9876	29.9824	**29.9732**
M_s	MW of sample gas, wet (lb/lb-mole)	27.4540	27.4251	27.3942	**27.4244**
V_s	Velocity of sample (ft/sec)	45.2598	46.7645	45.2555	**45.7599**
%I	Isokinetic sampling (%)	101.6122	100.7446	100.7835	**101.0467**
Q_a	Volumetric flow rate, actual (acfm)	173,798	179,576	173,781	**175,718**
Q_s	Volumetric flow rate, standard (scfm)	118,441	122,140	118,286	**119,622**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,705	96,031	92,736	**94,158**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	74,155	78,552	74,589	**75,766**
Q_a	Volumetric flow rate, actual (acf/hr)	10,427,863	10,774,535	10,426,862	**10,543,087**
Q_s	Volumetric flow rate, standard (scf/hr)	7,106,452	7,328,395	7,097,156	**7,177,334**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,622,323	5,761,845	5,564,184	**5,649,451**
Q_a	Volumetric flow rate, actual (m^3/hr)	295,323	305,141	295,295	**298,586**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,259	207,544	200,996	**203,266**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	159,227	163,179	157,581	**159,996**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	126,007	133,478	126,745	**128,743**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	187,537	193,394	187,291	**189,407**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	148,371	152,053	146,837	**149,087**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	117,416	124,377	118,103	**119,965**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 13B
HF Parameters

	Run No.	1	2	3	Average
	Date (2010)	Mar 16	Mar 16	Mar 16	
	Start Time (approx.)	11:49	13:33	15:07	
	Stop Time (approx.)	13:07	14:44	16:16	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.7	183.9	184.2	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	310	310	310	**310**
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 %)	9.9000	9.5300	9.7200	**9.7167**
CO_2	Carbon dioxide (dry volume %)	9.7100	10.0400	9.9600	**9.9033**
T_s	Sample temperature (°F)	297.9600	299.4400	298.8800	**298.7600**
B_w	Actual water vapor in gas (% by volume)	20.8842	21.3764	21.5998	**21.2868**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,798	179,576	173,781	**175,718**
Q_s	Volumetric flow rate, standard (scfm)	118,441	122,140	118,286	**119,622**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,705	96,031	92,736	**94,158**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	74,155	78,552	74,589	**75,766**
Q_a	Volumetric flow rate, actual (acf/hr)	10,427,863	10,774,535	10,426,862	**10,543,087**
Q_s	Volumetric flow rate, standard (scf/hr)	7,106,452	7,328,395	7,097,156	**7,177,334**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,622,323	5,761,845	5,564,184	**5,649,451**
Q_a	Volumetric flow rate, actual (m^3/hr)	295,323	305,141	295,295	**298,586**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,259	207,544	200,996	**203,266**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	159,227	163,179	157,581	**159,996**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	126,007	133,478	126,745	**128,743**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	187,537	193,394	187,291	**189,407**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	148,371	152,053	146,837	**149,087**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	117,416	124,377	118,103	**119,965**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	36.4042	36.9891	35.7340	**36.3758**
%I	Isokinetic sampling (%)	101.6122	100.7446	100.7835	**101.0467**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0359	<0.0348	<0.0326	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (lb/dscf)	<2.1740E-09	<2.0752E-09	<2.0123E-09	**<2.0872E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<2.7472E-09	<2.5370E-09	<2.5019E-09	**<2.5954E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<2.6867E-09	<2.4804E-09	<2.4245E-09	**<2.5305E-09**
C_a	HF Concentration (lb/acf)	<1.1721E-09	<1.1098E-09	<1.0739E-09	**<1.1186E-09**
C_{sd}	HF Concentration (ppmdv)	<0.0419	<0.0400	<0.0388	**<0.0402**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0529	<0.0489	<0.0482	**<0.0500**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0518	<0.0478	<0.0467	**<0.0488**
C_w	HF Concentration (ppmwv)	<0.0331	<0.0314	<0.0304	**<0.0317**
C_{sd}	HF Concentration (mg/dscm)	<0.0348	<0.0332	<0.0322	**<0.0334**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0440	<0.0406	<0.0401	**<0.0416**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0430	<0.0397	<0.0388	**<0.0405**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0188	<0.0178	<0.0172	**<0.0179**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0374	<0.0357	<0.0346	**<0.0359**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0472	<0.0436	<0.0430	**<0.0446**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0462	<0.0426	<0.0417	**<0.0435**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0122	<0.0120	<0.0112	**<0.0118**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0055	<0.0054	<0.0051	**<0.0053**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0535	<0.0524	<0.0490	**<0.0517**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000040	<0.000037	<0.000036	**<0.000037**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000041	<0.000038	<0.000037	**<0.000038**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

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

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:17	09:04	10:32	
Stop Time (approx.)		08:17	10:04	11:32	
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)	-2.1000	-2.0000	-2.2000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.05	30.05	30.05	**30.0500**
O_2	Oxygen (dry volume %)	8.5900	8.2100	8.0700	**8.2900**
CO_2	Carbon dioxide (dry volume %)	10.7200	11.0700	11.1600	**10.9833**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6900	80.7200	80.7700	**80.7267**
V_{lc}	Total Liquid collected (ml)	159.80	161.60	148.40	
V_m	Volume metered, meter conditions (ft^3)	35.6100	36.2500	35.4550	
T_m	Dry gas meter temperature (°F)	70.4167	73.3333	77.4167	
T_s	Sample temperature (°F)	503.1667	509.5833	508.1667	**506.9722**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1583	1.2000	1.1750	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	7.5202	7.6049	6.9837	**7.3696**
V_{mstd}	Volume metered, standard (dscf)	35.3886	35.8313	34.7771	**35.3323**
P_s	Sample gas pressure, absolute (in. Hg)	29.8956	29.9029	29.8882	**29.8956**
P_v	Vapor pressure, actual (in. Hg)	29.8956	29.9029	29.8882	**29.8956**
B_{wo}	Moisture measured in sample (% by volume)	17.5260	17.5082	16.7231	**17.2524**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	17.5260	17.5082	16.7231	**17.2524**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0588	30.0996	30.1084	**30.0889**
M_s	MW of sample gas, wet (lb/lb-mole)	27.9454	27.9812	28.0835	**28.0034**

Comments:
Average includes 3 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

USEPA Method 26A
HCl Parameters

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:17	09:04	10:32	
Stop Time (approx.)		08:17	10:04	11:32	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	184.1	184.3	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	310	310	310	**310**
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 %)	8.5900	8.2100	8.0700	**8.2900**
CO_2	Carbon dioxide (dry volume %)	10.7200	11.0700	11.1600	**10.9833**
T_s	Sample temperature (°F)	503.1667	509.5833	508.1667	**506.9722**
B_w	Actual water vapor in gas (% by volume)	17.5260	17.5082	16.7231	**17.2524**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	35.3886	35.8313	34.7771	**35.3323**
Laboratory Data					
m_n	Total HCl collected (mg)	860.2476	813.7980	910.7861	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	5.3600E-05	5.0080E-05	5.7747E-05	**5.3809E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	6.0524E-05	5.4855E-05	6.2563E-05	**5.9314E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	6.0001E-05	5.4287E-05	6.2094E-05	**5.8794E-05**
C_{sd}	HCl Concentration (ppmdv)	566.6961	529.4742	610.5397	**568.9033**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	639.8925	579.9599	661.4577	**627.1033**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	634.3613	573.9557	656.4943	**621.6038**
C_w	HCl Concentration (ppmwv)	467.3771	436.7727	508.4384	**470.8627**
C_{sd}	HCl Concentration (mg/dscm)	858.3366	801.9589	924.7435	**861.6797**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	969.2021	878.4263	1001.8656	**949.8313**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	960.8245	869.3322	994.3479	**941.5015**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	921.1417	860.6389	992.4077	**924.7294**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	1040.1194	942.7014	1075.1728	**1019.3312**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	1031.1288	932.9419	1067.1051	**1010.3919**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.8709	0.7893	0.9003	**0.8535**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.9100	0.8234	0.9418	**0.8917**

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Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

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

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:17	09:04	10:32	
Stop Time (approx.)		08:17	10:04	11:32	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9892	0.9892	0.9892	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-10.4000	-11.2000	-10.7000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.05	30.05	30.05	**30.0500**
O_2	Oxygen (dry volume %)	9.0300	9.1000	8.9200	**9.0167**
CO_2	Carbon dioxide (dry volume %)	10.2700	10.2200	10.3800	**10.2900**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.7000	80.6800	80.7000	**80.6933**
V_{lc}	Total Liquid collected (ml)	235.50	240.70	247.10	
V_m	Volume metered, meter conditions (ft^3)	41.3400	41.3400	41.6050	
T_m	Dry gas meter temperature (°F)	56.3750	60.7083	65.4583	
T_s	Sample temperature (°F)	299.2500	300.3333	299.2500	**299.6111**
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)	11.0826	11.3273	11.6285	**11.3462**
V_{mstd}	Volume metered, standard (dscf)	42.1331	41.7825	41.6702	**41.8619**
P_s	Sample gas pressure, absolute (in. Hg)	29.2853	29.2265	29.2632	**29.2583**
P_v	Vapor pressure, actual (in. Hg)	29.2853	29.2265	29.2632	**29.2583**
B_{wo}	Moisture measured in sample (% by volume)	20.8258	21.3281	21.8176	**21.3239**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	20.8258	21.3281	21.8176	**21.3239**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0044	29.9992	30.0176	**30.0071**
M_s	MW of sample gas, wet (lb/lb-mole)	27.5044	27.4400	27.3956	**27.4467**

Comments:

Average includes 3 runs.

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Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:17	09:04	10:32	
Stop Time (approx.)		08:17	10:04	11:32	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.6	184.1	184.3	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	310	310	310	**310**
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 %)	9.0300	9.1000	8.9200	**9.0167**
CO_2	Carbon dioxide (dry volume %)	10.2700	10.2200	10.3800	**10.2900**
T_s	Sample temperature (°F)	299.2500	300.3333	299.2500	**299.6111**
B_w	Actual water vapor in gas (% by volume)	20.8258	21.3281	21.8176	**21.3239**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	42.1331	41.7825	41.6702	**41.8619**
Laboratory Data					
m_n	Total HCl collected (mg)	26.0913	32.8638	23.8845	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	1.3655E-06	1.7343E-06	1.2639E-06	**1.4546E-06**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	1.5990E-06	2.0430E-06	1.4664E-06	**1.7028E-06**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	1.5955E-06	2.0364E-06	1.4611E-06	**1.6977E-06**
C_{sd}	HCl Concentration (ppmdv)	14.4365	18.3364	13.3623	**15.3784**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	16.9054	21.5996	15.5038	**18.0030**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	16.8684	21.5300	15.4477	**17.9487**
C_w	HCl Concentration (ppmwv)	11.4300	14.4256	10.4470	**12.1008**
C_{sd}	HCl Concentration (mg/dscm)	21.8660	27.7729	20.2390	**23.2926**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	25.6055	32.7155	23.4826	**27.2679**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	25.5494	32.6100	23.3976	**27.1857**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	23.4660	29.8050	21.7199	**24.9970**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	27.4791	35.1093	25.2008	**29.2631**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	27.4189	34.9961	25.1097	**29.1749**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0230	0.0294	0.0211	**0.0245**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0242	0.0309	0.0222	**0.0257**

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Date __________

Wheelabrator North Broward, Inc.
CleanAir Project No. 10955
Lime Silo

Visible Emission Parameters

Run 1

Date (2010) Mar 17
Start Time 10:26

Time	Time (sec)			
(min)	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	Time (sec)			
(min)	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				
21				
22				
23				
24				
25				
26				
27				
28				
29				
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56				
57				
58				
59				

Average Opacity 0
Minimum Reading 0
Maximum Reading 0
No. of Readings >5% 0

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End of Appendix

QA/QC DATA

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Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 16	Mar 16	Mar 16	
	Start Time (approx.)	07:21	10:00	12:36	
	Stop Time (approx.)	09:32	12:14	14:47	
	Total Duration of Test Run (min.)	131	134	131	
	Net Sampling Time (min.)	125	125	125	
	Sampling System Calibration Summary				
	Nozzle ID No:	270-1	270-1	270-1	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8050	0.8050	0.8050	
	Meter Box ID. No:	61-6	61-6	61-6	
Y_d	Meter Box Yd - Field Sheet	0.9900	0.9900	0.9900	
	Meter Box Yd - Database	0.9900	0.9900	0.9900	
	Meter Box ΔH@ - Field Sheet	1.6820	1.6820	1.6820	
	Meter Box ΔH@ - Database	1.6820	1.6820	1.6820	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0257	0.0261	0.0265	
	(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	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	60.00	60.00	60.00	
V_{mstd}	Actual Sample Volume (dscf)	80.553	81.154	81.553	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.1230	1.1375	1.1463	
Y_{qa}	Alternative Meter Calibration Factor	0.9879	0.9891	0.9860	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.2%	-0.1%	-0.4%	**-0.2%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	98.77	99.71	99.31	
	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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QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 18	Mar 18	Mar 18	
	Start Time (approx.)	07:09	09:49	12:27	
	Stop Time (approx.)	09:22	12:02	14:39	
	Total Duration of Test Run (min.)	133	133	132	
	Net Sampling Time (min.)	125	125	125	
Sampling System Calibration Summary					
	Nozzle ID No:	270-1	270-1	270-1	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8050	0.8050	0.8050	
	Meter Box ID. No:	66-24	66-24	66-24	
Y_d	Meter Box Yd - Field Sheet	0.9904	0.9904	0.9904	
	Meter Box Yd - Database	0.9904	0.9904	0.9904	
	Meter Box ΔH@ - Field Sheet	1.7516	1.7516	1.7516	
	Meter Box ΔH@ - Database	1.7516	1.7516	1.7516	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0271	0.0261	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)	0.0040	0.0020	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	60.00	60.00	60.00	
V_{mstd}	*Actual Sample Volume (dscf)*	*84.183*	*79.341*	*82.110*	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.2037	1.1523	1.1942	
Y_{qa}	Alternative Meter Calibration Factor	0.9897	0.9931	0.9905	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.1%	0.3%	0.0%	**0.1%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.31	98.93	99.93	
	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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QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 17	Mar 17	Mar 17	
	Start Time (approx.)	06:50	09:26	11:59	
	Stop Time (approx.)	09:03	11:38	14:11	
	Total Duration of Test Run (min.)	133	132	132	
	Net Sampling Time (min.)	125	125	125	
	Sampling System Calibration Summary				
	Nozzle ID No:	270-1	270-1	270-1	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8050	0.8050	0.8050	
	Meter Box ID. No:	66-14	66-14	66-14	
Y_d	Meter Box Yd - Field Sheet	0.9898	0.9898	0.9898	
	Meter Box Yd - Database	0.9898	0.9898	0.9898	
	Meter Box ΔH@ - Field Sheet	1.7643	1.7643	1.7643	
	Meter Box ΔH@ - Database	1.7643	1.7643	1.7643	
	QA/QC				
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0231	0.0249	0.0245	
	(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)	0.0000	0.0030	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	60.00	60.00	60.00	
V_{mstd}	Actual Sample Volume (dscf)	70.859	75.796	74.783	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0334	1.1107	1.0965	
Y_{qa}	Alternative Meter Calibration Factor	0.9959	0.9959	0.9979	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.6%	0.6%	0.8%	**0.7%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.44	100.53	100.01	
	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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QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

Run No.		1	2	3	
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		11:46	13:15	14:45	
Stop Time (approx.)		12:56	14:27	15:53	
Total Duration of Test Run (min.)		70	72	68	
Net Sampling Time (min.)		63	63	63	
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:	67-8-14	67-8-14	67-8-14	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	61-6	61-6	61-6	
Y_d	Meter Box Yd - Field Sheet	0.9900	0.9900	0.9900	
	Meter Box Yd - Database	0.9900	0.9900	0.9900	
	Meter Box ΔH@ - Field Sheet	1.6820	1.6820	1.6820	
	Meter Box ΔH@ - Database	1.6820	1.6820	1.6820	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0275	0.0275	0.0265	
	(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)	0.0010	0.0020	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	42.732	42.452	41.153	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.2034	1.2101	1.1602	
Y_{qa}	Alternative Meter Calibration Factor	0.9949	1.0028	0.9931	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.5%	1.3%	0.3%	**0.7%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.12	99.42	101.21	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	1	0	
	Number of points >110%	0	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: 10955
Unit 2 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

Run No.		1	2	3	
	Date (2010)	Mar 18	Mar 18	Mar 18	
	Start Time (approx.)	07:09	08:56	10:45	
	Stop Time (approx.)	08:24	10:10	12:05	
	Total Duration of Test Run (min.)	75	74	80	
	Net Sampling Time (min.)	63	63	63	
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:	67-8-14	67-8-14	67-8-14	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	66-14	66-14	66-14	
Y_d	Meter Box Yd - Field Sheet	0.9898	0.9898	0.9898	
	Meter Box Yd - Database	0.9898	0.9898	0.9898	
	Meter Box ΔH@ - Field Sheet	1.7643	1.7643	1.7643	
	Meter Box ΔH@ - Database	1.7643	1.7643	1.7643	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0244	0.0239	0.0246	
	(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)	0.0040	0.0020	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	38.207	36.894	37.310	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.1156	1.0736	1.0938	
Y_{qa}	Alternative Meter Calibration Factor	1.0110	0.9988	0.9997	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	2.1%	0.9%	1.0%	**1.4%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	98.31	99.17	98.03	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	2	0	0	
	Number of points >110%	1	0	0	
	Number of points <80%	2	0	0	
	Number of points >120%	0	0	0	

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QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 16	Mar 16	Mar 16	
	Start Time (approx.)	11:49	13:33	15:07	
	Stop Time (approx.)	13:07	14:44	16:16	
	Total Duration of Test Run (min.)	78	71	69	
	Net Sampling Time (min.)	63	63	63	
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:	67-8-14	67-8-14	67-8-14	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	66-14	66-14	66-14	
Y_d	Meter Box Yd - Field Sheet	0.9898	0.9898	0.9898	
	Meter Box Yd - Database	0.9898	0.9898	0.9898	
	Meter Box ΔH@ - Field Sheet	1.7643	1.7643	1.7643	
	Meter Box ΔH@ - Database	1.7643	1.7643	1.7643	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0236	0.0242	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)	0.0020	0.0020	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	36.404	36.989	35.734	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0442	1.0697	1.0297	
Y_{qa}	Alternative Meter Calibration Factor	0.9851	0.9877	0.9829	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.5%	-0.2%	-0.7%	**-0.5%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	101.61	100.74	100.78	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	3	2	1	
	Number of points >110%	5	2	1	
	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: 10955
Unit 2 FF Outlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 17	Mar 17	Mar 17	
	Start Time (approx.)	06:54	09:02	10:25	
	Stop Time (approx.)	07:54	10:02	11:25	
	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:	67-4-3	67-4-3	67-4-3	
	Meter Box ID. No:	66-24	66-24	66-24	
Y_d	Meter Box Yd - Field Sheet	0.9904	0.9904	0.9904	
	Meter Box Yd - Database	0.9904	0.9904	0.9904	
	Meter Box ΔH@ - Field Sheet	1.7516	1.7516	1.7516	
	Meter Box ΔH@ - Database	1.7516	1.7516	1.7516	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0280	0.0280	0.0282	
	(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	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	41.238	41.007	40.731	
	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	0.9803	0.9826	0.9823	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-1.0%	-0.8%	-0.8%	**-0.9%**

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QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 23 (PCDD/F)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 16	Mar 17	Mar 17	
	Start Time (approx.)	08:44	06:54	12:53	
	Stop Time (approx.)	13:36	12:19	17:26	
	Total Duration of Test Run (min.)	292	325	273	
	Net Sampling Time (min.)	250	250	250	
	Sampling System Calibration Summary				
	Nozzle ID No:	264-1	264-1	264-1	
D_n	Nozzle Diameter (in):	0.264	0.264	0.264	
	Probe ID No:	67-8-17	67-8-17	67-8-17	
C_p	Pitot Coefficient:	0.8340	0.8340	0.8340	
	Meter Box ID. No:	66-6	66-6	66-24	
Y_d	Meter Box Yd - Field Sheet	0.9901	0.9901	0.9904	
	Meter Box Yd - Database	0.9901	0.9901	0.9904	
	Meter Box ΔH@ - Field Sheet	1.7870	1.7870	1.7516	
	Meter Box ΔH@ - Database	1.7870	1.7870	1.7516	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0257	0.0275	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)	0.0050	0.0050	0.0050	
	Sample Volume				
	Minimum Volume Required (dscf)	120.00	120.00	120.00	
V_{mstd}	Actual Sample Volume (dscf)	156.061	168.824	164.129	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.1356	1.2325	1.1676	
Y_{qa}	Alternative Meter Calibration Factor	0.9855	0.9937	0.9808	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.5%	0.4%	-1.0%	**-0.4%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	97.97	100.32	101.57	
	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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QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

Run No.		1	2	3	
	Date (2010)	Mar 18	Mar 18	Mar 18	
	Start Time (approx.)	07:02	09:26	11:49	
	Stop Time (approx.)	08:02	10:37	12:49	
	Total Duration of Test Run (min.)	60	71	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:	67-4-4	67-4-4	67-4-4	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	85-4	85-4	85-4	
Y_d	Meter Box Yd - Field Sheet	1.0085	1.0085	1.0085	
	Meter Box Yd - Database	1.0085	1.0085	1.0085	
	Meter Box ΔH@ - Field Sheet	1.7723	1.7723	1.7723	
	Meter Box ΔH@ - Database	1.7723	1.7723	1.7723	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0247	0.0238	0.0237	
	(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)	38.191	36.424	35.652	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0916	1.0954	1.0954	
Y_{qa}	Alternative Meter Calibration Factor	0.9680	1.0125	1.0264	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-4.0%	0.4%	1.8%	**-0.6%**

041210 145802
INK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 18	Mar 18	Mar 18	
	Start Time (approx.)	07:02	09:26	11:49	
	Stop Time (approx.)	08:02	10:37	12:49	
	Total Duration of Test Run (min.)	60	71	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:	67-4-3	67-4-3	67-4-3	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	85-2	85-2	85-2	
Y_d	Meter Box Yd - Field Sheet	1.0066	1.0066	1.0066	
	Meter Box Yd - Database	1.0066	1.0066	1.0066	
	Meter Box ΔH@ - Field Sheet	1.7759	1.7759	1.7759	
	Meter Box ΔH@ - Database	1.7759	1.7759	1.7759	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0267	0.0266	0.0268	
	(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	0.0010	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	41.096	40.795	40.645	
	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	1.0058	1.0118	1.0108	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.1%	0.5%	0.4%	**0.3%**

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NLK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 17	Mar 17	Mar 17	
	Start Time (approx.)	06:54	09:02	10:25	
	Stop Time (approx.)	07:54	10:02	11:25	
	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:	67-4-5	67-4-5	67-4-5	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	61-8	61-8	61-8	
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	1.7580	1.7580	1.7580	
	Meter Box ΔH@ - Database	1.7580	1.7580	1.7580	
	QA/QC				
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0242	0.0243	0.0242	
	(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)	0.0040	0.0030	0.0040	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	35.882	36.433	36.196	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0916	1.0954	1.0916	
Y_{qa}	Alternative Meter Calibration Factor	1.0029	0.9981	0.9998	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	1.1%	0.7%	0.8%	**0.9%**

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KQK@

QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 26A (HCl)
QA/QC Results

		1	2	3	
Run No.		**1**	**2**	**3**	
Date (2010)		Mar 17	Mar 17	Mar 17	
Start Time (approx.)		06:54	09:02	10:25	
Stop Time (approx.)		07:54	10:02	11:25	
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:	67-4-3	67-4-3	67-4-3	
	Meter Box ID. No:	66-24	66-24	66-24	
Y_d	Meter Box Yd - Field Sheet	0.9904	0.9904	0.9904	
	Meter Box Yd - Database	0.9904	0.9904	0.9904	
	Meter Box ΔH@ - Field Sheet	1.7516	1.7516	1.7516	
	Meter Box ΔH@ - Database	1.7516	1.7516	1.7516	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0280	0.0280	0.0282	
	(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	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	41.238	41.007	40.731	
	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	0.9803	0.9826	0.9823	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-1.0%	-0.8%	-0.8%	**-0.9%**

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OJP@

QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

Run No.		1	2	3	
Date (2010)		Mar 16	Mar 16	Mar 16	
Start Time (approx.)		07:17	09:04	10:32	
Stop Time (approx.)		08:17	10:04	11:32	
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:	67-4-5	67-4-5	67-4-5	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	61-8	61-8	61-8	
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	1.7580	1.7580	1.7580	
	Meter Box ΔH@ - Database	1.7580	1.7580	1.7580	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0237	0.0242	0.0236	
	(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)	0.0040	0.0030	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	35.389	35.831	34.777	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.0757	1.0954	1.0836	
Y_{qa}	Alternative Meter Calibration Factor	1.0054	1.0078	1.0230	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	1.4%	1.6%	3.2%	**2.1%**

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NSJ@

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QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	1	2	3
	Date (2010)	Mar 16	Mar 16	Mar 16
	Start Time (approx.)	07:17	09:04	10:32
	Stop Time (approx.)	08:17	10:04	11:32
	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:	67-4-3	67-4-3	67-4-3
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400
	Meter Box ID. No:	61-11	61-11	61-11
Y_d	Meter Box Yd - Field Sheet	0.9892	0.9892	0.9892
	Meter Box Yd - Database	0.9892	0.9892	0.9892
	Meter Box ΔH@ - Field Sheet	1.7379	1.7379	1.7379
	Meter Box ΔH@ - Database	1.7379	1.7379	1.7379

QA/QC

	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0276	0.0276	0.0277	
	(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	0.0010	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	42.133	41.782	41.670	
	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	0.9790	0.9832	0.9811	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-1.0%	-0.6%	-0.8%	**-0.8%**

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LNK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

QA/QC ________
Date ________

Nozzle Calibration Sheet

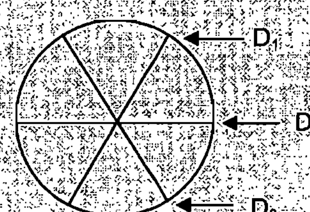
Client	Wheelabrator North Broward	Project Number	0955
Calibrated by	S. Brown	Unit	1-3 (Both Plants)
Date	3/15/10	Runs	1-3

	Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{ave} (inches)
5/29	0.270-1	0.270	0.270	0.271	0.001	0.270
M23	0.264-1	0.265	0.264	0.263	0.002	0.264
M13B	0.268-1	0.269	0.268	0.268	0.001	0.268
inlet	0.270-2	0.271	0.270	0.270	0.001	0.270
	0.270-3	0.270	0.270	0.270	0.000	0.270

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)

QA/QC SB
Date 3/24/10

CleanAir ENGINEERING

CDS005A-Nozzle.xls, August 2004

Meter Box Full Test Calibration

Meter Box No: 61-6

Date of Calibration: 7/17/2009

Meter Box Y_d: 0.9900

Calibration conducted by: OLEG LAVROV

Meter Box ΔH@: 1.6820

Barometric Pressure: 29.04

				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	In	Out	T_{ds} Avg.	In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.965	3.00	-1.70	1.0000	0.000	10.000	10.000	209.181	219.284	10.103	77.0	77.0	77.00	85.0	77.0	81.00	9.89	0.9854	1.7309
0.971	3.00	-1.70	1.0000	0.000	10.000	10.000	219.284	229.389	10.105	77.0	77.0	77.00	86.0	78.0	82.00	9.82	0.9870	1.7034
0.401	0.50	-1.00	1.0000	0.000	5.000	5.000	234.378	239.419	5.041	77.0	77.0	77.00	81.0	78.0	79.50	11.88	0.9927	1.6620
0.401	0.50	-1.00	1.0000	0.000	5.000	5.000	239.419	244.459	5.040	77.0	77.0	77.00	81.0	78.0	79.50	11.90	0.9929	1.6676
0.695	1.50	-1.50	1.0000	0.000	10.000	10.000	253.277	263.387	10.110	76.0	76.0	76.00	84.0	79.0	81.50	13.76	0.9917	1.6629
0.694	1.50	-1.50	1.0000	0.000	10.000	10.000	263.387	273.514	10.127	76.0	76.0	76.00	84.0	79.0	81.50	13.77	0.9900	1.6653
																Averages	0.98996	1.68200

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)
5.6	5.0
10.7	10.0
15.4	15.0
20.4	20.0
24.8	24.7

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 61-6

Office:

Calibrated by: OLEG LAVROV

Client:

Date: 1/18/08

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	51	50				
100	98	100	99				
150	148	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	450				
500	499	500	500				
550	548	550	550				
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 : 6/22/2010

Calibration Report No: R044791

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955
Location warehouse
Test Date 03/30/10
Operator E. Dieter

Meter No. 61-6
Meter Yd 0.9900
Meter ΔH@ 1.6820
Full Test Cal. Date 07/17/09

Orifice B-5
Orifice K' 0.5463
Orifice Cal. Date 01/28/10

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) 29.26 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	773.90	68	66								
1	5.0	777.48	68	66	71	1.50	19	5.0	3.58	67.0	0.9855	0.2%
2	10.0	781.07	70	66	71	1.50	19	5.0	3.59	67.5	0.9837	0.0%
3	15.0	784.66	71	67	74	1.50	19	5.0	3.59	68.5	0.9828	-0.1%
										Average Y_i	0.9840	
										Cal. Error	-0.6%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 61-8

Date of Calibration: 5/11/2009

Meter Box Y_d: 0.9916

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.7580

Barometric Pressure: 29.39

				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@
0.984	3.00	-1.70	1.0000	0.000	10.000	10.000	62.712	72.772	10.060	68.0	68.0	68.00	73.0	69.0	71.00	9.98	0.9880	1.7092
0.972	3.00	-1.70	1.0000	0.000	10.000	10.000	72.772	82.872	10.100	68.0	68.0	68.00	76.0	70.0	73.00	10.10	0.9878	1.7472
0.387	0.50	-1.10	1.0000	0.000	5.000	5.000	86.333	91.393	5.060	68.0	68.0	68.00	75.0	72.0	73.50	12.68	0.9944	1.8290
0.385	0.50	-1.10	1.0000	0.000	5.000	5.000	91.393	96.466	5.073	68.0	68.0	68.00	75.0	73.0	74.00	12.76	0.9928	1.8487
0.692	1.50	-1.30	1.0000	0.000	10.000	10.000	98.815	108.963	10.148	68.0	68.0	68.00	78.0	73.0	75.50	14.19	0.9924	1.7147
0.694	1.50	-1.30	1.0000	0.000	10.000	10.000	108.963	119.111	10.148	68.0	68.0	68.00	79.0	74.0	76.50	14.14	0.9943	1.6994
																Averages	0.99164	1.75804

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)
4.7	5.0
9.6	10.0
14.6	15.0
19.5	20.0
23.3	24.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 61-8

Calibrated by: OLEG LAVROV

Date: 5/11/09

Temperature Scale Used: Fahrenheit

Office: ________

Client: ________

Job No: ________

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	48				
100	99	99	98				
150	149	149	149				
200	199	199	199				
250	250	249	249				
300	300	299	299				
350	350	349	350				
400	400	399	399				
450	450	449	449				
500	500	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. 10955

Location warehouse

Test Date 03/30/10

Operator E. Dieter

Meter No. 61-8

Meter Yd 0.9916

Meter ΔH@ 1.7580

Full Test Cal. Date 05/11/09

Orifice B-5

Orifice K' 0.5463

Orifice Cal. Date 01/28/10

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) 29.26 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	535.20	71	68								
1	5.0	538.80	72	69	71	1.50	15	5.0	3.60	70.0	0.9856	-0.2%
2	10.0	542.40	73	69	73	1.50	15	5.0	3.60	70.8	0.9851	-0.2%
3	15.0	545.99	74	70	71	1.50	15	5.0	3.59	71.5	0.9911	0.4%
										Average Y_i	0.9873	
										Cal. Error	-0.4%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \frac{\Delta H}{13.6}\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 61-11

Date of Calibration: 7/20/2009

Meter Box Y_d: 0.9892

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.7379

Barometric Pressure: 29.33

				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@
0.967	3.00	-1.80	1.0000	0.000	10.000	10.000	659.039	669.161	10.122	74.0	74.0	74.00	84.0	75.0	79.50	10.02	0.9862	1.7461
0.965	3.00	-1.80	1.0000	0.000	10.000	10.000	669.161	679.296	10.135	74.0	74.0	74.00	86.0	77.0	81.50	10.04	0.9886	1.7465
0.393	0.50	-1.10	1.0000	0.000	5.000	5.000	688.693	693.774	5.081	74.0	74.0	74.00	81.0	78.0	79.50	12.32	0.9902	1.7500
0.399	0.50	-1.10	1.0000	0.000	5.500	5.500	693.774	699.354	5.580	74.0	74.0	74.00	81.0	78.0	79.50	13.36	0.9918	1.7007
0.682	1.50	-1.40	1.0000	0.000	10.000	10.000	701.953	712.144	10.191	74.5	74.5	74.50	86.0	79.0	82.50	14.20	0.9887	1.7436
0.682	1.50	-1.40	1.0000	0.000	10.000	10.000	712.144	722.346	10.202	74.5	74.5	74.50	87.0	80.0	83.50	14.20	0.9895	1.7404
																Averages	0.98917	1.73789

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
10.2	10.0
14.9	15.0
19.7	20.0
24.4	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 61-11 Office: ________

Calibrated by: OLEG LAVROV Client: ________

Date: 7/20/09 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	48	49	48				
100	98	99	98				
150	148	149	148				
200	198	199	198				
250	248	249	248				
300	298	299	298				
350	348	349	348				
400	398	399	398				
450	448	449	448				
500	498	499	498				
550	548	549	548				
600	598	599	598				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp date : 6/22/2010

Calibration Report No: R044701

CDS005C-Meter Full, April 2004a

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No.	10955	Meter No.	61-11	Orifice	B-5
Location	warehouse	Meter Yd	0.9892	Orifice K'	0.5463
Test Date	03/31/10	Meter ΔH@	1.7379	Orifice Cal. Date	01/28/10
Operator	E. Dieter	Full Test Cal. Date	07/20/09		

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) 29.03 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	365.80	69	70								
1	5.0	369.42	68	71	71	1.50	20	5.0	3.62	69.5	0.9792	-0.4%
2	10.0	373.02	68	71	72	1.50	20	5.0	3.60	69.5	0.9837	0.1%
3	15.0	376.61	67	71	72	1.50	20	5.0	3.59	69.3	0.9860	0.3%
										Average Y_i	0.9830	
										Cal. Error	-0.6%	

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: 66-6

Date of Calibration: 1/12/2010

Meter Box Y_d: 0.9901

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.7870

Barometric Pressure: 29.64

				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@
0.957	3.00	-1.80	1.0000	0.000	10.000	10.000	595.744	605.900	10.156	67.0	67.0	67.00	77.0	74.0	75.50	10.37	0.9887	1.8058
0.956	3.00	-1.80	1.0000	0.000	10.000	10.000	605.900	616.056	10.156	67.0	67.0	67.00	78.0	75.0	76.50	10.38	0.9905	1.8059
0.390	0.50	-1.20	1.0000	0.000	5.000	5.000	624.508	629.613	5.105	67.0	67.0	67.00	77.0	75.0	76.00	12.71	0.9920	1.8051
0.390	0.50	-1.20	1.0000	0.000	6.000	6.000	629.613	635.743	6.130	67.0	67.0	67.00	77.0	75.0	76.00	15.28	0.9913	1.8117
0.687	1.50	-1.50	1.0000	0.000	10.000	10.000	644.660	654.890	10.230	67.0	67.0	67.00	79.0	76.0	77.50	14.45	0.9896	1.7466
0.687	1.50	-1.50	1.0000	0.000	10.000	10.000	654.890	665.132	10.242	67.0	67.0	67.00	79.0	76.0	77.50	14.45	0.9884	1.7466
																Averages	0.99009	1.78696

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
10.1	10.0
15.3	15.0
20.2	20.0
24.9	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-6 Office: ______

Calibrated by: OLEG LAVROV Client: ______

Date: 1/12/10 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	51	51				
100	99	101	101				
150	149	151	151				
200	199	201	201				
250	249	251	250				
300	299	301	300				
350	349	351	350				
400	399	401	400				
450	449	451	450				
500	499	501	500				
550	549	551	550				
600	599	601	600				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Date Calibrated: 10/7/2010

Calibration Report No: R044701

CDS005C-Meter Full, April 2004a

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955 | Meter No. 66-6 | Orifice C-5

Location warehouse | Meter Yd 0.9901 | Orifice K' 0.5643

Test Date 03/31/10 | Meter ΔH@ 1.7870 | Orifice Cal. Date 02/03/10

Operator E. Dieter | Full Test Cal. Date 01/12/10

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) 29.03 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	47.30	72	71								
1	5.0	51.04	72	71	70	1.70	18	5.0	3.74	71.5	0.9831	-0.3%
2	10.0	54.77	73	71	70	1.70	18	5.0	3.73	71.8	0.9862	0.0%
3	15.0	58.49	73	72	71	1.70	18	5.0	3.72	72.3	0.9889	0.3%
										Average Y_i	0.9861	
										Cal. Error	-0.4%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H / 13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-14

Date of Calibration: 8/17/2009

Meter Box Y_d: 0.9898

Calibration Conducted by: O. Lavrov

Meter Box ΔH@: 1.7643

Barometric Pressure: 29.21

				Standard Meter Gas Volume (ft³)			Meter Box Gas Volume (ft³)			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@
0.943	3.00	-1.80	1.0000	0.000	10.000	10.000	473.148	483.260	10.112	77.0	77.0	77.00	86.0	79.0	82.50	10.18	0.9871	1.8165
0.938	3.00	-1.80	1.0000	0.000	10.000	10.000	483.260	493.403	10.143	77.0	77.0	77.00	88.0	81.0	84.50	10.23	0.9877	1.8276
0.392	0.50	-1.20	1.0000	0.000	5.000	5.000	502.282	507.357	5.075	77.0	77.0	77.00	85.0	82.0	83.50	12.24	0.9929	1.7410
0.392	0.50	-1.20	1.0000	0.000	5.000	5.000	507.357	512.444	5.087	77.0	77.0	77.00	85.0	82.0	83.50	12.25	0.9905	1.7439
0.680	1.50	-1.40	1.0000	0.000	10.000	10.000	521.145	531.347	10.202	77.5	77.5	77.50	89.0	84.0	86.50	14.09	0.9894	1.7272
0.680	1.50	-1.40	1.0000	0.000	10.000	10.000	531.347	541.532	10.185	77.5	77.5	77.50	89.0	84.0	86.50	14.10	0.9910	1.7296
																Averages	0.98976	1.76429

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 (ft³)
V_{ds}	Standard Meter Volume - Dry (ft³)
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), $Y_i \le Y_{avg} \pm 0.02$
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) $\Delta H@_i \le \Delta H@_{avg} \pm 0.2$
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)
5.6	5.0
10.5	10.0
15.8	15.0
20.6	20.0
25.2	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-14

Office:

Calibrated by: O. Lavrov

Client:

Date: 8/17/09

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	49	51	52				
100	99	101	102				
150	149	151	151				
200	199	201	202				
250	249	251	252				
300	299	301	302				
350	349	351	351				
400	399	401	402				
450	449	451	452				
500	499	501	502				
550	549	551	551				
600	599	601	602				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A

Serial No: T-225950

Calibrated By: JH Metrology

Exp.date : 6/22/2010

Calibration Report No: R044701

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955

Location warehouse

Test Date 03/30/10

Operator E. Dieter

Meter No. 66-14

Meter Yd 0.9898

Meter ΔH@ 1.7643

Full Test Cal. Date 08/17/09

Orifice C-5

Orifice K' 0.5643

Orifice Cal. Date 02/03/10

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) 29.26 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	753.30	73	71								
1	5.0	756.99	72	70	74	1.70	19	5.0	3.69	71.5	0.9927	0.0%
2	10.0	760.71	74	71	74	1.70	19	5.0	3.72	71.8	0.9852	-0.8%
3	15.0	764.38	75	71	73	1.70	19	5.0	3.67	72.8	1.0014	0.8%
										Average Y_i	0.9931	
										Cal. Error	0.3%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H / 13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \leq \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \leq \pm 5\%$$

CDS005B-Meter Post-CO, February 2004

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-24

Date of Calibration: 8/19/2009

Meter Box Y_d: 0.9904

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.7516

Barometric Pressure: 29.15

				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	-1.80	1.0000	0.000	10.000	10.000	580.884	591.020	10.136	76.5	76.5	76.50	86.0	79.0	82.50	9.96	0.9856	1.7392
0.967	3.00	-1.80	1.0000	0.000	10.000	10.000	591.020	601.178	10.158	76.5	76.5	76.50	89.0	80.0	84.50	9.91	0.9871	1.7186
0.381	0.50	-1.10	1.0000	0.000	5.000	5.000	615.932	621.024	5.092	77.0	77.0	77.00	86.0	84.0	85.00	12.58	0.9925	1.8361
0.381	0.50	-1.10	1.0000	0.000	5.000	5.000	621.024	626.117	5.093	77.0	77.0	77.00	87.0	85.0	86.00	12.58	0.9942	1.8327
0.685	1.50	-1.50	1.0000	0.000	10.000	10.000	629.337	639.566	10.229	77.0	77.0	77.00	92.0	86.0	89.00	13.98	0.9919	1.6944
0.685	1.50	-1.50	1.0000	0.000	10.000	10.000	639.566	649.822	10.256	77.0	77.0	77.00	93.0	87.0	90.00	13.97	0.9911	1.6889
																Averages	0.99042	1.75163

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)
4.7	5.0
9.8	10.0
14.7	15.0
20.0	20.0
24.2	25.0

CDS005C-Meter Full, April 2004a

CleanAir

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-24 Office: ____

Calibrated by: OLEG LAVROV Client: ____

Date: 8/19/09 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	49	48	48				
100	99	98	98				
150	149	148	148				
200	199	198	198				
250	249	248	248				
300	299	298	299				
350	349	348	349				
400	399	398	398				
450	450	448	449				
500	499	498	499				
550	549	548	549				
600	599	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 : 6/22/2010

Calibration Report No: RO44791

CleanAir ENGINEERING

CDS005C-Meter Full, April 2004a

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955
Location warehouse
Test Date 03/30/10
Operator E. Dieter

Meter No. 66-24
Meter Yd 0.9904
Meter ΔH@ 1.7516
Full Test Cal. Date 08/19/09

Orifice B-5
Orifice K' 0.5463
Orifice Cal. Date 01/28/10

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) 29.26 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	253.50	69	67								
1	5.0	257.08	70	67	71	1.50	20	5.0	3.58	68.3	0.9878	0.2%
2	10.0	260.67	71	67	72	1.50	20	5.0	3.59	68.8	0.9851	-0.1%
3	15.0	264.26	73	69	74	1.50	20	5.0	3.59	70.0	0.9856	-0.1%
										Average Y_i	0.9861	
										Cal. Error	-0.4%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.}: \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.}: Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 85-2

Date of Calibration: 11/17/2009

Meter Box Y_d: 1.0066

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.7759

Barometric Pressure: 29.35

				Standard Meter Gas Volume (ft³)			Meter Box Gas Volume (ft³)			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	-1.70	1.0000	0.000	10.000	10.000	200.383	210.311	9.928	67.5	67.5	67.50	77.0	74.0	75.50	10.16	1.0106	1.7539
0.959	3.00	-1.70	1.0000	0.000	10.000	10.000	210.311	220.285	9.974	67.5	67.5	67.50	80.0	75.0	77.50	10.23	1.0097	1.7748
0.388	0.50	-1.10	1.0000	0.000	5.000	5.000	222.808	227.844	5.036	68.0	68.0	68.00	75.0	75.0	75.00	12.65	1.0020	1.8126
0.388	0.50	-1.10	1.0000	0.000	5.000	5.000	227.844	232.882	5.038	68.0	68.0	68.00	75.0	75.0	75.00	12.65	1.0016	1.8126
0.683	1.50	-1.50	1.0000	0.000	10.000	10.000	237.848	247.883	10.035	68.0	68.0	68.00	81.0	75.0	78.00	14.36	1.0078	1.7518
0.683	1.50	-1.50	1.0000	0.000	10.000	10.000	247.883	257.913	10.030	68.0	68.0	68.00	81.0	75.0	78.00	14.35	1.0083	1.7494
																Averages	1.00665	1.77586

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 (ft³)
- V_{ds} Standard Meter Volume - Dry (ft³)
- 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)
4.9	5.0
10.1	10.0
15.3	15.0
20.5	20.0
25.3	25.0

CleanAir

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 85-2

Office:

Calibrated by: OLEG LAVROV

Client:

Date: 11/17/09

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	49	52	51				
100	98	101	101				
150	149	151	151				
200	200	201	201				
250	251	252	251				
300	301	301	301				
350	350	348	351				
400	400	401	400				
450	450	451	450				
500	500	502	500				
550	550	551	550				
600	600	602	600				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A

Serial No: T-225950

Calibrated By: JH Metrology

Exp. Date: 10/7/2010

Calibration Report No: R044791

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955 | Meter No. 85-2 | Orifice C-5
Location warehouse | Meter Yd 1.0066 | Orifice K' 0.5643
Test Date 03/29/10 | Meter ΔH@ 1.7759 | Orifice Cal. Date 02/03/10
Operator E. Dieter | Full Test Cal. Date 11/17/09

Barom. Press. (P_b) 29.26 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		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	745.20	63	55								
1	5.0	748.71	65	56	73	1.60	19	5.0	3.51	59.8	1.0218	0.3%
2	10.0	752.24	66	58	75	1.60	19	5.0	3.53	61.3	1.0170	-0.2%
3	15.0	755.78	68	59	75	1.60	19	5.0	3.54	62.8	1.0171	-0.2%
										Average Y_i	1.0186	
										Cal. Error	1.2%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 85-4

Date of Calibration: 11/25/2009

Meter Box Y_d: 1.0085

Calibration Conducted by: OLEG LAVROV

Meter Box ΔH@: 1.7723

Barometric Pressure: 29.09

				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@
0.965	3.00	-1.70	1.0000	0.000	11.000	11.000	278.946	289.808	10.862	67.5	67.5	67.50	76.0	69.0	72.50	11.09	1.0103	1.7589
0.954	3.00	-1.70	1.0000	0.000	10.000	10.000	289.808	299.707	9.899	67.5	67.5	67.50	79.0	71.0	75.00	10.20	1.0125	1.7936
0.385	0.50	-1.10	1.0000	0.000	5.000	5.000	304.068	309.063	4.995	67.5	67.5	67.50	76.0	72.0	74.00	12.62	1.0092	1.8270
0.385	0.50	-1.10	1.0000	0.000	5.000	5.000	309.063	314.066	5.003	67.5	67.5	67.50	76.0	73.0	74.50	12.65	1.0086	1.8322
0.687	1.50	-1.30	1.0000	0.000	10.000	10.000	345.224	355.314	10.090	67.5	67.5	67.50	81.0	76.0	78.50	14.15	1.0046	1.7097
0.687	1.50	-1.30	1.0000	0.000	10.000	10.000	355.314	365.392	10.078	67.5	67.5	67.50	81.0	76.0	78.50	14.16	1.0058	1.7122
																Averages	1.00850	1.77225

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)
5.1	5.0
9.9	10.0
15.1	15.0
19.5	20.0
24.8	25.0

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 85-4

Office:

Calibrated by: OLEG LAVROV

Client:

Date: 11/25/09

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	49	52	52				
100	99	102	102				
150	150	152	152				
200	200	202	202				
250	250	252	251				
300	300	302	301				
350	350	352	351				
400	400	401	401				
450	450	452	452				
500	500	501	501				
550	550	551	551				
600	600	601	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 : 10/7/2010

Calibration Report No: R044701

CleanAir.
ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955 | Meter No. 85-4 | Orifice C-5

Location warehouse | Meter Yd 1.0085 | Orifice K' 0.5643

Test Date 03/30/10 | Meter ΔH@ 1.7723 | Orifice Cal. Date 02/03/10

Operator E. Dieter | Full Test Cal. Date 11/25/09

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) 29.26 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	77.40	70	67								
1	5.0	81.03	71	67	72	1.60	21	5.0	3.63	68.8	1.0061	0.0%
2	10.0	84.67	72	68	72	1.60	21	5.0	3.64	69.5	1.0047	-0.2%
3	15.0	88.30	73	68	73	1.60	21	5.0	3.63	70.3	1.0080	0.2%

Average Y_i 1.0063

Cal. Error -0.2%

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004

CleanAir ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-4-4
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	75	75	0	0.00%	
2	200°F-250°F	233	235	-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	0.539	0.771	0.828	0.000
2	0.542	0.774	0.828	0.001
3	0.540	0.775	0.826	0.001
		Side 'A' Average Probe $C_{p(A)}$=	0.8273	0.0008

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	0.545	0.778	0.829	0.001
2	0.540	0.782	0.822	0.005
3	0.546	0.773	0.832	0.004
		Side 'B' Average Probe $C_{p(B)}$=	0.8278	0.0035

Specification: Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.827	−	0.828	=	-0.001	|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.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(A\text{ or }B)}\right|$$

All specifications are from EPA 600/9-76-005 section 3.1

Probe Cp= 0.828 Calibrated by: B. ARNOLD Date: 06/29/2009

CleanAir ENGINEERING

CDS002C-Pitot_TNL, Dec 2008

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-4-5
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	69	67	2	0.38%	
2	200°F-250°F	241	237	4	0.57%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? ⟶ **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 49 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	0.551	0.773	0.836	0.001
2	0.549	0.778	0.832	0.003
3	0.555	0.777	0.837	0.002
		Side 'A' Average Probe $C_{p(A)}$=	0.8348	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	0.566	0.772	0.847	0.003
2	0.557	0.777	0.838	0.006
3	0.568	0.775	0.847	0.003
		Side 'B' Average Probe $C_{p(B)}$=	0.8442	0.0039

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.835	−	0.844	=	-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.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P(A\,or\,B)}\right|$$

All specifications are from EPA-600/9-76-005 section 3.1

Probe Cp= 0.839 Calibrated by: R ARNOLD Date: 03/01/2010

CleanAir ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot

I.D. Number: 67-8-4

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	75	70	5	0.93%	
2	200°F-250°F	246	240	6	0.85%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? ⟶ **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 49 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	0.538	0.814	0.805	0.000
2	0.540	0.815	0.806	0.001
3	0.539	0.816	0.805	0.001
		Side 'A' Average Probe $C_{p(A)}$=	0.8052	0.0008

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	0.542	0.818	0.806	0.002
2	0.536	0.814	0.803	0.001
3	0.538	0.818	0.803	0.001
		Side 'B' Average Probe $C_{p(B)}$=	0.8039	0.0012

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.805	−	0.804	=	0.001	|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.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\mathrm{A\,or\,B})}\right|$$

All specifications are from EPA 600/9-76-005, section 3.1

Probe Cp= 0.805 Calibrated by: B. ARNOLD Date: 09/21/2009

CleanAir
ENGINEERING

CDS002C-Pitot_TNL, Dec 2008

Sample Probe Calibration

67·8·14

Probe Type: M5 with S-Type Pitot

I.D. Number: 5G-~~96-11~~

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	75	72	3	0.56%	
2	200°F-250°F	247	254	-7	0.99%	%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	0.547	0.808	0.815	0.001
2	0.548	0.813	0.813	0.001
3	0.548	0.811	0.814	0.000
		Side 'A' Average Probe $C_{p(A)}$=	0.8139	0.0008

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	0.544	0.810	0.812	0.002
2	0.543	0.810	0.811	0.000
3	0.541	0.812	0.808	0.002
		Side 'B' Average Probe $C_{p(B)}$=	0.8102	0.0014

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.814	−	0.810	=	0.004	|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.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\text{A or B})}\right|$$

All specifications are from EPA 600/9-76-005, section 3.1.

Probe Cp= 0.812 Calibrated by: R. ARNOLD Date: 09/21/2009

CleanAir ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot　　**I.D. Number:** 67-8-17
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	69	71	-2	0.38%	
2	200°F-250°F	240	235	5	0.71%	%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	0.790	0.838	0.001
2	0.564	0.797	0.833	0.004
3	0.568	0.790	0.840	0.003
		Side 'A' Average Probe $C_{p(A)}$=	0.8368	0.0028

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	0.548	0.769	0.836	0.005
2	0.543	0.774	0.829	0.002
3	0.548	0.782	0.829	0.003
		Side 'B' Average Probe $C_{p(B)}$=	0.8315	0.0032

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.837	−	0.831	=	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.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\text{A or B})}\right|$$

All specifications are from EPA-600/9-76-005, section 3.1

Probe Cp= 0.834　　Calibrated by: R ARNOLD　　Date: 03/04/2010

CleanAir ENGINEERING

CDS002C-Pitot_TNL, Dec 2008

AIR LIQUIDE Air Liquide America Specialty Gases LLC SCOTT™

Zero

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

CLEAN AIR ENGINEERING
SCOTT BROWN
500 WEST WOOD STREET
PALATINE IL 60067

PROJECT #: 05-76361-001
PO#: 24559-66-65000
ITEM #: 0501813 AL
DATE: 29May2009

CYLINDER #: AAL14589
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: aOrcie

RATA CLASS

Dual-Analyzed Calibration Standard

AIR LIQUIDE Air Liquide America Specialty Gases LLC — Scott™

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory		Customer
	P.O. No.: 57534-71-65000	CLEAN AIR ENGINEERING
AIR LIQUIDE AMERICA SPECIALTY GASES LLC	Project No.: 05-78153-003	DON ALLEN
1290 COMBERMERE STREET		500 W. WOOD STREET
TROY, MI 48083		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: ALM033730 **Certification Date:** 27Jul2009 **Exp. Date:** 26Jul2012

Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	5.91 %	+/- 1%	Direct NIST and NMi
OXYGEN	14.1 %	+/- 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	01Dec2011	K016398	23.20 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
PIR/2000/609015	16Jul2009	NDIR
CAI/110P/V03018	01Jul2009	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

First Triad Analysis			Second Triad Analysis	Calibration Curve	
Date: 27Jul2009	Response Unit:MV			Concentration=A+Bx+Cx2+Dx3+Ex4	
Z1=0.00000	R1=102.5000	T1=43.00000		r=0.999992	
R2=102.5000	Z2=0.00000	T2=43.00000		Constants:	A=-0.00322881
Z3=0.00000	T3=43.00000	R3=102.5000		B=0.13615338	C=-0.0005754
Avg. Concentration:	5.909	%		D=1.40219E-05	E=0

OXYGEN

First Triad Analysis			Second Triad Analysis	Calibration Curve	
Date: 28Jul2009	Response Unit:%			Concentration=A+Bx+Cx2+Dx3+Ex4	
Z1=0.00000	R1=23.20000	T1=14.06000		r=0.999992	
R2=23.20000	Z2=0.00000	T2=14.06000		Constants:	A=-0.00675558
Z3=0.00000	T3=14.06000	R3=23.20000		B=0.999864575	C=0
Avg. Concentration:	14.05	%		D=0	E=0

APPROVED BY: JEFF CROTEAU

Page 1 of 1

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.: 57439-71-65000
Project No.: 05-76738-005

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: ALM046255 **Certification Date:** 09Jun2009 **Exp. Date:** 08Jun2012

Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	13.9 %	+/- 1%	Direct NIST and NMi
OXYGEN	6.01 %	+/- 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 1675	02Oct2012	K006645	13.93 %	CARBON DIOXIDE
NTRM 2658	01Jan2010	K001290	10.03 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
PIR/2000/609015	11May2009	NDIR
CAI/110P/V03018	01Jun2009	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

First Triad Analysis			Second Triad Analysis	Calibration Curve	
Date: 09Jun2009	Response Unit:MV			Concentration=A+Bx+Cx2+Dx3+Ex4	
Z1=0.00000	R1=80.60000	T1=80.30000		r=0.999999	
R2=80.60000	Z2=0.00000	T2=80.30000		Constants:	A=-0.00492643
Z3=0.00000	T3=80.30000	R3=80.60000		B=0.111614122	C=0.00014738
Avg. Concentration:	13.86	%		D=6.76093E-06	E=0

OXYGEN

First Triad Analysis			Second Triad Analysis	Calibration Curve	
Date: 09Jun2009	Response Unit:%			Concentration=A+Bx+Cx2+Dx3+Ex4	
Z1=0.00000	R1=10.06000	T1=6.01000		r=0.999998	
R2=10.06000	Z2=0.00000	T2=6.01000		Constants:	A=-0.00970246
Z3=0.00000	T3=6.01000	R3=10.06000		B=0.999816092	C=0
Avg. Concentration:	6.005	%		D=0	E=0

APPROVED BY: JEFF GROTEAU

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ASTM D 6866-08 AND 7459-08 CO_2 SAMPLING/ANALYSIS RESULTS

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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 %	CO_2 Sample Rate (lpm)[1]	Stack Flow 2RSD (%)	Air Flow, DSCFM	Air Flow, DSCFM@ 7%O_2
1-O-M5/29-1	3/16/2010	07:21-09:32	183.9	293	191,586	9.5	9.9	0.2	11.6%	105,082	85,956
1-O-M5/29-2	3/16/2010	10:00-12:14	184.4	295	191,421	9.5	9.9	0.2	12.2%	104,870	86,310
1-O-M5/29-3	3/16/2010	12:36-14:47	183.4	301	193,814	9.7	9.8	0.2	15.3%	105,806	84,949
1-O-M13B-1	3/17/2010	11:46-12:56	184.0	303	205,926	10.6	9.1	0.4	12.1%	111,627	83,118
1-O-M13B-2	3/17/2010	13:15-14:27	184.0	302	207,433	10.1	9.6	0.4	12.9%	111,678	86,530
1-O-M13B-3	3/17/2010	14:45-15:53	184.1	303	198,952	10.0	9.8	0.4	11.0%	106,345	83,699
		Average	184.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.5%	[illegible]	[illegible]
2-O-M5/29-1	3/18/2010	07:09-09:22	183.9	307	201,928	10.1	9.3	0.2	13.9%	108,134	84,251
2-O-M5/29-2	3/18/2010	9:49-12:02	182.9	308	193,105	9.8	9.6	0.2	10.0%	103,333	82,890
2-O-M5/29-3	3/18/2010	12:27-14:39	183.9	308	199,217	9.9	9.6	0.2	16.8%	105,806	83,856
2-O-M13B-1	3/18/2010	07:09-08:24	183.9	306	190,226	10.0	9.3	0.4	14.3%	101,644	79,560
2-O-M13B-2	3/18/2010	08:56-10:10	184.2	305	182,805	9.6	9.6	0.4	10.0%	97,309	78,827
2-O-M13B-3	3/18/2010	10:45-12:05	183.0	306	185,088	10.2	9.1	0.4	13.4%	99,545	76,986
2-O-M23-1	3/16/2010	08:44-13:36	184.1	301	198,967	9.7	9.7	0.1	8.7%	107,335	86,640
2-O-M23-2	3/17/2010	06:54-12:19	184.3	307	214,211	9.7	9.8	0.1	7.0%	113,400	91,046
2-O-M23-3	3/17/2010	12:53-17:26	183.9	308	203,730	10.3	9.5	0.1	8.8%	108,891	82,961
		Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]
3-O-M5/29-1	3/17/2010	06:50-09:03	184.2	303	174,264	8.7	10.5	0.2	16.1%	90,897	79,715
3-O-M5/29-2	3/17/2010	09:26-11:38	184.2	304	186,885	8.3	10.9	0.2	9.4%	97,143	88,057
3-O-M5/29-3	3/17/2010	11:59-14:11	183.5	304	184,323	8.7	10.8	0.2	12.1%	105,806	84,424
3-O-M13B-1	3/16/2010	11:49-13:07	183.7	298	173,798	9.9	9.7	0.4	8.5%	101,644	74,155
3-O-M13B-2	3/16/2010	13:33-14:44	183.9	299	179,576	9.5	10.0	0.4	11.4%	96,031	78,552
3-O-M13B-3	3/16/2010	15:07-16:16	184.2	299	173,781	9.7	10.0	0.4	11.0%	92,736	74,589
		Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]
		Facility Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]

[1] CO_2 gas sample flow rate was within 10% of initial flow rate throughout all test runs.

In accordance with the EPA Greenhouse Gas (GHG) Monitoring, Reporting and Recordkeeping Regulations (MRRR) an integrated gas sample (IGS) of all FF Outlet isokinetic sample trains was collected in accordance with ASTM Method 7459-08. All of the test run IGS bags that met the 2 times relative standard deviation (2RSD) stack flow rate criteria (<30%) were proportionally combined into a single Tedlar® bag for analysis by Beta Analytic, Inc for Biogenic CO_2 utilizing ASTM Method D6866-08. All of the IGS bags were collected within 10% of the initial sample rate. The IGS bag collection rate is recorded on the field data sheets presented in Appendix G. The stack flow rate 2RSD is calculated and presented in the field data printouts (Appendix H) of this report. All outlet isokinetic samples met the 2RSD requirements.

BETA

ISO-17025 Accredited Testing Laboratory

PJLA ISO/IEC 17025:2005 Testing Accreditation # 59423

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com
www.betalabservices.com

Summary of Results : Biogenic CO2 Determination using ASTM-D6866

Submitter:	**Mr. Scott A. Brown**	**Date Received:**	**March 22, 2010**
Company:	**Clean Air Engineering**	**Date Reported:**	**March 26, 2010**

Laboratory Number	Submitter Label	Material	Mean Biomass CO2 Content*
Beta-277290	Wheelabrator North Broward - 3/16-18/2010	Biogenic CO2	63%

* ASTM-D6866 cites precision on the Mean Biomass CO2 Content as +/- 3% (absolute). This is the most conservative estimate of error in the measurement of complex biomass containing solids and liquids based on empirical results. Real precision for readily combustible and homogenous materials (e.g. gasoline) and especially samples recieved as CO2 (e.g. flue gas or CEMS exhaust) can be as low as +/- 0.5-2%. The result only applies to the analyzed material. Fluctuations in carbon content within a batch of product, gasoline or flue gas must be determined separately (e.g. averaged measurements of multiple solids or liquids, and single measurement of the combination of gas aliquots collected over time). The accuracy of the result as it applies to the analyzed product, fuel, or flue gas relies upon all the carbon in the analyzed material originating from either recently respired atmospheric carbon dioxide (within the last decade) or fossil carbon (more than 50,000 years old). "Percent biomass" specifically relates % renewable (or fossil) carbon to total carbon, not to total mass or molecular weight. Mean Biomass CO2 estimates greater than 100% are assigned a value of 100% for simplification.

ISO-17025 Accredited Testing Laboratory

PJLA ISO/IEC 17025:2005 Testing Accreditation # 59423

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com
www.betalabservices.com

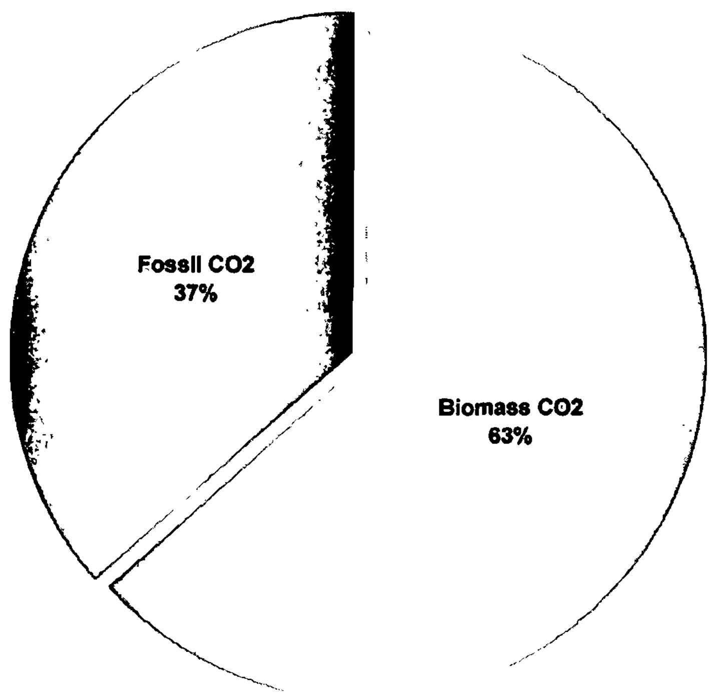
Report of Biomass CO2 Content Analysis using ASTM-D6866

Submitter:	**Clean Air Engineering**
Submitter Label:	**Wheelabrator North Broward - 3/16-18/2010**
Laboratory Number:	**Beta-277290**
Material Analyzed:	**Biogenic CO2**
Date Received:	**March 22, 2010**
Date Reported:	**March 26, 2010**

Biomass CO2: 63% *

(carbon-neutral CO2) (renewable carbon to total carbon)

Proportions Biomass CO2 vs. Fossil CO2
indicated by C14 content



* ASTM-D6866 cites precision on the mean Biomass CO2 Result as +/- 3% (absolute). This is the most conservative estimate of error in the measurement of complex biomass containing solids and liquids based on empirical results. Real precision for readily combustible and homogenous materials (e.g. gasoline) and especially samples recieved as CO2 (e.g. flue gas or CEMS exhaust) can be as low as +/- 0.5-2%. The result only applies to the analyzed material. Fluctuations in carbon content within a batch of product, gasoline or flue gas must be determined separately (e.g. averaged measurements of multiple solids or liquids, and single measurement of the combination of gas aliquots collected over time). The accuracy of the result as it applies to the analyzed product, fuel, or flue gas relies upon all the carbon in the analyzed material originating from either recently respired atmospheric carbon dioxide (within the last few decades) or fossil carbon (more than 50,000 years old). "Percent biomass" specifically relates % renewable (or fossil) carbon to total carbon, not to total mass or molecular weight. Mean Biomass CO2 estimates greater than 100% are assigned a value of 100% for simplification.

BETA

ISO-17025 Accredited Testing Laboratory

PJLA ISO/IEC 17025:2005 Testing Accreditation # 59423

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Explanation of Results

Biomass Analysis using ASTM-D6866

The application of ASTM-D6866 to derive a "Biomass CO2 content" for carbon dioxide effluents is built upon the same concepts as those used by the US Department of Agriculture to derive the biobased content of manufactured products containing biomass carbon. It is done by comparing a relative amount of radiocarbon (C14) in an unknown sample to that of a modern reference standard. The ratio in contemporary biomass will be 100% and the ratio in fossil materials will be zero. Carbon dioxide derived from combustion of a mixture of present day biomass and fossil carbon will yield an ASTM-D6866 result that directly correlates to the amount of biomass carbon combusted and carbon-neutral CO2 generated.

The modern reference standard is a National Institute of Standards and Technology (NIST) standard with a defined radiocarbon content of 100% contemporary carbon for the year AD 1950. AD 1950 was chosen since it represented a time prior to thermo-nuclear weapons testing which introduced large amounts of excess radiocarbon into the atmosphere with each explosion (termed "bomb carbon"). This was a logical point in time to use as a reference since this excess bomb carbon would change with increased or decreased weapons testing. A fixed correction for this effect is applied per the ASTM-D6866 requirements, applying specifically to carbon removed from the atmospheric CO2 reservoir since about 1996. Carbon removed prior to about 1996 will contain elevated radiocarbon signatures, not directly applicable to the ASTM-D6866 correction. Typical areas to which the correction may not apply are landfills more than 5-10 years old and to trees which began to grow more than 20 years ago.

Carbon dioxide effluent derived from combustion of 100% present day biomass will yield results of 100% renewable content. Carbon dioxide effluent derived from the combustion of 100% fossil fuel will yield results of 0% renewable content. Carbon dioxide produced from mixed fuels (biomass plus fossil fuel) will yield a percentage result in direct proportion to the biomass carbon consumed vs. fossil carbon consumed in the combustion. The final result is referred to as the MEAN BIOMASS CO2 CONTENT and assumes all the carbon in the carbon dioxide was derived from either present day living or fossil sources.

The results provided in this report involved materials provided without any source information. This situation is highly probable in a real life situation. The MEAN VALUE quoted in this report encompasses an absolute range of 6% (plus and minus 3% on either side of the MEAN BIOMASS CO2 CONTENT to account for variations in end component radiocarbon signatures (a conservative approximation). It is presumed that all materials are present day or fossil in origin and that the desired result is the amount of biomass component "present" in the material, not the amount of biomass material "used" in the manufacturing process. The most conservative interpretation of the reported percentages is as maximum values.

ASTM-D6866 results relate directly to the percentage carbon-neutral CO2 in an incineration effluent. A value of 71% renewable content measured on CO2 effluent would indicate that 71% of the exhausted CO2 was from biomass (29% from fossil fuel). It does not represent the weight of biomass combusted or the weight of fossil fuel combusted. This is advantageous since the weight of the fuels only indirectly relate to the up-take of carbon dioxide from the atmosphere. The respiration uptake compound was carbon dioxide and the combustion effluent was carbon dioxide. The ASTM-D6866 result directly and specifically relates to the amount of carbon-neutral CO2 consumed and expelled.

CHAIN OF CUSTODY FORM

CO2-NB-10955-001.

CLIENT Wheelabrator North Broward — PROJECT NO. 10955

PLANT Same — DEPT. 66

PROJECT MANAGER Scott Brown

ANALYSIS REQUESTED

CLEANAIR LAB NO.	RUN NO.	TEST LOCATION	DATE	SAMPLE MATRIX	NO. OF CONTAINERS	ORIGINAL VOLUME	ASTM D6866				ADDITIONAL INFORMATION
	all	Wheelabrator North Broward - 3/16/10 to 3/18/10	3/16-3/18	Tedlar Bag	1		X				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time	Relinquished by: (Signature)	Date / Time
[signature]	3/19/10 11:00	Zeneida [signature]	3/25/10 900		
Courier:	Date / Time	Relinquished by: (Signature)	Date / Time	Received for Analysis by: Zeneida Beta Analytic Inc [signature]	Date / Time 3/25/10 900

Special Handling Instructions

Forwarding Lab: Beta Analytical

PO Number:

This form was completed by: Scott Brown

Signature [signature] Date 3/19/10

CleanAir ENGINEERING

LD8001A_2-COC Palatine_M23, Jul 2002

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Palatine, IL 60067
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*277290*137443*
Brown, S / C13 / BM
Wheelabrator North Broward - 3

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End of Appendix