South Dakota Ambient Air Monitoring Annual Plan 2019

Pierre Airport Site Performance Evaluation Program (PEP) Audit

South Dakota
Department of Environment and Natural Resources
Air Quality Program

Table of Contents

List of Tables

List of Figures

Executive Summary

The South Dakota Department of Environment and Natural Resources (DENR) 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 of South Dakota's 2018 ambient air quality data finds the state's ambient air quality concentrations are demonstrating attainment with the Environmental Protection Agency's (EPA's) National Ambient Air Quality Standards (NAAQS).

The annual plan was published on the department's air quality website to provide public review and comments so appropriate adjustments could be made to meet the needs of the general public before the annual plan was finalized. The public review period began on May 29 and ended on June 28, 2019. No comments were received during the review period. 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 National Ambient Air Quality Standards 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 2019 and 2020:

1. Continue replacing older continuous monitors before the older continuous monitors become too expensive to repair and as resources allow;
2. Evaluate potential air monitoring sites to replace the Sioux Falls SD School Site and the Rapid City Credit Union Site. The department has been informed that these properties may be sold in the near future;
3. Close the Rapid City Library Site; and
4. Move the Aberdeen Fire Station #1 Site which will allow the installation and operation of continuous particulate monitors to replace the manual monitors.

1.0 INTRODUCTION

The United States Environmental Protection Agency through Title 40 of the Code of Federal Regulation and the Performance Partnership Agreement (PPA) requires the South Dakota Department of Environment and Natural Resources to complete an annual ambient air monitoring plan. EPA's requirements for the annual plan are listed in Title 40 of the Code of Federal Regulations §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 Title 40 of the Code of Federal Regulations 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 National Ambient Air Quality Standards 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 complied with this requirement by posting this document on the department's Air Quality Program website on May 29, 2019 at the following location for 30 days: http://denr.sd.gov/des/aq/airprogr.aspx. No comments were received during the review period. DENR has posted the finalized Annual Plan for 2019 on our webpage at: http://denr.sd.gov/des/aq/monitoring/state-mo.aspx .

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 State Implementation Plan to upgrade the program by establishing a network of State and Local Air Monitoring (SLAMS) stations and Special Purpose Monitoring (SPM) stations.

In the past, EPA has changed the National Ambient Air Quality Standards several times. Currently, EPA has established National Ambient Air Quality Standards for Particulate Matter (PM), Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2), Ozone, Carbon Monoxide (CO), and Lead.

The 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/m3) and an annual standard of 50 micrograms per cubic meter. 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 historically 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 micrograms per cubic meter to 35 micrograms per cubic meter in 2006. The annual standard was revised from 15 micrograms per cubic meter to 12 micrograms per cubic meter 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 historically demonstrated attainment with the $PM_{2.5}$ standards.

EPA set the first Sulfur Dioxide standards in 1971. The primary standards were 140 parts per billion for the 24-hour average and 30 parts per billion (ppb) for the annual average. The secondary standard was 500 parts per billion for the 3-hour average. The Sulfur Dioxide standard was revised in 2010 setting a new primary 1-hour standard of 75 parts per billion and revoking the 24-hour and annual standards. The department began monitoring for Sulfur Dioxide in 1974, using bubbler method samplers. 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 Sulfur Dioxide analyzers in Sioux Falls, Union County, Badlands National Park, and Rapid City. The Sulfur Dioxide monitoring network represents the highest population areas and rural areas of the state. South Dakota's ambient air monitoring network for Sulfur Dioxide has historically demonstrated attainment with the Sulfur Dioxide standards.

The Nitrogen Dioxide standard was established in 1971 setting an annual average standard of 53 parts per billion. In 2010, EPA revised the standard by adding a one-hour standard of 100 parts per billion. The annual standard was retained without any change in concentration level. The department first tested for Nitrogen Dioxide in 1974, using bubbler method samplers. 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 Nitrogen Dioxide in 2003 and currently operates continuous Nitrogen Dioxide monitors in Sioux Falls, Union County, Badlands National Park, and Rapid City. The Nitrogen Dioxide monitoring network represents the most populated and rural areas of the state. South Dakota's ambient air monitoring network for Nitrogen Dioxide has historically demonstrated attainment with the Nitrogen Dioxide 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 an 8-hour average of 0.08 parts per million. In 2008, EPA revised the 8-hour average to 0.075 parts per million. In 2015, EPA set the current 8-hour average at 0.070 parts per million. South Dakota's ambient air monitoring network for ozone was established in 1999 and is currently monitoring concentrations in Sioux Falls, Union County, Brookings, Badlands National Park, Wind Cave National Park, and Black Hawk. The ozone monitoring network represents the highest population and three rural areas of the state. South Dakota's ambient air monitoring network for ozone has historically demonstrated attainment with the ozone standards.

The Carbon Monoxide standard was established in 1971. The primary and secondary standards were 35 parts per million for the 1-hour average and 9 parts per million for the 8-hour average. In 1985, the primary standards were retained without revision and the secondary standards were revoked. The department began monitoring for Carbon Monoxide in 2009 as part of collecting air monitoring data to show background levels for the criteria pollutants prior to the anticipated construction of the Hyperion Energy Center. Three years of data was collected and monitoring was discontinued in 2013 because concentrations during the three years of sampling were very low. A second site was added in 2011, at the SD School Site in Sioux Falls as part of the required testing at a National Core (NCore) site. South Dakota's ambient air monitoring network for Carbon Monoxide has historically demonstrated attainment with the Carbon Monoxide standards.

The lead standard was established in 1978, with a concentration of 1.5 micrograms per cubic meter. Testing was done in the 80's and 90's and results showed compliance with the standard. In 2008, the standard was significantly revised setting a concentration level of 0.15 micrograms per cubic meter. 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. South Dakota's ambient air monitoring network for lead has historically demonstrated attainment with the lead standard.

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

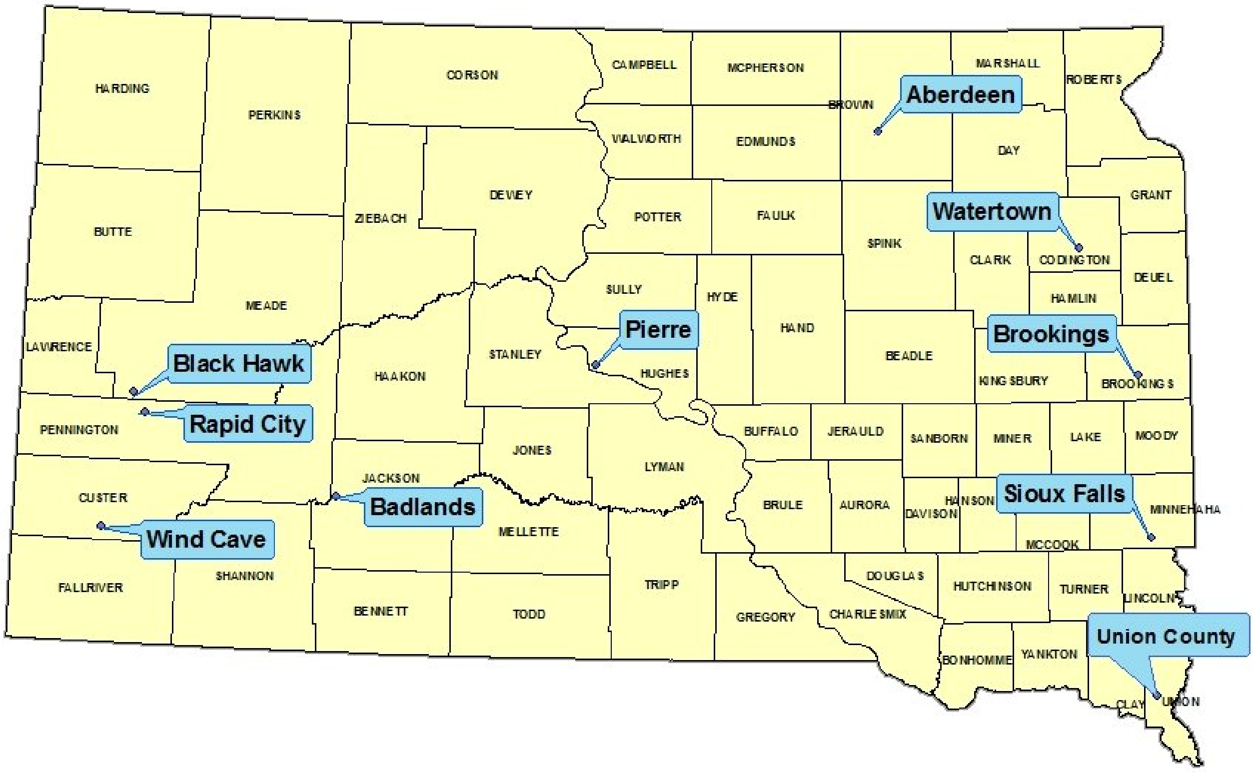
The department's Air Quality Program was established with the primary goal of protecting the health, welfare and property of South Dakotans from the detrimental effects of air pollution. The Clean Air Act of 1970 and subsequent amendments define air quality standards for various air pollutants necessary to protect the public from injurious pollution concentrations.

In order to attain and maintain the National Ambient Air Quality Standards, 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 2018, the ambient air monitoring network includes 13 ambient air monitoring sites run by the department. There are three sites in Rapid City, two sites in Pierre, and one site in the remaining eight locations. Figure 4-1 shows a map of the general locations and cities with ambient air monitoring sites in 2018.

Figure 4-1 – South Dakota Air Monitoring Sites



The following types of ambient air monitors and monitoring sites may be operated in South Dakota:

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

Ambient air monitoring site files are maintained in the department’s Pierre office for the state and local air monitoring stations, special purpose monitoring sites, and the National Core multi-pollutant site. 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. Air Quality System 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.

4.1 State and Local Air Monitoring Stations

A state and local air monitoring station consists of an air monitor for at least one air pollutant parameter selected by the state or local air programs to determine compliance with the National Ambient Air Quality Standards. At the beginning of 2018, 11 of the networks sites were considered a state and local air monitoring station. The sites in the network collected PM_{10} data at 10 sites, $PM_{2.5}$ data at 10 sites, Sulfur Dioxide and Nitrogen Dioxide at four sites, Ozone at six sites, and Carbon Monoxide at one site.

4.2 Special Purpose Monitoring

Special Purpose Monitoring is a generic term for all monitors not used to determine compliance with the National Ambient Air Quality Standards and 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. Four of the ambient air monitoring network sites operated some kind of special purpose monitoring monitor in 2018. The parameters tested by the special purpose monitoring monitors in South Dakota include:

1. Weather stations at the Black Hawk and SD School sites;
2. PM_{coarse} monitor, Total Reactive Nitrogen (NOy) analyzer, and $PM_{2.5}$ speciation monitors at the SD School Site; and
3. Radiation monitors operated at the Pierre Quonset and Rapid City National Guard sites.

Particulate matter coarse (PM_{coarse}) is particulate matter 10 microns in diameter or less (PM_{10}) minus particulate matter 2.5 microns in diameter or less ($PM_{2.5}$).

4.3 Prevention of Significant Deterioration Monitoring Sites

In 2018, no Prevention of Significant Deterioration air monitoring projects were started or completed.

4.4 Interagency Monitoring of Protected Visual Environments Network

Two Interagency Monitoring of Protected Visual Environments sites are being operated by the National Parks Service in South Dakota. The site locations are at the Badlands and Wind Cave National Parks. Data results for parameters collected by the National Park Service can be requested from the following website: http://views.cira.colostate.edu/fed/QueryWizard/

4.5 Environmental Radiation Network

The Environmental Radiation Network sites in Pierre and Rapid City are being operated as a part of the national network and are also considered Special Monitoring 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 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 Radiation Network monitor was installed at the Rapid City 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 Radiation Network monitors were 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

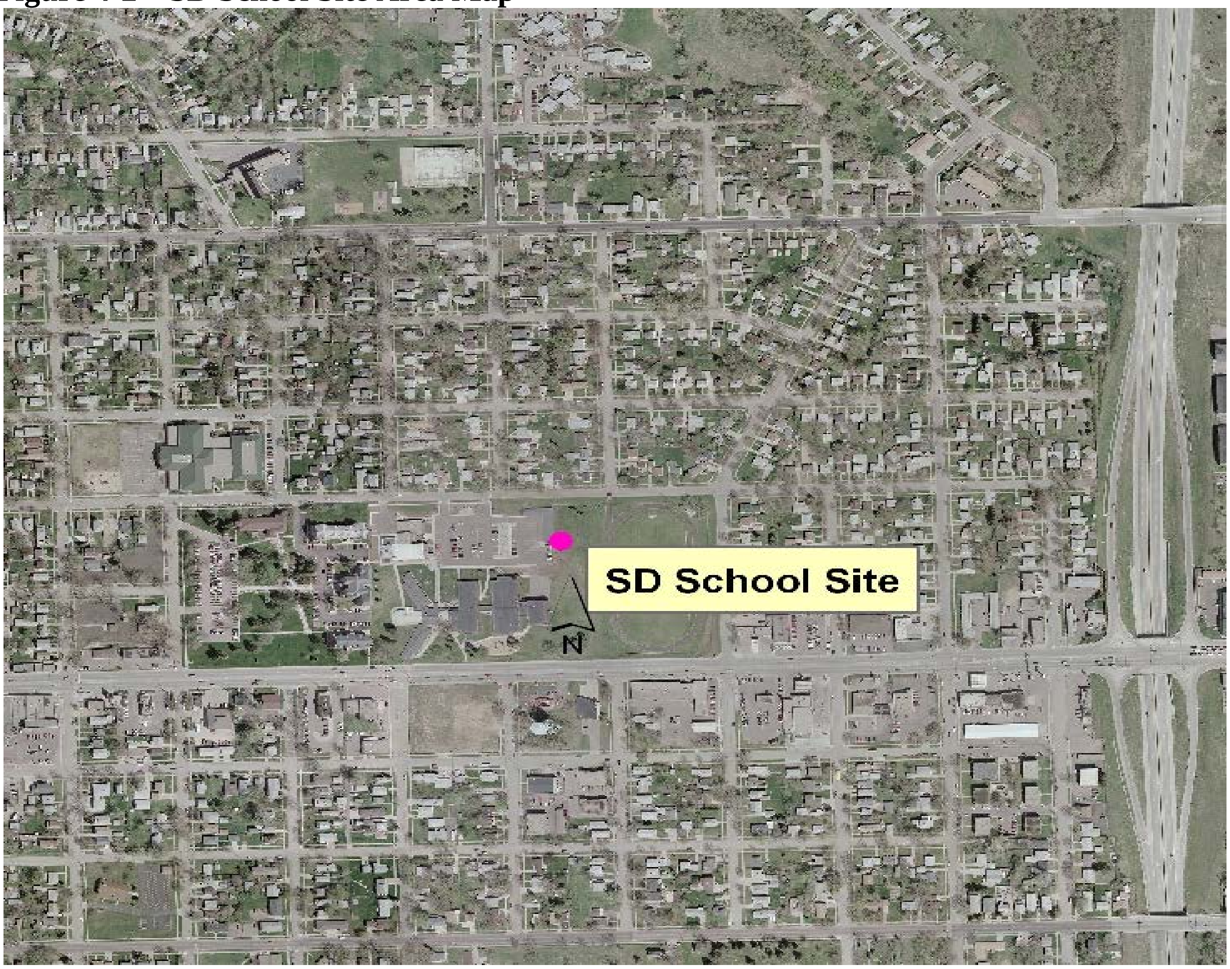
4.6 National Core Multi-Pollutant Site

The National Core 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 National Core site. The National Core 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 National Ambient Air Quality Standards;
5. Compliance through establishing nonattainment/attainment areas by comparison with the National Ambient Air Quality Standards; and
6. Support multiple disciplines of scientific research including public health, atmospheric and ecological.

The National Core site in South Dakota is located on the SD School 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 National Core 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



At the beginning of 2011, all required parameters were operating at the SD School Site. The SD School Site collects data for trace level Sulfur Dioxide, nitrogen oxides, all reactive oxides of nitrogen, Carbon Monoxide, ozone, $PM_{2.5}$ continuous and filter based manual monitors, PM_{coarse}, $PM_{2.5}$ 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 8.4% according to estimates done in July 2018. 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 National Ambient Air Quality Standards are being met, identify and attempt to quantify pollutant concentrations emitted by industries, and identify sources that have the potential to release the 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 National Ambient Air Quality Standards, the department has established some of the monitoring sites in rural areas such as the Wind Cave National Park, Badlands National Park, Union County, and Pierre. 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 and all parameters during national or international events such as wildfires that impact South Dakota.

The sites reporting data to the department's real time webpage are Wind Cave National Park, Badlands National Park, Brookings (Research Farm), Union County (Union County #1), Rapid City (Rapid City Credit Union and Black Hawk), Watertown, Pierre, and Sioux Falls (SD School) sites. The data includes hourly concentrations of PM_{10}, $PM_{2.5}$, Sulfur Dioxide, Nitrogen Dioxide, Carbon Monoxide, and ozone. South Dakota's air quality real time website is located at: http://denr.sd.gov/des/aq/aarealtime.aspx

In 2018, 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 #1, Credit Union, Black Hawk, Watertown, Pierre, and SD School sites were reporting hourly data to EPA's AirNow website located at: https://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 as funding becomes available.

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 still a 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 Interagency Monitoring of Protected Visual Environments monitors for PM_{10}, $PM_{2.5}$, and chemical analysis of the collected particulates. The department collects PM_{10}, $PM_{2.5}$, Sulfur Dioxide, Nitrogen Dioxide, and ozone data at the Badlands Site and PM_{10}, $PM_{2.5}$, and ozone data at the Wind Cave Site.

5.4 Metropolitan Statistical Areas

Title 40 of the Code of Federal Regulations 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 objectives 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 sites reporting data to the department's real time webpage are Wind Cave National Park, Badlands National Park, Brookings (Research Farm), Union County (Union County #1), Rapid City (Credit Union and Black Hawk sites), Watertown, Pierre (Airport), and Sioux Falls (SD School) 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 Air Quality System database site and by supporting local studies when funding is available.

EPA identified in Appendix D the minimum number of air monitoring SLAM sites and requirements for ozone, Carbon Monoxide, Nitrogen Dioxide, Sulfur Dioxide, particulate matter, and lead.

5.4.1 Required Ozone Monitoring Sites

The minimum number of required air monitoring sites for ozone is based on the population within a Metropolitan Statistical Areas (MSA). There are three Metropolitan Statistical Areas in

South Dakota. The Sioux Falls Metropolitan Statistical Area consists of Lincoln, McCook, Minnehaha, and Turner counties. The Rapid City Metropolitan Statistical Area consists of Meade and Pennington counties. Union County in South Dakota is part of the Sioux City Metropolitan Statistical Area which includes Dixon and Dakota counties in Nebraska and Woodbury County in Iowa.

To determine the number of monitoring sites for ozone, the design value is calculated, divided by the standard, and the results multiplied by 100. If the Metropolitan Statistical Area has a design value greater than 85% of the standard one site is required. The required number of sampling sites continues to increase as the population increases. If the highest concentration site in a Metropolitan Statistical Area has a design value less than 85% for ozone, the required number of sites may be one or even zero depending on the design value and population of the Metropolitan Statistical Area.

The typical peak ozone concentrations are expressed in the percentage of the design value (see Table 9-4) of the National Ambient Air Quality Standard for ozone (0.070 parts per million). Table 5-3 shows the population, design values as percent of the National Ambient Air Quality Standards and the minimum number of ozone monitoring site required for the Sioux Falls, Rapid City, and Sioux City Metropolitan Statistical Areas in the state after adding the data for the 2018 sampling year.

Table 5-3 – Minimum Ozone Sites Required

2010 MSA Population	**Counties**	**Site**	**AQS ID**	**Design Values as % of the NAAQS**	**> 85% Criteria (Yes or No)**	**Minimum Sites Required**
Sioux Falls MSA						
169,468 44,828 5,618 8,347	Minnehaha Lincoln McCook Turner	SD School	46-099-0008	Ozone 8-hr = 96%	Yes	1
228,261	**Total**					
Rapid City MSA						
100,948 25,434	Pennington Meade	Black Hawk	46-093-0001	Ozone 8-hr = 70%	No	0
126,382	**Total**					
Sioux City MSA						
14,399 6,000	Union, SD Dixon, NE	UC #1	46-129-0003	Ozone 8-hr = 91%	Yes	1
21,006 102,172	Dakota, NE Woodbury, IA					
143,577	**Total**					

There are two additional ambient air monitoring requirements in Appendix D for an ozone network. If a Metropolitan Statistical Area is required to have one or more ozone monitors, at least one of the ozone monitoring sites is required to be located at the expected high concentration area for the Metropolitan Statistical Area. The Metropolitan Statistical Areas in

South Dakota does not require more than one ozone monitoring site, but the department does locate the ozone monitoring site at the expected high concentration in the area. Ozone monitoring at a SLAMS monitoring site is only required during the ozone season which is the months of March through October in South Dakota. The department operates the ozone monitors all year round because the department has determined through experience that the monitors have less operational problems when operated continuously.

As a result of evaluating the air monitoring site data, based on the design values and populations, South Dakota is required to have an ozone monitoring site in the Sioux Falls and Sioux City Metropolitan Statistical Area (UC #1). Although Union County only represents 10% of the population of the Sioux City Metropolitan Statistical Area, the department is still required to operate one ozone monitoring site in Union County. The department has elected to operate an ozone monitor in the Rapid City area at Black Hawk even though it is not required. The ozone monitor is being used to determine the impacts in the area from local, national, and international events.

5.4.2 Required PM_{10} Monitoring Sites

The minimum number of PM_{10} monitoring sites is based on the population of the Metropolitan Statistical Area and the PM_{10} concentrations within the Metropolitan Statistical Area. All three Metropolitan Statistical Areas in South Dakota have a population between 100,000 to 250,000. To determine the number of monitoring sites for PM_{10}, the maximum 24-hour concentration level at a site is divided by the standard (150 micrograms per cubic meter) and the results multiplied by 100. For the size of the Metropolitan Statistical Areas in South Dakota, if the percentage is greater than 80% of the standard, zero to one site is required. If the percentage is less than 80%, zero sites are required.

Table 5-4 shows the population, the 24-hour maximum concentration as a percentage of the National Ambient Air Quality Standards, and the minimum site requirements for the Sioux Falls, Rapid City, and Sioux City Metropolitan Statistical Areas in the state. As a result of evaluating the air monitoring site data, South Dakota may be required to have one PM_{10} monitoring site in the Rapid City Metropolitan Statistical Area and in the Sioux City Metropolitan Statistical Area. Although the PM_{10} maximum concentration at the SD School Site is less than 80%, a PM_{10} monitor is still required at the NCore site.

Table 5-4 – Minimum PM_{10} Sites Required

2010 MSA Population	Counties	Site	AQS ID	PM_{10} Max Concentration as % of the NAAQS	> 80% Criteria (Yes or No)	Minimum Sites Required
Sioux Falls MSA						
169,468 44,828 5,618 8,347	Minnehaha Lincoln McCook Turner	SD School	46-099-0008	(59/150)(100) 24-hour = 39%	No	0
228,261	**Total**					

2010 MSA Population	Counties	Site	AQS ID	PM_{10} Max Concentration as % of the NAAQS	> 80% Criteria (Yes or No)	Minimum Sites Required
Rapid City MSA						
100,948 25,434	Pennington Meade	RC Credit Union	46-103-0020	(127/150)(100) 24-hr = 85%	Yes	0 - 1
126,382	**Total**	RC Library	46-103-1001	(44/150)(100) 24-hr = 29%	No	0
		Black Hawk	46-093-0001	(60/150)(100) 24-hr = 40%	No	0
Sioux City MSA						
14,399 6,000 21,006 102,172	Union, SD Dixon, NE Dakota, NE Woodbury, IA	UC #1	46-129-0001	(131/150)(100) 24-hr = 87%	Yes	0 - 1
143,577	**Total**					

5.4.3 Required $PM_{2.5}$ Monitoring Sites

The minimum number of required air monitoring sites for $PM_{2.5}$ is based on the population within a Metropolitan Statistical Area. As discussed for ozone monitoring sites, there are three Metropolitan Statistical Areas (Sioux Falls, Sioux City, and Rapid City) in South Dakota. All three Metropolitan Statistical Areas have a population from 50,000 to less than 500,000. In addition, each state must monitor for $PM_{2.5}$ at their NCore site.

If the Metropolitan Statistical Area has a design value (see Tables 9-2 and 9-3) greater than 85% of the $PM_{2.5}$ standards and the population is from 50,000 to less than 500,000 people, a minimum of one site is required. If the highest concentration site in a Metropolitan Statistical Area has a design value less than 85%, the minimum required number of sites for the above population range is zero.

Table 5-5 provides the data used to determine the minimum number of $PM_{2.5}$ monitoring sites in each Metropolitan Statistical Area. As a result of evaluating the air monitoring site data, based on the design values and populations, South Dakota is not required to have a monitoring site, but still needs one at the NCore site. The department will still operate $PM_{2.5}$ monitors in the Rapid City MSA and Sioux City MSA to monitor impacts from local, national, and international events.

Table 5-5 – Minimum $PM_{2.5}$ Sites Required

2010 MSA Population	Counties	Site	AQS ID	$PM_{2.5}$ Design Values as % of the NAAQS	> 85% Criteria (Yes or No)	Minimum Sites Required
Sioux Falls MSA						
169,468 44,828	Minnehaha Lincoln	SD School	46-099-0008	24-hour = 43%	No	0

2010 MSA Population	Counties	Site	AQS ID	$PM_{2.5}$ Design Values as % of the NAAQS	> 85% Criteria (Yes or No)	Minimum Sites Required
5,618 8,347	McCook Turner	SD School	46-099-0008	Annual = 49%	No	0
228,261	**Total**					
Rapid City MSA						
100,948 25,434	Pennington Meade	RC Credit Union	46-103-0020	24-hr = 63%	No	0
126,382	**Total**	RC Credit Union	46-103-0020	Annual = 57%	No	0
		RC Library	46-103-1001	24-hr = 51%	No	0
		RC Library	46-103-1001	Annual = 47%	No	0
Sioux City MSA						
14,399 6,000 21,006 102,172	Union, SD Dixon, NE Dakota, NE Woodbury, IA	UC #1	46-129-0001	24-hr = 46%	No	0
		UC #1	46-129-0001	Annual = 52%	No	0
143,577	**Total**					

5.4.4 Required Carbon Monoxide Monitoring Sites

The minimum monitoring requirements for Carbon Monoxide is based on core-based statistical areas (CBSA) which are established by the Office of Management and Budget. Core-based statistical areas are Metropolitan Statistical Areas (i.e., 50,000 or more populations).

A minimum of one Carbon Monoxide monitor is required to operate collocated with one required near-road Nitrogen Dioxide monitor in core-based statistical areas with a population greater 1,000,000 or more persons. None of the core-based statistical areas in South Dakota meet the population criteria. Therefore, no Carbon Monoxide monitoring is required under the minimum requirements, but Carbon Monoxide must be measured at the state's NCore site.

5.4.5 Required Nitrogen Dioxide Monitoring Sites

A minimum of one Nitrogen Dioxide monitor is required to operate at a microscale near-road monitoring station and at an expected highest Nitrogen Dioxide concentration representing the neighborhood or larger spatial scales in a core based statistical area with a population level of 1,000,000 or greater. None of the core-based statistical areas in South Dakota meet the population criteria. Therefore, no Nitrogen Dioxide monitoring is required under the minimum requirements, but Nitrogen Dioxide must be measured at the state's NCore site.

5.4.6 Required Sulfur Dioxide Monitoring Sites

Sulfur dioxide has a population-based monitoring requirement for a core-based statistical area (CBSA). The monitoring requirement is based on multiplying the total amount of sulfur dioxide, in tons per year, emitted within the counties in the core-based statistical area by the population within the core-based statistical area. The resulting product is divided by one million, providing the population weighted emissions index (PWEI) for the core-based statistical area.

A micropolitan statistical area is defined as a core-based statistical area with a population of greater than 10,000 but less than 50,000 people. A core-based statistical area with a population of 50,000 people or greater is defined as a metropolitan statistical area. In accordance with 40 CFR Part 58, Appendix D, Section 4.4.2, the state must operate a minimum number of sulfur dioxide monitoring sites, as described below:

- For any core-based statistical area with a calculated PWEI value equal to or greater than 1,000,000, a minimum of three SO2 monitors are required within that CBSA;
- For any CBSA with a calculated PWEI value equal to or greater than 100,000, but less than 1,000,000, a minimum of two SO2 monitors are required within that CBSA; and
- For any CBSA with a calculated PWEI value equal to or greater than 5,000, but less than 100,000, a minimum of one SO2 monitor is required within that CBSA.

Table 5-6 provides the data used for calculating the population weighted emissions index (PWEI) for each core-based statistical area (CBSA) and Micropolitan area in South Dakota. The Sulfur Dioxide emissions were derived from EPA's 2014 National Emission Inventory, as the 2017 data was not yet available. None of the PWEI values calculated are greater than 5,000. Therefore, no sulfur dioxide monitoring is required under the minimum requirements. However, in accordance with 40 CFR Part 58, Appendix D, Section 3(b), sulfur dioxide must be measured at the state's NCore site.

Table 5-6 – Population Weighted Emission Index

CBSA	Population	Counties	SO_2 Emissions	PWEI
Metropolitan Areas				
Sioux Falls	228,261	Lincoln, McCook, Minnehaha, and Turner	253.2 tons per year	58
Sioux City	143,577	Union (SD), Dakota and Dixon (NE), and Woodbury (IA)	13,520 tons per year	1,941
Rapid City	126,382	Meade and Pennington	639.4 tons per year	81
Micropolitan Areas				
Aberdeen	40,602	Brown and Edmunds	244.5 tons per year	10
Brookings	31,965	Brookings	95.1 tons per year	3
Huron	17,398	Beadle	15.6 tons per year	0
Mitchell	22,835	Davison and Hanson	19.5 tons per year	0
Pierre	19,988	Hughes and Stanley	13.6 tons per year	0
Spearfish	24,097	Lawrence	314.2 tons per year	8

CBSA	Population	Counties	SO_2 Emissions	PWEI
Vermillion	13,864	Clay	12.6 tons per year	0
Watertown	33,130	Codington and Hamlin	34.7 tons per year	1
Yankton	22,438	Yankton	17.4 tons per year	0

5.4.7 Required Lead Monitoring Sites

In 2010, EPA completed a rule change that requires source type testing in addition to network testing. The rule originally required lead testing at the National Core Site. The final rule required lead testing at the National Core Site only if the site is located in a city with a 500,000 and greater population. The National Core site is located in Sioux Falls and the city has a population under 500,000 so no testing is required.

The department is also required to conduct ambient lead monitoring near lead sources which are expected to or have been shown to contribute to a maximum lead concentration in the ambient air in excess of the National Ambient Air Quality Standards. South Dakota is in attainment of the National Ambient Air Quality Standard for lead. At a minimum, there must be one source-orientated monitoring site located to measure the maximum lead concentration in the ambient air resulting from each non-airport lead source which emits 0.50 or more tons per year and from each airport which emits 1.0 or more tons per year based on the most recent National Emission Inventory or other scientifically justifiable methods and data. Based on EPA's 2014 National Emission Inventory, there are no sources that emit 0.50 or more tons per year and no airports that emit 1.0 or more tons per year. Therefore, lead monitoring is not required in South Dakota.

5.5 Additional Monitoring

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

1. $PM_{2.5}$ background and transport monitors at the Badlands and Wind Cave sites; and
2. National Core monitoring equipment located in the city of Sioux Falls at the SD School Site. Each State is required to operate at least one NCore site. The NCore sites must measure, at a minimum, $PM_{2.5}$ particle mass using continuous and integrated/filter-based samplers, speciated $PM_{2.5}$, PM_{coarse} particle mass, ozone, Sulfur Dioxide, Carbon Monoxide, and Nitrogen Oxide/Total Reactive Nitrogen (NO/NO_Y), wind speed, wind direction, relative humidity, and ambient temperature.

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 for ozone, so no Photochemical Assessment Monitoring Stations sites are required.

5.6 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 National Ambient Air Quality Standards for these pollutants.

6.0 NETWORK MODIFICATIONS FOR 2019

The department will continue to evaluate the air monitoring network in 2019 to determine if any new sites are needed and/or existing sites need to be modified or closed to meet the needs of South Dakota and or federal requirements.

6.1 New Sites

The department may need to move the air monitoring sites at the Sioux Falls SD School Site and the Rapid City Credit Union Site. The department has been informed that these properties may be sold and the department is unsure if these sites can continue in 2019.

The department will establish a new monitoring site in Aberdeen to replace the Fire Station #1 Site if funding is available. This will allow the department to install continuous PM_{10} and $PM_{2.5}$ monitors in Aberdeen and replace manual monitors.

6.2 Sites Closed

The Library Site in Rapid City has operated since 1989 and is the oldest site in South Dakota. It was established to monitor the dust levels from fugitive sources such as sanding material placed on the roads during icy conditions. As the City of Rapid City changed from a limestone based sanding material to a silica base and using liquid deicing material in the downtown area, the dust concentrations in the downtown area improved in the early 1990's. The Library Site was continued in the last few years because the City of Rapid City reduced the amount of liquid deicing material because it was impacting the water quality of Rapid Creek. The change did not impact dust levels in the downtown area. In fact, PM_{10} concentrations at the Library Site continue to decline.

The Library site currently has manual monitors for PM_{10} and $PM_{2.5}$. The Credit Union site in Rapid City has PM_{10} and $PM_{2.5}$ continuous monitors. Of the two sites the Credit Union site experiences higher concentrations. The PM_{10} concentrations at the Library site after reducing the amount of liquid deicing and increasing sanding materials continues to decline. Therefore, the department will close the Library Site in Rapid City. Closing the Library Site would result in significant cost and time savings. In addition, it allows the department to use the savings and continue moving towards continuous monitoring and providing more real time data to the public.

6.3 Modifications

The department will continue to update older continuous style monitors with newer monitors.

7.0 REQUEST FOR WAIVER

There were no sampling frequency waivers requested for the 2018 sampling year.

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 National Ambient Air Quality Standards and to do special testing when needs arise or as required by EPA. In 2018, there were 11 active sites within South Dakota where criteria pollutants were monitored. The monitored pollutants include: particulate matter (PM_{10} and $PM_{2.5}$), Nitrogen Dioxide, Ozone, Carbon Monoxide, and Sulfur Dioxide.

The reliable operation of the monitors requires significant investment in staff time and inventory for upkeep, both which tend 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 when funding permits.

The operational life expectancy of a particulate matter monitor is about 10 years mainly due to detector and hardware board failures. With some major replacement of monitor components the operational age may be extended.

Monitors also experience catastrophic failures, at which time a determination is made whether replacing core components on an aging instrument is viable. The age of some instruments make sourcing parts difficult to impossible as they may no longer be supported by the manufacturer.

8.2 Data Loggers

The department currently operates eight ESC 8832 style data loggers and has two ESC 8872 style data loggers that are awaiting deployment. The eight data loggers are being used at each site that has continuous monitoring to provide near real time data to the public. The department also has two older style 8816 data loggers that can be used as a backup if needed. The average age of the ESC 8816 and 8832 style data loggers is approximately 9 years. Table 8-1 provides the department's list of data loggers.

Table 8-1 - Data Logger Service Records

No.	Serial #	Model	Purchased	Comments
1	3901	8816	<2006	backup
2	3802	8816	<2006	backup

No.	Serial #	Model	Purchased	Comments
3	2772	8832	2008	
4	2771K	8832	2008	
5	2770K	8832	2008	
6	2331K	8832	2008	
7	2431	8832	2008	
8	3992K	8832	2011	
9	4467K	8832	2012	
10	4868	8832	2015	
11	0622	8872	2016	
12	0623	8872	2016	

ESC discontinued the 8816 and 8832 model which makes it difficult to purchase replacement parts. Agile Air, which purchased ESC, is offering a newer data logger version 8872. The department purchased two ESC 8872 data loggers in federal fiscal year 2017. Shortly after purchasing the ESC 8872 data loggers, the department received reports from other states as well as from Agile Air that the computer-data logger interface is difficult to use. The department is finding this to be true since the department is still working on the two 8872 data loggers to prepare them for the field. Once they are programmed, the department will deploy and field test one of the 8872 data loggers to determine if this data logger meets the department's needs or another data logger needs to be evaluated.

The department is proposing to purchase a data logger in federal fiscal year 2020 and another in federal fiscal year 2021, if funding is available.

8.3 Manual Particulate Matter Monitors

8.3.1 Partisol Monitors

The department currently has eight Thermo Scientific Partisol 2000i manual monitors and four Thermo Scientific Partisol 2000 manual monitors (see Table 8-2). These Partisol manual monitors are Federal Reference Method (FRM) for $PM_{2.5}$ and PM_{10} monitoring.

Our oldest Partisol monitors are eight years old, with expected average longevity of 10-15 years. The department currently has one spare in reserve, a model 2000i, which can be used to replace a malfunctioning unit. The department continues to experience a high rate of repair for the older models but does not plan to purchase any new manual monitors since the department plans on shutting down two sites with manual monitors in 2019 and 2020. The department should be able to have enough spare parts to keep the one remaining manual monitor at the SD School Site operating.

Table 8-2 – Partisol Service Record

No.	Serial #	Model	Purchased	Comments
1	1041106	2000i	2011	
2	1031106	2000i	2011	
3	201021106	2000i	2011	
4	201011106	2000i	2011	spare
5	201881204	2000i	2011	
6	1751203	2000i	2012	
7	1891204	2000i	2012	
8	205631504	2000i	2016	
1	210881007	2000FRM	2010	
2	210851007	2000FRM	2010	
3	210771006	2000FRM	2010	
4	210801007	2000FRM	2010	

8.3.2 Hi-Vol PM_{10} Monitors

The department currently does not operate any Hi-Vol Particulate Matter manual monitors. The department has chosen to retain four working monitors in case the need arises for lead monitoring, special studies, or for lab analysis to determine contribution from sources.

8.3.3 Speciation $PM_{2.5}$ Monitors

The department currently has one speciation monitor at its National Core site and it was obtained in late 2016 with the cooperation of EPA. The current model is a SuperSASS which allows two sample cartridges to be loaded enabling the sampler to collect samples every 3^{rd} day with physical loading only required every 6^{th} day.

8.4 Continuous Particulate Matter Monitors

The department operates two kinds of continuous PM monitors: 5014i BETA and a Met One BAM 1020. The typical life-span for a continuous monitor running 24 hours a day, 365 days a year, is 10 years.

8.4.1 Thermo 5014i BETA Monitors

The department has two Thermo 5014i BETA continuous monitors. These monitors are four years old. Each monitor has had substantial downtime due to hardware and software failures and hardware defects. Both monitors have been sent back to the manufacturer for repair on several occasions. One unit is in service in Brookings; the other has been pulled from the field and recently repaired (see Table 8-3). The department will continue to use these monitors for PM_{10} sampling using one as an active monitor and the other as a backup, however replacement of this method should be considered when funding becomes available due to its unreliability.

Table 8-3 - 5014 Service Record

No.	Serial #	Purchased	Comments
1	CM13381007	2014	
2	CM13361013	2014	Spare

8.4.2 Met One BAM 1020 Monitors

The department has 15 operating BAM continuous monitors and one in reserve (See Table 8-4). The oldest monitors are ten years old. The department has not had many problems with these monitors but expect to begin having more operational problems as the monitors age. Because this monitor has been so reliable, the department has been gradually converting all continuous particulate monitoring to this method. Advantages to running one monitoring method are data consistency across sites, decreased training time for operators, reduced inventory of spare parts, and higher quality assurance during operational checks. The department plans on purchasing two BAM 1020 monitor in the 2019 federal fiscal year if funding is available.

Table 8-4 - BAM Service Record

No	Serial #	Purchased	Comments
1	H2949	2008	
2	H2972	2008	
3	H7027	2008	Spare
4	H7028	2008	
5	H7051	2008	
6	H7236	2008	
7	K1801	2010	
8	M5333	2011	
9	M12165	2012	
10	T15065	2015	
11	T19274	2015	
12	T15079	2015	
13	U15820	2017	
14	U15821	2017	
15	W25139	2018	
16	X12895	2018	

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. In 2018 the department purchased three new zero air supplies and a new Ekto shelter. The Ekto shelter replaced the aging shelter at the Black Hawk site. In 2019 the department has already purchased two new portable zero air supplies to be used for Performance Evaluations within the monitoring network. 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.

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 ozone 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 two backup ozone analyzers and one lab ozone analyzer. The lab ozone analyzer is used to conduct checks on ozone transfer standards and could be put in the field in case of an emergency.

On March 31, 2015, the department replaced the ozone analyzer at the Badlands site. The ozone instrument that was replaced was provided by the National Park Service, who operated it before the department took over the monitoring at this site. This instrument was 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 the backup ozone analyzers at the Badlands site. With this move, the department still has one backup ozone analyzer and one lab ozone analyzer (see Table 8-5). The department plans on purchasing an ozone analyzer in federal fiscal year 2019 and another in federal fiscal year 2020 if funding is available.

Table 8-5 - Ozone Analyzers

No.	Serial #	Purchased	Comments
1	49c-78317-388	2003	
2	0414006406	2004	
3	0525812377	2005	
4	0615817056	2006	
5	0810029426	2008	
6	08270002	2008	Spare
7	1313057856	2013	Lab Analyzer
8	1427262856	2014	

8.5.2 Sulfur Dioxide Analyzers

The department operates Sulfur Dioxide analyzers at four sites in South Dakota. The department also has three Sulfur Dioxide backup analyzers for use when there is a major repair needed. There is one located in the lab in Pierre and one each at the Sioux Falls regional office and the Rapid City regional office.

The Sulfur Dioxide 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 (see Table 8-6). The department originally planned to purchase a new Sulfur Dioxide analyzer in 2019, but other needs have pushed that purchase back to possibly 2020.

Table 8-6 - Sulfur Dioxide Analyzers

No.	Serial #	Purchased	Comments
1	0414006405	2004	Spare
2	0525112351	2005	
3	0621217058	2006	
4	0829531903	2008	Spare
5	0829531904	2008	Spare
6	0926837682	2009	
7	1117348531	2011	

8.5.3 Nitrogen Dioxide Analyzers

The department operates Nitrogen Dioxide analyzers at four sites in South Dakota. The National Core site in Sioux Falls also includes a NOy analyzer in addition to the traditional NOx analyzer. The department has three backup analyzers, which are typically housed at the regional offices in Sioux Falls and Rapid City.

Nitrogen Dioxide 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 $2,000 to $3,000. The oldest Nitrogen Dioxide analyzers in our network were purchased in 2008 (see Table 8-7). The department purchased two new analyzers in 2016 and had plans to purchase another in 2019, but other equipment needs have taken precedent, therefore the department will not be purchasing a new analyzer in 2019.

Table 8-7 - Nitrogen Dioxide Analyzers

No.	Serial #	Purchased	Comment
1	2411	2015	
2	3006	2016	
3	0824131747	2008	
4	298	2016	NOy
5	1116748523	2011	
6	1424162705	2014	Spare
7	0824131748	2008	Spare

8.5.4 Carbon Monoxide Analyzers

The department operates just one Carbon Monoxide analyzer at our National Core site in Sioux Falls. A Carbon Monoxide analyzer was located at Union County #1 for a few years, but has since been moved to the National Core site in Sioux Falls. The Thermo Scientific Carbon Monoxide analyzer which was the main Carbon Monoxide at the National Core site is now the backup analyzer (see Table 8-8). The department is not planning to purchase a new Carbon Monoxide analyzer in 2019.

Table 8-8 - Carbon Monoxide Analyzers

No.	Serial #	Purchased	Comment
1	0723923521	2007	Spare
2	0174	2008	

8.5.5 Multi-gas/Ozone Calibrators

The department operates either a multi-gas or ozone calibrator at each of the eight monitoring sites with gas analyzers. There is also an Environics 6103 located at the Sioux Falls regional office and Rapid City regional office that are used by staff to conduct quarterly audits. 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 plans on purchasing two new ozone primary standards in 2019 to replace the two oldest models, which were purchased in 2003. These purchases were not originally planned but issues with the two oldest models have pushed the timeline up to 2019 (see Table 8-9). The department may purchase another calibrator in federal fiscal year 2020, if funding is available.

Table 8-9 - Multi-gas/Ozone Calibrators

No.	Serial #	Model	Purchased	Comments
1	49CPS-7832-388	49CPS	2003	Spare
2	49CPS-78318-388	49CPS	2003	
3	0525812378	49i-PS	2005	Spare
4	0623018063	146i	2006	Spare
5	0824131746	49i-PS	2008	
6	0807328333	49i-PS	2008	
7	4290	6103	2008	
8	4298	6103	2008	
9	4299	6103	2008	
10	4561	6103	2009	
11	4562	6103	2009	
12	5047	6103	2011	
13	5881	6103	2013	
14	6223	6103	2014	
15	6588	6103	2015	

8.6 Meteorological Stations

The department currently has two meteorological (met) stations: Black Hawk and SD School sites. Each meteorological station consists of a temperature sensor, barometric pressure sensor,

wind direction vane, and anemometer (wind speed) mounted on a 10 meter tower. The operation of each instrument on the tower is checked every month. The SD School meteorological station is audited once per quarter even though the audit requirements for a National Core Site is biannually. The Black Hawk met station is audited biannually even though it is only required annually.
The department's data needs at the other monitoring sites are being met by reliable and available data from the National Weather Service collected from nearby airports.

9.0 COMPLIANCE WITH NATIONAL AMBIENT AIR QUALITY STANDARDS

This section provides a comparison of the collected data to the National Ambient Air Quality Standards. 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 (PM10)

The PM_{10} National Ambient Air Quality Standards is based on a 24-hour average concentration. The maximum 24-hour average concentration allowed is 150 micrograms per cubic meter. 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 micrograms per cubic meter is the highest level that still attains the 24-hour standard for PM_{10} based on EPA rounding to the nearest 10 micrograms per cubic meter.

In 2018, the statewide PM_{10} monitoring network included 10 monitoring locations. Two of the sites recorded data using manual monitors providing 24-hour sample concentrations (i.e., Rapid City Library and Fire Station #1 (Aberdeen) sites). Eight of the sites have continuous samplers providing 1-hour concentrations at the Rapid City Credit Union, SD School (Sioux Falls), Watertown, Black Hawk Elementary, Brookings Research Farm, Badlands, Wind Cave, and UC #1 (Union County) sites. Badlands, Wind Cave, and UC #1 sites are rural sites.

Table 9-1 contains a list of the expected exceedance and attainment status for the PM_{10} ambient air monitors throughout the state for calendar years 2016 to 2018.

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

Site	Expected Exceedance	Attainment Status
Rapid City Library	0.0	Yes
Rapid City Credit Union	0.7	Yes
Black Hawk Elementary	0.0	Yes
SD School	0.0	Yes
Badlands	0.0	Yes
Brookings Research Farm	0.0	Yes
Fire Station #1	2.0	No *

Site	Expected Exceedance	Attainment Status
Watertown	0.0	Yes
Wind Cave	0.0	Yes
UC #1	0.0	Yes

***** The expected exceedance is the result of one event that was flagged because it was caused by a dust storm.

There were no PM_{10} concentrations that exceeded the 24-hour standard at the Rapid City Library, Black Hawk Elementary, SD School, Badlands, Brooking Research Farm, Watertown, Wind Cave, or UC #1 sites. In 2016, 2017 and 2018, two PM_{10} concentration exceeded the 24-hour standard at the Rapid City Credit Union Site resulting in an expected exceedance of 0.7.

At the Fire Station #1 site in Aberdeen, there was one exceedance in 2018. Since the manual monitor runs on a 1 in 6 day sampling schedule, this one exceedance caused the 3-year expected exceedance calculation of two. The exceedance was flagged as an exceptional event because it was caused by a dust storm which is considered a natural event. An exceptional event is an uncontrollable event caused by natural sources of particulate matter or an event that is not expected to recur at a given location.

According to the National Weather Service, "Leading up to the event, conditions were warm and generally dry in the James River Valley during May. Those conditions combined with strong winds from decaying thunderstorms in south central South Dakota to produce a dust storm. South winds of 50 to 80 mph kicked up a significant amount of dirt/dust as the winds moved north, leading to visibilities being reduced to below ¼ mile in many locations. The reduced visibilities caused a few traffic incidents and the winds knocked down trees, tree branches, and powerlines." This is the first time the Fire Station #1 site experienced an exceedance in the 19 years it has operated. Therefore, the department believes this fits under the definition of an exceptional event and this exceedance was flagged. If needed, the department will develop an exceptional events package for this event and submit it to EPA for its concurrence.

The department considers all 10 sites in South Dakota are demonstrating attainment of the PM_{10} 24-hour standard.

9.2 Particulate Matter (PM2.5)

The $PM_{2.5}$ National Ambient Air Quality Standards consist of a 24-hour and annual standard. The 24-hour standard is 35 micrograms per cubic meter. Attainment of the 24-hour standard is achieved when the maximum 24-hour average concentration, based on the annual 98^{th} percentile averaged over three years (24-hour average design value), is less than or equal to 35 micrograms per cubic meter.

The $PM_{2.5}$ annual standard is 12 micrograms per cubic meter. Attainment is demonstrated when the maximum annual arithmetic mean averaged over three consecutive years (annual design value) is equal to or less than 12 micrograms per cubic meter.

9.2.1 PM$_{2.5}$ 24-Hour Standard

Table 9-2 shows the yearly 98th percentile for calendar years 2016 to 2018 used in the calculation of the 24-hour design value for PM$_{2.5}$, the 2018 24-hour design value, attainment 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.

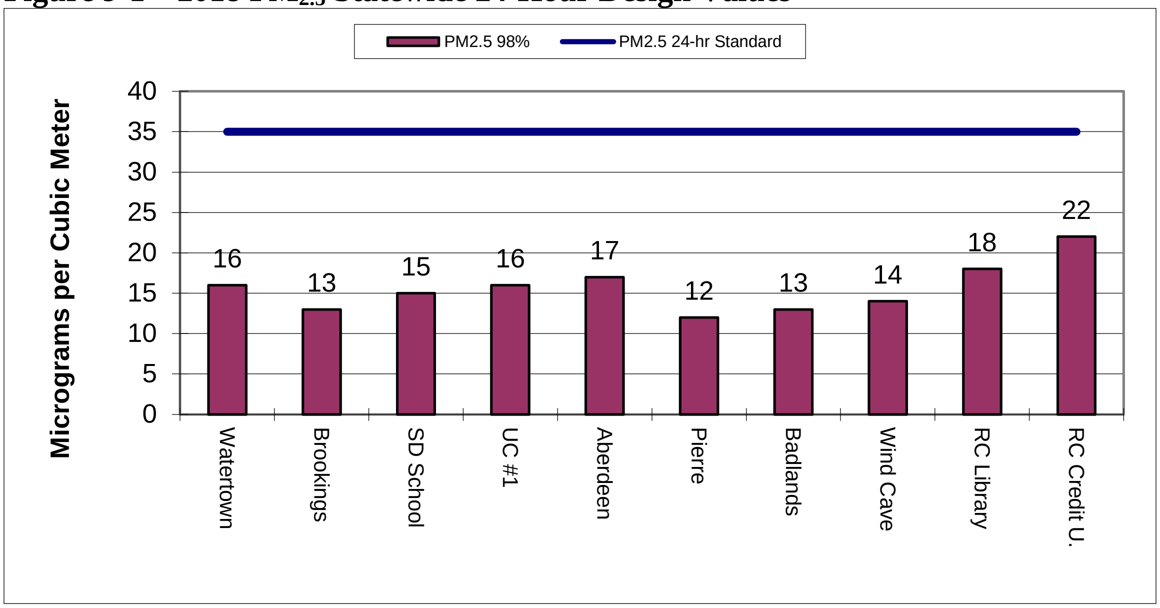
In 2018, the highest 24-hour 98th percentile concentration was 26.5 micrograms per cubic meter and was recorded at the Rapid City Credit Union site on a continuous PM$_{2.5}$ monitor. The site with the second highest 24-hour 98th percentile concentration in 2018 was at the Aberdeen Fire Station Site with 22.3 micrograms per cubic meter collected on a manual PM$_{2.5}$ monitor.

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

Site	Yearly 98th Percentile	2018 24-hour Design Value	Attainment Status	Percent of the Standard
Rapid City Library	2016 – 14.5 ug/m^3 2017 – 19.2 ug/m^3 2018 – 19.8 ug/m^3	18 ug/m^3	Yes	51%
Rapid City Credit Union	2016 – 15.7 ug/m^3 2017 – 23.6 ug/m^3 2018 – 26.5 ug/m^3	22 ug/m^3	Yes	63%
Badlands	2016 – 8.6 ug/m^3 2017 – 12.7 ug/m^3 2018 – 18.5 ug/m^3	13 ug/m^3	Yes	37%
Pierre Airport	2016 – 10.9 ug/m^3 2017 – 12.0 ug/m^3 2018 – 13.5 ug/m^3	12 ug/m^3	Yes	34%
SD School	2016 – 15.4 ug/m^3 2017 – 13.7 ug/m^3 2018 – 15.7 ug/m^3	15 ug/m^3	Yes	43%
Fire Station #1	2016 – 14.4 ug/m^3 2017 – 13.0 ug/m^3 2018 – 22.3 ug/m^3	17 ug/m^3	Yes	49%
Brookings Research Farm	2016 – 12.4 ug/m^3 2017 – 13.0 ug/m^3 2018 – 12.1ug/m^3	13 ug/m^3	Yes	37%
Watertown	2016 – 13.4 ug/m^3 2017 – 17.0 ug/m^3 2018 – 16.1 ug/m^3	16 ug/m^3	Yes	46%
Wind Cave	2016 – 9.7 ug/m^3 2017 – 17.6 ug/m^3 2018 – 15.9 ug/m^3	14 ug/m^3	Yes	40%
UC #1	2016 – 17.3 ug/m^3 2017 – 14.5 ug/m^3 2018 – 15.5 ug/m^3	16 ug/m^3	Yes	46%

Figure 9-1 contains a graph of the 24-hour design values for each site. The two highest design values for the 24-hour $PM_{2.5}$ standard from 2016 to 2018 were recorded in Rapid City at the Credit Union and Library sites with a concentration of 22 and 18 micrograms per cubic meter, respectively. This represents 63% and 51% of the standard for these two sites. The Pierre Airport site had the lowest 24-hour design values for $PM_{2.5}$ at 12 micrograms per cubic meter or 34% of the standard. All sites are attaining the 24-hour $PM_{2.5}$ standard.

Figure 9-1 – 2018 $PM_{2.5}$ Statewide 24-Hour Design Values



9.2.2 $PM_{2.5}$ Annual Standard

Table 9-3 contains a list of the annual averages, 2018 annual design values, attainment status, and percent of the standard for each of the $PM_{2.5}$ sites using the data from 2016 to 2018 in the state. The highest annual average concentration in 2018 was recorded at the Watertown Site at 7.7 micrograms per cubic meter. The second highest annual concentration in 2018 was at the Rapid City Credit Union Site with an annual average of 6.7 micrograms per cubic meter. The Wind Cave Site had the lowest annual average at 3.6 micrograms per cubic meter in 2018.

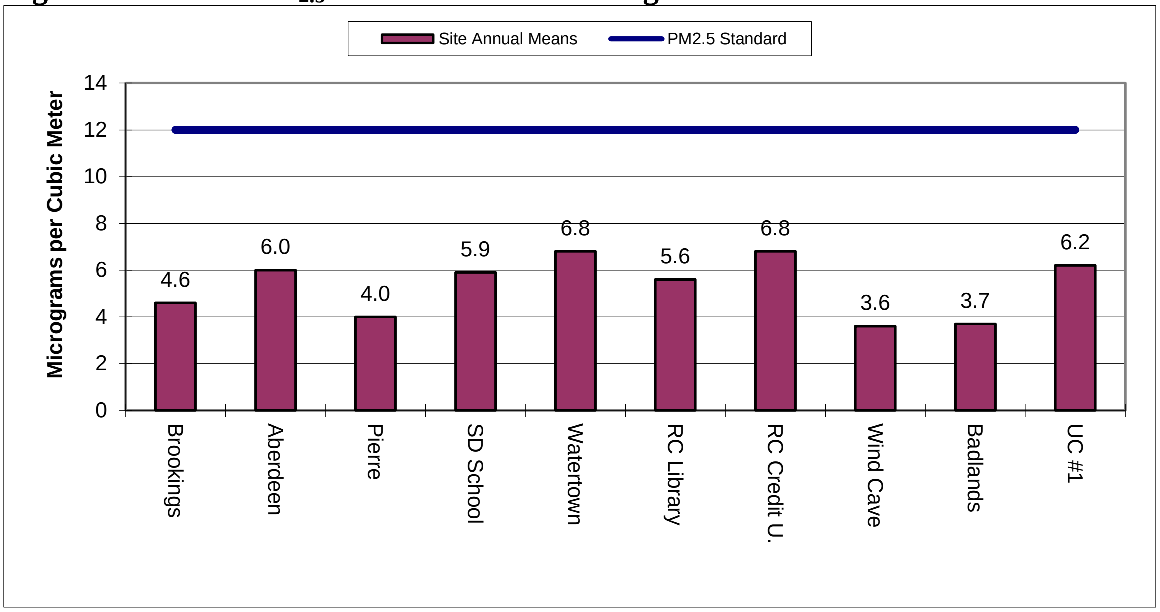
Table 9-3 – Statewide $PM_{2.5}$ Annual Concentrations

Site	Annual Averages	2018 Annual Design Values	Attainment Status	Percent of the Standard
Watertown	2016 – 5.1 ug/m^3 2017 – 7.5 ug/m^3 2018 – 7.7 ug/m^3	6.8 ug/m^3	Yes	57%
Brookings Research Farm	2016 – 4.5 ug/m^3 2017 – 4.7 ug/m^3 2018 – 4.7 ug/m^3	4.6 ug/m^3	Yes	38%
SD School	2016 – 6.5 ug/m^3 2017 – 5.6 ug/m^3 2018 – 5.5 ug/m^3	5.9 ug/m^3	Yes	49%

Site	Annual Averages	2018 Annual Design Values	Attainment Status	Percent of the Standard
UC #1	2016 – 5.8 ug/m^3 2017 – 6.4 ug/m^3 2018 – 6.3 ug/m^3	6.2 ug/m^3	Yes	52%
Fire Station #1	2016 – 5.4 ug/m^3 2017 – 5.8 ug/m^3 2018 – 6.6 ug/m^3	6.0 ug/m^3	Yes	50%
Pierre Airport	2016 – 4.3ug/m^3 2017 – 3.5 ug/m^3 2018 – 4.1 ug/m^3	4.0 ug/m^3	Yes	33%
Badlands	2016 – 2.5 ug/m^3 2017 – 3.6 ug/m^3 2018 – 5.0 ug/m^3	3.7 ug/m^3	Yes	31%
Wind Cave	2016 – 1.9 ug/m^3 2017 – 5.2 ug/m^3 2018 – 3.6 ug/m^3	3.6 ug/m^3	Yes	30%
Rapid City Library	2016 – 4.9 ug/m^3 2017 – 5.8 ug/m^3 2018 – 6.1 ug/m^3	5.6 ug/m^3	Yes	47%
Rapid City Credit Union	2016 – 6.2 ug/m^3 2017 – 7.6 ug/m^3 2018 – 6.7 ug/m^3	6.8 ug/m^3	Yes	57%

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 2018 design value that exceeded the annual $PM_{2.5}$ standard. The highest annual design values occurred at the Watertown and Rapid City Credit Union Sites with a level of 6.8 micrograms per cubic meter which is 57% of the annual standard. The lowest $PM_{2.5}$ annual design value occurred at the Wind Cave Site with a concentration of 3.6 micrograms per cubic meter which is 30% of the annual standard.

Figure 9-2 – 2018 $PM_{2.5}$ Statewide Annual Design Values



9.3 Lead

During the early 1980's, the department conducted lead sampling. The levels detected were well below the National Ambient Air Quality Standards 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 National Ambient Air Quality Standards. 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 National Ambient Air Quality Standards on October 15, 2008. The change significantly lowered the lead standard from 1.5 micrograms per cubic meter to 0.15 micrograms per cubic meter based on the annual maximum three month rolling average. Attainment of the lead National Ambient Air Quality Standards is achieved if the annual maximum three month rolling average, averaged over a three year period, is less than or equal to 0.15 micrograms per cubic meter.

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

9.4 Ozone

Six ozone ambient air monitoring sites were operated in 2018. The analyzers were located at SD School, UC #1, Brookings Research Farm, Badlands, Black Hawk, and Wind Cave sites. The National Ambient Air Quality Standard for ozone consists of a daily 8-hour average of 0.070

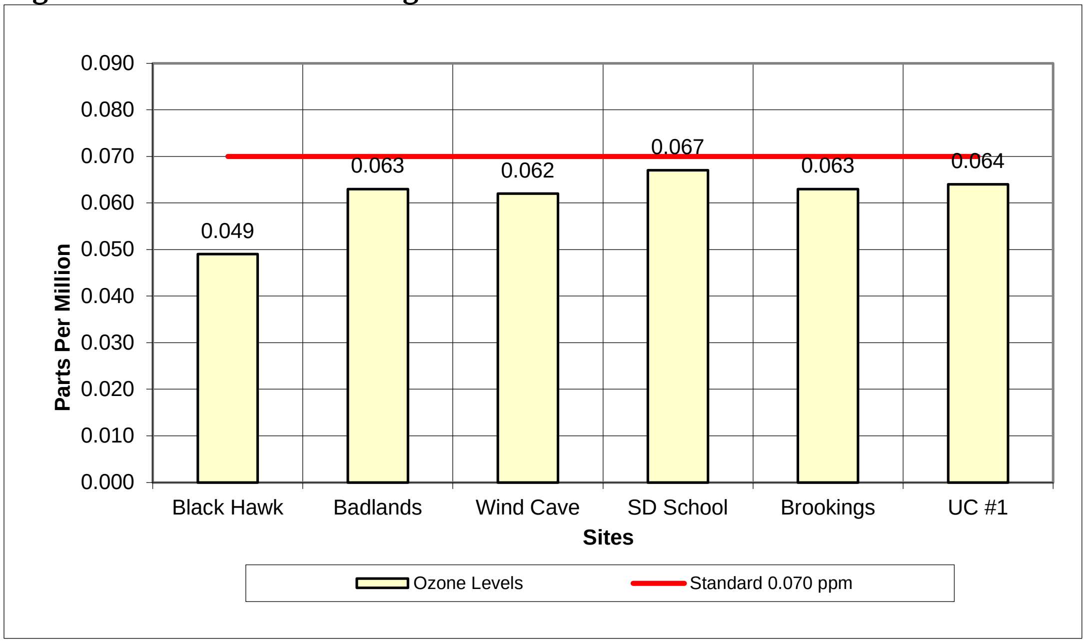
parts per million. The 8-hour standard is met when the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.070 parts per million.

The 4th highest concentration for each year, 2018 8-hour design value in parts per million, attainment status, and percent of the standard for each of the sites can be seen in Table 9-4 and the 2018 design value is summarized in Figure 9-3. From 2016 to 2018, the SD School Site had the highest 3-year average ozone concentrations in the state at 0.067 parts per million, which is 96% of the ozone standard. The SD School Site continues to be the highest ozone concentration site in the state since 2010. The second highest location was the UC #1 site at 0.064 parts per million also located in the eastern edge of the state. The Black Hawk site is reporting the lowest ozone design value with 0.049 parts per million or 70% of the standard.

Table 9-4 – Statewide Ozone 4th highest Concentrations

Site	4th Highest Concentration	2018 8-Hour Design Values	Attainment Status	Percent of the Standard
SD School	2016 – 0.066 ppm 2017 – 0.066 ppm 2018 – 0.069 ppm	0.067 ppm	Yes	96%
Brookings Research Farm	2016 – 0.061 ppm 2017 – 0.063 ppm 2018 – 0.067 ppm	0.063 ppm	Yes	90%
Black Hawk	2016 – 0.058 ppm 2017 – 0.045 ppm 2018 – 0.045 ppm	0.049 ppm	Yes	70%
Badlands	2016 – 0.060 ppm 2017 – 0.067 ppm 2018 – 0.063ppm	0.063 ppm	Yes	90%
Wind Cave	2016 – 0.060 ppm 2017 – 0.065 ppm 2018 – 0.063 ppm	0.062 ppm	Yes	89%
UC #1	2016 – 0.060 ppm 2017 – 0.066 ppm 2018 – 0.068 ppm	0.064 ppm	Yes	91%

Figure 9-3 – 2018 Ozone Design Values Statewide



The data collected in the past three years demonstrates that South Dakota is attaining the national ozone standard but a majority of the sites are at least 90% of the ozone design value.

9.5 Sulfur Dioxide

Four Sulfur Dioxide ambient air monitoring sites were operated in 2018. The analyzers were located at SD School, Badlands, Rapid City Credit Union, and UC #1 sites. The 1-hour Sulfur Dioxide standard concentration is 75 parts per billion. The area is attaining the standard when the three-year average of the yearly (99^{th} percentile) of the daily maximum 1-hour average concentrations is less than or equal to 75 parts per billion (1-hour design value). The secondary Sulfur Dioxide standard is based on a 3-hour average concentration of 0.5 parts per million, not to be exceeded more than once per year.

9.5.1 <u>Sulfur Dioxide 1-Hour Standard</u>

Table 9-5 contains the yearly 99^{th} percentile concentration, 1-hour design value, attainment status, and percent of the standard for each site. The Sulfur Dioxide 1-hour design values are based on Sulfur Dioxide data collected in 2016 to 2018. The highest 99^{th} percentile 1-hour levels in 2018 were recorded at the SD School Site and the Union County #1 Site with 3 parts per billion.

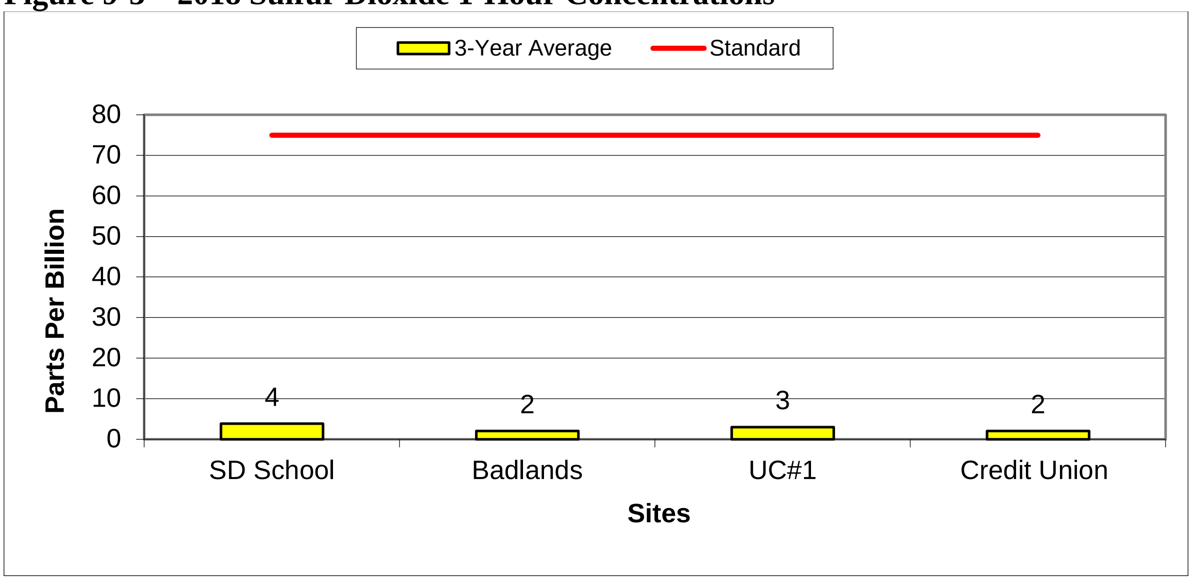
Table 9-5 – 2018 Statewide Sulfur Dioxide 1-hour Design Values

Site	99^{th} Percentile Concentration	1-Hour Design Values	Attainment Status	Percent of the Standard
SD School	2016 – 4 ppb 2017 – 5 ppb 2018 – 3 ppb	4 ppb	Yes	5%

Site	99th Percentile Concentration	1-Hour Design Values	Attainment Status	Percent of the Standard
Rapid City Credit Union	2016 – 1 ppb 2017 – 5 ppb 2018 – 2 ppb	2 ppb	Yes	3%
Badlands	2016 – 2 ppb 2017 – 2 ppb 2018 – 1 ppb	2 ppb	Yes	3%
UC #1	2016 – 3 ppb 2017 – 4 ppb 2018 – 3 ppb	3 ppb	Yes	4%

Figure 9-4 shows the three year average of the yearly 99th percentile or design value for the 1-hour concentration for each of the sites in the network for 2018. All four of the sites recorded concentrations well under the 1-hour standard. The highest 1-hour design value was recorded at the SD School Site with a concentration of 4 parts per billion which is 5% of the standard. The Badlands and Rapid City Credit Union sites each had concentrations of 2 parts per billion which is 3% of the standard. The data collected in the past three years demonstrates that South Dakota is attaining the new 1-hour Sulfur Dioxide standard.

Figure 9-3 – 2018 Sulfur Dioxide 1-Hour Concentrations



9.5.2 <u>Sulfur Dioxide 3-Hour Secondary Standard</u>

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 Sulfur Dioxide. South Dakota has very low levels of Sulfur Dioxide at the four monitoring sites. Therefore, the department opted to use the maximum 1-hour concentrations as a comparison for the 3-hour standard for Sulfur Dioxide. The highest 1-hour average concentration was recorded at the Credit Union site at 0.005 parts per million which is 1% of the Sulfur Dioxide secondary standard. Since the 1-hour average concentrations are not exceeding the secondary standard, all four sites are attaining the secondary standard for Sulfur Dioxide.

9.6 Nitrogen Dioxide

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

There were four Nitrogen Dioxide ambient air monitoring sites operated in 2018. The sampling locations were at the SD School, Badlands, Rapid City Credit Union, and UC #1 sites.

9.6.1 Nitrogen Dioxide 1-Hour Standard

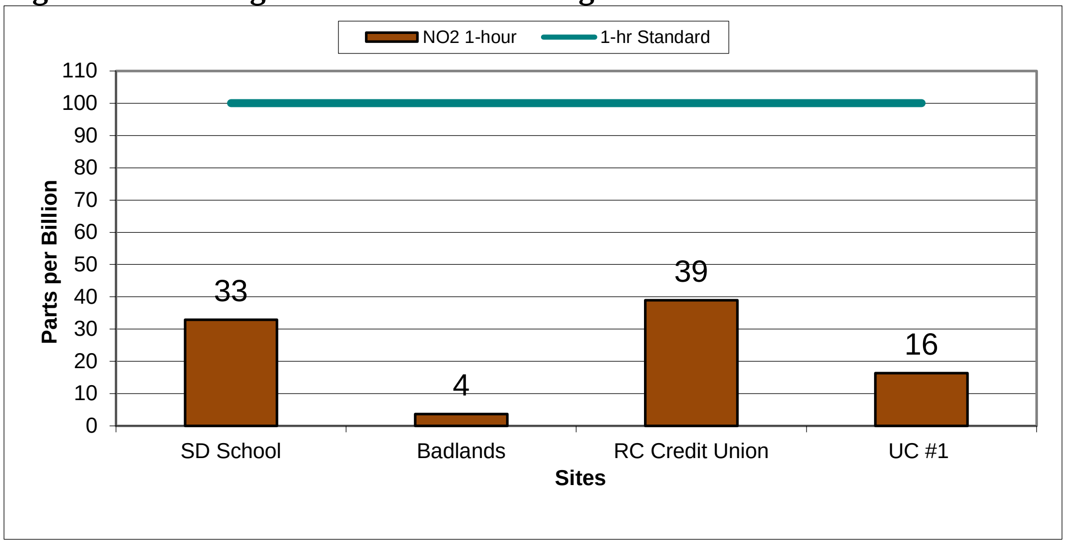
Table 9-6 contains the 1-hour 98th percentile concentration for each of the last three years, 1-hour design values, attainment status, and percent of the standard for each site. The Rapid City Credit Union Site had the highest 2018 98th percentile 1-hour concentration at 39.4 parts per billion. The second highest 1-hour concentration for 2018 was recorded at the SD School Site at 34.1 parts per billion.

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

Site	98th Percentile Concentration	1-Hour Design Values	Attainment Status	Percent of the Standard
SD School	2016 – 34.5 ppb 2017 – 30.2 ppb 2018 – 34.1 ppb	33 ppb	Yes	33%
Badlands	2016 – 3.5 ppb 2017 – 3.8 ppb 2018 – 3.8 ppb	4 ppb	Yes	4%
RC Credit Union	2016 – 37.6 ppb 2017 – 39.9 ppb 2018 – 39.4 ppb	39 ppb	Yes	39%
UC #1	2016 – 16.1 ppb 2017 – 15.3 ppb 2018 – 17.7 ppb	16 ppb	Yes	16%

Figure 9-5 shows the Nitrogen Dioxide 1-hour design values for each of the sites. The Rapid City Credit Union Site had the highest concentration at 39 parts per billion or 39% of the standard. The SD School Site recorded the 2nd highest 1-hour Nitrogen Dioxide design value at 33 parts per billion or 33% of the standard. All sites had concentrations under the 1-hour Nitrogen Dioxide standard and are attaining the standard using data from 2016 to 2018.

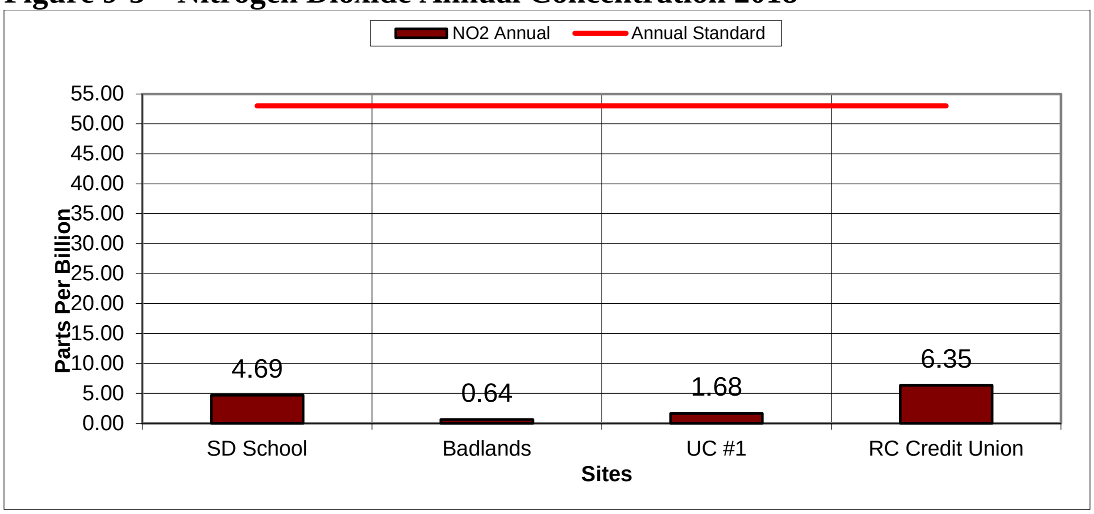
Figure 9-4 – Nitrogen Dioxide 1-hour Design Values 2018



9.6.2 Nitrogen Dioxide Annual Standard

Figure 9-6 shows the annual average for the four sites operated in 2018. The highest Nitrogen Dioxide annual average was recorded at the Rapid City Credit Union Site at 6.35 parts per billion. The Badlands Site remained at the same level near the detection level for the sampling method. In 2018, all four sites attained the annual standard for Nitrogen Dioxide.

Figure 9-5 – Nitrogen Dioxide Annual Concentration 2018

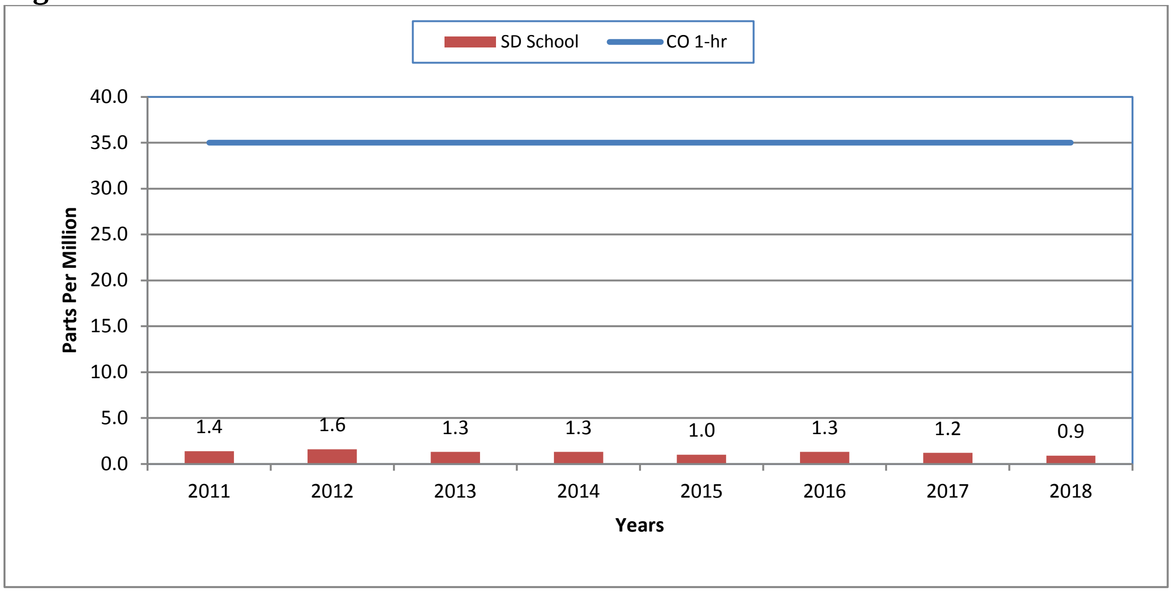


9.7 Carbon Monoxide

The Carbon Monoxide standard is based on two primary standards in the form of a one-hour and an 8-hour average concentration. The one-hour standard is 35.0 parts per million and is not to be exceeded more than once per year. The highest 1-hour concentration of Carbon Monoxide recorded at the SD School Site was 0.9 parts per million in 2018. Figure 9-6 shows the Carbon Monoxide 1-hour maximum concentrations for the SD School Site from 2011 through 2018.

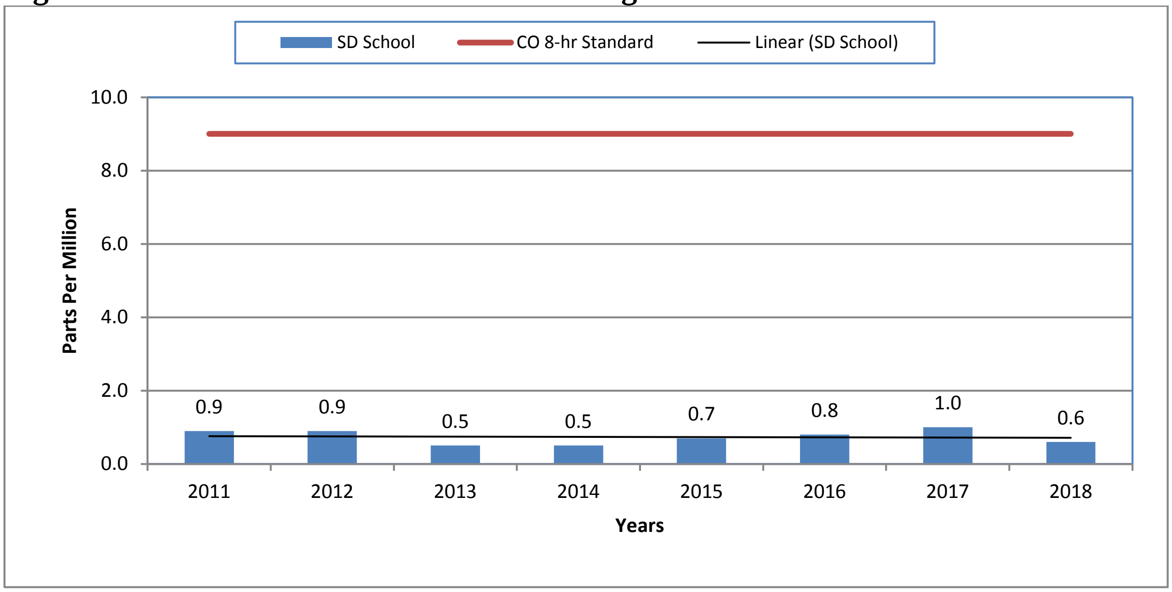
The Carbon Monoxide concentrations are very low. The Carbon Monoxide data shows the area is attaining the 1-hour National Ambient Air Quality Standard.

Figure 9-6 - Carbon Monoxide 1-Hour Concentration 2018



The other standard is an 8-hour average concentration of 9.0 parts per million, not to be exceeded more than once per year. The highest 8-hour average recorded at the SD School Site was 0.6 parts per million in 2018. Figure 9-7 shows the Carbon Monoxide maximum 8-hour average concentrations from the SD School Site from 2011 to 2018. The Carbon Monoxide concentrations are very low and the area is attaining the 8-hour average National Ambient Air Quality Standard.

Figure 9-7 - Carbon Monoxide 8-Hour Average Concentration 2018



9.8 2018 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% of or greater than the applicable standard. The evaluation of high concentration day for each parameter is as follows:

1. Ozone $\geq$ 0.063 parts per million, 8-hour average;
2. $PM_{2.5} \geq$ 32 micrograms per cubic meter, 24-hour average;
3. $PM_{2.5} \geq$ 10.8 ug/ m^3, annual average;
4. $PM_{10} \geq$ 135 ug/ m^3, 24-hour average;
5. Nitrogen Dioxide $\geq$ 90.0 parts per billion, 1-hour maximum;
6. Sulfur Dioxide $\geq$ 67.0 parts per billion, 1-hour maximum;
7. Carbon Monoxide $\geq$ 8.1 parts per million, 8-hour average; and
8. Carbon Monoxide $\geq$ 31.5 parts per million 1-hour maximum.

A review of the data showed no high concentrations days at the following sites in 2018: Black Hawk and Rapid City Library. None of the recorded samples at any of the locations throughout the state for $PM_{2.5}$ (annual), Sulfur Dioxide, Nitrogen Dioxide, and Carbon Monoxide (1-hour or 8-hour) had levels that exceeded the high concentration day criteria listed above for these pollutants.

9.8.1 $PM_{2.5}$ High Concentration Days

In 2018, there were six high concentration days for the 24-hour $PM_{2.5}$ standard throughout South Dakota. The high 24-hour $PM_{2.5}$ readings are shown in Table 9-7 and AirNow Air Quality Index (AQI) and AirNow Tech maps for each day are displayed in Appendix A. The AirNow Air Quality Index maps show the monitoring sites with high concentration days were at Moderate to Unhealthy for Sensitive Groups levels. The AirNow Tech maps show the wind barbs (direction and wind speed), fire locations, and the greyish areas represent smoke plumes. Although it is hard to see because of the smoke on the AirNow Tech maps, the maps are all the same area with South Dakota in the center of the map.

All the high days show fires or smoke in the area and nearby. In the February high concentration days the high concentrations appear to be impacted by more localized fires. In August, the high concentration days were caused by fires in Canada. Even though there were several high concentration days, they did not cause a violation of the standard.

Table 9-7 – 2018 High 24-Hour $PM_{2.5}$ Readings

No.	Site	Date	Monitor	Concentration (ug/m^3)
1	RC Credit Union	2/22/18	Continuous	34
2	RC Credit Union	2/23/18	Continuous	39
3	Fire Station #1	8/9/18	Manual	48
	Watertown		Continuous	37
4	Watertown	8/10/18	Continuous	35
5	Watertown	8/11/18	Continuous	33
6	Badlands	8/19/18	Continuous	44
	Pierre Airport		Continuous	38
	RC Credit Union		Continuous	43

9.8.2 PM_{10} High Concentration Days

During 2018, there was one high concentration day for PM_{10} in South Dakota. The high concentration day occurred at the Aberdeen Fire Station Site with a 24-hour average of 533 micrograms per cubic meter. The AirNow Air Quality Index (AQI) and AirNow Tech maps for each day are displayed in Appendix B. The AirNow Air Quality Index map shows the high concentration day at the Aberdeen Fire Station Site was at a Moderate level.

Since the manual monitor runs on a 1 in 6 day sampling schedule, this one exceedance caused a violation of the PM_{10} standard. The exceedance was caused by a natural event. According to the National Weather Service, "Leading up to the event, meteorological conditions were warm and generally dry in the James River Valley during May. Those conditions combined with strong winds from decaying thunderstorms in south central South Dakota produced a dust storm. South winds of 50 to 80 mph kicked up a significant amount of dirt/dust as the winds moved north, leading to visibilities being reduced to below ¼ mile in many locations. The reduced visibilities caused a few traffic incidents and the winds knocked down trees, tree branches, and powerlines." The Aberdeen Fire Station Site monitoring concentrations do not show up on the AirNow Tech maps because of the manual monitors, the Watertown Site shows concentrations were high with a PM_{10} hourly concentration of 160 micrograms per cubic meter. If not for the dust storm, all the sites in South Dakota would be attaining the PM_{10} 24-hour standard.

9.8.3 Ozone High Concentration Days

During 2018, there were 24 8-hour average high concentration days for ozone. The high days in the eastern part of the state were in April, May, and June. The high days in the western part of the state were in May, June, July, and August. See Table 9-8 for the high readings.

Table 9-8 - 2018 High 8-Hour Average Ozone Readings

No.	Date	Monitor	Concentration (ppm) [1]
1	4/17/18	SD School	0.063

No.	Date	Monitor	Concentration (ppm) [1]
2	4/23/18	Brookings	0.064
		SD School	0.068
		UC #1	0.066
3	5/16/18	SD School	0.067
		UC #1	0.068
4	5/17/18	Brookings	0.064
		SD School	0.067
		UC #1	0.066
5	5/23/18	SD School	0.067
		UC #1	0.066
		Wind Cave	0.063
6	5/24/18	UC #1	0.064
7	5/25/18	SD School	0.064
8	5/26/18	SD School	0.063
		UC #1	0.063
		Wind Cave	0.063
9	5/27/18	Brookings	0.069
		SD School	**0.075**
		UC #1	**0.074**
10	5/28/18	Brookings	0.065
		SD School	0.065
		UC #1	0.067
11	5/29/18	Brookings	0.063
		SD School	0.065
		UC #1	0.063
12	5/30/18	Brookings	0.067
13	5/31/18	Brookings	0.064
		SD School	0.065
		UC #1	0.067
14	6/1/18	Brookings	0.069
		SD School	**0.072**
		UC #1	**0.072**
15	6/4/18	Brookings	0.063
		SD School	0.067
		UC #1	0.065
16	6/5/19	Brookings	**0.071**
		SD School	**0.075**
		UC #1	**0.072**
17	6/6/18	Badlands	0.063
		SD School	0.069
		UC #1	0.067
18	6/8/18	Brookings	0.065
		SD School	0.064
19	6/13/18	Wind Cave	0.064

No.	Date	Monitor	Concentration (ppm) [1]
20	6/29/18	Brookings	0.066
21	7/10/18	Badlands	0.063
22	8/2/19	Badlands	0.066
		Wind Cave	0.065
23	8/3/18	Badlands	0.065
		Wind Cave	0.066
24	8/12/18	Badlands	0.065

[1] – Bolded concentrations that are shaded represent ozone concentrations that exceeded the 8-hour average ozone standard.

The AirNow Air Quality Index (AQI) and AirNow Tech maps for each day are displayed in Appendix C. Of the 24 high concentration days, only three days actually exceeded the 8-hour average standard of 0.070 parts per million at two to three monitoring sites. The highest concentration occurred twice at the SD School site with an 8-hour average of 0.075 parts per million. The first 0.075 parts per million concentration occurred on May 27, 2018 and the second occurred June 5, 2018. On May 27, 2018, a 8-hour average ozone concentration exceeded the standard was also observed at the Union County site at 0.074 parts per million. On June 5, 2018, a high concentration that exceeded the 8-hour average ozone standard occurred at the SD School, Brookings and Union County sites. The third day occurred on June 1, 2018, with two sites have high 8-hour average ozone concentrations of 0.072 parts per million. The occurrence of high concentrations at multiple sites on the same day in eastern South Dakota is a good indication the area was being impacted by other than local sources.

In western South Dakota, high ozone concentrations occurred on eight of the 24 days of high concentrations. The high concentration either occurred at the Badlands or Wind Cave national parks, except for two of the days with high concentrations occurring at both national parks. This is also a good indication that the area was being impacted by other than local sources.

In most cases, the AirNow Tech maps again show local fires or smoke plumes from fires in other areas influenced the ozone concentrations in South Dakota. The 24 high concentrations days did not cause a violation of the 8-hour average ozone standard.

10.0 AIR MONITORING SITE TRENDS

This section will evaluate each air monitoring site in the network, determine if the site should be continued, 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 Air Quality System 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 Title 40 of the Code of Federal Regulations Part 58.

10.1 Rapid City Area

The Rapid City area had a total of two monitoring sites collecting data in 2018. The high concentration site for PM_{10} was located at the Rapid City Credit Union Site and a continuous PM_{10} monitor was used to determine compliance with the National Ambient Air Quality Standards. In addition Sulfur Dioxide, Nitrogen Dioxide, and $PM_{2.5}$ analyzers were operated to determine current concentration levels. The Rapid City Library Site has manual Partisol 2000 and 2000i PM_{10} and $PM_{2.5}$ monitors collecting 24-hour data using a filter based gravimetric sampling method.

In cooperation with Rapid City, Pennington County, and local 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 by the National Weather Service 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 2018, a total of 4 high wind dust alerts were called for the Rapid City area. None of the alert days exceeded the PM_{10} 24-hour standard. The Natural Events Action Plan for the Rapid City area is working to maintain PM_{10} concentrations below the National Ambient Air Quality Standards during the high wind events on most days but still concentrations can exceed the standard.

An attainment designation was requested for PM_{10} and was approved by EPA for the Rapid City area in 2006. An attainment designation for the 24-hour $PM_{2.5}$ standard was requested for the Rapid City area in 2008 and for the annual $PM_{2.5}$ standard in 2014. EPA designated Pennington and Meade Counties as attainment/unclassifiable for 24-hour standard in 2010 and the annual standard in 2015.

10.1.1 Rapid City Library Site

The Rapid City Library Site is located on the library building in Rapid City. The site was established in 1972, and it is the longest running sampling site in South Dakota. 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 Rapid City Library Site. The Library site currently has manual monitors for PM_{10} and $PM_{2.5}$. The Credit Union site in Rapid City has PM_{10} and $PM_{2.5}$ continuous monitors. Of the two sites the Credit Union site experiences higher concentrations. The PM_{10} concentrations at the Library site after reducing the amount of liquid deicing and increasing sanding materials continues to decline. Therefore, the department will close the Library Site in Rapid City.

Figure 10-1 – Rapid City Library Site

PM_{10} sampling began at the site in 1985. The PM_{10} Hi-Vol monitors were replaced at the start of 2016 with low-volume manual Partisol 2000 monitors. The change in monitoring equipment standardized monitor flow rates between PM_{10} and $PM_{2.5}$ monitoring methods.

$PM_{2.5}$ monitors were added to the site in 1999. 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 Title 40 of the Code of Federal Regulations Part 58.

Table 10-1 – Rapid City Library Site Specifics

Parameter	Information
Site Name	Rapid City Library
AQS ID Number	46-103-1001
Street Address	6th 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-1298-126
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population

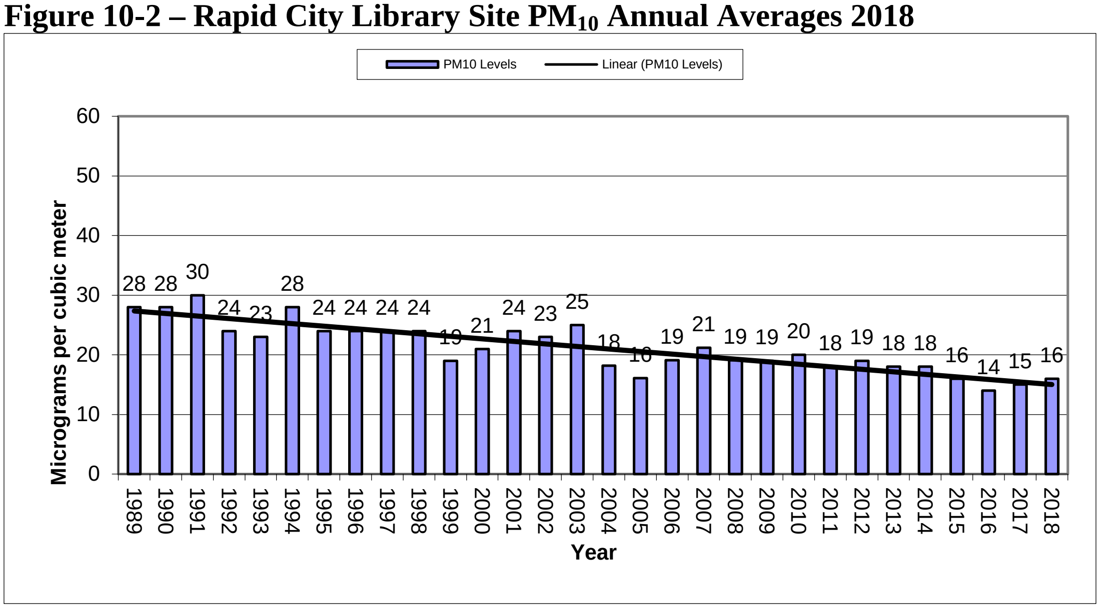
Parameter	Information
Sampling Method	Partisol 2000
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS),
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Equivalent Method RFPS-0498-117
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and 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 *Rapid City Library Site PM10 Data*

Annual average PM_{10} concentrations for the Rapid City Library Site are shown in Figure 10-2. The PM_{10} concentrations show a trend of decreasing concentrations ranging from a high of 30 micrograms per cubic meter in 1991, to a low of 14 micrograms per cubic meter in 2016. 2018 had a concentration of 16 micrograms per cubic meter. 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. This is the only site east of the hogback in Rapid City and provides a check on fugitive and point source emissions for PM_{10} in the eastern part of the city. The Library site currently has manual monitors for PM_{10} running on an every 3rd day sampling schedule.

The Credit Union site in Rapid City also has a PM_{10} monitor. Of the two sites the Credit Union site shows the higher concentrations.

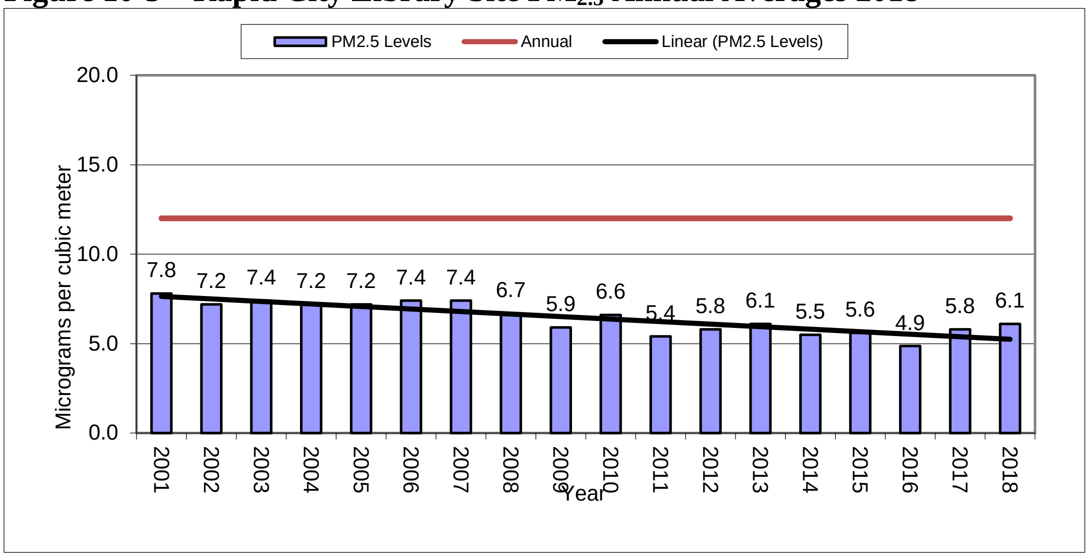
Figure 10-2 – Rapid City Library Site PM_{10} Annual Averages 2018



10.1.1.2 *Rapid City 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 trend shows decreasing concentrations with the highest annual average at 7.8 micrograms per cubic meter in 2001 and the lowest at 4.9 micrograms per cubic meter in 2016. The concentration for 2018 was 6.1 micrograms per cubic meter. The annual average concentrations vary in difference from the highest to lowest annual average by 2.9 micrograms per cubic meter. The trends indicate a declining $PM_{2.5}$ concentration levels for the site but for the past eight years the $PM_{2.5}$ concentrations have leveled off. The Library site currently has manual monitors for $PM_{2.5}$ running on an every 3rd day sampling schedule. The Credit Union site in Rapid City also has a $PM_{2.5}$ monitor. Of the two sites the Credit Union site shows the higher concentrations.

Figure 10-3 – Rapid City Library Site $PM_{2.5}$ Annual Averages 2018



10.1.2 <u>Rapid City Credit Union Site</u>

The Rapid City Credit Union Site is located on a lot next to Fire Station #3 building. The Rapid City 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 Rapid City 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}, $PM_{2.5}$, Sulfur Dioxide, and Nitrogen Dioxide standards and population exposure.

Figure 10-4 – Rapid City Credit Union Site

Continuous Met One BAM PM_{10} and Met One BAM $PM_{2.5}$ particulate monitors, Thermo Sulfur Dioxide and Thermo Nitrogen Dioxide monitors were operated at this site in 2018. The continuous particulate matter monitors provide hourly concentrations on an everyday sampling schedule. The hourly readings from the continuous PM_{10} monitor are used to investigate high concentration days for Rapid City and to compare concentrations to the PM_{10} National Ambient Air Quality Standards.

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 Code of Federal Regulations Part 58.

Table 10-2 – Rapid City Credit Union Site Specifics

Parameter	Information
Site Name	Rapid City 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-0798-122
Operating Schedule	Every Day

Parameter	Information
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Met One BAM-1020
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 Thermo 43i
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 Thermo 42i
Analysis Method	Chemiluminescence
Data Use	SLAMS (Comparison to the NAAQS) and Real-Time Data

In 2011, continuous Sulfur Dioxide and Nitrogen Dioxide analyzers were added to the Rapid City Credit Union Site to provide data on population exposure and source oriented testing near the facilities in the quarry area. Eight years of testing were completed at the end of 2018.

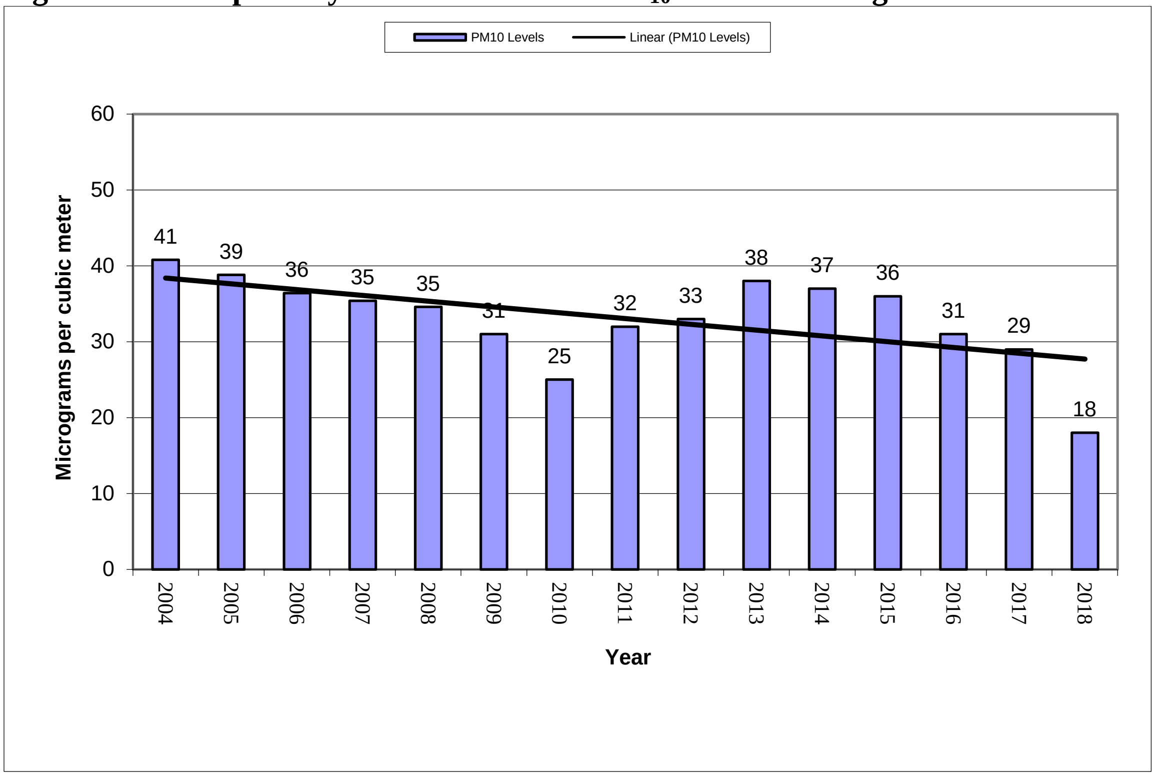
10.1.2.1 *Rapid City Credit Union Site PM_{10} Data*

The Rapid City 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 and increased through 2013. Since 2013, average concentration levels declined. Testing for PM_{10}

concentrations is a priority for this site, since we will be closing the Rapid City Library Site and the parameter will be continued.

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



10.1.2.2 *Rapid City 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 Rapid City 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 Federal Registered Method monitor.

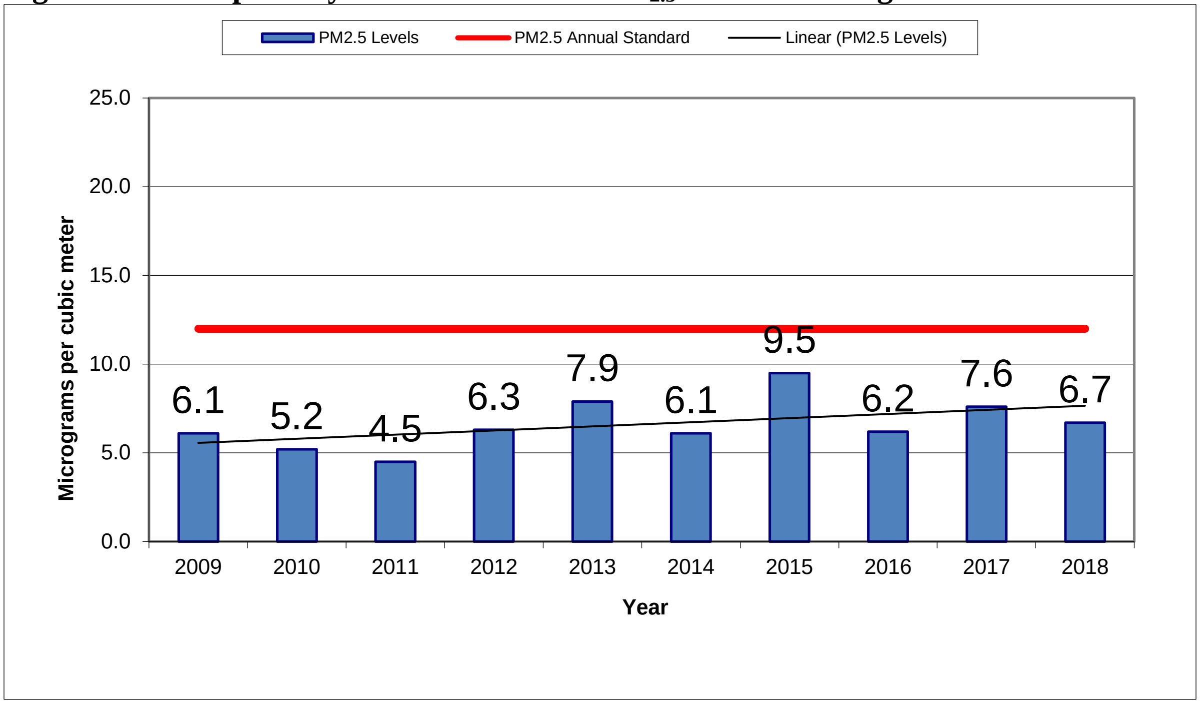
In 2009, a continuous method $PM_{2.5}$ monitor was added to the site as a special purpose monitor. Because the continuous monitor was a new method, EPA allows the operation of the monitor as a special purpose method for up to three years before the data from the monitor is required to be compared to the $PM_{2.5}$ standard. By the end of 2011, the continuous monitor had operated for three years and the Met One continuous $PM_{2.5}$ monitor received the federal equivalent method number. Data was similar between the methods of $PM_{2.5}$ monitoring, so as a cost savings measure the manual $PM_{2.5}$ monitor was removed and the continuous monitor became the state and local air monitoring stations monitor providing more valid 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 varied through the years. In 2011,

$PM_{2.5}$ annual concentrations reached its lowest level with a concentration of 4.5 micrograms per cubic meter. The highest annual average for $PM_{2.5}$ at this site was 9.5 micrograms per cubic meter in 2015. Smoke from wildfires in Canada and Pacific Northwest states had a large impact on the $PM_{2.5}$ annual average concentration in 2015, 2017, and 2018.

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

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

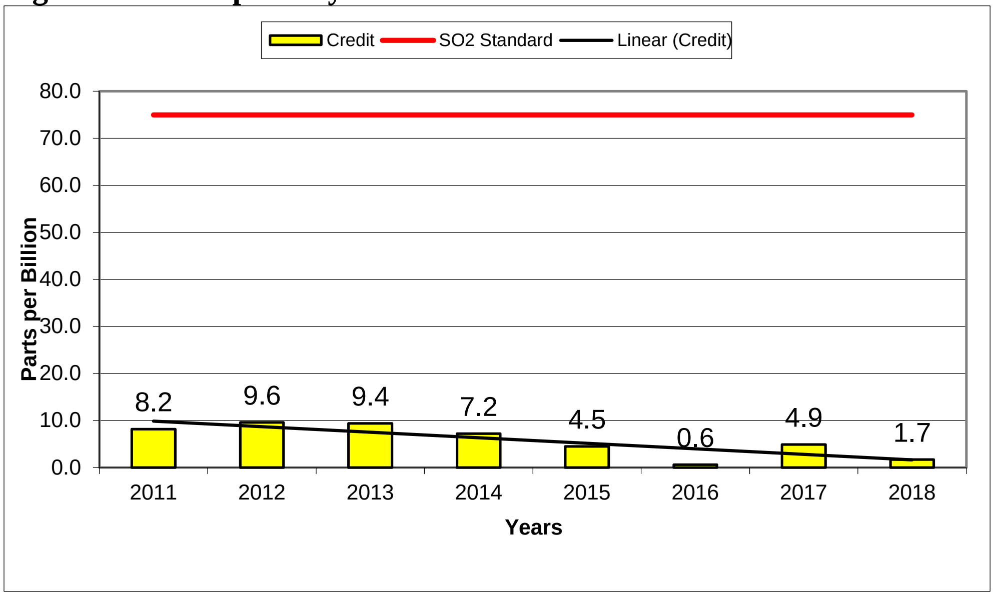


10.1.2.3 *Rapid City Credit Union Site Sulfur Dioxide*

Testing for Sulfur Dioxide 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 Sulfur Dioxide 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 Sulfur Dioxide recorded at the Rapid City Credit Union Site. The concentration level is low at only 2% of the standard. Trends indicate a decreasing Sulfur Dioxide concentration level for this site. Testing for Sulfur Dioxide will continue at this site.

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

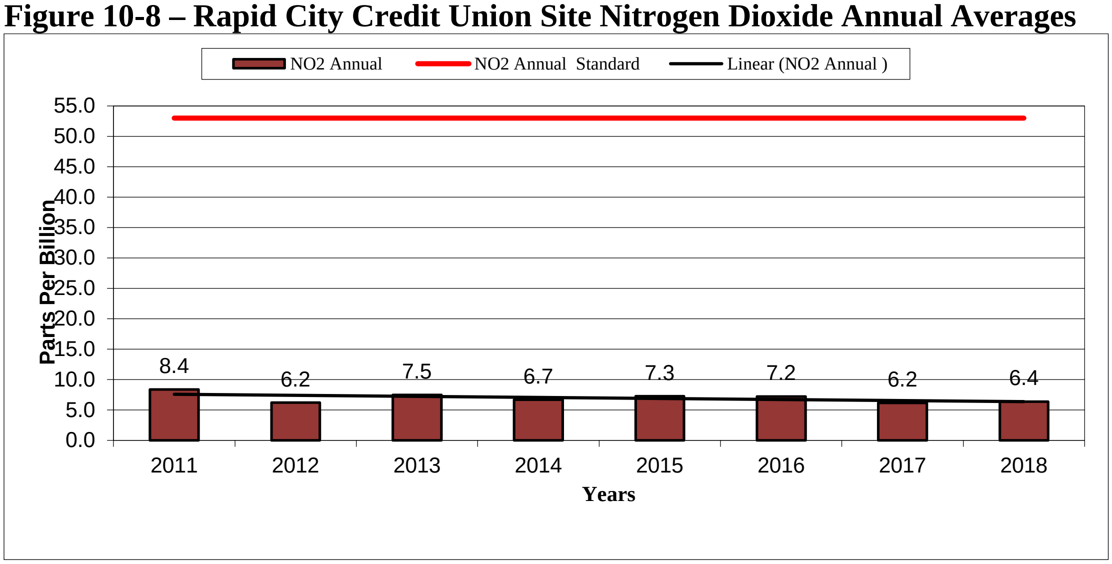


10.1.2.4 *Rapid City Credit Union Site Nitrogen Dioxide*

Testing for Nitrogen Dioxide 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 Nitrogen Dioxide standard includes a 1-hour and annual average concentration so the annual will be represented to track trends.

See Figure 10-8 for concentrations of Nitrogen Dioxide at the Rapid City Credit Union Site. The concentrations are low at 12% of the standard in 2018. The trend line shows a slightly declining concentration level for the annual average, but the annual average has declined over the past four years. Testing for Nitrogen Dioxide will continue at this site to further define the pollution level trend for this site.

Figure 10-8 – Rapid City 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 Metropolitan Statistical Area.

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 Rapid City 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 National Ambient Air Quality Standards were very low. In 2007, the ozone analyzer was moved from Rapid City Credit Union Site to the Black Hawk Site to determine ozone concentrations outside of the modeled one microgram Nitrogen Dioxide 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 current 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 National Ambient Air Quality Standards in the Rapid City Metropolitan Statistical Area.

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 Title 40 of the Code of Federal Regulations Part 58.

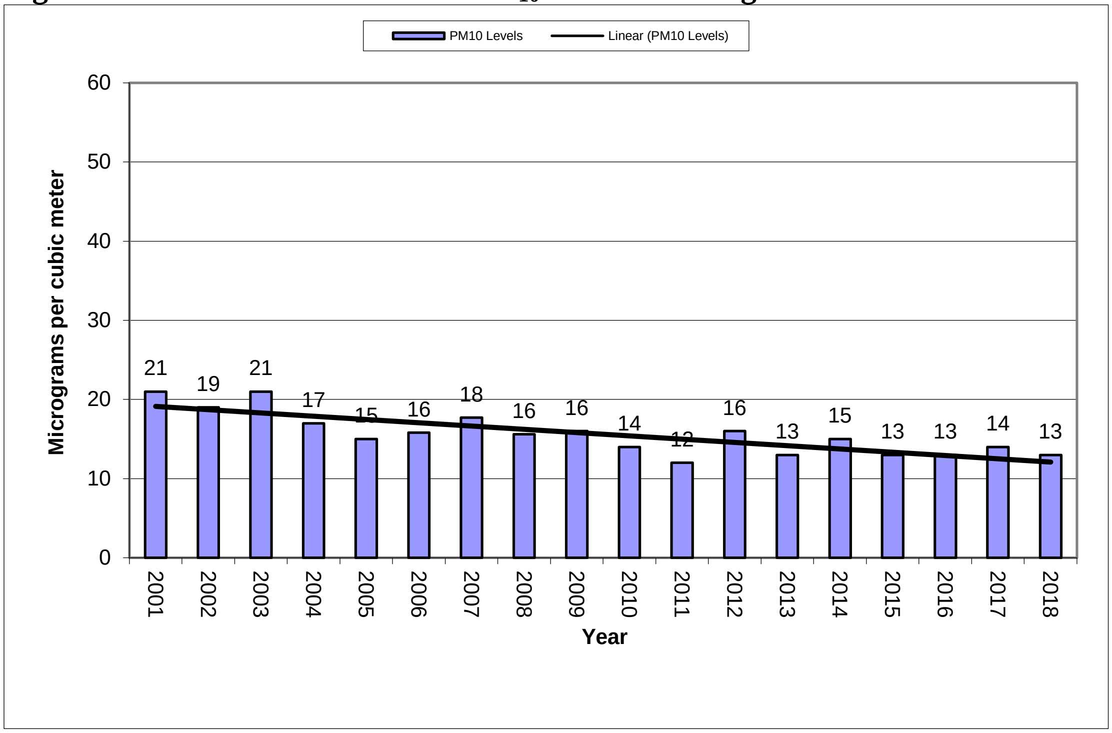
Table 10-3 – Black Hawk Site Specifics

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}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population, Urban Background
Sampling Method	T A Series FH 62 C14 Continuous
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
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 three years of PM_{10} concentration levels remained about the same. In 2004, the annual average dropped four micrograms per cubic meter. The highest annual average was 21 micrograms per cubic meter recorded in both 2001 and 2003. The lowest level of 12 micrograms per cubic meter was recorded in 2011. In 2018, the PM_{10} concentrations stayed similar to the last three years. The overall trend shows a decrease in concentrations over the eighteen year period but has started to flatten out in the last six years if not more. Plans are to continue to test for PM_{10} at this location.

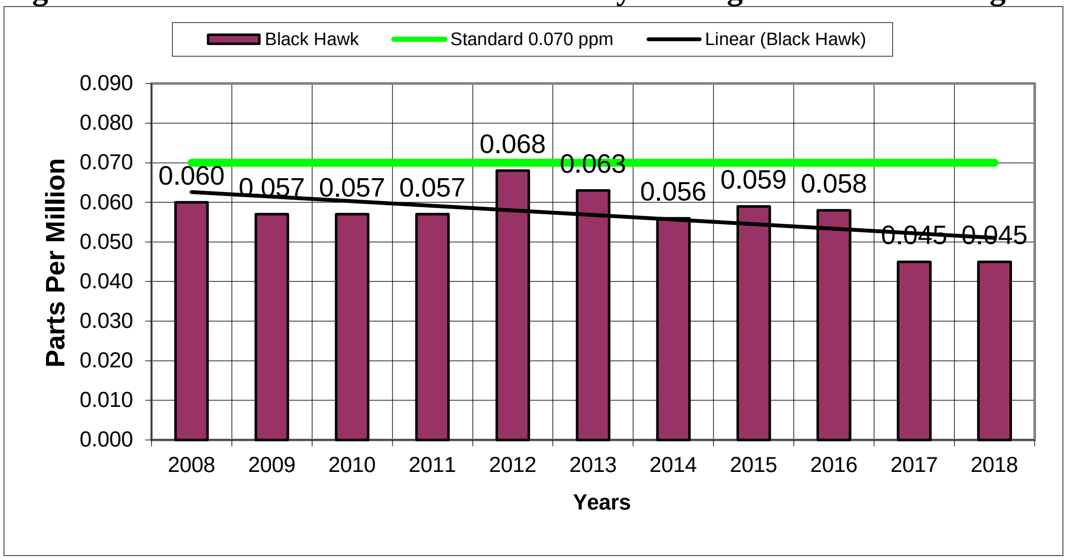
Figure 10-10 – Black Hawk Site – PM_{10} Annual Averages



10.2.2 Black Hawk Site Ozone Data

The 2018 sampling year is the eleventh 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 parts per billion and significantly at this site at 11 parts per billion. In 2018, ozone levels remained at the lowest levels in the site's history. The overall trends show a decrease in ozone concentration levels. 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 National Park 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 particulate matter and continuous monitors for particulate matter and gaseous air pollutants have been added over the years. Currently, the Badlands Site continuously monitors for PM_{10}, $PM_{2.5}$, Sulfur Dioxide, Nitrogen Dioxide, and ozone. 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.

Figure 10-12 –Badlands Site

The Badlands Site is located next to the Interagency Monitoring of Protected Visual Environments site operated by the National Park Service. The Interagency Monitoring of Protected Visual Environments data is used to determine what types of sources are impacting the visibility of the national parks in South Dakota. The goal of having a state and local air monitoring station site next to the Interagency Monitoring of Protected Visual Environments site is to determine air pollution background levels and to see if pollution trends show long range transport of air pollution into the state. Table 10-4 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations 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-0798-122
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM - 1020
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 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 Thermo 43c
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 Thermo 42i
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 Thermo 49i

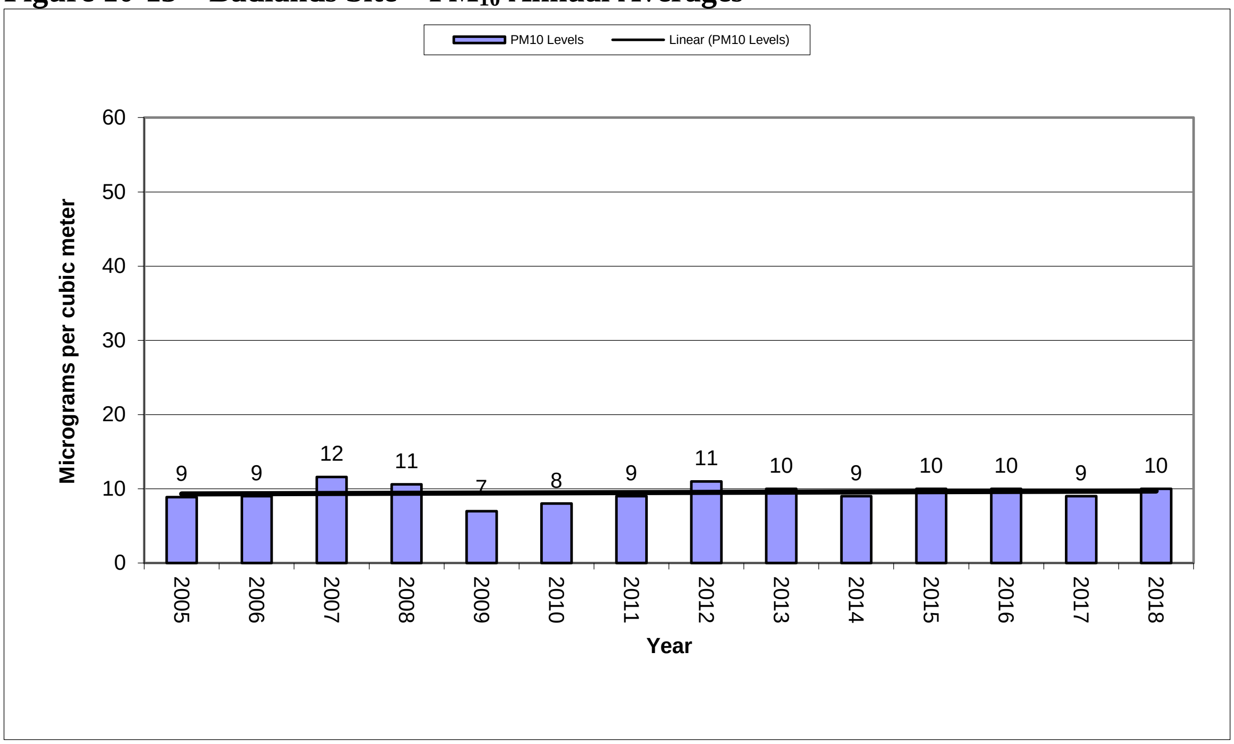
Parameter	Information
Analysis Method	Ultraviolet
Data Use	SLAMS (Comparison to the NAAQS) and Real-time Data

10.3.1 Badlands Site – PM_{10} Data

PM_{10} data has been collected at this site since 2000. The PM_{10} manual monitors were operated on an every sixth day schedule from 2000 through 2004. As of 2005, continuous monitoring methods have been employed.

Figure 10-13 contains a graph of the annual averages for the Badlands Site since the continuous monitor was installed. The annual average concentration over the last 14 years varied only slightly overall. The highest annual average concentration of 12 micrograms per cubic meter was recorded in 2007. The lowest annual average concentration of 7 micrograms per cubic meter was recorded in 2009. The PM_{10} concentrations recorded at this site are some of the lowest levels in the state and represent background levels 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

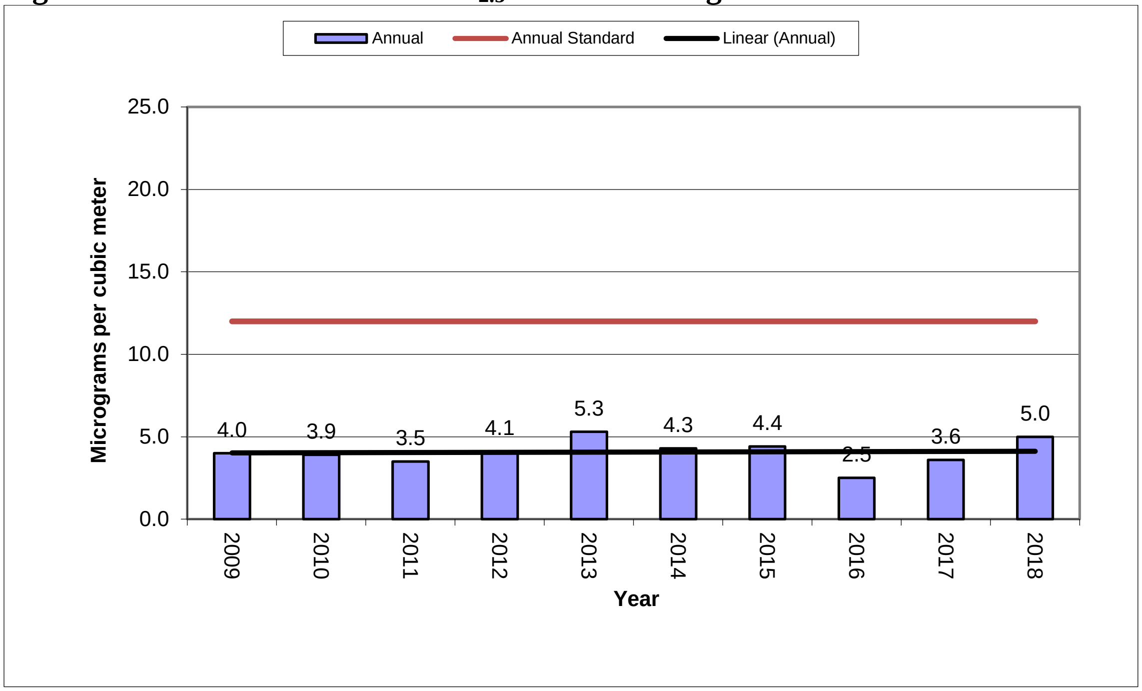


10.3.2 Badlands Site – $PM_{2.5}$ Data

The $PM_{2.5}$ manual monitors ran on an every third day schedule from 2001 to 2008. Beginning in 2009, the continuous Met One BAM-1020 Federal Equivalent Method replaced the manual RAAS 100 and the sampling schedule went to every day providing hourly and 24-hour average concentrations.

Figure 10-14 contains a graph of the annual averages for the continuous monitoring data. The annual averages for the Badlands Site show a concentration range with a high of 5.3 micrograms per cubic meter in 2013 and a low of 2.5 micrograms per cubic meter in 2016. Similar to the annual PM_{10} concentrations, $PM_{2.5}$ concentrations at this site have varied slightly over the years and are the lowest in the state. $PM_{2.5}$ concentrations at the Badlands Site represent background levels for western South Dakota. 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

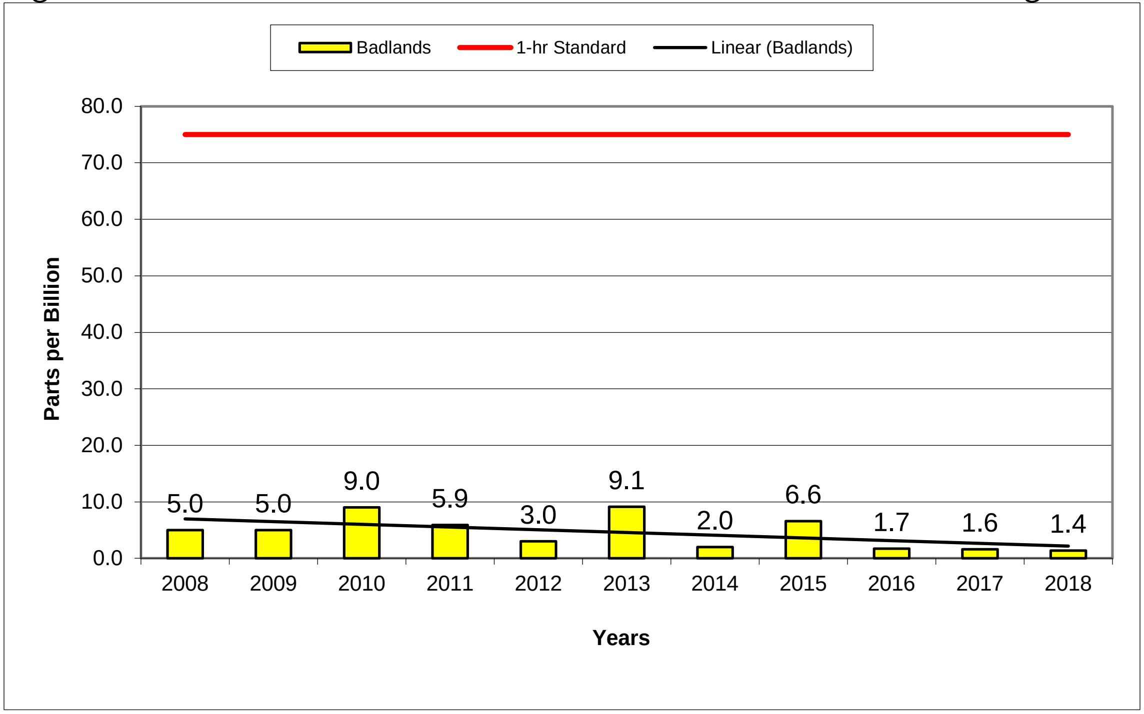


10.3.3 Badlands Site – Sulfur Dioxide Data

The first year of testing at the Badlands Site for Sulfur Dioxide occurred in 2005. As expected, concentrations for Sulfur Dioxide are very low and represent background levels. Concentrations are at or near the detection limit for the analyzers at 0.1 parts per billion.

In 2018, the annual 99^{th} percentile Sulfur Dioxide concentration was the lowest recorded in the history of the site at 1.4 parts per billion. See Figure 10-15 to view a graph of the annual 99^{th} percentile concentrations for Sulfur Dioxide. The linear trend line shows a decreasing level in concentrations but levels are very low and indicate minimal concentrations of Sulfur Dioxide. 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



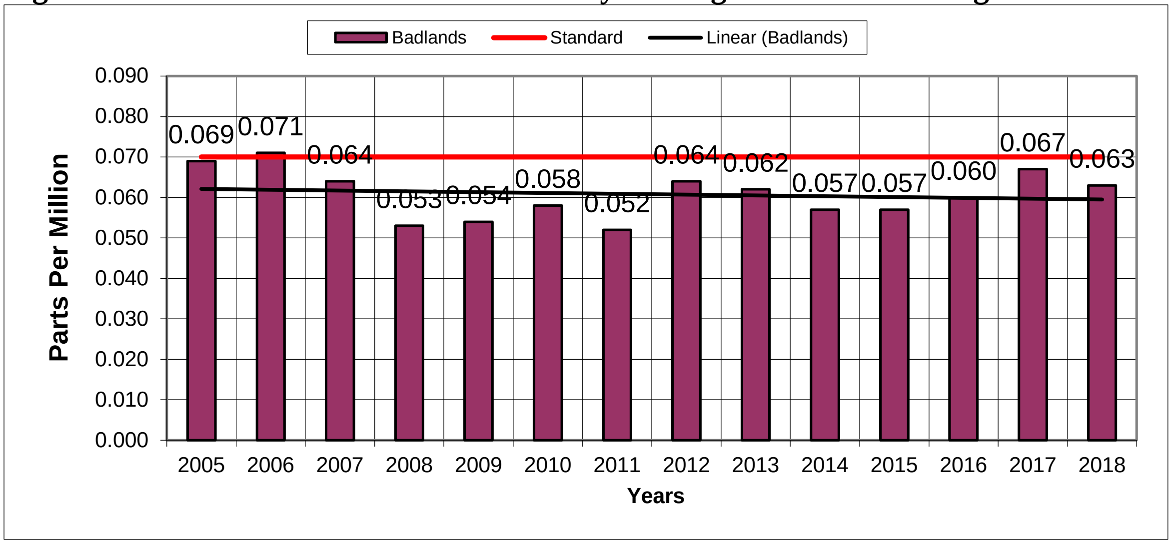
10.3.4 Badlands Site Ozone Data

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 National Ambient Air Quality Standards. 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 up and down over the fourteen years of testing. The yearly 4th highest 8-hour average ranged from a high of 0.071 parts per million in 2006 to a low of 0.052 parts per million in 2011. Currently it appears the ozone concentrations are on a slight decline. See Figure 10-16 to view a graph of the yearly 4th highest 8-hour average.

This parameter will continue to be a priority at this location because of past concentration levels at a site representing a rural area in western South Dakota and the testing is meeting the needs to continue the sampling effort.

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

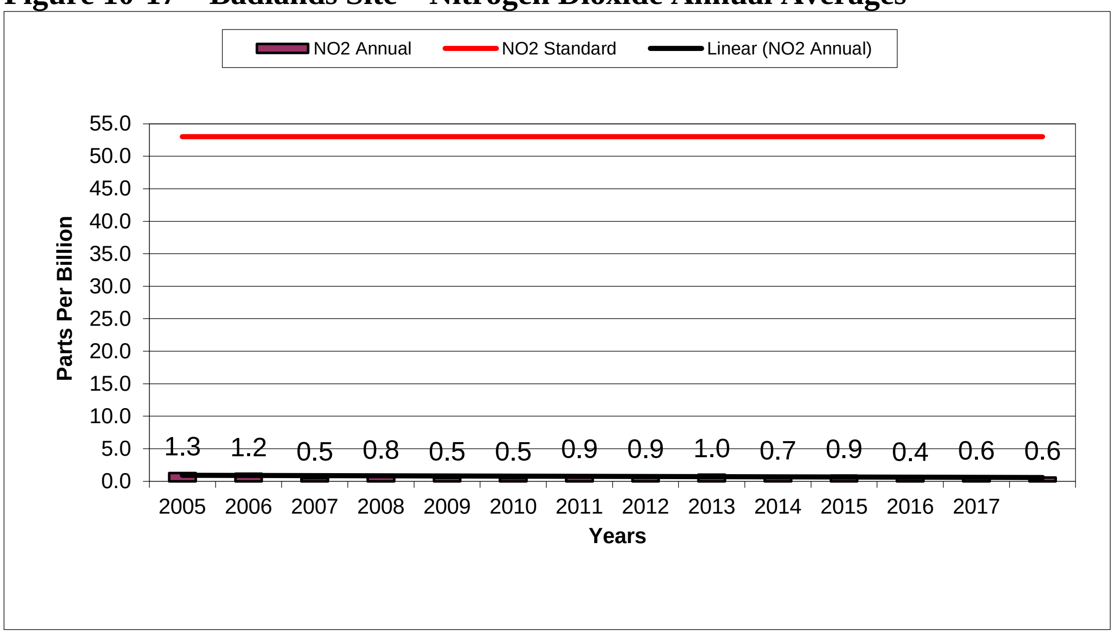


10.3.5 Badlands Site – Nitrogen Dioxide Data

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

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 at this location providing background concentration levels for western South Dakota.

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}, Sulfur Dioxide, Nitrogen Dioxide, 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. Currently, the Wind Cave Site continuously monitors for PM_{10}, $PM_{2.5}$, and ozone. 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 monitoring equipment at the Wind Cave Site is located in a sampling shelter next to the Interagency Monitoring of Protected Visual Environments site operated by the National Park Service. The Interagency Monitoring of Protected Visual Environments data will be used to determine what types of sources are impacting the visibility of the national parks in South Dakota. The purpose of having a State and Local Air Monitoring Stations site next to the Interagency Monitoring of Protected Visual Environments site is 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 Title 40 of the Code of Federal Regulations Part 58.

Table 10-5 – Wind Cave Site Specifics

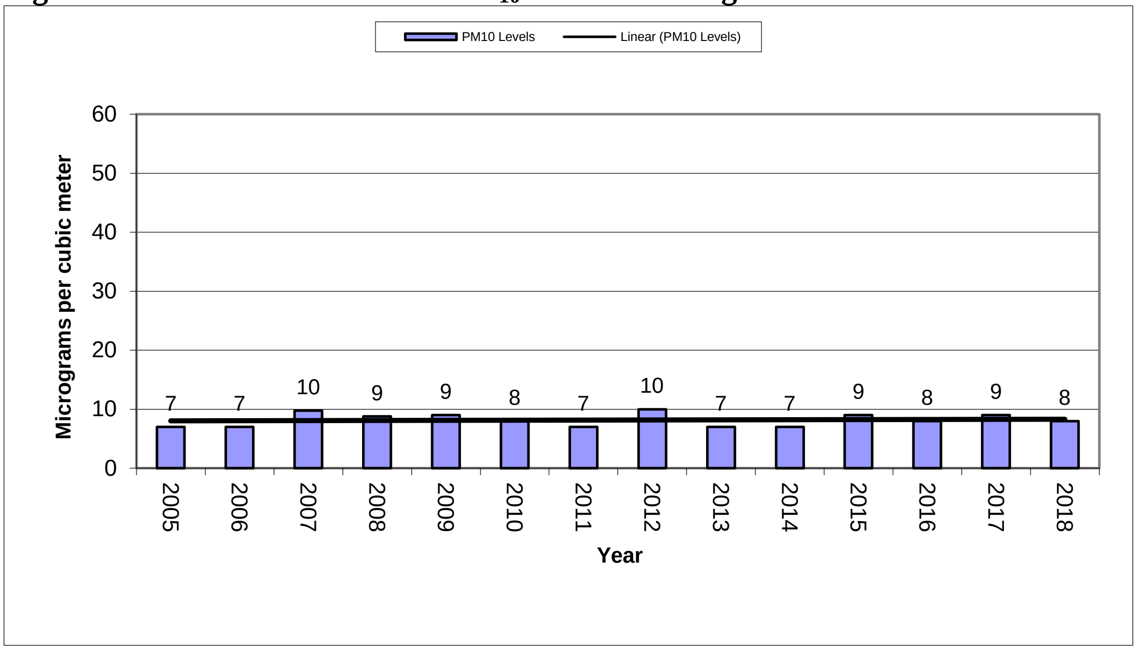
Parameter	Information
Site Name	Wind Cave
AQS ID Number	46-033-0132
Street Address	290 Elk Mountain Camp Road, Hot Springs, South Dakota
Geographic Coordinates	UTM Zone 13, NAD 83, E 622,471.56 N 4,823,856.93
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0798-122
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM - 1020
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 Thermo 49i
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 2018, PM_{10} concentrations were slightly less than those in 2017. The trend line indicates steady concentration levels over the 14 years of testing. The concentrations ranged from 7 to 10 micrograms per cubic meter and are very low representing background levels in western South Dakota. This parameter is meeting the goals of background, visibility protection, long range transport, and will be continued.

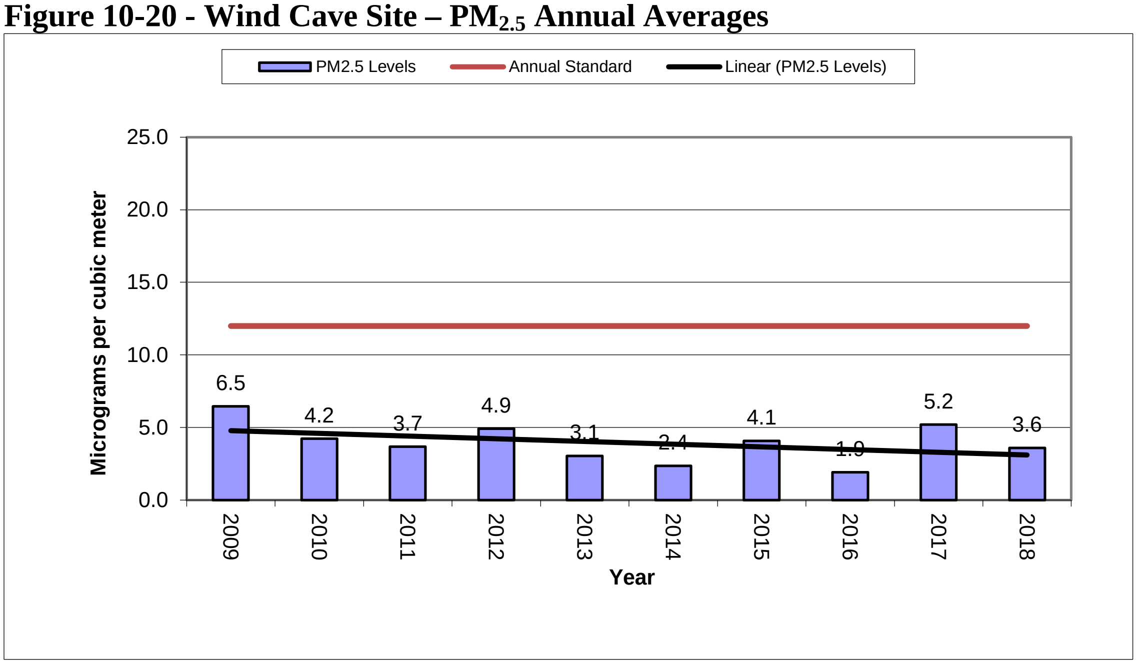
Figure 10-19 - Wind Cave Site – PM_{10} Annual Averages



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

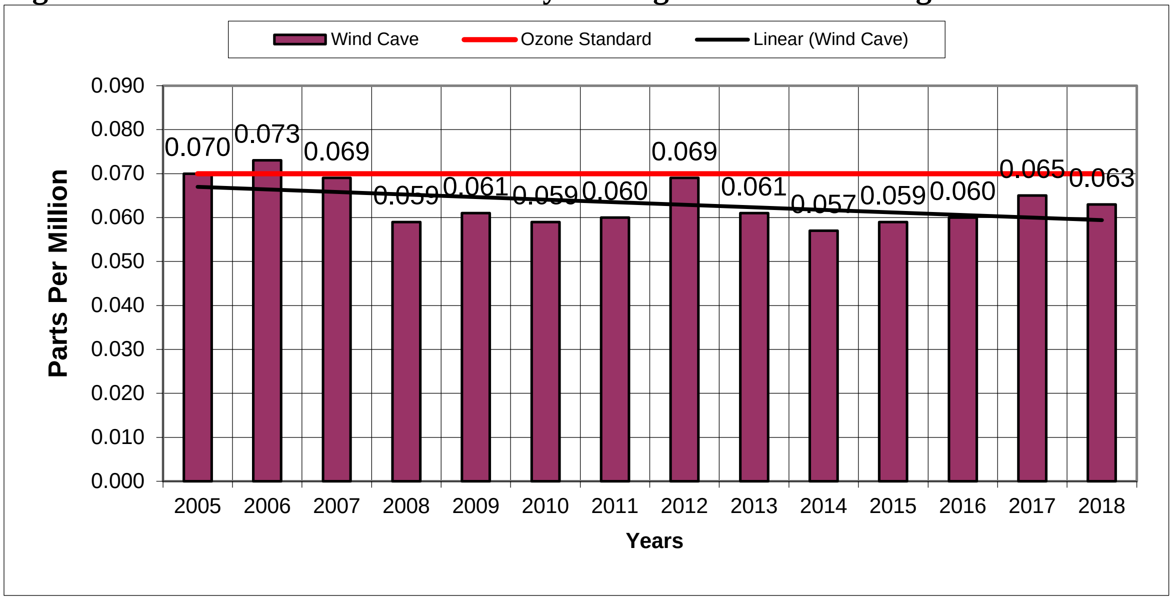


The $PM_{2.5}$ annual average concentrations range from 6.5 micrograms per cubic meter in 2009 to 1.9 micrograms per cubic meter in 2016. Concentrations were down in 2018 for this site. This parameter is meeting the goals of background, visibility protection, and long range transport and will be continued.

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 parts per million recorded in 2006. Ozone levels began to fall in 2007, in 2008 through 2011 the ozone concentrations leveled out. In 2012, Wind Cave ozone levels jumped back up to the approximate levels recorded when the department first started monitoring for ozone. However, in 2013 through 2016 the ozone concentrations dropped and leveled out similar to what occurred in 2008 through 2011. During 2017, there was an increase in concentration levels.

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 SD School Site - Sioux Falls Area

In 2018, one sampling site was operated in the Sioux Falls area, the 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 and monitors for PM_{10}, $PM_{2.5}$, ozone, Carbon Monoxide, Sulfur Dioxide, and Nitrogen Dioxide. In addition, special purpose parameters are sampled including PM_{coarse}, speciation $PM_{2.5}$ and Total Reactive Nitrogen. This is a very busy monitoring site collecting more than 140,000 data points per year all loaded to the EPA national database. Figure 10-22 shows a current picture of the SD School Site.

Figure 10-22 – 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 10-6 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58. In addition to the parameters listed in Table 10-6, a $PM_{2.5}$ speciation monitor is operated at an every 3rd day sampling schedule.

Table 10-6 – 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}	**(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)**

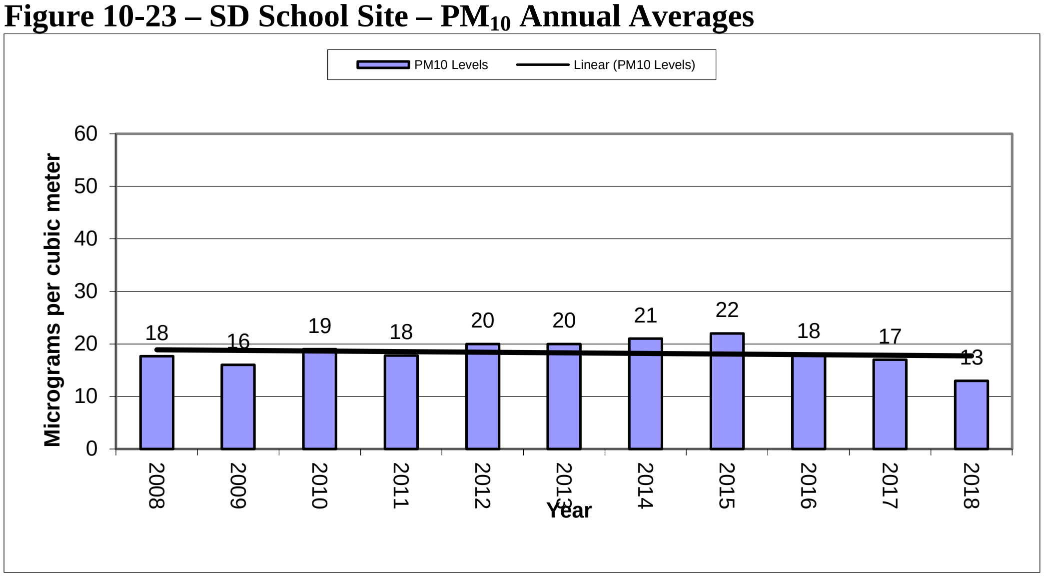
Parameter	Information
Sampler Type	Federal Reference Method RFPS-0498-117
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Partisol 2000 w/VSCC
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)
$PM_{10\text{-}2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0709-185
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)
$PM_{2.5}$	**(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-1194-099
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Teledyne API's T200
Analysis Methods	Chemiluminescence detection
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

Parameter	Information
Sampling Method	Teledyne API's T200
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 TLE
Analysis Methods	Pulsed Fluorescence
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data
CO	**(Continuous)**
Sampler Type	Federal Reference Method RFCA-1093-093
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Teledyne API 300E
Analysis Methods	Gas/Filter/Correlation
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data

10.5.1 SD School Site PM_{10} Data

Figure 10-23 shows a graph of the PM_{10} annual averages since 2008. The annual averages at the SD School Site range from a high of 22 micrograms per cubic meter in 2015 to a low of 13 micrograms per cubic meter in 2018. The trend line indicates a slightly decreasing concentration level, however, the PM_{10} concentrations for the last four years have dropped to a low of 13 micrograms per cubic meter in 2018. This parameter is meeting the goals of high concentration and population and will be continued.

Figure 10-23 – SD School Site – PM_{10} Annual Averages

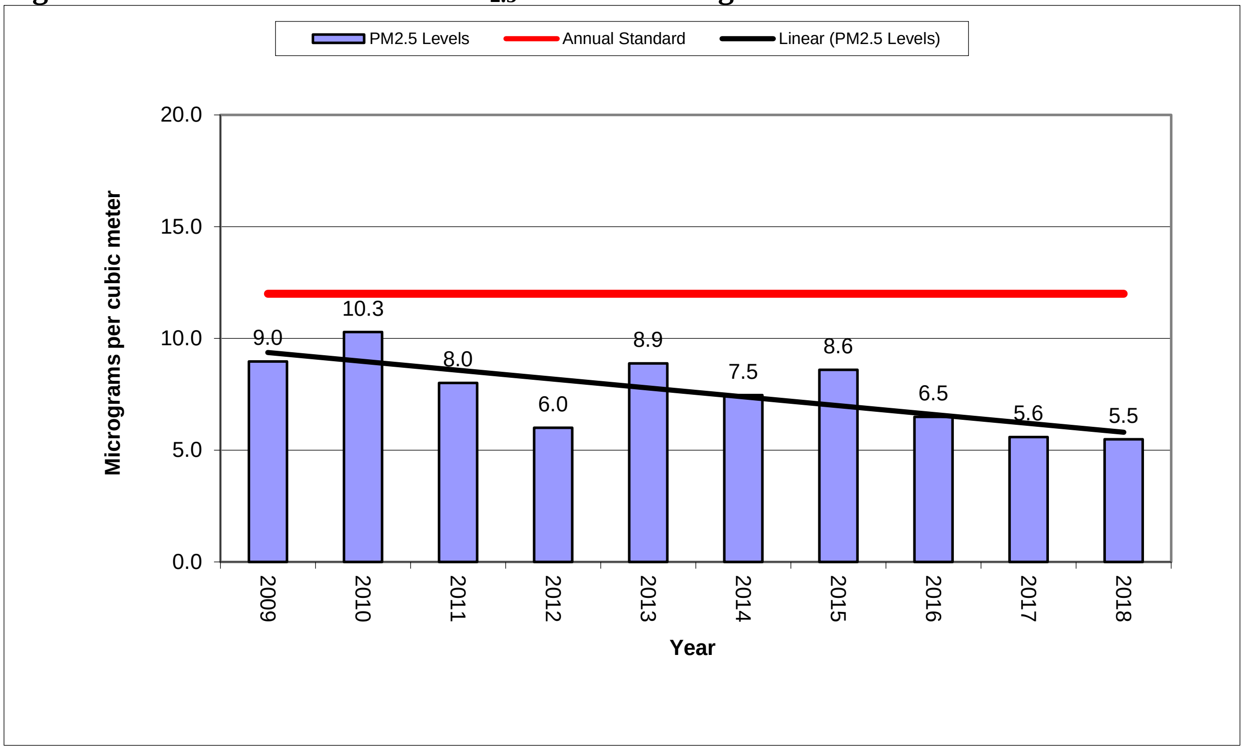


10.5.2 SD School Site – $PM_{2.5}$ Data

$PM_{2.5}$ data has been collected at this site since 2008. Annual averages for the SD School Site range from a low of 5.5 micrograms per cubic meter in 2018 to a high of 10.3 micrograms per cubic meter in 2010. The overall trend at this site shows a decrease in concentration levels with 2018 having the lowest annual average at the site with 5.5 micrograms per cubic meter. Figure 10-24 contains a graph of the annual averages.

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 10-24 – SD School Site – $PM_{2.5}$ Annual Averages

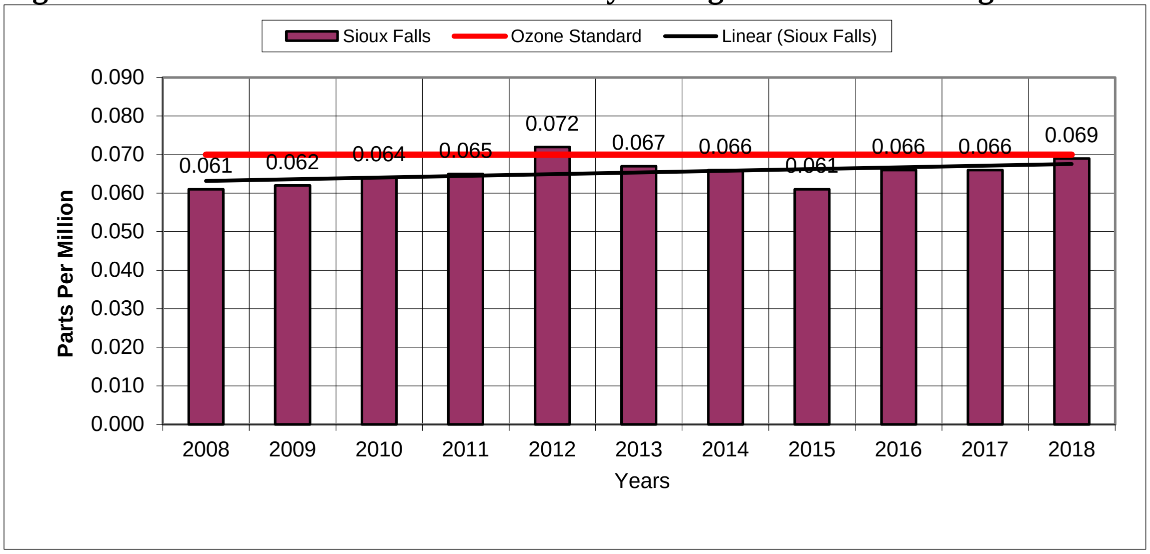


10.5.3 SD School Site Ozone Data

Sampling began for ozone at this site in 2008. The highest yearly 4th highest 8-hour ozone concentration recorded at this site was in 2012 at 0.072 parts per million. The lowest yearly 4th highest 8-hour ozone concentration was recorded at 0.061 parts per million in 2008 and 2015. The trend line shows a slightly increasing level of ozone over the eleven years of testing. In 2018, concentrations of ozone were higher than the past five years. Figure 10-25 contains a graph of each year's 4th highest ozone concentration level.

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.

Figure 10-25 – SD School Site - Ozone Yearly 4th Highest 8-Hour Averages

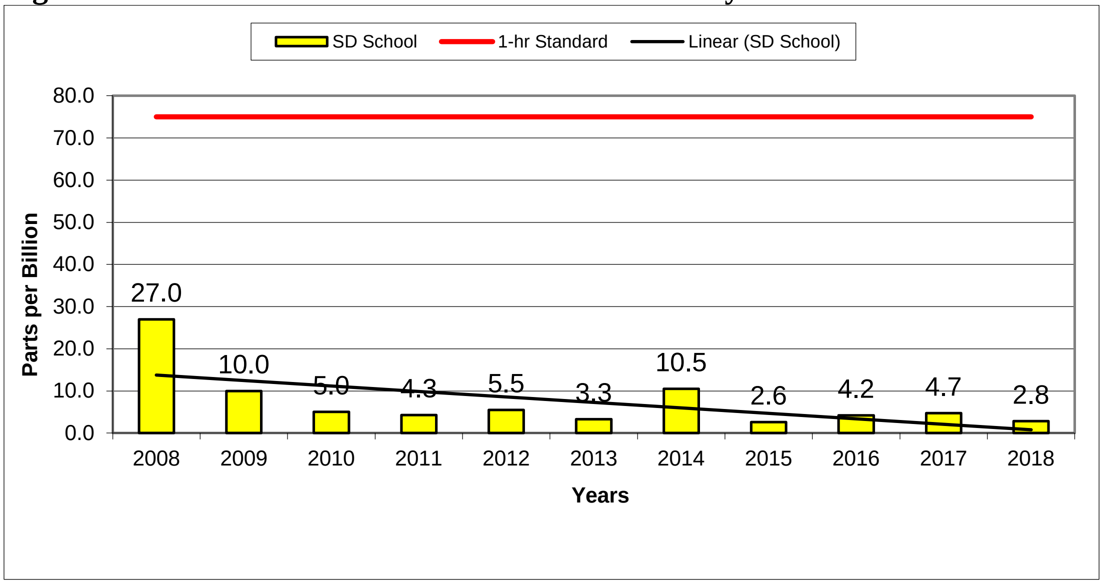


10.5.4 <u>SD School Site Sulfur Dioxide Data</u>

Testing for Sulfur Dioxide started in 2008 at this site. The levels of Sulfur Dioxide have dropped in concentration since the first year of testing. The type of analyzer was changed to a trace level Sulfur Dioxide analyzer in 2011. The detection level of this analyzer is now 0.1 parts per billion.

Sulfur Dioxide concentrations leveled out in 2010 through 2013 with the 1-hour 99th percentile for each year ranging from 3.3 to 5.5 parts per billion. In 2014, the 1-hour 99th percentile for Sulfur Dioxide concentrations jumped up to 10.3 parts per billion. Since then, the concentrations of Sulfur Dioxide decreased and leveled out again. The trend line shows a drop in concentrations of Sulfur Dioxide over the eleven years of testing. Figure 10-26 contains a graph of the Sulfur Dioxide yearly 1-hour 99th percentile for each sampling year.

Figure 10-26 – SD School Site – Sulfur Dioxide Yearly 1-hour 99th Percentile

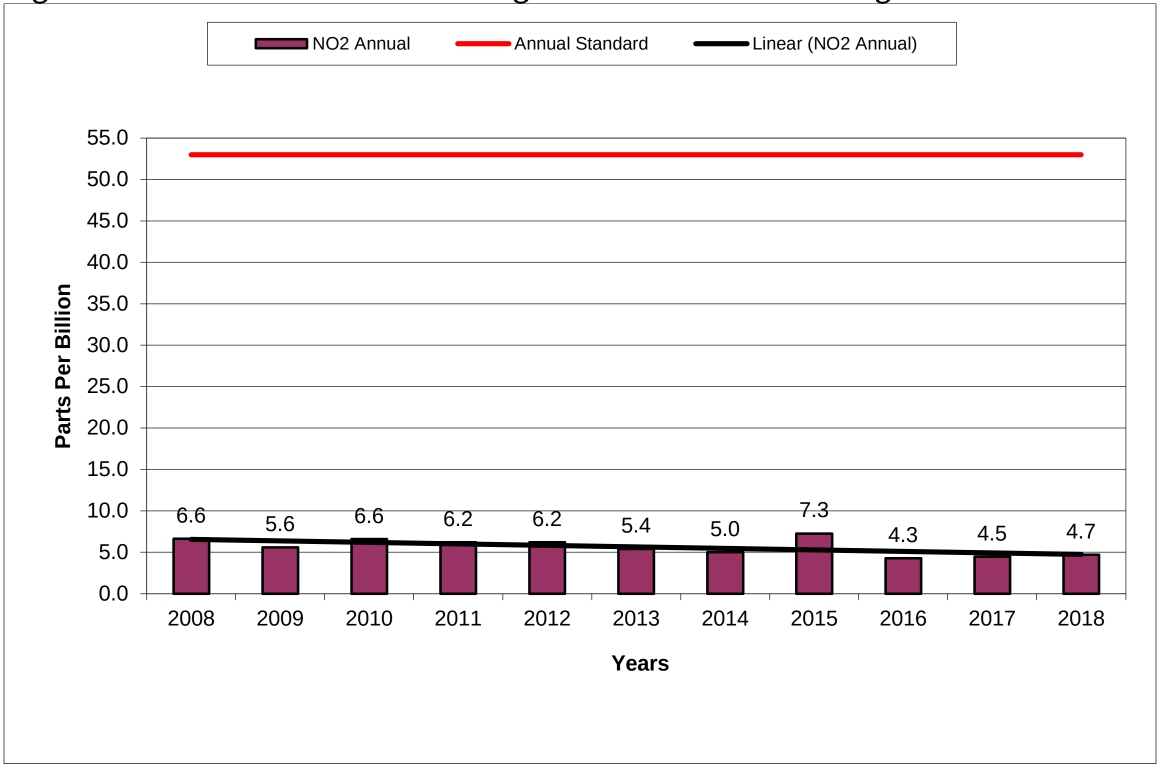


This parameter is meeting the goals of high concentration and population and testing will be continued at this site.

10.5.5 SD School Site Nitrogen Dioxide Data

The SD School Site began testing for Nitrogen Dioxide in 2008. The SD School Site is the second highest Nitrogen Dioxide concentration area in the state. There are only 3 parts per billion difference in annual concentration levels from the highest annual average of 7.3 parts per billion in 2015 to the lowest of 4.3 parts per billion in 2016. Trends show concentrations have a slight decrease at this site. Figure 10-27 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.

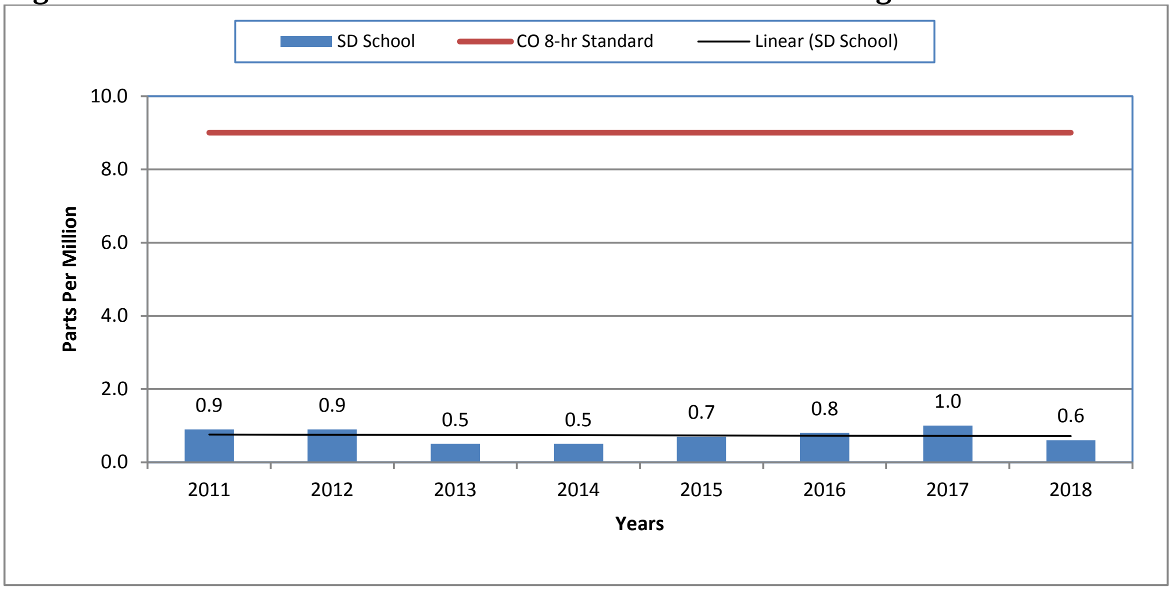
Figure 10-27 – SD School Site – Nitrogen Dioxide Annual Averages



10.5.6 SD School Site Carbon Monoxide Data

The department operates just one Carbon Monoxide analyzer at our National Core site in Sioux Falls. A Carbon Monoxide analyzer was located at Union County #1 for a few years, but has since been shut down. The SD School Site began testing for Carbon Monoxide in 2011. The Carbon Monoxide analyzer provides hourly concentration levels. The highest 8-hour average recorded at the SD School Site was 1.0 part per million in 2017. Trends show concentrations are steady at this site. Figure 10-28 shows the 8-hour 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 10-28 – SD School Site – Carbon Monoxide 8-hour averages



10.6 Fire Station #1 Site – Aberdeen Area

In 2018, 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 10-29 for a picture of the monitoring site.

Figure 10-29 – 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 Title 40 of the Code of Federal Regulations Part 58 are still met. Table 10-7 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

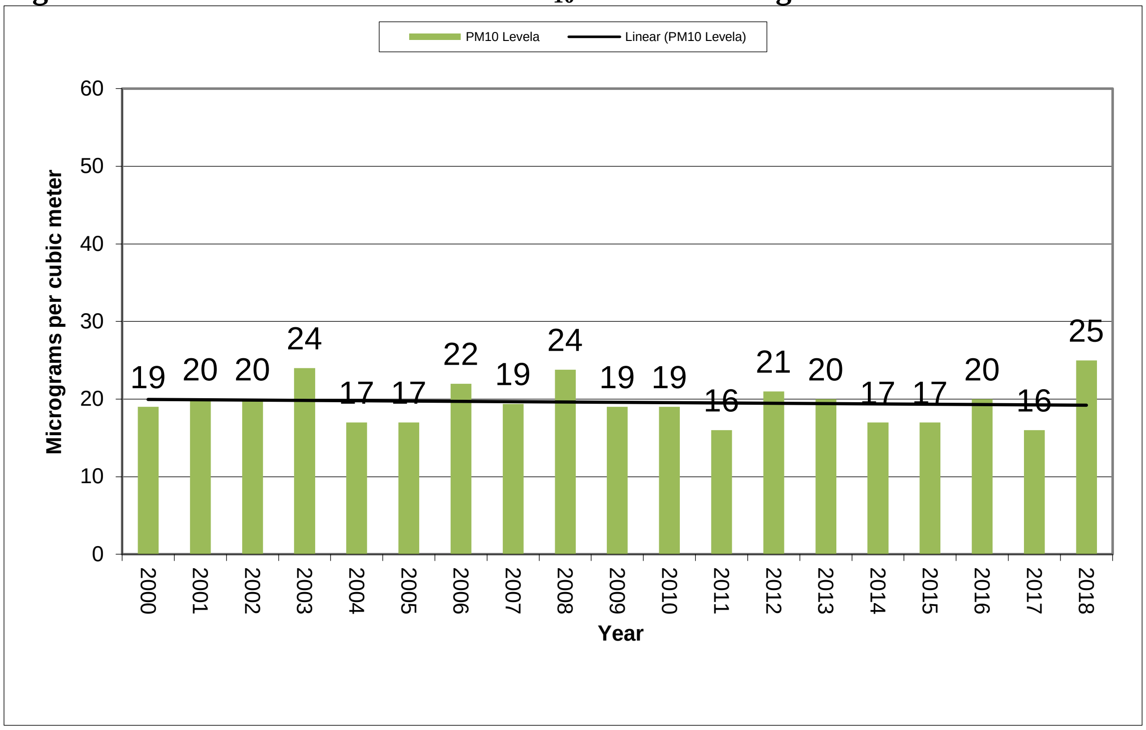
Table 10-7 – Fire Station #1 Site Specifics

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-1298-126
Operating Schedule	Every 6th Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Partisol 2000i
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS),
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Reference Method RFPS-0498-117
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Partisol 2000i 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. Figure 10-30 contains a graph of the annual averages since the site was setup in 2000.

Figure 10-30 – Fire Station #1 Site – PM_{10} Annual Averages



The annual average concentrations change from year to year, but the trends line indicates a slight decrease in concentrations over the nineteen years of testing. The annual averages range from a low of 16 micrograms per cubic meter in 2011 and 2017 to a high concentration level of 25 micrograms per cubic meter recorded in 2018.

The PM_{10} National Ambient Air Quality Standards is based on a 24-hour average concentration. The maximum 24-hour average concentration allowed is 150 micrograms per cubic meter. 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. At the Fire Station #1 site in Aberdeen, there was one exceedance in 2018 with a 24-hour average of 533.7 micrograms per cubic meter. Since the manual monitor runs on a 1 in 6 day sampling schedule, this one exceedance caused the 3-year expected exceedance calculation of two.

The department believes the exceedance was caused by a natural event. According to the National Weather Service, "Leading up to the event, conditions were warm and generally dry in the James River Valley during May. Those conditions combined with strong winds from decaying thunderstorms in south central South Dakota to produce a dust storm. South winds of 50 to 80 mph kicked up a significant amount of dirt/dust as the winds moved north, leading to visibilities being reduced to below ¼ mile in many locations. The reduced visibilities caused a few traffic incidents and the winds knocked down trees, tree branches, and powerlines." If not for the dust storm, this site would be attaining the PM_{10} 24-hour standard.

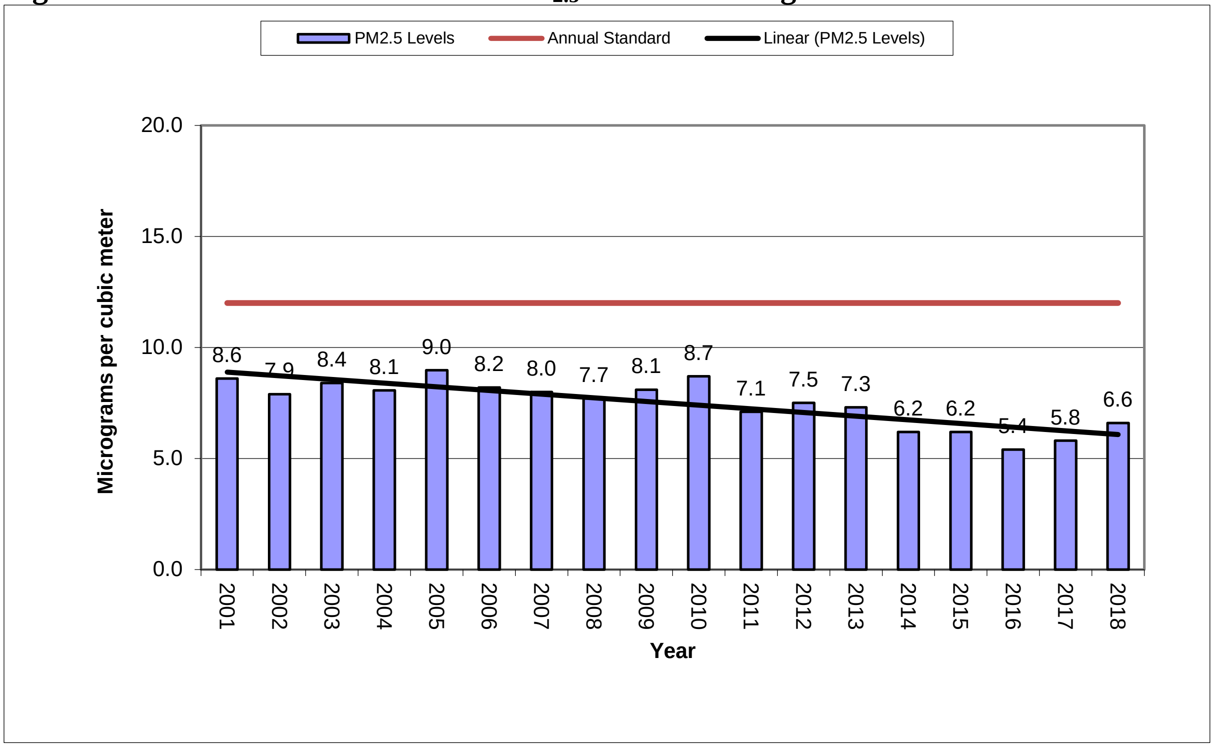
When running the manual monitors on a 1 in 6 day schedule, having even one exceedance will cause a violation of the standard. The department will evaluate switching from manual monitors to continuous monitors in Aberdeen to avoid a situation similar to this happening again.

Switching to a continuous monitor will result in a savings of time and money in the long run. With continuous monitors, the real time data will also be available to the public on the website.

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 5.4 micrograms per cubic meter in 2016 to 9.0 micrograms per cubic meter in 2005. The trend line shows that annual average is declining in concentration level over the last eighteen years. Figure 10-31 contains a graph of the annual average concentrations.

Figure 10-31 – Fire Station #1 Site – $PM_{2.5}$ Annual Averages



The testing for this parameter is meeting the goals of high concentration and population and will be continued. However, because of continued industrial growth, to provide for the testing for other pollutants and to provide real time hourly data to the public, the Aberdeen area will be evaluated to determine if continuous monitors should replace the manual monitors.

10.7 Research Farm Site – Brookings Area

The Research Farm Site was setup in 2008 and is located at the Soil Conservation Farm northwest of the city of Brookings. An older site located at the City Hall building in the center of Brookings was discontinued at the end of 2014.

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. The sampling for ozone was a requirement of the Prevention of Significant Deterioration permits for both facilities. The department operated the site and provided data to the facilities. The 3M Company 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 did not request any data from the Research Farm Site. Ozone data collected between 2008 and 2010 was added as a state and local air monitoring stations site to the National Database in 2010 and the site was continued, adding continuous PM_{10} and $PM_{2.5}$ in 2015.

The initial 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 The current goals are to collect ozone data downwind of a small city for comparison to the National Ambient Air Quality Standards and determine particulate matter data for a rural area in eastern South Dakota. The completion of the 2018 sampling year provides eleven years of testing and a better idea of trends for the ozone data. Figure 10-32 shows a current picture of the monitoring site.

Figure 10-32 –Research Farm Site

Table 10-8 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

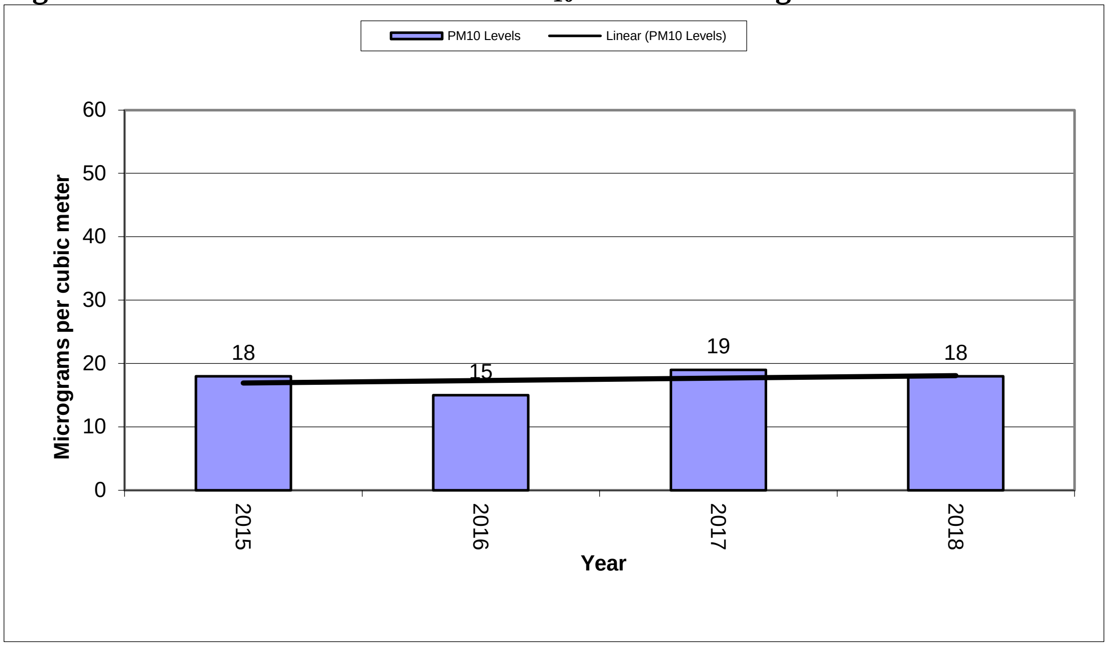
Table 10-8 –Research Farm Site Specifics

Parameter	Information
Site Name	Brookings 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),
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	Thermo 5014i BETA
Analysis Methods	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	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

10.7.1 Research Farm Site PM_{10} Data

PM_{10} sampling began at this site in 2015. The annual average for this site ranged from 15 micrograms per cubic meter in 2016 to 19 micrograms per cubic meter in 2017. Testing for this parameter is meeting the goals of high concentration and population. Figure 10-33 contains a graph of the annual averages since the site was setup.

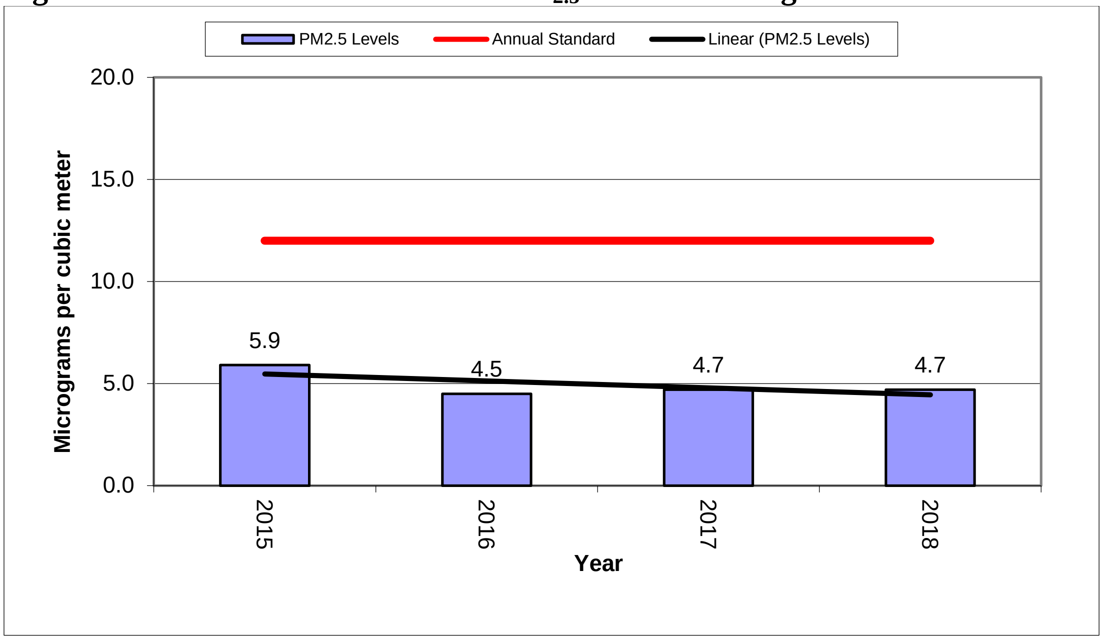
Figure 10-33 –Research Farm Site – PM_{10} Annual Averages



10.7.2 Research Farm Site $PM_{2.5}$ Data

$PM_{2.5}$ sampling began at this site in 2015. The annual average for this site ranged from 5.9 micrograms per cubic meter in 2015 to 4.5 micrograms per cubic meter in 2016. Annual averages are well under the standard. Figure 10-34 contains a graph of the annual averages since the site was setup.

Figure 10-34 –Research Farm Site – $PM_{2.5}$ Annual Averages

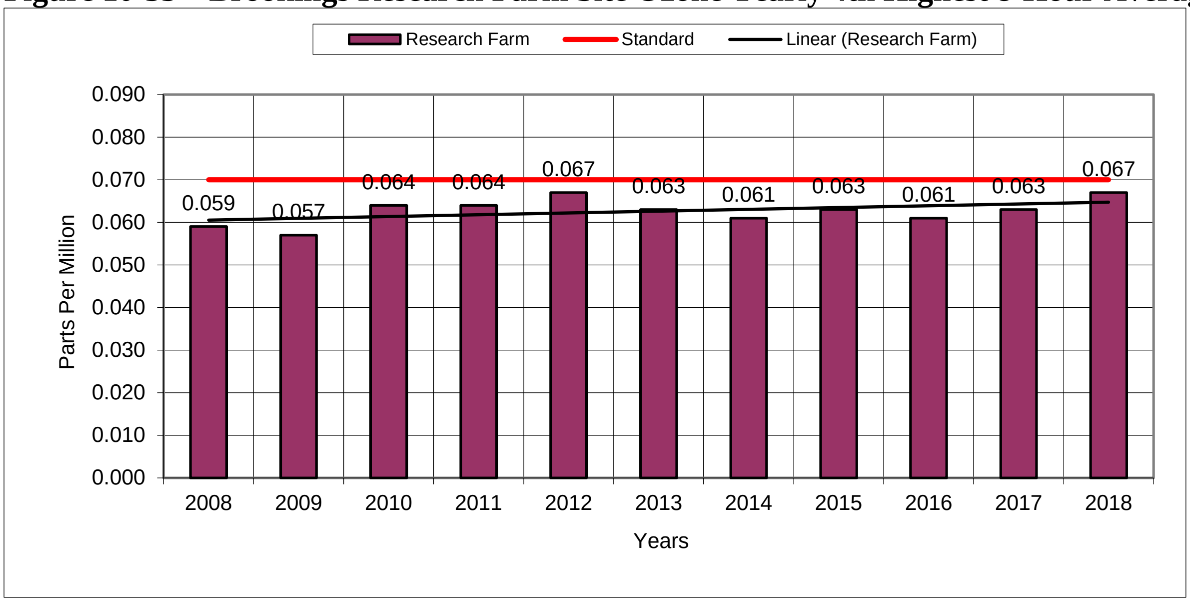


10.7.3 <u>Research Farm Site Ozone Data</u>

The 2018 sampling year is the eleventh ozone season of testing. The highest fourth highest 8-hour average for this site was at 0.067 parts per million in 2012 and 2018. The ozone data trend indicates a slightly increasing level.

The testing for this parameter is meeting the goals of a state and local air monitoring stations location and will be continued. It is meeting the goal of high concentration and population. The graph in Figure 10-35 shows the yearly 4th highest ozone concentration levels for the last eleven years.

Figure 10-35 – Brookings Research Farm Site Ozone Yearly 4th Highest 8-Hour Averages



10.8 Watertown Site

In 2018, 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. Figure 10-36 shows a picture of the monitoring site.

Figure 10-36 – Watertown Site

The current Watertown Site was established in 2003 as part of the implementation of the $PM_{2.5}$ network. In 2012, the manual $PM_{2.5}$ monitors were replaced with a continuous monitor. Testing at the site includes the parameters of PM_{10} and $PM_{2.5}$ at a sampling frequency of every day. The monitoring site is located in the western third of the city just east of an industrial park area. The site is located on City property in 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 10-9 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Table 10-9 – Watertown Site Specifics

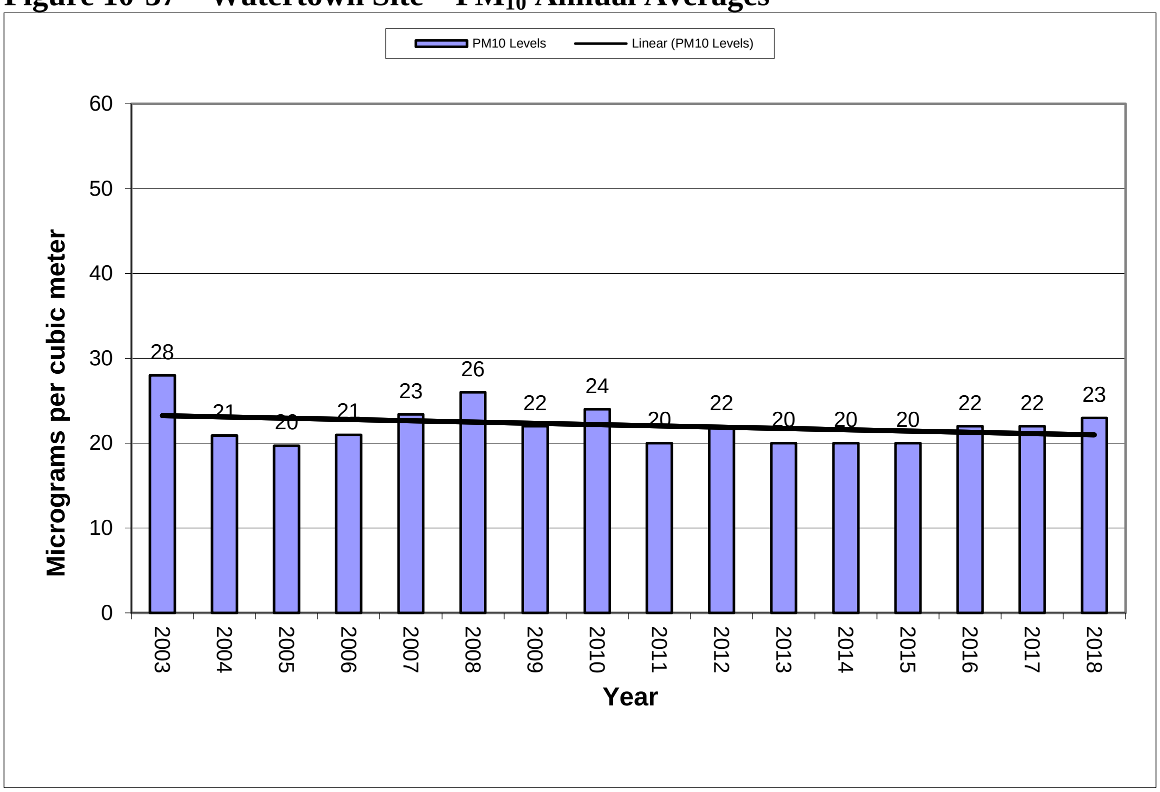
Parameter	Information
Site Name	Watertown
AQS ID Number	46-029-0002
Street Address	801 4th Ave. SW, Watertown, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 647,740.74 N 4,973,300.25
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0798-122
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Met One BAM-1020 Continuous
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-Time Data

Parameter	Information
$PM_{2.5}$	**(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 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data

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 micrograms per cubic meter recorded in 2003. The lowest annual average concentration of 20 micrograms per cubic meter was recorded in 2005, 2011, 2013, 2014, and 2015. The annual average indicates concentration levels are slightly decreasing during the 16 years of testing. The PM_{10} concentration can get close to and has exceeded the 24-hour standard. Testing for this parameter is meeting the goals of high concentration and population and will be continued. Figure 10-37 contains a graph of the annual averages.

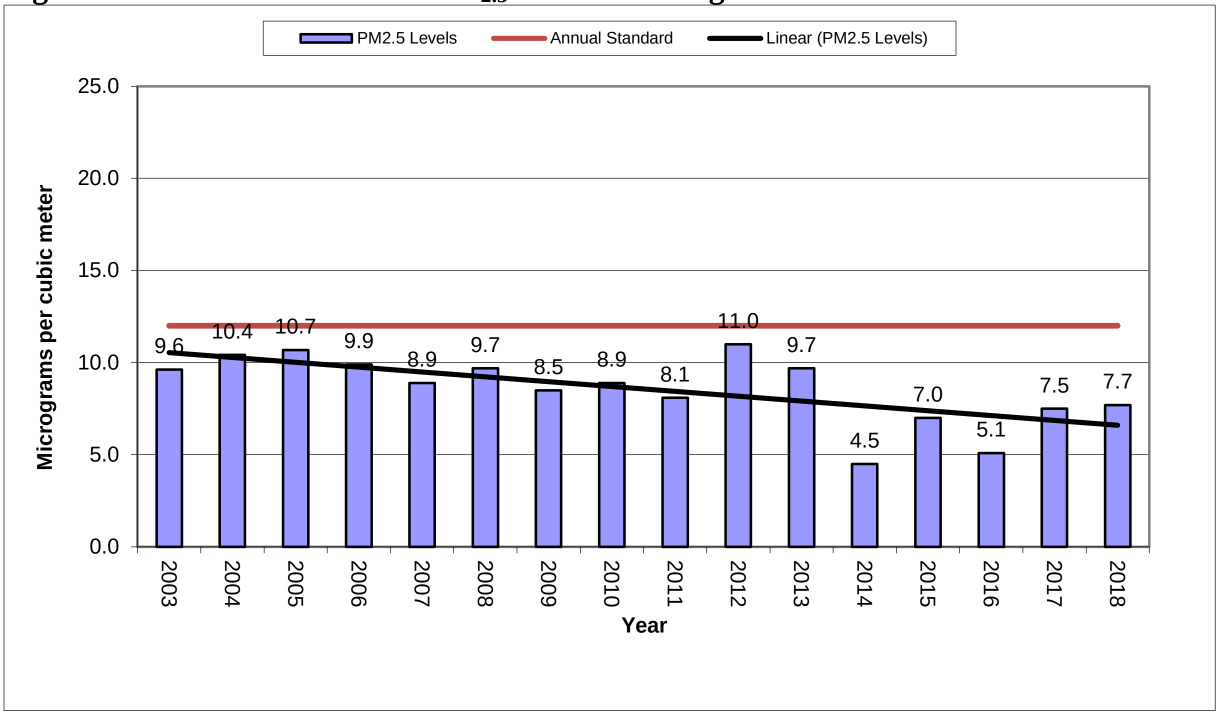
Figure 10-37 – Watertown Site – PM_{10} Annual Averages



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 micrograms per cubic meter in 2012 to a low of 4.5 micrograms per cubic meter in 2014. The annual average shows a decrease in $PM_{2.5}$ concentration levels over the 16 years of testing. Testing for this parameter is meeting the goals of high concentration and population and will be continued. Figure 10-38 contains a graph showing the annual average concentration for each year of operation.

Figure 10-38 – Watertown Site $PM_{2.5}$ Annual Averages



10.9 UC #1 Site – Union County

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 had 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, the UC #3 Site was closed with the ozone parameter moved to the UC #1 Site. At the end of 2013, the UC #2 Site was closed because it was a duplicate site to the UC #1 Site. At the end of 2013, the Carbon Monoxide testing at UC #1 Site was discontinued because recorded concentrations were very low and there was no indication concentrations would ever get close to the standard level.

The UC #1 Site is located about 4 1/2 miles north of Elk Point. Sampling began just before January 1, 2009. The goals for the site are background and for comparison to the National Ambient Air Quality Standards. Figure 10-39 provides a picture of the monitoring site looking to the North. Table 10-10 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Figure 10-39 – UC #1 Site

Table 10-10 – UC #1 Site Specifics

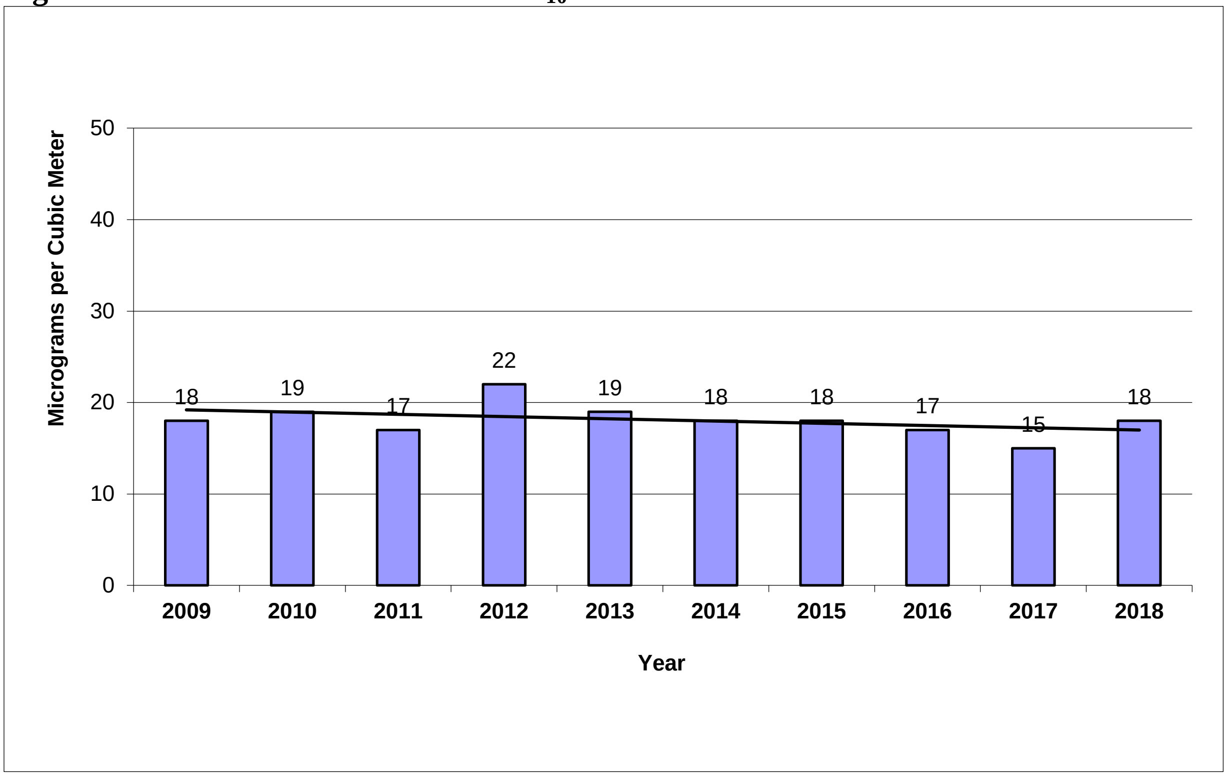
Parameter	Information
Site Name	UC #1
AQS ID Number	46-127-0001
Street Address	31988 457th Ave.
Geographic Coordinates	Lat. + 42.751518 Long. – 96.707208
MSA	Sioux City, IA-NE-SD

Parameter	Information
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Thermo TA 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 EQPM-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 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-1194-099
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Teledyne API T200
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)

10.9.1 UC #1 Site PM_{10} Data

The annual average PM_{10} concentrations at this site range from 15 micrograms per cubic meter in 2017 to 22 micrograms per cubic meter in 2012. Trends indicate concentrations show a slight decrease for UC #1 Site. Testing for this parameter is meeting the goals and will be continued. See the annual averages for the UC #1 Site in Figure 10-40.

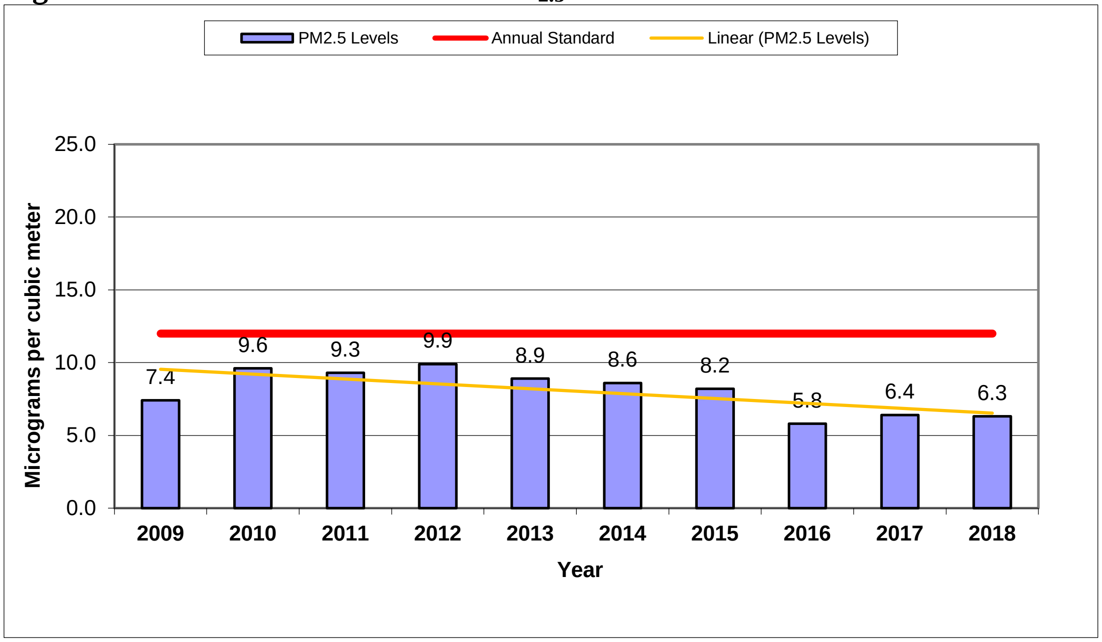
Figure 10-40 – UC #1 Site – Annual PM_{10} Concentrations



10.9.2 UC #1 Site $PM_{2.5}$ Data

The UC #1 Site continues to be one of the highest annual average and 24-hour locations in the state and in some years is the highest concentration site in the state. The trend line shows concentrations to be slightly decreasing over the ten years of testing. Testing for this parameter is meeting the goals and will be continued. See Figure 10-41 to view a graph of the annual averages.

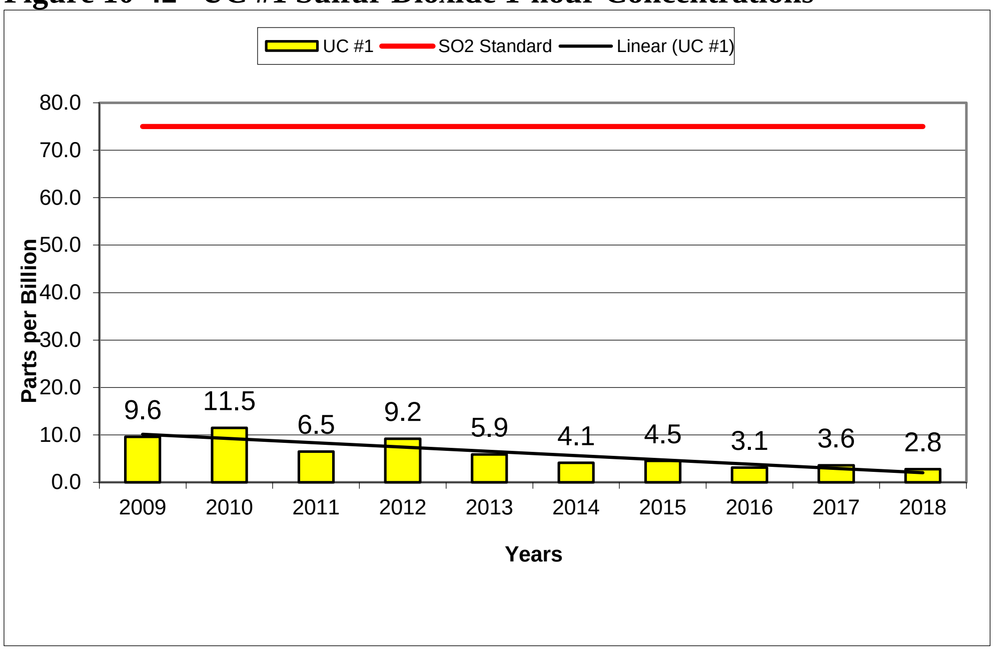
Figure 10-41 –UC #1 Site – Annual $PM_{2.5}$ Concentrations



10.9.3 UC #1 Site Sulfur Dioxide Data

Concentrations of Sulfur Dioxide follow the same trend as other sites in the state with many hourly average concentrations low near the detection level (0.1 parts per billion) for the analyzer method being used to collect the data. A trace level Sulfur Dioxide analyzer has operated at this site beginning in 2009. Trends indicate Sulfur Dioxide levels are dropping at this site. Testing for this parameter is meeting the goals and will be continued. See Figure 10-42 for a graph showing the 1-hour 99th percentile for this site.

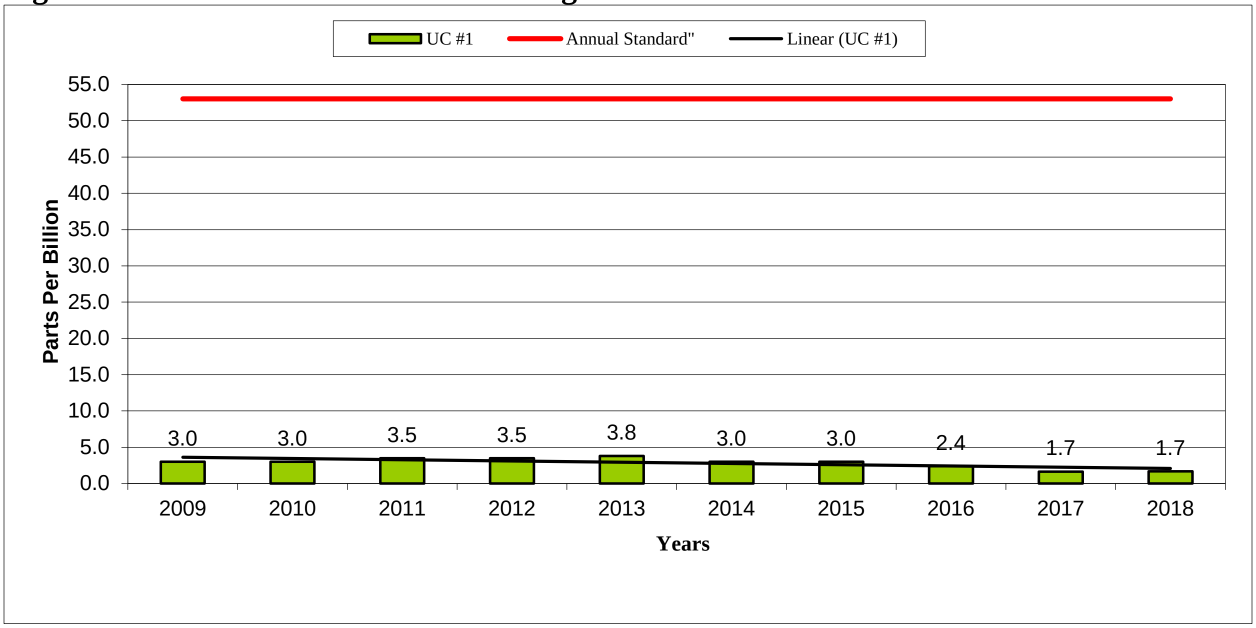
Figure 10-42 –UC #1 Sulfur Dioxide 1-hour Concentrations



10.9.4 UC #1 Site – Nitrogen Dioxide Data

Concentrations of Nitrogen Dioxide 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 Sulfur Dioxide parameter, the Nitrogen Dioxide 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 slightly decreasing concentration level for UC #1 over the ten years of testing. Testing for this parameter is meeting the goals and will be continued. Figure 10-43 shows a graph of the annual average concentrations for this site.

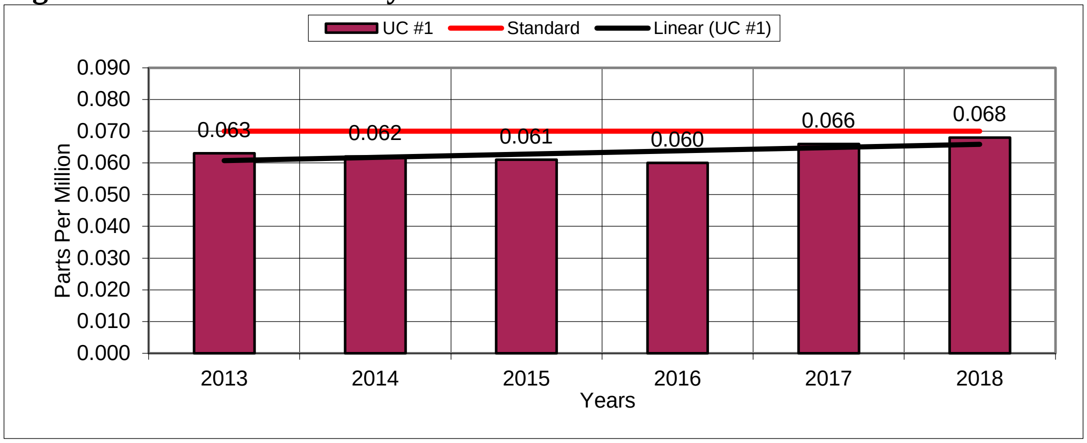
Figure 10-43 –UC #1 Site – Annual Nitrogen Dioxide Concentrations



10.9.5 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 2018. 2018 had the 8-hour average for this site with a concentration of 0.068 parts per million. See Figure 10-44 for a graph of the ozone concentrations at the UC #1 Site. The trend is slightly increasing in concentration levels. Testing for this parameter is meeting the goals and will be continued.

Figure 10-44 – Union County #1 Site Ozone Concentrations



10.10 Pierre Airport Site

Pierre is the capital city of South Dakota. It is located in the center of the state along the rough river bluffs overlooking the Missouri River. The population was 13,646 at the 2010 census. Pierre has a relatively dry, four-season climate with long, dry, cold winters, hot summers and brief spring and autumn transitions.

At the beginning of 2015, a new monitoring site was set up in Pierre. The site is located at the Pierre Regional Airport Industrial Park in northeast Pierre. The sampling goal for the new site was to test a new area of the state with no past $PM_{2.5}$ monitoring. Figure 10-45 provides a picture of the monitoring site looking to the North. Table 10-11 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Figure 10-45 – Pierre Airport Site

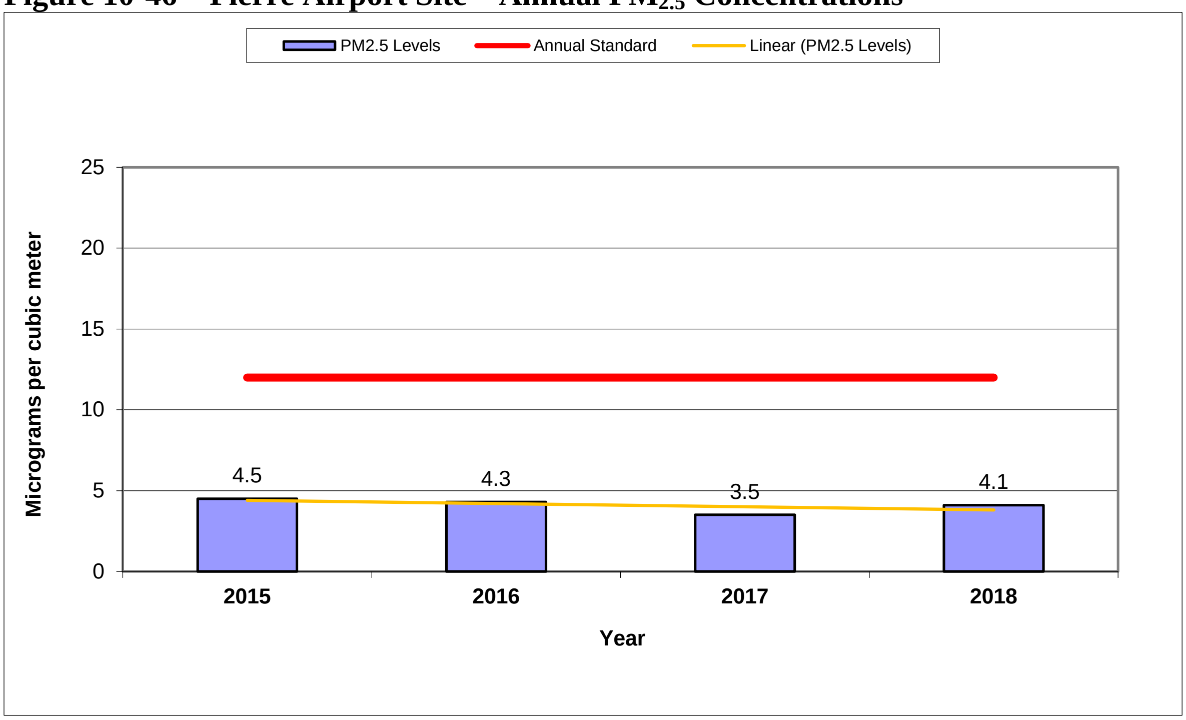
Table 10-11 – Pierre Airport Site Specifics

Parameter	Information
Site Name	Pierre Airport
AQS ID Number	46-065-0003
Street Address	4293 Airport Road
Geographic Coordinates	Lat. + 44.373786 Long. – 100.287269
MSA	None
$PM_{2.5}$	**(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 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)

10.10.1 Pierre Airport Site – $PM_{2.5}$ Data

2018 was the fourth year of monitoring at the Pierre Airport Site. The annual PM2.5 concentration at the site ranged from 4.5 micrograms per cubic meter in 2015 to 3.5 micrograms per cubic meter in 2017. The Pierre Airport Site shows relatively low concentrations, just above those at the two National Parks sites. See Figure 10-46 to view a graph of the annual averages. Testing for this parameter is meeting the goals and will be continued.

Figure 10-46 – Pierre Airport Site – Annual $PM_{2.5}$ Concentrations



11.0 SPECIAL AIR QUALITY MONITORING

11.1 PM2.5 Speciation Network

The $PM_{2.5}$ 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 program.

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

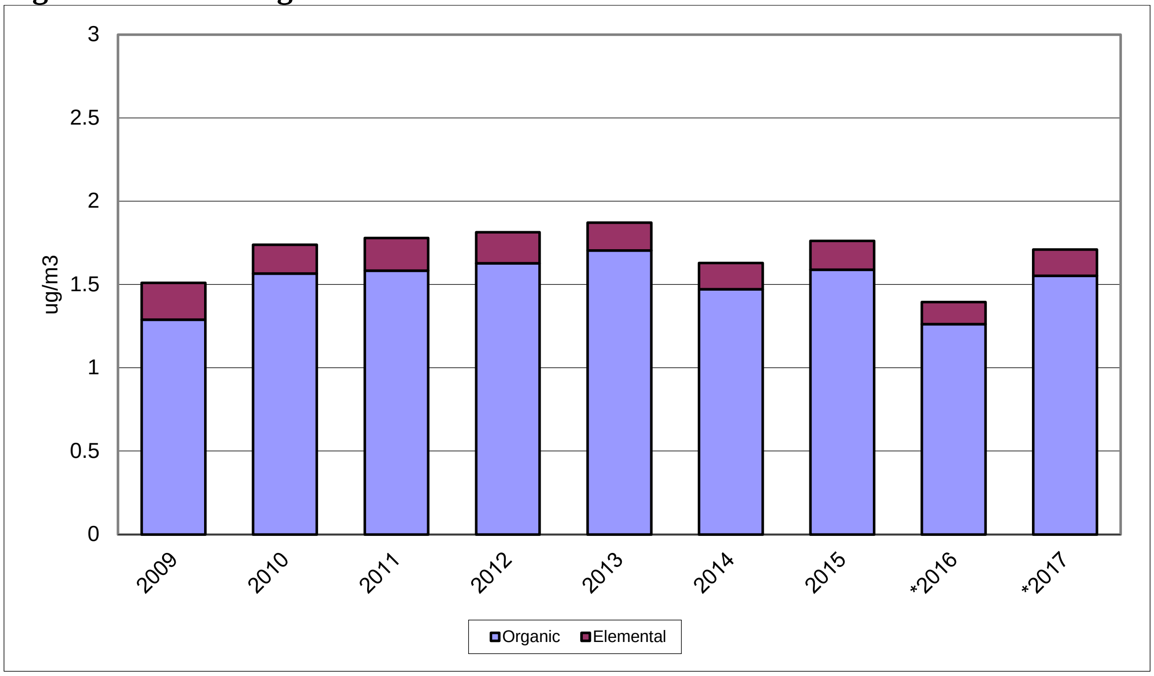
1. Assessing trends in mass component concentrations and related emissions, including specific source categories;
2. Characterizing annual and seasonal spatial variation of aerosols;
3. Determining the effectiveness of implementation control strategies;
4. Helping to implement the $PM_{2.5}$ standard 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; and
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 $PM_{2.5}$ Speciation Network. This site is located at the SD School Site and collects 24-hour air samples on a 3-day schedule. The $PM_{2.5}$ speciation monitor was moved from the KELO site to the SD School Site at the beginning of 2009. The SD 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 originally taken by the Met One SASS monitor. In September 2009, the Interagency Monitoring of Protected Visual Environments URG 3000N sampler was set up to do the carbon sampling. In November 2016, EPA Region 8 gave the department a Met One Super SASS monitor to replace the existing monitor.

At the beginning of 2016, a new lab was contracted to analyze and enter the data into EPA's Air Quality System. There is a lag in data entry and all of the 2018 data has not yet been entered at the time this annual report was written. Therefore, the following graphs will only show data through 2017. In the 2016 and 2017 sampling years, the data did not meet the completeness requirements, because of problems with the monitor.

Figure 11-1 shows the average total organic carbon and elemental carbon concentrations for the URG monitor. Concentrations of carbon are low. The organic carbon concentrations are consistently higher than the elemental carbon. The average contribution of elemental carbon to the overall concentration remained about the same while organic carbon concentrations fluctuate. Although 2016 indicates the lowest concentration for total carbon levels in the nine years of testing, the department is unsure why that occurred since 2017 carbon concentrations jumped back up.

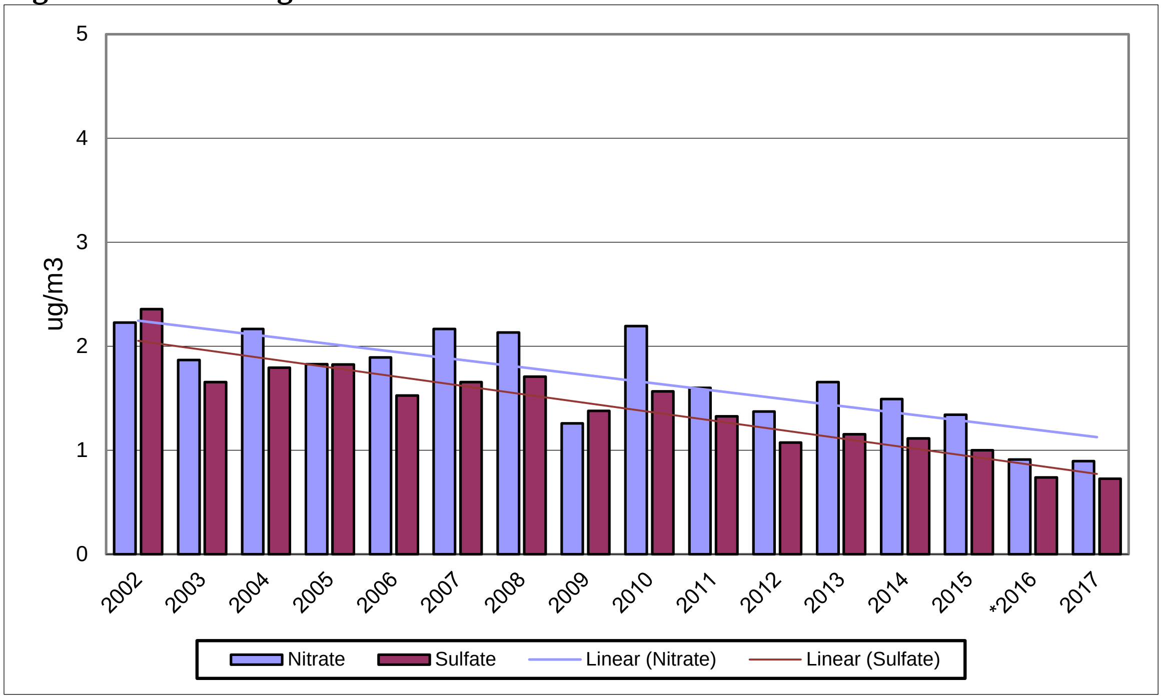
Figure 11-1 – Average URG Monitor Total Carbon Concentrations



* The data did not meet the completeness requirements for 2016 and 2017

Figure 11-2 shows the average nitrate and sulfate concentrations analyzed from the $PM_{2.5}$ samples. The graph shows trends for the concentration of nitrates and sulfates are declining overall with 2017 having the lowest concentrations during the sixteen years of testing in Sioux Falls.

Figure 11-2 – Average Nitrate and Sulfate Concentrations



* The data did not meet the completeness requirements for 2016

12.0 CONCLUSIONS

The ambient air quality monitoring network has demonstrated that South Dakota, except for the dust storm in Aberdeen, is currently attaining the federal National Ambient Air Quality Standards. The department is reviewing the option of submitting an exceptional events package for the dust storm and also eliminating the manual monitoring and replacing it with continuous monitors by moving the site. All sites meet the requirements of Title 40 of the Code of Federal Regulation, Part 58, Appendix A, C, D, and E.

The ambient air quality monitoring network is continually reviewed to ensure that there is adequate coverage of populated areas in the state as well as rural areas. 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:

1. No major modifications to the sampling network are planned, unless the department is required to find new monitoring sites to replace the Rapid City Credit Union and/or Sioux Falls' SD School sites;
2. The Rapid City Library Site will be closed; and
3. If funding is available, the Aberdeen Fire Station #1 Site with be moved to a different location that can accommodate continuous monitoring.

Equipment Purchase Priorities include the following items:

1. Purchase a new shelter for Aberdeen;
2. Continue to replace ESC 8816 data loggers;
3. Continue to replace C series calibrators and analyzers;

4. Continue to replace equipment as needed to maintain the National Core site; and
5. Purchase new equipment as required to meet EPA requirements.

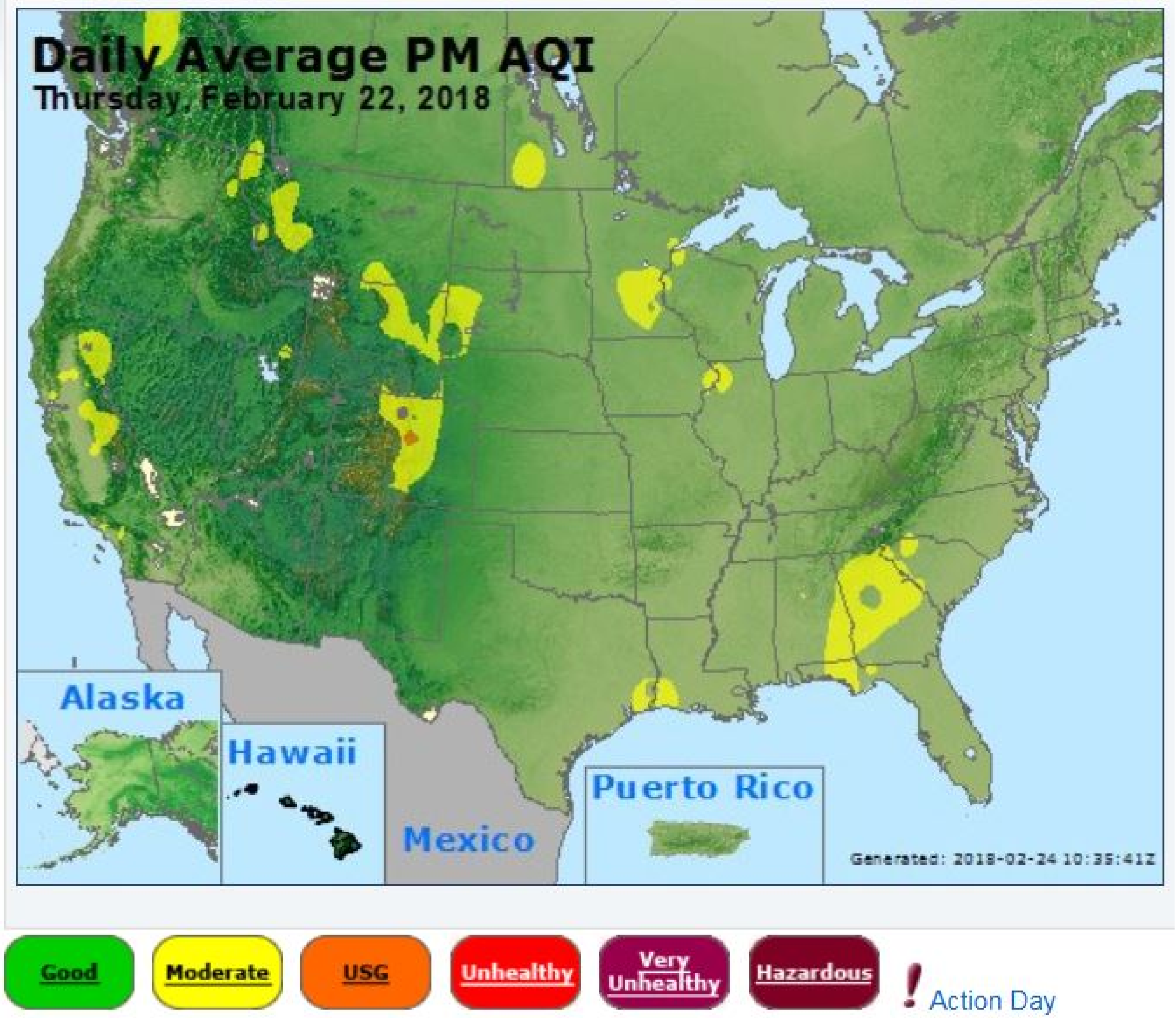
There is an ongoing effort to maintain staff training regarding the latest monitoring techniques and procedures to perform these studies. It is anticipated that the ambient air monitoring network will operate in much the same manner as it has in the past. This will include the identification of pollution 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. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Monitoring Program, EPA-54/B-17-001, January 2017, located at https://www3.epa.gov/ttn/amtic/files/ambient/pm25/qa/Final%20Handbook%20Document%201_17.pdf;
2. Title 40, Code of Federal Regulation, Part 50, located at https://www.ecfr.gov/cgi-bin/text-idx?SID=52f340d421aa94fe820d7ba0d1eb1e28&mc=true&node=pt40.2.50&rgn=div5;
3. Title 40, Code of Federal Regulation, Part 58, located at https://www.ecfr.gov/cgi-bin/text-idx?SID=eb02812221844f2f21472cc2dd32fc0e&mc=true&node=pt40.6.58&rgn=div5; and
4. SLAMS/NAMS/PAMS Network Review Guidance, EPA-454/R-98-003, March 1998, located at https://www3.epa.gov/ttn/amtic/files/ambient/criteria/netrev98.pdf.

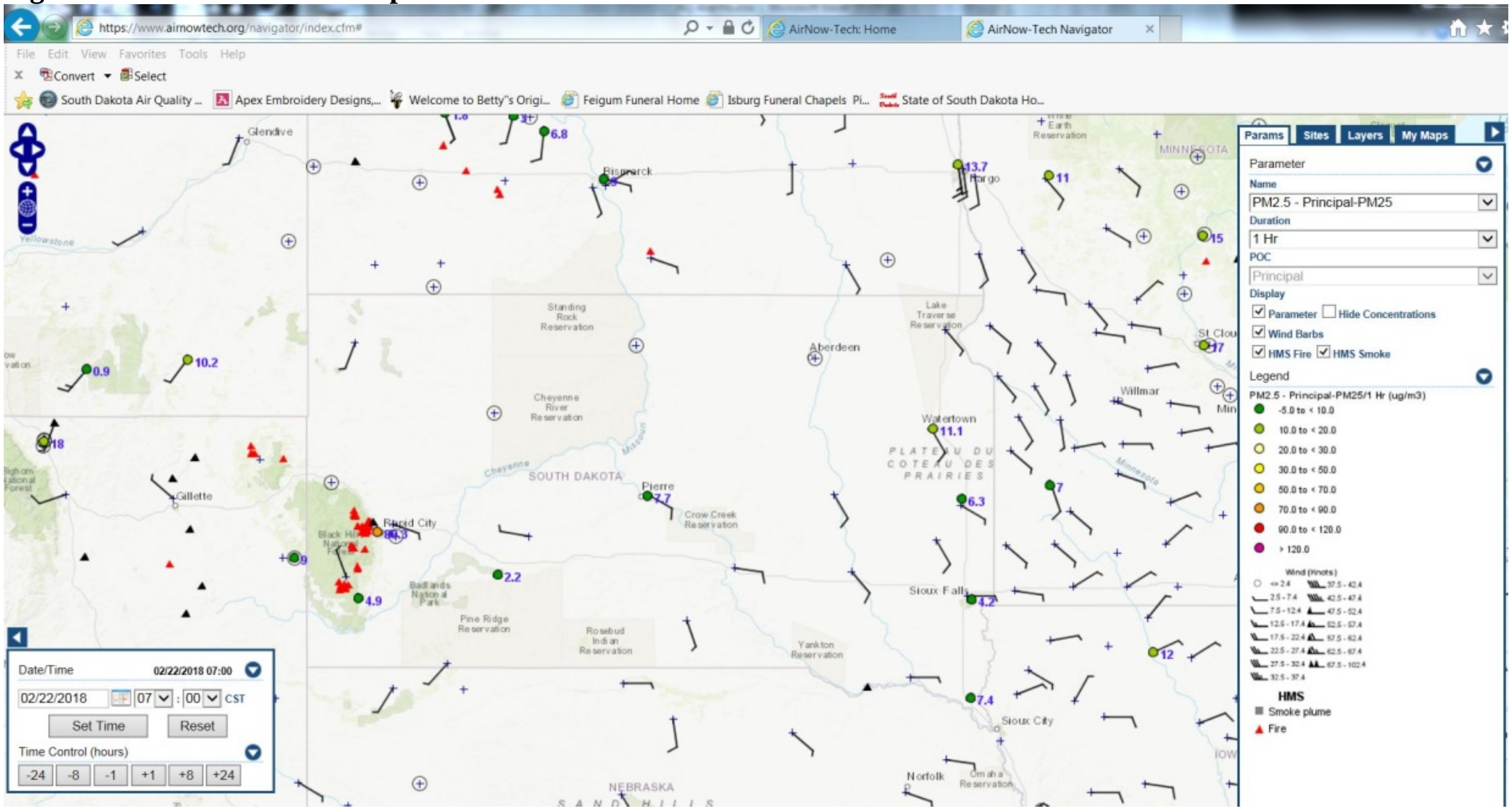
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-1 – AirNow Map for 2/22/18



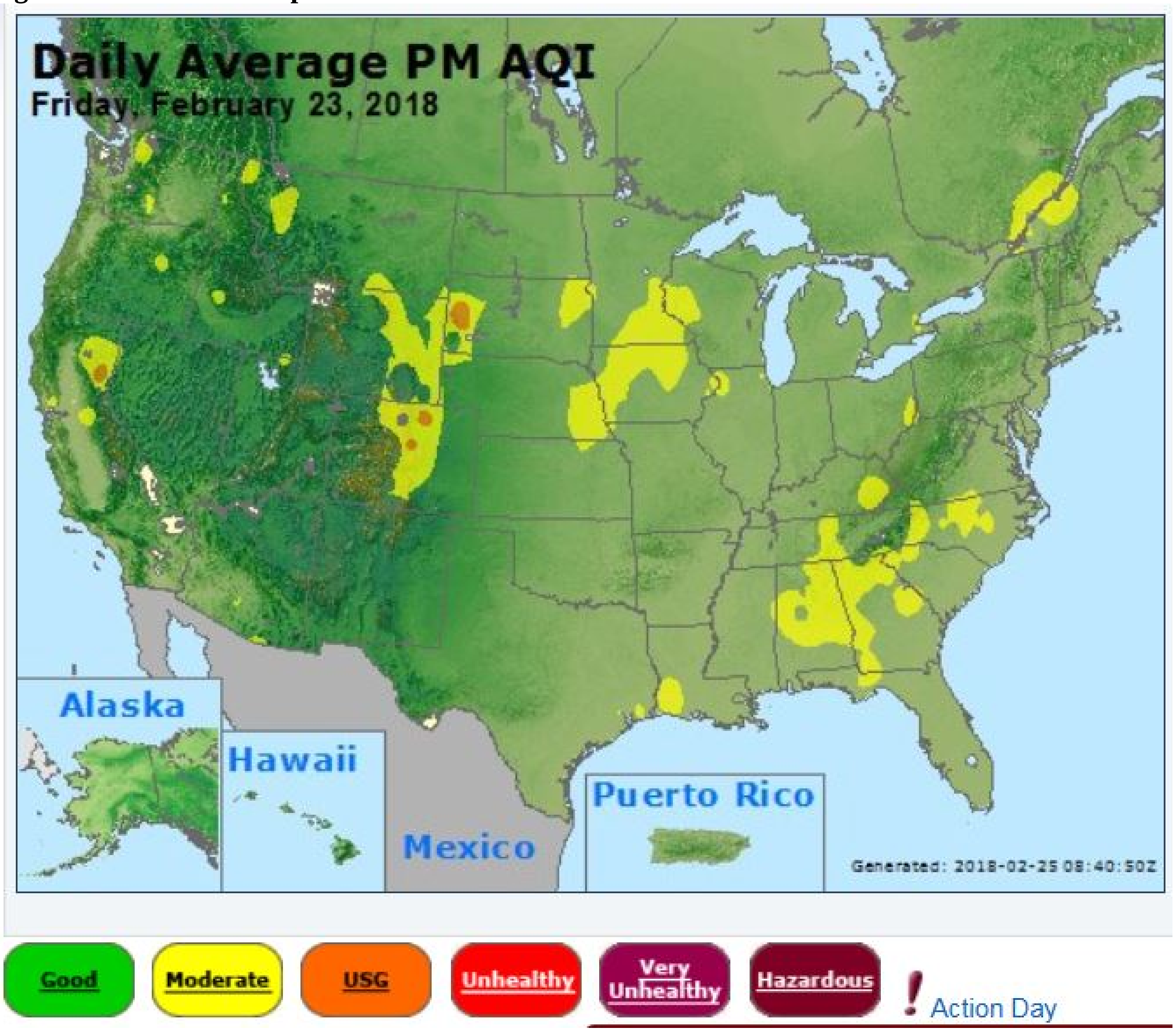
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-2 – AirNow Tech Map for 2/22/18



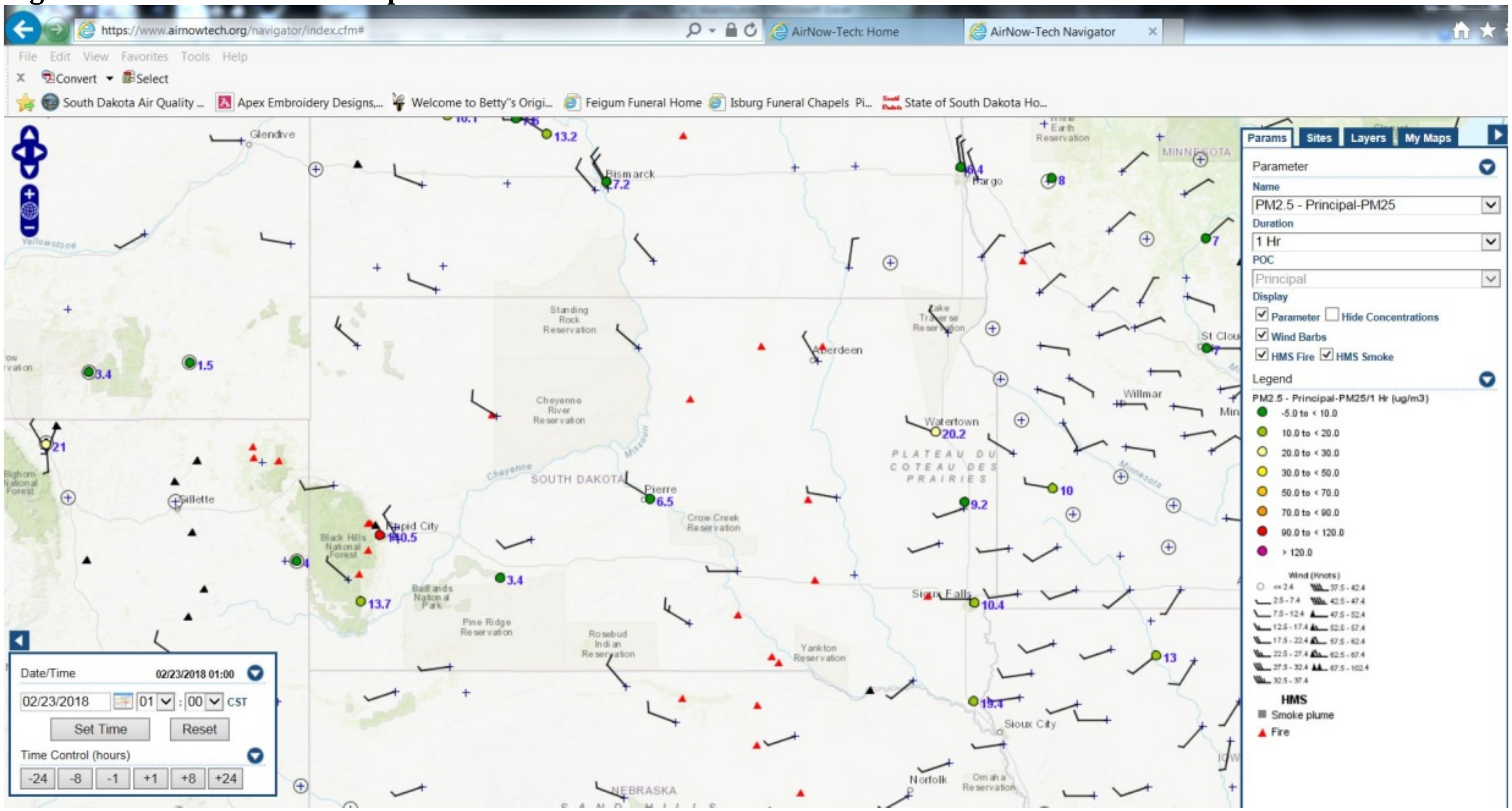
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-3 – AirNow Map for 2/23/18



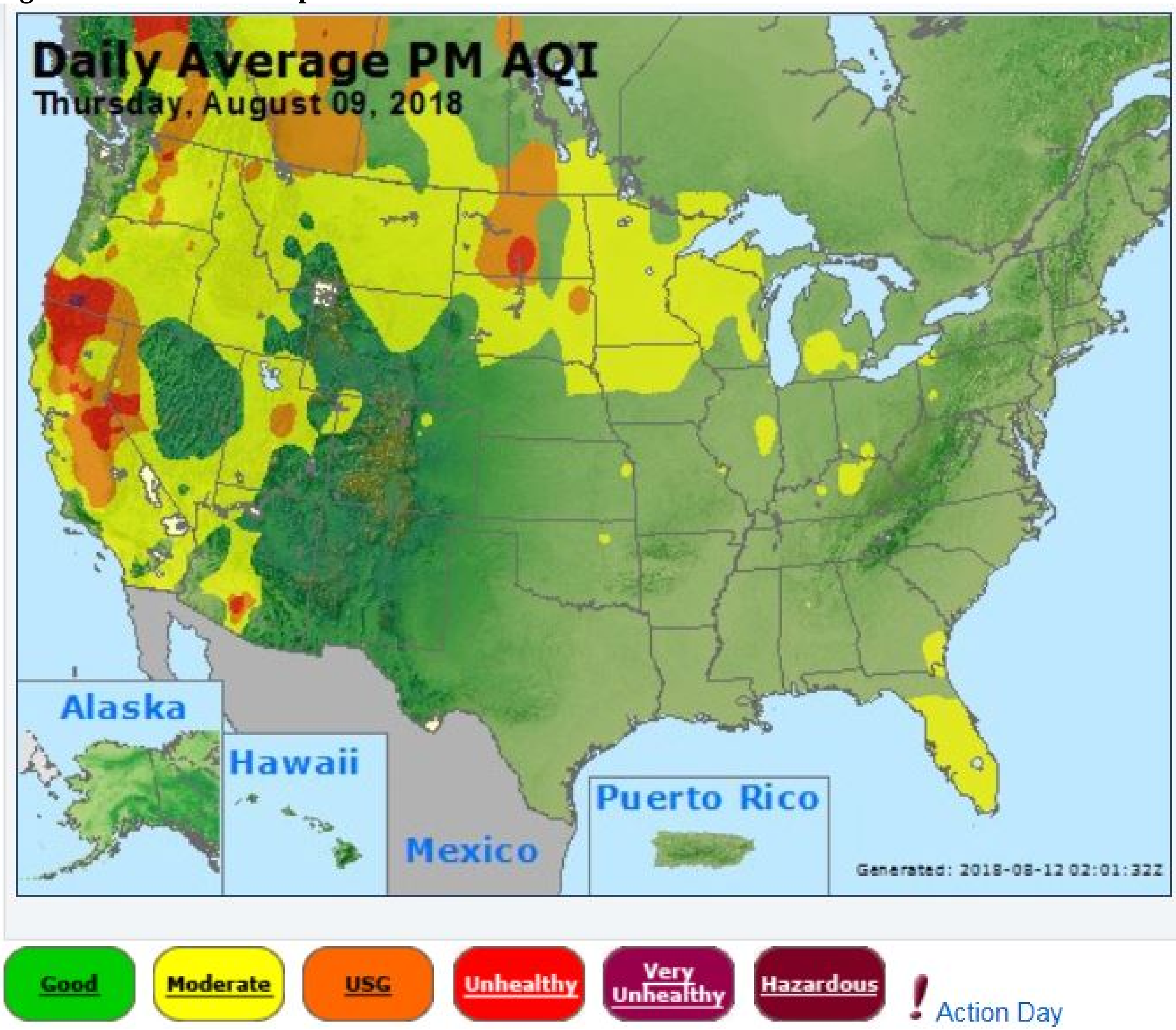
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-4 – AirNow Tech Map for 2/23/18



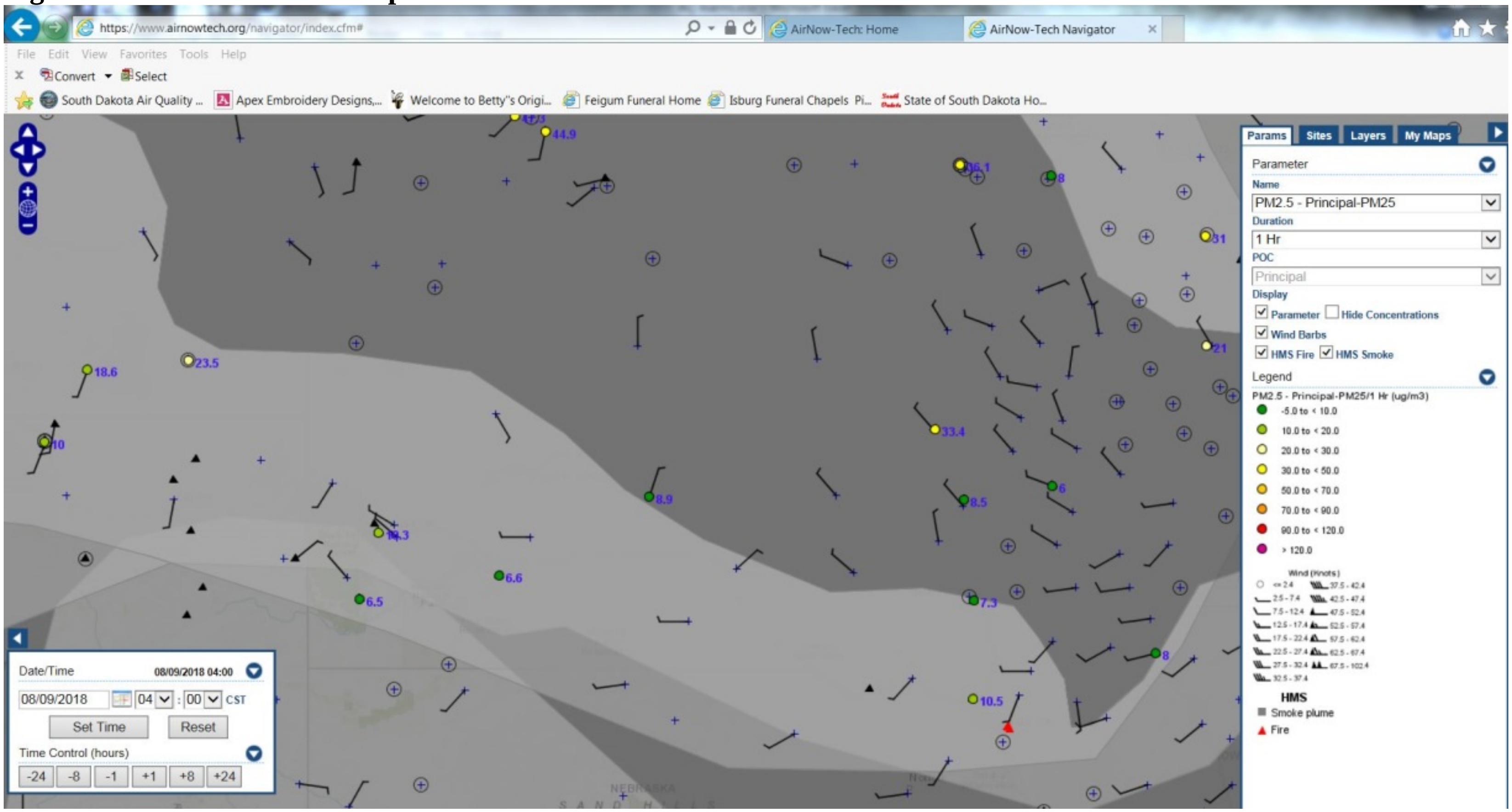
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-5 – AirNow Map for 8/9/18



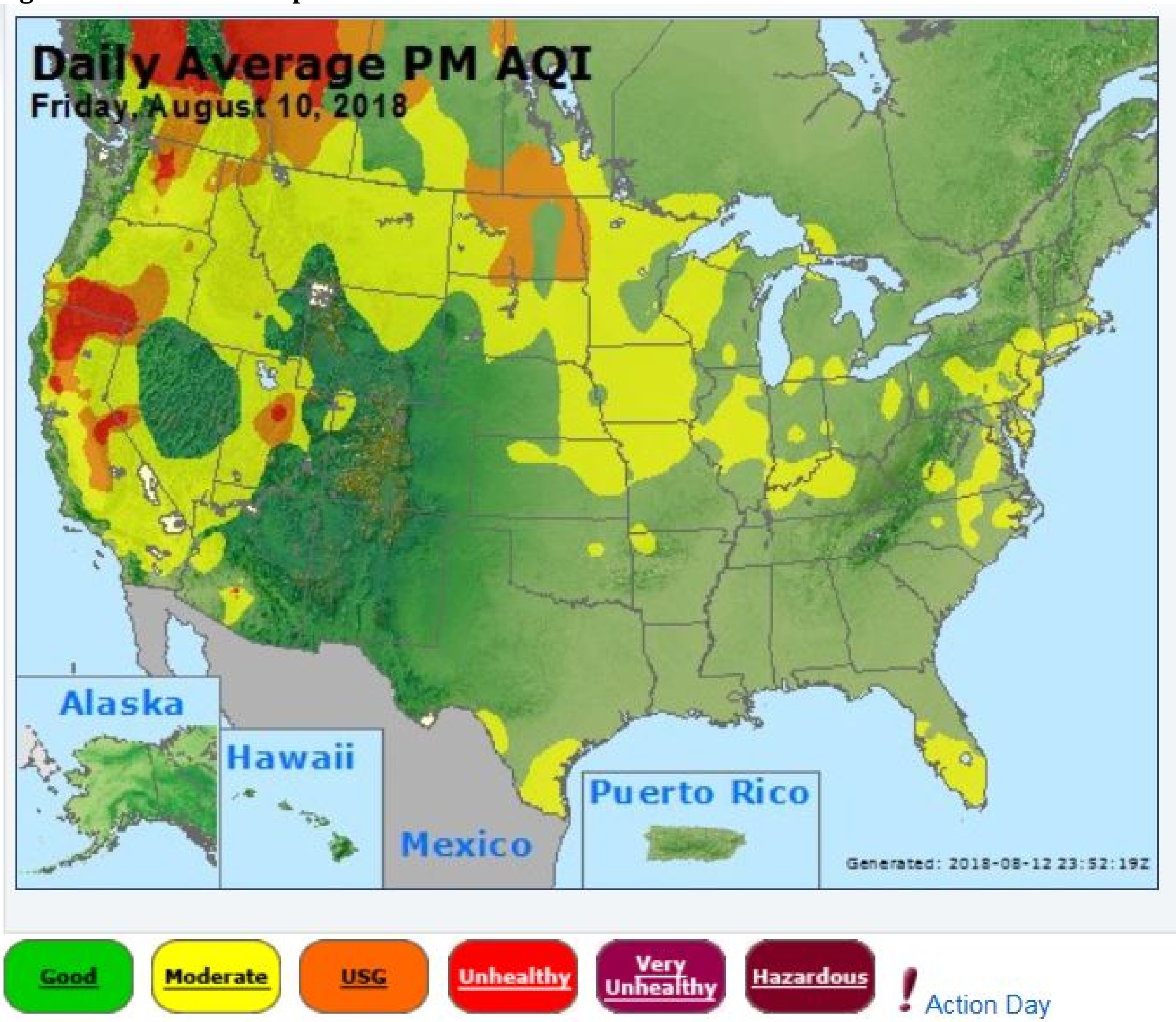
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-6 – AirNow Tech Map for 8/9/18



Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-7 - AirNow Map for 8/10/18



Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-8 - AirNow Tech Map for 8/10/18

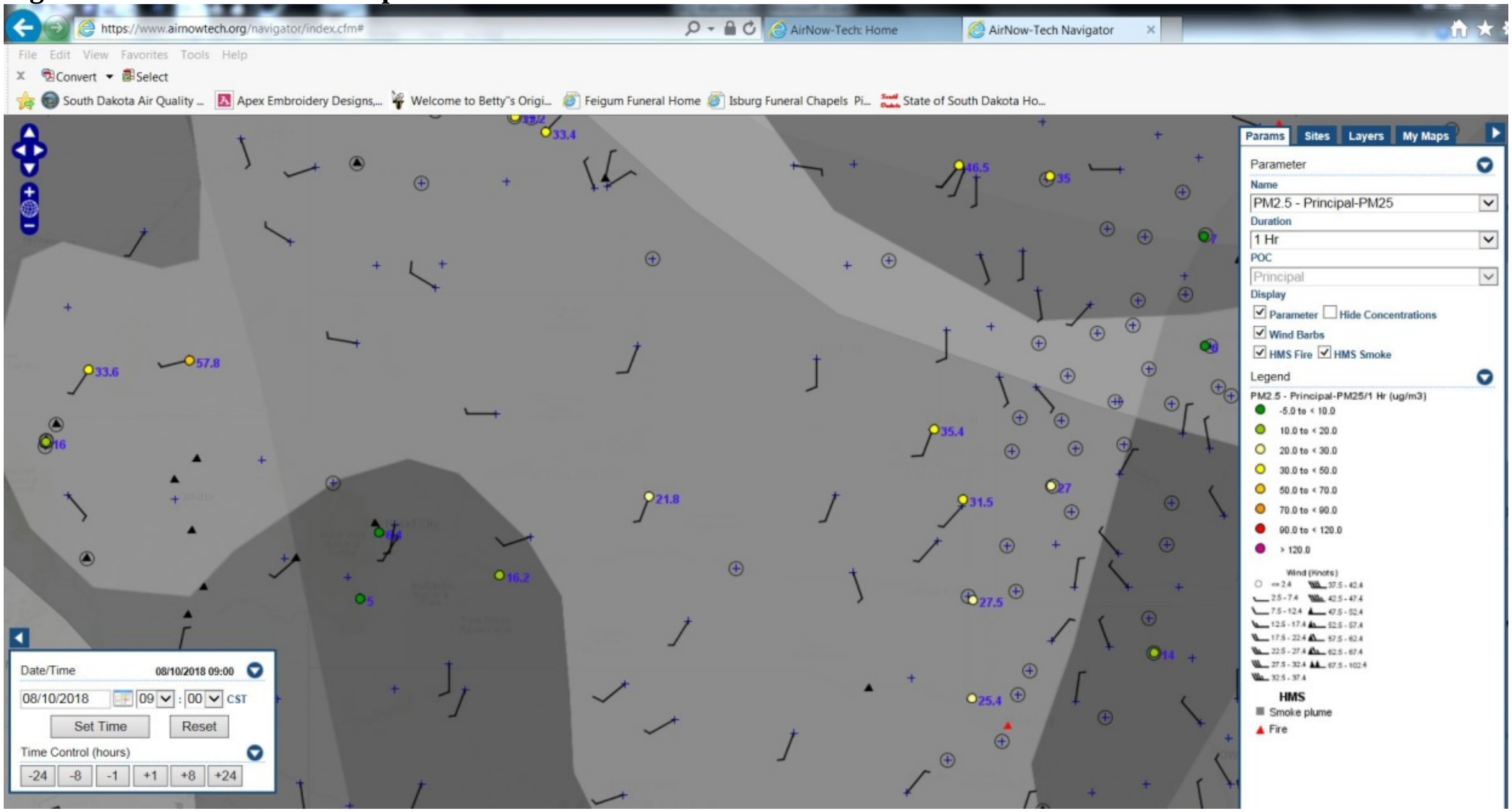
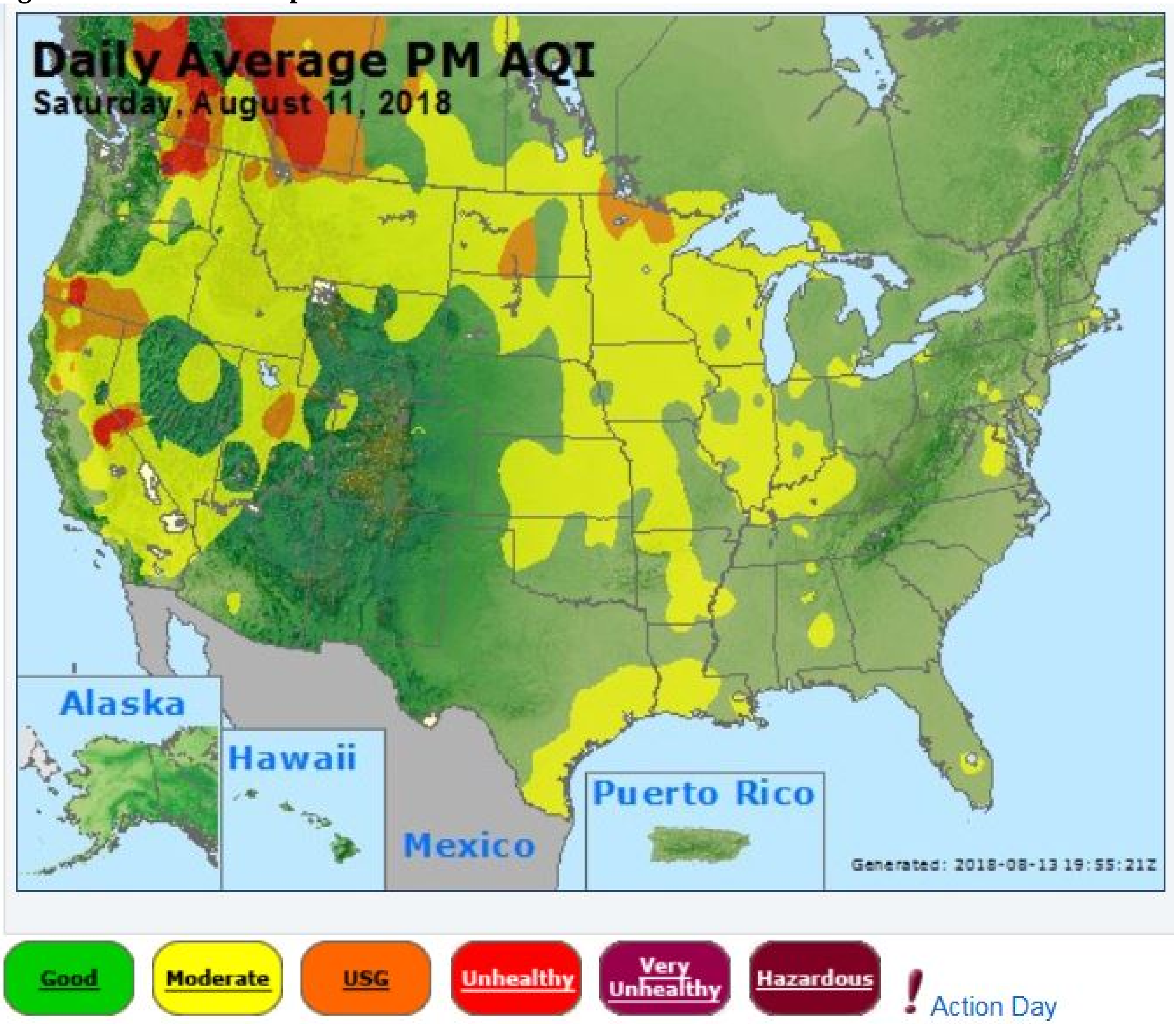
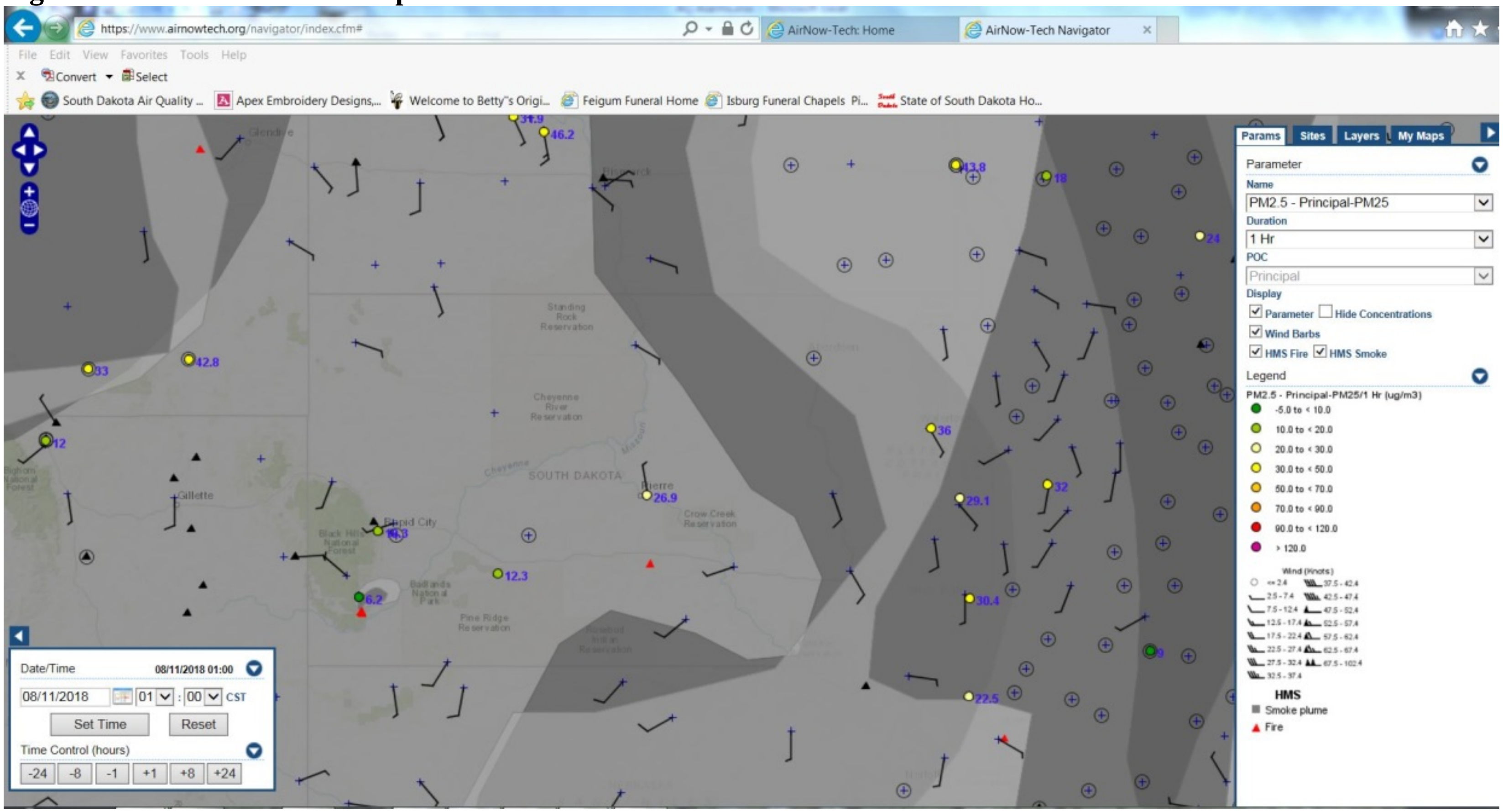


Figure A-9 - AirNow Map for 8/11/18



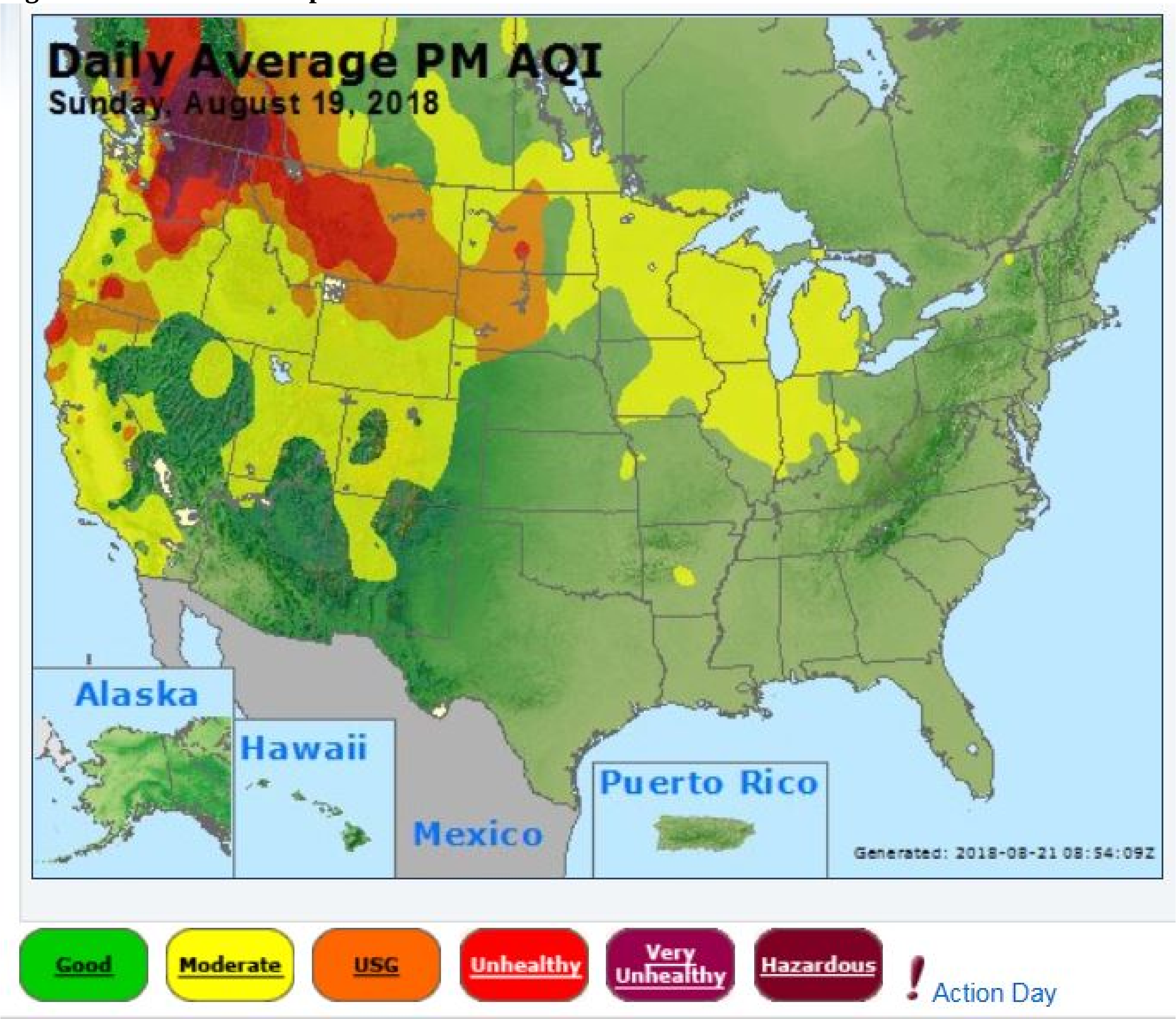
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-10 - AirNow Tech Map for 8/11/18



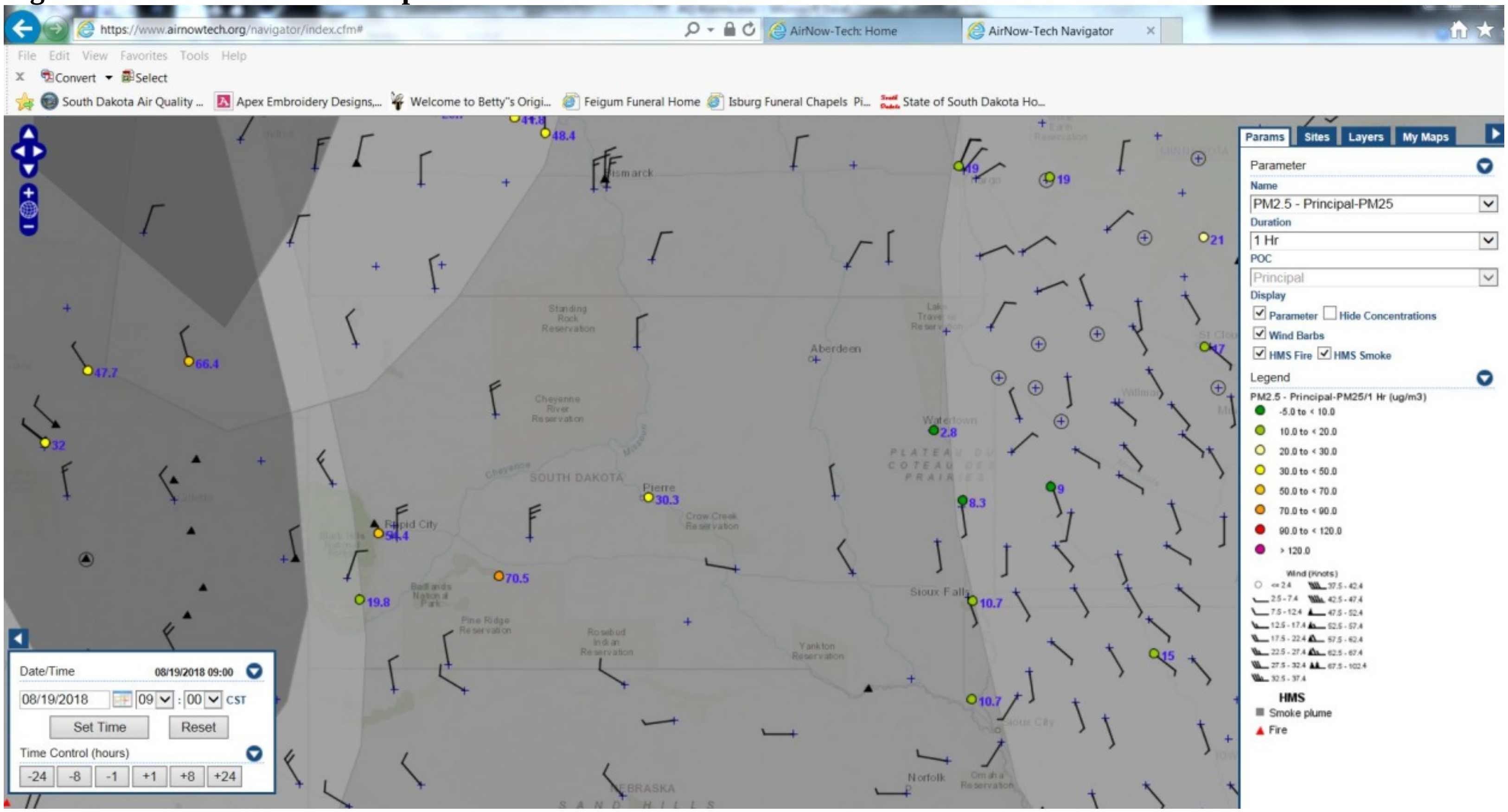
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-11 - AirNow Map for 8/19/18



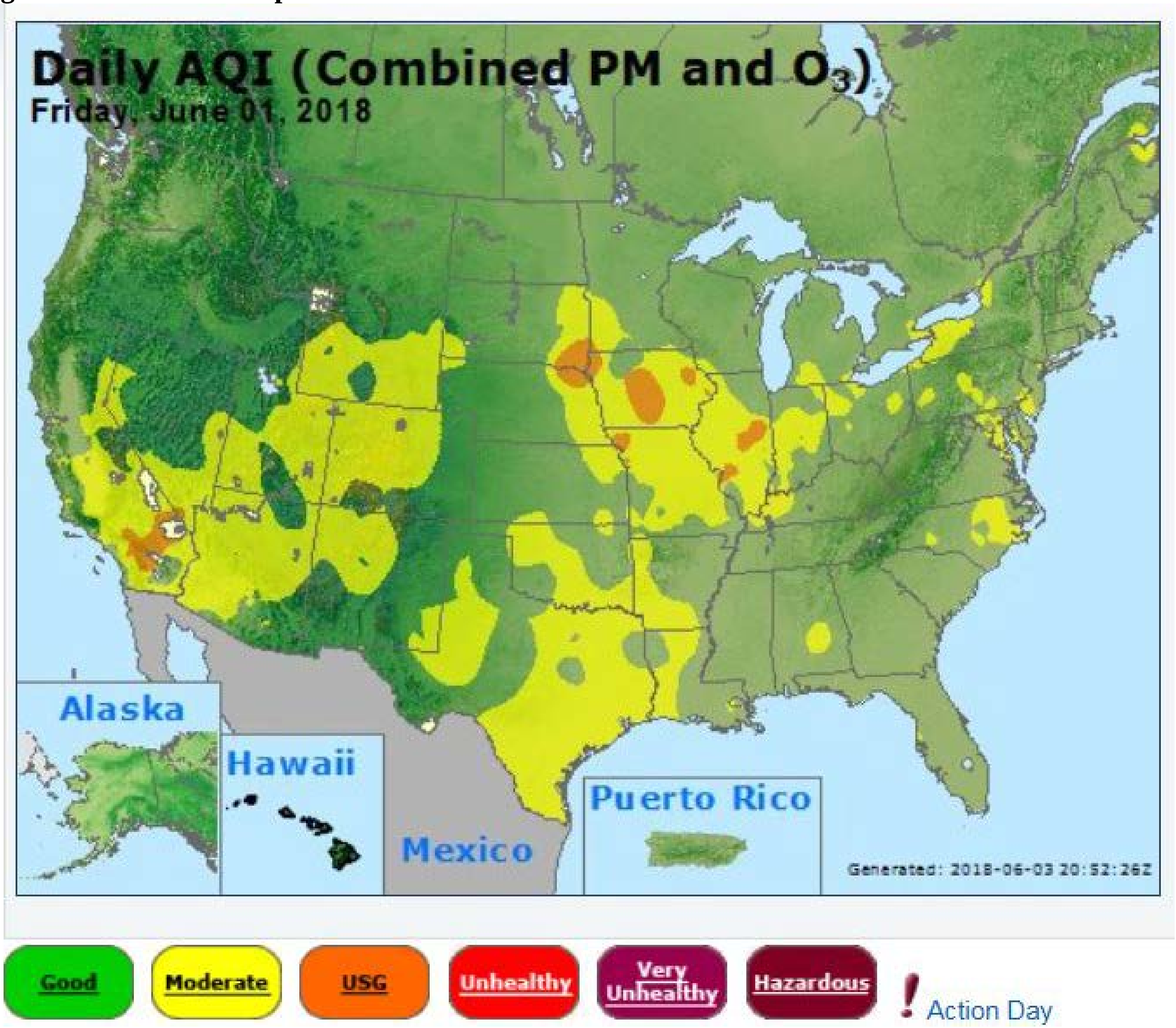
Appendix A
AirNow Maps for 24-hour $PM_{2.5}$ High Concentration Days

Figure A-12 - AirNow Tech Map for 8/19/18



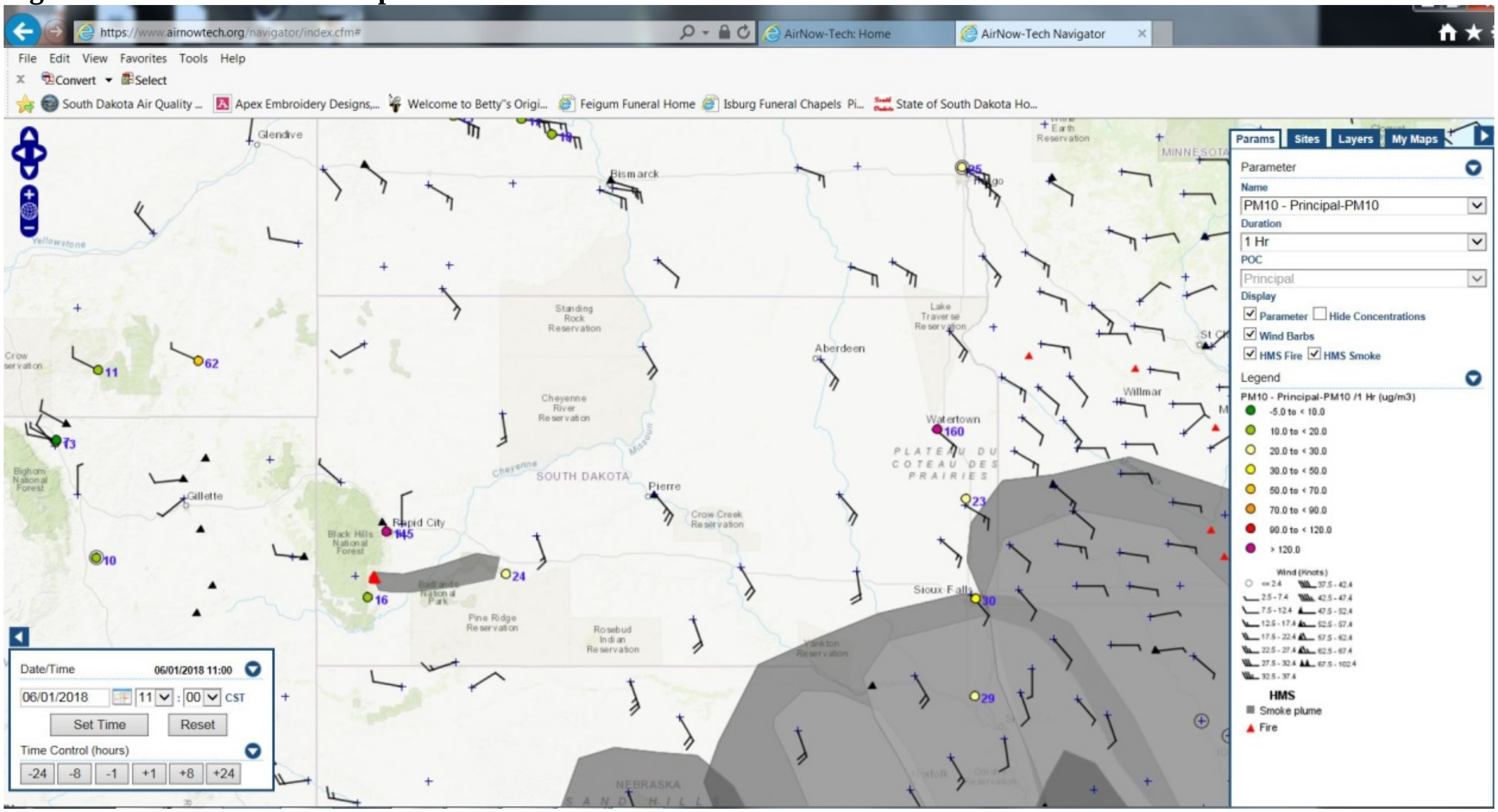
Appendix B
AirNow Maps for 24-hour PM_{10} High Concentration Day

Figure B-1 - AirNow Map for 6/1/18



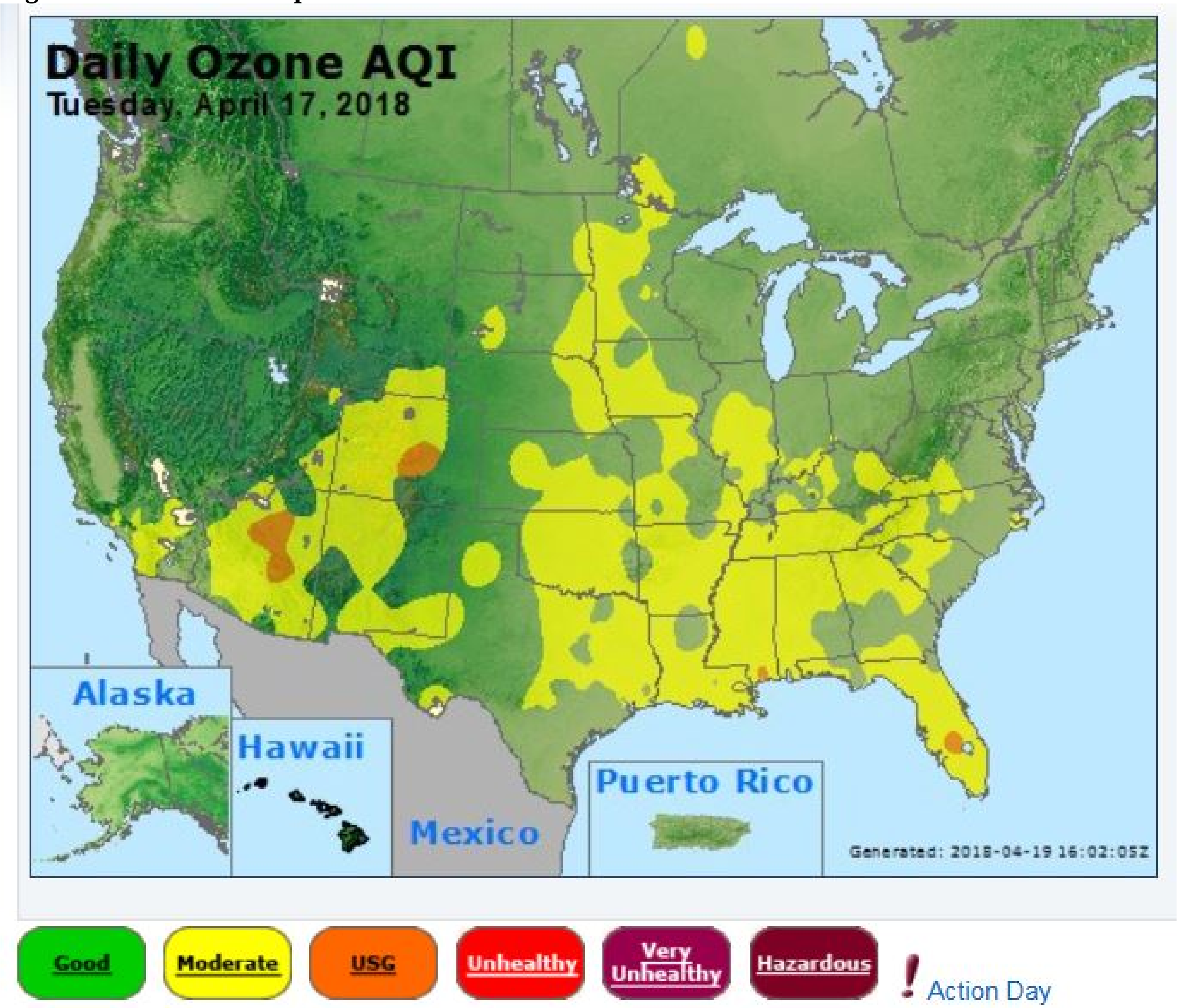
Appendix B
AirNow Maps for 24-hour PM_{10} High Concentration Day

Figure B-2 - AirNow Tech Map for 6/1/18



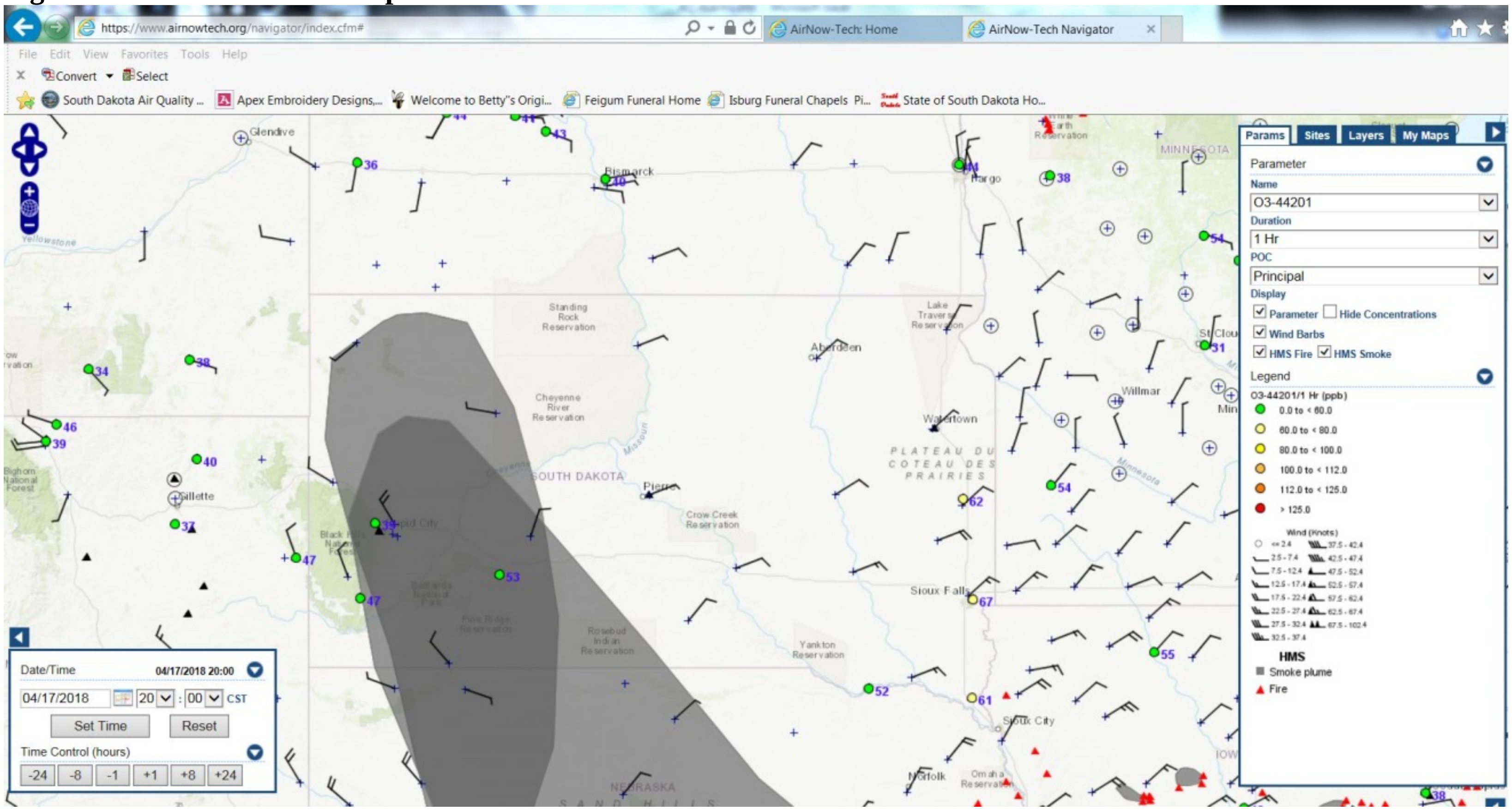
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-1 - AirNow Map for 4/17/18



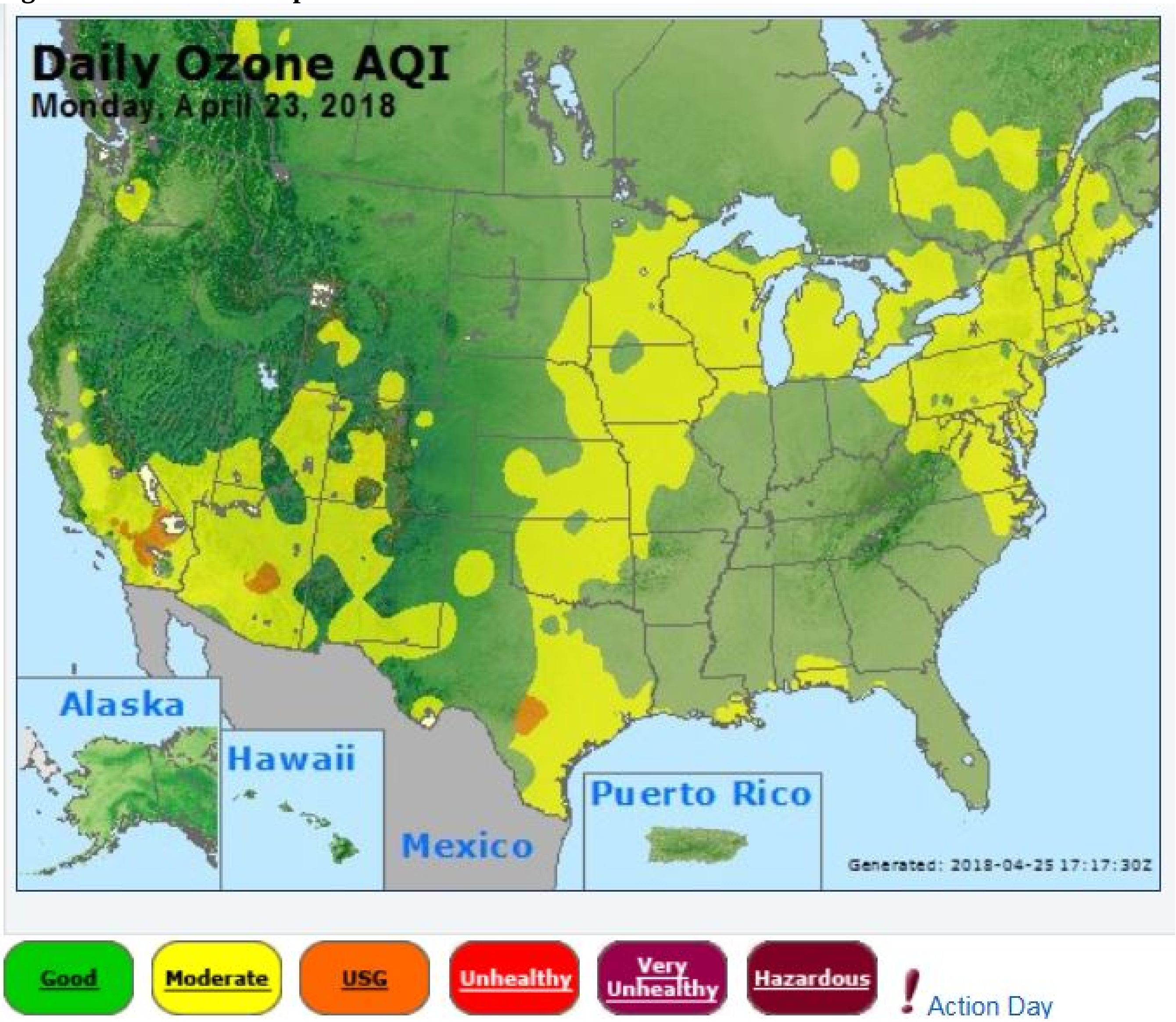
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-2 - AirNow Tech Map for 4/17/18



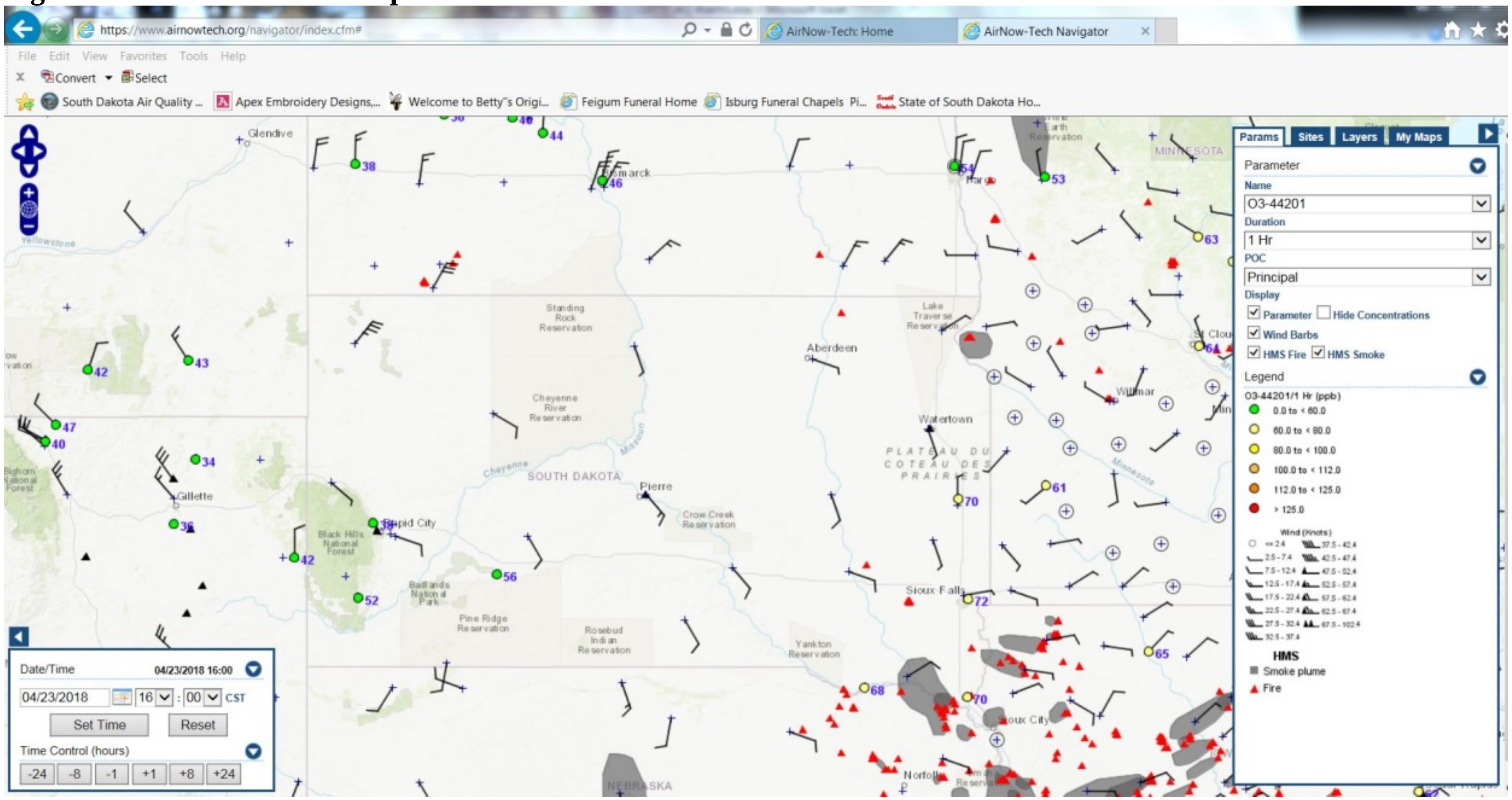
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-3 - AirNow Map for 4/23/18



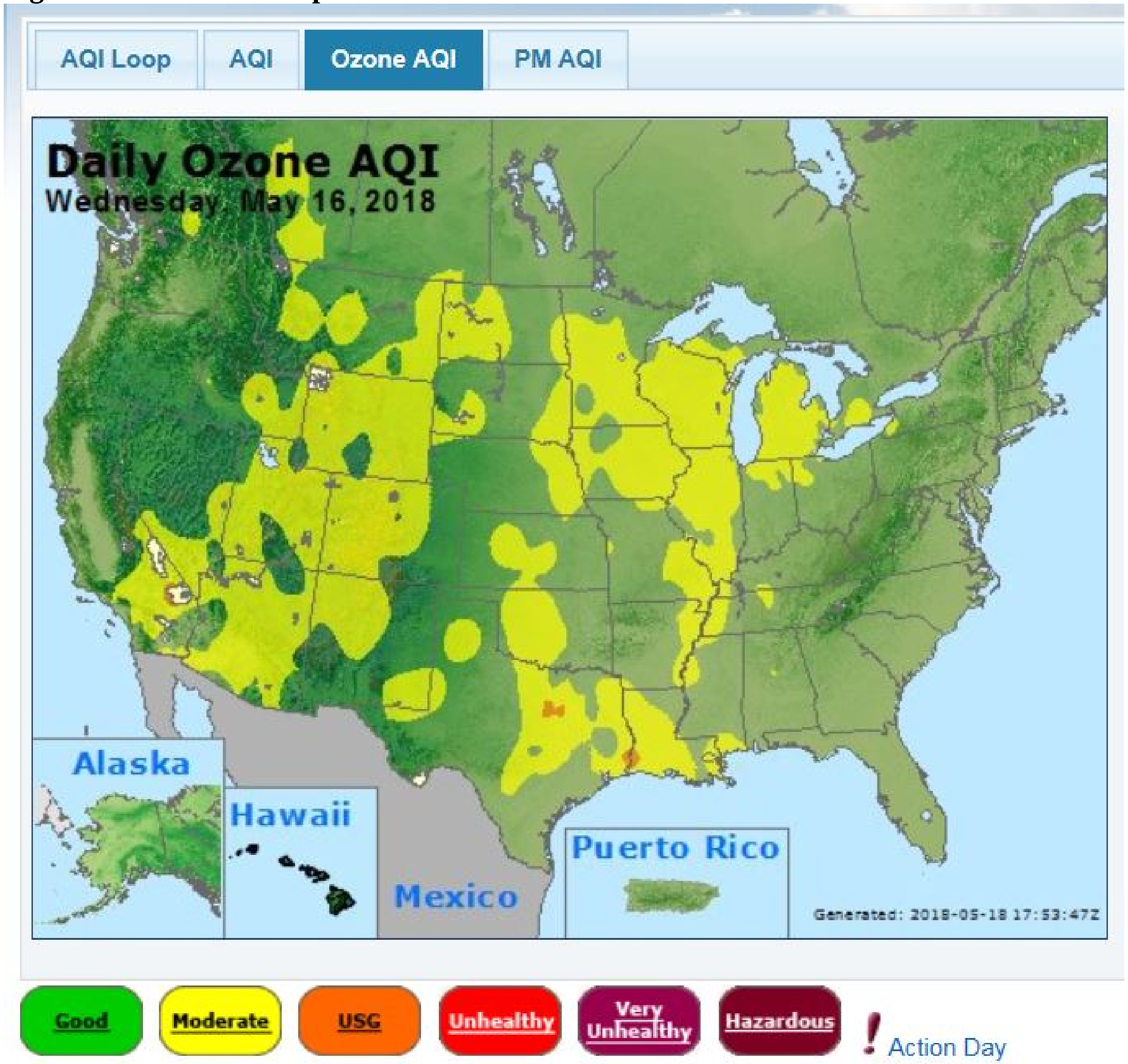
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-4 - AirNow Tech Map for 4/23/18



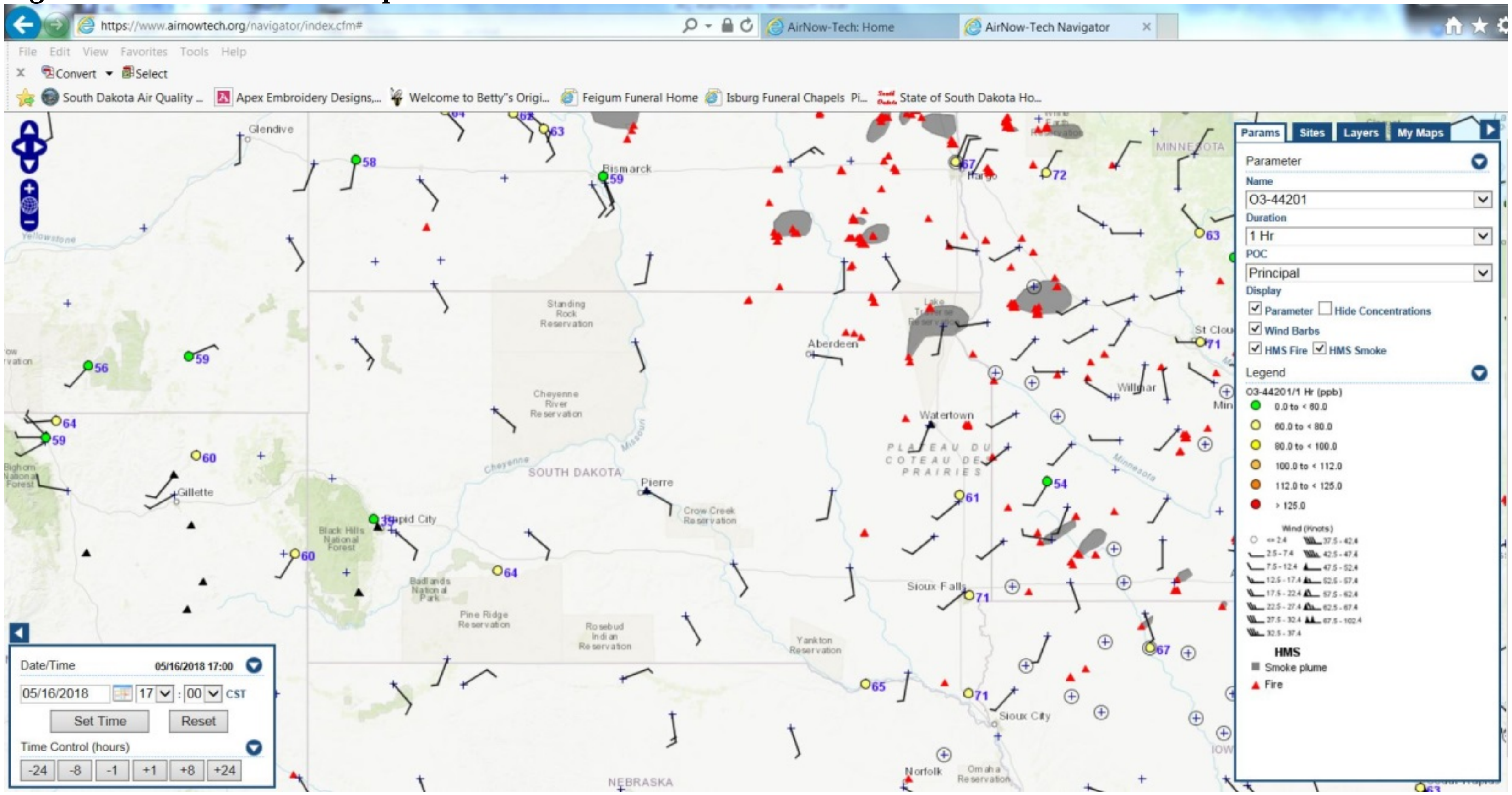
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-5 - AirNow Map for 5/16/18



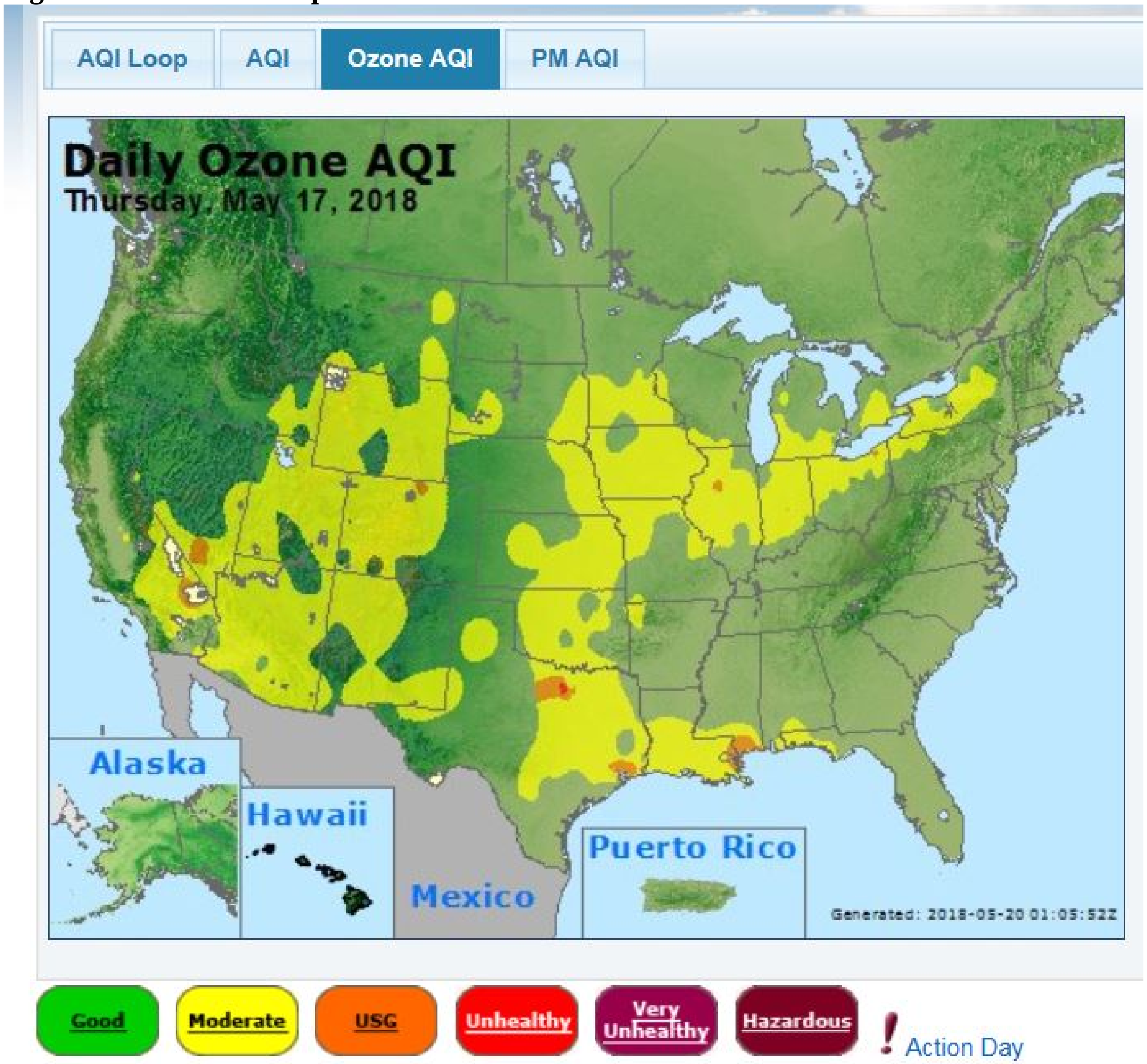
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-6 - AirNow Tech Map for 5/16/18



Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

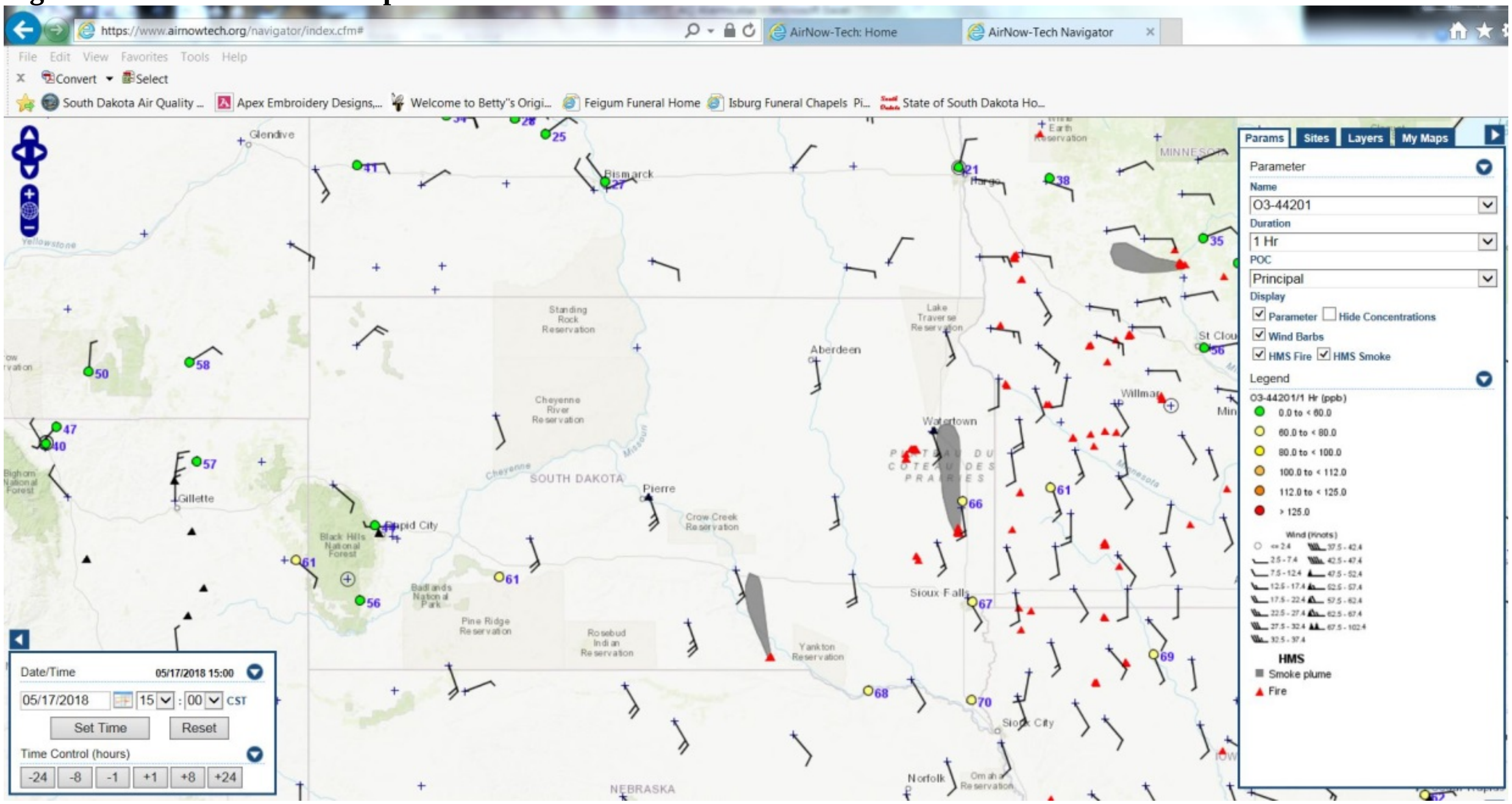
Figure C-7 - AirNow Map for 5/17/18



Appendix C

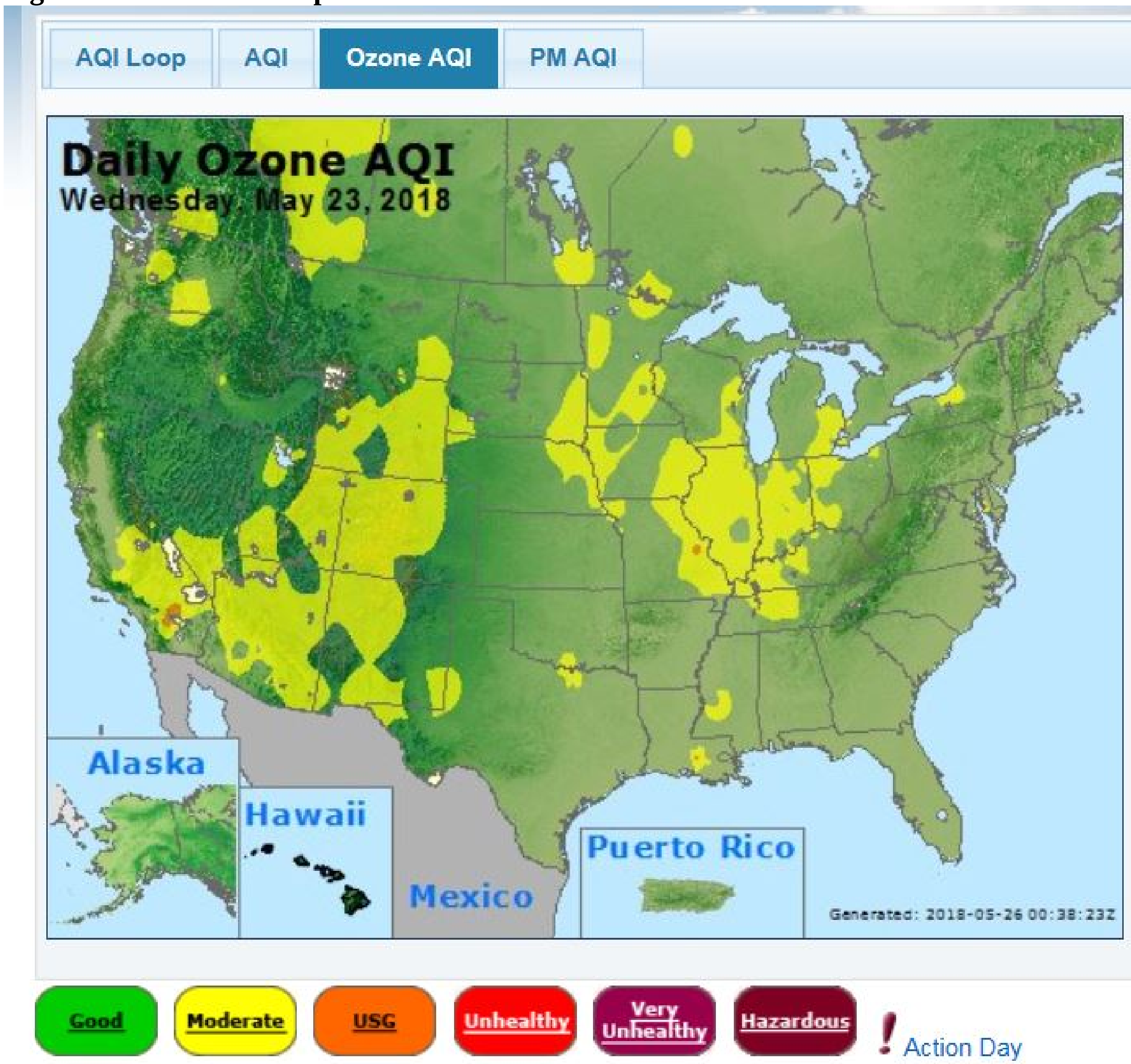
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-8 - AirNow Tech Map for 5/17/18



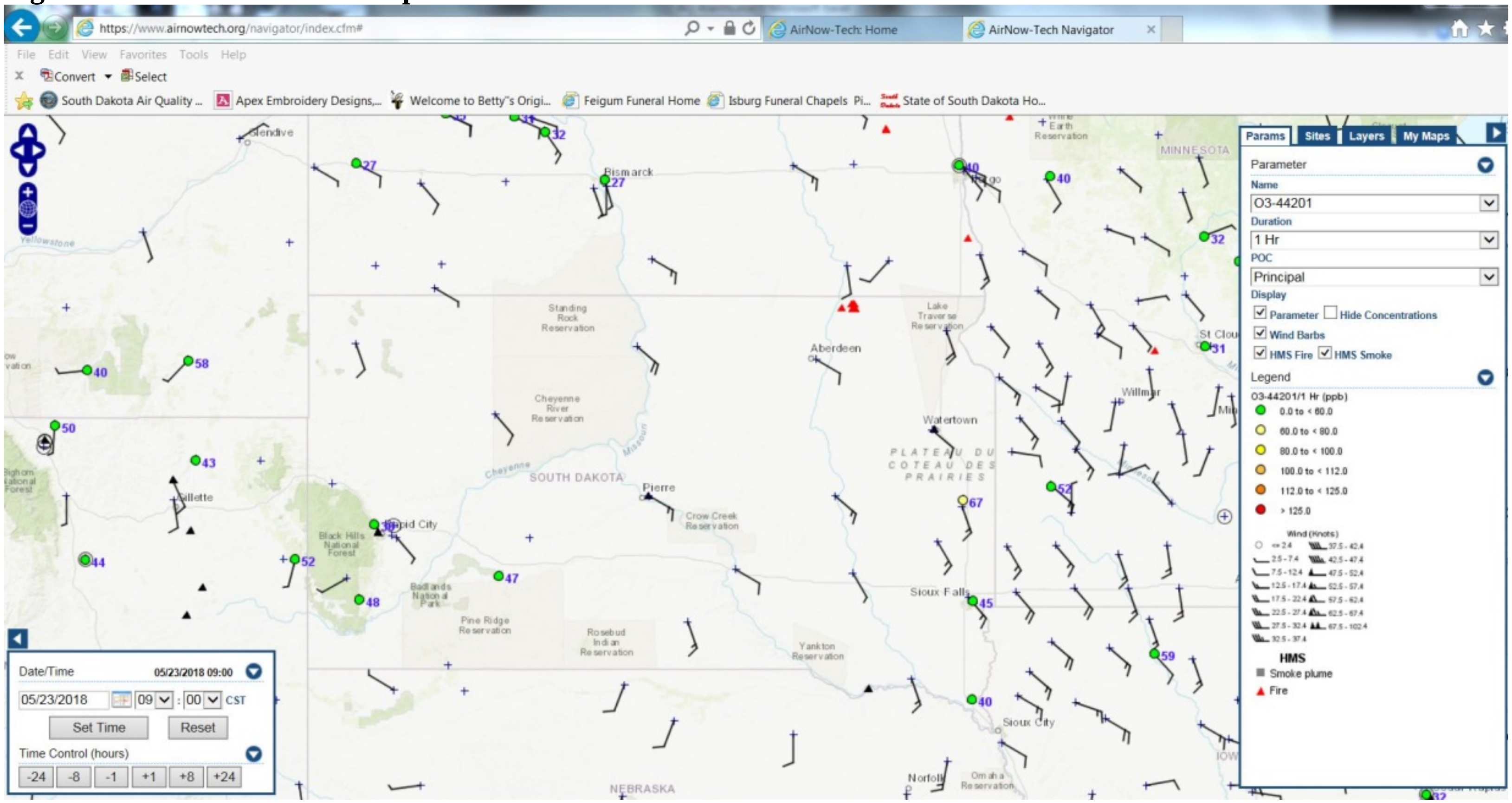
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-9 - AirNow Map for 5/23/18



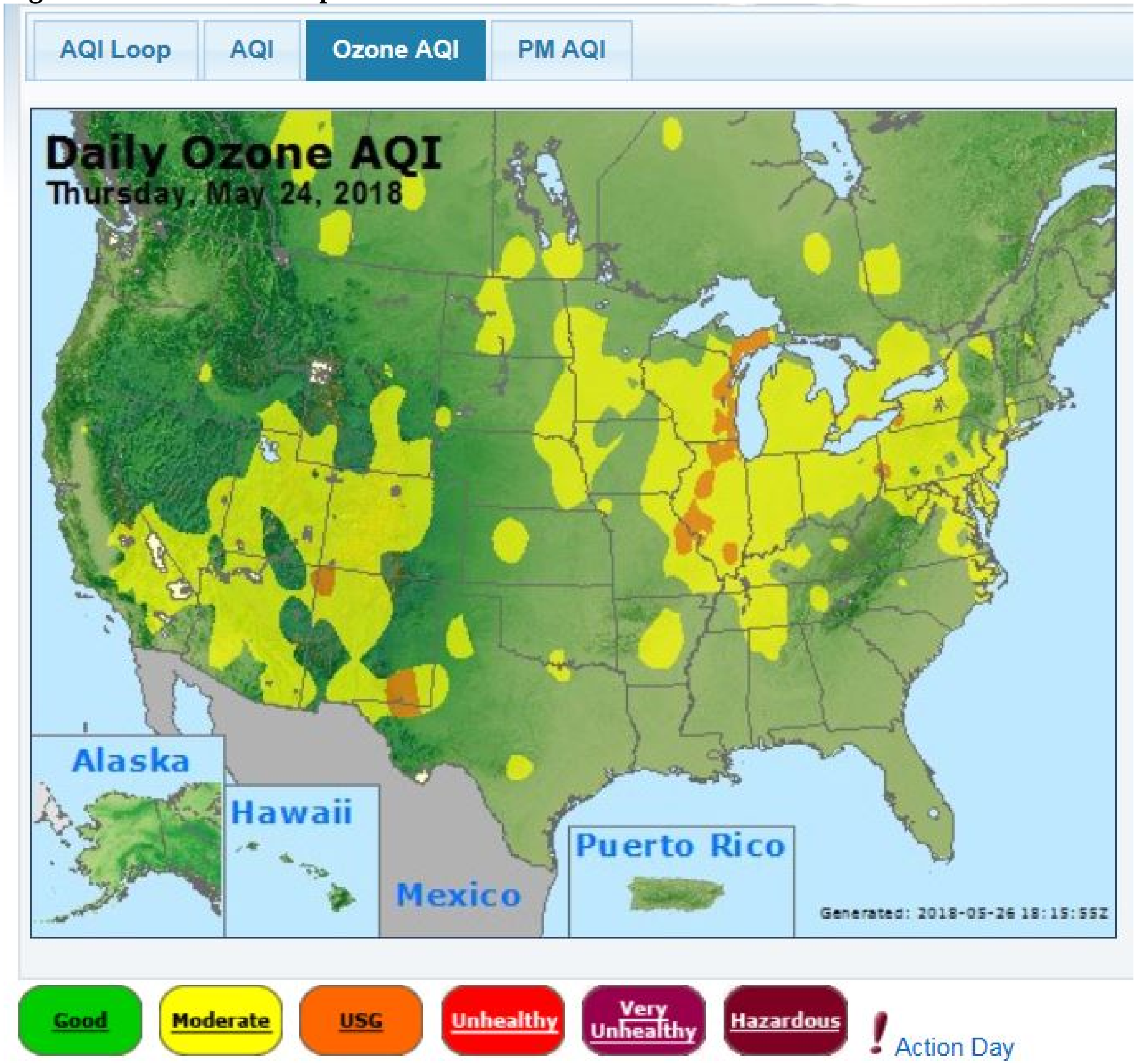
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-10 - AirNow Tech Map for 5/23/18



Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-11 - AirNow Map for 5/24/18



Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-12 - AirNow Tech Map for 5/24/18

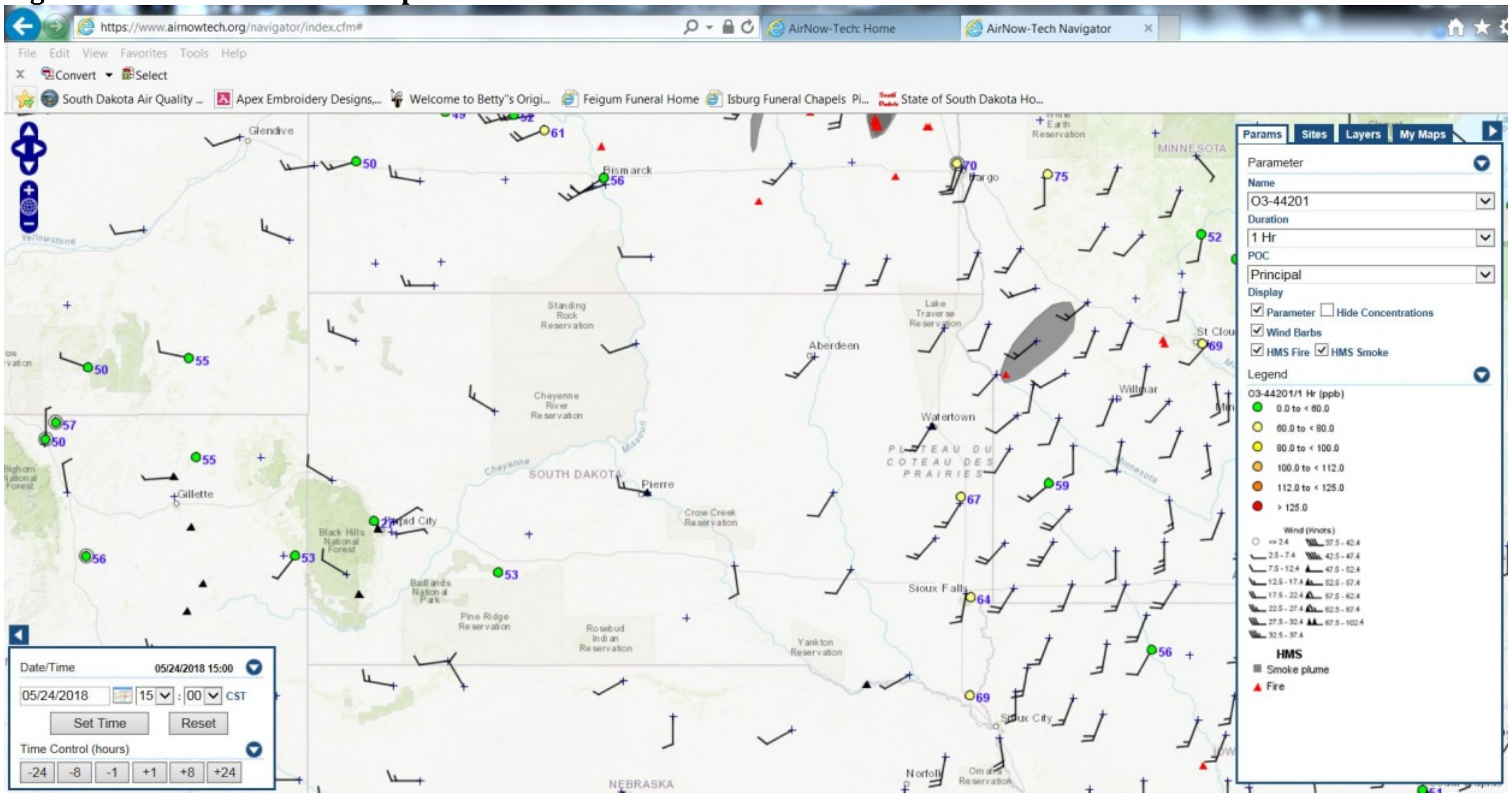
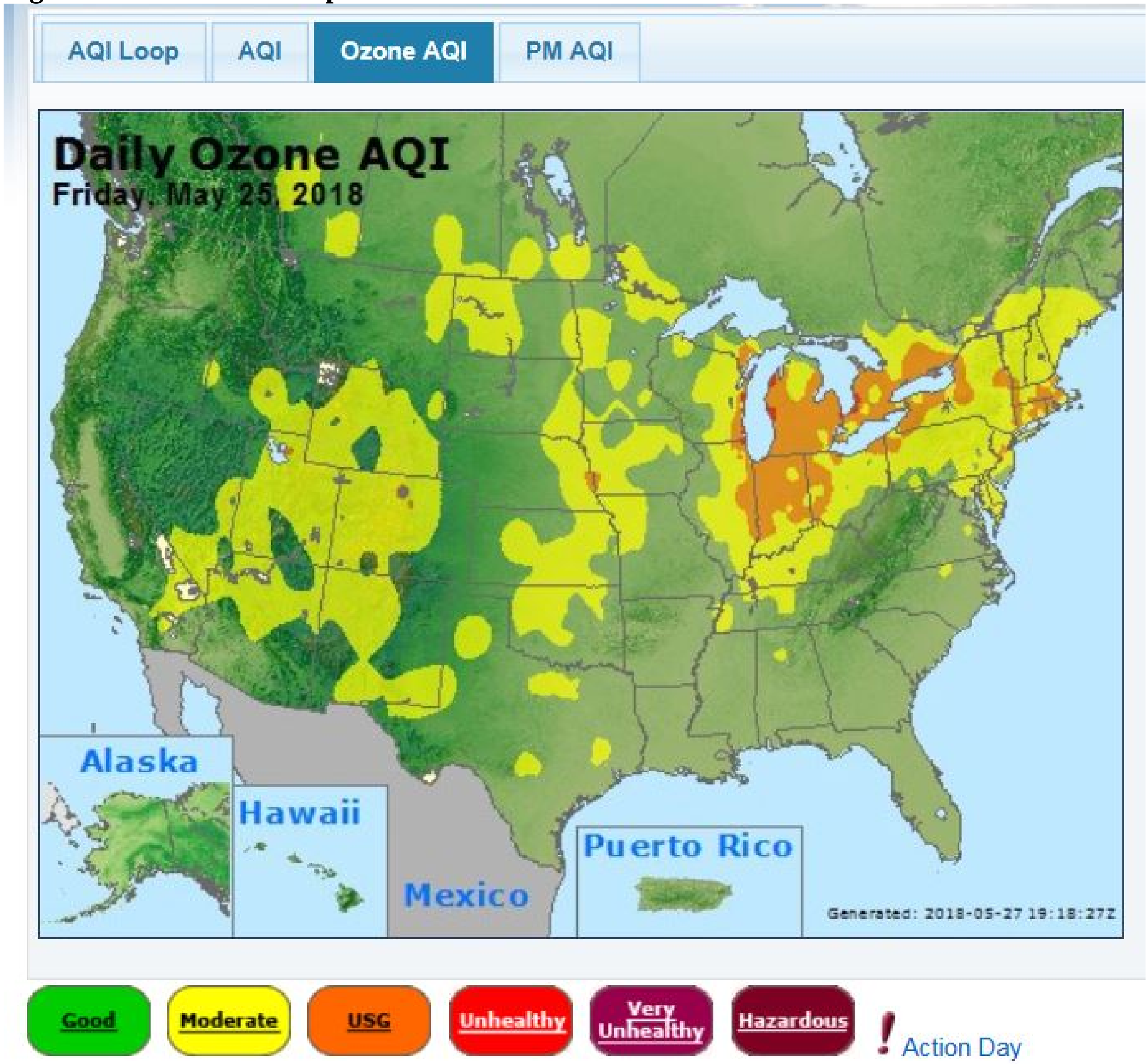
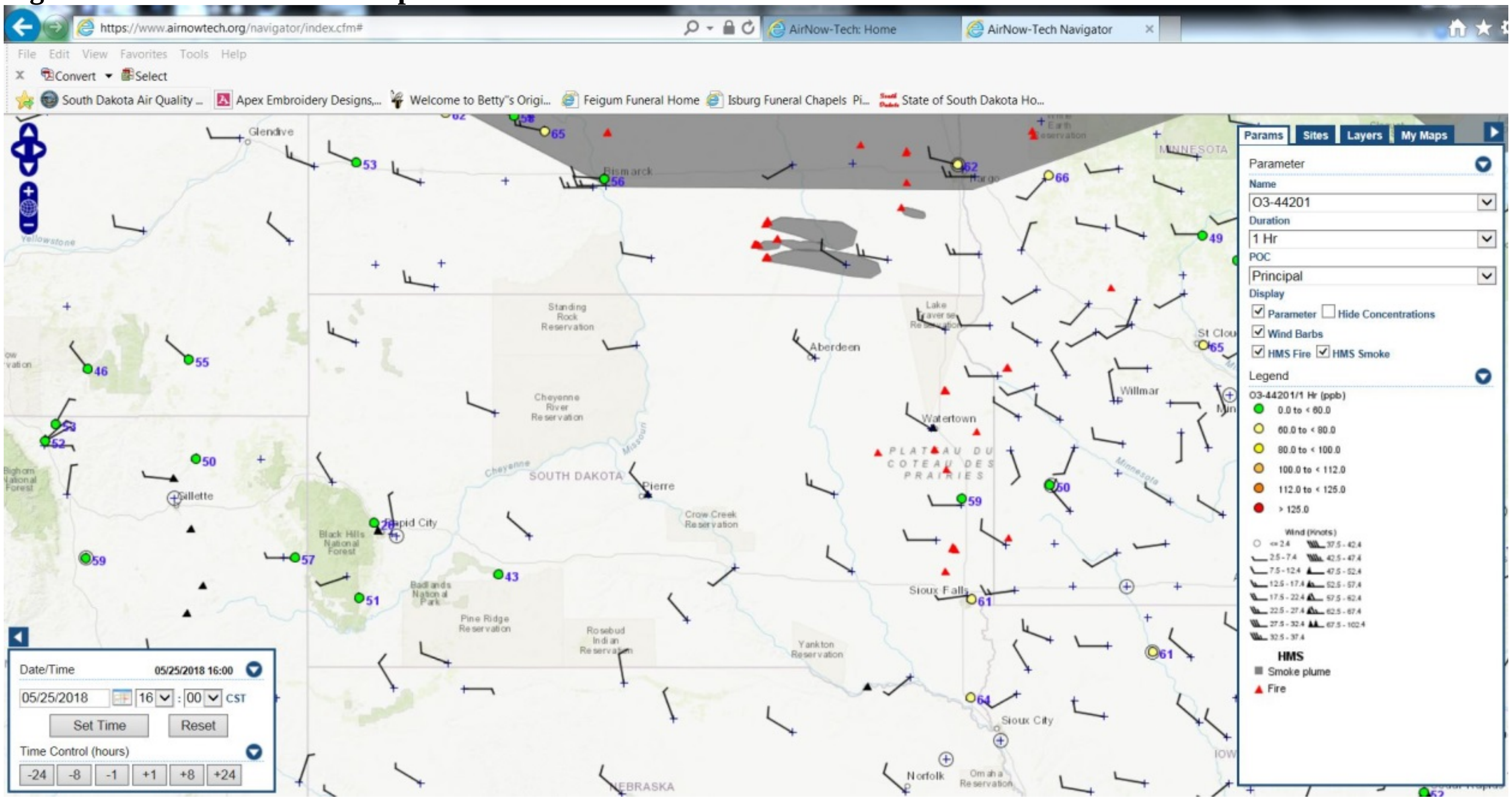


Figure C-13 - AirNow Map for 5/25/18



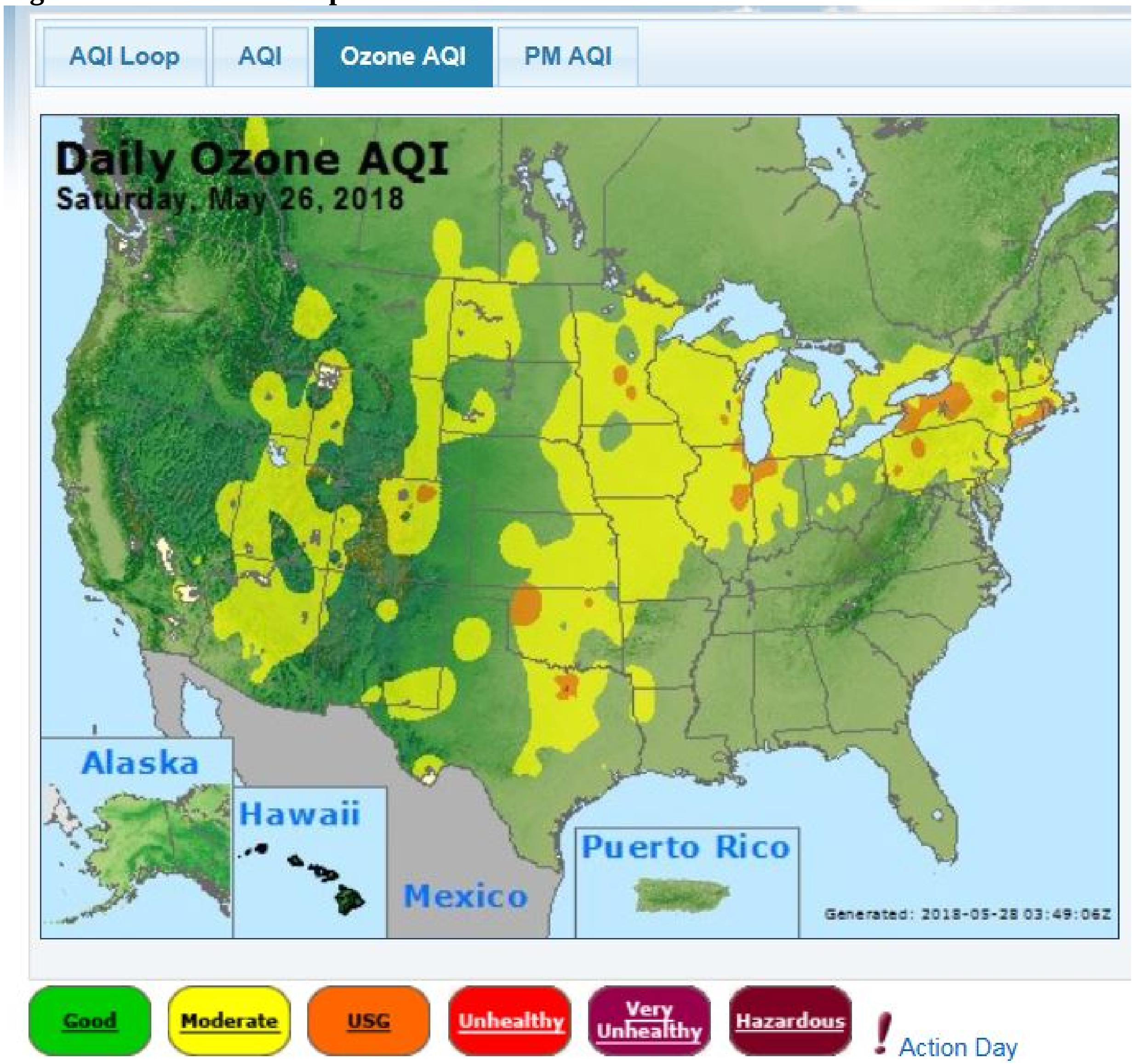
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-14 - AirNow Tech Map for 5/25/18



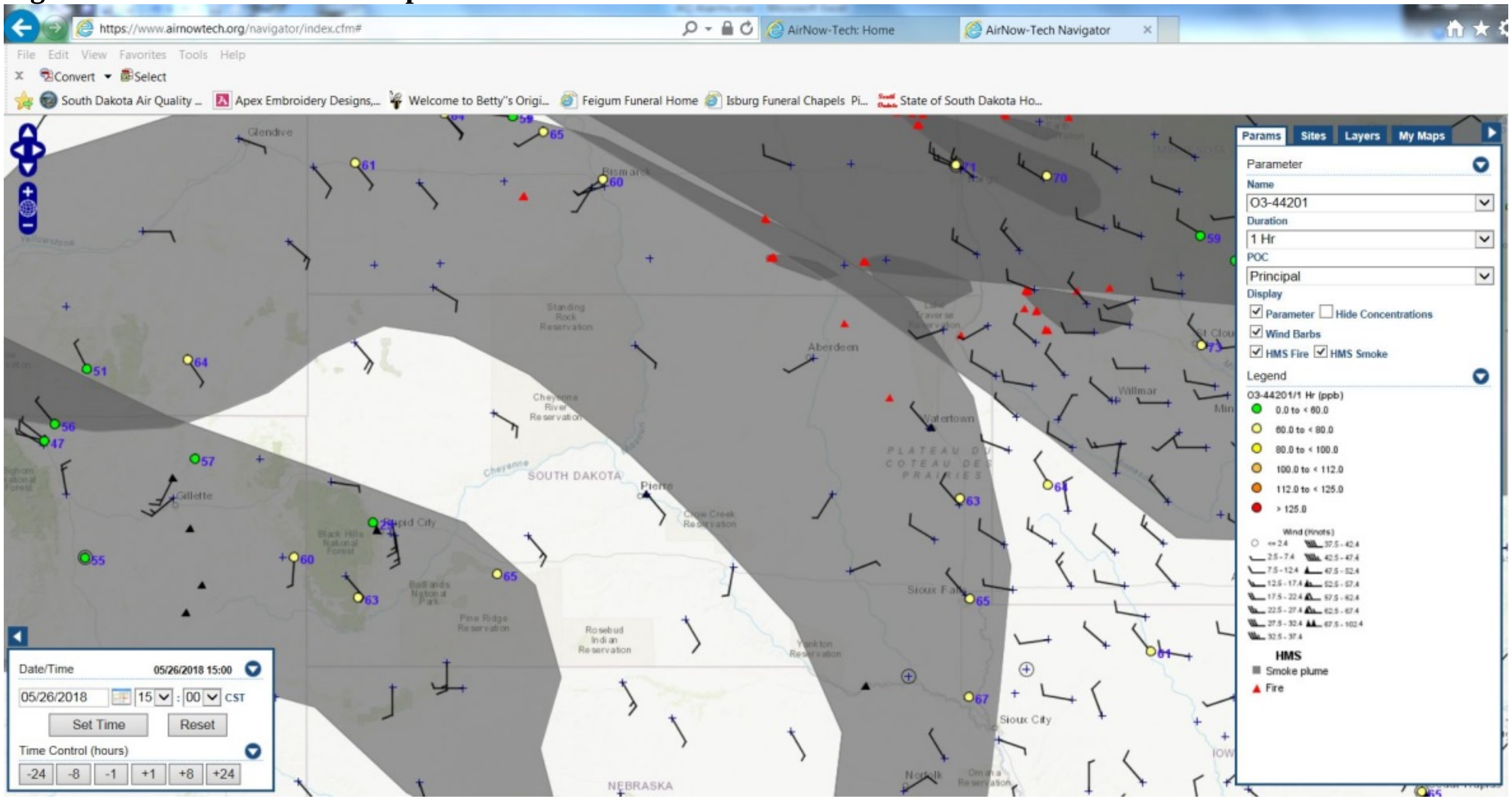
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-15 - AirNow Map for 5/26/18



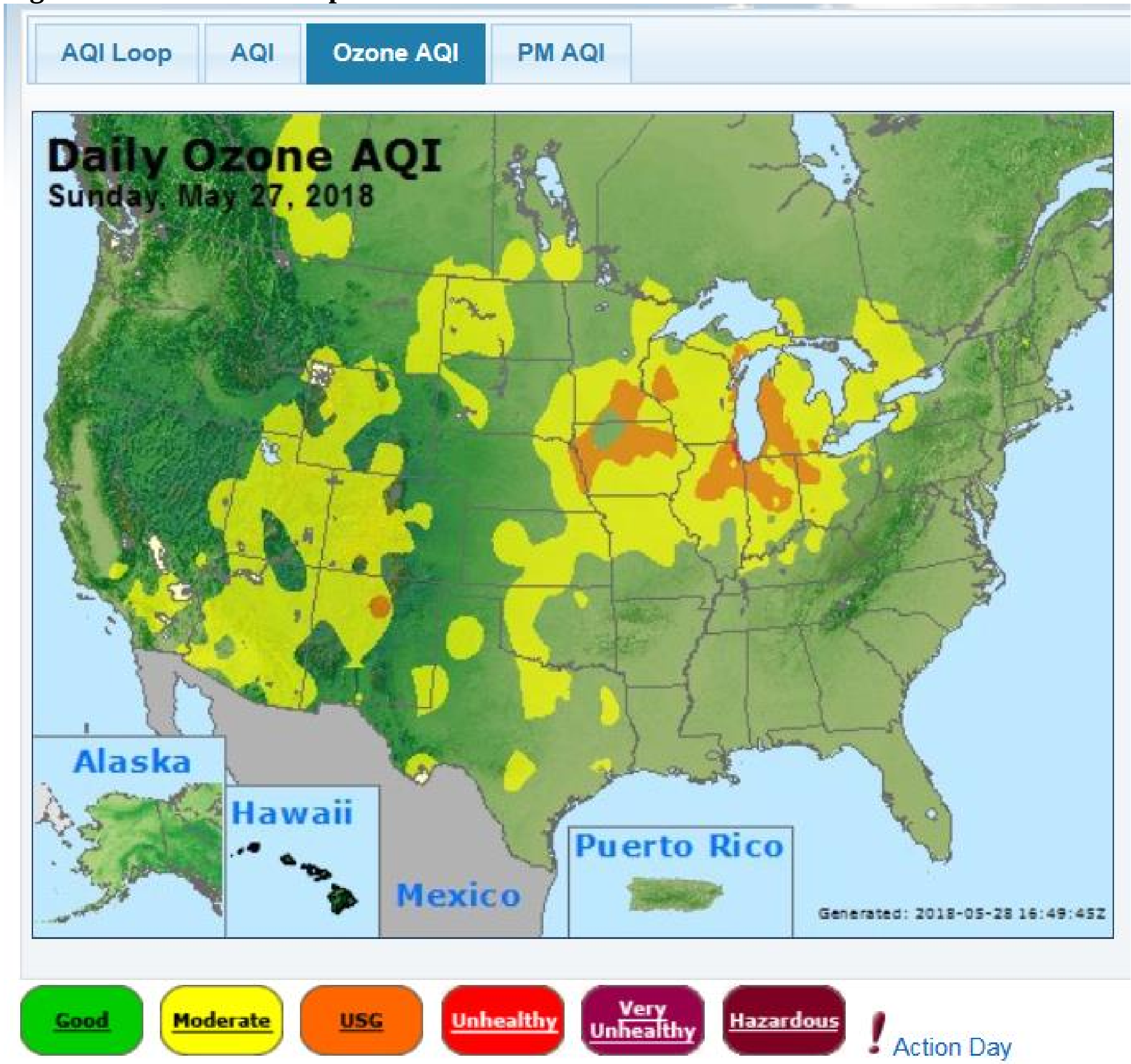
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-16 - AirNow Tech Map for 5/26/18



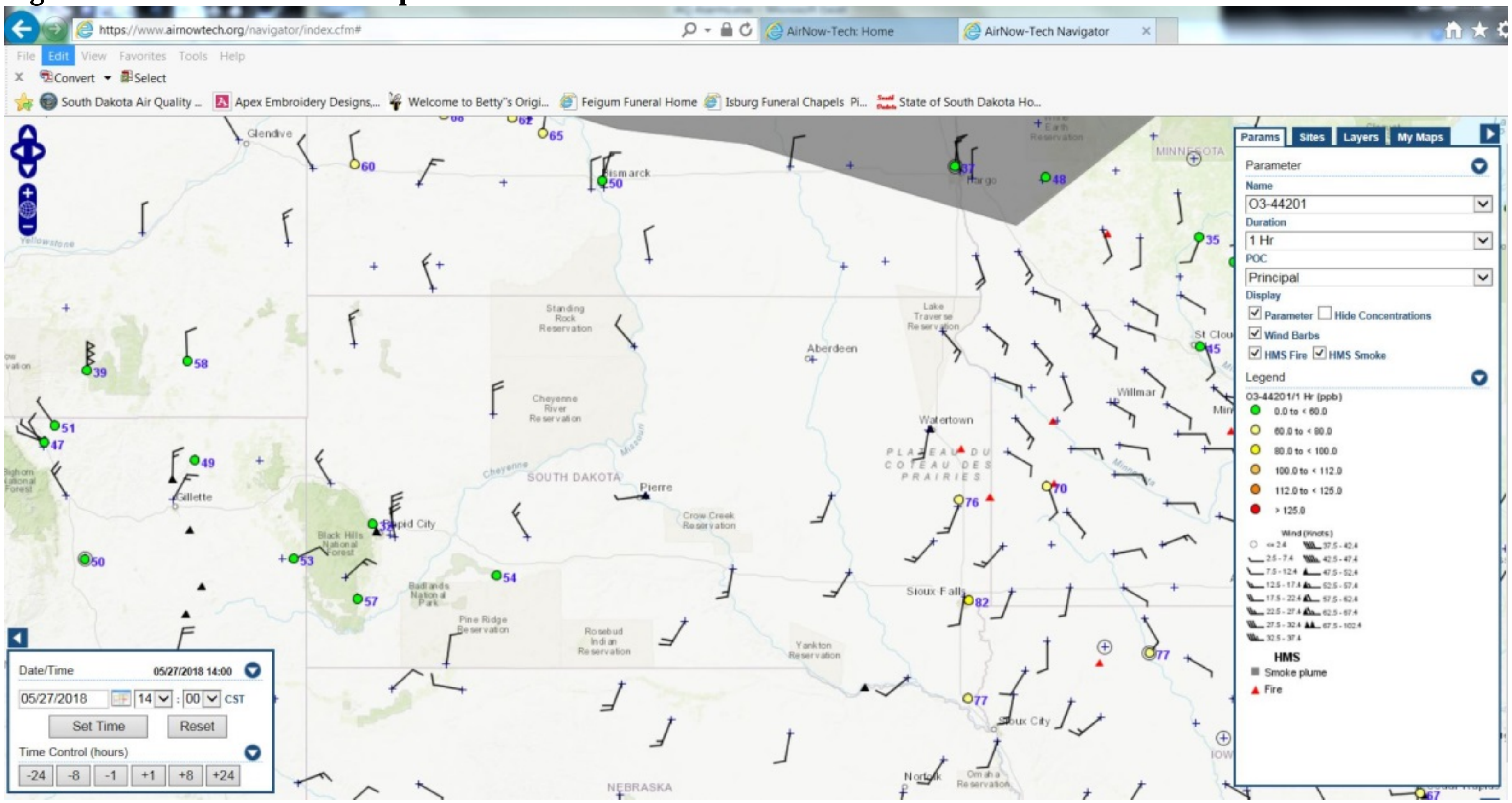
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-17 - AirNow Map for 5/27/18



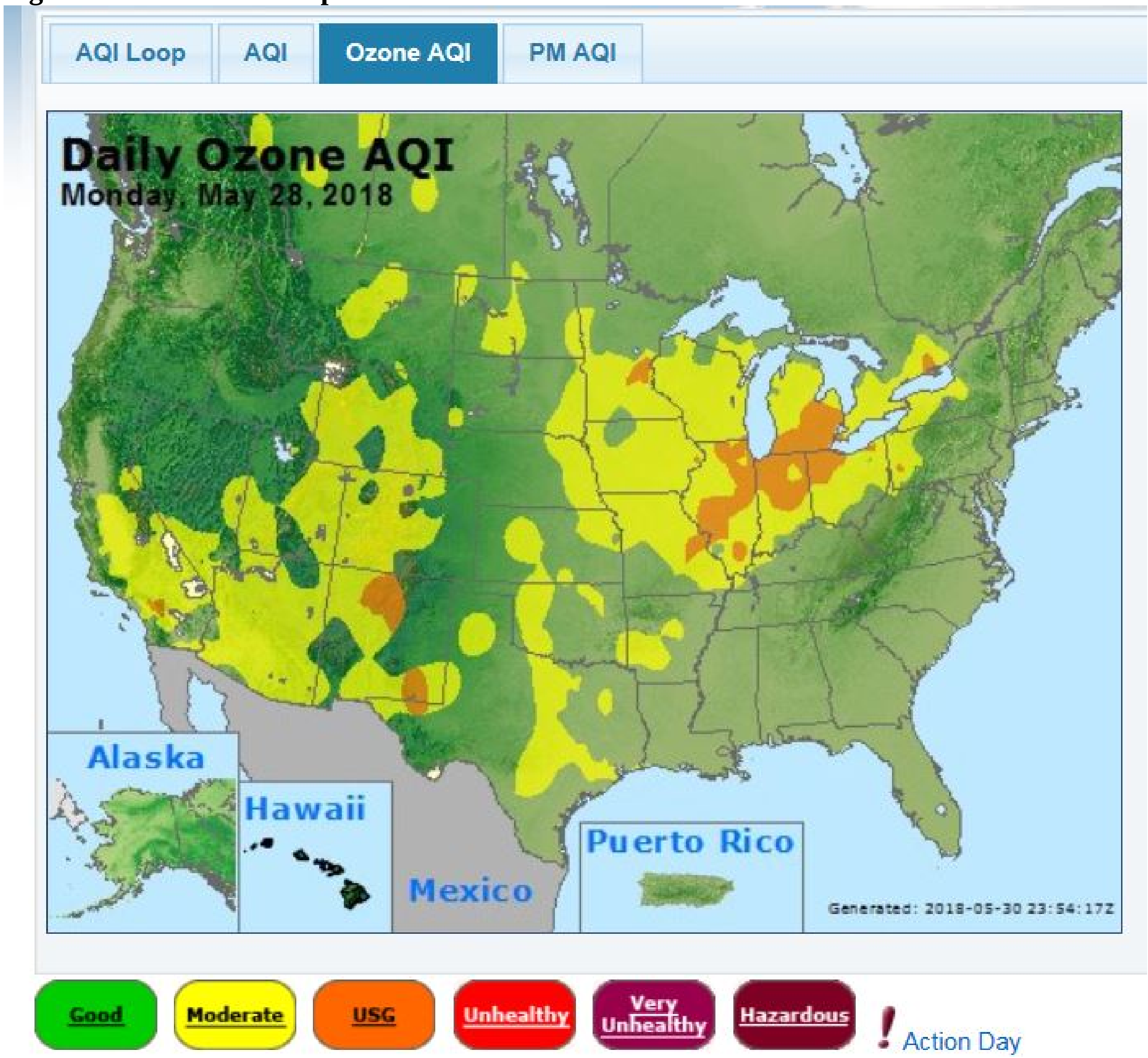
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-18 - AirNow Tech Map for 5/27/18



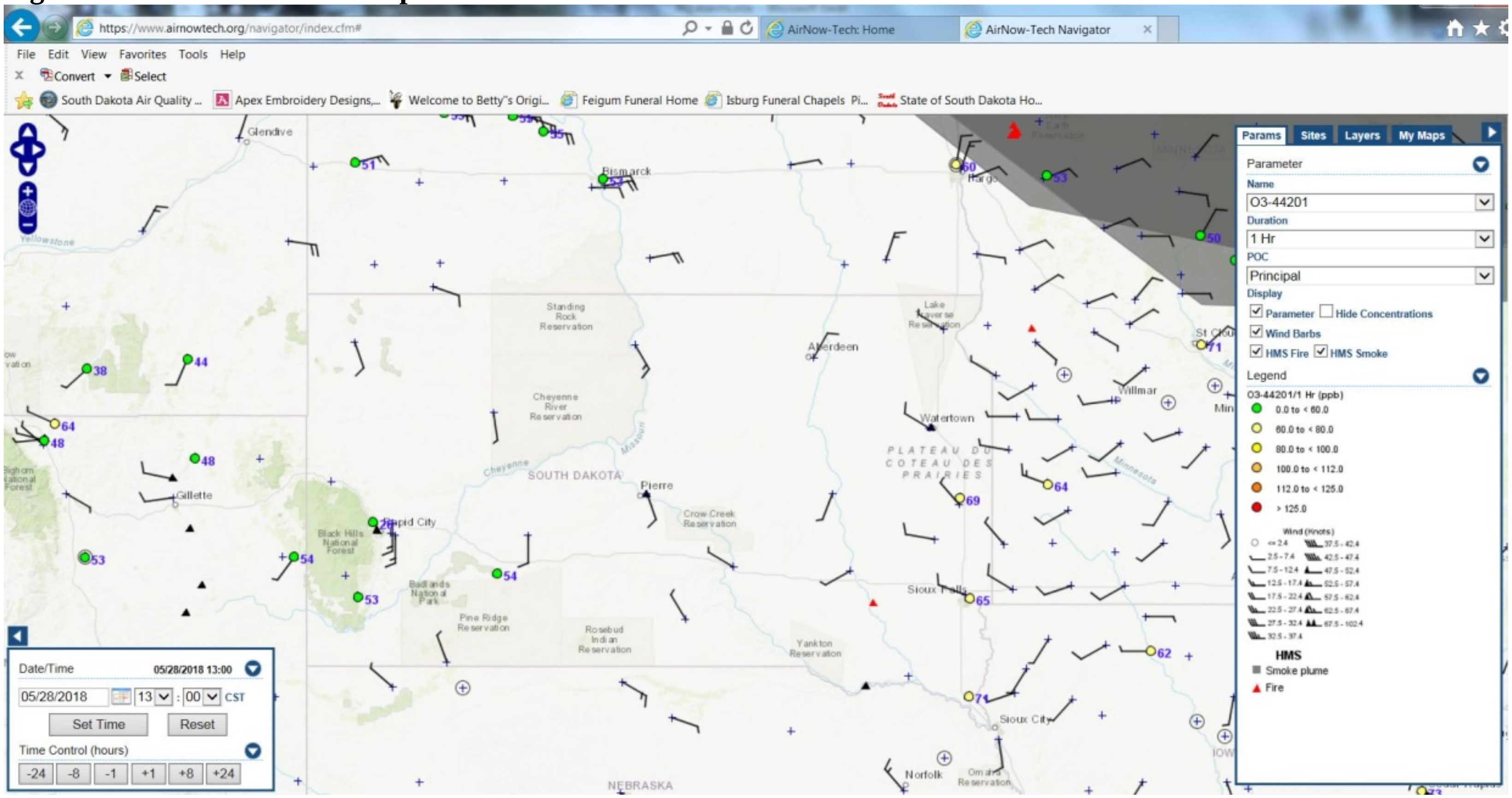
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-19 - AirNow Map for 5/28/18



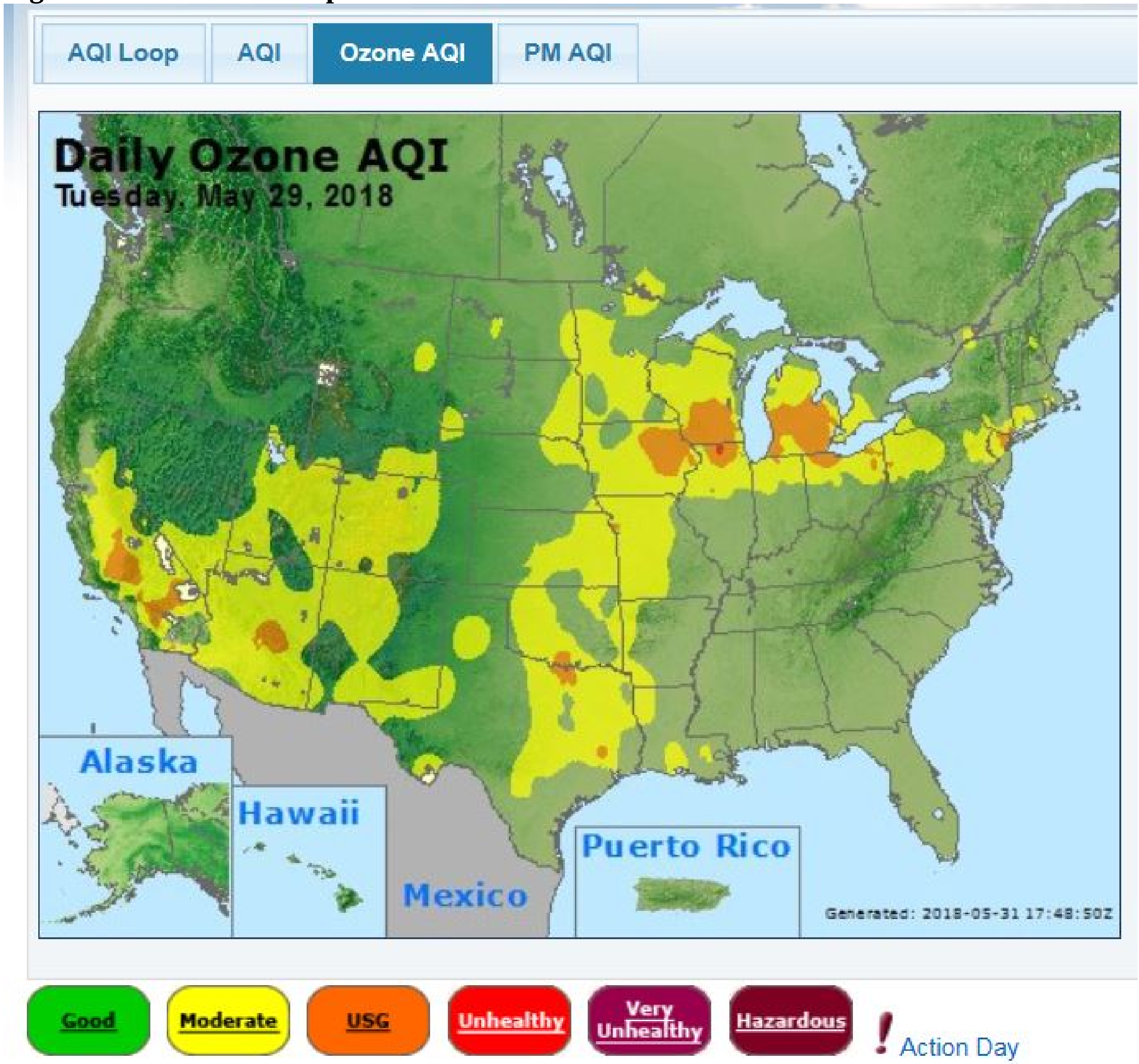
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-20 - AirNow Tech Map for 5/28/18



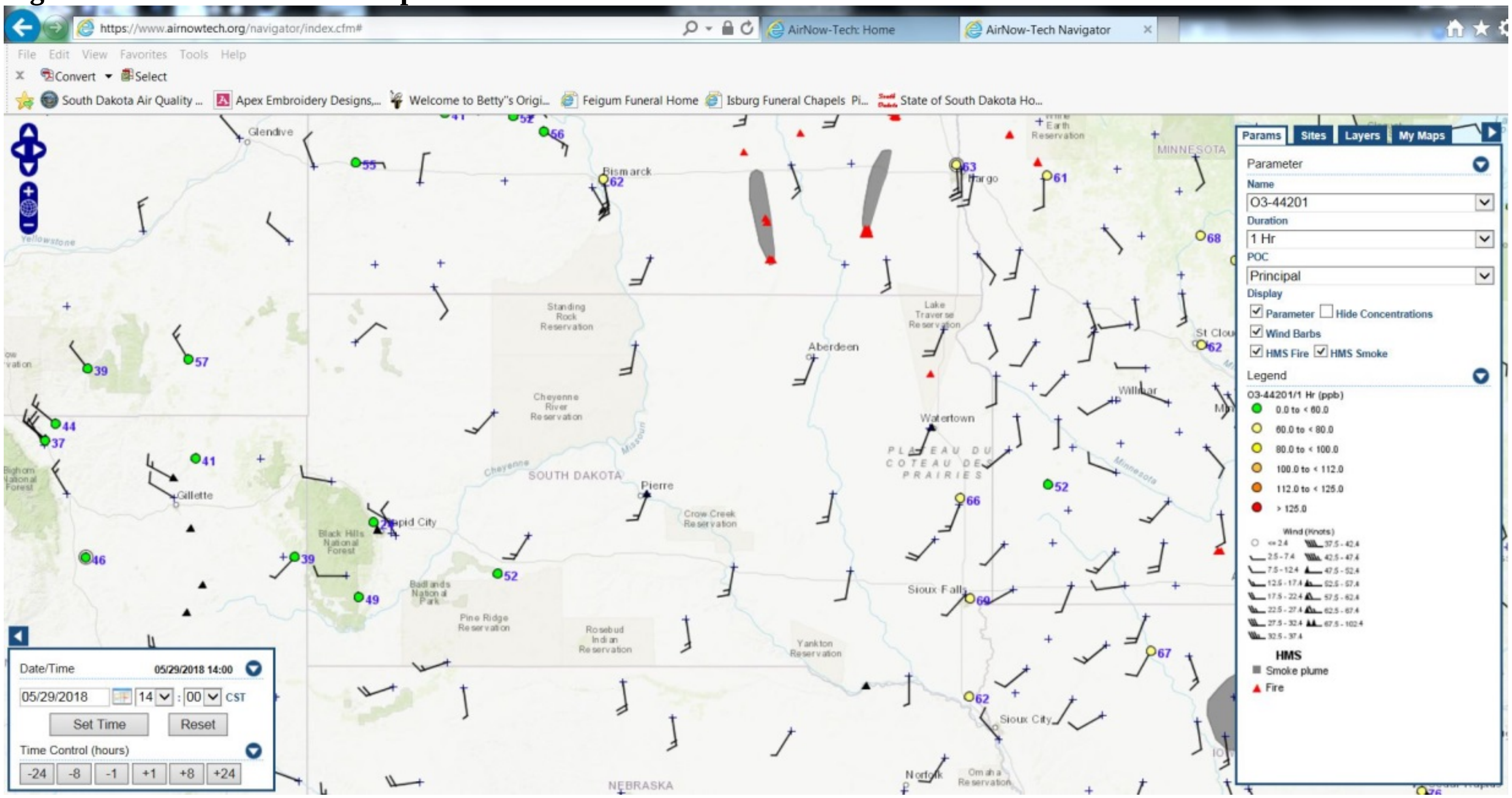
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-21 - AirNow Map for 5/29/18



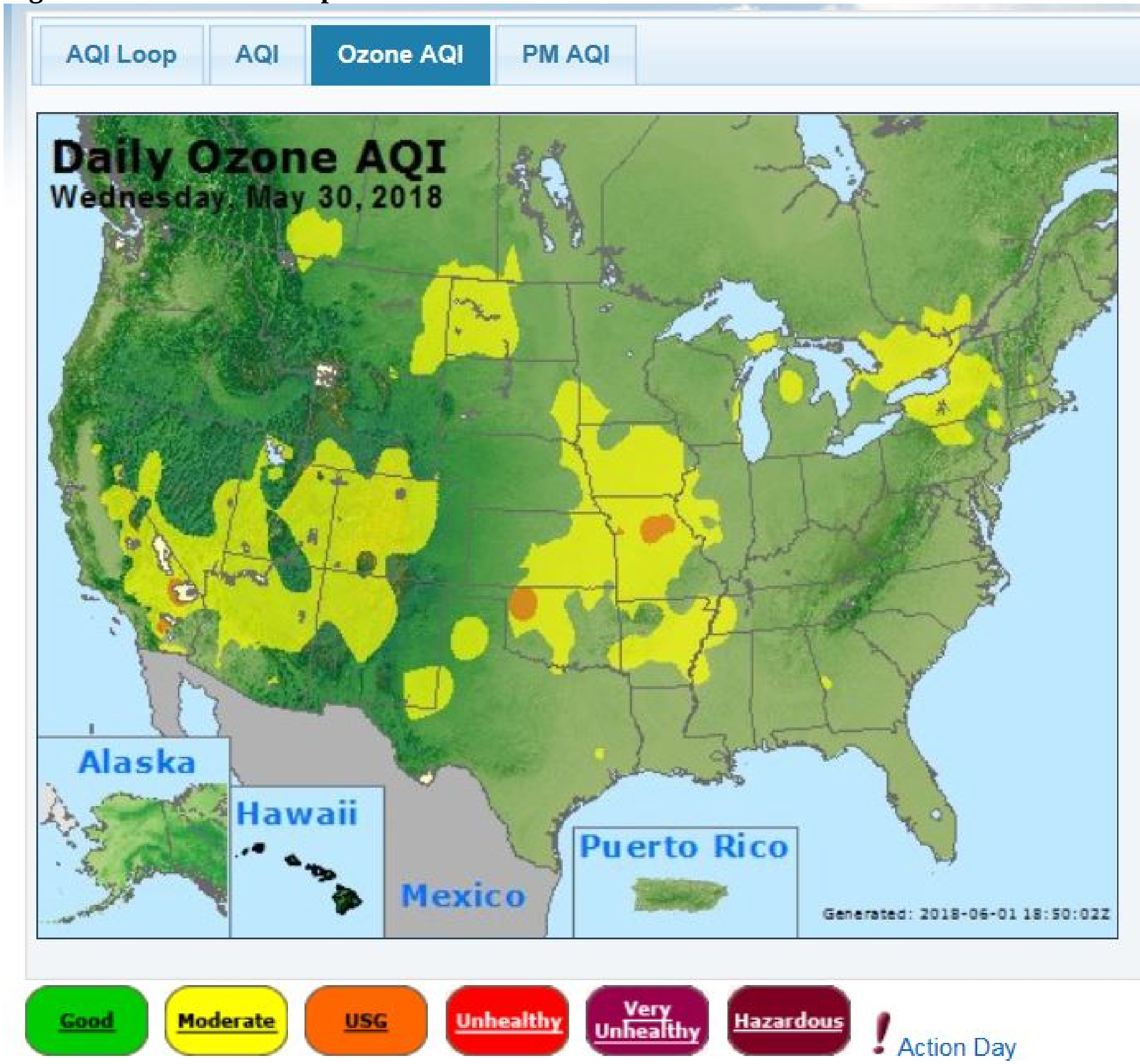
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-22 - AirNow Tech Map for 5/29/18



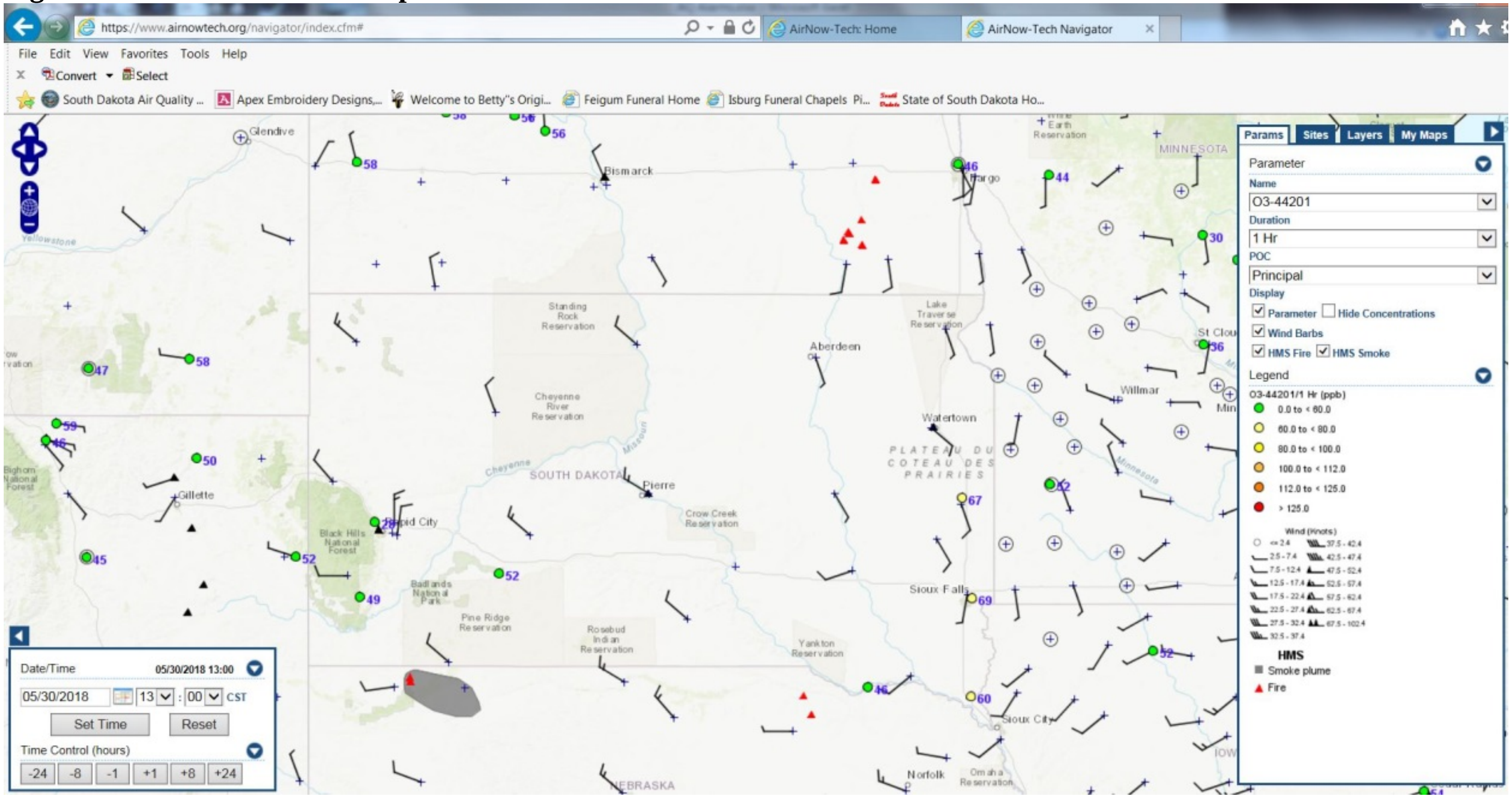
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-23 - AirNow Map for 5/30/18



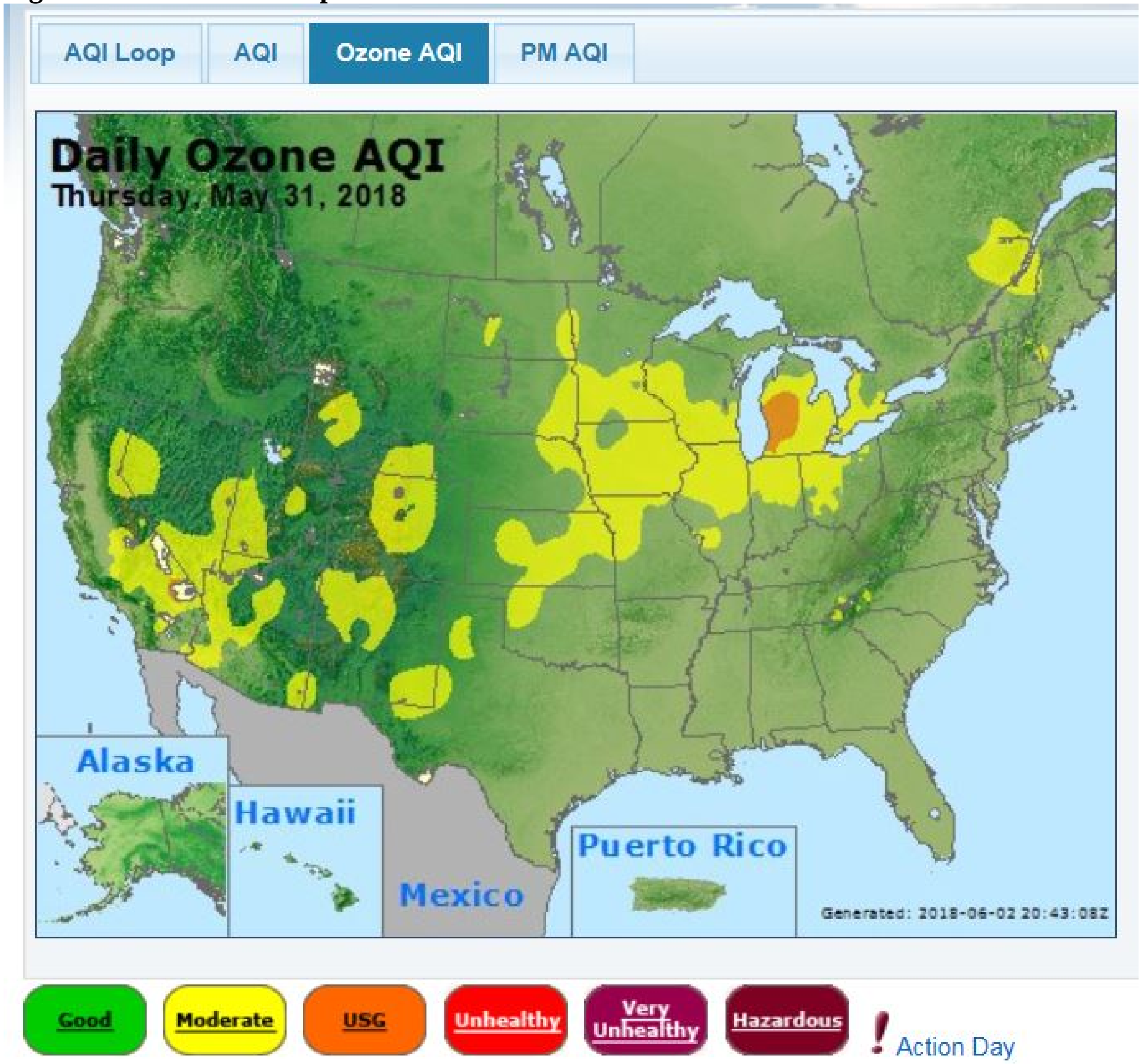
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-24 - AirNow Tech Map for 5/30/18



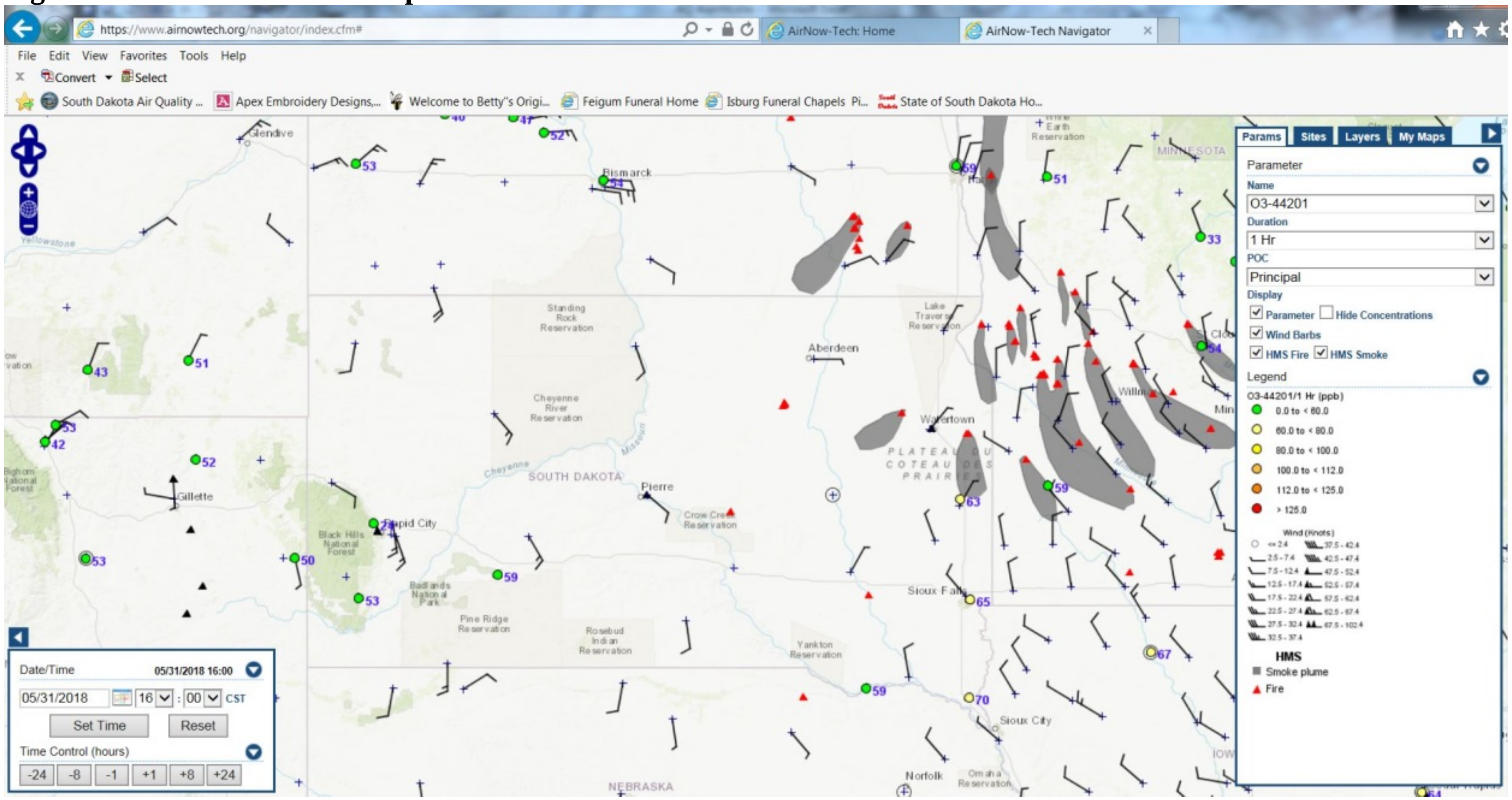
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-25 - AirNow Map for 5/31/18



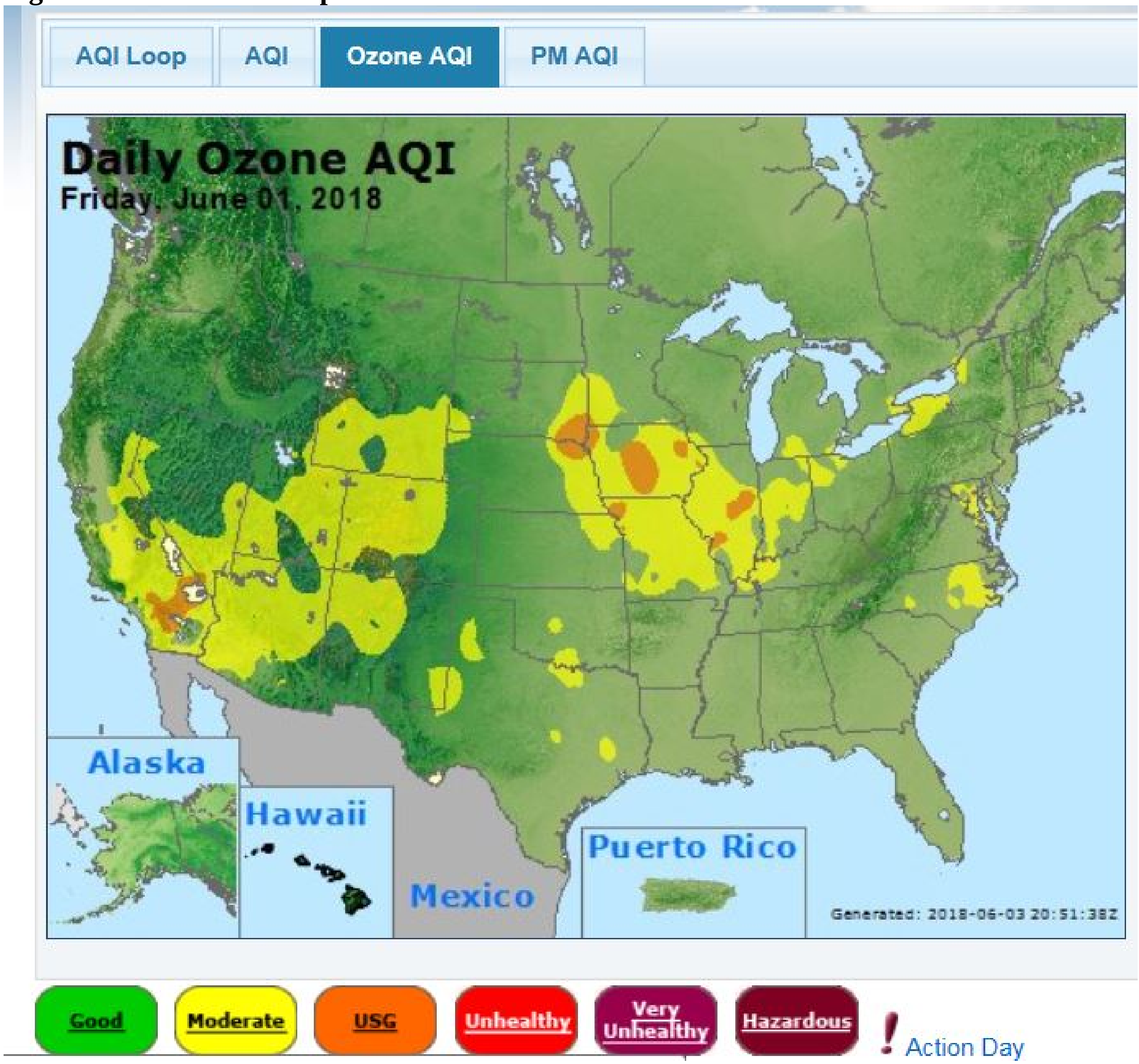
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-26 - AirNow Tech Map for 5/31/18



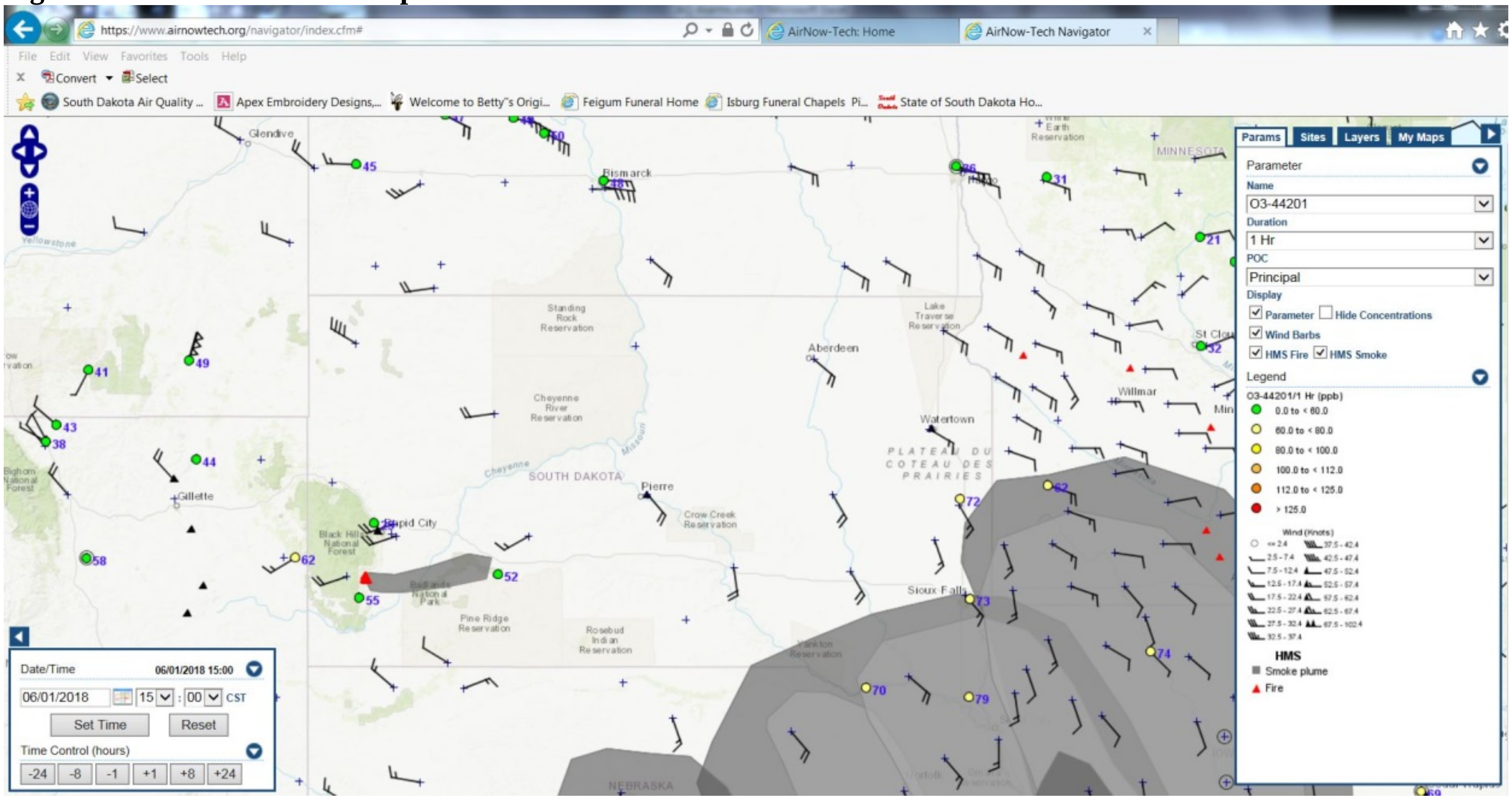
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-27 - AirNow Map for 6/1/18



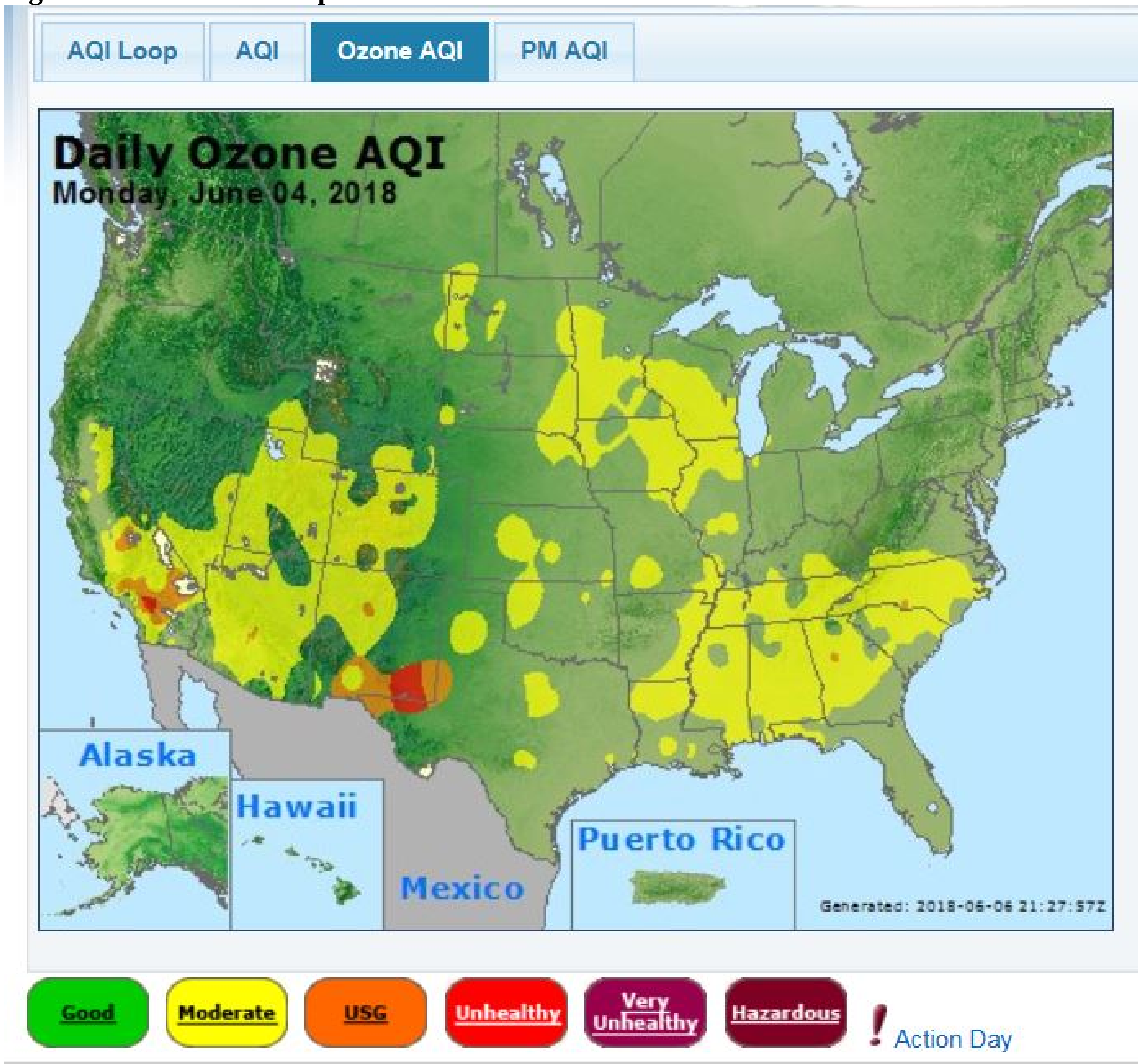
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-28 - AirNow Tech Map for 6/1/18



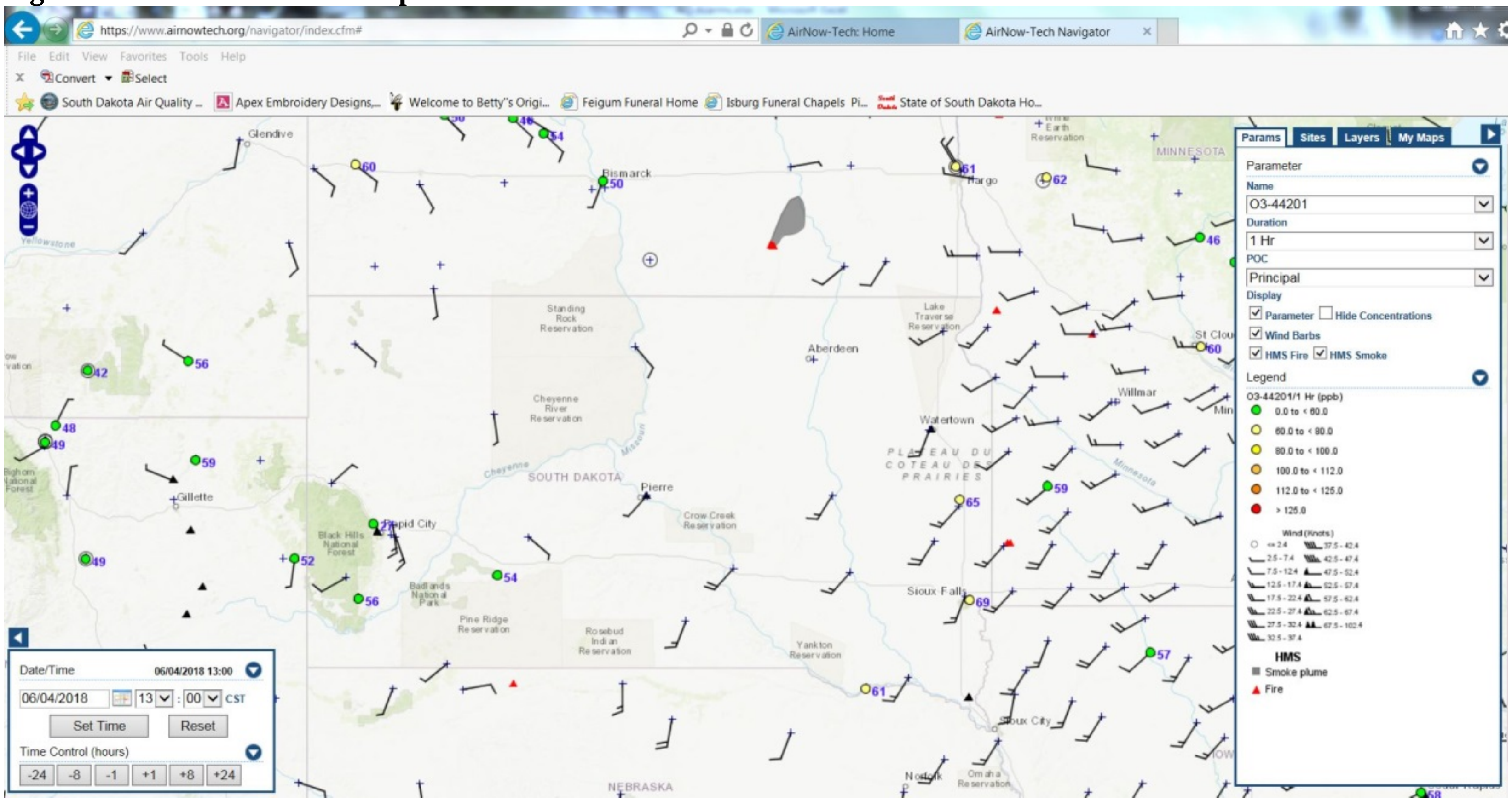
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-29 - AirNow Map for 6/4/18



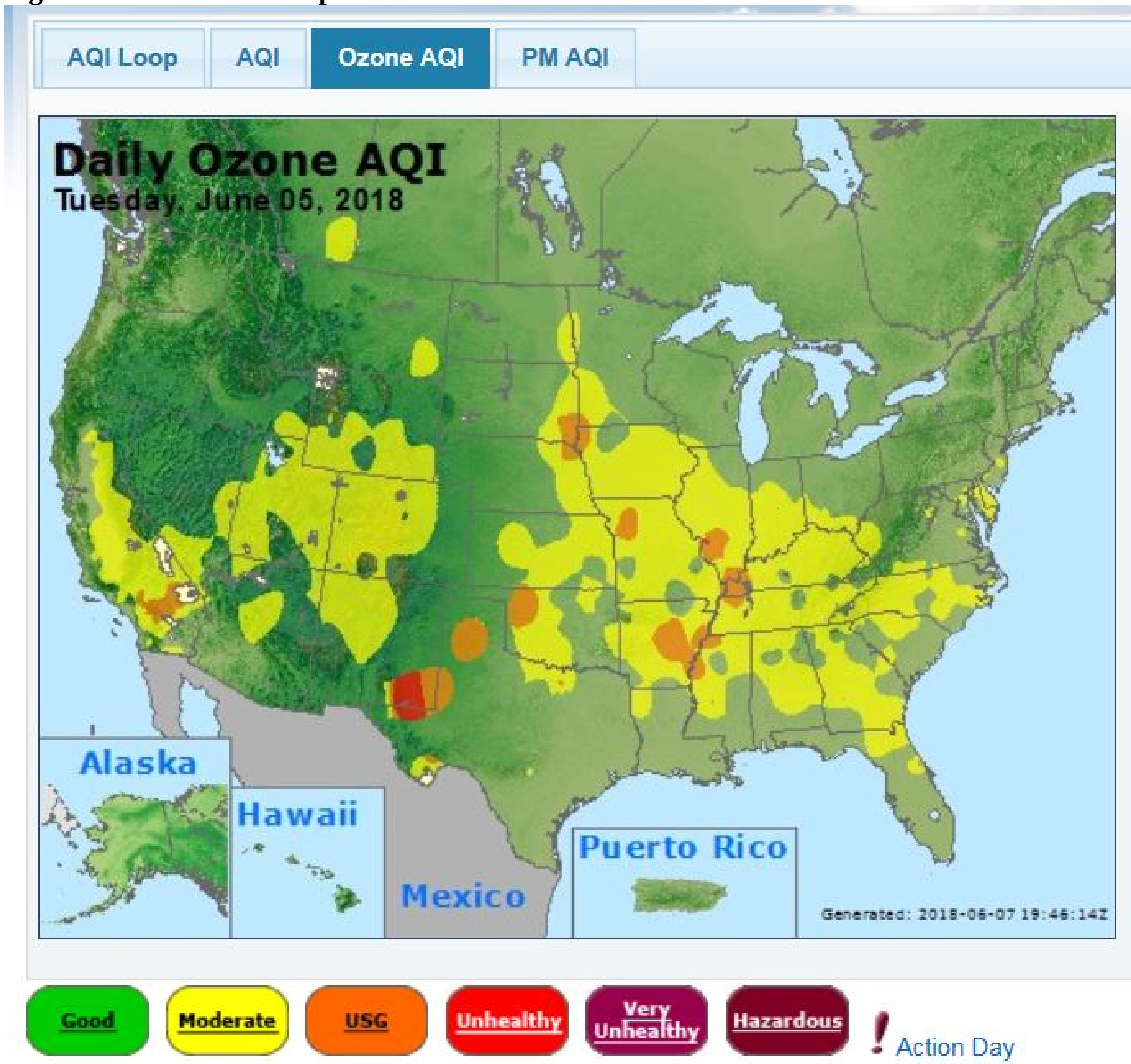
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-30 - AirNow Tech Map for 6/4/18



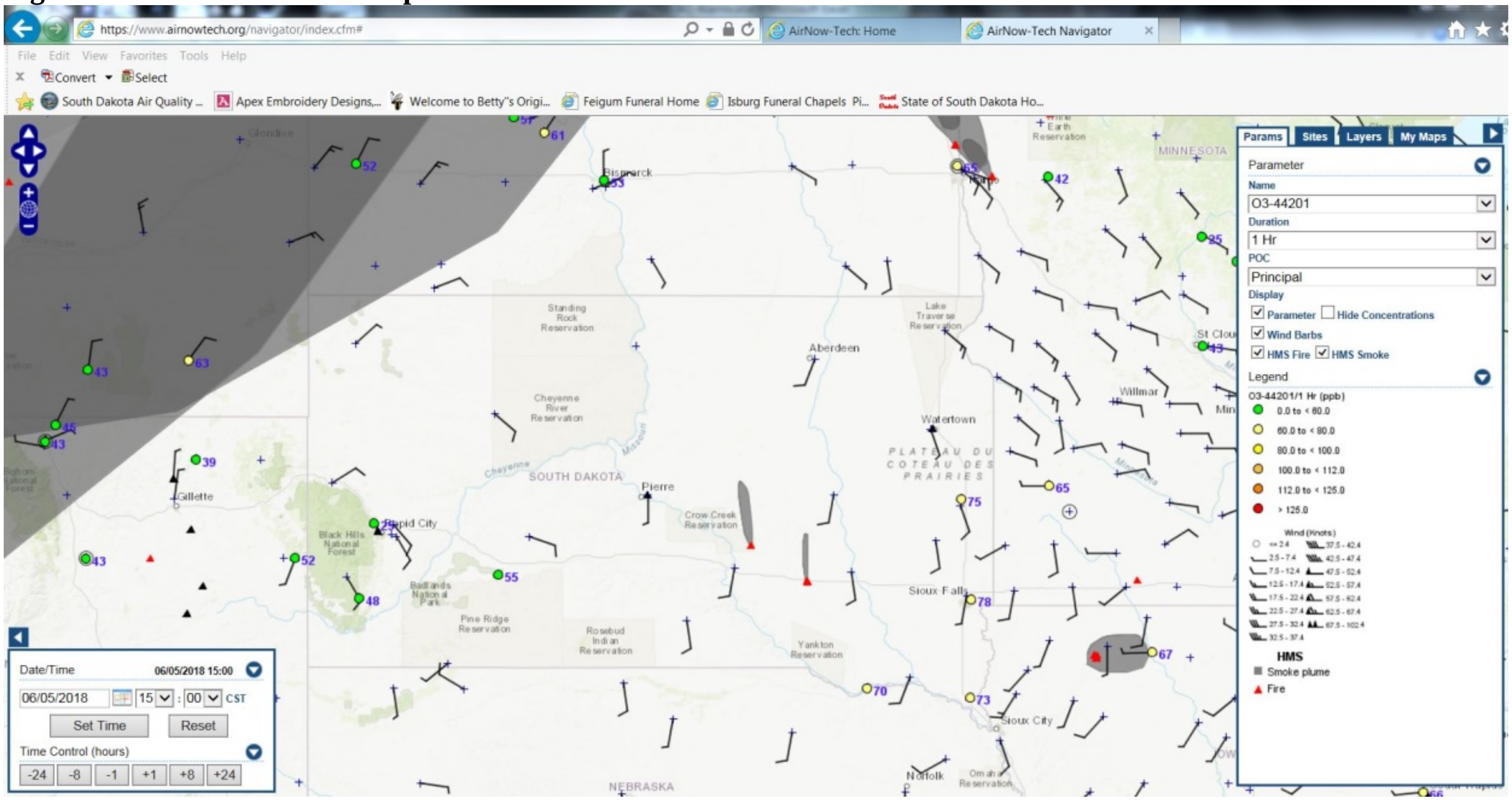
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-31 - AirNow Map for 6/5/18



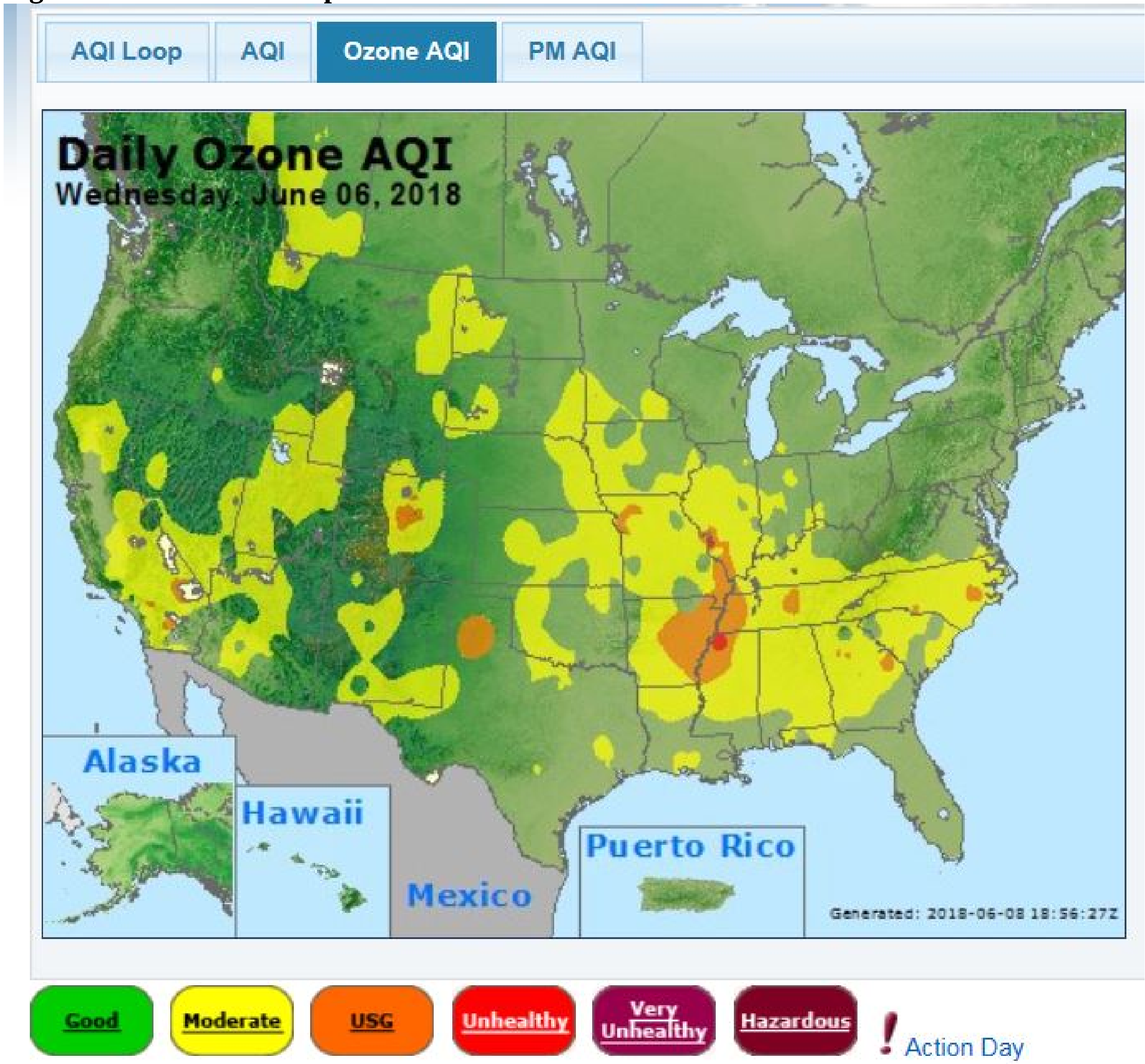
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-32 - AirNow Tech Map for 6/5/18



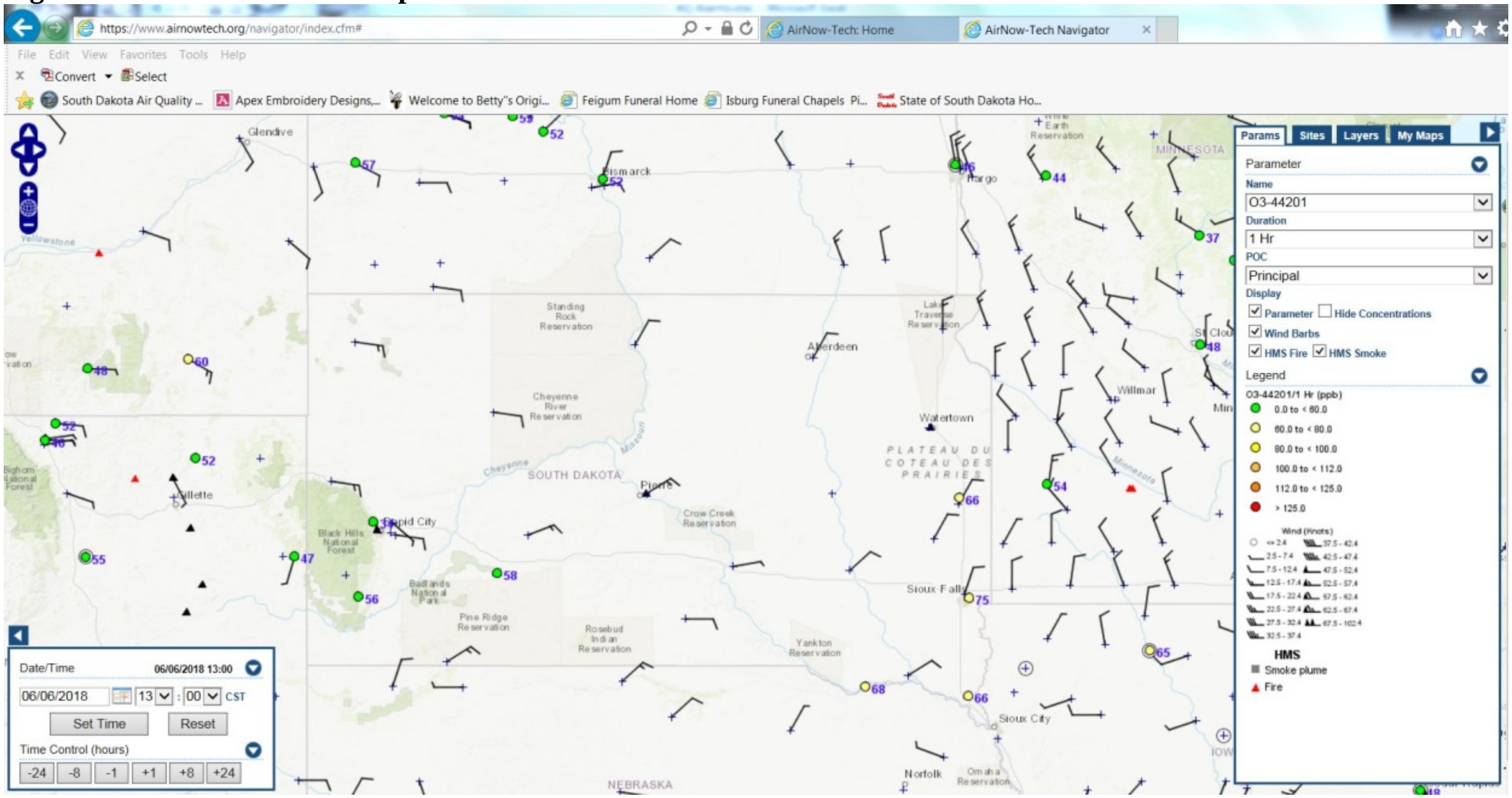
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-33 - AirNow Map for 6/6/18



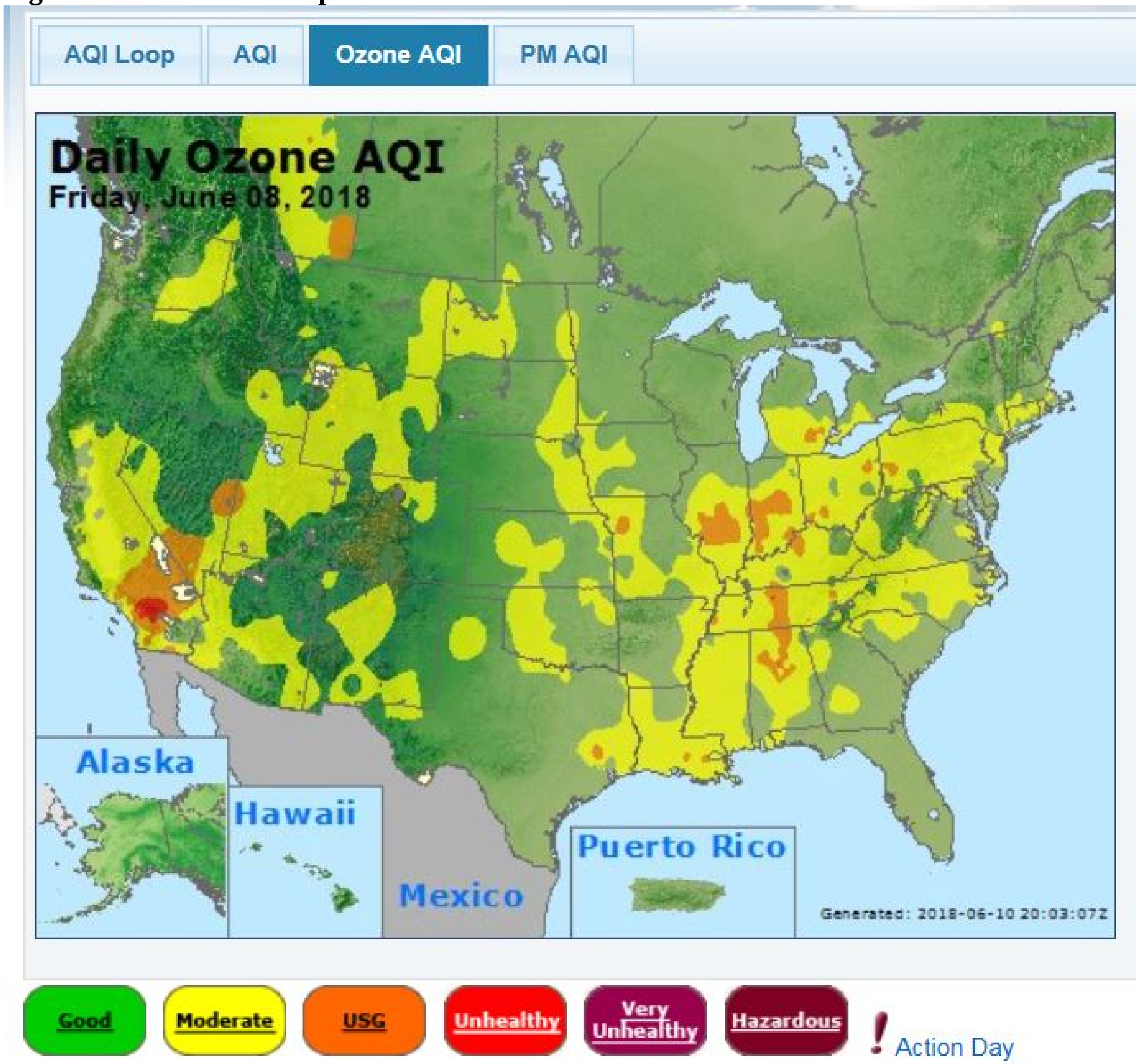
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-34 - AirNow Tech Map for 6/6/18



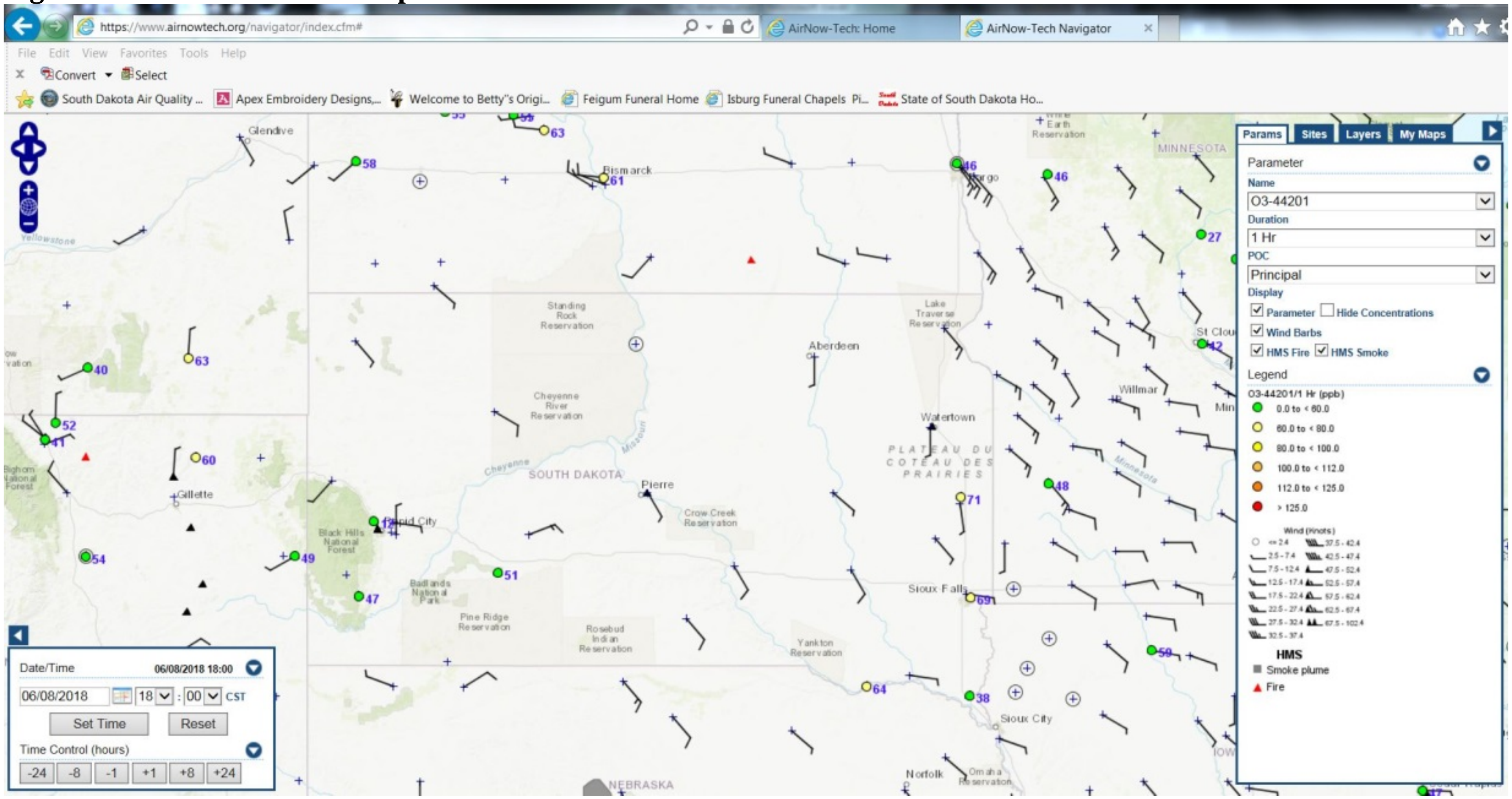
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-35 - AirNow Map for 6/8/18



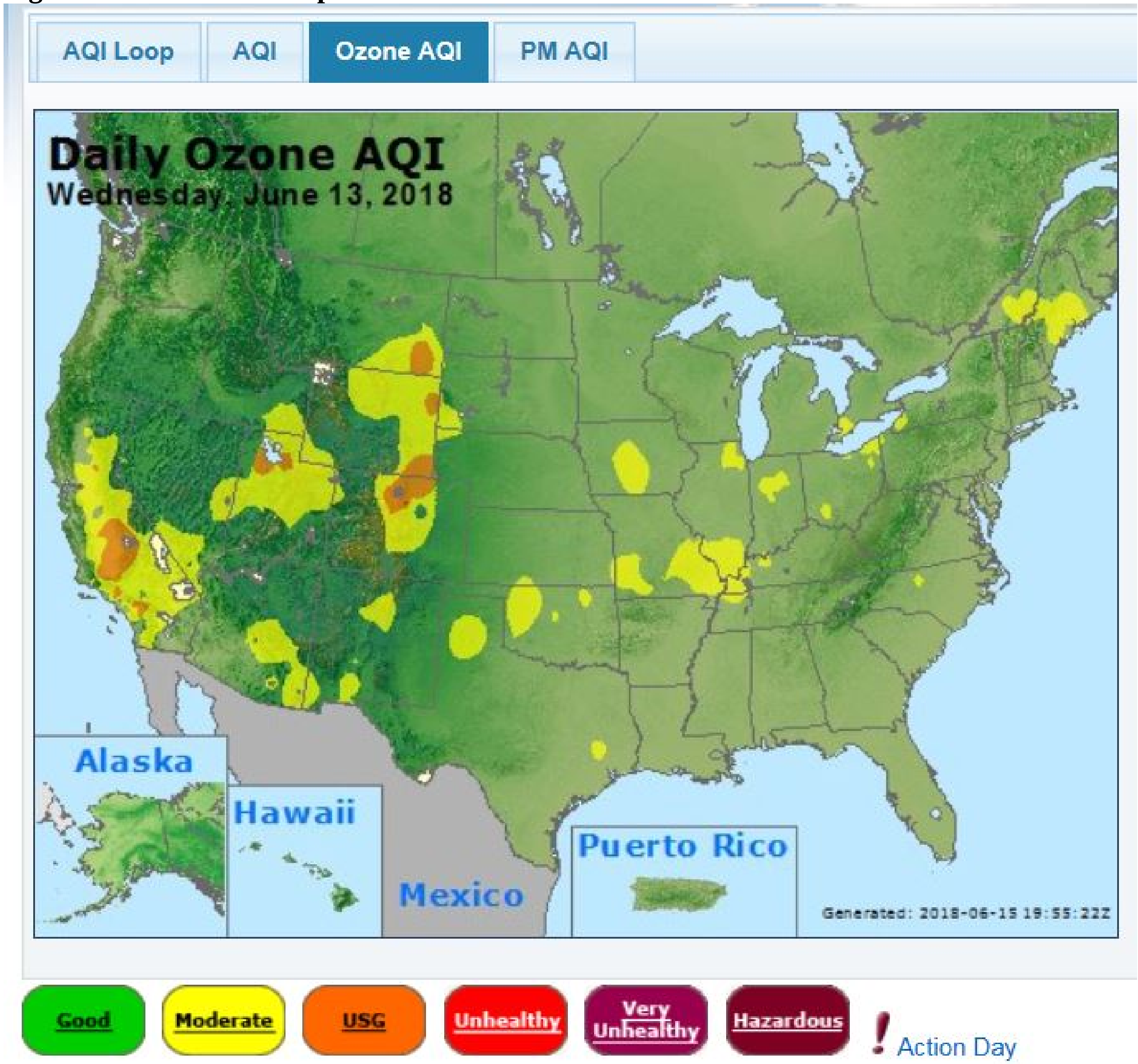
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-36 - AirNow Tech Map for 6/8/18



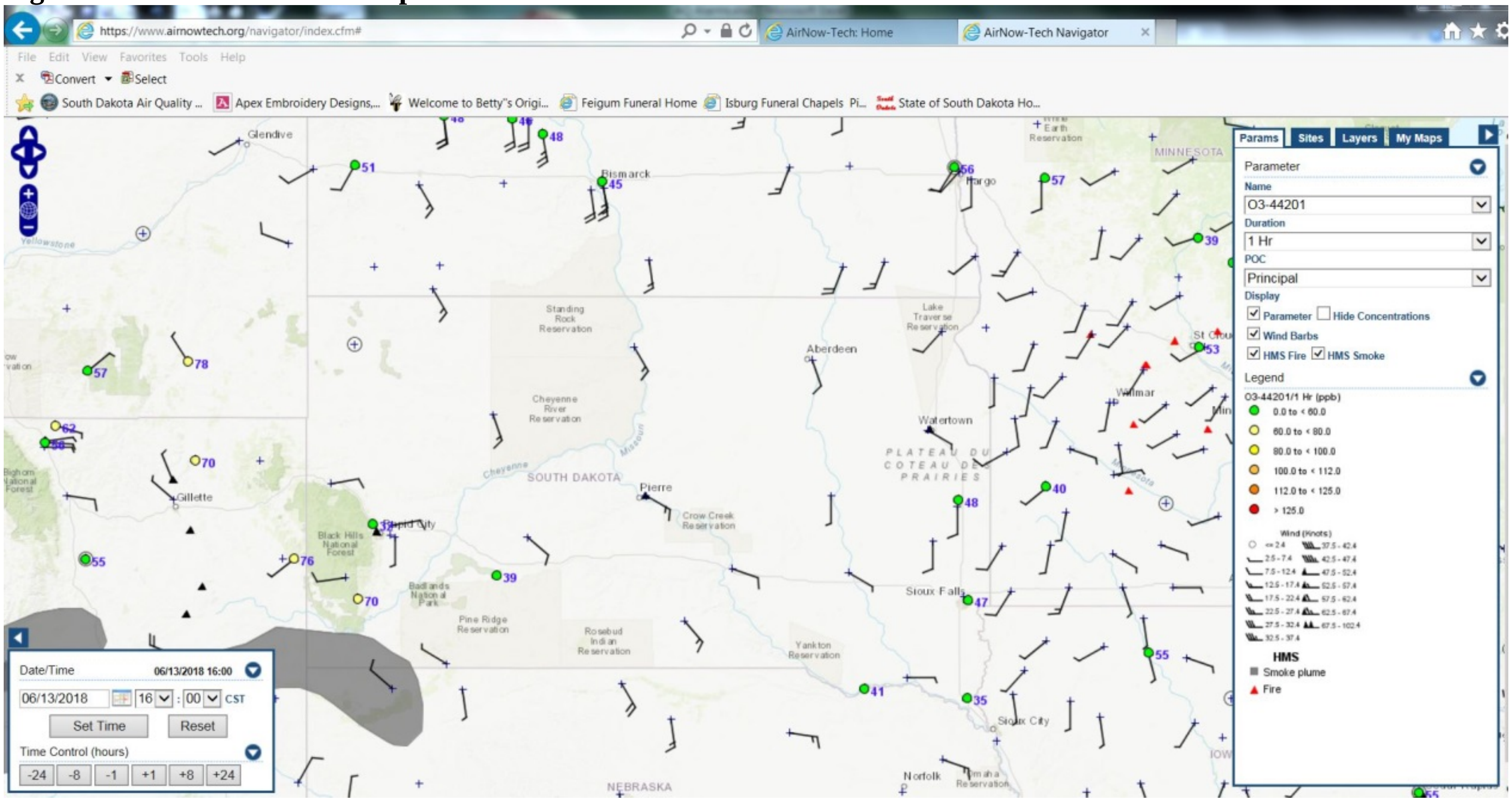
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-37 - AirNow Map for 6/13/18



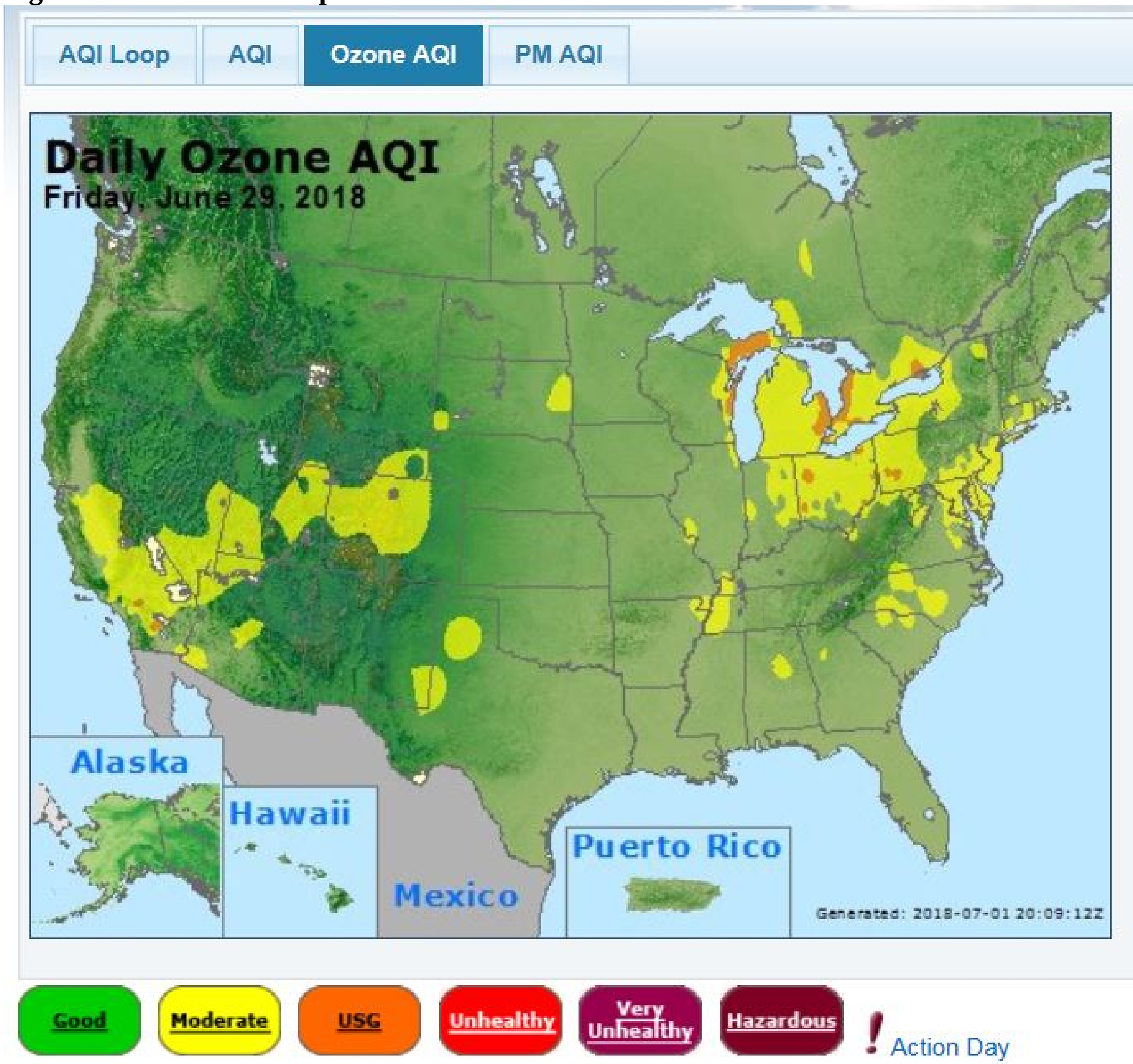
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-38 - AirNow Tech Map for 6/13/18



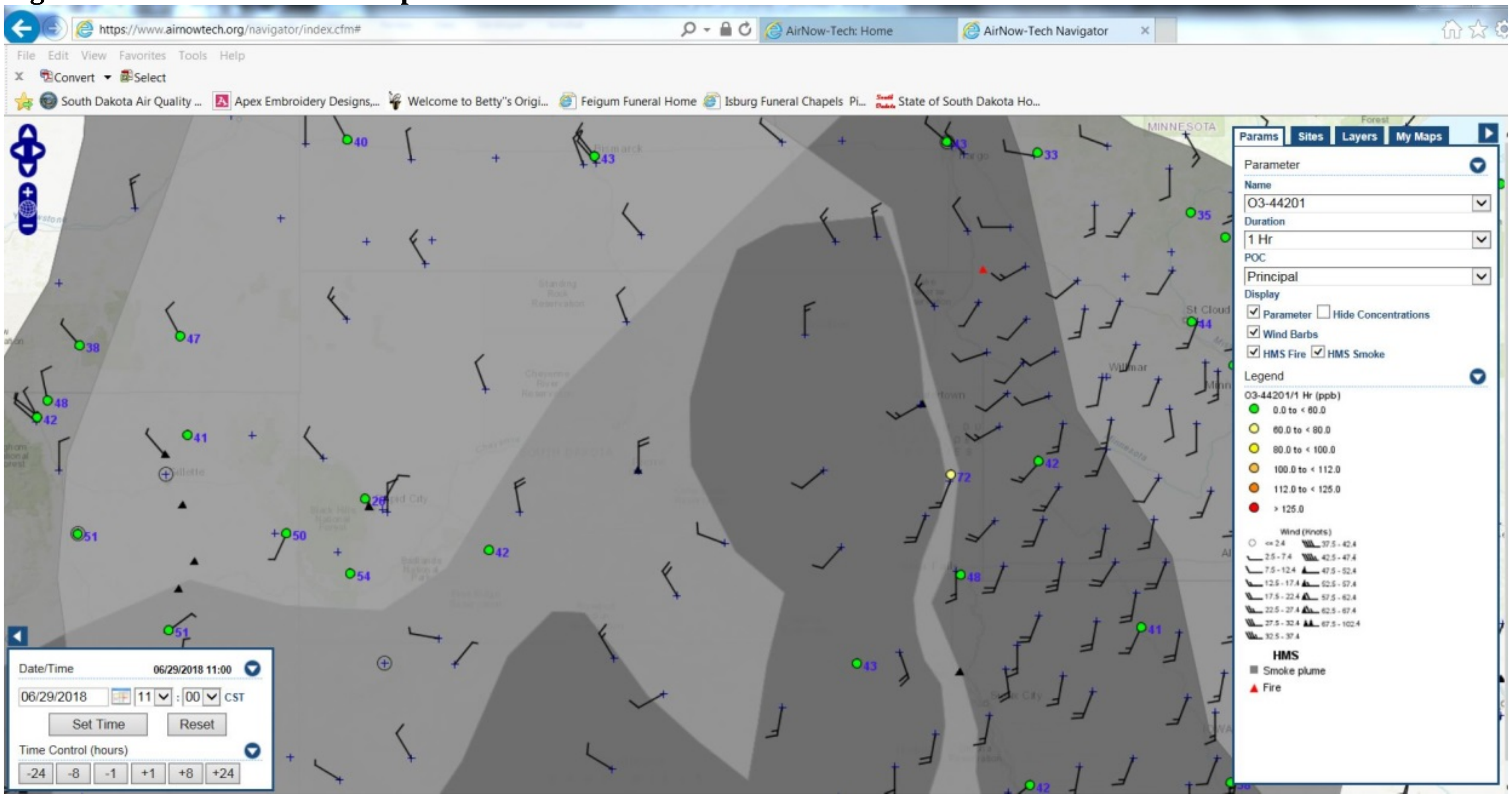
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-39 - AirNow Map for 6/29/18



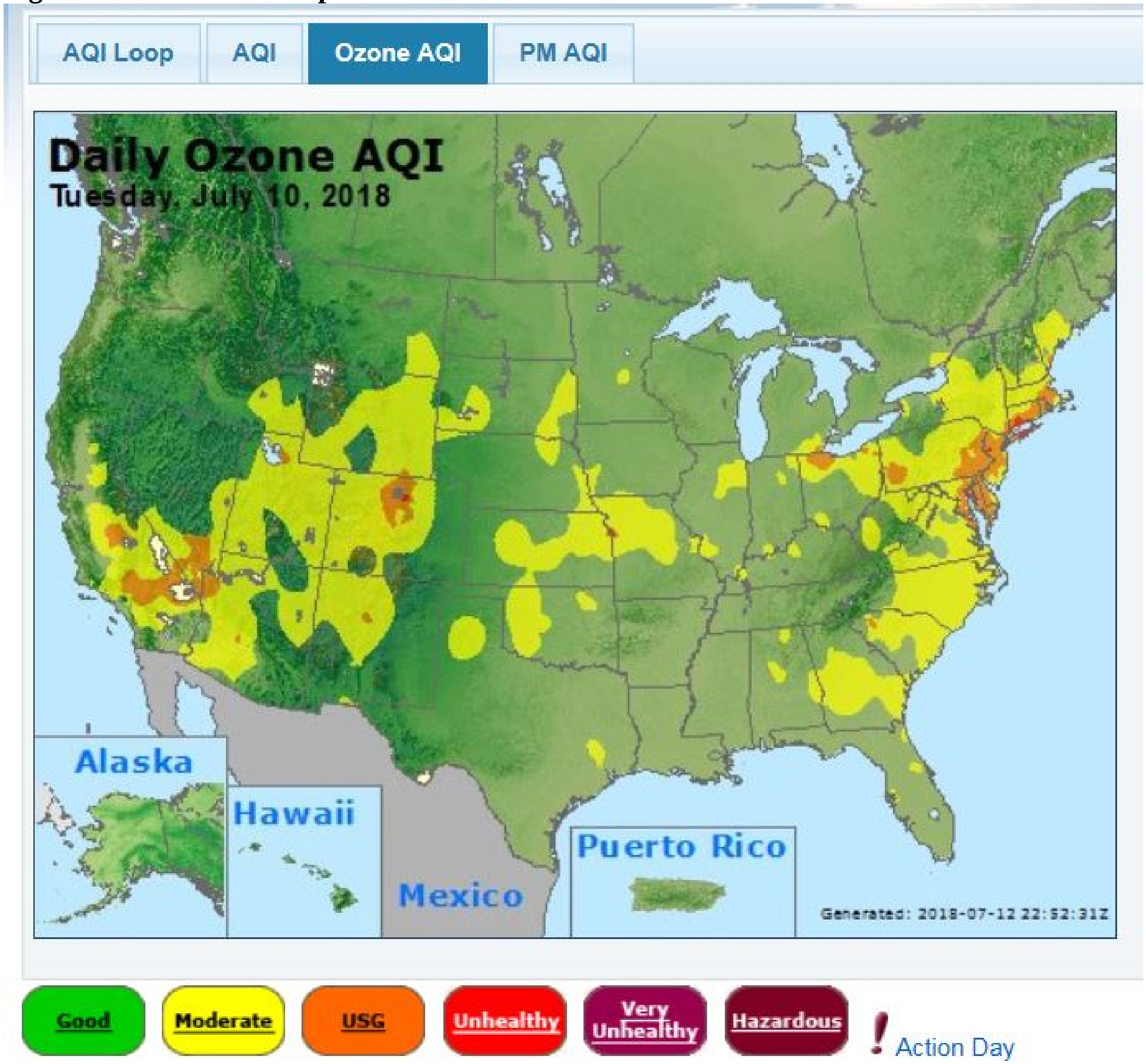
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-40 - AirNow Tech Map for 6/29/18



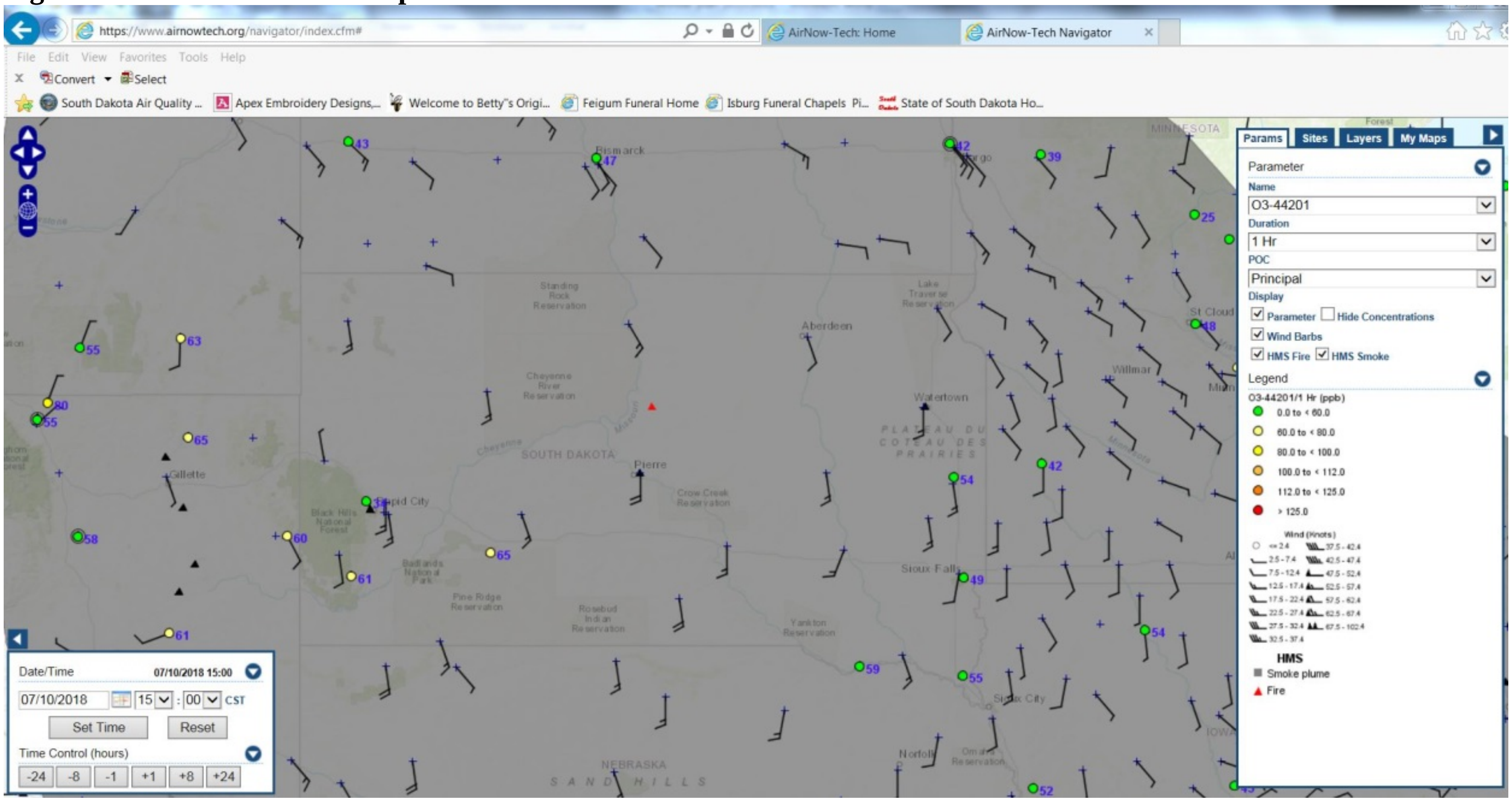
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-41 - AirNow Map for 7/10/18



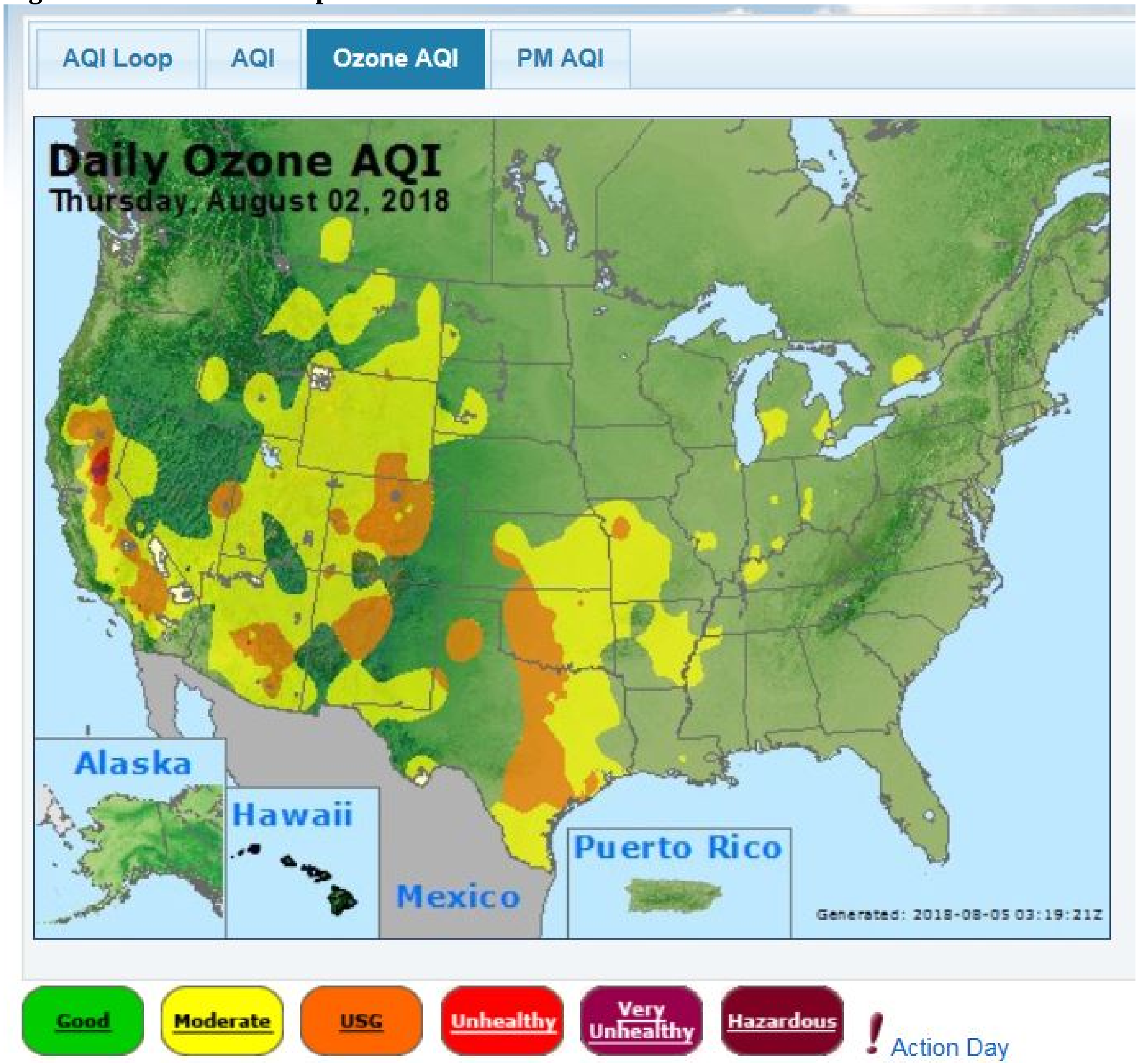
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-42 - AirNow Tech Map for 7/10/18



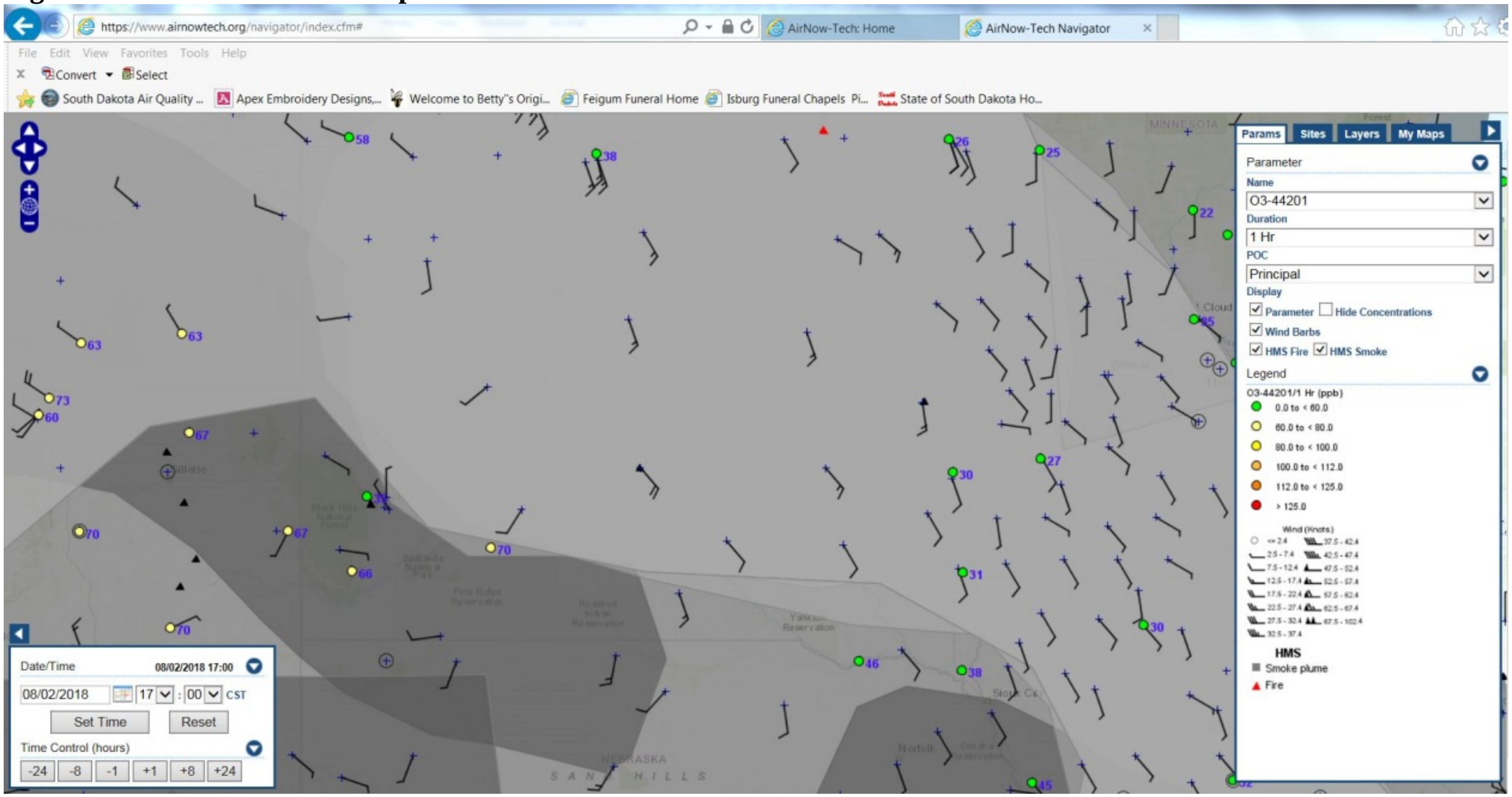
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-43 - AirNow Map for 8/2/18



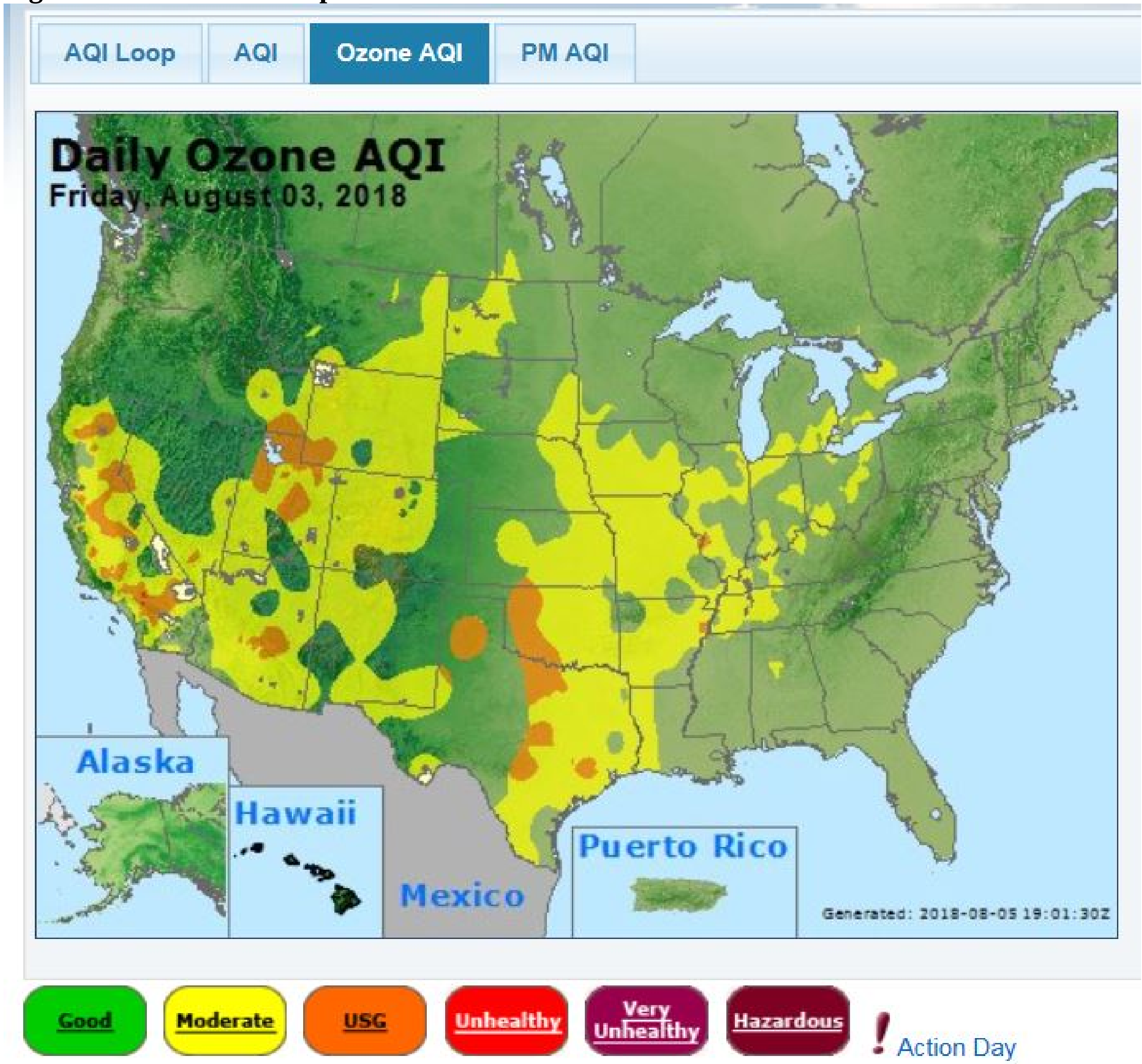
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-44 - AirNow Tech Map for 8/2/18



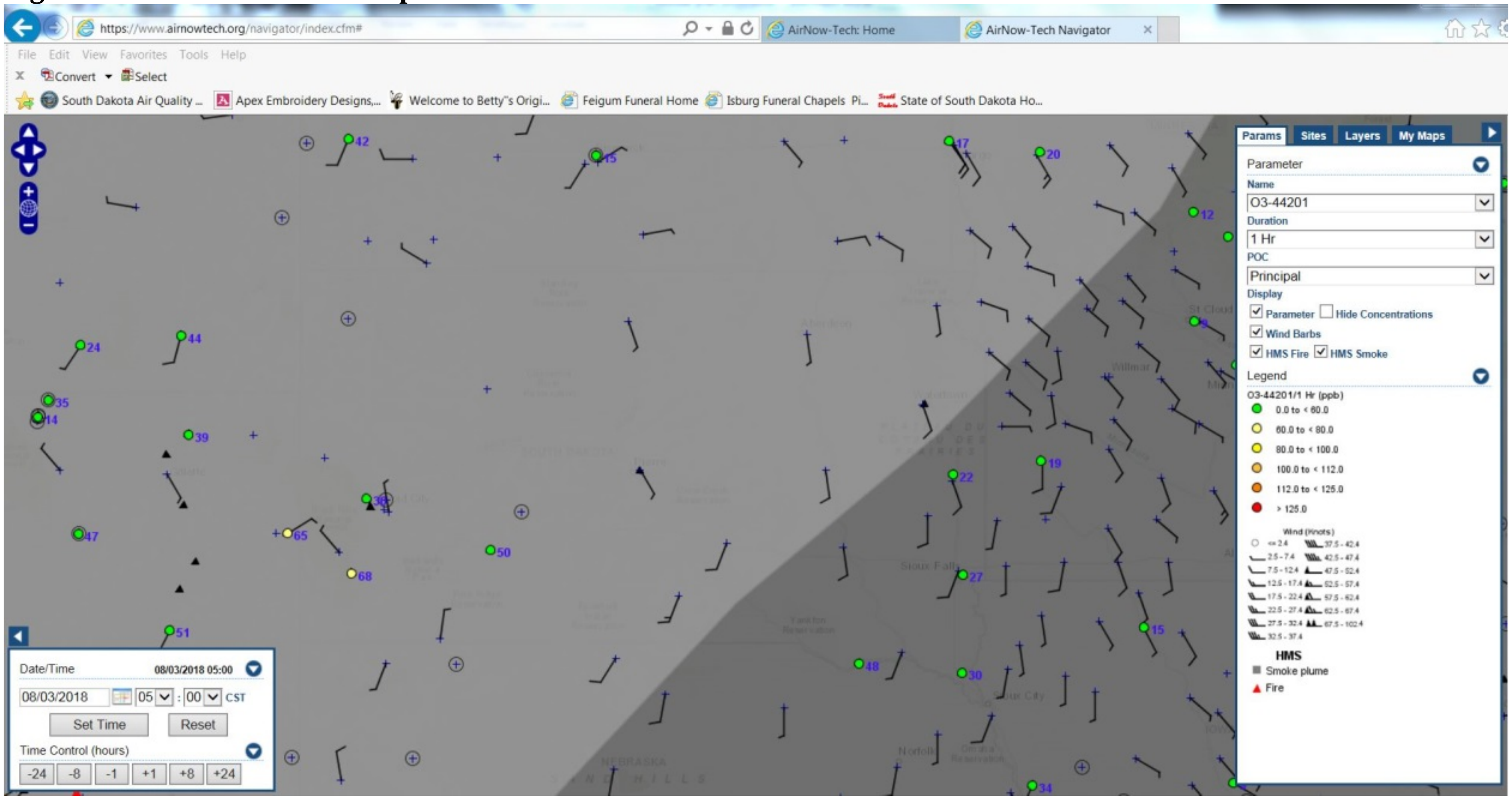
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-45 - AirNow Map for 8/3/18



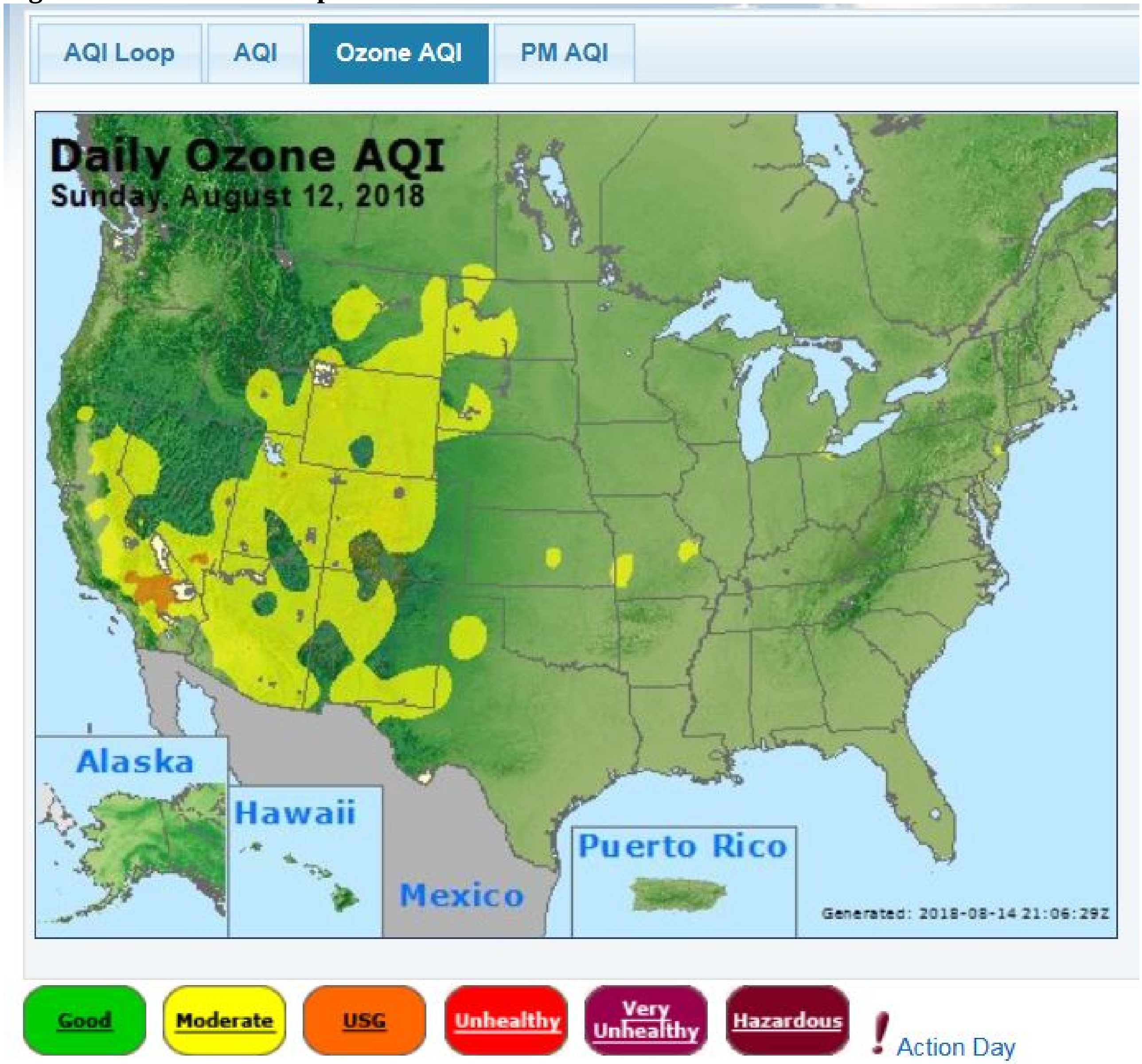
Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-46 - AirNow Tech Map for 8/3/18



Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-47 - AirNow Map for 8/12/18



Appendix C
AirNow Maps for 8-hour Average Ozone High Concentration Days

Figure C-48 - AirNow Tech Map for 8/12/18