Southwestern Pennsylvania Marcellus Shale Short-Term Ambient Air Sampling Report

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Commonwealth of Pennsylvania
Department of Environmental Protection

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Executive Summary

Since 2005, natural gas exploration activities in the Marcellus Shale Formation have increased significantly in the Commonwealth of Pennsylvania—more than 1,900 wells have been drilled, primarily in the southwest, northeast and northcentral regions. In response to the increased number of well sites and concerns about the impact of the Marcellus Shale natural gas drilling activities on air quality, the Pennsylvania Department of Environmental Protection (PA DEP or Department) launched a short-term, screening-level air quality sampling initiative in the southwest region in April 2010; the project was completed in August 2010. This report provides findings of the air sampling surveys in Greene and Washington counties; background air samples were collected in Washington County.

The scope of this short-term air monitoring study was limited to several natural gas facilities in Washington and Greene counties. Due to the limited scope and duration of the sampling and the limited number of sources and facilities sampled, the findings only represent conditions at the time of the sampling and do not represent a comprehensive study of emissions. While this short-term sampling effort does not address the cumulative impact of air emissions from natural gas operations in southwestern Pennsylvania, the sampling results will provide basic information on the type of pollutants emitted to the atmosphere during selected phases of gas extraction operations in the Marcellus Shale formation. This information will also be utilized to determine if the scope of the study should be expanded and will identify areas where additional sampling may be warranted or additional measures should be implemented for the protection of public health and the environment.

Surveys of the atmosphere were conducted during a five-week period using the Department's Bureau of Laboratories Mobile Analytical Unit (MAU) to measure the concentrations of a target list of pollutants associated with gas drilling. The Mobile Analytical Unit used Gas Chromatography/Mass Spectrometry (GC/MS) and Open Path Fourier Transform Infrared (OP-FTIR or Open Path) samplers to screen for approximately 48 volatile organic compounds (VOCs) including methane and benzene. Additional air samples were collected in canisters over a 24-hour period and analyzed by the PA DEP Laboratory. The five sampling weeks focused on ambient air pollution levels near two different compressor stations, a condensate tank farm, a wastewater impoundment and a background site.

The project goals include the short-term screening of ambient air concentrations of target pollutants near certain of Marcellus Shale gas drilling operations, assessing preliminary air quality impacts and determining if there were any immediate health risks from ambient pollutant concentrations to nearby residents or communities.

The key findings are as follows:

- Short-term sampling did detect concentrations of certain natural gas constituents including methane, ethane and propane, and associated

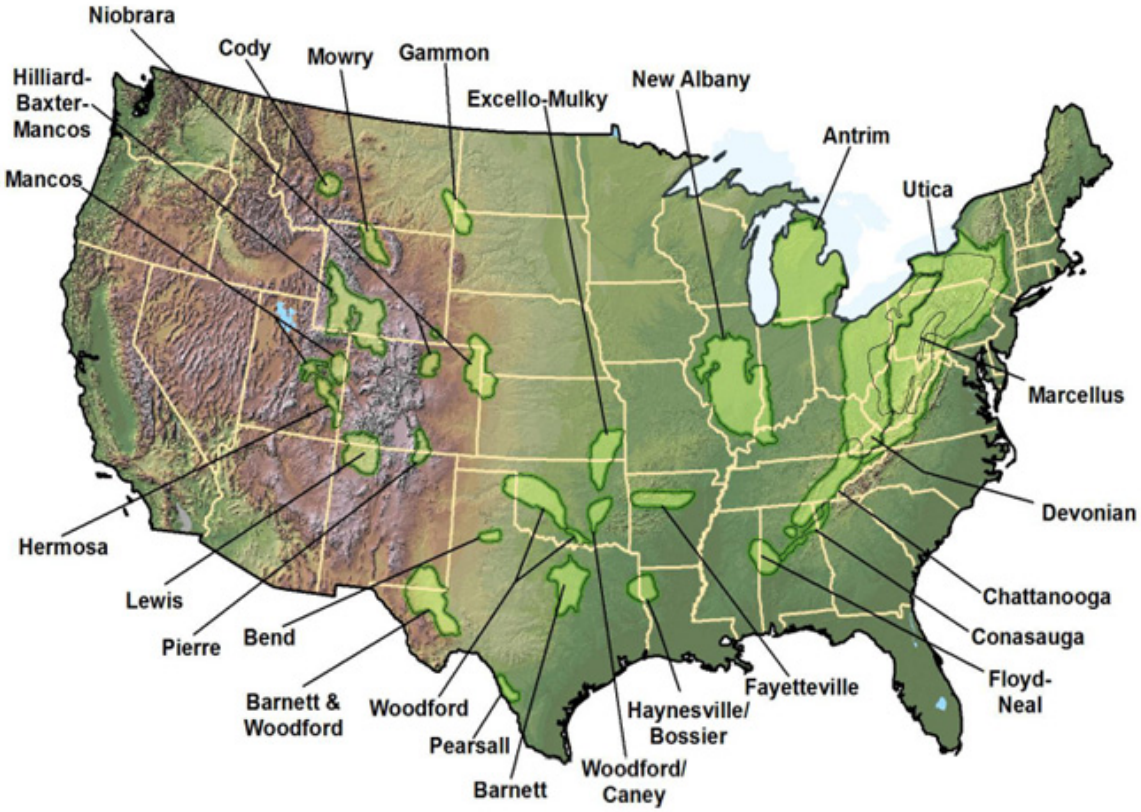
compounds such as benzene, in the air near Marcellus Shale drilling operations.

- Most of the compounds were detected during short-term sampling at two compressor stations in Greene and Washington counties.
- Certain compounds, mainly methyl mercaptan, were detected at levels which generally produce odors.
- Results of the limited ambient air sampling initiative conducted in the southwest region did not identify concentrations of any compound that would likely trigger air-related health issues associated with Marcellus Shale drilling activities.
- Sampling for carbon monoxide, nitrogen dioxide and ozone, did not detect levels above National Ambient Air Quality Standards at any of the sampling sites. The Department has not yet determined if the potential cumulative emissions of these pollutants from many natural gas exploration activities will result in violations of the health and welfare based federal standards.
- A specialized infrared camera that can detect emissions of certain pollutants from a source that otherwise may be invisible to the naked eye, did detect fugitive emissions from sources at the Energy Corp. Compressor Station. These emissions could contribute to the ambient concentrations detected at the site.

The PA DEP plans to continue short-term sampling near natural gas operations in the northcentral and northeast regions of the Commonwealth, specifically in Bradford, Susquehanna and Tioga counties. This sampling initiative will focus on emissions from compressor stations to determine if there is a consistent emissions profile statewide. The PA DEP will also attempt to sample during other natural gas exploration activities, such as flaring and actual drilling. When sampling is completed in the northcentral and northeast regions, the PA DEP will evaluate the results obtained in all three regions to determine the necessity and scope of future sampling or monitoring programs.

Introduction

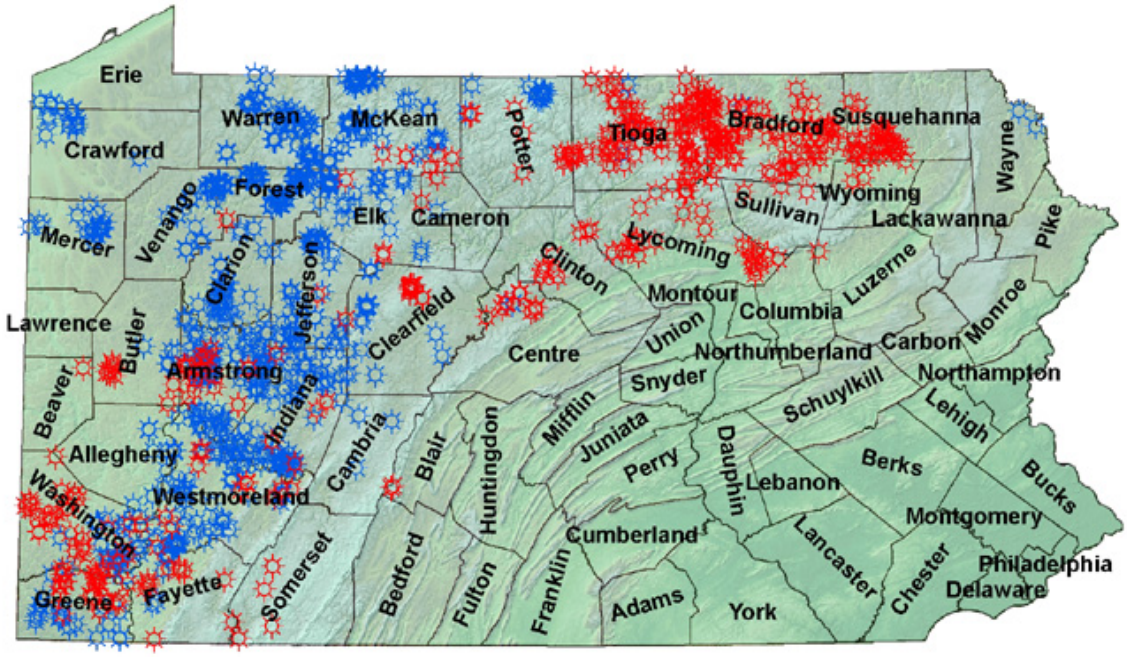
Shale gas is available in many basins across the United States (Figure 1). The Marcellus Shale Formation, which extends from New York into Pennsylvania, Maryland, Ohio, Virginia, and West Virginia, and covers approximately 95,000 square miles, is the most expansive shale gas "play" in the United States. The Marcellus play located within the borders of Pennsylvania is now one of the most active shale plays in terms of drilling, with operations primarily in the southwest, northcentral and northeast portions of the state. However, the Barnett Shale play in the Fort Worth Texas basin is the most active play in the country.



Source: U.S. DOE, 2009

Figure 1: Gas shale formations in the United States (U.S. DOE, 2009).

In recent years, the number of Marcellus Shale wells drilled in Pennsylvania has rapidly increased. In 2008, the number of wells drilled to tap Marcellus Shale gas was 195. In 2009 that number jumped to 768. Since January 2010, 903 wells have been drilled (Figure2) (Pa. DEP, 2010a).



Source: Pa. DEP, 2010a

Figure 2: Map of Marcellus (red) and non-Marcellus (blue) wells drilled in Pennsylvania in the first eight months of 2010 (Pa. DEP, 2010a).

The extraction of natural gas from Marcellus Shale involves many stages and provides many opportunities for the release of air pollutants during the process. The major stages of natural gas extraction include:

- Pad, Impoundment and Road Construction – All drilling operations need a flat area of certain acreage to conduct the drilling activities. Impoundments for fresh water or wastewater may also be built. Pollutants are emitted from diesel engines and dust is produced from truck traffic and heavy equipment.
- Drilling – Drilling rigs require power from diesel engines. Again more emissions from these engines.
- Fracturing – During this stage, large amounts of water and fracturing fluid are pumped into the well to create fractures for the gas to escape from the shale. A portion of the fluid is returned into a wastewater impoundment where it is eventually trucked for treatment. Emissions can come from diesel engines, the evaporation of the wastewater and the release of fracturing fluid chemicals, heavy metals and volatile organic compounds.
- Flaring – Flaring is done to test the gas well before production. Emissions are created from the burning of gas and atmospheric venting of non-combusted gas.

- Condensate Tanks – Gas pumped from the well may contain brine and other volatile organic compounds that condense into collection tanks. Air space in the tanks is vented to the atmosphere during periods of filling. If the nature of the gas is considered "wet" (vs. "dry"), the condensate may contain many other compounds such as benzene, toluene and xylenes.
- Compressor stations – Raw gas is piped from wells to compressor stations where the gas is pre-treated and compressed. Emissions from diesel engines that power the compressors, fugitive emissions from compression equipment, pipes and tanks are possible.

Along with the increased drilling operations described above, there has been an increase in the number of complaints to the Department's regional offices. A majority of the complaints have focused primarily on odors and nuisance dust from truck traffic.

Ambient Air Sampling

Prior to launching its Marcellus Shale short-term monitoring initiative, the PA DEP examined air sampling projects conducted by other states in separate shale basins (i.e. Barnett Shale in Forth Worth, Texas) during the development of the sampling protocol for this project. The sampling goals for this project were to obtain preliminary Pennsylvania-specific concentrations of certain pollutants emitted at, or near, natural gas Marcellus Shale exploration activities. As a result, the sampling goals are to:

- screen for ambient air concentrations of target pollutants near certain Marcellus Shale gas drilling operations;
- assess potential air quality impacts;
- assess any potential health risks from exposure to ambient concentrations; and
- determine whether the scope of the short-term Marcellus sampling initiative should be expanded.

The PA DEP is conducting short-term air sampling studies near natural gas operations in densely-drilled areas in the southwest, northcentral and northeast regions of the Commonwealth. This report focuses solely on Marcellus ambient air sampling completed in Washington and Greene counties in the southwest region in August 2010. This report does not address water quality or other environmental issues dealing with natural gas extraction.

Air sampling surveys in the northcentral and northeast regions including Bradford, Tioga and Susquehanna counties should be completed by the end of the year. The Department will prepare and issue reports for each of these regions when sampling in their respective areas are completed.

The general overview of the sampling plan is to conduct continuous downwind sampling near sources at natural gas facilities, and collect individual samples at population points at further distances from the source.

For the purpose of this report, a population point can either be an individual residence, community or town. The PA DEP sampling in the southwest region consisted of five, week-long, sampling events.

Table 1 provides a list of target compounds that was selected by PA DEP for this project. The list was compiled based on target information from other shale gas studies (Texas Commission on Environmental Quality [TCEQ], 2010; NYDEC, 2009; Town of Dish, 2009; Fed. Reg. 72:1; Pa. DEP, 2010b; Texas Environmental Research Consortium [TERC], 2009). The list also shows the PA DEP Bureau of Laboratories (BOL) capability to "detect" these target compounds by the various methods utilized during the project.

The main constituent of natural gas is methane. There are other compounds in natural gas found in lesser quantities (ethane, propane and butane), and still more in trace amounts.

- Methane, Ethane, Propane and Butane – Simple straight-chained molecules containing carbon and hydrogen, these compounds when isolated or combined are used mainly as fuels. Burning these compounds in the presence of excess oxygen produces carbon dioxide and water. Incomplete combustion can produce undesirable pollutants such as carbon monoxide and formaldehyde. Methane itself is a potent greenhouse gas. Standards have been established for acceptable concentrations of these compounds in workplace settings. However, there are no standards for acceptable levels in ambient air.
- "BTEX" – A group of compounds, namely Benzene, Toluene, Ethylbenzene and Xylene that are primarily found in petroleum derivatives are the main constituents of gasoline, however they are naturally occurring in some shale gas formations. They are also used as solvents and/or intermediates in the production of other chemicals. There are many health–related issues associated with chronic exposure to these compounds, mainly neurological effects. Benzene is also associated with hematological and carcinogenic effects.
- Methyl mercaptan – Methyl mercaptan is a naturally occurring compound present in some shale gas formations as well as in crude oil. Methyl mercaptan has a strong unpleasant smell that can be detected by the human nose at very low levels. Olfactory fatigue, or the inability to no longer smell methyl mercaptan, occurs after prolonged exposure.
- Carbon Monoxide, Nitrogen dioxide, Ozone – These pollutants are part of a group of six criteria air pollutants that are considered harmful to public health and the environment above certain levels. These pollutants come from or are caused by reactions of emissions from a wide variety of sources such as industry, energy production and mobile sources. The federal government has created ambient air standards for these pollutants that states strive to meet through permitting, planning, etc.

Equipment

Mobile Analytical Unit

The PA DEP BOL Mobile Analytical Unit (MAU) was deployed for each sampling week. The BOL utilized two MAU sampling vehicles, the MAU-1 and the MAU-4, when sampling:

> **MAU-1** – A RV-sized vehicle that houses an Agilent 6890/5975 MSD Gas Chromatograph/Mass Spectrometer (GC/MS) with a Dynatherm IACEM 980 Air Sampler. For each sample, a total of 0.5L of air was acquired at a constant rate over a 5-minute time period. Air samples were collected once per hour for the duration of the sampling session.
>
> **MAU-4** – A utility-sized truck that houses a RAM 2000 Open Path Fourier Transform Infrared Spectrometer (OP-FTIR or Open Path sampler). Pollutants in air between the MAU-4, containing the OP-FTIR, and a strategically-placed mirror are measured using an infrared beam that bounces off the mirror and back to a detector (referred to as the open path). The actual emplacement of the OPFTIR equipment depends on factors including topography, site layout, safety considerations and current meteorological conditions. A tradeoff exists between the length of the open path and detection limits; the longer the path, the higher the detection limits. The minimum length of the open path as well as other operational procedures, are based on the U. S. Environmental Protection Agency's (EPA) Compendium Method TO-16 (U.S. EPA, 1999a). A list of compounds that the OP-FTIR can detect can be found in the data files in Appendix A.

The MAU was set up downwind of the target source and operated continuously during selected sampling windows. The sampling windows were designed to capture pollutant concentrations during the early morning hours and late evening hours, to reflect the predominate times when complaints related to Marcellus gas exploration activities are received by PA DEP.

During the sampling week, the MAU would travel from Harrisburg to the sampling site and conduct six sampling sessions before returning to Harrisburg. Three of the sessions would run from 5:00 am to 12:00 pm and three would run from 5:00 pm to 12:00 am. PA DEP regional personnel familiar with the area, the drilling activities and reported complaints were assigned to provide support during the MAU sampling sessions.

Table 1: List of target compounds and PA DEP sampling capability.

CAS#	Target Compounds	DEP Sampling Capability		
		MAU	Canister	FLIR Camera
71-55-6	1,1,1-Trichloroethane		x	
79-34-5	1,1,2,2-Tetrachloroethane		x	
79-00-5	1,1,2-Trichloroethane		x	
75-34-3	1,1-Dichloroethane		x	
75-35-4	1,1-Dichloroethene		x	
95-63-6	1,2,4-Trimethylbenzene	x	x	
106-93-4	1,2-Dibromoethane		x	
107-06-2	1,2-Dichloroethane		x	
78-87-5	1,2-Dichloropropane		x	
106-99-0	1,3-Butadiene		x	
542-75-6	1,3-Dichloropropene		x	
67-64-1	Acetone		x	
71-43-2	Benzene	x	x	x
74-83-9	Bromomethane		x	
75-15-0	Carbon Disulfide	x	x	
56-23-5	Carbon Tetrachloride		x	
108-90-7	Chlorobenzene		x	
75-01-4	Chloroethene		x	
67-66-3	Chloroform		x	
74-87-3	Chloromethane	x	x	
630-08-0	Carbon monoxide	x		
110-82-7	Cyclohexane		x	
74-84-0	Ethane	x		x
100-41-4	Ethylbenzene	x	x	x
107-21-1	Ethylene Glycol			
50-00-0	Formaldehyde	x		
7647-01-0	Hydrogen Chloride	x		
7783-06-4	Hydrogen Sulfide	x		
74-82-8	Methane	x		x
67-56-1	Methanol	x		x
75-09-2	Methylene Chloride		x	
108-38-3	m-Xylene	x		
91-20-3	Naphthalene	x		
106-97-8	n-Butane	x		x
110-54-3	n-Hexane	x	x	x
	Nitrogen oxides	x		
95-47-6	o-Xylene	x	x	x
74-98-6	Propane	x		x
115-07-1	Propene		x	
106-42-3	p-Xylene	x		x
100-42-5	Styrene	x	x	
127-18-4	Tetrachloroethene		x	
108-88-3	Toluene	x	x	x
79-01-6	Trichloroethylene		x	
1330-20-7	Xylenes, Mixture		x	x

Canister Sampling

Air canister samples were collected using a method based on EPA Compendium Method TO-15 (U.S. EPA, 1999b). The method uses a specially-prepared canister and sampler that collects an air sample over a 24-hour period, which is then sent to the PA DEP BOL in Harrisburg for analysis using GC/MS. The equipment and methods used for this project are the same as is used in the statewide toxics monitoring network. Detection limits are low and in the sub part-per-billion volume (ppbv) level. A list of quantifiable compounds can be found in the data files in Appendix B.

The canisters are analyzed by the PA DEP BOL utilizing a 61-compound calibration mix. The calibration mix covers compounds-of-interest for various toxics work (Urban Air Toxics, Ozone, Fuel Spill, Superfund, etc.) and includes alkanes, alkenes, aromatics, CFC's, chlorobenzenes and oxygenated compounds.

The compounds of interest for this project that are not detected or quantified by this method include the simpler alkanes (methane, ethane, propane and butane) and criteria pollutants like carbon monoxide and nitrogen oxides. However, these compounds are able to be detected by the Open Path sampler utilized by the MAU.

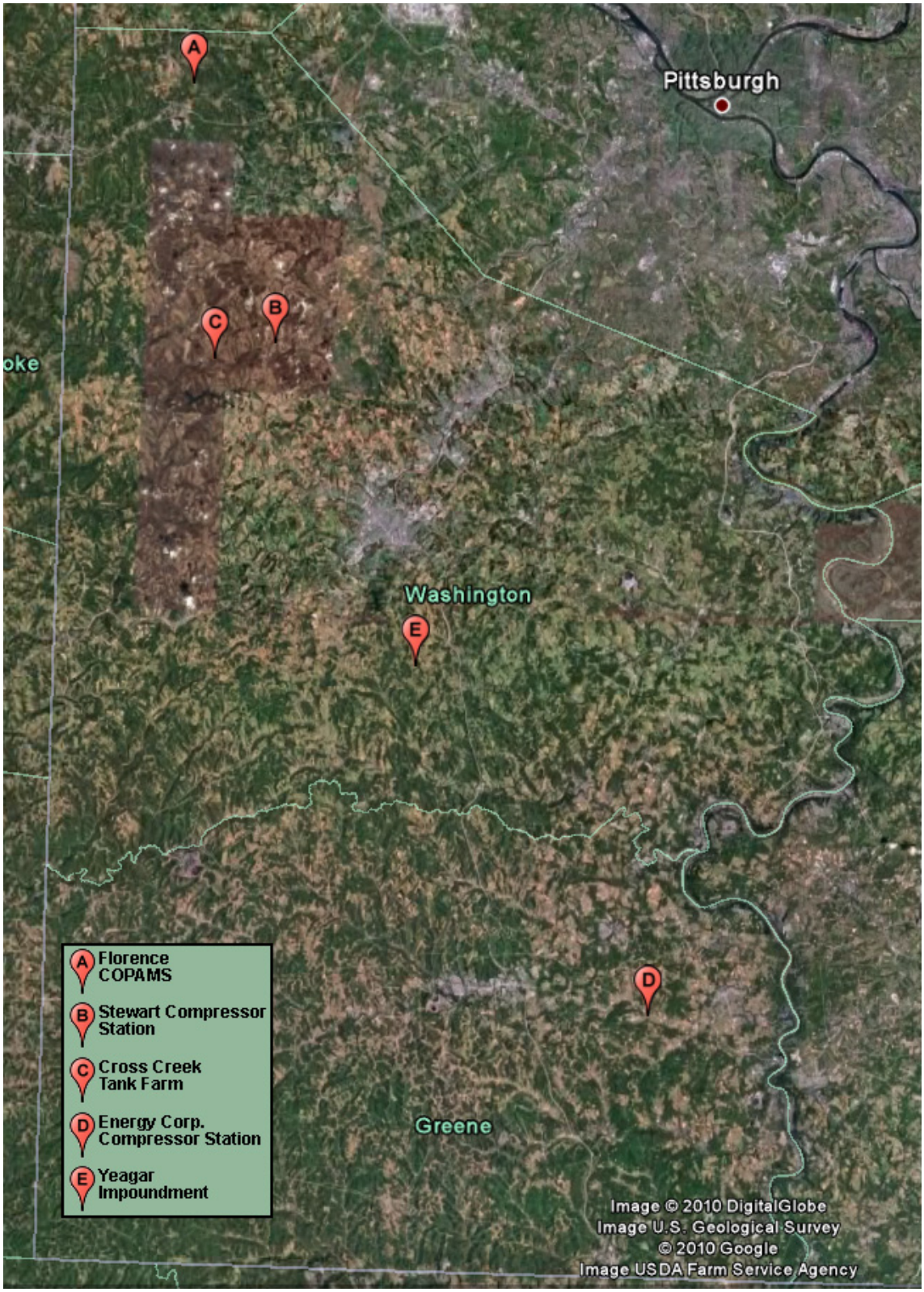
The PA DEP, Bureau of Air Quality, Toxics Monitoring Section provided the canisters and samplers to collect air samples and the training for regional field personnel to collect the air samples.

FLIR Infrared Camera

An infrared camera was employed to visually detect any gas plumes from the source of interest. The FLIR Model GF-320 infrared camera was used for this project. According to the FLIR Web site: "An infrared camera is a non-contact device that detects infrared energy (heat) and converts it into an electronic signal, which is then processed to produce a thermal image on a video monitor" (FLIR, 2010). When using the camera, gases that may be invisible to the naked eye look like smoke or thermal colors on the FLIR camera.

The camera was not used by PA DEP to quantify emissions but to show how emissions from the source of interest can possibly contribute to the sampling results. Advantages of the FLIR camera include the following:

- The camera is designed to detect leaks of the type of pollutants coming from drilling operations and detects emissions safely from a distance;
- The camera can survey a large area, then zoom in to a particular spot of interest, and;
- The camera can also record regular and infrared still images for comparison, as well as video.



Source: Google, 2010

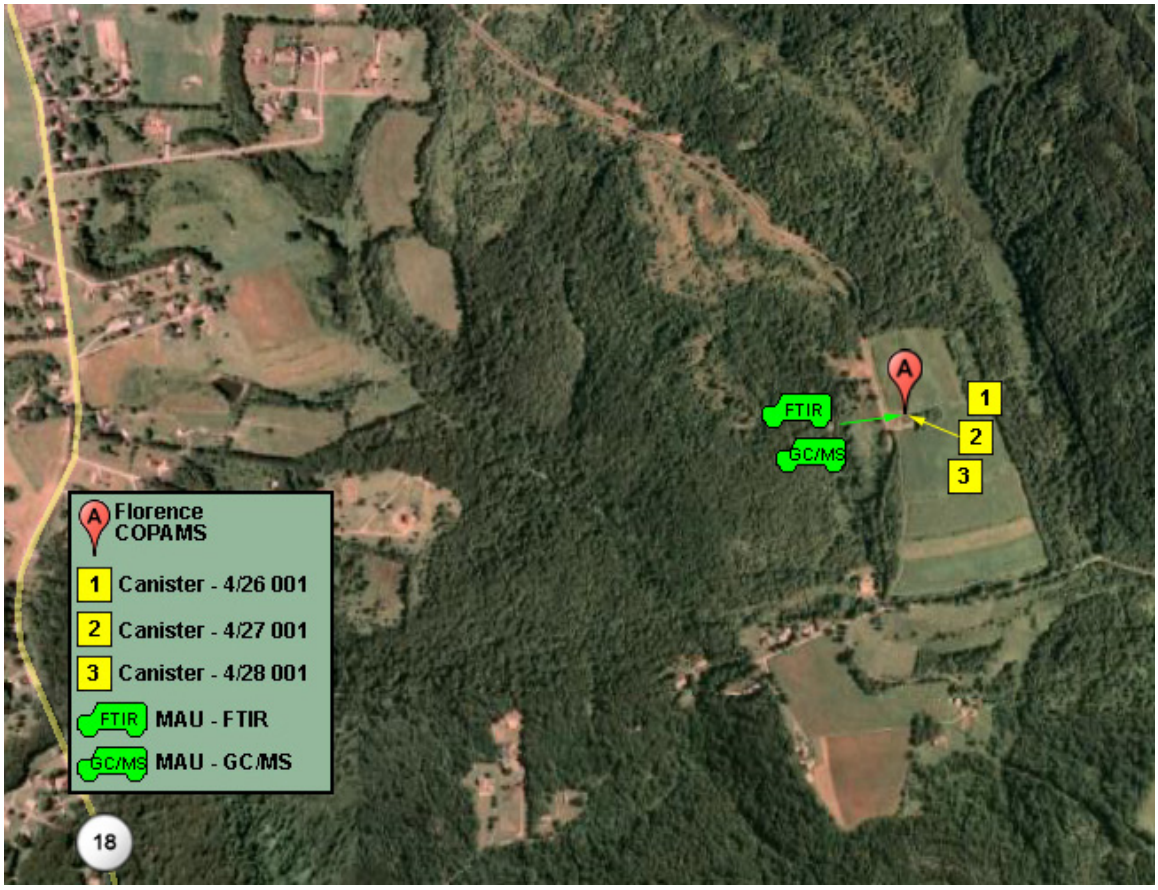
Figure 3: Map of sampling sites in the southwest region of Pennsylvania.

Sampling Sites

Figure 3 is a map of the overall sampling area in southwest Pennsylvania. The five sampling weeks were conducted in Washington and Greene counties.

The satellite maps used in this report were generated from Google Earth (Google, 2010) and in most cases, are from a period before drilling operations began. These maps show the approximate sampling locations and the surrounding terrain and population impacts.

Florence COPAMS – Week of April 26

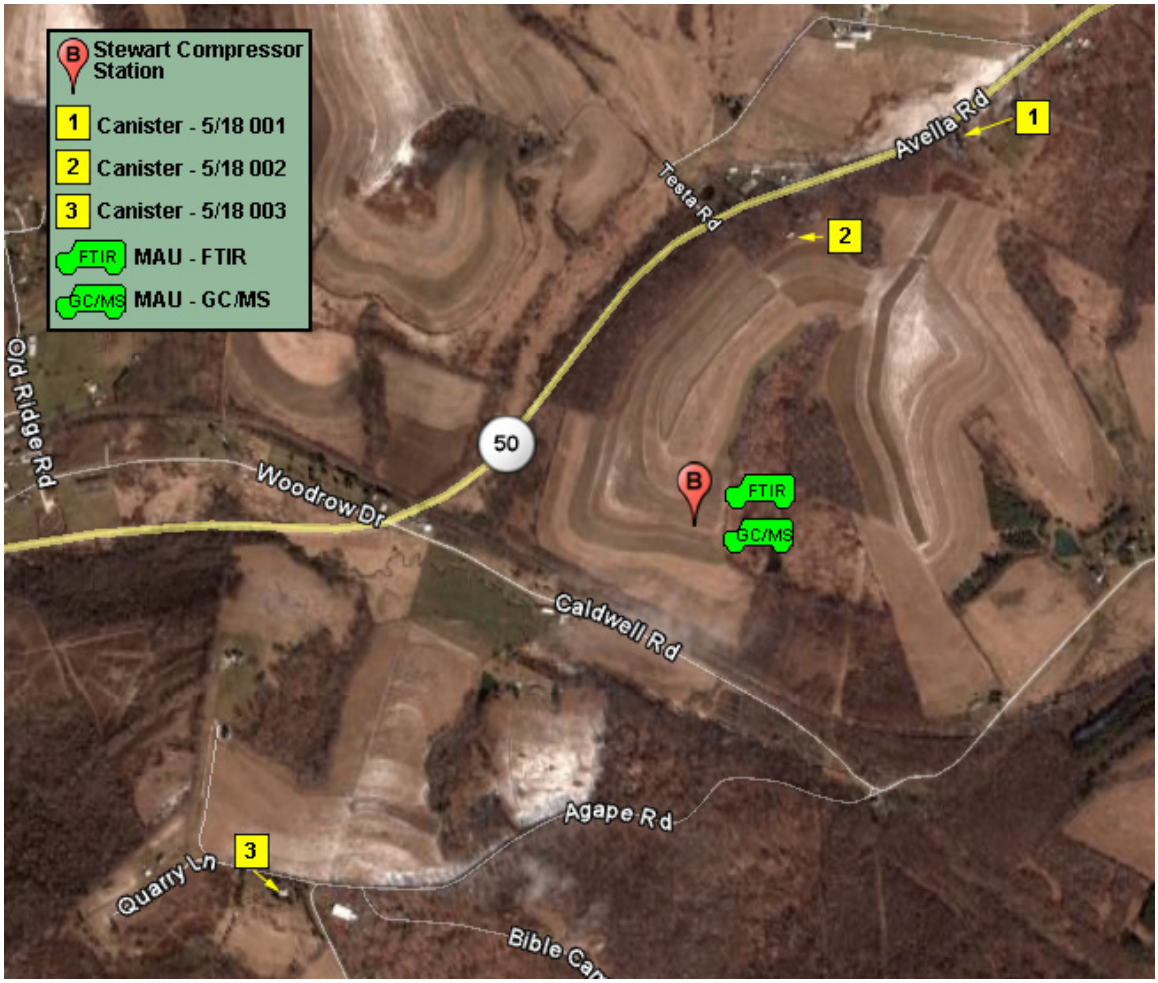


Source: Google, 2010

Figure 4: Map of the Florence COPAMS sampling site and sampling locations.

Both MAU samplers were located adjacent to the Florence Commonwealth of Pennsylvania Air Monitoring Station (COPAMS) within Tillman State Park (Washington County) for the duration of the sampling period. Three canister samples were collected at the site. The weather during the sampling week was mostly clear with light winds (see Appendix F). Sampling was conducted at this site to collect background information on pollutant concentrations in the area to compare to the future sampling weeks near drilling operations.

Stewart Compressor Station – Week of May 17



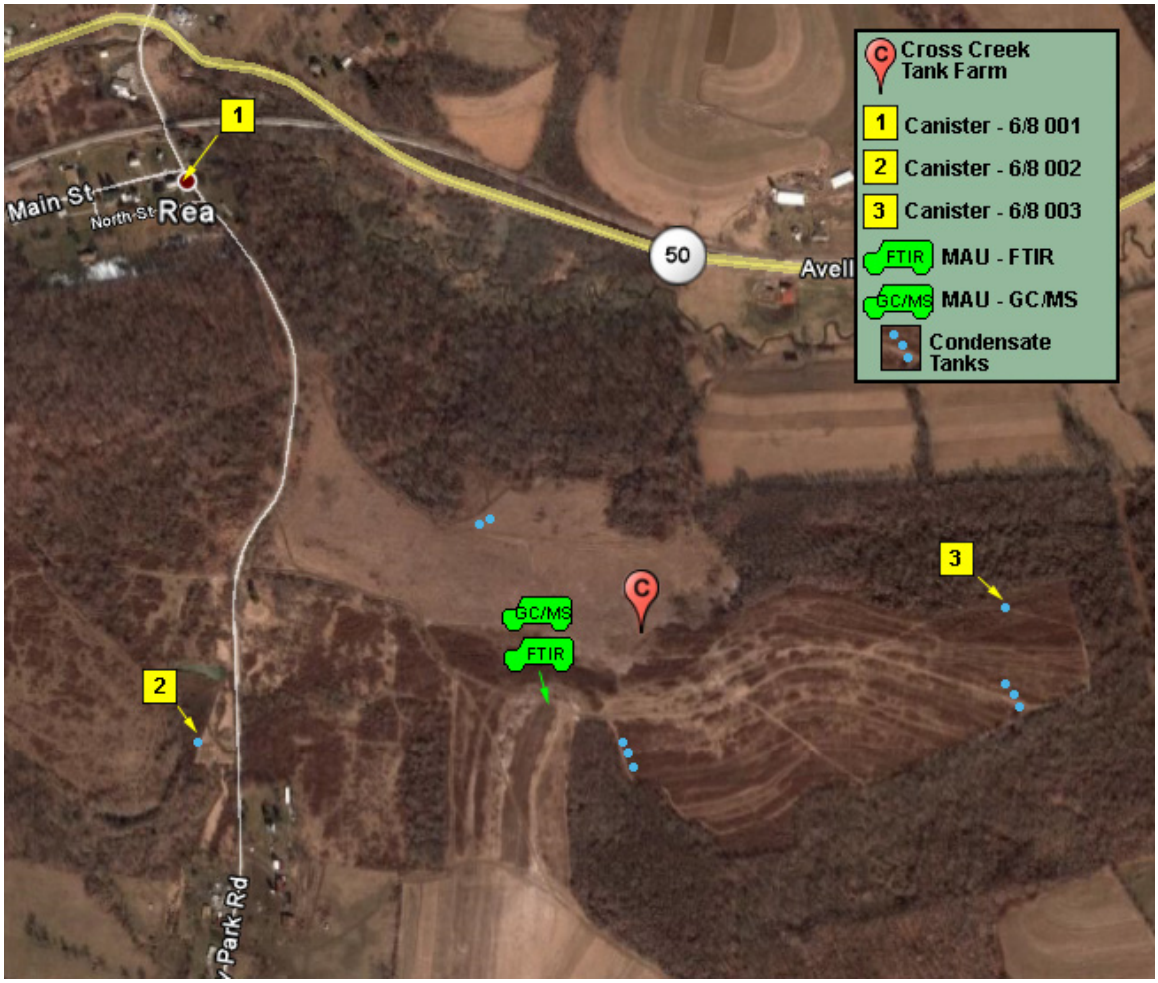
Source: Google, 2010

Figure 5: Map of the Stewart Compressor Station sampling site and sampling locations.

The second sampling week monitored ambient air pollutant concentrations close to the Stewart Compressor Station near Hickory, PA (Washington County). Both MAU samplers were situated outside the compressor station fence. The weather during the week had calm winds and rain during the first half of the week, with clearing skies during the second. Because conditions were calm, canister samples were collected on opposite sides of the compressor site at nearby residences who have expressed concerns about air quality in the past.

Another compressor facility was being built next to the Stewart Compressor Station, but was not in operation at the time of the PA DEP air sampling project.

Cross Creek Tank Farm – Week of June 7

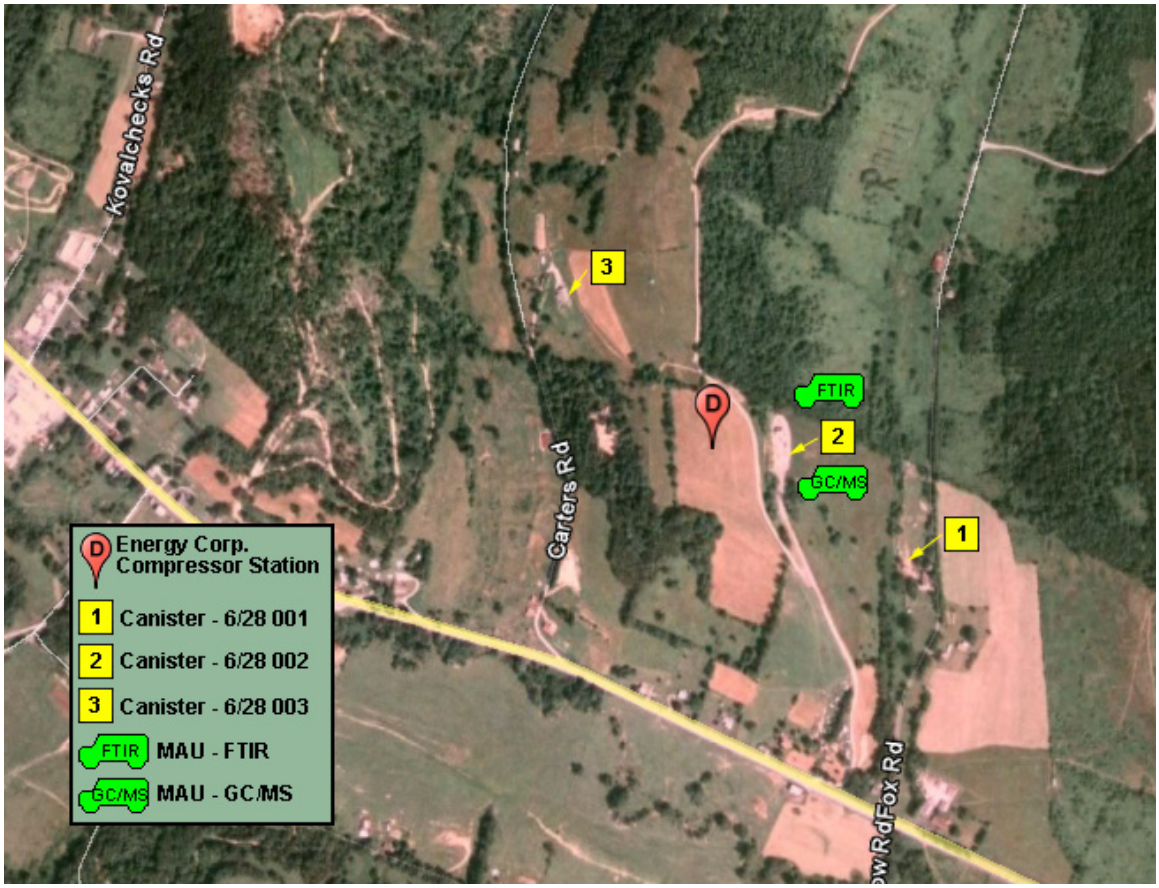


Source: Google, 2010

Figure 6: Map of the Cross Creek Tank Farm sampling site and sampling locations.

The third sampling week monitored ambient air pollutant concentrations close to condensate tanks near Rea, PA (Washington County). Both MAU samplers were situated off an access road situated in the middle of a cluster of condensate tanks. The weather during the week had light winds and a period of rain during the middle of the week. Because of the rural nature of the sampling area, only one canister sample was taken in a population area (Rea, PA). The other two canister samples were downwind of condensate tanks.

Energy Corp. Compressor Station – Week of June 28



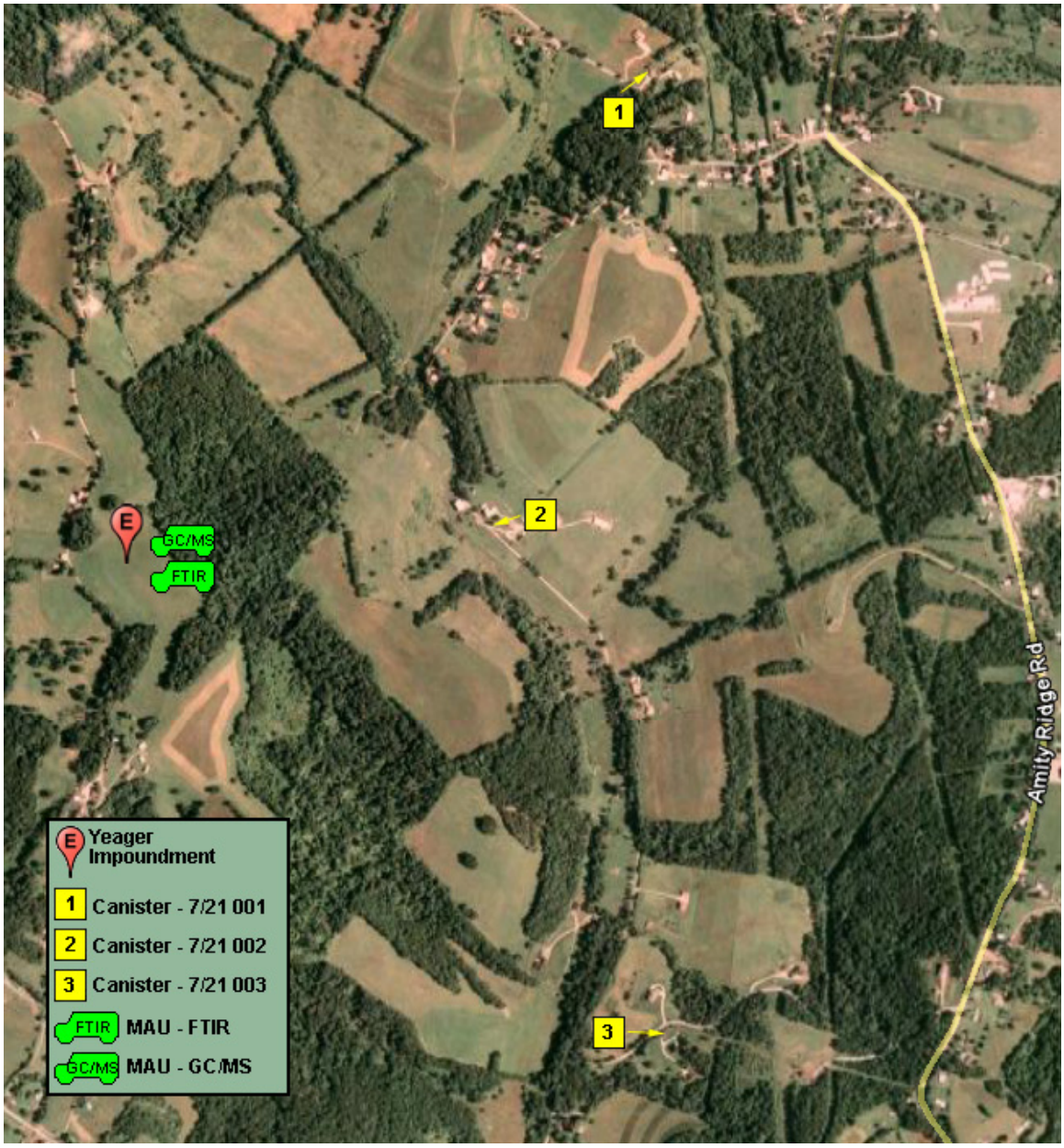
Source: Google, 2010

Figure 7: Map of the Energy Corp. Compressor Station sampling site and sampling locations.

During the fourth sampling week, PA DEP monitored ambient air pollutant concentrations at the Energy Corp. Compressor Station near Khedive, PA (Greene County). This second compressor station was chosen as a sampling site due to a different grade of gas (wet versus dry) that this station processes compared to the Stewart site.

Both MAU samplers were situated next to the compressor station. The weather during the week was mostly clear with light winds. One canister sample was taken at the MAU locations and two others at nearby residences.

Yeager Impoundment – Week of July 19



Source: Google, 2010

Figure 8: Map of the Yeager Impoundment sampling site and sampling locations.

Lastly, during the fifth sampling week, PA DEP monitored ambient air pollutant concentrations from an open and active fracturing-fluid wastewater impoundment near Washington, PA (Washington County). Both MAU samplers were set up next to the impoundment. The weather during the week was mostly clear with a light wind. All three canister samples were taken at nearby residences in an easterly direction.

Sampling Results

Mobile Analytical Unit

Results of the MAU's Open Path sampling are presented in Appendix A. The results are reported in separate tables for each site and in two types of units, parts per billion volume (ppbv) and micrograms per cubic meter (ug/m3). The ppbv unit is simply the number of parts of a chemical contained within a billion parts of air. The results are converted from ppbv to ug/m^3 by multiplying by the compounds molecular weight and dividing by the molar volume. The ug/m^3 units are useful when comparing the result to reference concentrations discussed in the Acute Risk Characterization section.

The OP-FTIR, an open path sampler, typically reports the highest 2-minute value if a compound was detected (unless otherwise noted). If the compound was detected at a high enough level during the sampling session (approximately 8 hours) to produce an average greater than the method detection limit (MDL), that average was reported. The Open Path sampling results provided in Appendix A also includes the detection limits for each compound during the sampling period. The OP-FTIR detection limits will vary depending on factors including the mode of deployment, humidity, and the distance traversed; water vapor will also interfere with the detection limits. Many of the compounds listed in Appendix A were not detected (neither had an average nor maximum concentration reported). For the compounds that were detected, most of the compounds had just the 2-minute maximum concentration reported rather than maximum and average concentrations.

When comparing the OP-FTIR data between sites, the background site (Florence COPAMS) had fewer detects of natural gas constituents than the other sites. There was more natural gas components (i.e., methane, ethane, propane and butane) detected at the two compressor stations than at the other three sites. However, there was some detection of these components at the Cross Creek Tank Farm and the Yeager Impoundment in Washington County. Greater quantities of methane were detected at the Energy Corp Compressor Station in Greene County than the Stewart Compressor Station in Washington County. There were more reported results for the odor-producing methyl mercaptan at the Yeager Impoundment sampling site.

Some of the results include the methane averages and maximums detected at the Energy Corporation's Compressor Station. During the six 7-hour sampling sessions at the station, average methane concentrations were calculated for five of the sampling sessions. The highest average methane concentration was approximately 24 parts per million (ppm)(1 ppm = 1,000 ppb). The maximum methane concentration during that sampling week was approximately 44.7 ppm.

Sampling results at the Yeager Impoundment site detected methane as well as methyl mercaptan in all sampling sessions, with a maximum methyl mercaptan concentration of approximately 1.2 ppm. During the first sampling session at the Cross Creek Tank Farm, PA DEP detected natural gas constituents with a maximum concentration for methane at 1.1 ppm, ethane at 0.7 ppm, propane at 2.1 ppm and butane at 2.5 ppm.

During the morning sampling session on May 20, 2010, at the Stewart Compressor Station, PA DEP detected many compounds in the part per million range, including 2-methyl butane, ethyl benzene, iso-butane, butane, hexane, octane and propane.

During the five-week ambient air sampling study in the Southwest region, the Department's GC/MS only detected benzene and toluene, and mainly at levels below 1.0 ppbv. Other tentatively identified compounds were detected by the GC/MS but at levels below the quantitation limit of the instrument of approximately 0.5 ppbv; the quantitation limit of 0.5 ppbv is the lowest amount of compound in a sample which can be quantitatively determined with suitable precision and accuracy. The types of compounds detected are widely variable but do include components of natural gas. Because those compounds cannot be quantified, they are not included in this report.

Canister Sampling

Results of the canister sampling can be found in Appendix B. Most of the 57 compounds in the analysis were not detected. This is common and seen at most sampling sites in the Commonwealth, simply because of the variety of compounds analyzed. However, more compounds were detected at the two DEP monitoring network sites in Arendtsville (Adams County) and Marcus Hook (Delaware County) simply because there was more chance for detection over the year. The averages for the two network sites are based on results from a possible 61 samples collected over an entire year.

Of the compounds detected, some are present in the atmosphere in stable amounts. For example, the compounds 1,1,2-trichloro-1,2,2-trifluoroethane, dichlorodifluoromethane, trichlorofluoromethane and chloromethane were once used as refrigerants and propellants but have been phased out due to destruction of the ozone layer. Carbon tetrachloride was used to produce these refrigerants but its production declined as their use was banned. Again even though these compounds are no longer being used or had their use curtailed, they persist at certain levels in the atmosphere.

Other compounds detected in the canister sampling are also seen at the PA DEP network sites across the Commonwealth. Results for 2-butanone, acrolein and methylene chloride were found to be close to or within the same range at monitoring sites in other regions of the Commonwealth where there are no natural gas drilling operations.

The following compounds that were detected are most likely related to the Marcellus Shale drilling activities: acetone, benzene, n-heptane, propene and toluene. Concentrations of these pollutants were at, or slightly higher than, levels detected in the DEP monitoring network sites. However, none were detected at levels of concern.

Recently, EPA determined that acrolein data from their School Air Toxics Monitoring Initiative was unreliable (U.S. EPA, 2010b). That initiative used the same canister collection method used in this project. PA DEP has adopted the same approach as EPA which is to present the acrolein data in effort of transparency, but to note the data should not be used for any type of analysis.

Most of the canister samples had several tentatively identified compounds. Again, these are compounds determined by DEP's lab chemist to be present in a sample, but cannot be quantified. The few exceptions are the three samples collected at the Cross Creek Tank Farm. One sample collected next to condensate tanks had estimated concentrations of natural gas constituents including propane, butane and hexane in excess of the 10 ppbv range.

FLIR Infrared Camera

The FLIR infrared camera was utilized during the Energy Corp. Compressor Station sampling the week of June 28, 2010. Two locations within the fence line of the compressor facility were filmed.

FLIR images of heavy condensate tanks are shown in Figure 9. As seen in the regular image on the left, each tank is vented by four pipes at the top of the tank. None of the pipes contain control devices. When condensate is pumped into the tank, the displaced air above the liquid is vented to the atmosphere. This venting can clearly be seen in the image on the right, highlighted by white arrows.

FLIR images of a compressor are shown in Figure 10. As seen in the regular image on the left, no emissions are visible when viewed by the naked eye. When viewed using the infrared detection (image on the right), a plume is visibly emanating from the compressor's packing gland, highlighted by the yellow arrow. The packing gland is the seal around the rotating shaft of the compressor where it meets the gas stream. This plume may contain compounds from the gas stream.

Again, these images show emissions from the Energy Corp. Compressor station that most likely relate to the results of the OP-FTIR sampling.

Figure 9: FLIR images of the heavy condensate tanks at the Energy Corp. Compressor Station. Gas emissions are referenced by the white arrows.

Figure 10: FLIR images of a compressor at the Energy Corp. Compressor Station. Gas emissions from the compressor's packing glands are reference by the yellow arrow.

Acute Risk Characterization

The sampling results were used to characterize the acute non-cancer health risks of ambient pollutant concentrations found around Marcellus Shale drilling operations to nearby residences or communities. To this end, the PA DEP compared sampling results to available reference concentrations (RfCs) and standards.

RfC and standards are concentrations of a particular pollutant, below which (non-cancer) adverse health effects are not expected to occur over a period of continuous exposure. There are RfCs and standards available for different periods of time. For example, there are chronic RfCs to compare against data collected over at least a one-year period. For this study, acute reference concentrations representing time periods of one day or less were used for the characterization. Values found above a reference concentration do not necessarily mean that adverse health effects will occur, but that there is more of a potential.

Appendix C lists the RfCs available for comparison to the OP-FTIR and canister results. A total of 33 of the 45 target compounds have an associated RfC for comparison. Because the Open Path sampling and canister samples were collected over different time periods, different sets of RfCs were used. The RfC sets are described in the following sections.

To make the comparison between the sample result and the RfC, a hazard quotient is traditionally calculated. A hazard quotient (HQ) is simply the sampling result (in ug/m^3) divided by the RfC. If the value is less than one, then non-cancer health effects are not expected. To be even more conservative in the risk assessment, and to account for effects from multiple pollutants that may be additive, the individual hazard quotients of a sample may be added to produce a hazard index (HI). Again, if the HI is less than one, then non-cancer health effects are not expected.

Any estimate of acute risk is based on a number of assumptions and some of the assumptions made for this study include the following:

- concentrations measured at the sampling sites are representative of exposures to the population in the area;
- effects from exposure to multiple chemicals are additive, and;
- the only risk considered in this report is due to inhalation.

The lifetime cancer risk was not calculated since the sampling period in this study was short term. Typically, a sampling period of at least one year is necessary for a lifetime cancer risk analysis.

Hazard Quotients for MAU Samples

The hazard quotient and index calculations for the OP-FTIR and GC/MS data are provided in Appendix D. In order to be more conservative with the risk estimates, hazard quotients were calculated using three different sets of RfCs used for screening risk assessments (U.S. EPA, 2010a). The three sets of RfCs include:

- Reference Exposure Levels (RELs) - California Environmental Protection Agency's (EPA) Reference Exposure Levels for no adverse effects. Most of the RELs used in this study are for 1-hour exposures.
- Acute Exposure Guideline Levels (AEGL) - EPA's Office of Prevention, Pesticides and Toxic Substances established the National Advisory Committee to develop Acute Exposure Guideline Levels (AEGL). The AEGL values are used by local, state and federal agencies for emergency planning, prevention and response to provide guidance in situations where the general public may be accidentally exposed to certain chemicals. PA DEP mainly used AEGL-1 values where the general population may experience mild transient and reversible effects. When these values were not available, AEGL-2 values were used where moderate effects may occur in the general population.
- Emergency Response Planning Guidelines (ERPGs) – American Industrial Hygiene Association, Emergency Response Planning Guidelines. Again, PA DEP mainly used ERPG-1 values that represent concentrations for exposure of the general population for up to 1 hour with effects to be mild.

The hazard quotient and indices in Appendix D were calculated using the OP-FTIR 2-minute maximum data. In doing this, an assumption is made that the 2-minute maximum represents a 1-hour average. Even with this assumption, most of the calculated hazard quotients and indices were well below the acceptable limit of 1.0 indicating non-cancer health effects are not expected when breathing pollutants in air at concentrations detected during the short-term sampling initiative. In fact, most hazard quotient calculations are so low they appear to be zero, but this is only due to rounding.

Only one hazard quotient calculation for a single benzene result (758 ppb) was above 1.0. The calculated HQ value of 1.86 for benzene during the Cross Creek Tank Farm sampling is most likely not a concern due to the "2-minute equals 1-hour" assumption and the fact that the other two RfCs for benzene produce acceptable hazard quotient calculations below 1.0. Furthermore, canister sampling results in the area were within acceptable levels as well.

Not shown are the hazard quotient and indices for OP-FTIR 7-hour average data. Because few averages were generated, and because there are fewer 8-hour RfCs available for comparison, only a small number of quotients were calculated. All of these quotients were well under the acceptable limit range and therefore were not included in this report.

Hazard Quotients for Canister Samples

The hazard quotient and index calculations for the canister data are presented in Appendix E. Because canister samples are 24-hours in duration, the hazard quotients were calculated using a different set of reference concentrations that are for the most part more conservative (are smaller values) than the ones used for the MAU data. Acute RfC values were taken from the Department of Energy's Risk Assessment Information System (RAIS) database (U.S. DOE, 2010). The list of RfC values in the database were compiled from a variety of sources using a selection hierarchy accepted by the PA DEP.

None of the calculated hazard quotients or indices approached the value of 1.0, indicating non-cancer health effects are not expected when breathing pollutants in air at concentrations during sampling.

National Ambient Air Quality Standards

For criteria pollutants, including carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide, the EPA has established concentration levels in air, below which are not considered harmful to public health and the environment. These concentrations are called the National Ambient Air Quality Standards (NAAQS). The criteria pollutants monitored in this study by the MAU OP-FTIR include carbon monoxide, nitrogen dioxide and ozone. The carbon monoxide standard for an 8-hour averaging time is 9,000 ppbv. The nitrogen dioxide standard for a one-hour period is 100 ppb. And the 2008 ozone standard for an 8-hour period is 75 ppb; EPA intends to issue a more protective ozone standard by October 31, 2010.

The EPA specifies how data is to be collected for comparison to the NAAQS. Although the federal methods were not employed for this study, the OP-FTIR did not detect enough concentrations of nitrogen dioxide and ozone to produce a 7-hour average result. Furthermore, for the three 7-hour averages calculated for carbon monoxide (the maximum being 85 ppb), none were close to the standard.

Although it is unlikely that individual drilling operations will cause an exceedance or violation of the NAAQS, combined effects from many of these operations in an area, along with other sources, may contribute to exceedances or violations of the NAAQS.

Odors

The Open Path sampler did detect certain compounds in concentrations above their odor thresholds. Methyl mercaptan, a sulfur-containing colorless gas with an unpleasant odor described as rotten cabbage or rotten eggs, is detectable by the nose at 1 ppb. This compound was detected at all sampling sites except the background site in Florence (Washington County), most notably for short periods in the range of 135 to 1,249 ppb during DEP's sampling of the Yeager Impoundment.

Discussion

Sampling by the PA DEP using both OP-FTIR and canister methods, did detect concentrations of natural gas constituents including methane, ethane, propane and butane in the air near various Marcellus Shale drilling operations. Concentrations of these constituents, ranging from 120 ppb to 44,744 ppb (or 44.7 ppm), were detected during sampling at the Stewart and Energy Corp. compressor stations. Although the types of compounds detected at the Stewart and Energy Corps compressor stations were similar, higher concentrations of methane were found at the Energy Corp. Compressor Station (at a maximum of 44.7 ppm versus 2.5 ppm at the Stewart site). It appears that emissions of compounds from uncontrolled condensate tanks at both the Energy Corp. Compressor Station and the Cross Creek Tank Farm were detected during sampling.

Benzene was one of the major pollutants of concern in the Texas Commission on Environmental Quality monitoring projects of the Barnett Shale formation (TCEQ, 2010). Although both sampling methods employed by the PA DEP for this study detected benzene, none were at the levels found in the Texas study. Only one benzene concentration (measured over a two-minute period) of 758 ppb produced a hazard quotient greater than 1.0, when compared to the most conservative of the three health-based reference concentrations (i.e. California EPA Reference Exposure Level) used in this study. Considering the assumptions made during the acute risk characterization and the other lower benzene concentration measured, the PA DEP has determined this one 2-minute sample result does not provide sufficient evidence that benzene should be considered a pollutant of concern near Marcellus Shale operations in southwestern Pennsylvania.

Certain compounds were detected at levels to produce odors; mainly the methyl mercaptan concentrations measured during the sampling of the Yeager Impoundment sampling in Washington County. The levels detected could cause violations of PA DEP odor emission provisions in 25 *Pa. Code* Section 123.31 (relating to limitations) if they persisted off the property and the Department determined that the odors were "malodors" as defined in 25 *Pa. Code* Section 121 (relating to definitions).[1] Prolonged or repeated exposures to strong odors may produce odor-related health effects such as headaches and nausea.

The FLIR infrared camera was an effective tool in showing emissions from drilling operations and identifying emission leaks from certain sources. The camera will continue to be deployed during future sampling surveys and investigative efforts.

Even though constituents of natural gas and other associated target compounds were detected, the screening results found during the five-week study, did not indicate a potential for major air-related health issues associated with the Marcellus Shale natural gas activities.

Next Steps

PA DEP plans to continue air sampling near Marcellus natural gas operations in the northcentral and northeast regions of the Commonwealth, specifically in Bradford, Susquehanna and Tioga counties. Sampling near compressor stations will be conducted to determine if there is a consistent pattern to the type and amounts of air pollutants in the air near these facilities. The additional sampling will allow a comparison of ambient air pollutant concentrations near facilities where wet gas is extracted (southwest portion of the state) versus dry gas (in the northcentral and northeast portions of the state). The PA DEP will attempt to conduct sampling at other types of natural gas production activities including flaring and active drilling operations.

When all sampling is completed in January 2011, PA DEP will conduct a comparative analysis of the results from the surveyed regions to determine what type of additional measures should be implemented to protect public health and the environment.

[1] *Malodor*—An odor which causes annoyance or discomfort to the public and which the Department determines to be objectionable to the public.

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Appendices

Appendix A: Mobile Analytical Unit OP-FTIR Data
Appendix B: Canister Data
Appendix C: Reference Concentrations
Appendix D: Mobile Analytical Unit Hazard Calculations
Appendix E: Canister Hazard Calculations
Appendix F: Mobile Analytical Unit Meteorological Data

Appendix A: Mobile Analytical Unit OP-FTIR Data

Florence COPAMS Background (ppb)

Compound	4/27/10						4/28/10						4/29/10					
	7:00 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am		
	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)
1,2,4-Trimethylbenzene	192	--	--	113	--	--	133	--	--	104	--	477	172	--	--	175	--	--
2-Methoxy-2-methylpropane (MTBE)	10	--	--	6	--	--	6	--	--	5	--	15	6	--	19	6	--	--
2-Methyl Butane	58	--	--	17	--	--	28	--	--	21	--	--	43	--	--	80	--	--
2-Methyl Pentane	49	--	--	23	--	--	27	--	--	22	--	--	31	--	--	54	--	--
3-Methyl Pentane	50	--	--	20	--	--	26	--	--	22	--	--	34	--	--	63	--	--
Benzene	135	--	--	69	--	153	77	--	--	66	--	--	85	--	--	102	--	213
Carbon Disulfide	70	--	--	44	--	--	40	--	--	44	--	--	41	--	--	52	--	--
Carbon Monoxide	22	--	--	12	--	--	12	--	--	10	--	198	16	--	55	25	--	86
Carbonyl Sulfide	7	--	--	4	--	--	4	--	--	3	--	--	4	--	--	4	--	--
Chloromethane	148	--	--	116	--	--	124	--	--	115	--	--	122	--	--	103	--	--
Dimethyl sulfide	57	--	--	31	--	--	30	--	--	27	--	--	31	--	--	29	--	--
Ethane	114	--	--	50	--	--	66	--	--	52	--	--	81	--	--	128	--	--
Ethylbenzene	167	--	--	58	--	123	85	172	254	70	--	602	136	185	340	195	--	799
Formaldehyde	17	--	--	8	--	--	9	--	--	8	--	--	11	--	--	15	--	--
Hydrogen Chloride	25	--	--	12	--	--	15	--	--	11	--	--	17	--	--	22	--	--
Hydrogen Sulfide	4728	--	--	2643	--	--	2704	--	--	2413	--	--	2743	--	--	2807	--	--
iso-Butane	40	--	--	15	--	--	24	--	--	17	--	--	30	--	74	48	--	--
Methane	129	--	--	50	--	--	73	--	--	54	--	121	127	--	--	165	--	--
Methanol	11	--	--	6	--	--	6	--	--	6	--	--	8	--	--	9	--	--
Methyl mercaptan	119	--	--	67	--	--	66	--	--	63	--	--	70	--	--	64	--	--
m-Xylene	64	--	--	46	--	--	62	--	--	38	--	--	90	--	--	69	--	--
Naphthalene	23	--	--	13	--	--	15	--	--	12	--	--	25	--	--	25	--	--
n-Butane	63	--	222	22	--	43	37	--	--	23	--	46	51	--	119	59	--	--
n-Heptane	479	--	--	145	--	--	241	--	--	176	--	--	342	--	--	603	--	--
n-Hexane	142	--	--	43	--	--	70	--	--	54	--	--	104	--	--	198	--	--
Nitric Acid	12	--	32	7	--	19	7	--	25	7	--	--	9	--	31	8	--	25
Nitric Oxide	431	--	--	255	--	--	249	--	--	219	--	--	254	--	--	249	--	--
Nitrogen Dioxide	75	--	191	42	--	--	41	--	--	36	--	--	41	--	--	39	--	--
Nitrous Acid	4	--	--	2	--	--	2	--	--	2	--	--	2	--	--	2	--	--
n-Octane	419	--	--	116	--	--	215	--	--	138	--	538	303	--	821	475	--	--
n-Pentane	91	--	--	30	--	--	45	--	--	35	--	--	68	--	--	127	--	--
o-Xylene	100	--	--	38	--	--	48	--	--	42	--	--	161	--	--	143	--	--
Ozone	22	--	--	12	--	--	13	--	--	11	--	--	14	--	46	18	--	--
Propane	79	--	--	24	--	--	39	--	--	30	--	--	58	--	--	103	--	--
p-Xylene	141	--	--	65	--	--	81	--	--	68	--	--	126	--	--	183	--	--
Styrene	23	--	68	12	--	38	17	--	80	12	--	37	16	--	42	20	--	103
Sulfur Dioxide	96	--	--	54	--	--	67	--	--	58	--	--	65	--	--	63	--	--
Toluene	172	--	--	70	--	--	131	--	--	81	--	--	195	--	--	186	--	--

4/29/10 - Carbon Monoxide - 86 (3-minute period)

Stewart Compressor Station (ppb)

Compound	5/18/10						5/19/10						5/20/10					
	5:25 am - 12:00 pm			4:50 pm - 12:00 am			5:10 am - 12:00 pm			5:10 pm - 12:00 am			5:10 am - 12:00 pm			4:00 pm - 12:00 am		
	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)
1,2,4-Trimethylbenzene	150	--	--	109	--	--	99	--	--	122	--	--	288	--	--	231	--	--
2-Methoxy-2-methylpropane (MTBE)	6	--	29	6	--	37	5	--	20	11	--	61	31	--	194	5	--	--
2-Methyl Butane	64	--	--	22	--	78	27	--	85	47	136	1741	120	447	4837	102	--	--
2-Methyl Pentane	46	--	--	25	--	57	25	--	60	75	--	--	216	--	954	61	--	--
3-Methyl Pentane	53	--	--	25	--	--	27	--	54	58	--	150	153	--	--	75	--	--
Benzene	95	--	--	55	--	209	59	--	--	86	--	--	284	--	--	112	--	--
Carbon Disulfide	49	--	--	59	--	--	48	--	--	170	--	--	280	--	--	78	--	--
Carbon Monoxide	20	--	220	10	30	153	11	--	415	16	85	798	41	--	690	30	--	169
Carbonyl Sulfide	4	--	--	6	--	--	3	--	--	5	--	--	23	--	--	4	--	--
Chloromethane	97	--	--	101	--	--	78	--	--	128	--	--	502	--	--	94	--	--
Dimethyl sulfide	41	--	--	38	--	--	30	--	--	81	--	252	348	--	--	39	--	--
Ethane	115	--	--	61	--	241	66	--	132	120	--	452	379	--	--	157	--	321
Ethylbenzene	186	--	--	70	--	--	88	--	222	153	--	464	374	--	2430	239	--	642
Formaldehyde	13	--	--	8	--	--	8	--	--	11	--	--	39	--	--	15	--	--
Hydrogen Chloride	20	--	--	12	--	--	12	--	--	16	--	--	54	--	--	24	--	--
Hydrogen Sulfide	3265	--	--	3585	--	--	2745	--	--	3896	--	--	18042	--	--	3153	--	--
iso-Butane	43	--	167	17	--	38	22	--	--	43	--	623	117	--	1606	59	--	179
Methane	143	--	--	69	--	--	72	--	--	102	--	720	270	--	839	221	--	2456
Methanol	8	--	--	6	--	--	5	--	--	7	--	34	24	--	54	9	--	21
Methyl mercaptan	90	--	414	157	--	--	68	--	157	276	--	--	2715	--	--	79	--	245
m-Xylene	46	--	--	27	--	--	27	--	--	33	--	--	85	--	--	64	--	--
Naphthalene	15	--	--	10	--	--	10	--	--	12	--	--	32	--	70	25	--	--
n-Butane	73	--	162	25	--	206	33	--	137	57	--	293	300	--	5438	81	--	385
n-Heptane	540	--	--	166	--	--	220	--	--	441	--	--	1086	--	--	783	--	--
n-Hexane	158	--	--	52	--	152	67	--	236	172	--	3263	358	--	9534	251	--	--
Nitric Acid	7	--	--	6	--	14	5	--	14	7	--	--	77	--	--	6	--	13
Nitric Oxide	263	--	--	474	--	--	242	--	--	339	--	--	1393	--	--	282	--	--
Nitrogen Dioxide	52	--	106	57	--	--	39	--	--	170	--	559	942	--	2563	55	--	178
Nitrous Acid	2	--	5	2	--	--	2	--	--	2	--	--	12	--	--	2	--	--
n-Octane	465	--	--	126	--	321	176	--	--	391	--	1310	949	--	11020	625	--	--
n-Pentane	96	--	--	39	--	--	45	--	--	78	--	--	189	--	--	156	--	--
o-Xylene	113	--	--	25	--	--	44	--	--	55	--	--	92	--	--	144	--	--
Ozone	16	--	--	10	--	22	10	--	--	15	--	--	51	--	--	17	--	--
Propane	91	--	--	31	--	142	40	--	120	52	255	3465	105	891	10269	134	--	354
p-Xylene	88	--	--	61	--	--	52	--	--	69	--	--	162	--	--	164	--	--
Styrene	15	--	40	11	--	27	11	--	32	15	--	35	53	--	--	22	--	--
Sulfur Dioxide	72	--	--	76	--	--	62	--	--	82	--	--	344	--	--	60	--	--
Toluene	184	--	--	61	--	--	101	--	--	101	--	--	201	--	--	244	--	--

5/18/10 - MTBE - 37 (occurred twice)
5/18/10 - n-Hexane - 152 (occurred twice)
5/20/10 - 2-Methyl Butane - 4837 (occurred twice)
5/20/10 - Propane - 10269 (occurred twice)
5/20/10 - Ethylbenzene - 642 (occurred twice)

Cross Creek Tank Farm (ppb)

Compound	6/8/10						6/9/10						6/10/10					
	5:00 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am		
	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)
1,2,4-Trimethylbenzene	216	--	--	341	--	--	118	--	--	105	--	--	274	--	--	366	--	--
2-Methoxy-2-methylpropane (MTBE)	6	--	29	5	--	--	7	17	54	9	--	88	5	--	--	4	--	--
2-Methyl Butane	96	--	1110	174	--	--	28	--	229	19	--	53	124	--	--	184	--	--
2-Methyl Pentane	65	--	291	90	--	352	33	--	--	24	--	--	80	--	--	103	--	--
3-Methyl Pentane	81	--	211	117	--	267	29	--	--	21	--	--	95	--	--	129	--	--
Benzene	109	--	758	150	--	--	69	--	--	55	--	208	117	--	--	151	--	--
Carbon Disulfide	84	--	--	48	--	--	114	--	--	99	--	--	30	--	--	39	--	--
Carbon Monoxide	32	--	--	47	--	--	14	--	--	10	--	--	40	--	--	49	--	--
Carbonyl Sulfide	6	--	--	3	--	--	7	--	--	8	--	--	3	--	--	3	--	--
Chloromethane	104	--	--	89	--	--	133	--	--	127	--	--	72	--	--	73	--	--
Dimethyl sulfide	50	--	--	34	--	80	77	--	--	67	--	--	25	--	--	23	--	--
Ethane	167	--	723	222	--	743	76	--	--	54	--	--	193	--	--	245	--	--
Ethylbenzene	246	--	543	357	--	--	97	--	253	64	--	--	292	--	--	353	--	--
Formaldehyde	16	--	--	22	--	--	11	--	--	8	--	--	19	--	--	22	--	--
Hydrogen Chloride	27	--	--	36	--	--	16	--	--	12	--	--	30	--	--	34	--	--
Hydrogen Sulfide	3720	--	--	3024	--	--	6090	--	--	5656	--	--	2868	--	--	2704	--	--
iso-Butane	70	--	207	97	--	--	24	--	112	16	--	47	67	--	--	95	--	--
Methane	245	--	1147	349	--	--	81	--	270	55	--	--	293	--	--	360	--	--
Methanol	10	--	--	13	--	--	6	--	--	5	--	--	10	--	--	13	--	--
Methyl mercaptan	127	--	--	71	--	154	211	--	--	179	--	--	52	--	--	50	--	--
m-Xylene	64	--	--	101	--	--	32	--	--	27	--	--	81	--	--	105	--	--
Naphthalene	23	--	--	38	--	--	12	--	--	11	--	--	31	--	--	40	--	--
n-Butane	105	--	2508	172	--	977	36	--	234	24	--	204	84	--	241	147	--	--
n-Heptane	809	--	--	1382	--	--	251	--	--	166	--	--	943	--	--	1423	--	--
n-Hexane	239	--	3535	432	--	962	69	--	763	46	--	--	306	--	--	456	--	--
Nitric Acid	6	--	--	6	--	12	11	--	--	10	--	--	5	--	--	5	--	17
Nitric Oxide	423	--	--	260	--	--	539	--	--	720	--	--	215	--	--	198	--	--
Nitrogen Dioxide	88	--	577	49	--	181	119	--	264	99	--	474	32	--	66	31	--	--
Nitrous Acid	2	--	--	2	--	--	2	--	--	3	--	--	2	--	--	1	--	--
n-Octane	699	--	--	1265	--	--	198	--	--	132	--	--	717	--	--	1188	--	--
n-Pentane	154	--	1161	267	--	--	46	--	273	31	--	--	181	--	--	268	--	--
o-Xylene	157	--	--	274	--	--	45	--	--	29	--	--	192	--	--	271	--	--
Ozone	19	--	--	25	--	--	12	--	--	10	--	--	20	--	--	26	--	--
Propane	140	--	2125	235	--	--	41	--	482	26	--	--	163	--	--	239	--	--
p-Xylene	143	--	--	247	--	--	64	--	--	62	--	--	182	--	--	260	--	--
Styrene	20	--	59	31	--	--	13	--	27	11	--	--	24	--	--	33	--	--
Sulfur Dioxide	64	--	--	57	--	--	90	--	--	98	--	--	53	--	--	48	--	--
Toluene	234	--	--	341	--	--	95	--	--	6	--	--	258	--	--	322	--	--

6/810 - Nitric Acid - 12 (occurred twice)
6/9/10 - n-Butane - 234 (5-minute period)
6/9/10 - Nitrogen Dioxide - 264 (occurred twice)

Energy Corp. Compressor Station (ppb)

Compound	6/28/10			6/29/10						6/30/10						7/1/10		
	5:57 pm - 12:00 pm			4:30 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am			4:45 am - 12:00 pm		
	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)
1,2,4-Trimethylbenzene	210	--	--	105	--	--	182	--	--	243	--	--	526	--	--	153	--	--
2-Methoxy-2-methylpropane (MTBE)	10	--	28	4	--	16	7	--	--	5	--	51	7	--	--	5	--	41
2-Methyl Butane	63	--	--	91	--	--	67	--	--	107	--	--	1066	--	--	134	--	--
2-Methyl Pentane	58	--	--	83	--	--	53	--	--	87	--	--	1946	--	--	147	--	--
3-Methyl Pentane	63	--	--	91	--	--	59	--	--	95	--	--	1280	--	--	140	--	--
Benzene	77	--	--	52	--	143	76	--	--	105	--	--	130	--	--	74	--	--
Carbon Disulfide	130	--	--	40	--	--	113	--	--	42	--	--	81	--	--	65	--	--
Carbon Monoxide	22	--	253	9	21	183	23	--	155	36	--	79	51	--	--	18	--	314
Carbonyl Sulfide	7	--	--	2	--	--	6	--	--	3	--	--	10	--	--	3	--	--
Chloromethane	145	--	--	74	--	--	104	--	--	84	--	--	86	--	--	81	--	--
Dimethyl sulfide	84	--	--	56	--	--	68	--	--	51	--	--	64	--	--	56	--	--
Ethane	141	--	861	191	--	455	129	--	283	211	--	--	3388	--	--	325	--	695
Ethylbenzene	161	--	331	118	--	--	166	--	451	242	--	504	328	--	--	176	--	--
Formaldehyde	13	--	--	11	--	--	12	--	--	20	--	--	349	--	--	21	--	--
Hydrogen Chloride	18	--	--	15	--	--	19	--	--	34	--	--	451	--	--	30	--	--
Hydrogen Sulfide	5826	--	--	3657	--	--	4048	--	--	3485	--	--	6405	--	--	3691	--	--
iso-Butane	45	--	90	64	--	--	44	--	--	72	--	--	1253	--	--	111	--	--
Methane	124	358	8606	84	1101	5086	146	332	2124	272	--	17266	3001	23961	44744	166	1911	33905
Methanol	7	--	--	5	--	--	7	--	--	10	--	--	12	--	--	7	--	47
Methyl mercaptan	204	--	--	119	--	280	151	--	--	123	--	356	153	--	410	149	--	317
m-Xylene	58	--	--	27	--	--	46	--	--	61	--	--	109	--	--	40	--	--
Naphthalene	23	--	--	11	--	--	18	--	--	23	--	--	43	--	--	15	--	--
n-Butane	50	--	166	49	--	176	79	--	200	101	--	248	226	527	667	89	--	667
n-Heptane	528	--	--	804	--	--	552	--	--	926	--	--	9658	--	--	1210	--	--
n-Hexane	155	--	--	223	--	--	164	--	--	263	--	--	2562	--	--	326	--	--
Nitric Acid	10	--	--	5	--	11	7	--	--	6	--	27	7	--	20	5	--	--
Nitric Oxide	823	--	--	202	--	570	565	--	--	225	--	--	925	--	--	251	--	1816
Nitrogen Dioxide	211	--	463	255	--	--	144	--	418	132	--	--	2687	--	--	331	--	--
Nitrous Acid	3	--	--	1	--	--	2	--	--	2	--	--	2	--	--	1	--	4
n-Octane	405	--	--	613	--	--	421	--	--	726	--	--	8263	--	--	965	--	--
n-Pentane	94	--	--	123	--	--	106	--	--	179	--	--	1404	--	--	190	--	--
o-Xylene	74	--	--	26	--	--	85	--	--	118	--	--	210	--	--	64	--	--
Ozone	14	--	--	10	--	26	13	--	--	18	--	--	24	--	--	12	--	30
Propane	89	--	--	128	--	--	93	--	--	151	--	--	1670	--	--	192	--	--
p-Xylene	155	--	--	67	--	--	113	--	--	141	--	--	277	--	--	89	--	--
Styrene	18	--	--	10	--	--	16	--	38	23	--	48	33	--	--	17	--	34
Sulfur Dioxide	101	--	--	51	--	--	72	--	--	60	--	--	66	--	--	59	--	--
Toluene	137	--	--	65	--	--	152	--	--	239	--	--	306	--	--	145	--	--

6/29/10 - Carbon monoxide - 183 (occurred three times)
6/30/10 - Styrene - 48 (occurred twice)
7/1/10 - MTBE - 41 (occurred twice)
7/1 - Nitrous Acid - (occurred twice)

Yeager Impoundment (ppb)

Compound	7/19/10			7/20/10						7/21/10						7/22/10		
	5:40 pm - 12:00 am			4:45 am - 12:00 pm			5:00 pm - 12:00 am			4:30 am - 12:00 pm			7:00 pm - 12:00 am			5:00 am - 12:00 pm		
	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)	Detect. Limit (ppb)	Avg. Conc. (ppb)	Max. Conc. (ppb)
1,2,4-Trimethylbenzene	508	--	--	366	--	--	480	--	--	198	--	--	422	--	--	400	--	--
2-Methoxy-2-methylpropane (MTBE)	9	--	--	10	--	97	7	--	21	4	--	13	5	--	--	9	--	49
2-Methyl Butane	67	--	--	99	--	--	77	--	--	52	--	--	80	--	--	82	--	--
2-Methyl Pentane	70	--	--	92	--	--	71	--	--	58	--	--	85	--	--	82	--	--
3-Methyl Pentane	71	--	--	93	--	--	73	--	--	57	--	--	86	--	--	84	--	--
Benzene	172	--	--	165	--	--	157	--	--	96	--	--	180	--	--	182	--	--
Carbon Disulfide	76	--	--	70	--	--	53	--	--	26	--	--	39	--	--	63	--	--
Carbon Monoxide	54	--	282	45	--	200	51	--	--	22	--	--	51	--	--	47	--	118
Carbonyl Sulfide	8	--	--	9	--	--	7	--	--	2	--	--	4	--	--	6	--	--
Chloromethane	140	--	--	199	--	--	122	--	--	65	--	--	77	--	--	128	--	--
Dimethyl sulfide	59	--	--	88	--	--	55	--	--	28	--	--	34	--	--	65	--	--
Ethane	171	--	--	212	--	--	165	--	--	137	--	--	201	--	--	191	--	--
Ethylbenzene	274	--	--	373	--	--	270	--	--	204	--	--	281	--	--	315	--	--
Formaldehyde	24	--	--	25	--	--	23	--	--	14	--	--	27	--	--	25	--	--
Hydrogen Chloride	38	--	--	39	--	--	37	--	--	21	--	--	43	--	--	39	--	--
Hydrogen Sulfide	4508	--	--	5537	--	--	4268	--	--	2378	--	--	2766	--	--	4434	--	--
iso-Butane	54	--	--	66	--	--	57	--	--	35	--	--	58	--	--	60	--	--
Methane	246	--	1239	242	593	1451	273	--	717	145	308	1172	261	--	754	192	511	1102
Methanol	13	--	39	14	--	--	13	--	--	8	--	--	14	--	--	14	--	--
Methyl mercaptan	118	--	726	240	--	1249	117	--	1003	58	--	135	80	--	156	152	--	604
m-Xylene	147	--	--	133	--	--	136	--	--	67	--	--	140	--	--	114	--	--
Naphthalene	54	--	--	49	--	--	52	--	--	24	--	--	49	--	--	47	--	--
n-Butane	75	--	--	92	--	--	78	--	--	60	--	--	94	--	--	99	--	--
n-Heptane	581	--	--	786	--	--	654	--	--	364	--	--	622	--	--	665	--	--
n-Hexane	164	--	--	237	--	--	192	--	--	125	--	--	193	--	--	196	--	--
Nitric Acid	11	--	--	13	--	--	9	--	--	5	--	--	5	--	--	9	--	--
Nitric Oxide	847	--	--	681	--	--	676	--	--	186	--	--	306	--	--	642	--	--
Nitrogen Dioxide	69	--	--	118	--	--	64	--	--	35	--	--	44	--	--	80	--	--
Nitrous Acid	3	--	--	4	--	--	3	--	--	1	--	--	2	--	--	2	--	10
n-Octane	441	--	--	597	--	--	498	--	--	276	--	--	470	--	--	501	--	--
n-Pentane	133	--	--	180	--	--	156	--	--	92	--	--	161	--	--	150	--	--
o-Xylene	192	--	--	224	--	--	188	--	--	105	--	--	187	--	--	179	--	--
Ozone	25	--	50	28	--	--	20	--	60	17	--	--	28	--	49	32	--	--
Propane	123	--	--	159	--	--	133	--	--	80	--	170	137	--	--	138	--	--
p-Xylene	409	--	--	337	--	--	396	--	--	172	--	--	385	--	--	332	--	--
Styrene	45	--	--	39	--	--	43	--	--	21	--	--	47	--	--	46	--	--
Sulfur Dioxide	78	--	--	94	--	--	74	--	--	48	--	--	53	--	--	70	--	--
Toluene	308	--	--	331	--	--	301	--	--	181	--	--	282	--	--	289	--	--

7/22/10 - Methane - 1102 (23-minute period)
7/20/10 - Methyl mercaptan - 1249 (6-minute period)
7/20/10 - Methyl mercaptan - 1003 (2-minute period)
7/22/10 - Methyl mercaptan - 604 (occurred twice)
7/20/10 - Ozone - 60 (occurred twice)
7/21/10 - Propane - 170 (10-minute period)

Florence COPAMS Background (ug/m^3)

Compound	MW	4/27/10						4/28/10						4/29/10					
		7:00 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am		
		Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)
1,2,4-Trimethylbenzene	120.2	944	--	--	555	--	--	654	--	--	511	--	2345	845	--	--	860	--	--
2-Methoxy-2-methylpropane (MTBE)	88.2	36	--	--	22	--	--	22	--	--	18	--	54	22	--	69	22	--	--
2-Methyl Butane	72.2	171	--	--	50	--	--	83	--	--	62	--	--	127	--	--	236	--	--
2-Methyl Pentane	86.2	173	--	--	81	--	--	95	--	--	78	--	--	109	--	--	190	--	--
3-Methyl Pentane	86.2	176	--	--	71	--	--	92	--	--	78	--	--	120	--	--	222	--	--
Benzene	78.1	431	--	--	220	--	489	246	--	--	211	--	--	271	--	--	326	--	680
Carbon Disulfide	76.1	218	--	--	137	--	--	125	--	--	137	--	--	128	--	--	162	--	--
Carbon Monoxide	28.0	25	--	--	14	--	--	14	--	--	11	--	227	18	--	63	29	--	99
Carbonyl Sulfide	60.1	17	--	--	10	--	--	10	--	--	7	--	--	10	--	--	10	--	--
Chloromethane	50.5	306	--	--	240	--	--	256	--	--	237	--	--	252	--	--	213	--	--
Dimethyl sulfide	62.1	145	--	--	79	--	--	76	--	--	69	--	--	79	--	--	74	--	--
Ethane	30.1	140	--	--	61	--	--	81	--	--	64	--	--	100	--	--	157	--	--
Ethylbenzene	106.2	725	--	--	252	--	534	369	747	1103	304	--	2614	591	803	1477	847	--	3470
Formaldehyde	30.0	21	--	--	10	--	--	11	--	--	10	--	--	14	--	--	18	--	--
Hydrogen Chloride	36.5	37	--	--	18	--	--	22	--	--	16	--	--	25	--	--	33	--	--
Hydrogen Sulfide	34.1	6589	--	--	3683	--	--	3768	--	--	3363	--	--	3823	--	--	3912	--	--
Iso-Butane	58.1	95	--	--	36	--	--	57	--	--	40	--	--	71	--	176	114	--	--
Methane	16.0	85	--	--	33	--	--	48	--	--	35	--	79	83	--	--	108	--	--
Methanol	32.0	14	--	--	8	--	--	8	--	--	8	--	--	10	--	--	12	--	--
Methyl mercaptan	48.1	234	--	--	132	--	--	130	--	--	124	--	--	138	--	--	126	--	--
m-Xylene	106.2	278	--	--	200	--	--	269	--	--	165	--	--	391	--	--	300	--	--
Naphthalene	128.2	121	--	--	68	--	--	79	--	--	63	--	--	131	--	--	131	--	--
n-Butane	58.1	150	--	528	52	--	102	88	--	--	55	--	109	121	--	283	140	--	--
n-Heptane	100.2	1963	--	--	594	--	--	987	--	--	721	--	--	1401	--	--	2471	--	--
n-Hexane	86.2	501	--	--	152	--	--	247	--	--	190	--	--	367	--	--	698	--	--
Nitric Acid	63.0	31	--	82	18	--	49	18	--	64	18	--	--	23	--	80	21	--	64
Nitric Oxide	30.0	529	--	--	313	--	--	306	--	--	269	--	--	312	--	--	306	--	--
Nitrogen Dioxide	46.0	141	--	359	79	--	--	77	--	--	68	--	--	77	--	--	73	--	--
Nitrous Acid	47.0	8	--	--	4	--	--	4	--	--	4	--	--	4	--	--	4	--	--
n-Octane	114.2	1957	--	--	542	--	--	1004	--	--	645	--	2513	1415	--	3835	2219	--	--
n-Pentane	72.2	268	--	--	89	--	--	133	--	--	103	--	--	201	--	--	375	--	--
o-Xylene	106.2	434	--	--	165	--	--	208	--	--	182	--	--	699	--	--	621	--	--
Ozone	48.0	43	--	--	24	--	--	26	--	--	22	--	--	27	--	90	35	--	--
Propane	44.1	142	--	--	43	--	--	70	--	--	54	--	--	105	--	--	186	--	--
p-Xylene	106.2	612	--	--	282	--	--	352	--	--	295	--	--	547	--	--	794	--	--
Styrene	104.2	98	--	290	51	--	162	72	--	341	51	--	158	68	--	179	85	--	439
Sulfur Dioxide	64.1	252	--	--	141	--	--	176	--	--	152	--	--	170	--	--	165	--	--
Toluene	92.1	648	--	--	264	--	--	493	--	--	305	--	--	734	--	--	701	--	--

Stewart Compressor Station (ug/m^3)

Compound	MW	5/18/10						5/19/10						5/20/10					
		5:25 am - 12:00 pm			4:50 pm - 12:00 am			5:10 am - 12:00 pm			5:10 pm - 12:00 am			5:10 am - 12:00 pm			4:00 pm - 12:00 am		
		Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)
1,2,4-Trimethylbenzene	120.2	737	--	--	536	--	--	487	--	--	600	--	--	1416	--	--	1135	--	--
2-Methoxy-2-methylpropane (MTBE)	88.2	22	--	105	22	--	133	18	--	72	40	--	220	112	--	700	18	--	--
2-Methyl Butane	72.2	189	--	--	65	--	230	80	--	251	139	401	5137	354	1319	14271	301	--	--
2-Methyl Pentane	86.2	162	--	--	88	--	201	88	--	211	264	--	--	761	--	3362	215	--	--
3-Methyl Pentane	86.2	187	--	--	88	--	--	95	--	190	204	--	529	539	--	--	264	--	--
Benzene	78.1	303	--	--	176	--	667	188	--	--	275	--	--	907	--	--	358	--	--
Carbon Disulfide	76.1	153	--	--	184	--	--	149	--	--	529	--	--	872	--	--	243	--	--
Carbon Monoxide	28.0	23	--	252	11	34	175	13	--	475	18	97	914	47	--	790	34	--	194
Carbonyl Sulfide	60.1	10	--	--	15	--	--	7	--	--	12	--	--	56	--	--	10	--	--
Chloromethane	50.5	200	--	--	209	--	--	161	--	--	264	--	--	1037	--	--	194	--	--
Dimethyl sulfide	62.1	104	--	--	97	--	--	76	--	--	206	--	640	884	--	--	99	--	--
Ethane	30.1	141	--	--	75	--	296	81	--	162	148	--	556	466	--	--	193	--	395
Ethylbenzene	106.2	808	--	--	304	--	--	382	--	964	664	--	2015	1624	--	10553	1038	--	2788
Formaldehyde	30.0	16	--	--	10	--	--	10	--	--	14	--	--	48	--	--	18	--	--
Hydrogen Chloride	36.5	30	--	--	18	--	--	18	--	--	24	--	--	81	--	--	36	--	--
Hydrogen Sulfide	34.1	4550	--	--	4996	--	--	3826	--	--	5430	--	--	25144	--	--	4394	--	--
iso-Butane	58.1	102	--	397	40	--	90	52	--	--	102	--	1481	278	--	3817	140	--	425
Methane	16.0	94	--	--	45	--	--	47	--	--	67	--	472	177	--	550	145	--	1611
Methanol	32.0	10	--	--	8	--	--	7	--	--	9	--	45	31	--	71	12	--	28
Methyl mercaptan	48.1	177	--	814	309	--	--	134	--	309	543	--	--	5341	--	--	155	--	482
m-Xylene	106.2	200	--	--	117	--	--	117	--	--	143	--	--	369	--	--	278	--	--
Naphthalene	128.2	79	--	--	52	--	--	52	--	--	63	--	--	168	--	367	131	--	--
n-Butane	58.1	174	--	385	59	--	490	78	--	326	135	--	696	713	--	12925	193	--	915
n-Heptane	100.2	2213	--	--	680	--	--	901	--	--	1807	--	--	4450	--	--	3208	--	--
n-Hexane	86.2	557	--	--	183	--	536	236	--	832	606	--	11502	1262	--	33607	885	--	--
Nitric Acid	63.0	18	--	--	15	--	36	13	--	36	18	--	--	198	--	--	15	--	33
Nitric Oxide	30.0	323	--	--	582	--	--	297	--	--	416	--	--	1710	--	--	346	--	--
Nitrogen Dioxide	46.0	98	--	199	107	--	--	73	--	--	320	--	1052	1772	--	4822	103	--	335
Nitrous Acid	47.0	4	--	10	4	--	--	4	--	--	4	--	--	23	--	--	4	--	--
n-Octane	114.2	2172	--	--	589	--	1499	822	--	--	1826	--	6119	4433	--	51477	2920	--	--
n-Pentane	72.2	283	--	--	115	--	--	133	--	--	230	--	--	558	--	--	460	--	--
o-Xylene	106.2	491	--	--	109	--	--	191	--	--	239	--	--	400	--	--	625	--	--
Ozone	48.0	31	--	--	20	--	43	20	--	--	29	--	--	100	--	--	33	--	--
Propane	44.1	164	--	--	56	--	256	72	--	216	94	460	6249	189	1607	18519	242	--	638
p-Xylene	106.2	382	--	--	265	--	--	226	--	--	300	--	--	703	--	--	712	--	--
Styrene	104.2	64	--	170	47	--	115	47	--	136	64	--	149	226	--	--	94	--	--
Sulfur Dioxide	64.1	189	--	--	199	--	--	162	--	--	215	--	--	901	--	--	157	--	--
Toluene	92.1	693	--	--	230	--	--	380	--	--	380	--	--	757	--	--	919	--	--

Cross Creek Tank Farm (ug/m^3)

Compound	MW	6/8/10						6/9/10						6/10/10					
		5:00 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am		
		Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)
1,2,4-Trimethylbenzene	120.2	1062	--	--	1676	--	--	580	--	--	516	--	--	1347	--	--	1799	--	--
2-Methoxy-2-methylpropane (MTBE)	88.2	22	--	105	18	--	--	25	61	195	32	--	317	18	--	--	14	--	--
2-Methyl Butane	72.2	283	--	3275	513	--	--	83	--	676	56	--	156	366	--	--	543	--	--
2-Methyl Pentane	86.2	229	--	1026	317	--	1241	116	--	--	85	--	--	282	--	--	363	--	--
3-Methyl Pentane	86.2	286	--	744	412	--	941	102	--	--	74	--	--	335	--	--	455	--	--
Benzene	78.1	348	--	2421	479	--	--	220	--	--	176	--	664	374	--	--	482	--	--
Carbon Disulfide	76.1	262	--	--	149	--	--	355	--	--	308	--	--	93	--	--	121	--	--
Carbon Monoxide	28.0	37	--	--	54	--	--	16	--	--	11	--	--	46	--	--	56	--	--
Carbonyl Sulfide	60.1	15	--	--	7	--	--	17	--	--	20	--	--	7	--	--	7	--	--
Chloromethane	50.5	215	--	--	184	--	--	275	--	--	262	--	--	149	--	--	151	--	--
Dimethyl sulfide	62.1	127	--	--	86	--	203	196	--	--	170	--	--	64	--	--	58	--	--
Ethane	30.1	205	--	889	273	--	914	93	--	--	66	--	--	237	--	--	301	--	--
Ethylbenzene	106.2	1068	--	2358	1550	--	--	421	--	1099	278	--	--	1268	--	--	1533	--	--
Formaldehyde	30.0	20	--	--	27	--	--	14	--	--	10	--	--	23	--	--	27	--	--
Hydrogen Chloride	36.5	40	--	--	54	--	--	24	--	--	18	--	--	45	--	--	51	--	--
Hydrogen Sulfide	34.1	5184	--	--	4214	--	--	8487	--	--	7882	--	--	3997	--	--	3768	--	--
iso-Butane	58.1	166	--	492	231	--	--	57	--	266	38	--	112	159	--	--	226	--	--
Methane	16.0	161	--	752	229	--	--	53	--	177	36	--	--	192	--	--	236	--	--
Methanol	32.0	13	--	--	17	--	--	8	--	--	7	--	--	13	--	--	17	--	--
Methyl mercaptan	48.1	250	--	--	140	--	303	415	--	--	352	--	--	102	--	--	98	--	--
m-Xylene	106.2	278	--	--	438	--	--	139	--	--	117	--	--	352	--	--	456	--	--
Naphthalene	128.2	121	--	--	199	--	--	63	--	--	58	--	--	162	--	--	210	--	--
n-Butane	58.1	250	--	5961	409	--	2322	86	--	556	57	--	485	200	--	573	349	--	--
n-Heptane	100.2	3315	--	--	5663	--	--	1028	--	--	680	--	--	3864	--	--	5831	--	--
n-Hexane	86.2	842	--	12461	1523	--	3391	243	--	2690	162	--	--	1079	--	--	1607	--	--
Nitric Acid	63.0	15	--	--	15	--	31	28	--	--	26	--	--	13	--	--	13	--	44
Nitric Oxide	30.0	519	--	--	319	--	--	661	--	--	884	--	--	264	--	--	243	--	--
Nitrogen Dioxide	46.0	166	--	1086	92	--	341	224	--	497	186	--	892	60	--	124	58	--	--
Nitrous Acid	47.0	4	--	--	4	--	--	4	--	--	6	--	--	4	--	--	2	--	--
n-Octane	114.2	3265	--	--	5909	--	--	925	--	--	617	--	--	3349	--	--	5549	--	--
n-Pentane	72.2	454	--	3425	788	--	--	136	--	805	91	--	--	534	--	--	791	--	--
o-Xylene	106.2	682	--	--	1190	--	--	195	--	--	126	--	--	834	--	--	1177	--	--
Ozone	48.0	37	--	--	49	--	--	24	--	--	20	--	--	39	--	--	51	--	--
Propane	44.1	252	--	3832	424	--	--	74	--	869	47	--	--	294	--	--	431	--	--
p-Xylene	106.2	621	--	--	1072	--	--	278	--	--	269	--	--	790	--	--	1129	--	--
Styrene	104.2	85	--	251	132	--	--	55	--	115	47	--	--	102	--	--	141	--	--
Sulfur Dioxide	64.1	168	--	--	149	--	--	236	--	--	257	--	--	139	--	--	126	--	--
Toluene	92.1	881	--	--	1284	--	--	358	--	--	23	--	--	972	--	--	1213	--	--

Energy Corp. Compressor Station (ug/m^3)

Compound	MW	6/28/10			6/29/10						6/30/10						7/1/10		
		5:57 pm - 12:00 pm			4:30 am - 12:00 pm			5:00 pm - 12:00 am			5:00 am - 12:00 pm			5:00 pm - 12:00 am			4:45 am - 12:00 pm		
		Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)
1,2,4-Trimethylbenzene	120.2	1032	--	--	516	--	--	895	--	--	1194	--	--	2585	--	--	752	--	--
2-Methoxy-2-methylpropane (MTBE)	88.2	36	--	101	14	--	58	25	--	--	18	--	184	25	--	--	18	--	148
2-Methyl Butane	72.2	186	--	--	268	--	--	198	--	--	316	--	--	3145	--	--	395	--	--
2-Methyl Pentane	86.2	204	--	--	293	--	--	187	--	--	307	--	--	6858	--	--	518	--	--
3-Methyl Pentane	86.2	222	--	--	321	--	--	208	--	--	335	--	--	4512	--	--	494	--	--
Benzene	78.1	246	--	--	166	--	457	243	--	--	335	--	--	415	--	--	236	--	--
Carbon Disulfide	76.1	405	--	--	125	--	--	352	--	--	131	--	--	252	--	--	202	--	--
Carbon Monoxide	28.0	25	--	290	10	24	210	26	--	178	41	--	90	58	--	--	21	--	360
Carbonyl Sulfide	60.1	17	--	--	5	--	--	15	--	--	7	--	--	25	--	--	7	--	--
Chloromethane	50.5	299	--	--	153	--	--	215	--	--	173	--	--	178	--	--	167	--	--
Dimethyl sulfide	62.1	213	--	--	142	--	--	173	--	--	130	--	--	163	--	--	142	--	--
Ethane	30.1	173	--	1059	235	--	559	159	--	348	259	--	--	4166	--	--	400	--	855
Ethylbenzene	106.2	699	--	1437	512	--	--	721	--	1959	1051	--	2189	1424	--	--	764	--	--
Formaldehyde	30.0	16	--	--	14	--	--	15	--	--	25	--	--	429	--	--	26	--	--
Hydrogen Chloride	36.5	27	--	--	22	--	--	28	--	--	51	--	--	672	--	--	45	--	--
Hydrogen Sulfide	34.1	8119	--	--	5097	--	--	5641	--	--	4857	--	--	8926	--	--	5144	--	--
iso-Butane	58.1	107	--	214	152	--	--	105	--	--	171	--	--	2978	--	--	264	--	--
Methane	16.0	81	235	5645	55	722	3336	96	218	1393	178	--	11325	1968	15717	29349	109	1253	22239
Methanol	32.0	9	--	--	7	--	--	9	--	--	13	--	--	16	--	--	9	--	62
Methyl mercaptan	48.1	401	--	--	234	--	551	297	--	--	242	--	700	301	--	807	293	--	624
m-Xylene	106.2	252	--	--	117	--	--	200	--	--	265	--	--	473	--	--	174	--	--
Naphthalene	128.2	121	--	--	58	--	--	94	--	--	121	--	--	225	--	--	79	--	--
n-Butane	58.1	119	--	395	116	--	418	188	--	475	240	--	589	537	1253	1585	212	--	1585
n-Heptane	100.2	2163	--	--	3294	--	--	2262	--	--	3794	--	--	39574	--	--	4958	--	--
n-Hexane	86.2	546	--	--	786	--	--	578	--	--	927	--	--	9031	--	--	1149	--	--
Nitric Acid	63.0	26	--	--	13	--	28	18	--	--	15	--	70	18	--	52	13	--	--
Nitric Oxide	30.0	1010	--	--	248	--	700	693	--	--	276	--	--	1135	--	--	308	--	2229
Nitrogen Dioxide	46.0	397	--	871	480	--	--	271	--	786	248	--	--	5056	--	--	623	--	--
Nitrous Acid	47.0	6	--	--	2	--	--	4	--	--	4	--	--	4	--	--	2	--	8
n-Octane	114.2	1892	--	--	2863	--	--	1967	--	--	3391	--	--	38598	--	--	4508	--	--
n-Pentane	72.2	277	--	--	363	--	--	313	--	--	528	--	--	4142	--	--	561	--	--
o-Xylene	106.2	321	--	--	113	--	--	369	--	--	512	--	--	912	--	--	278	--	--
Ozone	48.0	27	--	--	20	--	51	26	--	--	35	--	--	47	--	--	24	--	59
Propane	44.1	161	--	--	231	--	--	168	--	--	272	--	--	3012	--	--	346	--	--
p-Xylene	106.2	673	--	--	291	--	--	491	--	--	612	--	--	1203	--	--	386	--	--
Styrene	104.2	77	--	--	43	--	--	68	--	162	98	--	205	141	--	--	72	--	145
Sulfur Dioxide	64.1	265	--	--	134	--	--	189	--	--	157	--	--	173	--	--	155	--	--
Toluene	92.1	516	--	--	245	--	--	572	--	--	900	--	--	1152	--	--	546	--	--

Yeager Impoundment (ug/m^3)

Compound	MW	7/19/10			7/20/10						7/21/10						7/22/10		
		5:40 pm - 12:00 am			4:45 am - 12:00 pm			5:00 pm - 12:00 am			4:30 am - 12:00 pm			7:00 pm - 12:00 am			5:00 am - 12:00 pm		
		Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)	Detect. Limit (ug/m3)	Avg. Conc. (ug/m3)	Max. Conc. (ug/m3)
1,2,4-Trimethylbenzene	120.2	2497	--	--	1799	--	--	2359	--	--	973	--	--	2074	--	--	1966	--	--
2-Methoxy-2-methylpropane (MTBE)	88.2	32	--	--	36	--	350	25	--	76	14	--	47	18	--	--	32	--	177
2-Methyl Butane	72.2	198	--	--	292	--	--	227	--	--	153	--	--	236	--	--	242	--	--
2-Methyl Pentane	86.2	247	--	--	324	--	--	250	--	--	204	--	--	300	--	--	289	--	--
3-Methyl Pentane	86.2	250	--	--	328	--	--	257	--	--	201	--	--	303	--	--	296	--	--
Benzene	78.1	549	--	--	527	--	--	501	--	--	307	--	--	575	--	--	581	--	--
Carbon Disulfide	76.1	237	--	--	218	--	--	165	--	--	81	--	--	121	--	--	196	--	--
Carbon Monoxide	28.0	62	--	323	52	--	229	58	--	--	25	--	--	58	--	--	54	--	135
Carbonyl Sulfide	60.1	20	--	--	22	--	--	17	--	--	5	--	--	10	--	--	15	--	--
Chloromethane	50.5	289	--	--	411	--	--	252	--	--	134	--	--	159	--	--	264	--	--
Dimethyl sulfide	62.1	150	--	--	224	--	--	140	--	--	71	--	--	86	--	--	165	--	--
Ethane	30.1	210	--	--	261	--	--	203	--	--	168	--	--	247	--	--	235	--	--
Ethylbenzene	106.2	1190	--	--	1620	--	--	1173	--	--	886	--	--	1220	--	--	1368	--	--
Formaldehyde	30.0	29	--	--	31	--	--	28	--	--	17	--	--	33	--	--	31	--	--
Hydrogen Chloride	36.5	57	--	--	58	--	--	55	--	--	31	--	--	64	--	--	58	--	--
Hydrogen Sulfide	34.1	6283	--	--	7717	--	--	5948	--	--	3314	--	--	3855	--	--	6179	--	--
iso-Butane	58.1	128	--	--	157	--	--	135	--	--	83	--	--	138	--	--	143	--	--
Methane	16.0	161	--	813	159	389	952	179	--	470	95	202	769	171	--	495	126	335	723
Methanol	32.0	17	--	51	18	--	--	17	--	--	10	--	--	18	--	--	18	--	--
Methyl mercaptan	48.1	232	--	1428	472	--	2457	230	--	1973	114	--	266	157	--	307	299	--	1188
m-Xylene	106.2	638	--	--	577	--	--	590	--	--	291	--	--	608	--	--	495	--	--
Naphthalene	128.2	283	--	--	257	--	--	273	--	--	126	--	--	257	--	--	246	--	--
n-Butane	58.1	178	--	--	219	--	--	185	--	--	143	--	--	223	--	--	235	--	--
n-Heptane	100.2	2381	--	--	3221	--	--	2680	--	--	1491	--	--	2549	--	--	2725	--	--
n-Hexane	86.2	578	--	--	835	--	--	677	--	--	441	--	--	680	--	--	691	--	--
Nitric Acid	63.0	28	--	--	33	--	--	23	--	--	13	--	--	13	--	--	23	--	--
Nitric Oxide	30.0	1039	--	--	836	--	--	830	--	--	228	--	--	376	--	--	788	--	--
Nitrogen Dioxide	46.0	130	--	--	222	--	--	120	--	--	66	--	--	83	--	--	151	--	--
Nitrous Acid	47.0	6	--	--	8	--	--	6	--	--	2	--	--	4	--	--	4	--	19
n-Octane	114.2	2060	--	--	2789	--	--	2326	--	--	1289	--	--	2195	--	--	2340	--	--
n-Pentane	72.2	392	--	--	531	--	--	460	--	--	271	--	--	475	--	--	443	--	--
o-Xylene	106.2	834	--	--	973	--	--	816	--	--	456	--	--	812	--	--	777	--	--
Ozone	48.0	49	--	98	55	--	--	39	--	118	33	--	--	55	--	96	63	--	--
Propane	44.1	222	--	--	287	--	--	240	--	--	144	--	307	247	--	--	249	--	--
p-Xylene	106.2	1776	--	--	1463	--	--	1719	--	--	747	--	--	1671	--	--	1441	--	--
Styrene	104.2	192	--	--	166	--	--	183	--	--	89	--	--	200	--	--	196	--	--
Sulfur Dioxide	64.1	204	--	--	246	--	--	194	--	--	126	--	--	139	--	--	183	--	--
Toluene	92.1	1160	--	--	1247	--	--	1134	--	--	682	--	--	1062	--	--	1088	--	--

Appendix B: Canister Data

Canister Data All Sites (ppbv)

Compounds	MDL	Concentration (ppbv)																
		Florence 001	Florence 002	Florence 003	Stewart 001	Stewart 002	Stewart 003	CrossCreek 001	CrossCreek 002	CrossCreek 003	EnergyCorp 001	EnergyCorp 002	EnergyCorp 003	Yeager 001	Yeager 002	Yeager 003	Arendtsville	Marcus Hook
1,1,1-Trichloroethane	0.042	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.067	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-trifluoroethane	0.025	0.084	0.099	0.094	--	0.073	0.098	0.088	0.081	0.083	0.081	0.077	0.090	0.086	0.094	0.10	0.084	0.081
1,1,2-Trichloroethane	0.024	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	0.035	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	0.023	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.037	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.042	0.062
1,2,4-Trimethylbenzene	0.036	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.028	0.089
1,2-Dibromoethane	0.026	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.026	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	0.050	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	0.025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.013	--
1,2-Dichloropropane	0.024	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.017	0.015
1,3,5-Trimethylbenzene	0.064	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.033
1,3-Butadiene	0.164	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	0.050	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	0.049	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.026
1-Bromopropane	0.021	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-Ethyl-4-methylbenzene	0.048	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.037	0.036
2-Butanone (MEK)	0.160	0.28	0.56	0.42	0.31	0.51	0.40	0.96	0.68	1.4	0.62	--	0.75	0.78	0.89	0.70	0.89	0.79
2-Hexanone	0.148	0.63	--	--	--	--	--	0.17	--	--	0.25	--	--	0.28	--	--	0.13	0.081
2-Methoxy-2-methylpropane (MTBE)	0.041	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone (MIBK)	0.148	0.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	0.177	9.9	7.0	7.1	3.7	9.9	5.4	--	7.6	4.6	6.7	4.6	17	10	7.4	13	7.9	7.4
Acrolein	0.053	0.18	0.31	0.41	--	0.53	--	--	0.66	0.40	0.33	1.6	0.34	0.55	--	0.97	0.86	0.54
Benzene	0.022	0.092	0.093	0.25	0.16	0.11	0.13	0.22	0.20	0.42	0.14	0.11	0.093	0.10	0.15	0.11	0.16	0.54
Bromodichloromethane	0.024	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	0.024	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	0.025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.014	0.027
Carbon disulfide	0.151	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.079
Carbon tetrachloride	0.025	0.11	0.13	0.12	0.072	0.098	0.11	0.094	0.11	0.094	0.10	0.087	0.11	0.074	0.068	0.10	0.11	0.10
Chlorobenzene	0.024	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.017	0.031
Chloroethane	0.027	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.055	0.032
Chloroethene	0.025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.016
Chloroform	0.023	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.013	0.016
Chloromethane	0.028	0.59	0.68	0.61	--	0.58	0.64	0.61	0.66	0.66	0.64	0.70	0.67	0.82	0.88	0.87	0.56	0.55
cis-1,2-Dichloroethene	0.023	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.012	--
cis-1,3-Dichloro-1-propene	0.040	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	0.026	--	--	--	--	--	--	--	0.31	1.0	0.14	--	--	--	--	--	0.026	0.17
Dibromochloromethane	0.024	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	0.026	0.55	0.65	0.62	--	0.56	0.69	0.62	0.63	0.62	0.58	0.59	0.63	0.70	0.72	0.89	0.56	0.55
Ethylbenzene	0.021	--	--	--	--	--	--	0.026	--	0.024	--	0.044	--	--	--	--	0.019	0.083
Hexachloro-1,3-butadiene	0.054	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.029	0.032
m&p-Xylene	0.045	--	--	--	--	--	--	0.070	--	0.12	0.062	0.14	--	--	0.060	--	0.043	0.29
Methylene chloride	0.021	0.065	0.076	0.065	0.059	0.090	--	0.054	0.058	0.069	--	0.054	0.063	--	--	0.053	0.23	0.15
n-Heptane	0.024	0.060	--	--	--	0.058	0.039	0.17	0.72	2.6	0.050	0.33	0.080	0.053	--	0.072	0.044	0.18
n-Hexane	0.021	--	0.034	0.035	--	--	--	0.53	2.5	9.0	0.12	0.42	0.11	0.12	0.12	0.16	0.053	0.44
o-Xylene	0.021	--	--	--	--	--	--	0.026	--	0.028	0.025	0.032	0.026	--	--	--	0.018	0.096
Propene	0.152	0.42	0.50	0.53	0.61	1.3	2.2	2.0	5.8	12	1.3	4.2	1.2	1.4	1.4	1.9	0.60	14
Styrene	0.020	--	--	--	--	--	--	--	--	--	0.051	0.045	0.069	0.070	0.058	0.083	0.024	0.018
Tetrachloroethene (PERC)	0.021	--	--	--	--	--	--	--	--	--	--	0.092	0.030	--	--	--	0.016	0.037
Tetrahydrofuran (THF)	0.051	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.027	0.029
Toluene	0.023	0.082	0.068	0.16	0.14	0.14	0.18	0.19	0.17	0.35	0.24	0.25	0.15	0.13	0.20	0.17	0.17	1.7
trans-1,2-Dichloroethene	0.026	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.015	--
trans-1,3-Dichloro-1-propene	0.040	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	0.025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.013	--
Trichlorofluoromethane	0.026	0.25	0.30	0.29	--	0.24	0.32	0.27	0.26	0.26	0.26	0.24	0.26	0.27	0.28	0.30	0.26	0.25

-- Not Detected

Canister Data All Sites (ug/m^3)

Compounds	MDL	Concentration (ug/m^3)																
		Florence 001	Florence 002	Florence 003	Stewart 001	Stewart 002	Stewart 003	CrossCreek 001	CrossCreek 002	CrossCreek 003	EnergyCorp 001	EnergyCorp 002	EnergyCorp 003	Yeager 001	Yeager 002	Yeager 003	Arendtsville	Marcus Hook
1,1,1-Trichloroethane	0.230	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	0.462	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloro-1,2,2-trifluoroethane	0.194	0.64	0.76	0.72	--	0.56	0.75	0.67	0.62	0.64	0.62	0.59	0.69	0.66	0.72	0.77	0.64	0.62
1,1,2-Trichloroethane	0.132	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	0.142	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethene	0.091	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	0.274	1.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.31	0.46
1,2,4-Trimethylbenzene	0.175	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.14	0.44
1,2-Dibromoethane	0.198	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloro-1,1,2,2-tetrafluoroethane	0.184	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	0.301	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	0.101	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.054	--
1,2-Dichloropropane	0.110	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.076	0.067
1,3,5-Trimethylbenzene	0.316	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.16
1,3-Butadiene	0.362	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	0.302	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	0.297	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.15
1-Bromopropane	0.108	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1-Ethyl-4-methylbenzene	0.238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.18	0.17
2-Butanone (MEK)	0.473	0.83	1.7	1.2	0.91	1.5	1.2	2.8	2.0	4.1	1.8	--	2.2	2.3	2.6	2.1	2.6	2.3
2-Hexanone	0.606	2.6	--	--	--	--	--	0.70	--	--	1.0	--	--	1.1	--	--	0.51	0.33
2-Methoxy-2-methylpropane (MTBE)	0.148	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-pentanone (MIBK)	0.606	3.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	0.419	24	17	17	8.8	24	13	--	18	11	16	11	40	24	18	31	19	18
Acrolein	0.122	0.41	0.71	0.94	--	1.2	--	--	1.5	0.92	0.76	3.7	0.78	1.3	--	2.2	2.0	1.2
Benzene	0.071	0.29	0.30	0.80	0.51	0.35	0.42	0.70	0.64	1.3	0.45	0.35	0.30	0.32	0.48	0.35	0.52	1.7
Bromodichloromethane	0.160	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	0.253	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	0.098	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.053	0.11
Carbon disulfide	0.471	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25
Carbon tetrachloride	0.157	0.69	0.82	0.75	0.45	0.62	0.69	0.59	0.69	0.59	0.63	0.55	0.69	0.47	0.43	0.63	0.67	0.63
Chlorobenzene	0.112	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.077	0.14
Chloroethane	0.072	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.14	0.084
Chloroethene	0.065	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.041
Chloroform	0.113	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.062	0.077
Chloromethane	0.058	1.2	1.4	1.3	--	1.2	1.3	1.3	1.4	1.4	1.3	1.4	1.4	1.7	1.8	1.8	1.2	1.1
cis-1,2-Dichloroethene	0.090	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.049	--
cis-1,3-Dichloro-1-propene	0.182	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyclohexane	0.088	--	--	--	--	--	--	--	1.1	3.4	0.48	--	--	--	--	--	0.090	0.57
Dibromochloromethane	0.206	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorodifluoromethane	0.128	2.7	3.2	3.1	--	2.8	3.4	3.1	3.1	3.1	2.9	2.9	3.1	3.5	3.6	4.4	2.8	2.7
Ethylbenzene	0.093	--	--	--	--	--	--	0.11	--	0.10	--	0.19	--	--	--	--	0.084	0.36
Hexachloro-1,3-butadiene	0.575	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.31	0.34
m&p-Xylene	0.197	--	--	--	--	--	--	0.30	--	0.52	0.27	0.61	--	--	0.26	--	0.18	1.3
Methylene chloride	0.074	0.23	0.26	0.23	0.20	0.31	--	0.19	0.20	0.24	--	0.19	0.22	--	--	0.18	0.79	0.51
n-Heptane	0.100	0.25	--	--	--	0.24	0.16	0.70	3.0	11	0.20	1.4	0.33	0.22	--	0.30	0.18	0.75
n-Hexane	0.072	--	0.12	0.12	--	--	--	1.9	8.8	32	0.42	1.5	0.39	0.42	0.42	0.56	0.19	1.6
o-Xylene	0.092	--	--	--	--	--	--	0.11	--	0.12	0.11	0.14	0.11	--	--	--	0.078	0.41
Propene	0.263	0.72	0.86	0.91	1.1	2.2	3.8	3.4	10.0	21	2.2	7.2	2.1	2.4	2.4	3.3	1.0	24
Styrene	0.084	--	--	--	--	--	--	--	--	--	0.22	0.19	0.29	0.30	0.25	0.35	0.10	0.079
Tetrachloroethene (PERC)	0.139	--	--	--	--	--	--	--	--	--	--	0.62	0.20	--	--	--	0.11	0.25
Tetrahydrofuran (THF)	0.150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.080	0.085
Toluene	0.086	0.31	0.26	0.60	0.53	0.53	0.68	0.72	0.64	1.3	0.90	0.94	0.56	0.49	0.75	0.64	0.64	6.4
trans-1,2-Dichloroethene	0.105	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.059	--
trans-1,3-Dichloro-1-propene	0.182	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene (TCE)	0.134	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.068	--
Trichlorofluoromethane	0.148	1.4	1.7	1.6	--	1.3	1.8	1.5	1.5	1.5	1.5	1.3	1.5	1.5	1.6	1.7	1.4	1.4

-- Not Detected

Appendix C: Reference Concentrations

MAU – Reference Concentrations (RfC)

CAS#	Compound	RfC		
		REL (ug/m3)	AEGL (ug/m3)	ERPG-1 (ug/m3)
95-63-6	1,2,4-Trimethylbenzene			
1634-04-4	2-Methoxy-2-methylpropane (MTBE)		180000	
78-78-4	2-Methyl Butane			
73513-42-5	2-Methyl Pentane			
96-14-0	3-Methyl Pentane			
71-43-2	Benzene	1300	170000	170000
75-15-0	Carbon Disulfide	6200	40000	40000
630-08-0	Carbon Monoxide			
463-58-1	Carbonyl Sulfide		**140000**	
74-87-3	Chloromethane		**1900000**	
75-18-3	Dimethyl sulfide			
74-84-0	Ethane			
100-41-4	Ethylbenzene		140000	
50-00-0	Formaldehyde	55	1100	1100
7647-01-0	Hydrogen Chloride	2100	2700	2700
7783-06-4	Hydrogen Sulfide	42	710	710
75-28-5	iso-Butane			
74-82-8	Methane			
67-56-1	Methanol	28000	690000	690000
74-93-1	Methyl mercaptan			
1330-20-7	m-Xylene	22000		
91-20-3	Naphthalene			
106-97-8	n-Butane			
142-82-5	n-Heptane			
110-54-3	n-Hexane		**12000000**	
7697-37-2	Nitric Acid			
	Nitric Oxide			
10102-44-0	Nitrogen Dioxide			
7782-77-6	Nitrous Acid			
111-65-9	n-Octane			
109-66-0	n-Pentane			
95-47-6	o-Xylene			
10028-15-6	Ozone			
74-98-6	Propane			
1330-20-7	p-Xylene	22000		
100-42-5	Styrene	21000	85000	85000
7446-09-5	Sulfur Dioxide			
108-88-3	Toluene	37000	750000	750000

Sources
REL - CalEPA Recommended Exposure Limits (1-hr)
AEGL-1 - EPA Acute Exposure Guideline Levels for Mild Effects (1-hr)
AEGL-2 - EPA Acute Exposure Guideline Levels for Moderate Effects (1-hr)
ERPG-1 - DOE Emergency Removal Program Guidelines for Mild or Transient Effects (1-hr)

Canister - Reference Concentrations (RfC)

CAS#	Preferred Compound Names	Acute RfC (ug/m3)	Source RfC
71-55-6	1,1,1-Trichloroethane	9000	IRIS
79-34-5	1,1,2,2-Tetrachloroethane		
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane		
79-00-5	1,1,2-Trichloroethane		
75-34-3	1,1-Dichloroethane		
75-35-4	1,1-Dichloroethene		
120-82-1	1,2,4-Trichlorobenzene		
95-63-6	1,2,4-Trimethylbenzene		
106-93-4	1,2-Dibromoethane		
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane		
95-50-1	1,2-Dichlorobenzene		
107-06-2	1,2-Dichloroethane		
78-87-5	1,2-Dichloropropane	231	ATSDR
108-67-8	1,3,5-Trimethylbenzene		
106-99-0	1,3-Butadiene	220	ATSDR
541-73-1	1,3-Dichlorobenzene		
106-46-7	1,4-Dichlorobenzene	12000	ATSDR
106-94-5	1-Bromopropane		
622-96-8	1-Ethyl-4-methylbenzene		
78-93-3	2-Butanone (MEK)	13000	CALEPA
591-78-6	2-Hexanone		
1634-04-4	2-Methoxy-2-methylpropane (MTBE)	7210	ATSDR
108-10-1	4-Methyl-2-pentanone (MIBK)		
67-64-1	Acetone	61800	ATSDR
107-02-8	Acrolein	6.88	ATSDR
71-43-2	Benzene	28.8	ATSDR
75-27-4	Bromodichloromethane		
75-25-2	Bromoform		
74-83-9	Bromomethane	194	ATSDR
75-15-0	Carbon disulfide	6200	CALEPA
56-23-5	Carbon tetrachloride	1900	CALEPA
108-90-7	Chlorobenzene		
75-00-3	Chloroethane	39600	ATSDR
75-01-4	Chloroethene	1280	ATSDR
67-66-3	Chloroform	488	ATSDR
74-87-3	Chloromethane	1030	ATSDR
156-59-2	cis-1,2-Dichloroethene		
10061-01-5	cis-1,3-Dichloro-1-propene		
110-82-7	Cyclohexane		
124-48-1	Dibromochloromethane		
75-71-8	Dichlorodifluoromethane		
100-41-4	Ethylbenzene	43400	ATSDR
87-68-3	Hexachloro-1,3-butadiene		
108-38-3	m&p-Xylene	8680	ATSDR
75-09-2	Methylene chloride	2080	ATSDR
142-82-5	n-Heptane		
110-54-3	n-Hexane		
95-47-6	o-Xylene	22000	CALEPA
115-07-1	Propene		
100-42-5	Styrene	8520	ATSDR
127-18-4	Tetrachloroethene (PERC)	1360	ATSDR
109-99-9	Tetrahydrofuran (THF)		
108-88-3	Toluene	3770	ATSDR
156-60-5	trans-1,2-Dichloroethene	793	ATSDR
10061-02-6	trans-1,3-Dichloro-1-propene		
79-01-6	Trichloroethylene (TCE)	10700	ATSDR
75-69-4	Trichlorofluoromethane		

Sources
ATSDR - Agency for Toxics Substances and Disease Registry
CalEPA - California EPA
IRIS - EPA's Integrated Risk Information System
HEAST - EPA's Health Effects Assessment Summary Tables
NCEA - EPA's National Center for Environmental Assessment
PROV - EPA's Provisional Peer Reviewed Toxicity Values

Appendix D: Mobile Analytical Unit Hazard Calculations

OP-FTIR – Florence COPAMS Maximum

Compound	Hazard Quotient (Highest Conc/REL)						Hazard Quotient (Highest Conc/AEGL)						Hazard Quotient (Highest Conc/ERPG-1)					
	4/27/10		4/28/10		4/29/10		4/27/10		4/28/10		4/29/10		4/27/10		4/28/10		4/29/10	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
1,2,4-Trimethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methoxy-2-methylpropane (MTBE)	--	--	--	--	--	--	--	--	--	0.00	0.00	--	--	--	--	--	--	--
2-Methyl Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methyl Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methyl Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	0.38	--	--	--	0.52	--	0.00	--	--	--	0.00	--	0.00	--	--	--	0.00
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Monoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbonyl Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	0.00	0.01	0.02	0.01	0.02	--	--	--	--	--	--
Formaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
iso-Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methanol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl mercaptan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Heptane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitric Acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitric Oxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen Dioxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrous Acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Octane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ozone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
p-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	0.01	0.01	0.02	0.01	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Sulfur Dioxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hazard Index	0.01	0.38	0.02	0.01	0.01	0.54	0.00	0.01	0.01	0.02	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.01

OP-FTIR – Stewart Compressor Station Maximum

Compound	Hazard Quotient (Highest Conc/REL)						Hazard Quotient (Highest Conc/AEGL)						Hazard Quotient (Highest Conc/ERPG-1)					
	5/18/10		5/19/10		5/20/10		5/18/10		5/19/10		5/20/10		5/18/10		5/19/10		5/20/10	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
1,2,4-Trimethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methoxy-2-methylpropane (MTBE)	--	--	--	--	--	--	0.00	0.00	0.00	0.00	0.00	--	--	--	--	--	--	--
2-Methyl Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methyl Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methyl Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	0.51	--	--	--	--	--	0.00	--	--	--	--	--	0.00	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Monoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbonyl Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	0.01	0.01	0.08	0.02	--	--	--	--	--	--
Formaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
iso-Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methanol	--	--	--	0.00	0.00	0.00	--	--	--	0.00	0.00	0.00	--	--	--	0.00	0.00	0.00
Methyl mercaptan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Heptane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	--	--	--	--	--	--	--	0.00	0.00	0.00	0.00	--	--	--	--	--	--	--
Nitric Acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitric Oxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen Dioxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrous Acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Octane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ozone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
p-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	0.01	0.01	0.01	0.01	--	--	0.00	0.00	0.00	0.00	--	--	0.00	0.00	0.00	0.00	--	--
Sulfur Dioxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hazard Index	0.01	0.52	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.08	0.02	0.00	0.01	0.00	0.00	0.00	0.00

OP-FTIR – Cross Creek Tank Farm Maximum

Compound	Hazard Quotient (Highest Conc/REL)						Hazard Quotient (Highest Conc/AEGL)						Hazard Quotient (Highest Conc/ERPG-1)					
	6/8/10		6/9/10		6/10/10		6/8/10		6/9/10		6/10/10		6/8/10		6/9/10		6/10/10	
	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening
1,2,4-Trimethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methoxy-2-methylpropane (MTBE)	--	--	--	--	--	--	0.00	--	0.00	0.00	--	--	--	--	--	--	--	--
2-Methyl Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methyl Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methyl Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	1.86	--	--	0.51	--	--	0.01	--	--	0.00	--	--	0.01	--	--	0.00	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Monoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbonyl Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	0.02	--	0.01	--	--	--	--	--	--	--	--	--
Formaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
iso-Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methanol	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methyl mercaptan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Heptane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	--	--	--	--	--	--	0.00	0.00	0.00	--	--	--	--	--	--	--	--	--
Nitric Acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitric Oxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen Dioxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrous Acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Octane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ozone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
p-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	0.01	--	0.01	--	--	--	0.00	--	0.00	--	--	--	0.00	--	0.00	--	--	--
Sulfur Dioxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hazard Index	1.87	--	0.01	0.51	--	--	0.04	0.00	0.01	0.01	--	--	0.02	--	0.00	0.00	--	--

OP-FTIR – Energy Corp. Compressor Station Maximum

Compound	Hazard Quotient (Highest Conc/REL)							Hazard Quotient (Highest Conc/AEGL)							Hazard Quotient (Highest Conc/ERPG-1)						
	6/28/10	6/29/10		6/30/10		7/1/10		6/28/10	6/29/10		6/30/10		7/1/10		6/28/10	6/29/10		6/30/10		7/1/10	
	Evening	Morning	Evening	Morning	Evening	Morning		Evening	Morning	Evening	Morning	Evening	Morning		Evening	Morning	Evening	Morning	Evening	Morning	
1,2,4-Trimethylbenzene	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
2-Methoxy-2-methylpropane (MTBE)	--	--	--	--	--	--		0.00	0.00	--	0.00	--	0.00		--	--	--	--	--	--	
2-Methyl Butane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
2-Methyl Pentane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
3-Methyl Pentane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Benzene	--	0.35	--	--	--	--		--	0.00	--	--	--	--		--	0.00	--	--	--	--	
Carbon Disulfide	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Carbon Monoxide	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Carbonyl Sulfide	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Chloromethane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Dimethyl sulfide	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Ethane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Ethylbenzene	--	--	--	--	--	--		0.01	--	0.01	0.02	--	--		--	--	--	--	--	--	
Formaldehyde	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Hydrogen Chloride	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Hydrogen Sulfide	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
iso-Butane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Methane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Methanol	--	--	--	--	--	0.00		--	--	--	--	--	0.00		--	--	--	--	--	--	0.00
Methyl mercaptan	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
m-Xylene	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Naphthalene	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
n-Butane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
n-Heptane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
n-Hexane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Nitric Acid	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Nitric Oxide	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Nitrogen Dioxide	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Nitrous Acid	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
n-Octane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
n-Pentane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
o-Xylene	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Ozone	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Propane	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
p-Xylene	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Styrene	--	--	0.01	0.01	--	0.01		--	--	0.00	0.00	--	0.00		--	--	0.00	0.00	--	0.00	
Sulfur Dioxide	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Toluene	--	--	--	--	--	--		--	--	--	--	--	--		--	--	--	--	--	--	
Hazard Index	--	0.35	0.01	0.01	--	0.01		0.01	0.00	0.02	0.02	--	0.00		--	0.00	0.00	0.00	--	0.00	

OP-FTIR – Yeager Impoundment Maximum

Compound	Hazard Quotient (Highest Conc/REL)						Hazard Quotient (Highest Conc/AEGL)						Hazard Quotient (Highest Conc/ERPG-1)					
	7/19/10	7/20/10		7/21/10		7/22/10	7/19/10	7/20/10		7/21/10		7/22/10	7/19/10	7/20/10		7/21/10		7/22/10
	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning	Evening	Morning
1,2,4-Trimethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methoxy-2-methylpropane (MTBE)	--	--	--	--	--	--	--	0.00	0.00	0.00	--	0.00	--	--	--	--	--	--
2-Methyl Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methyl Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3-Methyl Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Monoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbonyl Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Formaldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Chloride	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Sulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
iso-Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methanol	0.00	--	--	--	--	--	0.00	--	--	--	--	--	0.00	--	--	--	--	--
Methyl mercaptan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Butane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Heptane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Hexane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitric Acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitric Oxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrogen Dioxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrous Acid	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Octane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
n-Pentane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ozone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
p-Xylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfur Dioxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hazard Index	0.00	--	--	--	--	--	0.00	0.00	0.00	0.00	--	0.00	0.00	--	--	--	--	--

GC/MS – All Sites

Site	Date	Time	Compound	Conc. (ppbv)	MW	Conc. (ug/m3)	Hazard Quotient (HQ)		
							Conc/ REL	Conc/ AEGL	Conc/ ERPG-1
Florence COPAMS	4/29/10	9:05	Benzene	0.50	78.1	1.60	0.00	0.00	0.00
		9:48	Benzene	0.98	78.1	3.13	0.00	0.00	0.00
		10:30	Benzene	0.70	78.1	2.24	0.00	0.00	0.00
Stewart Compressor Stn.	5/18/10	8:54	Toluene	0.62	92.1	2.34	0.00	0.00	0.00
	5/19/10	9:30	Benzene	0.77	78.1	2.46	0.00	0.00	0.00
			Toluene	1.10	92.1	4.14	0.00	0.00	0.00
	5/19/10	21:01	Benzene	0.64	78.1	2.04	0.00	0.00	0.00
	5/20/10	4:47	Benzene	0.50	78.1	1.60	0.00	0.00	0.00
	5/20/10	19:30	Benzene	0.99	78.1	3.16	0.00	0.00	0.00
			Toluene	0.58	92.1	2.18	0.00	0.00	0.00
Cross Creek Tank Farm	6/8/10	6:22	Benzene	0.69	78.1	2.20	0.00	0.00	0.00
			Toluene	0.79	92.1	2.98	0.00	0.00	0.00
	6/8/10	7:10	Benzene	0.49	78.1	1.56	0.00	0.00	0.00
Energy Corp. Compressor Stn.	6/30/10	21:28	Toluene	0.56	92.1	2.11	0.00	0.00	0.00
Yeager Impoundment	7/19/10	19:11	Toluene	0.64	92.1	2.41	0.00	0.00	0.00

Appendix E: Canister Hazard Calculations

Canister- All Sites

Compounds	RAIS 7/15 RfC Acute (ug/m3)	Source RfC	Hazard Quotient (HQ) Acute															
			Florence 001	Florence 002	Florence 003	Stewart 001	Stewart 002	Stewart 003	CrossCreek 001	CrossCreek 002	CrossCreek 003	EnergyCorp 001	EnergyCorp 002	EnergyCorp 003	Yeager 001	Yeager 002	Yeager 003	Arendtsville	Marcus Hook
1,1,1-Trichloroethane	9000	IRIS																	
1,1,2,2-Tetrachloroethane																			
1,1,2-Trichloro-1,2,2-trifluoroethane																			
1,1,2-Trichloroethane																			
1,1-Dichloroethane																			
1,1-Dichloroethene																			
1,2,4-Trichlorobenzene																			
1,2,4-Trimethylbenzene																			
1,2-Dibromoethane																			
1,2-Dichloro-1,1,2,2-tetrafluoroethane																			
1,2-Dichlorobenzene																			
1,2-Dichloroethane																			
1,2-Dichloropropane	231	ATSDR																	
1,3,5-Trimethylbenzene																			
1,3-Butadiene	220	ATSDR																	
1,3-Dichlorobenzene																			
1,4-Dichlorobenzene	12000	ATSDR																	
1-Bromopropane																			
1-Ethyl-4-methylbenzene																			
2-Butanone (MEK)	13000	CALEPA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
2-Hexanone																			
2-Methoxy-2-methylpropane (MTBE)	7210	ATSDR																	
4-Methyl-2-pentanone (MIBK)																			
Acetone	61800	ATSDR	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acrolein	6.88	ATSDR	0.06	0.10	0.14		0.18			0.22	0.13	0.11	0.53	0.11	0.18		0.32	0.29	0.18
Benzene	28.8	ATSDR	0.01	0.01	0.03	0.02	0.01	0.01	0.02	0.02	0.05	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.06
Bromodichloromethane																			
Bromoform																			
Bromomethane	194	ATSDR																	
Carbon disulfide	6200	CALEPA																	
Carbon tetrachloride	1900	CALEPA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chlorobenzene																			
Chloroethane	39600	ATSDR																0.00	0.00
Chloroethene	1280	ATSDR																	
Chloroform	488	ATSDR																	0.00
Chloromethane	1030	ATSDR	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cis-1,2-Dichloroethene																			
cis-1,3-Dichloro-1-propene																			
Cyclohexane																			
Dibromochloromethane																			
Dichlorodifluoromethane																			
Ethylbenzene	43400	ATSDR							0.00		0.00		0.00					0.00	0.00
Hexachloro-1,3-butadiene																			
m&p-Xylene	8680	ATSDR							0.00		0.00	0.00	0.00			0.00		0.00	0.00
Methylene chloride	2080	ATSDR	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00			0.00	0.00	0.00
n-Heptane																			
n-Hexane																			
o-Xylene	22000	CALEPA							0.00		0.00	0.00	0.00	0.00				0.00	0.00
Propene																			
Styrene	8520	ATSDR										0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tetrachloroethene (PERC)	1360	ATSDR											0.00	0.00				0.00	0.00
Tetrahydrofuran (THF)																			
Toluene	3770	ATSDR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
trans-1,2-Dichloroethene	793	ATSDR																	
trans-1,3-Dichloro-1-propene																			
Trichloroethylene (TCE)	10700	ATSDR																	
Trichlorofluoromethane																			
Hazard Index (HI) Acute			0.07	0.12	0.17	0.02	0.19	0.02	0.03	0.24	0.18	0.13	0.55	0.13	0.20	0.02	0.34	0.31	0.24

Appendix F: Mobile Analytical Unit Meteorological Data

Florence COPAMS Background

4/27/10							
Morning				Evening			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
7:15 AM	40	4	300	5:42 PM	75	7	310
7:45 AM	44	6	350	6:30 PM	68	4	350
8:00 AM	46	8	50	7:00 PM	62	6	0
8:30 AM	48	6	330	7:30 PM	56	3	0
9:00 AM	50	5	340	8:00 PM	46	3	30
9:40 AM	52	6	320	8:30 PM	44	1	350
10:00 AM	51	8	340	9:00 PM	42	3	330
10:30 AM	50	12	40	9:30 PM	41	2	310
11:00 AM	53	8	20	10:00 PM	41	2	320
11:35 AM	53	6	20	10:30 PM	40	3	310
12:00 PM	54	8	0	11:00 PM	38	2	320
				11:30 PM	38	2	310
				12:00 AM	38	2	320

4/28/10							
Morning				Evening			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
5:15 AM	30	2	300	4:45 PM	75	10	320
5:34 AM	29	3	300	5:30 PM	79	--	--
6:03 AM	29	2	310	6:00 PM	79	--	--
6:30 AM	30	2	290	6:30 PM	77	5	310
7:15 AM	31	2	310	7:00 PM	73	3	300
7:35 AM	32	1	290	7:30 PM	67	3	320
8:00 AM	34	4	290	8:00 PM	52	1	350
8:35 AM	38	1	300	8:30 PM	47	0	0
9:20 AM	42	4	310	9:00 PM	43	0	0
9:40 AM	44	7	320	9:30 PM	38	0	20
10:00 AM	45	2	280	10:00 PM	37	0	60
10:30 AM	48	6	330	10:30 PM	36	0	60
11:00 AM	49	5	290	11:00 PM	34	0	60
11:40 AM	49	5	350	11:30 PM	33	0	40
12:00 PM	48	2	310	12:00 AM	33	0	50

4/29/10							
Morning				Evening			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
4:50 AM	30	0	190	5:00 PM	71	3	310
5:45 AM	28	0	80	5:30 PM	65	2	280
6:10 AM	28	0	100	6:00 PM	63	0	90
6:30 AM	28	1	130	6:30 PM	66	0	170
7:05 AM	29	2	300	7:00 PM	88	1	140
7:30 AM	32	4	280	7:30 PM	74	1	150
8:20 AM	43	1	260	8:00 PM	63	0	160
8:55 AM	48	3	310	8:30 PM	56	1	220
9:30 AM	52	2	320	9:00 PM	53	0	230
10:07 AM	54	5	270	9:30 PM	50	0	240
10:30 AM	55	4	280	10:00 PM	48	0	220
11:00 AM	61	6	280	10:30 PM	46	0	230
11:30 AM	62	3	190	11:00 PM	45	0	170
12:00 PM	60	3	280	11:30 PM	43	0	200
				11:58 PM	43	2	210

Stewart Compressor Station

5/18/10							
Morning				Evening			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
5:30 AM	53	0	0	4:32 PM	61	0	123
6:00 AM	52	0	0	5:00 PM	61	0	21
6:30 AM	52	0	102	5:33 PM	61	1	26
7:00 AM	52	0	101	5:59 PM	60	0	61
7:30 AM	52	0	101	6:30 PM	59	0	67
8:00 AM	52	2	38	7:05 PM	59	0	65
8:15 AM	Lightning/ Heavy Rain			7:36 PM	59	0	71
9:20 AM	54	0	105	8:00 PM	58	0	28
10:00 AM	54	2	105	8:30 PM	57	0	71
10:30 AM	55	0	102	9:00 PM	56	0	59
11:00 AM	57	0	107	9:30 PM	55	0	5
11:30 AM	57	0	200	10:00 PM	55	0	53
12:00 PM	57	0	200	10:30 PM	55	0	53
				11:00 PM	53	0	38
				11:30 PM	53	0	47
				12:00 AM	52	0	47

5/19/10							
Morning				Evening			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
5:00 AM	52	0	116	5:00 PM	61	8	213
5:30 AM	51	0	360	5:35 PM	60	5	213
6:00 AM	50	0	12	6:05 PM	62	4	200
6:30 AM	50	0	30	6:32 PM	62	5	214
7:00 AM	50	0	21	7:10 PM	62	4	220
7:30 AM	50	0	360	7:30 PM	62	6	207
8:00 AM	50	0	350	8:00 PM	60	5	250
8:30 AM	50	0	350	8:26 PM	59	4	246
9:00 AM	51	0	350	8:32 PM	58	3	252
9:30 AM	51	0	350	9:00 PM	58	3	265
10:00 AM	51	3	17	9:27 PM	57	3	258
10:30 AM	51	4	31	9:58 PM	56	4	271
11:00 AM	52	0	18	10:01 PM	56	3	264
11:30 AM	52	2	26	10:32 PM	56	3	281
12:00 PM	53	0	30	11:18 PM	55	2	266
				11:50 PM	54	0	279

5/20/10							
Morning				Evening			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
5:00 AM	50	0	278	4:25 PM	76	0	40
5:30 AM	50	0	270	5:00 PM	77	0	83
6:00 AM	50	0	272	5:28 PM	77	3	244
6:30 AM	48	0	278	6:02 PM	77	0	266
7:00 AM	40	0	277	6:27 PM	78	0	266
7:30 AM	48	0	270	7:05 PM	78	0	265
8:00 AM	49	0	270	7:35 PM	73	0	251
8:30 AM	50	0	290	8:00 PM	73	0	251
9:00 AM	53	0	250	8:36 PM	70	0	251
9:30 AM	54	3	209	9:00 PM	67	0	251
10:00 AM	57	7	211	9:25 PM	65	0	251
10:30 AM	58	7	213	10:00 PM	63	0	251
11:00 AM	61	2	211	10:26 PM	62	0	251
11:30 AM	64	2	283	11:00 PM	61	0	251
12:00 PM	65	2	57	11:26 PM	60	0	251
				11:55 PM	60	0	251

Cross Creek Tank Farm

6/8/10								6/9/10								6/10/10							
Morning				Evening				Morning				Evening				Morning				Evening			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
5:00 AM	57	4	180	5:00 PM	71	0	275	5:00 AM	59	5	175	5:00 PM	67	3	190	5:00 AM	63	9	192	4:55 PM	76	6	296
5:30 AM	49	2	180	5:30 PM	69	3	313	5:30 AM	56	4	131	5:30 PM	68	5	195	5:30 AM	63	6	203	5:26 PM	77	11	253
6:00 AM	48	3	180	6:00 PM	70	0	348	6:00 AM	57	0	93	6:00 PM	68	5	213	6:00 AM	63	8	225	5:54 PM	77	5	304
6:30 AM	49	3	198	6:30 PM	70	0	348	6:30 AM	56	4	178	6:38 PM	69	1	204	6:30 AM	63	5	205	6:33 PM	75	6	306
7:00 AM	49	2	190	7:00 PM	69	0	13	7:00 AM	56	4	188	7:01 PM	69	7	188	7:00 AM	63	4	219	7:03 PM	74	5	316
7:30 AM	51	2	213	7:30 PM	68	0	13	7:30 AM	57	5	182	7:32 PM	70	4	188	7:30 AM	64	7	195	7:32 PM	75	5	292
8:00 AM	52	4	204	8:00 PM	68	0	13	8:00 AM	58	4	202	8:03 PM	70	5	175	8:00 AM	65	6	218	8:08 PM	73	7	313
8:30 AM	55	2	213	8:30 PM	68	0	63	8:30 AM	59	9	208	8:38 PM	70	6	145	8:30 AM	66	7	227	8:32 PM	72	4	330
9:00 AM	58	2	215	9:00 PM	66	0	63	9:00 AM	60	13	191	9:01 PM	70	4	165	9:00 AM	67	6	233	9:00 PM	70	7	340
9:30 AM	61	3	261	9:30 PM	65	0	99	9:30 AM	61	11	221	9:31 PM	69	7	157	9:30 AM	68	6	248	9:26 PM	69	5	13
10:00 AM	63	5	280	10:00 PM	64	0	28	10:00 AM	62	13	215	10:01 PM	69	7	269	10:00 AM	69	6	178	10:01 PM	69	3	23
10:30 AM	64	4	314	10:30 PM	65	0	38	10:30 AM	63	12	213	10:28 PM	69	5	219	10:30 AM	70	7	216	10:28 PM	69	3	17
11:00 AM	64	3	225	11:00 PM	64	0	71	11:00 AM	63	17	198	11:07 PM	69	4	257	11:00 AM	72	8	242	11:00 PM	67	5	42
11:30 AM	65	9	355	11:30 PM	63	1	113	11:30 AM	64	13	242	11:30 PM	69	3	244	11:30 AM	73	9	234	11:30 PM	66	3	52
				11:58 PM	63	0	73	12:00 PM	65	13	233					12:00 PM	74	8	210	11:58 PM	66	3	60

Energy Corp. Compressor Station

6/28/10				6/29/10								6/30/10								7/1/10			
Evening				Morning				Evening				Morning				Evening				Morning			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
5:45 PM	77	2	251	4:30 AM	66	0	288	5:00 PM	73	7	345	4:30 AM	56	3	306	5:00 PM	72	6	263	4:45 AM	50	2	310
6:15 PM	78	6	221	5:00 AM	66	0	253	5:30 PM	73	5	306	5:00 AM	52	3	304	5:30 PM	72	4	339	5:00 AM	50	4	302
7:00 PM	79	8	187	5:30 AM	65	0	279	6:02 PM	73	4	345	5:30 AM	52	1	307	6:04 PM	72	2	286	5:30 AM	49	2	307
7:37 PM	79	5	244	6:00 AM	65	0	310	6:30 PM	73	4	32	6:00 AM	60	0	307	6:32 PM	72	7	256	6:00 AM	48	2	313
8:02 PM	78	6	212	6:30 AM	65	2	259	7:00 PM	73	4	349	6:30 AM	51	0	307	7:00 PM	72	5	332	6:30 AM	49	2	318
8:35 PM	77	5	219	7:00 AM	64	2	273	7:30 PM	71	7	15	7:00 AM	53	0	309	7:30 PM	70	4	287	7:00 AM	49	0	303
9:12 PM	70	3	282	7:30 AM	65	2	273	8:00 PM	71	5	355	7:30 AM	53	3	315	8:05 PM	69	3	322	7:30 AM	52	0	203
9:35 PM	70	5	292	8:00 AM	67	3	282	8:25 PM	70	4	341	8:00 AM	59	0	290	8:30 PM	68	6	342	8:00 AM	54	1	198
10:02 PM	69	0	198	8:30 AM	68	4	281	9:00 PM	68	4	345	8:30 AM	60	1	190	9:00 PM	66	6	355	8:30 AM	57	1	179
10:32 PM	70	1	234	9:00 AM	68	5	250	9:30 PM	67	2	340	9:00 AM	63	2	213	9:30 PM	65	4	360	9:00 AM	61	0	150
11:02 PM	68	4	276	9:30 AM	69	4	269	10:00 PM	66	6	349	9:30 AM	64	1	304	10:00 PM	64	2	350	9:30 AM	64	3	255
11:28 PM	68	0	191	10:00 AM	70	5	298	10:32 PM	64	5	355	10:00 AM	65	2	299	10:30 PM	63	6	351	10:00 AM	66	4	65
11:58 PM	68	0	189	10:30 AM	71	2	272	11:00 PM	64	6	342	10:30 AM	66	3	341	11:00 PM	62	6	344	10:30 AM	65	6	44
				11:00 AM	72	4	265	11:30 PM	63	4	355	11:00 AM	67	2	306	11:30 PM	61	2	15	11:00 AM	65	4	30
				11:30 AM	73	4	269	11:58 PM	62	6	341	11:30 AM	67	3	299	11:58 PM	60	2	347	11:30 AM	67	2	346
				12:00 PM	73	6	13					12:00 PM	67	4	277					12:00 PM	65	4	289

Yeager Impoundment

7/19/10				7/20/10								7/21/10								7/22/10			
Evening				Morning				Evening				Morning				Evening				Morning			
Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)	Time	Temp (°F)	Wind Speed (mph)	Wind Dir. (Deg.)
5:40 PM	82	10	206	4:30 AM	70	2	63	5:10 PM	81	7	264	4:30 AM	72	6	229	Power Failure				5:00 AM	70	4	270
6:10 PM	82	17	221	5:00 AM	70	0	67	5:30 PM	80	8	263	5:00 AM	72	5	231	7:11 PM	85	9	290	5:30 AM	69	3	290
6:36 PM	82	13	219	5:30 AM	69	0	101	6:00 PM	80	7	234	5:30 AM	72	8	226	7:40 PM	83	6	260	6:08 AM	69	3	290
7:00 PM	82	9	208	6:00 AM	69	2	144	6:30 PM	80	10	243	6:00 AM	72	5	228	8:05 PM	82	9	280	6:30 AM	69	2	300
7:30 PM	80	10	223	6:30 AM	70	1	220	7:00 PM	79	6	225	6:30 AM	72	5	197	8:30 PM	80	9	270	7:00 AM	70	3	290
8:00 PM	80	8	219	7:00 AM	69	5	150	7:30 PM	79	4	276	7:00 AM	72	5	229	9:00 PM	78	6	280	7:30 AM	73	2	290
8:30 PM	79	3	276	7:30 AM	69	3	192	8:00 PM	78	10	211	7:30 AM	72	6	234	9:30 PM	78	7	290	8:20 AM	79	9	270
9:00 PM	77	4	272	8:00 AM	71	8	205	8:30 PM	77	8	225	8:00 AM	73	7	227	10:00 PM	77	8	270	8:35 AM	79	6	280
9:30 PM	76	2	252	8:30 AM	71	10	216	9:00 PM	76	6	238	8:30 AM	74	5	238					9:00 AM	81	5	300
10:05 PM	75	2	248	9:00 AM	72	9	219	10:00 PM	75	4	199	9:00 AM	74	10	219					9:30 AM	82	5	270
10:32 PM	75	0	258	9:30 AM	72	7	201	10:30 PM	74	4	211	9:30 AM	74	6	214					10:05 AM	84	14	280
11:00 PM	75	1	258	10:00 AM	73	8	184	11:00 PM	74	5	192	10:00 AM	74	6	236					10:30 AM	86	12	270
11:30 PM	74	0	224	10:30 AM	75	7	209	11:30 PM	73	4	163	10:30 AM	74	7	209					11:00 AM	86	14	270
11:58 PM	73	0	224	11:00 AM	76	6	223	11:58 PM	73	5	177	11:00 AM	74	5	250					11:30 AM	88	14	310
				11:30 AM	78	7	227					11:30 AM	75	4	198					11:59 AM	87	10	310
				12:00 PM	78	7	103																