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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:** 12 / 18 / 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: Henry M. Taylor **Date:** 12 / 13 / 2023

Name: Henry Taylor **Title:** Senior Reporting QC Specialist

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1.0 Introduction

1.1 Summary of Test Program

UP Paper, LLC 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 Boiler No. 4 (EUBLR004) at the UP Paper, LLC facility (State Registration No.: A6475) located in Manistique, Michigan. Testing was performed on November 14, 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-A6475-2019 by evaluating the quality of the emissions data produced by UP Paper, LLC's PEMS in accordance with 40 CFR Part 60, Appendices B and F.

The specific objectives were to:

- Verify the relative accuracy (RA) of the EUBLR004 PEMS for nitrogen oxides (NO_x) emissions (lb/MMBtu) (as NO_2), NO_x concentration (ppmvd), and oxygen (O_2) concentration (%-Dry) in accordance with Performance Specification 16 (PS-16)
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Table 1-1.

Table 1-1
Summary of Test Program

Test Date(s)	Unit ID/ Source Name	Activity/Parameters	Test Methods	No. of Runs	Duration (Minutes)
11/14/2023	EUBLR004 PEMS	O_2	EPA 3A	10	21
11/14/2023	EUBLR004 PEMS	NO_x	EPA 7E	10	21

For the Part 60 RATA, nine RATA runs were used to determine the RA of the EUBLR004 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 Table 1-2. 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 1-3. The tests were conducted according to the test plan (protocol) dated October 4, 2023 that was submitted to and approved by the EGLE.

Table 1-2
Summary of Part 60 PEMS RATA Results – EUBLR004 PEMS

November 14, 2023

Parameter/Units	Regulatory Reference	RA	Allowable
Part 60			
Oxygen (O_2)			
% volume dry	PS-16	0.21% *	≤ 1.0% O_2 *
Nitrogen Oxides (NO_x)			
ppmvd	PS-16	5.50%	≤ 20% of RM
lb/MMBtu	PS-16	5.57%	≤ 20% of RM

* RA based on |difference|

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location:	UP Paper LLC 402 West Ell Street Manistique, MI 49854
Project Contact:	Mark Ozoga
Role:	EH&S Specialist
Company:	UP Paper
Telephone:	260-729-8213
Email:	markozoga@uppaperllc.com

Agency Information

Regulatory Agency:	EGLE
Telephone:	517-335-3122

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC
Contact:	John Nestor
Title:	District Manager
Telephone:	248-548-8070
Email:	jonestor@montrose-env.com

Test personnel and observers are summarized in Table 1-3.

Table 1-3
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
John Nestor	Montrose	District Manager, QI
Shane Rabideau	Montrose	Field Technician
Mark Ozoga	UP Paper	Test Coordinator

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

Boiler No. 4 (EUBLR004) has an input capacity of 186.8 MMBtu/hr while firing natural gas. The steam from the boiler is dispatched to various process equipment at the facility. Low-NO_x combustors minimize the emissions of NO_x from the boilers.

2.2 Facility PEMS and Reference Method (RM) CEMS Descriptions

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

Table 2-1
Facility PEMS Information

Analyzer Type	Manufacturer	Model No.	Serial No.
O_2	CMC Solutions	SmartCEMS®-60	EUBLR004.9995
NO_x	CMC Solutions	SmartCEMS®-60	EUBLR004.9995

Table 2-2
RM CEMS Information

Analyzer Type	Manufacturer	Model No.	Serial No.	Range
O_2	SERVEPRO	1440	01440D1-5222	0 - 19.91
NO_x	Teledyne NOx	T200H	727	0 - 89.26

2.3 Flue Gas Sampling Location

Information regarding the sampling location is presented in Table 2-3.

Table 2-3
Sampling Location

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUBLR004 Exhaust Stack	52.0	240.0 / 4.6	360.0 / 6.9	Gaseous: 3

See Appendix A.1 for more information.

2.4 Operating Conditions and Process Data

The PEMS RATA was performed while EUBLR004 was operating at greater than 50% of permitted capacity 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 PEMS data for each 21-minute RATA run
- Heat Input Rate, MMBtu/hr
- Gas Flow Rate, kscfh

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 Concentrations 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 concentration of O_2 and CO_2. The performance requirements of the method must be met to validate data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Calibration span value is 19.91% O_2
- Method Exceptions:
  - For gaseous emissions sampling, MDL are calculated for each analyzer. The ISDL is equal to the sensitivity of the instrumentation, which is 2% of the span value.
- Target and/or Minimum Required Sample Duration: 21 minutes
- Target Analytes: O_2

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

3.1.2 EPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Source (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.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - A dry extractive sampling system is used to report emissions on a dry basis

- Calibration span value is 82.26 ppmvd NO_x

- Method Exceptions:
  - For gaseous emissions sampling, MDL are calculated for each analyzer. The ISDL is equal to the sensitivity of the instrumentation, which is 2% of the span value.

- Target and/or Minimum Required Sample Duration: 21 minutes

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

3.1.3 EPA Method 19, Determination 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.

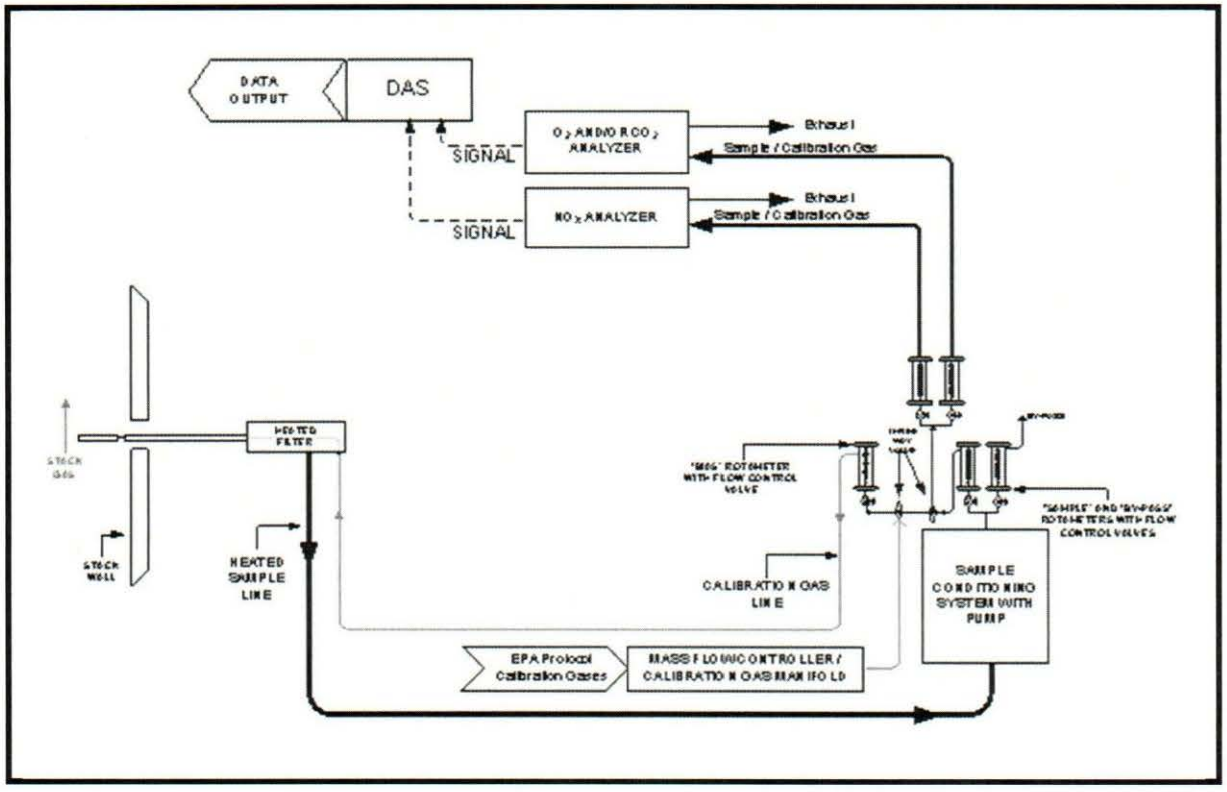
EPA Method 19 is used to calculate mass emission rates in units of lb/MMBtu. EPA Method 19, Table 19-2 contains a list of assigned fuel factors for different types of fuels, which can be used for these calculations.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - F factor is the oxygen-based F factor, dry basis (F_d)

- Method Exceptions:
  - None

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



3.1.4 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).

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - None
- Method Exceptions:

- None

- Applicable Performance Specifications - NO_x:
  - When average RM results are > 10 ppm and ≤ 100 ppm, RA calculated with RM in the denominator must be ≤ 20%
  - When average RM results are > 0.02 lb/MMBtu and ≤ 0.2 lb/MMBtu, RA calculated with RM in the denominator must be ≤ 20%
- Applicable Performance Specifications – O_2:
  - When RA is calculated as the absolute mean difference between the RM and CEMS, the RA must be within 1.0% O_2

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 Table 1-2. The results of individual test runs performed are presented in Tables 4-1 through 4-3. 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 -
EUBLR004 PEMS

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Heat Input Rate (MMBtu/hr)
1	11/4/2023	8:15-8:35	0.0348	0.0360	-0.0012	Y	119.0
2	11/4/2023	9:00-9:20	0.0345	0.0350	-0.0005	Y	120.2
3	11/4/2023	9:30-9:50	0.0342	0.0360	-0.0018	Y	119.1
4	11/4/2023	10:05-10:25	0.0341	0.0360	-0.0019	Y	118.5
5	11/4/2023	10:35-10:55	0.0343	0.0370	-0.0027	Y	117.5
6	11/4/2023	11:05-11:25	0.0342	0.0370	-0.0028	N	117.3
7	11/4/2023	11:35-11:55	0.0344	0.0340	0.0004	Y	120.8
8	11/4/2023	12:05-12:25	0.0355	0.0360	-0.0005	Y	134.8
9	11/4/2023	12:35-12:55	0.0355	0.0370	-0.0015	Y	136.4
10	11/4/2023	13:05-13:25	0.0361	0.0340	0.0021	Y	142.5
Averages			0.0348	0.0357	-0.0008		125.4

Standard Deviation	0.00142	
Confidence Coefficient (CC)	0.00109	
Unit Load	Normal	>50% of maximum rated capacity
RA based on mean RM value	5.57	%

* PEMS data provided by CMC Solutions, LLC.

Table 4-2
NO_x (ppmvd) RATA Results -
EUBLR004 PEMS

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Heat Input Rate (MMBtu/hr)
1	11/4/2023	8:15-8:35	27.019	27.833	-0.814	Y	119.0
2	11/4/2023	9:00-9:20	26.883	26.969	-0.086	Y	120.2
3	11/4/2023	9:30-9:50	26.500	27.795	-1.295	Y	119.1
4	11/4/2023	10:05-10:25	26.326	28.177	-1.851	Y	118.5
5	11/4/2023	10:35-10:55	26.417	28.602	-2.185	Y	117.5
6	11/4/2023	11:05-11:25	26.408	28.631	-2.223	N	117.3
7	11/4/2023	11:35-11:55	26.871	26.347	0.524	Y	120.8
8	11/4/2023	12:05-12:25	28.668	28.505	0.163	Y	134.8
9	11/4/2023	12:35-12:55	28.860	29.336	-0.476	Y	136.4
10	11/4/2023	13:05-13:25	29.373	26.503	2.870	Y	142.5
Averages			27.435	27.785	-0.350		125.427

Standard Deviation	1.50870	
Confidence Coefficient (CC)	1.15969	
Unit Load	Normal	>50% of maximum rated capacity
RA based on mean RM value	5.50	%

* PEMS data provided by CMC Solutions, LLC.

Table 4-3
O_2 (%-Dry) RATA Results -
EUBLR004 PEMS

Run No.	Date	Time	RM	PEMS*	Difference	Run used (Y/N)	Heat Input Rate (MMBtu/hr)
1	11/4/2023	8:15-8:35	4.031	4.105	-0.074	Y	119.0
2	11/4/2023	9:00-9:20	3.956	4.103	-0.147	Y	120.2
3	11/4/2023	9:30-9:50	4.074	4.110	-0.036	Y	119.1
4	11/4/2023	10:05-10:25	4.128	4.132	-0.004	Y	118.5
5	11/4/2023	10:35-10:55	4.158	4.106	0.052	Y	117.5
6	11/4/2023	11:05-11:25	4.129	4.101	0.028	N	117.3
7	11/4/2023	11:35-11:55	3.935	4.069	-0.134	Y	120.8
8	11/4/2023	12:05-12:25	3.326	3.672	-0.346	Y	134.8
9	11/4/2023	12:35-12:55	3.231	3.580	-0.349	Y	136.4
10	11/4/2023	13:05-13:25	3.192	4.050	-0.858	Y	142.5
Averages			3.781	3.992	-0.211		125.4

Unit Load	Normal	>50% of maximum rated capacity
RA based on |difference|	0.21	% as O2

* 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 60 Gas Cylinder Information

Gas Type	Gas Concentrations	Cylinder ID	Expiration Date
O_2, Balance N_2	10.08	EB0164485	4/20/2031
O_2, Balance N_2	19.91	CC300839	9/2/2030
NO_x, Balance N_2	50.2	CC49532	4/27/2031
NO_x, Balance N_2	89.26	CC49532	4/27/2030
NO_2, Balance Air	50.32	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).

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Appendix A
Field Data and Calculations

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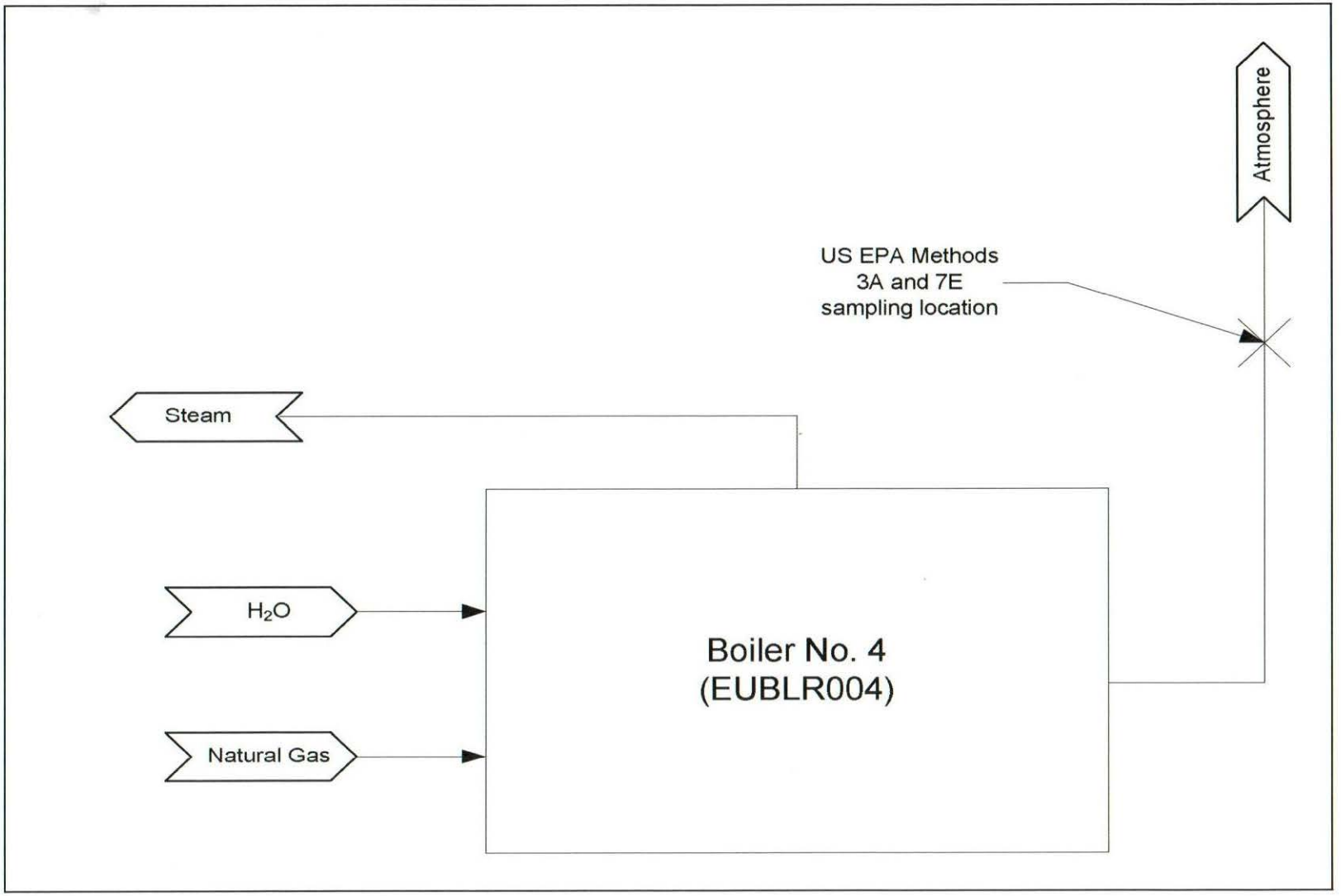
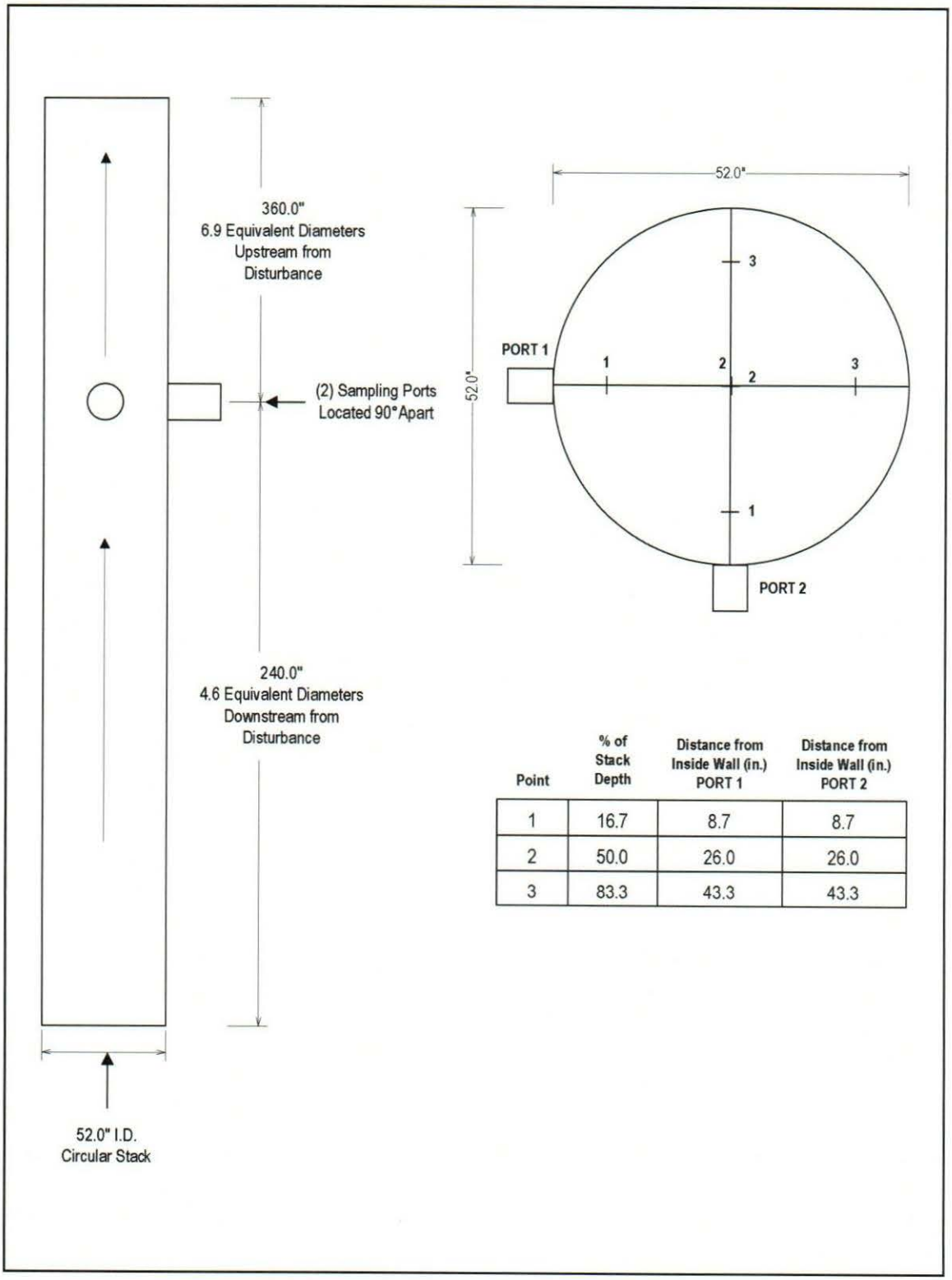
Appendix A.1
Sampling Locations

EUBLR004 SAMPLING LOCATION SCHEMATIC



EUBLR004 EXHAUST STACK TRAVERSE POINT LOCATION DRAWING



Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	16.7	8.7	8.7
2	50.0	26.0	26.0
3	83.3	43.3	43.3