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STATIONARY SOURCE SAMPLING REPORT
REFERENCE NO. 19-3091
COPY 1

Volume 1 of 2
(Report Text, Appendix A and Appendix E)

SPOKANE WASTE TO ENERGY
SPOKANE, WASHINGTON

EMISSIONS TESTING FOR:

Metals (including Mercury)
Hexavalent Chromium
Sulfuric Acid
Particulate
Hydrogen Chloride
Hydrogen Fluoride
Ammonia
4-8 PCDD/PCDFs
PAHs
PCBs

UNIT NUMBERS 1 AND 2

PERFORMED FOR: Spokane City Solid Waste Disposal

TEST DATES: March 25 - 28, 2019

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Volume 2 of 2
(Appendix B, Appendix C and Appendix D)

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REPORT CERTIFICATION

DEECO REPORT NO. 19-3091

The sampling and analysis performed for this report were carried out under my direction and supervision, and I hereby certify that, to the best of my knowledge, the test report is authentic and accurate.

Signature: ________________

Date: 6/7/19

Marc Hamilton
President, DEECO Inc.

FINAL REPORT DISTRIBUTION
SPOKANE CITY SOLID WASTE DISPOSAL
SPOKANE WASTE TO ENERGY
DEECO REPORT NO. 19-3091

Date	Copy No.	Delivered to	Company/Agency
June 28, 2019	1	Kelle Vigeland	Spokane City Solid Waste Disposal
June 28, 2019	2	City of Spokane Environmental Program	
June 28, 2019	3*	April Westby	SRCAA
June 28, 2019	4*	Kelle Vigeland	Spokane Waste-to-Energy Plant

* Distributed on CD Rom

REVISION DESCRIPTION
SPOKANE CITY SOLID WASTE DISPOSAL
SPOKANE WASTE TO ENERGY
DEECO REPORT NO. 19-3091

Revision	Date	Description

TABLE OF CONTENTS

1.0 INTRODUCTION. 1-1
1.1 Background. 1-1
1.2 Outline of Test Program.. 1-1
1.3 Test Participants.. 1-1

2.0 SUMMARY OF RESULTS. 2-1
2.1 Presentation. 2-1
2.1.1 Reporting of Non-Detected (ND) Values. 2-1
2.2 Aborted and/or Invalidated Runs. 2-1
2.3 Metals Results. 2-1
2.4 PCDD/PCDF Analytical Results. 2-2

3.0 PROCESS DESCRIPTION AND OPERATION. 3-1

4.0 SAMPLING AND ANALYTICAL PROCEDURES. 4-1
4.1 Stack Gas Sampling Points - EPA Methods 1 and 2 4-1
4.2 Flue Gas Composition - EPA Method 3. 4-1
4.3 Sampling and Analysis for Flue Gas Metals (As, Be, Cd, Cr, Pb, Ni, Se, Zn, and Hg) - EPA Method 29. 4-1
4.4 Sampling and Analysis of Filterable and Condensable Particulate - EPA Method 5/202. 4-5
4.5 Sampling and Analysis for Hydrogen Fluoride and Hexavalent Chromium - EPA Method 13B. 4-6
4.6 Sampling and Analysis for Hydrogen Chloride and Ammonia- EPA Method 26A.. 4-7
4.7 Sampling and Analysis for Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans (PCDD/PCDFs), Polynuclear Aromatic Hydrocarbons (PAHs) and Polychlorinated Biphenyls (PCBs) - EPA Method 23, and CARB 429/428. . . . 4-8
4.8 Sampling and Analysis for Sulfuric Acid Mist - EPA Method 8.. 4-12
4.9 Continuous Emission Monitoring for Non-Methane Hydrocarbons - EPA Method 25A.. 4-13
4.10 Visual and Fugitive Emissions - EPA Method 9 and Method 22. 4-15
4.10.1 EPA Method 9 (Opacity). 4-15
4.10.2 EPA Method 22 (Fugitive Emissions). 4-15
4.11 Equipment Calibration. 4-16

5.0 QA/QC PROCEDURES AND RESULTS. 5-1
5.1 Sampling Equipment. 5-1
5.2 Analytical QA/QC Results.. 5-5

List of Appendices

APPENDIX A TEST RESULTS (Volume 1)

1. Unit No, 1 Spray Dryer Absorber Inlet
   a. Mercury
   b. Hydrogen Chloride
2. Unit No. 1 Fabric Filter Outlet
   a. Metals and Mercury
   b. Hydrogen Chloride and Ammonia
   c. Hexavalent Chromium and Hydrogen Fluoride
   d. Total Particulate Matter
   e. Sulfuric Acid Mist
   f. Dioxin/Furans/PAHs/PCBs
   g. Non-Methane Hydrocarbons
3. Unit No. 2 Spray Dryer Absorber Inlet
   a. Mercury
   b. Hydrogen Chloride
4. Unit No. 2 Fabric Filter Outlet
   a. Metals and Mercury
   b. Hydrogen Chloride and Ammonia
   c. Hexavalent Chromium and Hydrogen Fluoride
   d. Total Particulate Matter
   e. Sulfuric Acid Mist
   f. Non-Methane Hydrocarbons

APPENDIX B FIELD DATA (Volume 2)

1. Unit No, 1 Spray Dryer Absorber Inlet
   a. Mercury
   b. Hydrogen Chloride
2. Unit No. 1 Fabric Filter Outlet
   a. Metals and Mercury
   b. Hydrogen Chloride and Ammonia
   c. Hexavalent Chromium and Hydrogen Fluoride
   d. Total Particulate Matter
   e. Sulfuric Acid Mist
   f. Non-Methane Hydrocarbons
3. Unit No. 2 Spray Dryer Absorber Inlet
   a. Mercury
   b. Hydrogen Chloride
4. Unit No. 2 Fabric Filter Outlet
   a. Metals and Mercury
   b. Hydrogen Chloride and Ammonia
   c. Hexavalent Chromium and Hydrogen Fluoride
   d. Total Particulate Matter
   e. Sulfuric Acid Mist
   f. Dioxin/Furans/PAHs/PCBs
   g. Non-Methane Hydrocarbons
5. Units Nos. 1 and 2
   a. Sampling Point Determinations and Cyclonic Flow Checks
   b. Ash Handling System Fugitive Emissions

List of Appendices (Continued)

APPENDIX C ANALYTICAL DATA (Volume 2)

1. Metals Including Mercury
2. Hexavalent Chromium and Hydrogen Fluoride
3. Hydrogen Chloride
4. Ammonia
5. Total Particulate Matter
6. Sulfuric Acid
7. PCDD/PCDFS, PAHs and PCBs

APPENDIX D CALIBRATION DOCUMENTATION (Volume 2)

APPENDIX E PROCESS DATA (Volume 1)

1. Process Parameters' Test Interval Averages
2. Continuous Opacity Monitoring System (COMS) data

List of Tables

Table **Page**

TABLE 1-1 TEST LOG. 1-2
TABLE 1-2 TEST PARTICIPANTS. 1-4
TABLE 2-1(a) OVERALL SUMMARY OF TEST RESULTS, UNIT NUMBERS 1 AND 2. 2-3
TABLE 2-1(b) FACILITY AIR FLOW DATA. 2-4
TABLE 2-2 SUMMARY OF TEST RESULTS, UNIT NUMBER 1. 2-5
TABLE 2-3 SUMMARY OF TEST RESULTS, UNIT NUMBER 2. 2-6
TABLE 2-4 PERFORMANCE TEST BASED OPERATING REQUIREMENTS. 2-7
TABLE 2-5 METALS EMISSIONS, UNIT NUMBER 1. 2-8
TABLE 2-6 HYDROGEN CHLORIDE AND AMMONIA EMISSIONS, UNIT NUMBER 1. 2-10
TABLE 2-7 HEXAVALENT CHROMIUM AND HYDROGEN FLUORIDE EMISSIONS, UNIT NUMBER 1. 2-11
TABLE 2-8 PARTICULATE EMISSIONS, UNIT NUMBER 1. 2-12
TABLE 2-9 SULFURIC ACID EMISSIONS, UNIT NUMBER 1. 2-13
TABLE 2-10 NON-METHANE HYDROCARBON EMISSIONS, UNIT NUMBER 1. . . . 2-14
TABLE 2-11 DIOXIN/FURAN, PAH AND PCB EMISSIONS, UNIT NUMBER 2. 2-15
TABLE 2-12 METALS EMISSIONS, UNIT NUMBER 2. 2-16
TABLE 2-13 HYDROGEN CHLORIDE AND AMMONIA EMISSIONS, UNIT NUMBER 2. 2-18
TABLE 2-14 HEXAVALENT CHROMIUM AND HYDROGEN FLUORIDE EMISSIONS, UNIT NUMBER 2. 2-19
TABLE 2-15 PARTICULATE EMISSIONS, UNIT NUMBER 2. 2-20
TABLE 2-16 SULFURIC ACID EMISSIONS, UNIT NUMBER 2. 2-21
TABLE 2-17 NON-METHANE HYDROCARBON EMISSIONS, UNIT NUMBER 2. . . . 2-22
TABLE 3-1 OPERATING PARAMETERS SUMMARY, TEST INTERVAL AVERAGES UNIT NUMBERS 1 AND 2. 3-3
TABLE 4-1 PCDDs/PCDFs, PAHs AND PCBs GLASSWARE CLEANING PROCEDURE. 4-9
TABLE 5-1 FIELD EQUIPMENT CALIBRATION SUMMARY. 5-2
TABLE 5-2 SUMMARY OF ANALYTICAL QA/QC RESULTS.. 5-6
TABLE 5-3 SUMMARY OF DUPLICATE ANALYSIS FOR MERCURY. 5-8
TABLE 5-4 METALS BLANKS AND DUPLICATE ANALYSES RESULTS. 5-9
TABLE 5-5 METALS REAGENT BLANKS CORRECTION RESULTS. 5-10
TABLE 5-6 PCDD/PCDF FLUE GAS SURROGATES STANDARDS PERCENT RECOVERIES. 5-12
TABLE 5-7 PCDD/PCDF FLUE GAS EXTRACTION STANDARDS PERCENT RECOVERIES. 5-12
TABLE 5-8 PCDD/PCDF FIELD AND LABORATORY BLANKS ANALYTICAL RESULTS. 5-13
TABLE 5-9 PCBs EXTRACTION AND SURROGATE STANDARDS PERCENT RECOVERIES. 5-14
TABLE 5-10 PCBs FIELD AND LABORATORY BLANKS ANALYTICAL RESULTS. 5-15

List of Tables (Continued)

Table **Page**

TABLE 5-11 PAH SURROGATE STANDARDS PERCENT RECOVERIES. 5-16
TABLE 5-12 PAH EXTRACTION STANDARDS PERCENT RECOVERIES. 5-17
TABLE 5-13 PAH FIELD AND LABORATORY BLANKS ANALYTICAL RESULTS AND REPORTING LIMITS.. 5-18
TABLE 5-14 AUDIT SAMPLE RESULTS. 5-19

List of Figures

Figure 3-1 Schematic of Unit Nos. 1 and 2 airflow.. 3-2
Figure 4-1 Schematic of Unit Nos. 1 and 2 SDA inlet sampling location.. 4-2
Figure 4-2 Schematic of Unit Nos. 1 and 2 FF outlet sampling location. 4-3
Figure 4-3 Schematic of Preparation for EPA Method 23/CARB 428/429. 4-11

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1.0 INTRODUCTION

1.1 Background

The City of Spokane contracted DEECO, Inc., based in Raleigh, North Carolina, to conduct a testing program at its facility, the Spokane Waste to Energy Facility, operated by the City of Spokane. Testing represented the annual compliance test for emission limits under SRCAA Regulation I, Section 6.17, and was carried out in accordance with Subpart Cb testing requirements under 40 CFR 60.38b and 40 CFR 60.58b. This testing was performed to demonstrate compliance with the Title V Permit No. AOP-3. The Spokane Waste to Energy facility (Spokane) operates two (2) Von Roll 400 ton per day municipal refuse-fired, water wall boiler trains manufactured by Babcock and Wilcox. Each boiler has been equipped with a Wheelabrator Air Pollution Control Inc. spray dryer absorber (SDA) and fabric filter (FF) for air pollution control. Combustion gases exit the boiler economizer and pass through the SDA. For control of nitrogen oxides, each boiler is equipped with a Selective Non-Catalytic Reduction (SNCR) System that uses anhydrous ammonia. Each boiler is also equipped with a powdered activated carbon injection system (PACIS) with the injection location just prior to the SDA. The PACIS was operated at a nominal rate of 2 pounds-per hour or more. Gases exit the SDA and enter the FF where they exit to an induced draft fan prior to entering separate flues in a common stack.

This report presents the test results for particulate and condensable matter, sulfuric acid (H_2SO_4), hydrogen fluoride (HF), hexavalent chromium (Cr^{+6}), hydrogen chloride (HCl), ammonia (NH_3), non-methane hydrocarbons (NMHC), trace metals (including As, Be, Cd, Cr, Pb, Ni, Hg, Se, Zn), polychlorinated dibenzodioxins and dibenzofurans (PCDD/PCDF), polyaromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), and fugitive emissions.

Only Unit No. 2 was tested for dioxin/furans, PCBs and PAHs. Under Condition 3M.g of the facility's Title V operating permit, reduced testing for dioxin/furan, PCBs, and PAHs was conducted because performance testing from the two most recent years indicate dioxin/furan emissions less than 15 nanograms per dry standard cubic meter and therefore the facility qualifies for reduced testing (i.e., testing of one unit per year, alternating units from year to year) under SRCAA Regulation I, Section 6.17.H. Because PCB and PAH emissions are measured at the same time as dioxin/furan, and with SRCAA approval under Condition 3M.g of the operating permit, the facility only tested one unit for PCBs and PAHs as well.

In accordance with 40 CFR 60.58b(c)(6) and 60.11(e)(5), the City of Spokane elects to submit continuous opacity monitoring system (COMS) results in lieu of EPA Method 9 observations to establish compliance with the opacity standard. Only COMS data recorded concurrently with particulate matter sampling are provided in **Appendix E** in deference to 40 CFR 60.11(e)(6) and the facility operating permit.

1.2 Outline of Test Program

Stationary source sampling was performed for the City of Spokane at their Waste to Energy facility in Spokane, Washington, on March 25 - 28, 2019. A test log, summarizing sampling locations, sampling objectives, sampling methods, test dates, and test run numbers for the test program, is in **Table 1-1.**

1.3 Test Participants

A list of the personnel involved in this test program is provided in **Table 1-2**.

TABLE 1-1
TEST LOG

Sampling Location	Sampling Parameter	Test Method	Test Date	Test Run Number
Facility Ash Handling System	Fugitive Emissions	EPA Method 22	3/25/19	Ash Handler Front-M22-1
			3/25/19	Ash Handler Front-M22-2
			3/25/19	Ash Handler Front-M22-3
			3/25/19	Ash Handler Rear-M22-1
			3/25/19	Ash Handler Rear-M22-2
			3/25/19	Ash Handler Rear-M22-3
Unit No. 1 SDA Inlet	Volumetric Flow Rate	EPA Methods 1 and 2	3/26/19	Unit1-In-M29-1
	Oxygen and Carbon Dioxide	EPA Method 3	3/26/19	Unit1-In-M29-2
	Gas Stream Moisture	EPA Method 4	3/26/19	Unit1-In-M29-3
	Mercury	EPA Method 29	3/28/19	Unit1-In-M29-4
	Oxygen and Carbon Dioxide	EPA Method 3	3/27/19	Unit1-In-M26A-1
	Gas Stream Moisture	EPA Method 4	3/27/19	Unit1-In-M26A-2
	Hydrogen Chloride	EPA Method 26A	3/27/19	Unit1-In-M26A-3
Unit No. 1 FF Outlet	Volumetric Flow Rate	EPA Methods 1 and 2	3/26/19	Unit1-Out-M29-1
	Oxygen and Carbon Dioxide	EPA Method 3	3/26/19	Unit1-Out-M29-2
	Gas Stream Moisture	EPA Method 4	3/26/19	Unit1-Out-M29-3
	Metals/Mercury	EPA Method 29	3/28/19	Unit1-Out-M29-4
			3/28/19	Unit1-Out-M29-5[2]
	Oxygen and Carbon Dioxide	EPA Method 3	3/27/19	Unit1-Out-M26A-1
	Gas Stream Moisture	EPA Method 4	3/27/19	Unit1-Out-M26A-2
	Hydrogen Chloride/Ammonia	EPA Method 26A	3/27/19	Unit1-Out-M26A-3
	Volumetric Flow Rate	EPA Methods 1 and 2	3/28/19	Unit1-Out-M13B-1
	Oxygen and Carbon Dioxide	EPA Method 3	3/28/19	Unit1-Out-M13B-2
	Gas Stream Moisture	EPA Method 4	3/28/19	Unit1-Out-M13B-3
	Hexavalent Chromium	EPA Method 13B	3/28/19	Unit1-Out-M13B-4[2]
	Hydrogen Fluoride			
	Volumetric Flow Rate	EPA Methods 1 and 2	3/26/19	Unit1-Out-M5/202-1
	Oxygen and Carbon Dioxide	EPA Method 3	3/26/19	Unit1-Out-M5/202-2
	Gas Stream Moisture	EPA Method 4	3/26/19	Unit1-Out-M5/202-3
	Total Particulate Matter/PM_{10}[1]	EPA Method 5/202		
	Volumetric Flow Rate	EPA Methods 1 and 2	3/27/19	Unit1-Out-M8-1
	Oxygen and Carbon Dioxide	EPA Method 3	3/27/19	Unit1-Out-M8-2
	Gas Stream Moisture	EPA Method 4	3/27/19	Unit1-Out-M8-3
	Sulfuric Acid Mist	EPA Method 8		
	Oxygen and Carbon Dioxide	EPA Method 3A	3/28/19	Unit1-Out-M25A-1
	Non-Methane Hydrocarbons	EPA Method 25A	3/28/19	Unit1-Out-M25A-2
			3/28/19	Unit1-Out-M25A-3

TABLE 1-1 (Continued)

Sampling Location	Sampling Parameter	Test Method	Test Date	Test Run Number
Unit No. 2 SDA Inlet	Volumetric Flow Rate Oxygen and Carbon Dioxide Gas Stream Moisture Mercury	EPA Methods 1 and 2 EPA Method 3 EPA Method 4 EPA Method 29	3/25/19 3/25/19 3/27/19 3/27/19	Unit2-In-M29-2 Unit2-In-M29-3 Unit2-In-M29-4 Unit2-In-M29-5
	Oxygen and Carbon Dioxide Gas Stream Moisture Hydrogen Chloride	EPA Method 3 EPA Method 4 EPA Method 26A	3/28/19 3/28/19 3/28/19	Unit2-In-M26A-1 Unit2-In-M26A-2 Unit2-In-M26A-3
Unit No. 2 FF Outlet	Volumetric Flow Rate Oxygen and Carbon Dioxide Gas Stream Moisture Metals/Mercury	EPA Methods 1 and 2 EPA Method 3 EPA Method 4 EPA Method 29	3/25/19 3/25/19 3/27/19 3/27/19	Unit2-Out-M29-2 Unit2-Out-M29-3 Unit2-Out-M29-4 Unit2-Out-M29-5
	Oxygen and Carbon Dioxide Gas Stream Moisture Hydrogen Chloride/Ammonia	EPA Method 3 EPA Method 4 EPA Method 26A	3/28/19 3/28/19 3/28/19	Unit2-Out-M26A-1 Unit2-Out-M26A-2 Unit2-Out-M26A-3
	Volumetric Flow Rate Oxygen and Carbon Dioxide Gas Stream Moisture Hexavalent Chromium Hydrogen Fluoride	EPA Methods 1 and 2 EPA Method 3 EPA Method 4 EPA Method 13B	3/27/19 3/27/19 3/27/19	Unit2-Out-M13B-1 Unit2-Out-M13B-2 Unit2-Out-M13B-3
	Volumetric Flow Rate Oxygen and Carbon Dioxide Gas Stream Moisture Total Particulate Matter/PM$_{10}$[1]	EPA Methods 1 and 2 EPA Method 3 EPA Method 4 EPA Method 5/202	3/25/19 3/25/19 3/25/19	Unit2-Out-M5/202-1 Unit2-Out-M5/202-2 Unit2-Out-M5/202-3
	Volumetric Flow Rate Oxygen and Carbon Dioxide Gas Stream Moisture Sulfuric Acid Mist	EPA Methods 1 and 2 EPA Method 3 EPA Method 4 EPA Method 8	3/28/19 3/28/19 3/28/19	Unit2-Out-M8-1 Unit2-Out-M8-2 Unit2-Out-M8-3
	Volumetric Flow Rate Oxygen and Carbon Dioxide Gas Stream Moisture PCDD/PCDF/PAH/PCB	EPA Methods 1 and 2 EPA Method 3 EPA Method 4 EPA Method 23	3/26/19 3/26/19 3/27/19 3/27/19	Unit2-Out-M23-1 Unit2-Out-M23-2 Unit2-Out-M23-3 Unit2-Out-M23-4[2]
	Oxygen and Carbon Dioxide Non-Methane Hydrocarbons	EPA Method 3A EPA Method 25A/18	3/27/19 3/27/19 3/27/19	Unit2-Out-M25A-1 Unit2-Out-M25A-2 Unit2-Out-M25A-3

[1] Concurrent opacity measurements were recorded using facility-installed COMs

[2] Field Blank Train

TABLE 1-2
TEST PARTICIPANTS

Organization	Participant and Function
City of Spokane, Spokane Waste-to-Energy	Kelle Vigeland Facility Test Coordinator
DEECO, Inc	Marc Hamilton Program Director
	John Futrell Sample Recovery Leader
	Dustin Carpenter Sampling Team Leader/VE and Fugitives Observer
	Dr. Scott Steinsberger CEMs Sampling Technician
	Trenton Lee Sampling Team Leader
	Jon Hafer Sampling Technician
	Nathan Chang Sampling Technician
	James Bolton Sampling Technician
	John Martin Sampling Team Leader
	Wilson Anderson Sampling Team Leader

2.0 SUMMARY OF RESULTS

2.1 Presentation

Tables 2-1 through 2-4 presents the emissions results for compounds having specific emissions stated in the applicable permit limits and/or required process parameters. **Tables 2-5 through 2-17** present run-by-run and sample-by-sample summaries; refer to the "List of Tables" and "List of Figures" of the "Table of Contents" for a cross reference. Detailed test results are presented in Volume 1, **Appendix A**; field and analytical data can be found in Volume 2, **Appendices B** and **C,** respectively; pertinent calibration data can be found in Volume 2, **Appendix D**; and detailed process data can be found in Volume 1, **Appendix E**.

2.1.1 Reporting of Non-Detected (ND) Values

For all ND results for all emissions in all test report summary tables, the following guidelines have been followed:

- ND values are reported as "ND(detection limit)" with the detection limit in parentheses in the reported units. (Unless otherwise noted on each summary table)
- ND values for single test runs results are equal to zero (0) when calculating test averages. (unless otherwise noted on each summary table)
- ND values for single fractions (ie front-half or back-half) are equal to zero (0) when calculating collection totals. (unless otherwise noted on each summary table)
- When all individual test results are ND, the average is reported as "ND(average detection limit)". (unless otherwise noted on each summary table)
- When all individual fractions of a single test run (ie front-half and back-half) are ND, the total collection is reported as "ND(sum of detection limits)". (unless otherwise noted on each summary table)

2.2 Aborted and/or Invalidated Runs

Unit 2-Out-M29-1 was back-flushed which also invalidated Unit 2-In-M29-1. Unit 2-Out-M29-5 and Unit 2-In-M29-5 were conducted as replacements. Unit 1-Out-M8-1 sample train was broken and the run aborted. Unit 1-Out-M8-4 was conducted in its place.

2.3 Metals Results

The reagent blank analytical results for the combined front/back half fractions' for chromium, lead, nickel and zinc were 0.824 µg, 0.350 µg, 2.04 µg, and 9.24 µg, respectively. All other metals and mercury fractions were below analytical detection limits. In accordance with Sections 12.6.3 and/or 12.7.3 of EPA Method 29, all runs' metals analytical results were adjusted to account for any reagent blanks above detectable limits. The adjusted results were used in the concentration and emission rate calculations. Metals blank corrections are presented in **Table 5-5**.

2.4 PCDD/PCDF, PAH and PCB Analytical Results

Two symbols are used in the presentation of the analytical results. The symbol indicates results that have special significance and require different procedures in calculations and data interpretation. All symbols surrounded with "ND( )" (Not Detected) and "{ }" carry this significance and are addressed as follows:

PCDD/PCDF The data reporting procedures outlined in EPA Method 23 are used in presenting all analytical results. For analytical results that were below detection limits, the values are surrounded by "ND( )", and are considered zero for calculating total catch weights per EPA Method 23, Section 9.9. Several results are reported as Estimated Maximum Potential Concentrations (EMPC). EMPC results do not meet all the identification criteria to be positively identified as a dioxin or furan since the integrated ion abundance ratios were not within 15% of the theoretical values specified in Method 23 Section 5.3.2.5, Table 4. For this reason, all EMPC results are enclosed in brackets {} and are considered zero when calculating total dioxin/furans.

PAHs PAH results surrounded by "ND( )" are indicative of analyte levels below the Reporting Limit, as defined in CARB Method 429, Section 9.2. The Reporting Limit is defined as 5 times the analyte level in the field blank train (See Section 9.2.4.2 in CARB 429). All analyte results above the analytical detection limit, but below this reporting limit are used as is, but are surrounded by "ND( )", since the result is below the reporting limit. If the analyte is below the reporting limit AND the analytical detection limit, then the analytical detection limit is used (and flagged with "ND( )"). In all tables, results are presented including and not including these "ND( )" results.

TABLE 2-1(a)
OVERALL SUMMARY OF TEST RESULTS

Emission Test Parameter	Test Average for Unit No. 1	Test Average for Unit No. 2	Title V Permit (AOP-3) Limit
Process Parameters			
Steam Flow, Klb/hr[1]	102.2	102.1	NA
FF Inlet Temperature, °F[2]	280.8	278.4	NA
Carbon Feed Rate, lb/hr[3]	2.1	2.1	NA
Dioxin/Furans			
FF Outlet ng/dscm @ 7% O_2	Not Run	0.6	30
FF Outlet TEQ, ng/dscm @ 7% O_2 [4]		0.01	0.5
Cadmium Emissions			
FF Outlet mg/dscm @ 7% O_2	0.0004	0.0008	0.035
FF Outlet µg/dscm @ 7% O_2	0.4	0.8	35
Hydrogen Chloride Emissions			
SDA Inlet ppm_{vd} @ 7% O_2	631.8	678.5	NA
FF Outlet ppm_{vd} @ 7% O_2	4.5	6.78	29[5] or
Removal Efficiency (concentration basis)	99.3%	99.0%	≥95%[5]
Lead Emissions			
FF Outlet mg/dscm @ 7% O_2	0.002	0.005	0.400
FF Outlet µg/dscm @ 7% O_2	1.7	5.2	400
Mercury Emissions			
SDA Inlet mg/dscm @ 7% O_2	0.059	0.031	NA
FF Outlet µg/dscm @ 7% O_2	7.22	3.5	NA
FF Outlet mg/dscm @ 7% O_2	0.007	0.003	0.050[5] or
Removal Efficiency (concentration basis)	84%	89%	85%[5]
Opacity, %	0.2%	0.0%	5%
Particulate Matter Emissions (Front Half Filterable)			
FF Outlet mg/dscm @ 7% O_2	2.0	4.6	25
Total PM_{10}, filterable and condensable			
FF Outlet gr/dscf @ 7% O_2	0.006	0.008	0.020
Hydrogen Fluoride Emissions			
FF Outlet ppm_{vd} @ 7% O_2	0.07	0.08	5.4
Non-Methane Hydrocarbon Emissions			
FF Outlet ppm_{vd} @ 7% O_2 as methane	0.5	0.3	17.9
Fugitive Emissions, % (Common Source for Units 1 and 2)	0		5%

[1] Average steam flow rate during mercury testing on Unit 1, and during dioxin/furans testing on Unit 2.

[2] Average FF Inlet Temperature during mercury testing on Unit 1, and during dioxin/furans testing on Unit 2.

[3] Average carbon feed rate during mercury and/or dioxin/furans testing.

[4] Based on 1989 International Toxic Equivalency factors (ITEF), according to SRCAA Order #95-10

[5] Permitted emission limits are based on emission concentration or removal efficiency, whichever is less stringent.

TABLE 2-1(b)
FACILITY AIR FLOW DATA

Run Number	**Run Date**	**Run Time (Cell Time)**		**Steam Flow klbs/hr**	**Flue Gas Temp Deg F**	**Air Flow acfm**	**O_2 %**	**CO_2 %**	**Air Flow dscfm**	**Air Flow dscfm @7%O_2**
		Start	**Stop**							
Unit1-Out-M13B-1	03/28/19	839	1008	101.7	247.8	109900	11.3	8.3	60100	41508
Unit1-Out-M13B-2	03/28/19	1034	1151	101.8	248.1	107800	11.6	7.9	58100	38873
Unit1-Out-M13B-3	03/28/19	1213	1329	101.8	249.2	112600	11.8	7.9	60300	39477
Unit1-Out-M5/202-1	03/26/19	817	1100	102.3	250.5	117600	11.6	7.9	64400	43088
Unit1-Out-M5/202-2	03/26/19	1125	1351	102.2	248.9	114700	11.6	7.9	62900	42084
Unit1-Out-M5/202-3	03/26/19	1417	1642	102.3	250.5	123300	11.8	7.7	66000	43209
Unit1-Out-M8-2	03/27/19	924	1039	101.8	248.1	113700	12.1	7.5	62200	39378
Unit1-Out-M8-3	03/27/19	1116	1232	102.0	247.6	113900	11.3	8.2	61500	42475
Unit1-Out-M8-4	03/27/19	1305	1421	101.8	249.0	114200	11.6	8.1	61100	40880
Unit1-Out-M29-1	03/26/19	830	1100	102.3	251.2	110800	11.6	7.9	60600	40545
Unit1-Out-M29-2	03/26/19	1125	1351	102.2	251.7	113900	11.7	8	61800	40904
Unit1-Out-M29-3	03/26/19	1418	1643	102.3	253.8	118700	11.4	8.2	63200	43194
Unit1-Out-M29-4	03/28/19	824	1056	101.8	247.4	111200	11.3	8.4	60300	41646
Unit 1 Average				**102.0**	**249.5**	**114000**	**11.6**	**8.0**	**61700**	**41328**
Unit2-Out-M23/428/429-1	03/26/19	751	1213	102.3	265.2	128700	11.9	7.8	69000	44676
Unit2-Out-M23/428/429-2	03/26/19	1228	1655	102.2	266.5	136100	11.8	7.9	70900	46417
Unit2-Out-M23/428/429-3	03/27/19	745	1211	101.8	260.3	128800	11.5	7.9	69100	46729
Unit2-Out-M13B-1	03/27/19	1256	1407	101.9	259.1	122600	11.6	7.9	64400	43088
Unit2-Out-M13B-2	03/27/19	1429	1542	101.6	260.7	127800	11.8	7.8	67400	44125
Unit2-Out-M13B-3	03/27/19	1553	1706	101.8	259.5	128800	11.6	7.9	67700	45296
Unit2-Out-M5/202-1	03/25/19	842	1115	102.2	265.6	125500	11.6	7.8	67100	44894
Unit2-Out-M5/202-2	03/25/19	1143	1405	102.2	269.8	127700	12.4	7.2	68300	41766
Unit2-Out-M5/202-3	03/25/19	1438	1704	101.7	266	127800	11.6	7.8	67500	45162
Unit2-Out-M8-1	03/28/19	815	932	101.7	258.6	121500	11.8	7.9	66100	43274
Unit2-Out-M8-2	03/28/19	1000	1117	101.6	256.8	124700	11.7	7.9	69100	45735
Unit2-Out-M8-3	03/28/19	1146	1302	101.9	259.5	128200	11.9	7.9	67100	43446
Unit2-Out-M29-2	03/25/19	1121	1347	102.2	270	123600	12.5	7.1	66100	39945
Unit2-Out-M29-3	03/25/19	1427	1649	101.6	266.4	123600	11.5	7.9	65000	43957
Unit2-Out-M29-4	03/27/19	805	1031	101.8	262.2	126500	11.8	7.7	68100	44583
Unit2-Out-M29-5	03/27/19	1058	1317	101.7	261.2	123300	11.5	8.1	64900	43889
Unit 2 Average				**101.9**	**263.0**	**126600**	**11.8**	**7.8**	**67400**	**44186**
Facility Average				**101.9**	**256.2**	**120300**	**11.7**	**7.9**	**64600**	**42757**

TABLE 2-2
SUMMARY OF TEST RESULTS, UNIT NUMBER 1

Emission Test Parameter	First Run	Second Run	Third Run	Fourth Run	Average	Title V Permit (AOP-3) Limit
Process Parameters						
Steam Flow, Klb/hr[1]	102.3	102.2	102.3	101.8	102.2	NA
FF Inlet Temperature, °F[2]	280.5	281.0	281.0	280.6	280.8	NA
Carbon Feed Rate, lb/hr[3]	2.1	2.1	2.1	2.0	2.1	NA
Cadmium Emissions						
FF Outlet mg/dscm @ 7% O_2	4.33×10^{-4}	3.19×10^{-4}	4.79×10^{-4}	2.05×10^{-4}	0.0004	0.035
FF Outlet µg/dscm @ 7% O_2	0.433	0.319	0.479	0.205	0.36	35
Hydrogen Chloride Emissions						
SDA Inlet ppm_{vd} @ 7% O_2	758.4	597.0	540.0	--	631.8	NA
FF Outlet ppm_{vd} @ 7% O_2	4.83	4.63	3.95	--	4.5	29[4] or
Removal Efficiency (conc. basis)	99.4%	99.2%	99.3%	--	99.3%	≥95%[4]
Lead Emissions						
FF Outlet mg/dscm @ 7% O_2	1.98×10^{-3}	2.01×10^{-3}	1.60×10^{-3}	1.06×10^{-3}	0.002	0.400
FF Outlet µg/dscm @ 7% O_2	1.98	2.01	1.60	1.06	1.7	400
Mercury Emissions						
SDA Inlet mg/dscm @ 7% O_2	0.114	0.062	0.038	0.023	0.059	NA
FF Outlet µg/dscm @ 7% O_2	5.92	10.67	7.23	5.06	7.22	NA
FF Outlet mg/dscm @ 7% O_2	5.92×10^{-3}	0.011	7.23×10^{-3}	5.06×10^{-3}	0.007	0.050[4] or
Removal Eff. (conc. basis)	95%	83%	81%	78%	84%	85%[4]
Opacity, %	0.2%	0.2%	0.2%	--	0.2%	5%
Particulate Matter Emissions (Filterable)						
FF Outlet mg/dscm @ 7% O_2	1.375	0.975	3.518	--	2.0	25
Total PM_{10}, filterable and condensable						
FF Outlet gr/dscf @ 7% O_2	7.43×10^{-3}	4.72×10^{-3}	6.52×10^{-3}	--	0.006	0.020
Hydrogen Fluoride Emissions						
FF Outlet ppm_{vd} @ 7% O_2	0.077	0.073	0.070	--	0.073	5.4
Non-Methane Hydrocarbon Emissions						
FF Outlet ppm_{vd} @ 7% O_2 as methane	0.4	0.6	0.4	--	0.5	17.9

[1] Average steam flow rate during mercury testing

[2] Average FF Inlet Temperature during mercury testing

[3] Average carbon feed rate during mercury and/or dioxin/furans testing

[4] Permitted emission limits are based on emission concentration or removal efficiency, whichever is less stringent.

TABLE 2-3
SUMMARY OF TEST RESULTS, UNIT NUMBER 2

Emission Test Parameter	**First Run**	**Second Run**	**Third Run**	**Fourth Run**	**Average**	**Title V Permit (AOP-3) Limit**
Process Parameters						
Steam Flow, Klb/hr[1]	102.3	102.2	101.8	---	102.1	NA
FF Inlet Temperature, °F[2]	278.3	278.5	278.4	---	278.4	NA
Carbon Feed Rate, lb/hr[3]	2.1	2.1	2.1	2.1	2.1	NA
Dioxin/Furans						
FF Outlet Total, ng/dscm @ 7% O_2	0.559	0.682	0.412	--	0.551	30
FF Outlet TEQ, ng/dscm @ 7% O_2 [4]	0.01	0.02	0.01	--	0.01	0.5
Cadmium Emissions						
FF Outlet mg/dscm @ 7% O_2	1.04×10^{-3}	1.40×10^{-3}	3.77×10^{-4}	0.442×10^{-4}	0.0008	0.035
FF Outlet μg/dscm @ 7% O_2	1.04	1.40	0.377	0.442	0.8	35
Hydrogen Chloride Emissions						
SDA Inlet ppm_{vd} @ 7% O_2	724.0	718.0	593.4	--	678.5	NA
FF Outlet ppm_{vd} @ 7% O_2	5.74	7.50	7.09	--	6.78	29[5] or
Removal Efficiency (conc. basis)	99.2%	99.0%	98.8%	--	99.0%	≥95%[5]
Lead Emissions						
FF Outlet mg/dscm @ 7% O_2	6.76×10^{-3}	9.24×10^{-3}	2.66×10^{-3}	2.29×10^{-3}	0.005	0.400
FF Outlet μg/dscm @ 7% O_2	6.76	9.24	2.66	2.29	5.2	400
Mercury Emissions						
SDA Inlet mg/dscm @ 7% O_2	0.047	0.030	0.017	0.028	0.031	NA
FF Outlet μg/dscm @ 7% O_2	6.09	3.05	2.12	2.69	3.5	NA
FF Outlet mg/dscm @ 7% O_2	6.09×10^{-3}	3.05×10^{-3}	2.12×10^{-3}	2.69×10^{-3}	0.003	0.050[5] or
Removal Eff. (conc. basis)	87%	90%	88%	91%	89%	85%[5]
Opacity, %	0.0%	0.0%	0.0%	--	0.0%	5%
Particulate Matter Emissions (Filterable)						
FF Outlet mg/dscm @ 7% O_2	4.20	2.05	7.63	--	4.6	25
Total PM_{10}, filterable and condensable						
FF Outlet gr/dscf @ 7% O_2	8.39×10^{-3}	5.18×10^{-3}	9.04×10^{-3}	--	0.008	0.020
Hydrogen Fluoride Emissions						
FF Outlet ppm_{vd} @ 7% O_2	0.087	0.083	0.055	--	0.075	5.4
Non-Methane Hydrocarbon Emissions						
FF Outlet ppm_{vd} @ 7% O_2 as methane	0.4	0.2	0.2	--	0.3	17.9

[1] Average steam flow rate during dioxin/furan testing

[2] Average FF Inlet Temperature during dioxin/furans testing

[3] Average carbon feed rate during dioxin/furans testing

[4] Based on 1989 International Toxic Equivalency factors (ITEF), according to SRCAA Order #95-10

[5] Permitted emission limits are based on emission concentration or removal efficiency, whichever is less stringent.

TABLE 2-4
PERFORMANCE TEST BASED OPERATING REQUIREMENTS

MWC Unit No.	Maximum Demonstrated MWC Unit Load, Klb/hr[1]	Maximum Demonstrated PMCD Temperature, °F[2]	Average Carbon Mass Feed Rate, lb/hr[3]
1	104[1]	281[2]	2
2	102	279	2

1. The highest 4-hour arithmetic average load (steam flow) achieved during four consecutive hours during the dioxin/furan emission tests. See 40 CFR 60.58b(i)(8) which is adopted by reference in SRCAA Regulation I, Section 6.17. Unit #1 Maximum Demonstrated MWC Unit Load established during the March, 2018 emission test, in deference to 40 CFR 60.58b(g)(5)(iii) which is adopted by reference in SRCAA Regulation I, Section 6.17.
2. The highest 4-hour arithmetic average temperature achieved at the particulate matter control device (fabric filter) inlet during four consecutive hours during the dioxin/furan emission tests. See 40 CFR 60.58b(i)(9) which is adopted by reference in SRCAA Regulation I, Section 6.17. Unit #1 Maximum Demonstrated PMCD Inlet Temperature established during the March, 2018 emission test, in deference to 40 CFR 60.58b(g)(5)(iii) which is adopted by reference in SRCAA Regulation I, Section 6.17.
3. The estimated hourly average carbon mass feed rate during the most recent mercury and dioxin/furan, whichever is highest, emissions tests. See 40 CFR 60.58b(m)(1)(i) which is adopted by reference in SRCAA Regulation I, Section 6.17.

TABLE 2-5
METALS EMISSIONS
UNIT NUMBER 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Run 4**	**Average**
Date	03/26/19	03/26/19	03/26/19	03/28/19	----
Time	830-1100	1125-1351	1418-1643	824-1056	----
Process Parameters					
Steam Flow, Klb/hr	102.3	102.2	102.3	101.8	102.2
FF Inlet Temperature, °F	280.5	281.0	281.0	280.6	280.8
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.0	2.1
Unit 1 Spray Dryer Absorber Inlet					
Stack Gas Temperature (F)	477.2	484.6	489.0	474.9	481.4
Stack Gas Moisture actual (%)	14.7	14.6	16.8	16.0	15.5
Oxygen Concentration (%)	9.8	10.3	9.6	10.1	10.0
Carbon Dioxide Conc. (%)	9.4	9.2	9.6	9.0	9.3
Volumetric Flowrate					
actual cfm	127,800	127,000	130,800	125,900	127,900
dry standard cfm	56,300	55,600	55,500	55,000	55,600
Meter Volume (dscf)	65.741	64.916	66.138	65.131	65.482
(dscm)	1.862	1.838	1.873	1.844	1.854
Isokinetic Variation (%)	99.1	99.1	101.1	100.6	100.0
Mercury					
Total Catch Wt, ug	169.821	86.864	57.65	33	---
Conc., ug/dscm @7% O_2	114.2	61.97	37.86	23.03	59.27
Conc., mg/dscm @7% O_2	0.114	0.062	0.038	0.023	0.059
Emission Rate, lb/hr	0.019	9.84×10^{-3}	6.40×10^{-3}	3.69×10^{-3}	9.79×10^{-3}
Emission Rate, lb/MMBtu	1.03×10^{-4}	5.57×10^{-5}	3.40×10^{-5}	2.07×10^{-5}	5.32×10^{-5}
Unit 1 Fabric Filter Outlet					
Stack Gas Temperature (°F)	251.2	251.7	253.8	247.4	251.0
Stack Gas Moisture (%)	17.5	18.0	19.3	18.8	18.4
Oxygen Concentration (%)	11.6	11.7	11.4	11.3	11.5
Carbon Dioxide Conc. (%)	7.9	8.0	8.2	8.4	8.1
Volumetric Flowrate					
actual cfm	110,800	113,900	118,700	111,200	113,700
dry standard cfm	60,600	61,800	63,200	60,300	61,500
Meter Volume (dscf)	70.184	72.023	74.359	69.764	71.583
(dscm)	1.987	2.039	2.106	1.976	2.027
Isokinetic Variation (%)	99.8	100.3	101.3	99.6	100.3
Arsenic					
Total Catch Wt, ug	0.324	ND(0.2)[1]	ND(0.2)	ND(0.2)	---
Conc., ug/dscm @7% O_2	0.244	ND(0.148)	ND(0.139)	ND(0.147)	<0.169
Conc., mg/dscm @7% O_2	2.44×10^{-4}	ND(1.48×10^{-4})	ND(1.39×10^{-4})	ND(1.47×10^{-4})	<1.69×10^{-4}
Emission Rate, lb/hr	3.70×10^{-5}	ND(2.27×10^{-5})	ND(2.25×10^{-5})	ND(2.29×10^{-5})	<2.63×10^{-5}
Emission Rate, lb/MMBtu	2.19×10^{-7}	ND(1.33×10^{-7})	ND(1.25×10^{-7})	ND(1.32×10^{-7})	<1.52×10^{-7}
Beryllium					
Total Catch Wt, ug	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
Conc., ug/dscm @7% O_2	ND(0.038)	ND(0.037)	ND(0.035)	ND(0.037)	ND(0.037)
Conc., mg/dscm @7% O_2	ND(3.76×10^{-5})	ND(3.70×10^{-5})	ND(3.47×10^{-5})	ND(3.66×10^{-5})	ND(3.65×10^{-5})
Emission Rate, lb/hr	ND(5.71×10^{-6})	ND(5.67×10^{-6})	ND(5.62×10^{-6})	ND(5.72×10^{-6})	ND(5.68×10^{-6})
Emission Rate, lb/MMBtu	ND(3.38×10^{-8})	ND(3.33×10^{-8})	ND(3.12×10^{-8})	ND(3.29×10^{-8})	ND(3.28×10^{-8})
Cadmium					
Total Catch Wt, ug	0.576	0.43	0.69	0.28	---
Conc., ug/dscm @7% O_2	0.433	0.319	0.479	0.205	0.359
Conc., mg/dscm @7% O_2	4.33×10^{-4}	3.19×10^{-4}	4.79×10^{-4}	2.05×10^{-4}	3.59×10^{-4}
Emission Rate, lb/hr	6.58×10^{-5}	4.88×10^{-5}	7.76×10^{-5}	3.20×10^{-5}	5.60×10^{-5}
Emission Rate, lb/MMBtu	3.89×10^{-7}	2.86×10^{-7}	4.31×10^{-7}	1.84×10^{-7}	3.23×10^{-7}

TABLE 2-5 (Continued)

Parameter	Run 1	Run 2	Run 3	Run 4	Average
Chromium					
Total Catch Wt, ug	2.076	5.596	1.116	0.686	---
Conc., ug/dscm @7% O_2	1.562	4.147	0.775	0.503	1.747
Conc., mg/dscm @7% O_2	1.56×10^{-3}	4.15×10^{-3}	7.75×10^{-4}	5.03×10^{-4}	1.75×10^{-3}
Emission Rate, lb/hr	2.37×10^{-4}	6.35×10^{-4}	1.25×10^{-4}	7.84×10^{-5}	2.69×10^{-4}
Emission Rate, lb/MMBtu	1.40×10^{-6}	3.72×10^{-6}	6.96×10^{-7}	4.52×10^{-7}	1.57×10^{-6}
Lead					
Total Catch Wt, ug	2.63	2.71	2.3	1.44	---
Conc., ug/dscm @7% O_2	1.978	2.008	1.598	1.055	1.660
Conc., mg/dscm @7% O_2	1.98×10^{-3}	2.01×10^{-3}	1.60×10^{-3}	1.06×10^{-3}	1.66×10^{-3}
Emission Rate, lb/hr	3.00×10^{-4}	3.08×10^{-4}	2.59×10^{-4}	1.65×10^{-4}	2.58×10^{-4}
Emission Rate, lb/MMBtu	1.78×10^{-6}	1.80×10^{-6}	1.44×10^{-6}	9.48×10^{-7}	1.49×10^{-6}
Nickel					
Total Catch Wt, ug	5.37	2.6	3.97	0.06	---
Conc., ug/dscm @7% O_2	4.039	1.927	2.758	0.044	2.192
Conc., mg/dscm @7% O_2	4.04×10^{-3}	1.93×10^{-3}	2.76×10^{-3}	4.40×10^{-5}	2.19×10^{-3}
Emission Rate, lb/hr	6.13×10^{-4}	2.95×10^{-4}	4.46×10^{-4}	6.86×10^{-6}	3.40×10^{-4}
Emission Rate, lb/MMBtu	3.63×10^{-6}	1.73×10^{-6}	2.48×10^{-6}	3.95×10^{-8}	1.97×10^{-6}
Selenium					
Total Catch Wt, ug	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	---
Conc., ug/dscm @7% O_2	ND(0.150)	ND(0.148)	ND(0.139)	ND(0.147)	ND(0.146)
Conc., mg/dscm @7% O_2	ND(1.50×10^{-4})	ND(1.48×10^{-4})	ND(1.39×10^{-4})	ND(1.47×10^{-4})	ND(1.46×10^{-4})
Emission Rate, lb/hr	ND(2.28×10^{-5})	ND(2.27×10^{-5})	ND(2.25×10^{-5})	ND(2.29×10^{-5})	ND(2.27×10^{-5})
Emission Rate, lb/MMBtu	ND(1.35×10^{-7})	ND(1.33×10^{-7})	ND(1.25×10^{-7})	ND(1.32×10^{-7})	ND(1.31×10^{-7})
Zinc					
Total Catch Wt, ug	23.38	20.38	23.58	23.18	---
Conc., ug/dscm @7% O_2	17.59	15.10	16.38	16.99	16.51
Conc., mg/dscm @7% O_2	0.018	0.015	0.016	0.017	0.017
Emission Rate, lb/hr	2.67×10^{-3}	2.31×10^{-3}	2.65×10^{-3}	2.65×10^{-3}	2.57×10^{-3}
Emission Rate, lb/MMBtu	1.58×10^{-5}	1.36×10^{-5}	1.47×10^{-5}	1.53×10^{-5}	1.48×10^{-5}
Mercury					
Total Catch Wt, ug	7.87	14.4	10.4	6.9	---
Conc., ug/dscm @7% O_2	5.920	10.67	7.225	5.056	7.218
Conc., mg/dscm @7% O_2	5.92×10^{-3}	0.011	7.23×10^{-3}	5.06×10^{-3}	7.22×10^{-3}
Emission Rate, lb/hr	8.99×10^{-4}	1.63×10^{-3}	1.17×10^{-3}	7.89×10^{-4}	1.12×10^{-3}
Emission Rate, lb/MMBtu	5.32×10^{-6}	9.58×10^{-6}	6.49×10^{-6}	4.54×10^{-6}	6.48×10^{-6}
Mercury Removal Efficiency					
% by concentration	95%	83%	81%	78%	84%

[1] "ND" indicates that the analyte was not detected in the sample, and the value in parenthesis is considered to be zero when calculating the overall average, except when the analyte was not detected for all runs.

TABLE 2-6
HYDROGEN CHLORIDE AND AMMONIA EMISSIONS
UNIT NUMBER 1

Parameter	Run 1	Run 2	Run 3	Average
Date	03/27/19	03/27/19	03/27/19	----
Time	843-1007*	1116-1216	1305-1405	----
Process Parameters				
Steam Flow, Klb/hr	101.8	102.0	101.9	101.9
FF Inlet Temperature, °F	281.5	280.6	280.9	281.0
Carbon Feed Rate, lb/hr	2.0	2.0	2.0	2.0
Unit 1 Spray Dryer Absorber Inlet				
Stack Gas Temperature (F)	489.8	487.5	496.3	491.2
Stack Gas Moisture actual (%)	15.0	16.1	16.7	15.9
Oxygen Concentration (%)	9.6	9.1	9.3	9.3
Carbon Dioxide Concentration (%)	9.8	10.1	10.0	10.0
Meter Volume (dscf)	39.401	39.115	39.105	39.207
(dscm)	1.116	1.108	1.107	1.110
Hydrogen Chloride				
Catch Wt, mg	1,044	852	757	---
Conc., mg/dscm	935.5	769.0	683.8	796.1
Conc., ppmvd @ 7% O_2	758.4	597.0	540.0	631.8
Unit 1 Fabric Filter Outlet				
Stack Gas Temperature (F)	246.8	246.7	247.5	247.0
Stack Gas Moisture actual (%)	17.9	18.8	19.5	18.7
Oxygen Concentration (%)	11.8	11.3	11.3	11.5
Carbon Dioxide Concentration (%)	7.8	8.1	8.3	8.1
Volumetric Flowrate				
actual cfm	113,500	113,900	114,000	113,800
dry standard cfm	62,100	61,600	61,100	61,600
Meter Volume (dscf)	39.008	38.599	38.385	38.664
(dscm)	1.105	1.093	1.087	1.095
Hydrogen Chloride				
Catch Wt, mg	5.303	5.30	4.50	---
Conc., mg/dscm	4.799	4.849	4.140	4.596
Conc., ppmvd @ 7% O_2	4.831	4.627	3.950	4.470
Emission Rate, lb/hr	1.116	1.119	0.947	1.061
Ammonia				
Catch Wt, mg	1.530	1.302	1.920	---
Conc., mg/dscm	1.385	1.191	1.766	1.447
Conc., ppmvd @ 7% O_2	2.993	2.441	3.619	3.017
Emission Rate, lb/hr	0.322	0.275	0.404	0.334
HCl Removal Efficiency				
% by concentration	99.4%	99.2%	99.3%	99.3%

* Run down 900 - 924

TABLE 2-7
HEXAVALENT CHROMIUM AND HYDROGEN FLUORIDE EMISSIONS
UNIT NUMBER 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	03/28/19	03/28/19	03/28/19	----
Time	839-1008	1034-1151	1213-1329	----
Process Parameters				
Steam Flow, Klb/hr	101.7	101.8	101.8	101.7
FF Inlet Temperature, °F	280.7	280.3	280.5	280.5
Carbon Feed Rate, lb/hr	2.0	2.0	2.0	2.0
Unit 1 Outlet				
Stack Gas Temperature (F)	247.8	248.1	249.2	248.4
Stack Gas Moisture actual (%)	18.1	19.3	19.6	19.0
Oxygen Concentration (%)	11.3	11.6	11.8	11.6
Carbon Dioxide Concentration (%)	8.3	7.9	7.9	8.0
Volumetric Flowrate				
actual cfm	109,900	107,800	112,600	110,100
dry standard cfm	60,100	58,100	60,300	59,500
Meter Volume (dscf)	34.468	33.794	35.147	34.470
(dscm)	0.976	0.957	0.995	0.976
Isokinetic Variation (%)	98.8	100.2	100.3	99.8
Hydrogen Fluoride				
Catch Wt, mg	0.152	0.138	0.134	---
Conc., mg/dscm	0.156	0.144	0.135	0.145
Conc., ppmvd @ 7% O_2	0.077	0.073	0.070	0.073
Emission Rate, lb/hr	0.035	0.031	0.030	0.032
Hexavalent Chromium				
Total Catch Wt, ug	ND(0.110)[1]	ND(0.114)	ND(0.114)	---
Conc., ug/dscm @ 7% O_2	ND(0.163)	ND(0.178)	ND(0.175)	ND(0.172)
Conc., mg/dscm @ 7% O_2	ND(1.63×10^{-4})	ND(1.78×10^{-4})	ND(1.75×10^{-4})	ND(1.72×10^{-4})
Emission Rate, lb/hr	ND(2.54×10^{-5})	ND(2.59×10^{-5})	ND(2.59×10^{-5})	ND(2.57×10^{-5})
Emission Rate, lb/MMBtu	ND(1.47×10^{-7})	ND(1.60×10^{-7})	ND(1.57×10^{-7})	ND(1.55×10^{-7})

[1] "ND" indicates that the analyte was not detected in the sample, and the value in parenthesis is considered to be zero when calculating the overall average, except when the analyte was not detected for all runs.

TABLE 2-8
PARTICULATE EMISSIONS
UNIT NUMBER 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	03/26/19	03/26/19	03/26/19	----
Time	817-1100	1125-1351	1417-1642	----
Process Parameters				
Steam Flow, Klb/hr	102.3	102.2	102.3	102.3
FF Inlet Temperature, °F	280.4	281.0	281.0	280.8
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.1
Unit 1 Outlet				
Stack Gas Temperature (F)	250.5	248.9	250.5	250.0
Stack Gas Moisture actual (%)	17.4	17.5	19.3	18.1
Oxygen Concentration (%)	11.6	11.6	11.8	11.7
Carbon Dioxide Concentration (%)	7.9	7.9	7.7	7.8
Volumetric Flowrate				
actual cfm	117,600	114,700	123,300	118,500
dry standard cfm	64,400	62,900	66,000	64,400
Meter Volume (dscf)	72.973	70.352	76.663	73.329
(dscm)	2.066	1.992	2.171	2.076
Isokinetic Variation (%)	97.5	97.1	100.1	98.2
Filterable Particulate				
Total Catch Wt, mg	1.9	1.3	5.0	---
Conc., mg/dscm @7% O_2	1.375	0.975	3.518	1.956
Conc., gr/dscf @7% O_2	6.01×10^{-4}	4.26×10^{-4}	1.54×10^{-3}	8.55×10^{-4}
Emission Rate, lb/hr	0.222	0.154	0.569	0.315
Emission Rate, lb/MMBTU	1.23×10^{-3}	8.76×10^{-4}	3.16×10^{-3}	1.76×10^{-3}
Condensable Particulate				
Total Catch Wt, mg	21.6	13.1	16.2	---
Conc., mg/dscm @7% O_2	15.63	9.829	11.40	12.28
Conc., gr/dscf @7% O_2	6.83×10^{-3}	4.29×10^{-3}	4.98×10^{-3}	5.37×10^{-3}
Emission Rate, lb/hr	2.521	1.549	1.845	1.972
Emission Rate, lb/MMBTU	0.014	8.83×10^{-3}	0.010	0.011
Total Particulate (including PM_{10})				
Total Catch Wt, mg	23.5	14.4	21.2	---
Conc., mg/dscm @7% O_2	17.00	10.80	14.92	14.24
Conc., gr/dscf @7% O_2	7.43×10^{-3}	4.72×10^{-3}	6.52×10^{-3}	6.22×10^{-3}
Emission Rate, lb/hr	2.743	1.703	2.414	2.287
Emission Rate, lb/MMBTU	0.015	9.70×10^{-3}	0.013	0.013

TABLE 2-9
SULFURIC ACID EMISSIONS
UNIT NUMBER 1

Parameter	Run 2[1]	Run 3	Run 4	Average
Date	03/27/19	03/27/19	03/27/19	----
Time	924-1039	1116-1232	1305-1421	----
Process Parameters				
Steam Flow, Klb/hr	101.8	102.0	101.8	101.9
FF Inlet Temperature, °F	280.5	280.5	280.7	280.6
Carbon Feed Rate, lb/hr	2.0	2.0	2.0	2.0
Unit 1 Outlet				
Stack Gas Temperature (F)	248.1	247.6	249.0	248.2
Stack Gas Moisture actual (%)	17.8	18.9	19.4	18.7
Oxygen Concentration (%)	12.1	11.3	11.6	11.7
Carbon Dioxide Concentration (%)	7.5	8.2	8.1	7.9
Volumetric Flowrate				
actual cfm	113,700	113,900	114,200	113,900
dry standard cfm	62,200	61,500	61,100	61,600
Meter Volume (dscf)	35.688	35.542	35.508	35.579
(dscm)	1.011	1.006	1.005	1.007
Isokinetic Variation (%)	98.9	99.5	100.0	99.5
Sulfuric Acid				
Catch Wt, mg	1.040	0.987	1.060	---
Conc., mg/dscm	1.029	0.981	1.055	1.022
Conc., ppmvd @ 7% O_2	0.399	0.349	0.387	0.378
Emission Rate, lb/hr	0.240	0.226	0.241	0.236

[1] See Section 2.2 for aborted or invalidated runs

TABLE 2-10
NON-METHANE HYDROCARBON EMISSIONS
UNIT NUMBER 1

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	03/28/19	03/28/19	03/28/19	----
Plant (Unix) Time	835-935	950-1050	1100-1200	----
Process Parameters				
Steam Flow, Klb/hr	101.9	101.9	101.5	101.8
FF Inlet Temperature, °F	280.7	281.1	281.2	281.0
Carbon Feed Rate, lb/hr	2.0	2.0	2.0	2.0
Outlet Oxygen Concentration (%)	11.1	11.1	11.0	11.1
Outlet Moisture Content (%)[1]	17.8	18.9	19.4	----
Non-Methane Hydrocarbon (HC) Emissions				
Total HC ppm_{vw} as methane (wet)	0.8	0.9	0.9	----
Total HC ppm_{vd} as methane (dry)	0.973	1.11	1.117	----
Methane ppm_{vw} (wet)	0.573	0.58	0.647	----
Methane ppm_{vd} (dry)	0.697	0.715	0.803	----
Non-Methane HC ppm_{vd} as methane (dry)	0.276	0.395	0.314	----
Non-Methane HC ppm_{vd} as methane, dry @ 7% O_2	0.4	0.6	0.4	0.5

[1] Moisture was measured by a concurrent, EPA Method 8 sampling train.

TABLE 2-11
DIOXIN/FURAN, PAH AND PCB EMISSIONS, UNIT NUMBER 2

Parameter	Run 1	Run 2	Run 3	Average
Date	03/26/19	03/26/19	03/27/19	----
Time	751-1213	1228-1655	745-1211	----
Process Parameters				
Steam Flow, Klb/hr	102.3	102.2	101.8	102.1
FF Inlet Temperature, °F	278.3	278.5	278.4	278.4
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.1
Unit No. 2 Outlet				
Stack Gas Temperature (F)	265.2	266.5	260.3	264.0
Stack Gas Moisture actual (%)	17.5	19.7	18.0	18.4
Oxygen Concentration (%)	11.9	11.8	11.5	11.7
Carbon Dioxide Concentration (%)	7.8	7.9	7.9	7.9
Volumetric Flowrate				
actual cfm	128,700	136,100	128,800	131,200
dry standard cfm	69,000	70,900	69,100	69,700
Meter Volume (dscf)	157.127	166.131	157.202	160.153
(dscm)	4.449	4.704	4.451	4.535
Isokinetic Variation (%)	98.1	100.9	98.8	99.3
Dioxin and Furans - 2,3,7,8-Equivalent PCDDs and PCDFs				
1989ITEF Toxic Equivalent (Tetra-Octa)				
Total pg (Including NDs or EMPCs)	34.7	57.8	30.4	---
ng/dscm @ 7% O_2 (Including NDs or EMPCs)	0.012	0.019	0.010	0.014
Total pg (NOT Including NDs or EMPCs)	27.8	55.5	19.3	---
ng/dscm @ 7% O_2 (NOT Including NDs or EMPCs)	9.65×10^{-3}	0.018	6.41×10^{-3}	0.011
lb/hr (NOT Including NDs or EMPCs)	1.62×10^{-9}	3.13×10^{-9}	1.12×10^{-9}	1.96×10^{-9}
Dioxin and Furans - Total PCDDs and PCDFs				
Tetra-Octa PCDD/PCDFs				
Total pg (Including NDs or EMPCs)	1820	2510	1470	---
ng/dscm @ 7% O_2 (Including NDs or EMPCs)	0.632	0.815	0.488	0.6
Total pg (NOT Including NDs or EMPCs)	1610	2100	1240	---
ng/dscm @ 7% O_2 (NOT Including NDs or EMPCs)	0.559	0.682	0.412	0.6
lb/hr (NOT Including NDs or EMPCs)	9.35×10^{-8}	1.19×10^{-7}	7.21×10^{-8}	9.47×10^{-8}
Polyaromatic Hydrocarbons (PAHs)				
Total PAHs				
ng (Including NDs)	1700	3180	1577	----
ng/dscm @ 7% O_2 (Including NDs)	590.3	1033	524	716
ng (Not Including NDs)	0	0	0	----
ng/dscm @ 7% O_2 (Not Including NDs)	0	0	0	0
Polychlorinated Biphenyls (PCBs)				
Total WHO TEQ PCBs				
ng (Including NDs)	0.00249	0.00637	0.00228	---
ng/dscm @ 7% O_2 (Including NDs)	8.64×10^{-4}	2.07×10^{-3}	7.57×10^{-4}	1.23×10^{-3}
ng (Not Including NDs)	0.0000201	0.000066	0.00000729	---
ng/dscm @ 7% O_2 (Not Including NDs)	6.98×10^{-6}	2.14×10^{-5}	2.42×10^{-6}	1.03×10^{-5}
Total Coplanar PCBs				
ng (Including NDs)	0.6239	1.6171	0.3722	---
ng/dscm @ 7% O_2 (Including NDs)	0.217	0.525	0.124	0.288
ng (Not Including NDs)	0.5113	1.3699	0.2433	---
ng/dscm @ 7% O_2 (Not Including NDs)	0.177	0.445	0.081	0.234
Total Mono-Deca PCBs				
ng (Including NDs)	47.9009	95.2926	22.1398	---
ng/dscm @ 7% O_2 (Including NDs)	16.63	30.94	7.355	18.31
ng (Not Including NDs)	47.8856	95.152	22.0885	---
ng/dscm @ 7% O_2 (Not Including NDs)	16.62	30.90	7.338	18.29

TABLE 2-12
METALS EMISSIONS
UNIT NUMBER 2

Parameter	**Run 2[1]**	**Run 3**	**Run 4**	**Run 5**	**Average**
Date	03/25/19	03/25/19	03/27/19	03/27/19	----
Time	1121-1347	1427-1649	805-1031	1058-1317	----
Process Parameters					
Steam Flow, Klb/hr	102.2	101.6	101.8	101.7	101.8
FF Inlet Temperature, °F	278.6	279.0	278.4	278.8	278.7
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.1	2.1
Unit 2 Spray Dryer Absorber Inlet					
Stack Gas Temperature (F)	492.9	503.3	489.5	491.7	494.4
Stack Gas Moisture actual (%)	14.2	14.5	13.4	15.4	14.4
Oxygen Concentration (%)	11.4	9.4	10.1	10.5	10.4
Carbon Dioxide Conc. (%)	8.0	9.9	9.2	8.7	9.0
Volumetric Flowrate					
actual cfm	131,700	141,300	132,100	129,600	133,700
dry standard cfm	57,500	60,900	58,300	55,800	58,100
Meter Volume (dscf)	66.718	71.113	67.764	65.832	67.857
(dscm)	1.889	2.014	1.919	1.864	1.922
Isokinetic Variation (%)	98.4	99.2	98.6	100.2	99.1
Mercury					
Total Catch Wt, ug	60.312	49.66	25.57	39.688	---
Conc., ug/dscm @7% O_2	46.72	29.80	17.15	28.46	30.53
Conc., mg/dscm @7% O_2	0.047	0.030	0.017	0.028	0.031
Emission Rate, lb/hr	6.88×10^{-3}	5.63×10^{-3}	2.91×10^{-3}	4.45×10^{-3}	4.97×10^{-3}
Emission Rate, lb/MMBtu	4.20×10^{-5}	2.68×10^{-5}	1.54×10^{-5}	2.56×10^{-5}	2.74×10^{-5}
Unit 2 Fabric Filter Outlet					
Stack Gas Temperature (°F)	270.0	266.4	262.2	261.2	265.0
Stack Gas Moisture (%)	17.7	19.4	17.4	19.4	18.5
Oxygen Concentration (%)	12.5	11.5	11.8	11.5	11.8
Carbon Dioxide Conc. (%)	7.1	7.9	7.7	8.1	7.7
Volumetric Flowrate					
actual cfm	123,600	123,600	126,500	123,300	124,300
dry standard cfm	66,100	65,000	68,100	64,900	66,000
Meter Volume (dscf)	76.873	77.124	78.526	75.837	77.090
(dscm)	2.177[1]	2.184	2.224	2.147	2.183
Isokinetic Variation (%)	100.2	102.1	99.2	100.6	100.5
Arsenic					
Total Catch Wt, ug	0.4	0.483	0.213	ND(0.2)[2]	<0.324
Conc., ug/dscm @7% O_2	0.304	0.327	0.146	ND(0.138)	<0.229
Conc., mg/dscm @7% O_2	3.04×10^{-4}	3.27×10^{-4}	1.46×10^{-4}	ND(1.38×10^{-4})	<2.29×10^{-4}
Emission Rate, lb/hr	4.55×10^{-5}	5.38×10^{-5}	2.44×10^{-5}	ND(2.26×10^{-5})	<3.66×10^{-5}
Emission Rate, lb/MMBtu	2.73×10^{-7}	2.94×10^{-7}	1.31×10^{-7}	ND(1.24×10^{-7})	<2.06×10^{-7}
Beryllium					
Total Catch Wt, ug	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
Conc., ug/dscm @7% O_2	ND(0.038)	ND(0.034)	ND(0.034)	ND(0.034)	ND(0.035)
Conc., mg/dscm @7% O_2	ND(3.80×10^{-5})	ND(3.39×10^{-5})	ND(3.43×10^{-5})	ND(3.44×10^{-5})	ND(3.52×10^{-5})
Emission Rate, lb/hr	ND(5.69×10^{-6})	ND(5.57×10^{-6})	ND(5.74×10^{-6})	ND(5.66×10^{-6})	ND(5.66×10^{-6})
Emission Rate, lb/MMBtu	ND(3.41×10^{-8})	ND(3.04×10^{-8})	ND(3.08×10^{-8})	ND(3.09×10^{-8})	ND(3.16×10^{-8})
Cadmium					
Total Catch Wt, ug	1.37	2.07	0.549	0.642	---
Conc., ug/dscm @7% O_2	1.041	1.402	0.377	0.442	0.816
Conc., mg/dscm @7% O_2	1.04×10^{-3}	1.40×10^{-3}	3.77×10^{-4}	4.42×10^{-4}	8.16×10^{-4}
Emission Rate, lb/hr	1.56×10^{-4}	2.31×10^{-4}	6.30×10^{-5}	7.27×10^{-5}	1.31×10^{-4}
Emission Rate, lb/MMBtu	9.35×10^{-7}	1.26×10^{-6}	3.39×10^{-7}	3.97×10^{-7}	7.33×10^{-7}

TABLE 2-12 (Continued)

Parameter	Run 2[1]	Run 3	Run 4	Run 5	Average
Chromium					
Total Catch Wt, ug	1.656	0.916	1.026	0.836	---
Conc., ug/dscm @7% O_2	1.259	0.620	0.705	0.576	0.790
Conc., mg/dscm @7% O_2	1.26×10^{-3}	6.20×10^{-4}	7.05×10^{-4}	5.76×10^{-4}	7.90×10^{-4}
Emission Rate, lb/hr	1.88×10^{-4}	1.02×10^{-4}	1.18×10^{-4}	9.46×10^{-5}	1.26×10^{-4}
Emission Rate, lb/MMBtu	1.13×10^{-6}	5.57×10^{-7}	6.33×10^{-7}	5.17×10^{-7}	7.10×10^{-7}
Lead					
Total Catch Wt, ug	8.89	13.64	3.88	3.33	---
Conc., ug/dscm @7% O_2	6.757	9.235	2.665	2.294	5.238
Conc., mg/dscm @7% O_2	6.76×10^{-3}	9.24×10^{-3}	2.66×10^{-3}	2.29×10^{-3}	5.24×10^{-3}
Emission Rate, lb/hr	1.01×10^{-3}	1.52×10^{-3}	4.45×10^{-4}	3.77×10^{-4}	8.38×10^{-4}
Emission Rate, lb/MMBtu	6.07×10^{-6}	8.30×10^{-6}	2.39×10^{-6}	2.06×10^{-6}	4.71×10^{-6}
Nickel					
Total Catch Wt, ug	3.41	2.2	1.56	2.01	---
Conc., ug/dscm @7% O_2	2.592	1.490	1.071	1.384	1.634
Conc., mg/dscm @7% O_2	2.59×10^{-3}	1.49×10^{-3}	1.07×10^{-3}	1.38×10^{-3}	1.63×10^{-3}
Emission Rate, lb/hr	3.88×10^{-4}	2.45×10^{-4}	1.79×10^{-4}	2.28×10^{-4}	2.60×10^{-4}
Emission Rate, lb/MMBtu	2.33×10^{-6}	1.34×10^{-6}	9.62×10^{-7}	1.24×10^{-6}	1.47×10^{-6}
Selenium					
Total Catch Wt, ug	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	---
Conc., ug/dscm @7% O_2	ND(0.152)	ND(0.135)	ND(0.137)	ND(0.138)	ND(0.141)
Conc., mg/dscm @7% O_2	ND(1.52×10^{-4})	ND(1.35×10^{-4})	ND(1.37×10^{-4})	ND(1.38×10^{-4})	ND(1.41×10^{-4})
Emission Rate, lb/hr	ND(2.27×10^{-5})	ND(2.23×10^{-5})	ND(2.29×10^{-5})	ND(2.26×10^{-5})	ND(2.27×10^{-5})
Emission Rate, lb/MMBtu	ND(1.37×10^{-7})	ND(1.22×10^{-7})	ND(1.23×10^{-7})	ND(1.24×10^{-7})	ND(1.26×10^{-7})
Zinc					
Total Catch Wt, ug	65.97	86.055	34.18	23.28	---
Conc., ug/dscm @7% O_2	50.14	58.27	23.48	16.03	36.98
Conc., mg/dscm @7% O_2	0.050	0.058	0.023	0.016	0.037
Emission Rate, lb/hr	7.50×10^{-3}	9.59×10^{-3}	3.92×10^{-3}	2.64×10^{-3}	5.91×10^{-3}
Emission Rate, lb/MMBtu	4.50×10^{-5}	5.23×10^{-5}	2.11×10^{-5}	1.44×10^{-5}	3.32×10^{-5}
Mercury					
Total Catch Wt, ug	8.01	4.51	3.08	3.91	---
Conc., ug/dscm @7% O_2	6.088	3.054	2.115	2.693	3.488
Conc., mg/dscm @7% O_2	6.09×10^{-3}	3.05×10^{-3}	2.12×10^{-3}	2.69×10^{-3}	3.49×10^{-3}
Emission Rate, lb/hr	9.11×10^{-4}	5.03×10^{-4}	3.53×10^{-4}	4.43×10^{-4}	5.52×10^{-4}
Emission Rate, lb/MMBtu	5.47×10^{-6}	2.74×10^{-6}	1.90×10^{-6}	2.42×10^{-6}	3.13×10^{-6}
Mercury Removal Efficiency					
% by concentration	87%	90%	88%	91%	89%

[1] See Section 2.2 for aborted or invalidated runs

[2] "ND" indicates that the analyte was not detected in the sample, and the value in parenthesis is considered to be zero when calculating the overall average, except when the analyte was not detected for all runs.

TABLE 2-13
HYDROGEN CHLORIDE AND AMMONIA EMISSIONS
UNIT NUMBER 2

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	03/28/19	03/28/19	03/28/19	----
Plant (Unix) Time	815-915	1000-1100	1146-1246	----
Process Parameters				
Steam Flow, Klb/hr	101.5	101.8	101.8	101.7
FF Inlet Temperature, °F	278.5	277.9	278.9	278.4
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.1
Unit 2 Spray Dryer Absorber Inlet				
Stack Gas Temperature (F)	499.4	501.8	511.0	504.1
Stack Gas Moisture actual (%)	13.7	16.0	15.1	14.9
Oxygen Concentration (%)	9.9	9.6	9.3	9.6
Carbon Dioxide Concentration (%)	9.4	9.8	9.9	9.7
Meter Volume (dscf)	39.213	38.925	38.368	38.835
(dscm)	1.110	1.102	1.086	1.099
Hydrogen Chloride				
Catch Wt, mg	965.0	976.0	816.0	---
Conc., mg/dscm	869.4	885.7	751.4	835.5
Conc., ppmvd @ 7% O_2	724.0	718.0	593.4	678.5
Unit 2 Fabric Filter Outlet				
Stack Gas Temperature (F)	260.1	257.6	261.1	259.6
Stack Gas Moisture actual (%)	17.9	19.4	19.3	18.9
Oxygen Concentration (%)	11.6	11.7	11.7	11.7
Carbon Dioxide Concentration (%)	8.1	8.0	7.9	8.0
Volumetric Flowrate				
actual cfm	121,800	125,600	128,100	125,200
dry standard cfm	65,600	66,700	67,800	66,700
Meter Volume (dscf)	35.883	34.332	35.577	35.264
(dscm)	1.016	0.972	1.007	0.998
Hydrogen Chloride				
Catch Wt, mg	5.92	7.317	7.17	---
Conc., mg/dscm	5.827	7.528	7.120	6.825
Conc., ppmvd @ 7% O_2	5.739	7.496	7.090	6.775
Emission Rate, lb/hr	1.432	1.881	1.808	1.707
Ammonia				
Catch Wt, mg	0.895	0.965	0.661	---
Conc., mg/dscm	0.881	0.993	0.656	0.843
Conc., ppmvd @ 7% O_2	1.863	2.122	1.403	1.796
Emission Rate, lb/hr	0.216	0.248	0.167	0.210
HCl Removal Efficiency				
% by concentration	99.2%	99.0%	98.8%	99.0%

TABLE 2-14
HEXAVALENT CHROMIUM AND HYDROGEN FLUORIDE EMISSIONS
UNIT NUMBER 2

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	03/27/19	03/27/19	03/27/19	----
Time	1256-1407	1429-1542	1553-1706	----
Process Parameters				
Steam Flow, Klb/hr	101.9	101.6	101.8	101.8
FF Inlet Temperature, °F	277.9	279.1	278.4	278.5
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.1
Unit 2 Outlet				
Stack Gas Temperature (F)	259.1	260.7	259.5	259.8
Stack Gas Moisture actual (%)	19.8	19.4	19.7	19.6
Oxygen Concentration (%)	11.6	11.8	11.6	11.7
Carbon Dioxide Concentration (%)	7.9	7.8	7.9	7.9
Volumetric Flowrate				
actual cfm	122,600	127,800	128,800	126,400
dry standard cfm	64,400	67,400	67,700	66,500
Meter Volume (dscf)	37.890	39.128	39.813	38.944
(dscm)	1.073	1.108	1.127	1.103
Isokinetic Variation (%)	101.3	100.0	101.2	100.8
Hydrogen Fluoride				
Catch Wt, mg	0.184	0.177	0.123	---
Conc., mg/dscm	0.171	0.160	0.109	0.147
Conc., ppmvd @ 7% O_2	0.087	0.083	0.055	0.075
Emission Rate, lb/hr	0.041	0.040	0.028	0.036
Hexavalent Chromium				
Total Catch Wt, ug	ND(0.120)[1]	ND(0.116)	ND(0.120)	---
Conc., ug/dscm @ 7% O_2	ND(0.167)	ND(0.160)	ND(0.159)	ND(0.162)
Conc., mg/dscm @ 7% O_2	ND(1.67×10^{-4})	ND(1.60×10^{-4})	ND(1.59×10^{-4})	ND(1.62×10^{-4})
Emission Rate, lb/hr	ND(2.70×10^{-5})	ND(2.64×10^{-5})	ND(2.70×10^{-5})	ND(2.68×10^{-5})
Emission Rate, lb/MMBtu	ND(1.50×10^{-7})	ND(1.44×10^{-7})	ND(1.43×10^{-7})	ND(1.45×10^{-7})

[1] "ND" indicates that the analyte was not detected in the sample, and the value in parenthesis is considered to be zero when calculating the overall average, except when the analyte was not detected for all runs.

TABLE 2-15
PARTICULATE EMISSIONS
UNIT NUMBER 2

Parameter	Run 1	Run 2	Run 3	Average
Date	03/25/19	03/25/19	03/25/19	----
Time	842-1115	1143-1405	1438-1704	----
Process Parameters				
Steam Flow, Klb/hr	102.2	102.2	101.7	102.0
FF Inlet Temperature, °F	278.0	278.5	279.1	278.5
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.1
Unit 2 Outlet				
Stack Gas Temperature (F)	265.6	269.8	266.0	267.1
Stack Gas Moisture actual (%)	18.2	17.7	19.2	18.4
Oxygen Concentration (%)	11.6	12.4	11.6	11.9
Carbon Dioxide Concentration (%)	7.8	7.2	7.8	7.6
Volumetric Flowrate				
actual cfm	125,500	127,700	127,800	127,000
dry standard cfm	67,100	68,300	67,500	67,600
Meter Volume (dscf)	76.717	78.987	78.834	78.179
(dscm)	2.172	2.237	2.232	2.214
Isokinetic Variation (%)	99.2	99.6	101.4	100.1
Filterable Particulate				
Total Catch Wt, mg	6.1	2.8	11.4	---
Conc., mg/dscm @7% O_2	4.198	2.047	7.634	4.626
Conc., gr/dscf @7% O_2	1.83×10^{-3}	8.95×10^{-4}	3.34×10^{-3}	2.02×10^{-3}
Emission Rate, lb/hr	0.706	0.320	1.291	0.772
Emission Rate, lb/MMBTU	3.77×10^{-3}	1.84×10^{-3}	6.86×10^{-3}	4.16×10^{-3}
Condensable Particulate				
Total Catch Wt, mg	21.8	13.4	19.5	---
Conc., mg/dscm @7% O_2	15.00	9.796	13.06	12.62
Conc., gr/dscf @7% O_2	6.55×10^{-3}	4.28×10^{-3}	5.71×10^{-3}	5.51×10^{-3}
Emission Rate, lb/hr	2.522	1.533	2.209	2.088
Emission Rate, lb/MMBTU	0.013	8.80×10^{-3}	0.012	0.011
Total Particulate				
Total Catch Wt, mg	27.9	16.2	30.9	---
Conc., mg/dscm @7% O_2	19.20	11.84	20.69	17.24
Conc., gr/dscf @7% O_2	8.39×10^{-3}	5.18×10^{-3}	9.04×10^{-3}	7.53×10^{-3}
Emission Rate, lb/hr	3.228	1.853	3.500	2.860
Emission Rate, lb/MMBTU	0.017	0.011	0.019	0.015

TABLE 2-16
SULFURIC ACID EMISSIONS
UNIT NUMBER 2

Parameter	Run 1	Run 2	Run 3	Average
Date	03/28/19	03/28/19	03/28/19	----
Plant (Unix) Time	815-932	1000-1117	1146-1302	----
Process Parameters				
Steam Flow, Klb/hr	101.7	101.6	101.9	101.7
FF Inlet Temperature, °F	278.4	278.2	279.0	278.5
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.1
Unit 2 Outlet				
Stack Gas Temperature (F)	258.6	256.8	259.5	258.3
Stack Gas Moisture actual (%)	17.3	16.0	20.3	17.9
Oxygen Concentration (%)	11.8	11.7	11.9	11.8
Carbon Dioxide Concentration (%)	7.9	7.9	7.9	7.9
Volumetric Flowrate				
actual cfm	121,500	124,700	128,200	124,800
dry standard cfm	66,100	69,100	67,100	67,400
Meter Volume (dscf)	37.919	38.962	39.661	38.847
(dscm)	1.074	1.103	1.123	1.100
Isokinetic Variation (%)	98.8	97.1	101.7	99.2
Sulfuric Acid				
Catch Wt, mg	0.956	1.050	0.937	---
Conc., mg/dscm	3.895	4.278	3.817	3.997
Conc., ppmvd @ 7% O_2	1.460	1.586	1.447	1.498
Emission Rate, lb/hr	0.964	1.107	0.959	1.010

TABLE 2-17
NON-METHANE HYDROCARBON EMISSIONS
UNIT NUMBER 2

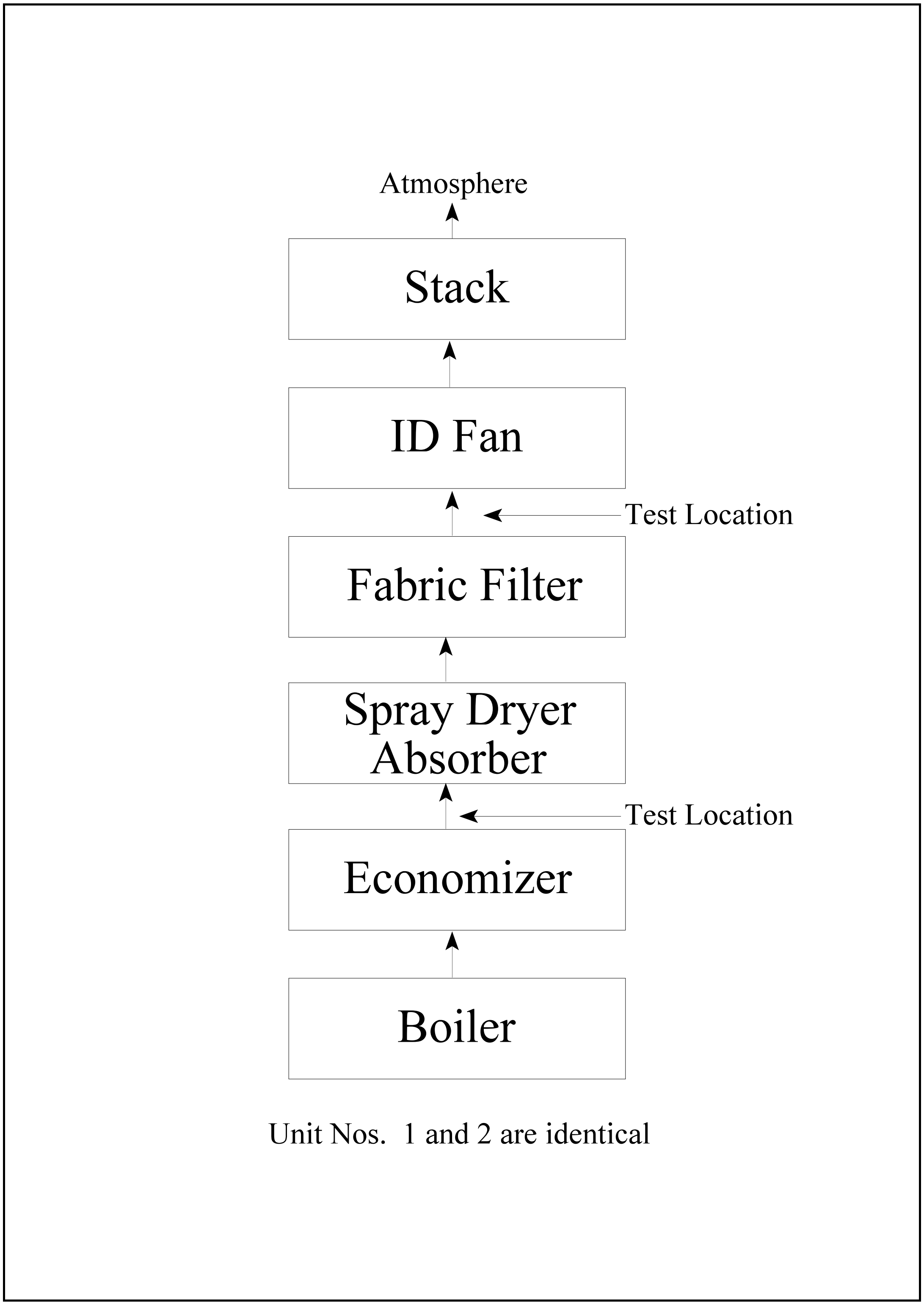
Parameter	Run 1	Run 2	Run 3	Average
Date	03/27/19	03/27/19	03/27/19	----
Plant (Unix) Time	900-1000	1010-1110	1130-1230	----
Process Parameters				
Steam Flow, Klb/hr	101.6	101.9	102.0	101.8
FF Inlet Temperature, °F	279.7	277.0	278.7	278.5
Carbon Feed Rate, lb/hr	2.1	2.1	2.1	2.1
Outlet Oxygen Concentration (%)	11.9	11.3	11.1	11.4
Outlet Moisture Content (%)[1]	17.3	16.0	20.3	----
Non-Methane Hydrocarbon (HC) Emissions				
Total HC ppm_{vw} as methane (wet)	0.7	0.6	0.6	----
Total HC ppm_{vd} as methane (dry)	0.846	0.714	0.753	----
Methane ppm_{vw} (wet)	0.468	0.55	0.47	----
Methane ppm_{vd} (dry)	0.566	0.58	0.647	----
Non-Methane HC ppm_{vd} as methane (dry)	0.281	0.134	0.106	----
Non-Methane HC ppm_{vd} as methane, dry @ 7% O_2	0.4	0.2	0.2	0.3

[1] Moisture was measured by a concurrent, EPA Method 8 sampling train.

3.0 PROCESS DESCRIPTION AND OPERATION

The Spokane Waste to Energy facility (Spokane) operates two (2) Von Roll 400 ton per day municipal refuse-fired, water wall boiler trains manufactured by Babcock and Wilcox. Each boiler has been equipped with a Wheelabrator Air Pollution Control Inc. spray dryer absorber (SDA) and fabric filter (FF) for air pollution control. Combustion gases exit the boiler economizer and pass through the SDA. For control of nitrogen oxides, each boiler is equipped with a Selective Non-Catalytic Reduction (SNCR) System that uses anhydrous ammonia. Each boiler is also equipped with a powdered activated carbon injection system (PACIS) with the injection location just prior to the SDA. The PACIS was operated at 2 pounds per hour or more. Gases exit the SDA and enter the FF where they exit to an induced draft fan prior to entering separate flues in a common stack. A schematic of the air flow from the boiler to the stack is shown in Figure 3.1. Unit Nos. 1 and 2 are identical.

The relevant process operational data recorded during testing is summarized in **Table 3-1** for Unit Nos 1 and 2. Detailed process data provided by the facility is reproduced in **Appendix E**.



Unit Nos. 1 and 2 are identical

Figure 3.1 Schematic of Unit Nos. 1 and 2 airflow

TABLE 3-1
OPERATING PARAMETERS SUMMARY, TEST INTERVAL AVERAGES
UNIT NUMBERS 1 AND 2

Test	Unit No.	Run No.	Date	DAS Time		Steam Flow klbs/hr	FF Inlet Temp deg F	Carbon Feed Rate lb/hr	Test	Unit No.	Run No.	Date	DAS Time		Steam Flow klbs/hr	FF Inlet Temp deg F	Carbon Feed Rate lb/hr
				Start	Stop								Start	Stop			
M-5 PM	1	1	3/26/19	8:17	11:00	102.3	280.4	2.1	**M-5** **PM**	2	1	3/25/19	8:42	11:15	102.2	278.0	2.1
		2	3/26/19	11:25	13:51	102.2	281.0	2.1			2	3/25/19	11:43	14:05	102.2	278.5	2.1
		3	3/26/19	14:17	16:42	102.3	281.0	2.1			3	3/25/19	14:38	17:04	101.7	279.1	2.1
					Avg	**102.3**	**280.8**	**2.1**						**Avg**	**102.0**	**278.5**	**2.1**
M-29 Metals Mercury	1	1	3/26/19	8:30	11:00	102.3	280.5	2.1	**M-29** **Metals** **Mercury**	2	2	3/25/19	11:21	13:47	102.2	278.6	2.1
		2	3/26/19	11:25	13:51	102.2	281.0	2.1			3	3/25/19	14:27	16:49	101.6	279.0	2.1
		3	3/26/19	14:18	16:43	102.3	281.0	2.1			4	3/27/19	8:05	10:31	101.8	278.4	2.1
		4	3/28/19	8:24	10:56	101.8	280.6	2.0			5	3/27/19	10:58	13:17	101.7	278.8	2.1
					Avg	**102.2**	**280.8**	**2.1**						**Avg**	**101.8**	**278.7**	**2.1**
M-26A HCl & NH3	1	1**	3/27/19	8:43	10:07	101.8	281.5	2.0	**M-26A** **HCl & NH3**	2	1	3/28/19	8:15	9:15	101.5	278.5	2.1
		2	3/27/19	11:16	12:16	102.0	280.6	2.0			2	3/28/19	10:00	11:00	101.8	277.9	2.1
		3	3/27/19	13:05	14:05	101.9	280.9	2.0			3	3/28/19	11:46	12:46	101.8	278.9	2.1
					Avg	**101.9**	**281.0**	**2.0**						**Avg**	**101.7**	**278.4**	**2.1**
M-13B & 306 Cr+6 & HF	1	1	3/28/19	8:39	10:08	101.7	280.7	2.0	**M-13B & 306** **Cr+6 & HF**	2	1	3/27/19	12:56	14:07	101.9	277.9	2.1
		2	3/28/19	10:34	11:51	101.8	280.3	2.0			2	3/27/19	14:29	15:42	101.6	279.1	2.1
		3	3/28/19	12:13	13:29	101.8	280.5	2.0			3	3/27/19	15:53	17:06	101.8	278.4	2.1
					Avg	**101.7**	**280.5**	**2.0**						**Avg**	**101.8**	**278.5**	**2.1**
M-8 H2SO4	1	2	3/27/19	9:24	10:39	101.8	280.5	2.0	**M-8** **H2SO4**	2	1	3/28/19	8:15	9:32	101.7	278.4	2.1
		3	3/27/19	11:16	12:32	102.0	280.5	2.0			2	3/28/19	10:00	11:17	101.6	278.2	2.1
		4	3/27/19	13:05	14:21	101.8	280.7	2.0			3	3/28/19	11:46	13:02	101.9	279.0	2.1
					Avg	**101.9**	**280.6**	**2.0**						**Avg**	**101.7**	**278.5**	**2.1**
M-25A NMHC	1	1	3/28/19	8:35	9:35	101.9	280.7	2.0	**M-25A** **NMHC**	2	1	3/27/19	9:00	10:00	101.6	279.7	2.1
		2	3/28/19	9:50	10:50	101.9	281.1	2.0			2	3/27/19	10:10	11:10	101.9	277.0	2.1
		3	3/28/19	11:00	12:00	101.5	281.2	2.0			3	3/27/19	11:30	12:30	102.0	278.7	2.1
					Avg	**101.8**	**281.0**	**2.0**						**Avg**	**101.8**	**278.5**	**2.1**
M-23 dioxins	1			Not Run This Year					**M-23** **Dioxins**	2	1	3/26/19	7:51	12:13	102.3	278.3	2.1
											2	3/26/19	12:28	16:55	102.2	278.5	2.1
											3	3/27/19	7:45	12:11	101.8	278.4	2.1
														Avg	**102.1**	**278.4**	**2.1**

* CEMS PST was 1 hour and 3 minutes behind PDT

** Run down 9:00 - 9:24 PDT (7:57 - 8:21 CEMS PST)

4.0 SAMPLING AND ANALYTICAL PROCEDURES

All sampling and analytical procedures were those recommended by the United States Environmental Protection Agency (EPA). This section provides brief descriptions of the sampling and analytical procedures used for this test program.

4.1 Stack Gas Sampling Points - EPA Methods 1 and 2

For the SDA inlet on Unit Nos. 1 and 2, the sampling ports were located in a horizontal duct between the economizer and the SDA. Two 90° four-inch sampling ports are provided in the 6'10" diameter duct, however safe access to the top port is unavailable. Sampling was performed in the side port only. The nearest upstream disturbance is the economizer at about ≥164 inches (>2 diameters) and the nearest down stream disturbance is the SDA at ≥41 inches (≥0.5 diameters) from the sampling ports. This sampling location meets the minimum requirements specified by EPA Method 1. Access to the test platform is provided via stairways in the boiler building. The location conforms to EPA Method 1 criteria. A picture of the SDA inlet sampling location is shown in Figure 4.1 for Unit Nos. 1 and 2.

For isokinetic sampling, a twelve (12) velocity and/or particulate traverse, in the side port only, was made at each sampling location using a type-S pitot tube and sampling nozzle in accordance with EPA Methods 2 and 5 procedures. Gas temperatures were measured using calibrated Type K thermocouples and digital readout devices.

For the FF outlets on Unit Nos. 1 and 2, the sampling ports were located in a vertical, square duct between the FF outlet and the I.D. fan. The duct work had ≥150" of straight run (> 2 duct diameters) before the sampling location and ≥37.5" of straight run (>0.5 duct diameters) before the I.D. fan. This location meets the minimum specifications for selection of a measurement site as outlined in EPA Method 1. A picture of the FF outlet sampling location is shown in Figure 4.2 for Unit Nos. 1 and 2.

For isokinetic sampling, a 25-point velocity and/or particulate traverse in each a 5 by 5 array was made at each sampling location using a type-S pitot tube and sampling nozzle in accordance with EPA Methods 2 and 5 procedures. Gas temperatures were measured using calibrated Type K thermocouples and digital readout devices.

4.2 Flue Gas Composition - EPA Method 3

Dry gas molecular weight was determined using the oxygen and carbon dioxide measurements following EPA Method 3 employing the integrated gas bag collection option and Orsat analysis. Stack gas moisture was measured in accordance with EPA Method 4 procedures using the condensation option contained within EPA Methods 5, 8, 13B, 23, 26A, and 29.

4.3 Sampling and Analysis for Flue Gas Metals (As, Be, Cd, Cr, Pb, Ni, Se, Zn, and Hg) - EPA Method 29

EPA Method 29 was used to collect Arsenic (As), Beryllium (Be), Cadmium (Cd), Total Chromium (Cr), Lead (Pb), Nickel (Ni), Selenium (Se), Zinc (Zn), and Mercury (Hg) stack gas samples from the Unit Nos. 1 and 2 Outlet sampling locations and to collect Hg at Unit Nos. 1 and

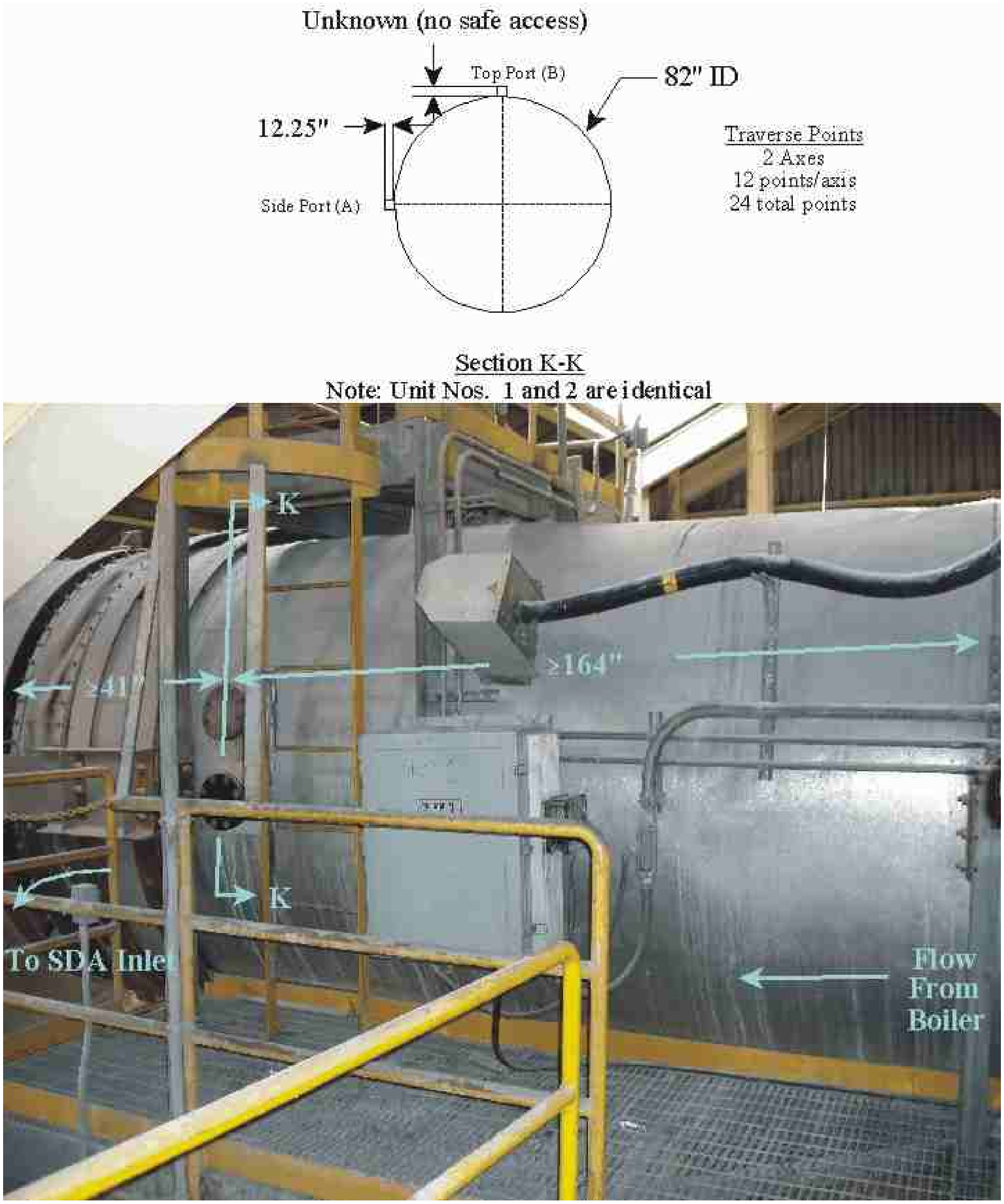


Figure 4.1 Schematic of Unit Nos. 1 and 2 SDA inlet sampling location.

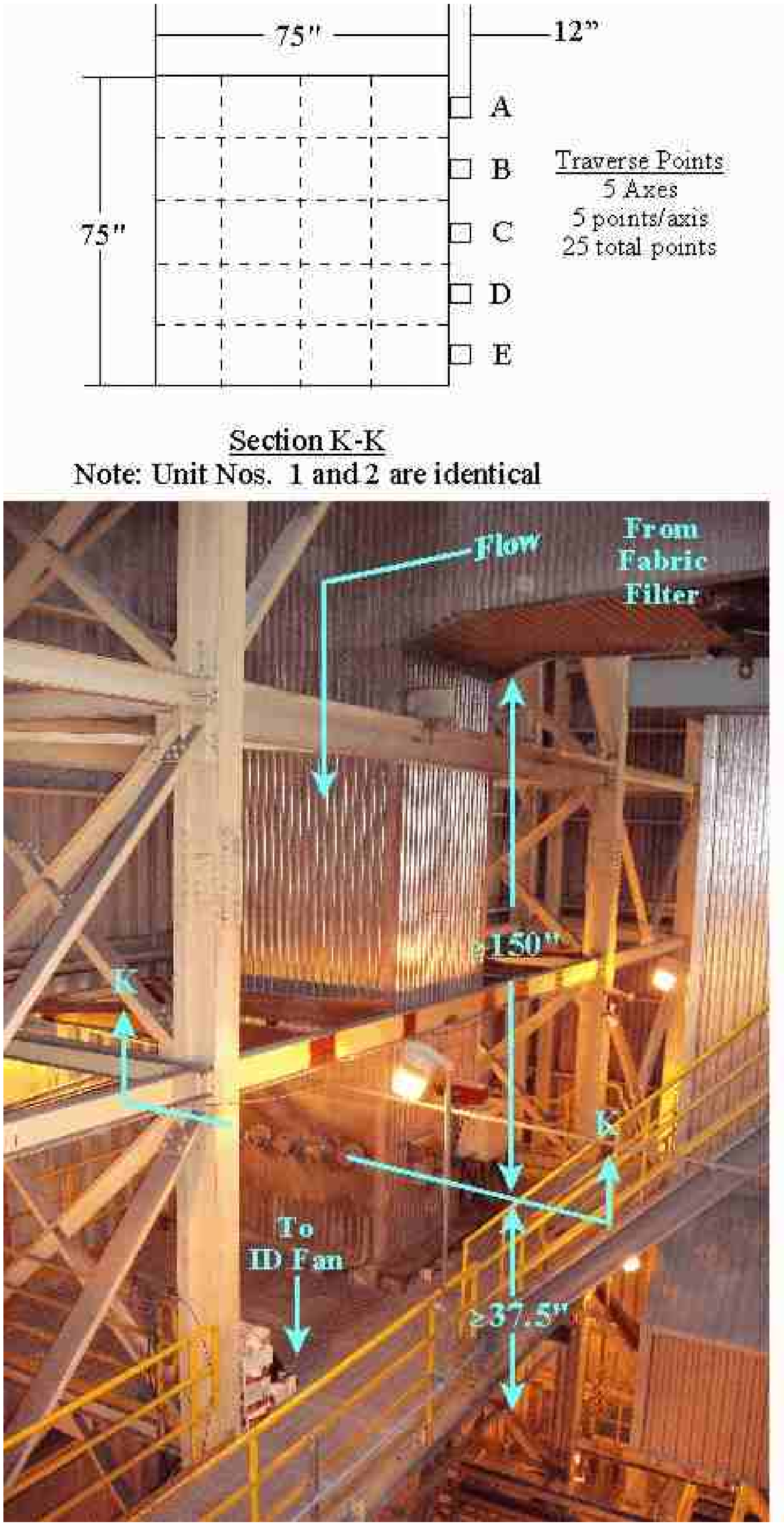


Figure 4.2 Schematic of Unit Nos. 1 and 2 FF outlet sampling location.

2 SDA Inlet sampling locations. A minimum of three, 125-minute runs were conducted at each outlet location, and 120-minute runs were conducted at each inlet location, with inlet and outlet sampling being conducted concurrently for all metals. A single reagent blank was recovered for blank correction and a single field blank taken for contamination and/or recovery problems.

The Method 29 sample train consisted of a glass nozzle and glass probe liner with a quartz fiber filter and a Teflon filter support. The reagents placed in the impingers were as follows: an empty first impinger, 100ml of 5% HNO_3/10% H_2O_2 in each of the second and third impingers, the fourth remained empty, 100 ml of acidic $KMnO_4$ in the fifth and sixth, and 200 grams of silica gel in the sixth impinger. In addition, a low metals quartz filter, such as Pallflex 2500QAT-UP, was used. The filter was placed between the probe exit and the first impinger with the probe and filter maintained at a temperature of 248±25 F.

At the conclusion of sampling the train was leak checked and transported to the sample recovery trailer. The probe and filter housing were removed and the impingers weighed for EPA Method 4 moisture determination. The front half of the sampling train (nozzle, probe, & front half of the filter housing) was brushed and rinsed with 100 mL of 0.1 N nitric acid into a uniquely identified glass sample jar to recover the metals. The brush was Teflon. The contents (condensate & reagent) of the first three impingers were placed in a uniquely identified glass sample jar. The back half of the filter holder through the second impinger was then rinsed into the same uniquely identified glass sample jar using 100 mL of 0.1N nitric acid solution. The fourth impinger's condensate was placed into a separate, uniquely identified glass sample jar, and the impinger and connecting glassware rinsed with 100 mL of 0.1M HNO_3 into the same jar. The contents (condensate & reagent) of the fifth and sixth impingers were placed in a uniquely identified glass sample jar. The impingers and connecting glassware were then rinsed into the same uniquely identified glass sample jar using 100 mL of acidic $KMnO_4$ solution. After the $KMnO_4$ rinse, the impingers and connecting glassware was rinsed into the same uniquely identified glass sample jar using 100 mL of DI water. To remove any residual brown deposits, the fifth and sixth impingers were rinsed with 25 mL of 8N HCl into a uniquely identified glass sample jar containing 200 mL of DI water.

Sample recovery from this combined train included:

1. Container No. 1 - Filter, quartz fiber
2. Container No. 2 - 0.1N HNO_3 rinses of nozzle, probe and front-half of filter holder
3. Container No. 3 - Contents HNO_3/H_2O_2 impingers, and 0.1N HNO_3 rinse of impingers and back -half of filter holder
4. Container No. 4 - Contents of knockout impinger, and 0.1N HNO_3 rinse of impingers
5. Container No. 5 - Contents H_2SO_4/$KMnO_4$ impingers, and H_2SO_4/$KMnO_4$ and DI H_2O rinse of impingers
6. Container No. 6 - 8N HCl rinse of H_2SO_4/$KMnO_4$ impingers (optional)

Analytical procedures followed those outlined in EPA Method 29, 40 CFR Pt. 60, App. A. The probe and nozzle rinses and the quartz filter were subjected to microwave digestion with concentrated hydrogen fluoride and nitric acid. The 5% nitric acid/10% hydrogen peroxide solution is reduced to near dryness, and digested with nitric acid and hydrogen peroxide. These solutions and the front half fractions were proportionally combined per EPA Method 29, Section 11.1, and the target metals (except mercury) were analyzed using inductively coupled plasma mass spectroscopy (ISP-MS). The front half, the 5%/10%, the fourth (empty), and fifth and sixth ($KMnO_4$) impingers' reagent/condensate/rinses and HCl rinse were analyzed for mercury using cold vapor atomic absorption spectroscopy (CVAAS).

Duplicate analyses was performed on all mercury samples. In addition, a field blank, reagent blanks, and a filter blank were collected and all blanks were analyzed. The field blank consisted of a complete sampling train assembled as though to collect a sample, but flue gas was not pulled through the sampling train. The field blank train was leak checked the same number of times as a sampling train used during a run. The train was placed at the sampling location for the duration of one run. The train was then returned to the laboratory and disassembled for recovery using the same procedure used to recover actual samples. The field blank was obtained using a train that had previously been used to collect at least one actual sample from the test site.

4.4 Sampling and Analysis for Filterable and Condensable Particulate - EPA Method 5/202

An EPA Method 5/202 sampling train was used to measure stack gas samples for filterable and condensable particulate matter from the Unit Nos. 1 and 2 Outlet sampling locations. A minimum of three, 125-minute sampling runs were performed. A glass nozzle and glass probe liner was used with a tare-weighed quartz fiber filter and a Teflon filter support. The gas exiting the filter is conveyed through a series of chilled impingers. The first three impingers each contained 100 mL of deionized water, and the first two were standard Smith-Greenburg with a tipped stem. The fourth impinger was left empty, and the final impinger contained 200 grams of silica gel. Condensable particulate matter was collected in the first three impingers.

Upon completion of the sample run for particulate matter the train was carefully removed from the stack, leak-checked, and moved to the clean-up area. Sample recovery was performed according to EPA Method 5 and EPA Method 202.

The probe and filter were removed and the impinger contents purged with nitrogen (see Section 5.2.1 of Method 202) or air (see Section 8.3 of Method 202), to remove dissolved sulfur dioxide (SO_2) gases. In all cases, nitrogen was purged at approximate rate of 20 L/min for a duration of 30 minutes. The purging step was unnecessary when the pH of the impinger solution for a given run was greater than 4.5.

The filter was placed into a uniquely identified petri dish. The nozzle, probe and front half of the filter holder were rinsed with acetone into a 500 mL glass jar. The impingers were weighed for moisture determination and the contents of the first three impingers were quantitatively recovered. The back half of the filter holder, the first three impingers and the connecting glassware were rinsed three times with deionized water, and the rinses combined with the impinger contents. The back half of the filter holder, the first three impingers and the connecting glassware were then rinsed three times with methylene chloride. The methylene chloride rinses of the impingers were combined into a separate, uniquely identified 500 mL glass sample jar.

Sample fractions were handled in the laboratory according to the procedures identified in EPA Method 5 (filterable particulate) and 202 (condensable particulate). Filterable particulate matter was measured by bringing the front-half acetone rinse to dryness and desiccating the quartz fiber filter and acetone rinse residue. Particulate was determined gravimetrically.

To perform the Method 202 back-half analysis, the impinger solutions are recovered into a graduated cylinder. The impingers are rinsed with DI water and the rinses are combined with the contents of the graduated cylinder and the final volume and pH are recorded. Ion chromatography (IC) is used for SO_4^{-} and Cl analysis using EPA Method 300. EPA Method 350.1 is used for NH_3 analysis.

The condensable matter is quantified by performing a solvent extraction using a separatory funnel on the remaining impinger solution. The impingers are given a final rinse with 75 ml of CH_2Cl_2, which are collected in a glass sample container for later use in the first extraction. Two (2) additional 75 ml portions of CH_2Cl_2 are used for a total of three (3) 75 ml extractions. The organic layer is transferred to a tared 150 ml beaker and this beaker's contents are allowed to evaporate in an evaporation chamber at ambient temperature to dryness, the beakers are desiccated, then weighed to a constant weight. The water layer is transferred to a tared 150 ml beaker with glass boiling beads and this beaker's contents are heated on a hot plate to boiling until approximately 50 ml remain in the beaker. The remaining 50 ml in the beaker are evaporated to dryness in an oven at 105 °C. The dried residue from the water layer for each sample is redissolved in 100 ml DI water. The solution is titrated with 0.1 N ammonium hydroxide (NH_4OH) to a pH of approximately 7.0 and the evaporation step is repeated. Sulfuric acid (H_2SO_4) present in the condensable particulate matter is hygroscopic, which creates an erroneous particulate weight. The ammonium reacts with the H_2SO_4 in an acid-base reaction which occurs during the titration procedure allowing a more accurate weight of condensable particulate matter to be obtained. Sample blanks containing DI water and CH_2Cl_2 are analyzed in an identical fashion as the representative "section". All beakers are desiccated for at least 24 hours and weighed to constant weights of ±0.5 milligrams (mg) after their contents have evaporated.

The total particulate matter weight is the sum of the net weights of the particulate matter found on the filter plus the net weights found in the beakers containing the sample, minus the weight of the NH_4^+ added/sulfates/chlorides, minus the acetone, water and methylene chloride blank concentrations. Method 202 allows a correction only of the ammonium added during the titration procedure. Sulfates were determined using ion chromatography. The IC results for SO_4^{-} are used in the SO_4^{-} correction calculation which is allowed under permitting standards. The SO_4^{-} corrected particulate matter weight is the final net weight minus the net weight of the SO_4^{-}. The mass of Cl^{-} in the sample after all samples have been brought to dryness can be assumed as being from ammonium chloride, since all HCl would have evaporated. This NH_4^+ can be subtracted from the final weight. Cl^{-} is determined by IC and is used to correct the condensable particulate matter weight.

The DI water and methylene chloride blank residue were below the maximum allowable per Method 202, and the acetone blank residue was below the allowable 0.001% (by weight) specified in EPA Method 5, Section 12.8.

4.5 Sampling and Analysis for Hydrogen Fluoride and Hexavalent Chromium - EPA Method 13B

An EPA Method 13B sampling train was used to collect hydrogen fluoride and hexavalent chromium from the Unit Nos. 1 and 2 Outlet sampling locations. Samples were withdrawn isokinetically from the sources following procedures outlined in EPA Method 5. Three 62.5-minute sample runs were performed at Units 1 and 2. The sampling train consisted of a glass nozzle, a heated glass probe with a type-S pitot tube attached, a filter, six chilled impingers, and a metering console. The filter was a Whatman 541 (or a Pallflex 2500QAT-UP) maintained at a temperature of 248°F ± 25°F. The first impinger contained 150 ml of 0.5N sodium hydroxide (NaOH), the second and third each contained 75 ml of 0.1N NaOH, the fourth and fifth impingers were empty, and last impinger contained silica gel.

After the run ended and the train leak checked, the filter was removed from the filter holder and placed in a 250 ml polyethylene bottle. The impingers were weighed, and their weights compared to the initial weights taken before the run to determine moisture catch. The NaOH reagent was transferred quantitatively to a uniquely identified 1000 mL polyethylene bottle and all exposed surfaces rinsed using DI water and these rinses were placed in the same bottle. The bottle was uniquely identified with a label and the liquid level marked.

A field blank was performed. A field blank consists of a complete sampling train which is assembled as though to collect a sample, but flue gas is not pulled through the sampling train. The field blank train was leak checked the same number of times as a sampling train used during a run. The train was placed at the sampling location for the duration of one run. The train was returned to the laboratory and disassembled for recovery using the same procedure used to recover actual samples. The field blank was obtained using a train that has previously been used to collect at least one actual sample from the test site.

An aliquot of the NaOH impinger contents and the rinses were analyzed for hydrogen fluoride using selective ion electrode. The filter, the NaOH impinger contents and rinses were combined and analyzed for hexavalent chromium using ion chromatography with post-column reaction. Field and reagent blanks were collected and analyzed for each analyte. One matrix spike analysis was performed for each analyte. All hydrogen fluoride runs were analyzed in duplicate.

4.6 Sampling and Analysis for Hydrogen Chloride and Ammonia - EPA Method 26A

An EPA Method 26A sampling train was used to measure stack gas samples for hydrogen chloride from the SDA Inlet and for hydrogen chloride and ammonia samples from the FF outlet sampling locations. Three 60-min runs were conducted. A heated glass probe liner was used with a heated quartz fiber (inlet) or PTFE-bonded glass fiber filter (outlet), a Teflon filter support (with teflon-coated sealing rings) and a series of chilled impingers. The outlet sampling train impinger system contained 50 ml of 0.1N sulfuric acid in the first and 100 ml in each of the second and third impingers, a fourth empty impinger, 100 ml of 0.1N sodium hydroxide in the fifth and sixth impingers, and 200 grams of silica gel in the seventh impinger. The inlet sampling train was the same except that the fourth empty impinger was eliminated. The optional cyclone was not used since the gas stream was not saturated with moisture. The filter was located in the heated compartment between the probe exit and the first impinger and maintained at stack gas temperature. In deference to the requirements of 40 CFR 60.58b, the probe and filter housing was heated to, or slightly above stack gas temperature (up to 350°F), instead of the normal 248 ±25°F from EPA Method 26A.

At the conclusion of sampling, the train was leak-checked, capped and transported to the sample recovery area. Sample recovery of the HCl involved quantitative recovery of the sulfuric acid impinger contents, followed by three rinses with deionized, distilled water of the impingers and all connecting glassware into a uniquely identified glass sample jar. The back half of the filter holder and the connecting glassware to the first impinger were also rinsed three times with deionized, distilled water and placed in the same sample jar. The container was labeled, and weighed to determine the final sample volume and the liquid level marked on the sample container.

The sulfuric acid impinger solutions were analyzed using ion chromatography techniques for chloride (Cl^-). The same solutions were analyzed for ammonia (NH_3). The NaOH impingers' contents and rinses were discarded. Duplicate analyses were performed on the samples and a reagent blank with precision demonstrated by duplicate injection of each sample. The duplicate analysis results of each individual sample were within 5% of their mean.

4.7 Sampling and Analysis for Polychlorinated Dibenzo-p-Dioxins, and Polychlorinated Dibenzofurans (PCDDs/PCDFs), Polynuclear Aromatic Hydrocarbons (PAHs), and Polychlorinated Biphenyls (PCBs) - EPA Method 23, and CARB 429/428

Samples for PCDD/PCDFs, PAHs, and PCBs were withdrawn isokinetically from the Unit No. 1 source using a combined EPA Method 23/CARB 428/429 sampling train. A minimum of three, 250-minute runs were conducted. A field blank was collected and consisted of a complete sampling train which was assembled as though to collect a sample, but flue gas was not pulled through the sampling train. The field blank train was leak checked the same number of times as a sampling train used during a run. The train was placed at the sampling location for the duration of one run. The train was returned to the laboratory and disassembled for recovery using the same procedure used to recover actual samples. The field blank was obtained using a train that had previously been used to collect at least one actual sample from the test site.

The sampling train consisted of a glass-lined heat-traced probe with a glass button hook nozzle, and attached thermocouple and pitot tube. The probe was maintained at a temperature of 248°F $\pm$ 25°F. After leaving the probe, the sample gas passed through a heated glass fiber filter (Reeve Angel 934 AH), a water-cooled condenser, and a sorbent module containing approximately 25 g of XAD-2 resin. The XAD module was followed by a series of six impingers. The XAD inlet temperature was monitored to ensure that the temperature of the flue gas sample entering the module was maintained below 20°C. This temperature was maintained by continuously circulating ice-chilled water through the condenser jacket and the jacket on the XAD module. The first impinger, acting as a condensate reservoir, was connected to the outlet of the XAD module and is modified with a short stem so that the sample gas did not bubble through the collected condensate.

The first, fourth and fifth impingers were empty, the second and third contained 100 mL of HPLC-grade water, and the sixth contained a known weight of silica gel. The XAD module, and impingers were weighed prior to assembling the sampling train to permit gravimetric moisture determination. All sample-exposed surfaces within the train were made of glass or Teflon; no sealant greases were used. The impingers were followed by a standard Method 5-type pump, dry gas meter, and calibrated orifice meter.

The glassware was cleaned according to the procedure in Table 4-1. The filter and XAD were precleaned for contamination according to procedures described in Method 23.

4.7.1 PCDD/PCDF, PAH, and PCB Sampling Procedures

Sampling was conducted isokinetically ($\pm$ 10%) with readings of flue gas parameters recorded at traverse points selected according to EPA Method 1. Leak-checks on the Method 23 sampling train were performed before and after each sampling run and for any port change. In the event that any portion of the train needed to be disassembled and reassembled (i.e., due to filter or resin changes), leak-checks were performed. The sampling train leak-checks and leakage rate (where applicable) are documented on the field test data sheet for each respective run. All leak checks were acceptable.

Following each sampling run, the probes were removed from the sampling train, the openings capped, and the sampling train returned to the sample recovery area.

TABLE 4-1
PCDDs/PCDFs, PAHs, AND PCBs GLASSWARE CLEANING PROCEDURE

1. Soak all glassware (ahead of the XAD module) in hot (≥50°C), soapy water (Alconox).
2. Rinse with tap water, three times.
3. Rinse with deionized water, three times.
4. Rinse with pesticide grade Acetone, three times.
5. Rinse with pesticide grade Toluene, three times.
6. Rinse with pesticide grade Hexane, three times
7. Bake at 450°F for 2 hours[a].
8. Cap glassware with clean glass plugs, Teflon tape or MeCl$_2$-rinsed aluminum foil.
9. Leave cleaned glassware capped until field assembly.

[a] Step 6 not used for probe lines or non-glass components which cannot withstand 450°F.

Blanks of reagents, XAD modules, and filters were collected. Reagent blanks of the recovery solvents were collected directly out of the dispensing bottles employed during sample recovery. All blank samples were archived.

Following completion of each test run, the Method 23/428/429 trains were transported to the sample recovery area on site, out of the sunlight. The impingers and XAD-2 trap were weighed and final and initial weights compared to determine moisture catch and the impinger contents placed in a uniquely identified sample jar. Acetone followed by methylene chloride (MeCl2) was used to conduct the initial rinses of the sampling train (front half components including nozzle, probe and front half of filter holder). The same rinses were repeated in the back half components of the train up to but not including the XAD-2 trap and placed in the same uniquely identified sample jar. These rinses were repeated using hexane. These rinses were followed by a final toluene rinse (three times) and combined with the acetone/MeCl2 rinses for analysis (this was performed on all but the impingers, up to the XAD-2 trap). The impinger contents were placed in a uniquely identified glass sample jar, and the impingers rinsed with acetone/MeCl2, followed by hexane. All Method 23/428/429 samples were refrigerated until delivered to the laboratory for analysis.

After all components were recovered/rinsed the following sample jars were included/contained in the run recovery:

Container 1	Filter(s)
Container 2	Rinses of nozzle, probe and front half of the filter holder and of the back half of the filter holder, transfer line (if used), and condenser (acetone & MeCl2)
Container 3	Rinses of nozzle, probe and front half of the filter holder and of the back half of the filter holder, transfer line (if used), and condenser (hexane)
Container 4	Toluene rinse of the entire train up to the XAD-2 trap (combined with Container 2)
Container 5	XAD-2 trap
Container 6	Impinger contents
Container 7	Acetone & MeCl2 rinses of impingers
Container 8	Hexane rinses of impingers
Container 9	Silica gel

4.7.2 PCDD/PCDF, PAH, and PCB Sample Analysis

The PCDD/PCDF, PAH, and PCB train samples were analyzed for PCDD/PCDFs following EPA Method 23. The analysis of PCDD/PCDFs by high resolution gas chromatography coupled to high resolution mass spectrometry (HRGC/HRMS) involves highly specialized procedures that require a complex series of extraction and clean-up steps. These procedures are described in EPA Method 23 and the extraction/analytical steps are shown in Figure 4.3. The actual analysis by HRGC/HRMS requires highly trained individuals and computerized data acquisition and data interpretation.

To monitor the extraction, clean-up, and analysis of the PCDD/PCDFs, labeled internal standards were added to the field samples and laboratory blanks. One set of labeled internal standards was added for all the Soxhlet extraction steps and the recoveries of these standards was used to adjust the results. The specific internal standards, surrogate standards, alternative standards, and recovery standards that were employed can be found in the analytical report from SGS North America.

Once the trace organic compounds were identified and confirmed by the procedures described above, the compounds were quantified by comparison of the response factors of the sample analytes to the response factors of known amounts of native trace organic compound external standards. The recoveries of the internal standards, added to the Soxhlet extraction step, were then used to adjust the results of the corresponding native PCDD/PCDFs (i.e., $^{13}C_{12}$-2,3,7,8-TCDD recovery was used to adjust results for all native TCDD's and TCDF's). Method 23 requires that a DB-225 column be used for confirmation of the 2,3,7,8-tetra furan and 2,3,7,8-tetra dioxin results. SGS North America no longer uses a DB-225 column, but an approved DB-5S column as a direct substitute.

The Method 23 train samples were analyzed for PAHs following CARB Method 429. The analysis of PAHs by high resolution gas chromatography coupled to mass spectrometry (HRGC/HRMS) involved highly specialized procedures that required a complex series of extraction and clean-up steps. These procedures are described in Method 429. The actual analysis by HRGC/LRMS required highly trained individuals and computerized data acquisition and data interpretation.

To monitor the extraction, clean-up, and analysis of the PAHs, labeled internal standards were added to the field samples and laboratory blanks. One set of labeled internal standards were added in all the Soxhlet extraction steps and the recoveries of these standards used to adjust the results.

For validating analytical data, the extraction and cleanup system was demonstrated to be free of contamination. Method blanks and matrix blanks were analyzed.

Once the trace organic compounds were identified and confirmed by the procedures described above, the compounds were quantified by comparison of the response factors of the sample analytes to the response factors of known amounts of native trace organic compound external standards. The recoveries of the internal standards, added to the Soxhlet extraction step, were then be used to adjust the results of the corresponding native PAHs.

Preparation and Analysis For PCDD\PCDFs, PAHs and TSVOCs

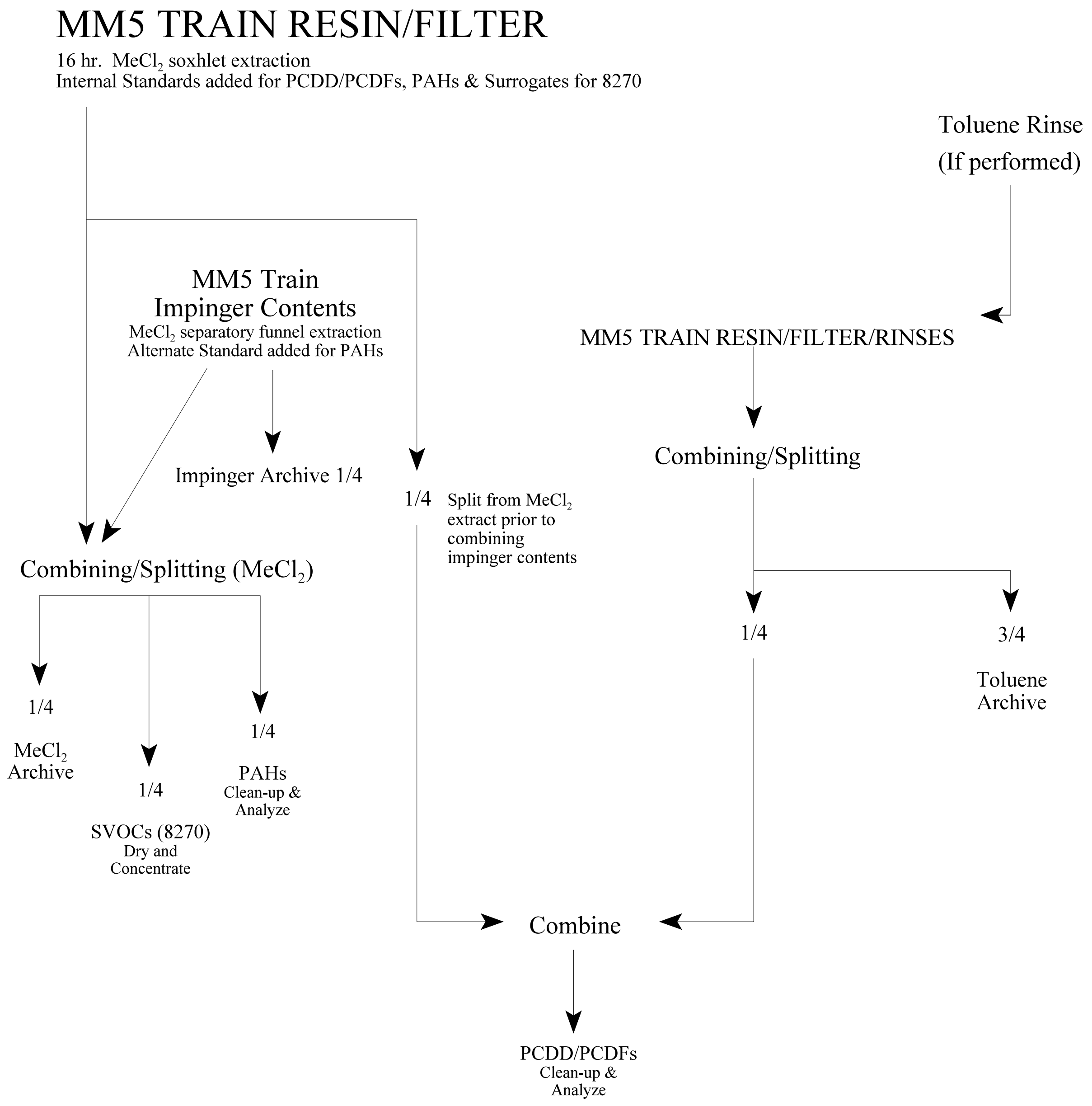


Figure 4.3 Sample Preparation for EPA Method 23/CARB 428/429 Analysis

The Method 23 train samples were analyzed for PCBs following CARB Method 428. The analysis of PCBs by high resolution gas chromatography coupled to mass spectrometry (HRGC/HRMS) involved highly specialized procedures that required a complex series of extraction and clean-up steps. These procedures are described in Method 1668. The actual analysis by HRGC/HRMS required highly trained individuals and computerized data acquisition and data interpretation.

To monitor the extraction, clean-up, and analysis of the PCBs, labeled internal standards were added to the field samples and laboratory blanks. One set of labeled internal standards were added in all the Soxhlet extraction steps and the recoveries of these standards used to adjust the results.

For validating analytical data, the extraction and cleanup system was demonstrated to be free of contamination. Method blanks and matrix blanks were analyzed.

Once the trace organic compounds were identified and confirmed by the procedures described above, the compounds were quantified by comparison of the response factors of the sample analytes to the response factors of known amounts of native trace organic compound external standards. The recoveries of the internal standards, added to the Soxhlet extraction step, were then be used to adjust the results of the corresponding native PCBs.

4.8 Sampling and Analysis for Sulfuric Acid Mist - EPA Method 8

An EPA Method 8 sampling train was used to collect sulfuric acid samples from Unit Nos. 1 and 2 Outlet sampling locations. Samples were withdrawn isokinetically using a combined EPA Method 5 and EPA Method 8 sampling train. The sampling train consisted of a glass nozzle, a heated glass probe with a Type S Pitot tube attached, a single filter, six chilled impingers, and a metering console. The optional first filter (F1) was not used, and the heated probe was connected directly to the first impinger and maintained at a temperature of 248 ± 25°F. The filter (F2) was located between the first and second impingers. The first impinger contained 100 ml of 80% isopropyl alcohol (IPA), the second and fifth were left empty, the third and fourth impingers each contained 100 ml of 5% hydrogen peroxide (H_2O_2), and the sixth impinger contained preweighed silica gel. Each of the 25 points was sampled for 2.5 minutes, resulting in net run times of 62.5 minutes. After sample collection, purging was conducted by drawing charcoal tube conditioned ambient air through the train for 15 minutes.

4.8.1 Sulfuric Acid Sample Recovery

At the conclusion of sampling the train was leak checked and transported to the sample recovery trailer. The probe and filter housing were removed and the impingers weighed for EPA Method 4 moisture determination. The IPA impinger reagent/condensate was transferred to a weighed, uniquely identified sample jar, weight recorded on the label and the liquid level marked. The H_2O_2 impinger reagent/condensate was transferred to a weighed, uniquely identified sample jar, weight recorded on the label and the liquid level marked. The silica gel was returned to the original container. The volume of water vapor condensed in the impingers and the volume of water vapor collected in the silica gel were summed and entered into moisture content calculations. The F2 filter was removed from the filter holder and added to the jar containing the IPA reagent.

The nozzle, and probe were brushed and rinsed with 80% IPA into a uniquely-identified glass sample jar. The first impinger, all connecting glassware, and the front half of the F2 filter were rinsed with 80% IPA into the IPA reagent jar. The IPA reagent jar contents were then diluted to 850 ml using 80% IPA. The back half of the F2 filter holder, and the second and third impingers were rinsed with DI water into the H_2O_2 reagent jar. The H_2O_2 reagent jar contents were diluted to 1000 ml using DI water.

4.8.2 Sulfuric Acid Sample Analysis

EPA Method 8 was used to analyze the 80% IPA reagent and the IPA rinse for H_2SO_4 mist (including SO_3) using the barium-thorin titration method. The special analytical procedures outlined in "Determination of Method 6 Samples in the Presence of Ammonia" by Foston Curtis of the EPA Emission Measurement Branch, were used (with a double titration) to subtract the bias caused by ammonia.

4.9 Continuous Emission Monitoring for Non-Methane Hydrocarbons - EPA Method 25A

A CEM system was operated to determine the emission concentrations of O_2 and CO_2 and total hydrocarbons (THC). The CEMS consisted of the sample acquisition system, the individual emission monitors, and the data acquisition system. A concurrent methane analyzer was operated in parallel with the THC monitor for methane correction. Total hydrocarbons were corrected for methane, resulting in "non-methane hydrocarbons" (NMHCs).

4.9.1 Continuous Emission Monitoring System

Using heat-traced Teflon tubing, stack gas was continuously extracted from each stack through a heated probe and filter, and conveyed to a heated manifold and pump. The gas sample was transported to the mobile laboratory monitor through heat-traced Teflon tubing. All heated components were maintained at a minimum of 250°F or greater if higher temperatures could be reliably maintained. Once inside the mobile laboratory, a portion of the heated sample was directed to the THC and methane analyzers and a portion of the gas sample directed through an ice bath, Teflon condensing system. This moisture-free stream was analyzed for O_2 and (optionally) CO_2.

The analyzer outputs were conveyed to a data logger and strip chart recorder. Each analyzer output was continuously traced on the strip chart and the concentrations were electronically stored on a personal computer.

After completion of the pre-test calibration routine, each CEM system was ready for operation. No further adjustments of sample flow rates, analyzer zero or span, or other critical CEM operating parameters were made until testing and post-test calibrations were complete.

4.9.2 Continuous Emission Monitors

Two analyzers (JUM VE-7 and CAI 300, or equivalent) were used to determine total organic hydrocarbons (THC) concentrations and methane according to EPA Method 25A. For the THC/methane analysis, each analyzer receives a hot, wet sample for measurement by a flame ionization detector (FID). The FID is fueled by a mixture of 40% helium and 60% hydrogen to reduce the effect of oxygen synergism. Burning hydrocarbon-free hydrogen in hydrocarbon-free air produces a negligible number of ions. Once a sample containing hydrocarbons is introduced into this flame a ionization process is started. This process creates a large number ions. A high polarizing voltage is applied between the two electrodes around the burner nozzle and produces an electrostatic field. Negative ions migrate to the collector electrode and positive ions migrate to the high voltage electrode. The generated ionization current between the two electrodes is directly proportional to the hydrocarbon concentration in the sample that is burned by the flame. This signal is measured and amplified to produce an output voltage proportional to the level of hydrocarbons in the gas stream.

The CAI Model ZRE O_2/CO_2 analyzer houses two measurement devices in one container. The O_2 concentrations are measured using the paramagnetic technique. An oxygen molecule, because of its sp3 electron orbital distribution, has an unpaired electron and hence displays a magnetic orientation. Since other elements that display this magnetic phenomenon are not common gasses at normal temperatures, the paramagnetic measurement technique is virtually specific for oxygen. The sample gas flows through a detection cell located in a very strong magnetic field. The concentration of O_2 gas present induces a pressure differential in the detector cell. The amount of differential pressure is proportional to the concentration of O_2 gas present.

The CO_2 concentrations in the analyzer are measured using a variation of the NDIR technique. An infrared light beam is modulated by a chopper system and passed through a sample cell of predetermined length that contains the gas sample to be analyzed. As the beam passes through the cell, the sample gas absorbs some of its energy. The attenuated beam (transmittance) emerges from the cell and is introduced to the front chamber of a two-chamber, infrared microflow detector. The detector is filled with the gas component of interest and consequently the beam experiences further energy absorption. This absorption process increases the pressure in both chambers. The differential pressure between the front and rear chamber of the detector causes a slight gas flow between the two chambers. This flow is detected by a mass-flow sensor and converted into an output signal.

4.9.3 Calibration Procedures for Continuous Emission Monitors

The THC and methane analyzers were subjected to a four-point pretest calibration prior to the first run in accordance with EPA Method 25A, and on a methane basis. Zero drift checks were performed between each sampling run and at the end of the test run. Between each test run and at the conclusion of the test, the sampling system bias check was repeated to assess analyzer drift and/or change in the sampling system bias. The results of these calibrations are included in Appendix B. For each run, the pre- and post-test calibrations were within the limits allowed by EPA Method 25A.

Calibration procedures were performed on the O_2/CO_2 analyzer in accordance with EPA Method 3A. It was calibrated before and after each test and a calibration check performed between each test run.

The pretest calibrations consisted of the following steps:

- Internal (direct) calibration of each analyzer to adjust calibration and check linearity.
- External (through the entire sampling system) calibration to check the system bias on zero and span gases.

The post test calibration consisted of an external system bias calibration check.

<u>Internal Calibration</u> - The O_2/CO_2 analyzer was calibrated using a certified zero and span (mid or high range as necessary) gas. Zero and span gases were directed to the analyzer through the appropriate plumbing, the calibration gas flow rates adjusted to the correct flow rate and the analyzer

adjusted with the appropriate span pot. After the analyzer was properly adjusted the linearity was checked using a mid-range calibration gas. The maximum allowable limit for linearity is 2% of the analyzer range. The analyzer was within these limits before proceeding.

External Calibration - The O_2/CO_2 analyzer external calibration bias check was performed by placing the CEM system in the sampling mode and injecting a zero and span gas into the sample line at the probe exit. This check demonstrates the absence of sampling system related bias, and also serves as a check of the integrity of the sample line. This is the same calibration used for the THC analyzer linearity and bias check.

4.9.4 Data Acquisition System

Output from the instrumental analyzers was directed to a Molytek Model 2702 32-channel analog/digital strip chart recorder for hardcopy output, and downloaded via the serial port to a laptop PC utilizing custom data acquisition software. Data for each of the analyzers was recorded every two seconds and written to the PC diskette. Data was averaged over the test period and corrected for calibration error and drift (if applicable) using a spreadsheet program.

4.9.5 Emission Measurement Procedures

After completion of the initial calibration, three 1-hour sampling runs were conducted on each FF outlet sampling location. Before and after each sampling period calibration checks were run to ensure the quality of the data being collected.

4.10 Visual and Fugitive Emissions - EPA Method 9 and Method 22

4.10.1 EPA Method 9 (Opacity)

The City of Spokane MWC operates and maintains a continuous opacity monitoring system (COMS) on the FF Outlet of all units. In accordance with CFR 60.58b(c)(6) as provided under 40 CFR 60.11(e)(5), opacity data results from the COMS were used in lieu of EPA Method 9 observations to establish compliance with the opacity standard. COMS data recorded concurrently with particulate matter sampling are provided in **Appendix E** in deference to 40 CFR 60.11(e)(6) and the facility operating permit.

4.10.2 EPA Method 22 (Fugitive Emissions)

EPA Method 22 fugitive emissions were determined at the ash handling system by the same qualified EPA Method 9 (opacity) observer. The units share a common ash handling system, and only a single emission point was observed. The observer positioned himself where the light source was not directly behind the unit/process being observed. Observations were taken in 20-minute intervals with breaks of ≥5 minutes (but no more than 10 minutes) between each interval.

After the observer found a suitable observation site (as defined by the Method), a stopwatch was started at time zero. If at any point during the sampling interval, fugitive emissions were observed (water vapor is not considered a fugitive emission), a second stopwatch was run until fugitives were no longer visible. The second stopwatch was started with each subsequent fugitive emission and stopped when fugitives were no longer visible. At the end of each 20-minute interval, the total time (from the second stopwatch) that fugitives were visible during the interval was recorded. Three one-hour runs were performed consisting of three 20-minute intervals each.

4.11 Equipment Calibration

Pertinent equipment calibration documentation is reproduced in Appendix D.

5.0 QA/QC PROCEDURES AND RESULTS

The objective of a quality assurance/quality control (QA/QC) program is to assure that the precision and accuracy of all environmental data generated by DEECO for clients are commensurate with data quality objectives (DQO's). DQO's are based on a common understanding of the intended end use(s) of the data, the measurement process, and the availability of resources. Once DQO's are established, formally or informally, QC protocol can be defined for the measurements.

In this project, the final data user will be City of Spokane. The data quality objectives in this project are to generate scientifically sound data to be used for demonstrating compliance with Washington air emission requirements.

5.1 Sampling Equipment

All of the sampling equipment used was calibrated according to the procedures outlined in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, EPA-600/4-77-027b.

5.1.1 Method 5-Type Sampling Equipment Calibrations

For sampling EPA Methods 5/202, 29, 23, 13B, 26A and 8, the procedures and equipment used to measure stack gas velocity and temperature measurements and the metering system used to maintain isokinetic sampling conditions and to determine the sample gas volume were subjected to pretest and posttest calibrations and/or inspections as required by the appropriate EPA methods. Table 5-1 presents a summary of the sampling equipment calibrations used for this test program.

5.1.1.1 Barometer - Barometric pressure values were obtained from a calibrated aneroid barometer.

5.1.1.2 Probe Nozzle - The probe nozzles used during testing were calibrated initially by the manufacturer and thereafter by the field sampling crew by checking for dimensional roundness. This was done by taking three separate measurements using alternative inside diameters and calculating the average. A micrometer with a minimum tolerance of 0.001 inch is used for measuring. If a deviation of more than 0.004 inch is found between any measurements, the nozzle is either discarded or repaired and remeasured. Measurements are recorded on the field data sheets in Appendix B.

5.1.1.3 Pitot Tubes - Each pitot tube used in sampling meets the design specifications for type-S pitot tubes in EPA Method 2. Therefore, a maximum value baseline coefficient (C_p) of 0.84 is assigned to each pitot tube. Calibration by the manufacturer for pitot face-opening alignment included measuring the external tubing diameter (dimension D_t), the base-to-opening plane distance (dimensions P_a and P_b), and the face opening misalignment angles, with all terms as described in EPA Method 2. Pitot tubes were visually inspected for structural integrity at the completion of each test. Inspection sheets for pitot tubes are included in Appendix D.

5.1.1.4 Calibration Meter and Metering System - DEECO uses two methods for calibration of the dry gas meter(s) for isokinetic sampling; secondary dry gas meter (EPA Method 5, Section 7.1) and calibrated critical orifice (EPA Method 5, Section 7.2). The following paragraphs discuss these procedures.

TABLE 5-1
FIELD EQUIPMENT CALIBRATION SUMMARY

Equipment	I.D. No.	Calibrated against	Allowable difference	Actual difference	Within allowable limits
Dry gas meter isokinetic trains	M5-14	Calibrated Critical Orifice	(γ±5% of γ pretest)	0.1%	Yes
	M5-19			1.1%	Yes
	M5-20			0.4%	Yes
	M5-23			1.6%	Yes
	M5-24			1.3%	Yes
	M5-26			0.3%	Yes
Nozzles[1]	Unit1-Inlet-M29-1	micrometer	±0.004 in. between high and low measure	0.002 max	Yes
	Unit1-Inlet-M29-2			0.002 max	Yes
	Unit1-Inlet-M29-3			0.002 max	Yes
	Unit1-Inlet-M29-4			0.002 max	Yes
	Unit1-Outlet-M29-1			0.001 max	Yes
	Unit1-Outlet-M29-2			0.001 max	Yes
	Unit1-Outlet-M29-3			0.001 max	Yes
	Unit1-Outlet-M29-4			0.001 max	Yes
	Unit2-Inlet-M29-2			0.002 max	Yes
	Unit2-Inlet-M29-3			0.002 max	Yes
	Unit2-Inlet-M29-4			0.002 max	Yes
	Unit2-Inlet-M29-5			0.002 max	Yes
	Unit2-Outlet-M29-2			0.001 max	Yes
	Unit2-Outlet-M29-3			0.002 max	Yes
	Unit2-Outlet-M29-4			0.002 max	Yes
	Unit2-Outlet-M29-5			0.001 max	Yes
	Unit1-Outlet-M13B-1			0.002 max	Yes
	Unit1-Outlet-M13B-2			0.002 max	Yes
	Unit1-Outlet-M13B-3			0.002 max	Yes
	Unit2-Outlet-M13B-1			0.001 max	Yes
	Unit2-Outlet-M13B-2			0.002 max	Yes
	Unit2-Outlet-M13B-3			0.001 max	Yes
	Unit1-Outlet-M8-2			0.001 max	Yes
	Unit1-Outlet-M8-3			0.001 max	Yes
	Unit1-Outlet-M8-4			0.001 max	Yes
	Unit2-Outlet-M8-1			0.001 max	Yes
	Unit2-Outlet-M8-2			0.001 max	Yes
	Unit2-Outlet-M8-3			0.001 max	Yes
	Unit1-Outlet-M5/202-1			0.002 max	Yes
	Unit1-Outlet-M5/202-2			0.001 max	Yes
	Unit1-Outlet-M5/202-2			0.001 max	Yes
	Unit2-Outlet-M5/202-1			0.001 max	Yes
	Unit2-Outlet-M5/202-2			0.002 max	Yes
	Unit2-Outlet-M5/202-3			0.001 max	Yes
	Unit2-Outlet-M23-1			0.001 max	Yes
	Unit2-Outlet-M23-2			0.002 max	Yes
	Unit2-Outlet-M23-3			0.001 max	Yes
Stack gas thermocouples	4-H	ASTM-3F thermometer	± 1.5%	0.2% max	Yes
	4-J			0.2% max	Yes
	7-D			0.3% max	Yes
	7-G			0.3% max	Yes
	7-Q			0.2% max	Yes
	7-S			0.2.% max	Yes
	8-K			0.3% max	Yes

TABLE 5-1 (Continued)

Equipment	I.D. No.	Calibrated against	Allowable difference	Actual difference	Within allowable limits
S-type pitot inspection	4-H	Angle indicator	See Method 2 face opening specs	2° max	Yes
	4-J			3° max	Yes
	7-D			2° max	Yes
	7-G			2° max	Yes
	7-Q			1° max	Yes
	7-S			1° max	Yes
	7-T			1° max	Yes
	8-K			1° max	Yes

[1] All nozzles used for this test program were new and had no ID assigned at the time of testing. Nozzles were field calibrated and the readings were recorded on the sampling data sheets. Nozzles are identified by the Run ID.

Secondary Reference Meter - The secondary reference meter equipment arrangement for calibration is shown in Figure 5.7 of EPA Method 5. The following prescribed procedures were followed: A wet test meter with a 1 ft^3/rev capacity and $\underline{+}1$ percent accuracy is the primary calibrant. The dry gas meter's pump is run for a minimum of 5 minutes at a flow rate of 0.35 cfm to condition the interior surface of the wet test meter. Leak checks are performed and if satisfactory, triplicate runs at no less than five different flow rates are done. A calibration curve is prepared and the meter is recalibrated after 200 hours of operation or annually, whichever comes first.

The calibration set-up for the dry gas metering system using the secondary reference meter in lieu of the wet test meter is given in Figure 5.5 of EPA Method 5. A leak check of the metering system before calibration was performed as shown in Figure 5.4 of EPA Method 5. The metering systems's pump is operated for 5 minutes at an orifice manometer setting of 0.5 inches H_2O to heat up the pump and system to stabilize the meter inlet and outlet temperatures. Values for the orifice setting (ΔH), wet test meter volume (V_w), corresponding dry test meter volume (V_d) dry test meter inlet and outlet gas temperatures (t_{di} and t_{dn}), and time are recorded for the initial calibration. Then the ratio of the wet test meter to the dry test meter (γ) and the orifice pressure differential that equates to 0.75 cfm at standard conditions ($\Delta H@$) are calculated.

Calibrated Critical Orifice - A series of up to five (but a minimum of 3) calibrated orifices can be used to generate the DGM correction factor (γ) and $\Delta H@$. After setting up the apparatus according to Figure 5-10 of EPA Method 5, a warm-up time of 15 minutes is performed equilibrate the temperature conditions through the DGM. The system is checked to ensure a leakage rate of zero.

Before calibrating the DGM, the orifice’s suitability as a calibration standard, and the appropriate operating vacuum were determined as follows (excerpted from EPA Method 5): Turn on the pump, fully open the coarse adjust valve, and adjust the by-pass valve to give a vacuum reading corresponding to about half of atmospheric pressure. Observe the meter box orifice manometer reading, ΔH. Slowly increase the vacuum reading until a stable reading is obtained on the meter box orifice manometer. Record the critical vacuum for each orifice. Orifices that do not reach a critical value shall not be used.

The barometric pressure, DGM temperature(s), initial volume reading are recorded and the runs are conducted at a vacuum of 25 to 50 mm Hg (1 to 2 in. Hg) above the critical vacuum and be at least 5 minutes each. Upon ending the run, the DGM temperature(s) are recorded again, the pump turned off, and the final DGM volume reading is recorded. These data (along with the calibration factor of each respective orifice) are used to calculate the DGM γ, and $\Delta H@$, per EPA Method 5, Equations 5-9 through 5-12.

A post-test meter calibration was made on the dry gas meter used during the test to check its accuracy against the pre-test calibration. This post-test calibration check was made following EPA Method 5, Section 7.2 procedures, using critical orifices as calibration standards to check the correction factor for the dry gas meter, or EPA Method 5, Section 16.3 involving calibration of the dry gas meter using in-field sampling data. As indicated in Table 5-1, all post-test meter calibrations met the acceptable criteria. The calibration data sheets for the dry gas meters are included in Appendix D.

5.1.1.5 Thermocouples and Digital Indicators - Thermocouples were calibrated by comparing them against an ASTM-3F mercury-in-glass thermometer at three temperatures. Each thermocouple was calibrated against temperature ranges to which it is typically exposed during test conditions, and they agreed within 1.5 percent (expressed in °R) of the reference thermometer throughout the entire calibration range. Also, thermocouples were checked at ambient temperature at the test site to verify calibration. The calibration data sheets for the thermocouples are included in Appendix D.

5.1.1.6 Pretest and Posttest Leak Checks of Sampling Trains - Each Method 5-type sampling train was subjected to pretest and posttest leak checks. For all valid sampling runs, the posttest leak checks were acceptable (less than 0.02 cfm at the highest vacuum recorded during the test run).

5.2 Analytical QA/QC Results

Analytical measurements of precision and accuracy were made on stack gas samples, and are detailed in each analytical report. In Table 5-2, a summary of the relevant analytical QA/QC results is provided. Tables 5-3 through 5-13 present results for the various target compounds' respective QA/QC results.

In accordance with New Source Performance Standards (NSPS) under 40CFR 60.8 Performance Test Provisions (http://www.gpo.gov/fdsys/pkg/FR-2010-09-13/pdf/2010-21820.pdf), audit samples were requested from an Accredited Audit Sample Provider (AASP) for all test methods for which a commercially available audit exists. The samples were provided to the respective analytical laboratories. The audit samples results are provided in Table 5-14.

TABLE 5-2
SUMMARY OF ANALYTICAL QA/QC RESULTS

Test Method	Parameter	QA/QC Criteria	QA/QC Status
EPA Methods 3A and 25A	Calibration Error	±5% of gas value (or span)	0.9% maximum[1]
	Zero Drift	±3% of instrument span	0.1% maximum[2]
	Calibration Drift	±3% of instrument span	1.0% maximum[3]
EPA Method 8 H_2SO_4 Mist	Reagent Blank	NA	<0.026 mg
EPA Method 5/202 for Total Condensables and Filterable Particulate Matter	Constant Weight	0.5 mg or 1% of the total weight less the tare weight; whichever is greater	≤0.5 mg
	DI Water Blank	≤0.001% by weight	0.2 mg/12 mL 0.0002% by weight
	$MeCl_2$ Blank	≤0.001% by weight	0.1 mg/94 mL 0.0001% by weight
	Acetone Blank	≤0.001% by weight	0.5 mg/86 mL 0.0005% by weight
EPA Method 13B for Cr^{+6} and HF (40 CFR, Pt.266, App IX Hexavalent Chromium)	Reagent Blank (Cr^{+6}) Reagent Blank (HF)	NA NA	0.515 µg ND(0.1) mg
	Duplicate Analysis (HF)	≤10%	2.7% maximum
	Matrix Spike (Cr^{+6}) Matrix Spike (HF)	75 - 125% 90 - 110%	101% - 102% Recovery 90 - 92% Recovery
EPA Method 26A for HCl, NH_3	Duplicate Analysis	NA ≤10%	Maximum 2.2% (HCl) Maximum 1.2% (NH_3)
	Matrix Spike Recovery	NA 90 - 110%	94 - 103% (HCl) 98 - 102% (NH_3)
	Reagent Blank	NA	ND(0.055) mg (HCl) ND(0.125) mg (NH_3)
PCDD/PCDF's by EPA Method 23	Tetra-hexa extraction standards recovery	40 - 130%	85.1-111%
	Hepta-octa extraction standards recovery	25 - 130%	47.9-106%
	Surrogate standards recovery	70 - 130%	88.1-113%
PAH's by CARB Method 429	Surrogate Standard Recovery	d10-Fluorene (50-150%) d14-Terphenyl (50-150%)	78.7 minimum % 115 maximum %
	Extraction Standard Recovery	50-150%	39.3 minimum % 103 maximum %

TABLE 5-2 (Continued)

Test Method	Parameter	QA/QC Criteria	QA/QC Status
PCB's by CARB Method 428	Surrogate Standard Recovery	13C-PCB-28 (70-130%) 13C-PCB-111 (70-130%) 13C-PCB-178 (70-130%)	84.9 minimum % 115 maximum %
	Extraction Standard Recovery	40-130%	37.1 minimum % 180 maximum %
EPA Method 29 Mercury	Matrix Spike Recovery	75 - 125%	81 - 111%
	Duplicate Analysis	≤10%	Maximum 3.3%
EPA Method 29 Metals	Matrix Spike Recovery	75 - 125%	Min. 71% (Be)[4] Max. 135% (As)[4]
	Duplicate Analysis	≤20%	4.6% Max. (Cd)
	Reagent Blank (Combined Front/Back half)	NA	As - ND(0.2) µg Be - ND(0.05) µg Cd - ND(0.2) µg Cr - 0.824 µg Pb - 0.350 µg Ni - 2.0 µg Se - ND(0.2) µg Zn - 9.24 µg

[1] Max calibration error occurred on Unit 2 Post-Run 1 for methane.

[2] Max zero drift occurred on Unit 2 Post-Run 1 for methane and THC.

[3] Max calibration drift occurred on Unit 2 Post-Run 1 for methane.

[4] See Analytical Narrative page 11 in the Analytical Report (Appendix C)

TABLE 5-3
SUMMARY OF DUPLICATE ANALYSIS FOR MERCURY

Sample	Analysis	Fraction				
		Front half (1A)	**H_2O_2/HNO_3 (2B)**	**Empty Impinger (3A)**	**$KMnO_4$ (3B)**	**HCl (3C)**
U1-I-M29-R1	#1	113	57.8	ND(0.2)	ND(0.5)	0.427
	#2	112	57.1	ND(0.2)	ND(0.5)	0.415
	RPD	1.5%	1.3%	NA	NA	2.8%
U1-I-M29-R2	#1	47.4	38.2	0.216	ND(0.5)	1.35
	#2	47.1	38.1	0.212	ND(0.5)	1.35
	RPD	0.7%	0.2%	1.8%	NA	0.0%
U1-I-M29-R3	#1	47.5	9.29	ND(0.2)	ND(0.5)	1.31
	#2	46.7	9.21	ND(0.2)	ND(0.5)	1.28
	RPD	1.6%	0.9%	NA	NA	2.3%
U1-I-M29-R4	#1	20.9	12.4	ND(0.2)	ND(0.5)	ND(0.4)
	#2	20.4	12.4	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	2.4%	0.2%	NA	NA	NA
U1-O-M29-R1	#1	ND(0.1)	7.88	ND(0.2)	ND(0.5)	ND(0.4)
	#2	ND(0.1)	7.86	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	0.2%	NA	NA	NA
U1-O-M29-R2	#1	ND(0.1)	14.3	ND(0.2)	ND(0.5)	ND(0.4)
	#2	ND(0.1)	14.4	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	0.5%	NA	NA	NA
U1-O-M29-R3	#1	ND(0.1)	10.3	ND(0.2)	ND(0.5)	ND(0.4)
	#2	ND(0.1)	10.4	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	1.0%	NA	NA	NA
U1-O-M29-R4	#1	ND(0.1)	6.98	ND(0.2)	ND(0.5)	ND(0.4)
	#2	ND(0.1)	6.82	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	2.3%	NA	NA	NA
U2-I-M29-R2	#1	30.8	28.9	ND(0.2)	ND(0.5)	0.603
	#2	30.6	29	ND(0.2)	ND(0.5)	0.621
	RPD	0.6%	0.5%	NA	NA	3.0%
U2-I-M29-R3	#1	34.5	11.4	ND(0.2)	0.868	3
	#2	34.4	11.2	ND(0.2)	0.872	2.98
	RPD	0.5%	2.0%	NA	0.5%	0.6%
U2-I-M29-R4	#1	17	8.58	ND(0.2)	ND(0.5)	ND(0.4)
	#2	17	8.55	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	0.0%	0.3%	NA	NA	NA
U2-I-M29-R5	#1	29.8	9.42	ND(0.2)	ND(0.5)	0.901
	#2	29	9.35	ND(0.2)	ND(0.5)	0.896
	RPD	2.6%	0.7%	NA	NA	0.6%
U2-O-M29-R2	#1	ND(0.1)	7.92	ND(0.2)	ND(0.5)	ND(0.4)
	#2	ND(0.1)	8.09	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	2.1%	NA	NA	NA
U2-O-M29-R3	#1	ND(0.1)	4.53	ND(0.2)	ND(0.5)	ND(0.4)
	#2	ND(0.1)	4.49	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	1.0%	NA	NA	NA
U2-O-M29-R4	#1	ND(0.1)	3.06	ND(0.2)	ND(0.5)	ND(0.4)
	#2	ND(0.1)	3.09	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	1.2%	NA	NA	NA
U2-O-M29-R5	#1	ND(0.1)	3.93	ND(0.2)	ND(0.5)	ND(0.4)
	#2	ND(0.1)	3.89	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	1.0%	NA	NA	NA
U2-Out-M29-RB (Reagent Blank)	#1, µg	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.5)	ND(0.4)
	#2, µg	ND(0.1)	ND(0.2)	ND(0.2)	ND(0.5)	ND(0.4)
	RPD	NA	NA	NA	NA	NA

[1] NA - One or both of the analyses (along with the average) was below 5× analytical detection limits. RPD is not applicable in this circumstance.

TABLE 5-4
METALS BLANKS AND DUPLICATE ANALYSES RESULTS

Analyte and Analytical Method (FH/BH)	Fraction	Reagent Blank, µg	Field Blank, µg	Matrix Spike Rec, %		Unit1-Out-M29-2 Catch, µg		Relative % Difference	Unit2-Out-M29-3 Catch, µg		Relative % Difference
				Unit 1	Unit 2	First Analysis	Second Analysis		First Analysis	Second Analysis	
Arsenic (ICP-MS)	Front/ Back[1]	ND(0.2)[2]	ND(0.2)	124%	135%[4]	ND(0.2)	ND(0.2)	NA[3]	0.484	0.483	0.3%
Beryllium (ICP-MS)	Front/ Back	ND(0.05)	ND(0.05)	71%[4]	76%	ND(0.05)	ND(0.05)	NA	ND(0.05)	ND(0.05)	NA
Cadmium (ICP-MS)	Front/ Back	ND(0.2)	ND(0.2)	106%	117%	0.440	0.420	4.6%	2.09	2.06	1.5%
Chromium (ICP-MS)	Front/ Back	0.824	1.34	75%	79%	6.44	6.40	0.7%	1.76	1.71	2.7%
Lead (ICP-MS)	Front/ Back	0.350	0.636	100%	101%	3.07	3.05	0.6%	14.1	13.9	1.0%
Nickel (ICP-MS)	Front/ Back	2.04	1.85	104%	119%	4.59	4.65	1.4%	4.23	4.21	0.6%
Selenium (ICP-MS)	Front/ Back	ND(0.2)	ND(0.2)	91%	110%	ND(0.2)	ND(0.2)	NA	ND(0.2)	ND(0.2)	NA
Zinc (ICP-MS)	Front/ Back	9.24	22.8	92%	94%	25.8	26.1	1.2%	92.9	93.2	0.3%

[1] The front and back half fractions were analyzed together.

[2] Concentration of analyte in sample is less than analytical detection limits.

[3] Not applicable. Analyte is less than 5× the analytical detection limit

[4] See Analytical Narrative page 11 of the Analytical Report (Appendix C)

TABLE 5-5
METALS REAGENT BLANKS CORRECTION RESULTS

Run # and Target Analyte	FH/BH Catch Weight, µg ($m_{Fh/Bh(actual)}$)	Blank Catch, µg ($m_{fhb-bhb(actual)}$)	Filter Diam., inches	1.4 * Area and 1 µg	5% of ½×$m_{fh/bh(actual)}$	Calculated $m_{Fh(assumed)}$	Calculated $m_{Bh(assumed)}$	Corrected Result to use µg[1]
Unit1-Out-M29-1 Chromium	2.9	0.824	3.22835	11.46 + 1	0.0725	1.038	1.038	2.076
Unit1-Out-M29-2 Chromium	6.42	0.824	3.22835	11.46 + 1	0.1605	2.798	2.798	5.596
Unit1-Out-M29-3 Chromium	1.94	0.824	3.22835	11.46 + 1	0.0485	0.558	0.558	1.116
Unit1-Out-M29-4 Chromium	1.51	0.824	3.22835	11.46 + 1	0.03775	0.343	0.343	0.686
Unit2-Out-M29-2 Chromium	2.48	0.824	3.22835	11.46 + 1	0.062	0.828	0.828	1.66
Unit2-Out-M29-3 Chromium	1.74	0.824	3.22835	11.46 + 1	0.0435	0.458	0.458	0.916
Unit2-Out-M29-4 Chromium	1.85	0.824	3.22835	11.46 + 1	0.04625	0.513	0.513	1.026
Unit2-Out-M29-5 Chromium	1.66	0.824	3.22835	11.46 + 1	0.0415	0.418	0.418	0.836
Unit1-Out-M29-1 Lead	2.98	0.35	3.22835	11.46 + 1	0.0745	1.315	1.315	2.63
Unit1-Out-M29-2 Lead	3.06	0.35	3.22835	11.46 + 1	0.0765	1.355	1.355	2.71
Unit1-Out-M29-3 Lead	2.65	0.35	3.22835	11.46 + 1	0.06625	1.15	1.15	2.3
Unit1-Out-M29-4 Lead	1.79	0.35	3.22835	11.46 + 1	0.04475	0.72	0.72	1.44
Unit2-Out-M29-2 Lead	9.24	0.35	3.22835	11.46 + 1	0.231	4.445	4.445	8.89
Unit2-Out-M29-3 Lead	13.99	0.35	3.22835	11.46 + 1	0.34975	6.82	6.82	13.64
Unit2-Out-M29-4 Lead	4.23	0.35	3.22835	11.46 + 1	0.10575	1.94	1.94	3.88
Unit2-Out-M29-5 Lead	3.68	0.35	3.22835	11.46 + 1	0.092	1.665	1.665	3.33
Unit1-Out-M29-1 Nickel	7.39	2.04	3.22835	11.46 + 1	0.18475	2.675	2.695	5.37
Unit1-Out-M29-2 Nickel	4.62	2.04	3.22835	11.46 + 1	0.1155	1.29	1.31	2.6
Unit1-Out-M29-3 Nickel	5.99	2.04	3.22835	11.46 + 1	0.14975	1.975	1.995	3.97
Unit1-Out-M29-4 Nickel	2.08	2.04	3.22835	11.46 + 1	0.052	0.02	0.04	0.06

TABLE 5-5 (Continued)

Run # and Target Analyte	**FH/BH Catch Weight, µg ($m_{Fh/Bh(actual)}$)**	**Blank Catch, µg ($m_{fhb-bhb(actual)}$)**	**Filter Diam., inches**	**1.4 * Area and 1 µg**	**5% of ½×$m_{fh/bh(actual)}$**	**Calculated $m_{Fh(assumed)}$**	**Calculated $m_{Bh(assumed)}$**	**Corrected Result to use µg[1]**
Unit2-Out-M29-2 Nickel	5.43	2.04	3.22835	11.46 + 1	0.13575	1.695	1.715	3.41
Unit2-Out-M29-3 Nickel	4.22	2.04	3.22835	11.46 + 1	0.1055	1.09	1.11	2.2
Unit2-Out-M29-4 Nickel	3.58	2.04	3.22835	11.46 + 1	0.0895	0.77	0.79	1.56
Unit2-Out-M29-5 Nickel	4.03	2.04	3.22835	11.46 + 1	0.10075	0.995	1.015	2.01
Unit1-Out-M29-1 Zinc	29	9.24	3.22835	11.46 + 1	0.725	9.88	13.5	23.38
Unit1-Out-M29-2 Zinc	26	9.24	3.22835	11.46 + 1	0.65	8.38	12	20.38
Unit1-Out-M29-3 Zinc	29.2	9.24	3.22835	11.46 + 1	0.73	9.98	13.6	23.58
Unit1-Out-M29-4 Zinc	28.8	9.24	3.22835	11.46 + 1	0.72	9.78	13.4	23.18
Unit2-Out-M29-2 Zinc	72.4	9.24	3.22835	11.46 + 1	1.81	31.58	34.39	65.97
Unit2-Out-M29-3 Zinc	93	9.24	3.22835	11.46 + 1	2.325	41.88	44.175	86.055
Unit2-Out-M29-4 Zinc	39.8	9.24	3.22835	11.46 + 1	0.995	15.28	18.9	34.18
Unit2-Out-M29-5 Zinc	28.9	9.24	3.22835	11.46 + 1	0.7225	9.83	13.45	23.28

[1] For the combined Front-half/Back-half blank correction we deduct $m_{fhb-bhb\ (combined)}$, which is equal to: $m_{fhb(assumed)} + m_{bhb(assumed)}$

To Calculate $m_{fhb(assumed)}$ we use the following guidelines:
If $0 \leq (½×m_{fhb-bhb(actual)}) \leq 11.46$, then $m_{fhb(assumed)} = (½×m_{fhb-bhb(actual)})$, otherwise use the greater of the I or II:
Where: I = 11.46 µg (derived by multiplying the filter area by 1.4)
II = the lesser of (a) ($½×m_{fhb-bhb(actual)}$), or (b) 5% of ($½×m_{fh/bh(actual)}$)

To Calculate $m_{bhb(assumed)}$ we use the following guidelines:
If $0 \leq (½×m_{fhb-bhb(actual)}) \leq 1$, then $m_{bhb(assumed)} = (½×m_{fhb-bhb(actual)})$, otherwise we use the greater of the I or II:
Where: I = 1 µg
II = the lesser of (a) ($½×m_{fhb-bhb}$), or (b) 5% of ($½×m_{fh/bh}$)

[2] The result is zero after implementing blank correction procedures

TABLE 5-6
PCDD/PCDF FLUE GAS SURROGATES STANDARDS PERCENT RECOVERIES

Sample Description	Surrogate				
	$^{37}Cl_4$-2378-TCDD	^{13}C-12347-PeCDD	^{13}C-12346-PeCDF	^{13}C-123469-HxCDF	^{13}C-1234689-HpCDF
Unit2-Out-M23-1	105	105	103	102	99.7
Unit2-Out-M23-2	98.5	93.6	95.6	92.3	88.1
Unit2-Out-M23-3	103	104	110	113	109
Unit2-Out-M23-4 (Field Blank)	97.9	95.7	97.7	96	97.4

TABLE 5-7
PCDD/PCDF FLUE GAS EXTRACTION STANDARDS PERCENT RECOVERIES

Sample Description	^{13}C-2378-TCDD	^{13}C-12378-PeCDD	^{13}C-123478-HxCDD	^{13}C-123678-HxCDD	^{13}C-123789-HxCDD	^{13}C-1234678-HpCDD	^{13}C-OCDD	^{13}C-2378-TCDF	^{13}C-12378-PeCDF	^{13}C-23478-PeCDF	^{13}C-123478-HxCDF	^{13}C-123678-HxCDF	^{13}C-234678-HxCDF	^{13}C-123789-HxCDF	^{13}C-1234678-HpCDF	^{13}C-1234789-HpCDF	^{13}C-OCDF
Unit 2-Outlet-M23-1	88.9	97.7	92.6	88.8	94.9	102	69.3	92.2	94.2	101	99.3	101	88.9	93.2	102	99.3	79.8
Unit 2-Outlet-M23-2	99.4	96.6	102	98.7	108	108	76.2	102	99.6	97.2	100	102	101	108	108	106	85.3
Unit 2-Outlet-M23-3	94.1	91.9	99.6	95.5	102	102	76	98.7	95.8	95.2	95.9	98.1	97.9	99.8	103	96.5	83.3
Unit 2-Outlet-M23-4 (F. Blk)	88.8	87.2	111	104	85.1	81.7	38.3	96.3	90.6	92.8	104	100	92.6	94.1	75.4	87.1	47.9

TABLE 5-8
PCDD/PCDF FIELD AND LABORATORY BLANKS ANALYTICAL RESULTS

COMPOUND	Method Blank, pg	Field Blank, pg (Unit2-Outlet-M23-4)
2378-TCDD	ND(5.14)[1]	ND(4.7)
Total TCDD	0	0
12378-PeCDD	ND(3.88)	ND(5.19)
Total PeCDD	0	10.7
123478-HxCDD	ND(2.9)	ND(3.83)
123678-HxCDD	ND(3.01)	8.07
123789-HxCDD	ND(3.08)	9.07
Total HxCDD	0	127
1234678-HpCDD	18.3	164
Total HpCDD	18.3	321
OCDD	ND(5.67)	413
TOTAL PCDDs	**18.3**	**871.7**
2378-TCDF	ND(4.99)	{10.5}[1]
Total TCDF	0	122
12378-PeCDF	ND(2.88)	14.8
23478-PeCDF	ND(3.23)	9.97
Total PeCDF	0	123
123478 HxCDF	ND(2.24)	{8.18}
123678 HxCDF	ND(1.93)	{12.1}
234678 HxCDF	ND(2.25)	11.3
123789 HxCDF	ND(2.59)	ND(2.67)
Total HxCDF	0	58.6
1234678 HpCDF	ND(1.82)	{28.8}
1234789 HpCDF	ND(2.01)	{1.76}
Total HpCDF	0	0
OCDF	ND(6.3)	19.8
TOTAL PCDFs	**ND(30.24)**	**323.4**
TOTAL PCDD/PCDFs	**18.3[2]**	**1190[2]**

[1] Data surrounded by a "ND( )" are indicative of levels of analytes that are below the detection limit. Any values surrounded by "{}" are indicative of values that are EMPC. The value is the detection limit of the given analyte.

[2] As reported in the SGS North America report provided in Appendix C.

TABLE 5-9
PCBs EXTRACTION AND SURROGATE STANDARDS PERCENT RECOVERIES

Sample Parameter	Unit2-Out-M23/428/429-1	Unit2-Out-M23/428/429-2	Unit2-Out-M23/428/429-3	Unit2-Out-M23/428/429-4 (FB)
Extraction Standards				
^{13}C-PCB-1	78.1	74.7	75.5	98.1
^{13}C-PCB-3	86.6	99.1	83.7	115
^{13}C-PCB-4	88.4	90.8	81.8	114
^{13}C-PCB-15	96.5	129	89.7	147
^{13}C-PCB-19	87.2	87.8	79.8	108
^{13}C-PCB-37	89.2	74.7	90	81.4
^{13}C-PCB-54	88.5	70.4	91.9	86.3
^{13}C-PCB-77	56	34.1	69.2	37.1
^{13}C-PCB-81	76.1	62.6	75.5	59.7
^{13}C-PCB-104	109	103	105	91.9
^{13}C-PCB-105	90.2	74.3	89.1	75.3
^{13}C-PCB-114	97.1	86.8	87.4	85.8
^{13}C-PCB-118	87.8	67.8	88.8	63.7
^{13}C-PCB-123	97.2	87.9	87.3	88
^{13}C-PCB-126	77.2	57.1	76.2	62.4
^{13}C-PCB-153	126	132	109	131
^{13}C-PCB-155	131	166	112	161
^{13}C-PCB-156/157	94.1	88.3	86.9	85.8
^{13}C-PCB-167	103	104	89	105
^{13}C-PCB-169	78.1	67.2	68.7	52.1
^{13}C-PCB-170	120	112	112	118
^{13}C-PCB-180	120	128	115	124
^{13}C-PCB-188	145	180	119	166
^{13}C-PCB-189	97.5	95.8	94	98.3
^{13}C-PCB-202	134	147	101	143
^{13}C-PCB-205	86.7	83.5	87.5	83.2
^{13}C-PCB-206	103	106	93.7	101
^{13}C-PCB-208	112	115	102	114
^{13}C-PCB-209	103	112	91.3	104

TABLE 5-10
PCBs FIELD AND LABORATORY BLANKS ANALYTICAL RESULTS

Analyte	**Laboratory Blank, pg**	**Field Blank, pg**
PCB 77	ND(8.07)[1]	{44.4}
PCB-81	ND(7.46)	ND(9.87)
PCB-105	14	{88.9}
PCB-114	ND(7.03)	ND(17.6)
PCB-118	47.8	310
PCB-123	ND(6.58)	ND(16.4)
PCB-126	ND(7.29)	ND(24.5)
PCB-156/157	{9.22}[1]	ND(29.7)
PCB-167	ND(6.05)	ND(17.6)
PCB-169	ND(9.53)	ND(54)
PCB-189	ND(7.2)	ND(28.1)
Total PCBs	**2,680**	**74,800**
Total Monochlorobiphenyl	19.8	4,080
Total Dichlorobiphenyl	1,130	44,000
Total Trichlorobiphenyl	302	9,400
Total Tetrachlorobiphenyl	556	12,200
Total Pentachlorobiphenyl	517	4,160
Total Hexachlorobiphenyl	126	864
Total Heptachlorobiphenyl	26.5	79.6
Total Octachlorobiphenyl	ND(6.95)	ND(30.7)
Total Nonachlorobiphenyl	ND(7.74)	ND(38.8)
Deca PCB-209	ND(10.4)	ND(35.4)

[1] Data surrounded by a “ND( )” are indicative of levels of analytes that are below the detection limit. Any values surrounded by “{}” are indicative of values that are EMPC. The value is the detection limit of the given analyte.

TABLE 5-11
PAH SURROGATE STANDARD PERCENT RECOVERIES

Sample Description	**d10-Fluorene**	**d14-Terphenyl**
Unit2-Out-M23/428/429-1	78.7	89.8
Unit2-Out-M23/428/429-2	111	105
Unit2-Out-M23/428/429-3	115	103
Unit2-Out-M23/428/429-4 (Field Blank)	84.9	85.5

TABLE 5-12
PAH EXTRACTION STANDARDS PERCENT RECOVERIES

Analyte	Unit2-Out-M23/428/429-1	Unit2-Out-M23/428/429-2	Unit2-Out-M23/428/429-3	Unit2-Out-M23/428/429-4 (FB)
$^{13}C_6$-Naphthalene	53.9	32.5	39.5	39.3
$^{13}C_6$-2-Methylnaphthalene	67.3	44.1	46.4	53.9
$^{13}C_6$-Acenaphthylene	62.5	52.3	47.3	71.1
$^{13}C_6$-Acenaphthene	80.6	62.8	56.2	80
$^{13}C_6$-Fluorene	75.4	68.8	62.9	73.8
$^{13}C_6$-Phenanthrene	66.8	77.5	64.3	71.8
$^{13}C_6$-Anthracene	55.7	63.1	56.6	66.9
$^{13}C_6$-Fluoranthene	93.4	92.8	85.8	96.3
$^{13}C_3$-Pyrene	95.2	94.7	89.1	102
$^{13}C_6$-Benz(a)anthracene	97.8	80.5	81.8	85.6
$^{13}C_6$-Chrysene	102	85.9	85.1	86.5
$^{13}C_6$-Benzo(b)fluoranthene	102	93.5	86.5	93
$^{13}C_6$-Benzo(k)fluoranthene	103	95.2	91.3	96.8
$^{13}C_4$-Benzo(e)pyrene	106	90.6	92.8	82.8
$^{13}C_4$-Benzo(a)pyrene	53.8	68.9	69.9	78
d_{12}-Perylene	60.9	55.2	66.1	83.4
$^{13}C_6$-Ideno(1,2,3-c,d)pyrene	83.7	79	98.9	71.9
$^{13}C_6$-Dibenzo(a,h)anthracene	84.8	78.6	97.4	66.4
$^{13}C_{12}$-Benzo(g,h,i)perylene	87.2	70.4	94.5	62

TABLE 5-13
PAH FIELD AND LABORATORY BLANKS ANALYTICAL RESULTS AND REPORTING LIMITS

Analyte	Laboratory Blank, ng	Field Blank, ng	Sample Train Reporting Limit, ng[1]
$^{13}C_6$-Naphthalene	337	874	4370
2-Methylnaphthalene	72.1	287	1435
Acenaphthylene	0.391	33.3	166.5
Acenaphthene	9.93	46.5	232.5
Fluorene	9.72	136	680
Phenanthrene	25.4	724	3620
Anthracene	1.41	33.6	168
Fluoranthene	3.36	62.6	313
Pyrene	2.12	43.1	215.5
Benz(a)anthracene	0.202	1.6	8
Chrysene	0.578	4.51	22.55
Benzo(b)fluoranthene	1.05	5.16	25.8
Benzo(k)fluoranthene	0.206	1.39	6.95
Benzo(e)pyrene	0.173	7.69	38.45
Benzo(a)pyrene	0.149	2.59	12.95
Perylene	ND(0.11)	0.503	2.515
Ideno(1,2,3-c,d)pyrene	0.225	6.28	31.4
Dibenzo(a,h)anthracene	0.314	ND(0.611)	4
Benzo(g,h,i)perylene	0.285	31.2	156

[1] The reporting limit is defined as 4.0 ng in sample or 5 times the field blank value. Total catch weights in air samples are surrounded by “ND( )” if the analyte catch is greater than 4.0 ng and less than 5 times the field blank value.

TABLE 5-14
AUDIT SAMPLE RESULTS

AASP	Project No.	Laboratory	Analyte	Units	Lab Results	Acceptable Range	Acceptable
RTC	SSAS369	ElementOne	Arsenic	µg/Filter	30.6	37.8-70.1	No
			Beryllium	µg/Filter	57.9	41.1-76.4	Yes
			Cadmium	µg/Filter	31.3	22.5-41.8	Yes
			Chromium	µg/Filter	29.6	17.9-33.3	Yes
			Lead	µg/Filter	58.5	41.9-77.9	Yes
			Nickel	µg/Filter	62.6	48.2-89.5	Yes
			Selenium	µg/Filter	49.3	41.1-79.3	Yes
			Zinc	µg/Filter	64.3	45.5-84.5	Yes
			Mercury	ng/mL	175	126-234	Yes
			Hydrogen Chloride	mg/L	47.8	32.8-60.8	Yes
			Fluoride	mg/dscm	9.5	7.0-13.0	Yes