1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

DTE Energy-St. Clair Power Plant (SCPP) (State Registration No.: B2796) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on Coal-Fired Boiler No. 6 (EU-BOILER6-SC) at the DTE Energy-SCPP facility located in East China Township, Michigan. Testing was performed on August 10, 2021, 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-B2796-2015c.

The specific objectives were to:

- Verify the emissions of non-sulfuric filterable particulate matter (FPM) at the electrostatic precipitator (ESP) exhaust stack associated with EU-BOILER6-SC
- 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)
8/10/2021	EU-BOILER6-SC	Velocity/Volumetric Flow Rate	EPA 1, 2	3	60
8/10/2021	EU-BOILER6-SC	O_2, CO_2	EPA 3A	3	60
8/10/2021	EU-BOILER6-SC	Moisture	EPA 4	3	60
8/10/2021	EU-BOILER6-SC	Non-sulfuric FPM	EPA 5B	3	60

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 dated March 4, 2021 that was submitted to the EGLE.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
EU-BOILER6-SC
AUGUST 10, 2021

Parameter/Units	Average Results	Emission Limits
Non-Sulfuric Filterable Particulate Matter (FPM)		
lb/10^3 lb-wet exhaust gas @ 50% EA	0.0084	0.15

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	DTE Energy - St. Clair Power Plant 4901 Pointe Drive East China Township, MI 48054	
Project Contact:	Jason Logan	Dominic Vendittelli
Role:	Environmental Specialist	Environmental Engineer
Company:	DTE Energy	DTE Energy
Telephone:	734-548-2128	810-326-6355
Email:	jason.logan@dteenergy.com	Dominic.Vendittelli@dteenergy.com

Agency Information

Regulatory Agency:	EGLE	
Agency Contact:	Karen Kajiya-Mills	Mark Dziadosz
Telephone:	517-335-3122	586-854-1611
Email:	kajiya-millk@michigan.gov	dziadoszm@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Matthew Young	David Trahan
Title:	District Manager	Field Project Manager
Telephone:	248-548-8070	248-548-8070
Email:	myoung@montrose-env.com	dtrahan@montrose-env.com

Laboratory Information

Laboratory:	Montrose Royal Oak
City, State:	Royal Oak, MI 48073
Method:	EPA Method 5B

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

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
Matthew Young	Montrose	District Manager, QI
Michael Nummer	Montrose	Field Technician
Shane Rabideau	Montrose	Field Technician
Jason Logan	DTE Energy - St. Clair Power Plant	Observer/Client Liaison/Test Coordinator
Dominic Vendittelli	DTE Energy - St. Clair Power Plant	Observer/Client Liaison/Test Coordinator

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The DTE Energy-SCPP employs the use of four coal-fired boilers (EU-BOILER2-SC, EU-BOILER4-SC, EU-BOILER6-SC, and EU-BOILER7-SC) to produce power throughout SE Michigan. Boiler No. 6 (EU-BOILER6-SC) is a combustion engineering boiler which operates as a base loaded unit capable of producing 2,100,000 pounds of steam per hour. The boiler's turbine generator was manufactured by Westinghouse and has a nominally rated capability of 350 MW.

EU-BOILER6-SC emissions are controlled by a Research Corporation ESP which has a collection efficiency of 99.6%. EU-BOILER6-SC was in operation for this test event.

2.2 FLUE GAS SAMPLING LOCATIONS

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

TABLE 2-1
SAMPLING LOCATIONS

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance: Downstream EPA "B" (in./dia.)	Distance from Nearest Disturbance: Upstream EPA "A" (in./dia.)	Number of Traverse Points
EU-BOILER6-SC ESP Exhaust Stack	228.0	1,332.0 / 5.8	3,180.0 / 14.0	Isokinetic: 24 (6/port); Gaseous: 1

The sampling locations were 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 while EU-BOILER6-SC was operating at maximum routine operating conditions (> 80% of maximum power output), and the ESP was operating at the conditions required by the permit.

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.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 TEST METHODS

The test methods for this test program were presented previously 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 (Stausscheibe) 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.

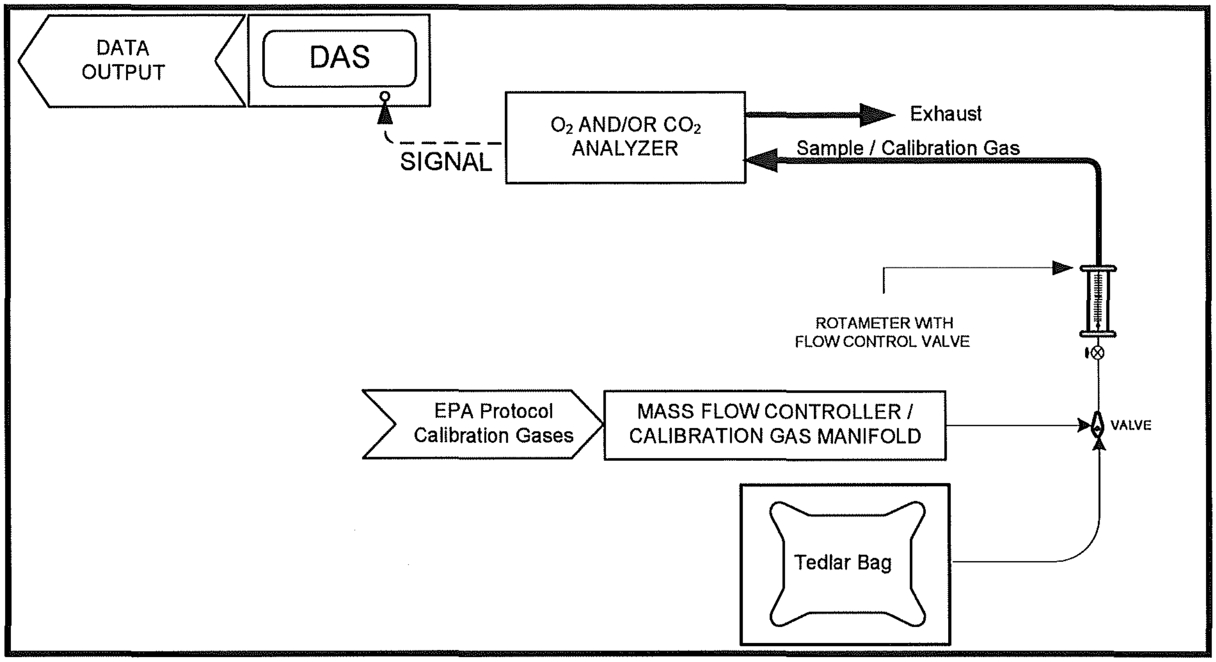
The typical sampling system is detailed in Figure 3-2.

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.

For the purpose of this test event, Tedlar bags were utilized to collect exhaust gas from each ESP exhaust stack. Then, the Tedlar bags were analyzed using EPA Method 3A. The typical sampling system is detailed in Figure 3-1.

FIGURE 3-1
EPA METHOD 3A (O_2/CO_2) TEDLAR BAG 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.

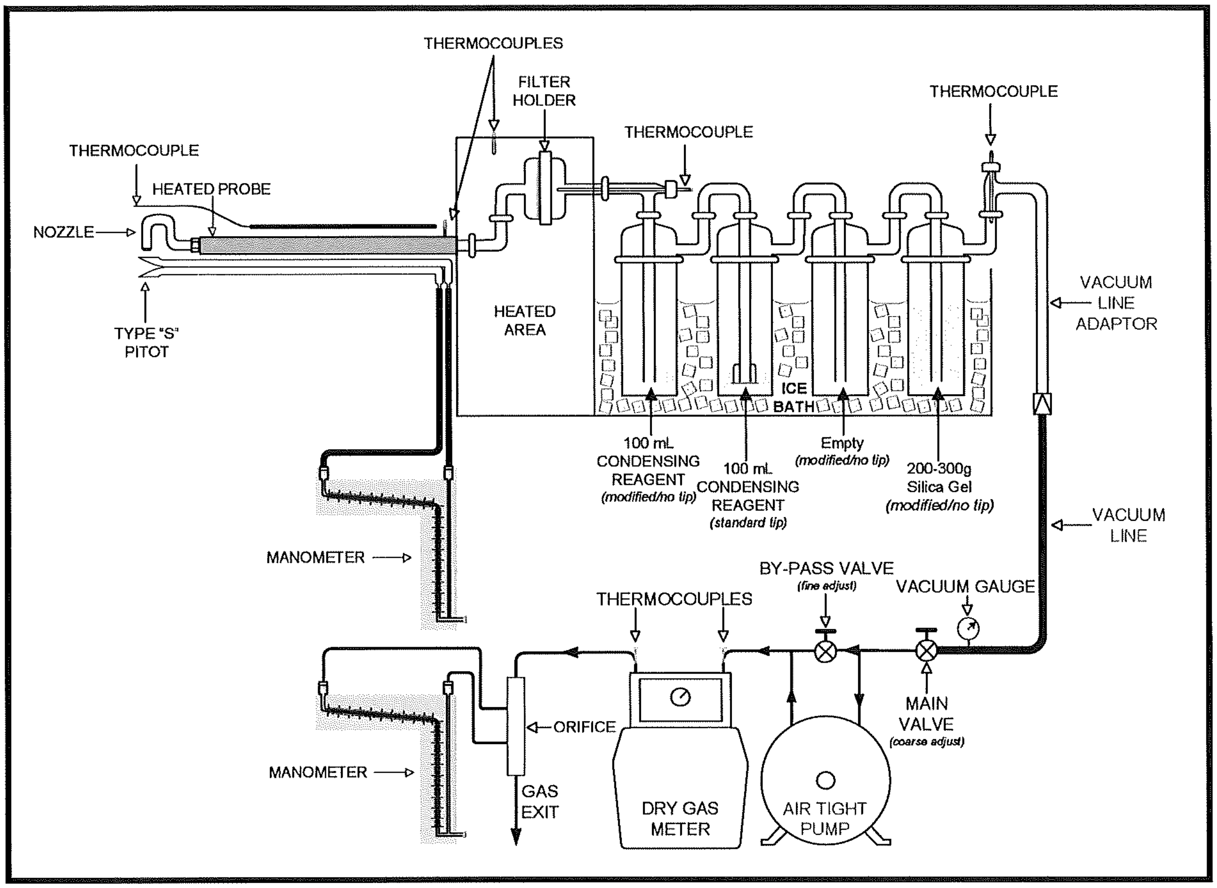
The typical sampling system is detailed in Figure 3-2.

3.1.5 EPA Method 5B, Determination of Nonsulfuric Acid Particulate Matter Emissions from Stationary Sources

EPA Method 5B is a m anual, isokinetic method used to measure nonsulfuric acid FPM emissions. Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature of 160 ± 14 °C (320 ± 25 °F). The collected sample is then heated in an oven at 160 °C (320 °F) for 6 hours to volatilize any condensed sulfuric acid that may have been collected, and the nonsulfuric acid particulate mass is determined gravimetrically.

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

FIGURE 3-2
EPA METHOD 5B 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 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.

TABLE 4-1
NON-SULFURIC FPM EMISSIONS RESULTS -
EU-BOILER6-SC

Run Number	1	2	3	Average
Date	8/10/2021	8/10/2021	8/10/2021	--
Time	8:04-9:16	9:51-11:01	11:24-12:33	--
Flue Gas Parameters				
O_2, % volume dry	8.03	8.23	8.18	8.15
CO_2, % volume dry	11.31	11.09	11.31	11.24
flue gas temperature, °F	307.8	308.6	310.9	309.1
moisture content, % volume	10.07	9.91	10.56	10.18
volumetric flow rate, scfm	780,623	759,323	776,798	772,248
volumetric flow rate, dscfm	702,023	684,074	694,798	693,632
excess air, %	60.50	62.99	62.55	62.01
Non-Sulfuric Filterable Particulate Matter (FPM)				
grains/dscf	0.0043	0.0041	0.0051	0.0045
lb/hr	26.0	23.8	30.6	26.8
lb/10^3 lb-wet exhaust gas @ 50% EA	0.0080	0.0076	0.0095	0.0084

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.

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.

EPA Method 5B analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met, except if noted in Section 5.2. An EPA Method 5 reagent blank was analyzed. The maximum allowable amount that can be subtracted is 0.001% of the weight of the acetone blank. The blank did not exceed the maximum residue allowed.

5.2 QA/QC DISCUSSION

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

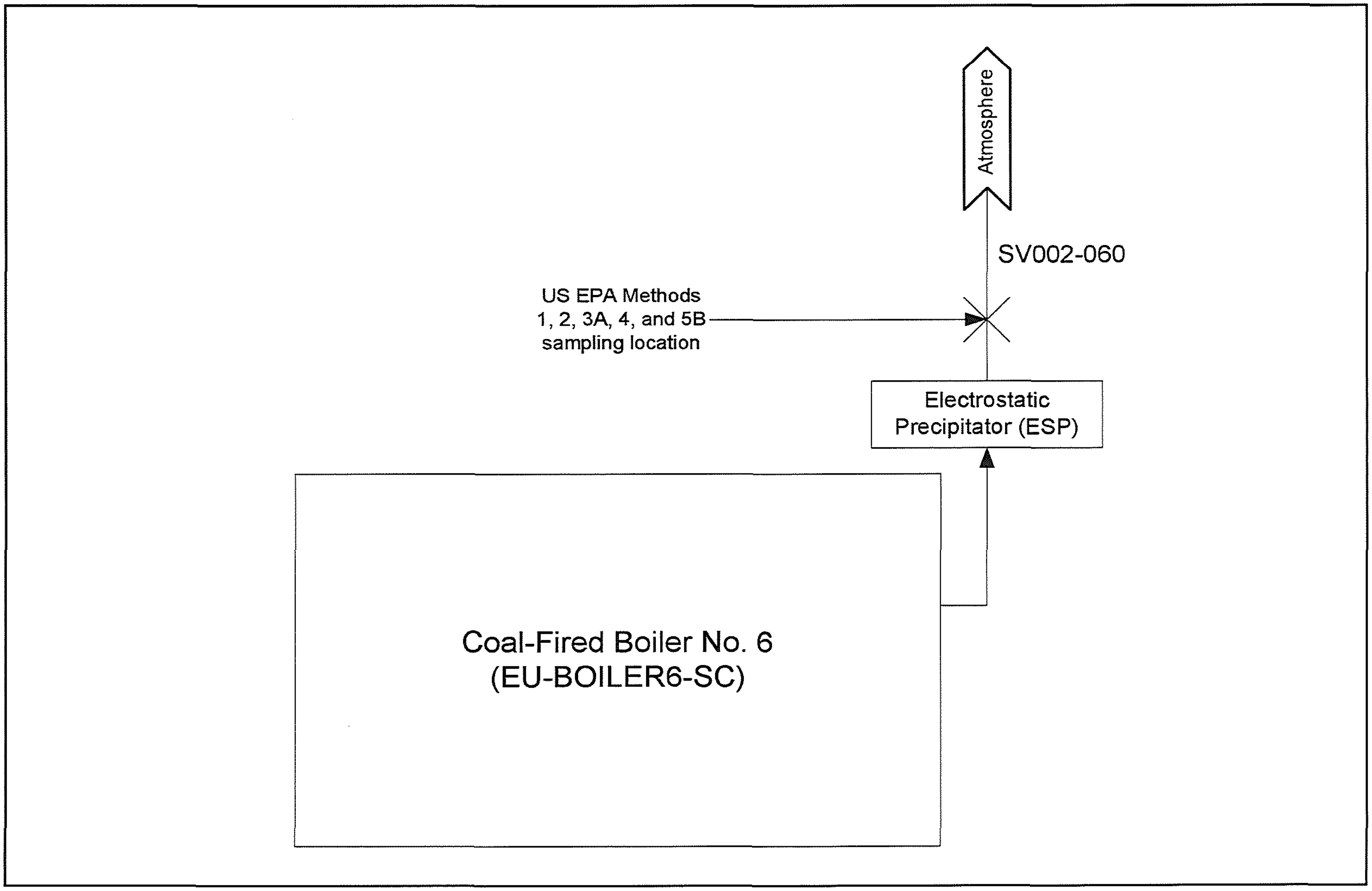
5.3 QUALITY STATEMENT

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 D 7036-04 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).

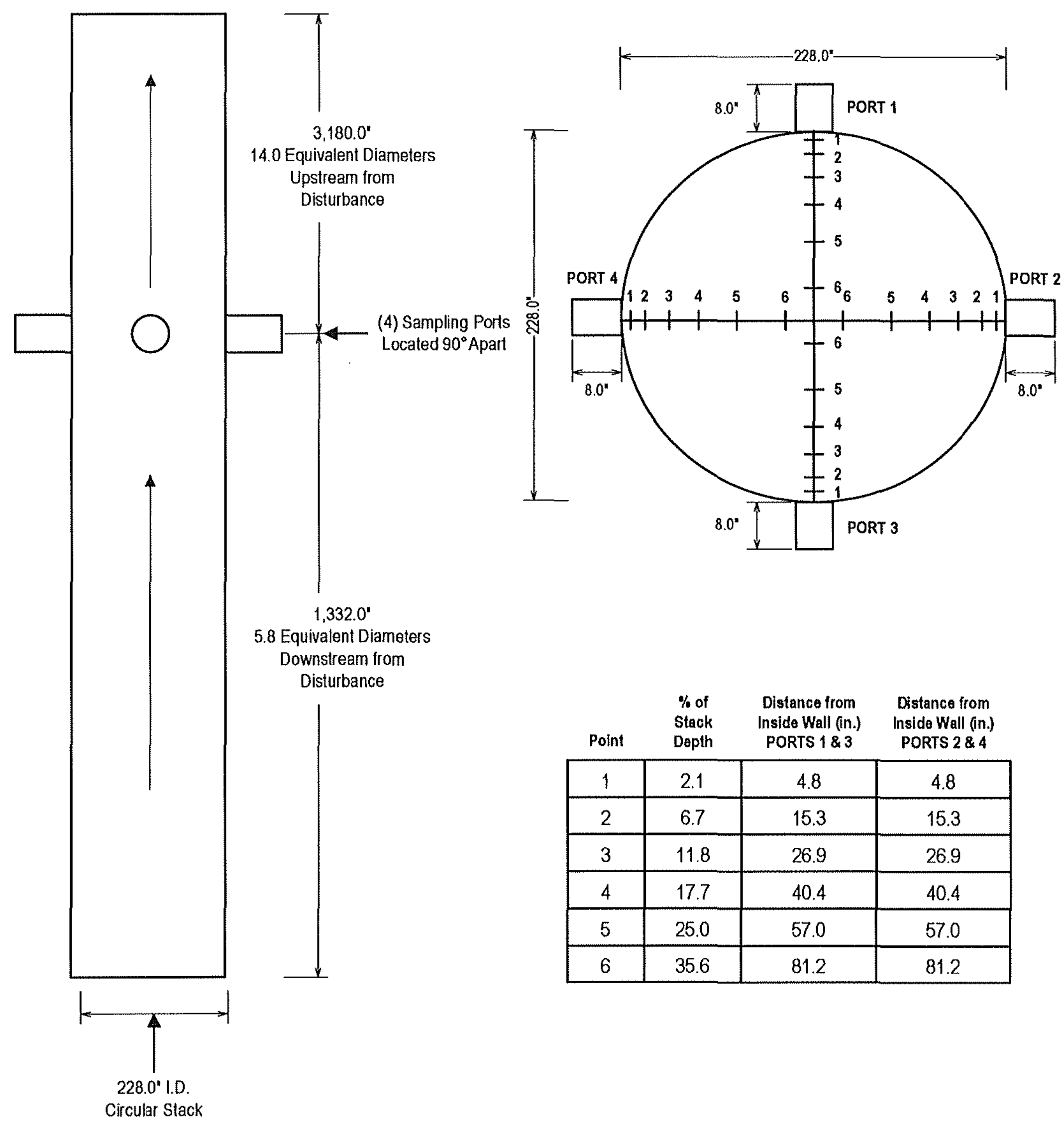
APPENDIX A
FIELD DATA AND CALCULATIONS

Appendix A.1
Sampling Locations

EU-BOILER6-SC SAMPLING LOCATION SCHEMATIC



EU-BOILER6-SC ESP EXHAUST STACK TRAVERSE POINT LOCATION DRAWING



Point	% of Stack Depth	Distance from Inside Wall (in.) PORTS 1 & 3	Distance from Inside Wall (in.) PORTS 2 & 4
1	2.1	4.8	4.8
2	6.7	15.3	15.3
3	11.8	26.9	26.9
4	17.7	40.4	40.4
5	25.0	57.0	57.0
6	35.6	81.2	81.2

Appendix A.2
EU-BOILER6-SC ESP Exhaust Stack Data Sheets

TEST DATA

	Run 1	Run 2	Run 3	Average
Number of Test Runs	3			
Traverse Points	24			
Stack Cross-Sectional Diameter 1 (**circular**) (in)	228.0	228.0	228.0	228.0
Stack Cross-Sectional Diameter 2 (**circular**) (in)	228.0	228.0	228.0	228.0
Pitot Tube Coefficient (Cp)	0.84	0.84	0.84	0.84
Barometric Pressure at Ground Level (Pbar) (in Hg)	29.89	29.91	29.91	29.90
Elevation Difference Between Ground Level and Meter Box Locations (ft)	580	580	580	580
Elevation Difference Between Ground Level and Sampling Locations (ft)	700	700	700	700
Initial Dry Gas Meter Reading (ft3)	922.750	974.510	22.290	
Final Dry Gas Meter Reading (ft3)	974.220	1022.110	70.440	
Dry Gas Meter Calibration Factor (Gamma)	1.020	1.020	1.020	1.020
Dry Gas Meter Calibration Coefficient (Delta H@)	1.83	1.83	1.83	1.83
Total Sampling Run Time (Theta) (min)	60	60	60	60
Volume of Water Vapor Condensed in the Impingers (g)	104.6	100.6	98.7	101.3
Weight of Water Vapor Collected in Silica Gel (g)	15.7	9.2	14.9	13.3
Air Percent by Volume Oxygen in Stack Gas (%-dry)	8.03	8.23	8.18	8.15
Air Percent by Volume Carbon Dioxide in Stack Gas (%-dry)	11.31	11.09	11.31	11.24
Air Percent by Volume Nitrogen in Stack Gas (%-dry)	**80.66**	**80.68**	**80.51**	80.62
Average Pitot Rotation Angle	3.3			
Test Run Start Time (hrmin)	8/10/2021 8:04	8/10/2021 9:51	8/10/2021 11:24	
Test Run Stop Time (hrmin)	8/10/2021 9:16	8/10/2021 11:01	8/10/2021 12:33	

DETAILED RESULTS

Stack Gas Conditions

Stack Gas Conditions	Run 1	Run 2	Run 3	Average
Stack Cross-Sectional Area (A) (ft2)	283.53	283.53	283.53	283.53
Barometric Pressure at Sampling Location (in Hg)	29.19	29.21	29.21	29.20
Dry Molecular Weight of Stack Gas (Md) (lb/lb-mole)	30.13	30.10	30.14	30.12
Wet Molecular Weight of Stack Gas (Ms) (lb/lb-mole)	28.91	28.91	28.86	28.89
Average Absolute Stack Gas Pressure (Ps) (in Hg)	29.20	29.22	29.22	29.22
Average Stack Gas Static Pressure (ps) (in H2O)	0.20	0.20	0.20	0.20
Average Stack Gas Temperature (ts) (°F)	307.8	308.6	310.9	309.1
Average Stack Gas Temperature (Ts) (°R)	767.8	768.6	770.9	769.1
Average Stack Gas Velocity (Vs) (ft/sec)	68.11	66.27	68.00	67.46
Average Stack Gas Velocity (Vs) (ft/min)	4,086	3,976	4,080	4,047
Wet Volumetric Stack Gas Flow at Actual Conditions (Qaw) (acfm)	1,158,621	1,127,396	1,156,718	1,147,578
Wet Volumetric Stack Gas Flow at Standard Conditions* (scfm)	780,623	759,323	776,798	772,248
Dry Volumetric Stack Gas Flow at Standard Conditions* (Qstd) (dscfm)	702,023	684,074	694,798	693,632
Percent by Volume Moisture as measured in Stack Gas (%H2O)	10.07	9.91	10.56	10.18
Percent Excess Air (%)	60.50	62.99	62.55	62.01

Test Results

Test Results	Run 1	Run 2	Run 3	Average
Volume of Dry Gas Sampled at Standard Conditions* (Vmstd) (dscf)	50.672	47.074	45.394	47.713
Rate of Dry Gas Sampled at Standard Conditions* (dscfm)	0.845	0.785	0.757	0.795
Dry Mole Fraction of Flue Gas (Mfd)	0.899	0.901	0.894	0.898
Average Velocity Pressure (Delta P) (in H2O)	0.99	0.95	0.99	0.97
Average Square Root of Delta P	0.99	0.97	0.99	0.98
Average Pressure Differential of Orifice Meter (Delta H) (in H2O)	2.48	2.15	2.14	2.26
Average DGM Temperature (tm) (°F)	81.3	78.8	86.8	82.3
Average Dry Gas Meter Temperature (Tm) (°R)	541.3	538.8	546.8	542.3
Volume of Metered Gas Sample (Vm) (dry) (acf)	51.470	47.600	48.150	49.073

SAMPLING QA

	Run 1	Run 2	Run 3	Average
Post-Test Meter Calibration Check Value (Yqa)	1.009	1.013	1.007	1.010
Post-Test/Pre-Test Calibration Factor Difference (%)	1.03	0.64	1.26	0.98
Allowable Post-Test Leak Rate (dscfm)	0.020	0.020	0.020	0.020
Current Sampling Rate Status	**Too High**	**Too High**	**Too High**	
1-Hour Sample Volume Based on Current Sampling Rate (dscf)	50.672	47.074	45.394	47.713
Probe Nozzle Diameter (in)	0.241	0.241	0.241	0.241
Percent Isokinetic of Sampling Rate (% I)	108.1	103.1	97.9	103.0
In Field Isokinetic QA	~HIGH~	**GOOD**	**GOOD**	
Count of Velocity Pressure Readings Below 0.05 in H2O	0	0	0	0
Sensitivity Factor for Differential Pressure Gauge (T)	1.003	1.003	1.003	1.003
Is Meter Box Manometer Adequate (Yes / No) ?	YES	YES	YES	

* Standard Conditions defined as 70°F and 29.92 in-Hg.

MEASURED DATA FROM TEST RUNS

Point Count	Run #	Run Time (min)	Pitot Delta P (in H2O)	Square Root of Delta P	Orifice Delta H (in H2O)	DGM Temp IN (°F)	DGM Temp OUT (°F)	Average DGM Temp (°F)	Stack Pressure (in H2O)	Stack Temp (°F)
1	1	0	0.88	0.938	2.25	86	86	86.00	0.2	306
2	1	2.5	0.86	0.927	2.20	82	84	83.00		308
3	1	5	0.87	0.933	2.20	81	84	82.50		308
4	1	7.5	0.93	0.964	2.35	81	83	82.00		309
5	1	10	0.91	0.954	2.30	81	82	81.50		309
6	1	12.5	0.89	0.943	2.25	81	82	81.50		309
7	1	15	0.92	0.959	2.30	80	80	80.00		308
8	1	17.5	0.95	0.975	2.40	81	80	80.50		308
9	1	20	1.00	1.000	2.50	82	80	81.00		309
10	1	22.5	1.10	1.049	2.75	82	80	81.00		309
11	1	25	1.20	1.095	3.00	82	80	81.00		310
12	1	27.5	1.20	1.095	3.00	83	80	81.50		310
13	1	30	1.00	1.000	2.50	81	79	80.00		309
14	1	32.5	1.00	1.000	2.50	82	79	80.50		308
15	1	35	1.10	1.049	2.75	82	79	80.50		306
16	1	37.5	1.10	1.049	2.75	82	79	80.50		306
17	1	40	1.10	1.049	2.75	83	79	81.00		306
18	1	42.5	1.05	1.025	2.65	83	79	81.00		307
19	1	45	0.77	0.877	1.95	81	79	80.00		308
20	1	47.5	0.98	0.990	2.45	82	79	80.50		307
21	1	50	1.05	1.025	2.65	83	79	81.00		307
22	1	52.5	1.10	1.049	2.75	83	79	81.00		307
23	1	55	0.95	0.975	2.40	84	79	81.50		307
24	1	57.5	0.90	0.949	2.00	84	79	81.50		307
25	2	0	0.63	0.794	1.50	76	76	76.00	0.2	306
26	2	2.5	0.68	0.825	1.60	76	75	75.50		306
27	2	5	0.48	0.693	1.10	76	75	75.50		306
28	2	7.5	0.84	0.917	2.00	76	75	75.50		306
29	2	10	1.30	1.140	2.95	77	75	76.00		306
30	2	12.5	0.95	0.975	2.15	78	75	76.50		307
31	2	15	1.00	1.000	2.25	77	78	77.50		307
32	2	17.5	1.10	1.049	2.50	80	77	78.50		307
33	2	20	1.20	1.095	2.70	80	76	78.00		306
34	2	22.5	1.05	1.025	2.35	80	76	78.00		306
35	2	25	1.05	1.025	2.35	81	77	79.00		308
36	2	27.5	0.90	0.949	2.00	81	77	79.00		308
37	2	30	0.95	0.975	2.15	80	78	79.00		308
38	2	32.5	0.90	0.949	2.05	81	77	79.00		310
39	2	35	1.10	1.049	2.56	81	78	79.50		310
40	2	37.5	1.00	1.000	2.25	82	78	80.00		310
41	2	40	1.10	1.049	2.50	82	78	80.00		311
42	2	42.5	1.05	1.025	2.35	83	78	80.50		311
43	2	45	0.81	0.900	1.85	80	78	79.00		310
44	2	47.5	0.86	0.927	1.95	83	79	81.00		311
45	2	50	0.95	0.975	2.15	83	79	81.00		311
46	2	52.5	0.98	0.990	2.20	84	80	82.00		312
47	2	55	0.92	0.959	2.10	84	80	82.00		312
48	2	57.5	0.88	0.938	2.00	84	80	82.00		312

MEASURED DATA FROM TEST RUNS

Point Count	Run #	Run Time (min)	Pitot Delta P (in H2O)	Square Root of Delta P	Orifice Delta H (in H2O)	DGM Temp IN (°F)	DGM Temp OUT (°F)	Average DGM Temp (°F)	Stack Pressure (in H2O)	Stack Temp (°F)
49	3	0	0.85	0.922	1.85	82	79	80.50	0.2	311
50	3	2.5	0.87	0.933	1.90	81	80	80.50		311
51	3	5	0.87	0.933	1.90	83	80	81.50		311
52	3	7.5	0.92	0.959	2.00	84	81	82.50		312
53	3	10	0.85	0.922	1.85	85	81	83.00		313
54	3	12.5	0.75	0.866	1.65	86	82	84.00		313
55	3	15	0.90	0.949	1.95	86	82	84.00		312
56	3	17.5	0.93	0.964	2.00	87	83	85.00		311
57	3	20	0.96	0.980	2.10	87	83	85.00		312
58	3	22.5	0.96	0.980	2.10	88	83	85.50		311
59	3	25	1.10	1.049	2.40	89	84	86.50		312
60	3	27.5	0.90	0.949	1.95	90	84	87.00		312
61	3	30	1.00	1.000	2.00	89	85	87.00		311
62	3	32.5	0.98	0.990	2.15	90	85	87.50		310
63	3	35	1.10	1.049	2.40	91	85	88.00		309
64	3	37.5	1.05	1.025	2.30	92	86	89.00		309
65	3	40	1.00	1.000	2.20	93	86	89.50		309
66	3	42.5	0.82	0.906	1.80	93	87	90.00		310
67	3	45	1.15	1.072	2.50	92	87	89.50		310
68	3	47.5	1.10	1.049	2.40	93	88	90.50		310
69	3	50	1.20	1.095	2.65	93	88	90.50		310
70	3	52.5	1.26	1.122	2.65	95	89	92.00		311
71	3	55	1.25	1.118	2.75	95	89	92.00		311
72	3	57.5	0.88	0.938	1.95	96	89	92.50		310

TEST DATA - EPA Method 3A (O_2)

Number of Concentration Runs: 3

Analyzer Calibration

	Run 1	Run 2	Run 3	Average
Actual Concentration of the Mid-Level Calibration Gas (%)	9.73	9.73	9.73	9.73
Actual Concentration of the High-Level Calibration Gas (%)	20.48	20.48	20.48	20.48
Analyzer Span During Test Run (%)	20.48	20.48	20.48	20.48
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Analyzer Calibration Response for Zero Gas (%)	0.00	0.00	0.00	0.00
Analyzer Calibration Response for Mid-Level Gas (%)	9.78	9.78	9.78	9.78
Analyzer Calibration Response for High Level Gas (%)	20.49	20.49	20.49	20.49
Initial System Calibration Response for Zero Gas (%)	0.00	0.00	0.00	0.00
Initial System Calibration Response for Upscale Gas (%)	9.78	9.78	9.78	9.78
Final System Calibration Response for Zero Gas (%)	0.04	0.04	0.04	0.04
Final System Calibration Response for Upscale Gas (%)	9.73	9.73	9.73	9.73

Analyzer Calibration QA

	Run 1	Run 2	Run 3	Average
Initial System Calibration Bias for Zero Gas (% of Span)	0.00	0.00	0.00	0.00
Initial System Calibration Bias for Upscale Gas (% of Span)	0.00	0.00	0.00	0.00
Final System Calibration Bias for Zero Gas (% of Span)	0.20	0.20	0.20	0.20
Final System Calibration Bias for Upscale Gas (% of Span)	-0.24	-0.24	-0.24	-0.24
System Drift for Zero Gas (% of Span)	0.20	0.20	0.20	0.20
System Drift for Upscale Gas (% of Span)	-0.24	-0.24	-0.24	-0.24
Analyzer Calibration Error for Zero Gas (% of Span)	0.00	0.00	0.00	0.00
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.23	0.23	0.23	0.23
Analyzer Calibration Error for High-Level Gas (% of Span)	0.05	0.05	0.05	0.05

CONCENTRATION CALCULATIONS - DRY SYSTEM

Calculate the Average Effluent Oxygen O_2 Concentration

	Run 1	Run 2	Run 3	Average
Average O_2 Concentration Indicated by Gas Analyzer, dry basis (%-dry)	8.05	8.25	8.20	8.17
Average of Initial and Final System Calibration Bias Check Responses for the Zero Gas (%)	0.02	0.02	0.02	0.02
Average of Initial and Final System Calibration Bias Check Responses for the Upscale Calibration Gas (%)	9.76	9.76	9.76	9.76
Average Effluent O_2 Concentration, dry basis (%-dry)	8.03	8.23	8.18	8.15

TEST DATA - EPA Method 3A (CO_2)

Number of Concentration Runs: 3

Analyzer Calibration

	Run 1	Run 2	Run 3	Average
Actual Concentration of the Mid-Level Calibration Gas (%)	10.10	10.10	10.10	10.10
Actual Concentration of the High-Level Calibration Gas (%)	20.65	20.65	20.65	20.65
Analyzer Span During Test Run (%)	20.65	20.65	20.65	20.65
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Analyzer Calibration Response for Zero Gas (%)	0.01	0.01	0.01	0.01
Analyzer Calibration Response for Mid-Level Gas (%)	10.45	10.45	10.45	10.45
Analyzer Calibration Response for High Level Gas (%)	20.66	20.66	20.66	20.66
Initial System Calibration Response for Zero Gas (%)	0.01	0.01	0.01	0.01
Initial System Calibration Response for Upscale Gas (%)	10.45	10.45	10.45	10.45
Final System Calibration Response for Zero Gas (%)	0.00	0.00	0.00	0.00
Final System Calibration Response for Upscale Gas (%)	10.47	10.47	10.47	10.47

Analyzer Calibration QA

	Run 1	Run 2	Run 3	Average
Initial System Calibration Bias for Zero Gas (% of Span)	0.00	0.00	0.00	0.00
Initial System Calibration Bias for Upscale Gas (% of Span)	0.00	0.00	0.00	0.00
Final System Calibration Bias for Zero Gas (% of Span)	-0.05	-0.05	-0.05	-0.05
Final System Calibration Bias for Upscale Gas (% of Span)	0.10	0.10	0.10	0.10
System Drift for Zero Gas (% of Span)	-0.05	-0.05	-0.05	-0.05
System Drift for Upscale Gas (% of Span)	0.10	0.10	0.10	0.10
Analyzer Calibration Error for Zero Gas (% of Span)	0.05	0.05	0.05	0.05
Analyzer Calibration Error for Mid-Level Gas (% of Span)	1.69	1.69	1.69	1.69
Analyzer Calibration Error for High-Level Gas (% of Span)	0.05	0.05	0.05	0.05

CONCENTRATION CALCULATIONS - DRY SYSTEM

Calculate the Average Effluent Carbon Dioxide CO_2 Concentration

	Run 1	Run 2	Run 3	Average
Average CO_2 Concentration Indicated by Gas Analyzer, dry basis (%)	11.71	11.49	11.72	11.64
Average of Initial and Final System Calibration Bias Check Responses for the Zero Gas (%)	0.01	0.01	0.01	0.01
Average of Initial and Final System Calibration Bias Check Responses for the Upscale Calibration Gas (%)	10.46	10.46	10.46	10.46
Average Effluent CO_2 Concentration, dry basis (%)	11.31	11.09	11.31	11.24

TEST DATA - EPA Method 5B

Gravimetric Weights	Run 1	Run 2	Run 3	Average
Nonsulfuric Acid Particulate Weight in Probe Rinse (mg)	1.4	2.3	2.5	2.1
Nonsulfuric Acid Particulate Weight in Filter Catch (mg)	12.8	10.1	12.6	11.8

DETAILED RESULTS

Stack Conditions	Run 1	Run 2	Run 3	Average
Wet Air Flow Rate at Standard Conditions*, 1000 lb-wet exhaust gas/hr	3500.8	3404.7	3477.2	3460.9

Emission Results	Run 1	Run 2	Run 3	Average
Nonsulfuric Acid Particulate Matter Emission Rate (lbs/hr)	26.0	23.8	30.6	26.8
Nonsulfuric Acid Particulate Matter Emission Rate, (lb/1,000 lb-wet exhaust gas @50% excess air)	0.0080	0.0076	0.0095	0.0084

Concentration Results	Run 1	Run 2	Run 3	Average
Nonsulfuric Acid Particulate Matter Concentration (grains/dscf)	0.0043	0.0041	0.0051	0.0045

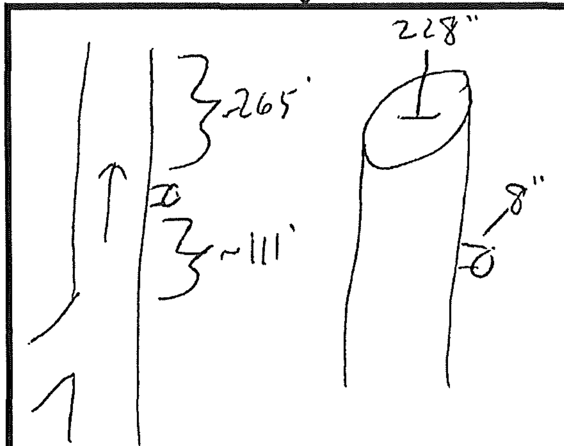
* Standard Conditions defined as 70°F and 29.92 in-Hg.

MAQS

USEPA METHOD 2 GAS VELOCITY TRAVERSE
AND VOLUMETRIC FLOWRATE DATA SHEET

Client: DTE SCPP
Sampling Location: Unit 6
Run Number: preflow
Date: 8-9-21 Time: 11:41 - 12:09
Port and Stack: 236 in.
Port: 8 in.
Nipple Protrusion: – in.
Stack Diameter: 228 in.
Bar. Pressure: 29.97 in Hg
Static Pressure: 0.2 in H_2O
Moisture %: ~16
% CO2: ~16 % CO: ______
% O2: ~9 % N2: ______

Stack Diagram



Weather conditions: Sunny, warm

Operators: MN/MY Manometer ID: MB 3
Pitot Tube number: 8C Umbilical ID: UMB 12
Pitot Tube factor, Cp: .84 Pitot Line ID: –
Site Elevation: 582 ft. Upstream: ~265 in.
Port Height: ~126 ft. Downstream: ~111 in.

Leak Check- Positive: Pre: ✓ @ 3.2 Post: ✓ @ 3.1 Negative: Pre: ✓ @ 3.4 Post: ✓ @ 3.3

% of Stack Diameter	Point Distance (in.)	Traverse Point Number	Velocity Head (ΔP) in H2O	Stack Temp °F	Null Angle (zero ΔP angle)	Flow Angle Ø (90° from null angle)
		1	.84	310	0	
		2	.88	310	0	
		3	.90	310	0	
		4	.93	310	0	
		5	.91	310	-10	
		6	.88	310	-10	
		1	.88	311	0	
		2	.89	311	0	
		3	1.00	311	0	
		4	1.20	311	0	
		5	1.15	311	-5	
		6	1.05	311	-5	
		1	.90	307	5	
		2	.92	307	5	
		3	1.05	307	0	
		4	1.10	307	0	
		5	1.100	307	-5	
		6	.93	307	-5	
		1	1.05	308	5	
		2	1.10	308	5	
		3	1.20	308	-5	
		4	1.30	308	-5	
		5	1.20	308	-5	
		6	1.10	308	-5	

US EPA Method 1 Traverse Point Determination

Relative Port Location	N	E	S	W
From Far Wall to Outside of Port (in.)	236.0	236.0	236.0	236.0
Nipple Length or Wall Thickness (in.)	8.0	8.0	8.0	8.0
Port Protrusion Length (opt) (in.)	0.0	0.0	0.0	0.0
Depth of Stack or Duct (in.)	228.0	228.0	228.0	228.0
Stack or Duct Type	Circular			
Port Hole Inner Diameter (in.)	--			
Stack or Duct Width (If Rectangular) (in.)				
Stack Outer Circumference (in.)				
Number of Ports Traversed	4			
Elevation of Meter Box from Ground Level (ft)	580			
Elevation of Ports from Ground Level (ft)	700			
Stack Build-up (in.)	0.0			
Stack Cross-Sectional Diameter 1 (in)	228.0			
Stack Cross-Sectional Diameter 2 (in)	228.0			

Note:
Add nipple protrusion length to Point 1 only.
Actual nipple length = (length - protrusion)

Relocate to a distance equal to the inside diameter of the nozzle being used or to the above minimum distances, whichever is larger.

This Stack having a diameter greater than 24-inches, shall have no traverse points located within 1.0-inch of the stack wall.

"Vertical" or "Horizontal" Flow	Vertical
Direction of Flow	Up
"Velocity" or "Isokinetic" Traverse	Isokinetic

New Method 1 verified on 8/9/2021 by: MN/MY

Port Distance Upstream from Flow Disturbance (in.)	3180.0
Diameters Upstream from Flow Disturbance (³ 0.5 De)	14.0
Minimum Traverse Points Needed for a Velocity Traverse *	12
Minimum Traverse Points Needed for a Isokinetic Traverse *	12

Port Distance Downstream from Flow Disturbance (in.)	1332.0
Diameters Downstream from Flow Disturbance (³ 2.0 De)	5.8
Minimum Traverse Points Needed for a Velocity Traverse *	16
Minimum Traverse Points Needed for a Isokinetic Traverse *	20

Minimum Traverse Points per Method 1	20
Number of Traverse Points for this Circular Stack or Duct	24
Point Overide	24

Duct Area - in^2 40828.14
Duct Area - ft^2 283.5287

Port	Point	% of Duct Depth	Dist. From Inside Wall (Decimal)	Dist. From Outside Wall (Decimal)
1	1	2.1	4.8	12.8
1	2	6.7	15.3	23.3
1	3	11.8	26.9	34.9
1	4	17.7	40.4	48.4
1	5	25.0	57.0	65.0
1	6	35.6	81.2	89.2
2	1	2.1	4.8	12.8
2	2	6.7	15.3	23.3
2	3	11.8	26.9	34.9
2	4	17.7	40.4	48.4
2	5	25.0	57.0	65.0
2	6	35.6	81.2	89.2
3	1	2.1	4.8	12.8
3	2	6.7	15.3	23.3
3	3	11.8	26.9	34.9
3	4	17.7	40.4	48.4
3	5	25.0	57.0	65.0
3	6	35.6	81.2	89.2
4	1	2.1	4.8	12.8
4	2	6.7	15.3	23.3
4	3	11.8	26.9	34.9
4	4	17.7	40.4	48.4
4	5	25.0	57.0	65.0
4	6	35.6	81.2	89.2

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Data

Project Information	**Equipment Identification**
Date: 8-10-21 Project #: 008915	Ref. Thermometer:
Customer / Facility: DTE SCPP	Hygrometer:
Unit ID / Sample Location: Unit 6	Field Balance: 4
Run #: 1, 2, 3 Operator: Matt Young	Check Weights: 5
	Calipers: 2

Balance Audit: (Field balance must be within 0.5g of check weight mass)

Date:	8-10-21			
Standard mass, g	500.0			
Field balance mass, g	499.8			

Ambient Conditions (Mobile Lab)

Relative humidity, %:

Temperature, °F:

Mobile lab # :

Moisture Determination

	Contents	Run 1 Initial	Run 1 Final	Run 1 Net Gain	Run 2 Initial	Run 2 Final	Run 2 Net Gain	Run 3 Initial	Run 3 Final	Run 3 Net Gain
Knockout										
Impinger 1		767.2	858.5	91.3	858.5	951.2	92.7	951.2	971.8	20.6
Impinger 2		778.5	787.6	9.1	787.6	794.0	6.4	794.0	870.5	76.5
Impinger 3		666.2	670.4	4.2	670.4	671.9	1.5	671.9	673.5	1.6
Impinger 4				104.6			100.6			
Impinger 5										
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel		972.5	988.2	15.7	988.2	997.4	9.2	977.7	992.6	14.9
Train Net Gain (Vlc)				120.3			109.8			113.6

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

Nozzle 1 diameters .741 D1 .741 D2 .741 D3 .741 Average

Nozzle 2 diameters ______ D1 ______ D2 ______ D3 ______ Average

Nozzle 3 diameters ______ D1 ______ D2 ______ D3 ______ Average

Nozzle Material: ☐ quartz ☐ glass ☒ steel ☐ titanium ☐ inconel ☐ other

Probe Type: ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner: ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☐ Quartz Fiber ☒ Glass Fiber ☐ Teflon ☐ Teflon/Quartz ☐ Other:

Filter Number: Run 1: H-702 Run 2: H-759 Run 3: H-701 Run ____: ______

Back Half: ☐ Quartz Fiber ☐ Glass Fiber ☐ Teflon ☐ Teflon/Quartz ☐ Other:

Reagent Information

Type	Lot Number

Sample Observations

Run 1

Run 2

Run 3

QA/QC Check: Completeness: ✓ Legibility: ✓ Accuracy: ✓ Specifications: ✓

Checked by: Mike Nummer Team Leader: Matt Young

001AS-OPS-RBETA

US EPA Method 4 Gravimetric Determination for Moisture
US EPA Method 5B Sampling Train

RUN 1

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**767.2**	**858.5**	91.3
Impinger No. 2	**778.5**	**787.6**	9.1
Impinger No. 3	**666.2**	**670.4**	4.2
		Total Condensed:	**104.6**
Silica Gel	**972.5**	**988.2**	15.7
		Total Absorbed:	**15.7**
		Overall Total:	**120.3**

RUN 2

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**858.5**	**951.2**	92.7
Impinger No. 2	**787.6**	**794.0**	6.4
Impinger No. 3	**670.4**	**671.9**	1.5
		Total Condensed:	**100.6**
Silica Gel	**988.2**	**997.4**	9.2
		Total Absorbed:	**9.2**
		Overall Total:	**109.8**

RUN 3

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**951.2**	**971.8**	20.6
Impinger No. 2	**794.0**	**870.5**	76.5
Impinger No. 3	**671.9**	**673.5**	1.6
		Total Condensed:	**98.7**
Silica Gel	**977.7**	**992.6**	14.9
		Total Absorbed:	**14.9**
		Overall Total:	**113.6**

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MONTROSE AIR QUALITY SERVICES

EPA Method 5b Field Datasheet (Isokinetic)

Project Information		Sampling Conditions		ALT 011 TC ID:	Ambient °F	Ref. °F
Date 8-10-21	Project # 008915	Static Pressure, in. H_2O 0.20	Ambient Temp, °F 72	Stack 8'C-1	72	72
Customer/Facility DTE SCPP		Barometric Pressure, in. Hg 29.89	Ref. Barometer ID NOAA	Probe 8'C-2	72	72
Unit ID/Sample Location Unit 6		Wind Speed / Direction S 7 mph	Precipitation, Y (N) type	Filter Box		
Run # 1	Operator Mike Nummer	Probe / Filter Temp Range, °F 320 ± 25		Filter Exit IFE 2	72	72
				Meter outlet MB 3	72	72
				Impinger Exit FC 1	72	72
				Other 6'G	86	86

Sampling Equipment IDs	Calibration	Equipment Checks	Pre	Mid	Post
Meterbox ID MB 3	Meterbox Y 1.020	Pitot (+), pass @ in. H_2O	☒ @ 3.2	☐ @	☒ @ 3.5
Umbilical ID UMB 12	Meterbox ΔH@, in. H_2O 1.83	Pitot (-), pass @ in. H_2O	☒ @ 3.4	☐ @	☒ @ 3.3
Nozzle ID SS 4-9	Nozzle diameter, Dn, in. .241	Pitot visual inspection	☒ pass	☐ pass	☒ pass
Pitot / Probe ID 8'C	Pitot coefficient, Cp .84	Nozzle visual inspection	☒ pass	☐ pass	☒ pass
Manometer ID MB 3	Manometer zero and level ☒ yes	Meter, cfm @ in. Hg	0.005 @ 15	@	0.000 @ 9
Sensitivity 0-10"	K-Factor 2.50	Intermediate leak check volume, ft^3		/	/

Ref. Thermometer ID Cal Kit 5

Continuity Check ☒ Continuity w/ Proper Polarity

Notes:

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	8:04	922.75	.88	2.20	2.25	306	317		322	66	86	86		6
2	2.5		924.87	.86	2.15	2.20	308	321		329	62	82	84		6
3	5		926.93	.87	2.18	2.20	308	317		326	61	81	84		6
4	7.5		928.96	.93	2.33	2.35	309	319		321	60	81	83		6
5	10		931.05	.91	2.28	2.30	309	315		324	59	81	82		6
6	12.5		933.10	.89	2.23	2.25	309	316		323	60	81	82		6
	15	8:19	935.14												
1	15	8:23	935.14	.92	2.30	2.30	308	312		309	64	80	80		6
2	17.5		937.22	.95	2.38	2.40	308	316		317	64	81	80		6
3	20		939.33	1.00	2.50	2.50	309	313		327	64	82	80		6.5
4	22.5		941.48	1.10	2.75	2.75	309	311		329	64	82	80		7
5	25		943.76	1.20	3.00	3.00	310	317		326	61	82	80		8
6	27.5		946.09	1.20	3.00	3.00	310	318		330	59	83	80		8
	30	8:38	948.45												
1	30	8:42	948.45	1.00	2.50	2.50	309	329		311	63	81	79		6.5
2	32.5		950.59	1.00	2.50	2.50	308	323		312	59	82	79		6.5
3	35		952.74	1.10	2.75	2.75	306	321		326	58	82	79		7
4	37.5		955.02	1.10	2.75	2.75	306	315		325	57	82	79		7
5	40		957.36	1.10	2.75	2.75	306	317		325	58	83	79		7
6	42.5		959.57	1.05	2.63	2.65	307	312		321	58	83	79		7
	45	8:57	961.78												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By Mike Nummer Team Leader Matt Young

MONTROSE AIR QUALITY SERVICES

EPA Method 5b Field Datasheet (Isokinetic)

M049AS-008915-RT-800

Project Information

Date	8-10-21
Project #	008915
Customer/Facility	DTE SCPP
Unit ID/Sample Location	Unit 6
Run #	1
Operator	Mike Nummer

Sampling Conditions

Static Pressure, in. H_2O	0.20
Ambient Temp, °F	72
Barometric Pressure, in. Hg	29.89
Ref. Barometer ID	NOAA
Wind Speed / Direction	S 7 mph
Precipitation, Y / (N), type	
Probe / Filter Temp Range, °F	320 ± 25

ALT 011

	TC ID:	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID	MB 3
Umbilical ID	UMB 12
Nozzle ID	SS 4-9
Pitot / Probe ID	8'C
Manometer ID	MB 3
Sensitivity	0-10"

Calibration

Meterbox Y	1.020
Meterbox ΔH@, in. H_2O	1.83
Nozzle diameter, Dn, in.	.241
Pitot coefficient, Cp	.821
Manometer zero and level	☑ yes
K-Factor	2.52

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 3.2	☐ @	☑ @ 3.5
Pitot (-), pass @ in. H_2O	☑ @ 3.4	☐ @	☑ @ 3.3
Pitot visual inspection	☑ pass	☐ pass	☑ pass
Nozzle visual inspection	☑ pass	☐ pass	☑ pass
Meter, cfm @ in. Hg	0.005 @ 15	@	0.000 @ 9
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	45	9:01	961.78	.77	1.93	1.95	308	324		325	61	81	79		5.5
2	47.5		963.67	.98	2.45	2.45	307	329		323	54	82	79		7
3	50		965.81	1.05	2.63	2.65	307	321		324	52	83	79		7
4	52.5		967.99	1.10	2.75	2.75	307	314		324	56	83	79		7
5	55		970.22	.95	2.38	2.40	307	319		320	56	84	79		6.5
6	57.5		972.32	.90	2.25	2.06	307	318		321	57	84	79		5.5
	60	9:16	974.22												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By Mike Nummer Team Leader Matt Young

001AS-QMS-FM-225RB

MONTROSE AIR QUALITY SERVICES

EPA Method 5b Field Datasheet (Isokinetic)

Project Information		Sampling Conditions			
Date	8-10-21	Static Pressure, in. H_2O	0.26	Ambient Temp, °F	74
Project #	008915	Barometric Pressure, in. Hg	29.91	Ref. Barometer ID	NOAA
Customer/Facility	DTE SCPP	Wind Speed / Direction	5 8 mph	Precipitation, Y / N, type	N
Unit ID/Sample Location	Unit 6	Probe / Filter Temp Range, °F	320 ± 25		
Run #	2	Operator	Mike Nummer		

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs		Calibration	
Meterbox ID	MB 3	Meterbox Y	1.026
Umbilical ID	UMB 12	Meterbox ΔH@, in. H_2O	1.83
Nozzle ID	SS 4-9	Nozzle diameter, Dn, in.	.241
Pitot / Probe ID	8' C	Pitot coefficient, Cp	.84
Manometer ID	MB 3	Manometer zero and level	☒ yes
Sensitivity	0-10"	K-Factor	2.25

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☒ @ 3.5	☐ @	☒ @ 3.2
Pitot (-), pass @ in. H_2O	☒ @ 3.3	☐ @	☒ @ 3.3
Pitot visual inspection	☒ pass	☐ pass	☒ pass
Nozzle visual inspection	☒ pass	☐ pass	☒ pass
Meter, cfm @ in. Hg	0.005 @ 15	@	0.005 @ 10
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	9:51	974.51	.63	1.42	1.50	306	309		321	67	76	76		4.5
2	2.5		976.19	.68	1.53	1.66	306	304		321	64	76	75		4.5
3	5		977.96	.48	1.08	1.16	306	325		317	54	76	75		4
4	7.5		979.34	.84	2.00	2.00	306	336		323	56	76	75		5.5
5	10		981.27	1.30	2.92	2.95	306	326		327	51	77	75		7
6	12.5		983.61	.95	2.14	2.15	307	316		317	49	78	75		5.5
	15	10:06	985.59												
1	15	10:09	985.59	1.00	2.25	2.25	307	319		323	60	77	78		6
2	17.5		987.63	1.10	2.47	2.52	307	322		321	53	80	77		6.5
3	20		989.79	1.20	2.70	2.70	306	318		322	52	80	76		7
4	22.5		992.02	1.05	2.36	2.35	306	321		320	52	80	76		6.5
5	25		994.11	1.05	2.36	2.35	308	317		320	53	81	77		6.5
6	27.5		996.21	.90	2.02	2.00	308	322		319	54	81	77		5.5
	30	10:24	998.11												
1	30	10:27	998.11	.95	2.14	2.15	308	320		311	62	80	78		5.5
2	32.5		1000.12	.90	2.02	2.05	310	326		323	58	81	77		5.5
3	35		1002.07	1.10	2.47	2.50	310	322		326	58	81	78		6.5
4	37.5		1004.21	1.00	2.25	2.25	310	314		320	59	82	78		6
5	40		1006.22	1.10	2.47	2.50	311	320		328	59	82	78		6.5
6	42.5		1008.36	1.05	2.36	2.35	311	317		319	59	83	78		6
	45	10:42	1010.45												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By Mike Nummer Team Leader Matt Young

MONTROSE AIR QUALITY SERVICES

EPA Method 5b Field Datasheet (Isokinetic)

Project Information

Date 8-10-21 Project # 008915

Customer/Facility DTE SCPP

Unit ID/Sample Location Unit 6

Run # 2 Operator Mike Nummer

Sampling Conditions

Static Pressure, in. H_2O 0.20 Ambient Temp, °F 74

Barometric Pressure, in. Hg 29.91 Ref. Barometer ID NOAA

Wind Speed / Direction S 8 mph Precipitation, Y (N) type

Probe / Filter Temp Range, °F 320 ± 25

ALT 011

	TC ID:	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB 3

Umbilical ID UMB 12

Nozzle ID SS 4-9

Pitot / Probe ID 8' C

Manometer ID MB 3

Sensitivity 0-10"

Calibration

Meterbox Y 1.020

Meterbox ΔH@, in. H_2O 1.83

Nozzle diameter, Dn, in. .241

Pitot coefficient, Cp .84

Manometer zero and level ☒ yes

K-Factor 2.25

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☒ @ 3.5	☐ @	☒ @ 3.2
Pitot (-), pass @ in. H_2O	☒ @ 3.3	☐ @	☒ @ 3.3
Pitot visual inspection	☒ pass	☐ pass	☒ pass
Nozzle visual inspection	☒ pass	☐ pass	☒ pass
Meter, cfm @ in. Hg	0.005 @ 15	@	0.005 @ 10
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	45	10:46	1010.45	.81	1.82	1.85	310	320		331	66	82	78		5
2	47.5		1012.29	.86	1.93	1.95	311	322		323	63	83	79		5
3	50		1014.18	.95	2.14	2.15	311	318		320	61	83	79		6
4	52.5		1016.20	.98	2.20	2.20	312	322		322	62	84	80		6
5	55		1018.24	.92	2.07	2.10	312	316		313	62	84	80		5.5
6	57.5		1020.20	.88	1.98	2.00	312	319		318	62	84	80		5.5
	60	11:01	1022.11												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By Mike Nummer Team Leader Matt Young

MONTROSE AIR QUALITY SERVICES

EPA Method 5b Field Datasheet (Isokinetic)

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Project Information

Date 8-10-11 Project # 008915

Customer/Facility DTE SCPP

Unit ID/Sample Location Unit 6

Run # 3 Operator Mike Nummer

Sampling Conditions

Static Pressure, in. H_2O 0.26 Ambient Temp, °F 77

Barometric Pressure, in. Hg 29.91 Ref. Barometer ID NOAA

Wind Speed / Direction SSW 7 mph Precipitation, Y / N, type

Probe / Filter Temp Range, °F 320 ± 25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB 3

Umbilical ID UMB 12

Nozzle ID SS 4-9

Pitot / Probe ID 8' C

Manometer ID MB 3

Sensitivity 0-10"

Calibration

Meterbox Y 1.020

Meterbox ΔH@, in. H_2O 1.83

Nozzle diameter, Dn, in. .241

Pitot coefficient, Cp .84

Manometer zero and level ☒ yes

K-Factor 2.26

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☒ @ 3.2	☐ @	☒ @ 3.1
Pitot (-), pass @ in. H_2O	☒ @ 3.3	☐ @	☒ @ 3.5
Pitot visual inspection	☒ pass	☐ pass	☒ pass
Nozzle visual inspection	☒ pass	☐ pass	☒ pass
Meter, cfm @ in. Hg	0.005 @ 15	@	0.000 @ 8
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	11:24	22.29	.85	1.87	1.85	311	307		321	67	82	79		4.5
2	2.5		24.18	.87	1.91	1.90	311	310		322	66	81	80		4.5
3	5		26.07	.87	1.91	1.90	311	324		317	59	83	80		4.5
4	7.5		27.95	.92	2.02	2.00	312	324		323	57	84	81		4.5
5	10		29.86	.85	1.87	1.85	313	321		320	58	85	81		4.5
6	12.5		31.71	.75	1.65	1.65	313	320		321	57	86	82		4.5
	15	11:39	33.46												
1	15	11:42	33.46	.90	1.98	1.95	312	326		319	62	86	82		4.5
2	17.5		35.36	.93	2.04	2.00	311	320		322	60	87	83		4.5
3	20		37.30	.96	2.11	2.10	312	319		312	59	87	83		5
4	22.5		39.29	.96	2.11	2.10	311	320		324	60	88	83		5
5	25		41.27	1.10	2.42	2.40	312	319		332	60	89	84		5.5
6	27.5		43.41	.90	1.98	1.95	312	319		316	61	90	84		4.5
	30	11:57	45.33												
1	30	11:59	45.33	1.00	2.20	2.00	311	326		311	63	89	85		5
2	32.5		47.37	.98	2.15	2.15	310	319		326	58	90	85		5
3	35		49.37	1.10	2.42	2.40	309	320		319	58	91	85		5.5
4	37.5		51.49	1.05	2.31	2.30	309	321		324	58	92	86		5
5	40		53.54	1.00	2.20	2.20	309	319		324	58	93	86		5
6	42.5		55.54	.82	1.80	1.80	310	320		321	59	93	87		4.5
	45	12:14	57.44												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By Mike Nummer Team Leader Matt Young

001AS-QMS-FM-225RB

MONTROSE AIR QUALITY SERVICES

EPA Method 5b Field Datasheet (Isokinetic)

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Project Information		Sampling Conditions				ALT 011	TC ID:	Ambient °F	Ref. °F
Date 8-10-11	Project # 008915	Static Pressure, in. H_2O	0.20	Ambient Temp, °F	77	Stack			
Customer/Facility	DTE SCPP	Barometric Pressure, in. Hg	29.91	Ref. Barometer ID	NOAA	Probe			
Unit ID/Sample Location	Unit 6	Wind Speed / Direction	SSW 7 mph	Precipitation, Y / N, type		Filter Box			
Run # 3	Operator Mike Nummer	Probe / Filter Temp Range, °F	320 ± 25			Filter Exit			

Sampling Equipment IDs		Calibration		Equipment Checks	Pre	Mid	Post
Meterbox ID	MB 3	Meterbox Y	1.026	Pitot (+), pass @ in. H_2O	☒ @ 3.2	☐ @	☒ @ 3.1
Umbilical ID	UMB 12	Meterbox ΔH@, in. H_2O	1.83	Pitot (-), pass @ in. H_2O	☒ @ 3.3	☐ @	☒ @ 3.5
Nozzle ID	SS 4-9	Nozzle diameter, Dn, in.	.241	Pitot visual inspection	☒ pass	☐ pass	☒ pass
Pitot / Probe ID	8' C	Pitot coefficient, Cp	.84	Nozzle visual inspection	☒ pass	☐ pass	☒ pass
Manometer ID	MB 3	Manometer zero and level	☒ yes	Meter, cfm @ in. Hg	0.005 @ 15	@	0.000 @ 8
Sensitivity	0-16"	K-Factor	2.20	Intermediate leak check volume, ft^3		/	/

Meter outlet:

Impinger Exit:

Other:

Ref. Thermometer ID:

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	45	12:18	57.44	1.15	2.53	2.50	310	320		324	62	92	87		5.5
2	47.5		59.61	1.16	2.42	2.40	310	319		322	58	93	88		5
3	50		61.74	1.26	2.64	2.65	310	326		317	57	93	88		6
4	52.5		63.99	1.26	2.64	2.65	311	320		329	57	95	89		6
5	55		66.22	1.25	2.75	2.75	311	319		324	57	95	89		6
6	57.5		68.51	.88	1.93	1.95	316	319		314	58	96	89		4.5
	60	12:33	70.44												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By Mike Nummer Team Leader Matt Young

MAQS CEM Calibration Field Data Sheet

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Client: DTE
Date: 8/10/21, 8/11/21
Analyzer #'s: 19

Operator: MY
Sampling Location: DTE SCPP unit 6+7

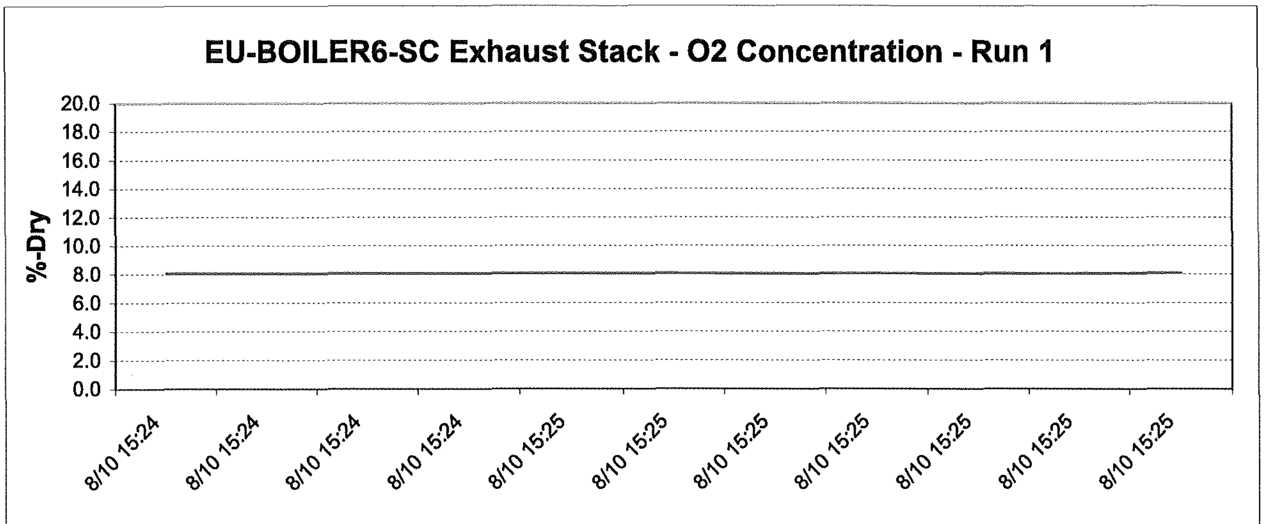
Environics # yes / (no)

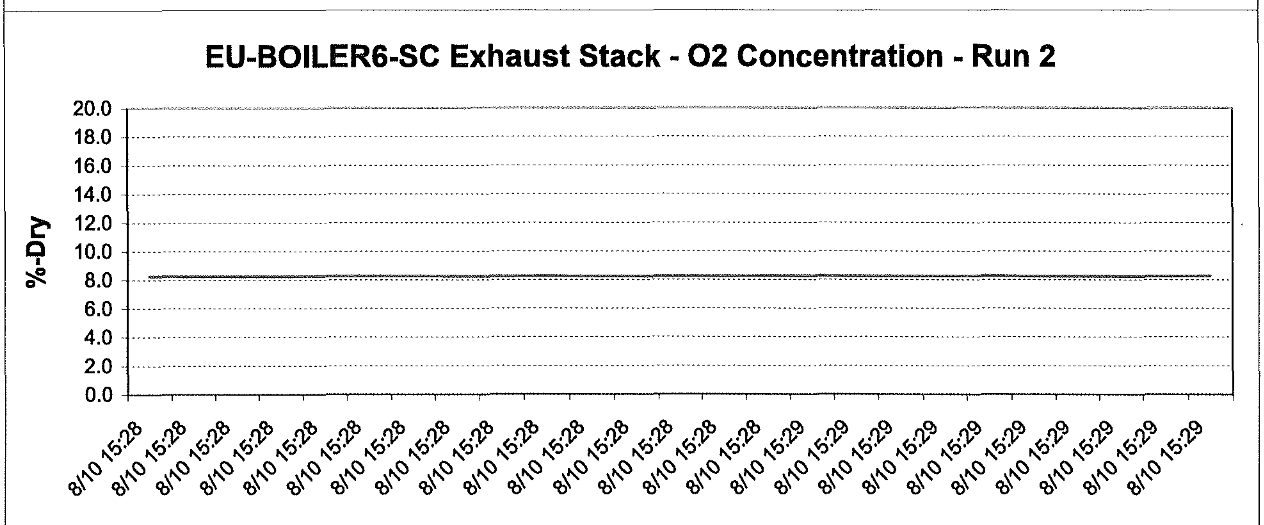
Range						
Cyinder Values						
Time	Pollutant O_2	Pollutant CO_2	Pollutant	Pollutant	Pollutant	Notes: Run/Cal Info & File Name
1515	0	0				* unit 6 Precal
1517	20.5	20.6				
1520	9.8	10.5				
1523	8	11.5				* U6 r1
1527	8	11.5				* U6 r2
1531	8	11.5				* U6 r3
1536	9.7	10.4				* unit 6 Post cal
1539	.01	0.0				
15:02 ~~1500~~	-.01	.00				* unit 7 Precal
1505	20.4	20.5				
1510	9.7	10.35				
1514	9.9	9.8				* U7 r1
1519	9.9	9.9				* U7 r2
1525	9.8	10.1				* U7 r3
1532	9.6	10.4				* unit 7 Post cal
1535	.0	.0				

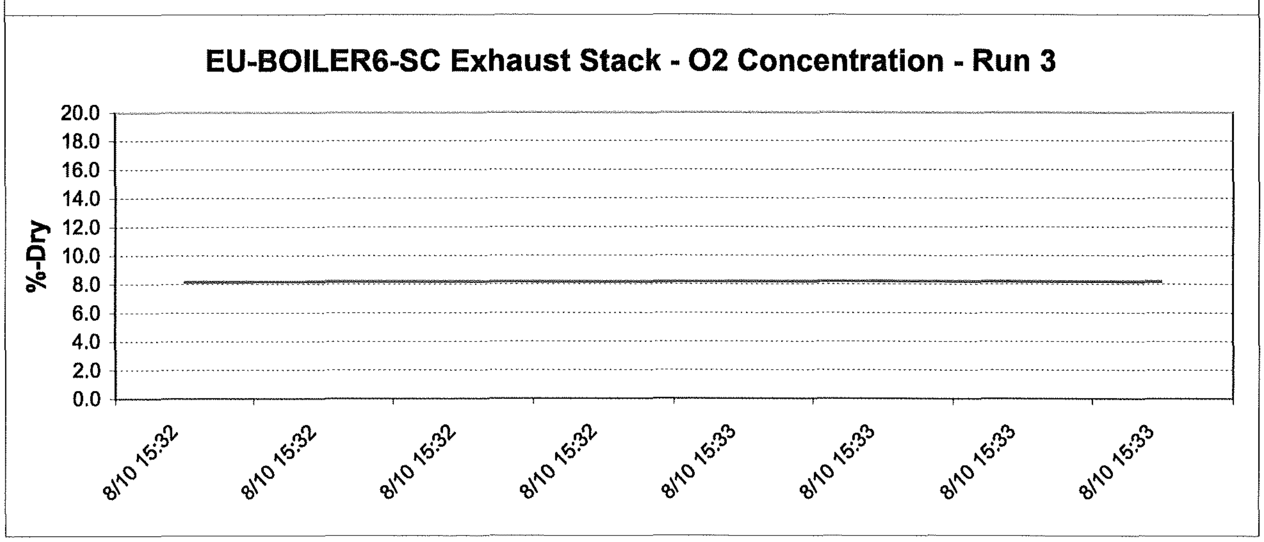
Cylinder Serial Numbers

20 combo CC27654
10 combo SG9153163BAL

Revision 3.0
KL 1/6/14


EU-BOILER6-SC Exhaust Stack - O2 Concentration - Run 1
%-Dry
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
8/10 15:24
8/10 15:25


EU-BOILER6-SC Exhaust Stack - O2 Concentration - Run 2
%-Dry
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
8/10 15:28
8/10 15:29


EU-BOILER6-SC Exhaust Stack - O2 Concentration - Run 3
%-Dry
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
8/10 15:32
8/10 15:33

EPA Methods 1, 2, 3A, 4, and 5B Nomenclature and Sample Calculations

Run No. - 1

Constants

CO_2F_{wt}= 44.0	in wg= 0.073529	NO_2F_{wt}= 46.01	$HClF_{wt}$= 36.46
O_2F_{wt}= 32.0	gr= 0.000142857	COF_{wt}= 28.01	SO_2F_{wt}= 64.06
CON_2F_{wt}= 28.0	mmBtu= 1000000 Btu	$H_2SO_4F_{wt}$= 98.08	Cl_2F_{wt}= 70.91
H_2OF_{wt}= 18.015	CF_{wt}= 12.011	T_{std}= 530.00	P_{std}= 29.92
ArF_{wt}= 40.0	PF_{wt}= 44.0962		

Stack Variables

Cp =	0.84		pitot tube coefficient (dimensionless)
P_{bar} =	29.89	in. Hg	barometric pressure
E_{box} =	580	ft	elevation difference between ground level and meter box
E_{sam} =	700	ft	elevation difference between ground level and sampling ports
γ =	1.0200		gamma, dry gas meter calibration factor (dimensionless)
θ =	60.0	min	net run time (minutes)
V_{lc} =	120.3	g	total mass of liquid collected in impingers (g)
$\%CO_2$ =	11.31	%	percent CO_2 by volume (dry basis) (dimensionless)
$\%O_2$ =	8.03	%	percent O_2 by volume (dry basis) (dimensionless)
$\%N_2$ =	80.66	%	percent N_2 by volume (dry basis) (dimensionless)
A =	283.53	ft^2	stack cross-sectional area
P_g =	0.20	in. H_2O	flue gas static pressure
T_{savg} =	767.83	R	average absolute flue gas temperature (460R+tsavg °F)
$SQ\Delta P_{avg}$ =	0.99	in. wg	average square root ΔP
ΔH =	2.48	in. wg	average pressure differential of orifice meter
T_m =	541.27	R	dry gas meter temperature (460R+tsavg °F)
V_m =	51.47	ft^3	volume of metered gas sample (dry actual cubic feet)
D_n =	0.241	in.	sampling nozzle diameter

Calculated Stack Variables

Barometric pressure at sampling location

NOTE: Barometric pressure recorded at ground level

$$P_{sam} = P_{bar} - [(E_{sam} / 100 \text{ ft}) * 0.1 \text{ in. Hg}]$$

$$P_{sam} = 29.89 - ((700.0 / 100) * 0.1)$$

$$P_{sam} = 29.19 \text{ in. Hg}$$

Volume of dry gas sampled at standard conditions (dscf)

$$V_{mstd} = \gamma * Vm * [P_{bar} - ([(E_{box} / 100 \text{ ft}) * 0.1 \text{ in. Hg}] + (\Delta H / 13.6)) / P_{std}] * (T_{std} / T_m)$$

$$V_{mstd} = 1.0200 * 51.470 * ((29.89 - ((580.0 / 100) * 0.1) + (2.4833 / 13.6)) / 29.92) * (530.0 / 541.271)$$

$$V_{mstd} = 50.672 \text{ ft}^3$$

Volume of water vapor at standard conditions (68 °F, scf)

$$V_{wstd} = (0.04716 \text{ ft}^3/g) * Vlc$$

$$V_{wstd} = (0.04716 * 120.3)$$

$$V_{wstd} = 5.7 \text{ ft}^3$$

Percent moisture by volume as measured in flue gas

$\%H_2O\ (Measured) = 100 * [V_{wstd} / (V_{wstd} + V_{mstd})]$

$\%H_2O\ (Measured) = 100 * (5.673 / (5.673 + 50.672))$

$\%H_2O\ (Measured) =$ 10.07

$\%H_2O\ (Saturated) = (100 / P_{sam}) * 10 \wedge (6.6911 - (3144 / (T_{savg} + 390.86 - 460)))$

$\%H_2O\ (Saturated) = (100 / 29.204706) * 10 \wedge (6.6911 - (3144 / (767.833333 + 390.86 - 460)))$

$\%H_2O\ (Saturated) =$ 532.01

$\%H_2O =$ 10.07

Absolute flue gas pressure

$P_s = P_{sam} + (Pg / 13.6)$

$P_s = 29.19 + (0.20 / 13.6)$

$P_s =$ 29.20 in. Hg

Dry mole fraction of flue gas (dimensionless)

$M_{fd} = 1 - (\%H_2O / 100)$

$M_{fd} = 1 - (10.07 / 100)$

$M_{fd} =$ 0.899

Dry molecular weight of flue gas (lb/lb-mole)

$M_d = [(\%CO_2 / 100) * 44.0] + [(\%O_2 / 100) * 32.0] + [((100 - \%CO_2 - \%O_2) / 100) * 28.0]$

$M_d = ((11.31 / 100) * 44.0) + ((8.03 / 100) * 32.0) + (((100 - 11.31 - 8.03) / 100) * 28.0)$

$M_d =$ 30.13 lb/lb-mole

$M_d =$ 30.13

Wet molecular weight of flue gas (lb/lb-mole)

$M_s = M_d * M_{fd} + (H_2OF_{wt} * (\%H_2O / 100))$

$M_s = 30.131 * 0.899 + 18.02 * (10.07 / 100)$

$M_s =$ 28.9107 lb/lb-mole

Average flue gas velocity (ft/sec)

$v_s = 85.49 * Cp * (SQ\Delta P_{avg}) * (T_{savg} / (P_s * M_s))^{0.5}$

$v_s = 85.49 * 0.84 * (0.9945) * (767.83 / (29.205 * 28.911)) \wedge 0.5$

$v_s =$ 68.1072 ft/sec

Wet volumetric flue gas flow rate at actual conditions (acfm)

$Q_{aw} = v_s * A * 60$ sec/min

$Q_{aw} = 68.107 * 283.529 * 60$

$Q_{aw} =$ 1,158,621 ft^3/min

Wet volumetric flue gas flow rate at standard conditions (scfm)

$Q_{sdw} = v_s * A * (T_{std} / T_{savg}) * (P_s / P_{std}) * 60$ sec/min

$Q_{sdw} = 68.107 * 283.529 * (530.0 / 767.833) * (29.205 / 29.92) * 60$

$Q_{sdw} =$ 780,623 ft^3/min

Dry volumetric flue gas flow rate at standard conditions (dscfm)

$Q_{sd} = M_{fd} * v_s * A * (T_{std} / T_{savg}) * (P_s / P_{std}) * 60$ sec/min

$Q_{sd} = 0.899 * 68.1072 * 283.5287 * (530.0 / 767.833) * (29.205 / 29.92) * 60$

$Q_{sd} =$ 702,023 ft^3/min

Percent Excess Air

$\%EA = [\%O_2 - (0.5) * \%CO] / [0.264 * (100 - \%CO_2 - \%O_2) - (\%O_2 - 0.5 * \%CO)]$

$\%EA = ((8.03 - (0.5) * 0.00) / (0.264 * (100 - 11.31 - 8.03) - (8.03 - 0.5 * 0.00))) * 100$

%EA = 60.50 %

Isokinetic Calculations

Percent Isokinetic of sampling rate (%)

$\%I = (P_{std} / T_{std}) * (T_{savg} / P_s) * [V_{mstd} / (v_s * M_{fd} * \theta) * (\pi * (D_n / 2)^2 / 144)] * (100 / 60)$

%I = (29.92 / 530.0) * (767.833 / 29.205) * (50.672 / (68.1072 * 0.899 * 60.0 * 3.141593 * (0.241 / 2) ^ 2) / 144) * (100 / 60)

%I = 107.7 %

Method 5B Calculations

Wet Air Flow Rate at Standard Conditions, 1,000 lb-wet exhaust gas/hr

WetFlow $(Q_{sdw} * M_s * (60 / 386.8)) / 1000$

WetFlow 780,623 * 28.91 * (60 / 386.8)) / 1000

WetFlow 3500.8 1,000 lb-wet exhaust gas/hr

Nonsulfuric Acid PM total catch weight (mg)

$mg_{quan} =$ 14.2 mg

Nonsulfuric Acid PM concentration (grains/dscf)

$C_{grcm} = 0.0154322 * mg_{quan} / V_{mstd}$

$C_{grcm} = 0.0154322 * 14.20 / 50.672$

$C_{grcm} =$ 0.0043 gr/ft^3

Nonsulfuric Acid PM mass emission rate (lb/hr)

$EMR_{lbhr} = (mg_{quan} / V_{mstd}) * Q_{sd} * (60 / 453592)$

$EMR_{lbhr} = 14.20 / 50.672 * 702,023.2 * (60 / 453592)$

$EMR_{lbhr} =$ 26.0 lb/hr

Nonsulfuric Acid PM mass emission rate (lb/1,000 lb of wet exhaust gas @ 50% excess air)

$EMR_{lbhr} = EMR_{lbhr} / WetFlow * ((100 + \%EA) / 150)$

$EMR_{lbhr} = 26.02 / 3,500.8 * (100 *60.50) / 150)$

$EMR_{lbhr} =$ 0.0080 lb/1,000 lb-wet exhaust gas