Source Test Report for 2023 Part 75 PEMS RATA Testing

Boilers (EUBOILER1, EUBOILER2, EUBOILER3) Turbines (EUCTG1, EUCTG2, EUCTG3)

Dearborn Industrial Generation, LLC Dearborn, Michigan

Prepared For:

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For Submission To:

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N6631_test_20230320

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STAC STACK TESTING ACCREDITATION COUNCIL A2LA ACCREDITED TO ASTM D7036 ONLY CERT #3925.01

Test Results Summary - Boilers

	Boiler 1100	Boiler 2100	Boiler 3100
Source ID Number:	EUBOILER1	EUBOILER2	EUBOILER3
Control Device:	NA	NA	NA
Sampling Location:	Exhaust	Exhaust	Exhaust
Operating Load:	High/Normal	High/Normal	High/Normal
Permit Number:	EGLE PTI No. 163-17, MI-ROP-N6631-2012a		
NO_x Emission Rate RA (lb/MMBtu):	-0.0005	-0.0002	0.0015
40 CFR Part 75 (NO_x) Section 2.3.1.2(f) Criteria Used	±0.015 lb/MMBtu	±0.015 lb/MMBtu	±0.015 lb/MMBtu
O_2 Concentration RA (%):	0.24	2.27	2.45
40 CFR Part 75 (O_2) Section 2.3.1.2(a) Criteria Used	--	≤ 7.5%	≤ 7.5%
40 CFR Part 75 (O_2) Section 2.3.1.2(h) Criteria Used	± 0.7% O_2	--	--

Test Results Summary - Turbines

	Turbine 1100	Turbine 2100	Turbine 3100
Source ID Number:	EUCTG1	EUCTG2	EUCTG3
Control Device:	NA	NA	NA
Sampling Location:	Exhaust	Exhaust	Exhaust
Operating Load:	High/Normal	High/Normal	High/Normal
Permit Number:	EGLE PTI Nos. 8-17 and 163-17, MI-ROP-N6631-2012a		
NO_x Emission Rate RA (lb/MMBtu):	-0.0013	-0.0004	-0.0002
40 CFR Part 75 (NO_x) Section 2.3.1.2(f) Criteria Used	±0.015 lb/MMBtu	±0.015 lb/MMBtu	±0.015 lb/MMBtu
O_2 Concentration RA (%):	2.58	0.78	1.61
40 CFR Part 75 (O_2) Section 2.3.1.2(a) Criteria Used	≤ 7.5%	≤ 7.5%	≤ 7.5%

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Review and Certification

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature: John Nestor **Date:** 05 / 22 / 2023

Name: John Nestor **Title:** District Manager

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature: robert j lisy jr **Date:** 05 / 22 / 2023

Name: Robert J. Lisy, Jr. **Title:** Reporting Hub Manager

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1.0 Introduction

1.1 Summary of Test Program

Dearborn Industrial Generation, LLC (DIG) contracted Montrose Air Quality Services, LLC (Montrose) to perform the Annual Quality Assurance (QA) Relative Accuracy Test Audit (RATA) for the Predictive Emission Monitoring Systems (PEMS) associated with the Boilers 1100 (EUBOILER1), 2100 (EUBOILER2), and 3100 (EUBOILER3) and Turbines 1100 (EUCTG1), 2100 (EUCTG2), and 3100 (EUCTG3) at the DIG facility (State Registration Number: N6631) located in Dearborn, Michigan. Testing was performed on March 20-24, 2023, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operation Permit No. MI-ROP-N6631-2012a and Permit-to-Install (PTI) Nos. 8-17 and 163-17 by evaluating the quality of the emissions data produced by DIG's PEMS in accordance with 40 CFR Part 75, Appendices A and B.

The specific objectives were to:

- Verify the relative accuracy (RA) of the EUBOILER1 PEMS, EUBOILER2 PEMS, and EUBOILER3 PEMS for nitrogen oxides (NO_x) emissions (lb/MMBtu) (as NO_2) and oxygen (O_2) concentration (%-Dry) in accordance with 40 CFR Part 75 (NO_x) Section 2.3.1.2(f), 40 CFR Part 75 (O_2) Sections 2.3.1.2(a) and 2.3.1.2(h), and Performance Specifications 2 (PS-2), 3 (PS-3), and 16 (PS-16)
- Verify the relative accuracy (RA) of the EUCTG1 PEMS, EUCTG2 PEMS, and EUCTG3 PEMS for NO_x emissions (lb/MMBtu) (as NO_2) and O_2 concentration (%-Dry) in accordance with 40 CFR Part 75 (NO_x) Section 2.3.1.2(f), 40 CFR Part 75 (O_2) Section 2.3.1.2(a), and PS-2, PS-3, and PS-16
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Tables 1-1 and 1-2.

Table 1-1
Summary of Boiler Test Program

Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
3/23/2023	EUBOILER1	O_2	EPA 3A	11	21
3/23/2023	EUBOILER1	NO_x	EPA 7E	11	21
3/24/2023	EUBOILER2	O_2	EPA 3A	11	21
3/24/2023	EUBOILER2	NO_x	EPA 7E	11	21
3/22/2023-3/23/2023	EUBOILER3	O_2	EPA 3A	11	21
3/22/2023-3/23/2023	EUBOILER3	NO_x	EPA 7E	11	21

Table 1-2
Summary of Turbine Test Program

Test Date(s)	Unit ID/ Source Name	Activity/Parameters	Test Methods	No. of Runs	Duration (Minutes)
3/20/2023	EUCTG1	O_2	EPA 3A	10	21
3/20/2023	EUCTG1	NO_x	EPA 7E	10	21
3/20/2023	EUCTG2	O_2	EPA 3A	10	21
3/20/2023	EUCTG2	NO_x	EPA 7E	10	21
3/21/2023	EUCTG3	O_2	EPA 3A	10	21
3/21/2023	EUCTG3	NO_x	EPA 7E	10	21

For the Part 75 PEMS RATA, nine RATA runs were used to determine the RA of the EUBOILER1 PEMS, EUBOILER2 PEMS, EUBOILER3 PEMS, EUCTG1 PEMS, EUCTG2 PEMS, and EUCTG3 PEMS.

To simplify this report, a list of Units and Abbreviations is included in Appendix C.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The RA test results are summarized and compared to their respective regulatory requirements in Tables 1-3 through 1-8. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-9. The tests were conducted according to the test plan (protocol) dated February 15, 2023, that was submitted to and approved by the EGLE.

Table 1-3
Summary of Part 75 PEMS RATA Results – EUBOILER1 PEMS

March 23, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 75 – Annual (Reduced Frequency)			
Oxygen (O_2)			
% volume dry	App. B Sect. 2.3.1.2	0.24	± 0.7% O_2
Nitrogen Oxides (NO_x)			
lb/MMBtu (low emitter)	App. B Sect. 2.3.1.2	-0.0005	± 0.015 lb/MMBtu

Table 1-4
Summary of Part 75 PEMS RATA Results – EUBOILER2 PEMS

March 24, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 75 – Annual (Reduced Frequency)			
Oxygen (O_2)			
% volume dry	App. B Sect. 2.3.1.2	2.27	≤ 7.5% of RM
Nitrogen Oxides (NO_x)			
lb/MMBtu (low emitter)	App. B Sect. 2.3.1.2	-0.0002	± 0.015 lb/MMBtu

Table 1-5
Summary of Part 75 PEMS RATA Results – EUBOILER3 PEMS

March 22-23, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 75 – Annual (Reduced Frequency)			
Oxygen (O_2)			
% volume dry	App. B Sect. 2.3.1.2	2.45	≤ 7.5% of RM
Nitrogen Oxides (NO_x)			
lb/MMBtu (low emitter)	App. B Sect. 2.3.1.2	0.0015	± 0.015 lb/MMBtu

Table 1-6
Summary of Part 75 PEMS RATA Results – EUCTG1 PEMS

March 20, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 75 – Annual (Reduced Frequency)			
Oxygen (O_2)			
% volume dry	App. B Sect. 2.3.1.2	2.58	≤ 7.5% of RM
Nitrogen Oxides (NO_x)			
lb/MMBtu (low emitter)	App. B Sect. 2.3.1.2	-0.0013	± 0.015 lb/MMBtu

Table 1-7
Summary of Part 75 PEMS RATA Results – EUCTG2 PEMS

March 20, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 75 – Annual (Reduced Frequency)			
Oxygen (O_2)			
% volume dry	App. B Sect. 2.3.1.2	0.78	≤ 7.5% of RM
Nitrogen Oxides (NO_x)			
lb/MMBtu (low emitter)	App. B Sect. 2.3.1.2	-0.0004	± 0.015 lb/MMBtu

Table 1-8
Summary of Part 75 PEMS RATA Results – EUCTG3 PEMS

March 21, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 75 – Annual (Reduced Frequency)			
Oxygen (O_2)			
% volume dry	App. B Sect. 2.3.1.2	1.61	≤ 7.5% of RM
Nitrogen Oxides (NO_x)			
lb/MMBtu (low emitter)	App. B Sect. 2.3.1.2	-0.0002	± 0.015 lb/MMBtu

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location:	Dearborn Industrial Generation, LLC 2400 Miller Road Dearborn, MI 48121	
Project Contact:	Theon Heisserer	Kathryn Cunningham
Role:	Environmental Manager	Environmental Support
Company:	DIG	DIG
Telephone:	313-336-7189 Ext. 250	517-768-3462
Email:	Theon.HeissererIV@cmsenergy.com	Kathryn.cunningham@cmsenergy.com

Agency Information

Regulatory Agency:	EGLE
Agency Contact:	TPU Supervisor
Telephone:	517-335-3122
Email:	--

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	John Nestor	Robert J. Lisy, Jr.
Title:	District Manager	Reporting Hub Manager
Telephone:	248-548-8070	440-262-3760
Email:	jonestor@montrose-env.com	rlisy@montrose-env.com

Subcontractor Information

Company: CMC Solutions, Inc.
Contact: Brian Swanson
Telephone: 248-960-1632
Email: bswanson@cmcsolutions.org

Test personnel and observers are summarized in Table 1-9.

Table 1-9
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
John Nestor	Montrose	District Manager, QI
Shane Rabideau	Montrose	Field Technician
Theon Heisserer	DIG	Test Coordinator
Andrew Riley	EGLE	Observer

Qualified individual information is presented in Table 1-10.

Table 1-10
Part 75 Qualified Individual Information

Data Element	Information
QI Name	John Nestor
AETB Name	Montrose Air Quality Services, LLC
AETB Phone Number	440-262-3760
AETB Email Address	qualitymanagement@montrose-env.com
Exam Date	Group 1: 3/18/2023 Group 3: 3/16/2023
Provider Name	Source Evaluation Society
Provider Email Address	qstiprogram@gmail.com

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

The DIG facility operates three boilers (Boiler 1100 (EUBOILER1), Boiler 2100 (EUBOILER2), and Boiler 3100 (EUBOILER3)) and three combustion turbines (Turbine 1100 (EUCTG1), Turbine 2100 (EUCTG2), and Turbine 3100 (EUCTG3)).

2.1.1 Boilers 1100, 2100, and 3100

The EUBOILER1, EUBOILER 2, and EUBOILER3 boilers are nominally rated at an output capacity of 500,000 lb/hr of superheated steam at a minimum pressure of 1,350 psig and temperature of 960°F. The input capacity of the boilers while firing natural gas (NG) and blast furnace gas (BFG) is 746 MMBtu/hr, and the BFG to NG ratio is approximately 90% to 10%. The boilers typically operate under co-firing conditions, rarely operating under NG only conditions; therefore, the RATA testing was performed under the co-firing conditions only. The steam from each boiler is dispatched to a steam turbine for electrical generation. Low-NO_x combustors minimize the emissions of NO_x from the boilers.

2.1.2 Turbine 1100

The EUCTG1 simple-cycle turbine is nominally rated at an output capacity of 181 Megawatts (MW) with a heat input of 1,638 MMBtu/hr. Low-NOx combustors minimize the emissions of NO_x from the turbine, while the emissions of CO and SO_2 are minimized by the efficient combustion of low sulfur bearing clean-burning fuels.

2.1.3 Turbines 2100 and 3100

The EUCTG2 and EUCTG3 combined-cycle turbines are nominally rated at an output of 179 MW with a heat input of 1,626 MMBtu/hr. NG is used as the primary fuel. The combined-cycle turbine generators consist of a compressor, combustion turbine, and generator. Energy is generated at the combustion turbine by drawing in ambient air by means of burning fuel and expanding the hot combustion gases in a three-stage turbine. Hot exhaust gases from the combustion turbine are directed to a multi-pressure heat recovery steam generator (HRSG) to produce steam. Low-NO_x combustors minimize the emissions of NO_x from the turbines, while the emissions of CO and SO_2 are minimized by the efficient combustion of low sulfur bearing clean-burning fuels.

Turbines 1100, 2100, and 3100 are each fired exclusively with pipeline quality natural gas.

2.2 Facility PEMS and Reference Method (RM) CEMS Descriptions

The Facility PEMS information is presented in Tables 2-1 and 2-2, and the RM CEMS analyzer information is presented in Table 2-3.

Table 2-1
Facility PEMS Information - Boilers

PEMS ID	Measurement Type	Manufacturer	Model No.	Serial No.
EUBOILER1 PEMS	O_2, NO_x	CMC Solutions	SmartCEMS®-75	DIG.BL1100.256738
EUBOILER2 PEMS	O_2, NO_x	CMC Solutions	SmartCEMS®-75	DIG.BL2100.256738
EUBOILER3 PEMS	O_2, NO_x	CMC Solutions	SmartCEMS®-75	DIG.BL3100.256738

Table 2-2
Facility PEMS Information - Turbines

PEMS ID	Measurement Type	Manufacturer	Model No.	Serial No.
EUCTG1 PEMS	O_2, NO_x	CMC Solutions	SmartCEMS®-75	DIG.GT1100.97341
EUCTG2 PEMS	O_2, NO_x	CMC Solutions	SmartCEMS®-75	DIG.GT2100.52081
EUCTG3 PEMS	O_2, NO_x	CMC Solutions	SmartCEMS®-75	DIG.GT3100.52081

Table 2-3
RM CEMS Information

Analyzer Type	Manufacturer	Model No.	Serial No.	Range
O_2	Teledyne	T802	197	0-19.91%
NO_x	Teledyne	T200H	727	0-91.39 ppm

2.3 Flue Gas Sampling Location

Information regarding the sampling location is presented in Tables 2-4 and 2-5.

Table 2-4
Boiler Sampling Locations

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUBOILER1 Exhaust	126.0	1,680 / 13.3	480 / 3.8	Gaseous: 3
EUBOILER2 Exhaust	126.0	1,680 / 13.3	480 / 3.8	Gaseous: 3
EUBOILER3 Exhaust	126.0	1,680 / 13.3	480 / 3.8	Gaseous: 3

Table 2-5
Turbine Sampling Locations

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUCTG1 Exhaust	228.0 X 264.0	720 / 2.9	240 / 1.0	Gaseous: 3
EUCTG2 Exhaust	210.0	1,200 / 5.7	360 / 1.7	Gaseous: 3
EUCTG3 Exhaust	210.0	1,200 / 5.7	360 / 1.7	Gaseous: 3

See Appendix A.1 for more information.

2.4 Operating Conditions and Process Data

The PEMS RATAs were performed while the boilers and turbines were operating at normal high load conditions.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The Facility PEMS and process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Facility Boiler PEMS data for each 21-minute RATA run
- Facility Turbine PEMS data for each 21-minute RATA run
- Boiler steam load, klb/hr
- Boiler mixed fuel F-Factor, dscf/MMBtu
- Turbine load, MW

3.0 Sampling and Analytical Procedures

3.1 Test Methods

The test methods for this test program have been presented in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 3A, Determination of Oxygen and Carbon Dioxide in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 3A is an instrumental test method used to measure the concentration of O_2 and CO_2 in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentrations of O_2 and CO_2. The performance requirements of the method must be met to validate data.

The typical sampling system is detailed in Figure 3-1.

3.1.2 EPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 7E is an instrumental test method used to continuously measure emissions of NO_x as NO_2. Conditioned gas is sent to an analyzer to measure the concentration of NO_x. NO and NO_2 can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO_2. The performance requirements of the method must be met to validate the data.

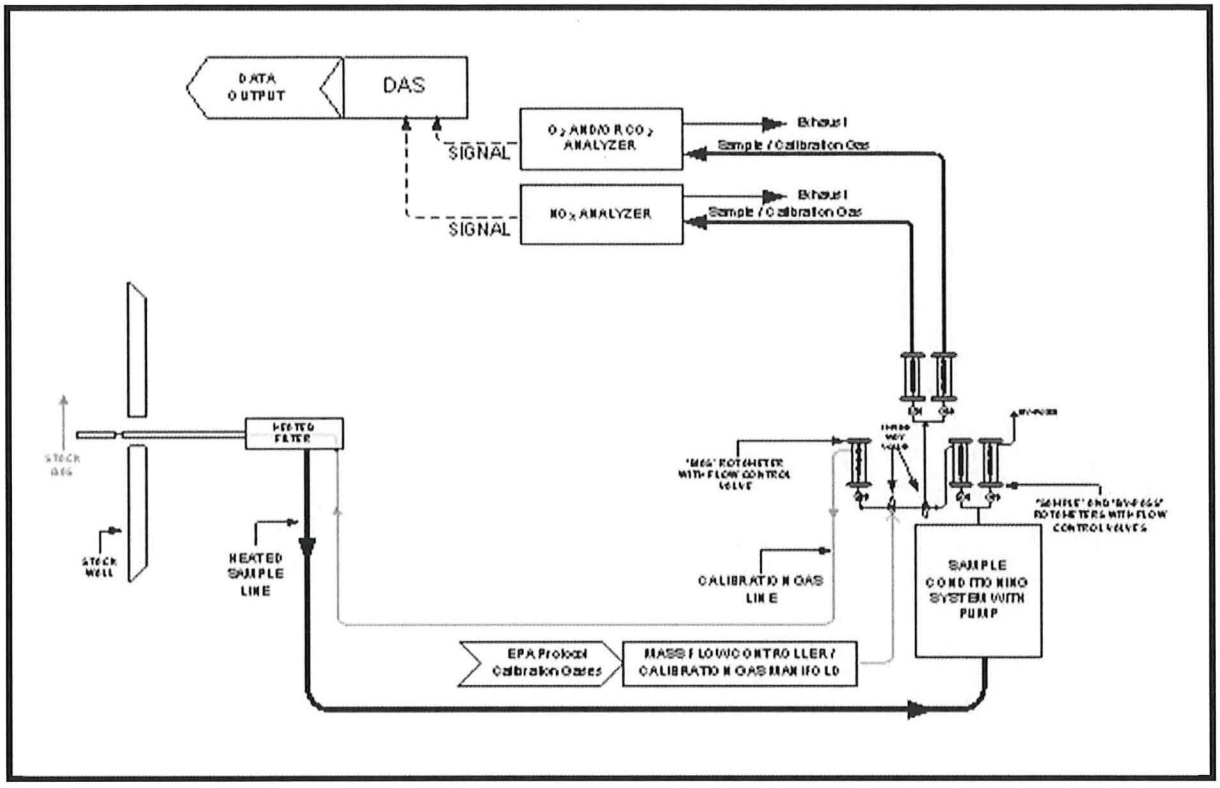
The typical sampling system is detailed in Figure 3-1.

3.1.3 EPA Method 19, Measurement of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates

EPA Method 19 is a manual method used to determine (a) PM, SO_2, and NO_x emission rates; (b) sulfur removal efficiencies of fuel pretreatment and SO_2 control devices; and (c) overall reduction of potential SO_2 emissions. This method provides data reduction procedures, but does not include any sample collection or analysis procedures.

EPA Method 19 is used to calculate mass emission rates in units of lb/MMBtu. EPA Method 19, Table 19-2 contains a list of assigned fuel factors for different types of fuels, which can be used for these calculations.

Figure 3-1
EPA Methods 3A and 7E Sampling Train



3.1.4 EPA Performance Specification 2, Specifications and Test Procedures for SO_2 and NO_x Continuous Emission Monitoring Systems in Stationary Sources

EPA Performance Specification 2 is a specification used to evaluate the acceptability of SO_2 and NO_x CEMS. The evaluation is conducted at the time of installation or soon after, and whenever specified in the regulations. The CEMS may include, for certain stationary sources, a diluent (O_2 or CO_2) monitor. The RA and CD tests are conducted to determine conformance of the CEMS to the specification.

3.1.5 EPA Performance Specification 3, Specifications and Test Procedures for O_2 and CO_2 Continuous Monitoring Systems in Stationary Sources

EPA Performance Specification 3 is a specification used to evaluate the acceptability of O_2 and CO_2 CEMS. The evaluation is conducted at the time of installation or soon after, and whenever specified in the regulations. This specification applies to O_2 or CO_2 monitors that are not included under PS-2. The RA and CD tests are conducted to determine conformance of the CEMS to the specification.

3.1.6 EPA Performance Specification 16, Specifications and Test Procedures for Predictive Emission Monitoring Systems in Stationary Sources

EPA Performance Specification 16 is a specification used to evaluate the acceptability of Predictive Emission Monitoring Systems (PEMS) to show compliance with an emission limitation under 40 CFR 60, 61, or 63. These procedures are used to certify a PEMS after initial installation and periodically thereafter to ensure the system is operating properly and meets the requirements of all applicable regulations. Ongoing QA/QC tests include sensor evaluation, bias correction, quarterly Relative Accuracy Audits (RAA), and annual Relative Accuracy Test Audits (RATA).

3.2 Process Test Methods

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

4.0 Test Discussion and Results

4.1 Field Test Deviations and Exceptions

No field deviations or exceptions from the test plan or test methods occurred during this test program.

4.2 Presentation of Results

The RA results are compared to the regulatory requirements in Tables 1-3 through 1-8. The results of individual test runs performed are presented in Tables 4-1 through 4-12. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

Table 4-1
NO_x (lb/MMBtu) RATA Results
EUBOILER1

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Steam Load (klb/hr)
1	3/23/2023	11:50-12:11	0.0198	0.0200	-0.0002	Y	213.7
2	3/23/2023	12:25-12:46	0.0222	0.0240	-0.0018	Y	187.4
3	3/23/2023	13:00-13:21	0.0202	0.0240	-0.0038	N	198.8
4	3/23/2023	13:40-14:01	0.0238	0.0270	-0.0032	N	191.9
5	3/23/2023	14:15-14:36	0.0251	0.0250	0.0001	Y	183.4
6	3/23/2023	14:55-15:16	0.0225	0.0250	-0.0025	Y	193.9
7	3/23/2023	15:35-15:56	0.0217	0.0220	-0.0003	Y	178.4
8	3/23/2023	16:10-16:31	0.0226	0.0230	-0.0004	Y	176.2
9	3/23/2023	16:45-17:06	0.0224	0.0230	-0.0006	Y	177.1
10	3/23/2023	17:35-17:56	0.0222	0.0220	0.0002	Y	189.9
11	3/23/2023	18:10-18:31	0.0237	0.0230	0.0007	Y	188.4
Averages			0.0225	0.0230	-0.0005		187.6

Unit Load	Normal	
RA based on mean difference	-0.0005	lb/MMBtu as NO_x

* PEMS data provided by CMC Solutions, LLC.

Table 4-2
O_2 (%-Dry) RATA Results
EUBOILER1

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Steam Load (klb/hr)
1	3/23/2023	11:50-12:11	3.888	3.941	-0.053	Y	213.7
2	3/23/2023	12:25-12:46	3.925	3.453	0.472	N	187.4
3	3/23/2023	13:00-13:21	3.964	3.710	0.254	Y	198.8
4	3/23/2023	13:40-14:01	4.044	3.620	0.424	Y	191.9
5	3/23/2023	14:15-14:36	4.155	3.632	0.523	N	183.4
6	3/23/2023	14:55-15:16	3.781	3.701	0.080	Y	193.9
7	3/23/2023	15:35-15:56	3.586	3.528	0.058	Y	178.4
8	3/23/2023	16:10-16:31	4.059	3.703	0.356	Y	176.2
9	3/23/2023	16:45-17:06	4.020	3.803	0.217	Y	177.1
10	3/23/2023	17:35-17:56	4.204	3.773	0.431	Y	189.9
11	3/23/2023	18:10-18:31	4.128	3.734	0.394	Y	188.4
Averages			3.964	3.724	0.240		189.8

Unit Load	Normal	
RA based on mean difference	0.24	% as O_2

* PEMS data provided by CMC Solutions, LLC.

Table 4-3
NO_x (lb/MMBtu) RATA Results
EUBOILER2

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Steam Load (klb/hr)
1	3/24/2023	7:45-8:06	0.0194	0.0220	-0.0026	N	175.9
2	3/24/2023	8:20-8:41	0.0189	0.0200	-0.0011	Y	176.2
3	3/24/2023	8:55-9:16	0.0191	0.0200	-0.0009	Y	145.7
4	3/24/2023	9:35-9:56	0.0203	0.0200	0.0003	Y	125.7
5	3/24/2023	10:15-10:36	0.0212	0.0190	0.0022	Y	171.1
6	3/24/2023	10:55-11:16	0.0201	0.0200	0.0001	Y	185.4
7	3/24/2023	11:30-11:51	0.0199	0.0200	-0.0001	Y	156.9
8	3/24/2023	12:05-12:26	0.0194	0.0200	-0.0006	Y	168.5
9	3/24/2023	12:45-13:06	0.0185	0.0200	-0.0015	Y	176.4
10	3/24/2023	13:20-13:41	0.0187	0.0190	-0.0003	Y	165.9
11	3/24/2023	13:55-14:16	0.0230	0.0200	0.0030	N	177.2
Averages			0.0196	0.0198	-0.0002		163.5

Unit Load	Normal	
RA based on mean difference	-0.0002	lb/MMBtu as NO_x

* PEMS data provided by CMC Solutions, LLC.

Table 4-4
O_2 (%-Dry) RATA Results
EUBOILER2

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Steam Load (klb/hr)
1	3/24/2023	7:45-8:06	4.414	4.862	-0.448	N	175.9
2	3/24/2023	8:20-8:41	4.589	4.534	0.055	Y	176.2
3	3/24/2023	8:55-9:16	4.641	4.596	0.045	Y	145.7
4	3/24/2023	9:35-9:56	4.661	4.636	0.025	Y	125.7
5	3/24/2023	10:15-10:36	4.451	4.473	-0.022	Y	171.1
6	3/24/2023	10:55-11:16	4.542	4.522	0.020	Y	185.4
7	3/24/2023	11:30-11:51	4.514	4.587	-0.073	Y	156.9
8	3/24/2023	12:05-12:26	4.661	4.469	0.192	Y	168.5
9	3/24/2023	12:45-13:06	4.639	4.495	0.144	Y	176.4
10	3/24/2023	13:20-13:41	4.783	4.462	0.321	N	165.9
11	3/24/2023	13:55-14:16	4.503	4.526	-0.023	Y	177.2
Averages			4.578	4.538	0.040		164.8

Standard Deviation	0.0831	
Confidence Coefficient (CC)	0.0639	
Unit Load	Normal	
RA based on mean RM value	2.27	%

* PEMS data provided by CMC Solutions, LLC.

Table 4-5
NO_x (lb/MMBtu) RATA Results
EUBOILER3

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Steam Load (klb/hr)
1	3/22/2023	10:10-10:31	0.0255	0.0230	0.0025	Y	195.8
2	3/22/2023	11:30-11:51	0.0274	0.0240	0.0034	Y	186.4
3	3/22/2023	12:05-12:26	0.0288	0.0240	0.0048	Y	191.3
4	3/22/2023	13:15-13:36	0.0283	0.0230	0.0053	Y	184.5
5	3/22/2023	13:55-14:16	0.0268	0.0270	-0.0002	Y	189.0
6	3/22/2023	14:35-14:56	0.0284	0.0340	-0.0056	N	188.1
7	3/22/2023	15:30-15:51	0.0276	0.0290	-0.0014	N	188.8
8	3/23/2023	7:30-7:51	0.0232	0.0220	0.0012	Y	241.6
9	3/23/2023	8:05-8:26	0.0220	0.0200	0.0020	Y	241.0
10	3/23/2023	8:45-9:06	0.0222	0.0200	0.0022	Y	241.6
11	3/23/2023	9:20-9:41	0.0191	0.0200	-0.0009	Y	240.0
Averages			0.0248	0.0232	0.0015		212.8

Unit Load	Normal	
RA based on mean difference	0.0015	lb/MMBtu as NO_x

* PEMS data provided by CMC Solutions, LLC.

Table 4-6
O_2 (%-Dry) RATA Results
EUBOILER3

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Steam Load (klb/hr)
1	3/22/2023	10:10-10:31	5.230	5.369	-0.139	Y	195.8
2	3/22/2023	11:30-11:51	5.386	5.488	-0.102	Y	186.4
3	3/22/2023	12:05-12:26	5.358	5.268	0.090	Y	191.3
4	3/22/2023	13:15-13:36	5.353	5.233	0.120	Y	184.5
5	3/22/2023	13:55-14:16	5.366	5.155	0.211	Y	189.0
6	3/22/2023	14:35-14:56	5.375	5.225	0.150	Y	188.1
7	3/22/2023	15:30-15:51	5.350	5.243	0.107	Y	188.8
8	3/23/2023	7:30-7:51	5.421	5.475	-0.054	Y	241.6
9	3/23/2023	8:05-8:26	5.317	5.835	-0.518	N	241.0
10	3/23/2023	8:45-9:06	5.394	5.716	-0.322	N	241.6
11	3/23/2023	9:20-9:41	5.505	5.691	-0.186	Y	240.0
Averages			5.372	5.350	0.022		200.6

Standard Deviation	0.1430	
Confidence Coefficient (CC)	0.1099	
Unit Load	Normal	
RA based on mean RM value	2.45	%

* PEMS data provided by CMC Solutions, LLC.

Table 4-7
NO_x (lb/MMBtu) RATA Results
EUCTG1

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Turbine Load (MW)
1	3/20/2023	6:55-7:16	0.0275	0.0300	-0.0025	N	187.7
2	3/20/2023	7:25-7:46	0.0283	0.0300	-0.0017	Y	187.6
3	3/20/2023	8:20-8:41	0.0293	0.0300	-0.0007	Y	186.7
4	3/20/2023	8:50-9:11	0.0289	0.0300	-0.0011	Y	186.0
5	3/20/2023	9:20-9:41	0.0300	0.0300	0.0000	Y	185.4
6	3/20/2023	9:55-10:16	0.0282	0.0300	-0.0018	Y	184.7
7	3/20/2023	10:25-10:46	0.0293	0.0310	-0.0017	Y	184.4
8	3/20/2023	10:55-11:16	0.0296	0.0310	-0.0014	Y	183.4
9	3/20/2023	11:25-11:46	0.0290	0.0310	-0.0020	Y	182.2
10	3/20/2023	12:00-12:21	0.0294	0.0310	-0.0016	Y	180.7
Averages			0.0291	0.0304	-0.0013		184.6

Unit Load	Normal	
RA based on mean difference	-0.0013	lb/MMBtu as NO_x

* PEMS data provided by CMC Solutions, LLC.

Table 4-8
O_2 (%-Dry) RATA Results
EUCTG1

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Turbine Load (MW)
1	3/20/2023	6:55-7:16	13.316	13.780	-0.464	N	187.7
2	3/20/2023	7:25-7:46	13.529	13.801	-0.272	Y	187.6
3	3/20/2023	8:20-8:41	13.602	13.808	-0.206	Y	186.7
4	3/20/2023	8:50-9:11	13.567	13.802	-0.235	Y	186.0
5	3/20/2023	9:20-9:41	13.519	13.800	-0.281	Y	185.4
6	3/20/2023	9:55-10:16	13.493	13.807	-0.314	Y	184.7
7	3/20/2023	10:25-10:46	13.400	13.822	-0.422	Y	184.4
8	3/20/2023	10:55-11:16	13.574	13.799	-0.225	Y	183.4
9	3/20/2023	11:25-11:46	13.449	13.805	-0.356	Y	182.2
10	3/20/2023	12:00-12:21	13.456	13.799	-0.343	Y	180.7
Averages			13.510	13.805	-0.295		184.6

Standard Deviation	0.0704	
Confidence Coefficient (CC)	0.0541	
Unit Load	Normal	
RA based on mean RM value	2.58	%

* PEMS data provided by CMC Solutions, LLC.

Table 4-9
NO_x (lb/MMBtu) RATA Results
EUCTG2

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Turbine Load (MW)
1	3/20/2023	14:10-14:31	0.0267	0.0280	-0.0013	Y	184.5
2	3/20/2023	14:50-15:11	0.0270	0.0270	0.0000	Y	183.3
3	3/20/2023	15:20-15:41	0.0262	0.0270	-0.0008	Y	183.2
4	3/20/2023	15:55-16:16	0.0269	0.0270	-0.0001	Y	183.2
5	3/20/2023	16:30-16:51	0.0278	0.0270	0.0008	Y	183.7
6	3/20/2023	17:05-17:26	0.0274	0.0270	0.0004	Y	183.4
7	3/20/2023	17:40-18:01	0.0264	0.0270	-0.0006	Y	183.5
8	3/20/2023	18:15-18:36	0.0269	0.0270	-0.0001	Y	183.7
9	3/20/2023	18:50-19:11	0.0250	0.0270	-0.0020	Y	183.3
10	3/20/2023	19:35-19:56	0.0247	0.0270	-0.0023	N	183.4
Averages			0.0267	0.0271	-0.0004		183.5

Unit Load	Normal	
RA based on mean difference	-0.0004	lb/MMBtu as NO_x

* PEMS data provided by CMC Solutions, LLC.

Table 4-10
O_2 (%-Dry) RATA Results
EUCTG2

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Turbine Load (MW)
1	3/20/2023	14:10-14:31	13.167	13.110	0.057	Y	184.5
2	3/20/2023	14:50-15:11	13.187	13.090	0.097	Y	183.3
3	3/20/2023	15:20-15:41	13.191	13.090	0.101	Y	183.2
4	3/20/2023	15:55-16:16	13.158	13.084	0.074	Y	183.2
5	3/20/2023	16:30-16:51	13.193	13.094	0.099	Y	183.7
6	3/20/2023	17:05-17:26	13.171	13.087	0.084	Y	183.4
7	3/20/2023	17:40-18:01	13.170	13.091	0.079	Y	183.5
8	3/20/2023	18:15-18:36	13.175	13.093	0.082	Y	183.7
9	3/20/2023	18:50-19:11	13.210	13.086	0.124	Y	183.3
10	3/20/2023	19:35-19:56	13.229	13.086	0.143	N	183.4
Averages			13.180	13.092	0.088		183.5

Standard Deviation	0.0192	
Confidence Coefficient (CC)	0.0148	
Unit Load	Normal	
RA based on mean RM value	0.78	%

* PEMS data provided by CMC Solutions, LLC.

Table 4-11
NO_x (lb/MMBtu) RATA Results
EUCTG3

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Turbine Load (MW)
1	3/21/2023	7:55-8:16	0.0205	0.0210	-0.0005	Y	190.2
2	3/21/2023	8:25-8:46	0.0207	0.0210	-0.0003	Y	189.6
3	3/21/2023	9:00-9:21	0.0209	0.0210	-0.0001	Y	188.7
4	3/21/2023	9:35-9:56	0.0204	0.0210	-0.0006	Y	187.7
5	3/21/2023	10:20-10:41	0.0196	0.0210	-0.0014	N	185.9
6	3/21/2023	10:55-11:16	0.0206	0.0210	-0.0004	Y	185.4
7	3/21/2023	11:40-12:01	0.0216	0.0210	0.0006	Y	184.4
8	3/21/2023	12:15-12:36	0.0209	0.0210	-0.0001	Y	184.4
9	3/21/2023	12:40-13:01	0.0205	0.0210	-0.0005	Y	183.2
10	3/21/2023	13:15-13:36	0.0210	0.0210	0.0000	Y	184.0
Averages			0.0208	0.0210	-0.0002		186.4

Unit Load	Normal	
RA based on mean difference	-0.0002	lb/MMBtu as NO_x

* PEMS data provided by CMC Solutions, LLC.

Table 4-12
O_2 (%-Dry) RATA Results
EUCTG3

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Turbine Load (MW)
1	3/21/2023	7:55-8:16	13.128	12.914	0.214	Y	190.2
2	3/21/2023	8:25-8:46	13.124	12.902	0.222	Y	189.6
3	3/21/2023	9:00-9:21	13.130	12.884	0.246	Y	188.7
4	3/21/2023	9:35-9:56	13.142	12.867	0.275	N	187.7
5	3/21/2023	10:20-10:41	13.147	12.912	0.235	Y	185.9
6	3/21/2023	10:55-11:16	13.135	12.963	0.172	Y	185.4
7	3/21/2023	11:40-12:01	13.178	13.172	0.006	Y	184.4
8	3/21/2023	12:15-12:36	13.177	13.176	0.001	Y	184.4
9	3/21/2023	12:40-13:01	13.181	13.291	-0.110	Y	183.2
10	3/21/2023	13:15-13:36	13.171	13.233	-0.062	Y	184.0
Averages			13.152	13.050	0.103		186.2

Standard Deviation	0.1423	
Confidence Coefficient (CC)	0.1095	
Unit Load	Normal	
RA based on mean RM value	1.61	%

* PEMS data provided by CMC Solutions, LLC.

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

Table 5-1 presents a summary of the gas cylinder information.

Table 5-1
Part 75 Gas Cylinder Information

Gas Type	Gas Concentrations	Cylinder ID	Expiration Date
O_2, Balance N_2	9.969%	CC210720	9/2/2030
O_2, Balance N_2	10.08%	ALM-041308	11/10/2030
O_2, Balance N_2	19.91%	SG9162511BAL	9/2/2030
NO_x, Balance N_2	50.06 ppmv	CC429472	8/26/2030
NO_x, Balance N_2	91.39 ppmv	AAL069508	11/30/2029
NO_2, Balance Air	50.32 ppmv	EB0147946	9/14/2025

EPA Method 3A and 7E calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

The NO_2 to NO converter efficiency check of the analyzer was conducted per the procedures in EPA Method 7E, Section 8.2.4. The conversion efficiency met the criteria.

5.2 QA/QC Discussion

All QA/QC criteria were met during this test program.

5.3 Quality Statement

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).

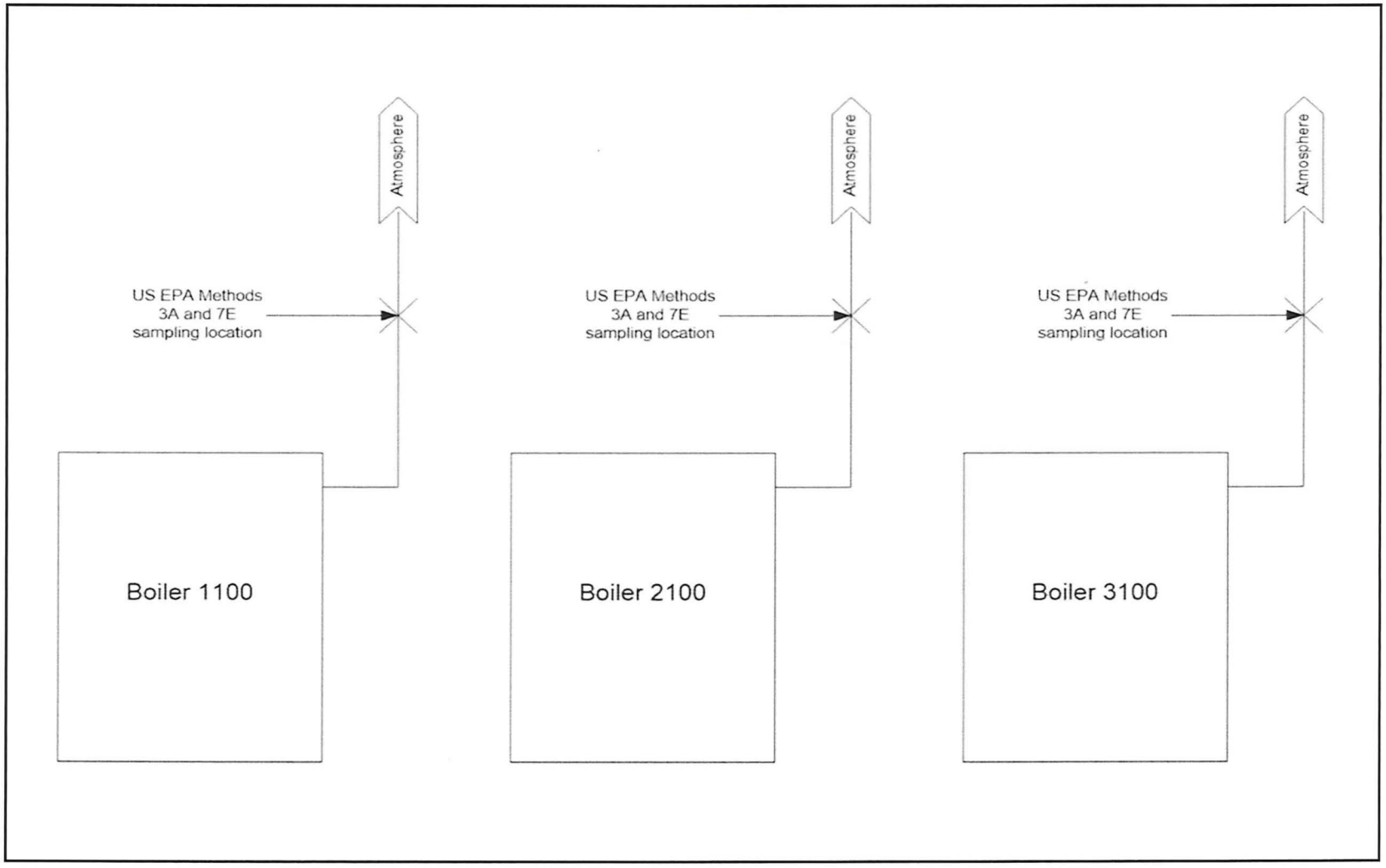
MONTROSE
AIR QUALITY SERVICES

Appendix A
Field Data and Calculations

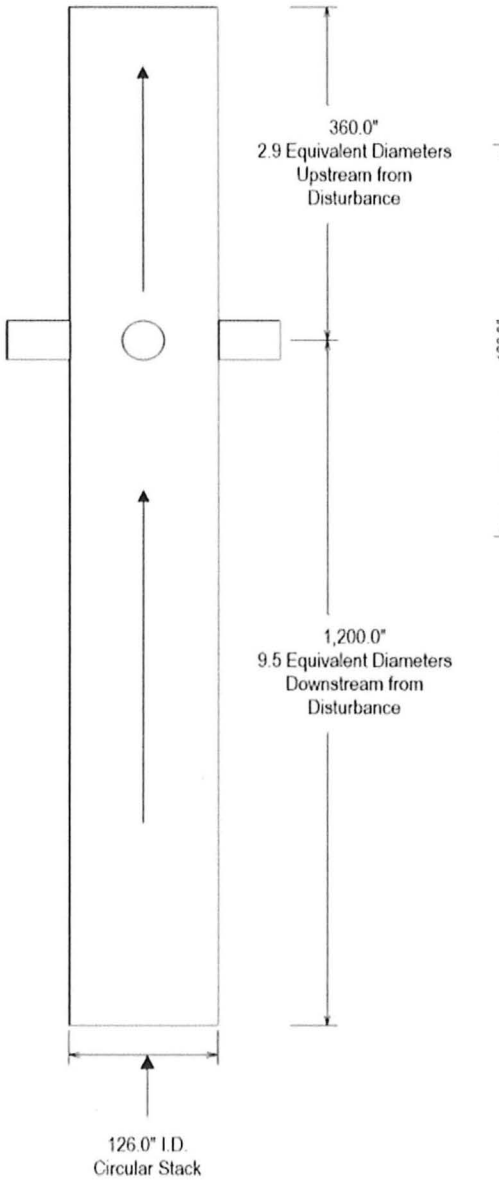
MONTROSE
AIR QUALITY SERVICES

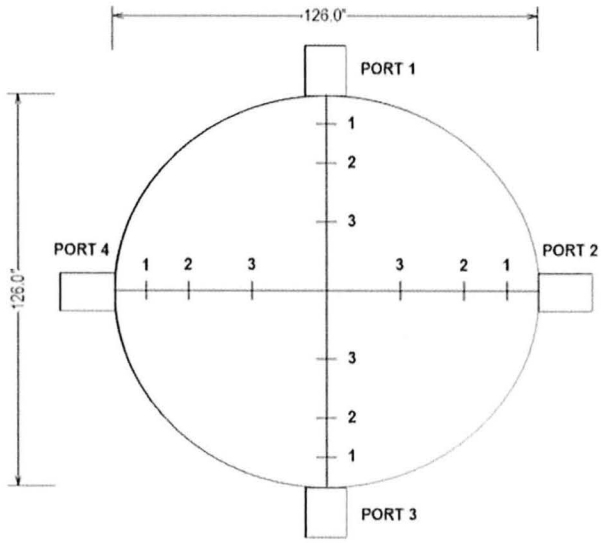
Appendix A.1
Sampling Locations

BOILERS SAMPLING LOCATION SCHEMATIC



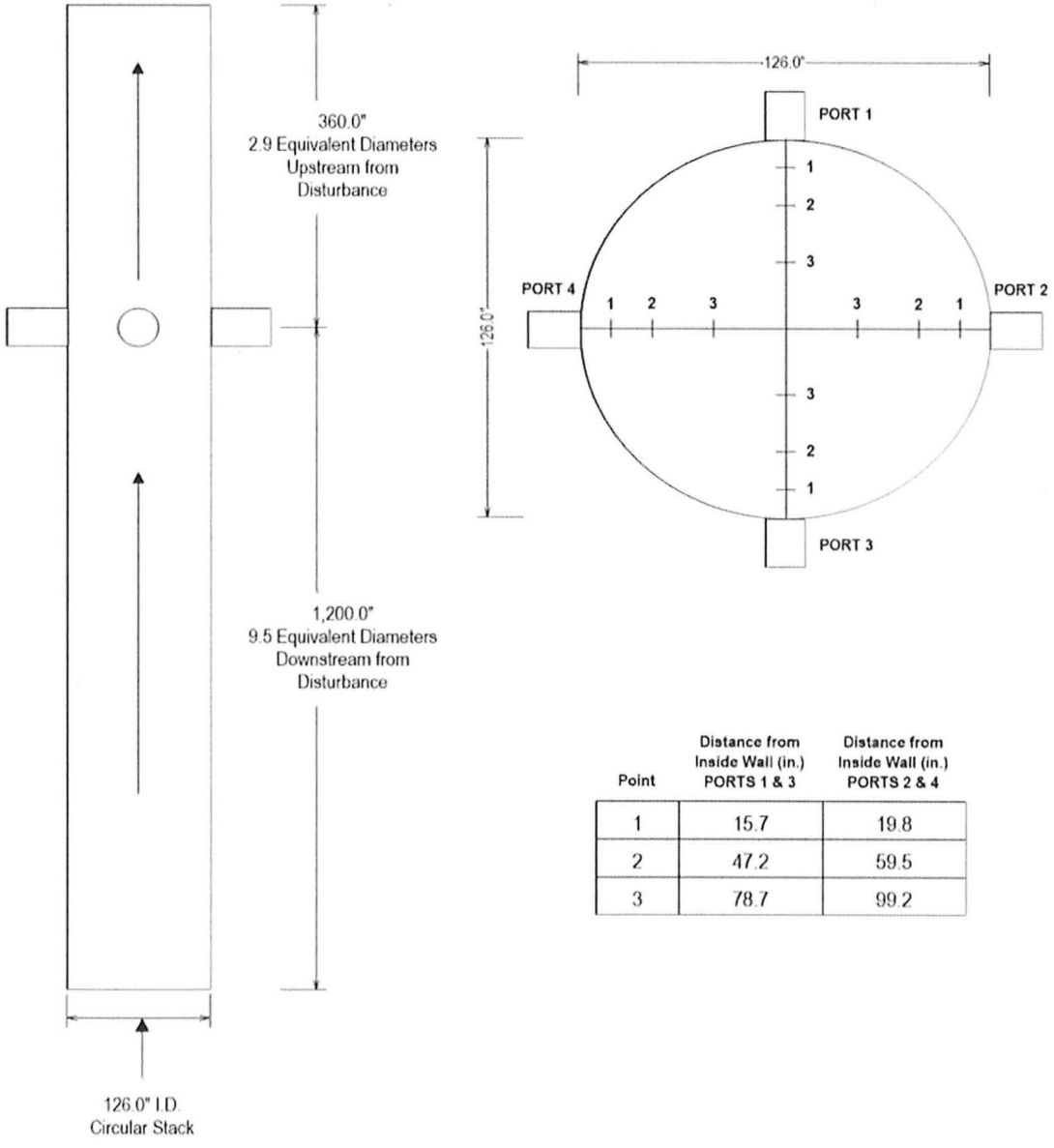
BOILER 1100 EXHAUST TRAVERSE POINT LOCATION DRAWING





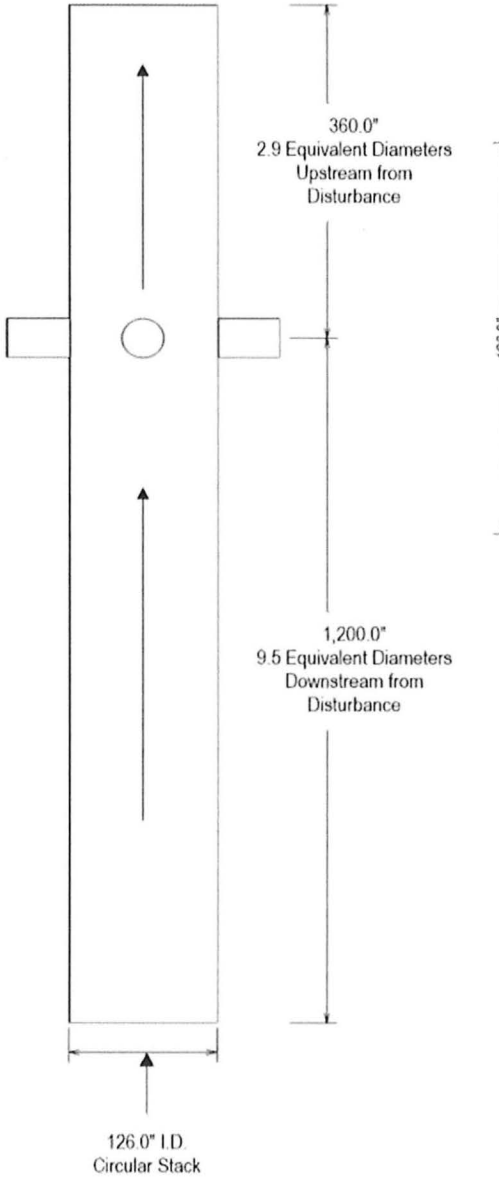
Point	Distance from Inside Wall (in.) PORTS 1 & 3	Distance from Inside Wall (in.) PORTS 2 & 4
1	15.7	19.8
2	47.2	59.5
3	78.7	99.2

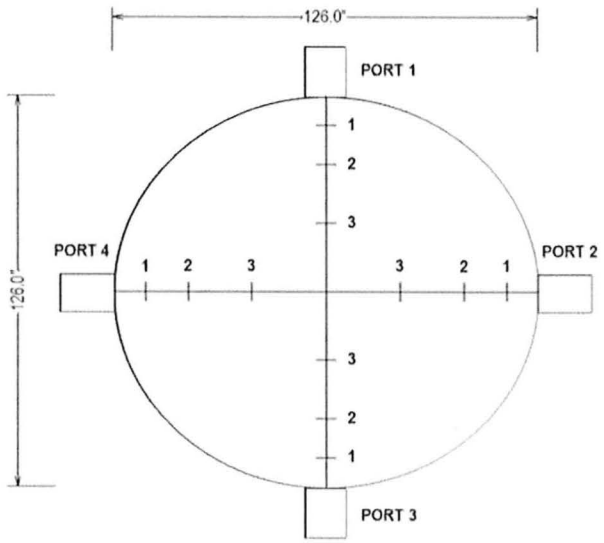
BOILER 2100 EXHAUST TRAVERSE POINT LOCATION DRAWING



Point	Distance from Inside Wall (in.) PORTS 1 & 3	Distance from Inside Wall (in.) PORTS 2 & 4
1	15.7	19.8
2	47.2	59.5
3	78.7	99.2

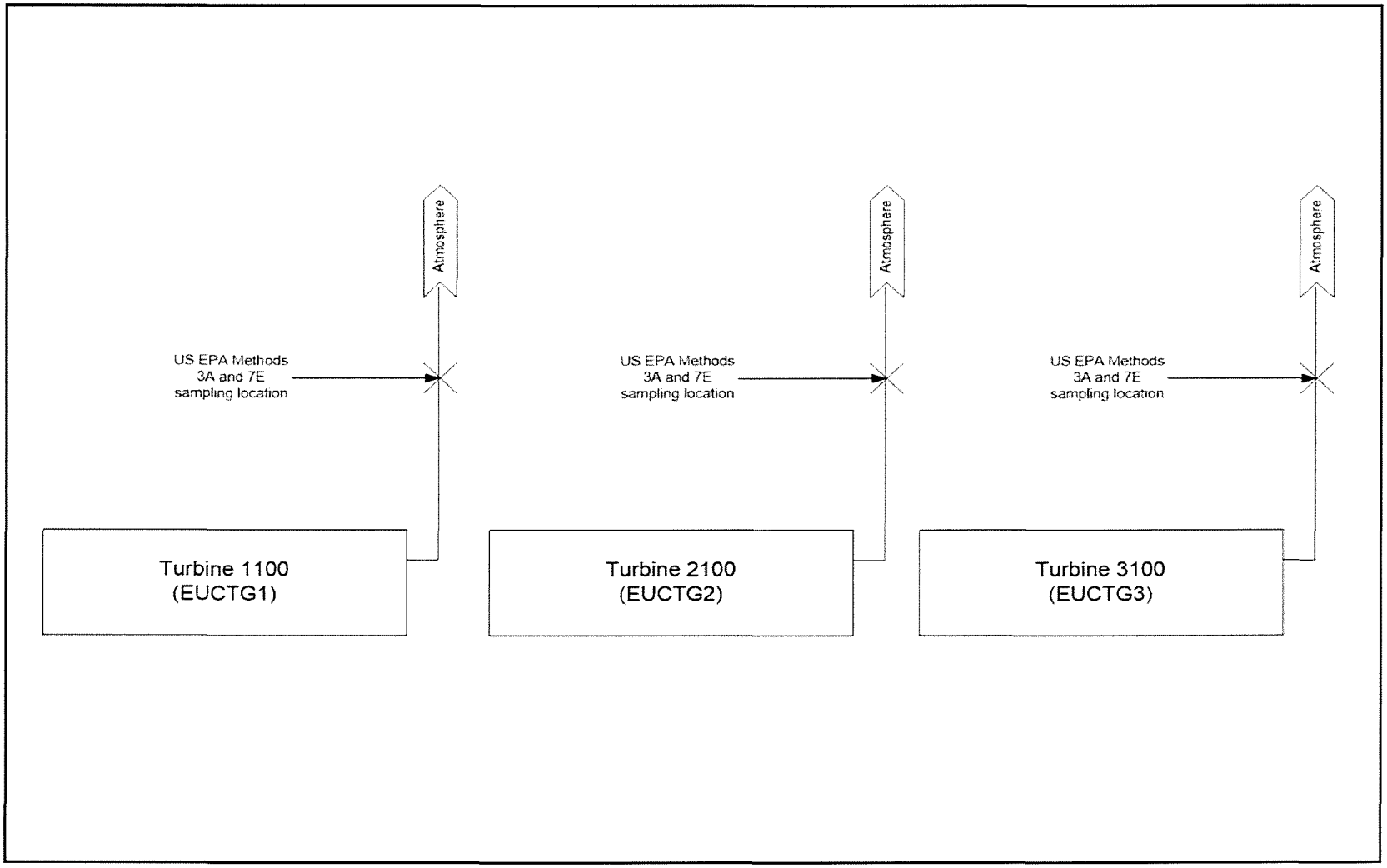
BOILER 3100 EXHAUST TRAVERSE POINT LOCATION DRAWING



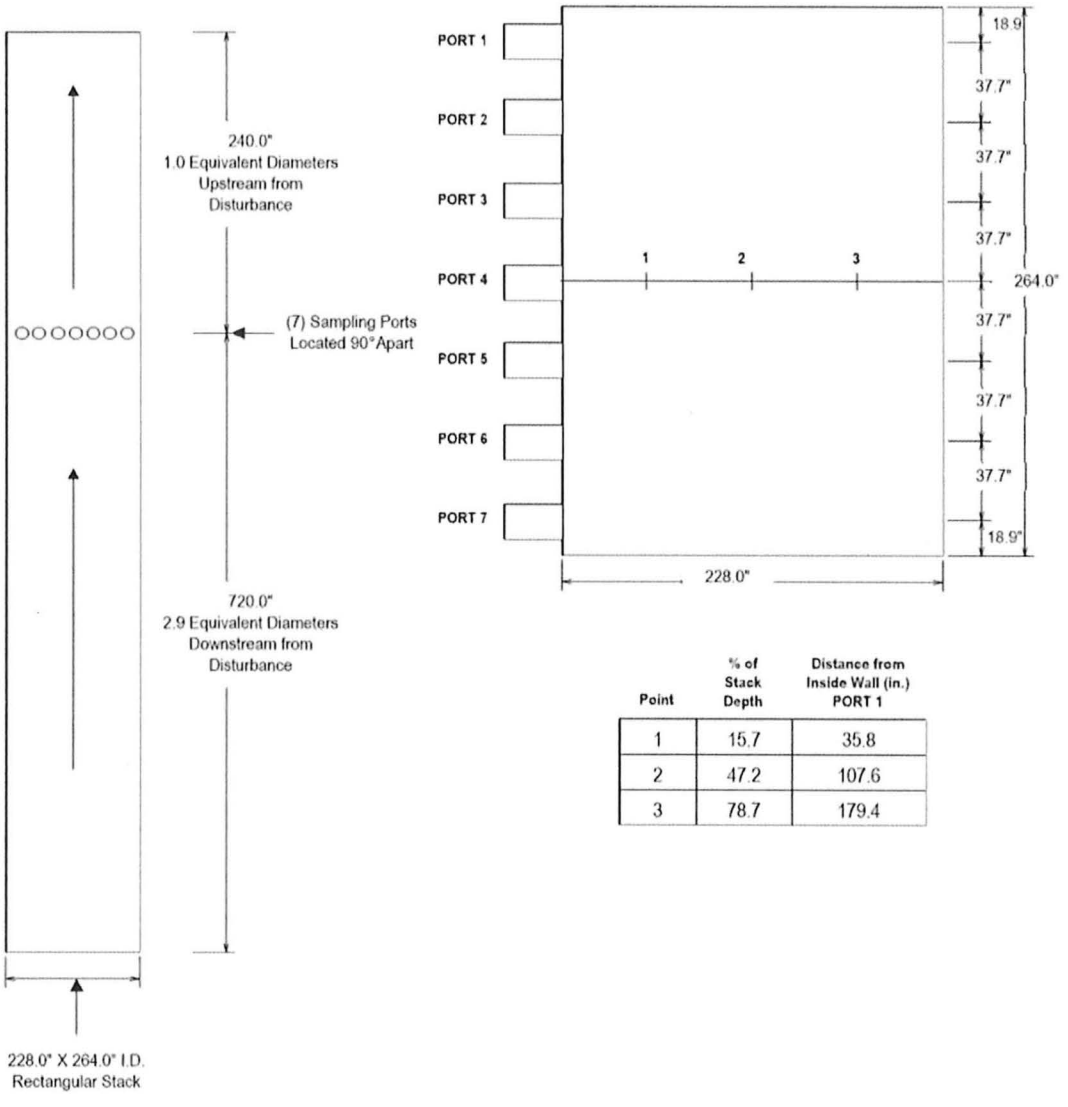


Point	Distance from Inside Wall (in.) PORTS 1 & 3	Distance from Inside Wall (in.) PORTS 2 & 4
1	15.7	19.8
2	47.2	59.5
3	78.7	99.2

TURBINES SAMPLING LOCATION SCHEMATIC

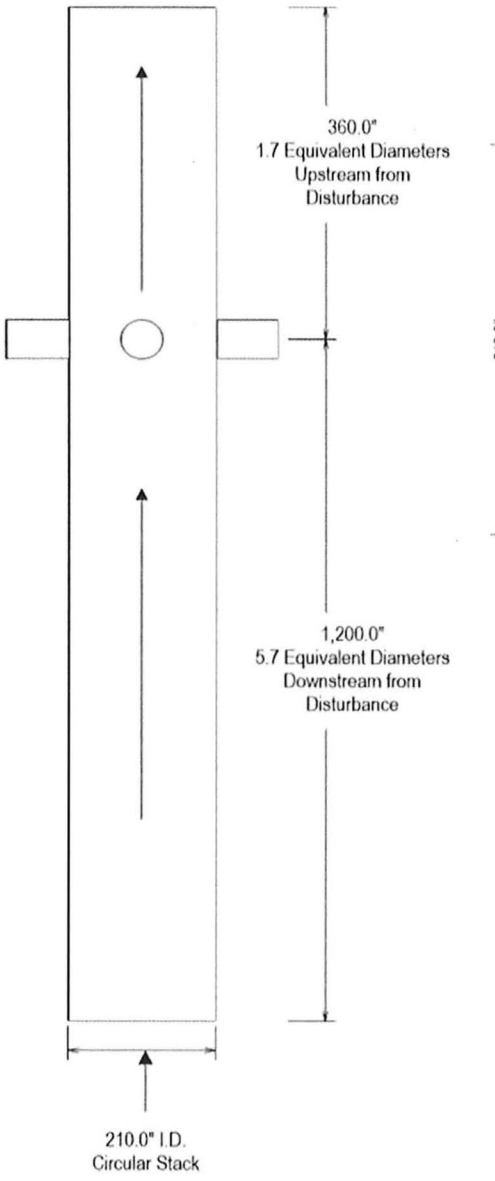


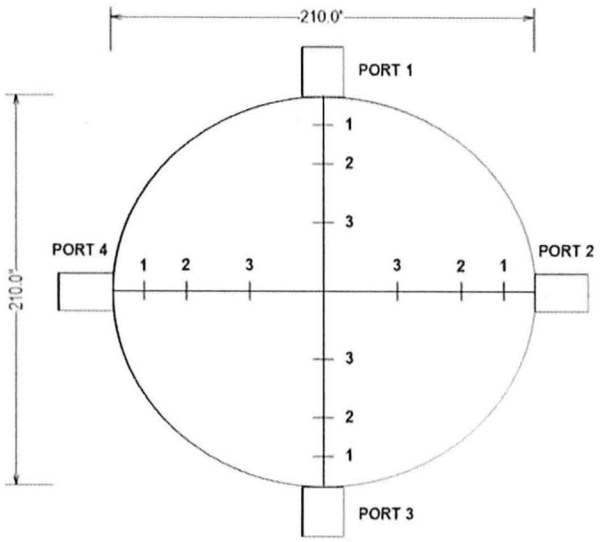
EUCTG1 EXHAUST TRAVERSE POINT LOCATION DRAWING



Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1
1	15.7	35.8
2	47.2	107.6
3	78.7	179.4

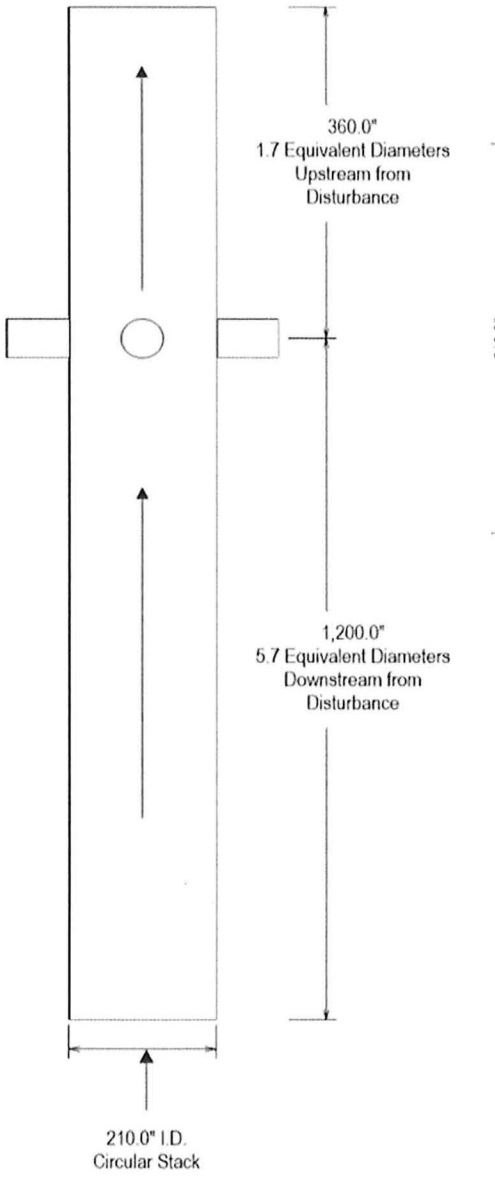
EUCTG2 EXHAUST TRAVERSE POINT LOCATION DRAWING

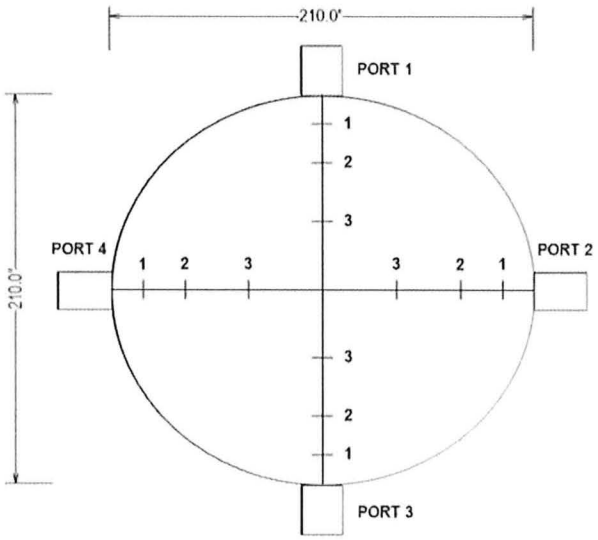




Point	Distance from Inside Wall (in.) PORTS 1 & 3	Distance from Inside Wall (in.) PORTS 2 & 4
1	15.7	33.0
2	47.2	99.1
3	78.7	165.3

EUCTG3 EXHAUST TRAVERSE POINT LOCATION DRAWING





Point	Distance from Inside Wall (in.) PORTS 1 & 3	Distance from Inside Wall (in.) PORTS 2 & 4
1	15.7	33.0
2	47.2	99.1
3	78.7	165.3