South Dakota Ambient Air Monitoring Annual Plan 2015

South Dakota Department of Environment and Natural Resources
Air Quality Program

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Executive Summary

The South Dakota Department of Environment and Natural Resources (department) develops an annual ambient air monitoring network plan which is a review of the ambient air monitoring network each year as required by Title 40 of the Code of Federal Regulation (CFR), Part 58. The review finds the state's ambient air quality concentrations are demonstrating attainment with EPA's National Ambient Air Quality Standards (NAAQS).

The annual plan is published in the department's air quality website to provide public review and comments so adjustments can be made to meet the needs of the general public before the annual plan is finalized. The annual plan includes the following major sections:

1. Ambient air monitoring goals, plans and needs are in Sections 3.0 through 5.0, respectively;
2. Proposed modifications to the ambient air monitoring network to meet the changing trends, national requirements, and state needs are in Section 6.0;
3. Sampling frequency waivers are identified in Section 7.0;
4. Purchase replacement plan is in Section 8.0;
5. Evaluation of collected data compared to the NAAQS is in Section 9.0;
6. Air pollution trends for each site are in Sections 10.0; and
7. Special air quality monitoring is identified in Section-11.0.

The department is planning the following site modifications in 2015 and 2016 based on the state's needs and a consent decree between EPA and the Sierra Club and the Natural Resources Defense Council:

1. The department plans to replace the PM_{10} Andersen Hi-Vols with Thermo Partisol 2000 monitors at Aberdeen and Rapid City Library sites;
2. The department will replace the manual PM_{10} Hi-Vol at Black Hawk Site with a TA Series FH 62 C14 Thermo BETA continuous monitor;
3. Continue to replace the old TA Series FH 62 C14 continuous monitors with new BETA monitors; and
4. Establish a new sulfur dioxide (SO_2) monitoring site or sites in Grant County to determine the highest 1-hour SO_2 concentrations around the Big Stone Power Plant. This proposed project may start in 2016.

1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) through Title 40 of the Code of Federal Regulation (CFR) and the Performance Partnership Agreement requires the South Dakota Department of Environment and Natural Resources (department) to complete an annual ambient air monitoring plan. EPA's requirements for the annual plan are listed in 40 CFR § 58.10. The plan will cover a review of the ambient air monitoring sites and determine if the network is meeting the monitoring objectives in 40 CFR Part 58, Appendixes A, C, D, and E. The plan will identify needed modifications to the network such as the termination or relocation of a monitor, addition of new parameters, or the establishment of new stations. The plan will update compliance concentrations for comparison to the NAAQS and to determine trends for each sampling parameter.

The department is required to take public comments on the plan for 30 days prior to submitting the plan to EPA. The department will comply with this requirement by posting this document on the department's Air Quality Program website at the following location for 30 days:

http://denr.sd.gov/des/aq/airprogr.aspx

All comments received by the department during this 30 day period will be addressed by the department and the appropriate changes will be incorporated into the plan. If a substantial change is made to the plan because of a comment, another 30 day public comment period will be completed. The final annual plan will be submitted to EPA for review including all public comments and the department's responses to the comments.

2.0 AMBIENT AIR MONITORING NETWORK HISTORY

In 1972, South Dakota developed and EPA approved a State Implementation Plan (SIP) which included the establishment and operation of an ambient air monitoring network for the state. In 1980, South Dakota submitted a revision to its SIP to upgrade the program by establishing a network of state and local air monitoring stations (SLAMS) and special purpose monitoring (SPM) stations.

In the past EPA has changed the NAAQS several times. Currently, EPA has established NAAQS for particulate matter (PM_{10} and $PM_{2.5}$), SO_2, nitrogen oxide (NO_2), ozone, carbon monoxide (CO), and lead.

The current particulate matter 10 microns in diameter or less (PM_{10}) standard was set in 1987 setting a 24-hour level of 150 micrograms per cubic meter (ug/m^3) and an annual standard of 50 ug/m^3. In 2006, EPA revoked the annual standard leaving only the 24-hour standard. The department began monitoring for PM_{10} in 1987, and is currently monitoring PM_{10} concentrations in Sioux Falls, Brookings, Watertown, Union County, Aberdeen, Badlands National Park, Wind Cave National Park, Black Hawk and Rapid City. The PM_{10} monitoring network represents the most populated and rural areas of the state. South Dakota's ambient air monitoring network for PM_{10} has continuously demonstrated attainment with the PM_{10} standards.

The particulate matter 2.5 microns in diameter or less ($PM_{2.5}$) standards for 24-hour and annual levels were set in 1997. EPA revised the $PM_{2.5}$ standard significantly by reducing the 24-hour standard from 65 ug/m^3 to 35 ug/m^3 in 2006. The annual standard was revised from 15 ug/m^3 to 12 ug/m^3 in 2013. The department began monitoring for $PM_{2.5}$ in 1999, and is currently monitoring $PM_{2.5}$ concentrations in Sioux Falls, Brookings, Watertown, Union County, Aberdeen, Pierre, Badlands National Park, Wind Cave National Park, and Rapid City. The $PM_{2.5}$ monitoring network represents the most populated and rural areas of the state. South Dakota's ambient air monitoring network for $PM_{2.5}$ has continuously demonstrated attainment with the $PM_{2.5}$ standards.

EPA set the first SO_2 standards in 1971. The primary standards were 140 ppb for the 24-hour average and 30 ppb for the annual average. The secondary standard was 500 ppb for the 3-hour average. The SO_2 standard was revised in 2010 setting a new primary 1-hour standard of 75 parts per billion (ppb) and revoking the 24-hour and annual standards. The department began monitoring for SO_2 in 1974. All the bubbler method samplers were closed out in the 1980s because of problems with the test method in cold climates and low concentration levels. In 2002, the program began setting up continuous analyzers and currently operates SO_2 analyzers in Sioux Falls, Union County, Badlands, and Rapid City. The SO_2 monitoring network represents the highest population areas and rural areas of the state. South Dakota's ambient air monitoring network for SO_2 has continuously demonstrated attainment with the SO_2.

The NO_2 standard was established in 1971 setting an annual average standard of 53 ppb. In 2010 EPA revised the standard by adding a one-hour standard of 100 ppb. The annual standard was retained without any change in concentration level. The department first tested for NO_2 in 1974. All the bubbler method samplers were closed out in the 1980s because of problems with the test method in cold climates and low concentration levels. The department started testing again for NO_2 in 2003 and currently operates continuous NO_2 monitors in Sioux Falls, Union County, Badlands, and Rapid City. The NO_2 monitoring network represents the most populated and rural areas of the state. South Dakota's ambient air monitoring network for NO_2 has continuously demonstrated attainment with the NO_2 standards.

The ozone standard was established in 1979, setting a 1-hour average standard of 0.120 parts per million (ppm). In 1997, the standard was revised setting a 8-hour average of 0.08 ppm. In 2008, EPA set the current ozone standard of 0.075 ppm. South Dakota's ambient air monitoring network for ozone was established in 1999 and is currently monitoring concentrations in Sioux Falls, Union County, Badlands National Park, Wind Cave National Park, and Black Hawk. The ozone monitoring network represents the most populated and rural areas of the state. South Dakota's ambient air monitoring network for ozone has continuously demonstrated attainment with the ozone standards.

The lead standard was established in 1978, with a concentration of 1.5 ug/m^3. In 2008, the standard was significantly revised setting a concentration level of 0.15 ug/m3. EPA made changes to the air monitoring requirements for lead in 2009 to help determine where states would need to test. The final rule did not require lead monitoring at the National Core site and all sources in South Dakota have emission levels less than 0.5 ton per year. Therefore, testing for lead is not required at this time.

Data collected from the ambient air monitoring network is entered into the federal database called the Air Quality System (AQS). Individuals interested in reviewing the air quality data can go to the EPA website at the following address:

http://www.epa.gov/airdata/

3.0 AIR MONITORING GOALS

The department's Air Quality Program was established with the primary goal of protecting the health, welfare and property of South Dakotans from the detrimental effects of air pollution. The Clean Air Act of 1970 and subsequent amendments define air quality standards for various air pollutants necessary to protect the public from injurious pollution concentrations. Air pollution concentrations that exceed these established standards can cause a public health hazard, nuisance, annoyance or damage buildings, property, animals, plants, forests, crops, exposed metals or otherwise interfere with the enjoyment of life or property.

In order to attain and maintain the NAAQS, the department developed regulations that restrict air pollution from sources, establishes these restrictions in an air quality permit, requires periodic inspections to ensure compliance, and maintains an ambient air monitoring network to provide air quality information and monitor the success of the Air Quality Program. Based on the ambient monitoring concentrations collected throughout the state, the department's Air Quality Program is meeting its goals.

4.0 AIR MONITORING PLAN

In calendar year 2014, the ambient air monitoring network included 13 ambient air monitoring sites run by the department. Figure 4-1 shows a map of the general locations and cities with ambient air monitoring sites at the beginning of 2014. The following types of ambient air monitors and monitoring sites are operated in South Dakota:

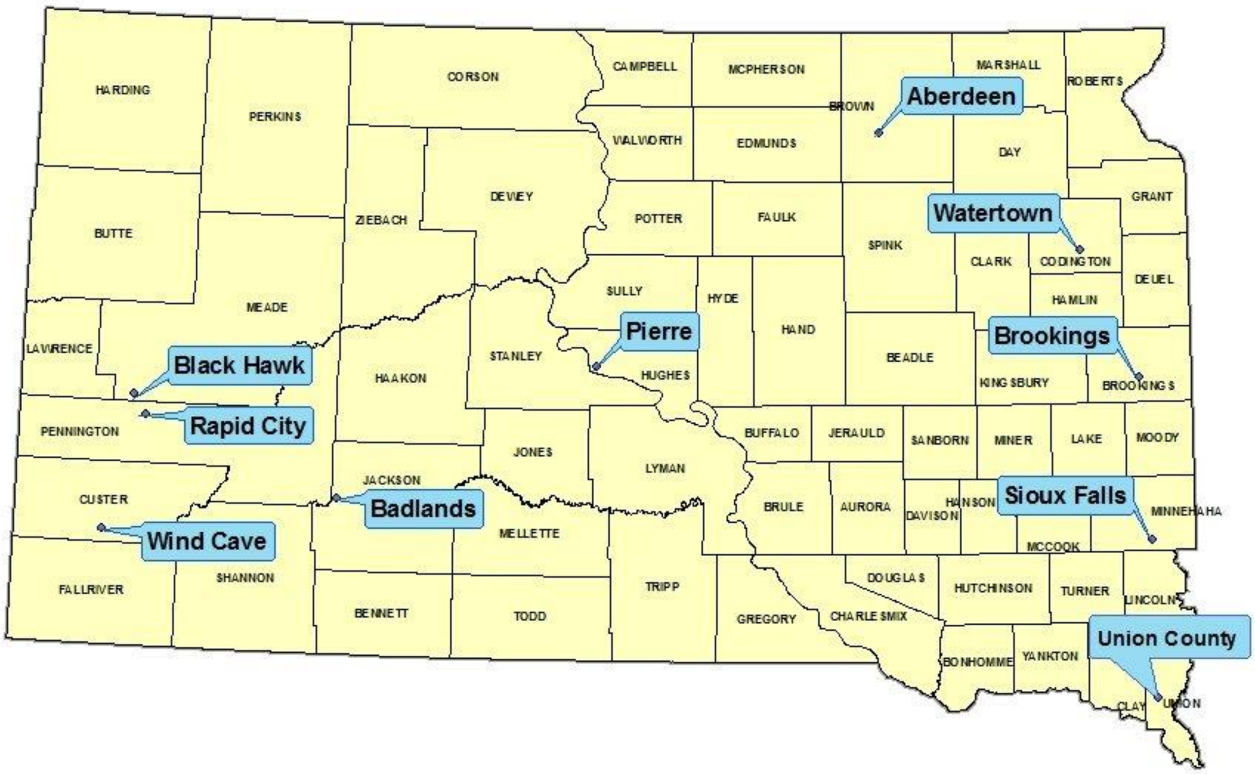
1. State and local air monitoring stations (SLAMS);
2. Special purpose monitors (SPM);
3. Prevention of Significant Deterioration (PSD) monitors;
4. Interagency Monitoring of Protected Visual Environments (IMPROVE) sites;
5. Environmental radiation ambient monitoring systems; and
6. National Core (NCore) multi pollutant sites.

Ambient air monitoring site files are maintained in the department's Pierre office for the SLAMS and SPM sites. The ambient air monitoring site files are available for public review during normal working hours from 8:00 AM to 5:00 PM each workday. The monitoring site files contain at a minimum the following information for each site:

1. AQS site identification form;
2. Sampling location;

3. Sampling and analysis method;
4. Operating schedule;
5. Monitoring objective and spatial scale;
6. Beginning date of operation; and
7. Site maps.

Figure 4-1 – South Dakota Air Monitoring Sites



4.1 State and Local Air Monitoring Stations (SLAMS)

A State and Local Air Monitoring Station consists of an air monitor selected by the state or local air programs to determine compliance with the NAAQS. At the beginning of 2014, 11 of the networks sites have at least one SLAMS monitor for at least one air pollutant parameter. The sites in the network collected PM_{10} data at 10 sites, $PM_{2.5}$ data at 10 sites, SO_2 and NO_2 at four sites, ozone at six sites and CO at one site.

4.2 Special Purpose Monitoring (SPM)

A Special Purpose Monitoring is a generic term for all monitors used for special studies. The data is reported to EPA, the equipment is EPA or non-EPA designated monitoring methods, and the monitoring data is used for special circumstances or needs. Six of the ambient air monitoring network sites operated some kind of SPM monitor in 2014. The parameters tested by the SPM monitors in South Dakota include:

1. Weather stations at the Black Hawk, SD School, Research Farm and UC #1 sites;
2. PM_{coarse} monitor, NOy analyzer, and $PM_{2.5}$ speciation monitors at the SD School Site; and
3. Radiation monitors operated at the Pierre and RC National Guard sites.

4.3 Prevention of Significant Deterioration (PSD) Monitoring Sites

In 2014, no Prevention of Significant Deterioration monitoring project were started or completed.

4.4 IMPROVE Network

Two Interagency Monitoring of Protected Visual Environments (IMPROVE) sites are being operated by the National Parks Service in South Dakota. The site locations are at the Badlands and Wind Cave National Park. Data results for parameters collected by the National Park Service can be requested from the individual national parks at:

http://vista.cira.colostate.edu/views/Web/Data/DataWizard.aspx.

4.5 Radiation Network (RadNet)

The RadNet sites in Pierre and Rapid City are being operated as a part of the national network of sampling sites. The Pierre Site has been operated since the early 1980s. The state has a limited role in operating the monitor. The state collects the samples, takes preliminary readings of radioactivity levels, and ships the samples to the EPA office of Radiation and Indoor Air. The type of sample collected is airborne particulates and measurements taken are gross beta radiation levels.

In 2009, EPA requested a second site in the state to be located in the Rapid City area. The new RadNet monitor was installed at the RC National Guard Site on May 7, 2009. The site is operated by the department's Rapid City Regional Office in conjunction with the Rapid City National Guard.

The general objectives of the sampling sites are to provide a means of estimating ambient levels of radioactive pollutants in our environment, to follow trends in environmental radioactivity levels, and to assess the impact of fallout and other intrusions of radioactive materials. Specifically, the RadNet monitor was designed to:

1. Provide a direct assessment of the population's intake of radioactive pollutants due to fallout;
2. Provide data for developing a set of dose computational models for specific sources and a national dose computational model to aggregate all sources and determine total population dose;
3. Monitor pathways for significant population exposure from routine, accidental, and terrorist releases of radioactivity from major sources;

4. Provide data for indicating additional sampling needs or other actions required to ensure public health and environmental quality in the event of a major release of radioactivity to the environment; and
5. Serve as a reference for data comparison with other localized and limited monitoring programs.

The radiation data collected at this site may be reviewed at:

http://oaspub.epa.gov/enviro/erams_query.simple_query

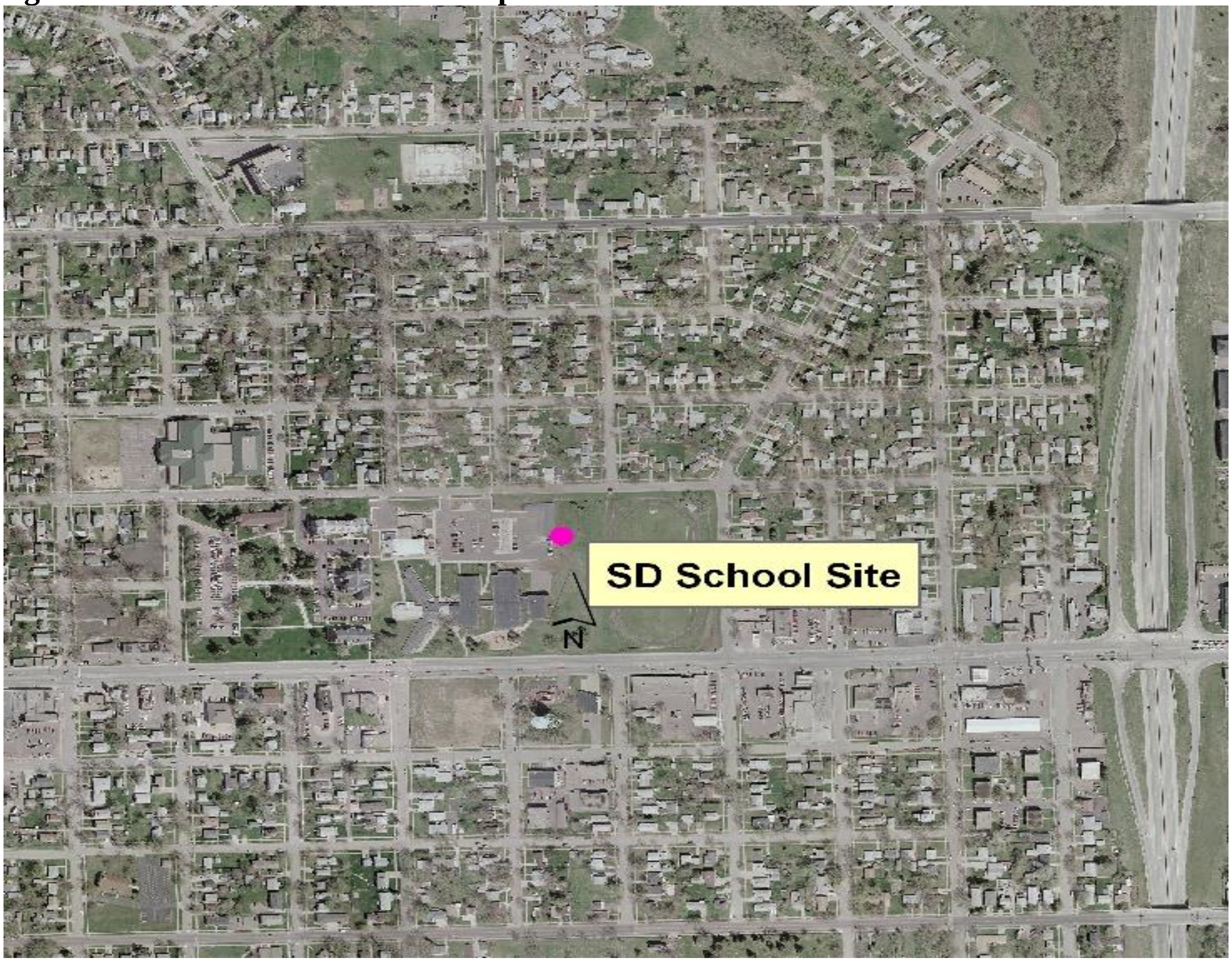
4.6 National Core Multi-Pollutant Site

The National Core (NCore) multi-pollutant monitoring site will provide data on several pollutants at lower detection levels and replaces the National Air Monitoring Station (NAMS) sites that have existed for several years. Each state's ambient air monitoring network is required to have at least one NCore site. At the beginning of 2011, all required parameters were operating at the SD School Site. The NCore site addresses the following monitoring objectives:

1. Timely reporting of data to the public through AirNow for air quality forecasting and other public reporting mechanisms;
2. Support development of emission strategies through air quality model evaluation and other observational methods;
3. Accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors;
4. Support long-term health assessments that contribute to ongoing reviews of the NAAQS;
5. Compliance through establishing nonattainment/attainment areas by comparison with the NAAQS; and
6. Support multiple disciplines of scientific research including public health, atmospheric and ecological.

The NCore site in South Dakota is located on the School for the Deaf campus in Sioux Falls, which is identified as the SD School Site (46-099-0008). This site meets the location requirements to be in an urban residential area. Sioux Falls was selected as the NCore site for South Dakota because it is the largest city in the state and is one of the state's fastest growing communities. See Figure 4-2 for an aerial view of the city around the SD School Site.

Figure 4-2 – SD School Site Area Map



The NCore site collects data for trace level SO_2, nitrogen oxides (NO, NO_2, and NOx), all reactive oxides of nitrogen (NO, $NO_{difference}$, and NOy), CO (CO), ozone (O_3), $PM_{2.5}$ continuous and filter based manual monitors, $PM_{10-2.5}$ mass, $PM_{2.5}$ speciated, PM_{10} and meteorological parameters of wind speed, wind direction, relative humidity, and ambient temperature.

5.0 AMBIENT AIR MONITORING NEEDS AND REQUIREMENTS

5.1 Monitoring State's Largest Population Centers

South Dakota's industrial base and population centers are typical of the northern plains states. The largest industry in the state is agriculture. Most of the other industries are located in several localized areas. The industries in these locations are typically small (less than 50 employees) and generally do not produce large quantities of air pollutants. Most are considered service oriented businesses or light industrial. The only heavy industrial facilities are the Big Stone Power Plant in Grant County and the quarry area in Rapid City.

The population distribution of the state follows the general industrial distribution. Most of the state's population of 814,180, in the 2010 Census, lives either on the eastern or western third of South Dakota. Since 2010, there has been a modest population increase in South Dakota of about 4% according to estimates done in 2015. The two largest cities in South Dakota are Sioux Falls and Rapid City located in southeastern and western South Dakota, respectively. The remaining population is primarily spread across the eastern third of the state with the remaining portion of the state sparsely populated. See Table 5-1 for a list of the 10 largest cities and Table 5-2 for a list of the 10 largest counties in the state.

Table 5-1 – 10 Largest Cities in South Dakota 2010

Ranking	City Name	Counties	Population
1	Sioux Falls	Minnehaha/Lincoln	153,888
2	Rapid City	Pennington /Meade	67,956
3	Aberdeen	Brown	26,091
4	Brookings	Brookings	22,056
5	Watertown	Codington	21,482
6	Mitchell	Davison	15,254
7	Yankton	Yankton	14,454
8	Pierre	Hughes	13,646
9	Huron	Beadle	12,592
10	Vermillion	Clay	10,571

Table 5-2 – 10 Counties with the Highest Populations 2010

Ranking	Counties	Population
1	Minnehaha	169,468
2	Pennington	100,948
3	Lincoln	44,828
4	Brown	36,531
5	Brookings	31,965
6	Codington	27,277
7	Meade	25,434
8	Lawrence	24,097
9	Yankton	22,438
10	Davison	19,504

Given South Dakota's population distribution, most of the air monitoring efforts of the state have in the past been concentrated in the areas of high population. Within these areas of high population, monitoring sites are chosen that will determine areas of high pollution concentration, determine if the NAAQS are being met, identify and attempt to quantify pollutant concentrations emitted by industries, and identify sources that have the potential to release highest amounts of pollutants. A majority of the air monitoring sites are currently being operated in or near the five largest cities and seven largest counties in the state. However, as EPA continues to lower the NAAQS, the department has established some of the monitoring sites in rural areas such as the Wind Cave National Park, Badlands National Park, and Union County. These sites are helping to determine long range impacts from other states and countries on South Dakota's rural and urban areas.

5.2 Real Time Data

Air monitoring goals have shifted to the collection of data using continuous air monitoring samplers and providing the data as quickly as possible for the public to use. Continuous samplers provide more data at lower operational cost, which is necessary as EPA continues to expand ambient air monitoring programs for the same amount of funding or less. In many cases the continuous monitoring can be accessed by telephone and uploaded to a website for public use. The public can then use this data to determine if they need to take extra precautions when doing outdoor activities. The real time information is also used to monitor PM_{10} and $PM_{2.5}$ concentrations when high wind dust alerts are forecasted for Rapid City.

The sites reporting data to the department's real time webpage are Wind Cave National Park, Badlands National Park, Brookings (Research Farm), Union County (UC #1), Rapid City (RC Credit Union and Black Hawk sites), Watertown, and Sioux Falls (SD School) sites. The data includes hourly concentrations of PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO, and ozone. The South Dakota's Air Quality website is located at:

http://denr.sd.gov/des/aq/aarealtime.aspx

In 2014, data uploaded from the $PM_{2.5}$ and PM_{10} monitors and ozone analyzers at Wind Cave National Park, Badlands National Park, Brookings (Research Farm), Union County (UC #1), Rapid City (RC Credit Union and Black Hawk sites), Watertown, and Sioux Falls (SD School) sites were reporting hourly data to EPA's AirNow website located at:

http://www.airnow.gov/

This data along with other monitoring sites around the nation provides the public and EPA with near real time data to show current air pollution levels and forecast levels for long range transport. The goal for the future is to add other locations in the state to this website and to the department's website.

5.3 Class I Areas

With the development of coal bed methane and oil and gas production in North Dakota, Wyoming, Montana and Colorado there is a growing need for data in rural and small cities in the western part of the state. In addition, South Dakota has developed a plan to implement the regional haze regulations required by the federal Clean Air Act. The implementation of these regulations will put more importance on air pollution levels in the state's two class I areas of Badlands and Wind Cave National Parks.

Ambient air monitors were placed in these areas in order to determine background levels and the impact of long range transport of air pollutants like particulate matter and ozone. In addition, continuous data is needed for modeling purposes to help in determining air quality permit requirements. The National Park sites collect data from IMPROVE monitors for PM_{10}, $PM_{2.5}$, and chemical analysis of the collected particulates. The department collects PM_{10}, $PM_{2.5}$, SO_2, NO_2, and ozone data at the Badlands Site and PM_{10}, $PM_{2.5}$, and ozone data at the Wind Cave Site.

5.4 Ozone Monitoring

Ozone monitoring is occurring in three sites on the eastern half of South Dakota and three sites on the western half of South Dakota and all sites demonstrate that South Dakota is attaining the current ozone standard. However, if EPA decides to lower the ozone standard this year, South Dakota may have areas that are exceeding the lower ozone standard in both rural and urban areas of the state.

Modeling conducted by Western Regional Air Partnership (WRAP), indicates that South Dakota contributes approximately 3 parts per billion to its ozone concentration. In 2014, South Dakota monitored ozone at six sites throughout South Dakota. The average ozone concentration of the six sites was 63 parts per billion with the values ranging from 61 to 68 parts per billion. Based on WRAP's modeling, South Dakota contributes approximately 5% to its ozone levels and the other 95% is from natural sources and transported into South Dakota from other states and countries. It will be important to maintain ozone monitoring in all areas of South Dakota to help demonstrate that long range transport of air pollution affects ozone concentration in South Dakota's rural and urban areas.

5.5 $PM_{2.5}$ Monitoring

In 2006, EPA significantly lowered the 24-hour $PM_{2.5}$ standard from 65 micrograms per cubic meter (ug/m^3) to 35 ug/m^3. EPA also lowered the annual standard from 15 ug/m^3 to 12 ug/m^3 in 2012. These revisions of the standards brought the compliance levels close to the concentrations recorded at the monitoring sites in the state's network.

Testing for $PM_{2.5}$ levels is a higher priority in South Dakota because recorded concentrations are significantly closer and may exceed the current 24-hour standard since EPA lowered the standards. Sample concentrations in the eastern half of the state are higher than the western half. The east part of the state has the highest levels in the state.

5.6 Metropolitan Statistical Areas

40 CFR Part 58, Appendix D, contains information used to design an ambient air monitoring network and lists three basic objectives in designing an ambient air monitoring network. The three basic objects are listed below:

1. Provide air pollution data to the general public in a timely manner. The department accomplishes this objective by providing Near Real Time data on the department's website at:

   http://denr.sd.gov/des/aq/aarealtime.aspx

   The data on this website includes hourly data from the Sioux Falls and Rapid City sites. It also includes other cities like Brookings and Watertown sites and rural areas like Union County, Badlands and Wind Cave sites. Specifically in the Rapid City area, High Wind Dust Alerts are called when meteorological conditions are forecasted that could cause high PM_{10} concentrations. This information along with a report graphing hourly concentrations recorded during the alert is also provided to the public through the department's website;
2. Support compliance with ambient air quality standards and emissions strategy development. The department accomplishes this objective by locating the sites throughout the state to assess the permit control measures and pollution emission impacts on the state. For example, the Rapid City air monitoring sites specifically evaluate the permit control measures and the special measures taken to reduce fugitive dust levels; and
3. Support for air pollution research studies. The department supports research by loading the air quality data into EPA's AQS database site and by supporting local studies when requested by the state's colleges.

EPA identified in Appendix D the air monitoring requirements for ozone, CO, NO_2, SO_2 , particulate matter, and lead. The number of required air monitoring sites for ozone and particulate matter is based on the state's Metropolitan Statistical Areas (e.g., determined by the population of the MSA and each pollutant's design value in the MSA). Each design value is specific to the pollutant and form of the standard. To determine the number of monitoring sites for ozone and particulate matter, the design value is calculated based on the pollutant concentration and the applicable form of the standard in 40 CFR Part 50, divided by the applicable pollutant's standard in 40 CFR Part 50, and the results multiplied by 100. The percentage is compared to the values in Appendix D to determine the minimum number of monitoring sites for ozone and particulate matter.

If there is no ambient air monitoring data for the MSA, only the minimum number of sites listed in Appendix D is required to be operated. If there is a minimum of three years of air quality data for the MSA, a design value is calculated. If the MSA has a design value greater than 85% of the standards for ozone and $PM_{2.5}$. If the MSA has a design value greater than 80% of the standard for PM_{10} and the population is greater than 100,000 people a minimum of one site is required.

The required number of sampling sites continues to increase as the population increases. If the highest concentration site in a MSA has a design value less than 80% for PM_{10} and 85% for ozone and $PM_{2.5}$, the required number of sites may be one or even zero depending on the design value and population of the MSA.

There is one additional ambient air monitoring requirement in Appendix D for an ozone network. If a MSA is required to have one or more ozone monitor, at least one of the ozone monitoring sites is required to be located at the expected high concentration area for the MSA.

Table 5-3 shows the population, design values and the minimum site requirements for the Sioux Falls, Rapid City, and Sioux City MSAs in the state after adding the data for 2014 sampling year.

Table 5-3 – 40 CFR Part 58, Appendix D Requirements for MSA

2010 MSA Population	Counties	Site	AQS ID	Maximum Design Values [1]	> 85% [2] Criteria (Yes or No)	Minimum Sites Required
Sioux Falls MSA						
169,468 44,828	Minnehaha Lincoln	SD School	46-099-0008	PM_{10} 24-hour = 69%	No	0
5,618 8,347	McCook Turner	SD School	46-099-0008	$PM_{2.5}$ 24-hour = 60%	No	0
228,261	**Total**	SD School	46-099-0008	$PM_{2.5}$ Annual = 63%	No	0
		SD School	46-099-0008	Ozone 8-hr = 91%	Yes	1
		KELO	46-099-0006	$PM_{2.5}$ 24-hour = 57%	No	0
		KELO	46-099-0006	$PM_{2.5}$ Annual = 69%	No	0
Rapid City MSA						
100,948 25,434	Pennington Meade	RC Credit Union	46-103-0020	PM_{10} 24-hr = 87%	No	0
126,382	**Total**	RC Credit Union	46-103-0020	$PM_{2.5}$ 24-hr = 46%	No	0
		RC Credit Union	46-103-0020	$PM_{2.5}$ Annual = 56%	No	0
		RC Library	46-103-1001	PM_{10} 24-hr = 37%	No	0
		RC Library	46-103-1001	$PM_{2.5}$ Annual = 48%	No	0
		RC Library	46-103-1001	$PM_{2.5}$ 24-hr = 43%	No	0
		Black Hawk	46-093-0001	PM_{10} 24-hr = 22%	No	0
		Black Hawk	46-093-0001	Ozone 8-hr = 83%	No	0

2010 MSA Population	Counties	Site	AQS ID	Maximum Design Values [1]	> 85% [2] Criteria (Yes or No)	Minimum Sites Required
Sioux City MSA						
14,399 6,000 21,006 102,172 **143,577**	Union, SD Dixon, NE Dakota, NE Woodbury, IA **Total**	UC #1	46-129-0001	PM_{10} 24-hr = 52%	No	0
		UC #1	46-129-0001	$PM_{2.5}$ 24-hr = 63%	No	0
		UC #1	46-129-0001	$PM_{2.5}$ Annual = 76%	No	0
		UC #1	46-129-0003	Ozone 8-hr = 83%	No	0

[1] – PM_{10} sites are % of the NAAQS; and
[2] – The criteria for PM_{10} is greater than 80% and the population of the MSA is 100,000 or greater.

Based on the design values and populations, South Dakota is required to have an ozone monitoring site in Sioux Falls.

The department operates the following additional types of monitors to meet the specific network requirements in 40 CFR Part 58, Appendix D:

1. $PM_{2.5}$ speciation monitor in Sioux Falls at the SD School Site; the largest urban area in the state and NCore Site;
2. $PM_{2.5}$ background and transport monitors at the Badlands and Wind Cave sites; and
3. NCore monitoring equipment located in the city of Sioux Falls at the SD School Site.

Another requirement in Appendix D is providing for a Photochemical Assessment Monitoring Stations (PAMS) which is required in areas classified as serious, severe, or extreme nonattainment for ozone. All areas in South Dakota are attaining the National Ambient Air Quality standard so no PAMS sites are required.

There is no Appendix D minimum requirements for air monitoring for CO. However, a CO air monitoring site is required at the NCore Site. CO air monitoring started at the NCore Site (SD School Site) in 2011.

There are population monitoring requirements for NO_2 in Appendix D. A NO_2 monitor is required when the core based statistical area (CBSA) has a population level of 500,000 or greater. There are no CBSAs with a population level greater than or equal to 500,000 in South Dakota. Therefore, there are no required NO_2 monitoring sites in South Dakota.

SO_2 has a population based monitoring requirement for a CBSA. The monitoring requirement is based on a calculation using the total amount of SO_2, in tons, emitted within the counties in the CBSA area and the population within the CBSA counties. The calculation is called the population weighted emissions index for the CBSA. Union County is part of the Sioux City CBSA and is the only area in South Dakota with a population weighted emissions index that has a value high enough to require a monitoring site. Union County does not contribute significantly to the population weighted emissions index for SO_2 in the Sioux City CBSA. The EPA rules require the monitoring site to be located in the parent CBSA or Sioux City, Iowa area in this case. There are no SO_2 monitoring sites required in South Dakota.

The minimum requirements for lead are based on the lead air emissions from a source or airport with an annual emissions rate of 0.5 tons per year or greater. There are no sources with an annual emission rate at or over 0.5 ton per year so there are no required monitoring sites in South Dakota.

5.7 Future Monitoring

There is currently minimal monitoring being completed in other parts of the state that have small, but expanding populations and industries. These areas include the northeastern and the northern Black Hills portions of the state. These areas will continue to be evaluated to determine whether additional monitoring efforts need to be conducted in those areas.

PM_{10}, $PM_{2.5}$ and ozone will be the focus of the ambient air monitoring network as levels of these pollutants have the greatest potential to have concentrations close to the standard as EPA continues to lower the NAAQS for these pollutants.

EPA has also determined for large sources of SO_2 the area around the source needs to be characterized by either modeling the sources emissions or air monitoring to determine if there are short term high concentrations of SO_2 that could affect public health. The proposed rule would require states to model or monitor these source areas before EPA will determine the attainment status of the county or area.

South Dakota has one large source of SO_2 emissions, Big Stone Power Plant, indicated by EPA in the proposed rule that could be required to be characterized. If these rules are finalized air monitoring would have to be started by January 1, 2017 and three complete years of data collected by December 31, 2020.

Under a consent decree between EPA and environmental groups on March 2, 2015, with no state input, EPA is requiring states to update the recommendations for counties with large sources of SO_2 emission. EPA will use the data to designate the counties for the 1-hour NAAQS for SO_2. DENR had originally designated Grant County along with the rest of the state in attainment of the SO_2 standard. Grant County is impacted by the consent decree because of the Big Stone Power Plant is a large source of SO_2 emissions as specified by the consent decree. DENR must provide information to show the Big Stone Power Plant is not causing the area to exceed the 1-hour standard by the September 2015, or EPA may designate the area non-attainment. DENR plans on reiterating to EPA that Grant County is attaining the standard and will provide additional information supporting an attainment conclusion.

6.0 NETWORK MODIFICATIONS FOR 2015 and 2016

6.1 New Sites

The department will make the following changes and will continue to evaluate the following areas for the need to modify the ambient air monitoring network:

1. The department is planning one or maybe two new SLAMS sites to be located around the Big Stone Power Plant in Grant County. The testing will determine if emissions levels from the plant are causing the area to exceed the 1-hour SO_2 standard. The sites would be setup either in the fall of 2015 or 2016.

6.2 Sites Closed

No sites are planned to be closed in the 2015 to 2016 period.

6.3 Modifications

The department is planning the following site modifications:

1. The department will continue to evaluate locations where continuous PM monitors can replace manual monitors in the network. If equipment is available the Black Hawk PM_{10} Hi-Vol manual monitor will be replaced with a BETA continuous PM_{10} monitor in December of 2015.
2. The manual PM_{10} Hi-Vol manual monitors at Aberdeen and RC Library will be replaced with Low-Vol Partisol 2000 monitors at the end of December 2015.

7.0 REQUEST FOR WAIVER

There were no sampling frequency waivers requested for the 2015 sampling year and none are proposed for 2016.

8.0 EQUIPMENT REPLACEMENT PLAN

8.1 Overview

The department is tasked with sampling the ambient air quality throughout the state of South Dakota to demonstrate compliance with the NAAQS and to do special testing when needs arise or as required by EPA. In 2014, there were eleven active sites within South Dakota where criteria pollutants are monitored. The monitored pollutants include: particulate matter (PM_{10} and $PM_{2.5}$), NO_2, Ozone, CO, and SO_2 .

The reliable operation of the monitors requires significant investment in both staff time and inventory for upkeep which tends to increase as the monitors age. Monitors should be replaced when they reach an age when cost of upkeep meets or exceeds the cost of new purchase and makes fiscal sense.

The average operational age of a PM monitor is about 10 years mainly due to detector and software board failures. With some major replacement of monitor components the operational age may be stretched to 14 years.

Monitors also experience catastrophic failures, at which time a determination is made whether replacing core components on an aging instrument is viable. Some instruments are of an age that parts are no longer available.

8.2 Data Loggers

The department currently operates seven ESC 8832 style data loggers and one ESC 8816 style data loggers with two more used as backups. The average age of the ESC 8816 style data logger is nine years and ESC has discontinued the 8816 style which makes it difficult to purchase replacement parts. In addition to the age of the data loggers, the department has lost a few data loggers to lighting strikes that come through the meteorological probes or down the power and phone lines.

Because of their age, the priority for the data loggers is to replace all the 8816 in the network of sites. Agile Air, which purchased ESC, is offering a newer data logger version 8864. The department has received reports from other states as well as from Agile Air that the computer-data logger interface is difficult or impossible to use. The department will continue to look for reliable replacement data loggers, but may need to look at the limited number of 8832's available through Agile Air.

Table 8-1 provides a location and service record of the existing data loggers at the time this document was written.

Table 8-1 - Data Logger Service Records

No.	S/N	Asset #	Location	Purchased	Series	Purchase	Comments
1	3901	NA	Spare	<2006	8816	no data	Backup
2	3802	none	Spare	<2006	8816	no data	Backup
3	4159	NA	Wind Cave	<2006	8816	no data	
1	2772	347247	Watertown	2008	8832	$8,485	
2	2771K	347248	UC #1	2008	8832	$8,485	
3	2770K	347249	RC Credit Union	2008	8832	$8,485	
4	2331K	NA	SF School	2008	8832	$8,485	
5	2431	NA	Research Farm	2008	8832	$8,485	
6	3992K	NA	Pierre Airport	2011	8832	$8,485	
7	4467K	351778	Black Hawk	2012	8832	$8,485	

8.3 Manual PM Monitors

8.3.1 Partisol Monitors

The department currently has seven Thermo Scientific Partisol 2000i manual monitors and five Thermo Scientific Partisol 2000 manual monitors (see Table 8-2). These Partisol manual monitors are part of the $PM_{2.5}$ monitoring network of sites.

In accordance with the 2014 annual plan, the department closed the KELO site which provided two extra Partisol manual monitors. The third Partisol manual monitor at the KELO Site was moved to the Aberdeen Site for Quality Assurance co-location checks. The department also combined the Brookings sites into one site and installed a PM continuous monitor leaving two extra Partisol manual monitors.

The changes were made in December of 2014. This provides five extra Partisol manual monitors that could be used for other purposes in the network of sites.

Table 8-2 – Partisol Service Record

No.	S/N	Asset #	Location	Purchased	Purchase $	Style
1	1041106	0350223	Transition	7/2011	$7,271	2000i
2	1031106	0350222	Transition	7/2011	$7,271	2000i
3	201021106	0350224	Aberdeen B	7/2011	$7,271	2000i
4	201011106	0350226	Aberdeen A	7/2011	$7,271	2000i
5	201881204	0351195	Aberdeen C	7/2011	$9,580	2000i
6	1751203	0351196	Library B	6/2012	$9,580	2000i
7	1891204	0351197	Library A	6/2012	$9,580	2000i
1	210881007	0349210	Transition	8/2010	$6,818	2000FRM
2	210851007	0349214	SFSD B	8/2010	$6,818	2000FRM
3	210811007	0349212	Transition	8/2010	$6,818	2000FRM
4	210771006	0349211	Transition	8/2010	$6,818	2000FRM
5	210801007	0349209	SFSD A	8/2010	$6,818	2000FRM

8.3.2 Hi-Vol PM_{10} Monitors

The department currently operates five Hi-Vol PM manual monitors for measuring PM_{10} concentrations in Aberdeen, RC Library, and Black Hawk sites (see Table 8-3). The Hi-Vol PM manual monitors were first used at the beginning of the monitoring program back in the 1970s. Some of the current manual monitors still have parts from the original monitors used to collect Total Suspended Particulates. The original Hi-Vol PM monitor design with pitch roof sampling head is still the reference method for the collection of Lead samples.

The currently used Hi-Vol PM manual monitors with the large mushroom head have had various parts that have been changed over the 35 plus years of service to modify how the flow rate was controlled and a change in the sampling head of the monitor to test for PM_{10}. This sampling method is still one of the reference methods but it has some operation limits that make it harder to compare recorded sampling results to other sites and to what the public would be exposed to during high concentration periods.

One of these limits is the Hi-Vol PM manual monitors operate at a high flow rate, 40 cubic feet/minute, compared to the newer low flow PM monitors which have a flow rate of 16.67 liters/minute. A change to the lower flow rate monitor method would bring the a flow levels close to what an adult person breaths and would compare to the newer PM monitors which use the same low flow method in most of the state's PM air monitoring network. In addition a change to the low flow method would save operational costs by eliminate the need to have spare parts and supplies for both the Hi-Vol and low flow methods. The change to low flow monitors would also make it simpler for staff to maintain the monitors, keep an inventory of parts and to keep the standard operating procedures current.

In 2016, the department is proposing to use the extra Partisol manual monitors from the network changes described in the Partisol Monitor section to replace the remaining Hi-Vol manual monitors at Aberdeen and RC Library sites. The Black Hawk Hi-Vol would be replaced with a continuous PM monitor. This proposal would require five of the extra Partisol manual monitors and leave one backup monitor. The plan is to purchase one additional monitor in 2015, so there is an additional backup Partisol 2000i to support the $PM_{2.5}$ manual monitor network.

Table 8-3 – PM_{10} Hi-Vol Manual Monitor Service Record

Site	# Monitors	Type	Asset #	Purchase Date
Aberdeen	2	SA/GMW1200	None	Unknown
RC Library	2	SA/GMW1200	None	Unknown
Black Hawk	1	SA/GMW1200	None	Unknown

8.3.3 Speciation $PM_{2.5}$ Monitors

The department currently has one speciation monitor at its NCore site and it was purchased around 1999. The sampling lines have been replaced several times and the control unit was returned to the manufacturer for major repairs in past years.

When the monitor was purchased the required sampling frequency was every 6th day which was the designed testing frequency when the monitor was purchased. In 2009, EPA changed the sampling frequency to every 3rd day. This requires that a staff member go on weekends to setup the monitor for some of the sampling runs. This is a strain on resources and is one of the reasons this monitor should be considered for replacement in the next three years.

8.4 Continuous PM Monitors

The department operates two kinds of continuous PM monitors, FH64C14 BETA and a Met One BAM. The FH64C14 BETAs are getting old and need to be replaced.

8.4.1 Thermo FH64C14 BETA Monitors

The department currently runs four BETA continuous monitors in the field and three are located in our lab with systematic problems. Table 8-4 provides a description of-each monitor and location.

This BETA continuous monitor fleet is aging with the oldest in operation over 12 years old. The current average age of the monitors is ten years old; the newest of these monitors is nine years old. The expected lifespan of the detectors in the monitor is ten years. The detectors can be replaced at $3,043 each. The problem remaining is the operating system is old and could malfunction at any time because of age making the repair costly with little or no additional operation time. In addition to the age, every two years, each monitor needs to be sent in to clean the measurement chamber at a current cost of $909.87. No other monitor currently has this requirement. For these reasons, the replacement of these BETA continuous monitors is a high priority for the department and should be replaced in the next three years.

Table 8-4 – BETA Service Record

No.	S/N	Asset #	Location	Maintenance Due Date	Purchase $	Date Purchased
1	405	0339810	Pierre Lab	01/08/2015	$13,972	2002
2	E1000	0343701	Badlands	05/30/2015	$15,447	2005
3	749	0341980	Brookings	01/09/2015	$12,686	2004
4	814	0341981	Watertown	05/02/2015	$12,686	2004
5	E1011	0343702	Pierre Lab	05/14/2016	$13,253	2005
6	727	0341968	Wind Cave	07/14/2013	$14,820	2004
7	412	0339809	Pierre Lab	08/27/2014	$14,572	2002

8.4.2 Thermo 5014i BETA Monitors

The department has two Thermo 5014i BETA continuous monitors. These are new monitors. Both have been placed in the field, one in Union County and one in Pierre (see Table 8-5). The department does not anticipate significant upkeep costs associated with these monitors for several years.

Table 8-5 – 5014 Service Record

No.	S/N	Asset #	Location	Comments	Purchase $	Date Purchased
1	CM13381007	353481	Rapid City	Running in the field	$19,600	2014
2	CM13361013	353480	UC 1	Running in the field	$19,600	2014

8.4.3 Met One BAM 1020 Monitors

The department has seven operating BAM continuous monitors with two in reserve (See Table 8-6). The oldest monitors are six years old. The department has not had many problems with these monitors but expect to begin having more operational problems as the fleet ages. There is no need to purchase replacements for these monitors at this time.

Table 8-6 – BAM Service Record

No.	S/N	Asset #	Location	Purchase $	Date Purchased
1	H2949	0346880	Brookings	$21,192	2008
2	H2972	0346881	SF School	$21,192	2008
3	H7027	0347244	Pierre Airport	$19,159	2008
4	H7028	0347243	UC #1	$19,159	2008
5	H7051	0347246	Wind Cave	$19,159	2008
6	H7236	0347245	Badlands	$19,159	2008
7	K1801	0349383	SF School	$17,027	2010
8	M5333	0350197	Watertown	$19,747	2011
9	M12165	0351076	RC Credit Union	$19,597	2012

8.4.4 PM Monitor Priorities for Equipment Replacement

The Thermo FH64C14 BETA PM continuous monitor is the highest priority for upgrade of the PM monitoring network. This style of monitor has reached it useful life span. The purchase of the Thermo 5014 BETAs in 2013 is the start of that replacement process. If two are purchased per year starting in 2015, it will take three more years to replace this type of monitor.

The second priority would be to replace the old PM_{10} Hi-Vols with the Partisol manual monitors. The replacement can be completed with current equipment. But this change would leave no backup monitor to support both the PM_{10} and $PM_{2.5}$ manual monitoring sites. A backup Partisol 2000 monitor should be purchased in the next two years so this change can be made by the start of 2016.

8.5 Continuous Gas Analyzers and Calibrators

The gaseous pollutant air monitoring network consists of continuous gas analyzers and calibrators that date back to 2003. The department has purchased various pieces of equipment nearly every year over the past decade with the last being an ozone analyzer, multi gas calibrator and a NOx analyzer in 2014. The department typically purchases replacement equipment for instruments that are 7–10 years old, although some analyzers, such as ozone can have a longer lifespan. Most of the analyzers and calibrators can be purchased for between $9,000 and $13,000.

8.5.1 Ozone Analyzers

The department currently operates ozone analyzers at six sites throughout South Dakota. The ozone instruments have been the most reliable and durable instruments in the monitoring network. In fact, the three oldest instruments in the network are an ozone analyzer and two calibrators purchased in 2003.

The department purchased a new ozone analyzer in 2014, with the anticipation of eventually needing to replace the ozone equipment at Badlands National Park. This purchase gave us three backup ozone analyzers. The backup ozone analyzer in the lab is also used to conduct checks on ozone transfer standards, which could be put in the field in case of an emergency.

On March 31, 2015 the department replaced both the ozone analyzer and calibrator at the Badlands site. The two ozone instruments that were replaced at the Badlands were provided by the National Park Service, who operated them before the department took over the monitoring at this site. These instruments were altered by the National Park Service consultant, Air Resource Services, and operated a little differently, which made it difficult to make repairs. For this reason, the department used one of our backup ozone analyzers at the Badlands site. With this move, the department still has two backup ozone analyzers (See Table 8-7).

Table 8-7 – Ozone Analyzers

No.	S/N	Asset #	Location	Purchase $	Date Purchased
1	49c-78317-388	340664	SFSD	$6,345.00	2003
2	0414006406	341964	Badlands	$6,596.00	2004
3	0525812377	343703	Lab	$7,081.20	2005
4	0615817056	344589	Wind Cave	$7,069.00	2006
5	0810029426	3M Project	BRF	$7,137.00	2008
6	08270002	347239	Black Hawk	$7,137.00	2008
7	131057856	352631	Lab	$9,450.00	2013
8	1427262856	354125	UC 1	$9,150.00	2014

8.5.2 SO_2 Analyzers

The department operates SO_2 analyzers at four sites in South Dakota. The department also has several SO_2 backup analyzers housed in the lab for use when there is a major repair needed.

The SO_2 analyzers have been fairly reliable and seldom need to be sent in for repair. Occasionally a lamp or detector needs to be replaced, which is something the department can do in-house. As with most Thermo Scientific instruments, the department does replace the pumps and installs pump kits on occasion, which is also something the department does in-house. The oldest model is from 2004, but the department does have a couple backups from 2009 and 2011.

The department gained another backup analyzer when Union County site #2 was shut down and with the current inventory, the department should not have to purchase any new analyzers for at least two to three years. However, the state of SD may need to determine compliance with the new 1-hour SO_2 standard for large sources. The Big Stone power plant would qualify which could cause us the need to establish one or possibly two monitoring sites near the facility. The department believes it has the SO_2 instruments to develop one site, but if two are required the department would need to purchase an additional SO_2 analyzer (See Table 8-8).

Table 8-8 – SO_2 Analyzers

No.	S/N	Asset #	Location	Purchase $	Date Purchased
1	0414006405	341883	Badlands	$8,585.00	2004
2	0525112351	343645	Lab	$9,292.50	2005
3	0621217058	344692	SFSD	$12,865.00	2006
4	0829531903	347356	UC 1	$11,079.00	2008
5	0829531904	347357	Credit Union	$11,079.00	2008
6	0926837682	348300	Lab	$11,079.00	2009
7	1117348531	350199	Lab	$12,065.00	2011

8.5.3 NO_2 Analyzers

The department operates NO_2 analyzers at four sites in South Dakota. The department has two backup analyzers. One is located in the lab and the other is at the regional office in Sioux Falls. Our newest analyzer was purchased in 2014.

NO_2 analyzers have been the most difficult to maintain and operate of the gaseous pollutant analyzers. Replacement parts can be very expensive and if the instrument needs to go back to the factory for repair, the cost can easily reach $1,000 - $2,000. The oldest analyzer in our network, which is a C-Series instrument, was purchased in 2004. The department recently sent to surplus a 2005 analyzer that continually needed repairs and was costing a lot to maintain.

At 11 years of age, the 2004 analyzer should be replaced in the next year or two as Thermo Scientific has indicated they will stop producing parts for the older C-Series instruments (See Table 8-9).

Table 8-9 – NO_2 Analyzers

No.	S/N	Asset #	Location	Purchase $	Date Purchased
1	0414006404	341932	Badlands	$9,241.91	2004
2	0615817057	344588	SFSD	$10,125.00	2006
3	0824131748	347241	UC 1	$10,350.00	2008
4	0824131747	347242	Credit Union	$10,350.00	2008
5	1018243236	349205	SFSD	$22,475.45	2010
6	1116748523	350098	Rapid City	$11,671.00	2011
7	1424162705	354197	Sioux Falls	$13,100.00	2014

8.5.4 CO Analyzers

The department operates just one CO analyzer at our NCORE site in Sioux Falls. A CO analyzer was located at Union County #1 for a few years, but has since been shut down and that analyzer is now the backup for the NCORE site. The Thermo Scientific CO analyzer in Sioux Falls has been very reliable with very few issues over the years. The monitor has never needed to go back to the factory for repair and very few replacement parts have been needed, making this instrument fairly inexpensive to operate. With no future expansion of CO sites in the plan for

South Dakota there does not appear to be a need for additional CO analyzers at this time (See Table 8-10).

Table 8-10 – CO Analyzers

No.	S/N	Asset #	Location	Purchase $	Purchase Date
1	0723923521	346191	SFSD	$13,320.00	2007
2	0174	347421	Lab	$9,328.75	2008

8.5.5 Multi-gas/Ozone Calibrators

The department operates a either a multi-gas or ozone calibrator at each of the monitoring sites with gas analyzers. The department originally used primarily Thermo Scientific calibrators for weekly checks and quarterly audits. Since then, the department started purchasing Environics 6103 calibrators, which can be used for multi-gas, ozone and photometer operation and are much lighter and easier to transport. Both types of calibrators have been very reliable and inexpensive to operate. The annual calibration of the flow controllers in these instruments has been the only recurring cost. The department has two Thermo Scientific 146C and one 49C PS calibrators that need to be replaced in the next year or two (See Table 8-11).

Table 8-11 – Multi-gas/Ozone Calibrators

No.	S/N	Asset #	Location	Purchase $	Date Purchased
1	49CPS-7832-388	340751	BRF O_3 Only	$7,583.33	2003
2	49CPS-78318-388	340753	Lab O_3 Only	$7,583.33	2003
3	0414006403	341965	Lab	$9,235.00	2004
4	0414006402	341966	Lab	$9,039.75	2004
5	0414006401	341967	Badlands O_3 Only	$7,871.00	2004
6	0528713392	343674	Badlands	$9,778.00	2005
7	0525812378	343830	Lab O_3 Only	$8,942.85	2005
8	0623018063	344875	Lab	$10,350.00	2006
9	0824131746	347240	Black Hawk O_3 Only	$9,630.00	2008
10	0807328333	N/A	Wind Cave O_3 Only	$9,630.00	2008
11	4290	347267	Lab	$10,440.00	2008
12	4298	347268	Lab	$10,440.00	2008
13	4299	347269	Credit Union	$10,440.00	2008
14	4561	348429	UC 1	$10,440.00	2009
15	4562	348430	SFSD	$10,440.00	2009
16	1353	350198	Lab	$10,485.00	2011
17	5881	352825	Lab	$10,615.00	2013
18	6223	354154	SF Office	$10,485.00	2014

8.5.6 Gas Pollutant Sampling Priorities for Equipment Replacement

If required to test around the Big Stone Power Plant a new SO_2 analyzer would be the top priority. The next priority is to replace the older C Series NO_2 analyzers and calibrators before the manufacturer stops making replacement parts. The site calibrator at the Badlands Site will be the top priority for replacement.

9.0 COMPLIANCE WITH NAAQS

This section provides a comparison of the collected data to the NAAQS. The comparison will determine if an area is attaining the standard. In addition, the comparison will assist in determining if more monitoring stations for certain parameters are needed in an area or an area no longer needs to monitor for a certain parameter or parameters.

9.1 Particulate Matter (PM_{10})

The PM_{10} NAAQS is based on a 24-hour average concentration. The maximum 24-hour average concentration allowed is 150 micrograms per cubic meter (ug/m^3). Attainment with the 24-hour standard is demonstrated when there is less than or equal to one expected exceedance per year averaged over three years. A 24-hour average concentration of 154.4 ug/m^3 is the highest level that still attains the 24-hour standard for PM_{10}.

In 2014, the statewide PM_{10} monitoring network included 10 monitoring locations. Three of the sites recorded data using manual monitors providing 24-hour sample concentrations. Seven of the sites have continuous samplers providing 1-hour concentrations. Rapid City has two PM_{10} air monitoring sites. Cities with one site include Sioux Falls, Aberdeen, Watertown, Black Hawk, and Brookings. Rural sites are operated at Badlands, Wind Cave and Union County.

Table 9-1 contains a list of the expected exceedance rate, second maximum concentration, attainment status and percent of the standard for the PM_{10} ambient air monitors throughout the state for calendar years 2012 to 2014. The percent of the standard is the second maximum concentration divided by the standard (150 µ/m^3). Sites with a PM_{10} percent standard greater than 80% of the NAAQS have a potential to have a 24-hour sample exceed the PM_{10} standard. The Rapid City Credit Union Site is the only site that has a percent greater than 80%.

Table 9-1 – Statewide PM_{10} 24-Hour Concentrations

Site	Expected Exceedance Rate	Second Maximum	Attainment?	Percent of the Standard
RC Library	0	49 ug/m^3	Yes	32%
RC Credit Union	0	123 ug/m^3	Yes	82%
Black Hawk	0	31 ug/m^3	Yes	21%
SF School	0	63 ug/m^3	Yes	42%
Badlands	0	28 ug/m^3	Yes	19%
Brookings	0	65 ug/m^3	Yes	43%
Aberdeen	0	36 ug/m^3	Yes	24%
Watertown	0	94 ug/m^3	Yes	63%
Wind Cave	0	23 ug/m^3	Yes	15%
UC #1	0	74 ug/m^3	Yes	49%

In 2012, 2013 and 2014, no PM_{10} concentrations exceeded the 24-hour standard. Currently, all the sites in South Dakota are attaining the PM_{10} 24-hour standard.

9.2 Particulate Matter ($PM_{2.5}$)

The $PM_{2.5}$ NAAQS consists of a 24-hour and annual standard. The 24-hour standard is 35 ug/m^3. Attainment of the 24-hour standard is achieved when the maximum 24-hour average concentration, based on the annual 98th percentile averaged over three years (24-hour average design value), is less than or equal to 35 ug/m^3.

The $PM_{2.5}$ annual standard is 12 ug/m^3. Attainment is demonstrated when the maximum annual arithmetic mean averaged over three consecutive years (annual design value) is equal to or less than 12 ug/m^3.

The testing for $PM_{2.5}$ concentrations continues to be a major priority for the state as EPA continues to lower the standard. EPA revised the 24-hour standard significantly lower, by 46%, in 2006. EPA then revised the annual standard in 2012 from 15 to 12 μ/m^3 which represents a 20% reduction in the annual standard. Sample concentrations that were well under the standard before now have levels near the revised standards.

In 2014, there were 10 $PM_{2.5}$ SLAMS sites operated in the state. Federal Reference Method (FRM) manual monitors, Partisol 2000, were operated at four of the $PM_{2.5}$ sites. Met One BAM continuous $PM_{2.5}$ monitors with Federal Equivalent Method designation were operated at six of the sites. The SD School Site operates both methods.

9.2.1 $PM_{2.5}$ 24-Hour Standard

Table 9-2 shows the yearly 24-hour 98th percentile for calendar years 2012 to 2014 used in the calculation of the 24-hour design value for $PM_{2.5}$ in 2014, the 24-hour design value, designation status of each site, and the percent of the standard. The percent of the standard in this case and for the rest of the pollutants is the design value divided by the standard. In 2014, the highest 24-hour 98th percentile concentration was 23.1 ug/m^3 or 66% of the standard and was recorded at the UC #1 Site in Union County on a Met One BAM continuous $PM_{2.5}$ monitor. The site with the second highest 24-hour 98th percentile concentration was at the SD School Site at 22.8 ug/m^3 collected on a Met One BAM continuous $PM_{2.5}$ monitor.

Table 9-2 – Statewide $PM_{2.5}$ 24-Hour Concentrations

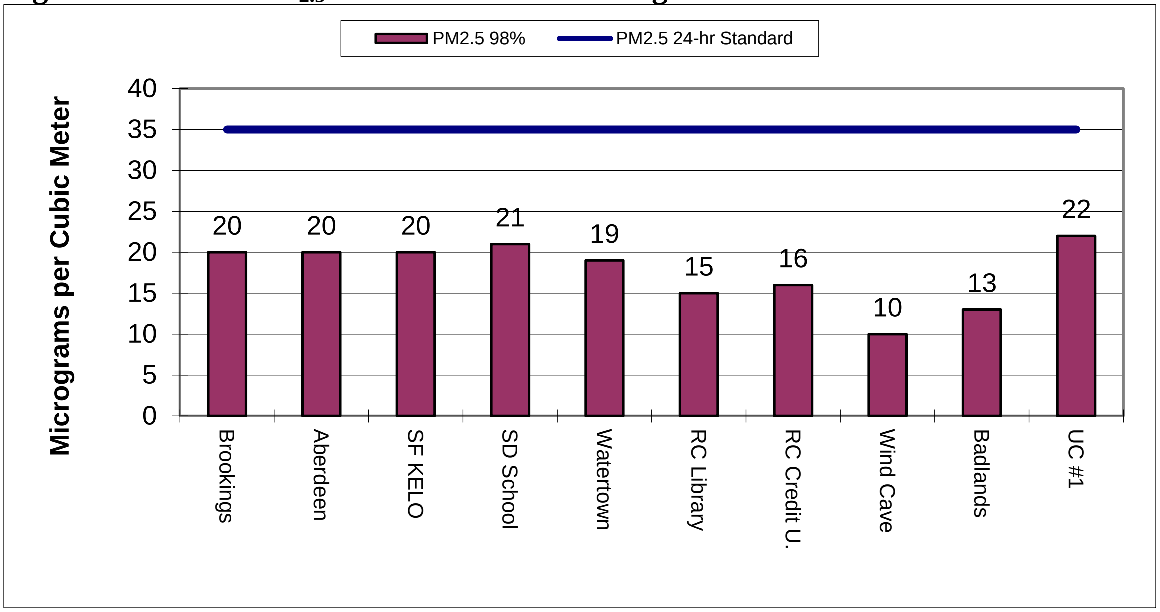
Site	Yearly 98th Percentile	24-hour Design Value 2014	Attainment Status	Percent of the Standard
RC Library	2012 – 14.5 ug/m^3 2013 – 14.2 ug/m^3 2014 – 16.0 ug/m^3	15 ug/m^3	Yes	43%
RC Credit Union	2012 – 17.1 ug/m^3 2013 – 15.3 ug/m^3 2014 – 15.0 ug/m^3	16 ug/m^3	Yes	46%
Badlands	2012 – 12.9 ug/m^3 2013 – 13.9 ug/m^3 2014 – 11.4 ug/m^3	13 ug/m^3	Yes	37%

Site	Yearly 98th Percentile	24-hour Design Value 2014	Attainment Status	Percent of the Standard
SD KELO	2012 – 20.8 ug/m^3 2013 – 21.8 ug/m^3 2014 – 18.6 ug/m^3	20 ug/m^3	Yes	57%
SD School	2012 – 17.3 ug/m^3 2013 – 23.4 ug/m^3 2014 – 22.8 ug/m^3	21 ug/m^3	Yes	60%
Aberdeen	2012 – 22.6 ug/m^3 2013 – 21.1 ug/m^3 2014 – 17.4 ug/m^3	20 ug/m^3	Yes	57%
Brookings	2012 – 20.6 ug/m^3 2013 – 22.9 ug/m^3 2011 – 17.7 ug/m^3	20 ug/m^3	Yes	57%
Watertown	2012 – 21.5 ug/m^3 2013 – 21.0 ug/m^3 2014 – 15.3 ug/m^3	19 ug/m^3	Yes	54%
Wind Cave	2012 – 14.9 ug/m^3 2013 – 9.4 ug/m^3 2014 – 7.1 ug/m^3	10 ug/m^3	Yes	29%
UC #1	2012 – 19.7 ug/m^3 2013 – 22.6 ug/m^3 2011 – 23.1 ug/m^3	22 ug/m^3	Yes	63%

Figure 9-1 contains a graph of the 24-hour design values for each site. The highest design value in 2014 was recorded at the UC #1 Site with a concentration of 22 ug/m^3 or 63% of the standard. The SD School Site had the next highest design value at 21 ug/m^3. As expected, the background site of Wind Cave had the lowest 24-hour design values for $PM_{2.5}$ at 10 ug/m^3. The monitoring sites had a mixed change with some increasing, some decreasing, and others staying the same in concentration levels with the addition of the 2014 data. All sites are attaining the 24-hour $PM_{2.5}$ standard.

The design values across the state appear to be moving closer to the same concentration levels by region. For example all the east half of the state sites are within 3 ug/m^3 of each other. In the western part of the state there is a slightly larger difference of 6 ug/m^3 between sites which is unchanged from the 2013 comparison.

Figure 9-1 – 2014 $PM_{2.5}$ Statewide 24-Hour design values



During 2012, none of the monitoring sites had a concentration greater than the 24-hour $PM_{2.5}$ standard. In 2013, the two sites in Union County had levels greater than the standard on the same day. There were four sites with concentrations greater than the standard on the same day in eastern edge of the state in 2014. The remaining sites in the state had no exceedances of the standard in 2014.

When using the 98th percentile standard one or two 24-hour $PM_{2.5}$ concentrations greater than the standard at a continuous monitoring site will not affect the 24-hour design value or the area attainment status because the 98th percentile may be the 7th or 8th highest reading for the year. But these concentrations may affect the annual design value and need to be considered when evaluating the data results for each year.

9.2.2 $PM_{2.5}$ Annual Standard

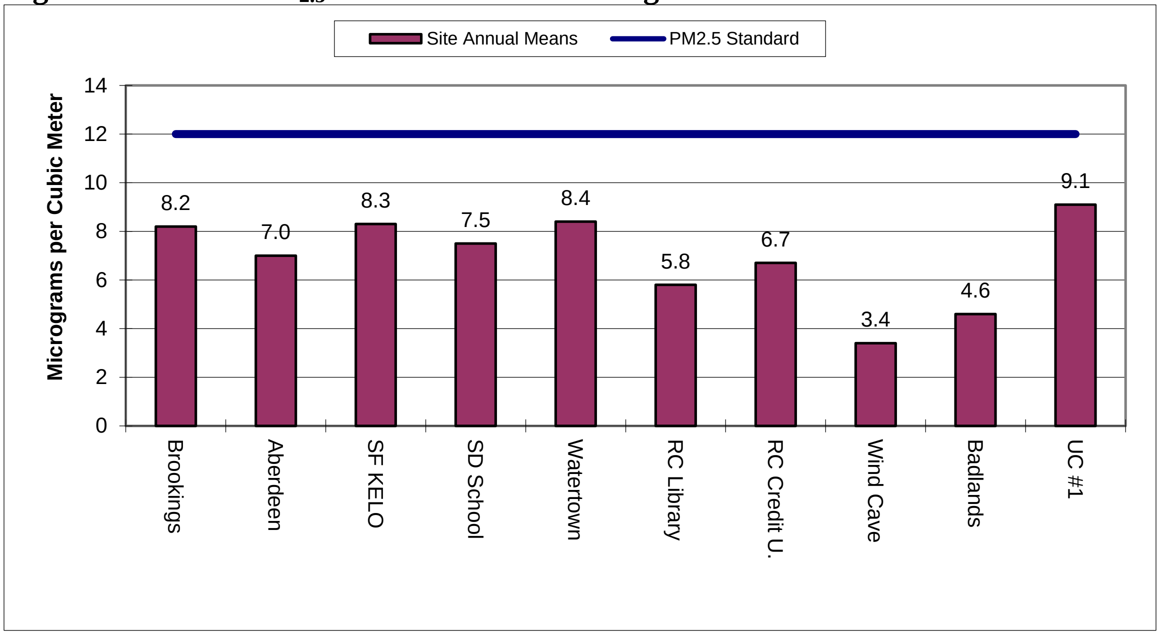
Table 9-3 contains a list of the annual averages, annual design values, attainment status, and percent of the standard for each of the $PM_{2.5}$ sites using the data from 2012 to 2014 in the state. The highest annual average concentration in 2014 was recorded at UC #1 Site at 8.6 ug/m^3. The second highest annual concentration was at the KELO and Brookings sites with an annual average of 7.7 ug/m^3. The Wind Cave Site had the lowest annual average at 2.4 ug/m^3 in 2014, slightly lower than in 2013.

Table 9-3 – Statewide $PM_{2.5}$ Annual Concentrations

Site	Annual Averages	2014 Annual Design Values	Attainment Status	Percent of the Standard
RC Library	2012 – 5.8 ug/m^3 2013 – 6.1 ug/m^3 2014 – 5.8 ug/m^3	5.8 ug/m^3	Yes	48%
RC Credit Union	2012 – 6.3 ug/m^3 2013 – 7.9 ug/m^3 2014 – 4.5 ug/m^3	6.7 ug/m^3	Yes	56%
Badlands	2012 – 4.1 ug/m^3 2013 – 5.3 ug/m^3 2014 – 4.3 ug/m^3	4.6 ug/m^3	Yes	38%
KELO	2012 – 8.7 ug/m^3 2013 – 8.6 ug/m^3 2014 – 7.7 ug/m^3	8.3 ug/m^3	Yes	69%
SD School	2012 – 6.0 ug/m^3 2013 – 8.9 ug/m^3 2014 – 7.4 ug/m^3	7.5 ug/m^3	Yes	63%
Brookings	2012 – 8.6 ug/m^3 2013 – 8.2 ug/m^3 2014 – 7.7 ug/m^3	8.2 ug/m^3	Yes	68%
Aberdeen	2012 – 7.5 ug/m^3 2013 – 7.3 ug/m^3 2014 – 6.2 ug/m^3	7.0 ug/m^3	Yes	58%
Watertown	2012 – 11.0 ug/m^3 2013 – 9.7 ug/m^3 2014 – 4.5 ug/m^3	8.4 ug/m^3	Yes	70%
Wind Cave	2012 – 4.9 ug/m^3 2013 – 3.1 ug/m^3 2014 – 2.4 ug/m^3	3.4 ug/m^3	Yes	28%
UC #1	2012 – 9.9 ug/m^3 2013 – 8.9 ug/m^3 2014 – 8.6 ug/m^3	9.1 ug/m^3	Yes	76%

Figure 9-2 contains a graph of the $PM_{2.5}$ annual average design value for each site. None of sites in the network had a 2014 design value that exceeded the annual $PM_{2.5}$ standard. The 2014 annual design value for each site followed the same pattern as the 24-hour levels. The highest design values occur in the eastern third of the state. The highest annual design value occurred at the UC #1 Site with a level of 9.1 ug/m^3 which is 76% of the annual standard. The lowest $PM_{2.5}$ annual design value occurred at the Wind Cave Site with a concentration of 3.4 ug/m^3 which is 28% of the annual standard. All of the $PM_{2.5}$ sites trended lower in annual average design values with the addition of the 2014 data.

Figure 9-2 – 2014 $PM_{2.5}$ Statewide Annual Design Values



9.3 Lead

During the early 1980's, the department conducted lead sampling. The levels detected were well below the NAAQS levels at that time. After passage of the 1990 Clean Air Act Amendments, there were concerns with the way EPA had instructed states in determining if those areas were in attainment of the lead standard. For this reason, a monitoring site was established in April 1992, at the Jaehn's Site in Rapid City to determine compliance with the standard. This site was downwind of GCC Dacotah, which is a cement plant that burns coal and has the potential to emit lead. The results of the analyzed data from the second quarter of 1992 through the first quarter of 1994 showed lead levels well below the NAAQS. Due to the low concentrations of lead in Rapid City, the sampling site was terminated at the end of the first quarter in 1994.

EPA changed the lead NAAQS on October 15, 2008. The change significantly lowered the lead standard from 1.5 ug/m^3 to 0.15 ug/m^3 based on the annual maximum three month rolling average. Attainment of the lead NAAQS is achieved if the annual maximum three month rolling average, averaged over a three year period, is less than or equal to 0.15 ug/m^3.

In 2010, EPA completed a rule change that requires source type testing in addition to network testing if a source has emissions of 0.5 tons or greater per year. The rule originally required lead testing at the NCore Site. The final rule required lead testing at the NCore Site only if the site is located in a city with a 500,000 and greater population. None of the facilities in the South Dakota emissions inventory have lead emissions at or greater than 0.5 tons per year so no source related testing is required at this time. The NCore site is located in Sioux Falls and the city has a population under 500,000 so no testing is required. Currently, there are no lead sampling sites planned for South Dakota because of the low potential for concentrations of lead pollution.

The lead sampling in the past and current emissions levels indicates that South Dakota is attaining the new lead standard.

9.4 Ozone

Ozone monitoring in South Dakota will continue to be one of the priority air pollutants because concentrations are getting close to the standard as EPA continues to lower the ozone standard. Ozone concentrations have not changed significantly in the state but the revisions of the standard brings the concentration closer to the state's background levels.

In 1999, the first ozone monitor was setup in South Dakota and was located at the Sioux Falls Hilltop Site. In 2000, a second ozone monitor was added at the Robbinsdale Site in Rapid City. In 2005, the Rapid City ozone monitoring site was moved to the RC Credit Union Site because of the planned move of the Robbinsdale sampling shelter to the Wind Cave Site.

In 2003, the National Parks Service added an ozone monitor to the Badlands Site. It is located in a shelter next to the IMPROVE monitors near the park visitor center/headquarters.

In 2005, a fourth ozone site was added at the Wind Cave Site. The Wind Cave Site was added to determine if a large increase in oil and gas production in Colorado, Wyoming and Montana would cause impacts on the Wind Cave National Park, which is a Class I area.

Air dispersion modeling results completed by the department showed the RC Credit Union Site does not meet location requirements in 40 CFR Part 58 because it is located in the middle of the one microgram impact area for NO_2 emissions from industrial sources in Rapid City. NO_2 emissions artificially lower ozone levels for a short distance from the source so concentrations will not reflect the actual area levels. Because of the NO_2 emissions the ozone analyzer was moved from the RC Credit Union Site to the Black Hawk Site in 2007.

Beginning in 2008, the Hilltop Site had to be moved and a new location was found at the School for the Deaf campus. The move to a new location was required because the city of Sioux Falls had to revert the Hilltop property back to the original owner when the water tower system was replaced ending the agreement to use the property.

In 2008, a fifth site was added north of Brookings at the Research Farm. The site was setup and operated in cooperation with the 3M Company and Valero Renewable Fuels Company as part of the issuance of a Prevention of Significant Deterioration permit.

In 2008, EPA adopted a new ozone standard at 0.075 ppm. The form of the standard remained as the fourth highest, daily 8-hour average, averaged over three years (ozone design value). In 2011, EPA implemented the 0.075 parts per million standard. EPA is also completing a 5-year review of the ozone standard in 2012 and when completed could further lower the standard.

In 2009, because of an application for a Prevention of Significant Deterioration permit a sixth site was added in the area of the proposed project in Union County UC #3 Site. After the permit expired with no renewal the department moved the ozone analyzer to the UC #1 Site.

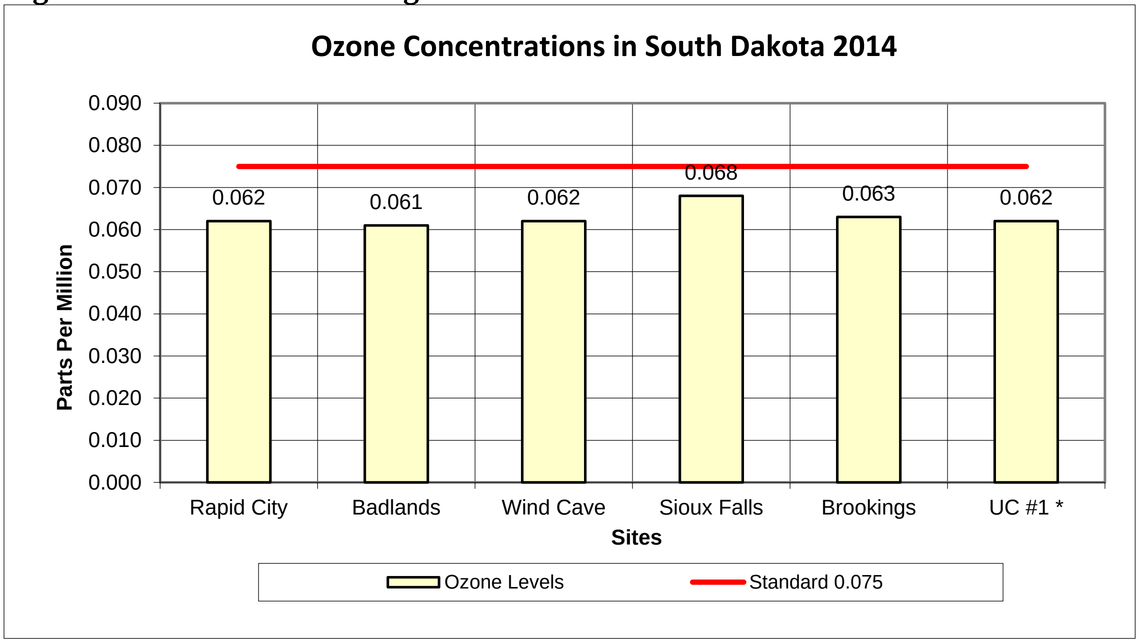
The 4th highest concentration for each year, 2014 design value in parts per million (ppm), attainment status, and percent of the standard for each of the sites can be seen in Table 9-4 and the 2014 design value is summarized in Figure 9-3. In 2014, the SD School Site had the highest 3-year average ozone concentrations in the state at 0.068 ppm, which is 91% of the 2008 revised ozone standard. The SD School Site continues to be the highest ozone highest concentration site in the state since 2010. The second highest location is the Research Farm Site at 0.063 ppm also located in the eastern edge of the state. Since 2008, both the Wind Cave and Badlands sites are reporting significantly lower ozone design values with the Badlands now the lowest site in the state. Ozone concentrations had a significant increase from 0.007 to 0.012 ppm for most of the sites statewide in 2012. In 2013, ozone concentrations returned to near each site's average level in some cases dropping 0.005 to 0.008 ppm lower. In 2014, ozone levels dropped slightly at all sites. The 2012 data will continue to keep ozone design values higher until the year falls out of the three year calculation at the end of 2015.

Table 9-4 – Statewide Ozone 4th highest Concentrations

Site	4th Highest Concentration	3-year Average Design Values	Attainment Status	Percent of the Standard
SD School	2012 – 0.072 ppm 2013 – 0.067 ppm 2014 – 0.066 ppm	0.068 ppm	Yes	91%
Research Farm	2012 – 0.067 ppm 2013 – 0.063 ppm 2014 – 0.061 ppm	0.063 ppm	Yes	84%
Black Hawk	2012 – 0.068 ppm 2013 – 0.063 ppm 2014 – 0.056 ppm	0.062 ppm	Yes	83%
Badlands	2012 – 0.064 ppm 2013 – 0.062 ppm 2014 – 0.057 ppm	0.061 ppm	Yes	81%
Wind Cave	2012 – 0.069 ppm 2013 – 0.061 ppm 2014 – 0.057 ppm	0.062 ppm	Yes	83%
UC #1	2012 – 2013 – 0.063 ppm 2014 – 0.062 ppm	0.062 ppm	Yes	83%

The data collected in the past three years demonstrates that South Dakota is attaining the national ozone standard but the sites located in the eastern part of the state are close to the 2008 ozone standard.

Figure 9-3 – 2014 Ozone Design Values Statewide



* Less than three years of sampling data.

9.5 Sulfur Dioxide

Concentrations of SO_2 are low in the state where the department believes the greatest SO_2 concentrations should occur and the probability of exceeding the standard is very low. Based on the data collected statewide, testing for this parameter should remain a low priority, except for the possible SO_2 monitoring required by EPA's consent decree with the Sierra Club. The department may need to monitor SO_2 in Grant County starting in 2016.

Four SO_2 ambient air monitoring sites were operated in 2014. The analyzers were located at SD School, Badlands, RC Credit Union, and UC #1 sites. EPA made a major change to the SO_2 standard in 2009 replacing the 24-hour and annual primary standard with a new 1-hour standard. The 1-hour SO_2 standard concentration is 75 parts per billion (ppb) based on the three year average of the yearly 99th percentile level (1-hour design value). The 3-hour secondary standard for SO_2 was not changed by EPA during this review.

9.5.1 Sulfur Dioxide 1-Hour Standard

Table 9-5 contains the yearly 99th percentile concentration, the 3-year average 1-hour design value, the attainment status, and present of the standard for each site. The site SO_2 design values are based on SO_2 data collected in 2012 to 2014. The highest 99th percentile 1-hour level in 2014 was recorded at the SD School Site at 11 ppb.

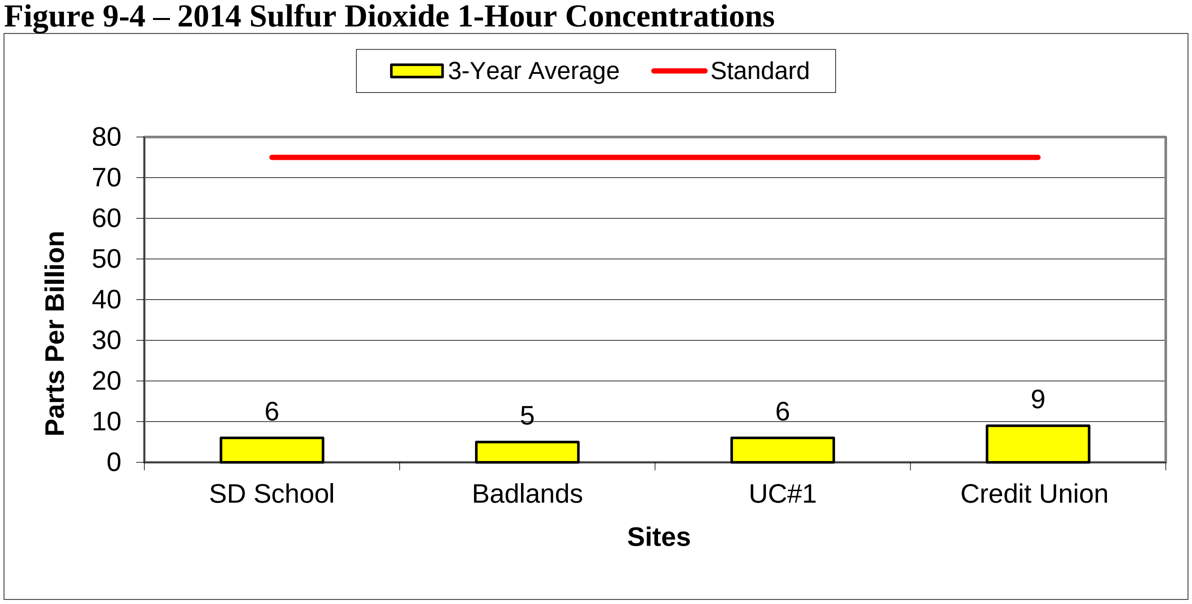
Table 9-5 – 2013 Statewide Sulfur Dioxide 1-hour Design Values

Site	99^{th} Percentile Concentration	3-year Average Design Values	Attainment Status	Percent of the Standard
SD School	2012 – 6 ppb 2013 – 9 ppb 2014 – 11 ppb	6 ppb	Yes	8%
RC Credit Union	2012 – 10 ppb 2013 – 9 ppb 2014 – 7 ppb	9 ppb	Yes	12%
Badlands	2012 – 3 ppb 2013 – 9 ppb 2014 – 2 ppb	5 ppb	Yes	7%
UC #1	2012 – 9 ppb 2013 – 6 ppb 2014 – 4 ppb	6 ppb	Yes	8%

Figure 9-4 shows the three year average of the yearly 99^{th} percentile or design value for the 1-hour concentration for each of the sites in the network for 2014. All four of the sites recorded concentrations well under the 1-hour standard. The highest 1-hour design value was recorded at the Credit Union Site with a maximum concentration of 9 ppb which is 12% of the standard. The second highest was recorded at the UC #1 and SD School sites with a concentration of 6 ppb which is 8% of the standard.

The data collected in the past three years demonstrates that South Dakota is attaining the new 1-hour SO_2 standard.

Figure 9-4 – 2014 Sulfur Dioxide 1-Hour Concentrations



9.5.2 Sulfur Dioxide 3-Hour Secondary Standard

The secondary SO_2 standard is based on a 3-hour average concentration of 0.500 ppm, not to be exceeded more than once per year. The EPA Air Quality Systems does not calculate the yearly 3-hour average so a comparison could not be made to the secondary standard for SO_2. South Dakota has very low levels of SO_2 at the four monitoring sites. Therefore, the department has opted to use the maximum 1-hour concentrations as a comparison for the 3-hour standard for SO_2. If the maximum 1-hour average does not exceed the secondary standard there should not be an issue with attainment.

The highest 1-hour average concentration was recorded at the SD School Site at 0.020 ppm which is 4% of the SO_2 secondary standard. All four sites are attaining the secondary standard for SO_2.

9.6 Nitrogen Dioxide

Beginning in 2010 the standard for NO_2 was revised by adding a 1-hour standard of 100 ppb and keeping the annual arithmetic mean standard of 53 ppb. Attainment is demonstrated when the 3-year average of 98th percentile daily maximum 1-hour concentration is less than or equal to 100 ppb (1-hour design value) and the annual arithmetic mean is less than or equal to 53 ppb (annual design value).

There were four NO_2 ambient air monitoring sites operated in 2014. The sampling locations were at the SD School, Badlands, RC Credit Union, and UC #1 sites.

Levels of NO_2 remain low in the state. Rural sites like Badlands remain well below the standard. Future priority locations for testing will include one year of testing for current background levels and multiple years of testing near major sources of NO_2 emissions for compliance with the national standards.

9.6.1 Nitrogen Dioxide 1-Hour Standard

Table 9-6 contains the 1-hour 98th percentile concentration for each of the last three years, 1-hour design values, the attainment status, and the percent of the standard for each site. The RC Credit Union Site had the highest yearly 98th percentile 1-hour concentration at 33.8 ppb. The second highest 1-hour concentration for 2014 was recorded at the SD School Site at 33.3 ppb.

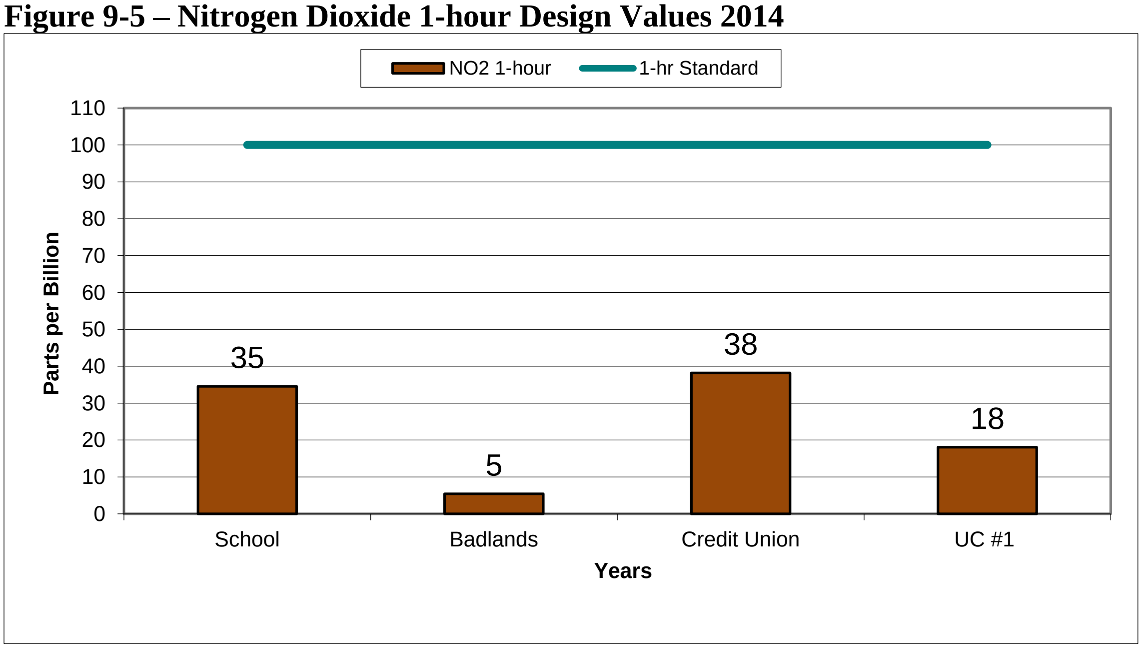
Table 9-6 – Nitrogen Dioxide 1-Hour 98th Percentile Concentrations

Site	98th Percentile Concentration	3-year Average Design Values	Attainment Status	Percent of the Standard
SD School	2012 – 36.6 ppb 2013 – 33.8 ppb 2014 – 33.3 ppb	35 ppb	Yes	35%
Badlands	2012 – 6.9 ppb 2013 – 6.0 ppb 2014 – 3.3 ppb	5 ppb	Yes	5%
RC Credit Union	2012 – 42.2 ppb 2013 – 38.6 ppb 2014 – 33.8 ppb	38 ppb	Yes	38%
UC #1	2012 – 15.9 ppb 2013 – 17.6 ppb 2014 – 20.7 ppb	18 ppb	Yes	18%

Figure 9-5 shows the NO_2 1-hour design values for each of the sites with three years of data. The RC Credit Union Site had the highest concentration at 38 ppb or 38% of the standard. The SD School Site recorded the 2nd highest 1-hour NO_2 design value at 35 ppb or 35% of the standard. In general the rural areas with background levels have concentrations near the detection level. Rural areas impacted by a large source of NO_2 emissions like at UC #1 recorded higher concentrations than background sites but the levels are still well under the standard.

All sites had concentrations under the 1-hour NO_2 standard and are attaining the standard using data from 2012 to 2014.

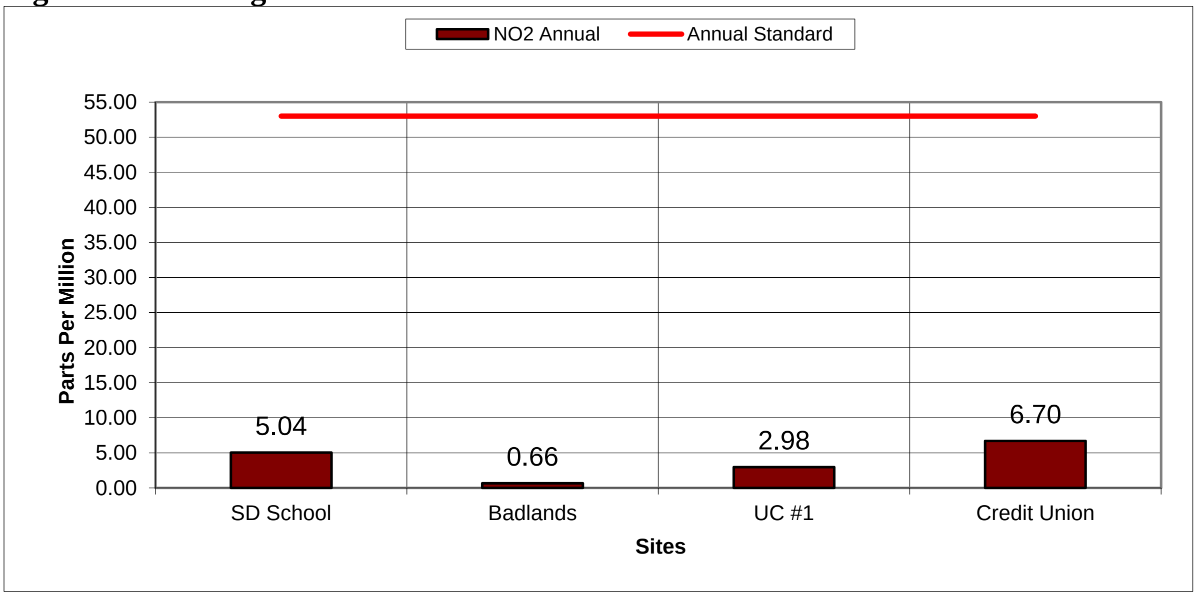
Figure 9-5 – Nitrogen Dioxide 1-hour Design Values 2014



9.6.2 Nitrogen Dioxide Annual Standard

Figure 9-6 shows the annual average for the four sites operated in 2014. The highest NO_2 annual average was recorded at the Credit Union Site at 6.70 ppb. The Badlands Site remained at about same level near the detection level for the sampling method. In 2014, all four sites attained the annual standard for NO_2.

Figure 9-6 – Nitrogen Dioxide Annual Concentration 2014



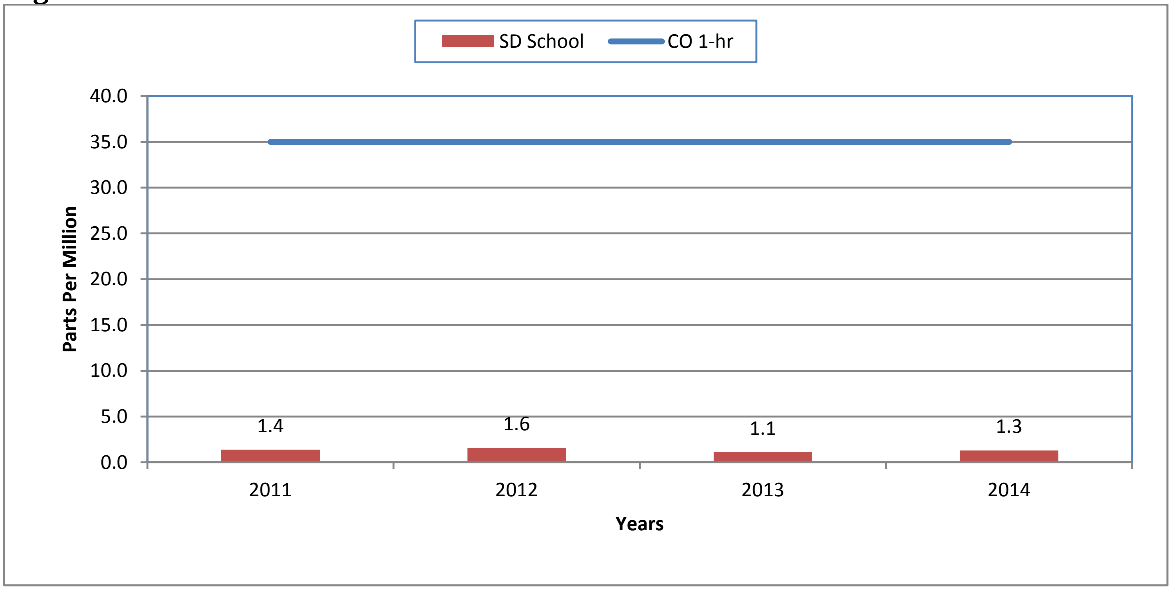
9.7 Carbon Monoxide

CO testing has a low priority in South Dakota. South Dakota's low population and traffic numbers on the state's roads keep the potential very low for concentrations near or over the standard.

The CO standard is based on two primary standards in the form of a one-hour and 8-hour average concentration. The department started the operation of the first CO analyzer in January of 2010 at UC #1 Site in Union County. A second analyzer was added to the SD School Site as required by the National Core sampling requirements and began testing at the start of 2011. Three years of testing show low concentrations at the UC #1 Site so testing for CO ended in 2013.

The one-hour standard is 35.0 ppm and is not to be exceeded more than once per year. The highest 1-hour concentration of CO recorded at the SD School Site was 1.3 ppm in 2014. Figure 9-7 shows the CO 1-hour maximum concentrations for the SD School Site from 2011 through 2014. The CO concentrations are very low. The CO data shows the area is attaining the 1-hour NAAQS.

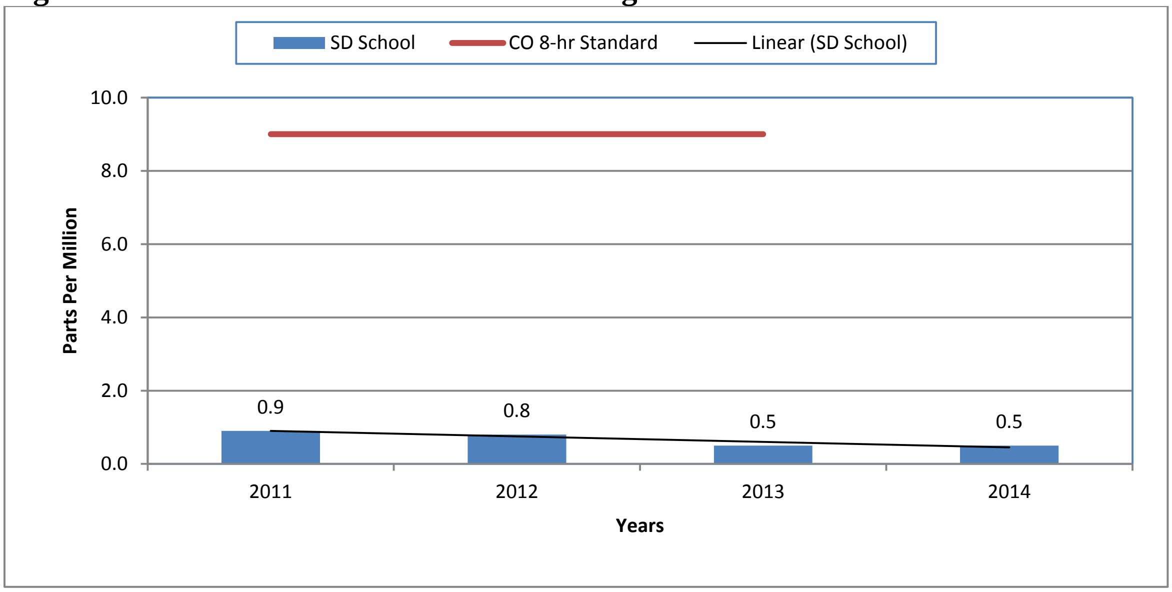
Figure 9-7 - Carbon Monoxide 1-Hour Concentration



The other standard is an 8-hour average concentration of 9.0 ppm, not to be exceeded more than once per year. The highest 8-hour average recorded at the SD School Site was 0.5 ppm in 2014. The CO concentrations are very low so the area is attaining the NAAQS. Figure 9-8 shows the CO maximum 8-hour average concentrations from the SD School Site from 2011 to 2014.

The CO concentrations at the SD School Site represent urban areas being collected in an area that has some of the highest traffic counts in the state. Future sampling may be limited to the collection of a year of data to determine background and population exposure.

Figure 9-8 - Carbon Monoxide 8-Hour Average Concentration



9.8 2014 High Concentrations Summary

Evaluating high concentration days are important because they affect the design values and need to be considered when evaluating the data results for each year. A conceptual theory on what caused the high concentrations can be formed and further developed in future years. In some cases, if local sources are causing the problem, early actions can be taken to reduce concentration levels and further protect public health from high levels. As EPA revises the national standards lower, information on the cause of the high concentration day needs to be collected soon after the event instead of three years after a standard revision. In some cases, the information may show long range transport or an exceptional event.

The department defined high concentration days as days where the concentration was 90% or greater than the applicable standard, except for ozone. For ozone, the department defined high concentration days as any concentration equal to or greater than EPA's proposed standard of 0.070 ppm. The evaluation of high concentration day for each parameter is as follows:

1. Ozone $\geq$ 0.070 ppm 8-hour average
2. $PM_{2.5}$ $\geq$ 32 ug/m3 24-hour average
3. PM_{10} $\geq$ 135 ug/m3 24-hour average
4. NO_2 $\geq$ 90.0 ppb 1-hour max
5. SO_2 $\geq$ 67.0 ppb 1-hour max
6. CO $\geq$ 8.1 ppm 8-hour average
7. CO $\geq$ 31.5 ppm 1-hour max average

A review of the data showed no high concentrations days at the following sites in 2014: Aberdeen, Badlands, Black Hawk, Brookings Research Farm, RC Credit Union, RC Library, Watertown, and Wind Cave. None of the recorded samples for PM_{10}, SO_2, NO_2, and CO had levels that exceeded the high concentration day listed above for these pollutants.

In 2014, $PM_{2.5}$ was the pollutant with the most high concentration days and all were in the eastern part of the state. The Sioux Falls KELO and SD School sites, the Brookings City Hall Site, and the Union County Site all had a high concentration day for $PM_{2.5}$ on March 6^{th}. The Union County site also had high concentration day on March 30^{th} and April 12^{th}. The high $PM_{2.5}$ readings are shown in Table 9-7.

Table 9-7 – 2014 High $PM_{2.5}$ Readings

Monitor	Date	Concentration (ug/m^3)
Brookings City Hall manual monitor	3/6/14	38.2
SF KELO manual monitor	3/6/14	36.6
SF KELO manual QA monitor	3/6/14	35.9
SF SD School manual monitor	3/6/14	36.4
SF SD School continuous monitor	3/6/14	36.5
Union County continuous monitor	3/6/14	35.4
Union County continuous monitor	3/30/14	34.3
Union County continuous monitor	4/12/14	34.7

Figures 9-9 to 9-14 show the AirNow and AirNow Tech maps for the days having high $PM_{2.5}$ readings. The AirNow Tech maps on all these days show many fires to the south with wind blowing from the south pushing the smoke up along the eastern edge of South Dakota.

Figure 9-9 – AirNow Map for 3/6/2014

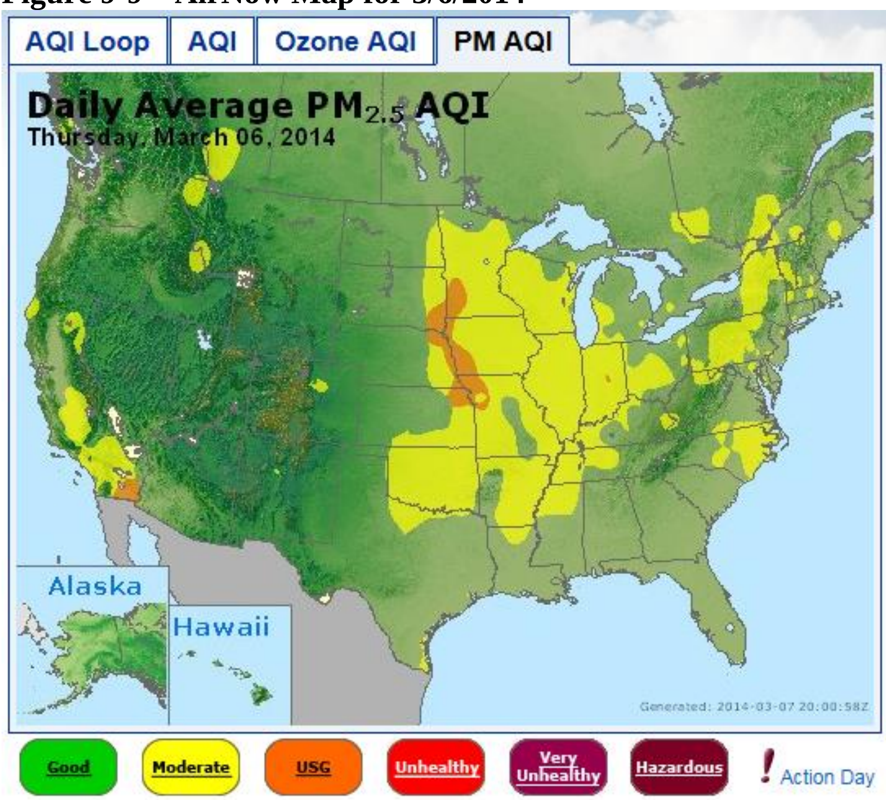


Figure 9-10 – AirNow Tech Map for 3/6/2014

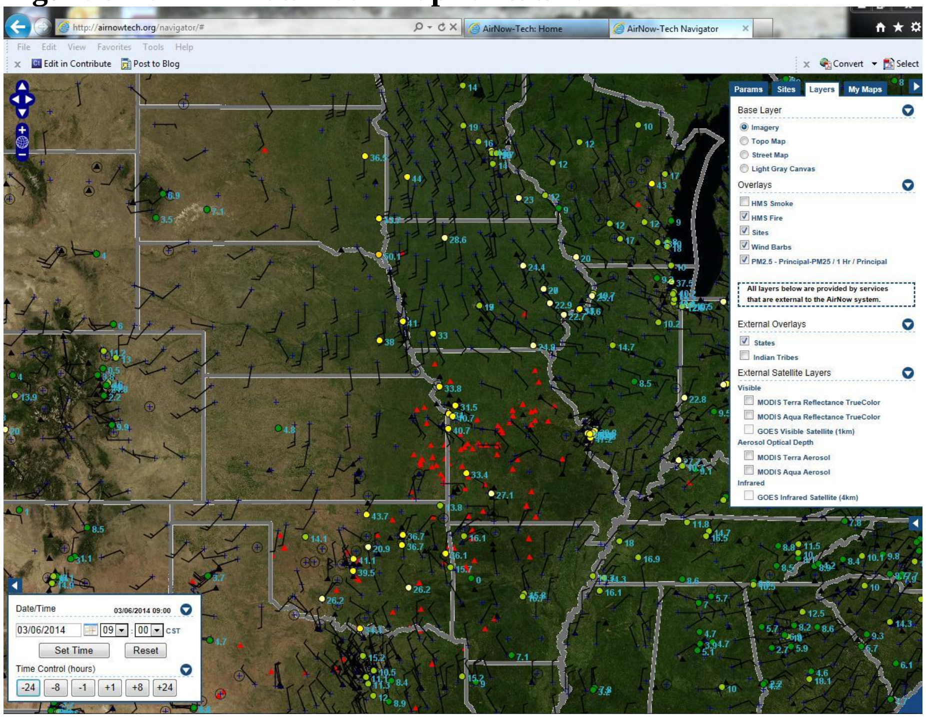


Figure 9-11 – AirNow Map for 3/30/2014

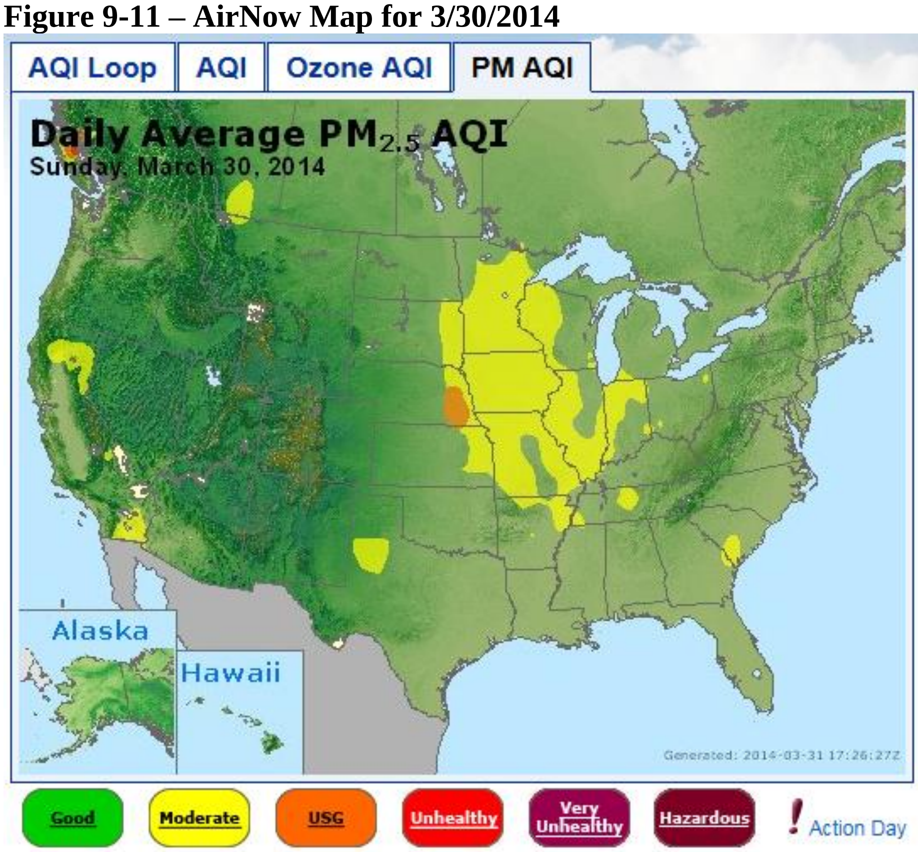


Figure 9-12 – AirNow Tech Map for 3/30/ 2014

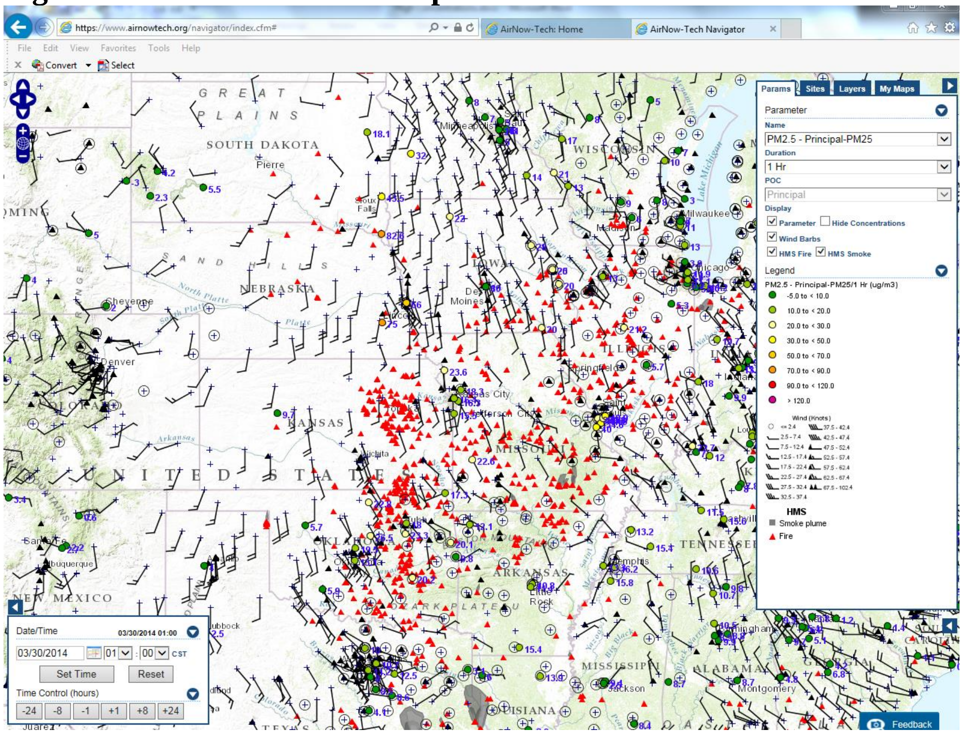


Figure 9-13 – AirNow Map for 4/12/2014

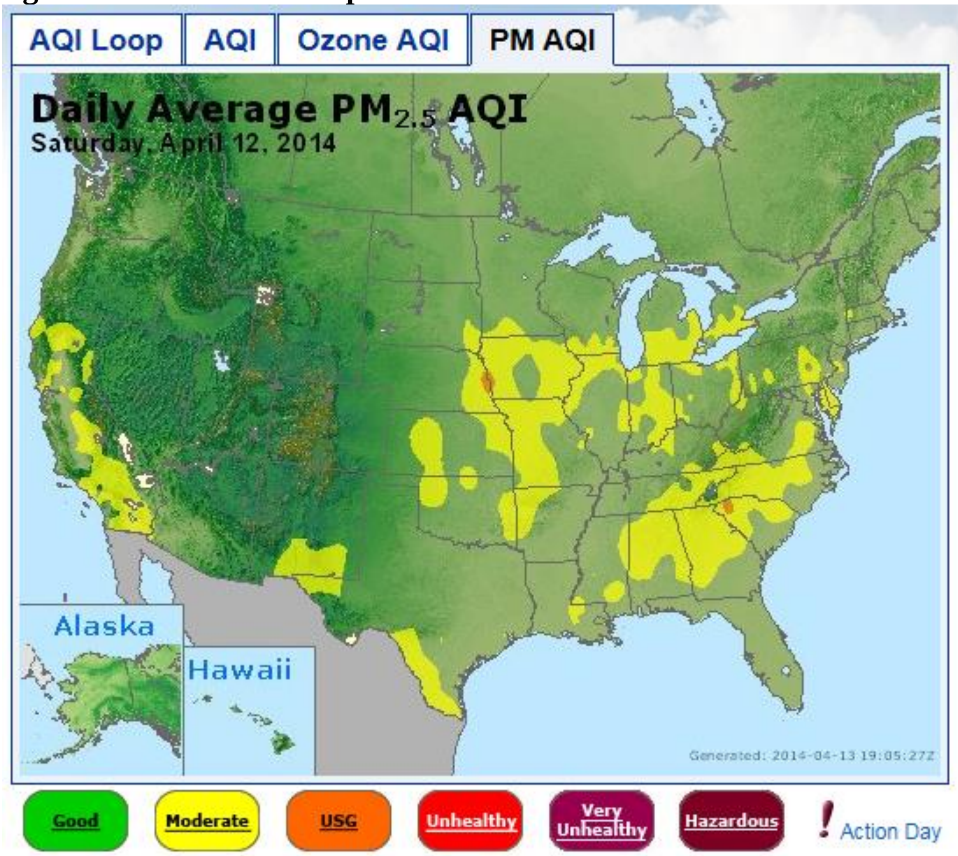
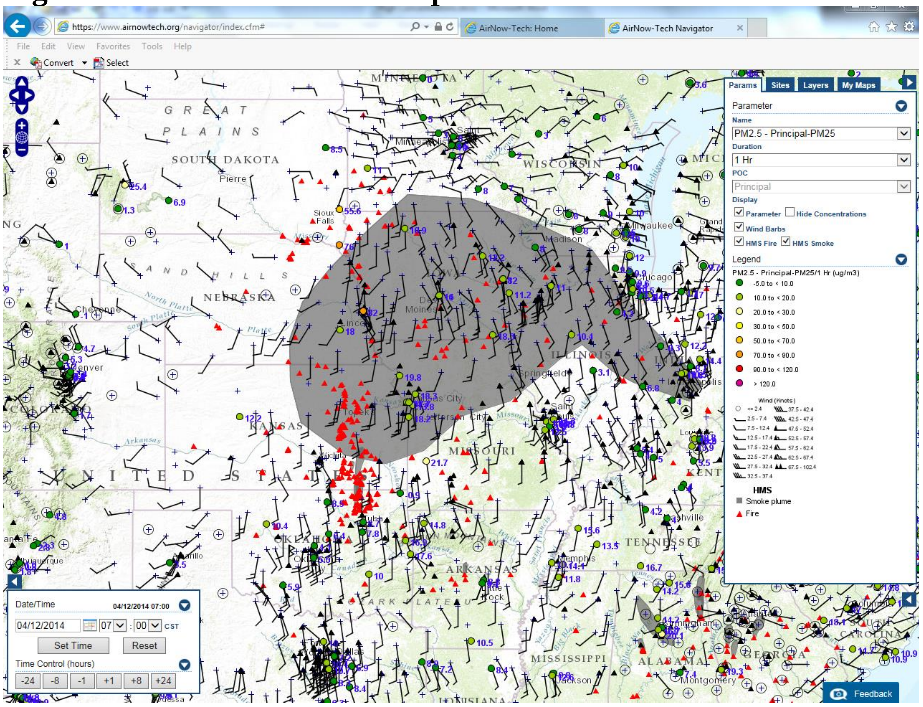


Figure 9-14 – AirNow Tech Map for 4/12/2014



During 2014, there was one high concentration day for Ozone. The high concentration day occurred April 20th at the Sioux Falls SD School Site with an 8-hour average of 0.072 ppm. Figures 9-15 and 9-16 show the AirNow and AirNow Tech maps for the day with a high ozone concentration day. In this case, the maps again show many fires to the south with wind blowing from the south pushing the smoke up along the eastern edge of South Dakota.

Figure 9-15 - AirNow Map for 4/20/2014

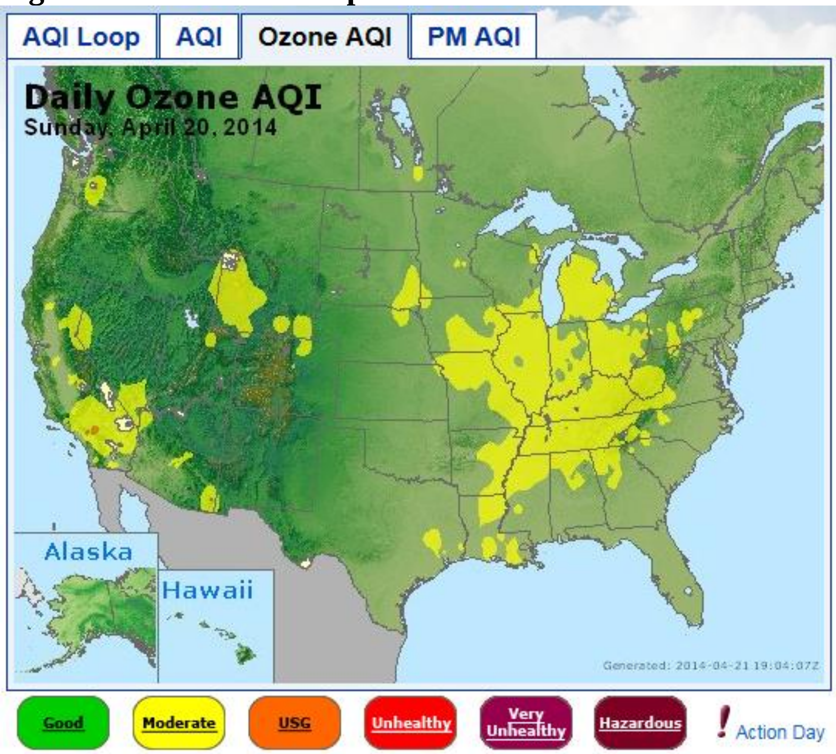
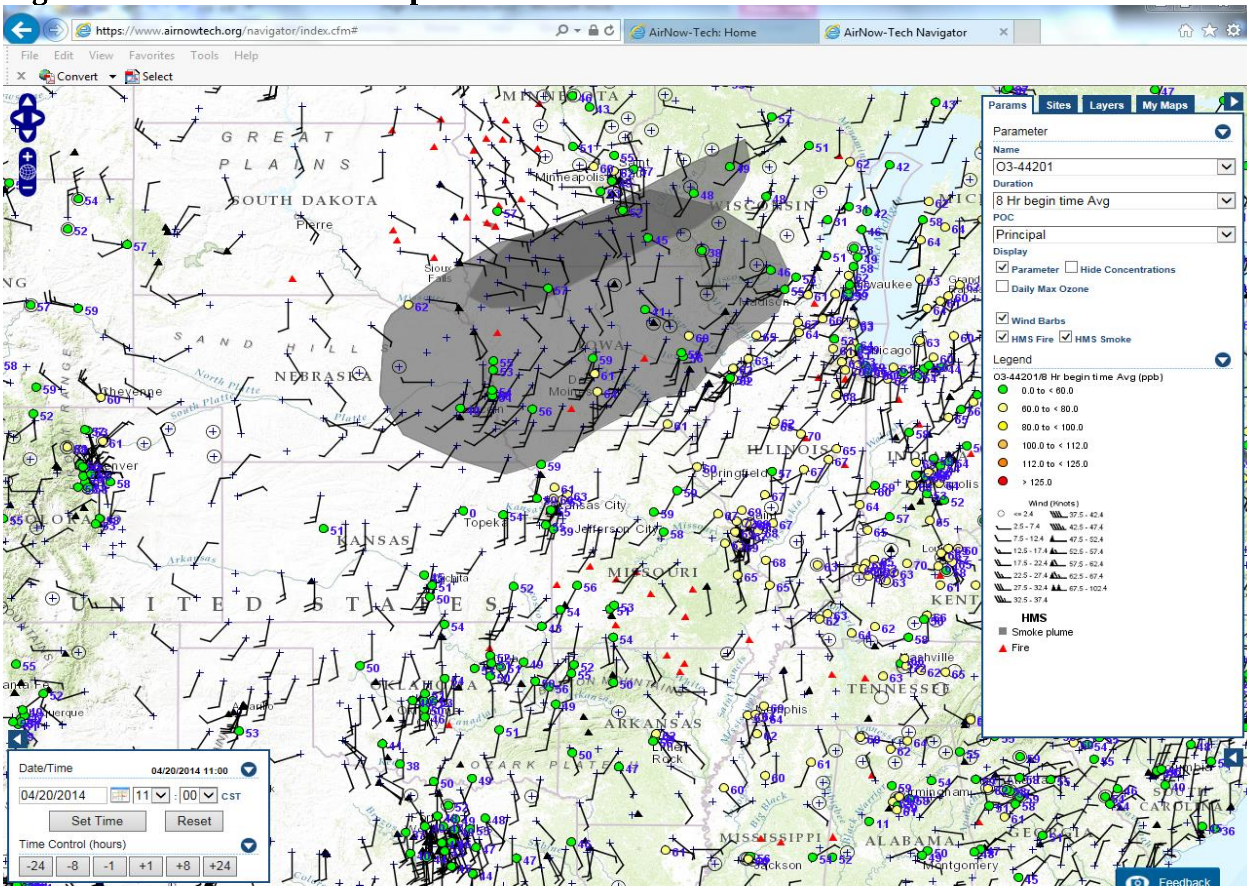


Figure 9-16-AirNow Tech Map for 4/20/2014



10.0 AIR MONITORING SITE TRENDS

This section will evaluate each air monitoring site in the network, determine if the site will continue and examine trends for each pollutant. Through this evaluation a determination is made if site goals are being met and if each testing parameter is needed at the site. This section also has site specific information tables including AQS ID #, location, operation, data use, sampling schedule, monitoring objectives, spatial scale, and sampling and analytical methods required as part of the annual plan requirements in 40 CFR Part 58.

10.1 Rapid City Area

The Rapid City area had a total of two monitoring sites collecting data in 2014. The high concentration site for PM_{10} was located at the RC Credit Union Site and a continuous PM_{10} monitor was used to determine compliance with the NAAQS standards. In addition, SO_2 and NO_2 analyzers were operated to determine current concentration levels. The RC Library Site has manual Andersen PM_{10} and Partisol 2000 $PM_{2.5}$ monitors collecting 24-hour data using a filter based gravimetric sampling method.

In cooperation with the City, County, and industry, the department is implementing a Natural Events Action Plan for the Rapid City area. Part of this plan is to alert the public of the potential of high dust levels caused by high winds and to advise the public of precautions to take during the high wind events. Under this plan high wind dust alerts are called when the following forecast conditions occur:

1. Hourly wind speeds exceed 20 miles per hour;
2. Peak wind gusts are greater than 40 miles per hour; and
3. Five consecutive days of 0.02 inches or less of precipitation each day excluding dry snow.

During 2014, a total of eight high wind dust alerts were called for the Rapid City area. None of the days exceeded the PM_{10} 24-hour standard. The highest 24-hour average concentration recorded during an alert was on April 23, 2014 at 97.3 ug/m^3. This demonstrates the implementation of the Natural Events Action Plan for the Rapid City area is working to maintain PM_{10} concentrations below the NAAQS during high wind events.

The Rapid City area had two monitoring sites collecting data for $PM_{2.5}$ in 2014. The Library Site has manual Andersen $PM_{2.5}$ monitors collecting 24-hour data using a filter based gravimetric sampling method. A continuous Met One BAM $PM_{2.5}$ monitor was operated on the RC Credit Union Site.

In the fall of 2008, a surface water quality problem was found when Rapid Valley began using Rapid Creek for a drinking water source. Testing indicated high levels of chlorides during snow melt events caused the drinking water to smell and the water treatment plant had to stop producing drinking water until chloride levels dropped. Testing indicated liquid deicer used on the streets during snow and ice events was causing the problem. The city of Rapid City began a process of reducing the use of liquid deicer and increasing the use of river sand in the eastern and south eastern parts of Rapid City to help reduce chloride levels in Rapid Creek. The department is working with Rapid City to determine which streets can be changed from chemical deicer to sand so air quality levels have not been affected. Currently, the changes in sanding material at these locations in the city have not cause high concentrations of PM_{10}.

10.1.1 RC Library Site

The RC Library Site is located on the library building in Rapid City. The site was established in 1972, and it is the oldest sampling site in South Dakota still operating. The site is geographically located in the downtown area of the city east of the hogback and in the Rapid Creek river valley. The site purpose is to evaluate population exposure, fugitive dust controls, the success of the street sanding and sweeping methods employed by the city of Rapid City and general concentration levels in the eastern part of the city. Figure 10-1 shows a picture of the RC Library Site.

Figure 10-1 – RC Library Site

PM_{10} sampling began at the site in 1985. $PM_{2.5}$ monitors were added to the site in 1999. An attainment designation for $PM_{2.5}$ was completed for the Rapid City area in 2004.

An attainment designation for PM_{10} was completed and approved by EPA for the Rapid City area in 2006. In 2012, the Andersen RAAS 100 $PM_{2.5}$ monitors were replaced with R&P Partisol 2000i monitors. Table 10-1 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

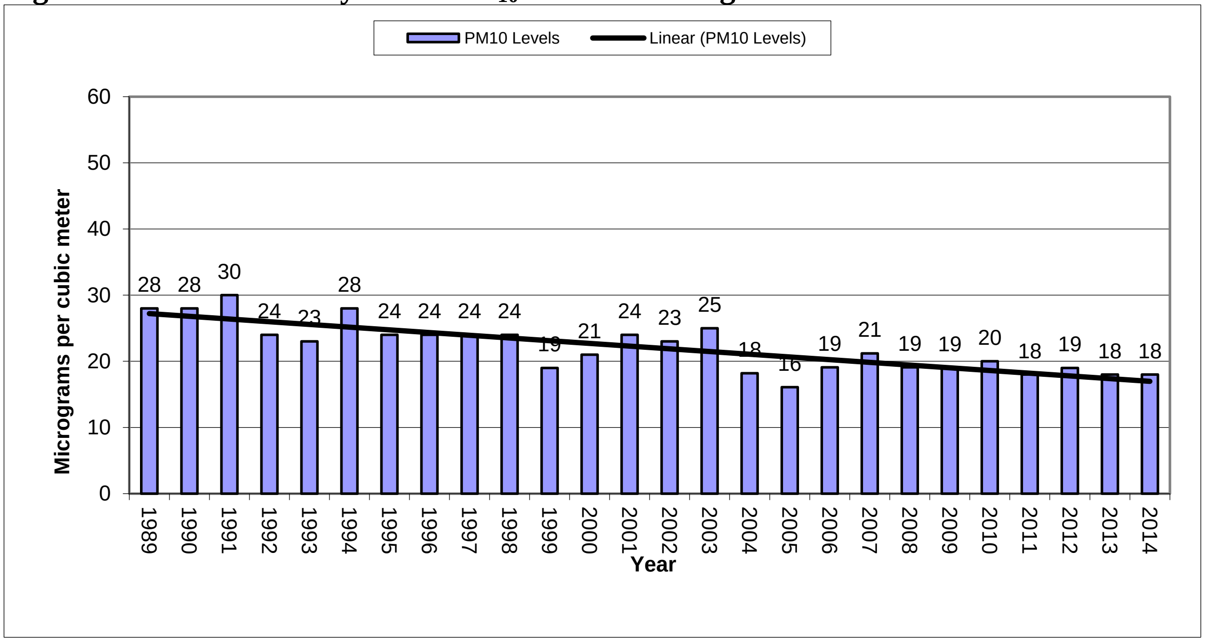
Table 10-1 – RC Library Site Specifics

Parameter	Information
Site Name	RC Library
AQS ID Number	46-103-1001
Street Address	6^{th} and Quincy, Rapid City, South Dakota
Geographic Coordinates	UTM Zone 13, NAD 83, E 641,837.99, N 4,882,111.77
MSA	Rapid City
PM_{10}	**(Manual)**
Sampler Type	Federal Reference Method RFPS-1287-063
Operating Schedule	Every 3^{rd} Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Hi-Vol SA/GMW-1200
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS),
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Equivalent Method EQPM-0202-143
Operating Schedule	Every 3^{rd} Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Partisol 2000i $PM_{2.5}$ w/VSC Cyclone
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)

10.1.1.1 *RC Library Site – PM_{10} Data*

Annual average PM_{10} concentrations for the RC Library Site are shown in Figure 10-2. The PM_{10} concentrations show a gradual decline from a high of 30 ug/m^3 in 1991, to a low of 16 ug/m^3 in 2005. The largest reduction in annual concentrations came when changes were implemented by the city on the street sanding and sweeping operations in the early 1990s. In the last nine years, annual concentrations have leveled off and are almost steady with a 1 or 3 ug/m^3 change per year. The plan is to continue the PM_{10} monitoring because this is the only site east of the hogback in Rapid City and the site will provide a check on PM_{10} levels as the city of Rapid City adjusts its sanding techniques in eastern part of the city.

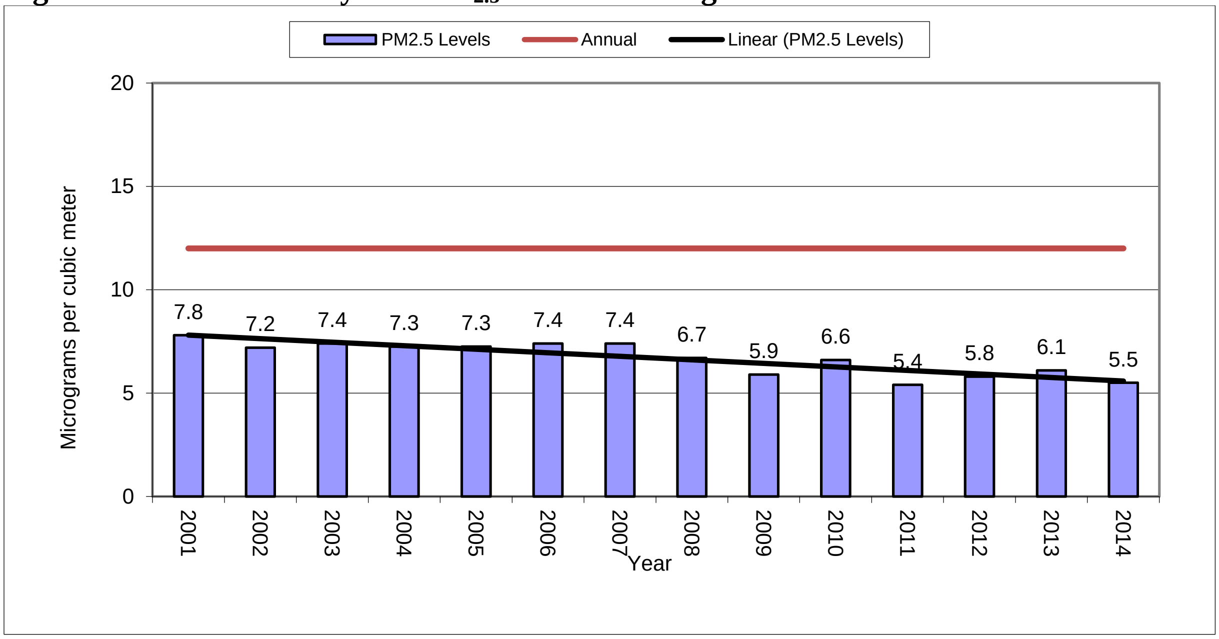
Figure 10-2 – RC Library Site – PM_{10} Annual Averages



10.1.1.2 *RC Library Site – $PM_{2.5}$ Data*

The graph in Figure 10-3 shows the $PM_{2.5}$ annual average for each sampling year since 2001. The highest annual average was 7.8 ug/m^3 in 2001 and the lowest was 5.4 ug/m^3 in 2011. The annual average concentrations vary in difference from the highest to lowest annual average by 2.4 ug/m^3. The trends indicate a declining $PM_{2.5}$ concentration level for the past seven years with 2011 recording the lowest annual average $PM_{2.5}$ concentration for this site. Plans are to continue testing for $PM_{2.5}$ at this site.

Figure 10-3 – RC Library Site $PM_{2.5}$ Annual Averages



10.1.2 RC Credit Union Site

The RC Credit Union Site is located on a lot next to Fire Station #3 building. The RC Credit Union Site replaced the Fire Station #3 Site in October 2003 and is the high PM_{10} concentration location for the western part of Rapid City. The RC Credit Union Site is located just south of the quarry area and is centrally located in relation to the quarry facilities. Figure 10-4 contains a picture of the monitoring site looking in a northwest direction towards the quarry area. The goal of this site is to determine if the Rapid City area is attaining the PM_{10} standard and population exposure.

Figure 10-4 – RC Credit Union Site

Continuous samplers Thermo BETA PM_{10}, Met One BAM $PM_{2.5}$, Thermo SO_2 and Thermo NO_2 monitors were operated at this site in 2014. The BETA PM_{10} monitor provides hourly concentrations on an everyday sampling schedule. The hourly readings from the continuous PM_{10} monitor are used to assist in the calling of high wind dust alerts for Rapid City and to compare concentrations to the PM_{10} NAAQS. An Andersen PM_{10} Hi-Vol manual monitor is also located at the site to take special samples during high wind dust alerts that can be analyzed to determine potential sources of the dust.

A continuous Met One BAM $PM_{2.5}$ monitor is used to supply hourly data for investigation of high concentration days and to compare to the $PM_{2.5}$ standards. Table 10-2 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Table 10-2 – RC Credit Union Site Specifics

Parameter	Information
Site Name	RC Credit Union
AQS ID Number	46-103-0020
Street Address	106 Kinney Ave.
Geographic Coordinates	UTM Zone 13, NAD 83, E 638,199.75, N 4,882,811.92
MSA	Rapid City
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day/co-located FEM to FRM every 12^{th} day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	T A Series FH 62 C14 Continuous
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) and Real-Time Data
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Met One BAM-1020
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-Time Data
SO_2	**(Continuous)**
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operation Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Instrumental
Analysis Method	Pulsed Fluorescent
Data Use	SLAMS (Comparison to the NAAQS) and Real-Time Data
NO_2	**(Continuous)**
Sampler Type	Federal Reference Method RFNA-1289-074
Operation Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Instrumental
Analysis Method	Chemiluminescence
Data Use	SLAMS (Comparison to the NAAQS) and Real-Time Data

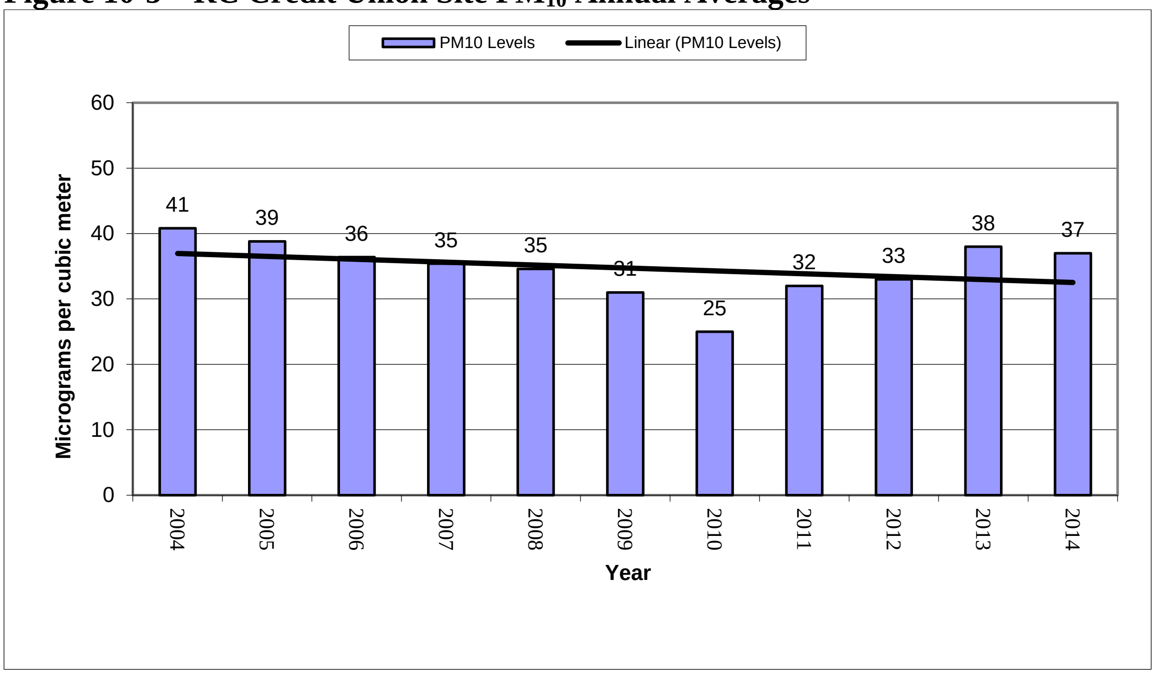
In 2011, continuous SO_2 and NO_2 analyzers were added to the RC Credit Union Site to provide data on population exposure and source oriented testing near the facilities in the quarry area. Three years of testing were completed at the end of 2013.

10.1.2.1 *RC Credit Union Site – PM_{10} Data*

The RC Credit Union Site began operation in October of 2003. Only three months of data was collected in 2003, so 2004 is the first complete sampling year. Figure 10-5 shows a graph of the annual average PM_{10} concentration.

The PM_{10} annual average concentration trend shows a declining level each year from 2004 to 2010. In 2011, average concentration levels increased back to the level in 2009. In 2014, average concentration levels declined slightly form 2013. Over the first seven years the annual concentrations declined significantly by 16.0 ug/m^3. In the last four years average concentrations increased by as much as 13 ug/m^3. Additional evaluation of the collected data will be completed for the 5-year assessment. Testing for PM_{10} concentrations is a priority for this site and the parameter will be continued.

Figure 10-5 – RC Credit Union Site PM_{10} Annual Averages



10.1.2.2 *RC Credit Union Site $PM_{2.5}$ Data*

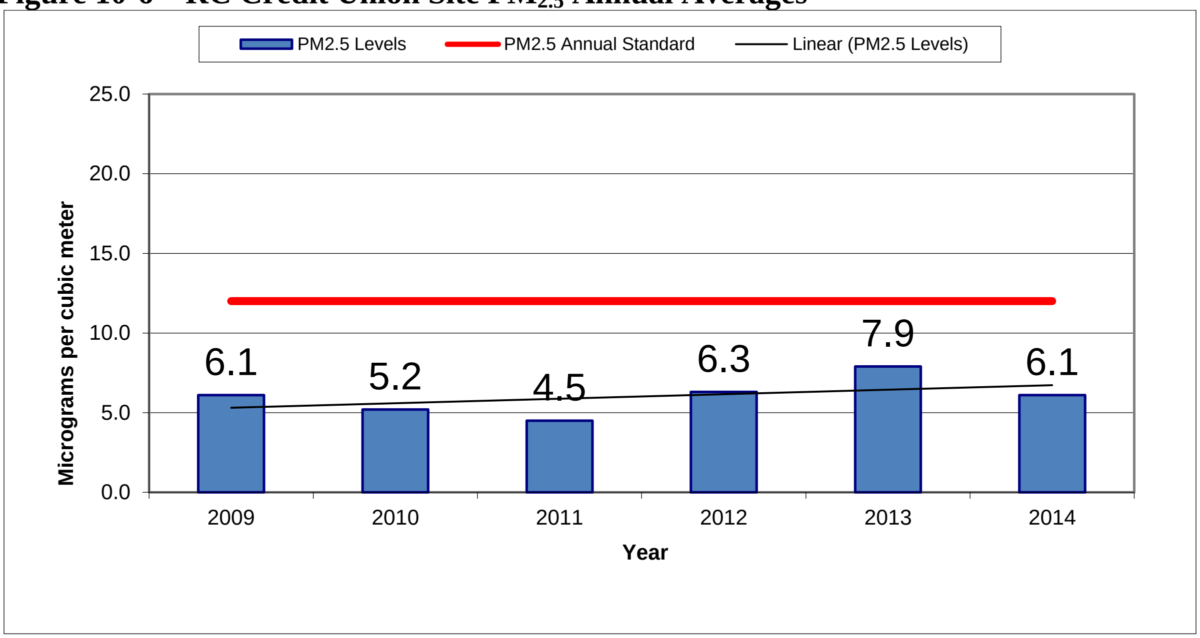
The testing for $PM_{2.5}$ parameter using the manual method began at this site in October 2003 and completed the first full year of testing in 2004. The RC Credit Union Site records the highest $PM_{2.5}$ concentrations in the Rapid City area for both 24-hour and annual concentrations using the manual FRM monitor.

In 2009, a continuous method $PM_{2.5}$ monitor was added to the site as a special purpose monitor. Because the continuous monitor was a new method, EPA allows the operation of the monitor as a special purpose method for up to three years before the data from the monitor is required to be compared to the $PM_{2.5}$ standard. By the end of 2011 the continuous monitor had operated for three years. As a cost savings change the manual $PM_{2.5}$ monitor was removed and the continuous monitor became the SLAMS monitor providing more data at a lower cost per year of operation.

Figure 10-6 shows the annual average for each sampling year since 2009 when the continuous monitor was setup. The annual average concentrations have remained relatively constant over the first four years. In 2011, $PM_{2.5}$ annual concentrations declined to the lowest level since the site began operation with a concentration of 4.5 ug/m^3 for the annual average. The highest annual average for $PM_{2.5}$ at this site was 7.9 ug/m^3 in 2013. In 2014, levels declined back to the levels in the first four years. Over the six year period, annual concentrations changed by 3.4 ug/m^3. The trends for the six years since the continuous monitor was installed show a slightly increasing concentration level.

The parameter of $PM_{2.5}$ will be continued at this site using the continuous monitor to determine compliance with the NAAQS and to determine any change in concentration levels.

Figure 10-6 – RC Credit Union Site $PM_{2.5}$ Annual Averages

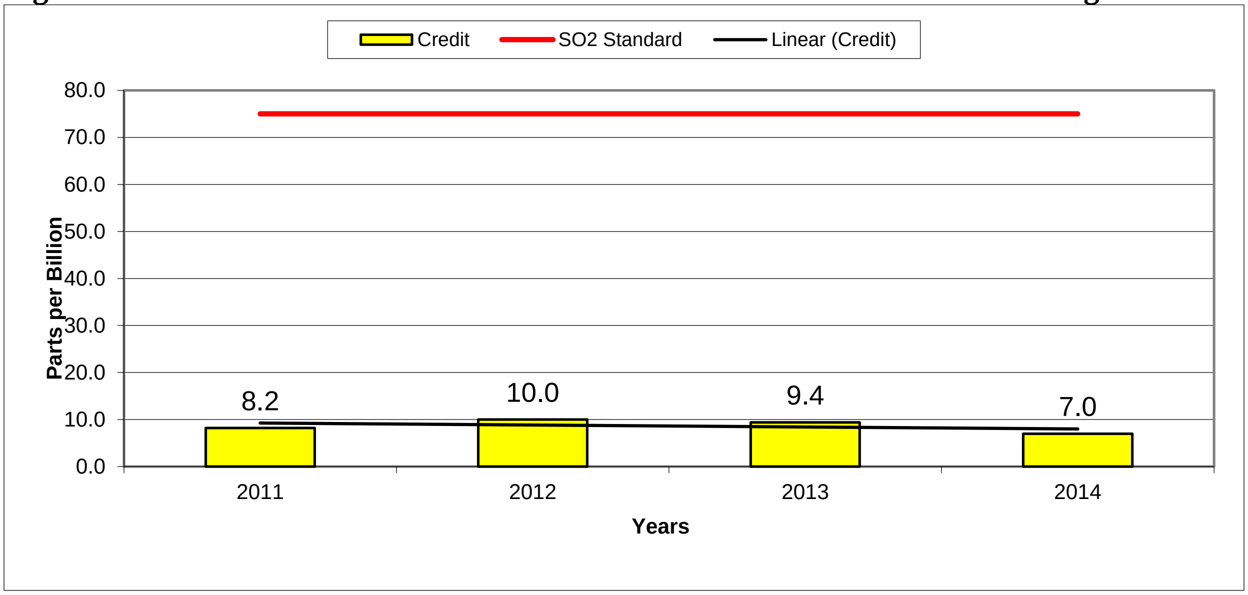


10.1.2.3 *RC Credit Union Site Sulfur Dioxide*

Testing for SO_2 started at the beginning of 2011 for this site. Some testing for the parameters was done in the 1990s but that data is old and there is need for the collection of new data. The annual standard for SO_2 was dropped when the standard was revised so the 1-hour, daily maximum, 99 percentile concentrations will be used to track trends.

See Figure 10-7 for the 1-hour daily maximum concentration of SO_2 recorded at the RC Credit Union Site. The concentration level is low at only 13% of the standard. Trends indicate a slightly decreasing SO_2 concentration level for this site. Testing for SO_2 will continue at this site to determine if the trend will continue beyond three years.

Figure 10-7 –RC Credit Union Site Sulfur Dioxide 99th Percentile 1-hour Averages

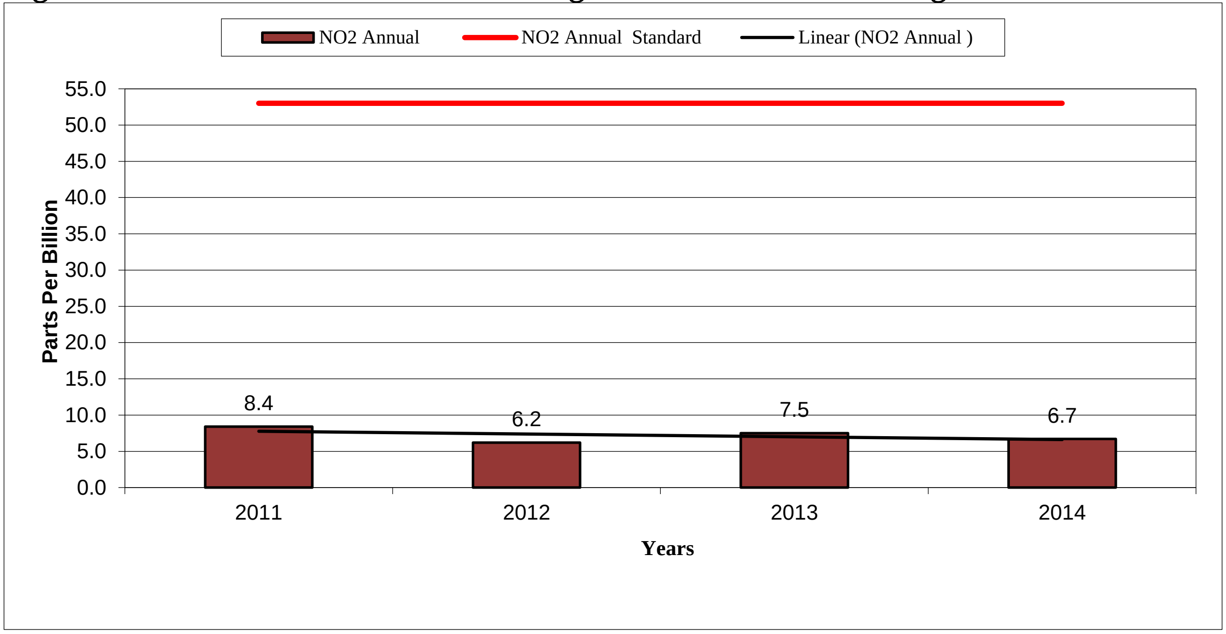


10.1.2.4 *RC Credit Union Site Nitrogen Dioxide*

Testing for NO_2 started at the beginning of 2011 for this site. Some testing for the parameters was completed in the 1990s but that data is old and there is a need for the collection of new data. The NO_2 standard includes a 1-hour and annual average concentrations so the annual will be represented to track trends.

See Figure 10-8 for concentrations of NO_2 at the RC Credit Union Site. The concentration are low only 13% of the standard in 2014. The trend shows a declining concentration level for the annual average. Testing for NO_2 will continue at this site to further define the pollution level trend for this site.

Figure 10-8 – RC Credit Union Site Nitrogen Dioxide Annual Averages



10.2 Black Hawk Site

Black Hawk is a small town located just north of Rapid City in Meade County north of the quarry area. Black Hawk is not an incorporated city but is a growing subdivision and is part of the Rapid City MSA. The goal of the Black Hawk Site is to determine urban background concentrations for PM_{10} coming into the Rapid City area from the north and determine compliance with the ozone NAAQS in the Rapid City MSA.

The Black Hawk Site was setup in the fall of 2000. The site is located on a small hill east of the Black Hawk Elementary School. PM_{10} and $PM_{2.5}$ monitors were located on a sampling shelter until October 2003 when the sampling shelter was moved to the RC Credit Union Site. The monitors were then located on scaffolding within a fenced area until the fall of 2006 when a shelter was added back to the site.

At the end of 2004 the $PM_{2.5}$ monitors were removed because concentrations were the lowest in the area and the potential for concentrations over the NAAQS were very low. In 2007, the ozone analyzer was moved from RC Credit Union Site to the Black Hawk Site to operate the ozone parameter outside of the modeled one microgram NO_2 influence area from air quality sources in western Rapid City. See Figure 10-9 for a current picture of the site looking to the northwest.

The land use around the site is mainly residential with a few service type businesses. There are no obstructions around the monitoring site. The limestone quarry industries are located to the south and southeast of the Black Hawk Site and are expanding to ore bodies located closer to this site. The closest new limestone quarry is currently operating about 1.5 miles south of the site.

Figure 10-9 – Black Hawk Site

The site's spatial scale is neighborhood for PM_{10} and ozone sampling. The objectives of the PM_{10} sampling are high concentration, population, and source impact. The objectives of the ozone sampling are high concentration and population. The goals are being met. Table 10-3 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Table 10-3 – Black Hawk Site Specifics

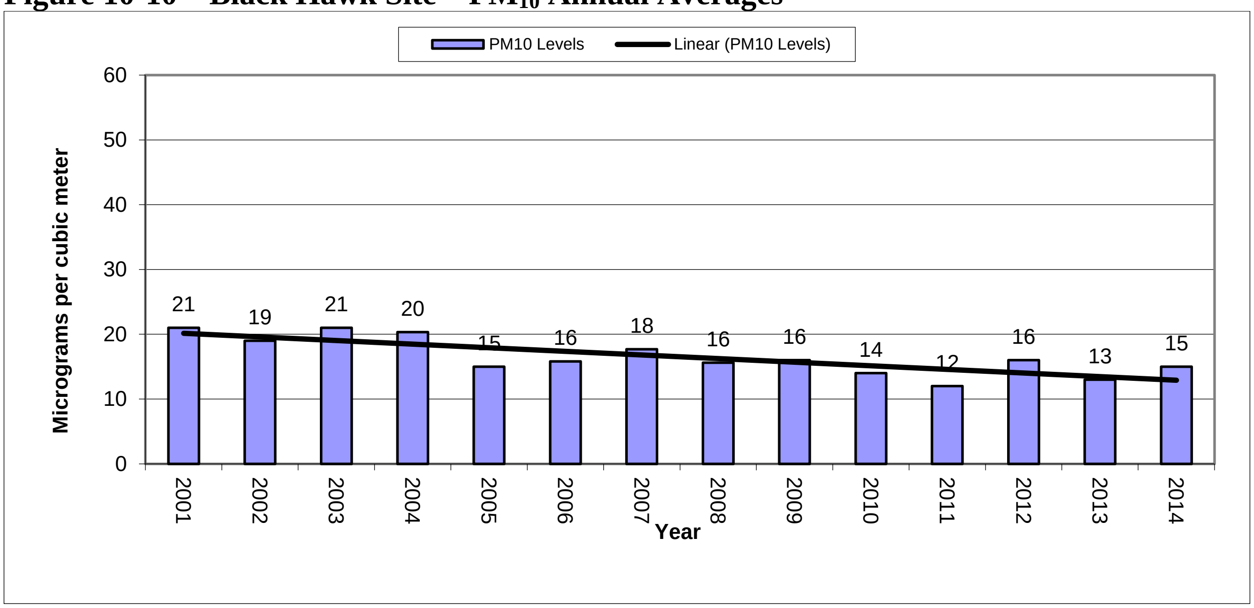
Parameter	Information
Site Name	Black Hawk Elementary
AQS ID Number	46-093-0001
Street Address	7108 Seeaire Street
Geographic Coordinates	UTM Zone 13, NAD 83, E 634,683.07 N 4,890,309.65
MSA	Rapid City
PM_{10}	**(Manual)**
Sampler Type	Federal Reference Method RFPS-1287-063
Operating Schedule	Every Sixth Day
Scale Representation	Neighborhood
Monitoring Objective	Population, Urban Background
Sampling Method	Hi-Vol SA/GMW-1200
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)
Ozone	**(Continuous)**

Parameter	Information
Sampler Type	Federal Equivalent Method EQOA-0880-147
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Instrumental Thermo 49i
Analysis Methods	Ultraviolet
Data Use	SLAMS (Comparison to the NAAQS) and Real-time Data

10.2.1 Black Hawk Site – PM_{10} Data

Figure 10-10 contains a graph showing the PM_{10} annual averages for the Black Hawk Site. The first four years of PM_{10} concentration levels remained about the same. In 2005, the annual average dropped significantly by approximately 4 ug/m^3 from the 2004 level. The highest annual average was 21 ug/m^3 recorded in both 2001 and 2003. The lowest level of 12 ug/m^3 was recorded in 2011. In 2014, the PM_{10} concentrations increased by 2 ug/m^3 from the concentration in 2013. The overall trend shows a decrease in concentrations over the thirteen year period.

Figure 10-10 – Black Hawk Site – PM_{10} Annual Averages

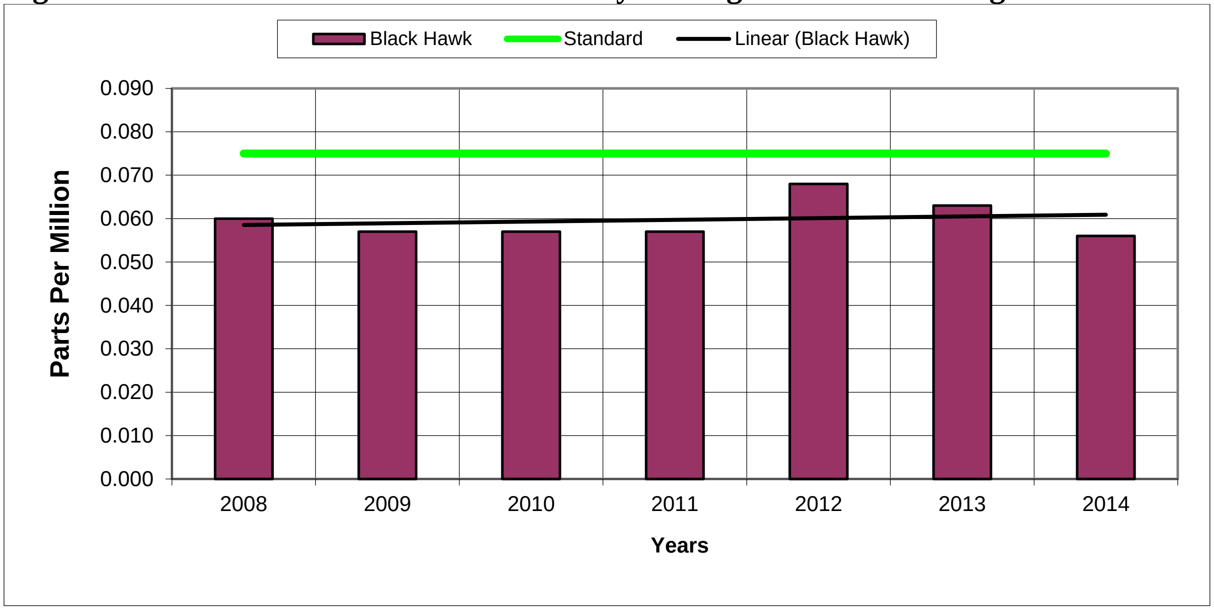


10.2.2 Black Hawk Site – Ozone Data

The 2014 sampling year is the seventh ozone season at the Black Hawk Site (see Figure 10-11). In the first year of testing (2008), the site recorded the second highest ozone level in the state. In 2012, the ozone levels were up statewide by 4 ppb and significantly at this site at 11 ppb. In 2014, ozone levels dropped lower for the second year in a row. Because of the high ozone concentration in 2012, the overall trends show a slight increasing ozone concentration level.

The testing results show the area is attaining the ozone standard. Plans are to continue to test for ozone at this location.

Figure 10-11 – Black Hawk Site Ozone Yearly 4th Highest 8-hour Averages



10.3 Badlands Site

The Badlands is one of two Class I areas in South Dakota designated for visibility protection under the Clean Air Act. The Badlands area is a large national park that attracts more than two million visitors each year. The Badlands area is a dry semi-desert area with short prairie grass and beautiful sandstone cliff vistas.

The Badlands Site was established in 2000, with manual monitors for PM_{10} and $PM_{2.5}$. The site is located next to the IMPROVE site which also included an ozone analyzer operated by the National Park Service. The site is in the southeast part of the park near the visitor center. Figure 10-12 shows a current picture of the Badlands Site.

In October of 2004, the number of pollutant parameters was increased by adding continuous monitors for PM_{10}, $PM_{2.5}$, SO_2, and NO_2. The changes increased the amount of data collected and provide additional information on transport of air pollution. At the end of 2007, the department took over the operation of the ozone monitor at this site upon the request made by the National Park Service.

Figure 10-12 –Badlands Site

The IMPROVE data is used to determine what type of sources are impacting the visibility of the national parks in South Dakota. The goal of having a SLAMS site next to the IMPROVE site is to determine how the data compares between the two different sampling methods, to determine air pollution background levels, and to see if pollution trends show long range transport of air pollution into the state. Table 10-5 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Table 10-4 – Badlands Site Specifics

Parameter	Information
Site Name	Badlands
AQS ID Number	46-071-0001
Street Address	25216 Ben Reifel Road, Interior, South Dakota 57750
Geographic Coordinates	UTM Zone 14, NAD 83, E 263,173.81 N 4,847,799.95
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	T A Series FH 62 C14 Continuous

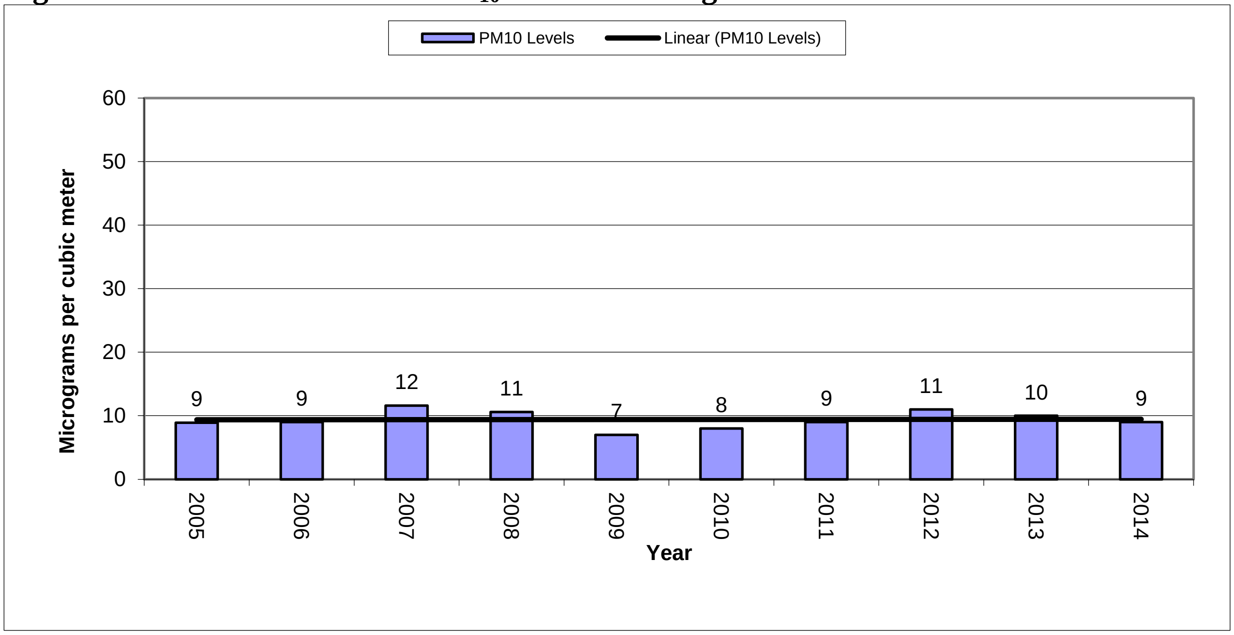
Parameter	Information
Analysis Method	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method RFPS-0308-170
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
SO_2	**(Continuous)**
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental
Analysis Methods	Pulsed Fluorescent
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data
NO_2	**(Continuous)**
Sampler Type	Federal Reference Method RFNA-1289-074
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental
Analysis Method	Chemiluminescence
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental
Analysis Method	Ultraviolet
Data Use	SLAMS (Comparison to the NAAQS) and Real-time Data

10.3.1 Badlands Site – PM_{10} Data

PM_{10} data has been collected at this site since 2000. The PM_{10} manual monitor was operated on an every sixth day schedule through 2004. Beginning in 2005, a continuous Thermo Beta Gauge PM_{10} monitor replaced the manual monitors.

Figure 10-13 contains a graph of the annual averages for the Badlands Site. The annual average concentration over the last 10 years varied only slightly overall. The highest annual average concentration of 12 ug/m^3 was recorded in 2007. The lowest annual average concentration of 7 ug/m^3 was recorded in 2009. Trends indicate a steady concentration level over the 10 years of testing. The PM_{10} concentrations recorded at this site are some of the lowest levels in the state and are considered background for the western half of the state. This parameter is meeting the goals for testing at this site and will be continued.

Figure 10-13 – Badlands Site – PM_{10} Annual Averages

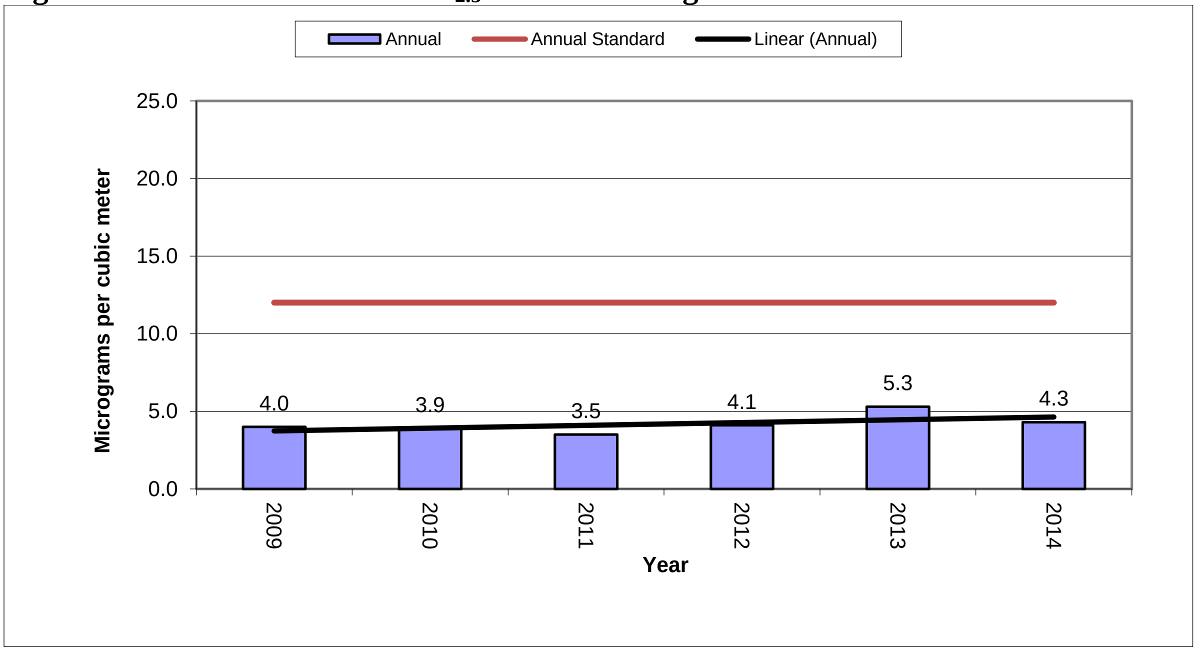


10.3.2 Badlands Site – $PM_{2.5}$ Data

The $PM_{2.5}$ manual monitors ran on an every third day schedule from 2001 to 2008. With the completion of the 2003 year, the site had three years of $PM_{2.5}$ data and the department was able to make a comparison of the concentration levels to the 24-hour and annual standards. The area was designated as attaining the standard. Beginning in 2009, the Met One BAM-1020 FEM replaced the manual RAAS 100 and the sampling schedule went to every day providing hourly and 24-hour average concentrations.

The annual averages for the Badlands Site show a concentration range with a high of 5.3 ug/m^3 in 2013 and a low of 3.5 ug/m^3 in 2011. The trend for the annual average is a slightly increasing concentration level. $PM_{2.5}$ concentrations at this site are the lowest in the state and represent background levels for western South Dakota. Figure 10-14 contains a graph of the annual averages. This parameter is meeting the goals for testing at this site and will be continued.

Figure 10-14 – Badlands Site $PM_{2.5}$ Annual Averages

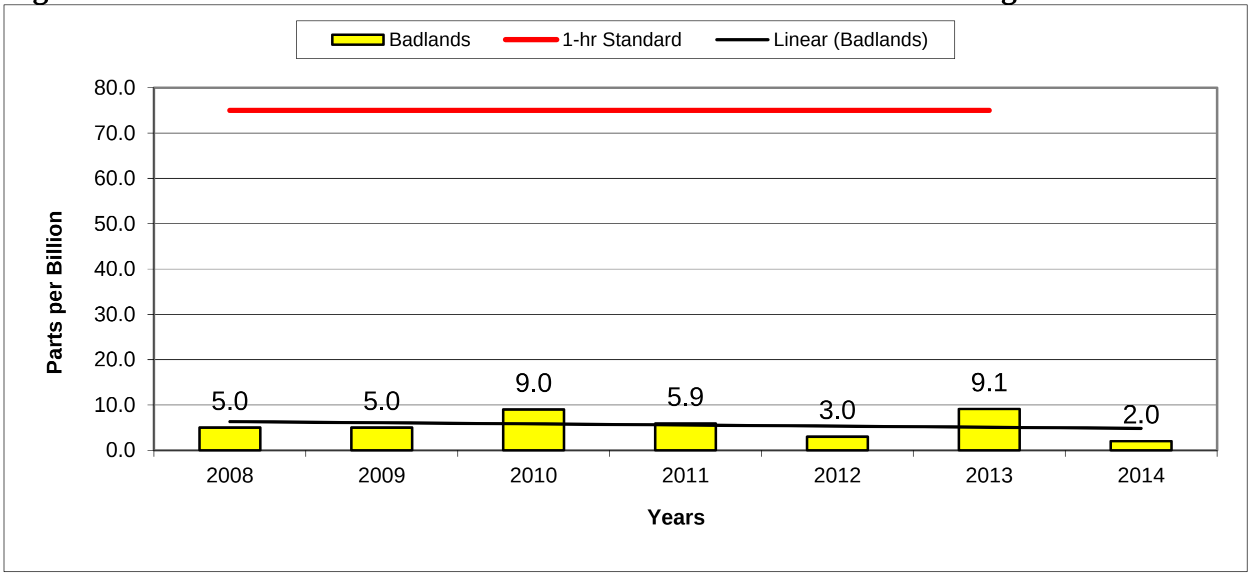


10.3.3 <u>Badlands Site – Sulfur Dioxide Data</u>

The first year of testing at the Badlands Site for SO_2 occurred in 2005. As expected, concentrations for SO_2 are very low and represent background levels. Concentrations are at or near the detection limit for the analyzers at 0.1 ppb for the annual average levels for SO2.

In 2014, the annual average was down from 2013 from 9.1 ppb to 2.0 ppb the lowest level reported during the seven years of testing for SO_2. See Figure 10-15 to view a graph of the annual average concentrations for SO_2. The linear trend line shows a slight decrease in concentrations but levels are very low and indicate minimal concentrations of SO_2. This parameter is meeting the goals for testing at this site and will be continued.

Figure 10-15 – Badlands Site Sulfur Dioxide 99th Percentile 1-hour Average



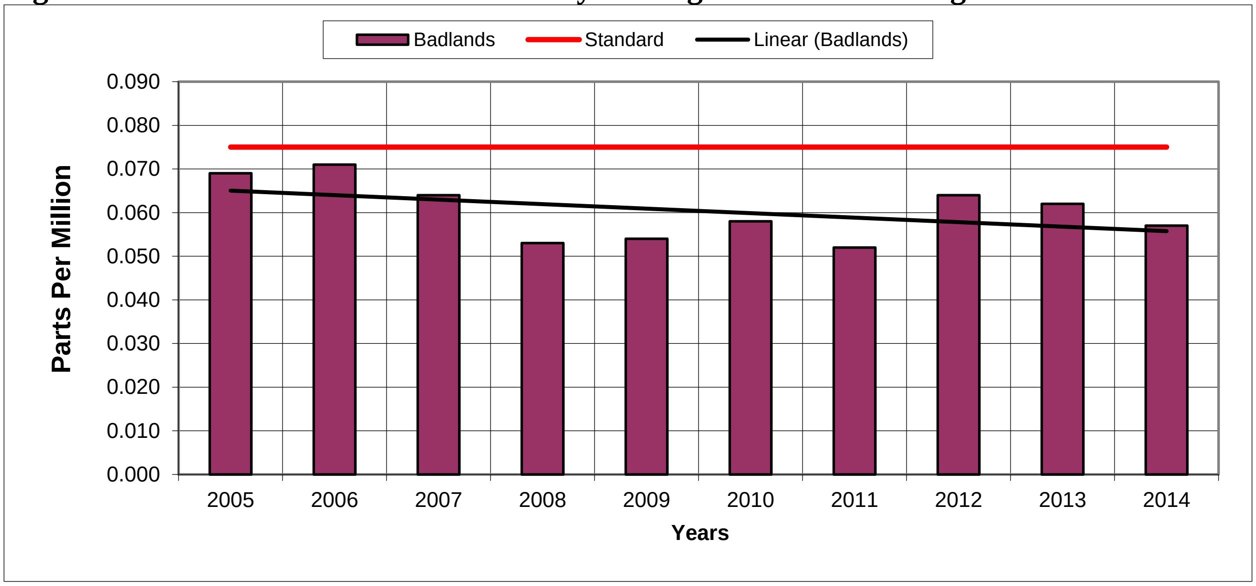
10.3.4 Badlands Site – Ozone Data

The first year of testing at the Badlands Site for ozone was in 2005, with equipment being operated by the National Park Service. The department completed quarterly audits of the ozone analyzer so data could be compared to the NAAQS. At the beginning of 2008 sampling year, the department took over the operation of the ozone analyzer.

Concentrations of ozone at this site have varied over the ten years of testing. The yearly 4th highest 8-hour average ranged from a high of 0.071 ppm in 2006 to a low of 0.052 ppm in 2011. This trend is similar to most of the sites in the western part of the state with lower ozone levels since 2006 and concentrations are down again in 2014 the second year in a row. See Figure 10-16 to view a graph of the yearly 4th highest 8-hour average. The linear trends line shows a declining concentration level due to concentrations.

This parameter will continue to be a priority at this location because of past concentration levels and the testing is meeting the needs to continue the sampling effort.

Figure 10-16 – Badlands Site Ozone Yearly 4th Highest 8-hour Averages

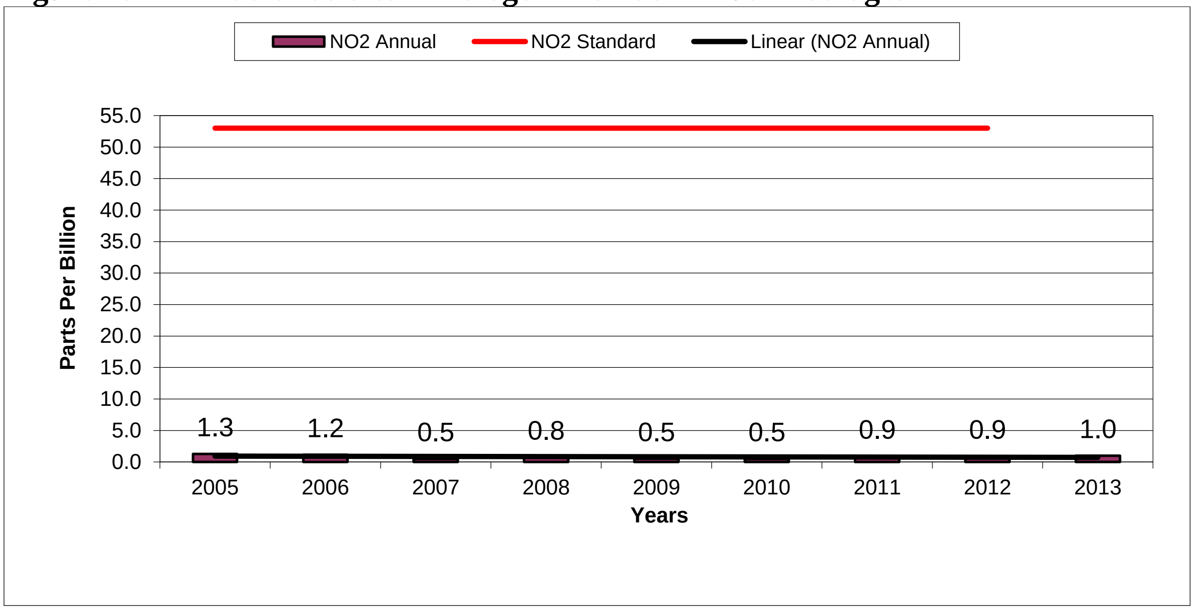


10.3.5 <u>Badlands Site – Nitrogen Dioxide Data</u>

The first year of testing at the Badlands Site for NO_2 occurred in 2005. As expected, concentrations for NO_2 are very low and represent background levels. Many hourly concentrations are at the detection limit of the analyzer at 1.0 ppb. The calculated annual average levels for all nine years are close to the detection level for NO_2.

See Figure 10-17 to view a graph of the annual average concentrations. The linear trends line shows a stable concentration level. This parameter will continue to be a priority at this location and the testing is meeting the needs to continue the sampling effort.

Figure 10-17 – Badlands Site – Nitrogen Dioxide Annual Averages



10.4 Wind Cave Site

The Wind Cave National Park is one of two Class I areas in South Dakota designated for visibility protection under the Clean Air Act. The Wind Cave area is a large national park located in the southern Black Hills of South Dakota. The Wind Cave Site was established in 2005, with manual monitors for $PM_{2.5}$ and continuous monitors for $PM_{2.5}$, PM_{10}, SO_2, NO_2, and ozone. At the end of 2010, the manual $PM_{2.5}$ monitors were removed from the site leaving only the continuous $PM_{2.5}$ monitor for this parameter.

The monitoring equipment is located in a sampling shelter next to the IMPROVE site operated by the National Park Service. The site is located a short distance west of the visitor center. Figure 10-18 shows a current picture of the Wind Cave Site.

Figure 10-18 – Wind Cave Site

The IMPROVE data will be used to determine what type of sources are impacting the visibility of the national parks in South Dakota. The purpose of having a SLAMS site next to the IMPROVE site is to determine how the data compares between the two different sampling methods, to determine air pollution background levels, and to see if pollution trends show long range transport of air pollution from outside of the state. Table 10-5 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Table 10-5 – Wind Cave Site Specifics

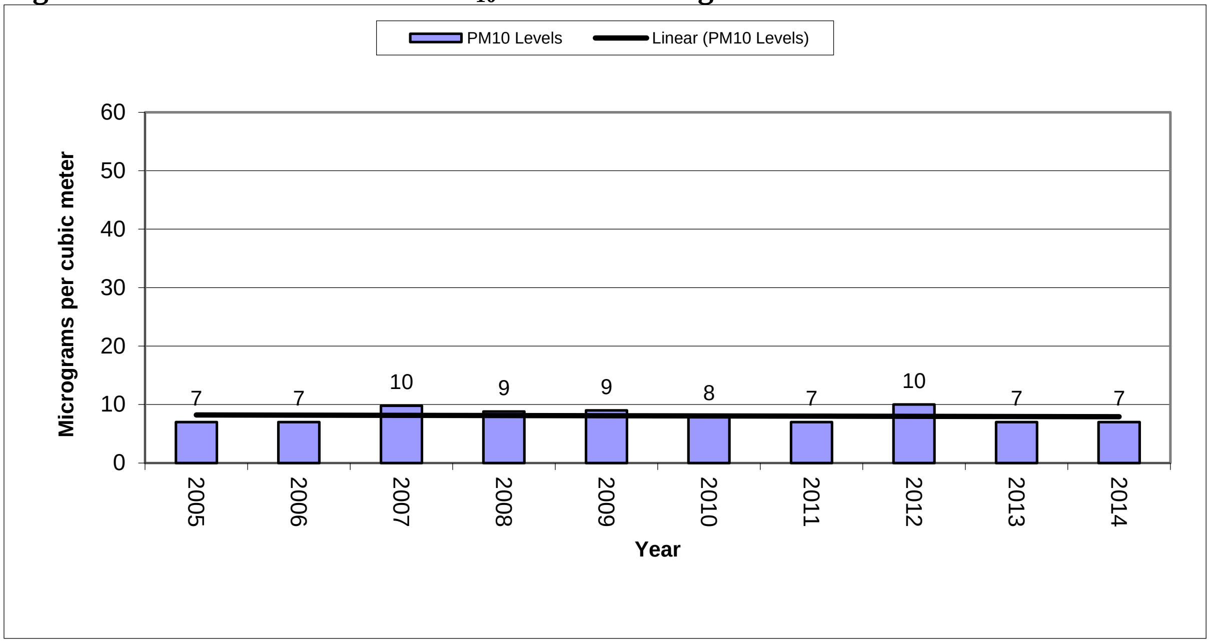
Parameter	Information
Site Name	Wind Cave
AQS ID Number	46-033-0132
Street Address	290 Elk Mountain Camp Road, Hot Springs, South Dakota
Geographic Coordinates	UTM Zone 13, NAD 83, E 622,471.56 N 4,823,856.93
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	T A Series FH 62 C14 Continuous
Analysis Method	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 FEM
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SPMS
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental
Analysis Method	Ultra Violet
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data

10.4.1 Wind Cave Site – PM_{10} Data

The PM_{10} concentrations at this site are one of the lowest in the state and are similar in concentrations as the Badlands Site. The Wind Cave Site is the most remote site in the state and a site that has no influence from industry and agriculture activities near the location. Figure 10-19 contains a graph showing the annual average PM_{10} concentrations.

The 2014, PM_{10} concentrations were the same as in 2013. The trend line indicates ~~a~~ steady concentration levels over the 10 years of testing. The concentrations ranged from 7 to 10 ug/m^3 and are very low representing background levels. This parameter is meeting the goals of background, visibility protection, long range transport, and will be continued.

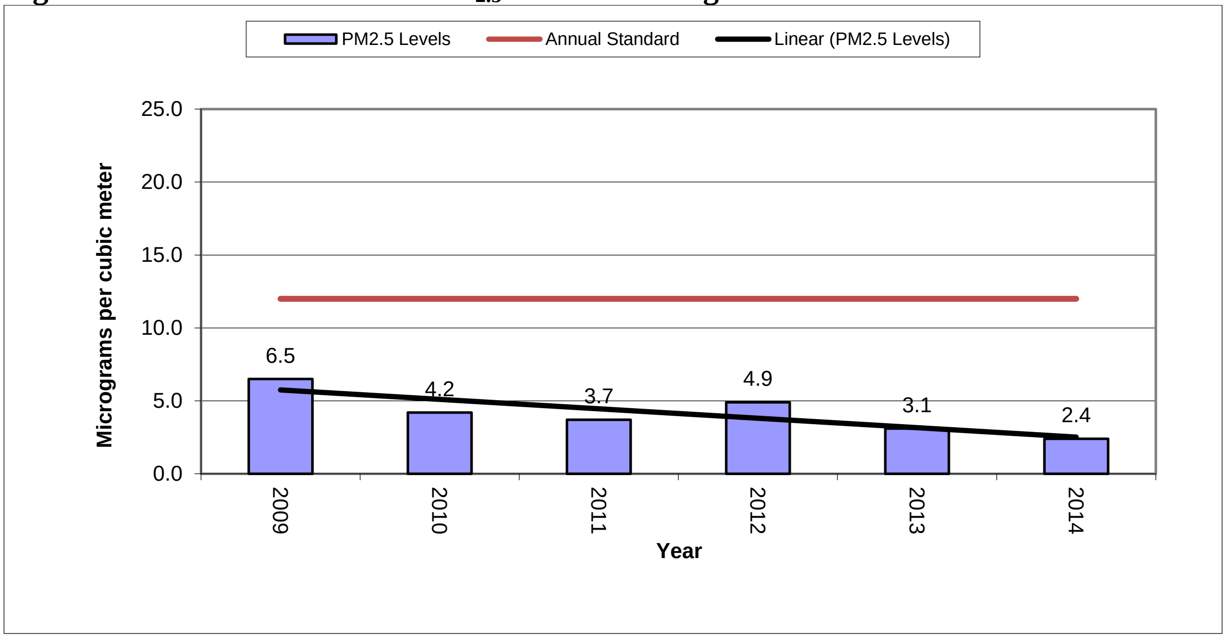
Figure 10-19 - Wind Cave Site PM_{10} Annual Averages



10.4.2 Wind Cave Site – $PM_{2.5}$ Data

The $PM_{2.5}$ concentrations are similar to the levels recorded at the Badlands Site and are some of the lowest in the state. Figure 10-20 contains a graph showing the annual average $PM_{2.5}$ concentration levels.

Figure 10-20 - Wind Cave Site $PM_{2.5}$ Annual Averages



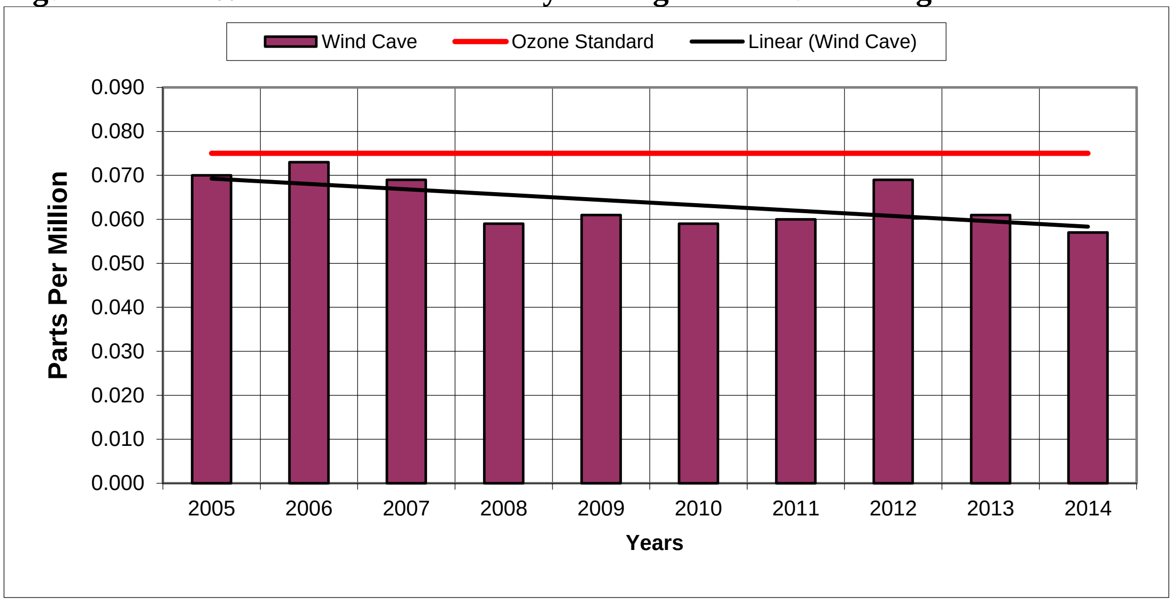
The linear trend line indicates a decrease in concentration levels during the last six years of testing. The $PM_{2.5}$ annual average concentration range from 6.5 ug/m^3 in 2009 to 2.4 ug/m^3 in

2014. Concentrations were down slightly in 2014 to a new low for this site. This parameter is meeting the goals of background, visibility protection, and long range transport and will be continued.

10.4.3 Wind Cave Site – Ozone Data

Figure 10-21 contains a graph of the ozone 8-hour concentrations for the Wind Cave Site since 2005. The Wind Cave Site had the highest reported yearly 4th highest 8-hour ozone level in the state at 0.073 ppm recorded in 2006. Ozone levels began to fall in 2007 and the trend line shows decreasing concentrations. In 2012, Wind Cave ozone levels jumped back up to the approximate levels recorded when the department first started monitoring for ozone; but in 2014, Wind Cave ozone levels decreased significantly to the lowest levels since testing began.

Figure 10-21 – Wind Cave Ozone Yearly 4th Highest 8-hour Averages



Testing for ozone is meeting the needs of the monitoring network by detecting transport pollution levels for this area of the state. Therefore, this parameter will be continued.

10.5 Sioux Falls Area

In 2013, two sampling sites were operated in the Sioux Falls area: 1) KELO and 2) SD School sites. The criteria pollutant parameters tested at these sites include PM_{10}, $PM_{2.5}$, ozone, CO, SO_2, and NO_2. In addition, special purpose parameters are sampled including continuous $PM_{2.5}$, $PM_{10-2.5}$, speciation $PM_{2.5}$ and NO_y. Air monitoring data shows the Sioux Falls area is attaining all of the NAAQS set by EPA.

The city continues to grow and now includes residential areas in two counties: 1) Minnehaha and 2) Lincoln. Sioux Falls is the largest city in the state with a 2010 Census population of 169,468 for Minnehaha County and 44,828 in Lincoln County. The industrial base is mainly service oriented businesses with a small amount of heavy industry.

10.5.1 <u>KELO Site</u>

The KELO Site was established in 1991, as a replacement for the City Hall Site. Figure 10-22 shows a current picture of the monitoring site. The site is located in the downtown, central part of the city and at 23 years of operation is the oldest site still operating in Sioux Falls.

Figure 10-22 – KELO Site

During an oversight review completed by EPA in 2001, it was noted that a tree planted to the west of the sampling site had grown and would require the sampling platform be moved about 10 feet east. The monitors were moved further east on the roof so the tree would not be an obstruction of the 360-degree arch around the monitor. In 2014, the distance between the monitors and the tree is sufficient so the tree is not an obstruction to the site. The height of the tree will be assessed each year to be sure the distance of the monitors from the tree meets the location requirements in 40 CFR Part 58.

In 2002, a $PM_{2.5}$ speciation monitor was added to the site to determine the chemical makeup of the $PM_{2.5}$ pollution. The sampler was located at this site because the $PM_{2.5}$ concentrations are some of the highest in the state and because the city of Sioux Falls is the largest population center in the state. The $PM_{2.5}$ speciation monitor was moved from this site to the SD School, NCore Site for South Dakota, at the beginning of 2009, as required by EPA rule.

At the end of 2010, the PM_{10} parameter was removed from this site because concentrations are low and have a very small chance of exceeding the national standard.

Sampling objectives for these monitoring parameters are population and high concentration. The sampling scale is neighborhood for $PM_{2.5}$. Table 10-6 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Table 10-6 - KELO Site Specifics

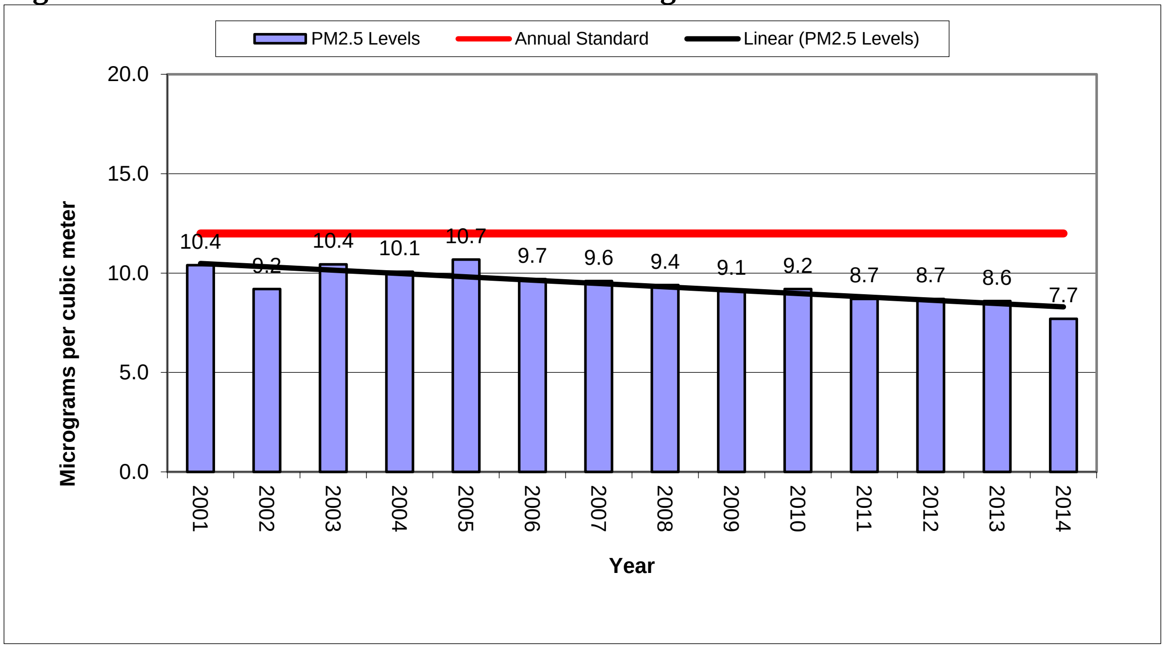
Parameter	Information
Site Name	KELO
AQS ID Number	46-099-0006
Street Address	500 South Phillips, Sioux Falls, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 683,678.21 N 4,823,550.80
MSA	Sioux Falls
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Equivalent Method EQPM-0202-143
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Partisol 2000 $PM_{2.5}$ w/VSCC
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)

10.5.1.1 *KELO Site – PM2.5 Data*

Sampling for $PM_{2.5}$ concentrations began in 2001. Annual averages for the KELO Site have a range from a high of 10.7 ug/m^3 in 2005 to a low of 7.7 ug/m^3 in 2014. Figure 10-23 contains a graph of the annual averages for the KELO Site.
A
nnual averages show some variation from year to year, but the trend line shows a decreasing concentration level. In 2014, the annual average concentration dropped to the lowest concentration level since the testing began in 2001.

The KELO and SD School sites have concentrations that are very similar and appear to be duplicating the sampling effort in Sioux Falls. The plan is to terminate the KELO Site at the end of 2014 and use the sampling resources in other locations in the state. See Attachment A for more details on the comparison of the two sites in Sioux Falls for $PM_{2.5}$ testing.

Figure 10-23 – KELO Site PM2.5 Annual Averages



10.5.2 SD School Site

The SD School Site replaced the SF Hilltop Site on January 1, 2008. The site is the National Core site for the state. Operating sampling parameters at the SD School Site include PM_{10}, $PM_{2.5}$, ozone, SO_2, NO_2, CO, NO_y, $PM_{10-2.5}$, meteorology, and $PM_{2.5}$ speciation in 2014. The setup of sampling equipment for $PM_{10-2.5}$ includes results for PM_{10} and $PM_{2.5}$ without adding any additional monitors to the site. This is a very busy monitoring site collecting more than 140,000 data points per year all loaded to the EPA national database. Figure 10-24 shows a current picture of the SD School Site.

The SD School Site is located on the east central part of the city. The site is about 1.2 miles southeast of the main industrial area in Sioux Falls. The area around the site is mainly residential. Interstate 229 which is a major commuting road runs north and south about three city blocks east of the monitoring site. Table 10-7 contains details on the monitoring site specific to the requirements in 40 CFR Part 58. In addition to the parameters listed in Table 10-8, a $PM_{2.5}$ speciation monitor is operated at an every 3^{rd} day sampling schedule.

Figure 10-24 – SD School Site

Table 10-7 – SD School Site Specifics

Parameter	Information
Site Name	SD School
AQS ID Number	46-099-0008
Street Address	2009 East 8th Street, Sioux Falls, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 687,288.70 N 4,822,930.29
MSA	Sioux Falls
PM_{10}/$PM_{2.5}$/PM_{coarse}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0798-122
Operating Schedule	Every Daily/Hourly
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Met One BAM-1020
Analysis Methods	beta attenuation
Data Use	SLAMS (Comparison to the NAAQS)
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Reference Method RFPS-0202-143
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration

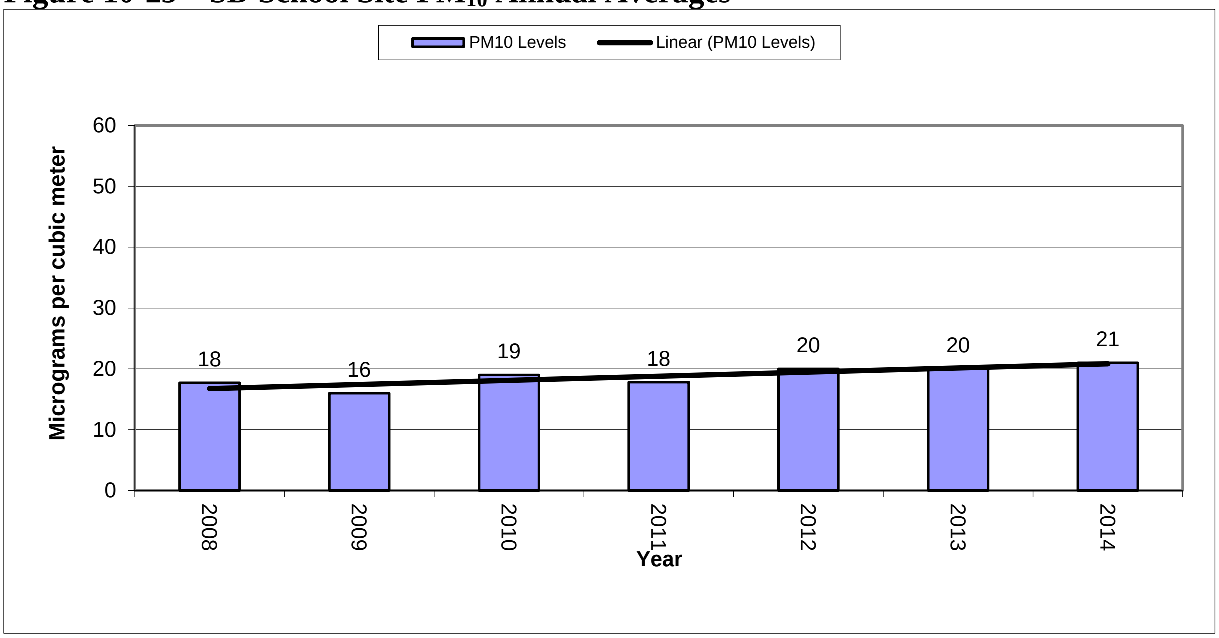
Parameter	Information
Sampling Method	Partisol 2000 w/VSCC
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Daily/Hourly
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Met One BAM-1020
Analysis Methods	beta attenuation
Data Use	SLAMS (Comparison to the NAAQS)
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Instrumental Thermo 49C
Analysis Methods	Ultraviolet
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data
NO_2	**(Continuous)**
Sampler Type	Federal Reference Method RFNA-1289-074
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Automated Analyzer Thermo 42c
Analysis Methods	Ultraviolet Fluorescence
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data
NO_y	**(Continuous)**
Sampler Type	None
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	Population
Sampling Method	Automated Analyzer Thermo 42i
Analysis Methods	Chemiluminescence NO-Dif-NO_y
Data Use	SPMs
SO_2	**(Continuous)**
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Instrumental Thermo 43i TL
Analysis Methods	Pulsed Fluorescence
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data
CO	**(Continuous)**

Parameter	Information
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Instrumental Thermo 48i TLE
Analysis Methods	Gas/Filter/Correlation
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data

10.5.2.1 *SD School Site – PM_{10} Data*

Figure 10-25 shows a graph of the PM_{10} annual averages since 2008. The annual averages at the SD School Site range from a high of 21 ug/m^3 in 201~~3~~4 to a low of 16 ug/m^3 in 2009. The trend line indicates a slightly increasing concentration level. This parameter is meeting the goals of high concentration and population and will be continued.

Figure 10-25 – SD School Site PM_{10} Annual Averages



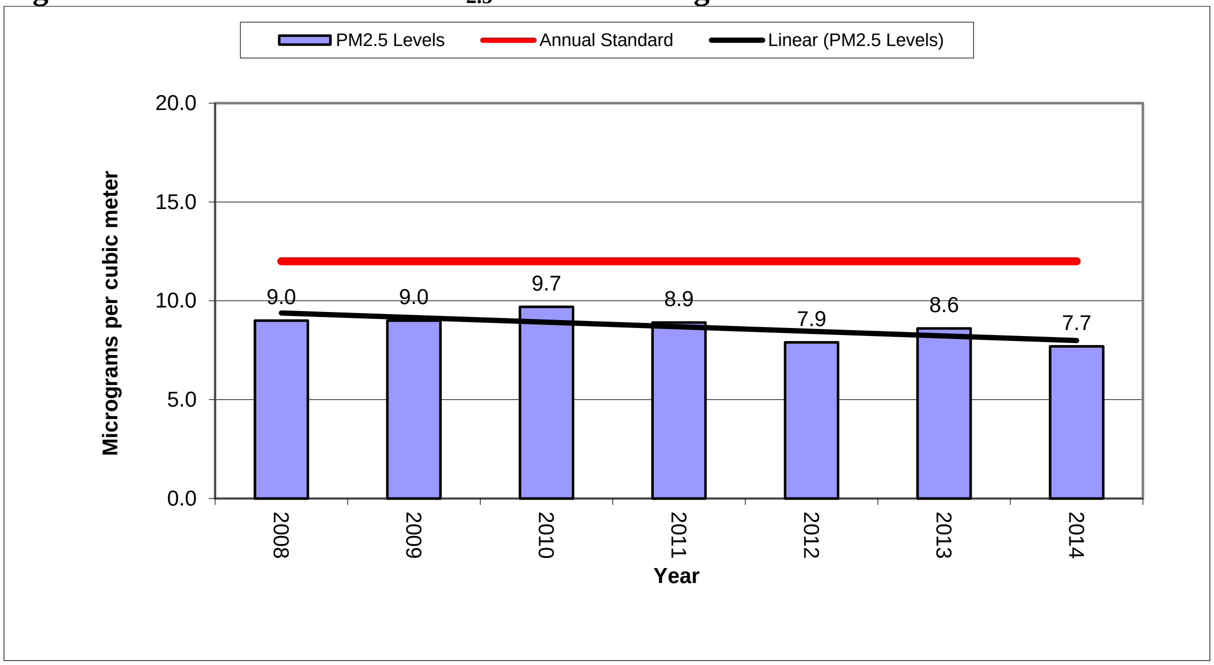
10.5.2.2 *SD School Site – $PM_{2.5}$ Data*

$PM_{2.5}$ data has been collected at this site since 2008. Annual averages for the SD School Site range from a low of 7.7 ug/m^3 in 2014 to a high of 9.7 ug/m^3 in 2010. The 2014 sampling year recorded the lowest concentration as recorded at this site. Figure 10-26 contains a graph of the annual averages.

Concentrations of $PM_{2.5}$ are some of the highest in the state at this site. In 2014, the SD School Site had concentrations of $PM_{2.5}$ that ranked as the highest in the state along with the City Hall Site but in some previous years it has rank as low as the third highest site statewide. This parameter will remain a priority because of past high concentrations levels for the annual and 24-

hour standards. Testing for this parameter is meeting the goals of high concentration and population and will be continued.

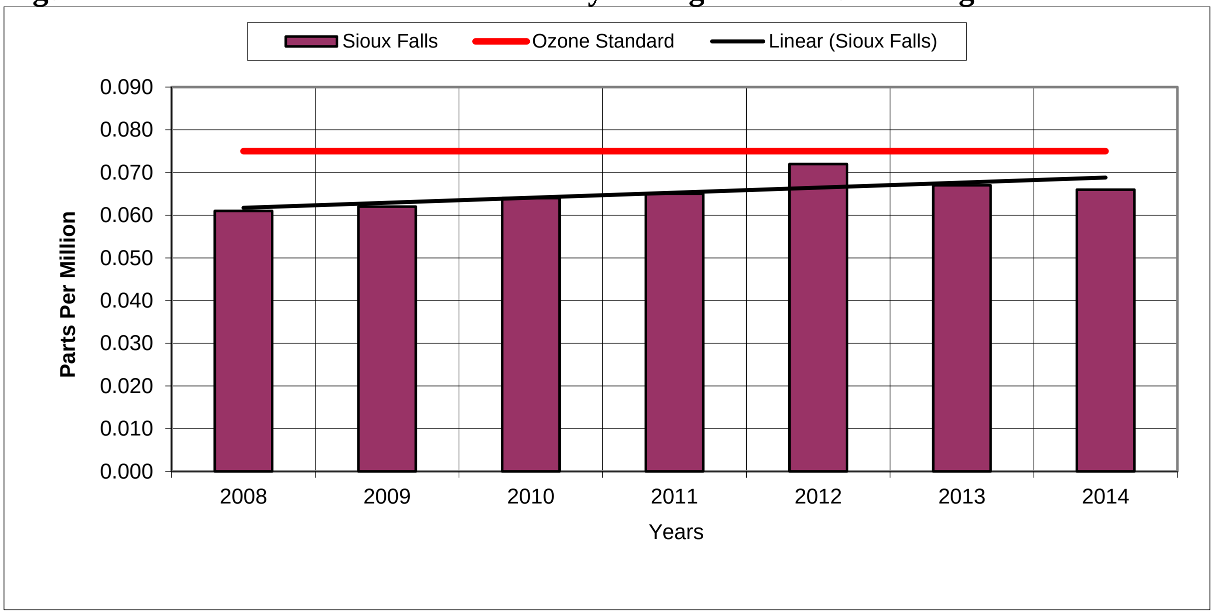
Figure 10-26 – SD School Site $PM_{2.5}$ Annual Averages



10.5.2.3 *SD School Site – Ozone Data*

Figure 10-27 contains a graph of each year's 4th highest ozone concentration level. The ozone analyzer runs on a continuous sampling schedule providing hourly concentrations to the data logger. The official yearly ozone season for South Dakota runs from June 1 to September 30.

Figure 10-27 – SD School Site Ozone Yearly 4th Highest 8-Hour Averages



Past sampling experience shows that some of the high ozone readings can occur outside of the official ozone season. The department operates the monitor year around instead of just during the ozone season.

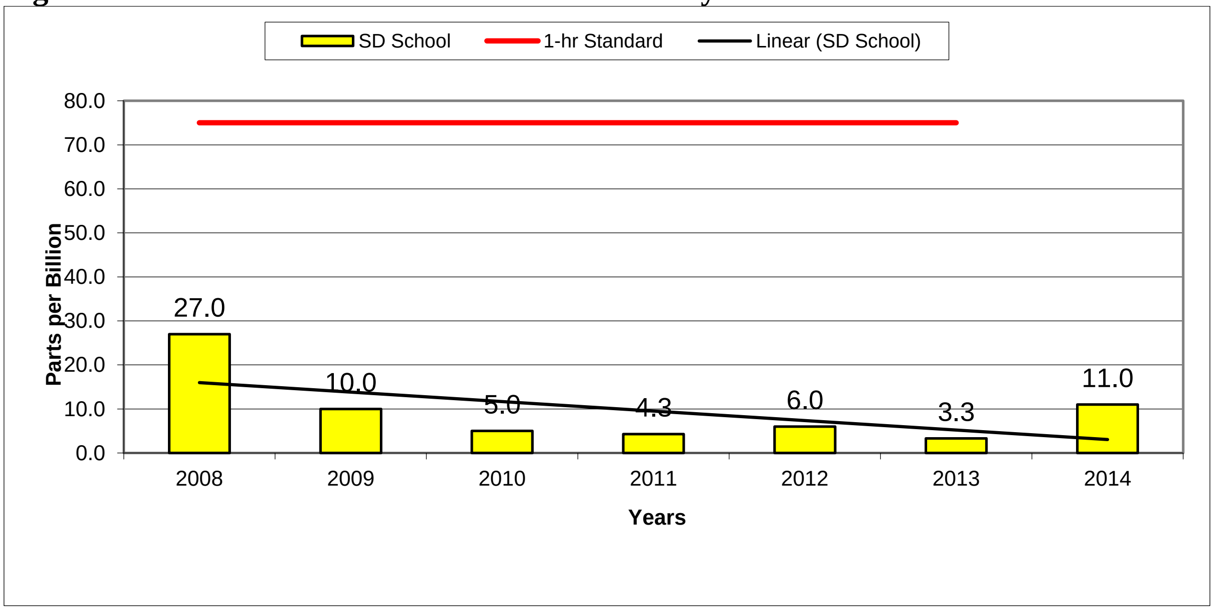
Sampling began for ozone at this site in 2008. The highest annual 4th highest 8-hour ozone concentration recorded at this site was in 2012 at 0.072 ppm. The lowest annual 4th highest 8-hour ozone concentration was recorded at 0.061 ppm in 2008. The trend line shows an increasing level of ozone over the six years of testing mostly due to the 2012 sampling year. In 2014, concentrations of ozone decreased by 0.002 ppm from the level in 2012. This parameter is meeting the goals of high concentration and population testing and is one of the highest sites in the state so the testing will be continued at this site.

10.5.2.4 *SD School Site – Sulfur Dioxide Data*

Testing for SO_2 started in 2008 at this site. A continuous analyzer is operated providing hourly concentration levels. The levels of SO_2 have dropped in concentration since the first year of testing. The type of analyzer was changed to a trace level SO2 analyzer in 2011. The detection level of this analyzer is now 0.1 ppb.

In 2014, concentrations of SO_2 increased from the previous years but are still significantly below the national standard. The trend line shows a drop in concentrations of SO_2 over the seven years of testing. This parameter is meeting the goals of high concentration and population and testing will be continued at this site. Figure 10-28 contains a graph of the SO_2 yearly 1-hour 99th percentile for each sampling year.

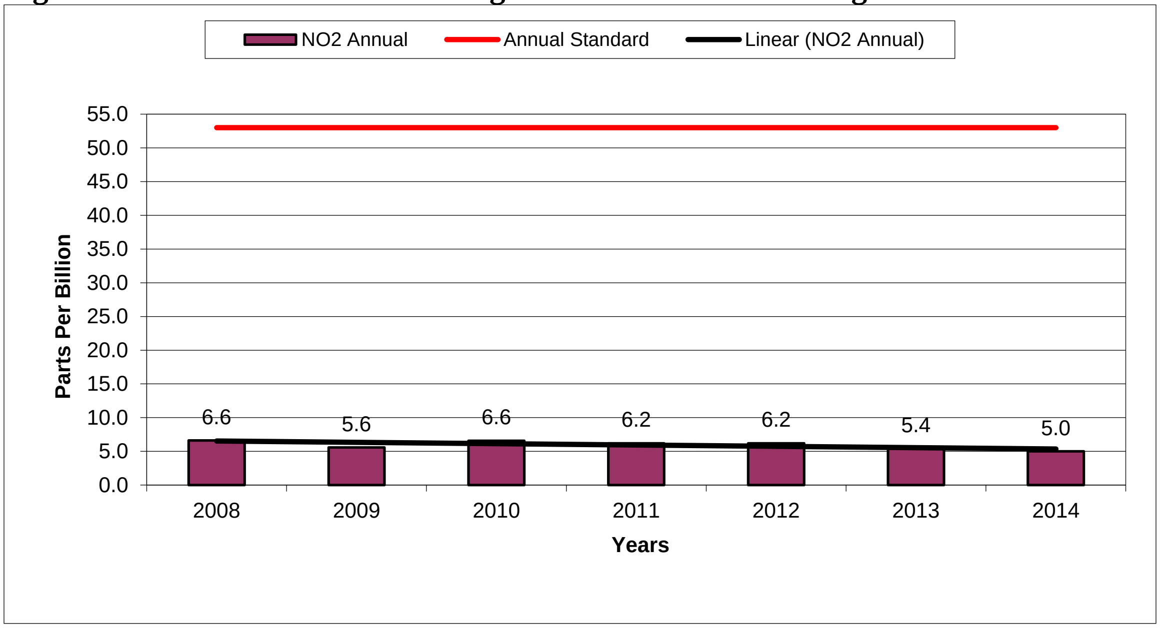
Figure 10-28 – SD School Site Sulfur Dioxide Yearly 1-hour 99th Percentile



10.5.2.5 *SD School Site – Nitrogen Dioxide Data*

The SD School Site began testing for NO_2 in 2008. The NO_2 analyzer provides hourly concentration levels. The SD School Site is the second highest NO_2 concentration areas in the state. There is only 1.6 ppb difference in annual concentration levels from highest annual average of 6.6 in 2008 and the lowest of 5.0 in 2014. Trends show concentrations are declining slightly at this site. Figure 10-29 shows the annual average for each of the years that data was collected. This parameter is meeting the goals of high concentration and population and will be continued.

Figure 10-29 – SD School Site Nitrogen Dioxide Annual Averages



10.6 Aberdeen Area

In 2014, one sampling site was operated in the city of Aberdeen at the Fire Station #1 Site. The Fire Station #1 Site was established in 2000 as part of the implementation of the $PM_{2.5}$ air monitoring network. The parameters tested at the site include PM_{10} and $PM_{2.5}$. The monitoring site is located in the center of the city on top of the fire station roof just east of the main downtown business area. The area around the site has service type businesses, county and city offices, and residential area to the east. See Figure 10-30 for a picture of the monitoring site.

Figure 10-30 – Aberdeen's Fire Station #1 Site

In 2009, Fire Station #1 was renovated and a small addition was added to the south side of the building. The addition required no changes at the site so the location requirements in 40 CFR Part 58 are still met. Table 10-8 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Table 10-8 – Fire Station #1 Site Specifics

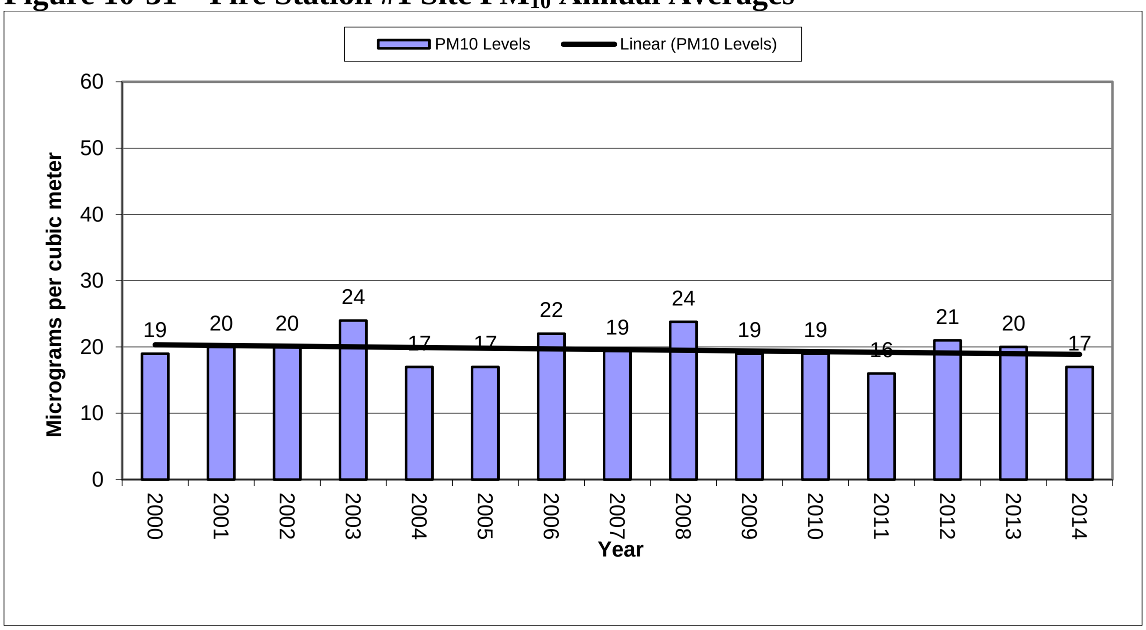
Parameter	Information
Site Name	Fire Station #1
AQS ID Number	46-013-0003
Street Address	111 2nd Ave SE, Aberdeen, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 540,216.92 N 5,034,545.94
MSA	None
PM_{10}	**(Manual)**
Sampler Type	Federal Reference Method RFPS-1287-063
Operating Schedule	Every 6th Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Hi-Vol SA/GMW-1200
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS),
$PM_{2.5}$	**(Manual)**

Parameter	Information
Sampler Type	Federal Equivalent Method EQPM-0804-153
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Partisol 2000 w/VSCC
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)

10.6.1 Fire Station #1 Site – PM_{10} Data

In 2009 the sampling schedule for PM_{10} changed from every third day to every 6th day because concentrations at the site continue to be low and the chance of recording a concentration over the current standard is very low. Figure 10-31 contains a graph of the annual averages since the site was setup in 2000.

Figure 10-31 – Fire Station #1 Site PM_{10} Annual Averages



The annual average concentrations change from year to year but with the addition of the annual average for 2014 the trends line indicates a steady concentrations over the fifteen years of testing. The annual averages range from a low of 16 ug/m^3 in 2011 to a high concentration level of 24 ug/m^3 recorded in 2003 and 2008. The testing for this parameter is meeting the goals of high concentration and population and will be continued.

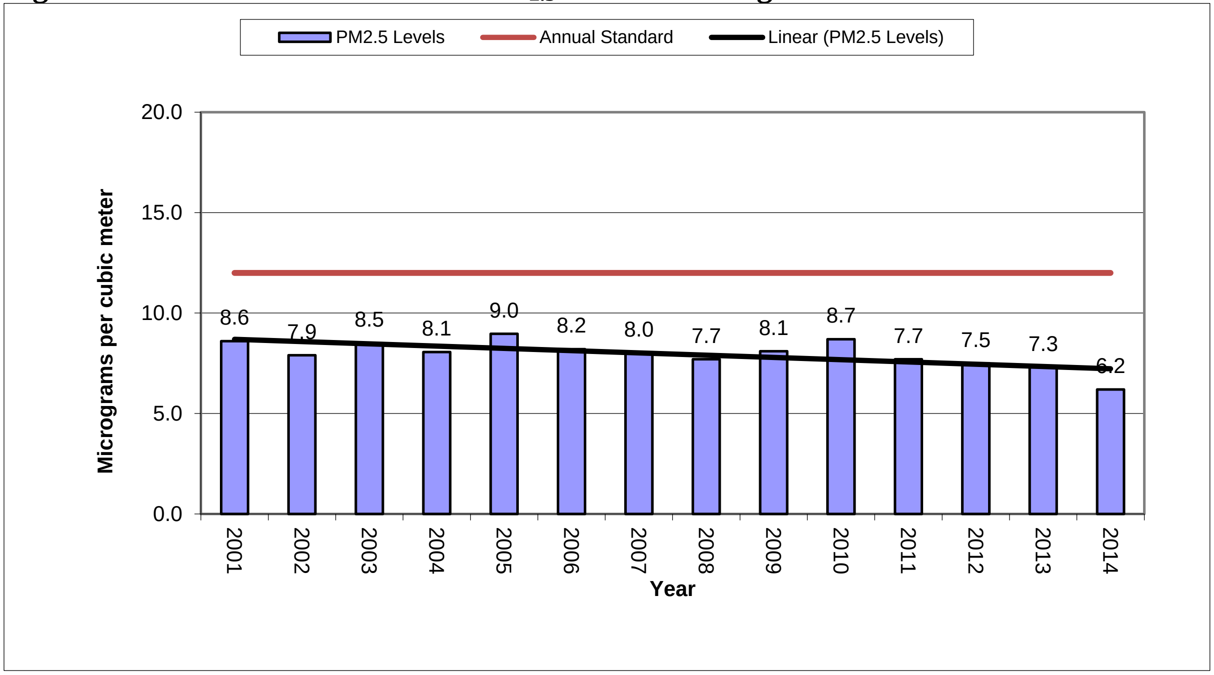
10.6.2 Fire Station #1 Site – $PM_{2.5}$ Data

Sampling began for $PM_{2.5}$ at this site in 2001. The $PM_{2.5}$ monitors run on an every third day sampling schedule. Annual averages for the Fire Station #1 Site in Aberdeen have ranged from

6.2 ug/m^3 in 2014 to 9.0 ug/m^3 in 2005. The 2014 annual average concentration was lower then was recorded in 2013 by 1.1 ug/m^3.

The trend line shows that annual average is declining in concentration level over the last fourteen years. The testing for this parameter is meeting the goals of high concentration and population and will be continued. Figure 10-32 contains a graph of the annual average concentrations.

Figure 10-32 – Fire Station #1 Site $PM_{2.5}$ Annual Averages



10.7 Brookings Area

In 2014 two air monitoring sites were operated in the Brookings County. The oldest site is located at the City Hall building in the center of the city of Brookings. Testing at this site includes PM_{10} and $PM_{2.5}$ parameters. The Research Farm Site was setup in 2008 and is located at the Soil Conservation Farm northwest of the city of Brookings. Testing at this site includes ozone and meteorological data.

10.7.1 City Hall Site

The City Hall Site was established in 1989 and sampled for levels of PM_{10}. The site is the result of a cooperative effort between the department and the city of Brookings. The area to the west of the site is residential and the areas north, east, and south have service oriented businesses and light industry. Brookings is a growing community with a 2010 population of 22,056 and has a growing industrial base. In 1999, $PM_{2.5}$ monitors were added to the site. The sampling frequency in 2012 was changed for PM_{10} to every day and $PM_{2.5}$ continues as every third day testing. Figure 10-33 shows a current picture of the monitoring site. Table 10-9 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Figure 10-33 – City Hall Site

Table 10-9 – City Hall Site Specifics

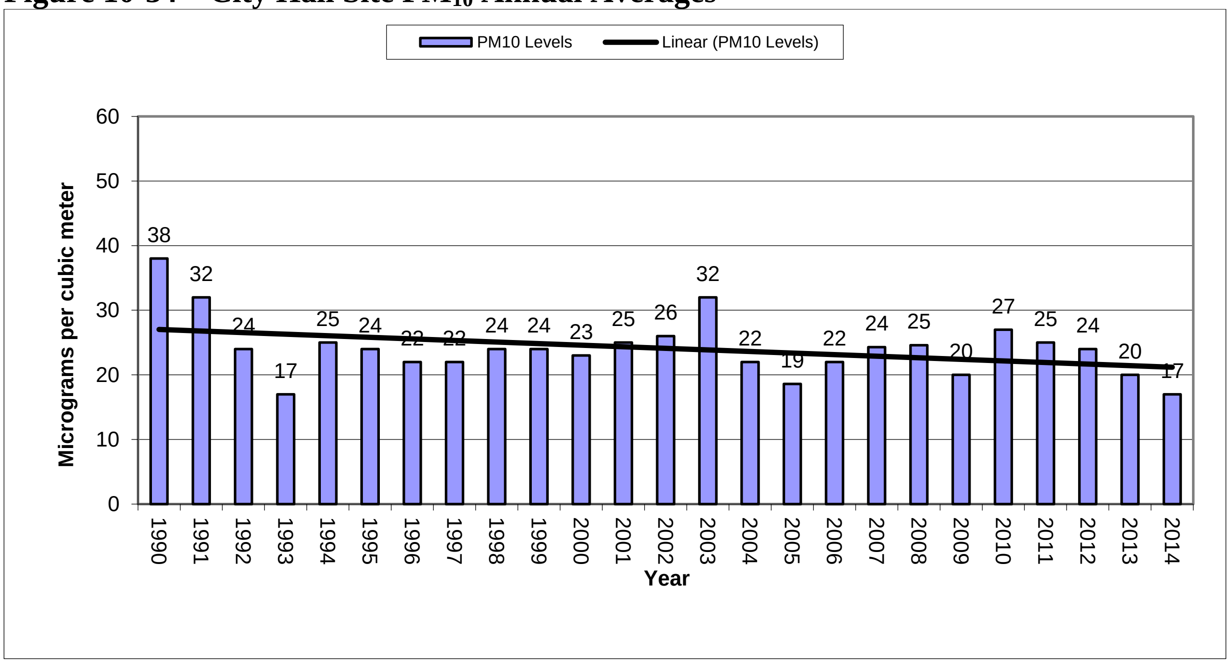
Parameter	Information
Site Name	City Hall
AQS ID Number	46-011-0002
Street Address	311 3rd Avenue, Brookings, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 675,410.76 N 4,908,468.06
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	T A Series FH 62 C14 Continuous
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-Time Data
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Equivalent Method EQPM-0202-143
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration

Parameter	Information
Sampling Method	R&P Partisol 2000 w/VSCC
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)

10.7.1.1 *City Hall Site – PM_{10} Data*

PM_{10} sampling began at this site in 1989. At the beginning of 2012 the manual monitors were replaced with a continuous. The annual averages range from a high of 38 ug/m^3 in 1990 to a low of 17 ug/m^3 in 1993 and 2014. The trend line shows concentration levels declining over the 24 years the site has been operating. In 2014, PM_{10} concentrations were down from the previous year by 3 ug/m^3 to the site low concentration matching the 1993 annual average. In Figure 10-34, there is a graph of the annual averages since the site was setup in 1989.

Figure 10-34 – City Hall Site PM_{10} Annual Averages



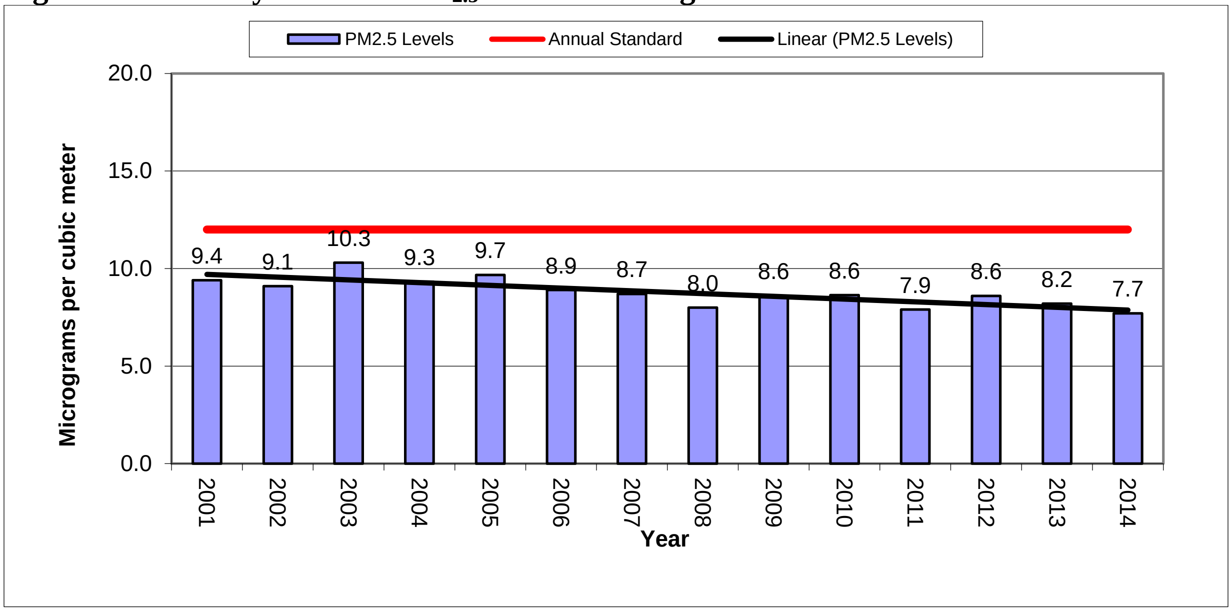
The current plan is to combine the two air monitoring sites in Brookings County into one at the end of 2014. The goal would be to close the City Hall Site and mover the sampling parameters to the Research Farm Site.

10.7.1.2 *City Hall Site – $PM_{2.5}$ Data*

The $PM_{2.5}$ monitors run on an every third day schedule since the site was setup in 1999. Annual averages for the City Hall Site range from a high of 10.3 ug/m^3 in 2003 to a low of 7.7 ug/m^3 in 2014. The trends for the thirteen years of testing show a decrease in $PM_{2.5}$ levels overall. In 2014, $PM_{2.5}$ annual average concentration was down slightly from the levels recorded in 2013.

Testing for this parameter is meeting the goals of high concentration and population. Most of the high 24-hour concentrations occur on days that are regional in scale. Annual averages are well under the standard and similar to the levels as the other eastern edge of the state sites. Therefore, the plan is to continue to test for $PM_{2.5}$ in Brookings County though the end of 2014 and then move the testing to the Research Farm Site so the manual method monitor can be replaced with a continuous monitor at the start of 2015. Figure 10-35 contains a graph of the annual average concentrations.

Figure 10-35 – City Hall Site $PM_{2.5}$ Annual Averages



10.7.2 Research Farm Site

The Research Farm Site was set up in cooperation with the 3M Company in Brookings and Valero Renewable Fuels Company near the city of Aurora which provided the equipment for the site. The sampling was a requirement of the Prevention of Significant Deterioration permits for both facilities. The department is operating the site and provided data to the facilities. The 3M Company has completed their air monitoring report using the data for 2008. Valero Renewable Fuels Company decided not to complete the facility upgrade under its Prevention of Significant Deterioration permit and no longer needs data from the Research Farm Site. Ozone data collected between 2008 and 2010 was added as a SLAMS site to the National Database in 2010.

The site location is outside of the NO_2 one microgram area modeled for the facilities in the Brookings area. The site collects data for ozone and meteorological parameters. The goals of the monitoring site were the evaluation of impacts to the ozone concentrations from modification at the 3M Company and Valero Renewable Fuels Company and to date the goals have been met. New goals have been added to collect ozone data downwind of a small city and for comparison to the NAAQS. The completion of the 2014 sampling year provides seven years of testing and a better idea of trends for the ozone data. Figure 10-36 shows a current picture of the monitoring site. Table 10-10 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Figure 10-36 – Research Farm Site

Table 10-10 – Research Farm Site Specifics

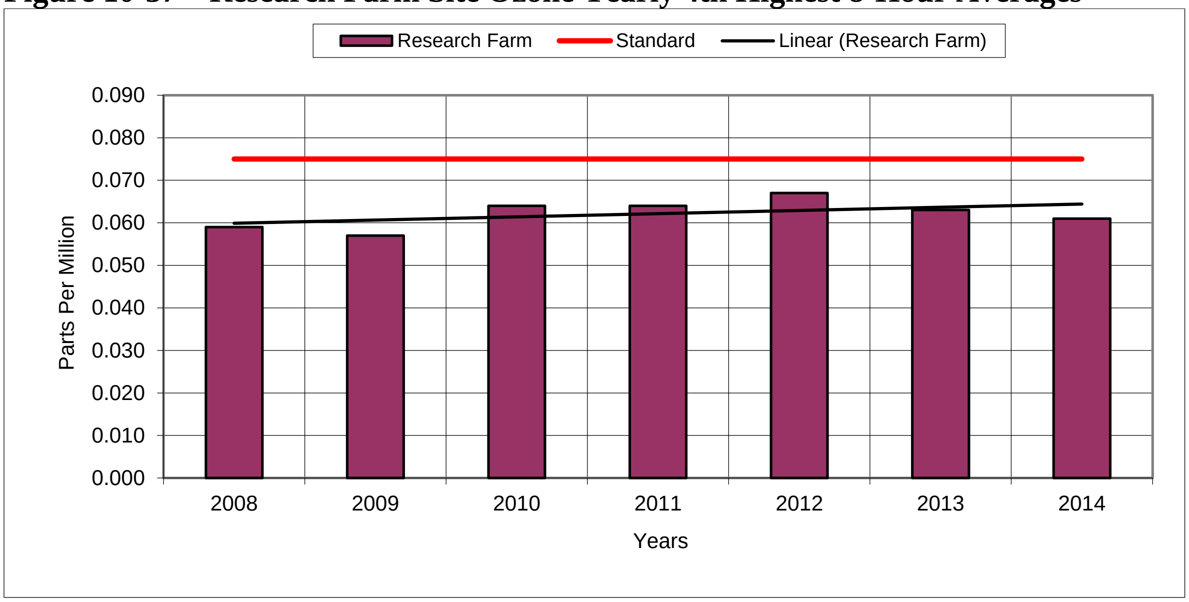
Parameter	Information
Site Name	Research Farm
AQS ID Number	46-011-0003
Street Address	3714 Western Ave.
Geographic Coordinates	UTM Zone 14, NAD 83, E 674766.316 N 4912930.911
MSA	None
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	High Concentration, Population, and Background
Sampling Method	Thermo 49i
Analysis Methods	ultraviolet
Data Use	SLAMS (Comparison to the NAAQS),

10.7.2.1 *Research Farm Site – Ozone Data*

The 2014 sampling year is the seventh ozone season of testing. In 2014, the Research Farm Site had a fourth highest 8-hour average for the year under the standard of 0.075 ppm. The ozone data trend indicates an increasing level but the last two years concentrations have decreased from the high in 2012. The ozone sampling sites along the eastern edge of state have all shown the same trend the last two years.

The testing for this parameter is meeting the goals of a SLAMS location and will be continued because it is one of three sites recording the highest concentrations in the state. It is meeting the goal of high concentration and population. The graph in Figure 10-37 shows the yearly 4th highest ozone concentration level for the last seven years.

Figure 10-37 – Research Farm Site Ozone Yearly 4th Highest 8-Hour Averages



10.8 Watertown Area

In 2014, one sampling site was operated in the city of Watertown. Watertown is the fourth largest city in South Dakota with a population of 21,482. The city has an increasing growth rate and industrial base. The industrial base is a mixture of service-oriented business and light industry. One other air monitoring site was operated in Watertown starting in 1974 and closed 1987. No other air monitoring data has been operated in the city. Figure 10-38 shows a picture of the monitoring site.

The current Watertown Site was established in 2003 as part of the implementation of the $PM_{2.5}$ network. The parameters tested at the site include PM_{10} on a sampling frequency of every day and $PM_{2.5}$ at a sampling frequency of every day. In 2012, the manual $PM_{2.5}$ monitors were replaced with a continuous monitor.

The monitoring site is located in the western third of the city just east of an industrial park area. The site is located on the roof of a monitoring shelter. The area around the site has service type businesses and light industry to the west and south. Residential areas are located to the north and east of the site. There have been no significant changes noted in buildings or trees around the site during this review. Table 10-11 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Figure 10-38 – Watertown Site

Table 10-11 – Watertown Site Specifics

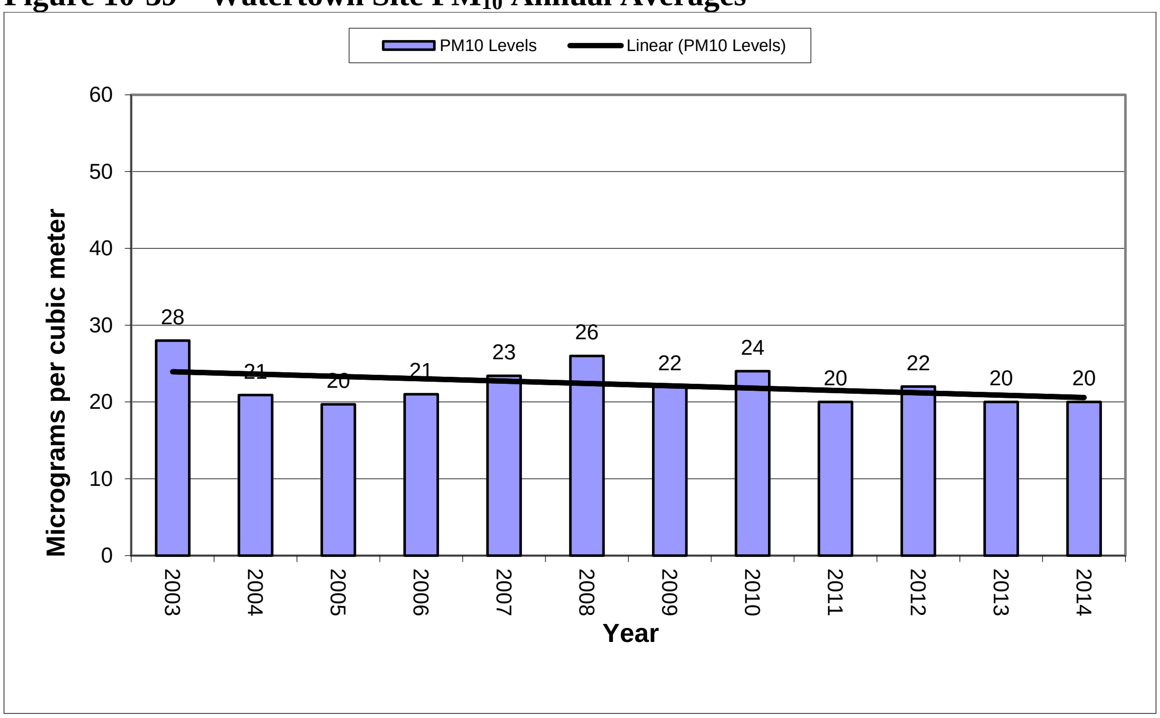
Parameter	Information
Site Name	Watertown
AQS ID Number	46-029-0002
Street Address	801 4th Ave. SW, Watertown, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 647,740.74 N 4,973,300.25
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	T A Series FH 62 C14 Continuous

Parameter	Information
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-Time Data
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method RFPS-0598-0119
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SPMS

10.8.1 Watertown Site PM_{10} Data

The PM_{10} monitor operated on an every third day sampling schedule until 2006 when a continuous PM_{10} monitor replaced the manual monitors and an everyday sampling schedule began. The highest recorded annual average for PM_{10} concentrations was 28 ug/m^3 recorded in 2003. The lowest annual average concentration of 20 ug/m^3 was recorded on the manual monitor in 2005 and continuous monitor in 2011, 2013, and 2014. The annual average indicates concentration levels are slightly decreasing during the 12 years of testing. Testing for this parameter is meeting the goals of high concentration and population and will be continued. Figure 10-39 contains a graph of the annual averages.

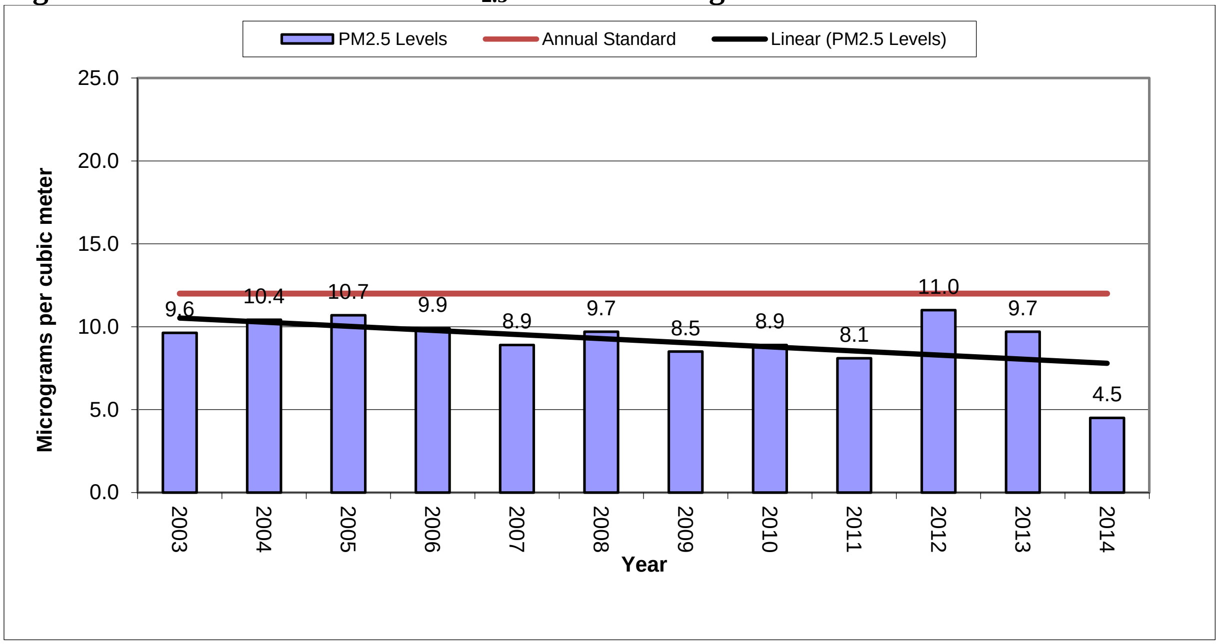
Figure 10-39 – Watertown Site PM_{10} Annual Averages



10.8.2 Watertown Site $PM_{2.5}$ Data

The $PM_{2.5}$ monitors were run on an every third day schedule since the $PM_{2.5}$ monitors were setup in 2003. Beginning in 2012 a continuous monitor was installed and the site reported hourly concentrations on an everyday schedule. Annual averages for the Watertown Site range from a high of 11.0 ug/m^3 in 2012 to a low of 4.5 ug/m^3 in 2014. The annual average shows a decrease in $PM_{2.5}$ concentration levels over the 12 years of testing even when including the 2012 year. Testing for this parameter is meeting the goals of high concentration and population and will be continued. Figure 10-40 contains a graph showing the annual average concentration for each year of operation.

Figure 10-40 – Watertown Site $PM_{2.5}$ Annual Averages



10.9 Union County Area

At the beginning of 2009, three new monitoring sites were set up in Union County. No ambient air quality testing had ever been completed in this county. All three sites are located north of Elk Point. The sampling goals for the new sites were to determine air pollution levels near the location of the proposed Hyperion Energy Center prior to construction, during construction, and post construction. Currently, the proposed project's Prevention of Significant Deterioration air quality permit has expired, no new application was submitted by the company and purchase easements on the property in Union County have all expired. By the end of 2013, the sites will have collected five years of data so there is an adequate amount of data for use to show background levels and the difference in sampling locations for future use. With no current project pending there is only need for one site to continue to show current levels in rural Union County.

In 2012, UC #3 Site was closed with the ozone parameter moved to UC #1. At the end of 2013 UC #2 was closed because it was a duplicate site to UC #1. At the end of 2013, the CO testing at

UC #1 was discontinued because recorded concentrations were very low and there was no indication concentrations would ever get close to the standard level.

10.9.1 UC #1 Site

UC #1 Site is located about 3 miles south of the proposed Hyperion Energy Center. Sampling began on or near January 1, 2009. The goals for the site are background and for comparison to the NAAQS. Figure 10-41 provides a picture of the monitoring site looking to the North. Table 10-12 contains details on the monitoring site specific to the requirements in 40 CFR Part 58.

Figure 10-41 – UC #1 Site

Table 10-12 – UC #1 Site Specifics

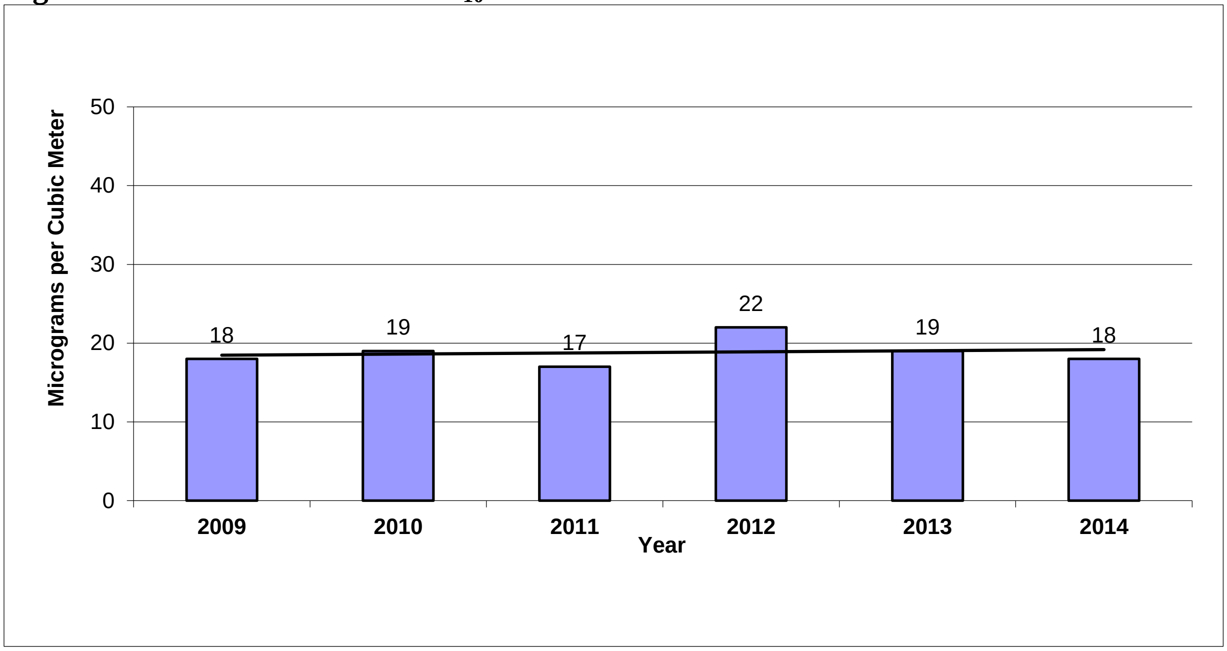
Parameter	Information
Site Name	UC #1
AQS ID Number	46-127-0001
Street Address	31988 457th Ave.
Geographic Coordinates	Lat. + 42.751518 Long. – 96.707208
MSA	Sioux City, IA-NE-SD
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport

Parameter	Information
Sampling Method	T A Series FH 62 C14 Continuous
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method RFPS-0598-0119
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
SO_2	**(Continuous)**
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental 43i Trace Level Thermo
Analysis Methods	Pulsed Fluorescent
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
NO_2	**(Continuous)**
Sampler Type	Federal Reference Method RFNA-1289-074
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental 42i Thermo/Fisher
Analysis Method	Chemiluminescence
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Thermo 49i
Analysis Method	Ultraviolet
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)

10.9.2 UC #1 Site – PM_{10} Data

The average concentrations of PM_{10} in UC #1 Site represent concentration levels similar to other sites in eastern South Dakota. The annual average PM_{10} concentrations in eastern part of the state range from 17 to 22 ug/m^3. The UC #1 Site annual averages ranked in the middle to the lower end of this range. Trends indicate concentrations are steady to increasing slightly for UC #1. The UC #1 Site had a lower PM_{10} level in 2014. See the annual averages for the UC #1 Site in Figure 10-42.

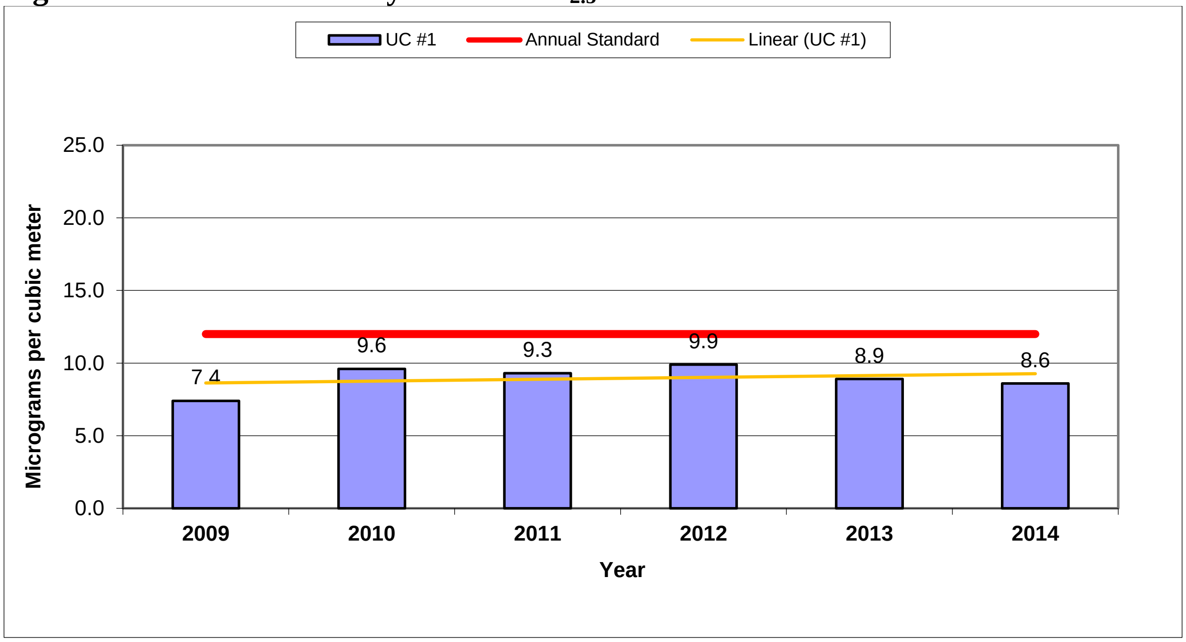
Figure 10-42 – UC #1 Annual PM_{10} Concentrations



10.9.3 UC #1 Site – $PM_{2.5}$ Data

The UC #1 Site continues to be one of the highest annual average locations in the state. During some years it is the highest concentration site in the state. The trend lines show concentrations to be slightly increasing over the six year sampling period. The last two years concentrations have decreased compared to levels in 2012. See Figure 10-43 to view a graph of the annual averages.

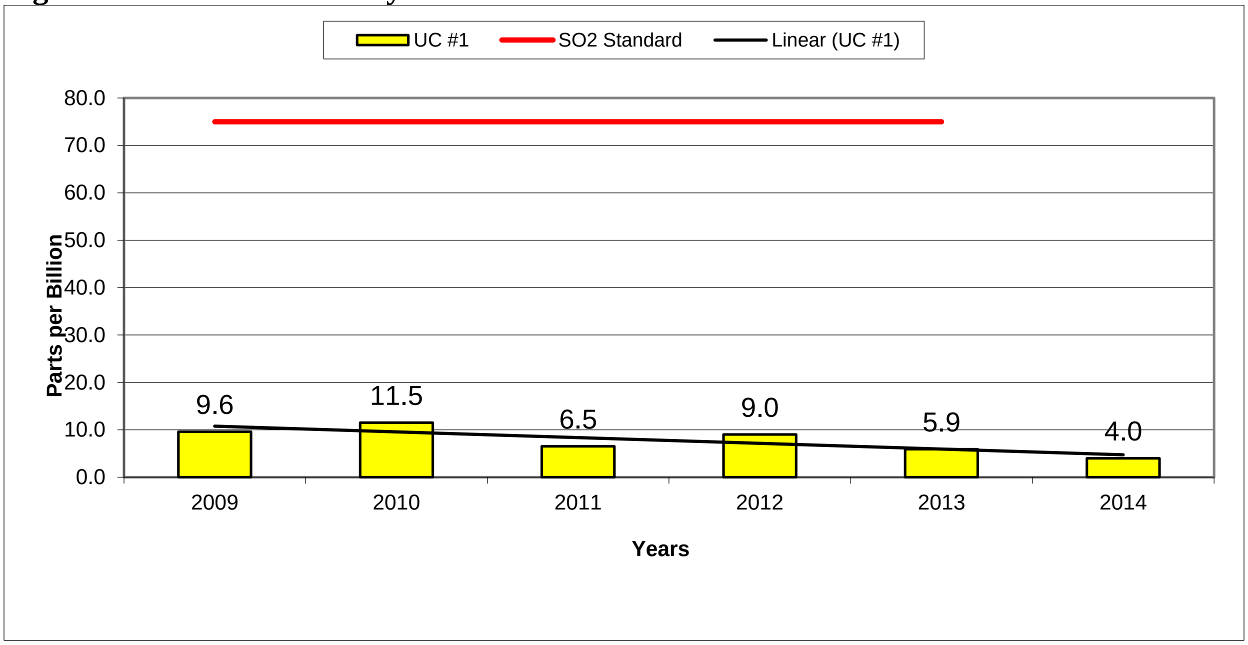
Figure 10-43 – Union County Annual $PM_{2.5}$ Concentrations



10.9.4 UC #1 Site – Sulfur Dioxide Data

Concentrations of SO_2 follow the same trend as other sites in the state with many hourly average concentrations low near the detection level (0.1 ppb) for the analyzer method being used to collect the data. A trace level SO_2 analyzer has operated at this site beginning in 2009. Trends indicate SO_2 levels are dropping slightly at this site. See Figure 10-44 for a graph showing the 1-hour 99^{th} percentile for this site.

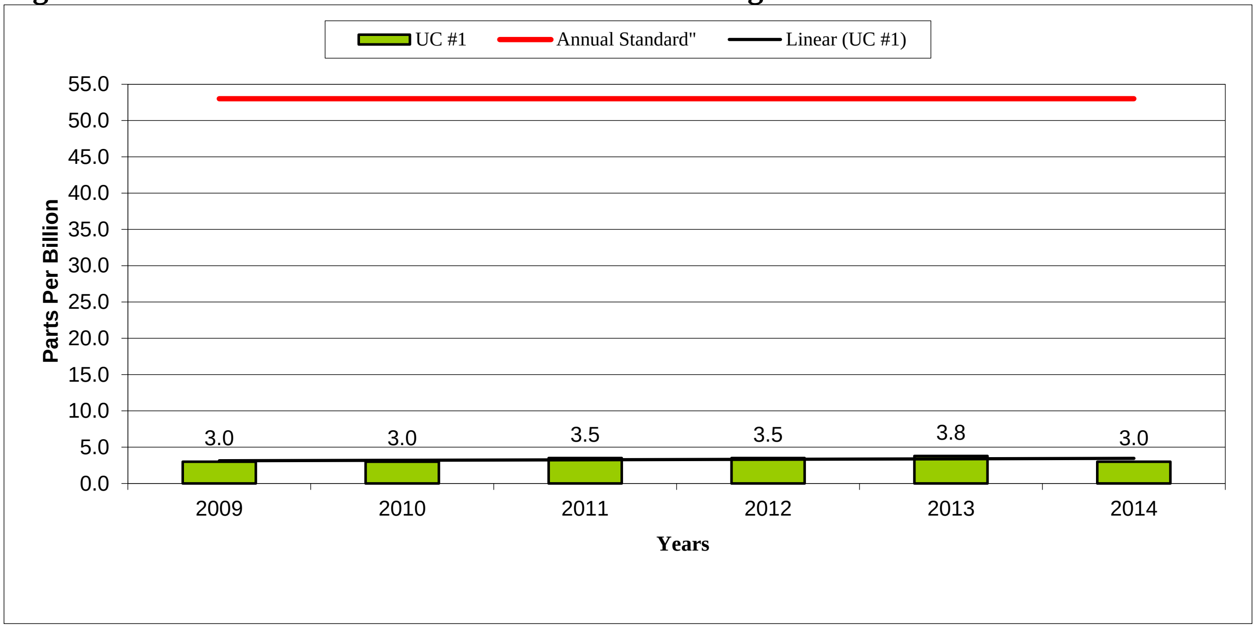
Figure 10-44 – Union County Sulfur Dioxide 1-hour Concentrations



10.9.5 UC #1 Site – Nitrogen Dioxide Data

Concentrations of NO_2 follow the same trends as other rural areas in the state like the Badlands and Wind Cave sites. Annual average concentrations are very low near the detection level for the analyzer method being used to collect the data. Just as the SO_2 parameter, the NO_2 parameter differences are noted from year to year when comparing a 1-hour average but the annual averages are very close in concentration. Trends indicate a steady concentration level for UC #1 over the six years of testing. Figure 10-45 shows a graph of the annual average concentrations for this site.

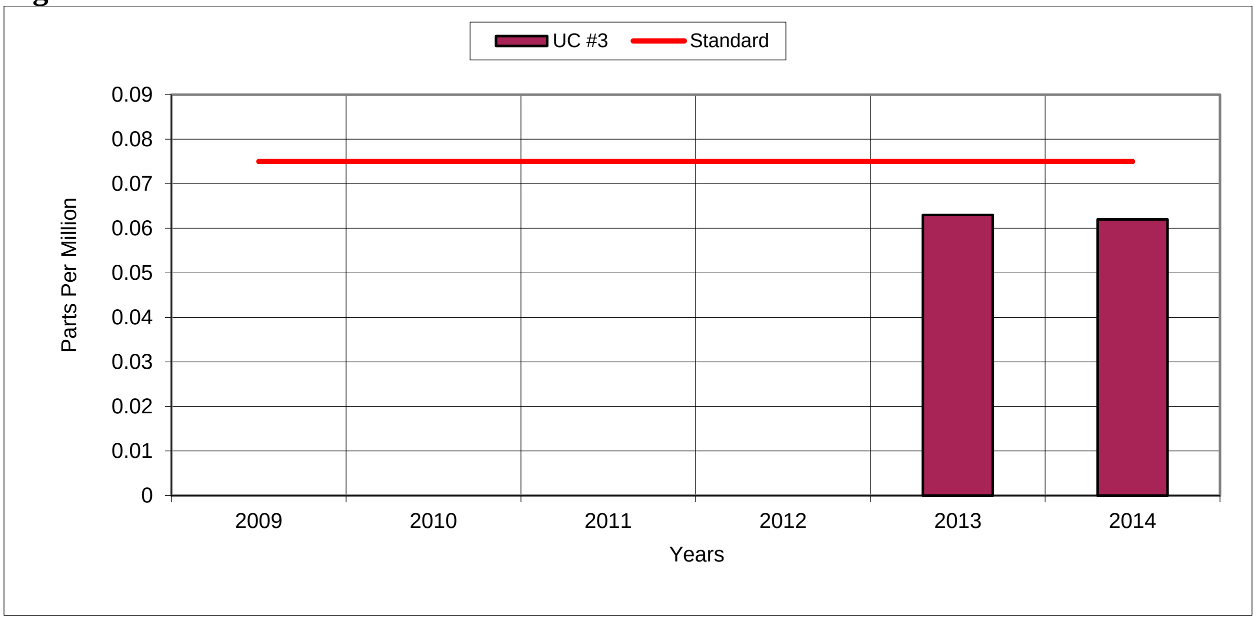
Figure 10-45 – UC #1 Site 1-Hour 98th Percentile Nitrogen Dioxide Concentrations



10.9.6 UC #1 Site – Ozone Data

The ozone 8-hour average for the UC #1 site recorded a concentration that was similar to levels recorded at the other two sites in the eastern part of the state in 2014. Because there are only two years of testing no trends can be determined. See Figure 10-46 for a graph of the ozone concentrations at the UC #1 Site. The addition of the 2015 sampling year will provide the first 3-year average to be compared to the national standard for ozone and will begin to show the trends for ozone levels at the site.

Figure 10-46 – UC #1 Site Ozone Concentrations



11.0 SPECIAL AIR QUALITY MONITORING

11.1 $PM_{2.5}$ Speciation Monitoring Program

Speciation Monitoring Program

The chemical speciation network will quantify mass concentrations and significant $PM_{2.5}$ constituents which include trace elements, sulfate, nitrate, sodium, potassium, ammonium, and carbon. This series of analytes is very similar to those measured within the Interagency Monitoring of Protected Visual Environments (IMPROVE) program.

Physical and chemical speciation data are anticipated to provide valuable information for:

1. Assessing trends in mass component concentrations and related emissions, including specific source categories.
2. Characterizing annual and seasonal spatial variation of aerosols.
3. Determining the effectiveness of implementation control strategies.
4. Helping to implement the $PM_{2.5}$ standard by using speciated data as input to air quality modeling analyses.
5. Aiding the interpretation of health studies by linking effects to $PM_{2.5}$ constituents.
6. Understanding the effects of atmospheric constituents on visibility impairment and regional haze.

South Dakota has one site that collects samples as part of the Speciation Network. This site collects 24-hour air samples on a 3-day schedule. The site is in Sioux Falls, located in southeastern South Dakota. Sioux Falls is the largest city in the state. The speciation monitor was moved from the KELO site to the SD School Site at the beginning of 2009. The School Site is located on the east central part of the city. The site is about 1.5 miles southeast of the main industrial area in Sioux Falls. The area around the site is mainly residential. Interstate 229 which is a major commuting road runs north and south about three city blocks east of the monitoring site. The predominant wind direction is northwest for most of the year with southeast winds during the summer months. Carbon samples were taken by the Met One SASS monitor. In September 2009, the Improve URG 3000N sampler was set up to do the carbon sampling.

Figure 11-1 shows a comparison of the $PM_{2.5}$ concentrations between the speciation monitor, the manual monitor, and the continuous monitor located at this site. Figure 11-2 shows the average total OC & EC concentrations for the URG. Figure 11-3 shows the average Nitrate and Sulfate concentrations.

It appears that sampling frequency and method type is affecting the difference in concentration levels and overall trend for the speciation monitor. The first two years of testing the speciation monitor ran on an every sixth day schedule. In 2011 to 2014, the schedule was changed to every third day. This reduced some of the difference in annual average concentration and brings the speciation monitor annual average comparable to the manual monitor annual average. The continuous monitor annual average is calculated using three times more samples so a difference in the annual mean is expected.

Figure 11-1 – Average $PM_{2.5}$ Concentration

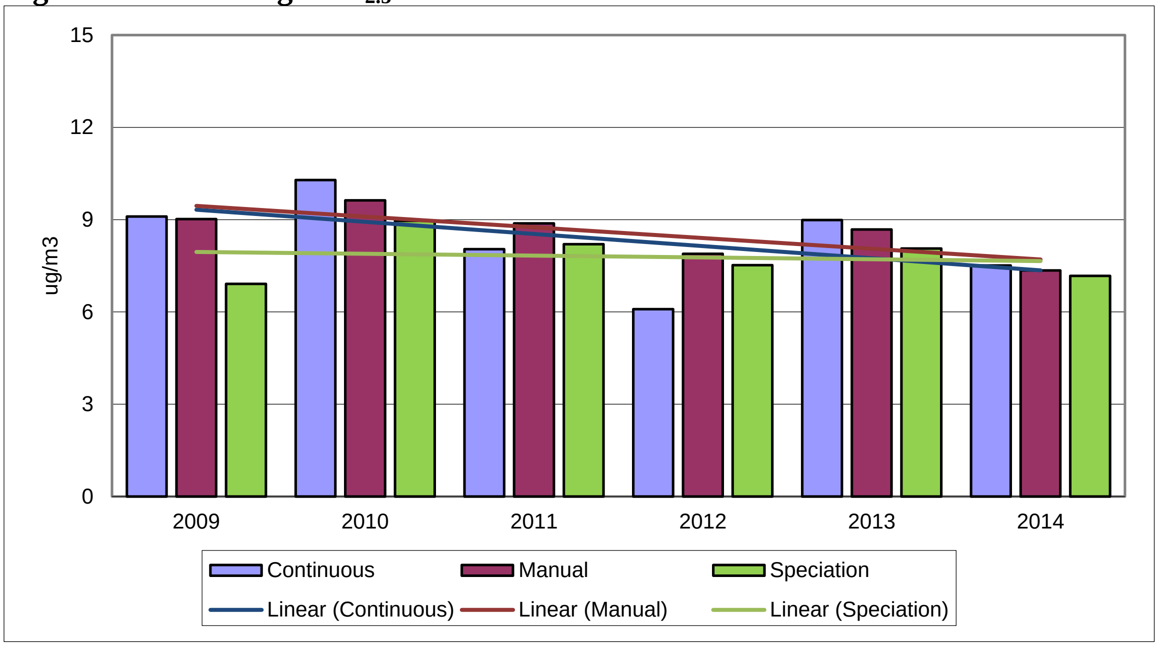
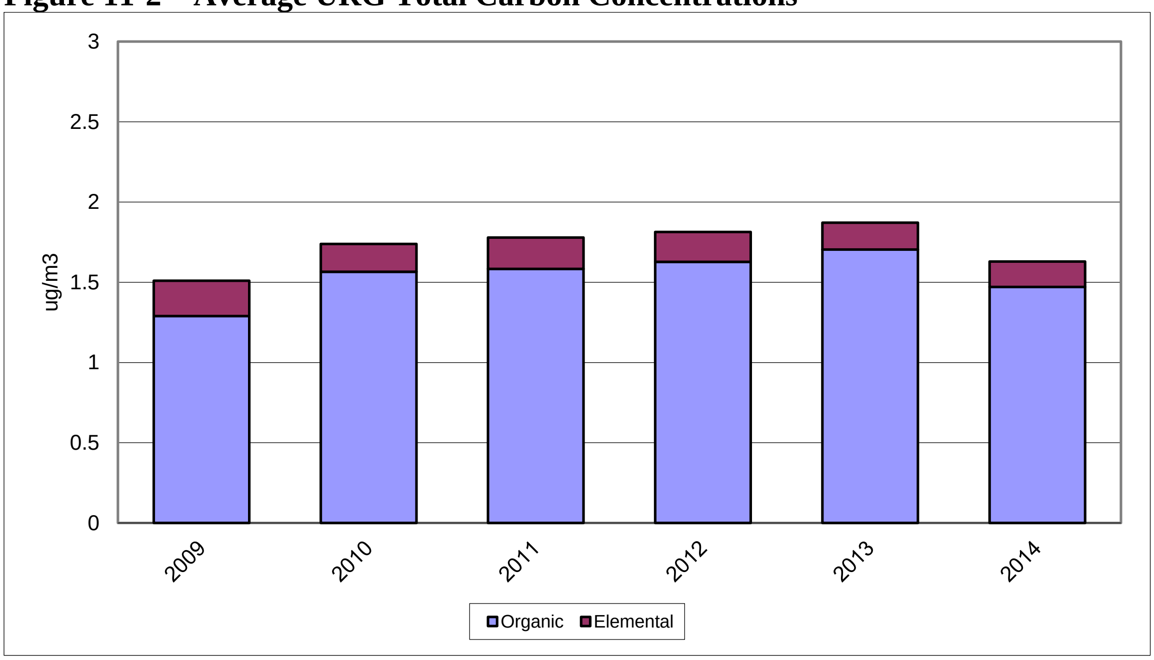


Figure 11-2 shows the average total organic carbon and elemental carbon concentrations for the URG. Concentrations of carbon are low. The organic carbon concentrations on the average

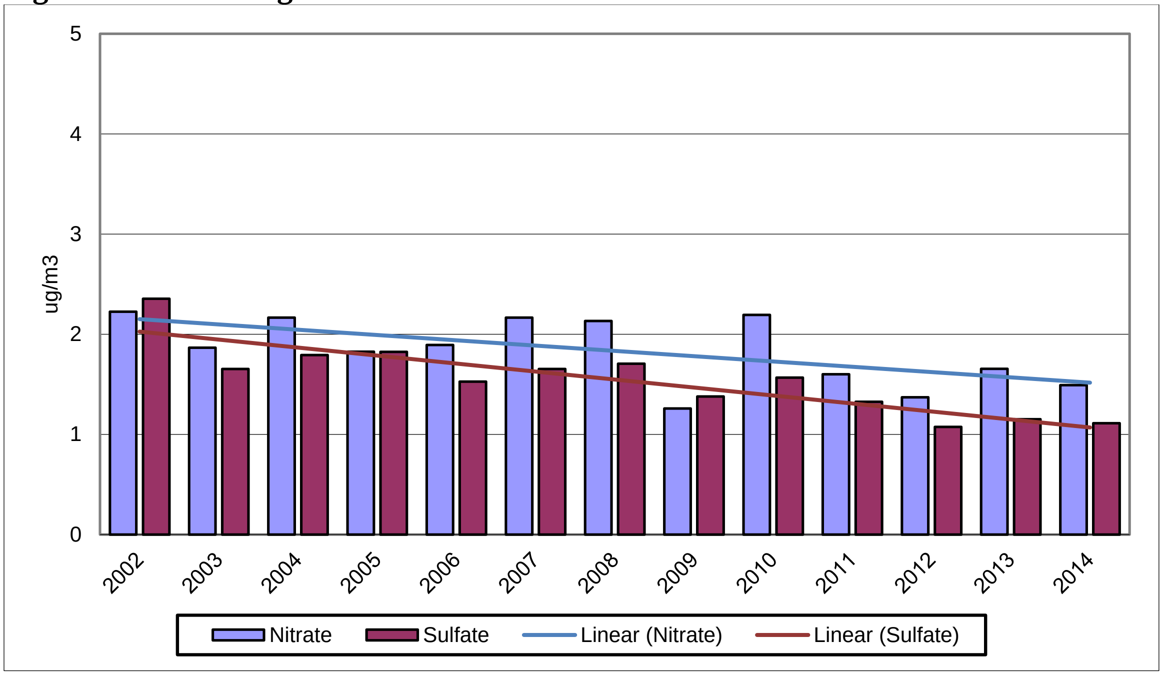
Figure 11-2 – Average URG Total Carbon Concentrations



are slightly higher in 2013 than in 2012. In 2014, concentrations were lower and decreased to the second lowest year for the site. The average contribution of elemental carbon to the overall concentration remained about the same from 2011 to 2013 and in 2014 levels were the lowest since 2009. The overall trend for total carbon shows a slight increase in total carbon levels in the six years of testing.

Figure 11-3 shows the average nitrate and sulfate concentrations analyzed from the $PM_{2.5}$ samples. The graph shows trends for the concentration of nitrates are declining overall and recorded a slight decrease in concentration in 2014 over the level in 2013. Sulfates in the $PM_{2.5}$ samples also decreased slightly in 2014. The trend line in the graph shows an overall declining sulfate levels by more than 50% during the thirteen years of testing in Sioux Falls.

Figure 11-3 – Average Nitrate and Sulfate Concentrations



12.0 CONCLUSIONS

The ambient air quality monitoring network has demonstrated that South Dakota is currently attaining the federal NAAQS. The Air Quality Program is working to ensure that any changes in the air quality of the state are reviewed for possible health effects to the public. The ambient air quality monitoring network is continually reviewed to ensure that there is adequate coverage of populated areas in the state. As the state's population and industry changes, monitoring sites will be added or moved to new locations.

Major modifications to the sampling network include:

- Establish a new SO_2 monitoring site or sites in Grant County to determine the highest 1-hour SO_2 concentrations around the Big Stone Power Plant. This proposed project may start in 2016

Equipment Purchase Priorities include the following items:

- Replace old Thermo FH 62 C14 PM BETA monitors;
- Replace old PM_{10} Hi-Vol monitor method at Aberdeen, RC Library and Black Hawk with Thermo Partisol 2000 monitors;
- Replace ESC 8816 data loggers;
- Replace C series calibrators and analyzers;
- Maintain the NCore site; and
- Purchase new equipment as required to meet EPA requirements.

There is an ongoing effort to maintain staff training regarding the latest monitoring techniques and procedures to perform these studies. It is anticipated that the ambient air monitoring network will operate in much the same manner as it has in the past. This will include the identification of pollution problems, measurement and evaluation of the extent of the problem, and determination of action to be taken to protect the environment and the health of the people of South Dakota.

13.0 REFERENCES

1. Environmental Protection Agency, May 1977. Quality Assurance Handbook for Air Pollution Measurement Systems Volume II, Ambient Air Specific Methods (as amended), EPA-600/4-77-027a, Office of Air Quality Planning and Standards, Research Triangle Park, N.C.;
2. Environmental Protection Agency, January 2003. Title 40 Code of Federal Regulation, Parts 50 and 58 (as amended), United States Government Printing Office, Superintendent of Documents, Washington, D.C.; and
3. Environmental Protection Agency, March 1998. SLAMS / NAMS / PAMS Network Review Guidance, EPA-454/R-98-003, Office of Air Quality Planning and Standards, Research Triangle Park, N.C.