HYDROTREATER LO-CAT OXIDIZER STACK VOC AND H_2S COMPLIANCE TEST REPORT AMERICAN REFINING GROUP, INC. BRADFORD, PENNSYLVANIA

Plan Approval No. 42-004E

Testing Date: December 8, 2010

Report Date: January 27, 2011

Prepared for:

American Refining Group, Inc.
77 N. Kendall Avenue
Bradford, Pennsylvania 16701

Prepared by:

Air/Compliance Consultants, Inc.
1050 William Pitt Way
Pittsburgh, Pennsylvania 15238
(412) 826-3636

PA Laboratory Registration Number: 02-742

Project Number 09-160

Air/Compliance Consultants, Inc.

SOURCE TEST REPORT STATEMENT

This statement signed by the on-site supervisor of the test team and the source owner/operator certifies that "to the best of their knowledge" the source test report has been checked for completeness, and that the results presented are accurate, error-free, legible, and representative of the actual emissions measured during testing.

HYDROTREATER LO-CAT OXIDIZER STACK
VOC AND H_2S COMPLIANCE TEST REPORT
AMERICAN REFINING GROUP, INC.
BRADFORD, PENNSYLVANIA

Plan Approval No. 42-004E

Testing Date: December 8, 2010

Project No. 09-160

Eric S. White, QSTI
Project Manager
Air/Compliance Consultants, Inc.

1/27/11
Date

Jason L. Goodling
Environmental Manager
American Refining Group, Inc.

1/26/11
Date

TABLE OF CONTENTS

TABLES

APPENDICES

HYDROTREATER LO-CAT OXIDIZER STACK
VOC AND H_2S COMPLIANCE TEST REPORT
AMERICAN REFINING GROUP, INC.
BRADFORD, PENNSYLVANIA

Plan Approval No. 42-004E

1 TEST REPORT SUMMARY

Plan Approval Number: 42-004E			
Source Name: Hydrotreater Lo-Cat Oxidizer Stack			**Source ID: #1001**
Pollutant	**Average Result**	**Permit Limit**	**Compliant / Non-compliant**
Non-Methane Non-Ethane Volatile Organic Compounds	1.53 lb/hr	NA	Compliant
Hydrogen Sulfide	0.011 lb/hr	NA	Compliant

2 INTRODUCTION

Air/Compliance Consultants, Inc. (ACCI) conducted a compliance emission evaluation program at the American Refining Group, Inc. (ARG) facility located in Bradford, Pennsylvania. The purpose of the testing was to determine the emissions from the LO-CAT oxidizer exhaust for volatile organic compounds (VOCs) as propane (C_3H_8) and hydrogen sulfide (H_2S). The LO-CAT oxidizer exhaust was tested as detailed in the Pennsylvania Department of Environmental Protection (PADEP) September 2009 submitted protocol. Copies of the original test protocol, PADEP response letter, and PADEP electronic mail confirmation of testing are contained in Appendix A.

3 TEST DATE AND PERSONNEL

Testing was conducted on December 8, 2010. ACCI testing personnel consisted of Mr. Eric S. White, QSTI, Project Manager; Mr. Todd Haas, QSTI, Project Scientist/M11 Analyst; and Messrs. Thomas Payne and Kenji Kinoshita, Scientists. Mr. Shawn Mosier of ARG served as the

liaison for the duration of the test program. The following tables details the contact personnel regarding this test program:

COMPANY	TESTING FIRM
Mr. Jason Goodling American Refining Group, Inc. 77 N. Kendall Avenue Bradford, Pennsylvania 16701 (814) 368-1223 – Telephone (814) 368-1427 – Facsimile jgoodling@amref.com	Mr. Eric S. White, QSTI Air/Compliance Consultants, Inc. 1050 William Pitt Way Pittsburgh, Pennsylvania 15238 (412) 826-3636 – Telephone (412) 826-3640 – Facsimile ewhite@air-comp.com

USEPA Methods 11, 18, and 25 were analyzed by the following laboratories:

USEPA Method 11	USEPA Method 18	USEPA Method 25
Air/Compliance Consultants, Inc. Mr. Todd Haas 1050 William Pitt Way Pittsburgh, Pennsylvania 15238 (412) 826-3636 – Telephone (412) 826-3640 – Facsimile thaas@air-comp.com PA Lab Registration #02-742	Air Quality Services Ms. Nancy Kotsko 4527 Clairton Blvd. Pittsburgh, Pennsylvania 15236 (412) 881-5630 –Telephone (412) 881-7925 –Facsimile aqs1@earthlink.net PA Lab Registration #02-711	Triangle Environmental Services Mr. Wayne Stollings 6661 S. Alston Avenue Durham, North Carolina 27713 (919) 361-2890 – Telephone (919) 361-3474 Facsimile Lab Registration # 68-3321

4 PROCESS DESCRIPTION

4.1 Hydrotreater Unit

The Hydrotreater unit (Source ID #1001) serves to remove sulfur from fuels and lube oils through a reaction with hydrogen that is produced in other refinery processes (platformer catalytic reforming). Sulfur removed from the fuels and lube oils in the Hydrotreater is contained in the off gas from the Hydrotreater in the form of H_2S. In turn, Hydrotreater unit off gas is directed to the Desulfurization unit.

4.2 Desulfurization Unit

The Desulfurization unit reduces sulfur loading in the off gas through a series of chemical reactions; the sulfur is recovered as a solid product. Unlike a Claus unit, which has been traditionally applied at petroleum refineries, the Desulfurization unit does not produce sulfur dioxide (SO_2) as a reactant; it uses chemical reduction and chemical oxidation to recover sulfur

from the gas, producing no potential hazardous by-products. The Desulfurization unit generally consists of an absorber section (ID #C1001) and an oxidizer section (ID #C1001A). In the absorber section, hydrogen atoms are liberated from sulfur as an iron chelate binds to the sulfur, thereby displacing the hydrogen. Following treatment of the Hydrotreater off gas stream in the absorber section, the resulting "sweet gas" is directed to various refinery process heaters and boilers. The iron chelate solution is regenerated in the oxidizer section as oxygen displaces sulfur bound to the chelate. The sulfur is then recovered as a solid and the regenerated iron chelate is pumped back to the absorber in a cyclical process. All atmospheric exhaust from the Desulfurization unit are from the oxidizer section and specifically the LO-CAT oxidizer stack (Stack ID #S1001).

5 TESTING PROCEDURES

All source testing was conducted in accordance with the October 8, 2009 test protocol, the PADEP acceptance letter sent October 26, 2009, PADEP electronic mail confirmation on November 12, 2010 and USEPA, Title 40, CFR, Part 60, Appendix A and the procedures described below.

5.1 Sampling and Traverse Locations – USEPA Method 1

The sampling location for the collection of gas-flow data is located at the desulfurization unit oxidizer vent exhaust stack. The inside diameter (ID) of the stack, at the sampling location, is 8.0". The nearest upstream disturbance from the flow sample port is 56" and the nearest downstream disturbance is 24". Two, 2.0" test ports, at 90° from each other, were utilized for the test program. Flow points were determined at 8 points per port for a total of 16 points in all.

5.2 Gas Flow and Temperature Measurements – USEPA Method 2

Gas flow measurements were conducted using USEPA Method 2, *Determination of Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube).* Although it was a small pipe, Method 2A could not be used due to the nipple length as discussed prior to the field test (November 11, 2010). The gas flow rate and temperature for the gas streams were measured by conducting simultaneous velocity and temperature measurements during each sampling run. Gas velocity head was measured with a calibrated S Type Pitot tube that was connected to a manometer. The

static pressure was measured using the same Pitot tube and manometer. A Chrome-Alumel thermocouple attached to a digital indicator was used to measure the gas temperature at each of the traverse points.

5.3 Carbon Dioxide and Oxygen Determination – USEPA Method 3C

The principles of USEPA Method 3C, *Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen from Stationary Sources,* was utilized for the determination of oxygen (O_2) and carbon dioxide (CO_2) for the test program. An integrated bag sample was pulled during each test run over the 60-minute test period. This bag was sent to AQS for analysis by USEPA Method 3C, ASTM D-1945. Nitrogen (N) concentrations were determined by the difference.

5.4 Moisture Content Sampling – USEPA Method 4

Moisture content sampling was conducted concurrently with each sampling run using the principles presented in USEPA Method 4, *Determination of Moisture Content in Stack Gases.* Parameters evaluated in order to determine the gas stream moisture content were sample gas volume, temperature, pressure and impingers, and silica gel moisture gain.

5.5 Hydrogen Sulfide Emissions - USEPA Method 11

The principles of USEPA Method 11, *Determination of Hydrogen Sulfide Content of Fuel Gas Streams in Petroleum Refineries*, were used for this test program. The sample gas was extracted through a short heated Teflon® probe connected to a series of six midget impingers. The first impinger contained 15 milliliters (ml) of hydrogen peroxide. The second impinger remained empty. The third, fourth, and fifth impingers each contained 15 ml of cadmium sulfate absorbing solution. A silica gel midget impinger followed the impinger set. A volatile organic sampling train (VOST) type meter box was utilized to control the sample flow rate and to measure the sample volume.

Three 60-minute test runs were performed. Samples were collected at a rate of 1 liter per minute (lpm) for each testing run. At the conclusion of each test, the impinger train was purged with clean ambient air for 15 minutes at a rate of 1 lpm.

5.6 Methane and Ethane Emissions – USEPA Method 18

Tedlar® bag samples were taken utilizing USEPA Method 18 procedures, *Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*. These bags were then analyzed for methane/ethane hydrocarbons; emissions are reported as non-methane/non-ethane VOCs (NMEVOC).

5.7 Total Gaseous Non-methane Organic Emissions– USEPA Method 25

USEPA Method 25, *Determination of Total Gaseous Non-methane Organic Emissions as Carbon*. The sampling system consisted of a heated probe, heated filter, condensate trap, flow control system, and sample tank. The sample tank was evacuated prior to collecting samples and leak checked 24 hours later. An emission sample was drawn from the sample port at a point centrally located within the duct, at a constant rate of 100 cubic centimeters per minute (ccm) through a heated filter and a condensate trap, chilled with dry ice, by means of the evacuated sample tank. After the 1-hour sample run, the condensate trap was removed from the sample train, capped, and uniquely labeled, then kept on dry ice until reaching the analytical laboratory. The sample tank was removed from the sample train, capped, and uniquely labeled. The sample set (1 trap and 1 sample tank), information was included on a Chain of Custody (COC) form completed for shipment to the laboratory. The total gaseous non-methane organics (TGNMOs) was determined by independently analyzing the condensate trap and sample tank fractions and combining the analytical results. Field data related to USEPA Method 25 sampling was recorded on field data sheets and have been provided in Appendix B. All laboratory analysis sheets are contained in Appendix C and all relevant quality assurance / quality control (QA/QC) data can be found in Appendix D.

5.8 Process Data

ARG personnel recorded the absorber refinery fuel gas throughput at least every 15 minutes during each testing period. A copy of the process data can be located in Appendix E

5.9 Calculations

Emission calculations were completed using a computer spreadsheet format. The results of each pertinent parameter are detailed on the spreadsheet for each sampling run and provided in the

Appendix B. A sample calculation for one complete test run of each parameter is included in Appendix F.

5.10 Calibrations

The following field equipment calibrations are contained in Appendix D:

- Thermocouple
- Dry gas meter and orifice
- Pitot tube
- Qualified Source Testing Individual (QSTI) Certificates

6 TESTING SUMMARY

The results of the testing program are presented in Tables 1 and 2 and Table 3 contains the table nomenclature.

7 CONCLUSION

A compliance emissions evaluation program has been conducted for the American Refining Group, Inc. on their LO-CAT oxidizer exhaust located in Bradford, Pennsylvania. Test results represent data that is considered to be representative of the emission rate at the prevailing operating conditions.

To the best of ACCI's knowledge, this source test report has been checked for completeness and the results contained herein are accurate, error-free, and representative of the actual emissions measured during testing.

TABLES

Table 1. VOC Test Results, Lo-Cat Desulfurization Unit (ID:1002), V-204 Vessel Outlet
American Refining Group, Inc., Bradford, Pennsylvania

Test Data		Run 1	Run 2	Run 3	Average
Date		12/08/10	12/08/10	12/08/10	
Start Time		7:57 AM	9:27 AM	10:57 AM	
End Time		8:57 AM	10:27 AM	11:57 AM	
Flow Rate	(ACFM)	386	561	572	506
Flow Rate	(SCFM)	333	484	493	437
Flow Rate	(DSCFM)	290	420	426	379
Flow Rate	(DSCM/min)	8	12	12	11
Sample Volume	(DSCF)	22.25	21.93	22.15	22.11
Sample Volume	(DSCM)	0.63	0.62	0.63	0.63
Carbon Dioxide (CO_2)	(dry volume %)	0.10	0.09	0.16	0.12
Oxygen (O_2)	(dry volume %)	20.25	20.02	20.09	20.12
Water Vapor (H_2O)	(volume %)	13.06	13.15	13.51	13.24
Stack Temperature	(°F)	122.8	123.0	124.0	123.3
Results					
Total Gaseous Non-Methane Organic (TGNMO) by M25					
TGNMO Conc. as Carbon	(ppm_{dv})	2361	2277	2281	2306.3
TGNMO Conc. as Propane	(ppm_{dv})	787.0	759.0	760.3	768.8
Non-Methane, Non-Ethane Volatile Organic Compounds (NMEVOC)					
Ethane Concentration	(ppm_{dv})	304.9	301.2	208.4	271.5
Ethane as Propane	(ppm_{dv})	203.3	200.8	138.9	181.0
NMEVOC Concentration as Propane	(ppm_{dv})	583.7	558.2	621.4	587.8
NMEVOC Emission Rate as Propane	(lb/hr)	1.16	1.61	1.82	1.53

Table 2. H_2S Test Results, Lo-Cat Desulfurization Unit (ID:1002), V-204 Vessel Outlet
American Refining Group, Inc., Bradford, Pennsylvania

Test Data		Run 1	Run 2	Run 3	Average
Date		12/08/10	12/08/10	12/08/10	
Start Time		12:46 PM	1:53 PM	3:00 PM	
End Time		1:46 PM	2:53 PM	4:00 PM	
Flow Rate	(ACFM)	567	563	588	573
Flow Rate	(SCFM)	489	486	507	494
Flow Rate	(DSCFM)	425	422	441	429
Flow Rate	(DSCM/min)	12	12	12	12
Sample Volume	(DSCF)	22.43	22.23	22.55	22.41
Sample Volume	(DSCM)	0.64	0.63	0.64	0.63
Carbon Dioxide (CO_2)	(dry volume %)	0.10	0.10	0.10	0.10
Oxygen (O_2)	(dry volume %)	20.70	20.70	20.70	20.70
Water Vapor (H_2O)	(volume %)	13.15%	13.15%	13.15%	13.15%
Stack Temperature	(°F)	123.0	123.0	123.0	123.0
Results					
Hydrogen Sulfide					
Concentration	(ppm_{dv})	2.74	11.65	0.45	4.95
Emission	(lb/hr)	0.0062	0.026	0.0011	0.011

Table 3.

TABLE NOMENCLATURE

SYMBOL		DESCRIPTION	SYMBOL		DESCRIPTION	SYMBOL		DESCRIPTION
%	-	Percent	gpm	-	Gallons per minute	OSHA	-	Occupational Safety & Health Administration
% Volume	-	Percent by volume	H_2O	-	Water	PADEP	-	PA Department of Environmental Protection
°F	-	Degrees Fahrenheit	H_2SO_4	-	Sulfuric acid	Pb	-	Lead
<	-	Less than	HAP	-	Hazardous air pollutant	PEL	-	Permissible exposure limit
>	-	Greater than	Hg	-	Mercury	PM	-	Particulate matter
AB	-	Acetone Blank	HI	-	Heat input	PM_{10}	-	Particulate matter less than 10 microns
ACFM	-	Actual cubic feet per minute	Hp	-	Horsepower	ppb	-	Parts per billion
BACT	-	Best Available Control Technology	hr	-	Hour	PPE	-	Personal protective equipment
BHP	-	Brake horsepower	IC	-	Ion chromatography	ppm	-	Parts per million
BTU	-	British thermal units	in H_2O	-	Inches of Water	ppm_{dv}	-	Parts per million, dry volume
C_3H_8	-	Propane	in Hg	-	Inches of Mercury	ppm_{wv}	-	Parts per million, wet volume
CE	-	Capture efficiency	Kg	-	Kilograms	psia	-	Pounds per square inch absolute
CEMS	-	Continuous emission monitor system	lb	-	Pound	psig	-	Pounds per square inch gauge
cf	-	Cubic foot	lb/hr	-	Pound per hour	PTI	-	Permit to Install
CFR	-	Code of Federal Regulations	lb/lb-mole	-	Pound per pound mole	PTE	-	Permanent total enclosure
CH_4	-	Methane	MACT	-	Maximum Achievable Control Technology	RA	-	Relative Accuracy
C_2H_6	-	Ethane	m^3	-	Cubic meters	RATA	-	Relative Accuracy Test Audit
Cl_2	-	Chlorine	MDL	-	Minimum detection limit	RM	-	Reference Method
CO	-	Carbon monoxide	mg	-	Milligrams	RMD	-	Relative mean difference
CO_2	-	Carbon dioxide	mg/g	-	Milligrams per gram	S	-	Sulfur
COG	-	Coke oven gas	mL	-	Milliliter	SCF	-	Standard cubic feet
DACF	-	Dry actual cubic feet	mm HG	-	Millimeters of mercury	SCFM	-	Standard cubic feet per minute
DACM	-	Dry actual cubic meters	MMBtu	-	Million British thermal units	SCM	-	Standard cubic meters
DE	-	Destruction efficiency	MNOC	-	Maximum normal operating capacity	SO_2	-	Sulfur dioxide
DSCF	-	Dry standard cubic feet	MSDS	-	Material Safety Data Sheet	STD	-	Standard
DSCFM	-	Dry standard cubic feet per minute	MW	-	Megawatts	TEQ	-	Toxicity Equivalence Quotient
FID	-	Flame Ionization Detector	N_2	-	Nitrogen	THC	-	Total hydrocarbons
ft	-	Foot	ND	-	Non-detectable	tph	-	Tons per hour
ft/sec	-	Feet per second	NDO	-	Natural draft opening	tpy	-	Tons per year
Ft^2	-	Square feet	NESHAP	-	National Emission Standard for Hazardous Air Pollutants	µg	-	Micrograms
Ft^3	-	Cubic feet	ng	-	Nanograms	USEPA	-	United States Environmental Protection Agency
ft^3/lb-mole	-	Cubic feet per pound mole	NMEVOC	-	Non-methane, non-ethane volatile organic compounds	VE	-	Visible emissions
g	-	Grams	NMVOC	-	Non-methane volatile organic compound	VOC	-	Volatile organic compound
g/mL	-	Gram per milliliter	NO_2	-	Nitrous Oxide	vol.	-	Volume
GC	-	Gas Chromatography	NO_x	-	Oxides of Nitrogen	w/o	-	With out
gr/DSCF	-	Grains per dry standard cubic feet	O_2	-	Oxygen			

APPENDIX A

Accepted PADEP Protocol and Agency Correspondence

HYDROTREATER LO-CAT DESULFURIZATION UNIT
VOC AND H2S TEST PROTOCOL
AMERICAN REFINING GROUP, INC.
BRADFORD, PENNSYLVANIA

Plan Approval No. 42-004E

September 2009

Prepared for:

American Refining Group, Inc.
77 N. Kendall Avenue
Bradford, Pennsylvania 16701

Prepared by:

Air/Compliance Consultants, Inc.
1050 William Pitt Way
Pittsburgh, Pennsylvania 15238
(412) 826-3636

PA Laboratory Registration Number: 02-742

Project Number 09-160

TEST METHOD CERTIFICATION

American Refining Group, Inc. and Air/Compliance Consultants, Inc. have conducted a review of the state and federal regulations which apply to each source at American Refining Group, Inc. in order to develop the test methods described in this protocol. We certify, to the best of our knowledge, that the test methods that have been incorporated into the attached protocol meet the testing requirements of the applicable regulations.

HYDROTREATER LO-CAT DESULFURIZATION UNIT
VOC AND H2S TEST PROTOCOL
AMERICAN REFINING GROUP, INC.
BRADFORD, PENNSYLVANIA

Plan Approval No. 42-004E

September 2009

Project No. 09-160

Eric S. White
Project Manager, QSTI
Air/Compliance Consultants, Inc.

Jason L. Goodling
Environmental Manager
American Refining Group, Inc.

TABLE OF CONTENTS

FIGURES

APPENDICES

HYDROTREATER LO-CAT DESULFURIZATION UNIT
VOC AND H2S TEST PROTOCOL
AMERICAN REFINING GROUP, INC.
BRADFORD, PENNSYLVANIA

Plan Approval No. 42-004E

1 INTRODUCTION

American Refining Group, Inc. (ARG) has contracted Air/Compliance Consultants, Inc. (ACCI) to perform an emissions evaluation of the LO-CAT oxidizer vent at their facility located in Bradford, Pennsylvania. Emission rates will be determined for volatile organic compounds (VOCs) as propane (C_3H_8) and hydrogen sulfide (H_2S). A previously approved VOC test protocol, submitted in 2008 and accepted on October 3, 2008, was referenced to complete the following protocol. This protocol represents the initial VOC and H_2S performance test for the aforementioned unit under the newly submitted Plan Approval No. 42-004E, formerly No. 42-004C. No testing was performed for the 2008 protocol.

2 COMPANY AND TESTING FIRM INFORMATION

COMPANY	TESTING FIRM
Mr. Jason Goodling American Refining Group, Inc. 77 N. Kendall Avenue Bradford, Pennsylvania 16701 (814) 368-1223 – Telephone (814) 368-1427 – Facsimile jgoodling@amref.com	Mr. Eric White Air/Compliance Consultants, Inc. 1050 William Pitt Way Pittsburgh, Pennsylvania 15238 (412) 826-3636 – Telephone (412) 826-3640 – Facsimile ewhite@air-comp.com

3 ANALYTICAL LABORATORY INFORMATION

USEPA Methods 11, 18, and 25 will be analyzed by the following laboratories:

USEPA Method 11	USEPA Method 18	USEPA Method 25
Air/Compliance Consultants, Inc. Mr. Todd Haas 1050 William Pitt Way Pittsburgh, Pennsylvania 15238 (412) 826-3636 – Telephone (412) 826-3640 – Facsimile thaas@air-comp.com PA Lab Registration #02-742	Air Quality Services Ms. Nancy Kotsko 4527 Clairton Blvd. Pittsburgh, Pennsylvania 15236 (412) 881-5630 –Telephone (412) 881-7925 –Facsimile aqs1@earthlink.net PA Lab Registration #02-711	Triangle Environmental Services Mr. Wayne Stollings 6661 S. Alston Avenue Durham, North Carolina 27713 (919) 361-2890 – Telephone (919) 361-3474 Facsimile Lab Registration # 68-3321

4 SCOPE AND OBJECTIVES

The scope of this project is to determine emissions from the Hydrotreater LO-CAT Desulfurization Unit and comply with the performance testing requirements of Plan Approval No. 42-004E. Testing and analyses will be conducted using the principles of the United States Environmental Protection Agency (USEPA) Methods 1, 2C, 3, 4, 11, 18, 25, 25A, and 205 as described in 40 Code of Federal Regulations (CFR), Part 60, Appendix A, and the methodology described in the PADEP *Source Testing Manual*. The testing is intended to comply with Pennsylvania Department of Environmental Protection's (PADEP) Plan Approval No. 42-004E Request for Testing. Pertinent pages of the Plan Approval are contained in Appendix A.

5 PROCESS DESCRIPTION

5.1 Hydrotreater Unit

The Hydrotreater unit (Source ID #S1001) serves to remove sulfur from fuels and lube oils through a reaction with hydrogen that is produced in other refinery processes (platformer catalytic reforming). Sulfur removed from the fuels and lube oils in the Hydrotreater is contained in the off gas from the Hydrotreater in the form of hydrogen sulfide (H_2S). In turn, Hydrotreater unit off gas is directed to the Desulfurization unit.

5.2 Desulfurization Unit

The Desulfurization unit reduces sulfur loading in the off gas through a series of chemical reactions; the sulfur is recovered as a solid product. Unlike a Claus unit, which has been traditionally applied at petroleum refineries, the Desulfurization unit does not produce sulfur dioxide (SO_2) as a reactant; it uses chemical reduction and chemical oxidation to recover sulfur from the gas, producing no potential hazardous by-products. The Desulfurization unit generally consists of an absorber section (ID #C1001) and an oxidizer section (ID #C1001A). In the absorber section, hydrogen atoms are liberated from sulfur as an iron chelate binds to the sulfur, thereby displacing the hydrogen. Following treatment of the Hydrotreater off gas stream in the absorber section, the resulting "sweet gas" is directed to various refinery process heaters and boilers. The iron chelate solution is regenerated in the oxidizer section as oxygen displaces sulfur bound to the chelate. The sulfur is then recovered as a solid and the regenerated iron

chelate is pumped back to the absorber in a cyclical process. All atmospheric exhaust from the Desulfurization unit will be from the oxidizer section and specifically the LO-CAT oxidizer stack (Stack ID #S1001). A simple block diagram is located in Figure 1.

6 TESTING PROCEDURES

Testing will be conducted in accordance with USEPA, Title 40, CFR, Part 60, Appendix A and the procedures described below.

6.1 Sampling and Traverse Locations

The sampling location for the collection of gas-flow data is located at the desulfurization unit oxidizer vent exhaust stack. The inside diameter of the stack, at the sampling location, is 8.0" (Figure 2). The nearest upstream disturbance from the flow sample port is approximately 56" and the nearest downstream disturbance is approximately 24". The flow and gas samples will be collected from the center of the stack as shown in Figure 2.

6.2 Gas Flow and Temperature Measurements

Gas flow measurements will be conducted using USEPA Method 2C, *Determination of Gas Velocity and Volumetric Flow Rate in Small Stacks or Ducts (Standard Pitot Tube)*. The gas flow rate and temperature for the gas streams will be measured by conducting simultaneous velocity and temperature measurements during each sampling run. Gas velocity head will be measured with a calibrated Standard Pitot tube that will be connected to a manometer. The static pressure will be measured using the same Pitot tube and manometer. A Chrome-Alumel thermocouple attached to a digital indicator will be used to measure the gas temperature at each of the traverse points.

6.3 CO_2 and O_2 Determination

The principles of USEPA Method 3A, *Gas Analysis for the Determination of Dry Molecular Weight (Instrumental Analyzer Procedure)*, will be utilized for the determination of oxygen (O_2) and carbon dioxide (CO_2) for the test program. A paramagnetic analyzer or equivalent will be used to continuously measure O_2 concentrations and a non-dispersive infrared (NDIR) analyzer or equivalent will be used to continuously measure CO_2 concentrations at each testing location.

An extractive gas-conditioning system will be used to convey the sample to the gas analyzers. Nitrogen (N) concentration will be determined by the difference.

6.4 Moisture Content Sampling

Moisture content sampling will be conducted concurrently with each sampling run using the principles presented in USEPA Method 4, *Determination of Moisture Content in Stack Gases.* Parameters to be evaluated in order to determine the gas stream moisture content will be sample gas volume, temperature, pressure and impingers, and silica gel moisture gain.

6.5 Determination of Hydrogen Sulfide Emissions

The principles of USEPA Method 11, *Determination of Hydrogen Sulfide Content of Fuel Gas Streams in Petroleum Refineries*, will be used for this test program. The sample gas will be extracted through a short Teflon probe connected to a series of six midget impingers. The first impinger will contain 15 milliliters (ml) of hydrogen peroxide. The second impinger will remain empty. The third, fourth, and fifth impingers will contain 15 ml of cadmium sulfate absorbing solution. A silica gel midget impinger will follow the impinger set. A volatile organic sampling train (VOST) type meter box will be used to control the sample flow rate and to measure the sample volume.

Three 60-minute test runs will be performed. Samples will be collected at a rate of approximately 1 liter per minute (lpm) for each testing run. At the conclusion of each test, the impinger train will be disconnected and the impinger train purged with clean ambient air for 15 minutes at a rate of 1 lpm.

6.6 Determination of VOC Emissions

USEPA Method 25A, *Determination of Total Gaseous Organic Concentration using a Flame Ionization Analyzer*, will be used to collect and analyze for total hydrocarbons (THC). Sampling will follow USEPA Guidance Document 033 for methodology and sampling system operation. See Figure 3 for Method 25A Sampling Train Schematic. The gas sample will be extracted with a heated sample line and analyzed with a JUM VOC analyzer without using a sample conditioner. This measurement provides information collectively on all hydrocarbons containing

gas constituents in terms of C_3H_8 equivalent concentrations. Three 60-minute sampling runs will be performed on the exhaust stack. Emissions will be reported in terms of propane. Sample lines will be heated to 375°±25°F. The instrument will be calibrated to 25-75% of span.

Tedlar bag samples will be taken utilizing USEPA Method 18 procedures, *Measurement of Gaseous Organic Compound Emissions by Gas Chromatography*. These bags will then be analyzed for methane/ethane hydrocarbons so emissions can be reported as non-methane/non-ethane volatile organic compounds (NMEVOC).

6.7 Determination of Total Gaseous Nonmethane Organic Emissions

If the results from Method 25A analysis are above 50 parts per million (ppm) as carbon, then the VOC emissions will be tested in accordance with USEPA Method 25, *Determination of Total Gaseous Nonmethane Organic Emissions as Carbon*. The sampling system consists of a heated probe, heated filter, condensate trap, flow control system, and sample tank (Figure 4). The sample tank will be evacuated prior to collecting samples and leak checked. An emission sample will be withdrawn from the sample port at a point centrally located within the duct, at a constant rate through a heated filter and a condensate trap, chilled with dry ice, by means of the evacuated sample tank. After the 1-hour sample run, the condensate trap will be removed from the sample train, capped, and uniquely labeled, then kept on dry ice until reaching the analytical laboratory. The sample tank will be removed from the sample train, capped, and uniquely labeled. The sample set (1 trap and 1 sample tank), information will be included on a Chain of Custody (COC) form completed for shipment to the laboratory. The total gaseous non-methane organics (TGNMOs) will be determined by independently analyzing the condensate trap and sample tank fractions and combining the analytical results. Field data related to USEPA Method 25 sampling will be recorded on field data sheets, which have been provided in Appendix C.

6.8 Verification of Gas Dilution System

USEPA Method 205, *Verification of Gas Dilution Systems for Field Instrument Calibrations*, utilizing USEPA Protocol gases and an Environics Model 4040 Computerized Gas Dilution System, may be used for several analyzer calibration values. USEPA Method 205 results and the unit calibration data will be included in the final report, if necessary.

6.9 Process Data

ARG personnel will record the absorber refinery fuel gas throughput at least every 15 minutes during each testing period for inclusion in the final report.

6.10 Calculations

Emission calculations will be completed by using a computer spreadsheet format. The results of each pertinent parameter will be detailed on a spreadsheet for each sampling run and provided in the final report. A sample calculation for one complete test run of each parameter will be included in the final report.

6.11 Calibrations

The following field equipment calibrations will be contained in the final report:

- Thermocouple,
- Dry gas meter and orifice,
- Pitot tube,
- Analyzer calibration data, and
- Calibration gas certificates and USEPA Method 205 verifications.

7 FORMULAS TO BE USED IN DATA REDUCTION

See Appendix B.

8 EXAMPLES OF FIELD DATA SHEETS

See Appendix C.

9 TESTING SCHEDULE

A tentative test date of December 9, 2009 is planned. ARG will contact the PADEP of the exact date.

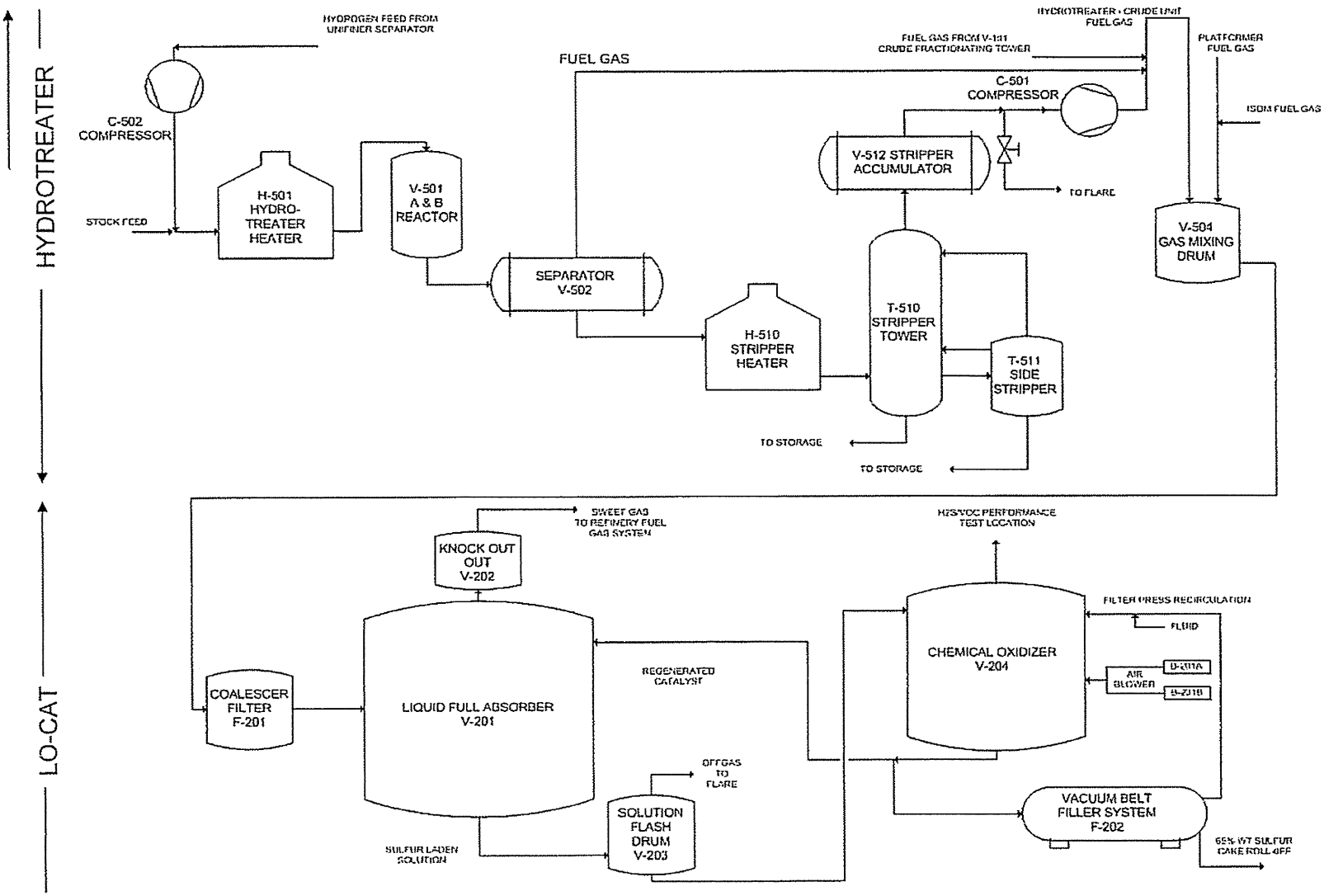
10 PLANT SAFETY

ACCI personnel will comply with all ARG safety requirements. Those requirements are hard hats, steel-toed work boots, full-length pants, shirt, and eye protection. Sampling sites may require additional items such as site specific safety training, respirators, Nomex coveralls, hearing protection, and fall protection items.

11 REPORTING

At the conclusion of the field evaluation program, a test report summarizing the findings will be prepared in accordance with USEPA and PADEP requirements. Included in the report will be a sampling procedure description, names of individuals present for the testing, and average test results for each pollutant. The report will also contain all field data sheets and supporting sample calculations. The final report will be submitted within 60 days after completion of the field-testing.

FIGURES

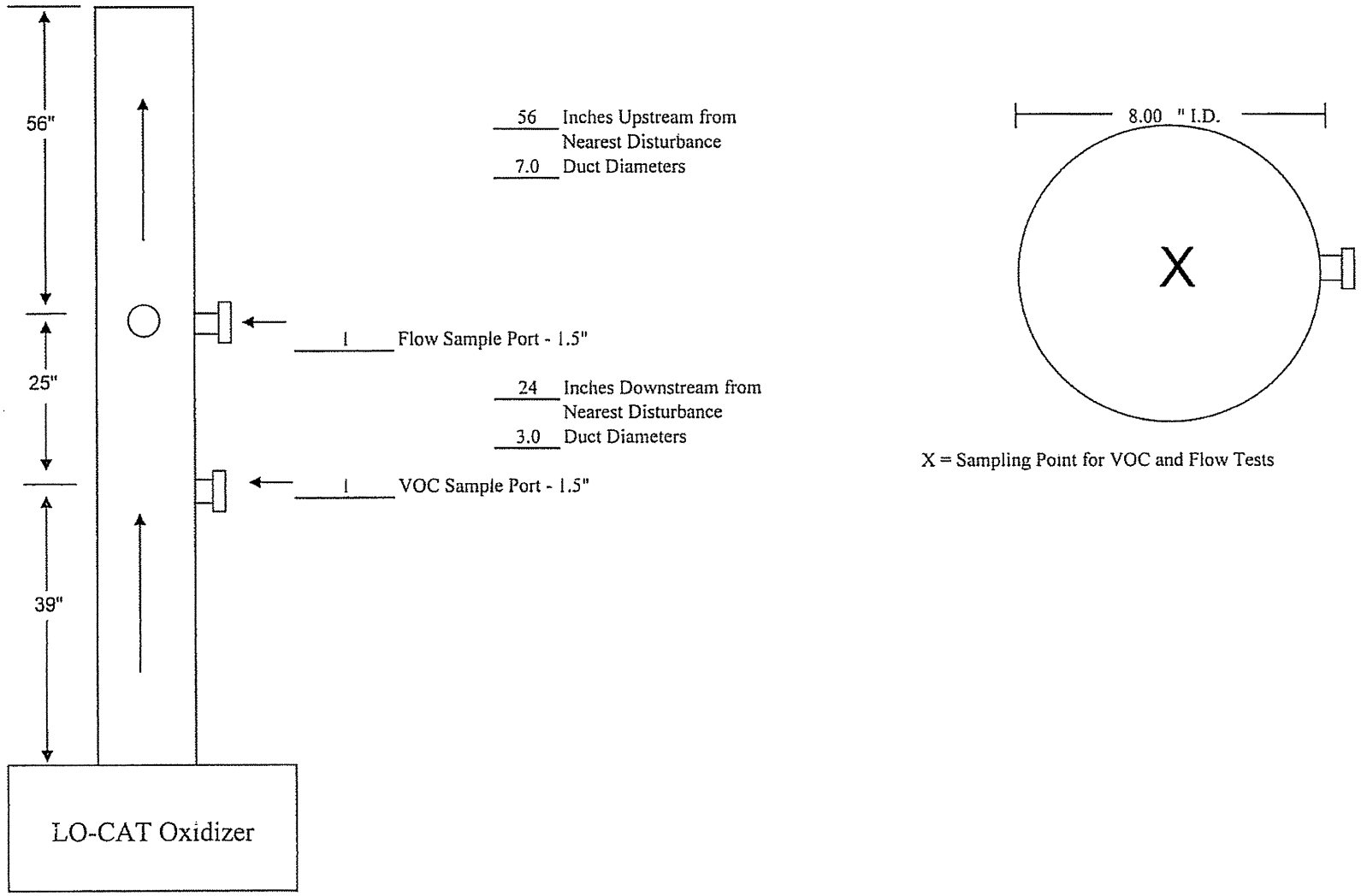


Air/Compliance Consultants, Inc.

Hydrotreater and Desulfurization Unit Sample Block Diagram
American Refining Group, Bradford, Pennsylvania

Figure 1

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 1 DATA SHEET

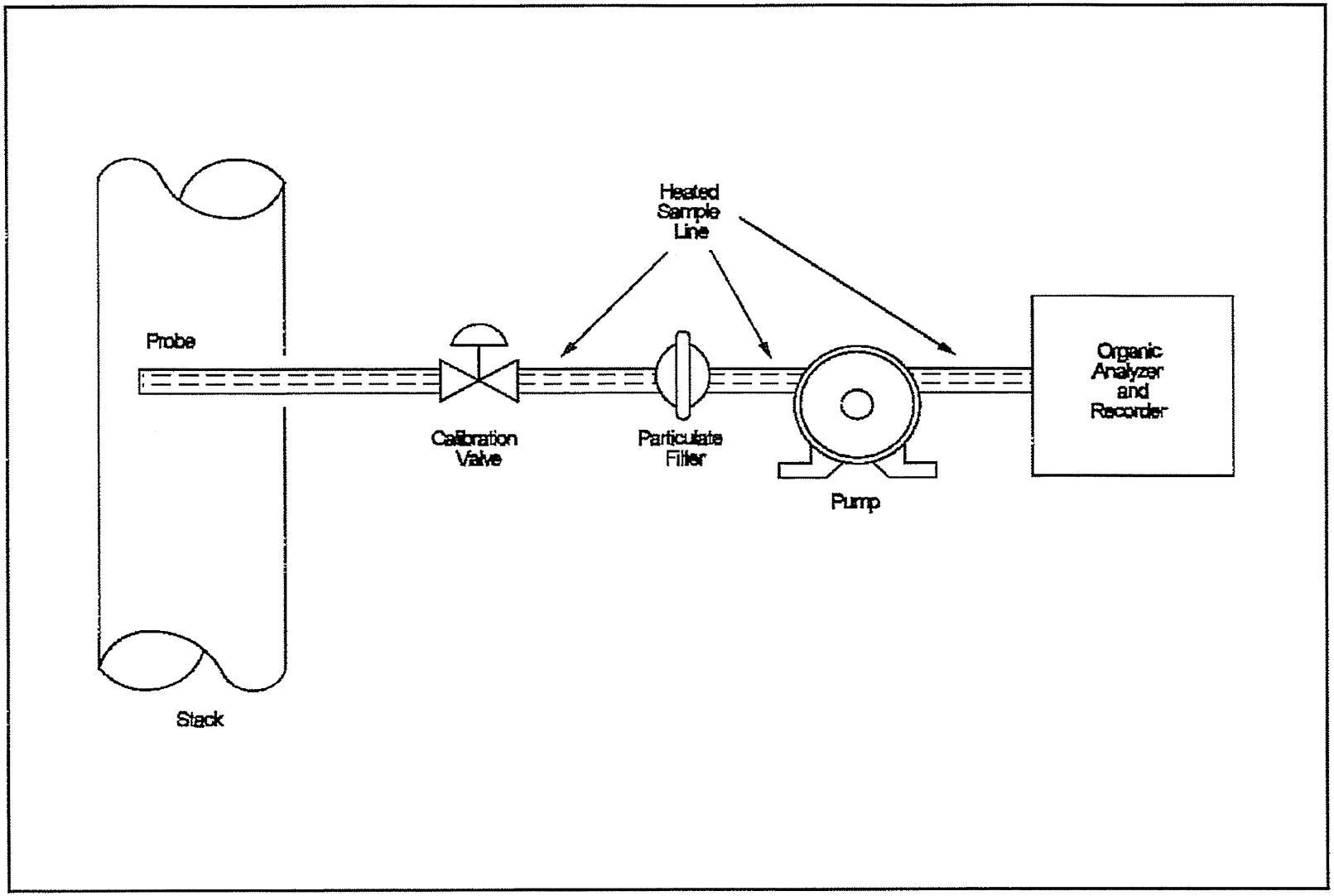


*not drawn to scale

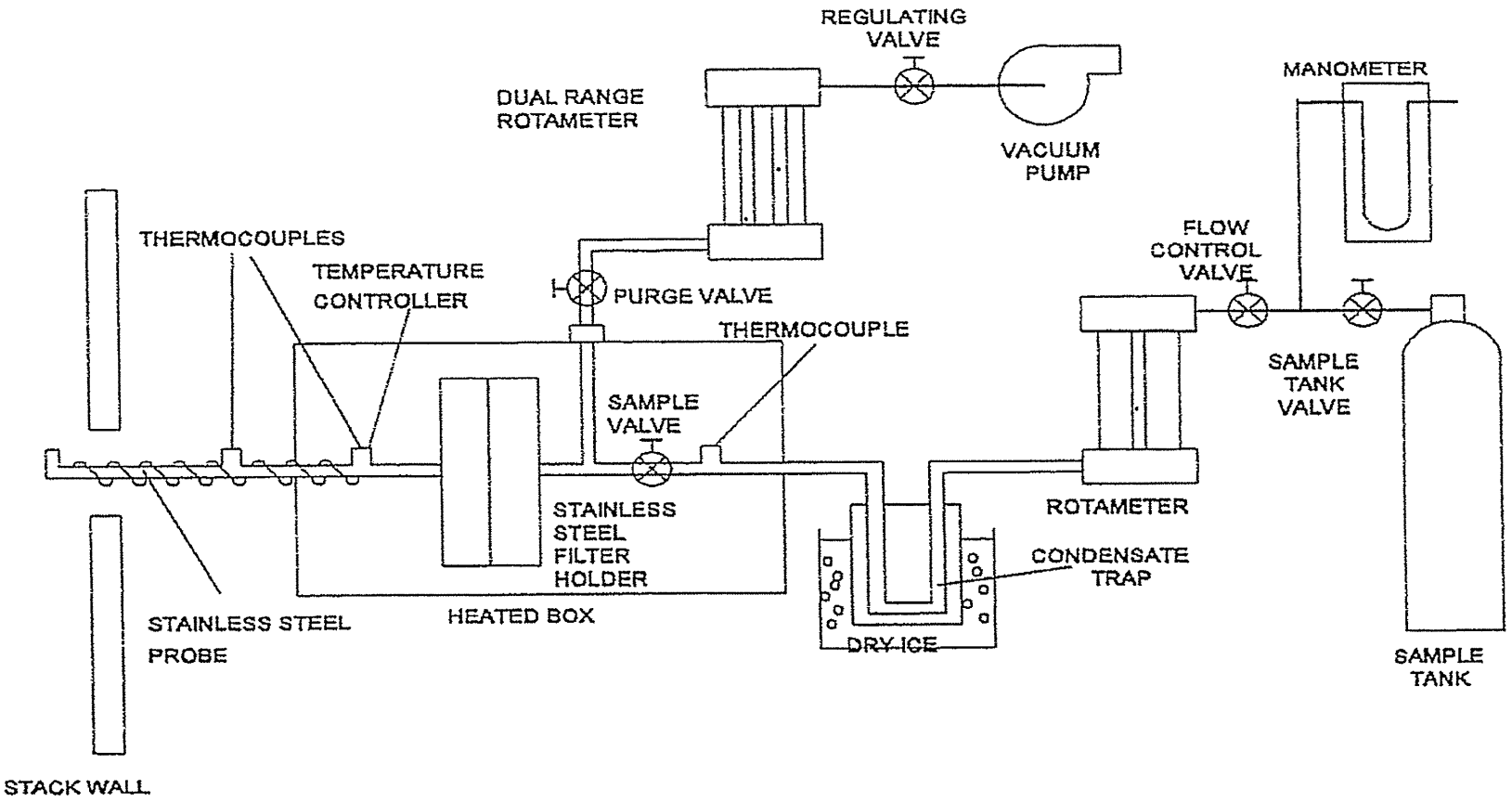
Air/Compliance Consultants, Inc.

LO-CAT Oxidizer Outlet Sample Location Schematic
American Refining Group, Inc. Bradford, Pennsylvania

Figure 2



Air/Compliance Consultants, Inc.	USEPA Method 25A Sampling Train Schematic	Figure 3



Air/Compliance Consultants, Inc.

METHOD 25 SAMPLING TRAIN SCHEMATIC	Figure 4

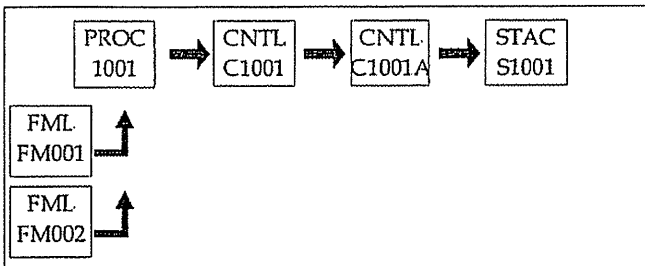
APPENDIX A

Relevant Pages of PADEP Plan Approval No. 42-004E and Agency Correspondence

SECTION D. Source Level Plan Approval Requirements

Source ID: 1001 Source Name: HYDROTREATER UNIT

Source Capacity/Throughput: 25.266 MCF/HR Refinery Gas



I. RESTRICTIONS.

Emission Restriction(s).

001 [25 Pa. Code §123.21]

General

No person may permit the emission into the outdoor atmosphere of sulfur oxides from a source in a manner that the concentration of the sulfur oxides, expressed as SO2, in the effluent gas exceeds 500 parts per million, by volume, dry basis.

002 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

(a) This source is subject to 25 Pa Code Sections 123.1, 123.31, and 123.41 for fugitive, odor, and visible emissions, respectively.

(b) No person may permit the emission into the outdoor atmosphere of particulate matter in a manner that the concentration of particulate matter in the effluent gas exceeds 0.04 grain per dry standard cubic foot.

II. TESTING REQUIREMENTS.

003 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

(a) Within 180 days of the issuance of the Plan Approval or a schedule approved by the Department, a stack test shall be performed in accordance with the provisions of Chapter 139 of the Rules and Regulations of the Department of Environmental Protection. The stack test shall be performed while the aforementioned source is operating at the maximum or normal rated capacity as stated on the application. The stack test shall be conducted for VOC and H2S at the exhaust from the LO-CAT Oxidizer (S1001).

(b) The following methods shall be used to conduct emission testing unless another method is approved by the Department.
If VOC<50 ppm C: THC M25A + M18 (methane/ethane)
If VOC >50 ppm C: NMOC M25
H2S: M11

(c) Pursuant to 25 Pa. Code 139.3, at least 45 calendar days prior to commencing an emissions testing program, a test protocol shall be submitted to the Department for review and approval. The test protocol shall meet all applicable requirements specified in the most current version of the Department's Source Testing Manual.

(d) Pursuant to 25 Pa. Code 139.3 at least 15 calendar days prior to commencing an emission testing program, notification as to the date and time of testing shall be given to the appropriate Regional Office. Notification shall also be sent to the Division of Source Testing and Monitoring. Notification shall not be made without prior receipt of a protocol acceptance letter from the Department.

(e) Pursuant to 25 Pa. Code Section 139.53(a)(3) within 15 calendar days after completion of the on-site testing portion of an emission test program, if a complete test report has not yet been submitted, an electronic mail notification shall be sent to the Department's Division of Source Testing and Monitoring indicating the completion date of the on-site testing.

SECTION D. Source Level Plan Approval Requirements

(f) Pursuant to 40 CFR Part 63.7(g) a complete test reports shall be submitted to the Department no later than 60 calendar days after completion of the on-site testing portion of an emission test program.
(g) Pursuant to 25 Pa. Code Section 139.53(b) a complete test report shall include a summary of the emission results on the first page of the report indicating if each pollutant measured is within permitted limits and a statement of compliance or non-compliance with all applicable permit conditions. The summary results will include, at a minimum, the following information:
1. A statement that the owner or operator has reviewed the report from the emissions testing body and agrees with the findings.
2. Permit number(s) and condition(s) which are the basis for the evaluation.
3. Summary of results with respect to each applicable plan approval condition.
4. Statement of compliance or non-compliance with each applicable plan approval condition.
(h) Pursuant to 25 Pa. Code § 139.3 all submittals shall meet all applicable requirements specified in the most current version of the Department's Source Testing Manual.
(i) All testing shall be performed in accordance with the provisions of Chapter 139 of the Rules and Regulations of the Department of Environmental Protection.
(j) Pursuant to 25 Pa. Code Section § 139.53(a)(1) and § 139.53(a)(3) all submittals, besides notifications, shall be accomplished through PSIMS*Online, available through https://www.depgreenport.state.pa.us/ecomm/Login.jsp, when it becomes available. If internet submittal can not be accomplished, three copies of the submittal shall be sent to the Pennsylvania Department of Environmental Protection, Bureau of Air Quality, Division of Source Testing and Monitoring, 400 Market Street, 12th Floor Rachael Carson State Office Building, Harrisburg, PA 17105-8468 with deadlines verified through document postmarks.
(k) The permittee shall insure all federal reporting requirements contained in the applicable subpart of 40 CFR are followed, including timelines more stringent than those contained herein. In the event of an inconsistency or any conflicting requirements between state and the federal, the most stringent provision, term, condition, method or rule shall be used.

III. MONITORING REQUIREMENTS.

No additional monitoring requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

IV. RECORDKEEPING REQUIREMENTS.

 # 004 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

(a) The permittee shall maintain a record of all preventative maintenance inspections of the source. These records shall, at a minimum, contain the dates of the inspections, any problems or defects, the actions taken to correct the problem or defects, and any routine maintenance performed.

(b) The permittee shall maintain a record of the following from the operational inspections:

1. The performance of an operational inspection

 # 005 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

ARG shall maintain a record of the date and time:
(a) The hydrotreater is operating
(b) The LO-CAT unit is operating.
(c) The hydrotreater is shut down
(d) The LO-CAT unit is shut down
The records shall be kept for a period of five years and made available to the Department upon request.

THIS PAGE INTENTIONALLY LEFT BLANK

Pennsylvania Department of Environmental Protection

P.O. Box 8468
Harrisburg, PA 17105-8468

October 3, 2008

Eric W
cc Jill

717-772-3938

Bureau of Air Quality

Mr. Jason L. Goodling
Environmental Manager
American Refining Group, Inc.
77 North Kendall Avenue
Bradford, PA 16701

Dear Mr. Goodling:

Re: ACCI Project 08-176

On September 25, 2008, the Department received the protocol for the baseline testing to determine the emissions of volatile organic compounds (VOC) from the Lo Cat Desulphurization Unit (ID: 1002) at American Refining Group's refinery in Bradford, McKean County. This protocol is unacceptable to the Department, unless all of the following conditions are met.

- All sample lines must be heated to 375±25°F.
- The instrument shall be calibrated such that the actual pollutant concentrations are approximately 25-75% of the span

Please notify the Regional Office and me at least ten business days prior to testing so that someone may be present to observe. Failure to do so could result in a rejection of the test results. Final acceptance of the test results is contingent upon fulfillment of all of the applicable requirements specified in Title 25, Chapter 139 of the PA Code; Plan Approval 42-00004C; and the Department's Source Testing Manual (Revision 3.3; November 2000). If there are any questions regarding this matter, please contact me at your convenience.

Sincerely,

Rick Szekeres

Rick Szekeres
Environmental Chemist
Source Testing Section
Division of Source Testing and Monitoring

APPENDIX B

Sample Calculations

ACCI SAMPLE CALCULATIONS
THC and Moisture
0
0
0
0
0%
January 0, 1900
Oxidizer Inlet and Outlet
Run 1

Vf	210.0	ml	Tstandard	68	F
Vi	200.0	ml	Pstandard	760	mm Hg
Wf	700.0	g	K1method 4	0.04706	scf/ml
Wi	650.0	g	K2method 4	0 04715	scf/g
	23.275	dacf	K1method 5	17.64	R/in. Hg
	0 000	dry actual liters	K4method 5	0 0945	
Yd	0.9960		$V/n_{standard}$	385.3	ft3/lb-mole
Pbar	28.64	in. Hg	Kp	85 49	
dHavg	1.70	in. H2O	p_s	0	0
Tm	67 0	F	π	3 141593	
O2	20.50	% dv	Ds (or L)	14.00	inches
CO2	0.00	% dv	Stack Width (W)	NA	inches
Pg	-0.34	in. H2O	Dn	NA	inches
Cp	0.84		Time	60	minutes
$(dP)^{1/2}$avg	1.000	in H2O^1/2	Tsavg	300 0	F
F_d	NA;Fd@68/760=NA	dscf/MMBtu	Product rate	NA	input ton/hr

CEMS DATA

Total Hydrocarbons

$Caverage_{THC}$	10.00	ppmwv
O_2 Correction	20 5	% dv
MW Propane	44	lb/lb-mole
MW Carbon	12	lb/lb-mole

1 Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

K1method 4=	0.04706 scf/ml
Vf=	210 0 ml
Vi=	200.0 ml
Vwc(std)=	0.471 scf

2 Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

K2method 4=	0 04715 scf/g
Wf=	700 0 g
Wi=	650 0 g
Vwsg(std)=	2.358 scf

3. Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

Vwc(std)=	0.471 scf
Vwsg(std)=	2.358 scf
Vw(std)=	2.828 scf

4 Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28 317 liters)

Volume metered in dacf=	23 275 dacf
Volume metered in dry actual liters=	0 000 dry actual liters
Vm=	23 275 dacf

$Vm(m^3)$ = Vm * (1 m^3 / 35.3145 cf)

Vm=	23.275 dacf
$Vm(m^3)$=	0.659 dacm

5. Volume of Gas Metered , dry basis. STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

K1method 5=	17.64	R/in. Hg
Vm=	23.275	dacf
Yd=	0.9960	
Pbar=	28.64	in. Hg
dHavg=	1.70	in. H2O
Tm=	67.0	F
Vm(std)=	22.320	dscf

$Vm(std)m^3$ = Vm(std) * (1 m^3 / 35.3145 cf)

Vm(std)=	22.320	dscf
$Vm(std)m^3$=	0.632	dscm

6. Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg}$ / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg}$ / Ps With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6.2 Eq. (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

Tsavg=	300.0	F
T=	759.7	R
C8=	-1.044040E+04	
C9=	-1.1294650E+01	
C10=	-2.702236E-02	
C11=	1.289036E-05	
C12=	-2.478068E-09	
C13=	6.545967E+00	
$SP_{H2O@Tsavg}$=	136.48	in. Hg
Ps=	28.62	in. Hg
Bws=	1.0000	vol. fraction

Bws = Vw(std) / (Vm(std) + Vw(std))

Vw(std)=	2.828	scf
Vm(std)=	22.320	dscf
Bws=	0.1125	vol. fraction
Bws used=	0.1125	vol. fraction

7 Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

CO2=	0.00	% dv
O2=	20.50	% dv
CO + N2=	79.50	% dv

8 Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

CO2=	0.00	% dv
O2=	20.50	% dv
CO + N2=	79.50	% dv
Md=	28.82	lb/lb-mole

9 Molecular weight of wet gas stream

Ms = Md * (1 - Bws) + 18 * Bws

Md=	28.82	lb/lb-mole
Bws=	0.1125	vol. fraction
Ms=	27.60	lb/lb-mole

10 Stack Pressure

Ps = Pbar + Pg/13 6

Pbar=	28 64	in Hg
Pg=	-0.34	in H2O
Ps=	28.62	in. Hg

11. Average Stack Gas Velocity

$Vs = Kp * Cp * (dP)^{1/2}avg * ((Tsavg + 460) / (Ps * Ms))^{1/2}$

Kp=	85.49	
Cp=	0.84	
$(dP)^{1/2}avg$=	1 0000	in. H2O^1/2
Tsavg=	300.0	F
Ps=	28.62	in. Hg
Ms=	27.60	lb/lb-mole
Vs=	70.44	ft/s

12. Area of the Stack

If W = 0, the stack is circular.

Circular

As = PI * (Ds)^2 / 4 * (1 ft / 12 in)^2

PI=	3.141593	
Ds=	14.00	inches
As=	1.07	ft2

Rectangular

As = L * W * (1 ft / 12 in.)^2

L=	0.00	inches
W= NA		inches
As=	0.00	ft2

13 Stack Gas Flow Rate, Actual

Qacfm = Vs * As * 60

Vs=	70.44	ft/s
As=	1.07	ft2
Qacfm=	4,518	acfm

$Qacm/min = Qacfm * (1\ m^3 / 35.3145\ cf)$

Qacfm=	4,518	acfm
Qacm/min=	128	acm/min

14 Stack Gas Flow Rate, Standard

Qscfm = Qacfm * ((Tstandard + 460) / (Tsavg + 460)) * (Ps / Pstandard)

Qacfm=	4.518	acfm
Tstandard=	68	F
Tsavg=	300.0	F
Ps=	28.62	in. Hg
Pstandard=	29 92	in Hg
Qscfm=	3.002	scfm

$Qscm/min = Qscfm * (1\ m^3 / 35.3145\ cf)$

Qscfm=	3,002	scfm
Qscm/min=	85.0	scm/min

15 Stack Gas Flow Rate, Dry Standard

Qdscfm = Qscfm * (1 - Bws)

Qscfm=	3,002	scfm
Bws=	0 1125	vol. fraction
Qdscfm=	2,664	dscfm

$Qdscm/min = Qdscfm * (1\ m^3 / 35.3145\ cf)$

Qdscfm=	2.664	dscfm
Qdscm/min=	75.4	dscm/min

16. Total Hydrocarbons (THC) as Propane Emission Concentration (ppmdv) (OUTLET)

THC as Propane	10.00	ppmwv
Bws	0.1125	vol. fraction
THC as Propane	11.27	ppm_{dv}

---

17. USEPA Method 18 Concentrations (OUTLET)

Methane	6.00	ppm_{dv}
Ethane	3.00	ppm_{dv}
M + E as Propane	4.00	ppm_{dv}

---

18. Non-Methane, Non-Ethane Emission Concentration (as Propane) (Outlet)

NMEVOC as C3H8 = THC (C3H8) - USEPA (M+E, as propane)

THC (as C3H8) =	11.27	ppmdv
M + E as Methane	4.00	ppm_{dv}
NMEVOC as C3H8 =	7.3	ppm_{dv}

---

19. NMEVOC Emission Rate (lb/hr), (OUTLET, as propane)

NEMEVOC(lb/hr) = NMEVOC / 1,000,000 * Qdscfm * (60 min / 1 hour) / $V/n_{standard}$ * $Carbon_{MW}$

NMEVOC (as Propane) =	7.267	ppm_{dv}
Qdscfm	2,664.4	dscfm
V/nstandard	385.3	ft3/lb-mole
MW Propane	44	lb/lb-mole
NMEVOC (lb/hr)	0.1327	lb/hr

---

20. NMEVOC Emission Rate (lb/day), (OUTLET)

NMEVOC (lb/day) = NMEVOC (lb/hr) * Operating Rate (hr/day)

NMEVOC (lb/hr)	0.1327	lb/hr
Operating Rate	1.61	hr/day
NMEVOC (lb/day)	0.214	lb/day

THIS PAGE INTENTIONALLY LEFT BLANK

ACCI SAMPLE CALCULATIONS
USEPA Method 25T HC and Moisture
Company Name
Project No.
Facility Location
Process Line
Normal
Test Date
Main Exhaust
Run 1

Vf	208 0	ml	Tstandard	68	F
Vi	200 0	ml	Pstandard	760	mm Hg
Wf	254 8	g	K1method 4	0 04707	scf/ml
Wi	248 3	g	K2method 4	0 04715	scf/g
	23 460	dacf	K1method 5	17 64	R/in. Hg
	0 000	dry actual liters	K4method 5	0 0945	
Yd	1 0010		Vmstandard	385 3	ft3/lb-mole
Pbar	29 30	in. Hg	Kp	85 49	
dHavg	1 70	in. H2O	pa	0	0
Tm	74 8	F	π	3 141593	
O2	18 00	% dv	Ds (or L)	24 00	inches
CO2	1 50	% dv	Stack Width (W)	NA	inches
Pg	-0 56	in H2O	Dn	NA	inches
Cp	0 84		Time	60	minutes
(dP)1/2avg	0 703	in. H2O^1/2	Tsavg	703 2	F
Fd	NA;Fd@68/760=NA	dscf/MMBtu	Product rate	NA	input ton/hr

1 Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

K1method 4=	0 04707	scf/g
Vf=	208 0	ml
Vi=	200 0	g
Vwc(std)=	0 377	scf

2 Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

K2method 4=	0 04715	R/in Hg
Wf=	254 8	g
Wi=	248 3	dacf
Vwsg(std)=	0 306	scf

3 Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

Vwc(std)=	0 377	scf
Vwsg(std)=	0 306	scf
Vw(std)=	0 683	scf

4 Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28 317 liters)

Volume metered in dacf=	23 460	dacf
Volume metered in dry ac	0 000	dry actual liters
Vm=	23 460	dacf

Vm(m3) = Vm * (1 m3 / 35 3145 cf)

Vm=	23 460	dacf
Vm(m3)=	0 664	dacm

5 Volume of Gas Metered , dry basis. STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13 6))) / (Tm + 460)

K1method 5=	17 64	0 00
Vm=	23 460	dscf
Yd=	1.0010	
Pbar=	29 30	in H2O
dHavg=	1 70	%dv
Tm=	74 8	F
Vm(std)=	22 794	dscf

Vm(std)m3 = Vm(std) * (1 m3 / 35 3145 cf)

Vm(std)=	22 794	dscf
Vm(std)m3=	0 645	dscm

---

6 Water Vapor in the Gas Stream

Bws used = the lower of SPH2O@Tsavg / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = SPH2O@Tsavg / Ps With a maximum allowable value of 1 0

SPH2O@Tsavg = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6 2 Eq (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29 921/14 696)

T = Tsavg + 459 67

Tsavg=	703 2	F
T=	1162 9	R
C8=	-1 044040E+04	
C9=	-1 1294650E+01	
C10=	-2 702236E-02	
C11=	1 289036E-05	
C12=	-2 478068E-09	
C13=	6 545967E+00	
SPH2O@Tsavg=	6340 59	in. Hg
Ps=	29 26	in. Hg
Bws=	1 0000	vol fraction

Bws = Vw(std) / (Vm(std) + Vw(std))

Vw(std)=	0 683	scf
Vm(std)=	22 794	dscf
Bws=	0 0291	vol fraction
Bws used=	0 0291	vol fraction

---

7 Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

CO2=	1 50	%dv
O2=	18 00	% dv
CO + N2=	80 50	% dv

---

8 Molecular weight of dry gas stream

Md = 0 44 * CO2 %dv + 0 32 * O2 %dv + 0 28 * (CO + N2 %dv)

CO2=	1 50	in. H2O
O2=	18 00	% dv
CO + N2=	80 50	% dv
Md=	28 96	lb/lb-mole

---

9 Molecular weight of wet gas stream

Ms = Md * (1 - Bws) + 18 * Bws

Md=	28 96	lb/lb-mole
Bws=	0 0291	vol fraction
Ms=	28 64	lb/lb-mole

---

10 Stack Pressure

Ps = Pbar + Pg/13 6

Pbar=	29 30	in H2O
Pg=	-0 56	in H2O
Ps=	29 26	in Hg

11 Average Stack Gas Velocity

Vs = Kp * Cp * (dP)1/2avg * ((Tsavg + 460) / (Ps * Ms))^1/2

Kp=	85 49	
Cp=	0 84	
(dP)1/2avg=	0 7033	in. H2O^1/2
Tsavg=	703 2	F
Ps=	29 26	in. Hg
Ms=	28 64	lb/lb-mole
Vs=	59 50	ft/s

12 Area of the Stack

If W = 0, the stack is circular

Circular

As = Pl * (Ds)^2 / 4 * (1 ft / 12 in.)^2

Pl=	3 141593	
Ds=	24 00	inches
As=	3 14	ft2

Rectangular

As = L * W * (1 ft / 12 in)^2

L=	0 00	inches
W= NA		inches
As=	0 00	ft2

13 Stack Gas Flow Rate, Actual

Qacfm = Vs * As * 60

Vs=	59 50	ft/s
As=	3 14	ft2
Qacfm=	11,216	acfm

Qacm/min = Qacfm * (1 m3 / 35 3145 cf)

Qacfm=	11,216	acfm
Qacm/min=	318	acm/min

14 Stack Gas Flow Rate, Standard

Qscfm = Qacfm * ((Tstandard + 460) / (Tsavg + 460)) * (Ps / Pstandard)

Qacfm=	11,216	acfm
Tstandard=	68	F
Tsavg=	703 2	F
Ps=	29 26	in Hg
Pstandard=	29 92	in Hg
Qscfm=	4,979	scfm

Qscm/min = Qscfm * (1 m3 / 35 3145 cf)

Qscfm=	4,979	scfm
Qscm/min=	141 0	scm/min

15 Stack Gas Flow Rate, Dry Standard

Qdscfm = Qscfm * (1 - Bws)

Qscfm=	4,979	scfm
Bws=	0 0291	vol fraction
Qdscfm=	4,834	dscfm

Qdscm/min = Qdscfm * (1 m3 / 35 3145 cf)

Qdscfm=	4,834	dscfm
Qdscm/min=	136 9	dscm/min

16 Total Gaseous Non-mehtane, Organic Compounds (TGNMOCs) as Carbon Emission Concentration (ppmdv) (Exhaust)

TGNMOCs as Carbon	56 00	ppmdv

17 TGNMOCs Emission Rate (lb/hr)

TGNMOCs(lb/hr) = TGNMOCs / 1,000,000 * Qdscfm * (60 min / 1 hour) / V/nstandard * CarbonMW

V/nstandard	385 3	ft3/lb-mole
MW Carbon	12	lb/lb-mole
TGNMOCs outlet	56 000	ppmdv
Qdscfm	4834 0	dscfm
TGNMOCs (lb/hr)	0 5059	lb/hr

18 Destruction Efficiency (lb/hr basis)

DE = (TGNMOCs lb/hr inlets - TGNMOCs lb/hr outlet) / TGNMOCs lb/hr inlets

TGNMOCs Hot Inlet	57 034	lb/hr
TGNMOCs Cold Inlet	11 25	lb/hr
TGNMOCs Main Ex	0 5059	lb/hr
DE	0 9926	
DE	99.26%	

This page intentionally left blank

ACCI SAMPLE CALCULATIONS
H2S

CEMS	8.48 ppm_v	n	9
Rm_{av}	8.10 ppm_v	t-value	2.306 (40 CFR 75, Appendix A, Table 7-1)
RMstd	161 ppm_v	n-1	8
d	-0.382	Mw H2S	34.07 g/g-mole

1. Standard Deviation

$Sd = [(\sum di^2-(\sum di)^2/n)/(n-1)]^{1/2}$ (40 CFR 75, Appendix A, Eq. A-8)

Run	di RM-CEMS	i^2
1	-1.66	2.75
2	-1.38	1.90
3	-0.61	0.37
4	0.22	0.05
5	0.79	0.63
6	-0.74	0.54
7	-1.23	1.52
8	1.64	2.68
9	-0.48	0.23
10	-4.21	17.69

Sum/Total of Runs Used	-3.44
*** indicates run used in calculations**	
Sum of Runs Used $\sum di^2$	10.66
Sum of Runs Used $(\sum di)^2$	11.84
Sd=	1.081

2. Confidence Coefficient (40 CFR 75, Appendix A, Eq. A-9)

$Cc = t\text{-value}*(S_d/n^{1/2})$

t-value	2.306 (40 CFR 75, Appendix A, Table 7-1)
n	9
Sd	1.081
Cc	0.830684347

3. Relative Accuracy to Reference Method (40 CFR 75, Appendix A, Eq. A-10)

$RA = [|d| + |Cc|]/RM_{av} * 100\%$

$\|d\|$	0.382343964
$\|Cc\|$	0.830684347
RM_{av}	8.10
RA	0.14979993
RA	14.98%

4. Relative Accuracy to Applicable Standard

$RA = [|d| + |Cc|]/RMstd * 100\%$

$\|d\|$	0.382343964
$\|Cc\|$	0.830684347
RMstd	161
RA	0.007534337
RA	0.75%

5. Volume Metered Standardized

$Vmstd = Vm * Yd * [(Tstd * Pbar)/(Tm * Pstd)]$

Vm	29.94 L
Yd	0.999
Tstd	293.15 °K
Pbar	732.03 mm. Hg
Tm	284.65 °K
Pstd	760 mm. Hg
Vmstd	29.67

6. H2S Concentration

$CH2S = 17040 * [((V_{IT} * N_I - V_{TT} * N_T)_{sample} - (V_{IT} * N_I - V_{TT} * N_T)_{blank})/Vmstd]$

	Sample		Blank
V_{IT}	50.00 ml	V_{IT}	50.00 ml
N_I	0.01 g-eq/liter	N_I	0.01 g-eq/liter
V_{TT}	48.62 ml	V_{TT}	49.99 ml
N_T	0.01 g-eq/liter	N_T	0.01 g-eq/liter

CH2S	7.87

$CH2S = CH2S * [24.04/34.07]$

CH2S	5.55

APPENDIX C

Example Field Data Sheets

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 2 AND METHOD 4 DATA SHEET

Client		Date	
ACCI Project #		Run #	
Plant Location		Meter Box #	
Stack ID		Yd	
Stack Diameter		Delta H	
Pitot ID		Test Crew:	
Pitot Cp		Pre-Test Leak Check	
B. P. (in Hg)		Impingers	
Ps (in. H_2O)		Pitot (+/-)	
Start Time:		Post-Test Leak Check	
Stop Time:		Impingers	
Fyrite Kit#:		Pitot (+/-)	

Stack Dia. Measured? ________

DIAGRAM

MOISTURE DATA

Clock	Elapsed	Meter Volume	Meter Temp	Delta H	Vacuum/ Pressure	Impinger Temp.
	Initial					
	5 Min					
	10 Min					
	15 Min					
	20 Min					
	25 Min					
	30 Min					
	35 Min					
	Final					

IMPINGER WEIGHTS

Impinger	Initial	Final
1		
2		
3		
4		
WET bulb		
DRY Bulb		

O_2%	CO_2%	N_2%

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp °F	Cyclonic ° from Hor.

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp °F	Cyclonic ° from Hor.

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 25A HEATING COMPONENT DATA SHEET

Client _____
Project Number _____
Plant Location _____
Sample Location _____

Start Time _____
Stop Time _____
Date _____
Run Number _____
Test Crew _____

HEATING COMPONENT	TEMP @ 15 MIN (°F)	TEMP @ 30 MIN (°F)	TEMP @ 45 MIN (°F)	TEMP @ 60 MIN (°F)

ACCI CEM Verification of Gas Dilution System for Field Instrument Calibrations Based on EMTIC TM-205

Client		Date	
Project No		Location	
Plant		Series No.	
Unit		S/N	
Operation		Last Calibration	
Tester(s)		Next Calibration	

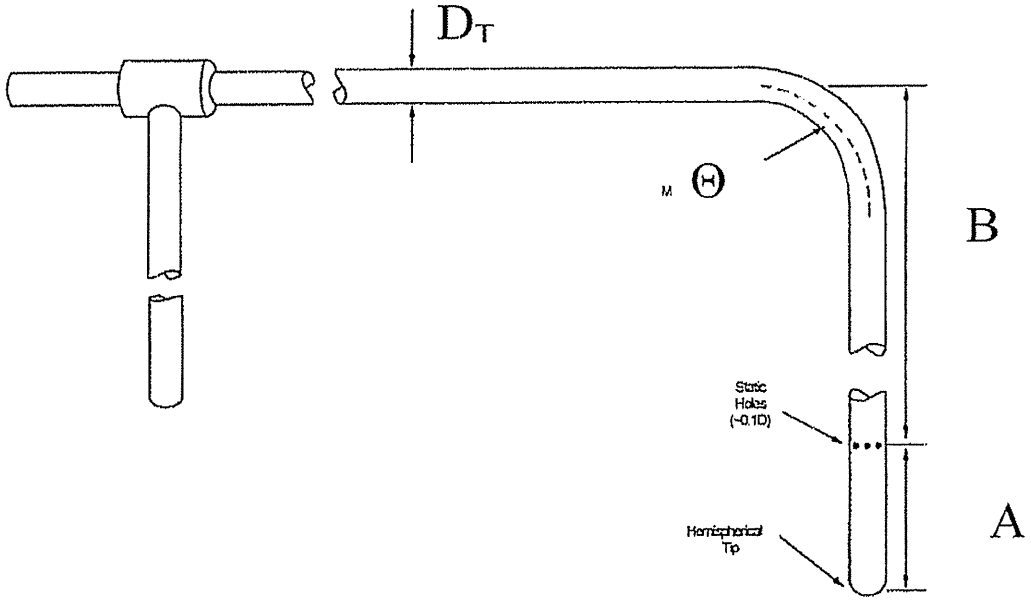
Mass Flow Controller	
Component of Protocol Calibration Gas Used	
Concentration of Protocol Gas Used	

Section 3.2.3 Prepared Dilutions	Analyzer Output	Section 3.2.4 Difference from Single Injection and the Average Instrument Response	Section 3.2.5 Difference from Average Output Concentration and the Predicted Concentration
Predicted Concentration 1			#DIV/0!
Instrument Response 1		#DIV/0!	
Instrument Response 2		#DIV/0!	
Instrument Response 3		#DIV/0!	
Average Response			
		+/- 2 % Allowable	+/- 2 % Allowable

Section 3.2.6 Mid-Level Supply Gas	Analyzer Output	Difference between Protocol Concentration and Average Instrument Response
Mid-Level Gas Concentration		#DIV/0!
Instrument Response 1		
Instrument Response 2		
Instrument Response 3		
Average Response	#DIV/0!	
		+/- 2 % Allowable

Predicted Concentration 2			#DIV/0!
Instrument Response 1		#DIV/0!	
Instrument Response 2		#DIV/0!	
Instrument Response 3		#DIV/0!	
Average Response	#DIV/0!		
		+/- 2 % Allowable	+/- 2 % Allowable

Air/Compliance Consultants, Inc. (ACCI)
Standard Pitot Tube Inspection Data Sheet



Allowable Range/Parameter	*Value*
Obstruction?	Y☐ N☐
Damaged?	Y☐ N☐
θ 90° Bend	Y☐ N☐
D_T inside diameter	"
Static Holes – 0.1 of D_T	"
Static Holes – equally spaced in a piezometer ring	Y☐ N☐
A = ≥ 6 x D_T	"
B = ≥ 8 x D_T	"

Certification:

I certify that the Standard Pitot Tube/Probe ID# _____ meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a Pitot tube calibration factor C_P of 0.99 ± 0.01.

Checked by: _____
(Signature / Date)

Air/Compliance Consultants, Inc. (ACCI)
Thermocouple Calibration Data Sheet

Probe I.D.: _____ ***Dry Gas Meter I.D.:*** _____

Standard Used: Mercury Thermometer ***Temperature Scale:*** °F

Converted to: °R (Equation= 460 + °F result)

Post Test

Temperature Range	Reference Thermometer (°R)	Probe Thermometer (°R)	Absolute Temperature Difference
Ice Bath			
Room Temp.			
Hot Bath			

Criteria are:
Hot Bath Value within 10% of the average stack temperature measured.
The absolute temperature Difference within 1.5% of Reference Standard used.
Section 10.3.1 of USEPA Method 2

Checked by: _____
(Signature / Date)

Client		Date	Run #
ACCI Project #			
Plant Location			
Stack ID			
Pre-Test Leak Check		Post-Test Leak Check	
Barometric Pressure (in. Hg)			
Start Time:		Stop Time:	
Test Crew			
Meter Box ID	_____	Y_d _____	$\Delta H_@$ _____
Meter Volume	Initial	Final	
Dry Gas Meter Temp	Initial	Final	
Delta H/Vacuum	Initial	Final	

ANALYSIS

		Sample		Blank	
Sample					
Volume of I_2 Solution Used(V_{IT})		_____	ml	_____	ml
Normality of I_2 Solution (N_I)		_____	g-eq/liter	_____	g-eq/liter
Volume of $Na_2S_2O_3$ Solution (V_{TT})					
	Initial Vol	_____	ml	_____	ml
	Final Vol	_____	ml	_____	ml
	Amount Used	_____	ml	_____	ml
Normality of $Na_2S_2O_3$ Solution (N_T)		_____	g-eq/liter	_____	g-eq/liter

METER VOLUME (STANDARD)

$$V_{M(std)} = \quad VmYd \quad \frac{T_{std}\, P_{bar}}{T_m\, P_{std}}$$

$T_{std} = 70\ °F = 573.15\ K$

$P_{std} = 760\ mmHg$

H2S CONCENTRATION

$$C_{H2S} = \quad 17.04 \times 10^3 \frac{(V_{IT}\, N_I - V_{TT}\, N_T)_{sample} - (V_{IT}\, N_I - V_{TT}\, N_T)_{blank}}{V_{m(std)}}$$

$$C_{H2S} = \quad C_{H2S} \quad * \quad \frac{24.45}{34.07}$$

Air/Compliance Consultants, Inc.

US EPA Method 25 VOC Canister Leak Check Form

Facility: _____ Project No: _____ Date: _____

City/State: _____ Run No.: _____

Sample Location: _____ Operator: _____

Pressure/Temp: _____ Pressure/Temp: _____

Date/Time	Tank No.	Vacuum	Date/Time	Tank No.	Vacuum

Air/Compliance Consultants, Inc.

US EPA Method 25 VOC Sample Record Form

Facility: _____ Project No: _____ Date: _____

City/State: _____ Run No.: _____

Sample Location: _____ Operator: _____

Tank No: _____ Trap No: _____ Sample ID: _____

Tank Vacuum mmHG cmHG	Barometric Pressure mm HG	Ambient Temperature °F
Pretest (Manometer) _____		
Post-test (Manometer) _____		

Leak Rate: _____ mmHG/1.0 min.

Pretest: _____

$P = 0.01(FP_b/V_t)$

P = Allowable pressure change, cm Hg.

P_b = Barometric pressure, cm Hg.

F = Sampling flow rate, cc/min

V_t = Sample train volume, cc

Time	Vacuum	Flowmeter Settings	Probe	Filter	Comments

Analysis Request / Chain of Custody Form

Air/Compliance Consultants, Inc.
www.air-comp.com
1050 William Pitt Way
Pittsburgh, PA 15238
Phone: 412-826-3636
Fax: 412-826-3640

Please Print Neatly

Page ____ of ____

(1) Client Name

Project Location | Project No.

Project Manager (PM)

PM Email

Laboratory | PO #

Lab Contact / Phone #

Sample Identification (2)	Date Collected	Time Collected	(3) Grab	(3) Composite	Matrix (4): ☐ Source ☐ Ambient / Air	☐ IH	Total # of Containers	Canisters*	Analysis Requested (5)	(6) Remarks	Temperature of samples upon receipt (if requested)

(7) **Turnaround Time Requested** (TAT)

(please circle): Normal Rush

Date results are needed: _____

If rush results requested please fax to:

Fax #: _____

(8) **Notes:**

Please call (412) 826-3636 if there are any questions prior to proceeding. Please cc slindquist@air-comp.com with all laboratory results

(11) **Project Manager Approval (Print & Sign)**

PM Sign: _____

PM Print: _____

COC completed by (initial): _____ Date _____

(9)

Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

(10) *Canister Pressure / Vacuum

Initial	Final	Units	Receipt

Instructions on reverse side correspond with circled numbers

WHITE - FILE • YELLOW - PM • PINK - LAB

№ 1500

This page intentionally left blank

Pennsylvania Department of Environmental Protection

P.O. Box 8468
Harrisburg, PA 17105-8468

October 26, 2009

Eric
cc: Jill

717-772-3938

Bureau of Air Quality

Mr. Jason L. Goodling
Environmental Manager
American Refining Group, Inc.
77 North Kendall Avenue
Bradford, PA 16701

Dear Mr. Goodling:

Re: ACCI Project 09-160

On October 20, 2009, the Department received the protocol for the baseline testing to determine the emissions of hydrogen sulfide (H_2S) and volatile organic compounds (VOC) from the absorber (ID: C1001) and oxidizer (ID: C1001A) sections of the Lo Cat Desulfurization Unit, used to control the sulfur emissions from the Hydrotreater Unit (ID: 1001) at American Refining Group's refinery in Bradford, McKean County. This protocol is acceptable to the Department.

Final acceptance of the test results is contingent upon fulfillment of all of the applicable requirements specified in Title 25, Chapter 139 of the PA Code; Plan Approval 42-00004E; and the Department's Source Testing Manual (Revision 3.3; November 2000). If there are any questions regarding this matter, please contact me at your convenience.

Sincerely,

Rick Szekeres

Rick Szekeres
Environmental Chemist
Source Testing Section
Division of Source Testing and Monitoring

This page intentionally left blank

Eric White

From: Szekeres, Richard [riszekeres@state.pa.us]
Sent: Friday, November 12, 2010 10:31 AM
To: Eric White
Cc: Bill Stanziana; Jason Goodling; Jill Merrill; Rob Frey
Subject: RE: ARG LO-CAT Desulfurization Unit Baseline testing
Importance: High

All proposed changes are acceptable.

Rick Szekeres, M.S. | Source Testing Section
Department of Environmental Protection
Rachel Carson State Office Building
400 Market Street | Harrisburg, PA 17101
Phone: 717.772.3938 | Fax: 717.772.2303
www.depweb.state.pa.us

-----Original Message-----
From: Eric White [mailto:EWhite@air-comp.com]
Sent: Thursday, November 11, 2010 10:49 AM
To: Szekeres, Richard
Cc: Bill Stanziana; Jason Goodling; Jill Merrill; Rob Frey
Subject: ARG LO-CAT Desulfurization Unit Baseline testing

Rick,
We have set a tentative date for the American Refining Group's, LO-CAT testing. Mr. Jason Goodling will confirm the following through formal notification; testing will commence on December 8th for THC's (M25; M18) and possibly Hydrogen Sulfide (H2S; M-11) testing. The 9th would be utilized as a contingency day to complete the H2S testing.

I reviewed the September 2009 protocol that was accepted on October 26, 2009.
The only slight deviations from the protocol will be:

- The use of an "S" type pitot instead of the proposed standard pitot. This is due to the port length on the unit and the inability to insert said pitot tube. This was per a previous discussion between you and I.
- We proposed to perform M25A analysis to determine whether M25A or M25 would be used. Previous data showed levels above the 50ppm as carbon; M25 specifications and not M25A. We will be performing the M25 only for total hydrocarbons.
- Ethane and Methane analysis would be via M18 bag sampling as stated in the protocol. No M25 separate Ethane analysis is required.
- Oxygen and Carbon Dioxide results were proposed as M3A, on site analysis. We will have the analysis run via 3C from the M25 samples or 3A from the M18 samples.

I hope to hear only good responses to this E-mail, (I will keep my fingers crossed on that one).
Feel free to contact me at any of the listings below.
Thanks,

APPENDIX B

ACCI Field Data Sheets

M25 Volatile Organic Compounds

SAMPLE DATA
Triangle Environmental Services, Inc.

Company Name: American Refining Group / LO-CAT			Date:	
Units of Measure:	Pressure: ☐ mm Hg ☑ in.Hg		Temperature: ☑ °F ☐ °C	
Sample # Run 2	Tank ID # 114		Trap ID # ALX	
Description (20 character limit)	RUN TWO ARG LOCAT			
	Barometric Pressure	Tank Vacuum	Absolute Pressure	Temperature
12-6-10 Pre-Test Data	29.08	29.00		70
12-8-10 Post-Test Data	28.50	8.00		20
Sample # Run 3	Tank ID # 251		Trap ID # AET	
Description (20 character limit)	RUN Three ARG LOCAT			
	Barometric Pressure	Tank Vacuum	Absolute Pressure	Temperature
12-6-10 Pre-Test Data	29.08	29.00		70
12-8-10 Post-Test Data	28.50	7.5		18
Sample #	Tank ID # 106		Trap ID #	
Description (20 character limit)				
	Barometric Pressure	Tank Vacuum	Absolute Pressure	Temperature
12-6-10 Pre-Test Data	29.08	29.00		70
Post-Test Data				
Sample # Run 1	Tank ID # 259		Trap ID # BRT	
Description (20 character limit)	RUN ONE ARG LOCAT			
	Barometric Pressure	Tank Vacuum	Absolute Pressure	Temperature
12-6-10 Pre-Test Data	29.08	29.00		70
12-8-10 Post-Test Data	28.52	7.56		20
Sample #	Tank ID #		Trap ID #	
Description (20 character limit)				
	Barometric Pressure	Tank Vacuum	Absolute Pressure	Temperature
Pre-Test Data				
Post-Test Data				
Sample #	Tank ID #		Trap ID #	
Description (20 character limit)				
	Barometric Pressure	Tank Vacuum	Absolute Pressure	Temperature
Pre-Test Data				
Post-Test Data				

Triangle Environmental Services, Inc.
LABORATORY SAMPLE INFORMATION AND CHAIN-OF-CUSTODY FORM

Company Name: Air Compliance Consultants, Inc.		Project/Client ID: ARG LO-CAT 09-160	Date: 12-9-10
Contact Person: Eric S. White	Phone #: 1-412-826-3636	Process Type: DeSubfurization	
Latest Date Complete Set of Samples Expected at Lab: 12-13-10	Note: Normal Turnaround is 15 working days after receipt of complete set of samples	Results Due Date: Normal Report Package Due Date: Normal	Extra charge will apply for rush results

Send Report to: (Street address required for Fed Ex shipment of report)	*Person* Eric S. White *Company* Air Compliance Consultants, Inc. *Address* 1050 William Pitt Way Pittsburgh, Pa 15238	Send Invoice to: (if different from report address)	*Person* Jen Hartman *Company* Same as Report address *Address* *PO#*
Phone # 412-826-3636	*FAX #* 412-826-3640		

✓ all applicable boxes

Analysis

US EPA: ☑ Method 25 ☐ Method 3-C ☐ Method 25-C (NMOC as C [default]) ☐ Method 10-B		SCAQMD: ☐ Method 25.1 ☐ Method 25.2	
# of Tank & Trap Samples: 6	# of Tank-Only Samples: 3	# of Trap-Only Samples: 3	# of Bag Samples: 0
☐ Audit with Delay (*extra charge*)	☐ Rush Turnaround (*extra charge*)	☑ High Concentrations Possible ☐ Call if Concentrations High	☐ Dilute High Concentrations (*extra charge*)

Special Instructions:

Tanks for Analysis (Bags) (List IDs): 114, 251, 259	Traps for Analysis (List IDs): ALX, AET, BBT

☑ TES Equipment	☐ Client Equipment	☐ Client Equipment to be Reconditioned
Tanks, Unused for Reconditioning (List IDs): 106		Traps, Unused for Reconditioning (List IDs): ATD

Relinquished by:		Date: 12-9-10	Time: 12:10	To: (Carrier) UPS			
Tanks received at TES by:	Condition:	Date:	Time:	Traps received at TES by:	Condition:	Date:	Time:

Air/Compliance Consultants, Inc.

US EPA Method 25 VOC Canister Leak Check Form

Facility: ARG | Project No: 09-160 | Date: 12-6-10

City/State: Bradford, Pa | Run No.: 24 hr leak ✓

Sample Location: LO-CAT Exhaust | Operator: EW

Pressure/Temp: 29.08 70 °F | Pressure/Temp: 28.40 24 °F

Date/Time	Tank No.	Vacuum	Date/Time	Tank No.	Vacuum
12-6-10 8:00	114	29.00	12-7-10 11:15	114	28.2
8:10	251	29.00	11:20	251	28.2
8:18	106	29.00	11:25	106	28.2
8:27	259	29.00	11:38	259	28.2

Air/Compliance Consultants, Inc.

US EPA Method 25 VOC Sample Record Form

Facility: ARG | Project No: 09-160 | Date: 12-8-10

City/State: Bradford, PA | Run No.: ~~Blank~~ ONE

Sample Location: LO-CAT Exhaust | Operator: ESW

Tank No: 257 | Trap No: BB 7 | Sample ID: ~~Blank~~ ONE

	Tank Vacuum ~~mmHG~~ ~~cmHG~~ HG"	Barometric Pressure ~~mm HG~~ HG"	Ambient Temperature °F
Pretest (Manometer)	28.00	28.52	20
Post-test (Manometer)	7.50	28.52	20

Leak Rate: mmHG/1.0 min.

Pretest: 0.0 in 10 min

10 min purge

$P = 0.01(FP_b/V_t)$

P = Allowable pressure change, cm Hg.

P_b = Barometric pressure, cm Hg.

F = Sampling flow rate, cc/min

V_t = Sample train volume, cc

Time	Vacuum	Flowmeter Settings	Probe	Filter	Comments
7:57	28.00	100	130	123	
8:02	25.00	100	129	124	
8:07	24.00	100	133	122	
8:12	23.00	100	132	132	
8:17	21.50	100	135	129	
8:22	20.00	100	133	128	
8:27	18.50	100	132	127	
8:32	17.00	100	133	126	
8:37	15.50	100	134	125	
8:42	13.00	100	134	122	
8:47	11.00	100	132	123	
8:52	9.00	100	135	123	
8:57	7.50	100	131	123	

Air/Compliance Consultants, Inc.

US EPA Method 25 VOC Sample Record Form

Facility: ARG | Project No: 09-160 | Date: 12-8-10

City/State: Bradford, PA | Run No.: Two

Sample Location: LO-CAT Exhaust | Operator: ESW

Tank No: 114 | Trap No: ALX | Sample ID: Run Two

	Tank Vacuum mmHG ~~cmHG~~ HG"	Barometric Pressure ~~mm HG~~ HG"	Ambient Temperature °F
Pretest (Manometer)	28.00	28.52	20
Post-test (Manometer)	8.00	28.50	18

Leak Rate: mmHG/1.0 min.

Pretest: 0.0 in 10 min.

10 min Range ✓

$P = 0.01(FP_b/V_t)$

P = Allowable pressure change, cm Hg.

P_b = Barometric pressure, cm Hg.

F = Sampling flow rate, cc/min

V_t = Sample train volume, cc

Time	Vacuum	Flowmeter Settings	Probe	Filter	Comments
9:27	28.00	100	130	124	
9:32	25.00	100	133	128	
9.37	23.50	100	132	129	
9.42	22.50	100	131	127	
9:47	21.50	100	132	123	
9:52	20.50	100	130	124	
9:57	19.00	100	130	122	
10 02	18.00	100	130	128	
10:07	16.50	100	131	127	
10.12	14.00	100	133	125	
10.17	12.00	100	134	122	
10:22	9.50	100	133	125	
10 27	8.00	100	135	127	

Air/Compliance Consultants, Inc.

US EPA Method 25 VOC Sample Record Form

Facility: ARG | Project No: 09-160 | Date: 12-8-10

City/State: Bradford, PA | Run No.: Three

Sample Location: LO-CAT Exhaust | Operator: ESW

Tank No: 251 | Trap No: AET | Sample ID:

	Tank Vacuum ~~mmHG~~ ~~cmHG~~ HG"	Barometric Pressure ~~mm HG~~ HG"	Ambient Temperature °F
Pretest (Manometer)	28-00	28.50	18
Post-test (Manometer)	7.5	28.50	18

Leak Rate: mmHG/1.0 min.

Pretest: 0.0 in 10 min

10 Min Purge ✓

$P = 0.01(FP_b/V_t)$

P = Allowable pressure change, cm Hg.

P_b = Barometric pressure, cm Hg.

F = Sampling flow rate, cc/min

V_t = Sample train volume, cc

Time	Vacuum	Flowmeter Settings	Probe	Filter	Comments
10:57	28-00	100	129	125	
11:02	25.00	100	130	124	
11:07	23.50	100	132	122	
11:12	22.0	100	132	132	
11:17	20.5	100	130	132	
11:22	18.5	100	131	127	
11:27	17.0	100	131	122	
11:32	16.0	100	132	124	
11:37	14.5	100	131	127	
11:42	12.5	100	131	127	
11:47	11.0	100	133	129	
11:52	9.0	100	130	130	
11:57	7.5	100	131	127	

This page intentionally left blank

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 2 AND METHOD 4 DATA SHEET

Client	ARG	Date	12/8/10
ACCI Project #	09-160	Run #	1
Plant Location	Bradford, Pa	Meter Box #	1595
Stack ID	LO-CAT Exhaust	Yd	1.007
Stack Diameter	8"	Delta H	1.760
Pitot ID	4P-1	Test Crew:	TP EW TH KK
Pitot Cp	0.84	Pre-Test Leak Check	
B. P. (in. Hg)	28.5	Impingers	0.000 @ 15"
Ps (in. H_2O)	+.16	Pitot (+/-)	✓+ ✓-
Start Time:	805	Post-Test Leak Check	
Stop Time:	835	Impingers	0.000 @ 15"
Fyrite Kit#:		Pitot (+/-)	✓+ ✓-

Stack Dia. Measured? _____

DIAGRAM

Field Balance #: _____

Reference Weight Result: _____

MOISTURE DATA

Clock	Elapsed	Meter Volume	Meter Temp		Delta H	Vacuum/ Pressure	Impinger Temp.
	Initial	290.007					
	5 Min	293.961	41	43	1.7	14	23
	10 Min	296.995	44	43	1.7	3.0	25
	15 Min	300.017	49	43	1.7	3.0	28
	20 Min	303.172	53	44	1.7	3.0	30
	25 Min	306.371	56	47	1.7	3.0	34
	30 Min	309.541	58	47	1.7	3.0	34
	35 Min	312.738	58	47	1.7	3.0	35
	Final						

IMPINGER WEIGHTS

Impinger	Initial	Final
1	100	120
2	100	108
3	0	0
4	236.7	241.2
WET bulb		
DRY Bulb		

O_2%	CO_2%	N_2%

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.
A 1	.12	123	2
2	.13	123	3
3	.12	123	2
4	.10	123	3
5	.07	122	5
6	.06	122	5
7	.07	122	0
8	.07	122	3
B 1	.08	123	0
2	.08	123	0
3	.09	123	4
4	.09	123	3
5	.09	123	0
6	.08	123	5
7	.09	123	5
8	.09	123	5

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 2 AND METHOD 4 DATA SHEET

Client	ARG	Date	12/18/10
ACCI Project #	09-160	Run #	2
Plant Location	Bradford, Pa	Meter Box #	1595
Stack ID	LO-CAT Exhaust	Yd	1.007
Stack Diameter	8"	Delta H	1.760
Pitot ID	48-1	Test Crew:	TP EW TH KK
Pitot Cp	0.84	Pre-Test Leak Check	
B. P. (in. Hg)	28.5	Impingers	0.002 @ 15"
Ps (in. H_2O)	+.15	Pitot (+/-)	√+ √-
Start Time:	930	Post-Test Leak Check	
Stop Time:	1000	Impingers	0.000 @ 11"
Fyrite Kit#:		Pitot (+/-)	√+ √-

Stack Dia. Measured? _____

DIAGRAM

Field Balance #: _____

Reference Weight Result: _____

MOISTURE DATA

Clock	Elapsed	Meter Volume	Meter Temp		Delta H	Vacuum/ Pressure	Impinger Temp.
	Initial	312.097					
	5 Min	316.760	47	48	1.7	2.0	30
	10 Min	320.371	47	48	1.7	2.0	32
	15 Min	324.151	50	47	1.7	2.0	34
	20 Min	327.891	51	47	1.7	2.0	35
	25 Min	331.454	54	48	1.7	2.0	38
	30 Min	335.050	54	48	1.7	2.0	39
	35 Min						
	Final						

IMPINGER WEIGHTS

Impinger	Initial	Final
1	100	734
2	100	101
3	0	0
4	739.9	743.2
WET bulb		
DRY Bulb		

O_2%	CO_2%	N_2%

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.
A 1	.21	123	
2	.22	123	
3	.22	123	
4	.22	123	
5	.21	123	
6	.19	123	
7	.19	123	
8	.19	123	
B 1	.18	123	
2	.18	123	
3	.17	123	
4	.17	123	
5	.17	123	
6	.16	123	
7	.16	123	
8	.15	123	

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 2 AND METHOD 4 DATA SHEET

Client	ARG	Date	12/8/10
ACCI Project #	09-160	Run #	3
Plant Location	Bradford, Pa	Meter Box #	1545
Stack ID	LO-CAT Exhaust	Yd	1.007
Stack Diameter	8"	Delta H	1.760
Pitot ID	4-1	Test Crew:	TP EW TH KK
Pitot Cp	0.84	Pre-Test Leak Check	
B. P. (in. Hg)	28.5	Impingers	0.000 @ 14"
Ps (in. H_2O)	+.15	Pitot (+/-)	√ √
Start Time:	1057	Post-Test Leak Check	
Stop Time:	1127	Impingers	0.000 @ 10"
Fyrite Kit#:		Pitot (+/-)	√ √

Stack Dia. Measured? _____

DIAGRAM

Field Balance #:_____

Reference Weight Result:_____

MOISTURE DATA

Clock	Elapsed	Meter Volume	Meter Temp		Delta H	Vacuum/ Pressure	Impinger Temp.
	Initial	335.266					
	5 Min	339.000	44	48	1.7	2.0	30
	10 Min	343.811	44	47	1.7	2.0	32
	15 Min	346.489	45	46	1.7	2.0	33
	20 Min	350.311	48	46	1.7	2.0	35
	25 Min	353.638	50	47	1.7	2.0	38
	30 Min	357.347	51	47	1.7	2.0	38
	35 Min						
	Final						

IMPINGER WEIGHTS

Impinger	Initial	Final
1	100	246
2	100	102
3	0	0
4	236.9	240.0
WET bulb		
DRY Bulb		

O_2%	CO_2%	N_2%

start: 1100 stop: 1106

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.
A 1	.19	124	
2	.20	124	
3	.21	124	
4	.22	124	
5	.22	124	
6	.22	124	
7	.21	124	
8	.19	124	
B 1	.17	124	
2	.17	124	
3	.18	124	
4	.18	124	
5	.18	124	
6	.19	124	
7	.19	124	
8	.18	124	

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.

This page intentionally left blank

Client:	ARG		Test Date:	December 8, 2010	
Project No.:	09-160		Test Location:	V-204 Vessel Outlet	
Plant:	Bradford, PA		Test Run:	Run 1	
Unit:	LO Cat Desulf		Test Start Time:	7:57 AM	
Unit Operation:	mnoc		Test Finish Time:	8:57 AM	
Blue is data input.	Red is a calculation.	Pink is a reference to a cell on another sheet.		Green is a reference to a cell on this sheet.	
Data Input			**Calculations**		
Control Box:	1595		CO + N2	79.65	% dv
Meter $DH_@$ (0.75 scfm)	1.760	in. H_2O	Water Collected (V_f - V_i)	128.0	ml
Meter Calibration Factor (Yd)	1.007		Water Vapor Condensed (Vwc(std))	6.024	scf
Barometric Pressure (Pbar)	28.50	in. Hg	Water Collected (W_f - W_i)	5.0	g
Stack Static Pressure (Pg)	0.16	in. H_2O	Water Vapor in Silica Gel (Vwsg(std))	0.236	scf
Stack Diameter (Ds) (L if rectangular)	8.0	inches	Vol. Water Vapor in Gas Stand.(Vw(std))	6.259	scf
Stack Width (enter NA if circular)	NA	inches	Volume Dry Gas Metered (Vm)	22.231	dacf
CO2	0.10	% dv	Vol. Dry Gas Metered Stand.(Vm(std))	22.249	dscf
O2	20.25	% dv	Volume Dry Gas Metered ($Vm(m^3)$)	0.630	dacm
Product Rate (enter NA if not needed)	NA	ton/hr	Vol. Dry Gas Metered Stand.($Vm(std)m^3$)	0.630	dscm
Is the input ton/hr metric? (YES=1)	0		Stack Absolute Pressure (Ps)	28.51	in. Hg
Pitot Tube Coefficient (Cp)	0.84		Stack Absolute Temperature (Tsavg)	582.4	R
Sample Calculation Title	Flow, Moisture, THC		H2O Vapor Pressure @ avg Stack Temp.	3.72	in. Hg
F_d @ 70 F and 760 mm Hg (NA if NA)	na	dscf/MMBtu	H2O in the gas at saturation (Bws)	0.1306	vol. fraction
Standard Temperature	68	F	H2O in the gas from test data (Bws)	0.2196	vol. fraction
Standard Pressure	760	mm Hg	H2O in the gas used (lower of the 2 Bws)	0.1306	vol. fraction
Pitot Tube Constant (Kp)	85.49		Is the Gas Stream Saturated With H2O?	YES	
Calculations			Dry Gas Molecular Weight (Md)	28.83	lb/lb-mole
Meter Temperature (Tm)	48.1	F	Wet Gas Molecular Weight (Ms)	27.41	lb/lb-mole
Stack Temperature (Tsavg)	122.8	F	Gas Velocity (Vs)	18.44	ft/s
Orifice Pressure Drop (dHavg)	1.700	in. H_2O	Is the stack circular or rectangular?	CIRCULAR	
GasVelocity Head $(dP)^{1/2}$avg	0.2973	in. H_2O^1/2	Area Stack (As)	0.349	ft^2
F_d @ Standard Conditions	NA	dscf/MMBtu	Actual Gas Flowrate	386	acfm
F_d @ Stan. Cond. & Actual O2	NA	dscf/MMBtu	Standard Gas Flowrate	333	scfm
Heat Input Based on F_d	NA	MMBtu/hr	Dry Standard Gas Flowrate	290	dscfm
K1method 4	0.04706	scf/ml	Actual Gas Flowrate	11	acm/min
K2method 4	0.04715	scf/g	Standard Gas Flowrate	9	scm/min
K1method 5	17.64	R/in. Hg	Dry Standard Gas Flowrate	8	dscm/min
K4method 5	0.0945		**Process Parameters**		
Standard lb-mole volume	385.3	ft^3/lb-mole	Operating Hours	50	hr/month
Volatile Organic Compounds (VOCs) as THC M 25			Operating Hours	1.67	hr/day
Use Bias Corrected? (1=YES, 0=NO)	0				
MW Propane	44	lb/lb-mole			
MW Carbon	12	lb/lb-mole			
O2 for Correction	7	vol. %			
TGNMO Concentration as Carbon	2361	$ppmd_v$			
TGNMO Concentration as Propane	787.00	$ppmd_v$			
Ethane as Propane	203.27	$ppmd_v$			
NMEVOC Conc as Propane	583.73	$ppmd_v$			
Emission Rate as Propane	1.159	lb/hr			
Non-Methane, Non-Ethane Compounds (VOC)					
TGNMO Concentration as Carbon	2361	ppm_{dv}			
Methane Concentration (M25 included)	320.00	ppmdv			
Ethane Concentration	304.90	ppmdv			
Ethane as Propane	203.27	ppmdv			
NMEVOC Concentration as Propane	583.73	ppmdv			
NMEVOC Emission Rate as Propane	1.159	lb/hr			
NME VOC Emission Rate as Propane	1.932	lb/day			

ARG **Run 1** **F or C?**

LO Cat Desulf **F=1,C=0** 1

Point	Pitot DP (dP) (in. H2O)	SQRT dP (in. H2O)$^{1/2}$	Orifice DP (dH) (in. H2O)	Stack Temp (F)	Meter Temp In/Out (F or C)	(F or C)
A-1	0.12	0.346	1.7	123	41	43
A-2	0.13	0.361	1.7	123	44	43
A-3	0.12	0.346	1.7	123	49	43
A-4	0.10	0.316	1.7	123	53	44
A-5	0.07	0.265	1.7	122	56	47
A-6	0.06	0.245	1.7	122	58	47
A-7	0.07	0.265		122	58	47
A-8	0.07	0.265		122		
B-1	0.08	0.283		123		
B-2	0.08	0.283		123		
B-3	0.09	0.300		123		
B-4	0.09	0.300		123		
B-5	0.09	0.300		123		
B-6	0.08	0.283		123		
B-7	0.09	0.300		123		
B-8	0.09	0.300		123		
Average	0.09	0.297	1.70	122.8		48.1

Initial volume	290.007	ft^3	Initial volume	0.000	liters
Final volume	312.238	ft^3	Final volume	0.000	liters
Total metered	22.231	dacf	Total metered	0.000	dry actual liters

Impinger	Final grams	Initial grams	Gram Gain	Final ml	Initial ml	ml Gain
1			0.0	220.0	100.0	120.0
2			0.0	108.0	100.0	8.0
3			0.0	0.0	0.0	0.0
4	241.2	236.2	5.0			0.0
5			0.0			0.0
6			0.0			0.0
7			0.0			0.0
8			0.0			0.0
9			0.0			0.0
10			0.0			0.0
Total	241.2	236.2	5.0	328.0	200.0	128.0
	W_f	W_i	(W_f - W_i)	V_f	V_i	(V_f - Vi)

Client:	ARG		Test Date:	December 8, 2010	
Project No.:	09-160		Test Location:	V-204 Vessel Outlet	
Plant:	Bradford, PA		Test Run:	Run 2	
Unit:	LO Cat Desulf		Test Start Time:	9:27 AM	
Unit Operation:	mnoc		Test Finish Time:	10:27 AM	
Blue is data input.	Red is a calculation.	Pink is a reference to a cell on another sheet.		Green is a reference to a cell on this sheet.	
Data Input			**Calculations**		
Control Box:	1595		CO + N2	79.89	% dv
Meter $DH_@$ (0.75 scfm)	1.76	in. H_2O	Water Collected (V_f - V_i)	141.0	ml
Meter Calibration Factor (Yd)	1.007		Water Vapor Condensed (Vwc(std))	6.635	scf
Barometric Pressure (Pbar)	28.50	in. Hg	Water Collected (W_f - W_i)	3.3	g
Stack Static Pressure (Pg)	0.15	in. H_2O	Water Vapor in Silica Gel (Vwsg(std))	0.156	scf
Stack Diameter (Ds) (L if rectangular)	8.0	inches	Vol. Water Vapor in Gas Stand.(Vw(std))	6.791	scf
Stack Width (enter NA if circular)	NA	inches	Volume Dry Gas Metered (Vm)	21.953	dacf
CO2	0.09	% dv	Vol. Dry Gas Metered Stand.(Vm(std))	21.927	dscf
O2	20.02	% dv	Volume Dry Gas Metered ($Vm(m^3)$)	0.622	dacm
Product Rate (enter NA if not needed)	NA	ton/hr	Vol. Dry Gas Metered Stand.($Vm(std)m^3$)	0.621	dscm
Is the input ton/hr metric? (YES=1)	0		Stack Absolute Pressure (Ps)	28.51	in. Hg
Pitot Tube Coefficient (Cp)	0.84		Stack Absolute Temperature (Tsavg)	582.7	R
Sample Calculation Title	Flow, Moisture, THC		H2O Vapor Pressure @ avg Stack Temp.	3.75	in. Hg
F_d @ 70 F and 760 mm Hg (NA if NA)	na	dscf/MMBtu	H2O in the gas at saturation (Bws)	0.1315	vol. fraction
Standard Temperature	68	F	H2O in the gas from test data (Bws)	0.2365	vol. fraction
Standard Pressure	760	mm Hg	H2O in the gas used (lower of the 2 Bws)	0.1315	vol. fraction
Pitot Tube Constant (Kp)	85.49		Is the Gas Stream Saturated With H2O?	YES	
Calculations			Dry Gas Molecular Weight (Md)	28.82	lb/lb-mole
Meter Temperature (Tm)	49.1	F	Wet Gas Molecular Weight (Ms)	27.39	lb/lb-mole
Stack Temperature (Tsavg)	123.0	F	Gas Velocity (Vs)	26.77	ft/s
Orifice Pressure Drop (dHavg)	1.700	in. H_2O	Is the stack circular or rectangular?	CIRCULAR	
GasVelocity Head $(dP)^{1/2}$avg	0.4315	in. H_2O^1/2	Area Stack (As)	0.349	ft^2
F_d @ Standard Conditions	NA	dscf/MMBtu	Actual Gas Flowrate	561	acfm
F_d @ Stan. Cond. & Actual O2	NA	dscf/MMBtu	Standard Gas Flowrate	484	scfm
Heat Input Based on F_d	NA	MMBtu/hr	Dry Standard Gas Flowrate	420	dscfm
K1method 4	0.04706	scf/ml	Actual Gas Flowrate	16	acm/min
K2method 4	0.04715	scf/g	Standard Gas Flowrate	14	scm/min
K1method 5	17.64	R/in. Hg	Dry Standard Gas Flowrate	12	dscm/min
K4method 5	0.0945		**Process Parameters**		
Standard lb-mole volume	385.3	ft^3/lb-mole	Operating Hours	50	hr/month
Volatile Organic Compounds (VOCs) as THC M 25			Operating Hours	1.67	hr/day
Use Bias Corrected? (1=YES, 0=NO)	0				
MW Propane	44	lb/lb-mole			
MW Carbon	12	lb/lb-mole			
O2 for Correction	7	vol. %			
TGNMO Concentration as Carbon	2277	$ppmd_c$			
TGNMO Concentration as Propane	759.00	$ppmd_c$			
Ethane as Propane	200.80	$ppmd_c$			
NMEVOC Conc as Propane	558.20	$ppmd_c$			
Emission Rate as Propane	1.607	lb/hr			
Non-Methane, Non-Ethane Compounds (VOC)					
TGNMO Concentration as Carbon	2277	ppm_{dv}			
Methane Concentration (M25 included)	312.00	ppmdv			
Ethane Concentration	301.20	ppmdv			
Ethane as Propane	200.80	ppmdv			
NMEVOC Concentration as Propane	558.20	ppmdv			
NMEVOC Emission Rate as Propane	1.607	lb/hr			
NME VOC Emission Rate as Propane	2.679	lb/day			

ARG **Run 2** **F or C?**

LO Cat Desulf **F=1,C=0** 1

Point	Pitot DP (dP) (in. H2O)	SQRT dP (in. H2O)$^{1/2}$	Orifice DP (dH) (in. H2O)	Stack Temp (F)	Meter Temp In/Out (F or C)	(F or C)
A-1	0.21	0.458	1.7	123	47	48
A-2	0.22	0.469	1.7	123	47	48
A-3	0.22	0.469	1.7	123	50	47
A-4	0.22	0.469	1.7	123	51	47
A-5	0.21	0.458	1.7	123	54	48
A-6	0.19	0.436	1.7	123	54	48
A-7	0.19	0.436		123		
A-8	0.19	0.436		123		
B-1	0.18	0.424		123		
B-2	0.18	0.424		123		
B-3	0.17	0.412		123		
B-4	0.17	0.412		123		
B-5	0.17	0.412		123		
B-6	0.16	0.400		123		
B-7	0.16	0.400		123		
B-8	0.15	0.387		123		
Average	0.19	0.432	1.70	123.0		49.1

Initial volume	313.097	ft^3	Initial volume	0.000	liters
Final volume	335.050	ft^3	Final volume	0.000	liters
Total metered	21.953	dacf	Total metered	0.000	dry actual liters

Impinger	Final grams	Initial grams	Gram Gain	Final ml	Initial ml	ml Gain
1			0.0	234.0	100.0	134.0
2			0.0	101.0	100.0	1.0
3			0.0	6.0	0.0	6.0
4	243.2	239.9	3.3			0.0
5			0.0			0.0
6			0.0			0.0
7			0.0			0.0
8			0.0			0.0
9			0.0			0.0
10			0.0			0.0
Total	243.2	239.9	3.3	341.0	200.0	141.0
	W_f	W_i	(W_f - W_i)	V_f	V_i	(V_f - Vi)

Client:	ARG		Test Date:	December 8, 2010	
Project No.:	09-160		Test Location:	V-204 Vessel Outlet	
Plant:	Bradford, PA		Test Run:	Run 3	
Unit:	LO Cat Desulf		Test Start Time:	10:57 AM	
Unit Operation:	mnoc		Test Finish Time:	11:57 AM	
Blue is data input.	Red is a calculation.	Pink is a reference to a cell on another sheet.		Green is a reference to a cell on this sheet.	
Data Input			**Calculations**		
Control Box:	1595		CO + N2	79.75	% dv
Meter $DH_@$ (0.75 scfm)	1.76	in. H_2O	Water Collected (V_f - V_i)	148.0	ml
Meter Calibration Factor (Yd)	1.007		Water Vapor Condensed (Vwc(std))	6.965	scf
Barometric Pressure (Pbar)	28.50	in. Hg	Water Collected (W_f - W_i)	3.1	g
Stack Static Pressure (Pg)	0.15	in. H_2O	Water Vapor in Silica Gel (Vwsg(std))	0.146	scf
Stack Diameter (Ds) (L if rectangular)	8.0	inches	Vol. Water Vapor in Gas Stand.(Vw(std))	7.111	scf
Stack Width (enter NA if circular)	NA	inches	Volume Dry Gas Metered (Vm)	22.081	dacf
CO2	0.16	% dv	Vol. Dry Gas Metered Stand.(Vm(std))	22.149	dscf
O2	20.09	% dv	Volume Dry Gas Metered ($Vm(m^3)$)	0.625	dacm
Product Rate (enter NA if not needed)	NA	ton/hr	Vol. Dry Gas Metered Stand.($Vm(std)m^3$)	0.627	dscm
Is the input ton/hr metric? (YES=1)	0		Stack Absolute Pressure (Ps)	28.51	in. Hg
Pitot Tube Coefficient (Cp)	0.84		Stack Absolute Temperature (Tsavg)	583.7	R
Sample Calculation Title	Flow, Moisture, THC		H2O Vapor Pressure @ avg Stack Temp.	3.85	in. Hg
F_d @70 and 760 mm Hg (NA if NA)	na	dscf/MMBtu	H2O in the gas at saturation (Bws)	0.1351	vol. fraction
Standard Temperature	68	F	H2O in the gas from test data (Bws)	0.2430	vol. fraction
Standard Pressure	760	mm Hg	H2O in the gas used (lower of the 2 Bws)	0.1351	vol. fraction
Pitot Tube Constant (Kp)	85.49		Is the Gas Stream Saturated With H2O?	YES	
Calculations			Dry Gas Molecular Weight (Md)	28.83	lb/lb-mole
Meter Temperature (Tm)	46.9	F	Wet Gas Molecular Weight (Ms)	27.37	lb/lb-mole
Stack Temperature (Tsavg)	124.0	F	Gas Velocity (Vs)	27.32	ft/s
Orifice Pressure Drop (dHavg)	1.700	in. H_2O	Is the stack circular or rectangular?	CIRCULAR	
GasVelocity Head $(dP)^{1/2}$avg	0.4398	in. H_2O^1/2	Area Stack (As)	0.349	ft^2
F_d @ Standard Conditions	NA	dscf/MMBtu	Actual Gas Flowrate	572	acfm
F_d @ Stan. Cond. & Actual O2	NA	dscf/MMBtu	Standard Gas Flowrate	493	scfm
Heat Input Based on F_d	NA	MMBtu/hr	Dry Standard Gas Flowrate	426	dscfm
K1method 4	0.04706	scf/ml	Actual Gas Flowrate	16	acm/min
K2method 4	0.04715	scf/g	Standard Gas Flowrate	14	scm/min
K1method 5	17.64	R/in. Hg	Dry Standard Gas Flowrate	12	dscm/min
K4method 5	0.0945		**Process Parameters**		
Standard lb-mole volume	385.3	ft^3/lb-mole	Operating Hours	50	hr/month
Volatile Organic Compounds (VOCs) as THC M 25			Operating Hours	1.67	hr/day
Use Bias Corrected? (1=YES, 0=NO)	0				
MW Propane	44	lb/lb-mole			
MW Carbon	12	lb/lb-mole			
O2 for Correction	7	vol. %			
TGNMO Concentration as Carbon	2281	$ppmd_v$			
TGNMO Concentration as Propane	760.33	$ppmd_v$			
Ethane as Propane	138.93	$ppmd_v$			
NMEVOC Conc as Propane	621.40	$ppmd_v$			
Emission Rate as Propane	1.815	lb/hr			
Non-Methane, Non-Ethane Compounds (VOC)					
TGNMO Concentration as Carbon	2281	ppm_{dv}			
Methane Concentration (M25 included)	321.00	ppmdv			
Ethane Concentration	208.40	ppmdv			
Ethane as Propane	138.93	ppmdv			
NMEVOC Concentration as Propane	621.40	ppmdv			
NMEVOC Emission Rate as Propane	1.815	lb/hr			
NME VOC Emission Rate as Propane	3.026	lb/day			

ARG **Run 3** **F or C?**
LO Cat Desulf **F=1,C=0** 1

Point	Pitot DP (dP) (in. H2O)	SQRT dP (in. H2O)$^{1/2}$	Orifice DP (dH) (in. H2O)	Stack Temp (F)	Meter Temp In/Out (F or C)	(F or C)
A-1	0.19	0.436	1.7	124	44	48
A-2	0.20	0.447	1.7	124	44	47
A-3	0.21	0.458	1.7	124	45	46
A-4	0.22	0.469	1.7	124	48	46
A-5	0.22	0.469	1.7	124	50	47
A-6	0.22	0.469	1.7	124	51	47
A-7	0.21	0.458		124		
A-8	0.19	0.436		124		
B-1	0.17	0.412		124		
B-2	0.17	0.412		124		
B-3	0.18	0.424		124		
B-4	0.18	0.424		124		
B-5	0.18	0.424		124		
B-6	0.19	0.436		124		
B-7	0.19	0.436		124		
B-8	0.18	0.424		124		
Average	0.19	0.440	1.70	124.0		46.9

Initial volume	335.266	ft^3	Initial volume	0.000	liters
Final volume	357.347	ft^3	Final volume	0.000	liters
Total metered	22.081	dacf	Total metered	0.000	dry actual liters

Impinger	Final grams	Initial grams	Gram Gain	Final ml	Initial ml	ml Gain
1			0.0	246.0	100.0	146.0
2			0.0	102.0	100.0	2.0
3			0.0	0.0	0.0	0.0
4	240.0	236.9	3.1			0.0
5			0.0			0.0
6			0.0			0.0
7			0.0			0.0
8			0.0			0.0
9			0.0			0.0
10			0.0			0.0
Total	240.0	236.9	3.1	348.0	200.0	148.0
	W_f	W_i	(W_f - W_i)	V_f	V_i	(V_f - Vi)

M11 Hydrogen Sulfide

Client	**ARG**	Date 12/8/10	Run # 1
ACCI Project #	**09-160**		
Plant Location	**Bradford, PA**		
Stack ID	LO-CAT Exhaust		
Pre-Test Leak Check	0.000	Post-Test Leak Check	
Barometric Pressure (in. Hg)	28.5		
Start Time:	1346	Stop Time: 1346	
Test Crew	TP EW THKK	Meter # 9002644	
Meter Box ID	HgCon-1	Y_d .9739	$\Delta H_@$ NA
Meter Volume	Initial 0	Final 59.530	
Dry Gas Meter Temp	Initial 57	Final 70	
Delta H/Vacuum	Initial 1pm 4.0	Final 1 4pm 4.0	

Probe temp: 250

ANALYSIS

		Sample		Blank	
Sample					
Volume of I_2 Solution Used(V_{IT})		50.00	ml	50.00	ml
Normality of I_2 Solution (N_I)		0.01	g-eq/liter	0.01	g-eq/liter
Volume of $Na_2S_2O_3$ Solution (V_{TT})					
	Initial Vol	0.00	ml	0.00	ml
	Final Vol	47.83	ml	49.10	ml
	Amount Used	47.83	ml	49.10	ml
Normality of $Na_2S_2O_3$ Solution (N_T)		0.01	g-eq/liter	0.01	g-eq/liter

METER VOLUME (STANDARD)

$$V_{M(std)} = \text{VmYd} \frac{T_{std} P_{bar}}{T_m P_{std}}$$

T_{std} = 70 °F = 573.15 K

P_{std} = 760 mmHg

H2S CONCENTRATION

$$C_{H2S} = 17.04 \times 10^3 \frac{(V_{IT} N_I - V_{TT} N_T)_{sample} - (V_{IT} N_I - V_{TT} N_T)_{blank}}{V_{m(std)}}$$

$$C_{H2S} = C_{H2S} * \frac{24.45}{34.07}$$

Client	**ARG**	Date	12/8/10	Run # 2
ACCI Project #	**09-160**			
Plant Location	**Bradford, PA**			
Stack ID	LO-CAT Exhaust			
Pre-Test Leak Check	0.000 @ 20"	Post-Test Leak Check	0.000 @ 10"	
Barometric Pressure (in. Hg)	28.5			
Start Time:	1353	Stop Time:	1453	
Test Crew	TP EW TM KK	Meter #	8007649	
Meter Box ID	HBCon-1	Y_d	.9739	$\Delta H_@$ NA
Meter Volume	Initial 0		Final 59.881	
Dry Gas Meter Temp	Initial 73		Final 75	
Delta H/Vacuum	Initial 1 lpm / 5.0		Final 1 lpm / 5.0	

ANALYSIS

	Sample		Blank	
Sample				
Volume of I_2 Solution Used(V_{IT})	50.00	ml	50.00	ml
Normality of I_2 Solution (N_I)	0.01	g-eq/liter	0.01	g-eq/liter
Volume of $Na_2S_2O_3$ Solution (V_{TT})				
Initial Vol	0.00	ml	0.00	ml
Final Vol	43.78	ml	49.10	ml
Amount Used	43.78	ml	49.10	ml
Normality of $Na_2S_2O_3$ Solution (N_T)	0.01	g-eq/liter	0.01	g-eq/liter

METER VOLUME (STANDARD)

$$V_{M(std)} = \text{VmYd} \frac{T_{std} P_{bar}}{T_m P_{std}}$$

T_{std} = 70 °F = 573.15 K

P_{std} = 760 mmHg

H2S CONCENTRATION

$$C_{H2S} = 17.04 \times 10^3 \frac{(V_{IT} N_I - V_{TT} N_T)_{sample} - (V_{IT} N_I - V_{TT} N_T)_{blank}}{V_{m(std)}}$$

$$C_{H2S} = C_{H2S} * \frac{24.45}{34.07}$$

Client	**ARG**	Date 12/8/10	Run # 3
ACCI Project #	**09-160**		
Plant Location	**Bradford, PA**		
Stack ID	LO-CAT Exhaust		
Pre-Test Leak Check	0.000 @ 12"	Post-Test Leak Check	0.000 @ 10"
Barometric Pressure (in. Hg)	28.5		
Start Time:	1500	Stop Time:	1600
Test Crew	TP EW TH KK	Meter #	8002649

Meter Box ID	HQ(con-1	Y_d	0.9739	$\Delta H_@$	NA
Meter Volume	Initial	0	Final	59.958	
Dry Gas Meter Temp	Initial	62	Final	64	
Delta H/Vacuum	Initial	1 LPM / 3.0	Final	1 LPM / 3.0	

ANALYSIS

		Sample		Blank	
Sample					
Volume of I_2 Solution Used(V_{IT})		50.00	ml	50.00	ml
Normality of I_2 Solution (N_I)		0.01	g-eq/liter	0.01	g-eq/liter
Volume of $Na_2S_2O_3$ Solution (V_{TT})					
	Initial Vol	0.00	ml	0.00	ml
	Final Vol	49.31	ml	49.10	ml
	Amount Used	49.31	ml	49.10	ml
Normality of $Na_2S_2O_3$ Solution (N_T)		0.01	g-eq/liter	0.01	g-eq/liter

METER VOLUME (STANDARD)

$$V_{M(std)} = VmYd \frac{T_{std} P_{bar}}{T_m P_{std}}$$

T_{std} = 70 °F = 573.15 K

P_{std} = 760 mmHg

H2S CONCENTRATION

$$C_{H2S} = 17.04 \times 10^3 \frac{(V_{IT} N_I - V_{TT} N_T)_{sample} - (V_{IT} N_I - V_{TT} N_T)_{blank}}{V_{m(std)}}$$

$$C_{H2S} = C_{H2S} * \frac{24.45}{34.07}$$

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 2 AND METHOD 4 DATA SHEET

Client	ARG	Date	12/8/10
ACCI Project #	09-160	Run #	MII Run 1
Plant Location	Bradford, Pa	Meter Box #	1595
Stack ID	LO-CAT Exhaust	Yd	1.007
Stack Diameter	8"	Delta H	1.760
Pitot ID	4'-1	Test Crew:	TP EW TH KK
Pitot Cp	0.84	Pre-Test Leak Check	
B. P. (in. Hg)	28.5	Impingers	0.0[illegible]14"
Ps (in. H_2O)	+.15	Pitot (+/-)	V+ / V-
Start Time:	1300	Post-Test Leak Check	
Stop Time:	1330	Impingers	
Fyrite Kit#:	NA	Pitot (+/-)	V+ / V-

Stack Dia. Measured? _____

DIAGRAM

Field Balance #:_____

Reference Weight Result:_____

MOISTURE DATA

Clock	Elapsed	Meter Volume	Meter Temp		Delta H	Vacuum/ Pressure	Impinger Temp.
	Initial	357.517					
	5 Min	361.302	39	42	1.7	2.0	78
	10 Min	365.085	39	41	1.7	2.0	79
	15 Min	368.555	41	41	1.7	2.0	31
	20 Min	372.347	43	41	1.7	2.0	34
	25 Min	376.090	44	41	1.7	2.0	36
	30 Min	379.644	45	41	1.7	2.0	38
	35 Min						
	Final						

IMPINGER WEIGHTS

Impinger	Initial	Final
1	100	236
2	100	104
3	0	0
4	738.3	740.5
WET bulb		
DRY Bulb		

O_2%	CO_2%	N_2%

start: 1300 stop: 1306

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.
A 1	.20	123	
2	.20	123	
3	.21	123	
4	.21	123	
5	.20	123	
6	.19	123	
7	.19	123	
8	.19	123	
B 1	.18	123	
2	.19	123	
3	.20	123	
4	.19	123	
5	.19	123	
6	.17	123	
7	.17	123	
8	.17	123	

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 2 AND METHOD 4 DATA SHEET

Client	ARG	Date	12/8/10
ACCI Project #	09-160	Run #	M11 Run2
Plant Location	Bradford, Pa	Meter Box #	1545
Stack ID	LO-CAT Exhaust	Yd	1.007
Stack Diameter	8"	Delta H	1.760
Pitot ID	41-1	Test Crew:	TP TH EW KK
Pitot Cp	0.84	Pre-Test Leak Check	
B. P. (in. Hg)	28.5	Impingers	0.000 @ 14"
Ps (in. H_2O)	+.15	Pitot (+/-)	V+ V-
Start Time:	1353	Post-Test Leak Check	
Stop Time:	1423	Impingers	0.000 @ 9"
Fyrite Kit#:	NA	Pitot (+/-)	V+ V-

Stack Dia. Measured? _____

DIAGRAM

Field Balance #:_____

Reference Weight Result:_____

MOISTURE DATA

Clock	Elapsed	Meter Volume	Meter Temp		Delta H	Vacuum/ Pressure	Impinger Temp.
	Initial	379.800					
	5 Min	383.446	41	41	1.7	2.0	30
	10 Min	387.310	43	42	1.7	2.0	31
	15 Min	390.985	46	43	1.7	2.0	36
	20 Min	394.510	48	45	1.7	2.0	38
	25 Min	398.114	49	44	1.7	2.0	40
	30 Min	401.848	48	45	1.7	2.0	39
	35 Min						
	Final						

IMPINGER WEIGHTS

Impinger	Initial	Final
1	100	225
2	100	102
3	0	0
4	224.2	228.2
WET bulb		
DRY Bulb		

O_2%	CO_2%	N_2%

start: 1357 stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.
A 1	.21	123	
2	.20	123	
3	.20	123	
4	.20	123	
5	.20	123	
6	.19	123	
7	.19	123	
8	.19	123	
B 1	.18	123	
2	.19	123	
3	.19	123	
4	.18	123	
5	.18	123	
6	.17	123	
7	.17	123	
8	.17	123	

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.

AIR/COMPLIANCE CONSULTANTS, INC.
USEPA METHOD 2 AND METHOD 4 DATA SHEET

Client	ARG	Date	12/18/10
ACCI Project #	09-160	Run #	M11 Run 3
Plant Location	Bradford, Pa	Meter Box #	1575
Stack ID	LO-CAT Exhaust	Yd	1.007
Stack Diameter	84	Delta H	1.760
Pitot ID	41-1	Test Crew:	TP EW TH KK
Pitot Cp	0.84	Pre-Test Leak Check	
B. P. (in. Hg)	28.5	Impingers	0.060 @ 15"
Ps (in. H_2O)	+.15	Pitot (+/-)	√ + √ -
Start Time:	1300	Post-Test Leak Check	
Stop Time:	1330	Impingers	0.000 @ 9"
Fyrite Kit#:	NA	Pitot (+/-)	√ + √ -

Stack Dia. Measured? _____

DIAGRAM

Field Balance #: _____

Reference Weight Result: _____

MOISTURE DATA

Clock	Elapsed	Meter Volume	Meter Temp		Delta H	Vacuum/ Pressure	Impinger Temp.
	Initial	402.067					
	5 Min	405.875	42	43	1.7	2.0	30
	10 Min	409.602	42	43	1.7	2.0	31
	15 Min	413.354	45	42	1.7	2.0	34
	20 Min	417.226	46	43	1.7	2.0	34
	25 Min	421.071	48	45	1.7	2.0	36
	30 Min	424.922	48	43	1.7	2.0	37
	35 Min						
	Final						

IMPINGER WEIGHTS

Impinger	Initial	Final
1	100	130
2	100	105
3	0	0
4	230.4	234
WET bulb		
DRY Bulb		

O_2%	CO_2%	N_2%

start: 1305 stop: 1310

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.
A1	.20	123	
2	.19	123	
3	.20	123	
4	.20	123	
5	.19	123	
6	.19	123	
7	.19	123	
8	.20	123	
B1	.21	123	
2	.22	123	
3	.22	123	
4	.22	123	
5	.22	123	
6	.21	123	
7	.21	123	
8	.21	123	

start: stop:

TRAVERSE PORT/POINT	Delta P	Stack Temp ° F	Cyclonic ° from Hor.

This page intentionally left blank

Client:	ARG		Test Date:	December 8, 2010	
Project No.:	09-160		Test Location:	V-204 Vessel Outlet	
Plant:	Bradford, PA		Test Run:	Run 1	
Unit:	LO Cat Desulf		Test Start Time:	12:46 PM	
Unit Operation:	mnoc		Test Finish Time:	1:46 PM	
Blue is data input.	Red is a calculation.	Pink is a reference to a cell on another sheet.		Green is a reference to a cell on this sheet.	
Data Input			**Calculations**		
Control Box:	1595		CO + N2	79.20	% dv
Meter $DH_@$ (0.75 scfm)	1.760	in. H_2O	Water Collected (V_f - V_i)	140.0	ml
Meter Calibration Factor (Yd)	1.007		Water Vapor Condensed (Vwc(std))	6.588	scf
Test Time (Theta)	60	minutes	Water Collected (W_f - W_i)	2.2	g
Barometric Pressure (Pbar)	28.50	in. Hg	Water Vapor in Silica Gel (Vwsg(std))	0.104	scf
Stack Static Pressure (Pg)	0.15	in. H_2O	Vol. Water Vapor in Gas Stand.(Vw(std))	6.692	scf
Stack Diameter (Ds) (L if rectangular)	8.0	inches	Volume Dry Gas Metered (Vm)	22.127	dacf
Stack Width (enter NA if circular)	NA	inches	Vol. Dry Gas Metered Stand.(Vm(std))	22.435	dscf
CO2	0.10	% dv	Volume Dry Gas Metered (Vm(m^3))	0.627	dacm
O2	20.70	% dv	Vol. Dry Gas Metered Stand.(Vm(std)m^3)	0.635	dscm
Product Rate (enter NA if not needed)	NA	ton/hr	Stack Absolute Pressure (Ps)	28.51	in. Hg
Is the input ton/hr metric? (YES=1)	0		Stack Absolute Temperature (Tsavg)	582.7	R
Pitot Tube Coefficient (Cp)	0.84		H2O Vapor Pressure @ avg Stack Temp.	3.75	in. Hg
Sample Calculation Title	Flow, Moisture, Hydrogen Sulfide		H2O in the gas at saturation (Bws)	0.1315	vol. fraction
F_d @ 70 F and 760 mm Hg (NA if NA)	na	dscf/MMBtu	H2O in the gas from test data (Bws)	0.2298	vol. fraction
Standard Temperature	68	F	H2O in the gas used (lower of the 2 Bws)	0.1315	vol. fraction
Standard Pressure	760	mm Hg	Is the Gas Stream Saturated With H2O?	YES	
Pitot Tube Constant (Kp)	85.49		Dry Gas Molecular Weight (Md)	28.84	lb/lb-mole
Calculations			Wet Gas Molecular Weight (Ms)	27.42	lb/lb-mole
Meter Temperature (Tm)	41.5	F	Gas Velocity (Vs)	27.06	ft/s
Stack Temperature (Tsavg)	123.0	F	Is the stack circular or rectangular?	CIRCULAR	
Orifice Pressure Drop (dHavg)	1.700	in. H_2O	Area Stack (As)	0.349	ft^2
GasVelocity Head $(dP)^{1/2}$avg	0.4364	in. H_2O^1/2	Actual Gas Flowrate	567	acfm
F_d @ Standard Conditions	NA	dscf/MMBtu	Standard Gas Flowrate	489	scfm
F_d @ Stan. Cond. & Actual O2	NA	dscf/MMBtu	Dry Standard Gas Flowrate	425	dscfm
Heat Input Based on F_d	NA	MMBtu/hr	Actual Gas Flowrate	16	acm/min
K1method 4	0.04706	scf/ml	Standard Gas Flowrate	14	scm/min
K2method 4	0.04715	scf/g	Dry Standard Gas Flowrate	12	dscm/min
K1method 5	17.64	R/in. Hg			
K4method 5	0.0945				
Standard lb-mole volume	385.3	ft^3/lb-mole			
Hydrogen Sulfide					
MW H2S	34.08	lb/lb-mole			
O2 for Correction	na	vol. %			
Concentration	2.74	ppm_{dv}			
Concentration	na	ppm_{dv} 7 % O2			
Concentration	na	gr/dscf			
Emission	0.0061811	lb/hr			
Emission	NA	lb/MMBtu			
Emission	NA:Not Needed	lb/ton prod.			

ARG **Run 1** **F or C?**

LO Cat Desulf **F=1,C=0** 1

Point	Pitot DP (dP) (in. H2O)	SQRT dP (in. H2O)^1/2	Orifice DP (dH) (in. H2O)	Stack Temp (F)	Meter Temp In/Out (F or C)	(F or C)
A-1	0.20	0.447	1.7	123	39	42
A-2	0.20	0.447	1.7	123	39	41
A-3	0.21	0.458	1.7	123	41	41
A-4	0.21	0.458	1.7	123	43	41
A-5	0.20	0.447	1.7	123	44	41
A-6	0.19	0.436	1.7	123	45	41
A-7	0.19	0.436	1.7	123		
A-8	0.19	0.436		123		
B-1	0.18	0.424		123		
B-2	0.19	0.436		123		
B-3	0.20	0.447		123		
B-4	0.19	0.436		123		
B-5	0.19	0.436		123		
B-6	0.17	0.412		123		
B-7	0.17	0.412		123		
B-8	0.17	0.412		123		
Average	0.19	0.436	1.70	123.0		41.5

Initial volume	357.517	ft^3	Initial volume	0.000	liters
Final volume	379.644	ft^3	Final volume	0.000	liters
Total metered	22.127	dacf	Total metered	0.000	dry actual liters

Impinger	Final grams	Initial grams	Gram Gain	Final ml	Initial ml	ml Gain
1			0.0	236.0	100.0	136.0
2			0.0	104.0	100.0	4.0
3			0.0	0.0	0.0	0.0
4	240.5	238.3	2.2			0.0
5			0.0			0.0
6			0.0			0.0
7			0.0			0.0
8			0.0			0.0
9			0.0			0.0
10			0.0			0.0
Total	240.5	238.3	2.2	340.0	200.0	140.0
	W_f	W_i	(W_f - W_i)	V_f	V_i	(V_f - Vi)

Client:	ARG		Test Date:	December 8, 2010	
Project No.:	09-160		Test Location:	V-204 Vessel Outlet	
Plant:	Bradford, PA		Test Run:	Run 2	
Unit:	LO Cat Desulf		Test Start Time:	1:53 PM	
Unit Operation:	mnoc		Test Finish Time:	2:53 PM	
Blue is data input.	Red is a calculation.	Pink is a reference to a cell on another sheet.		Green is a reference to a cell on this sheet.	
Data Input			**Calculations**		
Control Box:	1595		CO + N2	79.20	% dv
Meter $DH_@$ (0.75 scfm)	1.76	in. H_2O	Water Collected (V_f - V_i)	127.0	ml
Meter Calibration Factor (Yd)	1.007		Water Vapor Condensed (Vwc(std))	5.977	scf
Test Time (Theta)	60	minutes	Water Collected (W_f - W_i)	4.0	g
Barometric Pressure (Pbar)	28.50	in. Hg	Water Vapor in Silica Gel (Vwsg(std))	0.189	scf
Stack Static Pressure (Pg)	0.15	in. H_2O	Vol. Water Vapor in Gas Stand.(Vw(std))	6.165	scf
Stack Diameter (Ds) (L if rectangular)	8.0	inches	Volume Dry Gas Metered (Vm)	22.048	dacf
Stack Width (enter NA if circular)	NA	inches	Vol. Dry Gas Metered Stand.(Vm(std))	22.229	dscf
CO2	0.10	% dv	Volume Dry Gas Metered (Vm(m^3))	0.624	dacm
O2	20.70	% dv	Vol. Dry Gas Metered Stand.(Vm(std)m^3)	0.629	dscm
Product Rate (enter NA if not needed)	NA	ton/hr	Stack Absolute Pressure (Ps)	28.51	in. Hg
Is the input ton/hr metric? (YES=1)	0		Stack Absolute Temperature (Tsavg)	582.7	R
Pitot Tube Coefficient (Cp)	0.84		H2O Vapor Pressure @ avg Stack Temp.	3.75	in. Hg
Sample Calculation Title	Flow, Moisture, Hydrogen Sulfide		H2O in the gas at saturation (Bws)	0.1315	vol. fraction
F_d @ 70 F and 760 mm Hg (NA if NA)	na	dscf/MMBtu	H2O in the gas from test data (Bws)	0.2171	vol. fraction
Standard Temperature	68	F	H2O in the gas used (lower of the 2 Bws)	0.1315	vol. fraction
Standard Pressure	760	mm Hg	Is the Gas Stream Saturated With H2O?	YES	
Pitot Tube Constant (Kp)	85.49		Dry Gas Molecular Weight (Md)	28.84	lb/lb-mole
Calculations			Wet Gas Molecular Weight (Ms)	27.42	lb/lb-mole
Meter Temperature (Tm)	44.3	F	Gas Velocity (Vs)	26.88	ft/s
Stack Temperature (Tsavg)	123.0	F	Is the stack circular or rectangular?	CIRCULAR	
Orifice Pressure Drop (dHavg)	1.700	in. H_2O	Area Stack (As)	0.349	ft^2
GasVelocity Head $(dP)^{1/2}$avg	0.4335	in. H_2O^1/2	Actual Gas Flowrate	563	acfm
F_d @ Standard Conditions	NA	dscf/MMBtu	Standard Gas Flowrate	486	scfm
F_d @ Stan. Cond. & Actual O2	NA	dscf/MMBtu	Dry Standard Gas Flowrate	422	dscfm
Heat Input Based on F_d	NA	MMBtu/hr	Actual Gas Flowrate	16	acm/min
K1method 4	0.04706	scf/ml	Standard Gas Flowrate	14	scm/min
K2method 4	0.04715	scf/g	Dry Standard Gas Flowrate	12	dscm/min
K1method 5	17.64	R/in. Hg			
K4method 5	0.0945				
Standard lb-mole volume	385.3	ft^3/lb-mole			
Hydrogen Sulfide					
MW H2S	34.08	lb/lb-mole			
O2 for Correction	na	vol. %			
Concentration	11.65	ppm_{dv}			
Concentration	na	ppm_{dv} 7 % O2			
Concentration	na	gr/dscf			
Emission	0.0260857	lb/hr			
Emission	NA	lb/MMBtu			
Emission	NA:Not Needed	lb/ton prod.			

ARG **Run 2** **F or C?**

LO Cat Desulf **F=1,C=0** 1

Point	Pitot DP (dP) (in. H2O)	SQRT dP (in. H2O)$^{1/2}$	Orifice DP (dH) (in. H2O)	Stack Temp (F)	Meter Temp In/Out (F or C)	(F or C)
A-1	0.21	0.458	1.7	123	41	41
A-2	0.20	0.447	1.7	123	43	42
A-3	0.20	0.447	1.7	123	46	42
A-4	0.20	0.447	1.7	123	48	43
A-5	0.20	0.447	1.7	123	49	44
A-6	0.19	0.436	1.7	123	48	45
A-7	0.19	0.436	1.7	123		
A-8	0.19	0.436		123		
B-1	0.18	0.424		123		
B-2	0.19	0.436		123		
B-3	0.19	0.436		123		
B-4	0.18	0.424		123		
B-5	0.18	0.424		123		
B-6	0.17	0.412		123		
B-7	0.17	0.412		123		
B-8	0.17	0.412		123		
Average	0.19	0.434	1.70	123.0		44.3

Initial volume	379.800	ft^3	Initial volume	0.000	liters
Final volume	401.848	ft^3	Final volume	0.000	liters
Total metered	22.048	dacf	Total metered	0.000	dry actual liters

Impinger	Final grams	Initial grams	Gram Gain	Final ml	Initial ml	ml Gain
1			0.0	225.0	100.0	125.0
2			0.0	102.0	100.0	2.0
3			0.0	0.0	0.0	0.0
4	228.2	224.2	4.0			0.0
5			0.0			0.0
6			0.0			0.0
7			0.0			0.0
8			0.0			0.0
9			0.0			0.0
10			0.0			0.0
Total	228.2	224.2	4.0	327.0	200.0	127.0
	W_f	W_i	(W_f - W_i)	V_f	V_i	(V_f - Vi)

Client:	ARG		Test Date:	December 8, 2010	
Project No.:	09-160		Test Location:	V-204 Vessel Outlet	
Plant:	Bradford, PA		Test Run:	Run 3	
Unit:	LO Cat Desulf		Test Start Time:	3:00 PM	
Unit Operation:	mnoc		Test Finish Time:	4:00 PM	
Blue is data input.	Red is a calculation.	Pink is a reference to a cell on another sheet.		Green is a reference to a cell on this sheet.	
Data Input			**Calculations**		
Control Box:	1595		CO + N2	79.20	% dv
Meter $DH_@$ (0.75 scfm)	1.76	in. H_2O	Water Collected (V_f - V_i)	135.0	ml
Meter Calibration Factor (Yd)	1.007		Water Vapor Condensed (Vwc(std))	6.353	scf
Test Time (Theta)	60	minutes	Water Collected (W_f - W_i)	3.5	g
Barometric Pressure (Pbar)	28.50	in. Hg	Water Vapor in Silica Gel (Vwsg(std))	0.165	scf
Stack Static Pressure (Pg)	0.15	in. H_2O	Vol. Water Vapor in Gas Stand.(Vw(std))	6.518	scf
Stack Diameter (Ds) (L if rectangular)	8.0	inches	Volume Dry Gas Metered (Vm)	22.355	dacf
Stack Width (enter NA if circular)	NA	inches	Vol. Dry Gas Metered Stand.(Vm(std))	22.554	dscf
CO2	0.10	% dv	Volume Dry Gas Metered (Vm(m^3))	0.633	dacm
O2	20.70	% dv	Vol. Dry Gas Metered Stand.(Vm(std)m^3)	0.639	dscm
Product Rate (enter NA if not needed)	NA	ton/hr	Stack Absolute Pressure (Ps)	28.51	in. Hg
Is the input ton/hr metric? (YES=1)	0		Stack Absolute Temperature (Tsavg)	582.7	R
Pitot Tube Coefficient (Cp)	0.84		H2O Vapor Pressure @ avg Stack Temp.	3.75	in. Hg
Sample Calculation Title	Flow, Moisture, Hydrogen Sulfide		H2O in the gas at saturation (Bws)	0.1315	vol. fraction
F_d @70 and 760 mm Hg (NA if NA)	na	dscf/MMBtu	H2O in the gas from test data (Bws)	0.2242	vol. fraction
Standard Temperature	68	F	H2O in the gas used (lower of the 2 Bws)	0.1315	vol. fraction
Standard Pressure	760	mm Hg	Is the Gas Stream Saturated With H2O?	YES	
Pitot Tube Constant (Kp)	85.49		Dry Gas Molecular Weight (Md)	28.84	lb/lb-mole
Calculations			Wet Gas Molecular Weight (Ms)	27.42	lb/lb-mole
Meter Temperature (Tm)	44.0	F	Gas Velocity (Vs)	28.07	ft/s
Stack Temperature (Tsavg)	123.0	F	Is the stack circular or rectangular?	CIRCULAR	
Orifice Pressure Drop (dHavg)	1.700	in. H_2O	Area Stack (As)	0.349	ft^2
GasVelocity Head $(dP)^{1/2}$avg	0.4526	in. H_2O^1/2	Actual Gas Flowrate	588	acfm
F_d @ Standard Conditions	NA	dscf/MMBtu	Standard Gas Flowrate	507	scfm
F_d @ Stan. Cond. & Actual O2	NA	dscf/MMBtu	Dry Standard Gas Flowrate	441	dscfm
Heat Input Based on F_d	NA	MMBtu/hr	Actual Gas Flowrate	17	acm/min
K1method 4	0.04706	scf/ml	Standard Gas Flowrate	14	scm/min
K2method 4	0.04715	scf/g	Dry Standard Gas Flowrate	12	dscm/min
K1method 5	17.64	R/in. Hg			
K4method 5	0.0945				
Standard lb-mole volume	385.3	ft^3/lb-mole			
Hydrogen Sulfide					
MW H2S	34.08	lb/lb-mole			
O2 for Correction	na	vol. %			
Concentration	0.45	ppm_{dv}			
Concentration	na	ppm_{dv} 7 % O2			
Concentration	na	gr/dscf			
Emission	0.0010515	lb/hr			
Emission	NA	lb/MMBtu			
Emission	NA;Not Needed	lb/ton prod.			

ARG **Run 3** **F or C?**

LO Cat Desulf **F=1,C=0** 1

Point	Pitot DP (dP) (in. H2O)	SQRT dP $(in. H2O)^{1/2}$	Orifice DP (dH) (in. H2O)	Stack Temp (F)	Meter Temp In/Out (F or C)	(F or C)
A-1	0.20	0.447	1.7	123	42	43
A-2	0.19	0.436	1.7	123	42	43
A-3	0.20	0.447	1.7	123	45	42
A-4	0.20	0.447	1.7	123	46	43
A-5	0.19	0.436	1.7	123	48	43
A-6	0.19	0.436	1.7	123	48	43
A-7	0.19	0.436		123		
A-8	0.20	0.447		123		
B-1	0.21	0.458		123		
B-2	0.22	0.469		123		
B-3	0.22	0.469		123		
B-4	0.22	0.469		123		
B-5	0.22	0.469		123		
B-6	0.21	0.458		123		
B-7	0.21	0.458		123		
B-8	0.21	0.458		123		
Average	0.21	0.453	1.70	123.0		44.0

Initial volume	402.067	ft^3	Initial volume	0.000	liters
Final volume	424.422	ft^3	Final volume	0.000	liters
Total metered	22.355	dacf	Total metered	0.000	dry actual liters

Impinger	Final grams	Initial grams	Gram Gain	Final ml	Initial ml	ml Gain
1			0.0	230.0	100.0	130.0
2			0.0	105.0	100.0	5.0
3			0.0	0.0	0.0	0.0
4	233.9	230.4	3.5			0.0
5			0.0			0.0
6			0.0			0.0
7			0.0			0.0
8			0.0			0.0
9			0.0			0.0
10			0.0			0.0
Total	233.9	230.4	3.5	335.0	200.0	135.0
	W_f	W_i	(W_f - W_i)	V_f	V_i	(V_f - Vi)

This page intentionally left blank

USEPA Method 11 Worksheet
LoCat Outlet
12/8/2010

Run	Start Time	End Time	V_m L	Y_d	T_m °F	T_m °K	P_{bar} in. Hg	P_{bar} mm. Hg	Sample V_{IT} ml	Sample N_I g-eq/liter	Sample V_{TT} ml	Sample N_T g-eq/liter	Blank V_{IT} ml	Blank N_I g-eq/liter	Blank V_{TT} ml	Blank N_T g-eq/liter	V_{mstd}	H_2S ppm
1	12:46	13:46	59.530	0.9739	63.5	290.7	28.50	723.9	50.00	0.01	47.83	0.01	50.00	0.01	49.10	0.01	55.70	**2.74**
2	13:53	14:53	59.881	0.9739	74.0	296.5	28.50	723.9	50.00	0.01	43.78	0.01	50.00	0.01	49.10	0.01	54.92	**11.65**
3	15:00	16:00	59.958	0.9739	63.0	290.4	28.50	723.9	50.00	0.01	49.31	0.01	50.00	0.01	49.10	0.01	56.15	**0.45**

Tstd 293.15 °K 70 °F
Pstd 760 mm. Hg 29.92 in. Hg

L Liter
°F Degrees Fahrenheit
°K Degrees Kelvin
Pbar Barometric Pressure
V_{ITB} Volume Iodine Solution Intial for Blank
N_{IB} Normality of Iodine Solution Initial for Blank
V_{TTB} Volume Sodium Thiosulfate Solution used in Titration for Blank
N_{TB} Normality of Sodium Thiosulfate Solution used in Titration for Blank
V_{mstd} Volume metered corrected to Standard Conditions
V_{ITS} Volume Iodine Solution Intial for Sample
V_{TTS} Volume Sodium Thiosulfate Solution used in Titration for Sample
N_{TS} Normality of Sodium Thiosulfate Solution used in Titration for Sample

g-eq/liter Equivalent grams per liter
ppm Parts per million
Tstd Standard Temperature
Pstd Standard Pressure
in. Hg Inches of Mercury
mm. Hg Millimeters of Mercury
ml Milliliter
H_2S Hyrodgen Sulfide
V_m Volume Metered
Y_d Meter Correction Factor
T_m Meter Temperature
N_{IS} Normality of Iodine Solution Initial for Sample

APPENDIX C

Laboratory Data

M18 Ethane/Methane and O_2/CO_2

RECEIVED DEC 2 3 2010

Air Quality Services, Inc.

4527 Clairton Boulevard
Pittsburgh, PA 15236
412-881-5630
412-881-7925 FAX
aqs@comcast.net

Orig - Eric K.
cc: Rob

TABLE I
ANALYSIS OF AIR BAG SAMPLES FOR SELECTED COMPONENTS
AIR/COMPLIANCE CONSULTANTS, INC.
1050 WILLIAM PITT WAY
PITTSBURGH, PA 15238
PROJECT ID: #09-160 ARG/LO-CAT, BEDFORD, PA.
PURCHASE ORDER # NOT GIVEN
SAMPLES RECEIVED: DECEMBER 09, 2010

ACCI SAMPLE IDENTIFICATION AND SAMPLE DATE	AQS LABORATORY NUMBER	METHANE PPM	ETHANE PPM	CARBON DIOXIDE PPM	OXYGEN/ARGON PERCENT
12-08-10					
RUN ONE	AQS-99115	289.8	304.9	1039.2	20.25
RUN TWO	AQS-99116	326.7	301.2	884.1	20.02
RUN THREE	AQS-99117	188.0	208.4	1589.9	20.09

THE OXYGEN/ARGON AND CARBON DIOXIDE WERE ANALYZED BY GAS CHROMATOGRAPHY USING A THERMAL CONDUCTIVITY DETECTOR AS OUTLINED BY ASTM METHOD D-1945 AND EPA METHOD 3C. THE METHANE AND ETHANE WERE ANALYZED BY GAS CHROMATOGRAPHY USING A FLAME PHOTOMETRIC DETECTOR AS OUTLINED BY EPA METHOD 18.

Nancy M. Kalska
AIR QUALITY SERVICES, INC.

JOB 9268
REPORTED: DECEMBER 22, 2010

The presented data has been analyzed according to approved protocol and is certified to be complete and accurate.

GAS ANALYSIS BY GC USING TCD DETECTOR — EPA METHOD 3

CLIENT INFORMATION

CLIENT:	AIR COMPLIANCE CONSULTANTS	PROJECT:	ARG/LO-CAT
ADDRESS:	1050 WILLIAM PITT WAY	DATE:	DECEMBER 10, 2010
	PITTSBURGH, PA 15238	ANALYST:	M BRNA
CONTACT:	ERIC WHITE	AQS JOB #	9268

CALIBRATION DATA

REQUIRED:	OXYGEN	COLUMN:	SG/MS	
DETECTOR:	TCD	INJECTION VOLUME:	2.0	CC

CALIBRATION VALUE PERCENT	INJECT VOLUME ML	PEAK AREA COUNT	PEAK AREA COUNT	PEAK AREA COUNT	AVERAGE PEAK COUNT	STANDARD FACTOR PPM/COUNT	INDIVIDUAL AREA STD DEV	% STD DEV
20.95	2.0	3944.1600	4068.5870	4010.9740	4007.91	0.0052	50.84	1.27
4.99	2.0	954.6830	960.4470	958.8055	957.98	0.0052	2.42	0.25

CALIBRATION STATISTICAL DATA

MEAN FACTOR:	0.0052
STDDEV:	0.0000
	0.2

SAMPLE ANALYTICAL DATA

CLIENT SAMPLE ID	AQS LAB NUMBER	INJECT VOLUME ML	PEAK AREA COUNTS	PEAK AREA COUNTS	PEAK AREA COUNTS	AVERAGE PEAK COUNT	INDIVIDUAL AREA STD DEV	% STD DEV	OXYGEN PERCENT
RUN ONE	99115	2.0	3911.5000	3888.3505	3845.7510	3881.87	27.23	0.70	20.25
RUN TWO	99116	2.0	3879.8740	3884.4920	3747.8060	3837.39	63.37	1.65	20.02
RUN THREE	99117	2.0	3805.3590	3890.2860	3859.4725	3851.71	35.10	0.91	20.09

GAS ANALYSIS BY GC USING TCD DETECTOR — EPA METHOD 3

CLIENT INFORMATION

CLIENT:	AIR COMPLIANCE CONSULTANTS	PROJECT:	ARG/LO-CAT
ADDRESS:	1050 WILLIAM PITT WAY	DATE:	DECEMBER 10, 2010
	PITTSBURGH, PA 15238	ANALYST:	M BRNA
CONTACT:	ERIC WHITE	AQS JOB #	9268

CALIBRATION DATA

REQUIRED:	CARBON DIOXIDE	COLUMN:	SG/MS		
DETECTOR:	TCD	INJECTION VOLUME:	2.0	CC	

CALIBRATION VALUE PERCENT	INJECT VOLUME ML	PEAK AREA COUNT	PEAK AREA COUNT	PEAK AREA COUNT	AVERAGE PEAK COUNT	STANDARD FACTOR PPM/COUNT	INDIVIDUAL AREA STD DEV	% STD DEV
5.006	2.0	1050.2895	1127.6830	1143.0570	1107.01	0.0045	40.60	3.67
1.00	2.0	220.8235	216.9400	226.7425	221.50	0.0045	4.03	1.82
0.1038	2.0	22.3010	22.8040	22.8375	22.65	0.0046	0.25	1.08

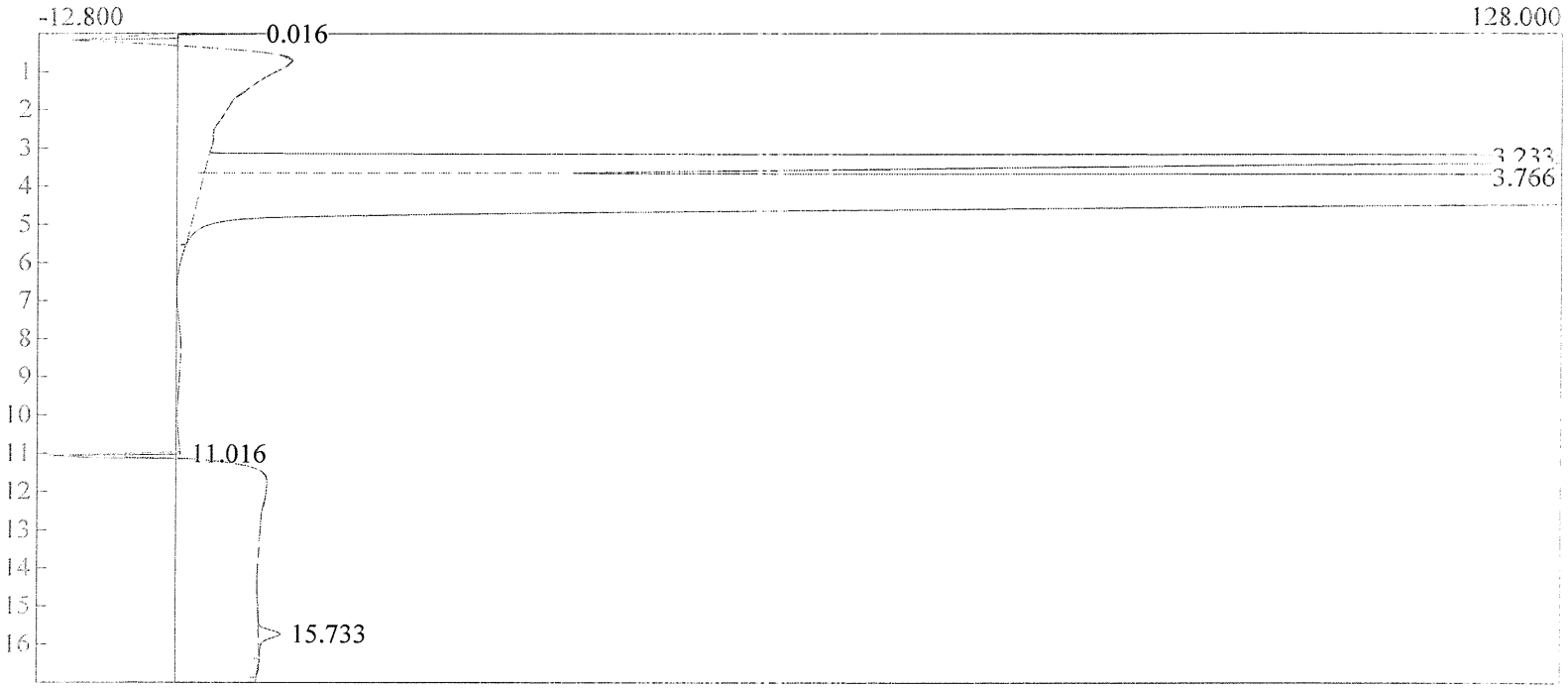
CALIBRATION STATISTICAL DATA

MEAN FACTO	0.0045
STDDEV:	0.0000
	0.7

SAMPLE ANALYTICAL DATA

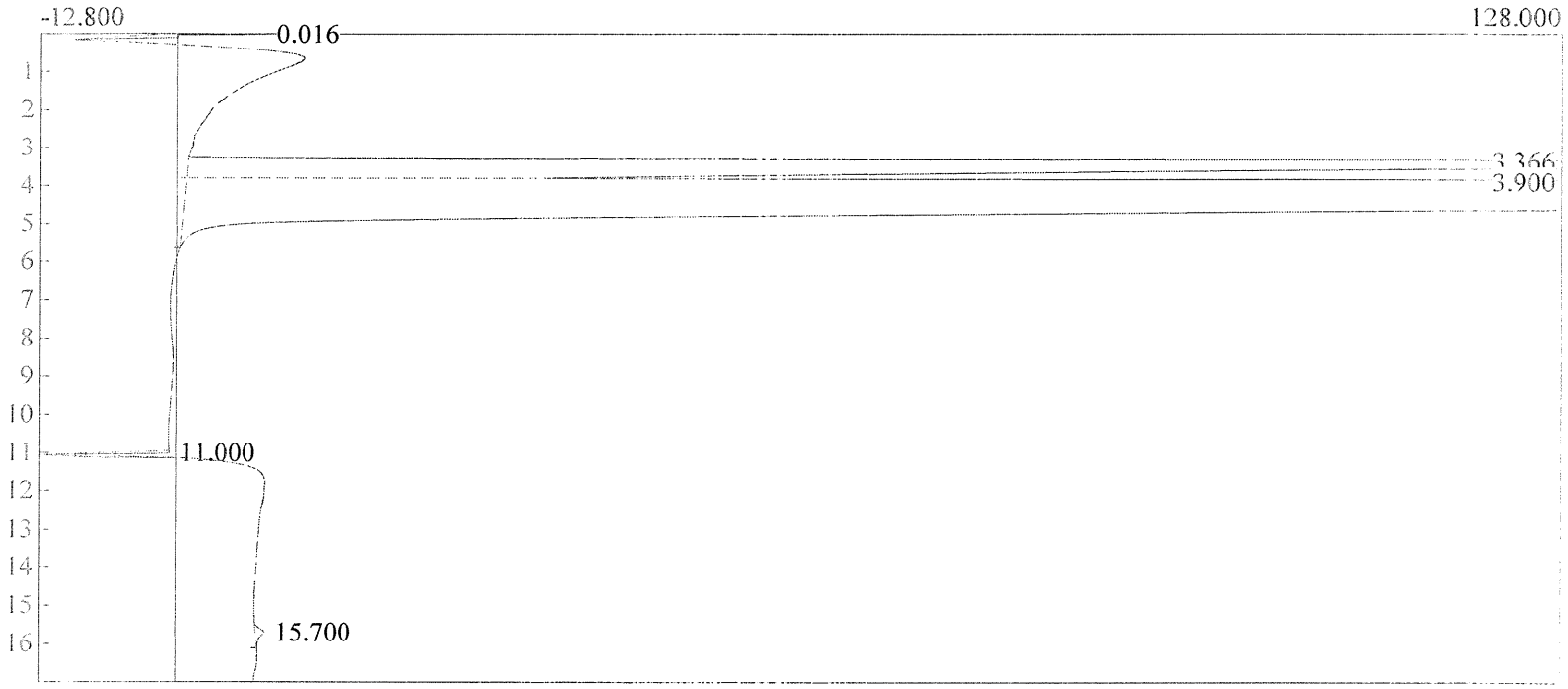
CLIENT SAMPLE ID	AQS LAB NUMBER	INJECT VOLUME ML	PEAK AREA COUNTS	PEAK AREA COUNTS	PEAK AREA COUNTS	AVERAGE PEAK COUNT	INDIVIDUAL AREA STD DEV	% STD DEV	CARBON DIOXIDE PERCENT	CARBON DIOXIDE PPM
RUN ONE	99115	2.0	23.62	22.6885	22.362	22.89	0.53	2.33	0.1	1039.2
RUN TWO	99116	2.0	19.324	19.569	19.5275	19.47	0.11	0.55	0.1	884.1
RUN THREE	99117	2.0	35.242	35.572	34.2445	35.02	0.56	1.61	0.2	1589.9

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: AIR
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



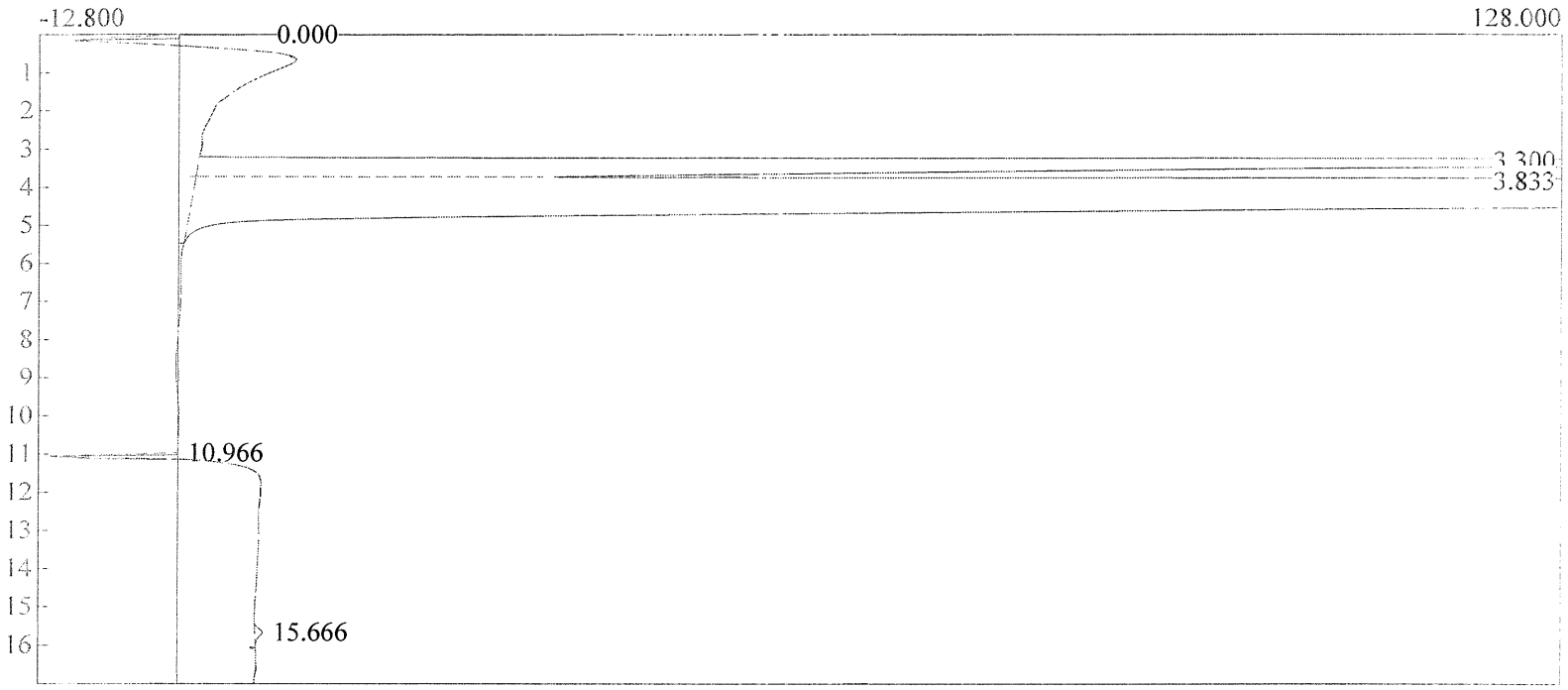
Component	Retention	Height	Area	Area %
OXYGEN	3.233	271.402	4010.9740	20.5658
NITROGEN	3.766	446.019	15371.7150	78.8166
CO2	15.733	2.027	34.9925	0.1794
			19417.6815	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: AIR
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



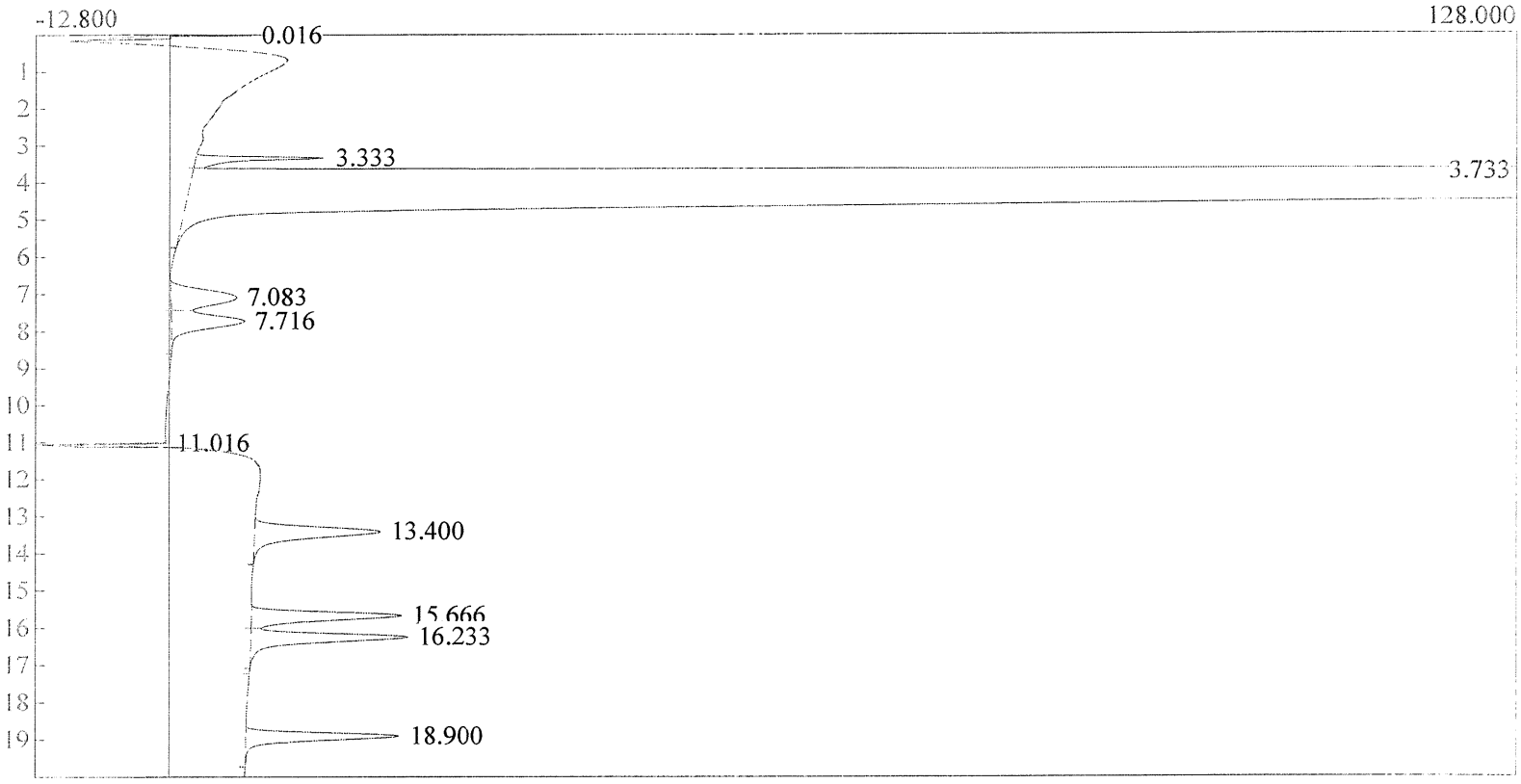
Component	Retention	Height	Area	Area %
OXYGEN	3.366	268.378	4068.5870	20.6856
NITROGEN	3.900	445.586	15503.1260	78.8215
CO2	15.700	0.782	12.3035	0.0626
			19584.0165	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: AIR
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



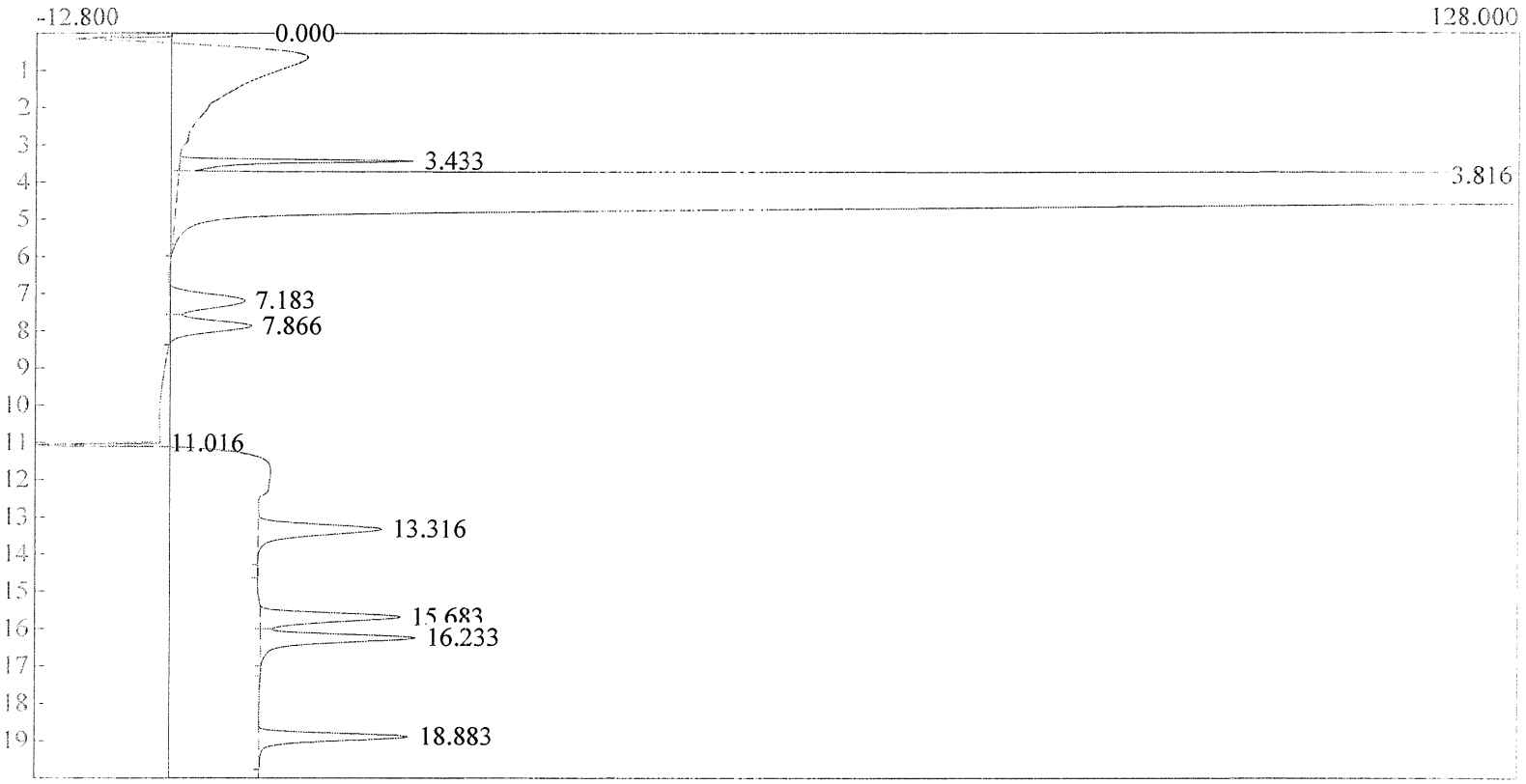
Component	Retention	Height	Area	Area %
OXYGEN	3.300	266.443	3944.1600	20.6878
NITROGEN	3.833	441.544	15037.0475	78.8718
CO2	15.666	0.717	11.2510	0.0590
			18992.4585	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: 1% MIX
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



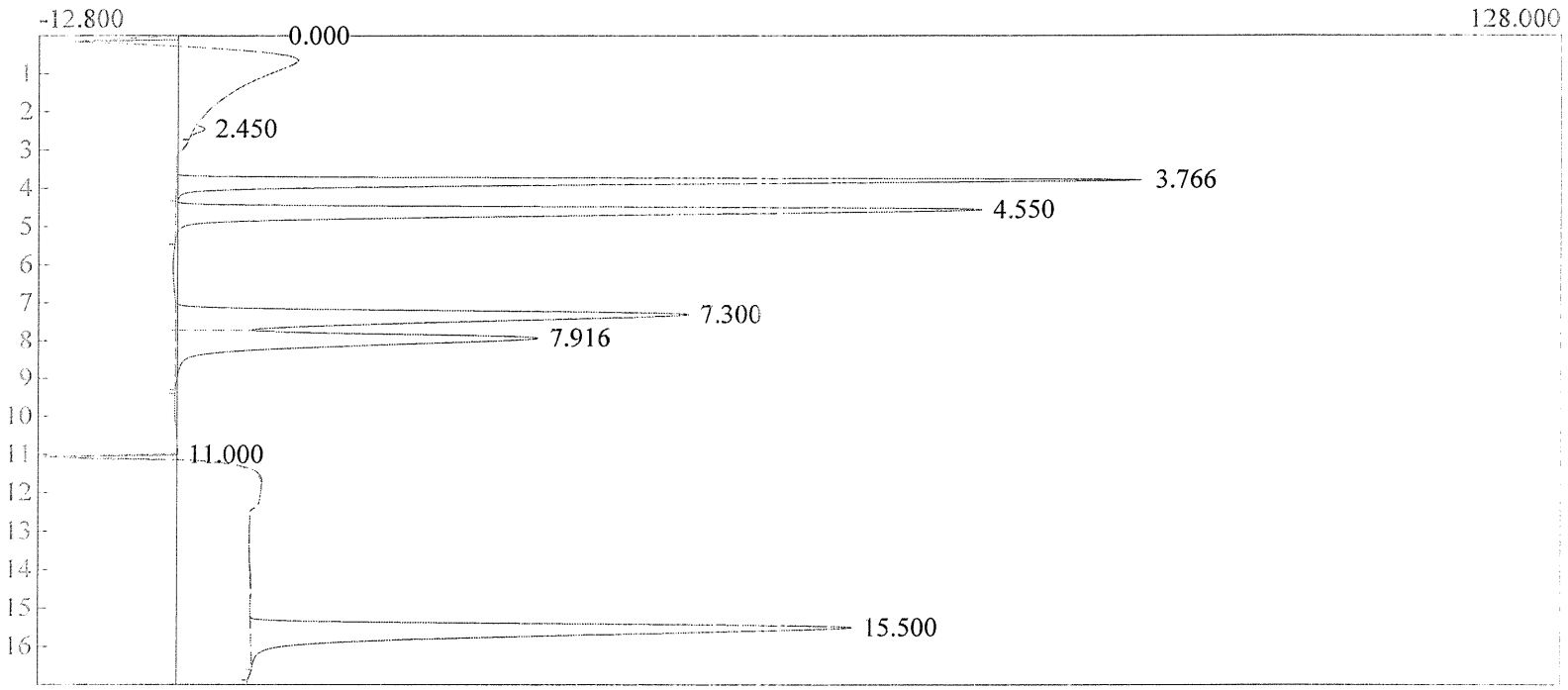
Component	Retention	Height	Area	Area %
OXYGEN	3.333	12.166	93.0780	0.4651
NITROGEN	3.733	528.347	18615.1940	93.0208
METHANE	7.083	6.218	173.2000	0.8655
CO	7.716	6.920	169.5940	0.8475
ETHANE	13.400	11.813	236.1960	1.1803
CO2	15.666	14.150	220.8235	1.1035
ETHYLENE	16.233	14.783	238.0075	1.1893
ACETYLENE	18.900	14.426	200.2080	1.0004
			19946.3010	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: 1% MIX
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



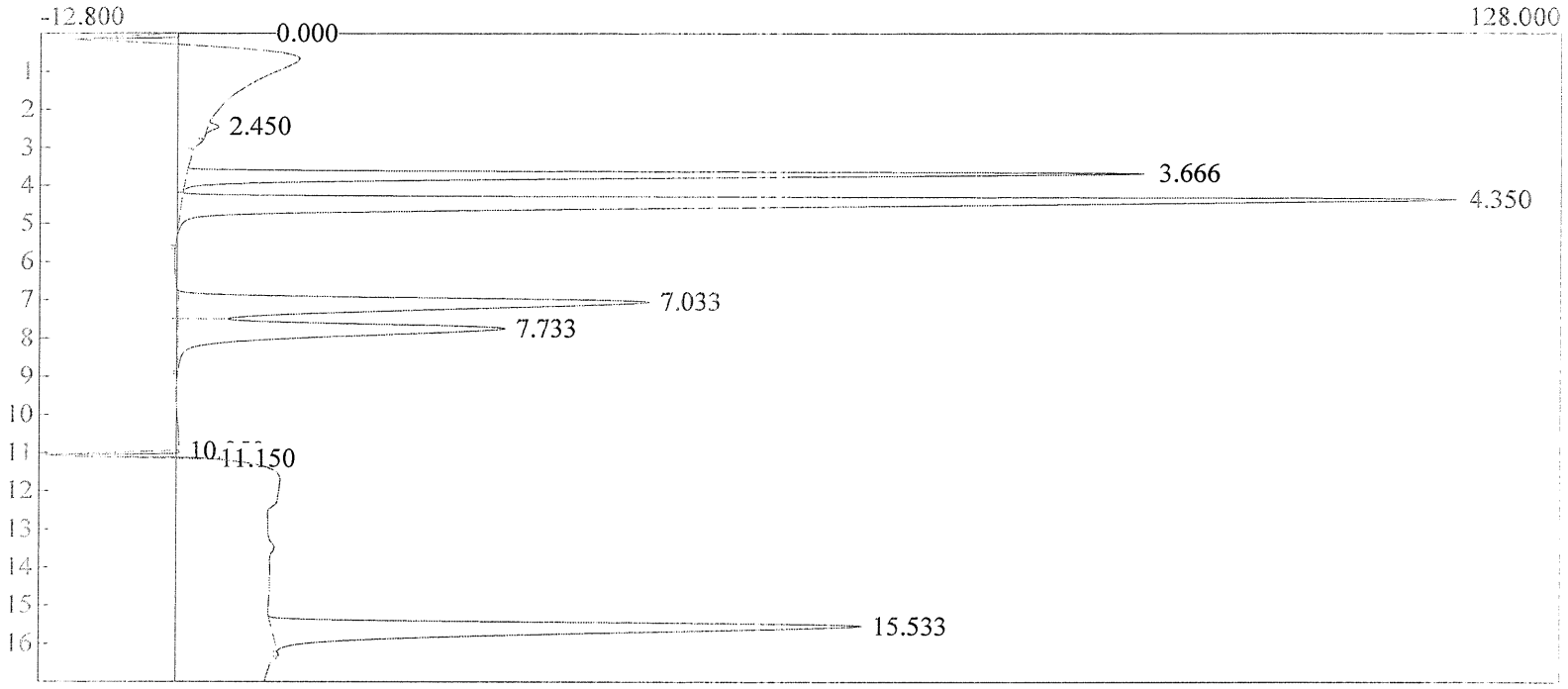
Component	Retention	Height	Area	Area %
OXYGEN	3.433	22.091	168.8895	0.8426
NITROGEN	3.816	525.329	18588.8590	92.7453
METHANE	7.183	7.119	180.2710	0.8994
CO	7.866	7.748	165.1690	0.8241
ETHANE	13.316	11.714	229.5205	1.1451
CO2	15.683	13.238	216.9400	1.0824
ETHYLENE	16.233	14.641	233.5370	1.1652
ACETYLENE	18.883	14.135	198.5030	0.9904
			19981.6890	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: 4-5% MIX
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



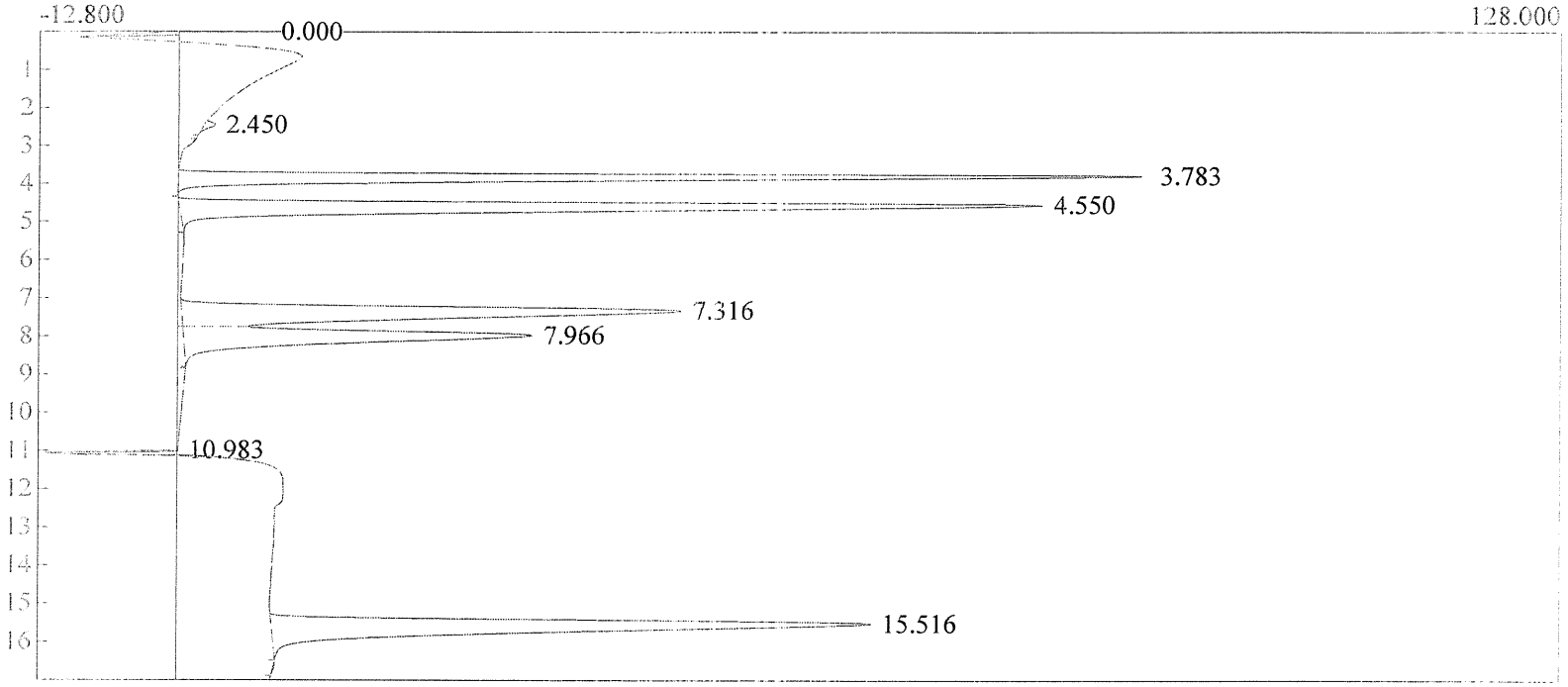
Component	Retention	Height	Area	Area %
OXYGEN	3.766	89.639	958.8055	19.4027
NITROGEN	4.550	74.686	1099.7765	22.2554
METHANE	7.300	47.446	950.8920	19.2425
CO	7.916	33.502	716.8165	14.5057
CO2	15.500	55.539	1143.0570	23.1312
			4869.3475	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: 4-5% MIX
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



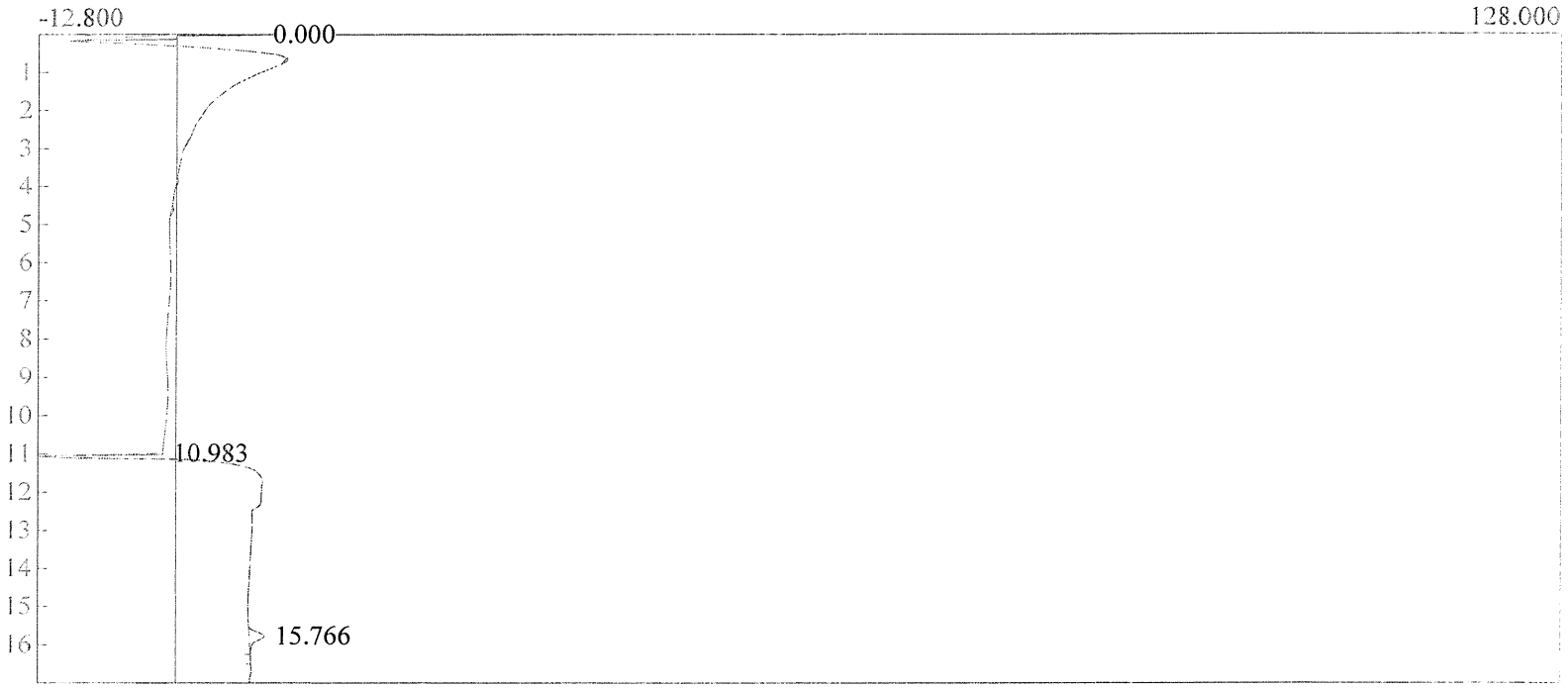
Component	Retention	Height	Area	Area %
OXYGEN	3.666	89.010	954.6830	17.0309
NITROGEN	4.350	118.326	1925.3040	34.3461
METHANE	7.033	43.492	909.7475	16.2293
CO	7.733	30.135	664.8390	11.8603
CO2	15.533	54.489	1050.2895	18.7364
			5504.8630	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: 4-5% MIX
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



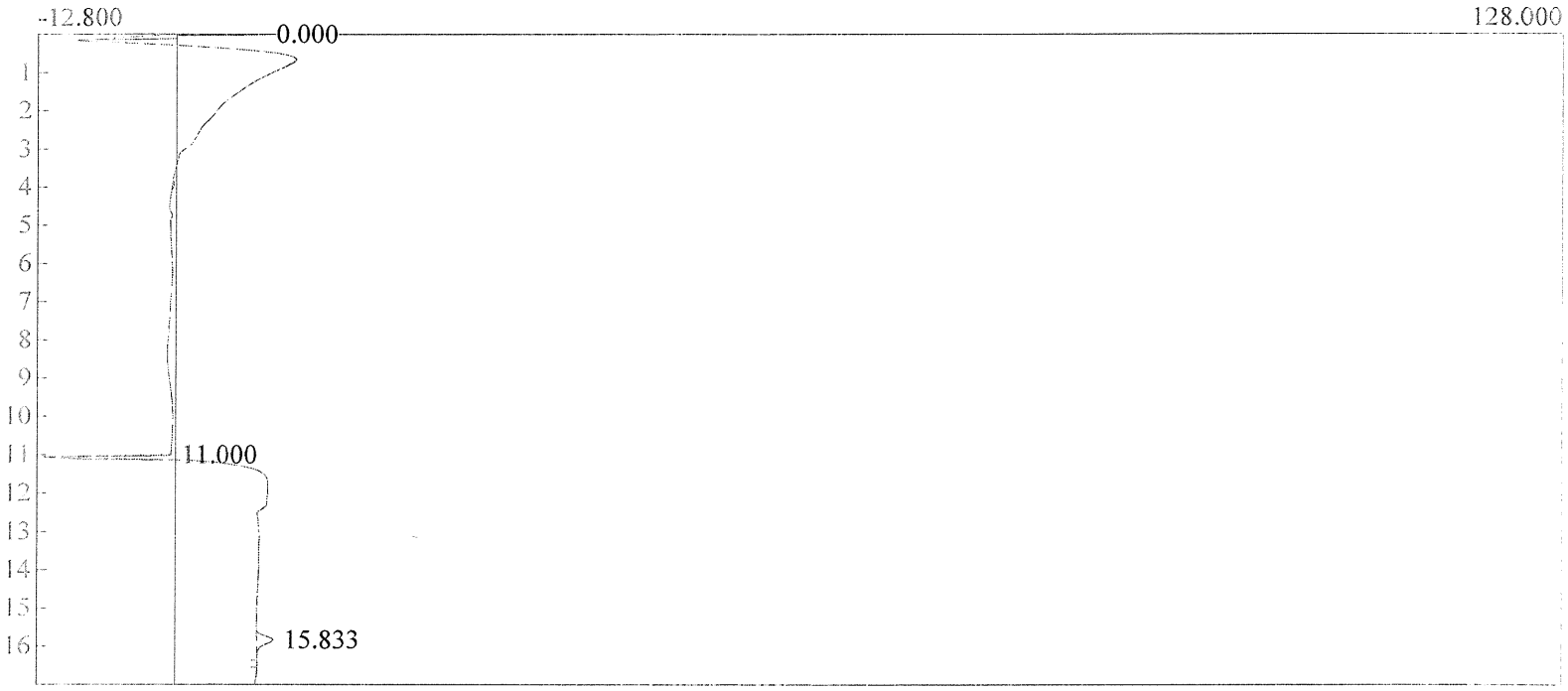
Component	Retention	Height	Area	Area %
OXYGEN	3.783	89.933	960.4470	19.3457
NITROGEN	4.550	80.050	1197.2580	24.1157
METHANE	7.316	46.210	932.4180	18.7812
CO	7.966	32.201	675.3580	13.6034
CO2	15.516	55.464	1127.6830	22.7143
			4893.1640	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: 1038 PPM CO2
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



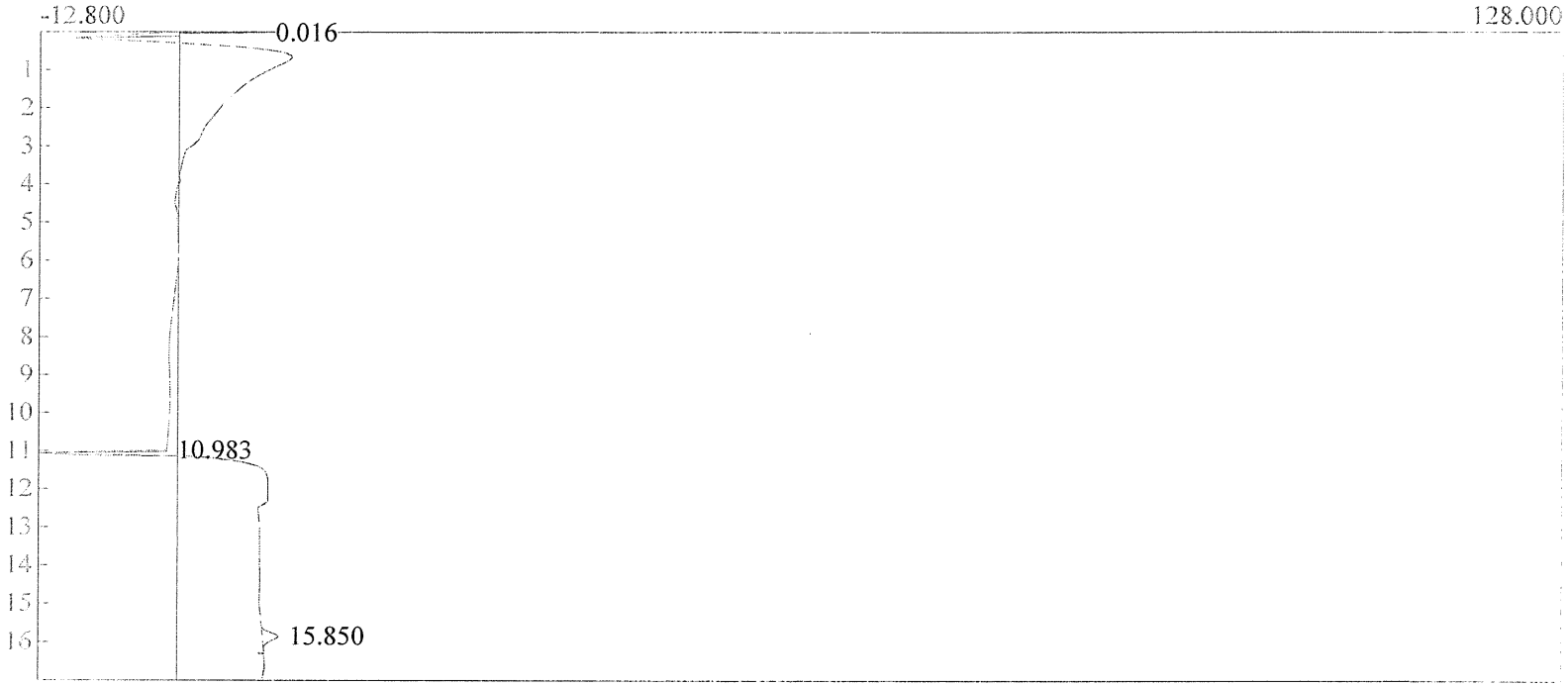
Component	Retention	Height	Area	Area %
CO2	15.766	1.410	22.3010	22.3706
			22.3010	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: 1038 PPM CO2
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



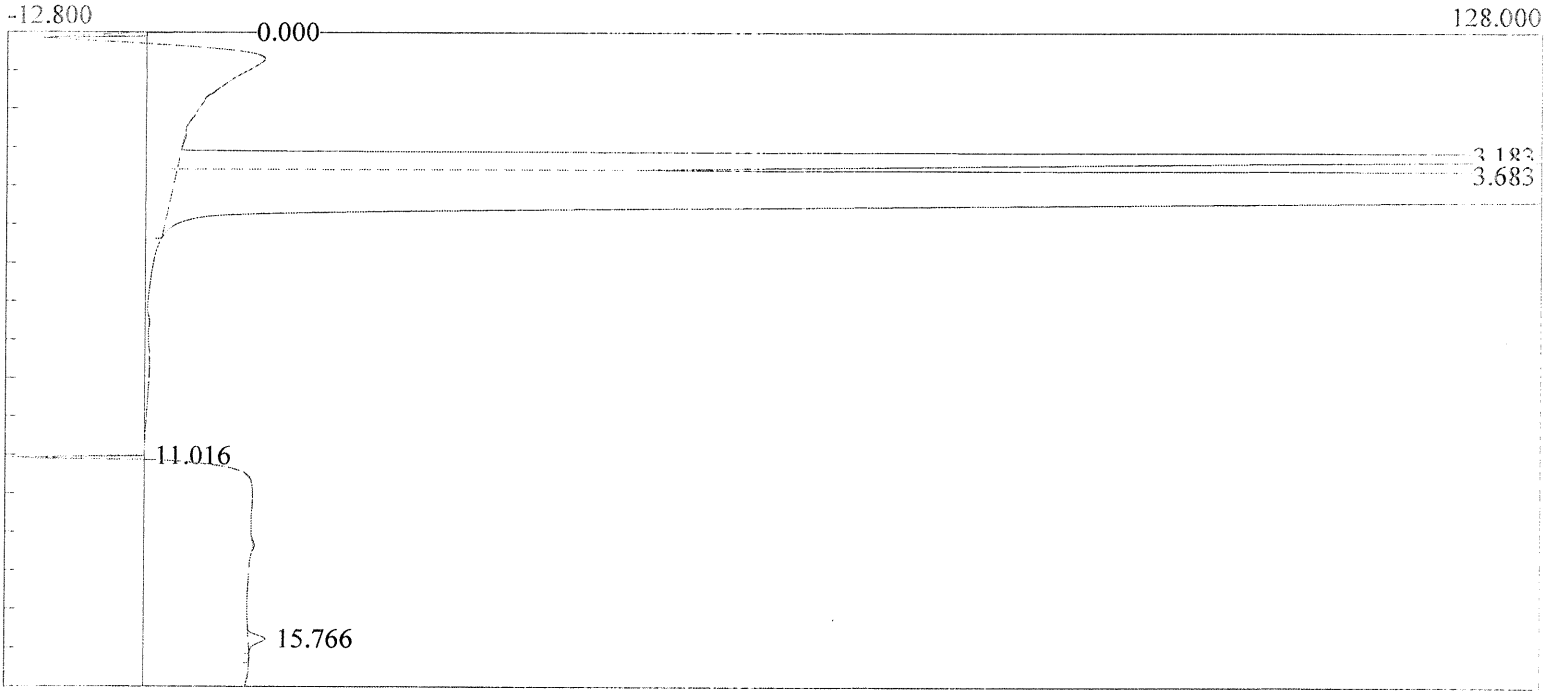
Component	Retention	Height	Area	Area %
CO2	15.833	1.515	22.8040	25.7962
			22.8040	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: 1038 PPM CO2
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



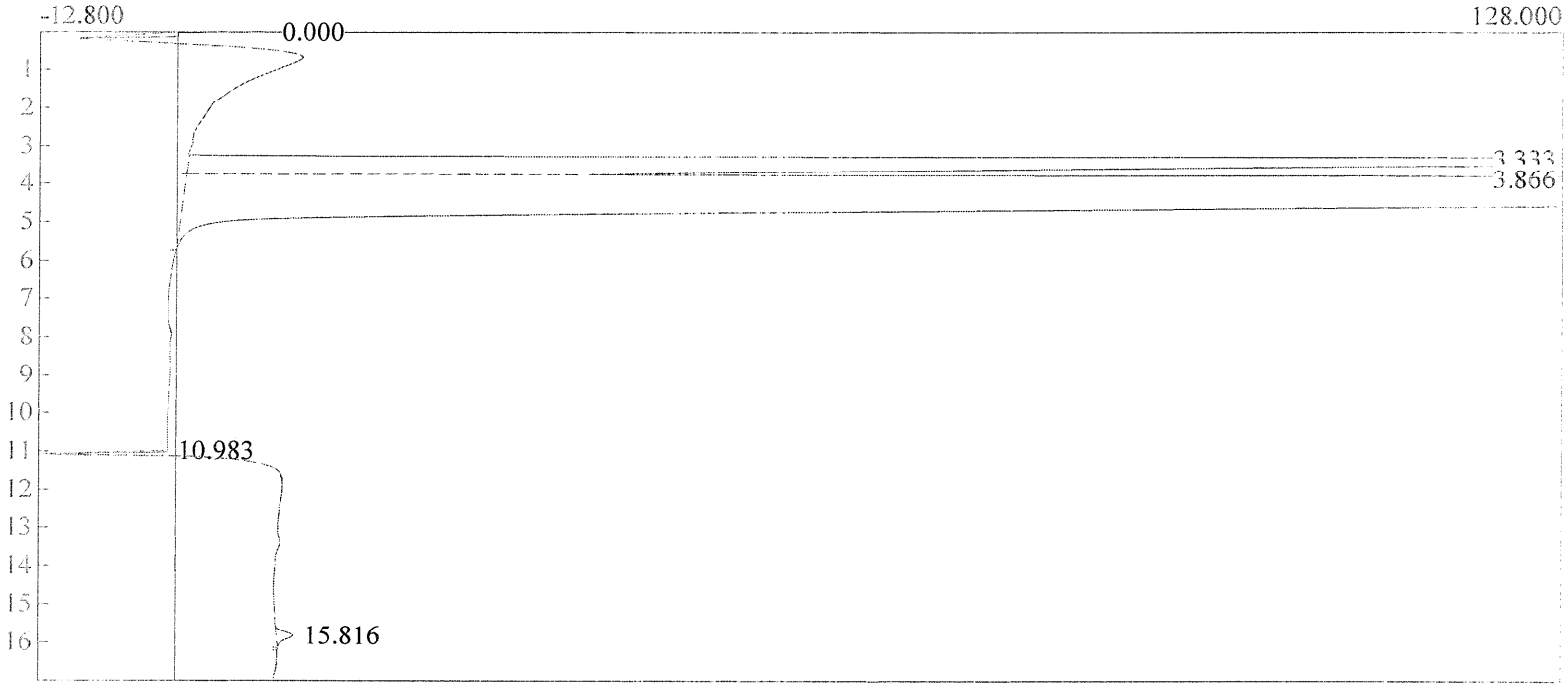
Component	Retention	Height	Area	Area %
CO2	15.850	1.503	22.6585	23.4504
			22.6585	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99115
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN ONE
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



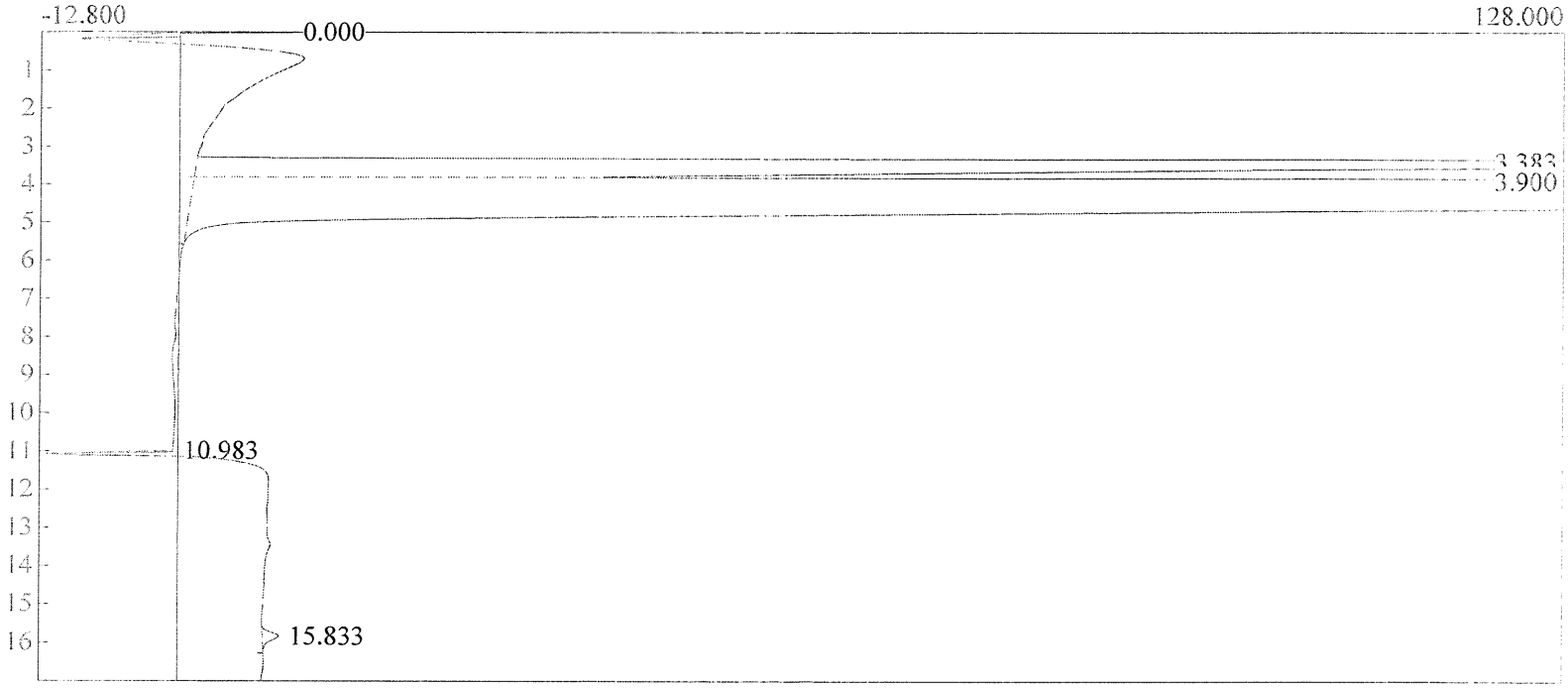
Component	Retention	Height	Area	Area %
OXYGEN	3.183	272.938	3845.7510	19.5436
NITROGEN	3.683	462.045	15737.9175	79.9781
CO2	15.766	1.515	22.3620	0.1136
			19606.0305	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99115
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN ONE
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



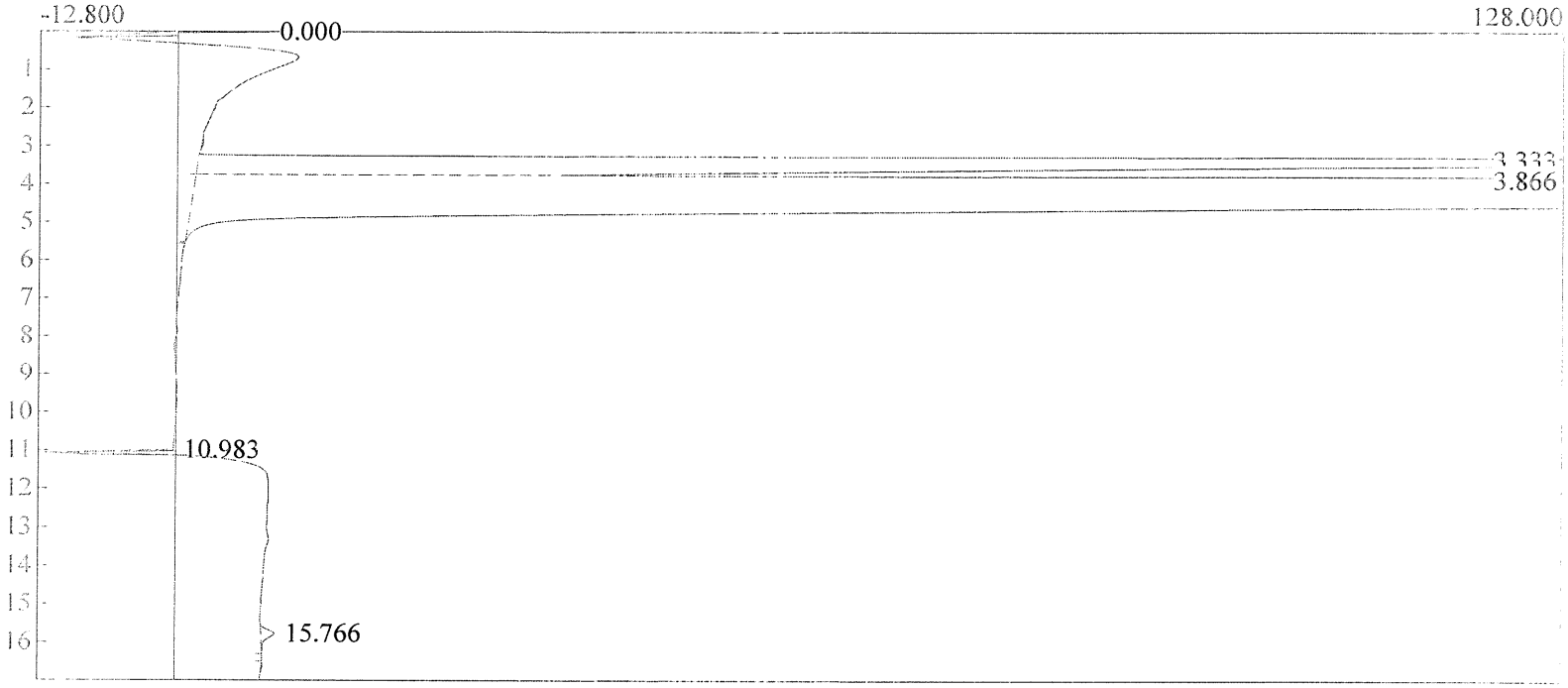
Component	Retention	Height	Area	Area %
OXYGEN	3.333	264.573	3888.3505	19.7214
NITROGEN	3.866	452.011	15724.6300	79.7539
CO2	15.816	1.573	22.6885	0.1151
			19635.6690	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99115
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN ONE
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



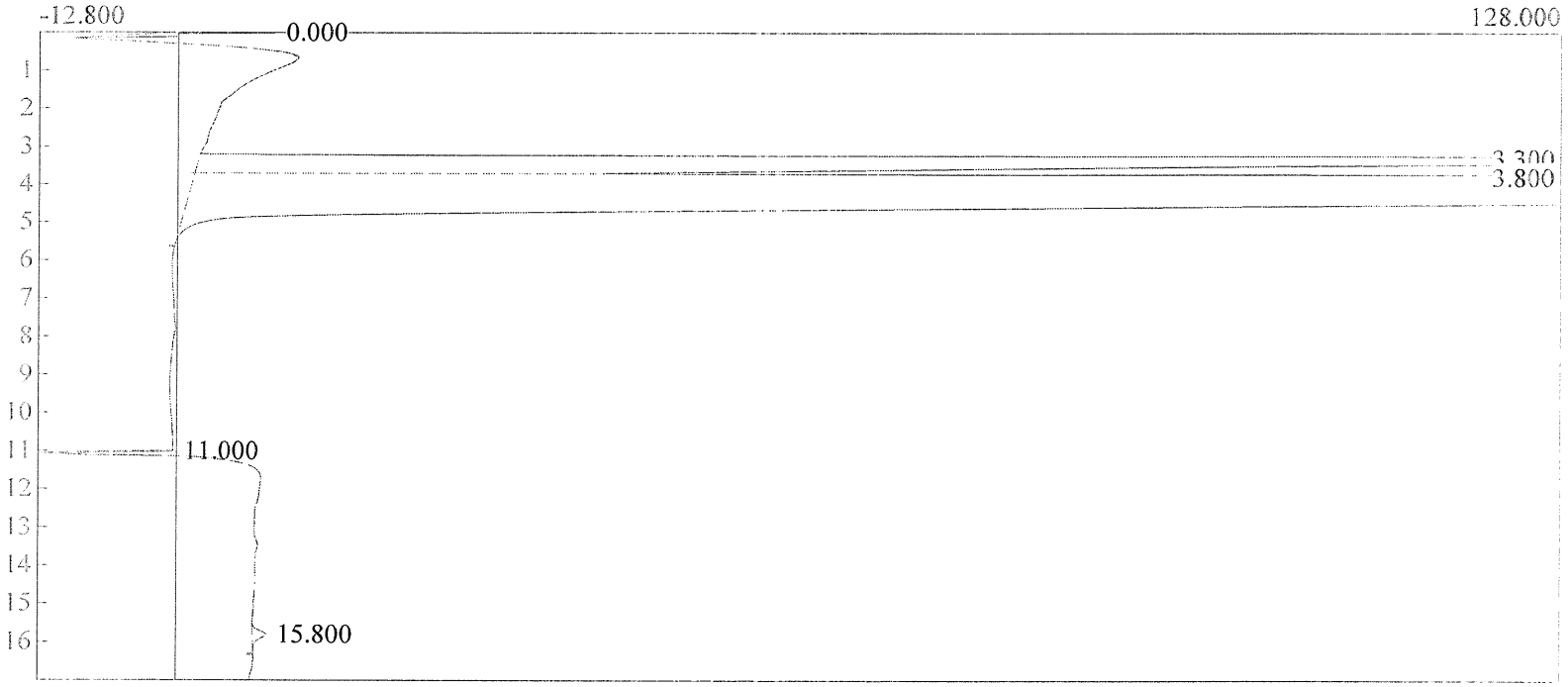
Component	Retention	Height	Area	Area %
OXYGEN	3.383	261.666	3911.5000	19.7597
NITROGEN	3.900	449.292	15767.7160	79.6536
CO2	15.833	1.520	23.6200	0.1193
			19702.8360	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99116
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN TWO
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



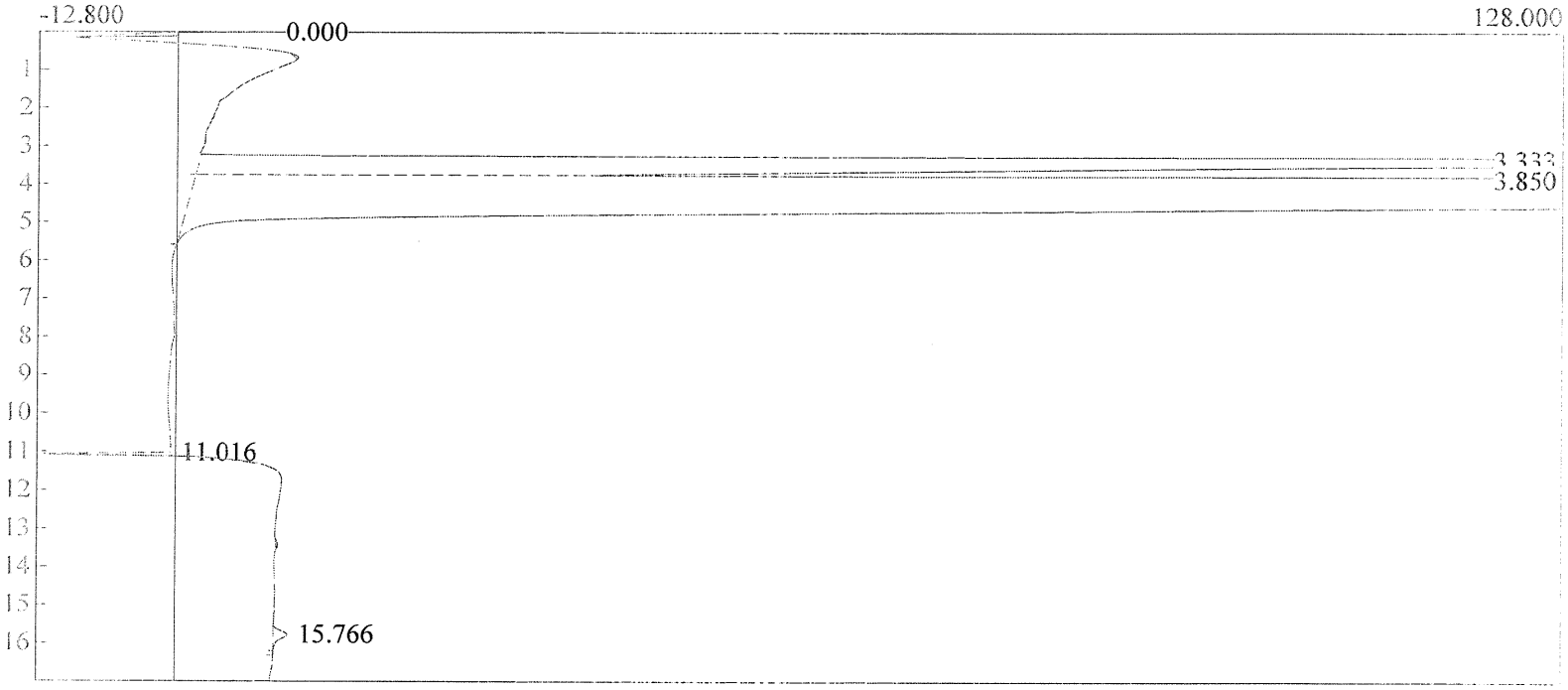
Component	Retention	Height	Area	Area %
OXYGEN	3.333	262.805	3879.8740	20.0142
NITROGEN	3.866	446.585	15404.9490	79.4659
CO2	15.766	1.250	19.3240	0.0997
			19304.1470	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99116
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN TWO
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



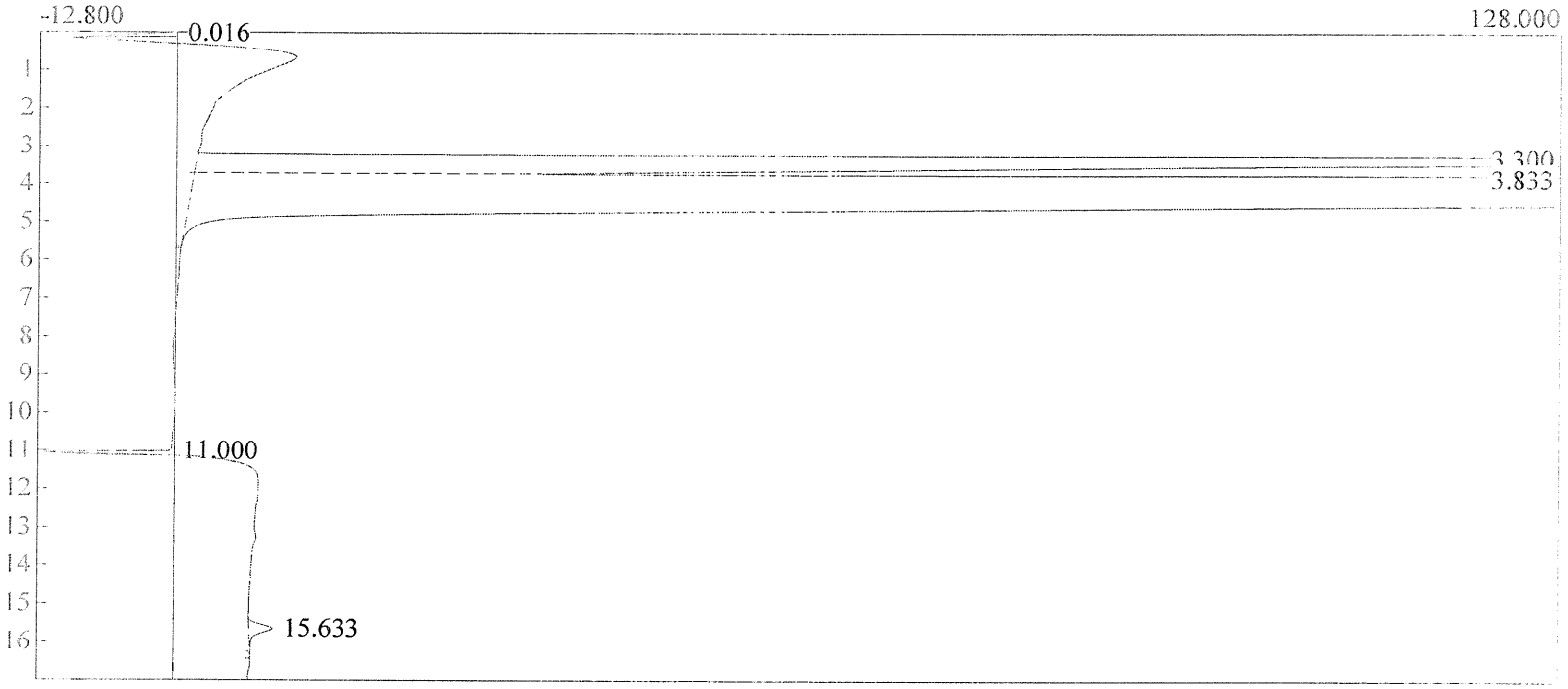
Component	Retention	Height	Area	Area %
OXYGEN	3.300	257.642	3747.8060	19.8355
NITROGEN	3.800	443.536	15043.4220	79.6184
CO2	15.800	1.276	19.5275	0.1034
			18810.7555	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99116
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN TWO
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



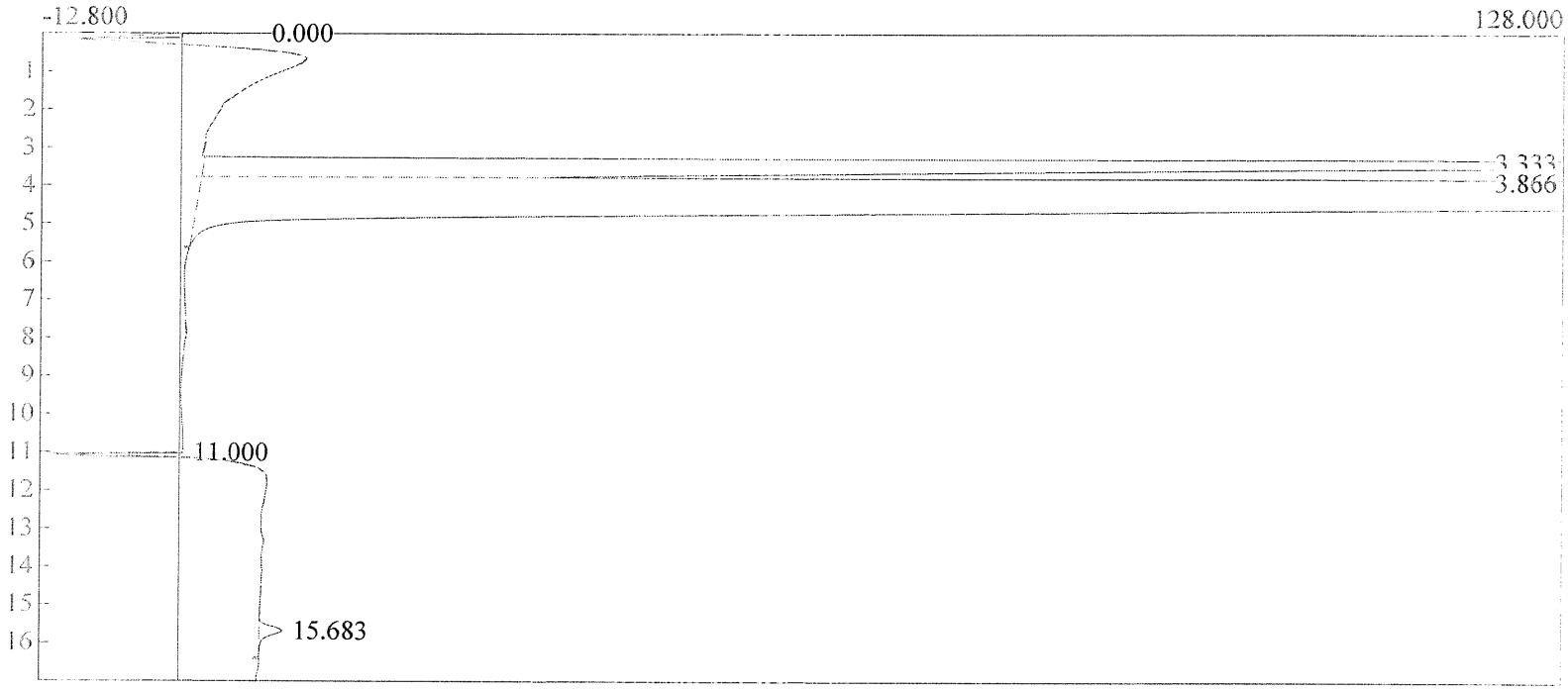
Component	Retention	Height	Area	Area %
OXYGEN	3.333	258.191	3884.4920	19.9325
NITROGEN	3.850	445.307	15521.7565	79.6467
CO2	15.766	1.252	19.5690	0.1004
			19425.8175	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99117
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN THREE
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



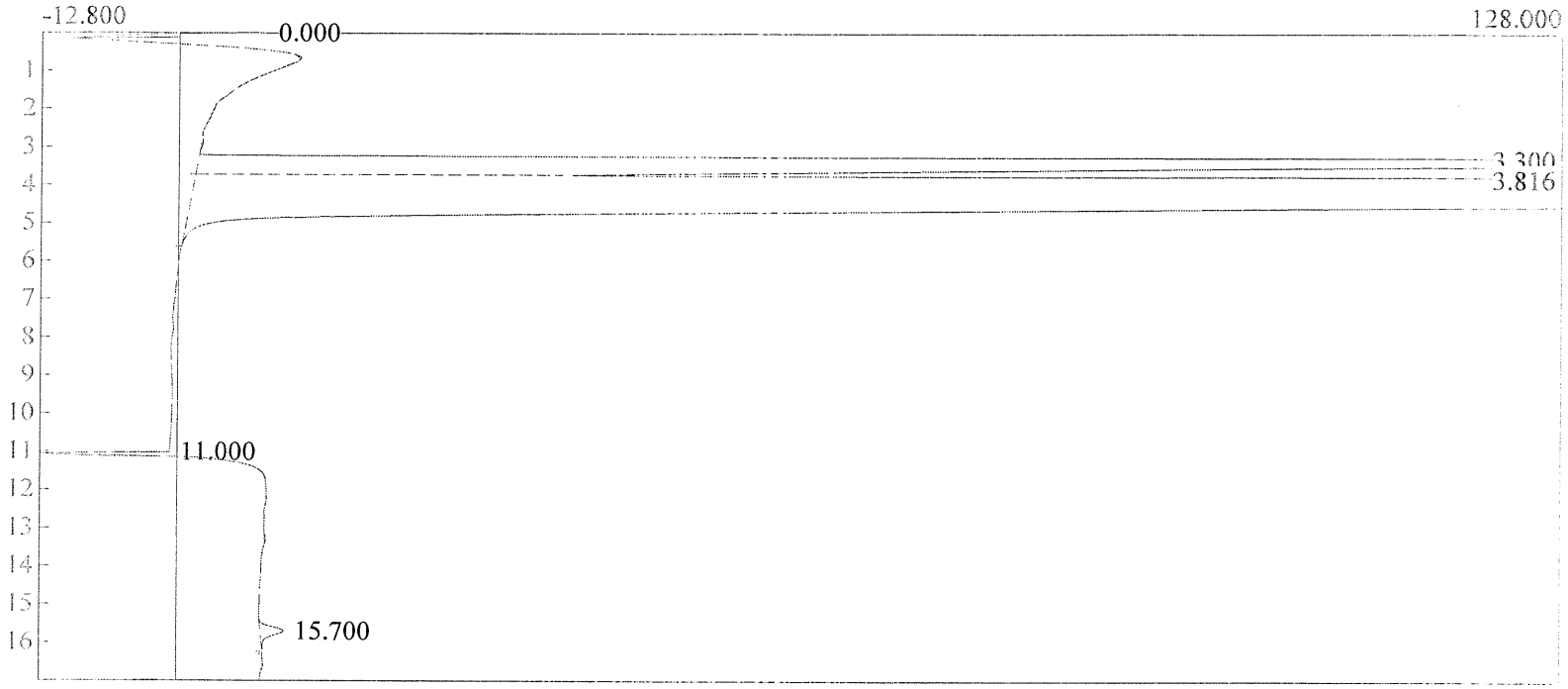
Component	Retention	Height	Area	Area %
OXYGEN	3.300	260.533	3805.3590	20.1451
NITROGEN	3.833	441.464	14994.5485	79.3792
CO2	15.633	2.184	35.2420	0.1866
			18835.1495	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99117
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN THREE
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



Component	Retention	Height	Area	Area %
OXYGEN	3.333	262.195	3890.2860	20.2706
NITROGEN	3.866	443.220	15198.5940	79.1933
CO2	15.683	2.117	35.5720	0.1854
			19124.4520	100.0000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99117
Description: TCD DETECTOR
Column: SILICA GEL/MOLE SIEVE
Carrier: HELIUM
Sample: RUN THREE
Operator: MAI BRNA
Comments: JOB #9268
OXYGEN AND CARBON DIOXIDE ANALYSIS



Component	Retention	Height	Area	Area %
OXYGEN	3.300	264.038	3859.4725	20.1054
NITROGEN	3.816	447.070	15232.9275	79.3537
CO2	15.700	2.117	34.2445	0.1784
			19126.6445	100.0000

GAS ANALYSIS BY GC USING FID DETECTOR — EPA METHOD 18

CLIENT INFORMATION

CLIENT:	AIR COMPLIANCE CONSULTANTS	PROJECT:	ARG/LO-CAT
ADDRESS:	1050 WILLIAM PITT WAY	DATE:	DECEMBER 10, 2010
	PITTSBURGH, PA 15238	ANALYST:	M BRNA
CONTACT:	ERIC WHITE	AQS JOB #	9268

CALIBRATION DATA

REQUIRED:	METHANE	COLUMN:	GSQ
DETECTOR:	FID	INJECTION VOLUME:	2.0 CC

CALIBRATION VALUE PPM Cv	INJECT VOLUME ML Civ	PEAK AREA COUNT Ca1	PEAK AREA COUNT Ca2	PEAK AREA COUNT Ca3	AVERAGE PEAK COUNT Ca	STANDARD FACTOR PPM/COUNT Cf	INDIVIDUAL AREA STD DEV	% STD DEV		
									Ca=	Avg(Ca1.Ca3)
									Cf=	Cv/Ca
1005.00	2.0	7267.9870	7250.3025	7245.4070	7254.57	0.1385	9.70	0.13		
100.00	2.0	819.7470	757.5340	843.8140	807.03	0.1239	36.35	4.50		
50.90	2.0	347.6940	368.0970	366.8690	360.89	0.1410	9.34	2.59	**PRE SAMPLE ANALYSIS**	
50.90	2.0	380.5780	375.2990	349.6910	368.52	0.1381	13.49	3.66	**POST SAMPLE ANALYSIS**	
25.10	2.0	182.1280	196.6525	186.2145	188.33	0.1333	6.12	3.25		
10.20	2.0	72.9540	72.7975	75.2380	73.66	0.1385	1.12	1.51		

CALIBRATION STATISTICAL DATA

MEAN FACTOR:	0.1356	Mf	Mf= Avg Cf
STDDEV:	0.0057		
	4.2		

SAMPLE ANALYTICAL DATA

CLIENT SAMPLE ID	AQS LAB NUMBER	INJECT VOLUME ML Siv	PEAK AREA COUNTS Sa1	PEAK AREA COUNTS Sa2	PEAK AREA COUNTS Sa2	AVERAGE PEAK COUNT Sa	INDIVIDUAL AREA STD DEV	% STD DEV	METHANE PPM	
										PPM= (Mf*Sa)*(Civ/Siv)
RUN ONE	99115	2.0	2066.7370	2252.8725	2092.9860	2137.53	82.26	3.85	289.8	
RUN TWO	99116	2.0	2298.2500	2369.7840	2561.8795	2409.97	111.31	4.62	326.7	
RUN THREE	99117	2.0	1436.6380	1355.1120	1369.5175	1387.09	35.53	2.56	188.0	

GAS ANALYSIS BY GC USING FID DETECTOR — EPA METHOD 18

CLIENT INFORMATION

CLIENT:	AIR COMPLIANCE CONSULTANTS	PROJECT:	ARG/LO-CAT
ADDRESS:	1050 WILLIAM PITT WAY	DATE:	DECEMBER 10, 2010
	PITTSBURGH, PA 15238	ANALYST:	M BRNA
CONTACT:	ERIC WHITE	AQS JOB #	9268

CALIBRATION DATA

REQUIRED:	ETHANE	COLUMN:	GSQ
DETECTOR:	FID	INJECTION VOLUME:	2.0 CC

CALIBRATION VALUE PPM Cv	INJECT VOLUME ML Civ	PEAK AREA COUNT Ca1	PEAK AREA COUNT Ca2	PEAK AREA COUNT Ca3	AVERAGE PEAK COUNT Ca	STANDARD FACTOR PPM/COUNT Cf	INDIVIDUAL AREA STD DEV	% STD DEV		
									Ca=	Avg(Ca1.Ca3)
									Cf=	Cv/Ca
1000.00	2.0	14916.3290	15640.4760	16147.2505	15568.02	0.0642	505.13	3.24		
100.00	2.0	1652.6610	1524.7315	1697.4220	1624.94	0.0615	73.18	4.50		
49.40	2.0	772.1900	836.7560	840.9155	816.62	0.0605	31.46	3.85	**PRE SAMPLE ANALYSIS**	
49.40	2.0	865.5050	789.4990	853.2750	836.09	0.0591	33.32	3.99	**POST SAMPLE ANALYSIS**	
24.30	2.0	376.9730	410.6010	387.1025	391.56	0.0621	14.09	3.60		
9.86	2.0	154.8925	148.3770	151.9045	151.72	0.0650	2.66	1.76		

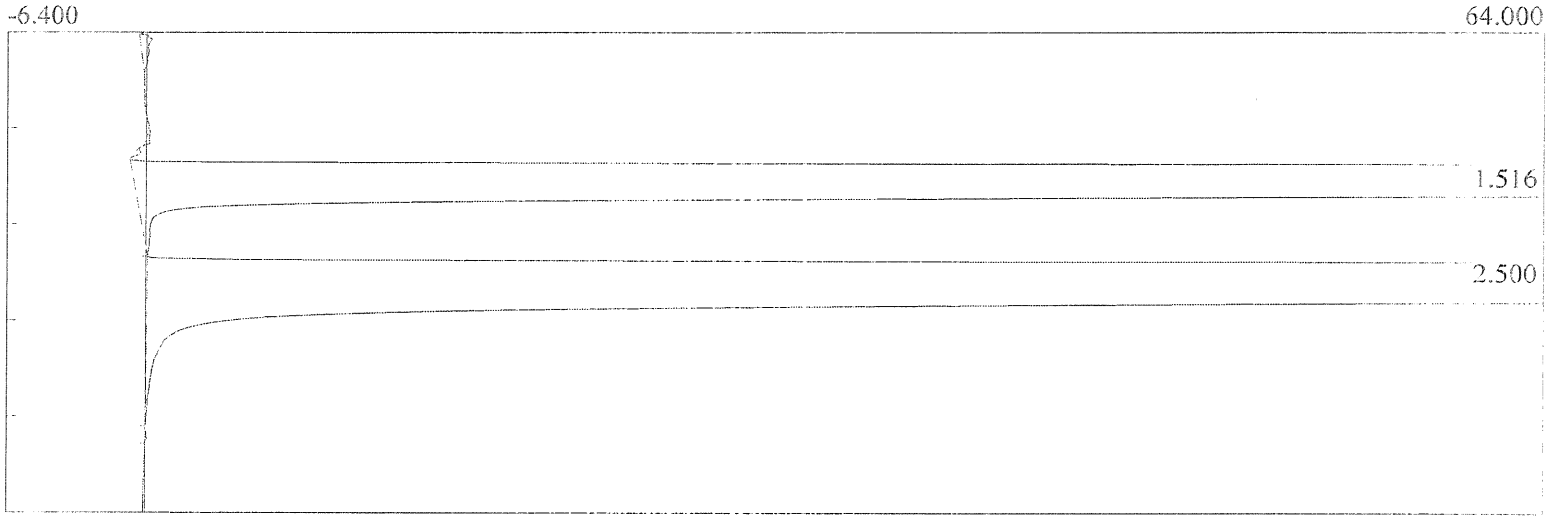
CALIBRATION STATISTICAL DATA

MEAN FACTOR:	0.0621	Mf	Mf=	Avg Cf
STDDEV:	0.0020			
	3.3			

SAMPLE ANALYTICAL DATA

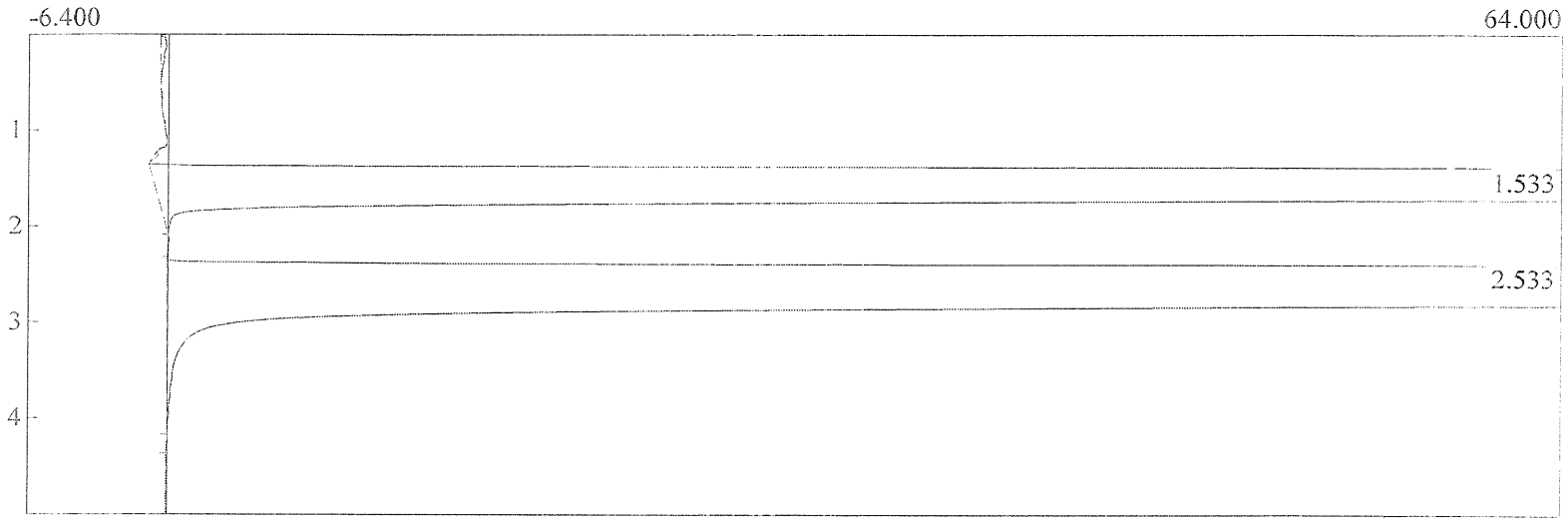
CLIENT SAMPLE ID	AQS LAB NUMBER	INJECT VOLUME ML Siv	PEAK AREA COUNTS Sa1	PEAK AREA COUNTS Sa2	PEAK AREA COUNTS Sa2	AVERAGE PEAK COUNT Sa	INDIVIDUAL AREA STD DEV	% STD DEV	ETHANE PPM	
									PPM=	(Mf*Sa)*(Civ/Siv)
RUN ONE	99115	2.0	4741.1315	5201.5755	4796.526	4913.08	205.25	4.18	304.9	
RUN TWO	99116	2.0	4583.046	4803.933	5170.6675	4852.55	242.35	4.99	301.2	
RUN THREE	99117	2.0	3507.734	3242.596	3324.825	3358.39	110.81	3.30	208.4	

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-14-2010
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30M
Carrier: HYDROGEN
Sample: 1000 PPM MIX
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



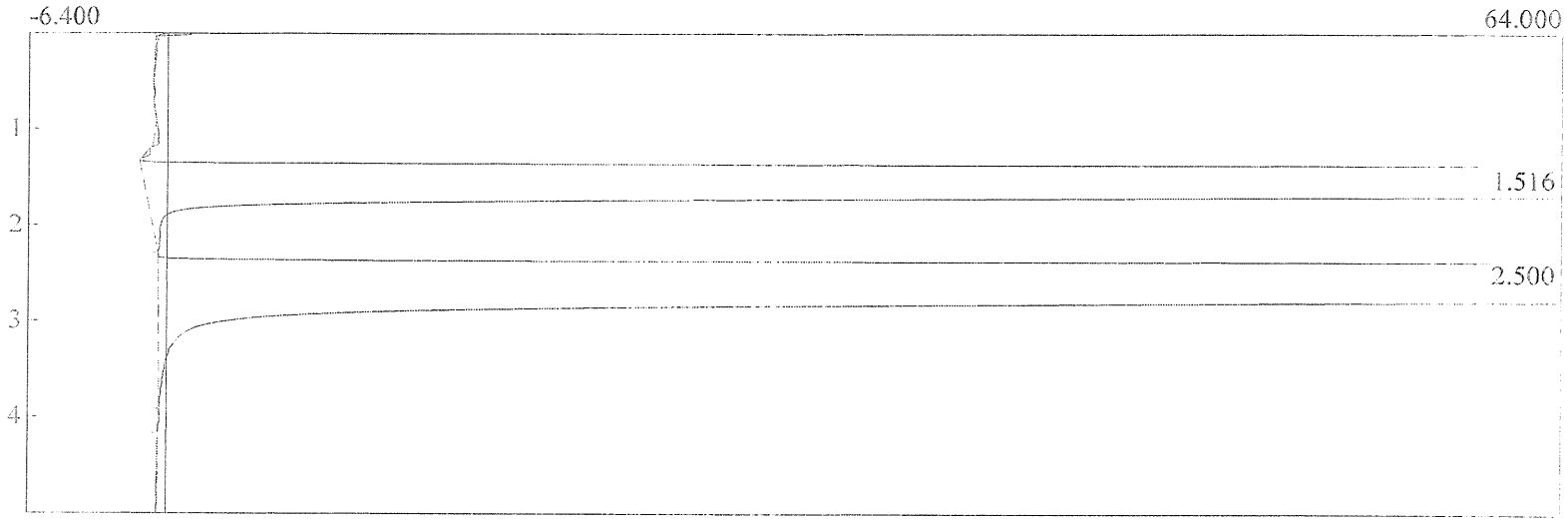
Component	Retention	Height	Area
METHANE	1.516	532.312	7245.4070
ETHANE	2.500	903.603	13193.3060
			20438.7130

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-14-2010
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30M
Carrier: HYDROGEN
Sample: 1000 PPM MIX
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



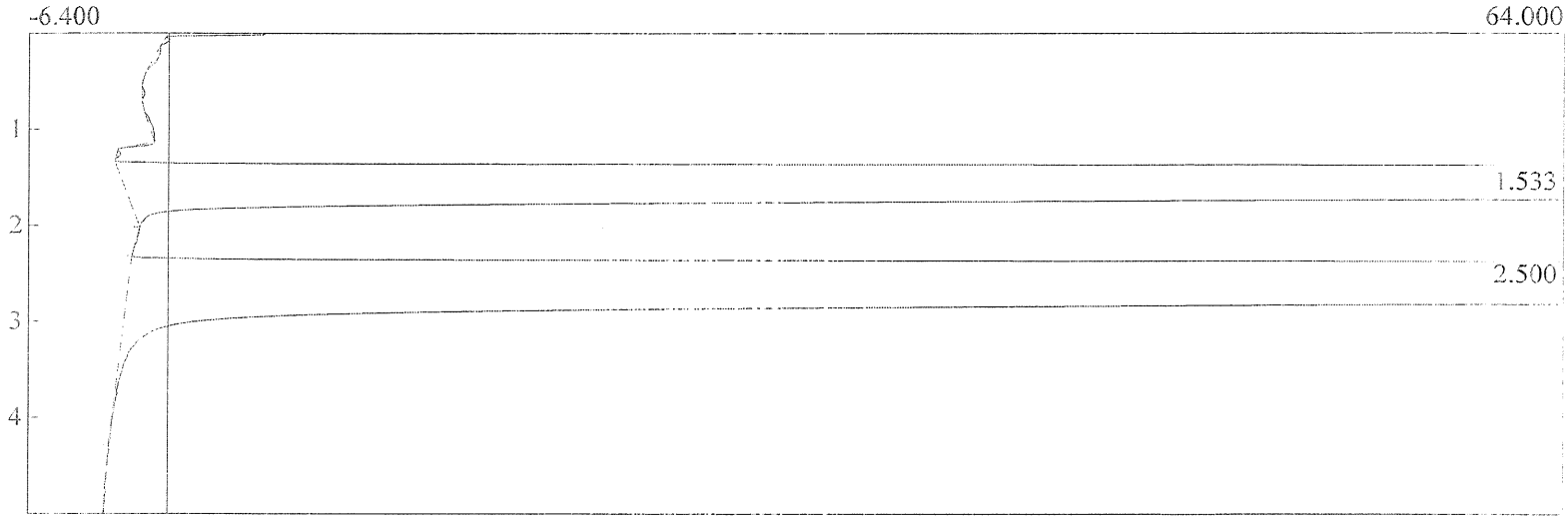
Component	Retention	Height	Area
METHANE	1.533	552.958	7267.9870
ETHANE	2.533	924.599	13281.0600
			20549.0470

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-14-2010
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30M
Carrier: HYDROGEN
Sample: 1000 PPM MIX
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



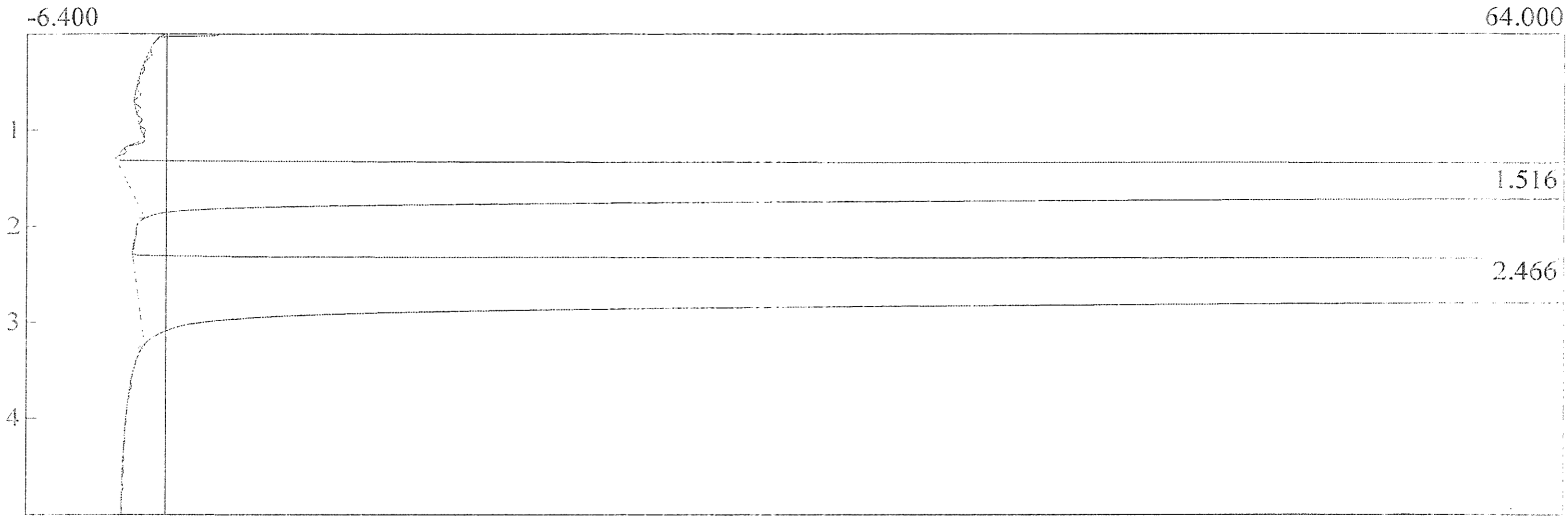
Component	Retention	Height	Area
METHANE	1.516	556.290	7250.3025
ETHANE	2.500	914.505	13213.7760
			20464.0785

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-14-2010
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30M
Carrier: HYDROGEN
Sample: 1000 PPM MIX
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



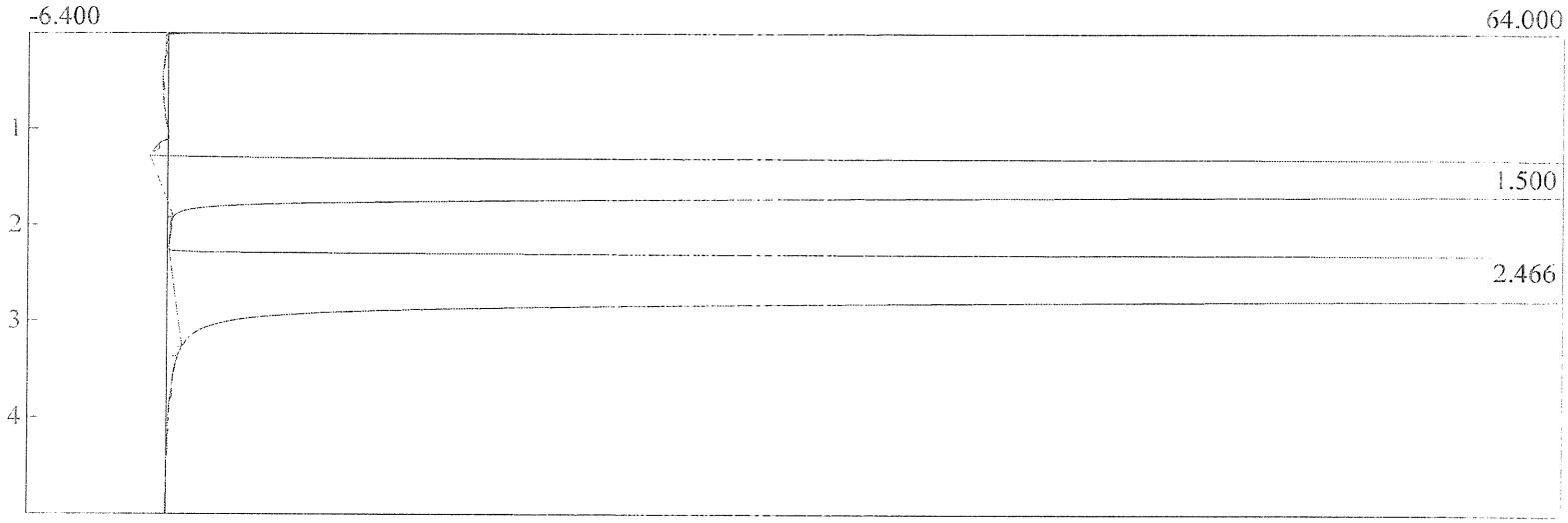
Component	Retention	Height	Area
METHANE	1.533	563.140	8250.5710
ETHANE	2.500	920.863	14916.3290
			23166.9000

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30M
Carrier: HYDROGEN
Sample: 1000 PPM MIX
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



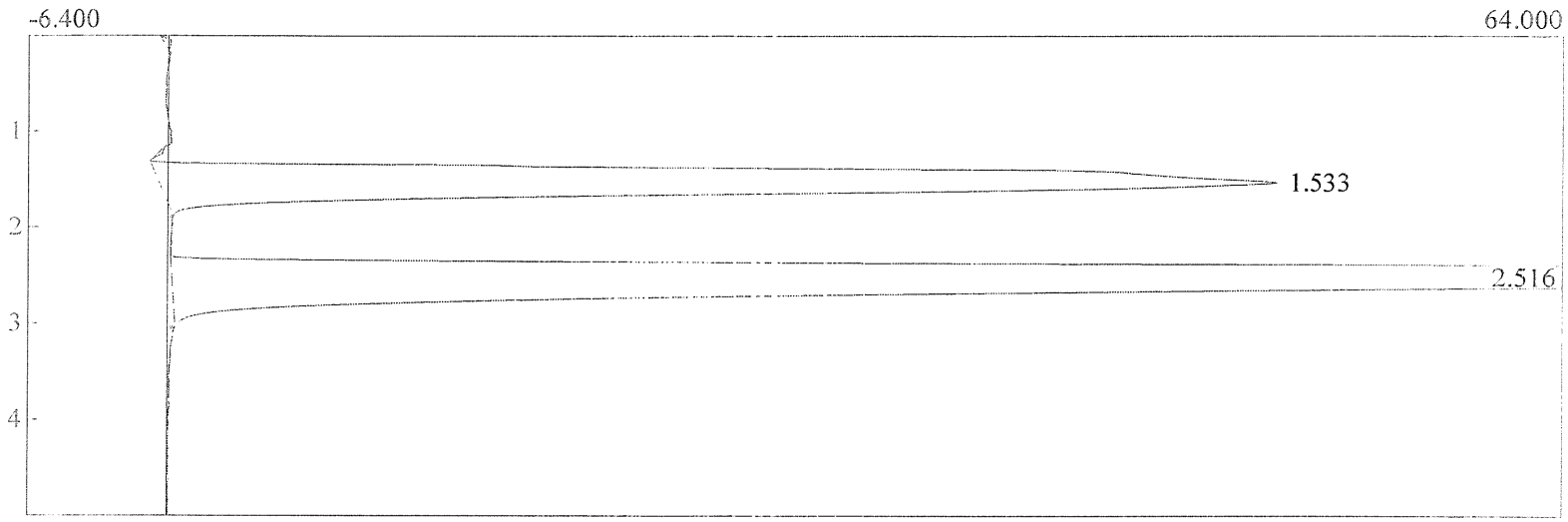
Component	Retention	Height	Area
METHANE	1.516	546.627	8689.4290
ETHANE	2.466	907.578	15640.4760
			24329.9050

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30M
Carrier: HYDROGEN
Sample: 1000 PPM MIX
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



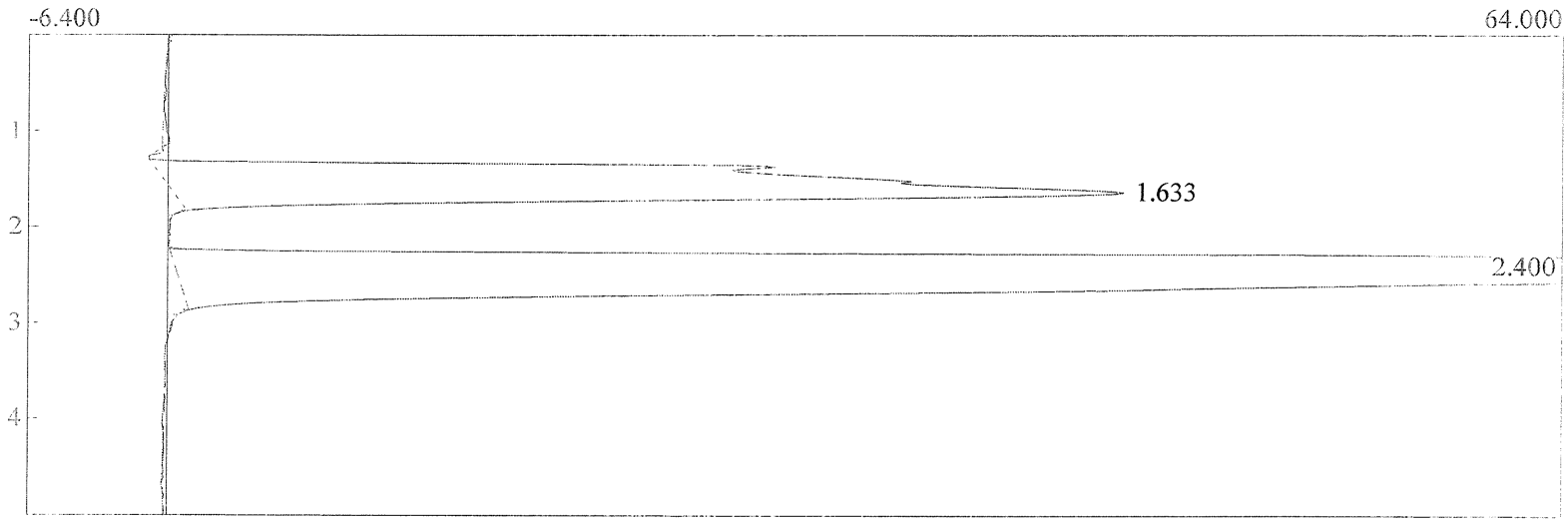
Component	Retention	Height	Area
METHANE	1.500	575.843	8994.8170
ETHANE	2.466	956.606	16147.2505
			25142.0675

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30M
Carrier: HYDROGEN
Sample: 100 PPM MIX
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



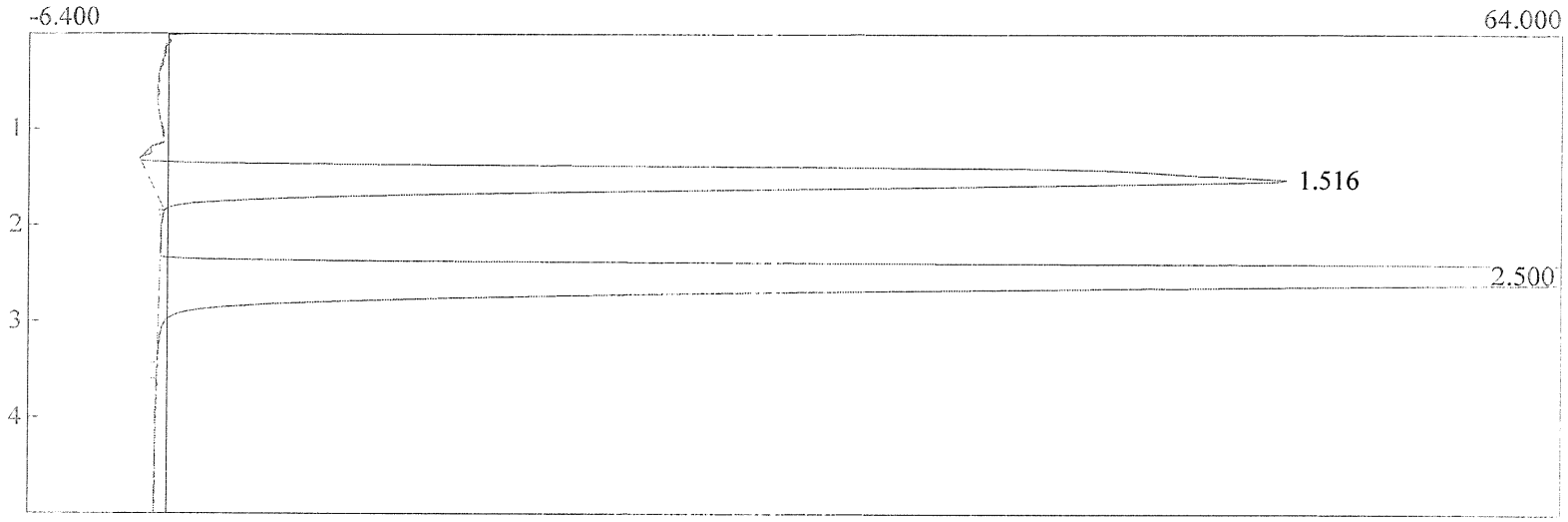
Component	Retention	Height	Area
METHANE	1.533	51.406	843.8140
ETHANE	2.516	103.547	1697.4220
			2541.2360

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 100 PPM M/100 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



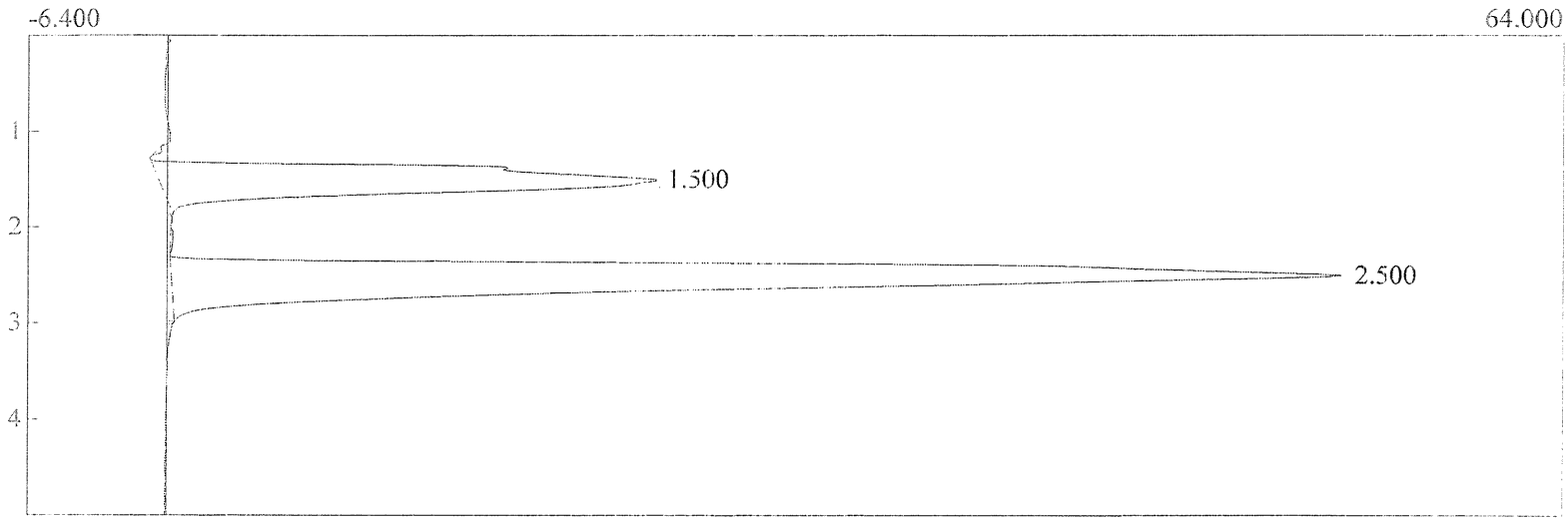
Component	Retention	Height	Area
METHANE	1.633	43.710	819.7470
ETHANE	2.400	77.141	1652.6610
			2472.4080

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30M
Carrier: HYDROGEN
Sample: 100 PPM MIX
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



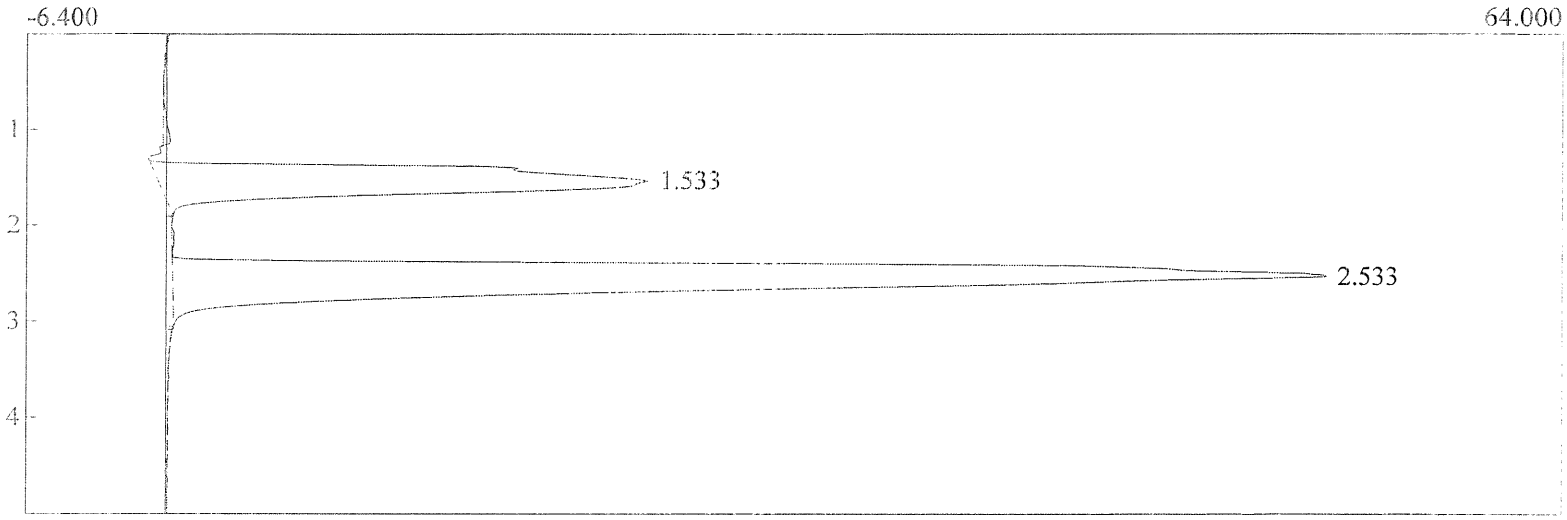
Component	Retention	Height	Area
METHANE	1.516	52.257	757.5340
ETHANE	2.500	103.177	1524.7315
			2282.2655

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 50.9 PPM M/49.4 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



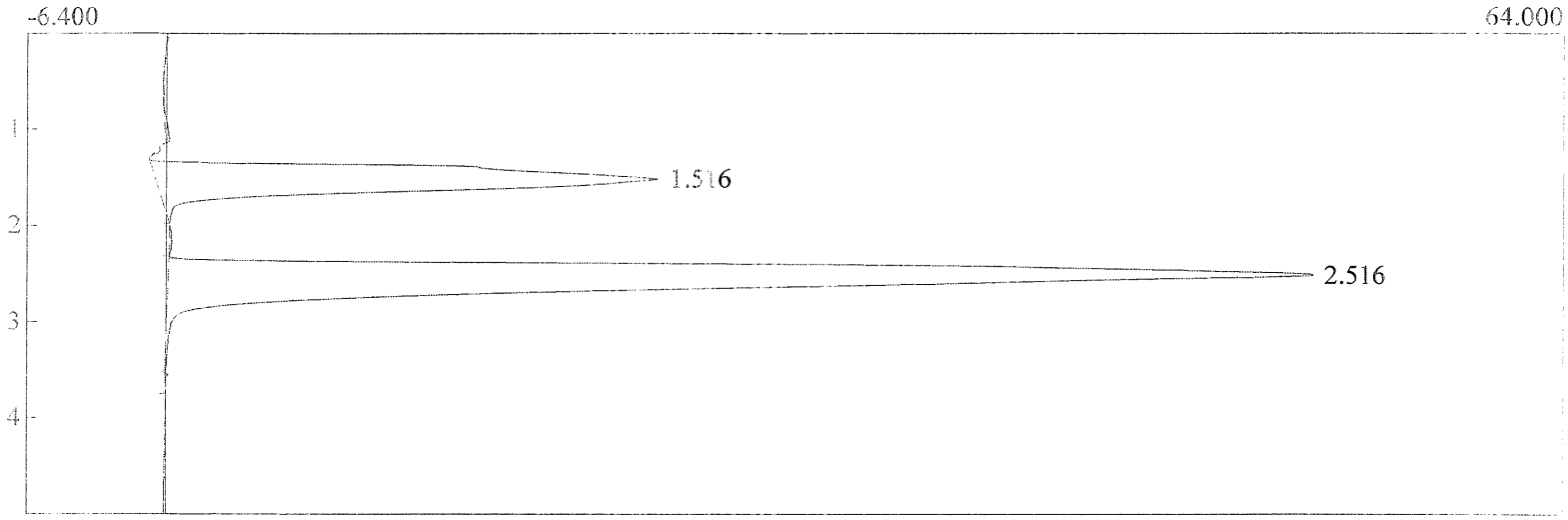
Component	Retention	Height	Area
METHANE	1.500	22.788	375.2990
ETHANE	2.500	53.806	853.2750
			1228.5740

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 50.9 PPM M/49.4 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



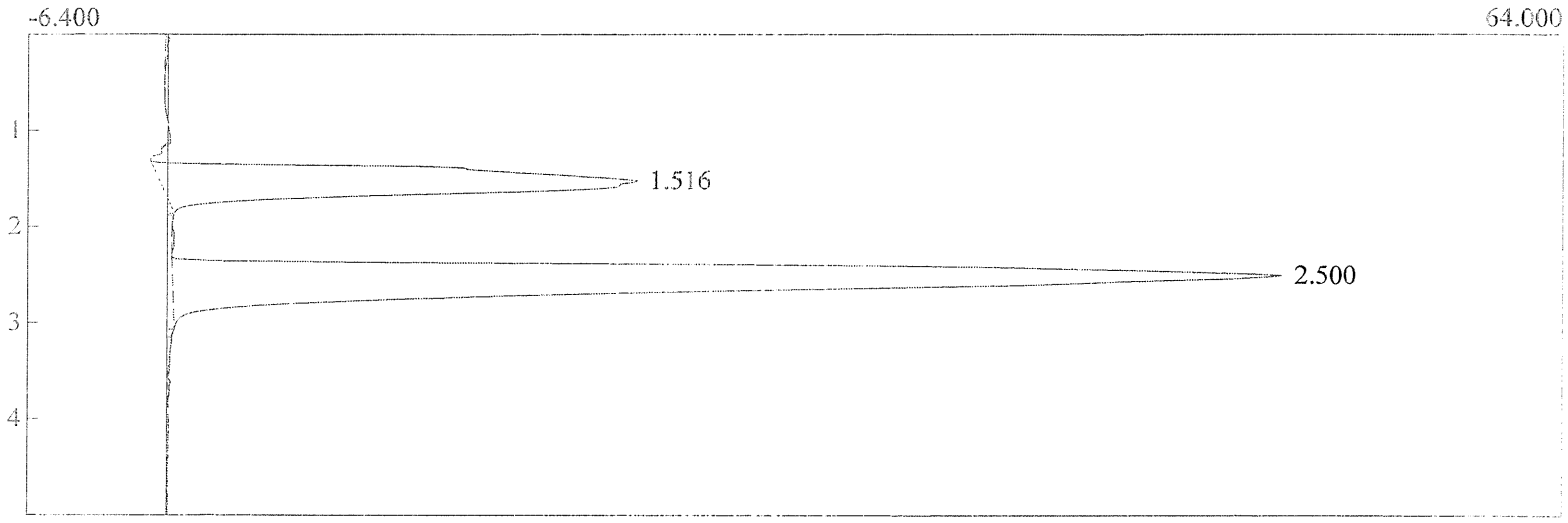
Component	Retention	Height	Area
METHANE	1.533	22.431	380.5780
ETHANE	2.533	52.916	865.5050
			1246.0830

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 50.9 PPM M/49.4 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



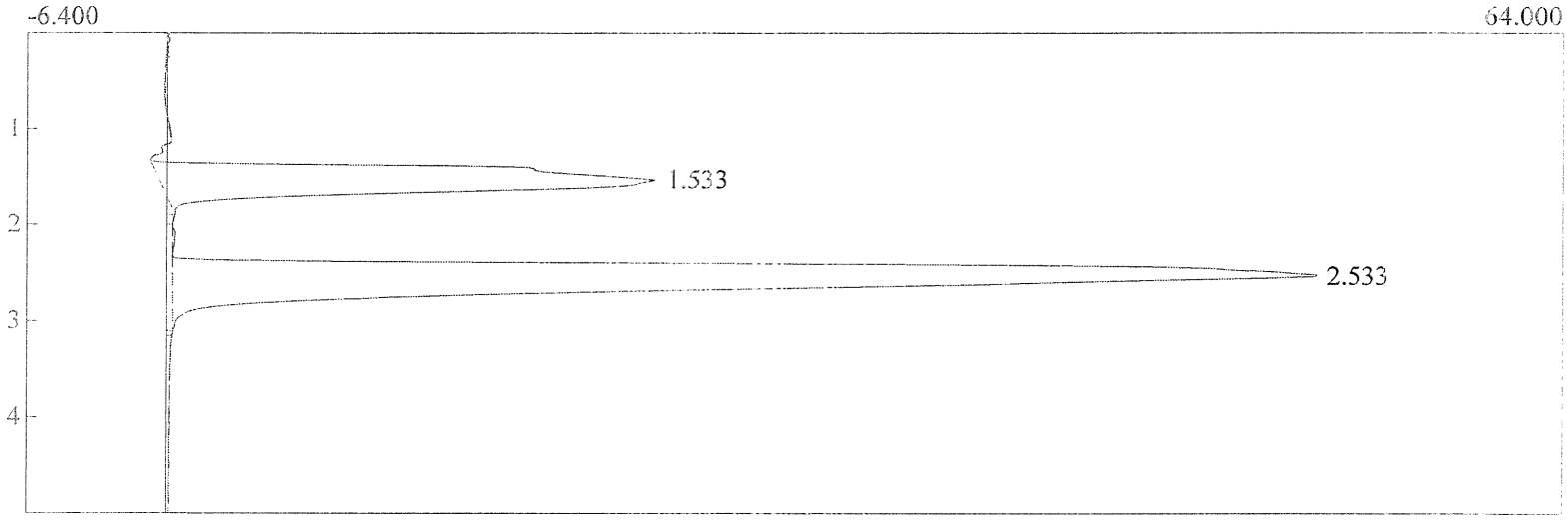
Component	Retention	Height	Area
METHANE	1.516	23.011	349.6910
ETHANE	2.516	52.492	789.4990
			1139.1900

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 50.9 PPM M/49.4 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



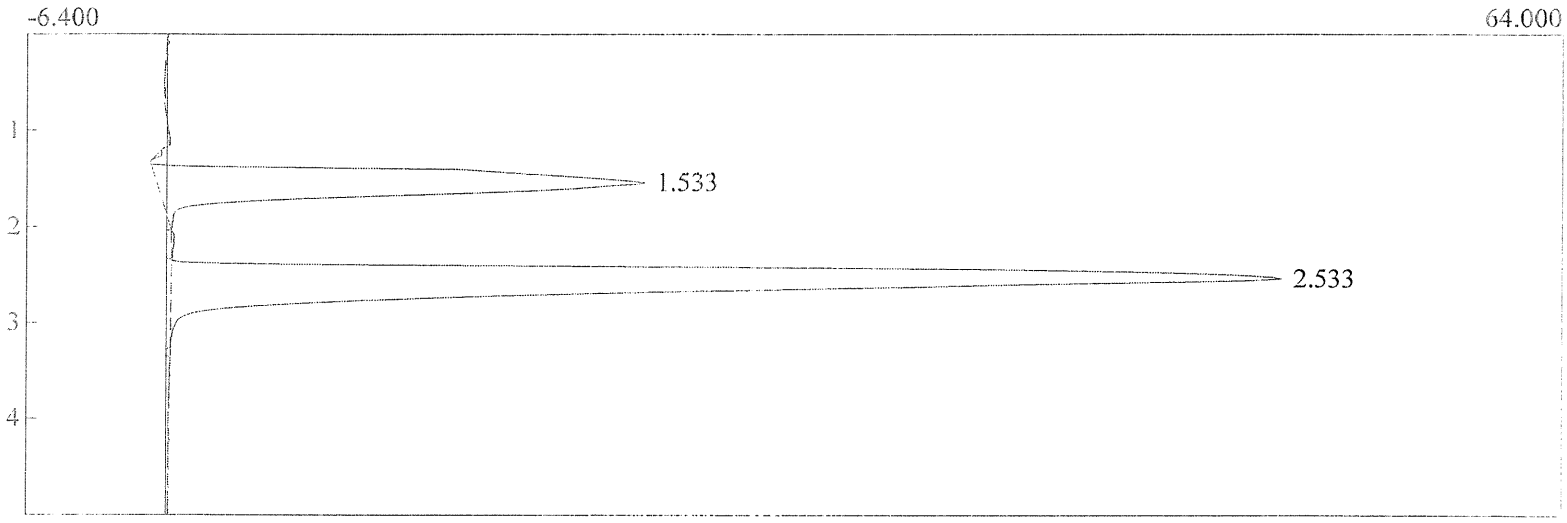
Component	Retention	Height	Area
METHANE	1.516	21.913	368.0970
ETHANE	2.500	50.965	836.7560
			1204.8530

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 50.9 PPM M/49.4 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



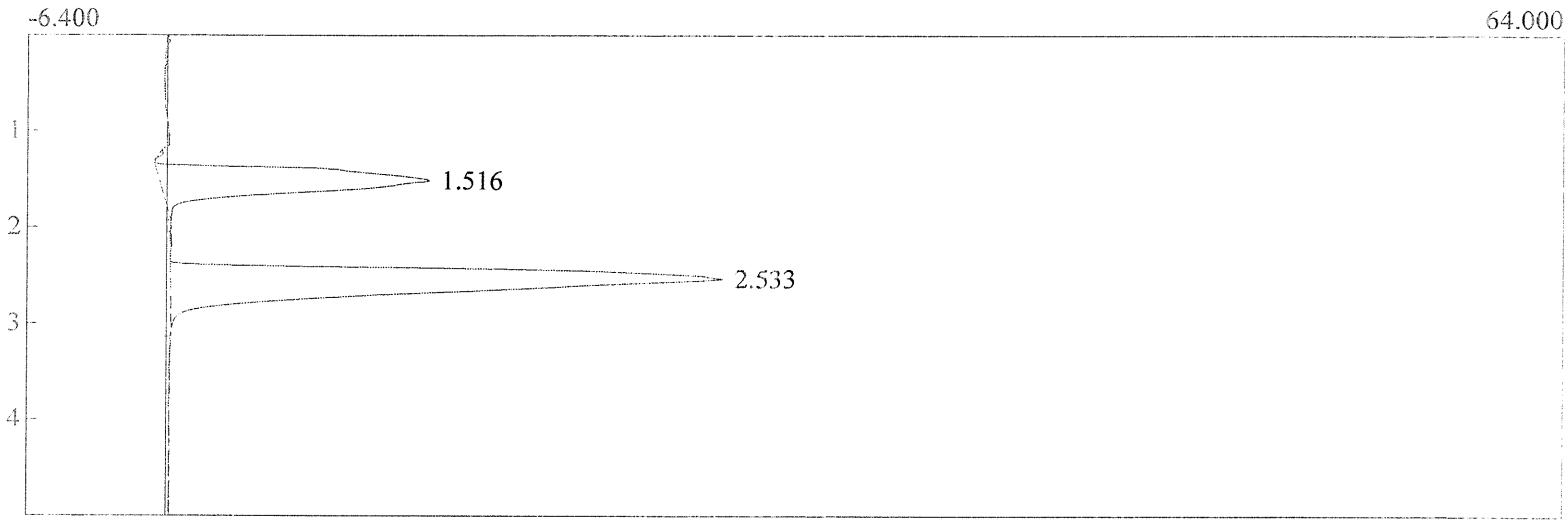
Component	Retention	Height	Area
METHANE	1.533	22.695	366.8690
ETHANE	2.533	52.431	840.9155
			1207.7845

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 50.9 PPM M/49.4 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



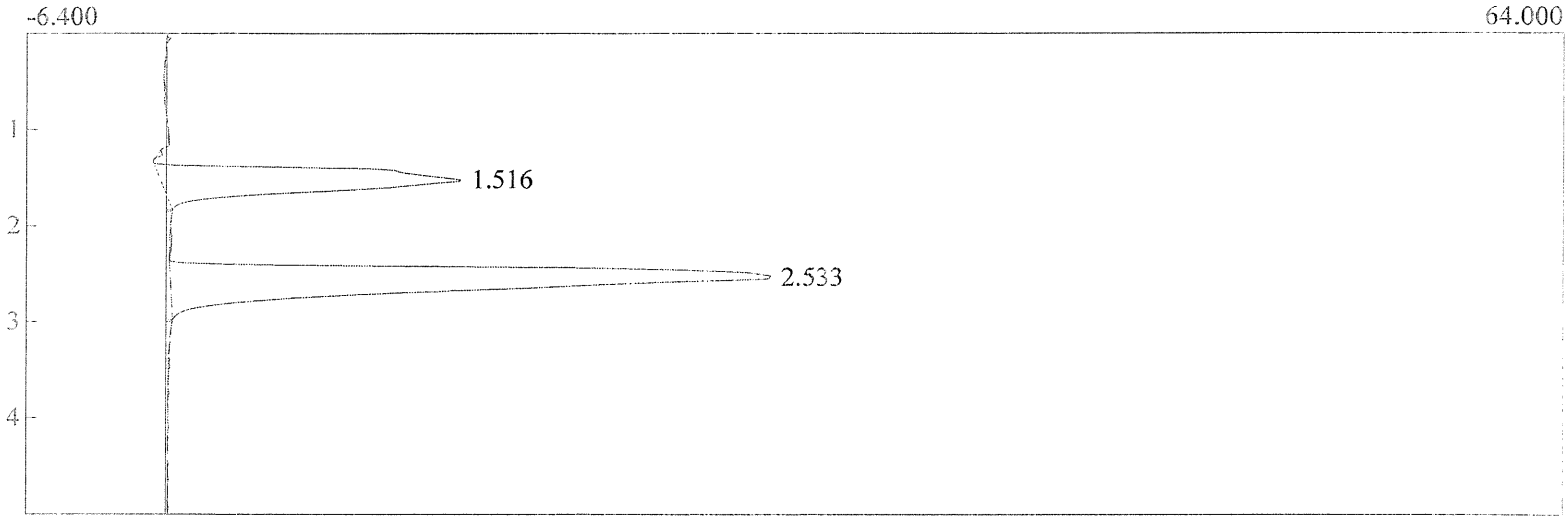
Component	Retention	Height	Area
METHANE	1.533	22.407	347.6940
ETHANE	2.533	50.942	772.1900
			1119.8840

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 25.1 PPM M/24.3 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



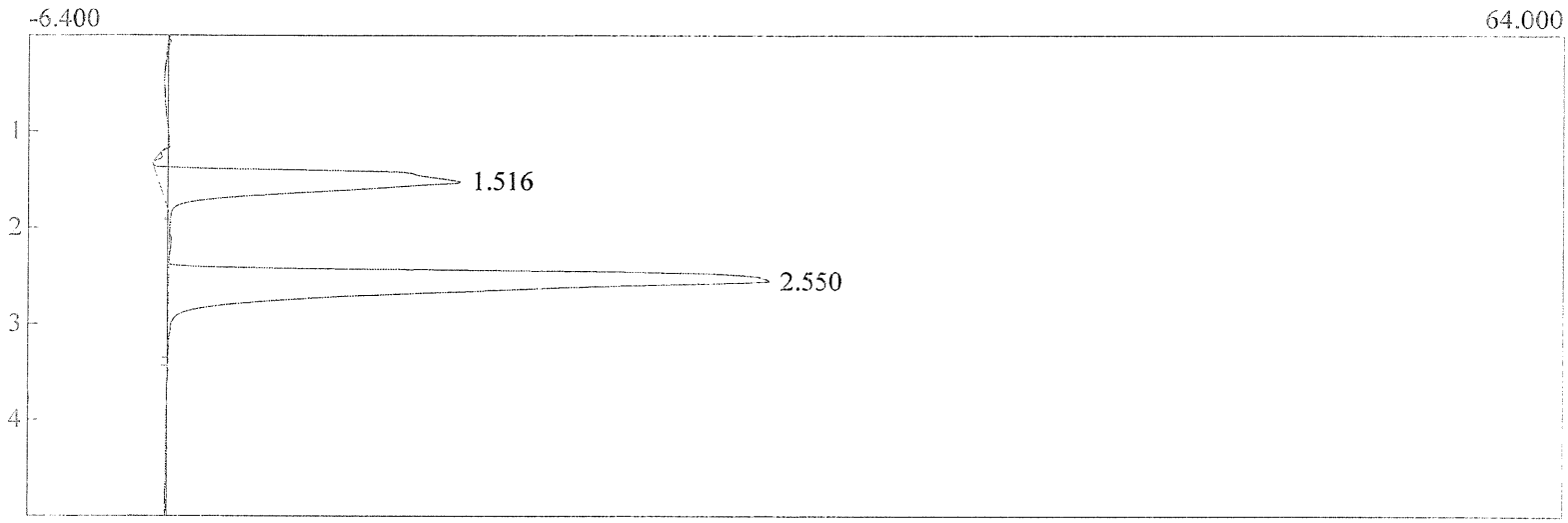
Component	Retention	Height	Area
METHANE	1.516	12.326	182.1280
ETHANE	2.533	25.289	376.9730
			559.1010

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 25.1 PPM M/24.3 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



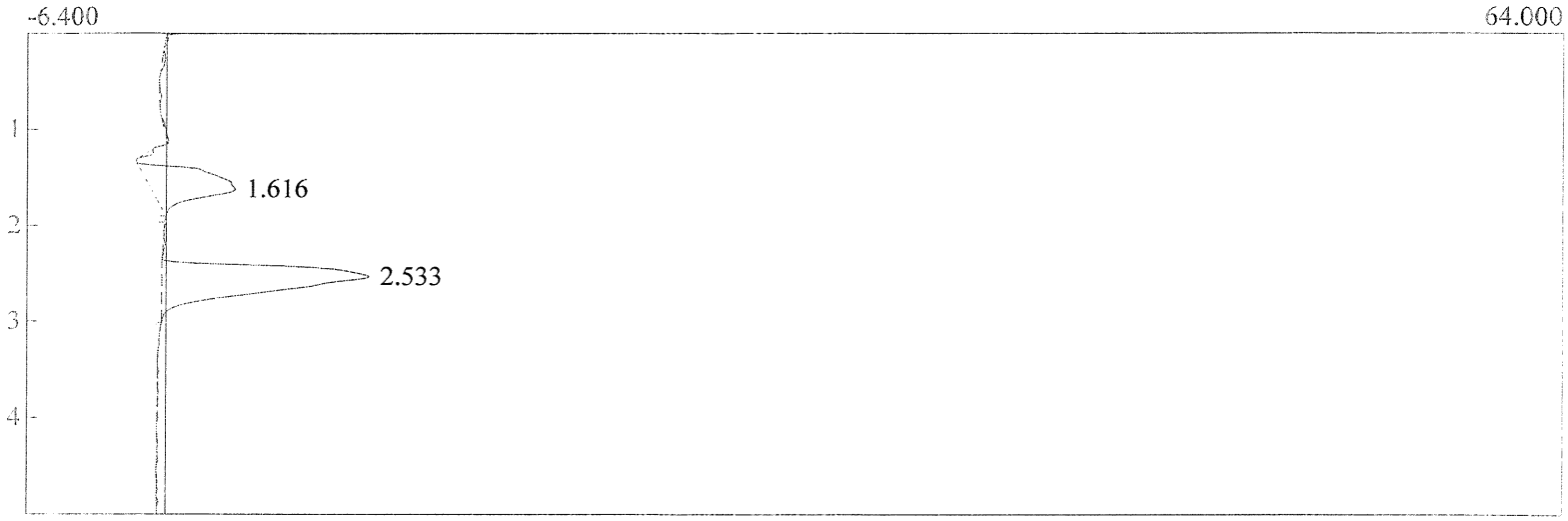
Component	Retention	Height	Area
METHANE	1.516	13.688	196.6525
ETHANE	2.533	27.437	410.6010
			607.2535

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 25.1 PPM M/24.3 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHAN AND ETHANE ANALYSIS



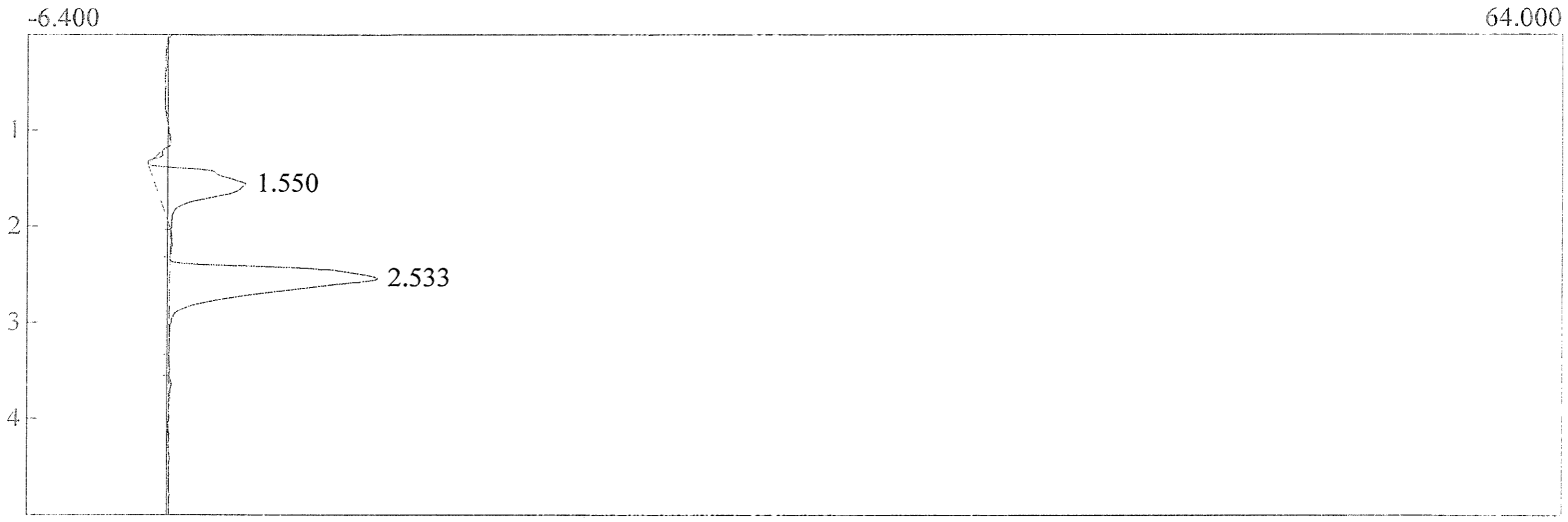
Component	Retention	Height	Area
METHANE	1.516	13.775	186.2145
ETHANE	2.550	27.497	387.1025
			573.3170

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 10.2 PPM M/9.86 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



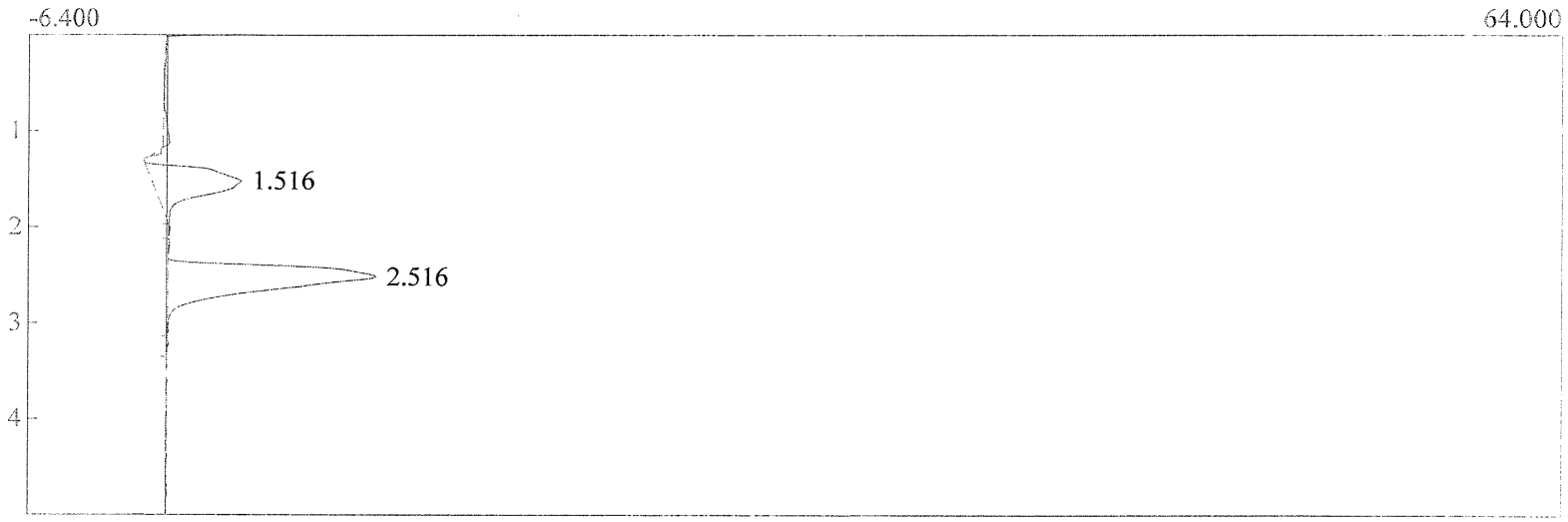
Component	Retention	Height	Area
METHANE	1.616	3.837	72.9540
ETHANE	2.533	9.444	154.8925
			227.8465

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 10.2 PPM M/9.86 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



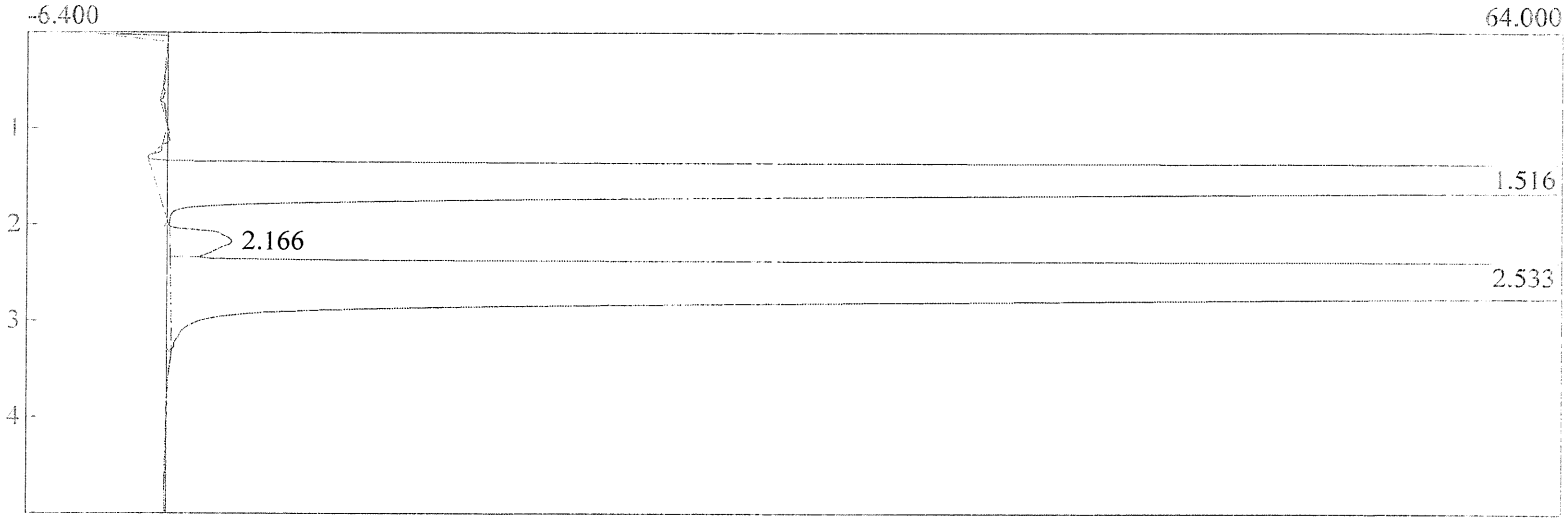
Component	Retention	Height	Area
METHANE	1.550	4.176	75.2380
ETHANE	2.533	9.453	151.9045
			227.1425

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Lab ID: STANDARD
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: 10.2 PPM M/9.86 PPM E
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



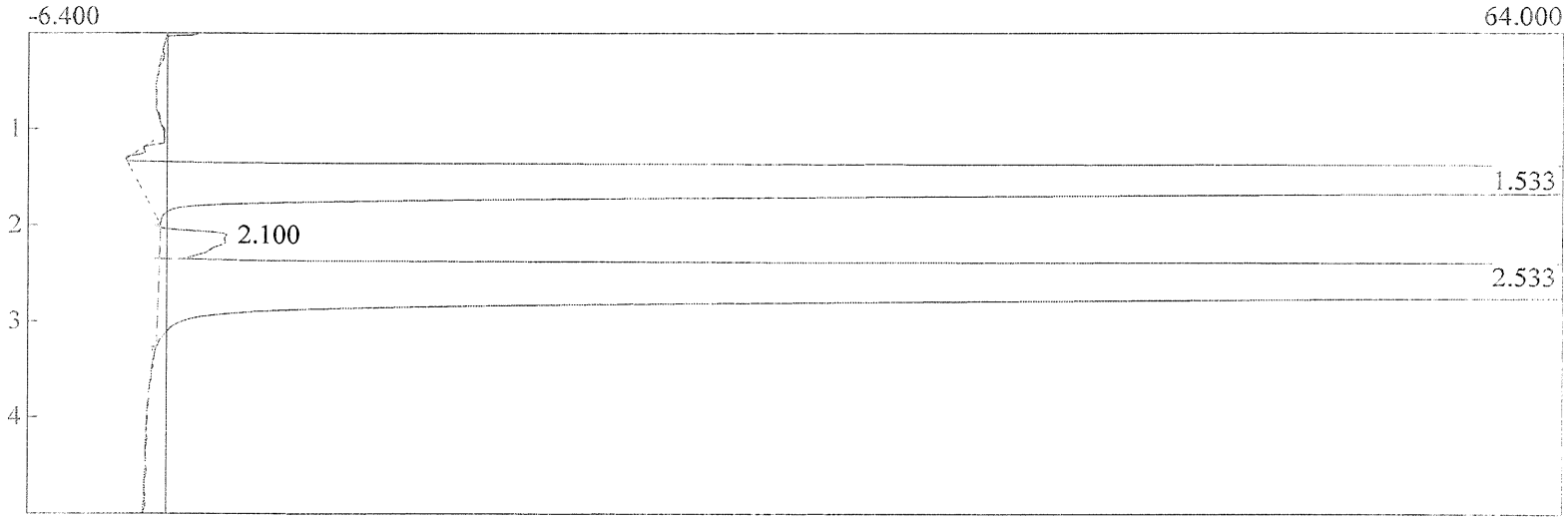
Component	Retention	Height	Area
METHANE	1.516	4.123	72.7975
ETHANE	2.516	9.456	148.3770
			221.1745

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99115
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN ONE
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



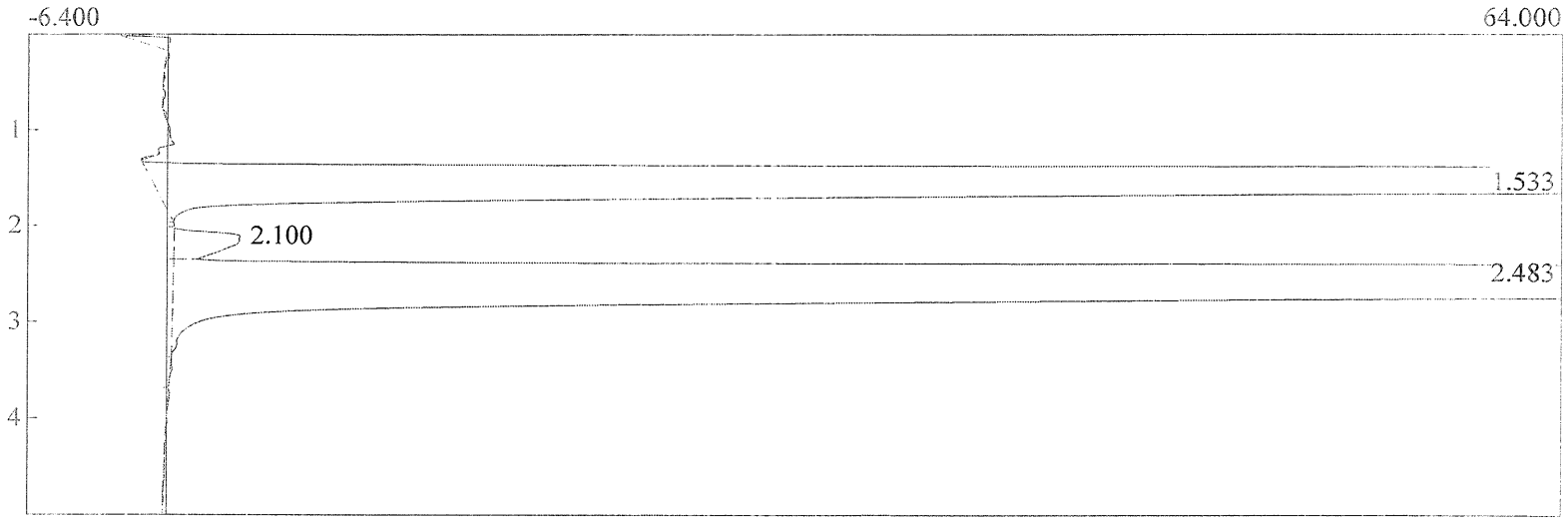
Component	Retention	Height	Area
METHANE	1.516	125.348	2092.9860
ETHANE	2.533	291.354	4796.5260
			6889.5120

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99115
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN ONE
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



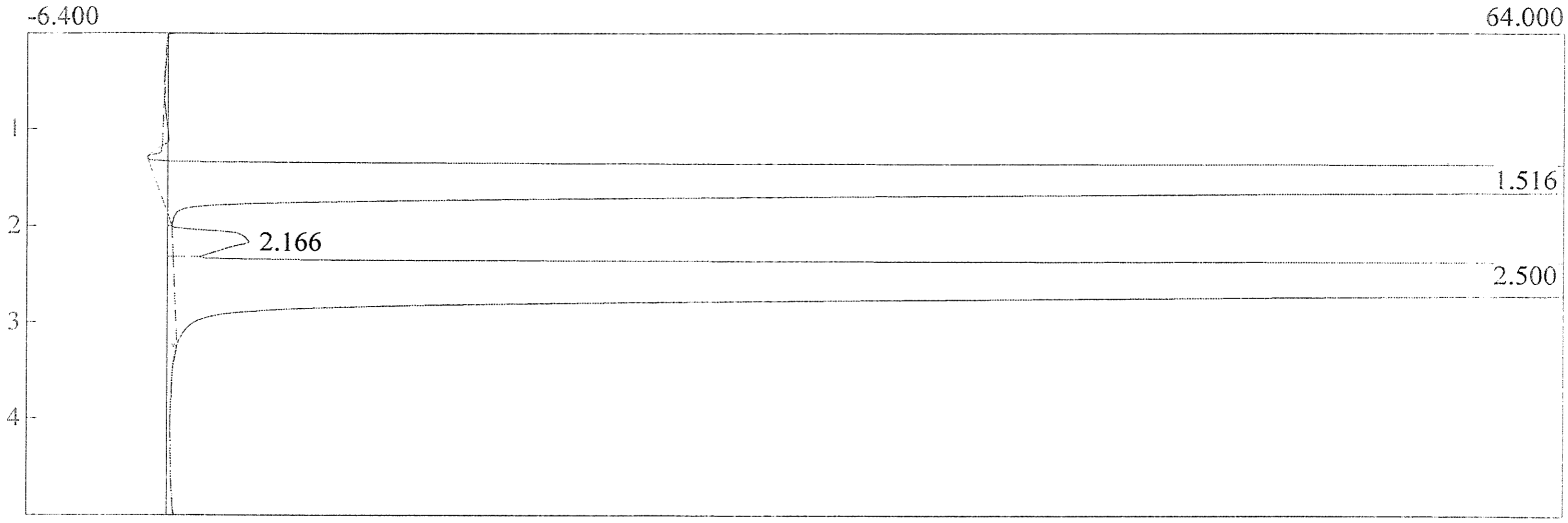
Component	Retention	Height	Area
METHANE	1.533	132.829	2252.8725
ETHANE	2.533	318.111	5201.5755
			7454.4480

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99115
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN ONE
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



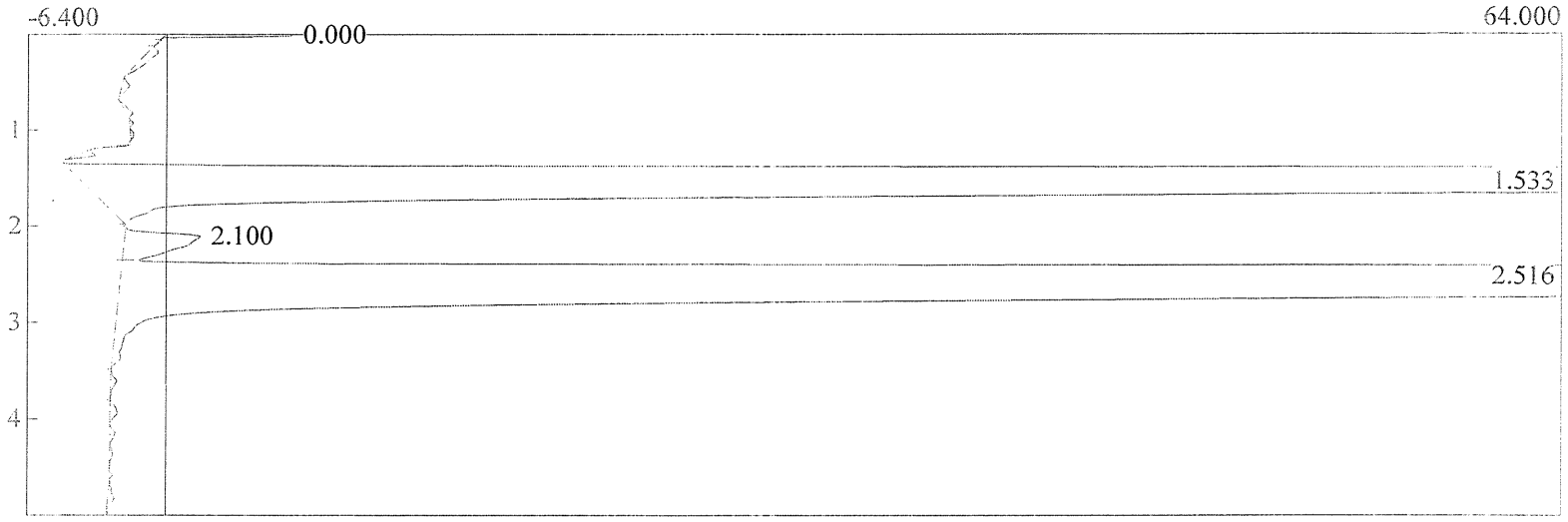
Component	Retention	Height	Area
METHANE	1.533	128.453	2066.7370
ETHANE	2.483	310.571	4741.1315
			6807.8685

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99116
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN TWO
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



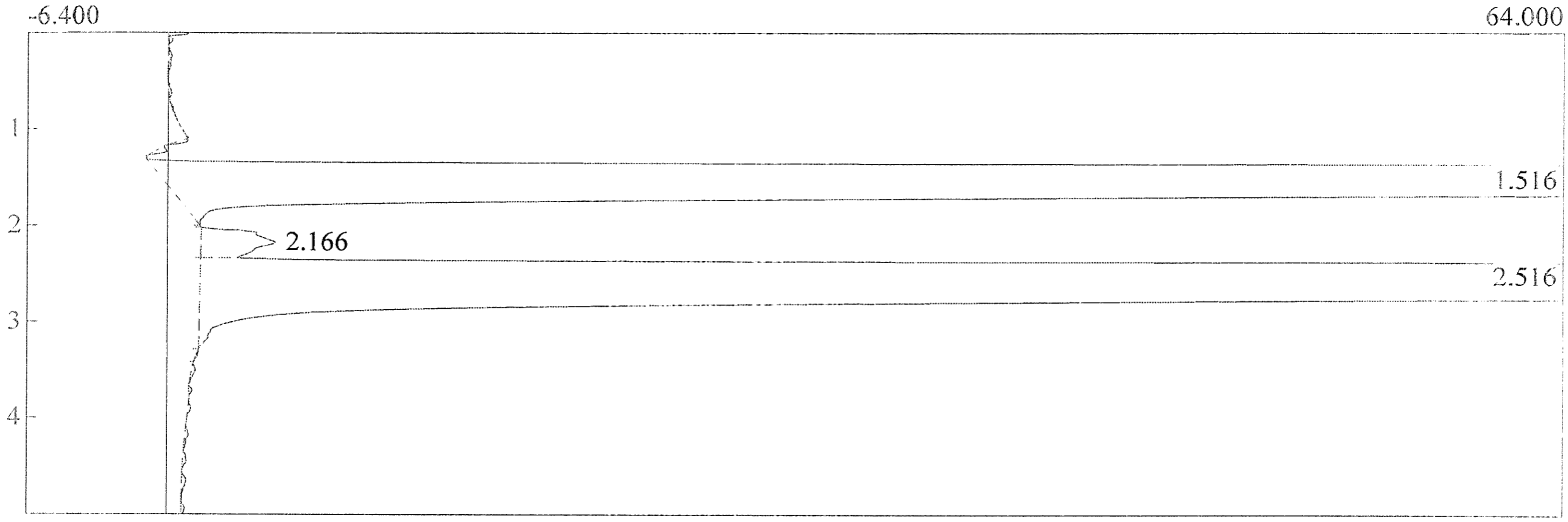
Component	Retention	Height	Area
METHANE	1.516	157.956	2369.7840
ETHANE	2.500	322.253	4803.9330
			7173.7170

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99116
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN TWO
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



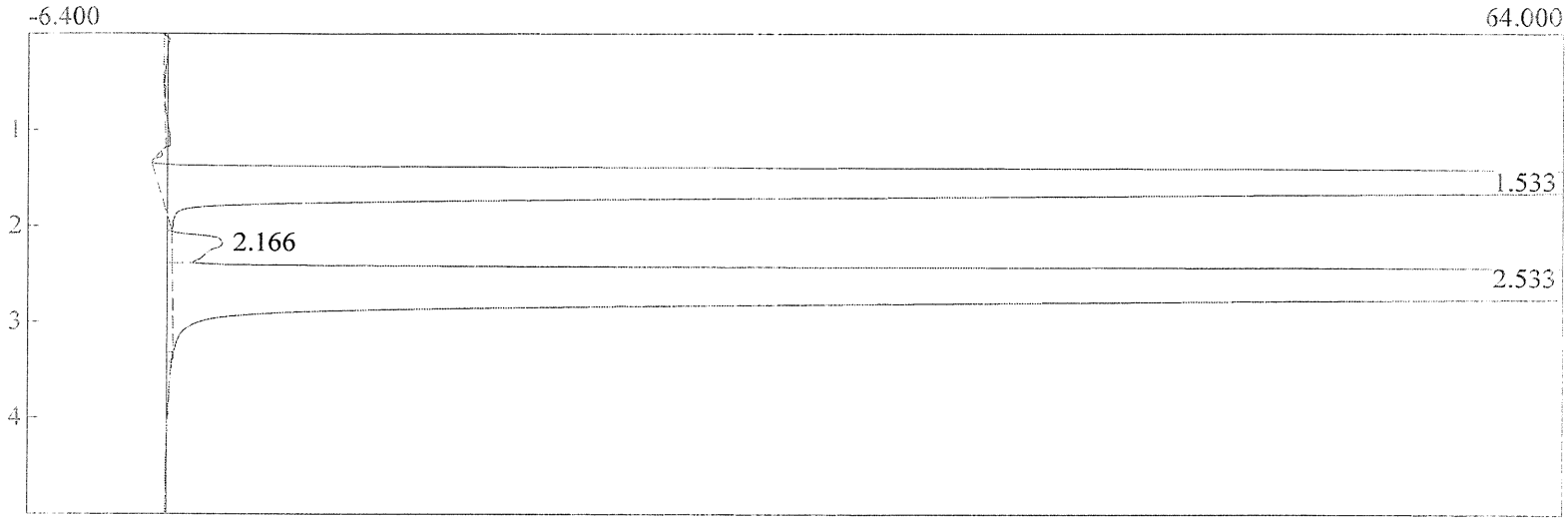
Component	Retention	Height	Area
METHANE	1.533	156.608	2298.2500
ETHANE	2.516	312.679	4583.0460
			6881.2960

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99116
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN TWO
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



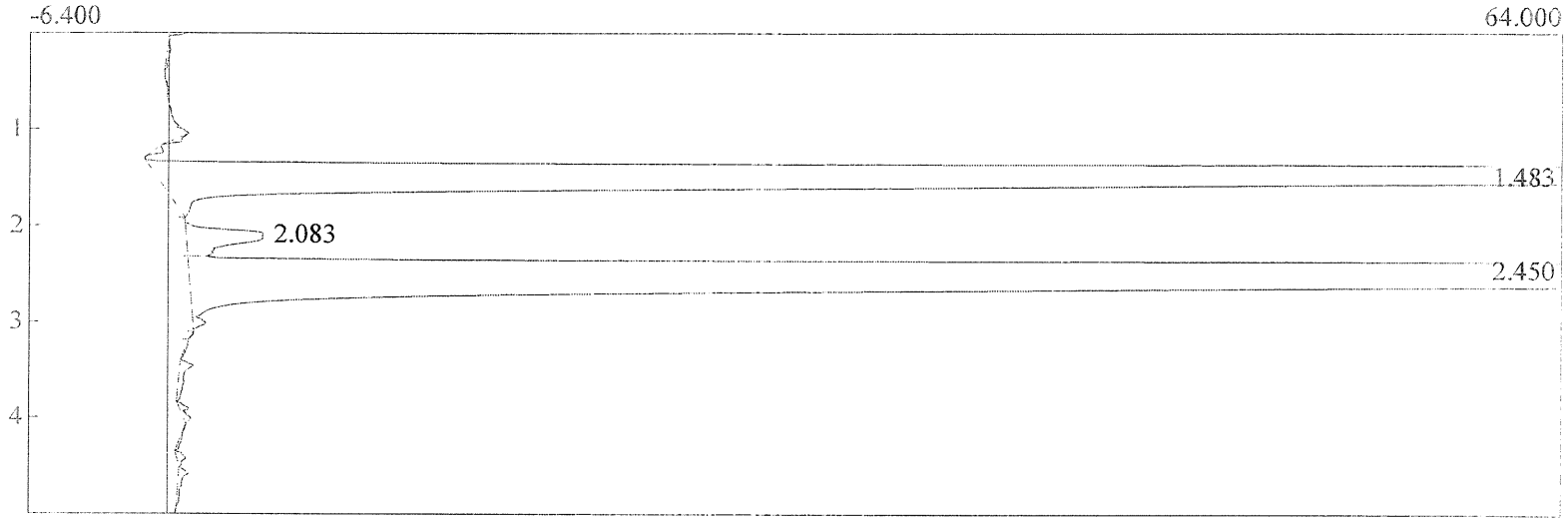
Component	Retention	Height	Area
METHANE	1.516	149.885	2561.8795
ETHANE	2.516	312.708	5170.6675
			7732.5470

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99117
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN THREE
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



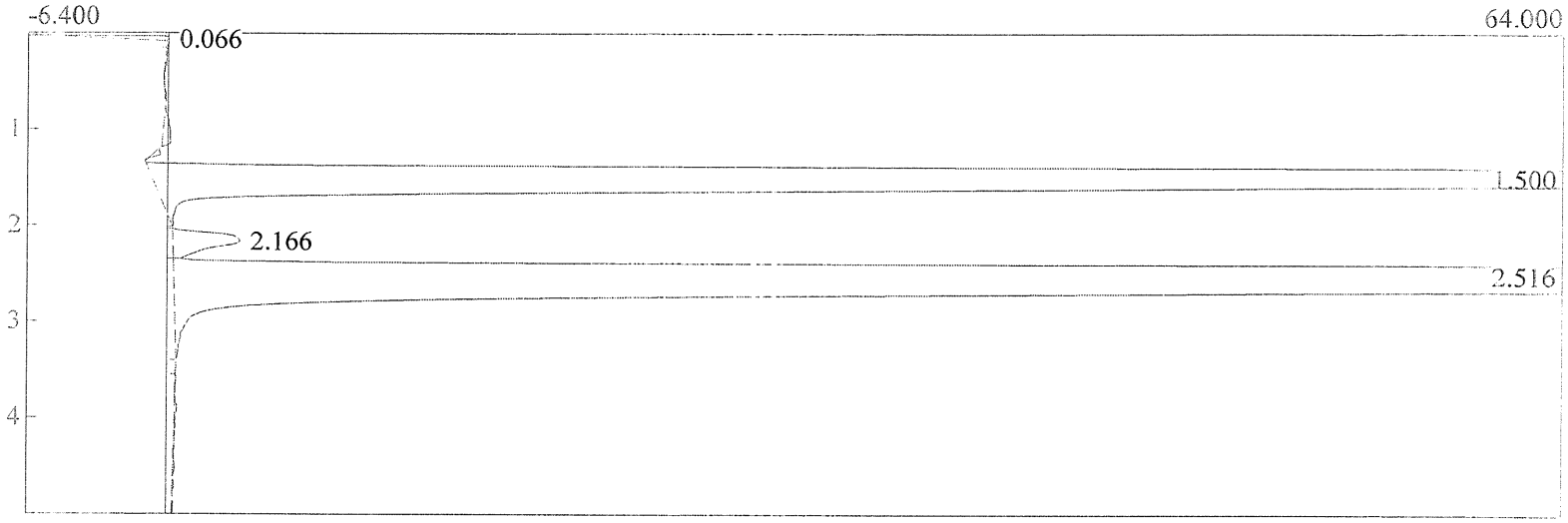
Component	Retention	Height	Area
METHANE	1.533	80.451	1355.1120
ETHANE	2.533	206.477	3242.5960
			4597.7080

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99117
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN THREE
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



Component	Retention	Height	Area
METHANE	1.483	125.032	1436.6380
ETHANE	2.450	328.419	3507.7340
			4944.3720

Lab name: AIR QUALITY SERVICES
Client: AIR/COMPLIANCE
Collected: 12-08-2010
Lab ID: 99117
Description: FID DETECTOR
Column: GSQ 30METER
Carrier: HYDROGEN
Sample: RUN THREE
Operator: MAI BRNA
Comments: JOB #9268
LOW LEVEL METHANE AND ETHANE ANALYSIS



Component	Retention	Height	Area
METHANE	1.500	118.719	1369.5175
ETHANE	2.516	282.153	3324.8250
			4694.3425

M25 Volatile Organic Compounds

NJ NELAP ID - NC004
PADEP Registration #68-3321

RECEIVED JAN 1 0 2011

cc: Eric N.
Jill Kobe

Method 25
Analytical Results

prepared for

AIR/COMPLIANCE CONSULTANTS, INC.
1050 William Pitt Way
Pittsburgh, PA 15238

by

Triangle Environmental Services, Inc.

We, the undersigned, certify to the best of our knowledge that all analytical data presented in this report have been checked for completeness; that the results are accurate, error-free, legible, and have been obtained in accordance with approved protocol; and that all deviations and analytical problems are summarized in the "Comments on the Analyses" page(s).

Approved by:

Wayne A. Stollings
President

Reviewed by:

Donna Nolen-Weathington
Method 25 Supervisor

Report
10195

January 7, 2011

P.O. Box 13294 Research Triangle Park, NC 27709 (800) 367-4862

Triangle Environmental Services, Inc.
COMMENTS ON THE ANALYSES

Report #10195 for Air/Compliance Consultants, Inc.
Project ID: ARG LO-CAT 09-160

Traps Received: 12/10/10 with dry ice
Tanks Received: 12/13/10

Samples Analyzed: 1/1-2/11 on Analyzer B
Client Chain-of-Custody forms: 1 pg

General:

- The analytical system indicates a background concentration of (1) "CO" due to the interference of O_2 resulting from the coelution of O_2 and CO and (2) CO_2 due to CO_2 and organic compounds in the recovery carrier gas. The CO, CO_2, and condensibles concentrations in the report are calculated using a "blank" correction, which results in a more accurate reporting and a better comparison of these concentrations in the analyses.

- The presence of organic compounds in the sample tank that should have condensed in the dry ice trap **may** result in an underreporting of those compounds (especially if oxygenated).

- A concentration of noncondensibles or condensibles of less than the RL is considered to be zero in computing the TGNMO.

All samples: All post-test tank pressure/temperature ratios agreed with the lab receipt pressure/temperature ratios within ± 4%.

Sample #1: When recovering the condensible portion of a sample, scientific-grade air is passed through the trap heated to 250 °C into an intermediate collection vessel. The collection is normally stopped when the CO_2 concentration in the trap effluent drops below 10 ppmC. For this sample, recovery was stopped when the concentration was ≈11 ppm. This may have an effect on the reported concentrations.

Triangle Environmental Services, Inc.

METHOD 25 TABLE OF RESULTS

Client: Air/Compliance Consultants, Inc. ID#10195 Analyzed: 1/1-2/11

Project ID: ARG LO-CAT 09-160

	Sample Description	Concentrations (ppmC)						Mass Conc. (mgC/cu.m)
		CO	CH4	CO2	Noncon-densibles	Conden-sibles	TGNMO	
1	Run 1 ARG LO-CAT	< 11	320	3511	2219	142	2361	1179
2	Run 2 ARG LO-CAT	< 12	312	2610	2140	137	2277	1137
3	Run 3 ARG LO-CAT	< 10	321	1359	2105	175	2281	1139

< # = Concentration Below Report Limit

* Please refer to the "Comments on the Analyses" page of the report for additional information.

Triangle Environmental Services, Inc.
METHOD 25 PROCEDURES

Report #10195

CALIBRATION

The calibrations satisfy the requirements for Methods 25, 25-C, and 10-B.

Triplicate injections of a calibration gas mixture consisting of carbon monoxide (≈200 ppm), methane (≈50 ppm), carbon dioxide (≈10,000 ppm), and propane(≈20 ppm) are made immediately before and after each batch of samples. Daily response factors are calculated from the pre-batch integrated responses (average area count / concentration in ppmC) and must agree within 10% of the response factors of the initial calibrations. Further, the post-batch response factors must agree within 2% of the pre-batch response factors. Both criteria must be met before the analyses are considered valid.

CONDENSATE RECOVERY

To flush the trap of CO_2, hydrocarbon-free air is flushed through the trap maintained at -78 °C into the sample tank until less than 10 ppm CO_2 is detected in the flow stream (the concentration of CO_2 is monitored with an NDIR CO_2 detector and measured using a CO_2 analyzer). The sample tank is pressurized to about 1200 mm Hg for analysis and is replaced with an intermediate collection vessel (ICV).

To oxidize the organic material in the trap, hydrocarbon-free air is then passed through the trap heated to 250 °C and the recovery oxidation catalyst into the ICV until less than 10 ppm CO_2 is detected in the flow stream. The ICV is pressurized to about 1200 mm Hg for analysis.

ANALYSIS

All samples, which include the daily calibration gas mixture, sample tanks, and ICVs, are analyzed in triplicate using a computer-interfaced gas chromatograph equipped with an automated gas sampling system and a flame ionization detector (FID). CO, CH_4, and CO_2 are eluted from the Unibead 1S-Carbosieve G column and pass through the analytical oxidation and reduction catalyst to the FID. The column is then backflushed to elute the nonmethane organic (NMO) fraction, which passes through the analytical oxidation and reduction catalysts to the FID.

CALCULATIONS

Calculations are done in accord with USEPA Method 25 procedures. A sample calculation for one of the samples is provided in the report. CO and CO_2 blanks are used to compensate for a background concentration of (1) "CO" due to the interference of O_2 resulting from the coelution of O_2 and CO and (2) CO_2 due to CO_2 and organic compounds in the recovery carrier gas. A concentration of noncondensibles or condensibles of less than the RL is considered to be zero in computing the TGNMO.

EQUIPMENT

Tanks and ICVs are at a minimum twice evacuated and filled with ambient air filtered through charcoal and are then evacuated to below 10 mm Hg and monitored for at least an hour to check that the tanks do not leak more than 1 mm Hg/hour. They are then pressurized to greater than ambient pressure with helium, analyzed to ensure < 2 ppmC NMO, and stored for later use.

Traps are flushed at 300 °C for at least 30 minutes with compressed air. Each trap is then flushed at 350 °C for thirty minutes with hydrocarbon-free air. The effluent is then routed through an oxidation catalyst and a reduction catalyst for analysis by FID-GC to confirm less than 10 ppmC total C.

Sampling units are reconditioned by replacing filters and checking that all sections operate properly. The unit is heated (with a PTFE line used in place of a trap) and is flushed with zero air for at least thirty minutes before an aliquot of this flow is injected into the analyzer. If the total carbon concentration is below 10 ppm, the unit is made ready for use and stored for shipment.

Certifications:

South Coast Air Quality Management District: ID# 94 LA 0401
New Jersey NELAP ID: NC004
Pennsylvania DEP: Registration #68-3321

Triangle Environmental Services, Inc.

METHOD 25 SAMPLE CALCULATION

Client: Air/Compliance Consultants, Inc. ID#10195 Analyzed: 1/1-2/11

Project ID: ARG LO-CAT 09-160

Sample # 1 Run 1 ARG LO-CAT

D A T A

Note: All pressure values have been converted when necessary to mm Hg and all temperature values to Kelvin.

Pressure, Temperature, Volume Data:

	Pressure (mm Hg)	Temp. (K)
Presampling	2.0	294.26
Postsampling	533.9	266.48
Lab Receipt	590.0	299.15
Tank Final	1197.0	299.15
CV Final	1528.0	299.15

Tank 259:
Tank Volume = 0.008390 cu.m

Trap BRT →
Collection Vessel 14:
CV Volume = 0.008349 cu.m

Response Factors (RF), Report Limits (RL), and Area Counts:

	RF (area/ppmC)	RL (ppmC)	Area 1	Area 2	Area 3
CO	296.2	11	739	743	739
CH4	299.8	7	48,008	47,811	47,750
CO2	308.0	7	541,702	540,382	539,508
Noncondensibles	286.6	5	317,948	316,295	317,645
Condensibles	308.0	8	18,295	18,014	18,002

CO Blank = 5 area counts CO2 Blank = 3 ppm

C A L C U L A T I O N S

Measured Concentrations, corrected for blank (ppmC):

Cm(CO) = [Area(CO) - CO Blank] / RF(CO)
= [739 - 5] / 296.2 = 2.5
= [743 - 5] / 296.2 = 2.5
= [739 - 5] / 296.2 = 2.5

Cm(CH4) = Area(CH4)/RF(CH4)
= 48008 / 299.8 = 160.1
= 47811 / 299.8 = 159.5
= 47750 / 299.8 = 159.3

Cm(CO2) = Area(CO2)/RF(CO2) - CO2 Blank
= 541702 / 308.0 - 3 = 1755.8
= 540382 / 308.0 - 3 = 1751.5
= 539508 / 308.0 - 3 = 1748.6

Triangle Environmental Services, Inc. Method 25 Sample Calculation (p. 2)
ID#10195

Cm(Noncondensibles) = Area(Noncondensibles)/RF(Noncondensibles)
= 317948 / 286.6 = 1109.4
= 316295 / 286.6 = 1103.6
= 317645 / 286.6 = 1108.3

Cm(Condensibles) = Area(Condensibles)/RF(Condensibles) - CO2 Blank
= 18295 / 308.0 - 3 = 56.4
= 18014 / 308.0 - 3 = 55.5
= 18002 / 308.0 - 3 = 55.4

Pressure-Temperature Ratio, Q(i) = P(i)/T(i) (mm Hg/K):

Tank Presampling: Q(2) = 2.0 / 294.26 = 0.007
Tank Postsampling: Q(1) = 533.9 / 266.48 = 2.004
Tank Lab Receipt: Q(5) = 590.0 / 299.15 = 1.972
Tank Final: Q(3) = 1197.0 / 299.15 = 4.001
CV Final: Q(4) = 1528.0 / 299.15 = 5.108

Volume Sampled (dscm) = 0.3857 x Tank Volume x [Q(1)-Q(2)]
= 0.3857 x 0.008390 x [2.004 - 0.007]
= 0.006461

Averages and % Relative Standard Deviations (%RSD) of Cm's are calculated.
(%RSD of C=%RSD of Cm)

Calculated Concentrations (ppmC):

C(CO) = Q(3)/[Q(1)-Q(2)] x Cm(CO)
= 4.001/(2.004 - 0.007) x 2.5 = 5.0 (<RL of 11)

C(CH4) = Q(3)/[Q(1)-Q(2)] x Cm(CH4)
= 4.001/(2.004 - 0.007) x 159.6 = 319.9

C(CO2) = Q(3)/[Q(1)-Q(2)] x Cm(CO2)
= 4.001/(2.004 - 0.007) x 1752.0 = 3511.0

C(Noncondensibles) = Q(3)/[Q(1)-Q(2)] x Cm(Noncondensibles)
= 4.001/(2.004 - 0.007) x 1107.1 = 2218.7

C(Condensibles)
= Volume(CV)/Volume(Tank) x Q(4)/[Q(1)-Q(2)] x Cm(Condensibles)
= 0.008349/0.008390 x 5.108/(2.004 - 0.007) x 55.8 = 142.0

Total Gaseous Non-Methane Organics(TGNMO)=C(Noncondensibles)+C(Condensibles)
= 2218.7 + 142.0
= 2360.7

Mass Concentration (mgC/cu.m)
= 0.4993 x TGNMO
= 0.4993 x 2360.7 = 1178.7

<RL of ### = Concentration Below Report Limit

Triangle Environmental Services, Inc.
METHOD 25 SAMPLE QA/QC DATA

Report #10195

DAILY RECOVERY SYSTEM CHECKS

11.1.1.1* **Condensate Recovery System Leak Check**

Evacuate system to ≤10 mm Hg absolute pressure, isolate system, and monitor for ten minutes.

Requirement: Pressure Change ≤3 mm Hg

11.1.1.2* **Condensate Recovery System Background Test**

Analyze recovery system effluent for CO_2 concentrations.

Requirement: CO_2 ≤ 10 ppm

11.1.1.3* **Condensate Oxidation Catalyst Efficiency Check** (Initial Check: 10.1.1.2)

Analyze 1% methane standard through oxidation catalyst.

Requirement: $CO_2 = CH_4$ concentration ± 4%

DAILY ANALYZER CHECKS

10.2* **Daily Calibration**

Response Factor Checks

Requirement: Daily RF = Initial RF ± 10%

Triplicate injections of a mixture of CO, CH_4, CO_2, and C_3H_8 are made before and after each batch of samples.

See the individual sample data sheet for the daily response factor.

10.1.2.3* **Initial Calibration/Linearity**

Triplicate injections of a calibration gas is made for each compound at four levels:

	Nominal Concentrations (ppm)				Initial RF for Analyzer A 10/22/10	Initial RF for Analyzer B 11/29/10
CO	5	200	1000	5000	175.65	292.07
CH_4	3	50	500	10,000	181.49	303.40
CO_2	3	50	500	10,000	173.94	300.00
propane	2	20	3000	10,000	178.80	299.09

* USEPA Method 25 Protocol (2000) Reference Number

Report #10195

INITIAL CONDENSATE RECOVERY SYSTEM CHECKS

10.1.1.1* **Carrier Gas and Auxiliary Gas Blank Check**

Requirement: $CO + CH_4 + CO_2 + NMO \leq 5$ ppm

10.1.1.3* **System Performance Check** March 1-8, 2000; Recovery Systems #1, 2, 3, 4

Volume Injected	Compound	Average % Recovery				% RSD			
50 µL	Hexane	101.0	102.0	98.8	104.6	0.058	0.101	1.680	0.229
50 µL	Decane	97.0	100.0	103.3	103.3	0.120	0.047	0.092	0.359
10 µL	Hexane	104.0	101.8	103.9	96.8	0.118	0.827	0.131	0.845
10 µL	Decane	98.0	97.0	99.6	99.0	0.119	0.232	1.360	0.092
	Requirement:	100 ± 5%				≤2%			

INITIAL NMO ANALYZER PERFORMANCE CHECKS

10.1.2.1* **Oxidation Catalyst Efficiency Check** Analyzer A, 4/8/98; Analyzer B, 4/21/98

FID response with reduction catalyst in bypass mode = 0, 0
Requirement: ≤1%

10.1.2.2* **Reduction Catalyst Efficiency Check** Analyzer A, 4/8/98; Analyzer B, 4/21/98

Response of CH_4 with oxidation and reduction catalysts in series mode and response with both catalysts in bypass mode to be within 5% of the average:
1.05 x Average Response > Response > 0.95 Average Response
or Higher Response/Lower Response < 1.105263
100.0%, 100.0% Requirement: < 110.5%

* USEPA Method 25 Protocol (2000) Reference Number

Report #10195

10.1.2.3* **Analyzer Linearity Check+NMO Calibration** Analyzer A, 10/22/10;Analyzer B, 11/29/10

	$100\times(1-RF/RF_{average})$	Requirement:
max. dev. CO:	+1.876%,-1.989%	± 2.5%
max. dev. CH_4:	-1.775%,+2.455%	± 2.5%
max. dev. CO_2:	+1.738%,-2.176%	± 2.5%
max. dev. NMO:	+2.427%,+1.914%	± 2.5%
max. %RSD:	1.67%, 1.73%	≤ 2%
$\frac{RF\ (NMO)}{RF\ (CO_2)}$ =	0.97, 1.00	1.0 ± 0.1

10.1.2.4* **System Performance Check** Analyzer A, 4/8/98; Analyzer B, 4/21/98, 5/1/98

	Measured Value, Expected Value		Requirement
	Analyzer A	Analyzer B	
Propane in Mix	19.6, 20.0	20.22, 20.0	± 5%
Hexane	50.6, 51.6	51.6, 51.6	± 5%
Toluene	20.3, 20.0	19.34, 20.0	± 5%
Methanol	104.5, 109.1	109.55, 109.0	± 5%

EQUIPMENT CHECKS

8.1.1* **Clean Sampling Equipment Check**

Sample Unit	ppmC total HC	@ 100%
Trap	ppmC total HC	@ 100%
Tank	ppmC NMO	@ 100%

8.1.2* **Sample Tank Evacuation and Leak Check**

Tank evacuated to ≤10 mm Hg absolute pressure, monitored for ≥1 hour, and passed for use if no pressure change (< 1 mm Hg/hr) is noted.

10.3* **Sample Tank and ICV Volumes**

Tank weighed empty, filled with deionized distilled water (temperature recorded), and weighed to the nearest 2 g. Volume calculated based on density of water at that temperature and results recorded in permanent file.

* USEPA Method 25 Protocol (2000) Reference Number

Triangle Environmental Services, Inc.
CALIBRATION DATA FOR THE ANALYSES

Client: Air/Compliance Consultants, Inc. ID#10195

Project ID: ARG LO-CAT 09-160

Method 25

2-JAN-11: Analyzer B

Preanalysis Calibration

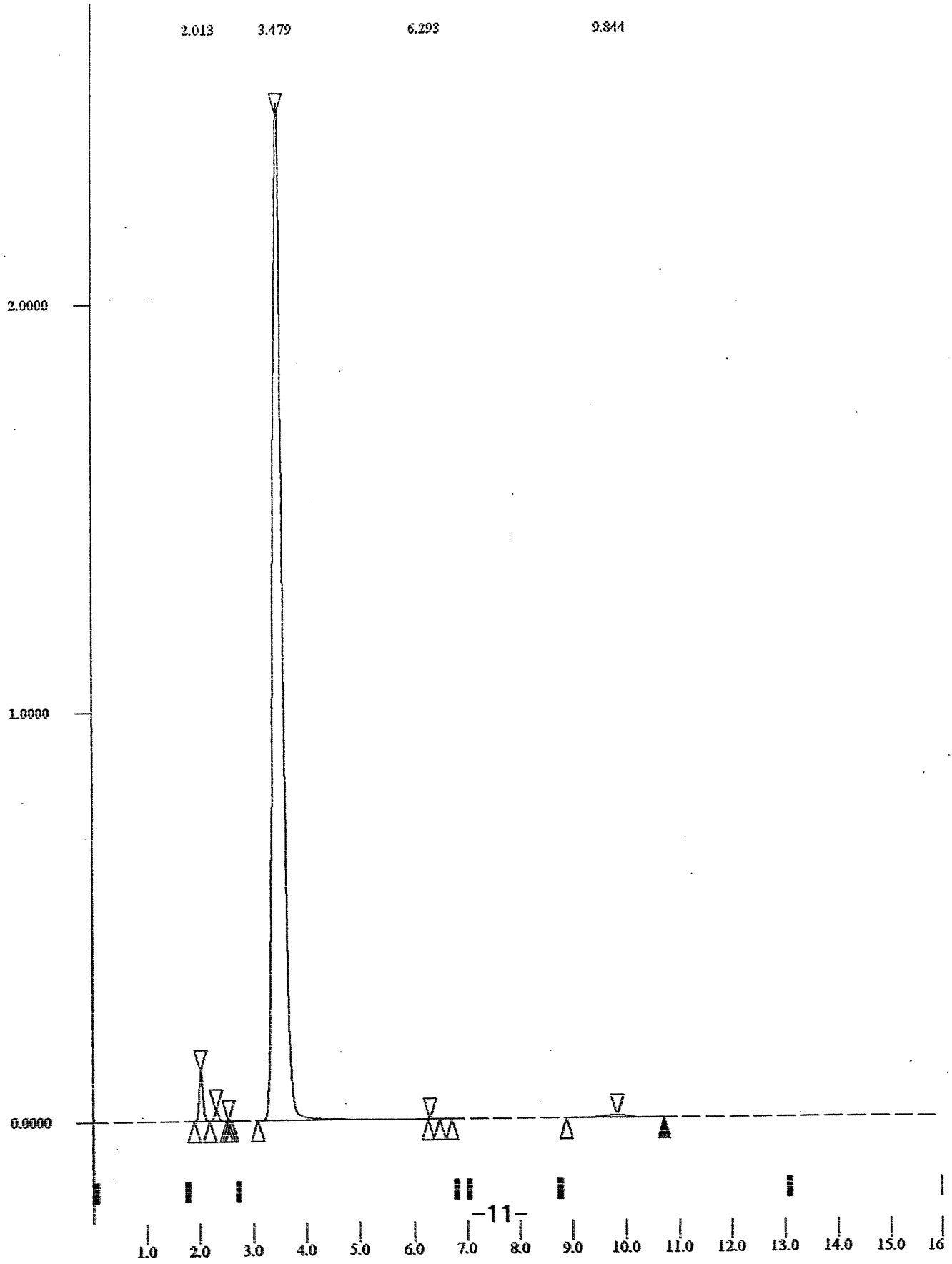
Compound	Conc.	Area(1)	Area(2)	Area(3)	Average	%RSD	RF	IRF	%Diff.
CO	200.5	59871	59266	59025	59387	0.7%	296.2	292.1	1.4%
CH4	49.1	14872	14747	14573	14731	1.0%	299.8	303.4	-1.2%
CO2	9950.0	3068108	3070163	3054688	3064320	0.3%	308.0	300.0	2.7%
C2+	61.7	17728	17796	17478	17667	0.9%	286.6	299.1	-4.2%

Postanalysis Calibration

Compound	Conc.	Area(1)	Area(2)	Area(3)	Average	RF(post)	RF(pre)	%Diff
CO	200.5	59749	59346	59437	59511	296.8	296.2	0.2%
CH4	49.1	14672	14497	14577	14582	296.8	299.8	-1.0%
CO2	9950.0	3059040	3052410	3051919	3054456	307.0	308.0	-0.3%
C2+	61.7	17792	17634	17565	17664	286.5	286.6	-0.0%

Sample # 1 259 / BRT
2 114 / ALX
3 251 / AET

Conc. = concentration in ppmC, %RSD = % relative standard deviation,
RF = response factor = Average Area/Conc., IRF = response factor from initial calibration,
%Diff. = %(RF-IRF)/IRF for preanalysis/= %(RF(post)-RF(pre)/RF(pre), C2+ = propane


2.013
3.479
6.293
9.844
2.0000
1.0000
0.0000
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16

Print Date: Mon Jan 03 12:03:04 2011 Page 1 of 1

Title :
Run File : C:\STAR\RECALCB\TES_B896.RUN
Method File : C:\STAR\RECALCB.MTH
Sample ID : 1- P mix CC61467

Injection Date: 2-JAN-11 5:55 PM Calculation Date: 3-JAN-11 11:39 AM

Operator :
Workstation: VOLUME 1
Instrument : Varian Star #1
Channel : A = M25

Detector Type: ADCB (10 Volts)
Bus Address : 16
Sample Rate : 10.00 Hz
Run Time : 16.002 min

********** Star Chromatography Workstation ******* Version 4.5 **********

Run Mode : Analysis - Subtract Blank Baseline
Peak Measurement: Peak Area
Calculation Type: External Standard

Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1	CO	242.0294	2.013	0.043	59871	BV	4.4	C
2	CH4	59.4701	2.294	0.094	14872	VB	5.0	C
3		0.0000	2.526	0.000	10	TS	0.0	
4	CO2	12270.9580	3.478	-0.122	3068108	BB	11.4	C
5		0.0000	6.293	0.000	50	TS	0.0	
6	C2+	70.7644	11.500	-0.050	17728	GR	0.0	U
	Totals:	12643.2219		-0.035	3160639			

Status Codes:
U - User-defined peak endpoint(s)
C - Out of calibration range

Total Unidentified Counts : 61 counts

Detected Peaks: 6 Rejected Peaks: 0 Identified Peaks: 4

Multiplier: 1 Divisor: 1

Baseline Offset: 8 microVolts

Noise (used): 100 microVolts - monitored before this run

Could not format the injection information for this run.
Install the driver for the module at address 17 (type 8) to format this data.

Calib. out of range; No Recovery Action Specified

Error Log:

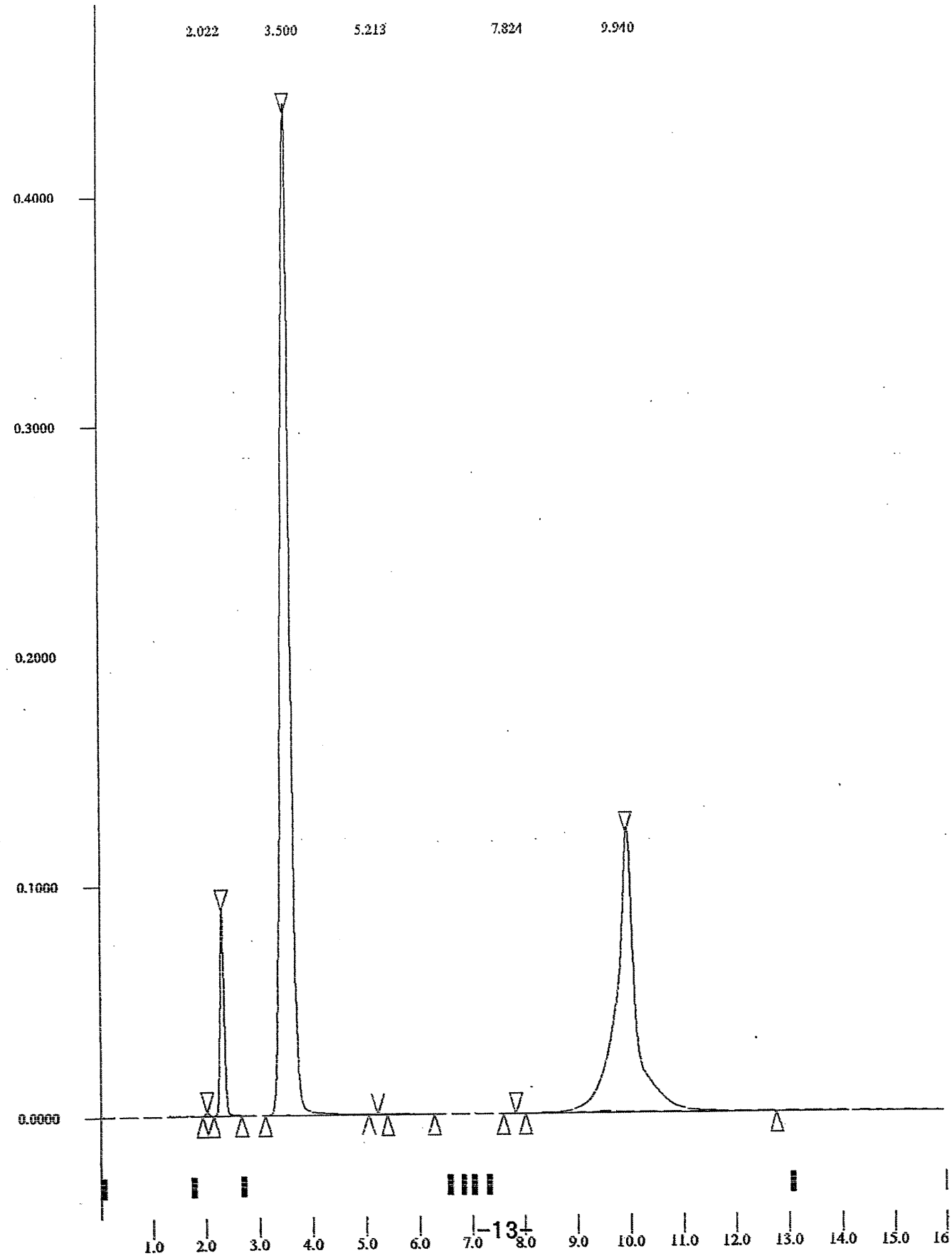
Could not format the error log for the module at address 17 (type 8).
Install the appropriate module driver to format this data.

ADC Board:

Original Notes:

Appended Notes:

****



Filename: C:\STAR\RECALCB\TES_B907.RUN Channel: A – M25

Print Date: Mon Jan 03 12:03:14 2011 Page 1 of 1

Title :
Run File : C:\STAR\RECALCB\TES_B907.RUN
Method File : C:\STAR\AUTOSAM.MTH
Sample ID : 2- tank 259

Injection Date: 2-JAN-11 9:16 PM Calculation Date: 2-JAN-11 9:32 PM

Operator :
Workstation: VOLUME 1
Instrument : Varian Star #1
Channel : A = M25
Detector Type: ADCB (10 Volts)
Bus Address : 16
Sample Rate : 10.00 Hz
Run Time : 16.002 min

********** Star Chromatography Workstation ******* Version 4.5 **********

Run Mode : Analysis - Subtract Blank Baseline
Peak Measurement: Peak Area
Calculation Type: External Standard

Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1	CO	2.9866	2.022	0.052	739	BP	4.5	
2	CH4	191.9787	2.297	0.097	48008	PB	5.0	C
3	CO2	2166.5496	3.500	-0.100	541702	BB	11.4	
4		0.0000	5.213	0.000	76	TS	0.0	
5	C2+	1269.1534	11.500	-0.050	317948	GR	0.0	UC
	Totals:	3630.6683		-0.001	908473			

Status Codes:
J - User-defined peak endpoint(s)
C - Out of calibration range

Total Unidentified Counts : 76 counts

Detected Peaks: 6 Rejected Peaks: 0 Identified Peaks: 4

Multiplier: 1 Divisor: 1

Baseline Offset: -2 microVolts

Noise (used): 70 microVolts - monitored before this run

Could not format the injection information for this run.
Install the driver for the module at address 17 (type 8) to format this data.

Calib. out of range; No Recovery Action Specified

Error Log:

Could not format the error log for the module at address 17 (type 8).
Install the appropriate module driver to format this data.

ADC Board:

Original Notes:

****

Triangle Environmental Services, Inc.

METHOD 25 DATA REPORT

Client: Air/Compliance Consultants, Inc. ID#10195 Analyzed: 1/1-2/11

Project ID: ARG LO-CAT 09-160

Sample # 1 Run 1 ARG LO-CAT

Pressure, Temperature, Volume Data:

	Pressure (mm Hg)	Temp. (K)	P/T
Presampling	2.0	294.26	0.007
Postsampling	533.9	266.48	2.004
Lab Receipt	590.0	299.15	1.972
Tank Final	1197.0	299.15	4.001
CV Final	1528.0	299.15	5.108

Tank 259:
Tank Volume = 0.008390 cu.m
Volume Sampled = 0.006461 dscm

$\frac{\text{Lab Receipt P/T}}{\text{Postsampling P/T}} = 0.984$

Trap BRT →
Collection Vessel 14:
CV Volume = 0.008349 cu.m

Response Factors (RF), Report Limits (RL), and Area Counts:

	RF (area/ppmC)	RL (ppmC)	Area 1	Area 2	Area 3
CO	296.2	11	739	743	739
CH4	299.8	7	48,008	47,811	47,750
CO2	308.0	7	541,702	540,382	539,508
Noncondensibles	286.6	5	317,948	316,295	317,645
Condensibles	308.0	8	18,295	18,014	18,002

Recovery Oxidation Catalyst Efficiency Check: CO2/CH4 = 100.6%
CO Blank = 5 area counts CO2 Blank = 3 ppm

Concentrations:

*=corrected for Blank	ppmC Amount	±	SD	%RSD
CO*	< 11			
CH4	320	±	1	0.3
CO2*	3511	±	7	0.2
Noncondensibles	2219	±	6	0.3
Condensibles*	142	±	1	1.0
TGNMO	2361			

Mass Concentration 1179 mgC/cu.m

< # = Concentration Below Report Limit

Triangle Environmental Services, Inc.

METHOD 25 DATA REPORT

Client: Air/Compliance Consultants, Inc. ID#10195 Analyzed: 1/1-2/11

Project ID: ARG LO-CAT 09-160

Sample # 2 Run 2 ARG LO-CAT

Pressure, Temperature, Volume Data:

	Pressure (mm Hg)	Temp. (K)	P/T
Presampling	2.0	294.26	0.007
Postsampling	520.7	266.48	1.954
Lab Receipt	566.0	299.15	1.892
Tank Final	1285.0	299.15	4.296
CV Final	1440.0	299.15	4.814

Tank 114:
Tank Volume = 0.008335 cu.m
Volume Sampled = 0.006259 dscm

Lab Receipt P/T / Postsampling P/T = 0.968

Trap ALX →
Collection Vessel 29:
CV Volume = 0.008369 cu.m

Response Factors (RF), Report Limits (RL), and Area Counts:

	RF (area/ppmC)	RL (ppmC)	Area 1	Area 2	Area 3
CO	296.2	12	699	642	665
CH4	299.8	7	42,680	42,556	42,121
CO2	308.0	7	363,739	367,155	365,200
Noncondensibles	286.6	5	277,969	278,563	277,622
Condensibles	308.0	8	17,845	17,781	18,088

Recovery Oxidation Catalyst Efficiency Check: CO2/CH4 = 102.7%
CO Blank = 5 area counts CO2 Blank = 3 ppm

Concentrations:

*=corrected for Blank	ppmC Amount	±	SD	%RSD
CO*	< 12			
CH4	312	±	2	0.7
CO2*	2610	±	12	0.5
Noncondensibles	2140	±	4	0.2
Condensibles*	137	±	1	1.0
TGNMO	2277			

Mass Concentration 1137 mgC/cu.m

< # = Concentration Below Report Limit

Triangle Environmental Services, Inc.

METHOD 25 DATA REPORT

Client: Air/Compliance Consultants, Inc. ID#10195 Analyzed: 1/1-2/11

Project ID: ARG LO-CAT 09-160

Sample # 3 Run 3 ARG LO-CAT

Pressure, Temperature, Volume Data:

	Pressure (mm Hg)	Temp. (K)	P/T
Presampling	2.0	294.26	0.007
Postsampling	533.4	265.37	2.010
Lab Receipt	597.0	299.15	1.996
Tank Final	1185.0	299.15	3.961
CV Final	1435.0	299.15	4.797

Tank 251:
Tank Volume = 0.008381 cu.m
Volume Sampled = 0.006475 dscm

$\frac{\text{Lab Receipt P/T}}{\text{Postsampling P/T}} = 0.993$

Trap AET →
Collection Vessel 148:
CV Volume = 0.008367 cu.m

Response Factors (RF), Report Limits (RL), and Area Counts:

	RF (area/ppmC)	RL (ppmC)	Area 1	Area 2	Area 3
CO	296.2	10	881	874	885
CH4	299.8	6	48,940	48,601	48,488
CO2	308.0	6	213,215	212,578	211,980
Noncondensibles	286.6	4	306,327	304,632	304,454
Condensibles	308.0	8	23,923	23,198	23,376

Recovery Oxidation Catalyst Efficiency Check: CO2/CH4 = 102.6%
CO Blank = 5 area counts CO2 Blank = 3 ppm

Concentrations:

*=corrected for Blank	ppmC Amount	±	SD	%RSD
CO*	< 10			
CH4	321	±	2	0.5
CO2*	1359	±	4	0.3
Noncondensibles	2105	±	7	0.3
Condensibles*	175	±	3	1.7
TGNMO	2281			

Mass Concentration 1139 mgC/cu.m

< # = Concentration Below Report Limit

Chain of Custody

Triangle Environmental Services, Inc.
LABORATORY SAMPLE INFORMATION AND CHAIN-OF-CUSTODY FORM

Company Name: Air Compliance Consultants, Inc.		Project/Client ID: ARG LO-CAT 09-160	Date: 12-9-10
Contact Person: Eric S. White	Phone #: 1-412-826-3636	Process Type: DeSulfurization	
Latest Date Complete Set of Samples Expected at Lab: 12-13-10	Note: Normal Turnaround is 15 working days after receipt of complete set of samples	Results Due Date: Normal Report Package Due Date: Normal	Extra charge will apply for rush results

Send Report to: (Street address required for Fed Ex shipment of report)	Person: Eric S. White Company: Air Compliance Consultants, Inc. Address: 1050 William Pitt Way Pittsburgh, Pa 15238	Send Invoice to: (if different from report address)	Person: Jen Hartman Company: Same as Report address Address: PO#
Phone # 412-826-3636	FAX # 412-826-3640		

✓ all applicable boxes

Analysis

US EPA: ☑ Method 25 ☐ Method 3-C ☐ Method 25-C (NMOC as C [default]) ☐ Method 10-B SCAQMD: ☐ Method 25.1 ☐ Method 25.2

# of Tank & Trap Samples: 6	# of Tank-Only Samples: 3	# of Trap-Only Samples: 3	# of Bag Samples: 0
☐ Audit with Delay (*extra charge*)	☐ Rush Turnaround (*extra charge*)	☑ High Concentrations Possible ☐ Call if Concentrations High	☐ Dilute High Concentrations (*extra charge*)

Special Instructions:

Tanks for Analysis (Bags) (List IDs): 114, 251, 259

Traps for Analysis (List IDs): ALX, AET, BBT

☑ TES Equipment	☐ Client Equipment	☐ Client Equipment to be Reconditioned
Tanks, Unused for Reconditioning (List IDs): 106		Traps, Unused for Reconditioning (List IDs): ATD

Relinquished by:		Date: 12-9-10	Time: 12:10	To: (Carrier) UPS				
Tanks received at TES by:	Condition: good	Date: 12-13-10	Time: 1:00	Traps received at TES by:	Condition: good	Date: 12-10-10	Time: 9:30	

APPENDIX D

Quality Assurance/Quality Control Data

Air/Compliance Consultants, Inc. (ACCI)
Thermocouple Calibration Data Sheet

Probe I.D.: 4'-1 ***Dry Gas Meter I.D.:*** 1595

Standard Used: NIST Certified Thermocouple Probe ID # 920213 ***Temperature Scale:*** °F

Converted to: °R (Equation= 460 + °F result)

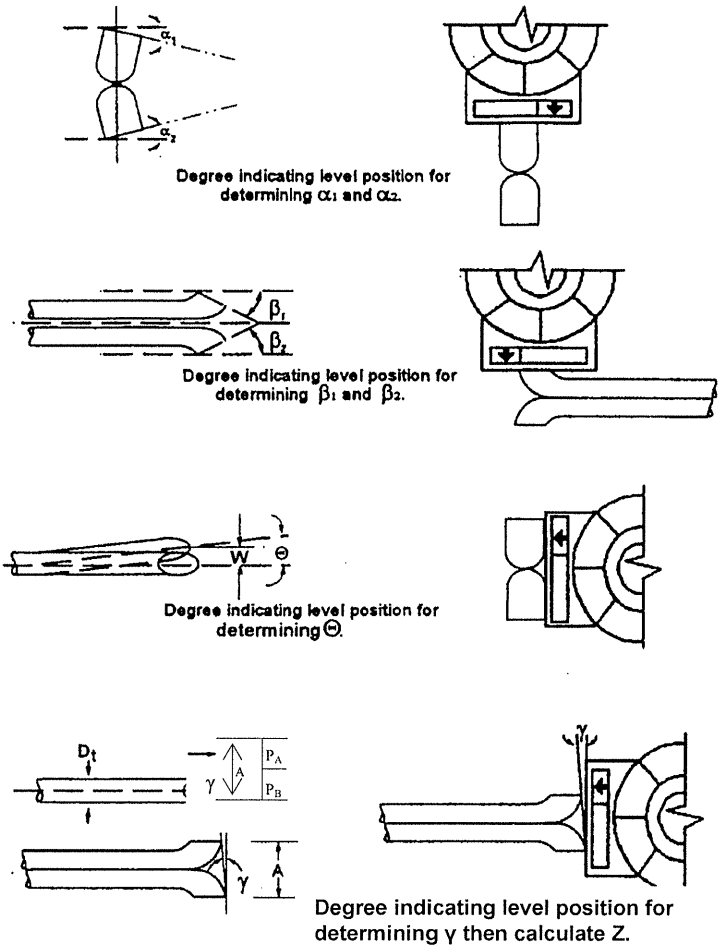
Post Test

Temperature Range	Reference Thermometer (°R)	Probe Thermometer (°R)	Absolute Temperature Difference (%)
Ice Bath	490	490	0
Room Temp.	525	525	0
Stack Temp.	582	580	0.3

Criteria are:
The Absolute Temperature Difference within 1.5% of Reference Standard used.
Section 10.3.2 of USEPA Method 2

Checked by: [signature] 12/9/10
(Signature / Date)

Air/Compliance Consultants, Inc. (ACCI)
Type S Pitot Tube Inspection Data Sheet



Allowable Range/Parameter		*Pre-Test Value*	*Post-Test Value*
Level and perpendicular?		Y☒ N☐	Y☒ N☐
Obstruction?		Y☐ N☒	Y☐ N☒
Damaged?		Y☐ N☒	Y☐ N☒
α1	(-10° < α1 < + 10°)	0	0
α2	(-10° < α2 < + 10°)	0	0
β1	(-5° < β1 < + 5°)	0	0
β2	(-5° < β2 < + 5°)	0	0
γ	(-2° < α1 < + 2°)	0	0
θ	(-1° < α1 < + 1°)	0	0
A	(for 1/4 " OD, 0.526 to 0.750 for 3/8" OD, 0.788 to 1.125)	.644	.644
Z =	A sin γ (≤ 0.125")	0	0
W =	A sin θ (≤ 0.03125")	0	0
P_A	(for 1/4 " OD, 0.263 to 0.375 for 3/8" OD, 0.394 to 0.563)	.320	.320
P_B	(for 1/4 " OD, 0.263 to 0.375 for 3/8" OD, 0.394 to 0.563)	.324	.324
$P_A - P_B$	(-0.063 to 0.063")	-.004	-.004
P_A/D_t	(1.05 to 1.50)	1.285	1.285
P_B/D_t	(1.05 to 1.50)	1.301	1.301
D_T	(3/16" ≤ D_t ≤ 3/8")	.249	.249

Certification:

I certify that the Type S Pitot Tube/Probe ID# 4'-1 calibrated by Caliper ID # CAL-5 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a Pitot tube calibration factor C_P of 0.84.

Checked by: _____ 12/8/10
(Signature / Date)

	Previous Cal	New Cal	% Difference
Y	1.003	1.007	0.405
dH	1.766	1.760	0.351

Air Compliance Consultants, Inc.
EPA Method 5
Meter Box Calibration
Pre-Test Orifice Method
English Meter Box Units, English K' Factor
Apex Orifices

Model #: C-5000
Serial #: 1595

Date: ——————> 10/28/10 60.00
Barometric Pressure: ——> 29.31 (in. Hg)
Theoretical Critical Vacuum:—> 13.83 (in. Hg)

!!!!!!!!
IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).
!!!!!!!!

DRY GAS METER READINGS									CRITICAL ORIFICE READINGS					
					Initial Temps.		Final Temps.					Ambient Temperature		
dH (in H2O)	Time (min)	Volume Initial (cu ft)	Volume Final (cu ft)	Volume Total (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.50	17.00	90.805	97.968	7.163	76.0	72.0	75.0	73.0	47	0.3241	21.5	69.0	70.0	69.5
0.92	13.00	64.500	71.883	7.383	69.0	66.0	71.0	68.0	55	0.4409	20.0	69.0	69.0	69.0
1.65	10.00	110.500	118.008	7.508	81.0	74.0	81.0	74.0	67	0.5737	18.5	70.0	70.0	70.0
3.15	10.00	80.500	90.644	10.144	75.0	69.0	79.0	71.0	73	0.7830	16.5	69.0	69.0	69.0
4.65	10.00	98.072	110.363	12.291	74.0	73.0	82.0	74.0	81	0.9440	15.5	70.0	70.0	70.0

RESULTS

DRY GAS METER VOLUME CORRECTED	
Vm(std) (cu ft)	Vm(std) (liters)
6.944	196.7
7.239	205.0
7.252	205.4
9.908	280.6
12.000	339.8

ORIFICE		
VOLUME CORRECTED		VOLUME NOMINAL
Vcr(std) (cu ft)	Vcr(std) (liters)	Vcr (cu ft)
7.018	198.7	7.187
7.304	206.9	7.473
7.304	206.9	7.487
9.978	282.6	10.209
12.018	340.4	12.320

DRY GAS METER CALIBRATION FACTOR	
Y	
Value (number)	Variation (number)
1.011	0.004
1.009	0.002
1.007	0.000
1.007	0.000
1.002	-0.006
Avg Y--> 1.007	

ORIFICE CALIBRATION FACTOR		
dH@		
Value (in H2O)	Value (mm H2O)	Variation (in H2O)
1.681	42.70	-0.079
1.684	42.78	-0.076
1.771	44.98	0.011
1.818	46.18	0.058
1.845	46.86	0.085
Avg dH@--> 1.760	44.70	

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +-0.2.

SIGNED: _____ Date: 10-29-10

C:\Documents and Settings\thaas.AIRCOM\Desktop\Meterbox Calibrations\2010 Calibrations\1595\1595 10-29-10

Air/Compliance Consultants, Inc.

Alternative Method 5 Post-Test Calibration Check			
Client:	ARG		
Facility:	Bradford, PA		
Source ID:	LO Cat Desulf		
Project Number:	09-160		
Date:	12/8/2010		
Control Box ID:	1595		
	Run 1	**Run 2**	**Run 3**
Data Input			
Test time (min)	30	30	30
Volume Dry Gas Metered (dacf)	22.127	22.048	22.355
Meter Temperature (F)	41.5	44.3	44.0
Barometric Pressure (in. Hg)	28.50	28.50	28.50
Orifice Pressure Drop (in. H_2O)	1.70	1.70	1.70
Dry Gas Molecular Weight (lb/lb mol)	28.84	28.84	28.84
Original Meter Correction Value	1.007	1.007	1.007
Meter $DH_@$ (in. H_2O)	1.76	1.76	1.76
Calculated Values			
Dry Gas Meter Calibration check value (Yqa)	**0.999**	**1.005**	**0.991**
Percent Difference (%)	**-0.81%**	**-0.17%**	**-1.58%**
Results			
Average Dry Gas Meter Calibration Check Val	**0.998**		
Original Meter Correction Value (Y orig)	**1.007**		
Percent Difference (%)	**-0.85%**	**Pass**	
Test conducted in accordance with EMC ALT-009 - Allowable ±5%			
Yqa=(time/dacf)*(sqrt((0.0319*(Tm+460))/(DH@*(Pbar+(DHavg/13.6)))*(29/Md))*SQRT(Dhavg))			

APEX INSTRUMENTS REFERENCE METER CALIBRATION
USING CRITICAL ORIFICE KIT
12-POINT ENGLISH UNITS

Critical orifice Information		
Orifice I.D.	Vacuum Needed	Part No.
Orifice #1	18" Hg/.200 lpm	J-16-BR
Orifice #2	16.5" Hg/.452 lpm	J-24-BR
Orifice #3	18" Hg/ 1.044 lpm	J-36-BR
Orifice #4	15" Hg/2.170 lpm	J-52-BR
Meter Gamma		1.00000

Calibration Conditions			
Date	Time	6-Dec-10	10:00
Barometric Pressure		29.5	in Hg
Calibration Technician		EW	
DGM Serial Number		8002649	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	°R/in Hg

Red = Calculation; Do not change
Yellow = Entry Cell
Pink = Reference to another cell; Do not change
Blue = Do not change entry.

Calibration Data										Results		
Run Time	Dry Gas Meter					Calibration orifice theoretical results				Dry Gas Meter		
	Orifice	Volume	Volume	Outlet Temp	Outlet Temp	Volume	Volume	Outlet Temp	Outlet Temp	Calibration Factor		Flowrate
Elapsed	Certification	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Value	Variation	Std & Corr
(Θ)		(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})	(Vw_i)	(Vw_f)	(t_{wi})	(t_{wf})	(Y)	(ΔY)	($Q_{m(std)(corr)}$)
min	lpm	lpm	lpm	°F	°F	lpm	lpm	°F	°F			cfm
10.00	0.200	0.000	2.121	78	78	0.000	2.000	78	78	0.9425	0.00177	0.193
10.00	0.200	2.121	4.245	79	80	0.000	2.000	79	80	0.9411	0.00044	0.193
10.00	0.200	4.245	6.375	80	82	0.000	2.000	80	82	0.9385	-0.00221	0.192
										0.9407	Averages	0.193
10.00	0.452	0.000	4.785	82	83	0.000	4.520	82	83	0.9436	0.00000	0.433
10.00	0.452	4.785	9.564	83	83	0.000	4.520	83	83	0.9447	0.00118	0.433
10.00	0.452	9.564	14.355	84	84	0.000	4.520	84	84	0.9424	-0.00118	0.432
										0.9436	Averages	0.432
5.00	1.044	0.000	5.300	84	85	0.000	5.220	84	85	0.9823	-0.00242	0.996
5.00	1.044	5.300	10.597	85	85	0.000	5.220	85	85	0.9829	-0.00187	0.996
5.00	1.044	10.597	15.861	85	86	0.000	5.220	85	86	0.9891	0.00429	0.995
										0.9848	Averages	0.996
5.00	2.170	0.000	10.498	86	87	0.000	10.850	86	87	1.0280	0.00153	2.064
5.00	2.170	10.498	21.010	87	87	0.000	10.850	87	87	1.0266	0.00016	2.062
5.00	2.170	21.010	31.541	87	87	0.000	10.850	87	87	1.0247	-0.00169	2.062
										1.0264	Averages	2.062

Overall Average Y **0.9739**

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature _____ Date 12-6-10

APEX INSTRUMENTS REFERENCE METER CALIBRATION
USING CRITICAL ORIFICE KIT
12-POINT ENGLISH UNITS

Critical orifice Information		
Orifice I.D.	Vacuum Needed	Part No.
Orifice #1	18" Hg/.200 lpm	J-16-BR
Orifice #2	16.5" Hg/.452 lpm	J-24-BR
Orifice #3	18" Hg/ 1.044 lpm	J-36-BR
Orifice #4	15" Hg/2.170 lpm	J-52-BR
Meter Gamma		1.00000

Calibration Conditions			
Date	Time	6-Dec-10	10:00
Barometric Pressure		29.5	in Hg
Calibration Technician		ESW	
DGM Serial Number		8002640	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	°R/in Hg

Red = Calculation; Do not change
Yellow = Entry Cell
Pink = Reference to another cell; Do not change
Blue = Do not change entry.

Calibration Data										Results		
Run Time	Dry Gas Meter					Calibration orifice theoretical results				Dry Gas Meter		
	Orifice	Volume	Volume	Outlet Temp	Outlet Temp	Volume	Volume	Outlet Temp	Outlet Temp	Calibration Factor		Flowrate
Elapsed	Certification	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Value	Variation	Std & Corr
(Θ)		(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})	(Vw_i)	(Vw_f)	(t_{wi})	(t_{wf})	(Y)	(ΔY)	($Q_{m(std)(corr)}$)
min	lpm	lpm	lpm	°F	°F	lpm	lpm	°F	°F			cfm
10.00	0.200	0.000	2.103	70	70	0.000	2.000	70	70	0.9505	0.00463	0.196
10.00	0.200	2.103	4.214	73	74	0.000	2.000	73	74	0.9469	0.00103	0.195
10.00	0.200	4.214	6.340	76	77	0.000	2.000	76	77	0.9403	-0.00565	0.194
										0.9459	Averages	0.195
10.00	0.452	0.000	4.789	79	79	0.000	4.520	79	79	0.9428	0.00150	0.436
10.00	0.452	4.789	9.581	80	80	0.000	4.520	80	80	0.9422	0.00091	0.435
10.00	0.452	9.581	14.390	80	81	0.000	4.520	80	81	0.9388	-0.00242	0.435
										0.9413	Averages	0.435
5.00	1.044	0.000	5.455	82	83	0.000	5.220	82	83	0.9544	-0.00352	1.000
5.00	1.044	5.455	10.891	83	84	0.000	5.220	83	84	0.9578	-0.00019	0.998
5.00	1.044	10.891	16.305	84	85	0.000	5.220	84	85	0.9617	0.00371	0.996
										0.9580	Averages	0.998
5.00	2.170	0.000	11.201	85	85	0.000	10.850	85	85	0.9634	-0.00236	2.069
5.00	2.170	11.201	22.364	86	87	0.000	10.850	86	87	0.9667	0.00092	2.064
5.00	2.170	22.364	33.521	87	87	0.000	10.850	87	87	0.9672	0.00144	2.062
										0.9658	Averages	2.065

Overall Average Y **0.9527**

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature _____ Date 12-6-10

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

ERIC S. WHITE

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 2ND DAY OF APRIL 2008 AND EFFECTIVE UNTIL APRIL 1ST, 2013

Peter R. Westlin, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

John R. Smith, QSTI/QSTO Review Board

Leroy F. Owens, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

APPLICATION NO. 2008-134

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

TODD A. HAAS

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 23RD DAY OF FEBRUARY 2009 AND EFFECTIVE UNTIL FEBRUARY 22ND, 2014

Peter R. Westlin, QSTI/QSTO Review Board

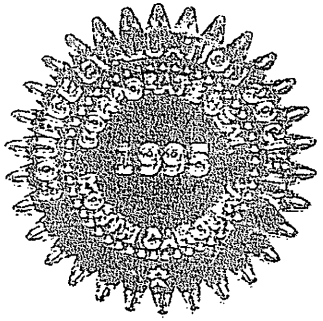
C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

John R. Smith, QSTI/QSTO Review Board

APPLICATION NO. 2009-305



APPENDIX E

Plant Production Data

METHOD 11 H_2S TEST

TEST #1 Date: 12/8/2009	START				END	
Time (Actual)	12:46PM	1:01PM	1:16PM	1:31PM	1:46PM	
Time (min.)	0	15	30	45	60	Average
RFG Throughput (scfm)	991	937	932	847	853	912

TEST #2 Date: 12/8/2009	START				END	
Time (Actual)	1:53PM	2:08PM	2:23PM	2:38PM	2:53PM	
Time (min.)	0	15	30	45	60	Average
RFG Throughput (scfm)	981	1059	1017	1034	974	1013

TEST #3 Date: 12/8/2009	START				END	
Time (Actual)	3:00PM	3:15PM	3:30PM	3:45PM	4:00PM	
Time (min.)	0	15	30	45	60	Average
RFG Throughput (scfm)	799	905	991	940	900	907

APPENDIX F

Sample Calculations

M25 Volatile Organic Compounds

ACCI SAMPLE CALCULATIONS
Flow, Moisture, THC
ARG
09-160
Bradford, PA
LO Cat Desulf
mnoc
December 8, 2010
V-204 Vessel Outlet
Run 1

Vf	328.0	ml	Tstandard	68	F
Vi	200.0	ml	Pstandard	760	mm Hg
Wf	241.2	g	K1method 4	0.04706	scf/ml
Wi	236.2	g	K2method 4	0.04715	scf/g
Vm	22.231	dacf	K1method 5	17.64	R/in. Hg
Vm	0.000	dry actual liters	K4method 5	0.0945	
Yd	1.0070		$V/n_{standard}$	385.3	ft3/lb-mole
Pbar	28.50	in. Hg	Kp	85.49	
dHavg	1.70	in. H2O			
Tm	48.1	F	π	3.141593	
O2	20.25	% dv	Ds (or L)	8.00	inches
CO2	0.10	% dv	Stack Width (W)	NA	inches
Pg	0.16	in. H2O	Tsavg	122.8	F
Cp	0.84		Product rate	1.67	hr/day
$(dP)^{1/2}avg$	0.297	in. H2O^1/2	F_d	na	dscf/MMBtu

TEST DATA	Total Hydrocarbons				
TGNMO as Carbon	2361	ppmdv			
TGNMO as Propane	787.00	ppmdv	Methane	320.00	ppm_{dv}
O_2 Correction	7.0	%	Ethane	304.90	ppm_{dv}
MW Propane	44	lb/lb-mole			
MW Carbon	12	lb/lb-mole			

Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

K1method 4=	0.04706 scf/ml
Vf=	328.0 ml
Vi=	200.0 ml
Vwc(std)=	6.024 scf

Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

K2method 4=	0.04715 scf/g
Wf=	241.2 g
Wi=	236.2 g
Vwsg(std)=	0.236 scf

Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

Vwc(std)=	6.024 scf
Vwsg(std)=	0.236 scf
Vw(std)=	6.259 scf

Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28.317 liters)

Volume metered in dacf=	22.231	dacf
Volume metered in dry actual liters=	0.000	dry actual liters
Vm=	22.231	dacf

$Vm(m^3) = Vm * (1\ m^3 / 35.3145\ cf)$

Vm=	22.231	dacf
$Vm(m^3)$=	0.630	dacm

Volume of Gas Metered , dry basis, STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

K1method 5=	17.64	R/in. Hg
Vm=	22.231	dacf
Yd=	1.0070	
Pbar=	28.50	in. Hg
dHavg=	1.70	in. H2O
Tm=	48.1	F
Vm(std)=	22.249	dscf

$Vm(std)m^3 = Vm(std) * (1\ m^3 / 35.3145\ cf)$

Vm(std)=	22.249	dscf
$Vm(std)m^3$=	0.630	dscm

Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg} / Ps$ and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg} / Ps$ With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature

1997 ASHRAE Handbook page 6.2 Eq. (6)

EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

Tsavg=	122.8	F
T=	582.4	R
C8=	-1.044040E+04	
C9=	-1.1294650E+01	
C10=	-2.702236E-02	
C11=	1.289036E-05	
C12=	-2.478068E-09	
C13=	6.545967E+00	
$SP_{H2O@Tsavg}$=	3.72	in. Hg
Ps=	28.51	in. Hg
Bws=	0.1306	vol. fraction

Bws = Vw(std) / (Vm(std) + Vw(std))

Vw(std)=	6.259	scf
Vm(std)=	22.249	dscf
Bws=	0.2196	vol. fraction
Bws used=	0.1306	vol. fraction

Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

CO2=	0.10	% dv
O2=	20.25	% dv
CO + N2=	79.65	% dv

Molecular weight of dry gas stream			
	Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)		
	CO2=	0.10	% dv
	O2=	20.25	% dv
	CO + N2=	79.65	% dv
	Md=	28.83	lb/lb-mole
Molecular weight of wet gas stream			
	Ms = Md * (1 - Bws) + 18 * Bws		
	Md=	28.83	lb/lb-mole
	Bws=	0.1306	vol. fraction
	Ms=	27.41	lb/lb-mole
Stack Pressure			
	Ps = Pbar + Pg/13.6		
	Pbar=	28.50	in. Hg
	Pg=	0.16	in. H2O
	Ps=	28.51	in. Hg
Average Stack Gas Velocity			
	Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2		
	Kp=	85.49	
	Cp=	0.84	
	$(dP)^{1/2}$avg=	0.2973	in. H2O^1/2
	Tsavg=	122.8	F
	Ps=	28.51	in. Hg
	Ms=	27.41	lb/lb-mole
	Vs=	18.44	ft/s
Area of the Stack	If W = 0, the stack is circular.		
	Circular		
	As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2		
	PI=	3.141593	
	Ds=	8.00	inches
	As=	0.35	ft2
	Rectangular		
	As = L * W * (1 ft / 12 in.)^2		
	L=	0.00	inches
	W=	NA	inches
	As=	0.00	ft2
Stack Gas Flow Rate, Actual			
	Qacfm = Vs * As * 60		
	Vs=	18.44	ft/s
	As=	0.35	ft2
	Qacfm=	386	acfm
	Qacm/min = Qacfm * (1 m^3 / 35.3145 cf)		
	Qacfm=	386	acfm
	Qacm/min=	11	acm/min

Stack Gas Flow Rate, Standard

Qscfm = Qacfm * ((Tstandard + 460) / (Tsavg + 460)) * (Ps / Pstandard)

Qacfm=	386	acfm
Tstandard=	68	F
Tsavg=	122.8	F
Ps=	28.51	in. Hg
Pstandard=	29.92	in. Hg
Qscfm=	333	scfm

Qscm/min = Qscfm * (1 m^3 / 35.3145 cf)

Qscfm=	333	scfm
Qscm/min=	9	scm/min

Stack Gas Flow Rate, Dry Standard

Qdscfm = Qscfm * (1 - Bws)

Qscfm=	333	scfm
Bws=	0.1306	vol. fraction
Qdscfm=	290	dscfm

Qdscm/min = Qdscfm * (1 m^3 / 35.3145 cf)

Qdscfm=	290	dscfm
Qdscm/min=	8	dscm/min

Total Gaseous Non-Methane Organics (TGNMO) as Carbon convertoed to as Propane

TGNMO as Propane = TGNMO as C ppmdv/3

Ethane as Propane = Ethane /1.5

TGNMO as Carbon	2361	ppm_{dv}
TGNMO as Propane	787.00	ppm_{dv}
Ethane Concentration	304.90	ppm_{dv}
Ethena Conc. As Propane	203.27	ppm_{dv}
NMEVOC Concentration as Propane	583.73	ppm_{dv}

NMEVOC emission rate as Propane (lb/hr)

THC(lb/hr) = C_{THC} / 1,000,000 * Qdscfm * (60 min / 1 hour) / $V/n_{standard}$ * $Propane_{MW}$

NMEVOC Concentration as Propane =	583.73	ppmdv
Qdscfm=	290	dscfm
$V/n_{standard}$=	385.3	ft3/lb-mole
Propane MW=	44.0	lb/lb-mole
NMEVOC Emission Rate as Propane =	1.16	lb/hr

M11 Hydrogen Sulfide

ACCI SAMPLE CALCULATIONS
Flow, Moisture, Hydrogen Sulfide
ARG
09-160
Bradford, PA
LO Cat Desulf
mnoc
December 8, 2010
V-204 Vessel Outlet
Run 1

Vf	340.0	ml	Tstandard	68	F
Vi	200.0	ml	Pstandard	760	mm Hg
Wf	240.5	g	K1method 4	0.04706	scf/ml
Wi	238.3	g	K2method 4	0.04715	scf/g
	22.127	dacf	K1method 5	17.64000	R/in. Hg
	0.000	dry actual liters	K4method 5	0.09450	
Yd	1.0070		$V/n_{standard}$	385.3	ft3/lb-mole
Pbar	28.50	in. Hg	Kp	85.49	
dHavg	1.70	in. H2O			
Tm	41.5	F	π	3.141593	
O2	20.70	% dv	Ds (or L)	8.00	inches
CO2	0.10	% dv	Stack Width (W)	NA	inches
Pg	0.15	in. H2O	Dn	na	inches
Cp	0.84		Time	60	minutes
$(dP)^{1/2}avg$	0.436	in. H2O^1/2	Tsavg	123.0	F
F_d	na	dscf/MMBtu	MW H2S	34.08	lb/lb-mole

1. Volume of Water Vapor Condensed (Vwc)

Vwc(std) = K1method 4 * (Vf - Vi)

K1method 4=	0.04706 scf/ml
Vf=	340.0 ml
Vi=	200.0 ml
Vwc(std)=	6.588 scf

2. Volume of Water Vapor Collected in Silica Gel (Vwsg)

Vwsg(std) = K2method 4 * (Wf - Wi)

K2method 4=	0.04715 scf/g
Wf=	240.5 g
Wi=	238.3 g
Vwsg(std)=	0.104 scf

3. Total Volume of Water Vapor in Gas Sample (Vw)

Vw(std) = Vwc(std) + Vwsg(std)

Vwc(std)=	6.588 scf
Vwsg(std)=	0.104 scf
Vw(std)=	6.692 scf

4. Volume of Gas Metered

Vm = Volume metered in dacf + Volume metred in dry actual liters * (1 cf / 28.317 liters)

Volume metered in dacf=	22.127	dacf
Volume metered in dry actual liters=	0.000	dry actual liters
Vm=	22.127	dacf

$Vm(m^3)$ = Vm * (1 m^3 / 35.3145 cf)

Vm=	22.127	dacf
$Vm(m^3)$=	0.627	dacm

---

5. Volume of Gas Metered , dry basis, STD

Vm(std) = (K1method 5 * Vm * Yd * (Pbar + (dHavg/13.6))) / (Tm + 460)

K1method 5=	17.64	R/in. Hg
Vm=	22.127	dacf
Yd=	1.0070	
Pbar=	28.50	in. Hg
dHavg=	1.70	in. H2O
Tm=	41.5	F
Vm(std)=	22.435	dscf

$Vm(std)m^3$ = Vm(std) * (1 m^3 / 35.3145 cf)

Vm(std)=	22.435	dscf
$Vm(std)m^3$=	0.635	dscm

---

6. Water Vapor in the Gas Stream

Bws used = the lower of $SP_{H2O@Tsavg}$ / Ps
and Vw(std) / (Vm(std) + Vw(std))

Bws = $SP_{H2O@Tsavg}$ / Ps With a maximum allowable value of 1.0

$SP_{H2O@Tsavg}$ = The saturation pressure of water at stack temperature
1997 ASHRAE Handbook page 6.2 Eq. (6)
EXP(C8/T + C9 +C10*T + C11*T^2 + C12*T^3 + C13*ln(T)) * (29.921/14.696)

T = Tsavg + 459.67

Tsavg=	123.0	F
T=	582.7	R
C8=	-1.044040E+04	
C9=	-1.1294650E+01	
C10=	-2.702236E-02	
C11=	1.289036E-05	
C12=	-2.478068E-09	
C13=	6.545967E+00	
$SP_{H2O@Tsavg}$=	3.75	in. Hg
Ps=	28.51	in. Hg
Bws=	0.1315	vol. fraction

Bws = Vw(std) / (Vm(std) + Vw(std))

Vw(std)=	6.692 scf
Vm(std)=	22.435 dscf
Bws=	0.2298 vol. fraction
Bws used=	0.1315 vol. fraction

7. Carbon Monoxide and Nitrogen in gas

CO + N2 = 100 - (CO2 + O2)

CO2=	0.10 % dv
O2=	20.70 % dv
CO + N2=	79.20 % dv

8. Molecular weight of dry gas stream

Md = 0.44 * CO2 %dv + 0.32 * O2 %dv + 0.28 * (CO + N2 %dv)

CO2=	0.10 % dv
O2=	20.70 % dv
CO + N2=	79.20 % dv
Md=	28.84 lb/lb-mole

9. Molecular weight of wet gas stream

Ms = Md * (1 - Bws) + 18 * Bws

Md=	28.84 lb/lb-mole
Bws=	0.1315 vol. fraction
Ms=	27.42 lb/lb-mole

10. Stack Pressure

Ps = Pbar + Pg/13.6

Pbar=	28.50 in. Hg
Pg=	0.15 in. H2O
Ps=	28.51 in. Hg

11. Average Stack Gas Velocity

Vs = Kp * Cp * $(dP)^{1/2}$avg * ((Tsavg + 460) / (Ps * Ms))^1/2

Kp=	85.49
Cp=	0.84
$(dP)^{1/2}$avg=	0.4364 in. H2O^1/2
Tsavg=	123.0 F
Ps=	28.51 in. Hg
Ms=	27.42 lb/lb-mole
Vs=	27.06 ft/s

12. Area of the Stack

If W = 0, the stack is circular.

Circular

As = PI * (Ds)^2 / 4 * (1 ft / 12 in.)^2

PI=	3.141593
Ds=	8.00 inches
As=	0.35 ft2

Rectangular

As = L * W * (1 ft / 12 in.)^2

L=		0.00 inches
W=	NA	inches
As=		0.00 ft2

13. Stack Gas Flow Rate, Actual

Qacfm = Vs * As * 60

Vs=	27.06 ft/s
As=	0.35 ft2
Qacfm=	567 acfm

Qacm/min = Qacfm * (1 m^3 / 35.3145 cf)

Qacfm=	567 acfm
Qacm/min=	16 acm/min

14. Stack Gas Flow Rate, Standard

Qscfm = Qacfm * ((Tstandard + 460) / (Tsavg + 460)) * (Ps / Pstandard)

Qacfm=	567 acfm
Tstandard=	68 F
Tsavg=	123.0 F
Ps=	28.51 in. Hg
Pstandard=	29.92 in. Hg
Qscfm=	489 scfm

Qscm/min = Qscfm * (1 m^3 / 35.3145 cf)

Qscfm=	489 scfm
Qscm/min=	14 scm/min

15. Stack Gas Flow Rate, Dry Standard

Qdscfm = Qscfm * (1 - Bws)

Qscfm=	489 scfm
Bws=	0.1315 vol. fraction
Qdscfm=	425 dscfm

Qdscm/min = Qdscfm * (1 m^3 / 35.3145 cf)

Qdscfm=	425 dscfm
Qdscm/min=	12 dscm/min

16. Volume Metered Standardized

Vmstd = Vm * Yd * [(Tstd * Pbar)/(Tm * Pstd)]

Vm	59.53 L
Yd	0.974
Tstd	293.15 °K
Pbar	723.90 mm. Hg
Tm	290.65 °K
Pstd	760 mm. Hg
Vmstd	55.70

17. Hydrogen Sulfide Concentration (ppm)

$CH2S = 17040 * [((V_{IT} * N_I - V_{TT} * N_T)_{sample} - (V_{IT} * N_I - V_{TT} * N_T)_{blank})/Vmstd]$

	Sample		Blank	
V_{IT}	50.00 ml	V_{IT}	50.00 ml	
N_I	0.01 g-eq/liter	N_I	0.01 g-eq/liter	
V_{TT}	47.83 ml	V_{TT}	49.10 ml	
N_T	0.01 g-eq/liter	N_T	0.01 g-eq/liter	
CH2S	3.89			

$CH2S = CH2S * [24.45/34.07]$

CH2S	2.74 ppmdv

18. Hydrogen Sulfide Emission Rate (lb/hr)

$E_{H2S} = E_{H2S} * Q_{DSCFM} * 60min/hr$

E_{H2S}=	2.745E+00 ppmdv
Q_{DSCFM}=	425 dscfm
E_{H2S}=	0.006 lb/hr

Nomenclature

NOMENCLATURE

SYMBOL		DESCRIPTION
ACFM	-	Actual cubic feet per minute
A_s	-	Stack Area
AB	-	Acetone Blank
AB1	-	Acetone Blank Tare Weight 1
AB2	-	Acetone Blank Tare Weight 2
ABF1	-	Acetone Blank Final Weight 1
ABF2	-	Acetone Blank Final Weight 2
AT1	-	Acetone Rinse Tare Weight 1
AT2	-	Acetone Rinse Tare Weight 2
A_n	-	Nozzle Area
B_{wo}	-	Moisture content of sample gas, measured impinger collection
B_{ws}	-	Moisture content of sample gas, wet saturated
BTU	-	British Thermal Units
C	-	Carbon
C_3H_8	-	Propane
Ca	-	Acetone Blank Correction
C_M	-	Average of initial and final system calibration bias check responses for the upscale gas, ppm
cf	-	Cubic foot
C_{MA}	-	Actual concentration of the upscale calibration gas, ppm
C_d	-	Concentration of Particulate Emissions
C_O	-	Average of initial and final system calibration bias check responses for the zero gas, ppm
CO	-	Carbon monoxide
CO_2	-	Carbon dioxide
C_p	-	Pitot co-efficient, 0.84 for S-type, 0.99 for standard (English units)
E_{NOX}	-	Emission rate of Oxides of nitrogen as NO2, lb/hr
DACF	-	Dry actual cubic feet
DSCF	-	Dry standard cubic feet
DACM	-	Dry actual cubic meters
DSCFM	-	Dry standard cubic feet per minute
dscf/MMBtu	-	Dry standard cubic feet per Million British Thermal Units (units for Fd)
D_S	-	Stack diameter
D_N	-	Nozzle diameter
°F	-	Degrees Fahrenheit
ft	-	foot
F1	-	Filter Final Weight 1
F2	-	Filter Final Weight 2
FT1	-	Filter Tare Weight 1
FT2	-	Filter Tare Weight 2
F_c	-	CO2 based F-Factor for natural gas (1,040 SCF/MMBtu)
F_d	-	F-factor
Ft^2	-	Square feet
Ft^3	-	Cubic feet
FTIR	-	Fourier Transform Infrared
ft^3/lb-mole	-	Cubic feet per pound mole
ft/sec	-	Feet per second
g	-	Grams
g/mL	-	Gram per milliliter
gr/DSCF	-	Grains per dry standard cubic feet

HI	-	Heat Input
ΔH_{avg}	-	Average pressure drop across the meter box during test run, inches H2O
H_2O	-	Water
Hg	-	Mercury
hr	-	Hour
in Hg	-	Inches of Mercury
in H_2O	-	Inches of Water
$\sqrt{inH_2O}$	-	Square root of Inches of Water
I	-	Isokinetic Sampling
K1 method 5	-	Conversion to standard conditions, 17.64 °R/inches Hg
K1 method 4	-	Conversion to standard conditions, 0.04707 f3/ml
K2 method 4	-	Conversion to standard conditions, 0.04715 ft3/g
K4 method 5	-	Conversion to standard conditions, 0.0945
K_p	-	Pitot tube constant, 85.49 for English units
Kg	-	Killograms
L	-	Length of Stack if Rectangular
lb	-	Pound
lb/lb-mole	-	Pound per pound mole
lb-mole	-	Pound mole
lb/hr	-	Pound per hour
lb/MMBTU	-	Pound per million British thermal units
ma	-	Average Final (total) weight after evaporation - Average Tare Weigth of Acetone Blank
m^3	-	Cubic meters
mg	-	Milligrams
mg/g	-	Milligrams per gram
mL	-	Milliliter
M_d	-	Molecular weight of stack gas mixture, dry basis
MMBTU	-	Million British Thermal Units
MMBtu/hr	-	Million British Thermal Units per hour
mm HG	-	Millimeters of Mercury
M_n	-	Mass of particulate matter, g
M_s	-	Molecular weight of stack gas mixture, wet basis
M_{SAT}	-	Ratio of vapor pressure of water at stack conditions to stack pressure
M_W	-	Molecular weight of a specific compound or element
N_2	-	Nitrogen
O_2	-	Oxygen
ng	-	Nanograms
NMNEVOC	-	Non-Methane, Non-Ethane Volatile Organic Compounds
NO_x	-	Oxides of Nitrogen
NO_2	-	Nitrous Oxide
%	-	Percent
% Volume	-	Percent by volume
% dv	-	Percent by volume, dry basis
ΔP	-	Gas velocity pressure, in H2O
P_a	-	Density of Acetone
P_{BAR}	-	Barometric pressure, in H2O
P_S	-	Static Pressure, in H2O
P_g	-	Total pressure of gas at stack conditions
P_{STD}	-	Standard pressure, 760 mmHG
$\sqrt{(P)_{AVG}}$	-	Averag of the square root of gas velocity pressure, in H2O
ppm_{dv}	-	Parts per million, volume and dry basis
ppb_{dv}	-	Parts per billion, volume and dry basis
Q_{ACFM}	-	Flow rate of stack gas, actual cubic feet per minute
Q_{SCFM}	-	Flow rate of stack gas, standard cubic feet per minute
Q_{DSCFM}	-	Flow rate of stack gas, dry standard cubic feet per minute

°R	-	Degrees Rankin
°R/in. Hg	-	Degrees Rankin per inches of Mercury
scf/ml	-	Standard cubic feet per milliliter
scf/g	-	Standard cubic feet per gram
SCFM	-	Standard cubic feet per minute
SCM	-	Standard cubic meters
SCF	-	Standard cubic feet
$SP_{H2O@Tavg}$	-	Saturation pressure of water at average stack temperature
STD	-	Standard
s	-	Second
T	-	Stack Temperature
tph	-	Tons per hour
ton/yr	-	Tons per year
T_M	-	Temperature of the dry gas meter
T_S	-	Temperature of the stack
T_{STD}	-	Standard temperature, 68 °F
THC	-	Total Hydrocarbons
ug	-	Micrograms
Va	-	Volume of Acetone Blank, in mL
Vaw	-	Volume of Acetone Rinse, in mL
vol.	-	Volume
V/n_{std}	-	Volume mole in standard conditions, in cubic feet per pound mole
V_{lc}	-	Total volume of water vapor condensed, at STP
V_m	-	Volume of sample gas measured by the dry gas meter
V_{MSTD}	-	Volume of sample gas measured by the dry gas meter, corrrected to standard conditions
VOC	-	Volatile Organic Compounds
V_S	-	Velocity of stack gas, ft/s
$V_{Wc(std)}$	-	Volume of water condensed, corrected to standard conditions
$V_{Wsg(std)}$	-	Volume of water collected in silica gel, corrected to standard conditions
$V_{W(std)}$	-	Volume of water vapor in gas stream, corrected to standard conditions
Y_d	-	Dry gas meter calibration factor
V_f	-	Final volume of water
V_i	-	Initial volume of water
W1	-	Acetone Rinse Final Weight 1
W2	-	Acetone Rinse Final Weight 2
W	-	Width of Stack if Rectangular
Wa	-	Weight of Acetone
W_f	-	Final weight
W_i	-	Initial weight