Wyoming
Ambient Air Monitoring
Annual Network Plan 2016

Taken at Moxa Arch on 6/22/2015

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Acronyms

AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AQD	Wyoming Department of Environmental Quality – Air Quality Division
AQRV	Air Quality Related Value
AQS	EPA's Air Quality System database
BAM	Beta Attenuation Monitor
CFR	United States Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
DRR	SO_2 Data Requirements Rule
EPA	United States Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
IWDW	Intermountain West Data Warehouse
IMPACT	AQD's Inventory, Monitoring, Permitting, And Compliance Tracking data repository
MSA	Metropolitan Statistical Area
$\mu g/m^3$	Micrograms per cubic meter
µSA	Micropolitan Statistical Area
NAAQS	National Ambient Air Quality Standard
NCore	National Core Multi-Pollutant Monitoring Station
NMHC	Non-Methane Hydrocarbons
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
NO_y	Reactive Oxides of Nitrogen
NPAP	National Performance Audit Program
NSR	AQD's New Source Review Program
O_3	Ozone
OAQPS	EPA's Office of Air Quality Planning & Standards
ppb	Parts per billion
ppm	Parts per million
PM_{10}	Particulate Matter less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$	Particulate Matter less than 2.5 micrometers in aerodynamic diameter
POC	Parameter Occurrence Code
PQAO	Primary Quality Assurance Organization
PRB	Powder River Basin
PSD	Prevention of Significant Deterioration
QAPP	Quality Assurance Project Plan
QMP	Quality Management Plan
SLAMS	State and Local Air Monitoring Stations
SO_2	Sulfur Dioxide
SPM	Special Purpose Monitor
TEOM	Tapered Element Oscillating Microbalance
THC	Total Hydrocarbons

UGRB	Upper Green River Basin (Portions of Lincoln and Sweetwater Counties and all of Sublette County)
UGWOS	Upper Green Winter Ozone Study
VOC	Volatile Organic Compounds
VSCC	Very Sharp Cut Cyclone
WAAQS	Wyoming Ambient Air Quality Standards
WAQSR	Wyoming Air Quality Standards & Regulations
WDEQ	Wyoming Department of Environmental Quality
WyVisNet	The AQD's monitoring website, **http://www.wyvisnet.com**

1.0 Introduction

The Wyoming Department of Environmental Quality-Air Quality Division (AQD) presents its annual ambient monitoring Network Plan for 2016 to the United States Environmental Protection Agency (EPA) in accordance with Title 40, Part 58.10(a)(1) of the Code of Federal Regulations (CFR). The Network Plan provides a comprehensive review of the ambient monitoring stations owned and operated by the AQD. This includes the AQD's State and Local Air Monitoring Stations (SLAMS), Special Purpose Monitors (SPMs), mobile trailers that monitor for particulates and or gaseous pollutants, and the National Core Multi-Pollutant Monitoring Station (NCore). Additionally, this Network Plan covers monitoring required by the SO_2 Data Requirements Rule (Title 40 Part 51 Subpart BB). The Network Plan also contains the details to show the AQD's ambient monitoring network will satisfy the requirements of Title 40, Part 58 Appendices A, C, D, & E of the CFR.

1.1 The AQD's Ambient Monitoring History

For over 40 years, the AQD Monitoring Section has been striving to efficiently and effectively monitor air quality in the State of Wyoming with the goal of protecting, conserving, and enhancing the quality of Wyoming's environment for the benefit of current and future generations. The Monitoring Section is part of the larger Air Quality Resource Management Program, which gathers ambient monitoring data, emission inventory trends, and planned development to provide the AQD with critical information in order to determine future policy considerations. As mentioned in the introduction, the AQD owns and operates different types of ambient monitoring stations: SLAMS, SPMs, mobile trailers, and an NCore station. The SLAMS stations are sited in populated areas to monitor public health and demonstrate compliance with the National Ambient Air Quality Standards (NAAQS). The SPM stations have multiple objectives including monitoring public heath, investigating pollutant concentrations downwind of sources, and determining background pollutant concentrations. For the past five (5) years, the AQD has also operated a fleet of mobile monitoring trailers to investigate questions or concerns about air quality on a short-term basis (typically one year). Additionally, the AQD operates an NCore station as part of the national network to evaluate long-term trends in air quality. The AQD also helps fund and evaluate data from Air Quality Related Value (AQRV) monitoring within Wyoming, such as visibility and acid deposition, as well as overseeing industrial monitoring required by air quality permits. Figure 1 shows the number of monitors the AQD runs or oversees from 1999 to May of 2016.

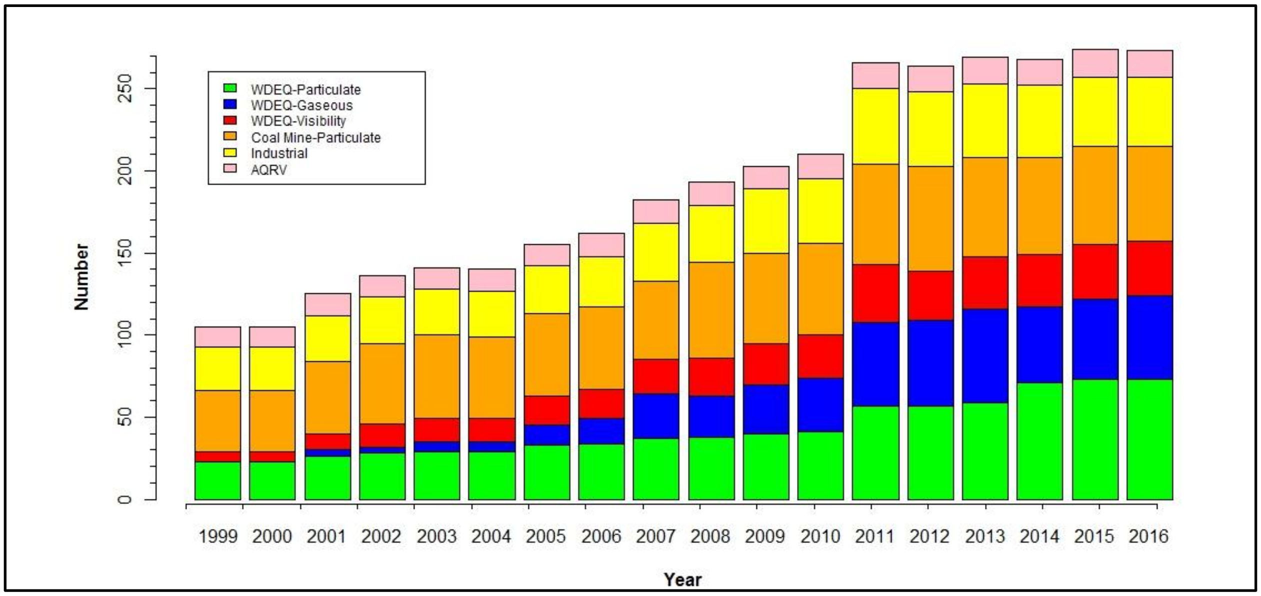


Figure 1. Number of Monitors in Wyoming from 1999-2016

1.2 General Monitoring Goals and Objectives

The AQD and Wyoming Department of Environmental Quality are committed to protect, conserve, and enhance the quality of Wyoming's environment for the benefit of current and future generations. In order to maintain the ambient air quality in accordance with the NAAQS for the seven (7) criteria pollutants, the AQD operates and maintains a network of ambient air quality monitors.

The Wyoming monitoring network, collectively, is designed to meet the following seven (7) basic ambient air monitoring objectives:

1. Determine representative concentrations in areas of high population density.
2. Determine impact on ambient air quality from significant sources.
3. Determine general background concentration levels.
4. Determine the extent of regional pollutant transport among populated areas and in rural and remote areas.
5. Determine welfare-related impacts in support of secondary standards.
6. Determine highest concentration expected to occur in the area covered by the network.
7. Research pollutant and meteorological behaviors in areas of concern.

It should be noted that not every monitor or monitoring station will meet all seven (7) objectives individually, but the AQD's monitoring network as a whole will encompass and fulfill all of the objectives. Figure 2, below, is a map that shows the AQD's SLAMS, SPMs, and Mobile monitoring current locations. Specific maps of each quadrant of Wyoming may be found in Appendix C. Following the map is a brief overview of the Wyoming Monitoring Network in Table 1.

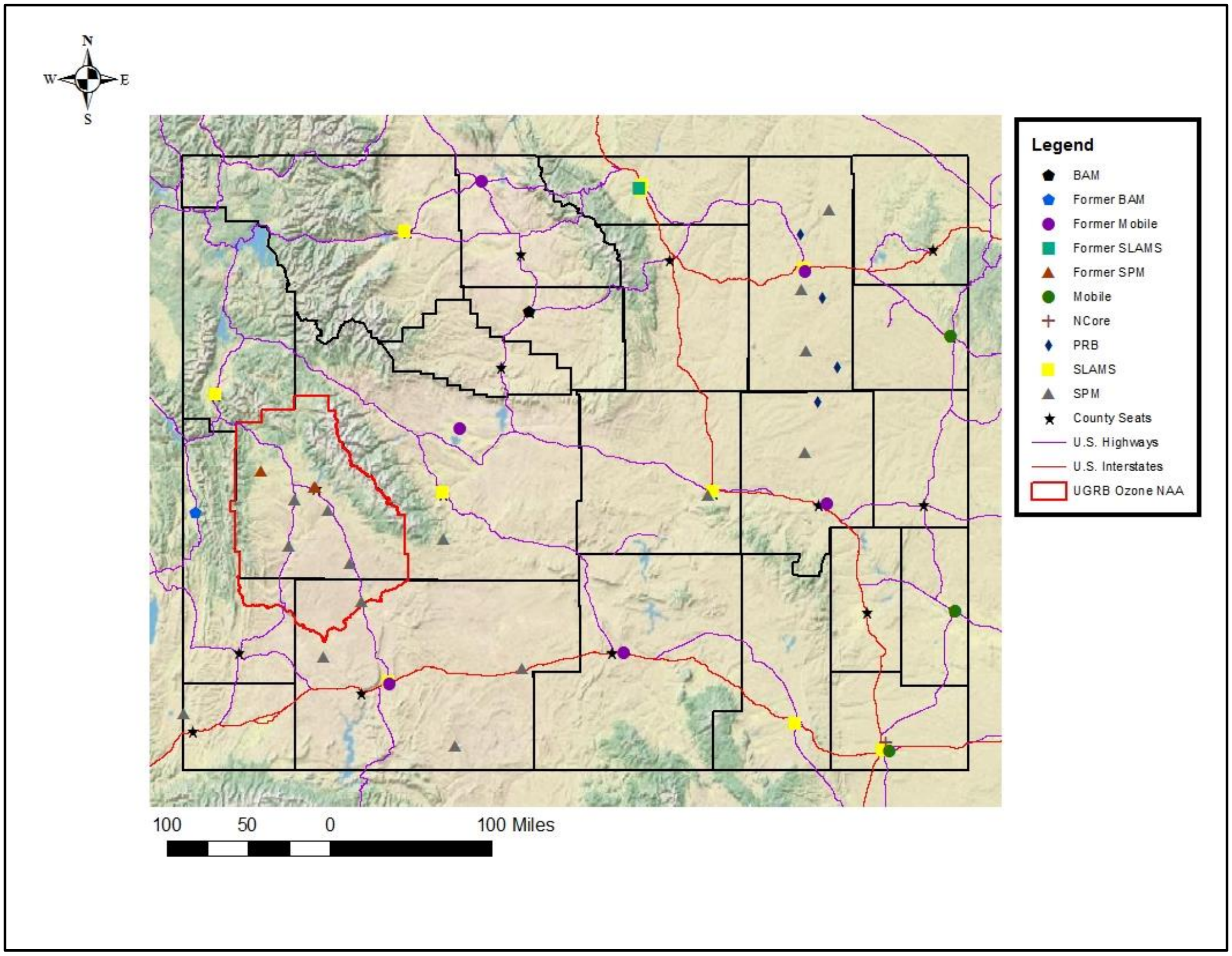


Figure 2. AQD Monitoring Site Locations (Past and Present)

NAME	COUNTY	PARAMETER										
		PM_{10} (manual)	**PM_{10} (continuous)**	**$PM_{2.5}$ (manual)**	**$PM_{2.5}$ (continuous)**	**NO_x**	**O_3**	**SO_2**	**CO**	**Camera**	**Met**	**Other**
Laramie SLAMS	Albany	X		X								
Belle Ayr BA-4	Campbell				X	X						
Black Thunder BTM-36-2	Campbell				X							
Buckskin Mine	Campbell				X							
Campbell County	Campbell		X			X	X			X	X	
Gillette SLAMS	Campbell	X										
Thunder Basin	Campbell					X	X			X	X	Visibility
Wright Jr-Sr High School	Campbell	X										
Antelope Site 7	Converse				X	X						
Converse County	Converse		X			X	X			X	X	CH_4/NMHC
Lander SLAMS	Fremont	X		X								
South Pass	Fremont				X	X	X			X	X	
Torrington Mobile	Goshen		X		X	X	X	X		X	X	CH_4/NMHC
Cheyenne SLAMS	Laramie	X		X								
Cheyenne Mobile	Laramie		X		X	X	X	X		X	X	CH_4/NMHC
Cheyenne NCore	Laramie		X	X	X	X	X	Trace	Trace	X	X	NO/NO_y, $PM_{10-2.5}$, Speciated $PM_{2.5}$
Casper SLAMS	Natrona	X		X								
Casper Gaseous	Natrona					X	X			X	X	
Cody SLAMS	Park	X		X								
Sheridan Meadowlark SLAMS	Sheridan	X		X								
Sheridan Police Station SLAMS	Sheridan		X	X							X	
Big Piney	Sublette					X	X			X	X	
Boulder	Sublette		X			X	X			X	X	NO_y CH_4/NMHC, Photolytic NO_2
Daniel South	Sublette		X			X	X			X	X	
Juel Spring	Sublette					X	X			X	X	
Pinedale Gaseous	Sublette				X	X	X			X	X	
Farson Met	Sweetwater										X	
Hiawatha	Sweetwater						X			X	X	
Moxa Arch	Sweetwater		X			X	X	X		X	X	
Rock Springs SLAMS	Sweetwater	X		X								
Wamsutter	Sweetwater		X			X	X			X	X	CH_4/NMHC
Jackson SLAMS	Teton	X		X								

NAME	COUNTY	PARAMETER										
		PM_{10} (manual)	PM_{10} (continuous)	$PM_{2.5}$ (manual)	$PM_{2.5}$ (continuous)	NO_x	O_3	SO_2	CO	Camera	Met	Other
Murphy Ridge	Uinta		X			X	X			X	X	
Worland BAM Trailer	Washakie		X		X						X	
Newcastle Mobile	Weston		X		X	X	X	X		X	X	CH_4/NMHC

Table 1. Overview of Wyoming Monitors

2.0 Air Monitoring Plan in 2016

2.1 SLAMS

The SLAMS are used for supplying general monitoring data for criteria pollutants and determining compliance with the NAAQS. The SLAMS are long-term stations that must meet and follow specific quality assurance, monitoring methodology, sampling objectives and siting requirements. The AQD SLAMS are located in Wyoming's most populous towns with the purpose of determining compliance with the NAAQS for the protection of public health. The ten (10) stations specified as Wyoming SLAMS locations are described below. Each description includes a satellite view of the SLAMS in the town or city, a table describing the site and instrumentation, and a graph of annual means of PM_{10} and, if measured at the site, $PM_{2.5}$.

2.1.1 Casper SLAMS

Figure 3. Casper SLAMS satellite view and monitor photo (inset)

Casper – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Casper SLAMS	City, County Bldg.; Center & C Streets (Casper MSA)	56-025-0001	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 3 days (primary); 1 in 12 days (collocate)	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes

Table 2. Casper SLAMS Monitor Information

This station is located in downtown Casper, a city and metropolitan statistical area (MSA) of approximately 56,000 people. Casper is the second largest city in Wyoming, located in Natrona County near the center of Wyoming. Sampling for PM_{10} began at this station in 1991. A collocated PM_{10} sampler was added in 2001 and the hi-volume PM_{10} samplers were replaced with low-volume partisols in 2010. Due to its population, the AQD added $PM_{2.5}$ sampling at the Casper station on May 22, 2009 to monitor $PM_{2.5}$ concentrations in Casper.

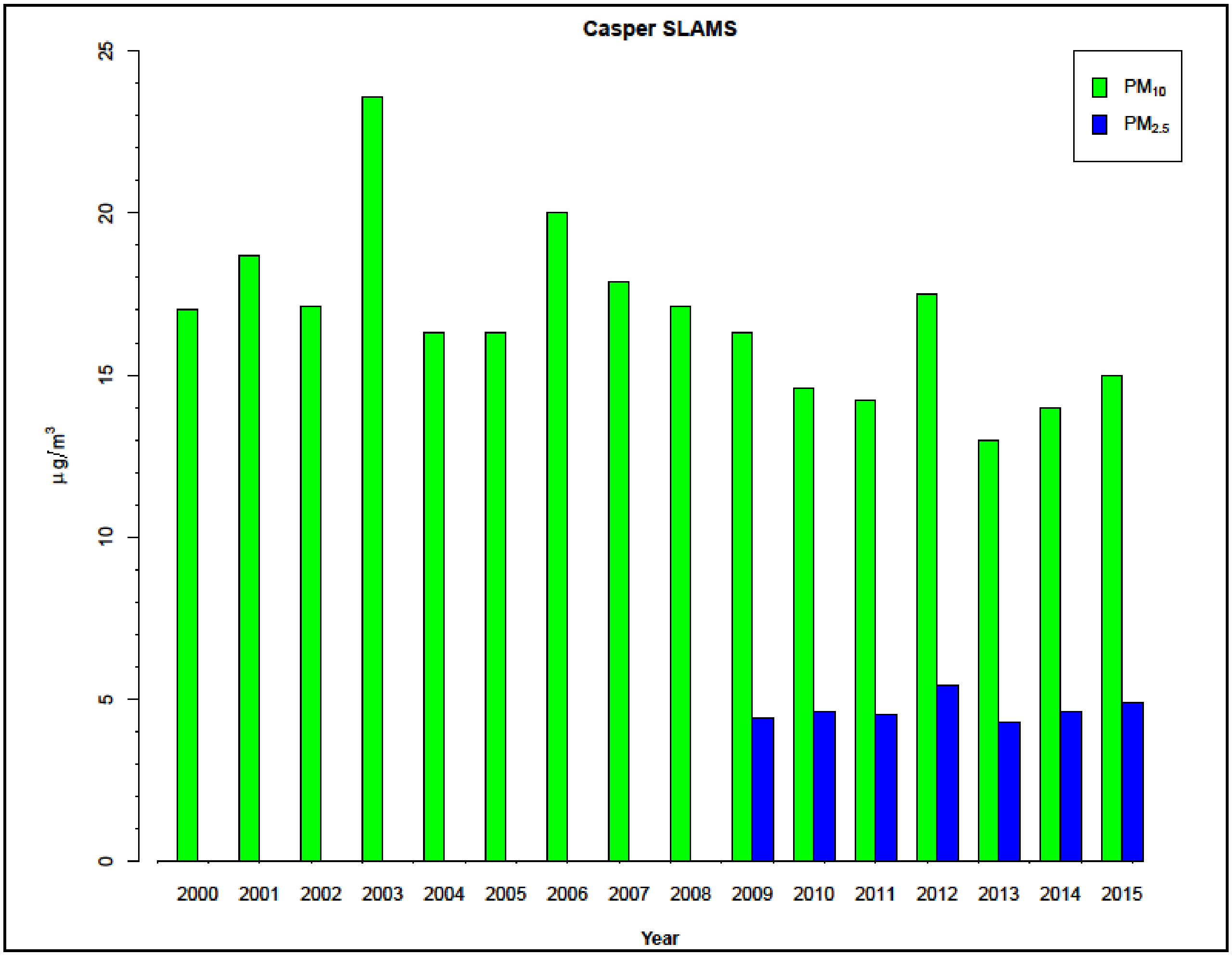


Figure 4. Casper SLAMS Annual Means

2.1.2 Cheyenne SLAMS

Figure 5. Cheyenne SLAMS satellite view with monitor photo (inset)

Cheyenne – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Cheyenne SLAMS	Emerson Bldg.; 23rd & Central Ave. (Cheyenne MSA)	56-021-0001	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 3 days (primary); 1 in 12 days (collocate)	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (primary); 1 in 12 days (collocate)	No planned changes

Table 3. Cheyenne SLAMS Monitor Information

The Cheyenne monitoring station is located in downtown Cheyenne on the roof of the Emerson Building; a State of Wyoming owned building. Cheyenne is the capital and largest city of Wyoming with a population of approximately 62,845 according to the 2014 U.S. Census Bureau estimate. The population size leads to the classification of Cheyenne, WY as a MSA. The PM_{10} sampling started in 1991. A collocated PM_{10} sampler was added in 2002. The $PM_{2.5}$ monitors were added in 1998. A collocated $PM_{2.5}$ sampler was added in March 2009 to comply with Title 40 Part 58 requirements from the CFR for collocation of samplers. The 2015 Network Assessment revealed a sharp correlation of the PM_{10} and $PM_{2.5}$ data between the Cheyenne SLAMS and Cheyenne NCore station. The AQD is evaluating these data further to determine if the SLAMS and NCore particulate data are redundant. If so, the AQD will consider the benefits and drawbacks of decommissioning the Cheyenne SLAMS.

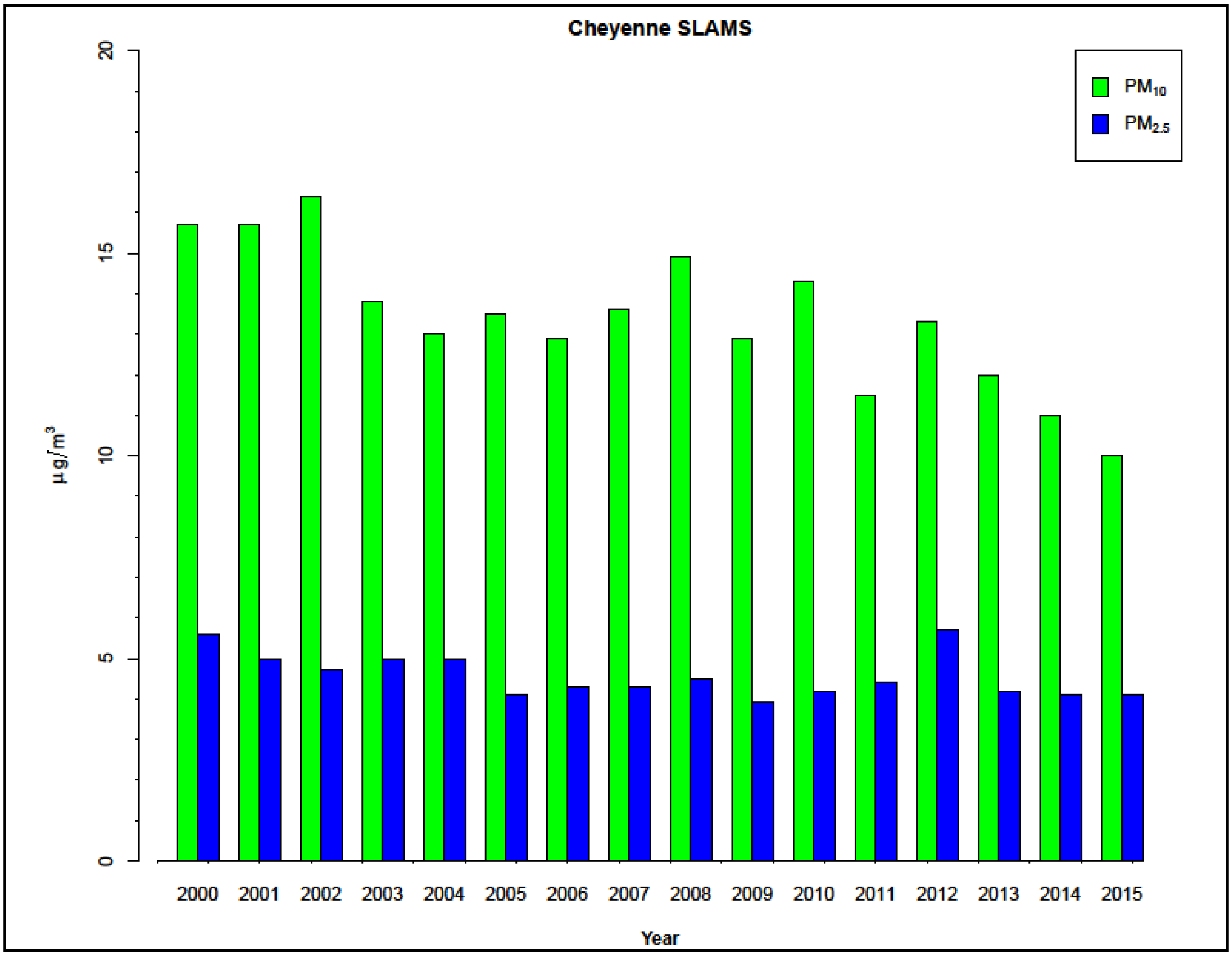


Figure 6. Cheyenne SLAMS Annual Means

2.1.3 Cody SLAMS

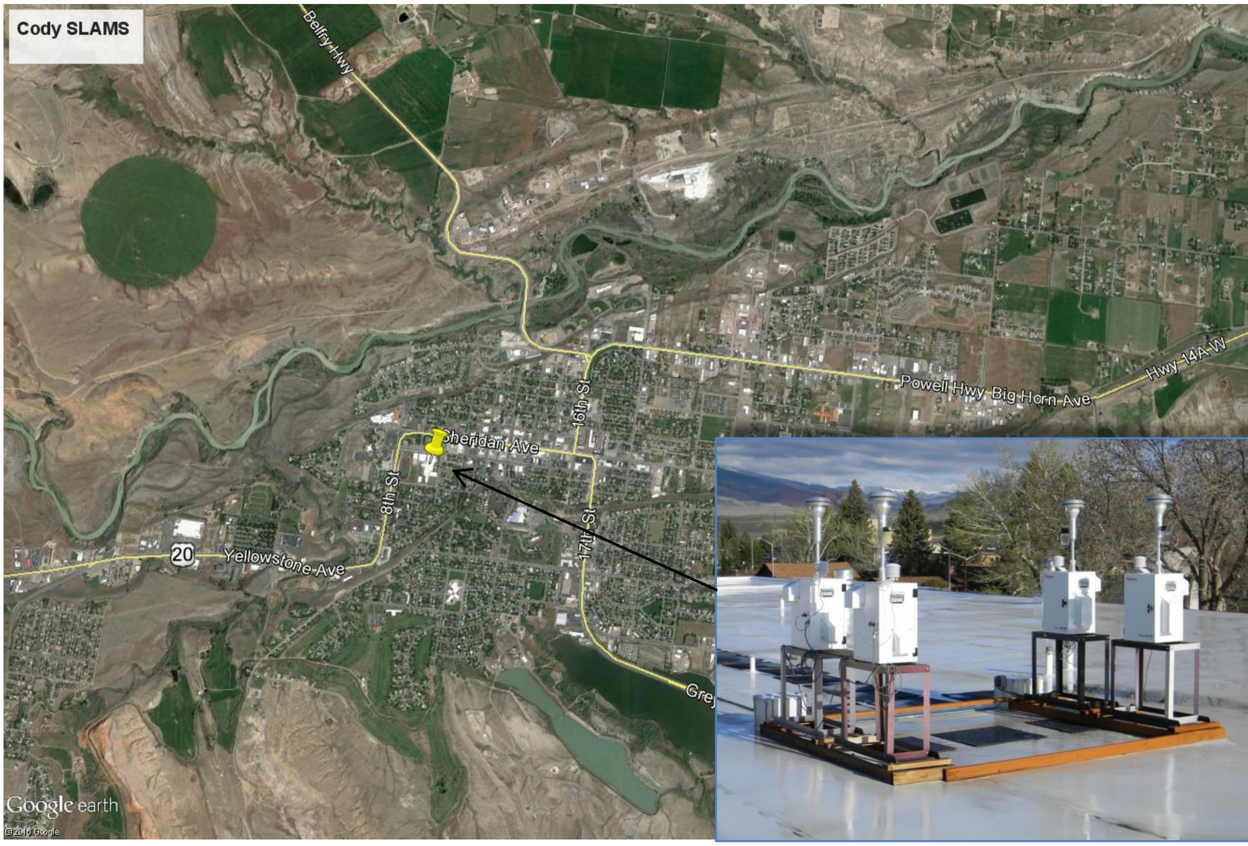


Figure 7. Cody SLAMS satellite view and monitor photo (inset)

Cody – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Cody SLAMS	1225 10th Street	56-029-0001	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes

Table 4. Cody SLAMS Monitor Information

Cody is located in the northwest portion of the State in Park County. Its population is approximately 9,600. The AQD initiated PM_{10} sampling at this station in 1988. The PM_{10} samplers were upgraded to the current instrument seen in Table 4 during 2010. In June 2008, $PM_{2.5}$ monitoring began at the Cody SLAMS. The AQD started monitoring $PM_{2.5}$ concentrations in Cody due to monitor impacts from wintertime sanding, wood smoke, summertime forest fires, and the nearby lake bed that can be exposed at low water levels.

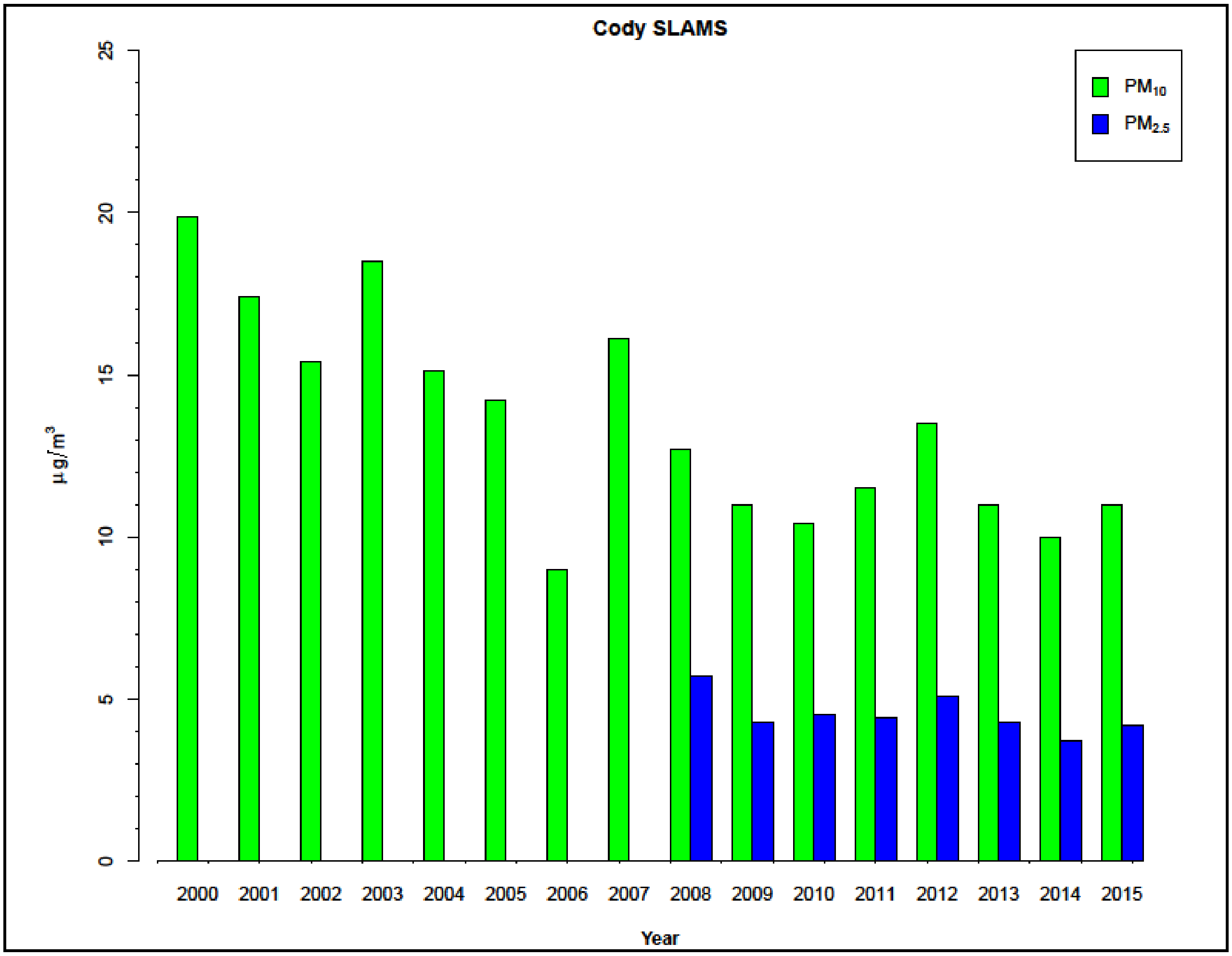


Figure 8. Cody SLAMS Annual Means

2.1.4 Gillette SLAMS

Figure 9. Gillette SLAMS satellite view and monitor photo (inset)

Gillette – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Gillette SLAMS	1000 W. 8th St.	56-005-1002	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 6 days	No planned changes

Table 5. Gillette SLAMS Monitor Information

Gillette is located in Campbell County, the northeastern part of the State. Its population is approximately 29,400 and is classified as a micropolitan statistical area (µSA). In 1991, PM_{10} sampling began at this station. In 2010, the sampler was upgraded to a low-volume sampler as defined above in Table 5.

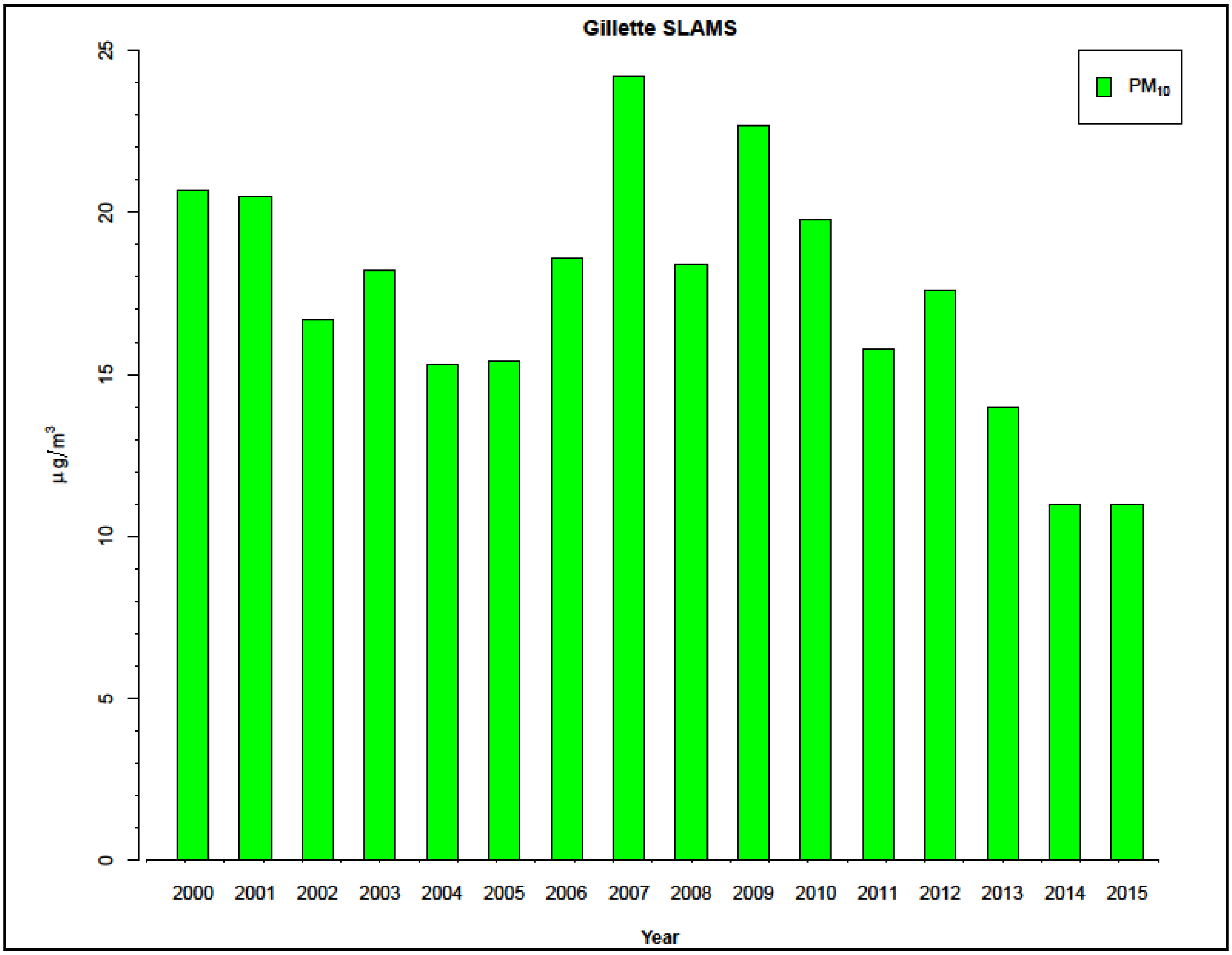


Figure 10. Gillette SLAMS Annual Means

2.1.5 Jackson SLAMS

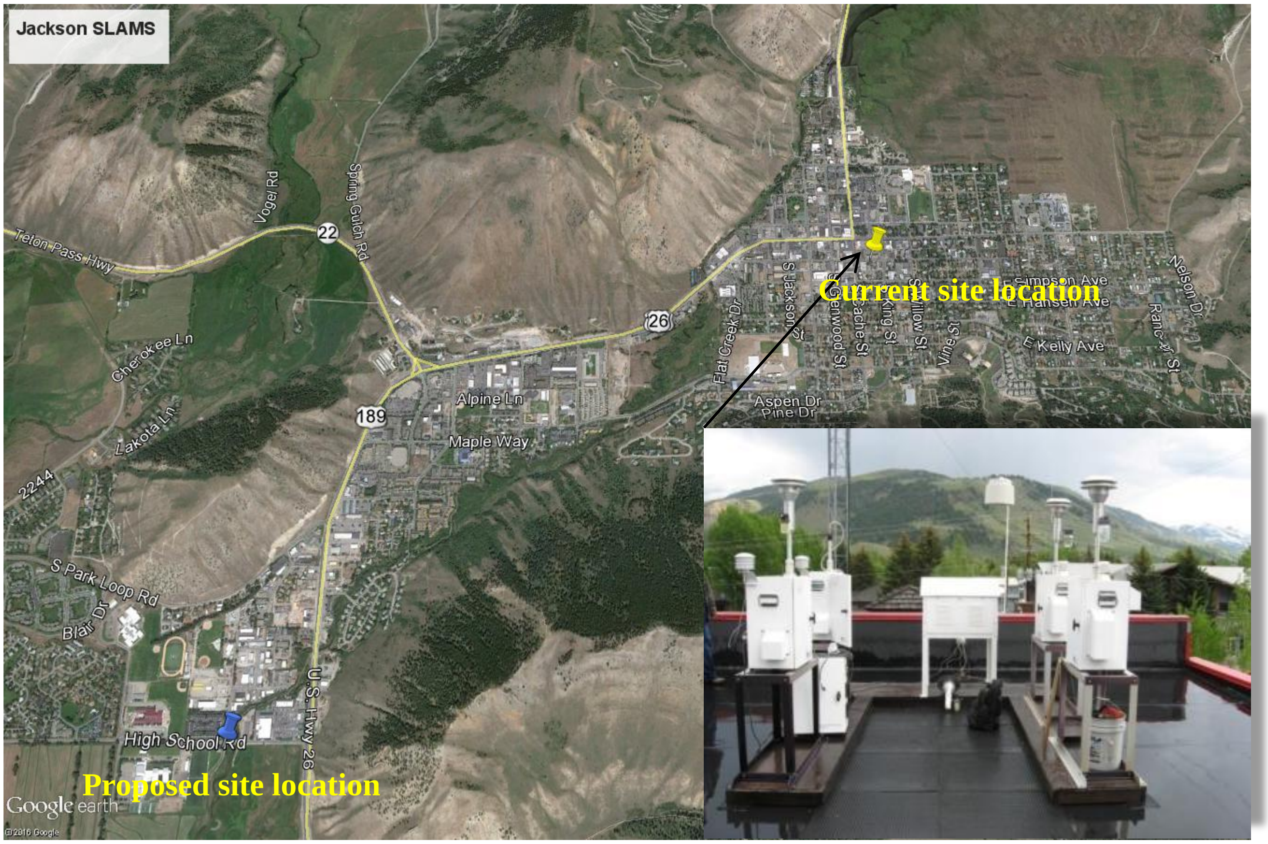


Figure 11. Jackson SLAMS satellite view and monitor photo (inset)

Jackson – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Jackson SLAMS	40 E. Pearl Ave.	56-039-1006	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes

Table 6. Jackson SLAMS Monitor Information

Jackson is located in Teton County in northwest Wyoming and is considered a µSA with a population of approximately 9,700. PM_{10} and $PM_{2.5}$ sampling began in Jackson in 2001 at the

Teton County Building Site. Sampling at the current location, Jackson Fire Station site, began in 2007. From a letter sent to the EPA on December 11, 2015, the AQD has received approval from Region VIII of the EPA (January 6, 2016) to relocate Jackson's SLAMS to the Teton County Transfer Station in the Spring of 2016 as a result of planned renovations at the Jackson Fire Station. The correspondence and network modification form may be viewed in Appendix D of this Network Plan, per Title 40, Part 58 Appendix D of the CFR.

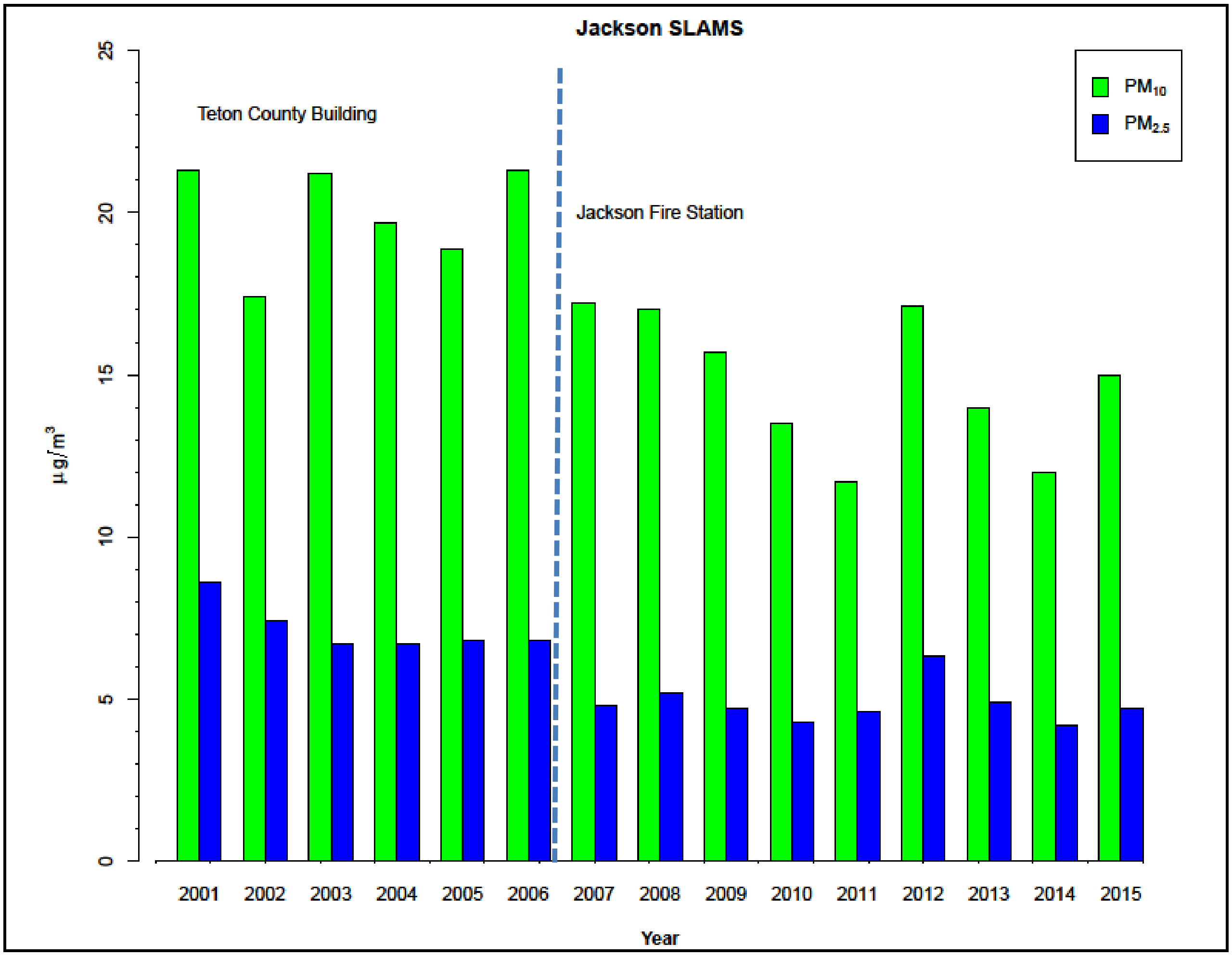


Figure 12. Jackson SLAMS Annual Means

2.1.6 Lander SLAMS

Figure 13. Lander SLAMS satellite view and monitor photo (inset)

Lander – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Lander SLAMS	600 Washington	56-013-1003	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes

Table 7. Lander SLAMS Monitor Information

The Lander monitoring station is located in Fremont County and has a population of approximately 7,600. The AQD began PM_{10} sampling at this station in 1989. The $PM_{2.5}$ monitors were installed in 2001.

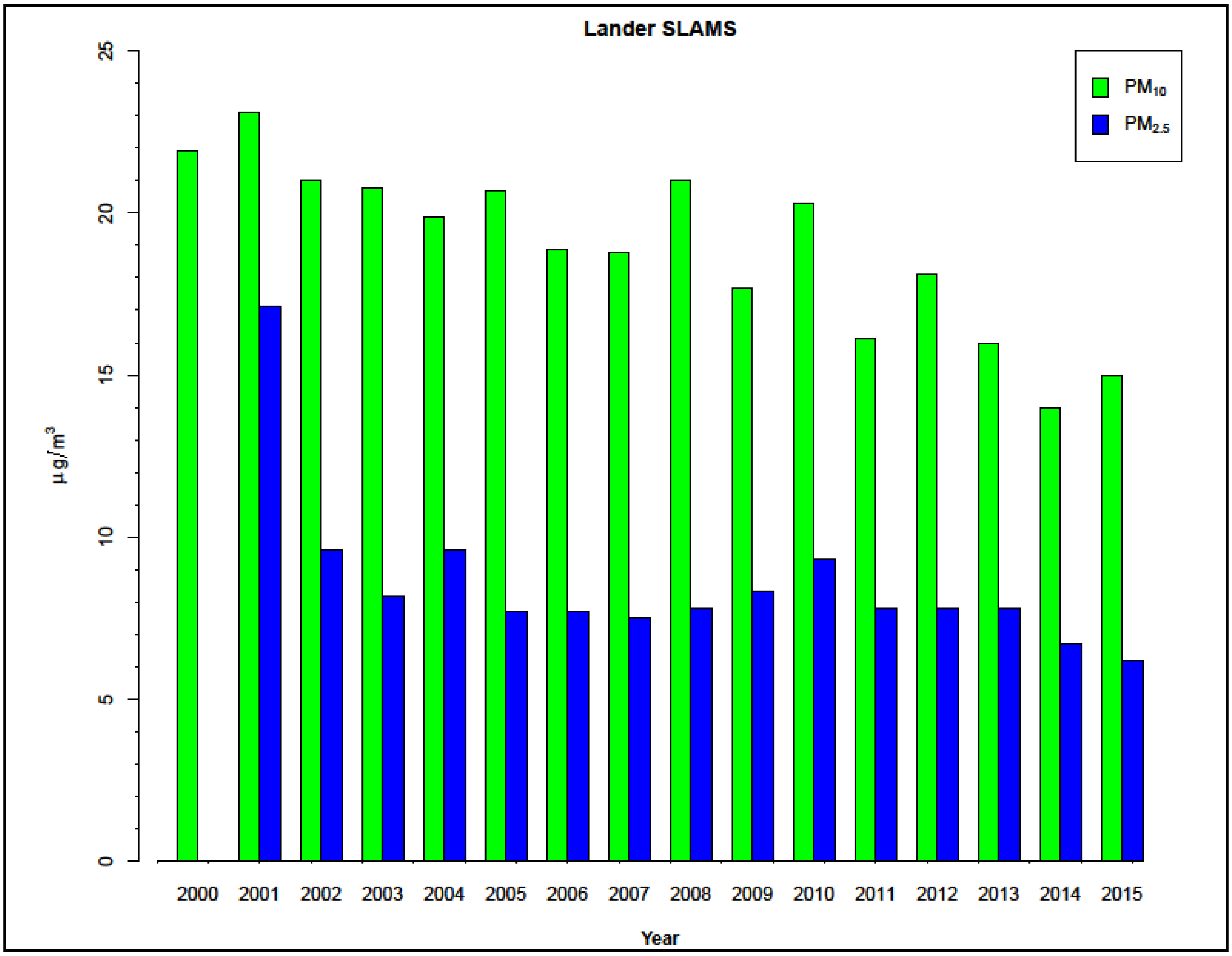


Figure 14. Lander SLAMS Annual Means

2.1.7 Laramie SLAMS

Figure 15. Laramie SLAMS satellite view and monitor photo (inset)

Laramie – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Laramie SLAMS	406 Ivinson	56-001-0006	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes

Table 8. Laramie SLAMS Monitor Information

Laramie is located in Albany County in the southeastern region of Wyoming. Laramie has a population of 31,300 and is therefore classified as a μSA. In 1989, the AQD began PM_{10} sampling in Laramie. The PM_{10} samplers were upgraded to low-volume samplers in 2010. The AQD added $PM_{2.5}$ samplers to the Laramie SLAMS in July 2009 to monitor impacts from wintertime sanding, wood smoke, and summertime forest fires.

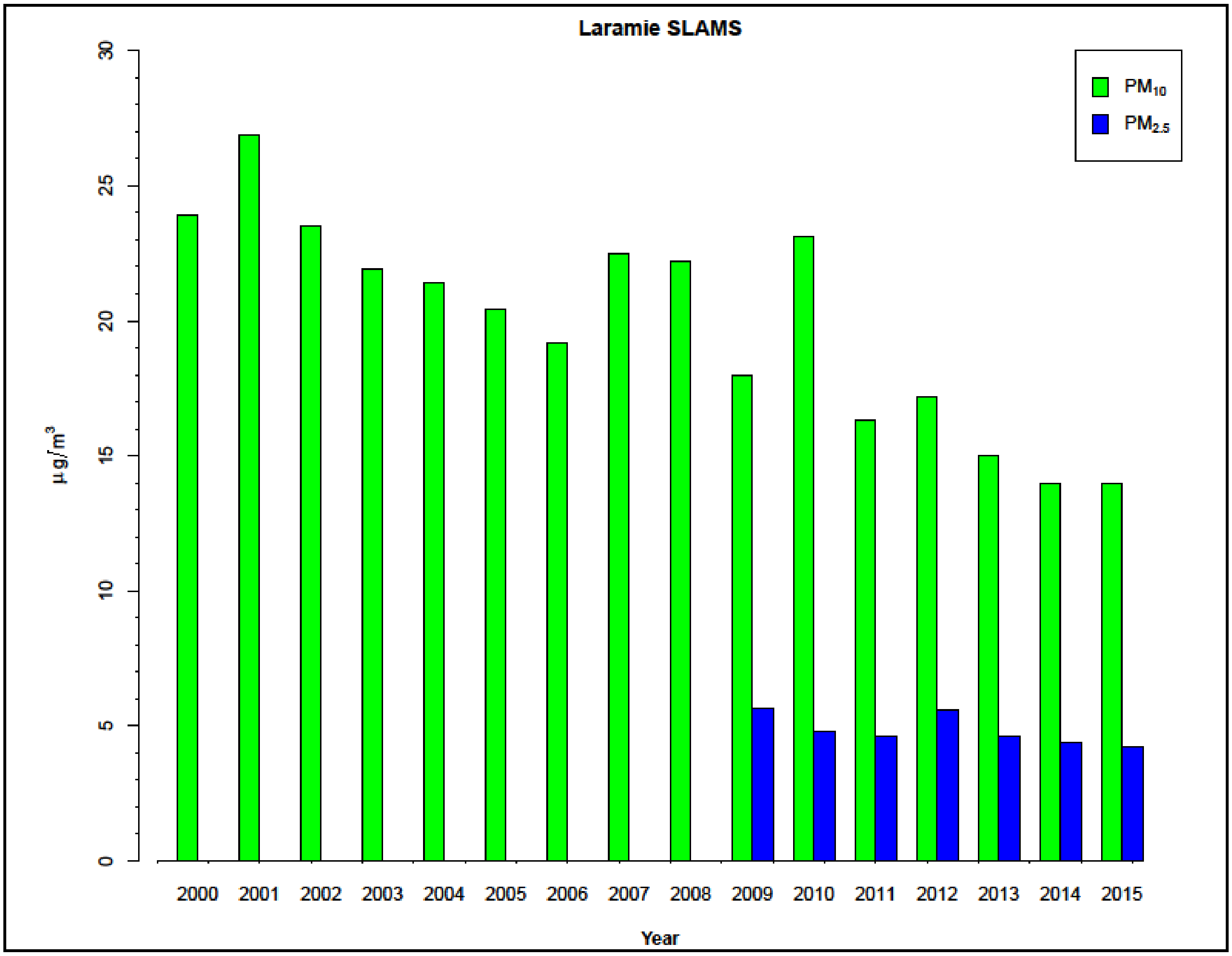


Figure 16. Laramie SLAMS Annual Means

2.1.8 Rock Springs SLAMS

Figure 17. Rock Springs SLAMS satellite view and monitor photo (inset)

Rock Springs – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Rock Springs SLAMS	625 Ahsay Ave.	56-037-0007	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes

Table 9. Rock Springs SLAMS Monitor Information

Rock Springs is located in the southwestern portion of the State in Sweetwater County. Rock Springs is a µSA with a population of approximately 23,200. The AQD initiated PM_{10} sampling at this SLAMS location in 1989 and samplers monitoring $PM_{2.5}$ were added in March 2008. The need for $PM_{2.5}$ was due primarily to population growth and energy development in the region.

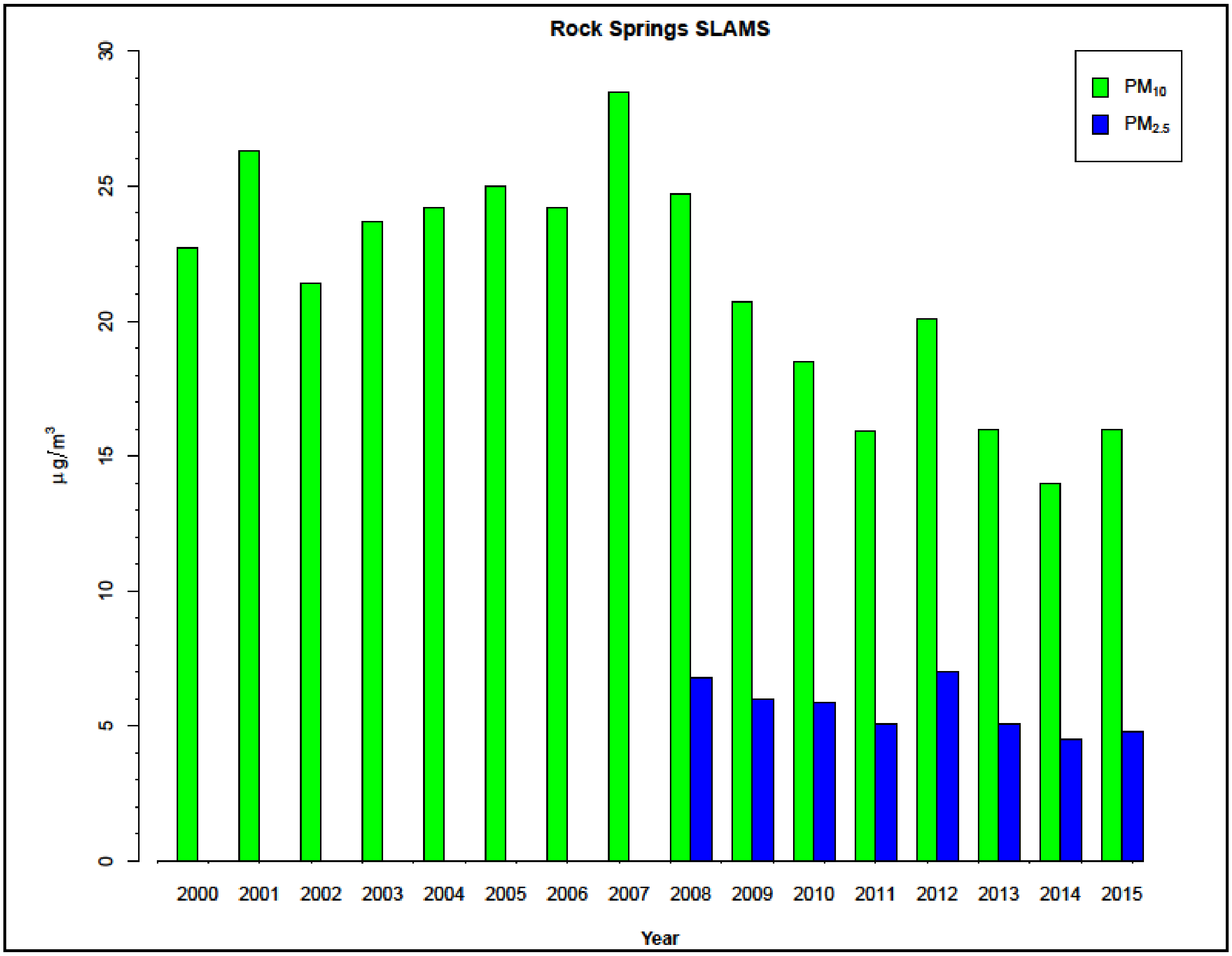


Figure 18. Rock Springs SLAMS Annual Means

2.1.9 Sheridan Meadowlark SLAMS

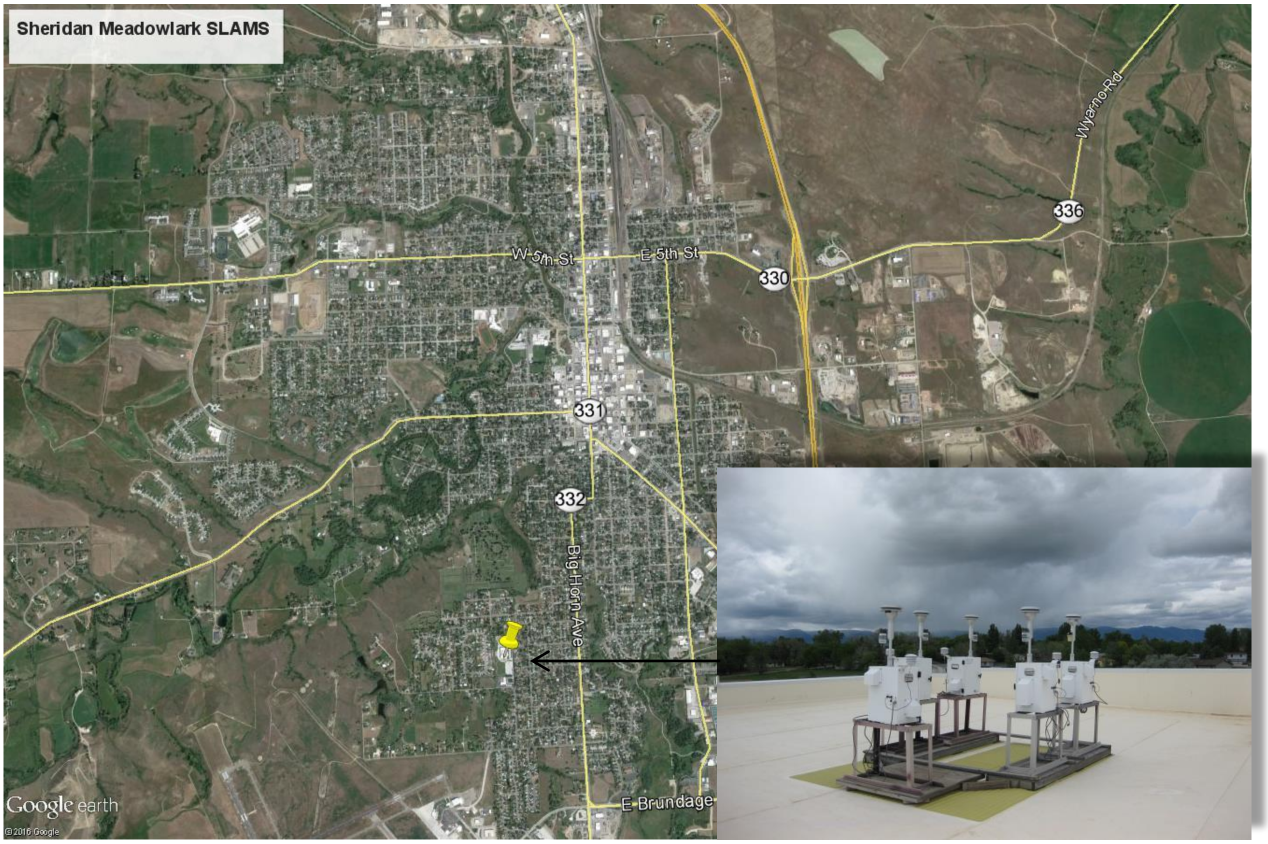


Figure 19. Sheridan Meadowlark SLAMS satellite view with monitor photo (inset)

Sheridan Meadowlark – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Sheridan Meadowlark SLAMS	1410 DeSmet Ave.	56-033-1003	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 3 days (primary); 1 in 12 days (collocate)	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (offset between the primary & satellite samplers)	No planned changes

Table 10. Sheridan Meadowlark SLAMS Monitor Information

This monitoring location is one of two stations in Sheridan, a µSA. Sheridan is located in north central Wyoming and has approximately 17,500 people. The city limits of Sheridan, WY comprise the designated boundaries of the State's only nonattainment area for PM_{10}.

Since 1998, the neighborhood-scale, population-oriented station has moved several times. From 1998-2005, PM_{10} and $PM_{2.5}$ had been monitored at the Sheridan Middle School; from 2005-2012 the station was located at the Highland Park School; beginning in July 2012 the station was sited at the Meadowlark Elementary School, its present location. A collocated PM_{10} monitor was placed at the station in 2007, to fulfill collocation requirements for the SLAMS network.

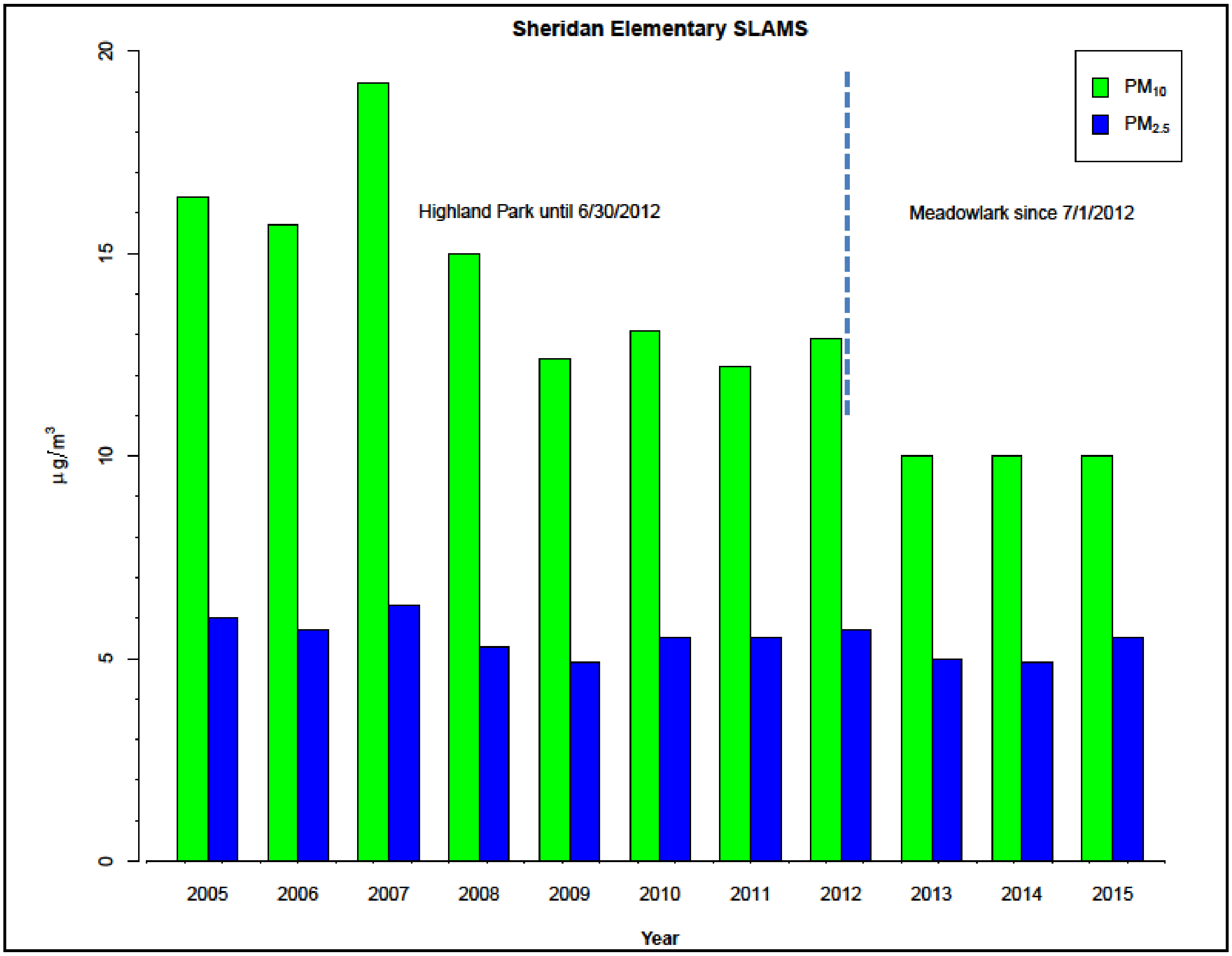


Figure 20. Sheridan Elementary SLAMS Annual Means

2.1.10 Sheridan Police Station SLAMS

Figure 21. Sheridan Police Station SLAMS satellite view and monitor photo (inset)

Sheridan Police Station – SLAMS Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Sheridan Police Station SLAMS	45 W. 12th St.	56-033-0002	PM_{10}	Continuous TEOM	Neighborhood	Hourly	No planned changes
			$PM_{2.5}$	R&P Co. Partisol Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (Manual filter-based)	Neighborhood	1 in 3 days (primary); 1 in 12 days (collocate)	No planned changes

Table 11. Sheridan Police Station SLAMS Monitor Information

The Sheridan-Police Station is one of the oldest monitoring stations in Wyoming. As discussed for the Sheridan Meadowlark SLAMS location, Sheridan is considered to be a µSA and is a nonattainment area for PM_{10}. The objective of the Sheridan-Police Station is to monitor the highest expected concentration of PM_{10} in the nonattainment area. Filter-based PM_{10} sampling began at this station in 1985 and was subsequently replaced by a continuous TEOM sampler on October 1, 2007. Sampling for $PM_{2.5}$ began in 1998. Additionally, meteorological instrumentation was added in 2008 to monitor weather conditions, giving the AQD better information for working with the community to prevent PM_{10} exceedances.

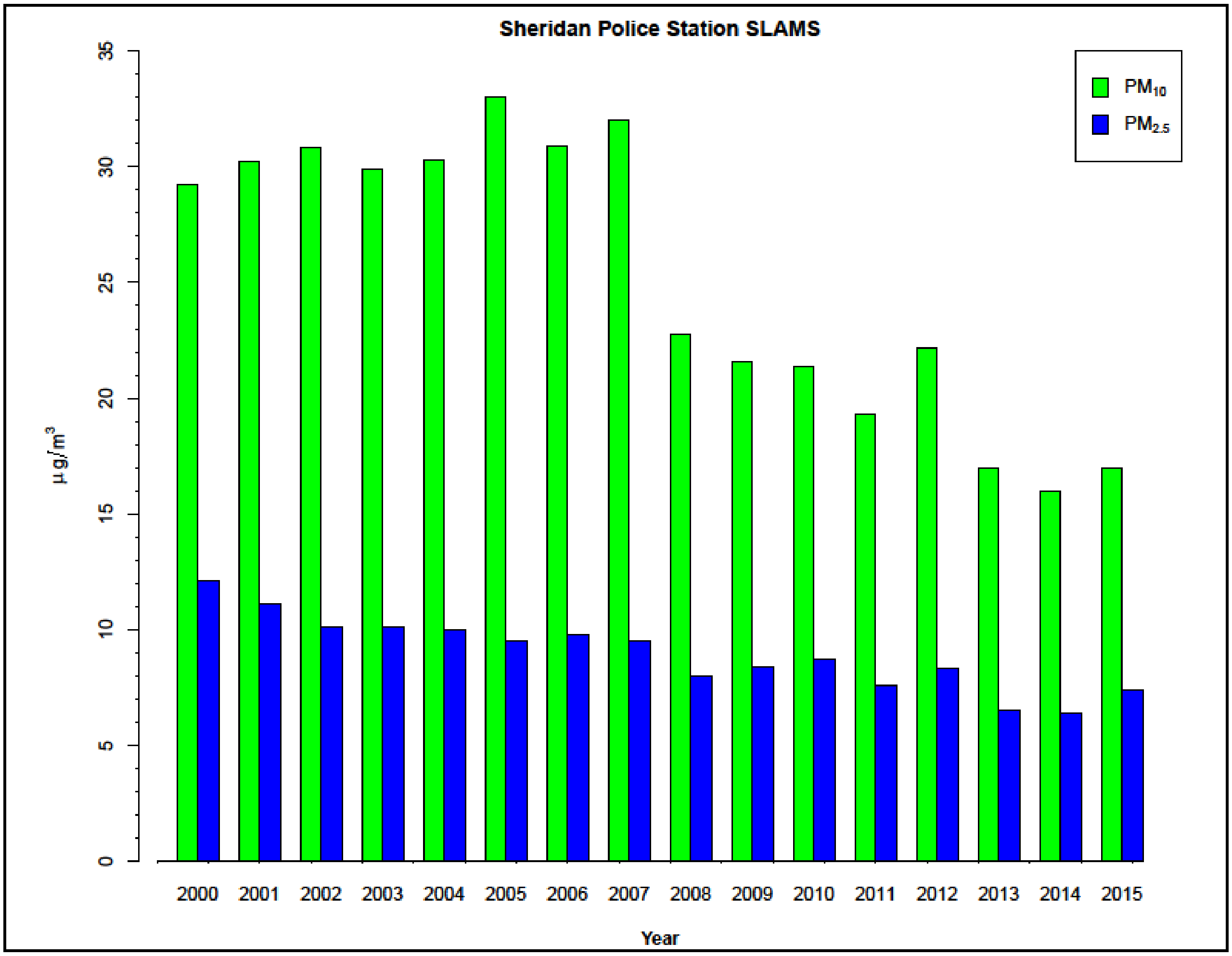


Figure 22. Sheridan Police Station SLAMS Annual Means

2.2. SPM Stations

The SPM stations, as mentioned in Section 1.1, have multiple objectives. The primary objectives, measuring background & downwind pollutant concentrations, pertain to public health. Each station presented below includes a photo of the site, a table with site and instrument information, and a brief synopsis about the site.

2.2.1 Big Piney

The Big Piney station is located four (4) miles south of the Town of Big Piney. In March 2011, the AQD placed a mobile monitoring station at this location to monitor near the Big Piney and LaBarge Gas Fields. The mobile monitoring station equipment included a digital camera, ozone analyzer, oxides of nitrogen analyzer, CH_4/NMHC/THC analyzer, continuous PM_{10} BAM, $PM_{2.5}$ BAM monitor, and meteorological monitor. After two full years of operation, the AQD performed an assessment of the data from the Big Piney station and determined that it would be beneficial to continue monitoring some parameters at this location. On December 10, 2013, the long-term Big Piney station became fully operational. The station currently monitors ozone, oxides of nitrogen, meteorological parameters, and has a camera for visibility purposes. Since the station was kept in the same location, data from this station continues to be reported under AQS ID 56-035-0700.

Big Piney Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Big Piney	4 miles south of Big Piney, WY	56-035-0700	O_3	Thermo 49i	Regional	Hourly	No planned changes
			$NO/NO_2/NO_x$	Thermo Fisher Scientific Model 42i-TL	Regional	Hourly	No planned changes

Table 12. Big Piney Monitor Information

2.2.2 Boulder

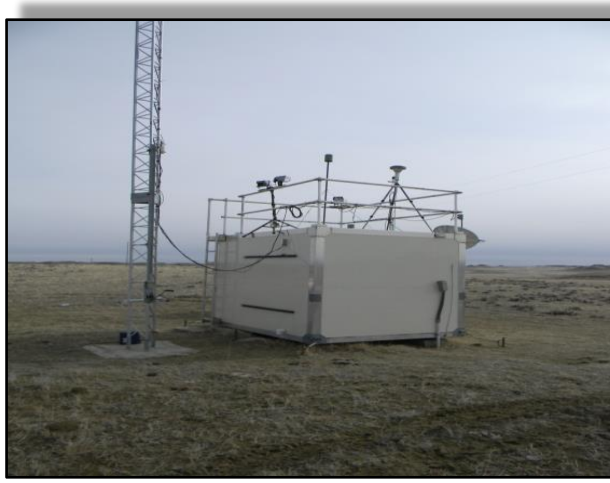
The Boulder station is located approximately five (5) miles southwest of Boulder, Wyoming and is used to track air quality in an area of natural gas development. The Boulder station's ozone monitor is also considered the "design value monitor" for the Upper Green River Basin (UGRB) Ozone Non-attainment area because Boulder ozone had the highest ozone values in the UGRB and is used as the monitor to determine if the UGRB is attaining the ozone NAAQS.

The Boulder Station began monitoring in February 2005, and includes gaseous (NO_x and ozone), continuous particulate (PM_{10} BAM), camera system and meteorological monitoring. The Boulder Station was also a hub for the AQD's 2007 - 2016 Upper Green Winter Ozone Studies. Additionally, long-term monitoring has been added to the Boulder Station to better understand ozone formation in the Upper Green River Basin Ozone Nonattainment Area. In 2016, this monitoring included photolytic NO_2, methane/non-methane hydrocarbons, speciated VOC monitoring, NO_y monitoring, UV radiometers, and upper air monitoring.

Boulder Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Boulder	5 miles southwest of Boulder, WY	56-035-0099	O_3	Teledyne-API Model 400E	Neighborhood	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Neighborhood	Hourly	No planned changes
			PM_{10}	Met One BAM 1020	Neighborhood	Hourly	No planned changes

Table 13. Boulder Monitor Information

2.2.3 Campbell County



The Campbell County station began operation in June 2003 and is located approximately 15 miles southwest of Gillette. This station is used to track air quality in an area of heavy coal-bed methane development. This station includes gaseous (NO_x and ozone), continuous particulate (PM_{10} TEOM), camera system and meteorological monitoring. The data analysis from the 2015 Network Assessment led to the determination that the Campbell County station has data from multiple pollutants which correlates well with sites owned by the AQD and by industry. Further analyses are needed to determine if removal is warranted. Planned changes during 2016 include installing a new $NO/NO_2/NO_x$ analyzer and replacing the existing TEOM with a BAM instrument.

Campbell County Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Campbell County	15 miles SSW of Gillette, WY	56-005-0456	O_3	Thermo 49i	Urban	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Urban	Hourly	New analyzer to be installed.
			PM_{10}	Thermo Fisher TEOM 1400ab	Urban	Hourly	TEOM will be replaced by a BAM.

Table 14. Campbell County Monitor Information

2.2.4 Casper Gaseous

The Casper Gaseous station began operations in March 2013. This station was sited to monitor population-based O_3 concentrations in Wyoming’s second largest city, a MSA. This siting fulfilled a finding in the 2010 Network Assessment regarding the need for population-based ozone monitoring in Casper, WY. The Casper Gaseous station monitors for: O_3, NO_x, meteorology, and visibility (via a camera system).

Casper Gaseous Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Casper Gaseous	2800 Pheasant Dr.	56-025-0100	O_3	Teledyne-API Model T400	Neighborhood/ Urban	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model T200	Neighborhood	Hourly	No planned changes

Table 15. Casper Gaseous Monitor Information

2.2.5 Converse County

The Converse County station is located approximately 38 miles northwest of Douglas and is used to evaluate ambient air quality in an area of regional oil and gas development. Air quality measurements at the Converse County station include gaseous parameters (NO_x, ozone, and methane/non-methane hydrocarbons), continuous particulate (PM_{10} BAM), a camera system, and meteorological monitoring. The Converse County station began operation in April 2015. The data analysis from the 2015 Network Assessment identified additional monitoring needs in central Converse County. This station fulfills the immediate monitoring needs in the local region.

Converse County Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Converse County	16 miles west of WY Highway 59 on Highland Loop Rd.	56-009-0010	O_3	Teledyne-API Model T400	Regional	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Regional	Hourly	No planned changes
			PM_{10}	Met One BAM 1020	Regional	Hourly	No planned changes

Table 16. Converse County Monitor Information

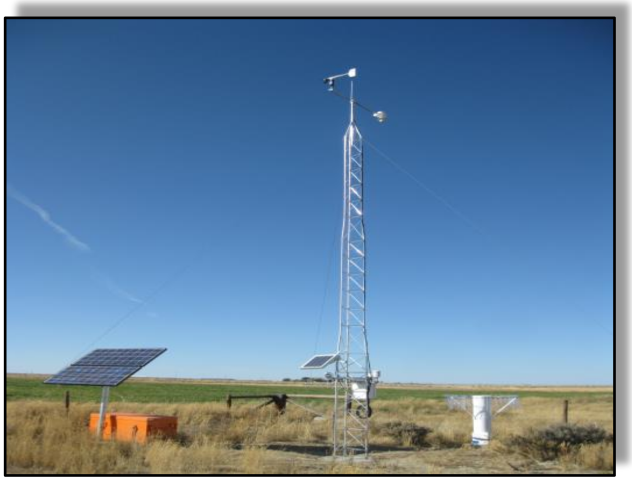
2.2.6 Daniel South

The Daniel South Station is located approximately five (5) miles south of the town of Daniel in Sublette County and is used to track air quality upwind of an area of extensive natural gas development. The Daniel South Station includes gaseous (NO_x and ozone), continuous particulate (PM_{10} TEOM), camera system and meteorological monitoring. The Daniel South Station began operation in July 2005. Due to the progressive failure of the PM_{10} TEOM, the AQD will replace the instrument with a BAM 1020 in 2016.

Daniel South Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Daniel South	5 miles south of Daniel, WY	56-035-0100	O_3	Teledyne-API Model T400	Regional	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Regional	Hourly	No planned changes
			PM_{10}	Thermo Fisher TEOM 1400ab	Regional	Hourly	Will be replaced with a BAM 1020 in 2016

Table 17. Daniel South Monitor Information

2.2.7 Farson Met



The AQD established a meteorological monitoring station in May 2011 to obtain meteorological data for characterizing the general meteorology and air characteristics near Farson, WY. This general area was targeted in the 2008 Southwest Wyoming Network Assessment and the 2010 Network Assessment, as a location to help fill a gap in needed meteorological data. The data collected at this station will be used for the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) or other meteorological modeling and comparison with other meteorological monitoring data. The data analysis from the 2015 Network Assessment showed that the Farson Meteorological station has successfully characterized meteorological conditions along the southeastern boundary of the UGRB for four (4) years and therefore could justifiably be decommissioned.

2.2.8 Hiawatha

The AQD began operation of the Hiawatha station in May 2011. This is the AQD's first monitoring station that uses renewable energy as its primary power source. The solar and wind powered monitoring station is located 35 miles south of Rock Springs, in the Hiawatha Gas Field. The 2010 Network Assessment noted this area of industrial oil and gas development would benefit from ambient air quality monitoring. The Hiawatha station includes ozone, a camera system, and meteorological equipment. This station is also part of the Intermountain West Data Warehouse (IWDW) Project. Planned changes during 2016 include installing a new O_3 analyzer to replace the current equipment which has been at the site since the outset of the site.

Hiawatha Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Hiawatha	Bitter Creek Rd. 43 miles SE of Rock Springs, WY	56-037-0077	O_3	Teledyne-API Model 400E	Regional	Hourly	Replace with a new T400 series ozone analyzer

Table 18. Hiawatha Monitor Information

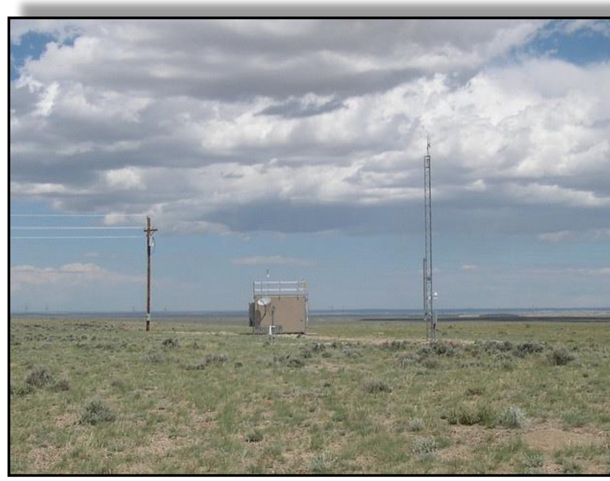
2.2.9 Juel Spring

The Juel Spring Station began operation in December 2009 and is located approximately 15 miles downwind (southeast) of the Jonah Gas Field. The Juel Spring Station includes gaseous (NO_x and ozone), a camera system and meteorological monitoring. This station is located in conjunction with the Union Cellular Juel Spring Tower station.

Juel Spring Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Juel Spring	20 miles northwest of Farson, WY	56-035-1002	O_3	Teledyne-API 400A	Urban	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API 200A	Urban	Hourly	No planned changes

Table 19. Juel Spring Monitor Information

2.2.10 Moxa Arch



The Moxa Arch station was installed in May 2010. This station is located about 25 miles northwest of Green River. The purpose of this monitoring station is to characterize and monitor meteorology and air quality in an area of heavy energy development. This station includes NO_x, SO_2, O_3, PM_{10} (a BAM instrument), a camera system, and meteorological equipment. The data analysis from the 2015 Network Assessment showed that ozone data is highly correlated with other stations and no significant trends in any pollutant have been seen since 2010 and therefore could justifiably be decommissioned.

Moxa Arch Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Moxa Arch	25 miles northwest of Green River, WY	56-037-0300	O_3	Teledyne-API Model 400E	Urban	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Urban	Hourly	No planned changes
			PM_{10}	Met One BAM 1020	Urban	Hourly	No planned changes
			SO_2	Thermo 43i	Urban	Hourly & 5-minute	No planned changes

Table 20. Moxa Arch Monitor Information

2.2.11 Murphy Ridge

Operations at Murphy Ridge were initiated in 2007. The station is located in the town of Bear River, about 10 miles north of Evanston on the Utah/Wyoming border. This site monitors pollutants transported from Utah including NO_x, O_3, PM_{10} via a continuous TEOM instrument, and meteorological parameters. A camera system is mounted on the shelter to provide visibility. The data analysis from the 2015 Network Assessment showed no significant trends in air quality concentrations since 2007 therefore Murphy Ridge could justifiably be decommissioned.

Murphy Ridge Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Murphy Ridge	Bear River, WY	56-041-0101	O_3	Teledyne-API Model 400E	Regional	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Regional	Hourly	No planned changes
			PM_{10}	Thermo Fisher TEOM 1400ab	Regional	Hourly	No planned changes

Table 21. Murphy Ridge Monitor Information

2.2.12 Pinedale Gaseous

The Pinedale Gaseous station began operations in January 2009 as a result of the need for population-based monitoring in this location, which was noted in the 2008 Southwest Wyoming Network Assessment. This station includes ozone, NO_x, a continuous $PM_{2.5}$ Beta Attenuation Monitor (BAM), and meteorology within the town of Pinedale. This station monitors pollutant concentrations in the most populated area in the UGRB Ozone Non-attainment Area. A camera system is also associated with this station on WyVisNet. However, the camera is housed in a different location with the objective of providing an overlook of the town of Pinedale.

Pinedale Gaseous Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Pinedale Gaseous	West side of City Park & Pine Creek	56-035-0101	O_3	Teledyne-API Model 400E	Urban	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Urban	Hourly	No planned changes
			$PM_{2.5}$	Met One BAM 1020	Urban	Hourly	No planned changes

Table 22. Pinedale Gaseous Monitor Information

2.2.13 South Pass

The South Pass Station began operation in 2007. The station is located on South Pass at the southern end of the Wind River Range. The purpose of this station is to monitor air quality on the southern end of the range which sees air masses from both the Upper Green River Basin to the northwest, and from the southwestern corner of the State. The station includes gaseous (NO_x and ozone), continuous particulate ($PM_{2.5}$ BAM), camera system and meteorological monitoring. The PM_{10} TEOM was shut down on March 20, 2014 due to reliability issues, and it was replaced with a $PM_{2.5}$ BAM that started data collection on March 24, 2014. The switch to $PM_{2.5}$ was made to assist the AQD in studying the impact of wildfires in the area.

South Pass Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
South Pass	South Pass, WY	56-013-0099	O_3	Thermo 49i	Urban	Hourly	No planned changes
			$NO/NO_2/NO_x$	Thermo 42i	Urban	Hourly	No planned changes
			$PM_{2.5}$	Met One BAM 1020	Urban	Hourly	No planned changes

Table 23. South Pass Monitor Information

2.2.14 Thunder Basin

The Thunder Basin Station is located approximately 30 miles northeast of Gillette, Wyoming and is used to track visibility, meteorology, and air quality in the area. The Thunder Basin Station began operating in October 1999 and includes gaseous (NO_x and ozone), camera system and meteorological monitoring. A new $NO/NO_2/NO_x$ analyzer will be installed in 2016 to replace older equipment.

Thunder Basin Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Thunder Basin	30 miles NNE of Gillette, WY	56-005-0123	O_3	Thermo 49i	Regional	Hourly	No planned changes
			$NO/NO_2/NO_x$	Thermo 42i	Regional	Hourly	New 42i model will be installed.

Table 24. Thunder Basin Monitor Information

2.2.15 Wamsutter

The Wamsutter site is approximately two (2) miles west of the town of Wamsutter. The objective of this station is to track air quality and meteorology in an area of extensive natural gas development. The Wamsutter station includes gaseous (NO_x and O_3), PM_{10} (a continuous TEOM), CH_4, NMHC, THC, and meteorological monitoring. A camera system provides coverage of visibility. This station started operations on March 13, 2006. Planned changes during 2016 include installing a new $NO/NO_2/NO_x$ analyzer and replacing the existing TEOM with a BAM instrument to update aging equipment.

Wamsutter Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Wamsutter	2 miles west of Wamsutter, WY	56-037-0200	O_3	Thermo 49i	Urban	Hourly	No planned changes
			$NO/NO_2/NO_x$	Thermo 42i	Urban	Hourly	New model 42i will be installed
			PM_{10}	Thermo Fisher TEOM 1400ab	Urban	Hourly	Will be replaced with a BAM 1020

Table 25. Wamsutter Monitor Information

2.2.16 Wright Jr-Sr High School

The Wright monitoring station is located in Campbell County in northern Wyoming. Wright is a community located west of the southern group of the Powder River Basin (PRB) coal mines. The purpose of this monitor is to track population exposure to PM_{10} in a community that is downwind of the coal mines. The data analysis from the 2015 Network Assessment revealed that PM_{10} data at Wright correlated significantly with six (6) nearby industrial monitors in the Powder River Basin (PRB). Further evaluation is necessary with respect to redundancy to other available monitoring data to determine if this station may be decommissioned.

Wright Jr-Sr High School Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Wright Jr-Sr High School	Adjacent to Wright Jr-Sr High School	56-005-0099	PM_{10}	R&P Co. Partisol Model 2000 (Manual filter-based)	Neighborhood	1 in 6 days	No planned changes

Table 26. Wright Jr-Sr High School Monitor Information

2.2.17 PRB NO_x

The Powder River Basin NO_x network began operation in January 2001 through a cooperative agreement between the AQD and the Wyoming Mining Association. The network monitors regional NO_2 concentrations in the PRB. The Belle Ayr - BA-4 Station is located near the railroad and represents a “maximum concentration” in and around the coal mines. The Antelope Station is located upwind from mining activities is considered to be background. The AQD also receives data from the Thunder Basin Coal Company’s Station at the Tracy Ranch; this monitoring station is considered downwind of mining activity. The AQD did not list the Tracy Ranch Station below because it is funded and operated solely by the Thunder Basin Coal Company. Due to the construction of an oilfield service road less than 100 feet from the Antelope 3 Site, this site was shut down on July 1, 2013. The Antelope Station was moved to a new location, renamed the Antelope 7 Site, and became operational in February 2015.

PRB NO_x Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Antelope – Site 7	Antelope Site 7	56-009-0009	$NO/NO_2/NO_x$	Teledyne-API 200A	Regional	Hourly	No planned changes
Belle Ayr – BA-4	Belle Ayr BA-4	56-005-0892	$NO/NO_2/NO_x$	Teledyne-API 200A	Micro Scale	Hourly	No planned changes

Table 27. PRB NO_x Monitor Information

2.2.18 PRB $PM_{2.5}$

The Powder River Basin $PM_{2.5}$ Network began operation in 1999. The purpose of the network is to characterize ambient fine particulate at and around the PRB coal mines. One monitor is located at each "group" of mines (north, middle and south) and one monitor is located away from mining activities to represent background levels. Due to the age of the instrumentation in the network, the AQD upgraded the instruments to continuous Thermo 1405DF TEOM monitors in 2010. During the second quarter of 2013, the AQD replaced the 1405DF instruments with Met One Beta Attenuation Monitors (BAMs) because of reliability issues with the 1405DF instruments. As a result of the construction of an oilfield service road less than 100 feet from the Antelope 3 Site, it was shut down on July 1, 2013 moved to a new location in February 2015, and the Antelope 7 Site.

PRB $PM_{2.5}$ Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Antelope – Site 7	Antelope Site 7	56-009-0009	$PM_{2.5}$	Met One BAM 1020	Regional	Hourly	No planned changes
Belle Ayr – BA-4	Belle Ayr BA-4	56-005-0892	$PM_{2.5}$	Met One BAM 1020	Neighborhood	Hourly	No planned changes
Black Thunder BTM-36-2	BTM-36-2 (Black Thunder Mine)	56-005-0891	$PM_{2.5}$	Met One BAM 1020	Neighborhood	Hourly	No planned changes
Buckskin Mine	Triton Coal Gillette, WY	56-005-1899	$PM_{2.5}$	Met One BAM 1020	Neighborhood	Hourly	No planned changes

Table 28. PRB $PM_{2.5}$ Monitor Information

2.3 Mobile Monitoring Trailers

Three (3) mobile monitoring trailers have been established and are being operated to help characterize air quality at various locations throughout the State of Wyoming. The mobile monitoring stations are self-contained monitoring shelters that may be moved to different locations in a relatively short time frame. The trailers include gaseous monitors (NO_x, SO_2, O_3, and methane/non-methane hydrocarbons), continuous PM_{10}, continuous $PM_{2.5}$, camera system, and meteorological instrumentation. The mobile monitoring stations may be used to monitor and characterize events, trends in air quality, or areas downwind of industrial development. The AQD locates and operates the mobile monitoring trailers at a given location for approximate durations of one (1) year. Current locations as of May 2016 for the three (3) mobile trailers include: Mobile #1 Torrington, Mobile #2 Cheyenne, and Mobile #3 Newcastle. More information about the future mobile monitoring trailer locations can be found in Section 5.0 of this Network Plan. The complete history of the mobile monitoring trailers is found in the table below.

Year	Mobile Trailer #1	Mobile Trailer #2	Mobile Trailer #3
2011	Big Piney	Pavillion	Gillette
2012	Big Piney	Pavillion	Converse County
2013	Rock Springs	Sinclair	Converse County
2014	Lovell	Sinclair	Converse County
2015	Lovell to Torrington	Sinclair	Converse County to Newcastle
2016 YTD	Torrington	Sinclair to Cheyenne	Newcastle

Table 29. Mobile Monitoring Trailer Location History

2.3.1.1 Mobile Trailer #1: Lovell

The Lovell air quality mobile monitoring station operated from July 10, 2014 to June 30, 2015. The mobile station was located within the city limits of Lovell, in a residential neighborhood. The station's objective was to characterize the population-based ozone and other air quality parameters in the Town of Lovell. A digital camera, ozone analyzer, oxides of nitrogen analyzer, methane/non-methane hydrocarbons, continuous PM_{10} and $PM_{2.5}$ BAMs and meteorological equipment were located at this station. The station was moved to Torrington on December 21, 2015.

Mobile Trailer #1: Lovell Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Lovell Mobile (7/10/2014-8/20/2015)	360 E. 5th St. Lovell, WY	56-003-0003	O_3	Teledyne-API Model 400E	Neighborhood	Hourly	Moved from Lovell to Torrington
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Neighborhood	Hourly	Moved from Lovell to Torrington
			PM_{10}	Met One BAM 1020	Neighborhood	Hourly	Moved from Lovell to Torrington
			$PM_{2.5}$	Met One BAM 1020	Neighborhood	Hourly	Moved from Lovell to Torrington

Table 30. Mobile Trailer #1 Monitor Information (Lovell)

2.3.1.2 Mobile Trailer #1: Torrington

The Torrington air quality mobile monitoring station began operations on December 21, 2015, and is slated to operate at this location for one (1) year. The mobile station is located within the city limits of Torrington, near a residential neighborhood and school. The station's objective is to characterize the population exposure to multiple air quality parameters in the Town of Torrington, located in the vicinity and downwind of a number of Title V and minor emissions sources. A digital camera, ozone analyzer, oxides of nitrogen analyzer, methane/non-methane hydrocarbons, continuous PM_{10} and $PM_{2.5}$ BAMs and meteorological equipment are located at this station. A sulfur dioxide analyzer was added to this station in January 2016.

Mobile Trailer #1: Torrington Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Torrington Mobile (12/21/2015-press time)	1446 E. N St. Torrington, WY	56-015-0004	O_3	Teledyne-API Model 400E	Neighborhood	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Neighborhood	Hourly	No planned changes
			PM_{10}	Met One BAM 1020	Neighborhood	Hourly	No planned changes
			$PM_{2.5}$	Met One BAM 1020	Neighborhood	Hourly	No planned changes
			SO_2	Thermo 43i	Neighborhood	Hourly & 5 minute	No planned changes

Table 31. Mobile Trailer #1 Monitor Information (Torrington)

2.3.2.1 Mobile Trailer #2: Sinclair

The Sinclair air quality mobile monitoring station operated from December 10, 2013 to February 17, 2016. The AQD continued operation at this location beyond the anticipated one (1) year duration while the AQD worked to place long-term SO_2 monitoring in the Town of Sinclair. The Sinclair Wyoming Refining Company began operating an SO_2 monitoring station in the Town of Sinclair on December 10, 2015 and the mobile station was moved after a few months of concurrent operation. The mobile station was located at the northwest side of town in Sinclair, in a residential neighborhood. The station's objective was to characterize the population exposure to sulfur dioxide and other air quality parameters in the Town of Sinclair, located upwind of the Sinclair refinery. A digital camera, ozone analyzer, oxides of nitrogen analyzer, sulfur dioxide, methane/non-methane hydrocarbons, continuous PM_{10} and $PM_{2.5}$ BAMs and meteorology equipment were located at this station. The station was moved to Cheyenne on March 29, 2016.

Mobile Trailer #2: Sinclair Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Sinclair Mobile (12/11/2013-2/17/2016)	510 N. 7th St. Sinclair, WY	56-007-1000	O_3	Teledyne-API Model 400E	Neighborhood	Hourly	Moved from Sinclair to Cheyenne
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Neighborhood	Hourly	Moved from Sinclair to Cheyenne
			PM_{10}	Met One BAM 1020	Neighborhood	Hourly	Moved from Sinclair to Cheyenne
			$PM_{2.5}$	Met One BAM 1020	Neighborhood	Hourly	Moved from Sinclair to Cheyenne
			SO_2	Thermo 43c	Neighborhood	Hourly & 5 minute	Moved from Sinclair to Cheyenne

Table 32. Mobile Trailer #2 Monitor Information (Sinclair)

2.3.2.2 Mobile Trailer #2: Cheyenne

The Cheyenne air quality mobile monitoring station began operations on March 29, 2016, and is slated to operate at this location for one (1) year. The mobile station is located within the city limits of Cheyenne on the southeast side of town, in a residential neighborhood. The station's objective is to characterize the population exposure to sulfur dioxide and other air quality parameters in the City of Cheyenne, located near the HollyFrontier refinery. A digital camera, ozone analyzer, oxides of nitrogen analyzer, sulfur dioxide, methane/non-methane hydrocarbons, continuous PM_{10} and $PM_{2.5}$ BAMs and meteorology equipment are located at this station.

Mobile Trailer #2: Cheyenne Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Cheyenne Mobile (3/15/2016-press time)	Phoenix Dr. Cheyenne, WY	56-021-0002	O_3	Teledyne-API Model 400E	Urban	Hourly	Moved from Sinclair to Cheyenne
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Urban	Hourly	Moved from Sinclair to Cheyenne
			PM_{10}	Met One BAM 1020	Urban	Hourly	Moved from Sinclair to Cheyenne
			$PM_{2.5}$	Met One BAM 1020	Urban	Hourly	Moved from Sinclair to Cheyenne
			SO_2	Thermo 43c	Urban	Hourly & 5 minute	Moved from Sinclair to Cheyenne

Table 33. Mobile Trailer #2 Monitor Information (Cheyenne)

2.3.3.1 Mobile Trailer #3: Converse County

The Converse County air quality mobile monitoring station operated from December 17, 2012 to July 7, 2015. This station was sited due to citizen concerns about oil and gas development in an area of rural residential population. The AQD continued operation at this location beyond the anticipated one (1) year while the AQD evaluated the need for a long-term monitoring station in Converse County. A long-term Converse County monitoring station began operations on April 10, 2015, about 35 miles northwest of the mobile station. A digital camera, ozone analyzer, oxides of nitrogen analyzer, methane/non-methane hydrocarbons, continuous PM_{10} and $PM_{2.5}$ BAMs and meteorology equipment were located at this station. The station was moved to Newcastle on July 10, 2015.

Mobile Trailer #3: Converse County Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Converse County Mobile (12/17/2012-7/9/2015)	369 Antelope Rd. Douglas, WY	56-009-0801	O_3	Teledyne-API Model 400E	Regional	Hourly	Moved from Converse County to Newcastle
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Regional	Hourly	Moved from Converse County to Newcastle
			PM_{10}	Met One BAM 1020	Regional	Hourly	Moved from Converse County to Newcastle
			$PM_{2.5}$	Met One BAM 1020	Regional	Hourly	Moved from Converse County to Newcastle

Table 34. Mobile Trailer #3 Monitor Information (Converse County)

2.3.3.2 Mobile Trailer #3: Newcastle

The Newcastle air quality mobile monitoring station began operations on July 10, 2015, and is slated to operate at this location for one (1) year. The mobile station is located within the city limits of the Town of Newcastle in the center of town. The station's objective is to characterize the population's exposure to sulfur dioxide and other air quality parameters in the Town of Newcastle, located near the Wyoming Refining Company's Newcastle refinery. A digital camera, ozone analyzer, oxides of nitrogen analyzer, sulfur dioxide, methane/non-methane hydrocarbons, continuous PM_{10} and $PM_{2.5}$ BAMs and meteorology equipment are located at this station.

Mobile Trailer #3: Newcastle Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Newcastle Mobile (7/10/2015-press time)	116 Casper Ave. Newcastle, WY	56-045-0004	O_3	Teledyne-API Model 400E	Neighborhood	Hourly	Moved from Converse County to Newcastle
			$NO/NO_2/NO_x$	Teledyne-API Model 200E	Neighborhood	Hourly	Moved from Converse County to Newcastle
			PM_{10}	Met One BAM 1020	Neighborhood	Hourly	Moved from Converse County to Newcastle
			$PM_{2.5}$	Met One BAM 1020	Neighborhood	Hourly	Moved from Converse County to Newcastle
			SO_2	Teledyne-API M100EU	Neighborhood	Hourly & 5 minute	Moved from Converse County to Newcastle

Table 35. Mobile Trailer #3 Monitor Information (Newcastle)

2.4 Cheyenne NCore

The Wyoming NCore monitoring station is located in Cheyenne near the North Soccer Complex Park. Cheyenne is one (1) of two (2) of Wyoming's MSAs. The NCore station was established during the summer of 2010 and became fully operational on January 1, 2011. This station was incorporated as part of the National Core Monitoring Network. The NCore stations will be the basis for developing a representative report card on air quality across the nation, capable of delineating differences among geographic and climatological regions. The monitored data will be used to characterize and monitor trends in air quality, compliance with the NAAQS, and may be used for national health assessments, model evaluations, and comparison with other ambient air monitoring data.

As specified as in Title 40 Part 58.13(a) of the CFR, the Cheyenne NCore station hosts a large suite of air quality and meteorological parameters. Gaseous parameters include: ozone, $NO/NO_2/NO_x$, trace CO, trace SO_2, and NO_y, total reactive oxides of nitrogen. In 2016, the AQD will replace the $NO/NO_2/NO_x$ analyzer, which has been at the site since 2011.

Particulate monitoring is a substantial part of routine operations at the NCore station. Currently, this station has a MetOne BAM Coarse system (includes PM_{10} and $PM_{2.5}$ instruments). This setup provides continuous data and an economical way to monitor PM_{10}, $PM_{10\text{-}2.5}$, and $PM_{2.5}$. The primary monitor for $PM_{2.5}$ is a filter-based Very Sharp Cut Cyclone (VSCC) gravimetric monitor. Two (2) Thermo Partisol 2000i Federal Reference Method (FRM) monitors were installed and began sampling on a one (1) in three (3) day schedule on January 1, 2014. This new setup helps fulfill the Wyoming $PM_{2.5}$ monitor network FRM and Federal Equivalent Method (FEM) collocation requirements.

Cheyenne NCore Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Cheyenne NCore	6909 Chief Washakie Ave. Cheyenne, WY	56-021-0100	O_3	Teledyne-API Model 400E	Neighborhood	Hourly	No planned changes
			$NO/NO_2/NO_x$	Teledyne-API T200U	Neighborhood	Hourly	New analyzer planned for 2016
			NO_y	Teledyne-API M200EU NOY	Regional	Hourly	No planned changes
			Trace SO_2	Teledyne-API T100U	Neighborhood	Hourly	No planned changes
			Trace CO	Teledyne-API M300EU	Neighborhood	Hourly	No planned changes
			PM_{10}	Met One BAM 1020	Neighborhood	Hourly	No planned changes
			Speciated $PM_{10-2.5}$	Met One BAM 1020	Neighborhood	Hourly	No planned changes
			$PM_{2.5}$	Met One BAM 1020	Neighborhood	Hourly	No planned changes
			$PM_{2.5}$ (Primary)	R&P Model 2000 $PM_{2.5}$ Air Sampler w/ VSCC (filter-based)	Neighborhood	1 in 3 days (primary); 1 in 12 days (collocate)	No planned changes
			Speciated $PM_{2.5}$	URG 3000N (filter-based)	Neighborhood	1 in 3 days	No planned changes

Table 36. Cheyenne NCore Monitor Information

2.5 Industrial Monitoring Sites

Historically, the AQD has required several industrial sources in the State to conduct ambient monitoring for criteria pollutants in and around specific facilities. The AQD's largest industrial network is at the Powder River Basin coal mines and consists of approximately 58 PM_{10} monitoring locations. The AQD also requires extensive networks of PM_{10} monitoring at the Trona facilities outside of Green River and coal mines in southwest Wyoming. As facilities obtain construction or modification permits from the AQD's New Source Review (NSR) program, they are often required to monitor for compliance with the ambient air quality standards downwind of their facilities. The monitoring program receives these data on a quarterly basis, and checks for compliance with the NAAQS as well as confirming that the facilities are following appropriate quality assurance measures.

2.6 IMPROVE Network

The purpose of the Interagency Monitoring of Protected Visual Environments (IMPROVE) network is to establish current visibility and aerosol conditions along with characterizing broad regional trends and visibility conditions using monitoring data collected in or near Class I areas across the United States. Wyoming has four (4) IMPROVE locations: Yellowstone National Park, Est. 1988; Bridger Wilderness Area, Est. 1988; North Absaroka Wilderness Area, Est. 2000; Thunder Basin National Grasslands, Est. 2002. The Cloud Peak Wilderness Area monitor, established in 2002, was shut down in Fall of 2015, due to budget cuts to the IMPROVE Program.

3.0 Compliance with NAAQS

The primary purpose of the AQD's SLAMS and SPM networks is to evaluate compliance with the NAAQS. The AQD's SLAMS and SPMs employ FRM and FEM technologies and operate according to the SLAMS or Prevention of Significant Deterioration (PSD) quality assurance specifications and therefore may be compared with the NAAQS. The AQD's SLAMS and SPM networks currently operate under project-specific quality assurance project plans (QAPPs) which are available in the Cheyenne office for viewing. The data from the mobile gaseous trailers are also reported in the tables within this section. While the trailers are operated according to the EPA's specifications for comparison with the NAAQS, they often operate for no more than 12 months and typically do not contain a complete calendar year of data due to their short-term deployments. Therefore, these data are generally not comparable to the design value, the true test of compliance with the NAAQS.

The following tables in Section 3 show 2013-2015 data and design values for each SLAMS and SPM monitoring station. All stations that operated in 2015 are included in the tables. All stations operated by the AQD are in compliance with the NAAQS from 2013-2015.

3.1 Particulate Matter (PM_{10})

There were 27 stations that monitored for PM_{10} at some point in 2015. The SLAMS network has ten stations that mostly use Thermo Partisol 2000 samplers to record PM_{10}. The Sheridan Police Station is the only SLAMS that employs a TEOM. The Thermo Partisol 2000 PM_{10} monitors have 30% collocation. This fulfills the collocation requirements of Title 40, Part 58 Appendix A of the CFR. The remainder of the AQD network uses seven (7) continuous MetOne BAM PM_{10} monitors and four (4) stations that have continuous Thermo TEOM PM_{10} monitors.

To comply with the 24-hour PM_{10} NAAQS, a monitor may only have one exceedance (a 24-hour average concentration greater than 150 $\mu g/m^3$) per year over a three-year period. The design value is the average number of exceedances per year from 2013-2015. A design value of zero (0) means the station has not recorded any values over 150 $\mu g/m^3$ during the three-year period. Wyoming also has an ambient air quality standard for PM_{10} in its state regulations. Compliance with the annual Wyoming Ambient Air Quality Standards (WAAQS) is determined by the three-year average of the annual mean. The three-year average of the mean must be below 50 $\mu g/m^3$. The two (2) tables in Section 3.1 show PM_{10} values with respect to the NAAQS and the

WAAQS. Throughout Section 3, the tables may have special notation instead of a value. The notation is explained below in the footer.

PM$_{10}$ Compliance with NAAQS of 150 µg/m^3					
Highest 24-Hour Average (µg/m^3)					
Site Name	2013	2014	2015	Design Value (2013-2015)	In Compliance
SLAMS					
Casper	39	30	59	0	Yes
Cheyenne	41	33	44	0	Yes
Cody	33	29	44	0	Yes
Gillette	36	25	39	0	Yes
Jackson	63	36	53	0	Yes
Lander	51	62	53	0	Yes
Laramie	57	42	41	0	Yes
Rock Springs	43	39	54	0	Yes
Sheridan-Meadowlark	31	20	68	0	Yes
Sheridan-Police Station	57	47	94	0	Yes
SPM					
Boulder	41	31	40	0	Yes
Campbell County	39	52	135	0	Yes
Converse County	N/A	N/A	42	N/A	N/A
Daniel South	41	26	36	0	Yes
Moxa Arch	79	67	52	0	Yes
Murphy Ridge	43	39	59	0	Yes
South Pass	34	15*	N/A	N/A	N/A
Wamsutter	193	41	47	0.3	Yes
Wright Jr-Sr High School	53	56	66	0	Yes
NCore					
Cheyenne NCore	42	34	78	0	Yes
Mobile Trailers**					
Big Piney	59	N/A	N/A	N/A	N/A
Converse County	99	36	71*	N/A	N/A
Lovell	N/A	45*	86*	N/A	N/A
Newcastle	N/A	N/A	42*	N/A	N/A
Rock Springs	119*	40*	N/A	N/A	N/A
Sinclair	N/A	107	82	N/A	N/A
Torrington	N/A	N/A	N/A	N/A	N/A

Table 37. PM$_{10}$ 24-hr NAAQS Comparison

- N/A – Site was not in operation at all for the year of study.
- * - The value did not meet data completeness requirements per Title 40 Part 50 of the CFR.
- ** - Mobile Trailers are in one (1) location for approximately one (1) year.
- *** - Site changed from a Mobile Trailer to a permanent location in 2013.
- ^ - For the three-year average, incomplete data years were used per WAQSR Chapter 2 Appendix 1.

PM$_{10}$ Compliance with WAAQS of 50 µg/m^3					
Annual Arithmetic Mean					
Site Name	**2013**	**2014**	**2015**	**Average (2013-2015)^**	**In Compliance**
SLAMS					
Casper	13	14	15	14	Yes
Cheyenne	12	11	10	11	Yes
Cody	11*	10*	11	10*	Yes
Gillette	14*	11*	11	12*	Yes
Jackson	14	12	15	13	Yes
Lander	16	14	15	15	Yes
Laramie	15	14	14	14	Yes
Rock Springs	16*	14	16	15	Yes
Sheridan-Meadowlark	10	10	10	10	Yes
Sheridan-Police Station	17	16	17	16	Yes
SPM					
Boulder	8	7	7	7	Yes
Campbell County	12	11	12	11	Yes
Converse County	N/A	N/A	8*	N/A	N/A
Daniel South	7	6	6	6	Yes
Moxa Arch	9	8	7	8	Yes
Murphy Ridge	9	9	9	9	Yes
South Pass	8	5*	N/A	N/A	N/A
Wamsutter	12	11	11	11	Yes
Wright Jr-Sr High School	16	14	15	15	Yes
NCore					
Cheyenne NCore	10	11	10	10	Yes
Mobile Trailers**					
Big Piney	9*	N/A	N/A	N/A	N/A
Converse County	10	9	N/A	N/A	N/A
Lovell	N/A	21*	16*	N/A	N/A
Newcastle	N/A	N/A	14*	N/A	N/A
Rock Springs	11*	7*	N/A	N/A	N/A
Sinclair	N/A	11	10	N/A	N/A
Torrington	N/A	N/A	N/A	N/A	N/A

Table 38. PM$_{10}$ Annual WAAQS Comparison

3.2 Particulate Matter (PM$_{2.5}$)

There were 24 AQD-owned monitoring stations that collected PM$_{2.5}$ data at some point in 2015. Within the PM$_{2.5}$ SLAMS network, the AQD has 22.2% of the monitors collocated to meet the 15% collocation requirement of Title 40, Part 58 Appendix A of the CFR. The AQD uses Thermo Partisol 2000 PM$_{2.5}$ monitors to collect the data at the SLAMS locations. During 2013, the AQD replaced the Thermo 1405DF monitors with MetOne BAM 1020 monitors at the four (4) PRB locations. The remaining SPM, NCore, and mobile locations use a MetOne BAM 1020 with a VSCC to monitor PM$_{2.5}$. The annual standard is attained when the three-year average

- N/A – Site was not in operation at all for the year of study.
- * - The value did not meet data completeness requirements per Title 40 Part 50 of the CFR.
- ** - Mobile Trailers are in one (1) location for approximately one (1) year.
- *** - Site changed from a Mobile Trailer to a permanent location in 2013.
- ^ - For the three-year average, incomplete data years were used per WAQSR Chapter 2 Appendix 1.

does not exceed 12.0 µg/m^3. Compliance with the 24-hour $PM_{2.5}$ NAAQS is met when the 3-year average of the 98th percentile concentration does not exceed 35 µg/m^3. Two (2) tables are presented below that compare $PM_{2.5}$ data under the two (2) standards.

$PM_{2.5}$ Compliance with NAAQS of 35 µg/m^3					
98% 24-Hour Average					
Site Name	**2013**	**2014**	**2015**	**Average (2013-2015)**	**In Compliance**
SLAMS					
Casper	13	14	15	14	Yes
Cheyenne	11	13	25	16	Yes
Cody	15	10*	19	15*	Yes
Jackson	11	13	15	13	Yes
Lander	29*	26	20	25*	Yes
Laramie	10	13	15	13	Yes
Rock Springs	12	10	19	13	Yes
Sheridan-Meadowlark	14	17	24	18	Yes
Sheridan-Police Station	17	20*	36	24	Yes
SPM					
Antelope Site 3 (PRB-$PM_{2.5}$ Network)	8*	N/A	N/A	N/A	N/A
Antelope Site 7 (PRB-$PM_{2.5}$ Network)	N/A	N/A	19	N/A	N/A
Belle Ayr BA-4 (PRB-$PM_{2.5}$ Network)	14*	11	19	14*	N/A
Black Thunder BTM-36-2 (PRB-$PM_{2.5}$ Network)	14*	10	22*	15*	Yes
Buckskin (PRB-$PM_{2.5}$ Network)	14	12	21	16	Yes
Pinedale Gaseous	13	12	14	13	Yes
South Pass	N/A	9*	12	N/A	N/A
NCore					
Cheyenne NCore	9	12	21	14	Yes
Mobile Trailers**					
Big Piney	9*	N/A	N/A	N/A	N/A
Converse County	8	8	10*	9*	N/A
Lovell	N/A	18*	15*	N/A	N/A
Newcastle	N/A	N/A	23*	N/A	N/A
Rock Springs	7*	3*	N/A	N/A	N/A
Sinclair	N/A	7	11	N/A	N/A
Torrington	N/A	N/A	N/A	N/A	N/A

Table 39. $PM_{2.5}$ 24-hr NAAQS Comparison 98th Percentile

- N/A – Site was not in operation at all for the year of study.
- * - The value did not meet data completeness requirements per Title 40 Part 50 of the CFR.
- ** - Mobile Trailers are in one (1) location for approximately one (1) year.
- *** - Site changed from a Mobile Trailer to a permanent location in 2013.
- ^ - For the three-year average, incomplete data years were used per WAQSR Chapter 2 Appendix 1.

PM$_{2.5}$ Compliance with NAAQS of 12.0 µg/m^3					
Annual Arithmetic Mean					
Site Name	2013	2014	2015	Average (2013-2015)	In Compliance
SLAMS					
Casper	4.3	4.6	4.9	4.6	Yes
Cheyenne	4.2	4.1*	4.1	4.1*	Yes
Cody	4.3	3.7*	4.2	4.1*	Yes
Jackson	4.9	4.2	4.7	4.6	Yes
Lander	7.8*	6.7	6.2	6.9*	Yes
Laramie	4.6	4.4	4.2	4.4	Yes
Rock Springs	5.1	4.5	4.8	4.8	Yes
Sheridan-Meadowlark	5.0	4.9	5.5	5.1	Yes
Sheridan-Police Station	6.5	6.4	7.4	6.8	Yes
SPM					
Antelope Site 3 (PRB-PM$_{2.5}$ Network)	2.9*	N/A	N/A	N/A	N/A
Antelope Site 7 (PRB-PM$_{2.5}$ Network)	N/A	N/A	4.2*	N/A	N/A
Belle Ayr BA-4 (PRB-PM$_{2.5}$ Network)	N/A	5.3	5.1	N/A	N/A
Black Thunder BTM-36-2 (PRB-PM$_{2.5}$ Network)	4.2*	3.9	5.0*	4.4*	Yes
Buckskin (PRB-PM$_{2.5}$ Network)	4.9	5.5	2.2	4.2	Yes
Pinedale Gaseous	4.8	5.5	5.0	5.1	Yes
South Pass	N/A	2.7*	2.5	N/A	N/A
NCore					
Cheyenne NCore	2.2*	3.9	4.4	3.5	Yes
Mobile Trailers**					
Big Piney	4.2*	N/A	N/A	N/A	N/A
Converse County	3.3	2.3	2.5*	N/A	N/A
Lovell	N/A	7.2*	9.1*	N/A	N/A
Newcastle	N/A	N/A	8.6*	N/A	N/A
Rock Springs	2.0*	0.4*	N/A	N/A	N/A
Sinclair	N/A	1.7	2.3	N/A	N/A
Torrington	N/A	N/A	N/A	N/A	N/A

Table 40. PM$_{2.5}$ Annual NAAQS Comparison

3.3 Nitrogen Dioxide (NO_2)

There were 22 AQD-owned stations that monitored NO_2 for part or all of 2015. Compliance with the annual primary NO_2 NAAQS is met when the annual average concentration in the calendar year is less than or equal to 53 ppb. The primary standard one-hour average concentration is 100 ppb. The maximum one-hour concentration per year is listed in the second NO_2 table below. The NO_2 calculated design value is met when the three-year average of the 98th percentile of the daily maximum one-hour average concentration does not exceed 100 ppb. This calculated three-year design value is located in the second NO_2 table below.

- N/A – Site was not in operation at all for the year of study.
- * - The value did not meet data completeness requirements per Title 40 Part 50 of the CFR.
- ** - Mobile Trailers are in one (1) location for approximately one (1) year.
- *** - Site changed from a Mobile Trailer to a permanent location in 2013.
- ^ - For the three-year average, incomplete data years were used per WAQSR Chapter 2 Appendix 1.

NO_2 Compliance with NAAQS of 53 ppb				
Annual Arithmetic Mean (ppb)				
Site Name	**2013**	**2014**	**2015**	**In Compliance**
Antelope Site 7 (PRB-NO_x Network)	N/A	N/A	3	Yes
Belle Ayr BA-4 (PRB-NO_x Network)	7	7	6	Yes
Big Piney***	1	1	1	Yes
Boulder	2	2	1	Yes
Campbell County	3	3	3	Yes
Casper Gaseous	3	4	5	Yes
Converse County	N/A	N/A	0*	Yes
Daniel South	1	1	0	Yes
Juel Spring	1	1	1	Yes
Moxa Arch	2	2	2	Yes
Murphy Ridge	2	2	2	Yes
Pinedale Gaseous	1	1	2	Yes
South Pass	1	1	1	Yes
Thunder Basin	1	1	1	Yes
Wamsutter	4	3	3	Yes
NCore				
Cheyenne NCore	4	4	4	Yes
Mobile Trailer**				
Converse County	3	3	3*	Yes
Lovell	N/A	5*	3*	Yes
Newcastle	N/A	N/A	5*	Yes
Rock Springs	4*	2*	N/A	Yes
Sinclair	N/A	6	6	Yes
Torrington	N/A	N/A	N/A	Yes

Table 41. NO_2 Comparison with Annual NAAQS

- N/A – Site was not in operation at all for the year of study.
- * - The value did not meet data completeness requirements per Title 40 Part 50 of the CFR.
- ** - Mobile Trailers are in one (1) location for approximately one (1) year.
- *** - Site changed from a Mobile Trailer to a permanent location in 2013.
- ^ - For the three-year average, incomplete data years were used per WAQSR Chapter 2 Appendix 1.

NO_2 Compliance with NAAQS of 100 ppb					
Annual 98% of Daily Maximum 1-hour Average (ppb)				3-year 98% 1-hour Design Value (ppb)	
Site Name	**2013**	**2014**	**2015**	**Design Value (2013-2015)**	**In Compliance**
Antelope Site 7 (PRB-NO_x Network)	N/A	N/A	35*	N/A	N/A
Belle Ayr BA-4 (PRB-NO_x Network)	35	35	32	34	Yes
Big Piney***	10*	9	8	9	Yes
Boulder	17	14	12	14	Yes
Campbell County	32	32	32	32	Yes
Casper Gaseous	34*	38	42	38*	Yes
Converse County	N/A	N/A	8*	N/A	N/A
Daniel South	4	3	3	3	Yes
Juel Spring	11	13	10	11	Yes
Moxa Arch	19	18	22	20	Yes
Murphy Ridge	14	12	12	12	Yes
Pinedale Gaseous	17	21	20	19	Yes
South Pass	5	4	5	5	Yes
Thunder Basin	9	10	8	9	Yes
Wamsutter	38	32	35	35	Yes
NCore					
Cheyenne NCore	37	34	38	36	Yes
Mobile Trailer**					
Converse County	23	24	24*	N/A	N/A
Lovell	N/A	32*	24*	N/A	N/A
Newcastle	N/A	N/A	28*	N/A	N/A
Rock Springs	31*	24*	N/A	N/A	N/A
Sinclair	N/A	37	36	N/A	N/A
Torrington	N/A	N/A	N/A	N/A	N/A

Table 42. NO_2 Comparison with Hourly NAAQS

3.4 Sulfur Dioxide (SO_2)

There were five (5) AQD-owned monitoring stations that monitored for SO_2 at some point in 2015. The NAAQS one-hour primary standard is met when the three-year average of the annual (99^{th} percentile) of the daily maximum one-hour average concentrations does not exceed 75 ppb.

SO_2 Compliance with NAAQS of 75 ppb					
Annual 99% 1-hour average (ppb)				3-year 99% 1-hour average (ppb)	
Site Name	**2013**	**2014**	**2015**	**Design Value (2013-2015)**	**In Compliance**
Moxa Arch	20	16	18	18	Yes
NCore					
Cheyenne NCore	6	4	19	10	Yes
Mobile Trailer**					
Newcastle Mobile	N/A	N/A	6*	N/A	N/A
Sinclair Mobile	N/A	8*	6*	N/A	N/A
Torrington Mobile	N/A	N/A	N/A	N/A	N/A

Table 43. SO_2 1-hr NAAQS Comparison

- N/A – Site was not in operation at all for the year of study.
- * - The value did not meet data completeness requirements per Title 40 Part 50 of the CFR.
- ** - Mobile Trailers are in one (1) location for approximately one (1) year.
- *** - Site changed from a Mobile Trailer to a permanent location in 2013.
- ^ - For the three-year average, incomplete data years were used per WAQSR Chapter 2 Appendix 1.

3.5 Carbon Monoxide (CO)

The AQD operated one (1) trace CO monitor during 2015. In past years, the AQD has operated stations that have monitored for CO. Most CO levels were relatively low and the benefit of monitoring at SPM locations was not justified for a long-term period. The level for the eight-hour NAAQS for CO is 9 ppm. The level for the one-hour NAAQS for CO is 35 ppm.

CO Compliance with NAAQS							
35 ppm Maximum 1-hour average concentration (ppm)				9 ppm Maximum 8-hour average concentrations (ppm)			In Compliance
Site Name	2013	2014	2015	2013	2014	2015	
NCore							
Cheyenne NCore	0.51	0.53	0.49	0.3	0.3	0.5	Yes

Table 44. CO NAAQS Comparison

3.6 Ozone (O_3)

The AQD operated 21 O_3 monitoring stations in Wyoming during 2015. To comply with the eight-hour ozone NAAQS, the daily maximum eight-hour ozone averages are ranked over a year. The three-year average of the 4th highest annual value must not exceed 0.070 ppm, as of December 28, 2015. The new standard may be found in Title 40, Part 50.19(a) of the CFR. In July 2012, the EPA designated the UGRB as a nonattainment area for the 2008 Ozone NAAQS of 0.075 ppm. The EPA published a finding of attainment on May 4, 2016 for the UGRB based on 2012-2014 ozone data. The remainder of the State is designated as unclassifiable/attainment.

- N/A – Site was not in operation at all for the year of study.
- * - The value did not meet data completeness requirements per Title 40 Part 50 of the CFR.
- ** - Mobile Trailers are in one (1) location for approximately one (1) year.
- *** - Site changed from a Mobile Trailer to a permanent location in 2013.
- ^ - For the three-year average, incomplete data years were used per WAQSR Chapter 2 Appendix 1.

O_3 Compliance with NAAQS of 0.070 ppm 4th Highest 8-Hour Average (ppm)					
Site Name	**2013**	**2014**	**2015**	**Design Value (2013-2015)**	**In Compliance**
Big Piney***	0.064	0.060	0.059	0.061	Yes
Boulder	0.061	0.060	0.055	0.058	Yes
Campbell County	0.061	0.059	0.062	0.060	Yes
Casper Gaseous	0.065	0.061	0.060	0.062	Yes
Converse County	N/A	N/A	0.060	N/A	N/A
Daniel South	0.063	0.062	0.062	0.062	Yes
Hiawatha	0.064	0.062	0.062	0.062	Yes
Juel Spring	0.064	0.062	0.061	0.062	Yes
Moxa Arch	0.067	0.063	0.071	0.067	Yes
Murphy Ridge	0.065	0.059	0.066	0.063	Yes
Pinedale Gaseous	0.061	0.059	0.059	0.059	Yes
South Pass	0.062	0.065	0.063	0.063	Yes
Thunder Basin	0.061	0.058	0.059	0.059	Yes
Wamsutter	0.064	0.060	0.060	0.061	Yes
NCore					
Cheyenne NCore	0.069	0.065	0.063	0.065	Yes
Mobile Trailer**					
Converse County Mobile	0.067	0.059	0.060*	N/A	N/A
Lovell Mobile	N/A	0.049*	0.056*	N/A	N/A
Newcastle Mobile	N/A	N/A	0.061*	N/A	N/A
Rock Springs Mobile	0.064*	0.050*	N/A	N/A	N/A
Sinclair Mobile	N/A	0.060	0.061	N/A	N/A
Torrington Mobile	N/A	N/A	N/A	N/A	N/A

Table 45. O_3 8-hr NAAQS Comparison

- N/A – Site was not in operation at all for the year of study.
- * - The value did not meet data completeness requirements per Title 40 Part 50 of the CFR.
- ** - Mobile Trailers are in one (1) location for approximately one (1) year.
- *** - Site changed from a Mobile Trailer to a permanent location in 2013.
- ^ - For the three-year average, incomplete data years were used per WAQSR Chapter 2 Appendix 1.

4.0 Special Studies

4.1 UGWOS

In the winters of 2005 and 2006, primarily in the month of February, the AQD measured 8-hour ozone concentrations greater than 80 ppb at the Daniel South, Jonah and Boulder monitoring stations. Elevated ozone concentrations are uncommon during the winter months; however, they do not appear to be an anomaly because these conditions were recorded in both February 2005 and February 2006. After recording elevated values for two (2) years, the AQD decided to conduct a study of winter ozone formation. The purposes of the study were, originally, to better understand the formation mechanisms and collect data to form a conceptual model of the winter ozone formation. Since 2007 the objectives of the study have been modified to fill gaps in data and conceptual understanding of winter ozone formation with the ultimate intent of developing a working photochemical grid model for the Upper Green River Basin.

During summer 2014, the AQD critically evaluated the Upper Green Winter Ozone Study (UGWOS) with respect to the current ozone reduction objective. The AQD reduced short-term winter monitoring for 2015 to VOC and aldehydes only based on this evaluation. The focus of the 2015 winter monitoring study was ongoing regulatory monitoring supplemented with six (6) locations for canister/cartridge collection with speciated VOC and aldehyde analyses in order to track changes in species with emission reductions. The AQD elected to continue the same sampling scheme for the Winter 2016 Ozone Season. The AQD will critically evaluate the UGWOS program again in the summer of 2016 in relation to the budget to determine what, if any, additional sampling will take place under the UGWOS program.

Quality Assurance Plans, data, and final reports from the UGWOS campaigns can be downloaded from this AQD website (**http://deq.wyoming.gov/aqd/winter-ozone/resources/winter-ozone-study/**).

4.2 VOC Monitoring

The AQD continues to perform continuous methane/non-methane hydrocarbon measurements at the Boulder location in addition to pulling periodic speciated VOC canisters. The AQD also operates methane/non-methane hydrocarbon analyzers in the mobile trailers. Additionally the AQD continues to collect CH_4 and NMHC at Wamsutter and Converse County.

4.3 Mobile BAM Trailer

The AQD has outfitted a mobile monitoring trailer with continuous BAM PM_{10} and $PM_{2.5}$ monitors for deployment in communities that may be impacted by smoke from wildfire activity, agricultural burning, or windblown dust. This portable system will allow the AQD to monitor near real-time PM_{10} and $PM_{2.5}$ concentrations, as well as meteorological conditions, so the AQD can properly inform the public when particulate levels may cause adverse health effects.

4.3.1 Worland

The AQD deployed the mobile BAM monitoring station to monitor particulate matter in a residential area of Worland, WY that may be impacted by agricultural activities. Data collection began on July 1, 2015 and will continue for one year. The station also collects data on local wind speed, wind direction, and temperature and is located south of town at Newell Sargent Park. The AQD is evaluating potential locations for deployment of the mobile BAM monitoring station after the station's time at Worland has finished.

4.4 Grand Teton

The AQD and National Park Service work cooperatively to fund a portion of the Grand Teton Monitoring Station located near the Teton Science School in the Grand Teton National Park. This monitoring station includes ozone, NADP wet deposition, nephelometer, camera system and meteorological instrumentation.

4.5 Intermountain West Data Warehouse Project

Since 2010, the AQD has participated in the IWDW; formerly known as the Three-State Study. The IWDW provides high quality tools for understanding and assessing the effects of current and future energy development and associated emission on air quality. The IWDW is a cooperative venture between Wyoming AQD, state agencies from Colorado, Utah, and New Mexico, Federal Land Managers, and the EPA. As part of this project, the Federal Government partially funded the Hiawatha station and contributed funding to install a methane/non-methane hydrocarbon analyzer along with speciated canisters at the Wamsutter monitoring station. For 2016, the AQD will continue to fund the Hiawatha Monitoring Station as well as the methane/non-methane hydrocarbon analyzer at Wamsutter. These and other data from the IWDW project can be viewed at the IWDW website: **http://views.cira.colostate.edu/TSDW**.

4.6 SO_2 Data Requirements Rule

On September 21, 2015 the EPA's "Data Requirements Rule for the 2010 1-hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)" (SO_2 DRR) became effective. This rule directs state agencies to provide data to characterize current air quality in areas with large sources of SO_2 emissions to identify maximum concentrations in ambient air. Characterization can be done through three different pathways: modeling, ambient monitoring, or emissions limitation. The AQD has delegated the responsibility to choose and implement the characterization pathway to the facilities that are subject to the rule. Table 46 lists the sources subject to this rule and their chosen pathway.

Emissions Sources Subject to the Data Requirements Rule		Pathway Chosen to Satisfy Rule	
Company	**Facility**	**Model**	**Monitor**
Basin Electric	Laramie River Station	X	
Multiple	Campbell County Electric Generating Units	X	
Burlington Resources	Lost Cabin Gas Plant		X
PacifiCorp	Dave Johnston	X	X
PacifiCorp	Naughton	X	
PacifiCorp	Jim Bridger	X	X
Sinclair Wyoming Refining Company	Sinclair Refinery		X
Multiple	Trona Group		X

Table 46. DRR Pathway for all Affected Facilities and Emissions Groups in Wyoming

PacifiCorp has elected to pursue both the modeling and monitoring pathways while awaiting modeling characterization of SO_2 concentrations at two (2) of their facilities. The Monitoring Section has worked in cooperation with PacifiCorp to identify the suitable locations for their SO_2 DRR ambient monitoring networks, which are detailed in the following sections. However, the implementation of these ambient networks will likely not be certain until after the public notice of this Plan. Therefore, the AQD is taking comment on PacifiCorp's proposed ambient monitoring locations, but reserves the right not to implement the monitoring pathway and associated SO_2 DRR ambient monitoring networks for these two (2) facilities in the event that PacifiCorp meets the requirements of the SO_2 DRR through the modeling pathway.

To comply with the rule, the AQD must provide a detailed plan and justification of monitoring locations for those facilities that chose the monitoring pathway in the Annual Network Plan to be approved by EPA Region VIII. In addition, the AQD is specifically seeking comment on the ambient monitoring proposals in this plan as required in the rule as well as the AQD's proposed implementation of a SLAMS equivalent network under this rule.

4.6.1 SO_2 DRR Networks and Delegation of Operations to Industrial Sources

The following plan details how the AQD will delegate and oversee operations of the SO_2 DRR Networks in a manner equivalent to a SLAMS network per Title 40 Part 51.1203(c) of the CFR:

> "…the required monitors shall be sited and operated as a SLAMS or in a manner equivalent to a SLAMS. In either case, monitors shall meet applicable criteria in 40 CFR Part 58, appendices A, C, and E and their data shall be subject to data certification and reporting requirements as prescribed in 40 CFR Part 58.15 and 58.16."

4.6.1.1 History

The AQD's Ambient and Emission Monitoring Section has long worked with EPA Region VIII and facilities to oversee ambient monitoring and requires operations of ambient monitors at facilities to collect data directly comparable to the NAAQS. The AQD's industrial monitoring program has existed since the 1980's and has been developed with EPA Region VIII through several mechanisms including the "Memorandum of Agreement on Procedures for Protecting PM_{10} NAAQS in the Powder River Basin" and the WDEQ – EPA Performance Partnership Agreement. The AQD has a standardized approach to cooperative monitor siting, approving quality assurance plans, oversight of quarterly reporting, reporting and uploading data to AQS, and responding to EPA inquiries for permit-required industrial monitoring stations. The AQD proposes to build upon this approach to implement the SO_2 DRR Network.

4.6.1.2 Title 40 Part 58 Implementation

For implementation of the SO_2 DRR network, the AQD has delegated the responsibility of procurement, siting, and operation of monitoring to facilities that are required to characterize SO_2 concentrations under Title 40 Part 51.1203 of the CFR and have chosen the ambient monitoring pathway in Section (c). The EPA's Office of Air Quality Planning and Standards (OAQPS) has issued a memo discussing the options for implementing a network operated by industry. This proposal outlines the AQD's choices for implementation.

Primary Quality Assurance Organization

The Primary Quality Assurance Organization (PQAO) is defined as

> "a monitoring organization, a group of organizations or other organization that is responsible for a set of stations that monitor the same pollutant and for which data quality assessments can be pooled. Each criteria pollutant sampler/monitor at a monitoring station must be associated with one PQAO."

Furthermore, Title 40 Part 58 Appendix A 1.2.1 of the CFR outlines the common factors that should be considered when defining a PQAO:

> "a) Operation by a common team of field operators according to a common set of procedures;
>
> b) Use of a common quality assurance project plan (QAPP) or standard operating procedures;
>
> c) Common calibration facilities and standards;
>
> d) Oversight by a common quality assurance organization; and
>
> e) Support by a common management organization (i.e. state agency) or laboratory."

Based on the definition and common factors, it is most appropriate to name the industrial facility, company or group of companies (known as "industrial monitoring entity" from here forward) as the PQAO for Wyoming's SO_2 DRR networks. Each industrial monitoring entity is choosing its own contractors to operate the station and perform quality control and quality assurance activities. Each of these entities will therefore have common laboratory facilities, standards, QAPPs, data validation practices and management to some degree. Therefore, the AQD will manage these networks consistent with existing industrial monitoring networks in Wyoming, with the industrial monitoring entity being the PQAO.

Coverage in Network Plans and Network Assessments

The AQD, through oversight of and cooperation with the industrial monitoring entity, will include the SO_2 DRR networks in the AQD's Annual Network Plan beginning in 2016 with the initial siting justification for EPA approval. The AQD will include these sites as a section in subsequent Network Plans and will ensure monitors are meeting the requirements stated under Title 40 Part 58.10 of the CFR. The AQD will also include these networks in the 5-year Network Assessment due in 2020 and subsequent years, if necessary.

Annual Data Certification, Data Submittal, and Archiving Requirements

The industrial monitoring entity will be responsible for appropriate quarterly reporting of validated data to the AQD including:

1) AQS formatted "Raw Data" file including hourly and 5-min SO_2 (or 5-min hourly max) data;
2) AQS formatted "QA/QC file" including all precision checks and any performance audits conducted during the quarter;
3) Written quarterly data summary.

These quarterly reporting items, which include a certification by the Responsible Official, will be submitted to AQD through the IMPACT portal no later than 60 days after the end of the quarter. The AQD will review the data and upload the raw and QA/QC data to AQS per Title 40 Part 58.16 of the CFR.

The industrial monitoring entity will be responsible for the Annual Data Certification, by letter to EPA Region VIII, per Title 40 Part 58.15 of the CFR. The AQD will provide necessary annual reports from AQS through the IMPACT system. The AQD will provide training for industrial monitoring entities prior to 2018 on how to properly perform a data certification.

Quality System Documentation

The WDEQ has an approved Quality Management Plan (QMP) in place that allows the AQD to review and approve environmental data collection activities described and covered under QMPs and QAPPs. The AQD has a checklist and review system in place for QAPP approval from industrial monitoring entities. The industrial monitoring entity must submit a combined QMP/QAPP to the AQD for approval by October 31, 2016. Approved QMP/QAPPs will be supplied to EPA Region VIII per Title 40 Part 58 Appendix A2 of the CFR.

Quality System Independence

The AQD plans for industrial monitoring entities to achieve quality independence through a combination of oversight by the AQD Quality Assurance Program and independent contracted performance evaluations. This combination will allow for consistent, qualified oversight with the appropriate levels of management separation. Details are in sections to follow.

Technical Systems Audit Program

The AQD will perform Technical Systems Audits on the industrial monitoring entities on the three-year schedule as specified in Title 40 Part 58 Appendix A of the CFR. The AQD has trained for these audits through a joint-audit with Region VIII that took place in 2013.

Measurement Quality Checks

One–point quality control checks will be implemented by the industrial monitoring entity as will an independent contracted annual performance audit. These items will be specified in the approved QAPP and reported to the AQD for upload into AQS.

The implementation of the National Performance Audit Program (NPAP) will be the responsibility of the industrial monitoring entity. Each entity will contract with EPA Region VIII's NPAP auditor or another certified auditor to audit their monitoring networks.

Meeting Probe and Path Siting Requirements

The AQD has worked with industrial monitoring entities and EPA Region VIII during the siting process to ensure that probe and monitoring path siting requirements stated in Title 40 Part 58 Appendix E of the CFR are met and locations represented in the 2016 AQD Annual Network Plan are appropriate for meeting the needs of the SO_2 DRR. Probe and path criteria will be reevaluated during AQD Technical Systems Audits.

4.6.1.3 Conclusion

The AQD has documented a straightforward plan, based on over thirty years of industrial monitoring oversight, that will ensure operations of the SO_2 DRR Networks in a manner equivalent to SLAMS. This proposal addresses all of the major requirements in the Revised Title 40 Part 58 of the CFR as well as considerations addressed in the OAQPS memo including data submittal and certification, quality system documentation, probe and path siting requirements, and measurement quality checks.

4.6.2 Lost Cabin Gas Plant

The Lost Cabin Gas Plant air quality monitoring station will begin operations by January 1, 2017, and will be operated to satisfy the requirements of the SO_2 DRR. The station will be located on an existing well pad approximately 670 meters south of the Lost Cabin Gas Plant facility in Fremont County (see Appendix E for siting justification). The station's objective is to characterize maximum1-hr SO_2 impacts from the Lost Cabin Gas Plant, a facility subject to the DRR, and a SO_2 analyzer will be located at this station.

Lost Cabin Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Lost Cabin	43.272, -107.59891	TBD	SO_2	TBD	Neighborhood	Continuous	Must be operational by 1/1/2017

Table 47. Lost Cabin Monitor Information

4.6.3 Dave Johnston Power Plant

The Dave Johnston Power Plant air quality monitoring station will begin operations by January 1, 2017, and will be operated to satisfy the requirements of the DRR. The station will be located on state land approximately 6.9 kilometers south of the Dave Johnston Power Plant near Glenrock (see Appendix F for siting justification). The station's objective is to characterize maximum 1-hr SO_2 impacts from the Dave Johnston Power Plant, a facility subject to the DRR and a SO_2 analyzer will be located at this station.

Dave Johnston Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Dave Johnston	42.776122, -105.798214	TBD	SO_2	TBD	Urban	Continuous	Must be operational by 1/1/2017

Table 48. Dave Johnston Power Plant Monitor Information

4.6.4 Jim Bridger Power Plant

The Jim Bridger Power Plant has an existing SO_2 monitoring station which will be used to satisfy the DRR. The station is located approximately 30 miles east of Rock Springs on County Route 15, in Sweetwater County, Wyoming. This station began operations on January 5, 2012. The station's objective is to characterize maximum 1-hr SO_2 impacts from the Jim Bridger Power Plant (see Appendix G for siting justification). A SO_2 analyzer will be located at this station.

Jim Bridger Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Jim Bridger	41.74649, -108.80374	TBD	SO_2	Teledyne-API 100E	Neighborhood	Continuous	No planned changes

Table 49. Jim Bridger Power Plant Monitor Information

4.6.5 Sinclair Oil Refinery

The Sinclair Oil Refinery has an existing SO_2 monitoring network, which will be used to help satisfy the DRR. The Sinclair In-Town station is located approximately 300 meters west of the Sinclair Oil Refinery facility with the objective of characterizing population exposure to SO_2 impacts within the Town of Sinclair. This station began operations on December 10, 2015. A SO_2 analyzer is located at this station. The Sinclair North East station is located directly north of the facility's fenceline with the objective of characterizing SO_2 impacts downwind of the facility. This station was relocated and began operations at the present site on December 18, 2015. There are SO_2 and NO_x analyzers located at this station. In addition to these existing sites, Sinclair will install another SO_2 monitor southwest of the facility by January 1, 2017, which will be operated to satisfy the requirements of the DRR. The station will be located at the Sinclair employee parking lot approximately 50 meters southwest of the facility (see Appendix H for siting justification for all sites). This station's objective is to characterize maximum 1-hr SO_2 impacts from the Sinclair Oil Refinery, a facility subject to the DRR and a SO_2 analyzer will be located at this station.

Sinclair Refinery Monitoring Network Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Sinclair In-Town	41.78270, -107.12088	56-007-0008	SO_2	Thermo 43i	Middle	Continuous	No planned changes
Sinclair North East	41.79358, -107.08339	56-007-0009	SO_2	API M-100E	Neighborhood	Continuous	No planned changes
Sinclair South Site	41.77876, -107.10899	TBD	SO_2	TBD	Middle	Continuous	Must be operational by 1/1/2017

Table 50. Sinclair Oil Refinery Monitor Information

4.6.6 Trona Environmental Subcommittee

The Trona Environmental Subcommittee consisting of: Tronox Alkali Wyoming Corporation (including the Westvaco and Granger Soda Ash Plants); Solvay Soda Ash Joint Venture and TATA Chemicals (Soda Ash) Partners will begin SO_2 network operations by January 1, 2017, and will be operated to satisfy the requirements of the DRR. Two monitoring stations will be included within the network, one located on the ridge east of TATA and Westvaco, the other located between TATA and Westvaco (see Appendix I for siting justification). The network's objective is to characterize maximum 1-hr SO_2 impacts from the Green River Basin trona producing area. A SO_2 analyzer will be located at each station.

Trona Environmental Subcommittee Monitoring Site Specifications							
Site Name	**Location**	**AQS ID**	**Parameter**	**Instrument**	**Scale**	**Sample Frequency**	**Operational Status**
Site 2	41.63001, -109.70159	TBD	SO_2	Thermo 43i	Neighborhood	Continuous	Must be operational by 1/1/2017
Site 11	41.58532, -109.76861	56-037-0014	SO_2	Thermo 43i	Neighborhood	Continuous	Must be operational by 1/1/2017

Table 51. Trona Environmental Subcommittee Monitor Information

4.7 Implementation of 2015 Network Assessment Outcomes

In October 2015, the AQD submitted its 2015 Network Assessment to the EPA as required by Title 40, Part 58.10(d) of the CFR. The Network Assessment is a comprehensive review, using a variety of analytical techniques, of an air regulatory agency's ambient monitoring network. The Network Assessment is performed every five (5) years. The full document can be found here (**http://deq.wyoming.gov/media/attachments/Air%20Quality/Monitoring/Wyo%20Network%20Assessments/2015_Air-Quality-Network-Assessment_Final.pdf**).

The 2015 Network Assessment was released for a 30 day public comment period. In the absence of any comments from the public, the following findings were submitted to EPA as considerations for the future operations of the AQD's Monitoring Network.

There were three general findings from the 2015 Network Assessment:

- There is a need to review and reconcile site objectives for each AQD monitoring station.
- The AQD needs to examine current monitoring at the Wind River Reservation.
- The AQD revisited 2010 Network Assessment findings.

The following findings suggest additional monitoring needs in Wyoming AQD's Network:

- There is a need for long-term monitoring in central Converse County.
- There is a need for monitoring in the city of Torrington.
- There is a need for monitoring in eastern Johnson County.
- There is a need for population-based monitoring in Laramie beyond what presently exists.
- There is a need for population-based monitoring in Sheridan beyond what presently exists.
- The AQD should conduct further analyses to determine the need for gaseous pollutant monitoring in all micropolitan statistical areas that have not already been studied.
- Carbon monoxide monitoring data would be beneficial in eastern Johnson County or central Converse County.
- The city of Buffalo has been identified as a potential location for population exposure and upwind background monitoring.
- The Moneta Divide is a region of planned oil and gas development identified as a potential location for AQD monitoring pending examination of current industrially-operated monitoring.

The findings where monitors could justifiably shut down in Wyoming AQD's Network:

- Murphy Ridge has shown consistent monitored concentrations and has not shown significant trends since monitoring operations began in 2007. Additionally, modeling background data needs have changed.
- The Farson Meteorological Station has successfully characterized meteorological conditions along the southeastern boundary of the Upper Green River Basin for four years.
- The instrument used to collect PM_{10} at Boulder has not recorded any exceedances since monitoring operations began in 2005. Due to the rising cost to maintain and repair the instrument, removal could be warranted.
- Similarly, other stations (Daniel South, Wamsutter, Murphy Ridge, and Campbell County) employ older instruments to measure PM_{10} requiring more site visits and maintenance. There is a need to conduct site specific evaluations, which would inform potential removal or replacement.
- Cheyenne has multiple monitoring stations that measure PM_{10} and $PM_{2.5}$. The data from both sites correlate well (>90%) with each other. The AQD will conduct more analyses regarding the possible removal of one of these sites, which would require federal approval.
- The monitoring station at Campbell County has data from multiple pollutants that correlates well with sites owned by the AQD and by industry. Further analyses are needed to determine if removal is warranted.
- The Wright Jr.-Sr. High School monitoring station has PM_{10} data that correlates well with multiple industrial monitors nearby. Further evaluation is warranted regarding potential removal.
- Data for the Moxa Arch has not shown any significant trends since operation started in 2010 and modeling needs have changed. Additionally, the O_3 data is highly correlated with other AQD stations in southwest Wyoming. Further analyses are needed to determine if removal is warranted.

More specific information about each of these findings is available in the 2015 Network Assessment.

In response to the findings, the AQD has already evaluated and reconciled monitor objectives in the Network Plan with those listed in AQS and made updates to the objectives in AQS. The AQD also revisited the 2010 Network Assessment findings and confirmed that there are no outstanding items to accomplish. With respect to the network additions discussed in the 2015 Network Assessment, the AQD established a stationary gaseous, particulate, and meteorological monitoring site in central Converse County during April 2015. A mobile gaseous trailer became operational in Torrington in December 2015 and includes SO_2 to evaluate transport of SO_2 from upwind sources.

The AQD will continue to evaluate available resources to implement the findings of the 2015 Network Assessment during 2016 and subsequent years. Currently, the AQD is evaluating available budget and resources for the upcoming 2017-2018 biennium. Findings of the 2015 Network Assessment will be evaluated and prioritized along with the current monitoring network, to determine changes in the future.

5.0 Future Ambient Monitoring Modifications

5.1 Casper Mobile

The AQD is in the midst of deploying the mobile gaseous trailers to towns and cities that have a major source oil refinery. From December 2013 to February 2016, a mobile trailer was sited in Sinclair, WY near the Sinclair Oil Refinery. Another mobile trailer was deployed to Newcastle, WY, in July 2015, where the Wyoming Refining Company-Newcastle Refinery is located. The Cheyenne Mobile Trailer is sited downwind of the HollyFrontier Refinery and is collecting ambient air and meteorological data for one (1) year. Collection of data for the Cheyenne Mobile site began in March 2016.

The next mobile trailer location will be in the city of Casper near the Sinclair Casper Refinery. It is expected that the Newcastle Mobile will be moved to this location early Fall 2016.

6.0 Conclusion

As required by Title 40, Part 58.10(a) of the CFR, the AQD has presented its annual Network Plan for 2016. The Network Plan demonstrates sufficient coverage throughout Wyoming. As population and industrial concerns change, the AQD strives to verify that the monitoring needs of Wyoming are satisfied. The market price fluctuations of Wyoming's natural resources may contribute to the availability of ambient monitoring activities deployed throughout the State.

Data collected at the AQD's monitoring stations through 2015 show that all monitors are attaining the NAAQS for PM_{10}, $PM_{2.5}$, NO_2, SO_2, O_3, and CO. Further, the operation of each monitoring site has met the requirements of Title 40, Part 58 Appendices A-E.

The AQD continually evaluates data collected at the AQD, industrial, and AQRV monitors to determine if changes in policy are needed to continue managing the air resource in Wyoming.

Any comments pertaining to the Wyoming Ambient Air Monitoring Annual Network Plan should be sent to the following contact:

Ms. Cara Keslar
Monitoring Section Supervisor
Wyoming Air Quality Division
200 West 17th Street
Cheyenne, WY 82002

Appendix A: AQD Monitoring Site Metadata

AQS ID	Site Name	Address	Land Use Type	Location Type	Monitor Type	Meets 40 CFR § 58 Appendix A, C, D & E Requirements*	Monitor Objective	Longitude	Latitude	Site Start Date
56-025-0001	Casper	City County Bldg. – Center & C Streets	Commercial	Urban & Center City	SLAMS	X	Population Exposure	-106.32509	42.85106	10/15/1998
56-021-0001	Cheyenne	Emerson Bldg. 23rd & Central Ave.	Residential	Urban & Center City	SLAMS	X	Population Exposure	-104.81766	41.13687	1/1/1979
56-029-0001	Cody	1225 10th St.	Residential	Suburban	SLAMS	X	Population Exposure	-109.06851	44.52464	1/1/1975
56-005-1002	Gillette	1000 W. 8th St.	Commercial	Urban & Center City	SLAMS	X	Population Exposure	-105.51702	44.28801	1/1/1978
56-039-1006	Jackson	40 E. Pearl Ave.	Commercial	Urban & Center City	SLAMS	X	Population Exposure	-110.76118	43.47808	6/8/2007
56-013-1003	Lander	600 Washington	Residential	Suburban	SLAMS	X	Population Exposure	-108.73556	42.84223	1/1/1987
56-001-0006	Laramie	406 Ivinson	Commercial	Urban & Center City	SLAMS	X	Population Exposure	-105.59173	41.31159	1/1/1968
56-037-0007	Rock Springs	625 Ahsay Ave.	Residential	Urban & Center City	SLAMS	X	Population Exposure	-109.22013	41.59259	1/1/1983
56-033-1003	Sheridan Meadowlark	1410 DeSmet Ave.	Residential	Urban & Center City	SLAMS	X	Population Exposure	-106.96432	44.78275	7/1/2012
56-033-0002	Sheridan – Police Station	45 West 12th St.	Commercial	Urban & Center City	SLAMS	X	Highest Concentration, Population Exposure	-106.95593	44.81514	10/5/1983
56-009-0009	Antelope Site 7 (PRB Network)	Antelope Site 7	Industrial	Rural	SPM	X	General/Background	-105.38857	43.42542	2/18/2015
56-005-0892	Belle Ayr BA-4 (PRB Network)	Belle Ayr BA-4	Industrial	Rural	SPM	X	Highest Concentration, Source Oriented	-105.34316	44.09707	7/9/1991
56-035-0700	Big Piney	4 miles south of Big Piney, WY	Residential	Rural	SPM	X	Source Oriented, General/Background	-110.09890	42.48640	3/30/2011
56-005-0891	Black Thunder BTM-36-2 (PRB Network)	BTM-36-2 (Black Thunder Mine)	Industrial	Rural	SPM	X	Source Oriented	-105.21330	43.64830	1/1/1985

AQS ID	Site Name	Address	Land Use Type	Location Type	Monitor Type	Meets 40 CFR § 58 Appendix A, C, D & E Requirements*	Monitor Objective	Longitude	Latitude	Site Start Date
56-035-0099	Boulder	5 miles southwest of Boulder, WY	Desert	Rural	SPM	X	Source Oriented, Highest Concentration	-109.75300	42.71900	2/1/2005
56-005-1899	Buckskin Mine (PRB Network)	Triton Coal Gillette, WY	Industrial	Rural	SPM	X	Source Oriented	-105.53976	44.50268	9/4/2008
56-005-0456	Campbell County	15 miles SSW of Gillette, WY	Desert	Rural	SPM	X	Source Oriented, General/Background	-105.52999	44.14696	7/15/2003
56-025-0100	Casper Gaseous	2800 Pheasant Dr.	Commercial	Urban & Center City	SPM	X	Population Exposure	-106.36501	42.82231	3/1/2013
56-021-0002	Cheyenne Mobile	Phoenix Dr. Cheyenne, WY	Residential	Urban & Center City	SPM	X	Population Exposure	-104.75308	41.13069	3/29/2016
56-021-0100	Cheyenne NCore	6909 Washakie Ave.	Residential	Suburban	NCore	X	National Core Monitoring Site	-104.77842	41.18235	1/1/2011
56-009-0010	Converse County	16 miles west of WY Highway 59 on Highland Loop Rd.	Industrial	Rural	SPM	X	General/Background	-105.49896	43.10108	4/10/2015
56-035-0100	Daniel South	5 miles south of Daniel, WY	Desert	Rural	SPM	X	General/Background	-110.0551	42.7907	7/1/2005
56-037-1000	Farson Met	0.7 miles northwest of intersection of U.S. Highway 191 & WY Highway 28	Desert	Rural	SPM	X	General/Background	-109.4541	42.1184	4/27/2011
56-037-0077	Hiawatha	Bitter Creek Rd. 43 miles SE of Rock Springs, WY	Desert	Rural	SPM	X	General/Background	-108.619	41.158	3/30/2011
56-035-1002	Juel Spring	20 miles NW of Farson, WY	Desert	Rural	SPM	X	Source Oriented, General/Background	-109.56050	42.37350	12/11/2009
56-037-0300	Moxa Arch	25 miles NW of Green River, WY	Desert	Rural	SPM	X	Source Oriented	-109.78833	41.75056	5/27/2010
56-041-0101	Murphy Ridge	Bear River, WY	Agricultural	Rural	SPM	X	General/Background	-111.04238	41.37300	1/1/2007

AQS ID	Site Name	Address	Land Use Type	Location Type	Monitor Type	Meets 40 CFR § 58 Appendix A, C, D & E Requirements*	Monitor Objective	Longitude	Latitude	Site Start Date
56-045-0004	Newcastle Mobile	116 Casper Ave.	Mobile	Suburban	SPM	X	Population Exposure	-104.20432	43.84989	7/10/2015
56-035-0101	Pinedale Gaseous	West side of City Park & Pine Creek	Residential	Suburban	SPM	X	Population Exposure	-109.87076	42.86982	1/1/2009
56-013-0099	South Pass	South Pass, WY	Forest	Rural	SPM	X	General/Background	-108.72000	42.53000	3/12/2007
56-005-0123	Thunder Basin	30 miles NNE of Gillette, WY	Desert	Rural	SPM	X	General/Background	-105.29030	44.65220	5/1/2001
56-015-0005	Torrington Mobile	1446 East N St.	Mobile	Rural	SPM	X	Population Exposure	-104.16750	42.05900	12/21/2915
56-037-0200	Wamsutter	2 miles west of Wamsutter, WY	Desert	Rural	SPM	X	Source Oriented, General/Background	-108.02458	41.67745	3/1/2006
56-005-0099	Wright Jr-Sr High School	Adjacent to Wright Jr-Sr High School	Residential	Rural	SPM	X	General/Background, Population Exposure	-105.49149	43.75615	11/1/2002
NOT IN AQS	Worland BAM Trailer	South of Newell Sargent Park	Residential	Rural	SPM	X	Population Exposure	-107.96000	44.01000	3/17/2015

Table 52. Metadata of AQD Sites

Appendix B: 2015 SLAMS Precision and Accuracy

$PM_{2.5}$

$PM_{2.5}$	AQS ID	POC	Site Name	Precision Checks (Number-Type)	Accuracy Audit Q1	Accuracy Audit Q2	Accuracy Audit Q3	Accuracy Audit Q4	Flow Verification Q1	Flow Verification Q2	Flow Verification Q3	Flow Verification Q4
	56-021-0100	POC-1	Cheyenne NCore	29-Analytical	0	1	0	1	3	3	3	3
		POC-11		NA	0	1	0	1	3	3	3	3
		POC-2		NA	0	1	0	1	3	3	3	3
		POC-3		55-Analytical 12-Flow Rate	0	1	0	1	3	3	3	3
	56-021-0001	POC-1	Cheyenne SLAMS	28-Anayltical	0	1	0	1	3	3	3	3
		POC-11		NA	0	1	0	1	3	3	3	3
		POC-2		NA	0	1	0	1	3	3	3	3
	56-025-0001	POC-1	Casper SLAMS	NA	0	1	0	1	3	3	3	3
		POC-11		NA	0	1	0	1	3	3	3	3
	56-039-1006	POC-1	Jackson SLAMS	NA	0	1	0	1	3	3	2	2
		POC-11		NA	0	1	0	1	3	3	2	2
	56-029-0001	POC-1	Cody SLAMS	NA	0	1	0	1	3	3	2	3
		POC-11		NA	0	1	0	1	3	3	2	3
	56-013-1003	POC-1	Lander SLAMS	NA	0	1	0	1	3	3	2	2
		POC-11		NA	0	1	0	1	3	3	2	2
	56-001-0006	POC-1	Laramie SLAMS	NA	1	0	1	0	3	3	2	1
		POC-11		NA	1	0	1	0	3	3	2	1
	56-037-0007	POC-1	Rock Springs SLAMS	NA	1	0	1	0	3	3	3	3
				NA	1	0	1	0	3	3	3	3
	56-033-0002	POC-1	Sheridan Police Station SLAMS	26-Analytical	0	1	0	1	3	3	3	3
		POC-2		NA	0	1	0	1	3	3	3	3
		POC-11		NA	0	1	0	1	3	3	3	3
	56-033-1003	POC-1	Sheridan Meadowlark School SLAMS	NA	1	0	0	1	3	3	3	3
		POC-11		NA	1	0	0	1	3	3	3	3

Table 53. $PM_{2.5}$ SLAMS Precision & Accuracy

PM_{10}

PM_{10}	AQS ID	POC	Site Name	Precision Checks (Number – Type)	Accuracy Audit				Flow Verification			
					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	56-025-0001	POC-4	Casper SLAMS	29-Analytical	0	1	1	1	3	3	3	3
		POC-5		NA	0	1	1	1	3	3	3	3
		POC-44		NA	0	1	1	1	3	3	3	3
	56-021-0001	POC-1	Cheyenne SLAMS	29-Analytical	0	1	0	1	3	3	3	3
		POC-11		NA	0	1	0	1	3	3	3	3
		POC-2		NA	0	1	0	1	3	3	3	3
	56-021-0100	POC-3	Cheyenne NCore	NA	0	1	0	1	3	3	3	3
	56-029-0001	POC-3	Cody SLAMS	NA	0	1	0	1	3	3	2	3
		POC-33		NA	0	1	0	1	3	3	2	3
	56-005-1002	POC-5	Gillette SLAMS	NA	0	1	0	1	3	3	3	3
	56-039-1006	POC-1	Jackson SLAMS	NA	0	1	0	1	3	3	2	2
		POC-11		NA	0	1	0	1	3	3	2	2
	56-013-1003	POC-3	Lander SLAMS	NA	0	1	0	1	3	3	2	2
		POC-33		NA	0	1	0	1	3	3	2	2
	56-001-0006	POC-5	Laramie SLAMS	NA	1	0	1	0	3	3	2	1
		POC-55		NA	1	0	1	0	3	3	2	1
	56-037-0007	POC-2	Rock Springs SLAMS	NA	1	0	1	0	3	3	2	2
		POC-22		NA	1	0	1	0	3	3	2	2
	56-033-0002	POC-1	Sheridan Police Station SLAMS	12-Flow Rate	1	0	1	0	3	3	3	3
	56-033-1003	POC-1	Sheridan Meadowlark School SLAMS	30-Analytical	1	0	0	1	3	3	3	3
		POC-11		NA	1	0	0	1	3	3	3	3
		POC-2		NA	1	0	0	1	3	3	3	3

Table 54. PM_{10} SLAMS Precision & Accuracy

Appendix C: Regional Quadrant Maps of the AQD's Monitoring Locations

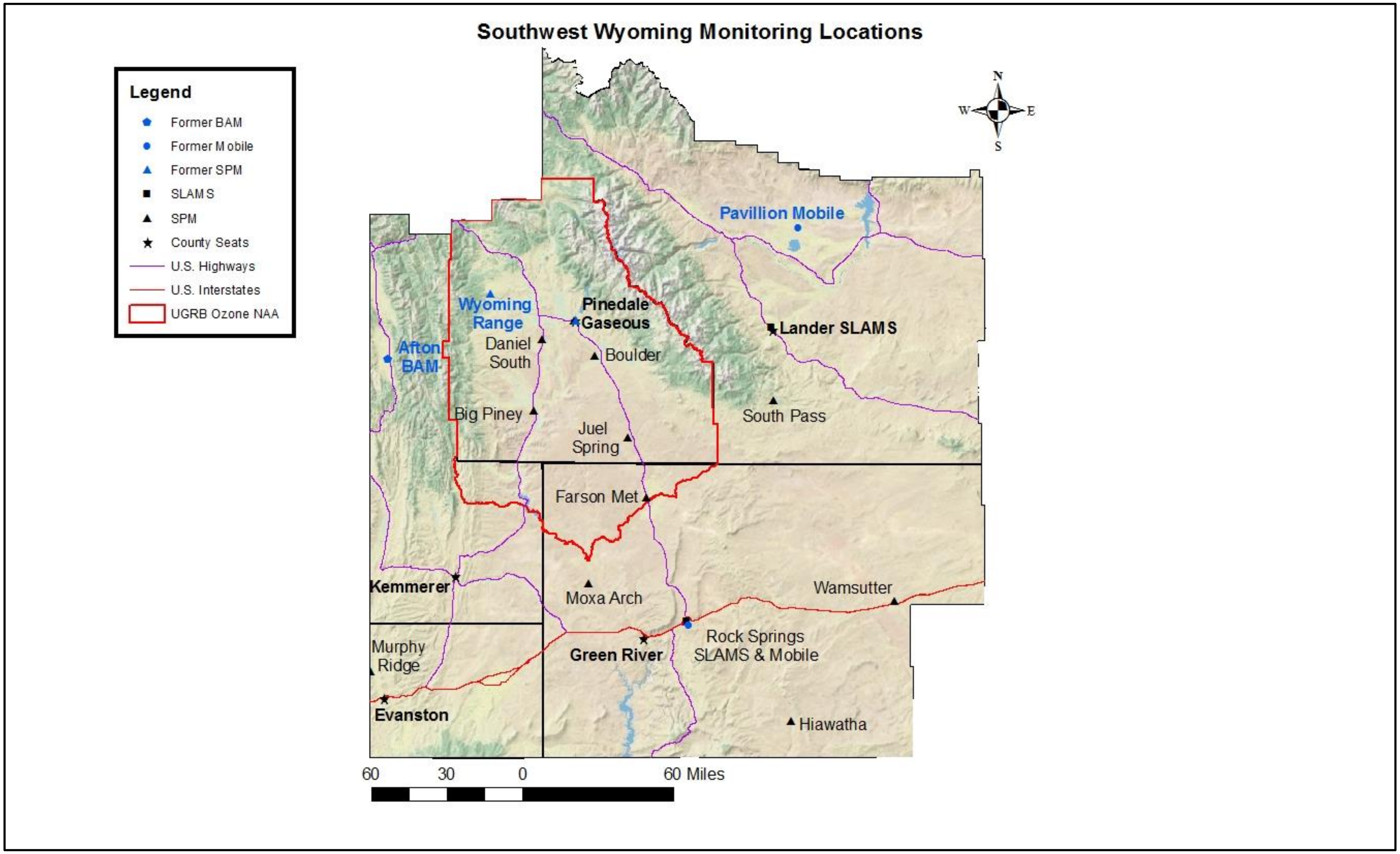


Figure 23. Southwest Wyoming Monitoring Locations

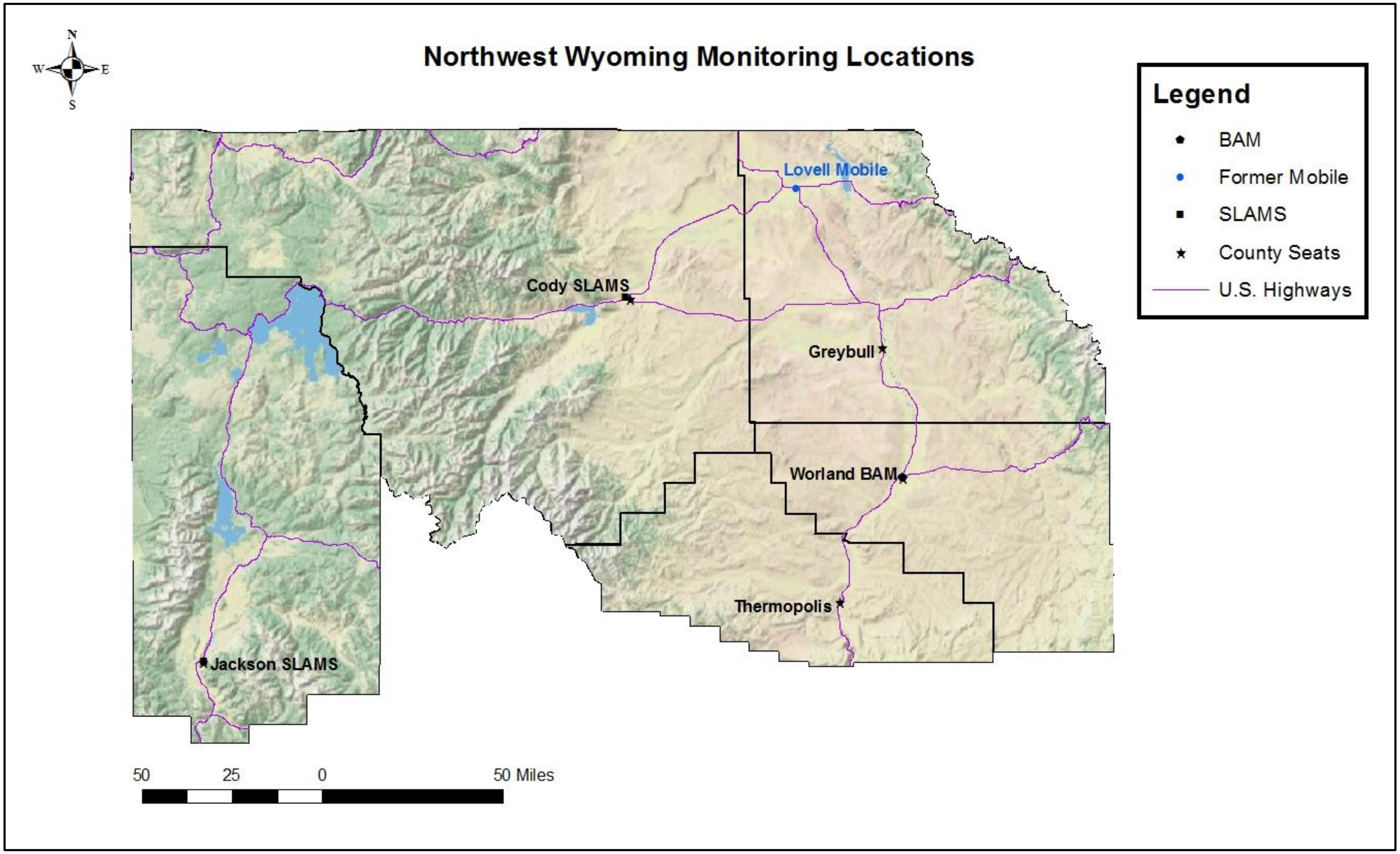


Figure 24. Northwest Wyoming Monitoring Locations

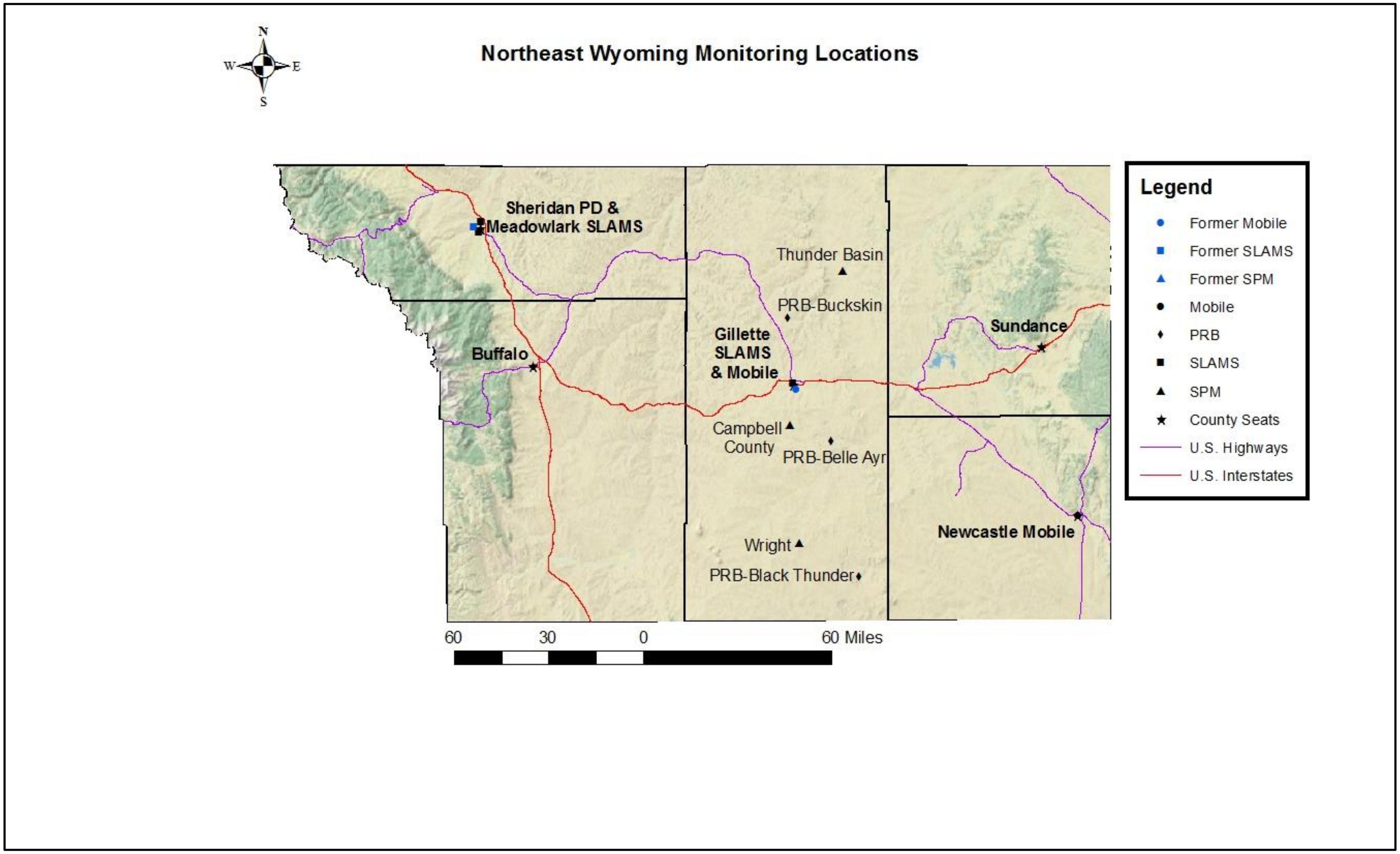


Figure 25. Northeast Wyoming Monitoring Locations

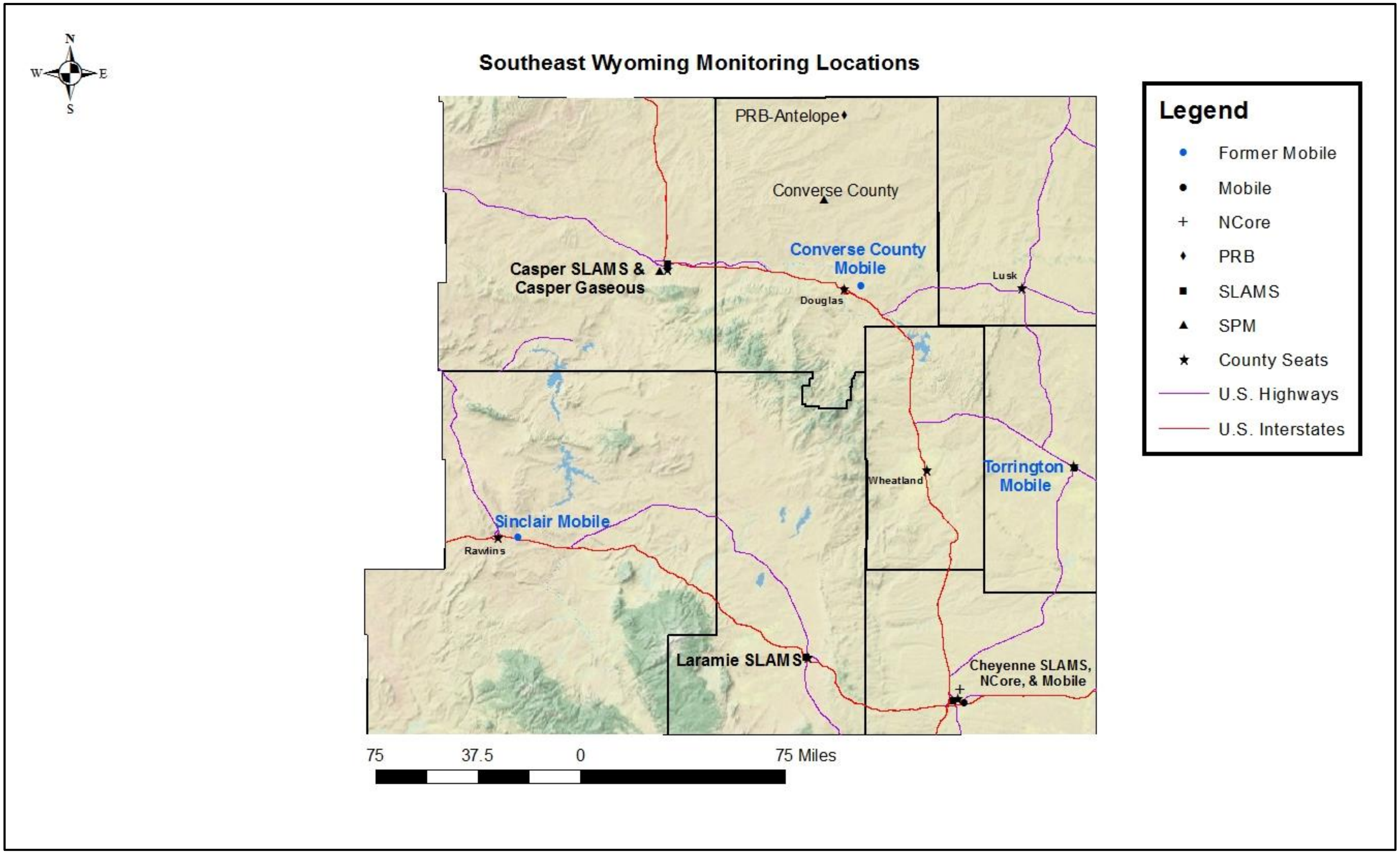


Figure 26. Southeast Wyoming Monitoring Locations

Appendix D: Jackson SLAMS Relocation Request

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

DEQ

Matthew H. Mead, Governor

Todd Parfitt, Director

December 11, 2015

Mr. Albion Carlson
EPA-Air Monitoring Section
1595 Wynkoop Street
Denver, CO 80202-1129

Re: Request to move Jackson – Fire Department SLAMS PM_{10} and $PM_{2.5}$ monitors

Dear Mr. Carlson:

The Wyoming Department of Environmental Quality –Air Quality Division (AQD) is seeking to relocate the PM_{10} and $PM_{2.5}$ monitoring site currently located at the soon to be renovated Fire Department in Jackson, Wyoming. The AQD has worked in conjunction with the Teton County Facilities Management Manager and Department of Energy Idaho Operations Office (DOE Idaho) to identify a proposed replacement site at the Teton County Transfer Station located off High School Road, also located in Jackson, Wyoming

The existing Fire Department PM SLAMS (56-039-1006) site was established at 40 East Pearl Avenue, Jackson, Wyoming in June 2007. This site represents a neighborhood scale, population oriented station. A current list of the Jackson Fire Department parameters operating at the site and a medium scale map of the site are given in Attachments 1 and 2, respectively. The Jackson PM SLAMS samplers are currently collocated with the DOE Idaho sampler. A letter discussing DOE Idaho sampling is included in Attachment 9. The AQD has determined that this site should be relocated because Teton County has informed the AQD of planned renovations (adding solar panels) to occur in the spring of 2016 and has indicated that they would like air samplers relocated to new site.

The proposed new site is located at the Teton County Transfer Station off of High School Road, in Jackson, Wyoming (coordinates 43°27'27.95 N, 110° 47' 52.78 W). The AQD's SLAMS Project Manager, Mark Gagen, visited the proposed site on December 3, 2015. Views of the proposed new site are given in Attachment 3. As can be seen in Attachment 5, the new proposed location is located adjacent to the Jackson High School. The investigation of the site showed that all the siting criteria can be reasonably met and initial conversations with the Teton County Facilities Management Manager and Department of Energy Idaho are favorable.

Based upon review of meteorological data collected at the Jackson Hole Airport and the unique topographic features around Jackson, the AQD has concluded that meteorological conditions are very similar. The wind roses can be found in Attachment 4 to this letter.

In addition to meeting the siting criteria and acceptable meteorological conditions, the new site also gives the AQD a chance to offer AQD's technicians and local site operators a safer environment to accomplish sampling. The Jackson Fire Department location was only accessible by ladder, while the new location will be located at ground level in fenced area. Teton County has offered it's assistance in preparing the site with electricity and fencing to place the samplers at the new location.

200 West 17th Street · Cheyenne, WY 82002 · http://deq.wyoming.gov · Fax (307)635-1784
ADMIN/OUTREACH ABANDONED MINES AIR QUALITY INDUSTRIAL SITING LAND QUALITY SOLID & HAZ. WASTE WATER QUALITY

Listed below is a summary of attachments for this application:

Attachment 1:	Jackson Fire Department – PM SLAMS- Parameter List
Attachment 2:	Map of Jackson, Wyoming Existing and Proposed SLAMS Site
Attachment 3:	Views from proposed site
Attachment 4:	Meteorological Data from Jackson Hole Airport
Attachment 5:	Proposed New Site at Teton County Transfer Station
Attachment 6:	Region 8 Network Modification Request Form
Attachment 7:	Current Site Description Report
Attachment 8:	Current Quicklook Criteria Parameters
Attachment 9:	Letter from Department of Energy Idaho Operations letter

Since all requirements and logistical factors are favorable for this site, the AQD is seeking Region 8's approval on the Teton County Transfer Station location for the population –based PM SLAMS site in Jackson. As part of this process, the details of the new location will be officially requested in the 2016 Annual Network Plan. The AQD welcomes your consideration of our request and looks forward to your response. Please direct any questions to Mark Gagen (307-777-7351) or Cara Keslar (307-777-8684).

Sincerely,

Mark Gagen

Mark Gagen
CEMS Coordinator
Air Quality Division

Enclosure (1)
cc: Cara Keslar, Monitoring Section Supervisor
Darla Potter, AQRM Program Manager
SLAMS File

State of Wyoming Ambient Air Monitoring Site Modification Form (Version 1, 12-2011)

DATE: 12/07/2015	CITY: Jackson	STATE: WY

AQS SITE ID: 56-039-1006	SITE NAME: Jackson Transfer Station

PROPOSED MODIFICATION/REASON WHY/SITE OBJECTIVE:

Teton County Facilities Management has indicated that they would like air samplers relocated to new site. Fire Department has planned renovations in Spring 2016. Jackson SLAMS represents a neighborhood scale, population oriented station.

AIR QUALITY PARAMETER (PM10, SO2, CO, NO2, ETC.)	MONITOR TYPE (NAMS, SLAMS, SPM, TRIBAL, etc.)	CHECK ONE OR MORE OF THE APPLICABLE CATEGORIES BELOW:				LIST SAMPLER EQUIPMENT
		MAX CONC	SOURCE IMPACT	POPULATION EXPOSURE	BACKGROUND	
PM10	SLAMS			✓		Thermo FRM Partisol 2000
PM2.5	SLAMS			✓		Thermo FRM Partisol 2000

PROPOSED SAMPLING START OR REMOVAL DATE OR DATE STARTED OR REMOVED: During 1st Quarter of 2016

ESTIMATED MEASUREMENTS FOR AIR QUALITY PARAMETERS:

LOCATION (LAT./LONG. OR UTM=S): LAT: 43° 27' 27.952" N / LONG: -110° 47' 52.779" W

SITE ELEVATION (M. MSL): 6119 MSL	PROBE HEIGHT (M. AGL): 2 M

DISTANCE TO TREE DRIPLINE (M)	DIRECTION TO TREE	DISTANCE TO OBSTACLE (M)	DIRECTION TO OBSTACLE	OBSTACLE HEIGHT ABOVE PROBE (M)	OBSTACLE COMMENTS
N/A	N/A	N/A	N/A	N/A	

UNRESTRICTED AIR FLOW: ☑ >270 DEG. ☐ >180 DEG. <CRITERIA______________DEG.

DISTANCE TO INTERSECTIONS (M):

DISTANCE FROM SUPPORTING STRUCTURES (M): VERT.________HORIZ.________

DISTANCE TO EDGE OF NEAREST ROADWAY	NAME OF ROADWAY	DIRECTION	DAILY TRAFFIC ESTIMATES	YEAR OF TRAFFIC ESTIMATES	TYPE OF ROADWAY	COMMENTS
58.8 Meters	High School Road	NORTH	<= 2,000		Local	Traffic Count Not Found
370 Meters	US Hwy 89	EAST	7,919	2014	Principle Arterial	
2,500 Meter	Big Trail Drive	SOUTH	<= 500		Local	Traffic Count Not Found
1250 Meters	South Park Loop Roadt	WEST	<= 500		Local	Traffic Count Not Found

DISTANCE TO NEAREST POINT SOURCES (MILES)	DIRECTION TO POINT SOURCES	DISTANCE TO NEAREST AREA SOURCES (MILES)	DIRECTION TO AREA SOURCES	COMMENTS
N/A	N/A	5.5 Miles	South	

CERTIFICATION: I certify the network modification proposed above meets all 40 CFR 58, Appendix E siting criteria, except as noted with submittal.

Printed Name: Mark Gagen Signature: Mark Gagen

FOR EPA USE ONLY: Received Date:__________ Follow-up Actions:____________________ Approval Status Given:__________ Email Response Date:__________ Letter Response Date:__________

FOR METEOROLOGICAL PARAMETERS ONLY:

MONITORING PURPOSE/OBJECTIVES:
N/A Sampler sensors determines ambient temperature and pressure for flow rate calculation.

PROPOSED MONITORING SCHEDULE/DURATION:	EPA Ambient Particulate Matter Monitoring 1/3 Sampling Schedule.
PROPOSED START/REMOVAL DATE OR DATE STARTED/REMOVED:	4/1/2015

DATA ACQUISITION SYSTEM:					
PRIMARY: Partiol - FRM sampler Internal Data Logger			PARAMETERS:	APPLICABLE √ those that apply	SENSOR HT (M)
BACKUP			WINDSPEED/DIRECTION		
EQUIPMENT MANUFACTURER/MODEL: THERMO FRM 2000 Partisol Sampler			SOLAR RADIATION		
			RELATIVE HUMIDITY		
WILL THE DATA BE USED FOR MODELING?	YES ⦿	NO ○	PRESSURE	✓	
IS SITE REQUIRED FOR SIP?	YES ⦿	NO ○	SIGMA THETA		
UNRESTRICTED AIRFLOW?	YES ⦿	NO ○	PRECIPITATION		
DISTANCE TO TREE DRIPLINE (M)	N/A		TEMPERATURE	✓	
NEARBY TERRAIN: SMOOTH ✓	ROLLING	ROUGH	OTHER (DESCRIBE)		

TOPOGRAPHIC FEATURES (E.G HILLS, MOUNTAINS, VALLEYS, RIDGES, BODIES OF WATER):
Jackson is located in the Snake River Valley between the Gros Ventre and Teton Mountain Ranges.

COMMENTS:

2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

JAN 06 2016

Ref: 8P-AR

Ms. Cara Keslar
Monitoring Section Supervisor, Air Quality Division
Department of Environmental Quality
200 West 17th Street
Cheyenne, Wyoming 82002

Re: Response to Network Modification Request Dated December 11, 2015

Dear Cara:

We recently received a Network Modification Request Form (NMRF) from your office in a letter emailed and dated December 11, 2015. The table below summarizes the proposed change that has been requested, including the date of the request, the common name of the air monitoring station, the Air Quality System (AQS) identification number, the affected parameters, and the type of change proposed.

Date	Location & Common Name	AQS Identification Number	Affected Parameters	Type of Change
12/11/2015	Jackson	56-039-1006	PM_{10} and $PM_{2.5}$	Site Relocation

The NMRF indicates that the Jackson – Fire Department site (56-039-1006) located in Jackson, Wyoming, will be relocated to a new site in Jackson due to planned renovations at the Fire Department in the spring of 2016. The proposed relocation site (Jackson - Transfer Station) is at the Teton County Transfer Station located off High School Road in Jackson and is adjacent to the Jackson High School. The actual site details of the new location will be addressed in the 2016 Annual Network Plan.

We concur with this network modification request and appreciate the submittal of the NMRF discussed above. Please ensure that monitoring stop and start dates are entered into AQS, along with the revised site metadata.

If you have any questions on this issue, please contact me at (303) 312-6431 or Albion Carlson, of my staff, at (303) 312-6207.

Sincerely,

Deirdre Rothery, Supervisor
Air Permitting, Monitoring, and Modeling Unit
Air Program

cc: Mark Gagen WY DEQ

Appendix E: Lost Cabin Gas Plant SO_2 DRR Final Monitoring Plan

BURLINGTON RESOURCES

Sent via UPS

April 11, 2016

Mr. Daniel Sharon
Air Quality Analyst
WDEQ-Air Quality Division
200 West 17th Street
Cheyenne, Wyoming 82002

Re: Final Monitoring Plan
Implementation of EPA's 1-Hour SO_2 Data Requirements Rule (DRR) for Lost Cabin Gas Plant
Burlington Resources, Inc.
Lost Cabin Gas Plant, Fremont County

Dear Mr. Sharon:

Burlington Resources Inc. (Burlington Resources) submits the attached Final Monitoring Plan and results of the modeling analysis conducted to inform placement of the ambient SO_2 monitor for the Lost Cabin Gas Plant (LCGP). The attached document finalizes the Draft Monitoring Plan submitted by LCGP on February 15, 2016 based on the information gathered during the WDEQ and EPA site visit on March 8, 2016 and Burlington's further review of siting logistics and other considerations for selecting the final site.

As requested by the WDEQ, this final Monitoring Plan with the location for the proposed SO_2 monitor is being provided for inclusion in the Annual Network Plan. If you have any questions or require additional information, please contact me at

Sincerely,

Shelby Hanks

Shelby Hanks
Plant Superintendent

Cc (Via email only): Cara Kessler, Amber Potts WDEQ
Patrick McKean, Jamie Christopher, SLR International

165 LOST CABIN ROAD, P.O. BOX 5, LYSITE, WYOMING 82642, TELEPHONE 307-876-4100, FAX 307-876-4174

Certification Document
Final Monitoring Plan
Implementation of EPA's 1-Hour SO_2 Data Requirements Rule (DRR) for Lost Cabin Gas Plant
Title V Permit 3-2-157-2

Based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Name:	Shelby Hanks
Signature:	Shelby Hanks
Title:	Plant Superintendent
Date:	2016-04-11

<u>Final Monitoring Plan for Placement of Ambient SO_2 Monitor</u>

Burlington Resources conducted air dispersion modeling analysis to inform the decision on where to locate the ambient SO_2 monitoring station. The modeling was conducted by SLR Corporation following the recommendations in the United States Environmental Protection Agency (EPA) SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (Monitoring TAD, dated December 2013). The receptor score ranking procedure followed the example provided in Appendix A of the Monitoring TAD.

This document provides an overview of the modeling inputs and methods, and presents the results of the analysis.

Modeling Inputs and Methods

<u>Emissions and Stack Parameters</u>

Based on discussions with the WDEQ, LCGP modeled the actual SO_2 emissions for calendar year 2014.

Actual hourly emission rates (lb/hr), exhaust flow rate and temperature are available from continuous emission monitoring systems (CEMS) for the three tail gas incinerators (Unit IDs H- 3302-1 thru H-3302-3 of WDEQ Permit 3-2-157). The CEMS data was used to calculate the lb/hr emission rate for each tail gas incinerator. During turnaround events (TARs) and/or emergency flaring episodes the gas from the incinerator trains can be sent to the flares. Flare 1 (Unit IID H-5201) controls emissions from Train 1 and Train 2, while Flare 2 (Unit ID H-5201-3) controls emissions from Train 3 during TARs or emergency flaring episodes. The LCGP is required to track and report the SO_2 emissions resulting from TARs and emergency episodes. This involves tracking the duration of the flaring event (start time and end time), the volume of gas flared, and the H_2S content of the gas flared. This data was used to calculate the hourly SO_2 emissions resulting from each flaring episode in 2014. For the remaining hours of the year when no flaring episodes were occurring, the permitted allowable pilot/purge SO_2 emissions were used.

An AERMOD hourly emission file was developed using the available CEMS and flare data. The hourly emission file is used in AERMOD to vary the modeled emission rates, stack temperatures, and velocities. Other stack information such as the Universal Transverse Mercator (UTM) locations, base elevations, and diameters are "fixed" in the model and were obtained from the most recent permit modeling for the LCGP.

Since the flare effective release height and diameter cannot be varied in the AERMOD hourly emission file, these parameters were calculated following EPA's screening procedures

(EPA 1995[1]) using each flare's physical stack height and average heat release rate obtained from flaring events for the period from 2012 through 2014. The calculated 3-year average effective release height and diameter for each flare were used in AERMOD. The flare exhaust temperature and velocity were set to the EPA (1995) default values of 1,273 Kelvin (K) and 20 meters per second (m/s), respectively.

For all other emission units (EU) (boilers, engines, and a turbine), emission rates and stack parameters reflect permit limits and were modeled assuming continuous operation of each EU.

Finally, prior to inputting to the AERMOD model, all emission rates were normalized using a reference emission rate, as recommended in Section 3.1 of the Monitoring TAD. The use of normalized emissions allows for the preservation of the relative magnitude of the emissions while still enabling the model to predict ambient SO_2 concentration maxima.

AERMOD Model Setup and Inputs

AERMOD Modeling System and Options:

This modeling analysis used the current version of the EPA-approved AERMOD modeling system in accordance with the Modeling TAD[2], 40 C.F.R 51, Appendix W, and WDEQ-AQD modeling guidance[3]. Current version numbers of the AERMOD model and pre-processors that were used include:

- AERMAP Version 11103;
- AERSURFACE Version 13016;
- AERMET Version 15181; and
- AERMOD Version 15181.

AERMOD model input options were set to their regulatory default values.

Plume Downwash:

Direction-specific building dimensions were calculated using the current version of the EPA-approved Building Profile Input Program (BPIPPRM Version 04274). Building dimensions were obtained from a site plan and confirmed against recent aerial imagery. A simplified plot plan of the LCGP facility, showing the location of all structures and EUs used in the plume downwash calculations, is provided in Figure 1.

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[1] SCREEN3 Model User's Guide (EPA-454/B-95-004). Office of Air Quality Planning and Standards. September 1995.
[2] SO_2 NAAQS Designations Modeling Technical Assistance Document. December 2013.
[3] Wyoming Department of Environmental Quality/Air Quality Division Guidance for Conducting Near-Field Modeling Analyses for Minor Sources. September 2014.

Available Meteorological Data and Processing:

Representative and quality-assured meteorological data are not available for the years 2012, 2013, or 2014. The WDEQ-AQD indicated during a conference call on January 14, 2016 that the best available site-specific meteorological data should be used in the modeling analysis, along with 2014 actual emissions, and that this can be a one-year data set for purposes of modeling to inform new SO_2 monitor placement. The LCGP voluntarily initiated a meteorological monitoring program on July 1, 2015 to support the 1-hour SO_2 attainment designation process[4]. The current monitoring program consists of the following parameters, with validated data available from July-December 2015:

- 13.3- and 21.0-meter (m) horizontal meter wind speed, wind direction, and wind direction standard deviation (σ_θ);
- 13.6- and 21.5-m vertical wind speed standard deviation (σ_w);
- 2.0-, 10.1-, and 20.4-m ambient temperature;
- 10.1-2.0 m ambient temperature difference; and
- Total solar radiation.

Site-specific meteorological data were also collected on a 10-m tower during calendar years 1999 and 2000 as required by Air Quality Permit MD-343. This monitoring program consisted of the following parameters:

- 10-m horizontal meter wind speed, wind direction, and σ_θ; and
- 2-m ambient temperature.

The WDEQ-AQD previously determined that the 1999-2000 data were satisfactory for use in dispersion modeling analyses[5]. During January 14, 2016 conference call, the WDEQ-AQD indicated that data from this historical monitoring program could be used to supplement the current 2015 data to create the one-year site-specific data set.

Wind roses for July-December 2015 (new tower) were reviewed and compared to 1999 and 2000 (old tower), as well as valid data capture, to determine whether 1999 or 2000 would be the most suitable to complete the one-year data set. Based on this review, it was determined that the period from January through June 2000 would be the best data to combine with the July through December 2015 data to create the one-year data set.

Surface characteristics (roughness length, Bowen Ratio, and albedo) for each month, and corresponding year of data collection, were assigned following guidance provided in the current

---

[4] Lost Cabin Meteorological Monitoring Station Quality Assurance Project Plan dated June 24, 2015.
[5] Letter from D. Olson (WDEQ-AQD) to D. Tisdale (Burlington Resources). April 17, 2001.

version of the AERMOD Implementation Guide (AIG) and using the AERSURFACE processor. The current version of AERSURFACE provided by EPA (Version 13016) supports the use of land cover data from the United States Geological Survey (USGS) National Land Cover Data 1992 archives (NLCD92). The LCGP was constructed in the late 1990's and is not present in the NLCD92 data set. To address this, SLR modified the AERSURFACE source code to accommodate 2001 and newer land cover data[6], which does include the LCGP facility. The modified code also allows monthly assignment of soil moisture conditions in a single run[7].

Newer versions of NLCD data, beginning with NLCD2001, have land use classifications that do not appear in the NLCD92 data. The code modification involves re-assigning NLCD2001 (or newer) land use classification codes that do not appear in the NLCD92 land use classification scheme to the appropriate NLCD92 classification code. For this project, NLCD2001 data were used for the year 2000 AERSURFACE processing, and NLCD2011 data were used for the year 2015 processing. AERSURFACE was used to calculate surface characteristics for twelve 30-degree sectors for each meteorological data set. Seasonal classifications were determined following the AIG using snow cover and precipitation data from the nearby Shoshoni COOP station. The output from AERSURFACE was used as input to Stage 3 of AERMET.

Prior to running AERMET, upper air data from the nearest National Weather Service (NWS) upper air site at Riverton airport were obtained from the Forecast Systems Laboratory (FSL)/NCDC Radiosonde Data Archive. Upper air data were obtained for both the 2000 and 2015 periods of record. Surface observations of temperature and cloud cover were also obtained from Riverton for year 2000 since site-specific solar radiation/delta-temperature data were not available at the LCGP during this time.

The LCGP site-specific data, Riverton upper air data and surface observations, and AERSURFACE surface characteristics were processed using the latest version of AERMET to generate AERMOD ready surface and profile files. Stage 3 of AERMET was run for each individual year to retain the seasonal and moisture determinations for each year. The individual AERMET-generated files were combined into single surface and profile files to create a calendar year of data. The year time stamp was changed to 2014 to allow the use of concurrent hourly emissions[8]. A wind rose is provided in Figure 2.

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[6] SLR's version of AERSURFACE has been approved for regulatory use in the State of Alaska (Technical Analysis Report for Air Quality Control Minor Permit AQ1271MSS01. May 18, 2015).

[7] SLR's version of AERSURFACE has also been used in a PSD permit application in the State of Wyoming (Prevention of Significant Deterioration Air Quality Construction Permit Application Jonathon Lime Plant Laramie, Wyoming. December 2013).

[8] Modeling TAD, Section 7.4.

Receptor Grids

Cartesian receptor grids centered on the LCGP were defined using Universal Transverse Mercator (UTM) Zone 13 North American Datum 1983 (NAD83) coordinates. The grids were designed to adequately resolve the highest predicted pollutant impacts while at the same time allowing for reasonable execution time. Several receptor grids of varying resolution were defined, exceeding the minimum requirements listed in the WDEQ-AQD's modeling guidance. The grids consisted of a set of nested receptors placed at:

- 25-m resolution along the ambient air boundary.
- 25-m resolution extending to a distance of approximately 100 m from the ambient air boundary.
- 50-m resolution extending to a distance of approximately 500 m from the ambient air boundary.
- 100-m resolution extending to approximately 1 kilometer (km) from the ambient air boundary.
- 250-m resolution extending to approximately 5 km from the ambient air boundary.
- 500-m resolution extending to approximately 20 km from the ambient air boundary.

Receptor elevation and scale heights were obtained using the AERMAP terrain processor. The digital elevation dataset provided as input to AERMAP was National Elevation Dataset (NED) data at 1/3 arc-second resolution, which is equivalent to approximately 10 m in the project area. The resulting receptor elevations were reviewed against topographic maps. Drawings showing the receptor grids overlaid onto topographic maps are provided in Figure 3 and Figure 4.

Modeling Results and Score Ranking

Step 1: Determining and Ranking Maximum Design Value Locations

The AERMOD model was run for all receptors shown in Figure 3 and Figure 4. The receptors with the maximum normalized design values (NDV) over the entire modeling domain are shown in Figure 5. The maximum NDV receptor is circled in red and is approximately 545 m south of the LCGP ambient air boundary. Table 1 shows the top 10 NDV receptors ranked from highest (highest NDV = rank 1) to lowest (lowest NDV = rank 10). To prioritize the receptors to be evaluated for informing new ambient SO_2 monitor placement, the top 200 NDV receptors identified from this step and shown in Figure 6 were ranked and analyzed, as recommended by the Monitoring TAD, Appendix A.

Step 2: Determining Frequency of Occurrence of Concentration Maxima

The next step in the analysis is designed to account for the frequency in which a receptor has daily maximum 1-hour SO_2 concentrations. To assess the frequency of occurrence of concentration maxima at a given receptor the MAXDAILY option was used, which outputs the maximum 1-hour concentration for each receptor for each day of the model simulation. This output was used to determine the number of days for which each receptor was the overall highest 1-hour concentration for each day for the modeled one-year period. Table 2 shows the top 10 receptors' frequency of days ranked from highest (highest number of days = rank 1) to lowest (lowest number of days = rank 10).

Figure 7 shows the location of the maximum NDV receptor and the receptor with the highest number of days with daily maximum 1-hour SO_2 concentrations (22 days). The receptor with the highest number of days is located approximately 545 m south of the LCGP ambient air boundary and 50 m to the west of the maximum NDV location at an adjacent receptor.

Step 3: Scoring of Maximum NDVs and Frequency of Occurrence of Concentration Maxima

The final step in the analysis consisted of creating a prioritized list of receptor locations for consideration of new ambient SO_2 monitoring sites using the receptor-by-receptor NDVs and frequency of having the 1-hour daily maximum concentration amongst the top 200 NDV receptors.

Table 3 provides the top 10 results of the score ranking used to generate a list of receptor locations, ranked in general order of desirability with regard to potentially siting new ambient SO_2 monitors. Figure 8 and Figure 9 show the receptors ranked by "Score1", reflecting rankings of maximum NDV and frequency of having the 1-hour daily maxima amongst the top 200 NDV receptors. Lower numerical values of "Score1" indicate higher probabilities of experiencing peak 1-hour SO_2 concentrations. The top two receptors with the lowest scores are the receptors identified in Figure 8 and Figure 9, and are located approximately 545 m south of the LCGP ambient air boundary.

Modeling Conclusions

Based on the scoring procedure discussed in Step 3 above, the top two receptors with the lowest scores are approximately 545 m south of the LCGP ambient air boundary. The lowest scoring receptor location indicates higher probabilities of experiencing peak 1-hour SO_2 concentrations. The coordinates are listed below:

- 43° 16' 19.2" north latitude, 107° 35' 56.1" west longitude (WGS84)
- 289,100 m Easting, 4,794,300 m Northing (UTM Zone 13, NAD83)

Logistical Considerations

As part of Burlington Resources' Draft Monitoring Plan dated February 15, 2016, preliminary siting logistics of placing a new ambient SO_2 monitor in the vicinity of the modeled location were evaluated, including nearby power availability, land access, etc. Burlington Resources operates natural gas wells in the immediate area surrounding the LCGP. These well pads are leased from either private land owners or the Federal government. The nearest existing well pad to the model-predicted lowest scoring receptor is the Burlington Resources MDU 6-11 well pad located approximately 135 meters south of the modeled receptor (see Figure 10).

Upon further evaluation of the model-predicted location and the well pad, the MDU 6-11 well pad presented in the Draft Monitoring Plan is considered the better of the two options. Installing the monitoring station at the lowest scoring receptor site would require substantial land disturbance and adversely impact the surrounding environment.

In order to install the monitor at the lowest scoring receptor shown in Figure 10, the receptor site will need to be cleared, leveled, and compacted. Additionally, a new access road will need to be built for installing the monitoring station equipment and accessing the equipment for routine maintenance checks. Disturbing the land at the lowest scoring receptor presents additional challenges due to the fact the land is privately owned and will require substantial negotiations to ensure all interested party needs are met.

The monitoring station's access road and pad would require Burlington Resources enter into a new surface use agreement with the landowner of the area, which will increase the company's annual fee for surface rights in the surrounding area creating additional costs that would otherwise not be incurred from installing the station on the MDU 6-11 well pad.

In addition to landowner negotiation hurdles, the Highland desert area surrounding the recommended MDU 6-11 well pad has a significant amount of sagebrush which would need to be cleared in order to establish a monitor site. Sagebrush provides habitat for a large number of species in the area, including the Greater Sage Grouse, various raptor species, white-tailed jackrabbit, and antelope, all of which could be adversely impacted by disturbing the habitat from installating the monitoring station at the lowest-scoring receptor.

The following additional logistics were also considered when evaluating the MDU 6-11 well pad location:

- It is very close (within about 135 meters) to the model-recommended location;
- There are no known nearby sources of SO_2 besides the LCGP;
- The pad is large enough to accommodate an air quality monitoring shelter (8'X8' climate controlled shelter requiring about a 15'X15' footprint);

- Electric power is available from a nearby well pad (shown in Figure 10) and can be brought to the proposed well pad site.
- The site is accessible from existing roads, which is an important consideration especially during winter;
- The well pad is already cleared and minimal site preparation would be needed for the shelter; and
- The site can be secured with fencing if necessary.

Final Monitor Location Recommendation

Given the model uncertainties, Burlington Resources maintains installing the SO_2 monitoring station off the MDU 6-11 well pad at the lowest scoring receptor does not provide appreciable value to fulfilling the purpose of the DRR, which is to characterize maximum 1-hour ambient SO_2 concentrations. Any benefits of potentially refining the monitor location are outweighed by the costs to the environment and to the company.

Based on the modeling results and logistical considerations described above, Burlington Resources will place the ambient SO_2 monitor at the location shown in Figure 10. This location was approved by the WDEQ-AQD on a letter dated March 24, 2016.. The coordinates listed in the WDEQ-AQD letter are listed below:

- 289,020 m Easting, 4,794,195 m Northing (UTM Zone 13, NAD83)

As stated in the above referenced WDEQ-AQD letter, the monitor will be sited approximately at the coordinates listed above to satisfy the SO2 DRR. Access to the monitor via the existing road will be taken into account when determining the exact coordinates.

In relation to the LCGP, since Burlington Resources does not own or preclude public access to well pad MDU 6-11, the monitor location meets the definition of ambient air found in 40 C.F.R. 50.1(e). The area controlled by LCGP is described by the ambient air boundary shown in Figure 1 and Figure 10.

Attachment 1

Tables

Table 1 Top 10 Ranked Normalized Design Values

UTM_E [1]	UTM_N [1]	DV_Rank
289100.00	4794300.00	1
289700.00	4795350.00	2
289650.00	4795350.00	3
289100.00	4794200.00	4
289750.00	4795350.00	5
289600.00	4795350.00	6
289800.00	4795350.00	7
289100.00	4794350.00	8
289800.00	4795300.00	9
289750.00	4795300.00	10

[1] Zone 13, NAD83

Where:

DV_Rank = the rank with regard to NDV (highest NDV is rank 1)

Table 2 Top 10 Ranked Frequency of 1-Hour Daily Maxima

UTM_E [1]	UTM_N [1]	nDays	nDays_Rank
289050.00	4794300.00	22	1
289500.00	4795250.00	21	2
289050.00	4794400.00	20	3
289400.00	4795550.00	17	4
289050.00	4794650.00	13	5
289425.00	4795375.00	12	6
289500.00	4792250.00	11	7
289500.00	4795800.00	11	8
288800.00	4794000.00	9	9
289100.00	4794650.00	8	10

[1] Zone 13, NAD83

Where:

nDays = the number of days that the receptor is the highest concentration for the day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)

Table 3 Ranked Design Value and Frequency of 1-Hour Daily Maxima

UTM_E [1]	UTM_N [1]	DV_Rank	nDays	nDays_Rank	Score1	Score_Rank
289100.00	4794300.00	1	5	19	20	1
289050.00	4794300.00	32	22	1	33	2
289050.00	4794350.00	24	7	13	37	3
289100.00	4794350.00	8	3	32	40	4
289050.00	4794400.00	39	20	3	42	5
289200.00	4793800.00	12	2	45	57	6
289000.00	4793250.00	58	4	22	80	7
289100.00	4794400.00	60	4	23	83	8
289000.00	4793500.00	57	3	29	86	9
288750.00	4793500.00	67	4	21	88	10

[1] Zone 13, NAD83

Where:

DV_Rank = the rank with regard to NDV (highest NDV is rank 1)
nDays = the number of days that the receptor is the highest concentration for the day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)
Score1 = is the sum of DV_Rank and nDays_Rank for each receptor
Score_Rank = the rank of the scores [lowest total score ("Score1" of 20) is rank 1].

Attachment 2

Figures

Figure 1 LCGP Structures and Stacks Used in the Downwash Analysis

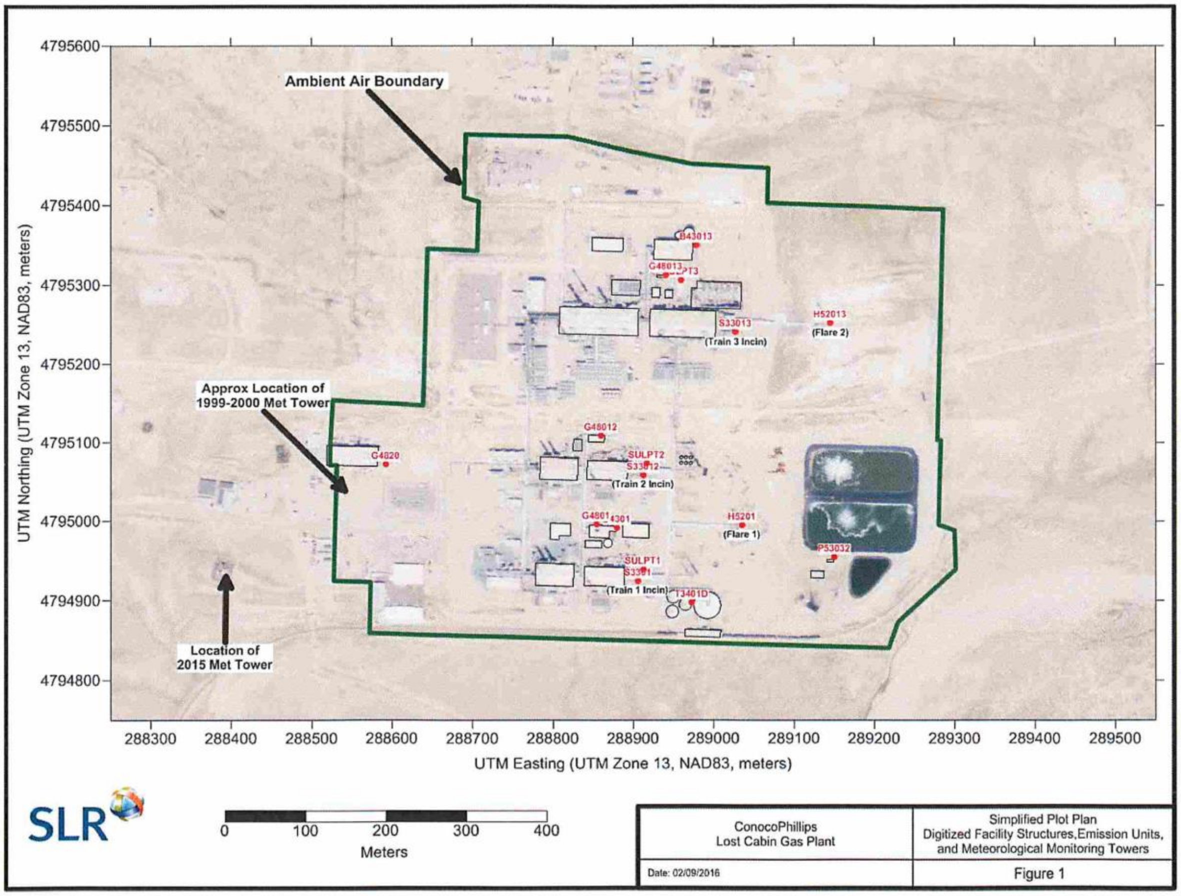

Figure 2 LCGP Wind Rose

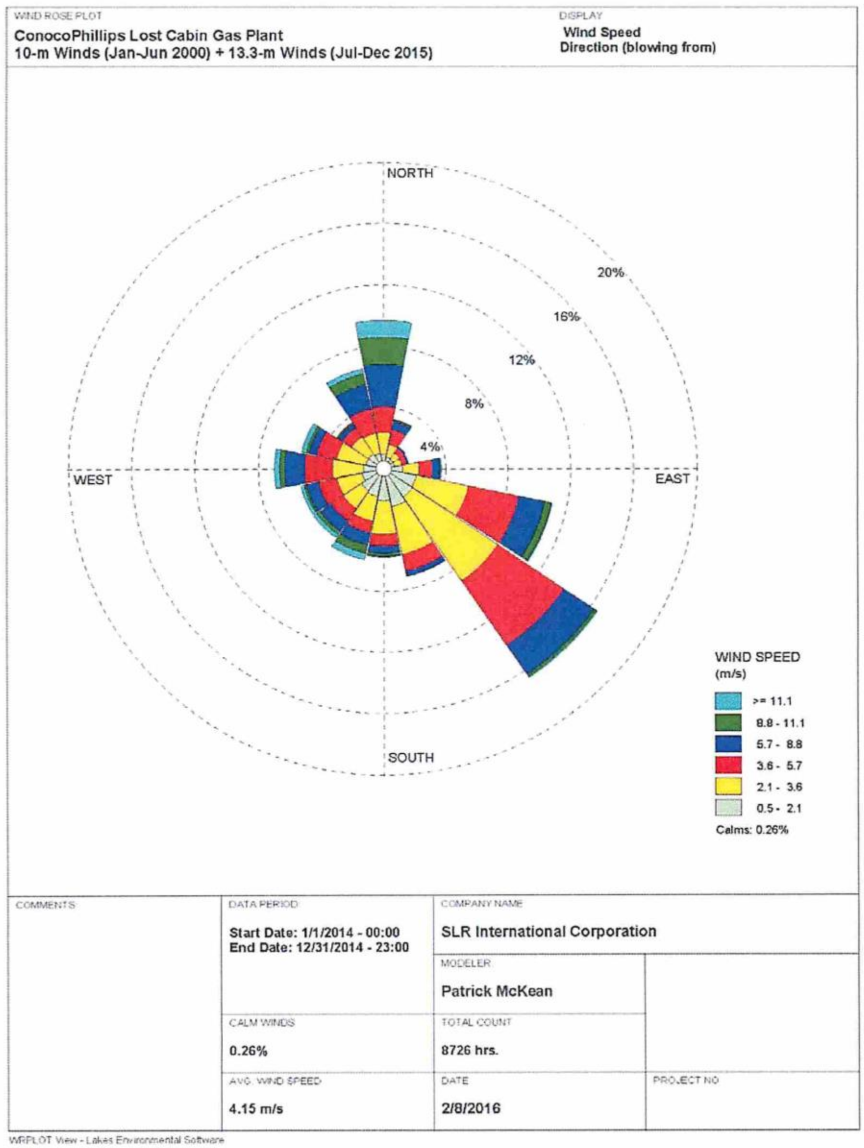

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Figure 3 Far-Field Receptor Grid

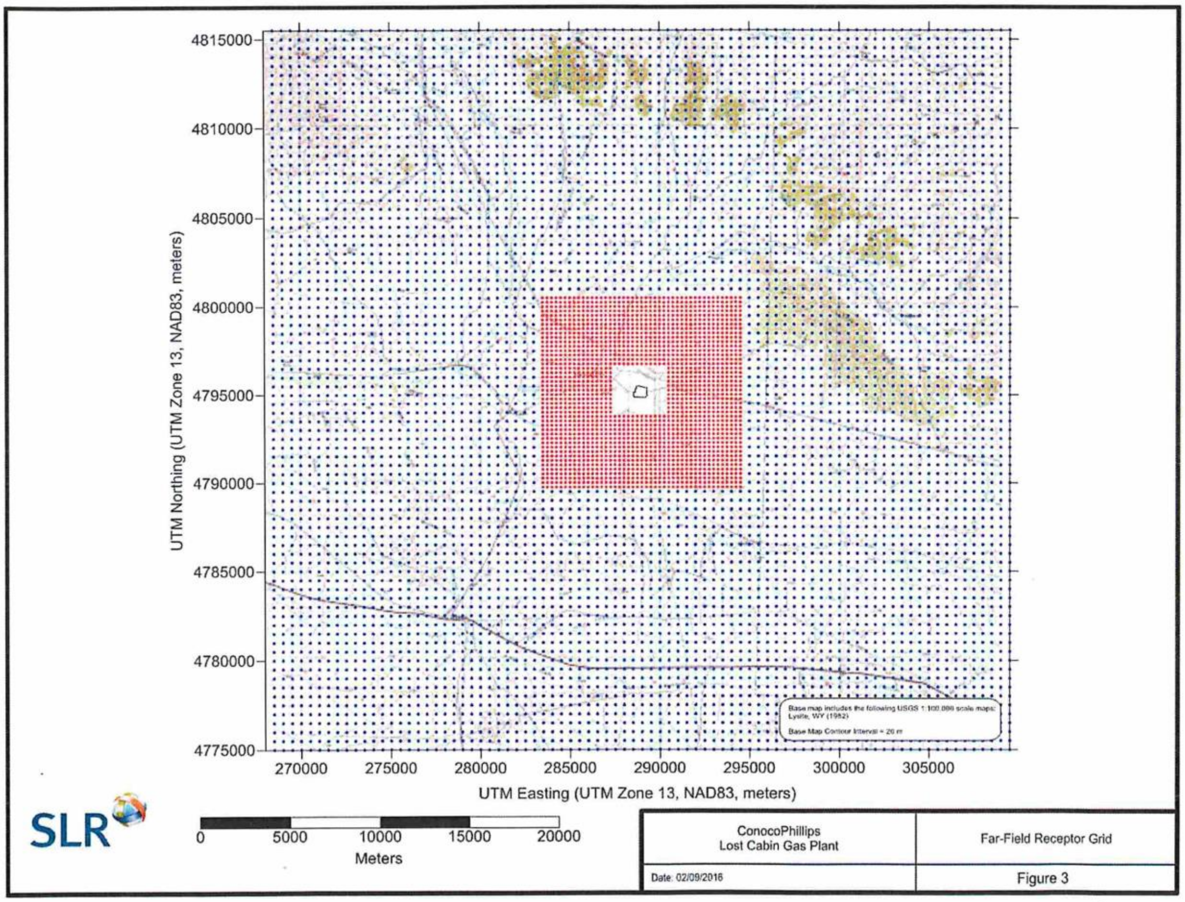

Figure 4 Near-Field Receptor Grid

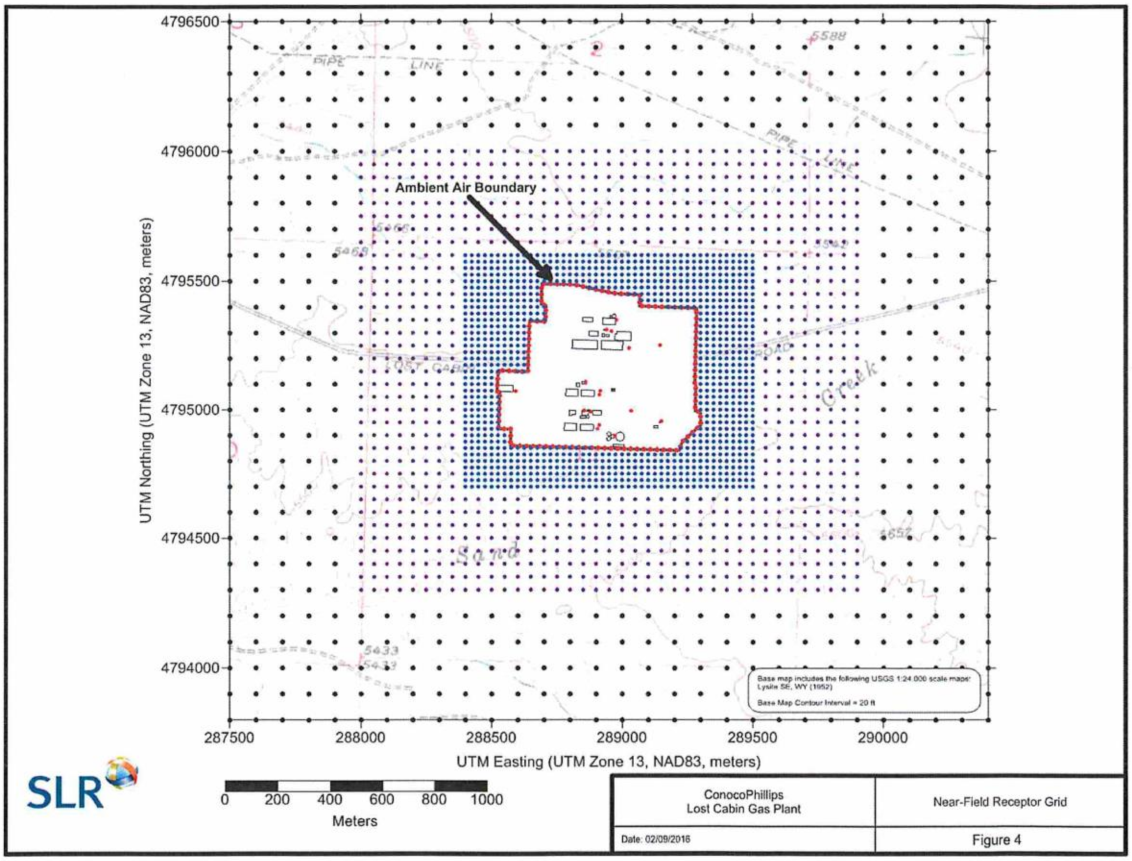

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Figure 5 Maximum 1-Hour SO_2 Normalized Design Values

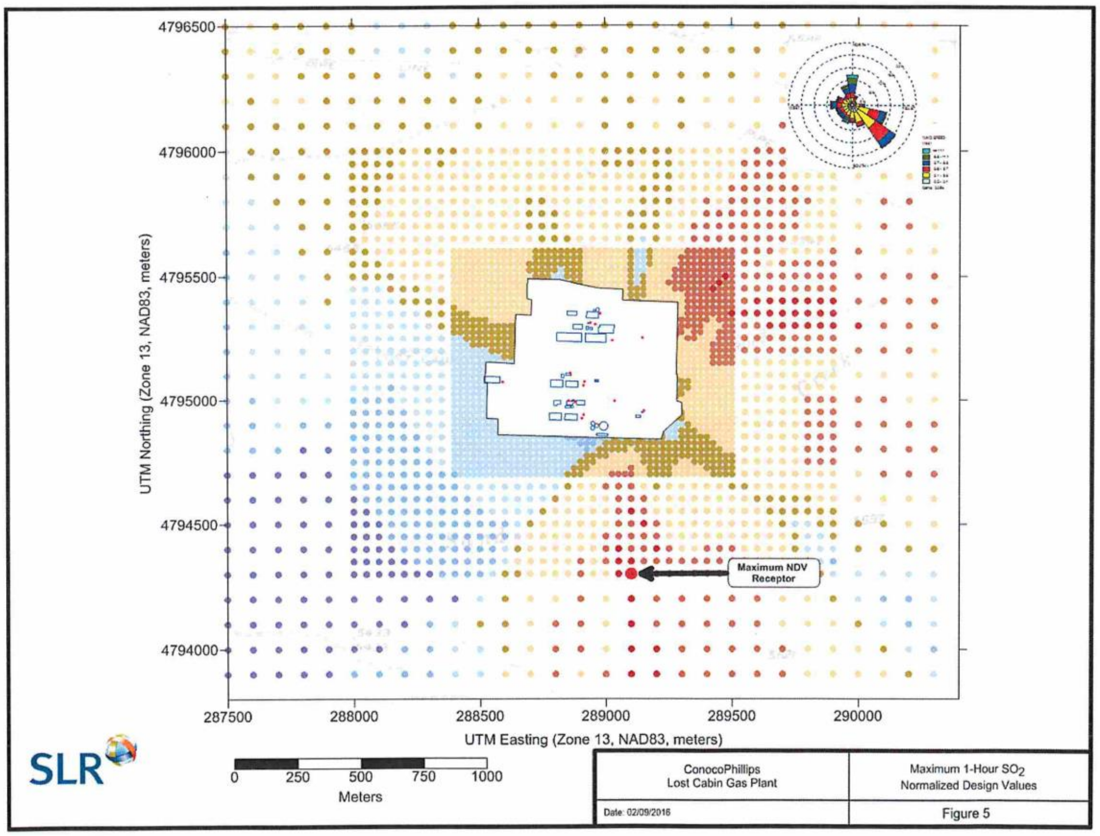
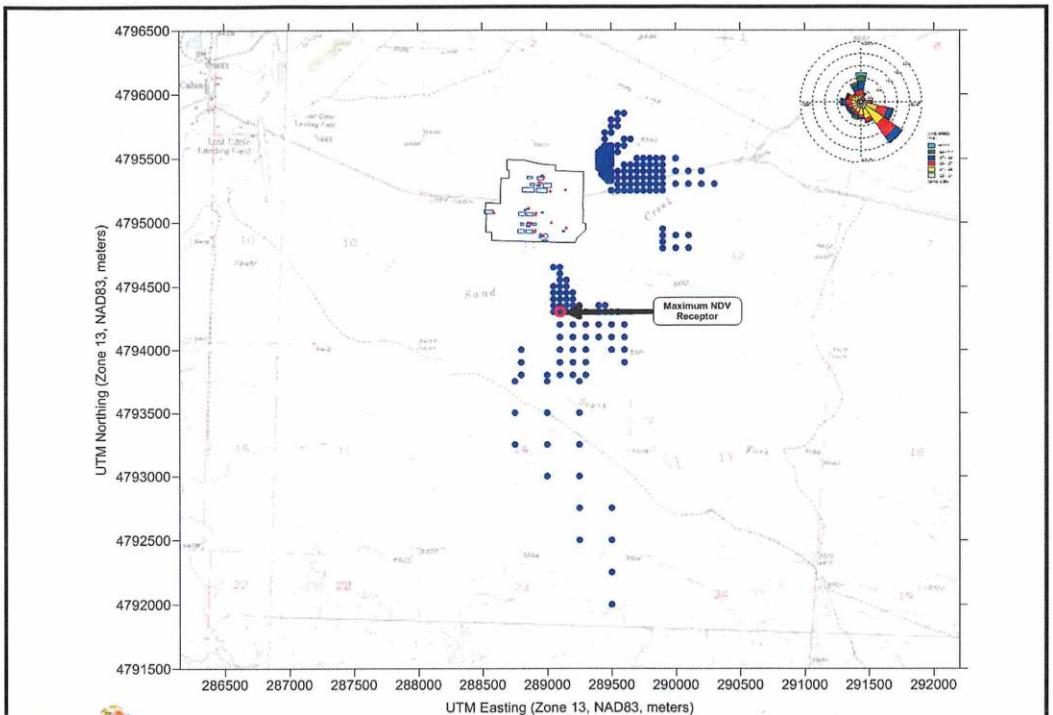


Figure 6 Locations of the Top 200 1-Hour SO_2 Normalized Design Values



ConocoPhillips Lost Cabin Gas Plant	Locations of the Top 200 1-Hour SO_2 Normalized Design Values
Date: 02/09/2018	Figure 6

Figure 7 Location of the Highest Number of Days with Daily Maximum 1-Hour SO_2 Concentrations

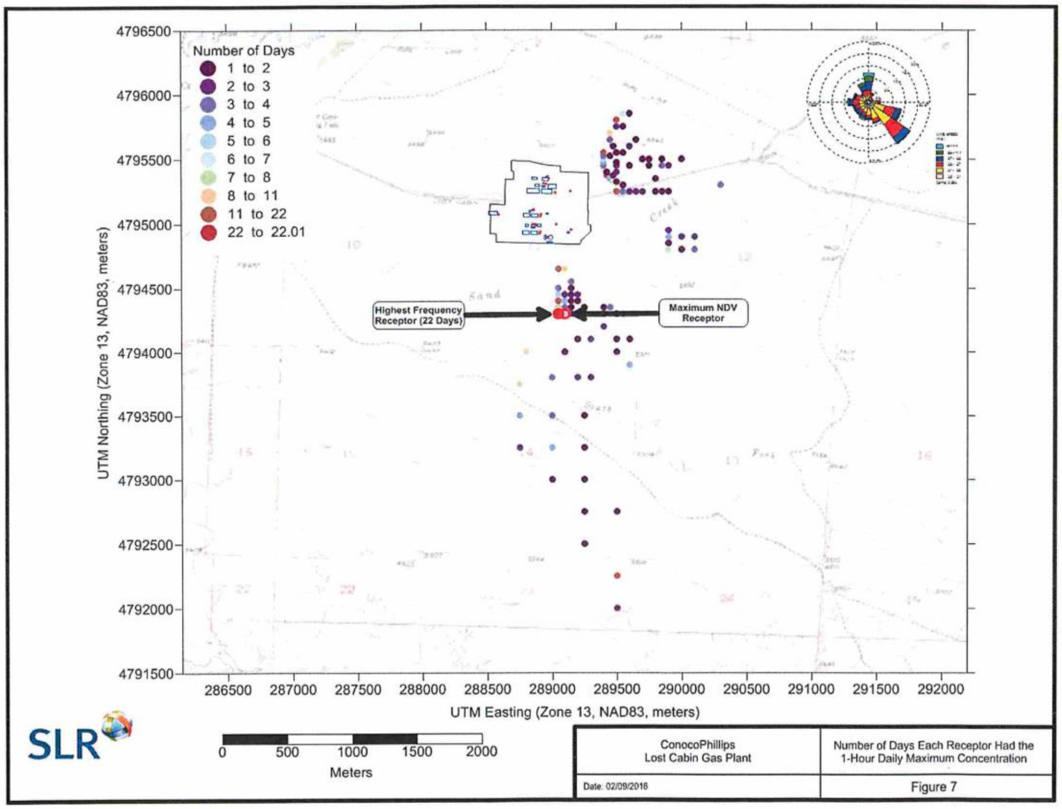


Figure 8 Receptors by "Score1" Calculated from Ranked Design Value and Frequency of 1-Hour Daily Maxima

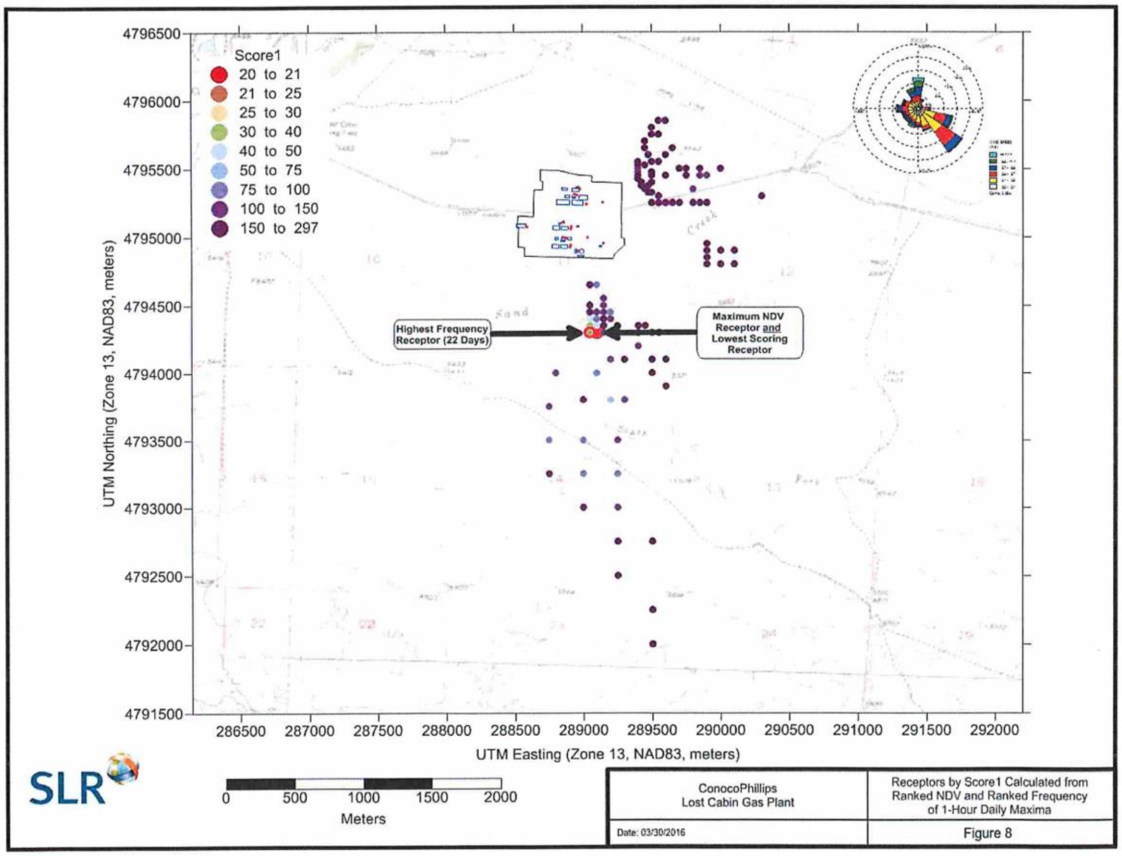


Figure 9 Receptors by "Score1" Calculated from Ranked Design Value and Frequency of 1-Hour Daily Maxima (Close-up)

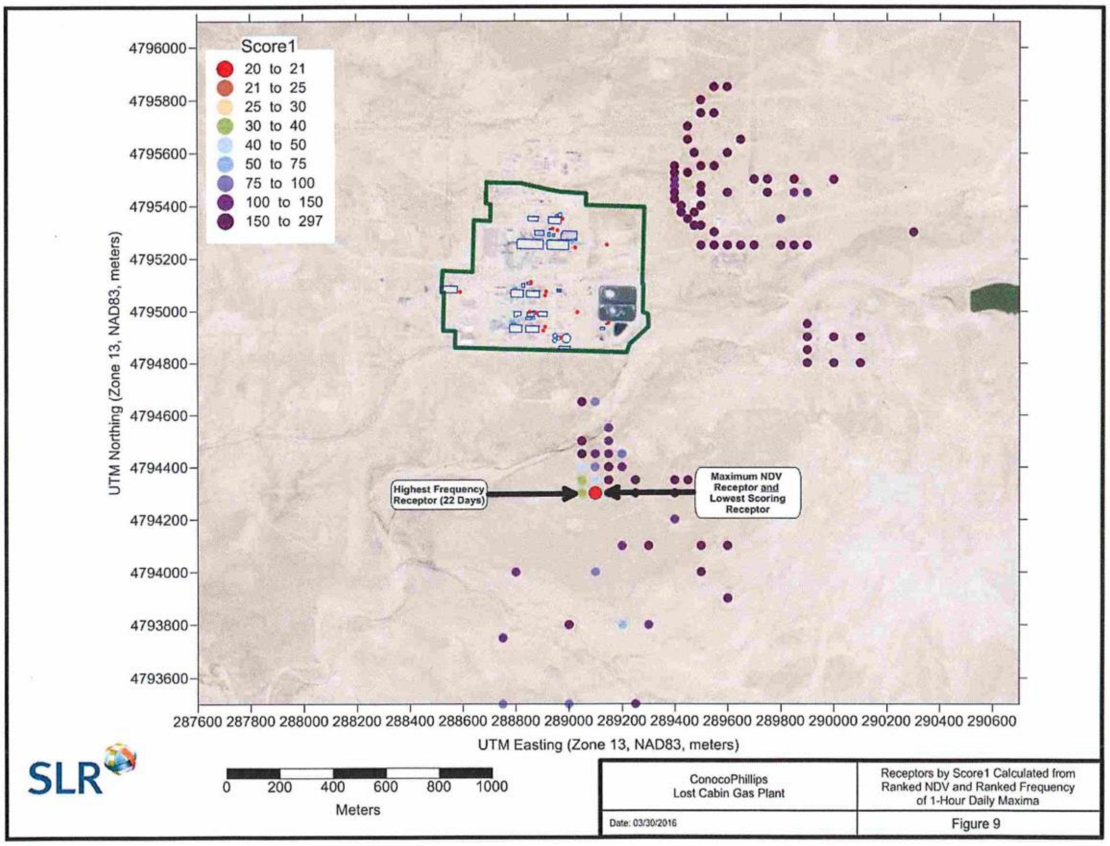


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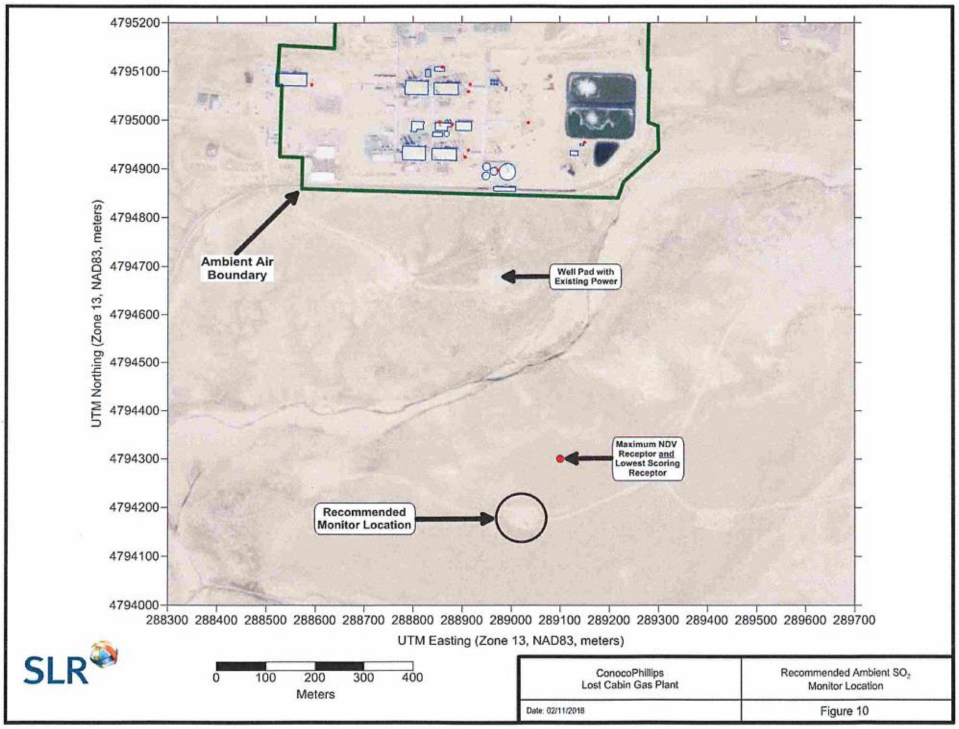
Figure 10 Recommended Ambient SO_2 Monitor Location



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Appendix F: Dave Johnston SO_2 DRR Final Monitoring Plan

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VIA E-MAIL: Daniel.sharon@wyo.gov

April 13, 2016

Mr. Dan Sharon
Wyoming DEQ – Air Quality Division
200 West 17th Street
Third Floor
Cheyenne, Wyoming 82002

RE: Dave Johnson Ambient Sulfur Dioxide Siting Plan

Dear Mr. Sharon:

This plan provides the results of a modeling analysis performed by AECOM that may be used to support the selection of an ambient SO_2 monitor location in the vicinity of the Dave Johnston Power Plant, operated by PacifiCorp and located approximately 5 miles southeast of Glenrock, in Converse County, Wyoming. The modeling analysis review that is summarized below includes the following steps:

- Based upon initial modeling, the AERMOD model was run on a reduced receptor grid that included areas most likely to be among the highest impacted areas.
- The model output was analyzed following the steps outlined in Appendix A of the U.S. EPA Monitoring Technical Assistance Document[1]. These steps focus upon first identifying the "top 200 receptors" based upon peak daily 1-hour maximum predicted concentrations. Then these candidate receptors are given a score based upon the magnitude and frequency of peak daily 1-hour maximum concentrations.
- The analyses provided below includes an evaluation of modeled design value (DV[2]) spatial distributions in combination with the frequency of 1-hour daily maxima predicted by AERMOD using the MAXDAILY output option.

Representative meteorological data used in the dispersion modeling analysis were selected in accordance with the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W). The most recent three years (2013-2015) of meteorological data collected by the National Weather Service (NWS) at the Converse County Airport located in Douglas, WY were used in this analysis. The meteorological station is located approximately 32 kilometers east of the Dave Johnston Power Plant. Both the Power Plant and the airport are located in the North Platte River Valley north of the Laramie Mountain Range which primarily consists of shrub land.

[1] http://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2MonitoringTAD.pdf

[2] The design value is the 99th percentile peak daily 1-hour maximum concentration averaged over the years modeled, computed at each model receptor.

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The Converse County Airport was determined to be the most representative meteorological site for dispersion modeling purposes due to its proximity to the site, the similarity of complex terrain and land use characteristics, and the quality and availability of data for the modeling period (2013-2015).

A second meteorological tower was identified as a potential candidate for representative wind data. The Deer Creek meteorological station is operated by the Wyoming Department of Transportation (WyDOT) and is located on the southern side of the I-25 corridor approximately 7 km west of the Dave Johnston facility. However, WyDOT acknowledged that there were no quality control records for the site. Without adequate quality control information, the Deer Creek meteorological tower was determined to not be suitable for the dispersion modeling analysis.

The sections below describe the steps followed to obtain a prioritized list of receptor locations for consideration of a monitoring site using modeled receptor DVs and frequency of receptors having the 1-hour daily maximum concentration among the top 200 DV receptors.

Step 1: Determining and Ranking Maximum Design Value Locations

The AERMOD model (Version 15181) was run for all receptors shown in Figure 1 and Figure 2. To provide the most accurate concentration estimates, we used the EPA-proposed low wind options (ADJ_U* and LOWWIND3). The actual hourly emissions for years 2013-2015 were modeled, with all results normalized (divided) by a reference emission rate of 5 g/s. The first step in the monitor siting process was to account for the location of receptors with the highest magnitude of impacts. The receptors with the maximum design values (DVs, the 99th percentile peak daily 1-hour maximum concentrations averaged over the years modeled) over the entire modeling domain. Table 1 presents the top 10 DV receptors ranked from highest (highest DV = rank 1) to lowest (lowest DV = rank 10). To prioritize the receptors to be evaluated for potentially establishing the location of an ambient SO_2 monitor, the top 200 DV receptors identified from this step and shown in Figure 3 and 4 were ranked and analyzed, as recommended by the Monitoring TAD, Appendix A.

Step 2: Determining Frequency of Occurrence of Concentration Maxima

The next step in the analysis is designed to account for the frequency in which the top 200 receptors identified in Step 1 have daily maximum 1-hour SO_2 concentrations. To assess the frequency of occurrence of concentration maxima at a given receptor, the MAXDAILY option was used, which outputs the maximum 1-hour concentration for each receptor for each day of the model simulation (three years from 2013 to 2015). This output was used to determine the number of days for which each receptor was the overall highest 1-hour concentration for the day for the three modeled years. Table 2 shows the top 10 receptors' frequency of days ranked from highest (highest number of days = rank 1) to lowest (lowest number of days frequency = rank 10). Days for which all of the selected receptors (which were in a relatively small area) were tied for the highest concentration (because they were all assigned the background value) were not counted.

Figures 5 and 6 show the location of the maximum DV receptor and the receptor with the highest number of days with daily maximum 1-hour SO_2 concentrations (168 days), respectively. The receptor with the highest number of days is located on high terrain.

Step 3: Scoring of Maximum DVs and Frequency of Occurrence of Concentration Maxima

The final step in the analysis consisted of creating a prioritized list of receptor locations for consideration of a new ambient SO_2 monitoring site by using the receptor-by-receptor DVs and frequency of having the 1-hour daily maximum concentration among the top 200 DV receptors.

Table 3 provides the top 10 results of the score ranking used to generate a list of receptor locations, ranked in general order of desirability with regard to potential new ambient SO_2 monitors. Figure 7 shows the receptors ranked by "Score", reflecting rankings of maximum DV and frequency of having the 1-hour daily maxima amongst the top 200 DV receptors. Lower numerical values of "Score1" indicate higher probabilities of experiencing peak 1-hour SO_2 concentrations. The top two receptors with the lowest scores are located on elevated terrain west of the Box Elder Creek. Note that the lowest score means the best location in terms of a combined consideration of concentration magnitude and frequency of impact. Bird's eye views of the peak impact area from two perspectives, generated by Google Earth imagery, are shown in Figures 8 and 9.

Feasibility Review for Siting a Monitor in the Model-Identified Peak Predicted Concentration Area

After an on-site review of the modeled high impact areas, it was determined that the impact areas were not accessible by vehicle and there are no power lines in the area. Therefore, it is not feasible to place an ambient sulfur dioxide monitoring site at any of the top 200 receptors. In order to best represent the high impact areas it is proposed that a monitoring site be located in line from the plant to the impact areas as close to the impact areas as possible at a location that is accessible year round and has nearby power. This site is located on state land, and is currently being leased to Lancaster Livestock Enterprises, who expressed an interest and willingness to allow the use of this location for ambient air monitoring. It was determined that this location is the best possible representation of ambient air due to the close proximity of nearby dwellings, and its being adjacent (within 50 meters) to a publicly accessible road. After a siting trip with the WDEQ, it was determined that the best location to place a monitoring site that would best represent the impact areas is located at UTM coordinates 434,703 meters East and 4,736,263 meters North – Zone 13, at an elevation of 5,485 feet (see Figure 10). This site is available and deemed ready for placement of an ambient monitoring station. It was chosen specifically because year-round accessibility will be assured, and line power is readily available and remote communications will be optimal. Lastly, it is as close to the top 200 receptors as practicable.

An alternate site, approximately 3,000 feet to the east, was discussed as a better location; however, negotiations with a land owner adverse to the intent of this monitoring failed.

Study Conclusions

The analysis of monitor locations likely to be most impacted by the Dave Johnston plant was conducted using AERMOD, consistent with guidance provided in EPA's SO_2 monitoring TAD. The modeling involved the most recent 3 years (2013-2015) with actual hourly emissions (normalized by a reference emission rate of 5 g/s), and using concurrent meteorological data from the Converse County Airport (Douglas, WY).

The procedures recommended by the monitoring TAD involved the identification of the top 200 receptors according to the predicted design values. These receptors were then ranked according to the magnitudes and the frequencies of the predicted concentrations.

A monitoring siting trip showed that the modeled top 200 receptor locations for placing an ambient sulfur dioxide monitor are not accessible. As a result, an alternative monitoring location was chosen and accepted.

Table 1: Top 10 Ranked Design Value Receptors

UTM_E[1]	UTM_N[1]	Normalized Concentration (µg/m³)	DV_Rank
437900	4734600	31.29	1
436000	4734800	30.83	2
437800	4734600	30.77	3
436100	4734800	30.74	4
437500	4734700	30.47	5
436700	4734700	30.39	6
437800	4734500	30.20	7
437500	4734600	30.17	8
437600	4734300	29.83	9
437200	4734700	29.63	10

[1] Zone 13, WGS84

Where: DV_Rank = the rank with regard to DV (highest DV is rank 1)

Table 2: Top 10 Receptors, Ranked by Frequency of 1-Hour Daily Maxima Over 3 Years of Modeling

UTM_E[1]	UTM_N[1]	nDays	nDays_Rank
438400	4734700	168	1
432500	4735200	80	2
437900	4734800	46	3
438400	4734600	40	4
434300	4734900	32	5
436000	4735000	28	6
435900	4733700	26	7
434800	4735100	25	8
434300	4734300	24	9
436800	4734900	24	10

[1] Zone 13, WGS84

Where:

nDays = the number of days that the receptor is the highest concentration for the day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)

Table 3: Receptor Ranking by Design Value and Frequency of 1-Hour Daily Maxima

UTM_E[1]	UTM_N[1]	DV_Rank	nDays	nDays_Rank	Score	Score_Rank
436100	4734800	4	12	28	32	1
437800	4734600	3	11	33	36	2
436700	4734700	6	11	31	37	3
436200	4734700	13	8	41	54	4
437900	4734700	17	10	37	54	5
437700	4734700	24	11	32	56	6
436000	4734800	2	6	57	59	7
437400	4734700	16	8	44	60	8
437500	4734600	8	7	52	60	9
437400	4734600	22	8	43	65	10

[1] Zone 13, WGS84

Where:
DV_Rank = the rank with regard to DV (highest DV is rank 1)
nDays =the number of days that the receptor is the highest concentration for that day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)
Score = is the sum of DV_Rank and nDays + Rank for each receptor
Score_Rank = the rank of the scores [lowest total score ("Score" of 32) is rank 1].

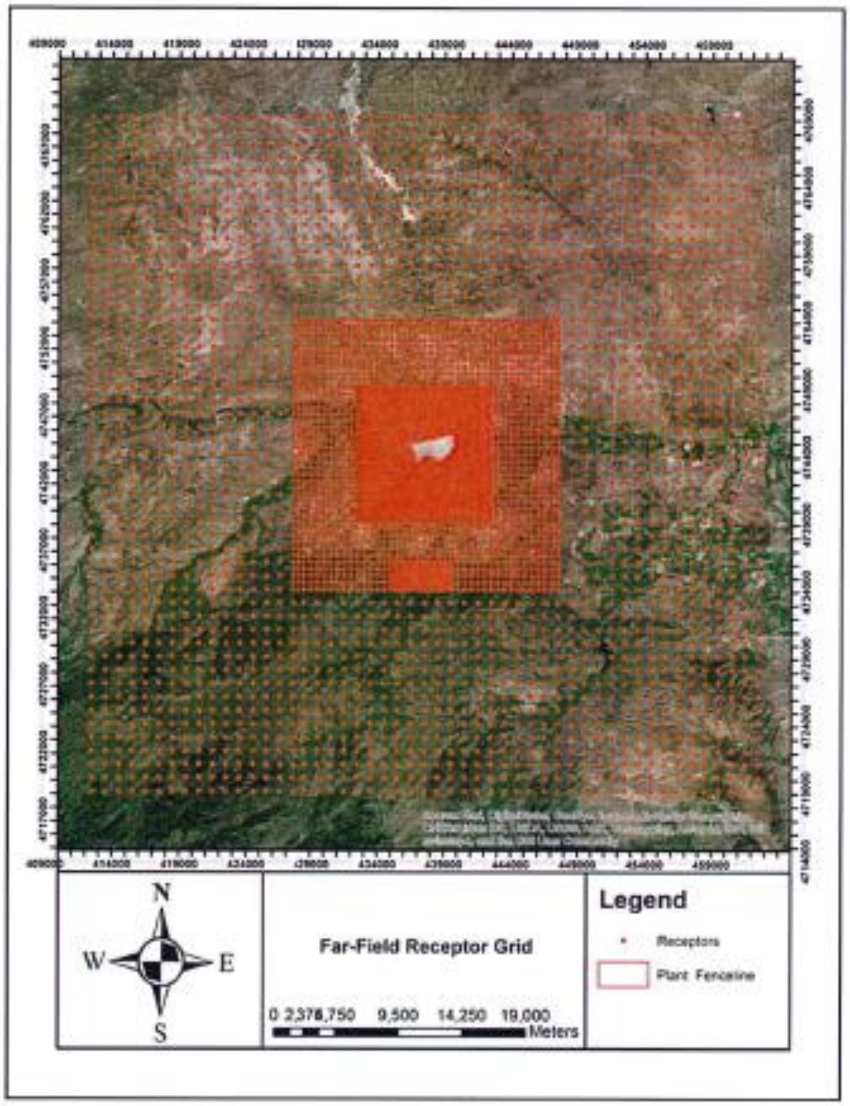

Figure 1: Far-Field Receptor Grid (AECOM)

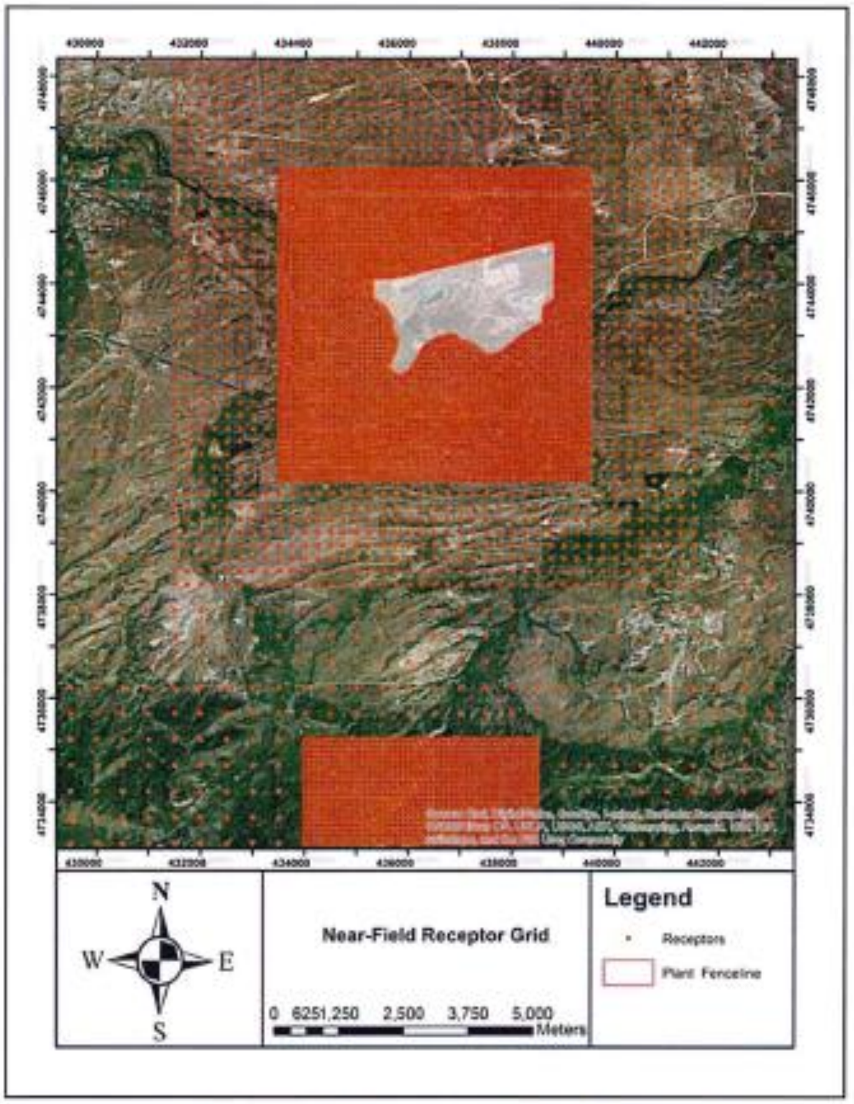

Figure 2: Near-Field Receptor Grid (AECOM)

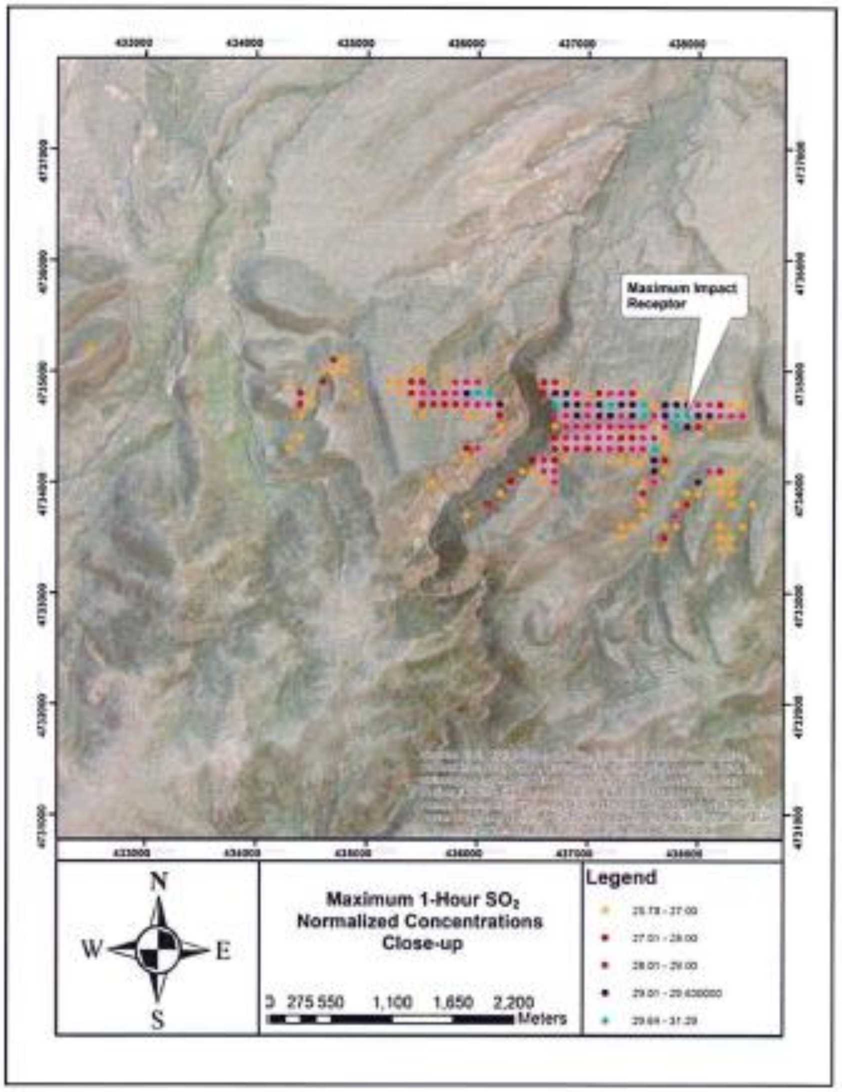

Figure 3: Locations and Ranking of Maximum 1-Hour SO_2 Design Value Receptors (AECOM)

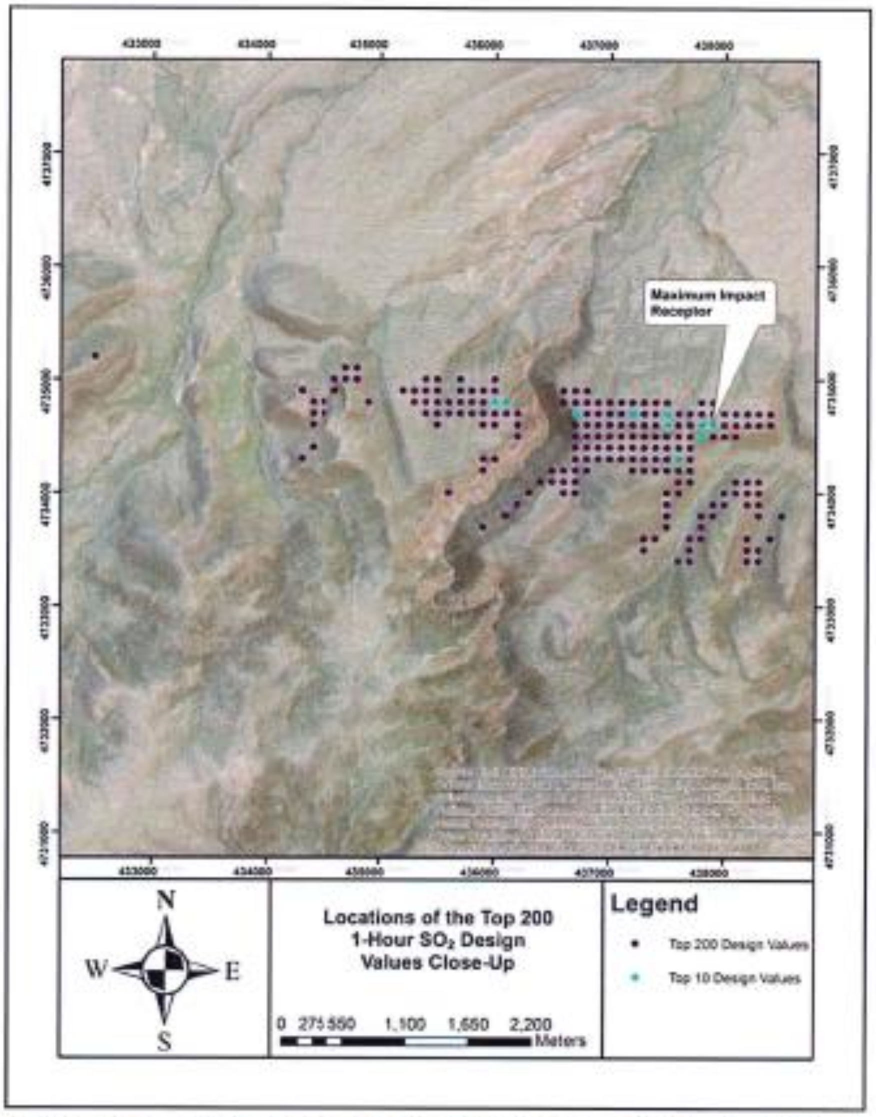

Figure 4: Locations of the Top 10 and 200 1-Hour SO_2 Design Value Receptors (AECOM)

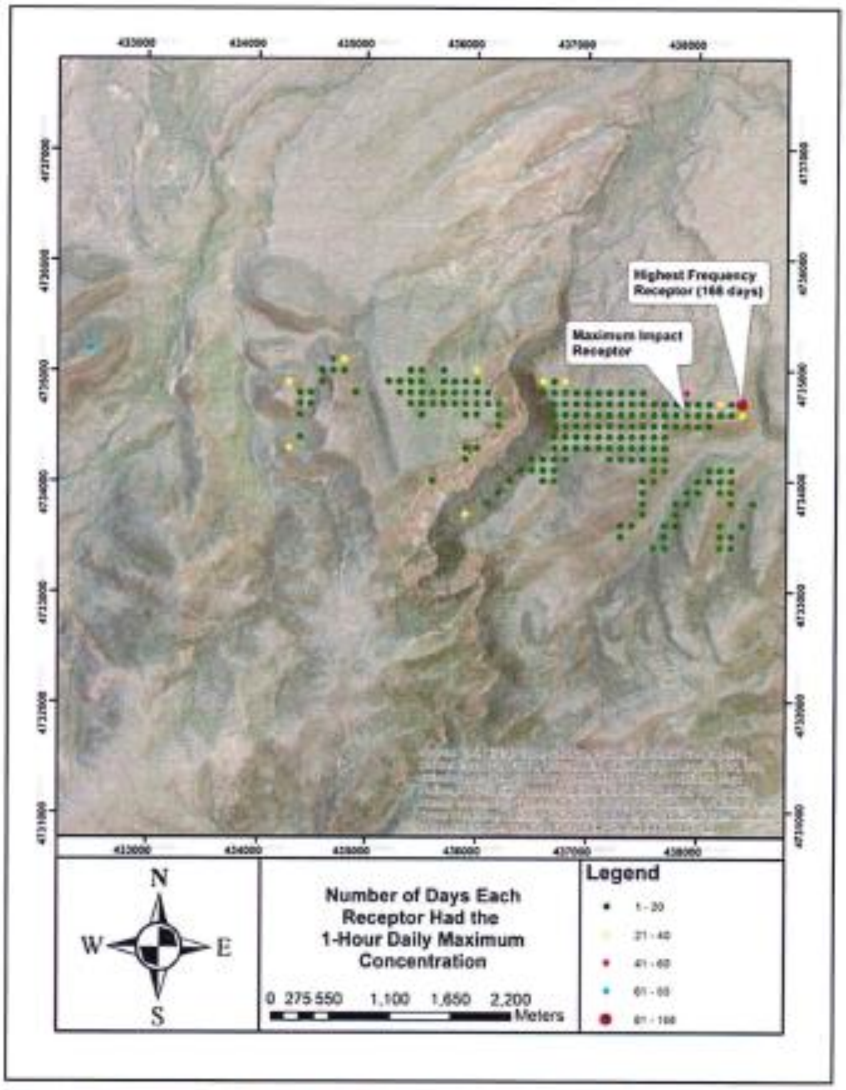

Figure 5: Locations and Rank of Receptors with the highest Number of Days of Daily Maximum 1-Hour SO_2 Concentrations (AECOM)

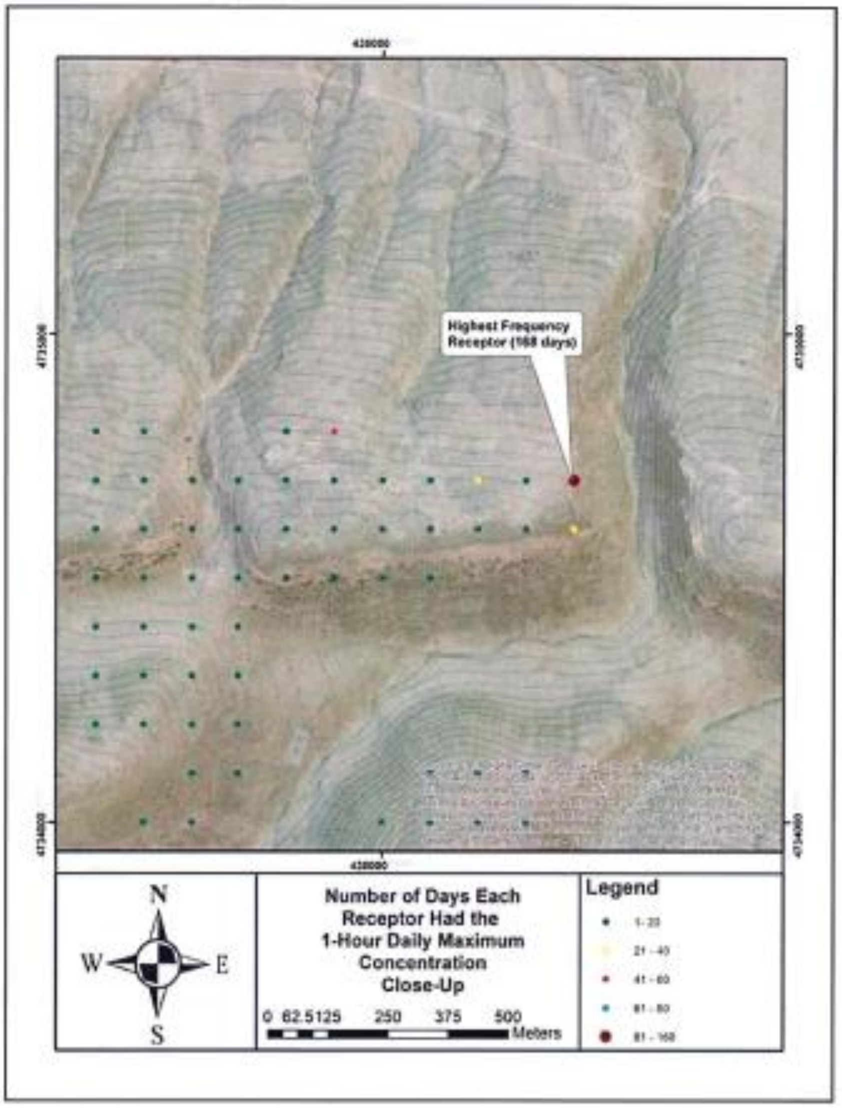

Figure 6: Locations and Rank of the Receptors with the Highest Number of Days of Daily Maximum 1-Hour SO_2 Concentrations (Close up) (AECOM)

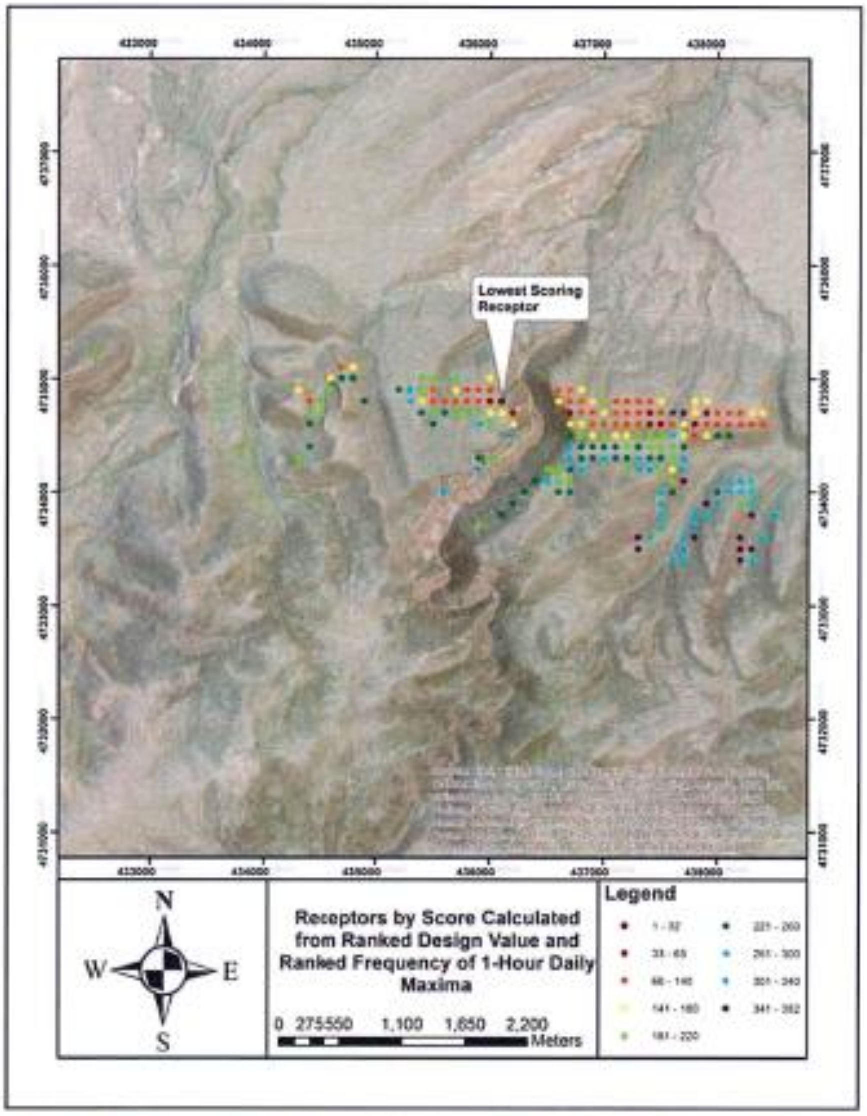

Figure 7: Receptors by Score Calculated from Ranked Design Value and Frequency of 1-Hour Daily Maxima (AECOM)

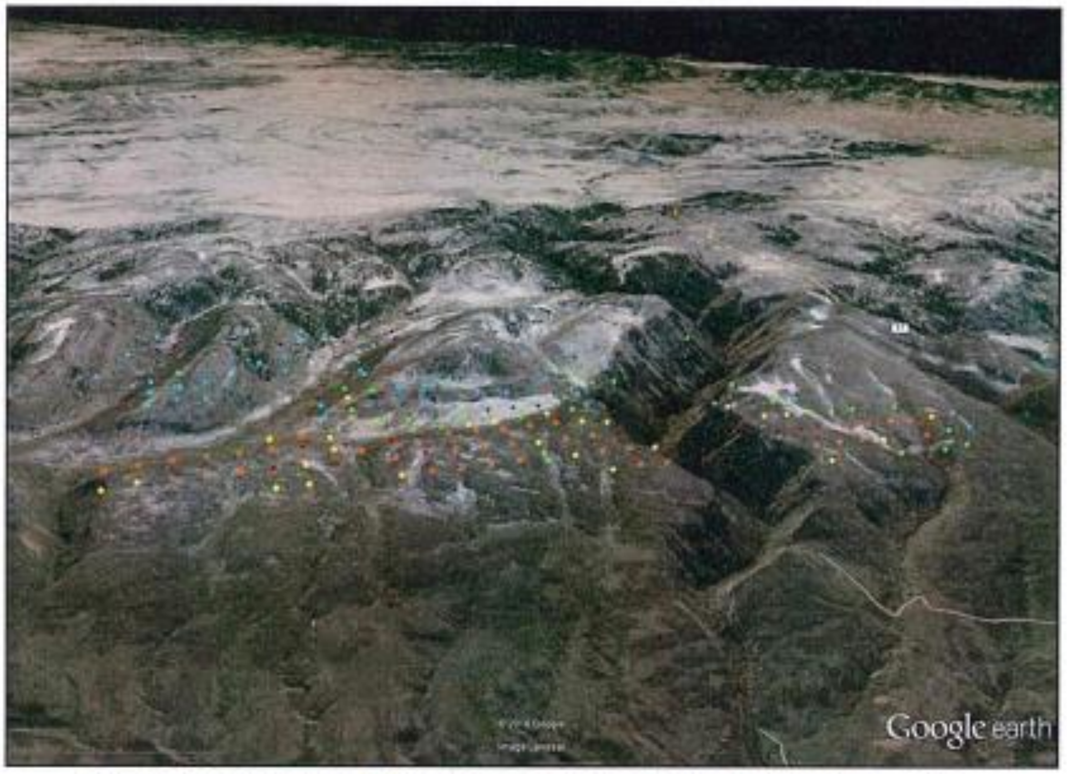

Figure 8: Lowest Score Ranked Receptors Overlaid on Terrain (Close-up)

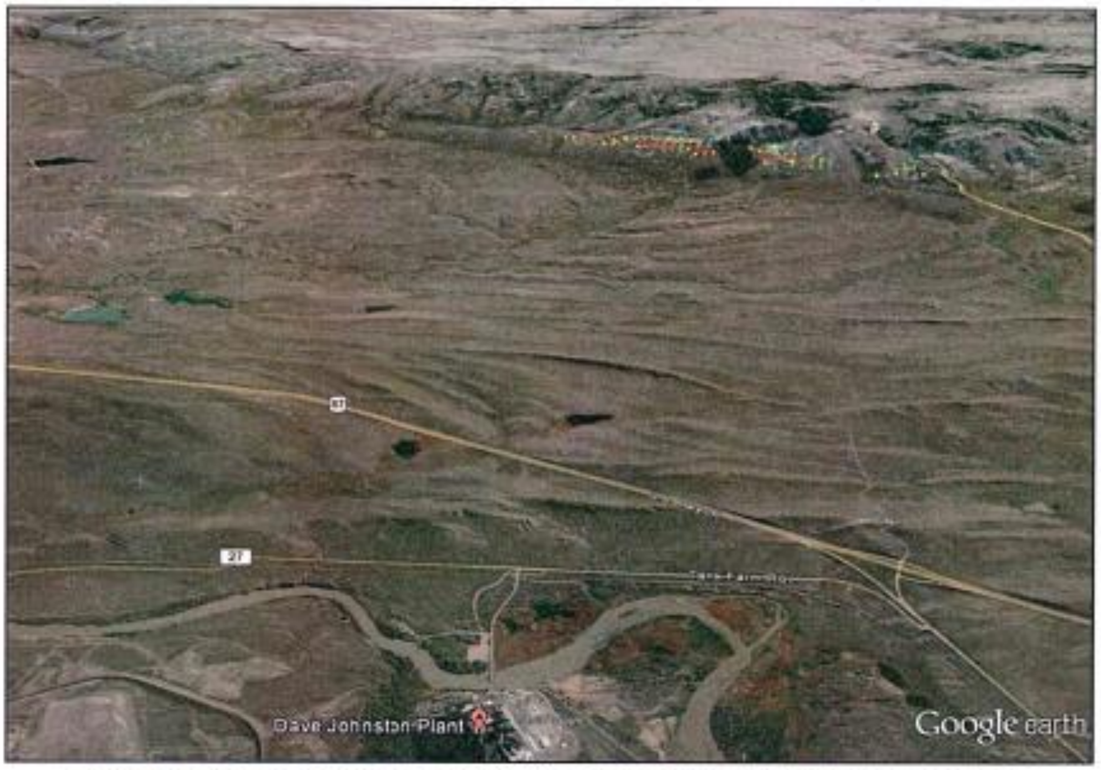

Figure 9: Lowest Scoring Receptors Overlaid with Google Earth Terrain Imagery

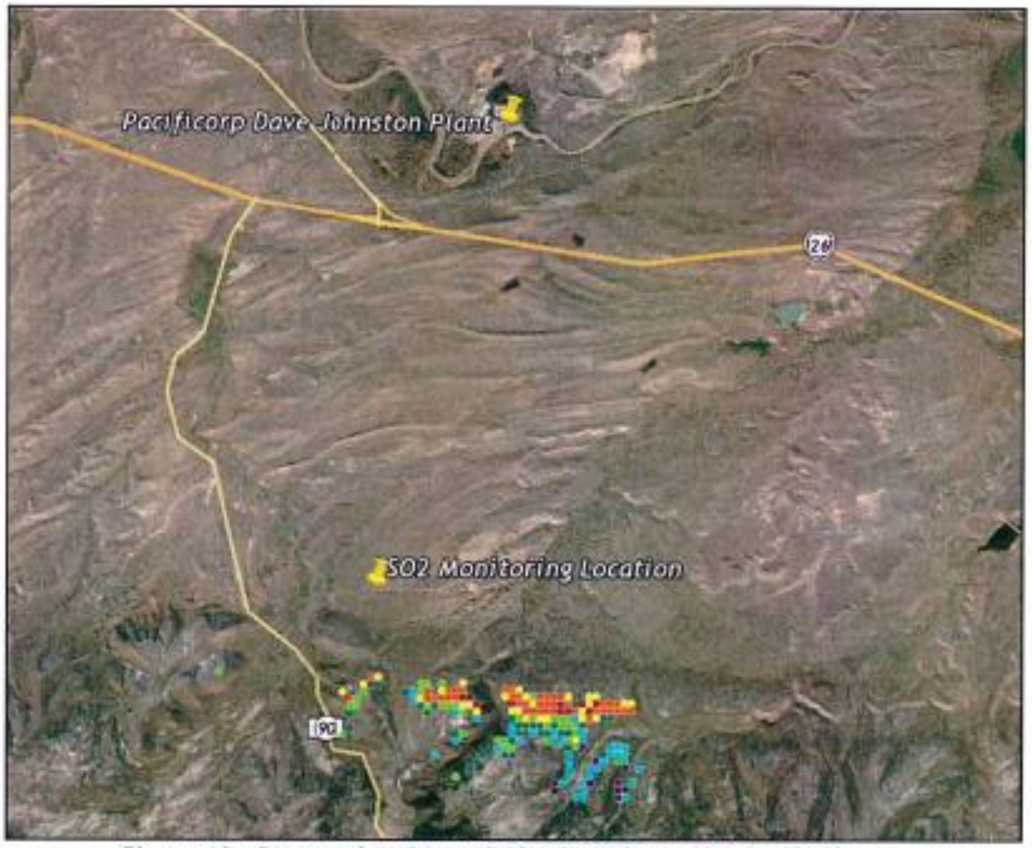

Figure 10 : Proposed Ambient Sulfur Dioxide monitoring Station

If you have any questions or comments about the information presented in this letter, please do not hesitate to call me at (801) 272-3000 ext 307.

Sincerely,

MSI TRINITY

Casey Lenhart
Managing Consultant

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Appendix G: Jim Bridger Power Plant SO_2 DRR Final Monitoring Plan

4525 Wasatch Blvd | Suite 200 | Salt Lake City, UT 84124 | P (801) 272-3000 | F (801) 272-3040
trinityconsultants.com

MSi Meteorological Solutions Inc. A Trinity Consultants Company | Trinity Consultants

VIA E-MAIL: Aaron.maisch@wyo.gov

April 20, 2016

Mr. Aaron Maisch
Wyoming DEQ – Air Quality Division
200 West 17th Street
Third Floor
Cheyenne, Wyoming 82002

RE: Jim Bridger Ambient Sulfur Dioxide Siting Plan

Dear Mr. Maisch:

This plan provides the results of a modeling analysis performed by AECOM that may be used to support the selection of an ambient SO_2 monitor location in the vicinity of the Jim Bridger Power Plant, operated by PacifiCorp and located approximately 10 miles southeast of Superior, in Sweetwater County, Wyoming. The modeling analysis review that is summarized below includes the following steps:

- Based upon initial modeling, the AERMOD model was run on a reduced receptor grid that included areas most likely to be among the highest impacted areas.
- The model output was analyzed following the steps outlined in Appendix A of the U.S. EPA Monitoring Technical Assistance Document[1]. These steps focus upon first identifying the "top 200 receptors" based upon peak daily 1-hour maximum predicted concentrations. Then these candidate receptors are given a score based upon the magnitude and frequency of peak daily 1-hour maximum concentrations.
- The analyses provided below includes an evaluation of modeled design value (DV[2]) spatial distributions in combination with the frequency of 1-hour daily maxima predicted by AERMOD using the MAXDAILY output option.

Representative meteorological data used in the dispersion modeling analysis were selected in accordance with the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W). The most recent three years (2012-2014) of meteorological data collected onsite were used in this analysis. Wind roses and summary meteorological data are presented below.

[1] http://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2MonitoringTAD.pdf.

[2] The design value is the 99th percentile peak daily 1-hour maximum concentration averaged over the years modeled, computed at each model receptor.

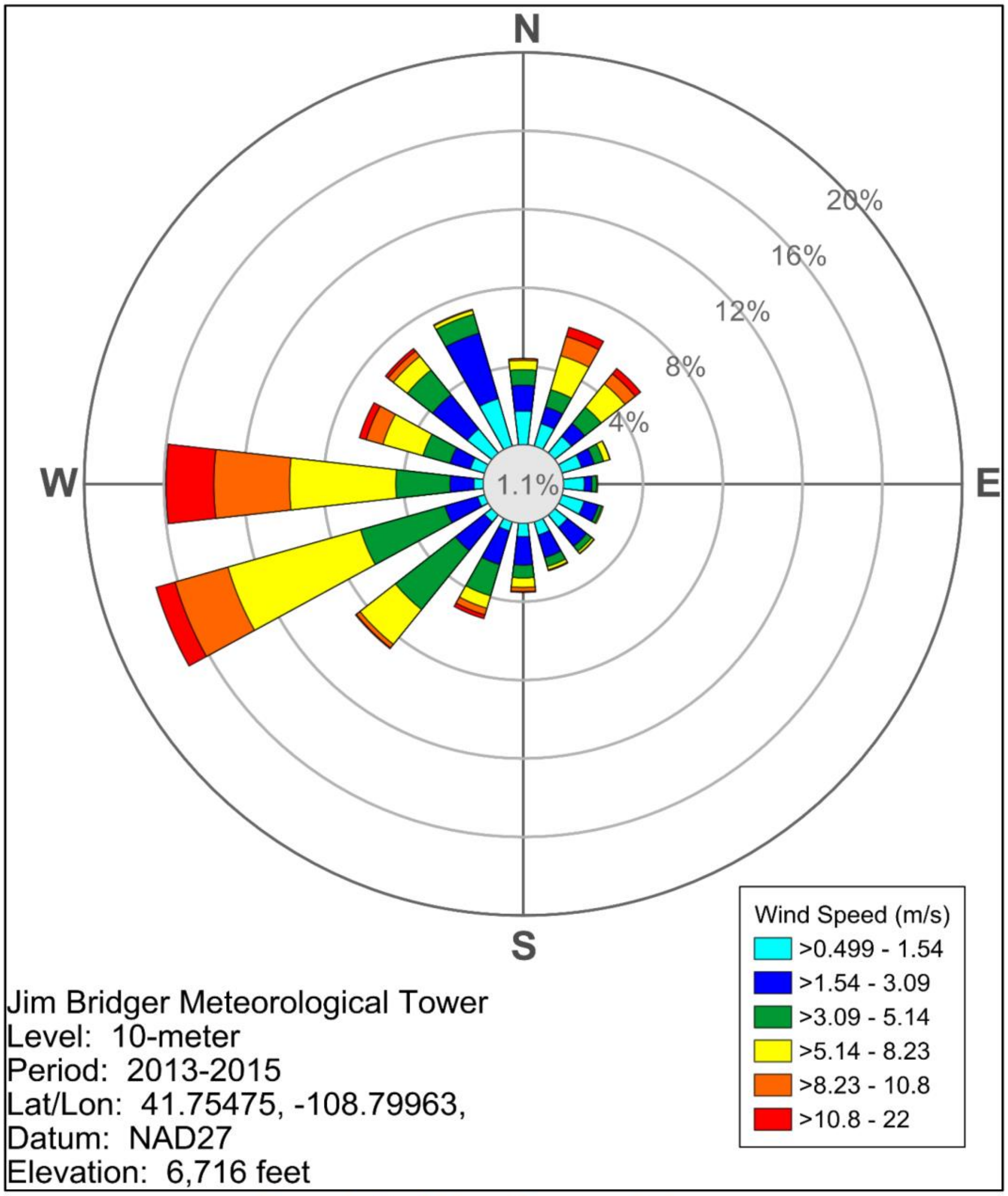

Figure 1: Jim Bridger 10-meter wind rose

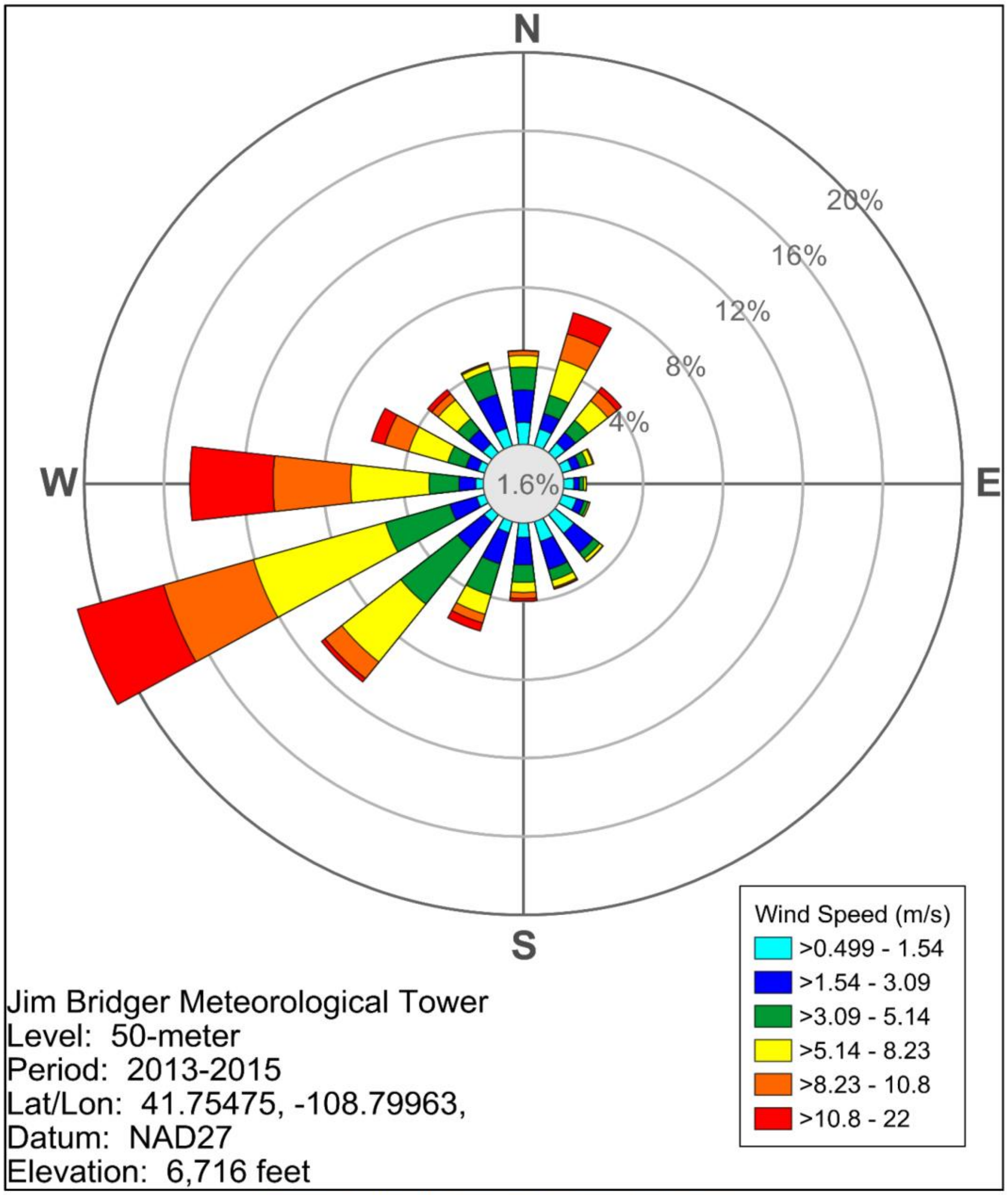

Figure 2: Jim Bridger 50-meter wind rose

Year	Temperature (°C)						DT (°C)				RH (%)		Precip (in)
	2m		10m		50m		10-2		50-2				
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
2012	-33.05	33.74	-31.56	31.97	-26.99	31	-2.654	4.174	-4.021	8.6	4.03	98.5	4.9
2013	-31.91	33.26	-30.65	31.76	-28.63	31.15	-2.945	3.582	-4.436	7.519	7.37	97.6	5.53
2014	-27.9	33.02	-27.68	30.87	-27.36	29.78	-2.304	3.898	-3.632	7.566	5.996	97.1	9.83

Table 1: Summary Meteorological Data

The sections below describe the steps followed to obtain a prioritized list of receptor locations for consideration of a monitoring site using modeled receptor DVs and frequency of receptors having the 1-hour daily maximum concentration among the top 200 DV receptors. This analysis does not evaluate whether the potential monitoring locations are logistically feasible based on local topography, availability of line power and land ownership. Final justification for preferred monitoring locations will require ground reconnaissance review of candidate sites.

Step 1: Determining and Ranking Maximum Design Value Locations

The AERMOD model (Version 15181) was run for all receptors shown in Figure 3 and Figure 4. To provide the most accurate concentration estimates, we used the EPA-proposed low wind options (ADJ_U* and LOWWIND3). The actual hourly emissions for years 2013-2015 were modeled, with all results normalized (divided) by a reference emission rate of 5 g/s. The first step in the monitor siting process was to account for the location of receptors with the highest magnitude of impacts. The receptors with the maximum design values (DVs, the 99th percentile peak daily 1-hour maximum concentrations averaged over the years modeled) over the entire modeling domain. Table 2 shows the top 10 DV receptors ranked from highest (highest DV = rank 1) to lowest (lowest DV = rank 10). To prioritize the receptors to be evaluated for potentially establishing the location of an ambient SO_2 monitor, the top 200 DV receptors identified from this step and shown in Figure 5, 6, and 7, were ranked and analyzed, as recommended by the Monitoring TAD, Appendix A.

Step 2: Determining Frequency of Occurrence of Concentration Maxima

The next step in the analysis is designed to account for the frequency in which the top 200 receptors identified in Step 1 have daily maximum 1-hour SO2 concentrations. To assess the frequency of occurrence of concentration maxima at a given receptor, the MAXDAILY option was used, which outputs the maximum 1-hour concentration for each receptor for each day of the model simulation (three years from 2013 to 2015). This output was used to determine the number of days for which each receptor was the overall highest 1-hour concentration for the day for the three modeled years. Table 3 shows the top 10 receptors' frequency of days ranked from highest (highest number of days = rank 1) to lowest (lowest number of days frequency = rank 10). Days for which all of the selected receptors (which were in a relatively small area) were tied for the highest concentration (because they were all assigned the background value) were not counted.

Figures 8 and 9 show the location of the maximum DV receptor and the receptor with the highest number of days with daily maximum 1-hour SO2 concentrations (109 days), respectively. The receptor with the highest number of days is located on high terrain.

Step 3: Scoring of Maximum DVs and Frequency of Occurrence of Concentration Maxima

The final step in the analysis consisted of creating a prioritized list of receptor locations for consideration of anew ambient SO2 monitoring site by using the receptor-by-receptor DVs and frequency of having the 1-hour daily maximum concentration among the top 200 DV receptors.

Table 4 provides the top 10 results of the score ranking used to generate a list of receptor locations, ranked in general order of desirability with regard to potential new ambient SO2 monitors. Figures 10 and 11 show the receptors ranked by "Score", reflecting rankings of maximum DV and frequency of having the 1-hour daily maxima amongst the top 200 DV receptors. Lower numerical values of "Score1" indicate higher probabilities of experiencing peak 1-hour SO2 concentrations. The top two receptors with the lowest scores are located on elevated terrain southeast of Zirkel Mesa. Note that the lowest score means the best location in terms of a combined consideration of concentration magnitude and frequency of impact.

Feasibility Review for Siting a Monitor in the Model-Identified Peak Predicted Concentration Area

After an on-site review of the modeled high impact areas, it was determined that the impact areas were not accessible by vehicle during much of the year, and power is not available in the area. Therefore, it is not feasible to place an ambient sulfur dioxide monitoring site at any of the top 200 receptors. In order to best represent the high impact areas it was suggested that a monitoring site be located in line from the plant to the impact areas as close to the impact areas as possible at a location that is accessible year round and has nearby power. Two locations (image 1) were considered for alternate monitoring stations.

- Site 1: 679,690.00 meters E, 4,627,607.00 meters N
- Site 2: 681,322.00 meters E, 4,627,307.00 meters N

Image 1: Alternate Monitoring Locations

For comparison purposes, preliminary modeling compared Site 1 against the current location of the Jim Bridger ambient SO2 monitor and gave a maximum concentration for each site. Image 2 shows the fenced boundary of the plant property and the locations of the monitoring sites. The current ambient SO2 monitoring site is outside that boundary and therefore would be considered "ambient" air.

Image 2: Site location comparison

From preliminary model results (2013-2015 meteorology/emissions data, using the ADJ U* low wind refinement in AERMET and the LOWWIND3 option in AERMOD) the maximum modeled 1-hour SO_2 design concentrations (including background) are as follows:

- Site 1 (new potential site): 71.01 μg/m^3
- Current site: 107.56 μg/m^3

Unfortunately, the lowest scoring receptors are located in a narrow valley which does not meet EPA siting criteria within 40 CFR Part 58 Appendix E. In addition, the nearest monitoring location that meets App. E criteria, along with power availability, models a lower NDV that the current SO2 monitoring location. It was therefore determined that leaving the current monitoring station in place is the best possible representation of ambient air, and the best possible option all-around. After a siting trip with the WDEQ, it was recommended that the monitoring station currently located at UTM coordinates 682,614.39 meters East and 4,623,961.37 meters North – Zone 12, at an elevation of 6,712 feet (see Figure 12), is the best location to retain a monitoring site that would best represent the impact areas. This site is currently operating and deemed to be the best possible location for an ambient monitoring station. It was chosen specifically because year-round accessibility will be assured, line power is still readily available, and remote communications are optimal. Lastly, it is as close to the top 200 receptors as practicable.

Study Conclusions

The analysis of monitor locations likely to be most impacted by the Jim Bridger plant was conducted using AERMOD, consistent with guidance provided in EPA's SO_2 monitoring TAD. The modeling involved the most recent 3 years (2013-2015) with actual hourly emissions (normalized by a reference emission rate of 5 g/s), and using concurrent onsite meteorological data.

The procedures recommended by the monitoring TAD involved the identification of the top 200 receptors according to the predicted design values. These receptors were then ranked according to the magnitudes and the frequencies of the predicted concentrations.

A monitoring siting trip showed that the modeled top 200 receptor locations for placing an ambient sulfur dioxide monitor are not accessible year-round. As a result, an alternative monitoring location was chosen and accepted.

Table 2: Top 10 Ranked Design Value Receptors

UTM_E[1]	UTM_N[1]	Normalized Concentration (µg/m³)	DV_Rank
674100.00	4627900.00	40.03	1
674100.00	4628100.00	39.79	2
674000.00	4628000.00	39.75	3
674100.00	4628000.00	39.66	4
674100.00	4628200.00	39.47	5
674070.50	4628072.00	39.46	6
674000.00	4628100.00	39.23	7
674200.00	4628100.00	39.20	8
673900.00	4628000.00	39.19	9
674100.00	4627800.00	39.05	10

[1] Zone 13, WGS84

Where: DV_Rank = the rank with regard to DV (highest DV is rank 1)

Table 3: Top 10 Receptors, Ranked by Frequency of 1-Hour Daily Maxima Over 3 Years of Modeling

UTM_E[1]	UTM_N[1]	nDays	nDays_Rank
674400.00	4628000.00	109	1
673700.00	4627800.00	83	2
673100.00	4629600.00	60	3
673800.00	4627900.00	35	4
671700.00	4630100.00	22	5
673700.00	4627600.00	21	6
674200.00	4628600.00	20	7
674000.00	4627500.00	16	8
673600.00	4627500.00	14	9
674400.00	4628000.00	10	10

[1] Zone 12, WGS84

Where:

nDays = the number of days that the receptor is the highest concentration for the day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)

Table 4: Receptor Ranking by Design Value and Frequency of 1-Hour Daily Maxima

UTM_E[1]	UTM_N[1]	DV_Rank	nDays	nDays_Rank	Score	Score_Rank
674100.00	4627900.00	1	109	19	20	1
674200.00	4628600.00	17	83	7	24	2
673900.00	4627500.00	20	60	16	36	3
674000.00	4627600.00	15	35	25	40	4
674200.00	4628000.00	11	22	30	41	5
674000.00	4627800.00	34	21	10	44	6
674200.00	4628200.00	14	20	31	45	7
673800.00	4627600.00	28	16	22	50	8
674100.00	4627700.00	26	14	28	54	9
673600.00	4627600.00	32	10	24	56	10

[1] Zone 12, WGS84

Where:
DV_Rank = the rank with regard to DV (highest DV is rank 1)
nDays =the number of days that the receptor is the highest concentration for that day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)
Score = is the sum of DV_Rank and nDays + Rank for each receptor
Score_Rank = the rank of the scores [lowest total score ("Score" of 32) is rank 1].

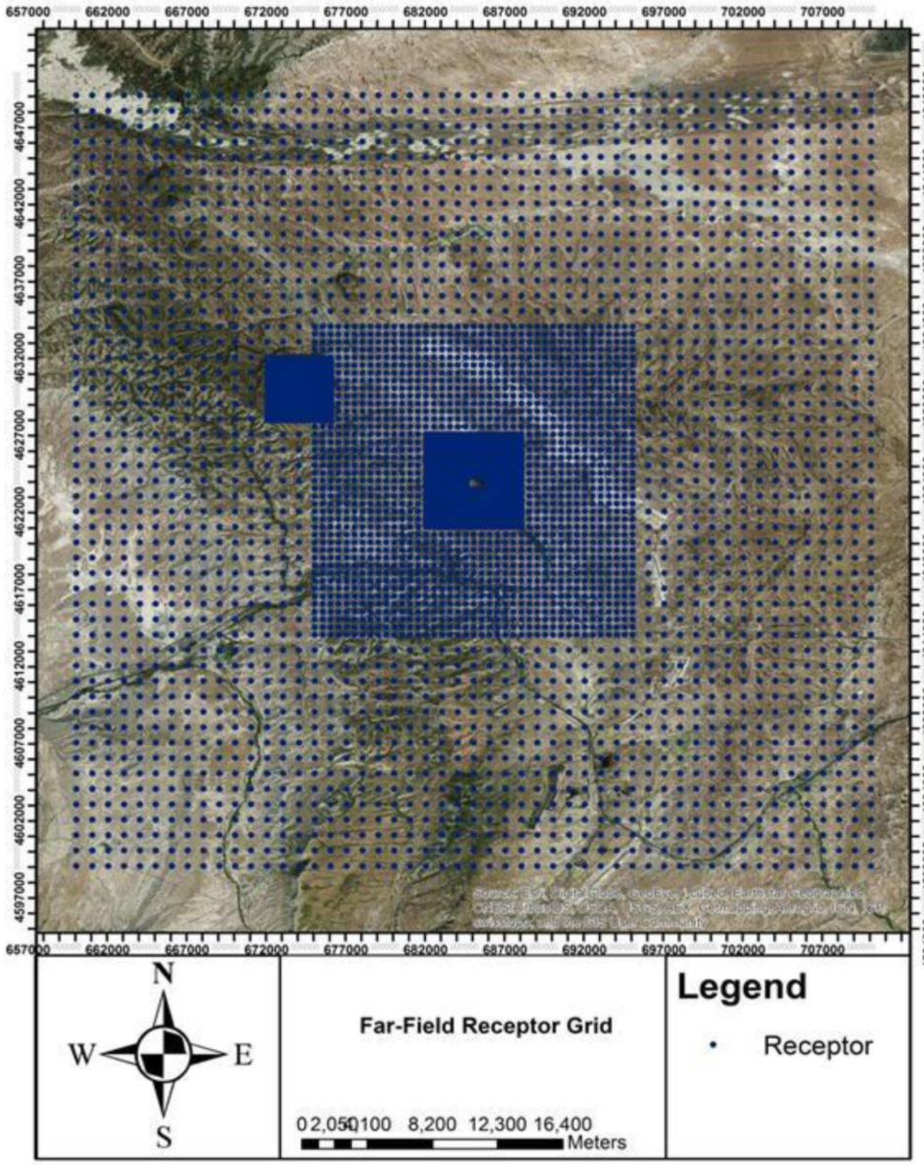

Figure 3: Far-Field Receptor Grid (AECOM)

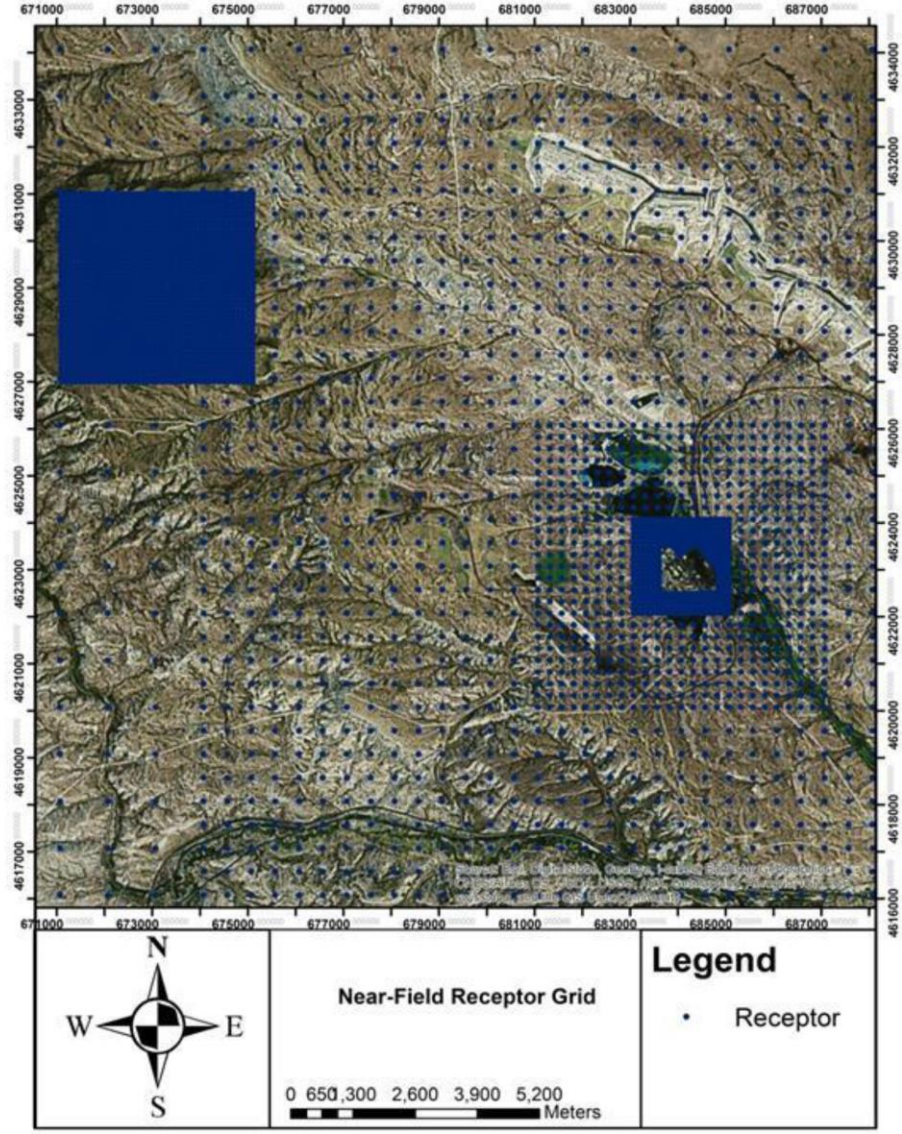

Figure 4: Near-Field Receptor Grid (AECOM)

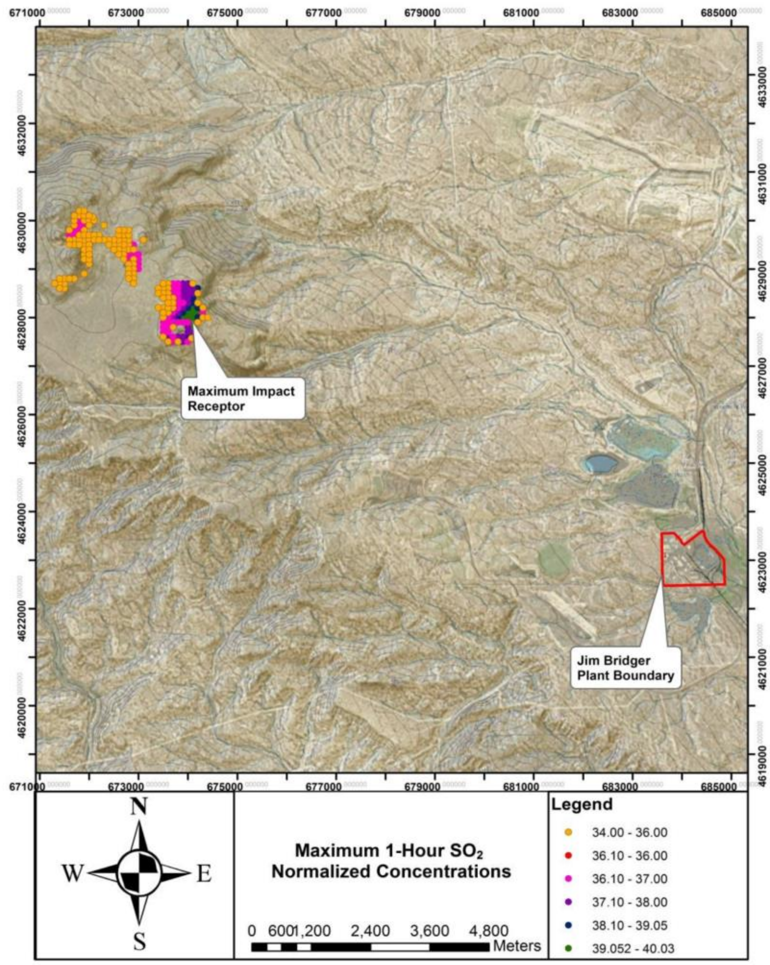

Figure 5: Locations and Ranking of Maximum 1-Hour SO_2 Design Value Receptors (AECOM)

Mr. Aaron Maisch
April 20, 2016
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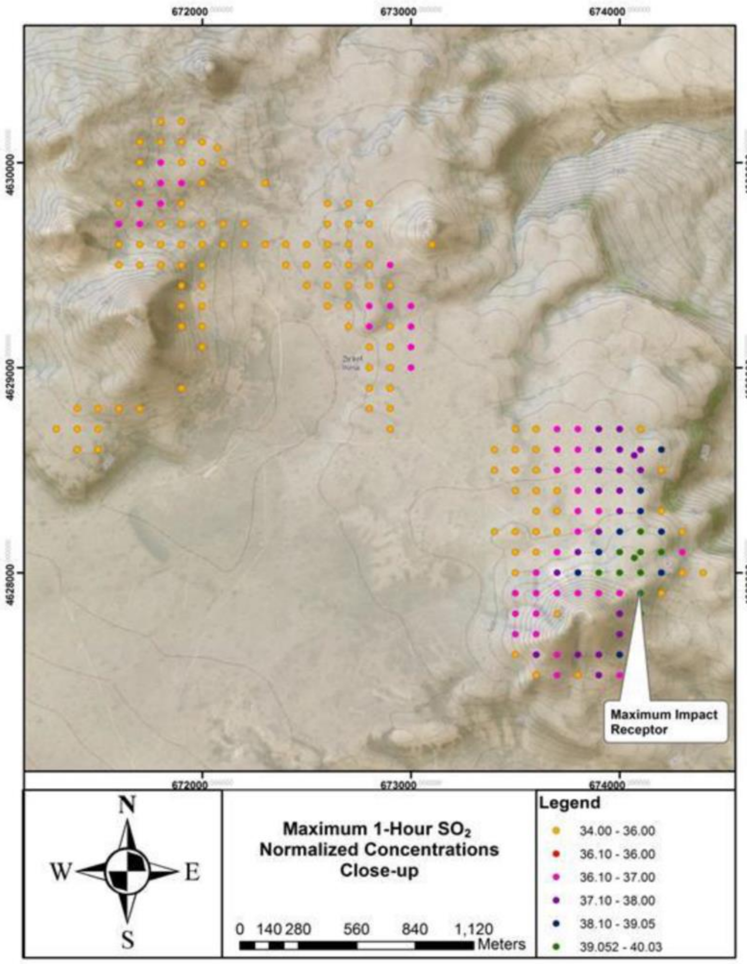

Figure 6: Locations of the Top 10 and 200 1-Hour SO_2 Design Value Receptors (Close-up) (AECOM)

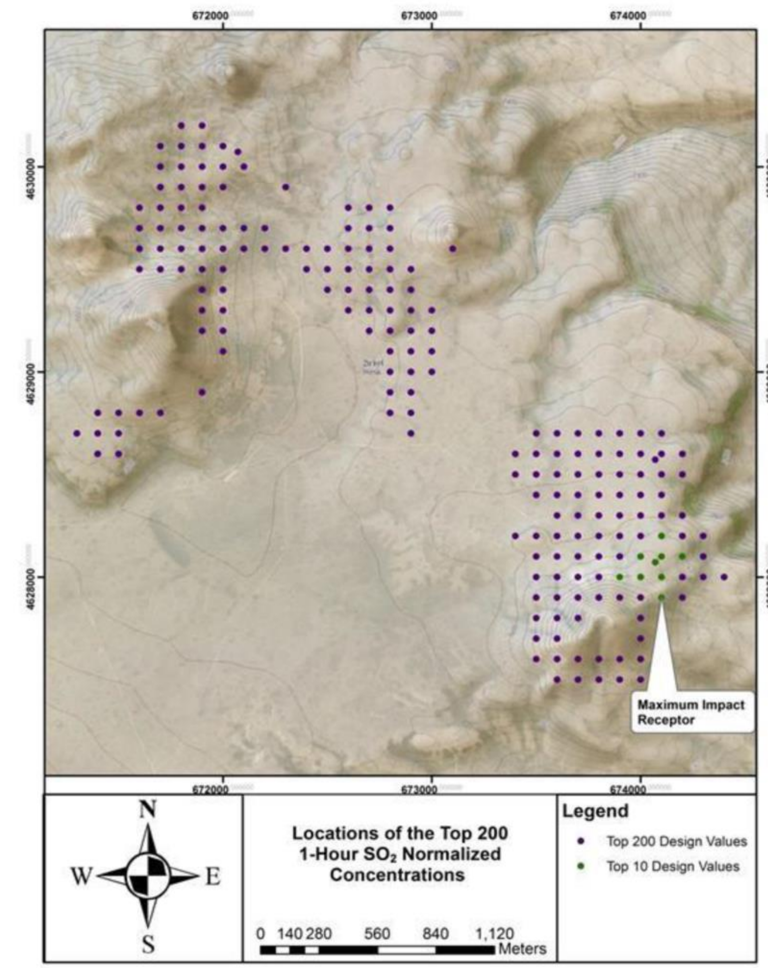

Figure 7: Locations and Rank of Receptors with the highest Number of Days of Daily Maximum 1-Hour SO_2 Concentrations (AECOM)

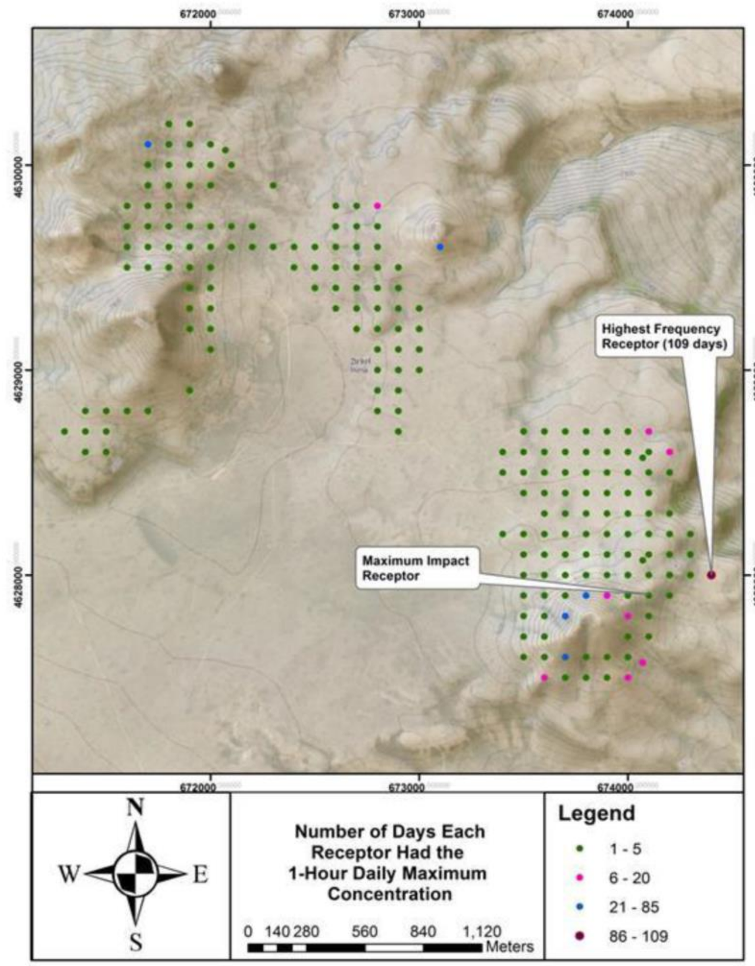

Figure 8: Locations and Rank of the Receptors with the Highest Number of Days of Daily Maximum 1-Hour SO_2 Concentrations (AECOM)

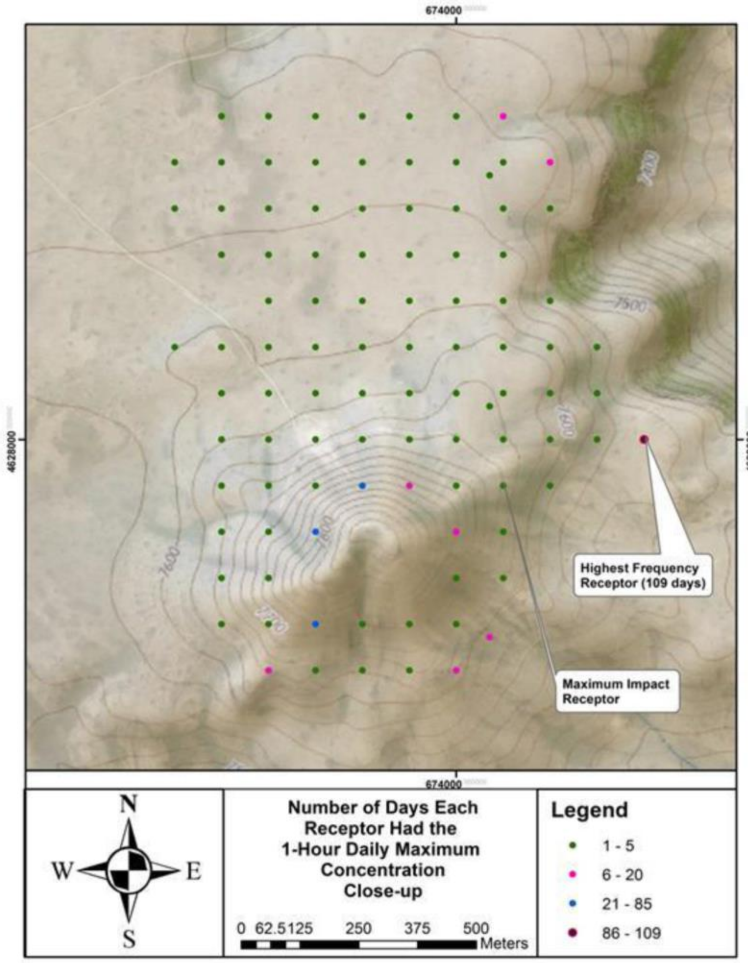

Figure 9: Locations and Rank of the Receptors with the Highest Number of Days of Daily Maximum 1-Hour SO_2 Concentrations (Close-up) (AECOM)

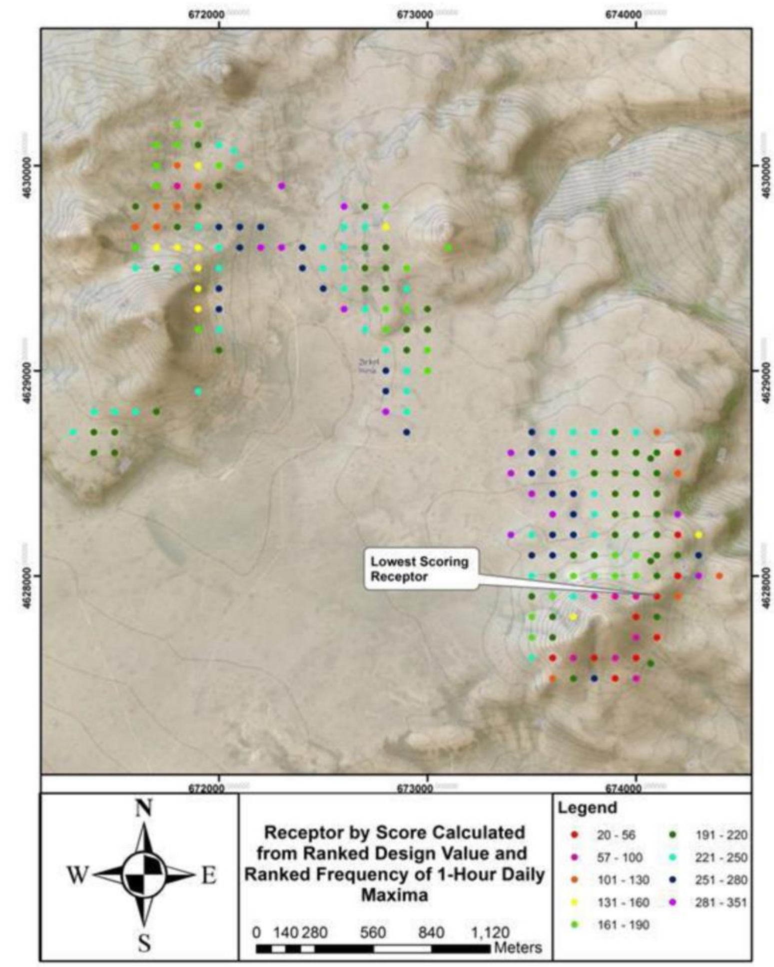

Figure 10: Receptors by Score Calculated from Ranked Design Value and Frequency of 1-Hour Daily Maxima (AECOM)

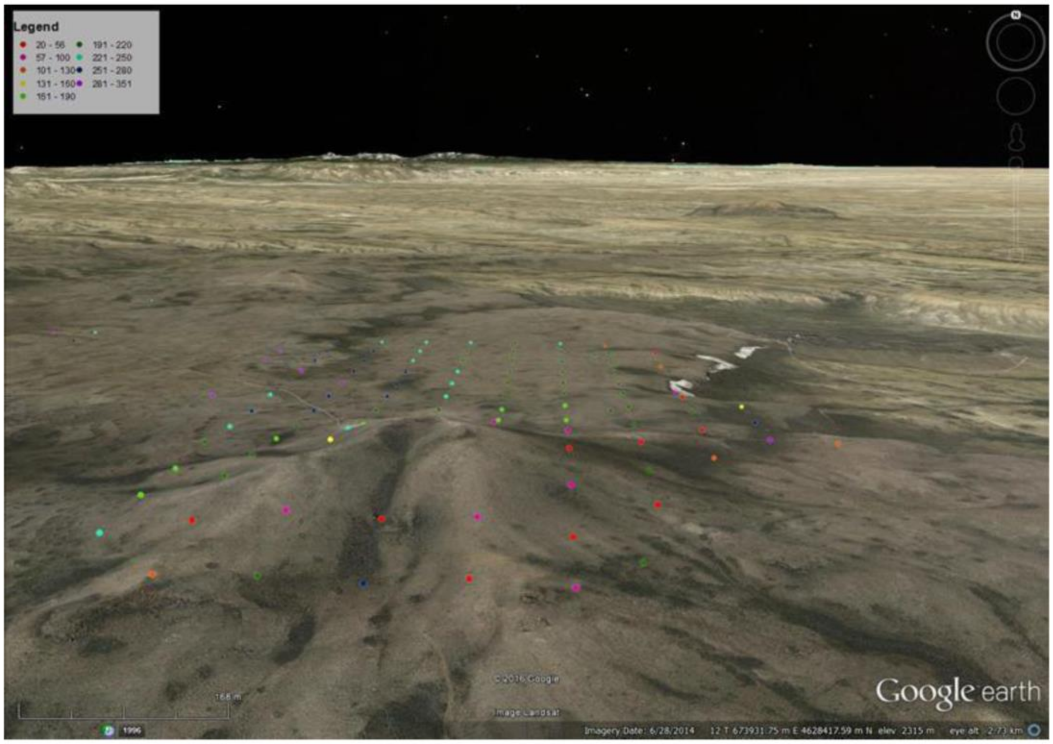

Figure 11: Lowest Score Ranked Receptors Overlaid on Terrain (Close-up) (AECOM)

Mr. Aaron Maisch
April 20, 2016
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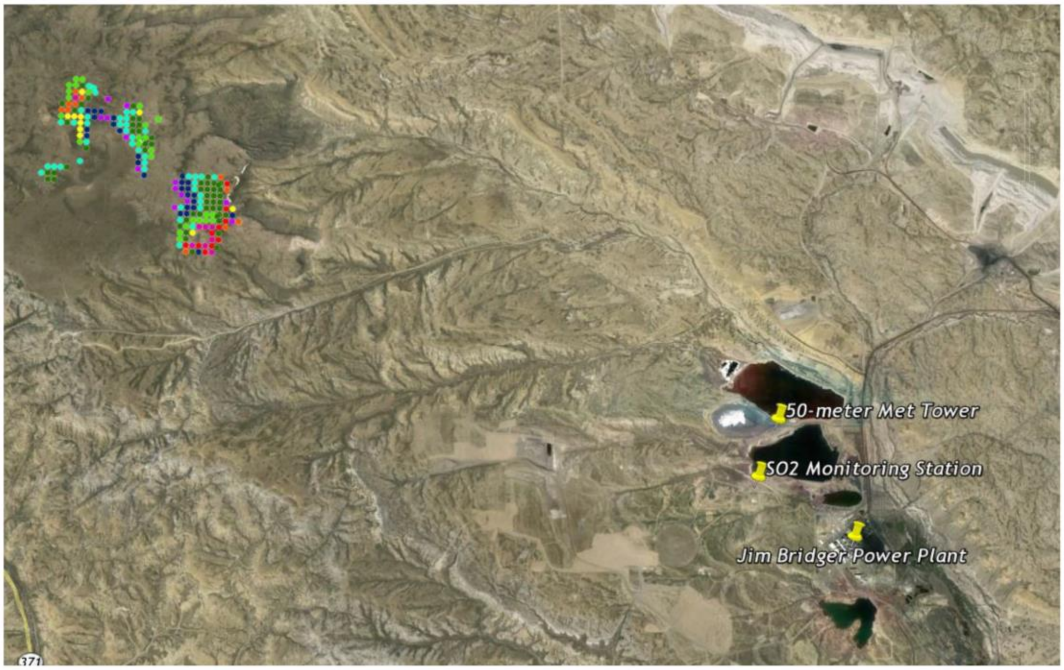

Figure 12: Proposed Ambient Sulfur Dioxide monitoring Station compared to top 200 receptors

If you have any questions or comments about the information presented in this letter, please do not hesitate to call me at (801) 272-3000 ext 307.

Sincerely,

MSI TRINITY

Casey Lenhart
Managing Consultant

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HEADQUARTERS >
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North America | Europe | Middle East | Asia

Appendix H: Sinclair Wyoming Refining Company SO_2 DRR Final Monitoring Plan

Certified Mail
Return Receipt Requested

 # 7015 0640 0003 6708 2445

April 15, 2016

Mr. Daniel Sharon
Air Quality Monitoring Project Manager
Wyoming Department of Environmental Quality
Air Quality Division
200 West 17th Street, 3rd Floor
Cheyenne, WY 82002

Subject: Sinclair Wyoming Refining Company (SWRC)
Submittal of SO_2 Data Requirements Rule Monitoring Plan – Final (Rev. #1)

Dear Mr. Sharon:

With this correspondence, SWRC is submitting revision #1 of the final version of the SO_2 Data Requirements Rule[1] Monitoring Plan to the Division. This final plan includes the revised preferred and alternate locations for the southwestern ambient SO_2 monitoring station in accordance with the Division's March 24, 2016 letter to SWRC. Please use this plan and disregard the previous plan sent to the Division dated April 12, 2016.

SWRC's preferred and alternative monitoring station locations for the southwestern refinery boundary are shown in Attachment 1, Figure 11. SWRC is also providing in Attachment 1, Section 2.0, a discussion of the ambient SO_2 monitoring network in the vicinity of the refinery.

Should you have any questions or concerns regarding this report please feel free to contact the Environmental Manager, John Pfeffer, at (307) 328-3548.

Sincerely,

Steve Sondergard
Refinery Manager

SS/sbg

Attachment

[1] 40 CFR 51 Subpart BB - Data Requirements for Characterizing Air Quality for the Primary SO_2 NAAQS.

Sinclair Wyoming Refining Company

P.O. BOX 277, SINCLAIR, WYOMING 82334
AREA CODE (307) 324-3404

cc:
M. Serres

cc: Electronic
J. Maffuccio
J. Pfeffer
S. Greene
L. Hart
C. Keslar – WDEQ/AQD
Environmental Reader File

Q:\Environmental\Data Requirements Rule\South Ambient Air Monitoring Siting Plan 4-15-16 rev 0.docx

Attachment 1: SO_2 Data Requirements Rule Monitoring Plan – Final (Rev. #1) Including Initial Modeling Analysis to Support the Selection of New Ambient SO_2 Monitor Locations using Updated Emission Rates

1.0 Introduction

At the current time, Sinclair Wyoming Refining Company (SWRC) is operating two ambient SO_2 monitors in the vicinity of its refinery located in Sinclair, WY, as shown in Figure 1. These monitors include one in the town of Sinclair to cover an area of population, and another to the NE of the refinery at the current fenceline to cover the area with the most frequent wind flow. The Wyoming DEQ has expressed interest in locating a third monitor to the south or southwest of the refinery to address near-fenceline impacts on that side of the refinery. This plan includes the modeling results that are used to support the selection of this additional ambient SO_2 monitor location in the vicinity of the SWRC facility. The analysis tasks that were completed are summarized below:

- The ambient air boundary was modeled using the original December 2015 SLR modeling that incorporated the revised ambient air boundary provided by the AQD. The same receptor grid was incorporated into this iteration of modeling as SLR's.
- We were able to replicate the results of SLR for their monitor placement recommendations.
- The AERMOD model was re-run using Potential to Emit emission rates taken from SWRC's most recent air permitting actions.
- The model output was analyzed following the steps outlined in Appendix A of the Monitoring TAD[1]. The analyses included an evaluation of modeled design value[2] (DV) spatial distributions in combination with the frequency of 1-hour daily maxima predicted by AERMOD using the MAXDAILY output option.

The sections below describe the steps followed to obtain a prioritized list of receptor locations for consideration of new monitoring sites using modeled receptor DVs and frequency of receptors having the 1-hour daily maximum concentration amongst the top 200 DV receptors.

---

[1] The analysis deviated from the Monitoring TAD regarding the design value analysis. Per the AQD's direction, the analysis used model-predicted design values from actual emissions rather than normalized design values from scaled emissions [e-mail from C. Keslar (WDEQ-AQD) to P. McKean (SLR) dated November 12, 2015].

[2] The 3-year average of the 99^{th} percentile of the daily maximum 1-hour values.

1.1 Step 1: Determining and Ranking Maximum Design Value Locations

The AERMOD model (Version 15181) was run with updated emissions (based on source PTE) for all receptors shown in Figure 2 and Figure 3. The first step in the monitor siting process was to account for the location of receptors with the highest magnitude of impacts. The receptors with the maximum design values (DVs, the 99th percentile peak daily 1-hour maximum concentrations averaged over the years modeled) over the entire modeling domain are shown in Figure 4. The darker receptors represent higher DV concentrations, with the maximum DV receptor circled in red. Table 1 shows the top 10 DV receptors ranked from highest (highest DV = rank 1) to lowest (lowest DV = rank 10). To prioritize the receptors to be evaluated for potentially establishing new ambient SO_2 monitors, the top 200 DV receptors identified from this step and shown in Figure 5 were ranked and analyzed, as recommended by the Monitoring TAD, Appendix A.

1.2 Step 2: Determining Frequency of Occurrence of Concentration Maxima

The next step in the analysis is designed to account for the frequency in which receptors have daily maximum 1-hour SO_2 concentrations. To assess the frequency of occurrence of concentration maxima at a given receptor, the MAXDAILY option was used, which outputs the maximum 1-hour concentration for each receptor for each day of the model simulation (three years from 2012 to 2014). This output was used to determine the number of days for which each receptor was the overall highest 1-hour concentration for the day for the three modeled years. Table 2 shows the top 10 receptors' frequency of days ranked from highest (highest number of days = rank 1) to lowest (lowest number of days frequency = rank 10).

Figure 6 and Figure 7 show the location of the maximum DV receptor (magnitude) and the receptor with the highest number of days (frequency) with daily maximum 1-hour SO_2 concentrations (252 days). The receptor with the highest number of days is located on the ambient air boundary south and slightly east of the flares. However, after the final step of scoring the maximum DVs and frequency of occurrence shown in Step 3 below, this receptor is not in the list of top 10 scored receptors. The receptor with the 2nd highest number of days (96 days) of maximum concentrations is at the same location as the maximum DV receptor.

1.3 Step 3: Scoring of Maximum DVs and Frequency of Occurrence of Concentration Maxima

The final step in the analysis consisted of creating a prioritized list of receptor locations for consideration of new ambient SO_2 monitoring sites using the receptor-by-receptor

DVs and frequency of having the 1-hour daily maximum concentration amongst the top 200 DV receptors.

Table 3 provides the top 10 results of the score ranking used to generate a list of receptor locations, ranked in general order of desirability with regard to potentially siting new ambient SO_2 monitors. Figure 8 and Figure 9 show the receptors ranked by "Score", reflecting rankings of maximum DV and frequency of having the 1-hour daily maxima amongst the top 200 DV receptors. Lower numerical values of "Score" indicate higher probabilities of experiencing peak 1-hour SO_2 concentrations. The top two receptors with the lowest scores are located on the southern ambient boundary across Lincoln Avenue from the SWRC parking lot.

1.4 Review of Logistics for Siting a Monitor to the South of the Refinery

Sinclair has conducted a "ground reconnaissance" review of the identified area (zoomed in with Figure 10), and Figure 11 shows the sites that are feasible based upon locations with access, power, distance from very localized sources, and staying away from obstacles such as buildings and trees. The preferred site is located at the east end of the SWRC south parking lot, located south of the boilerhouse and adjacent to a fenced in area. Should the preferred site be deemed unacceptable, an alternate site located near the center of the SWRC parking lot is also indicated in Figure 11.

The table below provides the approximate coordinates for the preferred and alternate southwestern monitoring station locations (re: Attachment 1, Figure 11).

Location	Latitude	Longitude
Preferred Location	N 41°46'43.54"	W 107°06'32.39"
Alternate Location	N 41°46'43.56"	W 107°06'35.70"

The preferred and alternate monitoring station locations have near-by access to electrical power, are located away from surrounding vegetation and buildings and are located on property owned by SWRC.

1.5 Conclusions

Based on the scoring procedure discussed in Step 3, the location of the southwest ambient SO_2 monitor would be at or near the southern boundary near Lincoln Avenue, as shown in Figure 10. Note the lowest scoring receptor locations indicate higher probabilities of experiencing peak 1-hour SO_2 concentrations.

In accordance with the Division's March 24, 2016 letter to SWRC, SWRC's preferred and alternative monitoring station locations for the southwestern refinery boundary are in the

SWRC south parking lot as shown in Figure 11. Therefore, SWRC is proceeding with installation of the monitor at the Location #1 (preferred) site.

2.0 SO_2 Ambient Monitoring Network Description

In its March 28, 2016 telephone call with SWRC and as recommended in the Division's March 24, 2016 letter to SWRC, SWRC is providing a discussion of the ambient monitoring network in the vicinity of the refinery with respect to compliance with the SO_2 Data Requirements Rule. A discussion of the monitoring network, the rational used for siting the monitors and available off ramp(s) for removing the monitor(s) from service is provided below. A discussion of each of the three (3) ambient monitors included in the monitoring network is provided.

Northeastern Monitor:

The northeastern monitoring station was required to be installed per Notice of Violation and Order Docket No. 5625-15 dated October 21, 2015. This station includes SO_2 and NO_2 monitors and was located downwind with respect to the predominant wind direction as determined by historic annual wind roses and annual air dispersion modeling results. The northeastern monitoring station began operation on December 18, 2015 and is sited and operated per State and Local Air Monitoring Station (SLAMS) requirements.

The northeastern monitoring station siting was based upon the results of recent air dispersion modeling performed by the Division[2]. This station was located adjacent to the northern refinery fenceline near the SO_2 "hot spots" identified by the air dispersion modeling analysis. Because of concerns with the state highway right-of-way and power utility company rights-of-way, this monitor was located approximately 0.6 miles to the east of the highest modeled SO_2 "hot spot". On October 28, 2015, the Division approved the location of the northeastern monitor which remains placed at its current location[3]. This monitor was also required to be installed pursuant to Permit No. MD-410 and Permit No. MD-12620 and will require a permitting action to be removed from service.

Town of Sinclair Monitor:

The Town of Sinclair monitoring station was installed to replace a temporary (mobile) monitor that was operated by the Division. This monitoring station includes a SO_2 monitor and was located near the northern section of the Town of Sinclair. The Town of Sinclair monitoring station began operation on December 10, 2015 and is sited and operated per SLAMS requirements.

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[2] 12/28/15 Memorandum: Initial Modeling Analysis to Support the Selection of New Ambient SO2 Monitor Locations, P. McKean (SLR) to C. Keslar Et al. (WDEQ/AQD).

[3] 12/3/15 letter from N. Vehr (WDEQ/AQD) to S. Sondergard (SWRC).

The primary purpose of this monitor is to provide SO_2 concentration data to ensure protection of the health of the residents of Sinclair, WY. On July 9, 2015, the Division approved the location of the Town of Sinclair monitor which remains placed at its current location[4]. SWRC acknowledges that this monitoring station may be removed from service if the conditions of 40 CFR 51.1203(c)(3) have been met.

Southwestern Monitor:

The southwestern monitoring station (as discussed above) is intended to monitor the SO_2 "hot spot" located at the southwest refinery fenceline. This monitoring station will include a SO_2 monitor and will be located in the south refinery parking lot. SWRC acknowledges that this monitoring station may be removed from service if the conditions of 40 CFR 51.1203(c)(3) have been met.

[4] 7/9/15 letter from S. Dietrich (WDEQ/AQD) to S. Sondergard (SWRC).

Table 1 Top 10 Ranked Design Values

UTM_E[1]	UTM_N[1]	Concentration (µg/m³)	DV_Rank
324679.95	4627194.05	67.82	1
324729.93	4627192.55	56.05	2
324580.00	4627197.05	51.03	3
324629.98	4627195.55	50.89	4
324400.00	4627100.00	50.87	5
324500.00	4627000.00	49.74	6
324500.00	4627100.00	49.52	7
323750.00	4624500.00	49.43	8
324600.00	4626900.00	49.03	9
325129.75	4627180.54	48.73	10

[1] Zone 13, NAD27

Where:
DV_Rank = the rank with regard to DV (highest DV is rank 1)

Table 2 Top 10 Ranked Frequency of 1-Hour Daily Maxima

UTM_E[1]	UTM_N[1]	nDays	nDays_Rank
325758.00	4627360.92	252	1
324679.95	4627194.05	96	2
325742.80	4627324.53	55	3
324779.91	4627191.05	53	4
326428.30	4628747.65	39	5
324729.93	4627192.55	30	6
325465.68	4627216.32	28	7
324500.00	4622000.00	19	8
325324.89	4627181.52	16	9
325678.37	4628758.17	16	10

[1] Zone 13, NAD27

Where:
nDays = the number of days that the receptor is the highest concentration for the day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)

Table 3 ranked design Value and Frequency of 1-Hour Daily Maxima

UTM_E[1]	UTM_N[1]	DV_Rank	nDays	nDays_Rank	Score	Score_Rank
324679.95	4627194.05	1	96	2	3	1
324729.93	4627192.55	2	30	6	8	2
324629.98	4627195.55	4	11	15	19	3
322000.00	4622500.00	13	15	11	24	4
323000.00	4622000.00	22	12	12	34	5
323750.00	4624500.00	8	8	26	34	6
324580.00	4627197.05	3	7	34	37	7
324600.00	4626900.00	9	7	36	45	8
325129.75	4627180.54	10	7	38	48	9
324979.82	4627185.04	29	8	27	56	10

[1] Zone 13, NAD27

Where:
DV_Rank = the rank with regard to DV (highest DV is rank 1)
nDays =the number of days that the receptor is the highest concentration for the day
nDays_Rank = the rank of the receptor with regards to nDays (highest nDays is rank 1)
Score = is the sum of DV_Rank and nDays + Rank for each receptor
Score_Rank = the rank of the scores [lowest total score ("Score" of 3) is rank 1].

Figure 1 Current Monitor Locations

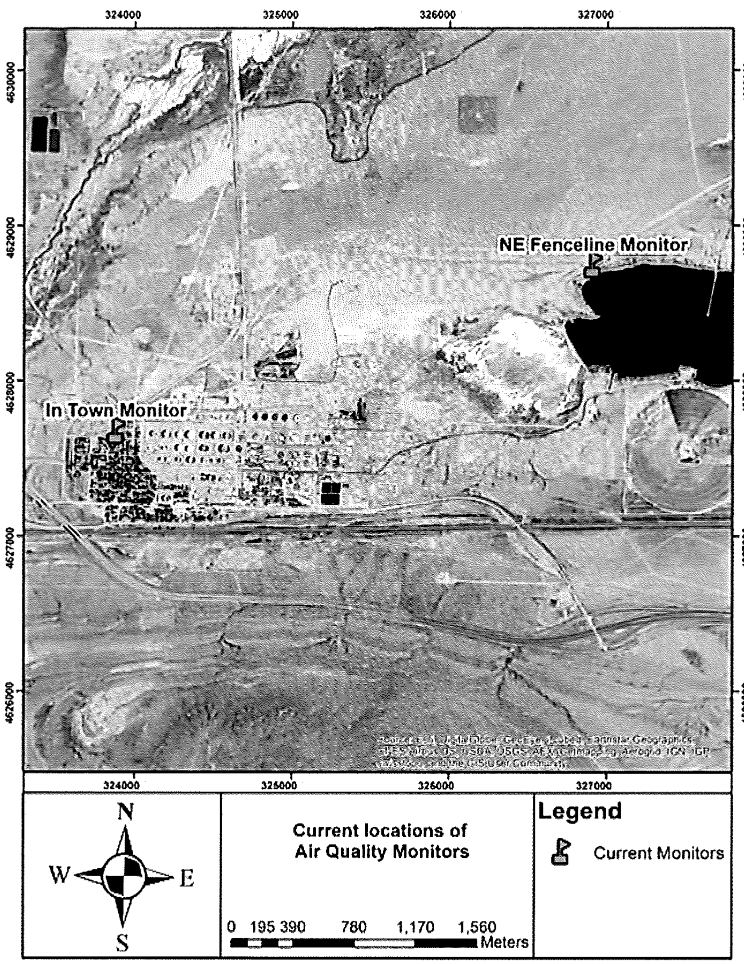


Figure 2 Far-Field Receptor Grid

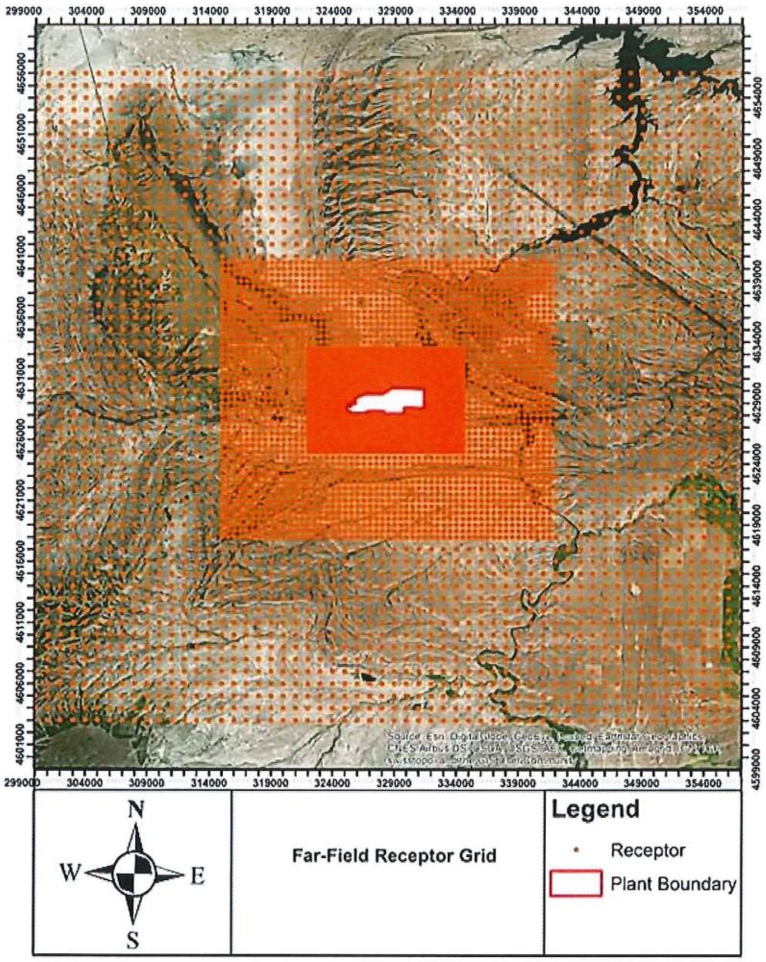


Figure 3 Near-Field Receptor Grid

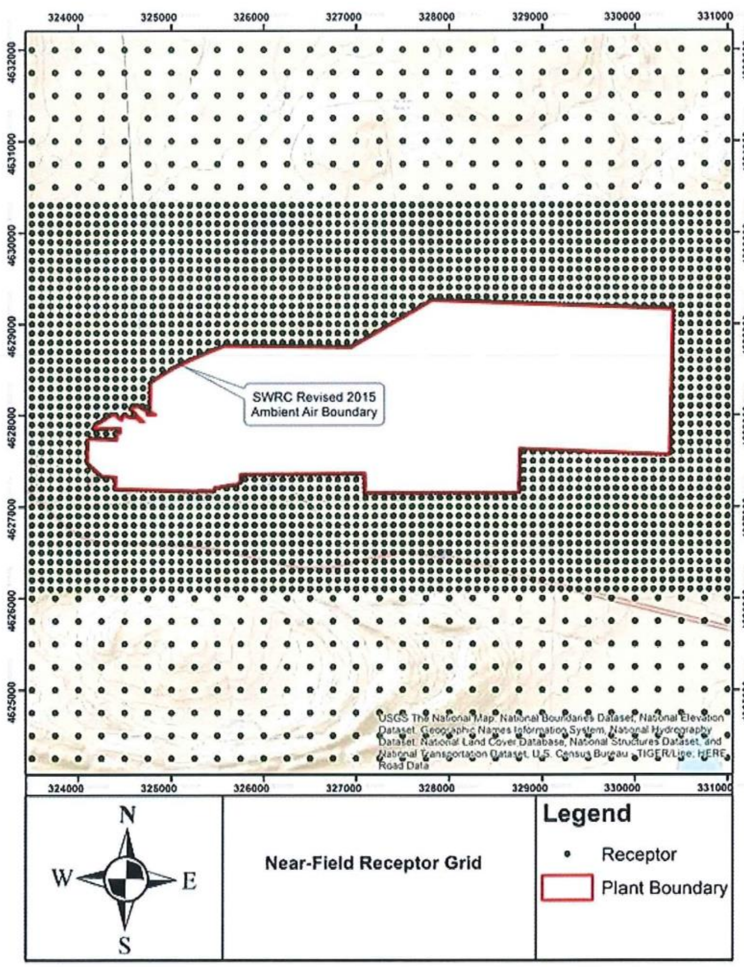


Figure 4 Maximum 1-Hour SO_2 Design Values

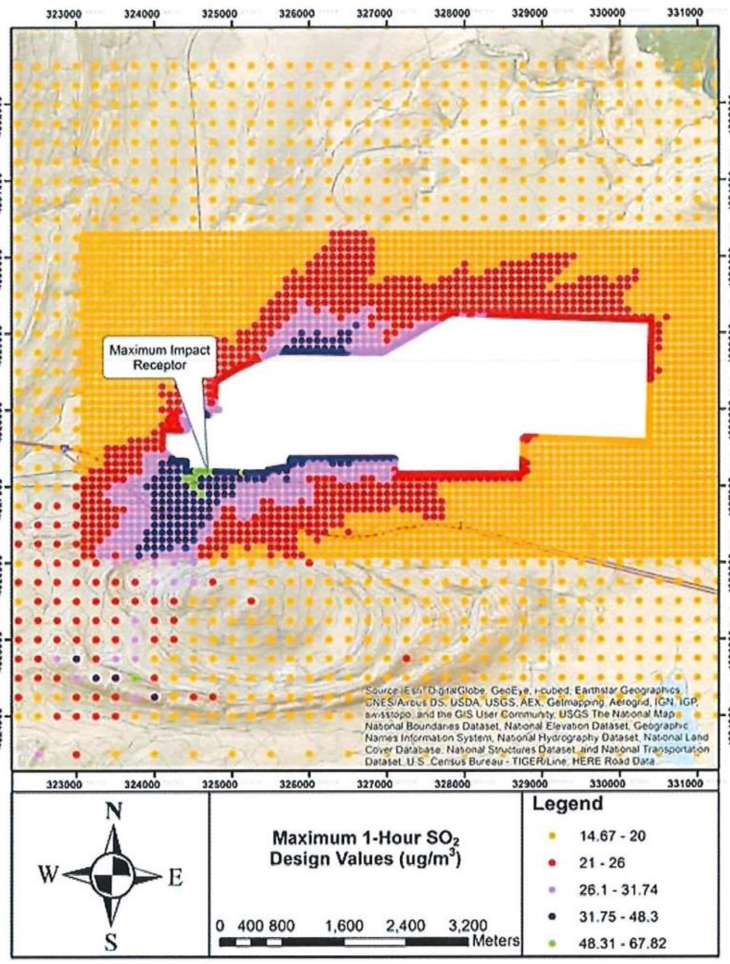


Figure 5 Locations of the Top 200 1-Hour SO_2 Design Values

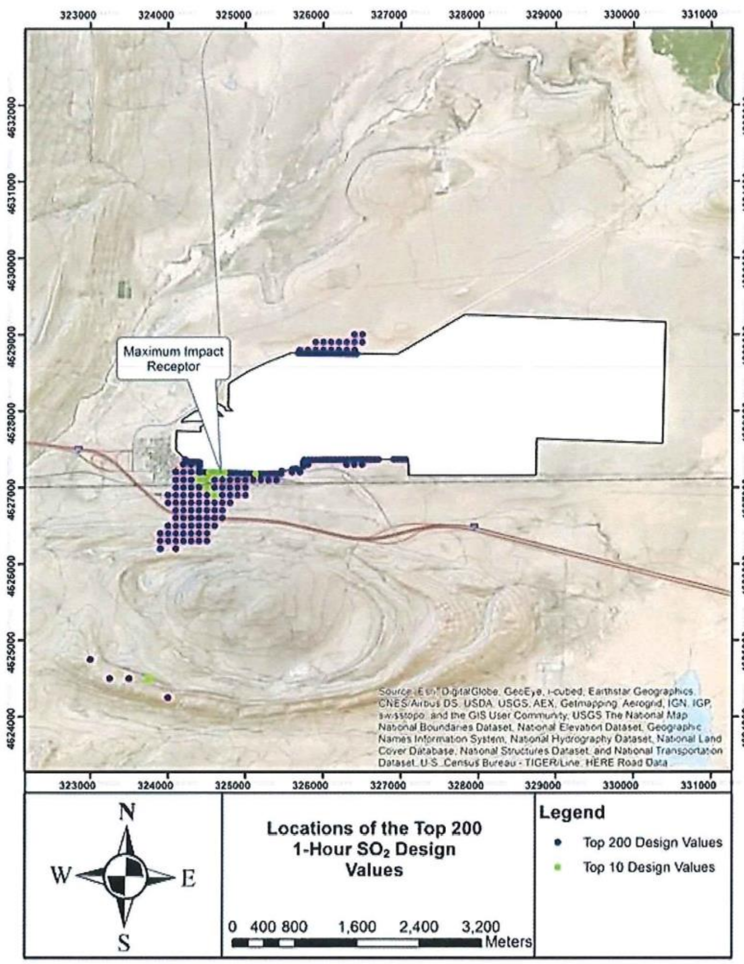


Figure 6 Location of the Highest Number of Days with Daily maximum 1-Hour SO_2 Concentrations

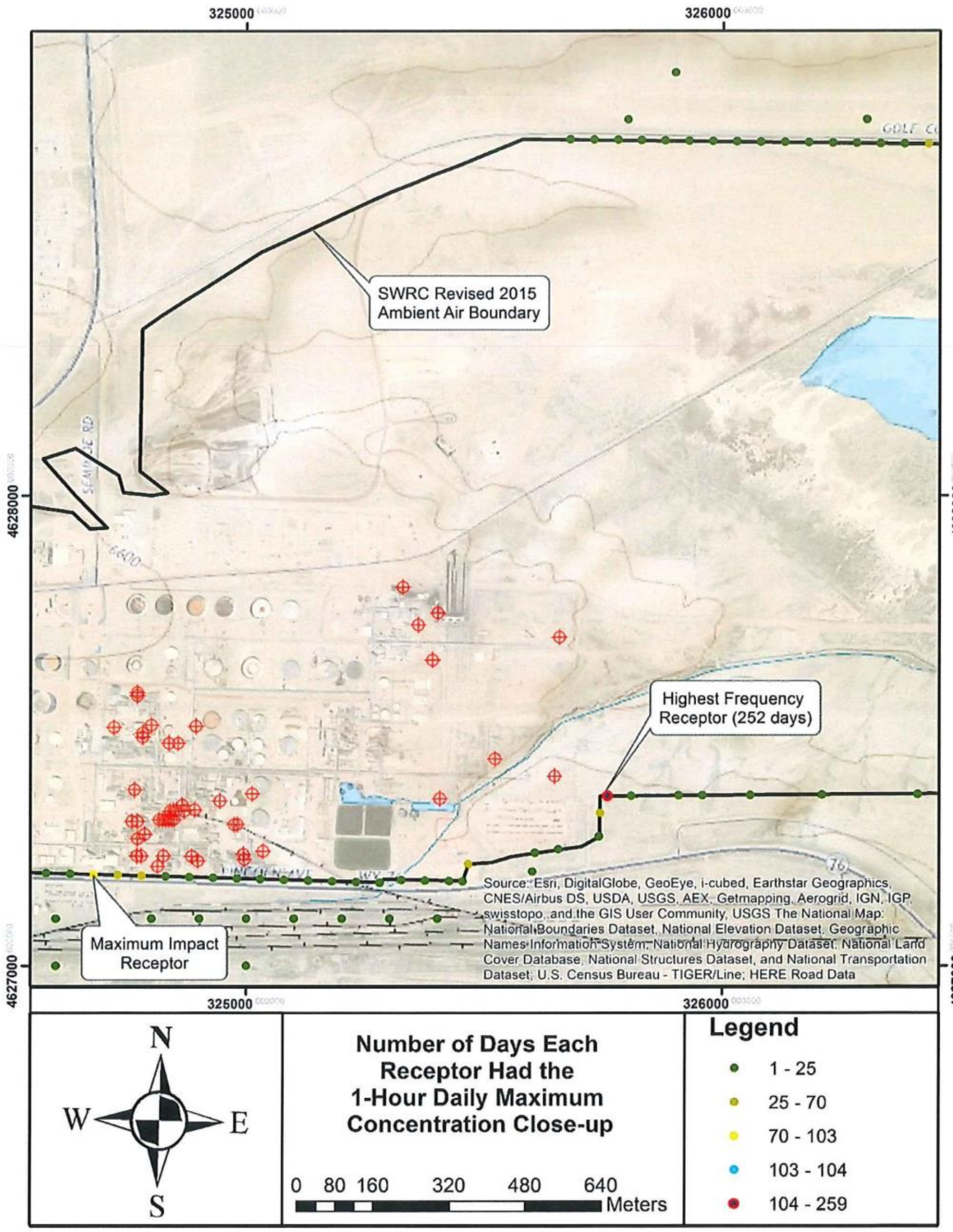


Figure 7 Location of the Highest Number of Days with Daily maximum 1-Hour SO_2 Concentrations (Close-up)

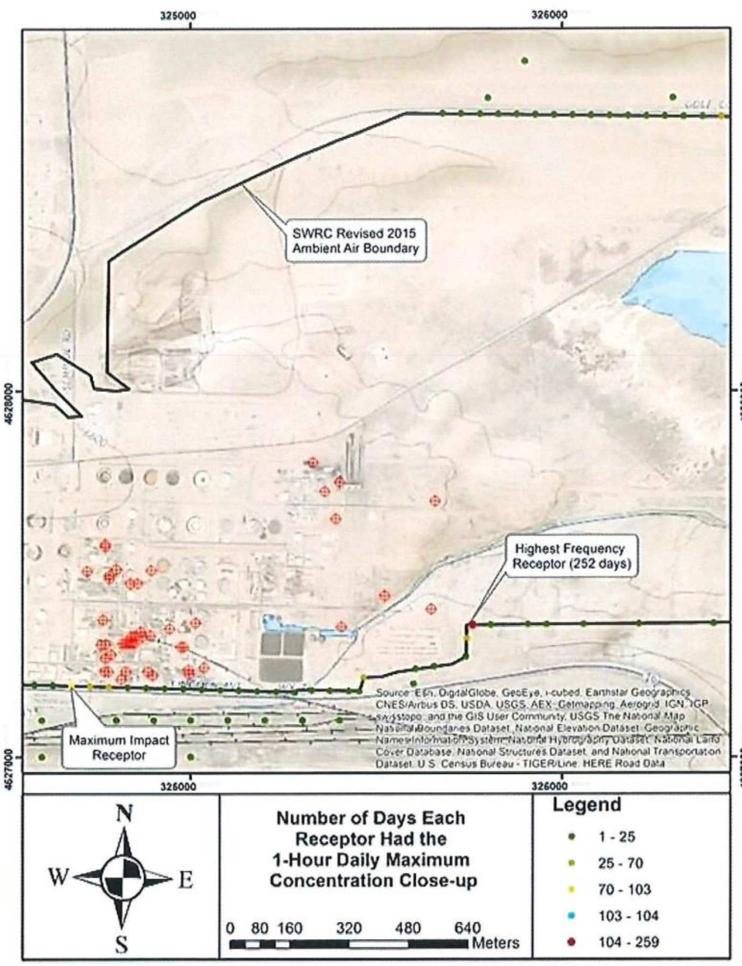


Figure 8 Receptors by Score Calculated from Ranked Design Value and Frequency of 1-Hour Daily Maxima

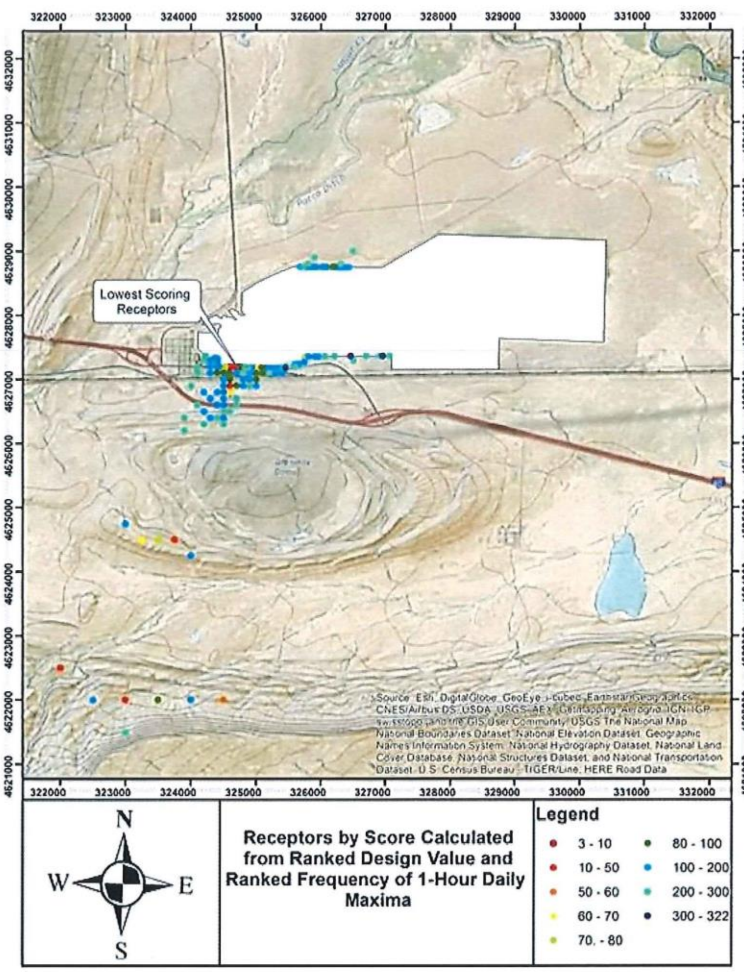


Figure 9 Receptors by Score Calculated from Ranked Design Value and Frequency of 1-Hour Daily Maxima (Close-up)

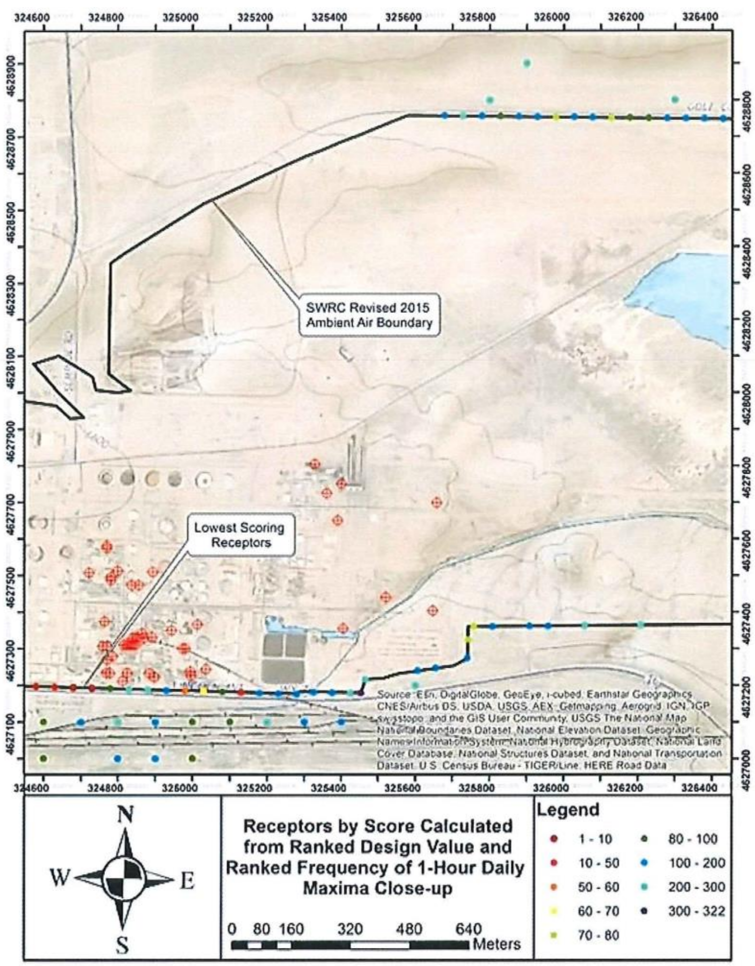


Figure 10 Receptors by Score Calculated from Ranked Design Value and Frequency of 1-Hour Daily Maxima (Close-up of Lowest Scoring)

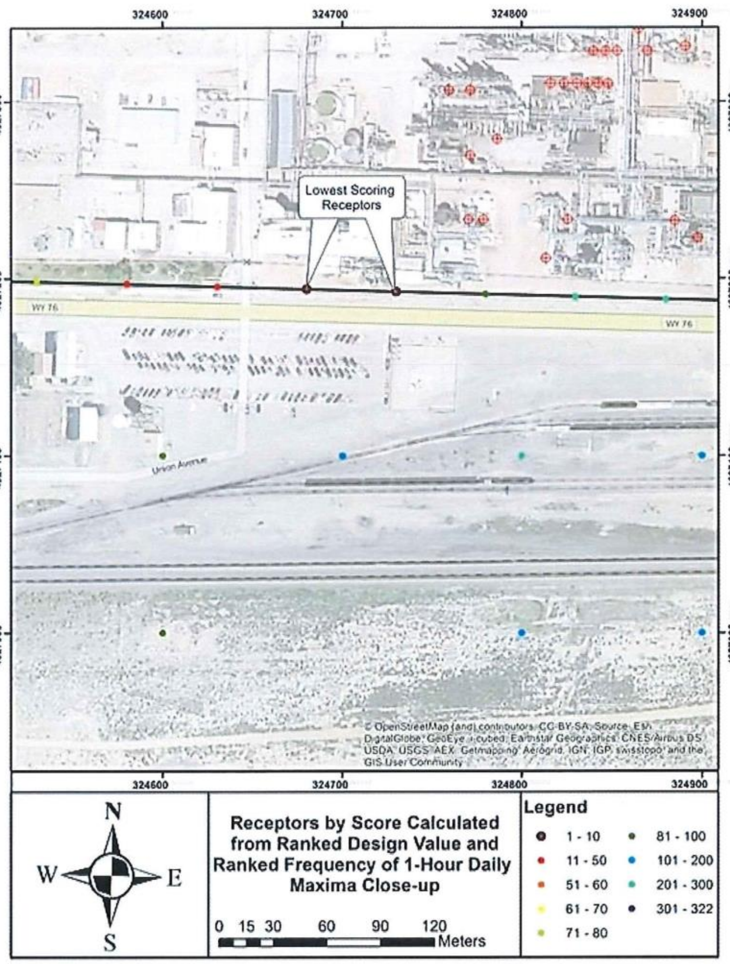
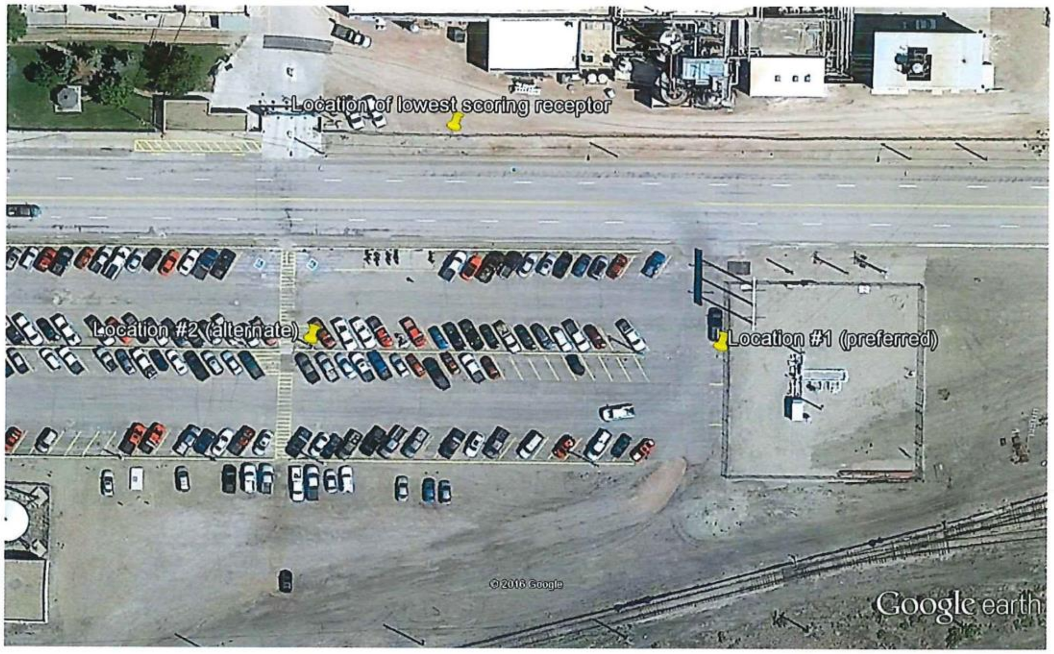


Figure 11 Preferred and Alternate Locations for Monitor Placement Based on Siting Logistics



Appendix I: Trona Group SO_2 DRR Final Monitoring Plan

Ambient Air SO_2 Network Justification and Monitoring Protocol

Trona Environmental Subcommittee:

Green River Basin Trona Patch SO_2 Attainment Designation

Sweetwater County, Wyoming

April 2016

Prepared by:

INTER-MOUNTAIN LABS

IML Air Science
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Sheridan, WY 82801
(307) 674-7506

1.0 Tables of Contents, Figures, and Tables

1.1 Table of Contents

1.2 List of Tables

1.3 List of Figures

2.0 Introduction

The Trona Environmental Subcommittee – Green River Basin Trona Patch SO_2 Attainment Designation (TES) air monitoring network is proposed to measure ambient concentrations of sulfur dioxide (SO_2) at two locations. The monitoring locations were chosen by the Wyoming Department of Environmental Quality – Air Quality Division (AQD) in conjunction with the Environmental Protection Agency (EPA) following a site visit in March 2016. The sites were selected through consideration of modeling results, power availability, accessibility, topography, industrial activity (permit boundaries), and according to 40 CFR Part 58, Appendix E. The objective of the ambient air monitoring network is to gather SO_2 data representing air quality and compliance with the National Ambient Air Quality Standards (NAAQS)

This ambient air monitoring plan has been developed to provide the opportunity for review of network design, specifications, and operations by the AQD and EPA.

3.0 Monitoring Network Design

To meet the stated objectives, TES plans to establish and operate an ambient air monitoring network that measures concentrations of SO_2 in ambient air at two sites; Site 2 and Site 4.These monitoring sites are intended to provide representative air quality data at locations that may be affected by operations. Instrument selection and specifications are detailed in subsequent sections.

3.1 Measurement Sites

Sites have been selected and approved based on relationship to air pollution sources and electrical power availability. The sites were determined using the following criteria:

- Project objectives – The site must meet the objectives of the Ambient Air Monitoring Project as defined by AQD.
- Power availability – Potential sites must be within a practical distance from established electrical power lines to keep project costs reasonable.
- Access/right of way – The site must provide reasonable year-round access. Minimizing the cost and time of establishing rights of way is important to meet project goals.
- Obstacles – The site must be free from obstacles that could affect meteorological and air quality.
- Land ownership – The ownership of the land of a potential site has the possibility of affecting the timeline and cost of permitting as well as establishing leases and rights of way.
- Wildlife – The new sites many not be located within 0.6 miles of any identified and active Greater Sage Grouse leks.

Pollutant monitoring sites are located on or near permit boundaries in ambient air, as required by 40 CFR 58 Appendix E, that defines where (NAAQS) apply. The SO_2 ambient air monitors will be operated in accordance with a Federal Equivalent Method (FEM), *EQSA-0486-060*. Concentrations will be measured continuously, recorded as 5 minute and hourly averages, and reported as 1-hour and 3-hour block averages for comparison to the applicable SO_2 NAAQS standards.

The sites will consist of two SO_2 monitoring systems. Each location will measure impacts generated from the project in their respective region; the Site 4 to the west of the river basin and Tata permit boundary and the Site 2 at the ridge to the northeast of the Tata permit boundary.

Table 1 below provides the locations selected and approved by AQD where monitors will be placed within a reasonable proximity to the industrial sources. The locations will be installed where power is already established and are accessible throughout the year.

Table 1. Air Monitoring Network

Site	UTM (meters) Zone 12T, NAD83		Elevation (feet)	Parameter
	Northing	Easting		
Site 2	4,609,503	608,147	6,607	SO_2
Site 4	4,606,586	603,769	6,399	

Figure 1 on the following page is a map showing ambient air boundaries for all TES facilities and proposed monitoring locations for the project. Figure 2 follows showing the proposed locations at a closer view, in relation to the Tata permit boundary and proximity to "high rank" model receptors. Appendix B contains the modeling study performed by McVehil – Monnett Associates for monitor placement. The Top 20 "high rank" receptors from the study are shown in Figures 1 and 2 and relation to the proposed sites.

Power availability is limited throughout much of the project area. Adding new transmission lines to the infrastructure is constrained by topography and the power provider. Installation of new transmission lines by the power provider could not occur in a time frame as required by the scope of work of the project. Therefore, sites with established power have been chosen to site the monitors near the high rank model receptors.

Site 4 will be located near the "11 receptor" and at the established Tata #4 site. The site is operated for particulate monitoring and has power available along with a site access road.

Site 2 is located roughly a ½ mile north of the "13 receptor" and along the same prominent ridge containing 18 of the top 20 receptors. Power is available at the location and an existing site access road.

Figure 1. TES SO_2 Proposed Monitoring Network with Top 20 Receptors

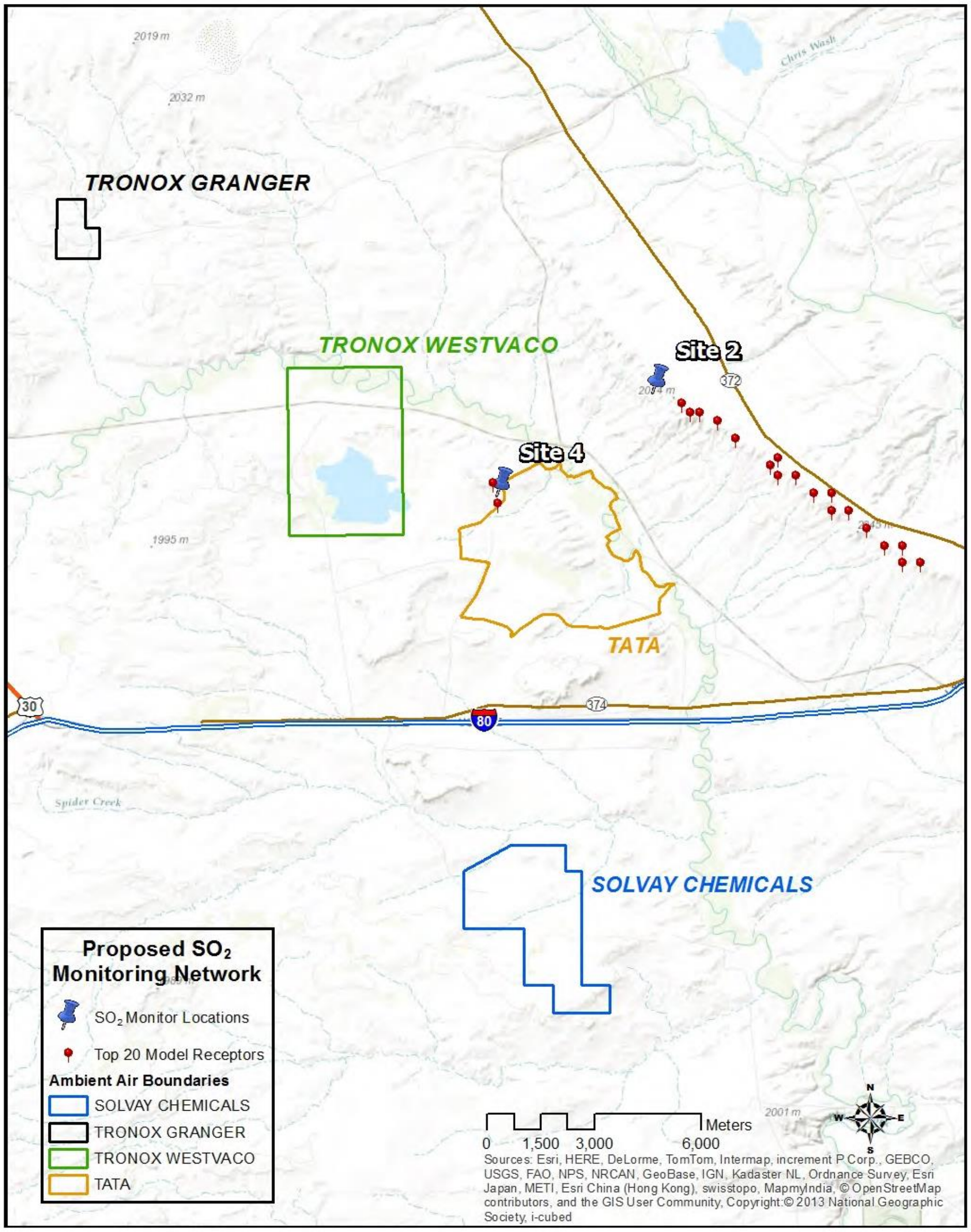
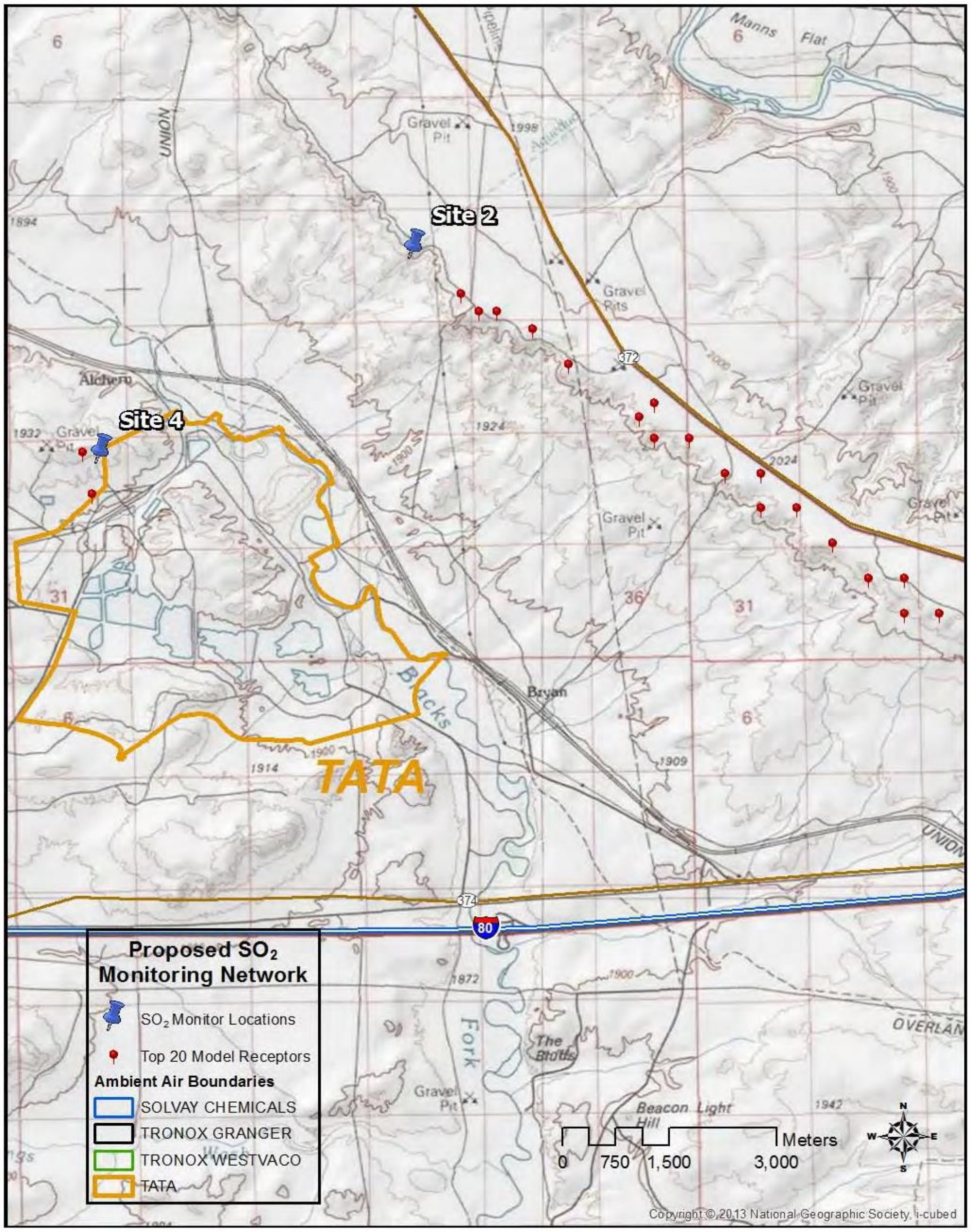


Figure 2. Tata Permit Boundary, SO_2 Proposed Locations, and Top 20 Receptors



3.2 Quality Assurance

TES plans to design and operate the ambient air monitoring network in accordance with 40 CFR parts 50 and 58 Appendix A. A Quality Assurance Project Plan (QAPP) will be developed and submitted to AQD for approval prior to the operation of the network. The QAPP will document project management, data generation and acquisition, assessment and oversight, and data validation and verification. All applicable standard operating procedures will be included in the document.

3.3 Operations

Inter-Mountain Laboratories (IML), subcontracted through TES, will perform routine maintenance and monthly quality control procedures. The contractor will also conduct quarterly and semi-annual quality control procedures, monitor the operations by routinely evaluating data streams and instrument status, conduct data validation and reporting, as well as perform preventative maintenance and repairs.

The monitoring network will continuously measure all parameters. Data will be collected on-site to a battery backed data acquisition system (DAS) and downloaded to off-site servers hourly. The DAS is equipped with sufficient internal memory to store data in the event telecommunications are interrupted. This allows the contractor to monitor the systems' operational status and minimize data loss. Data will also be available to TES personnel in near-real time through an Internet-based service.

4.0 Air Quality Monitoring

Air quality monitoring at the two project sites will consist of monitoring concentrations of SO_2. All parameters are regulated by NAAQS and compliance with standards is the primary objective of the monitoring. The air quality characterized by this monitoring program will also serve as baseline for dispersion modeling exercises, and as a reference for measuring future impacts from the operations.

4.1 Site Selection

Ambient air quality concentrations will be measured at two sites near the Tata project property boundaries. The sites will be located within land leased by TATA. Selected sites meet the general site selection criteria for measurement systems listed below in Table 2.

Table 2. Air Monitor Site Selection Criteria.

Parameter	Criteria	Sites
Vertical placement	Inlet 2 to 15 meters above ground for gaseous pollutants	2 meters above ground
Inlet exposure	Unrestricted air flow 270° around inlet	360° unrestricted flow
Spacing from obstructions	Distance between inlet and obstruction at least 2 meters	> 2 meters from obstructions
Spacing from trees	Inlet at least 20 meters from drip line	> 20 meters

Two potential sites have already been selected (Table 1), based on their relationship to air pollution sources, model results, and electrical power availability. Ambient air quality monitoring site selections are based on guidance criteria in *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume II. Ambient Air Quality Monitoring Program* (EPA, 2013).

TES in cooperation with the AQD, ensures that the sites selected meet all U.S. EPA site selection criteria including 40 CFR 58 Appendix E.

4.2 Sulfur Dioxide Measurement Instrumentation

At each monitoring site, ambient concentration of sulfur dioxide will be measured continuously using a Thermo Fischer model 43i pulsed fluorescence SO_2 analyzer. The Model 43i pulsed fluorescence analyzer uses the proven UV fluorescence measurement principal for measuring low level SO_2. Concentrations will be measured continuously, recorded as 5 minute and hourly averages, and reported as 1-hour and 3-hour block averages. This instrument has US EPA Federal Equivalent Method designation for SO_2 (*EQSA-0486-060*). Table 3 summarizes Model 43i specifications. Quality assurance span, zero, and precision checks will be performed daily utilizing a Thermo Fischer model 146i dynamic dilution calibrator.

Table 3. Sulfur Dioxide Measurement System Specifications

Parameter	Specification
Lower Detectable Limit	0.5 ppb
Measurement range	0 - 1,000 ppb
Precision	1% of reading or 1 ppb (whichever is greater)
Zero Noise	0.25 ppb
Drift: Zero	<1 ppb/day
Drift: Span	±1% full scale
Sample Flow Rate	0.5 to 1.0 l/min
Operating temperature	20°C-30°C (Performance)

4.3 Measurement Systems Quality Assurance

To assure the quality of data from air monitoring measurements, two distinct and important interrelated functions must be performed. One function is the control of the measurement process through broad quality assurance activities, such as establishing policies and procedures, developing data quality objectives, assigning roles and responsibilities, conducting oversight and reviews, and implementing corrective actions. The other function is the control of the measurement process through the implementation of specific quality control procedures such as audits and calibration checks.

Weekly remote virtual site visits and operational checks from IML will verify system operational status. However, site visits are necessary as well. A site inspector will be trained to provide periodic (bi-monthly) inspections of the monitoring systems. Site inspection visits will include inspection of the physical condition of shelter, pollutant instrumentation, and communication equipment. Shelter climate control will be assessed for proper operation, standard gas cylinder content levels will be recorded, instrument operation status will be checked, and security measures will be verified. The site operator will fill the check list out on the computer in the enclosure. The computer will be set up so the checklist can easily be emailed to IML headquarters and also printed to keep a hard copy in the shelter. A binder will be kept in the shelter to keep the hard copy checklist.

Field standards requiring calibration include flow transfer standard, temperature standards, and altimeters/barometers and will be certified annually. The procedures used for these sampler and instrument calibrations are detailed in the field contractor's SOP's.

Each quarter, qualified IML personnel will perform gaseous system routine maintenance, audit, and calibration procedures. In addition to routine maintenance and quarterly activities, operational checks and procedures will be performed which include automated checks, status conditions, data downloads, and initial data screening.

An audit will be performed on each portion of the ambient air monitoring system quarterly and will be conducted in accordance with the guidelines provided in 40 CFR 58 Appendix A.

4.4 Data Acquisition, Data Quality Assurance and Reporting

Recorded data will be downloaded to a PC periodically by means of a telemetry system. The selected instrument has internal data storage for more than one year of hourly data, providing adequate backup in the event of a telemetry system failure.

Data validation will entail a combination of ensuring that data processing operations have been carried out correctly and of monitoring the quality of the internal QC assessments. Data validation can identify problems in either of these areas. Once problems are identified, the data will be corrected or invalidated, and corrective actions will be taken.

Data validation will be performed through automated and interactive procedures. Software tools will perform a preliminary check of hourly data to find anomalies (unreasonable values, instrument fault status, etc.). IML will review the results of these checks, along with site inspection records, field data sheets, and any other available information, to make validation determinations.

Following preliminary checks, data are evaluated for reasonableness for the season and may be checked with other data collected at nearby sites. Data are considered invalid when either their value or their rate of change is unreasonable, when observations or audit results indicate a sensor is not operating properly, and when the system was being audited or serviced. All invalidated data and the reason for the invalidation, including invalidation code and qualifier, will be documented in the quarterly reports. Preliminary data checks will be conducted weekly and full data QC will be performed monthly. IML will send TES monthly progress reports outlining all site activities and the system status.

Data recovery goals will include at least 75% recovery on a quarterly basis for each monitoring site. Table 4 lists the pollutant averaging times and NAAQS guidelines to which the system will adhere and be reported.

Reports of all quality-related activities, including a summary of routine and un-scheduled services performed, summary data collection statistics and results, documentation of QA/QC activities and corrective actions will be included in quarterly reports. All hourly data will be formatted for input into the national AQS database. Quarterly reports will be submitted to AQD within 60 days following the end of the calendar quarter. Annual reports will be submitted within 90 days following the end of the calendar year.

Table 4. Criteria Pollutant NAAQS Guidelines

Criteria Pollutant	Averaging Time	Max Concentration	NAAQS Guidelines
Sulfur Dioxide	1-hour period	0.075 ppm	99th percentile of 1-hour daily max concentrations, averaged over 3 years
	3-hour period	0.5 ppm	Not to be exceeded more than once per year

5.0 Conclusion

The network will consist of two sites (Site 2 and Site 4) monitoring ambient air for sulfur dioxide. The monitoring sites were selected based on the following criteria in order of importance:

- Site visit and determination of locations by the AQD
- Proximity to mining activities and maximum modeled concentrations
- Power availability
- Access – roads, inclement weather and land ownership
- Ambient air – siting locations outside of facility ambient air boundaries
- Topography – influence on pollutant transport and deposition
- Wildlife – avoidance of impacts to local wildlife

Both proposed locations are located very near existing power sources and have good site accessibility. The Site 4 location is proposed to be located where particulate sampling is ongoing while the Site 2 would be located adjacent to a communications tower. The existing power would not require expensive and time consuming installation of new power lines. In addition each site is visited frequently (every 6 days for the particulate monitoring location) for routine inspections and has maintained roads present.

As illustrated in the modeling report, SO_2 emissions from Solvay and Tronox Granger are a small fraction of the regional emissions. The impacts from the Solvay and Tronox Granger emissions were negligible in comparison to the rest of the network and model results were sufficiently below the NAAQS allowable criteria. Therefore, a monitor located downwind of the Solvay operations is not warranted. Likewise, a monitor immediately downwind of Tronox Granger is not warranted. The principal emission sources are at Tronox Westvaco and TATA, both of which are near the proposed monitoring sites.

The monitoring systems will be installed in November 2016. A startup audit will be performed along with submittal of the site modification form within 30 days following installation. The quality assurance project plan (QAPP) will have been completed prior to the installation. The system will be operational and data reporting will commence January 1, 2017.

Appendix A: WDEQ - AQD Ambient Monitor Siting Memo (March 29, 2016)

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

DEQ

Matthew H. Mead, Governor

Todd Parfitt, Director

March 29, 2016

WMA Trona SO2 Attainment Workgroup
Martin Stearns, Tronox Alkali
Tim Brown, Solvay
Steve Dietrich, Tata Chemicals

RE: Trona Workgroup – Ambient Monitor Siting under SO_2 Data Requirements Rule

Dear Wyoming Mining Association,

The Air Quality Division (AQD) has reviewed the "Modeling Analysis for the Identification of Potential Source-Oriented SO_2 Monitoring Locations for the Trona Patch Regional Area in the Green River Basin, Wyoming" submitted by the Trona Workgroup (Trona) on February 23, 2016 after revising Appendix B.

In this submission, Trona proposes two primary location for ambient SO_2 monitoring stations, one along the ridge east of TATA and TROXW, the other is located about 0.2 km west of TATA, between TATA and TROXW. Trona proposed placing the first monitor approximately 1 mile northwest of the Score 2 Receptor along the established power lines. During a brief siting visit on March 8, the need for a second monitor was discussed. Placing a second monitor near the Score 11 Receptor at the established TATA PM_{10} monitoring location "#4" was found to be practical and appropriate.

After consulting with the EPA, the AQD hereby requires Trona to site two SO_2 monitoring stations to satisfy the SO_2 Data Requirements Rule; one monitor at or near UTM 608,146.5 E, 4,609,502.6 N, Zone 12, WGS 84 and the second monitor at UTM 603769.2 E, 4606585.7 N, Zone 12, WGS 84. The AQD recommends that within the final monitoring plan Trona address the reasoning for moving the monitoring locations away from the impacted receptors due to power availability. Please revise the Monitoring Plan to include the new monitoring locations and submit the final document to the AQD by **April 15, 2016**. This final document will be included in the AQD's 2016 Network Plan, subject to public comment and EPA approval.

The AQD will approve the proposed changes to the monitoring network, with the following conditions:

- A startup audit shall be conducted on the SO_2 sampler following installation.
- A site modification form (attached) shall be completed for the site following installation (electronic version available here: http://deq.wyoming.gov/aqd/monitoring/resources/reference-documents/).
- A revised QAPP/Quality Management Plan (QMP) for the monitoring program shall be submitted to the AQD by October 31, 2016. The AQD will provide guidance and a checklist for this document under separate cover.
- The monitoring network shall comply with 40 CFR parts 50 and 58.

Monitoring networks used to satisfy the Data Requirements Rule must be operational by **January 1, 2017**. Upon startup of the new monitor, the AQD will assign a unique (or existing) AQS site ID to the Sites and communicate this to Trona for reporting purposes.

Any future changes to this network configuration must be approved in writing by the AQD prior to any changes being made.

Please contact Aaron Maisch at aaron.maisch@wyo.gov or 307-777-6903 if you have questions concerning this matter or need additional guidance.

Sincerely,

Nancy E. Vehr
Administrator
Wyoming DEQ – Air Quality Division

Cc: Aaron Maisch, Air Quality Analyst
Cara Keslar, Monitoring Section Supervisor
Amber Potts, Planning Section Supervisor
Tony Hoyt, District Engineer

[Attachment: Site Modification Form]

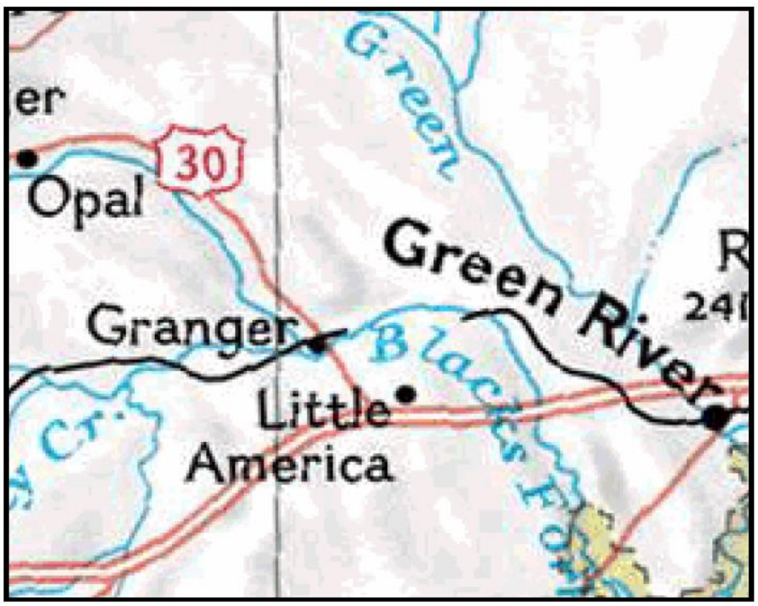
Appendix B: McVehil – Monnett Associates Site Identification Study

For **Wyoming Mining Association**

2601 Central
P.O. Box 866
Cheyenne, WY 82003

Modeling Analysis for the Identification of Potential Source-Oriented SO_2 Monitoring Locations for the Trona Patch Regional Area in the Green River Basin, Wyoming

December 2015
MMA Project Number 2625-13



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1.0 Introduction

This report describes the near-field air quality dispersion modeling analysis performed by McVehil-Monnett Associates (MMA) on behalf of the Wyoming Mining Association (WMA) for the Trona Patch regional area, situated in the central Green River Basin, Wyoming. The modeling analysis was conducted for the purpose of identifying potential locations for source-oriented sulfur dioxide (SO_2) monitoring stations to characterize regional ambient air quality.

The Environmental Protection Agency (EPA) established a 1-hour SO_2 National Ambient Air Quality Standard (NAAQS) in June 2010. Section 107 of the Clean Air Act (CAA) requires that states submit a designation recommendation within one year following promulgation of a new NAAQS. The State of Wyoming submitted a recommendation that all counties in the state be designated as "unclassifiable" with respect to the SO_2 standard.

EPA has opted to defer 1-hour SO_2 designations for most areas in the country and has requested that the states determine how they will demonstrate compliance/noncompliance utilizing local ambient monitoring, air quality modeling, or a combination of both. The three WMA member soda ash companies in southwest Wyoming that combust coal, TRONOX Alkali (TRONOX), Solvay, and TATA Chemicals (TATA), have been cooperatively engaged with the Wyoming Department of Environmental Quality, Air Quality Division (WDEQ/AQD) to develop a demonstration strategy for the Trona Patch regional area. The cooperative effort between the three WMA-member companies and the WDEQ/AQD has resulted in this modeling effort.

This modeling analysis followed MMA's document *Modeling Protocol for the Identification of Potential Source-Oriented SO_2 Monitoring Locations for the Trona Patch Regional Area in the Green River Basin, Wyoming* (MMA, 2014) submitted to WDEQ/AQD on May 8, 2014. The WDEQ/AQD approved the protocol on May 20, 2014, requesting that minor modifications be made to some of the pre-processing steps; these changes were incorporated and are reflected in this analysis. Additional minor adjustments were requested by WDEQ/AQD on July 7, 2015 during a joint conference call between WDEQ/AQD, WMA, Solvay, TATA, TRONOX and MMA. These adjustments involved an updated modeling system, new analysis years, and meteorological data processing; the requested changes were also incorporated into the present analysis.

The methodologies employed for this modeling effort were based on EPA and WDEQ/AQD guidance found in the following documents:

- *SO_2 NAAQS Designations Modeling Technical Assistance Document* (EPA, December 2013) (Modeling TAD)
- *SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document* (EPA, December 2013) (Monitoring TAD)
- 40 CFR Part 51 Appendix W, *Guideline to Air Quality Models*, (EPA, November 2005) (GAQM)
- *Applicability of Appendix W Modeling Guidance for the 1-hour SO2 NAAQS, (EPA, August 2010)*
- *WDEQ/AQD Guidance for Submitting Major Source/PSD Modeling Analyses,* January 2014 (WDEQ PSD Guidance)
- *AERMET Processing*, (WDEQ/AQD, July 2015)
- EPA Memorandum from Anna Marie Wood, "General Guidance for Implementing the 1-hour SO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO_2 Significant Impact Level" (August 23, 2010)
- EPA Memorandum from Tyler Fox, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 Ambient Air Quality Standard" (March 1, 2011).

The primary guidance documents that determined the general approach are the Monitoring TAD, the Modeling TAD, and the GAQM. Where necessary and applicable, other state and federal guidance documents listed were considered.

This modeling report is structured as follows: Section 2.0 discusses the modeling approach; Section 3.0 describes the Trona Patch plants and sources; Section 4.0 provides a brief overview of AERMOD; Section 5.0 details the model setup and input parameters; Section 6.0 describes model result processing and analysis; and Section 7.0 summarizes conclusions.

2.0 Model Approach to Inform Potential SO_2 Monitor Placement

The purpose of the modeling effort is to identify potential source-oriented SO_2 monitoring locations that will satisfy EPA and WDEQ/AQD requirements for characterizing ambient air in the region. This modeling approach meets that purpose without inferring any attainment status for the region. The modeling seeks to characterize the effects of the interaction of the combined Trona Patch SO_2 sources, wind flow patterns, meteorological conditions and area terrain. The analysis generates a concentration pattern for the modeling domain without producing design values to be compared to the ambient standard.

This modeling therefore does not support permitting or SIP efforts where the focus is the emissions limits necessary to achieve attainment. The approach for a monitor placement analysis, as prescribed in the Monitoring and Modeling TADs, is different than for a regulatory analysis.

2.1 Approach and Source Characterization

The only sources that were included in the modeling were the Trona Patch SO_2 sources at TRONOX Granger (TROXG), TRONOX Westvaco (TROXW), Solvay and TATA. Background sources were not included in the analysis and monitored background concentrations were not added to model results, such as would be done in a typical regulatory modeling effort. The inclusion of background sources and monitored background concentrations is not appropriate for a modeling effort focused solely on the identification of potential source-oriented monitoring locations.

For the analysis, the Monitoring and Modeling TADs specify that the most recent three years of actual emissions be used along with actual source parameters. As a further condition, the Monitoring TAD specifies the use of normalized emission rates instead of actual emission rates. Normalized emission rates are calculated by dividing actual emission rates by a reference value. The reference divisor can be any number, with the only stipulation that the same value be consistently used across the model inventory. All other modeled source parameters reflect actual values.

Utilizing this methodology, the relative scale of emissions across the source inventory remains the same, as well as the dispersion characteristics of the source plumes. The normalized design value (NDV) output from this analysis provides overall concentration patterns for the regional area with localized maxima and minima, but does not produce concentration values appropriate for comparison to the standard.

2.2 Receptor Grid Generation

The receptor grid for the modeling analysis was established based on WDEQ PSD Guidance instead of that presented in the Monitoring TAD. The WDEQ guidance method was selected due to the complicating factor of four proximately-located sources being involved in the analysis. Employing the more dense grid of the WDEQ PSD Guidance better identifies the effects of the interaction of plumes from these plants in the localized region. The Monitoring TAD permits exclusion of receptors in areas where ambient monitoring is not feasible; for example water bodies and military bases. No ambient air areas in the Trona Patch region meet these qualifications. Therefore, with the exception of areas inside the trona plant ambient air boundaries, no receptor locations within the modeling domain were excluded from the analysis.

2.3 Meteorological Data

The Monitoring TAD requires that the meteorological data utilized be concurrent with the actual emissions. For this modeling effort, the meteorological data collected at Solvay were selected as representative, utilizing the most recent complete three years concurrent with emissions: 2012, 2013 and 2014.

2.4 Model Results and Processing of Normalized Design Values

Appendix A of the Monitoring TAD provides guidance for determination of potential monitor locations. The 3-year mean of the 4th daily highest 1-hour average NDV is calculated for each receptor, and then the top 10, 25, 100 and 200 NDVs receptors are identified. For the top 200 NDV receptor subset, an additional analysis is performed that calculates the number of days over the three years that each receptor represents the maximum concentration for that day. The NDV ranking and the frequency ranking are then combined to identify an isolated set of receptors that the model predicts will have both relatively high NDV and high frequency of occurrence. The isolated receptor set indicates potential monitor locations for further evaluation based on siting criteria requirements.

3.0 Trona Plant SO_2 Source Summary

The four trona plants that comprise this analysis, TROXG, TROXW, Solvay and TATA, are located approximately 60 kilometers (km) west of the city of Rock Springs, Wyoming and within about a 20 km radius of the towns of Little America and Granger. The distance between the northern most plant, TROXG, and the southern most plant, Solvay, is approximately 24 km. Figure 3-1 displays the general location of the four plants.

TRONOX, Solvay and TATA provided plant configurations, ambient air boundaries, stack parameters, and SO_2 emissions data for their respective plants. Plot plans for the four trona plants are presented in Appendix A. Figure 3-2 depicts the plant ambient air boundaries, and Appendix B contains the justification for these boundaries by identifying how public access will be restricted. The WDEQ/AQD requested that the justifications be provided in an appendix with this modeling report.

The SO_2 sources at TROXG, TROXW, Solvay and TATA are described below, along with their actual and normalized emission rates. The source inventory covers the years 2012, 2013 and 2014, the most recent complete three years. The reference divisor applied to all sources in the inventory to create normalized emission rates was 68.5752, which equates to the 3-year mean of the hourly emission rate for all sources at TATA from 2012 to 2014 (see Table 3-4).

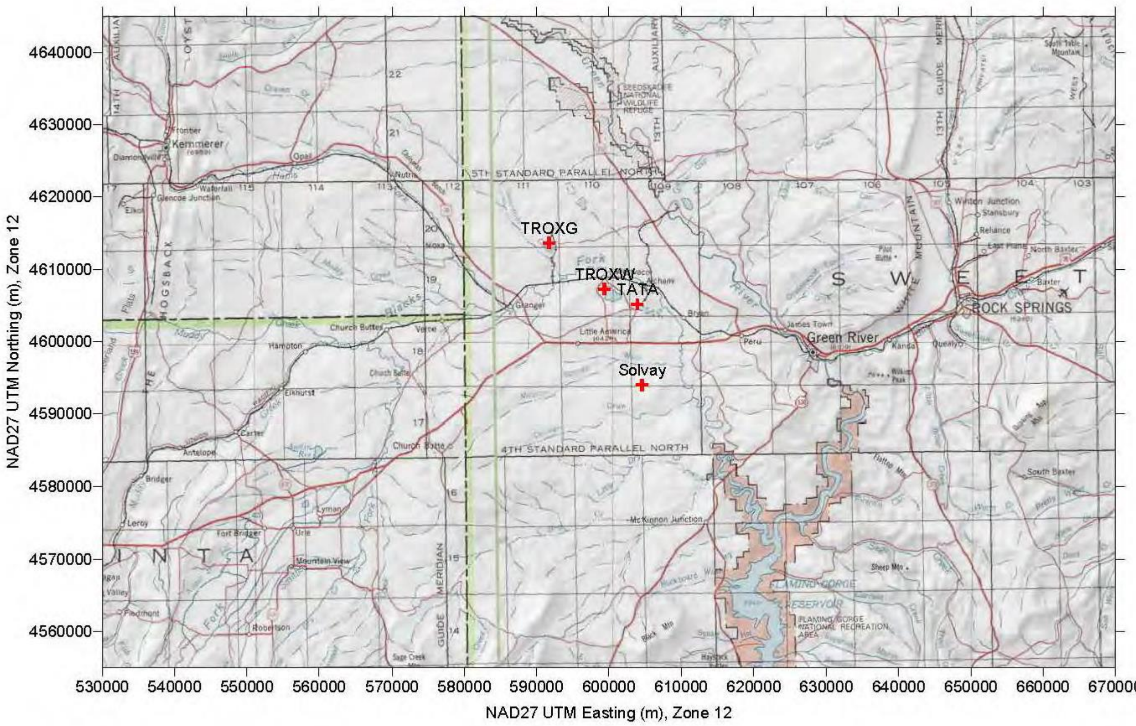

Figure 3-1. General Site Locations for Trona Plants TROXG, TROXW, Solvay, and TATA in Green River Basin, Wyoming

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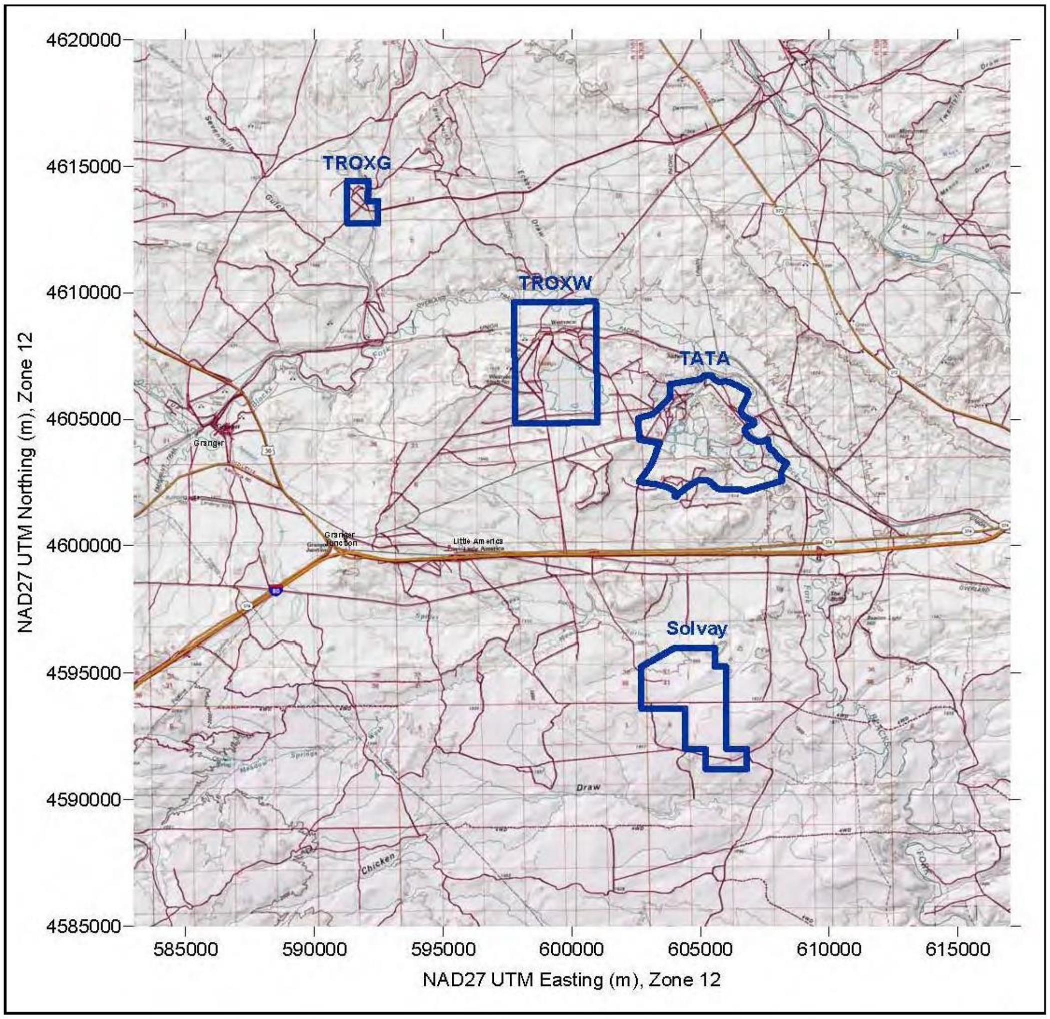

Figure 3-2. Property Boundaries for TROXG, TROXW, Solvay, and TATA

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3.1 TRONOX Granger

The SO_2 emissions sources at TROXG are two coal-fired boilers. Table 3-1 presents actual and normalized emissions for the three modeling years. Annual emissions in tons per year (tpy) were based on continuous emission monitoring (CEM) data; short-term emissions in pounds per hour (lbs/hr) and grams per second (g/s) were calculated by dividing annual emissions by annual operating hours for each respective year.

Table 3-1. Actual and Normalized SO_2 Emissions for TROX Granger for 2012 to 2014

Year	Model ID	Source Description	Operating Hours	SO_2 Emission Rates			Normalized Emission Rate[1] (g/s)
				(tpy)	(lb/hr)	(g/s)	
2012	UIN14	No. 1 Coal-fired Boiler	7614	163.3	42.89	5.4046	0.07881
	UIN15	No. 2 Coal-fired Boiler	7821	156.6	40.05	5.0457	0.07358
2013	UIN14	No. 1 Coal-fired Boiler	8243	194.6	47.22	5.9491	0.08675
	UIN15	No. 2 Coal-fired Boiler	8040	148.7	36.99	4.6606	0.06796
2014	UIN14	No. 1 Coal-fired Boiler	8007	208.9	52.18	6.5745	0.09587
	UIN15	No. 2 Coal-fired Boiler	7680	140.8	36.67	4.6199	0.06737

1. Represents the actual emission rate in g/s divided by the reference value 68.5752 (see Section 3.4).

3.2 TRONOX Westvaco

Emissions of SO_2 at TROXW are two coal-fired boilers. Table 3-2 lists actual and normalized emissions for the three modeling years. Annual emissions were calculated based on CEM data; short-term emissions were calculated by dividing annual emissions by annual operating hours for each respective year.

Table 3-2. Actual and Normalized SO_2 Emissions for TROX Westvaco for 2012 to 2014

Year	Model ID	Description	Operating Hours	SO_2 Emission Rates			Normalized Emission Rate[1] (g/s)
				(tpy)	(lb/hr)	(g/s)	
2012	NS1A	No. 6 Coal-fired Boiler	8139	1536.3	377.52	47.5659	0.69363
	NS1B	No. 7 Coal-fired Boiler	7572	1292.4	341.36	43.0108	0.62721
2013	NS1A	No. 6 Coal-fired Boiler	7819	1443.3	369.18	46.5154	0.67831
	NS1B	No. 7 Coal-fired Boiler	8130	1495.4	367.87	46.3509	0.67591
2014	NS1A	No. 6 Coal-fired Boiler	8447	1468.7	347.74	43.8149	0.63893
	NS1B	No. 7 Coal-fired Boiler	8164	1441.9	353.23	44.5065	0.64902

1. Represents the actual emission rate in g/s divided by the reference value 68.5752 (see Section 3.4).

3.3 Solvay

The SO_2 emissions sources at Solvay consist of two calciners with one common stack, two coal-fired boilers, one sulfur burner, one metabisulfite dryer, and a bisulfite loadout facility. Note the latter two sources only operated in 2012. Table 3-3 lists actual and normalized emissions for the three analysis years. For Model Source IDs 17, 33 and 73, annual emissions were based on stack test data; for Model Source ID 89, annual emissions were based on allowable emissions in lbs/hr multiplied by operating hours; and for Model Source IDs 18 and 19, annual emissions were calculated based on coal throughput and applicable lbs/MMBtu emission factors. Short-term emissions were calculated by dividing annual emissions by annual operating hours for each respective year.

Table 3-3. Actual and Normalized SO_2 Emissions for Solvay for 2012 to 2014

Year	Model ID	Description	Operating Hours	SO_2 Emission Rates (tpy)	SO_2 Emission Rates (lb/hr)	SO_2 Emission Rates (g/s)	Normalized Emission Rate[2] (g/s)
2012	17	"A" & "B" Calciner	8760	4.26	0.97	0.1224	1.7851E-03
	18	#1 Coal Fired Boiler	8760	10.62	2.42	0.3055	4.4548E-03
	19	#2 Coal Fired Boiler	8760	17.60	4.02	0.5063	7.3832E-03
	33	Sulfur Burner	8760	0.36	0.08	0.0104	1.5177E-04
	73	Metabisulfite Dryer[1]	8760	0.03	0.01	0.0010	1.4095E-05
	89	Bisulfite Loadout Facility[1]	8760	1.3417E-03	3.0632E-04	3.8596E-05	5.6283E-07
2013	17	"A" & "B" Calciner	8760	4.24	0.97	0.1220	1.7787E-03
	18	#1 Coal Fired Boiler	8760	19.20	4.38	0.5523	8.0543E-03
	19	#2 Coal Fired Boiler	8760	18.47	4.22	0.5313	7.7481E-03
	33	Sulfur Burner	8760	0.35	0.08	0.0101	1.4682E-04
	73	Metabisulfite Dryer[1]	8760	0.00	0.00	0.0000	0.0000E+00
	89	Bisulfite Loadout Facility[1]	8760	0.00	0.00	0.0000	0.0000E+00
2014	17	"A" & "B" Calciner	8760	4.19	0.96	0.1205	1.7577E-03
	18	#1 Coal Fired Boiler	8760	1.05	0.24	0.0302	4.4047E-04
	19	#2 Coal Fired Boiler	8760	23.10	5.27	0.6645	9.6904E-03
	33	Sulfur Burner	8760	0.34	0.08	0.0098	1.4263E-04
	73	Metabisulfite Dryer[1]	8760	0.00	0.00	0.0000	0.0000E+00
	89	Bisulfite Loadout Facility[1]	8760	0.00	0.00	0.0000	0.0000E+00

1. Source only operated in 2012.
2. Represents the actual emission rate in g/s divided by the reference value 68.5752 (see Section 3.4).

3.4 TATA

The SO_2 emissions sources at TATA comprise two boilers, firing coal and fuel oil. Table 3-4 lists actual and normalized emissions for the three model years. Annual emissions were calculated based on coal and oil MMBtu throughput and annual mean CEM lbs/MMBtu data; short-term emissions were calculated by dividing annual emissions by annual operating hours for each respective year. The reference value 68.5752 employed in the analysis equates to the 3-year mean of all of TATA's sources.

Table 3-4. Actual and Normalized SO_2 Emissions for TATA for 2012 to 2014

Year	Model ID	Description	Operating Hours	SO_2 Emission Rates (tpy)	SO_2 Emission Rates (lbs/hr)	SO_2 Emission Rates (g/s)	Normalized Emission Rate[2] (g/s)
2012	GR_2_L	C Boiler	8745.4	1873.7	428.49	53.9903	0.78732
	GR_3_W	D Boiler	8584.2	2955.2	688.53	86.7544	1.26510
2013	GR_2_L	C Boiler	8570.7	1792.3	418.24	52.6981	0.76847
	GR_3_W	D Boiler	8564.7	2869.8	670.15	84.4384	1.23132
2014	GR_2_L	C Boiler	8170.5	1726.3	422.57	53.2437	0.77643
	GR_3_W	D Boiler	8504.0	2710.7	637.51	80.3265	1.17136
Reference Value[1]:						68.5752	

1. The reference value equates to the 3-year mean for the two boilers at TATA over the 2012 to 2014 period. This arbitrary value is used as the divisor for all actual emission rates for all sources included in the model to generate normalized emissions.
2. Represents actual emission rate in g/s divided by the reference value 68.5752.

4.0 Air Quality Dispersion Model Selection

From the GAQM, the regulatory default model for near-field dispersion modeling is the AERMOD modeling system. AERMOD 15181, the latest available version, was employed to assess NDV impacts from the Trona Patch sources.

AERMOD is a modeling system developed by the **A**merican Meteorological Society/**EPA** **R**egulatory **M**odel **I**mprovement **C**ommittee (AERMIC). The **AER**MIC **mod**el (AERMOD) modeling system consists of two main pre-processors, AERMAP and AERMET, and the AERMOD model itself.

The purpose of AERMAP is to characterize terrain. Input includes electronic maps with digitized elevations and a user-generated receptor grid. AERMAP calculates mean sea level (MSL) elevation and hill height scale for each receptor, with the latter used to determine how a plume will interact with terrain; the produced file is directly read by AERMOD.

The purpose of AERMET is to characterize meteorology. Input consists of onsite meteorological surface data; National Weather Service (NWS) meteorological surface data, required if onsite data are not available or if cloud cover is needed to supplement onsite data; NWS upper air data from twice daily soundings; and land surface characteristics. The pre-processor AERSURFACE can be used to provide the required meteorological station land surface characteristics based on electronic land use land cover (LULC) maps available on the Internet. AERMET produces two files directly read by AERMOD. One file contains hourly surface meteorological data as well as parameters used in dispersion calculations. The other file contains vertical profile of hourly meteorological data at various levels from the entered monitored data.

AERMOD combines the receptor file from AERMAP, the two meteorological data files from AERMET, and source data to calculate ambient air concentration or ground deposition results at each receptor. AERMOD evaluates impacts one pollutant at a time for selected averaging periods.

5.0 Model Setup and Parameter Inputs

Model inputs and control parameter options were selected in accordance with guidance established in the Monitoring TAD, the Modeling TAD, GAQM, *User's Guide for the AMS/EPA Regulatory Model - AERMOD*, *User's Guide for the AERMOD Terrain Preprocessor (AERMAP), User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*, *AERSURFACE User's Guide*; WDEQ *AERMET Processing*; WDEQ PSD Guidance, and *Applicability of Appendix W Modeling Guidance for the 1-hour SO2 NAAQS, (EPA, August 2010)*. Model output and post-processing of the model results followed the guidance listed in the Monitoring TAD.

5.1 Model Control Options

AERMOD was set in regulatory default mode for a rural region with concentration output. The pollutant ID was set to SO_2 with an 1-hour averaging period. The model was executed for years 2012, 2013 and 2014 separately with the respective emissions and meteorological data.

5.2 SO_2 Source Locations for the Trona Plants

Stack locations of the SO_2 sources in North American Datum 27 (NAD27) Universal Transverse Mercator (UTM), Zone 12 coordinates are presented in Table 5-1.

Table 5-1. SO_2 Source Locations for TROXG, TROXW, Solvay and TATA Trona Plants

			NAD27 UTM Coordinates, Zone 12		
Trona Plant	Model ID	Description	Easting (m)	Northing (m)	Base Elevation (m)
TROXG	UIN14	No. 1 Coal-fired Boiler	591757.0	4613898.4	1938.8
	UIN15	No. 2 Coal-fired Boiler	591770.0	4613884.3	1938.8
TROXW	NS1A	No. 6 Coal-fired Boiler	599377.2	4607952.9	1921.9
	NS1B	No. 7 Coal-fired Boiler	599381.1	4607952.9	1921.8
Solvay	17	"A" & "B" Calciner	603705.5	4594844.9	1905.0
	18	#1 Coal Fired Boiler	603861.3	4594835.2	1905.0
	19	#2 Coal Fired Boiler	603862.0	4594823.4	1905.0
	33	Sulfur Burner	603915.2	4594760.7	1907.1
	73	Metabisulfite Dryer	603915.7	4594748.7	1907.1
	89	Bisulfite Loadout Facility	604018.8	4594728.5	1907.1
TATA	GR_2_L	C Boiler	603835.0	4605188.0	1900.0
	GR_3_W	D Boiler	603806.6	4605200.4	1900.0

5.3 SO_2 Source Parameters and Characteristics

All of the modeled SO_2 sources from the four trona plants were characterized as point sources. Table 5-2 lists model input parameters for each model year.

Table 5-2. Model Input Parameters for SO_2 Point Sources for TROXG, TROXW, Solvay and TATA for Years 2012, 2013 and 2014

Year	Trona Plant	Model ID	Source Description	Normalized Emission Rate (g/s)	Stack Height (m)	Exit Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
2012	TROXG	UIN14	No. 1 Coal-fired Boiler	7.8813E-02	45.78	333.8	11.00	1.98
		UIN15	No. 2 Coal-fired Boiler	7.3579E-02	45.78	334.9	11.10	1.98
	TROXW	NS1A	No. 6 Coal-fired Boiler	6.9363E-01	91.44	333.8	17.15	3.51
		NS1B	No. 7 Coal-fired Boiler	6.2721E-01	91.44	336.7	15.90	3.51
	Solvay	17	"A" & "B" Calciner	1.7851E-03	54.90	478.0	29.15	3.66
		18	#1 Coal Fired Boiler	4.4548E-03	54.90	325.0	17.68	2.21
		19	#2 Coal Fired Boiler	7.3832E-03	54.90	322.0	18.29	2.21
		33	Sulfur Burner	1.5177E-04	30.50	338.7	10.52	0.61
		73	Metabisulfite Dryer	1.4095E-05	29.00	305.0	17.07	0.61
		89	Bisulfite Loadout Facility	5.6283E-07	4.37	322.0	3.66	0.23
	TATA	GR_2_L	C Boiler	7.8732E-01	40.23	447.0	16.88	3.05
		GR_3_W	D Boiler	1.2651E+00	39.62	463.2	17.51	3.81
2013	TROXG	UIN14	No. 1 Coal-fired Boiler	8.6753E-02	45.78	337.5	17.08	1.98
		UIN15	No. 2 Coal-fired Boiler	6.7963E-02	45.78	337.3	17.35	1.98
	TROXW	NS1A	No. 6 Coal-fired Boiler	6.7831E-01	91.44	347.7	18.18	3.51
		NS1B	No. 7 Coal-fired Boiler	6.7591E-01	91.44	345.3	17.69	3.51
	Solvay	17	"A" & "B" Calciner	1.7787E-03	54.90	478.0	29.15	3.66
		18	#1 Coal Fired Boiler	8.0543E-03	54.90	325.0	17.68	2.21
		19	#2 Coal Fired Boiler	7.7481E-03	54.90	322.0	18.29	2.21
		33	Sulfur Burner	1.4682E-04	30.50	338.7	10.52	0.61
		73	Metabisulfite Dryer	0.0000E+00	29.00	305.0	17.07	0.61
		89	Bisulfite Loadout Facility	0.0000E+00	4.37	322.0	3.66	0.23
	TATA	GR_2_L	C Boiler	7.6847E-01	40.23	447.0	16.88	3.05
		GR_3_W	D Boiler	1.2313E+00	39.62	463.2	17.51	3.81
2014	TROXG	UIN14	No. 1 Coal-fired Boiler	9.5873E-02	45.78	339.6	17.39	1.98
		UIN15	No. 2 Coal-fired Boiler	6.7370E-02	45.78	341.0	17.97	1.98
	TROXW	NS1A	No. 6 Coal-fired Boiler	6.3893E-01	91.44	345.3	19.34	3.51
		NS1B	No. 7 Coal-fired Boiler	6.4902E-01	91.44	342.9	18.60	3.51
	Solvay	17	"A" & "B" Calciner	1.7577E-03	54.90	478.0	29.15	3.66
		18	#1 Coal Fired Boiler	4.4047E-04	54.90	325.0	17.68	2.21
		19	#2 Coal Fired Boiler	9.6904E-03	54.90	322.0	18.29	2.21
		33	Sulfur Burner	1.4263E-04	30.50	338.7	10.52	0.61
		73	Metabisulfite Dryer	0.0000E+00	29.00	305.0	17.07	0.61
		89	Bisulfite Loadout Facility	0.0000E+00	4.37	322.0	3.66	0.23
	TATA	GR_2_L	C Boiler	7.7643E-01	40.23	447.0	16.88	3.05
		GR_3_W	D Boiler	1.1714E+00	39.62	463.2	17.51	3.81

5.4 Building Downwash

EPA's utility program Building Profile Input Program (BPIP) generated building downwash parameters, employing the PRIME option. Stack and structure locations for the four trona plants were entered into BPIP (04274) in NAD27 UTM Zone 12 coordinates. Respective downwash parameters for each plant were incorporated into AERMOD. Figures 5-1A to 5-1D depict structure and SO_2 stack locations for the four plants, with Figure 5-1A for TROXG, Figure 5-1B for TROXW, Figure 5-1C for Solvay, and Figure 5-1D for TATA.

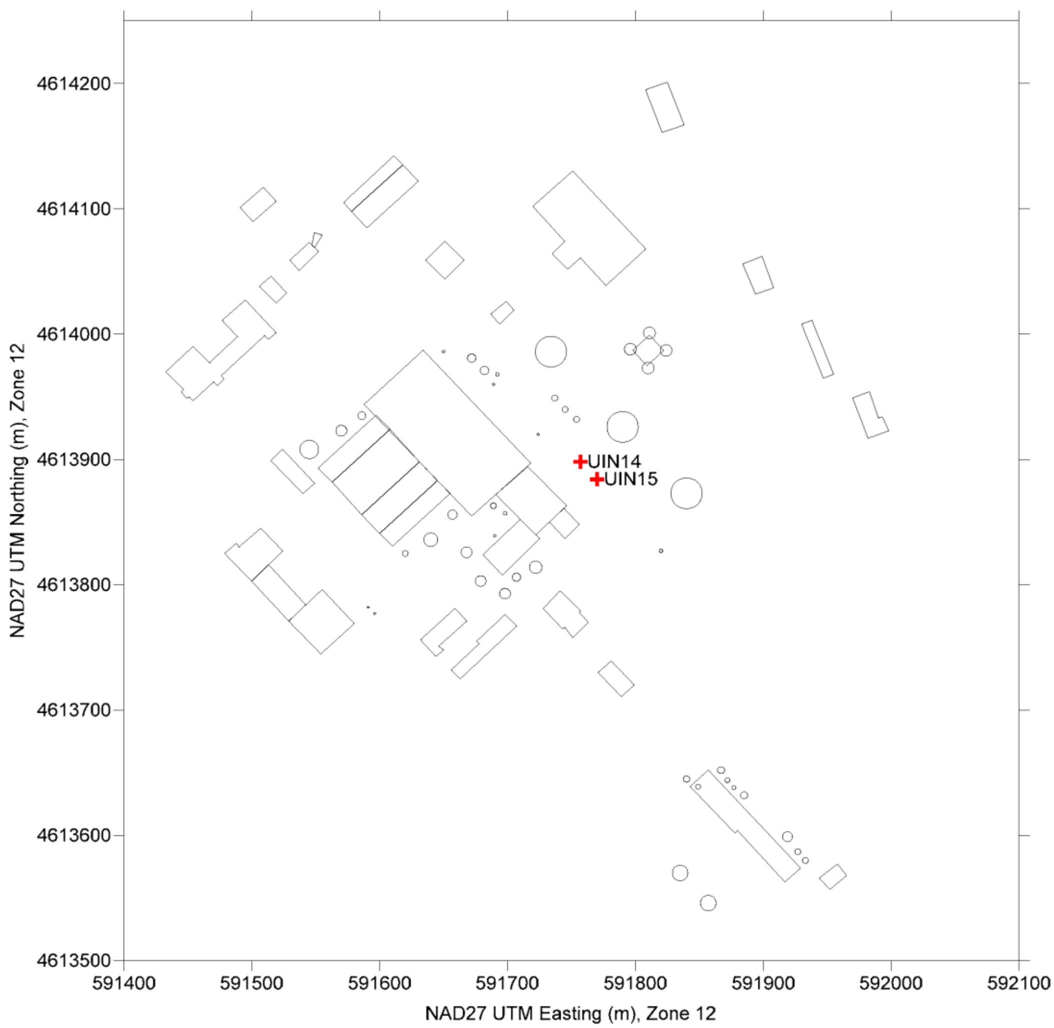


Figure 5-1A. Building and SO_2 Source Stack Locations for TRONOX Granger

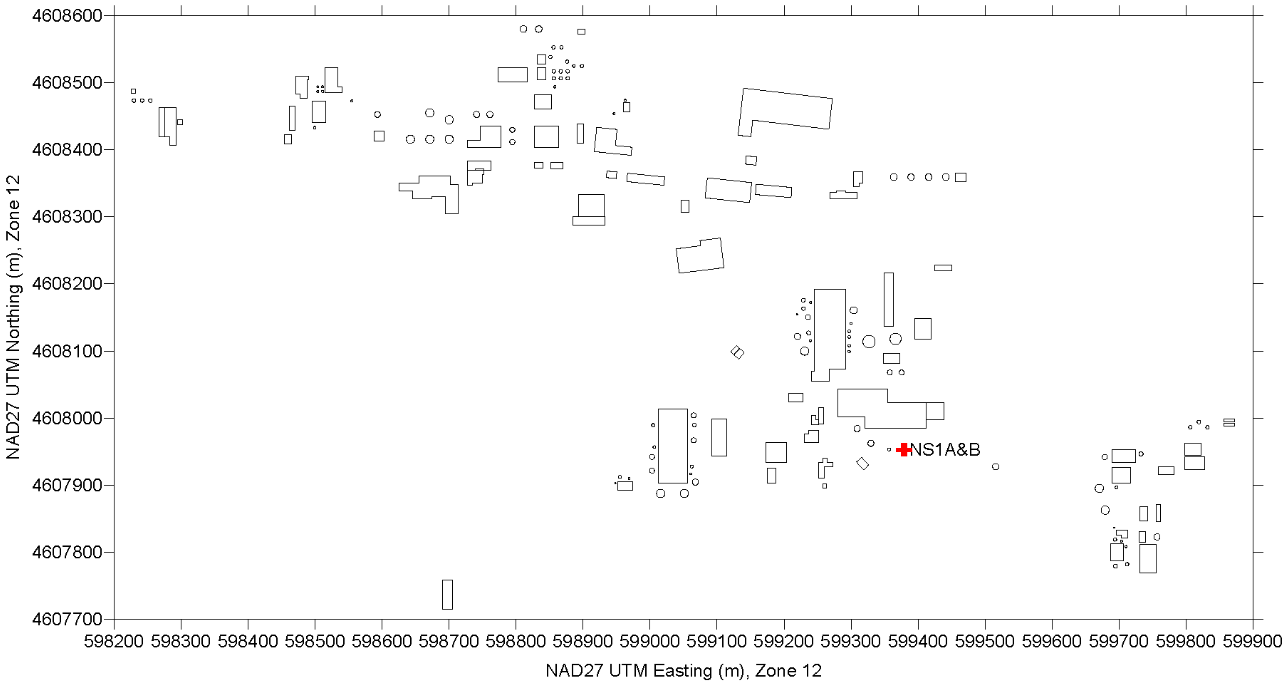


Figure 5-1B. Building and SO_2 Source Stack Locations for TRONOX Westvaco

16

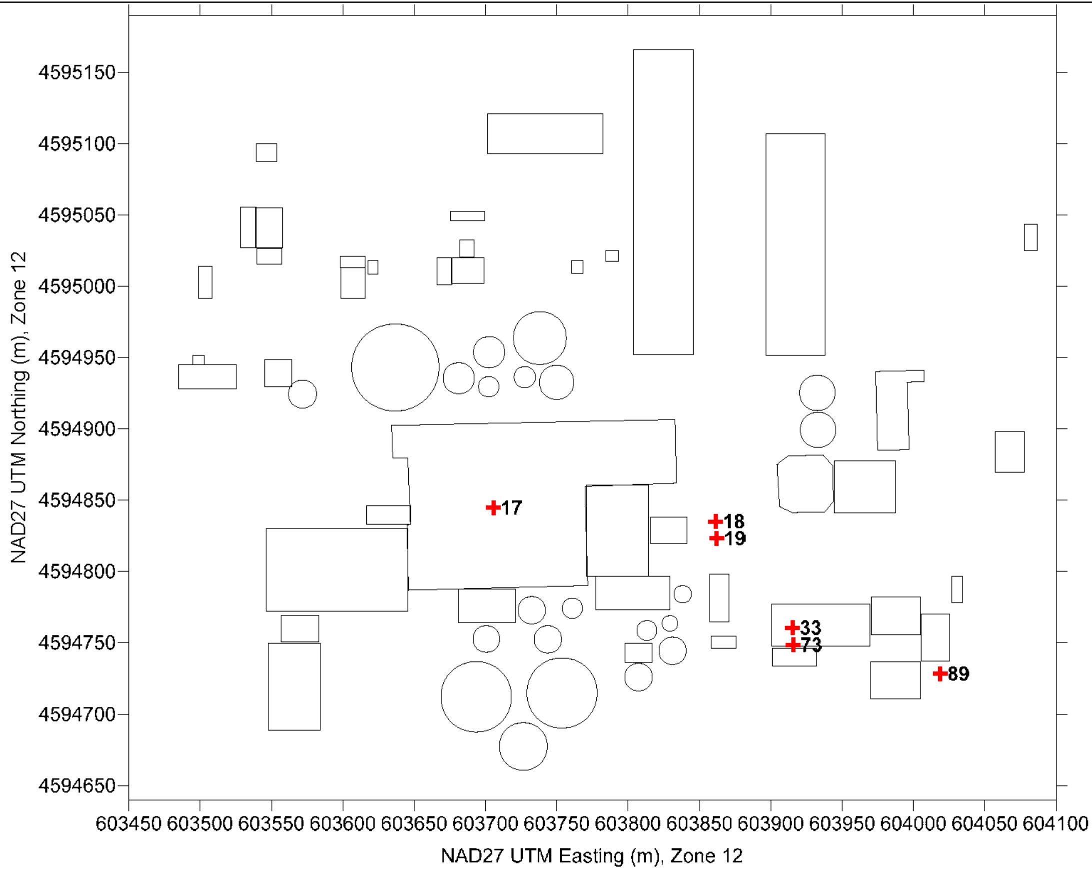


Figure 5-1C. Building and SO_2 Source Stack Locations for Solvay

17

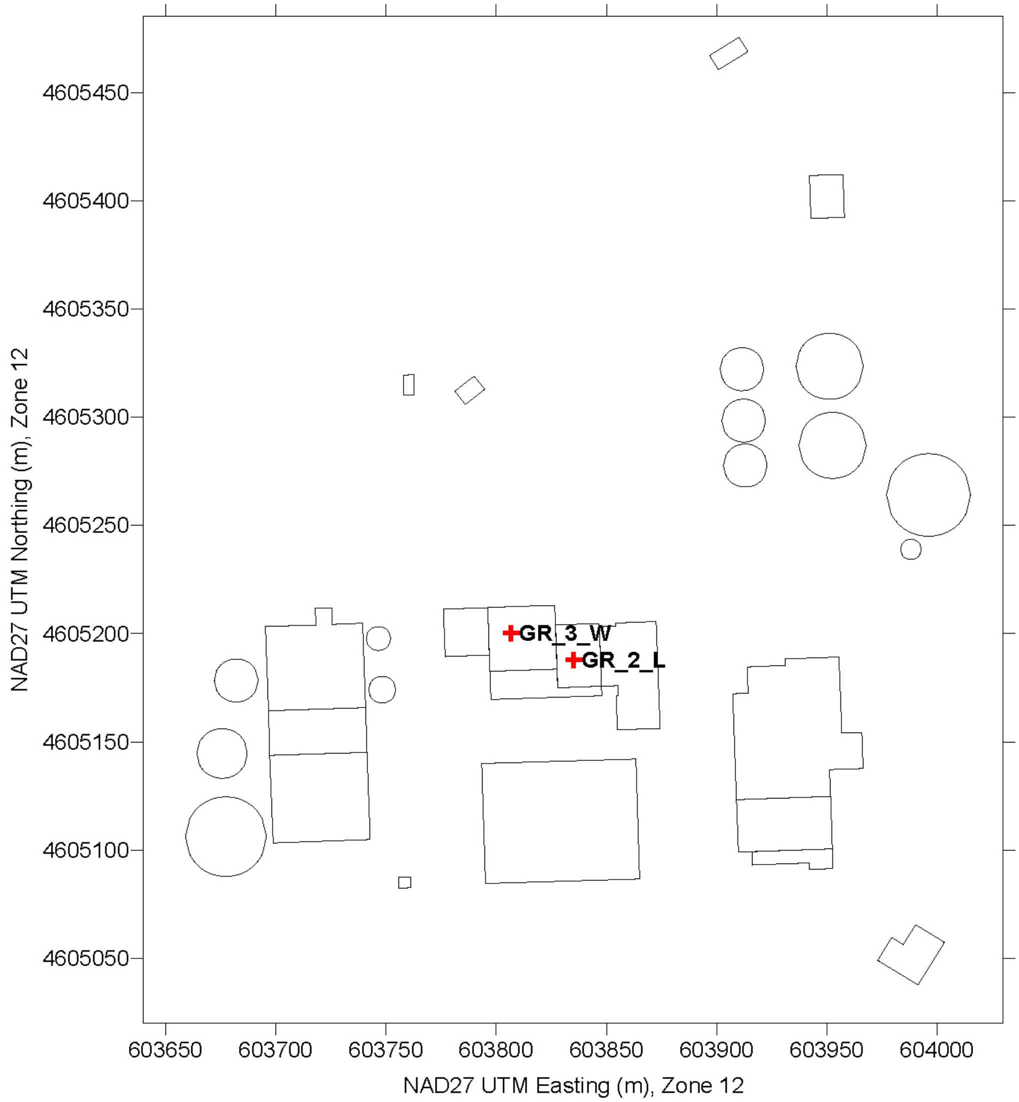


Figure 5-1D. Building and SO_2 Source Stack Locations for TATA

18

5.5 Receptor Grid Generation

A discrete Cartesian receptor grid for the modeling analysis was generated in NAD27 UTM Zone 12 coordinates, consisting of a series of nested grids centered on each trona plant. Table 5-3 summarizes the placement for these grids and associated receptor spacing. The receptor grid spacing along the property boundaries (fence lines) was set at 50 meters. The density of the receptor grid nests relaxed in stages from 100-meter to 1000-meter spacing as distance from the property boundary increased from 1 kilometer (km) to beyond 10 km.

Table 5-3. General Receptor Grid Placement from Ambient Air Boundaries for Each of the Trona Plants

Distance From Property Boundary (km)	Receptor Spacing (m)	Grid Type
At Fence Line	50	Cartesian
Fence line to 1.0	100	Cartesian
1 to 3	250	Cartesian
3 to 10	500	Cartesian
10 and beyond	1000	Cartesian

Generated receptors were not allowed to fall inside any trona plant ambient air boundary. Due to the close proximity of the plants, overlap between individual plant grids started with the 250-meter spaced grid; overlap receptors are superfluous and were eliminated. The full grid extended about 65 km from the plants to capture a definitive decrease in NDV concentrations. The resultant receptor grid consists of over 35,000 receptors and is depicted in Figure 5-2.

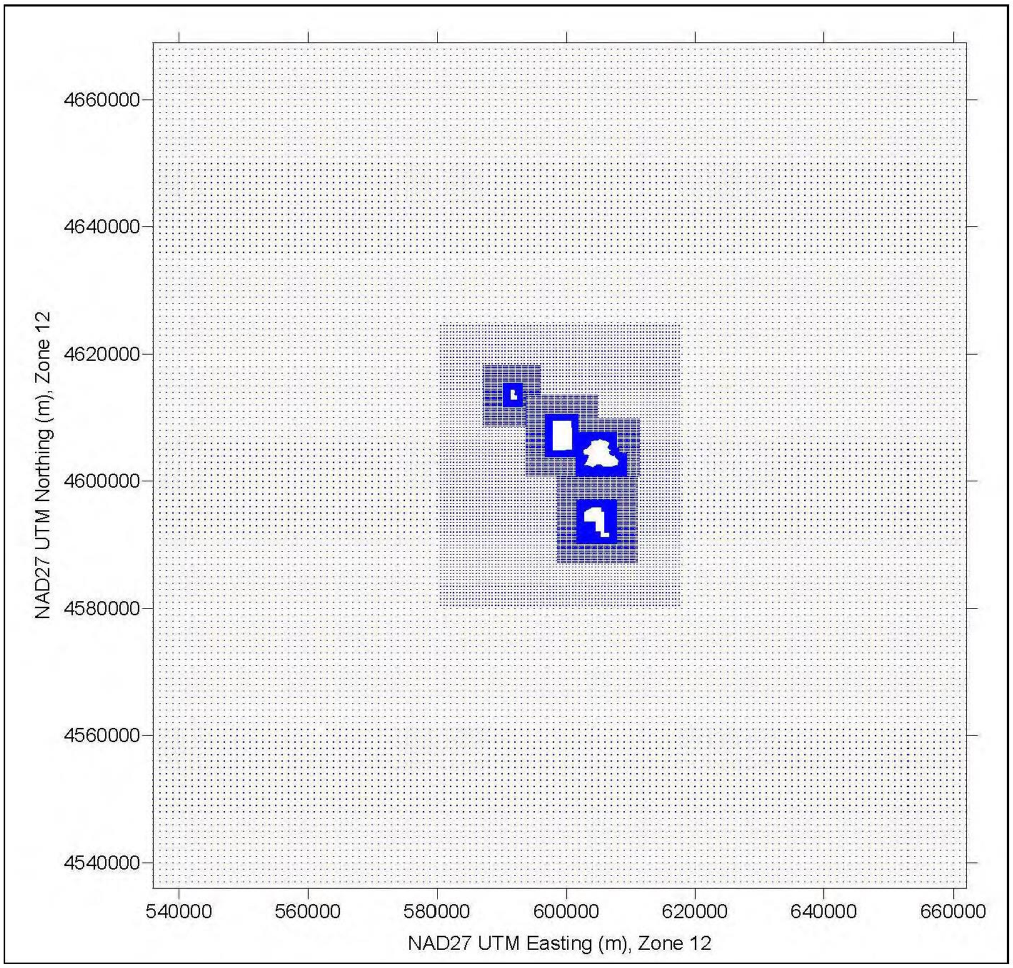


Figure 5-2. Receptor Grid for SO_2 Monitor Placement Modeling Analysis for the Trona Patch

The receptor grid was processed through AERMAP 11103, the most current version, using National Elevation Data (NED) maps obtained from the Multi-Resolution Land Characteristics Consortium website (www.mlcr.gov). The receptors and domain area were set in AERMAP in NAD27 by employing option '1' in the program control file. Domain limits were not entered, forcing AERMAP to use the entire area covered by the NED maps to perform calculations for hill height scale. AERMAP generated an output receptor file consisting of UTM Easting (m), UTM Northing (m), MSL elevation (m) and hill height scale (m) for each receptor.

5.6 Meteorological Data Selection and Processing

5.6.1 Meteorological Data

Hourly onsite meteorological data collected at Solvay for years 2012 to 2014 were employed for the modeling analysis. Table 5-4 lists the monitored parameters and collection levels.

Table 5-4. Meteorological Parameters and Collection Levels for the Solvay Tower

Meteorological Parameter	Collection Level (m)
Temperature	2, 10 and 30
Wind Speed	10 and 30
Wind Direction	10 and 30
Sigma Theta	10 and 30
Vertical Wind Speed	10 and 30
Sigma Phi	10 and 30
Total Precipitation	Ground
Relative Humidity	2
Barometric Pressure	Ground
Solar Radiation	Ground

Employing AERMET 15181, the most current version, onsite hourly meteorological data were processed with concurrent Rock Springs, WY NWS data obtained from the National Climatic Data Center (NCDC) (ftp://ftp.ncdc.noaa.gov/pub/data/noaa/) in Integrated Surface Hourly Data (ISHD) format, and Riverton, WY upper air data obtained from the National Oceanic and Atmospheric Administration and Earth System Research Laboratory (NOAA/ESRL) Radiosonde Database website (www.esrl.noaa.gov/raobs), extracted for all levels and all times. All onsite data collected at all levels were entered into AERMET, using a delta temperature (delta T) of 2 to 10 meters. Delta T was calculated on an hourly basis by subtracting the hourly mean temperature at 10 meters from the respective hourly mean temperature at 2 meters, such that a positive Delta T indicates an inversion. For the stable boundary layer, the Bulk Richardson algorithm (i.e., METHOD STABLEBL BULKRN) was selected.

Note that 10-meter temperature data were missing from October 1 to 24, 2013, and hence Delta T could not be calculated for this time period. To calculate stability during this period, Rock Springs cloud cover data were employed. Rock Springs NWS surface data were not otherwise substituted for missing onsite data.

5.6.2 AERSURFACE

To generate the needed LULC surface parameters, AERSURFACE (13016), the most recent version, was employed along with NCLD1992 LULC data maps obtained from the Multi-Resolution Land Characteristics Consortium website (www.mlcr.gov). Given that there have not been significant changes in the general region from the 1992 maps, these data adequately represent land cover in the vicinity of the meteorological tower at Solvay.

When running AERSURFACE for the Solvay meteorological tower, default values were selected, where applicable. Additional settings included the following selections:

- Site at an airport?: No
- Continuous snow cover in the winter?: No (see Section 5.6.2.2)
- Surface moisture: Wet, Dry and Average (see Section 5.6.2.1)
- Arid region: Yes
- Number of sectors: 12
- Time variation: Monthly
- Seasons breakdown: Standard (i.e., December, January and February is winter, etc.)

For the Rock Springs NWS site, AERSURFACE was run with the same LULC map and the same default options and settings, except "Yes" was selected for describing if the site was at an airport.

5.6.2.1 Surface Moisture

To characterize surface moisture, monthly precipitation data for the model years were compared to climatological precipitation probabilities. For Solvay, because a 30-year climate record does not exist, Green River, WY was selected as the proxy climate station. For Rock Springs, WY, a long-term climate record exists and was used to characterize surface moisture for the NWS surface site.

Monthly precipitation data for Green River and Rock Springs for the period 1981 to 2014 were obtained from the Global Historical Climatology Network-Daily (GHCN-D) found on the NCDC web site (www.ncdc.noaa.gov/). A few years were missing from each data set; thus to determine precipitation probabilities from a 30-year data set, 34 years of monthly data were downloaded. From these data, the 30th and 70th percentiles for each month for the 30-year period were calculated for each station.

Monthly precipitation amounts recorded at Solvay for the three model years were compared to the respective monthly Green River percentiles; the Rock Springs monthly precipitation values were compared against its respective climate percentiles. Months with precipitation below the 30th percentile were considered "dry", months with precipitation above the 70th percentile were considered "wet", and months with precipitation between 30th and 70th percentiles were considered "normal" (i.e., average).

Table 5-5 lists monthly precipitation at Solvay for model years 2012, 2013 and 2014 and the Green River monthly 30th and 70th precipitation probability levels. Also listed are whether the month was considered dry (D), wet (W) or normal (N). Table 5-6 lists the same information for Rock Springs.

Table 5-5. Solvay Monthly Precipitation Amount for Years 2012, 2013 and 2014 Compared to the Calculated 30-Year Climatic Monthly Precipitation Probabilities for Green River, Wyoming

Green River, Wyoming 1981-2014												
	Month (Inches)											
Statistic[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
30th Percentile	0.12	0.24	0.43	0.41	0.33	0.35	0.25	0.33	0.35	0.60	0.18	0.16
70th Percentile	0.36	0.54	0.80	1.19	1.38	0.98	0.74	0.71	1.01	1.01	0.54	0.49
Solvay												
Model Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	0.48	0.16	0.23	0.67	0.11	0.03	0.28	0.34	0.51	0.37	0.88	0.25
Surface Moisture[2]:	**W**	**D**	**D**	**N**	**D**	**D**	**N**	**N**	**N**	**D**	**W**	**N**
2013	0.03	0.24	0.27	0.14	0.51	0.17	0.3	0.18	2.57	1.25	0.09	0.43
Surface Moisture[2]:	**D**	**D**	**D**	**D**	**N**	**D**	**N**	**D**	**W**	**W**	**D**	**N**
2014	0.12	0.35	0.26	0.15	0.55	1.02	0.88	1.81	2.85	0.01	0.23	0.37
Surface Moisture[2]:	**D**	**N**	**D**	**D**	**N**	**W**	**W**	**W**	**W**	**D**	**N**	**N**

1. Calculated from monthly data obtained from Global Historical Climatology Network-Daily (GHCN-D). The data set covers 34 years due to missing data to make a complete 30-year data set for each month.
2. Surface moisture definition **W**=wet, **D**=dry and **N**=normal (average).

Table 5-6. Rock Springs Monthly Precipitation Amount for Years 2012, 2013 and 2014 Compared to the Calculated 30-Year Climatic Monthly Precipitation Probabilities

Rock Springs, Wyoming 1981-2014												
	Month (Inches)											
Statistic[1]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
30th Percentile	0.18	0.20	0.43	0.39	0.52	0.39	0.34	0.35	0.55	0.43	0.19	0.20
70th Percentile	0.53	0.63	0.70	1.13	1.37	0.96	0.70	0.76	1.07	0.98	0.47	0.40
Rock Springs												
Model Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	0.21	0.35	0.08	0.54	0.21	0.00	1.29	0.01	0.01	0.07	0.17	0.20
Surface Moisture[2]:	N	N	D	N	D	D	W	D	D	D	D	D
2013	0.06	0.33	0.20	0.37	0.56	0.00	0.21	0.50	1.37	0.86	0.04	0.18
Surface Moisture[2]:	D	N	D	D	N	D	D	N	W	N	D	D
2014	0.07	0.08	0.43	0.24	0.49	0.29	0.35	0.52	1.20	0.32	0.14	0.11
Surface Moisture[2]:	D	D	D	D	D	D	N	N	W	D	D	D

1. Calculated from monthly data obtained from Global Historical Climatology Network-Daily (GHCN-D). The data set covers 34 years due to missing data to make a complete 30-year data set for each month.
2. Surface moisture definition **W**=wet, **D**=dry and **N**=normal (average).

AERSURFACE was run three times for Solvay and three times for Rock Springs, selecting the three different surface moistures of dry, wet and normal while maintaining the other respective settings. The resultant surface outputs from these runs were then merged on a monthly basis, as appropriate for wet, dry or normal, to create single-year surface parameters for each of the three model years for both Solvay and Rock Springs.

5.6.2.2 Snow Cover

As Solvay does not collect snow cover data, Green River snow cover was used as a proxy when determining if the site experiences continuous snow cover. GHCN-D data from NCDC for Green River indicate that snow did not cover the ground at a depth of greater than 1 inch for 50% of the time for December, January and February for years 2012, 2013 and 2014. For Rock Springs, the GHCN-D data showed a similar pattern. Therefore, the setting in AERSURFACE for continuous snow cover for both Solvay and Rock Springs was set to "No".

5.6.3 AERMET Processing

AERMET was run separately for each meteorological year, with the respective AERRSURFACE data, generating an AERMOD-ready surface and profile files for each year. Annual data recovery for the pre-processed AERMET data sets exceeds 98% for each year. The 3-year wind rose is displayed in Figure 5-2. Predominant wind directions were from the west at about 25% and west-northwest at 23%, and the mean wind speed was 4.01 m/s, with less than 1% calm winds.

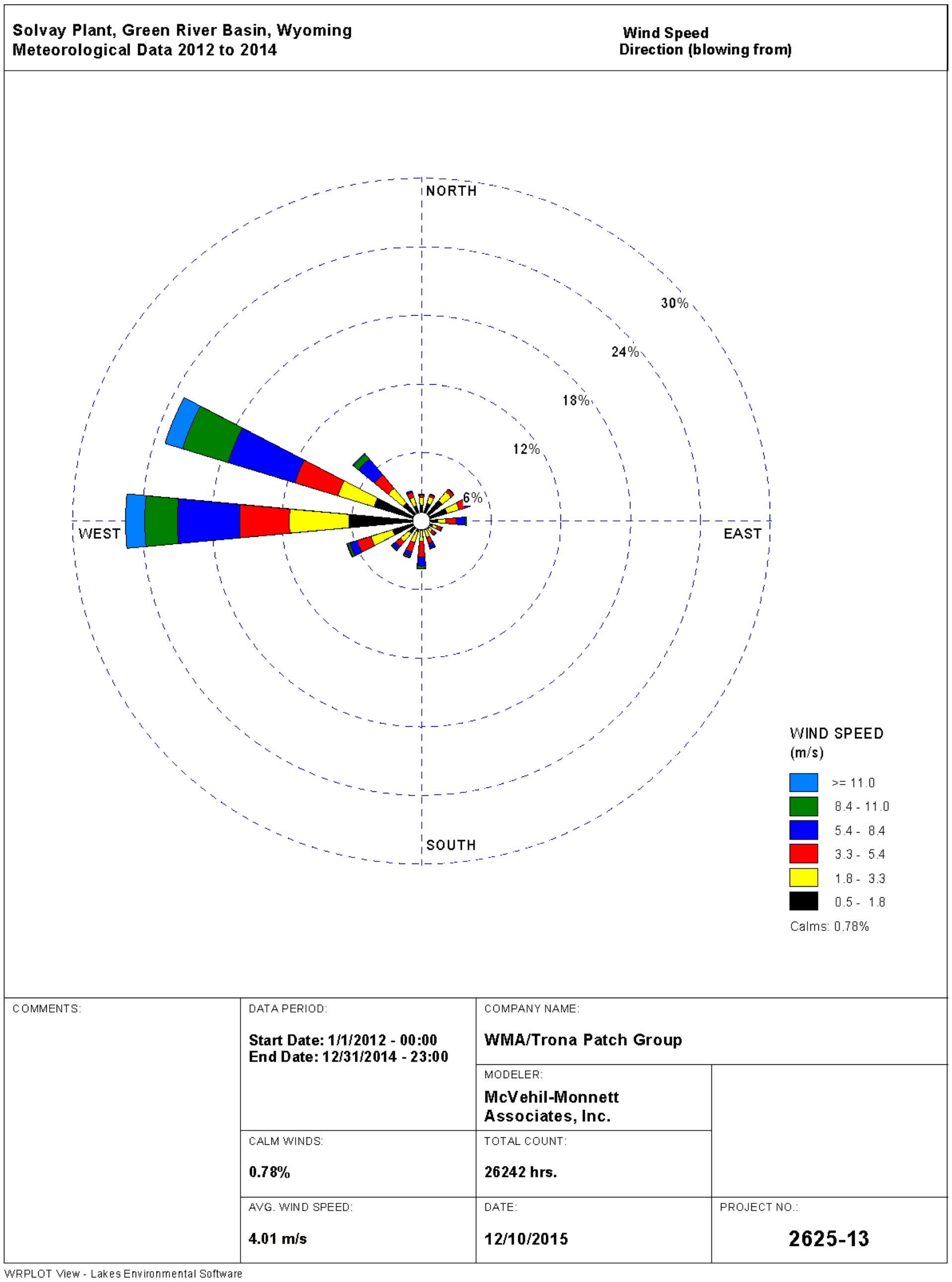


Figure 5-3. 3-Year Wind Rose for Solvay Onsite Meteorological Station, 2012 to 2014

6.0 Model Result and Analysis for Potential Monitor Locations

6.1 3-Year Mean 1-Hour 4th Daily Highest NDVs

Using the output option MXDYBYR, AERMOD generated NDV concentration results for the 4th highest (4H) daily 1-hour average (equivalent to the 99th percentile) for each receptor for each model year. The MXDYBYRY output files for 2012, 2013 and 2014 were used to calculate a 3-year mean of the 4H 1-hour NDV at each receptor. The ratios of the 3-year mean of the 4H NDV at each of the receptor to the highest 4th high (H4H) NDV over all receptors were also generated to illustrate differences between NDVs across the modeling domain.

Figure 6-1 depicts the 3-year mean of the 4H 1-hour NDVs. Relatively high SO_2 NDVs, indicated by medium blue, dark red and dark blue, are seen in the immediate vicinity of the plants, as well as east and southeast of the plants. The receptor that represents the maximum concentration is indicated by a red circle. Figure 6-2 depicts the NDV ratios. Large ratios occur between the plants as well as east and southeast of the trona plants.

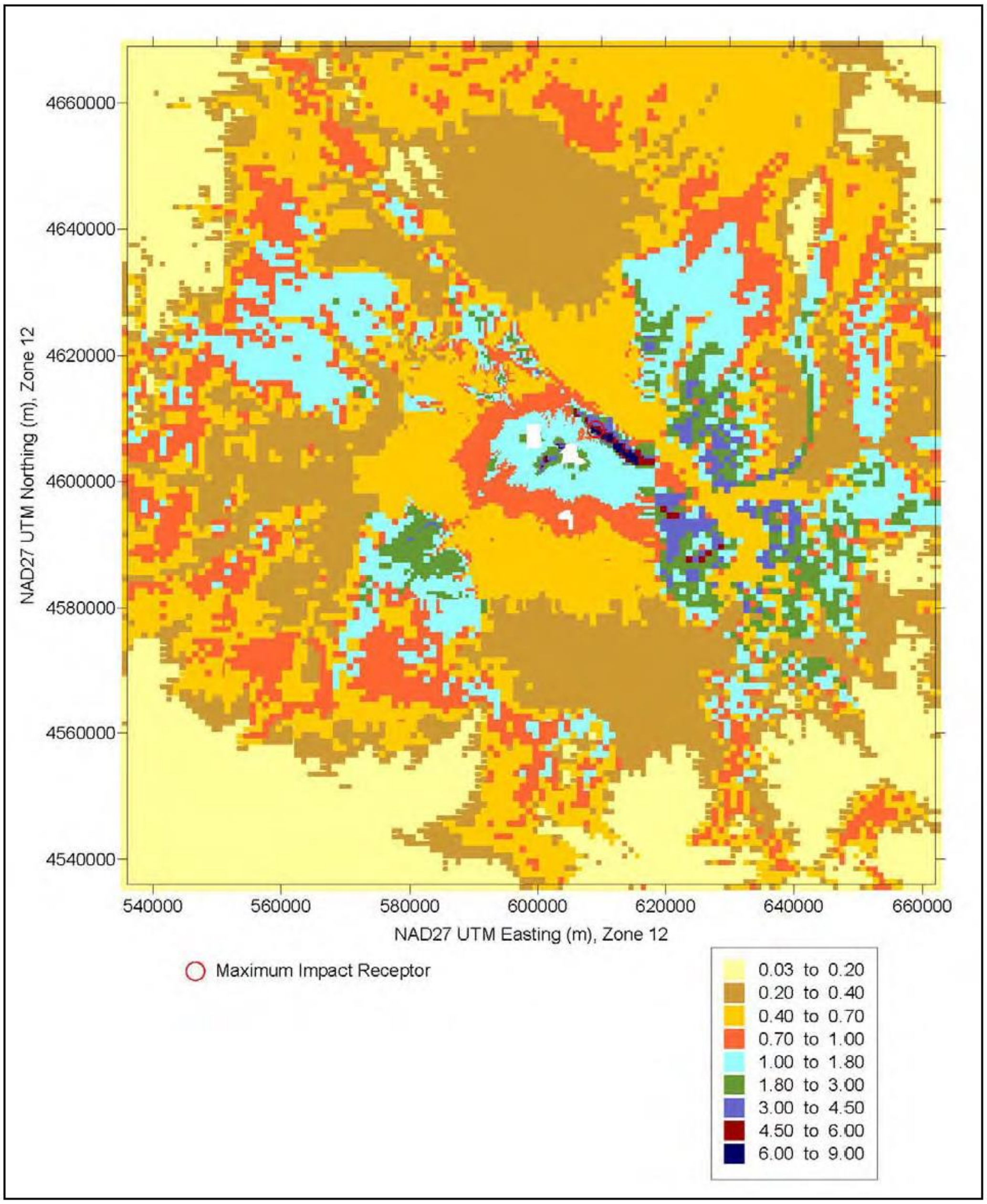


Figure 6-1. 3-Year Mean 4H Daily 1-hour SO_2 NDVs from the Trona Patch Sources

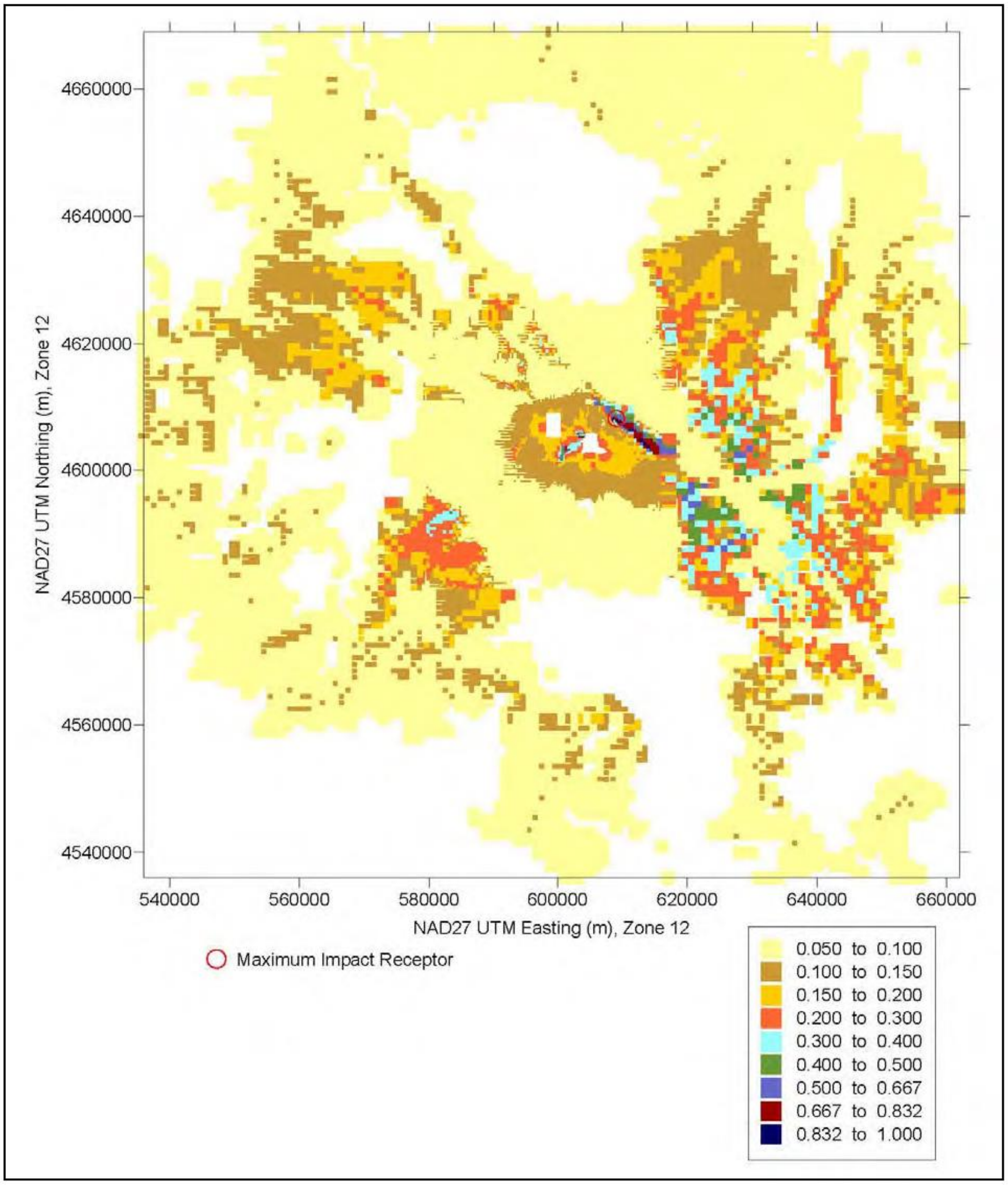


Figure 6-2. Ratios of 3-Year Mean 4H Daily NDV to 3-Year Mean H4H NDV

6.2 Top Receptor Analysis

The next step of the analysis prioritized locations to be considered for monitoring by addressing both overall high NDVs and high frequency of occurrence of daily maximum NDV; the location of a source-oriented monitor should reflect both aspects. The combination of these two factors allows for better characterization of the air quality for an area.

The modeled 3-year mean 4H 1-hour NDVs for all receptors were ranked from highest to lowest. The top 200, 100, 25 and 10 NDV receptors were isolated; these subsets are displayed in Figure 6-3A for the top 200 and 100 NDV receptors, and in Figure 6-3B for the top 25 and 10 NDV receptors. The top 200 and 100 receptors are found within about 30 km east and southeast of the plants, immediately adjacent to TATA on the west side, and in the vicinity between TATA and TROXW. The top 25 and 10 NDV receptors are mostly within 5 to 10 km east of TATA.

The top 200 receptors provided the sub-set for the frequency analysis. AERMOD was re-run for the top 200 receptors with all three meteorological years combined into one file. The emissions year selected for this run was 2014, as this year produced the maximum H4H 1-hour NDV. For this modeling step the MAXDAILY option was implemented to output the maximum 1-hour NDV for each receptor for each day over the 3-year period (1,096 days). This resultant file was then post-processed to determine the number of days over the 3-year period that each of the top 200 receptors represented the maximum daily NDV. Figure 6-4 depicts the result of this assessment. Receptors with higher frequency of being the maximum daily receptor occur in three areas: between TATA and TROXW; approximately 5 to 20 km east of TATA; and 15 to 25 km east of Solvay.

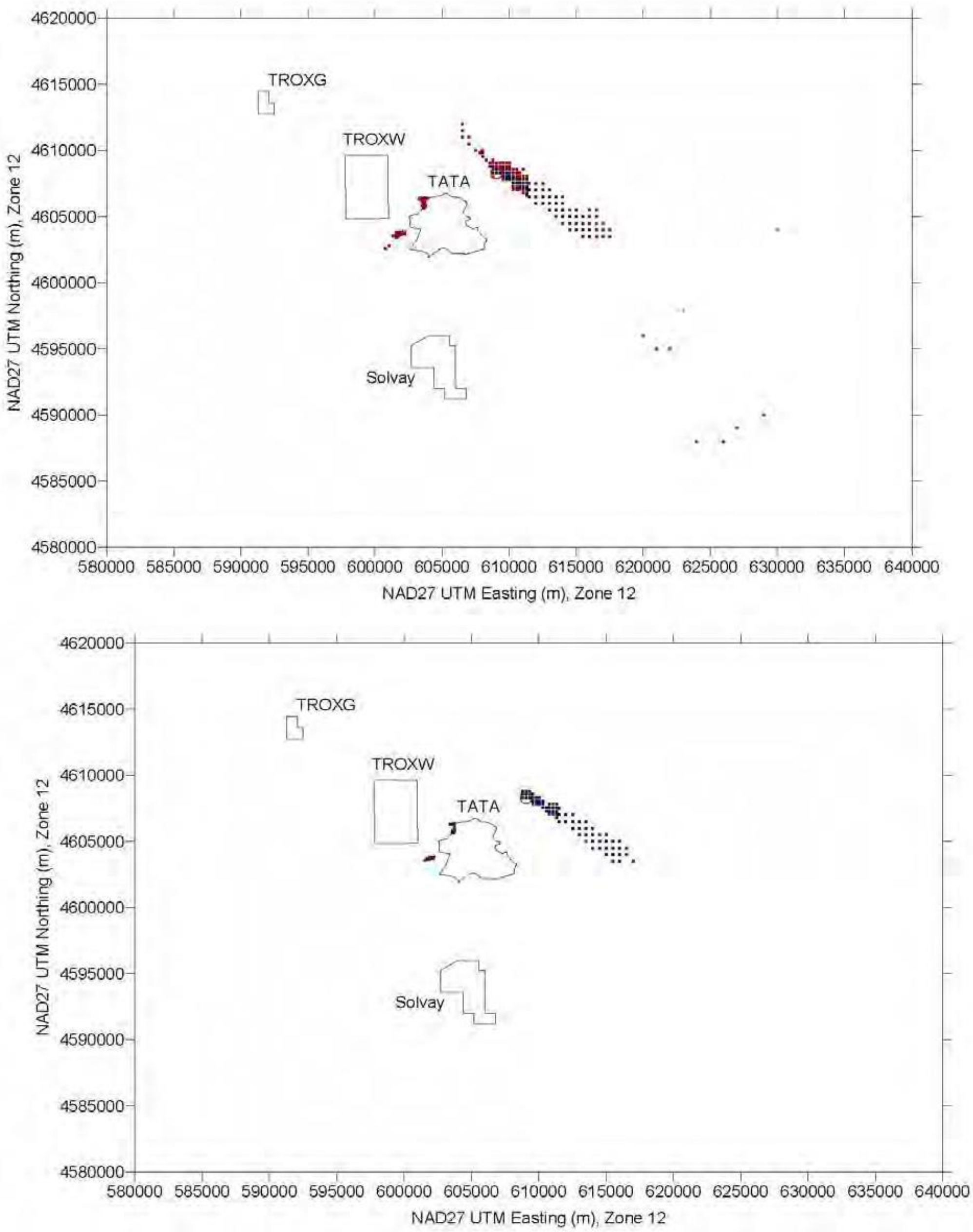
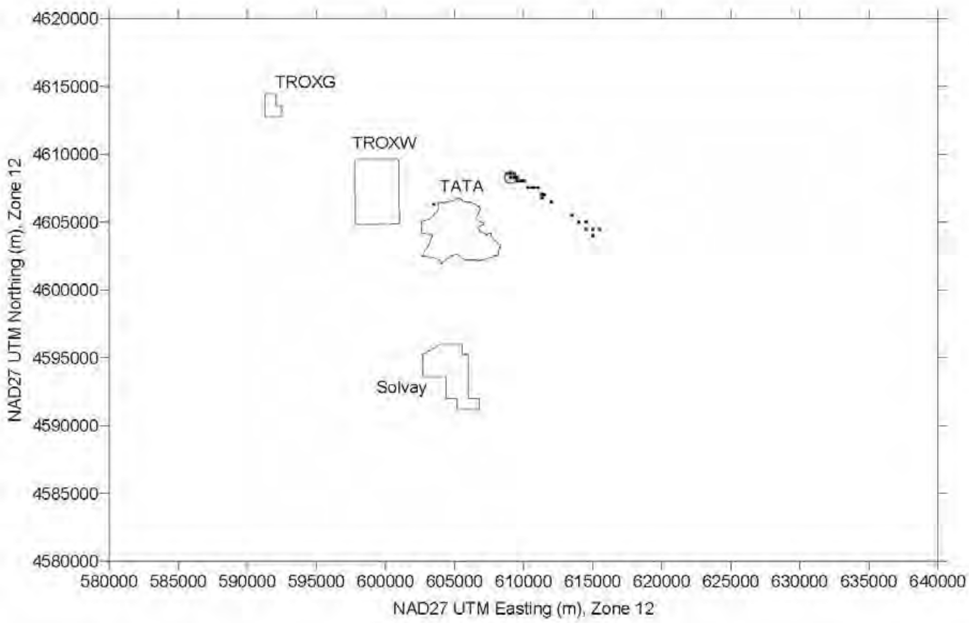


Figure 6-3A. (top) Top 200 and (bottom) Top 100 NDV Receptors



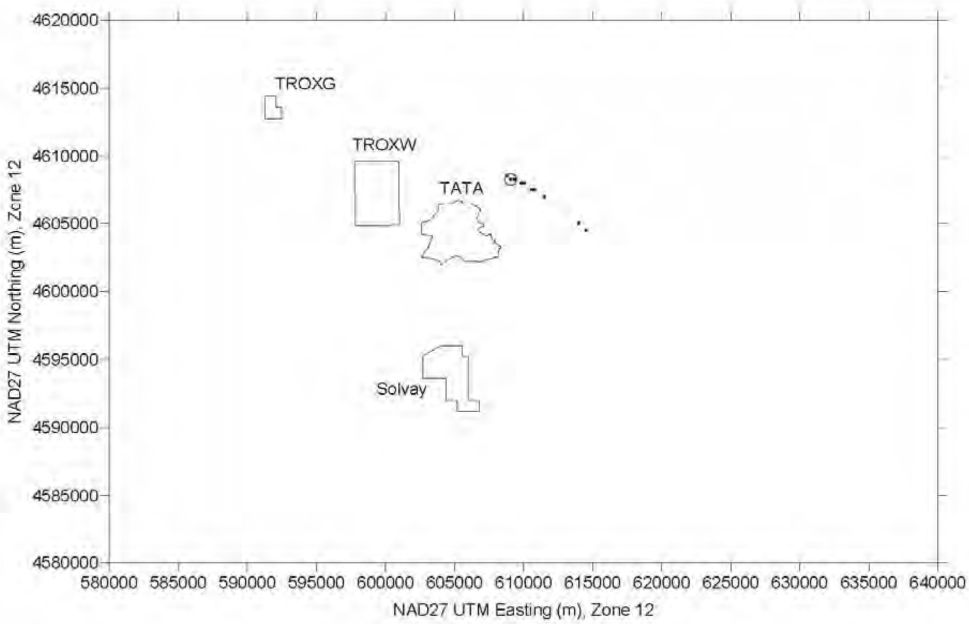


Figure 6-3B. (top) Top 25 and (bottom) Top 10 NDV Receptors

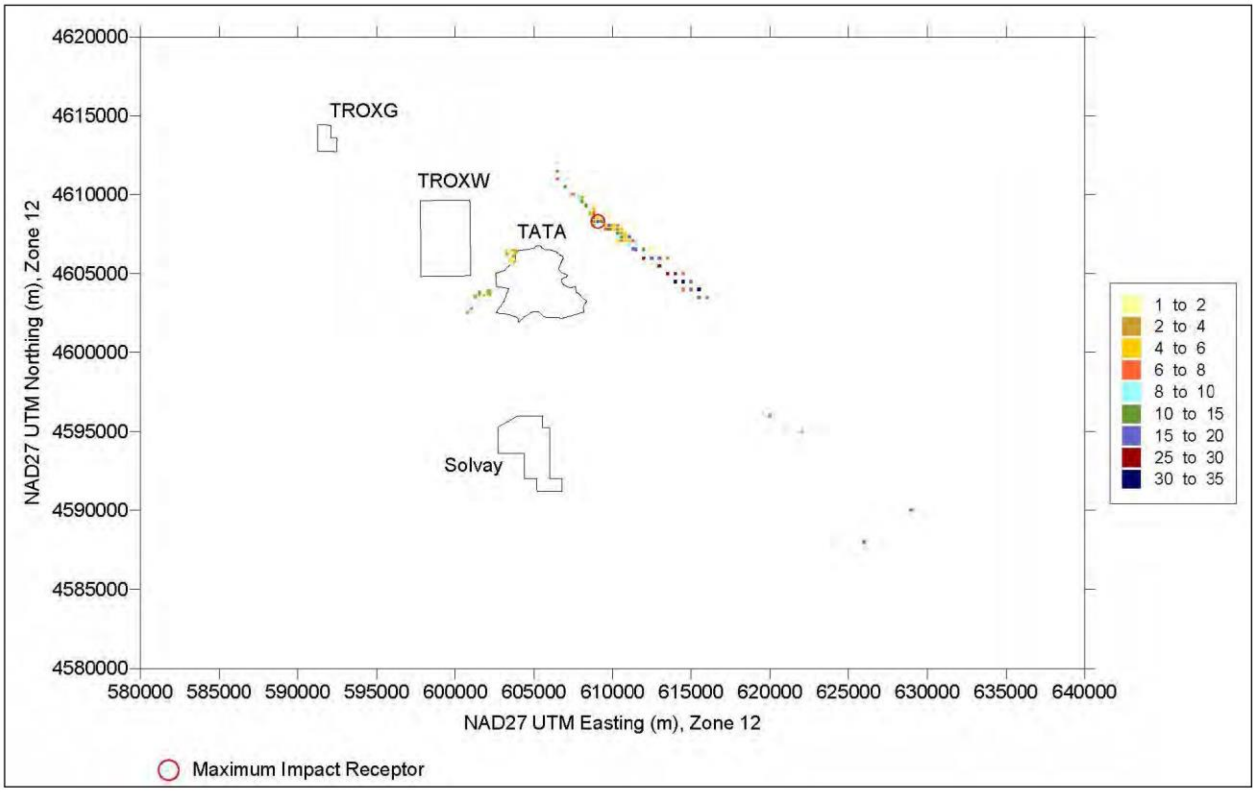


Figure 6-4. Cumulative Number of Days the Individual Top 200 Receptors Represented the 1-Hour Daily Maximum Concentration for Years 2012 to 2014

The next step involved a further refinement that combined the rank of each of the top 200 receptors in terms of NDV magnitude and the number of days each receptor represented the daily maximum 1-hour concentration. For this scheme, each receptor was ranked from highest to lowest for NDV magnitude, with the receptor with the highest being ranked as 1; the receptors were also ranked from highest to lowest for the number of days the receptor represented the daily maximum concentration, with the receptor with the highest number of days being ranked as 1. For each of the 200 receptors, the two ranks were summed together to provide a total score, with the lowest possible score being 2. The receptors were then sorted by combined score in ascending order; receptors with lower overall scores indicate both relatively high NDVs and frequently occurring daily maximums.

The combined score analysis for the top 200 receptors is displayed in Figure 6-5A; Figure 6-5B shows a smaller scale closer to TATA and TROXW; and Figure 6-5C only depicts those receptors with a combined score less than 100 for better definition. Figures 6-5B and 6-5C also show a base map for location clarification. Table 6-1 lists the top 20 receptors ranked according to lowest combined score.

Receptors with relatively low scores occur between the TATA and TROXW plants as well as along the ridge 5 to 10 km east of the TATA. The top seven receptors with the lowest overall score occurred along this ridge (dark blue and red squares). The 8^{th} and 12^{th} lowest receptors in overall score occurred along this ridge as well as between TATA and TROXW, indicated by the medium blue squares. The 13^{th} through the 20^{th} lowest receptors (green squares) occurred on the western TATA property boundary and on the ridge.

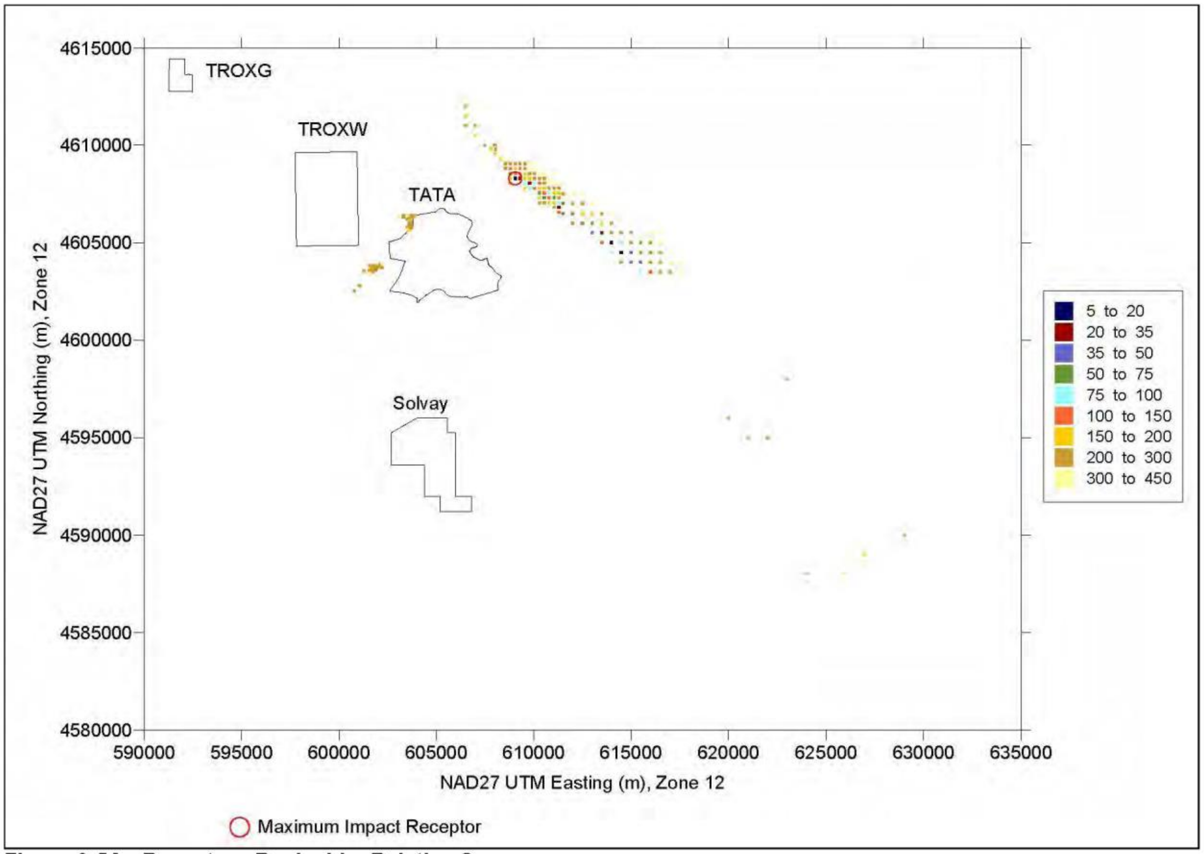


Figure 6-5A. Receptors Ranked by Relative Score.

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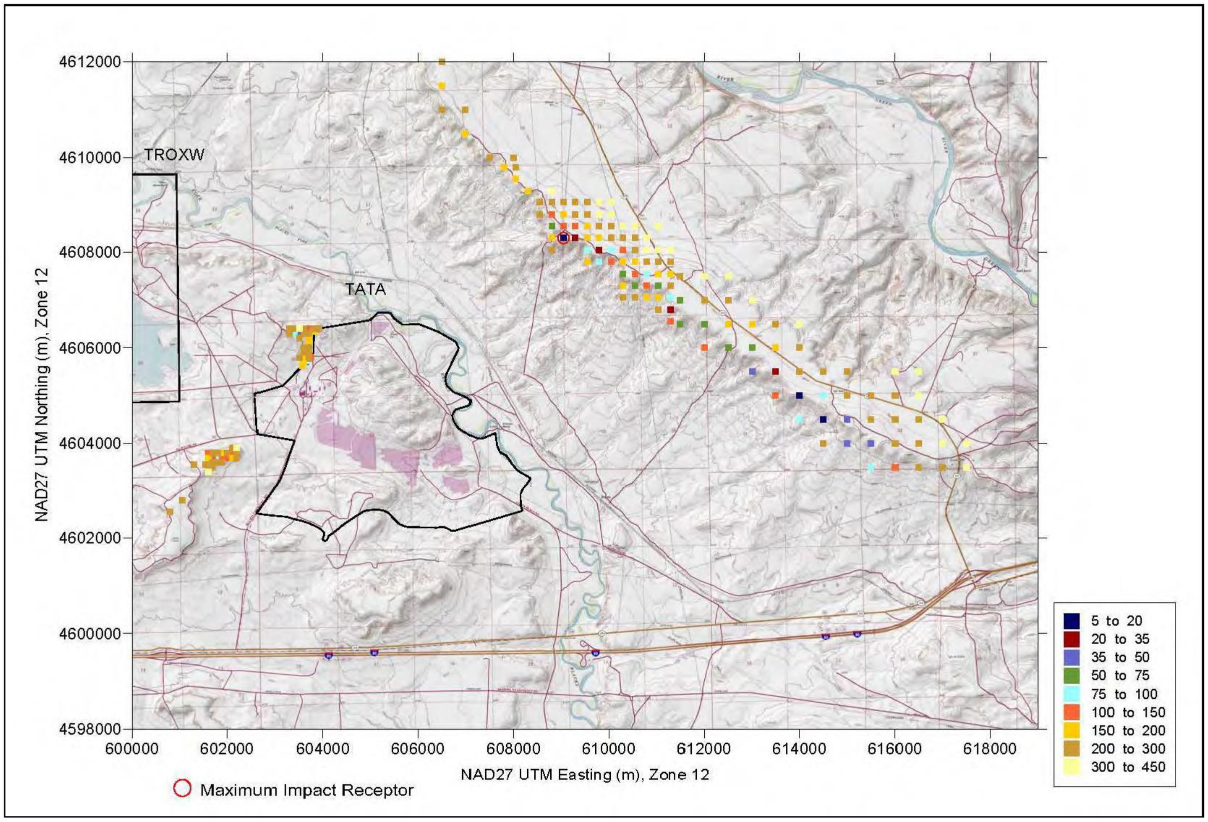

Figure 6-5B. Receptors Ranked by Relative Score in Vicinity of TROXW and TATA Plants

35

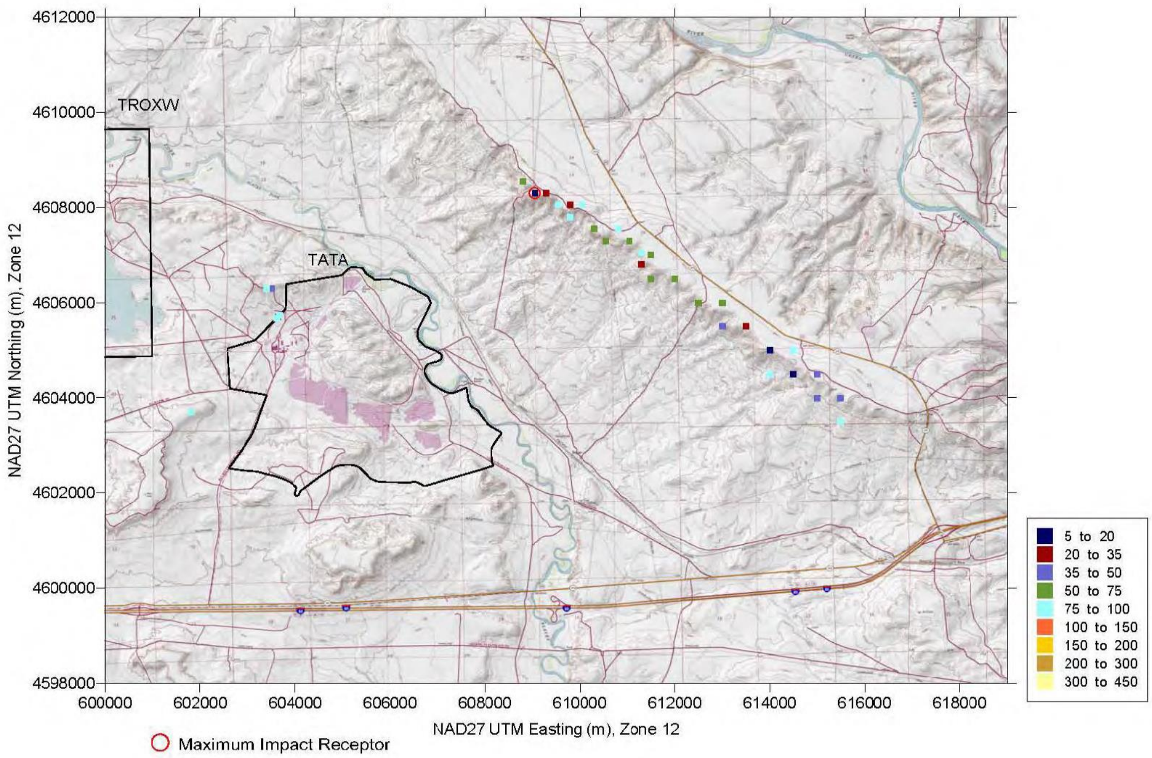

Figure 6-5C. Receptors Ranked by Relative Score Below 100 in Vicinity of TROXW and TATA Plants

36

Table 6-1. Combined Score of DV Rank and NDays Rank for the Top 20 Combine Score Rank Receptors.[1]

X (m)	Y (m)	NDV	DV Rank	NDays	NDays Rank	Score	Score Rank
614500.0	**4604500.0**	**7.94566**	**4**	**30**	**2**	**6**	**1**
609050.0	**4608300.0**	**8.71678**	**1**	**19**	**12**	**13**	**2**
614000.0	4605000.0	7.49686	10	28	5	15	3
609800.0	4608050.0	8.24389	3	17	17	20	4
611300.0	**4606800.0**	**7.47169**	**11**	**21**	**9**	**20**	**5**
613500.0	4605500.0	7.30772	15	20	10	25	6
609300.0	4608300.0	8.64439	2	13	29	31	7
615000.0	4604000.0	7.20620	18	16	20	38	8
615000.0	4604500.0	7.23606	17	15	23	40	9
615500.0	4604000.0	6.62676	40	30	3	43	10
603500.0	**4606300.0**	**7.43265**	**12**	**11**	**34**	**46**	**11**
613000.0	4605500.0	6.54698	43	29	4	47	12
613000.0	4606000.0	6.80264	31	16	19	50	13
608800.0	4608550.0	7.55660	8	10	44	52	14
610300.0	4607550.0	7.24193	16	11	36	52	15
603640.4	4605703.2	6.89290	28	14	24	52	16
612000.0	4606500.0	6.94740	24	12	33	57	17
611500.0	4606500.0	6.67669	37	15	22	59	18
611500.0	4607000.0	7.51315	9	9	53	62	19
612500.0	4606000.0	6.45470	48	16	18	66	20

1. The primary receptors in bold red text and the alternate receptors in bold blue text indicate potential monitoring station locations.

This analysis narrowed the receptors of interest down to a select few from the entire modeled grid of over 35,000 receptors. Based on the geographical distribution of the receptors shown in Figure 6-5C and the overall scores listed in Table 6-1, two potential primary monitor locations are identified, as well as two alternate locations. The primary and alternate locations are indicated respectively in bold red and blue text in the table, and are depicted in Figure 6-6. The first proposed primary monitor location is Score Rank 1, and represents the 4th highest DV rank and the 2nd highest NDays rank. This location is in the vicinity of several highly ranked receptors, and can represent the group of receptors in this area. The second proposed primary monitor location is the receptor with Score Rank 11 situated between TATA and TROXW. The first alternate location is the maximum modeled receptor with Score Rank 2, DV Rank of 1, and NDays Rank of 12. This is in the vicinity of several highly ranked receptors, and can represent the group of receptors in this area. The second alternate location is the receptor with Score Rank 5, almost directly east of TATA.

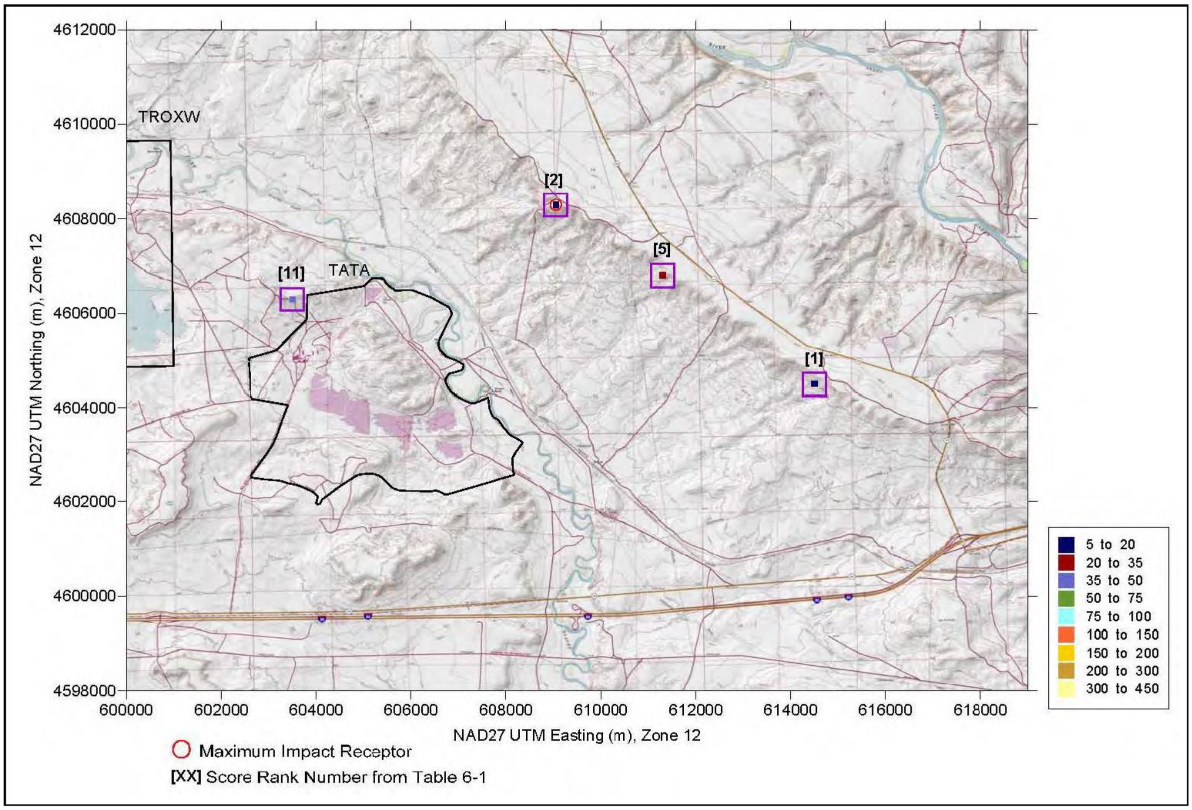

Figure 6-6. Proposed SO_2 Monitor Locations for the Central Green River Basin, with Relative Score and Score Rank

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7.0 Conclusions

A modeling analysis was conducted for the purpose of identifying potential source-oriented SO_2 monitoring site locations.

Two primary and two alternate monitoring locations were identified that reflect both relatively high NDVs as well as high frequency of occurrence. One primary and two alternate sites are along the ridge east of TATA and TROXW, and one primary site is located about 0.2 km west of TATA, between TATA and TROXW.

If WDEQ/AQD agrees with this assessment, the next phase of this analysis will be for the proposed primary monitoring sites to be surveyed to determine whether it is physically and technically feasible to place monitors at or near these locations. The two alternate locations should be evaluated if the feasibility study fails at one or both of the primary sites.

8.0 References

Fox, Tyler., 2011 Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard. U.S. Environmental Protection Agency, Research Triangle Park NC 27711, March 1, 2011.

McVehil-Monnett Associates, 2014: Modeling Protocol for the Identification of Potential Source-Oriented SO_2 Monitoring Locations for the Trona Patch Regional Area in the Green River Basin, Wyoming (May 2014), Englewood, Colorado.

Page, Stephen D., 2010: U.S. EPA Memorandum on Guidance Concerning the Implementation of the 1-Hour SO_2 NAAQS for the Prevention of Significant Deterioration Program. U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711. August 23, 2010.

U.S. Environmental Protection Agency, 2004: User's Guide for the AMS/EPA Regulatory Model-AERMOD, EPA-454/B-03-001, September 2004 (Addendum December 2006, Last Revised June 2015), Research Triangle Park, NC.

U.S. Environmental Protection Agency, 2004: User's Guide for the AMS/EPA Regulatory Model-AERMOD Meteorological Preprocessor (AERMET), EPA-454/B-03-002, November 2004 (Addendum November 2004, Last Revised June 2015), Research Triangle Park, NC.

U.S. Environmental Protection Agency, 2004: User's Guide for the AMS/EPA Regulatory Model-AERMOD Terrain Preprocessor (AERMAP), EPA-454/B-03-003, October 2004 (Addendum October 2004, Last Revised March 2011), Research Triangle Park, NC.

U.S. Environmental Protection Agency, 2008: AERSURFACE User's Guide, EPA-454/B-03-003, January 2008 (Last Revised January 2013), Research Triangle Park, NC.

U.S Environmental Protection Agency, 2005: Guideline on Air Quality Models, 40 CFR Part 51, Appendix W.

U.S. Environmental Protection Agency, 2013: SO_2 NAAQS Designations Modeling Technical Assistance Document , May 2013. Office of Air and Radiation, Office of Air Quality Planning and Standards, Air Quality Assessment Division, Research Triangle Park, NC.

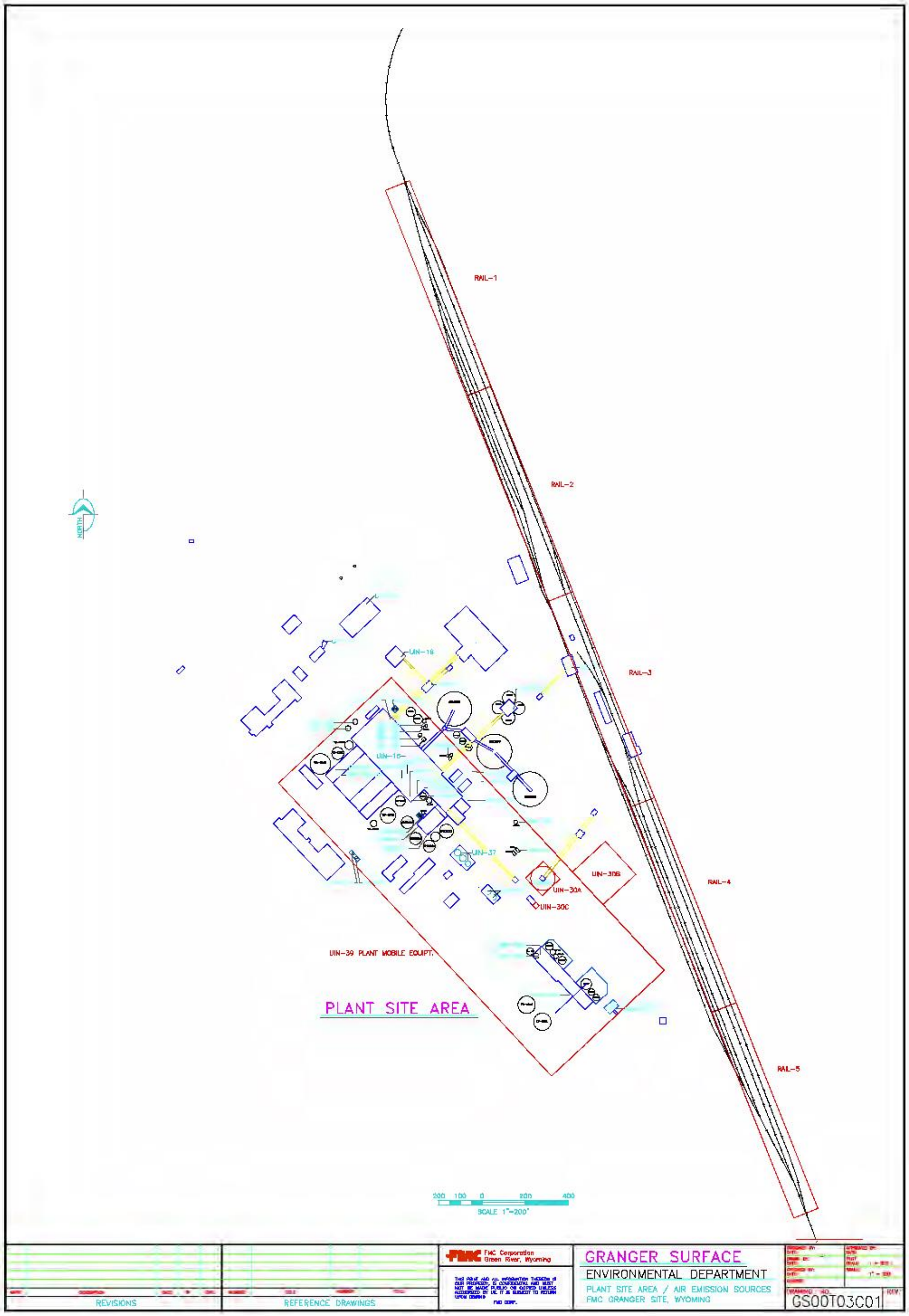
Wood, A.M., 2010: U.S. EPA Memorandum on General Guidance for Implementing the 1-hour NO2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO2 Significant Impact Level. U.S. Environmental Protection Agency, Research Triangle Park NC 27711. June 28, 2010.

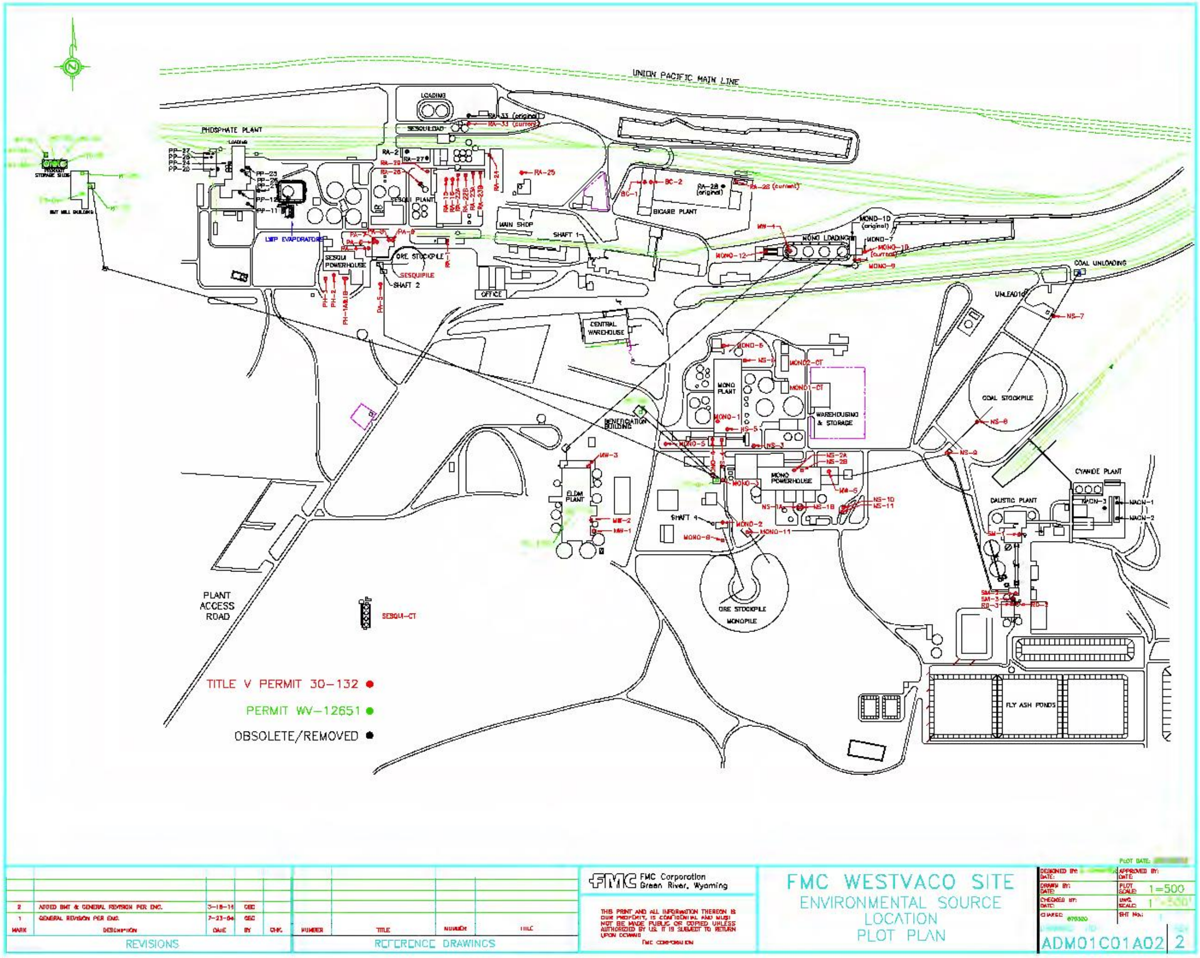
Wyoming Department of Environmental Quality/Air Quality Division, 2014: Guidance for Submitting Major Source/PSD Modeling Analyses. January 2014, WDEQ/AQD, Cheyenne, WY.

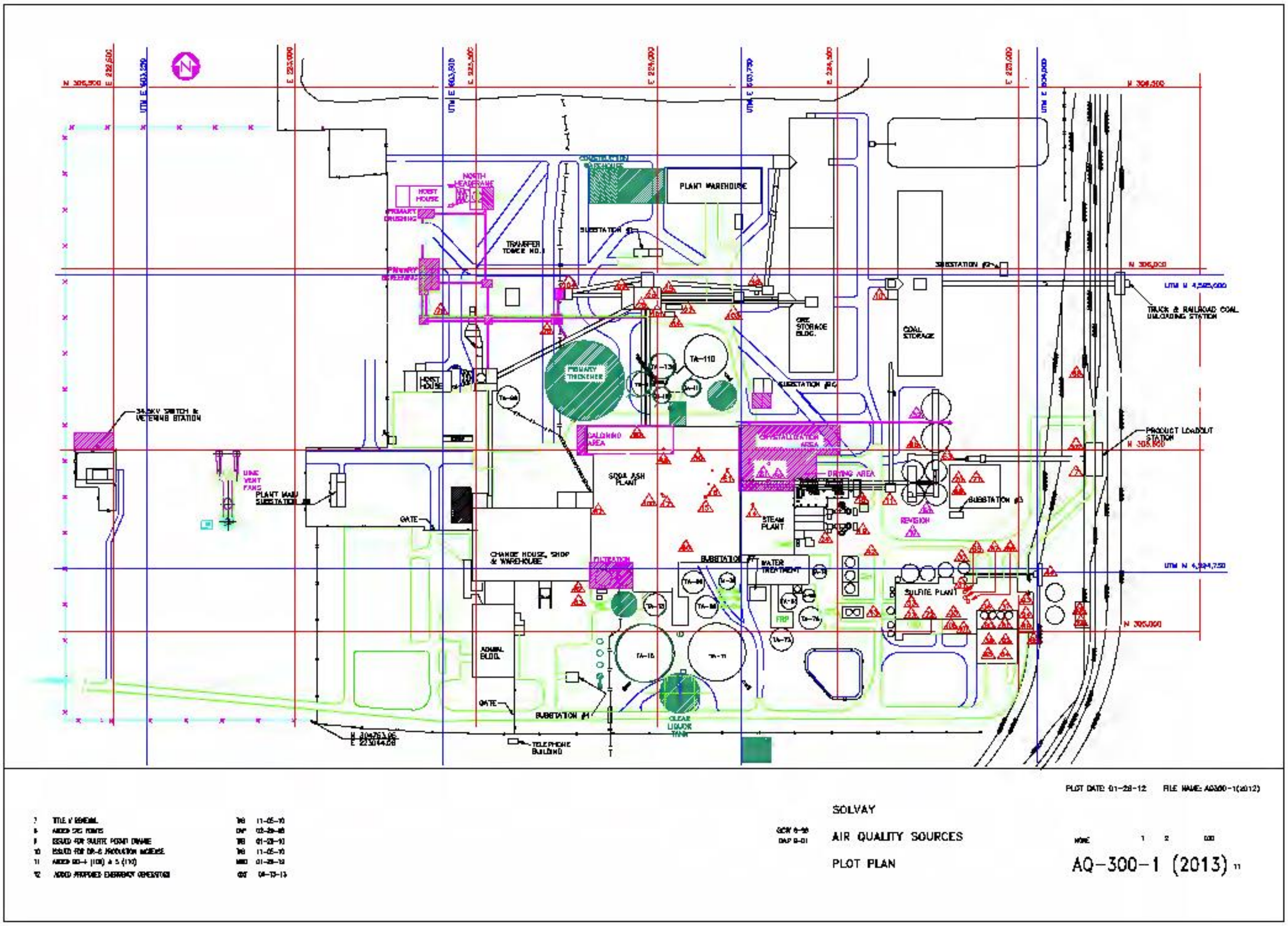
Wyoming Department of Environmental Quality/Air Quality Division, 2015: *AERMET Processing*, July 2015, WDEQ/AQD, Cheyenne, WY.

Appendix A

Plant Layout for TROX Granger, TROX Westvaco, Solvay and TATA


RAIL-1
RAIL-2
RAIL-3
RAIL-4
RAIL-5
NORTH
UIN-16
UIN-37
UIN-30B
UIN-30A
UIN-30C
UIN-39 PLANT MOBILE EQUIPT.
PLANT SITE AREA
200 100 0 200 400
SCALE 1"=200'
FMC Corporation
Green River, Wyoming
GRANGER SURFACE
ENVIRONMENTAL DEPARTMENT
PLANT SITE AREA / AIR EMISSION SOURCES
FMC GRANGER SITE, WYOMING
REVISIONS
REFERENCE DRAWINGS
GS00T03C01


UNION PACIFIC MAIN LINE
PHOSPHATE PLANT
SESQUI PLANT
MAIN SHOP
BICARB PLANT
MONO LOADING
COAL UNLOADING
SESQUI POWERHOUSE
ORE STOCKPILE
SESQUIPILE
SHAFT 2
OFFICE
CENTRAL WAREHOUSE
MONO PLANT
WAREHOUSING & STORAGE
COAL STOCKPILE
BENEFICIATION BUILDING
ELDM PLANT
MONO POWERHOUSE
CYANIDE PLANT
CAUSTIC PLANT
ORE STOCKPILE MONOPILE
FLY ASH PONDS
PLANT ACCESS ROAD
SESQUI-CT
TITLE V PERMIT 30-132
PERMIT WV-12651
OBSOLETE/REMOVED
2 ADDED BMT & GENERAL REVISION PER ENG. 3-18-14 GEC
1 GENERAL REVISION PER ENG. 7-23-04 GEC
MARK DESCRIPTION DATE BY CHK.
REVISIONS
NUMBER TITLE NUMBER TITLE
REFERENCE DRAWINGS
FMC Corporation Green River, Wyoming
THIS PRINT AND ALL INFORMATION THEREON IS OUR PROPERTY, IS CONFIDENTIAL AND MUST NOT BE MADE PUBLIC OR COPIED UNLESS AUTHORIZED BY US. IT IS SUBJECT TO RETURN UPON DEMAND
FMC CORPORATION
FMC WESTVACO SITE
ENVIRONMENTAL SOURCE LOCATION PLOT PLAN
PLOT SCALE: 1=500
ADM01C01A02
2


PLANT WAREHOUSE
TRANSFER TOWER NO.1
ORE STORAGE BLDG.
COAL STORAGE
TRUCK & RAILROAD COAL UNLOADING STATION
PRIMARY THICKENER
TA-110
SODA ASH PLANT
CALCINING AREA
CRYSTALLIZATION AREA
DRYING AREA
STEAM PLANT
WATER TREATMENT
SULFITE PLANT
PRODUCT LOADOUT STATION
CHANGE HOUSE, SHOP & WAREHOUSE
ADMIN. BLDG.
GATE
SUBSTATION #4
CLEAR LIQUOR TANK
TELEPHONE BUILDING
TA-15
TA-11
PLANT MAIN SUBSTATION
34.5KV SWITCH & METERING STATION
HOIST HOUSE
PLOT DATE: 01-28-12
SOLVAY
AIR QUALITY SOURCES
PLOT PLAN
AQ-300-1 (2013)

EMISSION POINTS – UPDATED: JUNE 2013

AQD#	NAME
2a	ORE CRUSHING BLDG. (BF–1)
6a	PRODUCT SILOS – TOP #1 (BF–31)
6b	PRODUCT SILOS – BOTTOM #1 (BF–33)
7	PRODUCT LOADOUT STATION (BF–32)
10	COAL CRUSHING STORAGE BLDG. (BF–35)
11	COAL CONVEYOR TRANSFER (BF–39)
14	BOILER COAL BUNKER AREA HOUSEKEEPING (BF–36)
15	DR–1&2 STEAM TUBE DRYERS (COMMON STACK) (WS–4) & (WS–5)
16	PRODUCT CLASSIFIERS (4) (BF–24)
17	A & B CALICINERS (COMMON STACK) (EP–1) & (EP–2)
18	#1 COAL – FIRED BOILER (EP–3) & (WS–7)
19	#2 COAL – FIRED BOILER (EP–4) & (WS–8)
24	BOILER FLY ASH SILO (BF–41)
25	ALKATEN CRUSHING (BF–54)
26	DR–3 ALKATEN DRYER & CONVEYING (BF–55)
27	ALKATEN LOADOUT AND BULK CONTAINERS (BF–56)
30	LIME BIN #1 (BF–507)

AQD#	NAME
31	LIME BIN #2 (BF–508)
33	SULFUR BURNER (WS–454)
35	SULFITE DRYER (WS–455)
36	SULFITE PRODUCT BIN #1 (BF–503)
37	SULFITE PRODUCT BIN #2 (BF–504)
38	SULFITE PRODUCT BIN #3 (BF–505)
42	SULFITE HCL TANK VENT (TA–423)
43	SULFUR STORAGE TANK (TA–501)
44	LIME UNLOADING (BF–509)
46	ORE TRANSFER STATION (BF–62)
48	GAS CALCINER (EP–5)
50	DRYER AREA (BF–84)
51	GAS PRODUCT DRYER (EP–6)
52	PRODUCT SILO – TOP (BF–79)
53	PRODUCT SILO – BOTTOM (BF–86)
54	T–200 SILO (BF–103)
62	CARBON (BF–100)

AQD#	NAME
63	PERLITE (BF–101)
64	SULFITE BLENDING #2 (BF–601)
65	SULFITE BLENDING #1
66	CARBON/PERLITE SCRUBBER (WS–9)
67	BOTTOM ASH (BF–42)
68	TRONA PRODUCT BAGGING SILO (BF–205)
70	SODIUM SULFITE BAGGING SILO (BF–206)
71	METABISULFITE BAGGING SILO (BF–201)
72	SODA ASH MBS FEED SILO (BF–700)
73	METABISULFITE DRYER (WS–701 PB–702)
76	"D" TRAIN ORE SCREENING BAGHOUSE
79	ORE TRANSFER POINT BAGHOUSE
80	"D" ORE CALCINER PRECIPITATOR
81	"D" TRAIN DRYER AREA BAGHOUSE
82	DR–6 PRODUCT DRYER PRECIPITATOR
88	TRONA PRODUCTS TRANSLOADING SYSTEM
89	BISULFITE SCRUBBER

AQD#	NAME
90	BLENDING BAG DUMP #1
91	BLENDING BAG DUMP #2
92	TRONA PRODUCTS BIN #2 (BF–506)
93	TRONA PRODUCTS RAIL LOADOUT (BF–501)
94	SULFITE LOADOUT (BF–765)
95	TRONA PRODUCTS LOADOUT BIN VENT (BF–521)
96	T–200 TP+ BIN BAGHOUSE (BF–550)
97	SODA ASH TP+ BIN BAGHOUSE (BF–551)
98	TP+ AREA BAGHOUSE (BF–564)
99	CRUSHER BAGHOUSE #2 (BF–75)
100	CALCINER COAL BUNKER BAGHOUSE (BF–37)
101	DR–7 TRONA PRODUCTS DRYER (BF–108)
102	T–200 RAIL LOADOUT (BF–109)
103	EAST RECYCLE/RECLAIM
104	WEST RECYCLE/RECLAIM
105	SAS DRYER #1 (BF–805)
106	SAS SILO BAGHOUSE #1 (BF–807)
107	SAS DRYER #2 (BF–812)
108	SAS SILO BAGHOUSE #2 (BF–814)

OTHER EMISSION POINTS

MV	MINE VENT (ME–10)
FRP	EMERGENCY FIRE PUMP (PU–76)
GND	EMERGENCY ELECTRICITY GENERATING C/S (EG–301)
EG–3	EMERGENCY SHAFT GENERATOR
EG–4a,c	MAIN SHAFT EMERGENCY SHAFT GENERATOR
E–3	GVBH COMPRESSOR

CTH	COOLING TOWERS HIGH FLOW (CT–1)
CTL	COOLING TOWERS LOW FLOW (T–501)
GNS	2 – STEAM PLANT EMERGENCY GENERATING (EG–1&2)
PB	EMERGENCY PONY BOILER (BO–3)
E–4	GM 8.2L GVBH PUMP
E–5	GM 4.3L GVBH PUMP

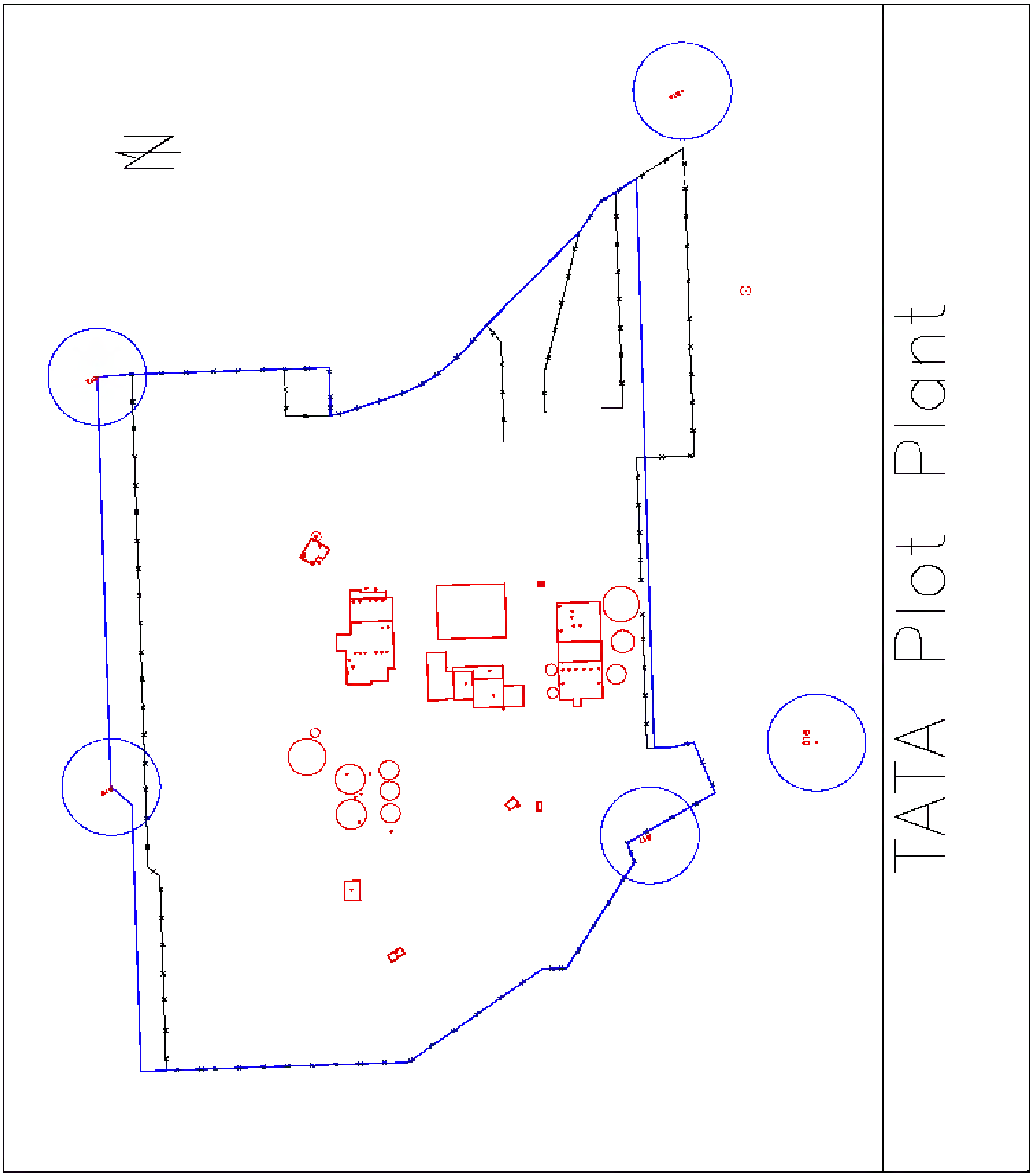
	GVBH FLARE
	DECA MELTER
EG–5a	Proposed Emergency Generator #1
EG–5b	Proposed Emergency Generator #2
EG–5c	Proposed Emergency Generator #3

01–28–12 000AQ204

SURFACE FACILITY

EMISSIONS PLOT PLAN NONE 1 1 000

DESCRIPTIONS 000–AQ–204


TATA Plot Plant

Appendix B

Ambient Air Boundary Justifications for TROX Granger, TROX Westvaco, Solvay and TATA

TROX Granger and TROX Westvaco

TRONOX

December 15, 2015

Jonathan Downing
Executive Director
Wyoming Mining Association
P.O. Box 866
Cheyenne, WY 82003

Subject: Tronox Ambient Air Boundaries for WMA SO2 Attainment Monitoring

Dear Mr. Downing:

The Wyoming Department of Environmental Quality – Air Quality Division (AQD) has requested that the WMA member companies participating in the WMA SO2 Attainment Monitoring project in the Green River Basin provide documentation on how each site's ambient air boundary is delineated on the ground. This documentation is to be included as an appendix to the McVehil-Monnett modeling report produced for the WMA monitoring model.

The ambient air boundaries (AAB) for the Tronox Westvaco (TROXW) and Granger (TROXG) sites are shown, at a large scale, in Figure 3-2 of the McVehil-Monnett model report. Smaller scale depictions of the respective AABs are depicted in the attached figures. The Westvaco AAB is delineated on the ground by postings (see attached photo) as approved in AQD's May 25, 2011 AAB change approval letter (copy attached). The Granger facility has not been required in the past to delineate it's AAB on the ground surface but plans to install postings similar to Westvaco's in 2016.

Posting of the AABs is preferred over fencing because of the remote location of the facilities and the abundance of wildlife in the area that can be negatively impacted by fencing. Migrating mule deer and antelope as well as resident greater sage grouse have all shown documented negative impacts from fencing.

Please let me know if you have any questions. Thank you for WMA's support in this project.

Sincerely,

Martin Stearns
Environmental Coordinator – Air and Waste

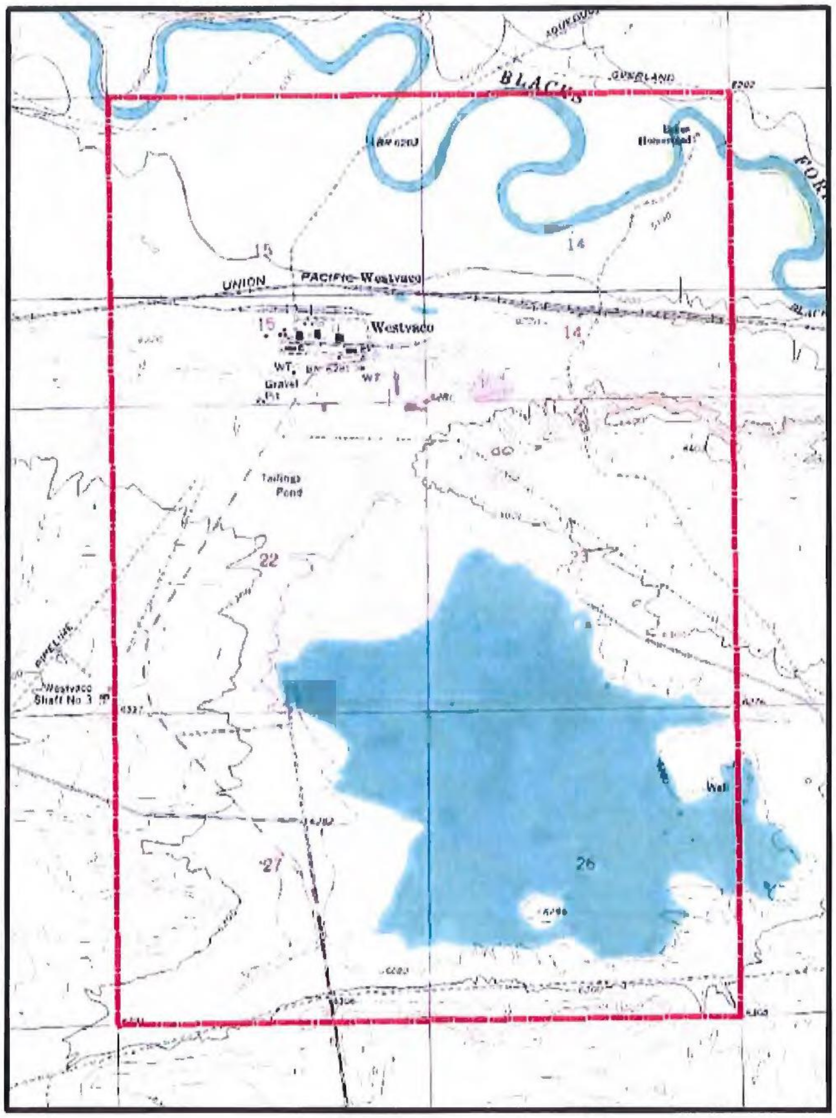
cc: John Lucas - Tronox

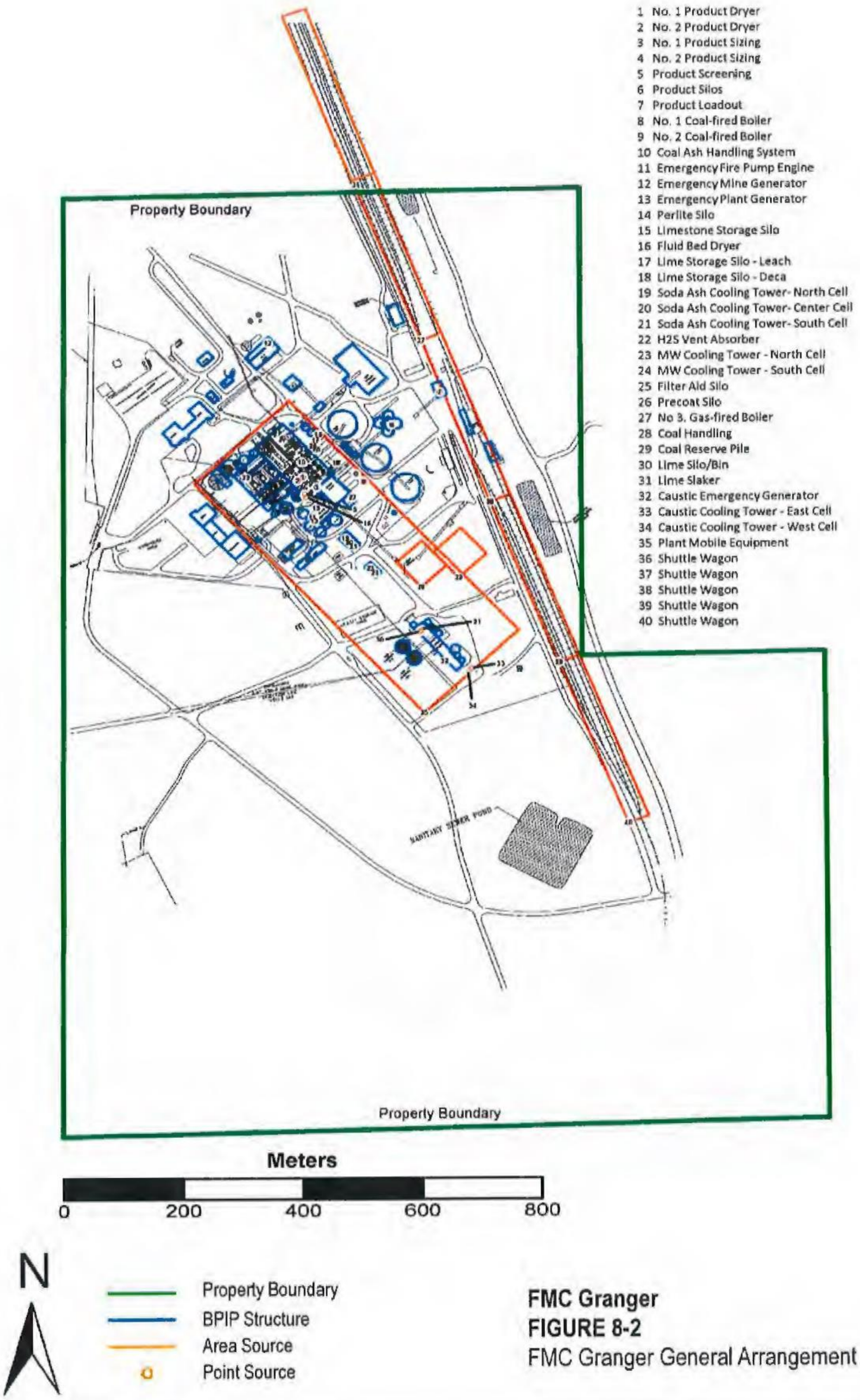
580 Westvaco Road, P.O. Box 872 • Green River, WY 82935
+1.307.875.2580

www.TRONOX.com

FMC Westvaco – Ambient Air Boundary
Page 2 of 2

Revised Ambient Air Boundary for FMC Westvaco





FMC Granger
FIGURE 8-2
FMC Granger General Arrangement

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Matthew H. Mead, Governor

John Corra, Director

FMC Corporation
Management
MAY 31 2011
Green River, WY

May 25, 2011

Mr. John Lucas
Environmental Team Leader
FMC Corporation
P. O. Box 872
Green River, WY 82935

Re: FMC Westvaco Ambient Air Boundary

Dear Mr. Lucas:

The Division of Air Quality (Division) of the Wyoming Department of Environmental Quality has reviewed your letter of May 5, 2011 that requests approval of a change to the ambient air boundary for the Westvaco plant. Based on that letter and our conference call of May 24, 2011, the Division has approved a revision to the ambient air boundary for Westvaco. The extent of the new boundary is shown in the figure below. The Division approves the new boundary for use in future air quality permitting actions for the plant, provided that FMC restricts access to the area within the boundary with fencing or postings to inform the public. If we may be of further assistance to you, please feel free to contact this office.

Sincerely,

Steven A. Dietrich

Steven A. Dietrich
Administrator
Air Quality Division

cc: Tony Hoyt
FMC Westvaco Compliance File

Herschler Building · 122 West 25th Street · Cheyenne, WY 82002 · http://deq.state.wy.us

ADMIN/OUTREACH	ABANDONED MINES	AIR QUALITY	INDUSTRIAL SITING	LAND QUALITY	SOLID & HAZ. WASTE	WATER QUALITY
(307) 777-7758	(307) 777-6145	(307) 777-7391	(307) 777-7369	(307) 777-7756	(307) 777-7752	(307) 777-7781
FAX 777-7682	FAX 777-6462	FAX 777-5616	FAX 777-6937	FAX 777-5864	FAX 777-5973	FAX 777-5973


AMBIENT AIR
BOUNDARY
FMC

Solvay

SOLVAY

December 14, 2015

Jonathan Downing
Executive Director
Wyoming Mining Association
P.O. Box 866
Cheyenne, WY 82003

RE: Public Access to Solvay Chemicals, Inc.'s Ambient Air Boundary

Mr. Downing:

Solvay Chemicals, Inc. is an environmentally responsible company concerned with the health and welfare of the public and its employees. Solvay Chemicals, Inc. (Solvay) operates a trona mine and soda ash and derivatives processing facility in Southwestern Wyoming, approximately 20 miles west of Green River, WY. The facility is located in the NE1/4 of Section 31, T18N, R109W. The closest residence to the facility is the Bonomo Ranch, located on the Blacks Fork river approximately two and a half miles east of the ambient air boundary.

In order to improve miners' safety and reduce greenhouse gas emissions, Solvay operates a Mine Waste Methane Recovery (MARS) system. This project includes the use of various small engines throughout the current approximately 2,700 acre ambient air boundary. The MARS system develops and expands with the expansion of the mine encompassing additional area as the mine advances. Thus, the facility's ambient air boundary has been expanded to include this system.

Furthermore, the facility is located in an area commonly referred to as the "checkerboard" where land section ownership alternates between public and private and the land provides vast open habitat for several wildlife species including: the pronghorn antelope and the Greater sage grouse. Since many of the leases within Solvay's ambient air boundary reside on public land, Solvay is obligated to abide by the Governor's Executive Order regulations for the preservation of these species and fences restricting this free range would not be allowed.

In addition, this area is also open range and utilized for the grazing of mainly sheep and cattle. These land uses in conjunction with the need for an extended ambient air

Solvay Soda Ash Joint Venture, 400 County Road 85, PO Box 1167, Green River, WY 82935 • 307-875-6500
www.solvay.com

boundary to provide for the safety of Solvay's miners prohibits the fencing of the facility's ambient air boundary.

However, Solvay is committed to providing its employees and the public with information relevant to their health and welfare. Therefore in order to alert the public, Solvay has installed ambient air boundary marker signs at all main roads entering the ambient air boundary. Enclosed please find a map showing the facility's ambient air boundary and the placement of the ambient air boundary marker signs.

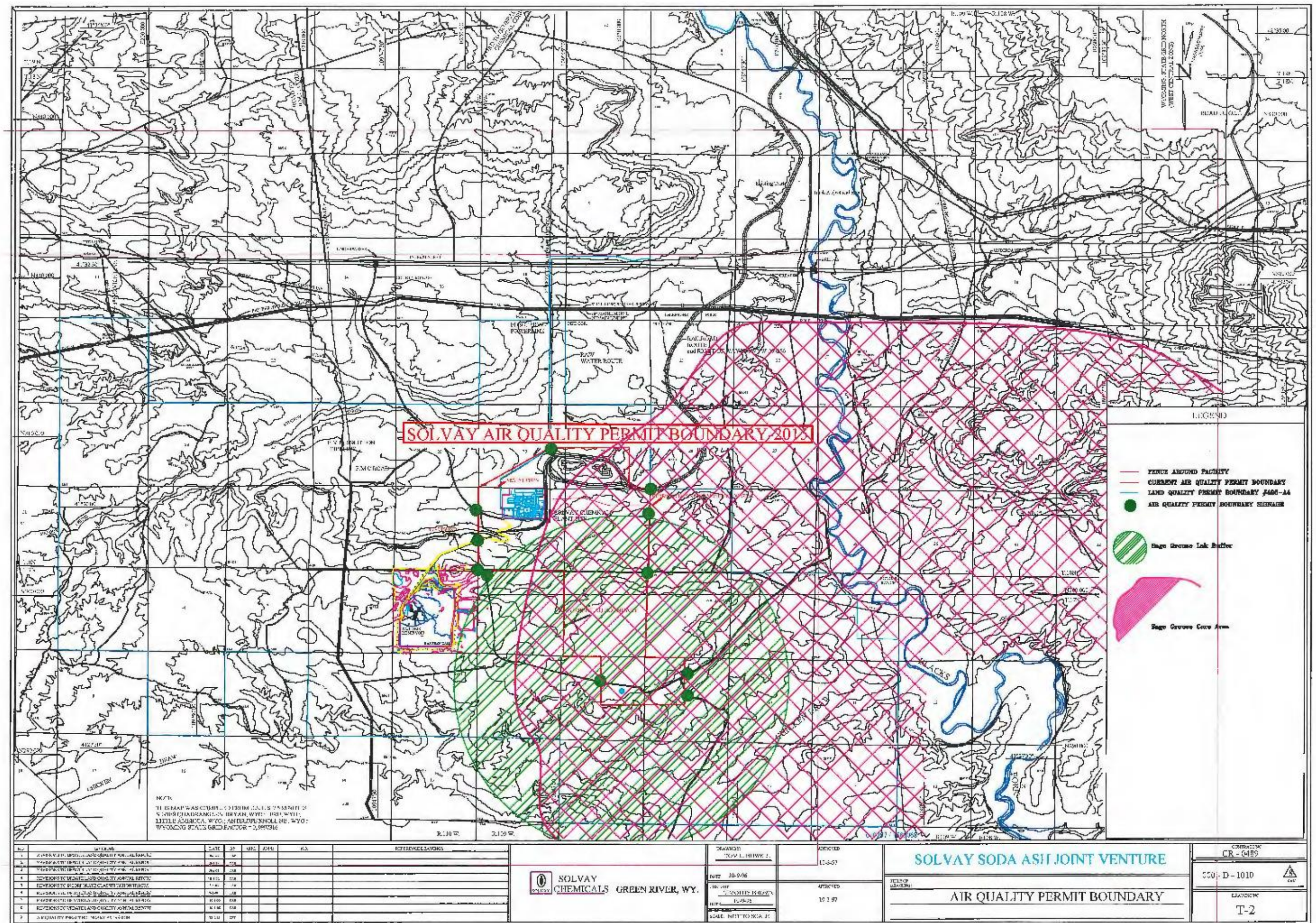
If you have any questions, please contact me at (307) 872 – 6571.

Respectfully submitted,

Ouisha Dean
Environmental Engineer

Enclosures
Cc: Tony Hoyt

Solvay Soda Ash Joint Venture, 400 County Road 85, PO Box 1167, Green River, WY 82935 • 307-875-6500
www.solvay.com


SOLVAY AIR QUALITY PERMIT BOUNDARY 2013
LEGEND
FENCE AROUND FACILITY
CURRENT AIR QUALITY PERMIT BOUNDARY
AIR QUALITY PERMIT BOUNDARY SIGNAGE
Sage Grouse Lek Buffer
Sage Grouse Core Area
SOLVAY CHEMICALS GREEN RIVER, WY.
SOLVAY SODA ASH JOINT VENTURE
AIR QUALITY PERMIT BOUNDARY
CR - 0489
D - 1010
T-2

TATA

December 18, 2015

Mr. Jonathan Downing
Executive Director
Wyoming Mining Association
P.O. Box 866
Cheyenne, Wyoming 82002

RE: Tata Chemicals (Soda Ash) Partners Ambient Air Boundary

Dear Mr. Downing-

Tata Chemicals (Soda Ash) Partners (Tata) is participating in the WMA 1-Hour SO_2 Attainment Monitoring project in the Green River Basin. As part of this project, the Wyoming Department of Environmental Quality Air Quality Division (AQD) has indicated that each WMA participating member must provide adequate documentation to support their ambient air boundary (AAB) location. Tata is submitting this letter and the attached map as a supplement to the McVehile-Monnett modeling report to help support the delineation of the Tata ambient air boundary.

Tata continues to make protection of the health and welfare of the public, employees, and the environment a top priority. Tata's environmental responsibility includes the preservation of wildlife and habitat, especially when it comes to greater sage-grouse mule deer, and pronghorn. As part of meeting this responsibility, Tata has embarked on a entering into a Candidate Conservation Agreement with Assurances / Habitat Conservation Plan for the greater sage-grouse with integrated Candidate Conservation Agreement / Section 7 Strategy with the U.S. Fish and Wildlife Service. This agreement has been submitted under the Wyoming Mining Natural Resource Foundation on behalf of Tata and other trona industry participants. In addition to this conservation initiative, it is also a stipulation for Tata to protect othe greater sage-grouse and its core habitat under Executive Order 2015-4 *Greater Sage-Grouse Core Area Protection*.

In order to meet these wildlife and habitat protection initiatives and provide the necessary means for an adequate ambient air boundary, important decisions on implementation are necessary. Tata has determined that physical barriers, such as fencing, could be detrimental to the protection of wildlife, crucial habitat, and migration corridors in this remote location. Therefore, Tata proposes the ambient air boundary outlined in the attached map be delineated by more wildlife friendly means such as posted signs and the use of existing natural physical barriers or roads.

TATA CHEMICALS (SODA ASH) PARTNERS

20 Miles West of Green River • P.O. Box 551 • Green River, Wyoming 82935-0551
Telephone 307-875-3350

Mr. Jonathan Downing
December 18, 2015
Page 2

In addition, the BLM definition of "open areas" is being referenced to help in the AAB decision. This means that man-made disturbances will be limited to existing roads and the use of posted signs has been chosen to provide the best protection for ungulate migration corridors and sage-grouse habitat, while still limiting public access.

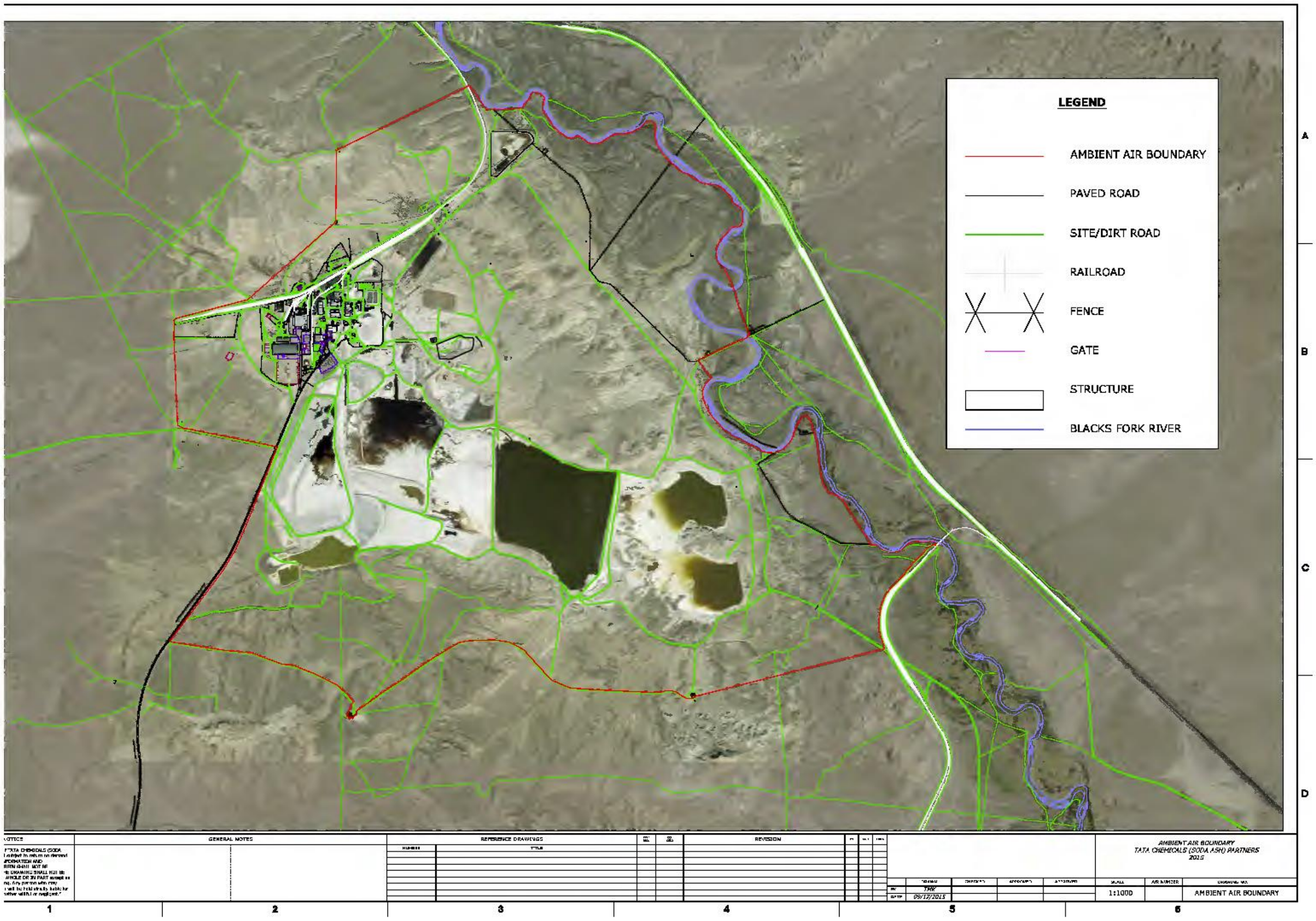
We are interested in any comments or requests for additional information in the 1-Hour SO_2 Attainment Monitoring project and we appreciate WMA's support. Should you have any questions or require additional information, please do not hesitate to contact me via telephone at (307) 872-3441, or via email at cmueller@tatachemicals.com

Sincerely,

Casey Mueller
Supervisor of Environmental Engineering

Attachment

CC: Karl Cleary – TATA Technical Manager, w/attachment
Steve Dietrich – TATA Environmental Manager, w/attachment


LEGEND
AMBIENT AIR BOUNDARY
PAVED ROAD
SITE/DIRT ROAD
RAILROAD
FENCE
GATE
STRUCTURE
BLACKS FORK RIVER
A
B
C
D
GENERAL NOTES
REFERENCE DRAWINGS
REVISION
AMBIENT AIR BOUNDARY
TATA CHEMICALS (SODA ASH) PARTNERS
2015
TMK
09/12/2015
1:1000
AMBIENT AIR BOUNDARY
1
2
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5
6