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REPORT ON HCL AND VOC TESTING

Performed for:
MARATHON ASHLAND PETROLEUM
LPCCR INLET AND OUTLET
CATLETTSBURG, KY

Client Reference No: CN00037874
CleanAir Project No: 9684
Revision 0: March 11, 2005

To the best of our knowledge, the data presented in this report are accurate, complete, error free, legible and representative of the actual emissions during the test program.

Submitted by,

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REVISION HISTORY

REPORT ON HCL AND VOC TESTING

Revision History

Revision No:	Date	Pages	Comments
0	03/11/05	All	Original version of document.

CONTENTS

1 PROJECT OVERVIEW 1-1
Table 1-1: Summary of Test Results 1-1
DISCUSSION OF TEST PROGRAM 1-2

2 RESULTS 2-1
Table 2-1: LPCCR - Hydrogen Chloride 2-1
Table 2-2: LPCCR - Volitile Organic Compounds 2-2

3 DESCRIPTION OF INSTALLATION 3-1
PROCESS DESCRIPTION 3-1
DESCRIPTION OF SAMPLING LOCATION(S) 3-2
Table 3-1: Sampling Points 3-2
Figure 3-1: LPCCR Inlet and Outlet Sampling Points (EPA Method 1) 3-3

4 METHODOLOGY 4-1
Table 4-1: Summary of Sampling Procedures 4-1

5 APPENDIX 5-1
TEST METHOD SPECIFICATIONS ..... A
SAMPLE CALCULATIONS ..... B
PARAMETERS C
QA/QC DATA ..... D
FIELD DATA ..... E
FIELD DATA PRINTOUTS ..... F
LABORATORY DATA ..... G
MONITOR DATA ..... H

PROJECT OVERVIEW

Marathon Ashland Petroleum (MAP) contracted Clean Air Engineering (CleanAir) to perform hydrogen chloride (HCl) and volatile organic compound (VOC) testing at their facility located in Catlettsburg, Kentucky for compliance purposes.

The test parameters included the following parameters:

- HCl;
- VOC;
- volumetric flow rate.

The testing took place at the LPCCR inlet and outlet on February 18, 2005. Coordinating the field testing were:

Bill Fritz – MAP
Harold Scott – MAP
Mike Vianzon – CleanAir
Eric Doak – CleanAir

Table 1-1 outlines the schedule adhered to during the test program. Table 1-2 summarizes the results of the test program. A more detailed presentation of the test conditions and results of analysis are shown in Tables 2-1 through 2-2 on pages 2-1 through 2-2.

Table 1-1:
Summary of Test Results

Source Constituent	Sampling Method	Average Emission	Limits[1]
LPCCR			
VOC (ppmdv @ 3% O_2, as hexane)	EPA M25A	2.1	20
HCl (ppmdv @ 3% O_2)	EPA M26	0.21	10
HCl Removal Efficiency (%)	EPA M26	99.97	97%

[1] Limits obtained from facility KDAQ Minor Permit Revision Submitted on June 23, 2004.

PROJECT OVERVIEW

DISCUSSION OF TEST PROGRAM

A heated gas sample was continuously extracted from both the scrubber inlet and outlet and delivered at 350 °F to a lab trailer. A slip stream of the heated gas was split three ways with a heated manifold. A portion of the gas was analyzed for HCl using EPA Method 26.

The second portion of the gas sample was analyzed for VOC by EPA Method 25A. This sample was delivered hot to a heated flame ionization detector (FID) analyzer.

The final portion of the gas sample passed directly into a refrigerated condenser which cooled the gas to approximately 35°F to remove the stack gas moisture. From there it was delivered to oxygen (O_2) and carbon dioxide (CO_2) instruments and analyzed using EPA Method 3A. All analyzers were calibrated on-site using certified mixtures of calibration gases.

The gas moisture content was measured using EPA Method 4 procedures with the EPA Method 26 sample trains. At the conclusion of each test run, a flow traverse using a calibrated pitot tube was performed to determine volumetric flow rates at the inlet and outlet.

The HCl removal efficiency was calculated using the inlet and outlet concentrations corrected to 3% oxygen (ppm @ 3% O_2).

The VOC analyzer was calibrated with EPA Protocol 1 propane gas with a balance of nitrogen. The one-minute propane averages during each test run were converted to hexane using the mass ratio (MW of propane to hexane, 44/86) correction factor of 0.511628.

Chlorine (Cl_2) results at the inlet and outlet of the scrubber as well as VOC concentrations at the scrubber inlet are presented in Appendix C.

RESULTS

Table 2-1:
LPCCR - Hydrogen Chloride

Run No.		1	2	3	Average
Date (2005)		Feb 18	Feb 18	Feb 18	
Start Time (approx.)		08:45	10:36	12:19	
Stop Time (approx.)		09:45	11:36	13:19	
Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	0.66	0.64	0.62	**0.64**
CO_2	Carbon dioxide (dry volume %)	17.1	17.1	17.2	**17.1**
T_s	Sample temperature (°F)	289	283	281	**284**
B_w	Actual water vapor in gas (% by volume)	1.3	1.7	2.0	**1.7**
Inlet Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	272	266	192	**243**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	188	185	133	**169**
Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.072	4.054	4.051	**4.059**
Inlet Laboratory Data					
m_n	Total HCl collected (mg)	137.0130	142.2498	167.3421	
Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	784	818	963	**855**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	694	723	850	**755**
C_{sd}	HCl Concentration (mg/dscm)	1,188	1,239	1,459	**1,295**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	1,051	1,094	1,288	**1,144**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.84	0.86	0.73	**0.81**
Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	0.67	0.64	0.63	**0.64**
CO_2	Carbon dioxide (dry volume %)	16.8	16.7	16.9	**16.8**
T_s	Sample temperature (°F)	63	65	65	**64**
B_w	Actual water vapor in gas (% by volume)	0.45	0.91	0.23	**0.53**
Outlet Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	182	170	161	**171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	181	168	160	**170**
Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.136	4.105	4.100	**4.114**
Outlet Laboratory Data					
m_n	Total HCl collected (mg)	0.0383	0.0352	0.0520	
Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	0.22	0.20	0.30	**0.24**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	0.19	0.18	0.26	**0.21**
C_{sd}	HCl Concentration (mg/dscm)	0.33	0.30	0.45	**0.36**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	0.29	0.27	0.40	**0.32**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.00022	0.00019	0.00027	**0.00023**
RE	Reduction Efficiency (% Removal, ppm @ 3% O_2 based)	99.97%	99.98%	99.97%	**99.97%**

RESULTS

Table 2-2:
LPCCR - Volitile Organic Compounds

Run No.		1	2	3	Average
Date (2005)		Feb 18	Feb 18	Feb 18	
Start Time (approx.)		08:47	10:38	12:21	
Stop Time (approx.)		09:47	11:38	13:21	
Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	0.67	0.64	0.63	**0.64**
CO_2	Carbon Dioxide (dry volume %)	16.8	16.7	16.9	**16.8**
B_{wo}	Moisture (volume %)	0.45	0.91	0.23	**0.53**
Q_{std}	Standard conditions (dscfm)	181	168	160	**170**
Outlet VOC					
C	Concentration (ppmdv, as propane)	5.2	4.4	4.6	**4.7**
C	Concentration (ppmdv, as hexane)	2.7	2.2	2.4	**2.4**
C	Concentration (ppmdv @ 3% O_2, as hexane)	2.4	2.0	2.1	**2.1**
E	Emission rate (lb/hr)	0.0065	0.0050	0.0051	**0.0055**

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION

In order to meet the Refinery MACT II regulation (40 CFR 63 Subpart UUU, effective April 11, 2005), CRLLC has installed two-stage scrubber systems for each of the two subject vent streams (LPCCR and HPCCR). The first stage consists of a venturi scrubber that mixes dilute caustic with the regeneration vent gas.

As the caustic and the regeneration vent gas pass through the scrubber, about 80% to 90% of the hydrochloric acid and the majority of the chlorine gas is removed. The vent gas stream then flows to the second stage of treatment, the vent gas wash tower.

The wash tower uses a packed bed and dilute caustic wash to remove the remainder of the hydrochloric acid. The scrubbed vent gas is then vented to the atmosphere meeting the required 97% HCL removal efficiency.

The project was subject to a KDAQ Minor Permit Revision submitted on June 23rd, 2004.

DESCRIPTION OF INSTALLATION

DESCRIPTION OF SAMPLING LOCATION(S)

Sampling point locations were determined according to EPA Method 1.

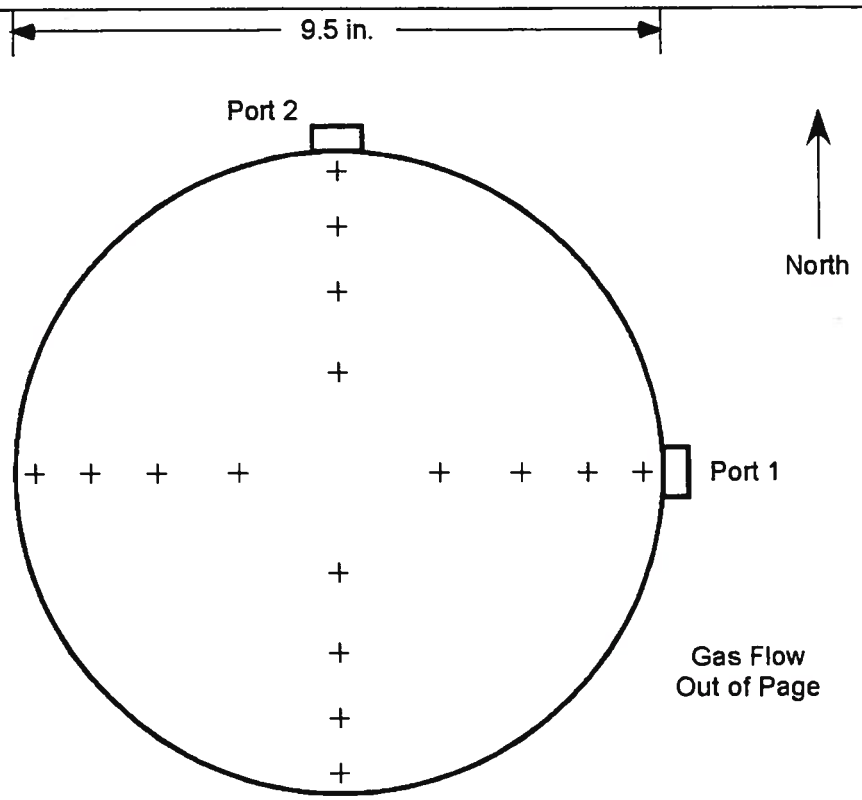
Table 3-1 outlines the sampling point configurations. Figure 3-1 illustrates the sampling points and orientation of sampling ports for each of the sources tested in the program.

Table 3-1:
Sampling Points

Location	Constituent	Method	Run No.	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
LPCCR Outlet	volumetric flow	1-4	1-3	2	8	varied	varied	3-2
LPCCR Inlet	volumetric flow	1-4	1-3	2	8	varied	3-2	
LPCCR In/Out	VOC/HCl	25A, 26	1-3	1	1	60	60	NA

DESCRIPTION OF INSTALLATION

DESCRIPTION OF SAMPLING LOCATION (CONTINUED)



Traverse Point	Port to Point Distance (in.)
1	9.0
2	8.5
3	7.7
4	6.4
5	3.1
6	1.8
7	1.0
8	0.5

Duct diameters upstream from flow disturbance (A):	2.0	Limit: 0.5
Duct diameters downstream from flow disturbance (B):	7.0	Limit: 2.0

Figure 3-1: LPCCR Inlet and Outlet Sampling Points (EPA Method 1)

METHODOLOGY

Clean Air Engineering followed procedures as detailed in U.S. Environmental Protection Agency (EPA) Methods 1, 2, 3A, 4, 25A and 26. The following table summarizes the methods and their respective sources.

Table 4-1:
Summary of Sampling Procedures

Title 40 CFR Part 60 Appendix A	
Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 3A	"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 25A	"Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer"
Method 26	"Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Non-Isokinetic Method"

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and on the World Wide Web at http://www.cleanair.com.

Diagrams of the sampling apparatus and major specifications of the sampling, recovery and analytical procedures are summarized for each method in Appendix A.

Clean Air Engineering followed specific quality assurance and quality control (QA/QC) procedures as outlined in the individual methods and in USEPA "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III Stationary Source-Specific Methods", EPA/600/R-94/038C. Additional QA/QC methods as prescribed in Clean Air's internal Quality Manual were also followed. Results of all QA/QC activities performed by Clean Air Engineering are summarized in Appendix D.

APPENDIX

TEST METHOD SPECIFICATIONS ..... A
SAMPLE CALCULATIONS ..... B
PARAMETERS C
QA/QC DATA ..... D
FIELD DATA ..... E
FIELD DATA PRINTOUTS ..... F
LABORATORY DATA ..... G
MONITOR DATA ..... H

TEST METHOD SPECIFICATIONS

A

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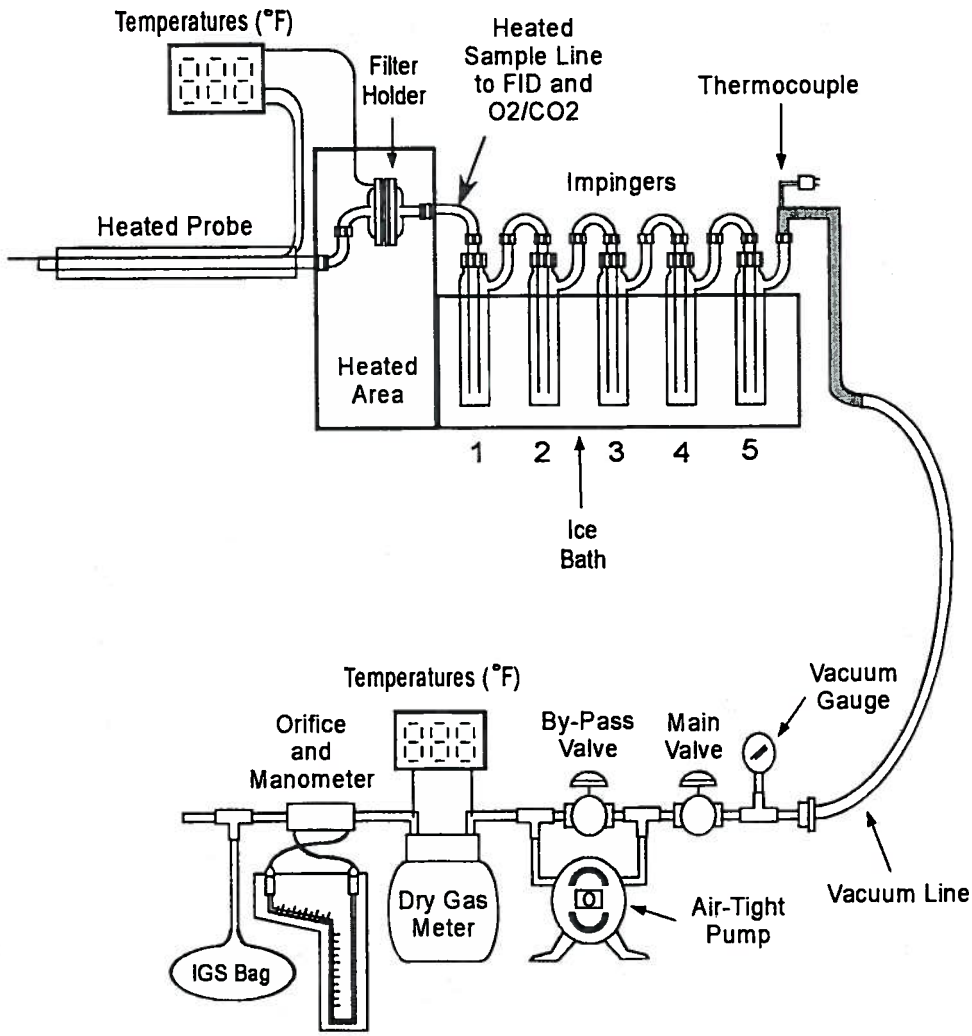
EPA Method 26
Sampling Train Configuration



Impinger Contents	
Impinger 1	0.1 N H2S04
Impinger 2	0.1 N H2S04
Impinger 3	0.1 N NaOH
Impinger 4	0.1 N NaOH
Impinger 5	Silica Gel

Specification Sheet for EPA Method 26

Source Location Name(s)	LPCCR
Pollutant(s) to be Determined	Hydrogen Chloride (HCl)
Other Parameters to be Determined from Train	Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	60 minutes
No. of Sample Traverse Points	N/A	1 for M26, 16 for Flow
Sample Time per Point	N/A	60 for M26, varies for flow
Sampling Rate	Constant Rate (2 lpm±10%)	Proportional to Velocity
Sampling Probe		
Nozzle Material	N/A	None
Nozzle Design	N/A	N/A
Probe Liner Material	Borosilicate Glass	Stainless Steel
Effective Probe Length	N/A	3 feet
Probe Temperature Set-Point	>248ºF	350˚F
Velocity Measuring Equipment		
Pitot Tube Design	None	Type S
Pitot Tube Coefficient	N/A	0.84
Pitot Tube Calibration by	N/A	Geometric
Pitot Tube Attachment	N/A	Separate Probe
Metering System Console		
Meter Type	Dry Gas Meter or Critical Orifice	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 liters
Meter Size	N/A	0.1 liter/revolution
Meter Calibrated Against	Wet Test Meter	Wet Test Meter
Pump Type	Diaphragm or equivalent	Diaphragm
Temperature Measurements	Dial Thermometer or equivalent	Type K Thermocouple/Pyrometer
Temperature Resolution	2°F-5.4°F	1.0˚F
ΔP Differential Pressure Gauge	N/A	N/A
ΔH Differential Pressure Gauge	N/A	Magnehelic
Barometer	Mercury, aneroid or other.	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Teflon or Quartz	Stainless Steel
Filter Support Material	Teflon Frit	Stainless Steel
Cyclone Material	N/A	None
Filter Heater Set-Point	>248ºF	350˚F
Filter Material	Teflon/Glass Mat (Quartz, Optional High Temp>410F)	Quartz Fiber
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for EPA Method 26

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	5 or 6 (Midget Impingers)	6
Impinger Stem Types		
Impinger 1	Midget Shortened Stem	Midget Shortened Stem
Impinger 2	Midget Bubbler	Midget Bubbler
Impinger 3	Midget Bubbler	Midget Fritted
Impinger 4	Midget Bubbler	Midget Bubbler
Impinger 5	Midget Bubbler	Open Tip
Impinger 6	Mae West	
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	N/A	N/A
Sample Collection Medium	N/A	N/A
Sample Analysis	N/A	N/A
Sample Recovery Information		
Probe Brush Material	N/A	N/A
Probe Rinse Reagent	N/A	N/A
Probe Rinse Wash Bottle Material	N/A	N/A
Probe Rinse Storage Container	N/A	N/A
Filter Recovered?	No	No
Filter Storage Container	N/A	N/A
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	Deionized Distilled Water	Deionized Distilled Water
Impinger Wash Bottle	Polyethylene or glass	Teflon
Impinger Storage Container	Polyethylene	Polyethylene
Analytical Information		
Method 4 H_2O Determination by	N/A	Gravimetric and Volumetric
Filter Preparation Conditions	N/A	N/A
Front-Half Rinse Preparation	N/A	N/A
Back-Half Analysis	Ion Chromatography	Ion Chromatography
Additional Analysis	None	None

EPA Method 26
Analytical Flowchart

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition

Container 1
Back half filter holder, Impingers 1, 2, 3 and connecting glassware

↓

Quantitatively transfer each sample to a volumetric flask or graduated cylinder and dilute with water to 100 ml

↓

Analyze by ion chromatography for total chloride

↓

Report results as HCl

Container 3
Impingers 4, 5 and connecting glassware

↓

Qualitatively transfer each sample to a volumetric flask or graduated cylinder and dilute with water to 100 ml

↓

Analyze by ion chromatography for total chloride

↓

Report results as Cl2

Reagent Blanks

↓

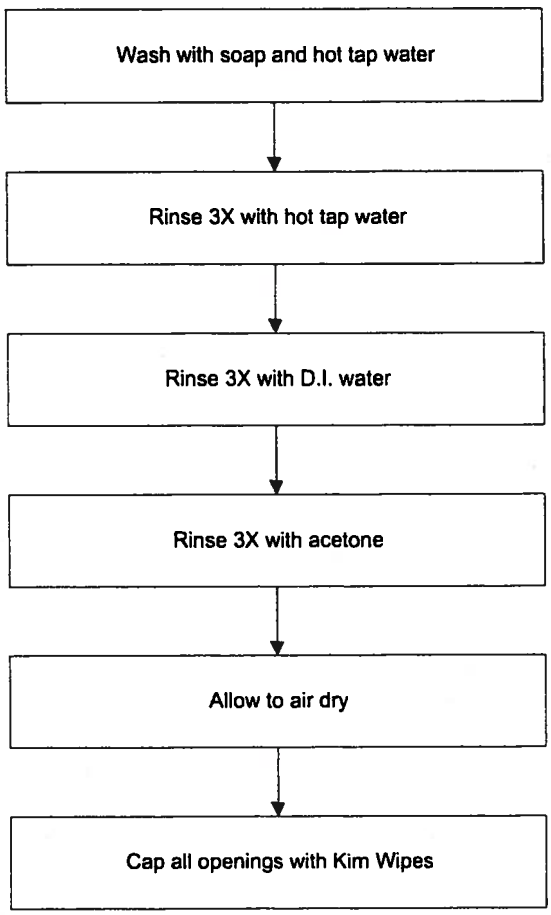
Analyze by ion chromatography for total chloride

Audit Samples

↓

Audit samples must be analyzed the same as field samples

EPA Method 26
Glassware Preparation Procedures



EPA Method 26
Sample Recovery Flowchart

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)

Teflon Filter

Archive or discard

Container 1
250 ml Plastic

Impingers 1, 2, 3 and U-bends

Empty contents into container

Rinse components 3X with D.I. Water

Label container and measure volume by weight

Visual Inspection

Container 2
250 ml Plastic

Impingers 4, 5 and U-bends

Empty contents into container

Rinse components 3X with D.I. Water

Add sodium thiosulfate (25 mg per ppm-dscm)

Seal container, shake to mix

Label container and measure volume by weight

Visual Inspection

Silica Gel

Measure volume by weight, note any color change

Recycle silica gel

Container 3
Sulfuric Acid Blank
(H_2SO_4)
250 ml Plastic

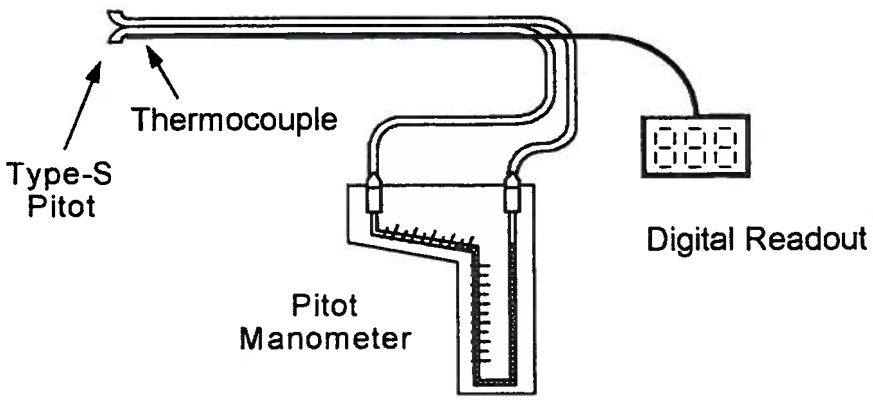
30 ml of 0.1N H_2SO_4 diluted to approximate volume of samples using water from rinse bottle

Container 4
Sodium Hydroxide Blank
(NaOH)
250 ml Plastic

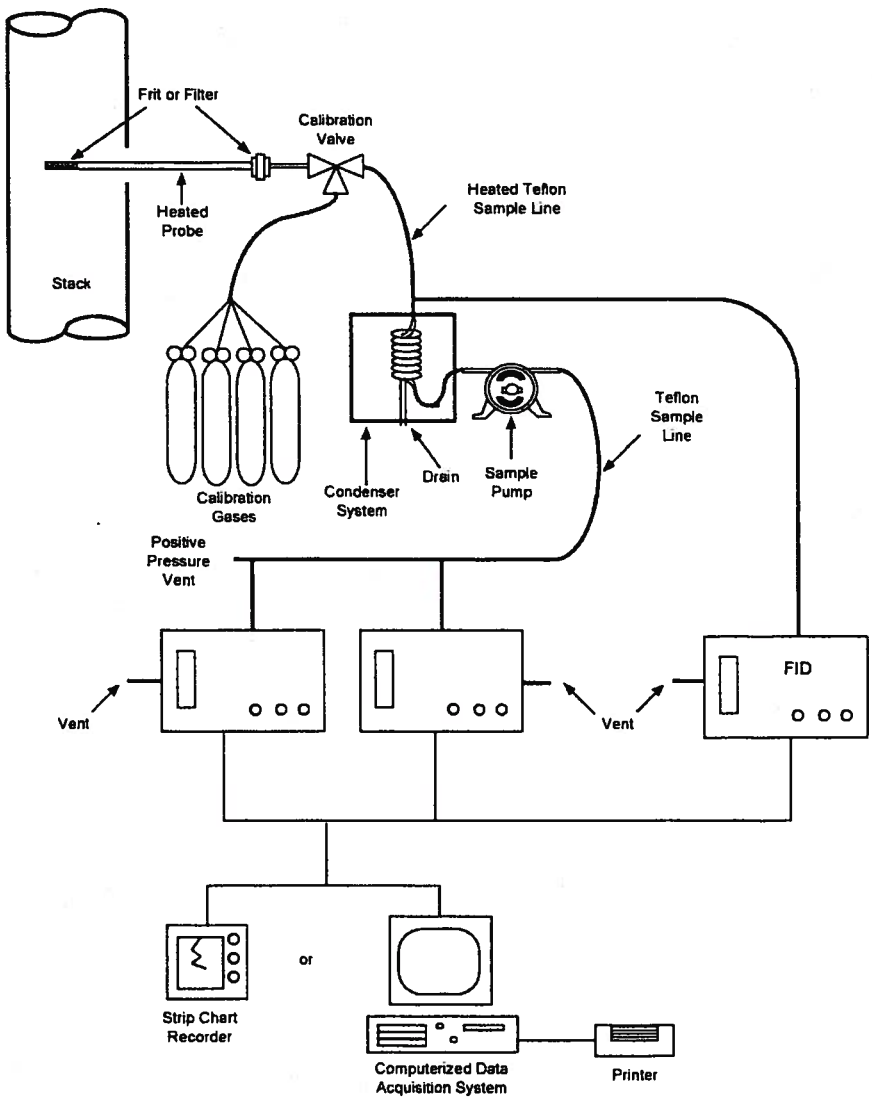
30 ml NaOH diluted to approximate volume of samples using NaOH from rinse bottle

Add sodium thiosulfate

EPA Method 2
Sampling Train Configuration



EPA Method ??
Sampling Train Configuration



Number	Gas	Monitor	Range Used	Calibration Gas Concentrations
1	VOC	JUM 3-300A	0-50	26.2,44.46,84.84
2	O2	Servomex 1440	0-25	10.15, 21.43
3	CO2	Servomex 1440	0-25	10.09, 17.99

Specification Sheet for EPA Method 25A

Source Location Name(s)	LPCCR Inlet and Outlet
Pollutant(s) to be Determined	Total Gaseous Organic Concentration
Other Parameters to be Determined from Train	Diluents (O2 and CO2) - USEPA Method 3A

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	60 minutes
No. of Sample Traverse Points	N/A	1
Sample Time per Point	N/A	60 minutes
Sampling Rate	Constant Rate	Constant Rate
Sampling Probe		
Nozzle Material	N/A	None
Nozzle Design	N/A	N/A
Probe Liner Material	Stainless Steel or Equivalent	Stainless Steel
Effective Probe Length	Sufficient to Traverse Points	3 feet
Probe Temperature Set-Point	Prevent Condensation (>230°F)	248°F±25°F
Particulate Filter		
In-Stack Filter	Optional	N/A
In-Stack Filter Material	N/A	N/A
External Filter	Yes	Yes
External Filter Material	Glass Fiber Mat	Borosilicate Glass Fiber Mat
External Filter Set-Point	Prevent Condensation (>230°F)	350°F
Sample Delivery System		
Heated Sample Line Material	Stainless Steel or Teflon	Teflon
Heated Sample Line Set-Point	Prevent Condensation (>230°F)	350°F
Heated Sample Line Connections	Probe Exit to Analyzer	Probe to Moisture System and THC Analyzer
Moisture Removal System	N/A	Refrigerator-type condenser
Sample Pump Type	N/A	Diaphragm
Sample Pump Material	Non-reactive to sample gases	Teflon
Sample Flow Control	Constant Rate	Constant Rate (±10%)
Non-Heated Sample Line Material	N/A	Teflon
Non-Heated Sample Line Connections	N/A	Moisture Removal to Diluent Analyzers
Additional Filters	Optional	Yes
Additional Filter Type	N/A	Particulate Removal
Additional Filter Location	Optional	Before Analyzers
Filter Material	N/A	Glass Fiber
Analyzer Description		
Oxygen (O_2)	EPA Method 3A (Paramagnetic)	EPA Method 3A (Paramagnetic)
Carbon Dioxide (CO_2)	EPA Method 3A (NDIR)	EPA Method 3A (NDIR)
Sulfur Dioxide (SO_2)	N/A	
Nitrogen Oxides (NO_x)	N/A	
Carbon Monoxide (CO)	N/A	
Total Hydrocarbon (THC)	EPA Method 25A (Flame Ionization Detection)	EPA Method 25A (Flame Ionization Detection)
Hydrogen Chloride (HCl)	N/A	
Ammonia (NH_3)	N/A	

Specification Sheet for EPA Method 25A

	Standard Method Specification	Actual Specification Used
Instrument Span Range		
Oxygen (O_2)	≤ 1.33 x Expected Maximum	0-25%
Carbon Dioxide (CO_2)	≤ 1.33 x Expected Maximum	0-25%
Sulfur Dioxide (SO_2)	N/A	N/A
Nitrogen Oxides (NO_x)	N/A	N/A
Carbon Monoxide (CO)	N/A	N/A
Total Hydrocarbon (THC)	1.5 to 2.5 x Expected Maximum	0-50 ppm
Hydrogen Chloride (HCl)	N/A	N/A
Ammonia (NH_3)	N/A	N/A
Data Acquisition		
Data Recorder	Strip chart, Analog Computer or Digital Recorder	Analog Computer
Recorder Resolution	0.5 Percent of Span	0.1 Percent of Span
Data Storage	Manually or Automatic	Manually
Measurement Freq. <60 min. Sample Time	1-min. intervals or 30 measurements (less restrictive)	One reading per second
Recording Freq. <60 min. Sample Time	1-min. intervals or 30 measurements (less restrictive)	One Minute Average (60, 1 second readings)
Measurement Freq. >60 min. Sample Time	2-min. intervals or 96 measurements (less restrictive)	N/A
Recording Freq. >60 min. Sample Time	2-min. intervals or 96 measurements (less restrictive)	N/A
Calibration Gas Specifications		
Oxygen (O_2)	EPA Protocol 1	EPA Protocol 1
Carbon Dioxide (CO_2)	EPA Protocol 1	EPA Protocol 1
Sulfur Dioxide (SO_2)	N/A	
Nitrogen Oxides (NO_x)	N/A	
Carbon Monoxide (CO)	N/A	
Total Hydrocarbon (THC)	EPA Protocol 1	EPA Protocol 1
Hydrogen Chloride (HCl)	N/A	
Ammonia (NH_3)	N/A	

SAMPLE CALCULATIONS

B

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USEPA Method 2 (Velocity & Flow Rate)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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N

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04707)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	0.4	ml
0.04707	= Ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04707	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	0.02	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	29.70	in. Hg
T_m	= average dry gas meter temperature (°F)	=	77.83	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	4.25	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9944	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	2.20	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	4.136	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	29.70	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-0.02	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.70	in. Hg

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4. Actual water vapor pressure at sample gas temperature less than 212°F (In. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	62.75	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	0.57	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (In. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (In. Hg)	=	29.70	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	Previously Defined	in. Hg

6. Moisture measured In sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	4.136	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	0.02	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.0045	
		=	0.45	%

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7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.70	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	0.57	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		0.0191	
		=	1.91	%

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	0.0191	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.0045	
B_w	= actual water vapor in gas	=	0.0045	
		=	0.45	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.8	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	0.7	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	82.58	%

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10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.8	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	0.7	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	82.6	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.71	%

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.0045	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.71	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	30.65	lb/lb·mole

12. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_P)(\sqrt{\Delta P})\left(\sqrt{\frac{(T_s+460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.84	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	30.65	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.70	in. Hg
T_s	= average sample gas temperature (°F)	=	62.75	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.113	$\sqrt{\text{in. } H_2O}$
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	6.15	ft/sec

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13. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft^2)	=	0.49	ft^2
V_s	= sample gas velocity (ft/sec)	=	6.15	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	182	acfm

14. Total flow of sample gas (scfm)

$$Q_s = (Q_a)\left(\frac{P_s}{29.92}\right)\left(\frac{68+460}{T_s+460}\right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	182	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.70	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	62.8	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	182	scfm

15. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.0045	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	182	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181	dscfm

16. Dry flow of sample gas corrected to 7%O_2 (dscfm)

$$Q_{std7} = (Q_{std})\left(\frac{20.9 - O_2}{20.9 - 7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	0.7	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
7	= oxygen content of corrected gas (%)	=	7.0	%
Q_{std7}	= volumetric flow rate at STP and 7%O_2, dry basis (dscfm)	=	264	dscfm

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17. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-min})(60)$$

Where

$Q_{std-min}$	=	volumetric flow rate, english units (ft^3/min)	=	181	dscfm
60	=	conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	=	volumetric flow rate, hourly basis (dscf/hr)	=	10,870	dscf/hr

18. Metric Conversion of Gas Volumes (Q_{std} example)

$$Q_{std-metric} = (Q_{std-english})\left(\frac{60}{35.31}\right)$$

Where:

$Q_{std-english}$	=	volumetric flow rate, english units (ft^3/min)	=	181	dscfm
35.31	=	conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	=	conversion factor (min/hr)	=	60	min/hr
$Q_{std-metric}$	=	volumetric flow rate, metric units (m^3/hr)	=	308	dry std m^3/hr

19. Standard to Normal Conversion of Gas Volumes (Q_{std} example)

$$Q_{Normal} = (Q_{std-metric})\left(\frac{32+460}{68+460}\right)$$

Where:

$Q_{std-metric}$	=	volumetric flow rate, metric units (dry std m^3/hr)	=	308	dry std m^3/hr
32	=	normal temperature (°F)	=	32	°F
68		standard temperature (°F)	=	68	°F
460	=	standard temperature in Rankine (68°F)	=	460	
Q_{Normal}	=	volumetric flow rate, metric units (dry Nm^3/hr)	=	287	dry Nm^3/hr

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EPA METHOD 26 SAMPLE CALCULATIONS - HCl ANALYSIS

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughtout. The final table is formatted to an appropriate number of significant figures.

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1. Chloride to HCl conversion factor

$$K_{HCl} = \frac{MW_{HCl}}{n \times MW_{Cl^-}}$$

Where:

MW_{HCl}	= molecular weight of HCl (mg/mg-mole)	=	36.461	mg/mg-mole
MW_{Cl^-}	= molecular weight of chloride ion (mg/mg-mole)	=	35.453	mg/mg-mole
n	= molar ratio of chloride to HCl	=	1.0	mole Cl/mole HCl
K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	

2. Total HCl collected (mg)

$$m_{HCl} = K_{HCl} \times \frac{(S_{Cl-1} v_1 + S_{Cl-2} v_2)}{1000}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
S_{Cl-1}	= chloride concentration of sample fraction 1 (mg/liter)	=	0.6100	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	61.0	ml
S_{Cl-2}	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{HCl}	= total HCl collected in sample (mg)	=	0.0383	mg

Note: Non-detects are treated as zero in summations.

DEFINITION
Fraction 1 = entire sample except last impinger containing applicable absorbing reagent.
Fraction 2 = last impinger containing applicable absorbing reagent, analyzed separately to evaluate collection efficiency.
If entire sample is analyzed as a single fraction, then data is included as Fraction 1 (Fraction 2 = 0).

3. Allowable blank subtraction (mg)

$$m_b = K_{HCl} \times B_{Cl} \times \frac{(v_1 + v_2)}{1000}$$

$$m_b = 0 \quad \text{if } B_{Cl} < MDL$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
B_{Cl}	= chloride concentration of blank (mg/liter)	=	<0.0530	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	61.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_b	= allowable blank subtraction (mg)	=	0.0000	mg

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4. Total HCl collected, corrected for blank (mg)

$$m_{nb} = m_{HCl} - m_b$$

Where:

m_{HCl}	= total HCl collected in sample (mg)	=	0.0383	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= total HCl collected, corrected for blank (mg)	=	0.0383	mg

5. Minimum detectable HCl (mg)

$$m_{MDL} = K_{HCl} \times MDL \times \frac{(v_1 + v_2)}{1000}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
MDL	= minimum detectable chloride concentration	=	-0.053	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	61.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{MDL}	= minimum detectable HCl (mg)	=	<0.0033	mg

6. Total HCl value used in emission calculations (mg)

$$m_n = MAXIMUM \ [m_{nb} \ \ or \ \ < m_{MDL}]$$

Where:

m_{nb}	= total HCl collected, corrected for blank (mg)	=	0.0383	mg
m_{MDL}	= minimum detectable HCl (mg)	=	<0.0033	mg
m_n	= total HCl value used in emission calculations (mg)	=	0.0383	mg

7. Collection QC check (% mass collected in second fraction)

$$EFF = 100 \times \frac{K_{HCl} \times S_{Cl-2} \times \frac{v_2}{1000}}{m_{HCl}}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
S_{Cl-2}	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
m_{HCl}	= total HCl collected in sample (mg)	=	0.0383	mg
1000	= conversion factor (ml/liter)	=	1000	ml/liter
100	= conversion factor	=	100	%
EFF	= Collection QC check (% mass collected in second fraction)	=	0.00	%

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EPA METHOD 26 SAMPLE CALCULATIONS - HCl RESULTS

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughtout. The final table is formatted to an appropriate number of significant figures.

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1. HCl concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	0.0383	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
C_{sd}	= HCl concentration (lb/dscf)	=	2.0394E-08	lb/dscf

2. HCl concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{0.850}{1000}\right)\left(\frac{10^6}{MW}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	0.0383	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
MW	= molecular weight of HCl (g/g-mole)	=	36.461	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
1000	= conversion factor (mg/g)	=	1,000	mg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= HCl concentration (ppmdv)	=	0.2156	ppmdv

3. HCl concentration (ppmwv)

$$C_w = C_{sd}\left(1 - \frac{B_w}{100}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	0.2156	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	0.4532	% v/v
100	= conversion factor (%)	=	100	%
C_w	= HCl concentration (ppmwv)	=	0.2146	ppmwv

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4. HCl concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	0.0383	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= HCl concentration (mg/dscm)	=	0.3266	mg/dscm

5. HCl concentration (mg/Nm^3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	0.0383	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= HCl concentration (mg/Nm^3 dry)	=	0.3505	mg/Nm^3 dry

6. HCl concentration corrected to x% O_2 (ppmdv example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	0.2156	ppmdv
x	= oxygen content of corrected gas (%)	=	3.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	0.7	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= HCl concentration corrected to x%O_2 (ppmdv)	=	0.1907	ppmdv @ x%O_2

7. HCl concentration corrected to y% CO_2 (ppmdv example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	0.2156	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.8	%
C_{sdy}	= HCl concentration corrected to y%CO2 (ppmdv)	=	0.1545	ppmdv @ y%CO_2

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8. HCl concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= HCl concentration (lb/dscf)	=	2.0394E-08	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	182	acfm
C_a	= HCl concentration at actual gas conditions (lb/acf)	=	2.0353E-08	lb/acf

9. HCl rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)(Q_{std})(60)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	0.0383	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= HCl rate (lb/hr)	=	0.0002	lb/hr

10. HCl rate (kg/hr)

$$E_{kg/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{(Q_{std})(60)}{10^6}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	0.0383	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
10^6	= conversion factor (mg/kg)	=	10^6	g/kg
$E_{kg/hr}$	= HCl rate (kg/hr)	=	0.0001	kg/hr

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EPA METHOD 26 SAMPLE CALCULATIONS - Cl_2 ANALYSIS

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughtout. The final table is formatted to an appropriate number of significant figures.

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1. Chloride to Cl_2 conversion factor

$$K_{Cl\,2} = \frac{MW_{Cl\,2}}{n \times MW_{Cl^-}}$$

Where:

MW_{Cl2}	= molecular weight of Cl_2 (mg/mg-mole)	=	70.906	mg/mg-mole
MW_{Cl-}	= molecular weight of chloride ion (mg/mg-mole)	=	35.453	mg/mg-mole
n	= molar ratio of chloride to Cl_2	=	2.0	mole Cl/mole Cl_2
K_{Cl2}	= conversion factor to convert mass Cl^- to mass Cl_2	=	1.000	

2. Total Cl_2 collected (mg)

$$m_{Cl_2} = K_{Cl_2} \times \frac{(S_{Cl\text{-}1} v_1 + S_{Cl\text{-}2} v_2)}{1000}$$

Where:

K_{Cl2}	= conversion factor to convert mass Cl^- to mass Cl_2	=	1.000	
$S_{Cl\text{-}1}$	= chloride concentration of sample fraction 1 (mg/liter)	=	<0.0530	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	57.0	ml
$S_{Cl\text{-}2}$	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{Cl2}	= total Cl_2 collected in sample (mg)	=	<0.0030	mg

Note: Non-detects are treated as zero in summations.

DEFINITION
Fraction 1 = entire sample except last impinger containing applicable absorbing reagent.
Fraction 2 = last impinger containing applicable absorbing reagent, analyzed separately to evaluate collection efficiency.
If entire sample is analyzed as a single fraction, then data is included as Fraction 1 (Fraction 2 = 0).

3. Allowable blank subtraction (mg)

$$m_b = K_{Cl_2} \times B_{Cl} \times \frac{(v_1 + v_2)}{1000}$$

$$m_b = 0 \quad \text{if } B_{Cl} < MDL$$

Where:

K_{Cl2}	= conversion factor to convert mass Cl^- to mass Cl_2	=	1.000	
B_{Cl}	= chloride concentration of blank (mg/liter)	=	0.0000	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	57.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_b	= allowable blank subtraction (mg)	=	0.0000	mg

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4. Total Cl2 collected, corrected for blank (mg)

$$m_{nb} = m_{Cl_2} - m_b$$

Where:

m_{Cl2}	= total Cl_2 collected in sample (mg)	=	<0.0030	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= total Cl_2 collected, corrected for blank (mg)	=	<0.0030	mg

5. Minimum detectable Cl2 (mg)

$$m_{MDL} = K_{Cl_2} \times MDL \times \frac{(v_1 + v_2)}{1000}$$

Where:

K_{Cl2}	= conversion factor to convert mass Cl^- to mass Cl_2	=	1.000	
MDL	= minimum detectable chloride concentration	=	-0.053	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	57.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{MDL}	= minimum detectable Cl_2 (mg)	=	<0.0030	mg

6. Total Cl2 value used in emission calculations (mg)

$$m_n = MAXIMUM \ [m_{nb} \ \ or \ \ < m_{MDL}]$$

Where:

m_{nb}	= total Cl_2 collected, corrected for blank (mg)	=	<0.0030	mg
m_{MDL}	= minimum detectable Cl_2 (mg)	=	<0.0030	mg
m_n	= total Cl_2 value used in emission calculations (mg)	=	<0.0030	mg

7. Collection QC check (% mass collected in second fraction)

$$EFF = 100 \times \frac{K_{Cl_2} \times S_{Cl-2} \times \frac{v_2}{1000}}{m_{Cl_2}}$$

Where:

K_{Cl2}	= conversion factor to convert mass Cl^- to mass Cl_2	=	1.000	
S_{Cl-2}	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
m_{Cl2}	= total Cl_2 collected in sample (mg)	=	<0.0030	mg
1000	= conversion factor (ml/liter)	=	1000	ml/liter
100	= conversion factor	=	100	%
EFF	= Collection QC check (% mass collected in second fraction)	=	0.00	%

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EPA METHOD 26 SAMPLE CALCULATIONS - Cl_2 RESULTS

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughtout. The final table is formatted to an appropriate number of significant figures.

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N_M

1. Cl_2 concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)$$

Where:

m_n	= total Cl_2 collected, corrected for applicable blank (mg)	=	<0.0030	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
C_{sd}	= Cl_2 concentration (lb/dscf)	=	<1.6106E-09	lb/dscf

2. Cl_2 concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{0.850}{1000}\right)\left(\frac{10^6}{MW}\right)$$

Where:

m_n	= total Cl_2 collected, corrected for applicable blank (mg)	=	<0.0030	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
MW	= molecular weight of Cl_2 (g/g-mole)	=	70.906	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
1000	= conversion factor (mg/g)	=	1,000	mg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= Cl_2 concentration (ppmdv)	=	<0.0088	ppmdv

3. Cl_2 concentration (ppmwv)

$$C_w = C_{sd}\left(1 - \frac{B_w}{100}\right)$$

Where:

C_{sd}	= Cl_2 concentration (ppmdv)	=	<0.0088	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	0.4532	% v/v
100	= conversion factor (%)	=	100	%
C_w	= Cl_2 concentration (ppmwv)	=	<0.0087	ppmwv

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4. Cl_2 concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= total Cl_2 collected, corrected for applicable blank (mg)	=	<0.0030	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= Cl_2 concentration (mg/dscm)	=	<0.0258	mg/dscm

5. Cl_2 concentration (mg/Nm³ dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

m_n	= total Cl_2 collected, corrected for applicable blank (mg)	=	<0.0030	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= Cl_2 concentration (mg/Nm³ dry)	=	<0.0277	mg/Nm³ dry

6. Cl_2 concentration corrected to x% O_2 (ppmdv example)

$$C_{sdx} = C_{sd}\left(\frac{20.9-x}{20.9-O_2}\right)$$

Where:

C_{sd}	= Cl_2 concentration (ppmdv)	=	<0.0088	ppmdv
x	= oxygen content of corrected gas (%)	=	3.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	0.7	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= Cl_2 concentration corrected to x%O_2 (ppmdv)	=	<0.0077	ppmdv @ x%O_2

7. Cl_2 concentration corrected to y% CO_2 (ppmdv example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= Cl_2 concentration (ppmdv)	=	<0.0088	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.8	%
C_{sdy}	= Cl_2 concentration corrected to y%CO_2 (ppmdv)	=	<0.0063	ppmdv @ y%CO_2

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8. Cl_2 concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= Cl_2 concentration (lb/dscf)	=	<1.6106E-09	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	182	acfm
C_a	= Cl_2 concentration at actual gas conditions (lb/acf)	=	<1.6074E-09	lb/acf

9. Cl_2 rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)(Q_{std})(60)$$

Where:

m_n	= total Cl_2 collected, corrected for applicable blank (mg)	=	<0.0030	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= Cl_2 rate (lb/hr)	=	<0.0000	lb/hr

10. Cl_2 rate (kg/hr)

$$E_{kg/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{(Q_{std})(60)}{10^6}\right)$$

Where:

m_n	= total Cl_2 collected, corrected for applicable blank (mg)	=	<0.0030	mg
V_{mstd}	= volume metered, standard (dscf)	=	4.1359	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
10^6	= conversion factor (mg/kg)	=	10^6	g/kg
$E_{kg/hr}$	= Cl_2 rate (kg/hr)	=	<0.0000	kg/hr

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

CEM Field Sample Calculations for THC Outlet

Sample data taken from Run 1 and Channel 2

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

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1. Average of a calibration series

$$C_{mce} = \frac{(C_1 + C_2 + C_3)}{3}$$

Where:

C_1, C_2, C_3	= concentrations of 3 consecutive gas samples that are representative of the calibration gas			
C_{mce}	= average concentration of a calibration series In this case the low cal series for channel 2	=	26.067	ppmwv

2a. Calibration Error Check for Hydrocarbons (5% of actual calibration gas value error allowed by Method 25A)

$$E_{HC} = abs\left|\frac{C_{mce} - C_{ma}}{C_{ma}}\right| \le l_{cal}$$

Where:

C_{mce}	= average concentration of a calibration series In this case the low cal series for channel 2	=	26.067	ppmwv
C_{ma}	= concentration of actual calibration gas value	=	26.200	ppmwv
l_{cal}	= limit for calibration error for hydrocarbons	=	5.0%	
E_{HC}	= calibration error check value	=	0.51%	**Pass**

2b. Calibration Error Check for non-Hydrocarbons (2% of Instrument Span)

$$E = abs\left|\frac{C_{mce} - C_{ma}}{Span}\right| \le l_{cal}$$

Where:

C_{mce}	= average concentration of a calibration series In this case the low cal series for channel 2	=	26.067	ppmwv
C_{ma}	= concentration of actual calibration gas value	=	26.200	ppmwv
Span	= instrument span value	=	100.000	
l_{cal}	= limit for calibration error for non-hydrocarbons	=	2.0%	
E	= calibration error check value	=	NA	

3. System Bias as Percent of Span Value (5% is allowed)

$$E_{Bias} = abs\left|\frac{C_{mf} - C_{mce}}{Span}\right| \le l_{bias}$$

Where:

C_{mce}	= average concentration of a calibration series in this case the Low cal series for channel 2	=	26.067	ppmwv
C_{mf}	= calibration error response concentration for Cal01	=	26.323	ppmwv
Span	= instrument span value	=	100.000	ppmwv
l_{bias}	= limit for system bias error	=	5.0%	
E_{bias}	= calibration bias error check value	=	0.26%	**Pass**

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

4. System Drift as Percent of Span Value (3%)

$$E_{Drift} = abs\left|\frac{C_{mf} - C_{mi}}{Span}\right| \le l_{drift}$$

Where:

C_{mf}	= calibration error response concentration for Cal01 (final)	=	26.323	ppmwv
C_{mi}	= calibration error response concentration for Cal00 (initial)	=	25.941	ppmwv
Span	= instrument span value	=	100.000	ppmwv
l_{drift}	= limit for system drift error	=	3.0%	
E_{drift}	= calibration drift error check value	=	0.38%	**Pass**

5. Average Concentration for an entire Run

$$C = \frac{\sum_{i=1}^{N} C_i}{N}$$

Where:

C_i	= All concentration readings for the entirety of Run 1 for the monitor looking for THC on channel 2	=	i=1 5.555	ppmwv
N	= total number of readings in Run 1	=	60	
C	= average THC concentration for Run 1	=	5.362	ppmwv

6. Drift-Corrected Average Concentration for an entire Run

$$C_{DC} = \left(C - \frac{C_{oi} + C_{of}}{2}\right)\left(\frac{C_{ma}}{\frac{C_{mi} + C_{mf}}{2} - \frac{C_{oi} + C_{of}}{2}}\right)$$

C_{ma}	= concentration of actual calibration gas value	=	26.200	ppmwv
C	= average THC concentration for Run 1	=	5.362	ppmwv
C_{mf}	= calibration error response concentration for Cal01 (final)	=	26.323	ppmwv
C_{mi}	= calibration error response concentration for Cal00 (initial)	=	25.941	ppmwv
C_{of}	= calibration error response concentration for Cal01 (final) for zero gas	=	0.422	ppmwv
C_{oi}	= calibration error response concentration for Cal00 (initial) for zero gas	=	-0.026	ppmwv
C_{DC}	= drift corrected average concentration for Run 1	=	5.217	ppmwv

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CEM Emissions Sample Calculations for THC Outlet

Sample data taken from Run 1 and Channel 2

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

030805 145327

1. THC concentration (ppmdv)

$$C(ppmdv) = k_1 \times C_{DC} \quad if \quad dry \quad gas$$

$$C(ppmdv) = \frac{k_1 \times C_{DC}}{\left(1 - B_w/100\right)} \quad if \quad wet \quad gas$$

Where:

C_{DC}	= drift corrected average concentration	=	5.217	ppmwv
B_w	= actual water vapor in gas (% v/v)	=	0.453	% v/v
100	= conversion factor to change percentage to decimal	=	100	
k_1	= ppm/% to ppm conversion factor for diluent gases	=	1	
C (ppmdv)	= THC concentration (ppmdv)	=	5.240	ppmdv

2. THC concentration (ppmwv)

$$C(ppmwv) = k_1 \times C_{DC} \quad if \quad wet \quad gas$$

$$C(ppmwv) = k_1 \times C_{DC} \times \left(1 - B_w/100\right) \quad if \quad dry \quad gas$$

Where:

C_{DC}	= drift corrected average concentration	=	5.217	ppmwv
B_w	= actual water vapor in gas (% v/v)	=	0.453	% v/v
100	= conversion factor to change percentage to decimal	=	100	
k_1	= ppm/% to ppm conversion factor for diluent gases	=	1	
C (ppmwv)	= THC concentration (ppmwv)	=	5.217	ppmwv

3. THC concentration (lb/dscf)

$$C(lb/dscf) = \frac{C(ppmdv) \times MW(gas)}{10^6\ ppm \times 385.3}$$

Where:

C (ppmdv)	= THC concentration (ppmdv)	=	5.240	ppmdv
MW	= Molecular Weight of THC gas	=	44.0972	lb/lb-mole
10^6	= conversion factor from decimal to ppm	=	1.00E+06	
385.3	= molar volume	=	385.3	dscf/lb-mole
C (lb/dscf)	= THC concentration (lb/dscf)	=	5.997E-07	lb/dscf

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4. THC concentration (lb/scf)

$$C\,(lb\,/\,scf\,) = C\,(lb\,/\,dscf\,) \times \frac{Q_{std}}{Q_s}$$

Where:

C (lb/dscf)	= THC concentration (lb/dscf)	=	5.997E-07	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181.173299	dscf/min
Q_s	= volumetric flow rate (standard cubic feet/min)	=	181.9980695	scf/min
C (lb/scf)	= THC concentration (lb/scf)	=	5.970E-07	lb/scf

5. THC concentration (lb/acf)

$$C\,(lb\,/\,acf\,) = C\,(lb\,/\,dscf\,) \times \frac{Q_{std}}{Q_a}$$

Where:

C (lb/dscf)	= THC concentration (lb/dscf)	=	5.997E-07	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181.173299	dscf/min
Q_a	= volumetric flow rate (actual cubic feet/min)	=	181.5321472	acf/min
C (lb/acf)	= THC concentration (lb/acf)	=	5.986E-07	lb/acf

6. THC concentration (%dv)

$$C\,(\%\,dv) = C\,(ppmdv\,) \times \frac{100}{10^6}$$

Where:

C (ppmdv)	= THC concentration (ppmdv)	=	5.240	ppmdv
100	= conversion factor from decimal to percentage	=	1.00E+02	
10^6	= conversion factor from decimal to ppm	=	1.00E+06	
C (%dv)	= THC concentration (%dv)	=	0.0005%	%dv

7. THC concentration (mg/dscm)

$$C\,(mg\,/\,dscm) = C\,(lb\,/\,dscf) \times k_2 \times 35.31$$

Where:

C (lb/dscf)	= THC concentration (lb/dscf)	=	5.997E-07	lb/dscf
k_2	= conversion factor from lb to mg	=	453515	mg/lb
35.31	= conversion factor from dscf to dscm	=	35.31	ft^3/m^3
C (mg/dscm)	= THC concentration (mg/dscm)	=	9.604	mg/dscm

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8. THC concentration (mg/Nm3 dry)

$$C \quad (mg / Nm^3\ dry) = C(lb/dscf) \times k_2 \times 35.31 \times \left(\frac{68+460}{32+460}\right)$$

Where:

C (lb/dscf)	= THC concentration (lb/dscf)	=	5.997E-07	lb/dscf
k_2	= conversion factor from lb to mg	=	453515	mg/lb
35.31	= conversion factor from dscf to dscm	=	35.31	ft^3/m^3
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C (mg/Nm3 dry)	= THC concentration (mg/Nm3 dry)	=	10.307	mg/Nm^3 dry

9. THC concentration corrected to 3% O2 (ppmdv example)

$$C(ppmdv@\ x\%02) = C(ppmdv) \times \left(\frac{20.9-x}{20.9-O_2}\right)$$

Where:

C (ppmdv)	= THC concentration (ppmdv)	=	5.240	ppmdv
x	= oxygen content of corrected gas (%)	=	3.00	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	0.666	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C (ppmdv - O2)	= THC concentration corrected to 3% O2 (ppmdv example)	=	4.636	ppmdv @ 3%O2

10. THC concentration corrected to 12% CO2 (ppmdv example)

$$C(ppmdv\ @\ y\%CO_2) = C(ppmdv) \times \left(\frac{y}{CO_2}\right)$$

Where:

C (ppmdv)	= THC concentration (ppmdv)	=	5.240	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.00	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	16.752	%
C (ppmdv -CO2)	= THC concentration corrected to 12% CO2 (ppmdv example)	=	3.754	ppmdv @ 12%CO2

11. THC emission rate (lb/hr)

$$E_{lb/hr} = C\ (lb\ /\ dscf\ ) \times Q_{std} \times 60$$

Where:

C (lb/dscf)	= THC concentration (lb/dscf)	=	5.997E-07	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181.173299	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= THC emission rate (lb/hr)	=	0.007	lb/hr

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12. THC emission rate (kg/hr)

$$E_{kg/hr} = C(lb/dscf) \times Q_{std} \times 60 \times 0.454$$

Where:

C (lb/dscf)	= THC concentration (lb/dscf)	=	5.997E-07	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	181.173299	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
0.454	= conversion factor (kg/lb)	=	0.454	kg/lb
$E_{kg/hr}$	= THC emission rate (kg/hr)	=	0.003	kg/hr

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PARAMETERS

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet

USEPA Method 26 (HCl & CL2)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 18	Feb 18	Feb 18	
Start Time (approx.)		08:45	10:36	12:19	
Stop Time (approx.)		09:45	11:36	13:19	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9944	0.9944	0.9944	
C_p	Pitot tube coefficient	0.84	0.84	0.84	
P_g	Static pressure (in. H_2O)	-0.0200	-0.0100	-0.0100	
A_s	Sample location area (ft^2)	0.4922	0.4922	0.4922	
P_{bar}	Barometric pressure (in. Hg)	29.70	29.70	29.70	**29.7000**
O_2	Oxygen (dry volume %)	0.6657	0.6406	0.6279	**0.6447**
CO_2	Carbon dioxide (dry volume %)	16.7516	16.7257	16.8892	**16.7888**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	82.5827	82.6337	82.4830	**82.5665**
V_{lc}	Total Liquid collected (ml)	0.40	0.80	0.20	
V_m	Volume metered, meter conditions (ft^3)	4.2466	4.2331	4.2356	
T_m	Dry gas meter temperature (°F)	77.8333	80.1667	81.1250	
T_s	Sample temperature (°F)	62.7500	65.1875	64.5625	**64.1667**
ΔH	Meter box orifice pressure drop (in. H_2O)	2.2000	2.2000	2.2000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	0.0188	0.0377	0.0094	**0.0220**
V_{mstd}	Volume metered, standard (dscf)	4.1359	4.1050	4.1001	**4.1136**
P_s	Sample gas pressure, absolute (in. Hg)	29.6985	29.6993	29.6993	**29.6990**
P_v	Vapor pressure, actual (in. Hg)	0.5680	0.6191	0.6057	**0.5976**
B_{wo}	Moisture measured in sample (% by volume)	0.4532	0.9090	0.2291	**0.5304**
B_{ws}	Saturated moisture content (% by volume)	1.9125	2.0847	2.0393	**2.0122**
B_w	Actual water vapor in gas (% by volume)	0.4532	0.9090	0.2291	**0.5304**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.1129	0.1052	0.1000	**0.1060**
M_d	MW of sample gas, dry (lb/lb-mole)	30.7069	30.7017	30.7274	**30.7120**
M_s	MW of sample gas, wet (lb/lb-mole)	30.6493	30.5863	30.6982	**30.6446**
V_s	Velocity of sample (ft/sec)	6.1465	5.7430	5.4471	**5.7789**
Q_a	Volumetric flow rate, actual (acfm)	182	170	161	**171**
Q_s	Volumetric flow rate, standard (scfm)	182	169	161	**171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	181	168	160	**170**
Q_a	Volumetric flow rate, actual (acf/hr)	10,892	10,177	9,653	**10,240**
Q_s	Volumetric flow rate, standard (scf/hr)	10,920	10,156	9,644	**10,240**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	10,870	10,064	9,622	**10,185**
Q_a	Volumetric flow rate, actual (m^3/hr)	308	288	273	**290**
Q_s	Volumetric flow rate, standard (m^3/hr)	309	288	273	**290**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	308	285	273	**288**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	288	268	255	**270**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	287	266	254	**269**

Comments:

Average includes 3 runs.

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QA/QC _____
Date _____

Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet

USEPA Method 26
HCl Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 18	Feb 18	Feb 18	
Start Time (approx.)		08:45	10:36	12:19	
Stop Time (approx.)		09:45	11:36	13:19	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.6657	0.6406	0.6279	**0.6447**
CO_2	Carbon dioxide (dry volume %)	16.7516	16.7257	16.8892	**16.7888**
T_s	Sample temperature (°F)	62.7500	65.1875	64.5625	**64.1667**
B_w	Actual water vapor in gas (% by volume)	0.4532	0.9090	0.2291	**0.5304**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	182	170	161	**171**
Q_s	Volumetric flow rate, standard (scfm)	182	169	161	**171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	181	168	160	**170**
Q_a	Volumetric flow rate, actual (acf/hr)	10,892	10,177	9,653	**10,240**
Q_s	Volumetric flow rate, standard (scf/hr)	10,920	10,156	9,644	**10,240**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	10,870	10,064	9,622	**10,185**
Q_a	Volumetric flow rate, actual (m^3/hr)	308	288	273	**290**
Q_s	Volumetric flow rate, standard (m^3/hr)	309	288	273	**290**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	308	285	273	**288**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	288	268	255	**270**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	287	266	254	**269**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.1359	4.1050	4.1001	**4.1136**
Laboratory Data					
m_n	Total HCl collected (mg)	0.0383	0.0352	0.0520	**0.0418**
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	2.0394E-08	1.8885E-08	2.7952E-08	**2.2410E-08**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	1.8041E-08	1.6686E-08	2.4681E-08	**1.9803E-08**
C_a	HCl Concentration (lb/acf)	2.0353E-08	1.8675E-08	2.7864E-08	**2.2297E-08**
C_{sd}	HCl Concentration (ppmdv)	0.2156	0.1997	0.2955	**0.2369**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	0.1907	0.1764	0.2609	**0.2094**
C_w	HCl Concentration (ppmwv)	0.2146	0.1978	0.2948	**0.2358**
C_{sd}	HCl Concentration (mg/dscm)	0.3266	0.3024	0.4476	**0.3589**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	0.2889	0.2672	0.3952	**0.3171**
C_a	HCl Concentration (mg/m^3 (actual,wet))	0.3259	0.2991	0.4462	**0.3571**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	0.3505	0.3245	0.4804	**0.3851**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	0.3100	0.2867	0.4242	**0.3403**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.0002	0.0002	0.0003	**0.0002**
$E_{kg/hr}$	HCl Rate (kg/hr)	0.0001	0.0001	0.0001	**0.0001**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet

USEPA Method 26
Cl_2 Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 18	Feb 18	Feb 18	
Start Time (approx.)		08:45	10:36	12:19	
Stop Time (approx.)		09:45	11:36	13:19	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.6657	0.6406	0.6279	**0.6447**
CO_2	Carbon dioxide (dry volume %)	16.7516	16.7257	16.8892	**16.7888**
T_s	Sample temperature (°F)	62.7500	65.1875	64.5625	**64.1667**
B_w	Actual water vapor in gas (% by volume)	0.4532	0.9090	0.2291	**0.5304**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	182	170	161	**171**
Q_s	Volumetric flow rate, standard (scfm)	182	169	161	**171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	181	168	160	**170**
Q_a	Volumetric flow rate, actual (acf/hr)	10,892	10,177	9,653	**10,240**
Q_s	Volumetric flow rate, standard (scf/hr)	10,920	10,156	9,644	**10,240**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	10,870	10,064	9,622	**10,185**
Q_a	Volumetric flow rate, actual (m^3/hr)	308	288	273	**290**
Q_s	Volumetric flow rate, standard (m^3/hr)	309	288	273	**290**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	308	285	273	**288**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	288	268	255	**270**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	287	266	254	**269**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.1359	4.1050	4.1001	**4.1136**
Laboratory Data					
m_n	Total Cl_2 collected (mg)	<0.0030	<0.0030	<0.0029	**<0.0030**
Chlorine (Cl_2) Results					
C_{sd}	Chlorine Concentration (lb/dscf)	<1.6106E-09	<1.5943E-09	<1.5677E-09	**<1.5909E-09**
C_{sd3}	Chlorine Concentration @3% O_2 (lb/dscf)	<1.4248E-09	<1.4086E-09	<1.3842E-09	**<1.4059E-09**
C_a	Chlorine Concentration (lb/acf)	<1.6074E-09	<1.5765E-09	<1.5627E-09	**<1.5822E-09**
C_{sd}	Chlorine Concentration (ppmdv)	<0.0088	<0.0087	<0.0085	**<0.0086**
C_{sd7}	Chlorine Concentration @3% O_2 (ppmdv)	<0.0077	<0.0077	<0.0075	**<0.0076**
C_w	Chlorine Concentration (ppmwv)	<0.0087	<0.0086	<0.0085	**<0.0086**
C_{sd}	Chlorine Concentration (mg/dscm)	<0.0258	<0.0255	<0.0251	**<0.0255**
C_{sd3}	Chlorine Concentration @3% O_2 (mg/dscm)	<0.0228	<0.0226	<0.0222	**<0.0225**
C_a	Chlorine Concentration (mg/m^3 (actual,wet))	<0.0257	<0.0252	<0.0250	**<0.0253**
C_{sd}	Chlorine Concentration (mg/Nm^3 dry)	<0.0277	<0.0274	<0.0269	**<0.0273**
C_{sd3}	Chlorine Concentration @3% O_2 (mg/Nm^3 dry)	<0.0245	<0.0242	<0.0238	**<0.0242**
$E_{lb/hr}$	Chlorine Rate (lb/hr)	<0.000018	<0.000016	<0.000015	**<0.000016**
$E_{kg/hr}$	Chlorine Rate (kg/hr)	<0.000008	<0.000007	<0.000007	**<0.000007**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet

USEPA Method 26 (HCl & CL2)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 18	Feb 18	Feb 18	
Start Time (approx.)		08:45	10:36	12:19	
Stop Time (approx.)		09:45	11:36	13:19	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9907	0.9907	0.9907	
C_p	Pitot tube coefficient	0.84	0.84	0.84	
P_g	Static pressure (in. H_2O)	0.0600	0.0500	0.0600	
A_s	Sample location area (ft^2)	0.4922	0.4922	0.4922	
P_{bar}	Barometric pressure (in. Hg)	29.70	29.70	29.70	**29.7000**
O_2	Oxygen (dry volume %)	0.6582	0.6365	0.6228	**0.6392**
CO_2	Carbon dioxide (dry volume %)	17.0901	17.1076	17.1836	**17.1271**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	82.2518	82.2559	82.1936	**82.2337**
V_{lc}	Total Liquid collected (ml)	1.10	1.50	1.80	
V_m	Volume metered, meter conditions (ft^3)	4.2377	4.2377	4.2487	
T_m	Dry gas meter temperature (°F)	83.6667	86.0417	87.9167	
T_s	Sample temperature (°F)	288.5000	282.8750	281.4375	**284.2708**
ΔH	Meter box orifice pressure drop (in. H_2O)	2.6000	2.6000	2.6000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	0.0518	0.0706	0.0847	**0.0690**
V_{mstd}	Volume metered, standard (dscf)	4.0718	4.0541	4.0506	**4.0588**
P_s	Sample gas pressure, absolute (in. Hg)	29.7044	29.7037	29.7044	**29.7042**
P_v	Vapor pressure, actual (in. Hg)	29.7044	29.7037	29.7044	**29.7042**
B_{wo}	Moisture measured in sample (% by volume)	1.2556	1.7118	2.0488	**1.6721**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	1.2556	1.7118	2.0488	**1.6721**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.1414	0.1388	0.1000	**0.1268**
M_d	MW of sample gas, dry (lb/lb-mole)	30.7607	30.7627	30.7743	**30.7659**
M_s	MW of sample gas, wet (lb/lb-mole)	30.6005	30.5442	30.5126	**30.5524**
V_s	Velocity of sample (ft/sec)	9.2158	9.0214	6.4950	**8.2441**
Q_a	Volumetric flow rate, actual (acfm)	272	266	192	**243**
Q_s	Volumetric flow rate, standard (scfm)	191	188	136	**171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	188	185	133	**169**
Q_a	Volumetric flow rate, actual (acf/hr)	16,331	15,986	11,510	**14,609**
Q_s	Volumetric flow rate, standard (scf/hr)	11,437	11,280	8,137	**10,285**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	11,293	11,087	7,971	**10,117**
Q_a	Volumetric flow rate, actual (m^3/hr)	462	453	326	**414**
Q_s	Volumetric flow rate, standard (m^3/hr)	324	319	230	**291**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	320	314	226	**287**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	302	298	215	**271**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	298	293	210	**267**

Comments:

Average includes 3 runs.

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet

USEPA Method 26
HCl Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 18	Feb 18	Feb 18	
Start Time (approx.)		08:45	10:36	12:19	
Stop Time (approx.)		09:45	11:36	13:19	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.6582	0.6365	0.6228	**0.6392**
CO_2	Carbon dioxide (dry volume %)	17.0901	17.1076	17.1836	**17.1271**
T_s	Sample temperature (°F)	288.5000	282.8750	281.4375	**284.2708**
B_w	Actual water vapor in gas (% by volume)	1.2556	1.7118	2.0488	**1.6721**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	272	266	192	**243**
Q_s	Volumetric flow rate, standard (scfm)	191	188	136	**171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	188	185	133	**169**
Q_a	Volumetric flow rate, actual (acf/hr)	16,331	15,986	11,510	**14,609**
Q_s	Volumetric flow rate, standard (scf/hr)	11,437	11,280	8,137	**10,285**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	11,293	11,087	7,971	**10,117**
Q_a	Volumetric flow rate, actual (m^3/hr)	462	453	326	**414**
Q_s	Volumetric flow rate, standard (m^3/hr)	324	319	230	**291**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	320	314	226	**287**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	466	458	329	**418**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	302	298	215	**271**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	298	293	210	**267**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0718	4.0541	4.0506	**4.0588**
Laboratory Data					
m_n	Total HCl collected (mg)	137.0130	142.2498	167.3421	**148.8683**
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	7.4197E-05	7.7369E-05	9.1094E-05	**8.0887E-05**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	6.5613E-05	6.8345E-05	8.0415E-05	**7.1458E-05**
C_a	HCl Concentration (lb/acf)	5.1310E-05	5.3658E-05	6.3084E-05	**5.6017E-05**
C_{sd}	HCl Concentration (ppmdv)	784.4530	817.9939	963.1008	**855.1826**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	693.6981	722.5848	850.1919	**755.4916**
C_w	HCl Concentration (ppmwv)	774.6032	803.9917	943.3687	**840.6545**
C_{sd}	HCl Concentration (mg/dscm)	1188.1583	1238.9604	1458.7441	**1295.2876**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	1050.6980	1094.4507	1287.7285	**1144.2924**
C_a	HCl Concentration (mg/m^3 (actual,wet))	821.6524	859.2623	1010.2004	**897.0384**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	1275.0967	1329.6161	1565.4815	**1390.0648**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	1127.5783	1174.5324	1381.9526	**1228.0211**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.8379	0.8578	0.7261	**0.8073**
$E_{kg/hr}$	HCl Rate (kg/hr)	0.3800	0.3890	0.3293	**0.3661**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet

USEPA Method 26
Cl_2 Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 18	Feb 18	Feb 18	
Start Time (approx.)		08:45	10:36	12:19	
Stop Time (approx.)		09:45	11:36	13:19	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.6582	0.6365	0.6228	**0.6392**
CO_2	Carbon dioxide (dry volume %)	17.0901	17.1076	17.1836	**17.1271**
T_s	Sample temperature (°F)	288.5000	282.8750	281.4375	**284.2708**
B_w	Actual water vapor in gas (% by volume)	1.2556	1.7118	2.0488	**1.6721**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	272	266	192	**243**
Q_s	Volumetric flow rate, standard (scfm)	191	188	136	**171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	188	185	133	**169**
Q_a	Volumetric flow rate, actual (acf/hr)	16,331	15,986	11,510	**14,609**
Q_s	Volumetric flow rate, standard (scf/hr)	11,437	11,280	8,137	**10,285**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	11,293	11,087	7,971	**10,117**
Q_a	Volumetric flow rate, actual (m^3/hr)	462	453	326	**414**
Q_s	Volumetric flow rate, standard (m^3/hr)	324	319	230	**291**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	320	314	226	**287**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	302	298	215	**271**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	298	293	210	**267**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0718	4.0541	4.0506	**4.0588**
Laboratory Data					
m_n	Total Cl_2 collected (mg)	0.9270	1.0206	1.0858	**1.0111**
Chlorine (Cl_2) Results					
C_{sd}	HCl Concentration (lb/dscf)	5.0200E-07	5.5510E-07	5.9106E-07	**5.4939E-07**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	4.4392E-07	4.9036E-07	5.2177E-07	**4.8535E-07**
C_a	HCl Concentration (lb/acf)	3.4715E-07	3.8498E-07	4.0932E-07	**3.8048E-07**
C_{sd}	HCl Concentration (ppmdv)	2.7292	3.0179	3.2134	**2.9868**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	2.4134	2.6659	2.8367	**2.6387**
C_w	HCl Concentration (ppmwv)	2.6949	2.9662	3.1475	**2.9362**
C_{sd}	HCl Concentration (mg/dscm)	8.0388	8.8892	9.4651	**8.7977**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	7.1088	7.8524	8.3554	**7.7722**
C_a	HCl Concentration (mg/m^3 (actual,wet))	5.5591	6.1650	6.5547	**6.0929**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	8.6270	9.5396	10.1576	**9.4414**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	7.6290	8.4269	8.9668	**8.3409**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.0057	0.0062	0.0047	**0.0055**
$E_{kg/hr}$	HCl Rate (kg/hr)	0.0026	0.0028	0.0021	**0.0025**

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	1
Date (2005)	Feb 18
Start Time	8:47
End Time	9:47
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	5.22	3.84	0.67	16.75	0.66	17.09	2.67	1.96
Concentration (ppmdv)	5.24	3.89					2.68	1.99
Concentration (ppmwv)	5.22	3.84					2.67	1.96
Concentration (%dv)	0.00052	0.00039	0.666	16.752	0.658	17.090	0.00027	0.00020
Concentration (%wv)	0.00052	0.00038	0.663	16.676	0.650	16.875	0.00027	0.00020
Concentration @3%O2 (ppm)	4.64	3.33					2.37	1.70
Mass Rate (lb/hr)	0.0065	0.0050					0.0065	0.0050
Removal Efficiency (%)	-39.2%							

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	2
Date (2005)	Feb 18
Start Time	10:38
End Time	11:38
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	4.31	3.56	0.64	16.73	0.64	17.11	2.21	1.82
Concentration (ppmdv)	4.35	3.62					2.23	1.85
Concentration (ppmwv)	4.31	3.56					2.21	1.82
Concentration (%dv)	0.00044	0.00036	0.641	16.726	0.637	17.108	0.00022	0.00019
Concentration (%wv)	0.00043	0.00036	0.635	16.574	0.626	16.815	0.00022	0.00018
Concentration @3%O2 (ppm)	3.84	3.10					1.97	1.59
Mass Rate (lb/hr)	0.0050	0.0046					0.0050	0.0046
Removal Efficiency (%)	-23.9%							

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	3
Date (2005)	Feb 18
Start Time	12:21
End Time	13:21
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	4.61	4.07	0.63	16.89	0.62	17.18	2.36	2.08
Concentration (ppmdv)	4.62	4.15					2.37	2.12
Concentration (ppmwv)	4.61	4.07					2.36	2.08
Concentration (%dv)	0.00046	0.00042	0.628	16.889	0.623	17.184	0.00024	0.00021
Concentration (%wv)	0.00046	0.00041	0.626	16.850	0.610	16.832	0.00024	0.00021
Concentration @3%O2 (ppm)	4.08	3.56					2.09	1.82
Mass Rate (lb/hr)	0.0051	0.0038					0.0051	0.0038
Removal Efficiency (%)	-14.8%							

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Scott Specialty Gases

Dual-Analyzed Calibration Standard

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CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
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TROY,MI 48083

P.O. No.: 51846-71-65000
Project No.: 05-94391-008

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CLEAN AIR ENGINEERING
DON ALLEN
500 W. WOOD STREET
PALATINE IL 60067

ANALYTICAL INFORMATION

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

Cylinder Number: ALM053831 **Certification Date:** 7/22/02 **Exp. Date:** 7/21/2005

Cylinder Pressure*:** 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
PROPANE	26.20	PPM	+/- 1%	Direct NIST and NMi
AIR		BALANCE		

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

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1668	8/01/05	ALM010723	99.50 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/6000/08963016A	06/25/02	FLAME IONIZATION

ANALYZER READINGS

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

First Triad Analysis

PROPANE

Date:07/22/02 Response Unit:HGHT

Z1=0.00000	R1=749936.0	T1=196282.0
R2=748041.0	Z2=0.00000	T2=196172.0
Z3=0.00000	T3=196727.0	R3=748300.0

Avg. Concentration: 26.20 PPM

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4

r=0.999995

Constants:	A=0.0804372
B=1.31E-04	C=0.00
D=0.00	E=0.00

APPROVED BY: _____
SCOTT KING

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET,TROY,MI 48083

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

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: 51790-71-65000
Project No.: 05-93517-029

Customer

CLEAN AIR ENGINEERING
DON ALLEN
500 W. WOOD STREET
PALATINE IL 60067

ANALYTICAL INFORMATION

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

Cylinder Number: ALM033262 **Certification Date:** 7/01/02 **Exp. Date:** 6/30/2005
Cylinder Pressure*:** 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
PROPANE	44.46	PPM	+/- 1%	Direct NIST and NMi
AIR		BALANCE		

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

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997. Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1668	8/01/05	ALM010723	99.50 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/6000/08963016A	06/25/02	FLAME IONIZATION

ANALYZER READINGS

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

First Triad Analysis **Second Triad Analysis** **Calibration Curve**

PROPANE

Date:07/01/02	Response Unit:HGHT	
Z1 = 0.00000	R1 = 754045.0	T1 = 335366.0
R2 = 754186.0	Z2 = 0.00000	T2 = 336468.0
Z3 = 0.00000	T3 = 335774.0	R3 = 753055.0
Avg. Concentration:	44.46	PPM

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 0.999995	
Constants:	A = 0.0804372
B = 1.31E-04	C = 0.00
D = 0.00	E = 0.00

APPROVED BY: SCOTT KING

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

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

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
1290 COMBERMERE STREET
TROY,MI 48083

P.O. No.: 52729-71-6500
Project No.: 05-10604-001

Customer

CLEAN AIR ENGINEERING
DON ALLEN
500 W. WOOD STREET
PALATINE IL 60067

ANALYTICAL INFORMATION

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

Cylinder Number: ALM033719 **Certification Date:** 28May2002 **Exp. Date:** 27May2005

Cylinder Pressure*:** 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
PROPANE	84.84	PPM	+/- 1%	Direct NIST and NMi
AIR		BALANCE		

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

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1668	01Aug2005	ALM010723	99.50 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/6000/08963016A	23May2002	FLAME IONIZATION

ANALYZER READINGS

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

PROPANE

First Triad Analysis

Date: 28May2002 Response Unit:HGHT

Z1 = 0.00000	R1 = 764729.0	T1 = 649926.0
R2 = 761259.0	Z2 = 0.00000	T2 = 649323.0
Z3 = 0.00000	T3 = 650956.0	R3 = 761275.0

Avg. Concentration: 84.84 PPM

Second Triad Analysis

Calibration Curve

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 1.000000

Constants:	A = -0.0006231
B = 1.28E-04	C = 0.00
D = 0.00	E = 0.00

Special Notes: STOCK#: RATA710

APPROVED BY: _____
SCOTT KING

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

9810 BAY AREA BLVD,PASADENA,TX 77507 Phone: 281-474-5800 Fax: 281-474-5857

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA,TX 77507

P.O. No.: 52832-71-65000
Project No.: 04-21086-029

Customer

CLEAN AIR ENGINEERING
NANCY DAVIS
321 CENTURY PLAZA
SUITE 130
HOUSTON TX 77073

ANALYTICAL INFORMATION

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

Cylinder Number: 1L1974 **Certification Date:** 12Nov2003 **Exp. Date:** 11Nov2006

Cylinder Pressure*:** 1900 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	10.09 %	+/- 1%	Direct NIST and NMi
OXYGEN	10.15 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

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

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1675	01Jun2004	K005025	13.93 %	CARBON DIOXIDE
NTRM 2658	02Oct2006	ALM065073	9.930 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
MTI-A/M200/171109	15Oct2003	GAS CHROMATOGRAPHY
MTI-A/M200/171109	20Oct2003	GAS CHROMATOGRAPHY

ANALYZER READINGS

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

First Triad Analysis **Second Triad Analysis** **Calibration Curve**

CARBON DIOXIDE

Date: 12Nov2003 Response Unit:AREA

Z1 = 16.00000	R1 = 50136.00	T1 = 36552.00
R2 = 50173.00	Z2 = 29.00000	T2 = 36597.00
Z3 = 19.00000	T3 = 36614.00	R3 = 50238.00

Avg. Concentration: 10.09 %

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999993319
Constants: A = -0.039892224
B = 0.000279651 C =
D = E =

OXYGEN

Date: 12Nov2003 Response Unit:AREA

Z1 = 114.0000	R1 = 37337.00	T1 = 37977.00
R2 = 37403.00	Z2 = 77.00000	T2 = 38033.00
Z3 = 110.0000	T3 = 38138.00	R3 = 37566.00

Avg. Concentration: 10.15 %

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999993435
Constants: A = -0.019864017
B = 0.000267171 C =
D = E =

APPROVED BY: D Kelly

DAVID KELLY

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

9810 BAY AREA BLVD,PASADENA,TX 77507
Phone: 281-474-5800 Fax: 281-474-5857

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA,TX 77507

P.O. No.: 53319-73-65000
Project No.: 04-24654-011

Customer

CLEAN AIR INSTRUMENT RENTALS

321 CENTURY PLAZA
SUITE 110
HOUSTON TX 77073

ANALYTICAL INFORMATION

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

Cylinder Number: ALM033531 **Certification Date:** 24May2004 **Exp. Date:** 24May2007
Cylinder Pressure*:** 1850 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	17.99 %	+/- 1%	Direct NIST and NMi
OXYGEN	21.43 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1675	01Jun2004	K000792	13.93 %	CARBON DIOXIDE
NTRM 2658	02Oct2006	ALM065073	9.930 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
MTI-A/M200/171109	24May2004	GAS CHROMATOGRAPHY
MTI-A/M200/171109	30Apr2004	GAS CHROMATOGRAPHY

ANALYZER READINGS

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

CARBON DIOXIDE

First Triad Analysis

Date: 24May2004 Response Unit:AREA

Z1=27.00000	R1=50111.00	T1=64575.00
R2=49973.00	Z2=52.00000	T2=64637.00
Z3=81.00000	T3=64636.00	R3=50045.00

Avg. Concentration: 17.99 %

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999999462
Constants: A=-0.007960789
B=0.00027771 C=
D= E=

OXYGEN

First Triad Analysis

Date: 24May2004 Response Unit:AREA

Z1=53.00000	R1=36650.00	T1=78954.00
R2=38574.00	Z2=28.00000	T2=79060.00
Z3=32.00000	T3=79185.00	R3=36700.00

Avg. Concentration: 21.43 %

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999997146
Constants: A=-0.024907814
B=0.000269251 C=
D= E=

APPROVED BY: DAVID KELLY

Scott Specialty Gases

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

CERTIFICATE OF ANALYSIS

WAREHOUSE/STOCK
WAREHOUSE/STOCK/
CHICAGO WAREHOUSE
868 SIVERT
WOOD DALE IL 60191

PROJECT #: 05-26119-003
PO#: GENERAL STOCK
ITEM #: 0501813 AL
DATE: 14Dec2004

CYLINDER #: ALM042802
FILL PRESSURE: 02000 PSIG

PURE MATERIAL: NITROGEN CAS# 7727-37-9

GRADE: ZERO GAS

PURITY: 99.998%

IMPURITY	MAXIMUM CONCENTRATIONS
THC	0.5 PPM

ANALYST: Ashwani Vaz

SAMPLE PROBE CALIBRATION DATA

Probe Type: M5 I.D. number: 67-4-1

Thermocouple Calibration

Reference Type: _____ Reference I.D. No: _____ Pyrometer I.D. No: _____ Degrees: F / C

Point No.	Target Temp.	Reference Temp	Indicated Temp	Temp Difference	% Difference
1	ice-32°F				
2	ambient-70°F				
3	hot oil-150°F				
4	boiling H_2O-212°F				
5	hot oil-320°F				

Specification: %Difference ≤1.5

Does assembly meet specifications? [ ] → If "NO" thermocouple must be replaced.

Geometric Pitot Calibration

Is pitot assembly in good repair? YES / NO if "NO" explain: _____

If repairs are required, pitot does not meet specification.

[X] "S" Pitot

Measurement				Specification
a1 =	1	a2 =	0	<10°
b1 =	0	b2 =	0	<5°
γ =	0	θ =	2	
Pa =	0.326	Pb =	0.396	Pa + Pb = A
A =	0.722	Dt =	0.748	

Calculations

z = A sin γ = 0.000 <0.125"

w = A sin θ = 0.025197 <0.03125"

assembly meet specifications? YES / NO

[ ] Standard Pitot

Measurement		Specification
Tube O.D.		(D)
Static Hole I.D.		0.1 x D =
Length,		
Tip to Static		> 6xD =
Static to Bend		>8xD =

Does assembly meet specifications? YES / NO

If "YES" "S" pitot Cp=0.84; Std pitot Cp=0.99
If "NO" wind tunnel calibration is required.

Wind Tunnel Pitot Calibration

Reference Pitot I.D. No: _____ Reference Pitot Cp: _____

Pitot Side 'A':

Trial No.	Reference ΔP	Probe ΔP	Probe Cp*	Deviation from Average Cp*
1				
2				
3				

Side 'A' Average Probe Cp= _____

Specification: Cp Deviations ≤0.01

Pitot Side 'B':

Trial No.	Reference ΔP	Probe ΔP	Probe Cp*	Deviation from Average Cp*
1				
2				
3				

Side 'B' Average Probe Cp= _____

Specification: Cp Deviations ≤0.01

** Probe Cp=(Reference Cp)√(Reference ΔP / Probe ΔP); Cp Deviation=Trial Probe Cp - Average Probe Cp*

Side 'A' Average Cp _____ Side 'B' Average Cp _____ = Difference _____ Abs. Diff. ≤0.01

Does assembly meet specifications? YES / NO → *If "YES" Cp=Average of Side 'A' and 'B' Cp values.*
If "NO" PITOT MUST BE REPLACED.

All specifications are from EPA 600/9-76-060, Section 3.

PROBE Cp = 0.84 Calibrated by: M. Ambler Date: 9/15/04

CE9003A-Pitot.xls, Feb 2001
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CleanAir ENGINEERING

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FIELD DATA

E

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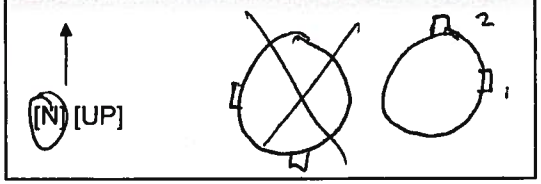
TEST LOCATION: OUTLET

UNIT: LPCCR SCRUBBER

VELOCITY DETERMINATION FIELD DATA SHEET

Client	MARATHON ASHLAND PET.
Project No.	9684
Plant	CATLETTSBURG REFINERY
Date	2/18/05
Meter Operator	E. DOAK
Probe Operator	M. CASTNER / A. BINKLY
Source of Moisture and Molecular Weight Data	HCl MIDGETS

Cross-Section of Test Location



Amb. Temp. (°F)	40
Bar. Press.	29.70 [in. Hg] [mbar]
Pitot Cp	0.84
Probe I.D. No.	67-4-1
Duct Diameters from Disturbance	
Downstream	2
Upstream	7
First point all the way [In] [Out]	
Port Len. (in.)	17
Gas Flow [In] [Out] of page	
Duct Dimensions (in.)	9.5

Run 1	Load NORMAL	Run 2	Load NORMAL	Run 3	Load NORMAL	Run	Load
Start Time 959	Stop Time 1005	Start Time 1204	Stop Time 1211	Start Time 1328	Stop Time 1334	Start Time	Stop Time
Static Press. (in. H_2O) -0.02		Static Press. (in. H_2O) -0.01		Static Press. (in. H_2O) -0.01		Static Press. (in. H_2O)	
Post-Test Leak Check: Pass ☑ Fail ☐		Post-Test Leak Check: Pass ☑ Fail ☐		Post-Test Leak Check: Pass ☑ Fail ☐		Post-Test Leak Check: Pass ☐ Fail ☐	

Traverse Point Number	Stack Temp. T_s (°F)	Velocity Head ΔP (in.H_2O)	Notes	Traverse Point Number	Stack Temp. T_s (°F)	Velocity Head ΔP (in.H_2O)	Notes	Traverse Point Number	Stack Temp. T_s (°F)	Velocity Head ΔP (in.H_2O)	Notes	Traverse Point Number	Stack Temp. T_s (°F)	Velocity Head ΔP (in.H_2O)	Notes
2-1	58	0.02		2-1	63	0.01		2-1	63	0.01					
2	61	0.02		2	64	0.01		2	64	0.01					
3	62	0.02		3	65	0.01		3	64	0.01					
4	62	0.02		4	65	0.01		4	64	0.01					
5	62	0.01		5	66	0.01		5	65	0.01					
6	63	0.02		6	67	ED ~~0.01~~	0.02	6	65	0.01					
7	63	0.01		7	67	ED ~~0.01~~	0.02	7	65	0.01					
8	64	0.01		8	66	0.01		8	66	0.01					
1-1	63	0.01		1-1	64	0.01		1	64	0.01					
2	63	0.01		2	64	0.01		2	64	0.01					
3	63	0.01		3	64	0.01		3	65	0.01					
4	63	0.01		4	65	0.01		4	65	0.01					
5	63	0.01		5	65	0.01		5	65	0.01					
6	64	0.01		6	66	0.01		6	65	0.01					
7	65	0.01		7	66	0.01		7	65	0.01					
8	65	0.01		8	66	0.01		8	64	0.01					
Total	1004	*1.8071			1043	*1.6828			1033	*1.6000				*	
Average	62.7500	0.1130			65.1875	0.1052			64.5625	0.1000					

* Sum of square roots. Circle correct bracketed units on data sheet.

CleanAir ENGINEERING

QA/QC ED
Date 2-18-05

FDS002-Velocity.xls, August 2004
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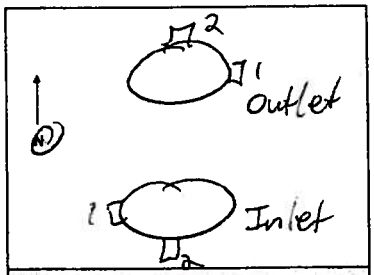
UNIT: LPICR Scrubber RUN: 1

VOST FIELD DATA SHEET

PAGE 1 OF 1

TEST LOCATION: ~~Stack~~ - Outlet

Client	Marathon Ashland Pet
Project Number	9684
Date	2/18/05
~~Location~~ ~~Load~~	Outlet
Operator	M. Custred



Cross-Section of Testing Location

Bar. Press. (in. Hg)	29.70
VOST Box Number	67-V2
Meter Box Number	80-063004-1
Meter Y_d	0.9944
Meter ΔH @	NA

Field Blank I.D.	—
Tenax	—
Tenax / Charcoal	—

Probe Heater Setting	350°
Probe Material	S.S.
Probe Number	NA
Probe Length	NA

DATA SET NO. A

Start Time 08:45 Stop Time 09:45

Leak Rate Before 0.01 [cfm] [LPM] @ 8 (in. Hg)

Leak Rate ~~Before~~ After 0.01 [cfm] [LPM] @ 11 (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp. (Meter Temp IN)	Trap 2 Temp. (Meter Temp OUT)	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume 9676.90 / Sample Gas Volume V_m [ft^3]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
5	2	50	350°	73	72	ICE	NA	7	2.2	9686.74	
10	↓	51	↓	74	73	↓	↓	7	2.2	9696.86	
15	↓	51	↓	75	74	↓	↓	7	2.2	9706.94	
20	↓	50	↓	77	75	↓	↓	7	2.2	9716.88	
25	↓	51	↓	77	76	↓	↓	7	2.2	9726.76	
Average	↓	—	↓	—	—	↓	↓	—	—	—	

DATA SET NO. B

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp. (Meter Temp IN)	Trap 2 Temp. (Meter Temp OUT)	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3] (L)	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
30	2	51	350°	78	77	ICE	NA	7	2.2	9736.90	
35	↓	51	↓	79	78	↓	↓	7	2.2	9746.99	
40	↓	50	↓	80	79	↓	↓	7	2.2	~~9757~~ 9757.04	
45	↓	50	↓	81	80	↓	↓	7	2.2	~~9767.08~~ 9767.08	
50	↓	50	↓	82	80	↓	↓	7	2.2	9777.10	
Average	↓	—	↓	—	—	↓	↓	—	—	—	

DATA SET NO. C

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp. (Meter Temp IN)	Trap 2 Temp. (Meter Temp OUT)	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3] (L)	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
55	2	50	350°	82	81	ICE	NA	7	2.2	9787.11	
60	2	50	350°	83	82	ICE	NA	7	2.2	9797.15	
				941.0	927.0						
Average									2.2000	120.2500	

77.8333

QA/QC ED
Date 2-15-05

4.2466 ft3

CleanAir Engineering

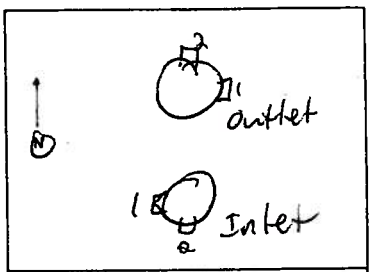
UNIT: LPCCR Scrubber RUN: 2

VOST FIELD DATA SHEET

PAGE 1 OF 1

TEST LOCATION: Stack- Outlet

Client	Marathon Ashland Pet
Project Number	9684
Date	2/18/05
Location	Outlet
Operator	M Castner



Cross-Section of Testing Location

Bar. Press. (in. Hg)	29.70
VOST Box Number	67-V2
Meter Box Number	80-063004-1
Meter Y_d	0.9944
Meter ΔH @	NA

Field Blank I.D.	—
Tenax	—
Tenax / Charcoal	—

Probe Heater Setting	350°
Probe Material	S.S.
Probe Number	NA
Probe Length	NA

DATA SET NO. A

Start Time 10:36 Stop Time 11:36

Leak Rate Before 0.01 [cfm] [LPM] @ 9 (in. Hg)

Leak Rate ~~Before~~ After 0.01 [cfm] [LPM] @ 10 (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Meter Temp Trap 1 Temp. IN	Meter Temp Trap 2 Temp. OUT	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
5	2	50	350°	80	80	ICE	NA	6	2.2	9797.82	
10		50		80	80			6	2.2	9807.82	
15		50		79	79			6	2.2	9817.85	
20		50		79	79			6	2.2	9827.84	
25		50		79	79			6	2.2	9837.78	
Average		—		—	—			—	—	9847.65	

DATA SET NO. B

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Meter Temp Trap 1 Temp. IN	Meter Temp Trap 2 Temp. OUT	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
30	2	50	350°	80	79	ICE	NA	6	2.2	9857.80	
35		50		80	79			6	2.2	9867.95	
40		50		80	80			6	2.2	9877.86	
45		50		81	80			6	2.2	9887.81	
50		50		82	81			6	2.2	9897.70	
Average		—		—	—			—	—	—	

DATA SET NO. C

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Meter Temp Trap 1 Temp. IN	Meter Temp Trap 2 Temp. OUT	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
55	2	50	350°	82	81	ICE	NA	6	2.2	9907.59	
60	2	50	350°	83	82	ICE	NA	6	2.2	9917.69	
				965.0	959.0						
Average				80.1667					2.2000	119.8700	

QA/QC EA Date 2-15-05

4.233 ft³

CleanAir Engineering

LPCCR

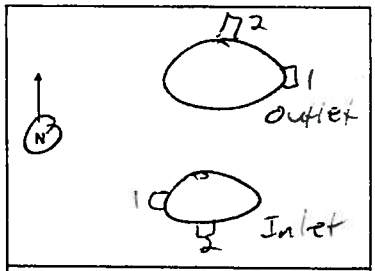
UNIT: Scrubber RUN: 3

VOST FIELD DATA SHEET

PAGE 4 OF 1

TEST LOCATION: Stack - Outlet

Client	Marathon Ashland Pet
Project Number	4684
Date	2/18/05
Location	Outlet
Operator	M. Castner



Cross-Section of Testing Location

Bar. Press. (in. Hg)	29.70
VOST Box Number	67-V2
Meter Box Number	80-063004-1
Meter Y_d	0.9944
Meter ΔH @	NA

Probe Heater Setting	350°
Probe Material	S.S.
Probe Number	NA
Probe Length	NA

Field Blank I.D.	—
Tenax	—
Tenax / Charcoal	—

DATA SET NO. A

Start Time 12:19 Stop Time 13:19

Leak Rate Before 0.01 [cfm] [LPM] @ 11 (in. Hg)

Leak Rate ~~Before~~ After 0.01 [cfm] [LPM] @ 11 (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp. (Meter Temp IN)	Trap 2 Temp. (Meter Temp OUT)	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
5	2	50	350°	81	80	ICE	NA	7	2.2	9918.54	
10		50		80	80			6	2.2	9938.74	
15		50		80	80			6	2.2	9948.67	
20		50		80	80			6	2.2	9958.57	
25		50		80	80			6	2.2	9968.76	
Average		—		—	—			—	—	—	

DATA SET NO. B

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp. (Meter Temp IN)	Trap 2 Temp. (Meter Temp OUT)	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
30	2	50	350°	81	80	ICE	NA	6	2.2	9978.68	
35		50		81	81			6	2.2	9988.54	
40		50		82	81			6	2.2	9998.69	
45		50		82	81			6	2.2	10008.82	
50		50		83	82			6	2.2	10018.61	
Average		—		—	—			—	—	—	

DATA SET NO. C

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp. (Meter Temp IN)	Trap 2 Temp. (Meter Temp OUT)	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
55	2	50	350°	83	82	ICE	NA	6	2.2	10028.40	
60	2	50	350°	84	83	ICE	NA	6	2.2	10038.48	
			~~977.0~~	977.0	970.0						
Average									2.2000	119.9400	

81.1250

4.236 ft^3

QA/QC EO
Date 2-18-05

CleanAir ENGINEERING

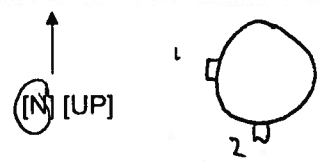
TEST LOCATION: INLET

UNIT: LP CCR SCRUBBER

VELOCITY DETERMINATION FIELD DATA SHEET

Client: MARATHON ASHLAND PET	Project No.: 9684
Plant: CATLETTSBURG REFINERY	Date: 2/18/05
Meter Operator: E. DOAK	
Probe Operator: M. CASTNER / R. BIHLER	
Source of Moisture and Molecular Weight Data: HCl MIDGETS	

Cross-Section of Test Location



Amb. Temp. (°F): 40	Bar. Press. ~~29.40~~ 29.70 (in. Hg) [mbar]
Pitot Cp: 0.84	Probe I.D. No.: 67-8-1
Duct Diameters from Disturbance	
Downstream: 7	Upstream: 3
First point all the way (In) [Out]	Port Len. (in.): 17
Gas Flow [In] (Out) of page	
Duct Dimensions (in.): 9.5	

Run 1	Load: ~~FULL~~ NORMAL ~~RWHITE BURN 2~~	Run 2	Load: FULL NORMAL	Run 3	Load: NORMAL	Run	Load
Start Time: 10:18	Stop Time: ~~10:23~~ 10:28	Start Time: 11:48	Stop Time: 11:55	Start Time: 14:02	Stop Time: 14:11	Start Time	Stop Time
Static Press. (in. H_2O): +0.06		Static Press. (in. H_2O): +0.05		Static Press. (in. H_2O): +0.06		Static Press. (in. H_2O)	
Post-Test Leak Check: Pass ☑ Fail ☐		Post-Test Leak Check: Pass ☑ Fail ☐		Post-Test Leak Check: Pass ☑ Fail ☐		Post-Test Leak Check: Pass ☐ Fail ☐	

Traverse Point Number	Stack Temp. T_s (°F)	Velocity Head ΔP (in.H_2O)	Notes	Traverse Point Number	Stack Temp. T_s (°F)	Velocity Head ΔP (in.H_2O)	Notes	Traverse Point Number	Stack Temp. T_s (°F)	Velocity Head ΔP (in.H_2O)	Notes	Traverse Point Number	Stack Temp. T_s (°F)	Velocity Head ΔP (in.H_2O)	Notes
2-1	279	0.02		2-1	276	0.02		2-1	~~268~~ 290	0.01					
2	285	0.02		2	278	0.02		2	273	0.01					
3	288	0.02		3	279	0.02		3	275	0.01					
4	290	0.02		4	282	0.02		4	282	0.01					
5	290	0.02		5	285	0.02		5	282	0.01					
6	289	0.02		6	280	0.02		6	281	0.01					
7	288	0.02		7	279	0.02		7	279	0.01					
8	284	0.02		8	277	0.01		8	273	0.01					
1-1	288	0.02		1-1	282	0.02		1	280	0.01					
2	289	0.02		2	284	0.02		2	282	0.01					
3	290	0.02		3	287	0.02		3	284	0.01					
4	292	0.02		4	289	0.02		4	285	0.01					
5	296	0.02		5	289	0.02		5	288	0.01					
6	291	0.02		6	289	0.02		6	290	0.01					
7	290	0.02		7	286	0.02		7	292	0.01					
8	287	0.02		8	284	0.02		8	287	0.01					
Total	4616	*2.2627			4526	*2.7213			4503	*0.6000				*	
Average	288.5000	0.1414			~~282.8750~~ 282.8750	0.1388			281.4375	0.1000					

* Sum of square roots.

Circle correct bracketed units on data sheet.

QA/QC: ED

Date: 2/18/05

CleanAir ENGINEERING

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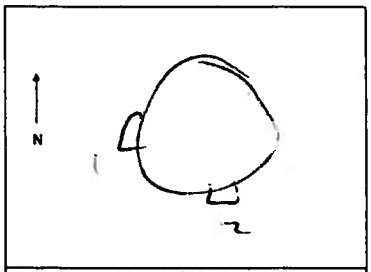
LICR Scrubber

UNIT: _____ RUN: 1

VOST FIELD DATA SHEET

TEST LOCATION: Inlet Stack

Client	Marathon Petroleum Refi
Project Number	96741
Date	2/18/05
Location	Inlet
Operator	PB



Cross-Section of Testing Location

Bar. Press. (in. Hg)	29.70
VOST Box Number	67 V1
Meter Box Number	N/A
Meter Y_d	0.9907
Meter ΔH @	N/A

Field Blank I.D.	N/A
Tenax	N/A
Tenax / Charcoal	N/A

Probe Heater Setting	350
Probe Material	S.S
Probe Number	N/A
Probe Length	N/A

DATA SET NO. A

Start Time 8:45 Stop Time 9:45

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before 0.01 [cfm] [LPM] @ 8 (in. Hg)

Initial Volume 5815.64

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp.		Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Sample Gas Volume V_m [ft^3]	Notes
5	2	49	350	N/A	N/A	ICE	81	79	9	2.6	5825.62	
10	↓	49	↓	↓	↓	↓	81	80	9	2.6	5835.66	
15	↓	49	↓	↓	↓	↓	82	80	9	2.6	5845.63	
20	↓	49	↓	↓	↓	↓	83	81	9	2.6	5855.64	
25	↓	49	↓	↓	↓	↓	84	83	9	2.6	5865.64	
Average	↓		↓	↓	↓	↓						

Cartridge I.D. Tenax _____ Tenax/Charcoal _____

DATA SET NO. B

Start Time _____ Stop Time _____

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp.		Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Sample Gas Volume V_m [ft^3]	Notes
30	2	49	350	N/A	N/A	ICE	85	83	9	2.6	5875.64	
35	↓	49	↓	↓	↓	↓	85	84	9	2.6	5885.65	
40	↓	49	↓	↓	↓	↓	85	84	9	2.6	5895.66	
45	↓	49	↓	↓	↓	↓	86	85	9	2.6	5905.65	
50	↓	49	↓	↓	↓	↓	86	85	9	2.6	5915.63	
Average	↓		↓	↓	↓	↓						

Initial Volume

Cartridge I.D. Tenax _____ Tenax/Charcoal _____

DATA SET NO. C

Start Time _____ Stop Time _____

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate ~~Before~~ 0.01 [cfm] [LPM] @ 14 (in. Hg)

Initial Volume

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp.		AFTER Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Sample Gas Volume V_m [ft^3]	Notes
55	2	49	350	N/A	N/A	ICE	87	86	9	2.6	5925.60	
60	↓	49	↓	↓	↓	↓	87	86	9	2.6	5935.64	
Average	↓		↓	↓	↓	↓						

Cartridge I.D. Tenax _____ Tenax/Charcoal _____

QA/QC ED
Date 2-18-05

2.60

120.000

83.4427

4.2378 ft³

CleanAir ENGINEERING

LPCA Scrubber

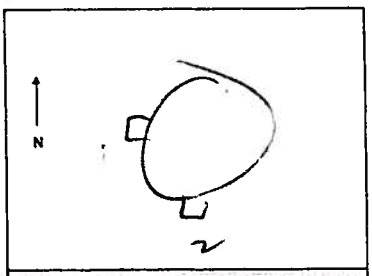
UNIT: ____ RUN: 2

VOST FIELD DATA SHEET

PAGE 1 OF 1

TEST LOCATION: Inlet Stack

Client	Marathon Petroleum [illegible]
Project Number	96-[illegible]
Date	2/18/05
Location	Inlet
Operator	PB



Cross-Section of Testing Location

Bar. Press. (in. Hg)	29.70
VOST Box Number	67-U1
Meter Box Number	N/A
Meter Y_d	0.9981
Meter ΔH @	N/A

Probe Heater Setting	350
Probe Material	S.S
Probe Number	N/A
Probe Length	N/A

Field Blank I.D.	N/A
Tenax	N/A
Tenax / Charcoal	N/A

DATA SET NO. A

Start Time 10:36 Stop Time 11:36

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before 0.01 [cfm] [LPM] @ 9 (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp. I	Meter Temp. O	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume 5934.33 / Sample Gas Volume V_m [ft^3]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
5	2	49	350	N/A	N/A	ICE	84	84	9.5	2.6	5946.27	
10	↓	49	↓	↓	↓	↓	85	84	9	2.6	5956.48	
15	↓	49	↓	↓	↓	↓	85	84	9	2.6	5966.57	
20	↓	49	↓	↓	↓	↓	85	84	9	2.6	5976.46	
25	↓	49	↓	↓	↓	↓	86	85	9	2.6	5986.45	
Average												

DATA SET NO. B

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
30	2	49	350	N/A	N/A	ICE	86 85	9	2.6	5996.45	
35	↓	49	↓	↓	↓	↓	87 85	9	2.6	6006.44	
40	↓	49	↓	↓	↓	↓	87 86	9	2.6	6016.45	
45	↓	49	↓	↓	↓	↓	88 86	9	2.6	6026.50	
50	↓	49	↓	↓	↓	↓	88 87	9	2.6	6036.55	
Average											

DATA SET NO. C

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate ~~Before~~ AFTER 0.01 [cfm] [LPM] @ 14 (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	SAMPLING RATE ss ball	Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp.	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume / Sample Gas Volume V_m [ft^3]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
55	2	49	350	N/A	N/A	ICE	89 88	9	2.6	6046.25	
60	↓	49	↓			↓	89 88	9	2.6	6056.33	
Average											

QA/QC ____ Date ____

2.60 120.000

.0417 4.238 ft3

CleanAir Engineering

UPCCP scrubber

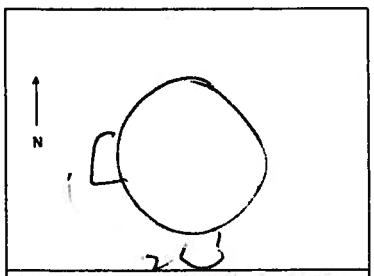
UNIT: ____ RUN: 3

VOST FIELD DATA SHEET

PAGE 1 OF 1

TEST LOCATION: Inlet Stack

Client	Marathon Ashland Pet
Project Number	9628-11
Date	2/13/2011
Location	Inlet
Operator	CB



Cross-Section of Testing Location

Bar. Press. (in. Hg)	29.70
VOST Box Number	67-VI
Meter Box Number	N/A
Meter Y_d	0.9987
Meter ΔH @	N/A

Field Blank I.D.	N/A
Tenax	N/A
Tenax / Charcoal	N/A

Probe Heater Setting	350
Probe Material	S.S
Probe Number	N/A
Probe Length	N/A

DATA SET NO. A

Start Time 12:19 Stop Time 13:19

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before 0.01 [cfm] [LPM] @ 9 (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	ss ball	Gas Temperatures, (°F) Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp. I	O	Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume 6056.91 Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
5	2	49	350	N/A	N/A	ICE	87	86	9	2.6	6056.91	
10		49					87	86	9	2.6	~~6057.~~ 6057.20	
15		49					87	86	9	2.6	6087.11	
20		49					87	86	9	2.6	6097.11	
25		49					88	87	9	2.6	6107.11	
Average												

DATA SET NO. B

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	ss ball	Gas Temperatures, (°F) Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp.		Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
30	2	49	350	N/A	N/A	ICE	88	87	9	2.6	6117.07	
35		49					89	88	9	2.6	6127.10	
40		49					89	88	9	2.6	6137.15	
45		49					89	88	9	2.6	6147.17	
50		49					90	89	9	2.6	6157.19	
Average												

DATA SET NO. C

Start Time Stop Time

Leak Rate Before [cfm] [LPM] @ (in. Hg)

Leak Rate Before 0.01 [cfm] [LPM] @ 14 (in. Hg)

Time (min.)	SAMPLING RATE [cfm] [LPM]	ss ball	Gas Temperatures, (°F) Probe Temp.	Trap 1 Temp.	Trap 2 Temp.	Cond. Temp.	Meter Temp.		Pump Vacuum (in. Hg)	Meter Pressure ΔH (in. H_2O)	Initial Volume Sample Gas Volume V_m [ft^3] [L]	Cartridge I.D. Tenax / Tenax/Charcoal / Notes
55	2	49	350	N/A	N/A	ICE	90	89	9	2.6	6167.20	
60		49					90	89	9	2.6	6177.22	
Average												

QA/QC____ Date____

2.60

120.310

87.9167

4.249 m^3

CleanAir Engineering

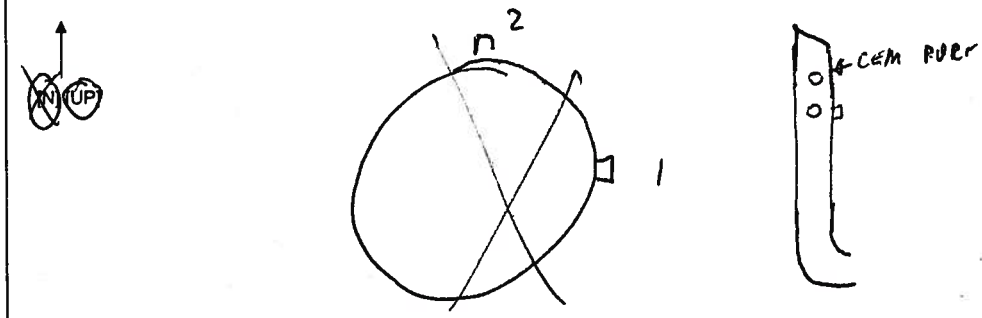
METHOD 1 FIELD DATA SHEET

TEST LOCATION: OUTLET
UNIT: LP CCR SCRUBBER

Client	MAPLLC	Project No.	96B4
Plant	CATLETTSBURG REFINERY	Date	2/15/05
Duct Dimensions	9.5 (in.)	Area	0.4922 (ft^2)
Port Length	17 (in.)	Port Diameter	4 (in.)
Equivalent Diameter (Rectangular Ducts) Deq=2LW/(L+W)		N/A	(in.)
Disturbance to Port Distance Upstream (A)	2		x D
Disturbance to Port Distance Downstream (B)	7		x D
Number of Points Required	16		
Number of Points / Port Required	8		

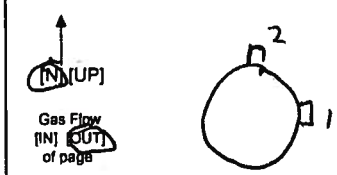
Point	% Diameter (Round Stacks Only)	Point Distance X	Probe Mark X + Port Depth
1	96.8		26.00 ~~26.19~~
2	89.5		25.51
3	80.6		24.66
4	67.7		23.43
5	32.3		20.07
6	19.4		18.04
7	10.5		17.99
8	3.2		17.50 ~~17.31~~ ED

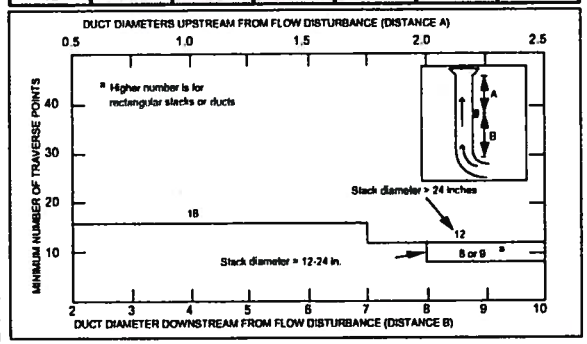
Location Schematic
Show side view of stack, including disturbances and port placement.

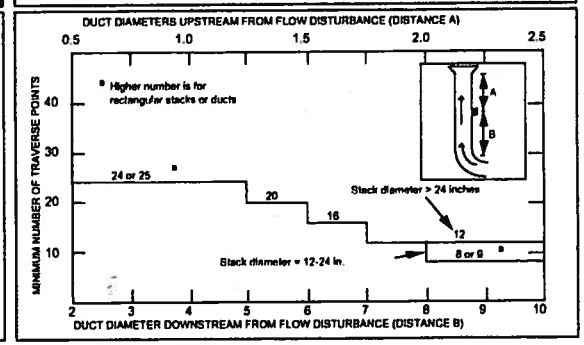


Traverse point number	Number of traverse points on a diameter: 2	4	6	8	10	12
1	85.4	93.3	95.6	96.8	97.4	97.9
2	14.6	75.0	85.4	89.5	91.8	93.3
3		25.0	70.4	80.6	85.4	88.2
4		6.7	29.6	67.7	77.4	82.3
5			14.6	32.3	65.8	75.0
6			4.4	19.4	34.2	64.4
7				10.5	22.6	35.6
8				3.2	14.6	25.0
9					8.2	17.7
10					2.6	11.8
11						6.7
12						2.1

Location Schematic
Show cross-section of stack, indicating port placement.







Circle correct bracketed directions on diagrams.

QA/QC ED
Date 2-15-05

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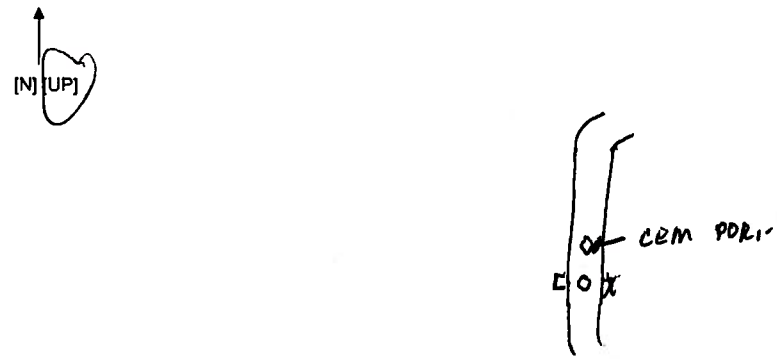
METHOD 1 FIELD DATA SHEET

TEST LOCATION: INLET
UNIT: LP CCR SCRUBBER

Client	MAPLLC	Project No.	9684
Plant	CATLETTSBURG REFINING	Date	2/15/05
Duct Dimensions	9.5 (in.)	Area	0.4922 (ft²)
Port Length	17 (in.)	Port Diameter	4 (in.)
Equivalent Diameter (Rectangular Ducts) Deq=2LW/(L+W)		N/A	(in.)
Disturbance to Port Distance Upstream (A)			x D
Disturbance to Port Distance Downstream (B)			x D
Number of Points Required	16		
Number of Points / Port Required	8		

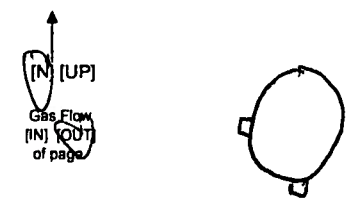
Point	% Diameter (Round Stacks Only)	Point Distance X	Probe Mark X + Port Depth
1	96.8		26.00
2	89.5		25.51
3	80.6		24.66
4	67.7		23.43
5	32.3		20.07
6	19.4		18.04
7	10.5		17.99
8	3.2		17.50

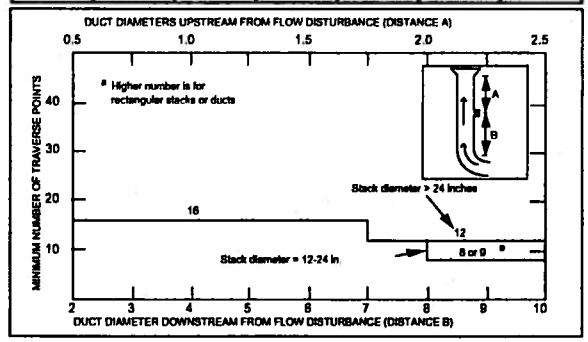
Location Schematic
Show side view of stack, including disturbances and port placement.

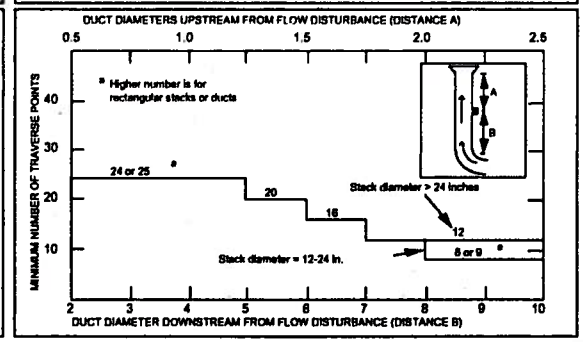


Traverse point number	Number of traverse points on a diameter: 2	4	6	8	10	12
1	85.4	93.3	95.6	96.8	97.4	97.9
2	14.6	75.0	85.4	89.5	91.8	93.3
3		25.0	70.4	80.6	85.4	88.2
4		6.7	29.6	67.7	77.4	82.3
5			14.6	32.3	65.8	75.0
6			4.4	19.4	34.2	64.4
7				10.5	22.6	35.6
8				3.2	14.6	25.0
9					8.2	17.7
10					2.6	11.8
11						6.7
12						2.1

Location Schematic
Show cross-section of stack, indicating port placement.







Circle correct bracketed directions on diagrams.

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Date [illegible]/05

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FIELD DATA PRINTOUTS

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Field Data Printout

Test Method: USEPA Method 26
Analyte: HCl & CL2

Location: LPCCR Scrubber Outlet
Test Run: 1
Client: Marathon Ashland Petroleum
Project No: 9684
Source Area (ft^2): 0.49224

Test Date: 2/18/05
Start Time: 08:45
Stop Time: 09:45
Leak Rate Before: 0.010 lpm @ 8 "Hg
Leak Rate After: 0.010 lpm @ 11 "Hg

Bar. Press. (in. Hg): 29.70
Static P: 0.0
O_2 (dry volume %): 0.67
CO_2 (dry volume %): 16.75
N_2+CO (dry volume %): 82.58

H_2O (condensate, ml or gm): 0.4
H_2O (silica, g): 0.0
Actual Moisture (%): 0.45

Nozzle ID No: NA
Nozzle Diameter (D_n): NA
Probe ID No: 67-4-1
Pitot C_p: 0.84
Pitot Leak Check: ☑ Pass ☐ Fail

Meter Box ID. No: 67-V2
Meter ΔH@: NA
Meter Y_d: 0.99440

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (liters)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			9676.90						
2-01	5.0	0.02	2.20	9686.74	58	73	72	0.14	0.35	
2-02	10.0	0.02	2.20	9696.86	61	74	73	0.14	0.36	
2-03	15.0	0.02	2.20	9706.94	62	75	74	0.14	0.36	
2-04	20.0	0.02	2.20	9716.88	62	77	75	0.14	0.35	
2-05	25.0	0.01	2.20	9726.76	62	77	76	0.10	0.35	
2-06	30.0	0.02	2.20	9736.90	63	78	77	0.14	0.36	
2-07	35.0	0.01	2.20	9746.99	63	79	78	0.10	0.36	
2-08	40.0	0.01	2.20	9757.04	64	80	79	0.10	0.35	
1-01	45.0	0.01	2.20	9767.08	63	81	80	0.10	0.35	
1-02	50.0	0.01	2.20	9777.10	63	82	80	0.10	0.35	
1-03	55.0	0.01	2.20	9787.11	63	82	81	0.10	0.35	
1-04	60.0	0.01	2.20	9797.15	63	83	82	0.10	0.35	
1-05		0.01			63			0.10		
1-06		0.01			64			0.10		
1-07		0.01			65			0.10		
1-08		0.01			65			0.10		
Final	60.0		2.20000	120.25000	62.75000	77.83333		0.11294	4.24657	
16 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.1130	2.2000	120.2500	62.7500	77.8333				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

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Field Data Printout

Test Method: USEPA Method 26
Analyte: HCl & CL2

Location: LPCCR Scrubber Outlet
Test Run: 2
Client: Marathon Ashland Petroleum
Project No: 9684
Source Area (ft^2): 0.49224

Bar. Press. (in. Hg): 29.70
Static P: 0.0
O_2 (dry volume %): 0.64
CO_2 (dry volume %): 16.73
N_2+CO (dry volume %): 82.63

Nozzle ID No: NA
Nozzle Diameter (D_n): NA
Probe ID No: 67-4-1
Pitot C_p: 0.84
Pitot Leak Check: ☑ Pass ☐ Fail

Test Date: 2/18/05
Start Time: 10:36
Stop Time: 11:36
Leak Rate Before: 0.010 lpm @ 9 "Hg
Leak Rate After: 0.010 lpm @ 10 "Hg

H_2O (condensate, ml or gm): 0.8
H_2O (silica, g): 0.0
Actual Moisture (%): 0.91

Meter Box ID. No: 67-V2
Meter ΔH@: NA
Meter Y_d: 0.99440

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (liters)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			9797.82						
2-01	5.0	0.01	2.20	9807.82	63	80	80	0.10	0.35	
2-02	10.0	0.01	2.20	9817.85	64	80	80	0.10	0.35	
2-03	15.0	0.01	2.20	9827.84	65	79	79	0.10	0.35	
2-04	20.0	0.01	2.20	9837.78	65	79	79	0.10	0.35	
2-05	25.0	0.01	2.20	9847.65	66	79	79	0.10	0.35	
2-06	30.0	0.02	2.20	9857.80	67	80	79	0.14	0.36	
2-07	35.0	0.02	2.20	9867.95	67	80	79	0.14	0.36	
2-08	40.0	0.01	2.20	9877.86	66	80	80	0.10	0.35	
1-01	45.0	0.01	2.20	9887.81	64	81	80	0.10	0.35	
1-02	50.0	0.01	2.20	9897.70	64	82	81	0.10	0.35	
1-03	55.0	0.01	2.20	9907.59	64	82	81	0.10	0.35	
1-04	60.0	0.01	2.20	9917.69	65	83	82	0.10	0.36	
1-05		0.01			65			0.10		
1-06		0.01			66			0.10		
1-07		0.01			66			0.10		
1-08		0.01			66			0.10		
Final	60.0		2.20000	119.87000	65.18750	80.16667		0.10518	4.23315	
16 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.1052	2.2000	119.8700	65.1875	80.1667				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

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Field Data Printout

Test Method: USEPA Method 26
Analyte: HCl & CL2

Location: LPCCR Scrubber Outlet
Test Run: 3
Client: Marathon Ashland Petroleum
Project No: 9684
Source Area (ft^2): 0.49224

Test Date: 2/18/05
Start Time: 12:19
Stop Time: 13:19
Leak Rate Before: 0.010 lpm @ 11 "Hg
Leak Rate After: 0.010 lpm @ 11 "Hg

Bar. Press. (in. Hg): 29.70
Static P: 0.0
O_2 (dry volume %): 0.63
CO_2 (dry volume %): 16.89
N_2+CO (dry volume %): 82.48

H_2O (condensate, ml or gm): 0.2
H_2O (silica, g): 0.0
Actual Moisture (%): 0.23

Nozzle ID No: NA
Nozzle Diameter (D_n): NA
Probe ID No: 67-4-1
Pitot C_p: 0.84
Pitot Leak Check: ☑ Pass ☐ Fail

Meter Box ID. No: 67-V2
Meter ΔH@: NA
Meter Y_d: 0.99440

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (liters)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			9918.54						
2-01	5.0	0.01	2.20	9928.75	63	81	80	0.10	0.36	
2-02	10.0	0.01	2.20	9938.74	64	80	80	0.10	0.35	
2-03	15.0	0.01	2.20	9948.67	64	80	80	0.10	0.35	
2-04	20.0	0.01	2.20	9958.57	64	80	80	0.10	0.35	
2-05	25.0	0.01	2.20	9968.76	65	80	80	0.10	0.36	
2-06	30.0	0.01	2.20	9978.68	65	81	80	0.10	0.35	
2-07	35.0	0.01	2.20	9988.54	65	81	81	0.10	0.35	
2-08	40.0	0.01	2.20	9998.69	66	82	81	0.10	0.36	
1-01	45.0	0.01	2.20	10008.82	64	82	81	0.10	0.36	
1-02	50.0	0.01	2.20	10018.61	64	83	82	0.10	0.35	
1-03	55.0	0.01	2.20	10028.40	65	83	82	0.10	0.35	
1-04	60.0	0.01	2.20	10038.48	65	84	83	0.10	0.36	
1-05		0.01			65			0.10		
1-06		0.01			65			0.10		
1-07		0.01			65			0.10		
1-08		0.01			64			0.10		
Final	60.0		2.20000	119.94000	64.56250	81.12500		0.10000	4.23562	

16 points sampled

QC-Check: Field Averages	Sq.Rt.ΔP				
	0.1000	2.2000	119.9400	64.5625	81.1250
	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK

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USEPA Method 3 Laboratory Data

Test Method: USEPA Method 2
Analyte: Velocity & Flow Rate

Location: LPCCR Scrubber Outlet
Client: Marathon Ashland Petroleum
Project No: 9684
Method: EPA Method 3
Fuel Type:
F_o for Fuel: N/A

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: CEM
1	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		16.75162		0.66565	82.58272	30.70689	1.20790	☐ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: CEM
2	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		16.72570		0.64064	82.63366	30.70174	1.21127	☐ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: CEM
3	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		16.88915		0.62785	82.48299	30.72738	1.20031	☐ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
	1							
	2							
	3							
	Avg.							
CEM or Other Avg:								☐ Fo value within expected range.

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Field Data Printout

Test Method: USEPA Method 26
Analyte: HCl & CL2

Location: LPCCR Scrubber Inlet
Test Run: 1
Client: Marathon Ashland Petroleum
Project No: 9684
Source Area (ft^2): 0.49224

Bar. Press. (in. Hg): 29.70
Static P: 0.1
O_2 (dry volume %): 0.66
CO_2 (dry volume %): 17.09
N_2+CO (dry volume %): 82.25

Nozzle ID No: NA
Nozzle Diameter (D_n): NA
Probe ID No: 67-4-1
Pitot C_p: 0.84
Pitot Leak Check: ☑ Pass ☐ Fail

Test Date: 2/18/05
Start Time: 08:45
Stop Time: 09:45
Leak Rate Before: 0.010 lpm @ 8 "Hg
Leak Rate After: 0.010 lpm @ 14 "Hg

H_2O (condensate, ml or gm): 1.1
H_2O (silica, g): 0.0
Actual Moisture (%): 1.26

Meter Box ID. No: 67-V1
Meter ΔH@: NA
Meter Y_d: 0.99070

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (liters)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			5815.64						
2-01	5.0	0.02	2.60	5825.62	279	81	79	0.14	0.35	
2-02	10.0	0.02	2.60	5835.66	285	81	80	0.14	0.35	
2-03	15.0	0.02	2.60	5845.63	288	82	80	0.14	0.35	
2-04	20.0	0.02	2.60	5855.64	290	83	81	0.14	0.35	
2-05	25.0	0.02	2.60	5865.64	290	84	83	0.14	0.35	
2-06	30.0	0.02	2.60	5875.64	289	85	83	0.14	0.35	
2-07	35.0	0.02	2.60	5885.65	288	85	84	0.14	0.35	
2-08	40.0	0.02	2.60	5895.66	284	85	84	0.14	0.35	
1-01	45.0	0.02	2.60	5905.65	288	86	85	0.14	0.35	
1-02	50.0	0.02	2.60	5915.63	289	86	85	0.14	0.35	
1-03	55.0	0.02	2.60	5925.60	290	87	86	0.14	0.35	
1-04	60.0	0.02	2.60	5935.64	292	87	86	0.14	0.35	
1-05		0.02			296			0.14		
1-06		0.02			291			0.14		
1-07		0.02			290			0.14		
1-08		0.02			287			0.14		
Final	60.0		2.60000	120.00000	288.50000	83.66667		0.14142	4.23774	

16 points sampled

QC-Check: Field Averages	Sq.Rt.ΔP				
	0.1414	2.6000	120.0000	288.5000	83.6670
	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK

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Field Data Printout

Test Method: USEPA Method 26
Analyte: HCl & CL2

Location: LPCCR Scrubber Inlet
Test Run: 2
Client: Marathon Ashland Petroleum
Project No: 9684
Source Area (ft^2): 0.49224

Test Date: 2/18/05
Start Time: 10:36
Stop Time: 11:36
Leak Rate Before: 0.010 lpm @ 9 "Hg
Leak Rate After: 0.010 lpm @ 14 "Hg

Bar. Press. (in. Hg): 29.70
Static P: 0.1
O_2 (dry volume %): 0.64
CO_2 (dry volume %): 17.11
N_2+CO (dry volume %): 82.26

H_2O (condensate, ml or gm): 1.5
H_2O (silica, g): 0.0
Actual Moisture (%): 1.71

Nozzle ID No: NA
Nozzle Diameter (D_n): NA
Probe ID No: 67-4-1
Pitot C_p: 0.84
Pitot Leak Check: ☑ Pass ☐ Fail

Meter Box ID. No: 67-V1
Meter ΔH@: NA
Meter Y_d: 0.99070

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (liters)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			5936.33						
2-01	5.0	0.02	2.60	5946.27	276	84	84	0.14	0.35	
2-02	10.0	0.02	2.60	5956.48	278	85	84	0.14	0.36	
2-03	15.0	0.02	2.60	5966.57	279	85	84	0.14	0.36	
2-04	20.0	0.02	2.60	5976.46	282	85	84	0.14	0.35	
2-05	25.0	0.02	2.60	5986.45	285	86	85	0.14	0.35	
2-06	30.0	0.02	2.60	5996.45	280	86	85	0.14	0.35	
2-07	35.0	0.02	2.60	6006.44	279	87	85	0.14	0.35	
2-08	40.0	0.01	2.60	6016.45	277	87	86	0.10	0.35	
1-01	45.0	0.02	2.60	6026.50	282	88	86	0.14	0.35	
1-02	50.0	0.02	2.60	6036.55	284	88	87	0.14	0.35	
1-03	55.0	0.02	2.60	6046.25	287	89	88	0.14	0.34	
1-04	60.0	0.02	2.60	6056.33	289	89	88	0.14	0.36	
1-05		0.02			289			0.14		
1-06		0.02			289			0.14		
1-07		0.02			286			0.14		
1-08		0.02			284			0.14		
Final	60.0		2.60000	120.00000	282.87500	86.04167		0.13883	4.23774	
16 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.1388	2.6000	120.0000	282.8750	86.0417				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

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Field Data Printout

Test Method: USEPA Method 26
Analyte: HCl & CL2

Location: LPCCR Scrubber Inlet
Test Run: 3
Client: Marathon Ashland Petroleum
Project No: 9684
Source Area (ft^2): 0.49224

Bar. Press. (in. Hg): 29.70
Static P: 0.1
O_2 (dry volume %): 0.62
CO_2 (dry volume %): 17.18
N_2+CO (dry volume %): 82.19

Nozzle ID No: NA
Nozzle Diameter (D_n): NA
Probe ID No: 67-4-1
Pitot C_p: 0.84
Pitot Leak Check: ☑ Pass ☐ Fail

Test Date: 2/18/05
Start Time: 12:19
Stop Time: 13:19
Leak Rate Before: 0.010 lpm @ 9 "Hg
Leak Rate After: 0.010 lpm @ 14 "Hg

H_2O (condensate, ml or gm): 1.8
H_2O (silica, g): 0.0
Actual Moisture (%): 2.05

Meter Box ID. No: 67-V1
Meter ΔH@: NA
Meter Y_d: 0.99070

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (liters)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			6056.91						
2-01	5.0	0.01	2.60	6066.91	270	87	86	0.10	0.35	
2-02	10.0	0.01	2.60	6077.20	273	87	86	0.10	0.36	
2-03	15.0	0.01	2.60	6087.11	275	87	86	0.10	0.35	
2-04	20.0	0.01	2.60	6097.11	282	87	86	0.10	0.35	
2-05	25.0	0.01	2.60	6107.11	282	88	87	0.10	0.35	
2-06	30.0	0.01	2.60	6117.07	281	88	87	0.10	0.35	
2-07	35.0	0.01	2.60	6127.10	279	89	88	0.10	0.35	
2-08	40.0	0.01	2.60	6137.15	273	89	88	0.10	0.35	
1-01	45.0	0.01	2.60	6147.17	280	89	88	0.10	0.35	
1-02	50.0	0.01	2.60	6157.19	282	90	89	0.10	0.35	
1-03	55.0	0.01	2.60	6167.20	284	90	89	0.10	0.35	
1-04	60.0	0.01	2.60	6177.22	285	90	89	0.10	0.35	
1-05		0.01			288			0.10		
1-06		0.01			290			0.10		
1-07		0.01			292			0.10		
1-08		0.01			287			0.10		
Final	60.0		2.60000	120.31000	281.43750	87.91667		0.10000	4.24868	

16 points sampled

QC-Check: Field Averages	Sq.Rt.ΔP				
	0.1000	2.6000	120.3100	281.4375	87.9167
	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK

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USEPA Method 3 Laboratory Data

Test Method: USEPA Method 2
Analyte: Velocity & Flow Rate

Location: LPCCR Scrubber Inlet
Client: Marathon Ashland Petroleum
Project No: 9684
Method: EPA Method 3
Fuel Type:
F_o for Fuel: N/A

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: CEM
1	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		17.09006		0.65818	82.25175	30.76074	1.18442	☐ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: CEM
2	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		17.10763		0.63651	82.25587	30.76268	1.18447	☐ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: CEM
3	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		17.18357		0.62281	82.19362	30.77428	1.18003	☐ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
	1							
	2							
	3							
	Avg.							
CEM or Other Avg:								☐ Fo value within expected range.

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LABORATORY DATA

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet

USEPA Method 26
Chloride Laboratory Data Summary

Run No.	Blank	1	2	3
Date (2005)		Feb 18	Feb 18	Feb 18
Start Time (approx.)		08:45	10:36	12:19
Stop Time (approx.)		09:45	11:36	13:19

☐ DRAFT LAB DATA

MDL	Min. detectable limit (mg Cl^-/liter)	<0.0530

HCl as Total Chloride

B_{Cl}	Blank concentration (mg Cl^-/liter)	<0.0530

S_{Cl-1}	Fraction 1 concentration (mg Cl^-/liter)	1931.6100	1976.7900	2359.1900	
S_{Cl-2}	Fraction 2 concentration (mg Cl^-/liter)				
v_1	Fraction 1 sample volume (ml)	69.0	70.0	69.0	
v_2	Fraction 2 sample volume (ml)				
m_{HCl}	HCl collected before blank subtraction (mg)	137.0130	142.2498	167.3421	
m_b	Allowable blank subtraction (mg)	0.0000	0.0000	0.0000	
m_{nb}	HCl collected after blank subtraction (mg)	137.0130	142.2498	167.3421	
m_{MDL}	Minimum detectable HCl (mg)	<0.0038	<0.0038	<0.0038	
m_n	*Total HCl used in emission calculations (mg)*	137.0130	142.2498	167.3421	
EFF	Collection QC Check (% collected in Fraction 2)	0.00%	0.00%	0.00%	

Cl_2 as Total Chloride

B_{Cl}	Blank concentration (mg Cl^-/liter)	<0.0530

S_{Cl-1}	Fraction 1 concentration (mg Cl^-/liter)	15.4500	16.2000	17.8000	
S_{Cl-2}	Fraction 2 concentration (mg Cl^-/liter)				
v_1	Fraction 1 sample volume (ml)	60.0	63.0	61.0	
v_2	Fraction 2 sample volume (ml)				
m_{Cl2}	Cl_2 collected before blank subtraction (mg)	0.9270	1.0206	1.0858	
m_b	Allowable blank subtraction (mg)	0.0000	0.0000	0.0000	
m_{nb}	Cl_2 collected after blank subtraction (mg)	0.9270	1.0206	1.0858	
m_{MDL}	Minimum detectable Cl_2 (mg)	<0.0032	<0.0033	<0.0032	
m_n	*Total Cl_2 used in emission calculations (mg)*	0.9270	1.0206	1.0858	
EFF	Collection QC Check (% collected in Fraction 2)	0.00%	0.00%	0.00%	

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Date _____

Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet

USEPA Method 26
Chloride Laboratory Data Summary

Run No.	Blank	1	2	3
Date (2005)		Feb 18	Feb 18	Feb 18
Start Time (approx.)		08:45	10:36	12:19
Stop Time (approx.)		09:45	11:36	13:19

☐ DRAFT LAB DATA

MDL	Min. detectable limit (mg Cl^-/liter)	<0.0530

HCl as Total Chloride

B_{Cl}	Blank concentration (mg Cl^-/liter)	<0.0530

S_{Cl-1}	Fraction 1 concentration (mg Cl^-/liter)	0.6100	0.6000	0.7900	
S_{Cl-2}	Fraction 2 concentration (mg Cl^-/liter)				
v_1	Fraction 1 sample volume (ml)	61.0	57.0	64.0	
v_2	Fraction 2 sample volume (ml)				
m_{HCl}	HCl collected before blank subtraction (mg)	0.0383	0.0352	0.0520	
m_b	Allowable blank subtraction (mg)	0.0000	0.0000	0.0000	
m_{nb}	HCl collected after blank subtraction (mg)	0.0383	0.0352	0.0520	
m_{MDL}	Minimum detectable HCl (mg)	<0.0033	<0.0031	<0.0035	
m_n	*Total HCl used in emission calculations (mg)*	0.0383	0.0352	0.0520	
EFF	Collection QC Check (% collected in Fraction 2)	0.00%	0.00%	0.00%	

Cl_2 as Total Chloride

B_{Cl}	Blank concentration (mg Cl^-/liter)	

S_{Cl-1}	Fraction 1 concentration (mg Cl^-/liter)	<0.0530	<0.0530	<0.0530	
S_{Cl-2}	Fraction 2 concentration (mg Cl^-/liter)				
v_1	Fraction 1 sample volume (ml)	57.0	56.0	55.0	
v_2	Fraction 2 sample volume (ml)				
m_{Cl2}	Cl_2 collected before blank subtraction (mg)	<0.0030	<0.0030	<0.0029	
m_b	Allowable blank subtraction (mg)	0.0000	0.0000	0.0000	
m_{nb}	Cl_2 collected after blank subtraction (mg)	<0.0030	<0.0030	<0.0029	
m_{MDL}	Minimum detectable Cl_2 (mg)	<0.0030	<0.0030	<0.0029	
m_n	*Total Cl_2 used in emission calculations (mg)*	<0.0030	<0.0030	<0.0029	
EFF	Collection QC Check (% collected in Fraction 2)	0.00%	0.00%	0.00%	

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CERTIFICATE OF ANALYSIS

Client Name: Marathon Ashland
Plant/Facility: Catlettsburg
Project Number: 9684
Sample Numbers: 1 through 51

Date Received: 2/14/2005
Date Reported: 2/21/2005
Sample Type: Impinger C and R
Parameters: Chloride

Laboratory Number	Sample Identification	Sample Volume (ml)	Cl- Sample Conc. (mg/l)	Total Chloride as Cl- (mg)	Total Chloride as HCl (mg)
9487-01	h20	100	<0.053	<0.0053	<0.0054
9487-02	h2so4	100	<0.053	<0.0053	<0.0054
9487-03	naoh	100	<0.053	<0.0053	<0.0054
9487-40	1 in 1 comp	69	1,931.61	134.05	137.87
9487-41	1 in 1 cl2 comp	60	15.45	0.92	0.95
9487-42	1 out 1 comp	61	0.61	0.04	0.04
9487-43	1 out 1 cl2 comp	57	<0.053	<0.0030	<0.0031
9487-44	2 in comp	70	1,976.79	137.58	141.50
9487-45	2 in comp cl2	63	16.20	1.02	1.05
9487-46	2 out comp	57	0.60	0.03	0.04
9487-47	2 out comp cl2	56	<0.053	<0.0030	<0.0030
9487-48	3 in comp	69	2,359.19	162.08	166.68
9487-49	3 in comp cl2	61	17.80	1.08	1.11
9487-50	3 out comp	64	0.79	0.05	0.05
9487-51	3 out comp cl2	55	<0.053	<0.0029	<0.0030

Matrix Spike Analysis	% Recovery
9487-40	102.9%

Analyst: Michael Vianzon

CHROMATOGRAPHIC DATA REDUCTION

Client
Project Number: 9684
Analyte Chloride
Date 2/15/2005
Stock Standard 1848.49 mg/l
Working Stock Conc. 18.4849 mg/l

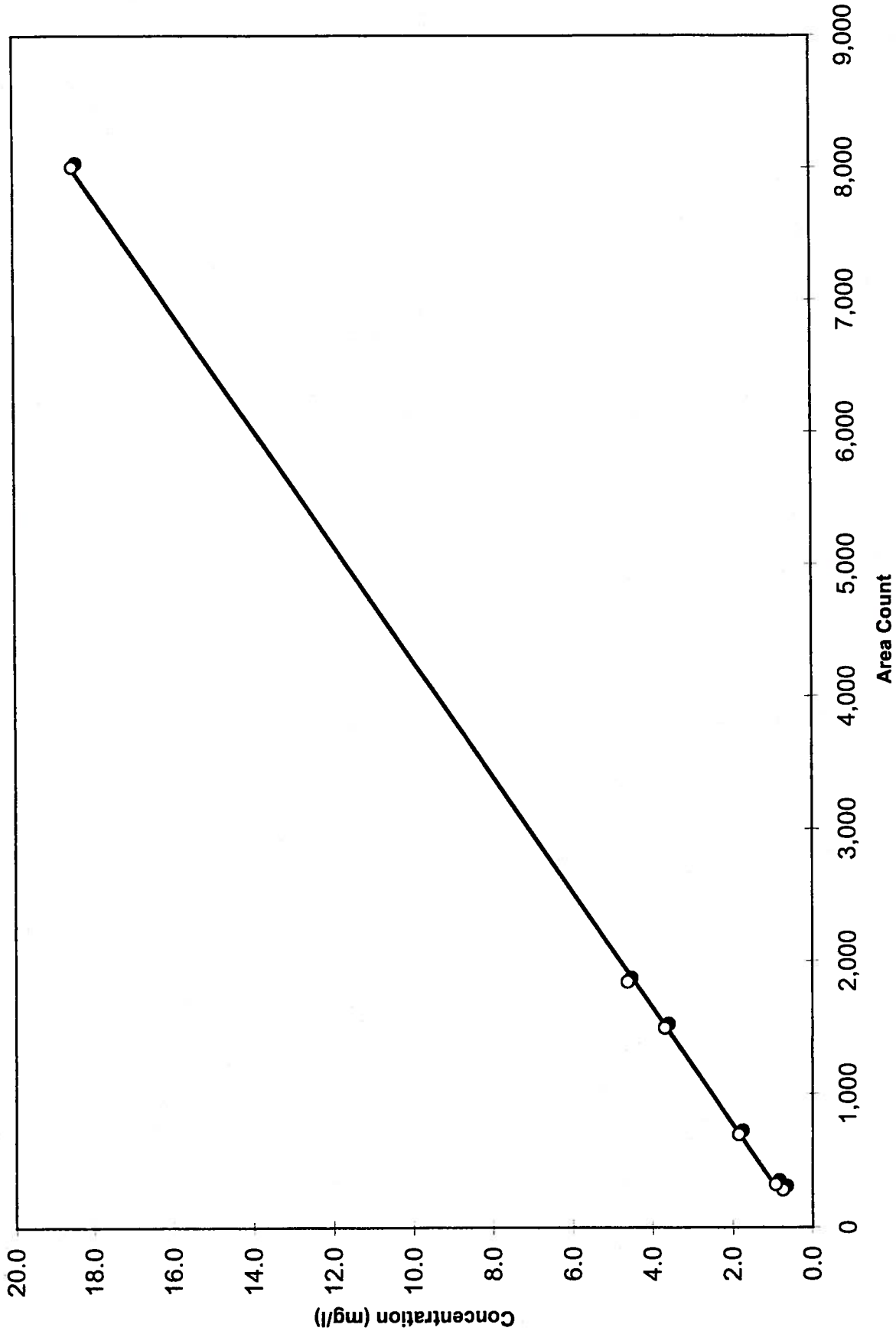
Analyte: **Chloride**

Standards Calibration Data

Calibration Point	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Conc. (mg/l)	**0.7394**	**0.9242**	**1.8485**	**3.6970**	**4.6212**	**18.4849**	
Pre-Cal 1 Trial 1	298.793	321.943	700.185	1,434.985	1,841.320	7,912.147	
Pre-Cal 1 Trial 2	280.157	312.000	683.009	1,476.619	1,821.000	7,907.064	
Post-Cal 1 Trial 1							
Post-Cal 1 Trial 2							
Pre-Cal 2 Trial 1	279.128	325.242	696.000	1,577.000			
Pre-Cal 2 Trial 2	291.000	334.000	694.374				
Post-Cal 2 Trial 1	274.830	322.080	700.872	1,501.344	1,851.361	8,106.882	
Post-Cal 2 Trial 2	281.510	325.582	709.092	1,495.159	1,862.933	8,112.701	
Average	**284.236**	**323.474**	**697.255**	**1,497.021**	**1,844.153**	**8,009.698**	
%RSD	3.13	2.20	1.24	3.45	0.96	1.44	
Response Factor	0.0026	0.0029	0.0027	0.0025	0.0025	0.0023	
Avg RF=	0.0026						
%RSD Resp. Factor	7.25						

Measured Area Counts (Counts)	Actual Concentration (mg/L)	Regression Concentration (mg/L)	Difference pt-Line (% Scale)	Is Difference Less Than 2% of Scale?	Difference pt-Line (Relative %)	Is Relative Difference Less Than 10%?
284.2363	0.739	0.884	-0.78%	Yes	-19.62%	No
323.4744	0.924	0.974	-0.27%	Yes	-5.40%	Yes
697.2550	1.849	1.828	0.11%	Yes	1.12%	Yes
1,497.0214	3.697	3.654	0.23%	Yes	1.16%	Yes
1,844.1533	4.621	4.447	0.94%	Yes	3.77%	Yes
8,009.6983	18.485	18.528	-0.23%	Yes	-0.23%	Yes

Regression Constants			Is Coefficient of Regression > 0.995?
Slope	m =	0.0023	
Intercept	b =	0.2354	
Coeff.	R^2 =	0.9997	Yes


Concentration (mg/l)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
Area Count

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CHROMATOGRAPHIC DATA REDUCTION

Client: Marathon Ashland Petroleum
Project Number: 9684
Analyte: Chloride
Date: 2/15/2005

MDL= 0.053 mg/l

Sample Location	Sample Identification Number	Sample Idenification	Area Counts Trial 1	Area Counts Trial 2	Area Count Average	Area Count Duplicate Difference	Is Duplicate Difference Within Warning - Control Limits ?	Duplicate Relative Difference (%)	DF (Analysis Dilution Factor)	V_{soln} (Total Sample Volume, ml)	C_{reg} (Concentration, mg/l from Reg Curve)	C_{resp} (Concentration mg/l from Resp Factor)	$M_{analyte}$ Total Amount of Analyte (mg)
Blank H2O	9487-01	h20	0.000	0.000	0.000	na	na	na	1	100	LDL	LDL	<0.005
Blank H2SO4	9487-02	h2so4	0.000	0.000	0.000	na	na	na	1	100	LDL	LDL	<0.005
Blank NaOH	9487-03	naoh	0.000	0.000	0.000	na	na	na	1	100	LDL	LDL	<0.005
compliance run 1 in	9487-40	1 in 1 comp	1596.299	1580.780	1588.539	15.519	Yes	1.0%	500	69	1,931.61	2,037.68	134.05
compliance run 1 cl2 in	9487-41	1 in 1 cl2 comp	6620.254	6705.938	6663.096	85.684	Yes	1.3%	1	60	15.45	17.09	0.92
compliance run 1 out	9487-42	1 out 1 comp	133.432	196.151	164.792	62.719	Yes	38.1%	1	61	0.61	0.42	0.04
compliance run 1 cl2 out	9487-43	1 out 1 cl2 comp	0.000	0.000	0.000	na	na	na	1	57	LDL	LDL	<0.003
compliance run 2 in	9487-44	2 in comp	1610.695	1645.522	1628.109	34.827	Yes	2.1%	500	70	1,976.79	2,088.43	137.58
compliance run 2 in cl2	9487-45	2 in comp cl2	7054.002	6930.767	6992.384	123.236	Yes	1.8%	1	63	16.20	17.94	1.02
compliance run 2 out	9487-46	2 out comp	169.274	153.571	161.423	15.703	Yes	9.7%	1	57	0.60	0.41	0.03
compliance run 2 out cl2	9487-47	2 out comp cl2	0.000	0.000	0.000	na	na	na	1	56	LDL	LDL	<0.003
compliance run 3 in	9487-48	3 in comp	1991.374	1934.609	1962.991	56.766	Yes	2.9%	500	69	2,359.19	2,518.00	162.08
compliance run 3 in cl2	9487-49	3 in comp cl2	7714.000	7667.962	7690.981	46.038	Yes	0.6%	1	61	17.80	19.73	1.08
compliance run 3 out	9487-50	3 out comp	221.626	263.888	242.757	42.262	Yes	17.4%	1	64	0.79	0.62	0.05
compliance run 3 out cl2	9487-51	3 out comp cl2	0.000	0.000	0.000	na	na	na	1	55	LDL	LDL	<0.003
Matrix Spike													Spike Recovery
	9487-40	1 in 1 comp	1591.432	1537.618	1564.525	53.814	Yes	3.4%					102.9%

	Variable	Value
Control Limits for Duplicate Analyses	R_{avg}	66
	D_4	3.268
	UCL	215
	UWL	209
	LCL	0
	LWL	0

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Client	0
Project Number:	9684
Analyte	Chloride
Date	2/15/2005

Determination of Detection Limit

(in accordance with 40 CFR 136, Appendix B)

Analyte	Chloride
Area Count	
Trial 1	298.793
Trial 2	280.157
Trial 3	279.128
Trial 4	291.241
Trial 5	281.605
Trial 6	291.130
Trial 7	283.050
Trial 8	
Trial 9	
Trial 10	
Trial 11	
Trial 12	
Trial 13	
Trial 14	
Trial 15	
Trial 16	
Average	**286.443**
Std Dev	7.3650
RMS Dev	2.57%

n	$t_{(n-1,0.99)}$
7	3.143
8	2.998
9	2.896
10	2.821
11	2.764
16	2.602
21	2.528

Average Response Factor	0.00257
Measured Concentration (mg/l)	
Trial 1	0.918
Trial 2	0.875
Trial 3	0.873
Trial 4	0.900
Trial 5	0.878
Trial 6	0.900
Trial 7	0.882
Trial 8	
Trial 9	
Trial 10	
Trial 11	
Trial 12	
Trial 13	
Trial 14	
Trial 15	
Trial 16	
Average	**0.890**
Std Dev	0.0168
RMS Dev	1.89%
$t_{(n-1,0.99)}$	3.143
Det Lim (mg/l)	**0.053**

Actual Conc	0.7394
Slope	2.28E-03
Intercept	0.2354
Coeff of Corr	0.9997

CHROMATOGRAPHIC DATA REDUCTION

Client 0
Project Number: 9684
Analyte Chloride
Date 2/15/2005

Determination of Control Limits for Duplicate Analyses

$$R_i = |AreaCount_1 - AreaCount_2|$$

$$R_{avg} = \frac{\sum_{i=1}^{n} R_i}{n}$$

Where:

n	=	Number of duplicates
R_i	=	Range for each set of duplicates
D_4	=	Constant (3.268 for duplicates)
UCL	=	Upper Control Limit
UWL	=	Upper Warning Limit
LCL	=	Lower Control Limit
LWL	=	Lower Warning Limit

$$UCL = D_4 R_{avg}$$

$$UWL = \tfrac{2}{3}(D_4 R_{avg}) + R_{avg}$$

Note: For duplicates, both LCL and LWL are zero.

Variable	Value
R_{avg}	66
D_4	3.268
UCL	215
UWL	209
LCL	0
LWL	0

Values for	9487-02
m	0.0023
b	0.2354
AreaCount	0
DF	1
RF_{avg}	0.0026
V_{soln}	100
C_{reg}	LDL
C_{resp}	LDL
$M_{Analyte}$	<0.005

Determination of Concentration of Analyte

$$C_{reg} = [m(AreaCount) + b]DF$$

Where:

C_{reg}	=	Analyte concentration from regression curve (mg/l)
m	=	Slope of regression curve
b	=	Y-Intercept of regression curve
AreaCount	=	Average area count from duplicate analyses
DF	=	Sample dilution factor

$$C_{resp} = RF_{avg}(AreaCount)DF$$

Where:

C_{resp}	=	Analyte concentration from response factors (mg/l)
RF_{avg}	=	Average response factor for analyte (ppm/Area Count)
DF	=	Sample dilution factor

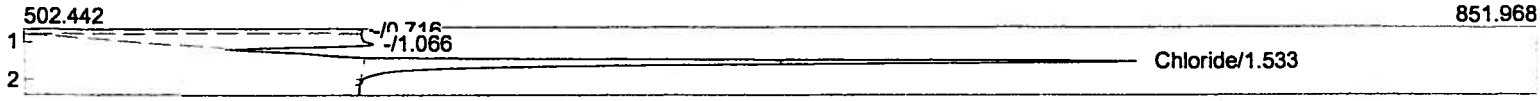
$$M_{Analyte} = \frac{C_{reg}(V_{soln})}{1000}$$

Where:

$M_{Analyte}$	=	Total amount of analyte in sample (mg)
C_{reg}	=	Analyte concentration from regression curve (mg/l)
V_{soln}	=	Total sample volume (ml)
1000	=	Conversion factor (ml/l)

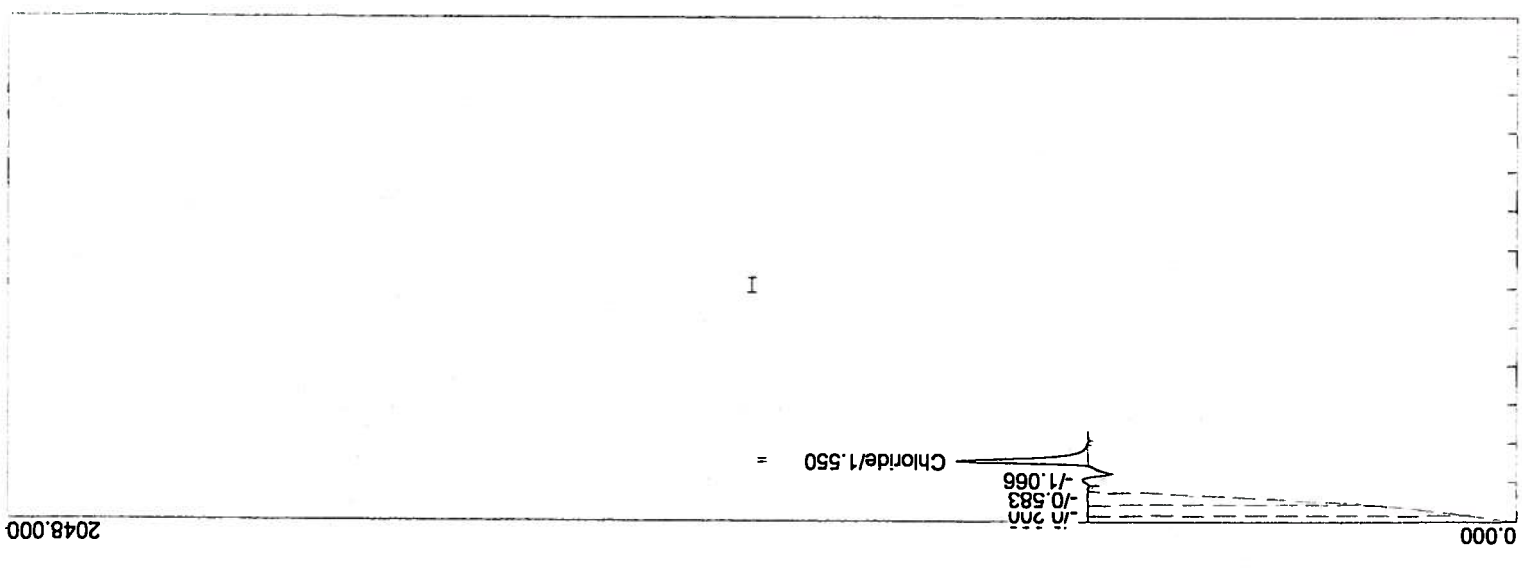
CleanAir

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 09:19:16
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 1 in 2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



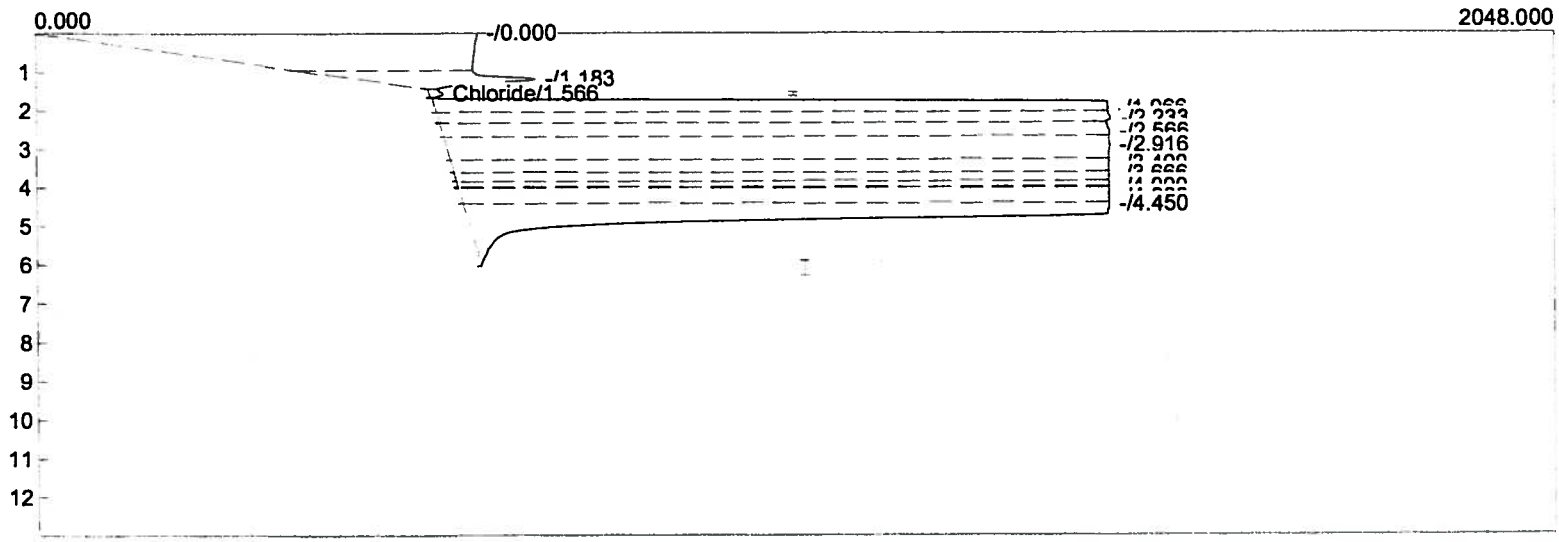
Component	Retention	Area	Height	External	Units
Chloride	1.533	1580.7800	179.674	185.0975	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1580.7800		185.0975	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 09:15:42
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 1 in 1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

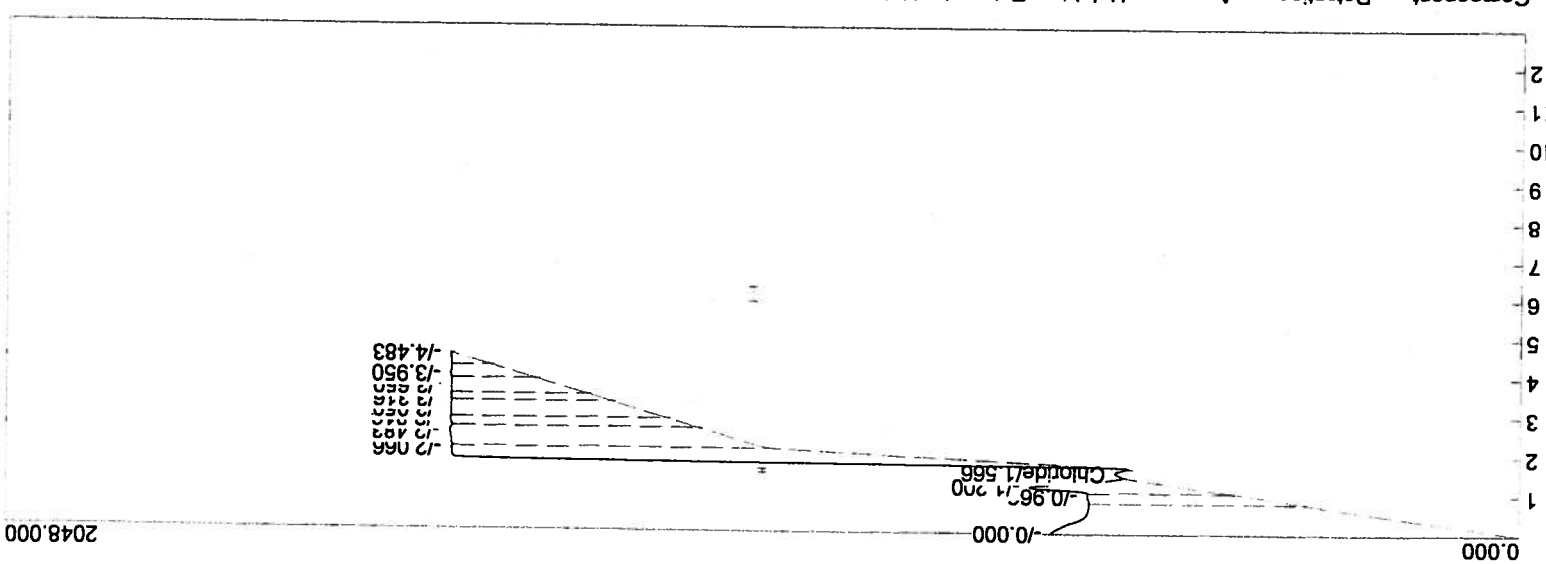


Component	Retention	Area	Height	External	Units
Chloride	1.550	1596.2985	178.308	187.0373	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1596.2985		187.0373	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 09:28:54
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 1 out 2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



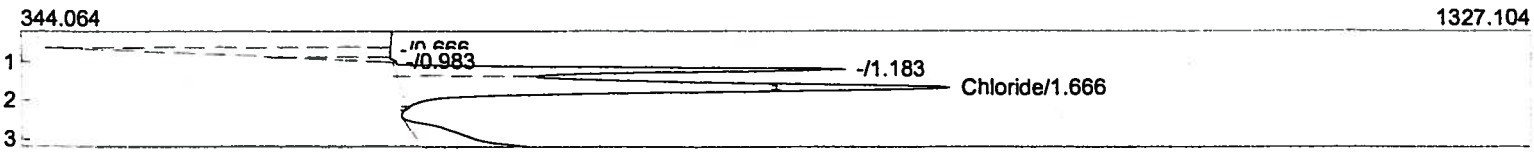
Component	Retention	Area	Height	External	Units
Chloride	1.566	196.1510	19.102	19.6151	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		196.1510		19.6151	



Component	Retention	Area	Height	External	Units
Chloride	1.566	133.4320	15.821	13.3432	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		133.4320		13.3432	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 09:22:35
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 1 out 1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 09:36:58
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 1 in 1 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

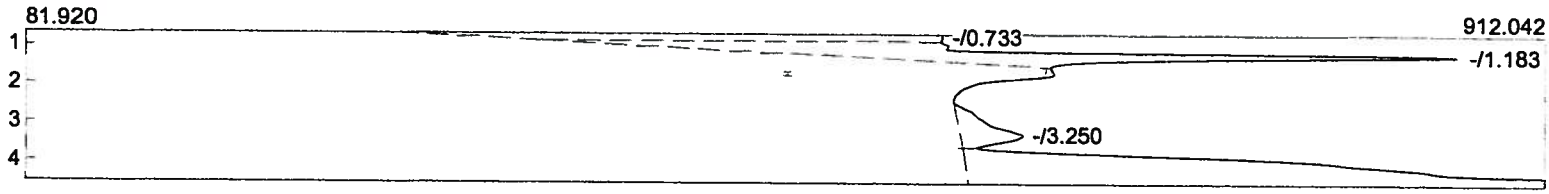


Component	Retention	Area	Height	External	Units
Chloride	1.666	6620.2540	358.313	815.0317	ppm
Sulfate	5.933	4670.9770	668.201	571.3721	ppm
Sulfate	6.050	15776.4480	663.544	1959.5560	ppm
		27067.6790		3345.9599	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 09:46:30
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 1 in 2 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

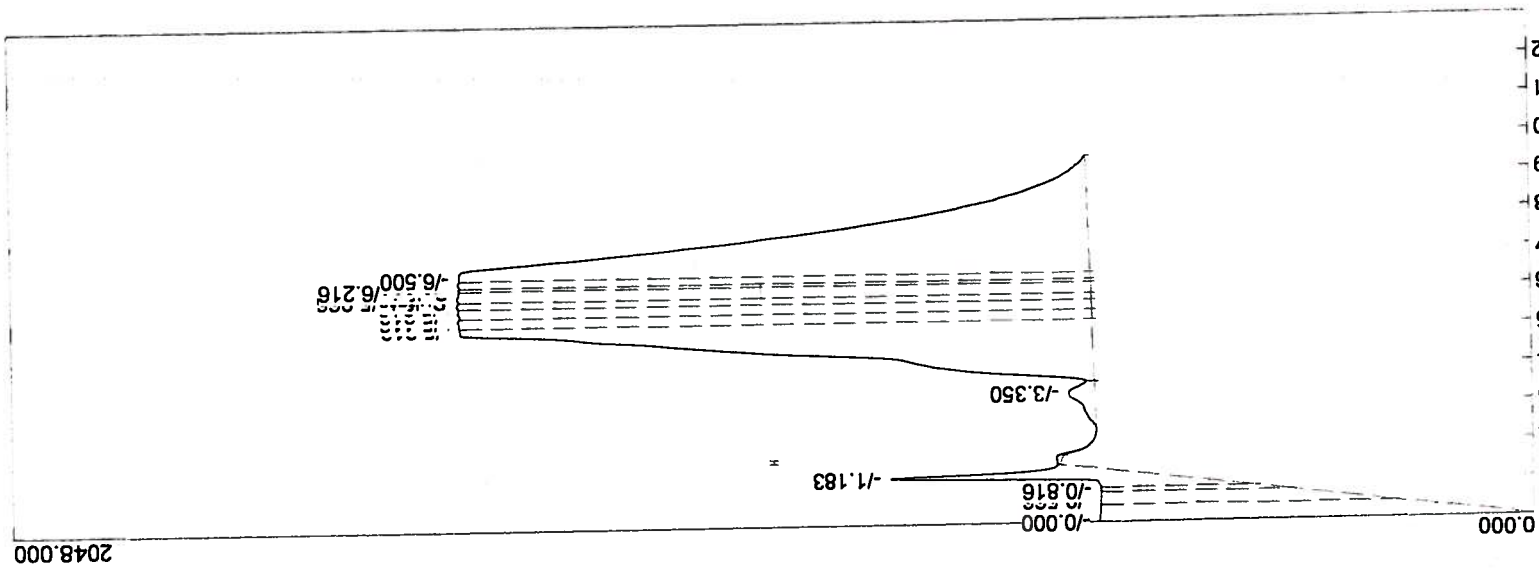
Component	Retention	Area	Height	External	Units
Chloride	1.683	6705.9380	358.142	825.7423	ppm
Sulfate	6.050	10904.1170	840.438	1350.5146	ppm
Sulfate	6.250	10053.9190	838.549	1244.2399	ppm
		27663.9740		3420.4968	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 09:57:27
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 1 out 1 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



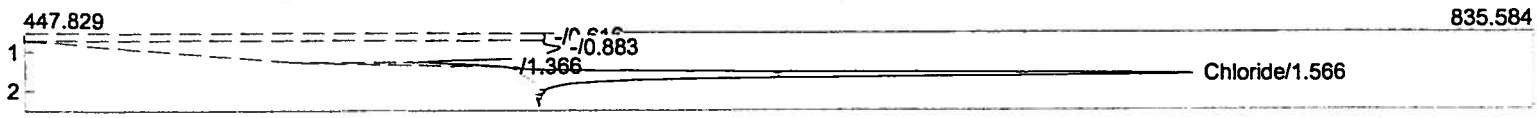
Component	Retention	Area	Height	External	Units
Chloride	0.000	0.0000	0.000	0.0000	ppm
Sulfate	6.166	5056.2710	843.294	619.5339	ppm
Sulfate	6.283	8421.3460	843.047	1040.1682	ppm
		13477.6170		1659.7021	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 10:07:28
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 1 out 2 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



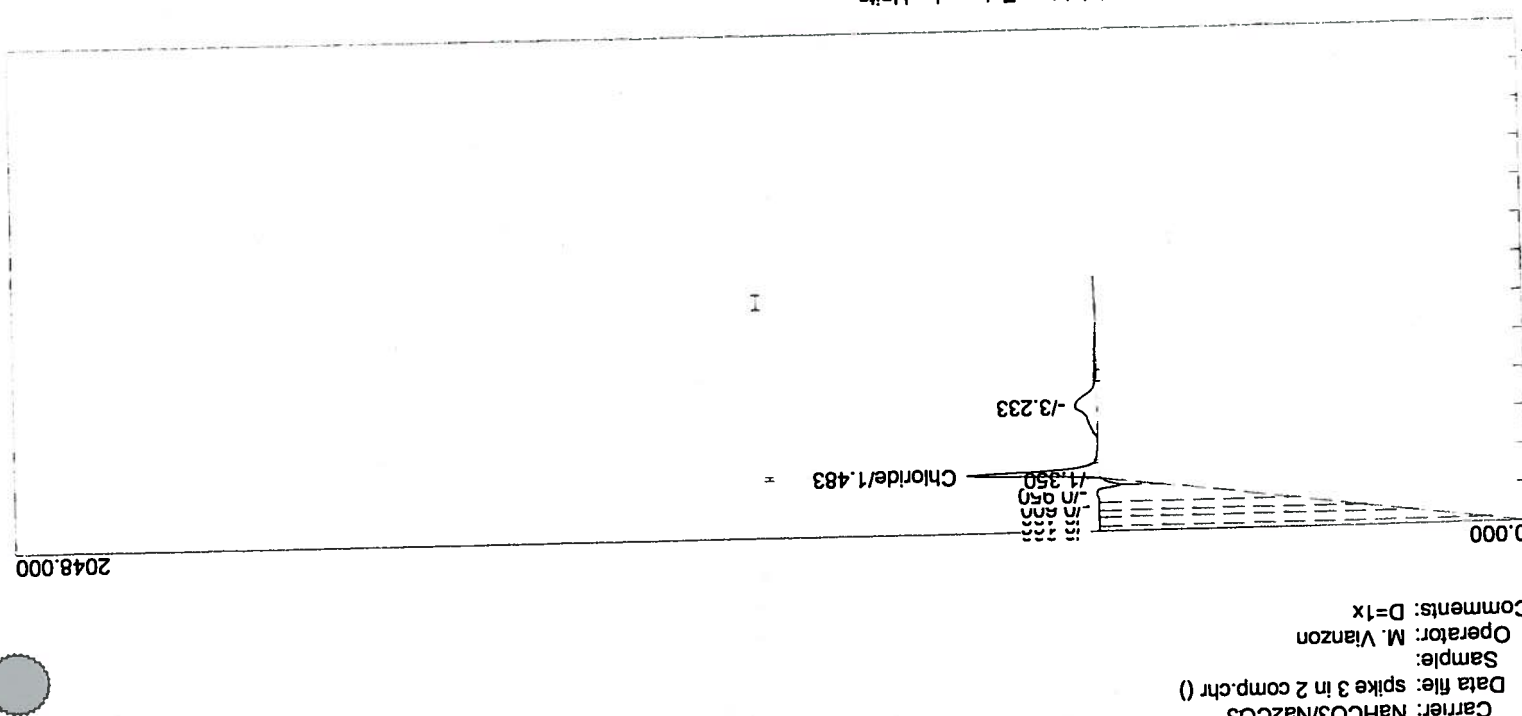
Component	Retention	Area	Height	External	Units
Chloride	0.000	0.0000	0.000	0.0000	ppm
Sulfate	5.966	14485.1545	854.134	1798.1443	ppm
Sulfate	6.216	4254.4790	851.271	519.3099	ppm
		18739.6335		2317.4542	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 10:18:02
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: spike 3 in 1 comp.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



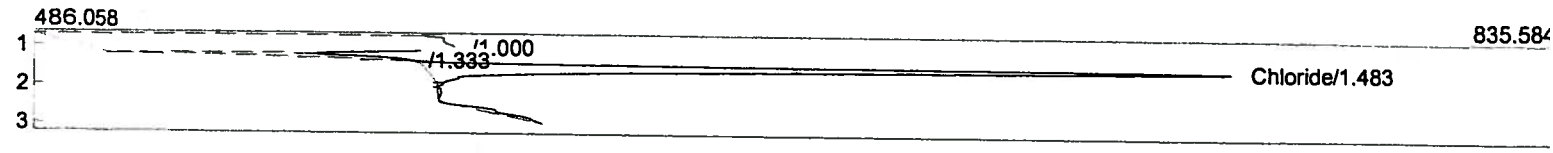
Component	Retention	Area	Height	External	Units
Chloride	1.566	1591.4320	172.412	186.4290	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1591.4320		186.4290	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 10:22:21
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: spike 3 in 2 comp.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



Component	Retention	Area	Height	External	Units
Chloride	1.483	1537.6180	179.054	179.7022	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1537.6180		179.7022	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 11:03:00
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 2 in 2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

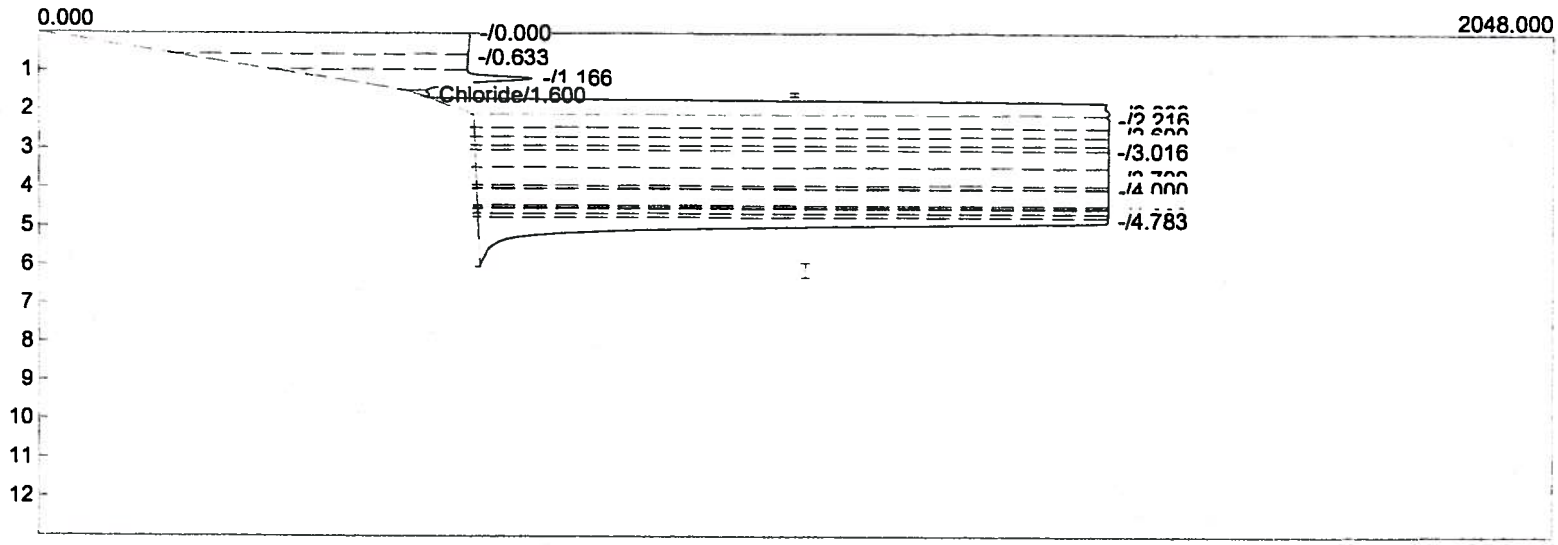


Component	Retention	Area	Height	External	Units
Chloride	1.483	1645.5220	188.559	193.1902	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1645.5220		193.1902	

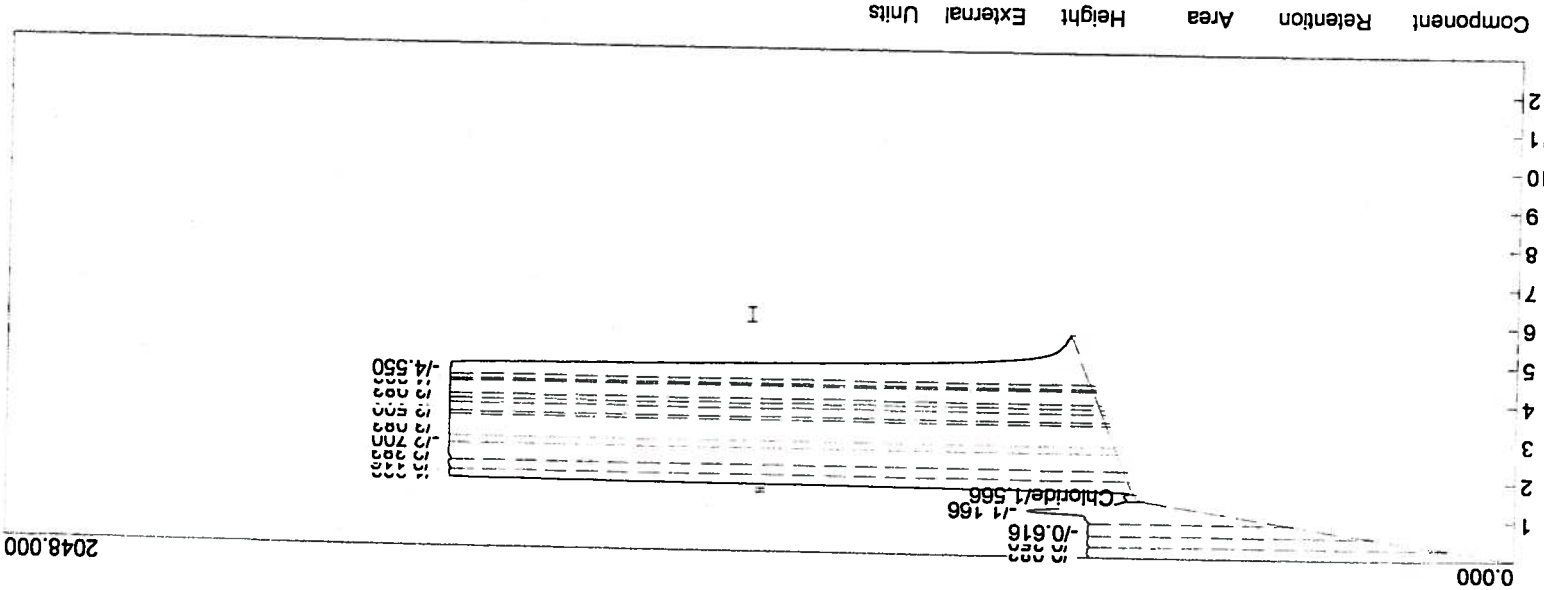
Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 10:59:46
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 2 in 1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

Component	Retention	Area	Height	External	Units
Chloride	1.483	1610.6950	184.105	188.8369	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1610.6950		188.8369	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 11:13:59
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 2 out 2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



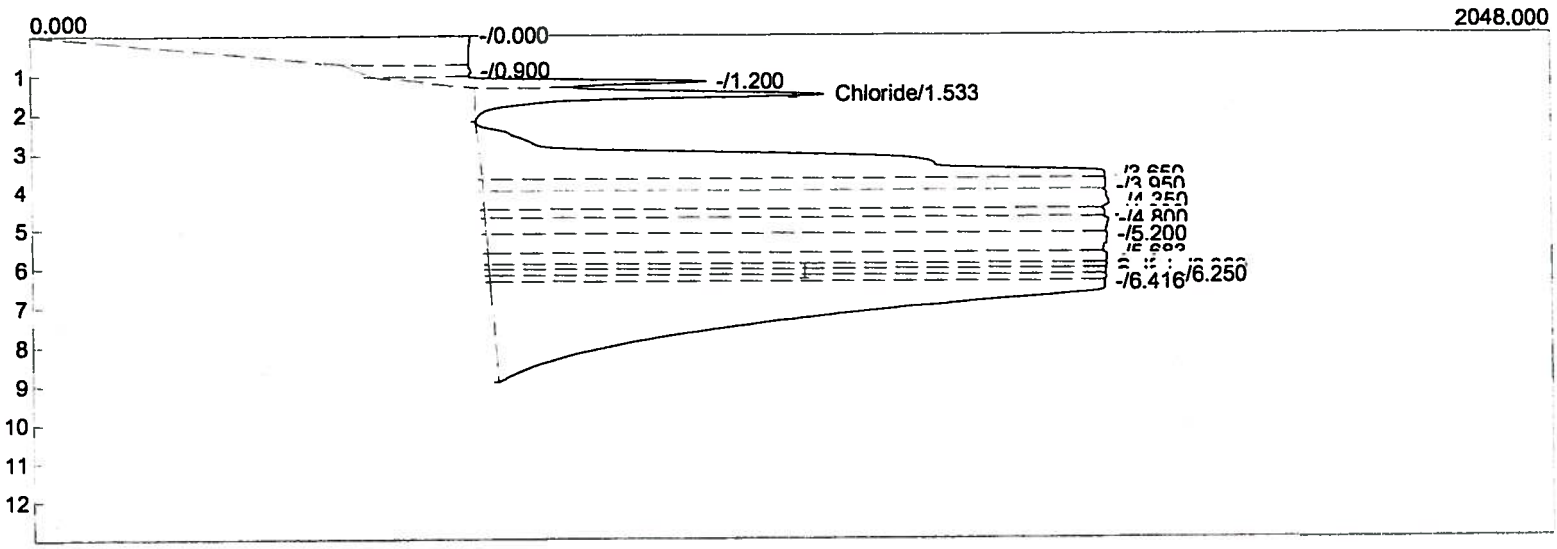
Component	Retention	Area	Height	External	Units
Chloride	1.600	153.5710	11.917	15.3571	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		153.5710		15.3571	



Component	Retention	Area	Height	External	Units
Chloride	1.566	169.2740	16.119	16.9274	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		169.2740		16.9274	

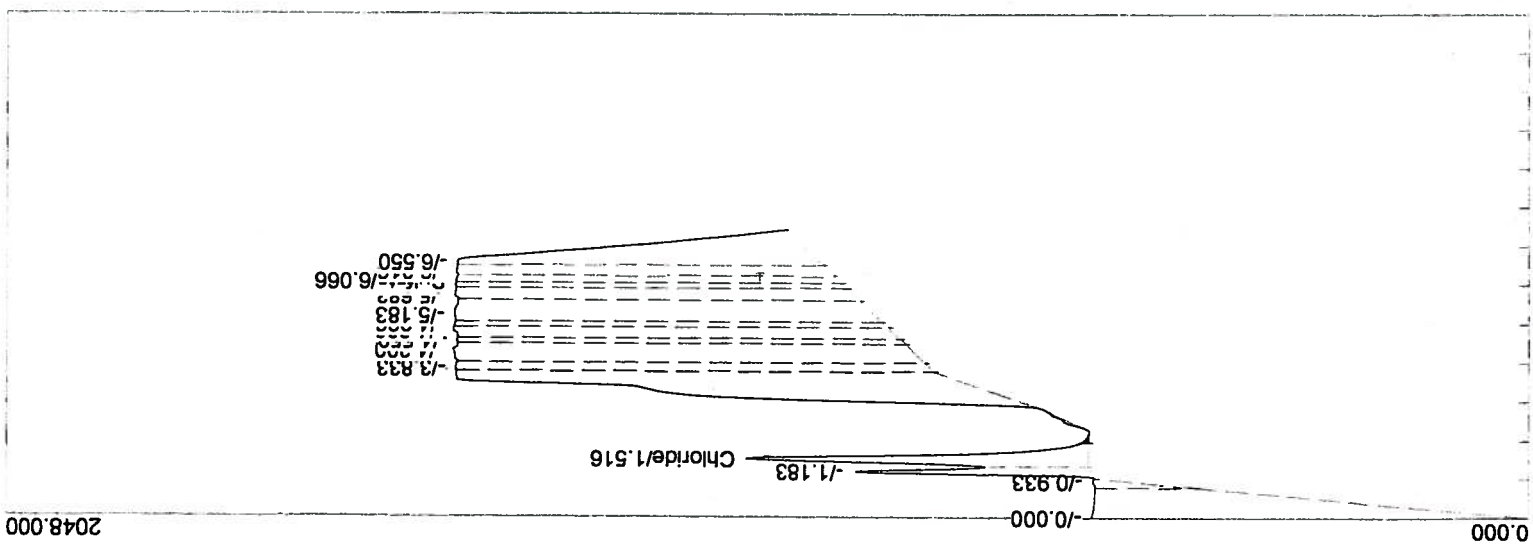
Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 11:06:55
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 2 out 1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 11:21:29
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 2 in 1 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



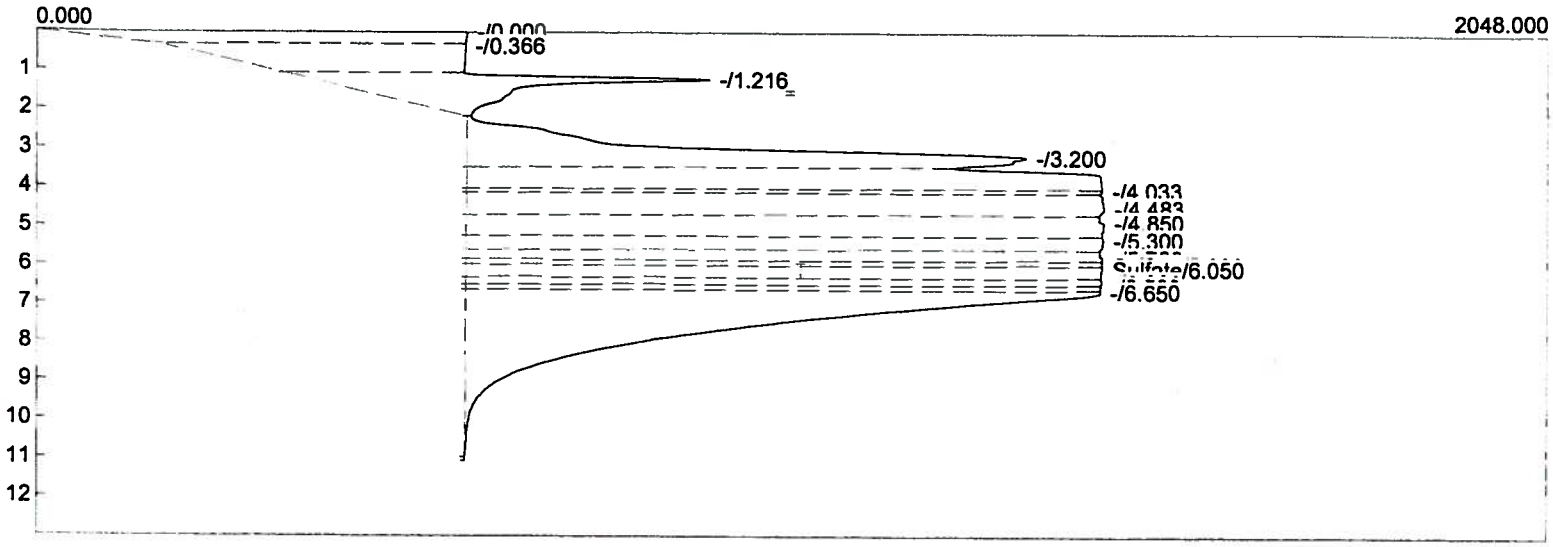
Component	Retention	Area	Height	External	Units
Chloride	1.533	7054.0020	476.091	869.2503	ppm
Sulfate	5.966	6673.3820	835.414	821.6728	ppm
Sulfate	6.066	7496.3375	833.776	924.5422	ppm
Sulfate	6.250	8321.8170	833.144	1027.7271	ppm
		29545.5385		3643.1923	

Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 11:31:13
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 2 in 2 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



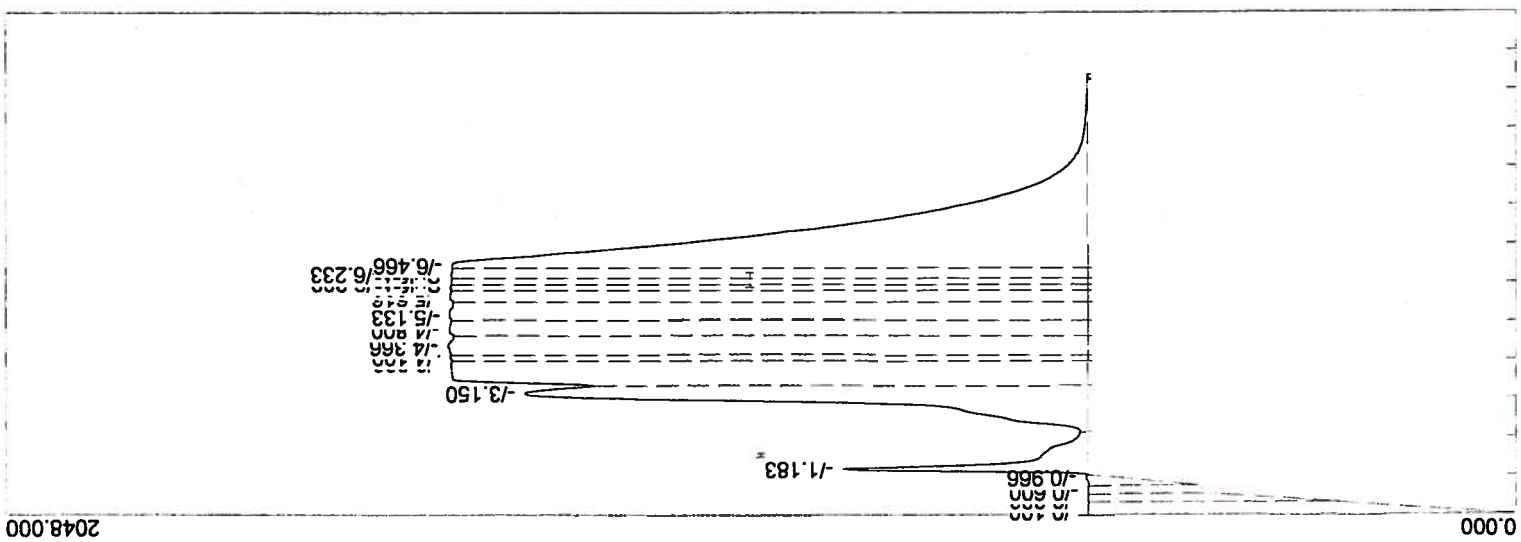
Component	Retention	Area	Height	External	Units
Chloride	1.516	6930.7665	462.375	853.8458	ppm
Sulfate	5.966	4197.6240	525.971	512.2030	ppm
Sulfate	6.066	5663.4020	519.487	695.4253	ppm
		16791.7925		2061.4741	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 11:41:28
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 2 out 1 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



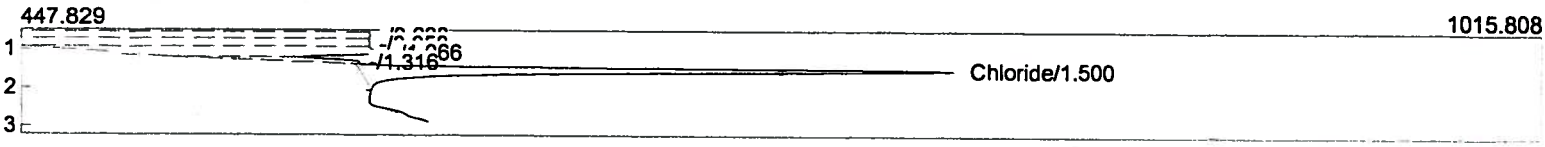
Component	Retention	Area	Height	External	Units
Chloride	0.000	0.0000	0.000	0.0000	ppm
Sulfate	5.933	6891.2720	862.119	848.9090	ppm
Sulfate	6.050	16354.7705	862.352	2031.8463	ppm
		23246.0425		2880.7553	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 11:53:13
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 2 out 2 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



Component	Retention	Area	Height	External	Units
Chloride	0.000	0.0000	0.000	0.0000	ppm
Sulfate	6.000	8634.6370	863.931	1066.8296	ppm
Sulfate	6.233	13803.4530	864.117	1712.9316	ppm
		22438.0900		2779.7613	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 12:40:05
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 3 in 1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

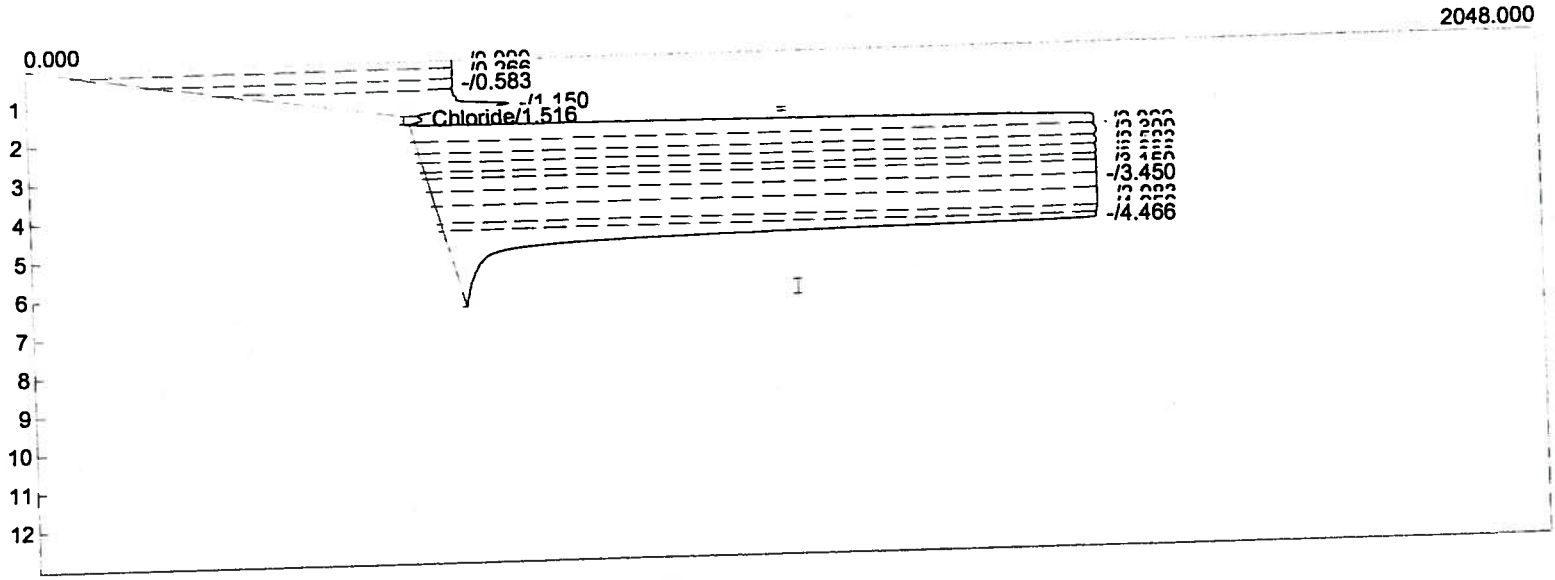


Component	Retention	Area	Height	External	Units
Chloride	1.500	1991.3740	225.103	236.4218	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1991.3740		236.4218	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 12:43:35
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 3 in 2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

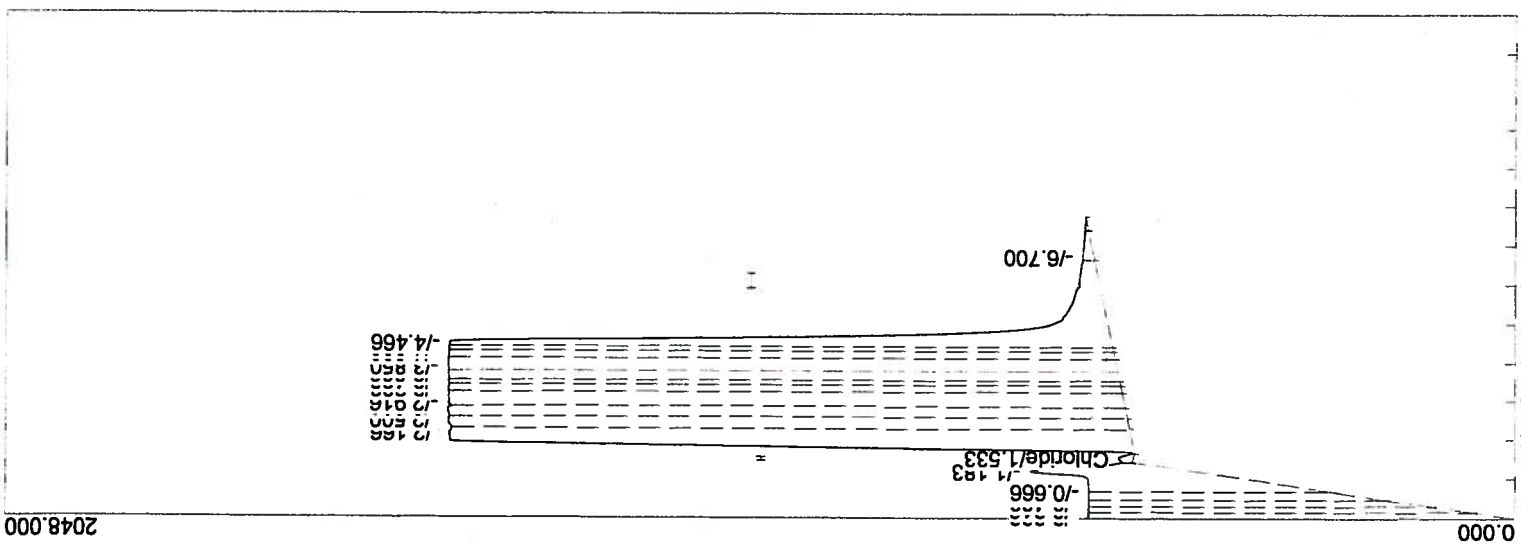
Component	Retention	Area	Height	External	Units
Chloride	1.483	1934.6085	222.306	229.3261	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1934.6085		229.3261	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 12:56:21
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 3 out 2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



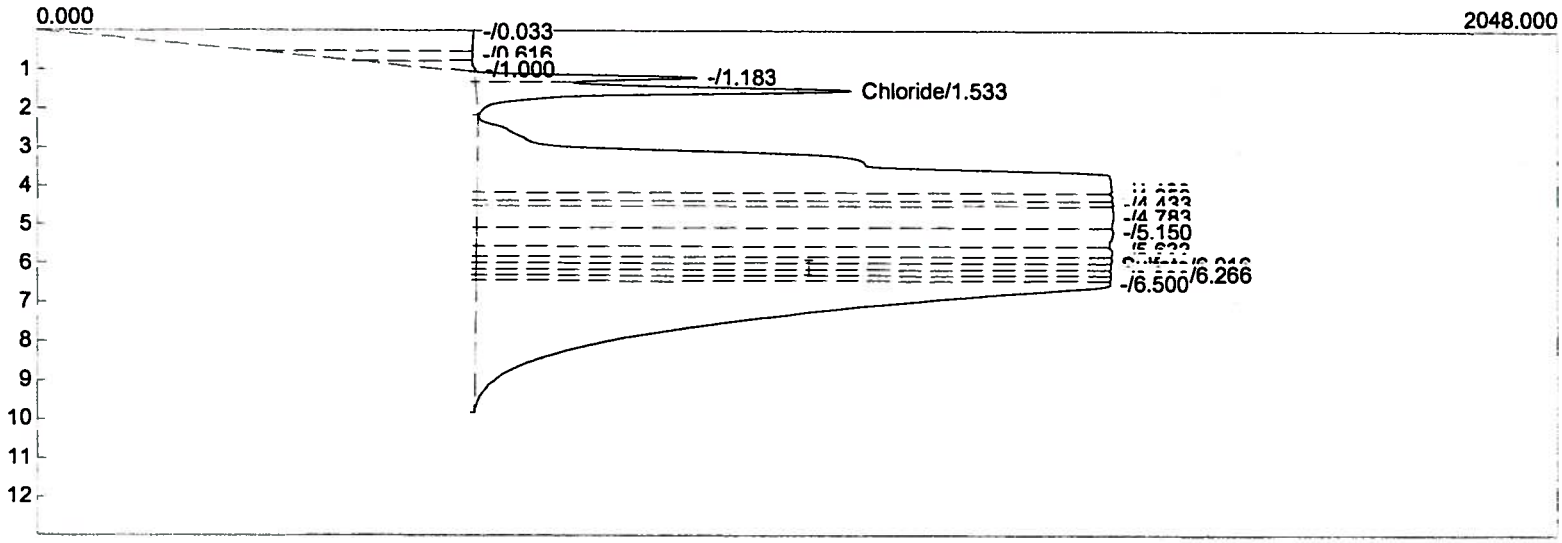
Component	Retention	Area	Height	External	Units
Chloride	1.516	263.8875	24.793	26.3888	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		263.8875		26.3888	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 12:47:32
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 3 out 1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



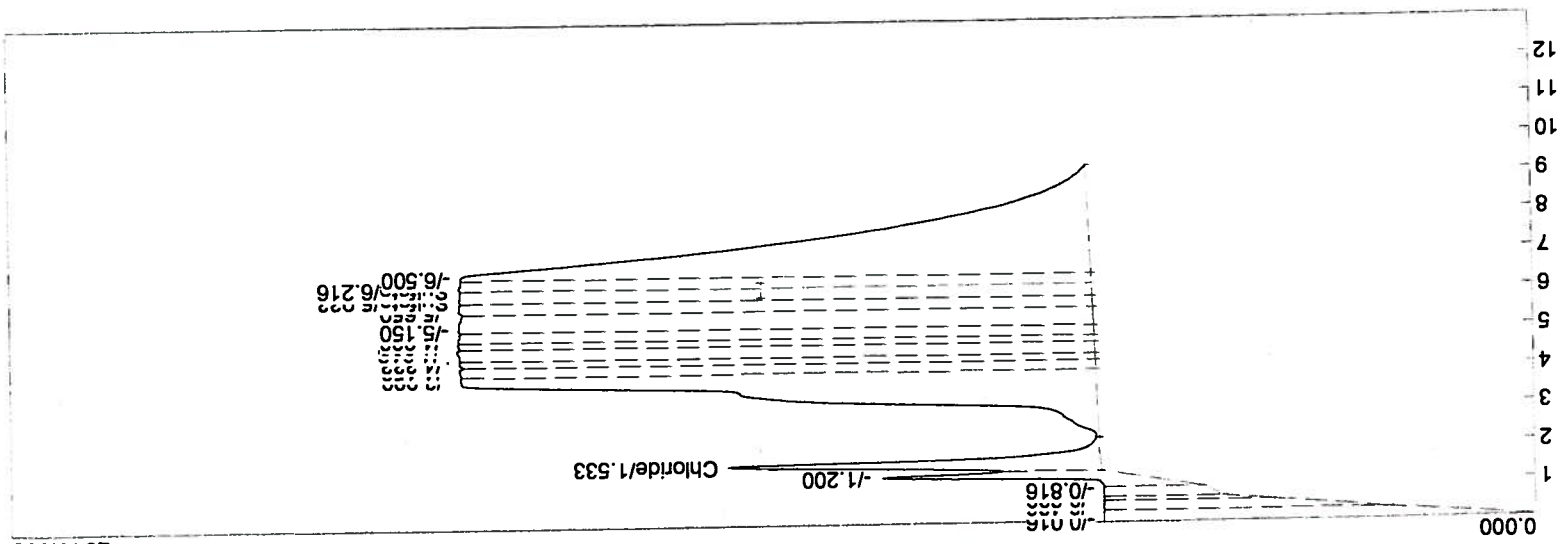
Component	Retention	Area	Height	External	Units
Chloride	1.533	221.6260	19.884	22.1626	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		221.6260		22.1626	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:03:51
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 3 in 1 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



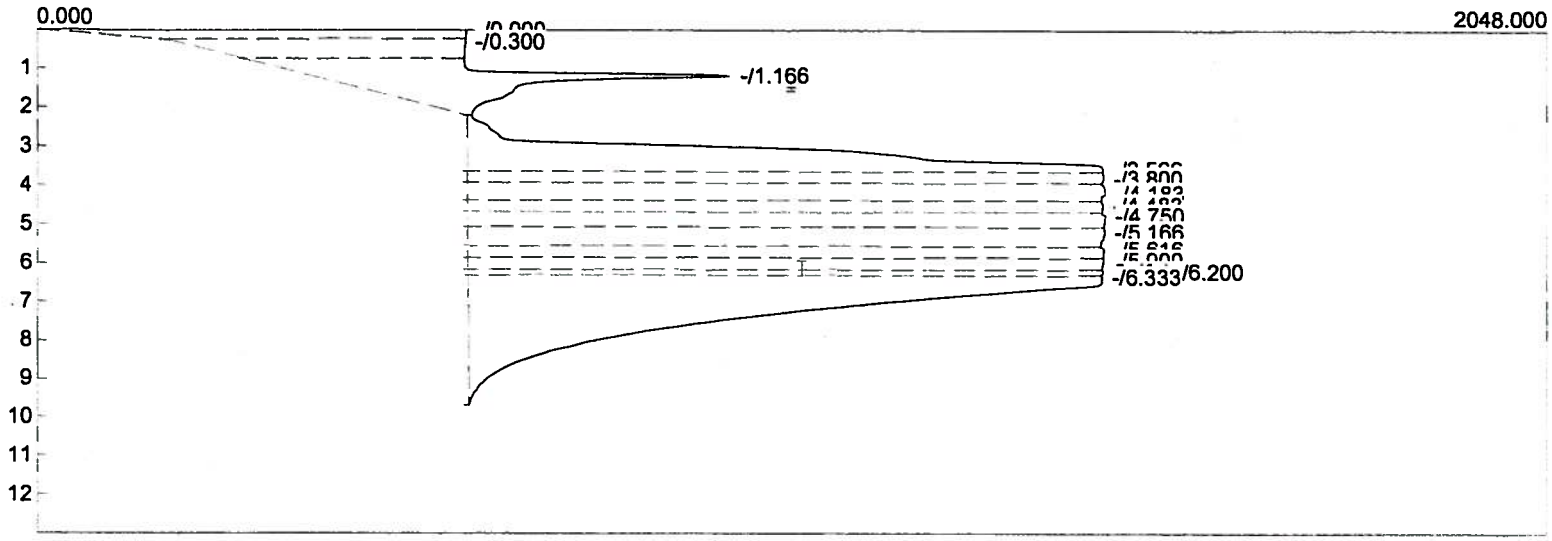
Component	Retention	Area	Height	External	Units
Chloride	1.533	7714.0985	510.037	951.7623	ppm
Sulfate	6.016	8561.1350	856.786	1057.6419	ppm
Sulfate	6.266	7706.1920	857.373	950.7740	ppm
		23981.4255		2960.1782	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:14:49
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 3 in 2 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



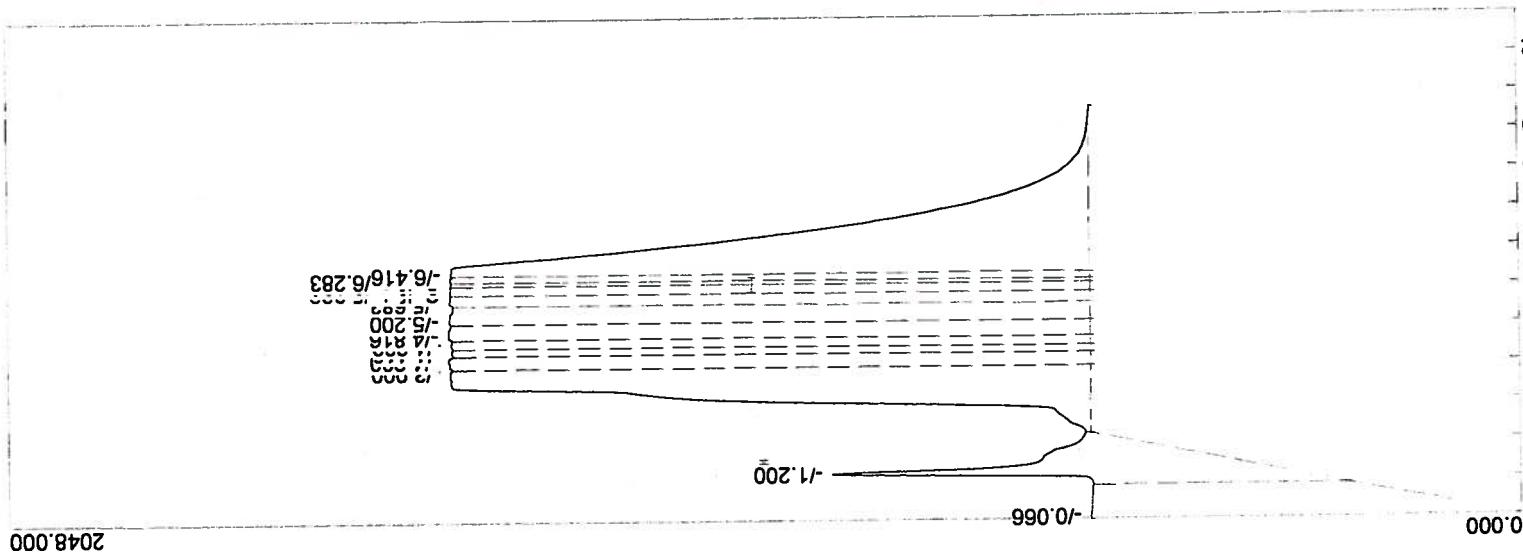
Component	Retention	Area	Height	External	Units
Chloride	1.533	7667.9620	502.215	945.9953	ppm
Sulfate	5.933	16188.8645	853.887	2011.1081	ppm
Sulfate	6.216	13615.3480	852.943	1689.4185	ppm
		37472.1745		4646.5218	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:24:57
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 3 out 1 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



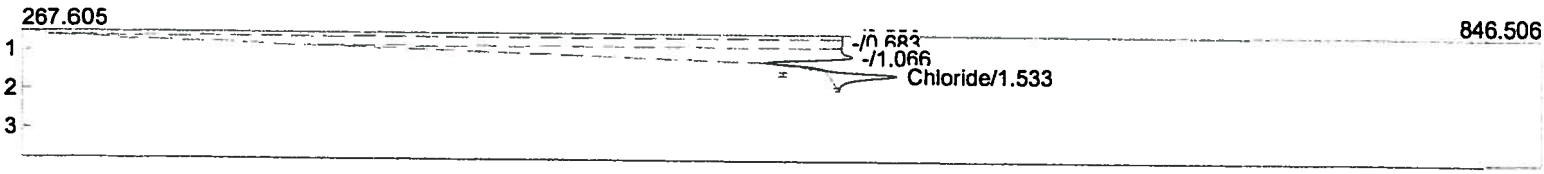
Component	Retention	Area	Height	External	Units
Chloride	0.000	0.0000	0.000	0.0000	ppm
Sulfate	6.200	7718.0505	858.948	952.2563	ppm
		7718.0505		952.2563	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:35:11
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: compliance 3 out 2 cl2.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



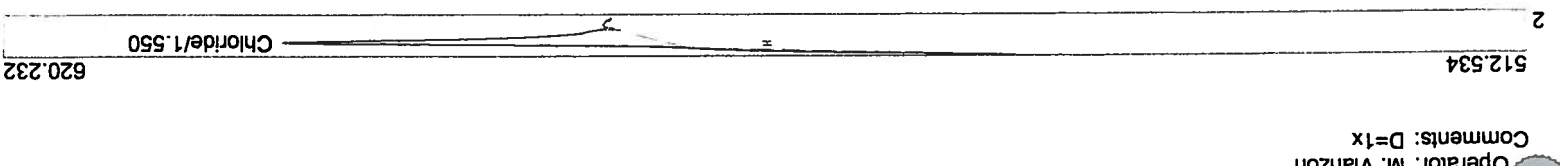
Component	Retention	Area	Height	External	Units
Chloride	0.000	0.0000	0.000	0.0000	ppm
Sulfate	5.966	12082.5180	864.156	1497.8148	ppm
Sulfate	6.166	5174.1920	862.772	634.2740	ppm
Sulfate	6.283	8623.3550	863.628	1065.4194	ppm
		25880.0650		3197.5081	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:46:21
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 1-1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



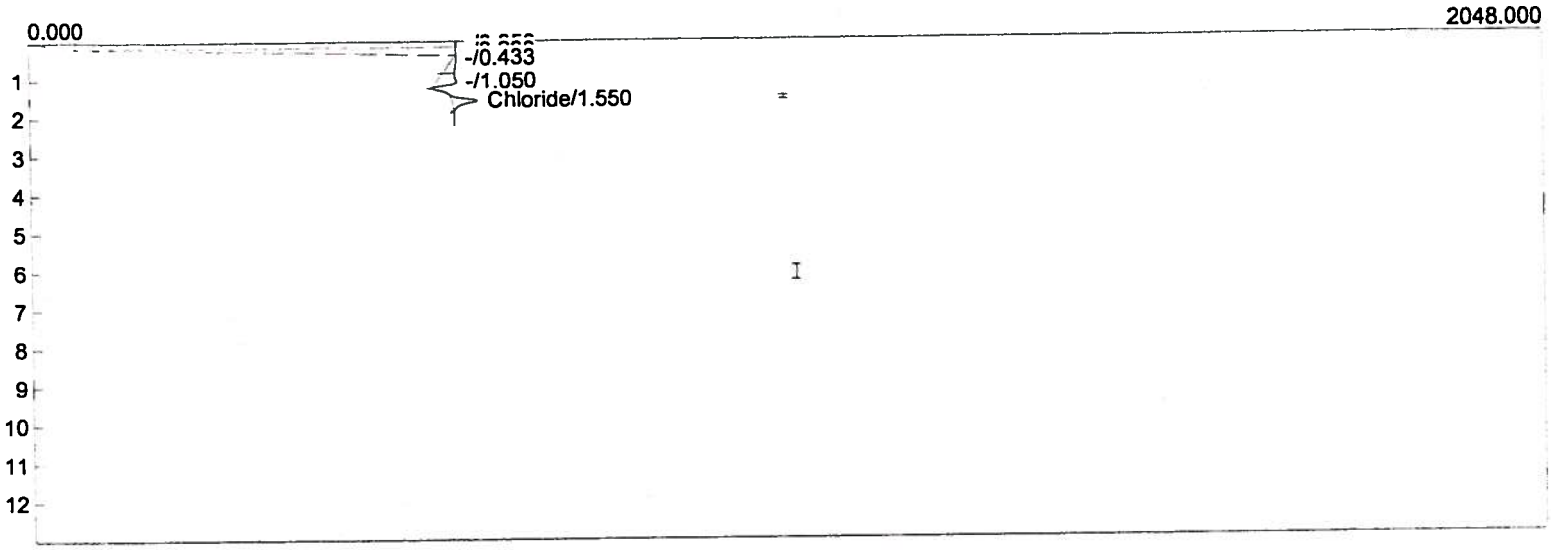
Component	Retention	Area	Height	External	Units
Chloride	1.533	274.8300	26.549	27.4830	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		274.8300		27.4830	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:49:10
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 1-02.CHR ()
Sample:
Operator: M. Vianzon
Comments: D=1x



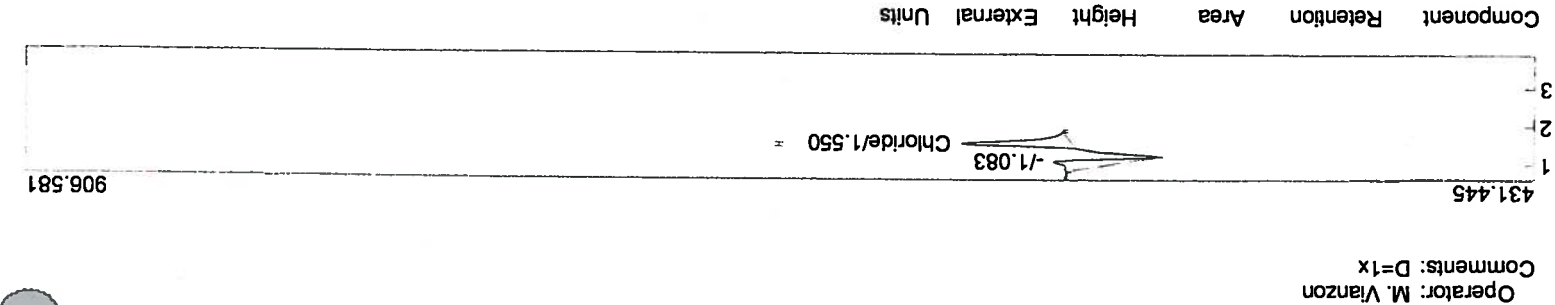
Component	Retention	Area	Height	External	Units
Chloride	1.550	281.5100	27.122	28.1510	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		281.5100		28.1510	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:55:08
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 2-02.CHR ()
Sample:
Operator: M. Vianzon
Comments: D=1x



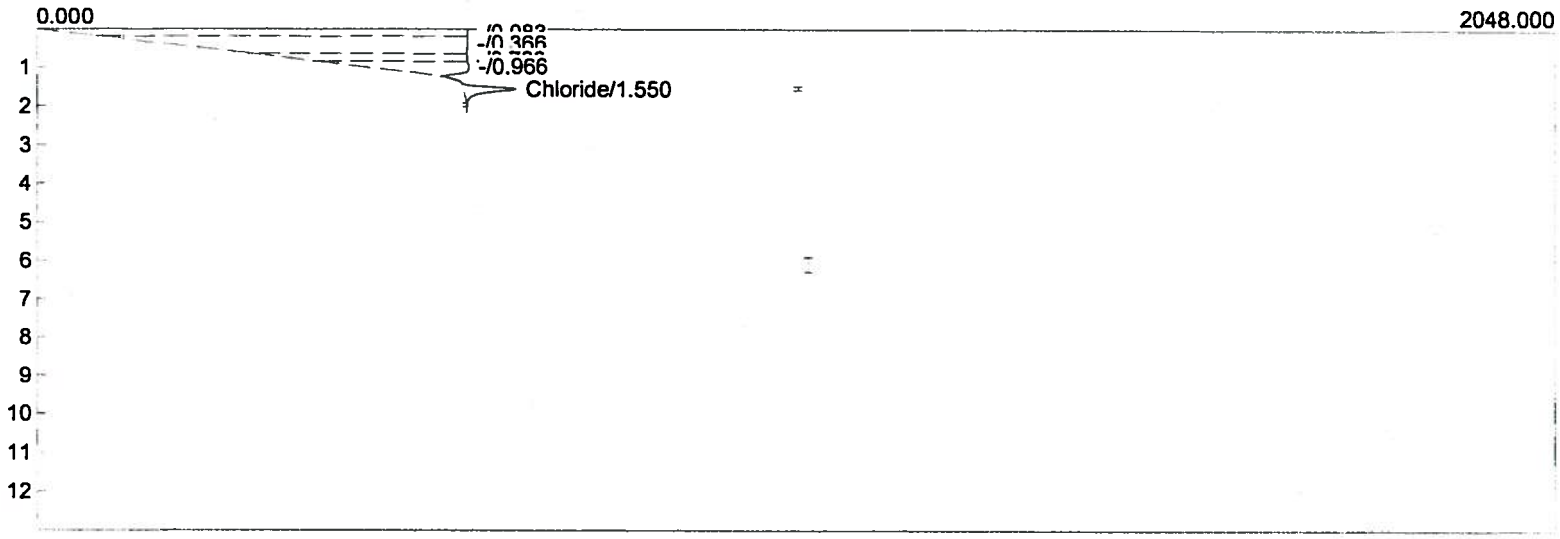
Component	Retention	Area	Height	External	Units
Chloride	1.550	325.5815	34.777	32.5581	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		325.5815		32.5581	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:52:11
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 2-1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



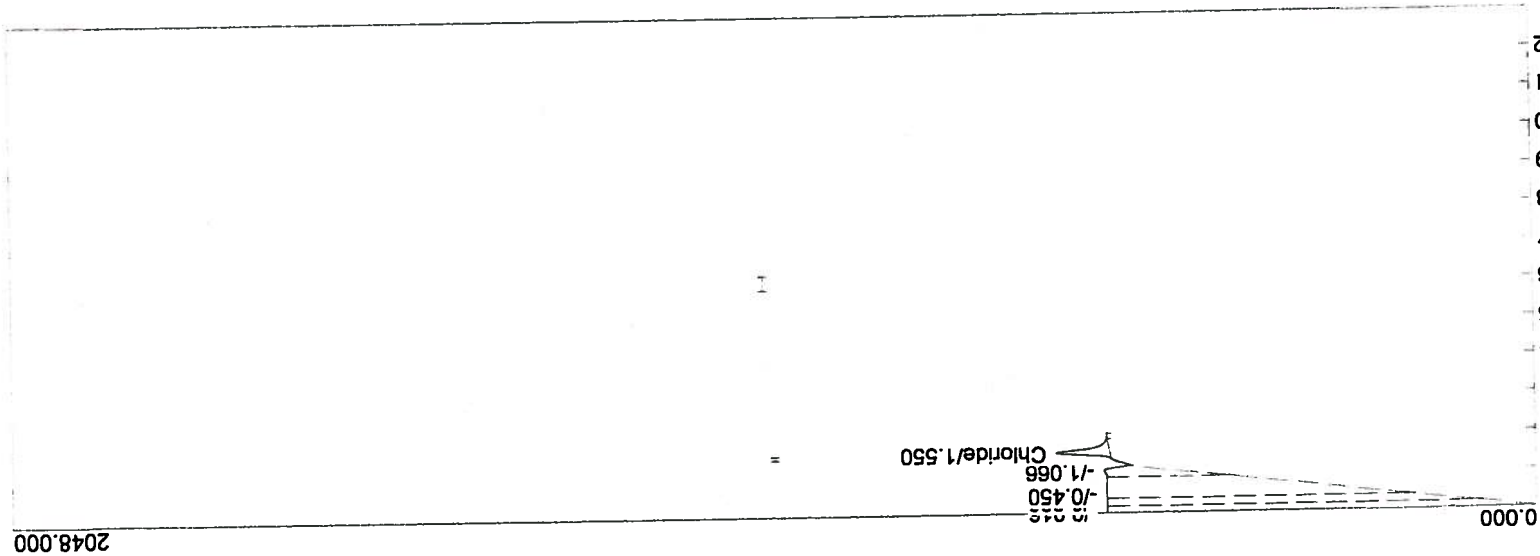
Component	Retention	Area	Height	External	Units
Chloride	1.550	322.0800	34.617	32.2080	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		322.0800		32.2080	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 13:58:24
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 3-1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



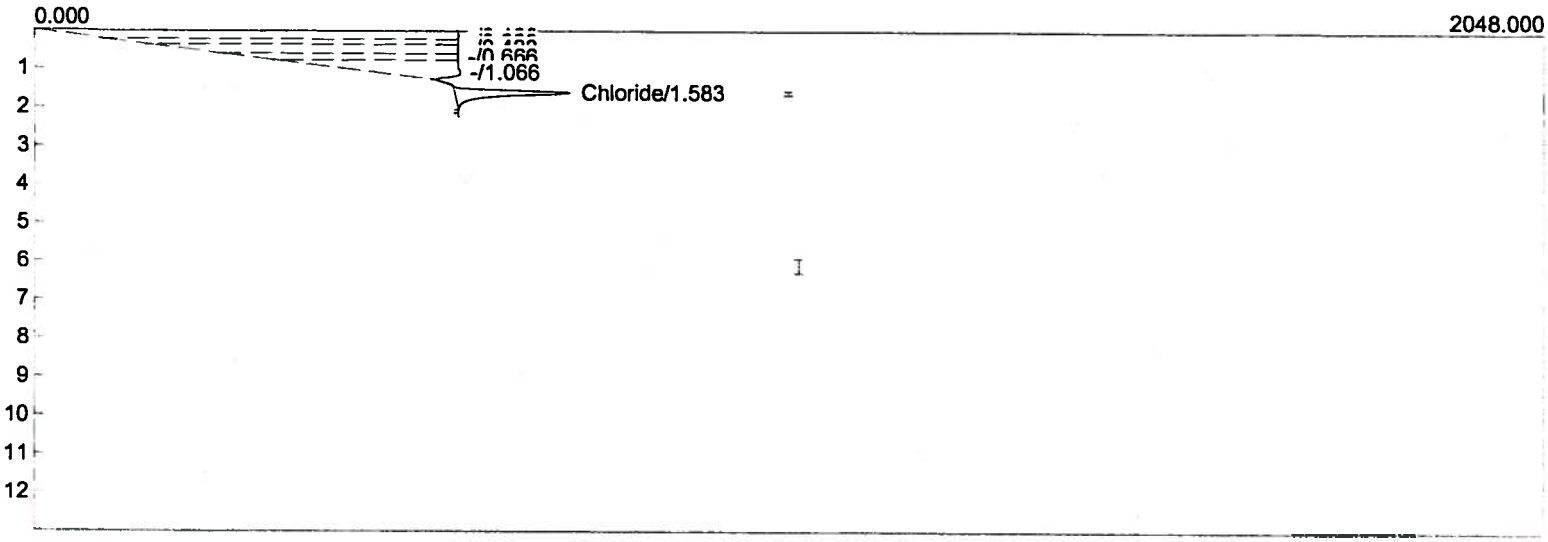
Component	Retention	Area	Height	External	Units
Chloride	1.550	700.8715	72.066	75.1089	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		700.8715		75.1089	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 14:01:28
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 3-02.CHR ()
Sample:
Operator: M. Vianzon
Comments: D=1x



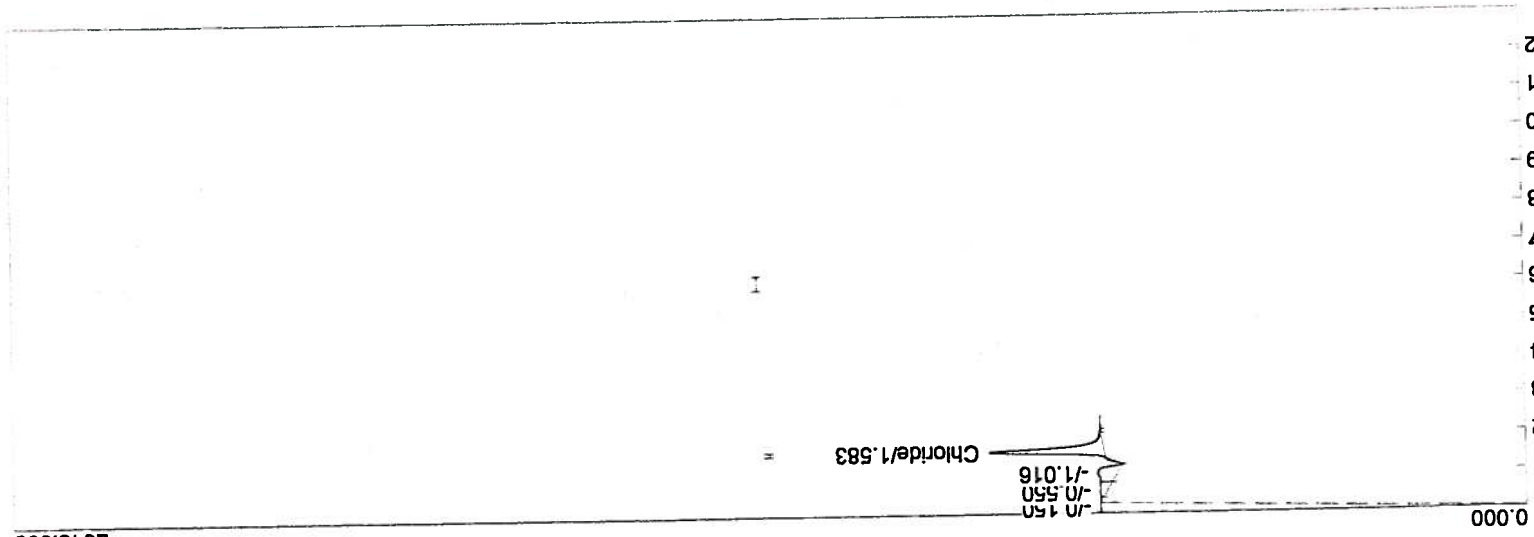
Component	Retention	Area	Height	External	Units
Chloride	1.550	709.0915	72.852	76.1364	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		709.0915		76.1364	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 14:05:02
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 4-1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



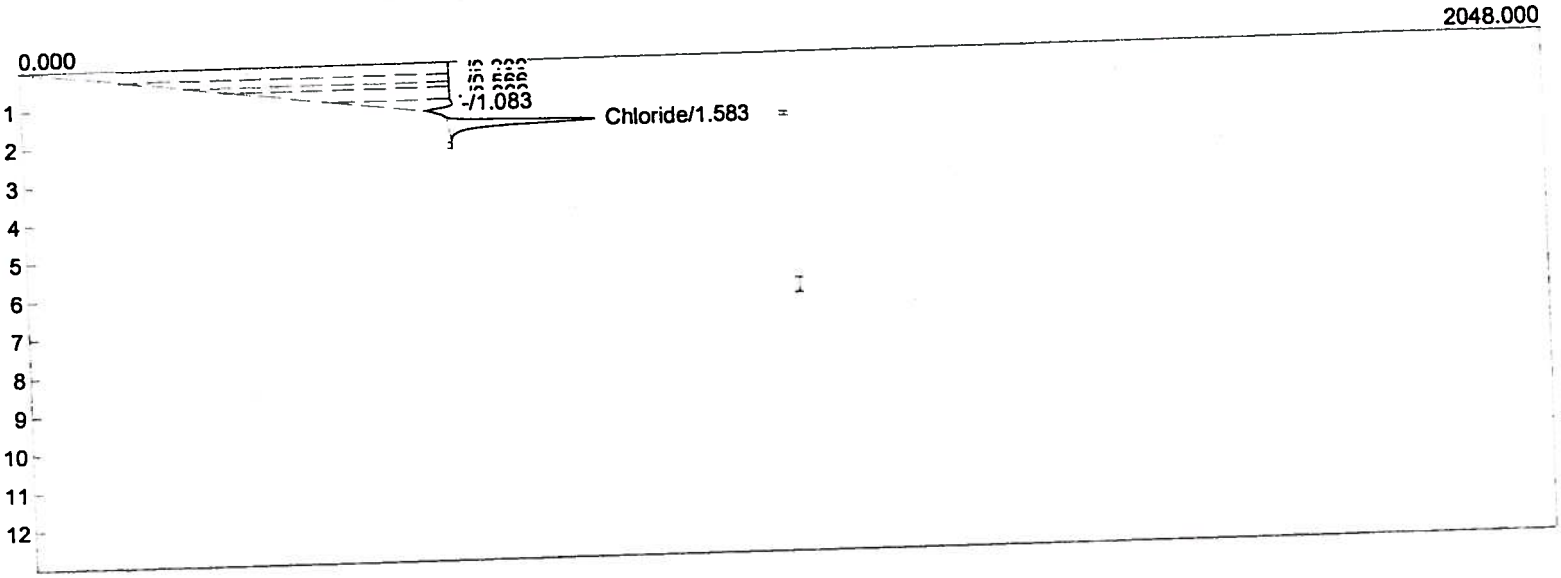
Component	Retention	Area	Height	External	Units
Chloride	1.583	1501.3440	157.321	175.1680	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1501.3440		175.1680	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 14:08:20
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 4-02.CHR ()
Sample:
Operator: M. Vianzon
Comments: D=1x

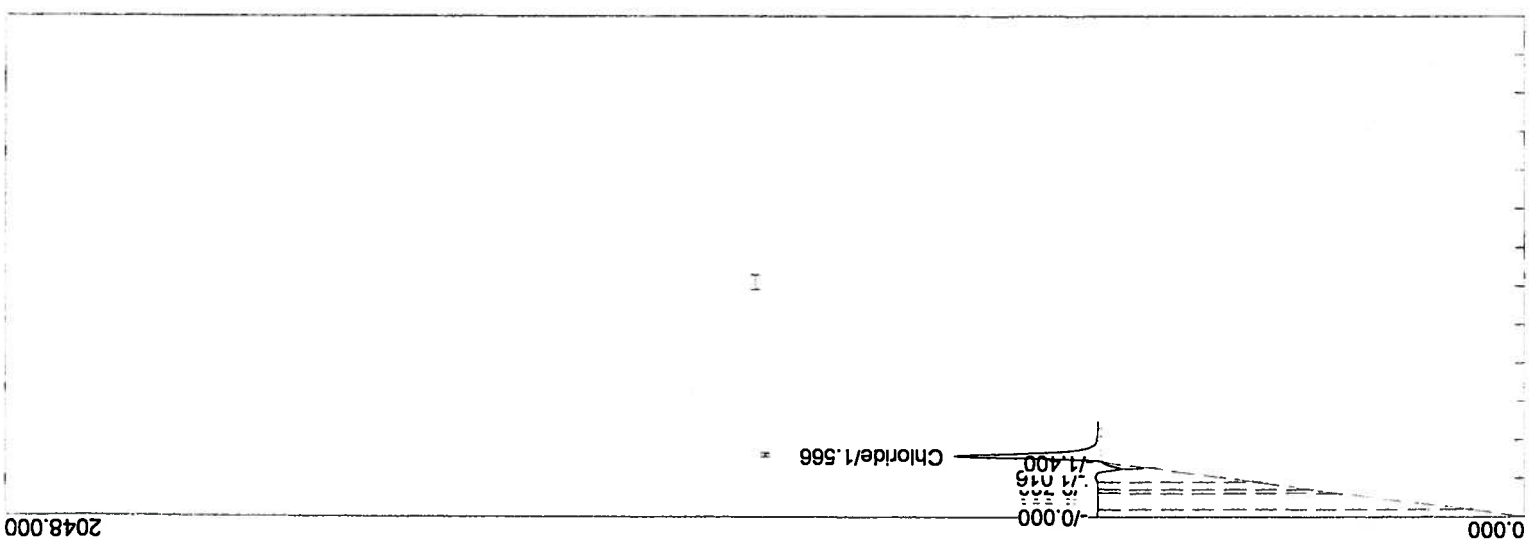


Component	Retention	Area	Height	External	Units
Chloride	1.583	1495.1590	155.221	174.3949	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1495.1590		174.3949	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 14:15:08
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 5-02.CHR ()
Sample:
Operator: M. Vianzon
Comments: D=1x



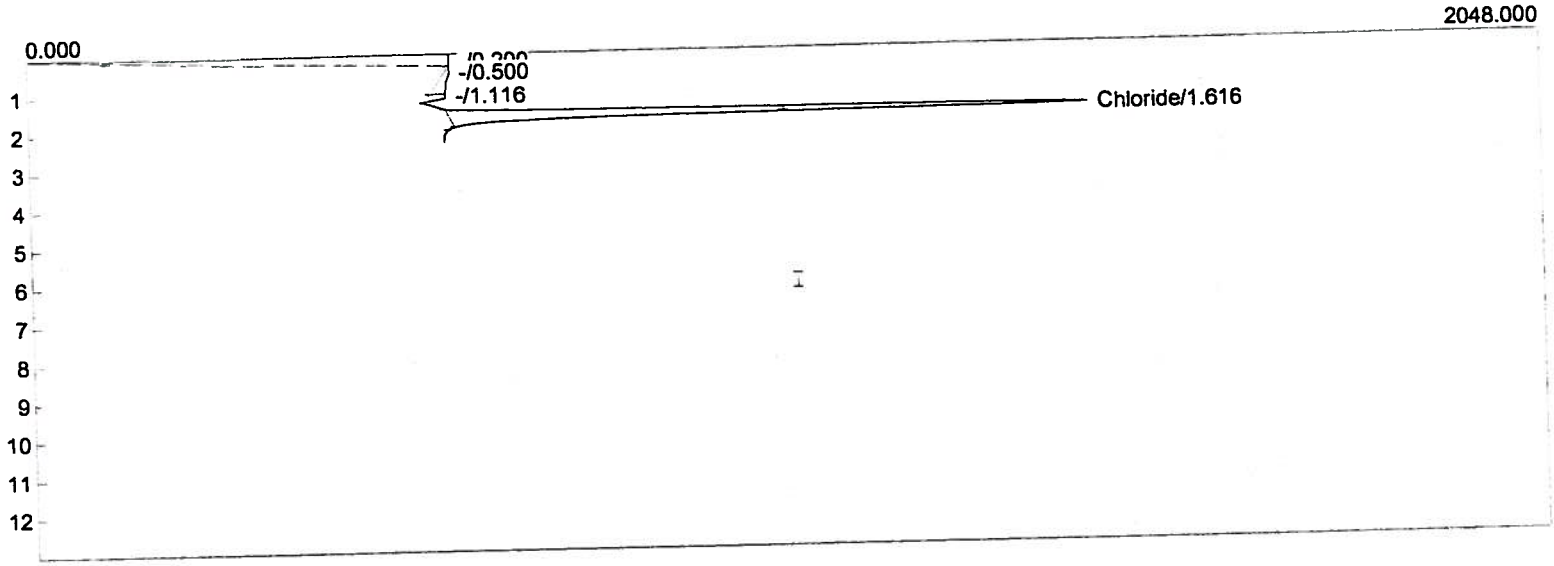
Component	Retention	Area	Height	External	Units
Chloride	1.583	1862.9325	197.405	220.3666	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1862.9325		220.3666	



Component	Retention	Area	Height	External	Units
Chloride	1.566	1851.3605	197.121	218.9201	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		1851.3605		218.9201	

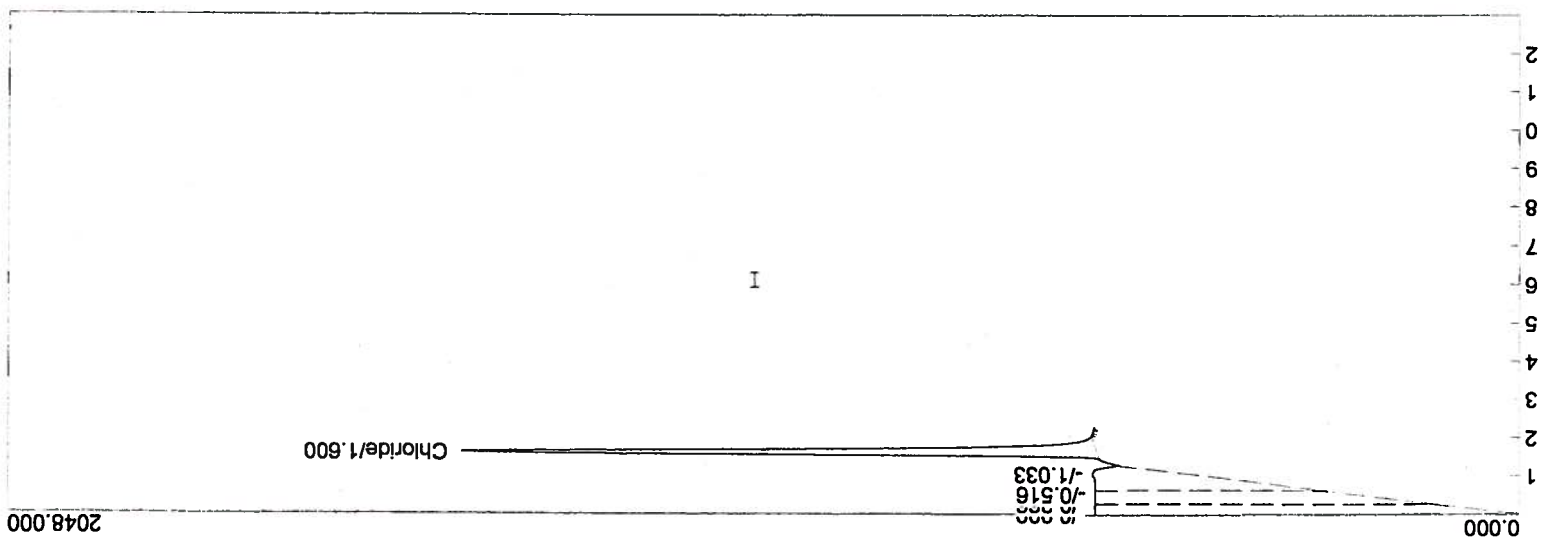
Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 14:11:51
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 5-1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 14:21:54
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 6-02.CHR ()
Sample:
Operator: M. Vianzon
Comments: D=1x



Component	Retention	Area	Height	External	Units
Chloride	1.616	8112.7010	860.910	1001.5876	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		8112.7010		1001.5876	

Lab name: Analytical Services
Client: Marathon Ashland Pet
Client ID: 9684
Analysis date: 02/18/2005 14:18:23
Method: Syringe Injection
Lab ID: 27647
Carrier: NaHCO3/Na2CO3
Data file: post cal 6-1.chr ()
Sample:
Operator: M. Vianzon
Comments: D=1x



Component	Retention	Area	Height	External	Units
Chloride	1.600	8106.8820	864.963	1000.8603	ppm
Sulfate	0.000	0.0000	0.000	0.0000	ppm
		8106.8820		1000.8603	

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MONITOR DATA

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005	
Start Time	7:54
Stop Time	8:15

CALIBRATION ERROR

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv
Instrument Information						
Manufacturer:	J.U.M	J.U.M	Servomex	Servomex	Servomex	Servomex
Model:	3-300A	3-300A	1440	1440	1440	1440
Detection:	FID	FID	Paramanet	NDIR	Paramanet	NDIR
Asset or Serial No:	203713	203712	202524	202739	203469	203502
Instrument Span Value	100	100	25	25	25	25
System Response Time (seconds)	25	25	55	55	55	55
Actual Value of Calibration Gasses						
Zero	0.0	0.0	0	0	0	0
Low	26.20	26.20	10.15	10.09	10.15	10.09
Mid	44.46	44.46	NA	NA	NA	NA
High	84.84	84.84	21.43	17.99	21.43	17.99
Actual gas to be used for bias checks	26.200	26.200	10.150	10.090	10.150	10.090
Cylinder ID						
Zero	ALM042802	ALM042802	ALM042802	ALM042802	ALM042802	ALM042802
Low	ALM053831	ALM053831	1L1974	1L1974	1L1974	1L1974
Mid	ALM033262	ALM033262				
High	ALM033719	ALM033719	ALM033531	ALM033531	ALM033531	ALM033531
Instrument Response to Calibration Gas						
Zero	-0.002	-0.153	0.067	0.073	0.030	0.033
Low	26.067	26.139	10.093	10.177	10.064	10.109
Mid	44.330	44.399	NA	NA	NA	NA
High	84.846	84.811	21.466	17.942	21.409	18.002
Calibration Error as Percent of Span Value (Limit = 2%, EPA Method 25A limit = 5% of actual calibration gas value)						
Zero	0.0%	-0.2%	0.3%	0.3%	0.1%	0.1%
Low	-0.5%	-0.2%	-0.2%	0.3%	-0.3%	0.1%
Mid	-0.3%	-0.1%	NA	NA	NA	NA
High	0.0%	0.0%	0.1%	-0.2%	-0.1%	0.0%
Calibration Error Status						
Zero	OK	OK	OK	OK	OK	OK
Low	OK	OK	OK	OK	OK	OK
Mid	OK	OK	NA	NA	NA	NA
High	OK	OK	OK	OK	OK	OK

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07:54:31	3.663	0.389	-0.006	0.004	-0.015	-0.018
07:54:46	3.552	0.239	-0.006	0.005	-0.016	-0.018
07:55:01	3.549	0.129	-0.007	0.003	-0.018	-0.018
07:55:16	3.673	0.168	-0.006	0.000	-0.025	-0.021
07:55:31	3.720	0.166	-0.006	-0.002	-0.016	-0.016
07:55:46	3.691	0.166	-0.008	-0.006	-0.005	-0.007
07:56:01	3.621	0.194	-0.007	-0.006	-0.006	-0.006
07:56:16	3.744	0.221	-0.008	-0.004	-0.006	-0.007
07:56:31	3.914	0.327	-0.009	0.000	-0.006	-0.011
07:56:46	3.938	0.322	1.506	0.051	1.366	-0.004
07:57:01	3.902	0.321	20.297	13.617	19.007	7.637

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005	
Start Time	7:54
Stop Time	8:15

CALIBRATION ERROR

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv
07:57:16	3.803	0.313	21.625	17.774	21.492	17.630
07:57:31	3.816	0.251	21.668	17.861	21.550	18.001
07:57:46	3.928	0.217	21.686	17.895	21.569	18.062
07:58:01	3.979	0.173	21.695	17.911	21.532	18.093
07:58:16	3.959	0.205	21.699	17.920	21.509	18.113
07:58:31	3.893	0.295	21.701	17.920	21.443	18.127
07:58:46	3.893	2.284	21.705	17.922	21.452	18.164
07:59:01	4.060	4.277	21.708	17.933	21.412	18.173
07:59:16	4.081	5.478	21.689	17.941	21.408	18.179
07:59:31	3.634	5.521	21.603	17.947	21.409	18.184
07:59:46	3.342	5.861	21.497	17.951	21.410	18.188
08:00:01	3.556	4.978	21.467	17.936	21.412	18.164
08:00:16	3.813	4.811	21.469	17.933	21.412	17.991
08:00:31	4.023	5.595	21.469	17.931	21.392	17.993
08:00:46	4.023	5.170	21.466	17.935	21.408	17.991
08:01:01	4.000	4.729	21.466	17.941	21.408	17.998
08:01:16	3.984	4.505	21.466	17.940	21.409	18.001
08:01:31	4.145	4.456	21.466	17.945	21.410	18.007
08:01:46	4.215	5.359	16.925	14.293	18.045	14.681
08:02:01	4.194	4.648	10.192	10.164	10.450	8.880
08:02:16	4.075	4.334	10.115	10.240	10.099	10.101
08:02:31	4.090	4.011	10.103	10.232	10.078	10.117
08:02:46	4.248	4.044	10.100	10.224	10.072	10.116
08:03:01	4.257	4.962	10.091	10.189	10.067	10.112
08:03:16	4.190	4.422	10.094	10.175	10.065	10.108
08:03:31	4.096	4.060	10.092	10.176	10.064	10.110
08:03:46	4.109	3.818	10.093	10.178	10.062	10.110
08:04:01	4.221	3.932	10.013	10.177	9.993	10.108
08:04:16	15.253	29.120	1.969	15.205	2.313	14.905
08:04:31	0.938	-0.200	4.088	14.505	3.348	10.633
08:04:46	0.106	-0.549	2.882	2.777	0.408	0.859
08:05:01	-0.015	-0.371	0.151	0.311	0.058	0.151
08:05:16	-0.024	-0.218	0.086	0.176	0.043	0.090
08:05:31	-0.018	-0.119	0.075	0.128	0.037	0.066
08:05:46	-0.003	-0.140	0.073	0.102	0.033	0.052
08:06:01	-0.002	-0.152	0.070	0.083	0.031	0.040
08:06:16	-0.002	-0.166	0.066	0.073	0.031	0.033
08:06:31	0.037	28.539	0.064	0.063	0.029	0.025
08:06:46	73.400	84.410	0.313	0.056	3.281	0.040
08:07:01	85.390	84.913	14.845	0.083	18.216	0.047
08:07:16	85.739	85.044	20.166	0.044	20.313	0.019
08:07:31	85.919	84.659	20.331	0.041	20.402	0.017
08:07:46	85.324	84.688	20.369	0.037	20.419	0.018
08:08:01	84.866	84.677	20.389	0.037	20.427	0.018
08:08:16	84.975	84.760	20.399	0.037	20.429	0.017
08:08:31	84.988	84.791	20.406	0.033	20.435	0.012
08:08:46	85.071	84.762	20.410	0.031	20.437	0.012
08:09:01	84.965	84.799	20.417	0.025	20.440	0.006
08:09:16	84.850	84.816	20.413	0.024	20.440	0.006
08:09:31	84.855	84.770	20.421	0.024	20.440	0.006
08:09:46	84.832	84.847	20.421	0.018	20.443	0.006
08:10:01	84.848	84.544	20.422	0.024	20.445	0.006
08:10:16	48.811	3.573	20.421	0.024	20.295	0.006
08:10:31	0.321	0.142	14.439	0.021	7.482	0.006
08:10:46	0.077	-0.023	0.963	0.018	0.356	0.004
08:11:01	-0.059	-0.041	0.185	0.018	0.099	0.000
08:11:16	-0.049	-0.143	0.124	0.018	0.068	0.000
08:11:31	-0.114	-0.108	0.098	0.018	0.053	0.000

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005	
Start Time	7:54
Stop Time	8:15

CALIBRATION ERROR

	Channel 2 THC	Channel 3 THC	Channel 4 O2	Channel 5 CO2	Channel 6 O2	Channel 7 CO2
	Outlet ppmwv	Inlet ppmwv	Outlet %dv	Outlet %dv	Inlet %dv	Inlet %dv
08:11:46	6.530	33.853	0.084	0.018	0.049	0.000
08:12:01	43.736	44.361	2.504	0.018	10.064	0.000
08:12:16	44.143	44.402	18.291	0.018	19.947	0.000
08:12:31	44.243	44.467	20.413	0.017	20.468	0.001
08:12:46	44.285	44.510	20.519	0.016	20.511	0.006
08:13:01	44.358	44.477	20.564	0.006	20.533	0.005
08:13:16	44.347	44.210	20.587	0.014	20.536	0.000
08:13:31	40.667	28.962	20.606	0.018	20.501	0.013
08:13:46	26.175	26.219	20.554	0.031	20.166	0.113
08:14:01	26.082	26.185	20.453	0.031	20.345	0.006
08:14:16	26.076	26.182	20.479	0.016	20.363	0.000
08:14:31	26.071	26.167	20.492	0.012	20.365	0.000
08:14:46	26.048	26.125	20.506	0.011	20.367	0.000
08:15:01	26.081	26.125	20.517	0.010	20.369	0.000

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 8:16
Stop Time 8:23

CALIBRATION BIAS 00

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv
System Response to Calibration Gasses						
C_{ol} Zero gas	-0.026	-0.080	0.072	0.038	0.039	0.013
C_{ml} Upscale gas	25.941	26.179	10.118	10.128	10.013	10.048
Calibration Error Reponses						
C_{oce} Zero gas	-0.002	-0.153	0.067	0.073	0.030	0.033
C_{mce} Upscale gas	26.067	26.139	10.093	10.177	10.064	10.109
Actual Upscale Gas Value						
C_{ma} Upscale gas	26.2	26.2	10.15	10.09	10.15	10.09
Data Acquisition Span Value						
	100	100	25	25	25	25
System Bias as Percent of Span Value (5%)						
Zero gas	0.0%	0.1%	0.0%	-0.1%	0.0%	-0.1%
Upscale gas	-0.1%	0.0%	0.1%	-0.2%	-0.2%	-0.2%
Calibration Bias Status						
Zero gas	OK	OK	OK	OK	OK	OK
Upscale gas	OK	OK	OK	OK	OK	OK
Previous Calibration Bias Responses						
C_{oi} Zero gas	NA	NA	NA	NA	NA	NA
C_{mi} Upscale gas	NA	NA	NA	NA	NA	NA
System Drift as Percent of Span Value (3%)						
Zero gas	NA	NA	NA	NA	NA	NA
Upscale gas	NA	NA	NA	NA	NA	NA
Calibration Drift Status						
Zero gas	NA	NA	NA	NA	NA	NA
Upscale gas	NA	NA	NA	NA	NA	NA

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08:16:49	-0.168	-0.067	2.819	2.010	0.554	0.875
08:17:04	-0.150	-0.091	0.159	0.229	0.068	0.123
08:17:19	-0.184	-0.006	0.096	0.125	0.053	0.065
08:17:34	-0.117	-0.107	0.083	0.082	0.047	0.037
08:17:49	-0.160	-0.023	0.077	0.058	0.043	0.023
08:18:04	-0.094	-0.111	0.073	0.045	0.041	0.016
08:18:19	-0.148	-0.033	0.072	0.038	0.038	0.012
08:18:34	0.164	-0.098	0.070	0.032	0.038	0.011
08:18:49	-0.006	-0.181	1.700	0.821	4.329	2.657
08:19:04	-0.142	-0.192	9.166	8.479	9.546	9.092
08:19:19	-0.178	-0.225	10.050	9.974	9.973	9.923
08:19:34	-0.200	-0.205	10.090	10.058	9.998	9.997
08:19:49	-0.215	-0.204	10.104	10.087	10.005	10.021
08:20:04	-0.228	-0.195	10.112	10.106	10.010	10.030
08:20:19	-0.243	-0.197	10.114	10.115	10.010	10.037
08:20:34	-0.243	-0.192	10.117	10.121	10.011	10.045
08:20:49	-0.247	-0.210	10.117	10.129	10.013	10.049
08:21:04	4.764	22.033	10.119	10.134	10.015	10.052
08:21:19	25.623	25.942	10.695	9.925	13.974	7.587
08:21:34	25.854	26.087	18.224	3.112	19.765	0.973
08:21:49	25.913	26.144	20.364	0.329	20.300	0.134
08:22:04	25.928	26.183	20.481	0.148	20.338	0.065
08:22:19	25.937	26.162	20.508	0.104	20.350	0.041
08:22:34	25.957	26.191	20.522	0.077	20.355	0.023
08:22:49	25.958	20.049	20.527	0.060	20.360	0.020
08:23:04	10.600	6.276	20.531	0.047	19.059	0.342

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Marathon Ashland Petroleum February 18, 2005
Clean Air Project No. 9684 Start Time 8:47
Catlettsburg Refinery Stop time 9:47
Outlet, Inlet

REFERENCE METHOD RUN 1

		Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv	C6H14 Outlet ppmwv	C6H14 Inlet ppmwv
Calibration Checks									
C_{oi}	Initial zero gas	-0.026	-0.080	0.072	0.038	0.039	0.013		
C_{mi}	Initial upscale gas	25.941	26.179	10.118	10.128	10.013	10.048		
C_{of}	Final zero gas	0.422	0.185	0.046	0.058	0.012	0.042		
C_{mf}	Final upscale gas	26.323	26.783	10.020	10.119	9.986	10.081		
C_{ma}	Actual concentration of upscale gas	26.2	26.2	10.15	10.09	10.15	10.09		
Gaseous Emissions Results									
C	Average concentration, uncorrected	5.362	3.925	0.716	16.775	0.672	17.028	2.743	2.008
C_{dc}	**concentration, drift corrected**	**5.217**	**3.839**	**0.666**	**16.752**	**0.658**	**17.090**	**2.669**	**1.964**

Clock Time (at end of 1 minute period)

031005 163108

08:48	5.555	4.063	0.730	16.804	0.681	16.975	2.842	2.079
08:49	5.610	4.024	0.727	16.790	0.694	16.961	2.870	2.059
08:50	5.581	3.972	0.734	16.782	0.696	16.966	2.855	2.032
08:51	5.568	3.839	0.736	16.789	0.692	16.984	2.849	1.964
08:52	5.574	3.878	0.736	16.804	0.686	17.011	2.852	1.984
08:53	5.583	4.007	0.732	16.820	0.682	17.024	2.857	2.050
08:54	5.535	3.987	0.730	16.832	0.689	17.025	2.832	2.040
08:55	5.444	3.952	0.730	16.846	0.690	17.026	2.785	2.022
08:56	5.425	3.795	0.727	16.847	0.683	17.033	2.776	1.942
08:57	5.392	3.917	0.723	16.851	0.677	17.038	2.759	2.004
08:58	5.440	4.090	0.721	16.852	0.674	17.040	2.783	2.093
08:59	5.480	3.995	0.721	16.851	0.687	17.031	2.804	2.044
09:00	5.461	3.845	0.725	16.852	0.685	17.035	2.794	1.967
09:01	5.434	3.657	0.724	16.859	0.684	17.041	2.780	1.871
09:02	5.407	3.745	0.724	16.862	0.678	17.050	2.767	1.916
09:03	5.428	3.863	0.726	16.862	0.684	17.051	2.777	1.976
09:04	5.411	3.879	0.730	16.862	0.698	17.044	2.768	1.985
09:05	5.391	3.828	0.736	16.863	0.696	17.055	2.758	1.958
09:06	5.373	3.675	0.731	16.878	0.687	17.067	2.749	1.880
09:07	5.339	3.803	0.724	16.881	0.675	17.072	2.732	1.946
09:08	5.361	3.945	0.722	16.883	0.667	17.061	2.743	2.018
09:09	5.372	3.945	0.716	16.871	0.676	17.034	2.748	2.018
09:10	5.344	3.910	0.715	16.857	0.674	17.022	2.734	2.000
09:11	5.328	3.759	0.712	16.841	0.669	17.018	2.726	1.923
09:12	5.289	3.897	0.708	16.836	0.661	17.022	2.706	1.994
09:13	5.342	4.004	0.707	16.830	0.665	17.029	2.733	2.049
09:14	5.335	3.951	0.710	16.828	0.678	17.027	2.730	2.022
09:15	5.255	3.909	0.716	16.833	0.682	17.027	2.688	2.000
09:16	5.306	3.780	0.718	16.826	0.666	17.042	2.715	1.934
09:17	5.258	3.973	0.709	16.820	0.662	17.046	2.690	2.033
09:18	5.298	4.066	0.708	16.802	0.661	17.039	2.711	2.080
09:19	5.298	4.018	0.709	16.782	0.676	17.020	2.711	2.056
09:20	5.237	3.930	0.714	16.756	0.677	17.017	2.679	2.011
09:21	5.189	3.791	0.715	16.747	0.670	17.023	2.655	1.939
09:22	5.145	3.921	0.713	16.740	0.660	17.036	2.633	2.006
09:23	5.193	4.017	0.709	16.743	0.665	17.030	2.657	2.055
09:24	5.267	3.983	0.714	16.744	0.681	17.019	2.695	2.038
09:25	5.347	3.901	0.724	16.736	0.676	17.033	2.736	1.996
09:26	5.377	3.748	0.721	16.733	0.670	17.040	2.751	1.918
09:27	5.383	3.852	0.717	16.737	0.662	17.055	2.754	1.971
09:28	5.446	3.967	0.713	16.734	0.667	17.044	2.786	2.029
09:29	5.479	3.966	0.719	16.716	0.673	17.041	2.803	2.029
09:30	5.475	3.907	0.719	16.718	0.672	17.042	2.801	1.999
09:31	5.483	3.795	0.715	16.713	0.654	17.060	2.805	1.942
09:32	5.464	3.996	0.699	16.729	0.642	17.066	2.796	2.044
09:33	5.546	4.096	0.693	16.719	0.643	17.052	2.837	2.095
09:34	5.530	4.056	0.694	16.709	0.654	17.029	2.829	2.075
09:35	5.456	3.988	0.696	16.690	0.669	17.005	2.792	2.040

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 8:47
Stop time 9:47

REFERENCE METHOD RUN 1

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv	C6H14 Outlet ppmwv	C6H14 Inlet ppmwv
09:36	5.396	3.818	0.705	16.678	0.674	16.995	2.761	1.954
09:37	5.317	3.994	0.713	16.660	0.672	17.004	2.720	2.043
09:38	5.312	4.042	0.717	16.658	0.671	17.016	2.718	2.068
09:39	5.257	3.991	0.720	16.665	0.682	17.013	2.690	2.042
09:40	5.173	3.931	0.722	16.672	0.677	17.021	2.647	2.011
09:41	5.156	3.762	0.715	16.677	0.661	17.033	2.638	1.925
09:42	5.113	3.977	0.702	16.680	0.640	17.042	2.616	2.035
09:43	5.171	4.064	0.690	16.681	0.637	17.033	2.646	2.079
09:44	5.178	4.055	0.686	16.672	0.651	17.008	2.649	2.075
09:45	5.131	4.025	0.691	16.667	0.650	17.014	2.625	2.059
09:46	5.138	3.912	0.687	16.664	0.657	17.010	2.629	2.002
09:47	5.117	4.050	0.693	16.665	0.661	17.012	2.618	2.072

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 9:49
Stop Time 9:56

CALIBRATION BIAS 01

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv
System Response to Calibration Gasses						
C_{of} Zero gas	0.422	0.185	0.046	0.058	0.012	0.042
C_{mf} Upscale gas	26.323	26.783	10.020	10.119	9.986	10.081
Calibration Error Reponses						
C_{oce} Zero gas	-0.002	-0.153	0.067	0.073	0.030	0.033
C_{mce} Upscale gas	26.067	26.139	10.093	10.177	10.064	10.109
Actual Upscale Gas Value						
C_{ma} Upscale gas	26.2	26.2	10.15	10.09	10.15	10.09
Data Acquisition Span Value						
	100	100	25	25	25	25
System Bias as Percent of Span Value (5%)						
Zero gas	0.4%	0.3%	-0.1%	-0.1%	-0.1%	0.0%
Upscale gas	0.3%	0.6%	-0.3%	-0.2%	-0.3%	-0.1%
Calibration Bias Status						
Zero gas	OK	OK	OK	OK	OK	OK
Upscale gas	OK	OK	OK	OK	OK	OK
Previous Calibration Bias Responses						
C_{oi} Zero gas	-0.026	-0.080	0.072	0.038	0.039	0.013
C_{mi} Upscale gas	25.941	26.179	10.118	10.128	10.013	10.048
System Drift as Percent of Span Value (3%)						
Zero gas	0.4%	0.3%	-0.1%	0.1%	-0.1%	0.1%
Upscale gas	0.4%	0.6%	-0.4%	0.0%	-0.1%	0.1%
Calibration Drift Status						
Zero gas	OK	OK	OK	OK	OK	OK
Upscale gas	OK	OK	OK	OK	OK	OK

031005 163108

09:50:43	0.309	0.178	0.050	0.098	0.012	0.062
09:50:58	0.270	0.226	0.049	0.082	0.012	0.054
09:51:13	0.371	0.161	0.048	0.073	0.012	0.047
09:51:28	0.397	0.197	0.047	0.065	0.012	0.043
09:51:43	0.402	0.189	0.045	0.061	0.012	0.043
09:51:58	0.428	0.153	0.047	0.058	0.012	0.043
09:52:13	0.436	0.213	0.047	0.055	0.011	0.039
09:52:28	0.440	0.158	0.044	0.054	0.044	0.037
09:52:43	0.072	0.016	1.466	0.728	6.028	4.184
09:52:58	-0.021	0.060	8.719	8.007	9.791	9.627
09:53:13	-0.065	0.046	9.916	9.917	9.957	9.993
09:53:28	-0.070	0.024	9.974	10.033	9.971	10.037
09:53:43	-0.075	0.033	9.990	10.069	9.976	10.053
09:53:58	-0.086	0.046	9.997	10.086	9.981	10.063
09:54:13	-0.114	0.052	10.006	10.098	9.981	10.069
09:54:28	-0.111	0.032	10.010	10.107	9.984	10.078
09:54:43	-0.091	0.015	10.016	10.113	9.984	10.080
09:54:58	-0.065	0.090	10.020	10.119	9.987	10.082
09:55:13	-0.063	8.575	10.024	10.124	9.988	10.081
09:55:28	16.409	26.462	10.027	10.127	10.673	9.901
09:55:43	25.984	26.649	13.349	7.814	17.946	3.499
09:55:58	26.131	26.714	19.681	1.033	20.163	0.309
09:56:13	26.160	26.735	20.269	0.225	20.285	0.111
09:56:28	26.245	26.747	20.312	0.140	20.303	0.078
09:56:43	26.321	26.789	20.330	0.104	20.311	0.064
09:56:58	26.403	26.815	20.340	0.084	20.315	0.056

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 10:38
Stop time 11:38

REFERENCE METHOD RUN 2

		Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv	C6H14 Outlet ppmwv	C6H14 Inlet ppmwv
Calibration Checks									
C_{zi}	Initial zero gas	0.422	0.185	0.046	0.058	0.012	0.042		
C_{mi}	Initial upscale gas	26.323	26.783	10.020	10.119	9.986	10.081		
C_{zf}	Final zero gas	0.308	0.123	0.036	0.075	0.010	0.054		
C_{mf}	Final upscale gas	26.177	26.480	10.000	10.122	9.981	10.081		
C_{ma}	Actual concentration of upscale gas	26.2	26.2	10.15	10.09	10.15	10.09		
Gaseous Emissions Results									
C	Average concentration, uncorrected	4.624	3.751	0.671	16.732	0.636	17.059	2.366	1.919
C_{dc}	**concentration, drift corrected**	**4.311**	**3.560**	**0.641**	**16.726**	**0.637**	**17.108**	**2.206**	**1.821**

Clock Time (at end of 1 minute period)

031005 163108

10:39	4.575	3.816	0.701	16.751	0.670	17.065	2.341	1.953
10:40	4.562	3.805	0.699	16.748	0.657	17.079	2.334	1.947
10:41	4.594	3.992	0.696	16.747	0.649	17.086	2.350	2.042
10:42	4.631	3.887	0.694	16.741	0.654	17.086	2.370	1.989
10:43	4.567	3.784	0.688	16.758	0.654	17.080	2.337	1.936
10:44	4.507	3.635	0.688	16.750	0.656	17.074	2.306	1.860
10:45	4.451	3.631	0.688	16.753	0.647	17.079	2.277	1.858
10:46	4.440	3.775	0.689	16.741	0.644	17.068	2.272	1.931
10:47	4.506	3.741	0.688	16.731	0.649	17.047	2.305	1.914
10:48	4.566	3.674	0.685	16.715	0.644	17.036	2.336	1.880
10:49	4.595	3.534	0.679	16.704	0.640	17.031	2.351	1.808
10:50	4.617	3.565	0.676	16.689	0.631	17.036	2.362	1.824
10:51	4.657	3.691	0.672	16.681	0.634	17.036	2.383	1.889
10:52	4.687	3.649	0.675	16.677	0.650	17.034	2.398	1.867
10:53	4.680	3.590	0.684	16.678	0.652	17.040	2.394	1.837
10:54	4.667	3.546	0.684	16.687	0.632	17.070	2.388	1.814
10:55	4.679	3.549	0.670	16.712	0.629	17.079	2.394	1.816
10:56	4.691	3.724	0.668	16.718	0.629	17.078	2.400	1.905
10:57	4.700	3.697	0.669	16.715	0.644	17.061	2.405	1.892
10:58	4.670	3.641	0.677	16.711	0.642	17.063	2.389	1.863
10:59	4.627	3.591	0.672	16.713	0.619	17.084	2.367	1.837
11:00	4.632	3.659	0.654	16.725	0.594	17.110	2.370	1.872
11:01	4.627	3.789	0.635	16.741	0.594	17.085	2.367	1.938
11:02	4.578	3.765	0.633	16.724	0.604	17.048	2.342	1.926
11:03	4.566	3.694	0.632	16.703	0.622	17.002	2.336	1.890
11:04	4.550	3.597	0.645	16.673	0.623	16.992	2.328	1.841
11:05	4.525	3.611	0.654	16.662	0.631	16.983	2.315	1.848
11:06	4.541	3.750	0.664	16.652	0.640	16.983	2.323	1.919
11:07	4.560	3.635	0.675	16.652	0.664	16.973	2.333	1.860
11:08	4.462	3.531	0.693	16.642	0.645	17.001	2.283	1.806
11:09	4.387	3.472	0.677	16.670	0.628	17.022	2.245	1.776
11:10	4.408	3.548	0.660	16.683	0.617	17.026	2.255	1.815
11:11	4.484	3.700	0.652	16.686	0.617	17.021	2.294	1.893
11:12	4.489	3.735	0.655	16.676	0.627	17.020	2.297	1.911
11:13	4.491	3.694	0.657	16.676	0.634	17.023	2.298	1.890
11:14	4.508	3.610	0.661	16.679	0.635	17.040	2.306	1.847
11:15	4.507	3.694	0.663	16.696	0.639	17.048	2.306	1.890
11:16	4.544	3.859	0.673	16.702	0.642	17.066	2.325	1.974
11:17	4.587	3.821	0.679	16.722	0.660	17.066	2.347	1.955
11:18	4.553	3.800	0.690	16.734	0.657	17.089	2.329	1.944
11:19	4.561	3.687	0.687	16.752	0.638	17.126	2.334	1.886
11:20	4.547	3.774	0.670	16.786	0.627	17.137	2.326	1.931
11:21	4.572	3.892	0.662	16.796	0.628	17.125	2.339	1.991
11:22	4.619	3.899	0.666	16.796	0.639	17.102	2.363	1.995
11:23	4.674	3.832	0.670	16.789	0.639	17.094	2.392	1.961
11:24	4.730	3.714	0.668	16.788	0.630	17.088	2.420	1.900
11:25	4.731	3.831	0.664	16.787	0.633	17.085	2.420	1.960
11:26	4.821	3.927	0.666	16.780	0.638	17.079	2.467	2.009

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 10:38
Stop time 11:38

REFERENCE METHOD RUN 2

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv	C6H14 Outlet ppmwv	C6H14 Inlet ppmwv
11:27	4.834	3.894	0.674	16.773	0.657	17.058	2.473	1.992
11:28	4.823	3.776	0.686	16.768	0.661	17.061	2.468	1.932
11:29	4.764	3.682	0.688	16.775	0.644	17.082	2.438	1.884
11:30	4.733	3.830	0.675	16.798	0.627	17.094	2.421	1.960
11:31	4.828	4.013	0.663	16.808	0.622	17.082	2.470	2.053
11:32	4.859	4.035	0.661	16.801	0.629	17.059	2.486	2.064
11:33	4.849	3.930	0.658	16.794	0.628	17.051	2.481	2.010
11:34	4.804	3.831	0.657	16.783	0.621	17.055	2.458	1.960
11:35	4.767	3.939	0.652	16.784	0.616	17.067	2.439	2.015
11:36	4.788	4.103	0.650	16.782	0.615	17.075	2.449	2.099
11:37	4.755	4.072	0.653	16.795	0.641	17.061	2.433	2.083
11:38	4.736	3.951	0.668	16.797	0.649	17.072	2.423	2.021

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 11:40
Stop Time 11:47

CALIBRATION BIAS 02

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv
System Response to Calibration Gasses						
C_{ol} Zero gas	0.308	0.123	0.036	0.075	0.010	0.054
C_{ml} Upscale gas	26.177	26.480	10.000	10.122	9.981	10.081
Calibration Error Reponses						
C_{oce} Zero gas	-0.002	-0.153	0.067	0.073	0.030	0.033
C_{mce} Upscale gas	26.067	26.139	10.093	10.177	10.064	10.109
Actual Upscale Gas Value						
C_{ma} Upscale gas	26.2	26.2	10.15	10.09	10.15	10.09
Data Acquisition Span Value						
	100	100	25	25	25	25
System Bias as Percent of Span Value (5%)						
Zero gas	0.3%	0.3%	-0.1%	0.0%	-0.1%	0.1%
Upscale gas	0.1%	0.3%	-0.4%	-0.2%	-0.3%	-0.1%
Calibration Bias Status						
Zero gas	OK	OK	OK	OK	OK	OK
Upscale gas	OK	OK	OK	OK	OK	OK
Previous Calibration Bias Responses						
C_{oi} Zero gas	0.422	0.185	0.046	0.058	0.012	0.042
C_{mi} Upscale gas	26.323	26.783	10.020	10.119	9.986	10.081
System Drift as Percent of Span Value (3%)						
Zero gas	-0.1%	-0.1%	0.0%	0.1%	0.0%	0.0%
Upscale gas	-0.1%	-0.3%	-0.1%	0.0%	0.0%	0.0%
Calibration Drift Status						
Zero gas	OK	OK	OK	OK	OK	OK
Upscale gas	OK	OK	OK	OK	OK	OK

031005 163108

11:40:56	0.147	0.143	0.044	0.137	0.012	0.086
11:41:11	0.187	0.150	0.041	0.114	0.012	0.077
11:41:26	0.178	0.166	0.039	0.100	0.011	0.070
11:41:41	0.261	0.101	0.039	0.089	0.011	0.065
11:41:56	0.254	0.158	0.036	0.081	0.010	0.059
11:42:11	0.305	0.114	0.037	0.076	0.010	0.054
11:42:26	0.366	0.096	0.037	0.068	0.010	0.049
11:42:41	0.366	0.189	0.035	0.061	0.006	0.043
11:42:56	0.273	-0.010	0.034	0.055	1.194	0.355
11:43:11	-0.057	-0.005	2.911	1.889	8.640	7.472
11:43:26	-0.112	-0.013	9.342	8.993	9.911	9.895
11:43:41	-0.132	-0.034	9.934	9.977	9.961	10.021
11:43:56	-0.153	-0.041	9.969	10.055	9.970	10.048
11:44:11	-0.158	-0.031	9.984	10.079	9.976	10.060
11:44:26	-0.176	-0.021	9.992	10.096	9.978	10.067
11:44:41	-0.187	-0.026	9.996	10.106	9.980	10.074
11:44:56	-0.178	-0.054	9.999	10.116	9.980	10.078
11:45:11	-0.173	-0.052	10.000	10.120	9.981	10.079
11:45:26	-0.178	-0.028	10.001	10.123	9.981	10.080
11:45:41	-0.192	1.932	10.000	10.125	9.982	10.084
11:45:56	8.439	26.103	10.000	10.125	10.200	10.064
11:46:11	25.885	26.416	11.273	9.476	17.224	4.464
11:46:26	26.074	26.460	18.819	2.129	20.148	0.332
11:46:41	26.183	26.468	20.191	0.285	20.281	0.122
11:46:56	26.188	26.546	20.269	0.158	20.301	0.085
11:47:11	26.173	26.538	20.289	0.120	20.307	0.067
11:47:26	26.170	26.356	20.296	0.094	20.300	0.029

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 12:21
Stop time 13:21

REFERENCE METHOD RUN 3

		Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv	C6H14 Outlet ppmwv	C6H14 Inlet ppmwv
Calibration Checks									
C_{oi}	Initial zero gas	0.308	0.123	0.036	0.075	0.010	0.054		
C_{mi}	Initial upscale gas	26.177	26.480	10.000	10.122	9.981	10.081		
C_{of}	Final zero gas	0.665	0.054	0.036	0.074	0.005	0.051		
C_{mf}	Final upscale gas	26.177	26.336	9.982	10.084	9.967	10.058		
C_{ma}	Actual concentration of upscale gas	26.2	26.2	10.15	10.09	10.15	10.09		
Gaseous Emissions Results									
C	Average concentration, uncorrected	5.010	4.174	0.652	16.861	0.619	17.112	2.563	2.136
C_{dc}	**concentration, drift corrected**	**4.613**	**4.067**	**0.628**	**16.889**	**0.623**	**17.184**	**2.360**	**2.081**

Clock Time (at end of 1 minute period)

031005 163108

12:22	4.373	4.303	0.659	16.812	0.637	17.064	2.237	2.201
12:23	4.429	4.111	0.661	16.818	0.634	17.077	2.266	2.103
12:24	4.438	3.967	0.658	16.829	0.621	17.098	2.271	2.030
12:25	4.499	4.267	0.652	16.841	0.611	17.104	2.302	2.183
12:26	4.607	4.296	0.648	16.847	0.616	17.094	2.357	2.198
12:27	4.650	4.297	0.649	16.847	0.620	17.092	2.379	2.198
12:28	4.713	4.145	0.648	16.848	0.605	17.108	2.411	2.121
12:29	4.687	4.056	0.632	16.860	0.592	17.111	2.398	2.075
12:30	4.750	4.334	0.622	16.864	0.596	17.085	2.430	2.217
12:31	4.846	4.332	0.628	16.843	0.612	17.048	2.479	2.216
12:32	4.846	4.280	0.644	16.813	0.632	17.026	2.479	2.190
12:33	4.829	4.127	0.658	16.801	0.636	17.028	2.471	2.111
12:34	4.780	3.960	0.664	16.797	0.633	17.046	2.445	2.026
12:35	4.769	4.218	0.664	16.807	0.620	17.076	2.440	2.158
12:36	4.841	4.163	0.658	16.825	0.623	17.083	2.477	2.130
12:37	4.786	4.132	0.659	16.841	0.630	17.093	2.449	2.114
12:38	4.777	3.986	0.659	16.859	0.634	17.092	2.444	2.039
12:39	4.746	3.907	0.661	16.863	0.618	17.105	2.428	1.999
12:40	4.786	4.200	0.653	16.870	0.606	17.108	2.449	2.149
12:41	4.917	4.226	0.646	16.870	0.609	17.088	2.516	2.162
12:42	5.033	4.204	0.646	16.858	0.619	17.074	2.575	2.151
12:43	5.110	4.065	0.650	16.850	0.622	17.074	2.615	2.080
12:44	5.092	3.926	0.654	16.840	0.627	17.082	2.605	2.008
12:45	5.118	4.139	0.660	16.837	0.623	17.097	2.619	2.118
12:46	5.186	4.257	0.661	16.835	0.625	17.105	2.653	2.178
12:47	5.260	4.228	0.661	16.845	0.630	17.122	2.691	2.163
12:48	5.259	4.058	0.661	16.868	0.629	17.127	2.691	2.076
12:49	5.149	3.954	0.660	16.873	0.621	17.142	2.635	2.023
12:50	5.167	4.233	0.655	16.887	0.614	17.146	2.643	2.166
12:51	5.226	4.313	0.654	16.875	0.616	17.136	2.674	2.206
12:52	5.226	4.312	0.653	16.873	0.625	17.122	2.674	2.206
12:53	5.199	4.123	0.652	16.863	0.621	17.115	2.660	2.110
12:54	5.101	3.925	0.650	16.859	0.617	17.116	2.610	2.008
12:55	5.066	4.175	0.650	16.854	0.607	17.119	2.592	2.136
12:56	5.068	4.210	0.645	16.853	0.611	17.111	2.593	2.154
12:57	5.072	4.182	0.647	16.857	0.627	17.099	2.595	2.140
12:58	5.075	4.017	0.655	16.857	0.632	17.093	2.596	2.055
12:59	4.994	3.881	0.661	16.854	0.625	17.108	2.555	1.986
13:00	4.999	4.185	0.658	16.864	0.621	17.115	2.557	2.141
13:01	5.076	4.213	0.658	16.871	0.623	17.123	2.597	2.156
13:02	5.081	4.225	0.659	16.882	0.629	17.126	2.600	2.162
13:03	5.082	4.055	0.658	16.892	0.622	17.133	2.600	2.075
13:04	5.015	3.939	0.653	16.893	0.616	17.145	2.566	2.015
13:05	5.035	4.243	0.647	16.897	0.607	17.150	2.576	2.171
13:06	5.100	4.269	0.645	16.893	0.614	17.151	2.609	2.184
13:07	5.094	4.291	0.647	16.897	0.620	17.149	2.606	2.195
13:08	5.104	4.177	0.651	16.895	0.622	17.155	2.611	2.137
13:09	5.072	4.025	0.651	16.904	0.611	17.181	2.595	2.059

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 12:21
Stop time 13:21

REFERENCE METHOD RUN 3

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv	C6H14 Outlet ppmwv	C6H14 Inlet ppmwv
13:10	5.071	4.352	0.646	16.914	0.608	17.182	2.595	2.227
13:11	5.140	4.373	0.645	16.917	0.612	17.178	2.630	2.237
13:12	5.157	4.348	0.647	16.916	0.632	17.159	2.638	2.225
13:13	5.167	4.187	0.661	16.910	0.616	17.172	2.644	2.142
13:14	5.212	4.033	0.649	16.906	0.604	17.171	2.667	2.064
13:15	5.294	4.388	0.640	16.900	0.595	17.154	2.709	2.245
13:16	5.421	4.390	0.636	16.874	0.605	17.127	2.774	2.246
13:17	5.438	4.385	0.640	16.861	0.615	17.106	2.782	2.244
13:18	5.449	4.228	0.646	16.846	0.624	17.093	2.788	2.163
13:19	5.403	4.044	0.654	16.840	0.626	17.100	2.765	2.069
13:20	5.344	4.287	0.662	16.851	0.632	17.108	2.734	2.193
13:21	5.365	4.303	0.668	16.854	0.632	17.132	2.745	2.202

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

February 18, 2005
Start Time 13:23
Stop Time 13:28

CALIBRATION BIAS 03

	Channel 2 THC Outlet ppmwv	Channel 3 THC Inlet ppmwv	Channel 4 O2 Outlet %dv	Channel 5 CO2 Outlet %dv	Channel 6 O2 Inlet %dv	Channel 7 CO2 Inlet %dv
System Response to Calibration Gasses						
C_{of} Zero gas	0.665	0.054	0.036	0.074	0.005	0.051
C_{mf} Upscale gas	26.177	26.336	9.982	10.084	9.967	10.058
Calibration Error Reponses						
C_{oce} Zero gas	-0.002	-0.153	0.067	0.073	0.030	0.033
C_{mce} Upscale gas	26.067	26.139	10.093	10.177	10.064	10.109
Actual Upscale Gas Value						
C_{ma} Upscale gas	26.2	26.2	10.15	10.09	10.15	10.09
Data Acquisition Span Value						
	100	100	25	25	25	25
System Bias as Percent of Span Value (5%)						
Zero gas	0.7%	0.2%	-0.1%	0.0%	-0.1%	0.1%
Upscale gas	0.1%	0.2%	-0.4%	-0.4%	-0.4%	-0.2%
Calibration Bias Status						
Zero gas	OK	OK	OK	OK	OK	OK
Upscale gas	OK	OK	OK	OK	OK	OK
Previous Calibration Bias Responses						
C_{oi} Zero gas	0.308	0.123	0.036	0.075	0.010	0.054
C_{mi} Upscale gas	26.177	26.480	10.000	10.122	9.981	10.081
System Drift as Percent of Span Value (3%)						
Zero gas	0.4%	-0.1%	0.0%	0.0%	0.0%	0.0%
Upscale gas	0.0%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%
Calibration Drift Status						
Zero gas	OK	OK	OK	OK	OK	OK
Upscale gas	OK	OK	OK	OK	OK	OK

031005 163108

13:23:36	0.513	0.070	0.039	0.100	0.006	0.065
13:23:51	0.562	0.042	0.037	0.089	0.001	0.067
13:24:06	0.619	0.047	0.036	0.084	0.006	0.062
13:24:21	0.669	0.034	0.037	0.079	0.006	0.056
13:24:36	0.669	0.062	0.036	0.074	0.005	0.051
13:24:51	0.658	0.067	0.035	0.069	0.005	0.047
13:25:06	0.703	0.075	0.034	0.064	0.006	0.037
13:25:21	0.256	-0.031	0.037	0.061	2.512	1.163
13:25:36	-0.076	-0.065	4.408	3.220	9.277	8.612
13:25:51	-0.166	-0.067	9.615	9.434	9.924	9.936
13:26:06	-0.171	-0.078	9.939	9.985	9.954	10.015
13:26:21	-0.218	-0.039	9.962	10.049	9.961	10.038
13:26:36	-0.226	-0.064	9.978	10.072	9.965	10.050
13:26:51	-0.225	-0.085	9.982	10.084	9.967	10.059
13:27:06	-0.221	12.449	9.986	10.096	9.967	10.065
13:27:21	18.867	26.213	9.987	10.102	12.299	8.906
13:27:36	26.007	26.318	14.385	6.840	19.386	1.473
13:27:51	26.137	26.351	19.845	0.741	20.227	0.175
13:28:06	26.191	26.398	20.229	0.209	20.272	0.100
13:28:21	26.201	26.258	20.254	0.118	20.276	0.068

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet - Black Burn

USEPA Method 2
HCl Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 15	Feb 15	Feb 15	
Start Time (approx.)		13:27	15:50	19:16	
Stop Time (approx.)		13:37	16:00	19:24	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.4177	0.3423	0.3554	**0.3718**
CO_2	Carbon dioxide (dry volume %)	11.1939	12.3634	12.6195	**12.0590**
T_s	Sample temperature (°F)	80.8750	82.5625	79.3125	**80.9167**
B_w	Actual water vapor in gas (% by volume)	2.1605	1.1441	2.2743	**1.8596**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	289	281	341	**304**
Q_s	Volumetric flow rate, standard (scfm)	279	271	331	**293**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	273	268	323	**288**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dscfm)	402	396	478	**425**
Q_a	Volumetric flow rate, actual (acf/hr)	17,332	16,875	20,483	**18,230**
Q_s	Volumetric flow rate, standard (scf/hr)	16,737	16,245	19,837	**17,607**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	16,376	16,059	19,386	**17,274**
Q_a	Volumetric flow rate, actual (m^3/hr)	491	478	580	**516**
Q_s	Volumetric flow rate, standard (m^3/hr)	474	460	562	**499**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	464	455	549	**489**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dry m^3/hr)	683	673	811	**723**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	442	429	523	**465**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	432	424	512	**456**
Q_{std3}	Volumetric flow rate, dry normal @3%O_2 (Nm^3/hr)	637	627	756	**673**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0500	4.0670	4.0452	**4.0541**
Laboratory Data					
m_n	Total HCl collected (mg)	0.5208	0.5159	0.7081	**0.5816**
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	2.8357E-07	2.7970E-07	3.8598E-07	**3.1642E-07**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	2.4782E-07	2.4354E-07	3.3629E-07	**2.7588E-07**
C_a	HCl Concentration (lb/acf)	2.6792E-07	2.6618E-07	3.6531E-07	**2.9980E-07**
C_{sd}	HCl Concentration (ppmdv)	2.9981	2.9571	4.0808	**3.3453**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	2.6201	2.5748	3.5555	**2.9168**
C_w	HCl Concentration (ppmwv)	2.9333	2.9233	3.9880	**3.2815**
C_{sd}	HCl Concentration (mg/dscm)	4.5410	4.4790	6.1809	**5.0669**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	3.9685	3.8999	5.3852	**4.4179**
C_a	HCl Concentration (mg/m^3 (actual,wet))	4.2904	4.2625	5.8499	**4.8009**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	4.8733	4.8067	6.6331	**5.4377**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	4.2589	4.1853	5.7793	**4.7411**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.0046	0.0045	0.0075	**0.0055**
$E_{kg/hr}$	HCl Rate (kg/hr)	0.0021	0.0020	0.0034	**0.0025**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet - Black Burn

USEPA Method 2
Cl_2 Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 15	Feb 15	Feb 15	
Start Time (approx.)		13:27	15:50	19:16	
Stop Time (approx.)		13:37	16:00	19:24	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.4177	0.3423	0.3554	**0.3718**
CO_2	Carbon dioxide (dry volume %)	11.1939	12.3634	12.6195	**12.0590**
T_s	Sample temperature (°F)	80.8750	82.5625	79.3125	**80.9167**
B_w	Actual water vapor in gas (% by volume)	2.1605	1.1441	2.2743	**1.8596**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	289	281	341	**304**
Q_s	Volumetric flow rate, standard (scfm)	279	271	331	**293**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	273	268	323	**288**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dscfm)	402	396	478	**425**
Q_a	Volumetric flow rate, actual (acf/hr)	17,332	16,875	20,483	**18,230**
Q_s	Volumetric flow rate, standard (scf/hr)	16,737	16,245	19,837	**17,607**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	16,376	16,059	19,386	**17,274**
Q_a	Volumetric flow rate, actual (m^3/hr)	491	478	580	**516**
Q_s	Volumetric flow rate, standard (m^3/hr)	474	460	562	**499**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	464	455	549	**489**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dry m^3/hr)	683	673	811	**723**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	442	429	523	**465**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	432	424	512	**456**
Q_{std3}	Volumetric flow rate, dry normal @3%O_2 (Nm^3/hr)	637	627	756	**673**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0500	4.0670	4.0452	**4.0541**
Laboratory Data					
m_n	Total Cl_2 collected (mg)	<0.0021	0.0446	0.0269	**<0.0245**
Chlorine (Cl_2) Results					
C_{sd}	HCl Concentration (lb/dscf)	<1.1542E-09	2.4191E-08	1.4652E-08	**<1.3333E-08**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	<1.0087E-09	2.1064E-08	1.2766E-08	**<1.1613E-08**
C_a	HCl Concentration (lb/acf)	<1.0905E-09	2.3022E-08	1.3868E-08	**<1.2660E-08**
C_{sd}	HCl Concentration (ppmdv)	<0.0063	0.1315	0.0797	**<0.0725**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	<0.0055	0.1145	0.0694	**<0.0631**
C_w	HCl Concentration (ppmwv)	<0.0061	0.1300	0.0778	**<0.0713**
C_{sd}	HCl Concentration (mg/dscm)	<0.0185	0.3874	0.2346	**<0.2135**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	<0.0162	0.3373	0.2044	**<0.1860**
C_a	HCl Concentration (mg/m^3 (actual,wet))	<0.0175	0.3687	0.2221	**<0.2027**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	<0.0198	0.4157	0.2518	**<0.2291**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	<0.0173	0.3620	0.2194	**<0.1996**
$E_{lb/hr}$	HCl Rate (lb/hr)	<0.0000	0.0004	0.0003	**<0.0002**
$E_{kg/hr}$	HCl Rate (kg/hr)	<0.0000	0.0002	0.0001	**<0.0001**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet - Black Burn

USEPA Method 26
HCl Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 15	Feb 15	Feb 15	
Start Time (approx.)		12:58	16:07	18:56	
Stop Time (approx.)		13:15	16:18	19:06	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.5824	0.3818	0.3850	**0.4497**
CO_2	Carbon dioxide (dry volume %)	11.1828	12.3905	12.7869	**12.1201**
T_s	Sample temperature (°F)	369.4375	425.1250	438.9375	**411.1667**
B_w	Actual water vapor in gas (% by volume)	1.0433	0.5821	0.5852	**0.7369**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	430	496	546	**491**
Q_s	Volumetric flow rate, standard (scfm)	271	293	317	**294**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	268	291	316	**292**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dscfm)	392	430	466	**429**
Q_a	Volumetric flow rate, actual (acf/hr)	25,817	29,778	32,762	**29,452**
Q_s	Volumetric flow rate, standard (scf/hr)	16,263	17,579	19,043	**17,628**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	16,093	17,476	18,931	**17,500**
Q_a	Volumetric flow rate, actual (m^3/hr)	731	843	928	**834**
Q_s	Volumetric flow rate, standard (m^3/hr)	461	498	539	**499**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	456	495	536	**496**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dry m^3/hr)	666	731	791	**729**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	429	464	503	**465**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	425	461	500	**462**
Q_{std3}	Volumetric flow rate, dry normal @3%O_2 (Nm^3/hr)	621	681	737	**680**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0179	4.0196	3.9984	**4.0120**
Laboratory Data					
m_n	Total HCl collected (mg)	99.3105	101.7237	120.2027	**107.0790**
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	5.4500E-05	5.5801E-05	6.6289E-05	**5.8863E-05**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	4.8015E-05	4.8681E-05	5.7839E-05	**5.1512E-05**
C_a	HCl Concentration (lb/acf)	3.3974E-05	3.2749E-05	3.8304E-05	**3.5009E-05**
C_{sd}	HCl Concentration (ppmdv)	576.2110	589.9639	700.8430	**622.3393**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	507.6473	514.6828	611.5082	**544.6127**
C_w	HCl Concentration (ppmwv)	570.1991	586.5298	696.7418	**617.8236**
C_{sd}	HCl Concentration (mg/dscm)	872.7480	893.5787	1061.5197	**942.6155**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	768.8992	779.5554	926.2104	**824.8884**
C_a	HCl Concentration (mg/m^3 (actual,wet))	544.0426	524.4285	613.3840	**560.6184**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	936.6076	958.9625	1139.1919	**1011.5874**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	825.1602	836.5961	993.9819	**885.2460**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.8771	0.9752	1.2549	**1.0357**
$E_{kg/hr}$	HCl Rate (kg/hr)	0.3978	0.4423	0.5691	**0.4697**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet - Black Burn

USEPA Method 26
Cl_2 Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 15	Feb 15	Feb 15	
Start Time (approx.)		12:58	16:07	18:56	
Stop Time (approx.)		13:15	16:18	19:06	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.5824	0.3818	0.3850	**0.4497**
CO_2	Carbon dioxide (dry volume %)	11.1828	12.3905	12.7869	**12.1201**
T_s	Sample temperature (°F)	369.4375	425.1250	438.9375	**411.1667**
B_w	Actual water vapor in gas (% by volume)	1.0433	0.5821	0.5852	**0.7369**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	430	496	546	**491**
Q_s	Volumetric flow rate, standard (scfm)	271	293	317	**294**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	268	291	316	**292**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dscfm)	392	430	466	**429**
Q_a	Volumetric flow rate, actual (acf/hr)	25,817	29,778	32,762	**29,452**
Q_s	Volumetric flow rate, standard (scf/hr)	16,263	17,579	19,043	**17,628**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	16,093	17,476	18,931	**17,500**
Q_a	Volumetric flow rate, actual (m^3/hr)	731	843	928	**834**
Q_s	Volumetric flow rate, standard (m^3/hr)	461	498	539	**499**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	456	495	536	**496**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dry m^3/hr)	666	731	791	**729**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	429	464	503	**465**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	425	461	500	**462**
Q_{std3}	Volumetric flow rate, dry normal @3%O_2 (Nm^3/hr)	621	681	737	**680**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0179	4.0196	3.9984	**4.0120**
Laboratory Data					
m_n	Total Cl_2 collected (mg)	<0.0017	<0.0026	0.5760	**<0.1934**
Chlorine (Cl_2) Results					
C_{sd}	HCl Concentration (lb/dscf)	<9.5983E-10	<1.4246E-09	3.1765E-07	**<1.0668E-07**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	<8.4562E-10	<1.2428E-09	2.7716E-07	**<9.3082E-08**
C_a	HCl Concentration (lb/acf)	<5.9833E-10	<8.3608E-10	1.8355E-07	**<6.1661E-08**
C_{sd}	HCl Concentration (ppmdv)	<0.0052	<0.0077	1.7269	**<0.5800**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	<0.0046	<0.0068	1.5068	**<0.5061**
C_w	HCl Concentration (ppmwv)	<0.0052	<0.0077	1.7168	**<0.5766**
C_{sd}	HCl Concentration (mg/dscm)	<0.0154	<0.0228	5.0867	**<1.7083**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	<0.0135	<0.0199	4.4383	**<1.4906**
C_a	HCl Concentration (mg/m^3 (actual,wet))	<0.0096	<0.0134	2.9393	**<0.9874**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	<0.0165	<0.0245	5.4589	**<1.8333**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	<0.0145	<0.0214	4.7631	**<1.5997**
$E_{lb/hr}$	HCl Rate (lb/hr)	<0.0000	<0.0000	0.0060	**<0.0020**
$E_{kg/hr}$	HCl Rate (kg/hr)	<0.0000	<0.0000	0.0027	**<0.0009**

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	1
Date (2005)	Feb 15
Start Time	11:14
End Time	12:24
Elapsed Time (hh:mm)	01:10

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	3.42	4.67	0.42	11.19	0.58	11.18	1.75	2.39
Concentration (ppmdv)	3.49	4.72					1.79	2.42
Concentration (ppmwv)	3.42	4.67					1.75	2.39
Concentration (%dv)	0.000	0.000	0.418	11.194	0.582	11.183	0.000	0.000
Concentration (%wv)	0.000	0.000	0.409	10.952	0.576	11.066	0.000	0.000
Concentration @3%O2 (ppm)	3.05	4.05					1.56	2.07
Mass Rate (lb/hr)	0.0065	0.0087					0.0065	0.0087
Removal Efficiency (%)	24.53%							

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	2
Date (2005)	Feb 15
Start Time	14:41
End Time	15:41
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	1.44	3.71	0.34	12.36	0.38	12.39	0.74	1.90
Concentration (ppmdv)	1.46	3.73					0.75	1.91
Concentration (ppmwv)	1.44	3.71					0.74	1.90
Concentration (%dv)	0.00015	0.00037	0.342	12.363	0.382	12.391	0.000075	0.00019
Concentration (%wv)	0.00014	0.00037	0.338	12.222	0.380	12.318	0.000074	0.00019
Concentration @3%O2 (ppm)	1.27	3.20					0.65	1.64
Mass Rate (lb/hr)	0.0027	0.0075					0.0027	0.0074
Removal Efficiency (%)	60.25%							

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	3
Date (2005)	Feb 15
Start Time	17:48
End Time	18:48
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	1.19	3.28	0.36	12.62	0.39	12.79	0.61	1.68
Concentration (ppmdv)	1.22	3.30					0.62	1.69
Concentration (ppmwv)	1.19	3.28					0.61	1.68
Concentration (%dv)	0.00012	0.00033	0.355	12.620	0.385	12.787	0.00006	0.00017
Concentration (%wv)	0.00012	0.00033	0.347	12.333	0.383	12.712	0.00006	0.00017
Concentration @3%O2 (ppm)	1.06	2.83					0.54	1.45
Mass Rate (lb/hr)	0.0027	0.0071					0.0027	0.0071
Removal Efficiency (%)	62.43%							
Combustion Efficiency (%)								

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet - White Burn

USEPA Method 2
HCl Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 16	Feb 16	Feb 16	
Start Time (approx.)		10:55	13:17	16:31	
Stop Time (approx.)		11:02	13:30	16:36	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.7704	0.7940	0.8284	**0.7976**
CO_2	Carbon dioxide (dry volume %)	17.5989	17.5703	17.3779	**17.5157**
T_s	Sample temperature (°F)	68.2500	72.3750	73.0625	**71.2292**
B_w	Actual water vapor in gas (% by volume)	0.5734	0.4604	0.9169	**0.6502**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	249	279	234	**254**
Q_s	Volumetric flow rate, standard (scfm)	244	271	228	**248**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	243	270	225	**246**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dscfm)	351	391	326	**356**
Q_a	Volumetric flow rate, actual (acf/hr)	14,911	16,711	14,026	**15,216**
Q_s	Volumetric flow rate, standard (scf/hr)	14,644	16,285	13,650	**14,860**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	14,560	16,210	13,525	**14,765**
Q_a	Volumetric flow rate, actual (m^3/hr)	422	473	397	**431**
Q_s	Volumetric flow rate, standard (m^3/hr)	415	461	387	**421**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	412	459	383	**418**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dry m^3/hr)	597	664	553	**605**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	386	430	360	**392**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	384	428	357	**390**
Q_{std3}	Volumetric flow rate, dry normal @3%O_2 (Nm^3/hr)	556	619	515	**564**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0807	4.0704	4.0693	**4.0735**
Laboratory Data					
m_n	Total HCl collected (mg)	0.6051	0.8051	0.6225	**0.6775**
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	3.2696E-07	4.3613E-07	3.3729E-07	**3.6679E-07**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	2.9074E-07	3.8828E-07	3.0080E-07	**3.2661E-07**
C_a	HCl Concentration (lb/acf)	3.1927E-07	4.2305E-07	3.2525E-07	**3.5586E-07**
C_{sd}	HCl Concentration (ppmdv)	3.4568	4.6110	3.5660	**3.8779**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	3.0739	4.1051	3.1802	**3.4531**
C_w	HCl Concentration (ppmwv)	3.4369	4.5898	3.5334	**3.8534**
C_{sd}	HCl Concentration (mg/dscm)	5.2357	6.9840	5.4013	**5.8737**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	4.6558	6.2177	4.8169	**5.2301**
C_a	HCl Concentration (mg/m^3 (actual,wet))	5.1127	6.7745	5.2084	**5.6985**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	5.6188	7.4950	5.7965	**6.3034**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	4.9965	6.6726	5.1693	**5.6128**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.0048	0.0071	0.0046	**0.0055**
$E_{kg/hr}$	HCl Rate (kg/hr)	0.0022	0.0032	0.0021	**0.0025**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet - White Burn

USEPA Method 2
Cl_2 Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 16	Feb 16	Feb 16	
Start Time (approx.)		10:55	13:17	16:31	
Stop Time (approx.)		11:02	13:30	16:36	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.7704	0.7940	0.8284	**0.7976**
CO_2	Carbon dioxide (dry volume %)	17.5989	17.5703	17.3779	**17.5157**
T_s	Sample temperature (°F)	68.2500	72.3750	73.0625	**71.2292**
B_w	Actual water vapor in gas (% by volume)	0.5734	0.4604	0.9169	**0.6502**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	249	279	234	**254**
Q_s	Volumetric flow rate, standard (scfm)	244	271	228	**248**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	243	270	225	**246**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dscfm)	351	391	326	**356**
Q_a	Volumetric flow rate, actual (acf/hr)	14,911	16,711	14,026	**15,216**
Q_s	Volumetric flow rate, standard (scf/hr)	14,644	16,285	13,650	**14,860**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	14,560	16,210	13,525	**14,765**
Q_a	Volumetric flow rate, actual (m^3/hr)	422	473	397	**431**
Q_s	Volumetric flow rate, standard (m^3/hr)	415	461	387	**421**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	412	459	383	**418**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dry m^3/hr)	597	664	553	**605**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	386	430	360	**392**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	384	428	357	**390**
Q_{std3}	Volumetric flow rate, dry normal @3%O_2 (Nm^3/hr)	556	619	515	**564**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0807	4.0704	4.0693	**4.0735**
Laboratory Data					
m_n	Total Cl_2 collected (mg)	0.6648	<0.0025	<0.0032	**<0.2235**
Chlorine (Cl_2) Results					
C_{sd}	HCl Concentration (lb/dscf)	3.5922E-07	<1.3781E-09	<1.7518E-09	**<1.2078E-07**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	3.1944E-07	<1.2269E-09	<1.5623E-09	**<1.0741E-07**
C_a	HCl Concentration (lb/acf)	3.5078E-07	<1.3368E-09	<1.6893E-09	**<1.1794E-07**
C_{sd}	HCl Concentration (ppmdv)	1.9530	<0.0075	<0.0095	**<0.6567**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	1.7366	<0.0067	<0.0085	**<0.5839**
C_w	HCl Concentration (ppmwv)	1.9418	<0.0075	<0.0094	**<0.6529**
C_{sd}	HCl Concentration (mg/dscm)	5.7525	<0.0221	<0.0281	**<1.9342**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	5.1153	<0.0196	<0.0250	**<1.7200**
C_a	HCl Concentration (mg/m^3 (actual,wet))	5.6173	<0.0214	<0.0271	**<1.8886**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	6.1734	<0.0237	<0.0301	**<2.0757**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	5.4896	<0.0211	<0.0268	**<1.8458**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.0052	<0.0000	<0.0000	**<0.0018**
$E_{kg/hr}$	HCl Rate (kg/hr)	0.0024	<0.0000	<0.0000	**<0.0008**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet - White Burn

USEPA Method 2
HCl Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 16	Feb 16	Feb 16	
Start Time (approx.)		10:55	13:17	16:31	
Stop Time (approx.)		11:02	13:30	16:36	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.5868	0.6155	0.6477	**0.6167**
CO_2	Carbon dioxide (dry volume %)	18.0321	18.0187	17.9506	**18.0005**
T_s	Sample temperature (°F)	66.0000	66.0000	66.0000	**66.0000**
B_w	Actual water vapor in gas (% by volume)	1.0414	1.1620	1.4995	**1.2343**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0256	4.0037	4.0195	**4.0163**
Laboratory Data					
m_n	Total HCl collected (mg)	225.7638	196.2511	180.1562	**200.7237**
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	1.2366E-04	1.0808E-04	9.8828E-05	**1.1019E-04**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	1.0897E-04	9.5378E-05	8.7349E-05	**9.7233E-05**
C_{sd}	HCl Concentration (ppmdv)	1307.4307	1142.7226	1044.8720	**1165.0084**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	1152.1067	1008.3929	923.5098	**1028.0031**
C_w	HCl Concentration (ppmwv)	1293.8152	1129.4441	1029.2040	**1150.8211**
C_{sd}	HCl Concentration (mg/dscm)	1980.2775	1730.8051	1582.5975	**1764.5600**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	1745.0186	1527.3450	1398.7782	**1557.0473**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	2125.1759	1857.4494	1698.3973	**1893.6742**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	1872.7029	1639.1020	1501.1278	**1670.9776**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet - White Burn

USEPA Method 2
Cl_2 Parameters

Run No.		1	2	3	Average
Date (2005)		Feb 16	Feb 16	Feb 16	
Start Time (approx.)		10:55	13:17	16:31	
Stop Time (approx.)		11:02	13:30	16:36	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.5868	0.6155	0.6477	**0.6167**
CO_2	Carbon dioxide (dry volume %)	18.0321	18.0187	17.9506	**18.0005**
T_s	Sample temperature (°F)	66.0000	66.0000	66.0000	**66.0000**
B_w	Actual water vapor in gas (% by volume)	0.5812	0.4681	0.9281	**0.6591**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0256	4.0037	4.0195	**4.0163**
Laboratory Data					
m_n	Total Cl_2 collected (mg)	0.5030	0.7484	0.7232	**0.6582**
Chlorine (Cl_2) Results					
C_{sd}	HCl Concentration (lb/dscf)	2.7550E-07	4.1220E-07	3.9673E-07	**3.6147E-07**
C_{sd3}	HCl Concentration @7% O_2 (lb/dscf)	1.8852E-07	2.8246E-07	2.7229E-07	**2.4776E-07**
C_{sd}	HCl Concentration (ppmdv)	1.4978	2.2409	2.1568	**1.9652**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	1.0249	1.5356	1.4803	**1.3470**
C_w	HCl Concentration (ppmwv)	1.4891	2.2305	2.1368	**1.9521**
C_{sd}	HCl Concentration (mg/dscm)	4.4118	6.6007	6.3530	**5.7885**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	3.0189	4.5232	4.3603	**3.9675**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	4.7346	7.0837	6.8179	**6.2121**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	3.2398	4.8541	4.6794	**4.2578**

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	1
Date (2005)	Feb 16
Start Time	9:44
End Time	10:44
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	4.09	4.96	0.77	17.60	0.59	18.03	2.09	2.54
Concentration (ppmdv)	4.12	5.01					2.11	2.56
Concentration (ppmwv)	4.09	4.96					2.09	2.54
Concentration (%dv)	0.00041	0.00050	0.770	17.599	0.587	18.032	0.00021	0.00026
Concentration (%wv)	0.00041	0.00050	0.766	17.498	0.581	17.844	0.00021	0.00025
Concentration @3%O2 (ppm)	3.66	4.29					1.87	2.19
Mass Rate (lb/hr)	0.01						0.01	
Removal Efficiency (%)	14.68%							

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	2
Date (2005)	Feb 16
Start Time	12:00
End Time	13:00
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	4.26	5.36	0.79	17.57	0.62	18.02	2.18	2.74
Concentration (ppmdv)	4.28	5.42					2.19	2.77
Concentration (ppmwv)	4.26	5.36					2.18	2.74
Concentration (%dv)	0.00043	0.00054	0.794	17.570	0.616	18.019	0.00022	0.00028
Concentration (%wv)	0.00043	0.00054	0.790	17.489	0.608	17.809	0.00022	0.00027
Concentration @3%O2 (ppm)	3.81	4.64					1.95	2.37
Mass Rate (lb/hr)	0.0079						0.0079	
Removal Efficiency (%)	17.98%							

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	3
Date (2005)	Feb 16
Start Time	15:20
End Time	16:20
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	3.95	5.06	0.83	17.38	0.65	17.95	2.02	2.59
Concentration (ppmdv)	3.98	5.14					2.04	2.63
Concentration (ppmwv)	3.95	5.06					2.02	2.59
Concentration (%dv)	0.00040	0.00051	0.828	17.378	0.648	17.951	0.00020	0.00026
Concentration (%wv)	0.00039	0.00051	0.821	17.219	0.638	17.681	0.00020	0.00026
Concentration @3%O2 (ppm)	3.55	4.40					1.82	2.25
Mass Rate (lb/hr)	0.0062						0.01	
Removal Efficiency (%)	19.23%							

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet - White Burn

USEPA Method 2
HCl Parameters

Run No.		4	5	6	Average
Date (2005)		Feb 17	Feb 17	Feb 17	
Start Time (approx.)		10:35	13:34	15:41	
Stop Time (approx.)		10:41	13:41	15:49	
Gas Conditions					
O_2	Oxygen (dry volume %)	1.5546	0.7949	0.6696	**1.0064**
CO_2	Carbon dioxide (dry volume %)	16.5596	17.1183	17.1789	**16.9522**
T_s	Sample temperature (°F)	64.4375	70.6875	68.0000	**67.7083**
B_w	Actual water vapor in gas (% by volume)	0.3454	0.3471	0.3460	**0.3461**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	228	213	191	**211**
Q_s	Volumetric flow rate, standard (scfm)	227	209	189	**208**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	226	208	188	**207**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dscfm)	314	301	273	**296**
Q_a	Volumetric flow rate, actual (acf/hr)	13,702	12,762	11,472	**12,645**
Q_s	Volumetric flow rate, standard (scf/hr)	13,601	12,519	11,310	**12,477**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	13,554	12,475	11,271	**12,433**
Q_a	Volumetric flow rate, actual (m^3/hr)	388	361	325	**358**
Q_s	Volumetric flow rate, standard (m^3/hr)	385	355	320	**353**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	384	353	319	**352**
Q_{std3}	Volumetric flow rate, dry std@3%O_2 (dry m^3/hr)	534	511	465	**503**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	359	330	298	**329**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	358	329	297	**328**
Q_{std3}	Volumetric flow rate, dry normal @3%O_2 (Nm^3/hr)	498	476	433	**469**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0744	4.0545	4.0675	**4.0654**
Laboratory Data					
m_n	Total HCl collected (mg)	0.7927	0.8369	1.3604	**0.9966**
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	4.2901E-07	4.5513E-07	7.3746E-07	**5.4053E-07**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	3.9695E-07	4.0521E-07	6.5251E-07	**4.8489E-07**
C_a	HCl Concentration (lb/acf)	4.2437E-07	4.4490E-07	7.2455E-07	**5.3127E-07**
C_{sd}	HCl Concentration (ppmdv)	4.5357	4.8119	7.7968	**5.7148**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	4.1968	4.2841	6.8987	**5.1266**
C_w	HCl Concentration (ppmwv)	4.5201	4.7952	7.7698	**5.6950**
C_{sd}	HCl Concentration (mg/dscm)	6.8699	7.2883	11.8093	**8.6558**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	6.3567	6.4889	10.4490	**7.7649**
C_a	HCl Concentration (mg/m^3 (actual,wet))	6.7956	7.1244	11.6027	**8.5076**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	7.3726	7.8216	12.6734	**9.2892**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	6.8218	6.9637	11.2136	**8.3330**
$E_{lb/hr}$	HCl Rate (lb/hr)	0.0058	0.0057	0.0083	**0.0066**
$E_{kg/hr}$	HCl Rate (kg/hr)	0.0026	0.0026	0.0038	**0.0030**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Outlet - White Burn

USEPA Method 2
Cl_2 Parameters

Run No.		4	5	6	Average
Date (2005)		Feb 17	Feb 17	Feb 17	
Start Time (approx.)		10:35	13:34	15:41	
Stop Time (approx.)		10:41	13:41	15:49	
Gas Conditions					
O_2	Oxygen (dry volume %)	1.5546	0.7949	0.6696	**1.0064**
CO_2	Carbon dioxide (dry volume %)	16.5596	17.1183	17.1789	**16.9522**
T_s	Sample temperature (°F)	64.4375	70.6875	68.0000	**67.7083**
B_w	Actual water vapor in gas (% by volume)	0.3454	0.3471	0.3460	**0.3461**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	228	213	191	**211**
Q_s	Volumetric flow rate, standard (scfm)	227	209	189	**208**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	226	208	188	**207**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	314	301	273	**296**
Q_a	Volumetric flow rate, actual (acf/hr)	13,702	12,762	11,472	**12,645**
Q_s	Volumetric flow rate, standard (scf/hr)	13,601	12,519	11,310	**12,477**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	13,554	12,475	11,271	**12,433**
Q_a	Volumetric flow rate, actual (m^3/hr)	388	361	325	**358**
Q_s	Volumetric flow rate, standard (m^3/hr)	385	355	320	**353**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	384	353	319	**352**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	534	511	465	**503**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	359	330	298	**329**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	358	329	297	**328**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	498	476	433	**469**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0744	4.0545	4.0675	**4.0654**
Laboratory Data					
m_n	Total Cl_2 collected (mg)	<0.0025	<0.0025	<0.0030	**<0.0027**
Chlorine (Cl_2) Results					
C_{sd}	HCl Concentration (lb/dscf)	<1.3481E-09	<1.3835E-09	<1.6377E-09	**<1.4564E-09**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	<9.6863E-10	<9.5654E-10	<1.1252E-09	**<1.0168E-09**
C_a	HCl Concentration (lb/acf)	<1.3335E-09	<1.3524E-09	<1.6090E-09	**<1.4317E-09**
C_{sd}	HCl Concentration (ppmdv)	<0.0073	<0.0075	<0.0089	**<0.0079**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	<0.0053	<0.0052	<0.0061	**<0.0055**
C_w	HCl Concentration (ppmwv)	<0.0073	<0.0075	<0.0089	**<0.0079**
C_{sd}	HCl Concentration (mg/dscm)	<0.0216	<0.0222	<0.0262	**<0.0233**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	<0.0155	<0.0153	<0.0180	**<0.0163**
C_a	HCl Concentration (mg/m^3 (actual,wet))	<0.0214	<0.0217	<0.0258	**<0.0229**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	<0.0232	<0.0238	<0.0281	**<0.0250**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	<0.0166	<0.0164	<0.0193	**<0.0175**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet - White Burn

USEPA Method 2
HCl Parameters

Run No.		4	5	6	Average
Date (2005)		Feb 17	Feb 17	Feb 17	
Start Time (approx.)		10:35	13:34	15:41	
Stop Time (approx.)		10:41	13:41	15:49	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.6314	0.6695	0.6562	**0.6524**
CO_2	Carbon dioxide (dry volume %)	17.7579	17.6048	17.5497	**17.6375**
T_s	Sample temperature (°F)	66.0000	66.0000	66.0000	**66.0000**
B_w	Actual water vapor in gas (% by volume)	0.6927	1.1608	1.6285	**1.1607**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0489	4.0080	3.9806	**4.0125**
Laboratory Data					
m_n	Total HCl collected (mg)	174.6788	161.4647	189.6840	**175.2758**
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	9.5130E-05	8.8830E-05	1.0507E-04	**9.6344E-05**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	8.4013E-05	7.8597E-05	9.2908E-05	**8.5173E-05**
C_{sd}	HCl Concentration (ppmdv)	1005.7698	939.1657	1110.8923	**1018.6093**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	888.2368	830.9746	982.2757	**900.4957**
C_w	HCl Concentration (ppmwv)	998.8029	928.2641	1092.8012	**1006.6227**
C_{sd}	HCl Concentration (mg/dscm)	1523.3720	1422.4911	1682.5940	**1542.8190**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	1345.3527	1258.6215	1487.7870	**1363.9204**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	1634.8382	1526.5759	1805.7106	**1655.7082**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	1443.7931	1350.7157	1596.6495	**1463.7195**

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Marathon Ashland Petroleum
Clean Air Project No: 9684
LPCCR Scrubber Inlet - White Burn

USEPA Method 2
Cl_2 Parameters

Run No.		4	5	6	Average
Date (2005)		Feb 17	Feb 17	Feb 17	
Start Time (approx.)		10:35	13:34	15:41	
Stop Time (approx.)		10:41	13:41	15:49	
Gas Conditions					
O_2	Oxygen (dry volume %)	0.6314	0.6695	0.6562	**0.6524**
CO_2	Carbon dioxide (dry volume %)	17.7579	17.6048	17.5497	**17.6375**
T_s	Sample temperature (°F)	66.0000	66.0000	66.0000	**66.0000**
B_w	Actual water vapor in gas (% by volume)	0.6927	1.1608	1.6285	**1.1607**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	4.0489	4.0080	3.9806	**4.0125**
Laboratory Data					
m_n	Total Cl_2 collected (mg)	1.1037	0.6646	0.9275	**0.8986**
Chlorine (Cl_2) Results					
C_{sd}	HCl Concentration (lb/dscf)	6.0107E-07	3.6564E-07	5.1376E-07	**4.9349E-07**
C_{sd3}	HCl Concentration @3% O_2 (lb/dscf)	5.3083E-07	3.2352E-07	4.5428E-07	**4.3621E-07**
C_{sd}	HCl Concentration (ppmdv)	3.2678	1.9879	2.7931	**2.6829**
C_{sd3}	HCl Concentration @3% O_2 (ppmdv)	2.8859	1.7589	2.4697	**2.3715**
C_w	HCl Concentration (ppmwv)	3.2452	1.9648	2.7476	**2.6525**
C_{sd}	HCl Concentration (mg/dscm)	9.6254	5.8553	8.2272	**7.9026**
C_{sd3}	HCl Concentration @3% O_2 (mg/dscm)	8.5005	5.1807	7.2747	**6.9853**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	10.3296	6.2837	8.8292	**8.4808**
C_{sd3}	HCl Concentration @3% O_2 (mg/Nm^3 dry)	9.1225	5.5598	7.8070	**7.4964**

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	1
Date (2005)	Feb 17
Start Time	9:27
End Time	10:27
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	3.45	4.38	1.55	16.56	0.63	17.76	1.76	2.24
Concentration (ppmdv)	3.46	4.40					1.77	2.25
Concentration (ppmwv)	3.45	4.38					1.76	2.24
Concentration (%dv)	0.00035	0.00044	1.555	16.560	0.631	17.758	0.00018	0.00023
Concentration (%wv)	0.00034	0.00044	1.549	16.502	0.628	17.653	0.00018	0.00022
Concentration @3%O2 (ppm)	3.20	3.77					1.64	1.93
Mass Rate (lb/hr)	0.0054						0.01	
Removal Efficiency (%)	15.11%							
Combustion Efficiency (%)								

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Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	2
Date (2005)	Feb 17
Start Time	12:26
End Time	13:26
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	5.44	3.84	0.79	17.12	0.67	17.60	2.79	1.97
Concentration (ppmdv)	5.46	3.88					2.80	1.99
Concentration (ppmwv)	5.44	3.84					2.79	1.97
Concentration (%dv)	0.001	0.000	0.795	17.118	0.669	17.605	0.000	0.000
Concentration (%wv)	0.001	0.000	0.792	17.059	0.663	17.433	0.000	0.000
Concentration @3%O2 (ppm)	4.86	3.32					2.49	1.70
Mass Rate (lb/hr)	0.0078						0.0078	
Removal Efficiency (%)	-46.38%							

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Date_____

Marathon Ashland Petroleum
Clean Air Project No. 9684
Catlettsburg Refinery
Outlet, Inlet

Continuous Emissions Monitoring Parameters

Run Number	3
Date (2005)	Feb 17
Start Time	14:35
End Time	15:35
Elapsed Time (hh:mm)	01:00

Channel	2	3	4	5	6	7	8	9
Parameter	THC	THC	O2	CO2	O2	CO2	C6H14	C6H14
Location	Outlet	Inlet	Outlet	Outlet	Inlet	Inlet	Outlet	Inlet
Measurement Units	ppmwv	ppmwv	%dv	%dv	%dv	%dv	ppmwv	ppmwv
Measured Average (drift-corrected)	5.09	3.87	0.67	17.18	0.66	17.55	2.60	1.98
Concentration (ppmdv)	5.11	3.92					2.61	2.01
Concentration (ppmwv)	5.09	3.87					2.60	1.98
Concentration (%dv)	0.001	0.000	0.670	17.179	0.656	17.550	0.000	0.000
Concentration (%wv)	0.001	0.000	0.667	17.119	0.647	17.311	0.000	0.000
Concentration @3%O2 (ppm)	4.52	3.36					2.31	1.72
Mass Rate (lb/hr)	0.0066						0.0066	
Removal Efficiency (%)	-34.50%							

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