URS 40942238

Source Test Report
for the
205 Delayed Coking Unit
Drum 205-1201 and Drum 205-1202
Depressurization Vents

Volume 1

Prepared for:

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Executive Summary

Direct source testing (i.e., the "2010 Source Test") was conducted from May 7 through September 2, 2010, on the 205 Delayed Coking Unit (205 DCU) Drum 205-1201 Depressurization Vent (1201 Vent) and Drum 205-1202 Depressurization Vent (1202 Vent) at the Marathon Petroleum Company LLC, Louisiana Refining Division. The objective of the 2010 Source Test was to quantify the concentrations and mass emission rates of non-methane/non-ethane volatile organic compounds (NMNE VOC), methane, ethane, benzene, toluene, selected semivolatile organic compounds (SVOC), total particulate matter (PM), and total reduced sulfur (TRS) in the 1201 Vent and 1202 Vent gas streams. The 2010 Source Test was performed during the atmospheric depressurization step of the delayed coking process prior to the removal of petroleum coke from the coke drum. The 205 DCU was operated under a variety of conditions during the 2010 Source Test.

A summary of the mass emission rates quantified during the 2010 Source Test is provided in Table ES-1. As explained in this report, the reported mass emissions rates are conservative in nature. Gas samples were collected during 19 separate venting cycles (i.e., atmospheric depressurization events) of the 1201 Vent, located on Drum 1201, and six (6) separate venting cycles of the 1202 Vent, located on Drum 1202. The tested venting cycles are designated as Runs 1 through 25. Valid NMNE VOC, methane, ethane, benzene, toluene and TRS results were not obtained during Runs 5, 6 and 20 due to various sampling system malfunctions (see Section 5.0 for details). Selected SVOC emissions were quantified during Runs 1-10 and total PM emissions were quantified during Runs 1-9 and 11-15. Tables ES-2, ES-3 and ES-4 present the averages of target compound concentrations and mass emission rates measured during conditions representative of the current, normal operation of the 205 DCU. The current, normal operation of the 205 DCU is defined by a coke drum pressure prior to atmospheric venting of approximately 2 psig, a top water quench, and no amine-based hydrogen sulfide scavenger chemical injection. Data identified to potentially include significant bias was excluded from the averaging of mass emission rates.

Drums 1201 and 1202 are identical and operated in the same manner with the same feedstock; therefore, it is assumed that the average annual mass emissions from the atmospheric depressurization vents located on each of the two coke drums are identical. Mass emission rates were calculated by using both the measured and extrapolated (see Section 2.0 for details) emissions per venting cycle and assuming a maximum potential venting cycle frequency of 515 per calendar year from both Drum 1201 and Drum 1202 combined (i.e., continuous, uninterrupted 34-hour total batch cycles on a given coke drum over the course of a year). As a practical matter, it is unlikely the 205 DCU is operated at this frequency during any given year due to normal production delays associated with the batch delayed coking process.

Table ES-1. Mass Emission Rate Results Summary

Run No.	Date	NMNE VOC Mass Emission Rate (tons/yr)	Methane Mass Emission Rate (tons/yr)	Ethane Mass Emission Rate (tons/yr)	Benzene Mass Emission Rate (tons/yr)	Toluene Mass Emission Rate (tons/yr)	Total SVOC Mass Emission Rate (tons/yr)	Total PM Mass Emission Rate (tons/yr)	H_2S[1] Mass Emission Rate (tons/yr)
1	5/7/10	25.7	78.8	18.3	0.286	1.58	0.29	2.31	12.0
2	5/8/10	22.8	48.6	10.7	0.162	0.497	0.35	2.81	9.14
3	5/9/10	3.39	19.7	4.12	ND[2]	0.373	0.14	1.92	4.24
4	5/11/10	3.19	12.5	2.80	ND	0.350	0.078	1.15	2.21
5	5/16/10	I[3]	I	I	I	I	0.56	5.03	I
6	5/18/10	I	I	I	I	I	0.140	0.95	I
7	5/19/10	0.776	5.92	1.31	ND	0.166	0.042	0.281	0.665
8	5/20/10	5.26	53.9	13.7	0.154	0.383	0.27	2.09	7.74
9	5/22/10	37.9	56.3	13.6	0.209	0.455	0.25	1.59	5.43
10	5/23/10	28.4	164	44.4	0.624	1.46	0.59	NP[4]	31.1
11	6/14/10	53.8	38.7	9.13	ND	1.03	NP	0.882	4.83
12	6/16/10	17.3	73.5	18.1	0.148	0.304	NP	1.83	12.7
13	6/17/10	33.0	69.6	15.9	0.105	0.149	NP	3.55	8.93
14	6/17/10	22.6	88.7	21.9	0.461	1.10	NP	2.79	7.73
15	6/18/10	3.11	2.70	0.684	ND	ND	NP	0.558	1.14
16	8/26/10	5.88	51.0	11.5	0.0911	0.198	NP	NP	0.486
17	8/27/10	0	30.3	7.81	0.0525	ND	NP	NP	2.56
18	8/28/10	12.3	15.2	4.03	ND	ND	NP	NP	1.25
19	8/29/10	14.7	76.5	18.7	0.311	0.645	NP	NP	9.92
20	8/29/10	I	I	I	I	I	NP	NP	I
21	8/30/10	39.5	140	34.6	0.462	1.06	NP	NP	18.0
22	8/31/10	48.5	78.1	19.9	0.338	0.788	NP	NP	5.91
23	9/1/10	13.0	56.0	13.4	0.170	0.342	NP	NP	1.27
24	9/1/10	2.43	60.3	14.7	0.232	0.619	NP	NP	0.120
25	9/2/10	4.49	186	38.2	0.649	1.54	NP	NP	15.8

[1] Hydrogen sulfide was the only TRS compound detected above applicable method detection limits during applicable test runs.

[2] Target compound concentrations were not detected ("ND") above applicable method detection limits.

[3] Invalid test run ("I") for the applicable target compound.

[4] Applicable sampling method not performed ("NP") for target compound.

Table ES-2. Average VOC and TRS Mass Emission Rate Results

Run No.	Date	NMNE VOC	Methane	Ethane	Benzene	Toluene	H_2S[1]
Mass Emission Rate (tons/year)							
7	5/19/10	0.776	5.92	1.31	ND[2]	0.166	0.665
9	5/22/10	37.9	56.3	13.6	0.209	0.455	5.43
10	5/23/10	28.4	164	44.4	0.624	1.46	31.1
11	6/14/10	53.8	38.7	9.13	ND	1.03	4.83
12	6/16/10	17.3	73.5	18.1	0.148	0.304	12.7
Average		**27.6**	**67.7**	**17.3**	**0.196**	**0.685**	**11.0**
Mass Emission Rate (lbs/cycle)							
7	5/19/10	3.01	23.0	5.08	ND	0.644	2.58
9	5/22/10	147	219	52.8	0.812	1.77	21.1
10	5/23/10	110	637	172.3	2.42	5.68	121
11	6/14/10	209	150	35.43	ND	4.01	18.7
12	6/16/10	67.1	285	70.2	0.576	1.18	49.2
Average		**107**	**263**	**67.2**	**0.762**	**2.66**	**42.5**
Time-Weighted Average Concentration (ppmvw)							
7	5/19/10	43.6	1,472	163	ND	4.47	78.4
9	5/22/10	2,090	7,930	1,015	5.83	10.8	377
10	5/23/10	1,560	21,717	3,116	17.1	33.9	1,978
11	6/14/10	2,893	5,471	686	ND	27.3	311
12	6/16/10	746	8,910	1,166	3.29	5.72	688
Average		**1,467**	**9,100**	**1,229**	**5.25**	**16.4**	**686**

[1] Hydrogen sulfide was the only TRS compound detected above applicable method detection limits during applicable test runs.

[2] Target compound was not detected (ND); zero (0) used calculation of average.

Table ES-3. Average Total PM Mass Emission Rate Results

Run No.	Date	FPM	CPM	Total PM
Mass Emission Rate (tons/year)				
6	5/18/10	0.0686	0.884	0.953
7	5/19/10	0.00636	0.275	0.281
9	5/22/10	0.0736	1.51	1.59
11	6/14/10	0.0846	0.797	0.882
12	6/16/10	0.201	1.63	1.83
Average		**0.0869**	**1.02**	**1.11**
Mass Emission Rate (lbs/cycle)				
6	5/18/10	0.266	3.43	3.70
7	5/19/10	0.0247	1.07	1.09
9	5/22/10	0.286	5.88	6.16
11	6/14/10	0.328	3.09	3.42
12	6/16/10	0.781	6.32	7.10
Average		**0.337**	**3.96**	**4.29**
Concentration (mg/dscm)				
6	5/18/10	1,154	14,872	16,026
7	5/19/10	212	9,166	9,378
9	5/22/10	674	13,851	14,525
11	6/14/10	1,579	14,881	16,460
12	6/16/10	2,300	18,593	20,893
Average		**1,184**	**14,273**	**15,456**

Table ES-4. Average Total SVOC Mass Emission Rate Results

Run No.	Date	Total SVOC
Mass Emission Rate (tons/year)		
6	5/18/10	0.14
7	5/19/10	0.042
9	5/22/10	0.25
10	5/23/10	0.59
Average		**0.26**
Mass Emission Rate (lbs/cycle)		
6	5/18/10	0.54
7	5/19/10	0.16
9	5/22/10	0.98
10	5/23/10	2.3
Average		**0.99**
Concentration (mg/dscm)		
6	5/18/10	2,400
7	5/19/10	1,400
9	5/22/10	2,300
10	5/23/10	3,200
Average		**2,300**

1.0 Introduction

Marathon Petroleum Company LLC, Louisiana Refining Division (MPC), operates a petroleum refinery on the east bank of the Mississippi River at Garyville, St. John the Baptist Parish, Louisiana. MPC is a highly automated petroleum refinery with the capacity to convert approximately 436,000 barrels of crude oil per day (based on the annual average) into finished products. MPC currently operates under Part 70 Permit Nos. 2640-V6, dated October 12, 2009, 2887-V7 dated January 6, 2009, 2891-V6 dated November 26, 2008, 2893-V11 dated December 16, 2009, and 3039-V6 dated February 3, 2010. MPC also has two PSD permits: PSD-LA-640 (M-1), dated April 10, 2008, and PSD-LA-719 (M-1), dated May 28, 2008. The new 205 DCU, commissioned on February 2, 2010, is one of several manufacturing processes operating under Part 70 Permit 3039-V6.

MPC engaged URS Corporation (URS) of Austin, Texas, to prepare the "*Source Test Protocol for the 205 Delayed Coking Unit Drum 205-1201 Depressurization Vent* ("*Protocol"*)," and to conduct the 2010 Source Test to measure the approximate annual mass emissions of target compounds from the 205 DCU. The *Protocol* describes the sampling and analytical methodologies used to measure NMNE VOC, methane, ethane, benzene, toluene, selected SVOC, total PM (including filterable and condensible PM), and TRS mass emission rates from the 1201 Vent and 1202 Vent of the 205 DCU during the atmospheric depressurization operating cycle (i.e., venting cycle).

The 2010 Source Test of the 205 DCU atmospheric depressurization vent gas streams was a challenging project that required much more than the performance of standard source testing methodologies for target compounds in a matrix of air. Currently, there are no US EPA-approved reference methods specifically designed to collect and analyze samples from this unique intermittent process vent. The accurate and precise measurement of emissions could not be performed without significantly modifying existing US EPA-approved reference methods that were primarily developed for use on combustion process exhaust gases. The extremely high moisture content (>99%) and the high velocity (>200 mph) of the gas stream, the quantity of target analytes, the dynamic nature of the gas stream's characteristics and the variable batch nature of the delayed coking process made the implementation of existing US EPA-approved reference methods impossible as currently written. The *Protocol* developed by URS discusses in detail the modified reference methods used on the 1201 Vent and 1202 Vent gas streams, and in some cases establishes alternative quality assurance/quality control (QA/QC) criteria applied to the emissions data (see Section 5.0).

URS mobilized to the 205 DCU on four (4) separate occasions between May 7 and September 2, 2010, and a total of 25 test runs were performed on the 1201 and 1202 Vents. This *Source Test*

Report for the 205 DCU Drum 205-1201 and Drum 205-1202 Depressurization Vents presents the results of the 2010 Source Test in a format similar to other test reports submitted to US EPA for this category of emissions source. This report presents the following:

- Section 2.0 – Summary of Results;
- Section 3.0 – Sampling and Analytical Procedures;
- Section 4.0 – Calculations; and
- Section 5.0 – Quality Assurance Objectives for Measurement Data.

Report appendices provide copies of raw data, including chain-of-custody forms, sampling logs, raw analytical instrument output, laboratory reports, 205 DCU process data, and sampling equipment calibration forms. General information regarding the testing at the 205 DCU is summarized in Table 1-1.

Table 1-1. Source Test Information

Facility Name	Marathon Petroleum Company LLC, Louisiana Refining Division
Contact Person(s)	Elizabeth Olavesen
Telephone Number	985-535-7565
Facility Address	4663 West Airline Highway Garyville, Louisiana 70051
Types of Process Sampled	DCU Atmospheric Depressurization Vent Gas Stream
Person Responsible for Conducting Source Test	Chris Weber
Telephone Number	512-419-5369
Testing Company Name	URS Corporation
URS Address	9400 Amberglen Boulevard Austin, Texas 78729
Person(s) Conducting Source Test	Chris Weber, Kevin McGinn Adam Blank, Carl Galloway Gene Youngerman, Meggen DeLollis Nathan Reichardt, Alex Bellon Kindal Keen, Dave Maxwell Dan Currin, Austen Sofhauser Emmanuel Pamintuan, Jennifer Patureau
Modified US EPA Reference Methods Performed	US EPA Methods 1, 2, 3, 4, 5, 15, 16, 18, 25A and 202 US EPA Other Test Method 12 SW-846 Method 0010
Dates of Source Testing	May 7-September 2, 2010

1.1 205 DCU Description

MPC's 205 DCU converts heavy oil into more valuable products and feed stocks. It produces approximately 2,877 tons per day (1,050,105 tons per year) high-sulfur coke which is sold as solid fuel on the open market. A brief description of 205 DCU operations is presented in this section.

The 205 DCU is equipped with one (1) process heater. This equipment combusts refinery fuel gas (RFG) or natural gas to provide heat for the coking process. The process heater is upstream of two (2) coke drums and each coke drum has a dedicated atmospheric depressurization vent. The 205 DCU's two (2) coke drums, each with a height of 96 feet (tangent to tangent) and an internal diameter of 30 feet, are designated as Drum 205-1201 and Drum 205-1202. The two (2) depressurization vents are designated as the 205-1201 Vent and the 205-1202 Vent.

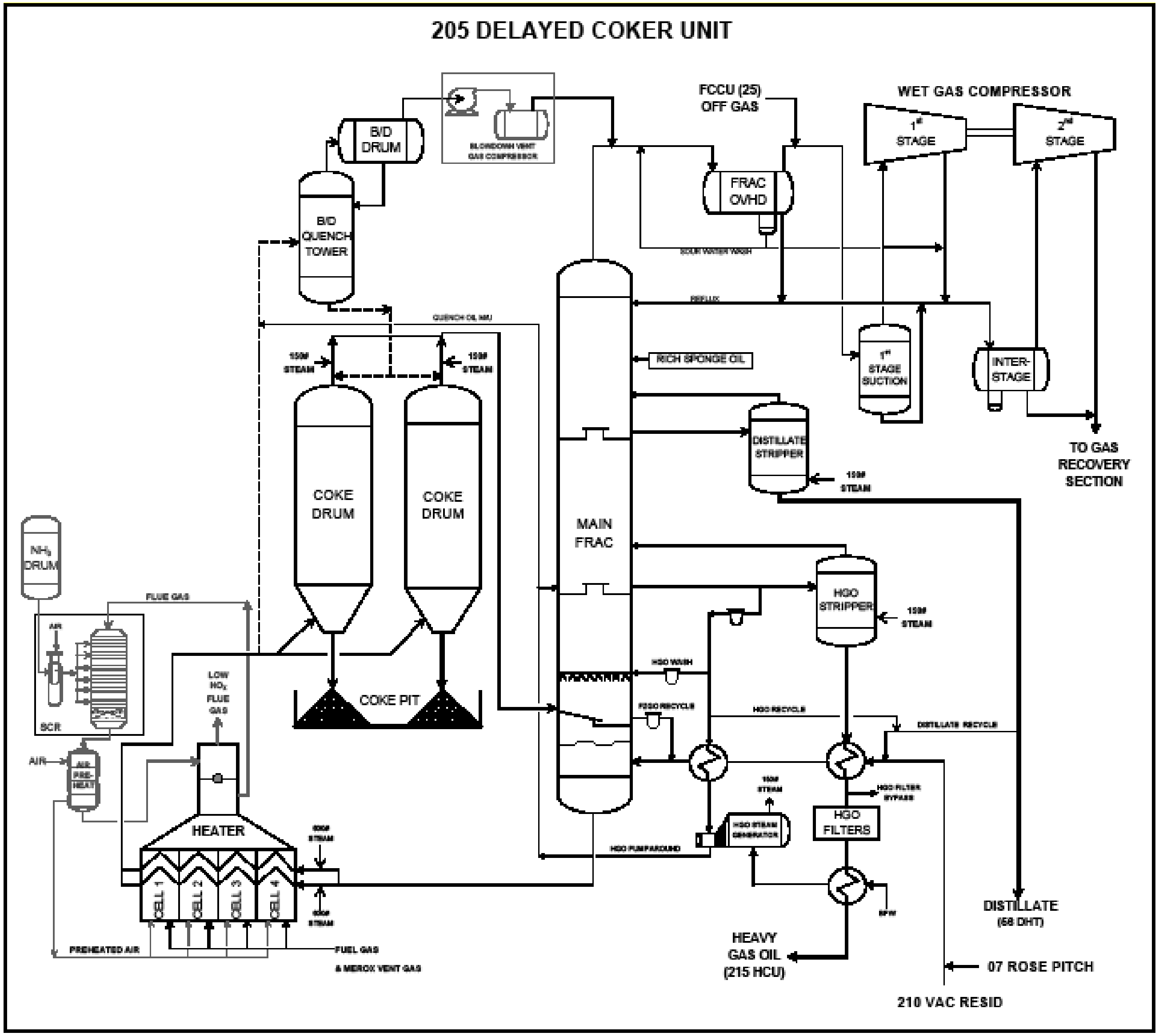
The 205 DCU converts, via thermal cracking, residual oil from the vacuum or crude unit into gas oil that can be made into light products, fuel gases and petroleum (pet) coke. The fixed carbon and ash from the feedstock are fused together into solid pet coke at high temperatures (approximately 900°F) and deposited in the on-line coke drum in a porous structure while volatile constituents are driven out of the coke drum and into the fractionator. After an "on-line" coke drum is filled with pet coke, it becomes "off-line" and any residual volatile compounds are recovered from the pet coke via steaming to the fractionator and blowdown tower. The entire 205 DCU operates in a continuous series of cycles where the off-line coke drum is steam stripped, cooled, emptied of pet coke and warmed, while the on-line coke drum is filled with coke via heated feedstock, and vice versa. A 205 DCU process flow diagram is included as Figure 1-1.

Steam and quench water are added to the off-line coke drum to reduce the volatile hydrocarbon content and lower the temperature of the pet coke prior to removal (i.e., coke-cutting). A clarifier, blowdown from steam generators, and blowdown from cooling towers all contribute to the 205 DCU quench water supply, which is contained in an open tank prior to injection to the coke drum. Following the quenching cycle and prior to the removal of the coke drum's top and bottom flanges to allow for the coke-cutting process, a 12" vent pipe opens to depressurize a coke drum directly to atmosphere (i.e., venting cycle). Quench water is added to the coke drum during the venting cycle. In accordance with New Source Performance Standard (NSPS) Subpart Ja [40 CFR §63.103(c)], the depressurization process is unrestricted and the vents may activate at any internal pressure of the coke drum.

After the coke drum has reached atmospheric pressure, the top flange is removed (i.e., de-headed), and the coke drum is soaked with quench water and drained for approximately two hours. Finally, the pet coke is cut out of the coke drum with a high-pressure water nozzle that is lowered through the top flange. The pet coke drains from the coke drum into a partially enclosed pit, and is then transferred to a conveyer system for distribution and transport off the refinery.

A single coke drum is typically operated on a 17-hour operating cycle with a total batch process duration of 34 hours. The "batch process duration" is the period of time that includes the operating cycle as well as coke drum post-cutting procedures such as steaming, re-heading, pressure-testing and back-warming. The 205 DCU currently operates with a potential maximum of 258 batch cycles annually for a single coke drum and 515 batch cycles annually for the two (2) coke drums combined. Section 2.0 presents the approximate durations of key 205 DCU operational cycles during the 2010 Source Test.

Figure 1-1. 205 DCU Process Flow Diagram



1.2 Source Test Objectives

The 2010 Source Test of the 205 DCU was designed to quantify the emissions of the following target compounds while operating the process unit under various conditions and work practices:

- NMNE VOC;
- Methane;
- Ethane;
- Benzene;
- Toluene;
- Selected SVOC;
- Total PM, including filterable PM (FPM) and condensible PM (CPM); and
- TRS.

According to the *Protocol*, the 205 DCU was to be operated at two (2) separate conditions during the 2010 Source Test. During the first operating condition (Test Condition 1), the 205 DCU was to be vented to atmosphere after the internal pressure of the coke drum reached approximately 3 psig. During the second operating condition (Test Condition 2), the 205 DCU was to be vented to atmosphere after the internal pressure of the coke drum reached approximately 2 psig. One key objective of the 2010 Source Test was to establish the impact of the change in coke drum venting pressure on target compound mass emission rates from the 1201 Vent.

As preliminary emissions data became available, the project objectives were expanded to include the manipulation of operating conditions and work practices to reduce hydrogen sulfide emissions. Specifically, the quenching cycle was manipulated throughout the four (4) test conditions and the direct injection of an amine-based hydrogen sulfide scavenger chemical (ProSweet S1761 manufactured by GE) into the coke drum was attempted during Test Conditions 3 and 4. In addition, six (6) specialized sampling ports were installed on the 1202 Vent to collect as much data as practicable within the negotiated project schedule.

Gas samples were collected during 25 separate venting cycles of the 205 DCU (19 separate venting cycles of the 1201 Vent, located on Drum 1201, and six (6) separate venting cycles of the 1202 Vent, located on Drum 1202). The tested venting cycles are designated as Runs 1 through 25, and applicable tables presented in this report include both the Run number and the Run I.D., a character string that specifies the Test Condition number, Test Condition Run number, and the 205 DCU Vent I.D. Valid NMNE VOC, methane, ethane, benzene, toluene, and TRS emissions data was collected during 22 of the 25 venting cycles tested during Test Conditions 1 through 4. Valid selected SVOC emissions data was collected during all 10 of the venting cycles tested during Test Conditions 1 and 2. Valid total PM emissions data was collected during 14 of the 15 venting cycles tested during Test Conditions 1, 2 and 3.

Per the *Protocol*, at least four (4) separate venting cycles were sampled during each of the original two (2) test conditions (Test Conditions 1 and 2) of the 2010 Source Test, and four (4) valid measurements were made for each target compound during each of the original two (2) test conditions. During Runs 14, 15, and 22-25, the amine-based hydrogen sulfide scavenger chemical was injected into the coke drum while all other operating conditions were consistent.

To supplement emissions data, the following 205 DCU operating parameters were recorded during the 2010 Source Test:

- Feed rate to the tested coke drum (barrels/batch cycle);
- Coke produced from the tested coke drum (tons/batch cycle);
- Duration of batch cycle for the tested drum (hours);
- Duration of the total operating cycle for the tested coke drum (hours);
- Duration of steam to fractionator per batch cycle for the tested coke drum (hours);
- Duration of steam to blowdown quench tower per batch cycle for the tested coke drum (hours);
- Duration of quenching per batch cycle for the tested coke drum (hours);
- Quench water volume per batch cycle for the tested coke drum (gallons);
- Duration of soaking per batch cycle for the tested coke drum (hours);
- Outage (fill distance from top) per batch cycle for the tested coke drum (feet);
- Chemical injection volume per batch cycle for the tested coke drum (gallons);
- Internal temperature near the top of the tested coke drum during the operating cycle until the beginning of the venting cycle (°F);
- Duration of quench water draining cycle per batch cycle for the tested coke drum (minutes);
- Duration of the coke-cutting cycle per batch cycle for the tested coke drum (hours);
- Duration of atmospheric venting cycle per batch cycle for the tested coke drum (hours); and
- Internal pressure of the tested coke drum during the operating cycle until the end of the venting cycle (psig).

1.3 Source Test Strategy

A venting cycle is defined in the *Protocol* as the period of time between the activation of the vent (i.e., opening) and the optimal depressurization of a coke drum to atmosphere that is necessary before the draining and coke-cutting cycles can begin. Optimal depressurization was contingent upon the temperature and pressure of the coke drum and the volumes of quench water and steam used to cool the petroleum coke. The duration of each venting cycle was dependent upon the batch process operation of the 205 DCU, and the condition of optimal depressurization was determined on a case-by-case basis at the discretion of the 205 DCU operators. The normal operation of the 205 DCU was modified during the 2010 Source Test to allow gas samples to be collected for at least 30 minutes after vent activation and prior to initiating the draining cycle on the tested coke drum. During normal operation, the draining cycle may be initiated on the 205 DCU only a few minutes after vent activation. This strategy was maintained in every test run except Run 13 and approximately doubled the average length of a normal venting cycle from 30 minutes to one (1) hour. This modification of normal operating conditions may have contributed to an overestimation of actual emissions during the current, normal operation of the 205 DCU.

Tables 1-2 through 1-5 present the test run durations as well as the operating durations of each modified sampling train during a given test run. URS began collecting NMNE VOC, methane, ethane, benzene, toluene, selected SVOC and TRS gas samples within one (1) minute of vent activation during each test run unless otherwise noted. The collection of some gas samples for the determination of total PM concentration, moisture concentration, and volumetric flow rate commenced within two (2) minutes of vent activation. Gas samples were collected until the coke drum reached optimal depressurization, or for as long as the sampling equipment remained operable within acceptable performance ranges, or until health and safety limitations were encountered. Generally, direct measurements of target compound concentrations were made during at least 50% of the duration of each complete venting cycle, and direct measurements of vent gas volumetric flow rates were made during a least 90% of the duration of each complete venting cycle. However, during Run 2, sampling activities were terminated after approximately 30% of the venting cycle had elapsed due to hazardous weather conditions.

This report incorporates a conservative data reduction strategy (i.e., overestimation of emissions) by using both directly measured and extrapolated data to quantify target compound emission rates throughout each complete venting cycle (see Section 2.0 for details). For example, extrapolated NMNE VOC mass emission rates on average contributed to approximately 17% of the total NMNE VOC mass emission rates reported per test run. Section 2.9 of this report presents the averages of target compound mass emission rates measured during conditions representative of the current, normal operation of the 205 DCU. The current, normal operation of the 205 DCU is defined by a coke drum pressure prior to atmospheric venting of approximately 2 psig, a top water quench, and no amine-based hydrogen sulfide scavenger chemical injection.

Table 1-2. Venting Cycle and Sampling Train Durations – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Modified Sampling Method	Sampling Interval (hh:min)	Sampling Duration (min)	Fraction of Venting Cycle Sampled (%)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	US EPA Methods 5/202	01:48-02:25	37	86
					SW-846 Method 0010	01:48-02:26	38	88
					US EPA Method 2	01:49-02:31	42	98
					US EPA Methods 15/16/18/25A/OTM 12	01:48-02:28	40	93
2	TC1-R2-1201	5/8/10	08:59-10:17	78	US EPA Methods 5/202	08:59-09:25	26	33
					SW-846 Method 0010	08:59-09:25	26	33
					US EPA Method 2	08:59-09:25	26	33
					US EPA Methods 15/16/18/25A/OTM 12	08:59-09:24	25	32
3	TC1-R3-1201	5/9/10	17:55-19:17	82	US EPA Methods 5/202	17:55-18:58	63	77
					SW-846 Method 0010	17:55-18:44	49	60
					US EPA Method 2	17:55-19:11	76	93
					US EPA Methods 15/16/18/25A/OTM 12	17:55-18:59	64	78
4	TC1-R4-1201	5/11/10	02:54-04:08	74	US EPA Methods 5/202	02:54-03:40	46	62
					SW-846 Method 0010	02:54-03:40	46	62
					US EPA Method 2	02:54-04:01	67	91
					US EPA Methods 15/16/18/25A/OTM 12	02:54-04:00	66	89
5	TC1-R5-1201	5/16/10	15:24-17:17	113	US EPA Methods 5/202	15:24-16:36	72	64
					SW-846 Method 0010	15:24-16:11	47	42
					US EPA Method 2	15:24-17:10	106	94
					US EPA Methods 15/16/18/25A/OTM 12	I[1]		N/A

[1] I = Invalid Test Run

Table 1-3. Venting Cycle and Sampling Train Durations – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Modified Sampling Method	Sampling Interval (hh:min)	Sampling Duration (min)	Fraction of Venting Cycle Sampled (%)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	US EPA Methods 5/202	00:34-01:21	47	94
					SW-846 Method 0010	00:34-01:20	46	92
					US EPA Method 2	00:34-01:24	50	100
					US EPA Methods 15/16/18/25A/OTM 12	I[1]		N/A
7	TC2-R2-1201	5/19/10	10:55-11:39	44	US EPA Methods 5/202	10:55-11:33	38	86
					SW-846 Method 0010	10:55-11:33	38	86
					US EPA Method 2	10:55-11:39	44	100
					US EPA Methods 15/16/18/25A/OTM 12	10:55-11:37	39	89
8	TC2-R3-1201	5/20/10	21:54-23:13	79	US EPA Methods 5/202	21:54-23:09	75	95
					SW-846 Method 0010	21:54-23:09	75	95
					US EPA Method 2	21:55-23:13	78	99
					US EPA Methods 15/16/18/25A/OTM 12	21:54-23:10	73	92
9	TC2-R4-1201	5/22/10	08:08-09:32	84	US EPA Methods 5/202	08:08-09:08	60	71
					SW-846 Method 0010	08:08-09:08	60	71
					US EPA Method 2	08:08-09:32	84	100
					US EPA Methods 15/16/18/25A/OTM 12	08:08-09:08	58	69
10	TC2-R5-1201	5/23/10	15:56-16:58	62	SW-846 Method 0010	15:56-16:51	55	89
					US EPA Method 2	15:56-16:58	62	100
					US EPA Methods 15/16/18/25A/OTM 12	15:56-16:47	48	77

[1] I = Invalid Test Run

Table 1-4. Venting Cycle and Sampling Train Durations – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Modified Sampling Method	Sampling Interval (hh:min)	Sampling Duration (min)	Fraction of Venting Cycle Sampled (%)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	US EPA Methods 5/202	21:35-22:19	44	88
					US EPA Methods 15/16/18/25A/OTM 12	21:33-22:23	31	62
12	TC3-R2-1201	6/16/10	07:55-08:56	61	US EPA Methods 5/202	07:56-08:54	58	95
					US EPA Methods 15/16/18/25A/OTM 12	07:55-08:56	41	67
13	TC3-R1-1202	6/17/10	02:46-03:50	64	US EPA Methods 5/202	02:46-03:50	64	100
					US EPA Methods 15/16/18/25A/OTM 12	02:46-04:00	59	92
14	TC3-R3-1201	6/17/10	20:35-21:41	66	US EPA Methods 5/202	20:37-21:39	62	94
					US EPA Methods 15/16/18/25A/OTM 12	20:35-21:39	48	73
15	TC3-R2-1202	6/18/10	14:28-15:16	48	US EPA Methods 5/202	14:28-15:14	46	96
					US EPA Methods 15/16/18/25A/OTM 12	14:28-15:16	28	58

Table 1-5. Venting Cycle and Sampling Train Durations – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Modified Sampling Method	Sampling Interval (hh:min)	Sampling Duration (min)	Fraction of Venting Cycle Sampled (%)
16	TC4-R1-1201	8/26/10	10:23-11:13	50	US EPA Method 2	10:23-11:13	50	100
					US EPA Method 4	10:23-10:53	30	60
					US EPA Methods 15/16/18/25A/OTM 12	10:23-10:53	26	52
17	TC4-R2-1201	8/27/10	20:04-21:03	59	US EPA Method 2	20:05-21:00	55	93
					US EPA Method 4	20:05-20:35	30	51
					US EPA Methods 15/16/18/25A/OTM 12	20:04-20:34	27	46
18	TC4-R1-1202	8/28/10	13:06-13:56	50	US EPA Method 2	13:08-13:56	48	96
					US EPA Method 4	13:08-13:38	30	60
					US EPA Methods 15/16/18/25A/OTM 12	13:06-13:40	34[2]	68
19	TC4-R3-1201	8/29/10	05:50-06:51	61	US EPA Method 2	05:50-06:46	56	92
					US EPA Method 4	05:50-06:20	30	49
					US EPA Methods 15/16/18/25A/OTM 12	05:50-06:40	31	51
20	TC4-R2-1202	8/29/10	22:56-23:54	58	US EPA Method 2	22:57-23:51	54	93
					US EPA Method 4	22:57-23:27	30	52
					US EPA Methods 15/16/18/25A/OTM 12	I[1]		N/A

[1] I = Invalid Test Run

[2] Valid methane, ethane, benzene, toluene and TRS samples were collected from 13:21 to 13:40 during Run 18

Table 1-5 (Continued). Venting Cycle and Sampling Train Durations – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Modified Sampling Method	Sampling Interval (hh:min)	Sampling Duration (min)	Fraction of Venting Cycle Sampled (%)
21	TC4-R4-1201	8/30/10	15:32-16:15	43	US EPA Method 2	15:33-16:13	40	93
					US EPA Method 4	15:33-16:03	30	70
					US EPA Methods 15/16/18/25A/OTM 12	15:32-16:07	25	58
22	TC4-R3-1202	8/31/10	08:30-09:32	62	US EPA Method 2	08:32-09:19	47	76
					US EPA Method 4	08:32-09:02	30	48
					US EPA Methods 15/16/18/25A/OTM 12	08:30-09:15	32	52
23	TC4-R5-1201	9/1/10	01:58-02:34	36	US EPA Method 2	01:58-02:34	36	100
					US EPA Method 4	01:58-02:28	30	83
					US EPA Methods 15/16/18/25A/OTM 12	01:58-02:28	27	75
24	TC4-R4-1202	9/1/10	18:36-19:17	41	US EPA Method 2	18:37-19:17	40	98
					US EPA Method 4	18:37-19:07	30	73
					US EPA Methods 15/16/18/25A/OTM 12	18:36-19:02	21	51
25	TC4-R6-1201	9/2/10	11:29-12:14	45	US EPA Method 2	11:30-12:14	44	98
					US EPA Method 4	11:30-12:00	30	67
					US EPA Methods 15/16/18/25A/OTM 12	11:29-11:59	24	53

1.4 Quality Assurance Summary

Any sampling and/or analytical QA/QC issues associated with the data obtained through the 2010 Source Test are described in Section 5.0. Table 1-6 presents QA summaries for each of the modified US EPA reference methods performed on the 1201 Vent and 1202 Vent. Due to the difficulty associated with sampling this type of atypical source, the non-traditional use and application of the sampling methodology and equipment, and the "unknowns" of any given research project, these issues were not entirely unexpected. A review of the data quality associated with the NMNE VOC, methane, ethane, benzene, toluene and TRS mass emission rate measurements performed during Runs 1-4, 7-19 and 21-25 indicates that these data are supportable and usable for the purpose intended. Valid NMNE VOC, methane, ethane, benzene, toluene and TRS results were not obtained during Runs 5, 6 and 20 due to various sampling system malfunctions (see Section 5.0 for details). NMNE VOC, methane, ethane, benzene, toluene, and TRS results obtained during Run 2 should be interpreted as an estimate of emissions only, since approximately 70% of emissions data were extrapolated. A review of the data quality associated with all selected SVOC and Total PM mass emission rate measurements indicates that these data are supportable and usable for the purpose intended.

Table 1-6. Quality Assurance Summary

Modified Sampling Method	Parameter	Deviations from the *Protocol* and Quality Assurance/Quality Control Issues
US EPA Methods 1/2/3/4	Sampling Points, Velocity and Volumetric Flow Rate, Dry Gas Molecular Weight, and Moisture Concentration	1) Port 1 was not used for the stand-alone modified US EPA Method 2 sampling train 2) Data collected using US EPA Method 2 at the sampling port furthest upstream from the outlet of the vent was used for the calculation volumetric flow rates when multiple trains were operated during a venting cycle 3) The molecular weight of methane (16.0 g/g-mol) was assigned to the entire dry sample gas fraction during all test runs to calculate vent gas velocity 4) The design and contents of the stand-alone modified US EPA Methods 2/4 sampling train impingers were modified 5) Approximately 70% of emissions data were extrapolated during Run 2 due to interruption of sampling by hazardous weather conditions 6) Vent gas velocity, static pressure, temperature and moisture concentration data were not collected until two (2) minutes after vent activation during Runs 11, 14, 18 and 22.
US EPA Methods 5/202	Filterable PM and Condensible PM Concentration	1) Measurable PM was detected in the two (2) field blank sampling trains 2) The design and contents of the modified US EPA Method 5/202 sampling train impingers were modified 3) The isokinetic sampling criteria of ≤110% specified in the *Protocol* was not met during Runs 2, 7-10 4) Port 4 was not always used for the modified US EPA Methods 5/202 sampling trains 5) Approximately 70% of emissions data were extrapolated during Run 2 due to interruption of sampling by hazardous weather conditions 6) Modified US EPA Methods 5/202 sampling trains performed during Runs 5-9 may not have collected gas samples at measurement locations that complied with US EPA Method 1
SW-846 Method 0010	Selected SVOC Concentration	1) The design and contents of the modified SW-846 Method 0010 sampling train impingers were modified 2) The isokinetic sampling rate criteria of ≤110% specified in the *Protocol* was not met during Runs 2 and 7-10 3) All modified SW-846 Method 0010 sampling trains may not have collected gas samples at measurement locations that complied with US EPA Method 1 4) Approximately 70% of emissions data were extrapolated during Run 2 due to interruption of sampling by hazardous weather conditions 5) Several compounds were found in the laboratory blanks of field blank sampling train 6) Some LCS and LCSD for analytical batches did not meet laboratory specifications 7) Many surrogate spike recoveries did not meet laboratory specifications

Table 1-6 (Continued). Quality Assurance Summary

Modified Sampling Method	Parameter	Deviations from the *Protocol* and Quality Assurance/Quality Control Issues
US EPA Methods 15 and 16 and Other Test Method 12	TRS Concentration and Dilution Sampling System	1) Runs 5, 6 and 20 are invalid due to dilution sampling system malfunction 2) Approximately 70% of emissions data were extrapolated during Run 2 due to interruption of sampling by hazardous weather conditions 3) The analysis of sample *MAR-1202-41-M15/18-Bag1* was invalid due to a leak in the sample bag 4) The triplicate pre-test calibration for the mid-level dimethyl disulfide calibration gas failed <5% RPD criteria during Runs 17 and 18 5) The Laboratory Evaluation required by US EPA Method 205 was not completed for MeSH, DMS, and DMDS 6) The Laboratory Evaluation required by US EPA Method 205 failed <2% error criteria for H_2S and COS 7) Post-test calibration drift for the low-level H_2S calibration gas failed <5% error criteria during Runs 8, 9, 22, 23, 24 and 25 8) Post-test calibration drift for the mid-level H_2S calibration gas failed <5% error criteria during Runs 7, 9, 12, 19, 20, 23 and 24 9) Post-test calibration drift for the high-level H_2S calibration gas failed <5% error criteria during Runs 5, 7, 9, 11, 12, 16, 20, 21, 22 and 23 10) Dilution System Calibration/Sampling Line Loss Study not performed during Runs 2 and 11 11) Dilution System Calibration/Sampling Line Loss Study not valid during Run 4 12) Sampling Line Loss Study failed the ≤20% recovery criteria specified in the *Protocol* during Runs 1, 3, 10, 12, 14 and 15
US EPA Method 18 and Other Test Method 12	Methane, Ethane, Benzene and Toluene Concentrations and Dilution Sampling System	1) Runs 5, 6 and 20 were invalid due to dilution sampling system malfunction 2) Approximately 70% of emissions data were extrapolated during Run 2 due to interruption of sampling by hazardous weather conditions 3) During Run 13, sample *MAR-1202-31-M15/18-Bag2* was analyzed in duplicate rather than in triplicate for all target compounds 4) During Run 18, the analysis of sample *MAR-1202-41-M15/18-Bag1* was invalid due to a leak in the sample bag 5) Duplicate post-test calibrations were performed for benzene and toluene during Runs 1 and 2 6) Single post-test calibration injections were performed for all target compounds during Runs 3 and 4 7) The post-test calibrations for toluene failed <5% RPD criteria during Run 8 8) The post-test calibrations for methane and ethane failed <5% RPD criteria during Run 9 9) The post-test calibrations for benzene and toluene failed <5% RPD criteria during Run 11 10) The post-test calibration for toluene failed <5% RPD criteria during Run 23 11) Recovery Study not performed during Run 2 12) Recovery Study failed 100±10% criteria during Runs 1, 3, 4, 8, 10, 11, 14, 15 and 24

Table 1-6 (Continued). Quality Assurance Summary

Modified Sampling Method	Parameter	Deviations from the *Protocol* and Quality Assurance/Quality Control Issues
US EPA Method 25A and Other Test Method 12	Total Hydrocarbon Concentration and Dilution Sampling System	1) Runs 5, 6 and 20 are invalid due to dilution sampling system malfunction 2) Approximately 70% of emissions data were extrapolated during Run 2 due to interruption of sampling by hazardous weather conditions 3) The calibration gases used to demonstrate the Calibration Error Test and Drift Test on THC1 during Run 18 were outside the concentration ranges specified by the method 4) THC2 Drift Test (diluted) was not performed following Run 2 5) The post-test dilution ratio was used to interpret the Drift Test during Runs 1, 11 and 24 6) The dilution sampling system ratio changed significantly (>20% RPD) during Run 1, and the post-test dilution ratio was more conservative and used to calculate actual THC concentrations 7) The dilution sampling system ratio changed significantly (>20% RPD) during Run 11, and the post-test dilution ratio was more conservative and used to calculate actual THC concentrations 8) During Run 25, a US EPA Protocol gas containing 900 ppmv propane and a balance of nitrogen was used as the dilution gas instead of pure nitrogen, and measured THC concentrations during the Calibration Error Test, test run, and Drift Test were corrected to the 900 ppmv propane baseline 9) During Runs 2-4, 7, 11, 13, 15-19, and 21-25, only one (1) gas analyzer was used to measure THC concentrations

2.0 Summary of Results

This section presents a summary of 205 DCU process operations during the 2010 Source Test as well as NMNE VOC, methane, ethane, benzene, toluene, selected SVOC, total PM and TRS emissions data. The modified US EPA reference methods used for sampling and analysis were described in detail in the *Protocol* and are discussed briefly in Section 3.0. The calculations used for this measurement program are presented in Section 4.0. QA/QC objectives for the measurement data and any deviations from methodologies described in the *Protocol* are discussed in Section 5.0.

2.1 205 DCU Process Operations

The 205 DCU was operated under a variety of operating conditions during the 2010 Source Test. On average, a single coke drum was operated on a 17-hour operating cycle with a total batch process duration of 34 hours. The quenching cycle was manipulated throughout the four (4) test conditions and minimum quenching time and quench water volume targets of 6.5 hours and 250,000 gallons, respectively, were established for Test Conditions 3 and 4. A maximum coke drum overhead temperature of 250°F was also targeted during Test Conditions 3 and 4. The direct injection of an amine-based hydrogen sulfide scavenger chemical (ProSweet S1761 manufactured by GE) into the coke drum was attempted during Runs 14, 15 and 22-25. Table 2-1 presents a process data summary for the 205 DCU. Table 2-2 presents the durations of selected components of the 205 DCU operating cycle recording during the 2010 Source Test. Printouts of selected process data recorded during the 2010 Source Test are included in **Appendix 2-1**.

Normal operating conditions of the 205 DCU were modified during the 2010 Source Test to postpone the draining cycle and increase the duration of the venting cycle. This procedure allowed gas samples to be collected for at least 30 minutes after vent activation and prior to initiating the draining cycle on the tested coke drum. During normal operation, the draining cycle may be initiated on the 205 DCU only a few minutes after vent activation. Once the draining cycle is initiated and quench water and steam are released from the bottom flange of the coke drum, the coke drum pressure typically decreases very rapidly and gas ceases to exit the depressurization vent within a few minutes. The extension of the duration of the venting cycle, coupled with the incorporation of a data reduction strategy that develops mass emission rates throughout the complete venting cycle, may have contributed to an overestimation of actual emissions. The volume of steam released to atmosphere may increase as the petroleum coke and quench water are kept at elevated temperatures within the partially-sealed coke drum for longer durations.

Complete venting cycles lasted from 36 to 113 minutes and the average duration was 60 minutes. Venting cycle durations were determined using the venting cycle start times recorded by URS scientists and the venting cycle end times either recorded by URS scientists or produced through an extrapolation of volumetric flow rate data or coke drum pressure data. The venting cycle start times corresponded to the first visual observations of steam exiting the vent pipe, rounded to the nearest whole minute. In many cases, the venting cycle end times corresponded to the measurement of zero (0) differential pressure in the vent pipe using US EPA Method 2, "*Determination of Stack Gas Velocity and Flow Rate from Stationary Sources (Type-S Pitot Tube).*" During venting cycles when the direct measurement of volumetric flow rate could not be made for the entirety of the emissions event, venting cycle end times were estimated using extrapolated volumetric flow rate data and compared with coke drum pressure data recorded by MPC.

During Run 2, hazardous weather conditions forced URS personnel to terminate sampling and evacuate the 205 DCU. As a consequence, approximately 30% of the venting cycle was sampled directly and 70% of emissions were extrapolated. In addition, several quality assurance/quality control activities associated with the measurement of VOC and TRS were incomplete. For these reasons, emissions reported for Run 2 are qualified as estimates and not included in the averaging of selected emissions to represent the current, normal operation of the 205 DCU.

During Run 13, a miscommunication occurred between URS and MPC personnel and the draining cycle was not initiated approximately 30 minutes after the beginning of the venting cycle. Sample collection was performed for 64 minutes before the abnormal operating procedure was recognized and communicated between URS and MPC personnel. The draining cycle began after sample collection was terminated, and the emissions reported for Run 13 are qualified as estimates and not included in the averaging of selected emissions to represent the current, normal operation of the 205 DCU. No emissions were extrapolated during Run 13, and a potential positive bias is associated with all reported emissions data.

During Runs 16-19, no top water quench was applied to the tested coke drum during the operating cycle. The use of a top water quench is associated with the current, normal operation of the 205 DCU, and reported emissions from these test runs are not included in the averaging of emissions.

The current, normal operation of the 205 DCU is defined by a coke drum pressure prior to atmospheric venting of approximately 2 psig, a top water quench, and no amine-based hydrogen sulfide scavenger chemical injection.

Table 2-1. 205 DCU Process Summary

Run No.	Date	Coke Drum I.D.	Coke Drum Feed Rate (bbl per batch cycle)	Coke Production (tons per batch cycle)	Quench Water Volume (gallons)	Coke Drum Outage (feet)	Chemical Injection Volume (gallons)	Coke Drum Overhead Temperature (°F)	Coke Drum Pressure (psig)	Total Vent Gas Volume (scf)[1]	Process and Data Quality Notes
1	5/7/10	1201	28,591	1,815	209,858	37.0	0	242	3.28	569,871	
2	5/8/10	1201	27,358	1,941	233,206	31.0	0	244	2.34	560,284	Extrapolated emissions during 70% of venting cycle
3	5/9/10	1201	27,786	1,930	267,404	31.7	0	235	3.15	1,193,081	
4	5/11/10	1201	27,936	1,962	247,702	30.0	0	252	3.27	766,917	
5	5/16/10	1201	26,486	1,918	241,994	32.1	0	275	3.08	1,019,299	Invalid test run for VOC and TRS
6	5/18/10	1201	26,152	1,805	308,052	37.5	0	242	2.39	740,376	Invalid test run for VOC and TRS
7	5/19/10	1201	26,939	1,752	273,336	40.0	0	248	2.04	403,002	
8	5/20/10	1201	25,978	1,752	268,084	40.0	0	257	2.89	883,578	
9	5/22/10	1201	26,652	1,805	273,215	37.5	0	249	1.83	583,863	
10	5/23/10	1201	26,524	1,878	273,755	34.0	0	243	2.27	673,809	
11	6/14/10	1201	23,045	1,805	261,280	37.5	0	238	2.35	581,848	
12	6/16/10	1201	25,205	1,813	277,332	37.1	0	241	2.23	709,050	
13	6/17/10	1202	29,083	1,897	253,881	33.1	0	113	2.68	1,101,676	Abnormal condition: draining cycle delayed
14	6/17/10	1201	28,996	1,687	265,662	43.1	15	231	2.15	827,361	
15	6/18/10	1202	26,156	1,813	379,058	37.1	30	119	3.43	527,894	
16	8/26/10	1201	26,234	1,652	344,022	44.7	0	299	1.17	73,773	Abnormal condition: no top water quench
17	8/27/10	1201	27,647	1,657	284,876	44.5	0	268	2.20	688,720	Abnormal condition: no top water quench
18	8/28/10	1202	26,803	1,813	274,263	37.1	0	271	2.43	404,576	Abnormal condition: no top water quench
19	8/29/10	1201	26,316	1,563	259,112	49.0	0	239	2.09	818,419	Abnormal condition: no top water quench
20	8/29/10	1202									Invalid test run for all parameters
21	8/30/10	1201	28,037	1,773	244,093	39.0	0	288	1.80	338,882	
22	8/31/10	1202	27,560	1,771	264,197	39.1	30	278	1.13	527,886	
23	9/1/10	1201	27,045	1,844	268,338	35.7	30	349	1.53	190,273	
24	9/1/10	1202	26,863	1,673	273,947	44.3	30	257	2.16	337,254	
25	9/2/10	1201	27,274	1,842	236,227	35.7	15	272	2.33	470,999	

[1] Total vent gas volume was calculated using directly measured and extrapolated data collected by URS with modified US EPA Methods 2, 3 and 4

Table 2-2. 205 DCU Operating Cycle Durations

Run No.	Date	Coke Drum I.D.	Operating Cycle Duration (hours)	Quench Cycle Duration (hours)	Soak Duration (hours)	Steam to Fractionator/ Blowdown Duration (minutes)	Draining Cycle Duration (minutes)	Coke-Cutting Cycle Duration (hours)	Venting Cycle Duration (minutes)	Process and Data Quality Notes
1	5/7/10	1201	16.1	6.4	1.0	68	40	3.2	43	
2	5/8/10	1201	15.8	5.7	1.8	77	50	2.5	78	Extrapolated emissions during 68% of venting cycle
3	5/9/10	1201	16.2	6.7	1.0	68	50	2.6	82	
4	5/11/10	1201	17.4	6.5	1.8	52	45	2.6	74	
5	5/16/10	1201	16.5	6.0	2.0	53	40	2.1	113	Invalid test run for VOC and TRS
6	5/18/10	1201	15.9	6.5	0.8	63	60	2.0	50	Invalid test run for VOC and TRS
7	5/19/10	1201	18.9	6.9	1.8	59	40	2.8	44	
8	5/20/10	1201	17.6	6.9	1.8	53	50	2.0	79	
9	5/22/10	1201	16.5	6.7	1.2	61	45	2.8	84	
10	5/23/10	1201	15.5	5.9	1.0	58	45	2.5	62	
11	6/14/10	1201	16.6	6.8	2.3	60	50	3.0	50	
12	6/16/10	1201	19.1	7.4	2.5	50	60	2.5	61	
13	6/17/10	1202	18.4	6.8	3.0	80	90	3.0	74	Abnormal condition: draining cycle delayed
14	6/17/10	1201	17.0	6.6	2.2	60	55	2.8	66	
15	6/18/10	1202	20.7	7.3	1.0	60	50	2.6	48	
16	8/26/10	1201	17.1	7.4	0.8	60	40	2.3	50	Abnormal condition: no top water quench
17	8/27/10	1201	17.0	7.1	1.3	60	50	2.0	59	Abnormal condition: no top water quench
18	8/28/10	1202	17.1	7.1	1.2	66	45	3.0	50	Abnormal condition: no top water quench
19	8/29/10	1201	16.6	6.8	1.0	-[1]	40	3.0	61	Abnormal condition: no top water quench
20	8/29/10	1202								Invalid test run for all parameters
21	8/30/10	1201	17.1	6.5	1.5	66	45	3.5	43	
22	8/31/10	1202	17.0	6.5	1.8	57	30	2.3	62	
23	9/1/10	1201	16.9	6.9	1.1	60	20	2.3	36	
24	9/1/10	1202	17.1	6.7	1.0	63	30	3.2	41	
25	9/2/10	1201	18.9	6.5	1.8	-[1]	20	3.4	45	

[1] Data not available

2.2 Data Reduction Approach

Mass emission rates are typically expressed using an industry standard of mass per unit time, such as pounds per hour (lbs/hr), by relating the average concentration of a target compound to the average volumetric flow rate of a gas stream through a stack or vent. However, the use of a simple average is inappropriate for developing an emissions profile for the intermittent and dynamic characteristics of the atmospheric depressurization vent source. Parameters such as gas stream differential pressure and vent static pressure varied greatly during the venting cycle as the coke drum depressurized and coke drum temperature and pressure fluctuated. Typical combustion sources – for which the US EPA reference methods were originally developed – do not operate as dynamic batch processes and instead produce effluent gas streams that are more or less static in their profiles. In contrast, the duration and profile of each complete venting cycle varied according to the batch process of the 205 DCU.

The data reduction approach used in this report integrates target compound mass emission rates as pounds per minute (lbs/min) throughout the complete venting cycle, starting at the point of vent activation and ending at the point of optimal depressurization of the coke drum. Mass emission rates during the period between the end of direct sampling and the end of the complete venting cycle are extrapolated. Total (i.e., directly measured + extrapolated) mass emission rates are expressed in this report as mass per batch cycle (lbs/cycle). This report incorporates a conservative data reduction strategy (i.e., overestimation of emissions) by using both the directly measured and extrapolated data to quantify target compound emission rates over each complete venting cycle. For example, extrapolated NMNE VOC mass emission rates on average contributed to approximately 17% of the total mass emission rates reported during each test run. Table 2-3 presents the average percentages of reported total mass emission rates per target compound that were extrapolated.

Table 2-3. Extrapolated Mass Emission Rates

Target Compound	Average Extrapolated Mass Emission Rates (% of Total)
NMNE VOC	17
Methane	13
Ethane	13
Benzene	10
Toluene	11
Total SVOC	16
Total PM	8.8
Hydrogen Sulfide	17

2.3 Results for Vent Gas Volumetric Flow Rate

Vent gas volumetric flow rate was measured according to modified US EPA Methods 2, 3, "*Gas Analysis for the Determination of Dry Molecular Weight*," and 4, "*Determination of Moisture Content in Stack Gases*." These methods were performed in conjunction with all modified US EPA Method 5/202 and SW-846 Method 0010 sampling trains. During Test Conditions 1 and 2, a stand-alone US EPA Method 2 sampling train was used to collect redundant vent gas differential pressure, temperature, and static pressure data for as long as possible during the venting cycle. During Test Condition 4, a stand-alone US EPA Method 2/4 sampling train collected sample gas for moisture determination in addition to differential pressure, temperature and static pressure data. Tables 2-4 through 2-7 present average volumetric flow rate and other operating data associated with the various modified sampling trains. These tables do not present extrapolated volumetric flow rate data.

During Test Condition 1, the modified US EPA Method 5/202 sampling train collected the highest volumetric flow rate data during the venting cycle. During Test Condition 2, the stand-alone US EPA Method 2 sampling train collected the highest volumetric flow rate data. During Test Conditions 3 and 4, only a single US EPA Method 5/202 or US EPA Method 2/4 sampling train was operated during a venting cycle. The sampling train operated in Port 4 during Runs 1-10 consistently measured the highest differential pressure when multiple sampling trains were operated simultaneously on the 12" pipe. This phenomenon suggested that the presence of a sampling probe in a given port may have created a flow disturbance at the port immediately downstream (see Section 3.0 for a description of the sampling ports). In cases where multiple sampling trains were performed during a venting cycle, the highest (i.e., most conservative) average volumetric flow rate data was used to develop mass emission rates for all target compounds. Regression curves were constructed with the most conservative volumetric flow rate data to extrapolate volumetric flow rate during periods when direct sampling was not performed.

Appendix 2-2 presents the database of instantaneous volumetric flow rates, calculated nominally every two (2) minutes during each venting cycle, which was used to develop average volumetric flow rates during various sampling intervals for NMNE VOC, methane, ethane, benzene, toluene, and TRS concentrations. This database was also used to develop average volumetric flow rates during periods of data extrapolation for all target compounds. **Appendix 2-2** also presents graphs of instantaneous vent gas volumetric flow rates versus the elapsed time of each venting cycle that include the regression curve equations used to extrapolate data.

Table 2-4. Sampling Train Data – Test Condition 1

Run No.	Run I.D.	Modified Sampling Method	Port Sampled	Moisture Conc. (%)	Dry Gas Sample Volume (dscf)	Wet Gas Sample Volume (scf)	Average Volumetric Flow Rate (scfm)	Average Volumetric Flow Rate (dscfm)	Isokinetic Sampling Rate (%)
1	TC1-R1-1201	US EPA Methods 5/202	4	99.0	1.08	103	15,184	158	77.2
		SW-846 Method 0010	3	98.9	1.16	104	13,042	144	86.4
		US EPA Method 2	2	N/A	N/A	N/A	12,561	134	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
2	TC1-R2-1201	US EPA Methods 5/202	4	99.0	0.898	84.6	11,435	120	120
		SW-846 Method 0010	3	98.5	1.27	85.2	10,514	155	129
		US EPA Method 2	2	N/A	N/A	N/A	10,233	129	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	-					
3	TC1-R3-1201	US EPA Methods 5/202	4	99.8	0.395	183	17,772	38.3	68.1
		SW-846 Method 0010	3	99.7	0.410	143	15,524	44.5	76.7
		US EPA Method 2	2	N/A	N/A	N/A	11,207	28.1	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
4	TC1-R4-1201	US EPA Methods 5/202	4	99.7	0.415	134	13,373	41.4	90.7
		SW-846 Method 0010	3	99.6	0.546	126	11,404	49.1	98.6
		US EPA Method 2	2	N/A	N/A	N/A	9,708	35.9	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	-					
5	TC1-R5-1201	US EPA Methods 5/202	2	98.7	2.20	164	8,992	119	107
		SW-846 Method 0010	3	98.6	1.75	126	10,553	145	105
		US EPA Method 2	4	N/A	N/A	N/A	9,510	128	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					

Table 2-5. Sampling Train Data – Test Condition 2

Run No.	Run I.D.	Modified Sampling Method	Port Sampled	Moisture Conc. (%)	Dry Gas Sample Volume (dscf)	Wet Gas Sample Volume (scf)	Average Volumetric Flow Rate (scfm)	Average Volumetric Flow Rate (dscfm)	Isokinetic Sampling Rate (%)
6	TC2-R1-1201	US EPA Methods 5/202	2	99.4	0.869	141	12,236	74.8	103
		SW-846 Method 0010	3	99.6	0.508	130	12,536	48.9	92.0
		US EPA Method 2	4	N/A	N/A	N/A	14,583	73.0	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
7	TC2-R2-1201	US EPA Methods 5/202	2	99.4	0.667	110	8,569	51.4	142
		SW-846 Method 0010	3	99.7	0.346	104	8,545	28.2	131
		US EPA Method 2	4	N/A	N/A	N/A	9,084	42.3	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
8	TC2-R3-1201	US EPA Methods 5/202	2	99.3	1.45	213	9,149	62.0	130
		SW-846 Method 0010	3	99.4	1.11	200	9,727	54.0	112
		US EPA Method 2	4	N/A	N/A	N/A	11,242	69.3	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
9	TC2-R4-1201	US EPA Methods 5/202	2	98.7	2.16	163	6,094	79.5	188
		SW-846 Method 0010	3	99.0	1.63	158	6,288	64.3	172
		US EPA Method 2	4	N/A	N/A	N/A	6,933	80.7	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
10	TC2-R5-1201	SW-846 Method 0010	3	98.3	2.69	153	10,056	174	115
		US EPA Method 2	4	N/A	N/A	N/A	11,029	191	N/A
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					

Table 2-6. Sampling Train Data – Test Condition 3

Run No.	Run I.D.	Modified Sampling Method	Port Sampled	Moisture Conc. (%)	Dry Gas Sample Volume (dscf)	Wet Gas Sample Volume (scf)	Average Volumetric Flow Rate (scfm)	Average Volumetric Flow Rate (dscfm)	Isokinetic Sampling Rate (%)
11	TC3-R1-1201	US EPA Methods 5/202	2	99.4	0.702	126	12,869	71.4	97.2
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
12	TC3-R2-1201	US EPA Methods 5/202	2	99.2	1.29	168	12,363	94.1	96.3
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
13	TC3-R1-1202	US EPA Methods 5/202	2	99.5	0.862	169	17,475	88.6	62.0
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
14	TC3-R3-1201	US EPA Methods 5/202	2	99.2	1.40	174	13,409	107	86.0
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					
15	TC3-R2-1202	US EPA Methods 5/202	2	99.9	0.0975	130	11,525	8.65	99.9
		US EPA Methods 15/16/18/25A/OTM 12	5	N/A					

Table 2-7. Sampling Train Data – Test Condition 4

Run No.	Run I.D.	Modified Sampling Method	Port Sampled	Moisture Conc. (%)	Dry Gas Sample Volume (dscf)	Wet Gas Sample Volume (scf)	Average Volumetric Flow Rate (scfm)	Average Volumetric Flow Rate (dscfm)	Isokinetic Sampling Rate (%)
16	TC4-R1-1201	US EPA Method 2	4	N/A	N/A	N/A	1,111	25.5	N/A
		US EPA Method 4	4	97.7	2.03	86.6	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					
17	TC4-R2-1201	US EPA Method 2	4	N/A	N/A	N/A	15,622	56.0	N/A
		US EPA Method 4	4	99.5	0.458	92.6	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					
18	TC4-R1-1202	US EPA Method 2	4	N/A	N/A	N/A	7,941	38.1	N/A
		US EPA Method 4	4	99.5	0.484	100	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					
19	TC4-R3-1201	US EPA Method 2	4	N/A	N/A	N/A	14,161	256	N/A
		US EPA Method 4	4	98.2	1.50	81.6	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					
20	TC4-R2-1202	US EPA Method 2	4	N/A	N/A	N/A	9,009	102	N/A
		US EPA Method 4	4	98.9	1.39	122	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					

Table 2-7 (Continued). Sampling Train Data – Test Condition 4

Run No.	Run I.D.	Modified Sampling Method	Port Sampled	Moisture Conc. (%)	Dry Gas Sample Volume (dscf)	Wet Gas Sample Volume (scf)	Average Volumetric Flow Rate (scfm)	Average Volumetric Flow Rate (dscfm)	Isokinetic Sampling Rate (%)
21	TC4-R4-1201	US EPA Method 2	4	N/A	N/A	N/A	8,224	131	N/A
		US EPA Method 4	4	98.4	2.00	124	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					
22	TC4-R3-1202	US EPA Method 2	4	N/A	N/A	N/A	9,365	119	N/A
		US EPA Method 4	4	98.7	1.59	124	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					
23	TC4-R5-1201	US EPA Method 2	4	N/A	N/A	N/A	5,561	86.3	N/A
		US EPA Method 4	4	98.4	1.85	117	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					
24	TC4-R4-1202	US EPA Method 2	4	N/A	N/A	N/A	7,990	112	N/A
		US EPA Method 4	4	98.6	1.78	125	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					
25	TC4-R6-1201	US EPA Method 2	4	N/A	N/A	N/A	9,847	137	N/A
		US EPA Method 4	4	98.6	1.81	128	N/A	N/A	N/A
		US EPA Methods 15/16/18/25A/OTM 12	2	N/A					

2.3.1 Results for Vent Gas Molecular Weight

It was not practicable to measure the oxygen or carbon dioxide concentrations in the sample gas using US EPA Method 3 because an adequate volume of dry gas, on average <2% of the total gas sample, could not be collected during the limited duration of the venting cycle. Therefore, the molecular weight of the dry fraction of the 1201 Vent and 1202 Vent gas was assumed to be equal to methane (16.0 g/g-mol), the most abundant compound detected in the vent gas stream after water (see Tables 2-13 through 2-16). Because the average moisture concentrations were in excess of 98%, the estimated dry gas molecular weight had an insignificant impact on the calculation of wet gas molecular weight. See Table 2-8 below.

Table 2-8. Results for Vent Gas Molecular Weight

Run No.	Run I.D.	Date	Venting Cycle (h:min)	Venting Cycle Duration (min)	TWA[1] Methane Mole Fraction	Average Water Mole Fraction	TWA Methane Conc. (% dry)[2]	Average Wet Gas Molecular Weight (g/g-mol)
1	**TC1-R1-1201**	5/7/10	01:48-02:31	43	0.0114	0.989	106	18.0
2	**TC1-R2-1201**	5/8/10	08:59-10:17	78	0.00820	0.987	65.0	18.0
3	**TC1-R3-1201**	5/9/10	17:55-19:17	82	0.00169	0.997	67.2	18.0
4	**TC1-R4-1201**	5/11/10	02:54-04:08	74	0.00149	0.996	40.3	18.0
5	**TC1-R5-1201**	5/16/10	15:24-17:17	113	I[3]	0.986	I	18.0
6	**TC2-R1-1201**	5/18/10	00:34-01:24	50	I	0.995	I	18.0
7	**TC2-R2-1201**	5/19/10	10:55-11:39	44	0.00147	0.997	44.5	18.0
8	**TC2-R3-1201**	5/20/10	21:54-23:13	79	0.00551	0.994	99.3	18.0
9	**TC2-R4-1201**	5/22/10	08:08-09:32	84	0.00793	0.990	77.5	18.0
10	**TC2-R5-1201**	5/23/10	15:56-16:58	62	0.0217	0.983	126	18.0
11	**TC3-R1-1201**	6/14/10	21:33-22:23	50	0.00547	0.994	98.7	18.0
12	**TC3-R2-1201**	6/16/10	07:55-08:56	61	0.00891	0.992	117	18.0
13	**TC3-R1-1202**	6/17/10	02:46-03:50	64	0.00547	0.995	108	18.0
14	**TC3-R3-1201**	6/17/10	20:35-21:41	66	0.00943	0.992	118	18.0
15	**TC3-R2-1202**	6/18/10	14:28-15:16	48	0.000341	0.999	45.5	18.0
16	**TC4-R1-1201**	8/26/10	10:23-11:13	50	0.0863	0.977	376	18.0
17	**TC4-R2-1201**	8/27/10	20:04-21:03	59	0.00378	0.995	76.9	18.0
18	**TC4-R1-1202**	8/28/10	13:06-13:56	50	0.00378	0.995	78.7	18.0
19	**TC4-R3-1201**	8/29/10	05:50-06:51	61	0.00823	0.982	45.6	18.0
20	**TC4-R2-1202**	8/29/10	22:56-23:54	58	I	0.989	I	18.0
21	**TC4-R4-1201**	8/30/10	15:32-16:15	43	0.0327	0.984	206	18.0
22	**TC4-R3-1202**	8/31/10	08:30-09:32	62	0.0143	0.987	113	18.0
23	**TC4-R5-1201**	9/1/10	01:58-02:34	36	0.0269	0.984	174	18.0
24	**TC4-R4-1202**	9/1/10	18:36-19:17	41	0.0160	0.986	114	18.0
25	**TC4-R6-1201**	9/2/10	11:29-12:14	45	0.0327	0.986	236	18.0

[1] Time-weighted average ("TWA").

[2] Due to differences in sampling and analytical methodologies and the use of extrapolated methane concentration data, the sum of some average water and time-weighted average methane concentrations exceeded 100%.

[3] Invalid ("I") test run for the measurement of methane.

2.4 Results for Methane, Ethane, Benzene and Toluene Emissions

Methane, ethane, benzene and toluene concentrations were measured according to modified US EPA Method 18, "*Measurement of Gaseous Organic Compound Emissions by Gas Chromatography,"* and the dilution sampling system procedures described in US EPA Other Test Method 12, "*Protocol for the Source Testing, Analysis, and Reporting of VOC Emissions from Hot Mix Asphalt Plant Dryers*."

2.4.1 Results for Methane Concentrations

FlexFoil® bag samples were collected from the same dilution sampling system used for the measurement of total hydrocarbon (THC) concentrations by modified US EPA Method 25A, "*Determination of Total Gaseous Organic Concentrations Using a Flame Ionization Analyzer*," and modified Other Test Method 12. Unless otherwise noted, integrated bag samples of vent gas were collected during at least two (2) separate sampling intervals during a venting cycle and analyzed by a gas chromatograph (GC)/flame ionization detector (FID) in triplicate. Average concentration results are presented as parts per million by volume, wet basis (ppmvw).

The average dilution ratios (DR) developed on a test run-by-test run basis through the operation of the dilution sampling system and the THC analyzers (see Section 2.5) were multiplied to the raw GC/FID analyses. These results (GC/FID raw data x DR) were then corrected to the average percent recovery achieved through the dilution system. The average percent recoveries were developed on a test run-by-test run basis by performing a modified Recovery Study based upon Section 8.4 of US EPA Method 18. Finally, average methane/propane equivalent concentrations were calculated using response factor (RF) per carbon data developed with the THC analyzers operated in accordance with modified US EPA Method 25A. Average methane/propane equivalent and average ethane/propane equivalent concentrations were subtracted from average THC concentrations to develop average NMNE VOC concentrations during a given sampling interval.

The average methane concentration data from each test run are presented in Tables 2-9 through 2-12. Valid methane results were not obtained during Runs 4, 5 and 20 due to malfunctions that occurred with the dilution sampling system. Raw data associated with the operation of the GC/FID, including all chromatograms, are included in **Appendix 2-3**.

Table 2-9. Results for Methane Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methane Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Methane/ Propane Equivalent Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	237	50.5	11,986	81.3	14,746	0.994	4,885
			02:04-02:19	208		10,508		12,928	0.994	4,283
			02:19-02:25	78.2		3,951		4,861	0.994	1,611
2	TC1-R2-1201	5/8/10	08:59-09:09	301	29.5	8,874	87.2	10,179	0.994	3,372
			09:09-09:24	234		6,892		7,905	0.994	2,619
3	TC1-R3-1201	5/9/10	17:55-18:10	53.3	30.0	1,601	78.8	2,032	0.994	673
			18:10-18:25	26.8		806		1,023	0.994	339
			18:25-18:40	34.5		1,037		1,317	0.994	436
			18:40-18:55	51.7		1,551		1,968	0.994	652
4	TC1-R4-1201	5/11/10	02:54-03:10	41.3	31.5	1,300	77.1	1,687	0.994	559
			03:10-03:25	35.1		1,107		1,436	0.994	476
			03:25-03:40	36.3		1,144		1,485	0.994	492
			03:40-03:55	34.4		1,084		1,406	0.994	466
5	TC1-R5-1201	5/16/10	Invalid Test Run							

Table 2-10. Results for Methane Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methane Sample Injections						
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Methane/ Propane Equivalent Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run							
7	TC2-R2-1201	5/19/10	10:55-11:10	23.0	63.8	1,467	101	1,454	0.994	482
			11:12-11:27	15.3		978		969	0.994	321
			11:28-11:34	35.3		2,254		2,232	0.994	740
8	TC2-R3-1201	5/20/10	21:54-22:10	120	55.4	6,668	86.6	7,697	0.994	2,550
			22:11-22:26	74.3		4,118		4,754	0.994	1,575
			22:27-22:42	69.6		3,858		4,453	0.994	1,475
			22:43-22:58	65.8		3,645		4,208	0.994	1,394
			22:58-23:09	97.7		5,412		6,247	0.994	2,070
9	TC2-R4-1201	5/22/10	08:08-08:23	249	59.3	14,763	100	14,769	1.23	6,072
			08:24-08:39	186		11,006		11,011	0.994	3,648
			08:40-08:55	171		10,142		10,146	0.994	3,361
			08:55-09:08	46.3		2,740		2,742	0.994	908
10	TC2-R5-1201	5/23/10	15:56-16:12	637	50.3	32,061	83.8	38,270	1.23	15,733
			16:14-16:29	153		7,703		9,195	0.994	3,046
			16:30-16:45	303		15,274		18,232	0.994	6,040

Table 2-11. Results for Methane Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methane Sample Injections						
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Methane/ Propane Equivalent Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	105	79.1	8,341	82.0	10,168	1.23	4,180
			21:50-22:05	31.6		2,503		3,052	1.23	1,255
12	TC3-R2-1201	6/16/10	07:55-08:10	273	56.2	15,361	94.2	16,307	1.23	6,704
			08:12-08:27	111		6,250		6,634	0.994	2,198
			08:29-08:40	95.2		5,356		5,686	0.994	1,884
13	TC3-R1-1202	6/17/10	02:46-03:02	316	35.9	11,358	93.4	12,161	1.44	5,847
			03:03-03:17	124		4,441		4,756	1.44	2,286
			03:20-03:34	73.6		2,645		2,833	1.44	1,362
			03:36-03:50	77.7		2,792		2,989	1.44	1,437
14	TC3-R3-1201	6/17/10	20:35-20:50	304	54.2	16,477	87.1	18,910	1.23	7,774
			20:52-21:07	107		5,826		6,686	0.994	2,215
			21:09-21:27	93.9		5,091		5,843	0.994	1,936
15	TC3-R2-1202	6/18/10	14:28-14:32	12.6	44.1	554	57.4	965	1.03	330
			14:34-14:48	7.63		336		586	1.03	200
			14:50-15:00	0.608		26.8		46.7	1.03	16.0

Table 2-12. Results for Methane Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methane Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Methane/ Propane Equivalent Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	4,451	47.7	212,334	95.1	223,337	1.10	82,203
			10:36-10:43	1,405		67,000		70,472	1.10	25,938
			10:43-10:53	626		29,839		31,385	1.10	11,552
17	TC4-R2-1201	8/27/10	20:04-20:14	112	62.4	6,996	92.1	7,600	1.01	2,560
			20:17-20:24	47.6		2,971		3,228	1.01	1,087
			20:24-20:34	38.5		2,405		2,613	1.01	880
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.4	-[1]	102	-[1]	1.03	-[1]
			13:21-13:28	51.4		2,947		2,902	1.03	994
			13:28-13:36	36.4		2,089		2,057	1.03	705
			13:36-13:40	96.0		5,509		5,425	1.03	1,858
19	TC4-R3-1201	8/29/10	05:50-06:00	312	46.0	14,372	92.7	15,506	1.03	5,314
			06:05-06:11	128		5,908		6,374	1.03	2,184
			06:11-06:20	115		5,282		5,698	1.03	1,953
			06:34-06:40	118		5,446		5,876	1.03	2,014
20	TC4-R2-1202	8/29/10	Invalid Test Run							

[1] The bag sample collected during this sampling interval was invalid.

Table 2-12 (Continued). Results for Methane Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methane Sample Injections							
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Methane/ Propane Equivalent Conc. (ppmvw)
21	TC4-R4-1201	8/30/10	15:32-15:40	1,311	38.3	50,247	92.5	54,329	1.03	18,619
			15:50-16:00	425		16,282		17,605	1.03	6,033
			16:00-16:07	409		15,677		16,950	1.03	5,809
22	TC4-R3-1202	8/31/10	08:30-08:40	322	39.7	12,758	95.5	13,365	1.19	5,286
			08:45-08:52	326		12,906		13,520	1.19	5,347
			08:52-09:02	289		11,421		11,965	1.19	4,732
			09:10-09:15	410		16,224		16,996	1.19	6,722
23	TC4-R5-1201	9/1/10	01:58-02:07	996	37.9	37,782	92.5	40,849	1.03	13,995
			02:10-02:20	347		13,160		14,228	1.03	4,875
			02:20-02:28	383		14,515		15,694	1.03	5,377
24	TC4-R4-1202	9/1/10	18:36-18:46	296	43.3	12,811	78.2	16,376	1.19	6,476
			18:51-18:56	404		17,494		22,362	1.19	8,844
			18:56-19:02	256		11,064		14,142	1.19	5,593
25	TC4-R6-1201	9/2/10	11:29-11:38	1,344	49.4	66,353	98.2	67,550	1.04	23,467
			11:44-11:49	300		14,833		15,101	1.04	5,246
			11:49-11:59	306		15,093		15,365	1.04	5,338

2.4.2 Results for Methane Mass Emission Rates

Methane mass emission rates, calculated as lbs/min, lbs/interval, lbs/cycle, tons per year and metric tons per year, are presented in Tables 2-13 and 2-16. Section 2.2 discusses the development of target compound mass emission rates from both measured and extrapolated data. On average, 13% of the total methane mass emissions for each complete venting cycle were extrapolated.

Table 2-13. Results for Methane Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Methane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Methane Mass Emission Rate (lbs/min)	Methane Mass Emission Rate (lbs/interval)	Methane Mass Emission Rate (lbs/cycle)	Methane Mass Emission Rate (tons/year)	Methane Mass Emission Rate (metric tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:04	16	14,746	16,690	10.2	164	306	78.8	71.5
					02:04-02:19	15	12,928	16,503	8.87	133			
					02:19-02:28	9	4,861	5,113	1.03	9.30			
					02:28-02:31[1]	3	4,861	149	0.0302	0.0905			
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:09	10	10,179	11,923	5.04	50.4	189	48.6	44.1
					09:09-09:24	15	7,905	10,862	3.57	53.5			
					09:24-10:17[1]	53	7,905	4,867	1.60	84.8			
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:10	15	2,032	19,128	1.62	24.2	76.5	19.7	17.9
					18:10-18:25	15	1,023	19,964	0.849	12.7			
					18:25-18:40	15	1,317	18,571	1.02	15.2			
					18:40-18:59	19	1,968	12,852	1.05	20.0			
					18:59-19:17[1]	18	1,968	2,942	0.241	4.33			
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:10	16	1,687	16,856	1.18	18.9	48.5	12.5	11.3
					03:10-03:25	15	1,436	13,030	0.777	11.7			
					03:25-03:40	15	1,485	9,743	0.601	9.02			
					03:40-04:00	20	1,406	6,707	0.392	7.84			
					04:00-04:08[1]	8	1,406	2,354	0.138	1.10			
5	TC1-R5-1201	5/16/10	15:24-17:17	113	Invalid Test Run								

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-14. Results for Methane Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Methane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Methane Mass Emission Rate (lbs/minute)	Methane Mass Emission Rate (lbs/interval)	Methane Mass Emission Rate (lbs/cycle)	Methane Mass Emission Rate (tons/year)	Methane Mass Emission Rate (metric tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	Invalid Test Run								
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:12	17	1,454	13,691	0.827	14.1	23.0	5.92	5.37
					11:12-11:28	16	969	9,046	0.364	5.83			
					11:28-11:37	9	2,232	3,578	0.332	2.99			
					11:37-11:39[1]	2	2,232	501	0.0465	0.0930			
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-22:11	17	7,697	14,786	4.73	80.4	209	53.9	48.9
					22:11-22:27	16	4,754	12,888	2.55	40.7			
					22:27-22:43	16	4,453	11,690	2.16	34.6			
					22:43-22:58	15	4,208	10,392	1.82	27.3			
					22:58-23:10	12	6,247	7,762	2.02	24.2			
					23:10-23:13[1]	3	6,247	2,598	0.675	2.02			
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-08:24	16	14,769	10,738	6.59	105	219	56.3	51.1
					08:24-08:40	16	11,011	6,510	2.98	47.7			
					08:40-08:55	15	10,146	6,616	2.79	41.8			
					08:55-09:08	13	2,742	6,565	0.748	9.72			
					09:08-09:32[1]	24	2,742	5,120	0.583	14.0			
10	TC2-R5-1201	5/23/10	15:56-16:58	62	15:56-16:14	18	38,270	13,581	21.6	389	637	164	149
					16:14-16:30	16	9,195	12,036	4.60	73.6			
					16:30-16:47	17	18,232	10,940	8.29	141			
					16:47-16:58[1]	11	18,232	4,061	3.08	33.8			

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-15. Results for Methane Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Methane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Methane Mass Emission Rate (lbs/min)	Methane Mass Emission Rate (lbs/interval)	Methane Mass Emission Rate (lbs/cycle)	Methane Mass Emission Rate (tons/year)	Methane Mass Emission Rate (metric tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-21:50	17	10,168	13,728	5.80	98.6	150	38.7	35.1
					21:50-22:05	15	3,052	12,980	1.65	24.7			
					22:05-22:23[1]	18	3,052	11,753	1.49	26.8			
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:12	17	16,307	14,162	9.60	163	285	73.5	66.7
					08:12-08:29	17	6,634	12,844	3.54	60.2			
					08:29-08:40	11	5,686	12,386	2.93	32.2			
					08:40-08:56[1]	16	5,686	7,832	1.85	29.6			
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:03	17	12,161	17,120	8.65	147	270	69.6	63.1
					03:03-03:20	17	4,756	17,604	3.48	59.1			
					03:20-03:36	16	2,833	17,637	2.08	33.2			
					03:36-03:50	14	2,989	17,534	2.18	30.5			
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-20:52	17	18,910	14,003	11.0	187	344	88.7	80.5
					20:52-21:09	17	6,686	14,317	3.98	67.6			
					21:09-21:27	18	5,843	13,802	3.35	60.3			
					21:27-21:41[1]	14	5,843	8,629	2.10	29.3			
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-14:34	6	965	17,434	0.699	4.19	10.5	2.70	2.45
					14:34-14:50	16	586	15,222	0.371	5.93			
					14:50-15:00	10	46.7	10,653	0.0207	0.207			
					15:00-15:16[1]	16	46.7	4,869	0.00945	0.151			

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-16. Results for Methane Mass Emission Rates – Test Condition 4

<table>
<tr><th>Run No.</th><th>Run I.D.</th><th>Date</th><th>Venting Cycle (hh:mm)</th><th>Venting Cycle Duration (min)</th><th>Venting Cycle Interval (hh:mm)</th><th>Venting Cycle Interval Duration (min)</th><th>Average Methane Conc. (ppmvw)</th><th>Average Volumetric Flow Rate (scfm)</th><th>Methane Mass Emission Rate (lbs/min)</th><th>Methane Mass Emission Rate (lbs/interval)</th><th>Methane Mass Emission Rate (lbs/cycle)</th><th>Methane Mass Emission Rate (tons/year)</th><th>Methane Mass Emission Rate (metric tons/year)</th></tr>
<tr><td rowspan="4">16</td><td rowspan="4">TC4-R1-1201</td><td rowspan="4">8/26/10</td><td rowspan="4">10:23-11:13</td><td rowspan="4">50</td><td>10:23-10:36</td><td>13</td><td>223,337</td><td>908</td><td>8.42</td><td>110</td><td rowspan="4">198</td><td rowspan="4">51.0</td><td rowspan="4">46.2</td></tr>
<tr><td>10:36-10:43</td><td>7</td><td>67,000</td><td>951</td><td>2.65</td><td>18.5</td></tr>
<tr><td>10:43-10:53</td><td>10</td><td>31,385</td><td>1,318</td><td>1.72</td><td>17.2</td></tr>
<tr><td>10:53-11:13[1]</td><td>20</td><td>31,385</td><td>2,017</td><td>2.63</td><td>52.6</td></tr>
<tr><td rowspan="4">17</td><td rowspan="4">TC4-R2-1201</td><td rowspan="4">8/27/10</td><td rowspan="4">20:04-21:03</td><td rowspan="4">59</td><td>20:04-20:17</td><td>13</td><td>7,600</td><td>14,772</td><td>4.67</td><td>60.7</td><td rowspan="4">117</td><td rowspan="4">30.3</td><td rowspan="4">27.4</td></tr>
<tr><td>20:17-20:24</td><td>7</td><td>3,228</td><td>14,242</td><td>1.91</td><td>13.4</td></tr>
<tr><td>20:24-20:34</td><td>10</td><td>2,613</td><td>13,747</td><td>1.49</td><td>14.9</td></tr>
<tr><td>20:34-21:03[1]</td><td>29</td><td>2,613</td><td>9,040</td><td>0.982</td><td>28.5</td></tr>
<tr><td rowspan="5">18</td><td rowspan="5">TC4-R1-1202</td><td rowspan="5">8/28/10</td><td rowspan="5">13:06-13:56</td><td rowspan="5">50</td><td>13:06-13:21[1]</td><td>15</td><td>2,902</td><td>12,541</td><td>1.51</td><td>22.7</td><td rowspan="5">59.2</td><td rowspan="5">15.2</td><td rowspan="5">13.8</td></tr>
<tr><td>13:21-13:28</td><td>7</td><td>2,902</td><td>8,187</td><td>0.987</td><td>6.91</td></tr>
<tr><td>13:28-13:36</td><td>8</td><td>2,057</td><td>6,856</td><td>0.586</td><td>4.69</td></tr>
<tr><td>13:36-13:40</td><td>4</td><td>5,425</td><td>5,885</td><td>1.33</td><td>5.31</td></tr>
<tr><td>13:40-13:56[1]</td><td>16</td><td>5,425</td><td>5,427</td><td>1.22</td><td>19.6</td></tr>
<tr><td rowspan="5">19</td><td rowspan="5">TC4-R3-1201</td><td rowspan="5">8/29/10</td><td rowspan="5">05:50-06:51</td><td rowspan="5">61</td><td>05:50-06:05</td><td>15</td><td>15,506</td><td>15,862</td><td>10.2</td><td>153</td><td rowspan="5">297</td><td rowspan="5">76.5</td><td rowspan="5">69.4</td></tr>
<tr><td>06:05-06:11</td><td>6</td><td>6,374</td><td>15,814</td><td>4.19</td><td>25.1</td></tr>
<tr><td>06:11-06:34</td><td>23</td><td>5,698</td><td>14,406</td><td>3.41</td><td>78.5</td></tr>
<tr><td>06:34-06:40</td><td>6</td><td>5,876</td><td>12,218</td><td>2.98</td><td>17.9</td></tr>
<tr><td>06:40-06:51[1]</td><td>11</td><td>5,876</td><td>8,267</td><td>2.02</td><td>22.2</td></tr>
<tr><td>20</td><td>TC4-R2-1202</td><td>8/29/10</td><td>22:56-23:54</td><td>58</td><td colspan="9">Invalid Test Run</td></tr>
</table>

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-16 (Continued). Results for Methane Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Methane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Methane Mass Emission Rate (lbs/min)	Methane Mass Emission Rate (lbs/interval)	Methane Mass Emission Rate (lbs/cycle)	Methane Mass Emission Rate (tons/year)	Methane Mass Emission Rate (metric tons/year)
21	TC4-R4-1201	8/30/10	15:32-16:15	43	15:32-15:50	18	54,329	10,584	23.9	430	545	140	127
					15:50-16:00	10	17,605	7,489	5.48	54.8			
					16:00-16:07	7	16,950	7,089	4.99	35.0			
					22:05-22:23[1]	8	16,950	4,455	3.14	25.1			
22	TC4-R3-1202	8/31/10	08:30-09:32	62	08:30-08:45	15	13,365	11,922	6.62	99.3	303	78.1	70.9
					08:45-08:52	7	13,520	10,791	6.06	42.4			
					08:52-09:10	18	11,965	9,231	4.59	82.6			
					09:10-09:15	5	16,996	7,377	5.21	26.1			
					09:15-09:32[1]	17	16,996	4,388	3.10	52.7			
23	TC4-R5-1201	9/1/10	01:58-02:34	36	01:58-02:10	12	40,849	7,749	13.2	158	218	56.0	50.8
					02:10-02:20	10	14,228	4,900	2.90	29.0			
					02:20-02:28	8	15,694	3,920	2.56	20.5			
					02:28-02:34[1]	6	15,694	2,619	1.71	10.2			
24	TC4-R4-1202	9/1/10	18:36-19:17	41	18:36-18:51	15	16,376	12,937	8.80	132	234	60.3	54.7
					18:51-18:56	5	22,362	10,087	9.37	46.9			
					18:56-19:02	6	14,142	8,548	5.02	30.1			
					19:02-19:17[1]	15	14,142	2,815	1.65	24.8			
25	TC4-R6-1201	9/2/10	11:29-12:14	45	11:29-11:44	15	67,550	13,157	36.9	554	723	186	169
					11:44-11:49	5	15,101	11,927	7.49	37.4			
					11:49-11:59	10	15,365	11,259	7.19	71.9			
					11:59-12:14[1]	15	15,365	6,232	3.98	59.7			

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

2.4.3 Results for Ethane Concentrations

FlexFoil® bag samples were collected from the same dilution sampling system used for the measurement of THC concentrations by modified US EPA Method 25A and modified Other Test Method 12. Unless otherwise noted, integrated bag samples of vent gas were collected during at least two (2) separate sampling intervals during a venting cycle and analyzed by a GC/FID in triplicate. Average concentration results are presented as parts per million by volume, wet basis (ppmvw).

Some concentration results were below the applicable method detection limit and are reported as a maximum ("<"). The average DR developed on a test run-by-test run basis through the operation of the dilution sampling system and the THC analyzers (see Section 2.5) were multiplied to the raw GC/FID analyses. These results (GC/FID raw data x DR) were then corrected to the average percent recovery achieved through the dilution system. The average percent recoveries were developed on a test run-by-test run basis by performing a modified Recovery Study based upon Section 8.4 of US EPA Method 18. Finally, average ethane/propane equivalent concentrations were calculated using RF per carbon data developed with the THC analyzers operated in accordance with modified US EPA Method 25A. Average methane/propane equivalent and average ethane/propane equivalent concentrations were subtracted from average THC concentrations to develop average NMNE VOC concentrations during a given sampling interval.

The average ethane concentration data from each test run are presented in Tables 2-17 through 2-20. Valid ethane results were not obtained during Runs 4, 5 and 20 due to malfunctions that occurred with the dilution sampling system. Raw data associated with the operation of the GC/FID, including all chromatograms, are included in **Appendix 2-3**.

Table 2-17. Results for Ethane Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Ethane Sample Injections						
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Ethane/ Propane Equivalent Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	29.3	50.5	1,482	81.3	1,824	0.998	1,213
			02:04-02:19	25.4		1,285		1,581	0.998	1,052
			02:19-02:25	9.66		488		601	0.998	400
2	TC1-R2-1201	5/8/10	08:59-09:09	35.9	29.5	1,057	87.2	1,213	0.998	806
			09:09-09:24	27.2		802		920	0.998	612
3	TC1-R3-1201	5/9/10	17:55-18:10	5.99	30.0	180	78.8	228	0.998	152
			18:10-18:25	3.01		90.4		115	0.998	76.4
			18:25-18:40	3.85		116		147	0.998	97.5
			18:40-18:55	5.63		169		215	0.998	143
4	TC1-R4-1201	5/11/10	02:54-03:10	4.86	31.5	153	77.1	198	0.998	132
			03:10-03:25	4.18		132		171	0.998	114
			03:25-03:40	4.36		137		178	0.998	118
			03:40-03:55	4.18		132		171	0.998	113
5	TC1-R5-1201	5/16/10	Invalid Test Run							

Table 2-18. Results for Ethane Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Ethane Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Ethane/ Propane Equivalent Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run							
7	TC2-R2-1201	5/19/10	10:55-11:10	2.84	63.8	181	101	179	0.998	119
			11:12-11:27	1.76		112		111	0.998	73.8
			11:28-11:34	3.40		217		215	0.998	143
8	TC2-R3-1201	5/20/10	21:54-22:10	16.5	55.4	915	86.6	1,056	0.998	702
			22:11-22:26	10.1		557		643	0.998	428
			22:27-22:42	9.37		519		599	0.998	398
			22:43-22:58	8.75		485		559	0.998	372
			22:58-23:09	12.8		712		822	0.998	546
9	TC2-R4-1201	5/22/10	08:08-08:23	32.2	59.3	1,910	100	1,911	1.07	1,364
			08:24-08:39	23.8		1,408		1,409	0.998	937
			08:40-08:55	21.8		1,295		1,295	0.998	861
			08:55-09:08	5.81		344		344	0.998	229
10	TC2-R5-1201	5/23/10	15:56-16:12	92.5	50.3	4,658	83.8	5,560	1.07	3,970
			16:14-16:29	21.5		1,080		1,289	0.998	857
			16:30-16:45	43.1		2,169		2,589	0.998	1,722

Table 2-19. Results for Ethane Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Ethane Sample Injections						
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Ethane/ Propane Equivalent Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	13.3	79.1	1,053	82.0	1,284	1.07	917
			21:50-22:05	3.92		310		378	1.07	270
12	TC3-R2-1201	6/16/10	07:55-08:10	35.8	56.2	2,011	94.2	2,134	1.07	1,524
			08:12-08:27	14.6		820		871	0.998	579
			08:29-08:40	12.5		700		743	0.998	494
13	TC3-R1-1202	6/17/10	02:46-03:02	38.6	35.9	1,386	93.4	1,484	1.26	1,251
			03:03-03:17	15.0		541		579	1.26	488
			03:20-03:34	8.85		318		341	1.26	287
			03:36-03:50	9.29		334		357	1.26	301
14	TC3-R3-1201	6/17/10	20:35-20:50	40.0	54.2	2,170	87.1	2,490	1.07	1,778
			20:52-21:07	14.1		764		877	0.998	583
			21:09-21:27	12.2		662		760	0.998	505
15	TC3-R2-1202	6/18/10	14:28-14:32	1.71	44.1	75.4	57.4	131	0.986	86.3
			14:34-14:48	1.08		47.7		83.1	0.986	54.6
			14:50-15:00	<0.0197		<0.868		<1.51	0.986	<0.994

Table 2-20. Results for Ethane Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Ethane Sample Injections						
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Ethane/ Propane Equivalent Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	501	47.7	23,913	95.1	25,153	1.02	17,074
			10:36-10:43	176		8,399		8,834	1.02	5,997
			10:43-10:53	81.0		3,863		4,063	1.02	2,758
17	TC4-R2-1201	8/27/10	20:04-20:14	15.3	62.4	956	92.1	1,038	1.00	693
			20:17-20:24	6.57		410		446	1.00	297
			20:24-20:34	5.30		331		360	1.00	240
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.5	-[1]	102	-[1]	1.00	-[1]
			13:21-13:28	7.07		406		399	1.00	266
			13:28-13:36	5.28		303		298	1.00	198
			13:36-13:40	13.7		789		776	1.00	516
19	TC4-R3-1201	8/29/10	05:50-06:00	40.8	46.0	1,880	92.7	2,028	1.00	1,349
			06:05-06:11	16.8		773		834	1.00	555
			06:11-06:20	14.9		688		742	1.00	494
			06:34-06:40	15.2		700		755	1.00	502
20	TC4-R2-1202	8/29/10	Invalid Test Run							

[1] The bag sample collected during this sampling interval was invalid.

Table 2-20 (Continued). Results for Ethane Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Ethane Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)	Average THC Analyzer Response Factor	Average Ethane/ Propane Equivalent Conc. (ppmvw)
21	TC4-R4-1201	8/30/10	15:32-15:40	172	38.3	6,585	92.5	7,120	1.00	4,735
			15:50-16:00	55.0		2,107		2,278	1.00	1,515
			16:00-16:07	53.4		2,044		2,211	1.00	1,470
22	TC4-R3-1202	8/31/10	08:30-08:40	44.3	39.6	1,755	95.5	1,838	1.05	1,286
			08:45-08:52	44.2		1,750		1,833	1.05	1,282
			08:52-09:02	38.9		1,540		1,613	1.05	1,128
			09:10-09:15	54.6		2,160		2,263	1.05	1,582
23	TC4-R5-1201	9/1/10	01:58-02:07	127	37.9	4,798	92.5	5,187	1.00	3,448
			02:10-02:20	43.9		1,666		1,801	1.00	1,197
			02:20-02:28	47.9		1,816		1,964	1.00	1,305
24	TC4-R4-1202	9/1/10	18:36-18:46	38.2	43.3	1,655	78.2	2,116	1.05	1,479
			18:51-18:56	52.7		2,280		2,915	1.05	2,038
			18:56-19:02	33.2		1,436		1,836	1.05	1,284
25	TC4-R6-1201	9/2/10	11:29-11:38	179	49.4	8,839	98.2	8,998	1.04	6,212
			11:44-11:49	39.9		1,967		2,003	1.04	1,382
			11:49-11:59	40.3		1,989		2,025	1.04	1,398

2.4.4 Results for Ethane Mass Emission Rates

Ethane mass emission rates, calculated as lbs/min, lbs/interval, lbs/cycle and tons per year, are presented in Tables 2-21 through 2-24. Section 2.2 discusses the development of target compound mass emission rates from both measured and extrapolated data. Some concentration results were below the applicable method detection limit and are reported as a maximum (“<”). In subsequent mass emission rate calculations, when at least one (1) bag sample yielded a result above the method detection limit, concentration results below the method detection limit are treated as zero (0). On average, 13% of the total ethane mass emissions for each complete venting cycle were extrapolated.

Table 2-21. Results for Ethane Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Ethane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Ethane Mass Emission Rate (lbs/min)	Ethane Mass Emission Rate (lbs/interval)	Ethane Mass Emission Rate (lbs/cycle)	Ethane Mass Emission Rate (tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:04	16	1,824	16,690	2.38	38.1	70.9	18.3
					02:04-02:19	15	1,581	16,503	2.04	30.6		
					02:19-02:28	9	601	5,113	0.240	2.16		
					02:28-02:31[1]	3	601	149	0.00701	0.0210		
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:09	10	1,213	11,923	1.13	11.3	41.6	10.7
					09:09-09:24	15	920	10,862	0.781	11.7		
					09:24-10:17[1]	53	920	4,867	0.350	18.6		
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:10	15	228	19,128	0.341	5.12	16.0	4.12
					18:10-18:25	15	115	19,964	0.179	2.69		
					18:25-18:40	15	147	18,571	0.213	3.19		
					18:40-18:59	19	215	12,852	0.216	4.10		
					18:59-19:17[1]	18	215	2,942	0.0494	0.889		
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:10	16	198	16,856	0.262	4.18	10.9	2.80
					03:10-03:25	15	171	13,030	0.174	2.61		
					03:25-03:40	15	178	9,743	0.136	2.03		
					03:40-04:00	20	171	6,707	0.0895	1.79		
					04:00-04:08[1]	8	171	2,354	0.0314	0.251		
5	TC1-R5-1201	5/16/10	15:24-17:17	113	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-22. Results for Ethane Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Ethane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Ethane Mass Emission Rate (lbs/minute)	Ethane Mass Emission Rate (lbs/interval)	Ethane Mass Emission Rate (lbs/cycle)	Ethane Mass Emission Rate (tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	Invalid Test Run							
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:12	17	179	13,691	0.192	3.26	5.08	1.31
					11:12-11:28	16	111	9,046	0.0785	1.26		
					11:28-11:37	9	215	3,578	0.0601	0.541		
					11:37-11:39[1]	2	215	501	0.00842	0.0168		
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-22:11	17	1,056	14,786	1.22	20.8	53.2	13.7
					22:11-22:27	16	643	12,888	0.648	10.4		
					22:27-22:43	16	599	11,690	0.547	8.76		
					22:43-22:58	15	559	10,392	0.454	6.82		
					22:58-23:10	12	822	7,762	0.499	5.98		
					23:10-23:13[1]	3	822	2,598.4	0.167	0.501		
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-08:24	16	1,911	10,738	1.60	25.7	52.8	13.6
					08:24-08:40	16	1,409	6,510	0.717	11.5		
					08:40-08:55	15	1,295	6,616	0.670	10.0		
					08:55-09:08	13	344	6,565	0.177	2.30		
					09:08-09:32[1]	24	344	5,120	0.138	3.31		
10	TC2-R5-1201	5/23/10	15:56-16:58	62	15:56-16:14	18	5,560	13,581	5.90	106	172	44.4
					16:14-16:30	16	1,289	12,036	1.21	19.4		
					16:30-16:47	17	2,589	10,940	2.21	37.6		
					16:47-16:58[1]	11	2,589	4,061	0.822	9.04		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-23. Results for Ethane Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Ethane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Ethane Mass Emission Rate (lbs/min)	Ethane Mass Emission Rate (lbs/interval)	Ethane Mass Emission Rate (lbs/cycle)	Ethane Mass Emission Rate (tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-21:50	17	1,284	13,728	1.38	23.4	35.4	9.13
					21:50-22:05	15	378	12,980	0.383	5.75		
					22:05-22:23[1]	18	378	11,753	0.347	6.25		
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:12	17	2,134	14,162	2.36	40.2	70.2	18.1
					08:12-08:29	17	871	12,844	0.874	14.9		
					08:29-08:40	11	743	12,386	0.720	7.92		
					08:40-08:56[1]	16	743	7,832	0.455	7.28		
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:03	17	1,484	17,120	1.99	33.8	61.7	15.9
					03:03-03:20	17	579	17,604	0.797	13.5		
					03:20-03:36	16	341	17,637	0.470	7.51		
					03:36-03:50	14	357	17,534	0.490	6.86		
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-20:52	17	2,490	14,003	2.73	46.3	85.0	21.9
					20:52-21:09	17	877	14,317	0.982	16.7		
					21:09-21:27	18	760	13,802	0.820	14.8		
					21:27-21:41[1]	14	760	8,629	0.513	7.18		
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-14:34	6	131	17,434	0.179	1.07	2.66	0.684
					14:34-14:50	16	83.1	15,222	0.0989	1.58		
					14:50-15:00	10	<1.51	10,653	<0.00126	<0.0126		
					15:00-15:16[1]	16	<1.51	4,869	<0.000575	<0.00920		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-24. Results for Ethane Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Ethane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Ethane Mass Emission Rate (lbs/min)	Ethane Mass Emission Rate (lbs/interval)	Ethane Mass Emission Rate (lbs/cycle)	Ethane Mass Emission Rate (tons/year)
16	TC4-R1-1201	8/26/10	10:23-11:13	50	10:23-10:36	13	25,153	908	1.78	23.2	44.8	11.5
					10:36-10:43	7	8,834	951	0.657	4.60		
					10:43-10:53	10	4,063	1,318	0.419	4.19		
					10:53-11:13[1]	20	4,063	2,017	0.641	12.8		
17	TC4-R2-1201	8/27/10	20:04-21:03	59	20:04-20:17	13	1,038	14,772	1.20	15.6	30.3	7.81
					20:17-20:24	7	446	14,242	0.496	3.47		
					20:24-20:34	10	360	13,747	0.387	3.87		
					20:34-21:03[1]	29	360	9,040	0.254	7.37		
18	TC4-R1-1202	8/28/10	13:06-13:56	50	13:06-13:21[1]	15	399	12,541	0.392	5.87	15.6	4.03
					13:21-13:28	7	399	8,187	0.256	1.79		
					13:28-13:36	8	298	6,856	0.160	1.28		
					13:36-13:40	4	776	5,885	0.357	1.43		
					13:40-13:56[1]	16	776	5,427	0.329	5.27		
19	TC4-R3-1201	8/29/10	05:50-06:51	61	05:50-06:05	15	2,028	15,862	2.52	37.7	72.8	18.7
					06:05-06:11	6	834	15,814	1.03	6.19		
					06:11-06:34	23	742	14,406	0.836	19.2		
					06:34-06:40	6	755	12,218	0.721	4.33		
					06:40-06:51[1]	11	742	8,267	0.480	5.28		
20	TC4-R2-1202	8/29/10	22:56-23:54	58	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-24 (Continued). Results for Ethane Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Ethane Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Ethane Mass Emission Rate (lbs/min)	Ethane Mass Emission Rate (lbs/interval)	Ethane Mass Emission Rate (lbs/cycle)	Ethane Mass Emission Rate (tons/year)
21	**TC4-R4-1201**	8/30/10	15:32-16:15	43	15:32-15:50	18	7,120	10,584	5.89	106	134	34.6
					15:50-16:00	10	2,278	7,489	1.33	13.3		
					16:00-16:07	7	2,211	7,089	1.23	8.58		
					22:05-22:23[1]	8	2,211	4,455	0.770	6.16		
22	**TC4-R3-1202**	8/31/10	08:30-09:32	62	08:30-08:45	15	1,838	11,922	1.71	25.7	77.2	19.9
					08:45-08:52	7	1,833	10,791	1.55	10.8		
					08:52-09:10	18	1,613	9,231	1.16	21.0		
					09:10-09:15	5	2,263	7,377	1.30	6.52		
					09:15-09:32[1]	17	2,263	4,388	0.776	13.2		
23	**TC4-R5-1201**	9/1/10	01:58-02:34	36	01:58-02:10	12	5,187	7,749	3.14	37.7	51.8	13.4
					02:10-02:20	10	1,801	4,900	0.690	6.90		
					02:20-02:28	8	1,964	3,920	0.602	4.81		
					02:28-02:34[1]	6	1,964	2,619	0.402	2.41		
24	**TC4-R4-1202**	9/1/10	18:36-19:17	41	18:36-18:51	15	2,116	12,937	2.14	32.1	57.0	14.7
					18:51-18:56	5	2,915	10,087	2.30	11.5		
					18:56-19:02	6	1,836	8,548	1.23	7.36		
					19:02-19:17[1]	15	1,836	2,815	0.404	6.06		
25	**TC4-R6-1201**	9/2/10	11:29-12:14	45	11:29-11:44	15	8,998	13,157	9.26	139	148	38.2
					11:44-11:49	5	2,003	11,927	1.87	9.34		
					11:49-11:59	10	2,025	11,259	1.78	17.8		
					11:59-12:14[1]	15	2,025	6,232	0.986	14.8		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

2.4.5 Results for Benzene Concentrations

FlexFoil® bag samples were collected from the same dilution sampling system used for the measurement of THC concentrations by modified US EPA Method 25A and modified Other Test Method 12. Unless otherwise noted, integrated bag samples of vent gas were collected during at least two (2) separate sampling intervals during a venting cycle and analyzed by a GC/FID in triplicate. Average concentration results are presented as parts per million by volume, wet basis (ppmvw).

Some concentration results were below the applicable method detection limit and are reported as a maximum ("<"). The average DR developed on a test run-by-test run basis through the operation of the dilution sampling system and the THC analyzers (see Section 2.5) were multiplied to the raw GC/FID analyses. These results (GC/FID raw data x DR) were then corrected to the average percent recovery achieved through the dilution system. The average percent recoveries were developed on a test run-by-test run basis by performing a modified Recovery Study based upon Section 8.4 of US EPA Method 18.

The average benzene concentration data from each test run are presented in Tables 2-25 through 2-28. Valid benzene results were not obtained during Runs 4, 5 and 20 due to malfunctions that occurred with the dilution sampling system. Raw data associated with the operation of the GC/FID, including all chromatograms, are included in **Appendix 2-3**.

Table 2-25. Results for Benzene Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Benzene Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	0.183	50.5	9.24	81.3	11.4
			02:04-02:19	0.158		8.00		9.84
			02:19-02:25	<0.0976		<4.93		<6.07
2	TC1-R2-1201	5/8/10	08:59-09:09	0.233	29.5	6.87	87.2	7.88
			09:09-09:24	0.152		4.47		5.13
3	TC1-R3-1201	5/9/10	17:55-18:10	<0.0976	30.0	<2.87	77.3	<3.72
			18:10-18:25	<0.0976		<2.87		<3.72
			18:25-18:40	<0.0976		<2.87		<3.72
			18:40-18:55	<0.0976		<2.87		<3.72
4	TC1-R4-1201	5/11/10	02:54-03:10	<0.0976	31.5	<3.07	77.1	<3.99
			03:10-03:25	<0.0976		<3.07		<3.99
			03:25-03:40	<0.0976		<3.07		<3.99
			03:40-03:55	<0.0976		<3.07		<3.99
5	TC1-R5-1201	5/16/10	Invalid Test Run					

Table 2-26. Results for Benzene Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Benzene Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run					
7	TC2-R2-1201	5/19/10	10:55-11:10	<0.0976	63.8	<6.23	101	<6.17
			11:12-11:27	<0.0976		<6.23		<6.17
			11:28-11:34	<0.0976		<6.23		<6.17
8	TC2-R3-1201	5/20/10	21:54-22:10	0.102	55.4	5.68	86.6	6.55
			22:11-22:26	0.0985		5.45		6.30
			22:27-22:42	<0.0976		<5.41		<6.24
			22:43-22:58	<0.0976		<5.41		<6.24
			22:58-23:09	<0.0976		<5.41		<6.24
9	TC2-R4-1201	5/22/10	08:08-08:23	0.199	59.3	11.8	100	11.8
			08:24-08:39	0.158		9.33		9.34
			08:40-08:55	0.170		10.1		10.1
			08:55-09:08	<0.0976		<5.78		<5.79
10	TC2-R5-1201	5/23/10	15:56-16:12	0.469	50.3	23.6	83.8	28.2
			16:14-16:29	0.129		6.50		7.76
			16:30-16:45	0.256		12.9		15.4

Table 2-27. Results for Benzene Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Benzene Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	<0.0976	79.1	<7.72	82.0	<9.41
			21:50-22:05	<0.0976		<7.72		<9.41
12	TC3-R2-1201	6/16/10	07:55-08:10	0.197	56.2	11.1	94.2	11.8
			08:12-08:27	<0.0976		<5.49		<5.83
			08:29-08:40	<0.0976		<5.49		<5.83
13	TC3-R1-1202	6/17/10	02:46-03:02	0.179	35.9	6.45	93.4	6.90
			03:03-03:17	<0.0976		<3.51		<3.76
			03:20-03:34	<0.0976		<3.51		<3.76
			03:36-03:50	<0.0976		<3.51		<3.76
14	TC3-R3-1201	6/17/10	20:35-20:50	0.292	54.2	15.8	87.1	18.1
			20:52-21:07	0.134		7.25		8.32
			21:09-21:27	0.108		5.86		6.72
15	TC3-R2-1202	6/18/10	14:28-14:32	<0.0976	44.1	<4.30	57.4	<7.50
			14:34-14:48	<0.0976		<4.30		<7.50
			14:50-15:00	<0.0976		<4.30		<7.50

Table 2-28. Results for Benzene Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Benzene Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	1.18	47.7	56.1	95.1	59.0
			10:36-10:43	0.516		24.6		25.9
			10:43-10:53	0.326		15.5		16.3
17	TC4-R2-1201	8/27/10	20:04-20:14	0.0771	62.4	4.81	92.1	5.23
			20:17-20:24	<0.0672		<4.20		<4.56
			20:24-20:34	<0.0672		<4.20		<4.56
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.4	-[1]	102	-[1]
			13:21-13:28	<0.0672		<3.86		<3.80
			13:28-13:36	<0.0672		<3.86		<3.80
			13:36-13:40	<0.0672		<3.86		<3.80
19	TC4-R3-1201	8/29/10	05:50-06:00	0.236	46.0	10.8	92.7	11.7
			06:05-06:11	0.111		5.11		5.51
			06:11-06:20	0.108		4.95		5.34
			06:34-06:40	0.106		4.89		5.28
20	TC4-R2-1202	8/29/10	Invalid Test Run					
21	TC4-R4-1201	8/30/10	15:32-15:40	0.862	38.3	33.0	92.5	35.7
			15:50-16:00	0.310		11.9		12.9
			16:00-16:07	0.307		11.8		12.7
22	TC4-R3-1202	8/31/10	08:30-08:40	0.328	39.6	13.0	95.5	13.6
			08:45-08:52	0.285		11.3		11.8
			08:52-09:02	0.239		9.50		9.93
			09:10-09:15	0.324		12.8		13.4
23	TC4-R5-1201	9/1/10	01:58-02:07	0.599	37.9	22.7	92.5	24.6
			02:10-02:20	0.232		8.79		9.50
			02:20-02:28	0.255		9.68		10.5
24	TC4-R4-1202	9/1/10	18:36-18:46	0.242	43.3	10.5	78.2	13.4
			18:51-18:56	0.261		11.3		14.4
			18:56-19:02	0.215		9.29		11.9
25	TC4-R6-1201	9/2/10	11:29-11:38	0.897	49.4	44.3	98.2	45.1
			11:44-11:49	0.203		10.0		10.2
			11:49-11:59	0.281		13.9		14.1

[1] The bag sample collected during this sampling interval was invalid.

2.4.6 Results for Benzene Mass Emission Rates

Benzene mass emission rates, calculated as lbs/min, lbs/interval, lbs/cycle and tons per year, are presented in Tables 2-29 through 2-32. Section 2.2 discusses the development of target compound mass emission rates from both measured and extrapolated data. Some concentration results were below the applicable method detection limit and are reported as a maximum (“<”). In subsequent mass emission rate calculations, when at least one (1) bag sample yielded a result above the method detection limit, concentration results below the method detection limit are treated as zero (0). On average, 10% of the total benzene mass emissions for each complete venting cycle were extrapolated.

Table 2-29. Results for Benzene Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Benzene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Benzene Mass Emission Rate (lbs/min)	Benzene Mass Emission Rate (lbs/interval)	Benzene Mass Emission Rate (lbs/cycle)	Benzene Mass Emission Rate (tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:04	16	11.4	16,690	0.0385	0.616	1.11	0.286
					02:04-02:19	15	9.84	16,503	0.0329	0.494		
					02:19-02:28	9	<6.07	5,113	<0.00630	<0.0567		
					02:28-02:31[1]	3	<6.07	149	<0.000184	<0.000552		
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:09	10	7.88	11,923	0.0191	0.191	0.628	0.162
					09:09-09:24	15	5.13	10,862	0.0113	0.169		
					09:24-10:17[1]	53	5.13	4,867	0.00506	0.268		
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:10	15	<3.72	19,128	<0.0144	<0.217	<0.877	<0.226
					18:10-18:25	15	<3.72	19,964	<0.0151	<0.226		
					18:25-18:40	15	<3.72	18,571	<0.0140	<0.210		
					18:40-18:59	19	<3.72	12,852	<0.00970	<0.184		
					18:59-19:17[1]	18	<3.72	2,942	<0.00222	<0.0400		
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:10	16	<3.99	16,856	<0.0136	<0.218	<0.619	<0.159
					03:10-03:25	15	<3.99	13,030	<0.0105	<0.158		
					03:25-03:40	15	<3.99	9,743	<0.00789	<0.118		
					03:40-04:00	20	<3.99	6,707	<0.00543	<0.109		
					04:00-04:08[1]	8	<3.99	2,354	<0.00190	<0.0152		
5	TC1-R5-1201	5/16/10	15:24-17:17	113	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-30. Results for Benzene Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Benzene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Benzene Mass Emission Rate (lbs/min)	Benzene Mass Emission Rate (lbs/interval)	Benzene Mass Emission Rate (lbs/cycle)	Benzene Mass Emission Rate (tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	Invalid Test Run							
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:12	17	<6.17	13,691	<0.0171	<0.291	<0.514	<0.132
					11:12-11:28	16	<6.17	9,046	<0.0113	<0.181		
					11:28-11:37	9	<6.17	3,578	<0.00448	<0.0403		
					11:37-11:39[1]	2	<6.17	501	<0.000627	<0.00125		
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-22:11	17	6.55	14,786	0.0197	0.334	0.598	0.154
					22:11-22:27	16	6.30	12,888	0.0165	0.263		
					22:27-22:43	16	<6.24	11,690	<0.0148	<0.237		
					22:43-22:58	15	<6.24	10,392	<0.0132	<0.197		
					22:58-23:10	12	<6.24	7,762	<0.00982	<0.118		
					23:10-23:13[1]	3	<6.24	2,598.4	<0.00329	<0.00987		
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-08:24	16	11.8	10,738	0.0257	0.412	0.812	0.209
					08:24-08:40	16	9.34	6,510	0.0123	0.197		
					08:40-08:55	15	10.1	6,616	0.0135	0.203		
					08:55-09:08	13	<5.79	6,565	<0.00771	<0.100		
					09:08-09:32[1]	24	<5.79	5,120	<0.00601	<0.144		
10	TC2-R5-1201	5/23/10	15:56-16:58	62	15:56-16:14	18	28.2	13,581	0.0777	1.40	2.42	0.624
					16:14-16:30	16	7.76	12,036	0.0189	0.303		
					16:30-16:47	17	15.4	10,940	0.0342	0.581		
					16:47-16:58[1]	11	15.4	4,061	0.0127	0.140		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-31. Results for Benzene Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Benzene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Benzene Mass Emission Rate (lbs/min)	Benzene Mass Emission Rate (lbs/interval)	Benzene Mass Emission Rate (lbs/cycle)	Benzene Mass Emission Rate (tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-21:50	17	<9.41	13,728	<0.0262	<0.445	<1.22	<0.315
					21:50-22:05	15	<9.41	12,980	<0.0248	<0.372		
					22:05-22:23[1]	18	<9.41	11,753	<0.0224	<0.404		
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:12	17	11.8	14,162	0.0339	0.576	0.576	0.148
					08:12-08:29	17	<5.83	12,844	<0.0152	<0.258		
					08:29-08:40	11	<5.83	12,386	<0.0146	<0.161		
					08:40-08:56[1]	16	<5.83	7,832	<0.00926	<0.148		
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:03	17	6.90	17,120	0.0240	0.408	0.408	0.105
					03:03-03:20	17	<3.76	17,604	<0.0134	<0.228		
					03:20-03:36	16	<3.76	17,637	<0.0135	<0.215		
					03:36-03:50	14	<3.76	17,534	<0.0134	<0.187		
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-20:52	17	18.1	14,003	0.0515	0.876	1.79	0.461
					20:52-21:09	17	8.32	14,317	0.0242	0.411		
					21:09-21:27	18	6.72	13,802	0.0188	0.339		
					21:27-21:41[1]	14	6.72	8,629	0.0118	0.165		
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-14:34	6	<7.50	17,434	<0.0265	<0.159	<0.810	<0.209
					14:34-14:50	16	<7.50	15,222	<0.0232	<0.371		
					14:50-15:00	10	<7.50	10,653	<0.0162	<0.162		
					15:00-15:16[1]	16	<7.50	4,869	<0.00741	<0.119		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-32. Results for Benzene Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Benzene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Benzene Mass Emission Rate (lbs/min)	Benzene Mass Emission Rate (lbs/interval)	Benzene Mass Emission Rate (lbs/cycle)	Benzene Mass Emission Rate (tons/year)
16	TC4-R1-1201	8/26/10	10:23-11:13	50	10:23-10:36	13	59.0	908	0.0109	0.141	0.354	0.0911
					10:36-10:43	7	25.9	951	0.00500	0.0350		
					10:43-10:53	10	16.3	1,318	0.00437	0.0437		
					10:53-11:13[1]	20	16.3	2,017	0.00669	0.134		
17	TC4-R2-1201	8/27/10	20:04-21:03	59	20:04-20:17	13	5.23	14,772	0.0157	0.204	0.204	0.0525
					20:17-20:24	7	<4.56	14,242	<0.0132	<0.0922		
					20:24-20:34	10	<4.56	13,747	<0.0127	<0.127		
					20:34-21:03[1]	29	<4.56	9,040	<0.00836	<0.243		
18	TC4-R1-1202	8/28/10	13:06-13:56	50	13:06-13:21[1]	15	<3.80	12,541	<0.00967	<0.145	<0.317	<0.0816
					13:21-13:28	7	<3.80	8,187	<0.00631	<0.0442		
					13:28-13:36	8	<3.80	6,856	<0.00529	<0.0423		
					13:36-13:40	4	<3.80	5,885	<0.00454	<0.0181		
					13:40-13:56[1]	16	<3.80	5,427	<0.00418	<0.0669		
19	TC4-R3-1201	8/29/10	05:50-06:51	61	05:50-06:05	15	11.7	15,862	0.0377	0.565	1.21	0.311
					06:05-06:11	6	5.51	15,814	0.0177	0.106		
					06:11-06:34	23	5.34	14,406	0.0156	0.359		
					06:34-06:40	6	5.28	12,218	0.0131	0.0785		
					06:40-06:51[1]	11	5.28	8,267	0.00885	0.0973		
20	TC4-R2-1202	8/29/10	22:56-23:54	58	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-32 (Continued). Results for Benzene Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Benzene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Benzene Mass Emission Rate (lbs/min)	Benzene Mass Emission Rate (lbs/interval)	Benzene Mass Emission Rate (lbs/cycle)	Benzene Mass Emission Rate (tons/year)
21	TC4-R4-1201	8/30/10	15:32-16:15	43	15:32-15:50	18	35.7	10,584	0.0766	1.38	1.79	0.462
					15:50-16:00	10	12.9	7,489	0.0195	0.195		
					16:00-16:07	7	12.7	7,089	0.0183	0.128		
					22:05-22:23[1]	8	12.7	4,455	0.0115	0.0919		
22	TC4-R3-1202	8/31/10	08:30-09:32	62	08:30-08:45	15	13.6	11,922	0.0329	0.493	1.31	0.338
					08:45-08:52	7	11.8	10,791	0.0259	0.181		
					08:52-09:10	18	9.93	9,231	0.0186	0.335		
					09:10-09:15	5	13.4	7,377	0.0201	0.100		
					09:15-09:32[1]	17	13.4	4,388	0.0120	0.203		
23	TC4-R5-1201	9/1/10	01:58-02:34	36	01:58-02:10	12	24.6	7,749	0.0386	0.464	0.658	0.170
					02:10-02:20	10	9.50	4,900	0.00945	0.0945		
					02:20-02:28	8	10.5	3,920	0.00832	0.0666		
					02:28-02:34[1]	6	10.5	2,619	0.00556	0.0334		
24	TC4-R4-1202	9/1/10	18:36-19:17	41	18:36-18:51	15	13.4	12,937	0.0352	0.528	0.901	0.232
					18:51-18:56	5	14.4	10,087	0.0296	0.148		
					18:56-19:02	6	11.9	8,548	0.0206	0.124		
					19:02-19:17[1]	15	11.9	2,815	0.00678	0.102		
25	TC4-R6-1201	9/2/10	11:29-12:14	45	11:29-11:44	15	45.1	13,157	0.120	1.81	2.52	0.649
					11:44-11:49	5	10.2	11,927	0.0246	0.123		
					11:49-11:59	10	14.1	11,259	0.0323	0.323		
					11:59-12:14[1]	15	14.1	6,232	0.0179	0.268		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

2.4.7 Results for Toluene Concentrations

FlexFoil® bag samples were collected from the same dilution sampling system used for the measurement of THC concentrations by modified US EPA Method 25A and modified Other Test Method 12. Unless otherwise noted, integrated bag samples of vent gas were collected during at least two (2) separate sampling intervals during a venting cycle and analyzed by a GC/FID in triplicate. Average concentration results are presented as parts per million by volume, wet basis (ppmvw).

Some concentration results were below the applicable method detection limit and are reported as a maximum ("<"). The average DR developed on a test run-by-test run basis through the operation of the dilution sampling system and the THC analyzers (see Section 2.5) were multiplied to the raw GC/FID analyses. These results (GC/FID raw data x DR) were then corrected to the average percent recovery achieved through the dilution system. The average percent recoveries were developed on a test run-by-test run basis by performing a modified Recovery Study based upon Section 8.4 of US EPA Method 18.

The average toluene concentration data from each test run are presented in Tables 2-33 through 2-36. Valid toluene results were not obtained during Runs 4, 5 and 20 due to malfunctions that occurred with the dilution sampling system. Raw data associated with the operation of the GC/FID, including all chromatograms, are included in **Appendix 2-3**.

Table 2-33. Results for Toluene Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Toluene Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	1.09	50.5	54.9	81.3	67.5
			02:04-02:19	0.457		23.1		28.4
			02:19-02:25	0.185		9.37		11.5
2	TC1-R2-1201	5/8/10	08:59-09:09	0.539	29.5	15.9	87.2	18.2
			09:09-09:24	0.414		12.2		14.0
3	TC1-R3-1201	5/9/10	17:55-18:10	0.357	30.0	10.7	77.3	13.6
			18:10-18:25	0.188		5.64		7.16
			18:25-18:40	<0.165		<4.96		<6.30
			18:40-18:55	<0.165		<4.96		<6.30
4	TC1-R4-1201	5/11/10	02:54-03:10	0.277	31.5	8.72	77.1	11.3
			03:10-03:25	0.180		5.68		7.37
			03:25-03:40	0.197		6.22		8.07
			03:40-03:55	<0.165		<5.21		<6.75
5	TC1-R5-1201	5/16/10	Invalid Test Run					

Table 2-34. Results for Toluene Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Toluene Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run					
7	TC2-R2-1201	5/19/10	10:55-11:10	0.183	63.8	11.7	101	11.6
			11:12-11:27	<0.165		<10.5		<10.4
			11:28-11:34	<0.165		<10.5		<10.4
8	TC2-R3-1201	5/20/10	21:54-22:10	0.173	55.4	9.57	86.6	11.0
			22:11-22:26	0.166		9.19		10.6
			22:27-22:42	<0.165		<9.16		<10.6
			22:43-22:58	<0.165		<9.16		<10.6
			22:58-23:09	0.192		10.7		12.3
9	TC2-R4-1201	5/22/10	08:08-08:23	0.363	59.3	21.5	100	21.5
			08:24-08:39	0.310		18.3		18.4
			08:40-08:55	0.302		17.9		17.9
			08:55-09:08	<0.165		<9.80		<9.80
10	TC2-R5-1201	5/23/10	15:56-16:12	0.956	50.3	48.1	83.8	57.5
			16:14-16:29	0.250		12.6		15.0
			16:30-16:45	0.491		24.7		29.5

Table 2-35. Results for Toluene Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Toluene Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	<0.165	79.1	<13.1	82.0	<15.9
			21:50-22:05	0.428		33.9		41.3
12	TC3-R2-1201	6/16/10	07:55-08:10	0.344	56.2	19.3	94.2	20.5
			08:12-08:27	<0.165		<9.30		<9.87
			08:29-08:40	<0.165		<9.30		<9.87
13	TC3-R1-1202	6/17/10	02:46-03:02	0.216	35.9	7.75	93.4	8.30
			03:03-03:17	<0.165		<5.94		<6.36
			03:20-03:34	<0.165		<5.94		<6.36
			03:36-03:50	<0.165		<5.94		<6.36
14	TC3-R3-1201	6/17/10	20:35-20:50	0.675	54.2	36.6	87.1	42.0
			20:52-21:07	0.263		14.2		16.3
			21:09-21:27	0.166		9.01		10.3
15	TC3-R2-1202	6/18/10	14:28-14:32	<0.165	44.1	<7.29	57.4	<12.7
			14:34-14:48	<0.165		<7.29		<12.7
			14:50-15:00	<0.165		<7.29		<12.7

Table 2-36. Results for Toluene Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Toluene Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery Study (%)	Corrected Average Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	1.90	47.7	90.7	95.1	95.4
			10:36-10:43	0.912		43.5		45.8
			10:43-10:53	0.664		31.7		33.3
17	TC4-R2-1201	8/27/10	20:04-20:14	<0.175	62.4	<10.9	92.1	<11.9
			20:17-20:24	<0.175		<10.9		<11.9
			20:24-20:34	<0.175		<10.9		<11.9
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.5	-[1]	102	-[1]
			13:21-13:28	<0.175		<10.1		<9.89
			13:28-13:36	<0.175		<10.1		<9.89
			13:36-13:40	<0.175		<10.1		<9.89
19	TC4-R3-1201	8/29/10	05:50-06:00	0.414	46.0	19.1	92.7	20.6
			06:05-06:11	0.192		8.85		9.54
			06:11-06:20	0.191		8.81		9.50
			06:34-06:40	0.185		8.52		9.19
20	TC4-R2-1202	8/29/10	Invalid Test Run					
21	TC4-R4-1201	8/30/10	15:32-15:40	1.67	38.3	63.8	92.5	69.0
			15:50-16:00	0.610		23.4		25.3
			16:00-16:07	0.604		23.1		25.0
22	TC4-R3-1202	8/31/10	08:30-08:40	0.657	39.6	26.1	95.5	27.2
			08:45-08:52	0.598		23.7		24.8
			08:52-09:02	0.472		18.7		19.6
			09:10-09:15	0.605		24.0		25.1
23	TC4-R5-1201	9/1/10	01:58-02:07	1.00	37.9	38.1	92.5	41.2
			02:10-02:20	0.408		15.5		16.7
			02:20-02:28	0.471		17.8		19.3
24	TC4-R4-1202	9/1/10	18:36-18:46	0.602	43.3	26.0	78.2	33.3
			18:51-18:56	0.427		18.5		23.6
			18:56-19:02	0.462		20.0		25.5
25	TC4-R6-1201	9/2/10	11:29-11:38	1.73	49.4	85.2	98.2	86.7
			11:44-11:49	0.365		18.0		18.3
			11:49-11:59	0.658		32.5		33.1

[1] The bag sample collected during this sampling interval was invalid.

2.4.8 Results for Toluene Mass Emission Rates

Toluene mass emission rates, calculated as lbs/min, lbs/interval, lbs/cycle and tons per year, are presented in Tables 2-37 through 2-40. Section 2.2 discusses the development of target compound mass emission rates from both measured and extrapolated data. Some concentration results were below the applicable method detection limit and are reported as a maximum ("<"). In subsequent mass emission rate calculations, when at least one (1) bag sample yielded a result above the method detection limit, concentration results below the method detection limit are treated as zero (0). On average, 11% of the total toluene mass emissions for each complete venting cycle were extrapolated.

Table 2-37. Results for Toluene Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Toluene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Toluene Mass Emission Rate (lbs/min)	Toluene Mass Emission Rate (lbs/interval)	Toluene Mass Emission Rate (lbs/cycle)	Toluene Mass Emission Rate (tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:04	16	67.5	16,690	0.270	4.31	6.13	1.58
					02:04-02:19	15	28.4	16,503	0.112	1.68		
					02:19-02:28	9	11.5	5,113	0.0141	0.127		
					02:28-02:31[1]	3	11.5	149	0.000412	0.00123		
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:09	10	18.2	11,923	0.0520	0.520	1.93	0.497
					09:09-09:24	15	14.0	10,862	0.0364	0.545		
					09:24-10:17[1]	53	14.0	4,867	0.0163	0.864		
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:10	15	13.6	19,128	0.0623	0.934	1.45	0.373
					18:10-18:25	15	7.16	19,964	0.0342	0.513		
					18:25-18:40	15	<6.30	18,571	<0.0280	<0.420		
					18:40-18:59	19	<6.30	12,852	<0.0194	<0.368		
					18:59-19:17[1]	18	<6.30	2,942	<0.00443	<0.0798		
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:10	16	11.3	16,856	0.0456	0.730	1.36	0.350
					03:10-03:25	15	7.37	13,030	0.0230	0.345		
					03:25-03:40	15	8.07	9,743	0.0188	0.282		
					03:40-04:00	20	<6.75	6,707	<0.0108	<0.217		
					04:00-04:08[1]	8	<6.75	2,354	<0.00380	<0.0304		
5	TC1-R5-1201	5/16/10	15:24-17:17	113	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-38. Results for Toluene Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Toluene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Toluene Mass Emission Rate (lbs/min)	Toluene Mass Emission Rate (lbs/interval)	Toluene Mass Emission Rate (lbs/cycle)	Toluene Mass Emission Rate (tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	Invalid Test Run							
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:12	17	11.6	13,691	0.0379	0.644	0.644	0.166
					11:12-11:28	16	<10.4	9,046	<0.0225	<0.360		
					11:28-11:37	9	<10.4	3,578	<0.00890	<0.0801		
					11:37-11:39[1]	2	<10.4	501	<0.00125	<0.00249		
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-22:11	17	11.0	14,786	0.0391	0.664	1.48	0.383
					22:11-22:27	16	10.6	12,888	0.327	0.523		
					22:27-22:43	16	<10.6	11,690	<0.0296	<0.474		
					22:43-22:58	15	<10.6	10,392	<0.0264	<0.395		
					22:58-23:10	12	12.3	7,762	0.228	0.274		
					23:10-23:13[1]	3	12.3	2,598.4	0.00765	0.0229		
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-08:24	16	21.5	10,738	0.0553	0.885	1.77	0.455
					08:24-08:40	16	18.4	6,510	0.0286	0.457		
					08:40-08:55	15	17.9	6,616	0.0283	0.425		
					08:55-09:08	13	<9.80	6,565	<0.0154	<0.200		
					09:08-09:32[1]	24	<9.80	5,120	<0.0120	<0.288		
10	TC2-R5-1201	5/23/10	15:56-16:58	62	15:56-16:14	18	57.5	13,581	0.187	3.36	5.68	1.46
					16:14-16:30	16	15.0	12,036	0.0433	0.692		
					16:30-16:47	17	29.5	10,940	0.0772	1.31		
					16:47-16:58[1]	11	29.5	4,061	0.0287	0.315		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-39. Results for Toluene Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Toluene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Toluene Mass Emission Rate (lbs/min)	Toluene Mass Emission Rate (lbs/interval)	Toluene Mass Emission Rate (lbs/cycle)	Toluene Mass Emission Rate (tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-21:50	17	<15.9	13,728	<0.0522	<0.888	4.01	1.03
					21:50-22:05	15	41.3	12,980	0.1283	1.92		
					22:05-22:23[1]	18	41.3	11,753	0.1161	2.09		
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:12	17	20.5	14,162	0.0695	1.18	1.18	0.305
					08:12-08:29	17	<9.87	12,844	<0.0303	<0.516		
					08:29-08:40	11	<9.87	12,386	<0.0292	<0.322		
					08:40-08:56[1]	16	<9.87	7,832	<0.0185	<0.296		
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:03	17	8.30	17,120	0.0340	0.578	0.578	0.149
					03:03-03:20	17	<6.36	17,604	<0.0268	<0.455		
					03:20-03:36	16	<6.36	17,637	<0.0268	<0.429		
					03:36-03:50	14	<6.36	17,534	<0.0267	<0.373		
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-20:52	17	42.0	14,003	0.141	2.39	4.26	1.10
					20:52-21:09	17	16.3	14,317	0.0560	0.952		
					21:09-21:27	18	10.3	13,802	0.0341	0.614		
					21:27-21:41[1]	14	10.3	8,629	0.0213	0.299		
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-14:34	6	<12.7	17,434	<0.0530	<0.318	<1.62	<0.417
					14:34-14:50	16	<12.7	15,222	<0.0462	<0.740		
					14:50-15:00	10	<12.7	10,653	<0.0324	<0.324		
					15:00-15:16[1]	16	<12.7	4,869	<0.0148	<0.237		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-40. Results for Toluene Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Toluene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Toluene Mass Emission Rate (lbs/min)	Toluene Mass Emission Rate (lbs/interval)	Toluene Mass Emission Rate (lbs/cycle)	Toluene Mass Emission Rate (tons/year)
16	TC4-R1-1201	8/26/10	10:23-11:13	50	10:23-10:36	13	95.4	908	0.0207	0.269	0.769	0.198
					10:36-10:43	7	45.8	951	0.0104	0.0729		
					10:43-10:53	10	33.3	1,318	0.0105	0.105		
					10:53-11:13[1]	20	33.3	2,017	0.0161	0.322		
17	TC4-R2-1201	8/27/10	20:04-21:03	59	20:04-20:17	13	<11.9	14,772	<0.0421	<0.547	<1.97	<0.507
					20:17-20:24	7	<11.9	14,242	<0.0405	<0.284		
					20:24-20:34	10	<11.9	13,747	<0.0391	<0.391		
					20:34-21:03[1]	29	<11.9	9,040	<0.0257	<0.746		
18	TC4-R1-1202	8/28/10	13:06-13:56	50	13:06-13:21[1]	15	<9.89	12,541	<0.0297	<0.445	<0.972	<0.250
					13:21-13:28	7	<9.89	8,187	<0.0194	<0.136		
					13:28-13:36	8	<9.89	6,856	<0.0162	<0.130		
					13:36-13:40	4	<9.89	5,885	<0.0139	<0.0557		
					13:40-13:56[1]	16	<9.89	5,427	<0.0128	<0.205		
19	TC4-R3-1201	8/29/10	05:50-06:51	61	05:50-06:05	15	20.6	15,862	0.0781	1.17	2.50	0.645
					06:05-06:11	6	9.54	15,814	0.0361	0.217		
					06:11-06:34	23	9.50	14,406	0.0328	0.753		
					06:34-06:40	6	9.19	12,218	0.0269	0.161		
					06:40-06:51[1]	11	9.19	8,267	0.0182	0.200		
20	TC4-R2-1202	8/29/10	22:56-23:54	58	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-40 (Continued). Results for Toluene Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Toluene Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Toluene Mass Emission Rate (lbs/min)	Toluene Mass Emission Rate (lbs/interval)	Toluene Mass Emission Rate (lbs/cycle)	Toluene Mass Emission Rate (tons/year)
21	TC4-R4-1201	8/30/10	15:32-16:15	43	15:32-15:50	18	69.0	10,584	0.175	3.15	4.11	1.06
					15:50-16:00	10	25.3	7,489	0.0453	0.453		
					16:00-16:07	7	25.0	7,089	0.0425	0.297		
					22:05-22:23[1]	8	25.0	4,455	0.0267	0.213		
22	TC4-R3-1202	8/31/10	08:30-09:32	62	08:30-08:45	15	27.2	11,922	0.0777	1.16	3.06	0.788
					08:45-08:52	7	24.8	10,791	0.0640	0.448		
					08:52-09:10	18	19.6	9,231	0.0432	0.777		
					09:10-09:15	5	25.1	7,377	0.0443	0.222		
					09:15-09:32[1]	17	25.1	4,388	0.0264	0.448		
23	TC4-R5-1201	9/1/10	01:58-02:34	36	01:58-02:10	12	41.2	7,749	0.0763	0.916	1.33	0.342
					02:10-02:20	10	16.7	4,900	0.0196	0.196		
					02:20-02:28	8	19.3	3,920	0.0181	0.145		
					02:28-02:34[1]	6	19.3	2,619	0.0121	0.0725		
24	TC4-R4-1202	9/1/10	18:36-19:17	41	18:36-18:51	15	33.3	12,937	0.103	1.54	2.40	0.619
					18:51-18:56	5	23.6	10,087	0.0570	0.285		
					18:56-19:02	6	25.5	8,548	0.0522	0.313		
					19:02-19:17[1]	15	25.5	2,815	0.0172	0.258		
25	TC4-R6-1201	9/2/10	11:29-12:14	45	11:29-11:44	15	86.7	13,157	0.273	4.10	5.99	1.54
					11:44-11:49	5	18.3	11,927	0.0523	0.262		
					11:49-11:59	10	33.1	11,259	0.0891	0.891		
					11:59-12:14[1]	15	33.1	6,232	0.0493	0.740		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

2.5 Results for NMNE VOC Emissions

The total VOC concentration in the 1201 Vent and 1202 Vent gas streams was measured conservatively during the 2010 Source Test as THC using FID-based portable gas analyzers. The precise and accurate quantification of methane and ethane concentrations is critical to the measurement of VOC emissions because methane and ethane have been determined by US EPA to have negligible atmospheric photochemical reactivity. As such, the concentrations of methane and ethane may be subtracted from the average THC concentrations prior to the development of VOC mass emission rates. VOC results determined in this manner are referred to as non-methane/non-ethane VOC emissions (NMNE VOC). THC concentrations were measured according to modified US EPA Methods 25A, "*Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer*," and the dilution sampling system procedures described in US EPA OTM 12.

2.5.1 Results for NMNE VOC Concentrations

Samples of the 1201 Vent and 1202 Vent gas streams were extracted using the same dilution sampling system used to collect methane, ethane, benzene and toluene samples by modified US EPA Method 18 (see Section 2.4). The diluted sample gas was routed to gas analyzers that measured THC concentrations as parts per million by volume, wet basis (ppmvw), continuously during the venting cycle. Standards of propane in a balance of nitrogen were used to calibrate THC analyzers and nitrogen was also used as the dilution gas with the dilution sampling system. The average DR developed on a test run-by-test run basis was multiplied to the average total VOC concentration result per sampling interval. Average methane/propane and average ethane/propane equivalent concentrations were calculated using RF per carbon data applied to average methane and ethane concentration results from GC/FID analyses. Finally, average methane/propane equivalent and average ethane/propane equivalent concentrations were subtracted from average total VOC concentrations to develop average NMNE VOC concentrations during a given sampling interval.

During two (2) sampling intervals of Run 15, ethane concentrations were not measured above the applicable method detection limit. In this case, the ethane results were treated as zero (0) during the calculations for NMNE VOC concentrations. During some sampling intervals of Runs 3, 7, 8, 15, 16, 17, 24 and 25, the total of average methane/propane equivalent concentrations and ethane/propane equivalent concentrations exceeded average total VOC concentrations. In these cases, subsequent calculations for NMNE VOC mass emission rates applied a concentration of zero (0) ppmvw for NMNE VOC. Average total VOC and average NMNE VOC concentrations data per sampling interval for each test run are presented in Tables 2-41 through 2-44. Valid NMNE VOC concentration results were not obtained during Runs 4, 5 and 20 due to malfunctions that occurred with the dilution sampling system. Raw data associated with the operation of the THC analyzers are included in **Appendix 2-4**. **Appendix 2-4** also presents graphs of instantaneous THC concentration results per elapsed time of the venting cycle.

Table 2-41. Results for NMNE VOC Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Sampling Interval (hh:mm)	Sampling Duration (min)	Average Total VOC Conc. (ppmvw)	Average Methane Conc. (ppmvw)	Methane/ Propane Equivalent Conc. (ppmvw)	Average Ethane Conc. (ppmvw)	Ethane/ Propane Equivalent Conc. (ppmvw)	Average NMNE VOC Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:04	16	8,072	14,746	4,885	1,824	1,213	1,974
					02:04-02:19	15	6,646	12,928	4,283	1,581	1,052	1,311
					02:19-02:28	9	2,395	4,861	1,611	601	400	384
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:09	10	5,000	10,179	3,372	1,213	806	821
					09:09-09:24	15	4,830	7,905	2,619	920	612	1,599
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:10	15	1,110	2,032	673	228	152	285
					18:10-18:25	15	454	1,023	339	115	76.4	39.2
					18:25-18:40	15	610	1,317	436	147	97.5	76.5
					18:40-18:59	19	768	1,968	652	215	143	-26.6
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:10	16	950	1,687	559	198	132	259
					03:10-03:25	15	637	1,436	476	171	114	48.1
					03:25-03:40	15	677	1,485	492	178	118	67.1
					03:40-04:00	20	704	1,406	466	171	113	125
5	TC1-R5-1201	5/16/10	15:24-17:17	113	Invalid Test Run							

Table 2-42. Results for NMNE VOC Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Sampling Interval (hh:mm)	Sampling Duration (min)	Average Total VOC Conc. (ppmvw)	Average Methane Conc. (ppmvw)	Methane/ Propane Equivalent Conc. (ppmvw)	Average Ethane Conc. (ppmvw)	Ethane/ Propane Equivalent Conc. (ppmvw)	Average NMNE VOC Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	Invalid Test Run							
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:10	15	714	1,454	482	179	119	113
					11:12-11:27	15	217	969	321	111	73.8	-178
					11:28-11:37	9	692	2,232	740	215	143	-190
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-22:10	16	3,002	7,697	2,550	1,056	702	-250
					22:11-22:26	15	2,300	4,754	1,575	643	428	298
					22:27-22:42	15	2,208	4,453	1,475	599	398	334
					22:43-22:58	15	2,083	4,208	1,394	559	372	316
					22:58-23:10	12	2,665	6,247	2,070	822	546	49.4
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-08:23	15	10,718	14,769	6,072	1,911	1,364	3,282
					08:24-08:39	15	5,437	11,011	3,648	1,409	937	852
					08:40-08:55	15	5,196	10,146	3,361	1,295	861	973
					08:55-09:08	13	3,700	2,742	908	344.5	229	2,563
10	TC2-R5-1201	5/23/10	15:56-16:58	62	15:56-16:12	16	20,921	38,270	15,733	5,560	3,970	1,218
					16:14-16:29	15	4,681	9,195	3,046	1,289	857	777
					16:30-16:47	17	9,988	18,232	6,040	2,589	1,722	2,227

Table 2-43. Results for NMNE VOC Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Sampling Interval (hh:mm)	Sampling Duration (min)	Average Total VOC Conc. (ppmvw)	Average Methane Conc. (ppmvw)	Methane/ Propane Equivalent Conc. (ppmvw)	Average Ethane Conc. (ppmvw)	Ethane/ Propane Equivalent Conc. (ppmvw)	Average NMNE VOC Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-21:49	16	6,782	10,168	4,180	1,284	917	1,684
					21:50-22:05	15	5,040	3,052	1,255	378	270	3,516
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:10	15	9,827	16,307	6,704	2,134	1,524	1,599
					08:12-08:27	15	3,207	6,634	2,198	871	579	430
					08:29-08:40	11	2,785	5,686	1,884	743	494	407
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:02	16	8,494	12,161	5,847	1,484	1,251	1,396
					03:03-03:17	15	3,754	4,756	2,286	579	488	979
					03:20-03:34	14	2,589	2,833	1,362	341	287	940
					03:36-03:50	14	2,366	2,989	1,437	357	301	628
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-20:50	15	11,622	18,910	7,774	2,490	1,778	2,070
					20:52-21:07	15	3,282	6,686	2,215	877	583	484
					21:09-21:27	18	2,865	5,843	1,936	760	505	424
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-14:32	4	1,424	965	330	131	86.3	1,008
					14:34-14:48	14	-32.2	586	200	83.1	54.6	-287
					14:50-15:00	10	-249	46.7	16.0	<1.51	<0.994	-265

Table 2-44. Results for NMNE VOC Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Sampling Interval (hh:mm)	Sampling Duration (min)	Average Total VOC Conc. (ppmvw)	Average Methane Conc. (ppmvw)	Methane/ Propane Equivalent Conc. (ppmvw)	Average Ethane Conc. (ppmvw)	Ethane/ Propane Equivalent Conc. (ppmvw)	Average NMNE VOC Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-11:13	50	10:23-10:32	9	95,639	223,337	82,203	25,153	17,074	-3,638
					10:36-10:43	7	32,861	67,000	25,938	8,834	5,997	926
					10:43-10:53	10	17,919	31,385	11,552	4,063	2,758	3,609
17	TC4-R2-1201	8/27/10	20:04-21:03	59	20:04-20:14	10	2,930	7,600	2,560	1,038	693	-323
					20:17-20:24	7	1,195	3,228	1,087	446	297	-189
					20:24-20:34	10	931	2,613	880	360	240	-189
18	TC4-R1-1202	8/28/10	13:06-13:56	50	13:06-13:21[1]	15	2,188	2,902	965	399	273	950
					13:21-13:28	7	3,406	2,902	994	399	266	2,147
					13:28-13:36	8	928	2,057	705	298	198	24.5
					13:36-13:40	4	3,392	5,425	1,858	776	516	1,018
19	TC4-R3-1201	8/29/10	05:50-06:51	61	05:50-06:00	10	7,317	15,506	5,312	2,028	1,348	656
					06:05-06:11	6	3,387	6,374	2,184	834	555	649
					06:11-06:20	9	2,992	5,698	1,952	742	493	547
					06:34-06:40	6	3,118	5,876	2,013	755	502	603
20	TC4-R2-1202	8/29/10	22:56-23:54	58	Invalid Test Run							

[1] The bag sample collected during this sampling interval for methane and ethane analyses was invalid. NMNE VOC concentration results were extrapolated based upon methane and ethane concentrations measured during the subsequent sampling interval.

Table 2-44 (Continued). Results for NMNE VOC Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Sampling Interval (hh:mm)	Sampling Duration (min)	Average Total VOC Conc. (ppmvw)	Average Methane Conc. (ppmvw)	Methane/ Propane Equivalent Conc. (ppmvw)	Average Ethane Conc. (ppmvw)	Ethane/ Propane Equivalent Conc. (ppmvw)	Average NMNE VOC Conc. (ppmvw)
21	TC4-R4-1201	8/30/10	15:32-16:15	43	15:32-15:40	8	29,174	54,329	18,613	7,120	4,733	5,828
					15:50-16:00	10	8,013	17,605	6,031	2,278	1,515	467
					16:00-16:07	7	9,524	16,950	5,807	2,211	1,470	2,247
22	TC4-R3-1202	8/31/10	08:30-09:32	62	08:30-08:40	10	13,898	13,365	5,286	1,838	1,286	7,327
					08:45-08:52	7	7,488	13,520	5,347	1,833	1,282	859
					08:52-09:02	10	6,824	11,965	4,732	1,613	1,128	965
					09:10-09:15	5	9,283	16,996	6,722	2,263	1,582	979
23	TC4-R5-1201	9/1/10	01:58-02:34	36	01:58-02:07	9	19,525	40,849	13,995	5,187	3,448	2,082
					02:10-02:20	10	9,565	14,228	4,875	1,801	1,197	3,493
					02:20-02:28	8	8,271	15,694	5,377	1,964	1,305	1,589
24	TC4-R4-1202	9/1/10	18:36-19:17	41	18:36-18:46	10	7,091	16,376	6,476	2,116	1,479	-865
					18:51-18:56	5	10,576	22,362	8,844	2,915	2,038	-306
					18:56-19:02	6	7,758	14,142	5,593	1,836	1,284	881
25	TC4-R6-1201	9/2/10	11:29-12:14	45	11:29-11:38	9	27,136	67,550	23,467	8,998	6,212	-2,543
					11:44-11:49	5	8,686	15,101	5,246	2,003	1,382	2,058
					11:49-11:59	10	6,879	15,365	5,338	2,025	1,398	143

2.5.2 Results for NMNE VOC Mass Emission Rates

NMNE VOC mass emission rates, calculated as lbs/min, lbs/interval, lbs/cycle and tons per year, are presented in Tables 2-45 through 2-48. Section 2.2 discusses the development of target compound mass emission rates from both measured and extrapolated data. On average, 17% of the total NMNE VOC mass emissions for each complete venting cycle were extrapolated.

Table 2-45. Results for NMNE VOC Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average NMNE VOC Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	NMNE VOC Mass Emission Rate (lbs/min)	NMNE VOC Mass Emission Rate (lbs/interval)	NMNE VOC Mass Emission Rate (lbs/cycle)	NMNE VOC Mass Emission Rate (tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:04	16	1,974	16,690	3.77	60.4	100	25.7
					02:04-02:19	15	1,311	16,503	2.48	37.2		
					02:19-02:28	9	384	5,113	0.225	2.03		
					02:28-02:31[1]	3	384	149	0.00657	0.0197		
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:09	10	821	11,923	1.12	11.2	88.3	22.8
					09:09-09:24	15	1,599	10,862	1.99	29.9		
					09:24-10:17[1]	53	1,599	4,867	0.892	47.3		
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:10	15	285	19,128	0.625	9.38	13.2	3.39
					18:10-18:25	15	39.2	19,964	0.0896	1.34		
					18:25-18:40	15	76.5	18,571	0.163	2.44		
					18:40-18:59	19	0	12,852	0	0		
					18:59-19:17[1]	18	0	2,942	0	0		
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:10	16	259	16,856	0.500	7.99	12.4	3.19
					03:10-03:25	15	48.1	13,030	0.0718	1.08		
					03:25-03:40	15	67.1	9,743	0.0748	1.12		
					03:40-04:00	20	125	6,707	0.0960	1.92		
					04:00-04:08[1]	8	125	2,354	0.0337	0.270		
5	TC1-R5-1201	5/16/10	15:24-17:17	113	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-46. Results for NMNE VOC Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average NMNE VOC Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	NMNE VOC Mass Emission Rate (lbs/minute)	NMNE VOC Mass Emission Rate (lbs/interval)	NMNE VOC Mass Emission Rate (lbs/cycle)	NMNE VOC Mass Emission Rate (tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	Invalid Test Run							
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:12	17	113	13,691	0.177	3.01	3.01	0.776
					11:12-11:28	16	0	9,046	0	0		
					11:28-11:37	9	0	3,578	0	0		
					11:37-11:39[1]	2	0	501	0	0		
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-22:11	17	0	14,786	0	0	20.4	5.26
					22:11-22:27	16	298	12,888	0.439	7.03		
					22:27-22:43	16	334	11,690	0.447	7.15		
					22:43-22:58	15	316	10,392	0.376	5.65		
					22:58-23:10	12	49.4	7,762	0.0439	0.527		
					23:10-23:13[1]	3	49.4	2,598	0.0147	0.0441		
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-08:24	16	3,282	10,738	4.04	64.6	147	37.9
					08:24-08:40	16	852	6,510	0.635	10.2		
					08:40-08:55	15	973	6,616	0.738	11.1		
					08:55-09:08	13	2,563	6,565	1.93	25.1		
					09:08-09:32[1]	24	2,563	5,120	1.50	36.1		
10	TC2-R5-1201	5/23/10	15:56-16:58	62	15:56-16:14	18	1,218	13,581	1.894	34.1	110.1	28.4
					16:14-16:30	16	777	12,036	1.07	17.1		
					16:30-16:47	17	2,227	10,940	2.79	47.4		
					16:47-16:58[1]	11	2,227	4,061	1.04	11.4		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-47. Results for NMNE VOC Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average NMNE VOC Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	NMNE VOC Mass Emission Rate (lbs/min)	NMNE VOC Mass Emission Rate (lbs/interval)	NMNE VOC Mass Emission Rate (lbs/cycle)	NMNE VOC Mass Emission Rate (tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-21:50	17	1,684	13,728	2.65	45.0	209	53.8
					21:50-22:05	15	3,516	12,980	5.23	78.4		
					22:05-22:23[1]	18	3,516	11,753	4.73	85.2		
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:12	17	1,599	14,162	2.59	44.1	67.1	17.3
					08:12-08:29	17	430	12,844	0.633	10.8		
					08:29-08:40	11	407	12,386	0.578	6.36		
					08:40-08:56[1]	16	407	7,832	0.365	5.85		
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:03	17	1,396	17,120	2.74	46.5	128	33.0
					03:03-03:20	17	979	17,604	1.97	33.6		
					03:20-03:36	16	940	17,637	1.90	30.4		
					03:36-03:50	14	628	17,534	1.26	17.7		
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-20:52	17	2,070	14,003	3.32	56.4	87.9	22.6
					20:52-21:09	17	484	14,317	0.793	13.5		
					21:09-21:27	18	424	13,802	0.671	12.1		
					21:27-21:41[1]	14	424	8,629	0.419	5.87		
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-14:34	6	1,008	17,434	2.01	12.1	12.1	3.11
					14:34-14:50	16	0	15,222	0	0		
					14:50-15:00	10	0	10,653	0	0		
					15:00-15:16[1]	16	0	4,869	0	0		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-48. Results for NMNE VOC Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average NMNE VOC Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	NMNE VOC Mass Emission Rate (lbs/min)	NMNE VOC Mass Emission Rate (lbs/interval)	NMNE VOC Mass Emission Rate (lbs/cycle)	NMNE VOC Mass Emission Rate (tons/year)
16	TC4-R1-1201	8/26/10	10:23-11:13	50	10:23-10:36	13	0	908	0	0	22.8	5.88
					10:36-10:43	7	926	951	0.101	0.707		
					10:43-10:53	10	3,609	1,318	0.545	5.45		
					10:53-11:13[1]	20	3,609	2,017	0.834	16.7		
17	TC4-R2-1201	8/27/10	20:04-21:03	59	20:04-20:17	13	0	14,772	0	0	0	0
					20:17-20:24	7	0	14,242	0	0		
					20:24-20:34	10	0	13,747	0	0		
					20:34-21:03[1]	29	0	9,040	0	0		
18	TC4-R1-1202	8/28/10	13:06-13:56	50	13:06-13:21[1]	15	950	12,541	1.36	20.5	47.6	12.3
					13:21-13:28	7	2,147	8,187	2.01	14.1		
					13:28-13:36	8	24.5	6,856	0.0193	0.154		
					13:36-13:40	4	1,018	5,885	0.686	2.74		
					13:40-13:56[1]	16	1,018	5,427	0.633	10.1		
19	TC4-R3-1201	8/29/10	05:50-06:51	61	05:50-06:05	15	656	15,862	1.19	17.9	57.0	14.7
					06:05-06:11	6	649	15,814	1.17	7.05		
					06:11-06:34	23	547	14,406	0.902	20.7		
					06:34-06:40	6	603	12,218	0.844	5.06		
					06:40-06:51[1]	11	603	8,267	0.571	6.28		
20	TC4-R2-1202	8/29/10	22:56-23:54	58	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-48 (Continued). Results for NMNE VOC Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average NMNE VOC Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	NMNE VOC Mass Emission Rate (lbs/min)	NMNE VOC Mass Emission Rate (lbs/interval)	NMNE VOC Mass Emission Rate (lbs/cycle)	NMNE VOC Mass Emission Rate (tons/year)
21	TC4-R4-1201	8/30/10	15:32-16:15	43	15:32-15:50	18	5,828	10,584	7.07	127	153	39.5
					15:50-16:00	10	467	7,489	0.401	4.01		
					16:00-16:07	7	2,247	7,089	1.82	12.8		
					16:07-16:15[1]	8	2,247	4,455	1.15	9.17		
22	TC4-R3-1202	8/31/10	08:30-09:32	62	08:30-08:45	15	7,327	11,922	10.0	150	188	48.5
					08:45-08:52	7	859	10,791	1.06	7.44		
					08:52-09:10	18	965	9,231	1.02	18.4		
					09:10-09:15	5	979	7,377	0.827	4.14		
					09:15-09:32[1]	17	979	4,388	0.492	8.36		
23	TC4-R5-1201	9/1/10	01:58-02:34	36	01:58-02:10	12	2,082	7,749	1.85	22.2	50.3	13.0
					02:10-02:20	10	3,493	4,900	1.96	19.6		
					02:20-02:28	8	1,589	3,920	0.713	5.71		
					02:28-02:34[1]	6	1,589	2,619	0.477	2.86		
24	TC4-R4-1202	9/1/10	18:36-19:17	41	18:36-18:51	15	0	12,937	0	0	9.44	2.43
					18:51-18:56	5	0	10,087	0	0		
					18:56-19:02	6	881	8,548	0.863	5.18		
					19:02-19:17[1]	15	881	2,815	0.284	4.26		
25	TC4-R6-1201	9/2/10	11:29-12:14	45	11:29-11:44	15	0	13,157	0	0	17.4	4.49
					11:44-11:49	5	2,058	11,927	2.81	14.1		
					11:49-11:59	10	143	11,259	0.185	1.85		
					11:59-12:14[1]	15	143	6,232	0.102	1.53		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

2.6 Results for SVOC Emissions

Selected SVOCs were measured according to modified SW-846 Method 0010, "*Modified Method 5 Sampling Train*." SVOC samples were extracted from the 1201 Vent gas stream isokinetically. It is likely that some SVOCs present in the vent gas stream were quantified with the dilution sampling system and FID analyses according to modified US EPA Method 25A and reported as NMNE VOC. Therefore, some overlap may exist between the reported NMNE VOC and total SVOC mass emission rates. Total SVOC mass emission rates ranged between 0.7 and 5% of the NMNE VOC mass emission rates (per test run). A conservative estimate of the degree of overlap between the total SVOC and NMNE VOC mass emission rate data (i.e., the percentage of the NMNE mass emission rate data that is attributed to SVOC) was <5%.

2.6.1 Results for SVOC Concentrations

Three (3) sample fractions were extracted separately in accordance with modified SW-846 Method 3542, "*Extraction of Semivolatile Analytes Collected Using Method 0010 (Modified Method 5 Sampling Train*" (see Section 3.0 for details). The three (3) sampling train extracts were analyzed using SW-846 Method 8270C, "*Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)*." The three (3) sampling train fractions were:

- The combined filter and probe and nozzle rinses;
- The combined mid-train rinses and pre-XAD sorbent condensate catch; and
- The combined XAD sorbent and post-XAD condensate catch.

The following tables contain dry vent gas concentrations per sampling train that required the addition of three (3) analytical results (one per fraction) for selected SVOC. It is important to note that SVOC analyses resulted in consistent "hits" for some organic compounds (e.g., naphthalene) several orders of magnitude greater than the method detection limits for non-detected analytes. To simplify the reported data, if one (1) or more individual results of the data set are reported as a non-detect, the results are treated as zero (0) in the calculation of a total dry gas concentration per sampling train. The full laboratory report detailing the analyses of vent gas samples for SVOC concentrations is presented in **Appendix 2-5**. In addition to the target SVOC analytes listed in SW-846 Method 8270C, a MS library search was conducted and the 20 most-concentrated tentatively identified compounds (TICs) in the vent gas, per sample fraction, are reported in **Appendix 2-6.**

The minimum dry gas sample volume of 105.9 cubic feet specified by SW-846 Method 0010 was not obtained during any test run due to the limited sampling durations (<75 minutes), the minimal dry gas fraction of the 1201 Vent and 1202 Vent gas streams (<2%), and the large volume of water that was condensed in a relatively short period of time. However, a *wet* gas sample volume of >105.9 cubic feet (corrected to standard conditions) was collected during seven (7) out of ten (10) test runs. Per the *Protocol*, the failure to meet the specified sample volume criteria did not invalidate any collected data.

The analytical method detection limits for selected SVOC dry gas concentrations were affected by the reduced dry gas sample volumes collected on the high-moisture 1201 Vent gas stream. In addition, the high concentrations of some selected SVOC required multiple sample dilutions prior to laboratory analysis. After comparing the analytical data obtained through this test effort with professional experience using SW-846 Method 0010 on a variety of combustion sources, URS estimates that the SVOC method detection limits are generally at least two (2) orders of magnitude higher than those associated with typical source testing.

Tables 2-4 and 2-5 present summaries of modified SW-846 Method 0010 sampling train operating data such as dry and wet gas volumes collected and isokinetic sampling rates achieved. Selected SVOC concentrations measured during Test Condition 1 and Test Condition 2 are presented in Tables 2-49 through 2-58. SVOC were not measured during Test Condition 3 and Test Condition 4.

Table 2-49. SVOC Concentration Results – Run 1

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 1 / TC1-R1-1201	5/7/10	01:48-02:31	01:48-02:26	38	1.16
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	710	16	730	630
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	17	0	0	17	15
2,4-Dimethylphenol	0	0	0	0	0
Dimethyl phthalate	0	0	0	0	0
Aniline	0	0	0	0	0
Di-n-octyl phthalate	0	2,600	0	2,600	2,200
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	0	0	0	0
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	2,700	19	2,700	2,300
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	4.5	0	0	4.5	3.9
Fluorene	0	2,800	40	2,800	2,500
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	46	0	0	46	40
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	0	46,000	2,100	48,000	41,000
2-Methylphenol	0	380	0	380	330
Naphthalene	0	26,000	2,500	29,000	25,000
1-Naphthylamine	0	0	0	0	0

Table 2-49 (Continued). SVOC Concentration Results - Run 1

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 1 / TC1-R1-1201	5/7/10	01:48-02:31	01:48-02:26	38	1.16
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	27	4,400	0	4,400	3,800
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	64	630	0	690	600
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	49	0	0	49	42
Benzo(k)fluoranthene	13	0	0	13	11
Benzoic acid	0	0	0	0	0
Benzo(ghi)perylene	110	1,100	2.8	1,200	1,000
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	130	0	0	130	110
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	8.9	6,500	47	6,600	5,700
Phenol	0	0	0	0	0
2-Picoline	0	560	0	560	480
Pyrene	24	1,700	0	1,700	1,500
Pyridine	0	0	0	0	0
Acetophenone	0	0	0	0	0

Table 2-49 (Continued). SVOC Concentration Results - Run 1

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 1 / TC1-R1-1201	5/7/10	01:48-02:31	01:48-02:26	38	1.16

SVOC Analyte	Probe and Nozzle Rinses/ Filter Mass (µg)	Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)	XAD/ Post-XAD Condensate Mass (µg)	Total Mass (µg)	Total Conc. (µg/dscf)
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	0	0	0	0
3-Methylphenol & 4-Methylphenol	0	0	0	0	0
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	0	0	0	0
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	69	0	0	69	60
Dibenz(a,h)anthracene	61	0	0	61	53
Dibenzofuran	0	610	11	620	540
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-50. SVOC Concentration Results – Run 2

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 2 / TC1-R2-1201	5/8/10	08:59-10:17	08:59-09:25	26	1.27
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	810	24	830	650
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	4.5	0	0	4.5	3.5
2,4-Dimethylphenol	0	0	0	0	0
Dimethyl phthalate	0	0	0	0	0
Aniline	0	0	0	0	0
Di-n-octyl phthalate	0	2,500	0	2,500	2,000
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	0	0	0	0
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	2,200	20	2,200	1,700
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	0	0	0	0	0
Fluorene	1.6	3,400	63	3,500	2,700
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	4.7	0	0	4.7	3.7
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	6.5	67,000	4,400	71,000	56,000
2-Methylphenol	0	460	0	460	360
Naphthalene	0	38,000	5,300	43,000	34,000
1-Naphthylamine	0	0	0	0	0

Table 2-50 (Continued). SVOC Concentration Results - Run 2

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 2 / TC1-R2-1201	5/8/10	08:59-10:17	08:59-09:25	26	1.27
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	4,400	0	4,400	3,500
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	5.9	0	0	5.9	4.6
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	5.0	0	0	5.0	3.9
Benzo(k)fluoranthene	0	0	0	0	0
Benzoic acid	18	0	0	18	14
Benzo(ghi)perylene	12	0	0	12	9.4
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	13	0	0	13	10
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	6.0	6,400	60	6,500	5,100
Phenol	0	0	0	0	0
2-Picoline	0	740	8.8	750	590
Pyrene	3.2	1,200	0	1,200	940
Pyridine	0	0	0	0	0
Acetophenone	0	0	0	0	0

Table 2-50 (Continued). SVOC Concentration Results - Run 2

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 2 / TC1-R2-1201	5/8/10	08:59-10:17	08:59-09:25	26	1.27
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	0	0	0	0
3-Methylphenol & 4-Methylphenol	0	0	0	0	0
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	0	0	0	0
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	6.5	0	0	6.5	5.1
Dibenz(a,h)anthracene	5.9	0	0	5.9	4.6
Dibenzofuran	0	880	21	900	710
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-51. SVOC Concentration Results – Run 3

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 3 / TC1-R3-1201	5/9/10	17:55-19:17	17:55-18:44	49	0.410
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	260	39	300	730
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	0	0	0	0	0
2,4-Dimethylphenol	0	240	49	290	700
Dimethyl phthalate	0	0	0	0	0
Aniline	0	250	27	280	680
Di-n-octyl phthalate	0	250	0	250	610
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	100	0	100	240
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	1,800	250	2,100	5,000
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	0	430	57	490	1,200
Fluorene	0	1,200	170	1,400	3,300
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	0	0	0	0	0
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	0	14,000	2,400	16,000	40,000
2-Methylphenol	0	300	71	370	900
Naphthalene	0	8,200	1,900	10,000	25,000
1-Naphthylamine	0	0	0	0	0

Table 2-51 (Continued). SVOC Concentration Results - Run 3

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 3 / TC1-R3-1201	5/9/10	17:55-19:17	17:55-18:44	49	0.410
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	0	0	0	0
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	1.7	360	41	400	980
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	130	0	130	320
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	0	0	5.6	5.6	14
Benzo(k)fluoranthene	0	0	0	0	0
Benzoic acid	0	0	0	0	0
Benzo(ghi)perylene	2.3	0	0	2.3	5.6
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	2.8	82	8.1	93	230
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	0	3,900	540	4,400	11,000
Phenol	0	240	48	290	700
2-Picoline	0	240	64.0	300	740
Pyrene	1.2	1,600	210	1,800	4,400
Pyridine	0	0	25	25	61
Acetophenone	0	0	0	0	0

Table 2-51 (Continued). SVOC Concentration Results - Run 3

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 3 / TC1-R3-1201	5/9/10	17:55-19:17	17:55-18:44	49	0.410
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	250	50	300	730
3-Methylphenol & 4-Methylphenol	0	250	58	310	750
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	0	0	0	0
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	1.6	320	31	350	860
Dibenz(a,h)anthracene	0	0	0	0	0
Dibenzofuran	0	270	38	310	750
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-52. SVOC Concentration Results – Run 4

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 4 / TC1-R4-1201	5/11/10	02:54-04:08	02:54-03:40	46	0.546
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	210	50	260	480
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	0	0	0	0	0
2,4-Dimethylphenol	0	120	0	120	220
Dimethyl phthalate	0	0	0	0	0
Aniline	0	150	0	150	270
Di-n-octyl phthalate	5.1	250	0	260	470
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	96	21	120	210
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	1,100	200	1,300	2,400
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	0	240	36	280	510
Fluorene	0	770	160	930	1,700
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	0	0	0	0	0
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	0	11,000	3,400	14,000	26,000
2-Methylphenol	0	140	12	150	280
Naphthalene	0	6,100	1,900	8,000	15,000
1-Naphthylamine	0	0	0	0	0

Table 2-52 (Continued). SVOC Concentration Results - Run 4

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 4 / TC1-R4-1201	5/11/10	02:54-04:08	02:54-03:40	46	0.546
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	0	0	0	0
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	0	310	37	350	640
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	130	26	160	290
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	0	0	6.5	6.5	12
Benzo(k)fluoranthene	0	0	0	0	0
Benzoic acid	0	0	0	0	0
Benzo(ghi)perylene	0	0	0	0	0
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	0	73	7.3	80	150
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	0	2,200	390	2,600	4,700
Phenol	0	110	12	120	220
2-Picoline	0	220	16	240	430
Pyrene	0	970	140	1,100	2,000
Pyridine	0	0	0	0	0
Acetophenone	0	0	0	0	0

Table 2-52 (Continued). SVOC Concentration Results - Run 4

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 4 / TC1-R4-1201	5/11/10	02:54-04:08	02:54-03:40	46	0.546
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	120	12	130	240
3-Methylphenol & 4-Methylphenol	0	110	8.7	120	220
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	37	0	37	68
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	0	290	33	320	590
Dibenz(a,h)anthracene	0	0	0	0	0
Dibenzofuran	0	160	36	200	360
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-53. SVOC Concentration Results – Run 5

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 5 / TC1-R5-1201	5/16/10	15:24-17:17	15:24-16:11	47	1.75
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	1,200	160	1,400	780
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	0	0	0	0	0
2,4-Dimethylphenol	0	1,000	0	1,000	570
Dimethyl phthalate	0	0	0	0	0
Aniline	0	270	0	270	150
Di-n-octyl phthalate	0	13	0	13	7.4
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	0	0	0	0
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	2,500	280	2,800	1,600
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	0.0	390	29	420	240
Fluorene	0	3,600	400	4,000	2,300
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	34	89	4	130	72
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	0	59,000	7,600	67,000	38,000
2-Methylphenol	0	860	0	860	490
Naphthalene	0	32,000	5,500	38,000	21,000
1-Naphthylamine	0	0	0	0	0

Table 2-53 (Continued). SVOC Concentration Results - Run 5

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 5 / TC1-R5-1201	5/16/10	15:24-17:17	15:24-16:11	47	1.75
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	0	0	0	0
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	21	780	42	840	480
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	24	170	10	200	120
Benzo(k)fluoranthene	10	76	0	86	49
Benzoic acid	0	0	0	0	0
Benzo(ghi)perylene	92	220	7.4	320	180
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	91	460	23	570	330
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	3.8	5,700	550	6,300	3,600
Phenol	0	400	24	420	240
2-Picoline	0	790	52	840	480
Pyrene	7	1,700	120	1,800	1,000
Pyridine	0	160	0	160	91
Acetophenone	0	0	0	0	0

Table 2-53 (Continued). SVOC Concentration Results - Run 5

Run No. / Run I.D.	**Date**	**Venting Cycle (hh:mm)**	**Sampling Interval (hh:mm)**	**Sampling Duration (min)**	**Dry Gas Sample Volume (dscf)**
Run 5 / TC1-R5-1201	5/16/10	15:24-17:17	15:24-16:11	47	1.75
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	240	20	260	150
3-Methylphenol & 4-Methylphenol	0	700	25	730	410
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	27	0	27	15
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	51	12	63	36
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	25	760	38	820	470
Dibenz(a,h)anthracene	47	120	4	170	98
Dibenzofuran	0	580	83	660	380
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-54. SVOC Concentration Results – Run 6

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 6 / TC2-R1-1201	5/18/10	00:34-01:24	00:34-01:20	46	0.508
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	250	3	250	500
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	0	0	0	0	0
2,4-Dimethylphenol	0	290	0	290	570
Dimethyl phthalate	0	0	0	0	0
Aniline	0	210	0	210	410
Di-n-octyl phthalate	0	0	0	0	0
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	0	0	0	0
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	1,700	0	1,700	3,300
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	0	280	0	280	550
Fluorene	0	980	4	980	1,900
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	1.9	9.0	0	11	21
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	1.9	13,000	680	14,000	27,000
2-Methylphenol	0	290	0	290	570
Naphthalene	0	8,900	760	9,700	19,000
1-Naphthylamine	0	0	0	0	0

Table 2-54 (Continued). SVOC Concentration Results - Run 6

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 6 / TC2-R1-1201	5/18/10	00:34-01:24	00:34-01:20	46	0.508
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	0	0	0	0
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	2.9	260	0	260	520
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	0	26	0	26	51
Benzo(k)fluoranthene	0	12	0	12	24
Benzoic acid	0	0	57	57	110
Benzo(ghi)perylene	5.2	20	0	25	50
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	5.2	69	0	74	150
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	1.5	3,400	3.9	3,400	6,700
Phenol	0	190	2.6	190	380
2-Picoline	0	380	0.0	380	750
Pyrene	5.5	980	0	990	1,900
Pyridine	0	100	140	240	470
Acetophenone	0	0	0	0	0

Table 2-54 (Continued). SVOC Concentration Results - Run 6

Run No. / Run I.D.	**Date**	**Venting Cycle (hh:mm)**	**Sampling Interval (hh:mm)**	**Sampling Duration (min)**	**Dry Gas Sample Volume (dscf)**
Run 6 / TC2-R1-1201	5/18/10	00:34-01:24	00:34-01:20	46	0.508
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	200	0	200	390
3-Methylphenol & 4-Methylphenol	0	270	0	270	530
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	22	0	22	43
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	2.8	220	0	220	440
Dibenz(a,h)anthracene	2.3	11	0	13	26
Dibenzofuran	0	220	0	220	430
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-55. SVOC Concentration Results – Run 7

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 7 / TC2-R2-1201	5/19/10	10:55-11:39	10:55-11:33	38	0.346
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	96	1.7	98	280
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	0	0	0	0	0
2,4-Dimethylphenol	0	160	0	160	460
Dimethyl phthalate	0	0	0	0	0
Aniline	0	170	0	170	490
Di-n-octyl phthalate	0	0	0	0	0
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	0	0	0	0
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	470	1.5	470	1,400
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	0	160	0	160	460
Fluorene	0	440	3.9	440	1,300
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	0	0	0	0	0
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	0	4,600	310	4,900	14,000
2-Methylphenol	0	210	0	210	610
Naphthalene	1.0	3,100	340	3,400	9,900
1-Naphthylamine	0	0	0	0	0

Table 2-55 (Continued). SVOC Concentration Results - Run 7

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 7 / TC2-R2-1201	5/19/10	10:55-11:39	10:55-11:33	38	0.346
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	0	0	0	0
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	0	190	0	190	550
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	0	22	0	22	64
Benzo(k)fluoranthene	0	10	0	9.7	28
Benzoic acid	0	0	42	42	120
Benzo(ghi)perylene	1.6	12	0	14	39
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	0.0	47	0.0	47	140
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	0	1,500	6.0	1,500	4,400
Phenol	0	160	0	160	460
2-Picoline	0	160	1.0	160	470
Pyrene	0	630	1.2	630	1,800
Pyridine	0	43	8.7	52	150
Acetophenone	0	0	0	0	0

Table 2-55 (Continued). SVOC Concentration Results - Run 7

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 7 / TC2-R2-1201	5/19/10	10:55-11:39	10:55-11:33	38	0.346
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	190	0	190	550
3-Methylphenol & 4-Methylphenol	0	220	0	220	640
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	6	0	6.0	17
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	0	180	0	180	520
Dibenz(a,h)anthracene	0	0	0	0	0
Dibenzofuran	0	88	1.3	89	260
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-56. SVOC Concentration Results - Run 8

Run No. / Run I.D.	**Date**	**Venting Cycle (hh:mm)**	**Sampling Interval (hh:mm)**	**Sampling Duration (min)**	**Dry Gas Sample Volume (dscf)**
Run 8 / TC2-R3-1201	5/20/10	21:54-23:13	21:54-23:09	75	1.11
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	760	11	770	690
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	0	0	0	0	0
2,4-Dimethylphenol	0	730	0	730	660
Dimethyl phthalate	0	0	0	0	0
Aniline	0	350	0	350	310
Di-n-octyl phthalate	0	0	0	0	0
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	0	0	0	0
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	3,500	22	3,500	3,200
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	0	540	3	540	490
Fluorene	0	3,200	32	3,200	2,900
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	14	29	0	43	39
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	0	44,000	1,400	45,000	41,000
2-Methylphenol	0	730	0	730	660
Naphthalene	0	26,000	1,500	28,000	25,000
1-Naphthylamine	0	0	0	0	0

Table 2-56 (Continued). SVOC Concentration Results - Run 8

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 8 / TC2-R3-1201	5/20/10	21:54-23:13	21:54-23:09	75	1.11
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	0	0	0	0
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	6.0	550	0	560	500
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	5.3	86	0	91	82
Benzo(k)fluoranthene	2.1	27	0	29	26
Benzoic acid	0	0	57	57	51
Benzo(ghi)perylene	38	72	0	110	99
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	24	220	0.0	240	220
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	1.8	7,600	56	7,700	6,900
Phenol	0	420	0	420	380
2-Picoline	0	630	0	630	570
Pyrene	3.2	2,000	9.3	2,000	1,800
Pyridine	0	170	0	170	150
Acetophenone	0	0	0	0	0

Table 2-56 (Continued). SVOC Concentration Results - Run 8

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 8 / TC2-R3-1201	5/20/10	21:54-23:13	21:54-23:09	75	1.11
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	420	0	420	380
3-Methylphenol & 4-Methylphenol	0	660	0	660	590
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	56	0	56	50
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	6.2	490	0	500	450
Dibenz(a,h)anthracene	18	38	0	56	50
Dibenzofuran	0	580	8.1	590	530
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-57. SVOC Concentration Results - Run 9

Run No. / Run I.D.	**Date**	**Venting Cycle (hh:mm)**	**Sampling Interval (hh:mm)**	**Sampling Duration (min)**	**Dry Gas Sample Volume (dscf)**
Run 9 / TC2-R4-1201	5/22/10	08:08-09:32	08:08-09:08	60	1.63
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	850	8.4	860	530
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	0	0	0	0	0
2,4-Dimethylphenol	0	430	0	430	260
Dimethyl phthalate	0	0	0	0	0
Aniline	0	330	0	330	200
Di-n-octyl phthalate	0	0	0	0	0
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	0	0	0	0
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	0	2,000	10	2,000	1,200
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	0	360	0	360	220
Fluorene	0	3,100	20	3,100	1,900
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	3.3	20.0	0	23	14
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	0	53,000	1,400	54,000	33,000
2-Methylphenol	0	390	0	390	240
Naphthalene	0	32,000	1,900	34,000	21,000
1-Naphthylamine	0	0	0	0	0

Table 2-57 (Continued). SVOC Concentration Results - Run 9

Run No. / Run I.D.	**Date**	**Venting Cycle (hh:mm)**	**Sampling Interval (hh:mm)**	**Sampling Duration (min)**	**Dry Gas Sample Volume (dscf)**
Run 9 / TC2-R4-1201	5/22/10	08:08-09:32	08:08-09:08	60	1.63
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	0	0	0	0
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	2.0	370	0	370	230
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	0	47	0	47	29
Benzo(k)fluoranthene	0	24	0	24	15
Benzoic acid	0	0	0	0	0
Benzo(ghi)perylene	10	50	0	60	37
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	6.9	130	0	140	84
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	0	5,700	27	5,700	3,500
Phenol	0	230	0	230	140
2-Picoline	0	570	0	570	350
Pyrene	1.3	1,400	0	1,400	860
Pyridine	0	130	0	130	80
Acetophenone	0	0	0	0	0

Table 2-57 (Continued). SVOC Concentration Results - Run 9

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 9 / TC2-R4-1201	5/22/10	08:08-09:32	08:08-09:08	60	1.63
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	190	0	190	120
3-Methylphenol & 4-Methylphenol	0	360	0	360	220
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	56	0	56	34
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	2.2	340	0	340	210
Dibenz(a,h)anthracene	4.6	26	0	31	19
Dibenzofuran	0	560	5.0	570	350
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

Table 2-58. SVOC Concentration Results - Run 10

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 10 / TC2-R5-1201	5/23/10	15:56-16:58	15:56-16:51	55	2.69
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
Acenaphthene	0	2,100	84.0	2,200	810
Diethyl phthalate	0	0	0	0	0
p-Dimethylaminoazobenzene	0	0	0	0	0
7,12-Dimethylbenz(a)anthracene	0	0	0	0	0
2,4-Dimethylphenol	0	1,200	0	1,200	450
Dimethyl phthalate	0	0	0	0	0
Aniline	0	720	0	720	270
Di-n-octyl phthalate	0	0	0	0	0
4,6-Dinitro-2-methylphenol	0	0	0	0	0
2,4-Dinitrophenol	0	0	0	0	0
2,4-Dinitrotoluene	0	0	0	0	0
2,6-Dinitrotoluene	0	0	0	0	0
Diphenylamine	0	0	0	0	0
1,2-Diphenylhydrazine	0	0	0	0	0
Anthracene	17	5,700	85.0	5,800	2,200
Ethyl methanesulfonate	0	0	0	0	0
Fluoranthene	6.9	720	3.8	730	270
Fluorene	13	6,700	200.0	6,900	2,600
Hexachlorobenzene	0	0	0	0	0
Hexachlorobutadiene	0	0	0	0	0
Hexachlorocyclopentadiene	0	0	0	0	0
Hexachloroethane	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	89	62	0	150	56
Isophorone	0	0	0	0	0
3-Methylcholanthrene	0	0	0	0	0
Methyl methanesulfonate	0	0	0	0	0
2-Methylnaphthalene	31	120,000	6,200	130,000	47,000
2-Methylphenol	0	1,000	0	1,000	370
Naphthalene	8.1	67,000	5,400	72,000	27,000
1-Naphthylamine	0	0	0	0	0

Table 2-58 (Continued). SVOC Concentration Results - Run 10

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 10 / TC2-R5-1201	5/23/10	15:56-16:58	15:56-16:51	55	2.69
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
2-Naphthylamine	0	0	0	0	0
2-Nitroaniline	0	0	0	0	0
3-Nitroaniline	0	0	0	0	0
4-Nitroaniline	0	0	0	0	0
Nitrobenzene	0	0	0	0	0
Benzidine	0	0	0	0	0
2-Nitrophenol	0	0	0	0	0
4-Nitrophenol	0	0	0	0	0
N-Nitrosodi-n-butylamine	0	0	0	0	0
N-Nitrosodimethylamine	0	0	0	0	0
Benzo(a)anthracene	71	1,100	0	1,200	430
N-Nitrosodi-n-propylamine	0	0	0	0	0
N-Nitrosodiphenylamine	0	0	0	0	0
N-Nitrosopiperidine	0	0	0	0	0
Benzo(b)fluoranthene	54	240	0	290	110
Benzo(k)fluoranthene	25	83	0	110	40
Benzoic acid	0	0	0	0	0
Benzo(ghi)perylene	200	140	0	340	130
Pentachlorobenzene	0	0	0	0	0
Benzo(a)pyrene	190	590	0.0	780	290
Pentachloronitrobenzene	0	0	0	0	0
Pentachlorophenol	0	0	0	0	0
Phenacetin	0	0	0	0	0
Benzyl alcohol	0	0	0	0	0
Phenanthrene	34	12,000	190	12,000	4,500
Phenol	0	470	0	470	170
2-Picoline	0	1,500	0	1,500	560
Pyrene	36	2,900	14.0	3,000	1,100
Pyridine	0	240	0	240	89
Acetophenone	0	0	0	0	0

Table 2-58 (Continued). SVOC Concentration Results - Run 10

Run No. / Run I.D.	Date	Venting Cycle (hh:mm)	Sampling Interval (hh:mm)	Sampling Duration (min)	Dry Gas Sample Volume (dscf)
Run 10 / TC2-R5-1201	5/23/10	15:56-16:58	15:56-16:51	55	2.69
SVOC Analyte	**Probe and Nozzle Rinses/ Filter Mass (µg)**	**Pre-XAD Condensate/ Mid-Train Rinses Mass (µg)**	**XAD/ Post-XAD Condensate Mass (µg)**	**Total Mass (µg)**	**Total Conc. (µg/dscf)**
1,2,4,5-Tetrachlorobenzene	0	0	0	0	0
2,3,4,6-Tetrachlorophenol	0	0	0	0	0
1,2,4-Trichlorobenzene	0	0	0	0	0
2,4,5-Trichlorophenol	0	0	0	0	0
2,4,6-Trichlorophenol	0	0	0	0	0
Carbazole	0	430	0	430	160
3-Methylphenol & 4-Methylphenol	0	840	0	840	310
bis(2-Chloroethoxy)methane	0	0	0	0	0
bis(2-Chloroethyl) ether	0	0	0	0	0
bis(2-Chloroisopropyl) ether	0	0	0	0	0
bis(2-Ethylhexyl) phthalate	0	0	0	0	0
4-Bromophenyl phenyl ether	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0
Acenaphthylene	0	99	0	99	37
4-Chloroaniline	0	0	0	0	0
4-Chloro-3-methylphenol	0	0	0	0	0
1-Chloronaphthalene	0	0	0	0	0
2-Chloronaphthalene	0	0	0	0	0
2-Chlorophenol	0	0	0	0	0
4-Chlorophenyl phenyl ether	0	0	0	0	0
Chrysene	75	990	0	1,100	400
Dibenz(a,h)anthracene	110	96	0	210	77
Dibenzofuran	0	1,300	52.0	1,400	500
Di-n-butyl phthalate	0	0	0	0	0
1,2-Dichlorobenzene	0	0	0	0	0
1,3-Dichlorobenzene	0	0	0	0	0
1,4-Dichlorobenzene	0	0	0	0	0
3,3'-Dichlorobenzidine	0	0	0	0	0
4-Aminobiphenyl	0	0	0	0	0
2,4-Dichlorophenol	0	0	0	0	0
2,6-Dichlorophenol	0	0	0	0	0

2.6.2 Results for SVOC Mass Emission Rates

Total SVOC mass emission rates, calculated as lbs/min, lbs/interval and lbs/cycle, are presented in Table 2-59. Total SVOC concentrations were developed by adding all selected SVOC concentrations measured above applicable method detection limits. The mass emission rates developed for naphthalene (including 2-methylnaphthalene) contributed, on average, to 75% of the total SVOC mass emission rate developed for each test run. Table 2-60 presents these naphthalene (including 2-methylnaphthalene) mass emission rates. TIC mass emission rates are not reported. Section 2.2 discusses the development of target compound mass emission rates from both measured and extrapolated data. On average, 16% of the total SVOC mass emissions for each complete venting cycle were extrapolated.

Table 2-59. Total SVOC Mass Emission Rates

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (h:min)	Venting Cycle Interval Duration (min)	Total SVOC Conc. (ug/dscf)	Total SVOC Conc. (mg/dscm)	Average Volumetric Flow Rate (dscfm)	Total SVOC Mass Emission Rate (lbs/min)	Total SVOC Mass Emission Rate (lbs/interval)	Total SVOC Mass Emission Rate (lbs/cycle)	Total SVOC Mass Emission Rate (tons/year)
1	**TC1-R1-1201**	5/7/10	01:48-02:31	43	01:48-02:26	38	88,000	3,100	151	0.029	1.1	1.1	0.29
					02:26-02:31[1]	5	88,000	3,100	4.42	0.00086	0.0043		
2	**TC1-R2-1201**	5/8/10	08:59-10:17	78	08:59-09:25	26	110,000	3,800	118	0.028	0.73	1.4	0.35
					09:26-10:17[1]	52	110,000	3,800	50.1	0.012	0.62		
3	**TC1-R3-1201**	5/9/10	17:55-19:17	82	17:55-18:44	49	99,382	3,500	41.1	0.0090	0.44	0.55	0.14
					18:44-19:17[1]	33	99,382	3,500	14.7	0.0032	0.11		
4	**TC1-R4-1201**	5/11/10	02:54-04:08	74	02:54-03:40	46	58,000	2,000	41.4	0.0052	0.24	0.30	0.078
					03:40-04:08[1]	28	58,000	2,000	17.7	0.0022	0.063		
5	**TC1-R5-1201**	5/16/10	15:24-17:17	113	15:24-16:11	47	74,000	2,600	169	0.027	1.3	2.2	0.56
					16:11-17:17[1]	66	74,000	2,600	81.3	0.013	0.87		
6	**TC2-R1-1201**	5/18/10	00:34-01:24	50	00:34-01:20	46	67,000	2,400	77.8	0.011	0.53	0.54	0.14
					01:20-01:24[1]	4	67,000	2,400	24.5	0.0036	0.014		
7	**TC2-R2-1201**	5/19/10	10:55-11:39	44	10:55-11:33	38	39,000	1,400	48.1	0.0042	0.16	0.16	0.042
					11:33-11:39[1]	6	39,000	1,400	6.41	0.00055	0.0033		
8	**TC2-R3-1201**	5/20/10	21:54-23:13	79	21:54-23:09	75	87,000	3,100	72.1	0.014	1.0	1.1	0.27
					23:09-23:13[1]	4	87,000	3,100	26.2	0.0050	0.020		
9	**TC2-R4-1201**	5/22/10	08:08-09:32	84	08:08-09:08	60	65,000	2,300	88.9	0.013	0.77	0.98	0.25
					09:08-09:32[1]	24	65,000	2,300	60.8	0.0087	0.21		
10	**TC2-R5-1201**	5/23/10	15:56-16:58	62	15:56-16:51	55	90,000	3,200	207	0.041	2.2	2.3	0.59
					16:51-16:58[1]	7	90,000	3,200	27.1	0.0054	0.037		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-60. Naphthalene Mass Emission Rates

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Naphthalene[1] Conc. (ug/dscf)	Naphthalene[1] Conc. (mg/dscm)	Average Volumetric Flow Rate (dscfm)	Naphthalene Mass Emission Rate (lbs/min)	Naphthalene Mass Emission Rate (lbs/interval)	Naphthalene Mass Emission Rate (lbs/cycle)	Naphthalene Mass Emission Rate (tons/year)
1	**TC1-R1-1201**	5/7/10	01:48-02:31	43	01:48-02:26	38	66,000	2,300	151	0.022	0.83	0.84	0.22
					02:26-02:31[1]	5	66,000	2,300	4.42	0.00064	0.0032		
2	**TC1-R2-1201**	5/8/10	08:59-10:17	78	08:59-09:25	26	90,000	3,200	118	0.023	0.61	1.1	0.29
					09:26-10:17[1]	52	90,000	3,200	50.1	0.0099	0.52		
3	**TC1-R3-1201**	5/9/10	17:55-19:17	82	17:55-18:44	49	65,000	2,300	41.1	0.0059	0.29	0.36	0.092
					18:44-19:17[1]	33	65,000	2,300	14.7	0.0021	0.069		
4	**TC1-R4-1201**	5/11/10	02:54-04:08	74	02:54-03:40	46	41,000	1,400	41.4	0.0037	0.17	0.22	0.056
					03:40-04:08[1]	28	41,000	1,400	17.7	0.0016	0.045		
5	**TC1-R5-1201**	5/16/10	15:24-17:17	113	15:24-16:11	47	59,000	2,100	169	0.022	1.0	1.7	0.45
					16:11-17:17[1]	66	59,000	2,100	81.3	0.011	0.70		
6	**TC2-R1-1201**	5/18/10	00:34-01:24	50	00:34-01:20	46	46,000	1,600	77.8	0.0079	0.36	0.37	0.096
					01:20-01:24[1]	4	46,000	1,600	24.5	0.0025	0.010		
7	**TC2-R2-1201**	5/19/10	10:55-11:39	44	10:55-11:33	38	24,000	850	48.1	0.0025	0.097	0.099	0.026
					11:33-11:39[1]	6	24,000	850	6.41	0.00034	0.0020		
8	**TC2-R3-1201**	5/20/10	21:54-23:13	79	21:54-23:09	75	65,000	2,300	72.1	0.010	0.77	0.79	0.20
					23:09-23:13[1]	4	65,000	2,300	26.2	0.0038	0.015		
9	**TC2-R4-1201**	5/22/10	08:08-09:32	84	08:08-09:08	60	54,000	1,900	88.9	0.011	0.64	0.81	0.21
					09:08-09:32[1]	24	54,000	1,900	60.8	0.0072	0.17		
10	**TC2-R5-1201**	5/23/10	15:56-16:58	62	15:56-16:51	55	74,000	2,600	207	0.034	1.9	1.9	0.48
					16:51-16:58[1]	7	74,000	2,600	27.1	0.0044	0.031		

[1] Includes 2-methylnaphthalene concentrations.
[2] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

2.7 Results for Total PM Emissions

Modified US EPA Method 5, "*Determination of Particulate Matter Emissions from Stationary Sources*," was used to measure front-half FPM concentrations and modified US EPA Method 202, "*Determination of Condensible Particulate Emissions from Stationary Sources*," was used to measure back-half CPM concentrations in the 1201 Vent and 1202 Vent gas streams. FPM and CPM samples were extracted from the gas streams isokinetically using a single modified US EPA Method 5/202 sampling train.

2.7.1 Results for Total PM Concentrations

The FPM samples were recovered separately into the following components:

- Front-half (nozzle, probe liner and front-half of the filter holder) rinse with acetone; and
- Quartz-fiber filter.

The CPM samples were recovered separately into the following components:

- Contents of the first three impingers, including a water rinse of the impingers, the back-half of filter holder, the Teflon® transfer line and the coiled condenser; and
- A methylene chloride rinse of the first three impingers, the back-half of the filter holder, the Teflon® transfer line and the coiled condenser.

The minimum dry gas sample volume of >30 cubic feet typically associated with sampling for total PM concentrations was not obtained during any test run due to the limited sampling durations (<75 minutes), the minimal dry gas fraction of the 1201 Vent and 1202 Vent gas streams (<2%), and the large volume of water that was condensed in a relatively short period of time. However, a *wet* gas sample volume of >30 cubic feet (corrected to standard conditions) was collected during each applicable test run. Per the *Protocol*, the failure to meet the specified sample volume criteria did not invalidate any collected data.

Tables 2-4 through 2-6 present summaries of sampling train operating data such as dry and wet gas volumes collected and isokinetic sampling rates achieved. FPM concentrations measured during Test Conditions 1, 2 and 3 are presented in Table 2-61. CPM concentrations are presented in Table 2-62. On average, FPM constituted 8% and CPM constituted 92% of total PM mass measured per sampling train. Total PM concentrations are presented in Table 2-63. Total PM concentrations were not measured during Run 10 of Test Condition 2 and during the entirety of Test Condition 4. The full laboratory report detailing the analyses of vent gas samples for total PM emissions is presented in **Appendix 2-7**.

Table 2-61. Results for FPM Concentrations

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Sampling Interval (hh:mm)	Sampling Duration (min)	Filterable PM			Sample Volume (dscf)	FPM Conc. (mg/dscf)	FPM Conc. (mg/dscm)
							PNR PM Mass (mg)	Filter PM Mass (mg)	Total FPM Mass (mg)			
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:25	37	65.0	48.5	114	1.08	105	3,706
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:25	26	30.6	5.55	36.2	0.898	40.3	1,422
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:58	63	11.4	5.60	17.0	0.395	43.0	1,520
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:40	46	4.85	2.10	6.95	0.415	16.8	592
5	TC1-R5-1201	5/16/10	15:24-17:17	113	15:24-16:36	72	37.8	108	146	2.20	66.4	2,344
6	TC2-R1-1201	5/18/10	00:34-01:24	50	00:34-01:21	47	7.80	20.6	28.4	0.869	32.7	1,154
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:33	38	2.15	1.85	4.00	0.667	6.00	212
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-23:09	75	11.7	34.8	46.5	1.45	32.0	1,132
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-09:08	60	31.7	9.50	41.2	2.16	19.1	674
10	TC2-R5-1201	5/23/10	15:56-16:58	62	NP[1]							
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:35-22:19	44	14.8	16.6	31.4	0.702	44.7	1,579
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:56-08:54	58	25.6	58.4	84.0	1.29	65.1	2,300
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:50	64	98.8	18.2	117	0.862	136	4,792
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:37-21:39	62	11.0	23.0	34.0	1.40	24.2	855
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-15:14	46	42.5	3.90	46.4	0.0975	476	16,800

[1] Applicable test method not performed (NP) during test run

Table 2-62. Results for CPM Concentrations

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Sampling Interval (hh:mm)	Sampling Duration (min)	Condensible PM: Condensate PM Mass (mg)	Condensible PM: $MeCl_2$ Rinse PM Mass (mg)	Condensible PM: Total CPM Mass (mg)	Sample Volume (dscf)	CPM Conc. (mg/dscf)	CPM Conc. (mg/dscm)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:25	37	116	517	633	1.08	585	20,669
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:25	26	116	632	748	0.898	833	29,427
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:58	63	118	388	506	0.395	1,281	45,235
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:40	46	62.0	282	344	0.415	830	29,296
5	TC1-R5-1201	5/16/10	15:24-17:17	113	15:24-16:36	72	190	1,120	1,310	2.20	596	21,058
6	TC2-R1-1201	5/18/10	00:34-01:24	50	00:34-01:21	47	121	245	366	0.869	421	14,872
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:33	38	76.4	96.6	173	0.667	260	9,166
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-23:09	75	187	733	920	1.45	634	22,389
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-09:08	60	172	675	847	2.16	392	13,851
10	TC2-R5-1201	5/23/10	15:56-16:58	62	NP[1]							
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:35-22:19	44	100	196	296	0.702	421	14,881
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:56-08:54	58	140	539	679	1.29	526	18,593
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:50	64	255	609	864	0.862	1,002	35,388
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:37-21:39	62	235	754	989	1.40	704	24,876
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-15:14	46	115	87.8	203	0.0975	2,079	73,428

[1] Applicable test method not performed (NP) during test run

Table 2-63. Results for Total PM Concentrations

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Sampling Interval (hh:mm)	Sampling Duration (min)	FPM Conc. (mg/dscf)	FPM Conc. (mg/dscm)	CPM Conc. (mg/dscf)	CPM Conc. (mg/dscm)	Total PM Conc. (mg/dscf)	Total PM Conc. (mg/dscm)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:25	37	105	3,706	585	20,669	690	24,375
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:25	26	40.3	1,422	833	29,427	874	30,849
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:58	63	43.0	1,520	1,281	45,235	1,324	46,754
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:40	46	16.8	592	830	29,296	846	29,888
5	TC1-R5-1201	5/16/10	15:24-17:17	113	15:24-16:36	72	66.4	2,344	596	21,058	663	23,401
6	TC2-R1-1201	5/18/10	00:34-01:24	50	00:34-01:21	47	32.7	1,154	421	14,872	454	16,026
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:33	38	6.00	212	260	9,166	266	9,378
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-23:09	75	32.0	1,132	634	22,389	666	23,521
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-09:08	60	19.1	674	392	13,851	411	14,525
10	TC2-R5-1201	5/23/10	15:56-16:58	62	NP[1]							
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:35-22:19	44	44.7	1579	421	14,881	466	16,460
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:56-08:54	58	65.1	2,300	526	18,593	592	20,893
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:50	64	136	4,792	1,002	35,388	1,138	40,180
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:37-21:39	62	24.2	855	704	24,876	729	25,731
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-15:14	46	476	16,800	2,079	73,428	2,555	90,228

[1] Applicable test method not performed (NP) during test run

2.7.2 Results for Total PM Mass Emission Rates

FPM, CPM and total PM mass emission rates calculated as lbs/min, lbs/interval and lbs/cycle during Test Condition 1 are presented in Tables 2-64, 2-65 and 2-66, respectively. FPM, CPM and total PM mass emission rates during Test Condition 2 are presented in Tables 2-67 through 2-69. FPM, CPM and total PM mass emission rates during Test Condition 3 are presented in Tables 2-70 through 2-72. Section 2.2 discusses the development of target compound mass emission rates from both measured and extrapolated data. On average, 9% of the total PM mass emission rates for each complete venting cycle were extrapolated.

Table 2-64. Results for FPM Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total FPM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total FPM Mass Emission Rate (lbs/min)	Total FPM Mass Emission Rate (lbs/interval)	Total FPM Mass Emission Rate (lbs/cycle)	Total FPM Mass Emission Rate (tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:25	37	105	157	0.0364	1.35	1.36	0.351
					02:25-02:31[1]	6	105	8.93	0.00207	0.0124		
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:25	26	40	118	0.0104	0.271	0.503	0.130
					09:25-10:17[1]	52	40	50.1	0.00445	0.231		
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:58	63	43	38.3	0.00363	0.229	0.242	0.0624
					18:58-19:17[1]	19	43	7.42	0.000704	0.0134		
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:40	46	17	41.4	0.00153	0.0703	0.0886	0.0228
					03:40-04:08[1]	28	17	17.7	0.000652	0.0183		
5	TC1-R5-1201	5/16/10	15:24-17:17	113	15:24-16:36	72	66	150	0.0219	1.58	1.96	0.504
					16:36-17:17[1]	41	66	63.1	0.00924	0.379		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-65. Results for CPM Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total CPM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total CPM Mass Emission Rate (lbs/min)	Total CPM Mass Emission Rate (lbs/interval)	Total CPM Mass Emission Rate (lbs/cycle)	Total CPM Mass Emission Rate (tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:25	37	585	157	0.203	7.52	7.59	1.96
					02:25-02:31[1]	6	585	8.93	0.0115	0.0692		
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:25	26	833	118	0.216	5.62	10.4	2.68
					09:25-10:17[1]	52	833	50.1	0.0921	4.79		
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:58	63	1,281	38.3	0.108	6.81	7.21	1.86
					18:58-19:17[1]	19	1,281	7.42	0.0209	0.398		
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:40	46	830	41.4	0.0757	3.48	4.38	1.13
					03:40-04:08[1]	28	830	17.7	0.0323	0.904		
5	TC1-R5-1201	5/16/10	15:24-17:17	113	15:24-16:36	72	596	150	0.197	14.2	17.6	4.53
					16:36-17:17[1]	41	596	63.1	0.0830	3.40		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-66. Results for Total PM Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total PM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total PM Mass Emission Rate (lbs/min)	Total PM Mass Emission Rate (lbs/interval)	Total PM Mass Emission Rate (lbs/cycle)	Total PM Mass Emission Rate (tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:25	37	690	157	0.240	8.87	8.95	2.31
					02:25-02:31[1]	6	690	8.93	0.0136	0.0816		
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:25	26	874	118	0.226	5.89	10.9	2.81
					09:25-10:17[1]	52	874	50.1	0.0966	5.02		
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:58	63	1,324	38.3	0.112	7.04	7.45	1.92
					18:58-19:17[1]	19	1,324	7.42	0.0217	0.411		
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:40	46	846	41.4	0.0772	3.55	4.47	1.15
					03:40-04:08[1]	28	846	17.7	0.0329	0.922		
5	TC1-R5-1201	5/16/10	15:24-17:17	113	15:24-16:36	72	663	150	0.219	15.8	19.5	5.03
					16:36-17:17[1]	41	663	63.1	0.0923	3.78		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-67. Results for FPM Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total FPM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total FPM Mass Emission Rate (lbs/min)	Total FPM Mass Emission Rate (lbs/interval)	Total FPM Mass Emission Rate (lbs/cycle)	Total FPM Mass Emission Rate (tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	00:34-01:21	47	32.7	77.8	0.00561	0.264	0.266	0.0686
					01:21-01:24[1]	3	32.7	12.5	0.000898	0.00269		
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:33	38	6.00	48.1	0.000636	0.0242	0.0247	0.00636
					11:33-11:39[1]	6	6.00	6.41	0.0000848	0.000509		
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-23:09	75	32.0	72.1	0.00509	0.382	0.389	0.100
					23:09-23:13[1]	4	32.0	26.2	0.00185	0.00741		
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-09:08	60	19.1	88.9	0.00374	0.224	0.286	0.0736
					09:08-09:32[1]	24	19.1	60.8	0.00256	0.0614		
10	TC2-R5-1201	5/23/10	15:56-16:58	62	Test Method Not Performed							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-68. Results for CPM Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total CPM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total CPM Mass Emission Rate (lbs/min)	Total CPM Mass Emission Rate (lbs/interval)	Total CPM Mass Emission Rate (lbs/cycle)	Total CPM Mass Emission Rate (tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	00:34-01:21	47	421	77.8	0.0723	3.40	3.43	0.884
					01:21-01:24[1]	3	421	12.5	0.0116	0.0347		
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:33	38	260	48.1	0.0275	1.05	1.07	0.275
					11:33-11:39[1]	6	260	6.41	0.00367	0.0220		
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-23:09	75	634	72.1	0.101	7.56	7.70	1.98
					23:09-23:13[1]	4	634	26.2	0.0367	0.147		
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-09:08	60	392	88.9	0.0769	4.61	5.88	1.51
					09:08-09:32[1]	24	392	60.8	0.0526	1.26		
10	TC2-R5-1201	5/23/10	15:56-16:58	62	NP[2]							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

[2] Applicable test method not performed (NP) during test run

Table 2-69. Results for Total PM Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total PM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total PM Mass Emission Rate (lbs/min)	Total PM Mass Emission Rate (lbs/interval)	Total PM Mass Emission Rate (lbs/cycle)	Total PM Mass Emission Rate (tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	50	00:34-01:21	47	454	77.8	0.0779	3.66	3.70	0.953
					01:21-01:24[1]	3	454	12.5	0.0125	0.0374		
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:33	38	266	48.1	0.0281	1.07	1.09	0.281
					11:33-11:39[1]	6	266	6.41	0.00375	0.0225		
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-23:09	75	666	72.1	0.106	7.94	8.09	2.09
					23:09-23:13[1]	4	666	26.2	0.0385	0.154		
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-09:08	60	411	88.9	0.0806	4.84	6.16	1.59
					09:08-09:32[1]	24	411	60.8	0.0551	1.32		
10	TC2-R5-1201	5/23/10	15:56-16:58	62	NP[2]							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

[2] Applicable test method not performed (NP) during test run

Table 2-70. Results for FPM Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total FPM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total FPM Mass Emission Rate (lbs/min)	Total FPM Mass Emission Rate (lbs/interval)	Total FPM Mass Emission Rate (lbs/cycle)	Total FPM Mass Emission Rate (tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-22:19	46	44.7	70.1	0.00691	0.318	0.328	0.0845
					22:19-22:23[1]	4	44.7	26.4	0.00260	0.0104		
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:54	59	65.1	91.8	0.0132	0.777	0.781	0.201
					08:54-08:56[1]	2	65.1	14.0	0.00201	0.00402		
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:50	64	136	85.9	0.0257	1.64	1.64	0.424
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-21:39	64	24.2	105	0.00560	0.359	0.361	0.0929
					21:39-21:41[1]	2	24.2	18.6	0.000995	0.00199		
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-15:14	46	476	8.32	0.00873	0.401	0.403	0.104
					15:14-15:16[1]	2	476	0.778	0.000816	0.00163		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-71. Results for CPM Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total CPM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total CPM Mass Emission Rate (lbs/min)	Total CPM Mass Emission Rate (lbs/interval)	Total CPM Mass Emission Rate (lbs/cycle)	Total CPM Mass Emission Rate (tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-22:19	46	421	70.1	0.0651	3.00	3.09	0.797
					22:19-22:23[1]	4	421	26.4	0.0245	0.0980		
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:54	59	526	91.8	0.106	6.28	6.32	1.63
					08:54-08:56[1]	2	526	14.0	0.0163	0.0325		
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:50	64	1,002	85.9	0.190	12.1	12.1	3.13
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-21:39	64	704	105	0.163	10.4	10.5	2.70
					21:39-21:41[1]	2	704	18.6	0.0289	0.0579		
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-15:14	46	2,079	8.32	0.0381	1.75	1.76	0.454
					15:14-15:16[1]	2	2,079	0.778	0.00357	0.00713		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-72. Results for Total PM Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Total PM Conc. (mg/dscf)	Average Volumetric Flow Rate (dscfm)	Total PM Mass Emission Rate (lbs/min)	Total PM Mass Emission Rate (lbs/interval)	Total PM Mass Emission Rate (lbs/cycle)	Total PM Mass Emission Rate (tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-22:19	46	466	70.1	0.0720	3.31	3.42	0.882
					22:19-22:23[1]	4	466	26.4	0.0271	0.108		
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:54	59	592	91.8	0.120	7.06	7.10	1.83
					08:54-08:56[1]	2	592	14.0	0.0183	0.0365		
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:50	64	1,138	85.9	0.215	13.8	13.8	3.55
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-21:39	64	729	105	0.169	10.8	10.8	2.80
					21:39-21:41[1]	2	729	18.6	0.0299	0.0599		
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-15:14	46	2,555	8.32	0.0469	2.16	2.16	0.558
					15:14-15:16[1]	2	2,555	0.778	0.00438	0.00876		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

2.8 Results for TRS Emissions

TRS compound concentrations in the 1201 Vent and 1202 Vent gas streams were determined according to modified US EPA Method 16, "*Semicontinuous Determination of Sulfur Emissions from Stationary Sources*," and the dilution sampling system procedures described in US EPA OTM 12. In addition, the concentrations of carbon disulfide (CS_2) and carbonyl sulfide (COS) were determined according to modified US EPA Method 15, "*Determination of Hydrogen Sulfide, Carbonyl Sulfide, and Carbon Disulfide Emissions from Stationary Sources*." The *Protocol* developed for this Source Test expanded the standard definition of TRS to include CS_2 and COS in addition to dimethyl disulfide [$(CH_3)_2S_2$], dimethyl sulfide [$(CH_3)_2S$], hydrogen sulfide (H_2S), and methyl mercaptan (CH_4S).

2.8.1 Results for TRS Concentrations

FlexFoil® bag samples were collected from the same dilution sampling system used for the measurement of THC concentrations by modified US EPA Method 25A and methane, ethane, benzene and toluene concentrations by modified US EPA Method 18. Unless otherwise noted, integrated bag samples of vent gas were collected during at least two (2) separate sampling intervals during a venting cycle and analyzed by a GC/flame photometric detector (FPD) in triplicate. Average concentration results are presented as parts per million by volume, wet basis (ppmvw).

The average DR developed on a test run-by-test run basis through the operation of the dilution sampling system and the THC analyzers (see Section 2.5) was multiplied to the average raw GC/FPD analyses. These results (GC/FPD raw data x DR) were then corrected to the average percent recovery achieved through the dilution system. The average percent recoveries were developed on a test run-by-test run basis by performing a modified Dilution System Calibration/Sampling Line Loss Study based upon Section 8.3 of US EPA Method 15. All TRS compounds other than hydrogen sulfide were not detected during any sampling period of any test run above applicable method detection limits.

The average hydrogen sulfide concentration data from each test run are presented in Tables 2-73 through 2-76. The average carbonyl sulfide concentration data from each test run are presented in Tables 2-77 through 2-80. The average carbon disulfide concentration data from each test run are presented in Tables 2-81 through 2-84. The average dimethyl sulfide concentration data from each test run are presented in Tables 2-85 through 2-88. The average dimethyl disulfide concentration data from each test run are presented in Tables 2-89 through 2-92. The average methyl mercaptan concentration data from each test run are presented in Tables 2-93 through 2-96. Valid TRS results were not obtained during Runs 4, 5 and 20 due to malfunctions that occurred with the dilution sampling system. Raw data associated with the operation of the GC/FPD, including all chromatograms, are included in **Appendix 2-8**.

Table 2-73. Results for Hydrogen Sulfide Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Hydrogen Sulfide Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	15.4	50.5	778	70.9	1,097
			02:04-02:19	12.1		609		859
			02:19-02:25	6.58		333		469
2	TC1-R2-1201	5/8/10	08:59-09:09	24.6	29.5	726	73.2	991
			09:09-09:24	16.7		491		671
3	TC1-R3-1201	5/9/10	17:55-18:10	3.87	30.0	116	61.7	188
			18:10-18:25	2.12		63.5		103
			18:25-18:40	2.76		83.0		135
			18:40-18:55	4.39		132		214
4	TC1-R4-1201	5/11/10	02:54-03:10	2.95	31.5	92.9	73.3	127
			03:10-03:25	2.97		93.5		128
			03:25-03:40	3.11		98.0		134
			03:40-03:55	2.73		85.9		117
5	TC1-R5-1201	5/16/10	Invalid Test Run					

Table 2-74. Results for Hydrogen Sulfide Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Hydrogen Sulfide Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run					
7	TC2-R2-1201	5/19/10	10:55-11:10	0.858	63.8	54.8	86.3	63.4
			11:12-11:27	1.01		64.6		74.8
			11:28-11:34	1.44		92.2		107
8	TC2-R3-1201	5/20/10	21:54-22:10	5.65	55.4	313	82.3	381
			22:11-22:26	5.44		301		366
			22:27-22:42	4.99		277		336
			22:43-22:58	5.45		302		367
			22:58-23:09	7.10		394		478
9	TC2-R4-1201	5/22/10	08:08-08:23	6.88	59.3	408	79.9	510
			08:24-08:39	7.42		440		550
			08:40-08:55	9.25		548		686
			08:55-09:08	1.61		95.3		119
10	TC2-R5-1201	5/23/10	15:56-16:12	41.7	50.3	2,098	67.6	3,103
			16:14-16:29	12.4		626		926
			16:30-16:45	24.9		1,254		1,855

Table 2-75. Results for Hydrogen Sulfide Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Hydrogen Sulfide Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	5.18	79.1	410	73.2	560
			21:50-22:05	1.84		146		199
12	TC3-R2-1201	6/16/10	07:55-08:10	13.0	56.2	729	70.1	1,040
			08:12-08:27	8.54		480		685
			08:29-08:40	7.45		419		598
13	TC3-R1-1202	6/17/10	02:46-03:02	14.3	35.9	515	82.2	626
			03:03-03:17	7.51		270		328
			03:20-03:34	4.54		163		198
			03:36-03:50	5.11		184		223
14	TC3-R3-1201	6/17/10	20:35-20:50	5.65	54.2	306	66.8	458
			20:52-21:07	4.51		244		366
			21:09-21:27	4.70		255		381
15	TC3-R2-1202	6/18/10	14:28-14:32	1.80	44.1	79.3	56.0	142
			14:34-14:48	1.46		64.3		115
			14:50-15:00	0.491		21.6		38.6

Table 2-76. Results for Hydrogen Sulfide Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Hydrogen Sulfide Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	9.57	47.7	456	93.2	490
			10:36-10:43	7.21		344		369
			10:43-10:53	4.76		227		244
17	TC4-R2-1201	8/27/10	20:04-20:14	3.80	62.4	237	110	215
			20:17-20:24	2.81		175		159
			20:24-20:34	2.44		152		138
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.4	-[1]	99.3	-[1]
			13:21-13:28	2.79		160		161
			13:28-13:36	0.786		45.2		45.4
			13:36-13:40	2.36		136		136
19	TC4-R3-1201	8/29/10	05:50-06:00	14.1	46.0	649	86.1	753
			06:05-06:11	9.24		425		494
			06:11-06:20	7.84		361		419
			06:34-06:40	7.94		366		425
20	TC4-R2-1202	8/29/10	Invalid Test Run					
21	TC4-R4-1201	8/30/10	15:32-15:40	74.6	38.3	2,858	92.2	3,099
			15:50-16:00	30.3		1,161		1,258
			16:00-16:07	30.0		1,149		1,246
22	TC4-R3-1202	8/31/10	08:30-08:40	4.07	39.6	161	92.6	174
			08:45-08:52	12.9		513		553
			08:52-09:02	9.04		359		386
			09:10-09:15	25.6		1,015		1,096
23	TC4-R5-1201	9/1/10	01:58-02:07	8.38	37.9	318	93.2	341
			02:10-02:20	6.13		232		249
			02:20-02:28	6.07		230		247
24	TC4-R4-1202	9/1/10	18:36-18:46	<0.351	43.3	<15.2	79.4	<19.2
			18:51-18:56	0.517		22.4		28.2
			18:56-19:02	0.751		32.5		40.9
25	TC4-R6-1201	9/2/10	11:29-11:38	41.8	49.4	2,065	94.9	2,176
			11:44-11:49	18.9		932		982
			11:49-11:59	18.9		932		982

[1] The bag sample collected during this sampling interval was invalid.

Table 2-77. Results for Carbonyl Sulfide Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Carbonyl Sulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	<0.441	50.5	<22.3	70.9	<31.5
			02:04-02:19	<0.441		<22.3		<31.5
			02:19-02:25	<0.441		<22.3		<31.5
2	TC1-R2-1201	5/8/10	08:59-09:09	<0.441	29.5	<13.0	73.2	<17.7
			09:09-09:24	<0.441		<13.0		<17.7
3	TC1-R3-1201	5/9/10	17:55-18:10	<0.441	30.0	<13.2	61.7	<21.5
			18:10-18:25	<0.441		<13.2		<21.5
			18:25-18:40	<0.441		<13.2		<21.5
			18:40-18:55	<0.441		<13.2		<21.5
4	TC1-R4-1201	5/11/10	02:54-03:10	<0.441	31.5	<13.9	73.2	<19.0
			03:10-03:25	<0.441		<13.9		<19.0
			03:25-03:40	<0.441		<13.9		<19.0
			03:40-03:55	<0.441		<13.9		<19.0
5	TC1-R5-1201	5/16/10	Invalid Test Run					

Table 2-78. Results for Carbonyl Sulfide Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Carbonyl Sulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run					
7	TC2-R2-1201	5/19/10	10:55-11:10	<0.441	63.8	<28.1	86.3	<32.6
			11:12-11:27	<0.441		<28.1		<32.6
			11:28-11:34	<0.441		<28.1		<32.6
8	TC2-R3-1201	5/20/10	21:54-22:10	<0.441	55.4	<24.4	82.3	<29.7
			22:11-22:26	<0.441		<24.4		<29.7
			22:27-22:42	<0.441		<24.4		<29.7
			22:43-22:58	<0.441		<24.4		<29.7
			22:58-23:09	<0.441		<24.4		<29.7
9	TC2-R4-1201	5/22/10	08:08-08:23	<0.441	59.3	<26.1	79.9	<32.7
			08:24-08:39	<0.441		<26.1		<32.7
			08:40-08:55	<0.441		<26.1		<32.7
			08:55-09:08	<0.441		<26.1		<32.7
10	TC2-R5-1201	5/23/10	15:56-16:12	<0.441	50.3	<22.2	67.6	<32.8
			16:14-16:29	<0.441		<22.2		<32.8
			16:30-16:45	<0.441		<22.2		<32.8

Table 2-79. Results for Carbonyl Sulfide Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Carbonyl Sulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	<0.441	79.1	<34.9	73.2	<47.7
			21:50-22:05	<0.441		<34.9		<47.7
12	TC3-R2-1201	6/16/10	07:55-08:10	<0.441	56.2	<24.8	70.1	<35.4
			08:12-08:27	<0.441		<24.8		<35.4
			08:29-08:40	<0.441		<24.8		<35.4
13	TC3-R1-1202	6/17/10	02:46-03:02	<0.441	35.9	<15.8	82.2	<19.3
			03:03-03:17	<0.441		<15.8		<19.3
			03:20-03:34	<0.441		<15.8		<19.3
			03:36-03:50	<0.441		<15.8		<19.3
14	TC3-R3-1201	6/17/10	20:35-20:50	<0.441	54.2	<23.9	66.8	<35.8
			20:52-21:07	<0.441		<23.9		<35.8
			21:09-21:27	<0.441		<23.9		<35.8
15	TC3-R2-1202	6/18/10	14:28-14:32	<0.441	44.1	<19.4	56.0	<34.7
			14:34-14:48	<0.441		<19.4		<34.7
			14:50-15:00	<0.441		<19.4		<34.7

Table 2-80. Results for Carbonyl Sulfide Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Carbonyl Sulfide Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	<0.357	47.7	<17.0	93.2	<18.3
			10:36-10:43	<0.357		<17.0		<18.3
			10:43-10:53	<0.357		<17.0		<18.3
17	TC4-R2-1201	8/27/10	20:04-20:14	<0.357	62.4	<22.3	110	<20.2
			20:17-20:24	<0.357		<22.3		<20.2
			20:24-20:34	<0.357		<22.3		<20.2
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.4	-[1]	99.4	-[1]
			13:21-13:28	<0.357		<20.5		<20.6
			13:28-13:36	<0.357		<20.5		<20.6
			13:36-13:40	<0.357		<20.5		<20.6
19	TC4-R3-1201	8/29/10	05:50-06:00	<0.357	46.0	<16.4	86.1	<19.1
			06:05-06:11	<0.357		<16.4		<19.1
			06:11-06:20	<0.357		<16.4		<19.1
			06:34-06:40	<0.357		<16.4		<19.1
20	TC4-R2-1202	8/29/10	Invalid Test Run					
21	TC4-R4-1201	8/30/10	15:32-15:40	<0.357	38.3	<13.7	92.2	<14.8
			15:50-16:00	<0.357		<13.7		<14.8
			16:00-16:07	<0.357		<13.7		<14.8
22	TC4-R3-1202	8/31/10	08:30-08:40	<0.357	39.6	<14.1	92.6	<15.2
			08:45-08:52	<0.357		<14.1		<15.2
			08:52-09:02	<0.357		<14.1		<15.2
			09:10-09:15	<0.357		<14.1		<15.2
23	TC4-R5-1201	9/1/10	01:58-02:07	<0.357	37.9	<13.5	93.2	<14.5
			02:10-02:20	<0.357		<13.5		<14.5
			02:20-02:28	<0.357		<13.5		<14.5
24	TC4-R4-1202	9/1/10	18:36-18:46	<0.357	43.3	<15.4	79.4	<19.4
			18:51-18:56	<0.357		<15.4		<19.4
			18:56-19:02	<0.357		<15.4		<19.4
25	TC4-R6-1201	9/2/10	11:29-11:38	<0.357	49.4	<17.6	94.9	<18.5
			11:44-11:49	<0.357		<17.6		<18.5
			11:49-11:59	<0.357		<17.6		<18.5

[1] The bag sample collected during this sampling interval was invalid.

Table 2-81. Results for Carbon Disulfide Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Carbon Disulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	<0.492	50.5	<24.9	70.9	<35.1
			02:04-02:19	<0.492		<24.9		<35.1
			02:19-02:25	<0.492		<24.9		<35.1
2	TC1-R2-1201	5/8/10	08:59-09:09	<0.492	29.5	<14.5	73.2	<19.8
			09:09-09:24	<0.492		<14.5		<19.8
3	TC1-R3-1201	5/9/10	17:55-18:10	<0.492	30.0	<14.8	60.5	<24.0
			18:10-18:25	<0.492		<14.8		<24.0
			18:25-18:40	<0.492		<14.8		<24.0
			18:40-18:55	<0.492		<14.8		<24.0
4	TC1-R4-1201	5/11/10	02:54-03:10	<0.492	31.5	<15.5	73.2	<21.2
			03:10-03:25	<0.492		<15.5		<21.2
			03:25-03:40	<0.492		<15.5		<21.2
			03:40-03:55	<0.492		<15.5		<21.2
5	TC1-R5-1201	5/16/10	Invalid Test Run					

Table 2-82. Results for Carbon Disulfide Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Carbon Disulfide Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run					
7	TC2-R2-1201	5/19/10	10:55-11:10	<0.492	63.8	<31.4	86.3	<36.4
			11:12-11:27	<0.492		<31.4		<36.4
			11:28-11:34	<0.492		<31.4		<36.4
8	TC2-R3-1201	5/20/10	21:54-22:10	<0.492	55.4	<27.3	82.3	<33.1
			22:11-22:26	<0.492		<27.3		<33.1
			22:27-22:42	<0.492		<27.3		<33.1
			22:43-22:58	<0.492		<27.3		<33.1
			22:58-23:09	<0.492		<27.3		<33.1
9	TC2-R4-1201	5/22/10	08:08-08:23	<0.492	59.3	<29.2	79.9	<36.5
			08:24-08:39	<0.492		<29.2		<36.5
			08:40-08:55	<0.492		<29.2		<36.5
			08:55-09:08	<0.492		<29.2		<36.5
10	TC2-R5-1201	5/23/10	15:56-16:12	<0.492	50.3	<24.8	67.6	<36.7
			16:14-16:29	<0.492		<24.8		<36.7
			16:30-16:45	<0.492		<24.8		<36.7

Table 2-83. Results for Carbon Disulfide Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Carbon Disulfide Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	<0.492	79.1	<38.9	73.2	<53.2
			21:50-22:05	<0.492		<38.9		<53.2
12	TC3-R2-1201	6/16/10	07:55-08:10	<0.492	56.2	<27.7	70.1	<39.5
			08:12-08:27	<0.492		<27.7		<39.5
			08:29-08:40	<0.492		<27.7		<39.5
13	TC3-R1-1202	6/17/10	02:46-03:02	<0.492	35.9	<17.7	82.2	<21.5
			03:03-03:17	<0.492		<17.7		<21.5
			03:20-03:34	<0.492		<17.7		<21.5
			03:36-03:50	<0.492		<17.7		<21.5
14	TC3-R3-1201	6/17/10	20:35-20:50	<0.492	54.2	<26.7	66.8	<39.9
			20:52-21:07	<0.492		<26.7		<39.9
			21:09-21:27	<0.492		<26.7		<39.9
15	TC3-R2-1202	6/18/10	14:28-14:32	<0.492	44.1	<21.7	56.0	<38.7
			14:34-14:48	<0.492		<21.7		<38.7
			14:50-15:00	<0.492		<21.7		<38.7

Table 2-84. Results for Carbon Disulfide Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Carbon Disulfide Sample Injections				
				Average Conc. (ppmvw)	**Dilution Ratio**	**Average Conc. x Dilution Ratio (ppmvw)**	**Average Recovery (%)**	**Corrected Average Conc. (ppmvw)**
16	TC4-R1-1201	8/26/10	10:23-10:32	<0.398	47.7	<19.0	93.2	<20.4
			10:36-10:43	<0.398		<19.0		<20.4
			10:43-10:53	<0.398		<19.0		<20.4
17	TC4-R2-1201	8/27/10	20:04-20:14	<0.398	62.4	<24.8	110	<22.5
			20:17-20:24	<0.398		<24.8		<22.5
			20:24-20:34	<0.398		<24.8		<22.5
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.4	-[1]	99.3	-[1]
			13:21-13:28	<0.398		<22.9		<23.0
			13:28-13:36	<0.398		<22.9		<23.0
			13:36-13:40	<0.398		<22.9		<23.0
19	TC4-R3-1201	8/29/10	05:50-06:00	<0.398	46.0	<18.3	86.1	<21.3
			06:05-06:11	<0.398		<18.3		<21.3
			06:11-06:20	<0.398		<18.3		<21.3
			06:34-06:40	<0.398		<18.3		<21.3
20	TC4-R2-1202	8/29/10	Invalid Test Run					
21	TC4-R4-1201	8/30/10	15:32-15:40	<0.398	38.3	<15.2	92.2	<16.5
			15:50-16:00	<0.398		<15.2		<16.5
			16:00-16:07	<0.398		<15.2		<16.5
22	TC4-R3-1202	8/31/10	08:30-08:40	<0.398	39.6	<15.8	92.6	<17.0
			08:45-08:52	<0.398		<15.8		<17.0
			08:52-09:02	<0.398		<15.8		<17.0
			09:10-09:15	<0.398		<15.8		<17.0
23	TC4-R5-1201	9/1/10	01:58-02:07	<0.398	37.9	<15.1	93.2	<16.2
			02:10-02:20	<0.398		<15.1		<16.2
			02:20-02:28	<0.398		<15.1		<16.2
24	TC4-R4-1202	9/1/10	18:36-18:46	<0.398	43.3	<17.2	79.4	<21.7
			18:51-18:56	<0.398		<17.2		<21.7
			18:56-19:02	<0.398		<17.2		<21.7
25	TC4-R6-1201	9/2/10	11:29-11:38	<0.398	49.4	<19.6	94.9	<20.7
			11:44-11:49	<0.398		<19.6		<20.7
			11:49-11:59	<0.398		<19.6		<20.7

[1] The bag sample collected during this sampling interval was invalid.

Table 2-85. Results for Dimethyl Sulfide Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Dimethyl Sulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	<0.616	50.5	<31.1	70.9	<43.0
			02:04-02:19	<0.616		<31.1		<43.0
			02:19-02:25	<0.616		<31.1		<43.0
2	TC1-R2-1201	5/8/10	08:59-09:09	<0.616	29.5	<18.2	73.2	<24.8
			09:09-09:24	<0.616		<18.2		<24.8
3	TC1-R3-1201	5/9/10	17:55-18:10	<0.616	30.0	<18.5	61.7	<30.0
			18:10-18:25	<0.616		<18.5		<30.0
			18:25-18:40	<0.616		<18.5		<30.0
			18:40-18:55	<0.616		<18.5		<30.0
4	TC1-R4-1201	5/11/10	02:54-03:10	<0.616	31.5	<19.4	73.2	<26.5
			03:10-03:25	<0.616		<19.4		<26.5
			03:25-03:40	<0.616		<19.4		<26.5
			03:40-03:55	<0.616		<19.4		<26.5
5	TC1-R5-1201	5/16/10	Invalid Test Run					

Table 2-86. Results for Dimethyl Sulfide Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Dimethyl Sulfide Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run					
7	TC2-R2-1201	5/19/10	10:55-11:10	<0.616	63.8	<39.3	86.3	<45.5
			11:12-11:27	<0.616		<39.3		<45.5
			11:28-11:34	<0.616		<39.3		<45.5
8	TC2-R3-1201	5/20/10	21:54-22:10	<0.616	55.4	<34.1	82.3	<41.5
			22:11-22:26	<0.616		<34.1		<41.5
			22:27-22:42	<0.616		<34.1		<41.5
			22:43-22:58	<0.616		<34.1		<41.5
			22:58-23:09	<0.616		<34.1		<41.5
9	TC2-R4-1201	5/22/10	08:08-08:23	<0.616	59.3	<36.5	79.9	<45.7
			08:24-08:39	<0.616		<36.5		<45.7
			08:40-08:55	<0.616		<36.5		<45.7
			08:55-09:08	<0.616		<36.5		<45.7
10	TC2-R5-1201	5/23/10	15:56-16:12	<0.616	50.3	<31.0	67.6	<45.9
			16:14-16:29	<0.616		<31.0		<45.9
			16:30-16:45	<0.616		<31.0		<45.9

Table 2-87. Results for Dimethyl Sulfide Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Dimethyl Sulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	<0.616	79.1	<48.7	73.2	<66.6
			21:50-22:05	<0.616		<48.7		<66.6
12	TC3-R2-1201	6/16/10	07:55-08:10	<0.616	56.2	<34.6	70.1	<49.4
			08:12-08:27	<0.616		<34.6		<49.4
			08:29-08:40	<0.616		<34.6		<49.4
13	TC3-R1-1202	6/17/10	02:46-03:02	<0.616	35.9	<22.1	82.2	<26.9
			03:03-03:17	<0.616		<22.1		<26.9
			03:20-03:34	<0.616		<22.1		<26.9
			03:36-03:50	<0.616		<22.1		<26.9
14	TC3-R3-1201	6/17/10	20:35-20:50	<0.616	54.2	<33.4	66.8	<50.0
			20:52-21:07	<0.616		<33.4		<50.0
			21:09-21:27	<0.616		<33.4		<50.0
15	TC3-R2-1202	6/18/10	14:28-14:32	<0.616	44.1	<27.2	56.0	<48.5
			14:34-14:48	<0.616		<27.2		<48.5
			14:50-15:00	<0.616		<27.2		<48.5

Table 2-88. Results for Dimethyl Sulfide Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Dimethyl Sulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	<0.551	47.7	<26.3	93.2	<28.2
			10:36-10:43	<0.551		<26.3		<28.2
			10:43-10:53	<0.551		<26.3		<28.2
17	TC4-R2-1201	8/27/10	20:04-20:14	<0.551	62.4	<34.4	110	<31.2
			20:17-20:24	<0.551		<34.4		<31.2
			20:24-20:34	<0.551		<34.4		<31.2
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.4	-[1]	99.3	-[1]
			13:21-13:28	<0.551		<31.6		<31.9
			13:28-13:36	<0.551		<31.6		<31.9
			13:36-13:40	<0.551		<31.6		<31.9
19	TC4-R3-1201	8/29/10	05:50-06:00	<0.551	46.0	<25.4	86.1	<29.5
			06:05-06:11	<0.551		<25.4		<29.5
			06:11-06:20	<0.551		<25.4		<29.5
			06:34-06:40	<0.551		<25.4		<29.5
20	TC4-R2-1202	8/29/10	Invalid Test Run					
21	TC4-R4-1201	8/30/10	15:32-15:40	<0.551	38.3	<21.1	92.2	<22.9
			15:50-16:00	<0.551		<21.1		<22.9
			16:00-16:07	<0.551		<21.1		<22.9
22	TC4-R3-1202	8/31/10	08:30-08:40	<0.551	39.6	<21.8	92.6	<23.6
			08:45-08:52	<0.551		<21.8		<23.6
			08:52-09:02	<0.551		<21.8		<23.6
			09:10-09:15	<0.551		<21.8		<23.6
23	TC4-R5-1201	9/1/10	01:58-02:07	<0.551	37.9	<20.9	93.2	<22.4
			02:10-02:20	<0.551		<20.9		<22.4
			02:20-02:28	<0.551		<20.9		<22.4
24	TC4-R4-1202	9/1/10	18:36-18:46	<0.551	43.3	<23.9	79.4	<30.0
			18:51-18:56	<0.551		<23.9		<30.0
			18:56-19:02	<0.551		<23.9		<30.0
25	TC4-R6-1201	9/2/10	11:29-11:38	<0.551	49.4	<27.2	94.9	<28.7
			11:44-11:49	<0.551		<27.2		<28.7
			11:49-11:59	<0.551		<27.2		<28.7

[1] The bag sample collected during this sampling interval was invalid.

Table 2-89. Results for Dimethyl Disulfide Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Dimethyl Disulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	<0.765	50.5	<38.7	70.9	<54.5
			02:04-02:19	<0.765		<38.7		<54.5
			02:19-02:25	<0.765		<38.7		<54.5
2	TC1-R2-1201	5/8/10	08:59-09:09	<0.765	29.5	<22.5	73.2	<30.8
			09:09-09:24	<0.765		<22.5		<30.8
3	TC1-R3-1201	5/9/10	17:55-18:10	<0.765	30.0	<23.0	61.7	<37.2
			18:10-18:25	<0.765		<23.0		<37.2
			18:25-18:40	<0.765		<23.0		<37.2
			18:40-18:55	<0.765		<23.0		<37.2
4	TC1-R4-1201	5/11/10	02:54-03:10	<0.765	31.5	<24.1	73.2	<32.9
			03:10-03:25	<0.765		<24.1		<32.9
			03:25-03:40	<0.765		<24.1		<32.9
			03:40-03:55	<0.765		<24.1		<32.9
5	TC1-R5-1201	5/16/10	Invalid Test Run					

Table 2-90. Results for Dimethyl Disulfide Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Dimethyl Disulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run					
7	TC2-R2-1201	5/19/10	10:55-11:10	<0.765	63.8	<48.8	86.3	<56.5
			11:12-11:27	<0.765		<48.8		<56.5
			11:28-11:34	<0.765		<48.8		<56.5
8	TC2-R3-1201	5/20/10	21:54-22:10	<0.765	55.4	<42.4	82.3	<51.5
			22:11-22:26	<0.765		<42.4		<51.5
			22:27-22:42	<0.765		<42.4		<51.5
			22:43-22:58	<0.765		<42.4		<51.5
			22:58-23:09	<0.765		<42.4		<51.5
9	TC2-R4-1201	5/22/10	08:08-08:23	<0.765	59.3	<45.3	79.9	<56.7
			08:24-08:39	<0.765		<45.3		<56.7
			08:40-08:55	<0.765		<45.3		<56.7
			08:55-09:08	<0.765		<45.3		<56.7
10	TC2-R5-1201	5/23/10	15:56-16:12	<0.765	50.3	<38.5	67.6	<56.9
			16:14-16:29	<0.765		<38.5		<56.9
			16:30-16:45	<0.765		<38.5		<56.9

Table 2-91. Results for Dimethyl Disulfide Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Dimethyl Disulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	<0.765	79.1	<60.5	73.2	<82.6
			21:50-22:05	<0.765		<60.5		<82.6
12	TC3-R2-1201	6/16/10	07:55-08:10	<0.765	56.2	<43.0	70.1	<61.3
			08:12-08:27	<0.765		<43.0		<61.3
			08:29-08:40	<0.765		<43.0		<61.3
13	TC3-R1-1202	6/17/10	02:46-03:02	<0.765	35.9	<27.5	82.2	<33.4
			03:03-03:17	<0.765		<27.5		<33.4
			03:20-03:34	<0.765		<27.5		<33.4
			03:36-03:50	<0.765		<27.5		<33.4
14	TC3-R3-1201	6/17/10	20:35-20:50	<0.765	54.2	<41.5	66.8	<62.0
			20:52-21:07	<0.765		<41.5		<62.0
			21:09-21:27	<0.765		<41.5		<62.0
15	TC3-R2-1202	6/18/10	14:28-14:32	<0.765	44.1	<33.7	56.0	<60.2
			14:34-14:48	<0.765		<33.7		<60.2
			14:50-15:00	<0.765		<33.7		<60.2

Table 2-92. Results for Dimethyl Disulfide Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Dimethyl Disulfide Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	<0.830	47.7	<39.6	93.2	<42.5
			10:36-10:43	<0.830		<39.6		<42.5
			10:43-10:53	<0.830		<39.6		<42.5
17	TC4-R2-1201	8/27/10	20:04-20:14	<0.830	62.4	<51.8	110	<46.9
			20:17-20:24	<0.830		<51.8		<46.9
			20:24-20:34	<0.830		<51.8		<46.9
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.4	-[1]	99.3	-[1]
			13:21-13:28	<0.830		<47.6		<47.9
			13:28-13:36	<0.830		<47.6		<47.9
			13:36-13:40	<0.830		<47.6		<47.9
19	TC4-R3-1201	8/29/10	05:50-06:00	<0.830	46.0	<38.2	86.1	<44.3
			06:05-06:11	<0.830		<38.2		<44.3
			06:11-06:20	<0.830		<38.2		<44.3
			06:34-06:40	<0.830		<38.2		<44.3
20	TC4-R2-1202	8/29/10	Invalid Test Run					
21	TC4-R4-1201	8/30/10	15:32-15:40	<0.830	38.3	<31.8	92.2	<34.5
			15:50-16:00	<0.830		<31.8		<34.5
			16:00-16:07	<0.830		<31.8		<34.5
22	TC4-R3-1202	8/31/10	08:30-08:40	<0.830	39.6	<32.8	92.6	<35.4
			08:45-08:52	<0.830		<32.8		<35.4
			08:52-09:02	<0.830		<32.8		<35.4
			09:10-09:15	<0.830		<32.8		<35.4
23	TC4-R5-1201	9/1/10	01:58-02:07	<0.830	37.9	<31.5	93.2	<33.7
			02:10-02:20	<0.830		<31.5		<33.7
			02:20-02:28	<0.830		<31.5		<33.7
24	TC4-R4-1202	9/1/10	18:36-18:46	<0.830	43.3	<35.9	79.4	<45.2
			18:51-18:56	<0.830		<35.9		<45.2
			18:56-19:02	<0.830		<35.9		<45.2
25	TC4-R6-1201	9/2/10	11:29-11:38	<0.830	49.4	<40.9	94.9	<43.1
			11:44-11:49	<0.830		<40.9		<43.1
			11:49-11:59	<0.830		<40.9		<43.1

[1] The bag sample collected during this sampling interval was invalid.

Table 2-93. Results for Methyl Mercaptan Concentrations – Test Condition 1

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methyl Mercaptan Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
1	TC1-R1-1201	5/7/10	01:49-02:04	<0.504	50.5	<25.5	70.9	<35.9
			02:04-02:19	<0.504		<25.5		<35.9
			02:19-02:25	<0.504		<25.5		<35.9
2	TC1-R2-1201	5/8/10	08:59-09:09	<0.504	29.5	<14.9	73.2	<20.3
			09:09-09:24	<0.504		<14.9		<20.3
3	TC1-R3-1201	5/9/10	17:55-18:10	<0.504	30.0	<15.1	61.7	<24.5
			18:10-18:25	<0.504		<15.1		<24.5
			18:25-18:40	<0.504		<15.1		<24.5
			18:40-18:55	<0.504		<15.1		<24.5
4	TC1-R4-1201	5/11/10	02:54-03:10	<0.504	31.5	<15.9	73.2	<21.7
			03:10-03:25	<0.504		<15.9		<21.7
			03:25-03:40	<0.504		<15.9		<21.7
			03:40-03:55	<0.504		<15.9		<21.7
5	TC1-R5-1201	5/16/10	Invalid Test Run					

Table 2-94. Results for Methyl Mercaptan Concentrations – Test Condition 2

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methyl Mercaptan Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
6	TC2-R1-1201	5/18/10	Invalid Test Run					
7	TC2-R2-1201	5/19/10	10:55-11:10	<0.504	63.8	<32.2	86.3	<37.3
			11:12-11:27	<0.504		<32.2		<37.3
			11:28-11:34	<0.504		<32.2		<37.3
8	TC2-R3-1201	5/20/10	21:54-22:10	<0.504	55.4	<27.9	82.3	<33.9
			22:11-22:26	<0.504		<27.9		<33.9
			22:27-22:42	<0.504		<27.9		<33.9
			22:43-22:58	<0.504		<27.9		<33.9
			22:58-23:09	<0.504		<27.9		<33.9
9	TC2-R4-1201	5/22/10	08:08-08:23	<0.504	59.3	<29.9	79.9	<37.4
			08:24-08:39	<0.504		<29.9		<37.4
			08:40-08:55	<0.504		<29.9		<37.4
			08:55-09:08	<0.504		<29.9		<37.4
10	TC2-R5-1201	5/23/10	15:56-16:12	<0.504	50.3	<25.4	67.6	<37.5
			16:14-16:29	<0.504		<25.4		<37.5
			16:30-16:45	<0.504		<25.4		<37.5

Table 2-95. Results for Methyl Mercaptan Concentrations – Test Condition 3

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methyl Mercaptan Sample Injections				
				Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
11	TC3-R1-1201	6/14/10	21:33-21:49	<0.504	79.1	<39.9	73.2	<54.5
			21:50-22:05	<0.504		<39.9		<54.5
12	TC3-R2-1201	6/16/10	07:55-08:10	<0.504	56.2	<28.3	70.1	<40.4
			08:12-08:27	<0.504		<28.3		<40.4
			08:29-08:40	<0.504		<28.3		<40.4
13	TC3-R1-1202	6/17/10	02:46-03:02	<0.504	35.9	<18.1	82.2	<22.0
			03:03-03:17	<0.504		<18.1		<22.0
			03:20-03:34	<0.504		<18.1		<22.0
			03:36-03:50	<0.504		<18.1		<22.0
14	TC3-R3-1201	6/17/10	20:35-20:50	<0.504	54.2	<27.3	66.8	<40.9
			20:52-21:07	<0.504		<27.3		<40.9
			21:09-21:27	<0.504		<27.3		<40.9
15	TC3-R2-1202	6/18/10	14:28-14:32	<0.504	44.1	<22.2	56.0	<39.7
			14:34-14:48	<0.504		<22.2		<39.7
			14:50-15:00	<0.504		<22.2		<39.7

Table 2-96. Results for Methyl Mercaptan Concentrations – Test Condition 4

Run No.	Run I.D.	Date	Sampling Interval (hh:mm)	Methyl Mercaptan Sample Injections: Average Conc. (ppmvw)	Dilution Ratio	Average Conc. x Dilution Ratio (ppmvw)	Average Recovery (%)	Corrected Average Conc. (ppmvw)
16	TC4-R1-1201	8/26/10	10:23-10:32	<0.394	47.7	<18.8	93.2	<20.2
			10:36-10:43	<0.394		<18.8		<20.2
			10:43-10:53	<0.394		<18.8		<20.2
17	TC4-R2-1201	8/27/10	20:04-20:14	<0.394	62.4	<24.6	110	<22.3
			20:17-20:24	<0.394		<24.6		<22.3
			20:24-20:34	<0.394		<24.6		<22.3
18	TC4-R1-1202	8/28/10	13:06-13:21	-[1]	57.4	-[1]	99.3	-[1]
			13:21-13:28	<0.394		<22.6		<22.8
			13:28-13:36	<0.394		<22.6		<22.8
			13:36-13:40	<0.394		<22.6		<22.8
19	TC4-R3-1201	8/29/10	05:50-06:00	<0.394	46.0	<18.2	86.1	<21.1
			06:05-06:11	<0.394		<18.2		<21.1
			06:11-06:20	<0.394		<18.2		<21.1
			06:34-06:40	<0.394		<18.2		<21.1
20	TC4-R2-1202	8/29/10	Invalid Test Run					
21	TC4-R4-1201	8/30/10	15:32-15:40	<0.394	38.3	<15.1	92.2	<16.4
			15:50-16:00	<0.394		<15.1		<16.4
			16:00-16:07	<0.394		<15.1		<16.4
22	TC4-R3-1202	8/31/10	08:30-08:40	<0.394	39.6	<15.6	92.6	<16.9
			08:45-08:52	<0.394		<15.6		<16.9
			08:52-09:02	<0.394		<15.6		<16.9
			09:10-09:15	<0.394		<15.6		<16.9
23	TC4-R5-1201	9/1/10	01:58-02:07	<0.394	37.9	<15.0	93.2	<16.0
			02:10-02:20	<0.394		<15.0		<16.0
			02:20-02:28	<0.394		<15.0		<16.0
24	TC4-R4-1202	9/1/10	18:36-18:46	<0.394	43.3	<17.1	79.4	<21.5
			18:51-18:56	<0.394		<17.1		<21.5
			18:56-19:02	<0.394		<17.1		<21.5
25	TC4-R6-1201	9/2/10	11:29-11:38	<0.394	49.4	<19.5	94.9	<20.5
			11:44-11:49	<0.394		<19.5		<20.5
			11:49-11:59	<0.394		<19.5		<20.5

[1] The bag sample collected during this sampling interval was invalid.

2.8.2 Results for TRS Mass Emission Rates

Hydrogen sulfide mass emission rates, calculated as lbs/min, lbs/interval, lbs/cycle and tons per year, are presented in Tables 2-97 and 2-100. Mass emission rates for TRS compounds other than hydrogen sulfide were not calculated because these compounds were not detected during any sampling period of any test run above applicable method detection limits. Section 2.2 discusses the development of target compound mass emission rates from both measured and extrapolated data. Some hydrogen sulfide concentration results were below the applicable method detection limit and are reported as a maximum (“<”). In subsequent mass emission rate calculations, when at least one (1) bag sample yielded a result above the method detection limit, concentration results below the method detection limit are treated as zero (0). On average, 17% of the total hydrogen sulfide mass emissions for each complete venting cycle were extrapolated.

Table 2-97. Results for Hydrogen Sulfide Mass Emission Rates – Test Condition 1

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Hydrogen Sulfide Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Hydrogen Sulfide Mass Emission Rate (lbs/min)	Hydrogen Sulfide Mass Emission Rate (lbs/interval)	Hydrogen Sulfide Mass Emission Rate (lbs/cycle)	Hydrogen Sulfide Mass Emission Rate (tons/year)
1	TC1-R1-1201	5/7/10	01:48-02:31	43	01:48-02:04	16	1,097	16,690	1.62	26.0	46.7	12.0
					02:04-02:19	15	859	16,503	1.26	18.8		
					02:19-02:28	9	469	5,113	0.213	1.91		
					02:28-02:31[1]	3	469	149	0.00621	0.0186		
2	TC1-R2-1201	5/8/10	08:59-10:17	78	08:59-09:09	10	991	11,923	1.05	10.5	35.5	9.14
					09:09-09:24	15	671	10,862	0.646	9.68		
					09:24-10:17[1]	53	671	4,867	0.289	15.3		
3	TC1-R3-1201	5/9/10	17:55-19:17	82	17:55-18:10	15	188	19,128	0.319	4.79	16.5	4.24
					18:10-18:25	15	103	19,964	0.182	2.73		
					18:25-18:40	15	135	18,571	0.221	3.32		
					18:40-18:59	19	214	12,852	0.243	4.62		
					18:59-19:17[1]	18	214	2,942	0.0557	1.00		
4	TC1-R4-1201	5/11/10	02:54-04:08	74	02:54-03:10	16	127	16,856	0.189	3.03	8.56	2.21
					03:10-03:25	15	128	13,030	0.147	2.21		
					03:25-03:40	15	134	9,743	0.116	1.73		
					03:40-04:00	20	117	6,707	0.0697	1.39		
					04:00-04:08[1]	8	117	2,354	0.0245	0.196		
5	TC1-R5-1201	5/16/10	15:24-17:17	113	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-98. Results for Hydrogen Sulfide Mass Emission Rates – Test Condition 2

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Hydrogen Sulfide Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Hydrogen Sulfide Mass Emission Rate (lbs/min)	Hydrogen Sulfide Mass Emission Rate (lbs/interval)	Hydrogen Sulfide Mass Emission Rate (lbs/cycle)	Hydrogen Sulfide Mass Emission Rate (tons/year)
6	TC2-R1-1201	5/18/10	00:34-01:24	Invalid Test Run								
7	TC2-R2-1201	5/19/10	10:55-11:39	44	10:55-11:12	17	63.4	13,691	0.0769	1.31	2.58	0.665
					11:12-11:28	16	74.8	9,046	0.0600	0.959		
					11:28-11:37	9	107	3,578	0.0338	0.305		
					11:37-11:39[1]	2	107	501	0.00474	0.00948		
8	TC2-R3-1201	5/20/10	21:54-23:13	79	21:54-22:11	17	381	14,786	0.498	8.47	30.1	7.74
					22:11-22:27	16	366	12,888	0.418	6.68		
					22:27-22:43	16	336	11,690	0.348	5.57		
					22:43-22:58	15	367	10,392	0.337	5.06		
					22:58-23:10	12	478	7,762	0.329	3.95		
					23:10-23:13[1]	3	478	2,598	0.110	0.330		
9	TC2-R4-1201	5/22/10	08:08-09:32	84	08:08-08:24	16	510	10,738	0.485	7.77	21.1	5.43
					08:24-08:40	16	550	6,510	0.317	5.08		
					08:40-08:55	15	686	6,616	0.402	6.03		
					08:55-09:08	13	119	6,565	0.0693	0.901		
					09:08-09:32[1]	24	119	5,120	0.0541	1.30		
10	TC2-R5-1201	5/23/10	15:56-16:58	62	15:56-16:14	18	3,103	13,581	3.73	67.2	121	31.1
					16:14-16:30	16	926	12,036	0.987	15.8		
					16:30-16:47	17	1,855	10,940	1.80	30.6		
					16:47-16:58[1]	11	1,855	4,061	0.667	7.34		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-99. Results for Hydrogen Sulfide Mass Emission Rates – Test Condition 3

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Hydrogen Sulfide Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Hydrogen Sulfide Mass Emission Rate (lbs/min)	Hydrogen Sulfide Mass Emission Rate (lbs/interval)	Hydrogen Sulfide Mass Emission Rate (lbs/cycle)	Hydrogen Sulfide Mass Emission Rate (tons/year)
11	TC3-R1-1201	6/14/10	21:33-22:23	50	21:33-21:50	17	560	13,728	0.681	11.6	18.7	4.83
					21:50-22:05	15	199	12,980	0.229	3.43		
					22:05-22:23[1]	18	199	11,753	0.207	3.73		
12	TC3-R2-1201	6/16/10	07:55-08:56	61	07:55-08:12	17	1,040	14,162	1.30	22.2	49.2	12.7
					08:12-08:29	17	685	12,844	0.779	13.2		
					08:29-08:40	11	598	12,386	0.656	7.21		
					08:40-08:56[1]	16	598	7,832	0.415	6.63		
13	TC3-R1-1202	6/17/10	02:46-03:50	64	02:46-03:03	17	626	17,120	0.949	16.1	34.6	8.93
					03:03-03:20	17	328	17,604	0.512	8.70		
					03:20-03:36	16	198	17,637	0.310	4.96		
					03:36-03:50	14	223	17,534	0.347	4.85		
14	TC3-R3-1201	6/17/10	20:35-21:41	66	20:35-20:52	17	458	14,003	0.568	9.66	30.0	7.73
					20:52-21:09	17	366	14,317	0.464	7.88		
					21:09-21:27	18	381	13,802	0.466	8.39		
					21:27-21:41[1]	14	381	8,629	0.291	4.08		
15	TC3-R2-1202	6/18/10	14:28-15:16	48	14:28-14:34	6	142	17,434	0.219	1.31	4.42	1.14
					14:34-14:50	16	115	15,222	0.155	2.48		
					14:50-15:00	10	38.6	10,653	0.0364	0.364		
					15:00-15:16[1]	16	38.6	4,869	0.0166	0.266		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-100. Results for Hydrogen Sulfide Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Hydrogen Sulfide Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Hydrogen Sulfide Mass Emission Rate (lbs/min)	Hydrogen Sulfide Mass Emission Rate (lbs/interval)	Hydrogen Sulfide Mass Emission Rate (lbs/cycle)	Hydrogen Sulfide Mass Emission Rate (tons/year)
16	TC4-R1-1201	8/26/10	10:23-11:13	50	10:23-10:36	13	490	908	0.0394	0.512	1.88	0.486
					10:36-10:43	7	369	951	0.0311	0.218		
					10:43-10:53	10	244	1,318	0.0284	0.284		
					10:53-11:13[1]	20	244	2,017	0.0435	0.871		
17	TC4-R2-1201	8/27/10	20:04-21:03	59	20:04-20:17	13	215	14,772	0.281	3.66	9.95	2.56
					20:17-20:24	7	159	14,242	0.201	1.40		
					20:24-20:34	10	138	13,747	0.168	1.68		
					20:34-21:03[1]	29	138	9,040	0.111	3.21		
18	TC4-R1-1202	8/28/10	13:06-13:56	50	13:06-13:21[1]	15	161	12,541	0.179	2.68	4.83	1.25
					13:21-13:28	7	161	8,187	0.117	0.817		
					13:28-13:36	8	45.4	6,856	0.0276	0.221		
					13:36-13:40	4	136	5,885	0.0711	0.285		
					13:40-13:56[1]	16	136	5,427	0.0656	1.05		
19	TC4-R3-1201	8/29/10	05:50-06:51	61	05:50-06:05	15	753	15,862	1.06	15.9	38.5	9.92
					06:05-06:11	6	494	15,814	0.691	4.15		
					06:11-06:34	23	419	14,406	0.534	12.3		
					06:34-06:40	6	425	12,218	0.459	2.76		
					06:40-06:51[1]	11	425	8,267	0.311	3.42		
20	TC4-R2-1202	8/29/10	22:56-23:54	58	Invalid Test Run							

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

Table 2-100 (Continued). Results for Hydrogen Sulfide Mass Emission Rates – Test Condition 4

Run No.	Run I.D.	Date	Venting Cycle (hh:mm)	Venting Cycle Duration (min)	Venting Cycle Interval (hh:mm)	Venting Cycle Interval Duration (min)	Average Hydrogen Sulfide Conc. (ppmvw)	Average Volumetric Flow Rate (scfm)	Hydrogen Sulfide Mass Emission Rate (lbs/min)	Hydrogen Sulfide Mass Emission Rate (lbs/interval)	Hydrogen Sulfide Mass Emission Rate (lbs/cycle)	Hydrogen Sulfide Mass Emission Rate (tons/year)
21	TC4-R4-1201	8/30/10	15:32-16:15	43	15:32-15:50	18	3,099	10,584	2.90	52.3	70.0	18.0
					15:50-16:00	10	1,258	7,489	0.835	8.35		
					16:00-16:07	7	1,246	7,089	0.782	5.48		
					22:05-22:23[1]	8	1,246	4,455	0.492	3.93		
22	TC4-R3-1202	8/31/10	08:30-09:32	62	08:30-08:45	15	174	11,922	0.184	2.75	23.0	5.91
					08:45-08:52	7	553	10,791	0.528	3.70		
					08:52-09:10	18	386	9,231	0.316	5.68		
					09:10-09:15	5	1,096	7,377	0.716	3.58		
					09:15-09:32[1]	17	1,096	4,388	0.426	7.24		
23	TC4-R5-1201	9/1/10	01:58-02:34	36	01:58-02:10	12	341	7,749	0.234	2.81	4.92	1.27
					02:10-02:20	10	249	4,900	0.108	1.08		
					02:20-02:28	8	247	3,920	0.0858	0.686		
					02:28-02:34[1]	6	247	2,619	0.0573	0.344		
24	TC4-R4-1202	9/1/10	18:36-19:17	41	18:36-18:51	15	<19.2	12,937	<0.0220	<0.330	0.465	0.120
					18:51-18:56	5	28.2	10,087	0.0252	0.126		
					18:56-19:02	6	40.9	8,548	0.0310	0.186		
					19:02-19:17[1]	15	40.9	2,815	0.0102	0.153		
25	TC4-R6-1201	9/2/10	11:29-12:14	45	11:29-11:44	15	2,176	13,157	2.54	38.0	61.1	15.8
					11:44-11:49	5	982	11,927	1.04	5.19		
					11:49-11:59	10	982	11,259	0.979	9.79		
					11:59-12:14[1]	15	982	6,232	0.542	8.13		

[1] No direct measurements were obtained during this venting cycle interval. These results were extrapolated.

2.9 Summary of Results

Table 2-101 presents average NMNE VOC, methane, ethane, benzene, toluene and TRS concentrations in a time-weighted format. Time-weighted averages include extrapolated data from venting cycle intervals where no direct measurements were performed. Time-weighted averages were not used to calculate mass emission rates per venting cycle, and are presented in this section to compare the estimated relative concentrations of each target analyte per venting cycle. Total selected SVOC and total PM concentration data were obtained by the analysis of a single sample per venting cycle; therefore, these data cannot be time-weighted. Figure 2-1 presents a chart of time-weighted average concentrations developed for NMNE VOC, methane, ethane and hydrogen sulfide as mole fraction per test run. One-tenth of the actual methane mole fractions per test run are presented to aid comparisons between emissions profiles of the target compounds. Figure 2-2 presents a chart of the ratios of NMNE VOC to methane concentrations, ethane to methane concentrations, and hydrogen sulfide to methane concentrations.

Tables 2-102 and 2-103 present summaries of all target compound mass emission rates, in the units of pounds per hour and tons per year, respectively. The mass emission rates in the units of tons per year were calculated by using both the measured and extrapolated (see Section 2.0 for details) mass emissions per venting cycle and assuming a maximum potential venting cycle frequency of 515 per calendar year from both Drum 1201 and Drum 1202 combined (i.e., continuous, uninterrupted 34-hour total batch cycles on a given coke drum over the course of a year). Figure 2-3 presents a chart of mass emission rates (as tons/year) developed for NMNE VOC, methane, ethane and hydrogen sulfide. Figure 2-4 presents a chart of mass emission rates (as tons/year) developed for benzene, toluene, total selected SVOC and total PM.

Table 2-102. Summary of Results – Target Compound Concentrations

Run No.	Date	TWA[1] NMNE VOC Conc. (ppmvw)	TWA Methane Conc. (ppmvw)	TWA Ethane Conc. (ppmvw)	TWA Benzene Conc. (ppmvw)	TWA Toluene Conc. (ppmvw)	Total SVOC Conc. (mg/dscm)	Total PM Conc. (mg/dscm)	TWA H_2S[2] Conc. (ppmvw)
1	5/7/10	1,299	11,353	1,398	7.66	38.3	3,100	24,375	839
2	5/8/10	1,500	8,197	958	5.48	14.5	3,800	30,849	712
3	5/9/10	73.4	1,688	186	ND[3]	3.80	3,500	46,754	174
4	5/11/10	127	1,489	178	ND	3.94	2,000	29,888	125
5	5/16/10	I[4]	I	I	I	I	2,600	23,401	I
6	5/18/10	I	I	I	I	I	2,400	16,026	I
7	5/19/10	43.6	1,472	163	ND	4.47	1,400	9,378	78.4
8	5/20/10	197	5,506	741	2.69	2.38	3,100	23,521	384
9	5/22/10	2,090	7,930	1,015	5.83	10.8	2,300	14,525	377
10	5/23/10	1,560	21,717	3,116	17.1	33.9	3,200	NP[5]	1,978
11	6/14/10	2,893	5,471	686	ND	27.3	NP	16,460	311
12	6/16/10	746	8,910	1,166	3.29	5.72	NP	20,893	688
13	6/17/10	952	5,468	663	1.59	1.91	NP	40,180	312
14	6/17/10	863	9,426	1,236	10.1	20.0	NP	25,731	372
15	6/18/10	126	341	44.1	ND	ND	NP	90,228	66.2
16	8/26/10	2,295	86,278	10,214	28.8	51.2	NP	NP	325
17	8/27/10	0	3,785	519	1.15	ND	NP	NP	157
18	8/28/10	997	3,776	534	ND	ND	NP	NP	125
19	8/29/10	599	8,226	1,069	6.91	12.1	NP	NP	510
20	8/29/10	I	I	I	I	I	NP	NP	I
21	8/30/10	3,332	32,750	4,281	22.4	43.5	NP	NP	2,024
22	8/31/10	2,497	14,264	1,923	14.1	32.1	NP	NP	605
23	9/1/10	2,282	26,949	2,993	14.9	25.9	NP	NP	279
24	9/1/10	451	15,962	2,070	12.7	28.1	NP	NP	24.4
25	9/2/10	308	32,731	4,347	24.0	49.3	NP	NP	1,380

[1] Time-weighted average ("TWA").

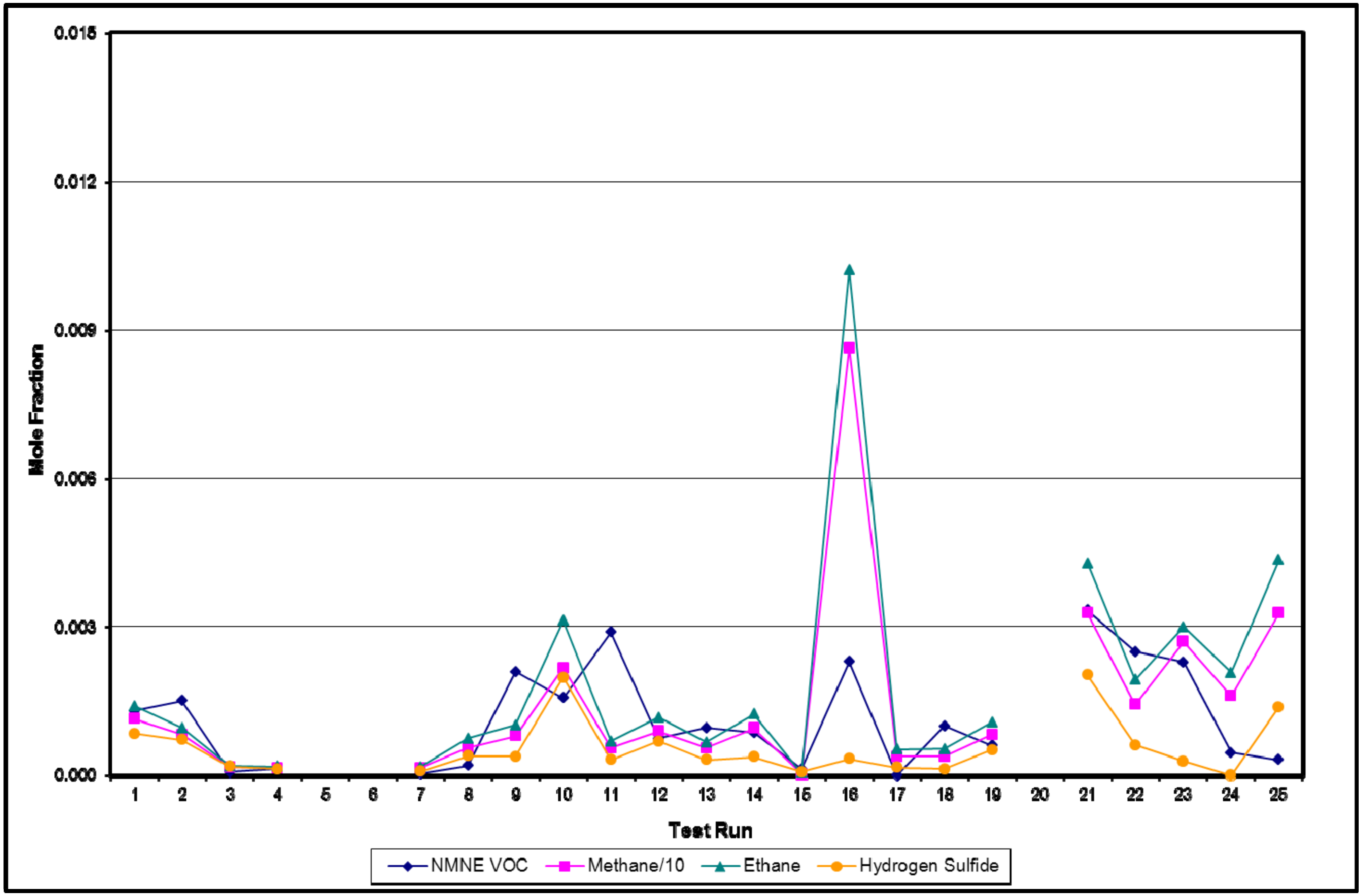
[2] Hydrogen sulfide was the only TRS compound detected above applicable method detection limits during applicable test runs.

[3] Target compound concentrations were not detected ("ND") above applicable method detection limits.

[4] Invalid test run ("I") for the applicable target compound.

[5] Applicable sampling method not performed ("NP") for target compound.

Figure 2-1. Summary of Results – NMNE VOC, Methane, Ethane and Hydrogen Sulfide Time-Weighted Average Concentrations



Note: One-tenth of the actual methane mole fractions per test run are presented to aid comparisons between emissions profiles of the target compounds.

Figure 2-2. Summary of Results – Selected Ratios of Time-Weighted Average Concentrations

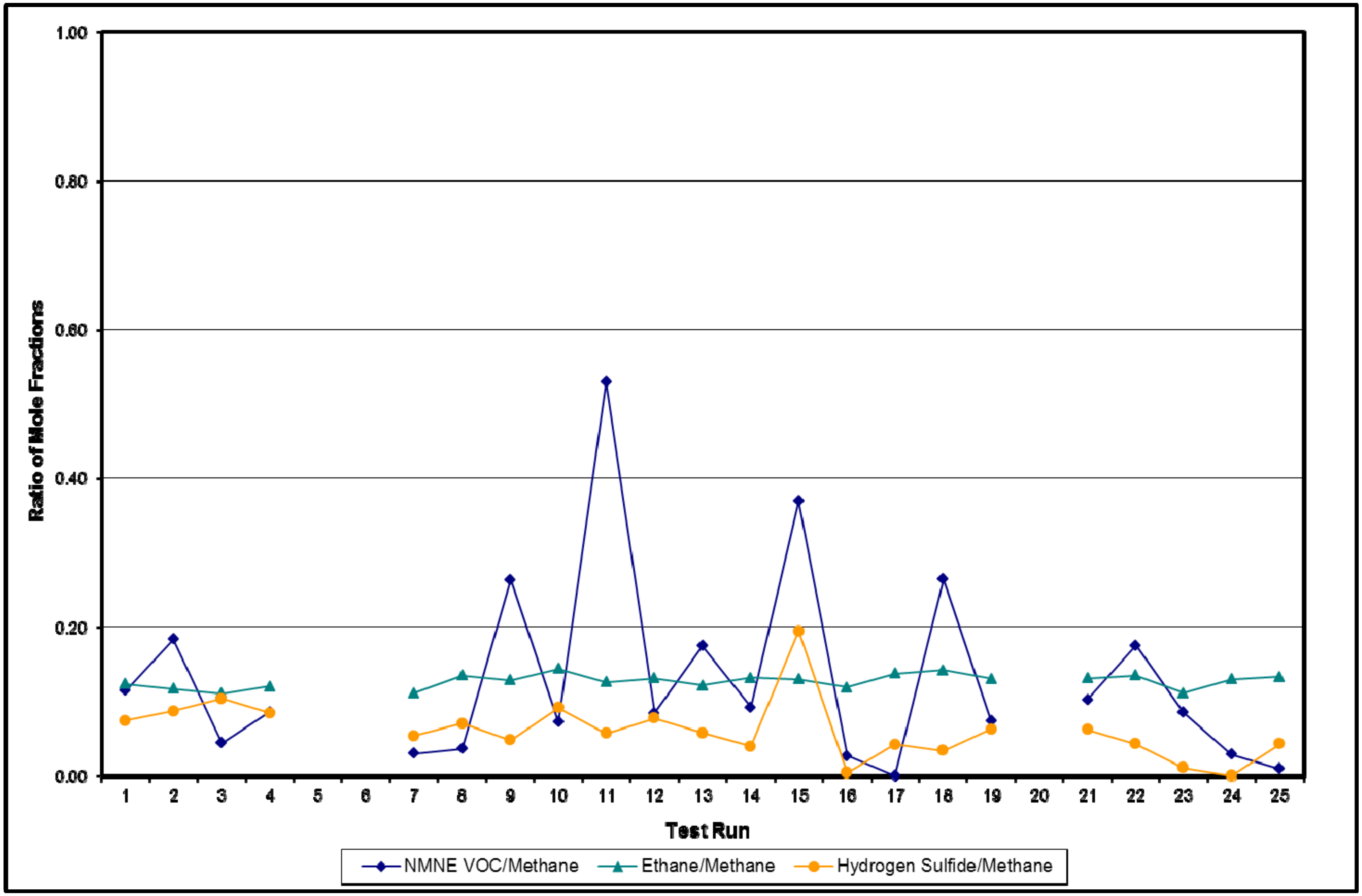


Table 2-103. Summary of Results –Target Compound Mass Emission Rates (lbs/cycle)

Run No.	Date	NMNE VOC Mass Emission Rate (lbs/cycle)	Methane Mass Emission Rate (lbs/cycle)	Ethane Mass Emission Rate (lbs/cycle)	Benzene Mass Emission Rate (lbs/cycle)	Toluene Mass Emission Rate (lbs/cycle)	Total SVOC Mass Emission Rate (lbs/cycle)	Total PM Mass Emission Rate (lbs/cycle)	H_2S[1] Mass Emission Rate (lbs/cycle)
1	5/7/10	99.6	306	70.9	1.11	6.13	1.1	8.95	46.7
2	5/8/10	88.3	189	41.6	0.628	1.93	1.4	10.9	35.5
3	5/9/10	13.2	76.5	16.0	ND[2]	1.45	0.55	7.45	16.5
4	5/11/10	12.4	48.5	10.9	ND	1.36	0.30	4.47	8.56
5	5/16/10	I[3]	I	I	I	I	2.2	19.5	I
6	5/18/10	I	I	I	I	I	0.54	3.70	I
7	5/19/10	3.01	23.0	5.08	ND	0.644	0.16	1.09	2.58
8	5/20/10	20.4	209	53.2	0.598	1.48	1.1	8.09	30.1
9	5/22/10	147	219	52.8	0.812	1.77	0.98	6.16	21.1
10	5/23/10	110	637	172	2.42	5.68	2.3	NP[4]	121
11	6/14/10	209	150	35.4	ND	4.01	NP	3.42	18.7
12	6/16/10	67.1	285	70.2	0.576	1.18	NP	7.10	49.2
13	6/17/10	128	270	61.7	0.408	0.578	NP	13.8	34.6
14	6/17/10	87.8	344	84.9	1.79	4.25	NP	10.8	30.0
15	6/18/10	12.1	10.5	2.66	ND	ND	NP	2.16	4.42
16	8/26/10	22.8	198	44.8	0.354	0.769	NP	NP	1.88
17	8/27/10	0	117	30.3	0.204	ND	NP	NP	9.95
18	8/28/10	47.6	59.2	15.6	ND	ND	NP	NP	4.83
19	8/29/10	57.0	297	72.8	1.21	2.50	NP	NP	38.5
20	8/29/10	I	I	I	I	I	NP	NP	I
21	8/30/10	153	545	134	1.79	4.11	NP	NP	70.0
22	8/31/10	188	303	77.2	1.31	3.06	NP	NP	23.0
23	9/1/10	50.3	218	51.8	0.658	1.33	NP	NP	4.92
24	9/1/10	9.44	234	57.0	0.901	2.40	NP	NP	0.465
25	9/2/10	17.4	723	148	2.52	5.99	NP	NP	61.1

[1] Hydrogen sulfide was the only TRS compound detected above applicable method detection limits during applicable test runs.

[2] Target compound concentrations were not detected (“ND”) above applicable method detection limits.

[3] Invalid test run (“I”) for the applicable target compound.

[4] Applicable sampling method not performed (“NP”) for target compound.

Table 2-104. Summary of Results –Target Compound Mass Emission Rates (tons/year)

Run No.	Date	NMNE VOC Mass Emission Rate (tpy)	Methane Mass Emission Rate (tpy)	Ethane Mass Emission Rate (tpy)	Benzene Mass Emission Rate (tpy)	Toluene Mass Emission Rate (tpy)	Total SVOC Mass Emission Rate (tpy)	Total PM Mass Emission Rate (tpy)	H_2S[1] Mass Emission Rate (tpy)
1	5/7/10	25.7	78.8	18.3	0.286	1.58	0.29	2.31	12.0
2	5/8/10	22.8	48.6	10.7	0.162	0.497	0.35	2.81	9.14
3	5/9/10	3.39	19.7	4.12	ND[2]	0.373	0.14	1.92	4.24
4	5/11/10	3.19	12.5	2.80	ND	0.350	0.078	1.15	2.21
5	5/16/10	I[3]	I	I	I	I	0.56	5.03	I
6	5/18/10	I	I	I	I	I	0.140	0.95	I
7	5/19/10	0.776	5.92	1.31	ND	0.166	0.042	0.281	0.665
8	5/20/10	5.26	53.9	13.7	0.154	0.383	0.27	2.09	7.74
9	5/22/10	37.9	56.3	13.6	0.209	0.455	0.25	1.59	5.43
10	5/23/10	28.4	164	44.4	0.624	1.46	0.59	NP[4]	31.1
11	6/14/10	53.8	38.7	9.13	ND	1.03	NP	0.882	4.83
12	6/16/10	17.3	73.5	18.1	0.148	0.304	NP	1.83	12.7
13	6/17/10	33.0	69.6	15.9	0.105	0.149	NP	3.55	8.93
14	6/17/10	22.6	88.7	21.9	0.461	1.10	NP	2.79	7.73
15	6/18/10	3.11	2.70	0.684	ND	ND	NP	0.558	1.14
16	8/26/10	5.88	51.0	11.5	0.0911	0.198	NP	NP	0.486
17	8/27/10	0	30.3	7.81	0.0525	ND	NP	NP	2.56
18	8/28/10	12.3	15.2	4.03	ND	ND	NP	NP	1.25
19	8/29/10	14.7	76.5	18.7	0.311	0.645	NP	NP	9.92
20	8/29/10	I	I	I	I	I	NP	NP	I
21	8/30/10	39.5	140	34.6	0.462	1.06	NP	NP	18.0
22	8/31/10	48.5	78.1	19.9	0.338	0.788	NP	NP	5.91
23	9/1/10	13.0	56.0	13.4	0.170	0.342	NP	NP	1.27
24	9/1/10	2.43	60.3	14.7	0.232	0.619	NP	NP	0.120
25	9/2/10	4.49	186	38.2	0.649	1.54	NP	NP	15.8

[1] Hydrogen sulfide was the only TRS compound detected above applicable method detection limits during applicable test runs.

[2] Target compound concentrations were not detected (“ND”) above applicable method detection limits.

[3] Invalid test run (“I”) for the applicable target compound.

[4] Applicable sampling method not performed (“NP”) for target compound.

Figure 2-3. Summary of Results – NMNE VOC, Methane, Ethane and Hydrogen Sulfide Mass Emission Rates

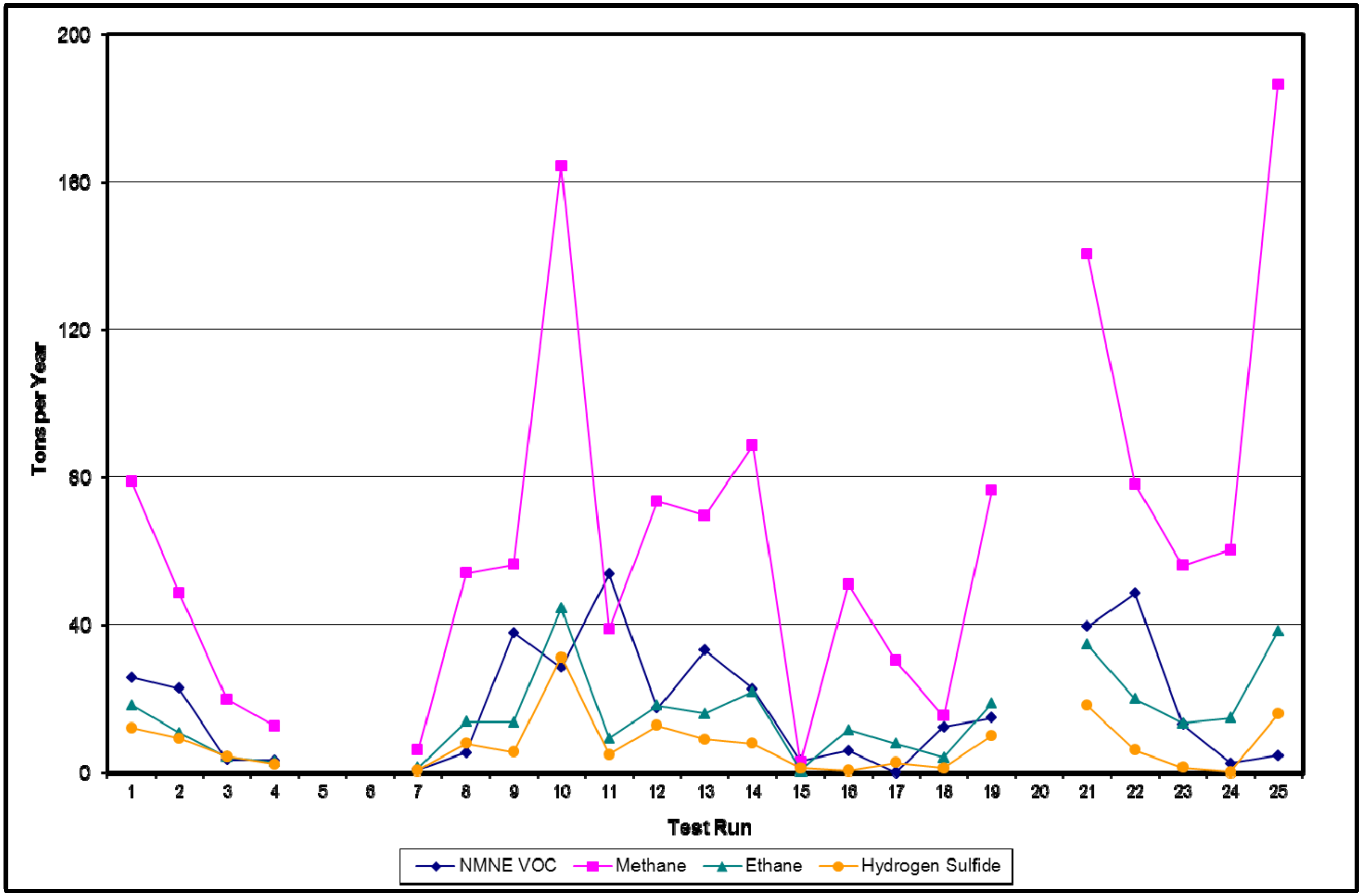
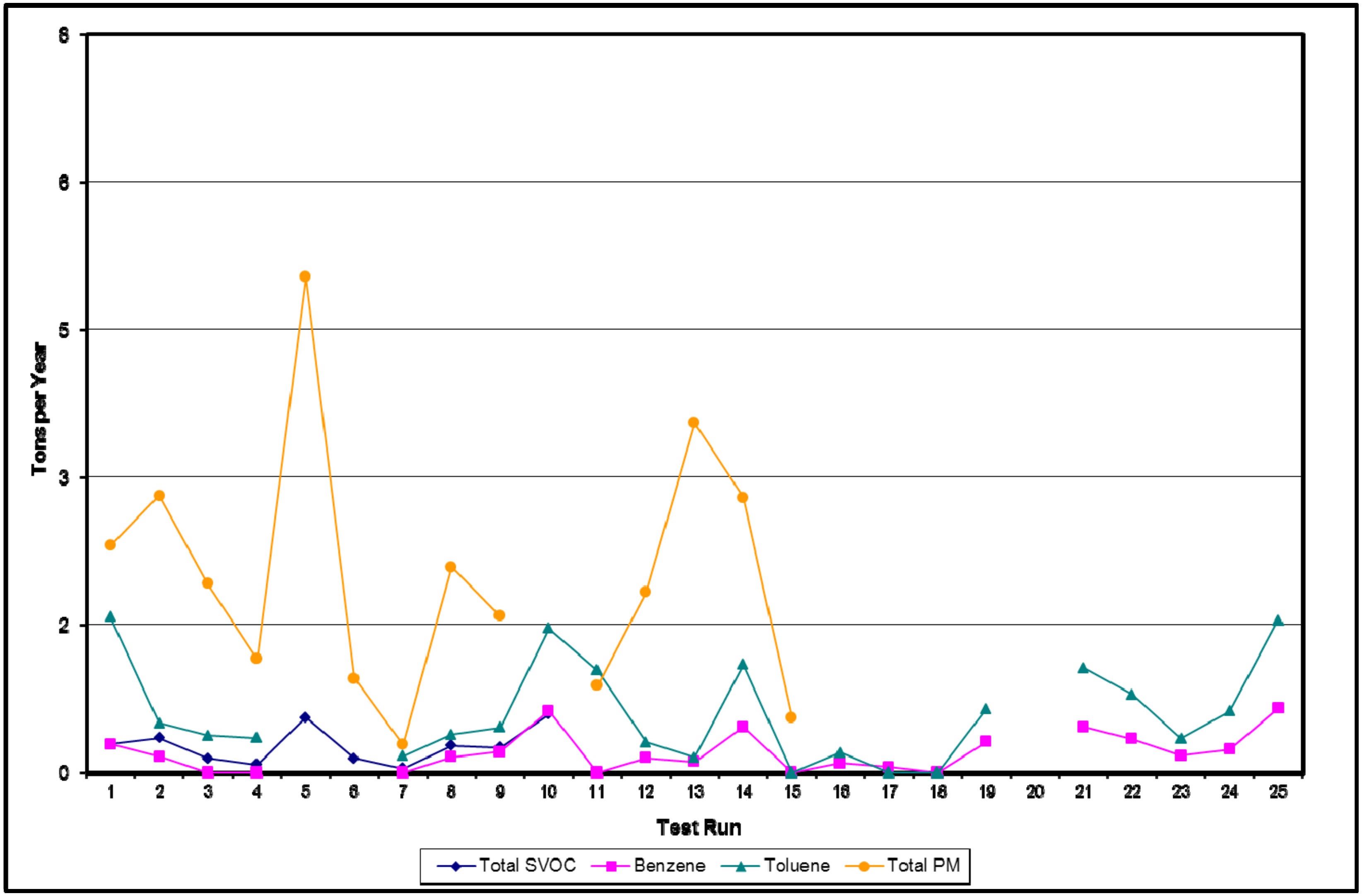


Figure 2-4. Summary of Results – Benzene, Toluene, Total SVOC and Total PM Mass Emission Rates



3.0 Sampling and Analytical Procedures

Emissions from the 1201 Vent and 1202 Vent were tested according to the *Protocol* using direct source testing methodologies. The sampling and analytical procedures followed during the 2010 Source Test are presented in this section and outlined in Table 3-1. Any deviations from the modified US EPA reference methods described in the *Protocol* are identified in this section and discussed in Section 5.0. **Appendix 3-1** presents the field sample logbook.

Table 3-1. Summary of Modified Sampling and Analytical Methods

Parameter	Modified Sampling Method	Modified Analytical Method
Sampling Location	US EPA Method 1	N/A
Velocity and Volumetric Flow Rate	US EPA Method 2	N/A
Molecular Weight	US EPA Method 3	Gas Chromatography/ Flame Ionization Detector by US EPA Methods 18
Moisture	US EPA Method 4	Gravimetric by US EPA Method 4
Total PM (FPM + CPM)	US EPA Methods 5 and 202	Gravimetric by US EPA Methods 5 and 202
TRS	US EPA Methods 15 and 16 and Other Test Method 12	Gas Chromatography/ Flame Photometric Detector by US EPA Methods 15 and 16
Selected SVOC	SW-846 Method 0010	Gas Chromatography/ Mass Spectrometry by SW-846 Methods 3542 and 8270C
Methane, Ethane, Benzene and Toluene	US EPA Methods 18 and Other Test Method 12	Gas Chromatography/ Flame Ionization Detector by US EPA Method 18
Total VOC and NMNE VOC	US EPA Methods 25A and Other Test Method 12	Flame Ionization Detector by US EPA Method 25A

3.1 Sampling Location by Modified US EPA Method 1

MPC installed six (6) sampling ports the 12” 1201 Vent pipe and six (6) sampling ports on the 12” 1202 Vent pipe to facilitate the simultaneous sampling of vent gas volumetric flow rate, NMNE VOC, methane, ethane, benzene, toluene, selected SVOC, total PM and TRS emissions. The design and physical locations of the six (6) sampling ports on each vent pipe were identical. Figure 3-1 presents a schematic of the vent pipes. Tables 3-2 through 3-6 describe the physical locations of the sampling ports relative to applicable upstream and downstream disturbances. Ports 1 and 6 were never utilized during the 2010 Source Test. Port 5 was only utilized for the modified US EPA Methods 15/16/18/25A/OTM 12 dilution sampling system during Test Conditions 1, 2 and 3. As discussed in the *Protocol*, no sampling ports utilized for vent gas velocity, total SVOC or total PM sampling provided orthogonal measurement lines across the 1201 Vent or 1202 Vent cross-sectional area. US EPA Method 1, "*Sample and Velocity Traverses for Stationary Sources*," was modified to allow for the use of a single traverse point at the center of the vent pipe by the stand-alone modified US EPA Method 2, stand-alone modified US EPA Methods 2/4, modified US EPA Methods 5/202, and modified SW-846 Method 0010 sampling trains at their respective sampling locations.

US EPA Method 1 requires that sampling points for the measurement of gas velocity, total PM and SVOC concentrations on stacks or ducts ≥12" in diameter be located at least one-half (0.5) vent diameters upstream and at least two (2) vent diameters downstream from the nearest flow disturbances. The sampling train operated in Port 4 (1201 Vent) during Runs 1-10 consistently measured the highest differential pressure when multiple sampling trains were operated simultaneously on the 12" pipe. This phenomenon suggested that the presence of a sampling probe in a given port may have created a flow disturbance at the port immediately downstream. As a consequence, the modified SW-846 Method 0010 sampling trains operated during Runs 1-4, the modified SW-846 Method 0010 and modified US EPA Methods 5/202 sampling trains operated during Runs 5-9, and the modified SW-846 Method 0010 sampling train operated during Run 10 may not have been in compliance with the measurement locations specified by US EPA Method 1 as modified by the *Protocol.* Data obtained by the stand-alone modified US EPA Method 2 sampling train operated in Port 2 during Runs 1-4 was only used to calculate the reported vent gas volumetric flow rate after the modified SW-846 Method 0010 and modified US EPA Methods 5/202 sampling trains had been removed from the vent pipe, thereby eliminating the flow disturbances potentially caused by those sampling probes and allowing compliance with modified US EPA Method 1. The possible flow disturbances caused by the sampling probes inserted into the 12" pipe were not anticipated, and the potential implications to the quality of the vent gas velocity, total SVOC and total PM concentration data are discussed in Section 5.0. Sampling data sheets used for modified US EPA Method 1 are included in **Appendix 3-2**.

Figure 3-1. Schematic of 1201 Vent and 1202 Vent Sampling Ports

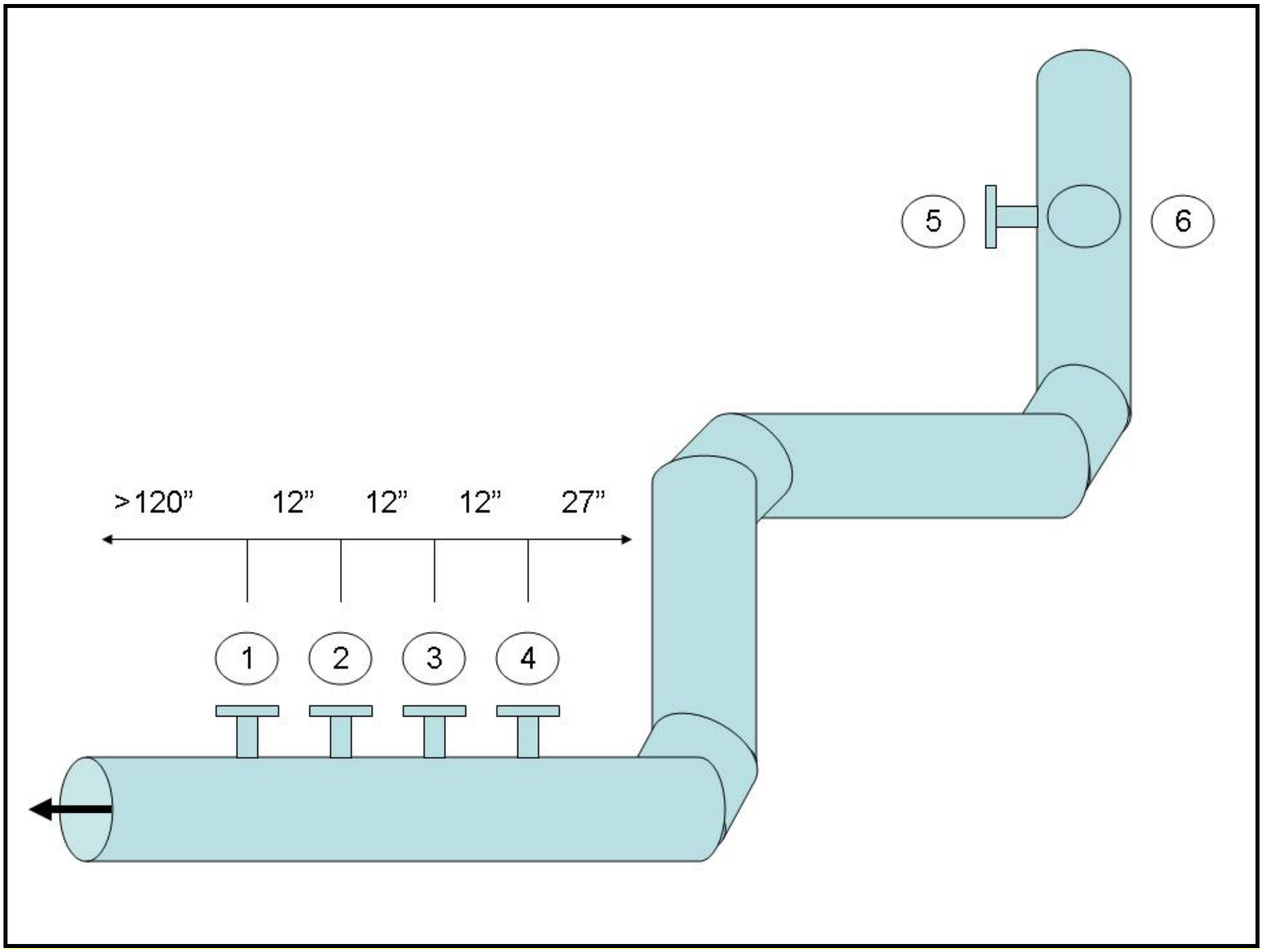


Table 3-2. Sampling Port Information – Runs 1-4

Port	Modified Sampling Method	Distance from Disturbance[1] (inches)		Equivalent Vent Diameters from Disturbance	
		Upstream	Downstream	Upstream	Downstream
1	Not Used	N/A	N/A	N/A	N/A
2	US EPA Method 2	132	12	11	1
3	SW-846 Method 0010	12	12	1	1
4	US EPA Methods 5/202	12	27	1	2.25
5	US EPA Methods 15/16/18/25A/OTM 12	N/A	N/A	N/A	N/A
6	Not used	N/A	N/A	N/A	N/A

[1] Includes potential flow disturbances caused by sampling probes inserted in the vent pipe.

Table 3-3. Sampling Port Information – Runs 5-9

Port	Modified Sampling Method	Distance from Disturbance[1] (inches)		Equivalent Vent Diameters from Disturbance	
		Upstream	Downstream	Upstream	Downstream
1	Not Used	N/A	N/A	N/A	N/A
2	US EPA Methods 5/202	132	12	11	1
3	SW-846 Method 0010	12	12	1	1
4	US EPA Method 2	12	27	1	2.25
5	US EPA Methods 15/1618/25A/OTM 12	N/A	N/A	N/A	N/A
6	Not used	N/A	N/A	N/A	N/A

[1] Includes potential flow disturbances caused by sampling probes inserted in the vent pipe.

Table 3-4. Sampling Port Information – Run 10

Port	Modified Sampling Method	Distance from Disturbance[1] (inches)		Equivalent Vent Diameters from Disturbance	
		Upstream	Downstream	Upstream	Downstream
1	Not Used	N/A	N/A	N/A	N/A
2	Not Used	N/A	N/A	N/A	N/A
3	SW-846 Method 0010	144	12	12	1
4	US EPA Method 2	12	27	1	2.25
5	US EPA Methods 15/1618/25A/OTM 12	N/A	N/A	N/A	N/A
6	Not used	N/A	N/A	N/A	N/A

[1] Includes potential flow disturbances caused by sampling probes inserted in the vent pipe.

Table 3-5. Sampling Port Information – Runs 11-15

Port	Modified Sampling Method	Distance from Disturbance[1] (inches)		Equivalent Vent Diameters from Disturbance	
		Upstream	Downstream	Upstream	Downstream
1	Not Used	N/A	N/A	N/A	N/A
2	US EPA Methods 5/202	132	51	11	4.25
3	Not Used	N/A	N/A	N/A	N/A
4	Not Used	N/A	N/A	N/A	N/A
5	US EPA Methods 15/1618/25A/OTM 12	N/A	N/A	N/A	N/A
6	Not used	N/A	N/A	N/A	N/A

[1] Includes potential flow disturbances caused by sampling probes inserted in the vent pipe.

Table 3-6. Sampling Port Information – Runs 16-25

Port	Modified Sampling Method	Distance from Disturbance[1] (inches)		Equivalent Vent Diameters from Disturbance	
		Upstream	Downstream	Upstream	Downstream
1	Not Used	N/A	N/A	N/A	N/A
2	US EPA Methods 15/1618/25A/OTM 12	N/A	N/A	N/A	N/A
3	Not Used	N/A	N/A	N/A	N/A
4	US EPA Method 2	156	27	13	2.25
5	Not Used	N/A	N/A	N/A	N/A
6	Not used	N/A	N/A	N/A	N/A

[1] Includes potential flow disturbances caused by sampling probes inserted in the vent pipe.

3.2 Velocity, Volumetric Flow Rate, Dry Gas Molecular Weight and Moisture Concentration by Modified US EPA Methods 2, 3 and 4

The 205 DCU atmospheric depressurization vent gas velocity and volumetric flow rate was measured according to modified US EPA Method 2, and the moisture concentration was measured according to modified US EPA Method 4. US EPA Methods 2 and 4 were performed concurrently with the modified US EPA Methods 5/202 and SW-846 Method 0010 sampling trains. In addition, a stand-alone modified US EPA Method 2 sampling train was used to collect redundant gas velocity and volumetric flow rate data during Runs 1-10, and a stand-alone modified US EPA Methods 2/4 sampling train was used to collect gas velocity, volumetric flow rate and moisture concentration data during Runs 16-20. In lieu of performing oxygen and carbon dioxide measurements per US EPA Method 3, the molecular weight of methane was assigned to the entire dry gas fraction during all test runs. The modified procedures by which velocity, volumetric flow rate, dry gas molecular weight and moisture concentration data were obtained on the atypical 1201 Vent and 1202 Vent gas streams are described in detail in the *Protocol,* and any deviations from those modified procedures are discussed in this section.

3.2.1 Sampling Train Design

The stand-alone modified US EPA Method 2 sampling train consisted of a sampling probe equipped with a Type-S pitot tube and instruments to measure the differential pressure, static pressure and temperature of the vent gas stream. The stand-alone modified US EPA Method 2/4 sampling train was designed and operated similarly to the modified US EPA Methods 5/202 sampling train (see Section 3.6 for details). During Test Condition 4, the design and contents of the stand-alone modified US EPA Method 2/4 sampling train impingers were adjusted to collect internal data on the condensate sample matrix. These adjustments did not compromise the effectiveness of the sampling train in determining moisture concentrations by gravimetric analysis. The specific impinger train designs utilized during Test Condition 4 are presented in **Appendix 3-2**.

3.2.2 Sampling Train Operation

Modified US EPA Method 2 was performed within at least two (2) minutes of vent activation and for as long as possible during the venting cycle until URS personnel evacuated the 205 DCU prior to the coke-cutting cycle. Generally, direct measurements of vent gas differential pressure, static pressure and temperature were made during at least 90% of the duration of each complete venting cycle. Differential pressure measurements across a Type-S pitot tube were made with a gauge-oil manometer or a digital manometer if the differential pressure exceeded 10 inches of H_2O. The vent gas static pressure was recorded using a gauge-oil manometer or magnehelic gauge if the static pressure exceeded 10 inches of H_2O. A calibration check was performed on the magnehelic gauges and digital manometers according to US EPA Method 2, Section 6.2.1. The vent gas differential pressure, static pressure and temperature readings were recorded nominally every two (2) minutes during the operation of the sampling train. Due to the high velocity, high moisture concentration, and limited duration of the venting cycle, it was not practicable to check for the presence of cyclonic flow. Per the *Protocol*, US EPA Method 2 was modified such that the extent of cyclonic flow was not determined as part of this sampling program.

Modified US EPA Method 4 was performed within at least two (2) minutes of vent activation and for as long as possible during the venting cycle until URS personnel evacuated the 205 DCU prior to the coke-cutting cycle. Generally, direct measurements of vent gas moisture concentration were made during at least 50% of the duration of each complete venting cycle. In the event that any leak rates exceeded 4% of the average dry gas sampling rate, the dry gas sample volume collected by the stand-alone modified US EPA Methods 2/4 sampling train was corrected according to the applicable calculations presented in US EPA Method 5.

3.2.3 Sample Analysis

All data collected using modified US EPA Method 2 was recorded real-time and no samples were collected for recovery and analysis. The moisture content of the gas stream was determined from the total weight gain of the impingers utilized in the modified US EPA Methods 5/202, SW-846 Method 0010, and stand-alone US EPA Methods 2/4 sampling trains according to modified US EPA Method 4. An average moisture concentration for each test run was developed from all of the valid moisture concentrations results obtained during the test run.

It was not practicable to measure the oxygen or carbon dioxide concentrations in the sample gas with US EPA Method 3 because a representative volume of dry gas, on average <2% of the total sample, could not be collected during the limited time a sampling train could be operated.

Furthermore, carbon dioxide was not expected at significant concentrations because the vent gas was not the result of a combustion process. Therefore, the molecular weight of the dry fraction of the 1201 Vent and 1202 Vent gas was assumed to be equal to methane (16.0 g/g-mol), the most abundant compound detected in the gas stream after water. Actual average methane concentrations (time-weighted) per venting cycle ranged from 0.0341 to 8.63% by volume. Because the average moisture concentrations were in excess of 98%, the estimated dry gas molecular weight had an insignificant impact on the calculation of wet gas molecular weight. When added together, average water and methane concentrations measured per test run at times exceeded 100% due to differences in sampling and analytical methodology.

Vent gas velocity, static pressure, temperature, dry gas molecular weight, and moisture concentration data collected by each modified sampling train were used to calculate vent gas volumetric flow rate per US EPA Method 2. The sampling train operated in Port 4 (1201 Vent) during Runs 1-10 consistently measured the highest differential pressure when multiple sampling trains were operated simultaneously on the 12" pipe. In cases where multiple sampling trains were performed during a venting cycle, the highest (i.e., most conservative) volumetric flow rate data was used to develop mass emission rates for all target compounds. Regression curves were constructed with the most conservative volumetric flow rate data to extrapolate volumetric flow rate during periods when direct sampling was not performed.

Appendix 2-2 presents the database of instantaneous volumetric flow rates, calculated nominally every two (2) minutes during each venting cycle, which was used to develop average volumetric flow rates during various sampling intervals for NMNE VOC, methane, ethane, benzene, toluene, TRS, total SVOC and total PM concentrations. This database was also used to develop average volumetric flow rates during periods of data extrapolation for all target compounds. **Appendix 2-2** also presents graphs of instantaneous vent gas volumetric flow rates versus the elapsed time of each venting cycle that include the regression curve equations used to extrapolate data. **Appendix 3-2** includes sampling data sheets used for the stand-alone modified US EPA Method 2 and US EPA Methods 2/4 sampling trains. **Appendix 3-3** includes calibration data for sampling equipment used with modified US EPA Methods 2 and 4.

3.2.4 Deviations from the *Protocol*

Five (5) deviations from the *Protocol* occurred during while performing modified US EPA Methods 2, 3 and 4 and their respective impacts on QA/QC are discussed further in Section 5.0.

- Vent gas velocity, static pressure, temperature, and moisture concentration data were not collected until two (2) minutes after vent activation during Runs 11, 14, 18 and 22;

- The modified sampling trains utilized sampling ports other than those designated in the *Protocol*;
- Data collected using modified US EPA Method 2 at the sampling port furthest upstream from outlet of the vent was used for the calculation of volumetric flow rates used to develop all target compound mass emission rates;
- The design and impinger contents of the stand-alone modified US EPA Methods 2/4 sampling train were altered; and
- The molecular weight of methane was assigned to the entire dry gas sample fraction during all test runs.

3.3 Methane, Ethane, Benzene and Toluene Concentrations by Modified US EPA Method 18 and Other Test Method 12

The concentrations of methane, ethane, benzene and toluene in the 1201 Vent and 1202 Vent gas streams were measured according to modified US EPA Method 18 and the dilution sampling system procedures described in US EPA OTM 12 during 22 venting cycles of the 2010 Source Test. Valid methane, ethane, benzene and toluene results were not obtained during Runs 5, 6 and 20 due to malfunctions that occurred with the dilution sampling system. The modified procedures by which methane, ethane, benzene and toluene concentration data were obtained on the atypical 1201 Vent and 1202 Vent gas streams are described in detail in the *Protocol,* and any deviations from those modified procedures are discussed in this section.

3.3.1 Sampling System Design

Samples of the 1201 Vent and 1202 Vent gas streams were extracted continuously using the modified US EPA Methods 15/16/18/25A/OTM 12 dilution sampling system (equipped with a glass critical orifice) and diluted with high-purity nitrogen at dilution ratios (DR) of approximately 48:1. A heated particulate filter was placed immediately downstream of the inlet to the stainless steel dilution sampling probe tip and upstream of the glass critical orifice. The diluted sample gas passed from the glass critical orifice through a heated Teflon® sampling line to a FlexFoil® bag. Integrated bag samples were collected during at least two (2) sampling intervals on each tested venting cycle. The FlexFoil® bag samples were then transported to the URS on-site laboratory until analysis on a wet basis by GC/FID. All VOC samples collected during Runs 2, 4, 7-19, and 21-25 were performed within 24 hours of collection. All VOC samples collected during Runs 1 and 3 were performed within 40 hours of collection.

3.3.2 Sampling System Operation

Diluted sample gas was collected within one (1) minute of vent activation (except during Run 18) and for as long as possible during the venting cycle until URS personnel evacuated the 205 DCU prior to the coke-cutting cycle. Generally, direct measurements of methane, ethane, benzene and toluene concentrations were made during at least 50% of the duration of each complete venting cycle.

An EPM Dilution Probe and CleanAir Engineering Exemplar Flow Panel were used as the dilution sampling system. A stable dilution air pressure and critical orifice vacuum greater than 14.7" Hg (manufacturer's specification) were maintained throughout all calibrations and sampling periods during valid test runs. During Runs 5, 6 and 20, valid methane, ethane, benzene and toluene concentration data were not obtained because the dilution system air pressure and critical orifice vacuum became unstable. This malfunction was due to clogging by moisture condensation and petroleum coke material.

It is important to note that with an average modified US EPA Method 18/25/OTM 12 dilution sampling system DR of approximately 48:1, the moisture concentrations in the FlexFoil® bag samples were <3%. All applicable dilution sampling system components were heated to approximately 300°F and the dew point of the sample gas was maintained lower than the operating temperature of the GC/FID analytical system to minimize sample loss or interferences due to moisture.

Prior to the start of sampling, the GC/FID was calibrated using Custom Certified (±2% accuracy) calibration gas standards for the target analytes in a balance of nitrogen. Stainless steel or Teflon® sample loops of various sizes were used to inject target concentrations of calibration gas to the GC/FID. FlexFoil® bags were used to store and introduce calibration gas from the gas cylinder to the GC/FID to mimic sample conditions as closely as possible. Recovery Studies were performed according to the *Protocol* either before or after each test run (except during Run 2) using a Custom Certified calibration gas standard containing methane in a balance of nitrogen. After all sample analyses, a post-test calibration was performed using a calibration gas standards identical to the ones used during the pre-test run calibration.

The following calibration and quality assurance procedures described in US EPA Method 18 were followed, with exceptions noted in Section 3.3.4:

- The instrument was calibrated at three (3) points for each species before sample analyses;
- The analysis of each of three (3) consecutive calibration injections differed by <5% from the average result at each concentration level;
- The calibration drift of the instrument was determined for each species at one (1) point (mid-level) after sample analyses;
- The average analyses of the mid-level calibration standard before sample analyses and after sample analyses differed by <5% from their average; and

- A 90-110% recovery of calibration gas samples introduced as close to the probe tip as possible was demonstrated during a modified Recovery Study.

3.3.3 Sample Analysis

Each FlexFoil® bag sample was analyzed in triplicate (except for sample *MAR-1202-31-M15/18-Bag2* during Run 13) and the final concentration result was calculated as the average of the triplicate analyses of the sample. The average DRs developed on a test run-by-test run basis through the operation of the dilution sampling system and the THC analyzers (see Section 3.4) were multiplied to the raw GC/FID analyses. These results (GC/FID raw data x DR) were then corrected to the average percent recovery achieved through the dilution system. The average percent recoveries were developed on a test run-by-test run basis by performing a modified Recovery Study based upon Section 8.4 of US EPA Method 18.

Method detection limits (MDL) were developed using the approach described in 40 CFR §136, Appendix B. According to this methodology, each standard is analyzed seven (7) times, and the MDL is defined as the standard deviation times the student's T value at the 99% confidence limit. The MDL was developed at the instrument using direct injection of calibration gas, transferred from the calibration gas cylinder or calibration gas dilution system to the GC/FID via a FlexFoil® bag. The analyte-specific method detection limits established through the calibration of the GC/FID are presented in Tables 3-7 and 3-8.

Raw GC/FID data is included in **Appendix 2-3**. Sampling data sheets used for the operation of the modified US EPA Methods 15/16/18/25A/OTM 12 dilution sampling system are presented in **Appendix 3-4**. GC/FID calibration information associated with the performance of modified US EPA Method 18 is included in **Appendix 3-5**.

Table 3-7. Modified US EPA Method 18 Method Detection Limits – Test Conditions 1-3

Injection	Methane 0.967 ppmv (AC)	Ethane 0.883 ppmv (AC)	Benzene 3.33 ppmv (AC)	Toluene 3.33 ppmv (AC)
1	0.622	1.15	380	508
2	0.636	1.17	382	502
3	0.626	1.17	385	500
4	0.618	1.16	381	511
5	0.633	1.16	386	502
6	0.636	1.17	376	492
7	0.627	1.15	385	517
Average AC	0.628	1.164	382	505
St. Dev. AC	0.00689	0.00720	3.42	7.88
St. Dev. X 3.143	0.0217	0.0226	10.8	24.8
Cal. Slope	0.623	1.15	110	150
Cal. Intercept	0	0	0	0
MDL	**0.0348**	**0.0197**	**0.0976**	**0.165**

Table 3-8. Modified US EPA Method 18 Method Detection Limits – Test Condition 4

Injection	Methane 5.8 ppmv (AC)	Ethane 5.3 ppmv (AC)	Benzene 3.33 ppmv (AC)	Toluene 3.33 ppmv (AC)
1	3.63	7.99	328	309
2	3.64	8.35	329	316
3	3.64	8.47	329	306
4	3.66	8.44	328	308
5	3.64	8.56	330	311
6	3.63	8.58	330	310
7	3.65	8.61	324	299
Average AC	3.64	8.43	328	309
St. Dev. AC	0.00993	0.213	2.06	5.18
St. Dev. X 3.143	0.0312	0.670	6.47	16.3
Cal. Slope	0.611	1.11	96.3	93.0
Cal. Intercept	0	0	0	0
MDL	**0.0511**	**0.602**	**0.0672**	**0.175**

3.3.4 Deviations from the *Protocol*

Nine (9) deviations from the *Protocol* occurred during the sampling for methane, ethane, benzene and toluene concentrations in the vent gas and their respective impacts on QA/QC are discussed further in Section 5.0.

- The GC/FID analysis of sample *MAR-1202-41-M15/18-Bag1* could not be performed due to a leak in the sample bag following Run 18;
- Sample *MAR-1202-31-M15/18-Bag2* was analyzed in duplicate during Run 13;
- Recovery Studies failed the 90-110% recovery criteria during Runs 1, 3, 4, 8, 10, 11, 14, 15 and 24;
- Only single post-test calibrations for all target compounds were performed during Runs 3 and 4;
- Post-test calibrations for benzene and toluene were performed in duplicate during Runs 1 and 2;
- Post-test calibrations for toluene failed <5% RPD criteria during Run 8;
- Post-test calibrations for methane and ethane failed <5% RPD criteria during Run 9;
- Post-test calibrations for benzene and toluene failed <5% RPD criteria during Run 11; and
- The post-test calibration for toluene failed <5% RPD criteria during Run 23.

3.4 NMNE VOC Concentrations by Modified US EPA Method 25A and Other Test Method 12

Total VOC concentrations in the 1201 Vent and 1202 Vent gas streams were measured according to modified US EPA Methods 25A and the dilution sampling system procedures described in US EPA OTM 12. The total VOC concentrations were measured conservatively as THC during 22 venting cycles of the 2010 Source Test. Valid total VOC results were not obtained during Runs 5, 6 and 20 due to malfunctions that occurred with the dilution sampling system. US EPA defines VOCs in 40 CFR §51.100(s) as "any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions." 40 CFR §51.100(s)(1) also lists many organic compounds, in addition to methane and ethane, which have been determined to have negligible photochemical reactivity and may be excluded as VOC if accurately quantified. NMNE VOC concentration results were reported by subtracting the average methane and ethane concentrations from the average total VOC concentrations measured during a given sampling period. The modified procedures by which NMNE VOC concentration data were obtained on the atypical 1201 Vent and 1202 Vent gas streams are described in detail in the *Protocol,* and any deviations from those modified procedures are discussed in this section.

3.4.1 Sampling System Design

Samples of the 1201 Vent and 1202 Vent gas streams were extracted continuously using the modified US EPA Methods 15/16/18/25A/OTM 12 dilution sampling system (equipped with a glass critical orifice) and diluted with high-purity nitrogen at known DRs of approximately 48:1. A heated particulate filter was placed immediately downstream of the inlet to the stainless steel dilution sampling probe tip and upstream of the glass critical orifice. The diluted sample gas passed from the glass critical orifice through a heated Teflon® sampling line to THC analyzers equipped with FIDs. Total VOC (as THC) concentrations in the diluted sample gas were measured continuously on a wet basis. During 18 out of 22 valid test runs, all raw THC concentrations were within the calibration span (direct) of a single instrument. During four (4) out of 22 valid test runs, raw THC concentrations were quantified by two (2) separate instruments calibrated at complementary spans. This multi-analyzer approach allowed the accurate and precise quantification of THC concentrations (as propane) from 0 to 100% by volume on a wet basis.

3.4.2 Sampling System Operation

Diluted sample gas was collected within one (1) minute of vent activation and for as long as possible during the venting cycle until URS personnel evacuated the 205 DCU prior to the coke-cutting cycle. Generally, direct measurements of NMNE VOC concentrations were made during at least 50% of the duration of each complete venting cycle.

Samples of the 1201 Vent and 1202 Vent gas streams were extracted using the same dilution sampling system used to collect methane, ethane, benzene, toluene and TRS samples by modified US EPA Methods 15, 16 and 18 (see Sections 3.3 and 3.7). A stable dilution air pressure and critical orifice vacuum greater than 14.7" Hg (manufacturer's specification) were maintained throughout all calibrations and sampling periods during valid test runs. During Runs 5, 6 and 20, valid NMNE VOC concentration data were not obtained because the dilution system air pressure and critical orifice vacuum became unstable. This malfunction was due to clogging by moisture condensation and petroleum coke material.

Prior to the start of sampling, THC analyzers were calibrated using either US EPA Protocol or Primary Standard (±1% accuracy) calibration gas standards for propane in a balance of nitrogen. Following sample analyses and unless otherwise noted, a Drift Test was performed using calibration gas standards identical to the ones used during the pre-test run Calibration Error Test. US EPA OTM 12 requires that the Calibration Error Test and Drift Test be performed with US EPA Protocol calibration gases introduced as close to the probe tip as possible and upstream of the dilution sampling system. As described in the *Protocol*, calibration gases at higher hydrocarbon concentrations than present in the actual (undiluted) 1201 Vent and 1202 Vent gas streams could not be easily procured or safely used during the 2010 Source Test. Therefore, some Primary Standard calibration gases were used in lieu of US EPA Protocol calibration gases, and high-range THC analyzers were not calibrated by introducing reference gas upstream of the dilution sampling system. Instead, high-range THC analyzers were calibrated directly, bypassing the dilution sampling system, while low-range THC analyzers were calibrated with dilution and used to establish test run-specific average DRs.

The following calibration and quality assurance procedures described in US EPA Method 25A were followed, with exceptions noted in Section 3.4.4:

- A pre-test run Calibration Error Test was performed at four (4) points before sample analyses;
- The analysis of each calibration gas during the Calibration Error Test differed by <5% error from the certified concentration;
- The post-test run Drift Test of the instrument was determined at two (2) points (zero and either low- or mid-level) after sample analyses;
- The analysis of each calibration gas during the Drift Test differed by <5% error from the certified concentration;
- The analyses of each calibration gas during the Drift Test differed by <3% of the instrument's calibration span from the Calibration Error Test results; and
- A response time test was conducted on each THC analyzer.

Average RFs for methane (RF_M) and ethane (RF_E) were determined experimentally by introducing both a methane and ethane Custom Certified (±2% accuracy) calibration standard (with a balance of nitrogen) to each THC analyzer prior to performing a test run. The methane and ethane RFs were calculated according to Equation 25Aap-1 in US EPA OTM 12. Some Methane and ethane RFs were obtained for high-range THC analyzers by introducing the gas standards directly, bypassing the dilution sampling system. Individual and average RFs for methane and ethane per each individual THC analyzer used during the 2010 Source Test are presented in **Appendix 3-6**.

3.4.3 Sample Analysis

When instantaneous THC concentrations were within a defined calibration span during a test run, the results were used in the calculation of the average total VOC concentration per sampling period. Total VOC sampling periods corresponded closely to the sampling periods for integrated bags samples collected for analyses by modified US EPA Method 18. The average DRs developed on a test run-by-test run basis were multiplied to the average total VOC concentration results per sampling interval. Average DRs were also applied to raw GC/FID and GC/FPD data collected using modified US EPA Method 18 and modified US EPA Methods 15/16, respectively. Average methane/propane and average ethane/propane equivalent concentrations were calculated using RF per carbon data applied to average methane and ethane concentration results from GC/FID analyses. Finally, average methane/propane equivalent and average ethane/propane equivalent concentrations were subtracted from average total VOC concentrations to develop average NMNE VOC concentrations during a given sampling interval.

Raw and corrected THC analyzer data is included in **Appendix 2-4**. Sampling data sheets used for the operation of the modified US EPA Methods 15/16/18/25A/OTM 12 dilution sampling system are presented in **Appendix 3-4**. THC analyzer calibration information associated with the performance of modified US EPA Method 25A is included in **Appendix 3-6**.

3.4.4 Deviations from the *Protocol*

Six (6) deviations from the *Protocol* occurred during the sampling for NMNE VOC concentrations in the vent gas and their respective impacts on QA/QC are discussed further in Section 5.0.

- During Runs 1-4, 7-8, 11, 13, 15-19, and 21-25, only one analyzer was used to measure THC concentrations during the venting cycle;
- During Runs 1 and 24, some dilution sampling system parameters fluctuated during sampling and de-stabilized the DR;
- A post-test Drift Test was not performed on any THC analyzer following Run 2;
- During Runs 1, 11, and 24, the Drift Test (diluted) criterion of ≤3% of span was not achieved on applicable THC analyzers due to a significant change in the dilution sampling system DR and/or actual THC analyzer drift;
- A US EPA Protocol gas containing 900 ppmv propane in a balance of nitrogen was used instead of pure nitrogen as the dilution gas during Run 25; and
- The calibration gases used to demonstrate the Calibration Error Tests and/or Drift Tests on THC1 during Run 11, THC1 during Run 18, THC2 during Run 19, THC2 during Run 21, THC1 during Run 24, and THC3 during Run 25 were slightly outside the concentration ranges specified in the *Protocol*.

3.5 SVOC Concentrations by Modified SW-846 Method 0010

Modified SW-846 Method 0010 was used to measure selected SVOC concentrations in the 1201 Vent gas stream during Runs 1-10 of the 2010 Source Test. SVOCs are defined in SW-846 Method 0010 as compounds having boiling points >100°C (212°F). Selected SVOC samples were extracted from the 1201 Vent as isokinetically as possible. Principal components of the sampling train included a quartz-fiber filter used to collect organic-laden PM and a porous polymeric resin (XAD) sorbent trap used to adsorb SVOCs. The modified procedures by which selected SVOC concentration data were obtained on the atypical 1201 Vent gas stream is described in detail in the *Protocol,* and any deviations from those modified procedures are discussed in this section.

3.5.1 Sampling Train Design

The modified SW-846 Method 0010 sampling train consisted of the following components:

- Stainless steel nozzle;
- Sampling probe with stainless steel liner (the probe will also be equipped with a Type-S pitot tube);
- Heated quartz-fiber filter;
- Heated Teflon® transfer line;
- Glass coiled condenser;
- One large glass impingers (3-liter), with knockout stem, empty;
- XAD-2® resin sorbent trap;
- One large glass impinger (3-liter), with modified Greenburg-Smith stem, containing 200 ml D.I. H_2O;
- One large glass impinger (3-liter), with Greenburg-Smith stem, containing 200 ml D.I. H_2O;
- Two standard glass impingers, with knockout stems, empty;
- Two standard glass impingers, with Greenburg-Smith stems, containing 100 ml 10% zinc acetate solution;
- One standard glass impinger, with knockout stem, empty;
- One standard glass impinger, with modified Greenburg-Smith stem, containing 100 ml 1.0N potassium hydroxide solution;
- One standard glass impinger, with knockout stem, empty;
- One standard glass impinger, with modified Greenburg-Smith stem, containing approximately 300 g of silica gel desiccant;
- Air-tight sample pump;
- Dry gas meter; and
- Orifice.

3.5.2 Sampling Train Operation

Modified SW-846 Method 0010 sampling trains were performed within at least two (2) minutes of vent activation and for as long as possible during each venting cycle until URS personnel evacuated the 205 DCU prior to the coke-cutting cycle. Modified US EPA Methods 2 and 4 (see Section 3.2) were performed concurrently with the modified SW-846 Method 0010 sampling trains. Generally, direct measurements of vent gas differential pressure, static pressure, temperature, moisture concentration and selected SVOC concentration were made during at least

50% of the duration of each complete venting cycle. In the event that any sampling train leak rates exceeded 4% of the average dry gas sampling rate, the dry gas sample volume collected by the modified SW-846 Method 0010 sampling train was corrected according to the applicable calculations presented in US EPA Method 5. The vent gas differential pressure, static pressure, temperature, and moisture concentration data obtained with each modified SW-846 Method 0010 sampling train were used to calculate the isokinetic sampling rate.

3.5.3 Sample Recovery and Analysis

After successful completion of each test run, the SVOC samples were recovered separately into the following components:

- Front-half (nozzle, probe liner, and front-half of the filter holder) rinse with 50/50 methanol/dichloromethane;
- Quartz-fiber filter;
- Contents of the single pre-XAD-2® knockout impinger used to trap condensate;
- Mid-train (all glassware between the filter and the inlet to the XAD-2® sorbent trap) rinse with 50/50 methanol/dichloromethane;
- XAD-2® resin sorbent trap; and
- Contents of the single post-XAD-2® knockout impinger used to trap condensate.

In addition, the moisture content of the gas stream was determined from the total weight gain of the impingers utilized in the modified SW-846 Method 0010 sampling train.

SVOC samples were prepared in the laboratory for analysis using SW-846 Method 3542. The three (3) modified analytical fractions that were analyzed separately in the laboratory by GC/mass spectrometry (MS) were:

- Combined filter and probe and nozzle rinses;
- Combined mid-train rinses and pre-XAD-2® sorbent condensate catch; and
- Combined XAD-2® resin sorbent and post-XAD-2® condensate catch.

Vent gas velocity, static pressure, temperature, dry gas molecular weight, and moisture concentration data collected by each modified sampling train were used to calculate vent gas volumetric flow rate per US EPA Method 2. The sampling train operated in Port 4 (1201 Vent) during Runs 1-10 consistently measured the highest differential pressure when multiple sampling trains were operated simultaneously on the 12” pipe. In cases where multiple sampling trains were performed during a venting cycle, the highest (i.e., most conservative) volumetric flow rate data was used to develop selected SVOC mass emission rates. Regression curves were constructed with the most conservative volumetric flow rate data to extrapolate volumetric flow rate during periods when direct sampling was not performed. The full laboratory report is presented in **Appendix 2-5**. **Appendix 3-3** includes calibration data for sampling equipment used with modified SW-846 Method 0010 sampling trains. **Appendix 3-7** includes sampling data sheets used for the modified SW-846 Method 0010 sampling trains.

3.5.4 Deviations from the *Protocol*

Three (3) deviations from the *Protocol* occurred during the sampling for selected SVOC concentrations in the vent gas and the impacts on QA/QC are discussed further in Section 5.0.

- The design and contents of the sampling train impingers were modified;
- The isokinetic sampling rate criteria of ≤110% specified in the Protocol was not met during Runs 2 and 7-10; and
- All modified SW-846 Method 0010 sampling trains may not have collected gas samples at measurement locations that complied with US EPA Method 1.

3.6 Total PM Concentrations by Modified US EPA Methods 5 and 202

Modified US EPA Methods 5 and 202 were used to measure total PM concentrations in the 1201 Vent gas stream during Runs 1-9 and 11-15 of the 2010 Source Test. US EPA Method 5 was used to measure front-half filterable PM (FPM) and US EPA Method 202 was used to measure back-half condensable PM (CPM). Due to the high moisture concentration (>98%) in the sample gas and the large particle size (>10 μm) of a significant portion of the FPM, the speciation of FPM_{10} and $FPM_{2.5}$ was not possible using currently available sampling technology. The modified procedures by which total PM concentration data were obtained on the atypical 1201 Vent gas stream is described in detail in the *Protocol,* and any deviations from those modified procedures are discussed in this section.

3.6.1 Sampling Train Design

The modified US EPA Methods 5/202 sampling train consisted of the following components:

- Stainless steel nozzle;
- Sampling probe with stainless steel liner (the probe will also be equipped with a Type-S pitot tube);
- Heated quartz-fiber filter;
- Teflon® transfer line;
- Glass coiled condenser;
- One large glass impinger (3-liter), with knockout stem, empty;

- One large glass impinger (3-liter), with modified Greenburg-Smith stem, containing 200 ml D.I. H_2O;
- One large glass impinger (3-liter), with Greenburg-Smith stem, containing 200 ml D.I. H_2O;
- Two standard glass impingers, with knockout stems, empty;
- Two standard glass impingers, with Greenburg-Smith stems, each containing 100 ml 10% zinc acetate solution;
- One standard glass impinger, with knockout stem, empty;
- One standard glass impinger, with modified Greenburg-Smith stem, containing 100 ml 1.0N potassium hydroxide solution;
- One standard glass impinger, with knockout stem, empty;
- One standard glass impinger, with modified Greenburg-Smith stem, containing approximately 300 g of silica gel desiccant;
- Air-tight sample pump;
- Dry gas meter; and
- Orifice.

3.6.2 Sampling Train Operation

Modified US EPA Method 5/202 sampling trains were performed within at least two (2) minutes of vent activation and for as long as possible during each venting cycle until URS personnel evacuated the 205 DCU prior to the coke-cutting cycle. Modified US EPA Methods 2 and 4 (see Section 3.2) were performed concurrently with the modified US EPA Methods 5/202 sampling trains. Generally, direct measurements of vent gas differential pressure, static pressure, temperature, moisture concentration and total PM concentration were made during at least 50% of the duration of each complete venting cycle. In the event that any sampling train leak rates exceeded 4% of the average dry gas sampling rate, the dry gas sample volume collected by the modified US EPA Methods 5/202 sampling train was corrected according to the applicable calculations presented in US EPA Method 5. The vent gas differential pressure, static pressure, temperature, and moisture concentration data obtained with each modified US EPA Methods 5/202 sampling train were used to calculate the isokinetic sampling rate.

3.6.3 Sample Analysis and Recovery

After the completion of each test run, the impinger contents of the sampling trains were immediately purged with nitrogen for one (1) hour according the US EPA Method 202. Following the purge, the total PM samples from each of the modified US EPA Method 5/202 sampling trains utilized during the venting cycle were recovered separately into the following components:

- Front-half (nozzle, probe liner and front-half filter holder) rinse with acetone;
- Quartz-fiber filter;
- Contents of the first three (3) impingers, including a water rinse of the impingers, the back-half of filter holder, the Teflon® transfer line and the coiled condenser; and
- A dichloromethane rinse of the first three (3) impingers, the back-half of the filter holder, the Teflon® transfer line and the coiled condenser.

In addition, the moisture content of the gas stream was determined from the total weight gain of the impingers utilized in the modified US EPA Methods 5/202 sampling train.

FPM determinations were performed according to US EPA Method 5. After delivery to the laboratory, the filter and the front-half sampling train rinse fractions were dried to constant weight. The weight gains from the filter and front-half rinse fractions were related to the dry gas volume collected and are reported as front-half particulate loading. The amount of CPM found in the impingers was determined according to US EPA Method 202. According to US EPA Method 202, the impinger solutions were extracted with dichloromethane, and the dichloromethane extract was combined with the dichloromethane rinse in the field. Both fractions (water and dichloromethane) were reduced to dryness, and the weight gain determined. These masses were related to the dry gas volume sampled and were reported as CPM.

Vent gas velocity, static pressure, temperature, dry gas molecular weight, and moisture concentration data collected by each modified sampling train were used to calculate vent gas volumetric flow rate per US EPA Method 2. The sampling train operated in Port 4 (1201 Vent) during Runs 1-10 consistently measured the highest differential pressure when multiple sampling trains were operated simultaneously on the 12" pipe. In cases where multiple sampling trains were performed during a venting cycle, the highest (i.e., most conservative) volumetric flow rate data was used to develop FPM, CPM and total PM mass emission rates. Regression curves were constructed with the most conservative volumetric flow rate data to extrapolate volumetric flow rate during periods when direct sampling was not performed. The full laboratory report is presented in **Appendix 2-7**. **Appendix 3-3** includes calibration data for sampling equipment used with modified US EPA Methods 5/202 sampling trains. **Appendix 3-8** includes sampling data sheets used for the modified US EPA Methods 5/202 sampling trains.

3.6.4 Deviations from the *Protocol*

Four (4) deviations from the *Protocol* occurred during the sampling for total PM concentrations in the vent gas and the impacts on QA/QC are discussed further in Section 5.0.

- The design and contents of the sampling train impingers were modified;

- The isokinetic sampling rate criteria of ≤110% specified in the Protocol was not met during Runs 2 and 7-10; and
- Modified US EPA Methods 5/202 sampling trains may not have collected gas samples at measurement locations that complied with US EPA Method 1 during Runs 5-9; and
- Port 4 was not always used for the modified US EPA Methods 5/202 sampling trains.

3.7 TRS Concentrations by Modified US EPA Methods 15/16 and Other Test Method 12

The concentrations of TRS compounds (hydrogen sulfide, carbonyl sulfide, carbon disulfide, dimethyl sulfide, dimethyl disulfide, and methyl mercaptan, per the *Protocol*) in the 1201 Vent and 1202 Vent gas streams were measured according to modified US EPA Methods 15 and 16 and the dilution sampling system procedures described in US EPA OTM 12 during 22 venting cycles of the 2010 Source Test. Valid TRS results were not obtained during Runs 5, 6 and 20 due to malfunctions that occurred with the dilution sampling system. The modified procedures by which TRS compound concentration data were obtained on the atypical 1201 Vent and 1202 Vent gas streams are described in detail in the *Protocol,* and any deviations from those modified procedures are discussed in this section.

3.7.1 Sampling System Design

Samples of the 1201 Vent and 1202 Vent gas streams were extracted continuously using the modified US EPA Methods 15/16/18/25A/OTM 12 dilution sampling system (equipped with a glass critical orifice) and diluted with high-purity nitrogen at known DRs of approximately 48:1. A heated particulate filter was placed immediately downstream of the inlet to the stainless steel dilution sampling probe tip and upstream of the glass critical orifice. The diluted sample gas passed from the glass critical orifice through a heated Teflon® sampling line to a FlexFoil® bag. Integrated bag samples were collected during at least two (2) sampling intervals on each tested venting cycle. The FlexFoil® bag samples were then transported to the URS on-site laboratory until analysis on a wet basis by GC/FPD. All VOC samples collected during Runs 2, 4, 7-19, and 21-25 were performed within 24 hours of collection. All VOC samples collected during Runs 1 and 3 were performed within 40 hours of collection.

3.7.2 Sampling System Operation

Diluted sample gas was collected within one (1) minute of vent activation (except during Run 18) and for as long as possible during the venting cycle until URS personnel evacuated the 205 DCU prior to the coke-cutting cycle. Generally, direct measurements of TRS compound concentrations were made during at least 50% of the duration of each complete venting cycle.

Samples of the 1201 Vent and 1202 Vent gas streams were extracted using the same dilution sampling system used to collect methane, ethane, benzene, toluene and NMNE VOC samples by modified US EPA Methods 18 and 25A (see Sections 3.3 and 3.4). A stable dilution air pressure and critical orifice vacuum greater than 14.7" Hg (manufacturer's specification) was maintained throughout all calibrations as well as the sampling periods for all valid test runs. During Runs 5, 6 and 20, valid TRS compound concentration data were not obtained because the dilution system air pressure and critical orifice vacuum became unstable. This malfunction was due to clogging by moisture condensation and petroleum coke material.

It is important to note that with an average modified US EPA Method 18/25/OTM 12 dilution sampling system DR of approximately 48:1, the moisture concentrations in the FlexFoil® bag samples were <3%. All applicable dilution sampling system components were heated to approximately 300°F and the dew point of the sample gas was maintained lower than the operating temperature of the GC/FPD analytical system to minimize sample loss or interferences due to moisture.

Data included in the "*Source Test Report for Volatile Organic Compound Emissions from the Delayed Coker Unit Depressurization Vent 1201*," submitted by Marathon to US EPA and LDEQ in July 2009, demonstrates that CO and CO_2 were not detected in Vent 1201 gas samples at levels above the analytical method detection limits (MDL), which were <0.5% (dry basis) for all samples. Corrected for the 1201 Vent and 1202 Vent gas moisture concentrations and the average DR of 48:1, CO and CO_2 levels of <3 ppmw were expected in the integrated bag samples. The potential desensitization of an FPD due to these concentrations of CO and CO_2 are negligible, and no interference demonstration was performed according to Section 4.2 of US EPA Methods 15 and 16. In addition, the concentration of sulfur dioxide in the integrated bag samples was not expected at a level requiring scrubbing according to Section 4.4 of US EPA Methods 15 and 16, and a SO_2 scrubber was not used with the dilution sampling system.

Prior to the start of sampling, the GC/FPD was calibrated using Custom Certified (±3-5% accuracy) calibration gas standards for the target analytes in a balance of nitrogen. US EPA Method 205 was followed to dilute high-level gas standards for use in instrument calibration. FlexFoil® bags were used to store and introduce calibration gas from the gas cylinder or calibration gas diluter to the GC/FPD to mimic sample conditions as closely as possible. Dilution System Calibration/Sampling Line Loss Studies were performed either before or after each test run (except during Run 2, 4 and 11) using a Custom Certified (±2% accuracy) calibration gas standard containing hydrogen sulfide in a balance of nitrogen. After all sample analyses, a post-test calibration was performed using a calibration gas standards identical to the ones used during the pre-test run calibration.

The following calibration and quality assurance procedures presented in US EPA Methods 15 and 16 were followed, with exceptions noted in Section 3.7.4:

- The instrument was calibrated at three (3) points for each TRS species before sample analyses;
- The analysis of each of three (3) consecutive calibration injections differed by <5% of the mean result at each concentration level;
- The post-test calibration of the instrument was determined at three (3) points for H_2S after sample analyses;
- The mean of the triplicate H_2S injections after sample analyses had a percent error of <5% from the mean of the triplicate H_2S injections before sample analyses at each concentration level;
- The entire dilution sampling system was challenged with one H_2S calibration standard prior to sample analyses, and the results of three (3) consecutive injections differed by ≤5% of the mean result.
- A sample loss of 80-120% was demonstrated by performing a modified Sampling Line Loss Study, and TRS concentration results were corrected according to Section 8.3.1 of EPA Method 15.

3.7.3 Sample Analysis

Each FlexFoil® bag sample was analyzed in triplicate (except for sample *MAR-1201-42-M15/18-Bag3* during Run 17) and the final concentration result was calculated as the average of the triplicate analyses of the sample. The average DRs developed on a test run-by-test run basis through the operation of the dilution sampling system and the THC analyzers (see Section 3.4) were multiplied to the raw GC/FPD analyses. These results (GC/FPD raw data x DR) were then corrected to the average percent recovery achieved through the dilution system. The average percent recoveries were developed on a test run-by-test run basis by performing a modified Dilution System Calibration/Sampling Line Loss Study.

Method detection limits (MDL) were developed using the approach described in 40 CFR §136, Appendix B. According to this methodology, each standard is analyzed seven (7) times, and the MDL is defined as the standard deviation times the student's T value at the 99% confidence limit. The MDL was developed at the instrument using direct injection of calibration gas, transferred from the calibration gas cylinder or calibration gas dilution system to the GC/FPD via a FlexFoil® bag. The analyte-specific method detection limits established through the calibration of the GC/FPD are presented in Tables 3-9 and 3-10.

Raw GC/FPD data is included in **Appendix 2-8**. Sampling data sheets used for the operation of the modified US EPA Methods 15/16/18/25A/OTM12 dilution sampling system are presented in

Appendix 3-4. GC/FPD calibration information associated with the performance of modified US EPA Methods 15/16 is included in **Appendix 3-9**.

Table 3-9. Modified US EPA Methods 15/16 Method Detection Limits – Test Conditions 1-3

Injection	Hydrogen Sulfide	Carbonyl Sulfide	Methyl Mercaptan	Dimethyl Sulfide	Carbon Disulfide	Dimethyl Disulfide
	1.00 ppmv	1.08 ppmv	0.936 ppmv	0.914 ppmv	0.946 ppmv	0.932 ppmv
	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)
1	0.590	1.04	0.862	0.585	2.14	1.51
2	0.561	1.09	0.732	0.636	2.19	1.34
3	0.468	0.901	0.689	0.535	1.80	1.09
4	0.535	0.893	0.633	0.438	1.88	1.11
5	0.582	0.948	0.615	0.581	1.65	1.07
6	0.494	0.970	0.765	0.569	1.88	1.08
7	0.545	0.963	0.664	0.645	2.06	1.20
Average AC	0.539	0.973	0.708	0.570	1.94	1.20
St. Dev. AC	0.0449	0.0721	0.0857	0.0695	0.196	0.166
St. Dev. X 3.143	0.141	0.227	0.269	0.218	0.616	0.522
ln(St. Dev. AC x 3.143)	-1.96	-1.48	-1.31	-1.52	-0.485	-0.649
Cal. Slope	0.508	0.530	0.522	0.505	0.533	0.492
Cal. Intercept	0.115	-0.0317	-0.000590	0.284	-0.450	0.0510
MDL	**0.415**	**0.441**	**0.504**	**0.616**	**0.492**	**0.765**

Table 3-10. Modified US EPA Methods 15/16 Method Detection Limits – Test Condition 4

Injection	Hydrogen Sulfide	Carbonyl Sulfide	Methyl Mercaptan	Dimethyl Sulfide	Carbon Disulfide	Dimethyl Disulfide
	1.00 ppmv	1.08 ppmv	0.936 ppmv	0.914 ppmv	0.946 ppmv	0.932 ppmv
	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)
1	1.63	6.52	3.96	4.27	15.6	20.9
2	2.35	6.56	3.40	4.90	14.5	20.1
3	2.45	7.35	4.14	4.40	15.7	21.7
4	2.28	7.49	4.61	5.68	15.5	21.7
5	2.38	6.76	4.50	4.50	14.8	19.7
6	2.28	6.42	3.84	3.97	13.1	18.9
7	2.25	7.29	4.30	4.33	15.0	21.4
Average AC	2.23	6.91	4.11	4.58	14.9	20.6
St. Dev. AC	0.274	0.448	0.416	0.558	0.890	1.08
St. Dev. X 3.143	0.862	1.41	1.31	1.75	2.80	3.39
ln(St. Dev. AC x 3.143)	-0.148	0.343	0.267	0.562	1.03	1.22
Cal. Slope	0.508	0.531	0.512	0.508	0.495	0.451
Cal. Intercept	-0.971	-1.21	-1.07	-0.881	-1.43	-0.738
MDL	**0.351**	**0.357**	**0.394**	**0.551**	**0.398**	**0.830**

3.7.4 Deviations from the *Protocol*

Ten (10) deviations from the *Protocol* occurred during the sampling for TRS compound concentrations in the vent gas and their respective impacts on QA/QC are discussed further in Section 5.0.

- The GC/FPD analysis of sample *MAR-1202-41-M15/18-Bag1* could not be performed due to a leak in the sample bag following Run 18;
- A Dilution System Calibration/Sampling Line Loss Study was not performed during Runs 2 and 11;
- A Dilution System Calibration/Sampling Line Loss Study was not valid during Run 4;
- Sampling Line Loss Studies failed the ≤20% loss criteria during Runs 1, 3, 10, 12, 14 and 15;
- The triplicate pre-test calibration for dimethyl disulfide failed <5% RPD criteria during Runs 17 and 18;
- Post-test calibration for the low-concentration hydrogen sulfide calibration gas failed <5% error criteria during Runs 8, 9, and 22-25;
- Post-test calibration for the mid-concentration hydrogen sulfide calibration gas failed <5% error criteria during Runs 7, 9, 12, 19, 20, 23 and 24;

- Post-test calibration for the high-concentration hydrogen sulfide calibration gas failed <5% error criteria during Runs 5, 7, 9, 11, 12, 16, and 20-23;
- The gas dilution system failed the 2% error criteria during the US EPA Method 205 Laboratory Evaluation for hydrogen sulfide and carbonyl sulfide; and
- The US EPA Method 205 Laboratory Evaluation was not completed for methyl mercaptan, dimethyl disulfide, and dimethyl sulfide.

4.0 Calculations

4.1 Data Reduction Approach

The goal of the 2010 Source Test was to quantify the mass emission rates of the target compounds released to atmosphere from Drum 205-1201 (Runs 1-12, 14, 16, 17, 19, 21, 23 and 25) and Drum 205-1202 (Runs 13, 15, 18, 20, 22 and 24) during the venting cycle. Mass emission rates are typically expressed using an industry standard of mass per unit time, such as pounds per hour (lbs/hr), by relating the concentration of a target compound to the average volumetric flow rate of a gas stream through an orifice. The data reduction approach used in this report integrates target compound mass emission rates as pounds per minute (lbs/min) throughout the complete venting cycle, starting at the point of vent activation and ending at the point of optimal depressurization of the coke drum. Generally, direct measurements of target compound concentrations were made during at least 50% of the duration of each complete venting cycle, and direct measurements of vent gas volumetric flow rates were made during a least 90% of the duration of each complete venting cycle. Mass emission rates during the period between the end of direct sampling and the end of the complete venting cycle are extrapolated. Total (i.e., directly measured + extrapolated) mass emission rates are expressed in this report as mass per batch cycle (lbs/cycle). This report incorporates a conservative data reduction strategy (i.e., overestimation of emissions) by using both the directly measured and extrapolated data to quantify target compound emission rates over each complete venting cycle.

4.2 Calculations

The following sub-sections present the equations that were applied to data collected during the 2010 Source Test. **Appendix 4-1** presents example calculations.

4.2.1 Vent Gas Molecular Weight

The molecular weight of the dry fraction of the 1201 Vent and 1202 Vent gas was assumed to be equal to methane (16.0 g/g-mol), the most abundant compound detected in the vent gas stream after water. The average molecular weight of the dry fraction of the vent gas was calculated per test run according to the following equation, based upon US EPA Equation 3-1:

$$M_d = \left(0.16 \times \%CH_4\right)$$

Where:

M_d = Average dry gas molecular weight, lb/lb-mol;

$\%CH_4$ = Average (time-weighted) percent methane by volume, dry basis, per test run; and

0.16 = Molecular weight of methane, divided by 100, lb/lb-mol.

The average molecular weight of the wet gas released from the 1201 Vent and 1202 Vent was calculated per test run according to the following equation, based upon EPA Equation 2-6:

$$M_s = \left(M_d \times \left[1 - B_{ws}\right]\right) + \left(18.0 \times B_{ws}\right)$$

Where:

M_s = Average wet gas molecular weight, lb/lb-mol;

M_d = Average dry gas molecular weight, lb/lb-mol;

B_{ws} = Average proportion of water vapor, by volume; and

18.0 = Molecular weight of water, lb/lb-mol.

4.2.2 Vent Gas Velocity

The average velocity of the gas released from the 1201 Vent and 1202 Vent during the venting cycle will be calculated according to US EPA Equation 2-7:

$$V_S = 85.49 \times C_P \times \sqrt{\Delta P} \times \sqrt{\frac{T_S}{P_S \times M_W}}$$

Where:

V_S = Average velocity of the vent gas (ft/sec);

85.49 = Conversion constant, per Equation 2-7 of US EPA Method 2;

C_p = Type-S pitot correction factor (0.84);

ΔP = Average of the square roots of the differential pressures measured by Type-S pitot tube (inches of water);

T_s = Average vent gas temperature (°R);

P_s = Average absolute pressure (inches of mercury); and

M_w = Average wet gas molecular weight (lb/lb-mole).

4.2.3 Vent Gas Volumetric Flow Rate – Standard Conditions

The average volumetric flow rate of the gas released from the 1201 Vent and 1202 Vent during the venting cycle, corrected to standard conditions, was calculated according to US EPA Method 2:

$$Q_s = 60 \times V_s \times A \times \left(\frac{528}{T_S}\right) \times \left(\frac{P_S}{29.92}\right)$$

Where:

Q_s	=	Average volumetric flow rate of the vent gas, corrected to standard conditions (scfm);
60	=	Conversion from seconds to minutes;
V_s	=	Average velocity of the vent gas (ft/sec);
A	=	Cross-sectional area of the 1201 Vent or 1202 Vent (ft^2);
528	=	Standard temperature (°R);
T_s	=	Average vent gas temperature (°R);
29.92	=	Standard pressure (inches of mercury); and
P_s	=	Average absolute vent pressure (inches of mercury).

The total gas volume (scf) released to atmosphere during the venting cycle was calculated by multiplying the average volumetric flow rate (scfm) by the duration of the venting cycle (minutes).

4.2.4 Vent Gas Volumetric Flow Rate – Dry Standard Conditions

The average volumetric flow rate of the gas released from the 1201 Vent and 1202 Vent, corrected to dry standard conditions, was calculated according to US EPA Method 2. The average venting cycle moisture concentration, developed from moisture concentrations quantified by each individual sampling train operated during a given venting cycle, and the average volumetric flow rate (corrected to standard conditions) was used to calculate average dry gas volumetric flow rates (dscfm) as:

$$Q_{sd} = Q_s \times (1 - B_{ws})$$

Where:

Q_{sd}	=	Average vent gas dry volumetric flow rate, standard conditions (dscfm);
Q_s	=	Average vent gas volumetric flow rate, standard conditions (scfm); and
B_{ws}	=	Average proportion of water vapor, by volume.

The total dry gas volume (dscf) released to atmosphere during the venting cycle was calculated by multiplying the average volumetric flow rate (dscfm) by the duration of the venting cycle (minutes).

4.2.5 Dry Gas Meter Sample Volume – Standard Conditions

The volume of dry gas collected by the modified US EPA Methods 5/202 and SW-846 Method 0010 sampling trains was very small (<3 dscf) and average dry gas sampling rates ranged from 0.1 to 2 liters per minute. Because of the relatively small dry gas sample volumes collected, some sampling train leak rates exceeded 4% of the average dry gas sampling rate and corrections to the dry gas volume were made according to US EPA Equation 5-1(a), Case I:

$$V'_{ac} = V_{ac} - \left(\left[L_p - L_a\right] \times T\right)$$

Where:

V'_{ac}	=	Actual dry gas meter sample volume, corrected (acf);
V_{ac}	=	Actual dry gas meter sample volume, uncorrected (acf);
L_p	=	Leakage rate observed during the post-test leak check (cfm);
L_a	=	4% of the average sampling rate (cfm); and
T	=	Operating duration of sampling train (min).

The dry gas meter volume at standard conditions will be calculated as:

$$V_{sd} = V'_{ac} \times \left(\frac{528}{T_m}\right) \times \left(\frac{BP + \left(\frac{P_m}{13.6}\right)}{29.92}\right)$$

Where:

V_{sd}	=	Dry gas meter volume at standard conditions (dscf);
V'_{ac}	=	Actual dry gas meter volume (acf);
528	=	Standard temperature (°R);
T_m	=	Average dry gas meter temperature (°R);
BP	=	Barometric pressure at the dry gas meter location (inches of mercury);
P_m	=	Dry gas meter pressure (inches of water);
13.6	=	Conversion from inches of water to inches of mercury (inches of water/inches of mercury); and
29.92	=	Standard pressure (inches of mercury).

4.2.6 Concentrations of PM and Selected SVOC in the Vent Gas

The concentrations of FPM, CPM, total PM or selected SVOCs were calculated as:

$$C_{g/dscf} = \frac{M}{V_{sd}}$$

Where:

$C_{g/dscf}$	=	Concentration of FPM, CPM, total PM or selected SVOCs (g/dscf);
M	=	Mass of FPM, CPM or total PM collected in the modified US EPA Methods 5/202 sampling train (g) or mass of selected SVOC collected in the modified SW-846 Method 0010 sampling train (g); and
V_{sd}	=	Dry gas meter volume collected with the modified US EPA Methods 5/202 or SW-846 Method 0010 sampling train, at standard conditions (dscf).

4.2.7 Concentrations of Methane, Ethane, Benzene, Toluene and NMNE VOCs in the Vent Gas

The concentration of total VOC (as propane) in the 1201 Vent and 1202 Vent gas was measured continuously throughout the venting cycle in units of parts per million volume, on a wet basis (ppmvw). The NMNE VOC concentration was calculated by subtracting the average concentrations of methane and ethane (as determined using modified US EPA Method 18) from the average concentration of total VOC (as THC using modified US EPA Method 25A) measured per sampling interval. The average concentration of NMNE VOC during each sampling period was calculated as:

$$C_{VOC} = C_{THC} - \left(\frac{C_M \times RF_M}{3} \right) - \left(\frac{2 \times C_E \times RF_E}{3} \right)$$

Where:

C_{VOC}	=	Average concentration of NMNE VOC, as propane (ppmvw);
C_{THC}	=	Average concentration of THC, as propane (ppmvw);
C_M	=	Average concentration of methane (ppmvw);
RF_M	=	Average FID response factor for methane, determined directly (unit-less);
C_E	=	Average concentration of ethane (ppmvw); and
RF_E	=	Average FID response factor for ethane, determined directly (unit-less).

Conversion of average benzene, toluene, methane, ethane and NMNE VOC concentration results from ppmvw to mole fraction was performed using this equation:

$$MF = \frac{C}{10^6}$$

Where:

MF	=	Average mole fraction of target compound (unit-less);
C	=	Average concentration of target compound (ppmvw); and
10^6	=	Conversion factor from ppmvw to mol/mol (unit-less).

4.2.8 Mass Emission Rate of PM and Selected SVOC

The mass emission rates of FPM, CPM, total PM and selected SVOC were calculated during the venting cycle using this equation:

$$\mathrm{MER_P} = C_{g/dscf} \times \left(\frac{\mathrm{Q_{sdt}}}{453.59} \right) \times \left(\frac{1}{cycle} \right)$$

Where:

MER_P	=	Mass emission rate of target compound, per venting cycle (lbs/cycle);
$C_{g/dscf}$	=	Concentration of target compound (g/dscf);
Q_{sdt}	=	Total volume of dry gas released to atmosphere, at standard conditions (dscf);
453.59	=	Conversion from grams to pounds (g/lb); and
cycle	=	One venting cycle.

4.2.9 Mass Emission Rate of Methane, Ethane, Benzene, Toluene, NMNE VOC and TRS

The mass emission rates of benzene, toluene, methane, ethane, NMNE VOC and TRS were calculated during each venting cycle interval using an equation based upon US EPA Equation Y-19 of the GHG Reporting Rule (40 CFR §98.253[i][2]):

$$MER_V = MF \times Q_{st} \times \left(\frac{MW}{385}\right) \times \left(\frac{1}{interval}\right)$$

Where:

MER_V	=	Mass emission rate of target compound, per venting cycle interval (lbs/interval);
MF	=	Average mole fraction of target compound per venting cycle interval (unit-less);
Q_{st}	=	Total volume of wet gas released to atmosphere during the venting cycle interval, at standard conditions (scf);
MW	=	Molecular weight of the target compound (lb/lb-mol);
385	=	Ideal gas law constant (scf/lb-mol);
interval	=	One venting cycle interval.

Mass emission rates calculated per venting cycle interval were then added together to report a mass emission rate per venting cycle.

4.2.10 Annual Mass Emission Rate of Target Compounds

Annual mass emission rates of target compounds from the 205 DCU were quantified using the following equation:

$$AMER = \frac{N \times MER}{2000}$$

Where:

AMER	=	Annual mass emission rate of target compound from the 205 DCU (tons/year);
N	=	Potential maximum number of batch cycles per year for both Drum 205-1201 and Drum 205-1202 combined (cycles/year);
MER	=	Mass emission rate of target compound per venting cycle (lbs/cycle); and
2000	=	Conversion from lbs to tons (lbs/ton).

5.0 Quality Assurance Objectives for Measurement Data

The 2010 Source Test conducted on the MPC 205 DCU is part of ongoing research of the potential emissions associated with DCU depressurization vent sources. The goal of the measurement program was to quantify the mass emission rates of the target compounds released to atmosphere from Drum 205-1201 (Runs 1-12, 14, 16, 17, 19, 21, 23 and 25) and Drum 205-1202 (Runs 13, 15, 18, 20, 22 and 24) during the venting cycle. Quality assurance/quality control (QA/QC) activities were performed as an integral part of this measurement program to ensure that results are of known quality. The 2010 Source Test was conducted in accordance with the *Protocol*, and any deviations from the *Protocol* are presented in Sections 1.4 and 3.0 and summarized in Table 1-6 of this document. The potential impact of these deviations on the test results is discussed in this section.

The primary objectives of the QA/QC effort were to control, assess and document data quality. To accomplish these objectives, the QA/QC approach consisted of the following key elements:

- Definition of data quality objectives that reflect the overall technical objectives of the measurement program;
- Design of a sampling, analytical, QA/QC and data analysis system to meet those objectives;
- Evaluation of the performance of the measurement system; and
- Initiation of corrective action when measurement system performance does not meet the specifications.

The QA procedures described in the *Protocol* include the use of sampling and analytical procedures, along with specified calibration requirements, QC checks, data reduction and validation procedures and sample tracking. A review of analytical results for QA/QC samples and assessment of overall data quality is presented in this section. Detailed QC information is presented in **Appendices 5-1** through **5-7** of this report. Sample Chain-of-Custody forms are included in **Appendix 5-8**.

The following seven (7) subsections present discussions of the QA/QC activities associated with each of the following project tasks:

- Section 5.1 – Collection and analysis of vent gas samples for methane, ethane, benzene and toluene concentrations;
- Section 5.2 – Collection and analysis of vent gas samples for total VOC concentration;
- Section 5.3 – Collection and analysis of vent gas samples for TRS concentration;

- Section 5.4 – Collection of and analysis of vent gas samples for velocity, moisture concentration, and volumetric flow rate;
- Section 5.5 – Collection of vent gas samples for total PM and selected SVOC analyses;
- Section 5.6 – Analysis of vent gas samples for total PM concentrations; and
- Section 5.7 – Analysis of vent gas samples for selected SVOC concentrations.

Several minor issues associated with sampling and analysis are identified and discussed below. Due to the difficulty associated with sampling this type of atypical source, the non-traditional use and application of the sampling methodology and equipment, and the "unknowns" of any given research project, these issues were not entirely unexpected. Overall, this report incorporates a conservative data reduction strategy (i.e., overestimation of emissions) by using both the directly measured and extrapolated data to quantify target compound mass emission rates over each complete venting cycle. In addition, the modification of normal operating conditions to postpone the draining cycle and increase the duration of the venting cycle may contribute to an overestimation of actual emissions during the normal, current operation of the 205 DCU.

A review of the data quality associated with the NMNE VOC, methane, ethane, benzene, toluene and TRS mass emission rate measurements performed during Runs 1-4, 7-19 and 21-25 indicates that these data are supportable and usable for the purpose intended. A review of the data quality associated with all selected SVOC and Total PM mass emission rate measurements indicates that these data are supportable and usable for the purpose intended.

5.1 Collection and Analysis of Vent Gas Samples for Methane, Ethane, Benzene and Toluene Concentrations

QA/QC activities associated with the collection of the vent gas samples for the measurement of methane, ethane, benzene and toluene concentrations using the modified US EPA Methods 15/16/18/25A/OTM 12 sampling system include:

- Use of calibrated sampling equipment;
- Use of calibration and dilution gas of appropriate and documented quality;
- Collection of samples at appropriate operating conditions;
- Proper operation of the dilution sampling system; and
- Collection of samples per the *Protocol* and applicable US EPA reference methods.

QA/QC activities associated with the analysis of vent gas samples for methane, ethane, benzene, and toluene concentrations include:

- Calibration of the analytical instrumentation;
- Use of documented calibration standards;
- Replicate analyses;
- Incorporation of appropriate holding-time criteria; and
- Analyses of samples per the *Protocol* and applicable US EPA reference methods.

A review of the data quality associated with these measurements indicates that the data collected during Runs 1-4, 7-19, and 21-25 are supportable and usable for the purpose intended. Refer to the detailed quality assessment in **Appendix 5-1**. The issues identified during the data quality review are:

- Runs 5, 6 and 20 were invalid due to dilution sampling system malfunction and no sample results are reported from these test runs.
- A Recovery Study was not performed during Run 2. The average recovery (87.2%) of the ten (10) Recovery Studies performed with a dilution sampling system identical to the one used during Run 2 was applied to all methane, ethane, benzene and toluene data collected during Run 2. This anomaly has no impact on the usability of the data.
- The *Protocol* specifies that the Recovery Study will demonstrate a 90-110% recovery of calibration gas samples introduced as close to the dilution sampling probe tip as possible. Actual recoveries demonstrated in the field ranged from 57.4 to 102%. Runs 1, 3, 4, 8, 10, 11, 14, 15, and 24 failed the 90-110% criteria. Average recoveries developed for separate dilution sampling systems used in the field were 87.2% (Runs 1-12 and 14), 75.4% (Runs 13 and 15), 93.8% (Runs 16, 17, 19, 21, 23 and 25), and 92.9% (Runs 18, 20, 22 and 24). Since all methane, ethane, benzene and toluene concentration data were corrected to applicable Recovery Studies, these anomalies have no impact on the usability of the data.
- The *Protocol* specifies that post-test calibrations will be performed in triplicate at a single calibration point. During Runs 1 and 2, the post-test calibrations for benzene and toluene were performed in duplicate. The post-test calibration showed excellent reproducibility between duplicate injections (<2% RPD) and with the pre-test calibration (>2% RPD). This anomaly has no significant impact on data quality.
- The *Protocol* specifies that post-test calibrations will be performed in triplicate at a single calibration point. During Runs 3 and 4, the post-test calibrations for methane, ethane, benzene and toluene were performed only once. The post-test calibration showed excellent reproducibility (<1.5% RPD) with the pre-test calibration and this anomaly has no significant impact on data quality.

- The *Protocol* specifies that post-test calibrations will agree with pre-test calibrations at ≤5% RPD. During Run 8, the precision between pre- and post-test calibrations for toluene was 7.53% RPD. A three-point post-test calibration for toluene was not performed to construct an alternate calibration curve according to US EPA Method 18. The GC/FID response for identical calibration gas was lower during the post-test calibrations, suggesting a potential low bias to sample analyses. However, toluene concentrations measured in the five (5) bag samples collected during Run 8 were less than the two (2) times the MDL. This anomaly has no significant impact on the usability of the data.

- The *Protocol* specifies that post-test calibrations will agree with pre-test calibrations at ≤5% RPD. During Run 9, the precision between pre- and post-test calibrations for methane was 6.40% RPD and the precision between pre- and post-test calibrations for ethane was 6.32% RPD. A three-point post-test calibration for methane and ethane was not performed to construct an alternate calibration curve according to US EPA Method 18. The GC/FID response for identical calibration gas was higher during the post-test calibrations, suggesting a potential high bias to sample analyses and a conservative estimate of methane and ethane emissions. This anomaly has no significant impact on the usability of the data.

- The *Protocol* specifies that post-test calibrations will agree with pre-test calibrations at ≤5% RPD. During Run 11, the precision between pre- and post-test calibrations for benzene was 18.3% RPD and the precision between pre- and post-test calibrations for toluene was 21.9% RPD. A three-point post-test calibration for benzene and toluene was not performed to construct an alternate calibration curve according to US EPA Method 18. The GC/FID response for identical calibration gas was lower during the post-test calibrations, suggesting a potential low bias to sample analyses. However, toluene concentrations measured in the two (2) bag samples collected during Run 11 were less than the MDL and toluene concentrations were less than five (5) times the MDL. This anomaly has no impact on the usability of the data.

- The *Protocol* specifies that post-test calibrations will agree with pre-test calibrations at ≤5% RPD. During Run 23, the precision between pre- and post-test calibrations for toluene was 5.69% RPD. A three-point post-test calibration for toluene was not performed to construct an alternate calibration curve according to US EPA Method 18. The GC/FID response for identical calibration gas was lower during the post-test calibrations, suggesting a potential low bias to sample analyses. However, toluene concentrations measured in the three (3) bag samples collected during Run 23 were less than the six (6) times the MDL. This anomaly has no impact on the usability of the data.

- The *Protocol* specifies that bag samples will be analyzed in triplicate. During Run 13, bag sample *MAR-1202-31-M15/18-Bag2* was analyzed in duplicate. The sample analyses for methane and ethane showed excellent reproducibility (<0.2% RPD and <0.3% RPD, respectively) between duplicate injections, and benzene and toluene were not measured above applicable MDLs. This anomaly has no significant impact on data quality.

- During Run 18, the analysis of bag sample *MAR-1202-41-M15/18-Bag1* was invalid due to a leak in the sample bag. The *Protocol* specifies a completeness objective of one (1) bag sample per venting cycle. Three (3) valid bag samples were collected during Run 18. Target compound concentrations in the vent gas were likely to be the highest during the beginning of the venting cycle, and the bag sample *MAR-1202-41-M15/18-Bag1* was collected during the first 15 minutes of the venting cycle. The loss of this critical data was mitigated by extrapolating emissions during this venting cycle interval (13:06-13:21). This anomaly has no impact on the usability of the data.

5.2 Collection and Analysis of Vent Gas Samples for Total VOC Concentration

QA/QC activities associated with the collection of vent gas samples using the modified US EPA Methods 15/16/18/25A/OTM12 sampling system include:

- Use of pre-printed data sheets;
- Use of dilution gas of appropriate and documented quality;
- Collection of samples at appropriate operating conditions;
- Proper operation of the dilution sampling system;
- Collection of samples per the *Protocol* and applicable US EPA reference methods.

QA/QC activities associated with the analysis of vent gas samples for total VOC (as THC) concentrations include:

- Use of calibrated sampling equipment;
- Performance of Calibration Error Tests;
- Performance of Drift Tests;
- Use of documented calibration standards; and
- Analyses of samples per the *Protocol* and applicable US EPA reference methods.

A review of the data quality associated with these measurements indicates that the data collected during Runs 1-4, 7-19, and 21-25 are supportable and usable for the purpose intended. Refer to the detailed quality assessment in **Appendix 5-2**. The issues identified during the data quality review are:

- Runs 5, 6 and 20 were invalid due to dilution sampling system malfunction and no sample results are reported from these test runs.
- Gas standards used for the calibration of several THC analyzers were slightly outside of US EPA Method 25A criteria for representing specific percentage ranges of the instrument's operating range. The US EPA Method 25A criteria are: 25-35% of span for the low-level gas, 45-55% of span for the mid-level gas and 80-90% of span for the high level gas. This anomaly has no impact on the usability of this data.
- The *Protocol* specifies that a Drift Test will be performed on applicable THC analyzers after each test run and that applicable Drift Test criteria will be met. During Run 2, a Drift Test was not performed due to the evacuation of all sampling personnel from the 205 DCU prior to the end of the venting cycle. Sample data collected during Run 2 provides an estimate of total VOC emissions. This anomaly has no impact on the usability of the data.
- During Runs 1, 11, and 24, the Drift Test (diluted) criterion of ≤3% of span was not achieved on applicable THC analyzers due to a significant change in the dilution sampling system DR and/or actual THC analyzer drift. In these cases, Drift Test (diluted) results were corrected to the post-test DR and were ≤3% of span. During Run 1, the health and safety requirement to evacuate the DCU prior to the coke-cutting cycle made the performance of a 3-pt Calibration Error (diluted) following the test run impossible and a single calibration gas was used to develop the post-test DR. During Runs 1 and 11, the post-test DR was more conservative and used to calculate actual THC concentrations during the test run. During Run 24, the pre-test DR was more conservative and used to calculate actual THC concentrations during the test run. These anomalies have no impact on the usability of the data.
- The *Protocol* specifies that sample gas will be analyzed by at least two (2) THC analyzers that are calibrated at complementary ranges to facilitate the most accurate measurement of actual emissions. During Runs 1-4, 7-8, 11, 13, 15-19, and 21-25, only one (1) gas analyzer was used to measure THC concentrations. Average THC concentrations during one-minute intervals of the venting cycle were within the calibration span (direct and/or diluted) of a single instrument, and the instrument performed with acceptable linearity, therefore the use of additional gas analyzers was not required. This anomaly has no significant impact on data quality.
- The *Protocol* specifies that gas used to dilute the sample gas will be nitrogen. During Run 25, a prolonged malfunction of the 205 DCU elevator prevented the transport of an adequate supply of nitrogen to the sampling location. To mitigate this issue, a US EPA Protocol gas containing 900 ppmv propane and a balance of nitrogen was used as the dilution gas. THC concentrations measured during the Calibration Error Test,

test run, and Drift Test were corrected to the 900 ppmv propane baseline. This anomaly has no impact on the usability of the data.

5.3 Collection and Analysis of Vent Gas Samples for TRS Concentrations

QA/QC activities associated with the collection of the vent gas samples for the measurement of TRS concentrations using the modified US EPA Methods 15/16/18/25A/OTM 12 sampling system include:

- Use of calibrated sampling equipment;
- Use of calibration and dilution gas of appropriate and documented quality;
- Collection of samples at appropriate operating conditions;
- Proper operation of the dilution sampling system; and
- Collection of samples per the *Protocol* and applicable US EPA reference methods.

QA/QC activities associated with the analysis of vent gas samples TRS concentrations include:

- Calibration of the analytical instrumentation;
- Use of documented calibration standards;
- Replicate analyses;
- Incorporation of appropriate holding-time criteria; and
- Analyses of samples per the *Protocol* and applicable US EPA reference methods.

A review of the data quality associated with these measurements indicates that the data collected during Runs 1-4, 7-19, and 21-25 are supportable and usable for the purpose intended. Refer to the detailed quality assessment in **Appendix 5-3**. The issues identified during the data quality review are:

- Runs 5, 6 and 20 were invalid due to dilution sampling system malfunction and no sample results are reported from these test runs.
- A Dilution System Calibration/Sampling Line Loss Study was not performed during Runs 2 and 11. The average recovery (73.2%) of the eight (8) Dilution System Calibration/Sampling Line Loss Studies performed with a dilution sampling system identical to the one used during Runs 2 and 11 was applied to all TRS data collected during Runs 2 and 11. This anomaly has impact on the usability of the data.
- A Dilution System Calibration/Sampling Line Loss Study was performed during Run 4 but the results were not valid due to a malfunctioning compressed gas cylinder regulator. The average recovery (73.2%) of the eight (8) Dilution System

Calibration/Sampling Line Loss Studies performed with a dilution sampling system identical to the one used during Run 4 was applied to all TRS data collected during Run 4. This anomaly has impact on the usability of the data.

- The *Protocol* specifies that the Dilution System Calibration/Sampling Line Loss Study will demonstrate a ≤20% loss of calibration gas samples introduced as close to the dilution sampling probe tip as possible. Actual recoveries demonstrated in the field ranged from 56.0 to 110%. Runs 1, 3, 10, 12, 14, 15, and 24 failed the ≤20% criteria. Average recoveries developed for separate dilution sampling systems used in the field were 73.2% (Runs 1-12 and 14), 69.1% (Runs 13 and 15), 95.0% (Runs 16, 17, 19, 21, 23 and 25), and 91.1% (Runs 18, 20, 22 and 24). Since all TRS concentration data were corrected to applicable Dilution System Calibration/Sampling Line Loss Studies, these anomalies have no impact on the usability of the data.

- The Laboratory Evaluation required by US EPA Method 205 for the use of a gas dilution system for GC/FPD calibration failed the <2% error criteria for the direct injection of hydrogen sulfide (3.87%) and carbonyl sulfide (4.72%). This procedure compares the calibrated GC/FPD responses to undiluted calibration gas from independent standards. US EPA Method 205 requires the use of a compressed gas cylinder used as an independent standard to be certified to at least 2% accuracy. However, the compressed gas cylinder used as an independent standard was certified to 5% accuracy. The GC/FPD responses to the hydrogen sulfide and carbonyl sulfide gas cylinders used during the Laboratory Evaluation were within the accuracy associated with the independent standards. For this test program, the accuracy of the GC/FPD responses to sample gas is limited by the accuracy associated with the gas dilution system used for all GC/FPD calibrations, or 5%. In addition, carbonyl sulfide was not detected above the MDL during any test run. This anomaly has no impact on the usability of the data.

- The Laboratory Evaluation required by US EPA Method 205 for the use of a gas dilution system for GC/FPD calibration was not completed for methyl mercaptan, dimethyl sulfide, or dimethyl disulfide. However, these compounds were not detected above the applicable MDLs during any test run. This anomaly has no impact on the usability of the data.

- The *Protocol* specifies that pre-test calibrations will be performed in triplicate at each calibration level and meet a precision criteria of <5% RPD. During the pre-test calibration performed prior to Runs 17 and 18, two (2) out of three (3) injections of the mid-level dimethyl disulfide calibration gas failed the precision criteria (8.51 and

6.77% RPD). Dimethyl disulfide was not detected above the MDL during any test run, and this anomaly has no significant impact on data quality.

- The *Protocol* specifies that post-test calibrations for hydrogen sulfide will be performed in triplicate at each calibration level and meet a precision criteria of <5% RPD. In addition, the mean of the triplicate post-test calibration injections of hydrogen sulfide will have a precision criteria of <5% error from the mean of the triplicate pre-test calibration injections of hydrogen sulfide. During Runs 8, 9, and 22-25, the means of the low-level post-test calibration injections of hydrogen sulfide had errors of 5.56, 7.51, 15.0, 19.5, 7.36 and 6.34%, respectively, from the means of the low-level pre-test calibration injections. The triplicate injections during the pre- and post-test calibrations showed excellent reproducibility. The pre-test and post-test calibration curves were compared and the curve that produced the highest and most conservative results for hydrogen sulfide concentrations in the sample gas was used. No other TRS species were detected above applicable MDLs during any test run. This anomaly has no significant impact on data quality.

- The *Protocol* specifies that post-test calibrations for hydrogen sulfide will be performed in triplicate at each calibration level and meet a precision criteria of <5% RPD. In addition, the mean of the triplicate post-test calibration injections of hydrogen sulfide will have a precision criteria of <5% error from the mean of the triplicate pre-test calibration injections of hydrogen sulfide. During Runs 7, 9, 12, 19, 20, 23 and 24, the means of the mid-level post-test calibration injections of hydrogen sulfide had errors of 10.0, 11.7, 9.64, 5.95, 7.54, 8.31 and 7.00%, respectively, from the means of the mid-level pre-test calibration injections. The triplicate injections during the pre- and post-test calibrations showed excellent reproducibility. The pre-test and post-test calibration curves were compared and the curve that produced the highest and most conservative results for hydrogen sulfide concentrations in the sample gas was used. No other TRS species were detected above applicable MDLs during any test run. This anomaly has no significant impact on data quality.

- The *Protocol* specifies that post-test calibrations for hydrogen sulfide will be performed in triplicate at each calibration level and meet a precision criteria of <5% RPD. In addition, the mean of the triplicate post-test calibration injections of hydrogen sulfide will have a precision criteria of <5% error from the mean of the triplicate pre-test calibration injections of hydrogen sulfide. During Runs 5, 7, 9, 11, 12, 16, and 20-23, the means of the high-level post-test calibration injections of hydrogen sulfide had errors of 7.48, 5.94, 10.0, 5.89, 9.38, 6.02, 9.36, 5.60, 8.81 and 7.82%, respectively, from the means of the high-level pre-test calibration injections. The triplicate injections during the pre- and post-test calibrations showed excellent reproducibility. The pre-test and post-test calibration curves were compared and the curve that produced the highest and most conservative results for hydrogen sulfide concentrations in the sample gas was used. No other TRS species were detected above applicable MDLs during any test run. This anomaly has no significant impact on data quality.

- During Run 18, the analysis of bag sample *MAR-1202-41-M15/18-Bag1* was invalid due to a leak in the sample bag. The *Protocol* specifies a completeness objective of one (1) bag sample per venting cycle. Three (3) valid bag samples were collected during Run 18. Target compound concentrations in the vent gas were likely to be the highest during the beginning of the venting cycle, and the bag sample *MAR-1202-41-M15/18-Bag1* was collected during the first 15 minutes of the venting cycle. The loss of this critical data was mitigated by extrapolating emissions during this venting cycle interval (13:06-13:21). This anomaly has no impact on the usability of the data.

5.4 Collection and Analyses of Vent Gas Samples for Velocity, Moisture Concentration and Volumetric Flow Rate

QA/QC activities associated with the collection and analyses of vent gas samples for velocity, moisture concentration, and volumetric flow rate using modified US EPA Methods 2/3/4 include:

- Use of pre-printed sampling data sheets;
- Use of calibrated sampling equipment;
- Collection of samples at appropriate operating conditions;
- Collection of acceptable sample volumes;
- Performance of sampling system leak checks; and
- Collection of samples per the *Protocol* and applicable US EPA reference methods.

QA/QC activities associated with the analysis of vent gas samples for moisture concentration, velocity, temperature, differential pressure and static pressure include:

- Use of pre-printed recovery data sheets;
- Calibration of the analytical instrumentation;
- Use of documented calibration standards; and
- Analyses of samples per the *Protocol* and applicable US EPA reference methods.

A review of the data quality associated with these measurements indicates that the data collected during all test runs are supportable and usable for the purpose intended. Refer to the detailed quality assessment in **Appendix 5-4**. The issues identified during the data quality review are:

- The *Protocol* specifies that Port 1 will be used for the stand-alone modified US EPA Method 2 sampling train. However, Port 1 was never used during the 2010 Source Test. The stand-alone modified US EPA Method 2 sampling train was used to collect redundant gas velocity and volumetric flow rate data during Runs 1-10 and was inserted into Port 2 during Runs 1-4 and into Port 4 during Runs 5-10. The stand-alone modified US EPA Methods 2/4 sampling train was used to collect gas velocity, volumetric flow rate and moisture concentration data during Runs 16-20 and was inserted into Port 4 during each of these test runs. This anomaly has no significant impact on data quality.
- The sampling train operated in Port 4 (1201 Vent) during Runs 1-10 consistently measured the highest differential pressure when multiple sampling trains were operated simultaneously on the 12" pipe. This phenomenon suggests that the presence of a sampling probe in a given port may have created a flow disturbance at the port immediately downstream and was not anticipated. In cases where multiple sampling trains were performed during a venting cycle, the highest (i.e., most conservative) volumetric flow rate data was used to develop mass emission rates for all target compounds. This anomaly has no impact on the usability of the data.
- The *Protocol* specifies that methane, ethane and NMNE VOC (as propane) concentration data obtained through the operation of the modified US EPA Methods 15/16/18/25A/OTM 12 dilution sampling system will be used to calculate the dry fraction of the vent gas molecular weight. Actual average methane concentrations (time-weighted) per venting cycle ranged from 0.0341 to 8.63% by volume. When added together, average water and methane concentrations measured per test run at times exceeded 100% due to differences in sampling and analytical methodology. Therefore, the molecular weight of the dry fraction of the 1201 Vent and 1202 Vent gas was assumed to be equal to methane (16.0 g/g-mol), the most abundant compound detected in the vent gas stream after water. Because the average moisture concentrations were in excess of 98%, the estimated dry gas molecular weight had an insignificant impact on the calculation of wet gas molecular weight. This anomaly has no impact on the usability of the data.
- The design and contents of the stand-alone modified US EPA Methods 2/4 sampling train impingers were modified from the *Protocol* to enhance the efficiency of sampling train preparation and breakdown and of moisture condensation and hydrogen sulfide removal prior to the dry gas meter component of the sampling train. This anomaly has no impact on data quality.
- The *Protocol* specifies that sampling equipment will begin collecting gas samples within one (1) minute of vent activation. Vent gas velocity, static pressure,

temperature and moisture concentration data were not collected until two (2) minutes after vent activation during Runs 11, 14, 18 and 22. The loss of one (1) minute of data does not significantly impact data quality, and is offset by the overall conservative data reduction approach applied to the measurement program.

5.5 Collection of Vent Gas Samples for Total PM and Selected SVOC Analyses

QA/QC activities associated with the collection of vent gas samples for total PM and selected SVOC analyses using modified US EPA Methods 5/202 and SW-846 Method 0010 sampling trains include:

- Use of pre-printed sampling data sheets;
- Use of calibrated sampling equipment;
- Collection of samples at appropriate operating conditions;
- Collection of acceptable sample volumes;
- Performance of sampling system leak checks; and
- Collection of samples per the *Protocol* and applicable US EPA reference methods.

5.5.1 Isokinetic Sampling

Isokinetic sampling train operating parameters such as the sampling nozzle orifice size were determined during preliminary project activities to achieve isokinetic sampling percentages as close to 100% as possible during the 2010 Source Test. Section 3.4.4 of the *Protocol* describes the difficulty involved in achieving 90-110% isokinetic sampling rates on the 1201 Vent and 1202 Vent sources and prescribes an isokinetic sampling acceptance criterion of <110%. However, isokinetic sampling percentages >110% will not invalidate any emissions data.

It is difficult to estimate the degree of bias associated with the measurement of total PM and selected SVOC concentrations when achieving isokinetic sampling rates outside the traditional criteria of 90-110%, or the project-specific criteria described above, without conducting further research and testing on high-moisture, high-velocity DCU Depressurization Vent sources. Generally, isokinetic sampling rates >100% have been suggested to bias pollutant concentration results low because the gas velocity at the sampling train nozzle orifice exceeds the velocity of the vent gas stream and a greater than representative number of small particles, aerosols, or droplets, which follow the gas flow pattern into the nozzle orifice, are collected in the sampling train. The conservative extrapolation of SVOC and total PM mass emission rates incorporated into this measurement project mitigates any low bias to the measurement data associated with isokinetic sampling rates >100%.

A review of the data quality associated with these measurements indicates that the data collected during all test runs are supportable and usable for the purpose intended. Refer to the detailed quality assessment in **Appendix 5-5**. The issues identified during the data quality review are:

- The design and contents of the modified US EPA Methods 5/202 and SW-846 Method 0010 sampling trains were altered from descriptions presented in the *Protocol* to increase the efficiency of moisture condensation and to protect sampling personnel and equipment from exposure to hydrogen sulfide. These deviations have no impact on the usability of the data.
- The *Protocol* specifies that Port 4 will be used for the modified US EPA Methods 5/202 sampling train. Port 4 was used during Runs 1-4. Port 2 was used during Runs 5-9 and 11-15. The sampling train operated in Port 4 (1201 Vent) during Runs 1-10 consistently measured the highest differential pressure when multiple sampling trains were operated simultaneously on the 12" pipe. This phenomenon suggests that the presence of a sampling probe in a given port may have created a flow disturbance at the port immediately downstream and was not anticipated. However, the modified US EPA Methods 5/202 sampling trains operated in Port 2 during Runs 5-9 may not have collected gas samples at measurement locations free of disturbances and in compliance with US EPA Method 1. In cases where multiple sampling trains were performed during a venting cycle, the highest (i.e., most conservative) volumetric flow rate data was used to develop mass emission rates for all target compounds. This anomaly has no impact on the usability of the data.
- The sampling train operated in Port 4 (1201 Vent) during Runs 1-10 consistently measured the highest differential pressure when multiple sampling trains were operated simultaneously on the 12" pipe. This phenomenon suggests that the presence of a sampling probe in a given port may have created a flow disturbance at the port immediately downstream and was not anticipated. As a consequence, the modified SW-846 Method 0010 sampling trains operated in Port 3 during Runs 1-10 may not have collected gas samples at measurement locations free of disturbances and in compliance with US EPA Method 1. In cases where multiple sampling trains were performed during a venting cycle, the highest (i.e., most conservative) volumetric flow rate data was used to develop mass emission rates for all target compounds. This anomaly has no impact on the usability of the data.
- The modified US EPA Methods 5/202 sampling trains performed during Runs 2 and 7-10 achieved isokinetic sampling rates >110%. This anomaly is discussed above and may bias total PM concentrations low, but does not impact the usability of the data.

- The modified SW-846 Method 0010 sampling trains performed during Runs 2 and 7-10 achieved isokinetic sampling rates >110%. This anomaly is discussed above and may bias selected SVOC concentrations low, but does not impact the usability of the data.

5.6 Analysis of Vent Gas Samples for SVOC Concentrations

QA/QC activities associated with the analysis of vent gas samples for selected SVOC concentrations include:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Preparation and analysis of laboratory blanks;
- Collection and analysis of field blanks;
- Preparation and analysis of media check samples;
- Preparation and analysis of laboratory control samples (LCS) and laboratory control sample duplicates (LCSD);
- Addition of surrogate spikes to every sample; and
- Analyses of samples per the applicable US EPA methods.

A review of the data quality associated with these measurements indicates the data from all test runs are supportable and usable for the purpose intended. Refer to the detailed quality assessment in **Appendix 5-6**. The issues identified during the data quality review are:

- Several compounds were detected in laboratory or field blanks. The blank results have no impact on the usability of the data. Most species were not observed. The species that were observed were both well below the levels found in the field samples and have no impact, or indicate a potential positive bias, which is conservative relative to an assessment of emissions. No data are qualified or invalidated based on results of blank analysis.

- Except for the LCS and LCSD identified by the laboratory as compromised, all LCS recoveries met specifications, and all RPDs met the laboratory specifications. Extraction errors were reported for the LCSD for batch 0130405, the LCS for batch 0134046, and the LCS for batch 0147082. As these errors only occurred on the LCS and LCSD, there is no impact on the samples themselves. No data are qualified or invalidated based on these findings.

- Many surrogate spike recoveries in the set of samples associated with the mid-train rinse and condensate fractions are zero. These samples were diluted significantly before analysis, effectively diluting the surrogate compounds below detection limits. Further, several samples that were diluted less (dilution factor of 10) showed unacceptably high recovery of nitrobenzene. These high recoveries are attributed to obvious matrix effects and reflect the high level of target analytes in these samples. Due to the high levels of target analytes, the samples needed to be diluted significantly before analysis, with an associated degradation in quantitation of the surrogate compounds that were spiked based on an undiluted sample. No data are invalidated or qualified based on these findings.

- Many surrogate spike recoveries in the set of samples associated with the sorbent trap and impinger catch fractions are zero. These samples were diluted significantly before analysis, effectively diluting the surrogate compounds below detection limits. Further, several samples that were diluted less (dilution factor of 10) showed unacceptably high recovery of nitrobenzene and low recovery of phenol. These recoveries are attributed to obvious matrix effects and reflect the high level of target analytes in these samples. Due to the high levels of target analytes, the samples needed to be diluted significantly before analysis, with an associated degradation in quantitation of the surrogate compounds that were spiked based on an undiluted sample. No data are invalidated or qualified based on these findings.

5.7 Analysis of Vent Gas Samples for Total PM Concentrations

QA/QC activities associated with the analysis of vent gas samples for total PM concentrations include:

- Sample handling and preservation;
- Preparation and analysis of samples within specified holding times;
- Collection and analysis of field blanks;
- Preparation and analysis of media check samples; and
- Analyses of samples per the *Protocol* and applicable US EPA reference methods.

A review of the data quality associated with these measurements indicates that the data from all test runs are supportable and usable for the purpose intended. Refer to the detailed quality assessment in **Appendix 5-7**. The single issue identified during this assessment is:

- Measurable levels were found in the two (2) separate field blank samples. Negligible levels were found in laboratory blanks. The blank results indicate a potential positive bias in the field results, which is conservative relative to an assessment of emissions. Since the test run results are significantly larger than the field blank results, the field blank contribution is negligible.