School Air Toxic Monitoring Project:

Church Rock Elementary School

by

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ABSTRACT

United States Environmental Protection Agency (USEPA) had identified and recommended air quality monitoring to take place at 63 schools throughout the country. Unfortunately, tribal schools were not considered during the time USEPA conducted the analysis. The importance of identifying any air toxic pollutants affecting school children needs to be analyzed. Conducting an air monitoring toxic analysis on the Navajo Nation at Church Rock Elementary School, Church Rock, New Mexico (CRNM) was carried out. The current school location posed a concern, in regards to the surrounding stationary, mobile, and natural emissions emitted all types of toxic pollutants. USEPA sponsors various air monitoring program, which Tribal Air Monitoring Support (TAMS) program undertook, and offered tribal programs, organizations or agencies to utilized air monitoring equipment's. The air monitoring setup was conducted with the contract Eastern Research Group, Inc. (ERG) laboratory, where collection of 24-hour ambient air samples for 60 days on a 6-day sampling interval were performed. The analysis for volatile organic compounds (VOCs)were collected from canister samples using USEPA Compendium Method TO-15, polycyclic aromatic hydrocarbons (PAHs) from polyurethane foam (PUF) and XAD-2 resin samples using USEPA Compendium Method TO-13A. Carbonyl compounds were collected by sorbent cartridge samples using USEPA Compendium Method TO-11A, and trace of metals from filters were sampled using USEPA Compendium Method IO-3.5 and FEM EQL-0512-202. A total of 53 VOC concentrations were greater than 1 $\mu g/m^3$, where dichlorodifluoromethane, trichlorofluoromethane, chloromethane, dichloromethane, propylene, toluene, acrolein and acetylene were detected. A total of 23 carbonyl compound concentrations were greater than 1 $\mu g/m^3$, where acetone and formaldehyde were measured. Naphthalene average with the highest average for PAHs, where phenanthrene and retene were the second and third highest averages. As for the metals the highest averages resulted from manganese, chromium and lead. Overall, the air toxic pollutants resulted from CRNM surrounding monitoring site were detected. Identifying the potential emitter source or sources cannot be assessed.

DEDICATION

I would like to dedicate this study to my family. Seeking a higher education has been challenging to complete, especially while working a full time job and facing different trials along the way. I am grateful for the encouragement and positive enforcement from family, especially from Stacey, who witness all the sacrifice I endured to get this study completed. Ahehee' (Thank you).

ACKNOWLEDGMENTS

I would like to acknowledge the Tribal Air Monitoring Support (TAMS) Center and ERG Laboratory for assisting me with this study. When this study was proposed as a thought, I was able with your help and assistance to make it a reality. The planning and funding incorporated from your office help me complete this study, as well as benefit the Navajo Nation school children in Church Rock, New Mexico. Ahehee' (Thank you).

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CHAPTER 1

INTRODUCTION

Air pollution has been linked to many negative human health effects, which are caused by a variety of emission sources, stationary and mobile factors. U.S. Environmental Protection Agency (EPA) (2015) states, “People exposed to toxic air pollutants at sufficient concentrations and durations may have an increased chance of getting cancer or experiencing other serious health effects. These health effects can include damage to the immune system, as well as neurological, reproductive (e.g., reduced fertility), developmental, respiratory and other health problems.” The factors emit air toxics that are known or suspected to cause cancer or other serious health problems, which has led to U.S. Environmental Protection Agency (EPA) – Office of Air Quality Planning and Standards (OAQPS) to develop a school air monitoring project called the School Air Toxics Monitoring Program (SATMP). The SATMP now described as the School Air Toxics Monitoring Initiative refer to the project where EPA, state, local and tribal monitoring of outdoor air around schools are conducted to address pollutants of known air toxics (EPA, 2015). EPA took part in a new initiative approach to ensure that children are breathing healthy outdoor air, where air quality monitoring at sixty-three (63) schools throughout the United States (US) was conducted. The importance of gathering air toxic data from various schools across the United States were conducted, but the tribal school air toxic data was lacking, where data could have assist in understanding if tribal school environments were also being affected by surrounding air toxics. Mostly tribal schools were not considered for the EPA’s analysis of selected schools to be included within the merit analysis about air quality. EPA is still addressing concerns about the deficiency of air quality information from surround tribal communities. Therefore, programs like the Tribal Air Monitoring Support (TAMS) Program has assisted with SATMP for tribal communities to perform air monitoring pilot projects, to help gather air monitoring data by loaning air monitoring equipment’s to be setup at designated sites. The Navajo Nation submitted a request through the Church Rock Chapter, located in Church Rock, New Mexico to be selected as an SATMP site to be setup at the Church Rock Elementary School (CRNM) in Church Rock, New Mexico.

Statement of Problem

EPA conducted recommendations at 63 schools across the country to ensure children are breathing healthy outdoor air. This was a new initiative to identify schools where investigation is to be conducted to produce data availabilities to EPA based on the air pollution within the surrounding school grounds. Unfortunately, schools on tribal lands have limited air pollution and emission information, and tribal schools were not considered part of the 63 schools assessment. Regardless of limited information, EPA is continues seeking tribal school data in order to eliminate concerns or address issues regarding potential air toxics might be impacting tribal school environment. The Navajo Nation land mass is the size of the state of Vermont. Conducting the school air toxic project to be setup at CRNM cannot be considered the only school toxic analysis information for the Navajo Nation. Selecting CRNM is a start for the Navajo Nation to be considered for additional air toxic monitoring studies to be assessed at other agencies within Navajo Nation. The importance of collecting data for the well-being and health status from children attending school can provide an assessment if potential air toxics are affecting their learning abilities or growth development.

The health related issues caused by breathing in air toxics for children can have an effect on their developmental growth to enhance their learning abilities. Research by Clark-Reyna, Grineski & Collins (2015) states the higher levels of residential air toxics, specifically from non-road mobile sources, are statistically significantly associated with lower grade point averages among fourth and fifth grade school children in El Paso, Texas. The CRNM air monitoring site is surrounded by an active production area where emission resulting from oil and gas facilities emit air toxics, nearby traffic represent mobile sources of air pollutants, and local residences continue to practice outdoor burning. All these sources can impact children's health.

Objectives & Scope

The project objective is to confirm ambient air monitoring efforts that can yield location specific air quality data. This data can be sufficient as an initial screening project for potential impacts from air toxics pollutants that can impact school grounds. This data should assist EPA, state, local and tribal agencies in enforcing policies on surrounding sources, or to request additional air

monitoring studies to be conducted. This study investigated the concentrations of key air toxics at CRNM over a 2-3 month period. The results of this study can help determine whether the concentrations of air toxics, in light of health risk-based criteria, may require additional follow-up activities. The results collected from CRNM will determine if additional data analysis will be needed by extending the short-term monitoring to a long-term status.

Limitations

This research only collected data pertaining to volatile organic compound (VOCs), carbonyl compounds, polycyclic aromatic hydrocarbons (PAH), and metals of particulate matter 10 (PM_{10}). The emitting source reviewed within this research is oil and gas production, mobile sources, and outdoor burning. Comparing another SATMP monitoring site information within this study, which was located in another area of the Navajo Nation, was limited. Due to the SATMP was conducted by a Navajo Nation program, and seeking permission to use information within this study was not granted or authorized.

Assumptions

This research approval to be conducted is to address air toxic emissions for the region within Church Rock, New Mexico. This monitoring data results is not to be considered the only data analysis to be determine for the Navajo Nation. Other sections of the Navajo Nation can be recommended or determine for further data analysis. The Navajo Nation is located within 3 states: Arizona, New Mexico and Utah. The east boundary side of the Navajo Nation local communities is in close proximities to Farmington, New Mexico and Gallup, New Mexico. The city of Farmington, New Mexico is considered a metropolitan status, but Gallup, New Mexico is not. It is assumed the Navajo Nation is considered a rural area, but border town population can have an effect on overall air shed status.

CHAPTER 2

LITERATURE REVIEW

Volatile Organic Compounds (VOCs)

Volatile organic compounds (VOC) contain carbon and can evaporate. EPA (2015a) defines VOCs as means of any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate, which participates in atmospheric photochemical reactions, except those designated by EPA as having negligible photochemical reactivity. The EPA Federal Register 40 CFR part 51 (1996) states, "This action adds perchloroethylene (perc), also known as tetrachloroethylene, to the list of compounds excluded from the definition of VOC on the basis that it has negligible photochemical reactivity, where this rule results in more accurate assessment of ozone formation potential and will assist in avoiding exceedances for the ozone health standards. This rule does this by causing control efforts to focus on compounds which are actual ozone precursors, rather than giving credit for control of a compound which has negligible photochemical reactivity." VOCs are used within household and commercial products. Some cleansers, disinfectants, waxes, glue, cosmetics, dry cleaning products, paints, varnishes and preservatives include VOCs. Other products VOCs are found in are gasoline, kerosene, fuel, cigarette smoke, and pesticides. Research by Ho and Lee (2001) states VOCs are an important group of air pollutants to be investigated, as they contribute to the most serious air pollution problems, where they have been demonstrated to be active in the formation of photochemical smog and ground-level ozone productions. Some VOCs found in urban air classified as carcinogenic compounds (1, 3-butadiene and benzene). VOCs can cause health effects, but the type and amount of exposure can vary with the individual exposed. Children are a potentially at-risk population because they may be both more exposed to VOCs and more susceptible to adverse effects than adults (Sexton et al., 2005). The types of health effects resulting from VOCs exposure may cause irritation to the eyes, nose, and throat. Also other health effects may be headaches, nausea, and nerve problems. The United States National Library of Medicine – Tox Town (2015) states, long-term exposure to volatile organic compounds can cause damage to the liver, kidneys, and central nervous system. Short-term

exposure to volatile organic compounds can cause eye and respiratory tract irritation, headaches, dizziness, visual disorders, fatigue, loss of coordination, allergic skin reactions, nausea, and memory impairment. “It is well established, for example, that children can be affected by different sources, pathways, and routes of exposure than adults; that children often have greater intake of air, food, beverages, soil, and dust per unit body weight and surface area; and that children differ from adults in terms of important pharmacokinetic and pharmacodynamics parameters” said Sexton et al.(2005). The effects of outdoor VOCs have a lower impact compared to indoor exposure. The outdoor exposure of VOCs are more common in urban areas, where sources are related to bus or automobile exhaust. While VOCs can also be a health concern outdoors, EPA regulates VOCs outdoor mainly because of their ability to create photochemical smog under certain conditions (EPA, 2015a).

Carbonyl Compounds

Carbonyl compounds are defined as a compound containing carbonyl groups, where a carbon atom is double bonded to an oxygen atom. Kim et al. (2007) states ambient carbonyls are directly discharged from such primary sources as exhaust gases of motor vehicles and incomplete combustion of hydrocarbons fuels in industrial machinery and industrial processes (production of paper, adhesive, automobile, etc.). Carbonyl compounds can be characterized as major odorous pollutants. Carbonyls are among the major species of organic compounds involved in photochemical air pollution, since aldehydes and ketones play an important role as products of photo oxidation of gas-phase hydrocarbons as a major source of free radicals (Ho & Lee, 2001). Wang, Lee & Ho (2007) state carbonyl compounds are toxic and the most observed toxic effects are irritation of skin, eyes and nasopharyngeal membranes. Formaldehyde is usually the most abundant and the airborne carbonyl compound most concern since it is classified carcinogenic to humans by the International Agency for Research on Cancer (2004). Another carbonyl compound exposure of health concerns is aldehydes. EPA (2015) lists health effects from aldehydes relating to inhalation concerns, where it can alter breathing patterns by narrowing airway openings, and damage cells lining the airways, prompting white blood cells to enter the lungs. Carbonyl sulfide is another element listed as a carbonyl compounds. The health effects of

carbonyl sulfide in animal studies show that exposure to high levels of carbonyl sulfide in the air can damage the areas of the brain that control movement and process sound information (ATSDR, 2014). Liu et al. (2006) defines the health effect of acrolein as a severe lung irritant that, at high acute exposures, can induce oxidative stress and delayed-onset lung injury, including asthma, congestion, and decreased pulmonary function These are just a few of carbonyl compounds health effects that children might be exposed to while attending school on a daily base.

Polycyclic Aromatic Hydrocarbons (PAH)

Polycyclic aromatic hydrocarbons (PAH) are a group of chemicals that occur naturally in coal, crude oil and gasoline. PAH are hydrocarbons where organic compounds contains only carbon and hydrogen. Also EPA (2008) states PAHs are created when products like coal, oil, gas, garbage are burned but the burning process is not complete. PAHs can stay in the environment for long periods of time. A few PAHs are used in medicines, plastics, dyes, and pesticides. The exposure of people encountering PAHs is based on breathing air contaminants that result from motor vehicle exhaust, agricultural or wood smoke, cigarette smoke, fumes from asphalt roads, industrial waste incineration, and release from hazardous waste sites. Also PAHs can attach itself to dust or other particles in the air. After PAHs are swallowed, breathed in, or in some cases, passed through the skin, the body converts PAHs into breakdown products called metabolites that pass out of the body in the urine or feces (CDC, 2013). The health effects associated with PAH suggest an adverse impact of prenatal PAH exposure on child behavior that could impact cognitive development and ability to learn, and have been shown to affect subsequent academic performance due to increase anxiety, depression and attention problems from PAH exposure (Perera, 2012). Several of the PAHs, including benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz [a, h] anthracene, and indeno [1, 2, 3-c, d] pyrene, have caused tumors in laboratory animals when they breathed these substances in the air, when they ate them, or when they had long periods of skin contact with them (ATSDR, 1995). Furthermore, studies of people show that individuals exposed by breathing or skin contact for long periods to mixtures that contain PAHs

and other compounds can also develop cancer (ATSDR, 1995). EPA (2008) has determined that benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3- c,d]pyrene are probable human carcinogens and that acenaphthylene, anthracene, benzo[g,h,i]perylene, fluoranthene, fluorene, phenanthrene, and pyrene are not classifiable as to human carcinogenicity. For example one of the listed probable human carcinogen is benzo (a) pyrene, which has been studied extensively and considered a potent carcinogen, meaning low doses may cause cancer (CDC, 2013).

Particulate Matter (PM) 10 Metals

"Particulate matter (PM) is used to describe solid or liquid particles that are airborne and transported and dispersed in atmosphere, which vary in number, size, shape, surface area, chemical composition, and solubility" stated by Contini, Cesari, Donateo, Chirizzi, & Belosi (2014). PM originates from a variety of natural or anthropogenic sources and possesses a range of morphological, physical, chemical, and thermodynamic properties. EPA (2015) states that the size of particles is directly linked to their potential for causing health problems. EPA is most concerned about particles 10 micrometers in diameter or smaller, which are the particles that generally pass through the throat and nose and enter the lungs. EPA groups particle pollution into two categories: inhalable coarse particles and fine particles. "Inhalable coarse particles," such as those found near roadways and dusty industries, are larger than 2.5 micrometers and smaller than 10 micrometers in diameter (EPA, 2015). "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter smaller, which can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industries and automobiles react in the air (EPA, 2015). This can have a serious health impact to the heart and lungs, and lead to serious health effects. EPA (2015) states numerous scientific studies have linked particle pollution exposure to a variety of problems, including premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

Metals can have additional health effects that can be detrimental. Research by Gieger and Cooper (2010) define differences in exposure to metals or inorganic metal compounds due to the difference between persistence in the body compared to organic compounds. Metals are neither created nor destroyed by biological and chemical processes, but may be bio transformed from one chemical species to another. The exposure to metals in the air is capable of causing a myriad of human health effects, ranging from cardiovascular and pulmonary inflammation to cancer and damage of vital organs (Gieger & Cooper, 2010). Additionally, metals have been associated with wide range of environmental and health effects including respiratory and pulmonary disorder, neurotoxicity, and cancer, which results from high concentrations of metals, especially near industrial facilities (Monn & Becker, 1999).

CHAPTER 3

METHODOLOGY

Method Overview

The laboratory ERG (Eastern Research Group) conducted the data analysis and overview, since collections from samplers were mailed to: ERG, Inc. 601 Keystone Park Drive, Suite 700, Morrisville, North Carolina, 27560. The samples were mailed on a weekly base after samplers collection were retrieved (Appendix A). The samples were collected by site operator (Ms. Karmen Billey), who participated and assist by setting up the air monitoring instruments along with retrieving the samples. The sampling plan was adopted by EPA SATMP, where TAMS followed the requirements of the School Air Toxics Monitoring Quality Assurance Project Plan (EPA, 2015). The samples were collected starting on December 25, 2014 through March 19, 2015. The samplings were collected in 1-in-6 day interval, where the samplers ran for 24 hours. EPA's Compendium methods versions were used by the laboratory ERG for data analysis. Four types of samplers were used to collect data information at CRNM site. Below are the listed EPA's Compendium methods used by ERG for data analysis, as well as descriptions provided below within this section:

- Compendium Method TO-15 for measuring 59 VOCs. EPA (1999) addresses the polar compounds to a lesser extent do not consistently chromatograph well. For example, acrolein is difficult to analyzed, but with gas chromatograph/mass spectrometry (GC/MS) in Selected Ion Monitoring (SIM) mode it can be accurately measured, even at low concentrations. The Compendium Method TO-15 is used for sampling and analytical procedures for the measurement of subsets of the 97 VOCs that are included in the 188 hazardous air pollutants (HAPs).
- Compendium Method TO-11A for measuring 15 carbonyl compounds. EPA (1999) states, "The carbonyl compounds in the sample are identified and quantified by comparing their retention times and area counts with those of standard DNPH derivatives. Formaldehyde, acetaldehyde, acetone, propionaldehyde, crotonaldehyde,

benzaladehyde, and o-, m-, p-tolualdehydes can be identified with high degree of confidence."

- Compendium Method TO-13A for measuring 22 PAHs. EPA (1999) determined in the laboratory in regards to collection efficiency, the Compendium Method TO-13A demonstrates to be greater than 95% for targeted PAHs, except for naphthalene, acenaphthylene, and acenaphthene.
- Compendium Method IO-3.5 and EPA Federal Equivalent Methods (FEM) EQL-0512-202 for PM_{10} were used to measure 11 metals. EPA (1999) indicated this measurement method is used for sampling and analytical procedures for the measurement of metals in ambient air. The analysis technique allows more than 60 elements to be quantitatively determined, and the isotopes of an element can be determined as well. However, this method only detects 20 compounds."

VOC Sampling and Analytical Method

Compendium Method TO-15 was used by ERG based on EPA (1999) guidelines. The air was sampled through a collection by a passivated stainless steel canister for VOC sampling. The stainless steel canisters were provided by the ERG laboratory, where the canisters were prepared (i.e., cleaned and evacuated) and mailed to the designated CRNM site operator before each sample for the monitoring site collection run dates were scheduled. At the time of canister setup, the canister is connected to air sampling equipment prior to each sampling event. The passivated canisters had an internal pressure that was lower than the atmospheric pressure. Due to the evacuated canister, air was able to flow into the canister automatically with the assistance of a solenoid valve system connected to the canister once it was opened. A mass flow controller device inlet was connected to the canister, which allowed air to enter at a constant rate during the 24 hour sampling collection date. At the designated time and date, the solenoid valve automatically closed and the air was stopped from flowing into the canister. The canisters were retrieved and returned back to ERG laboratory for analysis, along with Chain of Custody (CDC) forms (Appendix B).

The ERG laboratory conducted the analysis for each sample with gas chromatograph/mass spectrometry (GC/MS), operating in the Selected Ion Monitoring (SIM) mode. Laboratory staff were able to determine the concentrations of 59 VOCs. This analysis was carried out in this way because VOC analysis method reports only the sum concentration for two isomers (m-xylene and p-xylene) form the gas chromatograph column at the same time. VOC concentration data collected from CRNM are shown in Appendix A.

Carbonyl Compound Sampling and Analytical Method

Compendium Method TO-11A was used by ERG based on EPA (1999) guidelines. The carbonyl compound sampler has an ozone scrubber, where air goes through and then down into the cartridges. The cartridges contain silica gel coated with 2, 4-dinitrophenylhydrazine (DNPH), which is a compound identified to react with many aldehydes and ketones. Other compounds not considered carbonyl are not retained in the cartridge, which continue passing through without reacting with DNPH-coated matrix. ERG laboratory sent DNPH cartridges to the CRNM site operator, who connected the cartridge to the air sampling equipment, where the date and time of each sample was recorded within 24 hour sampling period. The cartridge was then retrieved and sent back to ERG laboratory for analysis, along with COC forms (Appendix C).

The ERG laboratory conducted the analysis for each sample by extracting the exposed DNPH cartridge with acetonitrile. To determine the amount of each carbonyl compounds within each cartridge, ERG used high-performance liquid chromatography (HPLC) with ultraviolet (UV) detection. Similar to the sum concentration of VOCs, three tolualdehyde isomers (m-xylene, o-xylene, and p-xylene) are removed from the HPLC column at the same time, where the sum concentration is only reported for these isomers and not separated. Carbonyl compound concentration data collected from CRNM are shown in Appendix A.

PAH Sampling and Analytical Method

Compendium Method TO-13A was used by ERG based on EPA (1999) guidelines and ASTM D6209. The ERG laboratory supplied the PUF/XAD-2® cartridge and a glass fiber filter, which were installed in high volume sampler. The samples were set to run for a 24 hour sampling

period. Once sampling period was completed, site operator retrieved the cartridge and filter, which were sent to ERG laboratory along with COC forms (Appendix D).

The ERG laboratory conducted the analysis by retrieving 14 days of sampling; the cartridge and filter were extracted together. The extraction was done by using toluene in hexane solution using the Dionex Accelerated Solvent Extractor (ASE) 350 or ASE 300. ERG states the extraction is concentrated to a final volume of 1.0 milliliter (mL). A volume of 1 microliter (µL) is injected into the GC/MS operating in the SIM mode to analyze for the 22 PAHs concentrations. PAHs concentration data collected from CRNM are shown in Appendix A.

PM_{10} Metals Sampling and Analytical Method

Compendium Method IO-3.5 and EPA FEM EQL-0512-202 was used by ERG based on EPA (1999) guidelines for the data analysis section. The collections of metal sampling were conducted by ambient air passing through a 47mm Teflon® filters. Particulate matter less than 10 microns (PM_{10}) were sampled at a low volume, where collections were done under local conditions. Site operator retrieved filters after the 24 hour sampling period, and returned them to the ERG laboratory for data analysis to be carried out, along with COC forms (Appendix E).

The ERG laboratory processes the filter analysis by digested the filters using a dilute nitric acid, hydrochloric acid, and hydrofluoric acid solution. Then the filter goes through an inductively coupled plasma-mass spectrometry (ICP-MS) to quantify the concentration of specific metals to be shown within the primary air sample. PM_{10} metals concentration data collected from CRNM are provided in Appendix A.

Site Description

Within this section the monitoring site characterization will be provided using geographical and physical information in regards to the selected air monitoring site and surrounding community setup to conduct the SATMP project. Furthermore, additional information as to why this particular SATMP was considered, including surrounding emission factors which might have an impact on the air quality site data analysis. The Navajo Nation is a federally recognized Indian Tribe with inherent powers of sovereignty and authority to manage and control the use of Navajo lands and resources. The Navajo Nation covers a land mass of about over 27,000 miles with the states of

Arizona, Utah, and New Mexico. Surrounding the Navajo Nation are the Southern Ute of Colorado, and Ute Mountain Ute Tribe. Hope Indian Reservations is located surrounded by the Navajo Nation in Arizona. The Navajo Nation has three (3) large non-contiguous sections located in New Mexico, which are Ramah Navajo Indian Reservation, Alamo Navajo Indian Reservation and Tohajiilee Indian Reservation. Figure 1 shows the overall boundaries of the Navajo Nation retrieved from the Navajo Area-Indian Health Services (2015) website. A red dot is placed on the Navajo Nation map designating the location of Church Rock, New Mexico.

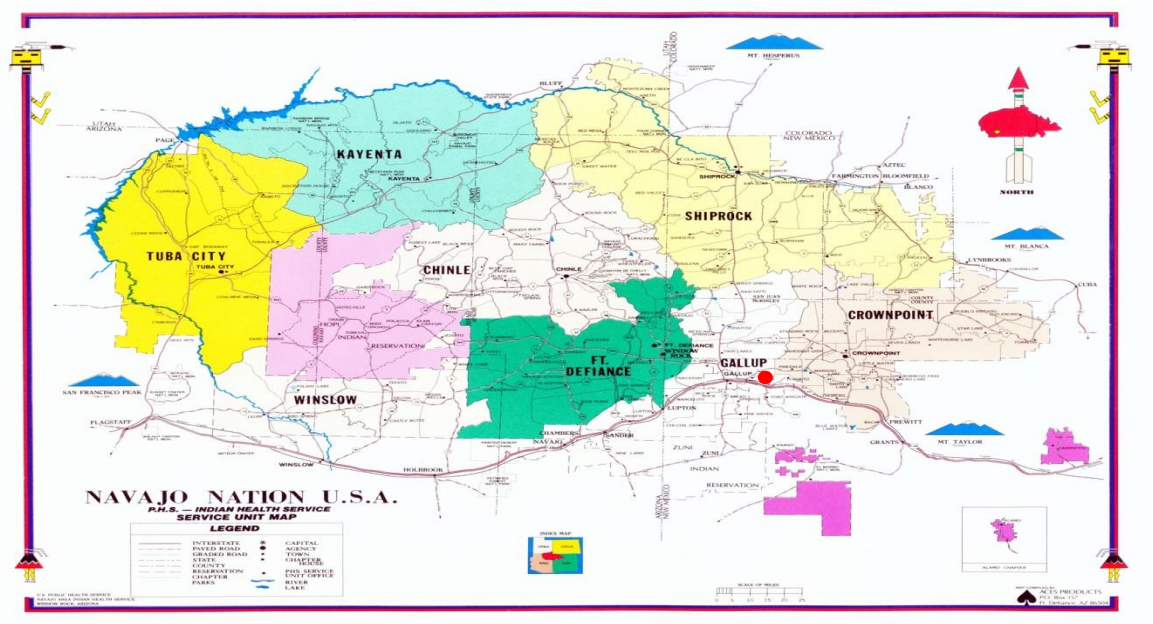

Figure 1. Navajo Nation boundary map.

Church Rock Elementary School is one (1) of nineteen (19) schools within Gallup McKinley County School, Gallup, New Mexico, is considered a "public" school. Church Rock Elementary School has teaching grade levels from pre-kindergarten to 5th grade, and about 95% are American Indian. The town of Church Rock is located about 7 miles east of Gallup, New Mexico and about 24 miles east from the state line. The Church Rock Elementary School was selected to be the designated monitoring site. Composite satellite images shown in figures 2 and 3 are retrieved from Google Earth Maps (2015) and show the location of Church Rock Elementary School and the community of Church Rock, New Mexico. Figure 2 shows the location of the school and a star has been place to provide an image where the monitoring site location on the

east side of the school was located. North from the Church Rock Elementary School are the red rock formations, shown in Figure 2, which are a part of the Red Rock State Park. Figure 3 shows the composite satellite image of Red Rock State Park. Across the street from the school are located with residential homes, which the area is categorized to be as residential and rural. The Church Rock community is located north of Interstate 40 (I-40), which runs east to west across the United States parallel with Route 66. Table 1 states the geographical information for the Church Rock Elementary School. An EPA Air Quality Standard (AQS) Code was assigned for this site.

Figure 2. Navajo Nation Church Rock (CRNM) Monitoring Site Location

Figure 3. Church Rock (CRNM) Monitoring Site – Wide View

Table 1.

Church Rock Monitoring Site Geographical Information

Site Code	AQS Code	Address	Location	County	Tribal Area	Latitude and Longitude	Land Use	Location Setting
CRNM	**35-031-2015**	**43 Challenger Road**	**Church Rock**	**McKinley**	**Navajo Nation**	**35.538747, -108.596741**	**Residential**	**Rural**

Figure 4 identifies emissions nearby the CRNM based from the point source information. The emissions locations are designated by the amount of nearby facilities located within a certain distance from CRNM. This will provide an idea of which emission sources and categories could have a direct impact on the overall air quality at CRNM. Figure 4 shows the proximity of emission and quantity sources to the monitoring site at a certain distance. Within a 10 miles radius distance from CRNM there are three (3) source categories determine. Two (2) oil and/or gas production, one (1) petroleum refining (Figure 5), and one (1) rail line/yard operations. The facilities closest to the monitoring site are oil and gas production, which are located at the bottom left side of Figure 4, north from Interstate Highway 40 (I-40). The facilities are located west and more than 3 miles from monitoring site. Additional, nearby facilities from CRNM include a casino

with installed generators, a rock and Gravel Company, and an out of business furniture making facility. The surrounding residential community near to CRNM conducts open trash burning practices that may contribute to the emissions of air toxics.

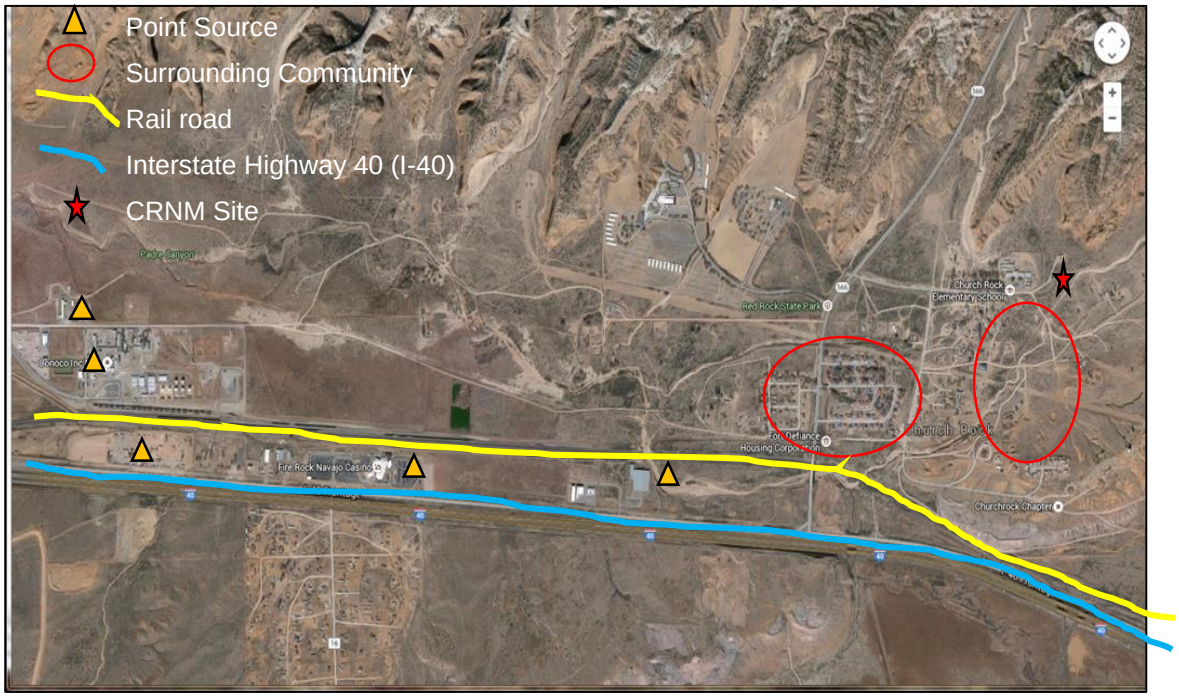

Figure 4. *Nearby Point Source Facilities from CRNM*

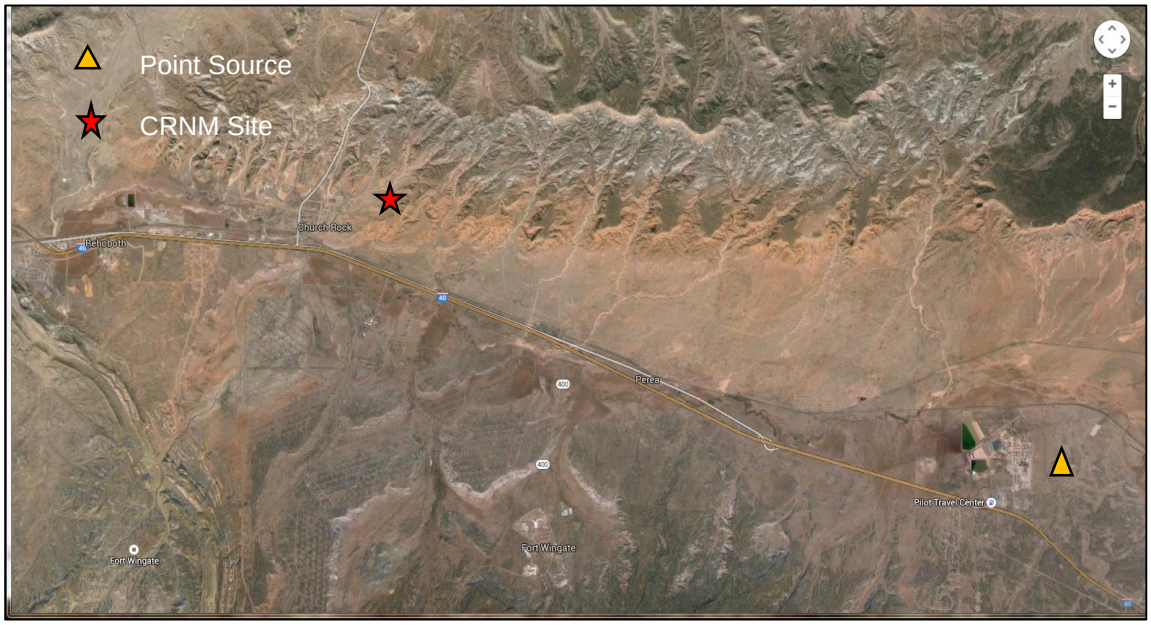

Figure 5. *Nearby Point Source Facilities from CRNM to Petroleum Refining Facility*

Sample Collection Schedule

Sample recovery for each sample from the air toxics instruments sampler in the SATMP network must happen within 72 hours of the end of the sample period. For 1-in-6 days sampling, this will normally be the day after a sample is completed and retrieved. At this time of sample recovery, the next sample would also be set-up, see Table 2. The sample collection began on December 25, 2014 and the last day for sampling took place on March 19, 2015, which is also shown in Table 2.

Table 2.

1-in-6 Days Sampling Calendar 2014-2015

December 2014						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	**25**	26	27
28	29	30	31			

January 2015						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February 2015						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

March 2015						
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Sample Collection Date

CHAPTER 4

RESULTS

The major goal of this study was to determine if there are any hazardous air pollutants surrounding school boundaries within the ambient air that could possibly are affect school children learning and developmental growth. The CRNM air-monitoring site was selected based on the potential surrounding sources by the TAMS steering committee (see Appendix F). Also the proposal for the CRNM air monitoring site to be considered had to be presented to the Church Rock Community Chapter and the Gallup McKinley School Board, since the CRNM site was located with the community and school district boundaries. Approval of community resolution and school board voting approval documentations are viewed in Appendix G. The ERG laboratory provided the data analysis reporting for this study, since all sample collections were sent off from the site operator to the laboratory. The laboratory report can be viewed in Appendix A.

A meteorological wind rose was determined at the CRNM site and four (4) air monitoring instruments. Based upon the CRNM study results, a health risk-based procedure was used to identify "pollutants of interest." The goals of the sample collection schedule will be address, which will show the samples validation from each sample collection date. A section providing information regarding health risk-based was used to help identify "pollutants of interest" based on the CRNM results of this study.

Sample Collection Schedule

The objective of the CRNM monitoring effort was to retrieve and analyze at least ten (10) sets of valid samples for valid samples for each analyte of interest. The study accomplished this objective: fifteen (15) valid metals and VOCs samples; twelve (12) carbonyl compounds and thirteen (13) PAHs sample. Table 3 shows the list of sample dates for the entire sampling period (December 25, 2014 – March 19, 2015). Majority of the samples were valid for analysis, but five (5) were not considered valid, due to sampler malfunction, lab issue, or sample did not run for the full 24 hours. At least having a set of ten (10) sets of samples for each method is related to the SATMP EPA effort measurements used in their previous studies.

Table 3.

Sample Collection Summary

Sample Date	Metals Analysis PM_{10}	Carbonyl Compounds	VOCs	PAHs
12/25/14	Reported	[a] Invalid	Reported	Reported
12/31/14	Reported	[a] Invalid	Reported	Reported
1/6/15	Reported	[a] Invalid	Reported	Reported
1/12/15	Reported	Reported	Reported	Reported
1/18/15	Reported	Reported	Reported	Reported
1/24/15	Reported	Reported	Reported	Reported
1/30/15	Reported	Reported	Reported	Reported
2/5/15	Reported	Reported	Reported	Reported
2/11/15	Reported	Reported	Reported	[b] Invalid
2/17/15	Reported	Reported	Reported	Reported
2/23/15	Reported	Reported	Reported	[c] Invalid
3/1/15	Reported	Reported	Reported	Reported
3/7/15	Reported	Reported	Reported	Reported
3/13/15	Reported	Reported	Reported	Reported
3/16/15	Reported	Reported	Reported	Reported
Total Valid vs Total Collected	15/15	12/15	15/15	13/15

[a] Sampler malfunction
[b] Lab Issue
[c] Sample did not run for or 24 hours
*ERG Laboratory provided data sample collection summary table in Appendix B.

Data Results

This section will provide a summary of the analytical results provided by ERG Laboratory, since they are the contracted lab assisting with TAMS on the SATMP for Navajo Nation in regards to CRNM air monitoring site (Appendix A). Within the Appendix B report the detection rate for each pollutant, minimum concentration, maximum concentration, average concentration

and the standard deviation are stated from pollutants measured from CRNM site for the whole sampling period.

The data results for VOC concentrations, illustrated in Figure 6, the highest average concentration are dichlorodifluoromethane (2.57± 0.13 μg/m^3). It is the only pollutant shown exceeding the 2.0 μg/m^3. There were two (2) pollutants greater than 1.0 μg/m^3 but not reaching 2.0 μg/m^3. The pollutants were chloromethane (1.45 ± 0.46 μg/m^3) and trichlorofluoromethane (1.33 ± 0.06 μg/m^3). The remaining VOC concentrations were below 1.0 μg/m^3. It was reported by ERG Laboratory (Appendix B) the maximum concentration for chloromethane was 4.55 μg/m^3 measured on February 5, 2015, where the next highest concentration was measured at 1.48 μg/m^3. The two (2) highest concentrations for chloromethane were recorded on two (2) separate sampling dates in the month of February 2015. Table 4 states the VOCs highest three (3) concentration range and median concentration.

Dichlorodifluoromethane resulted with a pollutant range of 2.13 μg/m^3 to 2.94 μg/m^3, with a median concentration of 2.65 μg/m^3. It was determine by ERG that there is relatively little variability in the concentration for this pollutant based on the derived confidence internals, even though this was the highest VOC average concentration pollutant within the sampling period. Chloromethane ranged from 0.942 μg/m^3 to 4.55 μg/m^3, with a median concentration of 1.23 μg/m^3. It was determined by ERG Laboratory the pollutant range and median concentration for chloromethane results indicate a relatively large confidence interval for this pollutant. The concentration pollutant range for trichlorofluoromethane is from 1.10 μg/m^3 to 1.46 μg/m^3, with 1.33 μg/m^3 as the median concentration. It was determined that this pollutant showed little variability measured at CRNM site.

Other VOC concentrations measured in Figure 6 results from this study were dichloromethane ranged from 0.289 μg/m^3 to 3.48 μg/m^3, with a median concentration of 0.87 μg/m^3. Also benzene had a data range from 0.323 μg/m^3 to 0.771 μg/m^3 with a median concentration of 0.588 μg/m^3, and carbon tetrachloride data ranged from 0.473 μg/m^3 to 0.756 μg/m^3 with a median concentration of 0.633 μg/m^3. Additional VOC concentrations exceeding average concentration of 0.5 μg/m^3 was propylene, toluene, acetylene and trichlorotrifluoroethane. The remaining VOC

concentration were between 0 μg/m^3 to 0.5 μg/m^3, where acrolein data range was 0 μg/m^3 to 1.1 μg/m^3 with a median concentration of 0.448 μg/m^3. Also other concentration below 0.5 μg/m^3 were xylene, acetonitrile, chloroform and etc. Additional discussion will be address further within this chapter in regards to the VOC concentration health impacts in the "Health Risk and Pollutant of Interest Summary" section. Overall, a total of 53 VOCs concentrations were measured to be greater than 1.0 μg/m^3 at CRNM air monitoring site: dichlorodifluoromethane and trichlorofluoromethane measured in 15 samples; chloromethane measured 14; dichloromethane measure 3; propylene and toluene 2; and acrolein and acetylene 1. Ten (10) VOC compounds were not detected at all in any sample collection. The goal of measuring 15 valid VOCs samples were gathered from CRNM and were met.

The method detection limits (MDL) have been established for the target analytes provided from EPA (2015) as part of the SATMP. The MDL listing of HAP compounds in Appendix H is the MDLs reported by ERG for use in the national lab contract for this project. Based on the VOC concentration results shown in Table 5, the EPA required MDL concentrations are highlighted with twelve (12) HAP compounds are higher than resulted concentration for this study: Bromodichloromethane, Bromoform, Chlorobenzene, p-Dichloroethane, Ethyl tert-butyl ether, Methyl methacrylate, Methyl tert-butyl ether, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, Trichloroethylene, Vinyl chloride. The other VOC concentrations resulted were higher than the EPA MDL values.

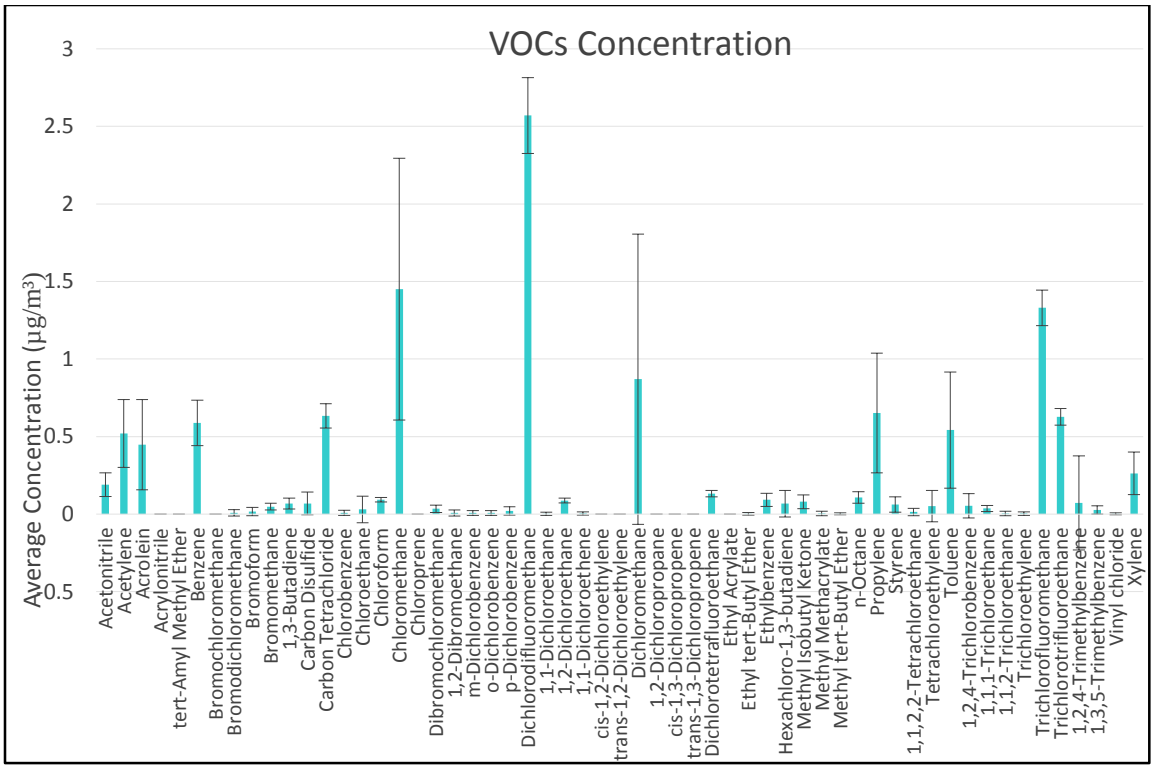

Figure 6. *Volatile Organic Compounds (VOCs) Concentration Over the Sample Period*
**ERG Laboratory provided the data analysis reported in Appendix B.*

Table 4

Results of Highest Concentration for VOCs

Highest Concentration Pollutants	Concentration Pollutant Range (µg/m³)	Median Concentration (µg/m³)	Confident Interval for Pollutant
Dichlorodifluoromethane	2.13 to 2.94	2.65	Relatively Little Variability
Chloromethane	0.942 to 4.55	1.23	Relatively Large Confidence Interval
Trichlorofluoromethane	1.10 to 1.46	1.33	Relatively Little Variability
**ERG Laboratory provided the data analysis reported in Appendix B.*			

Table 5

VOC Concentration Values compared to EPA Required Method Detection Limit (MDL)

VOCs	**Concentration µg/m³**	**EPA Required Method Detection Limit (MDL) µg/m³**
Acetonitrile	0.19	0.097
Acetylene	0.52	0.013
Acrolein	0.448	0.035
Benzene	0.588	0.020
Bromodichloromethane	0.00805	0.016
Bromoform	0.0166	0.020
1,3-Butadiene	0.068	0.006
Carbon Disulfide	0.0688	0.007
Carbon Tetrachloride	0.633	0.012
Chlorobenzene	0.008	0.011
Chloroform	0.092	0.012
Dibromochloromethane	0.0341	0.011
p-Dichlorobenzene	0.0205	0.023
Dichlorodifluoromethane	2.57	0.019
1,1-Dichloroethane	0.00271	0.008
Dichlorotetrafluoroethane	0.133	0.010
Ethyl tert-Butyl Ether	0.00223	0.028
Ethylbenzene	0.0925	0.015
Methyl Isobutyl Ketone	0.0797	0.025
Methyl Methacrylate	0.0041	0.110
Methyl tert-Butyl Ether	0.00169	0.051
n-Octane	0.107	0.018
Propylene	0.652	0.063

Styrene	0.0617	0.013
1,1,2,2-Tetrachloroethane	0.0138	0.019
Toluene	0.542	0.030
1,2,4-Trichlorobenzene	0.0535	0.052
1,1,2-Trichloroethane	0.00401	0.015
Trichloroethylene	0.00323	0.008
Trichlorofluoromethane	1.33	0.012
1,2,4-Trimethylbenzene	0.0725	0.052
1,3,5-Trimethylbenzene	0.0266	0.018
Vinyl chloride	0.00154	0.005
Xylene	0.263	0.028
** EPA Required MDL listed in Appendix H*.		

The data results from carbonyl compounds concentration shows the highest average concentration was acetone (2.20 ± 0.56 μg/m^3) in Figure 7, which exceeded 2.0 μg/m^3. The next pollutant measures with the highest concentration was formaldehyde (1.44 ± 0.21 μg/m^3). As determined by ERG Laboratory, the highest concentration of acetone was on March 19, 2015 and the two other acetone concentration exceeded 3.0 μg/m^3 in the month of March. The confidence level for acetone was determined to be relatively large due to the pollutant range from 1.05 μg/m^3 to 3.98 μg/m^3, and a median concentration of 1.98 μg/m^3, which is shown in Table 6. Formaldehyde was measured to have a pollutant concentration range from 0.811 μg/m^3 to 1.98 μg/m^3 and a median concentration of 1.58 μg/m^3. It was determined by ERG Laboratory that the confidence level could not be stated due to the median concentration averaging higher than the average concentration, where the lower end of the range is pulling down the study average. The remaining carbonyl compounds shown in Figure 7 were less than 1.0 μg/m^3. A total of 23 carbonyl compounds measured higher than 1.0 μg/m^3 at CRNM air monitoring site: acetone had 12 samples above this level and formaldehyde had 11. It was noted by ERG Laboratory two (2)

carbonyl compounds were not detected at all in the samples gather at CRNM. These were isovaleraldehyde and 2, 5-dimethylbenzaldehyde. The goal of the measuring 12 valid carbonyl compound samples were gathered from CRNM and were met

In comparison to the EPA required MDL (Appendix H) the carbonyl compound concentrations in Table 7 resulted with all concentrations from this study were higher than the EPA MDL values. The ERG laboratory used the listed target analytes MDL for use in the national lab contract for this project.

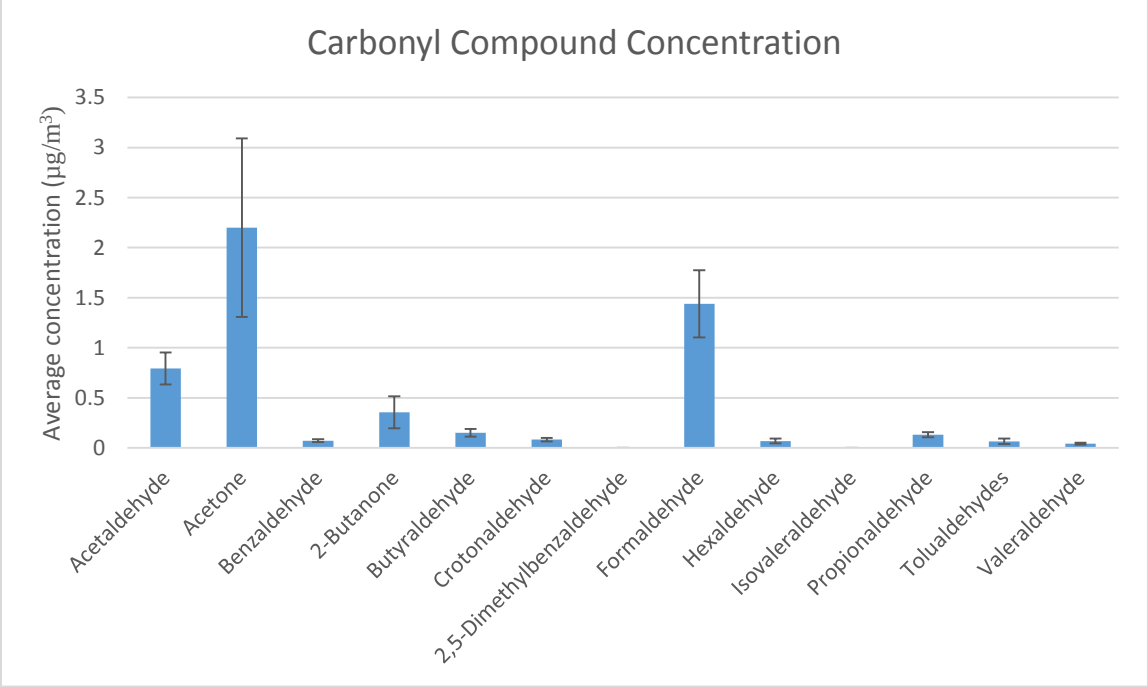

Figure 7. *Carbonyl Compound Concentration over the Sample Period*
**ERG Laboratory provided the data analysis reported in Appendix B.*

Table 6

Results of Highest Concentration for Carbonyl Compounds

Highest Concentration Pollutants	Concentration Pollutant Range (µg/m³)	Median Concentration (µg/m³)	Confident Interval for Pollutant
Acetone	1.05 to 3.98	1.98	Relatively Large Confidence
Formaldehyde	0.811 to 1.98	1.58	Undetermined
**ERG Laboratory provided the data analysis reported in Appendix B.*			

Table 7

Carbonyl Concentration Values compared to EPA Required Method Detection Limit (MDL)

Carbonyl Compounds	Concentration µg/m³	EPA Required Method Detection Limit (MDL) µg/m³
Acetaldehyde	0.793	0.0090
Acetone	2.2	0.0100
Benzaldehyde	0.0718	0.0010
Butyraldehyde	0.151	0.0600
Crotonaldehyde	0.0818	0.0050
Formaldehyde	1.44	0.0440
Hexaldehyde	0.0688	0.0050
Propionaldehyde	0.132	0.0120
Tolualdehydes	0.0656	0.0090
Valeraldehyde	0.0415	0.0050
** EPA Required MDL listed in Appendix H.*		

The data results from polycyclic aromatic hydrocarbons (PAH) concentration shows the highest average concentration was naphthalene (53.30 ± 14.66 ng/m^3) in Figure 8, which exceeded 50 ng/m^3. The ERG Laboratory data analysis determined the pollutant concentration

range for naphthalene was 19.2 ng/m^3 to 103 ng/m^3, where the maximum concentration was measured on February 5, 2015. The next highest PAH was phenanthrene (10.41 ± 1.39 ng/m^3), and the third highest measured concentration was retene (8.92 ± 3.59 ng/m^3). Figure 8 shows naphthalene to be about five times more than phenanthrene, and the rest of the PAH pollutants measured are all less than 5 ng/m^3. The goal of the measuring 13 valid PAH samples gathered from CRNM were met. A list of HAP compounds shown in Appendix H provides the EPA required method detection limits (MDL) with higher concentration value than the resulted concentrations from this study are highlighted in Table 8. The four (4) PAH concentrations were: Coronene, Cyclopenta[c,d]pyrene, Perylene, and Retene.

The data results from particulate matter 10 micron (PM_{10}) metals concentration shows the highest average concentration was manganese (4.32 ± 1.39 ng/m^3),the next pollutant measure was chromium (3.49 ± 0.33 ng/m^3), and the third highest measure was lead (0.56 ± 0.10 ng/m^3) in Figure 9. The ERG Laboratory data analysis determined that the variability related to manganese is more than the variability with chromium, which is shown with confidence interval. The rest of the metals measured were below 1.0 ng/m^3): nickel, antimony, arsenic, and selenium. The goal of the measuring 15 valid PM_{10} metals samples was met. The listing of HAP compounds in Appendix H was compared between the resulted concentration and EPA required method detection limits (MDL). The PM_{10} metal concentrations shown in Table 9 are all higher in value in comparison to the EPA MDL values.

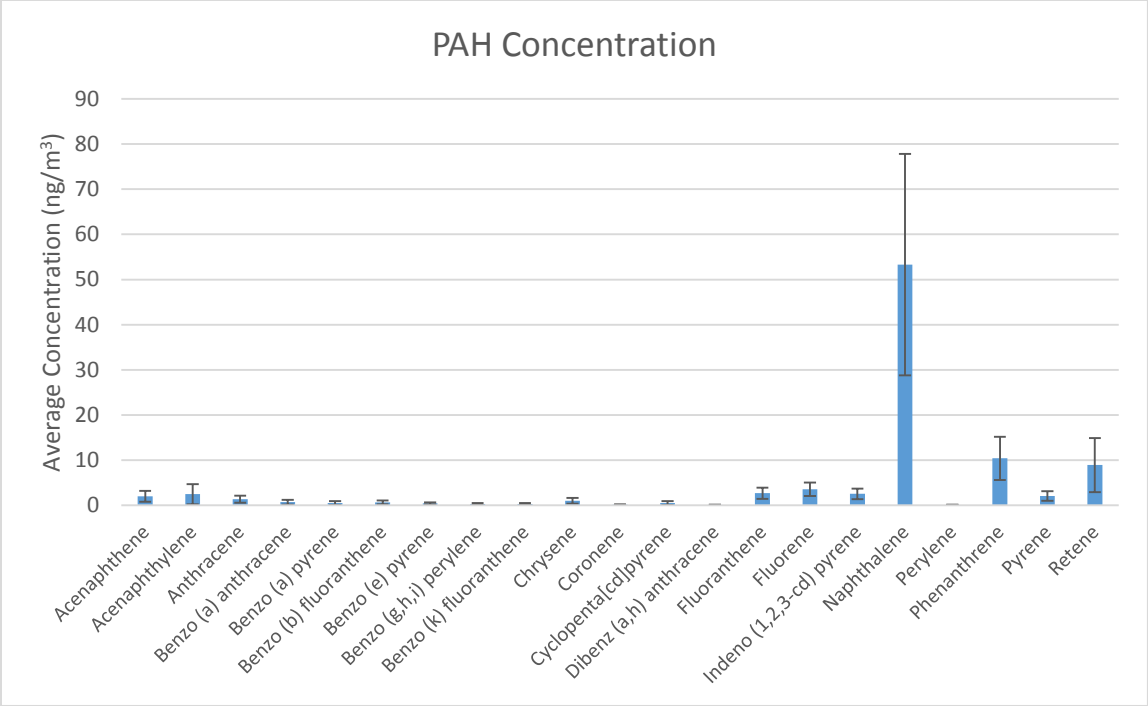

Figure 8. *Polycyclic Aromatic Hydrocarbon (PAH) Concentration over the Sample Period*

* *ERG Laboratory provided the data analysis reported in Appendix B.*

Table 8

PAH Concentration Values compared to EPA Required Method Detection Limit (MDL)

PAHs	**Concentration µg/m³**	**EPA Required Method Detection Limit µg/m³**
Anthracene	0.00133	0.000052
Benzo (a) anthracene	0.000702	0.000063
Benzo (a) pyrene	0.000519	0.000061
Benzo (b) fluoranthene	0.00067	0.000059
Benzo (e) pyrene	0.000407	0.000049
Benzo (g,h,i) perylene	0.000325	0.000033
Benzo (k) fluoranthene	0.000326	0.000059
Chrysene	0.00101	0.000040
Coronene	0.000141	0.043000
Cyclopenta[cd]pyrene	0.000516	0.064000

Dibenz (a,h) anthracene	0.0000824	0.000049
Fluoranthene	0.00268	0.000046
Fluorene	0.00354	0.000038
Indeno (1,2,3-cd) pyrene	0.00254	0.000040
Naphthalene	0.0533	0.000240
Perylene	0.0000817	0.028000
Phenanthrene	0.0104	0.000059
Pyrene	0.0021	0.000059
Retene	0.00892	0.057000
** EPA Required MDL listed in Appendix H*.		

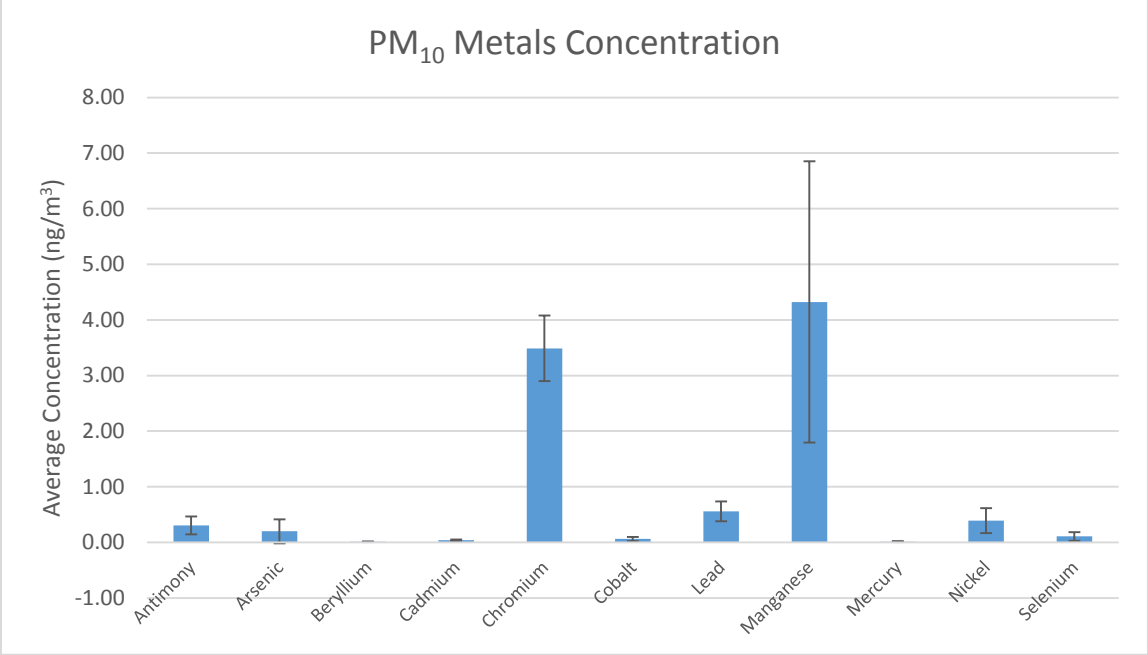

Figure 9. *Particulate Matter 10 (PM_{10}) Metals Concentration over the Sample Period*

* *ERG Laboratory provided the data analysis reported in Appendix B.*

Table 9

PM_{10} Metals Concentration Values compared to EPA Required Method Detection Limit (MDL)

Metals	**Concentration µg/m³**	**EPA Required Method Detection Limit µg/m³**
Antimony	0.000303133	0.000007
Arsenic	0.0001974	0.000009
Beryllium	0.00001118	0.000002
Cadmium	0.00004	0.000029
Chromium	0.003486667	0.000340
Cobalt	0.0000598	0.000006
Lead	0.000555	0.000056
Manganese	0.004322533	0.000057
Mercury	0.00001	0.000017
Nickel	0.000391533	0.000130
Selenium	0.000106933	0.000013

** EPA Required MDL listed in Appendix H.*

Meteorological Wind Rose Summary

A wind rose provides information on wind speed and direction at or near the monitoring site. The importance of gathering metrological wind rose information is to help determine the predominant direction from which direction the wind is blowing, which can help determine whether emissions are from an upwind or nearby source. Also the determination of high pollutant concentration can have a correlation to the specific wind direction, where a wind rose diagram is developed to the frequency of time that the wind blows from a particular directions.

A meteorological probe was setup at CRNM air monitoring site. The probe was initially setup to collect data starting with first sample collection date on December 25, 2014, but after viewing the data it did not start to collect data until January 13, 2015 and ended on March 19, 2015. Figure 10 shows the wind rose from January 13, 2015 to March 19, 2015. The frequency of the

wind directions around a 16-point compass is shown by petals position, where colors represent the wind speed. The wind rose illustrates the southwest quadrant is where most winds are detected, followed by the north, northeast and east quadrants. The calms winds between 1-4 knots were detected in all directions of wind observed. The winds from the southwest quadrant were stronger than the northwest quadrant, based on the color scheme, along with a higher frequency.

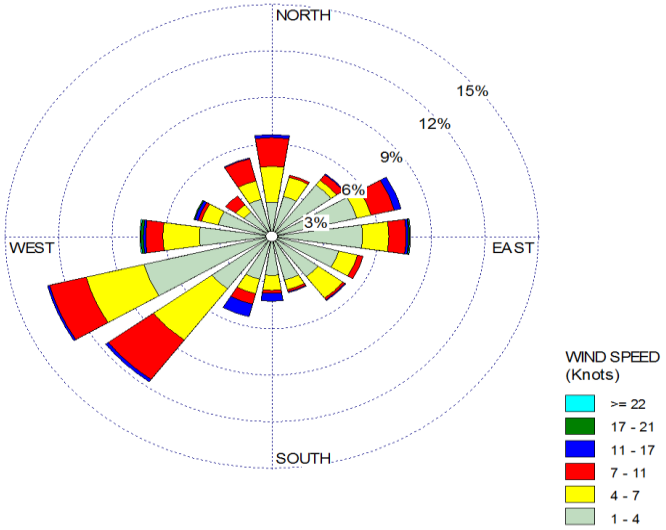

Figure10. *Wind Rose from CRNM Air Monitoring Site (January 13, 2015 – March 19, 2015)*
**ERG Laboratory provided the data analysis reported in Appendix B*

Health Risk and Pollutant of Interest Summary

Based on the results the following overview is to provide the health risk associated with the "pollutants of interest" from the CRNM air monitoring results. This summary addresses the targeted air toxics within ambient air. Hazardous air pollutants (HAPs) are those pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects (EPA, 2015). EPA has classified many hazardous air pollutants as "carcinogenic to humans," "likely to be carcinogenic to humans," or "suggestive evidence of carcinogenicity to humans" (EPA, 2015). The health risks are divided into cancer or noncancerous effects to determine the human health risk within this section of the study. Cancer risks are expressed as the number of excess cancer deaths per million people as

a result of inhaling the carcinogen over a 70 year lifetime. Noncancerous related health effects are associated with respiratory and lung issues that includes conditions like asthma to be caused. The health risk related to noncancerous defined by EPA (2015) is called hazard quotient (HQ), where “value of the HQ at or below one indicates that the exposure is not likely to result in adverse health effects.” Therefore, HQ is considered a unit less value. An HQ of less than 1 is not likely to have negative effects over a lifetime of exposure.

The human health risk analysis was conducted by ERG Laboratory, which is reported with Appendix A. The toxicity factors were defined by EPA (2015) for cancer unit risk estimates (UREs) and noncancerous reference concentrations (RfCs). Estimates were screened to identify any air toxic concentrations that represent a human health risk. The ERG Laboratory addresses the preliminary risk-based screen process for this section was adapted by the approach and risk-based methodology from the EPA published guidance document called A Preliminary Risk-Based Screening Approach for Air Toxics Monitoring Dataset (Appendix B). The screening values are converted from the cancer UREs and noncancerous RfCs, where the URE is converted to $\mu g/m^3$ and divided by one million. The noncancerous screening value is one-tenth of the RfC and converted from mg/m^3 to $\mu g/m^3$. For the final reporting of the screening value from this study, the lower of the two (2) screening values are used, where not all pollutants analyzed for this study had defined screening values. For this study a total of 65 pollutants have screening values analyzed. The analyses are located within Appendix A for the risk factors used for the study by ERG Laboratory. The “pollutant of interest” from the study was produced from the daily measurements of the target pollutants compared to the chronic risk screening values. The ERG Laboratory (Appendix A) conducted the risk-based screening process to identify “pollutant of interest” by determining the “failing the screen” method where the concentration greater than the risk screening value was indicated; for each pollutant the amount of failed screen was summed; percent contribution to total number of failed screens was calculated; and “pollutant of interest” were determine if pollutant top 95 percent (95%) of the total failed screen. Concentrations that may pose human health risks may be further studied.

Table 10 shows the overall risk-based screening results developed by ERG Laboratory from the CRNM air monitoring site. A total of eleven (11) "pollutants of interest" failed the screening process within the sampling period. Six (6) were from VOCs, two (2) from carbonyl compounds, two (2) PAHs, and one (1) from PM_{10} metals. Four (4) VOCs (benzene, 1, 3-butadiene, carbon tetrachloride, and 1, 2-dichloroethane) had fifteen (15) measurements and each failed the screen, meaning a 100% failure rate for each pollutant. Also there were two (2) carbonyl compounds (acetaldehyde and formaldehyde) which each had twelve (12) measurements and a 100% failure rate for each pollutant. For PAH (naphthalene) thirteen (13) samples were measured and ten (10) resulted in failed screening, resulting in a 77% failure rate. Also for PAH (benzo (a) pyrene) resulted with thirteen (13) valid measurement sampled and five (5) failed screen, with a 38 percent failure rate. The PM_{10} metal arsenic had fifteen (15) samples collected and four (4) failed the screen, resulting in a 27% failure rate. VOC pollutant 1, 2-dibromoethane is listed as one of the eleven (11) pollutants in Table 6, but due to arsenic exceeding 95 percent (95%) the next pollutant contributed equally to the failed screen amount will be designated as a "pollutant of interest." Table 6 states arsenic had four (4) failed screen resulting, where 1, 2-dibromoethane had two (2), therefore, is not contributed to the 95 percent of failed screen for CRNM. Overall, the shaded gray in Table 6 pollutants are the ten (10) pollutants out of eleven (11) that resulted in at least screened 95 percent (95%) of failed screen for CRNM air monitoring site.

Table 10

Risk-Based Screening Results for the CRNM Monitoring Site

Pollutant	Screening Value ($\mu g/m^3$)	# of Failed Screens	# of Measured Detections	% of Screens Failed	% of Total Failures	Cumulative % Contribution
Navajo Nation Church Rock, New Mexico - CRNM						
Benzene	0.13	15	15	100.00	13.39	13.39
1,3-Butadiene	0.03	15	15	100.00	13.39	26.79
Carbon Tetrachloride	0.17	15	15	100.00	13.39	40.18
1,2-Dichloroethane	0.038	15	15	100.00	13.39	53.57
Acetaldehyde	0.45	12	12	100.00	10.71	64.29
Formaldehyde	0.077	12	12	100.00	10.71	75.00
Naphthalene	0.029	10	13	76.92	8.93	83.93
Hexachloro- 1,3-butadiene	0.045	7	7	100.00	6.25	90.18
Benzo(a)pyrene	0.00057	5	13	38.46	4.46	94.64
Arsenic (PM_{10})	0.00023	4	15	26.67	3.57	98.21
1,2-Dibromoethane	0.0017	2	2	100.00	1.79	100.00
Total		112	134	83.58		

**ERG Laboratory provided the data analysis reported in Appendix B.*

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The purpose of this study was to determine if any hazardous air toxics were detected within the ambient air, which could have a health impact on school children who are attending school on a daily basis. The correlation between the data results and the health risk summary section of this study does not necessarily indicate an automatic similarity in measurement, but does state the results from this study have results with some health concerns. For example the pollutant measured with a high concentration results does not mean the pollutant also results with higher risk to human health. Also if the measurements were low, the pollutant might have a higher risk to human, due to the pollutant being more toxic, which is more of a risk associated within ambient air. From the results of this study there are several pollutants (dichlorodifluoromethane, acetone, and trichlorofluromethane) that did not have risk screening values, but results with high concentration were measured. Also chloromethane did not result with any failed risk screening values, therefore this pollutant did not appear on the Table 6. Formaldehyde did result with higher concentration value and failed screens, shown in Table 6. In Table 6 the listed pollutants that failed screens did not have relatively high concentrations, but the screening values are low, which meant the pollutant either failed for all or nearly all measured pollutants for that particular one. Benzene had a risk screening value of 0.13 $\mu g/m^3$, where the measured CRNM range resulted from 0.323 $\mu g/m^3$ to 0.771 $\mu g/m^3$, and all of benzene failed for screening. It was determined by ERG Laboratory the CRNM average for benzene concentration is 0.59 ± 0.08 $\mu g/m^3$ through the study period, this is less than the national average, which was estimated to be between 0.75 $\mu g/m^3$ to 1.0 $\mu g/m^3$. The national averages were gathered from the EPA's National-Scale Air Toxics Assessment (NATA) from 2005 (EPA, 2011), EPA's National Monitoring Programs (NMP) annual reports for 2011 and 2012 (EPA, 2015), and EPA's Report on the Environment (ROE) (EPA, 2015). Benzene concentration from this study did not exceed the national average estimates.

Another pollutant compared to the national average is carbon tetrachloride, which was used as a refrigerant and propellants for aerosol cans. The CRNM's average for this pollutant over the study period was 0.63 ± 0.04 µg/m^3 and the national average estimate was between 0.55 µg/m^3 and 0.70 µg/m^3 (EPA, 2011; EPA, 2015; EPA, 2015). Carbon tetrachloride exceeds the lower end of the national average estimate but not the highest. Formaldehyde over the study period average 1.44 ± 0.21 µg/m^3, which is also less than the national average estimated between 2.0 µg/m^3 to 3.0 µg/m^3 (EPA, 2011; EPA, 2015; EPA, 2015). This pollutant did not exceed the national average. Another pollutant concentration had the highest study average of 53.30 ± 14.66 ng/m^3 for PAHs is naphthalene. The concentration range was from 19.2 ng/m^3 to 103 ng/m^3, with a screening risk value of 29 ng/m^3 and all three (3) naphthalene failed screen measured at CRNM. The national average estimate for naphthalene between 70 ng/m^3 and 90 ng/m^3 (EPA, 2011; EPA, 2015; EPA, 2015). Naphthalene did not exceed the national average of estimate values, but had the highest concentration range of 103 ng/m^3 that exceed the highest end of national average estimate value.

Other PAH pollutants like retene, benzo(a)pyrene and acenaphthylene had high average concentration resulted and exceeded the national average estimate values, but did not have any failed screens or had no risk screening values determined. Retene has an average concentration 8.92 ± 3.59 ng/m^3, where the national average estimate is about 0.4 ng/m^3 (EPA, 2015). Benzo (a) pyrene had a study average of 0.52 ± 0.26 ng/m^3, with concentration range of 0.13 ng/m^3 to 1.42 ng/m^3. This pollutant failed five (5) screens, and the national average estimate is about 0.085 ng/m^3 (EPA, 2015). Acenaphthylene had a risk screening value but results with no failed screen. The overall study average was 2.46 ± 1.32 ng/m^3, where the national average estimate is about 0.6 ng/m^3 (EPA, 2015). These three (3) PAH pollutants had rather large confidence interval, where the relatively high levels of variability are indicated with the measurements.

As for the PM_{10} metals, arsenic measured concentration at CRNM was relatively low, but it resulted in failed screens. Arsenic was identified as one of the "pollutant of interest" in Table 6. The overall study average of arsenic is 0.20 ± 0.12 ng/m^3, and the national average estimate was reported to be 0.58 ng/m^3 by NATA 2005 (EPA, 2011), 0.75 ng/m^3 from EPA's 2012 NMP report

(EPA, 2015), and 0.87 ng/m^3 from EPA's ROE (EPA, 2015). Arsenic has been listed as a toxic pollutant, which is more risk associated to the ambient air. This pollutant did not exceed any of the national estimate averages.

Overall this study has provided an overview from the short-term air monitoring results setup at CRNM site. The CRNM site is located on the Navajo Nation tribal lands in the northwestern area of New Mexico. The sampling period was over a 3-month timeframe, where VOC, carbonyl compounds, PAH, and PM_{10} metals sample data were collected from CRNM site. A total of 11 pollutant failed screens, but 10 pollutants were detected as "pollutant of interest". It was stated by ERG Laboratory that the outcome of the "pollutant of interest" are the same pollutants that failed screen at any given monitoring location because nearly every measured detection was greater than the associated screening level (Appendix B). The study also found the wind direction might have had an impact on the overall data results. The majority of the wind came from the southwest direction at CRNM air monitoring site shown in figure 10. As illustrated in figure 4, majority of the point source emissions are located in the southwest direction from CRNM. The pollutants detected from this study could have been emitted from sources that are everywhere, for example mobile source or from localized industrial sources. The outcome from this study has determine that hazardous air toxics are looming over the surrounding schools and the ambient air school children are breathing is not pristine, which could have a health impact on their developmental and growth effects.

Recommendations for Future Studies

After completing this study the following are recommendations for future studies.

- A full year of air monitoring sampling period to be conducted would benefit the air toxics at CRNM site. This will help further address if additional steps are needed to determine an improvement of air quality from surrounding sources. Also through a one year sampling period, it would be beneficial to observe the seasonal weather effects of air quality data results and if there is a trend in highest measured concentration.
- Since within this study the wind rose collection dates started from January 13, 2015 to March 19, 2015, the lack of data information for the month of December 2014 and part of

January 2015 was needed. Determining the overall wind speed and direction from the start of sampling period would help if the higher concentrations resulted are really being affected from surrounding source.

- Comparison from emergency room visits relating to respiratory or health related issues from Church Rock Elementary School during the different weather patterns (winter vs. spring) could be favorable.
- Conducting additional SATMP monitoring site throughout the Navajo Nation would help determine if surrounding sources or wind pattern downwind drifts are affecting the overall air quality on school children.
- Further research in surrounding sources around CRNM would determine if the resulted concentration were being affected.

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APPENDIX A

ERG LABORATORY DRAFT REPORT

ERG

Summary Report

Ambient Air Monitoring Study at the Navajo Nation Church Rock, New Mexico Site

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1.0 Introduction

Air pollution contains many components that originate from a wide range of stationary, mobile, and natural emissions sources. Because some of these components include air toxics that are known or suspected to have the potential for negative human health effects, the U.S. Environmental Protection Agency (EPA) encourages state, local, and tribal agencies to understand and appreciate the nature and extent of toxic air pollution in their respective locations. To achieve this goal, EPA Office of Air Quality Planning and Standards (OAQPS) sponsors various monitoring programs, including the School Air Toxics Monitoring Program (SATMP). This program has been extended to perform additional studies in tribal communities in conjunction with the Tribal Air Monitoring Support (TAMS) Program (TAMS, 2015), of which the Navajo Nation has a participating monitoring site. The Navajo Nation collected 24-hour integrated ambient air samples for approximately 3 months, at 6-day sampling intervals, and sent them to EPA's national contract laboratory, Eastern Research Group, Inc. (ERG), for the analysis of volatile organic compounds (VOCs) from canister samples (Method TO-15), carbonyl compounds from sorbent cartridge samples (Method TO-11A), polycyclic aromatic hydrocarbons (PAHs) from polyurethane foam (PUF) and XAD-2® resin samples (Method TO-13A), and trace metals from filters (Method IO-3.5/FEM EQL-0512-202). This report provides characterizing information about the monitoring site location and summarizes the measurements collected at the CRNM monitoring site during the 3-month study.

2.0 Site Characterization

This section characterizes the monitoring site by providing geographical and physical information about the location of the site and the surrounding area. This information is provided to give the reader insight regarding factors that may influence the air quality near the site and assist in the interpretation of the ambient monitoring measurements. Figures 1 and 2 are composite satellite images retrieved from ArcGIS Explorer; the first shows the monitoring site and its immediate surroundings and the latter is a wider-angle image to show additional geographical elements.

The CRNM monitoring site is located in the town of Church Rock in northwest New Mexico. The town of Church Rock is located about 7 miles east of Gallup, New Mexico, and about 24 miles east of the state line. The monitoring site is located at Church Rock Elementary

School. Immediately north of the site are red rock formations, as shown in the composite satellite image in Figure 1, which are part of Red Rock State Park, and are a prominent feature in Figure 2. Residential properties are located across the street of from the elementary school. The surrounding area is classified as residential and is rural in nature with a primarily desert landscape. Much of Church Rock is located north of Interstate-40, which runs generally east-west across the state parallel with Route 66. CRNM is located about a half mile north of the interstate, with primarily residential dwellings situated between the site and the highway. Fort Wingate, a former Army installation (FWDA, 2015), lies to the south of I-40. Table 1 provides supplemental geographical information about the monitoring site.

Figure 1. Navajo Nation Church Rock (CRNM) Monitoring Site

Figure 2. Navajo Nation Church Rock (CRNM) Monitoring Site-Wide View

Table 1. Geographical Information for the CRNM Monitoring Site

Site Code	AQS Code	Address	Location	County	Tribal Area	Latitude and Longitude	Land Use	Location Setting
CRNM	35-031-2015	43 Challenger Road	Church Rock	McKinley	Navajo Nation	35.538747, -108.596741	Residential	Rural

Figure 3 identifies nearby point source emissions locations by source category, as reported in the 2011 NEI for point sources, version 2 (EPA, 2015a). Note that only sources within 10 miles of CRNM are included in the facility counts provided in Figure 3. The 10-mile boundary provides an indication of which emissions sources and emissions source categories could potentially have a direct effect on the air quality at the monitoring site. This boundary also provides both the proximity of emissions sources to the monitoring site as well as the quantity of such sources within a given distance of the site. Sources outside the 10-mile radius are still visible on the map, but have been grayed out in order to show emissions sources just outside the boundary.

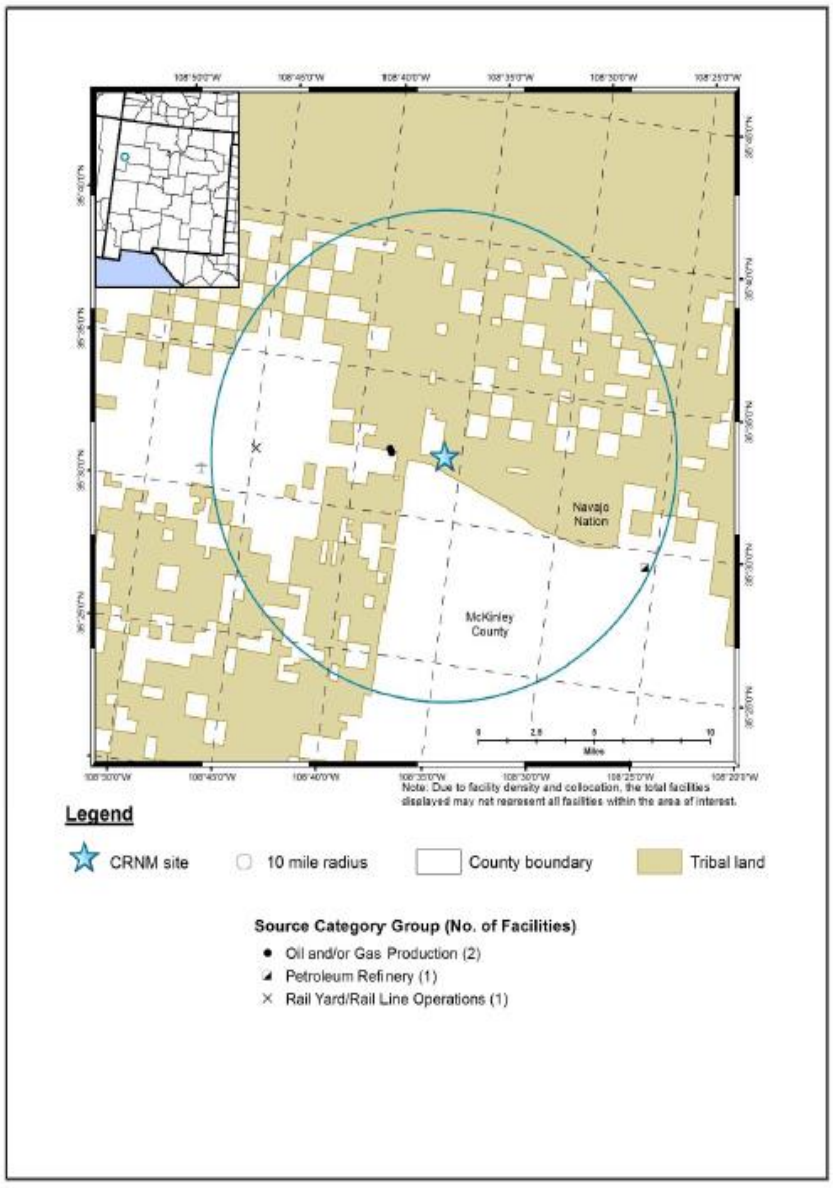
Figure 3 shows that the monitoring site is located in close proximity to relatively few emissions sources identified in the 2011 NEI. The four point source emissions sources within 10 miles of CRNM are included in following three source categories:

- Oil and/or gas production (2)
- Petroleum refining (1)
- Rail yard/rail line operations (1).

The closest facilities to CRNM are involved in oil and gas production and are located just outside the bottom-left side of Figure 2, just north of I-40, just greater than 2 miles west of CRNM. The only other point source shown in Figure 3 is an airport located outside the 10-mile radius, 10.5 miles to the southeast of the monitoring site.

According to Navajo Nation, nearby facilities not listed in the NEI include a casino and its generators, a rock and gravel company, and a furniture making facility. In addition, open burning and trash burning may contribute to emissions of air toxics near CRNM as population has increased (Navajo Nation, 2015).

Figure 3. NEI Point Sources Located Within 10 Miles of CRNM



3.0 Wind Rose Data

A wind rose shows the frequency at which a given wind speed and direction are measured near the monitoring site and can help identify the predominant direction from which the wind blows near the monitoring site. A wind rose is often used initially to determine where to install an ambient monitoring site when trying to capture emissions from an upwind source. A wind rose may also be useful in determining whether high concentrations correlate with a specific wind direction.

A wind rose was constructed to represent wind data for the sample period at CRNM. The wind rose was constructed by uploading hourly National Weather Service surface wind data from the nearest weather station with sufficient data into a wind rose software program, WRPLOT (Lakes, 2011). The weather station closest to CRNM with sufficient data is located at Gallup Municipal Airport, WBAN 23081 (NCDC, 2014 and NCDC, 2015). Figure 4a shows the orientation of and the distance between the monitoring site and weather station as well as the surrounding topographic features. Figure 4b presents the wind rose for the sample period, December 25, 2014 through March 19, 2015. This wind rose shows the frequency of wind directions as petals positioned around a 16-point compass, and uses color or shading to represent wind speeds.

Observations from Figures 4a and 4b include the following:

- The weather station at Gallup Municipal Airport is located about 11 miles west of CRNM, on the west side of Gallup. The variations in the terrain in the surrounding area are visible in Figure 4a.
- The wind rose shows that winds from the southwest quadrant (including west) and northeast quadrant (including east) were most commonly observed. Winds from the other quadrants were infrequently observed. Calm winds ($\leq$ 2 knots) accounted for just over one-third of wind observations during the sampling period.
- The average wind speed during the sample period was around 4.5 knots. The winds from the southwest quadrant tended to be stronger than those from the northwest quadrant. The strongest winds (shown in green and bright blue) tended to be out of the south-southwest to west.

Figure 4a. Location of CRNM and the Weather Station at Gallup Municipal Airport

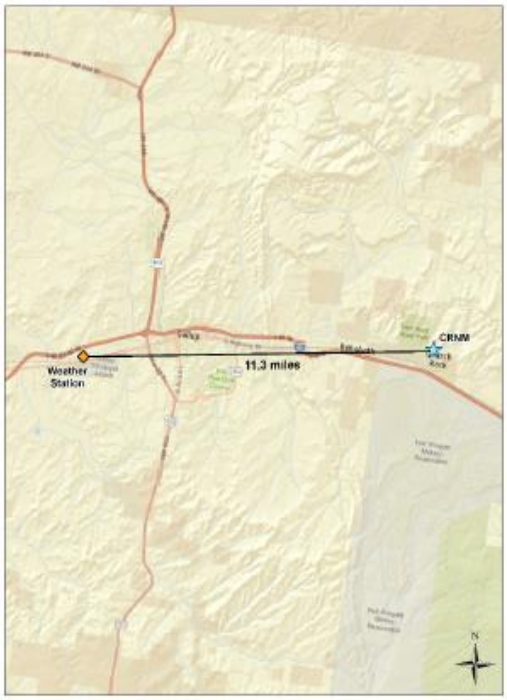
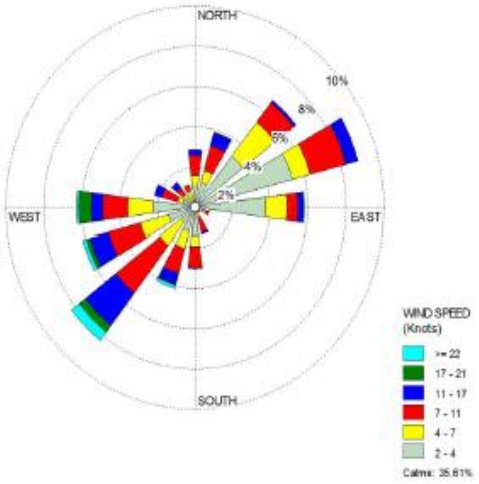


Figure 4b. Wind Rose for Gallup Municipal Airport (December 25, 2014-March 19, 2015)



4.0 Analytical Method Information

The first samples were collected at the CRNM site on December 25, 2014 and the last samples were collected on March 19, 2015. Samples were collected on a 1-in-6 day sampling schedule and ran for 24 hours. Four types of samples were collected at CRNM, which were analyzed at the laboratory using modified versions of EPA's Compendium methods:

- *Compendium Method TO-15* for the measurement of 59 VOCs
- *Compendium Method TO-11A* for the measurement of 15 carbonyl compounds
- *Compendium Method TO-13A* for the measurement of 22 PAHs
- A combination of *Compendium Method IO-3.5* and EPA *Federal Equivalent Methods (FEM) EQL-0512-202* (for PM_{10}) for the measurement of 11 metals.

A brief description of each method is provided below.

4.1 VOC Sampling and Analytical Method

Sampling and analysis for VOCs was performed using methodology based on EPA Compendium Method TO-15 (EPA, 1999a). Ambient air samples were collected in passivated stainless steel canisters for VOC analysis. The ERG laboratory distributed the prepared canisters (i.e., cleaned and evacuated) to the monitoring site before each scheduled sample collection event, and site operators connected the canisters to air sampling equipment prior to each sampling event. Prior to field sampling, the passivated canisters had internal pressures much lower than atmospheric pressure. Using this pressure differential, ambient air flowed into the canisters automatically once an associated system solenoid valve was opened. A mass flow controller on the sampling device inlet ensured that ambient air entered the canister at an integrated constant rate across the collection period. At the end of the 24-hour sampling period, the solenoid valve automatically closed and stopped ambient air from flowing into the canister. Site operators recovered and returned the canisters, along with the Chain of Custody (COC) forms and all associated documentation, to the ERG laboratory for analysis.

By analyzing each sample with gas chromatography incorporating mass spectrometry (GC/MS), operating in the Selected Ion Monitoring (SIM) mode, the laboratory staff determined ambient air concentrations of 59 VOCs. Because *m*-xylene and *p*-xylene elute from the GC column at the same time, the VOC analytical method reports only the sum concentration for

these two isomers, and not the separate concentration for each isomer. Concentration data for the VOC samples collected at CRNM are presented in Appendix A.

4.2 Carbonyl Compound Sampling and Analytical Method

Sampling and analysis for carbonyl compounds was performed using methodology based on EPA Compendium Method TO-11A (EPA, 1999b). Ambient air samples were collected by passing ambient air through an ozone scrubber and then through cartridges containing silica gel coated with 2,4-dinitrophenylhydrazine (DNPH), a compound known to react selectively and reversibly with many aldehydes and ketones. Carbonyl compounds in ambient air are retained in the sampling cartridge, while other compounds pass through the cartridge without reacting with the DNPH-coated matrix. The ERG laboratory distributed the DNPH cartridges to the monitoring site prior to each scheduled sample collection event and site operators connected the cartridges to the air sampling equipment. After each 24-hour sampling period, site operators recovered the cartridges and returned them, along with the COC forms and all associated documentation, to the ERG laboratory for analysis.

To quantify concentrations of carbonyl compounds in the sampled ambient air, laboratory analysts extracted the exposed DNPH cartridges with acetonitrile. High-performance liquid chromatography (HPLC) analysis and ultraviolet (UV) detection of these solutions determined the relative amounts of individual carbonyl compounds present in the original air sample. Because the three tolualdehyde isomers (*m*-, *o*-, *p*-) elute from the HPLC column at the same time, the carbonyl compound analytical method reports only the sum concentration for these isomers, and not the separate concentrations for each isomer, similar to *m*- and *p*-xylene described above. Concentration data for the carbonyl compound samples collected at CRNM are presented in Appendix B.

4.3 PAH Sampling and Analytical Method

Sampling and analysis for PAHs was performed using methodology based on EPA Compendium Method TO-13A (EPA, 1999c) and ASTM D6209 (ASTM, 2013). The ERG laboratory prepared sampling media and supplied them to the site before each scheduled sample collection event. The clean sampling PUF/XAD-2® cartridge and glass fiber filter are installed in

a high volume sampler by the site operators and allowed to sample for 24 hours. Sample collection modules and COC forms and all associated documentation were returned to the ERG laboratory after sample collection. Within 14 days of sampling, the filter and cartridge are extracted together using a toluene in hexane solution using the Dionex Accelerated Solvent Extractor (ASE) 350 or ASE 300. The sample extract is concentrated to a final volume of 1.0 milliliter (mL). A volume of 1 microliter (µL) is injected into the GC/MS operating in the SIM mode to analyze for 22 PAHs. Concentration data for the PAH sampled collected at CRNM are presented in Appendix C.

4.4 Metals Sampling and Analytical Method

Ambient air samples for metals analysis were collected by passing ambient air through 47mm Teflon® filters using low-volume samplers for particulate matter less than 10 microns (PM_{10}). Particulates in ambient air were collected on the filters (under local conditions) and, after a 24-hour sampling period, site operators recovered and returned the filters, along with the COC forms and all associated documentation, to the ERG laboratory for analysis. Extraction and analysis for the determination of metals in or on particulate matter was performed in accordance with EPA Compendium Method IO-3.5 and EPA FEM EQL-0512-202 (for PM_{10}) (EPA, 1999d; EPA, 2012). Upon receipt at the laboratory, the whole filters were digested using a dilute nitric acid, hydrochloric acid, and hydrofluoric acid solution. The digestate was then analyzed using inductively coupled plasma-mass spectrometry (ICP-MS) to quantify the concentration of individual metals present in the original air sample. Concentration data for the speciated metals samples collected at CRNM are presented in Appendix D.

4.5 Sample Collection Schedules

Table 2 presents a list of sample dates for the entire sample period as well as whether the samples collected and/or analyzed were valid or not. The goal of the monitoring effort was to collect and analyze at least 10 sets of valid samples for each method, similar to the model used in the SATMP effort. This goal was achieved for each method. Fifteen valid metals and VOC samples were collected and analyzed successfully; 12 valid carbonyl compound and 13 PAH samples were also collected and analyzed successfully.

Table 2. Sample Collection Summary

Sample Date	Metals Analysis PM_{10}	Carbonyl Compounds	VOCs	PAHs
12/25/14	Reported	Invalid[a]	Reported	Reported
12/31/14	Reported	Invalid[a]	Reported	Reported
1/6/15	Reported	Invalid[a]	Reported	Reported
1/12/15	Reported	Reported	Reported	Reported
1/18/15	Reported	Reported	Reported	Reported
1/24/15	Reported	Reported	Reported	Reported
1/30/15	Reported	Reported	Reported	Reported
2/5/15	Reported	Reported	Reported	Reported
2/11/15	Reported	Reported	Reported	Invalid[b]
2/17/15	Reported	Reported	Reported	Reported
2/23/15	Reported	Reported	Reported	Invalid[c]
3/1/15	Reported	Reported	Reported	Reported
3/7/15	Reported	Reported	Reported	Reported
3/13/15	Reported	Reported	Reported	Reported
3/19/15	Reported	Reported	Reported	Reported
Total Valid vs Total Collected	15/15	12/15	15/15	13/15

[a] Sampler malfunction. [b] Lab Issue. [c] Sample did not run for or 24 hours.

5.0 Statistical Summary

This section provides a brief overview of data treatment and presents a summary of analytical results. In order to compare concentrations across multiple sampling methods, all concentrations have been converted to a common unit of measure: microgram per cubic meter ($\mu g/m^3$). Concentrations of *m,p*-xylene and *o*-xylene were summed together and are henceforth referred to as simply "xylenes" throughout the remainder of this report, with the exception of Appendix E. Appendix E presents the detection rate for each pollutant as well as the minimum concentration, maximum concentration, average concentration, and the standard deviation for each pollutant measured at CRNM across the sampling period.

A brief summary for each method is presented below:

- The pollutants with the highest average concentration are dichlorodifluoromethane (2.57 ± 0.13 $\mu g/m^3$) and acetone (2.20 ± 0.56 $\mu g/m^3$). These are the only two pollutants with study averages greater than 2 $\mu g/m^3$. Pollutants with average concentrations greater than 1 $\mu g/m^3$ over the period of study are: chloromethane

(1.45 ± 0.46 µg/m^3), formaldehyde (1.44 ± 0.21 µg/m^3), and trichlorofluoromethane (1.33 ± 0.06 µg/m^3). Each of these pollutants was detected in all of the valid samples collected.

- The maximum concentration was measured on February 5, 2014 for chloromethane (4.55 µg/m^3) and is more than twice the next highest chloromethane measurement (1.48 µg/m^3), measured on two separate sample days in February. Concentrations of this pollutant range from 0.942 µg/m^3 to 4.55 µg/m^3, with a median concentration of 1.23 µg/m^3. This explains the relatively large confidence interval shown for the study average of this pollutant.

- The second highest concentration was measured on March 19, 2015 for acetone (3.98 µg/m^3), with two other acetone concentrations greater than 3 µg/m^3 also measured in March. Acetone accounts for three of the five highest concentrations measured at CRNM. Acetone concentrations measured at CRNM range from 1.05 µg/m^3 to 3.98 µg/m^3, with a median concentration of 1.98 µg/m^3. Similar to chloromethane, the average concentration of acetone has a relatively large confidence interval associated with it.

- Concentrations of dichlorodifluoromethane measured at CRNM range from 2.13 µg/m^3 to 2.94 µg/m^3, with a median concentration of 2.65 µg/m^3. Although this pollutant has one of the highest average concentrations over the period of sampling, there is relatively little variability in the measurements based on the confidence interval associated with the average. This pollutant accounts for 15 of 24 concentrations greater than or equal to 2 µg/m^3 measured at CRNM (with acetone accounting for six, dichloromethane accounting for two, and chloromethane accounting for one).

- Formaldehyde concentrations measured at CRNM range from 0.811 µg/m^3 to 1.98 µg/m^3, with a median concentration of 1.58 µg/m^3. The median concentration of formaldehyde is actually greater than the average concentration, as the concentrations at the lower end of the concentration range are pulling down the study average.

- Trichlorofluoromethane concentrations measured at CRNM range from 1.10 µg/m^3 to 1.46 µg/m^3, with a median concentration of 1.33 µg/m^3 and exhibiting little variability.

- A total of 53 VOC concentrations greater than 1 µg/m^3 were measured at CRNM: dichlorodifluoromethane and trichlorofluoromethane (15 each), chloromethane (14); dichloromethane (3), propylene and toluene (2 each), and acrolein and acetylene (1 each). Ten VOCs were not detected at all in the samples collected at CRNM. A total of 15 valid VOC samples were collected at CRNM.

- A total of 23 carbonyl compound concentrations greater than 1 µg/m^3 were measured at CRNM: acetone (12) and formaldehyde (11). Two carbonyl compounds were not detected at all in the samples collected at CRNM (isovaleraldehyde and

2,5-dimethylbenzaldehyd). A total of 12 valid carbonyl compound samples were collected at CRNM.

- Of the PAHs, naphthalene has the highest average over the study period (53.30 ± 14.66 ng/m^3) and the 12 highest individual measurements. Concentrations of naphthalene measured at CRNM range from 19.2 ng/m^3 to 103 ng/m^3, with the maximum naphthalene concentration measured on the same day as the maximum chloromethane concentration (February 5, 2015). The PAHs with the second and third highest average concentrations over the period of study are phenanthrene (10.41 ± 2.86 ng/m^3) and retene (8.92 ± 3.59 ng/m^3).

- The metals with the highest average concentrations are manganese (4.32 ± 1.39 ng/m^3), chromium (3.49 ± 0.33 ng/m^3), and lead (0.56 ± 0.10 ng/m^3). Of the 29 concentrations greater than 1 ng/m^3 measured at CRNM, total chromium accounted for 15 and manganese accounted for the remaining 14. However, the six highest metals concentrations measured at CRNM were for manganese.

- Most of the PAHs and speciated metals were detected in all valid samples collected at CRNM.

Figure 5 presents a bar graph of the 21 pollutants with average concentrations greater than 0.1 µg/m^3 over the study period. These are presented in descending order and with the 95 percent confidence intervals indicated. The confidence intervals make it easy to see which pollutants have a higher level of variability in the measurements collected (such as acetone and chloromethane) and which have relatively little variability (dichlorodifluoromethane and trichlorofluoromethane, to name a few). Figure 5 shows that most of the pollutants sampled for at CRNM have average concentrations less than 1 µg/m^3.

Figures 6 and 7 present similar graphical comparisons for the PAHs and PM_{10} metals, which all have study averages less than 0.1 µg/m^3 and therefore do not appear in Figure 5. Figure 6 shows that the average concentration for naphthalene is roughly five times greater than the next highest averages and that all but three PAHs have period averages less than 5 ng/m^3. Figure 7 shows that manganese and total chromium have the highest averages by a significant margin. This figure also shows that the variability associated with the manganese measurements is greater than the variability associated with the total chromium measurements, as indicated by the confidence intervals shown.

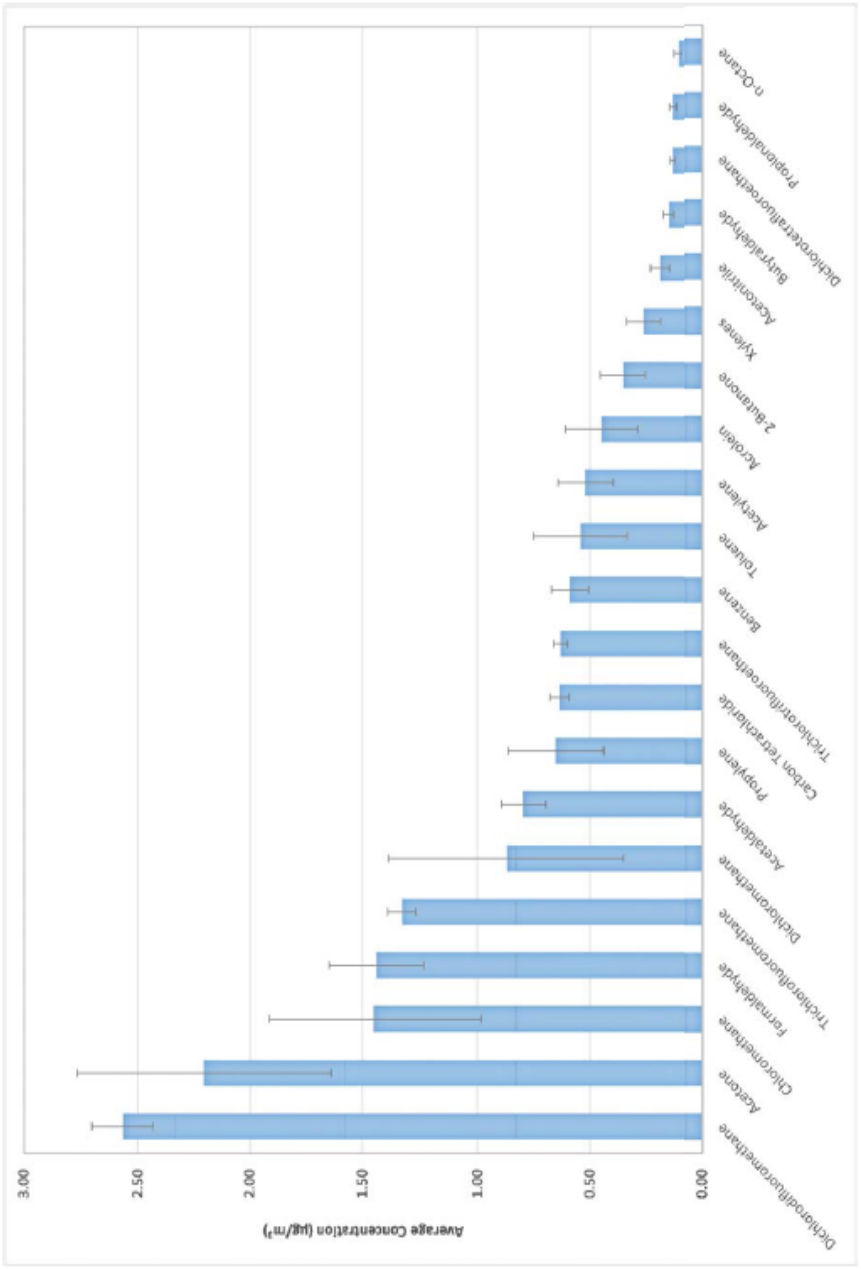


Figure 5. Average Concentrations over the Study Period

Figure 6. PAH Concentrations over the Study Period

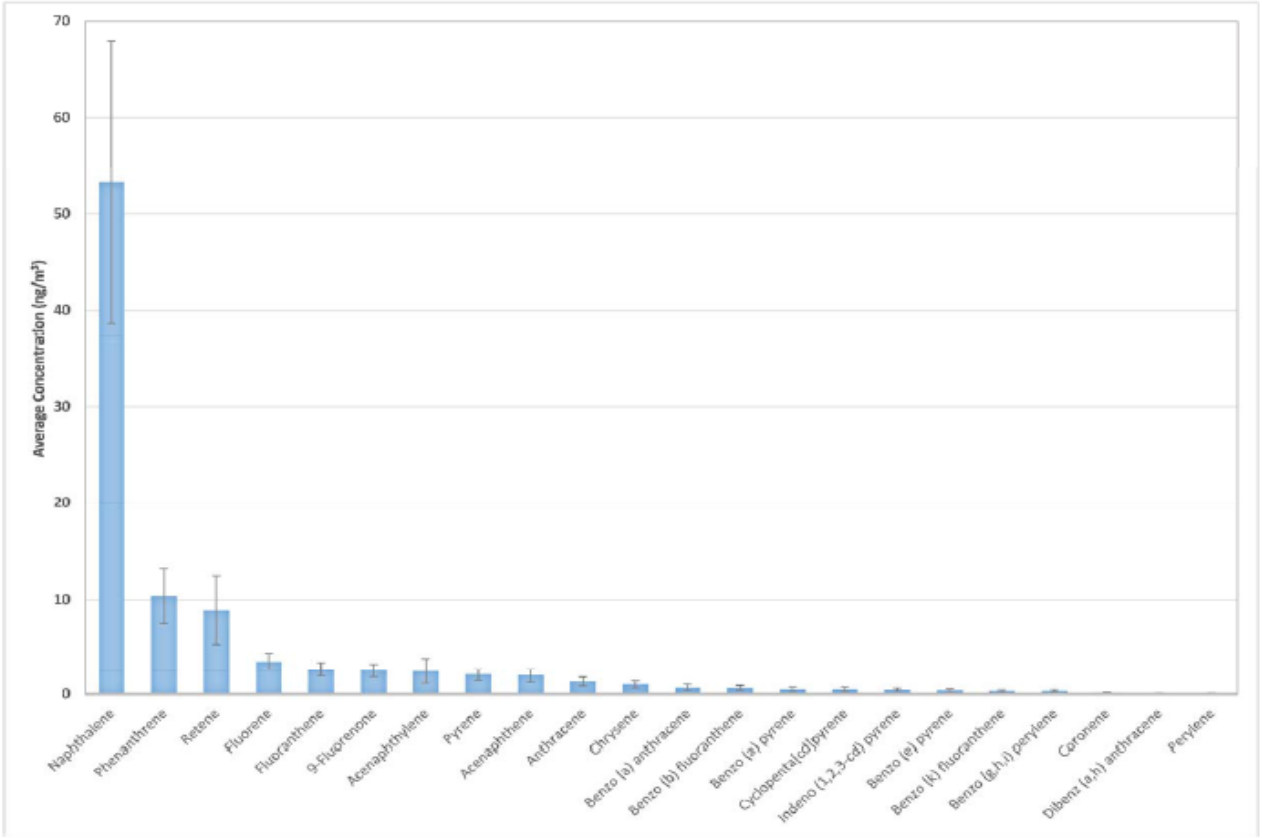
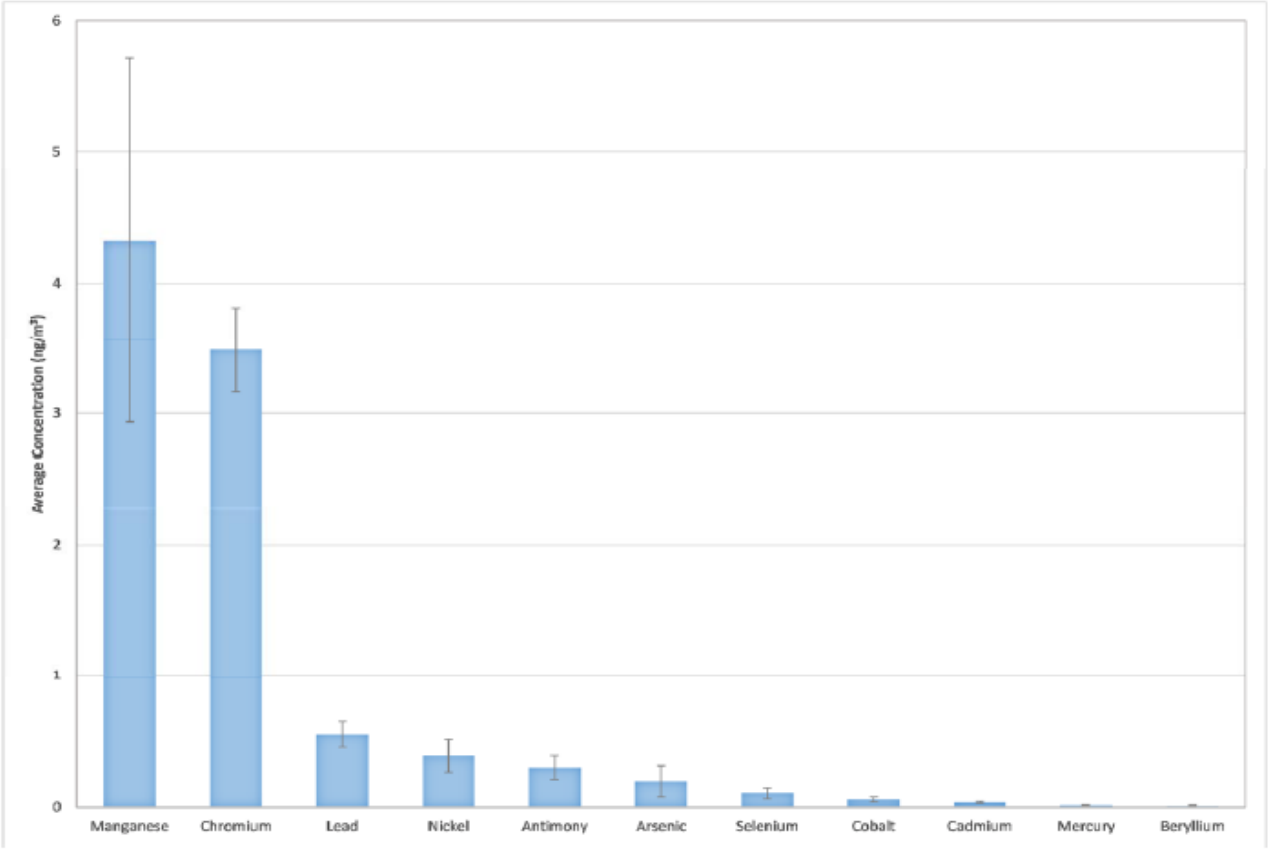


Figure 7. PM_{10} Metals Concentrations over the Study Period



6.0 Human Health Risk and the Pollutants of Interest

Health risk-based potential was used to identify "pollutants of interest" for CRNM based on the results of this study. The following paragraphs provide an overview of health risk terms and concepts and outline how pollutants of interest are determined and what can be gleaned from this information.

EPA defines risk as "the probability that damage to life, health, or the environment will occur as a result of a given hazard (such as exposure to a toxic chemical)" (EPA, 2011a). Human health risk can be defined in terms of time. Chronic effects develop from repeated exposure over long periods of time; acute effects develop from a single exposure or from exposures over short periods of time (EPA, 2010a). Health risk is also route-specific; that is, risk varies depending upon route of exposure (i.e., oral vs. inhalation). Because this report covers air toxics in ambient air, only the inhalation route is considered. Hazardous air pollutants (HAPs) are those pollutants "known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects" (EPA, 2015b).

Health risks are typically divided into cancer and noncancer effects when referring to human health risk. Cancer risk is defined as the likelihood of developing cancer as a result of exposure to a given concentration over a 70-year period, and is presented as the number of people at risk for cancer per million people. Noncancer health effects include conditions such as asthma; noncancer health risks are presented as a hazard quotient, the value below which no adverse health effects are expected (EPA, 2011a). Cancer risk is presented as a probability while the hazard quotient is a ratio and thus, a unitless value.

In order to assess health risk, EPA and other agencies develop toxicity factors, such as cancer unit risk estimates (UREs) and noncancer reference concentrations (RfCs), to estimate cancer and noncancer risks and to identify (or screen) where air toxics concentrations may present a human health risk. EPA has published a guidance document outlining a risk-based screening approach for performing an initial screen of ambient air toxics monitoring datasets (EPA, 2010a). The preliminary risk-based screening process provided in this report is an adaption of that approach and is a risk-based methodology for analysts and interested parties to

identify which pollutants may pose a health risk in their area. Cancer UREs and noncancer RfCs are converted into screening values. The cancer screening value is the cancer URE converted to $\mu g/m^3$ and divided by one million. The noncancer screening value is one-tenth of the noncancer RfC and converted from mg/m^3 to $\mu g/m^3$. The final screening value used in this report is the lower of the two screening values. Not all pollutants analyzed for during this study have screening values; of the pollutants sampled, 65 pollutants have screening values. The screening values used in this analysis are presented in Appendix F[1]. The results of this analysis may help identify where policy-makers want to shift their air monitoring priorities. The daily measurements of the target pollutants were compared to these chronic risk screening values in order to identify pollutants of interest across the study. The following risk-based screening process was used to identify pollutants of interest:

1. Each daily measurement was compared to its risk screening value, where applicable. Concentrations that are greater than the risk screening value are described as "failing the screen."

2. The number of failed screens was summed for each applicable pollutant.

3. The percent contribution of the number of failed screens to the total number of failed screens for the site was calculated for each applicable pollutant.

4. The pollutants contributing to the top 95 percent of the total failed screens for the site were identified as pollutants of interest. Pollutants of interest are those whose concentrations may pose a human health risk and may warrant further study and/or analysis.

In regards to Step 4 above, the actual cumulative contribution may exceed 95 percent in order to include all pollutants contributing to the minimum 95 percent criteria (refer to arsenic in Table 3). In addition, if the 95 percent cumulative criterion is reached, but the next pollutant contributed equally to the number of failed screens, that pollutant was also designated as a pollutant of interest. Results of the risk-based screening process are provided in Table 3.

[1] The risk-based screening process used in this report comes from guidance from EPA Region 4's report "A Preliminary Risk-Based Screening Approach for Air Toxics Monitoring Datasets" but the screening values referenced in that report have since been updated (EPA, 2014).

Due to various sampling and analytical issues, a few pollutants sampled for at CRNM that have risk screening values have been excluded from the risk screening process. These are described below:

- Laboratory analysts have indicated that acetonitrile values may be artificially high (or non-existent) due to site conditions and potential cross-contamination with concurrent sampling of carbonyl compounds using Method TO-11A. The inclusion of acetonitrile in data analyses must be determined on a site-specific basis by the agency responsible for the site.

- Acrolein was also excluded from the preliminary risk-based screening process due to questions about the consistency and reliability of the measurements (EPA, 2010b), as determined during EPA's School Air Toxics Monitoring Program.

Table 3. Risk-Based Screening Results for the CRNM Monitoring Site

Pollutant	Screening Value ($\mu g/m^3$)	# of Failed Screens	# of Measured Detections	% of Screens Failed	% of Total Failures	Cumulative % Contribution
Navajo Nation Church Rock, New Mexico - CRNM						
Benzene	0.13	15	15	100.00	13.39	13.39
1,3-Butadiene	0.03	15	15	100.00	13.39	26.79
Carbon Tetrachloride	0.17	15	15	100.00	13.39	40.18
1,2-Dichloroethane	0.038	15	15	100.00	13.39	53.57
Acetaldehyde	0.45	12	12	100.00	10.71	64.29
Formaldehyde	0.077	12	12	100.00	10.71	75.00
Naphthalene	0.029	10	13	76.92	8.93	83.93
Hexachloro-1,3-butadiene	0.045	7	7	100.00	6.25	90.18
Benzo(a)pyrene	0.00057	5	13	38.46	4.46	94.64
Arsenic (PM_{10})	0.00023	4	15	26.67	3.57	98.21
1,2-Dibromoethane	0.0017	2	2	100.00	1.79	100.00
Total		112	134	83.58		

Table 3 presents the results of the preliminary risk-based screening process for CRNM. Observations from Table 3 include the following:

- Concentrations of 11 pollutants (six VOCs, two carbonyl compounds, two PAHs, and one PM_{10} metal) exceeded their risk screening values, or "failed screens" over the sampling period; 112 of 134 concentrations for these 11 pollutants were greater than their associated risk screening value (or failed screens), representing an 84 percent combined failure rate.

- Four VOCs were detected in all 15 VOC samples collected at CRNM and failed all 15 screens (benzene, 1,3-butadiene, carbon tetrachloride, and 1,2-dichloroethane), representing a 100 percent pollutant-specific failure rate for each. Acetaldehyde and formaldehyde were also detected in all 12 valid samples collected and failed 100 percent of screens. Together, these six pollutants account for 75 percent of the total failed screens. Two additional VOCs, hexachloro-1,3-butadiene and 1,2-dibromoethane, were detected less frequently but also failed all their screens.

- Naphthalene was detected in all 13 valid PAH samples collected at CRNM and failed 10 screens, representing a 77 pollutant-specific failure rate. Benzo(a)pyrene was also detected in all 13 valid PAH samples collected at CRNM and failed five screens, representing a 38 pollutant-specific failure rate. Together, these PAHs account for 13 percent of the total failed screens.

- Arsenic was detected in all 15 metals samples collected and failed four screens, representing a 27 pollutant-specific failure rate. Arsenic is the only PM_{10} metal that failed screens and accounts for 4 percent of the total failed screens.

- Ten of these 11 pollutants contributed to at least 95 percent of failed screens for CRNM, and thus were identified as pollutants of interest. These pollutants are shaded in gray in Table 3.

A few items to note in regards to the statistical results presented in Section 5 and the risk screening results presented in Section 6: A pollutant measured in high quantities does not necessarily present a higher risk to human health than a pollutant measured in very low quantities. The more toxic the pollutant, the more risk associated with its concentrations in ambient air.

- Several of the pollutants identified in the statistical analysis section, such as dichlorodifluoromethane, acetone, trichlorofluoromethane do not have risk screening values. Other pollutants, such as chloromethane, have risk screening values, but the concentrations measured at CRNM did not fail any screens and thus, these pollutants do not appear in Table 3. Still other pollutants, such as formaldehyde, have "higher" concentrations and failed many screens.

- Several pollutants that failed screens and appear in Table 3 do not necessarily have relatively "high" concentrations; rather, the screening values are low, as a result of the risk associated with that particular pollutant, such that all or nearly all measured detections fail screens. An example of this is benzene. Benzene's risk screening value is 0.13 $\mu g/m^3$. Concentrations of benzene measured at CRNM range from 0.323 $\mu g/m^3$ to 0.771 $\mu g/m^3$, and thus, all benzene concentrations fail the screen. Yet, CRNM's average benzene concentration over the study period is 0.59 ± 0.08 $\mu g/m^3$, which is less than national average benzene concentration estimates (generally between 0.75 $\mu g/m^3$ and 1 $\mu g/m^3$), as reported in EPA's National-Scale Air Toxics

Assessment (NATA) from 2005 (EPA, 2011b); EPA's National Monitoring Programs (NMP) annual reports for 2011 and 2012 (EPA, 2015c); and EPA's Report on the Environment (ROE) (EPA, 2015d).

- Carbon tetrachloride is a pollutant that was used worldwide as a refrigerant. However, it was identified as an ozone-depleting substance in the stratosphere and its use was banned at the Kyoto Protocol. This pollutant has a long lifetime in the atmosphere, but slowly degrades over time. Today, its concentration in ambient air is fairly ubiquitous regardless of where it is measured. CRNM's average carbon tetrachloride concentration over the study period is 0.63 ± 0.04 $\mu g/m^3$, which falls within the national average concentration estimates (generally between 0.55 $\mu g/m^3$ and 0.70 $\mu g/m^3$) (EPA, 2011b; EPA, 2015c; and EPA, 2015d).

- Formaldehyde is primarily emitted as a by-product of combustion and can form secondarily in the atmosphere. CRNM's average formaldehyde concentration over the study period is 1.44 ± 0.21 $\mu g/m^3$, which is less than the national average concentration estimates, which vary between 2.0 $\mu g/m^3$ and 3.0 $\mu g/m^3$ (EPA, 2011b; EPA, 2015c; and EPA, 2015d).

- Dichlorodifluoromethane (2.57 ± 0.13 $\mu g/m^3$) and acetone (2.20 ± 0.56 $\mu g/m^3$) are the pollutants with the highest study average concentrations for CRNM. However, neither of these pollutants have risk screening values.

- The maximum concentration measured at CRNM was for chloromethane (4.55 $\mu g/m^3$), with concentrations of this pollutant ranging from 0.942 $\mu g/m^3$ to 4.55 $\mu g/m^3$. Chloromethane's risk screening value is 9 $\mu g/m^3$ and thus, none of the chloromethane concentrations measured at CRNM fail the screen.

- Naphthalene has the highest study average among the PAHs (53.30 ± 14.66 ng/m^3), with concentrations ranging from 19.2 ng/m^3 to 103 ng/m^3. With a risk screening value of 29 ng/m^3, all but three of the naphthalene concentrations measured at CRNM failed screens. National average concentration estimates fall between 70 ng/m^3 and 90 ng/m^3 (EPA, 2011b and EPA, 2015c).

- Other PAHs measured at CRNM have relatively high averages compared to the national program estimates, even though they did not fail screens or have no risk screening value. For example, retene has an average concentration of 8.92 ± 3.59 ng/m^3, with national average estimates around 0.4 ng/m^3 (EPA, 2015c). Retene has no risk screening value. Benzo(a)pyrene is another example. This pollutant's concentrations span an order of magnitude, ranging from 0.13 ng/m^3 to 1.42 ng/m^3, with a study average of 0.52 ± 0.26 ng/m^3. This pollutant failed five screens. National average estimates for benzo(a)pyrene are around 0.085 ng/m^3 (EPA, 2015c). Acenaphthylene is another, with a study average of 2.46 ± 1.32 ng/m^3, with national average estimates around 0.6 ng/m^3 (EPA, 2015c). Acenaphthylene has a risk screening value but there were no failed screens. Note that for each of these pollutants, the confidence intervals are rather large, indicating a relatively high level of variability associated with the measurements.

- Arsenic failed screens, even though the concentrations measured at CRNM appear relatively low compared to the other pollutants. Arsenic was also identified as a pollutant of interest for CRNM. The more toxic the pollutant, the more risk associated with its concentrations in ambient air. CRNM's average arsenic concentration over the study period is 0.20 ± 0.12 ng/m^3. This is less than the national average arsenic concentration estimates (0.58 ng/m^3 as reported in EPA's NATA from 2005 (EPA, 2011b), 0.75 ng/m^3 from EPA's 2012 NMP report (EPA, 2015c), and 0.87 ng/m^3 as reported in EPA's ROE (EPA, 2015d)).

7.0 Summary

This report provides an overview of the results of a short-term monitoring study at the CRNM monitoring site on the Navajo Nation tribal lands in New Mexico. VOC, carbonyl compound, PAH, and metals samples were collected over a 3-month period at the CRNM site. Although 11 pollutants failed screens for CRNM and 10 of these were identified as pollutants of interest for this site, these are mostly the same pollutants that fail screens at any given monitoring location because nearly every measured detection was greater than the associated screening level. Many of these pollutants are emitted by sources that are everywhere such as mobile sources but may also be emitted by sources more localized in nature (such as specific industrial sources). A full year's worth of monitoring would be beneficial in the characterization of ambient levels of air toxics at CRNM and would aid in the determination of whether additional steps are needed to improve air quality near the site. In addition, the collection of meteorological measurements, particularly wind speed and direction, would be beneficial in determining if any higher measurements correlate with a specific wind direction.

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Appendix A

VOC Raw Data

CRNM VOC Sampling Results

Sample Date/Time: 12/25/2014 00:00 Sample ID: 4123110-01 Units: ppbv Sample Type: Field Sample		Sample Date/Time: 12/31/2014 00:00 Sample ID: 5010721-01 Units: ppbv Sample Type: Field Sample		Sample Date/Time: 1/6/2015 00:00 Sample ID: 5011418-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.063	Acetonitrile	0.054	Acetonitrile	0.096
Acetylene	0.317	Acetylene	0.365	Acetylene	0.518
Acrolein	0.329	Acrolein	0.337	Acrolein	0.114
Acrylonitrile	ND	Acrylonitrile	ND	Acrylonitrile	ND
tert-Amyl Methyl Ether	ND	tert-Amyl Methyl Ether	ND	tert-Amyl Methyl Ether	ND
Benzene	0.143	Benzene	0.153	Benzene	0.223
Bromochloromethane	ND	Bromochloromethane	ND	Bromochloromethane	ND
Bromodichloromethane	ND	Bromodichloromethane	ND	Bromodichloromethane	ND
Bromoform	ND	Bromoform	ND	Bromoform	ND
Bromomethane	0.013	Bromomethane	0.014	Bromomethane	0.012
1,3-Butadiene	0.017	1,3-Butadiene	0.017	1,3-Butadiene	0.047
Carbon Disulfide	0.010	Carbon Disulfide	0.011	Carbon Disulfide	0.008
Carbon Tetrachloride	0.108	Carbon Tetrachloride	0.094	Carbon Tetrachloride	0.094
Chlorobenzene	ND	Chlorobenzene	ND	Chlorobenzene	ND
Chloroethane	ND	Chloroethane	ND	Chloroethane	ND
Chloroform	0.019	Chloroform	0.022	Chloroform	0.020
Chloromethane	0.516	Chloromethane	0.544	Chloromethane	0.492
Chloroprene	ND	Chloroprene	ND	Chloroprene	ND
Dibromochloromethane	0.006	Dibromochloromethane	0.007	Dibromochloromethane	0.006
1,2-Dibromoethane	ND	1,2-Dibromoethane	ND	1,2-Dibromoethane	ND
m-Dichlorobenzene	ND	m-Dichlorobenzene	ND	m-Dichlorobenzene	ND
o-Dichlorobenzene	ND	o-Dichlorobenzene	ND	o-Dichlorobenzene	ND
p-Dichlorobenzene	0.009	p-Dichlorobenzene	ND	p-Dichlorobenzene	ND
Dichlorodifluoromethane	0.446	Dichlorodifluoromethane	0.494	Dichlorodifluoromethane	0.499
1,1-Dichloroethane	ND	1,1-Dichloroethane	ND	1,1-Dichloroethane	ND
1,2-Dichloroethane	0.020	1,2-Dichloroethane	0.024	1,2-Dichloroethane	0.022
1,1-Dichloroethene	ND	1,1-Dichloroethene	ND	1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND	cis-1,2-Dichloroethylene	ND	cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND	trans-1,2-Dichloroethylene	ND	trans-1,2-Dichloroethylene	ND
Dichloromethane	0.085	Dichloromethane	0.083	Dichloromethane	0.119
1,2-Dichloropropane	ND	1,2-Dichloropropane	ND	1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND	cis-1,3-Dichloropropene	ND	cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND	trans-1,3-Dichloropropene	ND	trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.018	Dichlorotetrafluoroethane	0.020	Dichlorotetrafluoroethane	0.020
Ethyl Acrylate	ND	Ethyl Acrylate	ND	Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND	Ethyl tert-Butyl Ether	ND	Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.016	Ethylbenzene	0.016	Ethylbenzene	0.030
Hexachloro-1,3-butadiene	ND	Hexachloro-1,3-butadiene	ND	Hexachloro-1,3-butadiene	ND
Methyl Isobutyl Ketone	0.015	Methyl Isobutyl Ketone	0.025	Methyl Isobutyl Ketone	0.012
Methyl Methacrylate	ND	Methyl Methacrylate	ND	Methyl Methacrylate	ND
Methyl tert-Butyl Ether	0.007	Methyl tert-Butyl Ether	ND	Methyl tert-Butyl Ether	ND
n-Octane	0.013	n-Octane	0.025	n-Octane	0.026
Propylene	0.210	Propylene	0.297	Propylene	0.314
Styrene	ND	Styrene	ND	Styrene	0.024
1,1,2,2-Tetrachloroethane	ND	1,1,2,2-Tetrachloroethane	0.009	1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	0.009	Tetrachloroethylene	ND	Tetrachloroethylene	ND
Toluene	0.072	Toluene	0.079	Toluene	0.156
1,2,4-Trichlorobenzene	ND	1,2,4-Trichlorobenzene	ND	1,2,4-Trichlorobenzene	ND
1,1,1-Trichloroethane	0.009	1,1,1-Trichloroethane	0.008	1,1,1-Trichloroethane	0.008
1,1,2-Trichloroethane	ND	1,1,2-Trichloroethane	ND	1,1,2-Trichloroethane	ND
Trichloroethylene	ND	Trichloroethylene	ND	Trichloroethylene	ND
Trichlorofluoromethane	0.207	Trichlorofluoromethane	0.235	Trichlorofluoromethane	0.233
Trichlorotrifluoroethane	0.076	Trichlorotrifluoroethane	0.086	Trichlorotrifluoroethane	0.085
1,2,4-Trimethylbenzene	0.011	1,2,4-Trimethylbenzene	0.009	1,2,4-Trimethylbenzene	0.021
1,3,5-Trimethylbenzene	ND	1,3,5-Trimethylbenzene	ND	1,3,5-Trimethylbenzene	0.009
Vinyl chloride	ND	Vinyl chloride	ND	Vinyl chloride	ND
m,p-Xylene	0.031	m,p-Xylene	0.026	m,p-Xylene	0.059
o-Xylene	0.013	o-Xylene	0.011	o-Xylene	0.021

CRNM VOC Sampling Results

Sample Date/Time: 1/12/2015 00:00 Sample ID: 5011501-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.091
Acetylene	0.376
Acrolein	0.124
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.236
Bromochloromethane	ND
Bromodichloromethane	0.008
Bromoform	ND
Bromomethane	0.011
1,3-Butadiene	0.036
Carbon Disulfide	0.014
Carbon Tetrachloride	0.089
Chlorobenzene	ND
Chloroethane	ND
Chloroform	0.020
Chloromethane	0.455
Chloroprene	ND
Dibromochloromethane	0.007
1,2-Dibromoethane	ND
m-Dichlorobenzene	ND
o-Dichlorobenzene	ND
p-Dichlorobenzene	0.012
Dichlorodifluoromethane	0.430
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.022
1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	0.370
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.017
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.051
Hexachloro-1,3-butadiene	ND
Methyl Isobutyl Ketone	0.024
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.029
Propylene	0.452
Styrene	0.036
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	0.061
Toluene	0.420
1,2,4-Trichlorobenzene	ND
1,1,1-Trichloroethane	0.009
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.195
Trichlorotrifluoroethane	0.076
1,2,4-Trimethylbenzene	0.030
1,3,5-Trimethylbenzene	0.013
Vinyl chloride	ND
m,p-Xylene	0.115
o-Xylene	0.047

Sample Date/Time: 1/18/2015 00:00 Sample ID: 5012207-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.246
Acetylene	0.533
Acrolein	ND
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.241
Bromochloromethane	ND
Bromodichloromethane	ND
Bromoform	ND
Bromomethane	ND
1,3-Butadiene	0.054
Carbon Disulfide	0.089
Carbon Tetrachloride	0.075
Chlorobenzene	ND
Chloroethane	ND
Chloroform	0.020
Chloromethane	0.694
Chloroprene	ND
Dibromochloromethane	ND
1,2-Dibromoethane	ND
m-Dichlorobenzene	ND
o-Dichlorobenzene	ND
p-Dichlorobenzene	ND
Dichlorodifluoromethane	0.594
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.025
1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	0.270
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.020
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.025
Hexachloro-1,3-butadiene	ND
Methyl Isobutyl Ketone	0.056
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.018
Propylene	0.624
Styrene	0.024
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	0.216
1,2,4-Trichlorobenzene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.260
Trichlorotrifluoroethane	0.088
1,2,4-Trimethylbenzene	0.017
1,3,5-Trimethylbenzene	0.006
Vinyl chloride	ND
m,p-Xylene	0.048
o-Xylene	0.019

Sample Date/Time: 1/24/2015 00:00 Sample ID: 5012716-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.066
Acetylene	0.357
Acrolein	0.125
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.211
Bromochloromethane	ND
Bromodichloromethane	ND
Bromoform	0.005
Bromomethane	0.014
1,3-Butadiene	0.036
Carbon Disulfide	0.020
Carbon Tetrachloride	0.094
Chlorobenzene	ND
Chloroethane	ND
Chloroform	0.018
Chloromethane	0.567
Chloroprene	ND
Dibromochloromethane	0.004
1,2-Dibromoethane	ND
m-Dichlorobenzene	ND
o-Dichlorobenzene	ND
p-Dichlorobenzene	0.006
Dichlorodifluoromethane	0.563
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.022
1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	0.087
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.020
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.019
Hexachloro-1,3-butadiene	0.005
Methyl Isobutyl Ketone	0.015
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.014
Propylene	0.349
Styrene	0.019
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	0.006
Toluene	0.122
1,2,4-Trichlorobenzene	ND
1,1,1-Trichloroethane	0.007
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.236
Trichlorotrifluoroethane	0.083
1,2,4-Trimethylbenzene	0.011
1,3,5-Trimethylbenzene	0.006
Vinyl chloride	ND
m,p-Xylene	0.032
o-Xylene	0.012

CRNM VOC Sampling Results

Sample Date/Time: 1/30/2015 00:00 Sample ID: 5020311-01 Units: ppbv Sample Type: Field Sample		Sample Date/Time: 2/5/2015 00:00 Sample ID: 5021121-01 Units: ppbv Sample Type: Field Sample		Sample Date/Time: 2/11/2015 00:00 Sample ID: 5021829-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.117	Acetonitrile	0.152	Acetonitrile	0.133
Acetylene	0.354	Acetylene	0.627	Acetylene	1.09
Acrolein	0.170	Acrolein	ND	Acrolein	0.158
Acrylonitrile	ND	Acrylonitrile	ND	Acrylonitrile	ND
tert-Amyl Methyl Ether	ND	tert-Amyl Methyl Ether	ND	tert-Amyl Methyl Ether	ND
Benzene	0.174	Benzene	0.237	Benzene	0.226
Bromochloromethane	ND	Bromochloromethane	ND	Bromochloromethane	ND
Bromodichloromethane	ND	Bromodichloromethane	0.010	Bromodichloromethane	ND
Bromoform	0.007	Bromoform	0.006	Bromoform	ND
Bromomethane	0.016	Bromomethane	0.028	Bromomethane	0.012
1,3-Butadiene	0.030	1,3-Butadiene	0.067	1,3-Butadiene	0.040
Carbon Disulfide	0.016	Carbon Disulfide	0.070	Carbon Disulfide	0.013
Carbon Tetrachloride	0.110	Carbon Tetrachloride	0.107	Carbon Tetrachloride	0.116
Chlorobenzene	ND	Chlorobenzene	0.012	Chlorobenzene	ND
Chloroethane	ND	Chloroethane	0.130	Chloroethane	ND
Chloroform	0.024	Chloroform	0.022	Chloroform	0.019
Chloromethane	0.595	Chloromethane	2.20	Chloromethane	0.670
Chloroprene	ND	Chloroprene	ND	Chloroprene	ND
Dibromochloromethane	0.007	Dibromochloromethane	0.008	Dibromochloromethane	0.003
1,2-Dibromoethane	0.008	1,2-Dibromoethane	0.007	1,2-Dibromoethane	ND
m-Dichlorobenzene	0.007	m-Dichlorobenzene	0.006	m-Dichlorobenzene	ND
o-Dichlorobenzene	0.006	o-Dichlorobenzene	0.006	o-Dichlorobenzene	ND
p-Dichlorobenzene	0.008	p-Dichlorobenzene	0.009	p-Dichlorobenzene	ND
Dichlorodifluoromethane	0.550	Dichlorodifluoromethane	0.562	Dichlorodifluoromethane	0.543
1,1-Dichloroethane	ND	1,1-Dichloroethane	0.010	1,1-Dichloroethane	ND
1,2-Dichloroethane	0.028	1,2-Dichloroethane	0.026	1,2-Dichloroethane	0.024
1,1-Dichloroethene	ND	1,1-Dichloroethene	0.009	1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND	cis-1,2-Dichloroethylene	ND	cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND	trans-1,2-Dichloroethylene	ND	trans-1,2-Dichloroethylene	ND
Dichloromethane	0.122	Dichloromethane	0.132	Dichloromethane	0.112
1,2-Dichloropropane	ND	1,2-Dichloropropane	ND	1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND	cis-1,3-Dichloropropene	ND	cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND	trans-1,3-Dichloropropene	ND	trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.023	Dichlorotetrafluoroethane	0.025	Dichlorotetrafluoroethane	0.019
Ethyl Acrylate	ND	Ethyl Acrylate	ND	Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND	Ethyl tert-Butyl Ether	0.008	Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.027	Ethylbenzene	0.023	Ethylbenzene	0.023
Hexachloro-1,3-butadiene	0.008	Hexachloro-1,3-butadiene	0.006	Hexachloro-1,3-butadiene	ND
Methyl Isobutyl Ketone	0.016	Methyl Isobutyl Ketone	0.021	Methyl Isobutyl Ketone	0.014
Methyl Methacrylate	ND	Methyl Methacrylate	0.015	Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND	Methyl tert-Butyl Ether	ND	Methyl tert-Butyl Ether	ND
n-Octane	0.037	n-Octane	0.024	n-Octane	0.029
Propylene	0.264	Propylene	1.09	Propylene	0.432
Styrene	0.023	Styrene	0.020	Styrene	0.019
1,1,2,2-Tetrachloroethane	0.008	1,1,2,2-Tetrachloroethane	0.007	1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	0.010	Tetrachloroethylene	0.009	Tetrachloroethylene	ND
Toluene	0.121	Toluene	0.138	Toluene	0.139
1,2,4-Trichlorobenzene	0.007	1,2,4-Trichlorobenzene	0.004	1,2,4-Trichlorobenzene	ND
1,1,1-Trichloroethane	0.012	1,1,1-Trichloroethane	0.012	1,1,1-Trichloroethane	0.007
1,1,2-Trichloroethane	ND	1,1,2-Trichloroethane	0.011	1,1,2-Trichloroethane	ND
Trichloroethylene	ND	Trichloroethylene	0.009	Trichloroethylene	ND
Trichlorofluoromethane	0.254	Trichlorofluoromethane	0.259	Trichlorofluoromethane	0.242
Trichlorotrifluoroethane	0.092	Trichlorotrifluoroethane	0.094	Trichlorotrifluoroethane	0.080
1,2,4-Trimethylbenzene	0.022	1,2,4-Trimethylbenzene	0.016	1,2,4-Trimethylbenzene	0.018
1,3,5-Trimethylbenzene	0.018	1,3,5-Trimethylbenzene	0.009	1,3,5-Trimethylbenzene	0.007
Vinyl chloride	ND	Vinyl chloride	0.009	Vinyl chloride	ND
m,p-Xylene	0.048	m,p-Xylene	0.049	m,p-Xylene	0.054
o-Xylene	0.023	o-Xylene	0.020	o-Xylene	0.020

Sample Date/Time: 2/17/2015 00:00 Sample ID: 5022402-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.084
Acetylene	0.789
Acrolein	0.170
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.210
Bromochloromethane	ND
Bromodichloromethane	ND
Bromoform	ND
Bromomethane	0.010
1,3-Butadiene	0.026
Carbon Disulfide	0.011
Carbon Tetrachloride	0.120
Chlorobenzene	0.008
Chloroethane	ND
Chloroform	0.018
Chloromethane	0.716
Chloroprene	ND
Dibromochloromethane	0.003
1,2-Dibromoethane	ND
m-Dichlorobenzene	ND
o-Dichlorobenzene	ND
p-Dichlorobenzene	ND
Dichlorodifluoromethane	0.580
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.021
1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	0.228
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.020
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.014
Hexachloro-1,3-butadiene	ND
Methyl Isobutyl Ketone	0.008
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.017
Propylene	0.327
Styrene	0.015
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	0.092
1,2,4-Trichlorobenzene	ND
1,1,1-Trichloroethane	ND
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.258
Trichlorotrifluoroethane	0.082
1,2,4-Trimethylbenzene	0.007
1,3,5-Trimethylbenzene	ND
Vinyl chloride	ND
m,p-Xylene	0.029
o-Xylene	0.011

Sample Date/Time: 2/23/2015 00:00 Sample ID: 5022538-04 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.099
Acetylene	0.463
Acrolein	0.312
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.130
Bromochloromethane	ND
Bromodichloromethane	ND
Bromoform	ND
Bromomethane	0.015
1,3-Butadiene	0.014
Carbon Disulfide	0.012
Carbon Tetrachloride	0.116
Chlorobenzene	ND
Chloroethane	0.027
Chloroform	0.018
Chloromethane	0.716
Chloroprene	ND
Dibromochloromethane	0.004
1,2-Dibromoethane	ND
m-Dichlorobenzene	ND
o-Dichlorobenzene	ND
p-Dichlorobenzene	ND
Dichlorodifluoromethane	0.503
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.019
1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	1.00
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.017
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.012
Hexachloro-1,3-butadiene	ND
Methyl Isobutyl Ketone	0.020
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.039
Propylene	0.407
Styrene	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	0.065
1,2,4-Trichlorobenzene	ND
1,1,1-Trichloroethane	0.008
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.224
Trichlorotrifluoroethane	0.073
1,2,4-Trimethylbenzene	0.008
1,3,5-Trimethylbenzene	ND
Vinyl chloride	ND
m,p-Xylene	0.022
o-Xylene	0.009

Sample Date/Time: 3/1/2015 00:00 Sample ID: 5030916-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.150
Acetylene	0.413
Acrolein	0.261
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.182
Bromochloromethane	ND
Bromodichloromethane	ND
Bromoform	ND
Bromomethane	0.011
1,3-Butadiene	0.028
Carbon Disulfide	0.013
Carbon Tetrachloride	0.090
Chlorobenzene	ND
Chloroethane	ND
Chloroform	0.016
Chloromethane	0.622
Chloroprene	ND
Dibromochloromethane	ND
1,2-Dibromoethane	ND
m-Dichlorobenzene	ND
o-Dichlorobenzene	ND
p-Dichlorobenzene	ND
Dichlorodifluoromethane	0.500
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.019
1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	0.796
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.015
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.022
Hexachloro-1,3-butadiene	0.019
Methyl Isobutyl Ketone	0.023
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.021
Propylene	0.331
Styrene	0.027
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	0.012
Toluene	0.315
1,2,4-Trichlorobenzene	0.026
1,1,1-Trichloroethane	0.004
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.222
Trichlorotrifluoroethane	0.076
1,2,4-Trimethylbenzene	0.018
1,3,5-Trimethylbenzene	0.006
Vinyl chloride	ND
m,p-Xylene	0.048
o-Xylene	0.023

Sample Date/Time: 3/7/2015 00:00 Sample ID: 5031202-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.131
Acetylene	0.471
Acrolein	0.236
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.177
Bromochloromethane	ND
Bromodichloromethane	ND
Bromoform	0.006
Bromomethane	0.014
1,3-Butadiene	0.019
Carbon Disulfide	0.031
Carbon Tetrachloride	0.103
Chlorobenzene	0.006
Chloroethane	0.016
Chloroform	0.020
Chloromethane	0.577
Chloroprene	ND
Dibromochloromethane	0.005
1,2-Dibromoethane	ND
m-Dichlorobenzene	0.006
o-Dichlorobenzene	0.007
p-Dichlorobenzene	0.007
Dichlorodifluoromethane	0.535
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.023
1,1-Dichloroethene	0.006
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	0.090
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.021
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.017
Hexachloro-1,3-butadiene	0.018
Methyl Isobutyl Ketone	0.015
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.020
Propylene	0.232
Styrene	0.010
1,1,2,2-Tetrachloroethane	0.006
Tetrachloroethylene	0.007
Toluene	0.094
1,2,4-Trichlorobenzene	0.024
1,1,1-Trichloroethane	0.009
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.250
Trichlorotrifluoroethane	0.088
1,2,4-Trimethylbenzene	0.012
1,3,5-Trimethylbenzene	0.007
Vinyl chloride	ND
m,p-Xylene	0.033
o-Xylene	0.014

Sample Date/Time: 3/13/2015 00:00 Sample ID: 5031712-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.100
Acetylene	0.281
Acrolein	0.479
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.101
Bromochloromethane	ND
Bromodichloromethane	ND
Bromoform	ND
Bromomethane	0.007
1,3-Butadiene	0.015
Carbon Disulfide	0.007
Carbon Tetrachloride	0.086
Chlorobenzene	ND
Chloroethane	ND
Chloroform	0.012
Chloromethane	0.513
Chloroprene	ND
Dibromochloromethane	ND
1,2-Dibromoethane	ND
m-Dichlorobenzene	ND
o-Dichlorobenzene	ND
p-Dichlorobenzene	ND
Dichlorodifluoromethane	0.436
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.014
1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	0.163
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.013
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.011
Hexachloro-1,3-butadiene	0.020
Methyl Isobutyl Ketone	0.017
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.016
Propylene	0.231
Styrene	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	0.062
1,2,4-Trichlorobenzene	0.024
1,1,1-Trichloroethane	0.003
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.204
Trichlorotrifluoroethane	0.068
1,2,4-Trimethylbenzene	0.009
1,3,5-Trimethylbenzene	ND
Vinyl chloride	ND
m,p-Xylene	0.022
o-Xylene	0.011

Sample Date/Time: 3/19/2015 00:00 Sample ID: 5032411-01 Units: ppbv Sample Type: Field Sample	
Acetonitrile	0.113
Acetylene	0.359
Acrolein	0.112
Acrylonitrile	ND
tert-Amyl Methyl Ether	ND
Benzene	0.110
Bromochloromethane	ND
Bromodichloromethane	ND
Bromoform	ND
Bromomethane	0.010
1,3-Butadiene	0.014
Carbon Disulfide	0.006
Carbon Tetrachloride	0.105
Chlorobenzene	ND
Chloroethane	ND
Chloroform	0.014
Chloromethane	0.635
Chloroprene	ND
Dibromochloromethane	ND
1,2-Dibromoethane	ND
m-Dichlorobenzene	ND
o-Dichlorobenzene	ND
p-Dichlorobenzene	ND
Dichlorodifluoromethane	0.534
1,1-Dichloroethane	ND
1,2-Dichloroethane	0.015
1,1-Dichloroethene	ND
cis-1,2-Dichloroethylene	ND
trans-1,2-Dichloroethylene	ND
Dichloromethane	0.090
1,2-Dichloropropane	ND
cis-1,3-Dichloropropene	ND
trans-1,3-Dichloropropene	ND
Dichlorotetrafluoroethane	0.016
Ethyl Acrylate	ND
Ethyl tert-Butyl Ether	ND
Ethylbenzene	0.013
Hexachloro-1,3-butadiene	0.019
Methyl Isobutyl Ketone	0.010
Methyl Methacrylate	ND
Methyl tert-Butyl Ether	ND
n-Octane	0.014
Propylene	0.105
Styrene	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethylene	ND
Toluene	0.062
1,2,4-Trichlorobenzene	0.023
1,1,1-Trichloroethane	0.004
1,1,2-Trichloroethane	ND
Trichloroethylene	ND
Trichlorofluoromethane	0.253
Trichlorotrifluoroethane	0.080
1,2,4-Trimethylbenzene	0.012
1,3,5-Trimethylbenzene	ND
Vinyl chloride	ND
m,p-Xylene	0.025
o-Xylene	0.013

Appendix B

Carbonyl Compounds Raw Data

CRNM Carbonyl Compound Sampling Results

Sample Date/Time:	12/25/2014 00:00
Sample Type:	Field Sample
ID:	5010721-02
Units	ppbv
Acetaldehyde	Invalid - AN
Acetone	Invalid - AN
Benzaldehyde	Invalid - AN
2-Butanone	Invalid - AN
Butyraldehyde	Invalid - AN
Crotonaldehyde	Invalid - AN
2,5-Dimethylbenzaldehyde	Invalid - AN
Formaldehyde	Invalid - AN
Hexaldehyde	Invalid - AN
Isovaleraldehyde	Invalid - AN
Propionaldehyde	Invalid - AN
Tolualdehydes	Invalid - AN
Valeraldehyde	Invalid - AN

Sample Date/Time:	1/6/2015 00:00
Sample Type:	Field Sample
ID:	5011418-02
Units	ppbv
Acetaldehyde	Invalid - AN
Acetone	Invalid - AN
Benzaldehyde	Invalid - AN
2-Butanone	Invalid - AN
Butyraldehyde	Invalid - AN
Crotonaldehyde	Invalid - AN
2,5-Dimethylbenzaldehyde	Invalid - AN
Formaldehyde	Invalid - AN
Hexaldehyde	Invalid - AN
Isovaleraldehyde	Invalid - AN
Propionaldehyde	Invalid - AN
Tolualdehydes	Invalid - AN
Valeraldehyde	Invalid - AN

Sample Date/Time:	1/18/2015 00:00
Sample Type:	Field Sample
ID:	5012207-02
Units	ppbv
Acetaldehyde	0.463
Acetone	0.443
Benzaldehyde	0.023
2-Butanone	0.072
Butyraldehyde	0.056
Crotonaldehyde	0.030
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	1.28
Hexaldehyde	0.019
Isovaleraldehyde	ND
Propionaldehyde	0.056
Tolualdehydes	0.014
Valeraldehyde	0.013

Sample Date/Time:	1/30/2015 00:00
Sample Type:	Field Sample
ID:	5020311-02
Units	ppbv
Acetaldehyde	0.358
Acetone	0.697
Benzaldehyde	0.012
2-Butanone	0.100
Butyraldehyde	0.037
Crotonaldehyde	0.016
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	0.892
Hexaldehyde	0.009
Isovaleraldehyde	ND
Propionaldehyde	0.051
Tolualdehydes	0.008
Valeraldehyde	0.008

Sample Date/Time:	12/31/2014 00:00
Sample Type:	Field Sample
ID:	5010721-03
Units	ppbv
Acetaldehyde	Invalid - AN
Acetone	Invalid - AN
Benzaldehyde	Invalid - AN
2-Butanone	Invalid - AN
Butyraldehyde	Invalid - AN
Crotonaldehyde	Invalid - AN
2,5-Dimethylbenzaldehyde	Invalid - AN
Formaldehyde	Invalid - AN
Hexaldehyde	Invalid - AN
Isovaleraldehyde	Invalid - AN
Propionaldehyde	Invalid - AN
Tolualdehydes	Invalid - AN
Valeraldehyde	Invalid - AN

Sample Date/Time:	1/12/2015 00:00
Sample Type:	Field Sample
ID:	5011501-02
Units	ppbv
Acetaldehyde	0.279
Acetone	0.623
Benzaldehyde	0.015
2-Butanone	0.079
Butyraldehyde	0.036
Crotonaldehyde	0.023
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	0.659
Hexaldehyde	0.012
Isovaleraldehyde	ND
Propionaldehyde	0.036
Tolualdehydes	0.012
Valeraldehyde	0.009

Sample Date/Time:	1/24/2015 00:00
Sample Type:	Field Sample
ID:	5012716-02
Units	ppbv
Acetaldehyde	0.451
Acetone	0.710
Benzaldehyde	0.019
2-Butanone	0.093
Butyraldehyde	0.057
Crotonaldehyde	0.034
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	1.31
Hexaldehyde	0.012
Isovaleraldehyde	ND
Propionaldehyde	0.059
Tolualdehydes	0.016
Valeraldehyde	0.011

Sample Date/Time:	2/5/2015 00:00
Sample Type:	Field Sample
ID:	5021121-02
Units	ppbv
Acetaldehyde	0.463
Acetone	0.818
Benzaldehyde	0.022
2-Butanone	0.072
Butyraldehyde	0.043
Crotonaldehyde	0.038
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	1.34
Hexaldehyde	0.019
Isovaleraldehyde	ND
Propionaldehyde	0.056
Tolualdehydes	0.018
Valeraldehyde	0.014

CRNM Carbonyl Compound Sampling Results

Sample Date/Time:	2/11/2015 00:00
Sample Type:	Field Sample
ID:	5021829-02
Units	ppbv
Acetaldehyde	0.521
Acetone	0.975
Benzaldehyde	0.019
2-Butanone	0.115
Butyraldehyde	0.056
Crotonaldehyde	0.037
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	1.61
Hexaldehyde	0.021
Isovaleraldehyde	ND
Propionaldehyde	0.073
Tolualdehydes	0.021
Valeraldehyde	0.016

Sample Date/Time:	2/17/2015 00:00
Sample Type:	Field Sample
ID:	5022402-02
Units	ppbv
Acetaldehyde	0.529
Acetone	0.868
Benzaldehyde	0.014
2-Butanone	0.107
Butyraldehyde	0.047
Crotonaldehyde	0.032
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	1.48
Hexaldehyde	0.010
Isovaleraldehyde	ND
Propionaldehyde	0.056
Tolualdehydes	0.009
Valeraldehyde	0.010

Sample Date/Time:	2/23/2015 00:00
Sample Type:	Field Sample
ID:	5022538-01
Units	ppbv
Acetaldehyde	0.372
Acetone	0.840
Benzaldehyde	0.012
2-Butanone	0.139
Butyraldehyde	0.049
Crotonaldehyde	0.019
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	0.908
Hexaldehyde	0.012
Isovaleraldehyde	ND
Propionaldehyde	0.053
Tolualdehydes	ND
Valeraldehyde	0.009

Sample Date/Time:	3/1/2015 00:00
Sample Type:	Field Sample
ID:	5030916-02
Units	ppbv
Acetaldehyde	0.287
Acetone	0.590
Benzaldehyde	0.017
2-Butanone	0.049
Butyraldehyde	0.029
Crotonaldehyde	0.029
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	0.845
Hexaldehyde	0.018
Isovaleraldehyde	ND
Propionaldehyde	0.037
Tolualdehydes	0.017
Valeraldehyde	0.009

Sample Date/Time:	3/7/2015 00:00
Sample Type:	Field Sample
ID:	5031202-02
Units	ppbv
Acetaldehyde	0.515
Acetone	1.28
Benzaldehyde	0.014
2-Butanone	0.185
Butyraldehyde	0.065
Crotonaldehyde	0.030
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	1.11
Hexaldehyde	0.018
Isovaleraldehyde	ND
Propionaldehyde	0.067
Tolualdehydes	0.015
Valeraldehyde	0.013

Sample Date/Time:	3/13/2015 00:00
Sample Type:	Field Sample
ID:	5031712-02
Units	ppbv
Acetaldehyde	0.524
Acetone	1.59
Benzaldehyde	0.018
2-Butanone	0.202
Butyraldehyde	0.072
Crotonaldehyde	0.030
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	1.31
Hexaldehyde	0.027
Isovaleraldehyde	ND
Propionaldehyde	0.066
Tolualdehydes	0.014
Valeraldehyde	0.016

Sample Date/Time:	3/19/2015 00:00
Sample Type:	Field Sample
ID:	5032411-02
Units	ppbv
Acetaldehyde	0.508
Acetone	1.67
Benzaldehyde	0.013
2-Butanone	0.225
Butyraldehyde	0.067
Crotonaldehyde	0.024
2,5-Dimethylbenzaldehyde	ND
Formaldehyde	1.28
Hexaldehyde	0.024
Isovaleraldehyde	ND
Propionaldehyde	0.057
Tolualdehydes	0.016
Valeraldehyde	0.013

Appendix C

PAH Raw Data

CRNM PAH Sampling Results

Sample Date/Time: 12/25/2014 00:00 Sample ID: 4123110-02 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	1.12
Acenaphthylene	2.51
Anthracene	1.23
Benzo (a) anthracene	0.362
Benzo (a) pyrene	0.277
Benzo (b) fluoranthene	0.520
Benzo (e) pyrene	0.324
Benzo (g,h,i) perylene	0.206
Benzo (k) fluoranthene	0.276
Chrysene	0.719
Coronene	0.0837
Cyclopenta[cd]pyrene	0.245
Dibenz (a,h) anthracene	0.0513
Fluoranthene	2.79
Fluorene	2.58
9-Fluorenone	2.66
Naphthalene	39.5
Perylene	0.0410
Phenanthrene	8.82
Pyrene	2.06
Retene	4.50

Sample Date/Time: 12/31/2014 00:00 Sample ID: 5010721-06 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	ND
Acenaphthylene	2.01
Anthracene	0.641
Benzo (a) anthracene	0.169
Benzo (a) pyrene	0.182
Benzo (b) fluoranthene	0.280
Benzo (e) pyrene	0.162
Benzo (g,h,i) perylene	0.159
Benzo (k) fluoranthene	0.112
Chrysene	0.335
Coronene	0.0943
Cyclopenta[cd]pyrene	0.227
Dibenz (a,h) anthracene	0.0337
Fluoranthene	1.43
Fluorene	1.50
9-Fluorenone	0.899
Naphthalene	19.2
Perylene	0.0300
Phenanthrene	4.19
Pyrene	1.08
Retene	0.806

Sample Date/Time: 1/6/2015 00:00 Sample ID: 5011418-05 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	2.33
Acenaphthylene	3.52
Anthracene	1.70
Benzo (a) anthracene	1.04
Benzo (a) pyrene	0.664
Benzo (b) fluoranthene	1.05
Benzo (e) pyrene	0.602
Benzo (g,h,i) perylene	0.474
Benzo (k) fluoranthene	0.503
Chrysene	1.45
Coronene	0.193
Cyclopenta[cd]pyrene	0.672
Dibenz (a,h) anthracene	0.139
Fluoranthene	4.00
Fluorene	4.81
9-Fluorenone	4.60
Naphthalene	74.7
Perylene	0.103
Phenanthrene	15.2
Pyrene	3.03
Retene	12.8

Sample Date/Time: 1/12/2015 00:00 Sample ID: 5011501-03 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	3.24
Acenaphthylene	1.07
Anthracene	1.33
Benzo (a) anthracene	0.583
Benzo (a) pyrene	0.322
Benzo (b) fluoranthene	0.494
Benzo (e) pyrene	0.296
Benzo (g,h,i) perylene	0.230
Benzo (k) fluoranthene	0.265
Chrysene	0.797
Coronene	0.0858
Cyclopenta[cd]pyrene	0.316
Dibenz (a,h) anthracene	0.0610
Fluoranthene	2.42
Fluorene	4.01
9-Fluorenone	2.90
Naphthalene	58.0
Perylene	0.0507
Phenanthrene	12.0
Pyrene	1.83
Retene	10.6

CRNM PAH Sampling Results

Sample Date/Time: 1/18/2015 00:00 Sample ID: 5012207-03 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	3.49
Acenaphthylene	7.91
Anthracene	2.19
Benzo (a) anthracene	1.45
Benzo (a) pyrene	1.16
Benzo (b) fluoranthene	1.12
Benzo (e) pyrene	0.707
Benzo (g,h,i) perylene	0.587
Benzo (k) fluoranthene	0.567
Chrysene	1.77
Coronene	0.259
Cyclopenta[cd]pyrene	1.14
Dibenz (a,h) anthracene	0.156
Fluoranthene	3.96
Fluorene	5.75
9-Fluorenone	3.80
Naphthalene	80.8
Perylene	0.177
Phenanthrene	15.9
Pyrene	3.19
Retene	18.9

Sample Date/Time: 1/24/2015 00:00 Sample ID: 5012716-04 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	2.77
Acenaphthylene	5.26
Anthracene	2.49
Benzo (a) anthracene	1.77
Benzo (a) pyrene	1.42
Benzo (b) fluoranthene	1.39
Benzo (e) pyrene	0.869
Benzo (g,h,i) perylene	0.719
Benzo (k) fluoranthene	0.697
Chrysene	2.17
Coronene	0.295
Cyclopenta[cd]pyrene	1.55
Dibenz (a,h) anthracene	0.176
Fluoranthene	5.06
Fluorene	5.42
9-Fluorenone	4.33
Naphthalene	81.3
Perylene	0.215
Phenanthrene	17.0
Pyrene	4.24
Retene	20.6

Sample Date/Time: 1/30/2015 00:00 Sample ID: 5020311-06 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	ND
Acenaphthylene	0.912
Anthracene	0.903
Benzo (a) anthracene	0.292
Benzo (a) pyrene	0.130
Benzo (b) fluoranthene	0.302
Benzo (e) pyrene	0.174
Benzo (g,h,i) perylene	0.136
Benzo (k) fluoranthene	0.128
Chrysene	0.485
Coronene	0.0552
Cyclopenta[cd]pyrene	0.124
Dibenz (a,h) anthracene	0.0348
Fluoranthene	1.77
Fluorene	2.15
9-Fluorenone	1.71
Naphthalene	32.5
Perylene	0.0312
Phenanthrene	6.87
Pyrene	1.32
Retene	5.46

Sample Date/Time: 2/5/2015 00:00 Sample ID: 5021121-04 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	3.78
Acenaphthylene	3.26
Anthracene	3.06
Benzo (a) anthracene	1.46
Benzo (a) pyrene	1.08
Benzo (b) fluoranthene	1.34
Benzo (e) pyrene	0.833
Benzo (g,h,i) perylene	0.696
Benzo (k) fluoranthene	0.699
Chrysene	2.09
Coronene	0.339
Cyclopenta[cd]pyrene	1.06
Dibenz (a,h) anthracene	0.179
Fluoranthene	4.37
Fluorene	5.99
9-Fluorenone	3.65
Naphthalene	103
Perylene	0.173
Phenanthrene	19.4
Pyrene	3.64
Retene	14.7

CRNM PAH Sampling Results

Sample Date/Time: 2/11/2015 00:00 Sample ID: 5021829-04 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	Invalid - AR
Acenaphthylene	Invalid - AR
Anthracene	Invalid - AR
Benzo (a) anthracene	Invalid - AR
Benzo (a) pyrene	Invalid - AR
Benzo (b) fluoranthene	Invalid - AR
Benzo (e) pyrene	Invalid - AR
Benzo (g,h,i) perylene	Invalid - AR
Benzo (k) fluoranthene	Invalid - AR
Chrysene	Invalid - AR
Coronene	Invalid - AR
Cyclopenta[cd]pyrene	Invalid - AR
Dibenz (a,h) anthracene	Invalid - AR
Fluoranthene	Invalid - AR
Fluorene	Invalid - AR
9-Fluorenone	Invalid - AR
Naphthalene	Invalid - AR
Perylene	Invalid - AR
Phenanthrene	Invalid - AR
Pyrene	Invalid - AR
Retene	Invalid - AR

Sample Date/Time: 2/17/2015 00:00 Sample ID: 5022402-03 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	1.37
Acenaphthylene	3.97
Anthracene	1.20
Benzo (a) anthracene	0.772
Benzo (a) pyrene	0.728
Benzo (b) fluoranthene	0.926
Benzo (e) pyrene	0.575
Benzo (g,h,i) perylene	0.438
Benzo (k) fluoranthene	0.387
Chrysene	1.34
Coronene	0.183
Cyclopenta[cd]pyrene	0.586
Dibenz (a,h) anthracene	0.108
Fluoranthene	2.93
Fluorene	3.17
9-Fluorenone	2.22
Naphthalene	59.5
Perylene	0.106
Phenanthrene	9.63
Pyrene	2.31
Retene	8.63

Sample Date/Time: 2/23/2015 00:00 Sample ID: 5022538-03 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	Invalid - AG
Acenaphthylene	Invalid - AG
Anthracene	Invalid - AG
Benzo (a) anthracene	Invalid - AG
Benzo (a) pyrene	Invalid - AG
Benzo (b) fluoranthene	Invalid - AG
Benzo (e) pyrene	Invalid - AG
Benzo (g,h,i) perylene	Invalid - AG
Benzo (k) fluoranthene	Invalid - AG
Chrysene	Invalid - AG
Coronene	Invalid - AG
Cyclopenta[cd]pyrene	Invalid - AG
Dibenz (a,h) anthracene	Invalid - AG
Fluoranthene	Invalid - AG
Fluorene	Invalid - AG
9-Fluorenone	Invalid - AG
Naphthalene	Invalid - AG
Perylene	Invalid - AG
Phenanthrene	Invalid - AG
Pyrene	Invalid - AG
Retene	Invalid - AG

Sample Date/Time: 3/1/2015 00:00 Sample ID: 5030916-03 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	1.42
Acenaphthylene	0.833
Anthracene	0.944
Benzo (a) anthracene	0.279
Benzo (a) pyrene	0.145
Benzo (b) fluoranthene	0.292
Benzo (e) pyrene	0.167
Benzo (g,h,i) perylene	0.137
Benzo (k) fluoranthene	0.132
Chrysene	0.489
Coronene	0.0537
Cyclopenta[cd]pyrene	0.147
Dibenz (a,h) anthracene	0.0298
Fluoranthene	1.67
Fluorene	2.26
9-Fluorenone	1.42
Naphthalene	28.7
Perylene	0.0337
Phenanthrene	7.04
Pyrene	1.28
Retene	4.67

CRNM PAH Sampling Results

Sample Date/Time: 3/7/2015 00:00 Sample ID: 5031202-03 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	1.47
Acenaphthylene	0.256
Anthracene	0.522
Benzo (a) anthracene	0.462
Benzo (a) pyrene	0.338
Benzo (b) fluoranthene	0.497
Benzo (e) pyrene	0.290
Benzo (g,h,i) perylene	0.221
Benzo (k) fluoranthene	0.243
Chrysene	0.742
Coronene	0.0898
Cyclopenta[cd]pyrene	0.306
Dibenz (a,h) anthracene	0.0555
Fluoranthene	1.74
Fluorene	2.28
9-Fluorenone	1.54
Naphthalene	40.9
Perylene	0.0523
Phenanthrene	6.08
Pyrene	1.35
Retene	5.70

Sample Date/Time: 3/13/2015 00:00 Sample ID: 5031712-03 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	3.35
Acenaphthylene	0.220
Anthracene	0.558
Benzo (a) anthracene	0.259
Benzo (a) pyrene	0.162
Benzo (b) fluoranthene	0.274
Benzo (e) pyrene	0.162
Benzo (g,h,i) perylene	0.121
Benzo (k) fluoranthene	0.118
Chrysene	0.405
Coronene	0.0537
Cyclopenta[cd]pyrene	0.166
Dibenz (a,h) anthracene	0.0255
Fluoranthene	1.36
Fluorene	3.84
9-Fluorenone	1.98
Naphthalene	47.4
Perylene	0.0272
Phenanthrene	7.50
Pyrene	0.942
Retene	6.62

Sample Date/Time: 3/19/2015 00:00 Sample ID: 5032411-03 Units: ng/m3 Sample Type: Field Sample	
Acenaphthene	1.57
Acenaphthylene	0.305
Anthracene	0.528
Benzo (a) anthracene	0.227
Benzo (a) pyrene	0.142
Benzo (b) fluoranthene	0.227
Benzo (e) pyrene	0.129
Benzo (g,h,i) perylene	0.0981
Benzo (k) fluoranthene	0.108
Chrysene	0.372
Coronene	0.0440
Cyclopenta[cd]pyrene	0.165
Dibenz (a,h) anthracene	0.0210
Fluoranthene	1.31
Fluorene	2.23
9-Fluorenone	1.28
Naphthalene	27.4
Perylene	0.0220
Phenanthrene	5.65
Pyrene	0.968
Retene	1.97

Appendix D

Metals Raw Data

CRNM Metals Sampling Results

Sample Date/Time:	12/25/2014 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	4123110-03
Units	ng/m3
Antimony	0.17
Arsenic	0.33
Beryllium	0.01
Cadmium	0.04
Chromium	3.12
Cobalt	0.05
Lead	0.80
Manganese	2.99
Mercury	0.005
Nickel	0.17
Selenium	0.10

Sample Date/Time:	1/12/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5011501-04
Units	ng/m3
Antimony	0.295
Arsenic	0.099
Beryllium	0.0007
Cadmium	0.026
Chromium	4.28
Cobalt	0.029
Lead	0.499
Manganese	2.49
Mercury	0.010
Nickel	0.882
Selenium	0.033

Sample Date/Time:	1/30/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5020311-04
Units	ng/m3
Antimony	0.059
Arsenic	0.054
Beryllium	ND
Cadmium	0.006
Chromium	3.03
Cobalt	0.006
Lead	0.115
Manganese	0.308
Mercury	0.005
Nickel	0.104
Selenium	ND

Sample Date/Time:	12/31/2014 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5010721-04
Units	ng/m3
Antimony	0.22
Arsenic	0.37
Beryllium	ND
Cadmium	0.06
Chromium	2.63
Cobalt	0.05
Lead	0.71
Manganese	4.07
Mercury	0.02
Nickel	ND
Selenium	0.19

Sample Date/Time:	1/18/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5012207-04
Units	ng/m3
Antimony	0.564
Arsenic	0.181
Beryllium	0.009
Cadmium	0.076
Chromium	3.78
Cobalt	0.052
Lead	0.470
Manganese	4.43
Mercury	0.022
Nickel	0.385
Selenium	0.243

Sample Date/Time:	2/5/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5021121-03
Units	ng/m3
Antimony	0.466
Arsenic	0.038
Beryllium	0.014
Cadmium	0.042
Chromium	3.24
Cobalt	0.059
Lead	0.461
Manganese	4.98
Mercury	0.021
Nickel	0.346
Selenium	0.112

Sample Date/Time:	1/6/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5011418-04
Units	ng/m3
Antimony	0.577
Arsenic	0.017
Beryllium	0.011
Cadmium	0.029
Chromium	3.70
Cobalt	0.026
Lead	0.392
Manganese	1.78
Mercury	0.029
Nickel	0.233
Selenium	0.149

Sample Date/Time:	1/24/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5012716-03
Units	ng/m3
Antimony	0.247
Arsenic	0.222
Beryllium	0.005
Cadmium	0.034
Chromium	3.86
Cobalt	0.038
Lead	0.364
Manganese	2.82
Mercury	0.004
Nickel	0.287
Selenium	0.123

Sample Date/Time:	2/11/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5021829-03
Units	ng/m3
Antimony	0.504
Arsenic	0.051
Beryllium	0.018
Cadmium	0.029
Chromium	3.45
Cobalt	0.085
Lead	0.504
Manganese	6.71
Mercury	0.016
Nickel	0.358
Selenium	0.056

CRNM Metals Sampling Results

Sample Date/Time:	2/17/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5022402-04
Units	ng/m3
Antimony	0.161
Arsenic	0.025
Beryllium	0.022
Cadmium	0.036
Chromium	3.32
Cobalt	0.136
Lead	0.699
Manganese	9.88
Mercury	0.005
Nickel	0.469
Selenium	ND

Sample Date/Time:	3/7/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5031202-04
Units	ng/m3
Antimony	0.300
Arsenic	0.282
Beryllium	0.014
Cadmium	0.036
Chromium	3.61
Cobalt	0.134
Lead	0.691
Manganese	8.23
Mercury	0.006
Nickel	0.610
Selenium	0.160

Sample Date/Time:	2/23/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5022538-02
Units	ng/m3
Antimony	0.109
Arsenic	0.199
Beryllium	0.022
Cadmium	0.024
Chromium	4.57
Cobalt	0.051
Lead	0.567
Manganese	3.46
Mercury	0.017
Nickel	0.694
Selenium	0.007

Sample Date/Time:	3/13/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5031712-04
Units	ng/m3
Antimony	0.453
Arsenic	0.090
Beryllium	0.013
Cadmium	0.040
Chromium	4.17
Cobalt	0.097
Lead	0.682
Manganese	6.38
Mercury	0.006
Nickel	0.483
Selenium	0.084

Sample Date/Time:	3/1/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5030916-04
Units	ng/m3
Antimony	0.168
Arsenic	0.884
Beryllium	0.014
Cadmium	0.028
Chromium	2.28
Cobalt	0.019
Lead	0.577
Manganese	1.46
Mercury	0.014
Nickel	0.288
Selenium	0.113

Sample Date/Time:	3/19/2015 00:00
PM Type:	PM10
Sample Type:	Field Sample
ID:	5032411-04
Units	ng/m3
Antimony	0.254
Arsenic	0.119
Beryllium	0.015
Cadmium	0.041
Chromium	3.26
Cobalt	0.065
Lead	0.794
Manganese	4.85
Mercury	0.013
Nickel	0.564
Selenium	0.234

Appendix E

Statistical Summaries

VOC Sampling Statistics

Monitoring Site: CRNM **1st Valid Sample:** 12/25/2014 **Last Valid Sample:** 3/19/2015 **# Valid Samples:** 15 **PM Type:** NA **Units:** ug/m3

Analyte	# of Detects	# of Non-Detects	% of Detects	Minimum Concentration	Maximum Concentration	Arithmetic Mean	Standard Deviation
Acetonitrile	15	0	100.00	0.0908	0.414	0.19	0.0771
Acetylene	15	0	100.00	0.3	1.16	0.52	0.219
Acrolein	13	2	86.67	0	1.1	0.448	0.291
Acrylonitrile	0	15	0.00	0	0	0	0
tert-Amyl Methyl Ether	0	15	0.00	0	0	0	0
Benzene	15	0	100.00	0.323	0.771	0.588	0.147
Bromochloromethane	0	15	0.00	0	0	0	0
Bromodichloromethane	2	13	13.33	0	0.0671	0.00805	0.0207
Bromoform	4	11	26.67	0	0.0725	0.0166	0.0277
Bromomethane	14	1	93.33	0	0.109	0.0485	0.0218
1,3-Butadiene	15	0	100.00	0.031	0.149	0.068	0.0345
Carbon Disulfide	15	0	100.00	0.0187	0.278	0.0688	0.0734
Carbon Tetrachloride	15	0	100.00	0.473	0.756	0.633	0.078
Chlorobenzene	3	12	20.00	0	0.0554	0.008	0.0168
Chloroethane	3	12	20.00	0	0.344	0.0305	0.0861
Chloroform	15	0	100.00	0.0587	0.117	0.092	0.0145
Chloromethane	15	0	100.00	0.942	4.55	1.45	0.844
Chloroprene	0	15	0.00	0	0	0	0
Dibromochloromethane	11	4	73.33	0	0.0683	0.0341	0.024
1,2-Dibromoethane	2	13	13.33	0	0.0616	0.0077	0.0197
m-Dichlorobenzene	3	12	20.00	0	0.0422	0.00763	0.0153
o-Dichlorobenzene	3	12	20.00	0	0.0422	0.00763	0.0153

Appendix E - VOC Sampling Statistics.

VOC Sampling Statistics

Monitoring Site: CRNM **1st Valid Sample:** 12/25/2014 **Last Valid Sample:** 3/19/2015 **# Valid Samples:** 15 **PM Type:** NA **Units:** ug/m3

Analyte	# of Detects	# of Non-Detects	% of Detects	Minimum Concentration	Maximum Concentration	Arithmetic Mean	Standard Deviation
p-Dichlorobenzene	6	9	40.00	0	0.0723	0.0205	0.0261
Dichlorodifluoromethane	15	0	100.00	2.13	2.94	2.57	0.245
1,1-Dichloroethane	1	14	6.67	0	0.0406	0.00271	0.0101
1,2-Dichloroethane	15	0	100.00	0.0568	0.114	0.0876	0.0149
1,1-Dichloroethene	2	13	13.33	0	0.0358	0.00397	0.0104
cis-1,2-Dichloroethylene	0	15	0.00	0	0	0	0
trans-1,2-Dichloroethylene	0	15	0.00	0	0	0	0
Dichloromethane	15	0	100.00	0.289	3.48	0.87	0.935
1,2-Dichloropropane	0	15	0.00	0	0	0	0
cis-1,3-Dichloropropene	0	15	0.00	0	0	0	0
trans-1,3-Dichloropropene	0	15	0.00	0	0	0	0
Dichlorotetrafluoroethane	15	0	100.00	0.0911	0.175	0.133	0.0207
Ethyl Acrylate	0	15	0.00	0	0	0	0
Ethyl tert-Butyl Ether	1	14	6.67	0	0.0335	0.00223	0.00836
Ethylbenzene	15	0	100.00	0.0479	0.222	0.0925	0.0421
Hexachloro-1,3-butadiene	7	8	46.67	0	0.214	0.0677	0.0859
Methyl Isobutyl Ketone	15	0	100.00	0.0328	0.23	0.0797	0.0448
Methyl Methacrylate	1	14	6.67	0	0.0615	0.0041	0.0153
Methyl tert-Butyl Ether	1	14	6.67	0	0.0253	0.00169	0.00631
n-Octane	15	0	100.00	0.0609	0.183	0.107	0.0368
Propylene	15	0	100.00	0.181	1.88	0.652	0.386
Styrene	10	5	66.67	0	0.154	0.0617	0.0494

Appendix E - VOC Sampling Statistics.

VOC Sampling Statistics

Monitoring Site: CRNM **1st Valid Sample:** 12/25/2014 **Last Valid Sample:** 3/19/2015 **# Valid Samples:** 15 **PM Type:** NA **Units:** ug/m3

Analyte	# of Detects	# of Non-Detects	% of Detects	Minimum Concentration	Maximum Concentration	Arithmetic Mean	Standard Deviation
1,1,2,2-Tetrachloroethane	4	11	26.67	0	0.0619	0.0138	0.0232
Tetrachloroethylene	7	8	46.67	0	0.415	0.0517	0.102
Toluene	15	0	100.00	0.234	1.59	0.542	0.374
1,2,4-Trichlorobenzene	6	9	40.00	0	0.193	0.0535	0.0777
1,1,1-Trichloroethane	13	2	86.67	0	0.0656	0.0364	0.0197
1,1,2-Trichloroethane	1	14	6.67	0	0.0601	0.00401	0.015
Trichloroethylene	1	14	6.67	0	0.0485	0.00323	0.0121
Trichlorofluoromethane	15	0	100.00	1.1	1.46	1.33	0.114
Trichlorotrifluoroethane	15	0	100.00	0.522	0.722	0.628	0.0538
1,2,4-Trimethylbenzene	15	0	100.00	0.0345	0.148	0.0725	0.0303
1,3,5-Trimethylbenzene	9	6	60.00	0	0.0887	0.0266	0.0262
Vinyl chloride	1	14	6.67	0	0.0231	0.00154	0.00576
Xylenes	15	0	100.00	0.135	0.705	0.263	0.138

Carbonyl Compound Sampling Statistics

Monitoring Site: CRNM **1st Valid Sample:** 1/12/2015 **Last Valid Sample:** 3/19/2015 **# Valid Samples:** 12 **PM Type:** NA **Units:** ug/m3

Analyte	# of Detects	# of Non-Detects	% of Detects	Minimum Concentration	Maximum Concentration	Arithmetic Mean	Standard Deviation
Acetaldehyde	12	0	100.00	0.504	0.955	0.793	0.159
Acetone	12	0	100.00	1.05	3.98	2.2	0.892
Benzaldehyde	12	0	100.00	0.0522	0.1	0.0718	0.0156
2-Butanone	12	0	100.00	0.145	0.665	0.354	0.16
Butyraldehyde	12	0	100.00	0.0857	0.213	0.151	0.0379
Crotonaldehyde	12	0	100.00	0.046	0.109	0.0818	0.0187
2,5-Dimethylbenzaldehyde	0	12	0.00	0	0	0	0
Formaldehyde	12	0	100.00	0.811	1.98	1.44	0.336
Hexaldehyde	12	0	100.00	0.0369	0.111	0.0688	0.0226
Isovaleraldehyde	0	12	0.00	0	0	0	0
Propionaldehyde	12	0	100.00	0.0857	0.174	0.132	0.0249
Tolualdehydes	11	1	91.67	0	0.103	0.0656	0.0261
Valeraldehyde	12	0	100.00	0.0282	0.0565	0.0415	0.00947

Appendix E - Carbonyl Compound Sampling Statistics.

PAH Sampling Statistics

Monitoring Site: CRNM **1st Valid Sample:** 12/25/2014 **Last Valid Sample:** 3/19/2015 **# Valid Samples:** 13 **PM Type:** NA **Units:** ng/m3

Analyte	# of Detects	# of Non-Detects	% of Detects	Minimum Concentration	Maximum Concentration	Arithmetic Mean	Standard Deviation
Acenaphthene	11	2	84.62	0	3.78	1.99	1.22
Acenaphthylene	13	0	100.00	0.22	7.91	2.46	2.21
Anthracene	13	0	100.00	0.522	3.06	1.33	0.782
Benzo (a) anthracene	13	0	100.00	0.169	1.77	0.702	0.529
Benzo (a) pyrene	13	0	100.00	0.13	1.42	0.519	0.43
Benzo (b) fluoranthene	13	0	100.00	0.227	1.39	0.67	0.416
Benzo (e) pyrene	13	0	100.00	0.129	0.869	0.407	0.262
Benzo (g,h,i) perylene	13	0	100.00	0.0981	0.719	0.325	0.219
Benzo (k) fluoranthene	13	0	100.00	0.108	0.699	0.326	0.214
Chrysene	13	0	100.00	0.335	2.17	1.01	0.643
Coronene	13	0	100.00	0.044	0.339	0.141	0.0978
Cyclopenta[cd]pyrene	13	0	100.00	0.124	1.55	0.516	0.444
Dibenz (a,h) anthracene	13	0	100.00	0.021	0.179	0.0824	0.0581
Fluoranthene	13	0	100.00	1.31	5.06	2.68	1.24
Fluorene	13	0	100.00	1.5	5.99	3.54	1.48
9-Fluorenone	13	0	100.00	0.899	4.6	2.54	1.18
Naphthalene	13	0	100.00	19.2	103	53.3	24.5
Perylene	13	0	100.00	0.022	0.215	0.0817	0.0643
Phenanthrene	13	0	100.00	4.19	19.4	10.4	4.77
Pyrene	13	0	100.00	0.942	4.24	2.1	1.06
Retene	13	0	100.00	0.806	20.6	8.92	5.99

Appendix E - PAH Sampling Statistics.

Metals Sampling Statistics

Monitoring Site: CRNM **1st Valid Sample:** 12/25/2014 **Last Valid Sample:** 3/19/2015 **# Valid Samples:** 15 **PM Type:** PM10 **Units:** ng/m3

Analyte	# of Detects	# of Non-Detects	% of Detects	Minimum Concentration	Maximum Concentration	Arithmetic Mean	Standard Deviation
Antimony	15	0	100.00	0.059	0.577	0.303	0.163
Arsenic	15	0	100.00	0.017	0.884	0.197	0.214
Beryllium	13	2	86.67	0	0.022	0.0112	0.00696
Cadmium	15	0	100.00	0.006	0.076	0.0365	0.0154
Chromium	15	0	100.00	2.28	4.57	3.49	0.59
Cobalt	15	0	100.00	0.006	0.136	0.0598	0.0373
Lead	15	0	100.00	0.115	0.8	0.555	0.178
Manganese	15	0	100.00	0.308	9.88	4.32	2.53
Mercury	15	0	100.00	0.004	0.029	0.0129	0.00755
Nickel	14	1	93.33	0	0.882	0.392	0.225
Selenium	13	2	86.67	0	0.243	0.107	0.0766

Appendix F

Risk Factors Used Throughout the Report

Toxicity Factors Used Throughout the Monitoring Study

Pollutant	Preliminary Screening Value (µg/m3)	Cancer URE 1/(µg/m3)	Noncancer RfC (mg/m3)	Pollutant	Preliminary Screening Value (µg/m3)	Cancer URE 1/(µg/m3)	Noncancer RfC (mg/m3)
Acenaphthene	0.011	0.000088		Carbon Disulfide	70		0.7
Acenaphthylene	0.011	0.000088		Carbon Tetrachloride	0.17	0.000006	0.1
Acetaldehyde	0.45	0.0000022	0.009	Chlorobenzene	100		1
Acetonitrile	6		0.06	Chloroethane	1000		10
Acrolein	0.002		0.00002	Chloroform	9.8		0.098
Acrylonitrile	0.015	0.000068	0.002	Chloromethane	9		0.09
Antimony	0.02		0.0002	Chloroprene	0.0021	0.00048	0.02
Arsenic	0.00023	0.0043	0.000015	Chrysene	0.057	0.0000176	
Benzene	0.13	0.0000078	0.03	Cobalt	0.01		0.0001
Benzo (a) anthracene	0.0057	0.000176		Coronene	0.011	0.000088	
Benzo (a) pyrene	0.00057	0.00176		Dibenz (a,h) anthracene	0.00052	0.0019184	
Benzo (b) fluoranthene	0.0057	0.000176		1,2-Dibromoethane	0.0017	0.0006	0.009
Benzo (e) pyrene	0.011	0.000088		p-Dichlorobenzene	0.091	0.000011	0.8
Benzo (g,h,i) perylene	0.011	0.000088		1,1-Dichloroethane	0.625	0.0000016	0.5
Benzo (k) fluoranthene	0.0057	0.000176		1,2-Dichloroethane	0.038	0.000026	2.4
Beryllium	0.00042	0.0024	0.00002	1,1-Dichloroethene	20		0.2
Bromoform	0.91	0.0000011		Dichloromethane	60	0.000000016	0.6
Bromomethane	0.5		0.005	1,2-Dichloropropane	0.4		0.004
1,3-Butadiene	0.03	0.00003	0.002	cis-1,3-Dichloropropene	0.25	0.000004	0.02
Cadmium	0.00056	0.0018	0.00001	trans-1,3-Dichloropropene	0.25	0.000004	0.02

Toxicity Factors Used Throughout the Monitoring Study

Pollutant	Preliminary Screening Value (µg/m3)	Cancer URE 1/(µg/m3)	Noncancer RfC (mg/m3)	Pollutant	Preliminary Screening Value (µg/m3)	Cancer URE 1/(µg/m3)	Noncancer RfC (mg/m3)
Ethylbenzene	0.4	0.0000025	1	1,1,1-Trichloroethane	500		5
Fluoranthene	0.011	0.000088		1,1,2-Trichloroethane	0.0625	0.000016	0.4
Fluorene	0.011	0.000088		Trichloroethylene	0.2	0.0000048	0.002
Formaldehyde	0.077	0.000013	0.0098	Vinyl chloride	0.11	0.0000088	0.1
Hexachloro-1,3-butadiene	0.045	0.000022	0.09	Xylenes	10		0.1
Lead	0.015		0.00015				
Manganese	0.03		0.0003				
Mercury	0.03		0.0003				
Methyl Isobutyl Ketone	300		3				
Methyl Methacrylate	70		0.7				
Methyl tert-Butyl Ether	3.8	0.00000026	3				
Naphthalene	0.029	0.000034	0.003				
Nickel	0.0021	0.00048	0.00009				
Perylene	0.011	0.000088					
Propionaldehyde	0.8		0.008				
Selenium	2		0.02				
Styrene	100		1				
Tetrachloroethylene	3.8	0.00000026	0.04				
Toluene	500		5				
1,2,4-Trichlorobenzene	20		0.2				

APPENDIX B

VOC COC FORMS

ERG

Eastern Research Group, Inc.

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: _____ Canister Number: SAT135

City/State: _____ Lab Initial Can. Press. ("Hg): 29.5

AQS Code: _____ Date Can. Cleaned: 12/4/14

Collection Date: _____ Cleaning Batch # : 1-24/14

Options

SNMOC (Y/N): _____ Duplicate Event (Y/N): _____

TOXICS (Y/N): _____ Duplicate Can # : _____

Relinquished by: KB Date: 12-9-14

Field Setup

Received by: KBielay Date: 12/10/14

Operator: KB Illy Sys. #: _____ MFC Setting: _____

Setup Date: 12/11/14 Elapsed Timer Reset (Y/N): _____

Field Initial Can. Press. ("Hg): -2.2 Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 12/24/14 Sample Duration (3 or 24 hr): 24 hr

Operator: KBielay Elapsed Time: 23:49

Field Final Can. Press. ("Hg): KB -2.2 Canister Valve Closed (Y/N): Y

Status: **VALID** **VOID** (Circle one)

Relinquished by: KB Illy Date: 12/24/14

Lab Recovery

Received by: _____ Date: _____

Status: **VALID** **VOID** (Circle one) Lab Final Can. Press. ("Hg): _____

If void, why: _____

Comments: _____

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

Eastern Research Group, Inc.
601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: SATC15
City/State: _____
Lab Initial Can. Press. ("Hg): -28
AQS Code: _____
Date Can. Cleaned: 12/4/14
Collection Date: _____
Cleaning Batch # : 1-2-14
Options
SNMOC (Y/N): _____
Duplicate Event (Y/N): _____
TOXICS (Y/N): _____
Duplicate Can # : _____
Relinquished by: MB
Date: 12-9-14

Field Setup

Received by: KBilly
Date: 12/10/14
Operator: KBilly
Sys. #: _____
MFC Setting: _____
Setup Date: 12/24/14
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 01/02/15
Sample Duration (3 or 24 hr): 24
Operator: KBilly
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): 0
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KBilly
Date: 01/02/15

Lab Recovery

Received by: _____
Date: _____
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg): _____
If void, why: _____

Comments: "0" was reading on the gauge when Field Recovery canister pressure was taken

White: Sample Traveler
Canary: Lab Copy
Pink: Field Copy

ERG

Eastern Research Group, Inc.

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM

Canister Number: 21035

City/State: _____

Lab Initial Can. Press. ("Hg): -29.7

AQS Code: _____

Date Can. Cleaned: 12/11/14

Collection Date: _____

Cleaning Batch # : 2423

Options

SNMOC (Y/N): _____

Duplicate Event (Y/N): _____

TOXICS (Y/N): _____

Duplicate Can # : _____

Relinquished by: _____

Date: _____

Field Setup

Received by: KBilley

Date: 12/19/14

Operator: KBilley

Sys. #: _____

MFC Setting: _____

Setup Date: 01/12/15

Elapsed Timer Reset (Y/N): Y

Field Initial Can. Press. ("Hg): -22.5

Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 01/08/15

Sample Duration (3 or 24 hr): 24:00

Operator: KBilley

Elapsed Time: 23:49

Field Final Can. Press. ("Hg): -2.0

Canister Valve Closed (Y/N): Y

Status: **VALID** **VOID** (Circle one)

Relinquished by: KBilley

Date: 01/02/15

Lab Recovery

Received by: _____

Date: _____

Status: **VALID** **VOID** (Circle one)

Lab Final Can. Press. ("Hg): _____

If void, why: _____

Comments: Sample ran on 01/06/15.

White: Sample Traveler

Canary: Lab Copy

Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: 178
City/State:
Lab Initial Can. Press. ("Hg): -28
AQS Code:
Date Can. Cleaned: 12/4/14
Collection Date: 1/6/14
Cleaning Batch # : 1-24cc
Options
SNMOC (Y/N): Y
Duplicate Event (Y/N):
TOXICS (Y/N): Y
Duplicate Can # :
Relinquished by: KB
Date: 12-30-14

Field Setup

Received by: KBilly
Date: 12/30/14
Operator: KBilly
Sys. #:
MFC Setting:
Setup Date: 01/08/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 01/13/15
Sample Duration (3 or 24 hr): 24
Operator: KBilly
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -2
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KBilly
Date: 01/13/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample ran on 01/12/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRDM
Canister Number: SAT026
City/State: _____
Lab Initial Can. Press. ("Hg): 24.8
AQS Code: _____
Date Can. Cleaned: 1-7-15
Collection Date: 1/12/15
Cleaning Batch # : 1-2033

Options

SNMOC (Y/N): N
Duplicate Event (Y/N): _____
TOXICS (Y/N): _____
Duplicate Can # : _____
Relinquished by: MB
Date: 1-5-15

Field Setup

Received by: KB/LW
Date: 1/6/15
Operator: KB/LW
Sys. #: _____
MFC Setting: _____
Setup Date: ~~01/12/15~~ 1/12
Elapsed Timer Reset (Y/N): _____
Field Initial Can. Press. ("Hg): _____
Canister Valve Opened (Y/N): _____

Field Recovery

Recovery Date: _____
Sample Duration (3 or 24 hr): _____
Operator: _____
Elapsed Time: _____
Field Final Can. Press. ("Hg): _____
Canister Valve Closed (Y/N): _____
Status: **VALID** **VOID** (Circle one)
Relinquished by: _____
Date: _____

Lab Recovery

Received by: _____
Date: _____
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg): _____
If void, why: _____

Comments: No sample on 1/12/15. The canister could not get well with the sample timer. Tried several attempts but still leaked pressure (air). Therefore, did not sample.

White: Sample Traveler
Canary: Lab Copy
Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CKNM
Canister Number: 3251
City/State:
Lab Initial Can. Press. ("Hg): -28
AQS Code:
Date Can. Cleaned: 1/2/15
Collection Date: 1/18/15
Cleaning Batch # : 1-2433
Options
SNMOC (Y/N): N
Duplicate Event (Y/N):
TOXICS (Y/N): Y
Duplicate Can # :
Relinquished by: CMD
Date: 1-5-15

Field Setup

Received by:
Date: 1/16/15
Operator: KB, HW
Sys. #:
MFC Setting:
Setup Date: 1/17/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg):
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 01/19/15
Sample Duration (3 or 24 hr): 24:00
Operator: KB, HW
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -4
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KB, HW
Date: 01/19/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample set up to run on 01/18/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: DCOL
Canister Number: A1102
City/State:
Lab Initial Can. Press. ("Hg): -29.8
AQS Code:
Date Can. Cleaned: 11/4/15
Collection Date:
Cleaning Batch # : 1-2440
Options
SNMOC (Y/N): N
Duplicate Event (Y/N):
TOXICS (Y/N): Y
Duplicate Can # :
Relinquished by: MB
Date: 1.14.15

Field Setup

Received by: KB.Illy
Date: 01/15/15
Operator: KB.Illy
Sys. #:
MFC Setting:
Setup Date: 01/19/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 1/25/15
Sample Duration (3 or 24 hr): 24
Operator: KB.Illy
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -2
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KB.Illy
Date: 01/25/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample set to run on 1/24/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

ERG
Eastern Research Group Inc.
601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRMN
Canister Number: 054
City/State: _____
Lab Initial Can. Press. ("Hg): 29.4
AQS Code: _____
Date Can. Cleaned: 1/14/15
Collection Date: 2/5/15
Cleaning Batch # : 1-2449
Options
SNMOC (Y/N): _____
Duplicate Event (Y/N): _____
TOXICS (Y/N): _____
Duplicate Can # : _____
Relinquished by: MB
Date: 1-27-15

Field Setup

Received by: KB. Illy
Date: 1/28/15
Operator: KB. Illy
Sys. #: _____
MFC Setting: _____
Setup Date: 01/29/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -29.5
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 2/01/15
Sample Duration (3 or 24 hr): 24 hr
Operator: KB. Illy
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -2.5
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KB. Illy
Date: 02/01/15

Lab Recovery

Received by: _____
Date: _____
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg): _____
If void, why: _____

Comments: Sample to run out 01/30/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

Eastern Research Group, Inc.

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: 101
City/State:
Lab Initial Can. Press. ("Hg): -29.6
AQS Code:
Date Can. Cleaned: 1/21/15
Collection Date: 1/30/15
Cleaning Batch # : 1-2404
Options
SNMOC (Y/N): N
Duplicate Event (Y/N):
TOXICS (Y/N): Y
Duplicate Can # :
Relinquished by:
Date:

Field Setup

Received by: K.B. Ilg
Date: ~~1/21/15~~ 01/21/15
Operator: K.B. Ilg
Sys. #:
MFC Setting:
Setup Date: 01/27/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -16
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 01/29/15
Sample Duration (3 or 24 hr):
Operator: K.B. Ilg
Elapsed Time:
Field Final Can. Press. ("Hg):
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: K.B. Ilg
Date: 01/29/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample set to run on 1/30/15. The canister used to set was not used, since the pressure in canister was to low for sample.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: 151
City/State:
Lab Initial Can. Press. ("Hg): -29.4
AQS Code:
Date Can. Cleaned: 11/20/15
Collection Date: 2/11/15
Cleaning Batch # : 2c143
Options
SNMOC (Y/N): N
Duplicate Event (Y/N):
TOXICS (Y/N): Y
Duplicate Can # :
Relinquished by:
Date:

Field Setup

Received by: KBiley
Date: 2/03/15
Operator: KBiley
Sys. #:
MFC Setting:
Setup Date: 02/10/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 2/09/15
Sample Duration (3 or 24 hr): 24 hr.
Operator: KBiley
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -2
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KBiley
Date: 02/09/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample set to run for 02/07/15

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: 184
City/State:
Lab Initial Can. Press. ("Hg): 29.4
AQS Code:
Date Can. Cleaned: 1/22/15
Collection Date: 2/5/15
Cleaning Batch # : 2-2443
Options
SNMOC (Y/N): N
Duplicate Event (Y/N):
TOXICS (Y/N): Y
Duplicate Can # :
Relinquished by:
Date:

Field Setup

Received by: KBilly
Date: 2/3/15
Operator: KBilly
Sys. #:
MFC Setting:
Setup Date: 02/09/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 2/16/15
Sample Duration (3 or 24 hr): 24
Operator: KBilly
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -2
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KBilly
Date: 2/16/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample set to run on 2/11/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Eastern Research Group, Inc.
601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: 104
City/State:
Lab Initial Can. Press. ("Hg): 29.6
AQS Code:
Date Can. Cleaned: 1/24/15
Collection Date: 2/17/15
Cleaning Batch # : 14451
Options
SNMOC (Y/N): N
Duplicate Event (Y/N):
TOXICS (Y/N): Y
Duplicate Can # :
Relinquished by: KMB
Date: 2-10-15

Field Setup

Received by: KBilly
Date: 2/11/15
Operator: KBilly
Sys. #:
MFC Setting:
Setup Date: 02/16/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 2/22/15
Sample Duration (3 or 24 hr): 24
Operator: KBilly
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -2
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KBilly
Date: 02/22/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample set to run on 2/17/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: SA7070
City/State:
Lab Initial Can. Press. ("Hg): 29.6
AQS Code:
Date Can. Cleaned: ~~2-7~~ 2-4-15
Collection Date: 2-23-15
Cleaning Batch # : 4-2460
Options
SNMOC (Y/N):
Duplicate Event (Y/N):
TOXICS (Y/N):
Duplicate Can # :
Relinquished by:
Date:

Field Setup

Received by: KBilly
Date: 2/12/15
Operator: KBilly
Sys. #:
MFC Setting:
Setup Date: 2/22/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 2/24/15
Sample Duration (3 or 24 hr): 24
Operator: KBilly
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -3
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KBilly
Date: 2/24/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample left to ship on 2/23/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: 176
City/State:
Lab Initial Can. Press. ("Hg): -26
AQS Code:
Date Can. Cleaned: 2/11/15
Collection Date: 3/1/15
Cleaning Batch # : 22451
Options
SNMOC (Y/N): Y
Duplicate Event (Y/N):
TOXICS (Y/N): Y
Duplicate Can # :
Relinquished by: MB
Date: 2-18-15

Field Setup

Received by: KB, ILW
Date: 02/19/15
Operator: KB, ILW
Sys. #:
MFC Setting:
Setup Date: 02/28/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -21
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 3/04/15
Sample Duration (3 or 24 hr): 24 hr
Operator: KB, ILW
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -2
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KB, ILW
Date: 3/4/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Sample set to run on 03/10/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

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ERG Lab ID #

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: 055
City/State:
Lab Initial Can. Press. ("Hg): 29.7
AQS Code:
Date Can. Cleaned: 2/18/15
Collection Date: 3/7/15
Cleaning Batch # : 2-2162-1
Options
SNMOC (Y/N):
Duplicate Event (Y/N):
TOXICS (Y/N):
Duplicate Can # :
Relinquished by: RMB
Date: 2/25/15

Field Setup

Received by: KBilly
Date: 2/27/15
Operator: KBilly
Sys. #:
MFC Setting:
Setup Date: 03/04/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 3/8/15
Sample Duration (3 or 24 hr): 24.0 hr
Operator: KCB, KLW
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -1
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KCB, KLW
Date: 3/8/15

Lab Recovery

Received by:
Date:
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg):
If void, why:

Comments: Set to sample on 3/07/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
Canister Number: SAT017
City/State: —
Lab Initial Can. Press. ("Hg): -27
AQS Code: —
Date Can. Cleaned: 2/23/15
Collection Date: 3/4/15
Cleaning Batch # : 1-24-15

Options

SNMOC (Y/N): —
Duplicate Event (Y/N): —
TOXICS (Y/N): —
Duplicate Can # : —
Relinquished by: JHB
Date: 3/3/15

Field Setup

Received by: KB. Illy
Date: 3/4/15
Operator: KB. Illy
Sys. #: —
MFC Setting: —
Setup Date: 3/8/15
Elapsed Timer Reset (Y/N): Y
Field Initial Can. Press. ("Hg): -22
Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 3/15/15
Sample Duration (3 or 24 hr): 24 hr
Operator: KB. Illy
Elapsed Time: 23:49
Field Final Can. Press. ("Hg): -2
Canister Valve Closed (Y/N): Y
Status: **VALID** **VOID** (Circle one)
Relinquished by: KB. Illy
Date: 3/15/15

Lab Recovery

Received by: —
Date: —
Status: **VALID** **VOID** (Circle one)
Lab Final Can. Press. ("Hg): —
If void, why: —

Comments: Sample set to run on 3/13/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

TOXICS/SNMOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM — Canister Number: 684

City/State: _____ — Lab Initial Can. Press. ("Hg): -29.5

AQS Code: _____ — Date Can. Cleaned: 3/2/15

Collection Date: 3/19/15 — Cleaning Batch # : 1-2452

Options

SNMOC (Y/N): N — Duplicate Event (Y/N): _____

TOXICS (Y/N): _____ — Duplicate Can # : _____

Relinquished by: _____ — Date: 3/10/15

Field Setup

Received by: K.B.Illy — Date: 3/11/15

Operator: K.B.Illy — Sys. #: _____ — MFC Setting: _____

Setup Date: 3/15/15 — Elapsed Timer Reset (Y/N): Y

Field Initial Can. Press. ("Hg): -23 — Canister Valve Opened (Y/N): Y

Field Recovery

Recovery Date: 3/23/15 — Sample Duration (3 or 24 hr): 24 hr

Operator: K.B.Illy — Elapsed Time: 23:49

Field Final Can. Press. ("Hg): -1 mm Hg — Canister Valve Closed (Y/N): Y

Status: **VALID** **VOID** (Circle one)

Relinquished by: K.B.Illy — Date: 3/23/15

Lab Recovery

Received by: _____ — Date: _____

Status: **VALID** **VOID** (Circle one) — Lab Final Can. Press. ("Hg): _____

If void, why: _____

Comments: Samples set to run on 3/19/15.

White: Sample Traveler — Canary: Lab Copy — Pink: Field Copy

APPENDIX C

CARBONYL COMPOUNDS COC FORMS

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: ~~MB CHAN~~ CRNM Collection Date: 12-19-14

City/State: _____ Cartridge Lot #: 0071342440

AQS Code: _____ Duplicate Event (Y/N): _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilly Date: 12/10/14

Set-Up Date: 12/24/14 Operator: KBilly Sys. #: CRNM 1

Pre-Sampling Rotameter Reading (cc/min): 1530 Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 12/29/14 Sample Duration (3 or 24 hr): 24 hr.

Operator: KBilly Elapsed Time: 00:00

Post Sampling Rotameter Reading (cc/min): 0 Status: **VALID** **VOID** (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KBilly Date: 12/29/14

Lab Recovery

Received by: _____ Date: _____

Status: **VALID** **VOID** (Circle one) Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
12/25/14	00:00	0		0071342440 - P		

Comments: Sampled on 12/25/14. Brick pump did not operate well, I kept getting "Faint Flow". The pump would keep running, it shuts off when trying to get the "Post Sampling Rotameter Reading".

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: ~~MLK CHA~~ CRNM Collection Date: 12-29-14

City/State: _____ Cartridge Lot #: 0071312441A

AQS Code: _____ Duplicate Event (Y/N): _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilley Date: 12/10/14

Set-Up Date: 12/29/14 Operator: KB IKy Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): 990 Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 01/02/15 Sample Duration (3 or 24 hr): 24

Operator: KB. IKy Elapsed Time: 00 00

Post Sampling Rotameter Reading (cc/min): 495 Status: **VALID** **VOID** (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KB. IKy Date: 01/02/15

Lab Recovery

Received by: _____ Date: _____

Status: **VALID** **VOID** (Circle one) Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
12/31/14		24		0071312441A	P	

Comments: Can't set a flow, keep getting "Flow Fault"

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

P

ERG

Eastern Research Group, Inc.

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNN Collection Date: 12-31-14

City/State: _____ Cartridge Lot #: 0071342449A

AQS Code: _____ Duplicate Event (Y/N): _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilley Date: 12/18/14

Set-Up Date: 01/2/15 Operator: KBilley Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): _____ Elapsed Timer Reset (Y/N): _____

Field Recovery

Recovery Date: KBilley Sample Duration (3 or 24 hr): 24hr

Operator: KBilley Elapsed Time: 0:00

Post Sampling Rotameter Reading (cc/min): 495 Status: **VALID** **VOID** (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KBilley Date: 01/08/15

Lab Recovery

Received by: _____ Date: _____

Status: **VALID** **VOID** (Circle one) Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
01/06/15				0071342441A		

Comments: Did not run due to "fault flow." Sample ran on 01/06/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM — Collection Date: 11/6/15

City/State: _____ — Cartridge Lot #: 03234044E

AQS Code: _____ — Duplicate Event (Y/N): N

Relinquished by: RMB — Date: 1-5-15

Field Setup

Received by: KBilley — Date: 01/07/15

Set-Up Date: 01/08/15 — Operator: KBilley — Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): 6350 KB — Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 01/13/15 — Sample Duration (3 or 24 hr): 24

Operator: KBilley — Elapsed Time: 23:55

Post Sampling Rotameter Reading (cc/min): 1291 L — Status: (VALID) VOID (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KBilley — Date: 01/13/15

Lab Recovery

Received by: _____ — Date: _____

Status: VALID VOID (Circle one) — Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
01/12/15	24	23:55		03234044E		

Comments: Adjust Pump to 1533 for flow calibration to set to 900 cc/min. on the plastic flow meter. When I check the pre/post flow, the flow continuously increases. Pre-Sampling set @ 6350. Post-sampling was collected @ 1291 L.

White: Sample Traveler — Canary: Lab Copy — Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Field Blank Collection Date: 1/6/15

City/State: _____ Cartridge Lot #: 003234044E

AQS Code: _____ Duplicate Event (Y/N): N

Relinquished by: RMB Date: 1-5-15

Field Setup

Received by: KBilley Date: 01/07/15

Set-Up Date: 01/08/15 Operator: KBilley Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): ~ Elapsed Timer Reset (Y/N): _____

Field Recovery

Recovery Date: _____ Sample Duration (3 or 24 hr): _____

Operator: _____ Elapsed Time: _____

Post Sampling Rotameter Reading (cc/min): _____ Status: **VALID** **VOID** (Circle one)

Cartridges Capped (Y/N): _____

Relinquished by: _____ Date: _____

Lab Recovery

Received by: _____ Date: _____

Status: **VALID** **VOID** (Circle one) Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID

Comments: Field blank installed for sample date 01/12/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM — Collection Date: 1-12-15

City/State: _____ — Cartridge Lot #: 0030323008

AQS Code: _____ — Duplicate Event (Y/N): _____

Relinquished by: KMB — Date: 1-5-15

Field Setup

Received by: KBilly — Date: 01/06/15

Set-Up Date: 01/13/15 — Operator: KBilly — Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): 13.7 L — Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 01/19/15 — Sample Duration (3 or 24 hr): 24.00

Operator: KBilly — Elapsed Time: 24:00

Post Sampling Rotameter Reading (cc/min): 2042L — Status: (VALID) VOID (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KBilly — Date: 01/19/15

Lab Recovery

Received by: _____ — Date: _____

Status: VALID VOID (Circle one) — Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
01/18/15	24	24:00		0030323008		

Comments: Sample for 01/18/15 date.

White: Sample Traveler — Canary: Lab Copy — Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRVM Collection Date: 1-15-15

City/State: _____ Cartridge Lot #: 0032340444E

AQS Code: _____ Duplicate Event (Y/N): _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilly Date: 01/18/15

Set-Up Date: 01/19/15 Operator: KBilly Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): 16.2L Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 01/25/15 Sample Duration (3 or 24 hr): 24 hr

Operator: KBilly Elapsed Time: 23:52

Post Sampling Rotameter Reading (cc/min): 1288L Status: **VALID** **VOID** (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KBilly Date: 01/25/15

Lab Recovery

Received by: _____ Date: _____

Status: **VALID** **VOID** (Circle one) Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
01/24/15	24	23:52		0032340444E		

Comments: Sample set to run on 1/24/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRVM Collection Date: 1-30-15

City/State: _____ Cartridge Lot #: 0032340414E

AQS Code: _____ Duplicate Event (Y/N): _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KB, ILM Date: 01/21/15

Set-Up Date: 01/25/15 Operator: KB, ILM Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): 415cc Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 02/01/15 Sample Duration (3 or 24 hr): 24:00

Operator: KB, ILM Elapsed Time: 23:53

Post Sampling Rotameter Reading (cc/min): 1289L Status: (VALID) VOID (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KB, ILM Date: 02/01/15

Lab Recovery

Received by: _____ Date: _____

Status: VALID VOID (Circle one) Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
01/30/15	24hr			0032340414E		

Comments: Sample Set to run on 01/30/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

FB

ERG

ERG Lab ID #

801 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRVI Collection Date: 2-5-15

City/State: _____ Cartridge Lot #: 0232341044E

AQS Code: _____ Duplicate Event (Y/N): _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilly Date: _____

Set-Up Date: 02/01/15 Operator: KBilly Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): _____ Elapsed Timer Reset (Y/N): _____

Field Recovery

Recovery Date: _____ Sample Duration (3 or 24 hr): _____

Operator: _____ Elapsed Time: _____

Post Sampling Rotameter Reading (cc/min): _____ Status: **VALID** **VOID** (Circle one)

Cartridges Capped (Y/N): _____

Relinquished by: _____ Date: _____

Lab Recovery

Received by: _____ Date: _____

Status: **VALID** **VOID** (Circle one) Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
Field Blank				0232341044E		

Comments: Sample Field Blank for 02/01/15 run date.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

SK

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM — Collection Date: _____

City/State: _____ — Cartridge Lot #: 0032340414E

AQS Code: _____ — Duplicate Event (Y/N): _____

Relinquished by: _____ — Date: _____

Field Setup

Received by: KB, ILM — Date: 01/27/15

Set-Up Date: 02/01/15 — Operator: KB, ILM — Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): 459cc — Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 02/09/15 — Sample Duration (3 or 24 hr): 24 hr

Operator: KB, ILM — Elapsed Time: 23:59

Post Sampling Rotameter Reading (cc/min): 1281L — Status: **VALID** **VOID** (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KB, ILM — Date: 02/09/15

Lab Recovery

Received by: _____ — Date: _____

Status: **VALID** **VOID** (Circle one) — Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
02/05/15	23:53	24 hr.		0032340414E		

Comments: Sample to run on 02/05/15.

White: Sample Traveler — Canary: Lab Copy — Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRAM
Collection Date: 2-11-15
City/State:
Cartridge Lot #: 00323610444E
AQS Code:
Duplicate Event (Y/N):
Relinquished by:
Date:

Field Setup

Received by: KB, ILW
Date: 2/3/15
Set-Up Date: 02/09/15
Operator: KB, ILW
Sys. #:
Pre-Sampling Rotameter Reading (cc/min): 26.4L
Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 02/16/15
Sample Duration (3 or 24 hr): 24
Operator: KB, ILW
Elapsed Time: 23:55
Post Sampling Rotameter Reading (cc/min): 1292L
Status: **VALID** VOID (Circle one)
Cartridges Capped (Y/N): Y
Relinquished by: KB, ILW
Date: 02/16/15

Lab Recovery

Received by:
Date:
Status: **VALID** VOID (Circle one)
Temperature:
If void, why:
Sample Volume (total Liters):

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
2/11/15	24	23:55		00323610444E		

Comments: Sample to run on 2/11/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRVM Collection Date: 2-17-15

City/State: _____ Cartridge Lot #: 0032340441E

AQS Code: _____ Duplicate Event (Y/N): _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KB. Illy Date: 2/11/15

Set-Up Date: 02/16/15 Operator: KB. Illy Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): 24.5L Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 2/22/15 Sample Duration (3 or 24 hr): 24 hr

Operator: KB. Illy Elapsed Time: 23:51

Post Sampling Rotameter Reading (cc/min): 12.72 Status: (VALID) VOID (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KB. Illy Date: 2/22/15

Lab Recovery

Received by: _____ Date: _____

Status: VALID VOID (Circle one) Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
2/17/15	24	23:51		0032340441E		

Comments: Sample set to run on 2/17/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM
Collection Date: _____
City/State: _____
Cartridge Lot #: 0032340414E
AQS Code: _____
Duplicate Event (Y/N): _____
Relinquished by: _____ Date: _____

Field Setup

Received by: KB, ILM Date: 2/18/15
Set-Up Date: 2/22/15 Operator: KB, ILM Sys. #: _____
Pre-Sampling Rotameter Reading (cc/min): 27.5 L Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 2/24/15 Sample Duration (3 or 24 hr): 24
Operator: KB, ILM Elapsed Time: 23:55
Post Sampling Rotameter Reading (cc/min): 1291 L Status: **VALID** **VOID** (Circle one)
Cartridges Capped (Y/N): Y
Relinquished by: KB, ILM Date: 2/24/15

Lab Recovery

Received by: _____ Date: _____
Status: **VALID** **VOID** (Circle one) Temperature: _____
If void, why: _____
Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
2/23/15	24:00	23:55		0032340414E		

Comments: Sample set to run on 2/23/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM
Collection Date: _____
City/State: _____
Cartridge Lot #: 0032340415
AQS Code: _____
Duplicate Event (Y/N): _____
Relinquished by: _____ Date: _____

Field Setup

Received by: KB, Illy Date: 2/24/15
Set-Up Date: 2/28/15 Operator: KB, Illy Sys. #: _____
Pre-Sampling Rotameter Reading (cc/min): 26.8L Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 3/4/15 Sample Duration (3 or 24 hr): 24
Operator: KB, Illy Elapsed Time: 23:49
Post Sampling Rotameter Reading (cc/min): 1286L Status: **VALID** **VOID** (Circle one)
Cartridges Capped (Y/N): Y
Relinquished by: KB, Illy Date: 3/4/15

Lab Recovery

Received by: _____ Date: _____
Status: **VALID** **VOID** (Circle one) Temperature: _____
If void, why: _____
Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
3/01/15	24	23:49		0032340415		

Comments: Sample set to run on 3/01/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM — Collection Date: _____

City/State: _____ — Cartridge Lot #: 0323404E

AQS Code: _____ — Duplicate Event (Y/N): _____

Relinquished by: _____ — Date: _____

Field Setup

Received by: KBilly — Date: 2/27/15

Set-Up Date: 3/04/15 — Operator: KBilly — Sys. #: _____

Pre-Sampling Rotameter Reading (cc/min): 23.64 — Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 3/08/15 — Sample Duration (3 or 24 hr): 24

Operator: KBilly — Elapsed Time: 23:51

Post Sampling Rotameter Reading (cc/min): 1287L — Status: **VALID** **VOID** (Circle one)

Cartridges Capped (Y/N): Y

Relinquished by: KBilly — Date: 3/08/15

Lab Recovery

Received by: _____ — Date: _____

Status: **VALID** **VOID** (Circle one) — Temperature: _____

If void, why: _____

Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
3/7/15	24	23:51		0323404E		

Comments: Set to sample for 3/7/15.

White: Sample Traveler — Canary: Lab Copy — Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM
Collection Date: _____
City/State: _____
Cartridge Lot #: CO32340441E
AQS Code: _____
Duplicate Event (Y/N): _____
Relinquished by: _____ Date: _____

Field Setup

Received by: KBilly Date: 03/03/15
Set-Up Date: 3/8/15 Operator: KBilly Sys. #: _____
Pre-Sampling Rotameter Reading (cc/min): 41.2L Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 3/13/15 Sample Duration (3 or 24 hr): 24 hr.
Operator: KBilly Elapsed Time: 23:49
Post Sampling Rotameter Reading (cc/min): 1286L Status: **VALID** **VOID** (Circle one)
Cartridges Capped (Y/N): Y
Relinquished by: KBilly Date: 3/15/15

Lab Recovery

Received by: _____ Date: _____
Status: **VALID** **VOID** (Circle one) Temperature: _____
If void, why: _____
Sample Volume (total Liters): _____

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
3/13/15	24 hr	23:49		CO32340441E		

Comments: Sample set up time on 3/13/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

CARBONYL COMPOUNDS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM
Collection Date: 3-19-15 ~~3-23-15~~
City/State:
Cartridge Lot #: 0032340414F
AQS Code:
Duplicate Event (Y/N):
Relinquished by:
Date:

Field Setup

Received by: KBilby
Date: 3/10/15
Set-Up Date: 3/15/15
Operator: KBilby
Sys. #:
Pre-Sampling Rotameter Reading (cc/min): 27.5L
Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 3/23/15
Sample Duration (3 or 24 hr): 24 hr.
Operator: KBilby
Elapsed Time: 23:49
Post Sampling Rotameter Reading (cc/min): 12.8L
Status: (VALID) VOID (Circle one)
Cartridges Capped (Y/N): Y
Relinquished by: KBilby
Date: 3/23/15

Lab Recovery

Received by:
Date:
Status: VALID VOID (Circle one)
Temperature:
If void, why:
Sample Volume (total Liters):

PAMS

Sample Date	Sample Time	Sample Duration	Sample Volume	Cartridge Lot #	Sample ID	Lab ID
3/19/15	24:00	23:49		0032340414E		

Comments: Sample set to run on 3/19/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

APPENDIX D

PAH COC FORMS

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: ~~CHAPEL~~ CRNM
Container #: 344
City/State:
Collection Date: 12-19-14
AQS Code:
Collocated Event (Y/N): SID.47 2012
Other: VL: B121101-XB
PE: 53723
Cartridge Certification Date:
Relinquished by: BHC
Date: 12-19-14

Field Setup

Received by: KBilly
Date: 12/10/14
Site Operator: KBilly
System #:
Set-Up Date: 12/21/14
Elapsed Timer Reset (Y/N):
Collection Date: 12/22/14

Field Recovery

Recovery Date: 12/29/14

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	00:15				
End	23:45	0.3 °C	29.42	48	
Average					

Total Collection Time (Minutes) 23:45
Total Collection Volume (std. m^3)
Status: **Valid** **Void** (Circle one)
Site Operator: KBilly
Relinquished by: KBilly
Date: 12/29/14

Lab Recovery

Received by:
Date:
Container #:
Status: **Valid** **Void** (Circle one)
Temperature:
If void, why:

Comments: Changed "collection date" to 12/22/14. Not sure about the "Flowrate"?

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: ~~EHSCRNM~~ Container #: 556

City/State: Collection Date: 12-25-14

AQS Code: Collocated Event (Y/N): SVOC-122512

Other: VI. B4J1961-XB

Cartridge Certification Date: PL: 53723

Relinquished by: BHC Date: 12-1-14

Field Setup

Received by: KBilby Date: 12/29/14

Site Operator: KBilby System #:

Set-Up Date: 12/29/14 Elapsed Timer Reset (Y/N): N

Collection Date: 12/31/14

Field Recovery

Recovery Date: 01/02/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	[illegible]	[illegible]	[illegible]	12	
End	47:08	-2.0	591	12	
Average		-0.95	591.5	12	

Total Collection Time (Minutes) 23.49 Total Collection Volume (std. m^3) 24

Status: **Valid** **Void** (Circle one) Site Operator: KBilby

Relinquished by: KBilby Date: 01/2/15

Lab Recovery

Received by: Date: Container #:

Status: **Valid** **Void** (Circle one) Temperature:

If void, why:

Comments: Not sure how to set "Flowrate".

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

Eastern Research Group, Inc.

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM

City/State:

AQS Code:

Container #: 264

Collection Date: 12-31-14

Collocated Event (Y/N): [illegible]2012

Other: V1: B472201-XB

P1: 53157

Cartridge Certification Date:

Relinquished by: BAC Date: 12-17-14

Field Setup

Received by: KBilley Date: 12/18/14

Site Operator: KBilley

System #:

Set-Up Date: 01/02/15

Elapsed Timer Reset (Y/N): Y

Collection Date: 01/06/15

Field Recovery

Recovery Date: ~~01/06/15~~ 01/08/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	47:15	~~20.0~~	~~691.1~~	20	0.16111
End	70:36	16.5	~~696.5~~	20	0.15992
Average		2.25	593.8	20	0.160515

Total Collection Time (Minutes) 23:21 Total Collection Volume (std. m^3) 3.73

Status: **Valid** **Void** (Circle one) Site Operator: KBilley

Relinquished by: KBilley Date: 01/08/15

Lab Recovery

Received by: Date: Container #:

Status: **Valid** **Void** (Circle one) Temperature:

If void, why:

Comments: Sample ran on 01/06/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: LRNM
Container #: 2741
City/State:
Collection Date: 1-6-15
AQS Code:
Collocated Event (Y/N): SID: 41224012
Other: XL: B172201-XB
PI: 94555
Cartridge Certification Date:
Relinquished by: BHC
Date: 12-31-14

Field Setup

Received by: JCBelew
Date: 01/07/15
Site Operator: KBilley
System #:
Set-Up Date: 01/08/15
Elapsed Timer Reset (Y/N): Y
Collection Date: 01/12/15

Field Recovery

Recovery Date:

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	70.48	5.5	597	45	0.21425
End	94.58	5.4	594	48	0.21918
Average		5.45	595.5	46.5	0.216715

Total Collection Time (Minutes) 24.10
Total Collection Volume (std. m^3) 5.22
Status: **Valid** **Void** (Circle one)
Site Operator: KBilley
Relinquished by: KBilley
Date: 01/13/15

Lab Recovery

Received by:
Date:
Container #:
Status: **Valid** **Void** (Circle one)
Temperature:
If void, why:

Comments: Sample ran on 01/12/15. I have printed a copy of the XLS excel spreadsheet on "Calculations for SVOC – Flow Rate and Total Volume."

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

FB

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRVM
Container #: 557
City/State:
Collection Date: 1-6-15
AQS Code:
Collocated Event (Y/N): [illegible]
Other: M1: BG12201-xB
P1: 511555
Cartridge Certification Date:
Relinquished by: BK Date: 12-31-14

Field Setup

Received by: KRilley Date: 01/07/15
Site Operator: KBilley
System #:
Set-Up Date: 01/08/15
Elapsed Timer Reset (Y/N):
Collection Date: 01/08/15 for Sample Run 01/12/15.

Field Recovery

Recovery Date:

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start					
End					
Average					

Total Collection Time (Minutes)
Total Collection Volume (std. m^3)
Status: **Valid** **Void** (Circle one)
Site Operator:
Relinquished by: Date:

Lab Recovery

Received by: Date: Container #:
Status: **Valid** **Void** (Circle one) Temperature:
If void, why:

Comments: Installed FB and notice: plastic pedri dish is cracked. But still went a head and installed. FB used for sample run date 01/12/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNJ1

City/State:

AQS Code:

Container #: 233

Collection Date: 1-12-15

Collocated Event (Y/N): S1D:4J29012

Other: XL: BX110201 XB
PL: S4566

Cartridge Certification Date:

Relinquished by: BHC Date: 1-2-15

Field Setup

Received by: KBilly Date: 1/6/15

Site Operator: KBilly

System #:

Set-Up Date: 01/13/15

Elapsed Timer Reset (Y/N): Y

Collection Date: 01/18/15

Field Recovery

Recovery Date: 01/19/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	94.83	3.0	594 mmHg	45	0.21457
End	120.10	19.3	597 mmHg	~~44~~ 42	0.20500
Average		11.15	595.5	43.5	0.209785

Total Collection Time (Minutes) 25.17

Total Collection Volume (std. m^3) 5.28

Status: **Valid** (circled) **Void** (Circle one)

Site Operator: KBilly

Relinquished by: KBilly Date: 01/19/15

Lab Recovery

Received by: Date: Container #:

Status: **Valid** **Void** (Circle one) Temperature:

If void, why:

Comments: Sampled for 01/18/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM	
Field Sample ID:	CRNM	
Date Sampled:	1/18/2015	
Elapsed Time(minutes):	(or enter 0 for start and total for end)	
Start	94.83	
End	120	
Difference	25.17	
Temp (^{0}C):		**Temp (^{0}K):**
Start	3	276
End	19.3	292.3
Barometric ("Hg):		
Start	23.38	
End	23.5	
Magnehelic ("H_2O):		
Start	45	
End	42	
Temp Std (^{0}K):	298.15	
Barometric Std ("Hg):	29.92	
Sampler Calibration:		
Calibration Date:	12/19/2014	
Calibration Intercept (B2) value:	-1.970397882	
Calibration Slope (M2) value:	37.90700782	

Initial Flow Rate:	0.21457	m^3/min
Final Flow Rate:	0.20500	m^3/min
Total Initial Volume:	5.40	m^3
Total Final Volume:	5.16	m^3
Actual Volume:	**5.28**	m^3

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Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: Magnehelic ("H_2O) **X** $\frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}}$ **X** $\frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}}$ = y ("H_2O)

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3) Flow Rate (m^3/min) **X** Delta Time Change (min)

Actual Volume: (m^3) (Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRVM
City/State:
AQS Code:
Container #: 435
Collection Date: 1-15-15
Collocated Event (Y/N): SID:4729012
Other: XL: B4L0201-XB
PI: 54595
Cartridge Certification Date:
Relinquished by: BHC Date: 1-6-15

Field Setup

Received by: KBilly Date: 01/08/15
Site Operator: KB
Set-Up Date: 01/9/15
Collection Date: 01/24/15
System #:
Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 01/25/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	120.24	18.5	29.7	45	0.2110
End	145.72	12.1	29.8	45	0.21208
Average		15.8	29.75	45	0.2115

Total Collection Time (Minutes): 24:48
Total Collection Volume (std. m^3): 5.39
Status: **Valid** **Void** (Circle one)
Site Operator: KB
Relinquished by: KB Date: 01/25/15

Lab Recovery

Received by: Date: Container #:
Status: **Valid** **Void** (Circle one) Temperature:
If void, why:

Comments: Sample set to run on 01/24/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21100	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.21208	m^3/min
Date Sampled:	1/24/2015				
			Total Initial Volume:	5.38	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	5.40	m^3
Start	120.24				
End	145.72		Actual Volume:	**5.39**	m^3
Difference	25.48				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	18.5	291.5			
End	13.1	286.1			
Barometric ("Hg):					
Start	23.62				
End	23.5				
Magnehelic ("H_2O):					
Start	45				
End	45				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397882				
Calibration Slope (M2) value:	37.90700782				

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Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: Magnehelic ("H_2O) **X** $\frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}}$ **X** $\frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}}$ = y ("H_2O)

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3) Flow Rate (m^3/min) **X** Delta Time Change (min)

Actual Volume: (m^3) (Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

ERG (Eastern Research Group, Inc.)
601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRN11
City/State:
AQS Code:
Container #: 460
Collection Date: 1-30-15
Collocated Event (Y/N): SID: 12292012
Other: XL: 13412601-XB
PI: 55748
Cartridge Certification Date:
Relinquished by: BHC Date: 1-14-15

Field Setup

Received by: KBilby Date: 01/21/15
Site Operator: KBilby
System #:
Set-Up Date: 1/25/15
Elapsed Timer Reset (Y/N): Y
Collection Date: 1/30/15

Field Recovery

Recovery Date: 02/01/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	145:93	15.8	760 mm Hg	45	0.21174
End	170:16	14.3	597 mm Hg	45	0.21175
Average		15.05	598.5 mm Hg	45	0.211745

Total Collection Time (Minutes) 24:23
Total Collection Volume (std. m^3) 5.13
Status: **Valid** **Void** (Circle one)
Site Operator: KBilby
Relinquished by: KBilby Date: 02/01/15

Lab Recovery

Received by: Date: Container #:
Status: **Valid** **Void** (Circle one) Temperature:
If void, why:

Comments: Set to Sample on 01/30/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21174	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.21175	m^3/min
Date Sampled:	1/30/2015				
			Total Initial Volume:	5.13	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	5.13	m^3
Start	145.93				
End	170.16		Actual Volume:	**5.13**	m^3
Difference	24.23				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	15.8	288.8			
End	14.3	287.3			
Barometric ("Hg):					
Start	23.62				
End	23.5				
Magnehelic ("H_2O):					
Start	45				
End	45				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397882				
Calibration Slope (M2) value:	37.90700782				

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Calculations:

Flow Rate: (m^3/min) (1) Square Root of: $\text{Magnehelic ("H}_2\text{O)} \times \frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}} \times \frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}} = \text{y ("H}_2\text{O)}$

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3) Flow Rate (m^3/min) **X** Delta Time Change (min)

Actual Volume: (m^3) (Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRN11 Container #: 709

City/State: Collection Date: 2-5-15

AQS Code: Collocated Event (Y/N): N: 5416007

Other: Y1: BULK01-XP

Cartridge Certification Date: Y1: 55716

Relinquished by: BAC Date: 1-23-15

Field Setup

Received by: KBilly Date: 01/27/15

Site Operator: KBilly System #:

Set-Up Date: 02/01/15 Elapsed Timer Reset (Y/N): Y

Collection Date: 02/05/15

Field Recovery

Recovery Date: 02/09/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	170:39	14.1	~~96.5 mmHg~~	45	0.21174
End	193:73	11.1	~~97 mmHg~~	42	0.20720
Average		12.6	96.75	43.5	0.20947

Total Collection Time (Minutes) 23:34 Total Collection Volume (std. m^3) 4.89

Status: **Valid** **Void** (Circle one) Site Operator: KBilly

Relinquished by: KBilly Date: 02/09/15

Lab Recovery

Received by: Date: Container #:

Status: **Valid** **Void** (Circle one) Temperature:

If void, why:

Comments: Sample set to run on 2/05/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM	
Field Sample ID:	CRNM	
Date Sampled:	2/5/2015	
Elapsed Time(minutes):	(or enter 0 for start and total for end)	
Start	170.39	
End	193.73	
Difference	23.34	
Temp (^{0}C):		**Temp (^{0}K):**
Start	14.1	287.1
End	11.1	284.1
Barometric ("Hg):		
Start	23.48	
End	23.5	
Magnehelic ("H_2O):		
Start	45	
End	42	
Temp Std (^{0}K):	298.15	
Barometric Std ("Hg):	29.92	
Sampler Calibration:		
Calibration Date:	12/19/2014	
Calibration Intercept (B2) value:	-1.970397882	
Calibration Slope (M2) value:	37.90700782	

Initial Flow Rate:	0.21174	m^3/min
Final Flow Rate:	0.20720	m^3/min
Total Initial Volume:	4.94	m^3
Total Final Volume:	4.84	m^3
Actual Volume:	**4.89**	m^3

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Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: Magnehelic ("H_2O) **X** $\frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}}$ **X** $\frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}}$ = y ("H_2O)

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3)

Flow Rate (m^3/min) **X** Delta Time Change (min)

Actual Volume: (m^3)

(Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

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ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM1

City/State:

AQS Code:

Cartridge Certification Date:

Relinquished by: BHC

Container #: 15

Collection Date: 2-5-15

Collocated Event (Y/N): SID: 5416-07

Other: XI.B4L1(-1XP
PI: 55746

Date: 1-27-15

Field Setup

Received by: KBilley

Site Operator: KBilley

Set-Up Date: 02/01/05

Collection Date: 02/05/05

Date: 02/01/15

System #:

Elapsed Timer Reset (Y/N):

Field Recovery

Recovery Date: 02/01/05

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	Field Blank	11.5	546.5mb		
End					
Average					

Total Collection Time (Minutes)

Total Collection Volume (std. m^3)

Status: **Valid** **Void** (Circle one)

Site Operator:

Relinquished by:

Date:

Lab Recovery

Received by:

Date:

Container #:

Status: **Valid** **Void** (Circle one)

Temperature:

If void, why:

Comments: Field Blank for 02/05/15.

White: Sample Traveler | Canary: Lab Copy | Pink: Field Copy

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ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRLL
City/State:
AQS Code:
Container #: 233
Collection Date: 2-11-15
Collocated Event (Y/N): SID:5-116007
Other: VL: BG-13201-XB
VL: 55-716
Cartridge Certification Date:
Relinquished by: BHC Date: 2-2-15

Field Setup

Received by: KB, Illy Date: 2/3/15
Site Operator: KB, Illy
System #:
Set-Up Date: 02/09/15
Elapsed Timer Reset (Y/N): Y
Collection Date: 02/11/15

Field Recovery

Recovery Date: 2/16/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	193:80	9.3	97.5	45	0.21322
End	217:72	12.0	91.0	43	0.20802
Average		10.65	94.25	44	0.21062

Total Collection Time (Minutes) 23:92
Total Collection Volume (std. m^3) 5.04
Status: **Valid** **Void** (Circle one)
Site Operator: KB, Illy
Relinquished by: KB, Illy Date: 2/16/15

Lab Recovery

Received by: Date: Container #:
Status: **Valid** **Void** (Circle one) Temperature:
If void, why:

Comments: Sample set to run on 2/11/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21322	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.20802	m^3/min
Date Sampled:	2/11/2015				
			Total Initial Volume:	5.10	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	4.98	m^3
Start	193.8				
End	217.72		Actual Volume:	**5.04**	m^3
Difference	23.92				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	9.3	282.3			
End	12	285			
Barometric ("Hg):					
Start	23.52				
End	23.27				
Magnehelic ("H_2O):					
Start	45				
End	43				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397882				
Calibration Slope (M2) value:	37.90700782				

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Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: Magnehelic ("H_2O) **X** $\frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}}$ **X** $\frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}}$ = y ("H_2O)

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3) Flow Rate (m^3/min) **X** Delta Time Change (min)

Actual Volume: (m^3) (Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

ERG
Eastern Research Group, Inc.
601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRVM
City/State:
AQS Code:
Cartridge Certification Date:
Relinquished by: BHC   Date: 2-9-15

Container #: 700
Collection Date: 2-17-15
Collocated Event (Y/N): SID: 5116007
Other: XI: BS41301×B
PI: 55744

Field Setup

Received by: KB. Illy   Date: 2/11/15
Site Operator: KB. Illy
Set-Up Date: 2/16/15
Collection Date: 2/17/15
System #:
Elapsed Timer Reset (Y/N): Y

Field Recovery

Recovery Date: 2/22/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	218.09	12.1	591 mmHg	45	0.21158
End	242.70	13.1	590 mmHg	43	0.20758
Average		12.6	590.5	44	0.20958

Total Collection Time (Minutes) 24.61
Total Collection Volume (std. m^3) 5.16
Status: **Valid** (circled) **Void** (Circle one)
Site Operator: KB. Illy
Relinquished by: KB. Illy   Date: 2/22/15

Lab Recovery

Received by: ______ Date: ______ Container #: ______
Status: **Valid** **Void** (Circle one)   Temperature: ______
If void, why:

Comments: Sample set to run on 2/17/15.

White: Sample Traveler   Canary: Lab Copy   Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21158	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.20758	m^3/min
Date Sampled:	~~2/23/2015~~ 2/17/15 KM				
			Total Initial Volume:	5.21	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	5.11	m^3
Start	218.09				
End	242.7		Actual Volume:	**5.16**	m^3
Difference	24.61				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	12.1	285.1			
End	13.1	286.1			
Barometric ("Hg):					
Start	23.27			> enter for every s	
End	23.23			>enter for every s	
Magnehelic ("H_2O):					
Start	45				
End	43				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397882				
Calibration Slope (M2) value:	37.90700782				

Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: $\text{Magnehelic ("H}_2\text{O)} \times \frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}} \times \frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}} = \text{y ("H}_2\text{O)}$

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3) Flow Rate (m^3/min) X Delta Time Change (min)

Actual Volume: (m^3) (Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

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ERG Eastern Research Group, Inc.
601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: LRAM
City/State:
AQS Code:
Container #: 272
Collection Date: 2-23-15
Collocated Event (Y/N): SID: 5411600 7
Other: XL: BD1130 1-VB
PE: 5754 2
Cartridge Certification Date:
Relinquished by: BHC Date: 2-14-15

Field Setup

Received by: KBilly Date: 2/18/15
Site Operator: KBilly
System #:
Set-Up Date: 2/22/15
Elapsed Timer Reset (Y/N): Y
Collection Date: 2/23/15

Field Recovery

Recovery Date: 2/24/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	243.00	13.6	790.0	45	
End	253.55	1.2	792.5	50	0.22374
Average		7.4	791.25	47.5	0.21738

Total Collection Time (Minutes): 10.55
Total Collection Volume (std. m^3): 2.29
Status: **Valid** **Void** (Circle one)
Site Operator: KBilly
Relinquished by: KBilly Date: 2/24/15

Lab Recovery

Received by: Date: Container #:
Status: **Valid** **Void** (Circle one) Temperature:
If void, why:

Comments: Sample set up to run on 2/23/15. Notice the sample had a power outage during the sample period on 2/23/15. 'Void' due to not sampling the full 24 hour.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21102	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.22374	m^3/min
Date Sampled:	2/23/2015				
			Total Initial Volume:	2.23	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	2.36	m^3
Start	243				
End	253.55		**Actual Volume:**	**2.29**	m^3
Difference	10.55				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	13.6	286.6			
End	1.2	274.2			
Barometric ("Hg):					
Start	23.23				
End	23.33				
Magnehelic ("H_2O):					
Start	45				
End	50				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397882				
Calibration Slope (M2) value:	37.90700782				

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Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: $\text{Magnehelic ("H}_2\text{O)} \times \frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}} \times \frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}} = \text{y ("H}_2\text{O)}$

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3)

Flow Rate (m^3/min) **X** Delta Time Change (min)

Actual Volume: (m^3)

(Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

P

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CR.VM

City/State:

AQS Code:

Container #: 574

Collection Date: 3-1-15

Collocated Event (Y/N): SID:5A16207

Other: XL:B4122121-XB

PL: 57540

Cartridge Certification Date: FL:9531567

Relinquished by: BHC Date: 3-23-15

Field Setup

Received by: KB;ILM Date: 2/24/15

Site Operator:

Set-Up Date:

Collection Date:

System #:

Elapsed Timer Reset (Y/N):

Field Recovery

Recovery Date:

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start					
End					
Average					

Total Collection Time (Minutes)

Total Collection Volume (std. m^3)

Status: **Valid** **Void** (Circle one)

Site Operator:

Relinquished by: Date:

Lab Recovery

Received by: Date: Container #:

Status: **Valid** **Void** (Circle one) Temperature:

If void, why:

Comments: As the filter was being installed I accidentally tore the filter. Therefore, I am sending it back and was not used.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM1 Container #: 460

City/State: Collection Date: 3-7-15

AQS Code: Collocated Event (Y/N): S10.5411007

Other: XL: B1102901XB

Cartridge Certification Date: FL: 531557 PL: 57540

Relinquished by: BHC Date: 2-24-15

Field Setup

Received by: KBilley Date: 2/27/15

Site Operator: KBilley System #:

Set-Up Date: 2/28/15 Elapsed Timer Reset (Y/N):

Collection Date: 03/01/15

Field Recovery

Recovery Date: 3/4/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	253.80	16.4	589.0	45	0.21292
End	279.39	2.0	595.0	50	0.22386
Average		4.2	592	47.5	0.21839

Total Collection Time (Minutes) 25.59 Total Collection Volume (std. m^3) 5.59

Status: **Valid** **Void** (Circle one) Site Operator: KBilley

Relinquished by: KBilley Date: 3/4/15

Lab Recovery

Received by: Date: Container #:

Status: **Valid** **Void** (Circle one) Temperature:

If void, why:

Comments: Sample setup to run on 3/01/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21292	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.22386	m^3/min
Date Sampled:	3/1/2015				
			Total Initial Volume:	5.45	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	5.73	m^3
Start	253.8				
End	279.39		Actual Volume:	5.59	m^3
Difference	25.59				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	6.4	279.4			
End	2	275			
Barometric ("Hg):					
Start	23.19				
End	23.43				
Magnehelic ("H_2O):					
Start	45				
End	50				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397862				
Calibration Slope (M2) value:	37.90700782				

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Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: Magnehelic ("H_2O) X $\frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}}$ X $\frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}}$ = y ("H_2O)

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3) Flow Rate (m^3/min) X Delta Time Change (min)

Actual Volume: (m^3) (Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNA1 — Container #: 149

City/State: — Collection Date:

AQS Code: — Collocated Event (Y/N):

Other: XL:135.1301-XB

Cartridge Certification Date: FL:7531557 — PL: 55224

Relinquished by: BHC — Date: 3-3-15

Field Setup

Received by: KB,ilw — Date: 3/4/15

Site Operator: KB,ilw — System #:

Set-Up Date: 03/04/15 — Elapsed Timer Reset (Y/N): Y

Collection Date: 03/07/15

Field Recovery

Recovery Date: 3/8/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	279.78	1.5	595.5	45	0.21522
End	303.77	19.2	594.5	45	0.21010
Average		10.35	595	45	0.21266

Total Collection Time (Minutes) 23.99 — Total Collection Volume (std. m^3) 5.10

Status: **Valid** **Void** (Circle one) — Site Operator: KB,ilw

Relinquished by: KB,ilw — Date: 3/8/15

Lab Recovery

Received by: — Date: — Container #:

Status: **Valid** **Void** (Circle one) — Temperature:

If void, why:

Comments: Replacement for broken thimble. Sample was collected for 3/7/15.

White: Sample Traveler — Canary: Lab Copy — Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21522	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.21010	m^3/min
Date Sampled:	3/7/2015				
			Total Initial Volume:	5.16	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	5.04	m^3
Start	279.78				
End	303.77		Actual Volume:	**5.10**	m^3
Difference	23.99				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	1.5	274.5			
End	19.2	292.2			
Barometric ("Hg):					
Start	23.44				> enter for every s
End	23.41				>enter for every si
Magnehelic ("H_2O):					
Start	45				
End	45				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397882				
Calibration Slope (M2) value:	37.90700782				

Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: $\text{Magnehelic ("H}_2\text{O)} \times \frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}} \times \frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}} = \text{y ("H}_2\text{O)}$

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3) Flow Rate (m^3/min) X Delta Time Change (min)

Actual Volume: (m^3) (Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRNM
City/State:
AQS Code:

Container #: 576
Collection Date: 3-13-15
Collocated Event (Y/N): S.D. 5/11/007
Other: xL. BSB1091 XB

Cartridge Certification Date: FL. 193857 PL. 54175
Relinquished by: BHC Date: 3-2-15

Field Setup

Received by: KB. Illy Date: 3/03/15
Site Operator: KB. Illy System #:
Set-Up Date: 03/08/15 Elapsed Timer Reset (Y/N): Y
Collection Date: 3/13/15

Field Recovery

Recovery Date: 3/13/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	30 A:09	16.3	594.0	45	0.21082
End	327.62	17.1	600.0	48	0.21641
Average		16.7	597.0	46.5	0.21372

Total Collection Time (Minutes) 23.53 Total Collection Volume (std. m^3) 5.03
Status: **Valid** **Void** (Circle one) Site Operator: KB. Illy
Relinquished by: KB. Illy Date: 3/14/15

Lab Recovery

Received by: Date: Container #:
Status: **Valid** **Void** (Circle one) Temperature:
If void, why:

Comments: Sample set to run on 3/13/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21082	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.21661	m^3/min
Date Sampled:	3/13/2015				
			Total Initial Volume:	4.96	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	5.10	m^3
Start	304.09				
End	327.62		Actual Volume:	**5.03**	m^3
Difference	23.53				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	16.3	289.3			
End	17.1	290.1			
Barometric ("Hg):					
Start	23.39				> enter for every s
End	23.62				>enter for every s
Magnehelic ("H_2O):					
Start	45				
End	48				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397882				
Calibration Slope (M2) value:	37.90700782				

Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: Magnehelic ("H_2O) **X** $\frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}}$ **X** $\frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}}$ = y ("H_2O)

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3) Flow Rate (m^3/min) **X** Delta Time Change (min)

Actual Volume: (m^3) (Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

SVOC SAMPLE CHAIN OF CUSTODY

Lab Pre-Sampling

Site Code: CRV11 Container #: 231

City/State: Collection Date: 3-19-15

AQS Code: Collocated Event (Y/N): 10.5416007

Other: XL:BSB1291-XB

Cartridge Certification Date: PL:15656L4 PL:5400

Relinquished by: DHC Date: 3-1-15

Field Setup

Received by: KBilly Date: 3/10/15

Site Operator: KBilly System #:

Set-Up Date: 3/15/15 Elapsed Timer Reset (Y/N): Y

Collection Date: 3/19/15

Field Recovery

Recovery Date: 3/23/15

Collection System Information:

	Elapsed Time	Temp (°C)	Barometric ("Hg)	Magnehelic ("H_2O)	Flowrate (std. m^3/min)
Start	328.00	18.6°C	X [illegible] mm Hg	45	0.21497
End	351.31	12.5°C	598 mm Hg	48	0.21765
Average		15.55	599	46.5	0.21631

Total Collection Time (Minutes) 23:31 Total Collection Volume (std. m^3) 5.00

Status: **Valid** **Void** (Circle one) Site Operator: KBilly

Relinquished by: KBilly Date: 3/23/15

Lab Recovery

Received by: Date: Container #:

Status: **Valid** **Void** (Circle one) Temperature:

If void, why:

Comments: Samples set to run on 3/19/15.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

Calculations for SVOC - Flow Rate and Total Volume

Location:	Churchrock, NM		Initial Flow Rate:	0.21097	m^3/min
Field Sample ID:	CRNM		Final Flow Rate:	0.21765	m^3/min
Date Sampled:	3/19/2015				
			Total Initial Volume:	4.92	m^3
Elapsed Time(minutes):	(or enter 0 for start and total for end)		Total Final Volume:	5.07	m^3
Start	328				
End	351.31		Actual Volume:	**5.00**	m^3
Difference	23.31				
Temp (^{0}C):		**Temp (^{0}K):**			
Start	18.6	291.6			
End	12.5	285.5			
Barometric ("Hg):					
Start	23.62				
End	23.54				
Magnehelic ("H_2O):					
Start	45				
End	48				
Temp Std (^{0}K):	298.15				
Barometric Std ("Hg):	29.92				
Sampler Calibration:					
Calibration Date:	12/19/2014				
Calibration Intercept (B2) value:	-1.970397882				
Calibration Slope (M2) value:	37.90700782				

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Calculations:

Flow Rate: (m^3/min)

(1) Square Root of: $\text{Magnehelic ("H}_2\text{O)} \times \frac{\text{Initial Pressure ("Hg)}}{\text{Initial Temp (K)}} \times \frac{\text{Std Temp (K)}}{\text{Std Pressure ("Hg)}} = \text{y ("H}_2\text{O)}$

(2) (y ("H_2O) - Sampler Calibration B2 value ("Hg m^3/min) / Sampler Calibration M2 Value ("Hg)

Total Volume: (m^3)

Flow Rate (m^3/min) **X** Delta Time Change (min)

Actual Volume: (m^3)

(Total Initial Volume (m^3) + Total Final Volume (m^3)) / 2

APPENDIX E

PM_{10} METALS COC FORMS

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBailey Date: 12/10/14

Set-Up Date: 12/24/14 Operator: KBailey

Field Recovery

Recovery Date: 12/29/14 Sample Duration (i.e. 24 hr): 24

Status: (Valid) Void (Circle one)

Relinquished by: KBailey Date: 12/29/14

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
12/25/14	0000	0000	24			
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	22016234		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Samples ran on 12/25/14. Using a new PQ100 unit but which does not have Start/End Flows.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM

Collection Date:

City/State:

Duplicate Event (Y/N):

AQS Code:

Relinquished by:

Date:

Field Setup

Received by: KBilley

Date: 12/10/14

Set-Up Date: 12/29/14

Operator: KBilley

Field Recovery

Recovery Date: 01/02/15

Sample Duration (i.e. 24 hr): 24 hrs.

Status: Valid (circled) Void (Circle one)

Relinquished by: KBilley

Date: 01/02/15

Lab Recovery

Received by:

Date:

Status: Valid Void (Circle one)

If void, why:

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
12/31/14	00:00	00:00	24		24.58	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	2201142755		

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample to run on 12/31/14. Installed Field blank #2201142756. Recovery sensor read: S: 12/31; E: 01/01; Avg BP: 592; Avg T: -10.5°C; Flow: 17.07 aLpm; Flow: 15.08 sLpm; Vol: 24.58 m3; Std Vol: 21.72 m3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: K.B. Illy Date: 12/10/14 KB

Set-Up Date: 01/06 Operator: K.B. Illy

Field Recovery

Recovery Date: 01/08/15 Sample Duration (i.e. 24 hr): 24

Status: (Valid) Void (Circle one)

Relinquished by: KBilley Date: 01/08/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
01/06/15	00:00	00:00	24		24.59	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	2201621757		

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Run Completed. S: 01/06 00:00:00; E: 01/07 00:00:00.
Avg BP: 604 mm; Avg. T: -1.4°C; Flow: 17.07 aLPM; Flow: 14.88 sLPM
Volume: 24.59 m^3; Std. Vol: 21.43 m^3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilley Date: 12/10/14

Set-Up Date: 01/08/15 Operator: KBilley

Field Recovery

Recovery Date: 01/13/15 Sample Duration (i.e. 24 hr): 24

Status: Valid Void (Circle one)

Relinquished by: KBilley Date: 01/13/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
01/12/15	00:00	00:00	24		24.59	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	220163758		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sampled on 01/12/15.
S: 01/12: 00:00 E: 01/13 00:00; Avg. BP = 597 mm;
Avg. T = -1.8°C; Flow = 17.07 alpm; Flow = 14.75 slpm
Volume = 24.59 m^3; Std. Vol. = 21.24 m^3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

Eastern Research Group, Inc.

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilly Date: 12/10/14

Set-Up Date: 01/13/15 Operator: KBilly

Field Recovery

Recovery Date: 01/19/15 Sample Duration (i.e. 24 hr): 24

Status: (Valid) Void (Circle one)

Relinquished by: KBilly Date: 01/19/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
01/18/15	00:00	00:00	24.0		24.59	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	2201162760		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample on 1/18/15. "Run Completed"; S: 01/18 00:00:00; F: 01/19 00:00:00; Avg. BP: 1001 mm; Avg T: -2.0°C; Flow: 17.07 alpm; Flow: 14.86 slpm; Std. Vol: 21.40 m^3; Volume: 24.59 m^3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilly Date: 12/10/14

Set-Up Date: 1/19/15 Operator: KBilly

Field Recovery

Recovery Date: 01/25/15 Sample Duration (i.e. 24 hr): 24 hr

Status: (Valid) Void (Circle one)

Relinquished by: KBilly Date: 01/25/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
1/24/15	00:00	00:00	24:00		24.58	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	2201627-01		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample set to run on 01/24/15. "Run Completed" 5:01/24 00:00; Fin 1/25 00:00; Avg. Br. (Normally Avg 7: 3.00 Flow: 17.07 alpm; 14.88 alpm; Volume: 24.55 m^3; Tot Vol: 24.58

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KB. Illy Date: 12/11/14

Set-Up Date: 01/29/15 Operator: KB. Illy

Field Recovery

Recovery Date: 02/01/15 Sample Duration (i.e. 24 hr): 24 hr

Status: (Valid) Void (Circle one)

Relinquished by: KB. Illy Date: 02/01/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
01/30/15	00:00:01	0:00:01	24		24.59	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	7201627160		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample set to run on 01/30/15. "Run Completed"
S: 01/30/00:00:01; E: 01/31/00:00:01; Avg. BP: 595 mm; Avg. T: -2.5C
Flow: 17.07 aLpm; 14.78 sLpm; Volume: 24.59 m^3; Std Vol.: 21.29

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

Eastern Research Group, Inc.

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KB. Illy Date: 12/10/14

Set-Up Date: 02/01/15 Operator: KB. Illy

Field Recovery

Recovery Date: 02/01/15 Sample Duration (i.e. 24 hr): _____

Status: Valid Void (Circle one)

Relinquished by: KB. Illy Date: 02/01/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
KA Field Blank						
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
				220162763		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Field blank for 2/05/15 sample date.
Filter # 220162763.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KB, ILM Date: 12/10/14

Set-Up Date: 02/01/15 Operator: KB, ILM

Field Recovery

Recovery Date: 02/09/15 Sample Duration (i.e. 24 hr): 24 hr

Status: (Valid) Void (Circle one)

Relinquished by: KB, ILM Date: 02/09/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
02/05/15			24 hr.		24.58	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			KB 17.07	20162714		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample to run on 02/05/15. "Run Completed"
S: 02/05 00:00 E: 02/06 00:00, Avg. BP: 600mm Hg, Avg. T: 0.9°C;
Flow: 17.07 at 0°C, 14.69 psi; Std Vol.: 21.15 m^3; Vol.: 24.58 m^3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilly Date: 2/10/14

Set-Up Date: 02/09/15 Operator: KBilly

Field Recovery

Recovery Date: 2/16/15 Sample Duration (i.e. 24 hr): 24

Status: Valid Void (Circle one)

Relinquished by: KBilly Date: 2/16/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
2/11/15	00:00	00:00	24:00		24.58	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	22016276		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample set up to run on 2/11/15. "Run Completed" St: 2/11 00:00, E: 2/12 00:00, Avg. BP: 594 mm, Avg. T.: -2.2 C, Flow: 14.50 clpm, 17.07 alpm, Volume: 24.58 m^3, St.L.V.L.: 21.32 m^3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilly Date: 12/10/14

Set-Up Date: 02/16/15 Operator: KBilly

Field Recovery

Recovery Date: 2/22/15 Sample Duration (i.e. 24 hr): 24 hr

Status: (Valid) Void (Circle one)

Relinquished by: KBilly Date: 2/22/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
2/17/15	00:00	00:00	24:00		24.59	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	22016276		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample set to run on 2/17/15. "Run Completed" S: 02/17/15 00:00, E: 02/18/15 00:00, Avg BP: 597 mm, Avg T: -3.6°C, I Lo: 17.07 alpm, 19.54 slpm, Std Vol: 21.37 m^3, Vol: 24.59 m^3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

Eastern Research Group, Inc.

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KB, ILW Date: 12/10/14

Set-Up Date: 02/22/15 Operator: KB, ILW

Field Recovery

Recovery Date: 02/24/15 Sample Duration (i.e. 24 hr): 24 hr.

Status: (Valid) Void (Circle one)

Relinquished by: KB, ILW Date: 2/24/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
2/23/15	00:00	00:00	24		24.58	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	22C162767		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Simple setup & run on 2/23/15. Run completed 2/23 00:00 to 2/24 00:00, Avg BP: 594 mm, Avg T: -2.7C, Flow: 14.70 Lpm; 17.07 Lpm; Std Vol: 21.16 m3, Vol: 24.58 m3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG (Eastern Research Group, Inc.)
601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilby Date: 12/10/14

Set-Up Date: 2/28/15 Operator: KBilby

Field Recovery

Recovery Date: 3/4/15 Sample Duration (i.e. 24 hr): 24

Status: Valid Void (Circle one)

Relinquished by: KBilby Date: 3/4/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
03/01/15	00:00	00:00	24. hr.		24.59	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.08	2201627[illegible]		

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample set to run for 03/01/15. "Run Completed" Si: 03/01 00:00, E: 03/02 00:00; Avg. BP: 595 mm; Av. T.: 2.1°C, Flow: 17.08 alpm, 14.47 slpm; Volume: 24.59; Std. Vol = 20.84 m^3

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilby Date: 12/10/14

Set-Up Date: 03/04/15 Operator: KBilby

Field Recovery

Recovery Date: 3/8/15 Sample Duration (i.e. 24 hr): 24hr

Status: Valid Void (Circle one)

Relinquished by: KBilby Date: 3/8/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
3/7/15	0000	2400	24.0		24.58	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	22016279		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Set to sample on 3/7/15. Run completed 3/8/15 00:00 to 24:00; Avg. BP: 598 mm; Avg. T. 1.8°C; Flow: 17.07 alpm, 14.59 slpm; Std Vol.: 21.cm³, 24.58 m³ (Volume).

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

Eastern Research Group, Inc.

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

ERG Lab ID #

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBilley Date: 3/4/15

Set-Up Date: 3/8/15 Operator: KBilley

Field Recovery

Recovery Date: 3/15/15 Sample Duration (i.e. 24 hr): 24

Status: (Valid) Void (Circle one)

Relinquished by: KBilley Date: 3/15/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
3/13/15	00:00	00:00	24.59			
	~~Start MFC~~	~~End MFC~~	Avg Flow (L/min)	Filter #		
			17.07	2201627821		
Sample Date	**Start Time**	**End Time**	**Total Time**	**System #**	**Total Vol (m^3)**	**Lab ID**
	Start MFC	**End MFC**	**Avg Flow (L/min)**	**Filter #**		
Sample Date	**Start Time**	**End Time**	**Total Time**	**System #**	**Total Vol (m^3)**	**Lab ID**
	Start MFC	**End MFC**	**Avg Flow (L/min)**	**Filter #**		

Comments: See 1st Sample on 3/13/15. "Run Completed": S: 03/13 00:00:00, E: 03/14 00:00:00, Avg. BP: 599 mm Hg, Avg. T: 4.0°C; Flow: 14.49 aLpm, 17.07 aLpm; Vol.: 24.59 m^3; Std. Vol: 20.87

*I did not have any more carbon copy forms so I'm attaching two (2) copies to this form.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

ERG

ERG Lab ID #

601 Keystone Park Drive, Suite 700, Morrisville, NC 27560

PM_{10} / TSP METALS CHAIN OF CUSTODY

Lab Pre-Samp.

Site Code: CRNM Collection Date: _____

City/State: _____ Duplicate Event (Y/N): _____

AQS Code: _____

Relinquished by: _____ Date: _____

Field Setup

Received by: KBailey Date: 3/4/15

Set-Up Date: 3/15/15 Operator: KBailey

Field Recovery

Recovery Date: 3/23/15 Sample Duration (i.e. 24 hr): 24

Status: (Valid) Void (Circle one)

Relinquished by: KBailey Date: 3/23/15

Lab Recovery

Received by: _____ Date: _____

Status: Valid Void (Circle one)

If void, why: _____

PM_{10} / TSP METALS

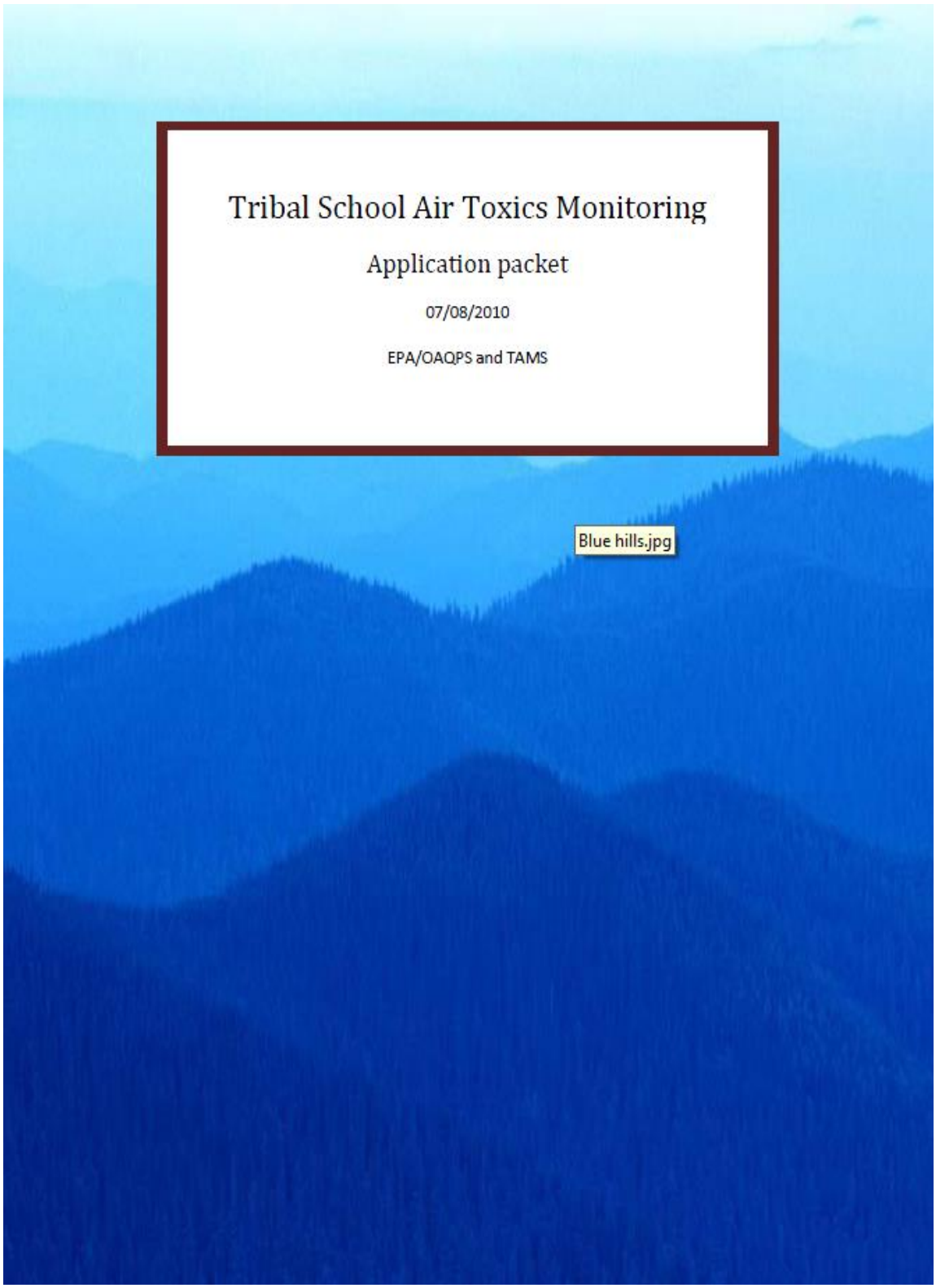
Sample Date	Start Time	End Time	Total Time	System #	Total Vol (m^3)	Lab ID
3/19/15	0:0:00		24		24.59	
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
			17.07	22162780		
Sample Date	**Start Time**	**End Time**	**Total Time**	**System #**	**Total Vol (m^3)**	**Lab ID**
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		
Sample Date	**Start Time**	**End Time**	**Total Time**	**System #**	**Total Vol (m^3)**	**Lab ID**
	Start MFC	End MFC	Avg Flow (L/min)	Filter #		

Comments: Sample set to run on 3/19/15; "Run Completed S: 03/19 00:00, E: 03/20 0:0:00; Avg. BP: 595 mm, Avg. T: 4.2 °C, Flow: 14.27 SLpm, 17.07 aLpm Std. Vol.: 20.69 m^3, Vol: 24.59 m^3.

White: Sample Traveler Canary: Lab Copy Pink: Field Copy

APPENDIX F

APPLICATION SUBMITTED TO TAMS


Tribal School Air Toxics Monitoring
Application packet
07/08/2010
EPA/OAQPS and TAMS
Blue hills.jpg

(I.) Background: Tribal School Air Toxics Monitoring Project Proposal

U.S. Environmental Protection Agency (EPA) has recommended air quality monitoring at 63 schools around the country as part of a new initiative to ensure children are breathing healthy outdoor air. EPA identified schools for monitoring based on information that raised some questions about air quality that merit investigation. That information included the best data available to EPA scientists about air pollution in the vicinity of schools, results of a computer modeling analysis, results from a recent newspaper analysis, and information from state and local air agencies. Unfortunately, because of limited information on tribal schools[1] and limited emissions information, most tribal schools could not be considered in time for EPA's analysis of the schools initially chosen to conduct monitoring. The term "tribal school" refers to any school located within a reservation boundary or any school operated by a tribe, BIA or tribal agency (regardless of location). EPA is still concerned that lack of information/data does not necessarily mean there is not a problem in Indian country and wants to ensure that we are investing in potential air toxics impacts around tribal schools as well. In order to accomplish this parallel effort to the national study, EPA, working with the Regional Offices, identified two tribal schools with appropriate conditions to initiate this monitoring effort.

Complete Article: http://www.usatoday.com/news/nation/environment/school-air-monitoring1.htm

Proposed Approach for the Tribal School Monitoring Analysis

Monitoring at first two schools: As in the national analysis, EPA will provide monitors and analysis following the requirements of the national monitoring plan and QAPP for these two schools. The tribes have the capacity and agreed to conduct the monitoring.

After the 60 – 90 day monitoring study is completed monitors will be transferred to the Tribal Air Monitoring Support (TAMS) Center for further deployment. Once the EPA monitoring program is over, the monitors will be provided to the TAMS Center to support activities in Indian country as appropriate.

A tribal working group of environmental professionals and representatives of the TAMS Steering Committee will determine the protocol for further deployment of monitors. Some criteria discussed on the first call included:

- Some demonstrated source of air toxics concern including point source(s), mobile sources, non-traditional sources like open burning, and garbage burning.
- Tribe's willingness to provide location information of the tribal school and submission of monitoring data through the AQS process.
- School is on/off the reservation or has a presence/location of schools on/off the reservation.
- Tribe has the capacity to run the monitors for the 60- 90 day period or availability of TAMS staff support for that or funding available for contractor support.
- Presence/location of daycare sites on/off the reservation.

EPA will work with the RTOCs and NTOC to reach out to the tribes to determine interest in participating in the school monitoring effort. We will also work with BIA or NCAI to reach tribes that don't have strong

environmental programs and don't participate in TOCs. Interest will be evaluated against criteria developed by the workgroup with the decision made by the TAMS steering committee.

Monitors will be rotated to new locations as available. Decisions on the length of time for the monitoring will be determined by the TAMS steering committee.

If any problems are found, the appropriate EPA Regional Offices, OECA, OAQPS, and other offices, in consultation with the tribe, will determine the appropriate actions. In some cases, there may be targeted enforcement, in others permit or regulatory action may be needed, and in other cases community initiatives may be necessary.

- Data will be captured on the tribal air site and linked to the national school program site (www.epa.gov/schoolair). The workgroup requested that the schools be identified on the national School Air toxic map and the tribal boundaries also be identified.

(II.) Planning and Operations Procedures: Tribal School Air Toxics Monitoring Study

- Monitors have been transferred to the TAMS Center, from EPA for deployment to **Tribal** applicants across the country. An application packet, criteria and process has been developed for those interested in monitoring.
- **Tribes** will be selected for monitoring as monitors are available and applications are processed. Schedule for monitoring and selection to be determined and approved by the TAMS Steering Committee and technical staff.
- Monitoring and analysis will follow the requirements of the national School Toxics Air Monitoring Initiative Quality Assurance Project Plan, Standard Operating Procedures, and/or approved plans for each of the selected schools.
- **Tribal** capacity will be assessed for running monitors; if technical assistance or training is needed/requested every attempt will be made to hold training for the Tribes interested in the program.
- The **Tribe** must agree to monitor and report data to the Tribal air toxic database.

LOGISTICS: After completion of a monitoring cycle the monitors are to be transferred to a location determined by the Tribal Air Monitoring Support (TAMS) Center Steering Committee. The monitors will remain assigned to the TAMS Center to support further monitoring activities in Indian country, as appropriate.

PROCEDURES AND PROCESSES: Monitors will be rotated to new school locations through an application process. Decisions on the schools, school priority and length of time for the monitoring will be determined by criteria developed and a process agreed upon by the Tribal planning team and the TAMS Steering Committee. The TAMS Steering Committee will update guidance as necessary and appropriate to improve the decision process.

- Application will be submitted to TAMS Center Co-Directors. (see below)

EPA TAMS Co-Director	ITEP TAMS Co-Director	TAMS Technical Assistance
Farshid Farsi	Christopher Lee	Henry Gerard
702/784-8263	702/784-8278	702/784-8268

Farsi.Farshid@epa.gov	Christopher.Lee@nau.edu	gerard.henry@epa.gov
4220 S. Maryland Pkwy, Bldg C Las Vegas, Nevada 89119		

- Applications and will be prioritized and assessed by voting members of the TAMS Steering Committee.
- When applying for monitoring the Tribes should identify when they will be ready for deployment of monitoring, if approved monitors need to be deployed as soon as possible and should not sit idle.
- A calendar of rotation, training, etc. will be maintained by the TAMS Center. Alternates will be identified in case a tribe is unable take their assigned rotation.

OUTREACH:

EPA and TAMS Center will work with the regional and national tribal organization to outreach to all tribes, even those without air programs, to promote interest in participating in the school monitoring project. Interested parties will be given application information and resources to learn more about the Tribal School Air Toxics Project. Outreach efforts will be in the form of:

- Newsletters, Fact Sheets, pamphlets
- Poster Sessions at National Tribal Meetings
- Canned presentations to share with those who are going to be presenting
- Presentations on conference calls or regional meetings
- Interagency presentations of the project to reach other Tribes who do not have air programs
- Resource feedback and sharing of experienced tribal monitoring
- Training of prospective tribal programs or select points of contact for monitoring project

ANALYSIS and Next steps:

If any problems are identified through monitoring, the appropriate EPA Regional Offices, OECA, OAQPS, and other offices, in consultation with the tribe, will determine the appropriate actions. In some cases, there may be targeted enforcement, permit, and regulatory actions, or community initiatives may be necessary.

DATA TRACKING:

Data will be captured on the tribal air website and linked to the national school air toxic program site. All data will need to be submitted to AQS, if technical assistance is needed to complete this please make sure the application reflects this need. National map will be updated with completed schools.

Note: Selected applicants will be required to sign and submit TAMS monitor agreement.

(III.) Application for Tribal School Air Toxics Monitoring

Date: September 15, 2014

Name of Tribe Navajo Nation – Church Rock Community Chapter

Address P.O. Box 549, Church Rock, New Mexico, 87311

Background of **Tribe** and proposed schools or educational program

The Navajo Nation is a federally recognized Indian Tribe with inherent powers of sovereignty and authority to manage and control the use of Navajo lands and resources. The Navajo Nation covering in land mass about 27,425 miles with the states of Arizona, Utah, and New Mexico. Surrounding the Navajo Nation are the Southern Ute of Colorado, and Ute Mountain Ute Tribe. Also the Hopi Indian Reservation is located surrounded by the Navajo Nation in Arizona. Additional to the Navajo Nation there are three large non-contiguous sections located in New Mexico: Ramah Navajo Indian Reservation, Alamo Navajo Indian Reservation and Tohajiilee Indian Reservation.

Church Rock Elementary School is one (1) of nineteen (19) schools within Gallup McKinley County School, Gallup, New Mexico, and considered a "public" school. Church Rock Elementary School has teaching grade levels from pre-kindergarten to 5th grade, and serves about 95% to American Indian students. The school is located about 4 miles east of Gallup, New Mexico. The population for Church Rock community is about 1,077 and located within the Eastern Navajo Nation Agency. Church Rock Navajo name is Kinlitsosinil, and is named for the natural landmark with the same name.

To the east direction from Church Rock community are the beautiful scenery of Mount Taylor, and toward the south direction lay the Zuni Mountains. Within the community of Church Rock it is distinguished with Red Rock structures on the north side of the Church Rock Elementary School. The Puerco River is located west from Church Rock community.

The major emissions are from surrounding facilities located west from Church Rock Elementary School, for example: oil & gas refinery, rock & gravel company, casino with generators, and furniture making facility. Also the transportation emission are currently highly accessible with Interstate Highway 40 (I-40) and BNSF Railroad Company both located within 2 miles south from Church Rock Elementary School. Development of mineral and fossil fuel resources and industrial and population growth within the region may contribute to the degradation of the air quality. In 1979, United Nuclear Corporation Church Rock uranium mill breached and spill 1,100 tons of milled uranium ore and about 94 million US gallons of heavy metal into the Puerco River. In 2005, the Navajo Nation prohibit any further uranium mining. In 2008, the US EPA and Navajo EPA have started a five-year plan to identify contaminated areas caused by uranium mining. The area of uranium mining that once existed is located about 5-6 miles north from Church Rock Elementary School. The National Park Service and other agencies and organizations are conducting air-monitoring programs around the borders of the Navajo Nation to ensure the health and well-being of the Navajo people are being protected.

Identified School Name	Church Rock Elementary School
Address of School(s)	P.O. Box 40, Churchrock, New Mexico, 87311
Lat and Long for school site	Latitude: 35.538747; Longitude: -108.596741
Grades and ages of children attending application school site	Grade: Pre-K – 5th grade level; Ages: 4-10 years old.
Is the school in the presence of /or on the reservation?	YES or NO

If not on reservation, describe native population? (Estimated ratio stats from the school, etc.)

Please describe the suspected sources of Air Toxics possibly impacting the identified school and type of monitoring to be requested? (Ex. Open burning, garbage burning, mobile sources, etc.) *See attached inventory.*

The possible sources of air toxics impacting the Church Rock Elementary School are open burning, trash burning, and mobile source emissions. Also other surround air toxics are being emitted by nearby oil & gas refinery, casino generators, rock & sand gravel facilities, Interstate Highway 40, and Highway 566. Church Rock Chapter request the following type of monitoring to be conducted: VOCs, PM10 HAP Metals, carbonyls, PAHs

Identify who the possible affected population would be and how they may be impacted? (Elementary age, infants, etc.)

The possible affected population would be the children, infants and elder within the Church Rock Elementary School and surround Church Rock Community Chapter area. The possible affected population area impacted due to the sensitivity of their health and development growth stage.

For this application, approval should be obtained to submit monitoring data to Air Quality Systems database and/or an OAQPS national tribal database?

Yes, Church Rock Community Chapter's approval to obtain data to submit monitoring data to Air Quality System (AQS) database and /or an OAQPS national tribal database.

If the tribe agrees to submit data, please explain the tribe's technical capacity available to submit data, or explain the need for technical assistance?

Ms. Karmen Billey, Arizona State University (ASU) Graduate Student has had previous work experience to submit data into the database. Has experience in setting up carbonyl and VOCs samplers in the past, as well as, meteorological monitoring setup. She might need additional training in regards to other listed sampler before project sample begins. Overall, she has received various training in courses offered by Tribal Air Monitoring Support (TAMS) Center, Las Vegas, NV and Inter Tribal Environmental Professional (ITEP), Flagstaff, AZ.

Explain your **Tribe's** technical capacity to operate the monitors or will technical assistance and/or what training will be required?

Ms. Billey has had technical capacity in operating the monitors for carbonyl and VOC sampler setup and sampler collection, but might need some training on the other listed samplers. Overall, she has operated many monitoring setup in previous employment in regards to FRM (PM2.5), TEOM (PM10/PM 2.5), Teledyne Gaseous Analyzer's (Ozone, NOx, SO_2). Also she has received training in maintaining instruments monitoring setup, calibrations, audit and able to follow SOPs and QAPP documentation given.

Is a designated person available at the Tribe to take training or be the point of contact for this project, if so please identify?

Ms. Karmen Billey, Arizona State University Graduate Student, will be the point of contact for this project.

Attach Photos of the 4 cardinal directions of the school or monitoring location.

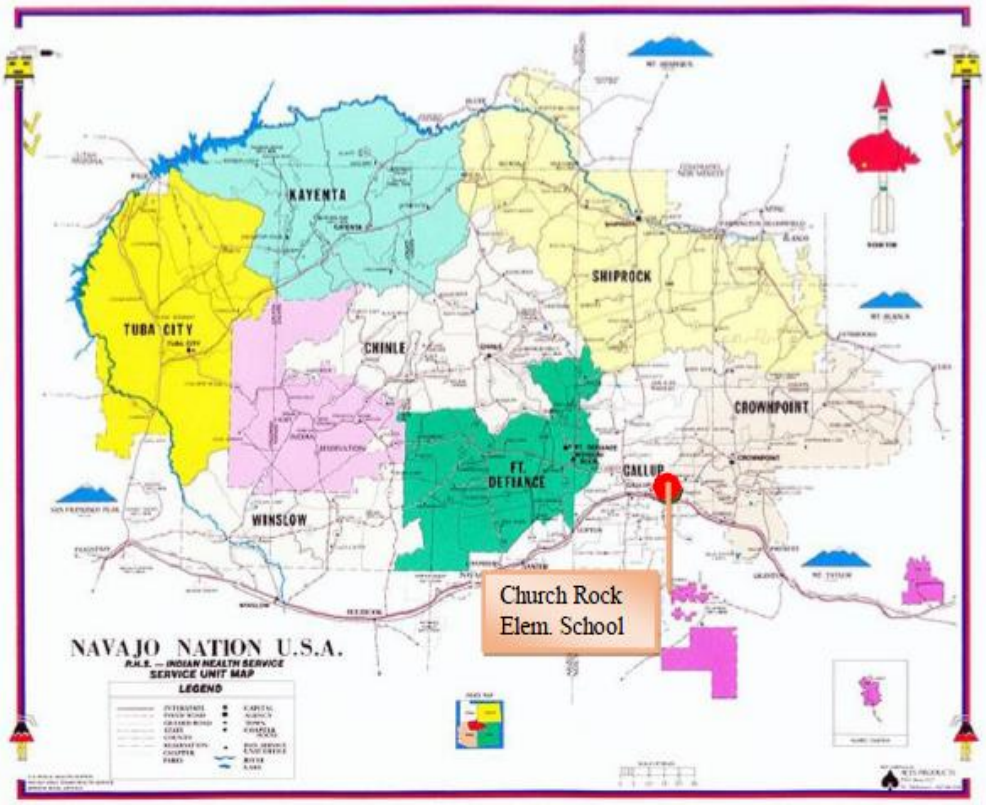


Photo taken of the front of Church Rock Elementary School.

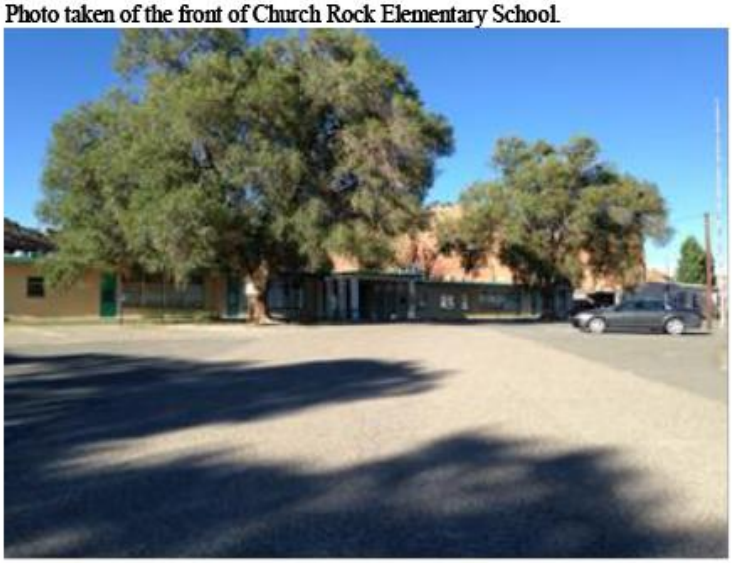


Photo taken from school in the south direction.

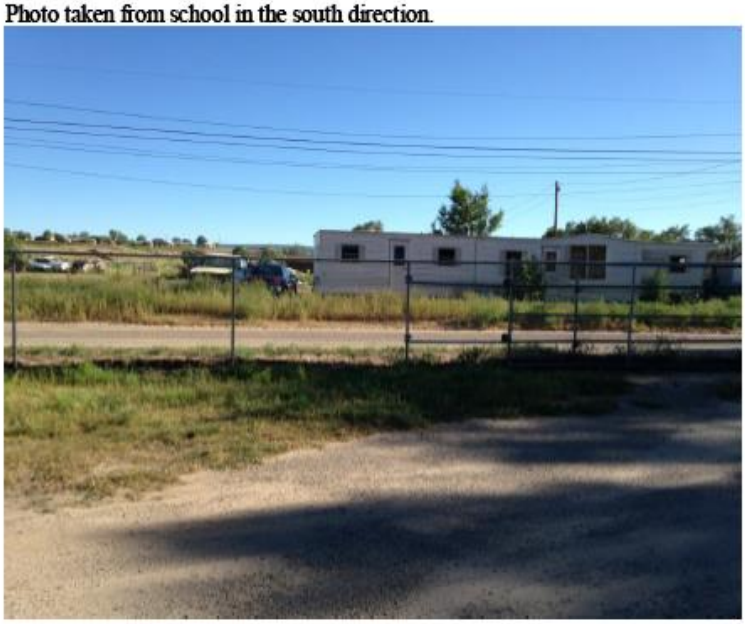


Photo taken from school in the west direction.

Photo taken from school in the north direction.

Photo taken from school in the east direction.

Nearby Facilities:

Photo of El Paseo Natural Gas Co. Refinery located 4 miles west from school.

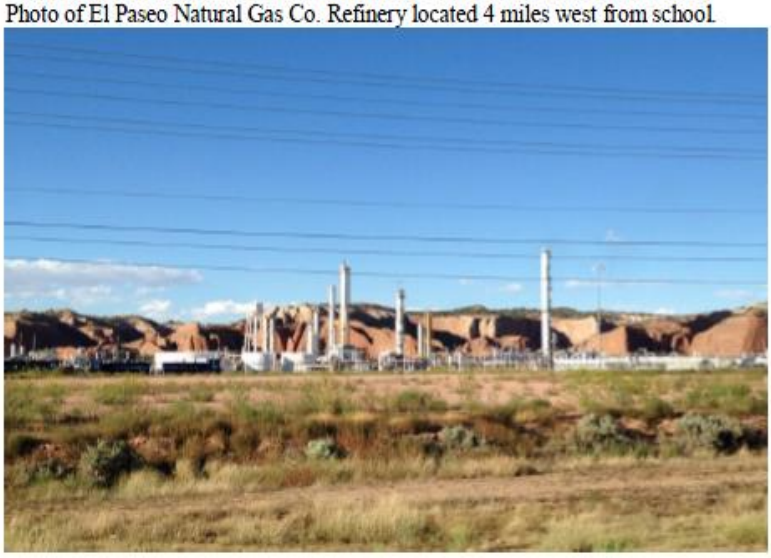


Photo of Sand, Rock & Gravel Facility located next to refinery and west from school.

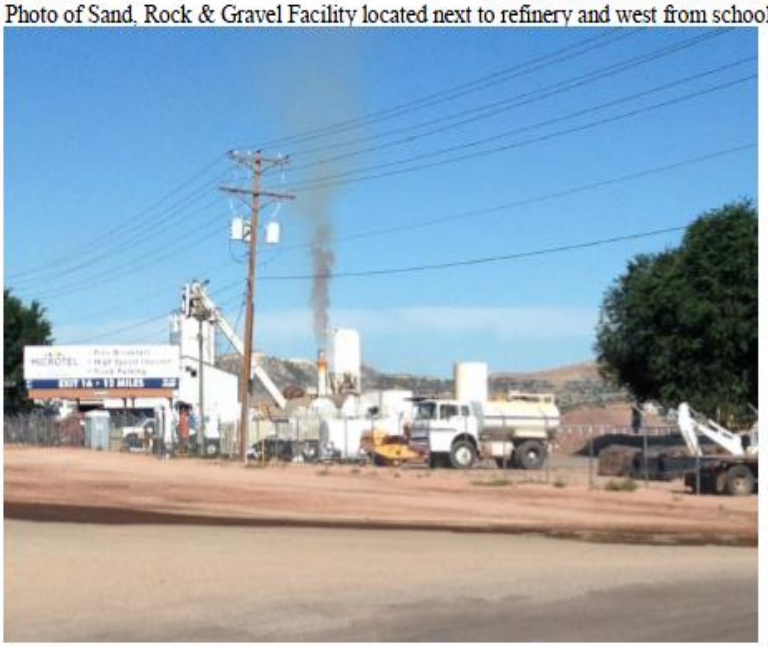


Photo of Navajo Firerock Casino with two shown generators located on the south side of casino.

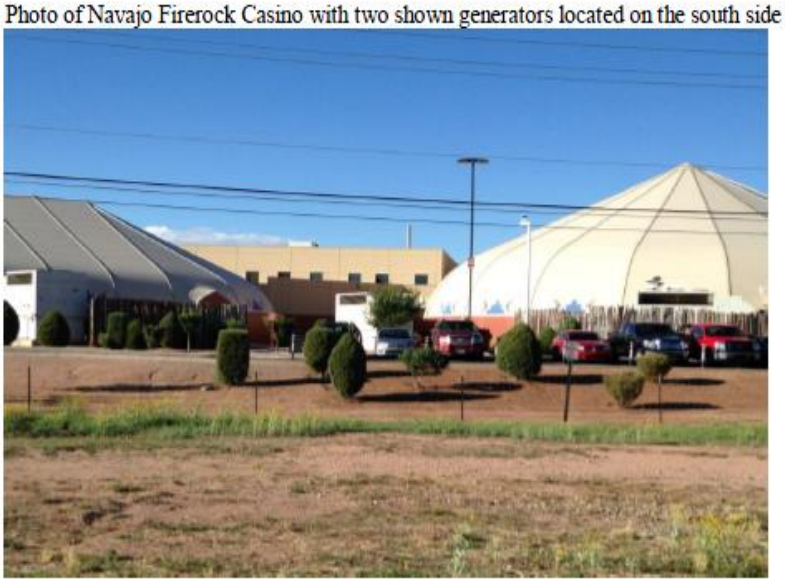


Photo of Cabinet Southwest facility located west of school.

When is the projected time for deployment of the monitors? (i.e. immediately, 3 months)

October 13, 2014 to December 19, 2014 (70 days)

APPENDIX G

APPROVAL DOCUMENTATION FROM CHAPTER AND SCHOOLBOARD

CHURCHROCK CHAPTER

P.O. Box 549
Churchrock, New Mexico 87311
Phone: (505) 905-5949 * Fax: (505) 905-6561
Website: http://churchrock.navajochapters.org
E-mail: Churchrock@navajochapters.org

Johnnie Henry Jr., PRESIDENT
Sherman Woody, VICE-PRESIDENT
Louise Jim, SECRETARY/TREASURER

Edmund Yazzie, COUNCIL DELEGATE
Emery Chee, LAND BOARD MEMBER
Vacant, COMMUITY SERVICES COORDINATOR

066-15-02

RESOLUTION OF THE CHURCHROCK CHAPTER

RECOMMENDING AND SUPPORTING MS. KARMEN BILLEY IN CONDUCTING A TRIBAL SCHOOL AIR TOXICS MONITORING AT THE CHURCHROCK ELEMENTARY SCHOOL ON BEHALF OF ENVIRONMENTAL PROTECTION AGENCY

WHEREAS:

1. Pursuant to Sections 1.B and 2.22 of the Navajo Nation Local Governance Act, the Churchrock Chapter is established to make decisions about local government matters, to conduct local government operations and to provide for the general health, safety and welfare of its membership; and

2. U.S. Environmental Protection Agency (EPA) has recommended air quality monitoring at 63 schools around the country as part of a new initiative to ensure children are breathing healthy outdoor air. EPA identified schools for monitoring based on information that raised some questions about air pollution in the vicinity of schools, results of a computer modeling analysis, results from a recent newspaper analysis, and information from state and local air agencies. Unfortunately, because of limited information on tribal schools and limited emissions information, most tribal schools could not be considered in time for EPA's analysis of the schools initially chosen to conduct monitoring. The term "tribal school" refers to any school located within a reservation boundary or any school operated by a tribe, BIA or tribal agency (regardless of location); and

3. EPA will provide monitors and analysis following the requirements of the national monitoring plan and QAPP for these two schools. The tribes have the capacity and agreed to conduct the monitoring. Two schools have been selected by committee and will be conducted by ASU graduate candidate student Ms. Karmen Billey; and

4. Some criteria discussed on the first call are: demonstrated source of air toxics concern including point source(s), mobile sources, non-traditional sources like open burning, and garbage burning; and

5. Churchrock Chapter is in full support of this project, this will provide much needed data compiling for our air we breathe for our children and elders. The air within the community continues to change daily and cause health issues to residents in Sundance and Churchrock; and

6. Ms. Karmen Billey, Arizona State University Graduate Student approach the Churchrock Chapter and requested the Air Monitoring project. Ms. Billey also received full support of the Gallup-McKinley County School Board during its October 6, 2014 meeting; and

7. It is therefore recommended by the Churchrock Chapter to fully support Ms. Billey in pursuing her objectives to monitor the air within the Churchrock community and the Churchrock Elementary School.

NOW THEREFORE IT BE RESOLVED THAT:

1. The Churchrock Chapter recommends and supports Ms. Karmen Billey in conducting a tribal school air toxic monitoring at the Churchrock Elementary School on behalf of the United States Environmental Protection Agency.

2. Attached to this resolution as "Attachment A" is the Tribal School Air Toxics Monitoring Application packet" submitted by Ms. Karmen Billey.

CERTIFICATION

We, the undersigned, hereby certify that the forging resolution was presented to the Churchrock Chapter, at a duly called regular chapter meeting at which a quorum was present, and it was approved by a vote of 41 in favor, 0 opposed, with 9 abstaining at Churchrock (Navajo Nation), New Mexico on the 13th day of October 2014.

Main Motion: Jess Cohn

Seconded by: Betty Charlie

Johnnie Henry Jr., President

Sherman Woody, Vice-President

Louise Jim, Secretary/Treasurer

Chapter Administrative Staff

Notice of Regular Meeting
October 6, 2014
The Board of Education
Gallup McKinley County Schools

A Regular meeting of the Board of Education of Gallup McKinley County Schools will be held October 6, 2014, beginning at 6:00 PM in the Board Room of the Student Support Center, 640 Boardman, Gallup, NM 87301.

The subjects to be discussed or considered or upon which any formal action may be taken are as listed below. Items do not have to be taken in the order shown on this meeting notice.

Unless removed from the consent agenda, items identified within the consent agenda will be acted on at one time.

1. Call to Order - Pledge of Allegiance/NM Pledge - Roll Call
   - A. Public Comment
2. Approval of Agenda
3. Approval of Minutes
4. Approval of Consent Agenda Items (*6b, *6c, *6d, *6e, *8b, *8c, *8f, *8g, *8h, *8i, *8j, *8k)
5. Study Circle
   - A. Reports
     - 1. Superintendent's Report
       - a. Recognition (Student, Staff and Other)
         - 1. JOM Program
       - b. Dolly Manson Grant
       - c. Gallup Reads
       - d. Del Norte Elementary School Design and Progress Report
       - e. State and Tribal Education Partnership (STEM) Travel Report
     - 2. Board Report (Meetings, Conventions, Conferences, Training Sessions)
     - 3. School Site Reports
       - a. Twin Lakes Elem.
     - 4. Indian Education Committee / JOM Report
     - 5. Notices and Communication
       - a. Announcements / Reminders
         - 1. October 9-10, 2014 ~ Fall Break - No School
         - 2. October 13, 2014 ~ Professional Development Day (No School)
         - 3. October 20, 2014 ~ BOE Meeting - Gallup Mid, 4PM
         - 4. October 21, 2014 ~ Report Cards
         - 5. November 3, 2014 ~ BOE Meeting
         - 6. November 11, 2014 ~ Veterans Day (No School)
         - 7. November 17, 2014 ~ BOE Meeting
         - 8. November 24-28, 2014 ~ Thanksgiving Break
6. Financial Section - CONSENT
   - A. 2014-2015 Budget Decrease
   - B. 2014-2015 Budget Increase
   - C. 2014-2015 Budget Adjustment Requests (Intra-Transfers)
   - D. 2014-2015 Budget Adjustment Requests (Inter-Transfers)
   - E. Current Bills-Operational, Federal Projects, Food Services, Other - CONSENT
7. Old Business - None
8. New Business
   - A. Report on, consideration of, and action on bids, proposals and use of existing contracts: CONSENT - None
   - B. Approval of Student Activity Travel: CONSENT
     - 1. Gallup High JR ROTC, 20 students, 2 chaperons, Phoenix, AZ, October 24-25, 2014 for Orienteering Championship. (Activity Fund) Trip 9738
   - C. Approval of Out-of-State Travel: CONSENT Board Policy D-3150 (10.8.1-10.8.8) - Travel Approved by Superintendent

1. Jarrid Thelen, St. Bonaventure, Dallas, TX, October 22-26, 2014 to attend National Standards Benchmark. (Title II-A)
2. Shannon Balok-Red Rock Elem, Kathy Bostic-Indian Hills Elem, Nashville, TN, October 25-29, 2014 to attend National Association for Music Educators. (Operational)
3. Betsy Soltero, Thoreau Elem, Nashville, TN, October 25-29, to attend National Association for Music Educator Conference. (Operational)
4. Tine Hayes, John Ohle, Miyamura, San Diego, CA, December 11-14, 2014 to attend Screen Printing Class.(Perkins)
5. Jenilee Charley, Belinda Cross, EDC, Sedona, AZ, November 12-15, 2014 to attend AZ AER Fall Conference. (Entitlement IDEA B)
6. Kate Poortenga, Karyn Weglarz, Rehoboth, Phoenix, AZ, October 8-10, 2014 to attend Reading and Writing Conference (Title II-A)

D. Approval of Superintendent Travel: CONSENT - None
E. Approval of Board of Education Travel- CONSENT - None
F. Approval of Charitable Contribution to Thoreau High School from Western Refinery - CONSENT
G. Approval of a Donation from Donor.org for Stagecoach Elementary School - CONSENT
H. Approval of the request for a Swimming Equipment Donation / Grant from Nike for Gallup High School - CONSENT
I. Approval of $1000 Donation from Richard Lambert, Church Group for Tse Yi Gai High School - CONSENT
J. Approval of the Transfer Ownership of Portable Classroom Buildings as Listed - (2) Portables to the Mariano Lake Chapter - CONSENT
K. Approval to Designate Jefferson Elementary as the "Magnet School" for the Blind & Visually Impaired and Indian Hills as the Magnet for the Deaf & Hearing Impaired - CONSENT
L. Approval of Dissertation Request "Tribal School Air Toxics Monitoring" by Karmen Billey - ACTION
M. Approval for the Use of Crownpoint and TseYiGai High Schools Gyms for Community Mass Vaccinations by Crownpoint Health Care Facility - ACTION
N. First Reading - Travel Policy and Approval/Reimbursement Procedures

9. Requested Topics by the Board for Future Meetings
10. EXECUTIVE SESSION-The Board will meet in executive session on pursuant to NMSA 1978 § 10-15-1 (H)(2) in regards to Personnel Actions Taken. .
11. Adjourn

APPENDIX H

TARGET ANALYTES AND REQUIRED METHOD DETECTION LIMITS

Appendix B. Target Analytes and Required Method Detection Limits *(4/10/09)*

The MDLs provided in the far right column below are those that can be achieved by the EPA's air toxics contract laboratory and are thus considered to be the requisite / minimally acceptable MDLs for the School Air Toxics monitoring initiative. These concentration values were compared with those labeled as "Lower Bound of Concentration Range of Potential Risk-Related Interest" so as to evaluate sufficiency for health-based decision making. With the exception of eight chemicals, the laboratory reported MDLs fall below the lower bound of the concentration range that might be of potential risk-related interest when measuring ambient concentrations. In all cases (including those eight chemicals for which the laboratory MDLs are higher than the lower bound concentrations), the MDL presented is considered sufficient for this initiative. The target analytes listed below include 1) any chemical identified as risk drivers on the 3/31/09 schools-for-monitoring list, and 2) any other chemicals captured and reported out by the analytical methods used in this project.

HAP Compound		Lower Bound of Concentration Range of Potential Risk-related Interest[1]	REQUIRED METHOD DETECTION LIMIT (MDL)[2]
CHEMICAL NAME	**CAS NO.**	**ug/m3**	**ug/m3**
Acetaldehyde	75-07-0	4.5E-01	9.0E-03
Acetonitrile	75-05-8	6.0E+00	9.7E-02
Acetone	67-64-1	No Value	1.0E-02
Acetylene	74-86-2	No Value	1.3E-02
Acrolein	107-02-8	2.0E-03	3.5E-02 [3]
Acrylonitrile	107-13-1	1.5E-02	3.1E-02 [3]
Antimony compounds	7440-36-0	0.02 [5]	6.7E-06 [4]
Arsenic compounds	7440-38-2	2.3E-04	9.2E-06 [4]
Benzene	71-43-2	1.3E-01	2.0E-02
Benzyl chloride	100-44-7	2.0E-02	8.0E-03
Benzaldehyde	100-52-7	No Value	1.0E-03
Beryllium compounds	7440-41-7	4.2E-04	1.8E-06 [4]
Bromochloromethane	74-97-5	No Value	2.4E-02
Bromodichloromethane	75-27-4	No Value	1.6E-02
Bromoform	75-25-2	9.1E-01	2.0E-02
1,3-Butadiene	106-99-0	3.3E-02	6.0E-03
Butyr/Isobutyraldehyde	123-72-8	No Value	6.0E-02
Cadmium compounds	7440-43-9	5.6E-04	2.9E-05 [4]
Carbon disulfide	75-15-0	7.0E+01	7.0E-03
Carbon tetrachloride	56-23-5	6.7E-02	1.2E-02
Chlorobenzene	108-90-7	1.0E+02	1.1E-02
Chloroform	67-66-3	9.8E+00	1.2E-02
Chloroprene	126-99-8	7.0E-01	1.1E-02
Chromium Compounds (all species)	7440-47-3	No Value	3.4E-04 [4]
Chromium (VI) compounds	18540-29-9	8.3E-05	4.3E-06
cis -1,2-Dichloroethylene	156-59-2	No Value	6.9E-02
trans- 1,2 -Dichloroethylene	75-69-4	No Value	1.0E-02
Cobalt compounds	7440-48-4	1.0E-02	5.5E-06 [4]
Crotonaldehyde	123-73-9	No Value	5.0E-03
p-Dichlorobenzene	106-46-7	9.1E-02	2.3E-02
1,3-Dichloropropene	542-75-6	2.5E-01	0.011 (cis), 0.014 (trans)
Dibromochloromethane	124-48-1	No Value	1.1E-02
Dichlorodifluoromethane	75-71-8	No Value	1.9E-02

Dichlorotetrafluoroethane	76-14-2	No Value	1.0E-02
2,5,- Dimethylbenzaldehyde	5779-94-2	No Value	2.0E-03
Ethyl acrylate	140-88-5	No Value	2.5E-01
Ethyl benzene	100-41-4	1.0E+02	1.5E-02
Ethyl chloride	75-00-3	1.0E+03	4.0E-03
Ethyl tert-Butyl Ether	637-92-3	No Value	2.8E-02
Ethylene dibromide	106-93-4	1.7E-03	1.1E-02 [3]
Ethylene dichloride	107-06-2	3.8E-02	8.0E-03
Ethylidene dichloride (1,1-Dichloroethane)	75-34-3	6.3E-01	8.0E-03
Formaldehyde	50-00-0	9.8E-01	4.4E-02
Hexachlorobutadiene	87-68-3	4.5E-02	0.13 [3]
Hexaldehyde	66-25-1	No Value	5.0E-03
Hexamethylene-1,6-diisocyanate	822-06-0	1.0E-03	2.5E-01 [3,5]
Isovaleraldehyde	590-86-3	No Value	4.0E-03
Lead compounds	7439-92-1	1.5E-01	5.6E-05 [4]
m -Dichlorobenzene	541-73-1	No Value	2.4E-02
Manganese compounds	7439-96-5	5.0E-03	5.7E-05 [4]
Mercury Compounds		0.03 [6]	1.7E-05 [4]
Methyl bromide	74-83-9	5.0E-01	7.0E-03
Methyl chloride	74-87-3	9.0E+00	1.3E-02
Methyl chloroform (1,1,1-Trichloroethane)	71-55-6	5.0E+02	8.0E-03
Methyl Ethyl Ketone	78-93-3	No Value	1.2E-01
Methyl isobutyl ketone	108-10-1	3.0E+02	2.5E-02
Methyl methacrylate	80-62-6	7.0E+01	1.1E-01
Methyl tert-butyl ether	1634-04-4	3.8E+00	5.1E-02
Methylene chloride	75-09-2	2.1E+00	2.6E-02
Methylene diphenyl diisocyanate	101-68-8	6.0E-02	2.23E-02 [5]
4,4'-Methylenedianiline	101-77-9	2.2E-03	0.025 [3,5]
n -Octane	111-65-9	No Value	1.8E-02
Naphthalene	91-20-3	2.9E-02	2.4E-04
Nickel compounds	7440-02-0	0.0042 [7]	1.3E-04 [4]
Acenaphthene	83-32-9	No Value	4.2E-05
Acenaphthylene	208-96-8	No Value	4.8E-05
Anthracene	120-12-7	No Value	5.2E-05
Benzo(a)anthracene	56-55-3	9.1E-03	6.3E-05
Benzo(b)fluoranthene	205-99-2	9.1E-03	5.9E-05
Benzo(k)fluoranthene	207-08-9	9.1E-03	5.9E-05
Benzo(g,h,i)perylene	191-24-2	No Value	3.3E-05
Benzo(a)pyrene	50-32-8	9.1E-04	6.1E-05
Benzo(e)pyrene	192-97-2	No Value	4.9E-05
Chrysene	218-01-9	9.1E-02	4.0E-05
Coronene	191-07-1	No Value	4.3E-02
Cyclopenta(c,d)pyrene	27208-37-3	No Value	6.4E-02
Dibenz(a,h)anthracene	53-70-3	8.3E-04	4.9E-05
Fluoranthene	206-44-0	No Value	4.6E-05
9-Fluoranthene	486-25-9	No Value	4.7E-05
Fluorene	86-73-7	No Value	3.8E-05
Indeno(1,2,3-cd)pyrene	193-39-5	9.1E-03	4.0E-05
o- Dichlorobenzene	95-50-1	No Value	2.5E-02
Phenanthrene	85-01-8	No Value	5.9E-05
Pyrene	129-00-0	No Value	5.9E-05

Perylene	1985-5-0	No Value	2.8E-02
Retene	483-65-8	No Value	5.7E-02
Propionaldehyde	123-38-6	No Value	1.2E-02
Propylene	115-07-1	No Value	6.3E-02
Propylene dichloride	78-87-5	5.3E-02	1.5E-02
Selenium compounds	7782-49-2	20 [7]	1.3E-05 [4]
Styrene	100-42-5	1.0E+02	1.3E-02
1,1,2,2-Tetrachloroethane	79-34-5	1.7E-02	1.9E-02 [3]
tert-Amyl Methyl Ether	994-05-8	No Value	2.8E-02
Tetrachloroethene	127-18-4	1.7E-01	1.8E-02
Toluene	108-88-3	5.0E+02	3.0E-02
2,4/2,6-Toluene diisocyanate mixture (TDI)	26471-62-5	7.0E-03	0.025 [3, 5]
o-Tolualdehyde	529-20-4	No Value	9.0E-03
m-Tolualdehyde	620-23-5	No Value	9.0E-03
p-Tolualdehyde	104-87-0	No Value	9.0E-03
1,2,4-Trichlorobenzene	120-82-1	2.0E+01	5.2E-02
1,1,2-Trichloroethane	79-00-5	6.3E-02	1.5E-02
1,2,4-Trimethylbenzene	95-63-6	No Value	5.2E-02
1,3,5-Trimethylbenzene	108-67-8	No Value	1.8E-02
Trichloroethylene	79-01-6	5.0E-01	8.0E-03
Trichlorofluoromethane	75-69-4	No Value	1.2E-02
Trichlorofluoroethane	76-13-1	No Value	2.4E-02
Valeraldehyde	110-62-3	No Value	5.0E-03
Vinyl chloride	75-01-4	1.1E-01	5.0E-03
Vinylidene chloride	75-35-4	2.0E+01	1.2E-02
o-Xylene	95-47-6	No Value	1.5E-02
Xylenes (mixed)	1330-20-7	1.0E+01	0.028 (mixed m,p)

[1] The value shown is the lower of the continuous lifetime exposure concentration associated with an HQ of 0.1 or a cancer risk of 1 x 10-6 (using OAQPS chronic toxicity values: http://www.epa.gov/ttn/atw/toxsource/summary.html, updated where needed).

[2] The values in this column reflect MDLs reported by ERG for use in the national lab contract for this project.

[3] The MDL for this constituent is higher than the lower bound of the concentration range of potential risk-related interest (i.e., concentrations below which risks are typically considered negligible). For this Schools Project, this MDL will be considered sufficient.

[4] The MDL value given is for the metal (e.g., antimony, arsenic, etc.). The analytical methodology being used in this project does not distinguish among various metal compounds. Only the total amount of metal will be measured and reported. (Note that some schools will be targeted for Cr^{+6} analysis. At these schools, a special monitor will be deployed that can determine the amount of Cr^{+6} present in air.)

[5] The MDL is estimated; a calculated MDL will be established prior to monitoring.

[6] This value is for a specific metal compound among multiple compounds in a group.

[7] For nickel and selenium, the value presented is the lowest for the types of compounds expected to be present in ambient air.