TEST REPORT

NO_x EMISSION TEST PROGRAM
HYDROGEN FURNACE

BP HUSKY REFINING LLC
TOLEDO, OHIO

PREPARED FOR:

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SECTIONONE Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by BP Husky Refining LLC (BP) to conduct a nitrogen oxides (NO_x) emission test on the Hydrogen Furnace at their refinery in Toledo, Ohio.

The complete test consisted of three (3) 60-minute sampling repetitions being conducted on June 20, 2008. Concurrent sampling was conducted in the South and North breeching/plenum ducts on the furnace located prior to the exhaust stack. There are no ports or access to the exhaust stack.

For each sampling repetition in each duct, the following gas parameters were determined:

Parameter	Units
Oxygen (O_2) concentration	% by volume - dry basis (db)
Nitrogen Oxides	
Concentration	ppmv db, lb/dscf
Emission Rate	lb/MMBtu

Note: Since an acceptable sampling location for flow measurements is not available, emissions in lb/hr were then calculated by multiplying the NO_X emission rate (lb/MMBtu) (F_d Factor based) (average of the two plenums), by the furnace heat input in MMBtu/hr.

These parameters were determined in accordance with 40CFR, Part 60, Appendix A, USEPA Methods 3A, 7E and 19 and 40CFR, Part 51, Appendix M, Method 205.

Mr. Bill Rupert of BP coordinated the test and monitored all pertinent process operations. Messrs. Rob Burton, Terrence Davis and Nathan Sekulic of ARI performed the testing. Mr. Peter Park of the City of Toledo, Department of Environmental Services, witnessed the testing.

This report summarizes the test procedures and results of this test program. Included, as appendices, is complete documentation of all calculation summary data, field data, ARI reference method monitoring data, process data and test equipment calibration data.

The test results are detailed in Section 3 of this document. A summary of the test results is presented in Table 1-1.

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TABLE 1-1. SUMMARY OF NO_X EMISSION TEST RESULTS

TEST RUN NO.	:	1	2	3	
TEST DATE	:	6/20/08	6/20/08	6/20/08	
TEST TIME	:	08:40 – 09:40	10:18 – 11:18	12:54 – 13:54	Average
Nitrogen Oxides (NO_x)					
Emission Rate					
lb/hr[1]		8.17	11.72	11.21	10.36
lb/MMBtu[2]		0.090	0.092	0.088	0.090

[1] Calculated by multiplying the average NO_x emission rate (lb/MMBtu) (F Factor Based) measured in the North and South plenums by the furnace heat input in MMBtu/hr

[2] Average of the North and South plenums. Calculated by multiplying the NO_x Conc. lb/dscf measured in each plenum by the F_d factor (dscf/MMBtu) corrected to 0% O_2

SECTIONTWO Testing and Analytical Procedures

2.1 OVERVIEW

The complete test consisted of three (3) 60-minute sampling repetitions. Concurrent sampling was conducted in the South and North breeching/plenum ducts located prior to the exhaust stack on the hydrogen furnace. There are no ports or access to the exhaust stack.

For each sampling repetition in each duct, the following gas parameters were determined:

Parameter	Units
O_2 concentration	% by volume - db
Nitrogen Oxides	
Concentration	ppmv db, lb/dscf
Emission Rate	lb/MMBtu

Note: Since an acceptable sampling location for flow measurements was not available, emissions in lb/hr were calculated by multiplying the NO_X emission rate (lb/MMBtu) (F_d Factor based) (average of the two ducts), by the furnace heat input in MMBtu/hr.

These parameters were determined in accordance with 40CFR, Part 60, Appendix A, USEPA Methods 3A, 7E and 19 and 40CFR, Part 51, Appendix M, Method 205 as listed below:

USEPA Methods	Description
3A	Determination of Oxygen and Carbon Dioxide Concentrations in Emission from Stationary Sources (Instrumental Analyzer Procedure)
7E	Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)
19	Determination of Sulfur Dioxide Removal Efficiency and Particulate, Sulfur Dioxide and Nitrogen Oxides Emission Rates
205	Validation of Gas Dilution Systems

2.2 O_2 AND NO_x SAMPLING (USEPA METHODS 3A AND 7E)

ARI's CEM sampling system consisted of an in-stack filter attached to a heated probe (maintained at ~ 300 °F) and three-way calibration tee. The probe system connected to a heated Teflon sampling line (@ 300 °F) that transported the gas sample from the stack through an electronic chiller to remove the moisture. The dry sample gas was then transported to a manifold system by a Teflon lined sample pump and Teflon sample line. The manifold was connected with sample gas intake lines for ARI's monitors (Figure 2-1). All components prior to the chiller were heated to ~ 300 degrees. Sampling was conducted at 3-points in one port at 16.7%, 50.0% and 83.3% of the 48 inch duct depth (in each of the two ducts).

ARI's monitors were calibrated with applicable zero and multiple range calibrated gases as specified in the applicable USEPA methods. The calibration gases were generated from protocol calibration gases using an Environics Model 4040 mass flow gas dilution system.

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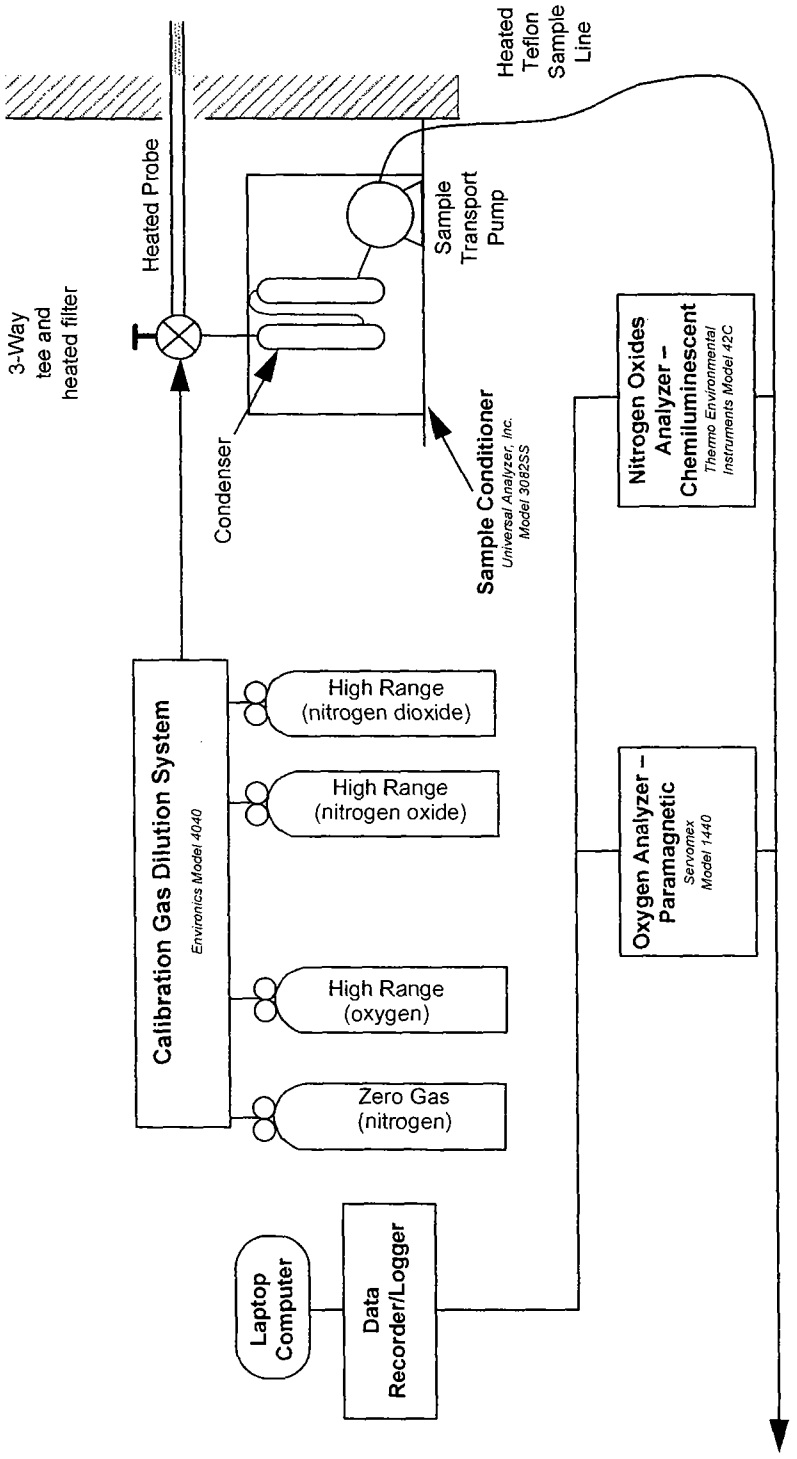

FIGURE 2-1. ARI CEM REFERENCE METHOD SAMPLING SYSTEM

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A system response check was conducted for each gaseous compound prior to beginning the stratification test. The highest response time was 3.5 minutes. Therefore ARI waited 2 times that response time (7 minutes to be conservative) prior to beginning each test run at the first sample point.

Continuous O_2 sampling was conducted following USEPA Method 3A. O_2 was measured using ARI's Servomex Model 1440 paramagnetic analyzer. A pre-test and post-test system bias along with the initial calibration error test were performed using diluted O_2 balance nitrogen standards with an analyzer span of 20%.

Continuous NO_x sampling was conducted following USEPA Method 7E procedures. NO_x was measured using ARI's Thermo Environmental Instruments, Inc. Model 42C chemiluminescent analyzer. A pre-test and post-test system bias along with the initial calibration error test were performed using diluted NO_x balance nitrogen standards at an analyzer span of 90.5 ppmv.

A pre-test converter efficiency test was conducted following procedures described in Method 7E. A known concentration of nitrogen dioxide (NO_2) in nitrogen (N_2) was introduced to the sample port of the analyzer. The analyzer was acceptable if the readout was greater than 90% of the NO_2 calibration standard.

The results of the initial calibration error test performed before the test program were within 2% of span for each calibration gas. Calibration gases were introduced at the 3-way tee located at the exit end of the sample probe to perform the system bias test. The pre-test and post-test system bias results were within the 5% of span allowed for each calibration gas. The system bias drift results were within the 3% of span allowed for each test run. The zero and upscale calibration gas system bias values obtained before and after each run were averaged and used to correct the data for that test run.

Results from the sample runs were continuously recorded by ARI's data acquisition system, which consisted of an Omega OMB-DAQ-56 datalogger connected to a computer for digital data archiving and data reduction. Omega DAQVIEW XL and Excel spreadsheet computer software were used for emission calculations and digital archiving.

2.3 F_d-FACTOR CALCULATION (USEPA METHOD 19)

Emission rates in pounds per million Btu heat input (lb/MMBtu) were calculated using the F_d-Factor (oxygen method, dry basis) procedure. A fuel gas sample was collected during each run and analyzed for composition and energy content by BP. The fuel gas analysis was used for calculation of the North and South plenums emission rate for each run in lb/MMBtu. The following equation was used to calculate the emission rates in lb/MMBtu for the North and South plenums for each run, based on fuel gas energy input:

$$E_{gas,lb/MMBtu} = \left(C_{gas,lb/dscf}\right) x \left(F_d\right) \times \left(\frac{20.9}{20.9 - \%O_2}\right)$$

Where:

$E_{gas,\ lb/MMBtu}$	=	pollutant emission rate in lb/MMBtu for each plenum
$C_{gas,\ lb/dscf}$	=	pollutant concentration in lb/dscf for each plenum
F_d	=	F-Factor in dscf/MMBtu
$\%O_2$	=	average oxygen value measured (%, db) for each plenum

2.4 EMISSION RATE DETERMINATION

Pollutant emission rates in lb/hr were determined by multiplying the average emission rate for the combined North and South plenums in pounds per million Btu heat input (lb/MMBtu) for each run by the average furnace heat input (MMBtu/hr) during the run. The heat input MMBtu/hr is based on the fuel gas sample heat content (Btu/scf) measured in the samples collected during each run and analyzed by BP's lab and the BP on-line instrumentation that continuously measures fuel gas flow rate (scfh) on the furnace for each of the runs.

The NO_x emission rate was calculated for each run as follows:

$$E_{Gas(lb/hr)} = Ef_{Gas(lb/MMBtu)} x\ Hi_{(MMBtu/hr)}$$

Where:

Ef_{gas}	=	Average North and South NO_x emission rate, lb/MMBtu
Hi	=	Furnace heat input, MMBtu/hr (based on BP fuel flow meter and analysis of fuel gas samples during each run by BP's lab)

2.5 GAS DILUTION SYSTEM VERIFICATION (USEPA METHOD 205)

All calibration gases were certified by USEPA Protocol 1 procedures. All diluted calibration standards were prepared using an Environics Model 4040 Dilution System that was verified by a field evaluation at the job site prior to testing following the requirements of USEPA Method 205 (40 CFR 51, Appendix M).

ARI's Servomex Model 1440 oxygen analyzer was calibrated following USEPA Method 3A procedures. After the calibration procedure was complete, diluted standards of 5.0% and 12.0% and a mid-range EPA Protocol 1 standard of 11.49% were alternately introduced in triplicate and an average instrument response was calculated for each standard. No single response differed by more than ±2% from the average response for each standard. The difference between the instrument average and the predicted concentration was less than ±2% for each diluted standard. The difference between the certified gas concentration and the average instrument response for the mid-range EPA Protocol 1 standard was less than ±2%.

SECTIONTHREE Results

The test results are presented in Table 3-1.

The results indicate an average NO_x emission rate of 10.4 lb/hr and 0.090 lb/MMBtu.

Summary calculation data, ARI reference method monitoring data, process and fuel gas data and calibration data are included in the appendices as detailed in the Table of Contents.

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TABLE 3-1. HYDROGEN FURNACE TEST RESULTS

COMPANY : BP Husky Refining LLC
LOCATION : Toledo, Ohio
SOURCE : Hydrogen Furnace
TEST DATE : 6/20/08

TEST LOCATION :	North Side			South Side			Combined			
RUN NO. :	1	2	3	1	2	3	1	2	3	
TEST TIME :	0840 -0940	1018-1118	1254 -1354	0840 -0940	1018 -1118	1254 -1354	0840 - 0940	1018 - 1118	1254 - 1354	Average
FURNACE PARAMETERS[1,2]										
O_2 based F-factor (dscf/MMBtu)							8,210	8,540	8,507	8,419
Fuel Gas Flow Rate, dscfh x 10^3							109.1	107.4	112.3	109.6
Heat Content of Fuel Gas, Btu/scf							834.4	1,185.9	1,137.8	1,053
Furnace Firing Rate, MMBtu/hr							91.04	127.34	127.80	113.67
OXYGEN										
Concentration, % db	9.61	9.56	9.18	10.25	9.95	9.68	9.93	9.76	9.43	9.71
NITROGEN OXIDES (NO_X)										
Concentration										
ppmv db	49.20	49.06	48.10	46.84	47.18	46.65				
x 10^{-6} lb/dscf	5.874	5.858	5.743	5.593	5.633	5.570				
Emission Rate										
lb/hr[3]							8.17	11.72	11.21	10.36
lb/MMBtu	0.089	0.092	0.087	0.090	0.092	0.088	0.090	0.092	0.088	0.090

[1]Fuel gas heat content based on fuel gas samples collected and analyzed by BP during each run.
[2]Furnace Heat Input (Hi) MMBtu/hr = Fuel gas flow rate (scfh) * Fuel gas heat content (Btu/scf).
[3]NO_x Emission Rate (lb/hr) = NO_x Emission Rate (lb/MMBtu) * Furnace Heat Input (Hi) (MMBtu/hr).

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APPENDIX A Field Data and Calculation Summaries

SUMMARY OF TEST RESULTS

TABLE	
COMPANY	BP Husky Refining LLC
LOCATION	Toledo, Ohio
SOURCE	Hydrogen Furnace (North and South)
TEST DATE	6/20/2008

TEST LOCATION	North Side			South Side			Combined			
TEST TIME	0840-0940	1018-1118	1254-1354	0840-0940	1018-1118	1254-1354	0840-0940	1018-1118	1254-1354	
RUN NO	1	2	3	1	2	3	1	2	3	Average
Furnace Parameters										
O_2 based F-factor (dscf/MMBtu)							8,210	8,540	8,507	8,419
Fuel Gas Flow Rate, dscfh							109,109	107,374	112,323	109,602
Heat Content of Fuel Gas, Btu/scf							834.4	1,185.9	1,137.8	1,053
Furnace Firing Rate, MMBtu/hr							91.04	127.34	127.80	115.39
Oxygen Concentration:										
% db	9.61	9.56	9.18	10.25	9.95	9.68	9.93	9.76	9.43	9.71
Nitrogen Oxides (NOx) Concentration:										
ppmv db	49.20	49.06	48.10	46.84	47.18	46.65				
x 10^{-6} lb/dscf	5.874	5.858	5.743	5.593	5.633	5.570				
Emission Rate:										
lb/hr							8.17	11.72	11.21	10.36
lb/MMBtu	0.089	0.092	0.087	0.090	0.092	0.088	0.090	0.092	0.088	0.090

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USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace
Test Date: 06/20/08
Test Run #: 1
Test Time: 0840-0940

Data Input:

North Duct: Average NOx Emissions(E_{NOx} North):	0.0893	**lb/MMBtu**
South Duct: Average NOx Emissions(E_{NOx} South):	0.0902	**lb/MMBtu**
Combined: Average NOx Emissions(E_{NOx}):	0.0897	**lb/MMBtu**
North Duct: Average O2 Conc.(C_{O2} North):	9.61	**% db**
South Duct: Average O2 Conc.(C_{O2} South):	10.25	**% db**
Combined: Average O2 Conc. (C_{O2}):	9.9	**% db**
O_2 based F-factor (F_d):	8,210.36	**dscf/MMBtu**
Furnace Fuel Gas Flow Rate (Q_{std}):	109,109	**dscfh**
Heat Content of Fuel Gas (H_t):	834.42	**Btu/scf**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

$$Hi_{(MMBtu/hr)} = Ht_{(Btu/dscf)} \times Q_{std\ (dscfh)} = \mathbf{91.04\ MMBtu/hr}$$

Average NOx Emission rate:

$$E_{gas,lb/hr} = E_{gas,lb/MMBtu} \times Hi_{MMBtu/hr} = \mathbf{8.17\ lb/hr}$$

Oxygen Based F-Factor Method

COMPANY: BP Husky Refining LLC
LOCATION: Toledo, Ohio
SOURCE: H2 Furnace
RUN NO: 1
TEST DATE: 06/20/08

INPUT

Carbon (%C)	=	67.13	**%**
Hydrogen (%H)	=	22.25	**%**
Oxygen (%O)	=	10.62	**%**
Nitrogen (%N)	=	0.00	**%**
Sulfur (%S)	=	0.00	**%**
Gross Calorific Value (GCV)	=	21,778.1	**Btu/lb**
Heat Content (H_t)	=	834.42	**Btu/scf**

Sample Calculations:

F-Factor:

$$F_d = \frac{10^6 \times \left[(3.64 \times \%H) + (1.53 \times \%C) + (0.57 \times \%S) + (0.14 \times \%N) - (0.46 \times \%O)\right]}{GCV} = 8{,}210.36 \quad \textbf{dscf/10}^6\textbf{ Btu}$$

USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace North
Test Date: 06/20/08
Test Run #: 1
Test Time: 0840-0940

Data Input:

Average chart reading (C):	49.11	**ppmv db**
Average pre/post-test zero calibration reading (C_o):	0.38	**ppmv db**
Calibration gas concentration (C_{ma}):	50.0	**ppmv db**
Average pre/post-test calibration gas reading (C_m):	49.91	**ppmv db**
Compound molecular weight (MW):	46.00	**lb/lb-mole**
Oxygen Conc.:	9.61	**% db**
O_2 based F-factor (F_d):	8,210.36	**dscf/MMBtu**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

NOx
Corrected for zero and calibration drift:

$$C_{gas} = \left(\overline{C} - C_O\right)\frac{C_{ma}}{C_m - C_O}$$ = **49.20 ppmv db**

NOx
Concentration:

$$C_{gas,lb/dscf} = C_{gas} \times \left(\frac{MW\ lb/lb-mole}{385.26 \times 10^6\ ft^3/lb-mole}\right)$$ = **5.874 x 10-6 lb/dscf**

NO_x Mass Emission Rate

$$E_{NO_x(lb/MMBtu)} = E_{NO_x(lb/dscf)} \times F_d \times \left(\frac{20.9}{20.9 - \%O_2}\right)$$ = **0.0893 lb/MMBtu**

USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace South
Test Date: 06/20/08
Test Run #: 1
Test Time: 0840-0940

Data Input:

Average chart reading (C):	45.96	**ppmv db**
Average pre/post-test zero calibration reading (C_o):	0.66	**ppmv db**
Calibration gas concentration (C_{ma}):	50.0	**ppmv db**
Average pre/post-test calibration gas reading (C_m):	49.01	**ppmv db**
Compound molecular weight (MW):	46.00	**lb/lb-mole**
Oxygen Conc.:	10.25	**% db**
O_2 based F-factor (F_d):	8,210.36	**dscf/MMBtu**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

NOx
Corrected for zero and calibration drift:

$$C_{gas} = \left(\overline{C} - C_O\right)\frac{C_{ma}}{C_m - C_O}$$ = **46.84 ppmv db**

NOx
Concentration:

$$C_{gas,lb/dscf} = C_{gas} \times \left(\frac{MW\ lb/lb-mole}{385.26 \times 10^6\ ft^3/lb-mole}\right)$$ = **5.593 x 10-6 lb/dscf**

NO_x Mass Emission Rate

$$E_{NO_x(lb/MMBtu)} = E_{NO_x(lb/dscf)} \times F_d \times \left(\frac{20.9}{20.9 - \%O_2}\right)$$ = **0.0902 lb/MMBtu**

USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace
Test Date: 06/20/08
Test Run #: 2
Test Time: 1018-1118

Data Input:

North Duct: Average NOx Emissions(E_{NOx} North):	0.0922	**lb/MMBtu**
South Duct: Average NOx Emissions(E_{NOx} South):	0.0918	**lb/MMBtu**
Combined: Average NOx Emissions(E_{NOx}):	0.0920	**lb/MMBtu**
North Duct: Average O2 Conc.(C_{O2} North):	9.56	**% db**
South Duct: Average O2 Conc.(C_{O2} South):	9.95	**% db**
Combined: Average O2 Conc. (C_{O2}):	9.76	**% db**
O_2 based F-factor (F_d):	8,540.23	**dscf/MMBtu**
Furnace Fuel Gas Flow Rate (Q_{std}):	107,374	**dscfh**
Heat Content of Fuel Gas (H_t):	1,185.94	**Btu/scf**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

$$Hi_{(MMBtu/hr)} = Ht_{(Btu/dscf)} \times Qstd_{(dscfh)} = \mathbf{127.34\ MMBtu/hr}$$

Average NOx Emission rate:

$$E_{gas,lb/hr} = E_{gas,lb/MMBtu} \times Hi_{MMBtu/hr} = \mathbf{11.72\ lb/hr}$$

Oxygen Based F-Factor Method

COMPANY: BP Husky Refining LLC
LOCATION: Toledo, Ohio
SOURCE: H2 Furnace
RUN NO: 2
TEST DATE: 06/20/08

INPUT

Carbon (%C)	=	72.79	**%**
Hydrogen (%H)	=	19.32	**%**
Oxygen (%O)	=	7.89	**%**
Nitrogen (%N)	=	0.00	**%**
Sulfur (%S)	=	0.00	**%**
Gross Calorific Value (GCV)	=	20,851.4	**Btu/lb**
Heat Content (H_t)	=	1,185.94	**Btu/scf**

Sample Calculations:

F-Factor:

$$F_d = \frac{10^6 \times \left[(3.64 \times \%H) + (1.53 \times \%C) + (0.57 \times \%S) + (0.14 \times \%N) - (0.46 \times \%O)\right]}{GCV} = 8{,}540.23 \quad \textbf{dscf/10}^6\textbf{ Btu}$$

USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace North
Test Date: 06/20/08
Test Run #: 2
Test Time: 1018-1118

Data Input:

Average chart reading (C):	48.31	**ppmv db**
Average pre/post-test zero calibration reading (C_o):	0.45	**ppmv db**
Calibration gas concentration (C_{ma}):	50.0	**ppmv db**
Average pre/post-test calibration gas reading (C_m):	49.22	**ppmv db**
Compound molecular weight (MW):	46.00	**lb/lb-mole**
Oxygen Conc.:	9.56	**% db**
O_2 based F-factor (F_d):	8,540.23	**dscf/MMBtu**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

NOx
Corrected for zero and calibration drift:

$$C_{gas} = \left(\overline{C} - C_O\right)\frac{C_{ma}}{C_m - C_O}$$ = **49.06 ppmv db**

NOx
Concentration:

$$C_{gas,lb/dscf} = C_{gas} \times \left(\frac{MW\ lb/lb-mole}{385.26 \times 10^6\ ft^3/lb-mole}\right)$$ = **5.858 x 10-6 lb/dscf**

NO_x Mass Emission Rate

$$E_{NO_x(lb/MMBtu)} = E_{NO_x(lb/dscf)} \times F_d \times \left(\frac{20.9}{20.9 - \%O_2}\right)$$ = **0.0922 lb/MMBtu**

USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace North
Test Date: 06/20/08
Test Run #: 2
Test Time: 1018-1118

Data Input:

Average chart reading (C):	46.07	**ppmv db**
Average pre/post-test zero calibration reading (C_o):	1.10	**ppmv db**
Calibration gas concentration (C_{ma}):	50.0	**ppmv db**
Average pre/post-test calibration gas reading (C_m):	48.76	**ppmv db**
Compound molecular weight (MW):	46.00	**lb/lb-mole**
Oxygen Conc.:	9.95	**% db**
O_2 based F-factor (F_d):	8,540.23	**dscf/MMBtu**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

NOx
Corrected for zero and calibration drift:

$$C_{gas} = \left(\bar{C} - C_O\right)\frac{C_{ma}}{C_m - C_O}$$ = **47.18 ppmv db**

NOx
Concentration:

$$C_{gas,lb/dscf} = C_{gas}\ x\left(\frac{MW\ \ lb/lb-mole}{385.26x10^6\ ft^3\ /\ lb-mole}\right)$$ = **5.633 x 10-6 lb/dscf**

NO_x Mass Emission Rate

$$E_{NO_x(lb/MMBtu)} = E_{NO_x(lb/dscf)} \times F_d \times \left(\frac{20.9}{20.9 - \%O_2}\right)$$ = **0.0918 lb/MMBtu**

USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace
Test Date: 06/20/08
Test Run #: 3
Test Time: 1254-1354

Data Input:

North Duct: Average NOx Emissions(E_{NOx} North):	0.0871	**lb/MMBtu**
South Duct: Average NOx Emissions(E_{NOx} South):	0.0883	**lb/MMBtu**
Combined: Average NOx Emissions(E_{NOx}):	0.0877	**lb/MMBtu**
North Duct: Average O2 Conc.(C_{O2} North):	9.18	**% db**
South Duct: Average O2 Conc.(C_{O2} South):	9.68	**% db**
Combined: Average O2 Conc. (C_{O2}):	9.43	**% db**
O_2 based F-factor (F_d):	8,506.89	**dscf/MMBtu**
Furnace Fuel Gas Flow Rate (Q_{std}):	112,323	**dscfh**
Heat Content of Fuel Gas (H_t):	1,137.79	**Btu/scf**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

$$Hi_{(MMBtu/hr)} = Ht_{(Btu/dscf)} \times Q_{std\ (dscfh)}$$ = **127.80 MMBtu/hr**

Average NOx Emission rate:

$$E_{gas,lb/hr} = E_{gas,lb/MMBtu} \times Hi_{MMBtu/hr}$$ = **11.21 lb/hr**

Oxygen Based F-Factor Method

COMPANY: BP Husky Refining LLC
LOCATION: Toledo, Ohio
SOURCE: H2 Furnace
RUN NO: 3
TEST DATE: 06/20/08

INPUT

Carbon (%C)	=	72.22	**%**
Hydrogen (%H)	=	19.60	**%**
Oxygen (%O)	=	8.18	**%**
Nitrogen (%N)	=	0.00	**%**
Sulfur (%S)	=	0.00	**%**
Gross Calorific Value (GCV)	=	20,935.2	**Btu/lb**
Heat Content (H_t)	=	1,137.79	**Btu/scf**

Sample Calculations:

F-Factor:

$$F_d = \frac{10^6 \times \left[(3.64 \times \%H) + (1.53 \times \%C) + (0.57 \times \%S) + (0.14 \times \%N) - (0.46 \times \%O)\right]}{GCV} = 8{,}506.89 \quad \textbf{dscf/10}^6\textbf{ Btu}$$

USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace North
Test Date: 06/20/08
Test Run #: 3
Test Time: 1254-1354

Data Input:

Average chart reading (C):	46.78	**ppmv db**
Average pre/post-test zero calibration reading (C_o):	0.35	**ppmv db**
Calibration gas concentration (C_{ma}):	50.0	**ppmv db**
Average pre/post-test calibration gas reading (C_m):	48.62	**ppmv db**
Compound molecular weight (MW):	46.00	**lb/lb-mole**
Oxygen Conc.:	9.18	**% db**
O_2 based F-factor (F_d):	8,506.89	**dscf/MMBtu**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

NOx
Corrected for zero and calibration drift:

$$C_{gas} = \left(\overline{C} - C_O\right)\frac{C_{ma}}{C_m - C_O}$$ = **48.10 ppmv db**

NOx
Concentration:

$$C_{gas,lb/dscf} = C_{gas} \times \left(\frac{MW\ lb/lb-mole}{385.26 \times 10^6\ ft^3/\ lb-mole}\right)$$ = **5.743 x 10-6 lb/dscf**

NO_x Mass Emission Rate

$$E_{NO_x(lb/MMBtu)} = E_{NO_x(lb/dscf)} \times F_d \times \left(\frac{20.9}{20.9 - \%O_2}\right)$$ = **0.0871 lb/MMBtu**

USEPA Method 7-E
NOx
Calibration Drift Correction And Emission Rate Calculation

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace North
Test Date: 06/20/08
Test Run #: 3
Test Time: 1254-1354

Data Input:

Average chart reading (C):	45.01	**ppmv db**
Average pre/post-test zero calibration reading (C_o):	1.27	**ppmv db**
Calibration gas concentration (C_{ma}):	50.0	**ppmv db**
Average pre/post-test calibration gas reading (C_m):	48.15	**ppmv db**
Compound molecular weight (MW):	46.00	**lb/lb-mole**
Oxygen Conc.:	9.68	**% db**
O_2 based F-factor (F_d):	8,506.89	**dscf/MMBtu**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

NOx
Corrected for zero and calibration drift:

$$C_{gas} = \left(\overline{C} - C_O\right)\frac{C_{ma}}{C_m - C_O}$$ = **46.65 ppmv db**

NOx
Concentration:

$$C_{gas,lb/dscf} = C_{gas}\ x\left(\frac{MW\ \ lb/lb-mole}{385.26x10^6\ ft^3\ /\ lb-mole}\right)$$ = **5.570 x 10-6 lb/dscf**

NO_x Mass Emission Rate

$$E_{NO_x(lb/MMBtu)} = E_{NO_x(lb/dscf)} \times F_d \times \left(\frac{20.9}{20.9 - \%O_2}\right)$$ = **0.0883 lb/MMBtu**

TRAVERSE POINT LOCATION FOR CIRCULAR AND RECTANGULAR DUCTS

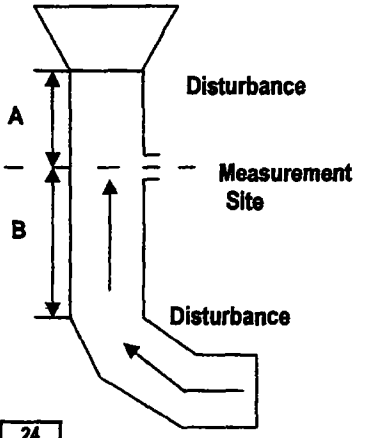
A-14

PLANT BP Husky
DATE 6-20-08
SAMPLING LOCATION Hydrogen Furnace
INSIDE OF FAR WALL TO OUTSIDE OF PORT (DISTANCE C) North and South Ducts
INSIDE OF NEAR WALL TO OUTSIDE OF PORT (DISTANCE D)
STACK ID 48" Deep x 83" Wide
NEAREST UPSTREAM DISTURBANCE (A) 7"
NEAREST DOWNSTREAM DISTURBANCE (B) 105"

CALCULATOR Rob Burton

Location of Traverse Points in Rectangular Stacks

	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8

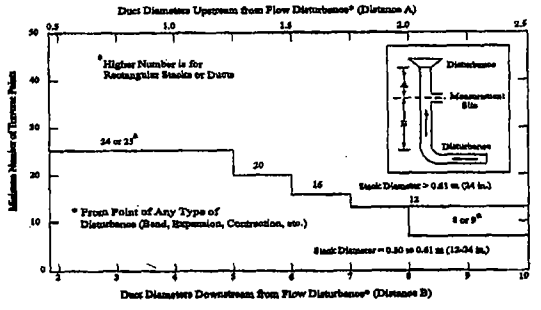


Rectangular Duct Equivalent Diameter Determination $\frac{2 \times L \times W}{L + W}$

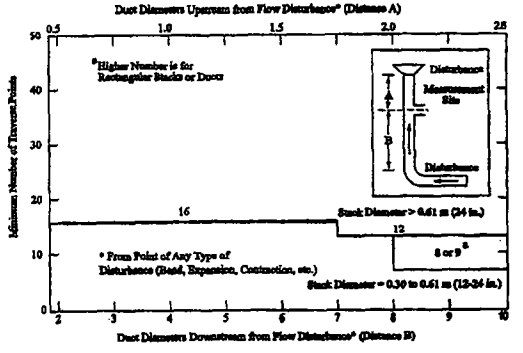
TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 1 AND 2 (TO NEAREST 1/8 INCH)	DISTANCE D (PORT DEPTH)	TRAVERSE POINT LOCATION FROM OUTSIDE OF PORT (SUM OF COLUMNS 3 AND 4)
1	16.7	48			8.0
2	50.0	48			24.0
3	83.3	48			40.0
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

LOCATION OF TRAVERSE POINTS ON CIRCULAR STACKS

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						96.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9



Minimum number of traverse points for particulate traverses.



Minimum number of traverse points for velocity (nonparticulate) traverses.

APPENDIX B ARI Reference Method Monitoring Data

Reference Method Monitor Data
One-Minute Averages

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace North
Test Date: 6/20/2008
Run #: 1
Test Time: 0840-0940

Reference Method Monitor #1:	
Analyzer Type:	**Oxygen**
Analyzer Scale:	20.00 %
Pre-test calibration span value:	9.95 %
Post-test calibration span value	9.97 %
Pre-test calibration zero value:	0.05 %
Post-test calibration zero value:	0.06 %
Calibration gas type:	Protocol 1 Oxygen %
Calibration gas concentration:	10.00 %
Monitor uncorrected average:	9.57 %
Monitor drift corrected average:	**9.61 %**

Reference Method Monitor #3:	
Analyzer Type:	**NOX**
Analyzer Scale:	90.52 ppm
Pre-test calibration span value:	49.60 ppm
Post-test calibration span value	50.21 ppm
Pre-test calibration zero value:	0.31 ppm
Post-test calibration zero value:	0.45 ppm
Calibration gas type:	Protocol 1 Nox ppm
Calibration gas concentration:	50.00 ppm
Monitor uncorrected average:	49.11 ppm
Monitor drift corrected average:	**49.20 ppm**

Clock Time	Elapsed Time	Oxygen Monitor #1 %	NOX Monitor #3 ppm
08 : 40	0		
08 : 41	1	9.4	49.5
08 : 42	2	9.5	50.0
08 : 43	3	9.3	49.8
08 : 44	4	9.4	49.1
08 : 45	5	9.5	49.0
08 : 46	6	9.4	50.0
08 : 47	7	9.3	50.0
08 : 48	8	9.5	49.7
08 : 49	9	9.4	49.7
08 : 50	10	9.6	49.5
08 : 51	11	9.5	49.5
08 : 52	12	9.6	49.1
08 : 53	13	9.5	49.5
08 : 54	14	9.5	49.3
08 : 55	15	9.5	49.3
08 : 56	16	9.5	49.4
08 : 57	17	9.6	49.2
08 : 58	18	9.8	49.2
08 : 59	19	9.6	49.2
9 : 0	20	9.5	48.9
9 : 1	21	9.6	49.2
9 : 2	22	9.5	49.1
9 : 3	23	9.5	48.9
9 : 4	24	9.4	49.2
9 : 5	25	9.6	48.9
9 : 6	26	9.6	49.1
9 : 7	27	9.6	48.9
9 : 8	28	9.6	49.2
9 : 9	29	9.6	49.1
9 : 10	30	9.6	48.9
9 : 11	31	9.6	49.0
9 : 12	32	9.6	48.8
9 : 13	33	9.5	49.1
9 : 14	34	9.7	49.1
9 : 15	35	9.5	49.5
9 : 16	36	9.7	49.0
9 : 17	37	9.6	49.2
9 : 18	38	9.6	49.0
9 : 19	39	9.6	48.9
9 : 20	40	9.6	49.2
9 : 21	41	9.7	49.4
9 : 22	42	9.6	48.8
9 : 23	43	9.6	48.9
9 : 24	44	9.7	49.0
9 : 25	45	9.5	49.1
9 : 26	46	9.6	48.8
9 : 27	47	9.6	48.6
9 : 28	48	9.7	48.7
9 : 29	49	9.6	48.9
9 : 30	50	9.7	48.8
9 : 31	51	9.6	48.8
9 : 32	52	9.6	48.8
9 : 33	53	9.7	48.9
9 : 34	54	9.7	48.7
9 : 35	55	9.7	48.9
9 : 36	56	9.6	48.8
9 : 37	57	9.6	49.1
9 : 38	58	9.6	46.9
9 : 39	59	9.7	48.7
9 : 40	60	9.8	48.8
	AVERAGE:	**9.6**	**49.1**

		Oxygen	
STRATIFICATION CHECK	**PT # 1 AVERAGE**	9.5	49.4
	PT # 2 AVERAGE	9.6	49.1
	PT # 3 AVERAGE	9.6	48.9
	AVERAGE	**9.6**	**49.1**

Reference Method Monitor Data
One-Minute Averages

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace South
Test Date: 6/20/2008
Run #: 1
Test Time: 0840-0940

Reference Method Monitor #1:	
Analyzer Type:	**Oxygen**
Analyzer Scale:	20.00 %
Pre-test calibration span value:	9.92 %
Post-test calibration span value	10.14 %
Pre-test calibration zero value:	-0.01 %
Post-test calibration zero value:	0.09 %
Calibration gas type:	Protocol 1 Oxygen %
Calibration gas concentration:	10.00 %
Monitor uncorrected average:	10.28 %
Monitor drift corrected average:	**10.25 %**

Reference Method Monitor #3:	
Analyzer Type:	**NOX**
Analyzer Scale:	90.52 ppm
Pre-test calibration span value:	48.60 ppm
Post-test calibration span value	49.41 ppm
Pre-test calibration zero value:	0.35 ppm
Post-test calibration zero value:	0.97 ppm
Calibration gas type:	Protocol 1 Nox ppm
Calibration gas concentration:	50.00 ppm
Monitor uncorrected average:	45.96 ppm
Monitor drift corrected average:	**46.84 ppm**

Clock Time	Elapsed Time	Oxygen Monitor #1 %	NOX Monitor #3 ppm
08 : 40	0		
08 : 41	1	10.1	45.0
08 : 42	2	10.1	45.0
08 : 43	3	10.0	45.1
08 : 44	4	10.0	45.1
08 : 45	5	10.1	45.1
08 : 46	6	10.1	45.4
08 : 47	7	10.1	45.5
08 : 48	8	10.3	46.0
08 : 49	9	10.3	46.5
08 : 50	10	10.4	46.4
08 : 51	11	10.4	46.7
08 : 52	12	10.4	46.4
08 : 53	13	10.3	46.0
08 : 54	14	10.3	45.2
08 : 55	15	10.4	45.2
08 : 56	16	10.3	45.2
08 : 57	17	10.3	45.1
08 : 58	18	10.3	43.5
08 : 59	19	10.3	43.8
9 : 0	20	10.1	45.1
9 : 1	21	10.2	43.8
9 : 2	22	10.3	43.4
9 : 3	23	10.4	44.9
9 : 4	24	10.3	45.7
9 : 5	25	10.3	46.0
9 : 6	26	10.4	45.6
9 : 7	27	10.4	45.6
9 : 8	28	10.4	45.7
9 : 9	29	10.4	45.7
9 : 10	30	10.4	45.7
9 : 11	31	10.4	45.9
9 : 12	32	10.5	45.8
9 : 13	33	10.3	46.2
9 : 14	34	10.5	46.2
9 : 15	35	10.3	46.2
9 : 16	36	10.5	46.2
9 : 17	37	10.5	46.2
9 : 18	38	10.4	46.6
9 : 19	39	10.3	46.9
9 : 20	40	10.2	46.6
9 : 21	41	10.2	46.8
9 : 22	42	10.2	46.6
9 : 23	43	10.2	47.3
9 : 24	44	10.2	47.3
9 : 25	45	10.2	46.9
9 : 26	46	10.2	46.4
9 : 27	47	10.1	46.6
9 : 28	48	10.3	46.4
9 : 29	49	10.2	46.3
9 : 30	50	10.3	46.3
9 : 31	51	10.3	46.6
9 : 32	52	10.2	46.9
9 : 33	53	10.2	46.9
9 : 34	54	10.3	46.8
9 : 35	55	10.3	46.9
9 : 36	56	10.2	47.1
9 : 37	57	10.2	46.5
9 : 38	58	10.2	46.9
9 : 39	59	10.4	46.3
9 : 40	60	10.6	47.2
	AVERAGE:	**10.3**	**46.0**

		Oxygen	
STRATIFICATION CHECK	**PT # 1 AVERAGE**	10.2	45.4
	PT # 2 AVERAGE	10.4	45.8
	PT # 3 AVERAGE	10.3	46.7
	AVERAGE	**10.3**	**46.0**

Reference Method Monitor Data
One-Minute Averages

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace North
Test Date: 6/20/2008
Run #: 2
Test Time: 1018-1118

Reference Method Monitor #1:	
Analyzer Type:	**Oxygen**
Analyzer Scale:	20.00 %
Pre-test calibration span value:	9.97 %
Post-test calibration span value	9.93 %
Pre-test calibration zero value:	0.06 %
Post-test calibration zero value:	-0.01 %
Calibration gas type:	Protocol 1 Oxygen %
Calibration gas concentration:	10.00 %
Monitor uncorrected average:	9.51 %
Monitor drift corrected average:	**9.58 %**

Reference Method Monitor #3:	
Analyzer Type:	**NOX**
Analyzer Scale:	90.52 ppm
Pre-test calibration span value:	50.21 ppm
Post-test calibration span value	48.24 ppm
Pre-test calibration zero value:	0.45 ppm
Post-test calibration zero value:	0.44 ppm
Calibration gas type:	Protocol 1 Nox ppm
Calibration gas concentration:	50.00 ppm
Monitor uncorrected average:	48.31 ppm
Monitor drift corrected average:	**49.06 ppm**

Clock Time	Elapsed Time	Oxygen Monitor #1 %	NOX Monitor #3 ppm
10 : 18	0		
10 : 19	1	9.5	48.6
10 : 20	2	9.6	48.7
10 : 21	3	9.5	48.6
10 : 22	4	9.5	48.5
10 : 23	5	9.4	48.7
10 : 24	6	9.4	49.0
10 : 25	7	9.5	48.7
10 : 26	8	9.4	48.8
10 : 27	9	9.4	48.5
10 : 28	10	9.5	48.8
10 : 29	11	9.4	48.7
10 : 30	12	9.5	48.2
10 : 31	13	9.4	48.5
10 : 32	14	9.4	48.3
10 : 33	15	9.4	48.3
10 : 34	16	9.4	48.4
10 : 35	17	9.3	48.3
10 : 38	18	9.3	47.8
10 : 37	19	9.3	48.1
10 : 38	20	9.3	48.0
10 : 39	21	9.4	48.1
10 : 40	22	9.4	48.6
10 : 41	23	9.4	48.4
10 : 42	24	9.3	48.7
10 : 43	25	9.4	48.7
10 : 44	26	9.5	48.9
10 : 45	27	9.4	48.4
10 : 46	28	9.4	48.6
10 : 47	29	9.5	48.3
10 : 48	30	9.5	48.5
10 : 49	31	9.4	48.7
10 : 50	32	9.3	48.8
10 : 51	33	9.4	48.7
10 : 52	34	9.4	48.5
10 : 53	35	9.4	48.4
10 : 54	36	9.4	48.8
10 : 55	37	9.3	48.3
10 : 56	38	9.4	48.5
10 : 57	39	9.4	48.4
10 : 58	40	9.6	48.1
10 : 59	41	9.7	48.0
11 : 0	42	9.7	48.5
11 : 1	43	9.7	48.1
11 : 2	44	9.7	48.3
11 : 3	45	9.8	48.5
11 : 4	46	9.8	47.7
11 : 5	47	9.8	48.0
11 : 6	48	9.8	48.1
11 : 7	49	9.8	47.9
11 : 8	50	9.7	48.1
11 : 9	51	9.8	47.8
11 : 10	52	9.6	48.1
11 : 11	53	9.6	48.1
11 : 12	54	9.7	48.2
11 : 13	55	9.6	47.9
11 : 14	56	9.6	47.9
11 : 15	57	9.8	47.5
11 : 16	58	9.7	47.2
11 : 17	59	9.7	47.3
11 : 18	60	9.7	47.6
	AVERAGE:	**9.5**	**48.3**

		Oxygen	
STRATIFICATION CHECK	**PT # 1 AVERAGE**	9.4	48.5
	PT # 2 AVERAGE	9.4	48.5
	PT # 3 AVERAGE	9.7	47.9
	AVERAGE	**9.5**	**48.3**

Reference Method Monitor Data
One-Minute Averages

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace South
Test Date: 6/20/2008
Run #: 2
Test Time: 1018-1118

Reference Method Monitor #1:	
Analyzer Type:	**Oxygen**
Analyzer Scale:	20.00 %
Pre-test calibration span value:	10.14 %
Post-test calibration span value	9.96 %
Pre-test calibration zero value:	0.09 %
Post-test calibration zero value:	0.03 %
Calibration gas type:	Protocol 1 Oxygen %
Calibration gas concentration:	10.00 %
Monitor uncorrected average:	10.00 %
Monitor drift corrected average:	**9.95 %**

Reference Method Monitor #3:	
Analyzer Type:	**NOX**
Analyzer Scale:	90.52 ppm
Pre-test calibration span value:	49.41 ppm
Post-test calibration span value	48.11 ppm
Pre-test calibration zero value:	0.97 ppm
Post-test calibration zero value:	1.23 ppm
Calibration gas type:	Protocol 1 Nox ppm
Calibration gas concentration:	50.00 ppm
Monitor uncorrected average:	46.07 ppm
Monitor drift corrected average:	**47.18 ppm**

Clock Time	Elapsed Time	Oxygen Monitor #1 %	NOX Monitor #3 ppm
10 : 18	0		
10 : 19	1	9.9	46.2
10 : 20	2	10.0	45.1
10 : 21	3	10.0	45.9
10 : 22	4	10.0	45.3
10 : 23	5	10.0	45.9
10 : 24	6	9.8	45.9
10 : 25	7	10.0	45.9
10 : 26	8	10.0	45.8
10 : 27	9	10.0	46.0
10 : 28	10	10.0	46.2
10 : 29	11	9.9	46.4
10 : 30	12	10.0	45.9
10 : 31	13	9.8	46.3
10 : 32	14	9.9	46.1
10 : 33	15	9.9	46.0
10 : 34	16	9.9	46.5
10 : 35	17	9.8	46.4
10 : 36	18	9.8	45.9
10 : 37	19	9.7	46.2
10 : 38	20	9.8	45.8
10 : 39	21	9.9	45.9
10 : 40	22	9.9	46.4
10 : 41	23	9.9	46.8
10 : 42	24	9.9	46.4
10 : 43	25	10.0	46.6
10 : 44	26	9.9	46.7
10 : 45	27	9.9	46.8
10 : 46	28	9.9	46.3
10 : 47	29	10.0	45.9
10 : 48	30	10.0	48.7
10 : 49	31	9.9	46.6
10 : 50	32	9.9	46.5
10 : 51	33	9.9	46.4
10 : 52	34	9.9	46.7
10 : 53	35	9.9	46.2
10 : 54	36	9.9	46.5
10 : 55	37	9.9	46.3
10 : 56	38	9.9	46.3
10 : 57	39	10.0	45.7
10 : 58	40	10.2	45.7
10 : 59	41	10.2	46.2
11 : 0	42	10.2	46.5
11 : 1	43	10.2	46.4
11 : 2	44	10.2	45.8
11 : 3	45	10.2	45.6
11 : 4	46	10.2	45.3
11 : 5	47	10.3	45.1
11 : 6	46	10.2	45.8
11 : 7	49	10.3	46.4
11 : 8	50	10.2	46.0
11 : 9	51	10.2	46.0
11 : 10	52	10.1	46.0
11 : 11	53	10.1	46.3
11 : 12	54	10.2	45.6
11 : 13	55	10.1	45.6
11 : 14	56	10.1	45.4
11 : 15	57	10.0	46.3
11 : 16	58	9.9	46.1
11 : 17	59	10.2	45.3
11 : 18	60	10.1	45.6
	AVERAGE:	**10.0**	**46.1**

		Oxygen	
STRATIFICATION CHECK	**PT # 1 AVERAGE**	9.9	46.0
	PT # 2 AVERAGE	9.9	46.4
	PT # 3 AVERAGE	10.2	45.9
	AVERAGE	**10.0**	**46.1**

Reference Method Monitor Data
One-Minute Averages

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace North
Test Date: 6/20/2008
Run #: 3
Test Time: 1254-1354

Reference Method Monitor #1:	
Analyzer Type:	**Oxygen**
Analyzer Scale:	20.00 %
Pre-test calibration span value:	9.93 %
Post-test calibration span value	9.87 %
Pre-test calibration zero value:	-0.01 %
Post-test calibration zero value:	0.00 %
Calibration gas type:	Protocol 1 Oxygen %
Calibration gas concentration:	10.00 %
Monitor uncorrected average:	9.09 %
Monitor drift corrected average:	**9.18 %**

Reference Method Monitor #3:	
Analyzer Type:	**NOX**
Analyzer Scale:	90.52 ppm
Pre-test calibration span value:	48.24 ppm
Post-test calibration span value	49.00 ppm
Pre-test calibration zero value:	0.44 ppm
Post-test calibration zero value:	0.25 ppm
Calibration gas type:	Protocol 1 Nox ppm
Calibration gas concentration:	50.00 ppm
Monitor uncorrected average:	46.78 ppm
Monitor drift corrected average:	**48.10 ppm**

Clock Time	Elapsed Time	Oxygen Monitor #1 %	NOX Monitor #3 ppm
12 : 54	0		
12 : 55	1	9.2	46.4
12 : 56	2	9.2	46.2
12 : 57	3	9.0	46.5
12 : 58	4	9.0	46.6
12 : 59	5	9.1	46.4
13 : 0	6	9.1	46.3
13 : 1	7	9.1	46.2
13 : 2	8	9.1	46.7
13 : 3	9	9.1	46.7
13 : 4	10	9.1	46.7
13 : 5	11	9.1	47.1
13 : 6	12	9.0	46.7
13 : 7	13	9.1	46.9
13 : 8	14	9.2	46.9
13 : 9	15	9.2	46.9
13 : 10	16	9.3	46.9
13 : 11	17	9.3	46.9
13 : 12	18	9.3	47.2
13 : 13	19	9.3	47.0
13 : 14	20	9.3	47.1
13 : 15	21	9.3	47.1
13 : 16	22	9.1	46.4
13 : 17	23	8.9	46.7
13 : 18	24	9.2	46.8
13 : 19	25	9.4	47.0
13 : 20	26	9.2	47.0
13 : 21	27	9.2	46.4
13 : 22	28	9.2	46.6
13 : 23	29	9.0	46.9
13 : 24	30	9.1	46.8
13 : 25	31	9.2	46.6
13 : 26	32	9.3	46.7
13 : 27	33	9.3	46.8
13 : 28	34	9.3	47.0
13 : 29	35	9.2	47.1
13 : 30	36	9.2	46.7
13 : 31	37	9.3	46.8
13 : 32	38	9.1	46.9
13 : 33	39	9.0	47.2
13 : 34	40	9.2	47.0
13 : 35	41	9.3	47.6
13 : 36	42	9.2	47.1
13 : 37	43	9.1	46.8
13 : 38	44	9.0	47.2
13 : 39	45	8.7	47.7
13 : 40	46	8.7	47.0
13 : 41	47	8.8	46.3
13 : 42	48	8.9	46.5
13 : 43	49	8.8	46.5
13 : 44	50	8.9	46.7
13 : 45	51	8.7	46.2
13 : 46	52	8.8	45.9
13 : 47	53	8.9	46.6
13 : 48	54	8.8	47.1
13 : 49	55	8.8	46.9
13 : 50	56	9.0	47.0
13 : 51	57	8.9	47.0
13 : 52	58	9.2	46.5
13 : 53	59	9.2	46.8
13 : 54	60	9.2	47.0
	AVERAGE:	**9.1**	**46.8**

		Oxygen	
STRATIFICATION CHECK	**PT # 1 AVERAGE**	9.1	46.7
	PT # 2 AVERAGE	9.2	46.8
	PT # 3 AVERAGE	8.9	46.8
	AVERAGE	**9.1**	**46.8**

Reference Method Monitor Data
One-Minute Averages

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Source: Hydrogen Furnace South
Test Date: 6/20/2008
Run #: 3
Test Time: 1254-1354

Reference Method Monitor #1:	
Analyzer Type:	**Oxygen**
Analyzer Scale:	20.00 %
Pre-test calibration span value:	9.98 %
Post-test calibration span value	9.92 %
Pre-test calibration zero value:	0.03 %
Post-test calibration zero value:	0.00 %
Calibration gas type:	Protocol 1 Oxygen %
Calibration gas concentration:	10.00 %
Monitor uncorrected average:	9.62 %
Monitor drift corrected average:	**9.68 %**

Reference Method Monitor #3:	
Analyzer Type:	**NOX**
Analyzer Scale:	90.52 ppm
Pre-test calibration span value:	48.11 ppm
Post-test calibration span value	48.20 ppm
Pre-test calibration zero value:	1.23 ppm
Post-test calibration zero value:	1.31 ppm
Calibration gas type:	Protocol 1 Nox ppm
Calibration gas concentration:	50.00 ppm
Monitor uncorrected average:	45.01 ppm
Monitor drift corrected average:	**46.65 ppm**

Clock Time	Elapsed Time	Oxygen Monitor #1 %	NOX Monitor #3 ppm
12 : 54	0		
12 : 55	1	9.6	45.2
12 : 56	2	9.5	45.0
12 : 57	3	9.5	44.8
12 : 58	4	9.5	45.4
12 : 59	5	9.6	45.0
13 : 0	6	9.5	45.0
13 : 1	7	9.5	45.0
13 : 2	8	9.6	45.0
13 : 3	9	9.6	44.8
13 : 4	10	9.6	45.1
13 : 5	11	9.6	45.2
13 : 6	12	9.5	45.1
13 : 7	13	9.6	45.5
13 : 8	14	9.6	45.6
13 : 9	15	9.8	45.5
13 : 10	16	9.8	45.4
13 : 11	17	9.7	45.3
13 : 12	18	9.8	45.4
13 : 13	19	9.8	45.1
13 : 14	20	9.8	45.3
13 : 15	21	9.7	45.5
13 : 16	22	9.5	45.8
13 : 17	23	9.4	44.9
13 : 18	24	9.7	44.7
13 : 19	25	9.7	45.6
13 : 20	26	9.7	45.2
13 : 21	27	9.7	45.2
13 : 22	28	9.7	45.8
13 : 23	29	9.6	44.9
13 : 24	30	9.7	45.0
13 : 25	31	9.8	45.1
13 : 26	32	9.8	45.1
13 : 27	33	9.8	44.8
13 : 28	34	9.7	45.3
13 : 29	35	9.6	45.6
13 : 30	36	9.7	44.8
13 : 31	37	9.8	45.0
13 : 32	38	9.8	45.0
13 : 33	39	9.6	44.9
13 : 34	40	9.9	45.3
13 : 35	41	9.9	45.4
13 : 36	42	9.9	45.0
13 : 37	43	9.8	45.2
13 : 38	44	9.6	45.1
13 : 39	45	9.4	44.9
13 : 40	46	9.2	45.3
13 : 41	47	9.4	45.0
13 : 42	48	9.4	44.9
13 : 43	49	9.4	44.2
13 : 44	50	9.4	44.0
13 : 45	51	9.4	44.2
13 : 46	52	9.5	44.1
13 : 47	53	9.6	44.0
13 : 48	54	9.4	44.5
13 : 49	55	9.4	44.9
13 : 50	56	9.5	45.0
13 : 51	57	9.4	44.8
13 : 52	58	9.8	44.5
13 : 53	59	9.8	44.2
13 : 54	60	9.8	44.0
	AVERAGE:	**9.6**	**45.0**

		Oxygen	
STRATIFICATION CHECK	**PT # 1 AVERAGE**	9.6	45.2
	PT # 2 AVERAGE	9.7	45.2
	PT # 3 AVERAGE	9.6	44.7
	AVERAGE	**9.6**	**45.0**

DAQView 15-Second DAS Averages

Client	BP Husky Refining LLC
Location	Toledo, Ohio
Source	H2 Furnace
Date	6/20/2008

	NORTH	NORTH	SOUTH	SOUTH			
Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 7:00:00	20.93	0.05	20.98	0.02	BEGIN CAL ERROR		
6/20/2008 7:00:15	20.44	0.05	20.98	0.25			
6/20/2008 7:00:30	13.19	0.20	20.98	0.40			
6/20/2008 7:00:45	3.74	1.00	20.98	0.45			
6/20/2008 7:01:00	0.46	2.63	20.98	0.07			
6/20/2008 7:01:15	0.17	0.95	20.98	0.02			
6/20/2008 7:01:30	0.12	0.18	20.98	0.02			
6/20/2008 7:01:45	0.09	0.05	20.98	0.02			
6/20/2008 7:02:00	0.08	0.05	20.98	0.02			
6/20/2008 7:02:15	0.07	0.05	20.98	0.02			
6/20/2008 7:02:30	0.07	0.05	20.98	0.02			
6/20/2008 7:02:45	0.06	0.05	20.98	0.02	Rechecking Line Integrity on North		
6/20/2008 7:03:00	0.06	0.05	20.98	0.02			
6/20/2008 7:03:15	0.05	0.05	20.98	0.02			
6/20/2008 7:03:30	0.05	0.05	20.98	0.02			
6/20/2008 7:03:45	0.05	0.05	20.98	0.02			
6/20/2008 7:04:00	0.05	0.05	20.98	0.02			
6/20/2008 7:04:15	0.05	0.05	20.98	0.02			
6/20/2008 7:04:30	0.04	0.05	20.99	0.02			
6/20/2008 7:04:45	0.04	0.05	20.88	0.02			
6/20/2008 7:05:00	0.04	0.05	9.76	0.02			
6/20/2008 7:05:15	0.05	0.05	0.79	-0.08			
6/20/2008 7:05:30	4.57	0.05	0.14	-0.08			
6/20/2008 7:05:45	16.23	0.05	0.09	-0.08			
6/20/2008 7:06:00	20.40	0.05	0.08	-0.08			
6/20/2008 7:06:15	20.82	0.10	0.06	-0.08			
6/20/2008 7:06:30	20.86	0.15	0.05	0.10			
6/20/2008 7:06:45	20.88	0.15	0.04	0.15			
6/20/2008 7:07:00	20.89	0.08	0.03	0.12			
6/20/2008 7:07:15	20.89	0.05	0.02	0.12			
6/20/2008 7:07:30	20.90	0.05	0.02	0.12			
6/20/2008 7:07:45	20.90	0.15	0.01	0.12	SOUTH		
6/20/2008 7:08:00	20.91	0.15	**0.00**	**0.12**	O2 cal gas conc.	0.00	%
6/20/2008 7:08:15	20.91	0.15	**0.00**	**0.12**	Analyzer Response	0.00	%
6/20/2008 7:08:30	20.92	0.15	**0.00**	**0.12**	NOx cal gas conc.	0.00	ppmv
6/20/2008 7:08:45	20.92	0.10	**0.00**	**0.12**	Analyzer Response	0.12	ppmv
6/20/2008 7:09:00	20.92	0.15	-0.01	0.12			
6/20/2008 7:09:15	20.92	0.10	0.00	0.12			
6/20/2008 7:09:30	20.92	0.05	5.31	0.80			
6/20/2008 7:09:45	20.92	0.05	17.45	1.82			
6/20/2008 7:10:00	20.92	0.05	19.08	0.55			
6/20/2008 7:10:15	20.92	0.05	18.96	0.22			
6/20/2008 7:10:30	20.93	0.05	19.37	0.22			
6/20/2008 7:10:45	20.93	0.05	19.82	0.22			
6/20/2008 7:11:00	20.93	0.05	20.08	0.22			
6/20/2008 7:11:15	20.93	0.05	20.18	0.22	SOUTH		
6/20/2008 7:11:30	20.93	0.05	**20.19**	0.22	O2 cal gas conc.	20.00	%
6/20/2008 7:11:45	20.93	0.05	**20.19**	0.22	Analyzer Response	20.19	%
6/20/2008 7:12:00	20.93	0.05	**20.19**	0.22			
6/20/2008 7:12:15	20.93	0.05	**20.20**	0.22			
6/20/2008 7:12:30	20.93	0.05	19.98	0.22			
6/20/2008 7:12:45	20.93	0.05	13.60	0.17			
6/20/2008 7:13:00	20.93	0.05	10.26	0.12			
6/20/2008 7:13:15	20.93	0.05	10.04	0.12			
6/20/2008 7:13:30	20.93	0.05	10.02	0.12	SOUTH		
6/20/2008 7:13:45	20.93	0.05	**10.01**	0.12	O2 cal gas conc.	10.00	%
6/20/2008 7:14:00	20.94	0.05	**10.01**	0.12	Analyzer Response	10.01	%
6/20/2008 7:14:15	20.94	0.05	**10.01**	0.12			
6/20/2008 7:14:30	20.93	0.05	**10.01**	0.12			
6/20/2008 7:14:45	20.94	0.05	9.42	0.12			
6/20/2008 7:15:00	20.94	0.05	5.88	0.12			
6/20/2008 7:15:15	20.94	0.05	5.03	0.12			
6/20/2008 7:15:30	20.94	0.05	4.98	0.12	SOUTH		
6/20/2008 7:15:45	20.94	0.05	**4.97**	0.12	O2 cal gas conc.	5.00	%
6/20/2008 7:16:00	20.94	0.05	**4.97**	0.12	Analyzer Response	4.97	%
6/20/2008 7:16:15	20.94	0.05	**4.96**	0.12			
6/20/2008 7:16:30	20.94	0.05	**4.96**	0.12			
6/20/2008 7:16:45	20.94	0.05	5.04	24.21			
6/20/2008 7:17:00	20.94	0.05	3.29	83.76			
6/20/2008 7:17:15	20.94	0.05	0.36	74.79			
6/20/2008 7:17:30	20.94	0.05	0.08	63.20			
6/20/2008 7:17:45	20.94	0.05	0.06	54.00			
6/20/2008 7:18:00	20.94	0.05	0.03	52.93			
6/20/2008 7:18:15	20.94	0.05	0.01	69.84			
6/20/2008 7:18:30	20.94	0.05	0.00	80.74			
6/20/2008 7:18:45	20.94	0.05	-0.01	90.33			
6/20/2008 7:19:00	20.94	0.13	-0.02	92.21			
6/20/2008 7:19:15	20.94	0.15	-0.02	93.48			
6/20/2008 7:19:30	20.94	0.15	-0.02	94.01			
6/20/2008 7:19:45	20.94	0.15	-0.03	94.33			
6/20/2008 7:20:00	20.94	0.15	-0.03	94.46			
6/20/2008 7:20:15	20.94	0.15	-0.03	94.53			

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 7:20:30	20.94	0.15	-0.03	94.58			
6/20/2008 7:20:45	20.95	0.15	-0.03	94.58			
6/20/2008 7:21:00	20.95	0.15	-0.03	94.58			
6/20/2008 7:21:15	20.95	0.15	-0.04	94.58			
6/20/2008 7:21:30	20.95	0.15	-0.04	94.51			
6/20/2008 7:21:45	20.95	0.15	-0.04	94.38			
6/20/2008 7:22:00	20.95	0.15	-0.04	94.38			
6/20/2008 7:22:15	20.95	0.15	-0.05	94.23			
6/20/2008 7:22:30	20.95	0.15	-0.05	94.18			
6/20/2008 7:22:45	20.95	0.15	-0.05	94.23			
6/20/2008 7:23:00	20.95	0.15	-0.05	94.18	SOUTH		
6/20/2008 7:23:15	20.95	0.15	-0.05	90.99	NOx cal gas conc.	90.52	ppmv
6/20/2008 7:23:30	20.95	0.15	-0.05	90.99	Analyzer Response	90.92	ppmv
6/20/2008 7:23:45	20.95	0.15	-0.05	90.88			
6/20/2008 7:24:00	20.95	0.15	-0.05	90.81			
6/20/2008 7:24:15	20.95	0.15	-0.05	90.94			
6/20/2008 7:24:30	20.95	0.15	-0.05	89.26			
6/20/2008 7:24:45	20.95	0.15	-0.05	77.94			
6/20/2008 7:25:00	20.95	0.15	-0.06	55.60			
6/20/2008 7:25:15	20.95	0.15	-0.06	50.05			
6/20/2008 7:25:30	20.95	0.15	-0.06	49.63			
6/20/2008 7:25:45	20.95	0.15	-0.06	49.50			
6/20/2008 7:26:00	20.95	0.15	-0.06	49.50			
6/20/2008 7:26:15	20.95	0.15	-0.06	49.40	SOUTH		
6/20/2008 7:26:30	20.95	0.15	-0.06	49.33	NOx cal gas conc.	50.00	ppmv
6/20/2008 7:26:45	20.95	0.15	-0.07	49.30	Analyzer Response	49.27	ppmv
6/20/2008 7:27:00	20.95	0.15	-0.07	49.23			
6/20/2008 7:27:15	20.95	0.15	-0.07	49.20			
6/20/2008 7:27:30	20.95	0.15	2.72	40.66	INJECT ZERO GAS UP LINE		
6/20/2008 7:27:45	20.95	0.15	16.04	20.81	BEGIN SYSTEM BIAS/RESPONSE TIME CHECKS		
6/20/2008 7:28:00	20.95	0.15	15.17	5.45			
6/20/2008 7:28:15	20.95	0.15	2.54	1.37			
6/20/2008 7:28:30	20.95	0.15	0.20	0.87			
6/20/2008 7:28:45	20.95	0.15	0.05	0.57			
6/20/2008 7:29:00	20.95	0.08	0.03	0.52			
6/20/2008 7:29:15	20.95	0.05	0.02	0.47			
6/20/2008 7:29:30	20.95	0.05	0.01	0.42			
6/20/2008 7:29:45	20.95	0.05	0.00	0.42	SOUTH		
6/20/2008 7:30:00	20.95	0.05	-0.01	0.42	O2 cal gas conc.	0.00	%
6/20/2008 7:30:15	20.95	0.05	-0.01	0.32	Analyzer Response	-0.01	%
6/20/2008 7:30:30	20.95	0.05	-0.01	0.32	NOx cal gas conc.	0.00	ppmv
6/20/2008 7:30:45	20.95	0.05	-0.01	0.32	Analyzer Response	0.35	ppmv
6/20/2008 7:31:00	20.95	0.05	-0.02	0.32	INJECT 50 PPMV NOX		
6/20/2008 7:31:15	20.95	0.05	-0.02	0.32			
6/20/2008 7:31:30	20.95	0.05	0.13	0.32			
6/20/2008 7:31:45	20.95	0.05	11.14	0.32			
6/20/2008 7:32:00	20.95	0.10	9.66	0.17			
6/20/2008 7:32:15	20.95	0.05	0.85	29.66			
6/20/2008 7:32:30	20.95	0.05	0.06	42.06			
6/20/2008 7:32:45	20.95	0.05	0.01	46.45			
6/20/2008 7:33:00	20.95	0.05	0.00	46.15			
6/20/2008 7:33:15	20.95	0.05	-0.01	46.45			
6/20/2008 7:33:30	20.95	0.05	-0.01	46.45			
6/20/2008 7:33:45	20.95	0.05	-0.01	46.15			
6/20/2008 7:34:00	20.95	0.05	-0.01	46.20			
6/20/2008 7:34:15	20.95	0.05	-0.01	47.20	INJECT 10% O2		
6/20/2008 7:34:30	20.95	0.05	-0.01	47.80	O2 RESPONSE TIME UPSCALE		
6/20/2008 7:34:45	20.95	0.05	-0.02	48.25	2.0 MINUTES		
6/20/2008 7:35:00	20.95	0.05	0.04	48.33			
6/20/2008 7:35:15	20.95	0.05	6.20	32.26			
6/20/2008 7:35:30	20.95	0.05	6.60	18.60			
6/20/2008 7:35:45	20.95	0.05	9.44	6.27			
6/20/2008 7:36:00	20.95	0.05	9.82	1.87			
6/20/2008 7:36:15	20.95	0.05	9.86	0.72			
6/20/2008 7:36:30	20.95	0.05	9.88	0.60			
6/20/2008 7:36:45	20.95	0.05	9.89	0.52			
6/20/2008 7:37:00	20.96	0.05	9.90	0.45			
6/20/2008 7:37:15	20.95	0.05	9.90	0.42			
6/20/2008 7:37:30	20.95	0.05	9.91	0.42			
6/20/2008 7:37:45	20.95	0.05	9.91	0.42			
6/20/2008 7:38:00	20.95	0.08	9.91	0.35	SOUTH		
6/20/2008 7:38:15	20.95	0.15	9.92	0.32	O2 cal gas conc.	10.00	%
6/20/2008 7:38:30	20.96	0.15	9.92	0.32	Analyzer Response	9.92	%
6/20/2008 7:38:45	20.95	0.15	9.92	0.32	INJECT 50 PPMV NOX		
6/20/2008 7:39:00	20.95	0.15	9.92	0.32			
6/20/2008 7:39:15	20.95	0.10	9.93	0.32			
6/20/2008 7:39:30	20.95	0.05	10.44	0.32	O2 RESPONSE TIME DOWNSCALE		
6/20/2008 7:39:45	20.96	0.05	13.20	5.37	1.75 MINUTES		
6/20/2008 7:40:00	20.96	0.05	3.77	20.81			
6/20/2008 7:40:15	20.96	0.05	0.35	39.41			
6/20/2008 7:40:30	20.96	0.05	0.11	46.03			
6/20/2008 7:40:45	20.96	0.05	0.08	46.15			
6/20/2008 7:41:00	20.96	0.05	0.06	46.30	NOX RESPONSE TIME UPSCALE		
6/20/2008 7:41:15	20.96	0.05	0.04	46.10	3.50 MINUTES		
6/20/2008 7:41:30	20.96	0.05	0.04	46.18			
6/20/2008 7:41:45	20.96	0.05	0.03	46.65			
6/20/2008 7:42:00	20.96	0.05	0.02	47.65			
6/20/2008 7:42:15	20.96	0.05	0.02	48.15			
6/20/2008 7:42:30	20.96	0.15	0.02	48.40			
6/20/2008 7:42:45	20.96	0.15	0.02	48.55			

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 7:43:00	20.96	0.15	0.01	48.63			
6/20/2008 7:43:15	20.96	0.15	0.01	48.70			
6/20/2008 7:43:30	20.96	0.15	0.01	48.68	SOUTH		
6/20/2008 7:43:45	20.96	0.15	0.01	48.60	NOx cal gas conc.	50.00	ppmv
6/20/2008 7:44:00	20.96	0.15	0.01	48.60	Analyzer Response	48.60	ppmv
6/20/2008 7:44:15	20.96	0.15	0.01	48.60			
6/20/2008 7:44:30	20.96	0.15	0.00	48.60			
6/20/2008 7:44:45	20.96	0.15	0.00	48.60	NOX RESPONSE TIME DOWNSCALE		
6/20/2008 7:45:00	20.96	0.15	0.00	48.35	3.00 MINUTES		
6/20/2008 7:45:15	20.17	0.15	0.71	47.25			
6/20/2008 7:45:30	9.48	0.15	3.93	28.39			
6/20/2008 7:45:45	1.02	0.10	17.48	11.72			
6/20/2008 7:46:00	0.09	0.05	20.54	15.27			
6/20/2008 7:46:15	0.05	0.05	20.75	10.92			
6/20/2008 7:46:30	0.04	0.05	20.79	6.62			
6/20/2008 7:46:45	0.03	0.05	20.82	4.02			
6/20/2008 7:47:00	0.03	0.05	20.83	2.85			
6/20/2008 7:47:15	0.03	0.05	20.85	2.12			
6/20/2008 7:47:30	0.03	0.05	20.85	1.70	NORTH		
6/20/2008 7:47:45	0.02	0.05	20.86	1.37	O2 cal gas conc.	0.00	%
6/20/2008 7:48:00	0.02	0.05	20.87	1.22	Analyzer Response	0.02	%
6/20/2008 7:48:15	0.02	0.05	20.88	1.07	NOx cal gas conc.	0.00	ppmv
6/20/2008 7:48:30	0.02	0.05	20.89	0.92	Analyzer Response	0.05	ppmv
6/20/2008 7:48:45	0.02	0.05	20.89	0.82			
6/20/2008 7:49:00	0.02	0.05	20.89	0.75			
6/20/2008 7:49:15	3.24	0.05	20.90	0.72			
6/20/2008 7:49:30	11.87	1.08	20.90	0.65			
6/20/2008 7:49:45	17.39	1.66	20.91	0.62			
6/20/2008 7:50:00	19.73	1.23	20.91	0.55			
6/20/2008 7:50:15	20.18	0.60	20.92	0.52			
6/20/2008 7:50:30	20.21	0.23	20.92	0.52			
6/20/2008 7:50:45	20.20	0.15	20.92	0.47	NORTH		
6/20/2008 7:51:00	20.18	0.13	20.92	0.42	O2 cal gas conc.	20.00	%
6/20/2008 7:51:15	20.18	0.05	20.93	0.42	Analyzer Response	20.18	%
6/20/2008 7:51:30	20.18	0.05	20.93	0.62			
6/20/2008 7:51:45	20.18	0.05	20.93	0.77			
6/20/2008 7:52:00	20.19	0.05	20.93	0.62			
6/20/2008 7:52:15	20.19	0.05	20.93	0.47			
6/20/2008 7:52:30	20.19	0.05	20.94	0.42			
6/20/2008 7:52:45	19.98	0.05	20.94	0.42			
6/20/2008 7:53:00	16.11	0.05	20.94	0.40			
6/20/2008 7:53:15	11.74	0.05	20.94	0.32			
6/20/2008 7:53:30	10.15	0.05	20.94	0.32			
6/20/2008 7:53:45	10.02	0.05	20.94	0.32	NORTH		
6/20/2008 7:54:00	10.01	0.05	20.95	0.32	O2 cal gas conc.	10.00	%
6/20/2008 7:54:15	10.01	0.05	20.95	0.32	Analyzer Response	10.01	%
6/20/2008 7:54:30	10.01	0.05	20.95	0.32			
6/20/2008 7:54:45	10.01	0.05	20.95	0.32			
6/20/2008 7:55:00	10.01	0.05	20.95	0.32			
6/20/2008 7:55:15	9.21	0.05	20.95	0.32			
6/20/2008 7:55:30	6.28	0.05	20.95	0.32			
6/20/2008 7:55:45	5.07	0.05	20.95	0.32			
6/20/2008 7:56:00	4.99	0.05	20.95	0.32	NORTH		
6/20/2008 7:56:15	4.98	0.05	20.95	0.32	O2 cal gas conc.	5.00	%
6/20/2008 7:56:30	4.98	0.05	20.95	0.32	Analyzer Response	4.98	%
6/20/2008 7:56:45	4.98	0.05	20.96	0.32			
6/20/2008 7:57:00	4.98	0.05	20.95	0.32			
6/20/2008 7:57:15	4.98	0.05	20.96	0.32			
6/20/2008 7:57:30	5.14	0.05	20.96	0.32			
6/20/2008 7:57:45	3.46	1.85	20.96	0.32			
6/20/2008 7:58:00	0.61	14.79	20.96	0.32			
6/20/2008 7:58:15	0.07	55.61	20.96	0.32			
6/20/2008 7:58:30	0.04	77.40	20.96	0.32			
6/20/2008 7:58:45	0.03	80.33	20.96	0.32			
6/20/2008 7:59:00	0.03	79.48	20.96	0.32			
6/20/2008 7:59:15	0.03	85.18	20.96	0.32			
6/20/2008 7:59:30	0.03	89.06	20.96	0.32			
6/20/2008 7:59:45	0.02	90.14	20.96	0.32			
6/20/2008 8:00:00	0.02	90.46	20.96	0.32			
6/20/2008 8:00:15	0.02	90.59	20.96	0.32			
6/20/2008 8:00:30	0.02	90.67	20.96	0.32			
6/20/2008 8:00:45	0.02	90.74	20.96	0.32			
6/20/2008 8:01:00	0.02	90.77	20.97	0.32	NORTH		
6/20/2008 8:01:15	0.02	90.84	20.97	0.32	NOx cal gas conc.	90.52	ppmv
6/20/2008 8:01:30	0.02	90.84	20.97	0.22	Analyzer Response	90.87	ppmv
6/20/2008 8:01:45	0.02	90.89	20.96	0.22			
6/20/2008 8:02:00	0.01	90.92	20.97	0.22			
6/20/2008 8:02:15	0.01	90.79	20.97	0.22			
6/20/2008 8:02:30	0.01	90.87	20.97	0.22			
6/20/2008 8:02:45	0.01	87.44	20.97	0.22			
6/20/2008 8:03:00	0.01	74.17	20.97	0.22			
6/20/2008 8:03:15	0.01	58.31	20.97	0.22			
6/20/2008 8:03:30	0.01	51.03	20.97	0.22			
6/20/2008 8:03:45	0.01	50.45	20.97	0.22			
6/20/2008 8:04:00	0.01	50.20	20.97	0.22			
6/20/2008 8:04:15	0.01	50.20	20.97	0.22	NORTH		
6/20/2008 8:04:30	0.01	50.18	20.97	0.22	NOx cal gas conc.	50.00	ppmv
6/20/2008 8:04:45	0.01	50.10	20.97	0.22	Analyzer Response	50.12	ppmv
6/20/2008 8:05:00	0.01	50.10	20.97	0.22			
6/20/2008 8:05:15	0.01	50.10	20.97	0.22			

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 8:05:30	3.22	50.00	20.97	0.22			
6/20/2008 8:05:45	11.38	41.93	20.97	0.22	BEGIN SYSTEM BIAS/RESPONSE TIME CHECKS		
6/20/2008 8:06:00	12.08	25.75	20.97	0.22			
6/20/2008 8:06:15	5.19	6.68	20.97	0.22			
6/20/2008 8:06:30	0.53	3.96	20.98	0.22			
6/20/2008 8:06:45	0.11	3.13	20.98	0.22			
6/20/2008 8:07:00	0.08	1.13	20.97	0.22			
6/20/2008 8:07:15	0.07	0.90	20.98	0.22			
6/20/2008 8:07:30	0.06	0.83	20.98	0.22	Recheck Line Integrity		
6/20/2008 8:07:45	0.06	0.68	20.98	0.22			
6/20/2008 8:08:00	0.05	0.63	20.98	0.22			
6/20/2008 8:08:15	0.05	0.55	20.98	0.22	INJECT 10% O2		
6/20/2008 8:08:30	0.05	0.53	20.98	0.22			
6/20/2008 8:08:45	0.05	0.45	20.98	0.22			
6/20/2008 8:09:00	0.05	0.45	20.98	0.22			
6/20/2008 8:09:15	0.70	0.38	20.98	0.22	O2 RESPONSE TIME UPSCALE		
6/20/2008 8:09:30	6.05	0.35	20.98	0.22	2.25 MINUTES		
6/20/2008 8:09:45	5.23	0.43	20.98	0.22			
6/20/2008 8:10:00	8.03	0.65	20.98	0.22			
6/20/2008 8:10:15	9.65	2.00	20.98	0.22			
6/20/2008 8:10:30	9.91	1.25	20.98	0.22			
6/20/2008 8:10:45	9.94	0.58	20.98	0.22			
6/20/2008 8:11:00	9.94	0.35	20.98	0.22	NORTH		
6/20/2008 8:11:15	9.95	0.35	20.98	0.22	O2 cal gas conc.	10.00	%
6/20/2008 8:11:30	9.95	0.35	20.98	0.22	Analyzer Response	9.95	%
6/20/2008 8:11:45	9.95	0.28	20.98	0.22	NOx cal gas conc.	0.00	ppmv
6/20/2008 8:12:00	9.96	0.25	20.98	0.22	Analyzer Response	0.31	ppmv
6/20/2008 8:12:15	9.96	0.25	20.98	0.22			
6/20/2008 8:12:30	9.96	0.25	20.98	0.22	INJECT 50 PPMV NOX		
6/20/2008 8:12:45	10.01	0.25	20.98	0.22			
6/20/2008 8:13:00	13.71	0.25	20.98	0.22			
6/20/2008 8:13:15	18.21	0.25	20.98	0.22			
6/20/2008 8:13:30	12.18	0.25	20.98	0.22			
6/20/2008 8:13:45	3.73	4.98	20.98	0.22			
6/20/2008 8:14:00	0.59	16.07	20.98	0.22	O2 RESPONSE TIME DOWNSCALE		
6/20/2008 8:14:15	0.14	38.44	20.98	0.22	2.25 MINUTES		
6/20/2008 8:14:30	0.10	44.24	20.98	0.22			
6/20/2008 8:14:45	0.09	45.67	20.98	0.22			
6/20/2008 8:15:00	0.08	45.77	20.98	0.22			
6/20/2008 8:15:15	0.07	45.69	20.98	0.22			
6/20/2008 8:15:30	0.07	45.72	20.98	0.22			
6/20/2008 8:15:45	0.07	46.55	20.98	0.22	NOX RESPONSE TIME UPSCALE		
6/20/2008 8:16:00	0.06	48.05	20.98	0.22	3.75 MINUTES		
6/20/2008 8:16:15	0.06	48.95	20.98	0.22			
6/20/2008 8:16:30	0.06	49.35	20.98	0.22			
6/20/2008 8:16:45	0.06	49.58	20.98	0.22	NORTH		
6/20/2008 8:17:00	0.05	49.60	20.98	0.22	O2 cal gas conc.	0.00	%
6/20/2008 8:17:15	0.05	49.60	20.99	0.22	Analyzer Response	0.05	%
6/20/2008 8:17:30	0.05	49.60	20.98	0.22	NOx cal gas conc.	50.00	ppmv
6/20/2008 8:17:45	0.05	49.60	20.98	0.22	Analyzer Response	49.60	ppmv inject zero air
6/20/2008 8:18:00	0.05	49.60	20.98	0.22			
6/20/2008 8:18:15	0.05	49.68	20.98	0.22			
6/20/2008 8:18:30	0.05	49.68	20.98	0.22			
6/20/2008 8:18:45	0.05	49.68	20.98	0.22			
6/20/2008 8:19:00	4.25	49.55	20.98	0.22			
6/20/2008 8:19:15	15.95	48.87	20.99	0.22	NOX RESPONSE TIME DOWNSCALE		
6/20/2008 8:19:30	20.36	26.43	20.99	0.22	2.50 MINUTES		
6/20/2008 8:19:45	20.80	9.01	20.98	0.22			
6/20/2008 8:20:00	20.84	1.86	20.98	0.22			
6/20/2008 8:20:15	20.86	1.18	20.98	0.22	RESPONSE TIME = 3.75 MINUTES X 2 =7.50 MINUTES BEFORE STARTING		
6/20/2008 8:20:30	20.87	0.93	20.98	0.22			
6/20/2008 8:20:45	20.87	0.78	20.98	0.22			
6/20/2008 8:21:00	20.88	0.73	20.98	0.22			
6/20/2008 8:21:15	20.88	0.65	20.98	0.22			
6/20/2008 8:21:30	20.89	0.63	20.99	0.22			
6/20/2008 8:21:45	20.89	0.55	20.99	0.22			
6/20/2008 8:22:00	20.89	0.55	20.99	0.22			
6/20/2008 8:22:15	20.89	0.48	20.98	0.22			
6/20/2008 8:22:30	20.90	0.45	20.99	0.22			
6/20/2008 8:22:45	20.90	0.45	20.99	0.22			
6/20/2008 8:23:00	20.90	0.45	20.99	0.22			
6/20/2008 8:23:15	20.90	0.45	20.99	0.22			
6/20/2008 8:23:30	20.90	0.45	20.99	0.22			
6/20/2008 8:23:45	20.91	0.45	20.99	0.22			
6/20/2008 8:24:00	20.90	0.35	20.98	0.22			
6/20/2008 8:24:15	20.91	0.35	20.98	0.22			
6/20/2008 8:24:30	20.91	0.35	20.99	0.22			
6/20/2008 8:24:45	20.91	0.35	20.99	0.22			
6/20/2008 8:25:00	20.91	0.35	20.99	0.22			
6/20/2008 8:25:15	20.91	0.35	20.99	0.22			
6/20/2008 8:25:30	20.91	0.35	20.99	0.22			
6/20/2008 8:25:45	20.91	0.35	20.99	0.22			
6/20/2008 8:26:00	20.91	0.25	20.99	0.22			
6/20/2008 8:26:15	20.91	0.25	20.99	0.22			
6/20/2008 8:26:30	20.91	0.25	20.99	0.22			
6/20/2008 8:26:45	20.91	0.33	20.99	0.22			
6/20/2008 8:27:00	20.91	0.35	20.99	0.22			
6/20/2008 8:27:15	20.91	0.35	20.99	0.22			
6/20/2008 8:27:30	20.91	0.35	20.99	0.22			
6/20/2008 8:27:45	20.91	0.28	20.99	0.22			

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 8:28:00	20.91	0.25	20.99	0.22	
6/20/2008 8:28:15	20.91	0.25	20.99	0.22	
6/20/2008 8:28:30	20.91	0.25	20.99	0.22	
6/20/2008 8:28:45	20.92	0.25	20.99	0.22	
6/20/2008 8:29:00	20.92	0.25	20.98	0.22	
6/20/2008 8:29:15	20.92	0.18	20.98	0.22	
6/20/2008 8:29:30	20.92	0.20	20.99	0.22	
6/20/2008 8:29:45	20.91	0.25	20.99	0.22	
6/20/2008 8:30:00	20.92	0.25	20.99	0.22	
6/20/2008 8:30:15	20.91	0.25	20.99	0.22	
6/20/2008 8:30:30	20.91	0.20	20.99	0.22	
6/20/2008 8:30:45	20.91	0.15	20.99	0.22	
6/20/2008 8:31:00	20.91	0.25	20.99	0.22	
6/20/2008 8:31:15	20.91	0.25	20.99	0.22	
6/20/2008 8:31:30	20.88	0.20	20.98	0.22	
6/20/2008 8:31:45	18.64	0.30	20.99	0.22	
6/20/2008 8:32:00	15.04	5.21	20.99	0.25	
6/20/2008 8:32:15	18.70	17.34	20.99	0.47	
6/20/2008 8:32:30	20.75	12.51	20.99	0.52	ONLINE AT POINT 1
6/20/2008 8:32:45	20.01	6.73	20.99	0.45	
6/20/2008 8:33:00	13.63	4.71	20.99	0.22	
6/20/2008 8:33:15	10.11	14.47	20.99	0.22	
6/20/2008 8:33:30	9.76	37.89	20.99	0.22	
6/20/2008 8:33:45	9.70	46.25	20.99	0.22	
6/20/2008 8:34:00	9.64	48.30	20.93	2.27	
6/20/2008 8:34:15	9.55	48.87	15.97	14.27	
6/20/2008 8:34:30	9.56	49.00	10.13	29.94	
6/20/2008 8:34:45	9.60	49.00	9.99	38.71	
6/20/2008 8:35:00	9.61	49.10	9.95	39.06	
6/20/2008 8:35:15	9.63	49.28	9.97	44.76	
6/20/2008 8:35:30	9.50	49.85	9.91	45.34	
6/20/2008 8:35:45	9.42	50.15	9.95	45.04	
6/20/2008 8:36:00	9.42	50.15	9.93	44.99	
6/20/2008 8:36:15	9.41	49.53	11.00	44.44	
6/20/2008 8:36:30	9.43	48.95	10.01	44.88	
6/20/2008 8:36:45	9.39	49.02	10.02	45.04	
6/20/2008 8:37:00	9.40	49.30	9.98	45.93	
6/20/2008 8:37:15	9.39	49.30	9.95	45.49	
6/20/2008 8:37:30	9.40	49.15	9.97	45.76	
6/20/2008 8:37:45	9.41	49.18	9.95	45.46	
6/20/2008 8:38:00	9.37	49.25	9.92	45.66	
6/20/2008 8:38:15	9.39	49.38	9.99	45.29	
6/20/2008 8:38:30	9.40	49.40	10.03	45.69	
6/20/2008 8:38:45	9.42	49.40	10.08	45.40	
6/20/2008 8:39:00	9.46	49.40	10.04	45.20	
6/20/2008 8:39:15	9.41	49.33	10.02	44.70	
6/20/2008 8:39:30	9.41	49.65	10.04	44.60	
6/20/2008 8:39:45	9.44	49.73	10.08	44.60	
6/20/2008 8:40:00	9.48	49.65	10.07	45.40	BEGIN RUN 1
6/20/2008 8:40:15	9.46	49.60	10.05	45.20	
6/20/2008 8:40:30	9.38	49.45	10.09	44.70	
6/20/2008 8:40:45	9.42	49.48	10.08	44.60	
6/20/2008 8:41:00	9.47	49.80	10.04	44.80	
6/20/2008 8:41:15	9.48	50.05	10.06	45.05	
6/20/2008 8:41:30	9.46	50.10	10.06	45.10	
6/20/2008 8:41:45	9.40	50.03	10.04	45.10	
6/20/2008 8:42:00	9.32	49.80	9.93	45.05	
6/20/2008 8:42:15	9.21	49.55	9.97	45.10	
6/20/2008 8:42:30	9.32	49.95	10.08	45.10	
6/20/2008 8:42:45	9.41	49.73	10.09	45.20	
6/20/2008 8:43:00	9.43	49.10	10.10	45.10	
6/20/2008 8:43:15	9.41	48.85	10.00	45.10	
6/20/2008 8:43:30	9.38	49.20	10.01	45.05	
6/20/2008 8:43:45	9.32	49.08	10.02	45.10	
6/20/2008 8:44:00	9.42	48.95	10.14	45.10	
6/20/2008 8:44:15	9.53	49.33	10.22	45.10	
6/20/2008 8:44:30	9.51	48.75	10.16	45.10	
6/20/2008 8:44:45	9.43	48.95	9.99	45.05	
6/20/2008 8:45:00	9.39	49.80	10.05	45.10	
6/20/2008 8:45:15	9.36	50.30	10.07	45.10	
6/20/2008 8:45:30	9.45	50.20	10.18	45.71	
6/20/2008 8:45:45	9.50	49.73	10.17	45.71	
6/20/2008 8:46:00	9.49	49.35	10.19	45.21	
6/20/2008 8:46:15	9.44	49.73	10.07	45.81	
6/20/2008 8:46:30	9.27	50.25	10.03	45.66	
6/20/2008 8:46:45	9.20	50.48	10.14	45.21	
6/20/2008 8:47:00	9.34	50.30	10.19	45.66	
6/20/2008 8:47:15	9.49	49.73	10.31	45.96	
6/20/2008 8:47:30	9.54	49.30	10.30	46.14	
6/20/2008 8:47:45	9.48	49.43	10.30	46.06	
6/20/2008 8:48:00	9.42	49.70	10.22	46.84	
6/20/2008 8:48:15	9.34	49.53	10.21	46.99	
6/20/2008 8:48:30	9.36	49.80	10.35	46.36	
6/20/2008 8:48:45	9.50	49.75	10.39	45.91	
6/20/2008 8:49:00	9.56	49.50	10.47	45.96	
6/20/2008 8:49:15	9.70	49.33	10.44	46.26	
6/20/2008 8:49:30	9.66	49.30	10.35	46.56	
6/20/2008 8:49:45	9.58	49.68	10.43	46.86	
6/20/2008 8:50:00	9.58	49.95	10.35	47.01	
6/20/2008 8:50:15	9.44	49.33	10.31	46.94	

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 8:50:30	9.47	49.35	10.48	46.41	
6/20/2008 8:50:45	9.67	49.25	10.56	46.26	
6/20/2008 8:51:00	9.73	49.00	10.51	46.44	
6/20/2008 8:51:15	9.64	49.00	10.49	46.59	
6/20/2008 8:51:30	9.60	49.15	10.45	46.38	
6/20/2008 8:51:45	9.58	49.20	10.30	46.39	
6/20/2008 8:52:00	9.50	49.30	10.28	46.54	
6/20/2008 8:52:15	9.47	49.80	10.34	46.34	
6/20/2008 8:52:30	9.54	49.65	10.36	45.63	
6/20/2008 8:52:45	9.56	49.38	10.39	45.40	
6/20/2008 8:53:00	9.55	49.10	10.34	45.35	
6/20/2008 8:53:15	9.52	49.10	10.38	45.35	
6/20/2008 8:53:30	9.53	49.45	10.28	45.05	
6/20/2008 8:53:45	9.40	49.52	10.27	45.10	
6/20/2008 8:54:00	9.49	49.35	10.36	45.15	
6/20/2008 8:54:15	9.55	49.30	10.46	44.84	
6/20/2008 8:54:30	9.56	49.30	10.36	45.40	
6/20/2008 8:54:45	9.52	49.21	10.34	45.35	
6/20/2008 8:55:00	9.54	49.15	10.29	45.35	
6/20/2008 8:55:15	9.54	49.30	10.32	45.05	
6/20/2008 8:55:30	9.51	49.50	10.35	45.10	
6/20/2008 8:55:45	9.54	49.48	10.31	45.15	
6/20/2008 8:56:00	9.57	49.25	10.26	45.84	
6/20/2008 8:56:15	9.54	49.18	10.31	45.46	
6/20/2008 8:56:30	9.57	49.35	10.35	44.66	
6/20/2008 8:56:45	9.61	49.20	10.38	44.63	
6/20/2008 8:57:00	9.58	49.10	10.38	44.76	
6/20/2008 8:57:15	9.61	49.30	10.37	44.46	
6/20/2008 8:57:30	9.57	49.05	10.32	42.81	
6/20/2008 8:57:45	9.56	49.30	10.29	42.04	
6/20/2008 8:58:00	9.55	49.60	10.20	42.36	
6/20/2008 8:58:15	9.60	49.35	10.86	41.98	
6/20/2008 8:58:30	9.60	48.95	10.20	45.01	
6/20/2008 8:58:45	9.58	48.80	10.10	45.88	
6/20/2008 8:59:00	9.54	48.80	10.07	45.76	
6/20/2008 8:59:15	9.48	48.72	10.02	45.46	
6/20/2008 8:59:30	9.45	48.75	10.08	44.66	
6/20/2008 8:59:45	9.53	49.20	10.14	44.63	
6/20/2008 9:00:00	9.57	49.45	10.07	44.76	
6/20/2008 9:00:15	9.53	49.10	10.13	44.46	
6/20/2008 9:00:30	9.57	49.20	10.22	43.81	
6/20/2008 9:00:45	9.54	49.10	10.41	42.04	
6/20/2008 9:01:00	9.49	48.90	10.29	43.61	
6/20/2008 9:01:15	9.39	48.95	10.33	42.68	
6/20/2008 9:01:30	9.50	49.25	10.24	43.56	
6/20/2008 9:01:45	9.42	49.23	10.20	43.83	
6/20/2008 9:02:00	9.40	49.15	10.38	44.01	
6/20/2008 9:02:15	9.52	49.22	10.39	44.68	
6/20/2008 9:02:30	9.51	48.68	10.37	45.36	
6/20/2008 9:02:45	9.49	48.50	10.30	45.43	
6/20/2008 9:03:00	9.48	48.85	10.19	45.46	
6/20/2008 9:03:15	9.37	49.45	10.18	46.08	
6/20/2008 9:03:30	9.36	49.45	10.34	45.76	
6/20/2008 9:03:45	9.55	49.10	10.37	45.68	
6/20/2008 9:04:00	9.64	48.75	10.38	45.96	
6/20/2008 9:04:15	9.67	48.62	10.36	46.33	
6/20/2008 9:04:30	9.58	48.90	10.27	46.11	
6/20/2008 9:04:45	9.51	49.27	10.23	45.71	
6/20/2008 9:05:00	9.52	49.45	10.34	45.26	
6/20/2008 9:05:15	9.63	49.20	10.39	45.63	
6/20/2008 9:05:30	9.68	48.85	10.42	45.81	
6/20/2008 9:05:45	9.67	48.87	10.45	45.81	
6/20/2008 9:06:00	9.65	49.00	10.40	45.76	
6/20/2008 9:06:15	9.63	48.97	10.38	45.56	
6/20/2008 9:06:30	9.62	48.85	10.40	45.51	
6/20/2008 9:06:45	9.68	48.97	10.36	45.66	
6/20/2008 9:07:00	9.65	49.15	10.41	45.71	
6/20/2008 9:07:15	9.62	49.27	10.41	45.28	
6/20/2008 9:07:30	9.61	49.30	10.33	46.11	
6/20/2008 9:07:45	9.51	48.97	10.30	45.81	
6/20/2008 9:08:00	9.53	48.85	10.42	45.26	
6/20/2008 9:08:15	9.63	49.35	10.35	46.21	
6/20/2008 9:08:30	9.59	49.15	10.39	45.81	
6/20/2008 9:08:45	9.58	48.90	10.30	45.68	
6/20/2008 9:09:00	9.52	48.90	10.34	45.86	
6/20/2008 9:09:15	9.50	49.10	10.38	45.98	
6/20/2008 9:09:30	9.60	48.95	10.51	45.56	
6/20/2008 9:09:45	9.73	48.67	10.37	45.48	
6/20/2008 9:10:00	9.64	48.60	10.40	45.76	
6/20/2008 9:10:15	9.60	49.00	10.31	46.13	
6/20/2008 9:10:30	9.52	49.00	10.26	45.91	
6/20/2008 9:10:45	9.47	49.30	10.42	45.73	
6/20/2008 9:11:00	9.62	49.35	10.52	45.66	
6/20/2008 9:11:15	9.69	48.70	10.48	45.96	
6/20/2008 9:11:30	9.65	48.45	10.47	45.81	
6/20/2008 9:11:45	9.61	48.62	10.40	45.86	
6/20/2008 9:12:00	9.52	49.00	10.33	46.16	
6/20/2008 9:12:15	9.51	49.15	10.30	46.21	
6/20/2008 9:12:30	9.51	49.05	10.25	46.36	
6/20/2008 9:12:45	9.47	49.10	10.36	45.96	

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 9:13:00	9.63	49.15	10.51	45.46	
6/20/2008 9:13:15	9.73	49.10	10.54	46.08	
6/20/2008 9:13:30	9.71	49.05	10.40	46.71	
6/20/2008 9:13:45	9.62	49.00	10.45	46.61	
6/20/2008 9:14:00	9.65	49.10	10.36	46.16	
6/20/2008 9:14:15	9.54	49.35	10.29	46.36	
6/20/2008 9:14:30	9.46	49.70	10.24	46.26	
6/20/2008 9:14:45	9.48	49.78	10.38	46.06	
6/20/2008 9:15:00	9.63	49.55	10.49	45.86	
6/20/2008 9:15:15	9.71	49.02	10.49	46.16	
6/20/2008 9:15:30	9.71	48.50	10.44	46.41	
6/20/2008 9:15:45	9.64	48.77	10.42	46.43	
6/20/2008 9:16:00	9.58	49.20	10.45	46.46	
6/20/2008 9:16:15	9.64	49.22	10.36	46.58	
6/20/2008 9:16:30	9.58	49.00	10.46	45.96	
6/20/2008 9:16:45	9.69	49.20	10.56	45.94	
6/20/2008 9:17:00	9.74	49.30	10.51	46.41	
6/20/2008 9:17:15	9.71	48.77	10.38	46.59	
6/20/2008 9:17:30	9.62	48.85	10.26	46.76	
6/20/2008 9:17:45	9.49	49.22	10.29	46.73	
6/20/2008 9:18:00	9.47	49.45	10.30	46.66	
6/20/2008 9:18:15	9.65	49.07	10.32	46.68	
6/20/2008 9:18:30	9.73	48.65	10.35	47.11	
6/20/2008 9:18:45	9.73	48.50	10.30	47.33	
6/20/2008 9:19:00	9.62	48.65	10.19	47.21	
6/20/2008 9:19:15	9.60	49.05	10.14	46.63	
6/20/2008 9:19:30	9.59	49.40	10.10	46.11	
6/20/2008 9:19:45	9.62	49.73	10.25	46.31	
6/20/2008 9:20:00	9.74	49.70	10.31	46.86	
6/20/2008 9:20:15	9.71	49.22	10.16	47.11	
6/20/2008 9:20:30	9.63	49.30	10.17	46.86	
6/20/2008 9:20:45	9.58	49.32	10.11	46.41	
6/20/2008 9:21:00	9.52	49.35	10.20	46.21	
6/20/2008 9:21:15	9.62	49.10	10.20	46.43	
6/20/2008 9:21:30	9.67	48.65	10.17	46.71	
6/20/2008 9:21:45	9.63	48.27	10.22	47.08	
6/20/2008 9:22:00	9.64	48.30	10.27	47.36	
6/20/2008 9:22:15	9.63	48.70	10.23	47.43	
6/20/2008 9:22:30	9.63	49.15	10.20	47.26	
6/20/2008 9:22:45	9.70	49.27	10.26	47.28	
6/20/2008 9:23:00	9.72	49.15	10.26	47.36	
6/20/2008 9:23:15	9.71	49.00	10.23	47.46	
6/20/2008 9:23:30	9.66	49.00	10.29	47.06	
6/20/2008 9:23:45	9.66	48.85	10.21	47.21	
6/20/2008 9:24:00	9.53	48.85	10.15	47.51	
6/20/2008 9:24:15	9.50	49.30	10.10	47.41	
6/20/2008 9:24:30	9.52	49.30	10.28	46.51	
6/20/2008 9:24:45	9.63	48.82	10.23	46.08	
6/20/2008 9:25:00	9.63	48.65	10.20	46.16	
6/20/2008 9:25:15	9.64	48.80	10.26	46.43	
6/20/2008 9:25:30	9.66	48.80	10.23	46.41	
6/20/2008 9:25:45	9.63	48.77	10.19	46.58	
6/20/2008 9:26:00	9.62	48.60	10.13	46.66	
6/20/2008 9:26:15	9.58	48.35	10.14	46.53	
6/20/2008 9:26:30	9.61	48.60	10.11	46.51	
6/20/2008 9:26:45	9.58	48.95	10.21	46.58	
6/20/2008 9:27:00	9.59	49.10	10.32	46.56	
6/20/2008 9:27:15	9.70	49.00	10.34	46.38	
6/20/2008 9:27:30	9.68	48.55	10.30	46.46	
6/20/2008 9:27:45	9.67	48.27	10.30	46.28	
6/20/2008 9:28:00	9.67	48.40	10.30	46.21	
6/20/2008 9:28:15	9.62	48.92	10.13	46.61	
6/20/2008 9:28:30	9.56	49.05	10.22	46.21	
6/20/2008 9:28:45	9.70	49.10	10.33	46.01	
6/20/2008 9:29:00	9.81	49.00	10.37	46.06	
6/20/2008 9:29:15	9.78	48.70	10.23	46.23	
6/20/2008 9:29:30	9.67	48.70	10.30	46.16	
6/20/2008 9:29:45	9.68	48.95	10.18	46.58	
6/20/2008 9:30:00	9.59	49.05	10.22	46.76	
6/20/2008 9:30:15	9.65	48.72	10.29	46.23	
6/20/2008 9:30:30	9.70	48.39	10.29	46.61	
6/20/2008 9:30:45	9.66	48.29	10.23	46.93	
6/20/2008 9:31:00	9.62	48.39	10.18	46.86	
6/20/2008 9:31:15	9.57	48.80	10.23	46.46	
6/20/2008 9:31:30	9.63	48.80	10.12	47.11	
6/20/2008 9:31:45	9.61	49.05	10.25	47.08	
6/20/2008 9:32:00	9.70	49.10	10.30	46.91	
6/20/2008 9:32:15	9.71	48.80	10.25	47.23	
6/20/2008 9:32:30	9.61	48.85	10.23	46.81	
6/20/2008 9:32:45	9.60	48.77	10.21	46.63	
6/20/2008 9:33:00	9.64	48.65	10.22	46.76	
6/20/2008 9:33:15	9.63	48.54	10.18	46.86	
6/20/2008 9:33:30	9.61	48.75	10.29	46.76	
6/20/2008 9:33:45	9.74	48.70	10.36	46.71	
6/20/2008 9:34:00	9.75	48.70	10.31	46.81	
6/20/2008 9:34:15	9.70	48.70	10.28	47.06	
6/20/2008 9:34:30	9.71	49.20	10.25	46.76	
6/20/2008 9:34:45	9.69	49.02	10.24	46.93	
6/20/2008 9:35:00	9.67	48.75	10.25	47.21	
6/20/2008 9:35:15	9.71	48.54	10.16	47.11	

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 9:35:30	9.58	48.80	10.10	47.46			
6/20/2008 9:35:45	9.57	49.27	10.22	46.78			
6/20/2008 9:36:00	9.67	49.45	10.26	46.01			
6/20/2008 9:36:15	9.66	49.22	10.26	46.31			
6/20/2008 9:36:30	9.59	48.80	10.23	46.61			
6/20/2008 9:36:45	9.62	48.85	10.23	47.08			
6/20/2008 9:37:00	9.58	49.00	10.20	47.26			
6/20/2008 9:37:15	9.59	48.90	10.23	46.88			
6/20/2008 9:37:30	9.59	48.90	10.26	46.81			
6/20/2008 9:37:45	9.60	48.77	10.27	46.73			
6/20/2008 9:38:00	9.68	48.70	10.20	46.66			
6/20/2008 9:38:15	9.69	48.80	10.25	46.46			
6/20/2008 9:38:30	9.70	48.80	10.49	46.01			
6/20/2008 9:38:45	9.67	48.55	10.54	46.01			
6/20/2008 9:39:00	9.71	48.40	10.55	46.41			
6/20/2008 9:39:15	9.75	48.60	10.58	47.01			
6/20/2008 9:39:30	9.79	49.10	10.54	47.61			
6/20/2008 9:39:45	9.76	48.92	10.56	47.81	END RUN 1		
6/20/2008 9:40:00	9.79	48.90	10.52	47.76			
6/20/2008 9:40:15	9.71	49.47	10.55	47.73			
6/20/2008 9:40:30	8.42	49.40	10.54	48.26			
6/20/2008 9:40:45	5.39	48.70	10.46	48.01			
6/20/2008 9:41:00	7.97	42.49	10.44	47.46			
6/20/2008 9:41:15	9.65	22.65	10.46	47.23			
6/20/2008 9:41:30	9.92	9.36	10.48	47.06			
6/20/2008 9:41:45	9.93	2.28	10.48	46.71			
6/20/2008 9:42:00	9.90	1.10	10.48	46.46			
6/20/2008 9:42:15	9.98	1.88	10.51	46.63			
6/20/2008 9:42:30	13.45	6.51	10.44	46.51			
6/20/2008 9:42:45	17.07	12.29	10.43	46.52			
6/20/2008 9:43:00	18.32	14.82	10.52	46.61			
6/20/2008 9:43:15	18.56	14.97	10.51	46.52			
6/20/2008 9:43:30	18.72	14.49	10.47	46.51			
6/20/2008 9:43:45	19.24	14.27	10.51	46.41			
6/20/2008 9:44:00	14.74	11.20	10.51	46.46			
6/20/2008 9:44:15	10.99	4.21	10.50	46.51			
6/20/2008 9:44:30	10.05	1.54	10.51	45.96			
6/20/2008 9:44:45	9.99	0.70	10.57	45.68			
6/20/2008 9:45:00	9.98	0.55	10.57	45.61			
6/20/2008 9:45:15	9.98	0.55	10.62	45.58			
6/20/2008 9:45:30	9.97	0.48	10.63	45.96	NORTH		
6/20/2008 9:45:45	9.97	0.45	10.56	46.23	O2 cal gas conc.	10.00	%
6/20/2008 9:46:00	9.97	0.45	10.51	46.31	Analyzer Response	9.97	%
6/20/2008 9:46:15	9.97	0.45	10.45	46.36	NOx cal gas conc.	0.00	ppmv
6/20/2008 9:46:30	9.97	0.45	10.46	46.06	Analyzer Response	0.45	ppmv
6/20/2008 9:46:45	9.97	0.45	10.48	45.63			
6/20/2008 9:47:00	9.86	0.53	10.46	45.31			
6/20/2008 9:47:15	8.60	2.68	10.49	44.96			
6/20/2008 9:47:30	3.63	15.59	10.53	45.16			
6/20/2008 9:47:45	0.67	21.55	10.57	44.83			
6/20/2008 9:48:00	0.15	29.50	10.59	44.76			
6/20/2008 9:48:15	0.11	38.99	10.63	45.13			
6/20/2008 9:48:30	0.10	34.18	10.56	45.26			
6/20/2008 9:48:45	0.09	31.91	10.53	45.28			
6/20/2008 9:49:00	0.08	27.85	10.50	45.11			
6/20/2008 9:49:15	0.08	23.10	10.52	44.86			
6/20/2008 9:49:30	0.07	27.23	10.57	45.11			
6/20/2008 9:49:45	0.07	36.76	10.61	45.23			
6/20/2008 9:50:00	0.07	44.27	10.65	45.21			
6/20/2008 9:50:15	0.06	48.20	10.67	45.01			
6/20/2008 9:50:30	0.06	49.47	10.59	44.96			
6/20/2008 9:50:45	0.06	49.95	10.46	45.16			
6/20/2008 9:51:00	0.06	50.10	10.46	45.16	NORTH		
6/20/2008 9:51:15	0.06	50.20	10.51	44.71	O2 cal gas conc.	0.00	%
6/20/2008 9:51:30	0.06	50.20	10.66	44.71	Analyzer Response	0.06	%
6/20/2008 9:51:45	0.05	50.22	10.69	44.31	NOx cal gas conc.	50.00	ppmv
6/20/2008 9:52:00	0.05	50.22	10.60	44.01	Analyzer Response	50.21	ppmv
6/20/2008 9:52:15	0.05	50.20	10.54	44.21			
6/20/2008 9:52:30	0.05	50.20	10.51	44.66			
6/20/2008 9:52:45	1.28	50.17	10.39	44.01			
6/20/2008 9:53:00	4.02	50.02	8.30	34.31			
6/20/2008 9:53:15	7.17	49.90	9.73	5.50			
6/20/2008 9:53:30	9.21	49.90	10.09	3.32			
6/20/2008 9:53:45	9.62	49.40	10.12	2.17			
6/20/2008 9:54:00	9.64	49.02	10.12	1.97			
6/20/2008 9:54:15	9.64	48.92	10.12	1.70			
6/20/2008 9:54:30	9.62	49.15	10.13	1.57			
6/20/2008 9:54:45	9.65	49.42	10.13	1.42			
6/20/2008 9:55:00	9.59	49.35	10.13	1.37			
6/20/2008 9:55:15	9.68	49.00	10.13	1.32			
6/20/2008 9:55:30	9.70	48.39	10.13	1.27			
6/20/2008 9:55:45	9.68	48.54	10.13	1.22			
6/20/2008 9:56:00	9.52	48.92	10.13	1.17			
6/20/2008 9:56:15	9.37	49.42	10.13	1.12			
6/20/2008 9:56:30	9.36	49.57	10.13	1.12	SOUTH		
6/20/2008 9:56:45	9.51	49.10	10.13	1.02	O2 cal gas conc.	10.00	%
6/20/2008 9:57:00	9.57	48.65	10.13	1.02	Analyzer Response	10.14	%
6/20/2008 9:57:15	9.50	48.37	10.14	0.92	NOx cal gas conc.	0.00	ppmv
6/20/2008 9:57:30	9.42	48.90	10.14	0.92	Analyzer Response	0.97	ppmv
6/20/2008 9:57:45	9.42	49.50	10.16	10.52			

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 9:58:00	9.32	49.65	5.94	22.62			
6/20/2008 9:58:15	9.32	49.42	0.98	42.48			
6/20/2008 9:58:30	9.44	48.97	0.46	45.96			
6/20/2008 9:58:45	9.45	48.55	0.41	47.03			
6/20/2008 9:59:00	9.52	48.40	0.40	46.96			
6/20/2008 9:59:15	9.53	48.32	0.39	47.36			
6/20/2008 9:59:30	9.47	48.47	0.39	47.11			
6/20/2008 9:59:45	9.41	49.00	0.36	47.66			
6/20/2008 10:00:00	9.38	49.22	0.33	48.36			
6/20/2008 10:00:15	9.32	49.07	0.31	49.23			
6/20/2008 10:00:30	9.29	48.85	0.29	49.36	SOUTH		
6/20/2008 10:00:45	9.49	48.92	0.30	49.41			
6/20/2008 10:01:00	9.54	48.70	0.29	49.41			
6/20/2008 10:01:15	9.51	48.17	0.28	49.41	NOx cal gas conc.	50.00	ppmv
6/20/2008 10:01:30	9.44	48.62	0.27	49.41	Analyzer Response	49.41	ppmv
6/20/2008 10:01:45	9.35	48.55	0.28	49.38			
6/20/2008 10:02:00	9.39	48.55	0.28	49.31			
6/20/2008 10:02:15	9.57	48.77	1.08	48.66			
6/20/2008 10:02:30	9.63	48.10	7.77	44.96			
6/20/2008 10:02:45	9.57	48.24	10.06	43.73			
6/20/2008 10:03:00	9.48	48.92	10.27	43.81			
6/20/2008 10:03:15	9.49	49.67	10.24	43.68			
6/20/2008 10:03:30	9.51	48.92	10.33	43.61			
6/20/2008 10:03:45	9.62	48.67	10.42	43.26			
6/20/2008 10:04:00	9.64	48.75	10.34	43.31			
6/20/2008 10:04:15	9.62	49.07	10.31	43.83			
6/20/2008 10:04:30	9.55	49.00	10.29	43.96			
6/20/2008 10:04:45	9.50	48.90	10.28	43.88			
6/20/2008 10:05:00	9.48	48.82	10.31	43.71			
6/20/2008 10:05:15	9.52	48.75	10.34	43.43			
6/20/2008 10:05:30	9.53	48.52	10.32	43.56			
6/20/2008 10:05:45	9.49	48.60	10.31	43.23			
6/20/2008 10:06:00	9.50	48.75	10.36	43.11			
6/20/2008 10:06:15	9.57	48.92	10.38	43.41			
6/20/2008 10:06:30	9.59	48.47	10.43	43.41			
6/20/2008 10:06:45	9.58	48.52	10.41	43.91			
6/20/2008 10:07:00	9.57	48.60	10.39	44.26			
6/20/2008 10:07:15	9.61	48.55	10.38	44.53			
6/20/2008 10:07:30	9.62	48.32	10.24	44.66			
6/20/2008 10:07:45	9.64	48.19	10.11	45.06			
6/20/2008 10:08:00	9.64	48.35	10.08	45.26			
6/20/2008 10:08:15	9.58	48.70	10.08	45.38			
6/20/2008 10:08:30	9.62	48.62	10.14	44.76			
6/20/2008 10:08:45	9.67	48.87	10.12	44.76			
6/20/2008 10:09:00	9.64	48.85	7.20	42.81			
6/20/2008 10:09:15	9.64	48.79	1.17	34.91			
6/20/2008 10:09:30	9.56	48.97	0.21	8.90			
6/20/2008 10:09:45	9.43	48.80	0.14	3.35			
6/20/2008 10:10:00	9.43	48.85	0.12	2.37			
6/20/2008 10:10:15	9.53	48.90	0.12	2.00			
6/20/2008 10:10:30	9.54	48.47	0.11	1.85	Back Online at Point 1		
6/20/2008 10:10:45	9.57	48.19	0.11	1.70	SOUTH		
6/20/2008 10:11:00	9.60	48.24	0.10	1.55	O2 cal gas conc.	0.00	%
6/20/2008 10:11:15	9.65	48.39	0.09	1.52	Analyzer Response	0.09	%
6/20/2008 10:11:30	9.72	48.15	0.09	1.45			
6/20/2008 10:11:45	9.72	48.44	0.09	1.40			
6/20/2008 10:12:00	9.60	48.60	2.50	11.89			
6/20/2008 10:12:15	9.56	48.75	8.82	30.94			
6/20/2008 10:12:30	9.60	49.12	10.00	41.66			
6/20/2008 10:12:45	9.58	49.10	9.99	43.88			
6/20/2008 10:13:00	9.49	48.95	10.00	44.26			
6/20/2008 10:13:15	9.55	48.75	10.01	44.66			
6/20/2008 10:13:30	9.53	48.95	9.96	45.03			
6/20/2008 10:13:45	9.52	49.10	9.94	44.98			
6/20/2008 10:14:00	9.54	49.17	10.02	44.76			
6/20/2008 10:14:15	9.63	49.20	10.10	44.51			
6/20/2008 10:14:30	9.68	48.95	10.11	45.03			
6/20/2008 10:14:45	9.60	48.70	10.05	45.23			
6/20/2008 10:15:00	9.56	48.52	9.96	45.46			
6/20/2008 10:15:15	9.48	48.65	9.87	45.66			
6/20/2008 10:15:30	9.44	49.02	9.94	45.36			
6/20/2008 10:15:45	9.54	49.30	10.07	45.16			
6/20/2008 10:16:00	9.59	49.17	10.04	45.08			
6/20/2008 10:16:15	9.55	48.90	10.02	45.41			
6/20/2008 10:16:30	9.57	49.32	10.04	45.93			
6/20/2008 10:16:45	9.54	48.95	10.03	45.78			
6/20/2008 10:17:00	9.50	48.80	9.99	45.33			
6/20/2008 10:17:15	9.58	48.70	10.03	44.86			
6/20/2008 10:17:30	9.62	48.45	9.95	45.76			
6/20/2008 10:17:45	9.52	48.49	9.92	45.91			
6/20/2008 10:18:00	9.44	48.57	9.99	45.68	BEGIN RUN 2		
6/20/2008 10:18:15	9.52	48.60	9.99	45.58			
6/20/2008 10:18:30	9.60	48.52	9.90	47.23			
6/20/2008 10:18:45	9.64	48.60	9.89	46.41			
6/20/2008 10:19:00	9.57	48.75	9.94	45.58			
6/20/2008 10:19:15	9.52	48.95	10.02	45.11			
6/20/2008 10:19:30	9.57	48.82	10.12	44.51			
6/20/2008 10:19:45	9.60	48.39	10.04	45.18			
6/20/2008 10:20:00	9.52	48.37	9.96	45.78			
6/20/2008 10:20:15	9.52	48.55	9.91	45.93			

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 10:20:30	9.54	48.92	9.98	46.16	
6/20/2008 10:20:45	9.53	48.55	9.99	45.61	
6/20/2008 10:21:00	9.52	48.25	9.99	45.31	
6/20/2008 10:21:15	9.49	48.15	10.02	45.38	
6/20/2008 10:21:30	9.46	48.52	9.95	45.31	
6/20/2008 10:21:45	9.42	48.90	9.98	45.31	
6/20/2008 10:22:00	9.45	48.92	10.05	45.46	
6/20/2008 10:22:15	9.48	48.75	9.92	45.83	
6/20/2008 10:22:30	9.43	48.37	9.95	45.98	
6/20/2008 10:22:45	9.43	48.70	9.90	46.13	
6/20/2008 10:23:00	9.42	48.80	9.83	46.13	
6/20/2008 10:23:15	9.45	48.95	9.78	45.91	
6/20/2008 10:23:30	9.45	49.32	9.77	45.91	
6/20/2008 10:23:45	9.42	48.95	9.84	45.56	
6/20/2008 10:24:00	9.44	48.95	9.92	45.63	
6/20/2008 10:24:15	9.46	49.00	9.98	46.08	
6/20/2008 10:24:30	9.51	48.68	10.03	45.93	
6/20/2008 10:24:45	9.55	48.30	10.01	45.94	
6/20/2008 10:25:00	9.52	48.43	9.99	45.86	
6/20/2008 10:25:15	9.47	48.75	9.95	45.51	
6/20/2008 10:25:30	9.41	48.80	9.95	45.51	
6/20/2008 10:25:45	9.40	48.60	9.99	45.51	
6/20/2008 10:26:00	9.43	48.50	9.92	45.73	
6/20/2008 10:26:15	9.39	48.50	9.96	46.18	
6/20/2008 10:26:30	9.41	48.50	10.00	46.03	
6/20/2008 10:26:45	9.48	48.55	9.99	45.98	
6/20/2008 10:27:00	9.49	48.60	10.02	45.91	
6/20/2008 10:27:15	9.50	48.75	9.98	46.08	
6/20/2008 10:27:30	9.44	49.05	9.96	46.46	
6/20/2008 10:27:45	9.43	48.90	10.00	46.48	
6/20/2008 10:28:00	9.44	48.72	10.00	46.41	
6/20/2008 10:28:15	9.41	48.55	9.83	46.41	
6/20/2008 10:28:30	9.26	48.75	9.80	46.41	
6/20/2008 10:28:45	9.31	48.80	9.86	46.26	
6/20/2008 10:29:00	9.37	48.57	9.96	45.88	
6/20/2008 10:29:15	9.53	48.10	10.10	45.66	
6/20/2008 10:29:30	9.58	48.17	10.05	45.96	
6/20/2008 10:29:45	9.50	48.10	10.00	46.11	
6/20/2008 10:30:00	9.51	48.32	9.93	46.26	
6/20/2008 10:30:15	9.41	48.70	9.83	46.46	
6/20/2008 10:30:30	9.24	48.45	9.73	46.23	
6/20/2008 10:30:45	9.28	48.65	9.80	46.21	
6/20/2008 10:31:00	9.34	48.47	9.86	46.28	
6/20/2008 10:31:15	9.39	48.10	9.89	46.36	
6/20/2008 10:31:30	9.42	48.10	9.84	46.06	
6/20/2008 10:31:45	9.41	48.55	9.84	45.88	
6/20/2008 10:32:00	9.32	48.62	9.84	45.88	
6/20/2008 10:32:15	9.38	48.40	9.86	46.01	
6/20/2008 10:32:30	9.44	48.07	9.92	46.08	
6/20/2008 10:32:45	9.44	48.00	9.89	46.21	
6/20/2008 10:33:00	9.43	48.16	9.90	46.21	
6/20/2008 10:33:15	9.40	48.40	9.93	46.25	
6/20/2008 10:33:30	9.33	48.47	9.93	46.91	
6/20/2008 10:33:45	9.33	48.45	9.91	46.77	
6/20/2008 10:34:00	9.33	48.40	9.86	46.56	
6/20/2008 10:34:15	9.32	48.40	9.80	46.25	
6/20/2008 10:34:30	9.30	48.35	9.81	46.38	
6/20/2008 10:34:45	9.28	48.05	9.80	46.41	
6/20/2008 10:35:00	9.28	47.80	9.77	46.03	
6/20/2008 10:35:15	9.31	47.80	9.83	45.56	
6/20/2008 10:35:30	9.31	48.00	9.86	45.76	
6/20/2008 10:35:45	9.25	47.75	9.81	46.41	
6/20/2008 10:36:00	9.28	48.00	9.75	46.46	
6/20/2008 10:36:15	9.28	48.35	9.73	46.26	
6/20/2008 10:36:30	9.29	48.17	9.69	46.21	
6/20/2008 10:36:45	9.30	47.90	9.76	45.71	
6/20/2008 10:37:00	9.34	47.87	9.76	45.58	
6/20/2008 10:37:15	9.27	47.90	9.73	45.81	
6/20/2008 10:37:30	9.26	47.97	9.75	45.98	
6/20/2008 10:37:45	9.32	48.35	9.86	45.71	
6/20/2008 10:38:00	9.37	48.30	9.82	45.68	
6/20/2008 10:38:15	9.33	48.10	9.91	45.71	
6/20/2008 10:38:30	9.36	48.10	9.95	45.71	
6/20/2008 10:38:45	9.38	48.10	9.91	46.41	
6/20/2008 10:39:00	9.31	48.50	9.93	46.38	
6/20/2008 10:39:15	9.36	48.85	9.89	46.06	
6/20/2008 10:39:30	9.43	48.65	9.92	46.26	
6/20/2008 10:39:45	9.45	48.55	9.98	46.75	
6/20/2008 10:40:00	9.39	48.30	9.94	46.75	
6/20/2008 10:40:15	9.36	48.25	9.95	46.65	
6/20/2008 10:40:30	9.39	48.57	9.90	47.03	
6/20/2008 10:40:45	9.35	48.40	9.88	46.66	
6/20/2008 10:41:00	9.39	48.60	9.90	46.36	
6/20/2008 10:41:15	9.35	48.85	9.94	46.26	
6/20/2008 10:41:30	9.28	48.72	9.86	46.71	
6/20/2008 10:41:45	9.31	48.70	9.86	46.21	
6/20/2008 10:42:00	9.39	48.80	9.97	46.08	
6/20/2008 10:42:15	9.43	48.80	10.01	46.36	
6/20/2008 10:42:30	9.40	48.57	10.00	46.90	
6/20/2008 10:42:45	9.40	48.65	9.99	46.91	

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 10:43:00	9.44	48.80	9.97	46.90	
6/20/2008 10:43:15	9.51	48.90	9.92	46.80	
6/20/2008 10:43:30	9.51	48.95	9.87	46.48	
6/20/2008 10:43:45	9.47	48.80	9.84	46.60	
6/20/2008 10:44:00	9.43	48.47	9.83	46.78	
6/20/2008 10:44:15	9.45	48.25	9.82	47.00	
6/20/2008 10:44:30	9.39	48.37	9.93	46.93	
6/20/2008 10:44:45	9.41	48.40	9.92	46.45	
6/20/2008 10:45:00	9.39	48.47	9.90	46.30	
6/20/2008 10:45:15	9.37	48.60	9.89	46.25	
6/20/2008 10:45:30	9.34	48.77	9.85	46.38	
6/20/2008 10:45:45	9.35	48.45	9.91	46.10	
6/20/2008 10:46:00	9.44	48.30	10.00	45.85	
6/20/2008 10:46:15	9.47	48.25	9.98	45.71	
6/20/2008 10:46:30	9.48	48.22	10.01	45.88	
6/20/2008 10:46:45	9.52	48.35	10.00	46.30	
6/20/2008 10:47:00	9.46	48.40	9.93	46.48	
6/20/2008 10:47:15	9.43	48.40	9.94	46.50	
6/20/2008 10:47:30	9.52	48.45	10.03	46.25	
6/20/2008 10:47:45	9.59	48.65	9.90	47.40	
6/20/2008 10:48:00	9.49	48.62	9.86	47.35	
6/20/2008 10:48:15	9.47	48.65	9.91	46.65	
6/20/2008 10:48:30	9.42	48.77	9.94	46.78	
6/20/2008 10:48:45	9.38	48.75	9.92	46.55	
6/20/2008 10:49:00	9.29	48.72	9.89	46.43	
6/20/2008 10:49:15	9.29	48.85	9.90	46.40	
6/20/2008 10:49:30	9.36	49.00	9.95	46.58	
6/20/2008 10:49:45	9.42	48.75	9.98	46.45	
6/20/2008 10:50:00	9.47	48.77	10.01	46.40	
6/20/2008 10:50:15	9.44	48.80	9.94	46.40	
6/20/2008 10:50:30	9.40	48.57	9.89	46.48	
6/20/2008 10:50:45	9.37	48.60	9.88	46.20	
6/20/2008 10:51:00	9.38	48.60	9.89	46.25	
6/20/2008 10:51:15	9.37	48.55	9.89	46.65	
6/20/2008 10:51:30	9.35	48.42	9.85	47.28	
6/20/2008 10:51:45	9.31	48.45	9.86	46.80	
6/20/2008 10:52:00	9.32	48.37	9.81	46.60	
6/20/2008 10:52:15	9.36	48.25	9.82	46.30	
6/20/2008 10:52:30	9.39	48.37	9.94	45.80	
6/20/2008 10:52:45	9.41	48.75	9.91	46.10	
6/20/2008 10:53:00	9.41	48.92	9.90	46.35	
6/20/2008 10:53:15	9.44	48.95	9.97	46.65	
6/20/2008 10:53:30	9.44	48.85	9.87	46.70	
6/20/2008 10:53:45	9.33	48.65	9.87	46.40	
6/20/2008 10:54:00	9.30	48.50	9.87	46.30	
6/20/2008 10:54:15	9.31	48.40	9.87	46.35	
6/20/2008 10:54:30	9.33	48.35	9.87	46.23	
6/20/2008 10:54:45	9.34	48.15	9.88	46.35	
6/20/2008 10:55:00	9.33	48.12	9.84	46.40	
6/20/2008 10:55:15	9.35	48.35	9.87	46.35	
6/20/2008 10:55:30	9.38	48.75	9.92	46.30	
6/20/2008 10:55:45	9.36	48.90	9.97	45.95	
6/20/2008 10:56:00	9.42	48.60	9.98	45.73	
6/20/2008 10:56:15	9.41	48.35	10.00	45.70	
6/20/2008 10:56:30	9.45	48.45	10.03	45.70	
6/20/2008 10:56:45	9.48	48.40	10.08	45.70	
6/20/2008 10:57:00	9.50	48.32	10.13	45.78	
6/20/2008 10:57:15	9.54	48.15	10.15	45.75	
6/20/2008 10:57:30	9.63	47.87	10.24	45.38	
6/20/2008 10:57:45	9.74	48.00	10.26	45.90	
6/20/2008 10:58:00	9.74	47.85	10.25	45.95	
6/20/2008 10:58:15	9.70	47.75	10.24	45.95	
6/20/2008 10:58:30	9.72	48.19	10.22	46.25	
6/20/2008 10:58:45	9.73	48.30	10.27	46.50	
6/20/2008 10:59:00	9.71	48.42	10.19	46.52	
6/20/2008 10:59:15	9.68	48.50	10.18	46.45	
6/20/2008 10:59:30	9.68	48.60	10.20	46.52	
6/20/2008 10:59:45	9.67	48.65	10.21	46.60	
6/20/2008 11:00:00	9.68	48.22	10.23	46.43	
6/20/2008 11:00:15	9.70	48.00	10.23	46.30	
6/20/2008 11:00:30	9.67	47.95	10.17	46.38	
6/20/2008 11:00:45	9.62	48.25	10.16	46.35	
6/20/2008 11:01:00	9.64	48.30	10.19	46.18	
6/20/2008 11:01:15	9.65	48.30	10.13	45.85	
6/20/2008 11:01:30	9.65	48.32	10.17	45.53	
6/20/2008 11:01:45	9.66	48.45	10.16	45.70	
6/20/2008 11:02:00	9.71	48.50	10.22	45.68	
6/20/2008 11:02:15	9.86	48.45	10.17	45.50	
6/20/2008 11:02:30	9.86	48.42	10.17	45.58	
6/20/2008 11:02:45	9.78	48.55	10.15	45.65	
6/20/2008 11:03:00	9.76	48.00	10.18	45.53	
6/20/2008 11:03:15	9.80	47.65	10.27	45.40	
6/20/2008 11:03:30	9.78	47.50	10.19	45.40	
6/20/2008 11:03:45	9.70	47.55	10.20	45.05	
6/20/2008 11:04:00	9.71	47.87	10.26	44.90	
6/20/2008 11:04:15	9.83	48.10	10.27	44.95	
6/20/2008 11:04:30	9.82	48.07	10.32	45.18	
6/20/2008 11:04:45	9.84	47.95	10.32	45.35	
6/20/2008 11:05:00	9.82	48.00	10.29	45.53	
6/20/2008 11:05:15	9.85	48.05	10.25	45.75	

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 11:05:30	9.83	48.25	10.22	45.85			
6/20/2008 11:05:45	9.79	47.95	10.19	46.15			
6/20/2008 11:06:00	9.75	47.90	10.28	46.23			
6/20/2008 11:06:15	9.79	47.90	10.33	46.25			
6/20/2008 11:06:30	9.80	47.92	10.28	46.38			
6/20/2008 11:06:45	9.77	48.05	10.25	46.75			
6/20/2008 11:07:00	9.77	48.20	10.24	46.33			
6/20/2008 11:07:15	9.71	48.10	10.16	45.85			
6/20/2008 11:07:30	9.64	47.85	10.08	45.93			
6/20/2008 11:07:45	9.67	48.10	10.26	45.70			
6/20/2008 11:08:00	9.83	47.95	10.24	46.00			
6/20/2008 11:08:15	9.77	47.75	10.18	46.30			
6/20/2008 11:08:30	9.72	47.55	10.16	46.03			
6/20/2008 11:08:45	9.70	47.80	10.13	45.85			
6/20/2008 11:09:00	9.64	48.15	10.04	46.13			
6/20/2008 11:09:15	9.54	48.30	10.08	46.25			
6/20/2008 11:09:30	9.65	48.30	10.15	45.68			
6/20/2008 11:09:45	9.71	47.80	10.15	45.85			
6/20/2008 11:10:00	9.70	47.72	10.11	46.30			
6/20/2008 11:10:15	9.62	47.95	10.09	46.50			
6/20/2008 11:10:30	9.60	48.45	10.14	46.28			
6/20/2008 11:10:45	9.65	48.20	10.10	46.00			
6/20/2008 11:11:00	9.72	48.22	10.14	45.78			
6/20/2008 11:11:15	9.72	48.30	10.18	45.60			
6/20/2008 11:11:30	9.74	48.25	10.23	45.50			
6/20/2008 11:11:45	9.70	48.00	10.17	45.35			
6/20/2008 11:12:00	9.68	47.67	10.17	45.43			
6/20/2008 11:12:15	9.70	47.65	10.09	45.55			
6/20/2008 11:12:30	9.59	47.87	10.00	45.55			
6/20/2008 11:12:45	9.57	48.25	9.97	45.85			
6/20/2008 11:13:00	9.59	48.17	10.04	45.63			
6/20/2008 11:13:15	9.62	48.05	10.05	45.25			
6/20/2008 11:13:30	9.67	47.85	10.09	45.23			
6/20/2008 11:13:45	9.68	47.60	10.04	45.40			
6/20/2008 11:14:00	9.73	47.52	9.97	45.83			
6/20/2008 11:14:15	9.77	47.50	10.00	46.30			
6/20/2008 11:14:30	9.75	47.37	9.99	46.58			
6/20/2008 11:14:45	9.78	47.75	9.98	46.45			
6/20/2008 11:15:00	9.79	47.40	9.87	46.63			
6/20/2008 11:15:15	9.71	47.10	9.81	46.60			
6/20/2008 11:15:30	9.71	47.12	9.95	45.73			
6/20/2008 11:15:45	9.70	47.20	10.10	45.35			
6/20/2008 11:16:00	9.71	47.32	10.14	45.30			
6/20/2008 11:16:15	9.70	47.40	10.20	45.30			
6/20/2008 11:16:30	9.72	47.30	10.19	45.33			
6/20/2008 11:16:45	9.75	47.30	10.19	45.10			
6/20/2008 11:17:00	9.79	47.45	10.20	45.18			
6/20/2008 11:17:15	9.78	47.60	10.20	45.50			
6/20/2008 11:17:30	9.71	47.60	10.14	45.90			
6/20/2008 11:17:45	9.65	47.60	10.05	45.85	END RUN 2		
6/20/2008 11:18:00	9.62	47.60	10.07	45.68			
6/20/2008 11:18:15	9.66	47.70	10.17	45.50			
6/20/2008 11:18:30	9.67	47.93	10.18	45.10			
6/20/2008 11:18:45	9.67	47.60	8.93	43.25			
6/20/2008 11:19:00	9.68	47.50	6.92	24.74			
6/20/2008 11:19:15	9.67	47.60	9.55	5.82			
6/20/2008 11:19:30	9.70	47.87	9.91	3.45			
6/20/2008 11:19:45	9.69	47.75	9.93	2.67			
6/20/2008 11:20:00	9.70	47.57	9.91	2.42			
6/20/2008 11:20:15	9.70	47.40	9.90	2.27			
6/20/2008 11:20:30	9.63	47.07	9.90	2.15			
6/20/2008 11:20:45	9.61	46.90	9.91	2.07			
6/20/2008 11:21:00	9.63	46.65	9.92	2.02			
6/20/2008 11:21:15	9.56	46.55	9.94	1.97			
6/20/2008 11:21:30	9.49	46.72	9.95	1.92			
6/20/2008 11:21:45	9.50	46.80	9.95	1.92			
6/20/2008 11:22:00	9.62	46.82	9.96	1.72			
6/20/2008 11:22:15	9.66	46.75	9.96	1.52			
6/20/2008 11:22:30	9.68	46.30	9.96	1.45			
6/20/2008 11:22:45	9.65	46.36	9.96	1.42			
6/20/2008 11:23:00	9.59	46.17	9.96	1.35	SOUTH		
6/20/2008 11:23:15	9.50	46.29	9.96	1.32	O2 cal gas conc.	10.00	%
6/20/2008 11:23:30	9.52	46.67	9.96	1.25	Analyzer Response	9.96	%
6/20/2008 11:23:45	9.62	46.46	9.96	1.22	NOx cal gas conc.	0.00	ppmv
6/20/2008 11:24:00	9.70	46.37	9.96	1.15	Analyzer Response	1.23	ppmv
6/20/2008 11:24:15	9.63	46.37	9.98	4.72			
6/20/2008 11:24:30	9.63	46.45	9.15	16.43			
6/20/2008 11:24:45	9.61	46.15	2.65	27.91			
6/20/2008 11:25:00	9.61	46.10	0.33	36.47			
6/20/2008 11:25:15	9.57	46.10	0.13	38.85			
6/20/2008 11:25:30	9.52	46.05	0.10	34.87			
6/20/2008 11:25:45	9.61	46.42	0.08	33.11			
6/20/2008 11:26:00	9.69	46.37	0.07	26.24			
6/20/2008 11:26:15	9.65	46.67	0.06	24.06			
6/20/2008 11:26:30	9.56	47.18	0.05	30.61			
6/20/2008 11:26:45	9.50	47.10	0.05	39.60			
6/20/2008 11:27:00	9.55	46.97	0.04	45.85			
6/20/2008 11:27:15	9.70	46.75	0.04	47.65			
6/20/2008 11:27:30	9.78	46.50	0.04	48.20	SOUTH		
6/20/2008 11:27:45	9.72	46.43	0.04	48.15	O2 cal gas conc.	0.00	%

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 11:28:00	9.62	46.77	0.03	48.12	Analyzer Response	0.03	%
6/20/2008 11:28:15	9.55	46.85	0.03	48.15	NOx cal gas conc.	50.00	ppmv
6/20/2008 11:28:30	9.47	46.62	0.03	48.00	Analyzer Response	48.11	ppmv
6/20/2008 11:28:45	9.59	46.85	0.02	47.95			
6/20/2008 11:29:00	9.73	46.43	0.02	47.80			
6/20/2008 11:29:15	9.71	46.27	0.02	47.75			
6/20/2008 11:29:30	9.68	46.32	2.86	47.15			
6/20/2008 11:29:45	9.43	46.48	3.99	44.85			
6/20/2008 11:30:00	7.27	46.35	8.36	41.15			
6/20/2008 11:30:15	8.39	39.82	9.83	39.90			
6/20/2008 11:30:30	9.68	26.43	10.04	41.08			
6/20/2008 11:30:45	9.89	7.36	10.01	41.50			
6/20/2008 11:31:00	9.91	2.28	9.95	42.23			
6/20/2008 11:31:15	9.91	1.01	9.99	42.51			
6/20/2008 11:31:30	9.91	0.83	9.89	42.33			
6/20/2008 11:31:45	9.92	0.75	9.78	42.45			
6/20/2008 11:32:00	9.92	0.65	9.81	42.38			
6/20/2008 11:32:15	9.92	0.58	9.96	42.25			
6/20/2008 11:32:30	9.92	0.55	10.05	42.28			
6/20/2008 11:32:45	9.92	0.55	10.07	42.65			
6/20/2008 11:33:00	9.93	0.53	10.01	43.28	NORTH		
6/20/2008 11:33:15	9.93	0.45	9.96	43.45	O2 cal gas conc.	10.00	%
6/20/2008 11:33:30	9.93	0.45	9.99	43.45	Analyzer Response	9.93	%
6/20/2008 11:33:45	9.93	0.45	9.92	43.70	NOx cal gas conc.	0.00	ppmv
6/20/2008 11:34:00	9.92	0.43	9.82	43.80	Analyzer Response	0.44	ppmv
6/20/2008 11:34:15	9.78	0.88	9.72	43.70			
6/20/2008 11:34:30	7.61	3.13	9.85	43.35			
6/20/2008 11:34:45	2.85	12.67	9.94	43.60			
6/20/2008 11:35:00	0.50	26.23	9.95	43.58			
6/20/2008 11:35:15	0.11	37.49	9.85	43.50			
6/20/2008 11:35:30	0.08	44.72	9.80	43.60	PMT COOLER ALARM On NORTH		
6/20/2008 11:35:45	0.07	44.95	9.79	43.60	Addendum It appears AC Has frozen		
6/20/2008 11:36:00	0.06	45.37	9.88	43.60			
6/20/2008 11:36:15	0.05	45.45	9.92	43.80			
6/20/2008 11:36:30	0.05	45.42	9.95	44.33			
6/20/2008 11:36:45	0.05	46.10	9.95	44.40			
6/20/2008 11:37:00	0.04	46.68	9.87	44.38			
6/20/2008 11:37:15	0.04	46.98	9.81	44.05			
6/20/2008 11:37:30	0.04	47.10	9.93	43.38			
6/20/2008 11:37:45	0.04	47.03	9.98	43.80			
6/20/2008 11:38:00	0.03	47.00	9.97	44.13			
6/20/2008 11:38:15	0.03	47.00	10.00	44.25			
6/20/2008 11:38:30	0.03	46.90	9.98	44.23			
6/20/2008 11:38:45	0.03	46.90	9.98	43.85			
6/20/2008 11:39:00	0.03	46.90	9.89	44.30			
6/20/2008 11:39:15	0.03	46.90	9.91	44.60			
6/20/2008 11:39:30	0.03	46.90	9.89	44.50	PMT COOLE ALARM ON SOUTH		
6/20/2008 11:39:45	0.03	46.90	9.96	44.05			
6/20/2008 11:40:00	0.03	46.90	10.04	43.78			
6/20/2008 11:40:15	0.02	46.90	10.07	43.80			
6/20/2008 11:40:30	0.02	46.80	10.12	44.08			
6/20/2008 11:40:45	0.02	46.80	10.15	44.45			
6/20/2008 11:41:00	0.36	46.80	10.11	44.48			
6/20/2008 11:41:15	4.66	46.80	10.10	44.45			
6/20/2008 11:41:30	8.49	46.73	10.02	44.52			
6/20/2008 11:41:45	9.46	46.95	9.95	44.65			
6/20/2008 11:42:00	9.48	46.63	9.93	44.60			
6/20/2008 11:42:15	9.48	46.48	10.02	44.60			
6/20/2008 11:42:30	9.53	46.60	10.09	44.57			
6/20/2008 11:42:45	9.63	46.53	10.16	44.45			
6/20/2008 11:43:00	9.69	46.53	10.14	44.52			
6/20/2008 11:43:15	9.70	46.38	10.15	44.45			
6/20/2008 11:43:30	9.66	46.08	10.06	44.12			
6/20/2008 11:43:45	9.59	46.53	10.06	44.25			
6/20/2008 11:44:00	9.54	46.83	10.09	44.42			
6/20/2008 11:44:15	9.53	46.75	9.99	44.45			
6/20/2008 11:44:30	9.53	46.48	10.02	44.25			
6/20/2008 11:44:45	9.53	46.33	10.04	44.00			
6/20/2008 11:45:00	9.57	46.15	10.08	43.75			
6/20/2008 11:45:15	9.66	46.07	10.16	43.75			
6/20/2008 11:45:30	9.70	46.15	10.13	44.20			
6/20/2008 11:45:45	9.63	45.92	10.06	44.65			
6/20/2008 11:46:00	9.54	46.30	10.06	44.82			
6/20/2008 11:46:15	9.58	46.45	10.06	44.70			
6/20/2008 11:46:30	9.63	46.25	10.01	44.07			
6/20/2008 11:46:45	9.60	45.95	9.97	43.90			
6/20/2008 11:47:00	7.42	46.27	10.07	43.70			
6/20/2008 11:47:15	2.58	46.42	10.15	43.60			
6/20/2008 11:47:30	0.36	45.95	10.20	43.37			
6/20/2008 11:47:45	0.07	44.97	10.16	43.75			
6/20/2008 11:48:00	0.04	45.07	10.06	44.05			
6/20/2008 11:48:15	0.04	44.82	10.07	44.15			
6/20/2008 11:48:30	0.03	44.19	10.04	43.90			
6/20/2008 11:48:45	0.03	44.52	9.90	43.95			
6/20/2008 11:49:00	0.03	44.29	10.05	43.87			
6/20/2008 11:49:15	0.02	44.57	10.12	43.65			
6/20/2008 11:49:30	0.02	45.44	10.11	43.22			
6/20/2008 11:49:45	0.02	46.07	10.00	43.35			
6/20/2008 11:50:00	0.02	46.45	9.90	43.27			
6/20/2008 11:50:15	0.02	46.50	9.83	43.13			

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 11:50:30	0.02	46.55	9.90	42.87	
6/20/2008 11:50:45	0.02	46.60	10.03	42.73	
6/20/2008 11:51:00	0.02	46.60	9.96	43.45	
6/20/2008 11:51:15	0.02	46.52	9.92	43.75	
6/20/2008 11:51:30	0.02	46.50	9.95	43.50	
6/20/2008 11:51:45	0.02	18.71	9.93	43.50	
6/20/2008 11:52:00	0.02	7.30	9.97	43.12	
6/20/2008 11:52:15	0.02	3.58	10.08	42.67	
6/20/2008 11:52:30	0.01	0.68	10.16	42.47	
6/20/2008 11:52:45	0.01	-0.05	10.17	42.92	
6/20/2008 11:53:00	0.01	35.46	10.10	43.50	
6/20/2008 11:53:15	0.01	46.67	10.08	43.65	
6/20/2008 11:53:30	0.01	46.52	10.03	43.45	
6/20/2008 11:53:45	0.01	46.49	10.01	43.22	
6/20/2008 11:54:00	0.01	46.49	10.12	42.85	
6/20/2008 11:54:15	0.01	46.57	10.16	42.70	
6/20/2008 11:54:30	0.01	46.50	10.11	42.73	
6/20/2008 11:54:45	0.01	46.50	10.11	42.88	
6/20/2008 11:55:00	0.01	46.42	10.06	43.25	
6/20/2008 11:55:15	0.42	46.36	10.09	43.47	
6/20/2008 11:55:30	4.82	46.22	10.10	43.50	
6/20/2008 11:55:45	8.53	46.34	10.13	42.90	
6/20/2008 11:56:00	9.47	46.25	10.19	42.93	
6/20/2008 11:56:15	9.54	46.00	10.18	43.15	
6/20/2008 11:56:30	9.59	45.92	10.22	43.33	
6/20/2008 11:56:45	9.71	45.85	10.30	42.95	
6/20/2008 11:57:00	9.82	45.72	10.30	43.40	
6/20/2008 11:57:15	9.75	45.70	10.23	43.70	
6/20/2008 11:57:30	9.67	45.87	10.17	43.73	
6/20/2008 11:57:45	9.62	46.10	10.13	43.80	
6/20/2008 11:58:00	9.60	46.35	10.15	44.15	
6/20/2008 11:58:15	7.13	46.65	10.18	44.00	
6/20/2008 11:58:30	2.33	46.60	10.13	43.60	
6/20/2008 11:58:45	0.28	46.00	10.16	43.68	
6/20/2008 11:59:00	0.04	46.02	10.22	43.48	
6/20/2008 11:59:15	0.02	46.35	10.25	43.25	
6/20/2008 11:59:30	0.01	46.05	10.28	43.08	
6/20/2008 11:59:45	0.00	46.30	10.29	43.53	
6/20/2008 12:00:00	0.00	46.30	10.25	43.75	
6/20/2008 12:00:15	0.00	46.40	10.20	44.05	
6/20/2008 12:00:30	0.00	46.57	10.13	44.22	
6/20/2008 12:00:45	0.00	47.10	10.08	43.77	
6/20/2008 12:01:00	0.00	47.29	10.15	43.32	PMT COOLER ALARM OFF ON SOUTH
6/20/2008 12:01:15	-0.01	40.08	10.18	39.42	
6/20/2008 12:01:30	0.00	21.74	10.19	35.00	
6/20/2008 12:01:45	0.00	40.14	10.14	43.18	
6/20/2008 12:02:00	0.00	47.50	10.09	44.05	
6/20/2008 12:02:15	0.00	47.50	10.07	43.90	
6/20/2008 12:02:30	0.00	47.50	10.12	43.75	
6/20/2008 12:02:45	0.00	47.40	10.17	43.45	
6/20/2008 12:03:00	0.00	47.40	10.16	43.75	
6/20/2008 12:03:15	0.00	47.35	10.11	43.97	
6/20/2008 12:03:30	0.01	47.22	10.08	44.11	
6/20/2008 12:03:45	0.01	47.10	10.05	43.97	
6/20/2008 12:04:00	0.01	47.17	10.01	32.30	
6/20/2008 12:04:15	0.01	47.35	10.02	31.71	
6/20/2008 12:04:30	0.00	47.30	10.03	43.57	
6/20/2008 12:04:45	0.00	47.35	10.01	44.02	
6/20/2008 12:05:00	0.00	47.40	9.95	43.95	
6/20/2008 12:05:15	0.01	47.35	9.87	43.80	
6/20/2008 12:05:30	0.01	47.30	9.79	43.65	
6/20/2008 12:05:45	0.01	47.40	9.75	43.28	
6/20/2008 12:06:00	0.01	47.40	9.76	42.95	
6/20/2008 12:06:15	0.01	47.40	9.89	42.50	
6/20/2008 12:06:30	0.01	47.47	9.96	42.08	
6/20/2008 12:06:45	0.01	47.50	9.92	42.60	
6/20/2008 12:07:00	0.01	47.50	9.92	42.70	
6/20/2008 12:07:15	0.01	47.50	9.91	43.00	
6/20/2008 12:07:30	0.01	47.50	9.84	43.58	
6/20/2008 12:07:45	0.01	47.50	9.82	43.43	
6/20/2008 12:08:00	0.02	47.50	9.82	43.15	
6/20/2008 12:08:15	0.02	47.50	9.89	43.23	
6/20/2008 12:08:30	0.01	47.50	9.99	43.65	
6/20/2008 12:08:45	0.01	47.50	9.98	43.95	
6/20/2008 12:09:00	0.01	47.50	9.94	43.97	
6/20/2008 12:09:15	0.01	47.45	9.96	43.82	
6/20/2008 12:09:30	0.01	47.40	9.98	43.72	
6/20/2008 12:09:45	0.01	47.40	10.02	43.87	
6/20/2008 12:10:00	0.01	47.32	9.99	44.12	
6/20/2008 12:10:15	0.01	47.30	9.93	44.27	
6/20/2008 12:10:30	0.66	47.30	9.88	44.35	
6/20/2008 12:10:45	5.32	47.30	9.85	44.13	
6/20/2008 12:11:00	8.76	47.67	9.99	43.70	
6/20/2008 12:11:15	9.59	47.85	10.00	43.77	
6/20/2008 12:11:30	9.66	46.97	9.95	44.20	
6/20/2008 12:11:45	9.54	46.35	9.94	43.60	
6/20/2008 12:12:00	9.56	46.20	9.89	43.77	
6/20/2008 12:12:15	9.62	46.14	9.96	43.77	
6/20/2008 12:12:30	9.63	46.02	10.05	43.50	
6/20/2008 12:12:45	13.05	46.25	10.04	44.10	

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 12:13:00	19.25	38.34	10.13	43.82			
6/20/2008 12:13:15	20.67	19.57	10.21	43.90			
6/20/2008 12:13:30	20.75	4.83	10.20	44.37			
6/20/2008 12:13:45	20.76	0.90	10.11	44.82			
6/20/2008 12:14:00	20.77	0.55	9.98	44.90			
6/20/2008 12:14:15	20.77	0.45	10.03	44.52			
6/20/2008 12:14:30	20.76	0.45	10.17	43.97			
6/20/2008 12:14:45	20.71	0.35	10.17	44.35			
6/20/2008 12:15:00	16.72	0.42	10.12	44.40			
6/20/2008 12:15:15	10.32	8.51	10.04	44.47	PMT COOLER ALARM OFF ON NORTH		
6/20/2008 12:15:30	4.62	28.75	10.02	44.73			
6/20/2008 12:15:45	0.92	42.94	9.95	44.87			
6/20/2008 12:16:00	0.08	46.69	9.93	44.38			
6/20/2008 12:16:15	0.02	47.50	10.00	44.35			
6/20/2008 12:16:30	0.00	48.15	9.96	44.65			
6/20/2008 12:16:45	0.00	48.15	9.90	44.60			
6/20/2008 12:17:00	-0.01	48.17	9.89	44.40	NORTH		
6/20/2008 12:17:15	-0.01	48.20	9.83	44.52	O2 cal gas conc.	0.00	%
6/20/2008 12:17:30	-0.01	48.20	9.89	44.90	Analyzer Response	-0.01	%
6/20/2008 12:17:45	-0.01	48.25	9.97	44.90	NOx cal gas conc.	50.00	ppmv
6/20/2008 12:18:00	-0.02	48.30	9.97	45.00	Analyzer Response	48.24	ppmv
6/20/2008 12:18:15	-0.02	48.40	9.94	45.00			
6/20/2008 12:18:30	-0.02	48.47	9.91	44.80			
6/20/2008 12:18:45	-0.02	48.35	9.84	44.30			
6/20/2008 12:19:00	1.84	48.24	9.82	44.59			
6/20/2008 12:19:15	6.67	36.79	9.75	41.61			
6/20/2008 12:19:30	8.91	10.12	9.77	34.35			
6/20/2008 12:19:45	9.30	36.43	9.92	26.98			
6/20/2008 12:20:00	9.36	47.64	9.92	40.50			
6/20/2008 12:20:15	9.38	47.04	9.84	45.40			
6/20/2008 12:20:30	9.37	47.32	9.86	44.85			
6/20/2008 12:20:45	9.37	47.29	9.91	44.72			
6/20/2008 12:21:00	9.38	47.07	9.96	44.50			
6/20/2008 12:21:15	9.36	46.99	9.88	44.47			
6/20/2008 12:21:30	9.25	47.30	9.80	44.70			
6/20/2008 12:21:45	9.20	46.74	9.73	45.12			
6/20/2008 12:22:00	9.21	47.07	9.80	45.05			
6/20/2008 12:22:15	9.28	47.49	9.85	44.92			
6/20/2008 12:22:30	9.33	47.19	9.84	44.80			
6/20/2008 12:22:45	9.31	47.24	9.94	44.80			
6/20/2008 12:23:00	9.38	47.27	9.92	45.15			
6/20/2008 12:23:15	9.43	47.19	9.99	45.22			
6/20/2008 12:23:30	9.39	47.19	9.94	45.05			
6/20/2008 12:23:45	9.34	47.24	9.96	45.00			
6/20/2008 12:24:00	9.43	47.17	9.93	44.85			
6/20/2008 12:24:15	9.46	47.14	9.90	44.87			
6/20/2008 12:24:30	9.47	47.47	9.99	45.05			
6/20/2008 12:24:45	9.50	46.99	9.99	45.00			
6/20/2008 12:25:00	9.55	46.89	9.99	44.85			
6/20/2008 12:25:15	9.61	47.04	10.04	44.80			
6/20/2008 12:25:30	9.60	47.22	10.03	44.85			
6/20/2008 12:25:45	9.65	47.44	10.09	45.05			
6/20/2008 12:26:00	9.67	47.32	10.12	44.80			
6/20/2008 12:26:15	9.68	47.24	10.11	44.70			
6/20/2008 12:26:30	9.77	47.37	10.06	44.90			
6/20/2008 12:26:45	9.75	47.44	9.93	45.65			
6/20/2008 12:27:00	9.63	47.39	9.94	45.85			
6/20/2008 12:27:15	9.48	47.24	9.99	45.67			
6/20/2008 12:27:30	9.45	47.14	10.04	45.50			
6/20/2008 12:27:45	9.50	47.24	10.06	45.67			
6/20/2008 12:28:00	9.56	47.49	10.08	44.90			
6/20/2008 12:28:15	9.59	47.79	9.99	44.90			
6/20/2008 12:28:30	9.54	47.99	9.80	45.25			
6/20/2008 12:28:45	9.47	47.84	9.90	45.20			
6/20/2008 12:29:00	9.45	47.49	9.90	45.50			
6/20/2008 12:29:15	9.46	47.14	9.89	45.45			
6/20/2008 12:29:30	9.39	47.07	9.75	45.25			
6/20/2008 12:29:45	9.34	47.24	9.76	45.37			
6/20/2008 12:30:00	9.42	47.27	9.90	45.20			
6/20/2008 12:30:15	9.51	47.09	10.02	45.02			
6/20/2008 12:30:30	9.57	46.84	10.05	44.95			
6/20/2008 12:30:45	9.53	46.84	10.05	45.40			
6/20/2008 12:31:00	9.48	47.09	10.07	45.50			
6/20/2008 12:31:15	9.45	47.29	10.08	45.20			
6/20/2008 12:31:30	9.59	47.19	10.02	44.70			
6/20/2008 12:31:45	9.62	47.09	10.00	44.52			
6/20/2008 12:32:00	9.55	47.12	9.99	44.95			
6/20/2008 12:32:15	9.54	47.19	10.02	45.25			
6/20/2008 12:32:30	9.52	47.22	10.04	45.40			
6/20/2008 12:32:45	9.51	47.34	10.01	45.15			
6/20/2008 12:33:00	9.45	47.29	9.95	44.80			
6/20/2008 12:33:15	9.44	47.14	9.86	44.77			
6/20/2008 12:33:30	9.43	47.04	9.81	44.95			
6/20/2008 12:33:45	9.43	47.09	9.78	44.90			
6/20/2008 12:34:00	9.41	46.99	9.77	45.15			
6/20/2008 12:34:15	9.40	46.99	9.83	44.97			
6/20/2008 12:34:30	9.45	47.19	9.86	44.40			
6/20/2008 12:34:45	9.47	47.04	9.90	44.22			
6/20/2008 12:35:00	9.37	47.07	9.85	44.30			
6/20/2008 12:35:15	9.31	47.19	9.78	44.30			

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 12:35:30	9.38	47.37	9.75	44.45	
6/20/2008 12:35:45	9.41	46.99	9.69	45.00	
6/20/2008 12:36:00	9.34	46.89	9.67	45.25	
6/20/2008 12:36:15	9.27	46.89	9.67	45.07	
6/20/2008 12:36:30	9.25	46.67	9.72	44.50	
6/20/2008 12:36:45	9.27	46.69	9.74	44.07	
6/20/2008 12:37:00	9.30	46.79	9.82	44.15	
6/20/2008 12:37:15	9.34	46.89	9.78	44.80	
6/20/2008 12:37:30	9.33	46.94	9.68	45.45	
6/20/2008 12:37:45	9.36	46.79	9.60	44.82	
6/20/2008 12:38:00	9.32	46.82	9.65	44.55	
6/20/2008 12:38:15	9.26	46.84	9.70	44.50	
6/20/2008 12:38:30	9.20	46.59	9.70	44.55	
6/20/2008 12:38:45	9.14	46.74	9.60	44.92	
6/20/2008 12:39:00	9.22	47.02	9.61	45.40	
6/20/2008 12:39:15	9.26	47.29	9.69	45.27	
6/20/2008 12:39:30	9.32	47.24	9.73	45.10	
6/20/2008 12:39:45	9.31	47.04	9.64	45.52	
6/20/2008 12:40:00	9.30	46.92	9.61	45.65	
6/20/2008 12:40:15	9.37	46.89	9.72	45.17	
6/20/2008 12:40:30	9.38	46.94	9.76	44.35	
6/20/2008 12:40:45	9.41	46.89	9.78	44.60	
6/20/2008 12:41:00	9.36	46.81	9.71	45.39	
6/20/2008 12:41:15	9.07	39.83	9.68	45.35	
6/20/2008 12:41:30	5.48	25.87	9.57	33.90	
6/20/2008 12:41:45	1.45	40.18	9.56	10.87	
6/20/2008 12:42:00	0.14	45.28	9.60	34.14	
6/20/2008 12:42:15	0.03	43.34	9.62	23.18	
6/20/2008 12:42:30	0.01	42.74	9.67	12.41	
6/20/2008 12:42:45	0.01	39.14	9.61	40.07	
6/20/2008 12:43:00	0.00	38.51	9.70	45.29	
6/20/2008 12:43:15	0.00	33.08	9.74	45.22	
6/20/2008 12:43:30	-0.01	20.72	9.56	45.30	
6/20/2008 12:43:45	-0.01	34.58	9.46	45.47	
6/20/2008 12:44:00	-0.01	43.91	9.60	45.15	
6/20/2008 12:44:15	-0.01	46.79	9.70	45.00	
6/20/2008 12:44:30	-0.01	47.61	9.75	45.00	
6/20/2008 12:44:45	-0.01	47.84	9.66	45.07	
6/20/2008 12:45:00	-0.02	47.98	9.62	45.10	
6/20/2008 12:45:15	-0.02	47.99	9.64	45.30	
6/20/2008 12:45:30	-0.02	48.06	9.67	45.45	Back Online at Point 1
6/20/2008 12:45:45	-0.02	48.04	9.75	45.37	
6/20/2008 12:46:00	-0.02	48.09	9.72	45.55	
6/20/2008 12:46:15	-0.02	48.09	9.67	45.17	
6/20/2008 12:46:30	-0.02	48.09	9.68	44.90	
6/20/2008 12:46:45	0.88	48.09	9.65	45.37	
6/20/2008 12:47:00	5.55	48.07	9.69	45.40	
6/20/2008 12:47:15	8.55	47.94	9.63	45.40	
6/20/2008 12:47:30	9.19	47.72	9.59	45.20	
6/20/2008 12:47:45	9.29	47.69	9.73	44.70	
6/20/2008 12:48:00	9.35	47.32	9.86	44.60	
6/20/2008 12:48:15	9.42	47.04	9.85	44.80	
6/20/2008 12:48:30	9.41	46.87	9.84	45.05	
6/20/2008 12:48:45	9.37	46.69	9.83	45.10	
6/20/2008 12:49:00	9.34	46.69	9.84	45.10	
6/20/2008 12:49:15	9.29	46.89	9.76	45.20	
6/20/2008 12:49:30	9.29	47.49	9.78	45.15	
6/20/2008 12:49:45	9.35	47.54	9.82	44.92	
6/20/2008 12:50:00	9.40	47.12	9.76	45.25	
6/20/2008 12:50:15	9.40	47.04	9.75	45.62	
6/20/2008 12:50:30	9.29	47.52	9.77	40.80	
6/20/2008 12:50:45	9.29	47.64	9.77	30.36	
6/20/2008 12:51:00	9.26	47.44	9.73	40.40	
6/20/2008 12:51:15	9.28	47.34	9.72	45.20	
6/20/2008 12:51:30	9.24	47.37	9.67	45.15	
6/20/2008 12:51:45	9.24	47.24	9.70	44.92	
6/20/2008 12:52:00	9.28	47.22	9.78	45.25	
6/20/2008 12:52:15	9.26	47.14	9.80	44.92	
6/20/2008 12:52:30	9.22	46.78	9.70	45.25	
6/20/2008 12:52:45	9.15	46.67	9.62	45.62	
6/20/2008 12:53:00	9.12	29.30	9.53	44.80	
6/20/2008 12:53:15	9.09	26.08	9.51	45.12	
6/20/2008 12:53:30	9.24	47.57	9.58	45.30	
6/20/2008 12:53:45	9.33	46.94	9.64	44.95	BEGIN RUN 3
6/20/2008 12:54:00	9.26	46.32	9.60	45.25	
6/20/2008 12:54:15	9.20	46.14	9.67	45.20	
6/20/2008 12:54:30	9.22	46.42	9.72	45.10	
6/20/2008 12:54:45	9.21	46.54	9.59	45.27	
6/20/2008 12:55:00	9.17	46.44	9.57	45.00	
6/20/2008 12:55:15	9.21	46.09	9.61	45.00	
6/20/2008 12:55:30	9.15	45.62	9.46	45.05	
6/20/2008 12:55:45	9.14	46.69	9.44	44.97	
6/20/2008 12:56:00	9.19	46.97	9.46	44.85	
6/20/2008 12:56:15	9.07	46.64	9.42	44.80	
6/20/2008 12:56:30	8.95	46.07	9.46	44.80	
6/20/2008 12:56:45	8.97	46.39	9.54	44.87	
6/20/2008 12:57:00	9.00	46.37	9.58	45.30	
6/20/2008 12:57:15	9.07	46.39	9.49	45.50	
6/20/2008 12:57:30	9.01	46.64	9.42	45.50	
6/20/2008 12:57:45	8.98	46.94	9.43	45.37	

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 12:58:00	9.00	46.72	9.51	45.05	
6/20/2008 12:58:15	9.05	46.44	9.55	44.97	
6/20/2008 12:58:30	9.15	46.29	9.66	44.95	
6/20/2008 12:58:45	9.25	46.34	9.57	44.90	
6/20/2008 12:59:00	9.19	46.24	9.50	45.25	
6/20/2008 12:59:15	9.04	46.24	9.54	45.20	
6/20/2008 12:59:30	9.12	46.62	9.54	44.95	
6/20/2008 12:59:45	9.16	46.19	9.54	44.80	
6/20/2008 13:00:00	9.11	45.97	9.52	44.65	
6/20/2008 13:00:15	9.07	45.99	9.53	44.62	
6/20/2008 13:00:30	9.07	46.24	9.57	45.05	
6/20/2008 13:00:45	8.97	46.49	9.49	45.75	
6/20/2008 13:01:00	8.94	46.87	9.52	45.05	
6/20/2008 13:01:15	9.08	46.94	9.61	44.70	
6/20/2008 13:01:30	9.17	46.59	9.58	44.90	
6/20/2008 13:01:45	9.17	46.59	9.57	45.22	
6/20/2008 13:02:00	9.13	46.59	9.61	44.80	
6/20/2008 13:02:15	9.06	46.64	9.66	44.60	
6/20/2008 13:02:30	9.00	46.79	9.63	44.75	
6/20/2008 13:02:45	9.04	46.84	9.58	45.10	
6/20/2008 13:03:00	9.06	46.62	9.52	45.05	
6/20/2008 13:03:15	9.10	46.49	9.64	44.87	
6/20/2008 13:03:30	9.09	46.79	9.58	44.95	
6/20/2008 13:03:45	9.06	46.79	9.49	45.55	
6/20/2008 13:04:00	9.07	46.94	9.48	45.55	
6/20/2008 13:04:15	9.10	47.19	9.59	45.17	
6/20/2008 13:04:30	9.17	47.39	9.63	44.90	
6/20/2008 13:04:45	9.10	46.94	9.62	45.17	
6/20/2008 13:05:00	9.05	46.44	9.51	45.05	
6/20/2008 13:05:15	8.99	46.44	9.49	44.87	
6/20/2008 13:05:30	8.95	46.82	9.51	44.90	
6/20/2008 13:05:45	8.93	46.94	9.50	45.42	
6/20/2008 13:06:00	8.97	46.89	9.54	45.25	
6/20/2008 13:06:15	9.06	46.89	9.56	45.20	
6/20/2008 13:06:30	9.08	46.97	9.57	45.50	
6/20/2008 13:06:45	9.14	46.79	9.67	45.94	
6/20/2008 13:07:00	9.20	46.69	9.70	45.85	
6/20/2008 13:07:15	9.18	46.79	9.67	45.80	
6/20/2008 13:07:30	9.11	47.09	9.59	45.65	
6/20/2008 13:07:45	9.11	47.09	9.59	45.27	
6/20/2008 13:08:00	9.15	47.09	9.65	45.70	
6/20/2008 13:08:15	9.20	47.04	9.72	45.50	
6/20/2008 13:08:30	9.21	46.92	9.83	45.30	
6/20/2008 13:08:45	9.24	46.59	9.87	45.47	
6/20/2008 13:09:00	9.22	46.62	9.82	45.40	
6/20/2008 13:09:15	9.23	46.75	9.75	45.27	
6/20/2008 13:09:30	9.29	47.04	9.80	45.30	
6/20/2008 13:09:45	9.31	47.32	9.84	45.62	
6/20/2008 13:10:00	9.34	46.92	9.86	45.25	
6/20/2008 13:10:15	9.30	46.63	9.66	45.35	
6/20/2008 13:10:30	9.19	46.69	9.71	45.45	
6/20/2008 13:10:45	9.21	47.22	9.74	45.32	
6/20/2008 13:11:00	9.17	47.17	9.80	45.40	
6/20/2008 13:11:15	9.25	47.24	9.84	45.52	
6/20/2008 13:11:30	9.29	47.42	9.83	45.45	
6/20/2008 13:11:45	9.30	46.97	9.77	45.10	
6/20/2008 13:12:00	9.33	46.99	9.81	45.15	
6/20/2008 13:12:15	9.29	46.99	9.81	44.85	
6/20/2008 13:12:30	9.30	47.09	9.73	44.90	
6/20/2008 13:12:45	9.18	47.09	9.66	45.35	
6/20/2008 13:13:00	9.21	46.97	9.77	45.15	
6/20/2008 13:13:15	9.30	46.97	9.86	45.10	
6/20/2008 13:13:30	9.37	47.12	9.81	45.25	
6/20/2008 13:13:45	9.29	47.27	9.69	45.65	
6/20/2008 13:14:00	9.19	47.54	9.62	45.35	
6/20/2008 13:14:15	9.27	47.47	9.65	45.42	
6/20/2008 13:14:30	9.34	46.92	9.67	45.55	
6/20/2008 13:14:45	9.33	46.47	9.70	45.65	
6/20/2008 13:15:00	9.25	46.24	9.60	45.95	
6/20/2008 13:15:15	9.09	46.24	9.45	45.87	
6/20/2008 13:15:30	8.99	46.54	9.45	45.80	
6/20/2008 13:15:45	8.95	46.77	9.41	45.72	
6/20/2008 13:16:00	8.95	46.67	9.42	45.35	
6/20/2008 13:16:15	8.93	46.59	9.40	44.95	
6/20/2008 13:16:30	8.89	46.62	9.35	44.75	
6/20/2008 13:16:45	8.96	46.84	9.48	44.57	
6/20/2008 13:17:00	9.12	46.89	9.64	44.45	
6/20/2008 13:17:15	9.11	46.74	9.59	44.62	
6/20/2008 13:17:30	9.16	46.57	9.72	44.75	
6/20/2008 13:17:45	9.25	46.94	9.75	44.85	
6/20/2008 13:18:00	9.32	46.74	9.77	45.10	
6/20/2008 13:18:15	9.36	46.82	9.75	45.60	
6/20/2008 13:18:30	9.39	47.19	9.72	45.90	
6/20/2008 13:18:45	9.38	47.27	9.71	45.87	
6/20/2008 13:19:00	9.24	47.07	9.63	45.70	
6/20/2008 13:19:15	9.14	46.99	9.64	45.10	
6/20/2008 13:19:30	9.20	47.04	9.68	44.90	
6/20/2008 13:19:45	9.19	46.74	9.74	45.27	
6/20/2008 13:20:00	9.17	46.44	9.72	45.10	
6/20/2008 13:20:15	9.18	46.37	9.72	44.87	

Scale	0-20	0-100	0-20	0-100	Comments
Units	% db	ppmv db	% db	ppmv db	
Clock Time	Oxygen	NO_x	Oxygen	NO_x	
6/20/2008 13:20:30	9.22	46.39	9.76	45.05	
6/20/2008 13:20:45	9.20	46.39	9.75	45.67	
6/20/2008 13:21:00	9.23	46.52	9.77	45.50	
6/20/2008 13:21:15	9.28	46.52	9.74	45.87	
6/20/2008 13:21:30	9.20	46.47	9.67	46.00	
6/20/2008 13:21:45	9.10	46.99	9.61	45.67	
6/20/2008 13:22:00	8.96	47.09	9.57	45.60	
6/20/2008 13:22:15	8.96	46.94	9.57	44.97	
6/20/2008 13:22:30	9.03	46.69	9.64	44.60	
6/20/2008 13:22:45	9.09	46.69	9.62	44.62	
6/20/2008 13:23:00	9.10	46.72	9.70	44.75	
6/20/2008 13:23:15	9.14	46.79	9.70	45.05	
6/20/2008 13:23:30	9.11	46.79	9.68	45.20	
6/20/2008 13:23:45	9.13	46.79	9.73	45.15	
6/20/2008 13:24:00	9.14	46.67	9.78	44.95	
6/20/2008 13:24:15	9.14	46.67	9.75	45.27	
6/20/2008 13:24:30	9.20	46.74	9.85	45.35	
8/20/2008 13:24:45	9.30	46.44	9.88	44.92	
6/20/2008 13:25:00	9.39	46.24	9.88	45.10	
8/20/2008 13:25:15	9.35	46.39	9.77	45.22	
6/20/2008 13:25:30	9.28	46.94	9.78	45.20	
6/20/2008 13:25:45	9.24	47.32	9.75	44.87	
6/20/2008 13:26:00	9.21	47.14	9.77	44.75	
6/20/2008 13:26:15	9.23	46.84	9.76	44.60	
6/20/2008 13:26:30	9.32	46.52	9.76	44.70	
6/20/2008 13:26:45	9.30	46.59	9.82	45.02	
6/20/2008 13:27:00	9.25	46.69	9.77	45.15	
6/20/2008 13:27:15	9.26	46.84	9.74	45.22	
6/20/2008 13:27:30	9.30	47.04	9.74	45.35	
6/20/2008 13:27:45	9.31	47.27	9.72	45.52	
6/20/2008 13:28:00	9.30	47.17	9.62	45.60	
6/20/2008 13:28:15	9.28	47.02	9.61	45.75	
6/20/2008 13:28:30	9.21	46.99	9.64	45.75	
6/20/2008 13:28:45	9.13	47.07	9.62	45.35	
6/20/2008 13:29:00	9.13	46.82	9.61	45.10	
6/20/2008 13:29:15	9.11	46.67	9.59	44.87	
6/20/2008 13:29:30	9.17	46.69	9.68	44.70	
6/20/2008 13:29:45	9.28	46.62	9.74	44.55	
6/20/2008 13:30:00	9.24	46.57	9.74	44.80	
6/20/2008 13:30:15	9.22	46.64	9.78	45.12	
6/20/2008 13:30:30	9.27	46.89	9.80	45.10	
6/20/2008 13:30:45	9.28	46.97	9.88	45.12	
6/20/2008 13:31:00	9.28	46.87	9.79	45.10	
6/20/2008 13:31:15	9.15	46.87	9.66	45.43	
6/20/2008 13:31:30	9.03	46.99	9.79	45.29	
6/20/2008 13:31:45	9.09	46.99	9.85	44.22	
6/20/2008 13:32:00	9.03	46.84	9.66	44.85	
6/20/2008 13:32:15	8.83	47.07	9.54	44.97	
6/20/2008 13:32:30	8.93	47.62	9.61	44.96	
6/20/2008 13:32:45	9.04	47.25	9.65	45.00	
6/20/2008 13:33:00	9.15	46.94	9.76	45.00	
6/20/2008 13:33:15	9.19	46.94	9.81	45.27	
6/20/2008 13:33:30	9.21	47.09	9.90	45.50	
6/20/2008 13:33:45	9.21	47.02	9.94	45.42	
6/20/2008 13:34:00	9.22	47.51	9.88	45.57	
6/20/2008 13:34:15	9.24	47.80	9.84	45.32	
6/20/2008 13:34:30	9.34	47.72	9.85	45.25	
6/20/2008 13:34:45	9.30	47.45	9.84	45.35	
6/20/2008 13:35:00	9.20	47.39	9.86	44.97	
6/20/2008 13:35:15	9.16	47.32	9.91	44.90	
6/20/2008 13:35:30	9.28	47.04	9.94	44.90	
6/20/2008 13:35:45	9.29	46.67	9.91	45.05	
6/20/2008 13:36:00	9.21	46.44	9.82	45.27	
6/20/2008 13:36:15	9.08	46.69	9.80	45.42	
6/20/2008 13:36:30	9.04	47.14	9.77	45.20	
6/20/2008 13:36:45	9.17	47.02	9.83	44.82	
6/20/2008 13:37:00	9.18	46.69	9.83	44.97	
6/20/2008 13:37:15	9.10	46.82	9.72	45.00	
6/20/2008 13:37:30	8.99	47.45	9.59	45.15	
6/20/2008 13:37:45	8.85	47.82	9.46	45.30	
6/20/2008 13:38:00	8.80	47.75	9.43	44.70	
6/20/2008 13:38:15	8.75	47.69	9.40	44.85	
6/20/2008 13:38:30	8.55	47.69	9.31	45.00	
6/20/2008 13:38:45	8.50	47.69	9.29	44.92	
6/20/2008 13:39:00	8.52	47.54	9.17	45.07	
6/20/2008 13:39:15	8.63	47.27	9.16	45.60	
6/20/2008 13:39:30	8.72	46.84	9.17	45.52	
6/20/2008 13:39:45	8.81	46.47	9.30	45.07	
6/20/2008 13:40:00	8.74	46.40	9.25	45.52	
6/20/2008 13:40:15	8.73	46.17	9.45	44.97	
6/20/2008 13:40:30	8.87	45.99	9.53	44.67	
6/20/2008 13:40:45	8.93	46.49	9.43	44.72	
6/20/2008 13:41:00	8.98	46.74	9.45	44.80	
6/20/2008 13:41:15	8.92	46.72	9.45	44.80	
6/20/2008 13:41:30	8.85	46.44	9.43	44.95	
6/20/2008 13:41:45	8.82	46.07	9.39	45.22	
6/20/2008 13:42:00	8.71	46.44	9.38	44.85	
6/20/2008 13:42:15	8.81	46.52	9.38	44.42	
6/20/2008 13:42:30	8.84	46.49	9.34	43.97	
6/20/2008 13:42:45	8.85	46.57	9.34	43.50	

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 13:43:00	8.83	46.90	9.37	43.42			
6/20/2008 13:43:15	8.89	46.77	9.40	43.90			
6/20/2008 13:43:30	8.90	46.50	9.43	44.35			
6/20/2008 13:43:45	8.90	46.57	9.51	44.52			
6/20/2008 13:44:00	8.82	46.45	9.47	44.15			
6/20/2008 13:44:15	8.69	46.32	9.40	44.10			
6/20/2008 13:44:30	8.67	46.09	9.39	44.25			
6/20/2008 13:44:45	8.76	46.02	9.38	44.37			
6/20/2008 13:45:00	8.79	45.79	9.47	44.15			
6/20/2008 13:45:15	8.85	45.84	9.48	44.10			
6/20/2008 13:45:30	8.85	45.94	9.53	44.10			
6/20/2008 13:45:45	8.88	45.82	9.62	43.97			
6/20/2008 13:46:00	9.07	46.25	9.72	43.30			
6/20/2008 13:46:15	9.01	46.47	9.67	43.70			
6/20/2008 13:46:30	8.87	46.70	9.55	44.22			
6/20/2008 13:46:45	8.81	46.95	9.48	44.62			
6/20/2008 13:47:00	8.79	47.00	9.44	44.85			
6/20/2008 13:47:15	8.65	47.00	9.26	44.77			
6/20/2008 13:47:30	8.82	46.99	9.38	44.40			
6/20/2008 13:47:45	8.94	47.40	9.55	43.97			
6/20/2008 13:48:00	8.90	46.65	9.45	44.50			
6/20/2008 13:48:15	8.78	46.62	9.36	44.60			
6/20/2008 13:48:30	8.72	47.00	9.41	44.90			
6/20/2008 13:48:45	8.80	47.17	9.40	45.42			
6/20/2008 13:49:00	8.92	47.15	9.42	45.57			
6/20/2008 13:49:15	8.96	47.02	9.46	44.87			
6/20/2008 13:49:30	9.03	47.00	9.61	44.65			
6/20/2008 13:49:45	9.05	46.92	9.43	44.87			
6/20/2008 13:50:00	8.81	46.84	9.27	45.32			
6/20/2008 13:50:15	8.71	47.17	9.28	45.17			
6/20/2008 13:50:30	8.85	47.50	9.43	44.72			
6/20/2008 13:50:45	9.04	46.57	9.74	44.15			
6/20/2008 13:51:00	9.21	45.89	9.86	43.85			
6/20/2008 13:51:15	9.24	46.07	9.80	44.57			
6/20/2008 13:51:30	9.15	46.79	9.76	44.95			
6/20/2008 13:51:45	9.11	47.12	9.71	44.67			
6/20/2008 13:52:00	9.17	46.74	9.67	45.12			
6/20/2008 13:52:15	9.24	46.52	9.81	44.22			
6/20/2008 13:52:30	9.31	46.50	9.90	43.70			
6/20/2008 13:52:45	9.22	46.74	9.90	43.77			
6/20/2008 13:53:00	9.19	47.10	9.85	44.22			
6/20/2008 13:53:15	9.22	47.05	9.84	43.80			
6/20/2008 13:53:30	9.22	46.84	9.81	43.72			
6/20/2008 13:53:45	9.21	46.97	9.81	44.17	END RUN 3		
6/20/2008 13:54:00	9.14	46.84	9.72	44.55			
6/20/2008 13:54:15	9.14	46.95	9.63	44.70			
6/20/2008 13:54:30	9.07	47.35	9.55	44.47			
6/20/2008 13:54:45	8.73	47.40	9.59	43.20			
6/20/2008 13:55:00	5.91	47.25	10.13	37.43			
6/20/2008 13:55:15	6.82	46.52	10.08	16.71			
6/20/2008 13:55:30	8.66	45.69	9.90	3.82			
6/20/2008 13:55:45	8.96	46.77	9.85	2.27			
6/20/2008 13:56:00	8.91	47.19	9.82	2.05			
6/20/2008 13:56:15	8.77	47.29	9.79	1.90			
6/20/2008 13:56:30	8.74	47.34	9.80	1.75			
6/20/2008 13:56:45	8.78	47.22	9.81	1.70			
6/20/2008 13:57:00	8.85	47.04	9.84	1.55			
6/20/2008 13:57:15	8.85	46.84	9.87	1.52			
6/20/2008 13:57:30	8.75	46.64	9.89	1.52			
6/20/2008 13:57:45	8.69	46.84	9.90	1.42	SOUTH		
6/20/2008 13:58:00	8.81	46.89	9.91	1.35	O2 cal gas conc.	10.00	%
6/20/2008 13:58:15	8.91	46.67	9.92	1.32	Analyzer Response	9.92	%
6/20/2008 13:58:30	8.97	46.29	9.92	1.25	NOx cal gas conc.	0.00	ppmv
6/20/2008 13:58:45	8.85	46.23	9.92	1.32	Analyzer Response	1.31	ppmv
6/20/2008 13:59:00	8.87	46.74	9.87	1.42			
6/20/2008 13:59:15	8.88	46.72	8.42	9.17			
6/20/2008 13:59:30	8.81	46.59	2.14	23.56			
6/20/2008 13:59:45	8.78	46.84	0.28	41.30			
6/20/2008 14:00:00	8.85	46.95	0.11	35.38			
6/20/2008 14:00:15	8.84	46.57	0.08	33.10			
6/20/2008 14:00:30	8.95	46.15	0.06	28.96			
6/20/2008 14:00:45	9.09	46.17	0.05	23.66			
6/20/2008 14:01:00	9.15	45.99	0.04	25.81			
6/20/2008 14:01:15	9.18	45.99	0.03	36.85			
6/20/2008 14:01:30	9.14	46.15	0.02	41.97			
6/20/2008 14:01:45	9.04	46.20	0.02	44.95			
6/20/2008 14:02:00	8.97	46.20	0.01	45.65			
6/20/2008 14:02:15	9.05	46.12	0.01	46.05			
6/20/2008 14:02:30	9.12	45.99	0.01	46.77			
6/20/2008 14:02:45	9.13	45.82	0.00	47.25			
6/20/2008 14:03:00	9.19	46.15	0.00	47.30			
6/20/2008 14:03:15	9.16	46.22	0.00	47.30			
6/20/2008 14:03:30	9.14	46.15	0.00	47.30			
6/20/2008 14:03:45	9.17	46.05	-0.01	47.30			
6/20/2008 14:04:00	9.20	46.09	-0.01	47.29			
6/20/2008 14:04:15	9.24	46.10	-0.01	46.95			
6/20/2008 14:04:30	9.33	46.09	1.94	45.37			
6/20/2008 14:04:45	9.41	46.09	8.23	40.29			
6/20/2008 14:05:00	9.40	46.10	9.68	32.63			
6/20/2008 14:05:15	9.33	46.20	9.77	39.10			

Scale	0-20	0-100	0-20	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/20/2008 14:05:30	9.28	46.35	9.78	41.97			
6/20/2008 14:05:45	9.20	46.52	9.68	42.70			
6/20/2008 14:06:00	9.22	46.80	9.76	42.52			
6/20/2008 14:06:15	9.39	46.60	11.67	36.40			
6/20/2008 14:06:30	9.47	46.20	18.56	23.63			
6/20/2008 14:06:45	9.70	45.87	20.51	4.72			
6/20/2008 14:07:00	14.54	45.84	20.70	3.47			
6/20/2008 14:07:15	19.77	32.78	20.73	2.67			
6/20/2008 14:07:30	20.65	15.41	20.76	2.37			
6/20/2008 14:07:45	20.72	3.93	18.09	9.72			
6/20/2008 14:08:00	20.74	1.00	4.59	28.98			
6/20/2008 14:08:15	20.74	0.67	0.47	43.20			
6/20/2008 14:08:30	20.75	0.60	0.13	46.65			
6/20/2008 14:08:45	20.76	0.55	0.08	46.60			
6/20/2008 14:09:00	20.76	0.50	0.05	46.77			
6/20/2008 14:09:15	20.76	0.45	0.04	46.75			
6/20/2008 14:09:30	20.77	0.45	0.03	47.00			
6/20/2008 14:09:45	20.77	0.42	0.02	47.65			
6/20/2008 14:10:00	20.77	0.35	0.02	48.02			
6/20/2008 14:10:15	20.77	0.35	0.01	48.15	SOUTH		
6/20/2008 14:10:30	20.77	0.35	0.01	48.20	O2 cal gas conc.	0.00	%
6/20/2008 14:10:45	20.77	0.35	0.00	48.20	Analyzer Response	0.00	%
6/20/2008 14:11:00	20.77	0.35	0.00	48.20	NOx cal gas conc.	50.00	ppmv
6/20/2008 14:11:15	20.77	0.32	-0.01	48.20	Analyzer Response	48.20	ppmv
6/20/2008 14:11:30	20.77	0.25	-0.01	48.20			
6/20/2008 14:11:45	20.77	0.25	-0.01	48.20			
6/20/2008 14:12:00	20.77	0.25	0.73	48.27			
6/20/2008 14:12:15	20.75	0.25	7.02	35.90			
6/20/2008 14:12:30	16.67	0.40	13.89	22.44			
6/20/2008 14:12:45	10.26	1.62	19.90	5.52			
6/20/2008 14:13:00	9.83	6.40	20.61	2.27			
6/20/2008 14:13:15	9.88	4.85	20.70	1.27			
6/20/2008 14:13:30	9.88	1.10	20.73	1.12			
6/20/2008 14:13:45	9.87	0.52	20.75	0.97			
6/20/2008 14:14:00	9.87	0.35	20.77	0.92			
6/20/2008 14:14:15	9.87	0.35	20.78	0.82			
6/20/2008 14:14:30	9.87	0.35	20.79	0.82			
6/20/2008 14:14:45	9.87	0.27	20.79	0.77	NORTH		
6/20/2008 14:15:00	9.87	0.25	20.80	0.72	O2 cal gas conc.	10.00	%
6/20/2008 14:15:15	9.87	0.25	20.79	0.72	Analyzer Response	9.87	%
6/20/2008 14:15:30	9.87	0.25	20.81	0.72	NOx cal gas conc.	0.00	ppmv
6/20/2008 14:15:45	9.87	0.25	20.82	0.67	Analyzer Response	0.25	ppmv
6/20/2008 14:16:00	9.87	0.25	20.82	0.62			
6/20/2008 14:16:15	9.87	0.25	20.83	0.62			
6/20/2008 14:16:30	9.87	0.25	20.84	0.62			
6/20/2008 14:16:45	9.87	0.25	20.84	0.62			
6/20/2008 14:17:00	10.61	0.25	20.84	0.62			
6/20/2008 14:17:15	16.13	0.25	20.85	0.52			
6/20/2008 14:17:30	20.03	0.25	20.85	0.52			
6/20/2008 14:17:45	20.66	0.17	20.85	0.52			
6/20/2008 14:18:00	17.76	0.15	20.85	0.52			
6/20/2008 14:18:15	8.78	0.20	20.85	0.52			
6/20/2008 14:18:30	2.25	6.85	20.85	0.52			
6/20/2008 14:18:45	0.30	25.77	20.85	0.52			
6/20/2008 14:19:00	0.07	40.39	20.86	0.52			
6/20/2008 14:19:15	0.04	45.22	20.87	0.52			
6/20/2008 14:19:30	0.03	45.64	20.87	0.52			
6/20/2008 14:19:45	0.02	46.04	20.87	0.52			
6/20/2008 14:20:00	0.01	46.24	20.87	0.52			
6/20/2008 14:20:15	0.00	47.19	20.86	0.42			
6/20/2008 14:20:30	0.00	48.24	20.87	0.42			
6/20/2008 14:20:45	0.00	48.64	20.87	0.42			
6/20/2008 14:21:00	-0.01	48.85	20.87	0.42	NORTH		
6/20/2008 14:21:15	-0.01	48.90	20.87	0.42	O2 cal gas conc.	0.00	%
6/20/2008 14:21:30	-0.01	48.90	20.88	0.42	Analyzer Response	-0.01	%
6/20/2008 14:21:45	-0.01	48.90	20.88	0.42			
6/20/2008 14:22:00	-0.01	48.95	20.88	0.42			
6/20/2008 14:22:15	-0.02	49.00	20.88	0.37			
6/20/2008 14:22:30	-0.02	49.00	20.88	0.32			
6/20/2008 14:22:45	-0.02	49.00	20.89	0.32	NOx cal gas conc.	50.00	ppmv
6/20/2008 14:23:00	3.22	49.00	20.88	0.32	Analyzer Response	49.00	ppmv
6/20/2008 14:23:15	14.88	44.29	20.88	0.32			

APPENDIX C Process and Fuel Gas Analysis Data

Hydrogen Furnace Stack Test Operating Data

Date/Time	FR_4423 Fuel Gas Consumption MSCFH	FRC_4401 Furnace Feed Rate MSCFH	AI4401 Excess O2 in Exhaust %	TI_2_429 Exhaust Temp. °F
20-Jun-08 08:40:00	110.457	134.674	8.44	560.79
20-Jun-08 08:41:00	110.431	134.527	8.44	560.71
20-Jun-08 08:42:00	110.404	134.371	8.44	560.63
20-Jun-08 08:43:00	110.378	134.215	8.44	560.56
20-Jun-08 08:44:00	110.351	134.059	8.45	560.48
20-Jun-08 08:45:00	110.325	133.903	8.45	560.40
20-Jun-08 08:46:00	110.299	133.746	8.45	560.32
20-Jun-08 08:47:00	110.272	133.590	8.46	560.24
20-Jun-08 08:48:00	110.246	133.434	8.46	560.20
20-Jun-08 08:49:00	110.220	133.278	8.47	560.47
20-Jun-08 08:50:00	110.193	133.122	8.47	560.83
20-Jun-08 08:51:00	110.167	132.966	8.47	561.19
20-Jun-08 08:52:00	110.141	132.809	8.48	561.56
20-Jun-08 08:53:00	110.114	132.653	8.48	561.92
20-Jun-08 08:54:00	110.088	132.497	8.49	562.28
20-Jun-08 08:55:00	110.061	132.341	8.49	562.64
20-Jun-08 08:56:00	110.035	132.185	8.50	563.00
20-Jun-08 08:57:00	110.009	132.029	8.51	563.37
20-Jun-08 08:58:00	109.970	131.872	8.51	563.73
20-Jun-08 08:59:00	109.891	131.716	8.52	564.05
20-Jun-08 09:00:00	109.807	131.560	8.53	563.98
20-Jun-08 09:01:00	109.724	131.404	8.53	563.80
20-Jun-08 09:02:00	109.641	131.248	8.54	563.62
20-Jun-08 09:03:00	109.558	131.092	8.55	563.44
20-Jun-08 09:04:00	109.475	130.936	8.55	563.26
20-Jun-08 09:05:00	109.392	130.779	8.56	563.08
20-Jun-08 09:06:00	109.308	130.648	8.57	562.90
20-Jun-08 09:07:00	109.225	130.606	8.57	562.72
20-Jun-08 09:08:00	109.142	130.573	8.58	562.54
20-Jun-08 09:09:00	109.059	130.539	8.59	562.36
20-Jun-08 09:10:00	108.976	130.506	8.59	562.18
20-Jun-08 09:11:00	108.893	130.472	8.60	562.00
20-Jun-08 09:12:00	108.809	130.439	8.61	561.81
20-Jun-08 09:13:00	108.726	130.405	8.61	561.63
20-Jun-08 09:14:00	108.643	130.372	8.62	561.45
20-Jun-08 09:15:00	108.560	130.338	8.63	561.28
20-Jun-08 09:16:00	108.477	130.305	8.63	561.24
20-Jun-08 09:17:00	108.393	130.271	8.64	561.23
20-Jun-08 09:18:00	108.310	130.238	8.65	561.22
20-Jun-08 09:19:00	108.227	130.204	8.65	561.21
20-Jun-08 09:20:00	108.144	130.171	8.66	561.20
20-Jun-08 09:21:00	108.061	130.137	8.65	561.18
20-Jun-08 09:22:00	107.978	130.104	8.65	561.17
20-Jun-08 09:23:00	107.894	130.070	8.65	561.16
20-Jun-08 09:24:00	107.836	130.037	8.64	561.15
20-Jun-08 09:25:00	107.868	130.003	8.64	561.14
20-Jun-08 09:26:00	107.908	129.970	8.63	561.13
20-Jun-08 09:27:00	107.949	129.936	8.63	561.12
20-Jun-08 09:28:00	107.989	129.903	8.63	561.11
20-Jun-08 09:29:00	108.029	129.869	8.62	561.10
20-Jun-08 09:30:00	108.070	129.836	8.62	561.08
20-Jun-08 09:31:00	108.110	129.802	8.61	561.07
20-Jun-08 09:32:00	108.150	129.815	8.61	561.06
20-Jun-08 09:33:00	108.190	129.997	8.61	561.05

Hydrogen Furnace Stack Test Operating Data

Date/Time	FR_4423 Fuel Gas Consumption MSCFH	FRC_4401 Furnace Feed Rate MSCFH	AI4401 Excess O2 in Exhaust %	TI_2_429 Exhaust Temp. °F
20-Jun-08 09:34:00	**108.231**	**130.195**	**8.60**	**561.04**
20-Jun-08 09:35:00	**108.271**	**130.393**	**8.60**	**561.03**
20-Jun-08 09:36:00	**108.311**	**130.590**	**8.60**	**561.02**
20-Jun-08 09:37:00	**108.352**	**130.788**	**8.59**	**561.01**
20-Jun-08 09:38:00	**108.392**	**130.986**	**8.59**	**561.00**
20-Jun-08 09:39:00	**108.432**	**131.184**	**8.58**	**560.99**
Average Run 1	***109.109***	***131.345***	***8.56***	***561.64***
20-Jun-08 09:40:00	108.473	131.381	8.58	560.97
20-Jun-08 09:41:00	108.513	131.579	8.58	560.96
20-Jun-08 09:42:00	108.553	131.777	8.57	560.95
20-Jun-08 09:43:00	108.594	131.975	8.57	560.93
20-Jun-08 09:44:00	108.634	132.172	8.56	560.91
20-Jun-08 09:45:00	108.674	132.370	8.56	560.90
20-Jun-08 09:46:00	108.714	132.568	8.56	560.88
20-Jun-08 09:47:00	108.755	132.766	8.55	560.86
20-Jun-08 09:48:00	108.795	132.963	8.55	560.84
20-Jun-08 09:49:00	108.835	133.161	8.54	560.83
20-Jun-08 09:50:00	108.850	133.359	8.54	560.81
20-Jun-08 09:51:00	108.774	133.557	8.53	560.79
20-Jun-08 09:52:00	108.691	133.754	8.53	560.77
20-Jun-08 09:53:00	108.608	133.952	8.52	560.75
20-Jun-08 09:54:00	108.525	134.150	8.52	560.61
20-Jun-08 09:55:00	108.442	134.348	8.52	560.45
20-Jun-08 09:56:00	108.359	134.545	8.51	560.28
20-Jun-08 09:57:00	108.276	134.743	8.51	560.12
20-Jun-08 09:58:00	108.193	134.941	8.51	559.96
20-Jun-08 09:59:00	108.110	135.139	8.51	559.79
20-Jun-08 10:00:00	108.027	135.338	8.51	559.63
20-Jun-08 10:01:00	107.944	135.536	8.51	559.47
20-Jun-08 10:02:00	107.861	135.734	8.51	559.30
20-Jun-08 10:03:00	107.778	135.932	8.51	559.14
20-Jun-08 10:04:00	107.694	136.131	8.50	558.99
20-Jun-08 10:05:00	107.611	136.329	8.50	559.04
20-Jun-08 10:06:00	107.528	136.527	8.50	559.13
20-Jun-08 10:07:00	107.445	136.725	8.50	559.22
20-Jun-08 10:08:00	107.362	136.924	8.50	559.31
20-Jun-08 10:09:00	107.279	137.122	8.50	559.40
20-Jun-08 10:10:00	107.196	137.320	8.50	559.49
20-Jun-08 10:11:00	107.113	137.519	8.50	559.58
20-Jun-08 10:12:00	107.030	137.717	8.50	559.67
20-Jun-08 10:13:00	106.947	137.915	8.50	559.76
20-Jun-08 10:14:00	106.864	138.113	8.50	559.84
20-Jun-08 10:15:00	106.781	138.312	8.50	559.93
20-Jun-08 10:16:00	106.728	138.510	8.50	559.97
20-Jun-08 10:17:00	106.776	138.708	8.50	560.00
20-Jun-08 10:18:00	**106.833**	**138.907**	**8.50**	**560.03**
20-Jun-08 10:19:00	**106.891**	**139.105**	**8.50**	**560.05**
20-Jun-08 10:20:00	**106.948**	**139.303**	**8.50**	**560.08**
20-Jun-08 10:21:00	**107.005**	**139.501**	**8.50**	**560.11**
20-Jun-08 10:22:00	**107.063**	**139.700**	**8.50**	**560.14**
20-Jun-08 10:23:00	**107.120**	**139.898**	**8.50**	**560.16**
20-Jun-08 10:24:00	**107.177**	**140.058**	**8.50**	**560.19**
20-Jun-08 10:25:00	**107.234**	**140.079**	**8.50**	**560.22**
20-Jun-08 10:26:00	**107.292**	**140.086**	**8.49**	**560.24**

Hydrogen Furnace Stack Test Operating Data

Date/Time	FR_4423 Fuel Gas Consumption MSCFH	FRC_4401 Furnace Feed Rate MSCFH	AI4401 Excess O2 in Exhaust %	TI_2_429 Exhaust Temp. °F
20-Jun-08 10:27:00	107.349	140.094	8.49	560.27
20-Jun-08 10:28:00	107.406	140.102	8.49	560.30
20-Jun-08 10:29:00	107.464	140.110	8.49	560.33
20-Jun-08 10:30:00	107.521	140.117	8.49	560.35
20-Jun-08 10:31:00	107.578	140.125	8.49	560.38
20-Jun-08 10:32:00	107.635	140.133	8.49	560.41
20-Jun-08 10:33:00	107.693	140.141	8.48	560.44
20-Jun-08 10:34:00	107.750	140.149	8.48	560.45
20-Jun-08 10:35:00	107.807	140.156	8.48	560.36
20-Jun-08 10:36:00	107.864	140.164	8.48	560.25
20-Jun-08 10:37:00	107.922	140.172	8.48	560.13
20-Jun-08 10:38:00	107.979	140.180	8.48	560.01
20-Jun-08 10:39:00	108.036	140.187	8.48	559.90
20-Jun-08 10:40:00	108.094	140.195	8.48	559.78
20-Jun-08 10:41:00	108.151	140.203	8.47	559.66
20-Jun-08 10:42:00	108.184	140.211	8.47	559.54
20-Jun-08 10:43:00	108.135	140.218	8.47	559.43
20-Jun-08 10:44:00	108.079	140.226	8.48	559.31
20-Jun-08 10:45:00	108.022	140.234	8.49	559.19
20-Jun-08 10:46:00	107.966	140.242	8.49	559.08
20-Jun-08 10:47:00	107.910	140.250	8.50	559.04
20-Jun-08 10:48:00	107.854	140.257	8.50	559.02
20-Jun-08 10:49:00	107.797	140.265	8.51	559.00
20-Jun-08 10:50:00	107.741	140.124	8.51	558.97
20-Jun-08 10:51:00	107.685	139.407	8.52	558.95
20-Jun-08 10:52:00	107.629	138.631	8.53	558.93
20-Jun-08 10:53:00	107.573	137.856	8.53	558.90
20-Jun-08 10:54:00	107.516	137.081	8.54	558.88
20-Jun-08 10:55:00	107.460	136.306	8.54	558.86
20-Jun-08 10:56:00	107.404	135.531	8.55	558.83
20-Jun-08 10:57:00	107.348	134.756	8.56	558.81
20-Jun-08 10:58:00	107.291	133.981	8.59	558.79
20-Jun-08 10:59:00	107.235	133.206	8.62	558.76
20-Jun-08 11:00:00	107.179	132.431	8.64	558.74
20-Jun-08 11:01:00	107.123	131.656	8.67	558.72
20-Jun-08 11:02:00	107.067	130.881	8.70	558.70
20-Jun-08 11:03:00	107.010	130.266	8.73	558.67
20-Jun-08 11:04:00	106.954	130.238	8.76	558.65
20-Jun-08 11:05:00	106.898	130.263	8.78	558.63
20-Jun-08 11:06:00	106.842	130.288	8.80	558.60
20-Jun-08 11:07:00	106.785	130.313	8.80	558.58
20-Jun-08 11:08:00	106.743	130.338	8.79	558.56
20-Jun-08 11:09:00	106.751	130.363	8.78	558.53
20-Jun-08 11:10:00	106.762	130.388	8.77	558.51
20-Jun-08 11:11:00	106.774	130.413	8.77	558.49
20-Jun-08 11:12:00	106.785	130.438	8.76	558.46
20-Jun-08 11:13:00	106.797	130.463	8.75	558.41
20-Jun-08 11:14:00	106.808	130.488	8.74	558.36
20-Jun-08 11:15:00	106.820	130.513	8.73	558.30
20-Jun-08 11:16:00	106.831	130.538	8.73	558.25
20-Jun-08 11:17:00	106.843	130.563	8.72	558.19
Average Run 2	*107.374*	*136.641*	*8.58*	*559.33*
20-Jun-08 11:18:00	106.855	130.588	8.71	558.14
20-Jun-08 11:19:00	106.866	130.613	8.70	558.08

Hydrogen Furnace Stack Test Operating Data

Date/Time	FR_4423 Fuel Gas Consumption MSCFH	FRC_4401 Furnace Feed Rate MSCFH	AI4401 Excess O2 in Exhaust %	TI_2_429 Exhaust Temp. °F
20-Jun-08 11:20:00	106.878	130.638	8.70	558.03
20-Jun-08 11:21:00	106.889	130.663	8.69	557.97
20-Jun-08 11:22:00	106.901	130.688	8.68	557.92
20-Jun-08 11:23:00	106.912	130.714	8.67	557.86
20-Jun-08 11:24:00	106.924	130.739	8.66	557.81
20-Jun-08 11:25:00	106.935	130.764	8.66	557.75
20-Jun-08 11:26:00	106.947	130.789	8.65	557.70
20-Jun-08 11:27:00	106.958	130.814	8.64	557.64
20-Jun-08 11:28:00	106.970	130.839	8.63	557.59
20-Jun-08 11:29:00	106.981	130.857	8.62	557.56
20-Jun-08 11:30:00	106.993	130.852	8.62	557.54
20-Jun-08 11:31:00	107.004	130.843	8.61	557.52
20-Jun-08 11:32:00	107.016	130.835	8.60	557.51
20-Jun-08 11:33:00	107.027	130.826	8.61	557.49
20-Jun-08 11:34:00	107.043	130.818	8.62	557.47
20-Jun-08 11:35:00	107.073	130.810	8.62	557.45
20-Jun-08 11:36:00	107.104	130.801	8.63	557.43
20-Jun-08 11:37:00	107.135	130.793	8.63	557.41
20-Jun-08 11:38:00	107.167	130.785	8.64	557.40
20-Jun-08 11:39:00	107.198	130.776	8.65	557.38
20-Jun-08 11:40:00	107.229	130.768	8.65	557.36
20-Jun-08 11:41:00	107.260	130.760	8.66	557.34
20-Jun-08 11:42:00	107.292	130.751	8.67	557.32
20-Jun-08 11:43:00	107.323	130.743	8.67	557.30
20-Jun-08 11:44:00	107.354	130.735	8.68	557.29
20-Jun-08 11:45:00	107.385	130.726	8.68	557.25
20-Jun-08 11:46:00	107.417	130.718	8.69	557.05
20-Jun-08 11:47:00	107.448	130.710	8.70	556.81
20-Jun-08 11:48:00	107.479	130.701	8.70	556.56
20-Jun-08 11:49:00	107.510	130.693	8.71	556.32
20-Jun-08 11:50:00	107.542	130.685	8.71	556.08
20-Jun-08 11:51:00	107.573	130.676	8.72	555.83
20-Jun-08 11:52:00	107.604	130.668	8.73	555.59
20-Jun-08 11:53:00	107.635	130.660	8.73	555.37
20-Jun-08 11:54:00	107.667	130.651	8.74	555.48
20-Jun-08 11:55:00	107.698	130.643	8.75	555.67
20-Jun-08 11:56:00	107.729	130.635	8.75	555.86
20-Jun-08 11:57:00	107.760	130.626	8.76	556.05
20-Jun-08 11:58:00	107.792	130.618	8.76	556.24
20-Jun-08 11:59:00	107.823	130.610	8.75	556.43
20-Jun-08 12:00:00	107.885	130.601	8.75	556.62
20-Jun-08 12:01:00	108.053	130.593	8.74	556.81
20-Jun-08 12:02:00	108.229	130.584	8.73	557.00
20-Jun-08 12:03:00	108.406	130.576	8.72	557.19
20-Jun-08 12:04:00	108.582	130.568	8.72	557.38
20-Jun-08 12:05:00	108.759	130.559	8.71	557.57
20-Jun-08 12:06:00	108.936	130.551	8.70	557.73
20-Jun-08 12:07:00	109.112	130.543	8.69	557.63
20-Jun-08 12:08:00	109.289	130.534	8.68	557.45
20-Jun-08 12:09:00	109.466	130.526	8.68	557.28
20-Jun-08 12:10:00	109.642	130.518	8.67	557.10
20-Jun-08 12:11:00	109.819	130.509	8.66	556.92
20-Jun-08 12:12:00	109.996	130.501	8.66	556.74
20-Jun-08 12:13:00	110.172	130.493	8.66	556.56

Hydrogen Furnace Stack Test Operating Data

Date/Time	FR_4423 Fuel Gas Consumption MSCFH	FRC_4401 Furnace Feed Rate MSCFH	AI4401 Excess O2 in Exhaust %	TI_2_429 Exhaust Temp. °F
20-Jun-08 12:14:00	110.349	130.484	8.66	556.38
20-Jun-08 12:15:00	110.526	130.476	8.66	556.20
20-Jun-08 12:16:00	110.702	130.468	8.66	556.03
20-Jun-08 12:17:00	110.879	130.459	8.66	555.85
20-Jun-08 12:18:00	111.056	130.451	8.66	555.67
20-Jun-08 12:19:00	111.232	130.443	8.66	555.49
20-Jun-08 12:20:00	111.409	130.434	8.66	555.31
20-Jun-08 12:21:00	111.586	130.501	8.66	555.13
20-Jun-08 12:22:00	111.762	130.858	8.66	554.90
20-Jun-08 12:23:00	111.939	131.245	8.66	554.67
20-Jun-08 12:24:00	112.115	131.631	8.65	554.46
20-Jun-08 12:25:00	112.292	132.018	8.65	554.60
20-Jun-08 12:26:00	112.450	132.404	8.64	554.82
20-Jun-08 12:27:00	112.539	132.790	8.63	555.04
20-Jun-08 12:28:00	112.622	133.177	8.62	555.26
20-Jun-08 12:29:00	112.705	133.563	8.61	555.49
20-Jun-08 12:30:00	112.788	133.950	8.59	555.71
20-Jun-08 12:31:00	112.871	134.336	8.58	555.93
20-Jun-08 12:32:00	112.953	134.723	8.57	556.16
20-Jun-08 12:33:00	113.036	135.109	8.56	556.38
20-Jun-08 12:34:00	113.119	135.495	8.55	556.60
20-Jun-08 12:35:00	113.202	135.882	8.54	556.82
20-Jun-08 12:36:00	113.285	136.268	8.53	557.05
20-Jun-08 12:37:00	113.368	136.655	8.52	557.27
20-Jun-08 12:38:00	113.450	137.041	8.51	557.49
20-Jun-08 12:39:00	113.533	137.428	8.51	557.72
20-Jun-08 12:40:00	113.616	137.814	8.50	557.93
20-Jun-08 12:41:00	113.699	138.200	8.49	558.01
20-Jun-08 12:42:00	113.782	138.587	8.48	558.07
20-Jun-08 12:43:00	113.865	138.973	8.47	558.12
20-Jun-08 12:44:00	113.948	139.360	8.47	558.18
20-Jun-08 12:45:00	114.030	139.746	8.46	558.23
20-Jun-08 12:46:00	114.113	140.133	8.45	558.29
20-Jun-08 12:47:00	114.196	140.483	8.44	558.34
20-Jun-08 12:48:00	114.279	140.695	8.43	558.40
20-Jun-08 12:49:00	114.362	140.893	8.42	558.45
20-Jun-08 12:50:00	114.445	141.092	8.41	558.45
20-Jun-08 12:51:00	114.528	141.290	8.40	558.43
20-Jun-08 12:52:00	114.557	141.488	8.38	558.41
20-Jun-08 12:53:00	114.403	141.686	8.37	558.39
20-Jun-08 12:54:00	**114.234**	**141.884**	**8.36**	**558.37**
20-Jun-08 12:55:00	**114.065**	**142.083**	**8.34**	**558.35**
20-Jun-08 12:56:00	**113.896**	**142.281**	**8.33**	**558.33**
20-Jun-08 12:57:00	**113.727**	**142.479**	**8.32**	**558.31**
20-Jun-08 12:58:00	**113.558**	**142.677**	**8.31**	**558.29**
20-Jun-08 12:59:00	**113.389**	**142.875**	**8.29**	**558.27**
20-Jun-08 13:00:00	**113.220**	**143.074**	**8.28**	**558.25**
20-Jun-08 13:01:00	**113.050**	**143.272**	**8.27**	**558.23**
20-Jun-08 13:02:00	**112.881**	**143.470**	**8.29**	**558.21**
20-Jun-08 13:03:00	**112.712**	**143.668**	**8.30**	**558.19**
20-Jun-08 13:04:00	**112.543**	**143.866**	**8.31**	**558.17**
20-Jun-08 13:05:00	**112.374**	**144.065**	**8.33**	**558.15**
20-Jun-08 13:06:00	**112.205**	**144.263**	**8.34**	**558.13**
20-Jun-08 13:07:00	**112.036**	**144.461**	**8.35**	**558.11**

Hydrogen Furnace Stack Test Operating Data

Date/Time	FR_4423 Fuel Gas Consumption MSCFH	FRC_4401 Furnace Feed Rate MSCFH	AI4401 Excess O2 in Exhaust %	TI_2_429 Exhaust Temp. °F
20-Jun-08 13:08:00	111.866	144.659	8.37	558.09
20-Jun-08 13:09:00	111.697	144.857	8.38	558.07
20-Jun-08 13:10:00	111.528	145.056	8.39	558.02
20-Jun-08 13:11:00	111.359	145.254	8.41	557.95
20-Jun-08 13:12:00	111.190	145.452	8.42	557.89
20-Jun-08 13:13:00	111.021	145.615	8.44	557.82
20-Jun-08 13:14:00	110.852	145.644	8.43	557.76
20-Jun-08 13:15:00	110.683	145.659	8.39	557.70
20-Jun-08 13:16:00	110.513	145.674	8.34	557.80
20-Jun-08 13:17:00	110.344	145.689	8.31	557.95
20-Jun-08 13:18:00	110.238	145.704	8.32	558.09
20-Jun-08 13:19:00	110.362	145.719	8.34	558.24
20-Jun-08 13:20:00	110.507	145.734	8.36	558.38
20-Jun-08 13:21:00	110.653	145.749	8.37	558.53
20-Jun-08 13:22:00	110.798	145.763	8.39	558.67
20-Jun-08 13:23:00	110.943	145.778	8.40	558.82
20-Jun-08 13:24:00	111.088	145.793	8.42	558.96
20-Jun-08 13:25:00	111.234	145.808	8.44	559.11
20-Jun-08 13:26:00	111.379	145.823	8.45	559.25
20-Jun-08 13:27:00	111.524	145.838	8.47	559.43
20-Jun-08 13:28:00	111.669	145.853	8.48	559.62
20-Jun-08 13:29:00	111.814	145.868	8.47	559.81
20-Jun-08 13:30:00	111.960	145.883	8.46	560.00
20-Jun-08 13:31:00	112.105	145.898	8.46	560.19
20-Jun-08 13:32:00	112.250	145.913	8.45	560.38
20-Jun-08 13:33:00	112.395	145.928	8.44	560.57
20-Jun-08 13:34:00	112.540	145.943	8.43	560.76
20-Jun-08 13:35:00	112.686	145.958	8.43	560.95
20-Jun-08 13:36:00	112.831	145.973	8.42	561.14
20-Jun-08 13:37:00	112.976	145.988	8.39	561.24
20-Jun-08 13:38:00	113.121	146.003	8.29	560.40
20-Jun-08 13:39:00	113.267	146.010	8.18	559.28
20-Jun-08 13:40:00	113.412	145.990	8.11	558.17
20-Jun-08 13:41:00	113.557	145.968	8.13	557.10
20-Jun-08 13:42:00	113.656	145.946	8.15	556.54
20-Jun-08 13:43:00	113.595	145.923	8.18	556.13
20-Jun-08 13:44:00	113.520	145.901	8.20	555.72
20-Jun-08 13:45:00	113.446	145.878	8.23	555.31
20-Jun-08 13:46:00	113.371	145.856	8.25	554.90
20-Jun-08 13:47:00	113.297	145.833	8.27	554.48
20-Jun-08 13:48:00	113.222	145.811	8.30	554.07
20-Jun-08 13:49:00	113.148	145.788	8.32	553.66
20-Jun-08 13:50:00	113.074	145.766	8.35	553.32
20-Jun-08 13:51:00	112.999	145.744	8.37	553.64
20-Jun-08 13:52:00	112.925	145.721	8.39	554.14
20-Jun-08 13:53:00	112.850	145.699	8.40	554.64
Average Run 3	*112.323*	*145.145*	*8.35*	*557.97*
20-Jun-08 13:54:00	112.776	145.676	8.41	555.09
20-Jun-08 13:55:00	112.701	145.654	8.42	555.10
20-Jun-08 13:56:00	112.627	145.631	8.38	554.97
20-Jun-08 13:57:00	112.552	145.609	8.35	554.84
20-Jun-08 13:58:00	112.478	145.586	8.32	554.70
20-Jun-08 13:59:00	112.403	145.564	8.28	554.57

COMPANY : BP Husky Refining LLC
LOCATION : Toledo, Ohio
SOURCE : H2 Furnace
RUN NO : 1
TEST DATE : 6/20/2008

Net Heat Content @ 68 deg F : 754.38 Btu/scf H_T = **28.10 MJ/scm**
Gross Heat Content @ 68 deg F : 834.42 Btu/scf 31.09 MJ/scm
Specific Gravity : 0.51

Compound	Formula	mol. wt.	mole comp % C_s	total lb/mole	Carbon lb/mole (C)	Hydrogen lb/mole (H)	Oxygen lb/mole (O)	Nitrogen lb/mole (N)	Sulfur lb/mole (S)	total lb/mole	spec. gravity	Net heat content in sample MJ/scm	Net heating value @ 25 deg.C Kcal/mole H_i	Gross heating value @ 25 deg.C Kcal/mole	Gross heating value in sample MJ/scm
N-HEXANE (C6+)	C_6H_{14}	86.17		0.00	0.00	0.00				0.00	0.00	0.00	928.93	1002.57	0.00
HYDROGEN	H_2	2.02	53.700	1.08		1.08				1.08	0.04	5.40	57.80	68.32	6.38
METHANE	CH_4	16.04	11.700	1.88	1.41	0.47				1.88	0.07	3.90	191.76	212.80	4.33
ETHANE	C_2H_6	30.07	13.400	4.03	3.22	0.81				4.03	0.14	7.96	341.26	372.82	8.69
ETHYLENE	C_2H_4	28.05	0.000	0.00	0.00	0.00				0.00	0.00	0.00	316.20	337.23	0.00
CARBON DIOXIDE	CO_2	44.01	0.000	0.00	0.00		0.00			0.00	0.00	0.00	0.00	0.00	0.00
PROPANE	C_3H_8	44.10	11.400	5.03	4.11	0.92				5.03	0.17	9.69	488.53	530.61	10.53
PROPYLENE	C_3H_6	42.08		0.00	0.00	0.00				0.00	0.00	0.00	460.43	491.99	0.00
ISOBUTANE	C_4H_{10}	58.12		0.00	0.00	0.00				0.00	0.00	0.00	633.74	686.34	0.00
N-BUTANE	C_4H_{10}	58.12		0.00	0.00	0.00				0.00	0.00	0.00	635.38	687.98	0.00
1-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	607.68	649.76	0.00
ISOBUTYLENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	604.06	646.13	0.00
TRS-2-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	604.99	647.07	0.00
CIS-2-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	606.04	648.12	0.00
ISOPENTANE	C_5H_{12}	72.15		0.00	0.00	0.00				0.00	0.00	0.00	780.12	843.24	0.00
N-PENTANE	C_5H_{12}	72.15		0.00	0.00	0.00				0.00	0.00	0.00	782.04	845.16	0.00
OXYGEN	O_2	32.00		0.00			0.00			0.00	0.00	0.00	0.00	0.00	0.00
NITROGEN	N_2	28.01		0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	CO	28.01	9.800	2.74	1.18		1.57			2.75	0.10	1.15	67.64	67.64	1.15
HYDROGEN SULFIDE	H_2S	34.08		0.00		0.00			0.00	0.00	0.00	0.00	123.57	134.25	0.00
TOTAL			100.0	14.76	9.91	3.28	1.57	0.00	0.00	14.76	0.51	28.10			31.09

$$H_T = K\sum_{i=1}^{n} C_i H_i$$

K = 1.740 x 10
$C_i = C_s$ x 10000

% C = 67.13
% H = 22.25
% O = 10.62
% N = 0.00
% S = 0.00

Gross Calorific Value = 21778 Btu/lb
Net Calorific Value = 19689 Btu/lb
$F_{d(higher)}$ = 8210 based on Higher Heating Value
$F_{d(lower)}$ = 9081 based on Lower Heating Value

$$F_d = \left\{ \frac{10^6 \left[3.64 \times \%H + 1.53 \times \%C + 0.57 \times \%S + 0.14 \times \%N - 0.46 \times \%O \right]}{\text{Gross Caloric Value}} \right\}$$

BPHTOL-00001217

COMPANY : BP Husky Refining LLC
LOCATION : Toledo, Ohio
SOURCE : H2 Furnace
RUN NO : 2
TEST DATE : 6/20/2008

Net Heat Content @ 68 deg F : 1,082.76 Btu/scf H_T = **40.34 MJ/scm**
Gross Heat Content @ 68 deg F : 1,185.94 Btu/scf 44.18 MJ/scm
Specific Gravity : 0.76

Compound	Formula	mol. wt.	mole comp % C_s	total lb/mole	Carbon lb/mole (C)	Hydrogen lb/mole (H)	Oxygen lb/mole (O)	Nitrogen lb/mole (N)	Sulfur lb/mole (S)	total lb/mole	spec. gravity	Net heat content in sample MJ/scm	Net heating value @ 25 deg.C Kcal/mole H_i	Gross heating value @ 25 deg.C Kcal/mole	Gross heating value in sample MJ/scm
N-HEXANE (C6+)	C_6H_{14}	86.17	0.600	0.52	0.43	0.08				0.52	0.02	0.97	928.93	1002.57	1.05
HYDROGEN	H_2	2.02	37.600	0.76		0.76				0.76	0.03	3.78	57.80	68.32	4.47
METHANE	CH_4	16.04	12.800	2.05	1.54	0.52				2.05	0.07	4.27	191.76	212.80	4.74
ETHANE	C_2H_6	30.07	15.100	4.54	3.63	0.91				4.54	0.16	8.97	341.26	372.82	9.80
ETHYLENE	C_2H_4	28.05	0.000	0.00	0.00	0.00				0.00	0.00	0.00	316.20	337.23	0.00
CARBON DIOXIDE	CO_2	44.01	0.000	0.00	0.00		0.00			0.00	0.00	0.00	0.00	0.00	0.00
PROPANE	C_3H_8	44.10	12.200	5.38	4.40	0.98				5.38	0.19	10.37	488.53	530.61	11.26
PROPYLENE	C_3H_6	42.08	0.000	0.00	0.00	0.00				0.00	0.00	0.00	460.43	491.99	0.00
ISOBUTANE	C_4H_{10}	58.12	5.200	3.02	2.50	0.52				3.02	0.10	5.73	633.74	686.34	6.21
N-BUTANE	C_4H_{10}	58.12	4.500	2.62	2.16	0.45				2.62	0.09	4.98	635.38	687.98	5.39
1-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	607.68	649.76	0.00
ISOBUTYLENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	604.06	646.13	0.00
TRS-2-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	604.99	647.07	0.00
CIS-2-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	606.04	648.12	0.00
ISOPENTANE	C_5H_{12}	72.15		0.00	0.00	0.00				0.00	0.00	0.00	780.12	843.24	0.00
N-PENTANE	C_5H_{12}	72.15		0.00	0.00	0.00				0.00	0.00	0.00	782.04	845.16	0.00
OXYGEN	O_2	32.00		0.00			0.00			0.00	0.00	0.00	0.00	0.00	0.00
NITROGEN	N_2	28.01		0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	CO	28.01	10.800	3.03	1.30		1.73			3.03	0.10	1.27	67.64	67.64	1.27
HYDROGEN SULFIDE	H_2S	34.08		0.00		0.00			0.00	0.00	0.00	0.00	123.57	134.25	0.00
TOTAL			98.8	21.91	15.95	4.23	1.73	0.00	0.00	21.91	0.76	40.34			44.18

$$H_T = K\sum_{i=1}^{n} C_i H_i$$

K = 1.740 x 10
$C_i = C_s$ x 10000

% C = 72.79
% H = 19.32
% O = 7.89
% N = 0.00
% S = 0.00

Gross Calorific Value = 20851 Btu/lb
Net Calorific Value = 19037 Btu/lb
$F_{d(higher)}$ = 8540 based on Higher Heating Value
$F_{d(lower)}$ = 9354 based on Lower Heating Value

$$F_d = \left\{ \frac{10^6 \left[3.64 \times \%H + 1.53 \times \%C + 0.57 \times \%S + 0.14 \times \%N - 0.46 \times \%O \right]}{\text{Gross Caloric Value}} \right\}$$

COMPANY : BP Husky Refining LLC
LOCATION : Toledo, Ohio
SOURCE : H2 Furnace
RUN NO : 3
TEST DATE : 6/20/2008

Net Heat Content @ 68 deg F : 1,037.76 Btu/scf H_T = **38.66 MJ/scm**
Gross Heat Content @ 68 deg F : 1,137.79 Btu/scf 42.39 MJ/scm
Specific Gravity : 0.73

Compound	Formula	mol. wt.	mole comp % C_s	total lb/mole	Carbon lb/mole (C)	Hydrogen lb/mole (H)	Oxygen lb/mole (O)	Nitrogen lb/mole (N)	Sulfur lb/mole (S)	total lb/mole	spec. gravity	Net heat content in sample MJ/scm	Net heating value @ 25 deg.C Kcal/mole H_i	Gross heating value @ 25 deg.C Kcal/mole	Gross heating value in sample MJ/scm
N-HEXANE (C6+)	C_6H_{14}	86.17	0.000	0.00	0.00	0.00				0.00	0.00	0.00	928.93	1002.57	0.00
HYDROGEN	H_2	2.02	39.800	0.80		0.80				0.80	0.03	4.00	57.80	68.32	4.73
METHANE	CH_4	16.04	12.700	2.04	1.53	0.51				2.04	0.07	4.24	191.76	212.80	4.70
ETHANE	C_2H_6	30.07	14.500	4.36	3.48	0.88				4.36	0.15	8.61	341.26	372.82	9.41
ETHYLENE	C_2H_4	28.05	0.000	0.00	0.00	0.00				0.00	0.00	0.00	316.20	337.23	0.00
CARBON DIOXIDE	CO_2	44.01	0.000	0.00	0.00		0.00			0.00	0.00	0.00	0.00	0.00	0.00
PROPANE	C_3H_8	44.10	12.100	5.34	4.36	0.98				5.34	0.19	10.29	488.53	530.61	11.17
PROPYLENE	C_3H_6	42.08	0.000	0.00	0.00	0.00				0.00	0.00	0.00	460.43	491.99	0.00
ISOBUTANE	C_4H_{10}	58.12	5.000	2.91	2.40	0.50				2.91	0.10	5.51	633.74	686.34	5.97
N-BUTANE	C_4H_{10}	58.12	4.300	2.50	2.07	0.43				2.50	0.09	4.75	635.38	687.98	5.15
1-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	607.68	649.76	0.00
ISOBUTYLENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	604.06	646.13	0.00
TRS-2-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	604.99	647.07	0.00
CIS-2-BUTENE	C_4H_8	56.11		0.00	0.00	0.00				0.00	0.00	0.00	606.04	648.12	0.00
ISOPENTANE	C_5H_{12}	72.15		0.00	0.00	0.00				0.00	0.00	0.00	780.12	843.24	0.00
N-PENTANE	C_5H_{12}	72.15		0.00	0.00	0.00				0.00	0.00	0.00	782.04	845.16	0.00
OXYGEN	O_2	32.00		0.00			0.00			0.00	0.00	0.00	0.00	0.00	0.00
NITROGEN	N_2	28.01		0.00				0.00		0.00	0.00	0.00	0.00	0.00	0.00
CARBON MONOXIDE	CO	28.01	10.700	3.00	1.29		1.71			3.00	0.10	1.26	67.64	67.64	1.26
HYDROGEN SULFIDE	H_2S	34.08		0.00		0.00			0.00	0.00	0.00	0.00	123.57	134.25	0.00
TOTAL			99.1	20.94	15.12	4.10	1.71	0.00	0.00	20.94	0.73	38.66			42.39

$$H_T = K\sum_{i=1}^{n} C_i H_i$$

K = 1.740 x 10
$C_i = C_s \times 10000$

% C = 72.22
% H = 19.60
% O = 8.18
% N = 0.00
% S = 0.00

Gross Calorific Value = 20935 Btu/lb
Net Calorific Value = 19095 Btu/lb
$F_{d(higher)}$ = 8507 based on Higher Heating Value
$F_{d(lower)}$ = 9327 based on Lower Heating Value

$$F_d = \left\{ \frac{10^6 \left[3.64 \times \%H + 1.53 \times \%C + 0.57 \times \%S + 0.14 \times \%N - 0.46 \times \%O \right]}{\text{Gross Caloric Value}} \right\}$$

BPHTOL-00001219

Description	Units	6/23/08 08:06 SLOP / MISC SAMS MISC OTHER SAMS	6/20/08 11:49 SLOP / MISC SAMS MISC OTHER SAMS	6/20/08 09:28 SLOP / MISC SAMS MISC OTHER SAMS
Sequence Number		1093283	1092840	1092835
Unit #		86	86	86
Code #		8	8	8
DATE COLLECTED	NTU	06/20/08	06/20/08	06/20/08
TIME COLLECTED	NTU	1240	1040	915
COMMENT	UNK	H2 Furnace	H2	H2
COMMENT1	UNK	--	Fuel Gas	Fuel Gas
C6+, Total	vol%	0	0	0.6
Hydrogen	vol%	53.7	39.8	37.6
Methane	vol%	11.7	12.7	12.8
Ethane	vol%	13.4	14.5	15.1
Ethylene	vol%	0	0	0
Carbon Dioxide	vol%	0	0	0
Propane	vol%	11.4	12.1	12.2
Propylene	vol%	0	0	0
Iso-Butane	vol%	0	5	5.2
N-Butane	vol%	0	4.3	4.5
Propadiene	vol%	0	0	0
Acetylene	vol%	0	0	0
H2S	vol%	0	0	0
t-2-Butene(UC4)	vol%	0	0	0
1-Butene(UC4)	vol%	0	0	0
i-Butylene(UC4)	vol%	0	0	0
c-2-Butene(UC4)	vol%	0	0	0
Oxygen/Argon	vol%	0	0	0
Iso-Pentane	vol%	0	1	1
Nitrogen	vol%	0	0	0
N-Pentane	vol%	0	0	0
1,3-Butadiene(UC4)	vol%	0	0	0
t-2-Pentene(UC5)	vol%	0	0	0
1-Pentene(UC5)	vol%	0	0	0
2-Methyl-2-Buene(UC5)	vol%	0	0	0
c-2-Penetene(UC5)	vol%	0	0	0
Carbon Monoxide	vol%	9.8	10.7	10.8
UC4, Total	vol%	0	0	0
UC5, Total	vol%	0	0	0
Vol%, Total	vol%	100	100	100
RGA-Mol Wt	vol%	14.8	21.6	22.7
RGA-Gr BTU	vol%	855.6	1215.6	1271.9
RGA-Net BTU	vol%	773.7	1109.1	1161.6
RGA-SG	vol%	0.29	0.36	0.37

****
Sample Report
****

Date: 06/23/2008 Time: 08:06 Unit: 86 Code: 8

Unit: SLOP / MISC SAMS
Code: MISC OTHER SAMS
seq: 1093283
Login Date: 06/23/2008
Login Time: 08:08
Prof#: 00001 DATE & TIME

Rel.Key/Comment Rec. ID = 000.01 ACTIVE 08/06/23 08:10 08/06/23 08:10
DATE COLLECTED = 06/20/08

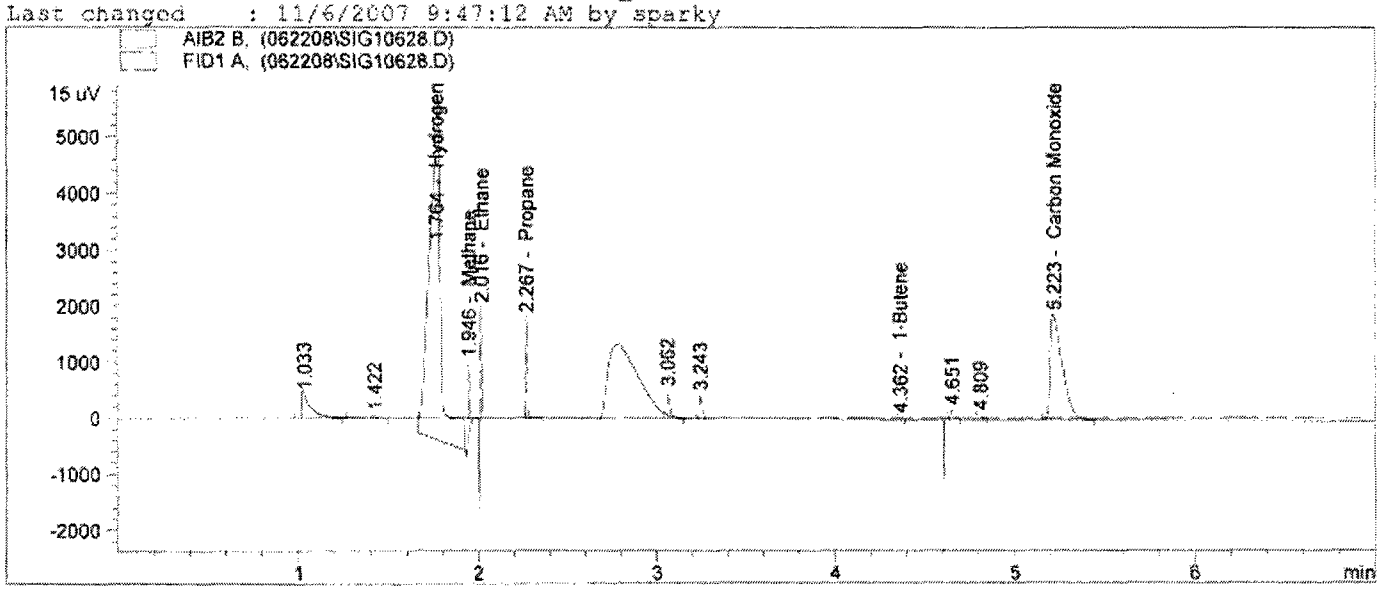
DCT1$

					Operational Specs		Control Lim	
Test	Det.			Result	Lower	Upper	Lower	
1	1	DATE COLLECTED	NTU	06/20/08				
1	2	TIME COLLECTED	NTU	1240				
11	1	COMMENT	UNK	H2 Furnace				
975	1	C6+, Total	vol%					
975	2	Hydrogen	vol%					
975	3	Methane	vol%					
975	4	Ethane	vol%					
975	5	Ethylene	vol%					
975	6	Carbon Dioxide	vol%					
975	7	Propane	vol%					
975	8	Propylene	vol%					
975	9	Iso-Butane	vol%					
975	10	N-Butane	vol%					
975	11	Propadiene	vol%					
975	12	Acetylene	vol%					
975	13	H2S	vol%					
975	14	t-2-Butene(UC4)	vol%					
975	15	1-Butene(UC4)	vol%					
975	16	i-Butylene(UC4)	vol%					
975	17	c-2-Butene(UC4)	vol%					
975	18	Oxygen/Argon	vol%					
975	19	Iso-Pentane	vol%					
975	20	Nitrogen	vol%					
975	21	N-Pentane	vol%					
975	22	1,3-Butadiene(UC4)	vol%					
975	23	t-2-Pentene(UC5)	vol%					
975	24	1-Pentene(UC5)	vol%					
975	25	2-Methyl-2-Buene(UC5	vol%					
975	26	c-2-Penetene(UC5)	vol%					
975	27	Carbon Monoxide	vol%					
975	28	UC4, Total	vol%					
975	29	UC5, Total	vol%					
975	30	Vol%, Total	vol%					
975	31	RGA-Mol Wt	vol%					
975	32	RGA-Gr BTU	vol%					
975	33	RGA-Net BTU	vol%					

Data File C:\HPCHEM\3\DATA\062208\SIG10628.D Sample Name: 1093283

Injection Date : 6/23/2008 8:13:07 AM
Sample Name : 1093283 Location : Vial 1
Acq. Operator : Inj : 1
Inj Volume : External

Method : C:\HPCHEM\3\METHODS\RGA_MIX.M
Last changed : 11/6/2007 9:47:12 AM by sparky



Normalized Percent Report

Sorted By : Retention Time
Calib. Data Modified : 10/25/2007 9:50:58 AM
Multiplier : 1.0000
Dilution : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: AIB2 B,
Signal 2: FID1 A,

RetTime [min]	Sig	Type	Area	Amt/Area	Norm %	Grp	Name
1.397	2		-	-	-	60	C6+
1.764	1	BP	2.70001e4	2.41191e-3	53.712771	1	Hydrogen
1.946	2	BB S	370.19333	3.82091e-2	11.666652	10	Methane
2.016	2	BB S	796.66730	2.03828e-2	13.393402	20	Ethane
2.040	1		-	-	-	5	Carbon Dioxide
2.089	2		-	-	-	21	Ethylene
2.267	2	BB S	1034.09314	1.33346e-2	11.373434	30	Propane
2.795	2		-	-	-	31	Propylene
3.116	2		-	-	-	43	i-Butane
3.311	2		-	-	-	40	n-Butane
3.460	2		-	-	-	32	Propadiene
3.600	2		-	-	-	22	Acetylene
4.003	1		-	-	-	8	Hydrogensulfide
4.230	2		-	-	-	41	t-2-Butene
4.362	2	BB	3.89546	9.91170e-3	0.031846	44	1-Butene
4.459	2		-	-	-	45	i-Butylene
4.575	2		-	-	-	42	c-2-Butene
4.587	1		-	-	-	6	Oxygen
4.726	2		-	-	-	51	i-Pentane
4.810	1		-	-	-	7	Nitrogen
4.919	2		-	-	-	50	n-Pentane
5.165	2		-	-	-	46	1,3-Butadiene

RetTime [min]	Sig	Type	Area	Amt/Area	Norm %	Grp	Name
5.223	1	BB	8835.05078	1.34783e-3	9.821895	4	Carbon Monoxide
5.418	2		-	-	-	54	t-2-Pentene
5.515	2		-	-	-	53	1-Pentene
5.560	2		-	-	-	56	2-Methyl-2-Butene
5.661	2		-	-	-	55	c-2-Pentene

Totals : 100.000000

Results obtained with enhanced integrator!
Group summary :

Group ID	Use	Area	Norm %
1		2.70001e4	53.712771
10		370.19333	11.666652
20		796.66730	13.393402
21		0.00000	0.000000
5		0.00000	0.000000
30		1034.09314	11.373434
31		0.00000	0.000000
43		0.00000	0.000000
40		0.00000	0.000000
32		0.00000	0.000000
22		0.00000	0.000000
41		0.00000	0.000000
44		3.89548	3.18463e-2
45		0.00000	0.000000
42		0.00000	0.000000
51		0.00000	0.000000
50		0.00000	0.000000
46		0.00000	0.000000
54		0.00000	0.000000
56		0.00000	0.000000
53		0.00000	0.000000
55		0.00000	0.000000
6		0.00000	0.000000
7		0.00000	0.000000
4		8835.05078	9.821895
60		0.00000	0.000000
8		0.00000	0.000000

2 Warnings or Errors :

Warning : Calibration warnings (see calibration table listing)
Warning : Calibrated compound(s) not found

*** End of Report ***

****
Sample Report
****

Date: 06/20/2008 Time: 09:28 Unit: 86 Code: 8

Unit: SLOP / MISC SAMS
Code: MISC OTHER SAMS
seq: 1092835
Login Date: 06/20/2008
Login Time: 09:31
Prof#: 00001 DATE & TIME

Rel.Key/Comment Rec. ID = 000.01 ACTIVE 08/06/20 09:31 08/06/20 09:31
DATE COLLECTED = 06/20/08

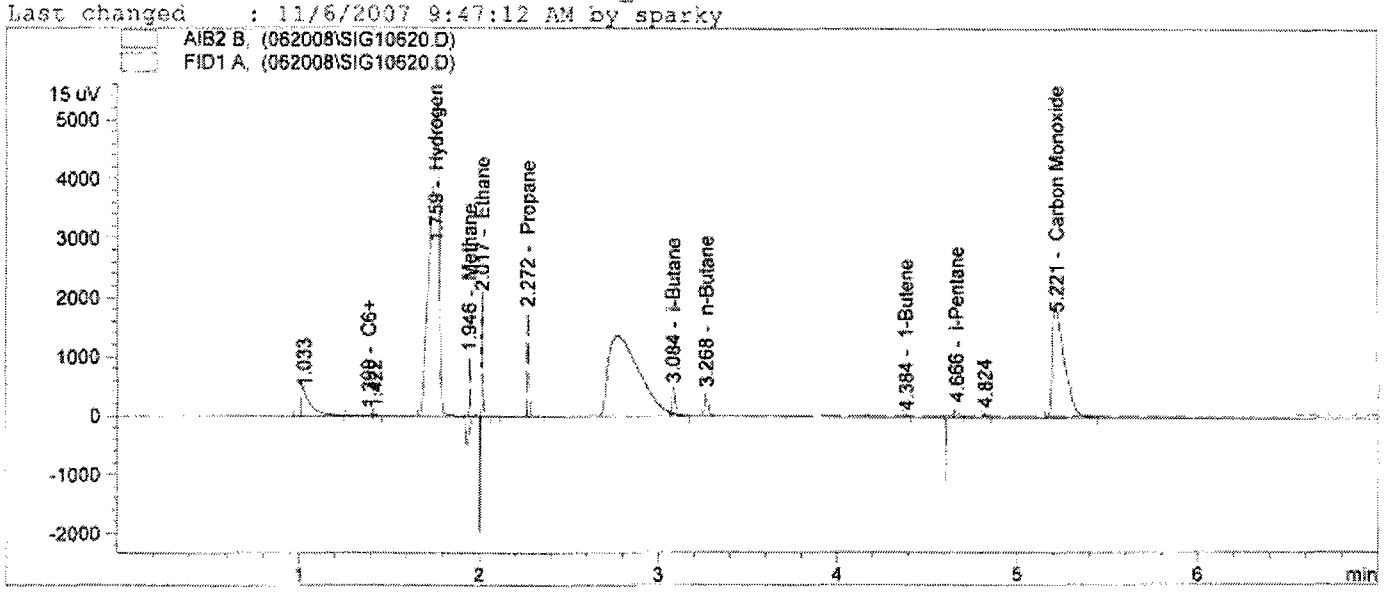
DCC7$

Test	Det.			Result	Operational Specs Lower	Operational Specs Upper	Control Lim Lower	
1	1	DATE COLLECTED	NTU	06/20/08				
1	2	TIME COLLECTED	NTU	0915				
11	1	COMMENT	UNK	H2				
29	1	COMMENT1	UNK	Fuel Gas				
975	1	C6+, Total	vol%					
975	2	Hydrogen	vol%					
975	3	Methane	vol%					
975	4	Ethane	vol%					
975	5	Ethylene	vol%					
975	6	Carbon Dioxide	vol%					
975	7	Propane	vol%					
975	8	Propylene	vol%					
975	9	Iso-Butane	vol%					
975	10	N-Butane	vol%					
975	11	Propadiene	vol%					
975	12	Acetylene	vol%					
975	13	H2S	vol%					
975	14	t-2-Butene(UC4)	vol%					
975	15	1-Butene(UC4)	vol%					
975	16	i-Butylene(UC4)	vol%					
975	17	c-2-Butene(UC4)	vol%					
975	18	Oxygen/Argon	vol%					
975	19	Iso-Pentane	vol%					
975	20	Nitrogen	vol%					
975	21	N-Pentane	vol%					
975	22	1,3-Butadiene(UC4)	vol%					
975	23	t-2-Pentene(UC5)	vol%					
975	24	1-Pentene(UC5)	vol%					
975	25	2-Methyl-2-Buene(UC5	vol%					
975	26	c-2-Penetene(UC5)	vol%					
975	27	Carbon Monoxide	vol%					
975	28	UC4, Total	vol%					
975	29	UC5, Total	vol%					
975	30	Vol%, Total	vol%					
975	31	RGA-Mol Wt	vol%					
975	32	RGA-Gr BTU	vol%					

975	33	RGA-Net BTU	vol%					
975	34	RGA-SG	vol%					

Injection Date : 6/20/2008 9:33:32 AM
Sample Name : 1092835 Location : Vial 1
Acq. Operator : Inj : 1
Inj Volume : External

Method : C:\HPCHEM\3\METHODS\RGA_HIX.M
Last changed : 11/6/2007 9:47:12 AM by sparky



Normalized Percent Report

Sorted By : Retention Time
Calib. Data Modified : 10/25/2007 9:50:58 AM
Multiplier : 1.0000
Dilution : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: AIB2 B,
Signal 2: FID1 A,

RetTime [min]	Sig	Type	Area	Amt/Area	Norm %	Grp	Name
1.390	2	PV	107.28768	6.69064e-3	0.644726	60	C6+
1.759	1	PB	1.73765e4	2.41191e-3	37.642762	1	Hydrogen
1.946	2	BB S	373.32468	3.82091e-2	12.811822	10	Methane
2.017	2	BB S	825.51141	2.03828e-2	15.112752	20	Ethane
2.040	1		-	-	-	5	Carbon Dioxide
2.089	2		-	-	-	21	Ethylene
2.272	2	BB S	1018.80017	1.33346e-2	12.201901	30	Propane
2.795	2		-	-	-	31	Propylene
3.084	2	BB	578.93280	1.00656e-2	5.233876	43	i-Butane
3.268	2	BB	499.34497	9.99696e-3	4.483594	40	n-Butane
3.460	2		-	-	-	32	Propadiene
3.600	2		-	-	-	22	Acetylene
4.003	1		-	-	-	8	Hydrogensulfide
4.230	2		-	-	-	41	t-2-Butene
4.384	2	BB	3.82299	9.91170e-3	0.034034	44	1-Butene
4.459	2		-	-	-	45	i-Butylene
4.575	2		-	-	-	42	c-2-Butene
4.587	1		-	-	-	6	Oxygen
4.666	2	BB	144.67540	8.07311e-3	1.049042	51	i-Pentane
4.810	1		-	-	-	7	Nitrogen
4.919	2		-	-	-	50	n-Pentane
5.165	2		-	-	-	46	1,3-Butadiene

RetTime [min]	Sig	Type	Area	Amt/Area	Norm %	Grp	Name
5.221	1	BB	8909.37305	1.34783e-3	10.785491	4	Carbon Monoxide
5.418	2		-	-	-	54	t-2-Pentene
5.515	2		-	-	-	53	1-Pentene
5.560	2		-	-	-	56	2-Methyl-2-Butene
5.661	2		-	-	-	55	c-2-Pentene

Totals : 100.000000

Results obtained with enhanced integrator!
Group summary :

Group ID	Use	Area	Norm %
1		1.73765e4	37.642762
10		373.32468	12.811822
20		825.51141	15.112752
21		0.00000	0.000000
5		0.00000	0.000000
30		1018.80017	12.201901
31		0.00000	0.000000
43		578.93280	5.233876
40		499.34497	4.483594
32		0.00000	0.000000
22		0.00000	0.000000
41		0.00000	0.000000
44		3.82299	3.40337e-2
45		0.00000	0.000000
42		0.00000	0.000000
51		144.67540	1.049042
50		0.00000	0.000000
46		0.00000	0.000000
54		0.00000	0.000000
56		0.00000	0.000000
53		0.00000	0.000000
55		0.00000	0.000000
6		0.00000	0.000000
7		0.00000	0.000000
4		8909.37305	10.785491
60		107.28766	0.644726
8		0.00000	0.000000

2 Warnings or Errors :

Warning : Calibration warnings (see calibration table listing)
Warning : Calibrated compound(s) not found

*** End of Report ***

****
Sample Report
****

Date: 06/20/2008 Time: 11:49 Unit: 86 Code: 8

Unit: SLOP / MISC SAMS
Code: MISC OTHER SAMS
seq: 1092840
Login Date: 06/20/2008
Login Time: 11:50
Prof#: 00001 DATE & TIME

Rel.Key/Comment Rec. ID = 000.01 ACTIVE 08/06/20 11:50 08/06/20 11:50
DATE COLLECTED = 06/20/08

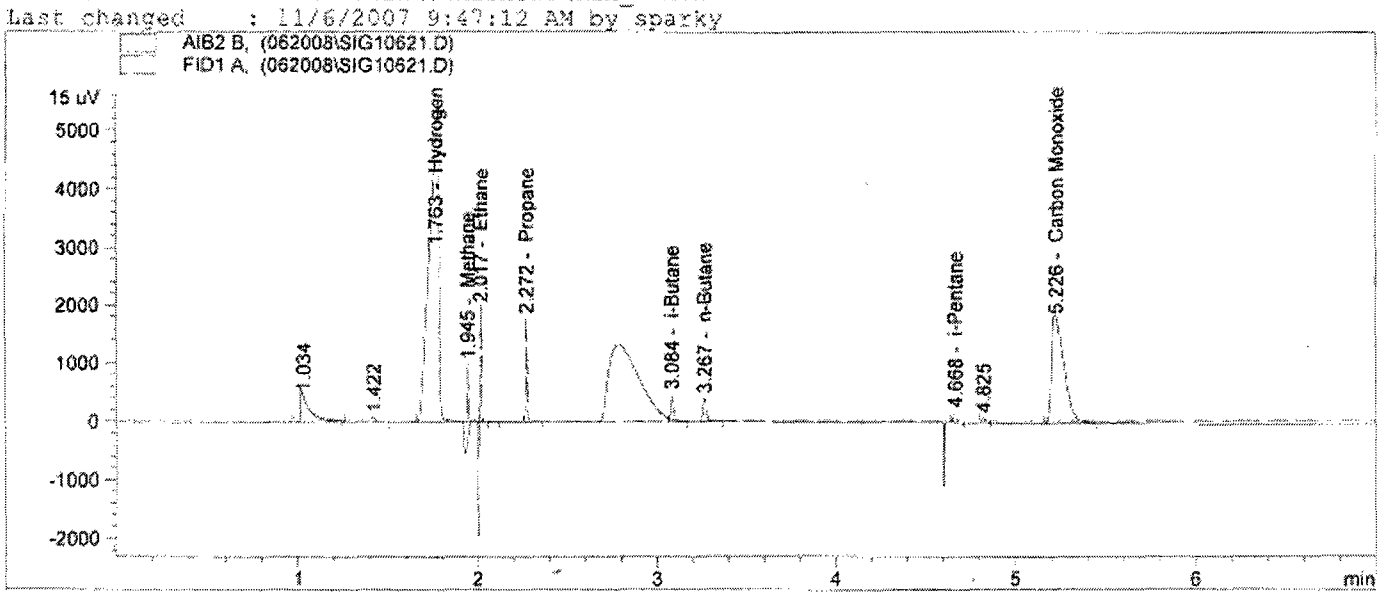
DCCC$

Test	Det.			Result	Operational Specs Lower	Operational Specs Upper	Control Lim Lower	
1	1	DATE COLLECTED	NTU	06/20/08				
1	2	TIME COLLECTED	NTU	1040				
11	1	COMMENT	UNK	H2				
29	1	COMMENT1	UNK	Fuel Gas				
975	1	C6+, Total	vol%	0.0				
975	2	Hydrogen	vol%	39.8				
975	3	Methane	vol%	12.7				
975	4	Ethane	vol%	14.5				
975	5	Ethylene	vol%	0.0				
975	6	Carbon Dioxide	vol%	0.0				
975	7	Propane	vol%	12.1				
975	8	Propylene	vol%	0.0				
975	9	Iso-Butane	vol%	5.0				
975	10	N-Butane	vol%	4.3				
975	11	Propadiene	vol%	0.0				
975	12	Acetylene	vol%	0.0				
975	13	H2S	vol%	0.0				
975	14	t-2-Butene(UC4)	vol%	0.0				
975	15	1-Butene(UC4)	vol%	0.0				
975	16	i-Butylene(UC4)	vol%	0.0				
975	17	c-2-Butene(UC4)	vol%	0.0				
975	18	Oxygen/Argon	vol%	0.0				
975	19	Iso-Pentane	vol%	1.0				
975	20	Nitrogen	vol%	0.0				
975	21	N-Pentane	vol%	0.0				
975	22	1,3-Butadiene(UC4)	vol%	0.0				
975	23	t-2-Pentene(UC5)	vol%	0.0				
975	24	1-Pentene(UC5)	vol%	0.0				
975	25	2-Methyl-2-Buene(UC5	vol%	0.0				
975	26	c-2-Penetene(UC5)	vol%	0.0				
975	27	Carbon Monoxide	vol%	10.7				
975	28	UC4, Total	vol%	0.0				
975	29	UC5, Total	vol%	0.0				
975	30	Vol%, Total	vol%	100.0				
975	31	RGA-Mol Wt	vol%	21.6				
975	32	RGA-Gr BTU	vol%	1215.6				

975	33	RGA-Net BTU	vol%	1109.1				
975	34	RGA-SG	vol%	0.360				

Injection Date : 6/20/2008 11:53:04 AM
Sample Name : 1092840 Location : Vial 1
Acq. Operator : Inj : 1
Inj Volume : External

Method : C:\HPCHEM\3\METHODS\RGA_HIX.M
Last changed : 11/6/2007 9:47:12 AM by sparky



Normalized Percent Report

Sorted By : Retention Time
Calib. Data Modified : 10/25/2007 9:50:58 AM
Multiplier : 1.0000
Dilution : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: AIB2 B,
Signal 2: FID1 A,

RetTime [min]	Sig	Type	Area	Amt/Area	Norm %	Grp	Name
1.397	2		-	-	-	60	C6+
1.763	1	BB	1.83416e4	2.41191e-3	39.766074	1	Hydrogen
1.945	2	PB S	369.08434	3.82091e-2	12.676735	10	Methane
2.017	2	BB S	789.93384	2.03828e-2	14.473321	20	Ethane
2.040	1		-	-	-	5	Carbon Dioxide
2.089	2		-	-	-	21	Ethylene
2.272	2	BB S	1012.43579	1.33346e-2	12.135649	30	Propane
2.795	2		-	-	-	31	Propylene
3.084	2	BB	548.26508	1.00656e-2	4.960699	43	i-Butane
3.267	2	BB	475.76260	9.99696e-3	4.275362	40	n-Butane
3.460	2		-	-	-	32	Propadiene
3.600	2		-	-	-	22	Acetylene
4.003	1		-	-	-	8	Hydrogensulfide
4.230	2		-	-	-	41	t-2-Butene
4.322	2		-	-	-	44	1-Butene
4.459	2		-	-	-	45	i-Butylene
4.575	2		-	-	-	42	c-2-Butene
4.587	1		-	-	-	6	Oxygen
4.668	2	BB	143.70656	8.07311e-3	1.042874	51	i-Pentane
4.810	1		-	-	-	7	Nitrogen
4.919	2		-	-	-	50	n-Pentane
5.165	2		-	-	-	46	1,3-Butadiene

RetTime [min]	Sig	Type	Area	Amt/Area	Norm %	Grp	Name
5.226	1	BB	8806.13965	1.34783e-3	10.669286	4	Carbon Monoxide
5.418	2		-	-	-	54	t-2-Pentene
5.515	2		-	-	-	53	1-Pentene
5.560	2		-	-	-	56	2-Methyl-2-Butene
5.661	2		-	-	-	55	c-2-Pentene

Totals : 100.000000

Results obtained with enhanced integrator!
Group summary :

Group ID	Use	Area	Norm %
1		1.83416e4	39.766074
10		369.08484	12.676735
20		789.93384	14.473321
21		0.00000	0.000000
5		0.00000	0.000000
30		1012.43579	12.135649
31		0.00000	0.000000
43		548.26508	4.960699
40		475.76260	4.275362
32		0.00000	0.000000
22		0.00000	0.000000
41		0.00000	0.000000
44		0.00000	0.000000
45		0.00000	0.000000
42		0.00000	0.000000
51		143.70656	1.042874
50		0.00000	0.000000
46		0.00000	0.000000
54		0.00000	0.000000
56		0.00000	0.000000
53		0.00000	0.000000
55		0.00000	0.000000
6		0.00000	0.000000
7		0.00000	0.000000
4		8806.13965	10.669286
60		0.00000	0.000000
8		0.00000	0.000000

2 Warnings or Errors :

Warning : Calibration warnings (see calibration table listing)
Warning : Calibrated compound(s) not found

*** End of Report ***

APPENDIX D

Calibration Data

CEM Calibration Error Data Sheet

Analyzer Response

Plant Name:	BP Husky Refining LLC	**ANALYZER SPAN VALUE (% or ppm)**	
Sampling Location:	Hydrogen Furnace North	**O_2:**	20.00
Date:	6/20/2008		
Plant Rep.:	Bill Rupert		
Team Leader:	N. Sekulic	**NOx:**	90.5
CEM Operator:	N. Sekulic		
Time:	Pre-test Cal Error		

	CYLINDER NUMBER	CYLINDER VALUE (% or ppm)	ANALYZER CALIBRATION RESPONSE	DIFFERENCE (% OF GAS/SPAN)
O_2 Zero	ALM005719 - N2	0.00	0.02	0.11
O_2 Low	ALM043309: 22.38%	5.00	4.98	-0.09
O_2 Mid	ALM043309: 22.38%	10.00	10.01	0.05
O_2 High	ALM043309: 22.38%	20.00	20.18	0.91

NOx Zero	ALM005719 - N2	0.0	0.05	0.06
NOx Low				
NOx Mid	ALM028937 90.52 ppmv	50.0	50.12	0.13
NOx High	ALM028937 90.52 ppmv	90.5	90.87	0.39

Convertor Check - Gas Cylinder				**Efficiency, %**
NO_2	**ALM038483**	**50.2**	**45.19**	**90.0**

O2 Method 205	**ALM048202**	**11.49**

CEM Calibration Error Data Sheet

Analyzer Response

		ANALYZER SPAN VALUE (% or ppm)	
Plant Name:	BP Husky Refining LLC		
Sampling Location:	Hydrogen Furnace South	**O_2:**	20.00
Date:	6/20/2008		
Plant Rep.:	Bill Rupert		
Team Leader:	N. Sekulic	**NOx:**	90.5
CEM Operator:	N. Sekulic		
Time:	Pre-test Cal Error		

	CYLINDER NUMBER	CYLINDER VALUE (% or ppm)	ANALYZER CALIBRATION RESPONSE	DIFFERENCE (% OF GAS/SPAN)
O_2 Zero	ALM005719 - N2	0.00	0.00	0.01
O_2 Low	ALM043309: 22.38%	5.00	4.97	-0.16
O_2 Mid	ALM043309: 22.38%	10.00	10.01	0.05
O_2 High	ALM043309: 22.38%	20.00	20.19	0.97

NOx Zero	ALM005719 - N2	0.0	0.12	0.14
NOx Low				
NOx Mid	ALM028937 90.52 ppmv	50.0	49.27	-0.81
NOx High	ALM028937 90.52 ppmv	90.5	90.92	0.44

Convertor Check - Gas Cylinder				**Efficiency, %**
NO_2	**ALM038483**	**50.2**	**45.30**	**90.2**

O2 Method 205	**ALM048202**	**11.49**

CEM CALIBRATION DATA
System Bias and Drift

Plant Name:	BP Husky Refining LLC	Plant Rep:	Bill Rupert		**Analyzer Span Value (% or ppm)**
Sampling Location:	Hydrogen Furnace North	Proj. Mgr.:	L. Goldfine	NOx	90.52 ppm
CEM Operator	N. Sekulic			O_2	20 %

Run:	1			2			3		
Date:	6/20/2008			6/20/2008			6/20/2008		
Time:	0840-0940			1018-1118			1254-1354		
	Pretest	**Posttest**	**Drift**	**Pretest**	**Posttest**	**Drift**	**Pretest**	**Posttest**	**Drift**
O_2 **Zero, %**	0.05	0.06	0.00	0.06	-0.01	-0.07	-0.01	0.00	0.01
Zero Bias, % of Span	0.26	0.28	0.02	0.28	-0.06	-0.34	-0.06	0.00	0.06
Cylinder Conc., %	10.00	10.00		10.00	10.00		10.00	10.00	
System Response, %	9.95	9.97	0.02	9.97	9.93	-0.04	9.93	9.87	-0.06
Cal Bias, % of Span	-0.24	-0.16	0.08	-0.16	-0.36	-0.21	-0.36	-0.65	-0.28
NO_X **Zero, ppm**	0.31	0.45	0.14	0.45	0.44	-0.01	0.44	0.25	-0.20
Zero Bias, % of Span	0.34	0.50	0.16	0.50	0.49	-0.01	0.49	0.27	-0.22
Cylinder Conc., ppm	50.00	50.00		50.00	50.00		50.00	50.00	
System Response, ppm	49.60	50.21	0.61	50.21	48.24	-1.98	48.24	49.00	0.76
Cal Bias, % of Span	-0.44	0.23	0.67	0.23	-1.95	-2.18	-1.95	-1.11	0.84

BPHTOL-00001235

CEM CALIBRATION DATA
System Bias and Drift

Plant Name:	BP Husky Refining LLC	Plant Rep:	Bill Rupert	
Sampling Location:	Hydrogen Furnace South	Proj. Mgr.:	L. Goldfine	
CEM Operator	N. Sekulic			

Analyzer Span Value (% or ppm)

NOx	90.52 ppm
O_2	20 %

Run:	1			2			3		
Date:	6/20/2008			6/20/2008			6/20/2008		
Time:	0840-0940			1018-1118			1254-1354		
	Pretest	Posttest	Drift	Pretest	Posttest	Drift	Pretest	Posttest	Drift
O_2 Zero, %	-0.01	0.09	0.10	0.09	0.03	-0.06	0.03	0.00	-0.03
Zero Bias, % of Span	-0.05	0.47	0.52	0.47	0.16	-0.31	0.16	0.00	-0.16
Cylinder Conc., %	10.00	10.00		10.00	10.00		10.00	10.00	
System Response, %	9.92	10.14	0.21	10.14	9.96	-0.17	9.96	9.92	-0.05
Cal Bias, % of Span	-0.39	0.68	1.07	0.68	-0.18	-0.86	-0.18	-0.42	-0.24
NO_X Zero, ppm	0.35	0.97	0.62	0.97	1.23	0.26	1.23	1.31	0.08
Zero Bias, % of Span	0.38	1.07	0.69	1.07	1.36	0.29	1.36	1.45	0.08
Cylinder Conc., ppm	50.00	50.00		50.00	50.00		50.00	50.00	
System Response, ppm	48.60	49.41	0.80	49.41	48.11	-1.30	48.11	48.20	0.09
Cal Bias, % of Span	-1.54	-0.65	0.89	-0.65	-2.09	-1.44	-2.09	-1.99	0.10

ARI REFERENCE METHOD CEMS DATA
USEPA METHOD 205
DILUTION SYSTEM VERIFICATION

Company: BP Husky Refining LLC
Location: Toledo, Ohio
Dilution System ID: 2336
Dilution Flow Rate: 3.0 lpm
Verification date: 6/19/2008

Analyzer Info

Monitor type: OXYGEN
Monitor range (%): 20
Monitor Serial No.: 1420C/2765

Initial Calibration Data

Calibration Concentration		Calibration results		% Difference	
Zero:	0.00	Zero:	0.03	Zero:	0.13
Low	5.00	Low	4.98	Low	0.08
Mid:	12.00	Mid:	12.07	Mid:	0.34
High:	20.00	High:	20.23	High:	1.16

Dilution System Verification

Mid level gas type: USEPA Protocol 1
Mid level concentration: 11.49 %
Mid level tank serial #: ALM048202

High level dilution gas type: USEPA Protocol 1
High level concentration: 22.38
High level tank serial #: ALM043309
Target concentration No. 1: 5.00
Target concentration No. 2: 12.00

Dilution System Results

Target Concentration No. 1

	Instrument Response	% difference from average*
Trial No. 1:	4.98	0.14
Trial No. 2:	4.97	0.06
Trial No. 3:	4.97	0.08
Average:	4.98	

% Difference from target concentratior 0.47%

Target Concentration No. 2

	Instrument Response	% difference from average*
Trial No. 1:	12.07	0.10
Trial No. 2:	12.05	0.04
Trial No. 3:	12.05	0.06
Average:	12.06	

% Difference from target concentration: 0.46%

Accuracy Results

	Instrument Response
Trial No. 1:	11.55
Trial No. 2:	11.53
Trial No. 3:	11.53

Calibration gas concentration: 11.49
Average analyzer response: 11.54
Percent difference: **0.41** *

*** Must be less than 2 %**

DAQView 15-Second DAS Averages

Client	BP Husky Refining LLC
Location	Toledo, Ohio
Source	H2 Furnace
Date	6/19/2008

	NORTH	NORTH	SOUTH	SOUTH			
Scale	0-10	0-100	0-10	0-100	**Comments**		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/19/2008 15:36:30	0.02	-0.06	20.85	-0.19	**BEGIN CAL ERROR**		
6/19/2008 15:36:45	0.03	-0.06	20.86	-0.19			
6/19/2008 15:37:00	0.03	0.07	20.86	-0.19			
6/19/2008 15:37:15	0.03	0.14	20.86	-0.19			
6/19/2008 15:37:30	0.03	0.12	20.86	-0.19			
6/19/2008 15:37:45	**0.03**	0.04	20.87	-0.19	**O2 cal gas conc.**	**0.00**	**%**
6/19/2008 15:38:00	**0.03**	0.04	20.87	-0.19	**Analyzer Response**	**0.03**	**%**
6/19/2008 15:38:15	**0.03**	0.05	20.87	-0.19			
6/19/2008 15:38:30	**0.03**	0.05	20.87	-0.19			
6/19/2008 15:38:45	3.64	0.05	20.88	-0.19			
6/19/2008 15:39:00	15.85	0.05	20.88	-0.19			
6/19/2008 15:39:15	19.69	0.10	20.88	-0.19			
6/19/2008 15:39:30	17.61	0.30	20.88	-0.19			
6/19/2008 15:39:45	18.97	1.05	20.88	-0.19			
6/19/2008 15:40:00	19.97	0.97	20.88	-0.21			
6/19/2008 15:40:15	20.11	0.65	20.88	-0.13			
6/19/2008 15:40:30	20.06	0.25	20.88	0.22			
6/19/2008 15:40:45	20.04	0.20	20.88	0.17			
6/19/2008 15:41:00	20.08	0.15	20.88	0.22			
6/19/2008 15:41:15	20.15	0.15	20.88	0.17			
6/19/2008 15:41:30	20.22	0.15	20.88	0.12			
6/19/2008 15:41:45	20.27	0.15	20.88	0.12			
6/19/2008 15:42:00	20.26	0.15	20.87	0.12			
6/19/2008 15:42:15	**20.23**	0.15	20.87	0.12	**O2 cal gas conc.**	**20.00**	**%**
6/19/2008 15:42:30	**20.23**	0.15	20.88	0.12	**Analyzer Response**	**20.23**	**%**
6/19/2008 15:42:45	**20.24**	0.15	20.88	0.12			
6/19/2008 15:43:00	**20.24**	0.15	20.88	0.12			
6/19/2008 15:43:15	20.23	0.15	20.88	0.12			
6/19/2008 15:43:30	19.42	0.15	20.88	0.12			
6/19/2008 15:43:45	15.28	0.15	20.88	0.12			
6/19/2008 15:44:00	12.55	0.15	20.88	0.12	**BEGIN M205 VERIFICATION**		
6/19/2008 15:44:15	12.09	0.15	20.88	0.12	**PRECISION CHECK MID #1**		
6/19/2008 15:44:30	**12.07**	0.15	20.88	0.12	**O2 cal gas conc.**	**12.00**	**%**
6/19/2008 15:44:45	**12.07**	0.15	20.88	0.12	**Analyzer Response**	**12.07**	**%**
6/19/2008 15:45:00	**12.07**	0.15	20.88	0.12			
6/19/2008 15:45:15	**12.07**	0.15	20.87	0.12			
6/19/2008 15:45:30	12.04	0.15	20.87	0.12			
6/19/2008 15:45:45	9.79	0.15	20.87	0.12			
6/19/2008 15:46:00	6.18	0.15	20.88	0.12			
6/19/2008 15:46:15	5.06	0.15	20.88	0.12			
6/19/2008 15:46:30	4.99	0.15	20.88	0.12			
6/19/2008 15:46:45	4.99	0.15	20.88	0.12	**PRECISION CHECK LOW #1**		
6/19/2008 15:47:00	**4.98**	0.15	20.88	0.12	**O2 cal gas conc.**	**5.00**	**%**
6/19/2008 15:47:15	**4.98**	0.15	20.88	0.12	**Analyzer Response**	**4.98**	**%**
6/19/2008 15:47:30	**4.98**	0.15	20.88	0.12			
6/19/2008 15:47:45	**4.99**	0.15	20.88	0.12			
6/19/2008 15:48:00	6.59	0.15	20.88	0.12			
6/19/2008 15:48:15	9.97	0.37	20.88	0.12			
6/19/2008 15:48:30	10.73	0.82	20.88	0.12			
6/19/2008 15:48:45	11.41	0.67	20.88	0.12	**INJECT 11.49% O2 ALM048202**		
6/19/2008 15:49:00	11.54	0.40	20.88	0.12	**ACCURACY CHECK #1**		
6/19/2008 15:49:15	**11.55**	0.25	20.88	0.12	**O2 cal gas conc.**	**11.49**	**ppmv**
6/19/2008 15:49:30	**11.55**	0.15	20.88	0.12	**Analyzer Response**	**11.55**	**ppmv**
6/19/2008 15:49:45	**11.55**	0.15	20.88	0.12			
6/19/2008 15:50:00	**11.55**	0.15	20.88	0.12			
6/19/2008 15:50:15	11.55	0.15	20.88	0.12			
6/19/2008 15:50:30	11.54	0.15	20.88	0.12			
6/19/2008 15:50:45	13.53	0.15	20.87	0.12			
6/19/2008 15:51:00	14.78	0.15	20.88	0.12			
6/19/2008 15:51:15	12.69	0.15	20.88	0.12			
6/19/2008 15:51:30	12.12	0.15	20.87	0.12			
6/19/2008 15:51:45	**12.05**	0.15	20.86	0.12	**PRECISION CHECK MID #2**		
6/19/2008 15:52:00	**12.05**	0.15	20.87	0.12	**O2 cal gas conc.**	**12.00**	**%**
6/19/2008 15:52:15	**12.05**	0.15	20.88	0.12	**Analyzer Response**	**12.05**	**%**
6/19/2008 15:52:30	**12.05**	0.15	20.88	0.10			
6/19/2008 15:52:45	12.05	0.15	20.88	0.02			
6/19/2008 15:53:00	12.04	0.15	20.88	0.05			
6/19/2008 15:53:15	10.15	0.15	20.88	0.12			
6/19/2008 15:53:30	6.40	0.15	20.87	0.02			
6/19/2008 15:53:45	5.08	0.15	20.87	0.02			
6/19/2008 15:54:00	4.98	0.05	20.88	0.02			
6/19/2008 15:54:15	4.98	0.05	20.87	0.02			
6/19/2008 15:54:30	**4.97**	0.05	20.87	0.02	**PRECISION CHECK LOW #2**		
6/19/2008 15:54:45	**4.97**	0.05	20.87	0.02	**O2 cal gas conc.**	**5.00**	**%**

D6

Scale	0-10	0-100	0-10	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/19/2008 15:55:00	**4.97**	0.05	20.87	0.12	**Analyzer Response**	**4.97**	**%**
6/19/2008 15:55:15	**4.97**	0.05	20.87	0.12			
6/19/2008 15:55:30	6.29	0.05	20.87	0.12			
6/19/2008 15:55:45	10.45	0.05	20.87	0.12	**INJECT 11.49% O2 ALM048202**		
6/19/2008 15:56:00	11.47	0.15	20.87	0.12	**ACCURACY CHECK #2**		
6/19/2008 15:56:15	**11.53**	0.15	20.87	0.12	**O2 cal gas conc.**	**11.49**	**ppmv**
6/19/2008 15:56:30	**11.53**	0.15	20.87	0.12	**Analyzer Response**	**11.53**	**ppmv**
6/19/2008 15:56:45	**11.53**	0.15	20.88	0.05			
6/19/2008 15:57:00	**11.53**	0.12	20.88	0.02			
6/19/2008 15:57:15	11.53	0.05	20.87	0.02			
6/19/2008 15:57:30	11.53	0.05	20.87	0.10			
6/19/2008 15:57:45	13.09	0.05	20.87	0.02			
6/19/2008 15:58:00	13.44	0.05	20.87	0.02			
6/19/2008 15:58:15	12.36	0.05	20.87	0.02			
6/19/2008 15:58:30	12.07	0.15	20.86	0.02			
6/19/2008 15:58:45	**12.05**	0.15	20.85	0.02	**PRECISION CHECK MID #3**		
6/19/2008 15:59:00	**12.05**	0.15	20.87	0.02	**O2 cal gas conc.**	**12.00**	**%**
6/19/2008 15:59:15	**12.05**	0.15	20.87	0.02	**Analyzer Response**	**12.05**	**%**
6/19/2008 15:59:30	**12.05**	0.05	20.87	0.12			
6/19/2008 15:59:45	12.05	0.05	20.87	0.05			
6/19/2008 16:00:00	12.04	0.05	20.87	0.02			
6/19/2008 16:00:15	10.00	0.05	20.87	0.02			
6/19/2008 16:00:30	6.31	0.05	20.87	0.02			
6/19/2008 16:00:45	5.07	0.05	20.87	0.02			
6/19/2008 16:01:00	4.98	0.05	20.88	0.02			
6/19/2008 16:01:15	**4.97**	0.05	20.87	0.02	**PRECISION CHECK LOW #3**		
6/19/2008 16:01:30	**4.97**	0.05	20.87	0.05	**O2 cal gas conc.**	**5.00**	**%**
6/19/2008 16:01:45	**4.97**	0.05	20.87	0.12	**Analyzer Response**	**4.97**	**%**
6/19/2008 16:02:00	**4.97**	0.05	20.87	0.12			
6/19/2008 16:02:15	4.97	0.05	20.87	0.05			
6/19/2008 16:02:30	4.97	0.05	20.87	0.02			
6/19/2008 16:02:45	6.50	0.05	20.86	0.02			
6/19/2008 16:03:00	10.61	0.05	20.87	0.02			
6/19/2008 16:03:15	11.48	0.12	20.86	0.02	**INJECT 11.49% O2 ALM048202**		
6/19/2008 16:03:30	11.53	0.15	20.87	0.02	**ACCURACY CHECK #3**		
6/19/2008 16:03:45	**11.53**	0.07	20.88	0.02	**O2 cal gas conc.**	**11.49**	**ppmv**
6/19/2008 16:04:00	**11.53**	0.05	20.88	0.02	**Analyzer Response**	**11.53**	**ppmv**
6/19/2008 16:04:15	**11.53**	0.05	20.87	0.02			
6/19/2008 16:04:30	**11.53**	0.05	20.87	0.02			
6/19/2008 16:04:45	11.53	0.05	20.87	0.02			
6/19/2008 16:05:00	10.62	0.05	20.88	0.02			
6/19/2008 16:05:15	3.44	0.05	20.87	0.02			
6/19/2008 16:05:30	0.22	0.05	20.87	0.02			
6/19/2008 16:05:45	0.02	0.05	20.87	0.02			
6/19/2008 16:06:00	0.01	**0.05**	20.87	0.02	**NOx cal gas conc.**	**0.00**	**ppmv**
6/19/2008 16:06:15	0.01	**0.05**	20.87	0.02	**Analyzer Response**	**0.05**	**ppmv**
6/19/2008 16:06:30	0.01	**0.05**	20.87	0.02			
6/19/2008 16:06:45	0.01	**0.05**	20.87	0.02			
6/19/2008 16:07:00	0.01	0.05	20.87	0.02			
6/19/2008 16:07:15	0.01	0.05	20.87	0.02			
6/19/2008 16:07:30	0.01	0.05	20.87	0.02			
6/19/2008 16:07:45	0.22	0.05	20.87	0.10			
6/19/2008 16:08:00	2.13	0.02	20.87	0.02			
6/19/2008 16:08:15	0.60	23.74	20.86	0.02			
6/19/2008 16:08:30	0.06	64.58	20.86	0.02			
6/19/2008 16:08:45	0.02	78.62	20.87	0.02			
6/19/2008 16:09:00	0.02	71.09	20.86	0.02			
6/19/2008 16:09:15	0.01	58.78	20.86	0.02			
6/19/2008 16:09:30	0.01	51.52	20.86	0.02			
6/19/2008 16:09:45	0.01	72.62	20.86	0.02			
6/19/2008 16:10:00	0.01	85.88	20.86	0.02			
6/19/2008 16:10:15	0.01	92.63	20.86	0.02			
6/19/2008 16:10:30	0.01	94.79	20.86	0.02			
6/19/2008 16:10:45	0.01	95.34	20.86	0.02			
6/19/2008 16:11:00	0.00	95.54	20.86	0.02			
6/19/2008 16:11:15	0.00	95.61	20.87	0.02			
6/19/2008 16:11:30	0.00	95.69	20.87	0.02			
6/19/2008 16:11:45	0.00	95.64	20.87	0.02			
6/19/2008 16:12:00	-0.01	90.56	20.87	0.07			
6/19/2008 16:12:15	-0.01	88.83	20.87	0.05			
6/19/2008 16:12:30	-0.01	90.13	20.87	0.02			
6/19/2008 16:12:45	-0.01	90.46	20.87	0.02			
6/19/2008 16:13:00	-0.01	90.38	20.87	0.02			
6/19/2008 16:13:15	-0.01	90.33	20.87	0.02			
6/19/2008 16:13:30	-0.01	90.18	20.87	0.02			
6/19/2008 16:13:45	-0.01	90.13	20.87	0.02			
6/19/2008 16:14:00	-0.01	90.41	20.87	0.02			
6/19/2008 16:14:15	-0.01	90.93	20.85	0.10			
6/19/2008 16:14:30	-0.01	90.58	20.87	0.12			
6/19/2008 16:14:45	-0.01	90.53	20.87	0.12			
6/19/2008 16:15:00	-0.01	90.48	20.87	0.12			

Scale	0-10	0-100	0-10	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/19/2008 16:15:15	-0.01	**90.36**	20.87	0.12	**NOx cal gas conc.**	**90.52**	**ppmv**
6/19/2008 16:15:30	-0.01	**90.33**	20.87	0.07	**Analyzer Response**	**90.34**	**ppmv**
6/19/2008 16:15:45	-0.01	**90.41**	20.87	0.02			
6/19/2008 16:16:00	-0.01	**90.28**	20.87	0.02			
6/19/2008 16:16:15	-0.01	90.23	20.86	0.02			
6/19/2008 16:16:30	-0.01	89.93	20.87	0.02			
6/19/2008 16:16:45	-0.01	89.41	20.87	0.02			
6/19/2008 16:17:00	-0.02	64.11	20.87	0.02			
6/19/2008 16:17:15	-0.02	53.83	20.87	0.02			
6/19/2008 16:17:30	-0.02	50.40	20.87	0.02			
6/19/2008 16:17:45	-0.02	50.15	20.87	0.02			
6/19/2008 16:18:00	-0.02	50.00	20.87	0.02			
6/19/2008 16:18:15	-0.02	49.92	20.86	0.02			
6/19/2008 16:18:30	-0.02	49.75	20.86	0.02			
6/19/2008 16:18:45	-0.02	49.62	20.85	0.02			
6/19/2008 16:19:00	-0.02	49.50	20.84	0.02			
6/19/2008 16:19:15	-0.02	**49.42**	20.85	0.02	**NOx cal gas conc.**	**50.00**	**ppmv**
6/19/2008 16:19:30	-0.02	**49.40**	20.86	0.02	**Analyzer Response**	**49.39**	**ppmv**
6/19/2008 16:19:45	-0.01	**49.40**	20.86	0.02			
6/19/2008 16:20:00	-0.01	**49.35**	20.86	0.02			
6/19/2008 16:20:15	-0.01	49.30	20.84	0.02			
6/19/2008 16:20:30	-0.01	49.25	20.84	0.02			
6/19/2008 16:20:45	-0.01	49.12	20.85	0.02			
6/19/2008 16:21:00	3.67	49.10	20.86	0.02			
6/19/2008 16:21:15	15.83	43.84	20.85	0.02			
6/19/2008 16:21:30	19.36	27.92	20.85	0.12			
6/19/2008 16:21:45	8.36	8.73	20.85	0.12			
6/19/2008 16:22:00	0.75	21.02	20.86	0.02			
6/19/2008 16:22:15	0.04	32.58	20.86	0.02			
6/19/2008 16:22:30	0.00	43.79	20.86	0.02			
6/19/2008 16:22:45	0.00	44.61	20.85	0.02			
6/19/2008 16:23:00	0.00	44.94	20.85	0.07			
6/19/2008 16:23:15	0.01	44.99	20.86	0.05			
6/19/2008 16:23:30	0.01	44.99	20.86	0.02			
6/19/2008 16:23:45	0.01	45.02	20.86	0.02	**Inject 50.2 ppmv NO2**		
6/19/2008 16:24:00	0.01	45.04	20.85	0.02	**NOX CONVERTER EFFICIENCY CHECK**		
6/19/2008 16:24:15	0.01	45.19	20.84	0.02	**ALM038483**		
6/19/2008 16:24:30	0.01	**45.19**	20.86	0.02	**NOx cal gas conc.**	**50.20**	**ppmv**
6/19/2008 16:24:45	0.01	**45.19**	20.86	0.02	**Analyzer Response**	**45.19**	**ppmv**
6/19/2008 16:25:00	0.01	**45.19**	20.85	0.02			
6/19/2008 16:25:15	0.01	**45.19**	20.83	0.02			
6/19/2008 16:25:30	0.01	45.19	20.85	0.02			
6/19/2008 16:25:45	0.01	44.91	20.85	0.02			
6/19/2008 16:26:00	0.05	44.84	20.84	0.02			
6/19/2008 16:26:15	6.45	44.79	20.86	0.02			
6/19/2008 16:26:30	17.77	37.53	20.25	0.12			
6/19/2008 16:26:45	20.74	20.29	13.61	0.45			
6/19/2008 16:27:00	20.95	6.35	1.79	0.22			
6/19/2008 16:27:15	20.94	2.38	0.21	0.05			
6/19/2008 16:27:30	20.92	1.65	0.09	0.02			
6/19/2008 16:27:45	20.91	1.40	0.06	0.02			
6/19/2008 16:28:00	20.90	1.20	0.04	0.02			
6/19/2008 16:28:15	20.89	1.08	0.02	0.02			
6/19/2008 16:28:30	20.89	0.95	0.00	0.02			
6/19/2008 16:28:45	20.88	0.87	0.00	0.02			
6/19/2008 16:29:00	20.88	0.80	-0.01	0.02			
6/19/2008 16:29:15	20.88	0.75	-0.03	0.02			
6/19/2008 16:29:30	20.88	0.65	0.02	0.02			
6/19/2008 16:29:45	20.88	0.65	0.06	0.02			
6/19/2008 16:30:00	20.88	0.60	**0.06**	**0.02**	**O2 cal gas conc.**	**0.00**	**%**
6/19/2008 16:30:15	20.87	0.55	**0.05**	**0.02**	**Analyzer Response**	**0.05**	**%**
6/19/2008 16:30:30	20.87	0.55	**0.05**	**0.02**	**NOx cal gas conc.**	**0.00**	**ppmv**
6/19/2008 16:30:45	20.87	0.55	**0.05**	**0.02**	**Analyzer Response**	**0.02**	**ppmv**
6/19/2008 16:31:00	20.87	0.55	0.22	0.02			
6/19/2008 16:31:15	20.87	0.55	11.32	0.02			
6/19/2008 16:31:30	20.87	0.45	10.63	3.42			
6/19/2008 16:31:45	20.87	0.45	1.06	11.32			
6/19/2008 16:32:00	20.87	0.45	0.12	65.09			
6/19/2008 16:32:15	20.87	0.45	0.06	83.09			
6/19/2008 16:32:30	20.87	0.40	0.05	83.04			
6/19/2008 16:32:45	20.87	0.45	0.04	81.52			
6/19/2008 16:33:00	20.87	0.35	0.04	86.59			
6/19/2008 16:33:15	20.87	0.35	0.03	89.35			
6/19/2008 16:33:30	20.86	0.35	0.03	90.79			
6/19/2008 16:33:45	20.86	0.35	0.02	90.97			
6/19/2008 16:34:00	20.86	0.35	0.02	91.13			
6/19/2008 16:34:15	20.86	0.35	0.02	86.18			
6/19/2008 16:34:30	20.86	0.35	0.02	86.06			
6/19/2008 16:34:45	20.86	0.27	0.01	90.53			
6/19/2008 16:35:00	20.86	0.25	0.01	90.78			
6/19/2008 16:35:15	20.86	0.25	0.02	90.86			

Scale	0-10	0-100	0-10	0-100	Comments		
Units	% db	ppmv db	% db	ppmv db			
Clock Time	Oxygen	NO_x	Oxygen	NO_x			
6/19/2008 16:35:30	20.86	0.25	0.01	90.73			
6/19/2008 16:35:45	20.86	0.25	0.01	90.61			
6/19/2008 16:36:00	20.86	0.25	0.00	90.64			
6/19/2008 16:36:15	20.86	0.25	0.00	**90.86**	**NOx cal gas conc.**	**90.50**	**ppmv**
6/19/2008 16:36:30	20.86	0.25	0.00	**90.98**	**Analyzer Response**	**90.94**	**ppmv**
6/19/2008 16:36:45	20.86	0.25	0.01	**90.94**			
6/19/2008 16:37:00	20.85	0.25	0.00	**90.98**			
6/19/2008 16:37:15	20.85	0.25	0.00	90.66			
6/19/2008 16:37:30	20.84	0.25	0.00	81.54			
6/19/2008 16:37:45	20.85	0.25	0.00	57.65			
6/19/2008 16:38:00	20.85	0.25	-0.01	50.65			
6/19/2008 16:38:15	20.85	0.25	-0.01	49.60			
6/19/2008 16:38:30	20.85	0.25	-0.01	49.50			
6/19/2008 16:38:45	20.84	0.25	0.00	49.43			
6/19/2008 16:39:00	20.85	0.25	-0.01	49.40			
6/19/2008 16:39:15	20.85	0.25	-0.01	**49.30**	**NOx cal gas conc.**	**50.00**	**ppmv**
6/19/2008 16:39:30	20.85	0.25	-0.01	**49.20**	**Analyzer Response**	**49.18**	**ppmv**
6/19/2008 16:39:45	20.85	0.25	-0.01	**49.13**			
6/19/2008 16:40:00	20.85	0.20	-0.01	**49.10**			
6/19/2008 16:40:15	20.84	0.15	0.61	47.53			
6/19/2008 16:40:30	20.84	0.15	6.12	45.95			
6/19/2008 16:40:45	20.84	0.15	0.98	44.63			
6/19/2008 16:41:00	20.84	0.15	0.05	39.76			
6/19/2008 16:41:15	20.84	0.22	0.00	38.61			
6/19/2008 16:41:30	20.84	0.25	0.00	39.46			
6/19/2008 16:41:45	20.84	0.25	0.00	39.88			
6/19/2008 16:42:00	20.84	0.25	-0.01	40.21			
6/19/2008 16:42:15	20.84	0.25	-0.01	40.43			
6/19/2008 16:42:30	20.84	0.25	-0.02	40.66			
6/19/2008 16:42:45	20.84	0.25	-0.02	40.88			
6/19/2008 16:43:00	20.83	0.25	-0.02	41.11			
6/19/2008 16:43:15	20.83	0.22	-0.02	41.30			
6/19/2008 16:43:30	20.83	0.15	-0.02	41.45			
6/19/2008 16:43:45	20.83	0.15	-0.01	41.60			
6/19/2008 16:44:00	20.83	0.15	-0.01	41.70			
6/19/2008 16:44:15	20.83	0.15	-0.01	41.80			
6/19/2008 16:44:30	20.83	0.15	-0.02	41.95			
6/19/2008 16:44:45	20.83	0.15	-0.02	42.05			
6/19/2008 16:45:00	20.83	0.15	-0.02	42.30			
6/19/2008 16:45:15	20.83	0.15	-0.02	42.38			
6/19/2008 16:45:30	20.83	0.15	-0.02	42.35			
6/19/2008 16:45:45	20.83	0.15	-0.02	42.43			
6/19/2008 16:46:00	20.83	0.15	-0.02	42.50			
6/19/2008 16:46:15	20.84	0.15	-0.02	42.60			
6/19/2008 16:46:30	20.84	0.15	-0.02	42.70			
6/19/2008 16:46:45	20.84	0.15	-0.02	42.75			
6/19/2008 16:47:00	20.84	0.15	-0.03	42.70			
6/19/2008 16:47:15	20.84	0.15	-0.03	42.70			
6/19/2008 16:47:30	20.84	0.15	-0.02	42.75			
6/19/2008 16:47:45	20.84	0.15	-0.02	42.88			
6/19/2008 16:48:00	20.84	0.15	-0.02	42.90			
6/19/2008 16:48:15	20.84	0.15	-0.02	43.00			
6/19/2008 16:48:30	20.84	0.15	-0.02	43.10			
6/19/2008 16:48:45	20.84	0.15	-0.03	43.15			
6/19/2008 16:49:00	20.84	0.15	-0.03	43.10			
6/19/2008 16:49:15	20.84	0.15	-0.03	43.10			
6/19/2008 16:49:30	20.84	0.15	-0.03	43.10			
6/19/2008 16:49:45	20.84	0.15	0.37	41.85			
6/19/2008 16:50:00	20.83	0.20	3.57	35.36			
6/19/2008 16:50:15	20.83	0.22	0.43	24.34	**Inject 50.2 ppmv NO2**		
6/19/2008 16:50:30	20.83	0.15	-0.02	22.61	**NOX CONVERTER EFFICIENCY CHECK**		
6/19/2008 16:50:45	20.83	0.22	-0.04	40.70	**ALM038483**		
6/19/2008 16:51:00	20.83	0.25	-0.05	44.95			
6/19/2008 16:51:15	20.83	0.25	-0.05	**45.28**	**NOx cal gas conc.**	**50.20**	**ppmv**
6/19/2008 16:51:30	20.82	0.25	-0.06	**45.30**	**Analyzer Response**	**45.30**	**ppmv**
6/19/2008 16:51:45	20.82	0.17	-0.06	**45.30**			
6/19/2008 16:52:00	20.81	0.15	-0.05	**45.30**			
6/19/2008 16:52:15	20.81	0.15	-0.06	45.33			
6/19/2008 16:52:30	20.82	0.15	-0.06	45.45			

COMPLIANCE CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: IL-303-06
Project No.: 05-47021-001

Customer

ARI ENVIRONMENTAL, INC.

951 OLD RAND ROAD #106
WAUCONDA IL 60084

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM038483 **Certification Date:** 06Sep2006 **Exp. Date:** 06Sep2008
Cylinder Pressure*:** 1800 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
NITROGEN DIOXIDE	50.2	PPM	+/- 2%	NIST and NMI
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol procedures , September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2654	04Jul2008	ALM058105	528.0 PPM	NITROGEN DIOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
BECKMAN/951/010177	06Sep2006	CHEMILUMINESCENCE

APPROVED BY: _____

AIR LIQUIDE Scott Specialty Gases
Air Liquide America Specialty Gases LLC

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083

Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: IL-183-08
Project No.: 05-64455-001

Customer

ARI ENVIRONMENTAL, INC.

951 OLD RAND ROAD #106
WAUCONDA IL 60084

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM043309 **Certification Date:** 10Apr2008 **Exp. Date:** 10Apr2011
Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	22.53	%	+/- 1%	Direct NIST and NMi
OXYGEN	22.38	%	+/- 1%	Direct NIST and NMi
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2300	01Nov2010	1D002807	23.04 %	CARBON DIOXIDE
NTRM 2658	01Jan2010	K015251	10.03 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
HORIBA/PIR-2000/701022	10Apr2008	NDIR
CALIFORNIA/110P/S02041	07Apr2008	PARAMAGNETIC

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis | Second Triad Analysis | Calibration Curve

CARBON DIOXIDE

First Triad Analysis		
Date: 10Apr2008	Response Unit:MV	
Z1 = 0.00000	R1 = 199.4000	T1 = 197.1000
R2 = 199.5000	Z2 = 0.00000	T2 = 197.2000
Z3 = 0.00000	T3 = 197.1000	R3 = 199.5000
Avg. Concentration:	22.53	%

Second Triad Analysis:

Calibration Curve	
Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 0.999998	
Constants:	A = -0.005894
B = 0.056761	C = 0.000082
D = 0.000001	E = 0

OXYGEN

First Triad Analysis		
Date: 08Apr2008	Response Unit:%	
Z1 = 0.00000	R1 = 10.03000	T1 = 22.36000
R2 = 10.04000	Z2 = 0.00000	T2 = 22.40000
Z3 = 0.00000	T3 = 22.40000	R3 = 10.04000
Avg. Concentration:	22.37	%

Second Triad Analysis:

Calibration Curve	
Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 1.000000	
Constants:	A = -0.000136
B = 1.000185	C = 0
D = 0	E = 0

APPROVED BY: _____

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-213

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: IL-128-07
Project No.: 05-52359-007

Customer

ARI ENVIRONMENTAL, INC.

951 OLD RAND ROAD #106
WAUCONDA IL 60084

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM048202 **Certification Date:** 05Mar2007 **Exp. Date:** 04Mar2010
Cylinder Pressure*:** 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
OXYGEN	11.49	%	+/- 1%	Direct NIST and NMI
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2350	01May2009	K026542	23.48 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
ROSEMOUNT/755R/1000430	23Feb2007	PARAMAGNETIC

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis

OXYGEN

Date: 05Mar2007 Response Unit:%

Z1 = 0.00000	R1 = 23.48000	T1 = 11.49000
R2 = 23.47000	Z2 = 0.00000	T2 = 11.49000
Z3 = 0.00000	T3 = 11.48000	R3 = 23.48000

Avg. Concentration: 11.49 %

Second Triad Analysis

Calibration Curve

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999999
Constants: A = -0.004566
B = 0.999952 C = 0
D = 0 E = 0

APPROVED BY:
D-12

Response Time Data

Company: BP Husky Refining LLC
Location Toledo, Ohio
Source: H2 Furnace
Test Date: 6/20/2008

COMPONENT	NORTH UPSCALE RESPONSE TIME MINUTES	NORTH DOWNSCALE RESPONSE TIME MINUTES	SOUTH UPSCALE RESPONSE TIME MINUTES	SOUTH DOWNSCALE RESPONSE TIME MINUTES
O2	2.25	2.25	2.0	1.8
NOX	3.75	2.5	3.0	3.0

BPHTOL-00001245

Interference Response

Analyzer Type:	Oxygen (O_2)
Manufacturer:	Servomex
Detector Type:	Paramagnetic
Model No.:	1440
Serial No.:	1420C/2765
Calibration Span (%):	11.27

		High Standard			Zero			
Test Gas	Test Gas Conc.	O_2 without interferent	O_2 with interferent	% Interference	Zero without interferent	Zero with interferent	% Interference	Maximum % Interference
NH_3	10 ppm	11.27	11.27	0.00	0.03	0.01	0.18	0.18
SO_2	20 ppm	11.25	11.25	0.00	0.01	0.01	0.00	0.00
CH_4	50 ppm	11.24	11.25	0.09	0.02	0.04	-0.18	0.18
CO	50 ppm	11.23	11.24	0.09	0.00	0.01	-0.09	0.09
CO_2	5%	11.23	11.26	0.27	0.00	-0.01	0.09	0.27
CO_2	12.55%	11.25	11.27	0.18	0.03	-0.02	0.44	0.44
NO_2	15 ppm	11.22	11.24	0.18	0.01	0.00	0.09	0.18
NO_x	15 ppm	11.22	11.25	0.27	0.01	0.01	0.00	0.27
H_2	1,020 ppm	11.24	11.23	-0.09	0.02	0.01	0.09	0.09
HCl	10 ppm	11.29	11.31	0.18	0.00	-0.01	0.09	0.18

Sum of the highest absolute value obtained with and without the pollutant present: 1.88 %
Allowable interference response: 2.5 %

Certification Date: 18-Aug-06
Operator: Steve Flaherty

Interference Response

Analyzer Type:	Carbon Dioxide (CO_2)
Manufacturer:	Servomex
Detector Type:	Paramagnetic
Model No.:	1440
Serial No.:	1415C
Calibration Span (%):	11.41

Test Gas	Test Gas Conc.	High Standard			Zero			Maximum % Interference
		CO_2 without interferent	CO_2 with interferent	% Interference	Zero without interferent	Zero with interferent	% Interference	
NH_3	10 ppm	11.41	11.39	-0.18	0.01	0.01	0.00	0.18
SO_2	20 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
CH_4	50 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
CO	50 ppm	11.41	11.41	0.00	0.01	0.01	0.00	0.00
NO_2	15 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
NO_x	15 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
H_2	1,020 ppm	11.37	11.37	0.00	0.01	0.01	0.00	0.00
HCl	10 ppm	11.41	11.38	-0.26	0.01	0.01	0.00	0.26

Sum of the highest absolute value obtained with and without the pollutant present: 0.44 %
Allowable interference response: 2.5 %

Certification Date: 18-Aug-06
Operator: Steve Flaherty

BPHTOL-00001247

Interference Response

Analyzer Type: Oxides of Nitrogen (NO_x)
Manufacturer: Thermo Environmental Instruments Inc.
Detector Type: Chemiluminescent
Model No.: 42C
Serial No.: 42CHL64932-345
Calibration Span (ppm): 100

Test Gas	Test Gas Conc.	High Standard			Zero			Maximum % Interference
		NO_x without interferent	NO_x with interferent	% Interference	Zero without interferent	Zero with interferent	% Interference	
NH_3	10 ppm	100.02	100.00	-0.02	0.08	-0.06	-0.14	0.14
CH_4	50 ppm	100.10	100.04	-0.06	0.08	0.05	-0.03	0.06
CO_2	5%	100.07	99.92	-0.15	0.08	-0.13	-0.21	0.21
CO_2	12.55%	100.11	99.07	-1.04	0.08	-0.42	-0.50	1.04
SO_2	20 ppm	100.10	100.08	-0.02	0.08	0.09	0.01	0.02
CO	50 ppm	100.09	99.96	-0.13	0.08	0.07	-0.01	0.13
H_2	1,020 ppm	100.11	100.10	-0.01	0.08	0.01	-0.07	0.07
HCl	10 ppm	100.02	99.94	-0.08	0.08	0.01	-0.07	0.08

Sum of the highest absolute value obtained with and without the pollutant present: 1.75 %
Allowable interference response: 2.5 %

Certification Date: 18-Aug-06
Operator: Steve Flaherty

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: IL-105-06
05-39283-001

Customer

ARI ENVIRONMENTAL, INC.

951 OLD RAND ROAD #106
WAUCONDA IL 60084

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM020919 **Certification Date:** 20Jan2006 **Exp. Date:** 20Jan2008
Cylinder Pressure*:** 1864 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
NITRIC OXIDE	90.52	PPM	+/- 1%	Direct NIST and NMi
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	90.52	PPM		Reference Value Only

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1684	04Jul2008	AAL070302	97.00 PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//0928621	09Jan2006	FTIR

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

NITRIC OXIDE

First Triad Analysis

Date: 13Jan2006	Response Unit:PPM	
Z1 = 0.01135	R1 = 97.38899	T1 = 90.96485
R2 = 97.43491	Z2 = 0.01136	T2 = 91.28032
Z3 = 0.09157	T3 = 91.31552	R3 = 97.50569
Avg. Concentration:	90.77	PPM

Second Triad Analysis

Date: 20Jan2006	Response Unit: PPM	
Z1 = -0.27845	R1 = 96.57404	T1 = 89.90740
R2 = 96.90026	Z2 = 0.09120	T2 = 90.23359
Z3 = 0.14120	T3 = 90.70045	R3 = 97.55422
Avg. Concentration:	90.27	PPM

Calibration Curve

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 9.99998E-1	
Constants:	A = 0.00000E+0
B = 1.00848E+0	C = 4.60000E-5
D = 0.00000E+0	E = 0.00000E+0

APPROVED BY: _____
JEFF CROTEAU