DTE

COMPLIANCE TEST REPORT

for

RELATIVE ACCURACY TEST AUDIT (RATA)

CONTINUOUS EMISSIONS MONITORING SYSTEM (CEMS)

CTG Turbine Units EU-CTG01-DP through EU-CTG04-DP

Belle River Power Plant
Dean CTGs
East China Township, Michigan

October 23-26, 2023

Prepared By
Environmental Management & Safety
Ecology, Monitoring, and Remediation
DTE Corporate Services, LLC
7940 Livernois Ave. G-4S
Detroit, MI 48210

CONTENTS

Section **Page**

RESULTS TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Safety Environmental Field Services Group (DTE) conducted a Relative Accuracy Test Audit (RATA) at the Belle River Power Plant (BRPP) Dean CTGs, located in China Township, Michigan. The fieldwork, performed on October 23-26, 2023, was conducted to satisfy Permit to Install conditions for DTE Electric Company, Belle River Peakers (PTI No. 116-01B) (state.mi.us).

The results of the RATA testing are highlighted below:

O_2, NO_x and CO RATA Results
Turbine Units EU-CTG01-DP through EU-CTG04-DP
Belle River Power Plant
Dean Peaker's
October 23-26, 2023

Parameter	Unit	Date	CEMS	RM	Relative Accuracy	Limit
CO (ppm)	EU-CTG03-DP	10-26	1.4	1.3	0.1	5(1)
NOx (lb/MMBtu)	EU-CTG03-DP	10-26	0.028	0.031	0.003*	<0.015(2)
O2 (%)	EU-CTG03-DP	10-26	15.1	15.0	0.7	1.0(3)
CO (ppm)	EU-CTG04-DP	10-23	4.3	3.6	0.7	5(1)
NOx (lb/MMBtu)	EU-CTG04-DP	10-23	0.029	0.029	0.000**	<0.015(2)
O2 (%)	EU-CTG04-DP	10-23	15.0	15.1	0.2	1.0(3)
CO (ppm)	EU-CTG02-DP	10-24	4.6	4.2	0.6	5(1)
NOx (lb/MMBtu)	EU-CTG02-DP	10-24	0.021	0.023	0.002***	<0.015(2)
O2 (%)	EU-CTG02-DP	10-24	14.9	15.1	1.4	1.0(3)
CO (ppm)	EU-CTG01-DP	10-25	4.8	4.5	0.4	5(1)
NOx (lb/MMBtu)	EU-CTG01-DP	10-25	0.025	0.027	0.003****	<0.015(2)
O2 (%)	EU-CTG01-DP	10-25	14.9	15.0	0.7	1.0(3)

(1) Part 60 (alt. criteria of abs mean diff + confidence coefficient) Allowable Limit
(2) Part 75 Low Emitter Criteria (mean diff. < + or – 0.015 lb/MMBtu) Allowable Limit
* A Bias Adjustment Factor (BAF) of 1.107 must be applied to DAHS per Part 75 criteria
** A Bias Adjustment Factor (BAF) of 1.000 must be applied to DAHS per Part 75 criteria
*** A Bias Adjustment Factor (BAF) of 1.089 must be applied to DAHS per Part 75 criteria
**** A Bias Adjustment Factor (BAF) of 1.103 must be applied to DAHS per Part 75 criteria
(3) Part 75 Allowable Limit

DTE

1. 0 INTRODUCTION

DTE Energy's Environmental Management and Safety Environmental Field Services Group (DTE) conducted a Relative Accuracy Test Audit (RATA) at the Belle River Power Plant (BRPP) Dean CTGs, located in China Township, Michigan. The fieldwork, performed on October 23-26, 2023, was conducted to satisfy Permit to Install conditions for DTE Electric Company, Belle River Peakers (PTI No. 116-01B) (state.mi.us).

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 3A, 7E, 10, 19, Part 75 Appendices A & B, and Part 60 Appendix B Performance Specifications 2, 3 and 4A.

The following DTE personnel participated in the testing program: Mark D. Westerberg, Senior Specialist - Environmental, Fred Meinecke, Specialist, and Kenneth R St. Amant, Specialist. Mr. Westerberg was the project leader. Mr. Joseph R. Grave, Lead O & M Technician at Belle River Power Plant Dean Peaker's, provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The Belle River Power Plant is a DTE Energy facility located at 4505 King Road in China Township, Michigan. The plant has four (4) simple cycle stationary combustion turbines at the Dean site, referred to as Units EU-CTG01-DP through EU-CTG04-DP operating as Peaker units.

Each combustion turbine includes a compressor, combustor, turbine and electric generator with a nominally rated load capacity of 82.4 megawatts (MW) at perfect conditions in simple cycle operation.

NO_x emissions are controlled by dry low NO_x technology and good combustion practices. CO emissions are controlled by good combustion practices and SO_2 emissions are controlled by utilizing low sulfur natural gas.

The RATA testing was performed while each Unit operated at full load conditions.

DTE

The exhaust stacks for Units EU-CTG01-DP through EU-CTG04-DP are rectangular ducts approximately 60 feet tall with an internal equivalent diameter of approximately 12 feet. See Figure 1 for a diagram of Units EU-CTG01-DP through EU-CTG04-DP sampling locations and stack dimensions.

Dean Peaker's utilizes Thermo-Fisher Scientific Continuous Emissions Monitoring Systems (CEMS) to record emissions during unit operations. The following Units were audited:

Unit	Analyzer	Manufacturer / Model	Serial Number
EU-CTG01-DP	NO_x	Thermo-Fisher Sci 42IQ/LS	12108911584
EU-CTG01-DP	O_2/CO	Thermo-Fisher Sci 48IQ	12108911588
EU-CTG02-DP	NO_x	Thermo-Fisher Sci 42IQ/LS	12108911585
EU-CTG02-DP	O_2/CO	Thermo-Fisher Sci 48IQ	12108911589
EU-CTG03-DP	NO_x	Thermo-Fisher Sci 42IQ/LS	12108911582
EU-CTG03-DP	O_2/CO	Thermo-Fisher Sci 48IQ	12101137279
EU-CTG04-DP	NO_x	Thermo-Fisher Sci 42IQ/LS	12108911583
EU-CTG04-DP	O_2/CO	Thermo-Fisher Sci 48IQ	12108911586

3.0 SAMPLING AND ANALYTICAL PROCEDURES

Emissions measurements were obtained in accordance with procedures specified in the USEPA *Standards of Performance for New Stationary Sources*. The sampling and analytical methods used in the testing program are indicated in the table below.

DTE

Sampling Method	Parameter	Analysis
USEPA Method 3A	Oxygen	Instrumental Analyzer Method
USEPA Method 7E	Oxides of Nitrogen	Chemiluminescent Analyzer
USEPA Method 10	Carbon Monoxide	NDIR Instrumental Analyzer Method

3.1 OXYGEN, OXIDES OF NITROGEN AND CARBON MONOXIDE (USEPA METHODS 3A, 7E AND 10)

3.1.1 Sampling Method

Oxygen (O_2) emissions were evaluated according to Performance Specification (PS) 3 "Specifications and Test Procedures for O_2 and CO_2 Continuous Emission Monitoring Systems in Stationary Sources" utilizing USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The O_2 analyzer utilizes a paramagnetic sensor.

Oxides of Nitrogen (NO_x) emissions were evaluated according to Performance Specification (PS) 2 "Specifications and Test Procedures for SO_2 and NO_x Continuous Emission Monitoring Systems in Stationary Sources" utilizing USEPA Method 7E, "Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)". The NO_x analyzer utilizes a Chemiluminescent detector.

Carbon monoxide (CO) emissions were evaluated following the Performance Specification (PS) 4 and 4A "Specifications and Test Procedures for Carbon Monoxide Continuous Emissions Monitoring Systems in Stationary Sources" utilizing USEPA Method 10,

DTE

"Determination of Carbon Monoxide Emissions from Stationary Sources". The CO analyzer utilizes a NDIR detector.

3.1.2 O_2, NO_x and CO Sampling Train

The EPA Methods 3A, 7E and 10 sampling system (Figure 2) consisted of the following components:

(1) Heated stainless steel sampling probe with heated filter.
(2) Heated Teflon™ sampling line.
(3) Universal® gas conditioner with particulate filter.
(4) Flexible unheated Teflon™ sampling line.
(5) Servomex 1400 O_2/CO_2 gas analyzer TECO 48i Chemiluminescent NO_x gas analyzer and TECO 48C NDIR CO gas analyzer.
(6) USEPA Protocol 1 calibration gases.
(7) Data Acquisition System

3.1.3 Sampling Train Calibration

The $O_2/NO_x/CO$ sampling trains were calibrated following the procedures outlined in USEPA Methods 3A, 7E and 10. Zero, span, and mid-range calibration gases were introduced directly into the O_2, NO_x and CO analyzers to determine the instruments linearity. A zero and mid-range span gas was then introduced through the entire sampling system to determine sampling system bias for each analyzer. Additional system calibrations were performed at the completion of each test.

3.1.4 Sampling Duration & Frequency

The RATA testing of the Units EU-CTG01-DP through EU-CTG04-DP O_2, NO_x and CO CEMS consisted of the best 9 of ten or eleven 21-minute samples at the test platform level of each unit's exhaust stack. Sampling was conducted at three points along a single path across the duct. Sampling was performed simultaneously for O_2, NO_x and CO. Data was recorded as 1-minute averages. The results are included in Appendix A.

3.1.5 Quality Control and Assurance (O_2, NO_x and CO)

All sampling and analytical equipment were calibrated following the guidelines referenced in Methods 3A, 7E and 10. Calibration gases were EPA Protocol 1 gases. The analyzer spans for Units EU-CTG01-DP through EU-CTG04-DP RATA testing were 0-17.51% (17.51, 10.11, and zero) for O_2, 0-17.85 ppm (17.85, 8.193, and zero) for NO_x, and 0-8.984 ppm (8.985, 5.052 and zero) for CO.

DTE

The 10.11% O_2 gas was used to zero the NO_x and CO analyzers and the 8.193 ppm NO_x gas was used to zero the O_2 analyzer.

Calibration gas certification sheets are included in Appendix C.

3.1.6 Data Reduction

The NO_x and CO emission readings in parts per million, dry (ppm_{dry}) and O_2 emission readings in percent (%) were recorded at 4-second intervals and averaged to 1-minute increments. The O_2, NO_x and CO emissions were drift corrected utilizing pre and post-run calibration data. The O_2 data was used to convert the NO_x ppm data to pounds per million British thermal units (lb/MMBtu).

The RM data collected for the Units EU-CTG01-DP through EU-CTG04-DP testing can be found in Appendix A.

Corresponding CEMS data collected during the Units EU-CTG01-DP through EU-CTG04-DP testing can be found in Appendix B.

RA calculations are based upon calculations found in USEPA Methods 3A, 7E, 10, 19 and PS2, 3, 4 and 4A. Example calculations can be found in Appendix D.

4.0 OPERATING PARAMETERS

Each Unit was tested at full load conditions which were determined by plant personnel. Load in terms of megawatts (MW) are included with the CEMS data located in Appendix B.

5.0 RESULTS

Tables 1 through 4 present the RATA testing results from Units EU-CTG01-DP through EU-CTG04-DP. The O_2, NO_x and CO monitors passed the RATA following the specifications of 40CFR60 – Performance Specification 2, 3, 4 and 4A and 40CFR75. The O_2 relative accuracy, calculated as %, met the criteria of <1.0% mean difference for all 4 units. The CO relative accuracy, calculated as ppm met the criteria of <5 ppm mean difference for all 4 units. The NO_x relative accuracy, calculated as pounds per million British Thermal units (lb/MMBtu), met the low emitter criteria of <0.015 lb/MMBtu mean difference for all 4 units. In addition,

DTE

unit (EU-CTG01-DP) had a bias adjustment factor (BAF) = 1.103, unit (EU-CTG02-DP) had a BAF = 1.089, unit (EU-CTG03-DP) has a BAF = 1.107, and unit (EU-CTG04-DP) has a BAF = 1.000 per 40CFR75 criteria.

DTE

6.0 CERTIFICATION STATEMENT

"I certify that I believe the information provided in this document is true, accurate, and complete. Results of testing are based on the good faith application of sound professional judgment, using techniques, factors, or standards approved by the Local, State, or Federal Governing body, or generally accepted in the trade."

Mr. Mark D. Westerberg, QSTI

This report prepared by:

Mr. Mark D. Westerberg, QSTI
Senior Specialist, Field Services Group
Environmental Management and Safety
DTE Energy Corporate Services, LLC

This report reviewed by:

Mr. Jason Logan, QSTI
Senior Specialist, Field Services Group
Environmental Management and Safety
DTE Energy Corporate Services, LLC

DTE

RESULTS TABLES

DTE

Table 1
Unit 11-1 (EU-CTG03-DP) CO, NO_x and O_2 CEMS RATA Results
Dean Peakers
October 26, 2023

Test No.	Test Times (DAHS)	CO RM (ppm)	CO CEM (ppm)	CO Difference (ppm)	O_2 RM (% O2)	O_2 CEM (% O2)	O_2 Difference (ppm)	NOx RM (lb/MMBtu)	NOx CEM (lb/MMBtu)	NOx Difference (lb/MMBtu)
1	7:23-7:44	1.3	1.5	-0.2	15.0	15.1	-0.1	0.031	0.028	0.003
2	7:55-8:16	1.4	1.5	-0.1	15.0	15.1	-0.1	0.031	0.028	0.003
3	8:25-8:46	1.4	1.5	-0.1	15.0	15.1	-0.1	0.031	0.028	0.003
4	8:56-9:17	1.4	1.5	-0.1	15.0	15.1	-0.1	0.031	0.028	0.003
5	9:26-9:47	1.3	1.4	-0.1	15.0	15.1	-0.1	0.031	0.028	0.003
6	9:57-10:18	1.3	1.4	-0.1	15.0	15.1	-0.1	0.031	0.028	0.003
7	10:27-10:48	1.2	1.3	-0.1	15.0	15.1	-0.1	0.031	0.028	0.003
8	10:56-11:17	1.2	1.3	-0.1	15.0	15.1	-0.1	0.031	0.028	0.003
9	11:25-11:46	1.1	1.2	-0.1	15.0	15.1	-0.1	0.031	0.028	0.003
10	11:57-12:18	1.2	1.1	0.1	15.0	15.1	-0.1	0.031	0.028	0.003
Avg:		**1.3**	**1.4**	**-0.1**	**15.0**	**15.1**	**-0.1**	**0.031**	**0.028**	**0.003**
		Standard Deviation:		**0.1**	**Standard Deviation:**		**0.0**	**Standard Deviation:**		**0.000**
		Confidence Coefficient (CC):		**0.0**	**Confidence Coefficient (CC):**		**0.0**	**Confidence Coefficient (CC):**		**0.000**
		[1]RELATIVE ACCURACY:		**0.1**	**RELATIVE ACCURACY:**		**0.7**	**[2]RELATIVE ACCURACY:**		**9.7**

Test not used in Calculation

[1] using PS4A alternate criteria of the absolute difference between the RM and CEMs plus the confidence coefficient (CC).

[2] passes on low emitter criteria - mean difference of + or - 0.015 lb/MMBtu for units emitting <0.200 lb/MMBtu

DTE

Table 2
Unit 11-2 (EU-CTG04-DP) CO, NO_x and O_2 CEMS RATA Results
Dean Peakers
October 23, 2023

Test No.	Test Times (DAHS)	CO RM (ppm)	CO CEM (ppm)	CO Difference (ppm)	O_2 RM (% O2)	O_2 CEM (% O2)	O_2 Difference (ppm)	NOx RM (lb/MMBtu)	NOx CEM (lb/MMBtu)	NOx Difference (lb/MMBtu)
1	8:28-8:49	4.5	5.2	-0.7	15.0	15.0	0.0	0.029	0.029	0.000
2	9:01-9:22	4.2	4.8	-0.6	15.0	15.0	0.0	0.029	0.029	0.000
3	9:30-9:51	3.8	4.4	-0.6	15.0	15.0	0.0	0.029	0.029	0.000
4	10:01-10:22	3.5	4.1	-0.6	15.0	15.0	0.0	0.029	0.029	0.000
5	10:33-10:54	3.3	4.0	-0.7	15.1	15.0	0.1	0.030	0.029	0.001
6	11:03-11:24	3.3	4.0	-0.7	15.1	15.1	0.0	0.030	0.029	0.001
7	11:32-11:53	**3.6**	**4.3**	**-0.7**	15.1	15.1	0.0	0.029	0.029	0.000
8	12:05-12:26	3.5	4.1	-0.6	**15.1**	**15.1**	**0.0**	**0.030**	**0.029**	**0.001**
9	12:38-12:59	3.2	3.9	-0.7	15.1	15.1	0.0	0.029	0.029	0.000
10	13:12-13:33	3.4	4.0	-0.6	15.1	15.1	0.0	0.029	0.029	0.000
Avg:		**3.6**	**4.3**	**-0.7**	**15.1**	**15.0**	**0.0**	**0.029**	**0.029**	**0.000**
			Standard Deviation:	**0.04**		**Standard Deviation:**	**0.03**		**Standard Deviation:**	**0.000**
			Confidence Coefficient (CC):	**0.03**		**Confidence Coefficient (CC):**	**0.03**		**Confidence Coefficient (CC):**	**0.000**
			[1]RELATIVE ACCURACY:	**0.7**		**RELATIVE ACCURACY:**	**0.2**		**[2]RELATIVE ACCURACY:**	**1.9**

Test not used in Calculation

[1] using PS4A alternate criteria of the absolute difference between the RM and CEMs plus the confidence coefficient (CC).

[2] passes on low emitter criteria - mean difference of + or - 0.015 lb/MMBtu for units emitting <0.200 lb/MMBtu

DTE

Table 3
Unit 12-1 (EU-CTG02-DP) CO, NO_x and O_2 CEMS RATA Results
Dean Peakers
October 24, 2023

Test No.	Test Times (DAHS)	CO RM (ppm)	CO CEM (ppm)	CO Difference (ppm)	O_2 RM (% O2)	O_2 CEM (% O2)	O_2 Difference (ppm)	NOx RM (lb/MMBtu)	NOx CEM (lb/MMBtu)	NOx Difference (lb/MMBtu)
1	7:15-7:36	4.0	4.9	-0.9	15.0	14.9	0.1	0.024	0.022	0.002
2	7:47-8:08	4.2	4.9	-0.7	15.0	14.9	0.1	0.023	0.022	0.001
3	8:20:8:41	4.3	4.8	-0.5	15.0	14.9	0.1	0.023	0.021	0.002
4	8:50-9:11	4.3	4.7	-0.4	15.1	14.9	0.2	0.023	0.021	0.002
5	9:20-9:41	4.1	4.5	-0.4	15.1	14.9	0.2	0.023	0.021	0.002
6	9:50-10:11	4.1	4.5	-0.4	15.1	14.9	0.2	0.023	0.021	0.002
7	10:22-10:43	4.2	4.4	-0.2	15.1	14.9	0.2	0.023	0.021	0.002
8	10:54-11:15	**4.2**	**4.3**	**-0.1**	15.1	14.9	0.2	0.023	0.021	0.002
9	11:28-11:49	**4.0**	**4.3**	**-0.3**	15.1	14.9	0.2	0.023	0.021	0.002
10	12:06-12:27	4.3	4.4	-0.1	**15.1**	**14.9**	**0.2**	**0.022**	**0.020**	**0.002**
11	12:38-12:59	4.3	4.5	-0.3	**15.1**	**14.9**	**0.2**	**0.022**	**0.020**	**0.002**
Avg:		**4.2**	**4.6**	**-0.4**	**15.1**	**14.9**	**0.2**	**0.023**	**0.021**	**0.002**
		Standard Deviation:		**0.2**	**Standard Deviation:**		**0.05**	**Standard Deviation:**		**0.000**
		Confidence Coefficient (CC):		**0.2**	**Confidence Coefficient (CC):**		**0.04**	**Confidence Coefficient (CC):**		**0.000**
		[1]RELATIVE ACCURACY:		**0.6**	**RELATIVE ACCURACY:**		**1.4**	**[2]RELATIVE ACCURACY:**		**9.28**

Test not used in Calculation

[1] using PS4A alternate criteria of the absolute difference between the RM and CEMs plus the confidence coefficient (CC).

[2] passes on low emitter criteria - mean difference of + or - 0.015 lb/MMBtu for units emitting <0.200 lb/MMBtu

DTE

Table 4
Unit 12-2 (EU-CTG01-DP) CO, NO_x and O_2 CEMS RATA Results
Dean Peakers
October 25, 2023

Test No.	Test Times (DAHS)	CO RM (ppm)	CO CEM (ppm)	CO Difference (ppm)	O_2 RM (% O2)	O_2 CEM (% O2)	O_2 Difference (ppm)	NOx RM (lb/MMBtu)	NOx CEM (lb/MMBtu)	NOx Difference (lb/MMBtu)
1	7:02-7:23	4.7	5.0	-0.4	15.1	14.9	0.2	0.028	0.024	0.004
2	7:35-7:56	4.9	5.1	-0.2	15.0	14.9	0.1	0.027	0.024	0.003
3	8:08-8:29	5.0	5.3	-0.3	15.0	14.9	0.1	0.027	0.025	0.002
4	8:43-9:04	4.9	5.1	-0.2	15.0	14.9	0.1	0.027	0.025	0.002
5	9:14-9:35	4.5	4.9	-0.4	15.0	14.9	0.1	0.027	0.025	0.002
6	9:47-10:08	4.4	4.7	-0.3	15.0	14.9	0.1	0.027	0.025	0.002
7	10:18-10:39	4.3	4.7	-0.4	15.0	14.9	0.1	0.028	0.025	0.003
8	10:50-11:11	4.1	4.5	-0.4	15.0	14.9	0.1	0.028	0.025	0.003
9	11:21-11:42	4.1	4.4	-0.3	15.0	15.0	0.0	0.028	0.025	0.003
10	11:54-12:15	4.3	4.4	-0.2	15.0	15.0	0.0	0.028	0.025	0.003
Avg:		**4.5**	**4.8**	**-0.3**	**15.0**	**14.9**	**0.1**	**0.027**	**0.025**	**0.003**
			Standard Deviation:	**0.1**		**Standard Deviation:**	**0.0**		**Standard Deviation:**	**0.001**
			Confidence Coefficient (CC):	**0.1**		**Confidence Coefficient (CC):**	**0.0**		**Confidence Coefficient (CC):**	**0.000**
			[1]RELATIVE ACCURACY:	**0.4**		**RELATIVE ACCURACY:**	**0.7**		**[2]RELATIVE ACCURACY:**	**10.79**

Test not used in Calculation

[1] using PS4A alternate criteria of the absolute difference between the RM and CEMs plus the confidence coefficient (CC).

[2] passes on low emitter criteria - mean difference of + or - 0.015 lb/MMBtu for units emitting <0.200 lb/MMBtu

DTE

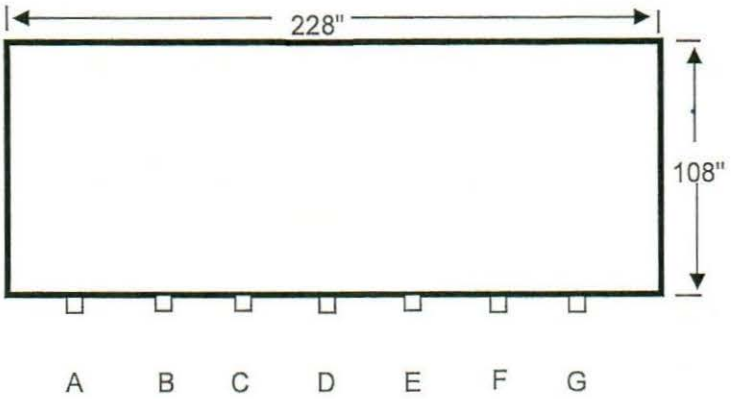
FIGURES

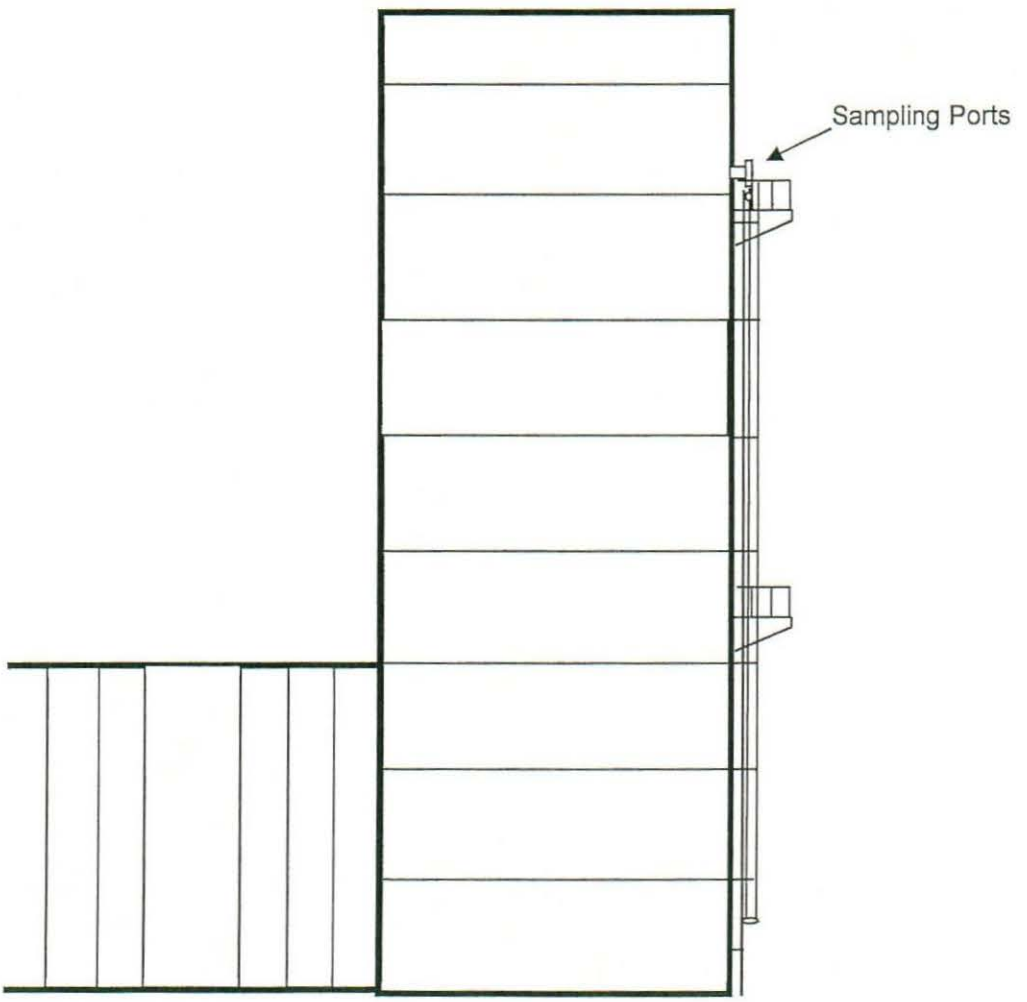
DTE

Figure 1 – Sampling Location
DTE – Dean CTGs

RATA SAMPLING POINTS

PORT	POINT
D	0.4 meter
D	1.0 meter
D	2.0 meter





DTE

Figure 2 – EPA Methods 3A, 7E and 10
DTE – Dean CTGs