

RECEIVED

APR 18 2023

AIR QUALITY DIVISION

**Source Test Report for
2023 Compliance Emissions Testing**

**Dry Calcium Chloride Process
Material Handling and Loading
(EUFLAKEDBULK)**

**Occidental Chemical Corporation
Ludington, Michigan**

Prepared For:

**Occidental Chemical Corporation
1600 S. Madison Street
Ludington, MI 49431**

Prepared By:

**Montrose Air Quality Services, LLC
4949 Fernlee Avenue
Royal Oak, MI 48073**

For Submission To:

**Michigan Department of Environment, Great Lakes, and Energy
Constitution Hall, 2nd Floor South
525 West Allegan Street
Lansing, MI 48933**

Document Number: MW049AS-023645-RT-1195

Test Date: February 15-16, 2023

Submittal Date: April 5, 2023



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:** 04 / 05 / 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:** 04 / 05 / 2023

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

Table of Contents

Section	Page
1.0 Introduction	5
1.1 Summary of Test Program	5
1.2 Key Personnel	6
2.0 Plant and Sampling Location Descriptions.....	8
2.1 Process Description, Operation, and Control Equipment.....	8
2.2 Flue Gas Sampling Location	8
2.3 Operating Conditions and Process Data	9
3.1 Test Methods	10
3.1.1 EPA Method 1	10
3.1.2 EPA Method 2.....	10
3.1.3 EPA Method 3.....	10
3.1.4 EPA Method 4.....	11
3.1.5 EPA Method 5.....	12
3.2 Process Test Methods.....	12
4.0 Test Discussion and Results.....	13
4.1 Field Test Deviations and Exceptions.....	13
4.2 Presentation of Results.....	13
5.0 Internal QA/QC Activities	15
5.1 QA/QC Audits.....	15
5.2 QA/QC Discussion.....	15
5.3 Quality Statement	15

List of Appendices

A Field Data and Calculations	16
A.1 Sampling Locations.....	17
A.2 S-50 Scrubber Data Sheets	20
A.3 Example Calculations	37
B Facility Process Data.....	42
C Laboratory Analysis Data	45
D Quality Assurance/Quality Control	48
D.1 Units and Abbreviations.....	49
D.2 Manual Test Method QA/QC Data.....	58
D.3 Accreditation Information/Certifications.....	69

E Regulatory Information 72
 E.1 Regulatory Correspondence 73
 E.2 Intent-to-Test Notification 76

List of Tables

1-1 Summary of Test Program 5
 1-2 Summary of Average Compliance Results – EUFLAKEDBULK 6
 1-3 Test Personnel and Observers 7
 2-1 Sampling Location 8
 4-1 FPM Emissions Results - EUFLAKEDBULK 14

List of Figures

3-1 EPA Method 5 Sampling Train 11

1.0 Introduction

1.1 Summary of Test Program

Occidental Chemical Corporation (OxyChem) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the Dry Calcium Chloride Process-Material Handling and Loading (EUFLAKEDBULK) at the OxyChem facility (State Registration No.: B1846) located in Ludington, Michigan. Testing was performed on February 15-16, 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-B1846-2021.

The specific objectives were to:

- Verify the emissions of filterable particulate matter (FPM) from the SV06066 exhaust stack of the S-50 Scrubber serving EUFLAKEDBULK
- 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)
2/15/2023 – 2/16/2023	EUFLAKEDBULK S-50 Scrubber	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	160
2/15/2023 – 2/16/2023	EUFLAKEDBULK S-50 Scrubber	O ₂ , CO ₂	EPA 3	3	160
2/15/2023 – 2/16/2023	EUFLAKEDBULK S-50 Scrubber	Moisture	EPA 4	3	160
2/15/2023 – 2/16/2023	EUFLAKEDBULK S-50 Scrubber	FPM	EPA 5	3	160

To simplify this report, a list of Units and Abbreviations is included in Appendix D.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 January 30, 2023, that was submitted to the EGLE.

Table 1-2
Summary of Average Compliance Results – EUFLAKEDBULK
February 15-16, 2023

Parameter/Units	Average Results	Emission Limits
Filterable Particulate Matter (FPM)		
lb/hr	0.042	--
lb/1,000 lbs dry exhaust gas	0.0009	0.1

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location: Occidental Chemical Corporation
 1600 S. Madison Street
 Ludington, MI 49431

Project Contact: Seth Garrity	Kaitlyn Woschlager
Role: Environmental Engineer, HES&S	Associate Process Engineer II
Company: OxyChem	OxyChem
Email: Seth_Garrity@oxy.com	Kaitlyn_Woschlager@oxy.com

Agency Information

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

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

Laboratory Information

Laboratory: OxyChem
 City, State: Ludington, MI
 Method: EPA Method 5

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
Roy Zimmer	Montrose	Field Technician
Seth Garrity	OxyChem	Test Coordinator
Jeremy Howe	EGLE	Observer
Andrew Riley	EGLE	Observer

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

The EUFLAKEDBULK unit consists of three product hoppers, truck and railcar load stations, a reclaim system to transfer calcium chloride from rail car to product hopper, and a pneumatic transport system to convey calcium chloride to the feed hopper for the dry calcium chloride process, identified as emission unit EUDGDCCFIBC. A slight negative pressure is maintained on the material handling equipment to induce a draft in order to collect the dust generated during handling operations.

The exhaust air from the EUFLAKEDBULK process is controlled by a venturi scrubber (S-50) followed by a liquid-air separator to remove contaminants before being vented. The venturi pressure drop and flow rate are monitored and controlled above the preset minimum. The liquid-air separator portion of the scrubber removes excess droplets by gravity due to lower air velocity. The air passes through a mist elimination section before being exhausted through the vent. The venturi pressure drop and the scrubbing fluid flow rate are monitored and controlled.

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.)	
S-50 Scrubber Exhaust Stack	29.5	225 / 7.6	96 / 2.2	Isokinetic: 16 (8/port)

Sample location was verified in the field to conform to EPA Method 1. See Appendix A.1 for more information.

2.3 Operating Conditions and Process Data

Emission tests were performed while EUFLAKEDBULK and the S-50 Scrubber were operating at the conditions required by the permit. EUFLAKEDBULK was tested when operating at maximum normal operating conditions.

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:

- S-50 brine flow rate, gpm
- J-50 venturi Δp , in-H₂O

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 (Staußscheibe) 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 3, Gas Analysis for the Determination of Dry Molecular Weight

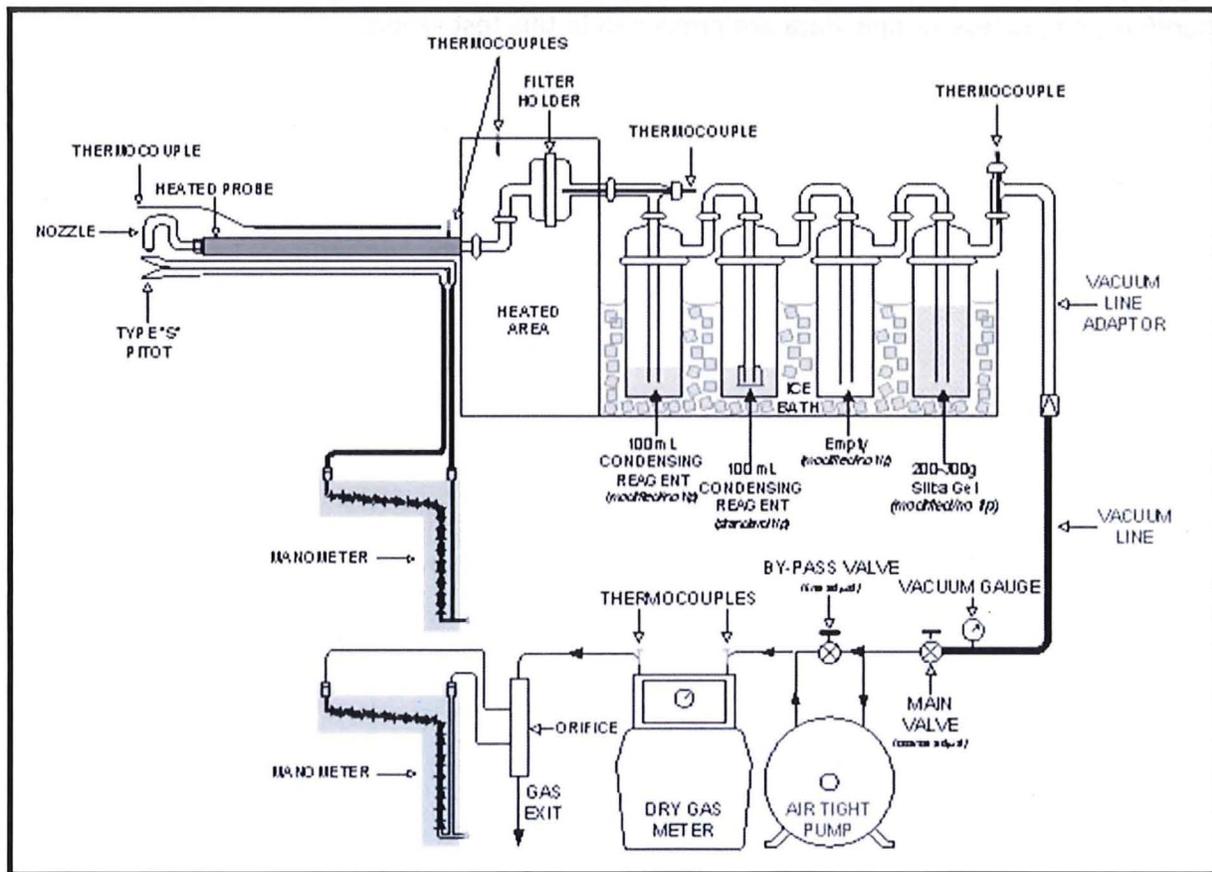
EPA Method 3 is used to calculate the dry molecular weight of the stack gas using one of three methods. The first choice is to measure the percent O₂ and CO₂ in the gas stream. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO₂ and percent O₂ using either an Orsat or a Fyrite analyzer. The second choice is to use stoichiometric calculations to calculate dry molecular weight. The third choice is to use an assigned value of 30.0, in lieu of actual measurements, for processes burning natural gas, coal, or oil.

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.

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

**Figure 3-1
EPA Method 5 Sampling Train**



3.1.5 EPA Method 5, Determination of Particulate Matter from Stationary Sources

EPA Method 5 is a manual, isokinetic method used to measure FPM emissions. The samples are analyzed gravimetrically. This method is performed in conjunction with EPA Methods 1 through 4. The stack gas is sampled through a nozzle, probe, filter, and impinger train. FPM results are reported in emission concentration and emission rate units. The Oxy Chemical Company Analytical Laboratory performed the gravimetric analysis for the EPA Method 5 samples.

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

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

During EPA Method 5 Run 3 at the S-50 Scrubber Exhaust Stack, filter exit temperatures began dropping below the acceptable $248 \pm 25^{\circ}\text{F}$ range as required by EPA Method 5, Section 6.1.1.7. The run was paused several times in an attempt to remedy the situation.

EGLE permitted the test to proceed at temperatures outside the acceptable range of EPA Method 5.

The Oxy Chemical Company Analytical Laboratory performed the gravimetric analysis for the EPA Method 5 samples. The analytical work procedure is available for review upon request.

4.2 Presentation of Results

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Table 4-1. 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.

RECEIVED

APR 18 2023

AIR QUALITY DIVISION

Table 4-1
FPM Emissions Results -
EUFLAKEDBULK

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	2/15/2023	2/15/2023	2/16/2023	--
Time	7:45-10:28	12:30-15:14	7:30-10:37	--
Process Data *				
S-50 Brine flow rate, gpm	25	25	25	--
J-50 Venturi ΔP , in-H ₂ O	3	3	3	--
Sampling & Flue Gas Parameters				
sample duration, minutes	160	160	160	--
O ₂ , % volume dry	20.90	20.90	20.90	20.90
CO ₂ , % volume dry	0.00	0.00	0.00	0.00
flue gas temperature, °F	69.1	68.1	61.8	66.3
moisture content, % volume	1.12	1.06	1.13	1.10
volumetric flow rate, dscfm	9,475	9,336	9,634	9,482
Filterable Particulate Matter (FPM)				
gr/dscf	0.00048	0.00052	0.00056	0.00052
lb/hr	0.039	0.042	0.046	0.042
lb/1,000 lbs dry exhaust gas	0.0009	0.001	0.001	0.001

* Process data was provided by OxyChem personnel.

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

The meter box and sampling train used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes, minimum sample durations, and percent isokinetics met the applicable QA/QC criteria.

Fyrite analyzer audits were performed during this test in accordance with EPA Method 3, Section 10.1 requirements. The results were within $\pm 0.5\%$ of the respective audit gas concentrations.

5.2 QA/QC Discussion

Montrose did not have a Qualified Individual (QI) for EPA Methods 1, 2, 3, 4, or 5 onsite during the test event as per ASTM D7036-04 requirements.

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).

Appendix A

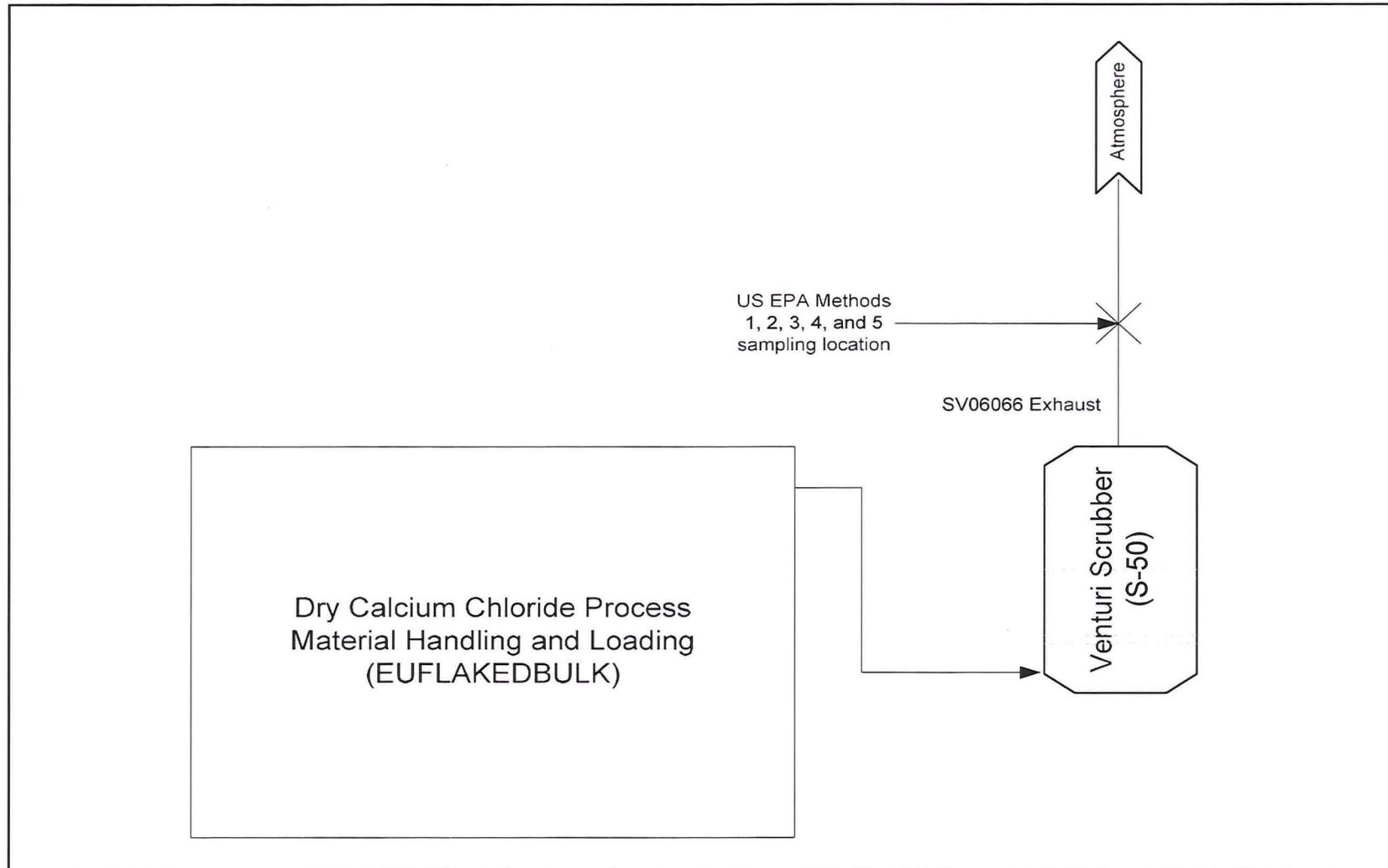
Field Data and Calculations



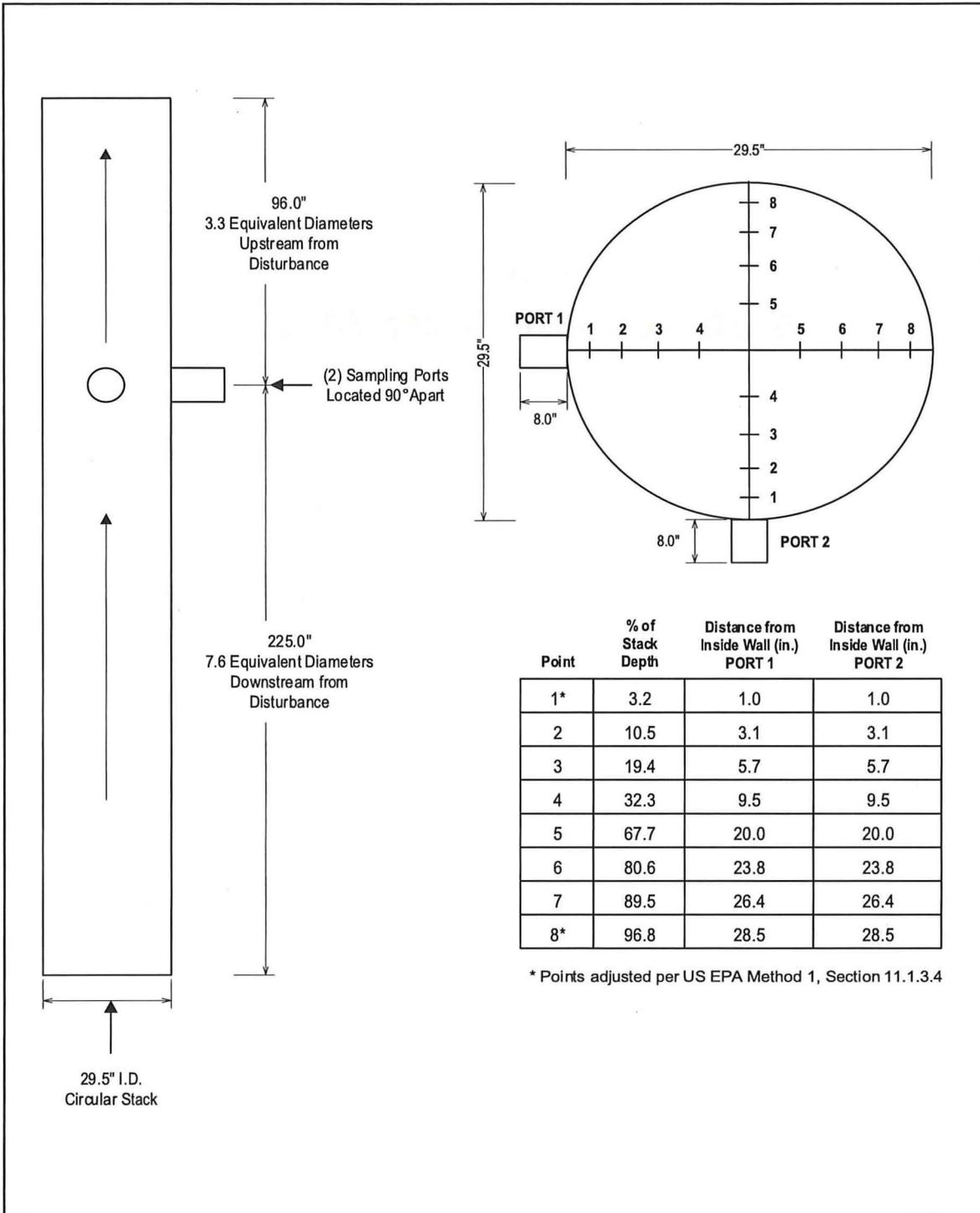
Appendix A.1

Sampling Locations

EUFLAKEDBULK SAMPLING LOCATION SCHEMATIC



S-50 SCRUBBER EXHAUST STACK TRAVERSE POINT LOCATION DRAWING



Appendix A.2

S-50 Scrubber Data Sheets