MONTROSE
AIR QUALITY SERVICES

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:** 09 / 28 / 2022

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:** 09 / 30 / 2022

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

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1.0 Introduction

1.1 Summary of Test Program

Rack Processing Michigan, LLC (Facility ID: N7679) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the Natural Gas-Fired Burn-Off Oven (EUBURNOFF) at the Rack Processing Michigan, LLC facility located in Wyoming, Michigan. Testing was performed on July 29-30, 2022, 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-N7679-2018.

The specific objectives were to:

- Verify the emissions of hydrogen chloride (HCl) at the exhaust stack (SV-BURNOFF) serving EUBURNOFF during an entire burn-off oven batch
- 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)
July 29-30, 2022	EUBURNOFF	Velocity/Volumetric Flow Rate	EPA 1 & 2	21	5-10
July 29-30, 2022	EUBURNOFF	O_2, CO_2	EPA 3A	1	1,260
July 29-30, 2022	EUBURNOFF	Moisture	EPA 4	1	1,260
July 29-30, 2022	EUBURNOFF	HCl	EPA 320	1	1,260

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 average emission test results are summarized and compared to their respective permit limits 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 April 19, 2022 that was submitted to the EGLE.

Table 1-2
Summary of Average Compliance Results – EUBURNOFF

July 29-30, 2022

Parameter/Units	Average Results	Emission Limits
Hydrogen Chloride (HCl)		
lb/hr	60.5	90
lb/batch	327.2	--
lb/lb-product	0.31	--

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location: Rack Processing Michigan, LLC
3513 Lousma Drive SE
Wyoming, MI 49548
Project Contact: Danny Jozwiak
Company: Rack Processing Michigan
Telephone: 989-619-3499
Email: djozwiak@rackprocessing.com

Agency Information

Regulatory Agency: EGLE
Agency Contact: Lindsey Wells
Telephone: 517-282-2345
Email: WellsL8@michigan.gov

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

Consultant Information

Company: Wright EHS Solutions
Contact: Amy H. Wright
Telephone: 937-830-9240
Email: wrightehsllc@gmail.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
David Koponen	Montrose	Field Technician
Danny Jozwiak	Rack Processing Michigan, LLC	Test Coordinator
Lindsey Wells	EGLE	Observer
April Lazaro	EGLE	Observer

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

Rack Processing Michigan, LLC utilizes a batch-type natural gas-fired burn-off oven (EUBURNOFF) for removing plastisol coating from metal parts. No more than 1,285 pounds of plastisol coating can be processed per batch. An EUBURNOFF batch takes approximately 9-20 hours to complete. The oven is equipped with a primary chamber of 0.928 MMBtu/hr and a 1.36 MMBtu/hr afterburner control system. The EUBURNOFF was in operation for this test event.

2.2 Flue Gas Sampling Location

Information regarding the sampling location is presented in Table 2-1.

Table 2-1
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.)	
EUBURNOFF Exhaust Stack	19.8	180.0 / 9.1	396.0 / 20.1	Flow: 16 (8/port) Gaseous: 1

The sampling location was verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using EPA Method 1, Section 11.4. See Appendix A.1 for more information.

2.3 Operating Conditions and Process Data

Emission tests were performed during a 21-hour burn-off oven batch.

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

- Production rate, lb-pastisol/batch

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 1, Sample and Velocity Traverses for Stationary Sources

EPA Method 1 is used to assure that representative measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance.

The sample port and traverse point locations are detailed in Appendix A.

3.1.2 EPA Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stauβcheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1.

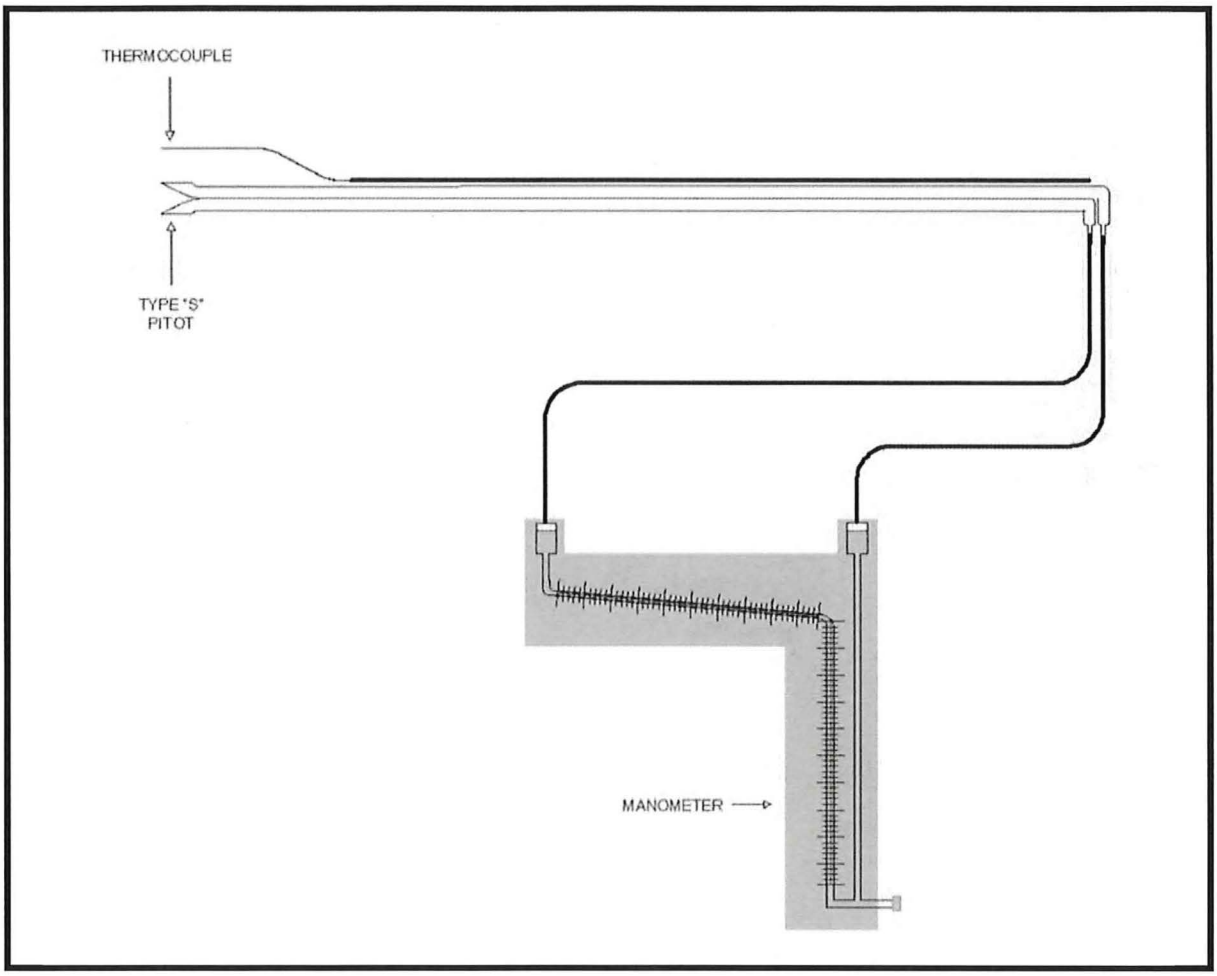
The typical sampling system is detailed in Figure 3-1.

3.1.3 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.

The typical sampling system is detailed in Figure 3-2.

Figure 3-1
EPA Method 2 Sampling Train



3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture. EPA Method 320 was used to determine moisture as per EPA Method 4, Section 16.3.

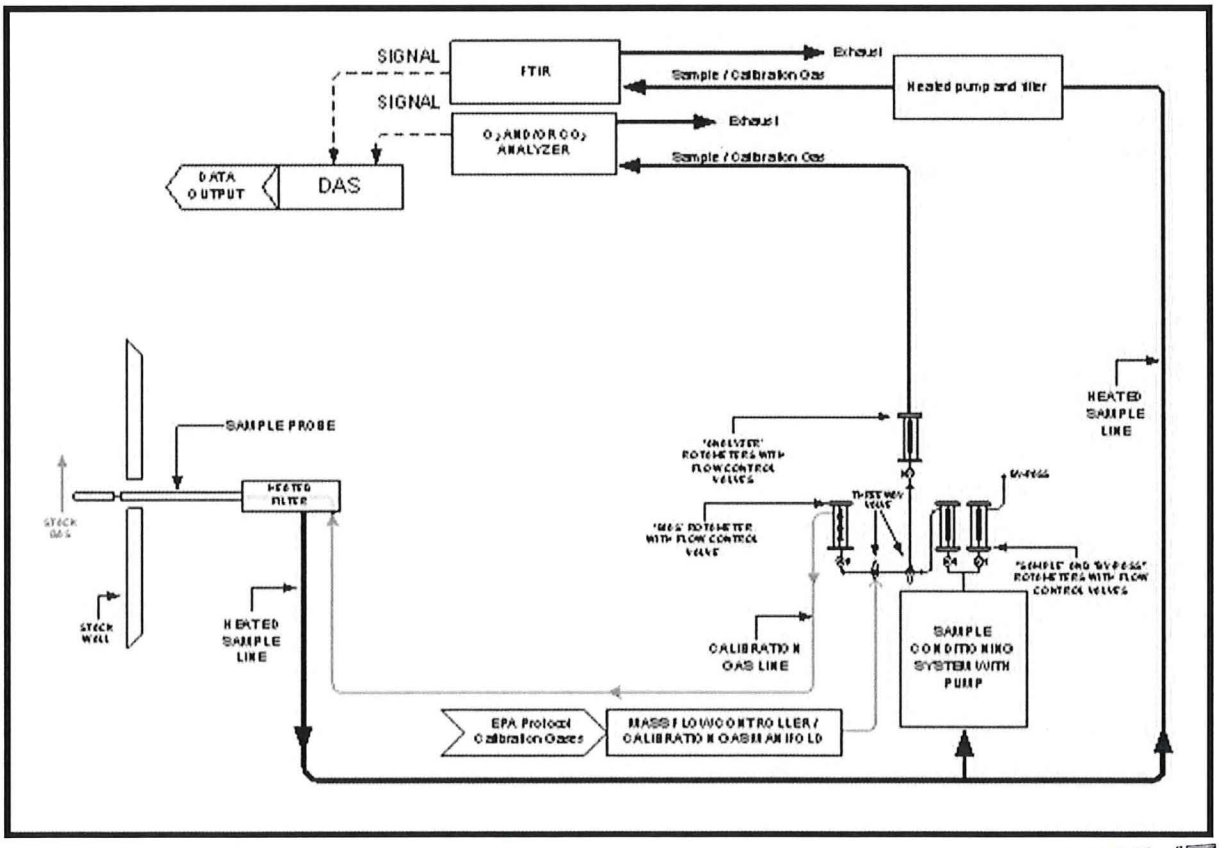
The typical sampling system is detailed in Figure 3-2.

3.1.5 EPA Method 320, Measurement of Vapor Phase Organic and Inorganic Emissions by Extractive FTIR Spectroscopy

EPA Method 320 is an instrumental test method used to measure specific analyte concentrations for which EPA reference spectra have been developed or prepared. Extractive emission measurements are performed using FTIR spectroscopy. The FTIR analyzer is composed of a spectrometer and detector, a high optical throughput sampling cell, analysis software, and a quantitative spectral library. The analyzer collects high resolution spectra in the mid infrared spectral region (400 to 4,000 cm-1), which are analyzed using the quantitative spectral library. This provides an accurate, highly sensitive measurement of gases and vapors.

The typical sampling system is detailed in Figure 3-2.

Figure 3-2
EPA Methods 3A, 4, and 320 Sampling Train



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 average results are compared to the permit limit in Table 1-2. The results of the compliance test run performed during the 21-hour burn-off oven batch are presented in Table 4-1. Results for each 1-hour segment of the test run are presented in Tables 4-2 through 4-8. 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.

Since more than 10% of the individual ΔP readings recorded at the EUBURNOFF Exhaust Stack were below 0.05 in-H_2O, a more sensitive micromanometer was utilized at this location as per EPA Method 2, Section 6.2.

Samples were analyzed for HCl by Fourier transform infrared (FTIR) spectroscopy. FTIR spectroscopy operates on the principles of the Beer-Lambert law. This law states that the intensity of light absorbed by an analyte is directly proportional to both the concentration of the analyte, as well as the distance the light travels through the analyte.

While onsite, the FTIR analyst was using a calibration curve labeled 2,000 ppm. The reference spectra used in this calibration curve were generated on a gas cell with a one-meter path length. The mks onsite was operating with a gas cell pathlength of 5.11 meters. The software correctly calculated the differences in pathlength from the reference spectra to the effluent spectra. However, the difference in pathlength meant this calibration curve was actually 5 times lower than the analyst believed and generated lower results onsite. Once manual validations were performed, a higher calibration curve was applied to the sample spectra to generate correct results.

Table 4-1
HCl Emissions Results -
EUBURNOFF

Parameter/Units	Run 1
Date	7/29/2022 – 7/30/2022
Test Duration, hr	21
Process Data *	
Production rate, lb-product/batch	1,048
Hydrogen Chloride (HCl)	
lb/hr	60.5
lb/batch	372.2
lb/lb-product	0.31

* Process data was provided by Rack Processing Michigan personnel.

Table 4-2
HCl Hourly (1-3 hours) Emissions Results -
EUBURNOFF

Parameter/Units	Run 1	Run 2	Run 3
Date	7/29/2022	7/29/2022	7/29/2022
Time	9:31-10:31	10:31-11:31	11:31-12:31
Sampling & Flue Gas Parameters			
sample duration, minutes	60	60	60
O_2, % volume dry	18.19	18.51	17.53
CO_2, % volume dry	2.40	2.23	3.18
flue gas temperature, °F	1,399.8	1,460.8	1,471.2
moisture content, % volume	6.26	5.34	5.88
volumetric flow rate, dscfm	825	657	670
Hydrogen Chloride (HCl)			
ppmvd	-0.1	132.9	2,094.9
lb/hr	0.0	0.5	8.0

Table 4-3
HCl Hourly (4-6 hours) Emissions Results - EUBURNOFF

Parameter/Units	Run 4	Run 5	Run 6
Date	7/29/2022	7/29/2022	7/29/2022
Time	12:31-13:31	13:31-14:31	14:31-15:31
Sampling & Flue Gas Parameters			
sample duration, minutes	60	60	60
O_2, % volume dry	18.04	16.74	15.56
CO_2, % volume dry	2.66	3.97	5.19
flue gas temperature, °F	1,602.5	1,556.3	1,528.6
moisture content, % volume	5.23	6.31	9.92
volumetric flow rate, dscfm	630	670	648
Hydrogen Chloride (HCl)			
ppmvd	3,957.5	5,363.6	15,663.2
lb/hr	14.2	20.4	57.6

Table 4-4
HCl Hourly (7-9 hours) Emissions Results - EUBURNOFF

Parameter/Units	Run 7	Run 8	Run 9
Date	7/29/2022	7/29/2022	7/29/2022
Time	15:31-16:31	16:31-17:31	17:31-18:31
Sampling & Flue Gas Parameters			
sample duration, minutes	60	60	60
O_2, % volume dry	15.59	16.91	18.29
CO_2, % volume dry	5.32	3.94	2.71
flue gas temperature, °F	1,499.0	1,551.8	1,508.6
moisture content, % volume	10.19	8.59	6.42
volumetric flow rate, dscfm	680	620	657
Hydrogen Chloride (HCl)			
ppmvd	15,653.5	10,138.9	5,582.8
lb/hr	60.5	35.7	20.8

Table 4-5
HCl Hourly (10-12 hours) Emissions Results - EUBURNOFF

Parameter/Units	Run 10	Run 11	Run 12
Date	7/29/2022	7/29/2022	7/29/2022
Time	18:31-19:31	19:31-20:31	20:31-21:31
Sampling & Flue Gas Parameters			
sample duration, minutes	60	60	60
O_2, % volume dry	18.00	18.00	18.27
CO_2, % volume dry	2.63	2.60	2.33
flue gas temperature, °F	1,508.2	1,566.7	1,531.1
moisture content, % volume	6.25	6.22	5.84
volumetric flow rate, dscfm	660	616	618
Hydrogen Chloride (HCl)			
ppmvd	4,573.9	4,309.9	3,289.1
lb/hr	17.1	15.1	11.5

Table 4-6
HCl Hourly (13-15 hours) Emissions Results - EUBURNOFF

Parameter/Units	Run 13	Run 14	Run 15
Date	7/29/2022	7/29/2022	7/29/2022 – 7/30/2022
Time	21:31-22:31	22:31-23:31	23:31-0:31
Sampling & Flue Gas Parameters			
sample duration, minutes	60	60	60
O_2, % volume dry	18.25	18.26	18.29
CO_2, % volume dry	2.35	2.46	2.50
flue gas temperature, °F	1,555.0	1,557.1	1,523.3
moisture content, % volume	5.83	5.97	6.03
volumetric flow rate, dscfm	630	638	625
Hydrogen Chloride (HCl)			
ppmvd	2,805.7	2,645.2	2,538.7
lb/hr	10.0	9.6	9.0

Table 4-7
HCl Hourly (16-18 hours) Emissions Results - EUBURNOFF

Parameter/Units	Run 16	Run 17	Run 18
Date	7/30/2022	7/30/2022	7/30/2022
Time	0:31-1:31	1:31-2:31	2:31-3:31
Sampling & Flue Gas Parameters			
sample duration, minutes	60	60	60
O_2, % volume dry	18.28	18.29	18.27
CO_2, % volume dry	2.55	2.53	2.52
flue gas temperature, °F	1,565.6	1,507.1	1,486.2
moisture content, % volume	6.19	5.90	5.83
volumetric flow rate, dscfm	609	620	614
Hydrogen Chloride (HCl)			
ppmvd	2,358.7	1,874.7	1,613.8
lb/hr	8.2	6.6	5.6

Table 4-8
HCl Hourly (19-21 hours) Emissions Results - EUBURNOFF

Parameter/Units	Run 19	Run 20	Run 21
Date	7/30/2022	7/30/2022	7/30/2022
Time	3:31-4:31	4:31-5:31	5:31-6:31
Sampling & Flue Gas Parameters			
sample duration, minutes	60	60	60
O_2, % volume dry	18.25	18.29	19.17
CO_2, % volume dry	2.54	2.57	1.75
flue gas temperature, °F	1,495.1	1,507.8	1,518.6
moisture content, % volume	5.69	5.54	5.17
volumetric flow rate, dscfm	632	619	614
Hydrogen Chloride (HCl)			
ppmvd	1,479.5	1,193.2	2,114.2
lb/hr	5.3	4.2	7.4

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

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

The EPA Method 320 performance parameters measured included signal to noise tests, noise equivalent absorbance (NEA), detector linearity, background spectra, potential interferents, and cell and system leakage. Quality assurance procedures included baseline measurement with ultra-high purity nitrogen, measurement of a calibration transfer standard, direct analyte calibration measurements, and measurements to determine baseline shift. SF_6 was also used as a tracer gas in the calibration gases to evaluate dilution ratios and verify the sample delivery system integrity. A dynamic matrix spike was performed using SF_6 as a tracer gas. The method QA/QC criteria were met.

5.2 QA/QC Discussion

Montrose did not have a Qualified Individual (QI) for EPA Method 320 onsite during the test event as per ASTM D7036-04 requirements. However, upon data review, all EPA Method 320 data quality objectives were met.

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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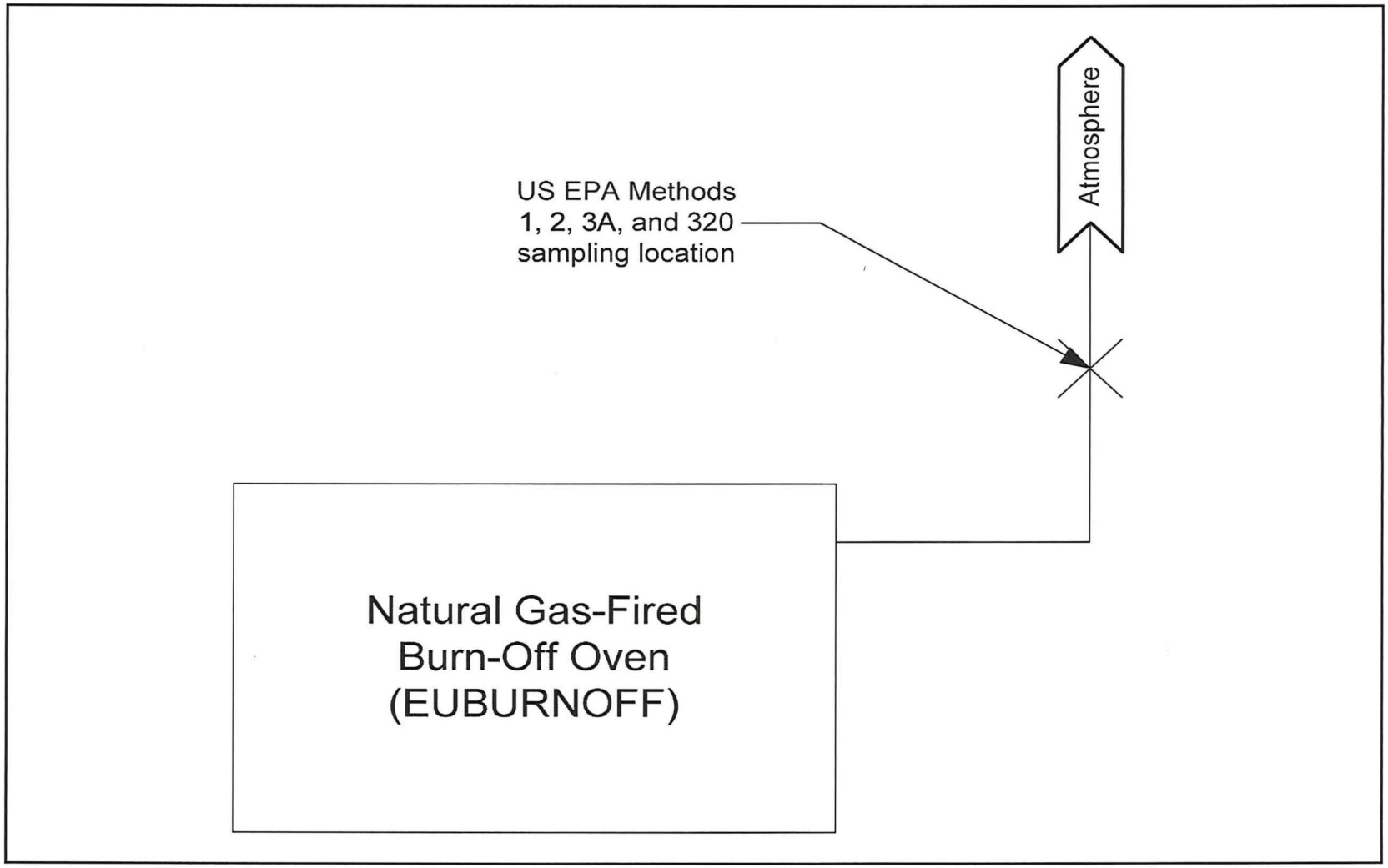
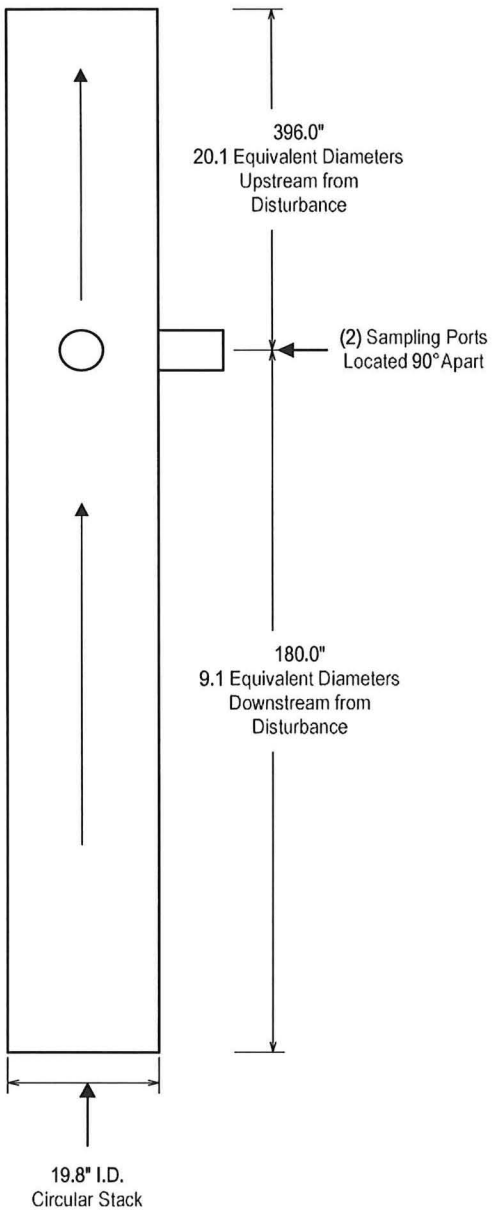
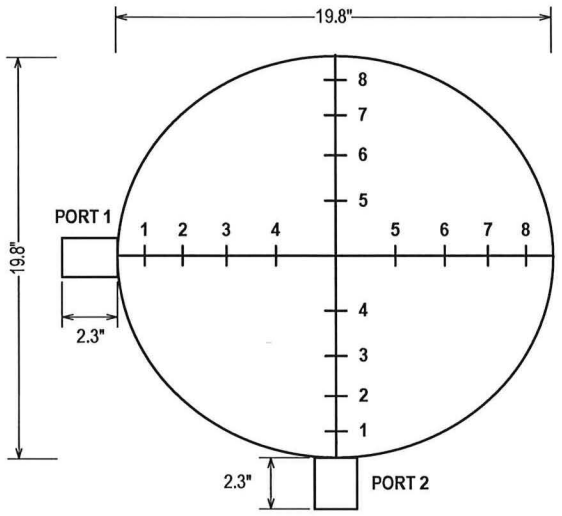
Appendix A.1
Sampling Locations

EUBURNOFF SAMPLING LOCATION SCHEMATIC



EUBURNOFF EXHAUST TRAVERSE POINT LOCATION DRAWING





Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	3.2	0.6	0.6
2	10.5	2.1	2.1
3	19.4	3.8	3.8
4	32.3	6.4	6.4
5	67.7	13.4	13.4
6	80.6	15.9	15.9
7	89.5	17.7	17.7
8	96.8	19.1	19.1