

CONTENTS

1.0 INTRODUCTION.....	1-1
1.1 Overview.....	1-1
1.2 Program Scope.....	1-1
1.3 Test Schedule.....	1-2
1.4 Report Organization.....	1-2
2.0 SUMMARY OF RESULTS.....	2-1
2.1 Overview.....	2-1
2.2 Emission Summary – PM/HCl/HF.....	2-1
2.3 Emission Summary – Trace Metals.....	2-1
2.4 Emission Summary – CO, SO ₂ , NO _x , TNMHC (VOC).....	2-1
2.5 Emission Summary – Opacity.....	2-1
3.0 SOURCE AND TRAVERSE POINT SUMMARY.....	3-1
3.1 Source Description.....	3-1
3.2 Sampling Point Description.....	3-1
3.3 Process Data.....	3-1
4.0 REFERENCE METHOD TEST PROCEDURES.....	4-1
4.1 Overview.....	4-1
4.2 CEMS Test Procedures.....	4-1
4.2.1 O ₂ , CO ₂ , CO, NO _x and SO ₂ Sampling and Calibration Procedures.....	4-1
4.2.2 THC Sampling and Calibration Procedures.....	4-2
4.2.3 Pollutant/Diluent Monitoring.....	4-3
4.2.4 CEMS Sampling System Description.....	4-4



4.3	Volumetric Flow Rate.....	4-5
4.3.1	Velocity and Temperature Profile.....	4-5
4.3.2	Moisture Determination via M5/26A/13B Sampling Train.....	4-6
4.4	Method 29/Multi-Metals	4-7
4.5	Particulate Matter/ HCl/ HF - EPA Method 5 / 26A.....	4-8
5.0	QUALITY ASSURANCE/QUALITY CONTROL	5-1
5.1	Overview.....	5-1
5.2	CEMS QA.....	5-1
5.2.1	Calibration Drift and System Bias Correction	5-2
5.2.2	Calibration Gases	5-3
5.2.3	Instrumental Monitoring.....	5-3
5.2.4	Sampling Setup.....	5-3
5.3	Volumetric Flowrate	5-4
5.3.1	Methods Equipment Calibrations	5-4
5.4	Method 29/Multi-Metals	5-4
5.5	Final Report.....	5-5



LIST OF TABLES

1-3	Table 1-1 Test Program Informational Summary.....
1-4	Table 1-2 Summary of Compliance Testing – EU1 and EU2.....
1-4	Table 1-3 Summary of AAL Testing – EU1 and EU2
2-2	Table 2-1 Particulate, HCl and HF Emission Summary – Emission Unit No. 1.....
2-3	Table 2-2 Particulate, HCl and HF Emission Summary – Emission Unit No. 2.....
2-4	Table 2-3 Trace Metals Emission Summary – Emission Unit No. 1.....
2-5	Table 2-4 Trace Metals Emission Summary – Emission Unit No. 2.....
2-6	Table 2-5 CO, SO ₂ , NO _x and TNMHC (VOC) Emission Summary – Emission Unit No. 1.....
2-7	Table 2-6 CO, SO ₂ , NO _x and TNMHC (VOC) Emission Summary – Emission Unit No. 2.....
3-2	Table 3-1 Summary of Process Data Parameters - EU1 and EU2.....
5-6	Table 5-1 QA/QC Procedures for Trace Metals – EPA Method 29
5-7	Table 5-2 QA/QC Procedures for PM/HCl/HF – EPA Method 5/26A

LIST OF FIGURES

3-3	Figure 3-1 Sampling Configuration – EU1 and EU2.....
-----	--



APPENDIX

A – PM/HCL/HF EMISSIONS RESULTS

B – TRACE METAL EMISSIONS RESULTS

C – NO_x, CO, SO₂, TNMHC EMISSIONS RESULTS

D – VISIBLE EMISSIONS DATA

E – LABORATORY ANALYTICAL DATA

F – EQUIPMENT CALIBRATION /CYLINDER GAS CERTIFICATION SHEETS

G – PROCESS DATA

H – FACILITY AIR QUALITY OPERATING PERMIT



1.0 INTRODUCTION

1.1 Overview

Eastmount Environmental Services, LLC of Newburyport, MA was retained by the Upper Blackstone Water Pollution Abatement District (UBW/PAD) to conduct compliance testing on Emission Unit Nos. 1 and 2 (EU1 and EU2) at the facility's Millbury, MA location. Testing was conducted in order to demonstrate each unit's compliance status with the limits presented in Table 1-2 of this report for the parameters identified in Section 4, Table 3 of the facility's Final Air Quality Operating Permit (See Appendix H). In addition, Eastmount conducted testing for the Ambient Air Limit (AAL) parameters presented in Table 8 of the facility's Final Air Quality Operating Permit. A summary of the primary parties involved in this test program is presented in Table 1-1.

1.2 Program Scope

This test program consisted of conducting three 60-minute Continuous Emission Monitoring System (CEMS) test runs on EU1 and EU2 for the determination of Oxygen (O_2), Carbon Dioxide (CO_2), Sulfur Dioxide (SO_2), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO) and Total Non-Methane Hydrocarbons (TNMHC) in accordance with EPA Methods 3A (O_2 and CO_2), 6C (SO_2), 7E (NO_x), 10 (CO) and 18/25A (TNMHC), 40CFR60, Appendix A.

Simultaneously with the CEMS monitoring, Eastmount also measured particulate matter in accordance with EPA Method 5, hydrogen chloride and hydrogen fluoride in accordance with EPA Method 26A, trace metals in accordance with EPA Method 29, and visible emissions in accordance with EPA Method 9. All procedures were conducted in strict accordance with these methods as found in 40 CFR 60, Appendix A. The Quality Assurance Handbook for Air Pollution Measurement Systems – Vol. III was adhered to as well.

The EPA Method 5/26A isokinetic sampling train was operated for 60 minutes per run. The EPA Method 29 isokinetic train was operated for 120 minutes per run. All tests were conducted in triplicate.

All emission rates were evaluated on an applicable standard basis. A summary of compliance test parameters, methodologies and applicable emission limits are presented in Table 1-2 while a summary of additional AAL test parameters are presented in Table 1-3.



1.3 Test Schedule

Testing on Emission Unit No. 1 (EU1) was completed on March 8, 2007. Testing on Emission Unit No. 2 (EU2) was completed on March 15, 2007.

1.4 Report Organization

The remainder of this test protocol is organized into three additional sections. Section 3 presents a source and traverse point summary. A description of the flue gas monitoring procedures are provided in Section 4, while Section 5 addresses the quality assurance/quality control aspects of the program. All calculation, calibrations, field data sheets and laboratory analytical data are presented in the appendices.



Table 1-1 Test Program Informational Summary

Source Information	
Facility Name:	UBWPAD
Address:	50 Route 20 Millbury, MA 01527
Contact:	Ms. Karla Sangrey, P.E.
Office:	(508) 755-1286
Independent Consultant	
Facility Name:	Camp Dresser & McKee
Address:	One Cambridge Place, 50 Hampshire Place Cambridge, MA 02139
Contact:	Mr. Frank Sapienza, P.E.
Office:	(617) 452-6239
Test Firm Information	
Test Organization:	Eastmount Environmental Services, LLC
Address:	65 Parker Street, Unit 3 Newburyport, MA 01950
Contact:	Mr. David A. Caron
Title:	Vice President/Monitoring Services
Office:	(978) 499-9300 x11
Cell:	(978) 302-6128
State Information	
Organization:	Mass. DEP – Central Regional Office
Address:	627 Main Street Worcester, MA 01608
Contacts:	Mr. Thomas P. Cusson/Permit Chief
Phone:	(508) 792-7692 x2851



Table 1-2 Summary of Compliance Testing – EU1 and EU2

Parameter	Test Method	Runs/unit	Run Duration ¹	Emission Limits
CO	10	3	60-minutes	186 ppmvd@7%O ₂ 74 tons per year
SO ₂	6C	3	60-minutes	16 ppmvd@7%O ₂ 35 tons per year
TNMHC (VOC)	18/25A	3	60-minutes	36 ppmvd@7%O ₂ 23 tons per year
NO _x	7E	3	60-minutes	162 ppmvd@7%O ₂ 105 tons per year
Particulate (PM)	1-5	3	60-minutes	0.014 gr/dscf 12 tons per year 1.3 lb/dry ton sludge
Lead (Pb)	29	3	120-minutes	122 ug/m ³
Beryllium (Be)	29	3	120-minutes	10 grams / 24 hours
Mercury (Hg)	29	3	120-minutes	3200 grams / 24 hours
Opacity	9	3	60-minutes	10% (max 6-min)

¹-It should be noted that all testing in Table 1-2 will initiate 30-minutes after and finish 30-minutes prior to the M29 sampling train for the respective test runs.

Table 1-3 Summary of AAL Testing – EU1 and EU2

Parameter	Runs/unit	Run Duration	EPA Test Method
HCL	3	60-minutes ¹	26A
HF	3	60-minutes ¹	13B
Metals: Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se and V	3	120-minutes	29

¹-It should be noted that all testing in Table 1-2 will initiate 30-minutes after and finish 30-minutes prior to the M29 sampling train for the respective test runs.



2.0 SUMMARY OF RESULTS

2.1 Overview

On March 8 and 15, 2007 Eastmount conducted compliance emission testing on EU1 and EU2 while the unit was operating normally. A summary of results by are presented in the following subsections.

2.2 Emission Summary – PM/HCI/HF

A summary of emission results are presented in Table 2-1 and 2-2, while all supporting test data are presented in Appendix A.

2.3 Emission Summary – Trace Metals

A summary of emission results are presented in Table 2-3 and 2-4, while all supporting test data are presented in Appendix B. For Run M29-U1-R2, the analytical lab experienced an unknown interference for vanadium analysis (although vanadium was undetected), resulting in an elevated detection limit. This elevated detection limit was used to calculate vanadium emissions for that run.

2.4 Emission Summary – CO, SO2, NOx, TNMHC (VOC)

A summary of the individual test runs results are presented in Table 2-5 and 2-6, while all supporting test data are presented in Appendix C.

2.5 Emission Summary – Opacity

There was no detected opacity from either the EU1 or EU2 flue during testing. Please refer to Appendix D to review the field data sheets.



Table 2-1 Particulate, HCl and HF Emission Summary – Emission Unit No. 1

Particulate, HCL, HF Emission Summary - EU 1																	
Parameter	Units	Date	Start Time	Stop Time	Particulate Matter				HCl		HF						
					lb/hr	lb/tons dry sludge	tons/year	ppmvd @7% O2	lb/hr	tons/year	ppmvd @7% O2	lb/hr	tons/year				
Run No.	U1-R1-M5/26A	8-Mar-07	9:27	10:27	0.000216	0.0122	0.00711	0.0533	0.278	0.0093	0.041	0.110	0.0020	0.0038	0.017	<	0.009
	U1-R3-M5/26A	8-Mar-07	14:35	15:40	0.001044	0.0624	0.0353	0.273	0.332	0.0115	0.050	0.141	0.0027	0.003	0.012	<	0.012
	U1-R4-M5/26A	8-Mar-07	16:08	17:14													
Average/ Compliance Value					0.00067	0.0361	0.0202	0.158	0.337	0.010	0.045	0.173	0.003				
	Compliance Limit				0.014		1.3	12									

Table 2-2 Particulate, HCl and HF Emission Summary – Emission Unit No. 2

Particulate, HCL, HF Emission Summary - EU 2															
Parameter	Units	Date	Start Time	Stop Time	Run No.										
					U2-R1-M5/26A	U2-R2-M5/26A	U2-R3-M5/26A	Average/ Compliance Value			Compliance Limit				
	MM/DD/YY	15-Mar-07	9:27	12:05	13:11	16:16									
	HH:MM	10:30													
	gr/dscf	0.000869	0.0129	0.0066	0.056	0.122	0.140	12							
	lb/hr	0.0552	0.0143	0.0164	0.242	0.315	0.0125	0.0549	0.158	0.0034	0.0141	0.0151			
	lb/tons dry sludge	0.0283	0.056	0.056	0.316	0.307	0.0129	0.0563	0.146	0.0032	0.0141	0.0151			
	tons/year	0.242	0.316	0.307	0.0127	0.0129	0.0125	0.0549	0.158	0.0034	0.0141	0.0151			
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														
	tons/year														
	ppmvd @7% O2														
	lb/hr														

1.92 1.95 1.93



Table 2-3 Trace Metals Emission Summary – Emission Unit No. 1

Trace Metals Emission Summary - Emission Unit 1									
Parameter	Units	Date	Start Time	Stop Time	Run No.				
					U1-R1-M29	U1-R2-M29	U1-R3-M29	Average/ Compliance Value	Compliance Limit
Antimony	ug/M3	<	3.59E-01	<	3.56E-01	<	3.14E-01	3.43E-01	
	lb/hr	<	8.29E-06	<	8.64E-06	<	8.28E-06	8.41E-06	
	grams/24hr	<	9.03E-02	<	9.40E-02	<	9.02E-02	9.15E-02	
Arsenic	ug/M3	9.33E-01	2.87E+00	4.87E-01	1.43E+00	3.47E-05	3.78E-01		
	lb/hr	2.16E-05	6.97E-05	1.28E-05					
	grams/24hr	2.35E-01	7.59E-01	1.40E-01					
Beryllium	ug/M3	<	8.97E-02	<	8.68E-02	<	7.85E-02	8.50E-02	
	lb/hr	<	2.07E-06	<	2.11E-06	<	2.07E-06	2.08E-06	
	grams/24hr	<	2.26E-02	<	2.29E-02	<	2.25E-02	2.27E-02	10
Cadmium	ug/M3	2.74E-01	3.90E+00	5.18E-01	1.56E+00	3.82E-05	4.16E-01		
	lb/hr	6.32E-06	9.47E-05	1.37E-05					
	grams/24hr	6.89E-02	1.03E+00	1.49E-01					
Chromium	ug/M3	3.64E+00	4.01E+02	1.27E+01	1.39E+02	3.38E-03	3.68E+01		
	lb/hr	8.42E-05	9.72E-03	3.36E-04					
	grams/24hr	9.17E-01	1.06E+02	3.66E+00					
Copper	ug/M3	1.77E+00	1.47E+01	1.11E+00	5.87E+00	1.43E-04	1.55E+00		
	lb/hr	4.09E-05	3.58E-04	2.94E-05					
	grams/24hr	4.45E-01	3.89E+00	3.20E-01					
Lead	ug/M3	7.58E-01	9.46E-01	5.53E-01	7.53E-01	1.84E-05	2.00E-01		122
	lb/hr	1.75E-05	2.30E-05	1.46E-05					
	grams/24hr	1.91E-01	2.50E-01	1.59E-01					
Nickel	ug/M3	5.29E+00	4.24E+02	1.33E+01	1.48E+02	3.59E-03	3.91E+01		
	lb/hr	1.22E-04	1.03E-02	3.51E-04					
	grams/24hr	1.33E+00	1.12E+02	3.82E+00					
Selenium	ug/M3	<	8.97E-01	9.81E-01	5.49E+00	1.34E-04	1.45E+00		
	lb/hr	<	2.07E-05	2.59E-05					
	grams/24hr	<	2.26E-01	2.82E-01					
Vanadium	ug/M3	2.56E-01	4.34E+00	1.57E-01	1.58E+00	3.85E-05	4.19E-01		
	lb/hr	5.91E-06	1.05E-04	4.14E-06					
	grams/24hr	6.43E-02	1.15E+00	4.51E-02					
Mercury	ug/M3	8.91E+01	7.69E+01	7.39E+01	8.00E+01	1.96E-03	2.13E+01		3200
	lb/hr	2.06E-03	1.87E-03	1.95E-03					
	grams/24hr	2.24E+01	2.03E+01	2.12E+01					

Table 2-4 Trace Metals Emission Summary – Emission Unit No. 2

Trace Metals Emission Summary - Emission Unit 2									
Parameter	Units	Date	Start Time	Stop Time	Run No.	Compliance Limit	Average/ Compliance Value	Compliance	Limit
Antimony	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	6.32E-01	2.09E-01	1.92E-05	3200
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	1.36E+00	2.74E-01	1.92E-05	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	4.44E-01	9.14E-02	2.09E-01	
Arsenic	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	3.27E-01	1.16E-01	2.74E-01	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	9.83E-06	3.67E-06	8.41E-06	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	1.07E-01	4.00E-02	9.15E-02	
Beryllium	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	7.03E-02	6.63E-02	6.84E-02	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	2.11E-06	2.10E-06	2.11E-06	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	2.30E-02	2.29E-02	2.29E-02	10
Cadmium	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	2.62E+00	7.56E-01	1.50E+00	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	7.87E-05	2.39E-05	4.59E-05	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	8.57E-01	2.61E-01	4.99E-01	
Chromium	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	3.49E+00	1.09E+00	8.63E+00	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	1.05E-04	3.46E-05	2.66E-04	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	1.14E+00	3.77E-01	2.89E+00	
Copper	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	4.02E+00	1.14E+00	2.42E+00	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	1.21E-04	3.61E-05	7.39E-05	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	1.32E+00	3.93E-01	8.05E-01	
Lead	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	4.52E+00	6.06E-01	1.89E+00	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	1.36E-04	1.92E-05	5.73E-05	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	1.48E+00	2.09E-01	6.24E-01	122
Nickel	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	2.35E+00	2.15E+00	8.67E+00	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	7.08E-05	6.63E-04	2.67E-04	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	7.71E-01	7.43E-01	2.91E+00	
Selenium	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	9.84E-01	1.13E+00	9.26E-01	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	2.96E-05	3.48E-05	2.85E-05	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	3.22E-01	2.29E-01	3.10E-01	
Vanadium	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	2.18E-01	1.37E-01	1.62E-01	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	6.55E-06	4.22E-06	4.99E-06	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	7.13E-02	4.60E-02	5.43E-02	
Mercury	ug/M3	3/15/07	8:45	11:00	U2-R1-M29	5.15E+01	6.49E+01	5.90E+01	
	lb/hr	3/15/07	8:45	11:00	U2-R2-M29	1.55E-03	2.00E-03	1.82E-03	
	grams/24hr	3/15/07	8:45	11:00	U2-R3-M29	1.69E+01	2.18E+01	1.98E+01	3200

Table 2-5 CO, SO₂, NO_x and TNMHC (VOC) Emission Summary – Emission Unit No. 1

CEMS Emission Summary - EU 1									
Parameter	Units	Date	Start Time	Stop Time	Run No.				
					U1-CEMS-R1	U1-CEMS-R3	U1-CEMS-R4	Average/ Compliance Value	Compliance Limit
CO	ppmvd @7% O ₂	8-Mar-07	9:27	10:27	24.19	29.48	29.06	27.58	186
	lb/hr	8-Mar-07	9:27	10:27	0.4771	0.7592	0.7715	0.6693	
	tons/year	8-Mar-07	9:27	10:27	2.090	3.325	3.379	2.93	74
NO _x	ppmvd @7% O ₂	8-Mar-07	9:27	10:27	79.17	79.00	70.98	76.38	162
	lb/hr	8-Mar-07	9:27	10:27	2.564	3.341	3.095	3.000	
	tons/year	8-Mar-07	9:27	10:27	11.231	14.635	13.558	13.14	105
SO ₂	ppmvd @7% O ₂	8-Mar-07	9:27	10:27	2.26	0.31	1.03	1.20	16
	lb/hr	8-Mar-07	9:27	10:27	0.1020	0.0184	0.0624	0.0609	
	tons/year	8-Mar-07	9:27	10:27	0.447	0.081	0.273	0.27	35
TNMHC	ppmvd @7% O ₂	8-Mar-07	9:27	10:27	1.52	1.75	1.65	1.64	36
	lb/hr	8-Mar-07	9:27	10:27	0.0176	0.0264	0.0258	0.0233	
	tons/year	8-Mar-07	9:27	10:27	0.077	0.116	0.113	0.102	23

Table 2-6 CO, SO₂, NO_x and TNMHC (VOC) Emission Summary – Emission Unit No. 2

CEMS Emission Summary - EU 2									
Parameter	Units	Run No.			Average/ Compliance Value	Compliance Limit	Date	Start Time	Stop Time
		1	2	3					
CO	ppmvd @7% O ₂	84.02	43.53	50.54	59.37	186			
	lb/hr	2.590	1.310	1.554	1.818	74			
	tons/year	11.34	5.74	6.81	7.96				
NO _x	ppmvd @7% O ₂	54.41	79.43	71.73	68.52	162			
	lb/hr	2.754	3.924	3.623	3.434				
	tons/year	12.06	17.19	15.87	15.04	105			
SO ₂	ppmvd @7% O ₂	1.67	3.53	2.89	2.70	16			
	lb/hr	0.1175	0.2431	0.2031	0.1879				
	tons/year	0.515	1.065	0.889	0.82	35			
TNMHC	ppmvd @7% O ₂	4.80	3.55	4.71	4.35	36			
	lb/hr	0.0867	0.0631	0.0851	0.0783				
	tons/year	0.380	0.276	0.373	0.343	23			



3.0 SOURCE AND TRAVERSE POINT SUMMARY

3.1 Source Description

This stack consists of an outer steel shell which encompasses three smaller stacks/flues. Exhaust from the Regenerative Thermal Oxidizers serving the incinerators is emitted to atmosphere through either of two flues while exhaust from emission unit #3 (the RTO used for odor control) has a dedicated flue. The exit height of each flue is 125 feet above ground level while each flue has an internal diameter at exit of 3.17 feet. The maximum exhaust gas flow rate for either flue serving both EU #1 and EU#2 is 42,389 cubic feet per minute at 267 degrees Fahrenheit (exit velocity of 90 fps).

3.2 Sampling Point Description

Testing was performed at the stack platform level which is 30' above the closest bend and 45' above grade. Testing for each stack was conducted on the platform which encircles the outer steel shell utilizing two sampling ports with elongated test sleeves located 90 degrees to each other. Eastmount temporarily installed monorails for testing in addition to temporarily removing a previously cut out top rail, enabling the sampling trains to inserted into the stack (a temporary chain will be used to replace the rail during sampling). A picture of the sample location and a summary of traverse points are presented in Figure 3-1.

3.3 Process Data

A summary of facility process data that was recorded by the facility data acquisition system and/or personnel is presented in Table 3-1. This data can be found in Appendix G.



Table 3-1 Summary of Process Data Parameters - EU1 and EU2

Data Frequency	Process Parameter	
	Sludge feed (%solids and %volatile solids)	Sludge feed rate (gallons/minute)
Collect and analyze once/half hour		
Total gallons/test duration (minutes)		
Readings once/15-minutes	<ul style="list-style-type: none"> • Combined venturi and tray scrubber pressure drop • Exhaust gas oxygen content • Scrubber inlet and outlet temperatures • Scrubber water flow rates for venturi and tray scrubber • Scrubber additive caustic feed rate • Scrubber effluent stream pH • RTO operating temperature • Auxiliary fuel feed rate 	



Figure 3-1 Sampling Configuration – EU1 and EU2

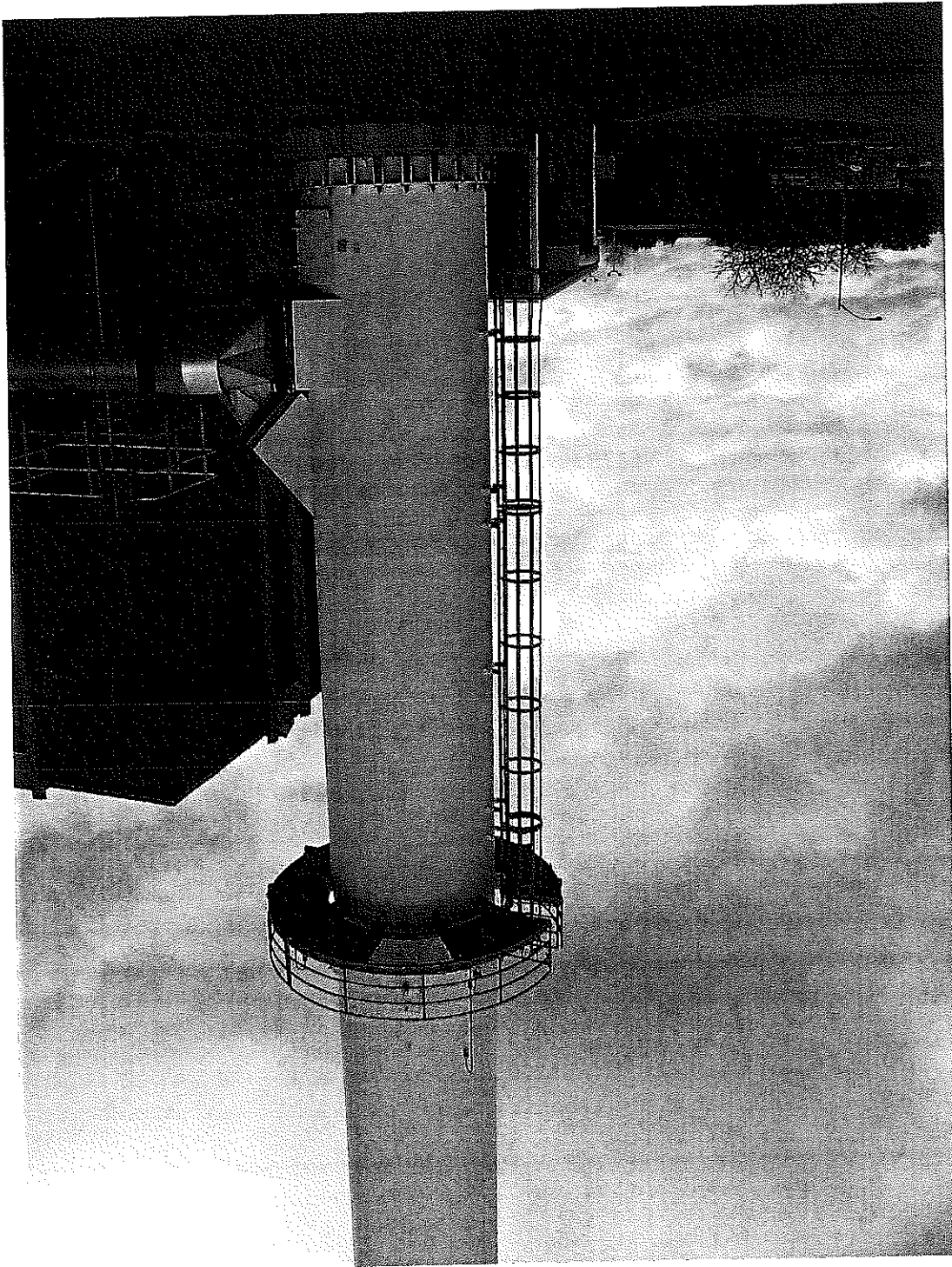
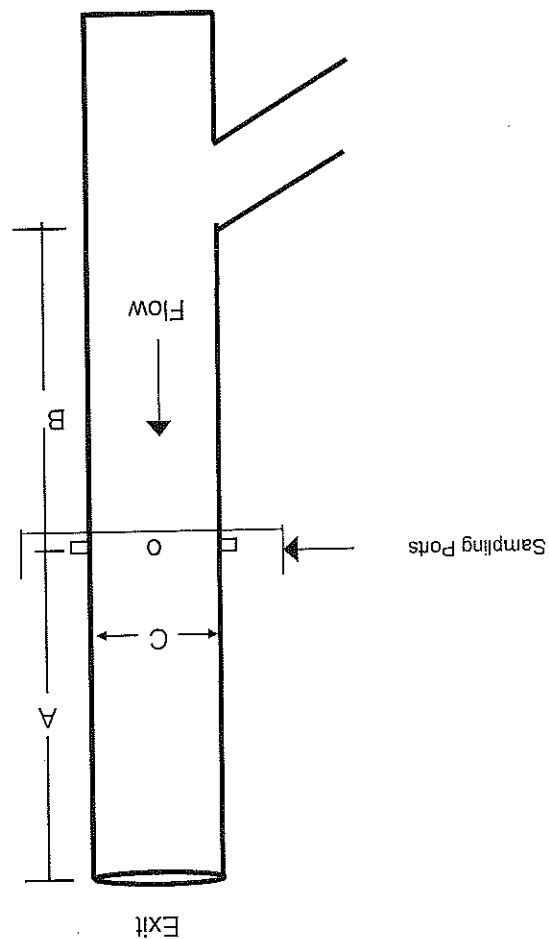


Figure 3-1 (Continued)

Stack Configuration		
Description	Distance	Equivalent Diameters
Upstream (A)	≥50'	≥50'
Downstream (B)	30'	8.2
Diameter (C)	3'8"	NA
Port Sleeve	18.5"	NA
Port Diameter	4"	NA
Particulate Traverse Points (per diameter)		
Traverse Points	% of diameter	Distance (inches)
1	4.4	1.9
2	14.6	6.4
3	29.6	13.0
4	70.4	31.0
5	85.4	37.6
6	95.6	42.1
CEMS Stratification Traverse Points ¹		
Traverse Points	% of diameter	Distance (inches)
1	16.7	7.3
2	50.0	22.0
3	83.3	36.7

¹ – The final CEMS traverse point(s) were selected in accordance with EPA Method 7E based upon the results of the stratification check.



4.0 REFERENCE METHOD TEST PROCEDURES

4.1 Overview

This stack testing program consisted of conducting a set of three 60-minute CEMS test runs for each of the parameters previously defined in Table 1-2. Specifically, each test run will be comprised CEMS monitoring for O₂, CO₂, CO, NO_x, SO₂ and TNMHC in conjunction with the combined isokinetic sampling train for PM/HCL/HF and Trace Metals. This section provides greater detail to the sampling procedures/components that as a whole comprised this test program.

4.2 CEMS Test Procedures

This section outlines all of the reference method CEMS test procedures associated with the conduct of this test program.

4.2.1 O₂, CO₂, CO, NO_x and SO₂ Sampling and Calibration Procedures

The O₂, CO₂, CO, NO_x and SO₂ CEMS analyzers were calibrated through both a direct and system calibration procedure in order to ensure the validity of all data collected. First, each instrument was calibrated directly (not through the system) with zero and two upscale points, as follows:

1. Deliver zero gas to respective analyzers until stable response is obtained, then adjust each analyzers zero potentiometer or equivalent to read as close to zero as possible.
2. Deliver span (highest value) gas to respective analyzers until stable response is obtained, then adjust each instruments span potentiometer or equivalent to read as close to the cylinder value as possible.
3. Deliver mid-level gas to respective analyzers until stable response is obtained, then calculate if the observed value meets 2% linearity criteria specified by the method. If the calibration meets the linearity criteria, proceed to system calibration procedures. Otherwise, take corrective action and repeat direct calibration procedures for analyzers not meeting the linearity criteria.

Following a successful direct calibration the instruments were subjected to a system calibration, as follows:



4. Deliver zero gas through the entire sampling system, record the respective analyzer responses and calculate the respective analyzers calibration biases.
 5. Deliver a representative upscale calibration gas through the entire system, record the respective analyzer responses and calculate the respective analyzers calibration biases.
- If initial bias criteria are satisfactorily met, a sampling run may be initiated following a sufficient purge of the sampling line with stack gas. Following the sampling run a subsequent system calibration is conducted as follows:

6. Deliver zero gas through the entire sampling system, record the respective analyzer response and calculate the respective analyzers calibration drift and biases.
7. Deliver a representative upscale (same gas cylinder as step 5) calibration gas through the entire system, record the respective analyzer responses and calculate the respective analyzers calibration drift and biases.

If all linearity, calibration drift and calibration bias criteria are met then the collected data is considered valid and subsequent runs may be conducted. Each run is required to be bracketed by system calibrations. If calibration criteria are not met, the data collected are not considered valid, corrective action is taken and all calibration steps are repeated.

4.2.2 THC Sampling and Calibration Procedures

The FID was calibrated prior to sampling using zero, low, mid and high methane (for CH₄ and THC channels) calibration gases certified in accordance with EPA Protocol procedures. Calibrations were conducted through the entire sample system. A description of the specific procedures is provided below:

- **Zero:** The zero point of the analyzer is determined using a pre-purified cylinder of nitrogen. The zero point is analyzed for a minimum of five minutes to monitor drift before sampling commences.
- **Low:** The low calibration gas is 25-35% of span. It is introduced to the sample system and the response of the analyzer is recorded.
- **Mid:** The mid calibration gas is 45-55% of span. It is introduced to the sample system and the response of the analyzer is recorded.



- **High:** The high calibration gas is 80-90% of span. It is introduced to the sample system and the response of the analyzer is adjusted accordingly.

Once the analyzer was calibrated, the system calibration valve was switched to sample mode and sampling commenced. The response time of the system was determined from the time the valve was actuated to the time the response of the FIA is 95% of the steady state sample value. The DAS then recorded the analyzer response throughout the test run. Following the test run, the sampling system was post calibrated. The post calibration consisted of delivering zero and a representative upscale calibration point through the entire sampling system and recording the system response. This response was used in conjunction with the initial system calibration in order to determine calibration drift over the test run period.

4.2.3 Pollutant/Diluent Monitoring

In general, the sample is extracted, analyzed, and recorded in accordance with the applicable Performance Specifications while following procedures delineated in the applicable instrumental analyzer procedures. All calibrations will be conducted utilizing EPA Protocol gases. The results of calibrations will be used to determine the acceptability of the test data. Each analyzer used during this test program is detailed below.

4.2.3.1 Oxygen (O₂)

During this test program, oxygen was monitored in accordance with EPA Method 3A, 40 CFR 60, Appendix A. Eastmount complied with instrumental analyzer procedure 3A utilizing a Teledyne Model 326A oxygen analyzer operated on a 0-25% range.

4.2.3.2 Carbon Dioxide (CO₂)

During this test program, carbon dioxide was monitored in accordance with EPA Method 3A, 40 CFR 60, Appendix A. Eastmount complied with instrumental analyzer procedure 3A utilizing a Fuji Model 3400 non-dispersive infrared analyzer operated on a 0-20% range.

4.2.3.3 Carbon Monoxide (CO)

During this test program, carbon monoxide was monitored in accordance with EPA Method 10, 40 CFR 60, Appendix A. Eastmount complied with Method 10 utilizing a TECO Model 481 (or equivalent) Non-Dispersive Infra Red (NDIR) analyzer operated on a 0-200 ppm range.





- **Sample Probe** - A heated stainless steel probe of sufficient length to sample three locations specified in Section 3.2 of PS2, 40 CFR 60, Appendix B.
- **Filter** - A spun glass fiber filter contained in a heated sheath. The filter is located between the sample probe and sample line, it is designed to remove particulate from the gas stream.
- **Sample Line** - 3/8" Teflon tubing in a heated sample line designed to transport the sample gas from the probe to the sample conditioning system (in the CEMS trailer). It should be noted that a slipstream of the sample is delivered to the TNMHC analyzer prior to the sample passing through the condenser.

4.2.4.1 Sample Delivery and Conditioning System

What follows is a description of the transportable continuous emissions monitor system that was used to quantify each of the diluents/pollutants that comprised this test program.

4.2.4 CEMS Sampling System Description

Total non-methane hydrocarbons were determined in accordance with EPA Method 18/25A at the outlet stack. Eastmount used a VIG Industries Model 200E flame ionization detector operated on a 0-100 ppm range. This instrument is capable of measuring both total hydrocarbons and methane on a real-time basis. The instrument meets the performance specifications of Methods 18/25A. It was calibrated prior to and following each test period using certified methane (+/- 2%) calibration gas standards in the range of 0-100ppm.

4.2.3.6 Total Non-methane Hydrocarbons (TNMHC)

During this test program, sulfur dioxide was monitored in accordance with EPA Method 6C, 40 CFR 60, Appendix A. Eastmount complied with instrumental analyzer procedure 6C utilizing a Bovar 721M monitor calibrated on a 0-100 ppm range.

4.2.3.5 Sulfur Dioxide (SO₂)

During this test program, oxides of nitrogen were monitored in accordance with EPA Method 7E, 40 CFR 60, Appendix A. Eastmount complied with instrumental analyzer procedure 7E utilizing a Model 42H NO_x chemiluminescent monitor calibrated on a 0-200 ppm range.

4.2.3.4 Oxides of Nitrogen (NO_x)



As part of the Method 5/26A/13B sampling train, Eastmount conducted volumetric flow rate determinations during this test program in accordance with procedures delineated in EPA Methods 1 and 2, 40 CFR 60, Appendix A. The system components necessary to conduct this testing are detailed below.

4.3.1 Velocity and Temperature Profile

4.3 Volumetric Flow Rate

- **Computer** – A Dell Inspiron 8500.
- **Software** – Iotech data acquisition system (DAQ 56). This system is programmed to collect data once per every two seconds, while reporting 1-minute averages. This software operates in a Windows environment.

4.2.4.3 Data Acquisition System

- **Calibration Gases** – EPA Protocol Gases certified in accordance with EPA Protocol procedures.
- **Calibration System** - A series of manual valves designed to deliver a specified gas either directly to an analyzer or through the entire sampling system by activating the appropriate valve sequence.
- **Calibration Line** – Teflon line (1/4") run in parallel to the sample line.
- **Calibration Tee** - Stainless steel tee (3/8") located between the probe and the filter that allows the operator to inject calibration gas through the entire sampling system. Excess calibration gas exits the probe eliminating any potential over pressurization.

4.2.4.2 Calibration System

- **Condensers** – A thermo-electrically designed chiller is used to reduce the sample dew point to four degrees Celsius. The chiller is located just prior to the main sample pump.
- **Sample Pump** - A diaphragm type vacuum pump to draw gas from the probe through the conditioning system and to the analyzers. The pump head is made of stainless steel, the valve disks are Viton and the diaphragm is Teflon coated.
- **Sample Distribution System** - A series of flow meters, valves and backpressure regulators allows the operator to maintain constant flow and pressure conditions during sampling and calibration.

- **Pitot Tube** - A Type "S" pitot tube was used to measure all gas velocities. The pitot tube met all of the dimensional criteria set forth in Method 2, therefore a coefficient of 0.84 was used.

- **Pitot Lines** - The pitot tube is connected to a manometer via leak free teflon tubing.
- **Manometer** - An inclined manometer capable of measuring ten inches of water column pressure drop was used.
- **Thermocouple** - A "K" type thermocouple is used to monitor the stack temperature at each traverse point.

- **Static Pressure** - One static pressure measurement is conducted during each test run by rotating the pitot tubes perpendicular to the direction of flow, disconnecting the negative pitot (if positive) and recording the deflection of the manometer.

- **Barometric Pressure** - The barometric pressure is determined on-site using an aneroid barometer that was previously calibrated at Eastmount's laboratory using a NIST traceable mercury barometer.

- **Gas Molecular Weight Determination** - The O_2 and CO_2 content of the sample gas is measured in accordance with EPA Method 3A, 40 CFR 60, Appendix A.

4.3.2 Moisture Determination via MS/26A/13B Sampling Train

Concurrent with each CEMS monitoring run Eastmount conducted a Method 5 isokinetic sampling train modified for additional collection/analysis of HCL and HF. The sampling train meets the specifications identified in EPA Method 5, with the exception that the impinger setup was modified as per EPA Test Methods 26A. Specifically, the first two impingers were both of the Greenburg-Smith (G-S) design with the standard tip, and each will contain 100 mL of 0.1 N H_2SO_4 , as per Method 26A. In accordance with Method 5, the probe liner and nozzle were borosilicate or quartz glass. A synopsis of the procedure is presented below.

1. **Sample Train Preparation** - Sample train preparation for high load test runs will consist of the following:

- Place 100ml of 0.1N H_2SO_4 in each of the first 2 impingers.
- Place 200 grams of silica gel in the fourth impinger.
- Record initial volumes and weights on the field data for each impinger.
- Assemble entire sampling train.

2. **Pre-Test Leak Check** - The system is leak checked at fifteen inches of vacuum (15"Hg). A leak rate of less than 0.02 CFM must be achieved prior to the start of sampling.

3. **Sampling** - A sample is collected isokinetically at an approximate rate of 0.75 dscfm. The sample gas volume, sample vacuum as well as probe, impinger, and dry gas



meter (in and out) temperatures are recorded at 5-minute intervals during each test run.

4. **Post-Test Leak Check** - Upon completion of each test run, the system is leak checked at or above the highest vacuum recorded during that run. All leak checks must be less than 0.02 CFM to be considered acceptable.

5. **Sample Recovery and Analysis** - The impingers are first recovered quantitatively for determination of net condensate gain at the completion of each test set. Subsequently, all glassware from the backhalf of the filter holder on is rinsed with DI water and added to the net condensate gain. The sample is then labeled for subsequent delivery to Maxxam Analytical for analysis.

4.4 Method 29/Multi-Metals

The Method 29 multi-metals sampling train consists of a basic EPA Method 5 train with a glass nozzle, Teflon union, glass probe liner, glass filter holder, quartz glass fiber filter, Teflon filter support, and additional impingers. The first and second impingers each contain 100 ml of 5% $\text{HNO}_3/10\% \text{H}_2\text{O}_2$ absorbing solution. The third impinger is left empty. The fourth and fifth impingers each contain 100 ml of 4% $\text{KMnO}_4/10\% \text{H}_2\text{SO}_4$, while the sixth impinger contains a pre-weighed amount of silica gel.

Prior to mobilization, all glassware for the sampling train is washed in hot water and detergent, thoroughly rinsed with tap water, soaked for at least 8 hours in a 10% HNO_3 bath, rinsed clean with HPLC-grade H_2O , rinsed with HPLC-grade acetone, allowed to dry, sealed and labeled.

Prior to sampling, a "K-factor" is established; the train is assembled and leak checked. After the probe and filter box reach the desired operating temperature, the probe is placed in the stack, and isokinetic sampling commences at a rate of 0.5 to 1.0 cfm. Sampling consists of collecting a sample isokinetically for ten minutes at each of 12 sample points previously identified in Figures 3-1. Eastmount conducted readings at 5-minute intervals throughout the testing.

Following each test run, the sample is carefully recovered in the field laboratory. Each train yields six sample fractions as follows:

- Fraction 1: The filter is carefully removed and placed in a prepared 250ml amber bottle.
- Fraction 2: The front half, including the nozzle, probe, and filter holder front half are rinsed with a Teflon brush and 100 ml of 0.1N HNO_3 into a prepared 250ml amber glass bottle.





The sampling train consisted of a glass nozzle, Teflon union, heated glass lined probe, a glass filter holder, heated quartz glass filter, Teflon filter support, and a series of impingers. The impinger condenser consisted of five impingers: the first, third, fourth and fifth were of the modified Greenburg-Smith design; the second was of the standard Greenburg-Smith type. The first and second impingers were loaded with 0.1N sulfuric acid (H_2SO_4) for absorbing HCl and NH_3 . The third impinger was empty. The fourth impinger contained a known amount of silica gel. All glassware was thoroughly cleaned and sealed for mobilization to the site prior to sampling.

Particulate matter was measured using EPA Methods 1 through 5. Hydrogen chloride and hydrogen fluoride were measured from the back half of this train in accordance with EPA Method 26A. Method 5 measurements included the determination of the proper number of sampling points and their locations in the stack (RM1), stack velocity and volumetric flow rate (RM2), stack gas molecular weight (RM3) and stack gas moisture content (RM4). The train was an EPA Method 5-type isokinetic sampling train. Sampling was conducted isokinetically for a period of 60 minutes per run, collecting a minimum of 30 dry standard cubic feet.

4.5 Particulate Matter/ HCl/ HF - EPA Method 5 / 26A

Prior to recovery all impinger volumes are recorded in order to determine the moisture net gain. Additionally, the sixth impinger containing the silica gel is weighed to determine net gain prior to the contents being discarded. Lastly, one set of reagent blanks is collected in accordance with the method during this test program. All samples are labeled, logged, and stored in a cool, dark area until delivery by courier to Maxxam Analytical in Burlington for analysis.

- Fraction 6: The fourth and fifth impingers are subsequently cleaned with 25 ml of 8N HCl and 200 ml of DI H_2O into a separate 250ml glass amber bottle.
- Fraction 5: The fourth and fifth impingers and contents are measured and rinsed into a 500ml amber glass bottle with 100 ml of 4% $KMnO_4$ / 10% H_2SO_4 , followed by a rinse of 100 ml of DI H_2O .
- Fraction 4: The third impinger and contents are measured and rinsed with 100 ml of 0.1N HNO_3 into a prepared 250ml amber glass bottle.
- Fraction 3: The back half, including the frit, filter holder back half, connecting glassware, plus the first and second impingers and contents are rinsed with 100 ml of 0.1N HNO_3 into a prepared 1000ml amber glass bottle.

All filters and beakers were weighed before and after sampling in strict accordance with the Method and the EPA Quality Assurance Handbook. They were desiccated for at least 24 hours, and then weighed at six-hour intervals until two consecutive weighings demonstrated a constant weight, \pm 0.5 milligrams.

Prior to sampling, the K-factor was established, and the train was assembled and leak checked. After the probe and filter box reached the desired operating temperature, the probe was placed in the stack, and isokinetic sampling took place.

At the completion of isokinetic sampling, the train was leak checked, disassembled, and sealed. All train recovery procedures were conducted in accordance with EPA Method 5 and 26A. The filter was carefully removed from the filter holder, placed in a labeled petri dish and stored in a portable desiccator. The nozzle, probe, and filter holder front half were thoroughly brushed and rinsed with acetone into a container labeled for identification. Volumes were noted and liquid levels marked.

A set of reagent blanks was taken for analysis along with the samples. The impinger condensate was measured in a graduated cylinder for determination of moisture in the flue gas.

Particulate samples were analyzed gravimetrically at Eastmount's laboratory in accordance with the method. The acetone rinses were evaporated to dryness in tared beakers. All filters and beakers were desiccated before and after sampling for 24 hours, and weighed at 6-hour intervals until two consecutive weights were within ± 0.5 mg. Additional information can be found in the Quality Control Procedures section of this report.

The back half samples were split and analyzed for HCl and HF by ion chromatography. Sample analysis was conducted by Maxxam Analytics Inc. of Burlington, Ontario.



5.0 QUALITY ASSURANCE/QUALITY CONTROL

5.1 Overview

Strict QA/QC protocols were followed during all phases of this project. These protocols included:

- QA objectives for measurement data;
- Data reduction;
- Internal QC;
- Calibration of equipment;
- Corrective action, if necessary; and
- Use of standardized field data sheets.

The following sections summarize specific aspects of the CEMS certification program.

5.2 CEMS QA

Specific procedures were followed to ensure the validity of the CEMS data collected for this task. The following subsections outline the specific procedures and performance criteria that was utilized to maintain quality assurance throughout the program.

- **Analyzer Calibration Error (ACE)** – At the beginning of each test day an analyzer calibration error (direct calibration) is conducted for each analyzer by introducing zero and an upscale calibration gas upstream from the respective analyzers and calibrating the respective analyzers to the corresponding calibration gas value. A mid-range gas is then injected to the respective analyzers in order to demonstrate linearity. The maximum allowable calibration error is 2% of instrument span. If this limit is not achieved, corrective action is taken and the procedure are repeated until successful. Analyzer calibration error is calculated as follows:

$$ACE = \frac{(C_{Dir} - C_v)}{CS} \times 100$$

Where:

C_{Dir} = Measured concentration of a calibration gas (low, mid, or high) when introduced in direct calibration mode, ppmv.



C_v = Manufacturer certified concentration of a calibration gas (low, mid, or high), ppmv.
CS = Calibration span, ppmv.

- **Sampling System Bias (SB)** – Following the performance of the analyzer calibration error a system bias check is conducted by introducing sampling gas through the entire sampling system (system calibration) and comparing the response of the analyzer calibration error with that of the system calibration. The maximum allowable calibration error is 5% of instrument span. If this limit is not achieved, the test run is voided and corrective action taken. If analyzer adjustments are made, the analyzer calibration error and system bias checks are repeated until the calibration met the EPA Method 7E criteria. System bias is calculated as follows:

$$SB = \frac{(C_s - C_{Dr})}{CS} \times 100$$

Where:

C_s = Measured concentration of a calibration gas (low, mid, or high) when introduced in system calibration mode, ppmv.

- **Calibration Drift (D)** – Prior to and following each test run a system calibration is conducted in order to determine calibration drift during each test period. The maximum allowable calibration drift is 3% of instrument span. If the calibration drift is exceeded, corrective action is taken. If any analyzer adjustments are made, a new analyzer calibration error and system bias check are conducted. Calibration drift is calculated as follows:

$$D = |SB_{final} - SB_{initial}| \times 100$$

5.2.1 Calibration Drift and System Bias Correction

Each instrumental analyzer method requires the correction of CEMS data for the system bias and calibration drift observed over each test period. All run averages are corrected for system bias and calibration drift as follows:

$$C_{Gas} = (C_{Avg} - C_o) \left[\frac{C_{MA}}{C_M - C_o} \right]$$

Where:



C_{Gas}	= Average effluent gas concentration adjusted for bias, ppmv.
C_{Avg}	= Average unadjusted gas concentration indicated by data recorder for test run.
C_o	= Average of initial and final system calibration bias (or 2-point system calibration error) check responses from the low-level (or zero) calibration gas, ppmv.
C_M	= Average of initial and final system calibration bias (or 2-point system calibration error) check responses for the upscale calibration gas, ppmv.
C_{MA}	= Actual concentration of the upscale calibration gas, ppmv.

5.2.2 Calibration Gases

All calibration gases utilized during the test program are prepared according to EPA Protocol quality standards. The gas specification sheets supplied by the vendor are provided in the appendices.

5.2.3 Instrumental Monitoring

The reference method CEMS system is leak-checked prior to the initiation of testing on each source. This ensures that a representative sample from the stack is being delivered to the monitors. The calibration drift/bias checks provide a continuous check data quality throughout the remainder of the test program.

CEMS data quality is assured throughout the test program by following procedures delineated in Instrumental monitoring Methods 6C (SO₂), 7E (NO_x), 10 (CO), 3A (O₂ and CO₂) and 18/25A (TNMHC). A summary of the QA portion of the test program is presented below.

5.2.4 Sampling Setup

The following procedures are conducted during the initial phase of the program

- **Sample Point Selection** – All sample points are selected in accordance with Section 3.2 of PS2.
- **Leak Check** – Prior to the initiation of testing the reference method CEMS system is leak checked from the end of the sample probe. If a leak is detected, it is traced and fixed. The procedure is then be repeated until successful.



5.3 Volumetric Flow Rate

The reference method sample train is leak-checked prior to and following each test run. This ensures that a representative sample from the stack will be drawn during each run.

Reference Method 1 is used for the selection of traverse points. Method 2 is used for the determination of volumetric flow. Method 3A is used for the collection of fixed gases during each test run and Method 4 is used for the determination of moisture.

5.3.1 Methods Equipment Calibrations

Eastmount's meter boxes, pitot tubes, thermocouples and barometers are maintained in accordance with specifications set forth in EPA "Quality Assurance Handbook for Air Pollution Measurement Systems - Volume III Stationary Source Specific Methods" Section 3.3.5 dated January 15, 1980 and with manufacturers suggested procedures. A summary is presented below:

- **Dry Gas Meter and Orifice Meter/EPA Method 5** - All dry gas meters are calibrated against a GCA/Precision wet test meter that is calibrated against a spirometer. The orifice meters in the meter control box are calibrated against the wet test meter and checked against the dry gas meter to which it is attached.

- **Balance** - All analytical balances are calibrated against Class M weights. A daily onsite check is also conducted using a Class S weight.

- **Thermocouples** - All type K thermocouples are calibrated against ASTM mercury in glass thermometers at two points. The first point is in an ice bath and the second at the boiling point of water.

- **Pitot Tubes** - All Type "S" stainless steel pitot tubes are designed to meet the dimensional criteria set forth in Method 2, therefore a coefficient of 0.84 (Type "S") will be used.

5.4 Method 29/Multi-Metals

Prior to field testing, extensive preparation is necessary to properly complete the test method. All glassware including probe liners, filter holders, impingers, connecting pieces, and sample containers, are thoroughly cleaned with detergent, tap water, DI water, soaked in a 10% HNO₃ bath for a minimum of eight hours, rinsed with DI H₂O, rinsed with high purity acetone and allowed to air dry before sealing with parafilm and labeling with the preparation date. All proper calibrations (i.e. meter box and thermocouples) are conducted per normal EPA Method 5 procedure.



Sampling is conducted in accordance with EPA Method 29 procedures for two hours at a flow rate of 0.5 to 1.0 cfm. Blanks are collected for all reagents in the field laboratory and are analyzed along with the test samples to determine the level of contamination introduced by field handling and background contamination.

Samples are recovered following procedures outlined previously in Section 4.4. Following recovery, chain of custody is maintained from the date of sampling through laboratory analysis at Maxxam Analytics in Burlington, Ontario. Maxxam Analytics calibrates instrumentation with standards prior to sample analysis. A calibration is verified with a lab control sample to verify the primary standard. This is required to be within 10% of true value. Actual emissions samples are then be injected in duplicate to demonstrate reproducibility (20% agreement). A continuing calibration check is performed every ten samples (20 injections). At completion, a final calibration verification is performed (20% agreement). During analysis, a separate sample aliquot is spiked with a known amount of standard for each analyte (one for front ½ and one for back ½ samples), and analyzed along with emissions samples. The spike recovery is required to be between 70% and 125% to be considered acceptable. If recovery is outside of that range, re-analysis by method of standard additions is required. A synopsis of QA/QC procedures is presented in Table 5-1.

5.5 Final Report

All test results are presented in an easy to read table format. Any deviations from approved monitoring methods are discussed in full. The report is sectioned as follows:

- Introduction
- Summary of Results
- Monitoring Procedures
- QA/QC
- Appendices (all supporting reference method and process data)



Table 5-1 QA/QC Procedures for Trace Metals – EPA Method 29

Task	Procedure
Glassware/ Teflon Preparation	<ol style="list-style-type: none"> 1. Wash all glassware and Teflon components in warm, soapy water. Rinse clean with tap water. Rinse thoroughly with DI water. 2. Soak all components in 10% nitric acid for 8 hours. Rinse all train components with DI water and acetone. Allow to air dry and seal with parafilm. 3. Use only high purity quartz filters and glass or Teflon components.
Sampling Train Set up	<ol style="list-style-type: none"> 1. Load/assemble sampling train components in field lab. Re-seal components and send up to stack. 2. Finish assembling train on stack. Leak check train with Teflon tape on finger.
Sampling Train Operation	<ol style="list-style-type: none"> 1. Operate sampling train between 0.5 and 1.0 cfm. 2. Leak check train with Teflon tape on finger. Seal train components with parafilm.
Sampling Train Recovery	<ol style="list-style-type: none"> 1. Place filter into petri dish (container #1). 2. Rinse nozzle through front half of filter holder with 0.1N HNO₃ into container 2. 3. Rinse filter holder back half through third impinger with 0.1N HNO₃ into container 3 along with condensate. 4. Rinse third impinger with 0.1N HNO₃ into container #4. 5. Rinse fourth and fifth impingers with acid potassium permanganate into container #5 along with condensate. 6. Clean fourth and fifth impingers with 8N HCl and H₂O into container #6. 7. Use Teflon squeeze bottles, spatulas for recovery. 8. Obtain reagent and filter blanks.
Sample Identification and Shipping	<ol style="list-style-type: none"> 1. Identify all samples by stack, method, run no., fraction and contents. 2. Generate chain of custody form identifying all samples. 3. Ship samples to analytical laboratory.
Sample Analysis	<ol style="list-style-type: none"> 1. Receive samples, verify chain of custody/contents. 2. Calibrate instrumentation with standards prior to sample analysis. Calibration is verified with a lab control sample to verify the primary standard. Must be within 10% of value. 3. Inject field emissions samples in duplicate to demonstrate reproducibility (20% agreement). 4. A continuing calibration check is performed every 10 samples (20 injections). At completion, a final calibration verification is performed (20% agreement). 5. Spike separate sample aliquot with a known amount of standard for each analyte (one for front ½ and one for back ½ samples), and analyze along with emissions samples. The spike recovery must be between 70% and 125% to be considered acceptable.



Table 5-2 QA/QC Procedures for PM/HCl/HF – EPA Method 5/26A

Task	Procedure
Filter/beaker preparation	<ol style="list-style-type: none"> 1. Identify filters and beakers. Wash beakers in warm, soapy water, rinse with DI water and allow to air dry. 2. Desiccate filters and beaker for 24 hours. 3. Calibrate balance to within 0.5 mg of standard daily using 1 g. and 100 g. NIST traceable weights. 4. Weigh filter and beakers to nearest 0.1 mg every six hours until two consecutive weight agree within ± 0.5 mg
Glassware/ Teflon Preparation	<ol style="list-style-type: none"> 1. Wash all glassware and Teflon components in warm, soapy water. Rinse clean with tap water. Rinse thoroughly with DI water. 2. Allow to air dry and seal with parafilm. 3. Use only high purity quartz filters and glass or Teflon components.
Sampling Train Set up	<ol style="list-style-type: none"> 1. Load/assemble sampling train components in field lab. Re-seal components and send up to stack. 2. Finish assembling train on stack.
Sampling Train Operation	<ol style="list-style-type: none"> 1. Operate sampling train between 0.5 and 1.0 cfm. 2. After leak check, seal train components with parafilm.
Sampling Train Recovery	<ol style="list-style-type: none"> 1. Rinse components from nozzle through front half of filter holder with reagent-grade acetone into container 1. 2. Remove filter and place in original petri dish. 3. Rinse first three impingers containing condensate with DI water into container 2 along with condensate. (Measure and discard NaOH). 4. Obtain reagent and filter blanks.
Sample Identification and Shipping	<ol style="list-style-type: none"> 1. Identify all samples by stack, method, run no., fraction and contents. 2. Generate chain of custody form identifying all samples. 3. Ship samples to analytical laboratory.
Particulate Analysis	<ol style="list-style-type: none"> 1. Desiccate filters for 24 hours. 2. Evaporate acetone rinses in tared beakers slowly. Desiccate beaker for 24 hours. 3. Calibrate balance to within 0.5 mg of standard daily using 1 g. and 100 g. NIST traceable weights. 4. Weigh filter and beakers to nearest 0.1 mg every six hours until two consecutive weight agree within ± 0.5 mg
HCl/HF Sample Analysis	<ol style="list-style-type: none"> 1. Receive samples, verify chain of custody/contents. 2. Calibrate IC instrumentation with four standards prior to sample analysis. 3. Inject field emissions samples in duplicate to demonstrate reproducibility (20% agreement). 4. At completion, a final four-point calibration verification is performed (5% agreement).

