



February 3, 2012

Robert W. Dinnen  
Superintendent  
Fort Cherry School District  
110 Fort Cherry Road  
McDonald, Pennsylvania 15057-2975

**RE: AIR MONITORING RESULTS FOR THE FRACKING AND FLARING PHASES OF GAS  
EXTRACTION OPERATIONS AT THE CHIARELLI WELL PAD**

Dear Dr. Dinnen:

ChemRisk was retained by the Fort Cherry School District school board to perform air monitoring in order to address concerns regarding children's potential for exposure to chemicals resulting from hydraulic fracturing operations at the Chiarelli well pad, which is located approximately 900 yards north of the Fort Cherry campus (Figure 1). This report presents the air monitoring results for the fracking and flaring phases of the natural gas extraction operations, and is the second report submitted to you as part of this air monitoring investigation. The first report (aka the "Baseline Report") presented the results of the baseline air sampling period, which was conducted prior to the commencement of hydraulic fracturing (November 14, 2011 through November 29, 2011). The Baseline Report also included background information regarding the premise of the air monitoring investigation, as well as detailed information about the materials and methods that were employed.

This second report focuses on presenting and contextualizing the results of the air monitoring conducted during the fracking (November 30, 2011 through December 27, 2011) and flaring (December 28, 2011 through January 16, 2012) phases of the gas extraction operations. It contains an overview of the Materials and Methods used; however, for more detailed information regarding the project Background and Materials and Methods, please refer to the Baseline Report.

**MATERIALS AND METHODS**

Fracking of the wells commenced on November 30, 2011 and continued until flaring began on December 28, 2011. Flaring ceased on January 16, 2012. As such, the fracking sampling period reflects the duration of fracking (November 11, 2011 through December 27, 2011), and the flaring sampling period reflects the duration of flaring (December 28, 2011 through January 6, 2012).

The sampling protocol remained consistent with that of the baseline sampling period. In summary, continuous air monitoring was conducted to measure total volatile organic compounds (VOCs) using a RAE Systems MultiRae Plus gas monitor (multiRAE) and a ppbRAE 3000 total VOC monitor (ppbRAE). The multiRAE was also used to measure carbon monoxide (CO), hydrogen sulfide (H<sub>2</sub>S), oxygen (O<sub>2</sub>) and explosive gases (including methane).<sup>1</sup> In order to evaluate specific compounds that may be present in the total VOCs measured using the continuous monitors, summa canisters were employed to collect 24-hour air samples. During the fracking phase, summa canister samples were collected on November 30 and December 9, 2011; during the flaring phase they were collected on December 28, 2011. An additional sample was collected during the flaring phase on December 27, 2011, however heavy rain on this day caused the sampling inlet to become clogged and rendered this sample invalid. The five valid samples were analyzed by Air Toxics, LTD in Folsom, CA in accordance with modified EPA Method TO-15 and were analyzed for 62 individual VOCs. Finally, meteorological conditions (i.e. wind direction, wind speed, temperature, humidity, precipitation and barometric pressure) were measured using a Davis Vantage Pro2 wireless weather station.

Both the multiRAE and ppbRAE monitors were calibrated periodically in accordance with the manufacturer's specifications. On occasion, these monitors went "offline" and therefore did not record measurements for varying periods of time. The reasons for these occurrences were not always evident but were sometimes due to an interruption in the power supply.

The air monitoring devices remained in the same locations and retained the same configurations as the baseline sampling period, with the air monitoring station situated at the northern end of the school and the weather station located on the roof of the school directly above the air monitoring station (Figure 2). The continuous monitoring devices (multiRAE, ppbRAE, and Davis weather station) were remotely linked to the host computer that was housed at the school and that was used to record the continuous monitoring results.

More detailed information regarding the materials and methods used for the fracking and flaring air monitoring phases can be found in the Baseline Report.

## **RESULTS and DISCUSSION**

### Hydrogen Sulfide (H<sub>2</sub>S)

The overall results indicate that the H<sub>2</sub>S concentrations measured during the fracking phase were similar to those measured during the flaring phase. Additionally, fracking and flaring concentrations were generally similar to the concentrations measured during the baseline period, although the average baseline concentrations were lower. A summary of the data for all three sampling periods is provided in Table 1 below.

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<sup>1</sup> The instrument used to measure these gases also measured oxygen and carbon monoxide. However, these two gases are only important in understanding hazardous atmospheres in confined spaces and thus, not discussed in this report.

**Table 1. Summary of H<sub>2</sub>S Results for the Baseline, Fracking and Flaring Sampling Periods** (concentrations in ppm)

		Sampling Period		
		Baseline	Fracking	Flaring
Daily average measurements	Mean	0.007	0.040	0.03
	Min.	0	0.00035	0
	Max.	0.14	0.15	0.15

Details of the H<sub>2</sub>S data collected during the fracking phase is presented in Table 1a at the end of this report. During the 26 days on which sampling occurred, the daily average concentrations ranged from 0.00035 to 0.15 ppm and had an overall daily mean of 0.040 ppm. Details of the H<sub>2</sub>S data collected during the flaring phase is presented in Table 1b at the end of this report. During the seven days on which sampling occurred, the daily average concentrations ranged from 0 to 0.15 ppm and had an overall daily mean of 0.030 ppm.

It should be noted that the concentrations reported here and in the baseline report are below the H<sub>2</sub>S resolution of the multiRAE (i.e., 1 ppm). According to the equipment manufacturer, concentrations below 0.5 ppm may be either a real detection of H<sub>2</sub>S by the sensor, or interference with electronic noise of the instrument. However, we have chosen to report the values recorded by the instrument, with the understanding that the values below 0.5 ppm may actually be overestimates and could be zero. Furthermore, on days when the instrument read H<sub>2</sub>S values greater than 0 ppm, the VOCs were also typically higher than on days with 0 ppm H<sub>2</sub>S, giving some indication that the non-zero value may be real. With those caveats in mind, the average H<sub>2</sub>S values measured during fracking and flaring were higher than those measured during the baseline sampling period and were often detected above typical background (i.e., 0.001 ppm). They were also sometimes present at levels above the PADEP daily standard (0.005 ppm) and the odor threshold (0.01 ppm). However, at no point during any sampling period did any of the measurements reach the action level (0.51 ppm).

#### Explosive Gases

Concentrations of explosive gases were not detected during fracking or flaring. All LEL measurements recorded during the baseline, fracking and flaring sampling periods were 0% of the LEL.

#### Total Volatile Organic Compounds

A summary of the data for the baseline, fracking, and flaring sampling periods is provided in Table 2 below. Due to differences in the sensitivities of the multiRAE and ppbRAE [the ppbRAE can detect lower levels of total VOCs (resolution = 0.001 ppm) than the multiRAE (resolution = 0.1 ppm)] it is most useful to compare total VOC concentrations as measured by each instrument. However, based on my discussions with the equipment manufacturer (RAE systems), the ppbRAE results are probably more reliable than the multiRAE because it was specifically designed to measure the very low level concentrations of VOCs.

**Table 2. Summary of Total VOC Results for the Baseline, Fracking and Flaring Sampling Periods** (concentrations in ppm)

		multiRAE			ppbRAE		
		Baseline	Fracking	Flaring	Baseline	Fracking	Flaring
Daily average measurements	Mean	0.23	0.10	0.21	0.11	0.0073	0.0046
	Min.	0	0	0.055	0	0	0
	Max.	0.48	0.36	0.52	0.39	0.031	0.022
Absolute measurements	Min.	0	0	0	0	0	0
	Max.	2.1	0.70	1.3	0.48	0.06	0.42

Details of the total VOC measurements obtained from the multiRAE and ppbRAE during the fracking are presented in Tables 1a and 2a, respectively; both tables are provided at the end of this report. Sampling occurred on 26 days during the fracking phase using both devices. Using the multiRAE, daily average concentrations ranged from 0 to 0.36 ppm and had an overall daily mean of 0.10 ppm. The absolute minimum and maximum concentrations, which were recorded on a once-per-minute basis when the multiRAE was operational, were 0 and 0.70 ppm, respectively. Using the ppbRAE, daily average concentrations ranged from 0 to 0.031 ppm and had an overall daily mean of 0.0073 ppm. Absolute minimum and maximum concentrations were 0 and 0.056 ppm, respectively.

Details of the total VOC measurements obtained from the multiRAE and ppbRAE during flaring are presented in Tables 1b and 2b at the end of this report. The multiRAE was used to collect data on seven days of the flaring period. Daily average concentrations ranged from 0.055 to 0.52 ppm and had an overall daily mean of 0.21 ppm. The absolute minimum and maximum concentrations were 0 and 1.3 ppm, respectively. The ppbRAE was used to collect data on nine days of the flaring period. Daily average concentrations ranged from 0 to 0.022 ppm and had an overall daily mean of 0.0046 ppm. The absolute minimum and maximum concentrations were 0 and 0.42 ppm, respectively.

These results indicate that in general, the total VOC concentrations measured during fracking were similar to those measured during flaring. Furthermore, the total VOC concentrations measured during both the fracking and flaring periods were lower than those measured during the baseline period. At no point during any of the three sampling periods did a total VOC measurement approach the action level of 20 ppm.

#### Individual Volatile Organic Compounds

Initially, the plan for collecting samples for individual VOC analysis was to deploy a summa canister when either 1) a real-time total VOC measurement exceeded 20 ppm, or 2) an odor (e.g. sulfur) was observed suggesting that additional investigation was prudent. Neither one of these things occurred during either the fracking nor the flaring phase of the gas extraction operations. As such, summa canisters were occasionally deployed for the purpose of capturing representative concentrations for each sampling phase.

Table 3a presents the results for the individual VOCs that were detected during the fracking sampling period. Over the two sampling days (11/30/11 and 12/9/11), the following 11 (of 62) compounds were detected: 1,4-dioxane, 2-butanone, acetone, benzene, chloromethane, cyclohexane, ethanol, Freon 11, Freon 12, hexane and toluene (reporting limits for these individual VOCs ranged from 0.00013 to 0.00072 ppm). These compounds are ubiquitous in the environment and typically detected in higher concentrations in urban settings.

Table 3b presents the results for the individual VOCs that were detected during the flaring sampling period; one sample was collected on 12/28/11 during this phase. Of the 62 VOCs analyzed, the following six were detected: acetone, benzene, chloromethane, Freon 11, Freon 12 and hexane (reporting limits for these individual VOCs ranged from 0.00016 to 0.00082 ppm). These compounds are ubiquitous in the environment and typically detected in higher concentrations in urban settings.

The chemical compounds detected during the flaring and fracking sampling periods were similar to those detected during the baseline sampling period, and the concentrations of the compounds were also similar. A comparison of the fracking and flaring data to background data collected by the PADEP is provided in Table 3c at the end of this report. All of the compounds detected during both the fracking and flaring phases were measured at concentrations that are similar to the background concentrations reported by the PADEP.

Another purpose for collecting the individual VOC data was so that it could be used to evaluate the potential for long term health risks. Although most of the VOCs analyzed for were not detected and those that were detected are generally present in the background air at the Ft. Cherry school, a screening-level human health evaluation was conducted by comparing the individual VOC concentrations to health-based screening levels. While screening levels that are directly applicable to a school child or school employee do not exist per se, screening levels are available that can be used as overly conservative screening values for children and teachers. As such, when available, USEPA air Regional Screening Levels (RSLs) were compared to the individual compounds (Table 3c). These RSLs are health-protective for inhalation exposures to a substance for 8 hours/day, 250 days/year, for 25 years (i.e., exposures that are more intense than would be expected for most persons who will be present at the school, with the exception of perhaps a custodian who works year-round). Furthermore, these RSL are universal for all age groups. All of the VOC concentrations measured at the school, whether during the baseline, fracking or flaring sampling phases, are below the health-based screening levels.

### Meteorological Conditions

Ambient weather conditions including as wind direction, wind speed, temperature, humidity, precipitation and barometric pressure were recorded throughout the different sampling phases as they can be useful in interpreting air monitoring results. Meteorological conditions can be important in understanding and modeling chemicals detected in air as these factors affect how they travel from source to exposure location.

A summary of the wind direction, wind speed, temperature, humidity, barometric pressure, and rainfall measured during the fracking and flaring sampling periods is presented in Table 4. As

depicted on Figures 3 and 4, the predominant wind direction was similar to that of the baseline data; consistently from the southwest, making the school generally upwind of the Chiarelli Units.

## SUMMARY

The results of the fracking and flaring sampling periods were similar to the results obtained from the baseline monitoring period and likewise, did not show anything remarkable with respect to chemicals detected in the ambient air. When volatile compounds were detected, they were consistent with background levels measured at the school and in other areas in Washington County. Furthermore, a basic yet conservative screening level evaluation shows that the detected volatile compounds were below health-protective levels.

If you have any questions regarding these results, please contact me at (412) 281-6900, ext. 1020 or by email at [jpanko@chemrisk.com](mailto:jpanko@chemrisk.com).

Sincerely,

A handwritten signature in cursive script that reads "Julie Panko".

Julie M. Panko, CIH  
Principal Health Scientist

## **TABLES**

**Table 1a. Summary of Continuous Monitoring for Air Quality Parameter Gases (Collected via the MultiRAE Plus)**

Location: Ft. Cherry School Campus

Sampling Period: Fracking

Sampling Date	n*	Hydrogen Sulfide (ppm)			Explosive Gases (% LEL)			Total VOCs (ppm)		
		Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max
11/30/2011	832	0.088	0	0.30	0	0	0	0.24	0.10	0.70
12/1/2011	1441	0.085	0	0.20	0	0	0	0.28	0	0.60
12/2/2011	1440	0.077	0	0.20	0	0	0	0.29	0.10	0.50
12/3/2011	1439	0.079	0	0.30	0	0	0	0.32	0.10	0.60
12/4/2011	1440	0.079	0	0.30	0	0	0	0.36	0	0.70
12/5/2011	1161	0.12	0	0.40	0	0	0	0.093	0	0.50
12/6/2011	1440	0.15	0	0.40	0	0	0	0.0024	0	0.10
12/7/2011	1425	0.15	0	0.40	0	0	0	0	0	0
12/8/2011	766	0.13	0	0.30	0	0	0	0	0	0
12/9/2011	1415	0.053	0	0.30	0	0	0	0.00021	0	0.10
12/10/2011	1006	0.0025	0	0.20	0	0	0	0.00060	0	0.10
12/12/2011	663	0.0032	0	0.10	0	0	0	0.0084	0	0.20
12/13/2011	1440	0.0053	0	0.10	0	0	0	0.0078	0	0.20
12/14/2011	1440	0.0051	0	0.10	0	0	0	0.0021	0	0.20
12/15/2011	1434	0.0035	0	0.10	0	0	0	0.011	0	0.40
12/16/2011	1439	0.0016	0	0.10	0	0	0	0.0013	0	0.10
12/17/2011	1440	0.0020	0	0.10	0	0	0	0.00028	0	0.10
12/18/2011	1169	0.0012	0	0.10	0	0	0	0.0029	0	0.20
12/19/2011	846	0.0043	0	0.10	0	0	0	0.015	0	0.30
12/20/2011	1417	0.0029	0	0.20	0	0	0	0.091	0	0.40
12/21/2011	1440	0.00035	0	0.10	0	0	0	0.20	0	0.40
12/22/2011	1439	0.00056	0	0.10	0	0	0	0.20	0	0.40
12/23/2011	1440	0.0020	0	0.20	0	0	0	0.16	0	0.30
12/24/2011	1440	0.0010	0	0.20	0	0	0	0.13	0	0.40
12/25/2011	321	0.00062	0	0.10	0	0	0	0.12	0	0.20
12/27/2011	888	0.0023	0	0.20	0	0	0	0.15	0	0.30
<i>Summary results for fracking sampling period<sup>a</sup>:</i>		<i>0.040</i>	<i>0</i>	<i>0.40</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0.10</i>	<i>0</i>	<i>0.70</i>

\* n = Number of measurements recorded each day. Measurements were recorded once per minute; n varies depending upon the duration that the sampling pump was operational.

<sup>a</sup> This summary represents the average of the daily mean values, the minimum of the daily minimum values, and the maximum of daily maximum values.



**Table 1b. Summary of Continuous Monitoring for Air Quality Parameter Gases (Collected via the MultiRAE Plus)**

Location: Ft. Cherry School Campus

Sampling Period: Flaring

Sampling Date	n*	Hydrogen Sulfide (ppm)			Explosive Gases (% LEL)			Total VOCs (ppm)		
		Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max
12/28/2011	1439	0.0019	0	0.20	0	0	0	0.14	0	0.30
12/29/2011	1287	0.0026	0	0.20	0	0	0	0.13	0	0.40
12/31/2011	260	0.0050	0	0.20	0	0	0	0.17	0	0.50
1/3/2012	83	0	0	0	0	0	0	0.055	0	0.20
1/4/2012	325	0	0	0	0	0	0	0.062	0	0.20
1/5/2012	469	0.058	0	0.20	0	0	0	0.42	0	1.0
1/6/2012	1440	0.15	0	0.40	0	0	0	0.52	0	1.3
<i>Summary results for flaring sampling period<sup>a</sup>:</i>		<i>0.030</i>	<i>0</i>	<i>0.40</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0.21</i>	<i>0</i>	<i>1.3</i>

\* n = Number of measurements recorded each day. Measurements were recorded once per minute; n varies depending upon the duration that the sampling pump was operational.

<sup>a</sup> This summary represents the average of the daily mean values, the minimum of the daily minimum values, and the maximum of daily maximum values.

**Table 2a. Summary of Continuous Monitoring for Total VOCs (Collected via the ppBRAE 3000)**

Location: Ft. Cherry School Campus

Sampling Period: Fracking

Sampling Date	n*	Concentrations in ppm		
		Daily Mean	Daily Min	Daily Max
11/30/2011	1439	0.00000069	0	0.0010
12/1/2011	1439	0	0	0
12/2/2011	1440	0	0	0
12/3/2011	1439	0	0	0
12/4/2011	1440	0.00084	0	0.0050
12/5/2011	1168	0	0	0
12/6/2011	1440	0.017	0	0.036
12/7/2011	1425	0.025	0.013	0.049
12/8/2011	768	0.027	0	0.043
12/9/2011	1428	0.012	0	0.043
12/10/2011	1006	0	0	0
12/12/2011	675	0	0	0
12/13/2011	1440	0.0027	0	0.026
12/14/2011	1440	0.0096	0	0.033
12/15/2011	1437	0.0020	0	0.030
12/16/2011	1441	0.031	0.024	0.056
12/17/2011	1440	0.023	0.015	0.030
12/18/2011	1169	0.010	0	0.022
12/19/2011	846	0.020	0.011	0.030
12/20/2011	1419	0.0094	0	0.026
12/21/2011	1440	0	0	0
12/22/2011	1439	0	0	0
12/23/2011	1440	0	0	0
12/24/2011	1440	0	0	0
12/25/2011	321	0	0	0
12/27/2011	888	0	0	0
<i>Summary results for fracking sampling period<sup>a</sup>:</i>		0.0073	0	0.056

\* n = Number of measurements recorded each day. Measurements were recorded once per minute; n varies depending upon the duration that the sampling pump was operational.

<sup>a</sup> This summary represents the average of the daily mean values, the minimum of the daily minimum values, and the maximum of daily maximum values.

**Table 2b. Summary of Continuous Monitoring for Total VOCs (Collected via the ppbRAE 3000)**

Location: Ft. Cherry School Campus

Sampling Period: Flaring

Sampling Date	n*	Concentrations in ppm		
		Daily Mean	Daily Min	Daily Max
12/28/2011	1440	0.00089	0	0.021
12/29/2011	1440	0.0029	0	0.025
12/30/2011	1440	0.00055	0	0.0090
12/31/2011	1439	0	0	0
1/1/2012	1440	0.0040	0	0.030
1/2/2012	1440	0.022	0.0030	0.036
1/3/2012	467	0.0062	0	0.027
1/5/2012	546	0	0	0
1/6/2012	1440	0.0054	0	0.042
<i>Summary results for flaring sampling period<sup>a</sup>:</i>		0.0046	0	0.042

\* n = Number of measurements recorded each day. Measurements were recorded once per minute; n varies depending upon the duration that the sampling pump was operational.

<sup>a</sup> This summary represents the average of the daily mean values, the minimum of the daily minimum values, and the maximum of daily maximum values.

**Table 3a. Summary of Detected Volatile Organic Compounds (collected via summa canister)**

Location: Ft. Cherry School Campus  
 Sampling Period: Fracking

Compound <sup>a</sup>	Concentrations in ppm			
	<u>11/30/2011</u>		<u>12/9/2011</u>	
	Result	Reporting Limit	Result	Reporting Limit
1,4-Dioxane	0.00017	0.00013	ND	0.00014
2-Butanone	ND	0.00067	0.00090	0.00072
Acetone	0.0020	0.00067	0.0010	0.00072
Benzene	0.00019	0.00013	ND	0.00014
Chloromethane	0.00050	0.00013	0.00034	0.00014
Cyclohexane	ND	0.00013	0.00022	0.00014
Ethanol	0.0012	0.00067	0.00079	0.00072
Freon 11	0.00022	0.00013	0.00018	0.00014
Hexane	0.00028	0.00013	ND	0.00014
Toluene	ND	0.00013	0.0018	0.00014

ND = Not detected above the reporting limit.

<sup>a</sup> A total of 62 individual VOC analytes were analyzed for in each of the samples using EPA Method TO-15-A; only those analytes that were detected are presented in this table. Reporting limits for all 62 individual VOCs ranged from 0.00013 to 0.00072 ppm.

**Table 3b. Summary of Detected Volatile Organic Compounds (collected via summa canister)**

Location: Ft. Cherry School Campus

Sampling Period: Flaring

Compound <sup>a</sup>	Concentrations in ppm	
	<u>12/28/2011</u>	
	Result	Reporting Limit
Acetone	0.00084	0.00082
Benzene	0.00020	0.00016
Chloromethane	0.00045	0.00016
Freon 11	0.00021	0.00016
Freon 12	0.00047	0.00016
Hexane	0.00025	0.00016

“ A total of 62 individual VOC analytes were analyzed for in each of the samples using EPA Method TO-15-A; only those analytes that were detected are presented in this table. Reporting limits for all 62 individual VOCs ranged from 0.00016 to 0.00082 ppm.

**Table 3c. Comparison of Detected Volatile Organic Compounds (collected via summa canister) to Additional Reference Levels (all concentrations ppm)**

Compound	Ft. Cherry School Campus Data					PADEP Background Concentration Ranges		USEPA RSLs <sup>c</sup>
	Baseline		Fracking	Flaring		Florence <sup>a</sup>	Charleroi <sup>b</sup>	
	11/17/2011	11/18/2011	11/30/2011	12/9/2011	12/28/2011			
1,4-Dioxane	--	--	0.00017	--	--	--	--	0.00044
2-Butanone	--	--	--	0.00090	--	0.00028 - 0.00056	0.0001 - 0.0026	7.3
Acetone	0.0074	0.0028	0.0020	0.0010	0.0008	0.0070 - 0.099	0.0072 - 0.029	59
Benzene	0.00016	--	0.00019	--	0.0002	0.000092 - 0.00025	0.00012 - 0.00036	0.00050
Chloromethane	0.00036	0.00035	0.00050	0.00034	0.00045	0.00059 - 0.00068	0.00001 - 0.00064	0.19
Cyclohexane	--	--	--	0.00022	--	--	0.0057 - 0.014	7.6
Ethanol	0.0076	0.00066	0.0016	0.00079	--	--	--	--
Freon 11	0.00032	0.00022	0.00022	0.00018	0.00021	0.00025 - 0.00030	--	0.54
Freon 12	0.0004	0.00044	0.00046	0.00038	0.00047	0.00055 - 0.00065	--	0.089
Heptane	--	--	--	--	--	0.00006	0.0027 - 0.0088	--
Hexane	0.00013	--	0.00028	--	0.00025	0.000034 - 0.000035	0.00059 - 0.0015	0.88
Toluene	0.00023	--	--	0.0018	--	0.000068 - 0.00016	0.00027 - 0.00067	5.8
2-Propanol	0.0054	--	--	--	--	0.00031 - 0.00060	--	13
m,p-Xylene	0.00014	--	--	--	--	--	0.000091 - 0.00024	0.10

-- Not detected or not available.

<sup>a</sup> These data represent a summary of three samples collected by the PADEP in Florence, Washington County, PA in 2010 as part of the Southwestern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Program.

<sup>b</sup> These data represent a summary of six samples collected by the PADEP in Charleroi, Washington County, PA in 2009 as part of their routine toxic substances air monitoring program.

<sup>c</sup> USEPA Industrial Air Regional Screening Levels (RSLs) are health-protective for exposures equating to inhalation of a substance for 8 hours/day, 250 days/year, for 25 years.

**Table 4 Summary of Meteorological Conditions**

Location: Ft. Cherry School Campus

Fracking											
Sampling Date	n*	Temperature (°F)			Humidity (%)			Barometric Pressure (inHg)			Rainfall (inches/day)
		Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Total
11/30/2011	144	33	29	37	85	76	96	29.5	29.2	29.8	0.010
12/1/2011	144	32	26	41	85	70	96	29.9	29.8	30.0	0
12/2/2011	144	35	29	42	82	71	89	30.0	29.9	30.2	0
12/3/2011	144	39	27	50	76	58	92	30.1	30.0	30.2	0
12/4/2011	144	51	41	61	56	34	75	29.9	29.8	30.0	0
12/5/2011	144	54	50	60	70	48	96	29.7	29.6	29.8	0.21
12/6/2011	144	41	38	51	97	93	98	29.6	29.6	29.7	0.11
12/7/2011	144	34	29	38	95	79	99	29.5	29.4	29.7	0.26
12/8/2011	144	29	26	34	83	73	89	29.8	29.7	29.9	0
12/9/2011	144	34	28	42	78	59	91	29.9	29.8	29.9	0
12/10/2011	144	27	22	33	67	47	88	30.1	29.9	30.2	0
12/11/2011	144	28	19	40	59	36	77	30.2	30.1	30.3	0
12/12/2011	144	34	25	44	55	40	66	30.1	30.1	30.1	0
12/13/2011	144	38	31	47	63	51	71	30.1	30.0	30.1	0
12/14/2011	144	42	37	50	83	65	96	29.9	29.7	30.0	0.02
12/15/2011	144	52	39	56	84	69	96	29.5	29.4	29.7	0.17
12/16/2011	144	33	31	39	78	74	83	29.8	29.6	29.9	0
12/17/2011	144	29	27	31	85	74	94	29.9	29.8	29.9	0
12/18/2011	144	29	27	34	87	74	95	29.9	29.8	29.9	0.03
12/19/2011	144	38	29	43	77	68	84	29.7	29.7	29.8	0.03
12/20/2011	144	40	36	43	96	82	98	29.7	29.6	29.8	0.34
12/21/2011	144	50	42	59	92	81	97	29.4	29.2	29.6	0.54
12/22/2011	144	44	39	48	90	84	98	29.6	29.5	29.7	0.47
12/23/2011	144	34	30	38	94	89	98	29.8	29.6	29.9	0.04
12/24/2011	144	32	28	36	83	74	92	30.0	29.9	30.1	0.01
12/25/2011	144	36	29	44	75	55	90	29.8	29.6	29.9	0
12/26/2011	144	36	30	42	73	59	87	29.9	29.7	30.0	0
12/27/2011	144	36	33	42	87	70	98	29.3	29.0	29.7	0.82
Summary results for fracking sampling period <sup>a</sup> :		37	19	61	80	34	99	30	29	30	0.11

Flaring											
Sampling Date	N=	Temperature (°F)			Humidity (%)			Barometric Pressure (inHg)			Rainfall (in/day)
		Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Total
12/28/2011	144	28	22	33	79	61	95	29.5	29.2	29.7	0.020
12/29/2011	144	31	20	40	80	66	92	29.5	29.4	29.7	0
12/30/2011	144	45	38	53	73	66	89	29.4	29.3	29.5	0
12/31/2011	144	40	38	44	91	85	96	29.6	29.4	29.7	0.020
1/1/2012	144	40	29	55	83	58	96	29.5	29.2	29.7	0.10
1/2/2012	144	25	21	29	83	62	93	29.6	29.5	29.6	0
1/3/2012	144	15	9.4	21	87	74	93	29.8	29.6	30.0	0
1/4/2012	144	20	9.2	28	78	60	89	29.8	29.6	29.9	0
1/5/2012	144	32	28	39	75	61	84	29.6	29.5	29.7	0
1/6/2012	144	46	37	56	56	45	65	29.5	29.4	29.5	0
Summary results for flaring sampling period <sup>a</sup> :		32	9.2	56	79	45	96	29.6	29.2	30.0	0.014

\* n = Number of measurements recorded each day. Measurements were recorded every 10 minutes.

<sup>a</sup> This summary represents the average of the daily mean values, the minimum of the daily minimum values, and the maximum of daily maximum values. For rain, an average of the daily total rainfall is represented.



## **FIGURES**



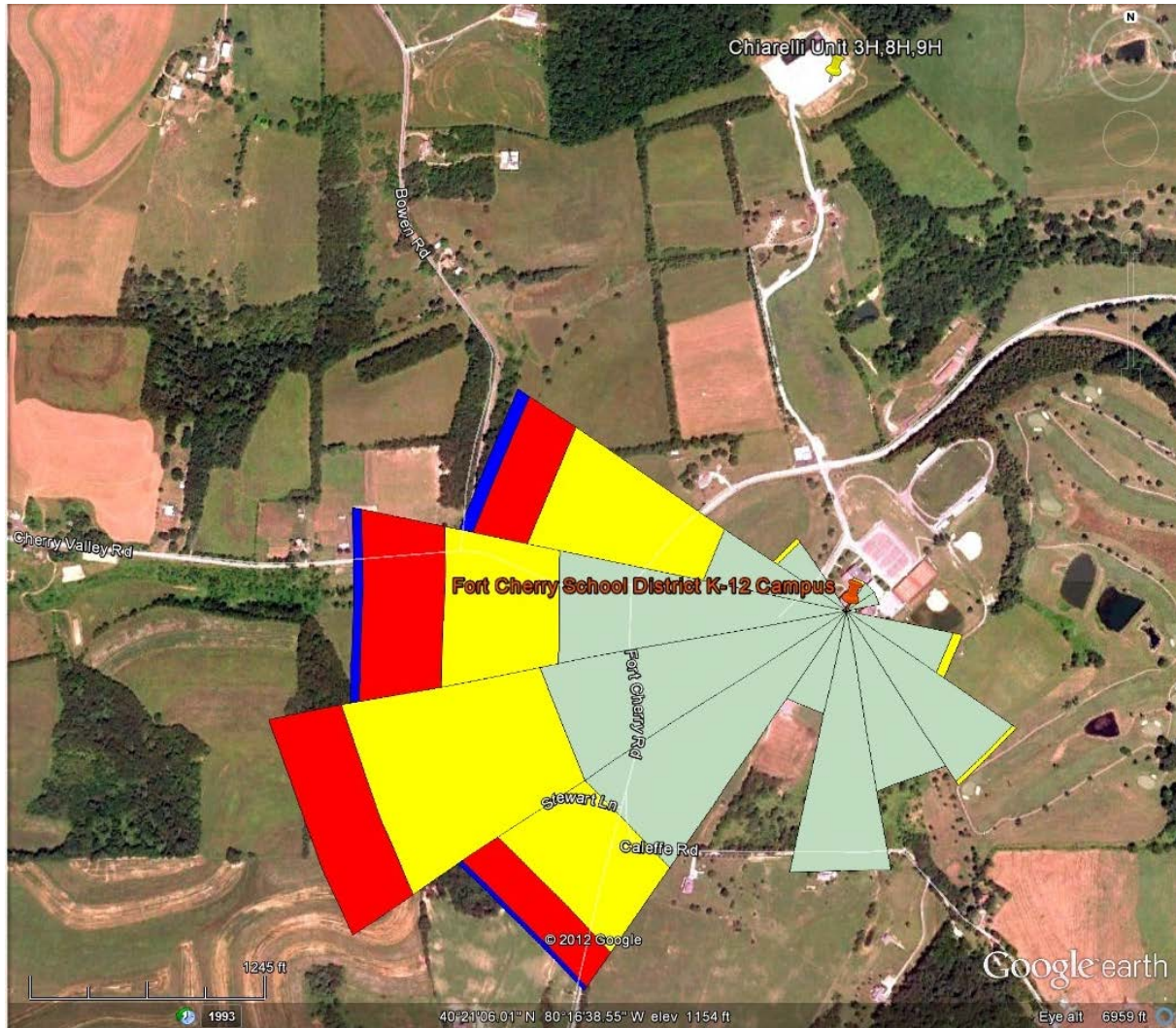
**Figure 1. Site Location Map.**



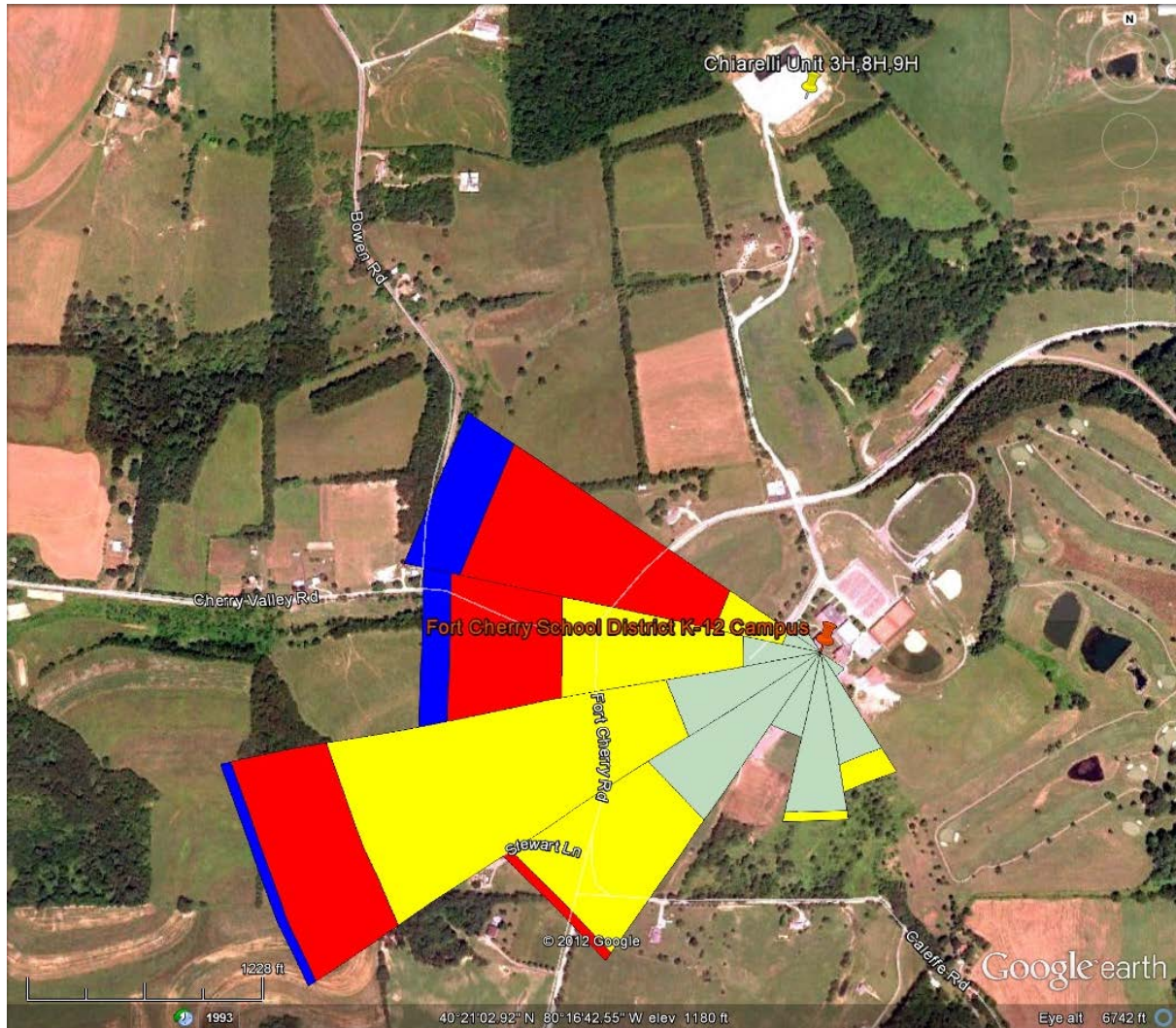


**Figure 2. Location of the air monitoring station and the meteorological station at the Ft. Cherry campus.**





**Figure 3. Screen shot from Google Earth showing the wind rose graph of Ft. Cherry wind data collected during the fracking sampling period, overlaid on the campus. The Chiarelli Units are also visible to the north of the campus.**



**Figure 4. Screen shot from Google Earth showing the wind rose graph of Ft. Cherry wind data collected during the flaring sampling period, overlaid on the campus. The Chiarelli Units are also visible to the north of the campus.**

## **APPENDIX A**



12/11/2011  
Ms. Julie Panko  
ChemRisk  
20 Stanwix Street  
Suite 505  
Pittsburgh PA 15222

Project Name: Ft. Cherry  
Project #: 11239  
Workorder #: 1112054

Dear Ms. Julie Panko

The following report includes the data for the above referenced project for sample(s) received on 12/2/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,



Ausha Scott  
Project Manager

Client Sample ID: LOC 2-11-30-11

Lab ID#: 1112054-02A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120613</b>	<b>Date of Collection:</b> 11/30/11 10:20:00 A
<b>Dil. Factor:</b>	<b>1.34</b>	<b>Date of Analysis:</b> 12/6/11 06:02 PM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.13	0.46	0.66	2.2
Freon 114	0.13	Not Detected	0.94	Not Detected
Chloromethane	0.13	0.50	0.28	1.0
Vinyl Chloride	0.13	Not Detected	0.34	Not Detected
1,3-Butadiene	0.13	Not Detected	0.30	Not Detected
Bromomethane	0.13	Not Detected	0.52	Not Detected
Chloroethane	0.67	Not Detected	1.8	Not Detected
Freon 11	0.13	0.22	0.75	1.2
Ethanol	0.67	1.2	1.3	2.3
Freon 113	0.13	Not Detected	1.0	Not Detected
1,1-Dichloroethene	0.13	Not Detected	0.53	Not Detected
Acetone	0.67	2.0	1.6	4.6
2-Propanol	0.67	Not Detected	1.6	Not Detected
Carbon Disulfide	0.67	Not Detected	2.1	Not Detected
3-Chloropropene	0.67	Not Detected	2.1	Not Detected
Methylene Chloride	0.27	Not Detected	0.93	Not Detected
Methyl tert-butyl ether	0.13	Not Detected	0.48	Not Detected
trans-1,2-Dichloroethene	0.13	Not Detected	0.53	Not Detected
Hexane	0.13	0.28	0.47	0.98
1,1-Dichloroethane	0.13	Not Detected	0.54	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.67	Not Detected	2.0	Not Detected
cis-1,2-Dichloroethene	0.13	Not Detected	0.53	Not Detected
Tetrahydrofuran	0.67	Not Detected	2.0	Not Detected
Chloroform	0.13	Not Detected	0.65	Not Detected
1,1,1-Trichloroethane	0.13	Not Detected	0.73	Not Detected
Cyclohexane	0.13	Not Detected	0.46	Not Detected
Carbon Tetrachloride	0.13	Not Detected	0.84	Not Detected
2,2,4-Trimethylpentane	0.67	Not Detected	3.1	Not Detected
Benzene	0.13	0.19	0.43	0.62
1,2-Dichloroethane	0.13	Not Detected	0.54	Not Detected
Heptane	0.13	Not Detected	0.55	Not Detected
Trichloroethene	0.13	Not Detected	0.72	Not Detected
1,2-Dichloropropane	0.13	Not Detected	0.62	Not Detected
1,4-Dioxane	0.13	0.17	0.48	0.63
Bromodichloromethane	0.13	Not Detected	0.90	Not Detected
cis-1,3-Dichloropropene	0.13	Not Detected	0.61	Not Detected
4-Methyl-2-pentanone	0.13	Not Detected	0.55	Not Detected
Toluene	0.13	Not Detected	0.50	Not Detected
trans-1,3-Dichloropropene	0.13	Not Detected	0.61	Not Detected
1,1,2-Trichloroethane	0.13	Not Detected	0.73	Not Detected
Tetrachloroethene	0.13	Not Detected	0.91	Not Detected



Client Sample ID: LOC 2-11-30-11

Lab ID#: 1112054-02A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120613</b>	<b>Date of Collection:</b> 11/30/11 10:20:00 A
<b>Dil. Factor:</b>	<b>1.34</b>	<b>Date of Analysis:</b> 12/6/11 06:02 PM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
2-Hexanone	0.67	Not Detected	2.7	Not Detected
Dibromochloromethane	0.13	Not Detected	1.1	Not Detected
1,2-Dibromoethane (EDB)	0.13	Not Detected	1.0	Not Detected
Chlorobenzene	0.13	Not Detected	0.62	Not Detected
Ethyl Benzene	0.13	Not Detected	0.58	Not Detected
m,p-Xylene	0.13	Not Detected	0.58	Not Detected
o-Xylene	0.13	Not Detected	0.58	Not Detected
Styrene	0.13	Not Detected	0.57	Not Detected
Bromoform	0.13	Not Detected	1.4	Not Detected
Cumene	0.13	Not Detected	0.66	Not Detected
1,1,2,2-Tetrachloroethane	0.13	Not Detected	0.92	Not Detected
Propylbenzene	0.13	Not Detected	0.66	Not Detected
4-Ethyltoluene	0.13	Not Detected	0.66	Not Detected
1,3,5-Trimethylbenzene	0.13	Not Detected	0.66	Not Detected
1,2,4-Trimethylbenzene	0.13	Not Detected	0.66	Not Detected
1,3-Dichlorobenzene	0.13	Not Detected	0.80	Not Detected
1,4-Dichlorobenzene	0.13	Not Detected	0.80	Not Detected
alpha-Chlorotoluene	0.13	Not Detected	0.69	Not Detected
1,2-Dichlorobenzene	0.13	Not Detected	0.80	Not Detected
1,2,4-Trichlorobenzene	0.67	Not Detected	5.0	Not Detected
Hexachlorobutadiene	0.67	Not Detected	7.1	Not Detected

**Container Type: 6 Liter Summa Canister (100% Certified)**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	100	70-130

Client Sample ID: Lab Blank

Lab ID#: 1112054-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120608</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/6/11 01:53 PM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.10	Not Detected	0.49	Not Detected
Freon 114	0.10	Not Detected	0.70	Not Detected
Chloromethane	0.10	Not Detected	0.21	Not Detected
Vinyl Chloride	0.10	Not Detected	0.26	Not Detected
1,3-Butadiene	0.10	Not Detected	0.22	Not Detected
Bromomethane	0.10	Not Detected	0.39	Not Detected
Chloroethane	0.50	Not Detected	1.3	Not Detected
Freon 11	0.10	Not Detected	0.56	Not Detected
Ethanol	0.50	Not Detected	0.94	Not Detected
Freon 113	0.10	Not Detected	0.77	Not Detected
1,1-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Acetone	0.50	Not Detected	1.2	Not Detected
2-Propanol	0.50	Not Detected	1.2	Not Detected
Carbon Disulfide	0.50	Not Detected	1.6	Not Detected
3-Chloropropene	0.50	Not Detected	1.6	Not Detected
Methylene Chloride	0.20	Not Detected	0.69	Not Detected
Methyl tert-butyl ether	0.10	Not Detected	0.36	Not Detected
trans-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Hexane	0.10	Not Detected	0.35	Not Detected
1,1-Dichloroethane	0.10	Not Detected	0.40	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected	1.5	Not Detected
cis-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.10	Not Detected	0.49	Not Detected
1,1,1-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Cyclohexane	0.10	Not Detected	0.34	Not Detected
Carbon Tetrachloride	0.10	Not Detected	0.63	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.10	Not Detected	0.32	Not Detected
1,2-Dichloroethane	0.10	Not Detected	0.40	Not Detected
Heptane	0.10	Not Detected	0.41	Not Detected
Trichloroethene	0.10	Not Detected	0.54	Not Detected
1,2-Dichloropropane	0.10	Not Detected	0.46	Not Detected
1,4-Dioxane	0.10	Not Detected	0.36	Not Detected
Bromodichloromethane	0.10	Not Detected	0.67	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
4-Methyl-2-pentanone	0.10	Not Detected	0.41	Not Detected
Toluene	0.10	Not Detected	0.38	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
1,1,2-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Tetrachloroethene	0.10	Not Detected	0.68	Not Detected

Client Sample ID: Lab Blank

Lab ID#: 1112054-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120608</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 12/6/11 01:53 PM</b>

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
2-Hexanone	0.50	Not Detected	2.0	Not Detected
Dibromochloromethane	0.10	Not Detected	0.85	Not Detected
1,2-Dibromoethane (EDB)	0.10	Not Detected	0.77	Not Detected
Chlorobenzene	0.10	Not Detected	0.46	Not Detected
Ethyl Benzene	0.10	Not Detected	0.43	Not Detected
m,p-Xylene	0.10	Not Detected	0.43	Not Detected
o-Xylene	0.10	Not Detected	0.43	Not Detected
Styrene	0.10	Not Detected	0.42	Not Detected
Bromoform	0.10	Not Detected	1.0	Not Detected
Cumene	0.10	Not Detected	0.49	Not Detected
1,1,2,2-Tetrachloroethane	0.10	Not Detected	0.69	Not Detected
Propylbenzene	0.10	Not Detected	0.49	Not Detected
4-Ethyltoluene	0.10	Not Detected	0.49	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,4-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
alpha-Chlorotoluene	0.10	Not Detected	0.52	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected	3.7	Not Detected
Hexachlorobutadiene	0.50	Not Detected	5.3	Not Detected

Container Type: NA - Not Applicable

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	97	70-130

Client Sample ID: CCV

Lab ID#: 1112054-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120602</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 12/6/11 08:54 AM</b>

<b>Compound</b>	<b>%Recovery</b>
Freon 12	86
Freon 114	84
Chloromethane	74
Vinyl Chloride	81
1,3-Butadiene	83
Bromomethane	99
Chloroethane	94
Freon 11	91
Ethanol	98
Freon 113	90
1,1-Dichloroethene	92
Acetone	97
2-Propanol	104
Carbon Disulfide	91
3-Chloropropene	106
Methylene Chloride	83
Methyl tert-butyl ether	105
trans-1,2-Dichloroethene	92
Hexane	102
1,1-Dichloroethane	94
2-Butanone (Methyl Ethyl Ketone)	97
cis-1,2-Dichloroethene	96
Tetrahydrofuran	100
Chloroform	92
1,1,1-Trichloroethane	96
Cyclohexane	99
Carbon Tetrachloride	109
2,2,4-Trimethylpentane	105
Benzene	86
1,2-Dichloroethane	88
Heptane	97
Trichloroethene	92
1,2-Dichloropropane	89
1,4-Dioxane	94
Bromodichloromethane	92
cis-1,3-Dichloropropene	101
4-Methyl-2-pentanone	96
Toluene	91
trans-1,3-Dichloropropene	100
1,1,2-Trichloroethane	88
Tetrachloroethene	89

Client Sample ID: CCV

Lab ID#: 1112054-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120602</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/6/11 08:54 AM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	97
Dibromochloromethane	96
1,2-Dibromoethane (EDB)	94
Chlorobenzene	90
Ethyl Benzene	95
m,p-Xylene	97
o-Xylene	100
Styrene	100
Bromoform	100
Cumene	96
1,1,2,2-Tetrachloroethane	85
Propylbenzene	88
4-Ethyltoluene	90
1,3,5-Trimethylbenzene	89
1,2,4-Trimethylbenzene	86
1,3-Dichlorobenzene	87
1,4-Dichlorobenzene	81
alpha-Chlorotoluene	99
1,2-Dichlorobenzene	84
1,2,4-Trichlorobenzene	93
Hexachlorobutadiene	90

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: LCS

Lab ID#: 1112054-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120603</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 12/6/11 09:29 AM</b>

<b>Compound</b>	<b>%Recovery</b>
Freon 12	94
Freon 114	93
Chloromethane	86
Vinyl Chloride	89
1,3-Butadiene	91
Bromomethane	100
Chloroethane	97
Freon 11	100
Ethanol	105
Freon 113	99
1,1-Dichloroethene	104
Acetone	100
2-Propanol	83
Carbon Disulfide	103
3-Chloropropene	128
Methylene Chloride	90
Methyl tert-butyl ether	115
trans-1,2-Dichloroethene	112
Hexane	109
1,1-Dichloroethane	102
2-Butanone (Methyl Ethyl Ketone)	98
cis-1,2-Dichloroethene	106
Tetrahydrofuran	106
Chloroform	102
1,1,1-Trichloroethane	108
Cyclohexane	107
Carbon Tetrachloride	116
2,2,4-Trimethylpentane	108
Benzene	93
1,2-Dichloroethane	96
Heptane	103
Trichloroethene	98
1,2-Dichloropropane	97
1,4-Dioxane	103
Bromodichloromethane	100
cis-1,3-Dichloropropene	110
4-Methyl-2-pentanone	104
Toluene	97
trans-1,3-Dichloropropene	107
1,1,2-Trichloroethane	93
Tetrachloroethene	95

Client Sample ID: LCS

Lab ID#: 1112054-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120603</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/6/11 09:29 AM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	109
Dibromochloromethane	104
1,2-Dibromoethane (EDB)	101
Chlorobenzene	98
Ethyl Benzene	102
m,p-Xylene	107
o-Xylene	109
Styrene	108
Bromoform	106
Cumene	106
1,1,2,2-Tetrachloroethane	97
Propylbenzene	100
4-Ethyltoluene	99
1,3,5-Trimethylbenzene	102
1,2,4-Trimethylbenzene	99
1,3-Dichlorobenzene	99
1,4-Dichlorobenzene	96
alpha-Chlorotoluene	115
1,2-Dichlorobenzene	98
1,2,4-Trichlorobenzene	158 Q
Hexachlorobutadiene	138 Q

Q = Exceeds Quality Control limits.

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: LCSD

Lab ID#: 1112054-05AA

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120606</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 12/6/11 12:06 PM</b>

<b>Compound</b>	<b>%Recovery</b>
Freon 12	90
Freon 114	87
Chloromethane	82
Vinyl Chloride	85
1,3-Butadiene	87
Bromomethane	98
Chloroethane	94
Freon 11	95
Ethanol	101
Freon 113	94
1,1-Dichloroethene	101
Acetone	97
2-Propanol	80
Carbon Disulfide	98
3-Chloropropene	121
Methylene Chloride	86
Methyl tert-butyl ether	111
trans-1,2-Dichloroethene	107
Hexane	105
1,1-Dichloroethane	97
2-Butanone (Methyl Ethyl Ketone)	94
cis-1,2-Dichloroethene	102
Tetrahydrofuran	102
Chloroform	98
1,1,1-Trichloroethane	102
Cyclohexane	104
Carbon Tetrachloride	111
2,2,4-Trimethylpentane	103
Benzene	91
1,2-Dichloroethane	94
Heptane	102
Trichloroethene	97
1,2-Dichloropropane	95
1,4-Dioxane	100
Bromodichloromethane	99
cis-1,3-Dichloropropene	107
4-Methyl-2-pentanone	101
Toluene	95
trans-1,3-Dichloropropene	108
1,1,2-Trichloroethane	96
Tetrachloroethene	97



Client Sample ID: LCSD

Lab ID#: 1112054-05AA

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>a120606</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/6/11 12:06 PM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	107
Dibromochloromethane	105
1,2-Dibromoethane (EDB)	104
Chlorobenzene	95
Ethyl Benzene	99
m,p-Xylene	105
o-Xylene	102
Styrene	100
Bromoform	105
Cumene	103
1,1,2,2-Tetrachloroethane	91
Propylbenzene	95
4-Ethyltoluene	95
1,3,5-Trimethylbenzene	100
1,2,4-Trimethylbenzene	95
1,3-Dichlorobenzene	99
1,4-Dichlorobenzene	92
alpha-Chlorotoluene	112
1,2-Dichlorobenzene	97
1,2,4-Trichlorobenzene	162 Q
Hexachlorobutadiene	144 Q

Q = Exceeds Quality Control limits.

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	101	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	104	70-130

12/19/2011  
Ms. Julie Panko  
ChemRisk  
20 Stanwix Street  
Suite 505  
Pittsburgh PA 15222

Project Name: Ft. Cherry  
Project #: 11239  
Workorder #: 1112239

Dear Ms. Julie Panko

The following report includes the data for the above referenced project for sample(s) received on 12/12/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,



Ausha Scott  
Project Manager

Client Sample ID: LOC-2-12-9-11

Lab ID#: 1112239-02A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121322</b>	<b>Date of Collection:</b> 12/9/11 8:30:00 AM
<b>Dil. Factor:</b>	<b>1.44</b>	<b>Date of Analysis:</b> 12/14/11 07:34 PM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.14	0.38	0.71	1.9
Freon 114	0.14	Not Detected	1.0	Not Detected
Chloromethane	0.14	0.34	0.30	0.70
Vinyl Chloride	0.14	Not Detected	0.37	Not Detected
1,3-Butadiene	0.14	Not Detected	0.32	Not Detected
Bromomethane	0.14	Not Detected	0.56	Not Detected
Chloroethane	0.72	Not Detected	1.9	Not Detected
Freon 11	0.14	0.18	0.81	1.0
Ethanol	0.72	0.79	1.4	1.5
Freon 113	0.14	Not Detected	1.1	Not Detected
1,1-Dichloroethene	0.14	Not Detected	0.57	Not Detected
Acetone	0.72	1.0	1.7	2.4
2-Propanol	0.72	Not Detected	1.8	Not Detected
Carbon Disulfide	0.72	Not Detected	2.2	Not Detected
3-Chloropropene	0.72	Not Detected	2.2	Not Detected
Methylene Chloride	0.29	Not Detected	1.0	Not Detected
Methyl tert-butyl ether	0.14	Not Detected	0.52	Not Detected
trans-1,2-Dichloroethene	0.14	Not Detected	0.57	Not Detected
Hexane	0.14	Not Detected	0.51	Not Detected
1,1-Dichloroethane	0.14	Not Detected	0.58	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.72	0.90	2.1	2.6
cis-1,2-Dichloroethene	0.14	Not Detected	0.57	Not Detected
Tetrahydrofuran	0.72	Not Detected	2.1	Not Detected
Chloroform	0.14	Not Detected	0.70	Not Detected
1,1,1-Trichloroethane	0.14	Not Detected	0.78	Not Detected
Cyclohexane	0.14	0.22	0.50	0.75
Carbon Tetrachloride	0.14	Not Detected	0.91	Not Detected
2,2,4-Trimethylpentane	0.72	Not Detected	3.4	Not Detected
Benzene	0.14	Not Detected	0.46	Not Detected
1,2-Dichloroethane	0.14	Not Detected	0.58	Not Detected
Heptane	0.14	Not Detected	0.59	Not Detected
Trichloroethene	0.14	Not Detected	0.77	Not Detected
1,2-Dichloropropane	0.14	Not Detected	0.66	Not Detected
1,4-Dioxane	0.14	Not Detected	0.52	Not Detected
Bromodichloromethane	0.14	Not Detected	0.96	Not Detected
cis-1,3-Dichloropropene	0.14	Not Detected	0.65	Not Detected
4-Methyl-2-pentanone	0.14	Not Detected	0.59	Not Detected
Toluene	0.14	1.8	0.54	6.9
trans-1,3-Dichloropropene	0.14	Not Detected	0.65	Not Detected
1,1,2-Trichloroethane	0.14	Not Detected	0.78	Not Detected
Tetrachloroethene	0.14	Not Detected	0.98	Not Detected

Client Sample ID: LOC-2-12-9-11

Lab ID#: 1112239-02A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121322</b>	<b>Date of Collection:</b> 12/9/11 8:30:00 AM
<b>Dil. Factor:</b>	<b>1.44</b>	<b>Date of Analysis:</b> 12/14/11 07:34 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	0.72	Not Detected	2.9	Not Detected
Dibromochloromethane	0.14	Not Detected	1.2	Not Detected
1,2-Dibromoethane (EDB)	0.14	Not Detected	1.1	Not Detected
Chlorobenzene	0.14	Not Detected	0.66	Not Detected
Ethyl Benzene	0.14	Not Detected	0.62	Not Detected
m,p-Xylene	0.14	Not Detected	0.62	Not Detected
o-Xylene	0.14	Not Detected	0.62	Not Detected
Styrene	0.14	Not Detected	0.61	Not Detected
Bromoform	0.14	Not Detected	1.5	Not Detected
Cumene	0.14	Not Detected	0.71	Not Detected
1,1,2,2-Tetrachloroethane	0.14	Not Detected	0.99	Not Detected
Propylbenzene	0.14	Not Detected	0.71	Not Detected
4-Ethyltoluene	0.14	Not Detected	0.71	Not Detected
1,3,5-Trimethylbenzene	0.14	Not Detected	0.71	Not Detected
1,2,4-Trimethylbenzene	0.14	Not Detected	0.71	Not Detected
1,3-Dichlorobenzene	0.14	Not Detected	0.86	Not Detected
1,4-Dichlorobenzene	0.14	Not Detected	0.86	Not Detected
alpha-Chlorotoluene	0.14	Not Detected	0.74	Not Detected
1,2-Dichlorobenzene	0.14	Not Detected	0.86	Not Detected
1,2,4-Trichlorobenzene	0.72	Not Detected	5.3	Not Detected
Hexachlorobutadiene	0.72	Not Detected	7.7	Not Detected

**Container Type: 6 Liter Summa Canister (100% Certified)**

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: Lab Blank

Lab ID#: 1112239-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121306</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/14/11 12:00 AM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.10	Not Detected	0.49	Not Detected
Freon 114	0.10	Not Detected	0.70	Not Detected
Chloromethane	0.10	Not Detected	0.21	Not Detected
Vinyl Chloride	0.10	Not Detected	0.26	Not Detected
1,3-Butadiene	0.10	Not Detected	0.22	Not Detected
Bromomethane	0.10	Not Detected	0.39	Not Detected
Chloroethane	0.50	Not Detected	1.3	Not Detected
Freon 11	0.10	Not Detected	0.56	Not Detected
Ethanol	0.50	Not Detected	0.94	Not Detected
Freon 113	0.10	Not Detected	0.77	Not Detected
1,1-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Acetone	0.50	Not Detected	1.2	Not Detected
2-Propanol	0.50	Not Detected	1.2	Not Detected
Carbon Disulfide	0.50	Not Detected	1.6	Not Detected
3-Chloropropene	0.50	Not Detected	1.6	Not Detected
Methylene Chloride	0.20	Not Detected	0.69	Not Detected
Methyl tert-butyl ether	0.10	Not Detected	0.36	Not Detected
trans-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Hexane	0.10	Not Detected	0.35	Not Detected
1,1-Dichloroethane	0.10	Not Detected	0.40	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected	1.5	Not Detected
cis-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.10	Not Detected	0.49	Not Detected
1,1,1-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Cyclohexane	0.10	Not Detected	0.34	Not Detected
Carbon Tetrachloride	0.10	Not Detected	0.63	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.10	Not Detected	0.32	Not Detected
1,2-Dichloroethane	0.10	Not Detected	0.40	Not Detected
Heptane	0.10	Not Detected	0.41	Not Detected
Trichloroethene	0.10	Not Detected	0.54	Not Detected
1,2-Dichloropropane	0.10	Not Detected	0.46	Not Detected
1,4-Dioxane	0.10	Not Detected	0.36	Not Detected
Bromodichloromethane	0.10	Not Detected	0.67	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
4-Methyl-2-pentanone	0.10	Not Detected	0.41	Not Detected
Toluene	0.10	Not Detected	0.38	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
1,1,2-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Tetrachloroethene	0.10	Not Detected	0.68	Not Detected

Client Sample ID: Lab Blank

Lab ID#: 1112239-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121306</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 12/14/11 12:00 AM</b>

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
2-Hexanone	0.50	Not Detected	2.0	Not Detected
Dibromochloromethane	0.10	Not Detected	0.85	Not Detected
1,2-Dibromoethane (EDB)	0.10	Not Detected	0.77	Not Detected
Chlorobenzene	0.10	Not Detected	0.46	Not Detected
Ethyl Benzene	0.10	Not Detected	0.43	Not Detected
m,p-Xylene	0.10	Not Detected	0.43	Not Detected
o-Xylene	0.10	Not Detected	0.43	Not Detected
Styrene	0.10	Not Detected	0.42	Not Detected
Bromoform	0.10	Not Detected	1.0	Not Detected
Cumene	0.10	Not Detected	0.49	Not Detected
1,1,2,2-Tetrachloroethane	0.10	Not Detected	0.69	Not Detected
Propylbenzene	0.10	Not Detected	0.49	Not Detected
4-Ethyltoluene	0.10	Not Detected	0.49	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,4-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
alpha-Chlorotoluene	0.10	Not Detected	0.52	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected	3.7	Not Detected
Hexachlorobutadiene	0.50	Not Detected	5.3	Not Detected

Container Type: NA - Not Applicable

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	94	70-130
4-Bromofluorobenzene	116	70-130

Client Sample ID: CCV

Lab ID#: 1112239-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121302</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/13/11 08:39 PM

<b>Compound</b>	<b>%Recovery</b>
Freon 12	99
Freon 114	97
Chloromethane	92
Vinyl Chloride	95
1,3-Butadiene	96
Bromomethane	116
Chloroethane	109
Freon 11	98
Ethanol	104
Freon 113	91
1,1-Dichloroethene	85
Acetone	106
2-Propanol	83
Carbon Disulfide	112
3-Chloropropene	87
Methylene Chloride	90
Methyl tert-butyl ether	86
trans-1,2-Dichloroethene	93
Hexane	87
1,1-Dichloroethane	94
2-Butanone (Methyl Ethyl Ketone)	89
cis-1,2-Dichloroethene	96
Tetrahydrofuran	91
Chloroform	92
1,1,1-Trichloroethane	96
Cyclohexane	85
Carbon Tetrachloride	92
2,2,4-Trimethylpentane	86
Benzene	89
1,2-Dichloroethane	97
Heptane	89
Trichloroethene	84
1,2-Dichloropropane	83
1,4-Dioxane	85
Bromodichloromethane	92
cis-1,3-Dichloropropene	87
4-Methyl-2-pentanone	80
Toluene	86
trans-1,3-Dichloropropene	89
1,1,2-Trichloroethane	84
Tetrachloroethene	88

Client Sample ID: CCV

Lab ID#: 1112239-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121302</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/13/11 08:39 PM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	76
Dibromochloromethane	80
1,2-Dibromoethane (EDB)	86
Chlorobenzene	86
Ethyl Benzene	93
m,p-Xylene	93
o-Xylene	91
Styrene	86
Bromoform	79
Cumene	91
1,1,2,2-Tetrachloroethane	86
Propylbenzene	89
4-Ethyltoluene	89
1,3,5-Trimethylbenzene	89
1,2,4-Trimethylbenzene	88
1,3-Dichlorobenzene	90
1,4-Dichlorobenzene	88
alpha-Chlorotoluene	86
1,2-Dichlorobenzene	88
1,2,4-Trichlorobenzene	81
Hexachlorobutadiene	92

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	99	70-130



Client Sample ID: LCS

Lab ID#: 1112239-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121303</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/13/11 09:27 PM

<b>Compound</b>	<b>%Recovery</b>
Freon 12	98
Freon 114	98
Chloromethane	89
Vinyl Chloride	92
1,3-Butadiene	92
Bromomethane	119
Chloroethane	105
Freon 11	101
Ethanol	72
Freon 113	94
1,1-Dichloroethene	90
Acetone	88
2-Propanol	71
Carbon Disulfide	98
3-Chloropropene	96
Methylene Chloride	96
Methyl tert-butyl ether	91
trans-1,2-Dichloroethene	102
Hexane	87
1,1-Dichloroethane	93
2-Butanone (Methyl Ethyl Ketone)	81
cis-1,2-Dichloroethene	94
Tetrahydrofuran	90
Chloroform	95
1,1,1-Trichloroethane	96
Cyclohexane	88
Carbon Tetrachloride	97
2,2,4-Trimethylpentane	86
Benzene	91
1,2-Dichloroethane	102
Heptane	92
Trichloroethene	91
1,2-Dichloropropane	92
1,4-Dioxane	83
Bromodichloromethane	89
cis-1,3-Dichloropropene	90
4-Methyl-2-pentanone	81
Toluene	89
trans-1,3-Dichloropropene	91
1,1,2-Trichloroethane	86
Tetrachloroethene	91

Client Sample ID: LCS

Lab ID#: 1112239-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121303</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 12/13/11 09:27 PM</b>

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	71
Dibromochloromethane	86
1,2-Dibromoethane (EDB)	94
Chlorobenzene	90
Ethyl Benzene	94
m,p-Xylene	92
o-Xylene	92
Styrene	89
Bromoform	84
Cumene	95
1,1,2,2-Tetrachloroethane	90
Propylbenzene	93
4-Ethyltoluene	89
1,3,5-Trimethylbenzene	93
1,2,4-Trimethylbenzene	86
1,3-Dichlorobenzene	94
1,4-Dichlorobenzene	91
alpha-Chlorotoluene	87
1,2-Dichlorobenzene	95
1,2,4-Trichlorobenzene	138 Q
Hexachlorobutadiene	146 Q

Q = Exceeds Quality Control limits.

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: LCSD

Lab ID#: 1112239-05AA

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121304</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/13/11 10:15 PM

<b>Compound</b>	<b>%Recovery</b>
Freon 12	99
Freon 114	92
Chloromethane	89
Vinyl Chloride	87
1,3-Butadiene	89
Bromomethane	116
Chloroethane	101
Freon 11	102
Ethanol	74
Freon 113	91
1,1-Dichloroethene	86
Acetone	88
2-Propanol	67
Carbon Disulfide	96
3-Chloropropene	93
Methylene Chloride	98
Methyl tert-butyl ether	90
trans-1,2-Dichloroethene	100
Hexane	85
1,1-Dichloroethane	92
2-Butanone (Methyl Ethyl Ketone)	76
cis-1,2-Dichloroethene	94
Tetrahydrofuran	88
Chloroform	96
1,1,1-Trichloroethane	98
Cyclohexane	85
Carbon Tetrachloride	94
2,2,4-Trimethylpentane	83
Benzene	88
1,2-Dichloroethane	100
Heptane	88
Trichloroethene	81
1,2-Dichloropropane	85
1,4-Dioxane	84
Bromodichloromethane	94
cis-1,3-Dichloropropene	86
4-Methyl-2-pentanone	75
Toluene	86
trans-1,3-Dichloropropene	94
1,1,2-Trichloroethane	92
Tetrachloroethene	87

Client Sample ID: LCSD

Lab ID#: 1112239-05AA

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e121304</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/13/11 10:15 PM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	72
Dibromochloromethane	87
1,2-Dibromoethane (EDB)	94
Chlorobenzene	92
Ethyl Benzene	92
m,p-Xylene	94
o-Xylene	93
Styrene	89
Bromoform	84
Cumene	98
1,1,2,2-Tetrachloroethane	90
Propylbenzene	91
4-Ethyltoluene	89
1,3,5-Trimethylbenzene	96
1,2,4-Trimethylbenzene	89
1,3-Dichlorobenzene	95
1,4-Dichlorobenzene	92
alpha-Chlorotoluene	88
1,2-Dichlorobenzene	96
1,2,4-Trichlorobenzene	137 Q
Hexachlorobutadiene	145 Q

Q = Exceeds Quality Control limits.

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	106	70-130

1/3/2012

Ms. Julie Panko  
ChemRisk  
20 Stanwix Street  
Suite 505  
Pittsburgh PA 15222

Project Name: Ft. Cherry  
Project #: 11239  
Workorder #: 1112625

Dear Ms. Julie Panko

The following report includes the data for the above referenced project for sample(s) received on 12/30/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,



Ausha Scott  
Project Manager

Client Sample ID: LOC.2-12-28-11

Lab ID#: 1112625-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123113</b>	<b>Date of Collection:</b> 12/28/11 11:20:00 A
<b>Dil. Factor:</b>	<b>1.64</b>	<b>Date of Analysis:</b> 12/31/11 01:26 PM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.16	0.47	0.81	2.3
Freon 114	0.16	Not Detected	1.1	Not Detected
Chloromethane	0.16	0.45	0.34	0.93
Vinyl Chloride	0.16	Not Detected	0.42	Not Detected
1,3-Butadiene	0.16	Not Detected	0.36	Not Detected
Bromomethane	0.16	Not Detected	0.64	Not Detected
Chloroethane	0.82	Not Detected	2.2	Not Detected
Freon 11	0.16	0.21	0.92	1.2
Ethanol	0.82	Not Detected	1.5	Not Detected
Freon 113	0.16	Not Detected	1.2	Not Detected
1,1-Dichloroethene	0.16	Not Detected	0.65	Not Detected
Acetone	0.82	0.84	1.9	2.0
2-Propanol	0.82	Not Detected	2.0	Not Detected
Carbon Disulfide	0.82	Not Detected	2.6	Not Detected
3-Chloropropene	0.82	Not Detected	2.6	Not Detected
Methylene Chloride	0.33	Not Detected	1.1	Not Detected
Methyl tert-butyl ether	0.16	Not Detected	0.59	Not Detected
trans-1,2-Dichloroethene	0.16	Not Detected	0.65	Not Detected
Hexane	0.16	0.25	0.58	0.88
1,1-Dichloroethane	0.16	Not Detected	0.66	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.82	Not Detected	2.4	Not Detected
cis-1,2-Dichloroethene	0.16	Not Detected	0.65	Not Detected
Tetrahydrofuran	0.82	Not Detected	2.4	Not Detected
Chloroform	0.16	Not Detected	0.80	Not Detected
1,1,1-Trichloroethane	0.16	Not Detected	0.89	Not Detected
Cyclohexane	0.16	Not Detected	0.56	Not Detected
Carbon Tetrachloride	0.16	Not Detected	1.0	Not Detected
2,2,4-Trimethylpentane	0.82	Not Detected	3.8	Not Detected
Benzene	0.16	0.20	0.52	0.64
1,2-Dichloroethane	0.16	Not Detected	0.66	Not Detected
Heptane	0.16	Not Detected	0.67	Not Detected
Trichloroethene	0.16	Not Detected	0.88	Not Detected
1,2-Dichloropropane	0.16	Not Detected	0.76	Not Detected
1,4-Dioxane	0.16	Not Detected	0.59	Not Detected
Bromodichloromethane	0.16	Not Detected	1.1	Not Detected
cis-1,3-Dichloropropene	0.16	Not Detected	0.74	Not Detected
4-Methyl-2-pentanone	0.16	Not Detected	0.67	Not Detected
Toluene	0.16	Not Detected	0.62	Not Detected
trans-1,3-Dichloropropene	0.16	Not Detected	0.74	Not Detected
1,1,2-Trichloroethane	0.16	Not Detected	0.89	Not Detected
Tetrachloroethene	0.16	Not Detected	1.1	Not Detected

Client Sample ID: LOC.2-12-28-11

Lab ID#: 1112625-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123113</b>	<b>Date of Collection:</b> 12/28/11 11:20:00 A
<b>Dil. Factor:</b>	<b>1.64</b>	<b>Date of Analysis:</b> 12/31/11 01:26 PM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
2-Hexanone	0.82	Not Detected	3.4	Not Detected
Dibromochloromethane	0.16	Not Detected	1.4	Not Detected
1,2-Dibromoethane (EDB)	0.16	Not Detected	1.3	Not Detected
Chlorobenzene	0.16	Not Detected	0.76	Not Detected
Ethyl Benzene	0.16	Not Detected	0.71	Not Detected
m,p-Xylene	0.16	Not Detected	0.71	Not Detected
o-Xylene	0.16	Not Detected	0.71	Not Detected
Styrene	0.16	Not Detected	0.70	Not Detected
Bromoform	0.16	Not Detected	1.7	Not Detected
Cumene	0.16	Not Detected	0.81	Not Detected
1,1,2,2-Tetrachloroethane	0.16	Not Detected	1.1	Not Detected
Propylbenzene	0.16	Not Detected	0.81	Not Detected
4-Ethyltoluene	0.16	Not Detected	0.81	Not Detected
1,3,5-Trimethylbenzene	0.16	Not Detected	0.81	Not Detected
1,2,4-Trimethylbenzene	0.16	Not Detected	0.81	Not Detected
1,3-Dichlorobenzene	0.16	Not Detected	0.99	Not Detected
1,4-Dichlorobenzene	0.16	Not Detected	0.99	Not Detected
alpha-Chlorotoluene	0.16	Not Detected	0.85	Not Detected
1,2-Dichlorobenzene	0.16	Not Detected	0.99	Not Detected
1,2,4-Trichlorobenzene	0.82	Not Detected	6.1	Not Detected
Hexachlorobutadiene	0.82	Not Detected	8.7	Not Detected

**Container Type: 6 Liter Summa Canister (100% Certified)**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	105	70-130

Client Sample ID: Lab Blank

Lab ID#: 1112625-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123107</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/31/11 09:08 AM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.10	Not Detected	0.49	Not Detected
Freon 114	0.10	Not Detected	0.70	Not Detected
Chloromethane	0.10	Not Detected	0.21	Not Detected
Vinyl Chloride	0.10	Not Detected	0.26	Not Detected
1,3-Butadiene	0.10	Not Detected	0.22	Not Detected
Bromomethane	0.10	Not Detected	0.39	Not Detected
Chloroethane	0.50	Not Detected	1.3	Not Detected
Freon 11	0.10	Not Detected	0.56	Not Detected
Ethanol	0.50	Not Detected	0.94	Not Detected
Freon 113	0.10	Not Detected	0.77	Not Detected
1,1-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Acetone	0.50	Not Detected	1.2	Not Detected
2-Propanol	0.50	Not Detected	1.2	Not Detected
Carbon Disulfide	0.50	Not Detected	1.6	Not Detected
3-Chloropropene	0.50	Not Detected	1.6	Not Detected
Methylene Chloride	0.20	Not Detected	0.69	Not Detected
Methyl tert-butyl ether	0.10	Not Detected	0.36	Not Detected
trans-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Hexane	0.10	Not Detected	0.35	Not Detected
1,1-Dichloroethane	0.10	Not Detected	0.40	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected	1.5	Not Detected
cis-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.10	Not Detected	0.49	Not Detected
1,1,1-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Cyclohexane	0.10	Not Detected	0.34	Not Detected
Carbon Tetrachloride	0.10	Not Detected	0.63	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.10	Not Detected	0.32	Not Detected
1,2-Dichloroethane	0.10	Not Detected	0.40	Not Detected
Heptane	0.10	Not Detected	0.41	Not Detected
Trichloroethene	0.10	Not Detected	0.54	Not Detected
1,2-Dichloropropane	0.10	Not Detected	0.46	Not Detected
1,4-Dioxane	0.10	Not Detected	0.36	Not Detected
Bromodichloromethane	0.10	Not Detected	0.67	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
4-Methyl-2-pentanone	0.10	Not Detected	0.41	Not Detected
Toluene	0.10	Not Detected	0.38	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
1,1,2-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Tetrachloroethene	0.10	Not Detected	0.68	Not Detected



Client Sample ID: Lab Blank

Lab ID#: 1112625-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123107</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 12/31/11 09:08 AM</b>

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
2-Hexanone	0.50	Not Detected	2.0	Not Detected
Dibromochloromethane	0.10	Not Detected	0.85	Not Detected
1,2-Dibromoethane (EDB)	0.10	Not Detected	0.77	Not Detected
Chlorobenzene	0.10	Not Detected	0.46	Not Detected
Ethyl Benzene	0.10	Not Detected	0.43	Not Detected
m,p-Xylene	0.10	Not Detected	0.43	Not Detected
o-Xylene	0.10	Not Detected	0.43	Not Detected
Styrene	0.10	Not Detected	0.42	Not Detected
Bromoform	0.10	Not Detected	1.0	Not Detected
Cumene	0.10	Not Detected	0.49	Not Detected
1,1,2,2-Tetrachloroethane	0.10	Not Detected	0.69	Not Detected
Propylbenzene	0.10	Not Detected	0.49	Not Detected
4-Ethyltoluene	0.10	Not Detected	0.49	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,4-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
alpha-Chlorotoluene	0.10	Not Detected	0.52	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected	3.7	Not Detected
Hexachlorobutadiene	0.50	Not Detected	5.3	Not Detected

Container Type: NA - Not Applicable

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	99	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	114	70-130

Client Sample ID: CCV

Lab ID#: 1112625-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123102</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/30/11 09:32 PM

<b>Compound</b>	<b>%Recovery</b>
Freon 12	98
Freon 114	107
Chloromethane	99
Vinyl Chloride	99
1,3-Butadiene	101
Bromomethane	75
Chloroethane	96
Freon 11	88
Ethanol	126
Freon 113	92
1,1-Dichloroethene	94
Acetone	100
2-Propanol	93
Carbon Disulfide	100
3-Chloropropene	87
Methylene Chloride	74
Methyl tert-butyl ether	93
trans-1,2-Dichloroethene	86
Hexane	90
1,1-Dichloroethane	90
2-Butanone (Methyl Ethyl Ketone)	82
cis-1,2-Dichloroethene	96
Tetrahydrofuran	91
Chloroform	92
1,1,1-Trichloroethane	89
Cyclohexane	88
Carbon Tetrachloride	85
2,2,4-Trimethylpentane	92
Benzene	87
1,2-Dichloroethane	86
Heptane	88
Trichloroethene	94
1,2-Dichloropropane	95
1,4-Dioxane	81
Bromodichloromethane	85
cis-1,3-Dichloropropene	83
4-Methyl-2-pentanone	80
Toluene	90
trans-1,3-Dichloropropene	85
1,1,2-Trichloroethane	89
Tetrachloroethene	87

Client Sample ID: CCV

Lab ID#: 1112625-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123102</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/30/11 09:32 PM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	78
Dibromochloromethane	81
1,2-Dibromoethane (EDB)	87
Chlorobenzene	91
Ethyl Benzene	93
m,p-Xylene	98
o-Xylene	92
Styrene	92
Bromoform	77
Cumene	94
1,1,2,2-Tetrachloroethane	93
Propylbenzene	91
4-Ethyltoluene	90
1,3,5-Trimethylbenzene	89
1,2,4-Trimethylbenzene	92
1,3-Dichlorobenzene	92
1,4-Dichlorobenzene	92
alpha-Chlorotoluene	86
1,2-Dichlorobenzene	88
1,2,4-Trichlorobenzene	78
Hexachlorobutadiene	84

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	92	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	104	70-130

Client Sample ID: LCS

Lab ID#: 1112625-06A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123103</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/30/11 10:13 PM

<b>Compound</b>	<b>%Recovery</b>
Freon 12	90
Freon 114	95
Chloromethane	96
Vinyl Chloride	92
1,3-Butadiene	88
Bromomethane	83
Chloroethane	86
Freon 11	85
Ethanol	81
Freon 113	90
1,1-Dichloroethene	90
Acetone	98
2-Propanol	81
Carbon Disulfide	109
3-Chloropropene	90
Methylene Chloride	94
Methyl tert-butyl ether	85
trans-1,2-Dichloroethene	106
Hexane	78
1,1-Dichloroethane	89
2-Butanone (Methyl Ethyl Ketone)	84
cis-1,2-Dichloroethene	101
Tetrahydrofuran	84
Chloroform	91
1,1,1-Trichloroethane	86
Cyclohexane	85
Carbon Tetrachloride	141 Q
2,2,4-Trimethylpentane	85
Benzene	88
1,2-Dichloroethane	90
Heptane	91
Trichloroethene	94
1,2-Dichloropropane	92
1,4-Dioxane	86
Bromodichloromethane	84
cis-1,3-Dichloropropene	78
4-Methyl-2-pentanone	83
Toluene	87
trans-1,3-Dichloropropene	83
1,1,2-Trichloroethane	85
Tetrachloroethene	77

Client Sample ID: LCS

Lab ID#: 1112625-06A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123103</b>	<b>Date of Collection: NA</b>
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis: 12/30/11 10:13 PM</b>

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	77
Dibromochloromethane	77
1,2-Dibromoethane (EDB)	84
Chlorobenzene	84
Ethyl Benzene	90
m,p-Xylene	86
o-Xylene	87
Styrene	84
Bromoform	82
Cumene	88
1,1,2,2-Tetrachloroethane	88
Propylbenzene	86
4-Ethyltoluene	80
1,3,5-Trimethylbenzene	84
1,2,4-Trimethylbenzene	78
1,3-Dichlorobenzene	88
1,4-Dichlorobenzene	89
alpha-Chlorotoluene	76
1,2-Dichlorobenzene	80
1,2,4-Trichlorobenzene	80
Hexachlorobutadiene	84

Q = Exceeds Quality Control limits.

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	111	70-130

Client Sample ID: LCSD

Lab ID#: 1112625-06AA

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

File Name:	e123104	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 12/30/11 10:52 PM

Compound	%Recovery
Freon 12	91
Freon 114	86
Chloromethane	89
Vinyl Chloride	89
1,3-Butadiene	89
Bromomethane	84
Chloroethane	95
Freon 11	86
Ethanol	80
Freon 113	89
1,1-Dichloroethene	101
Acetone	99
2-Propanol	83
Carbon Disulfide	110
3-Chloropropene	100
Methylene Chloride	98
Methyl tert-butyl ether	83
trans-1,2-Dichloroethene	98
Hexane	84
1,1-Dichloroethane	90
2-Butanone (Methyl Ethyl Ketone)	94
cis-1,2-Dichloroethene	94
Tetrahydrofuran	85
Chloroform	91
1,1,1-Trichloroethane	87
Cyclohexane	86
Carbon Tetrachloride	143 Q
2,2,4-Trimethylpentane	81
Benzene	86
1,2-Dichloroethane	88
Heptane	85
Trichloroethene	88
1,2-Dichloropropane	89
1,4-Dioxane	90
Bromodichloromethane	86
cis-1,3-Dichloropropene	81
4-Methyl-2-pentanone	82
Toluene	87
trans-1,3-Dichloropropene	84
1,1,2-Trichloroethane	89
Tetrachloroethene	86

Client Sample ID: LCSD

Lab ID#: 1112625-06AA

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e123104</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 12/30/11 10:52 PM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	76
Dibromochloromethane	82
1,2-Dibromoethane (EDB)	82
Chlorobenzene	89
Ethyl Benzene	98
m,p-Xylene	92
o-Xylene	88
Styrene	88
Bromoform	82
Cumene	88
1,1,2,2-Tetrachloroethane	91
Propylbenzene	91
4-Ethyltoluene	83
1,3,5-Trimethylbenzene	86
1,2,4-Trimethylbenzene	81
1,3-Dichlorobenzene	87
1,4-Dichlorobenzene	84
alpha-Chlorotoluene	82
1,2-Dichlorobenzene	84
1,2,4-Trichlorobenzene	86
Hexachlorobutadiene	88

Q = Exceeds Quality Control limits.

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	102	70-130



December 22, 2011

Robert W. Dinnen  
Superintendent  
Fort Cherry School District  
110 Fort Cherry Road  
McDonald, Pennsylvania 15057-2975

**RE: RESULTS OF BASELINE AIR MONITORING AT FT. CHERRY SCHOOL DISTRICT K-12  
CAMPUS**

Dear Dr. Dinnen:

ChemRisk was retained by the Fort Cherry School District school board to perform air monitoring in order to address concerns regarding children's potential for exposure to chemicals resulting from hydraulic fracturing operations at the Chiarelli well pad located approximately 900 yards north of the Fort Cherry campus. The results reported here pertain to the "baseline" sampling period, which was conducted from November 14, 2011 through November 29, 2011, prior to the commencement of hydraulic fracturing on November 30, 2011. This report is organized into the following sections: Background, Materials and Methods, Results and Discussion, and References. Figures and tables can be found at the end of the report.

## **BACKGROUND**

Local parents have expressed concerns regarding their children's potential for exposure to chemicals related to hydraulic fracturing. The Chiarelli well pad is located approximately 900 yards due north of the Ft. Cherry school campus, and consists of Units 3H, 8H, and 9H. Figure 1 provides an aerial snapshot of the area and depicts the locations of both the school and the Chiarelli well pad. The Ft. Cherry campus is thought to be located generally upwind of the Chiarelli well pad, however, the wind direction is not constant and there is a potential for conditions to change.

The extraction of natural gas through hydraulic fracturing of shale formations can result in the release of various chemicals. Based on the limited data available, these chemicals may potentially include methane, aromatic hydrocarbons including but not limited to benzene, toluene, xylene, ethylbenzene (also known as BTEX), glycols and glycol ethers, alcohols, and amines, which may be released from flowback water that results after the fracturing of the well and subsequent gas production (ATSDR 2008, NYDEC 2009). Although the PADEP conducted air sampling at several gas operation locations in the Marcellus Shale play, the data represent single day/events and thus little is known about the potential long term exposures to these chemicals as a result of hydraulic fracturing.



In order to address concerns regarding the potential for children's exposure to chemicals that may be related to the hydraulic fracturing operations, and to gain a better understanding regarding trends over time as the well is fracked and brought into production, ChemRisk developed an air monitoring program to perform at the campus. ChemRisk presented the monitoring plan to, and it was accepted by, the Wellness Committee and Ft. Cherry school board on September 19, 2011. As previously mentioned, this report is intended to provide baseline data that will be useful in contextualizing results to be obtained during fracking and well production.

## **MATERIALS AND METHODS**

Baseline sampling was performed between November 14 and 29, 2011. Continuous air monitoring was conducted to measure gases that could be associated with hydraulic fracturing including total volatile organic compounds (VOCs), hydrogen sulfide and explosive gases (including methane). Because continuous air monitoring instruments measure for total VOCs and not individual volatile compounds, VOCs were also sampled for using summa canisters, which allow for the collection of ambient air that can be analyzed for specific VOCs. Additionally, meteorological conditions were recorded using a weather station; specifically, wind direction, wind speed, temperature, humidity, precipitation and barometric pressure were measured.

An air monitoring station was established near the northern end of the school, which is the portion of the school that is closest to the Chiarelli well pad (Figure 2). Specifically, it is located outside of an office that is situated between the band and chorus rooms; this office also provides a source of electricity for the air monitoring equipment and security for the computers that record the data. As can be seen in Figure 2, this sampling location is around the corner from the northernmost part of the school (i.e., it is not in a direct line with the Chiarelli well pad); however it was deemed the best possible sampling location for logistical reasons.

The air monitoring station consists of a plastic crate containing the air monitoring equipment which sits atop a shelving unit stabilized by cinder blocks (Figures 3a, b). The configuration of the air monitoring station allows for sampling at a height approximating the breathing zone of a person, and protection of the continuous air monitoring equipment from inclement weather (i.e., rain, snow). Although not depicted in Figure 3a, when summa canisters were used to collect VOCs, the canisters were secured to the shelving unit with cable ties such that the inlet was at the approximate height of the continuous monitoring equipment (i.e., at a height approximating breathing height). The meteorological (MET) station is located on the roof of the school directly above the air monitoring station (Figure 2). A picture of the MET station is provided as Figure 4.

### Continuous Air Monitoring using Direct Reading Instrumentation

Continuous air monitoring was conducted using a combination of equipment manufactured by RAE Systems: a MultiRae Plus gas monitor (MultiRAE), ppbRAE 3000 total VOC monitor (ppbRAE) and a RAELink3 system (RAELink). The RAELink is a portable networking modem

that provides wireless communication between the MultiRAE and ppbRAE, and a host computer that datalogs the continuous monitoring results. The host computer is located just inside the building in the aforementioned office. Real-time data from both the MultiRAE and ppbRAE were relayed to the host computer and recorded every minute.

The MultiRAE monitor uses a photoionization detector (PID) to measure total VOCs and multiple sensors to measure CO, H<sub>2</sub>S, O<sub>2</sub> and explosive gases.<sup>1</sup> The ppbRAE monitor also measures total VOCs with a PID; however, this device can detect lower levels of total VOCs (0.001 ppm) than the MultiRAE (resolution = 0.1 ppm). The resolution for H<sub>2</sub>S is 1 ppm, and explosive gases were measured in terms of percent of the lower explosive limit (LEL) or the concentration of the gas in air at which the chemicals will cause an explosion. The resolution for the LEL is 1% of the LEL. It should be noted that the MultiRAE measures total explosive gases and is not specific for methane. However, to our knowledge there are no other sources of explosive vapors at the sampling station location.

Monitoring was conducted using the MultiRAE Plus from November 14 through 18, 2011 and on November 29, 2011. The monitor was stopped on November 18<sup>th</sup> as it was not operating properly, and it was replaced with a new unit on November 29<sup>th</sup>. Additional monitoring was done using the ppbRAE from November 14 through 23, 2011 and on November 29, 2011. The monitor was stopped on November 23<sup>rd</sup> due to lack of security over Thanksgiving break, and it was restarted on November 29<sup>th</sup>. On occasion, the monitors went “offline” and therefore did not record measurements for varying periods of time. The reasons for this included interruption of power supply, and full datalog memories (which were re-set to prevent this condition). Nonetheless, both monitors were calibrated periodically in accordance with the manufacturer’s specifications.

Action levels were set for some of the continuous monitoring parameters for the purpose of identifying dangerous situations and/or as determinants for deploying a summa canister in order to obtain more specific results for volatile compounds. Although these action levels are discussed here, they were developed more for the purpose of monitoring/sampling during well fracturing and production sampling periods. An action level of 0.51 ppm was established for H<sub>2</sub>S. This level is equivalent to the USEPA’s lowest Acute Exposure Guideline Level-1 (AEGL-1), which is a concentration above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure. An action level of 20 ppm was established for total VOCs, and is based on the AEGL-1 for styrene (an aromatic hydrocarbon detected at other gas operation sites). This action level is likely to be conservative (i.e., health protective) because it is currently unknown whether or not styrene would make up a significant proportion of the total VOCs that may be in the air. For explosive gases, the action level was set to 10% of the LEL. At the 10% level, the concentration is not high enough to cause an explosion, but it is an early indication that gases are building up and actions should be taken to disperse the gases.

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<sup>1</sup> The instruments used to measure these gases also measure oxygen and carbon monoxide. However, these two gases are only important in understanding hazardous atmospheres in confined spaces and thus, not discussed in this report.

### Air Sampling for Specific VOCs

Air samples were collected on November 17 and 18, 2011 in order to conduct analyses for specific compounds that may be present in the total VOCs. The samples were collected using summa canisters with 24-hour flow regulators analyzed by Air Toxics, LTD in Folsom, CA, in accordance with modified EPA Method TO-15. A total of 62 VOCs were included in this analysis with reporting limits for individual VOCs ranging from 0.00013 to 0.0008 ppm.

### Measurement of Meteorological Conditions

Meteorological conditions were measured using a Davis Vantage Pro2 wireless weather station. Specifically, wind direction, wind speed, temperature, humidity, precipitation and barometric pressure were measured. Real-time results were relayed to the host computer every ten minutes and datalogged. Measurements were made and recorded on all days of the baseline monitoring period (i.e., November 14 through 29, 2011).

## **RESULTS and DISCUSSION**

This section summarizes the results of the baseline air monitoring period. The analytical reports are provided in Appendix A. The ultimate purpose of the baseline results is to serve as a point of comparison for the air monitoring results that will be collected when hydraulic fracturing at the Chiarelli well pad commences and as the wells are brought into production.

### *Hydrogen Sulfide*

Daily average concentrations of H<sub>2</sub>S ranged from 0 to 0.14 ppm, and the average of the daily mean concentrations was 0.0070 ppm. The absolute minimum and maximum values measured during the baseline sampling period were 0 and 0.20 ppm. A summary of the H<sub>2</sub>S data is presented in Table 1. Background air concentrations of hydrogen sulfide are typically less than 0.001 ppm<sup>2</sup> and the odor threshold (i.e., the concentration at which people can begin to smell it) is 0.01 ppm (50 times less than the AEGL-1 value)<sup>3</sup>. Also, the Pennsylvania Department of Environmental Protection (PADEP) has established a standard for H<sub>2</sub>S of 0.005 ppm as a 24-hr average. Based on the five days of baseline sampling, the results indicate that under normal conditions (i.e., non-hydraulic fracturing), concentrations of H<sub>2</sub>S may occasionally be 1) present above levels that are typically considered to be background concentrations, 2) present at levels that are above the odor threshold and 3) present at levels above the PADEP daily standard. Specific sources of hydrogen sulfide were not identified at the school near the sampling station, however, typical background sources include: crude petroleum; natural gas; hot springs; bacterial breakdown of organic materials and waste (human and animal); and industrial activities, such as petroleum and natural gas drilling (OSHA, 2005).

### *Explosive Gases*

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<sup>2</sup> ATSDR, 2006. Toxguide for Hydrogen Sulfide (H<sub>2</sub>S). U.S. Department of Health and Human Services. Public Health Service. Agency for Toxic Substances and Disease Registry. Atlanta GA.

<http://www.atsdr.cdc.gov/toxguides/toxguide-114.pdf>.

<sup>3</sup> USEPA, 2010. Final AEGLs. U.S. EPA Office of Pollution Prevention and Toxics.

<http://www.epa.gov/opptintr/aegl/>

During the baseline sampling all LEL measurements were 0% of the LEL (Table 1).

#### *Total Volatile Organic Compounds*

A summary of the total VOC measurements from the MultiRAE and ppbRAE are presented in Tables 1 and 2. The average total VOCs measured by each instrument were similar, although differences due to sensitivities of the instruments were observed. During the baseline sampling, the multiRAE recorded daily mean levels ranging from 0 to 0.48 ppm, with an average of 0.23 ppm. Baseline data collected from the ppbRAE for a total of 11 days indicated the daily mean levels ranged from 0 to 0.385 ppm, with an average of the daily mean values of 0.107 ppm. There are no health based limits for total VOCs and information regarding background concentrations for total VOCs in Washington County PA was not identified. Nonetheless, the data provides a baseline for future comparisons and a way to understand the potential for airborne impacts from VOCs that may be associated with the Chiarelli site.

#### *Specific Volatile Organic Compounds*

A summary of the VOC concentrations from the summa canister analyses is presented in Table 3. For the November 17<sup>th</sup> sample, 10 of the 62 specific VOCs were detected, including Freon 12, Freon 11, chloromethane, ethanol, acetone, 2-propanol, hexane, benzene, toluene, and m,p-xylene. For the November 18<sup>th</sup> sample, only 5 of the 62 VOCs were detected including Freon 12, Freon 11, chloromethane, ethanol, and acetone. These chemicals are ubiquitous and typically detected in higher concentrations in urban settings. The baseline VOC concentrations from the summa canisters were compared to results reported by the PADEP for the background location (Florence site, Washington County) that they sampled as part of their Southwestern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Program (PADEP, 2010a). The PADEP summa canister samples were collected using the same method as those for Fort Cherry School. As shown on Table 3, the baseline Fort Cherry results were similar to or less than the range of background concentrations reported by the PADEP for compounds that they detected. Additionally, the baseline Fort Cherry results were compared to ambient air samples collected at a site in Charleroi, Washington County by PADEP in 2009 as part of their routine toxic substances air monitoring program. The Fort Cherry baseline results were similar to or less than the concentrations measured at the Charleroi site by the PADEP (PADEP, 2010b).

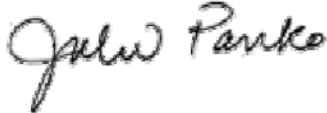
#### *Meteorological Conditions*

A summary of the baseline sampling period wind direction, wind speed, temperature, humidity, barometric pressure, and rainfall is presented in Table 4. Meteorological conditions can be important in understanding and modeling chemicals detected in air as these factors affect how they travel from source to exposure location. Although variable, the predominant wind direction during the baseline sampling period was from the southwest, putting the school generally upwind of the Chiarelli Units (Figure 5).

## SUMMARY

The results of the baseline sampling did not show anything remarkable with respect to chemicals detected in the ambient air. Going forward, all air monitoring and sampling results will be compared to the baseline measurements and health based concentrations as appropriate. If you have any questions regarding these results, please contact me at (412) 281-6900, ext. 1020 or by email at [jpanko@chemrisk.com](mailto:jpanko@chemrisk.com).

Sincerely,

A handwritten signature in black ink that reads "Julie Panko". The signature is written in a cursive, flowing style.

Julie M. Panko, CIH  
Principal Health Scientist

## REFERENCES

ATSDR (2008). Public health implications of ambient air exposures to volatile organic compounds as measured in rural, urban, and oil & gas development areas, Garfield County, Colorado. Atlanta, Georgia, U.S. Department of Health and Human Services.

NYDEC (2009). Supplemental generic environmental impact statement on the oil, gas, and solution mining regulatory program (draft). New York State Dept of Env Cons. Albany, NY, NYS Department of Environmental Conservation.

OSHA Fact Sheet: Hydrogen Sulfide.

[http://www.osha.gov/OshDoc/data\\_Hurricane\\_Facts/hydrogen\\_sulfide\\_fact.pdf](http://www.osha.gov/OshDoc/data_Hurricane_Facts/hydrogen_sulfide_fact.pdf)

PADEP (2010a). Southwestern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report. PADEP, Bureau of Air Quality. November 1, 2010.

PADEP (2010b). <http://www.dep.state.pa.us/dep/deputate/airwaste/aq/toxics/sites.htm>

## **APPENDIX A**

12/7/2011

Ms. Julie Panko

ChemRisk

20 Stanwix Street

Suite 505

Pittsburgh PA 15222

Project Name: Ft. Cherry

Project #: 11239

Workorder #: 1111417

Dear Ms. Julie Panko

The following report includes the data for the above referenced project for sample(s) received on 11/22/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Ausha Scott at 916-985-1000 if you have any questions regarding the data in this report.

Regards,



Ausha Scott

Project Manager



Client Sample ID: LOC2-11-17-11

Lab ID#: 1111417-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112826</b>	<b>Date of Collection:</b> 11/17/11 10:00:00 A
<b>Dil. Factor:</b>	<b>1.32</b>	<b>Date of Analysis:</b> 11/29/11 07:32 AM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.13	0.40	0.65	2.0
Freon 114	0.13	Not Detected	0.92	Not Detected
Chloromethane	0.13	0.36	0.27	0.75
Vinyl Chloride	0.13	Not Detected	0.34	Not Detected
1,3-Butadiene	0.13	Not Detected	0.29	Not Detected
Bromomethane	0.13	Not Detected	0.51	Not Detected
Chloroethane	0.66	Not Detected	1.7	Not Detected
Freon 11	0.13	0.32	0.74	1.8
Ethanol	0.66	7.6	1.2	14
Freon 113	0.13	Not Detected	1.0	Not Detected
1,1-Dichloroethene	0.13	Not Detected	0.52	Not Detected
Acetone	0.66	7.4	1.6	18
2-Propanol	0.66	5.4	1.6	13
Carbon Disulfide	0.66	Not Detected	2.0	Not Detected
3-Chloropropene	0.66	Not Detected	2.1	Not Detected
Methylene Chloride	0.26	Not Detected	0.92	Not Detected
Methyl tert-butyl ether	0.13	Not Detected	0.48	Not Detected
trans-1,2-Dichloroethene	0.13	Not Detected	0.52	Not Detected
Hexane	0.13	0.13	0.46	0.46
1,1-Dichloroethane	0.13	Not Detected	0.53	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.66	Not Detected	1.9	Not Detected
cis-1,2-Dichloroethene	0.13	Not Detected	0.52	Not Detected
Tetrahydrofuran	0.66	Not Detected	1.9	Not Detected
Chloroform	0.13	Not Detected	0.64	Not Detected
1,1,1-Trichloroethane	0.13	Not Detected	0.72	Not Detected
Cyclohexane	0.13	Not Detected	0.45	Not Detected
Carbon Tetrachloride	0.13	Not Detected	0.83	Not Detected
2,2,4-Trimethylpentane	0.66	Not Detected	3.1	Not Detected
Benzene	0.13	0.16	0.42	0.53
1,2-Dichloroethane	0.13	Not Detected	0.53	Not Detected
Heptane	0.13	Not Detected	0.54	Not Detected
Trichloroethene	0.13	Not Detected	0.71	Not Detected
1,2-Dichloropropane	0.13	Not Detected	0.61	Not Detected
1,4-Dioxane	0.13	Not Detected	0.48	Not Detected
Bromodichloromethane	0.13	Not Detected	0.88	Not Detected
cis-1,3-Dichloropropene	0.13	Not Detected	0.60	Not Detected
4-Methyl-2-pentanone	0.13	Not Detected	0.54	Not Detected
Toluene	0.13	0.23	0.50	0.86
trans-1,3-Dichloropropene	0.13	Not Detected	0.60	Not Detected
1,1,2-Trichloroethane	0.13	Not Detected	0.72	Not Detected
Tetrachloroethene	0.13	Not Detected	0.90	Not Detected

Client Sample ID: LOC2-11-17-11

Lab ID#: 1111417-03A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112826</b>	<b>Date of Collection:</b> 11/17/11 10:00:00 A
<b>Dil. Factor:</b>	<b>1.32</b>	<b>Date of Analysis:</b> 11/29/11 07:32 AM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
2-Hexanone	0.66	Not Detected	2.7	Not Detected
Dibromochloromethane	0.13	Not Detected	1.1	Not Detected
1,2-Dibromoethane (EDB)	0.13	Not Detected	1.0	Not Detected
Chlorobenzene	0.13	Not Detected	0.61	Not Detected
Ethyl Benzene	0.13	Not Detected	0.57	Not Detected
m,p-Xylene	0.13	0.14	0.57	0.62
o-Xylene	0.13	Not Detected	0.57	Not Detected
Styrene	0.13	Not Detected	0.56	Not Detected
Bromoform	0.13	Not Detected	1.4	Not Detected
Cumene	0.13	Not Detected	0.65	Not Detected
1,1,2,2-Tetrachloroethane	0.13	Not Detected	0.91	Not Detected
Propylbenzene	0.13	Not Detected	0.65	Not Detected
4-Ethyltoluene	0.13	Not Detected	0.65	Not Detected
1,3,5-Trimethylbenzene	0.13	Not Detected	0.65	Not Detected
1,2,4-Trimethylbenzene	0.13	Not Detected	0.65	Not Detected
1,3-Dichlorobenzene	0.13	Not Detected	0.79	Not Detected
1,4-Dichlorobenzene	0.13	Not Detected	0.79	Not Detected
alpha-Chlorotoluene	0.13	Not Detected	0.68	Not Detected
1,2-Dichlorobenzene	0.13	Not Detected	0.79	Not Detected
1,2,4-Trichlorobenzene	0.66	Not Detected	4.9	Not Detected
Hexachlorobutadiene	0.66	Not Detected	7.0	Not Detected

**Container Type: 6 Liter Summa Canister (100% Certified)**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	109	70-130

Client Sample ID: LOC2-11-18-11

Lab ID#: 1111417-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112827</b>	<b>Date of Collection:</b> 11/18/11 10:44:00 A
<b>Dil. Factor:</b>	<b>1.61</b>	<b>Date of Analysis:</b> 11/29/11 08:14 AM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.16	0.44	0.80	2.2
Freon 114	0.16	Not Detected	1.1	Not Detected
Chloromethane	0.16	0.35	0.33	0.72
Vinyl Chloride	0.16	Not Detected	0.41	Not Detected
1,3-Butadiene	0.16	Not Detected	0.36	Not Detected
Bromomethane	0.16	Not Detected	0.62	Not Detected
Chloroethane	0.80	Not Detected	2.1	Not Detected
Freon 11	0.16	0.22	0.90	1.2
Ethanol	0.80	1.6	1.5	3.0
Freon 113	0.16	Not Detected	1.2	Not Detected
1,1-Dichloroethene	0.16	Not Detected	0.64	Not Detected
Acetone	0.80	2.8	1.9	6.6
2-Propanol	0.80	Not Detected	2.0	Not Detected
Carbon Disulfide	0.80	Not Detected	2.5	Not Detected
3-Chloropropene	0.80	Not Detected	2.5	Not Detected
Methylene Chloride	0.32	Not Detected	1.1	Not Detected
Methyl tert-butyl ether	0.16	Not Detected	0.58	Not Detected
trans-1,2-Dichloroethene	0.16	Not Detected	0.64	Not Detected
Hexane	0.16	Not Detected	0.57	Not Detected
1,1-Dichloroethane	0.16	Not Detected	0.65	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.80	Not Detected	2.4	Not Detected
cis-1,2-Dichloroethene	0.16	Not Detected	0.64	Not Detected
Tetrahydrofuran	0.80	Not Detected	2.4	Not Detected
Chloroform	0.16	Not Detected	0.79	Not Detected
1,1,1-Trichloroethane	0.16	Not Detected	0.88	Not Detected
Cyclohexane	0.16	Not Detected	0.55	Not Detected
Carbon Tetrachloride	0.16	Not Detected	1.0	Not Detected
2,2,4-Trimethylpentane	0.80	Not Detected	3.8	Not Detected
Benzene	0.16	Not Detected	0.51	Not Detected
1,2-Dichloroethane	0.16	Not Detected	0.65	Not Detected
Heptane	0.16	Not Detected	0.66	Not Detected
Trichloroethene	0.16	Not Detected	0.86	Not Detected
1,2-Dichloropropane	0.16	Not Detected	0.74	Not Detected
1,4-Dioxane	0.16	Not Detected	0.58	Not Detected
Bromodichloromethane	0.16	Not Detected	1.1	Not Detected
cis-1,3-Dichloropropene	0.16	Not Detected	0.73	Not Detected
4-Methyl-2-pentanone	0.16	Not Detected	0.66	Not Detected
Toluene	0.16	Not Detected	0.61	Not Detected
trans-1,3-Dichloropropene	0.16	Not Detected	0.73	Not Detected
1,1,2-Trichloroethane	0.16	Not Detected	0.88	Not Detected
Tetrachloroethene	0.16	Not Detected	1.1	Not Detected

Client Sample ID: LOC2-11-18-11

Lab ID#: 1111417-04A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112827</b>	<b>Date of Collection:</b> 11/18/11 10:44:00 A
<b>Dil. Factor:</b>	<b>1.61</b>	<b>Date of Analysis:</b> 11/29/11 08:14 AM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
2-Hexanone	0.80	Not Detected	3.3	Not Detected
Dibromochloromethane	0.16	Not Detected	1.4	Not Detected
1,2-Dibromoethane (EDB)	0.16	Not Detected	1.2	Not Detected
Chlorobenzene	0.16	Not Detected	0.74	Not Detected
Ethyl Benzene	0.16	Not Detected	0.70	Not Detected
m,p-Xylene	0.16	Not Detected	0.70	Not Detected
o-Xylene	0.16	Not Detected	0.70	Not Detected
Styrene	0.16	Not Detected	0.68	Not Detected
Bromoform	0.16	Not Detected	1.7	Not Detected
Cumene	0.16	Not Detected	0.79	Not Detected
1,1,2,2-Tetrachloroethane	0.16	Not Detected	1.1	Not Detected
Propylbenzene	0.16	Not Detected	0.79	Not Detected
4-Ethyltoluene	0.16	Not Detected	0.79	Not Detected
1,3,5-Trimethylbenzene	0.16	Not Detected	0.79	Not Detected
1,2,4-Trimethylbenzene	0.16	Not Detected	0.79	Not Detected
1,3-Dichlorobenzene	0.16	Not Detected	0.97	Not Detected
1,4-Dichlorobenzene	0.16	Not Detected	0.97	Not Detected
alpha-Chlorotoluene	0.16	Not Detected	0.83	Not Detected
1,2-Dichlorobenzene	0.16	Not Detected	0.97	Not Detected
1,2,4-Trichlorobenzene	0.80	Not Detected	6.0	Not Detected
Hexachlorobutadiene	0.80	Not Detected	8.6	Not Detected

**Container Type: 6 Liter Summa Canister (100% Certified)**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	108	70-130

Client Sample ID: Lab Blank

Lab ID#: 1111417-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112814d</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 11/28/11 05:33 PM

<b>Compound</b>	<b>Rpt. Limit (ppbv)</b>	<b>Amount (ppbv)</b>	<b>Rpt. Limit (ug/m3)</b>	<b>Amount (ug/m3)</b>
Freon 12	0.10	Not Detected	0.49	Not Detected
Freon 114	0.10	Not Detected	0.70	Not Detected
Chloromethane	0.10	Not Detected	0.21	Not Detected
Vinyl Chloride	0.10	Not Detected	0.26	Not Detected
1,3-Butadiene	0.10	Not Detected	0.22	Not Detected
Bromomethane	0.10	Not Detected	0.39	Not Detected
Chloroethane	0.50	Not Detected	1.3	Not Detected
Freon 11	0.10	Not Detected	0.56	Not Detected
Ethanol	0.50	Not Detected	0.94	Not Detected
Freon 113	0.10	Not Detected	0.77	Not Detected
1,1-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Acetone	0.50	Not Detected	1.2	Not Detected
2-Propanol	0.50	Not Detected	1.2	Not Detected
Carbon Disulfide	0.50	Not Detected	1.6	Not Detected
3-Chloropropene	0.50	Not Detected	1.6	Not Detected
Methylene Chloride	0.20	Not Detected	0.69	Not Detected
Methyl tert-butyl ether	0.10	Not Detected	0.36	Not Detected
trans-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Hexane	0.10	Not Detected	0.35	Not Detected
1,1-Dichloroethane	0.10	Not Detected	0.40	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.50	Not Detected	1.5	Not Detected
cis-1,2-Dichloroethene	0.10	Not Detected	0.40	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.10	Not Detected	0.49	Not Detected
1,1,1-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Cyclohexane	0.10	Not Detected	0.34	Not Detected
Carbon Tetrachloride	0.10	Not Detected	0.63	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.10	Not Detected	0.32	Not Detected
1,2-Dichloroethane	0.10	Not Detected	0.40	Not Detected
Heptane	0.10	Not Detected	0.41	Not Detected
Trichloroethene	0.10	Not Detected	0.54	Not Detected
1,2-Dichloropropane	0.10	Not Detected	0.46	Not Detected
1,4-Dioxane	0.10	Not Detected	0.36	Not Detected
Bromodichloromethane	0.10	Not Detected	0.67	Not Detected
cis-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
4-Methyl-2-pentanone	0.10	Not Detected	0.41	Not Detected
Toluene	0.10	Not Detected	0.38	Not Detected
trans-1,3-Dichloropropene	0.10	Not Detected	0.45	Not Detected
1,1,2-Trichloroethane	0.10	Not Detected	0.54	Not Detected
Tetrachloroethene	0.10	Not Detected	0.68	Not Detected

Client Sample ID: Lab Blank

Lab ID#: 1111417-05A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112814d</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 11/28/11 05:33 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	0.50	Not Detected	2.0	Not Detected
Dibromochloromethane	0.10	Not Detected	0.85	Not Detected
1,2-Dibromoethane (EDB)	0.10	Not Detected	0.77	Not Detected
Chlorobenzene	0.10	Not Detected	0.46	Not Detected
Ethyl Benzene	0.10	Not Detected	0.43	Not Detected
m,p-Xylene	0.10	Not Detected	0.43	Not Detected
o-Xylene	0.10	Not Detected	0.43	Not Detected
Styrene	0.10	Not Detected	0.42	Not Detected
Bromoform	0.10	Not Detected	1.0	Not Detected
Cumene	0.10	Not Detected	0.49	Not Detected
1,1,2,2-Tetrachloroethane	0.10	Not Detected	0.69	Not Detected
Propylbenzene	0.10	Not Detected	0.49	Not Detected
4-Ethyltoluene	0.10	Not Detected	0.49	Not Detected
1,3,5-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,2,4-Trimethylbenzene	0.10	Not Detected	0.49	Not Detected
1,3-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,4-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
alpha-Chlorotoluene	0.10	Not Detected	0.52	Not Detected
1,2-Dichlorobenzene	0.10	Not Detected	0.60	Not Detected
1,2,4-Trichlorobenzene	0.50	Not Detected	3.7	Not Detected
Hexachlorobutadiene	0.50	Not Detected	5.3	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	109	70-130

Client Sample ID: CCV

Lab ID#: 1111417-06A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

File Name:	e112802	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 11/28/11 08:57 AM

Compound	%Recovery
Freon 12	123
Freon 114	119
Chloromethane	118
Vinyl Chloride	119
1,3-Butadiene	113
Bromomethane	88
Chloroethane	94
Freon 11	121
Ethanol	113
Freon 113	108
1,1-Dichloroethene	104
Acetone	109
2-Propanol	111
Carbon Disulfide	106
3-Chloropropene	109
Methylene Chloride	105
Methyl tert-butyl ether	111
trans-1,2-Dichloroethene	102
Hexane	104
1,1-Dichloroethane	108
2-Butanone (Methyl Ethyl Ketone)	104
cis-1,2-Dichloroethene	104
Tetrahydrofuran	111
Chloroform	109
1,1,1-Trichloroethane	114
Cyclohexane	104
Carbon Tetrachloride	128
2,2,4-Trimethylpentane	103
Benzene	106
1,2-Dichloroethane	117
Heptane	110
Trichloroethene	107
1,2-Dichloropropane	107
1,4-Dioxane	106
Bromodichloromethane	118
cis-1,3-Dichloropropene	111
4-Methyl-2-pentanone	118
Toluene	103
trans-1,3-Dichloropropene	118
1,1,2-Trichloroethane	110
Tetrachloroethene	108

Client Sample ID: CCV

Lab ID#: 1111417-06A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112802</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 11/28/11 08:57 AM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	112
Dibromochloromethane	124
1,2-Dibromoethane (EDB)	116
Chlorobenzene	108
Ethyl Benzene	105
m,p-Xylene	105
o-Xylene	108
Styrene	104
Bromoform	128
Cumene	109
1,1,2,2-Tetrachloroethane	116
Propylbenzene	111
4-Ethyltoluene	113
1,3,5-Trimethylbenzene	105
1,2,4-Trimethylbenzene	117
1,3-Dichlorobenzene	112
1,4-Dichlorobenzene	114
alpha-Chlorotoluene	124
1,2-Dichlorobenzene	113
1,2,4-Trichlorobenzene	110
Hexachlorobutadiene	114

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	105	70-130



Client Sample ID: LCS

Lab ID#: 1111417-07A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112803</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 11/28/11 09:47 AM

<b>Compound</b>	<b>%Recovery</b>
Freon 12	108
Freon 114	100
Chloromethane	103
Vinyl Chloride	104
1,3-Butadiene	98
Bromomethane	84
Chloroethane	114
Freon 11	108
Ethanol	96
Freon 113	96
1,1-Dichloroethene	99
Acetone	97
2-Propanol	100
Carbon Disulfide	117
3-Chloropropene	108
Methylene Chloride	95
Methyl tert-butyl ether	101
trans-1,2-Dichloroethene	103
Hexane	92
1,1-Dichloroethane	97
2-Butanone (Methyl Ethyl Ketone)	97
cis-1,2-Dichloroethene	93
Tetrahydrofuran	94
Chloroform	100
1,1,1-Trichloroethane	105
Cyclohexane	92
Carbon Tetrachloride	115
2,2,4-Trimethylpentane	86
Benzene	96
1,2-Dichloroethane	108
Heptane	98
Trichloroethene	100
1,2-Dichloropropane	97
1,4-Dioxane	99
Bromodichloromethane	108
cis-1,3-Dichloropropene	100
4-Methyl-2-pentanone	107
Toluene	92
trans-1,3-Dichloropropene	105
1,1,2-Trichloroethane	99
Tetrachloroethene	95

Client Sample ID: LCS

Lab ID#: 1111417-07A

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112803</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 11/28/11 09:47 AM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	100
Dibromochloromethane	111
1,2-Dibromoethane (EDB)	104
Chlorobenzene	97
Ethyl Benzene	94
m,p-Xylene	96
o-Xylene	97
Styrene	93
Bromoform	112
Cumene	99
1,1,2,2-Tetrachloroethane	107
Propylbenzene	102
4-Ethyltoluene	98
1,3,5-Trimethylbenzene	95
1,2,4-Trimethylbenzene	104
1,3-Dichlorobenzene	101
1,4-Dichlorobenzene	103
alpha-Chlorotoluene	98
1,2-Dichlorobenzene	103
1,2,4-Trichlorobenzene	109
Hexachlorobutadiene	106

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	102	70-130

Client Sample ID: LCSD

Lab ID#: 1111417-07AA

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112805</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 11/28/11 11:09 AM

<b>Compound</b>	<b>%Recovery</b>
Freon 12	105
Freon 114	98
Chloromethane	100
Vinyl Chloride	100
1,3-Butadiene	96
Bromomethane	104
Chloroethane	109
Freon 11	106
Ethanol	93
Freon 113	95
1,1-Dichloroethene	98
Acetone	94
2-Propanol	97
Carbon Disulfide	116
3-Chloropropene	106
Methylene Chloride	95
Methyl tert-butyl ether	100
trans-1,2-Dichloroethene	101
Hexane	91
1,1-Dichloroethane	96
2-Butanone (Methyl Ethyl Ketone)	94
cis-1,2-Dichloroethene	92
Tetrahydrofuran	94
Chloroform	99
1,1,1-Trichloroethane	104
Cyclohexane	92
Carbon Tetrachloride	116
2,2,4-Trimethylpentane	85
Benzene	96
1,2-Dichloroethane	107
Heptane	97
Trichloroethene	97
1,2-Dichloropropane	98
1,4-Dioxane	98
Bromodichloromethane	107
cis-1,3-Dichloropropene	100
4-Methyl-2-pentanone	105
Toluene	92
trans-1,3-Dichloropropene	109
1,1,2-Trichloroethane	99
Tetrachloroethene	95

Client Sample ID: LCSD

Lab ID#: 1111417-07AA

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

<b>File Name:</b>	<b>e112805</b>	<b>Date of Collection:</b> NA
<b>Dil. Factor:</b>	<b>1.00</b>	<b>Date of Analysis:</b> 11/28/11 11:09 AM

<b>Compound</b>	<b>%Recovery</b>
2-Hexanone	102
Dibromochloromethane	114
1,2-Dibromoethane (EDB)	106
Chlorobenzene	98
Ethyl Benzene	95
m,p-Xylene	96
o-Xylene	97
Styrene	94
Bromoform	114
Cumene	99
1,1,2,2-Tetrachloroethane	110
Propylbenzene	103
4-Ethyltoluene	100
1,3,5-Trimethylbenzene	96
1,2,4-Trimethylbenzene	106
1,3-Dichlorobenzene	103
1,4-Dichlorobenzene	106
alpha-Chlorotoluene	97
1,2-Dichlorobenzene	104
1,2,4-Trichlorobenzene	111
Hexachlorobutadiene	110

**Container Type: NA - Not Applicable**

<b>Surrogates</b>	<b>%Recovery</b>	<b>Method Limits</b>
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	103	70-130

## **FIGURES**



**Figure 1. Site Location Map.**





**Figure 2. Location of the air monitoring station and the meteorological station at the Ft. Cherry campus.**





Figure 3a

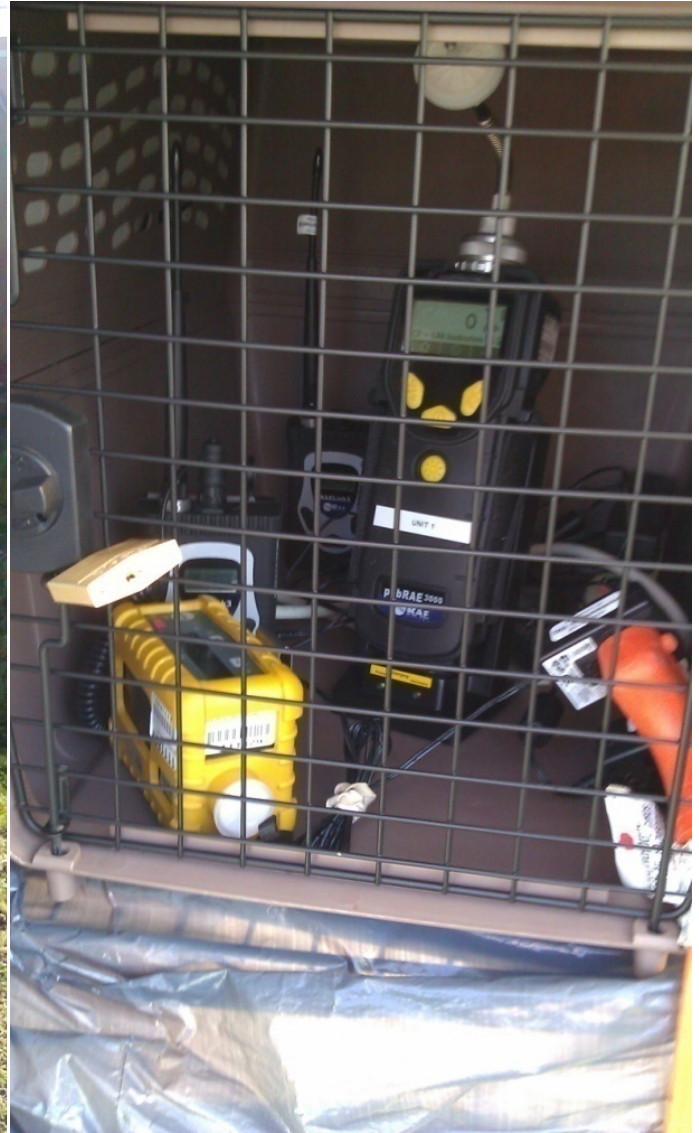


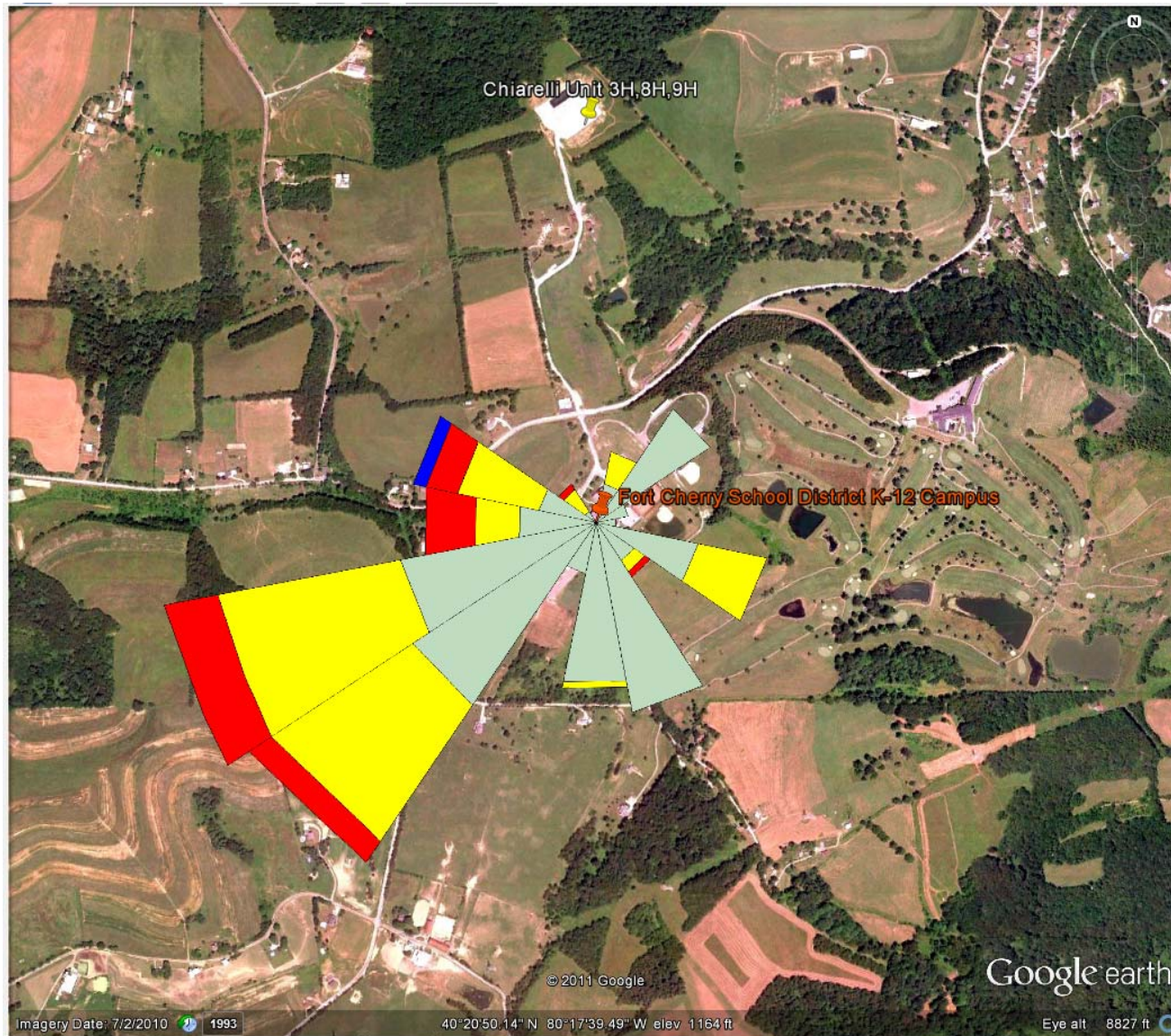
Figure 3b

**Figure 3a and 3b: Side view of the air monitoring station (3a) and view of the equipment within the protective housing (3b).**





**Figure 4. Photograph of the meteorological station.**



**Figure 5. Screen shot from Google Earth showing the wind rose graph of Ft. Cherry wind data overlaid on the campus. The Chiarelli Units are also visible to the north of the campus.**

## **TABLES**

**Table 1. Summary of Continuous Monitoring for Air Quality Parameter Gases (Collected via the MultiRAE Plus)**

Location: Ft. Cherry Campus

Sampling Period: Baseline

Sampling Date	n*	Hydrogen Sulfide (ppm)			Explosive Gases (% LEL)			Total VOCs (ppm)		
		Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max
11/14/2011	493	0.00061	0	0.10	0	0	0	0	0	0
11/15/2011	584	0.019	0	0.20	0	0	0	0	0	0
11/16/2011	437	0	0	0	0	0	0	0.25	0	0.70
11/17/2011	1165	0.00094	0	0.10	0	0	0	0.42	0	0.90
11/29/2011	873	0.014	0	0.20	0	0	0	0.48	0	2.1
<i>Summary results for baseline sampling period<sup>a</sup>:</i>		<i>0.0070</i>	<i>0</i>	<i>0.20</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0.23</i>	<i>0</i>	<i>2.1</i>

\* n = Number of measurements recorded each day. A measurement was recorded every minute; n varies depending upon the duration that the monitor was operational.

<sup>a</sup> This summary represents the average of the daily mean values, the minimum of the daily minimum values, and the maximum of daily maximum values.

**Table 2. Summary of Continuous Monitoring for Total VOCs (Collected via the ppbRAE 3000)**

Location: Ft. Cherry Campus

Sampling Period: Baseline

Sampling Date	n*	VOCs (ppm)		
		Daily Mean	Daily Min	Daily Max
11/14/2011	515	0.000	0.000	0.000
11/15/2011	967	0.000	0.000	0.000
11/16/2011	1405	0.128	0.000	0.483
11/17/2011	1439	0.385	0.323	0.478
11/18/2011	526	0.171	0.000	0.419
11/19/2011	1440	0.088	0.052	0.104
11/20/2011	1440	0.075	0.059	0.114
11/21/2011	1391	0.116	0.090	0.138
11/22/2011	1440	0.112	0.070	0.135
11/23/2011	521	0.098	0.069	0.128
11/29/2011	933	0.000	0.000	0.000
<i>Summary results for baseline sampling period<sup>a</sup>:</i>		0.107	0	0.483

\* n = Number of measurements recorded each day. A measurement was recorded every minute; n varies depending upon the duration that the monitor was operational.

<sup>a</sup> This summary represents the average of the daily mean values, the minimum of the daily minimum values, and the maximum of daily maximum values.

**Table 3. Summary of Detected Volatile Organic Compounds (collected via summa canister)**

Location: Ft. Cherry School Campus

Sampling Period: Baseline

Compound <sup>a</sup>	Concentrations in ppm				Background Concentration Range <sup>b</sup>
	11/17/2011		11/18/2011		
	Result	Reporting Limit	Result	Reporting Limit	
Freon 12	0.00040	0.00013	0.00044	0.00016	0.00055-0.00065
Chloromethane	0.00036	0.00013	0.00035	0.00016	0.00059 - 0.00068
Freon 11	0.00032	0.00013	0.00022	0.00016	0.00025 - 0.00030
Ethanol	0.0076	0.00066	0.0016	0.00080	Not identified
Acetone	0.0074	0.00066	0.0028	0.00080	0.0070 - 0.0099
2-Propanol	0.0054	0.00066	ND	0.00080	Not identified
Hexane	0.00013	0.00013	ND	0.00016	0.000034-0.000035
Benzene	0.00016	0.00013	ND	0.00016	0.000092 - 0.00025
Toluene	0.00023	0.00013	ND	0.00016	0.000068 - 0.00016
m,p-Xylene	0.00014	0.00013	ND	0.00016	ND

ND = Not detected above the reporting limit

<sup>a</sup> A total of 62 individual VOC analytes were analyzed in each samples using EPA Method TO-15-A; only those analytes that were detected are presented in this table. Reporting limits for the individual VOCs ranged from 0.00013 to 0.0008 ppm.

<sup>b</sup> Background concentrations refer to those measured at the Florence site as reported by the PADEP in Southwest Pa. Marcellus Shale Short-Term Air Sampling Report

**Table 4. Summary of Meteorological Conditions**

Location: Ft. Cherry Campus

Sampling Period: Baseline

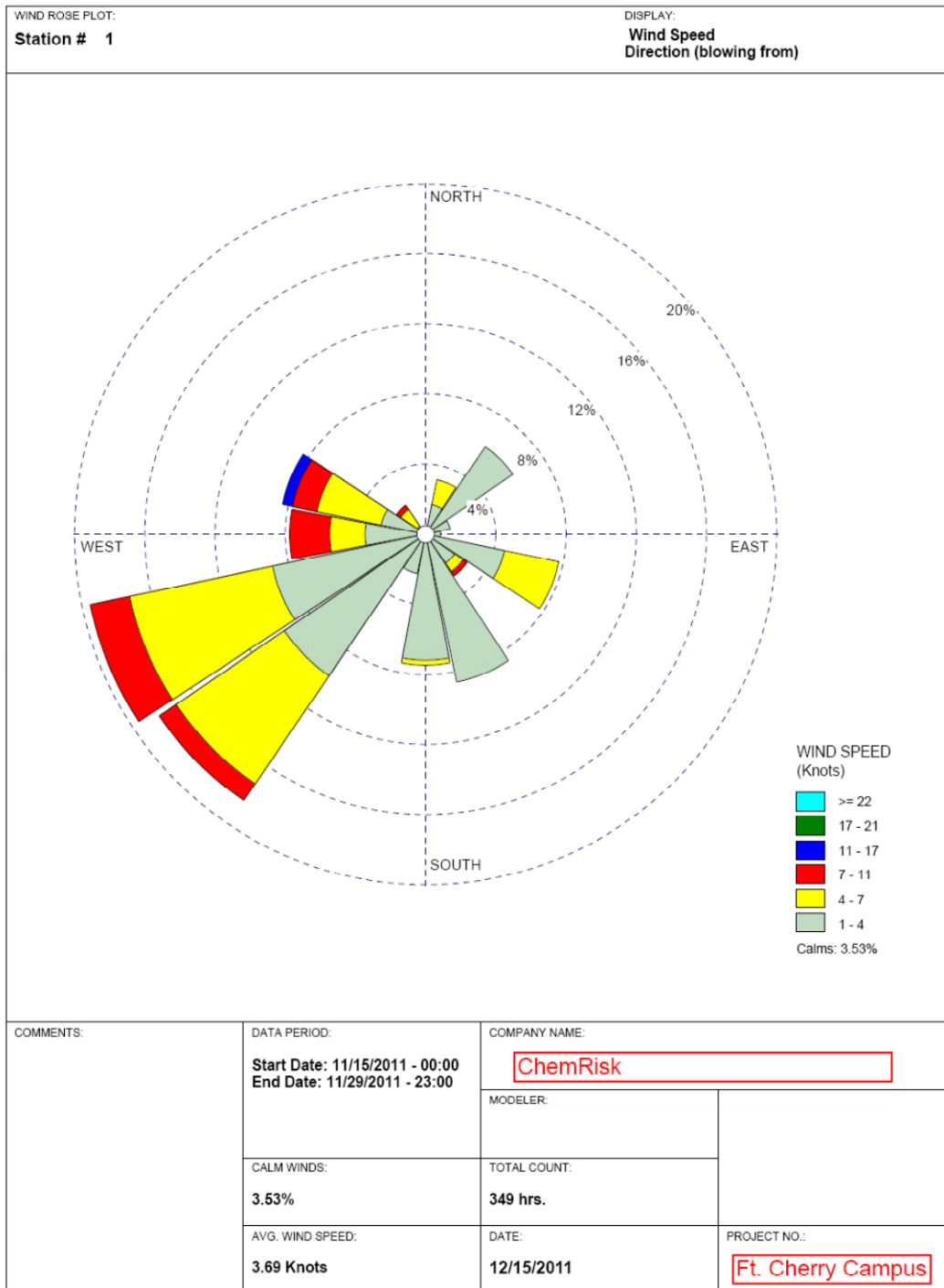
Sampling Date	n*	Temperature (°F)			Humidity (%)			Barometric Pressure (inHg)			Rainfall (inches/day)
		Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Mean	Daily Min	Daily Max	Daily Total
11/14/2011	47	71	70	72	48	48	60	29.3	29.2	29.4	0
11/15/2011	144	60	51	71	72	48	96	29.5	29.3	29.5	0.34
11/16/2011	144	48	36	52	93	74	98	29.5	29.4	29.6	0.31
11/17/2011	144	34	29	39	71	50	86	29.7	29.6	29.9	0
11/18/2011	144	32	23	43	58	41	74	30.0	29.9	30.1	0
11/19/2011	144	47	36	56	51	40	62	29.8	29.7	29.9	0
11/20/2011	144	55	45	58	81	62	97	29.7	29.7	29.8	0.26
11/21/2011	144	41	40	45	95	92	98	29.9	29.8	29.9	0.13
11/22/2011	144	46	40	57	98	94	99	29.6	29.3	29.8	1.2
11/23/2011	144	44	34	57	88	69	97	29.5	29.2	29.8	0.18
11/24/2011	144	37	33	45	93	82	98	29.9	29.8	30.0	0
11/25/2011	144	47	37	58	69	48	96	29.8	29.8	29.9	0
11/26/2011	144	53	48	59	56	44	73	29.8	29.7	29.8	0
11/27/2011	144	53	50	58	79	65	97	29.6	29.5	29.7	0.23
11/28/2011	144	55	49	60	91	80	99	29.6	29.4	29.6	0.19
11/29/2011	144	49	37	57	87	75	98	29.3	29.1	29.5	0.54
Summary results for baseline sampling period <sup>a</sup> :		51	23	60	77	40	99	29.6	29.1	29.9	0.19

\* n = Number of measurements recorded each day. Measurements were recorded every 10 minutes; sampling begun at 4:10 pm on 11/14/11.

<sup>a</sup> This summary represents the average of the daily mean values, the minimum of the daily minimum values, and the maximum of daily maximum values. For rain, an average of the daily total rainfall is represented.

## **GRAPHICS**





WRPLOT View - Lakes Environmental Software

**Graphic 1. This graph, constructed from wind speed and direction data using WRPLOT, shows the wind rose for Ft. Cherry School Campus.**