AtlanticPower Corporation
Morris Cogeneration, LLC | 8805 N. Tabler Road | Morris, IL 60450 | T: (815)941-0765 F: (815)941-1375

December 29th, 2016

Mrs. Yasmine Keppner-Bauman, Section Manager
Illinois Environmental Protection Agency
Bureau of Air Compliance Section # 40
1021 North Grand Avenue East
Springfield, Illinois 62702

RECEIVED
JAN 4 2017
AIR ENFORCEMENT BRANCH
U.S. EPA REGION 5

Subject: Modification of Existing Continuous Emission Monitoring System

Dear Mrs. Keppner-Bauman:

Morris Cogeneration, LLC located at 8805 North Tabler Road in Morris Illinois (ID# 063800AAJ), submits the enclosed hard copies of the reports for the Continuous Emissions Monitoring System Certification Tests performed by Mostardi Platt for Morris Cogeneration LLC at the Morris Cogeneration LLC Facility on the Combustion Turbine 1 Stack, Combustion Turbine 2 Stack, Combustion Turbine 3 Stack, Boiler 5 Stack, and Boiler 6 Stack in Morris, Illinois, on September 26 through 29, and October 28, 2016

If you have any questions or concerns, please contact me by phone at 815-941-0765 X 310 or email pskopnik@atlanticpower.com or Matt Wrightsman at 765-366-8555 or mwrightsman@atlanticower.com.

Sincerely,

Paul Skopnik

Cc:

Kevin Mattison-Bureau of Air
Illinois Environmental Protection Agency
Bureau of Air, Third Floor
9511 Harrison Street
Des Plaines, Illinois 60016

AtlanticPower Corporation
Morris Cogeneration, LLC | 8805 N. Tabler Road | Morris, IL 60450 | T: (815)941-0765 F: (815)941-1375

USEPA Region 5-Air Branch
USEPA (AR-17J)
Air and Radiation Division
77 West Jackson Boulevard
Chicago, Illinois 60604

IEPA Region 1- Field Operations
Illinois EPA, Bureau of Air
Regional Office #1
9511 Harrison Street
Des Plaines, Illinois 60016

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Continuous Emissions Monitoring System Certification Test Report

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Morris Cogeneration LLC
Morris Cogeneration Facility
Boiler 5 Stack
Morris, Illinois
Project No. M161004I

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Continuous Emissions Monitoring System Certification Test Report

Morris Cogeneration LLC
Morris Cogeneration Facility
Boiler 5 Stack
Morris, Illinois
RATA Test Date: October 28, 2016
7 Day Calibration Error Test Dates: September 23 through October 27, 2016
Linearity Test Date: September 8, 2016
Cycle Time Test Date: September 8, 2016

Report Submittal Date
December 9, 2016

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Project No. M161004I

888 Industrial Drive
Elmhurst, Illinois 60126
630-993-2100

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1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a continuous emissions monitoring (CEM) system certification test program at the Morris Cogeneration LLC Facility in Morris, Illinois, on the Boiler 5 Stack with the relative accuracy test audit (RTA) performed on October 28, 2016. This report summarizes the results of the test program and test methods used in accordance with the Mostardi Platt protocol M161004 dated January 14, 2016. Mostardi Platt is a self-certified air emissions testing body (AETB). A copy of Mostardi Platt's self-certification can be found in Appendix A.

The test location, RATA test date, and test parameters are summarized below.

TEST INFORMATION		
Test Location	**RATA Test Date**	**Test Parameters**
Boiler 5 Stack	October 28, 2016	Oxygen (O_2) and Nitrogen Oxides (NO_x)

The purpose of the test program was to demonstrate the relative accuracies of the Boiler 5 Stack O_2 and NO_x analyzers during the specified operating condition and to certify the CEMS. The test results from this test program indicate that each CEMS component meets the United States Environmental Protection Agency (USEPA) annual performance specification for relative accuracy as published in 40 Code of Federal Regulations Part 75 (40CFR75) and 40 Code of Federal Regulations Part 60 (40CFR 60).

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TEST RESULTS						
Parameter	**Date**	**Test**	**Units**	**Required Performance**	**Actual Performance**	**Bias Adjustment Factor (BAF)**
NO_x	10/28/16	RATA	lb/mmBtu	≤ 7.5 % of the mean reference value	3.44 %	1.000
			ppmvd	≤ 20.0 % of the mean reference value	2.13 %	N/A
			ppmvd@15 % O_2	≤ 20.0 % of the mean reference value	3.49 %	N/A
	9/23-10/23/16	7 Day Calibration Error Test	%	≤ 2.5 % of span each of seven days	≤ 2.12 % of span	N/A
	9/8/16	Linearity	%	≤ 5.0 % of the reference value	≤ 1.02 %	N/A
	9/8/16	Cycle Time	minutes	< 15 minutes for 95% stepchange	≤ 4 minutes	N/A
O_2	10/28/16	RATA	% dry	≤ 7.5 % of the mean reference value	0.98 %	N/A
	9/23-10/23/16	7-Day Calibration Error Test	%	≤ 0.5 % difference each of seven days	≤ 0.3 % difference	N/A
	9/8/16	Linearity Test	%	< 5.0 % of the reference value	≤ 0.69 %	N/A
	9/8/16	Cycle Time	minutes	< 15 minutes for 95% stepchange	≤ 4 minutes	N/A

No deviations, additions, or exclusions from the test protocol, test methods, the Mostardi Platt Quality Manual, or the ASTM D7036-12 occurred. The specific test conditions encountered did not interfere with the collection of the data.

The gas cylinders used to perform the RATA are summarized below.

GAS CYLINDER INFORMATION				
Parameter	**Gas Vendor**	**Cylinder Serial Number**	**Cylinder Value**	**Expiration Date**
NO_x	Airgas	CC100707	0.0 ppm	7/22/24
NO_x	Airgas	CC259027	17.97 ppm	6/7/19
NO_x	Airgas	CC306700	38.08 ppm	9/14/19
O_2	Airgas	CC259027	0.0 %	6/7/19
O_2	Airgas	CC100707	11.94 %	7/22/24
O_2	Airgas	XC021731B	22.01 %	6/9/24

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The identifications of the individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Facility	Morris Cogeneration LLC 8805 North Tabler Road Morris, Illinois 60450	Mr. Paul Skopnik Plant Manager pskopnik@atlanticpower.com
Testing Company Supervisor	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Stuart Sands Project Manager 630-993-2100 (phone) ssands@mp-mail.com
Testing Company Personnel		Mr. Daniel Kossack Test Engineer
		Mr. John Konrad Test Technician

2.0 TEST METHODOLOGY

Emission testing was conducted following the United States Environmental Protection Agency (USEPA) methods specified in 40CFR60, Appendix A, in addition to the test protocol and Mostardi Platt Quality Manual. Schematics of the test section diagram and sampling train used are included in Appendix C and D respectively. Calculation nomenclature are included in Appendix E. Copies of analyzer print-outs for each test run are included in Appendix F. CEM data and process data as provided by Morris Cogeneration LLC are also included in Appendix G.

The following methodologies were used during the test program:

Method 3A Oxygen (O_2) Determination

Stack gas O_2 concentrations and emission rates were determined in accordance with USEPA Method 3A, 40CFR60, Appendix A. A Servomex analyzer was used to determine the O_2 concentrations in the manner specified in the Method. The instrument has a paramagnetic detector and the O_2 operates in the nominal range of 0% to 25% with the specific range determined by the high-level calibration gas of 22.01 %. High-range calibrations were performed using USEPA Protocol gas. Zero nitrogen (a low ppm pollutant in balance nitrogen calibration gases) was introduced during other instrument calibrations to check instrument zero. High- and a mid-range % O_2 levels in balance nitrogen were also introduced. Zero and mid-range calibrations were performed using USEPA Protocol gas after each test run. Copies of the gas cylinder certifications are found in Appendix I. This testing met the performance specifications as outlined in the Method.

Method 7E Nitrogen Oxide (NO_x) Determination

Stack gas NO_x concentrations and emission rates were determined in accordance with USEPA Method 7E, 40CFR60, Appendix A. A Thermo Scientific Model 42i Chemiluminescence Nitrogen Oxides Analyzer was used to determine nitrogen oxides concentrations, in the manner specified in the Method. The instrument operated in the nominal range of 0 ppm to 100 ppm with the specific range determined by the high-level span calibration gas of 38.08 ppm.

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The Model 42i operates on the principle that nitric oxide (NO) and ozone (O_3) react to produce a characteristic luminescence with an, intensity linearly proportional to the NO concentration. Infrared light emission results when electronically excited NO_2 molecules decay to lower energy states. Specifically,

$$NO+O_3 \rightarrow NO_2+O_2+hv$$

Nitrogen dioxide (NO_2) must first be transformed into NO before it can be measured using the chemiluminescent reaction. NO_2 is converted to NO by a stainless steel NO_2-to-NO converter heated to about 627 °C. The flue gas sample is drawn into the Model 42*i* through the sample bulkhead. The sample flows through a capillary, and then to the mode solenoid valve. The solenoid valve routes the sample either straight to the reaction chamber (NO mode) or through the NO_2-to-NO converter and then to the reaction chamber (NO_x mode). A flow sensor prior to the reaction chamber measures the sample flow. Dry air enters the Model 42*i* through the dry air bulkhead, passes through a flow switch, and then through a silent discharge ozonator. The ozonator generates the ozone needed for the chemiluminescent reaction. At the reaction chamber, the ozone reacts with the NO in the sample to produce excited NO_2 molecules. A photomultiplier tube (PMT) housed in a thermoelectric cooler detects the luminescence generated during this reaction. From the reaction chamber, the exhaust travels through the ozone (O_3) converter to the pump, and is released through the vent.

The NO and NO_x concentrations calculated in the NO and NO_x modes are stored in memory. The difference between the concentrations is used to calculate the NO_2 concentration. The Model 42i outputs NO, NO_2, and NO_x concentrations to the front panel display, the analog outputs, and also makes the data available over the serial or ethernet connection.

Stack gas was delivered to the analyzer via a Teflon® sampling line, heated to a minimum temperature of 250°F. Excess moisture in the stack gas was removed using a refrigerated condenser. The entire system was calibrated in accordance with the Method, using USEPA Protocol gases introduced at the probe, before and after each test run. This testing met the performance specifications as outlined in the Method.

A list of calibration gases used and the results of all calibration and other required quality assurance checks are found in Appendix H. Copies of the gas cylinder certifications are found in Appendix I. The NO_2 to NO converter test can be found in Appendix J. This testing met the performance specifications as outlined in the Method.

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3.0 TEST RESULT SUMMARIES

Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004
Fuel Type: Natural Gas

Location: Boiler 5 Stack
Date: 10/28/16
Test Method: 7E, 3A
Fuel Factor: 8710

O2 based NOx lb/mmBtu RATA

CEM Monitor Information

NO_x Monitor/Model:	Teledyne T200H	**NO_x Serial # :**	430
O2 Monitor/Model:	Teledyne T200H	**O2 Serial # :**	430

1=accept 0=reject	Test Run	Test Date	Start Time	End Time	RM NO_x lb/MMBtu	CEM NO_x lb/MMBtu	(RM-CEM) Difference (di)	(RM-CEM) Difference^2 (di^2)
1	1	10/28/16	07:45	08:05	0.048	0.051	-0.003	0.000
0	2	10/28/16	08:18	08:38	0.048	0.051	-0.003	0.000
1	3	10/28/16	08:52	09:12	0.049	0.051	-0.002	0.000
1	4	10/28/16	09:25	09:45	0.050	0.051	-0.001	0.000
1	5	10/28/16	09:58	10:18	0.050	0.051	-0.001	0.000
1	6	10/28/16	10:30	10:50	0.049	0.050	-0.001	0.000
1	7	10/28/16	11:03	11:23	0.050	0.050	0.000	0.000
1	8	10/28/16	11:36	11:56	0.050	0.050	0.000	0.000
1	9	10/28/16	12:09	12:29	0.049	0.049	0.000	0.000
1	10	10/28/16	12:41	13:01	0.049	0.049	0.000	0.000

n	**9**	
t(0.025)	**2.306**	
Mean Reference Method Value	**0.049**	**RM avg**
Mean CEM Value	**0.050**	**CEM avg**
Sum of Differences	**-0.008**	**di**
Mean Difference	**-0.001**	**d**
Sum of Differences Squared	**0.000**	**di^2**
Standard Deviation	**0.001**	**sd**
Confidence Coefficient 2.5% Error (1-tail)	**0.001**	**cc**
Relative Accuracy	**3.44**	**RA**
Bias Adjustment Factor	**1.000**	**BAF**

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Location: Boiler 5 Stack
Date: 10/28/16
Test Method: 7E

NO_x ppmvd RATA

CEM Monitor Information

NO_x Monitor/Model:			Teledyne T200H		**NO_x Serial # :**		430	
1=accept 0=reject	**Test Run**	**Test Date**	**Start Time**	**End Time**	**RM NO_x ppmvd**	**CEM NO_x ppmvd**	**(RM-CEM) Difference (di)**	**(RM-CEM) Difference^2 (di^2)**
0	1	10/28/16	07:45	08:05	14.9	15.5	-0.6	0.4
1	2	10/28/16	08:18	08:38	15.0	15.6	-0.6	0.4
1	3	10/28/16	08:52	09:12	15.1	15.6	-0.5	0.3
1	4	10/28/16	09:25	09:45	15.4	15.6	-0.2	0.0
1	5	10/28/16	09:58	10:18	15.6	15.6	0.0	0.0
1	6	10/28/16	10:30	10:50	15.5	15.6	-0.1	0.0
1	7	10/28/16	11:03	11:23	15.7	15.5	0.2	0.0
1	8	10/28/16	11:36	11:56	15.6	15.5	0.1	0.0
1	9	10/28/16	12:09	12:29	15.5	15.5	0.0	0.0
1	10	10/28/16	12:41	13:01	15.4	15.4	0.0	0.0

n	**9**	
t(0.975)	**2.306**	
Mean Reference Method Value	**15.422**	**RM avg**
Mean CEM Value	**15.544**	**CEM avg**
Sum of Differences	**-1.100**	**di**
Mean Difference	**-0.122**	**d**
Sum of Differences Squared	**0.710**	**di^2**
Standard Deviation	**0.268**	**sd**
Confidence Coefficient 2.5% Error (1-tail)	**0.206**	**cc**
Relative Accuracy	**2.13**	**RA**

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Location: Boiler 5 Stack
Date: 10/28/16
Test Method: 7E, 3A

NOx ppmvd @ 15% O2 RATA

CEM Monitor Information

NO_x Monitor/Model:	Teledyne T200H	**NO_x Serial # :**	430
O_2 Monitor/Model:	Teledyne T200H	**O_2 Serial # :**	430

1=accept 0=reject	Test Run	Test Date	Start Time	End Time	RM NOx ppmvd @ 15 %O2	CEM NOx ppmvd @ 15 %O2	(RM-CEM) Difference (di)	(RM-CEM) Difference^2 (di^2)
0	1	10/28/16	07:45	08:05	13.1	13.9	-0.8	0.6
1	2	10/28/16	08:18	08:38	13.0	13.7	-0.7	0.5
1	3	10/28/16	08:52	09:12	13.3	13.8	-0.5	0.3
1	4	10/28/16	09:25	09:45	13.6	14.0	-0.4	0.2
1	5	10/28/16	09:58	10:18	13.5	13.9	-0.4	0.2
1	6	10/28/16	10:30	10:50	13.3	13.6	-0.3	0.1
1	7	10/28/16	11:03	11:23	13.6	13.6	0.0	0.0
1	8	10/28/16	11:36	11:56	13.5	13.6	-0.1	0.0
1	9	10/28/16	12:09	12:29	13.3	13.4	-0.1	0.0
1	10	10/28/16	12:41	13:01	13.2	13.3	-0.1	0.0

n	**9**	
t(0.975)	**2.306**	
Mean Reference Method Value	**13.367**	**RM avg**
Mean CEM Value	**13.656**	**CEM avg**
Sum of Differences	**-2.600**	**di**
Mean Difference	**-0.289**	**d**
Sum of Differences Squared	**1.180**	**di^2**
Standard Deviation	**0.232**	**sd**
Confidence Coefficient 2.5% Error (1-tail)	**0.178**	**cc**
Relative Accuracy	**3.49**	**RA**

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Client: Morris Cogeneration LLC **Location:** Boiler 5 Stack
Facility: Morris Cogeneration LLC Facility **Date:** 10/28/16
Project #: M161004 **Test Method:** 3A

O_2 % (dry) RATA

CEM Monitor Information

O_2 Monitor/Model:	Teledyne T200H	**O_2 Serial # :**	430

1=accept 0=reject	Test Run	Test Date	Start Time	End Time	RM O_2 % (dry)	CEM O_2 % (dry)	(RM-CEM) Difference (di)	(RM-CEM) Difference^2 (di^2)
1	1	10/28/16	07:45	08:05	14.2	14.3	-0.1	0.01
1	2	10/28/16	08:18	08:38	14.1	14.2	-0.1	0.01
1	3	10/28/16	08:52	09:12	14.2	14.3	-0.1	0.01
1	4	10/28/16	09:25	09:45	14.2	14.3	-0.1	0.01
1	5	10/28/16	09:58	10:18	14.1	14.3	-0.2	0.04
0	6	10/28/16	10:30	10:50	14.0	14.2	-0.2	0.04
1	7	10/28/16	11:03	11:23	14.1	14.2	-0.1	0.01
1	8	10/28/16	11:36	11:56	14.1	14.2	-0.1	0.01
1	9	10/28/16	12:09	12:29	14.0	14.1	-0.1	0.01
1	10	10/28/16	12:41	13:01	14.0	14.0	0.0	0.00

n	**9**	
t(0.025)	**2.306**	
Mean Reference Method Value	**14.111**	**RM avg**
Mean CEM Value	**14.211**	**CEM avg**
Sum of Differences	**-0.900**	**di**
Mean Difference	**-0.100**	**d**
Sum of Differences Squared	**0.110**	**di^2**
Standard Deviation	**0.050**	**sd**
Confidence Coefficient 2.5% Error (1-tail)	**0.038**	**cc**
Relative Accuracy	**0.98**	**RA**

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4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Morris Cogeneration LLC. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

CERTIFICATION

As the program manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results. The test program was performed in accordance with the test methods, test protocol, and the Mostardi Platt Quality Manual, as applicable.

MOSTARDI PLATT

Stuart T. Sands — Program Manager

Stuart T. Sands

Jeffrey M. Crivlare — Quality Assurance

Jeffrey M. Crivlare

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APPENDICES

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Appendix A – Company AETB Certification

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March 23, 2012

Effective immediately, Mostardi Platt self-certifies that all Part 75 test projects conform to the ASTM D 7036-04 Standard Practice. The following contact information is provided as required by the Standard:

Mostardi Platt
888 Industrial Drive
Elmhurst, Illinois 60126

630-993-2100

tplatt@mp-mail.com

Also, attached is a list of each Qualified Individual (QI) with the type of exam (e.g., Group I, II, III IV and/or V), the date the exam was taken and the name and email address of the exam provider.

Should you have any questions or need additional information, please contact Thomas Platt, P.E. at 630-993-2683.

Approved:

By: _____
Robert J. Platt
Chief Executive Officer

QSTI AETB Import Data

Last Name (REQUIRED)	First Name (REQUIRED)	M.I. (OPT)	Alt Contact Name (REQUIRED)	Alt Contact Phone Number (REQUIRED)	Alt Contact Email (REQUIRED)	Training Date (mm/dd/yyyy) (REQUIRED)	Training Provider Name (REQUIRED)	Exam Proctor Email (REQUIRED)	Document
Aksamitowski	Joseph		Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/1/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Banach	Scott	W	Mostard Platt	630-993-2100	tplatt@mp-mail.com	2/1/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Boor	Luke	A	Mostard Platt	630-993-2100	tplatt@mp-mail.com	7/2/2014	Source Evaluation Society	qstiprogram@gmail.com	Group IA
Burton	Stuart	L	Mostard Platt	630-993-2100	tplatt@mp-mail.com	2/1/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Cadagin	Kyle	J	Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/1/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Collins	Bill	R	Mostard Platt	630-993-2100	tplatt@mp-mail.com	3/4/2016	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Crivlare	Jeffrey	M	Mostard Platt	630-993-2100	tplatt@mp-mail.com	1/4/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Cronin	Sean	p	Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/1/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Dickinson	Abe	M	Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/1/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Dyra	Sean	P	Mostard Platt	630-993-2100	tplatt@mp-mail.com	4/3/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Ehlers	Eric	L	Mostard Platt	630-993-2100	tplatt@mp-mail.com	2/1/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Eldridge	Christopher	S	Mostard Platt	630-993-2100	tplatt@mp-mail.com	3/4/2016	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Garcia	Benjamin	V	Mostard Platt	630-993-2100	tplatt@mp-mail.com	3/4/2016	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Granskog	Reuben	J	Mostard Platt	630-993-2100	tplatt@mp-mail.com	9/8/2011	Source Evaluation Society	qstiprogram@gmail.com	Group I (RM 1,2,3,4)
Granskog	Reuben	J	Mostard Platt	630-993-2100	tplatt@mp-mail.com	11/22/2011	Source Evaluation Society	qstiprogram@gmail.com	Group III (RM 3A,6C,7E)
Halla	Jeffrey	L	Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/3/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Hasan	Ahmad	M	Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/1/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Hendricks	Ben		Mostard Platt	630-993-2100	tplatt@mp-mail.com	7/2/2014	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Howe	Jacob	W	Mostard Platt	630-993-2100	tplatt@mp-mail.com	3/4/2016	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Jensen	Christopher	E	Mostard Platt	630-993-2100	tplatt@mp-mail.com	1/4/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Karum	Marc		Mostard Platt	630-993-2100	tplatt@mp-mail.com	4/3/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Kirkman	Larry	G	Mostard Platt	630-993-2100	tplatt@mp-mail.com	5/31/2012	Source Evaluation Society	qstiprogram@gmail.com	Group I (RM 1,2,3,4)
Kirkman	Larry	G	Mostard Platt	630-993-2100	tplatt@mp-mail.com	5/31/2012	Source Evaluation Society	qstiprogram@gmail.com	Group II
Kirkman	Larry	G	Mostard Platt	630-993-2100	tplatt@mp-mail.com	5/31/2012	Source Evaluation Society	qstiprogram@gmail.com	Group III (RM 3A,6C,7E)
Kirkman	Larry	G	Mostard Platt	630-993-2100	tplatt@mp-mail.com	5/31/2012	Source Evaluation Society	qstiprogram@gmail.com	Group IV
Lipinski	Michal		Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/1/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Lyons	Patrick	J	Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/1/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
McGough	Scott		Mostard Platt	630-993-2100	tplatt@mp-mail.com	2/15/2013	Source Evaluation Society	qstiprogram@gmail.com	Group I (RM 1,2,3,4)
Mei	Timothy	A	Mostard Platt	630-993-2100	tplatt@mp-mail.com	3/4/2016	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Peterson	Mark	E	Mostard Platt	630-993-2100	tplatt@mp-mail.com	1/4/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Platt	Martin	E	Mostard Platt	630-993-2100	tplatt@mp-mail.com	7/2/2014	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Robertson	James	F	Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/3/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Rodriguez	Edward	M	Mostard Platt	630-993-2100	tplatt@mp-mail.com	2/13/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Russ	Timothy	E	Mostard Platt	630-993-2100	tplatt@mp-mail.com	4/3/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Sands	Stuart	T	Mostard Platt	630-993-2100	tplatt@mp-mail.com	2/1/2013	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Schuler	Brandon	R	Mostard Platt	630-993-2100	tplatt@mp-mail.com	9/17/2014	Source Evaluation Society	qstiprogram@gmail.com	Group I (RM 1,2,3,4)
Sollars	Richard	J	Mostard Platt	630-993-2100	tplatt@mp-mail.com	9/8/2011	Source Evaluation Society	qstiprogram@gmail.com	Group I (RM 1,2,3,4)
Sollars	Richard	J	Mostard Platt	630-993-2100	tplatt@mp-mail.com	9/8/2011	Source Evaluation Society	qstiprogram@gmail.com	Group III (RM 3A,6C,7E)
Sorce	A. Lawrence		Mostard Platt	630-993-2100	tplatt@mp-mail.com	3/4/2016	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)
Trezak	Christopher	S	Mostard Platt	630-993-2100	tplatt@mp-mail.com	10/1/2015	Source Evaluation Society	qstiprogram@gmail.com	Group V (Part 75)

3/24/2016

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Appendix B – QI Certification(s) for Field Personnel

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Qualified Individual

Stuart Sands

Has satisfactorily completed the requirements of

ASTM D 7036 – 04, Section 8.3

Standard Practice for Competence of Air Emission Testing Bodies

Examinations provided by Source Evaluation Society: www.sesnews.org, (919) 544-6338

All Part 75 test methods, under my supervision, shall conform to the company's Quality Manual and to this practice, in all respects.

Passed Group V Exam on 2/1/13

Expiration Date: 2/1/18

Signature: _____ **Date:** 3-15-13

Quality Manager: Thomas B. Platt **Technical Director:** Scott W. Barnes

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Appendix C - Test Section Diagram

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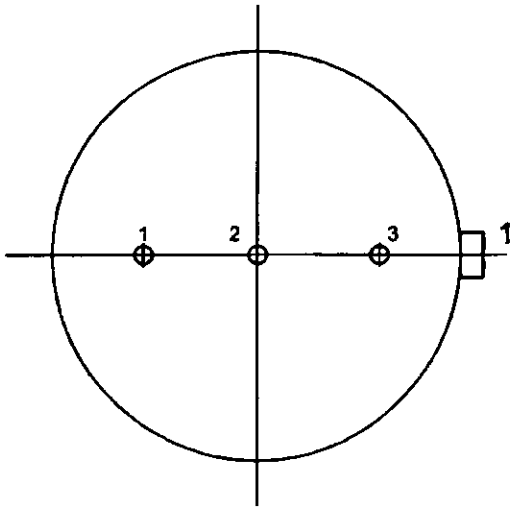
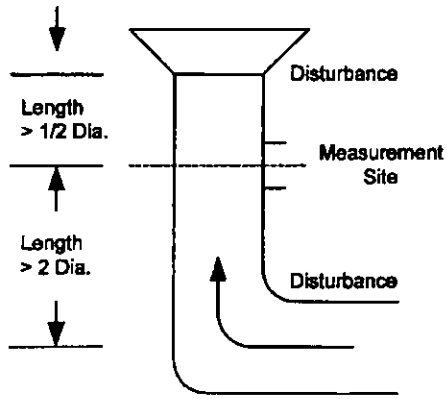
GASEOUS TRAVERSE FOR ROUND DUCTS





Job:	Morris Cogeneration LLC Morris, Illinois
Date:	October 28, 2016
Test Location:	Boiler 5 Stack
Stack Diameter (Feet):	10.75
Stack Area (Square Feet):	90.76
No. Sample Points:	3
No of Ports:	1
Port Length (Inches):	10

Distance from inside wall at port to traverse point:

1. 8.95 Feet (83.3 % of diameter)
2. 5.38 Feet (50.0 % of diameter)
3. 1.80 Feet (16.7 % of diameter)

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Appendix D - Sample Train Diagram

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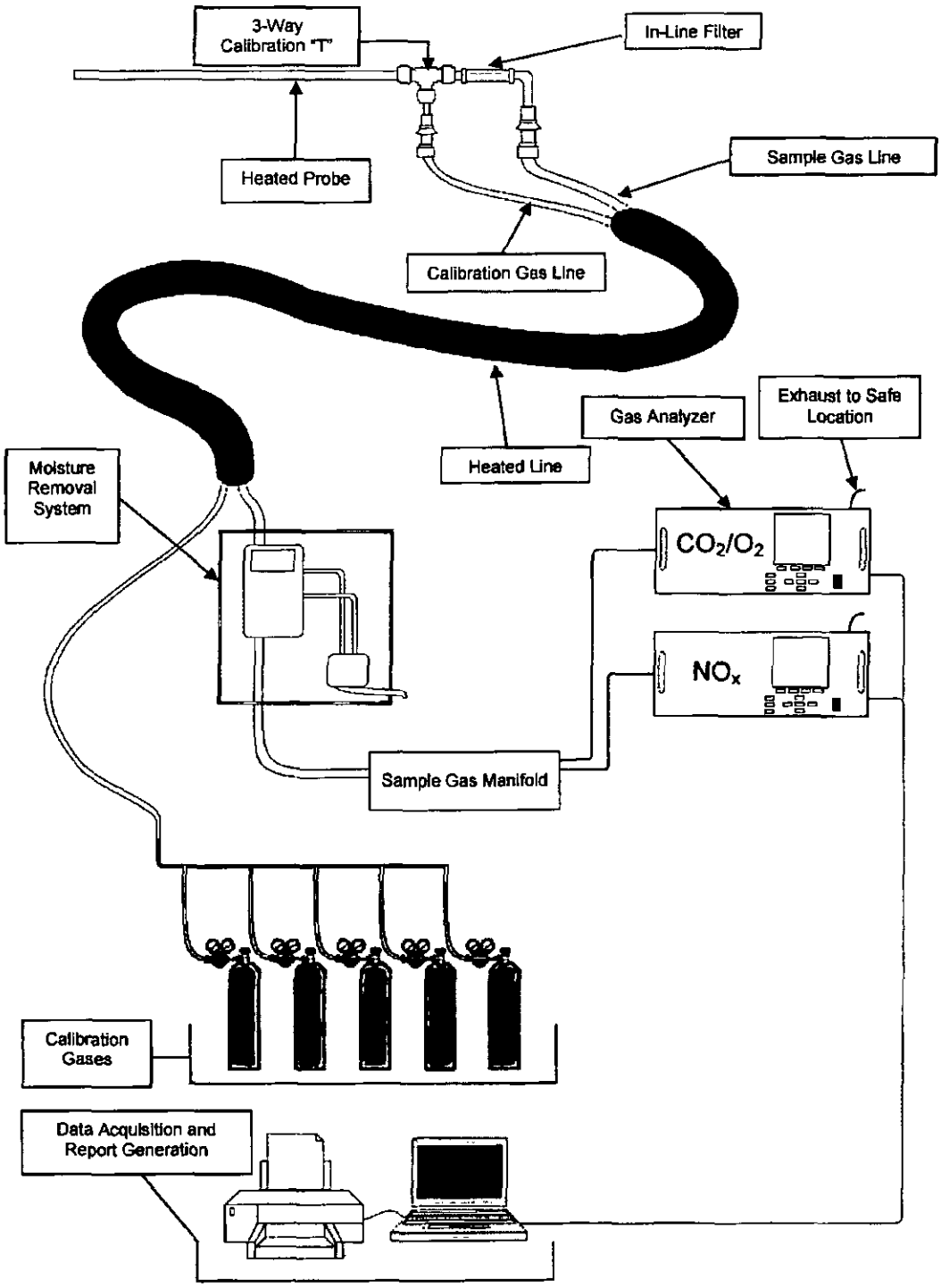
USEPA Methods 3A and 7E Extractive Gaseous Sampling Diagram



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Appendix E - Calculation Nomenclature and Formulas

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Test Location: Boiler 5 Stack
Date: 10/28/16

Sample Calculations

NOx ppmvd

$$(15.0 \text{ ppm} - 0.1 \text{ ppm}) \times \frac{18.0 \text{ ppm}}{18.0 \text{ ppm} - 0.1 \text{ ppm}} = 14.9 \text{ ppm}$$

O2 % (dry)

$$(14.20\ \% - -0.13\ \%) \times \frac{11.94\ \%}{11.94\ \% - -0.13\ \%} = 14.20\ \%$$

O2 based NOx lb/mmBtu

14.9 ppm x (1.194 x 10^-7) = 0.00000178 lbs/dscf

$$0.00000178 \text{ lbs/dscf} \times 8{,}710 \text{ dscf/mmBtu} \times \frac{20.9\%}{(20.9\% - 14.20\ \%)}$$

= 0.048 NOx lbs/mmBtu

NOx ppmvd @ 15% O2

14.9 x ((20.9 - 15)/(20.9 - 14.2)) = 13.1 NOx ppmvd @ 15% O2

$$C_{gas} = (C - C_o) \times \frac{C_{ma}}{C_m - C_o}$$

where:
C_{gas} = Effluent gas concentration, dry basis, ppm or %
C = Average gas concentration indicated by gas analyzer, dry basis, ppm or %
C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm or %
C_m = Average of initital and final system calibration bias check responses for the upscale calibration gas, ppm or %
C_{ma} = Actual concentration of the upscale calibration gas, ppm or %

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Derivation of Factors Used in Nitrogen Oxides Calculations

Factors for calculating concentration as pounds per dry standard cubic feet:

$$\text{Factor for } C_{NO_2} \text{ as } NO_2 = \frac{28316.846\,\text{ml/scf}}{4.53592\times10^{8}\ \mu\text{g/lb}} = 6.242801\times10^{-5}\ \frac{\text{lb/scf}}{\mu\text{g/ml}}\ \underline{\text{Use } 6.2428\times10^{-5}}$$

Factors for calculating from parts per million to lb/dscf:

Using 22.414 liters of gas per gram-mole at 0°C and 1 atmosphere pressure,

One pound-mole of gas is contained in 359.04765 ft^3 at 32°F and 29.92 in. Hg, or 385.31943 ft^3 at 68°F and 29.92 in. Hg

$$\text{ppm x } \frac{\text{Mw lb/lb–mole}}{385.31943\ \text{dscf/lb–mole}\times10^{6}} = \text{lb/dscf}$$

Where Mw = pollutant molecular weight; NO_2 = 46.0055 lb/lb-mole

$$\text{Factor for ppm } NO_x = \frac{1}{46.0055\times2.5952494\times10^{-9}} = 8.3755\times10^{6}\ \text{dscf/lb}$$

$$\underline{\text{Use } 8.3755\times10^{6}}$$

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ppm Conversion Calculations and Factors

ppm to lbs/scf

(ppm X) x (conversion factor X) = X lbs/scf

lbs/scf to lbs/hr

Dry ppm's with dry flow, and wet ppm's with wet flow.

(X lbs/scf) x (airflow scf/min) x (60 min/hr) = X lbs/hr

lbs/scf to lbs/mmBtu

Dry ppm's with dry diluent, and wet ppm's with wet diluent.

CO_2 – (X lbs/scf) x (F_c) x ($100/CO_2$) = X lbs/mmBtu

O_2 – (X lbs/scf) x (F_d) x ($20.9/(20.9-O_2)$) = X lbs/mmBtu

Conversion Factors

NO_x – 1.19396×10^{-7}

SO_2 – 1.6625×10^{-7}

CO – 7.2664×10^{-8}

CH_4 – 4.1637×10^{-8}

C_3H_8 – 1.1419×10^{-7}

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Emission Rate Calculations

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

A. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
c_s = pollutant concentration, grains/dscf

B. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd}C}{fuel\ flow\ rate\ (lb/hr)\ GCV} \times 10^6$$

Where E = lbs per million Btu
GCV = gross calorific value, Btu/lb
Q_{sd} = dry volumetric gas flow at standard conditions, dscf/hr

C. If an integrated gas sample is taken during the test and analyzed for $\%CO_2$ or $\%O_2$, dry basis by volume, with an approved USEPA Method 3 or 3A gas analyzer, then

$$E = CF_C \frac{100}{\%CO_2}\ or\ E = CF_d \frac{20.9}{(20.9 - \%O_2)}$$

Where $\%CO_2$ and $\%O_2$ are expressed as percent values:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the specified fuel type combusted in Figure 1.

Fd = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the specified fuel type combusted in Figure 1.

Fuel Type	F_d	F_c	Fuel Type	F_d	F_c
Coal, Anthracite	10100	1970	Fuel Oil	9190	1420
Coal, Bituminous	9780	1800	Municipal	9570	1820
Coal, Lignite	9860	1910	Natural Gas	8710	1040
Coal, Sub-Bituminous	9820	1840	Wood	9240	1830

Figure 1. Fuel Type

D. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_C = \frac{321 \times 10^3(\%C)}{GCV}\ where\ \%C = Carbon\ content\ by\ weight\ expressed\ as\ percent$$

$$F_d = \frac{[3.64(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O_2)]}{GCV} \times 10^6$$

H = Hydrogen, percent; C = Carbon, percent; S = Sulfur, percent; N = Nitrogen, percent; O = Oxygen, percent

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Relative Accuracy Test Audit (RATA) Calculations

Mean Difference

$$\bar{d} = \frac{1}{n}\sum_{i=1}^{n} di$$

Standard Deviation

$$Sd = \left[\frac{\sum_{i=1}^{n} d_i^2 - \frac{[\sum_{i=1}^{n} d_i]^2}{n}}{n-1}\right]^{1/2}$$

Confidence Coefficient

$$CC = t_{0.975}\frac{Sd}{\sqrt{n}}$$

Relative Accuracy

$$RA = \frac{|\bar{d}| + |CC|}{RM\ avg} \times 100$$

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ppmv to lb/hr Conversion Calculations

1. $$ppm\ SO_2 \times 1.660 \times 10^{-7} = \frac{lbs/SO_2}{scf}$$

$$\frac{lbs\ SO_2}{scf} \times \frac{scf}{min} \times \frac{60\ min}{hr} = \frac{lbs\ SO_2}{hr}$$

2. $$ppm\ NO_x \times 1.194 \times 10^{-7} = \frac{lbs/NO_{x2}}{scf}$$

$$\frac{lbs\ NO_x}{scf} \times \frac{scf}{min} \times \frac{60\ min}{hr} = \frac{lbs\ NO_x}{hr}$$

3. $$ppm\ CO \times 7.266 \times 10^{-8} = \frac{lbs/CO}{scf}$$

$$\frac{lbs\ CO}{scf} \times \frac{scf}{min} \times \frac{60\ min}{hr} = \frac{lbs\ CO}{hr}$$

4. $$ppm\ C_3H_8 \times 1.142 \times 10^{-7} = \frac{lbsC_3H_8}{scf}$$

$$\frac{lbs\ C_3H_8}{scf} \times \frac{scf}{min} \times \frac{60\ min}{hr} = \frac{lbs\ C_3H_8}{hr}$$

5. $$ppm\ CH_4 \times 4.164 \times 10^{-8} = \frac{lbs/CH_4}{scf}$$

$$\frac{lbs\ CH_4}{scf} \times \frac{scf}{min} \times \frac{60\ min}{hr} = \frac{lbs\ CH_4}{hr}$$

6. $$ppm\ NMHC\ as\ C_3H_8 \times 9.3427 \times 10^{-8} = \frac{lbs\ C}{scf}$$

$$\frac{lbs\ C}{scf} \times \frac{lbsscf}{min} \times \frac{60\ min}{hr} = \frac{lbs\ C}{hr}$$

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Appendix F - Reference Method Test Data (Hand and Computerized Sheets)

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PART 75 AND 60 GASEOUS FIELD DATA SHEET

Project Number:	M161004	Date:	10-28-16
Client:	Morris Cogeneration	Operator:	S. Sands
Test Location:	Boiler #5	Fuel Factor:	8710

	Time		Reference Method Data			Volumetric Flow Data		
Test	Start	End	NO_X ppm	SO_2 ppm	CO_2 %	Time	scfh, RM Data	scfh, CEM Data
1	745	805						
2	818	838						
3	852	912						
4	925	945						
5	958	1018						
6	1030	1050						
7	1103	1123						
8	1136	1156						
9	1209	1229						
10	1241	1301						
11								
12								

	Calibration Corrected RM Data				CEM Data			
Test	NO_X ppm	SO_2 ppm	CO_2 %	NO_X lbs/MMBtu	NO_X ppm	SO_2 ppm	CO_2 %	NO_X lbs/MMBtu
1	14.9		14.2	0.048	15.50	13.87	14.29	0.051
2	15.0		14.1	0.048	15.57	13.72	14.22	0.051
3	15.1		14.2	0.049	15.60	13.80	14.25	0.051
4	15.4		14.2	0.050	15.63	13.99	14.31	0.051
5	15.6		14.1	0.050	15.60	13.86	14.27	0.051
6	15.5		14.0	0.049	15.55	13.60	14.17	0.050
7	15.7		14.1	0.050	15.55	13.61	14.17	0.050
8	15.6		14.1	0.050	15.48	13.59	14.19	0.050
9	15.5		14.0	0.049	15.45	13.39	14.08	0.049
10	15.4		14.0	0.049	15.41	13.30	14.05	0.049
11								
12								

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Test Location: Boiler 5 Stack
Date: 10/28/16

Run 1

Time	NOx ppmvd	O2 % (dry)
7:45:00	15.05	14.25
7:46:00	15.55	14.19
7:47:00	15.49	14.22
7:48:00	15.59	14.2
7:49:00	15.43	14.23
7:50:00	15.21	14.22
7:51:00	15.12	14.22
7:52:00	15	14.16
7:53:00	14.97	14.22
7:54:00	14.9	14.21
7:55:00	15	14.17
7:56:00	14.91	14.21
7:57:00	14.87	14.23
7:58:00	14.87	14.22
7:59:00	14.82	14.16
8:00:00	14.77	14.16
8:01:00	14.76	14.2
8:02:00	14.73	14.22
8:03:00	14.66	14.2
8:04:00	14.65	14.19
8:05:00	14.73	14.19
Average	**15.00**	**14.20**

Run 2

Time	NOx ppmvd	O2 % (dry)
8:18:00	15.33	14.14
8:19:00	15.42	14.14
8:20:00	15.44	14.16
8:21:00	15.46	14.1
8:22:00	15.52	14.13
8:23:00	15.41	14.14
8:24:00	15.33	14.2
8:25:00	15.25	14.16
8:26:00	15.17	14.12
8:27:00	15	14.12
8:28:00	14.98	14.18
8:29:00	14.98	14.15
8:30:00	14.91	14.13
8:31:00	14.91	14.14
8:32:00	14.91	14.11
8:33:00	14.99	14.15
8:34:00	15.07	14.16
8:35:00	15.07	14.18
8:36:00	15.24	14.22
8:37:00	15.16	14.21
8:38:00	15.15	14.18
Average	**15.20**	**14.15**

Run 3

Time	NOx ppmvd	O2 % (dry)
8:52:00	15.55	14.16
8:53:00	15.62	14.19
8:54:00	15.71	14.14
8:55:00	15.72	14.17
8:56:00	15.77	14.14
8:57:00	15.65	14.11
8:58:00	15.47	14.15
8:59:00	15.65	14.15
9:00:00	15.61	14.14
9:01:00	15.27	14.23
9:02:00	15.18	14.17
9:03:00	15.12	14.25
9:04:00	14.89	14.24
9:05:00	14.97	14.17
9:06:00	14.97	14.14
9:07:00	14.94	14.21
9:08:00	15.06	14.18
9:09:00	14.96	14.19
9:10:00	15.03	14.14
9:11:00	15.1	14.12
9:12:00	15.28	14.15
Average	**15.30**	**14.17**

Run 4

Time	NOx ppmvd	O2 % (dry)
9:25:00	15.62	14.07
9:26:00	15.97	14.12
9:27:00	15.98	14.13
9:28:00	15.94	14.24
9:29:00	15.83	14.36
9:30:00	15.84	14.27
9:31:00	15.69	14.24
9:32:00	15.64	14.26
9:33:00	15.5	14.21
9:34:00	15.29	14.23
9:35:00	15.3	14.26
9:36:00	15.3	14.21
9:37:00	15.22	14.17
9:38:00	15.08	14.17
9:39:00	15.16	14.17
9:40:00	15.12	14.28
9:41:00	15.29	14.24
9:42:00	15.23	14.27
9:43:00	15.27	14.18
9:44:00	15.34	14.15
9:45:00	15.28	14.12
Average	**15.50**	**14.21**

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Test Location: Boiler 5 Stack
Date: 10/28/16

Run 5

Time	NOx ppmvd	O2 % (dry)
9:58:00	15.89	14.1
9:59:00	15.69	14.11
10:00:00	16.09	14.18
10:01:00	16.18	14.16
10:02:00	16.15	14.21
10:03:00	15.98	14.16
10:04:00	15.96	14.18
10:05:00	15.91	14.24
10:06:00	15.89	14.17
10:07:00	15.68	14.19
10:08:00	15.51	14.28
10:09:00	15.58	14.18
10:10:00	15.63	14.23
10:11:00	15.51	14.12
10:12:00	15.29	14.02
10:13:00	15.2	14.04
10:14:00	15.31	14.02
10:15:00	15.26	14.01
10:16:00	15.46	13.98
10:17:00	15.47	13.98
10:18:00	15.41	14.04
Average	**15.70**	**14.12**

Run 6

Time	NOx ppmvd	O2 % (dry)
10:30:00	16.27	14.09
10:31:00	16.27	14.07
10:32:00	16.27	14.05
10:33:00	16.15	13.99
10:34:00	15.98	14.08
10:35:00	15.75	14.15
10:36:00	15.8	14.06
10:37:00	15.61	14
10:38:00	15.53	13.95
10:39:00	15.44	13.96
10:40:00	15.5	13.95
10:41:00	15.28	13.95
10:42:00	15.12	13.98
10:43:00	15.21	13.97
10:44:00	15.41	14.01
10:45:00	15.51	14
10:46:00	15.56	14.01
10:47:00	15.46	14.01
10:48:00	15.45	14.03
10:49:00	15.45	14.02
10:50:00	15.49	13.93
Average	**15.60**	**14.01**

Run 7

Time	NOx ppmvd	O2 % (dry)
11:03:00	16.01	14.04
11:04:00	16.26	14.07
11:05:00	16.44	14
11:06:00	16.29	14.09
11:07:00	16.25	14.02
11:08:00	16.16	13.95
11:09:00	15.81	13.99
11:10:00	15.8	13.99
11:11:00	15.62	13.96
11:12:00	15.6	13.94
11:13:00	15.48	13.95
11:14:00	15.46	13.94
11:15:00	15.25	14.08
11:16:00	15.25	14.18
11:17:00	15.37	14.11
11:18:00	15.34	13.94
11:19:00	15.19	13.94
11:20:00	15.26	13.91
11:21:00	15.38	13.94
11:22:00	15.33	13.98
11:23:00	15.52	13.98
Average	**15.70**	**14.00**

Run 8

Time	NOx ppmvd	O2 % (dry)
11:36:00	15.74	14.02
11:37:00	15.74	14.01
11:38:00	15.87	14.02
11:39:00	15.87	14.07
11:40:00	15.93	14.16
11:41:00	16.01	13.99
11:42:00	15.84	13.98
11:43:00	15.58	14.12
11:44:00	15.5	14.12
11:45:00	15.68	13.99
11:46:00	15.49	14.07
11:47:00	15.53	14.01
11:48:00	15.31	13.95
11:49:00	15.29	13.98
11:50:00	15.32	13.97
11:51:00	15.25	13.96
11:52:00	15.29	13.93
11:53:00	15.12	13.96
11:54:00	15.09	13.9
11:55:00	15.16	13.93
11:56:00	15.38	13.92
Average	**15.50**	**14.00**

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Test Location: Boiler 5 Stack
Date: 10/28/16

Run 9			Run 10		
Time	NOx ppmvd	O2 % (dry)	Time	NOx ppmvd	O2 % (dry)
12:09:00	15.64	13.88	12:41:00	15.49	13.89
12:10:00	15.63	13.89	12:42:00	15.69	13.81
12:11:00	15.71	13.83	12:43:00	15.77	13.8
12:12:00	15.74	13.86	12:44:00	15.75	13.85
12:13:00	15.71	13.86	12:45:00	15.7	13.94
12:14:00	15.74	13.85	12:46:00	15.85	13.85
12:15:00	15.65	13.92	12:47:00	15.65	13.78
12:16:00	15.67	14	12:48:00	15.64	13.85
12:17:00	15.49	13.9	12:49:00	15.34	13.94
12:18:00	15.35	13.93	12:50:00	15.55	13.95
12:19:00	15.4	13.95	12:51:00	14.94	13.82
12:20:00	15.3	13.96	12:52:00	14.71	13.77
12:21:00	15.14	13.94	12:53:00	14.73	13.86
12:22:00	15.14	13.86	12:54:00	15.04	13.76
12:23:00	15.08	13.81	12:55:00	15.08	13.75
12:24:00	15.18	13.8	12:56:00	15.21	13.71
12:25:00	15.2	13.8	12:57:00	15.18	13.72
12:26:00	15.03	13.84	12:58:00	15.27	13.79
12:27:00	15.09	13.81	12:59:00	15.25	13.74
12:28:00	15.12	13.8	13:00:00	15.27	13.77
12:29:00	15.22	13.81	13:01:00	15.03	13.87
Average	**15.40**	**13.87**	**Average**	**15.30**	**13.82**

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Appendix G - Continuous Emissions Monitoring System Data and Plant Operating Data

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMD) Raw Value	B-5: NOX_RATE_P60 (LB/MMBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STEAM_FLOW (PPM) Raw Value
10/28/2016 7:45	13.9	15.5	0.051	14.3	18
10/28/2016 7:46	13.9	15.5	0.051	14.3	18
10/28/2016 7:47	13.9	15.5	0.051	14.3	18
10/28/2016 7:48	13.9	15.6	0.051	14.3	18
10/28/2016 7:49	13.9	15.5	0.051	14.3	18
10/28/2016 7:50	13.9	15.5	0.051	14.3	18
10/28/2016 7:51	13.9	15.5	0.051	14.3	18
10/28/2016 7:52	13.9	15.5	0.051	14.3	18
10/28/2016 7:53	13.9	15.5	0.051	14.3	18
10/28/2016 7:54	13.9	15.5	0.051	14.3	18
10/28/2016 7:55	13.6	15.5	0.05	14.2	18
10/28/2016 7:56	13.9	15.5	0.051	14.3	18
10/28/2016 7:57	13.9	15.5	0.051	14.3	18
10/28/2016 7:58	13.9	15.5	0.051	14.3	18
10/28/2016 7:59	13.9	15.5	0.051	14.3	18
10/28/2016 8:00	13.6	15.5	0.05	14.2	18
10/28/2016 8:01	13.9	15.5	0.051	14.3	18
10/28/2016 8:02	13.9	15.5	0.051	14.3	19
10/28/2016 8:03	13.9	15.5	0.051	14.3	18
10/28/2016 8:04	13.9	15.5	0.051	14.3	18
10/28/2016 8:05	13.9	15.5	0.051	14.3	18
	13.871	15.505	0.051	14.290	18.048

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMD) Raw Value	B-5: NOX_RATE_P60 (LBN/MBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STEAM_FLOW (PPM) Raw Value
10/28/2016 8:18	13.6	15.5	0.05	14.2	18
10/28/2016 8:19	13.6	15.5	0.05	14.2	18
10/28/2016 8:20	13.7	15.6	0.051	14.2	18
10/28/2016 8:21	13.7	15.6	0.051	14.2	18
10/28/2016 8:22	13.7	15.6	0.051	14.2	18
10/28/2016 8:23	13.7	15.6	0.051	14.2	18
10/28/2016 8:24	13.9	15.6	0.051	14.3	19
10/28/2016 8:25	13.7	15.6	0.051	14.2	18
10/28/2016 8:26	13.7	15.6	0.051	14.2	18
10/28/2016 8:27	13.7	15.6	0.051	14.2	18
10/28/2016 8:28	13.7	15.6	0.051	14.2	18
10/28/2016 8:29	13.7	15.6	0.051	14.2	18
10/28/2016 8:30	13.7	15.6	0.051	14.2	18
10/28/2016 8:31	13.7	15.6	0.051	14.2	18
10/28/2016 8:32	13.7	15.6	0.051	14.2	18
10/28/2016 8:33	13.6	15.5	0.05	14.2	18
10/28/2016 8:34	13.6	15.5	0.05	14.2	18
10/28/2016 8:35	13.9	15.5	0.051	14.3	18
10/28/2016 8:36	13.9	15.5	0.051	14.3	18
10/28/2016 8:37	13.9	15.6	0.051	14.3	18
10/28/2016 8:38	13.9	15.6	0.051	14.3	18
	13.729	15.571	0.051	14.224	18.095

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13 805	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMD) Raw Value	B-5: NOX_RATE_P60 (LBS/MBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STEAM_FLOW (PPM) Raw Value
10/28/2016 8:52	13.7	15.6	0.051	14.2	18
10/28/2016 8:53	13.9	15.6	0.051	14.3	18
10/28/2016 8:54	13.9	15.6	0.051	14.3	18
10/28/2016 8:55	13.7	15.6	0.051	14.2	18
10/28/2016 8:56	13.7	15.6	0.051	14.2	19
10/28/2016 8:57	13.7	15.6	0.051	14.2	19
10/28/2016 8:58	13.6	15.5	0.05	14.2	18
10/28/2016 8:59	13.6	15.5	0.05	14.2	18
10/28/2016 9:00	13.6	15.5	0.05	14.2	18
10/28/2016 9:01	13.9	15.6	0.051	14.3	18
10/28/2016 9:02	13.9	15.6	0.051	14.3	18
10/28/2016 9:03	14	15.7	0.052	14.3	18
10/28/2016 9:04	14.3	15.7	0.052	14.4	18
10/28/2016 9:05	14	15.7	0.052	14.3	18
10/28/2016 9:06	13.8	15.7	0.051	14.2	18
10/28/2016 9:07	13.9	15.6	0.051	14.3	18
10/28/2016 9:08	13.9	15.6	0.051	14.3	18
10/28/2016 9:09	13.9	15.6	0.051	14.3	18
10/28/2016 9:10	13.6	15.5	0.05	14.2	18
10/28/2016 9:11	13.6	15.5	0.05	14.2	18
10/28/2016 9:12	13.7	15.6	0.051	14.2	18
	13.805	15.595	0.051	14.252	18.095

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMD) Raw Value	B-5: NOX_RATE_P60 (LBM/MBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STEAM_FLOW (PPM) Raw Value
10/28/2016 9:25	13.7	15.6	0.051	14.2	18
10/28/2016 9:26	13.7	15.6	0.051	14.2	18
10/28/2016 9:27	13.7	15.6	0.051	14.2	18
10/28/2016 9:28	13.9	15.6	0.051	14.3	18
10/28/2016 9:29	14.2	15.6	0.052	14.4	18
10/28/2016 9:30	14.3	15.7	0.052	14.4	18
10/28/2016 9:31	14.1	15.8	0.052	14.3	18
10/28/2016 9:32	14.3	15.7	0.052	14.4	18
10/28/2016 9:33	14	15.7	0.052	14.3	18
10/28/2016 9:34	14	15.7	0.052	14.3	18
10/28/2016 9:35	14.2	15.6	0.052	14.4	18
10/28/2016 9:36	13.9	15.6	0.051	14.3	18
10/28/2016 9:37	13.9	15.6	0.051	14.3	18
10/28/2016 9:38	13.9	15.6	0.051	14.3	18
10/28/2016 9:39	13.9	15.6	0.051	14.3	18
10/28/2016 9:40	14.2	15.6	0.052	14.4	18
10/28/2016 9:41	14.2	15.6	0.052	14.4	18
10/28/2016 9:42	14.2	15.6	0.052	14.4	18
10/28/2016 9:43	13.9	15.6	0.051	14.3	18
10/28/2016 9:44	13.9	15.6	0.051	14.3	18
10/28/2016 9:45	13.7	15.6	0.051	14.2	18
	13.99047619	15.62857143	0.05147619	14.31428571	18

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMD) Raw Value	B-5: NOX_RATE_P60 (LBMMBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STEAM_FLOW (PPM) Raw Value
10/28/2016 9:58	13.7	15.6	0.051	14.2	18
10/28/2016 9:59	13.7	15.6	0.051	14.2	18
10/28/2016 10:00	13.9	15.6	0.051	14.3	18
10/28/2016 10:01	13.9	15.6	0.051	14.3	18
10/28/2016 10:02	13.9	15.6	0.051	14.3	18
10/28/2016 10:03	14.3	15.7	0.052	14.4	18
10/28/2016 10:04	14	15.7	0.052	14.3	18
10/28/2016 10:05	14.2	15.6	0.052	14.4	18
10/28/2016 10:06	13.9	15.6	0.051	14.3	18
10/28/2016 10:07	13.9	15.6	0.051	14.3	18
10/28/2016 10:08	14.2	15.6	0.052	14.4	19
10/28/2016 10:09	13.9	15.6	0.051	14.3	18
10/28/2016 10:10	14.2	15.6	0.052	14.4	18
10/28/2016 10:11	13.9	15.6	0.051	14.3	18
10/28/2016 10:12	13.7	15.6	0.051	14.2	18
10/28/2016 10:13	13.7	15.6	0.051	14.2	18
10/28/2016 10:14	13.7	15.6	0.051	14.2	18
10/28/2016 10:15	13.7	15.6	0.051	14.2	18
10/28/2016 10:16	13.5	15.6	0.05	14.1	18
10/28/2016 10:17	13.5	15.6	0.05	14.1	18
10/28/2016 10:18	13.6	15.5	0.05	14.2	18
	13.85714286	15.6047619	0.051095238	14.26666667	18.04761905

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMD) Raw Value	B-5, NOX_RATE_P60 (LBMMBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STEAM_FLOW (PPH) Raw Value
10/28/2016 10:30	13.9	15.6	0.051	14.3	18
10/28/2016 10:31	13.7	15.6	0.051	14.2	18
10/28/2016 10:32	13.7	15.6	0.051	14.2	18
10/28/2016 10:33	13.7	15.6	0.051	14.2	18
10/28/2016 10:34	13.7	15.6	0.051	14.2	18
10/28/2016 10:35	13.9	15.6	0.051	14.3	18
10/28/2016 10:36	13.7	15.6	0.051	14.2	18
10/28/2016 10:37	13.7	15.6	0.051	14.2	18
10/28/2016 10:38	13.4	15.5	0.05	14.1	18
10/28/2016 10:39	13.4	15.5	0.05	14.1	18
10/28/2016 10:40	13.4	15.5	0.05	14.1	18
10/28/2016 10:41	13.4	15.5	0.05	14.1	18
10/28/2016 10:42	13.5	15.6	0.05	14.1	18
10/28/2016 10:43	13.4	15.5	0.05	14.1	18
10/28/2016 10:44	13.6	15.5	0.05	14.2	18
10/28/2016 10:45	13.4	15.5	0.05	14.1	18
10/28/2016 10:46	13.7	15.6	0.051	14.2	18
10/28/2016 10:47	13.6	15.5	0.05	14.2	18
10/28/2016 10:48	13.6	15.5	0.05	14.2	18
10/28/2016 10:49	13.6	15.5	0.05	14.2	18
10/28/2016 10:50	13.5	15.6	0.05	14.1	18
Average	**13.6**	**15.6**	**0.050**	**14.2**	**18**

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPM) Raw Value	B-5: NOX_RATE_P60 (LBMMBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STACK_FLOW (PPM) Raw Value
10/28/2016 11:03	13.6	15.5	0.05	14.2	18
10/28/2016 11:04	13.7	15.6	0.051	14.2	18
10/28/2016 11:05	13.6	15.5	0.05	14.2	18
10/28/2016 11:06	13.9	15.6	0.051	14.3	18
10/28/2016 11:07	13.7	15.6	0.051	14.2	18
10/28/2016 11:08	13.5	15.6	0.05	14.1	18
10/28/2016 11:09	13.5	15.6	0.05	14.1	18
10/28/2016 11:10	13.6	15.5	0.05	14.2	18
10/28/2016 11:11	13.5	15.6	0.05	14.1	18
10/28/2016 11:12	13.5	15.6	0.05	14.1	18
10/28/2016 11:13	13.4	15.5	0.05	14.1	18
10/28/2016 11:14	13.5	15.6	0.05	14.1	18
10/28/2016 11:15	13.7	15.6	0.051	14.2	18
10/28/2016 11:16	13.9	15.5	0.051	14.3	18
10/28/2016 11:17	14.2	15.6	0.052	14.4	18
10/28/2016 11:18	13.5	15.6	0.05	14.1	18
10/28/2016 11:19	13.5	15.6	0.05	14.1	18
10/28/2016 11:20	13.4	15.5	0.05	14.1	18
10/28/2016 11:21	13.4	15.4	0.049	14.1	18
10/28/2016 11:22	13.6	15.4	0.05	14.2	18
10/28/2016 11:23	13.6	15.5	0.05	14.2	18
Average	**13.6**	**15.5**	**0.050**	**14.2**	**18**

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMD) Raw Value	B-5: NOX_RATE_P60 (LB/MMBTU) Raw Value	B-5: OX_P60 (PCT) Raw Value	B-5: STEAM_FLOW (PPM) Raw Value
10/28/2016 11:36	13.6	15.5	0.05	14.2	18
10/28/2016 11:37	13.6	15.5	0.05	14.2	18
10/28/2016 11:38	13.6	15.5	0.05	14.2	18
10/28/2016 11:39	13.6	15.4	0.05	14.2	18
10/28/2016 11:40	13.8	15.4	0.051	14.3	18
10/28/2016 11:41	13.6	15.5	0.05	14.2	18
10/28/2016 11:42	13.6	15.5	0.05	14.2	18
10/28/2016 11:43	13.6	15.5	0.05	14.2	18
10/28/2016 11:44	13.9	15.5	0.051	14.3	18
10/28/2016 11:45	13.6	15.5	0.05	14.2	18
10/28/2016 11:46	13.6	15.5	0.05	14.2	18
10/28/2016 11:47	13.7	15.6	0.051	14.2	18
10/28/2016 11:48	13.4	15.5	0.05	14.1	18
10/28/2016 11:49	13.6	15.4	0.05	14.2	18
10/28/2016 11:50	13.6	15.5	0.05	14.2	18
10/28/2016 11:51	13.7	15.6	0.051	14.2	345
10/28/2016 11:52	13.4	15.5	0.05	14.1	508
10/28/2016 11:53	13.6	15.4	0.05	14.2	18
10/28/2016 11:54	13.4	15.4	0.049	14.1	18
10/28/2016 11:55	13.4	15.4	0.049	14.1	18
10/28/2016 11:56	13.4	15.4	0.049	14.1	18
Average	**13.6**	**15.5**	**0.050**	**14.2**	**56.9**

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMDV) Raw Value	B-5: NOX_RATE_P60 (LBMMBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STEAM_FLOW (PPM) Raw Value
10/28/2016 12:09	13.4	15.5	0.05	14.1	18
10/28/2016 12:10	13.4	15.4	0.049	14.1	18
10/28/2016 12:11	13.2	15.4	0.049	14	18
10/28/2016 12:12	13.4	15.5	0.05	14.1	18
10/28/2016 12:13	13.4	15.4	0.049	14.1	18
10/28/2016 12:14	13.4	15.4	0.049	14.1	18
10/28/2016 12:15	13.4	15.4	0.049	14.1	18
10/28/2016 12:16	13.6	15.5	0.05	14.2	18
10/28/2016 12:17	13.4	15.4	0.049	14.1	18
10/28/2016 12:18	13.4	15.4	0.049	14.1	18
10/28/2016 12:19	13.6	15.5	0.05	14.2	18
10/28/2016 12:20	13.6	15.4	0.05	14.2	18
10/28/2016 12:21	13.6	15.5	0.05	14.2	18
10/28/2016 12:22	13.4	15.5	0.05	14.1	18
10/28/2016 12:23	13.3	15.5	0.049	14	18
10/28/2016 12:24	13.3	15.5	0.049	14	18
10/28/2016 12:25	13.2	15.4	0.049	14	18
10/28/2016 12:26	13.2	15.4	0.049	14	18
10/28/2016 12:27	13.3	15.5	0.049	14	18
10/28/2016 12:28	13.3	15.5	0.049	14	18
10/28/2016 12:29	13.3	15.5	0.049	14	18
Average	**13.4**	**15.5**	**0.049**	**14.1**	**18**

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Date/Time	B-5: NOX_CORR (PPM) Raw Value	B-5: NOX_P60 (PPMD) Raw Value	B-5: NOX_RATE_P60 (LBMMBTU) Raw Value	B-5: O2_P60 (PCT) Raw Value	B-5: STREAM_FLOW (PPM) Raw Value
10/28/2016 12:41	13.4	15.4	0.049	14.1	18
10/28/2016 12:42	13.3	15.5	0.049	14	18
10/28/2016 12:43	13.3	15.5	0.049	14	18
10/28/2016 12:44	13.3	15.5	0.049	14	18
10/28/2016 12:45	13.6	15.4	0.05	14.2	18
10/28/2016 12:46	13.4	15.4	0.049	14.1	18
10/28/2016 12:47	13.3	15.5	0.049	14	18
10/28/2016 12:48	13.2	15.4	0.049	14	17
10/28/2016 12:49	13.4	15.4	0.049	14.1	18
10/28/2016 12:50	13.6	15.4	0.05	14.2	18
10/28/2016 12:51	13.4	15.4	0.049	14.1	18
10/28/2016 12:52	13.3	15.5	0.049	14	18
10/28/2016 12:53	13.4	15.4	0.049	14.1	18
10/28/2016 12:54	13.2	15.4	0.049	14	18
10/28/2016 12:55	13.2	15.4	0.049	14	18
10/28/2016 12:56	13.2	15.4	0.049	14	18
10/28/2016 12:57	13.2	15.4	0.049	14	18
10/28/2016 12:58	13.1	15.3	0.048	14	18
10/28/2016 12:59	13.1	15.3	0.048	14	18
10/28/2016 13:00	13.2	15.4	0.049	14	18
10/28/2016 13:01	13.3	15.3	0.049	14.1	18
Average	**13.3**	**15.4**	**0.049**	**14.0**	**18**

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Continuous Emissions Monitoring System (CEMS)

40 CFR 75 Certification Test Report

7-Day Calibration Drift
Response Time
Linearity

Test Dates: September 9 thru October 27
Report Date: October 31 2016
Revision: 0
CEMTEK Project No.: 50522

Prepared for:

Morris Cogeneration, LLC
Boiler Unit B-5
Morris, IL

ORISPL Facility ID: 55216

Prepared by:
CEMTEK Environmental, Inc.
3041 S. Orange Ave
Santa Ana, CA 92707-4247
Phone: 714-437-7100
Fax: 714-437-7177
www.cemteks.com

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Table 1: NO_x Analyzer Test Results Summary 3
Table 2: O_2 Analyzer Test Results Summary 3

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1 Introduction

This document is intended to satisfy the CEMS certification requirements of the USEPA as required by the Code of Federal Regulations, Title 40, Part 75 (40 CFR 75), Appendix A and 40 CFR 60 Appendix B Performance Specifications. This document summarizes the test program and test results.

Data from the various tests performed under this program provides resources for evaluating the acceptability of the operation of the facility's continuous emissions monitoring system (CEMS).

The performance tests completed in this certification test program include:

- Linearity Check
- Cycle/Response Time Check
- Calibration Drift Check (7-day drift test)
- Relative Accuracy Test Audit (RATA)*

**RATA report to be submitted under separate cover.*

1.1 Facility Description

The Morris facility is a 177 MW natural gas-fired cogeneration facility located on Equistar Chemicals LP's (Equistar) chemical plant in Morris, Illinois, near Chicago. Equistar, a wholly owned subsidiary of Lyondell Basell Chemical Company, produces ethylene and its co-products and derivatives. They commenced commercial operations in 1998. Atlantic Power indirectly owns 100% of the project.

The cogeneration facility contains three natural gas fired (457 mmBtu/hr) 43,520 kw, General Electric combustion turbines, each with TurboPHASE™ Air Augmentation and a Heat Recovery Steam Generator (260 mmBtu/hr). In addition, there are two gas-fired (312 mmBtu/hr) boilers used as backup for steam to the plant if the combustion turbines ever go down. All of the steam and a portion of electricity generated at the facility are sold to Equistar under a long-term energy services agreement which expires in 2034. Excess electricity is sold into the PJM West market.

This report summarizes test results for Boiler B-5.

1.2 CEMS Overview

The CEMS measures concentrations of oxides of nitrogen (NO_X) in ppm, and percentage concentration of oxygen (O_2) from the turbine exhaust stack. All measurements are done on a real time basis. Contact closures are provided for alarms and system status.

All flue gas pollutant and diluent measurements are made on a dry basis. Effluent gas from the sampling location is filtered and transported through heated sample lines to the sample conditioning system in the main analyzer equipment rack. The sample conditioning system again filters the effluent gas. A sample gas cooler removes moisture. The dry, particulate-free effluent gas sample is supplied to each analyzer within the equipment rack. The analog outputs of each analyzer and certain plant signal inputs are transmitted to a system controller located with the analyzer components.

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The system operates automatically so operator attention is necessary only for manual verification and accuracy and normal maintenance.

Automatic zero and span calibrations are performed on the CEMS monitors every 24 hours. Certified EPA Protocol calibration gases are injected at a valve box in the back of the probe.

1.2.1 CEMS Analyzers

The following table summarizes the analyzer components of the CEMS.

Analyzer	Manufacturer/Model	Range(s)	Serial Number
NO_x	TAPI T200H	0-250 ppm	430
O_2	TAPI T200H	0-25%	430

1.2.2 Data Acquisition System

The CEMS Data Acquisition and Reporting is controlled by the DAHS. The DAHS is a PC-based, multi-user, multi-tasking system. The DAHS provides automated data monitoring and management capabilities to the CEMS. The DAHS is utilized for operator interface, data storage, report generation, and data display.

The PLC transmits data from the analyzers to the DAHS. The DAHS polls the PLC for data, to generate and store one (1) minute averages. The DAHS will indicate any occurrence of specification limit exceedances or CEM operational problems. In the DAHS, necessary reports are generated in the required format for submittal to the applicable regulatory agencies. These reports may be produced in either hard copy or electronic format and can be made available to state and local agencies.

All required reporting parameters follow the equations in 40 CFR Part 75 Appendices D, F, and G and facility operating permit as applicable.

The DAHS formulae listed in the Monitoring Plan Record are tested as part of the CEMS certification program. A hard copy of the results is included in Chapter 3 of this report. A certification statement verifying the system meets the missing data substitution procedures of Part 75 are also included with the formula verification results.

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2 Summary of Results

The results and procedural descriptions for the Calibration Error, Linearity Check, and Cycle/Response Time tests for all gas analyzers are summarized in the following sections.

Field data, DAHS printouts, and supporting documentation for the Calibration Error (drift), Linearity, and Cycle/Response Time tests are located within Section 4 of this document.

2.1 Results Summary Tables

Table 1: NO_x Analyzer Test Results Summary

Test	Results	Criteria	Test Date(s)
Linearity Check	Low = 0.49% Mid = 1.02% High = 0.20%	≤5% of reference or ≤5 ppm absolute difference (40 CFR 75, Appendix A)	09/08/16
Cycle Time	Zero run = 4 min Span run = 4 min	≤15 minutes (40 CFR 75, Appendix A)	09/08/16
7-Day Drift, Highest Reading	zero = 0.56% span = 2.12%	≤2.5% of span or for ranges ≤200 ppm, then ≤5 ppm absolute difference (40 CFR 75, Appendix A)	9/23/16 thru 10/27/16

Table 2: O_2 Analyzer Test Results Summary

Test	Results	Criteria	Test Date(s)
Linearity Check	Low = 0.05% Mid = 0.69% High = 0.00%	≤5% of reference or ≤0.5% difference (40 CFR 75, Appendix A)	09/08/16
Cycle Time	Zero run = 4 min Span run = 4 min	≤15 minutes (40 CFR 75, Appendix A)	09/08/16
7-Day Drift, Highest Reading	zero = 0.30% span = 0.10%	≤0.5% difference (40 CFR 75, Appendix A)	9/23/16 thru 10/27/16

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3 Test Procedures

The test procedures used in this certification program were done in accordance with the methods outlined in 40 CFR 75 Appendix A and 40 CFR 60 Appendix B Performance Specifications. The following provides a brief overview on individual test procedures.

3.1 7-Day Calibration Error Test, Part 75

An on-site calibration error test (7-day drift test) was performed for each NO_X, and O_2 monitoring system in accordance with 40 CFR 75, Appendix A, Section 6.3. The tests were performed while the unit was combusting fuel at stabilized stack temperature and pressure conditions.

The calibration error test consists of measuring the calibration error of each monitor scale once each day for seven (7) consecutive unit operating (process on line) days. The calibration error tests were conducted at two EPA Traceability Protocol 1 calibration gas concentrations: zero-level (0-20%) and high-level (80-100%) as specified in 40 CFR 75, Appendix A, Section 6.3.1.

In accordance with 40 CFR 75, Appendix A, Section 3.1, results of the 7-day calibration error test are acceptable if the daily calibration error does not exceed: 2.5% for NO_X, or 0.5% for O_2. Alternatively, if the pollutant monitor's span value is equal to or less than 200 ppm, then calibration error shall not exceed 5.0 ppm difference.

Calibrations were performed automatically at approximately 24-hour intervals by the PLC during the drift test period. The readings for each analyzer were taken from the DAHS at the completion of the calibration routine. Copies of the DAHS reports are included with this test report. Manual or automatic adjustments were not made to the monitors until after the zero and high drift responses had been taken for that day during the 7-day test.

The percent calibration error is determined using the following equation:

Daily Drift for Pollutants 40 CFR 75, Appendix A Equation A-5	
$CE = \frac{\lvert R - A \rvert}{S} \times 100$	CE = Calibration error as a percentage of instrument span R = Zero or high-level calibration gas value in ppm A = Actual monitor response to calibration gas in ppm S = Span of the instrument

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The calibration error for diluent (O_2) monitors is computed by the DAHS from the test results for each concentration level as follows:

Daily Drift for Diluents 40 CFR 75, Appendix A, Equation A-5	
$CE = \lvert R - A \rvert$	CE = Calibration error as a percentage of O_2 R = Zero or high-level calibration gas value in percent (%). A = Actual monitor response to calibration gas in percent (%)

3.2 Linearity Error Check, Part 75

An on-site linearity check test was conducted in accordance with the 40 CFR 75, Appendix A, for each O_2 and NO_X monitoring system. The test was performed while the unit was combusting primary fuel at stabilized stack temperature and pressure conditions.

EPA Protocol certified calibration gases were used to conduct the linearity checks of the analyzers. Three points (concentrations) of calibration gases, low (20-30%), mid (50-60%) and high (80-100%) were introduced at the probe (40 CFR 75, Appendix A, Section 5.2). Each monitor was challenged three times with the appropriate reference gas, without using the same gas twice in succession. The monitors' response for each concentration was recorded. The average of the three responses will be used to calculate the linearity error (40 CFR 75, Appendix A, Section 6.2).

Linearity error was calculated using the following equation.

Linearity Error Equation A-4, 40 CFR 75, Appendix A	
$LE = \frac{\lvert R - A \rvert}{R} \times 100$	LE = Percent Linearity Error R = Calibration gas reference value A = Average of monitor response

Linearity Check: Alternate Criteria 40 CFR 75, Appendix A, Section 3	
$LE = \lvert R - A \rvert$	LE = Percent linearity error R = Calibration gas reference value A = Average of monitor response

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Linearity checks are acceptable for monitor certification if none of the test results exceed the applicable performance specification of 40 CFR 75, Appendix A, Section 3.2. The results of the NO_X and O_2 shall be less than 5.0% as calculated by the above equation or the alternative criteria of ≤0.5% O_2 or ≤5 ppm difference for NO_X.

3.3 Cycle/Response Time Check, Part 75

The cycle time test measures the monitor's reaction time to a change in gas concentration (40 CFR 75, Appendix A, Section 6.4). The system measured stack concentrations until a stable response was observed. The stable stack value was recorded. A low-level (zero) calibration gas was injected at the probe sample interface. Gas injection at the probe continued until a stable monitor response was reached. Next the monitor was switched back to monitor stack gas until a stable reading was achieved and the time recorded. A span-level (80-100% of span) calibration gas was then injected at the probe until a stable response was reached. The amount of time required for the system to respond to 95% of the final stable calibration gas response value was recorded. The time was recorded for the upscale test and the downscale test for each analyzer. The response time for NO_X and O_2 will be ≤15 minutes.

The two cycle times for the upscale and downscale tests were compared. The longer of these two times was recorded as the cycle time for the analyzer.

For monitors with dual ranges, the test results from the range giving the longer cycle time was reported.

4 Test Data and Supporting Documentation

This section contains DAHS printouts, field data, and supporting documentation for the drift tests, linearity checks, response time checks and opacity monitor checks.

4.1 7-Day Calibration Drift Data

The following pages contain the test results, DAHS printouts, and supporting documentation for the drift tests performed on the gas analyzers and flow monitors. All test results are in accordance with the methods outlined in 40 CFR 75 Appendix A and 40 CFR 60 Appendix B Performance Specifications (as applicable).

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Atlantic Power Corporation - Morris Cogeneration LLC
Boiler Unit 5
Morris, IL

7-Day Calibration Error (Drift) - NOx

Manufacturer: TAPI
Model: T200H
Serial Number: 430
Analyzer Range (ppm): 250

		% of Span	% of Span Status	Bottle #	Exp. Date	Exp. Date Status
Calibration Gas, Zero (ppm)	0.00	0.00	OK			
Calibration Gas, Span (ppm)	228.00	91.20	OK	CC350384	25-Aug-2023	OK

Day	Date	Time	Zero Reading			Status By Alternate Criteria (diff.)	Zero Drift ([R-A]/S) x 100	Status By Primary Criteria (%span)
			Cal Gas (R)	Response (A)	Difference |R-A|			
1	23-Sep-16	5:09:00	0.00	1.40	1.40	PASS	0.56	PASS
2	24-Sep-16	6:09:00	0.00	1.30	1.30	PASS	0.52	PASS
3	26-Sep-16	10:36:00	0.00	1.00	1.00	PASS	0.40	PASS
4	27-Sep-16	6:09:00	0.00	0.90	0.90	PASS	0.36	PASS
5	19-Oct-16	5:47:00	0.00	0.90	0.90	PASS	0.36	PASS
6	20-Oct-16	5:13:00	0.00	0.60	0.60	PASS	0.24	PASS
7	27-Oct-16	9:29:00	0.00	0.40	0.40	PASS	0.16	PASS

Highest Zero Drift	0.56	
Higest Zero Difference	1.40	*

Day	Date	Time	Span Reading			Status By Alternate Criteria (diff.)	Span Drift ([R-A]/S) x 100	Status By Primary Criteria (%span)
			Cal Gas (R)	Response (A)	Difference |R-A|			
1	23-Sep-16	5:12:00	228.00	228.80	0.80	PASS	0.32	PASS
2	24-Sep-16	6:12:00	228.00	228.60	0.60	PASS	0.24	PASS
3	26-Sep-16	10:39:00	228.00	230.30	2.30	PASS	0.92	PASS
4	27-Sep-16	6:12:00	228.00	230.50	2.50	PASS	1.00	PASS
5	19-Oct-16	5:51:00	228.00	228.50	0.50	PASS	0.20	PASS
6	20-Oct-16	5:16:00	228.00	226.10	1.90	PASS	0.76	PASS
7	27-Oct-16	9:32:00	228.00	233.30	5.30	FAIL	2.12	PASS

Highest Span Drift	2.12	
Highest Span Difference	5.30	alternate not applicable

Notes:
Allowed calibration gas ranges (40 CFR 75)
0-20% of span
80-100% of span

Alternately a 40-60% of span may be used.
Change the % of Span cell limits if a mid-level gas is used.

Pass/Fail Criteria: 2.5% of span each day of drift period
or if the span is 200 ppm or less, then 5 ppm difference
(40 CFR 75, Appendix A, Section 3.1)

*Only use the "difference" value for span ranges less than 200 ppm as alternate criteria

Slight differences in values may be noted when comparing this spreadsheet against the DAHS report.
Differences are likely due to use of decimal place holders and rounding conventions used in this spreadsheet as compared against DAHS results.

Low range is exempt from Part 75 drift if range is less than or equal to 50 ppm.
This exemption can be disallowed by State agencies.

Equation (40 CFR 75, Appendix A, Eq. A-5):
CE = (|R - A| / R) x 100
or alternate for span ranges less than or equal to 200 ppm
CE = |R - A|

CE = Calibration Error, %
R = Calibration Gas Reference Value, ppm
A = Monitor Response, ppm
S = Analyzer Span Value

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Atlantic Power Corporation - Morris Cogeneration LLC
Boiler Unit 5
Morris, IL

7-Day Calibration Error (Drift) - O2

Manufacturer: TAPI
Model: T200H
Serial Number: 430
Analyzer Range (%): 25

		% of Span	% of Span Status	Bottle #	Exp. Date	Exp. Date Status
Calibration Gas, Zero (%)	0.00	0.00	OK			
Calibration Gas, Span (%)	21.00	84.00	OK	CC171006	11-Jun-2023	OK

Day	Date	Time	Zero Reading			
			Cal Gas (R)	Response (A)	Drift |R-A|	Status
1	23-Sep-16	5:12:00	0.00	0.00	0.00	PASS
2	24-Sep-16	6:12:00	0.00	0.00	0.00	PASS
3	26-Sep-16	10:39:00	0.00	0.00	0.00	PASS
4	27-Sep-16	6:12:00	0.00	0.00	0.00	PASS
5	19-Oct-16	5:51:00	0.00	-0.20	0.20	PASS
6	20-Oct-16	5:16:00	0.00	0.10	0.10	PASS
7	27-Oct-16	9:32:00	0.00	-0.30	0.30	PASS

Highest Zero Drift 0.30

Day	Date	Time	Span Reading			
			Cal Gas (R)	Response (A)	Drift |R-A|	Status
1	23-Sep-16	5:09:00	21.00	21.00	0.00	PASS
2	24-Sep-16	6:09:00	21.00	20.90	0.10	PASS
3	26-Sep-16	10:36:00	21.00	21.00	0.00	PASS
4	27-Sep-16	6:09:00	21.00	21.00	0.00	PASS
5	19-Oct-16	5:47:00	21.00	20.90	0.10	PASS
6	20-Oct-16	5:13:00	21.00	20.90	0.10	PASS
7	27-Oct-16	9:29:00	21.00	21.00	0.00	PASS

Highest Span Drift 0.10

Notes:
Allowed calibration gas ranges (40 CFR 75)
0-20% of span
80-100% of span

Pass/Fail Criteria: 0.5% difference for each day of the drift period
(40 CFR 75, Appendix A, Section 3.1)

Equation (40 CFR 75, Appendix A, Section 3.1):
CE = |R - A|

CE = Calibration Error, %
R = Calibration Gas Reference Value, %O2
A = Monitor Response, %O2

Slight differences in values may be noted when comparing this spreadsheet against the DAHS report.
Differences are likely due to use of decimal place holders and rounding conventions used in this spreadsheet as compared against DAHS results.

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Date/Time	Unit	Parameter	Type	Step	Target	Value	Drift	Status	Perf Spec	Span	Aborted?	Process	Cylinder Gas List	Cylinder Serial Number	Vendor	Cylinder Expiration Date
9/23/2016 5:09	B-5	NOX_P75	Daily	Zero	0	1.4	-0.6	PASS	2.5	250	FALSE	ON				
9/23/2016 5:12	B-5	NOX_P75	Daily	Upscale	228	228.9	-0.4	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
9/23/2016 6:09	B-5	NOX_P75	Daily	Zero	0	1	-0.4	PASS	2.5	250	FALSE	ON				
9/23/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.2	-0.5	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
9/23/2016 12:53	B-5	NOX_P75	Daily	Zero	0	1.2	-0.5	PASS	2.5	250	FALSE	ON				
9/23/2016 12:56	B-5	NOX_P75	Daily	Upscale	228	225.9	0.8	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
9/23/2016 16:37	B-5	NOX_P75	Daily	Zero	0	1.2	-0.5	PASS	2.5	250	FALSE	ON				
9/23/2016 16:40	B-5	NOX_P75	Daily	Upscale	228	226.6	0.6	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
9/24/2016 6:09	B-5	NOX_P75	Daily	Zero	0	1.3	-0.5	PASS	2.5	250	FALSE	ON				
9/24/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	228.6	-0.2	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
9/24/2016 15:10	B-5	NOX_P75	Daily	Zero	0	1.2	-0.5	PASS	2.5	250	FALSE	ON				
9/24/2016 15:13	B-5	NOX_P75	Daily	Upscale	228	225	1.2	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
9/25/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
9/25/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.3	-0.5	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
9/26/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
9/26/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	230	-0.8	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
9/26/2016 10:36	B-5	NOX_P75	Daily	Zero	0	1	-0.4	PASS	2.5	250	FALSE	ON				
9/26/2016 10:39	B-5	NOX_P75	Daily	Upscale	228	230.3	-0.9	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
9/27/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.9	-0.4	PASS	2.5	250	FALSE	ON				
9/27/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	230.5	-1	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
9/28/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.4	-0.2	PASS	2.5	250	FALSE	OFF				
9/28/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	230.2	-0.9	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
9/29/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
9/29/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.7	-0.7	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
9/30/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
9/30/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.5	-0.6	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/1/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/1/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.9	-0.8	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/2/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.6	-0.2	PASS	2.5	250	FALSE	OFF				
10/2/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.8	-0.7	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/3/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.6	-0.2	PASS	2.5	250	FALSE	OFF				
10/3/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.5	-0.6	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/4/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/4/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	198.5	11.8	FAIL	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/4/2016 7:07	B-5	NOX_P75	Daily	Zero	0	0.7	-0.3	PASS	2.5	250	FALSE	OFF				
10/4/2016 7:10	B-5	NOX_P75	Daily	Upscale	228	229.8	-0.7	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/5/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/5/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.4	-0.6	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/6/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/6/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	226.2	0.7	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/7/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.7	-0.3	PASS	2.5	250	FALSE	OFF				
10/7/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	227.2	0.3	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/8/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.6	-0.2	PASS	2.5	250	FALSE	OFF				
10/8/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	222	2.4	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/9/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/9/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	222.3	2.3	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/10/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.6	-0.2	PASS	2.5	250	FALSE	OFF				
10/10/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	221	2.8	WARN	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023

10/11/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/11/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	220.3	3.1	WARN	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/11/2016 12:57	B-5	NOX_P75	Daily	Zero	0	0.9	-0.4	PASS	2.5	250	FALSE	OFF				
10/11/2016 13:00	B-5	NOX_P75	Daily	Upscale	228	227.8	0.1	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/12/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/12/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	224.8	1.3	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/13/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.6	-0.2	PASS	2.5	250	FALSE	OFF				
10/13/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	221.4	2.6	WARN	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/13/2016 11:00	B-5	NOX_P75	Daily	Zero	0	0.7	-0.3	PASS	2.5	250	FALSE	OFF				
10/13/2016 11:03	B-5	NOX_P75	Daily	Upscale	228	230.5	-1	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/14/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.7	-0.3	PASS	2.5	250	FALSE	OFF				
10/14/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	232	-1.6	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/15/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/15/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	232.8	-1.9	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/16/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/16/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	236.1	-3.2	WARN	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/17/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	OFF				
10/17/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	239.4	-4.6	WARN	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/18/2016 6:08	B-5	NOX_P75	Daily	Zero	0	0.6	-0.2	PASS	2.5	250	FALSE	OFF				
10/18/2016 6:11	B-5	NOX_P75	Daily	Upscale	228	242.2	-5.7	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/19/2016 5:04	B-5	NOX_P75	Daily	Zero	0	0.8	-0.3	PASS	2.5	250	FALSE	OFF				
10/19/2016 5:07	B-5	NOX_P75	Daily	Upscale	228	228.4	-0.2	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/19/2016 5:47	B-5	NOX_P75	Daily	Zero	0	0.9	-0.4	PASS	2.5	250	FALSE	ON				
10/19/2016 5:51	B-5	NOX_P75	Daily	Upscale	228	228.5	-0.2	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
10/19/2016 6:09	B-5	NOX_P75	Daily	Zero	0	1	-0.4	PASS	2.5	250	FALSE	OFF				
10/19/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	227.8	0.1	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/19/2016 12:41	B-5	NOX_P75	Daily	Zero	0	1	-0.4	PASS	2.5	250	FALSE	ON				
10/19/2016 12:44	B-5	NOX_P75	Daily	Upscale	228	237.2	-3.7	WARN	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
10/20/2016 5:13	B-5	NOX_P75	Daily	Zero	0	0.6	-0.2	PASS	2.5	250	FALSE	ON				
10/20/2016 5:16	B-5	NOX_P75	Daily	Upscale	228	226.1	0.8	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
10/20/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	ON				
10/20/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	226.8	0.5	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
10/21/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0	0	PASS	2.5	250	FALSE	OFF				
10/21/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	225.7	0.9	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/21/2016 10:36	B-5	NOX_P75	Daily	Zero	0	0	0	PASS	2.5	250	FALSE	OFF				
10/21/2016 10:39	B-5	NOX_P75	Daily	Upscale	228	226	0.8	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/22/2016 6:09	B-5	NOX_P75	Daily	Zero	0	-0.1	0	PASS	2.5	250	FALSE	OFF				
10/22/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	225.9	0.8	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/23/2016 6:09	B-5	NOX_P75	Daily	Zero	0	-0.2	0.1	PASS	2.5	250	FALSE	OFF				
10/23/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.7	-0.7	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/24/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0	0	PASS	2.5	250	FALSE	OFF				
10/24/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	226.4	0.6	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/25/2016 6:09	B-5	NOX_P75	Daily	Zero	0	-0.1	0	PASS	2.5	250	FALSE	OFF				
10/25/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	227	0.4	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/26/2016 6:09	B-5	NOX_P75	Daily	Zero	0	-0.1	0	PASS	2.5	250	FALSE	OFF				
10/26/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	229.5	-0.6	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/26/2016 9:55	B-5	NOX_P75	Daily	Zero	0	0	0	PASS	2.5	250	FALSE	OFF				
10/26/2016 9:58	B-5	NOX_P75	Daily	Upscale	228	231.2	-1.3	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
10/27/2016 6:09	B-5	NOX_P75	Daily	Zero	0	-0.1	0	PASS	2.5	250	FALSE	OFF				

	10/27/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	232.3	-1.7	PASS	2.5	250	FALSE	OFF	NO,BALN	CC350584		8/25/2023
	10/27/2016 9:29	B-5	NOX_P75	Daily	Zero	0	0.4	-0.2	PASS	2.5	250	FALSE	ON				
	10/27/2016 9:32	B-5	NOX_P75	Daily	Upscale	228	233.3	-2.1	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
	10/27/2016 19:13	B-5	NOX_P75	Daily	Zero	0	0.5	-0.2	PASS	2.5	250	FALSE	ON				
	10/27/2016 19:16	B-5	NOX_P75	Daily	Upscale	228	227.1	0.4	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
	10/28/2016 6:09	B-5	NOX_P75	Daily	Zero	0	0.4	-0.2	PASS	2.5	250	FALSE	ON				
	10/28/2016 6:12	B-5	NOX_P75	Daily	Upscale	228	227	0.4	PASS	2.5	250	FALSE	ON	NO,BALN	CC350584		8/25/2023
	9/23/2016 5:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
	9/23/2016 5:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
	9/23/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
	9/23/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
	9/23/2016 12:53	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
	9/23/2016 12:56	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
	9/23/2016 16:37	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
	9/23/2016 16:40	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
	9/24/2016 6:09	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
	9/24/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
	9/24/2016 15:10	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
	9/24/2016 15:13	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
	9/25/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	9/25/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
	9/26/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	9/26/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
	9/26/2016 10:36	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
	9/26/2016 10:39	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
	9/27/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
	9/27/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
	9/28/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	9/28/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
	9/29/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	9/29/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
	9/30/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	9/30/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
	10/1/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	10/1/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
	10/2/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	10/2/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
	10/3/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	10/3/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
	10/4/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	10/4/2016 6:12	B-5	O2_P75	Daily	Zero	0	2.6	-2.6	FAIL	0.5	25	FALSE	OFF				
	10/4/2016 7:07	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	10/4/2016 7:10	B-5	O2_P75	Daily	Zero	0	-0.2	0.2	PASS	0.5	25	FALSE	OFF				
	10/5/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	10/5/2016 6:12	B-5	O2_P75	Daily	Zero	0	-0.1	0.1	PASS	0.5	25	FALSE	OFF				
	10/6/2016 6:09	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	10/6/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.1	-0.1	PASS	0.5	25	FALSE	OFF				
	10/7/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
	10/7/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.1	-0.1	PASS	0.5	25	FALSE	OFF				

10/8/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/8/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.5	-0.5	WARN	0.5	25	FALSE	OFF				
10/9/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/9/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.5	-0.5	WARN	0.5	25	FALSE	OFF				
10/10/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/10/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.6	-0.6	WARN	0.5	25	FALSE	OFF				
10/11/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/11/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.7	-0.7	WARN	0.5	25	FALSE	OFF				
10/11/2016 12:57	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/11/2016 13:00	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
10/12/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/12/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.3	-0.3	PASS	0.5	25	FALSE	OFF				
10/13/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/13/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.6	-0.6	WARN	0.5	25	FALSE	OFF				
10/13/2016 11:00	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/13/2016 11:03	B-5	O2_P75	Daily	Zero	0	-0.1	0.1	PASS	0.5	25	FALSE	OFF				
10/14/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/14/2016 6:12	B-5	O2_P75	Daily	Zero	0	-0.3	0.3	PASS	0.5	25	FALSE	OFF				
10/15/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/15/2016 6:12	B-5	O2_P75	Daily	Zero	0	-0.3	0.3	PASS	0.5	25	FALSE	OFF				
10/16/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/16/2016 6:12	B-5	O2_P75	Daily	Zero	0	-0.6	0.6	WARN	0.5	25	FALSE	OFF				
10/17/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/17/2016 6:12	B-5	O2_P75	Daily	Zero	0	-0.9	0.9	WARN	0.5	25	FALSE	OFF				
10/18/2016 6:08	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/18/2016 6:11	B-5	O2_P75	Daily	Zero	0	-1.2	1.2	PASS	0.5	25	FALSE	OFF				
10/19/2016 5:04	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/19/2016 5:07	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
10/19/2016 5:47	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
10/19/2016 5:51	B-5	O2_P75	Daily	Zero	0	-0.2	0.2	PASS	0.5	25	FALSE	ON				
10/19/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/19/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
10/19/2016 12:41	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
10/19/2016 12:44	B-5	O2_P75	Daily	Zero	0	-0.9	0.9	WARN	0.5	25	FALSE	ON				
10/20/2016 5:13	B-5	O2_P75	Daily	Upscale	21	20.9	0.1	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
10/20/2016 5:16	B-5	O2_P75	Daily	Zero	0	0.1	-0.1	PASS	0.5	25	FALSE	ON				
10/20/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
10/20/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
10/21/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/21/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.3	-0.3	PASS	0.5	25	FALSE	OFF				
10/21/2016 10:36	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/21/2016 10:39	B-5	O2_P75	Daily	Zero	0	0.3	-0.3	PASS	0.5	25	FALSE	OFF				
10/22/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/22/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.4	-0.4	PASS	0.5	25	FALSE	OFF				
10/23/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/23/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
10/24/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/24/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.3	-0.3	PASS	0.5	25	FALSE	OFF				
10/25/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023

10/25/2016 6:12	B-5	O2_P75	Daily	Zero	0	0.2	-0.2	PASS	0.5	25	FALSE	OFF					
10/26/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/26/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	OFF				
10/26/2016 9:55	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/26/2016 9:58	B-5	O2_P75	Daily	Zero	0	-0.1	0.1	PASS	0.5	25	FALSE	OFF				
10/27/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21.1	-0.1	PASS	0.5	25	FALSE	OFF	O2,BALN	CC171006		6/11/2023
10/27/2016 6:12	B-5	O2_P75	Daily	Zero	0	-0.2	0.2	PASS	0.5	25	FALSE	OFF				
10/27/2016 9:29	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
10/27/2016 9:32	B-5	O2_P75	Daily	Zero	0	-0.3	0.3	PASS	0.5	25	FALSE	ON				
10/27/2016 19:13	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
10/27/2016 19:16	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				
10/28/2016 6:09	B-5	O2_P75	Daily	Upscale	21	21	0	PASS	0.5	25	FALSE	ON	O2,BALN	CC171006		6/11/2023
10/28/2016 6:12	B-5	O2_P75	Daily	Zero	0	0	0	PASS	0.5	25	FALSE	ON				

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PRAXAIR

Praxair Distribution, Inc.
6055 Brent Drive
Toledo, OH 43611
Tel: (419) 729-7732 Fax:(419) 729-2411
PGVP ID: F12015

DocNumber: 000009936

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PRAXAIR WHSE HILLSIDE IL
12000 ROOSEVELT RD
HILLSIDE IL 601620

Praxair Order Number: 31518136
Customer P. O. Number: 05577537
Customer Reference Number:

Fill Date: 6/5/2015
Part Number: NI OX20.9E-AS
Lot Number: 0605GB15
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:		6/11/2023	NIST Traceable
Cylinder Number:		CC171006	Analytical Uncertainty:
21.0	%	OXYGEN	± 0.2 %
	Balance	NITROGEN	

Certification Information: *Certification Date:* 6/11/2015 *Term:* 96 Months *Expiration Date:* 6/11/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: OXYGEN

Requested Concentration: 20.9 %
Certified Concentration: 21.0 %
Instrument Used: Servomex 575
Analytical Method: Paramagnetic
Last Multipoint Calibration: 5/23/2015

Reference Standard Type: GMIS
Ref. Std. Cylinder #: EB0054984
Ref. Std. Conc: 22.33
Ref. Std. Traceable to SRM #: 2658a
SRM Sample #: 71-0-04
SRM Cylinder #: Cal05785

First Analysis Data:						Date: 6/11/2015	
Z:	0	R:	22.33	C:	21.05	Conc:	21.05
R:	22.33	Z:	0	C:	21.05	Conc:	21.05
Z:	0	C:	21.05	R:	22.33	Conc:	21.05
UOM:	%			Mean Test Assay:			21.05 %

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

Analyzed by: Josh Jones

Certified by: Rolonda Kaywood

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information con tained herein exceed the fee established for providing such information.

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6055 BRENT DR. TOLEDO, OH 43611
419-729-7732 FAX 419-729-2411

THE AMERICAN GAS GROUP

www.americangasgroup.com

ANALYTICAL REPORT

Certificate ID:	082815007	**Date:**	8/28/2015
Customer Name:	Weldstar - Aurora		
Customer Address:	1750 Mitchell Rd		
	Aurora IL 60504		
Purchase Order:	05676884	**Work Order:**	130393-00
Lot Number:	0805WD15	**Product Name:**	2-Component Mixture, EPA Protocol
Size:	AS	**Pressure:**	2000 psig @ 70 Deg F
Content:			
Serial #:	CC350584		
Analysis Date:	8/25/2015	**Vendor ID#**	F12015
Shelf Life:	8 years	**Expiration Date:**	8/25/2023

Component	Nominal	Actual	Accuracy	Method
Nitric Oxide	225 ppm	228 ppm	±0.6%	Chemiluminescence
Nitrogen Oxides (NOx)	225 ppm	229 ppm	±0.6%	Chemiluminescence
Nitrogen	Balance	Balance		

REFERENCE STANDARD	Std Type	Std #	Cyl #	Concentration	Exp Date
	GMIS	0325WA15	CC350162	252.9 ppm	8/7/2023
	GMIS	0325WA15	CC350162	253.2 ppm	8/7/2023

INSTRUMENTATION	Instrument / ID	Component	Last Multipoint Calibration
	Rosemount 951A	NO	8/17/2015
	Rosemount 951A	NOx	8/17/2015

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - MAY 2012:G1
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 100 PSIG

Protocal
Specialty Gases of America, Inc

Issued by: Josh Jones

Specialty Gases of America, Inc. QF051, Rev 0
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4.2 Linearity Data

The following pages contain the test results, DAHS printouts, and supporting documentation for the linearity checks performed on the gas analyzers (as applicable). All test results are in accordance with the methods outlined in 40 CFR 75 Appendix A, section 6.2.

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Linearity Test Report

Facility Name: MORRIS_COGEN Location: Morris, IL

NOX_P75 B-5 Audit Test Results Analyzer Span: 250.000 PPMD

Mfr. & Model: Teledyne T200H Serial Number: 430

LOW-Level Calibration Gas
(20-30% of Span)
(50.000 PPMD - 75.000 PPMD)

Concentration: 54.000
Cylinder No.: CC242393
Expiration Date: 08/25/2017

MID-Level Calibration Gas
(50-60% of Span)
(125.000 PPMD - 150.000 PPMD)

Concentration: 140.000
Cylinder No.: SA4689
Expiration Date: 07/13/2023

HIGH-Level Calibration Gas
(80-100% of Span)
(200.000 PPMD - 250.000 PPMD)

Concentration: 228.000
Cylinder No.: CC350584
Expiration Date: 08/25/2023

Test Date: 09/08/2016 Tester: Patrick Fiebrantz

	Low		Mid		High	
	Time	Monitor Value	Time	Monitor Value	Time	Monitor Value
Run 1	15:36	53.400	15:39	141.300	15:42	228.600
Run 2	15:46	53.800	15:49	141.700	15:52	228.100
Run 3	15:55	54.000	15:58	141.300	16:01	228.700
Avg. Monitor Response		53.733		141.433		228.467
Linearity Error		0.49		1.02		0.20
Absolute Difference		0.267		1.433		0.467
Test Status		PASSED		PASSED		PASSED

$$\text{Linearity Error} = \frac{|\text{Cal. Gas Concentration} - \text{Avg. Monitor Response}| \times 100}{\text{Cal. Gas Concentration}}$$

Absolute Difference = | Cal. Gas Concentration - Avg. Monitor Response |

Acceptable results for a successful linearity test for NOx/SO2 analyzers: Linearity error <= 5.0% or Abs. Difference <= 5 ppm
Acceptable results for a successful linearity test for CO2/O2 analyzers: Linearity error <= 5.0% or Abs. Difference 0.5%
Acceptable results for a successful linearity test for Hg analyzers: Linearity error <= 10.0% or Abs. Difference <= 0.8 ug/scm

component ID
NOx 512

Report generated on: 09/28/2016 17:47

Project No. M161004I
Boiler 5 Stack

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Linearity Test Report

Facility Name: MORRIS_COGEN Location: Morris, IL

O2_P75 B-5 Audit Test Results Analyzer Span: 25.000 PCT

Mfr. & Model: Teledyne T200H Serial Number: 430

LOW-Level Calibration Gas
(20-30% of Span)
(5.000 PCT - 7.500 PCT)

Concentration: 6.097 6.109
Cylinder No.: CC76191
Expiration Date: 06/30/2023

MID-Level Calibration Gas
(50-60% of Span)
(12.500 PCT - 15.000 PCT)

Concentration: 14.500
Cylinder No.: EB0004689
Expiration Date: 06/30/2023

HIGH-Level Calibration Gas
(80-100% of Span)
(20.000 PCT - 25.000 PCT)

Concentration: 21.000
Cylinder No.: CC171006
Expiration Date: 06/11/2023

Test Date: 09/08/2016 Tester: Patrick Fiebrantz

	Low		Mid		High	
	Time	Monitor Value	Time	Monitor Value	Time	Monitor Value
Run 1	15:03	6.100	15:06	14.400	15:09	21.000
Run 2	15:12	6.100	15:15	14.400	15:17	21.000
Run 3	15:23	6.100	15:26	14.400	15:29	21.000
Avg. Monitor Response		6.100		14.400		21.000
Linearity Error		0.05		0.69		0.00
Absolute Difference		0.003		0.100		0.000
Test Status		PASSED		PASSED		PASSED

$$\text{Linearity Error} = \frac{|\text{Cal. Gas Concentration} - \text{Avg. Monitor Response}| \times 100}{\text{Cal. Gas Concentration}}$$

Absolute Difference = | Cal. Gas Concentration - Avg. Monitor Response |

Acceptable results for a successful linearity test for NOx/SO2 analyzers: Linearity error <= 5.0% or Abs. Difference <= 5 ppm
Acceptable results for a successful linearity test for CO2/O2 analyzers: Linearity error <= 5.0% or Abs. Difference 0.5%
Acceptable results for a successful linearity test for Hg analyzers: Linearity error <= 10.0% or Abs. Difference <= 0.8 ug/scm

component-10 523 02

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CT Mid NOx linearity 10-5-15

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ANALYTICAL REPORT

Certificate ID:	072215004	Date:	7/22/2015
Customer Name:	Weldstar		
Customer Address:	1750 Mitchell RD		
	Aurora IL 60504 630-859-3100		
Purchase Order:	05610817	Work Order:	728909-00
Lot Number:	0629WH15	Product Name:	2-Component Mixture, EPA Protocol
Size:	AS	Pressure:	2000 psig @ 70 Deg F
Content:			
Serial #:	CC242393		
Analysis Date:	7/13/2015	Vendor ID#	F12015
Shelf Life:	8 years	Expiration Date:	7/13/2023

Component	Nominal	Actual	Accuracy	Method
Nitric Oxide	55.0 ppm	54.0 ppm	± 0.5% rel	Chemiluminescence
Nitrogen Oxides (NOx)	55.0 ppm	54.2 ppm	± 0.5%	Chemiluminescence
Nitrogen	Balance	Balance		

REFERENCE STANDARD	Std Type	Std #	Cyl #	Concentration	Exp Date
	GMIS	0111HG14	EB0022577	99.16 ppm	2/25/2023
	GMIS	0111HG14	EB0022577	99.43 ppm	2/25/2023

INSTRUMENTATION	Instrument / ID	Component	Last Multipoint Calibration
	Rosemount 951A	NO	7/13/2015
	Rosemount 951A	NOx	7/13/2015

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - MAY 2012:G1
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 100 PSIG

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Span gas installed 8-29-16 B5 & B6

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ANALYTICAL REPORT

Certificate ID:	072215002	**Date:**	7/22/2015
Customer Name:	Weldstar		
Customer Address:	1750 Mitchell RD		
	Aurora IL 60504 630-859-3100		
Purchase Order:	05610817	**Work Order:**	728909-00
Lot Number:	0629WF15	**Product Name:**	2-Component Mixture, EPA Protocol
Size:	AS	**Pressure:**	2000 psig @ 70 Deg F
Content:			
Serial #:	SA4689		
Analysis Date:	7/13/2015	**Vendor ID#**	F12015
Shelf Life:	8 years	**Expiration Date:**	7/13/2023

Component	Nominal	Actual	Accuracy	Method
Nitric Oxide	140 ppm	140 ppm	± 0.7%	FTIR
Nitrogen Oxides (NOx)	140 ppm	141 ppm	± 0.7%	FTIR
Nitrogen	Balance	Balance		

REFERENCE STANDARD	Std Type	Std #	Cyl #	Concentration	Exp Date
	GMIS	0216WJ15	ND54792	251.3 ppm	4/16/2023
	GMIS	0216WJ15	ND54792	252.2 ppm	4/16/2023

INSTRUMENTATION	Instrument / ID	Component	Last Multipoint Calibration
	MKS 2031	NO	6/26/2015
	MKS 2031	NOx	6/26/2015

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - MAY 2012:G1
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ANALYTICAL REPORT

Certificate ID:	082815007	**Date:**	8/28/2015
Customer Name:	Weldstar - Aurora		
Customer Address:	1750 Mitchell Rd		
	Aurora IL 60504		
Purchase Order:	05676884	**Work Order:**	130393-00
Lot Number:	0805WD15	**Product Name:**	2-Component Mixture, EPA Protocol
Size:	AS	**Pressure:**	2000 psig @ 70 Deg F
Content:			
Serial #:	CC350584		
Analysis Date:	8/25/2015	**Vendor ID#**	F12015
Shelf Life:	8 years	**Expiration Date:**	8/25/2023

Component	Nominal	Actual	Accuracy	Method
Nitric Oxide	225 ppm	228 ppm	±0.6%	Chemiluminescence
Nitrogen Oxides (NOx)	225 ppm	229 ppm	±0.6%	Chemiluminescence
Nitrogen	Balance	Balance		

REFERENCE STANDARD	Std Type	Std #	Cyl #	Concentration	Exp Date
	GMIS	0325WA15	CC350162	252.9 ppm	8/7/2023
	GMIS	0325WA15	CC350162	253.2 ppm	8/7/2023

INSTRUMENTATION	Instrument / ID	Component	Last Multipoint Calibration
	Rosemount 951A	NO	8/17/2015
	Rosemount 951A	NOx	8/17/2015

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - MAY 2012:G1
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 100 PSIG

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3G Linearity Low 10-26-15

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ANALYTICAL REPORT

Certificate ID:	071115010	**Date:**	7/11/2015
Customer Name:	Weldstar		
Customer Address:	1750 Mitchell RD		
	Aurora IL 60504 630-859-3100		
Purchase Order:	05610728	**Work Order:**	717097-00
Lot Number:	0626TC15	**Product Name:**	2-Component Mixture, EPA Protocol
Size:	AS	**Pressure:**	2000 psig @ 70 Deg F
Content:			
Serial #:	CC76191		
Analysis Date:	6/30/2015	**Vendor ID#**	F12015
Shelf Life:	8 years	**Expiration Date:**	6/30/2023

Component	Nominal	Actual	Accuracy	Method
Oxygen	6.00 %	6.09 %	± 0.4% rel	Paramagnetic
Nitrogen	Balance	Balance		

REFERENCE STANDARD	Std Type	Std #	Cyl #	Concentration	Exp Date
	GMIS	0122HJ13	CC316361	5.984%	9/30/2016

INSTRUMENTATION	Instrument / ID	Component	Last Multipoint Calibration
	Servomex	O2	6/23/2015

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - MAY 2012:G1.
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 100 PSIG

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Bo Linearity mid 10-26-15

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ANALYTICAL REPORT

Certificate ID:	071115007	**Date:**	7/11/2015
Customer Name:	Weldstar		
Customer Address:	1750 Mitchell RD		
	Aurora IL 60504 630-859-3100		
Purchase Order:	05610728	**Work Order:**	717097-00
Lot Number:	0626TA15	**Product Name:**	2-Component Mixture, EPA Protocol
Size:	AS	**Pressure:**	2000 psig @ 70 Deg F
Content:			
Serial #:	EB0004689		
Analysis Date:	6/30/2015	**Vendor ID#**	F12015
Shelf Life:	8 years	**Expiration Date:**	6/30/2023

Component	Nominal	Actual	Accuracy	Method
Oxygen	14.0 %	14.5 %	±0.2% rel	Paramagnetic
Nitrogen	Balance	Balance		

REFERENCE STANDARD	Std Type	Std #	Cyl #	Concentration	Exp Date
	GMIS	0413CA13	EB0054984	22.33%	4/13/2021

INSTRUMENTATION	Instrument / ID	Component	Last Multipoint Calibration
	Servomex	O2	6/23/2015

Note: * ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS - MAY 2012:G1.
* DO NOT USE STANDARD WHEN PRESSURE IS BELOW 100 PSIG

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PRAXAIR

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Toledo, OH 43611
Tel: (419) 729-7732 Fax:(419) 729-2411
PGVP ID: F12015

DocNumber: 000009936

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PRAXAIR WHSE HILLSIDE IL
12000 ROOSEVELT RD
HILLSIDE IL 601620

Praxair Order Number: 31518136
Customer P. O. Number: 05577537
Customer Reference Number:

Fill Date: 6/5/2015
Part Number: NI CX20.9E-AS
Lot Number: 060SG315
Cylinder Style & Outlet: AS CGA 590
Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	6/11/2023	NIST Traceable
Cylinder Number:	CC171006	Analytical Uncertainty:
21.0 %	OXYGEN	± 0.2 %
Balance	NITROGEN	

Certification Information: *Certification Date:* 6/11/2015 *Term:* 96 Months *Expiration Date:* 6/11/2023

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Do Not Use this Standard if Pressure is less than 100 PSIG.

Analytical Data: *(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)*

1. Component: OXYGEN

Requested Concentration: 20.9 %
Certified Concentration: 21.0 %
Instrument Used: Servomex 575
Analytical Method: Paramagnetic
Last Multipoint Calibration: 6/23/2015

Reference Standard Type: GMIS
Ref. Std. Cylinder #: EB0054984
Ref. Std. Conc: 22.33
Ref. Std. Traceable to SRM #: 2658a
SRM Sample #: 71-D-04
SRM Cylinder #: CB05765

First Analysis Data:						Date:	6/11/2015
Z:	0	R:	22.33	C:	21.05	Conc:	21.05
R:	22.33	Z:	0	C:	21.05	Conc:	21.05
Z:	0	C:	21.05	R:	22.33	Conc:	21.05
UOM:	%			Mean Test Assay:			21.05 %

Second Analysis Data:						Date:	
Z:	0	R:	0	C:	0	Conc:	0
R:	0	Z:	0	C:	0	Conc:	0
Z:	0	C:	0	R:	0	Conc:	0
UOM:	%			Mean Test Assay:			0 %

Analyzed by: Josh Jones

Certified by: Rolonda Haywood

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4.3 Cycle/Response Time Data

The following pages contain the test results, DAHS printouts, and supporting documentation for the cycle/response time checks performed on the gas analyzers. All test results are in accordance with the methods outlined in 40 CFR 75 Appendix A, section 6.4 .

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Atlantic Power Corporation - Morris Cogeneration LLC
Boiler Unit 5
Morris, IL

Cycle Time - NOx

Manufacturer: TAPI
Model: T200H
Serial Number: 430

			% of Span Status			Exp. Date Status
Analyzer Range (ppm)	250	**% of Span**		**Bottle #**	**Exp. Date**	
Span Calibration Gas (ppm)	228.0	91.20	OK	CC350384	25-Aug-23	OK
Zero Calibration Gas (ppm)	0.00					
Test Date	8-Sep-16					

	Step 1. Monitor Response at Stack Gas (start point)	Step 2. DAHS Time @ Stack Gas Monitor Response Value	Step 3. Monitor Response to Cal Gas Injection (end point)	Step 4. 95% of Step Change (calculated)	Step 5. Monitor Response Value at Step Change (from 1-min data)	Step 6. DAHS Time @ Monitor Response at Step Change	Step 7. Cycle Time (calculated)
Downscale (Zero Gas)	6.30	16:09:00	6.00	6.02	6.00	16:13:00	0:04:00
Upscale (Span Gas)	5.90	14:07:00	228.50	217.37	222.90	14:11:00	0:04:00

Longest Response Time 0:04:00

Notes:

Pass/fail criteria = 15 minutes or less

(40 CFR 75, Appendix A, Section 3.5)

Stabilized response value = reading with a change < 2% of span value for 2 minutes, or a reading with a change < 6% of the measured average concentration over 6 minutes. Or, reading is considered stable if it changes by no more than 0.5 ppm, or 0.2% CO2/O2 for two minutes.

Collect 1-minute data from the DAHS

Downscale: Stable flue gas point "down to" stable zero cal gas point

Upscale: Stable flue gas point "up to" stable span cal gas point

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Atlantic Power Corporation - Morris Cogeneration LLC
Boiler Unit 5
Morris, IL

Cycle Time - O2

Manufacturer: TAPI
Model: T200H
Serial Number: 430

			% of Span Status	Bottle #	Exp. Date	Exp. Date Status
Analyzer Range (%)	25					
Span Calibration Gas (%)	21.1	84.40	OK	SA17821	30-Jun-23	OK
Zero Calibration Gas (%)	0.00					
Test Date	8-Sep-16					

	Step 1. Monitor Response at Stack Gas (start point)	Step 2. DAHS Time @ Stack Gas Monitor Response Value	Step 3. Monitor Response to Cal Gas Injection (end point)	Step 4. 95% of Step Change (calculated)	Step 5. Monitor Response Value at Step Change (from 1-min data)	Step 6. DAHS Time @ Monitor Response at Step Change	Step 7. Cycle Time (calculated)
DOWNSCALE (ZERO GAS)	18.50	14:07:00	0.00	0.93	0.00	14:11:00	0:04:00
UPSCALE (SPAN GAS)	13.90	16:08:00	19.10	18.84	19.10	16:12:00	0:04:00

Longest Response Time 0:04:00

Notes:

Pass/fail criteria = 15 minutes or less

(40 CFR 75, Appendix A, Section 3.5)

Stabilized response value = reading with a change < 2% of span value for 2 minutes, or a *reading with a change < 6% of the measured average concentration over 6 minutes.* Or, reading is considered stable if it changes by no more than 0.5 ppm, or 0.2% CO2/O2 for two minutes.

Collect 1-minute data from the DAHS

Downscale: Stable flue gas point "down to" stable zero cal gas point

Upscale: Stable flue gas point "up to" stable span cal gas point

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B5 Responce time MinuteBlockEmi

Date/Time	B-5: NOX_P60 (PPMD) Raw Value (Read-Only Value)	B-5: NOX_P75 (PPMD) Raw Value (Read-Only Value)	B-5: O2_P60 (PCT) Raw Value (Read-Only Value)	B-5: O2_P75 (PCT) Raw Value (Read-Only Value)
09/08/16 14:07	Stable flue	5.9	Stable flue	18.5
09/08/16 14:08		2.4		20.9
09/08/16 14:09		0.8		20.9
09/08/16 14:10		91.4		4.6
09/08/16 14:11		222.9		0
09/08/16 14:12		226.9	zero	0
09/08/16 14:13	span	228.5		1.6
09/08/16 14:14		227.7		0
09/08/16 14:15		228.6		6.2
09/08/16 14:16		20.9		20.8
09/08/16 14:17		0.9		20.8
09/08/16 14:18		2.4		19.5
09/08/16 14:19		22.5		11.8
09/08/16 14:20		225.6		0
09/08/16 14:21		227.9		9.1
09/08/16 14:22		25		19.1
09/08/16 14:23		6		19.1
09/08/16 16:02		136.7		13.8
09/08/16 16:03		6.5		19.1
09/08/16 16:04		60.2		9.5
09/08/16 16:05		225.9		0
09/08/16 16:06		227.6		0
09/08/16 16:07		227.9		0
09/08/16 16:08		154.7	flue	13.9
09/08/16 16:09	Stable flue	6.3		19.1
09/08/16 16:10		6.4		19.2
09/08/16 16:11		4.5		20.2
09/08/16 16:12		6		19.1
09/08/16 16:13		6		19.1
09/08/16 16:14	zero	6	span	19.1

10/31/2016 8:42 AM

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Appendix H - Calibration and Response Time Data

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Client: Morris Cogeneration LLC		**Test Location:** Boiler 5 Stack	
Facility: Morris Cogeneration LLC Facility		**Date:** 10/28/2016	
Project #: M161004		**Operator:** S. Sands	
Box Truck:	BT2		
Probe Length:	8.0	ft	**Point Markings (including port length):**
Probe Type:	Extractive		**Point #** / **inches**
Sample Plane:	Horizontal		1 / 25.75
Port Length:	10	in.	2 / 57.24
Port Size (diameter):	6	in.	3 / 88.74
Port Type:	Flange		
Duct Shape:	Circular		
Diameter:	10.75	ft	
Duct Area:	90.76	Sq. Ft.	
Upstream Diameters:	>0.5		
Downstream Diameters:	>2.0		
Number of Ports Sampled:	1		
Number of Points per Port:	3		
Total Number of Traverse Points:	3		

Calibration Gases

Type	Setting	Cylinder ID	Cylinder Value	Analyzer Response	Difference, % of Span	Expiration Date	Mid cylinder % of high cylinder		Final Bottle Pressure, PSI
NOx ppmvd	Zero	CC100707	0	-0.36	0.95%	7/22/2024			>500
	Mid	CC259027	17.97	18.11	-0.37%	6/7/2019	47.19%		>500
	High	CC306700	38.08	38.70	-1.63%	9/14/2019			>500
O2 % (dry)	Zero	CC259027	0	0.00	0.00%	6/7/2019			>500
	Mid	CC100707	11.94	11.91	0.14%	7/22/2024	54.25%		>500
	High	XC021731B	22.01	22.14	-0.59%	6/9/2024			>500

Analyzer and Span Data

Type	CEM Analyzer Model	CEM Analyzer s/n			CEM Gas Span
NOx ppm	Teledyne T200H	430			100
O2 %	Teledyne T200H	430			25

Response Time Data

Type	RM Analyzer Make/Model	RM Analyzer s/n	Analyzer Span	RM Gas Span
NOx ppmvd	Thermo/42i	1023743808	100	38.08
O2 % (dry)	Servomex 1440	01440D1/4448	25	22.01
	Start		95% Response	Time (min)
Upscale				1.5
Downscale				1.5

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Fuel Type: Natural Gas
Fuel Factor: 8710
Diluent: O2 %

Location: Boiler 5 Stack
Date: 10/28/16
Operator: S. Sands
Project #: M161004
O2 % Correction: 15

NOx ppmvd Correction Data

Run #	Cma	Precal	Postcal	Pre zero	Post zero	Co	Cm	C	Cgas	Span Bias	Span Drift	Zero Bias	Zero Drift
1	17.97	17.99	18.07	0.19	0.10	0.15	18.03	15.00	14.9	0.11	0.21	-1.21	-0.24
2	17.97	18.07	18.23	0.10	0.48	0.29	18.15	15.20	15.0	-0.32	0.42	-2.21	1.00
3	17.97	18.23	18.05	0.48	0.34	0.41	18.14	15.30	15.1	0.16	-0.47	-1.84	-0.37
4	17.97	18.05	18.02	0.34	0.28	0.31	18.04	15.50	15.4	0.24	-0.08	-1.68	-0.16
5	17.97	18.02	18.15	0.28	0.34	0.31	18.09	15.70	15.6	-0.11	0.34	-1.84	0.16
6	17.97	18.15	17.97	0.34	0.37	0.36	18.06	15.60	15.5	0.37	-0.47	-1.92	0.08
7	17.97	17.97	17.86	0.37	0.26	0.32	17.93	15.70	15.7	0.60	-0.24	-1.63	-0.29
8	17.97	17.86	17.85	0.26	0.24	0.25	17.87	15.50	15.6	0.68	-0.08	-1.58	-0.05
9	17.97	17.85	17.82	0.24	0.34	0.29	17.84	15.40	15.5	0.76	-0.08	-1.84	0.26
10	17.97	17.82	17.90	0.34	0.21	0.28	17.86	15.30	15.4	0.55	0.21	-1.50	-0.34

O2 % (dry) Correction Data

Run #	Cma	Precal	Postcal	Pre zero	Post zero	Co	Cm	C	Cgas	Span Bias	Span Drift	Zero Bias	Zero Drift
1	11.94	11.95	11.93	-0.12	-0.13	-0.13	11.94	14.20	14.2	-0.09	-0.09	0.59	-0.05
2	11.94	11.93	11.94	-0.13	-0.14	-0.14	11.94	14.15	14.1	-0.14	0.05	0.64	-0.05
3	11.94	11.94	11.93	-0.14	-0.14	-0.14	11.94	14.17	14.2	-0.09	-0.05	0.64	0.00
4	11.94	11.93	11.92	-0.14	-0.15	-0.15	11.93	14.21	14.2	-0.05	-0.05	0.68	-0.05
5	11.94	11.92	11.90	-0.15	-0.13	-0.14	11.91	14.12	14.1	0.05	-0.09	0.59	0.09
6	11.94	11.90	11.88	-0.13	-0.15	-0.14	11.89	14.01	14.0	0.14	-0.09	0.68	-0.09
7	11.94	11.88	11.86	-0.15	-0.16	-0.16	11.87	14.00	14.1	0.23	-0.09	0.73	-0.05
8	11.94	11.86	11.84	-0.16	-0.15	-0.16	11.85	14.00	14.1	0.32	-0.09	0.68	0.05
9	11.94	11.84	11.82	-0.15	-0.16	-0.16	11.83	13.87	14.0	0.41	-0.09	0.73	-0.05
10	11.94	11.82	11.80	-0.16	-0.10	-0.13	11.81	13.82	14.0	0.50	-0.09	0.45	0.27

Cma = Concentration of Cal Gas
Cm=Average Pre and Post Span
C = Average value of test
Cgas = Corrected gas value of test
Co=Average Pre and Post Zero

Calibration Corrected Data

Run #	Run Date	Start Time	End Time	NOx ppmvd	NOx ppmvd @ 15% O2	O2 % (dry)	O2 based NOx lb/mmBtu
1	10/28/16	7:45	8:05	14.9	13.1	14.2	0.048
2	10/28/16	8:16	8:36	15.0	13.0	14.1	0.048
3	10/28/16	8:52	9:12	15.1	13.3	14.2	0.049
4	10/28/16	9:25	9:45	15.4	13.6	14.2	0.050
5	10/28/16	9:58	10:18	15.6	13.5	14.1	0.050
6	10/28/16	10:30	10:50	15.5	13.3	14.0	0.049
7	10/28/16	11:03	11:23	15.7	13.6	14.1	0.050
8	10/28/16	11:36	11:56	15.6	13.5	14.1	0.050
9	10/28/16	12:09	12:29	15.5	13.3	14.0	0.049
10	10/28/16	12:41	13:01	15.4	13.2	14.0	0.049

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Client:	Morris Cogeneration LLC
Facility:	Morris Cogeneration LLC Facility
Test Location:	Boiler 5 Stack
Date:	10/28/16
Project #:	M161004

Linearity Cal/Pre 1 Cal

Time	NOx ppmvd		O2 % (dry)	
6:38:00	-0.34		22.29	
6:39:00	-0.36		22.65	
6:40:00	-0.36	iz	22.14	ih
6:41:00	-0.36		22.13	
6:42:00	-0.37		22.19	
6:43:00	34.81		5.04	
6:44:00	89.59		0	iz
6:45:00	92.12		-0.04	
6:46:00	92.33		-0.05	
6:47:00	92.25		0.45	
6:48:00	32.95		12.3	
6:49:00	-0.28		11.91	im
6:50:00	-0.33		11.89	
6:51:00	10.75		4.26	
6:52:00	37.93		-0.2	
6:53:00	38.7	ih	-0.22	
6:54:00	37.59		0.12	
6:55:00	20.4		-0.09	
6:56:00	18.36		-0.1	
6:57:00	18.18		-0.11	
6:58:00	18.11	im	-0.04	
7:36:00	0.35		11.95	m
7:37:00	0.19	z	11.57	
7:38:00	11.71		0.02	
7:39:00	17.66		-0.1	
7:40:00	17.92		-0.11	
7:41:00	17.99	m	-0.12	z

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Test Location: Boiler 5 Stack
Date: 10/28/16

Post 1/Pre 2

Time	NOx ppmvd		O2 % (dry)	
8:09:00	18.19		-0.13	z
8:10:00	18.07	m	-0.14	
8:11:00	10.94		9.48	
8:12:00	0.17		11.71	
8:13:00	0.1	z	11.93	m

Post 2/Pre 3

Time	NOx ppmvd		O2 % (dry)	
8:44:00	0.48	z	11.94	m
8:45:00	2.52		4.81	
8:46:00	17.38		-0.12	
8:47:00	18.23	m	-0.14	z

Post 3/Pre 4

Time	NOx ppmvd		O2 % (dry)	
9:17:00	0.34	z	11.93	m
9:18:00	7.07		3.32	
9:19:00	17.5		-0.12	
9:20:00	18.05	m	-0.14	z

Post 4/Pre 5

Time	NOx ppmvd		O2 % (dry)	
9:51:00	0.28	z	11.92	m
9:52:00	7.17		2.25	
9:53:00	18.04		-0.13	
9:54:00	18.02	m	-0.15	z

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Test Location: Boiler 5 Stack
Date: 10/28/16

Post 5/Pre 6

Time	NOx ppmvd		O2 % (dry)	
10:21:00	0.34	z	11.9	m
10:22:00	4.89		13.48	
10:23:00	11.59		5.39	
10:24:00	18.15	m	-0.13	z

Post 6/Pre 7

Time	NOx ppmvd		O2 % (dry)	
10:54:00	0.37	z	11.88	m
10:55:00	5.95		3.92	
10:56:00	17.52		-0.13	
10:57:00	17.97	m	-0.15	z

Post 7/Pre 8

Time	NOx ppmvd		O2 % (dry)	
11:28:00	0.26	z	11.86	m
11:29:00	6.54		3.71	
11:30:00	17.75		-0.14	
11:31:00	17.86		-0.15	
11:32:00	17.88	m	-0.16	z

Post 8/Pre 9

Time	NOx ppmvd		O2 % (dry)	
12:00:00	0.38		11.84	m
12:01:00	0.24	z	11.69	
12:02:00	11.33		0.03	
12:03:00	17.8		-0.14	
12:04:00	17.85	m	-0.15	z

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Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Project #: M161004

Test Location: Boiler 5 Stack
Date: 10/28/16

Post 9/Pre 10					Post 10				
Time	NOx ppmvd		O2 % (dry)		Time	NOx ppmvd		O2 % (dry)	
12:33:00	0.34	z	11.82	m	13:09:00	0.34		11.8	m
12:34:00	2.81		4.69		13:10:00	0.21	z	11.79	
12:35:00	17.31		-0.14		13:11:00	12.35		0.59	
12:36:00	17.82		-0.16	z	13:12:00	17.89		-0.1	z
12:37:00	17.82	m	-0.17		13:13:00	17.9	m	-0.11	

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Appendix I - Calibration Gas Cylinder Data

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Airgas

Airgas USA, LLC
Airgas Specialty Gases
12722 S. Wentworth Avenue
Chicago, IL 60628
773-785-3000 Fax: 773-785-1928
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0309	Reference Number:	54-124556198-1
Cylinder Number:	CC259027	Cylinder Volume:	144.3 CF
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12016	Valve Outlet:	660
Gas Code:	NO,NOX,BALN	Certification Date:	Jun 07, 2016

Expiration Date: Jun 07, 2019

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	18.00 PPM	17.97 PPM	G1	+/- 1.4% NIST Traceable	05/31/2016, 06/07/2016
NITRIC OXIDE	18.00 PPM	17.94 PPM	G1	+/- 1.4% NIST Traceable	05/31/2016, 06/07/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12061611	CC283608	20.23 PPM NITRIC OXIDE/NITROGEN	+/- 1.5%	Apr 27, 2018
NTRM	12061611	CC283608 NOX	20.28 PPM NOx/NITROGEN	+/- 1.5%	Apr 27, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
TC-2 THERMO 42iHL 1407061176 NO	Chemiluminescence	May 25, 2016
TC-2 THERMO 42iHL 1407061176 NOx	Chemiluminescence	May 26, 2016

Triad Data Available Upon Request

Approved for Release

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Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
12722 S. Wentworth Ave.
Chicago, IL 60628
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI99E15A02H8	Reference Number:	54-124577377-1
Cylinder Number:	CC306700	Cylinder Volume:	136.1 CF
Laboratory:	124 - Chicago - IL	Cylinder Pressure:	1900 PSIG
PGVP Number:	B12016	Valve Outlet:	660
Gas Code:	NO,NOX,BALN	Certification Date:	Sep 14, 2016

Expiration Date: Sep 14, 2019

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	38.00 PPM	38.08 PPM	G1	+/- 1.0% NIST Traceable	09/14/2016
NITRIC OXIDE	38.00 PPM	38.08 PPM	G1	+/- 1.0% NIST Traceable	09/14/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13061239	CC403932	49.40 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Nov 19, 2019
PRM	12312	680179	10.01 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Oct 15, 2014
GMIS	812201405	CC502159	4.861 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Aug 12, 2017

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900100	FTIR	Sep 12, 2016
Nicolet 6700 AMP0900100	FTIR	Sep 12, 2016

Triad Data Available Upon Request

Signature on file

Approved for Release

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Airgas
an Air Liquide company

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI88E15A3424	Reference Number:	54-124566672-1
Cylinder Number:	CC100707	Cylinder Volume:	145.4 CF
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12016	Valve Outlet:	590
Gas Code:	O2,BALN	Certification Date:	Jul 22, 2016

Expiration Date: Jul 22, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	12.00 %	11.94 %	G1	+/- 1.0% NIST Traceable	07/22/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062016	CC367570	22.88 % OXYGEN/NITROGEN	+/- 0.2%	Apr 24, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Jul 19, 2016

Triad Data Available Upon Request

Signature on file

Approved for Release

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Airgas

Airgas USA, LLC
Airgas Specialty Gases
12722 S. Wentworth Avenue
Chicago, IL 60628
773-785-3000 Fax: 773-785-1928
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02NI78E15A0124	Reference Number:	54-124558051-1
Cylinder Number:	XC021731B	Cylinder Volume:	146.3 CF
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12016	Valve Outlet:	590
Gas Code:	O2,BALN	Certification Date:	Jun 09, 2016

Expiration Date: Jun 09, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which effect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	22.00 %	22.01 %	G1	+/- 0.5% NIST Traceable	06/09/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062016	CC387570	22.88 % OXYGEN/NITROGEN	+/- 0.2%	Apr 24, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	May 31, 2016

Triad Data Available Upon Request

Approved for Release

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Appendix J - NO_2 to NO Converter Efficiency Test

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NO2 to NO Converter Test

Client: Morris Cogeneration LLC
Facility: Morris Cogeneration LLC Facility
Test Location: Boiler 5 Stack
Date: 10/28/2016
Project #: M161004

Conv. Temp: 627.1 °C
Max: 15.1 ppm
Min: 14.9 ppm
% of Max: 1.52 %

Pre-Calibration			Test			Post-Calibration		
Time	NO_x	Cal Flag	Time	NO_x		Time	NO_x	Cal Flag
6:40:00	-0.36	z	7:02:00	15.01		7:36:00	0.35	z
6:41:00	-0.36		7:03:00	15.03		7:37:00	0.19	
6:42:00	-0.37		7:04:00	14.99		7:38:00	11.71	
6:43:00	34.81		7:05:00	15.03		7:39:00	17.66	
6:44:00	89.59		7:06:00	15.03		7:40:00	17.92	
6:45:00	92.12		7:07:00	15.02		7:41:00	17.99	m
6:46:00	92.33		7:08:00	15.01				
6:47:00	92.25		7:09:00	15.09	Max			
6:48:00	32.95		7:10:00	15.03				
6:49:00	-0.28		7:11:00	15.09	Max			
6:50:00	-0.33		7:12:00	15.02				
6:51:00	10.75		7:13:00	15.02				
6:52:00	37.93		7:14:00	15.01				
6:53:00	38.7	h	7:15:00	15.07				
6:54:00	37.59		7:16:00	14.93				
6:55:00	20.4		7:17:00	15.06				
6:56:00	18.36		7:18:00	15.01				
6:57:00	18.18		7:19:00	14.92				
6:58:00	18.11	m	7:20:00	14.93				
			7:21:00	14.93				
			7:22:00	14.93				
			7:23:00	14.99				
			7:24:00	14.89				
			7:25:00	14.88				
			7:26:00	14.86	Min			
			7:27:00	14.89				
			7:28:00	14.91				
			7:29:00	14.88				
			7:30:00	14.91				
			7:31:00	14.89				
			7:32:00	14.89				

PRE-CAL RESULT

zero	-0.36
mid	0.37%
high	1.63%

POST-CAL RESULT

zero	0.35
mid	0.05%

Type		RM Analyzer Make/Model	RM Analyzer s/n	Analyzer Span	RM Gas Span
NOx ppmvd		Thermo/42i	1023743808	100	38.08
Type	**Setting**	**Cylinder ID**	**Cylinder Value**	**Analyzer Response**	**Difference, % of Span**
NOx ppmvd	Zero	CC100707	0	-0.36	0.95%
	Mid	CC259027	17.97	18.11	-0.37%
	High	CC306700	38.08	38.70	-1.63%

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END OF THE REPORT

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