Missouri Department of Natural Resources
Air Pollution Control Program
2016 Monitoring Network Plan

November 15, 2016

TABLE OF CONTENTS

SUMMARY OF PROPOSED CHANGES

Missouri's Monitoring Network Plan discusses the following recent and proposed changes in detail in the sections below:

- Proposed discontinuation of lead monitoring at the Pevely North site.
- Reduction in lead sampling frequency from every third day to every sixth day at St. Joe State Park.
- Discontinuation of TSP lead sampling at the Blair Street NCore site; completed as proposed in the 2015 Monitoring Network Plan following finalization of the monitoring rule.
- Proposed discontinuation of lead monitoring at the Bills Creek site.
- Sulfur dioxide (SO_2) monitoring began in 2015 in the areas around the Labadie and Rush Island Energy Centers; these sites are classified as Industrial Monitoring Stations. An additional Industrial SO_2 Monitoring Station will be installed southwest of the Labadie Energy Center and begin operation by January 1, 2017, and an additional Industrial SO_2 Monitoring Station will be installed north of the Labadie Energy Center with a target date to begin operation by January 1, 2017.
- Industrial SO_2 monitoring is planned to begin by January 1, 2017 in the area around the Doe Run Buick Resource Recovery facility to meet the requirements of the SO_2 Data Requirements Rule (DRR).
- Industrial SO_2 monitoring is planned to begin by January 1, 2017 in the area around the Noranda Aluminum facility to meet the requirements of the SO_2 DRR.
- Proposed discontinuation of SO_2 monitoring at the South Charleston and James River South sites in Springfield.
- Changes in designation of primary and collocated $PM_{2.5}$ instruments at Blair Street and discontinuation of collocated FRM $PM_{2.5}$ sampler at Troost; these changes were in accordance with provisions in the finalized monitoring rule.
- A 1405-F FEM $PM_{2.5}$ instrument and collocated FRM sampler are being installed at the Ladue site.
- Discontinuation of the IMPROVE protocol sampling system at El Dorado Springs in January 2016 as a result of IMPROVE network evaluation and recommended changes.
- The $PM_{2.5}$ instrument at Missouri State University (MSU) in Springfield was relocated to the Hillcrest High School site because of development on the MSU site.
- Ozone monitoring will begin in March (instead of April) in 2017 as a result of the finalized monitoring rule.
- Evaluation of PM_{10} data from the 1405-DF FEM instruments continues; once these data are determined to be acceptable, modification of distribution of PM_{10} instruments at existing sites will be proposed.
- A collocated PM_{10} monitor was installed at the Carthage site in April 2016.
- The PM_{10} low volume samplers at Troost and St. Joseph Pump Station will be replaced with TEOM-1400ab FEM monitors.
- The photolytic nitrogen dioxide (NO_2) instrument that was being evaluated at Forest Park has been moved to Blair Street and is the primary instrument.

- The Foley monitoring site will be moved from its current location for logistical reasons. It will be relocated to a nearby site within less than 4 kilometers of the current site and representative of the same air mass.

HOW TO MAKE PUBLIC COMMENTS CONCERNING THIS PLAN

The Monitoring Network Plan, Revision 0 was originally posted for comment on May 27, 2016 and comments accepted through June 28, 2016. Comments received and response to comments are included as Appendix 6 to this revised plan. This revised Monitoring Network Plan (Revision 1) has been revised only to include two additional SO_2 monitoring stations southwest and north of the Labadie Energy Center and to provide information currently available on the required relocation of the Foley monitoring station. Comments concerning this revision to the Monitoring Network Plan may be sent electronically to: cleanair@dnr.mo.gov or in writing to the following address and must be received by close of business December 15, 2016:

Missouri Department of Natural Resources
Air Pollution Control Program
Air Quality Analysis Section/Air Monitoring Unit
P.O. Box 176
Jefferson City, MO 65102

INTRODUCTION

The Missouri Department of Natural Resources operates an extensive network of ambient air monitors to comply with the Clean Air Act and its amendments. The Ambient Air Quality Monitoring Network for the State of Missouri consists of State and Local Air Monitoring Stations (SLAMS), Special Purpose Monitoring (SPM) Stations, and National Core (NCore) monitoring consistent with requirements in federal regulation 40 CFR 58.

40 CFR 58.10 requires that states submit to EPA an annual monitoring network plan including any proposed network changes. 40 CFR 58.14 states that the monitoring network plan submitted one year after a network assessment should also meet the requirements for a network modification plan. A network assessment was completed in 2015; therefore, this document is intended to meet the requirements for a network modification plan as well as the requirement for an annual monitoring network plan. 40 CFR 58.10 also requires that the plan include a statement of whether the operation of each monitor meets the requirements of appendices A, B, C, D, and E of 40 CFR 58 where applicable. All of the monitors in the Missouri air monitoring network, including those operated by the State and those operated by industries under State review meet the applicable requirements of 40 CFR 58. With regard to state and local air monitoring station changes, approval by the Environmental Protection Agency Regional Administrator is required.

The plan must contain the following information for each monitoring station in the network; most of this information is listed for each site in Appendix 1; number 5 is addressed in the body of this document:

1. The Air Quality System site identification number for existing stations.
2. The location, including the street address and geographical coordinates, for each monitoring station.
3. The sampling and analysis method used for each measured parameter.
4. The operating schedule for each monitor.
5. Any proposal to remove or move a monitoring station within a period of eighteen months following the plan submittal.
6. The monitoring objective and spatial scale of representativeness for each monitor.
7. The identification of any sites that are or are not suitable for comparison against the annual $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS).
8. The metropolitan statistical area, core-based statistical area, combined statistical area or other area represented by the monitor.

Network Design

Federal regulation (40 CFR Part 58) establishes the design criteria for the ambient air monitoring network. The network is designed to meet three general objectives:

- Provide air pollution data to the public in a timely manner.
- Support compliance with ambient air quality standards and emissions strategy development.
- Support air pollution research studies.

Specific objectives for the monitoring sites are to determine the highest pollution concentrations in an area, to measure typical concentrations in areas of high population density, to determine the impact of significant sources or source categories, to determine general background levels and to determine the extent of regional pollutant transport among populated areas. Minimum site requirements are provided for ozone, sulfur dioxide, CO, NO_2, PM_{10} and $PM_{2.5}$ based on Core Based Statistical Area (CBSA) population.

Appendix E to Part 58 establishes the specific requirements for monitor/probe siting to ensure the ambient data represents the stated objectives and spatial scale. The requirements are pollutant/scale specific and involve horizontal/vertical placement. Periodically, department staff visit and evaluate each monitoring site to ensure that each site continues to meet the requirements of 40 CFR 58 Appendix E. Any issues related to probe siting, such as growth of trees or other vegetation, are addressed by taking appropriate action following the site visits. Documentation of these reviews is maintained on file. Additional details concerning the sites may be found in Appendix 1.

There is only one $PM_{2.5}$ monitor in Missouri that is not applicable for comparison to the annual NAAQS. The Branch Street site is a middle-scale site focused on a group of sources in the industrial riverfront area and is not representative of neighborhood or larger spatial scale for

$PM_{2.5}$ monitoring. The $PM_{2.5}$ monitors deployed to collocate with the near-roadway NO_2 monitors are micro-scale monitors, but EPA has indicated in 40 CFR 58 Appendix D, 4.7.1(c)(2) that "…In many situations, monitoring sites that are representative of microscale or middle-scale impacts are not unique and are representative of many similar situations. This can occur along traffic corridors or other locations in a residential district. In this case, one location is representative of a number of small scale sites and is appropriate for evaluation of long-term or chronic effects." these monitors may be considered by EPA to be representative of larger areas near roadways and comparable to the annual $PM_{2.5}$ NAAQS consistent with 40 CFR 58.30.

Unanticipated Network Modifications

Changes to the monitoring network may occur outside the annual monitoring network planning process due to unforeseen circumstances resulting from severe weather, natural events, changes in property ownership, or other situations that occur after the monitoring plan has been posted for public inspection and approved by the EPA Regional Administrator. Any changes to the network that result due to conditions outside the state's logistical control and not included in the current monitoring network plan will be communicated in writing to EPA Region VII staff and identified in the subsequent annual monitoring network plan.

Special Purpose Monitors (SPM)

Consistent with 40 CFR 58.20 (a) "An SPM is defined as any monitor included in an agency's monitoring network that the agency has designated as a special purpose monitor in its annual monitoring network plan and in AQS, and which the agency does not count when showing compliance with the minimum requirements of this subpart for the number and siting of monitors of various types. "

Special purpose monitors may be established for many different purposes, including but not limited to, NAAQS compliance evaluation, air quality research and characterization, air quality investigation, and monitoring method evaluation.

The department includes SPMs in the annual monitoring network plan required by §58.10. The department installs and approves the installation of these monitors consistent with 40 CFR 58.20 (f). In addition, the department removes, or allows removal of these monitors, following federal guidelines. There is more description of each SPM later in the document. The Missouri Monitoring Network Description, Appendix 1, identifies which monitors are SPM and which are SLAMS.

Industrial Monitors

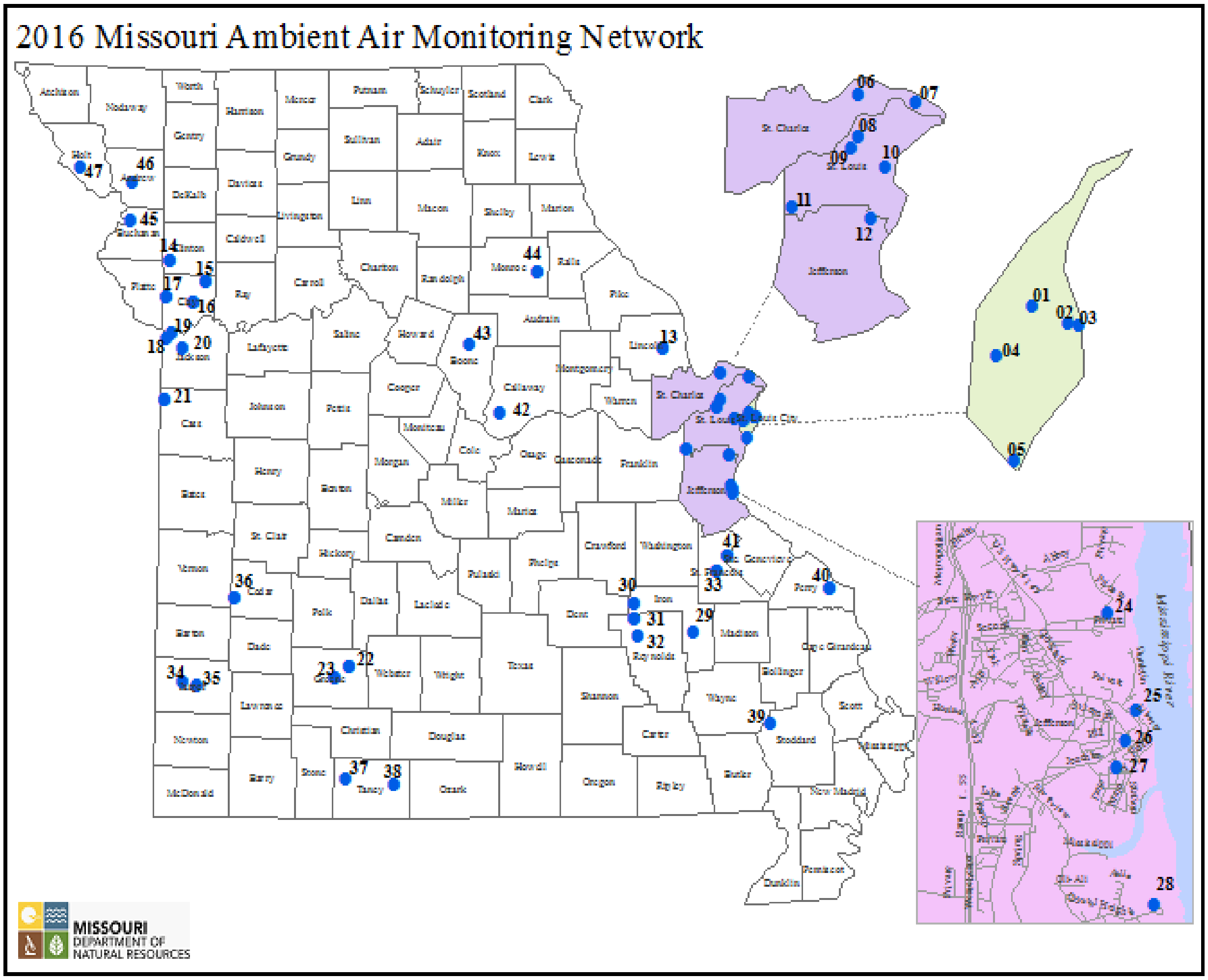
Ambient air monitoring sites classified as Industrial in this plan indicate that the ambient air monitoring at that site is being conducted by the industrial source or its contractor under an approved industrial monitoring Quality Assurance Project Plan (QAPP) and departmental Quality Management Plan (QMP). Department staff conducts quality assurance audits of these monitoring sites consistent with the approved QAPP.

For decades Missouri has overseen ambient air monitoring sites operated by industrial sources for NAAQS compliance. The department has incorporated these Industrial sites in the annual Monitoring Network Plans. Currently, industrial monitoring for some lead and SO_2 sites is incorporated in the ambient air monitoring network.

Some industrial monitoring sites in the lead network are classified in AQS as non-regulatory due to the sites having transitioned to non-ambient status. However, the department has required continued monitoring at these locations in agreements with the industrial source for trends analysis or other purposes.

2016 AMBIENT AIR MONITORING NETWORK, STATE SITES

The 2016 statewide monitoring network is shown below in the map and table.



Legend (State's Monitoring Network)

St. Louis Area

Site#	Site Name	Parameter Monitored
01	Margaretta	PM_{10}, SO_2, NO_2, NO_x, NO, IT
02	Blair Street	PM_{10}, $PM_{10\text{-}LC}$, $PM_{2.5}$, $PM_{2.5}$(Spec), PMCoarse, O_3, SO_2, NO_2, NO_y, NO_x, NO, CO, Carbonyls, PAHs, VOCs, Air Toxics, Carbons, PM_{10} Metals, WS, WD, OT, IT, SR, BP, RH
03	Branch Street	PM_{10}, $PM_{10\text{-}LC}$, $PM_{2.5}$, PMCoarse, WS, WD, OT, IT, BP, RH
04	Forest Park	$PM_{10\text{-}LC}$, $PM_{2.5}$, PMCoarse, NO_2, NO_x, NO, CO, BC, WS, WD, OT, IT, SR, BP, RH, Prec
05	South Broadway	PM10, PM10-LC, PM2.5, PMCoarse, IT, BP, RH
06	Orchard Farm	O3, IT
07	West Alton	O3, WS, WD, OT, IT, SR
08	Rider Trail I-70	NO2, Nox, NO, WS, WD, OT, IT, SR, Prec, SO2 (RES)
09	Maryland Heights	O3, IT
10	Ladue	PM2.5, WS, WD, OT, IT, BP, RH
11	Pacific	O3, WS, WD, OT, IT
12	Arnold West	PM10, PM10-LC, PM2.5, PM2.5(Spec), IT PMCoarse, O3, WS, WD OT, IT, BP, RH
13	Foley*	O3, WS, WD, IT

Kansas City Area

Site#	Site Name	Parameter Monitored
14	Trimble	O3, IT
15	Watkins Mill	O3, IT
16	Liberty	PM10-LC PM2.5, PMCoarse, O3, WS, WD, OT, IT, SR, BP, RH
17	Rocky Creek	O3, IT
18	Troost	PM10, PM2.5, SO2, NO2, Nox, OT, IT
19	Front Street	PM10
20	Blue Ridge I-70	PM10-LC, PM2.5, PMCoarse, NO2, Nox, NO, CO, BC, WS, WD, OT, IT, SR, BP, RH, Prec
21	Richards Gebaur-South	PM10-LC, PM2.5, PMCoarse, O3, WS, WD, OT, IT, BP, RH

Springfield Area

Site#	Site Name	Parameter Monitored
22	Fellows Lake	O_3, IT
23	Hillcrest High School	O_3, PM_{10}, $PM_{10\text{-}LC}$, $PM_{2.5}$, PMCoarse, OT, IT, BP, RH

Herculaneum Area

Site#	Site Name	Parameter Monitored
24	Pevely	Pb
25	Sherman	Pb
26	Dunklin High School	Pb
27	Mott Street	Pb
28	Ursuline North	Pb

New Lead Belt Area

Site#	Site Name	Parameter Monitored
29	Glover	Pb
30	Buick NE	Pb, SO2, WS, WD, IT
31	Oates	Pb
32	Fletcher	Pb
33	St. Joe State Park	Pb

Outstate Area

Site#	Site Name	Parameter Monitored
34	Alba	O3, IT
35	Carthage	PM10, WS, WD, IT
36	El Dorado Springs	PM10-LC, PM2.5, PMCoarse, O3, WS, WD, OT, IT, BP, RH
37	Branson	O3, WS, WD, IT
38	Hercules Glades	PM2.5 (Spec)-IMPROVE
39	Mingo	PM2.5 (Spec)-IMPROVE
40	Farrar	O3, IT
41	Bonne Terre	O3
42	New Bloomfield	O3, IT
43	Finger Lakes	O3, IT
44	Mark Twain State Park	PM10, SO2, NO2, Nox, NO, O3, WS, WD, IT
45	St. Joseph Pump Station	PM10, PM10-LC, PM2.5, PMCoarse WS, WD, OT, IT, RH
46	Savannah	O3, WS, WD, IT
47	Forest City, Exide	Pb

*To be relocated

Acronym

PM_{10}	Particulate Matter (Diameter size ≤10 micrometer
PM10-LC	PM10 Local Condition
PM2.5	Particulate Matter (Diameter size ≤2.5 micrometer)
PMCoarse	Particulate Matter (Diameter size between 2.5 and 10 micrometer)
Spec	Speciation
SO2	Sulfur Dioxide
NO2	Nitrogen Dioxide
NO	Nitric Oxide
NOy	Reactive Oxides of Nitrogen
NOx	Oxides of Nitrogen
CO	Carbon Monoxide
Pb	Lead (High Volume)
BC	Black Carbon
Prec	Precipitation
WS	Resultant Wind Speed
WD	Resultant Wind Direction
OT	Outside Temperature
IT	Inside Temperature
SR	Solar Radiation
BP	Barometer Pressure
RH	Relative Humidity
IMPROVE	Interagency Monitoring of Protected Visual Environment (Regional Haze)
RES	Research

Notes:

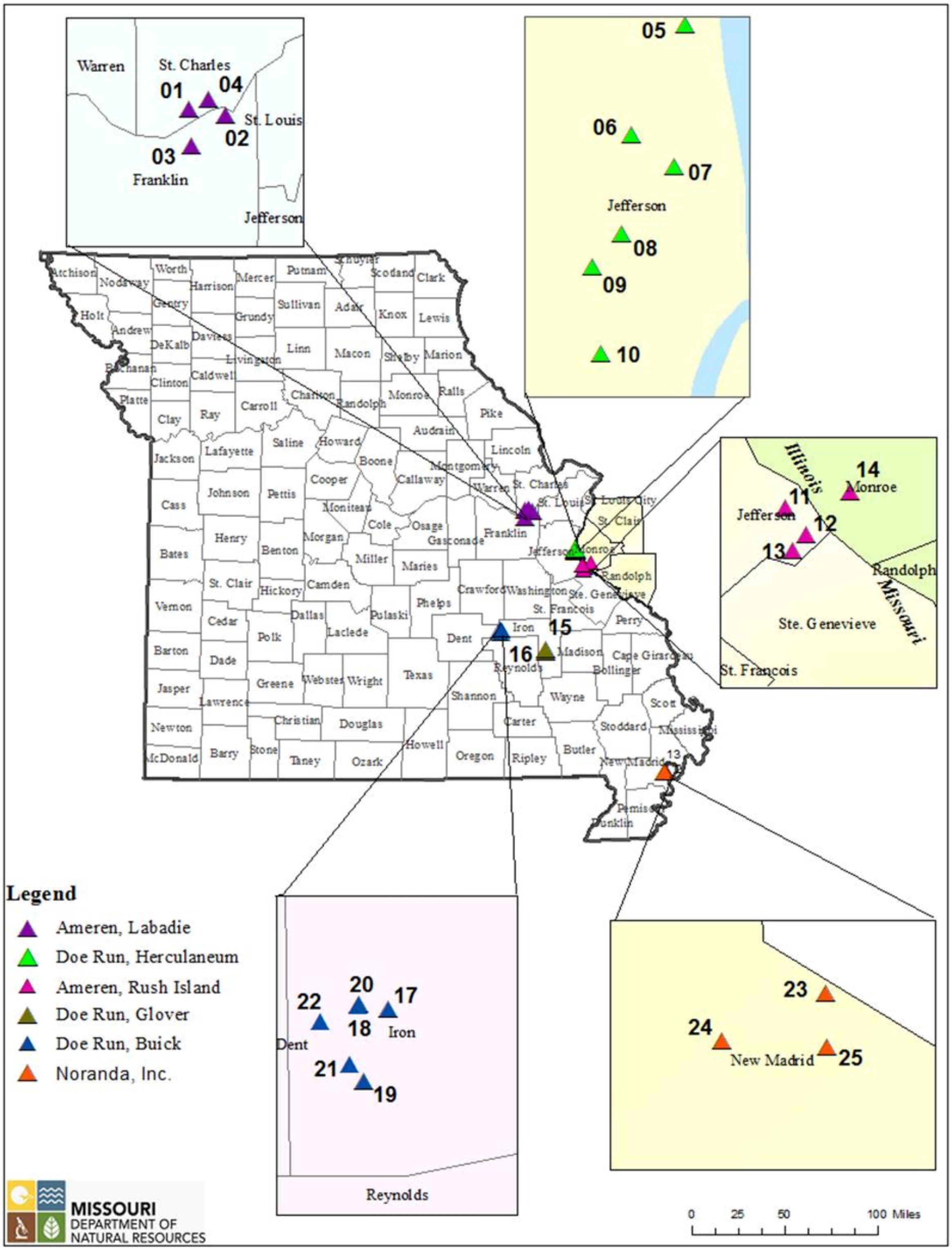
a. The acronym $PM_{10\text{-}LC}$ is also commonly referred to as PM_{10c} when collected with a low volume sampler consistent with appendix O to Part 50. $PM_{10\text{-}LC}$ means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers where the concentration is reported at local conditions of ambient temperature and barometric pressure. $PM_{10\text{-}LC}$ is used in this document to describe any continuous or filter based PM_{10} low volume measurement concentration that is reported at local conditions of ambient temperature and barometric pressure.

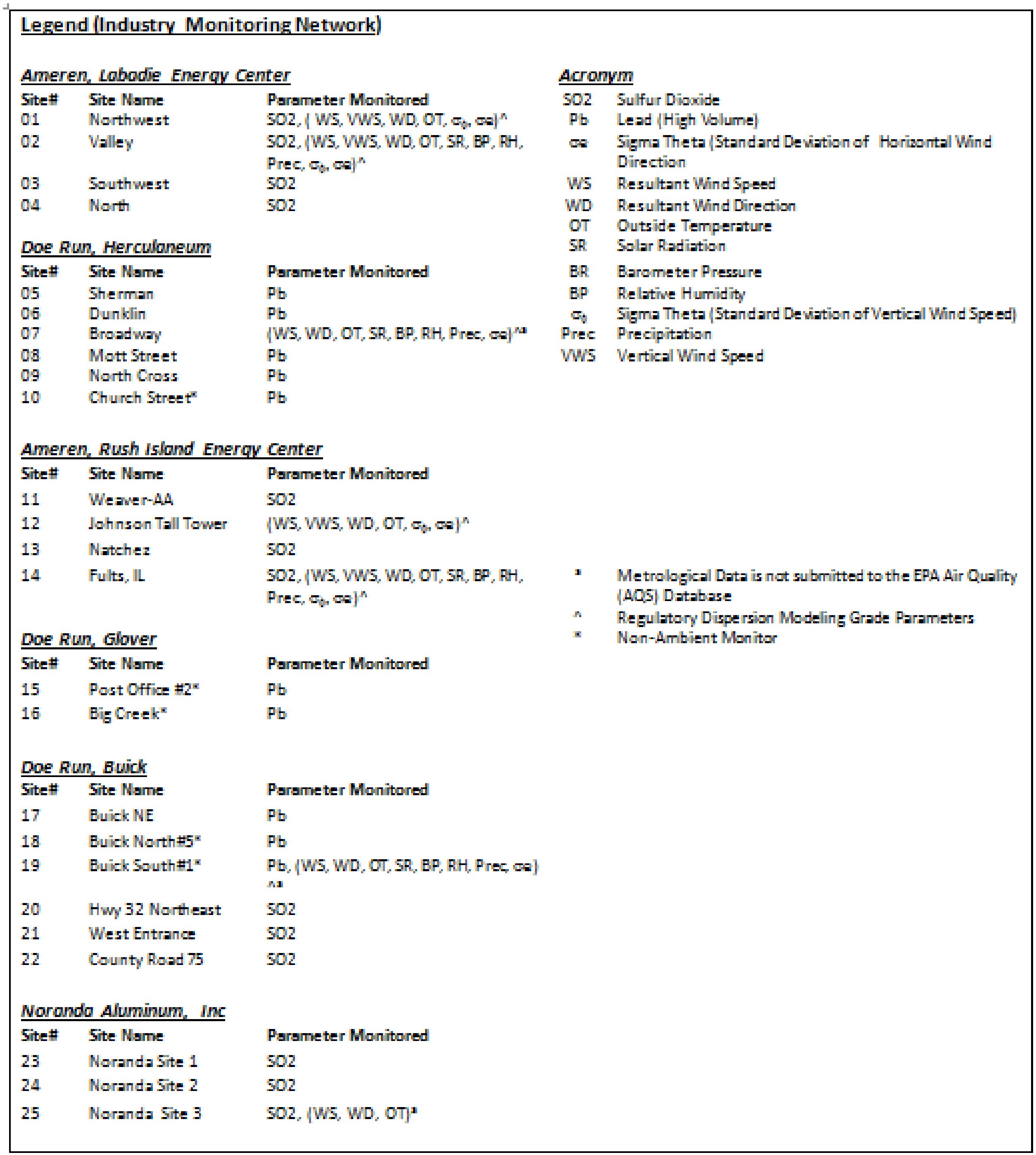
b. PM_{10} means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers where the concentration is adjusted to EPA reference conditions of ambient temperature and barometric pressure (25 °C and 760 millimeters of mercury or STP).

c. PMcoarse is also frequently referred to as $PM_{10\text{-}2.5}$.

2016 AMBIENT AIR MONITORING NETWORK, INDUSTRIAL SITES

Monitoring sites operated by industries are shown in the following map and listed in the following table.





Legend (Industry Monitoring Network)

Ameren, Labadie Energy Center

Site#	Site Name	Parameter Monitored
01	Northwest	SO2, (WS, VWS, WD, OT, σ_{ϕ}, σθ)^
02	Valley	SO2, (WS, VWS, WD, OT, SR, BP, RH, Prec, σ_{ϕ}, σθ)^
03	Southwest	SO2
04	North	SO2

Doe Run, Herculaneum

Site#	Site Name	Parameter Monitored
05	Sherman	Pb
06	Dunklin	Pb
07	Broadway	(WS, WD, OT, SR, BP, RH, Prec, σθ)^ª
08	Mott Street	Pb
09	North Cross	Pb
10	Church Street*	Pb

Ameren, Rush Island Energy Center

Site#	Site Name	Parameter Monitored
11	Weaver-AA	SO2
12	Johnson Tall Tower	(WS, VWS, WD, OT, σ_{ϕ}, σθ)^
13	Natchez	SO2
14	Fults, IL	SO2, (WS, VWS, WD, OT, SR, BP, RH, Prec, σ_{ϕ}, σθ)^

Doe Run, Glover

Site#	Site Name	Parameter Monitored
15	Post Office #2*	Pb
16	Big Creek*	Pb

Doe Run, Buick

Site#	Site Name	Parameter Monitored
17	Buick NE	Pb
18	Buick North#5*	Pb
19	Buick South#1*	Pb, (WS, WD, OT, SR, BP, RH, Prec, σθ) ^ª
20	Hwy 32 Northeast	SO2
21	West Entrance	SO2
22	County Road 75	SO2

Noranda Aluminum, Inc

Site#	Site Name	Parameter Monitored
23	Noranda Site 1	SO2
24	Noranda Site 2	SO2
25	Noranda Site 3	SO2, (WS, WD, OT)ª

Acronym

SO2	Sulfur Dioxide
Pb	Lead (High Volume)
σθ	Sigma Theta (Standard Deviation of Horizontal Wind Direction
WS	Resultant Wind Speed
WD	Resultant Wind Direction
OT	Outside Temperature
SR	Solar Radiation
BR	Barometer Pressure
BP	Relative Humidity
σ_{ϕ}	Sigma Theta (Standard Deviation of Vertical Wind Speed)
Prec	Precipitation
VWS	Vertical Wind Speed

ª	Metrological Data is not submitted to the EPA Air Quality (AQS) Database
^	Regulatory Dispersion Modeling Grade Parameters
*	Non-Ambient Monitor

PROPOSED CHANGES TO THE NETWORK

1. Lead Monitoring Network

Changes to airborne lead monitoring requirements were published in the Federal Register: December 27, 2010 (Volume 75, Number 247). The new rules require a plan for monitoring lead sources emitting 0.50 tons per year or more, revised from the previous requirement for monitoring sources emitting one ton per year or more. Airports are specifically exempted from these requirements except for a special study being conducted at specific airports, none of which are in Missouri.

Department staff reviewed the 2014 reported lead emissions and identified only one source not previously identified, NorthStar Battery in Springfield, as emitting greater than 0.50 tons of lead per year and for which ambient air monitoring is not currently being conducted or where EPA has not already granted a modeling waiver consistent with 40 CFR 58 Appendix D, 4.5 (a) (ii). However, a revised construction permit (no. 012016-002, issued in January 2016) for that facility limits its lead emissions to not more than 0.15 ton per year. Therefore, monitoring adjacent to this facility is not required.

1.1 Forest City, Exide Monitoring Site

The 2013 Monitoring Network Plan identified the resumption of lead TSP monitoring at a location near the Exide Secondary Lead Smelter in Forest City, MO. The monitoring method initially deployed, as described in the 2012 Monitoring Network Plan, utilized the low volume PM_{10} sampler and Pb-PM_{10} analysis performed by X-ray Fluorescence (XRF) following specifications and procedures in 40 CFR part 50 Appendix Q. Since the deployment of the Pb-PM_{10} FRM, as a Special Purpose Monitor, in March of 2012, three month rolling averages of airborne lead were monitored at concentrations greater than 0.15 micrograms per cubic meter ($\mu g/m^3$). As a result a Pb-TSP sampler was deployed in August 2012 for subsequent attainment determination. The department discontinued the Pb-PM_{10} FRM in December 2013 but the Pb-TSP sampler continues to monitor lead at the site. As a result of changes in operations at that facility, including addition of pollution control equipment, an exceedance of the lead NAAQS has not been monitored at that site since October-December 2013. Discontinuing the Forest City monitor may be proposed in future monitoring network plans if this trend continues.

1.2 Doe Run Operated Sites

1.2.1 Doe Run Lead Sites

Doe Run operates lead monitoring sites in the vicinity of their industrial facilities in Herculaneum, Glover, and Boss. Operation of some of these sites is required by Consent Judgments or Agreements with the department, and operation of other sites is voluntary.

1.2.2 Doe Run Meteorological Sites

Doe Run Herculaneum also operates one ten meter tower meteorological monitoring site as per language set forth under the 2011 Consent Judgment. Doe Run Herculaneum discontinued the 40 meter tower at Broad Street as per the Consent Judgment.

1.3 Department's Lead Monitoring Network in Herculaneum

With the cessation of primary lead smelting at the Doe Run facility in Herculaneum, the department proposes discontinuing monitoring at the Pevely North site. That site has never shown an exceedance of the lead NAAQS since it began operation in January 2010, and has averaged 0.01 µg/m^3 since smelting operations at Herculaneum were discontinued at the end of 2013. The Pevely North site meets the conditions in 40 CFR Part 58.14 (c) (1) for discontinuation; it has shown attainment for the last six years, it has a probability of less than 10 percent of exceeding 80 percent of the NAAQS, it is not required by an attainment or maintenance plan, and there are other monitors in the Herculaneum area with higher design values that will remain in operation.

The department continues to carefully evaluate the lead data monitored at its sites in Herculaneum and may consider additional modification, particularly sampling schedules at the Mott site.

1.4 St. Joe State Park Monitoring Site

The department has reduced the frequency of sampling at the Special Purpose lead monitoring site at St. Joe State Park from every third day to every sixth day. The St. Joe State Park site was intended to monitor airborne lead concentrations during remediation activities involving old lead mining waste in the Federal Mine Tailings. The bulk of the remediation activity was completed as of late July/early August of 2014. The three-month rolling average has not exceeded the lead standard, 0.15 µg/m^{3,} since the site began monitoring lead on July 1, 2010. The highest three-month rolling average airborne lead concentration at that site was 0.14 µg/m^3 in July-September 2011. This elevated lead concentration was attributable to remediation activities near the monitor. Since that time the three-month average lead concentration at that site has not exceeded 0.13 µg/m^3.

1.5 Blair Street TSP Lead Monitor

The department proposed in the 2015 monitoring network plan to discontinue the TSP Lead Monitor at the Blair Street NCore site in St. Louis pending finalization of proposed revisions to Ambient Monitoring Quality Assurance and other requirements in 40 CFR 58. The "Revisions to Ambient Monitoring Quality Assurance and Other Requirements; Final Rule," Federal Register volume 81, number 59 (March 28, 2016), effective April 27, 2016, removed the requirement for TSP lead monitoring at urban NCore sites from 40 CFR Part 58. Therefore, TSP lead monitoring at Blair Street was discontinued at the end of April 2016. The Blair Street TSP lead monitor has never shown an exceedance of the NAAQS. The average three-month average from October 2011 through February 2016 is 0.02 μg/m^3.

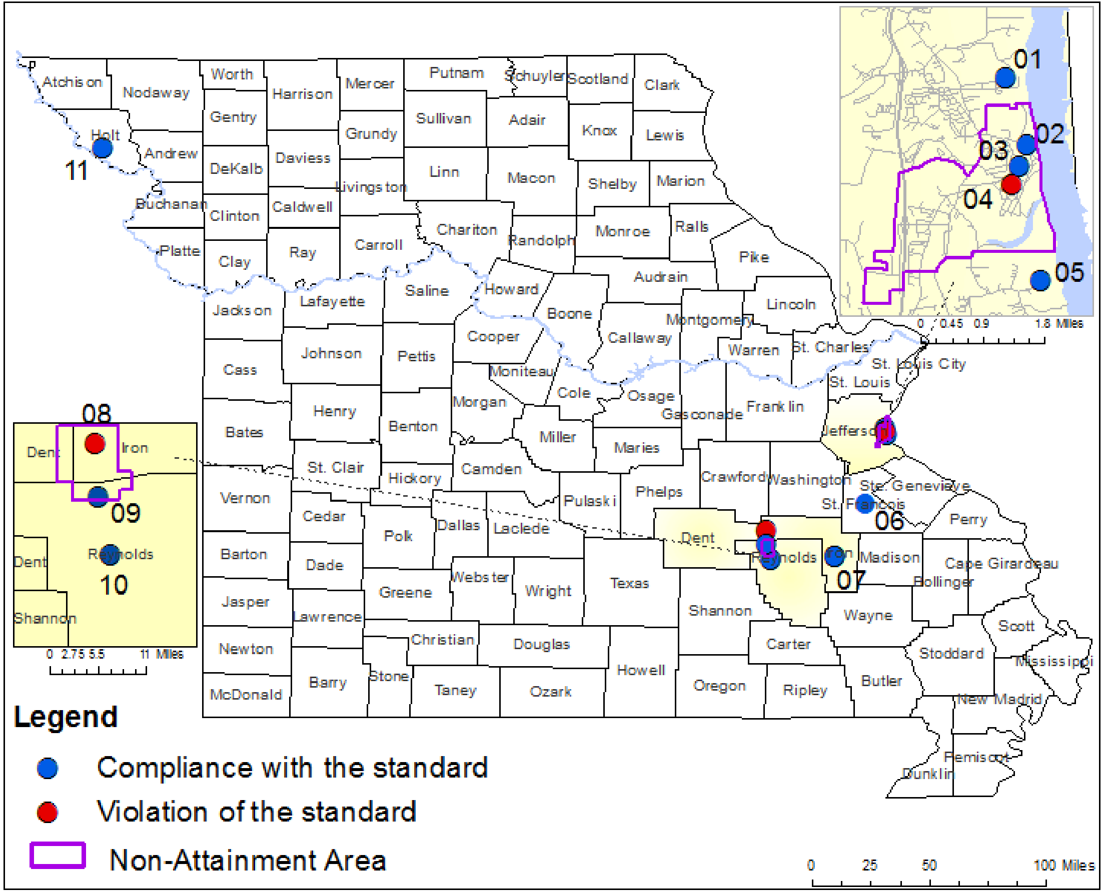
1.6 Bills Creek Lead Monitor

The department proposes to discontinue monitoring at the Bills Creek site in the New Lead Belt area. Lead emissions from the Brushy Creek mine/mill complex, which this site was intended to monitor, were reported as 0.34 tons per year in 2014. This site has not shown an exceedance of the lead NAAQS since it began operation in January 2010. The average three-month average from January-March 2010 through December 2015-February 2016 is 0.02 μg/m^3. The Bills Creek site meets the conditions in 40 CFR Part 58.14 (c) (1) for discontinuation; it has shown attainment for the last six years, it has a probability of less than 10 percent of exceeding 80 percent of the NAAQS, it is not required by an attainment or maintenance plan, and there are other monitors in the area with higher design values that will remain in operation.

The 2016 lead monitoring network is shown in the map below.

Missouri Statewide Lead (Pb) Monitoring Network, 2016

Rolling 3-Month Average NAAQS = 0.15 ug/m^3



Legend

- ● Compliance with the standard
- ● Violation of the standard
- ☐ Non-Attainment Area

Site# SiteName (14-16 1st Max Avg^)

Herculaneum Area

- 01 Pevely (0.04)
- 02 Herculaneum, Sherman (0.13)
- 03 Herculaneum, Dunklin H. Sch. (0.14)
- 04 Herculaneum, Mott Street **(0.32)**
- 05 Ursuline North (0.05)

Old Pb Belt Area

- 06 St. Joe State Park (0.05)

Site# SiteName (14-16 1st Max Avg^)

New Pb Belt Area

- 07 Glover (0.08)
- 08 Buick NE **(0.26)**
- 09 Oates (0.06)
- 10 Fletcher (0.05)

Outstate Area

- 11 Forest City, Exide Levee (0.15)

Missouri
Department of Natural Resources
Air Pollution Control Program
Monitoring Unit, November, 2016

^Quality assured data through June 30th, 2016
Red & Bold: Violation of the standard

2. Sulfur Dioxide (SO_2) Monitoring Network

On June 2, 2010, the US EPA revised the primary SO_2 standard by establishing a 1-hour standard at the level of 75 parts per billion (ppb). The EPA revoked the two previous primary standards of 140 ppb evaluated over 24-hrs and 30 ppb evaluated over an entire year. The 2011 Monitoring Network Plan[1] identified the minimum network monitoring required by the Population Weighted Emissions Index (PWEI). This analysis has been updated using 2010 census data and 2011 NEI emissions. The required numbers of monitoring sites based on the PWEI (2 sites each in the St. Louis and Kansas City CBSAs) did not change. The department's 2016 SO_2 monitoring network is shown in the map below.

In May 2014 US EPA published proposed data requirements regulations related to SO_2 air quality monitoring and air quality dispersion modeling near emission sources. These requirements were finalized in the SO_2 Data Requirements Rule (DRR) published in the Federal Register on August 21, 2015. This final rule requires that air agencies must characterize air quality, either by monitoring or modeling, around sources that emit 2,000 tons per year (tpy) or more of SO_2. The requirement for air quality characterization near a source may be avoided by adopting enforceable emission limits that ensure that the source will not emit more than 2,000 tpy of SO_2. On January 15, 2016 the department submitted a final list identifying the sources in the state around which SO_2 air quality will be characterized. That submittal may be found at https://www3.epa.gov/airquality/sulfurdioxide/drr/mo.pdf. The Ameren Missouri Labadie Energy Center and the Noranda Aluminum facility (both discussed below) were included on that list. The Doe Run Buick Resource Recycling Facility (also discussed below) reports emissions less than 2,000 tpy but was also included on the list because emissions from that facility were uncertain and under review at the time of the January submittal. The Ameren Missouri Rush Island Energy Center was not included in the list, because it is within a previously-designated nonattainment area (designated as nonattainment due to emissions from another facility). Monitoring in the area around that Rush Island is being conducted on an accelerated schedule (compared to the DRR timeline) by agreement between the department and Ameren associated with the plan for the Jefferson County nonattainment area submitted to EPA in May 2015.

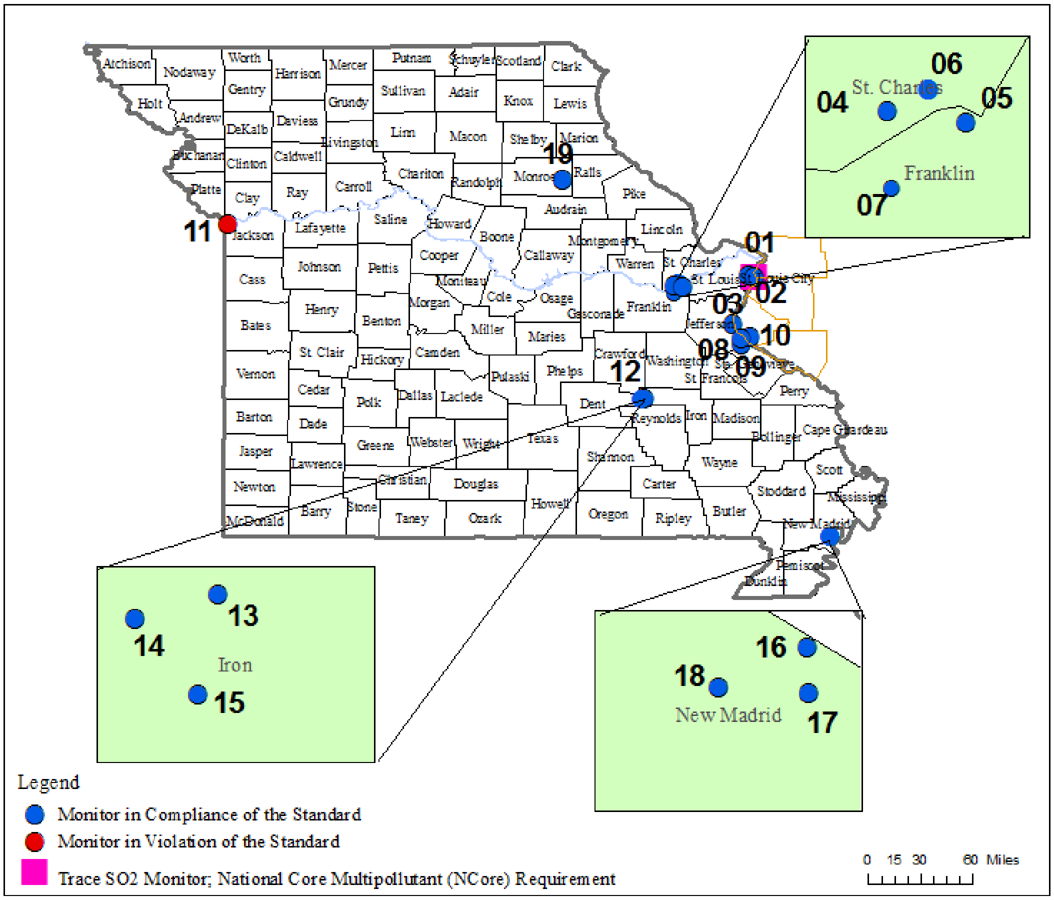
For each facility listed in the January 2016 submittal, the state is required to identify by July 1, 2016, the approach (ambient monitoring or air quality modeling) that will be used to characterize air quality or identify sources whose emissions will be limited to less than 2,000 tpy by an enforceable agreement. For source areas that will be evaluated through ambient monitoring, the air agency must submit information on monitoring sites to the EPA by July 1, 2016, as part of its annual monitoring network plan (this plan). This SO_2 monitoring to meet the DRR must begin by January 1, 2017. Monitoring near these sources -in Missouri is discussed in the following sections. This monitoring is being conducted by the industries operating the sources, but the monitoring must be conducted in accordance with the SLAMS requirements in 40 CFR Part 58, and the department will review and approve the siting of the monitor(s) based on federal regulations and oversee the operation of the monitors. To meet the requirements of the DRR, these monitors will need a minimum of three years of monitoring data. The source cannot

---

[1] http://dnr.mo.gov/env/apcp/docs/2011monitoringnetwork.pdf

discontinue the monitor thereafter without EPA approval based on the requirements of 40 CFR 51.1203(c)(3) or 40 CFR 58.14.

Missouri Statewide SO_2 Monitoring Network, 2016
1-hour NAAQS = 75 ppb



Site# SiteName (14-16 DV*)

St. Louis Area, MO
01 Margaretta (16)
02 Blair Street (25)
03 Herc, Mott Street (23)
04 Ameren-Northwest^ ~(31)
05 Ameren-Valley^~(40)
06 Ameren-North^**
07 Ameren-Southwest^**
08 Ameren-Weaver-AA^~(24)
09 Ameren-Natchez^~(27)
10 Ameren-Fults, IL^~~

Site# SiteName (14-16 DV*)

Kansas City Area, MO
11 Troost **(92)**

Outstate Area, MO
12 Buick NE (46)
13 Hwy 32 Northeast^**
14 County Road 75^**
15 West Entrance^**

Site# SiteName (14-16 DV*)

Outstate Area, MO
16 Noranda Site 1^**
17 Noranda Site 2^**
18 Noranda Site 3^**
19 Mark Twain State Park (7)

**Quality assured data through June 30th, 2016*
^Industry Monitor
~Began Monitoring in 2015 (99th Percentile)
~~Began Monitoring in 2016
***Site not operating and still under review*
Red & Bold: Violation of the standard

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

2.1 Industrial SO_2 & Meteorological Monitoring near the Labadie and Rush Island Energy Centers

As indicated in the Missouri 2015 Monitoring Network Plan, two SO_2 ambient Air Monitoring networks have been deployed around the Labadie and Rush Island power pants. At the time the plan was posted for public inspection, EPA had not promulgated the SO_2 DRR or revisions to the monitoring requirements in 40 CFR 58. The SO_2 DRR and revisions to 40 CFR 58 were published in the Federal Register on August 21, 2015 and March 28, 2016, respectively.

The recently revised quality assurance requirements of 40 CFR 58 Appendix A, indicate in section 1.1 (a) that "This appendix specifies the minimum quality system requirements applicable to SLAMS and other monitor types whose data are intended to be used to determine compliance with the NAAQS (e.g., SPMs, tribal, CASTNET, NCore, industrial, etc.),…" This revision supports states using monitors with any of these classifications to satisfy the DRR monitoring requirements in 40 CFR 51.1203 (c) so long as these monitors are being operated in a manner equivalent to SLAMS. Both SLAMS and industrial NAAQS compliance monitoring networks in Missouri are operated under a department approved QAPP consistent with the departmental Quality Management Plan (QMP) that has been approved by EPA Region VII.

EPA Region VII indicated in a January 25, 2016 letter approving our 2015 Monitoring Network Plan that they did not evaluate the Labadie and Rush Island SO_2 monitoring networks described in detail in that plan due to our classification of those monitors as Special Purpose Monitors (SPM). EPA also recommended that if we reclassify these sites as SLAMS they would evaluate these SO_2 monitors consistent with the SO_2 DRR for the 1-hour SO_2 NAAQS.

Despite EPA's previous recommendation to classify these monitors as SLAMS, after reviewing the revisions to 40 CFR 58 against monitor classifications as they apply to NAAQS compliance monitoring, we have decided to classify the Labadie and Rush Island SO_2 monitors as industrial SO_2 monitors. This is consistent with how we have handled industrial monitors used for NAAQS compliance in both our SO_2 and lead ambient air monitoring networks. Industrial and SPM monitors have been utilized for NAAQS compliance monitoring and other purposes in Missouri for decades. For example, the James River SO_2 monitoring site is an Industrial monitoring site operated by the City Utilities of Springfield and the department operates a SPM SO_2 monitor at our Buick Northeast site. Such monitoring sites have been included in past Monitoring Network Plans and approved by EPA Region 7.

The following sections describe changes to the Labadie and Rush Island SO_2 monitoring networks where they differ from the original 2015 Monitoring Network Plan. References to the previous plan will be addressed in this plan, as needed.

2.1.1 Labadie Energy Center

On March 20, 2015 EPA updated implementation guidance as a result of the March 2, 2015 U.S. District Court for the Northern District of California accepting an enforceable order and agreement between the EPA and Sierra Club and Natural Resources Defense council. This agreement is intended to resolve litigation related to the deadline for completing the 1-hour SO_2 NAAQS designations process.

Since proposing the first two SO_2 monitors near the Labadie Energy Center in our 2015 Monitoring Network Plan, EPA promulgated the SO_2 DRR. Consistent with the DRR definitions section, 40 CFR 51.1200, the area designation status with respect to the one-hour SO_2 NAAQS determines if this area is subject to the DRR. The DRR applies if the area around the Labadie Energy Center is not designated as a nonattainment area. On June 30, 2016, EPA designated that area as unclassifiable (Federal Register, volume 81, number 133, July 12, 2016). Therefore, the DRR applies to this area, and this monitoring network is designed consistent with the requirements of the DRR and ready for EPA's review and approval.

The department will continued to work with the Ameren UE to collect quality assured SO_2 ambient air quality data and meteorological data near the Labadie Energy Center to provide quantifiable and useful technical information to meet the DRR requirements and supplement the ongoing 1-hour SO_2 NAAQS implementation process.

Two industrial SO_2 ambient air monitoring sites and a meteorological monitoring station began operation in April 2015 in the area around the Ameren UE Labadie Energy Center, located at 226 Labadie Power Plant Road in Franklin County, Missouri. Two additional industrial SO_2 monitoring sites southwest and north of the Labadie Energy Center will be installed. The southwest site will begin operation by January 1, 2017. The location of that site was determined on the basis of dispersion modeling using, in part, meteorological data collected at the Valley site established in 2015, as discussed in Appendix 5. The target date for beginning operation of the north site is January 1, 2017. The location of that site was also determined on the basis of dispersion modeling (see Appendix 5). Also, meteorological monitoring using a 10 meter tower will be added at the Northwest site, beginning by January 1, 2017, and the SODAR instrument will be relocated from the Valley site to the Northwest site. These monitoring sites (see the following table) are operated by Ameren UE under a department-approved Quality Assurance Project Plan (QAPP). The rationale for site selection based on modeling results is discussed extensively in the 2015 Monitoring Network Plan and in Appendix 5 in this Plan.

Summary of Industrial Monitoring Stations:
Monitoring Objective: Source Oriented
Spatial Scale of representativeness: Middle Scale ($100m^2$ to $0.5\ km^2$)
Labadie Northwest -SO_2, 10 Meter Meteorological Station and Sound Detection and Ranging (SODAR). (Lat: 38.5818 Long: -90.865528)
Labadie Valley -SO_2, 10 Meter Meteorological Station. (Lat: 38.572522 Long: -90.796911)
Labadie Southwest -SO_2, (Lat: 38.52814 Long: -90.86326; these are approximate; final coordinates will be determined after installation)
Labadie North –SO_2, (Lat: 38.59558 Long: -90.82860; these are approximate; final coordinates will be determined after installation)
(The Osage Ridge meteorological site described in the 2015 monitoring network plan was not installed due to technical difficulties; the SODAR instrument, currently at the Valley site, and soon to be relocated to the Northwest site because of potential flooding threats at the Valley site, is being used for upper air measurement. A 10 meter meteorological monitoring tower is also being added at the Northwest site.)

2.1.2 Rush Island Energy Center

On March 23, 2015 the Department and Ameren UE entered into a Consent Agreement (Appendix 3 of the 2015 Monitoring Network Plan) which included Ameren installing and operating an SO_2 monitoring network around the Rush Island Energy Center under department oversight. The siting of these monitors was consistent with the technical process described in the SO_2 DRR.

Although the primary objective of the Rush Island ambient air monitoring project is to satisfy the terms of the aforementioned Consent Agreement, it is possible that the quality assured monitoring data may be used for other future purposes depending on the final outcome of EPA's national implementation strategy for the 2010 1-hour SO2 NAAQS and the Jefferson County Nonattainment area implementation process.

The department will continued to work with the Ameren UE to collect quality assured SO_2 ambient air quality data and meteorological data near the Rush Island power station to provide quantifiable and useful information to supplement the ongoing 1-hour SO2 NAAQS implementation process.

The Rush Island monitoring network design was based on evaluation of dispersion modeling, as described in the 2015 Monitoring Network Plan and in Appendix 2 of this plan, based on the "SO2 NAAQS Designations Modeling Technical Assistance Document," https://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf This updated modeling assessment did not change the recommended locations for monitoring. This network began operation in December 2015.

Summary of Rush Island area Industrial Monitoring Stations:
Monitoring Objective: Source Oriented
Spatial Scale of representativeness: Middle Scale (100m^2 to 0.5 km^2)
Weaver-AA -SO_2. (Lat: 38.144529 Long: -90.304726)
Natchez -SO_2, (Lat: 38.10525 Long: -90.29842)
Fults, IL, -SO_2, 10 Meter Meteorological Station (Lat: 38.15908 Long: -90.22728)
Johnson Tall Tower -Meteorological Station Only, anemometers at 62.5m and 132.5m levels (Lat: 38.11999 Long: -90.28214)

2.2 Industrial SO_2 & Meteorological Monitoring near the Doe Run Buick Resource Recycling Facility

The Doe Run Company will conduct SO_2 monitoring at three sites in the area around the Buick Resource Recovery Facility near Boss, Missouri starting by January 1, 2017 to meet the requirements of the SO_2 Data Requirements Rule, as described above. Meteorological monitoring is already being conducted at the Buick South lead monitoring site, south of the facility. These sites will be operated under a department-approved QAPP, which will include performance evaluations (audits) by department staff. Potential areas for these ambient SO_2 monitoring sites were determined on the basis of air quality modeling of the impact of facility emissions. These evaluations are described in Appendix 3. Figures in the appendix show the recommended areas and the locations of the monitoring sites superimposed on aerial photographs of the facility and surrounding area. West Entrance is located west of the facility and County Road 75 is to the northeast. Department Staff evaluated the Sawmill site, north of the facility but for logistical reasons Doe Run proposed the former Prevention of Significant Deterioration (PSD) SO_2 site as the third monitoring site, called Highway 32 Northeast. This site is located less than a quarter mile east of the Sawmill site and within the modeled area of impact. Department staff and EPA Region 7 staff visited the first two proposed monitoring sites on May 11, 2016 and determined that the sites could be developed to meet the siting criteria in 40 CFR Part 58 Appendix E. Department staff visited all three sites on November 10, 2016, verified that the sites have been developed and installed to meet siting criteria, but made additional recommendations on tree removal to improve exposure to the potential source. Latitude and longitude coordinates in the following table were measured during the most recent site visit.

Summary of Doe Run Buick area Industrial Monitoring Stations:
Monitoring Objective: Source Oriented
Spatial Scale of representativeness: Middle Scale ($100m^2$ to $0.5\ km^2$)

West Entrance -SO_2. (Lat: 37.63211 Long: -91.13565)
County Road 75 -SO_2, (Lat: 37.64876 Long: -91.14890)
Hwy 32 Northeast (Former PSD site) -SO_2, (Lat: 37.65319 Long: 91.12795)

2.3 Industrial SO_2 & Meteorological Monitoring near the Noranda Aluminum Facility

Noranda Aluminum will conduct SO_2 monitoring at three sites and meteorological monitoring at one site in the area around their facility near New Madrid, Missouri starting by January 1, 2017 to meet the requirements of the SO_2 Data Requirements Rule, as described above. These sites will be operated under a department-approved QAPP, which will include performance evaluations (audits) by department staff. Potential areas for these ambient SO_2 monitoring sites were determined on the basis of air quality modeling of the impact of facility emissions, and the potential area for meteorological monitoring was determined on the basis of an analysis by a department meteorologist. These evaluations are described in Appendix 4. Figures in the appendix show the recommended areas and the locations of the monitoring sites superimposed on aerial photographs of the facility and surrounding area. Site 1 is near the northeast corner of the facility, site 2 is to the east of the facility, and site 3 is near the southwest corner of the facility. In addition to these evaluations, department staff visited the proposed monitoring sites in November 2015 and determined that the sites could be developed to meet the siting criteria in 40 CFR Part 58 Appendix E. Latitude and longitude coordinates in the following table were measured during that site visit and are approximate, since monitors have not yet been installed. Final coordinates will be determined once the sites are installed.

This Noranda Aluminum facility has recently been sold. The department will continue working with the new owners on this SO_2 monitoring project.

Summary of Noranda Aluminum area Industrial Monitoring Stations:
Monitoring Objective: Source Oriented

Spatial Scale of representativeness: Middle Scale (100m^2 to 0.5 km^2)
Site 1 -SO_2, (Lat: 36.51364 Long: -89.56093)
Site 2 -SO_2, (Lat: 36.50838 Long: -89.56074)
Site 3 -SO_2 and Meteorology, (Lat: 36.50899 Long: -89.57099)

2.4 South Charleston and James River South Sites

The department proposes to discontinue monitoring at the South Charleston and James River South sites in Springfield. These sites were intended to monitor ambient SO_2 concentrations near the City Utilities of Springfield James River Power Station. The following table lists SO_2 design values for these sites for the last five years. The design values have been steadily decreasing for both sites, and only the 2009-2011 design value at James River South exceeds the NAAQS during the last five years.

SO_2 Design Values (ppb)

	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015
South Charleston	62	54	44	35	26
James River South	81	68	44	32	25

Also, the power station formerly burned coal but switched fuel to natural gas on October 15, 2015. The operating permit for that facility (OP2016-003, effective January 29, 2016) limits the fuel to natural gas. A forthcoming State SO_2 rule amendment will also have a limit requiring James River Power Station to switch fuel to natural gas. Once the amended state rule becomes effective, the consent agreement that required SO_2 monitoring (at the James River South site but not at the South Charleston site) near the facility will terminate and the monitoring requirement will then not be in the State Implementation Plan. Since the fuel switch, the maximum daily one-hour average at South Charleston has been 3.2 ppb, and the maximum daily one-hour average at James River South has been 2.8 ppb.

The South Charleston site meets the conditions in 40 CFR Part 58.14 (c) (1) for discontinuation; it has shown attainment for the last five years, it has a probability of less than 10 percent of exceeding 80 percent of the NAAQS, and has never been required by an attainment or maintenance plan. The James River South site does not yet meet the conditions in 40 CFR Part 58.14 (c) (1) because of the design value slightly exceeding the NAAQS for 2009-2011 (when the power station was still burning coal). However, given the enforceable fuel change from coal to natural gas, the department requests that the James River South site also be discontinued under the provision in 40 CFR Part 58.14 (c) that “Other requests for discontinuation may also be approved on a case-by-case basis….”

2.5 Rider Trail I-70 Site

The department recently added a sulfur dioxide air monitor to the existing Rider Trail, I-70 monitoring site. The addition of a sulfur dioxide monitor at this site is to evaluate sulfur dioxide levels in the general area. Any sulfur dioxide concentrations monitored at this site may be due to several emissions sources in the area. If the monitor records sulfur dioxide at levels of concern, the department will gather additional information to try to determine which sources are causing or contributing to the levels of concern. The department will evaluate the levels recorded after one year of operation and decide whether or not it is appropriate to continue operating a sulfur dioxide monitor at this location.

Since the monitor is located in the near-roadway environment and there are several other SO_2 sources in the area, the department is initially classifying the spatial scale of representativeness of the SO_2 measurements as middle-scale. This classification may be reevaluated if trends in the monitoring data and other analysis warrant increasing the spatial scale of representativeness. The monitoring objective for this monitor is to measure population exposure.

3. National Air Toxics Trends Stations (NATTS), and Other Non-Criteria Pollutant Special Purpose Monitoring

3.1 National Air Toxics Trends Stations Monitoring

Routine NATTS monitoring will continue at Blair Street. In addition to the regular NATTS monitoring, additional NATTS grant funds have been utilized to support continuing collocation of a near real time PM_{10} Metals Monitor (Xact™ 620) at the Blair Street site to increase understanding of the temporal variation of metals in the ambient air (particularly arsenic and lead) routinely measured by the time integrated 24-hr filter based PM_{10} sampling at this site. This project is useful in supplementing ambient air monitoring data objectives addressed in EPA’s multi pollutant strategy. Continued operation of the PM_{10} Metals Monitor (Xact™ 620) will depend on the availability of funds.

3.2 Organic and Elemental Carbon Monitor Evaluation Project

The EPA Office of Air Quality Planning and Standards (OAQPS) contacted the EPA Regional Office and the state of Missouri about participating in a three year monitor evaluation study which began in the summer/fall of 2011. EPA provided the monitor and certain related components in exchange for the state providing in-kind staff time to operate and report data to the EPA Air Quality System (AQS) from the instrument. The location for the study is the Blair St. site, since the site is currently part of the NCore, NATTS and Chemical Speciation monitoring programs. The data from the Blair Street site is used extensively in various health and air pollution studies. Since elemental and organic carbon account for a significant amount of the particulate matter mass measured at this site at various times, understanding the temporal variation in carbon species relative to the 24-hr integrated filter based carbon data will be useful in understanding the local source contributions and diurnal variation in the carbon concentrations. This project will be useful in supplementing ambient air monitoring data objectives addressed in EPA’s multi-pollutant monitoring strategy.

Currently, the preliminary near real-time monitoring data for this monitor is being reported each hour to the State of Missouri web page and is being uploaded to AQS.

3.3 Black Carbon

As part of the condition of receiving one time section 103 Grant funds to implement certain sites for the near-roadway monitoring network, the department will continue to conduct special purpose $PM_{2.5}$ black carbon monitoring at the Forest Park and Blue Ridge I-70 near roadway NO_2 sites using aethalometers.

4. $PM_{2.5}$ Monitoring Network

4.1 $PM_{2.5}$ SLAMS Network

The TEOM-1405-DF is the primary instrument being used in the state network for $PM_{2.5}$ measurement. The EPA has also designated the TEOM-1405-DF, operating with firmware version 1.70 and later, as a Federal Equivalent Method (FEM) on November 12, 2013 for PM_{10} and $PM_{10-2.5}$, (http://www.gpo.gov/fdsys/pkg/FR-2013-11-12/pdf/2013-27016.pdf). The Thermo-Fisher 1.71 firmware version has been integrated into the TEOM-1405-DF monitors, and the department is evaluating the performance of the instruments with this firmware for PM_{10} measurement. Until this evaluation is completed, the PM_{10} channels from the TEOM-1405-DF instruments are not being reported to AQS. Once the instruments are determined to be successfully operating for these channels, the PM_{10c} and PM_{10} parameters will provide more temporal and spatial coverage for PM_{10} in the network.

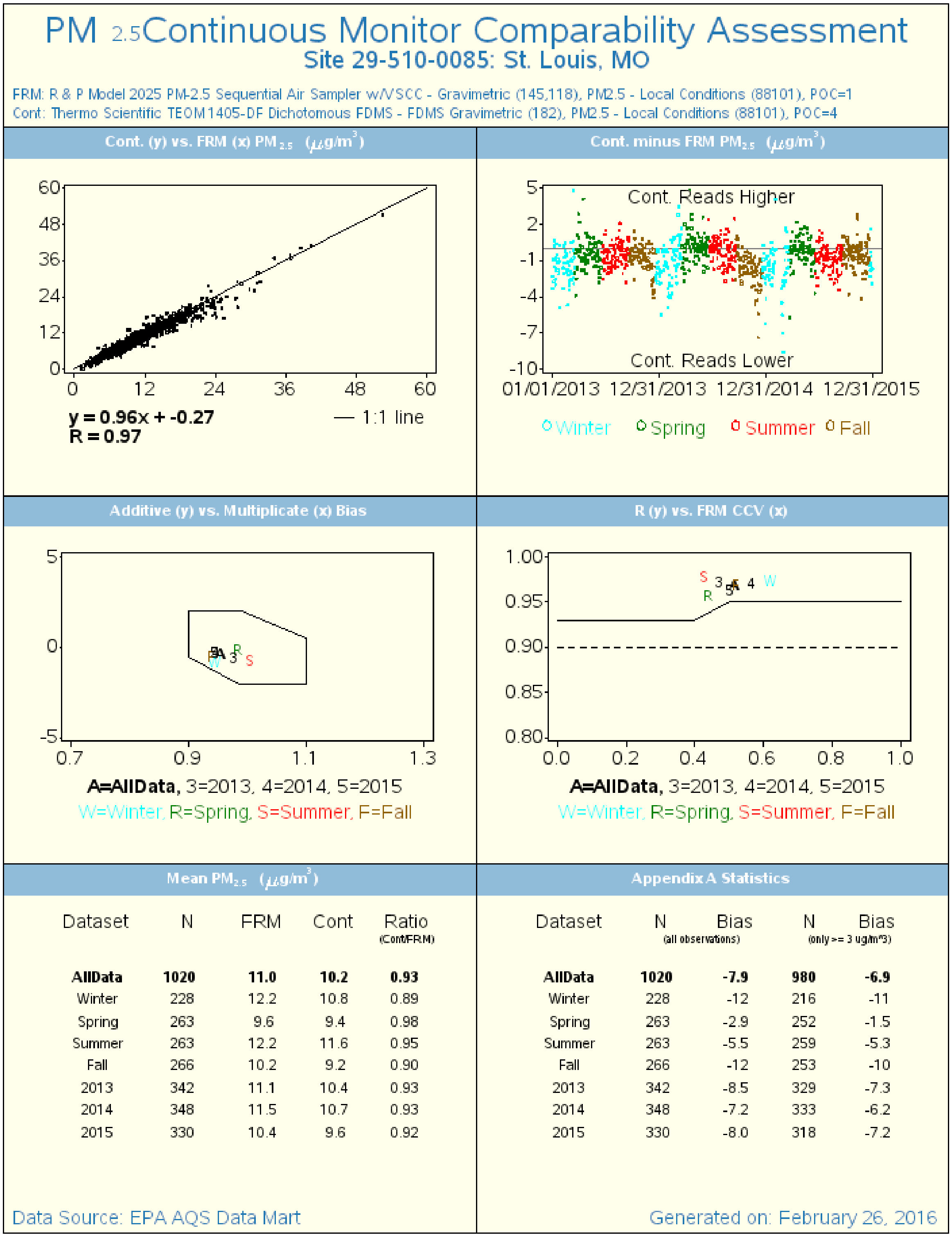
Network $PM_{2.5}$ collocated FRM requirements were previously satisfied at the Blair Street NCore site in St. Louis and the Troost site in Kansas City. The following page reports the FRM/FEM Comparability statistics (Class III performance criteria of 40 CFR Part 53) for three years of the TEOM-1405-DF (EQPM-0609-182) operating at the Blair Street, St. Louis NCore site. The additive and multiplicative bias meets the Class III performance criteria of 40 CFR Part 53.

The “Revisions to Ambient Monitoring Quality Assurance and Other Requirements; Final Rule,” Federal Register volume 81, number 59 (March 28, 2016), effective April 27, 2016, removed the requirement for collocated monitoring for $PM_{10-2.5}$ at NCore sites from 40 CFR Part 58. Therefore, operation of the collocated set of filter samplers used for measurement of $PM_{10-2.5}$ filter samplers was discontinued at the Blair Street site. At the same time, the TEOM-1405-DF FEM was re-designated as the primary $PM_{2.5}$ instrument at this site. The Blair Street FEM/FRM comparability statistics below show that this method meets the comparability criteria, and setting the TEOM-1405-DF as the primary $PM_{2.5}$ reporting monitor at Blair St. allows us to use it in AQS for the network data quality assessment. The FRM $PM_{2.5}$ sampler at Blair Street was re-designated as the collocated reporting FRM sampler for the state network, and also provides $PM_{2.5}$ for the calculation of $PM_{10-2.5}$ and reporting FRM $PM_{2.5}$ for the NCore site. This change allowed the collocated FRM $PM_{2.5}$ sampler at the Troost site to be discontinued. Two FRM PM_{10} samplers remain at Blair Street: one used to report both PM_{10c} (at local conditions) for calculation of $PM_{10-2.5}$ and PM_{10} at standard conditions, and a second one which provides collocation for the PM_{10} measurement. The current $PM_{2.5}$ network is summarized in the table below.

Two TEOM-1405-DF instruments are operated at the St. Joseph Pump Station site, one designated as primary, and one as collocated to satisfy the collocation requirement for that FEM method.

The department will also operate a 1405-F $PM_{2.5}$ instrument and a collocated FRM at Ladue in part to evaluate the 1405-F for possible additional future use in the network.

Class III Performance Criteria of 40 CFR Part 53
Blair Street St. Louis Air Quality System # 29-510-0085
TEOM-1405-DF, EQPM-0609-182 ($PM_{2.5}$)
January 2013 through December 2015
Source: EPA AirData $PM_{2.5}$ Continuous Monitor Comparability Assessments



$PM_{2.5}$ Continuous Monitor Comparability Assessment
Site 29-510-0085: St. Louis, MO

FRM: R & P Model 2025 PM-2.5 Sequential Air Sampler w/VSCC - Gravimetric (145,118), PM2.5 - Local Conditions (88101), POC=1
Cont: Thermo Scientific TEOM 1405-DF Dichotomous FDMS - FDMS Gravimetric (182), PM2.5 - Local Conditions (88101), POC=4

Cont. (y) vs. FRM (x) $PM_{2.5}$ ($\mu g/m^3$)

Cont. minus FRM $PM_{2.5}$ ($\mu g/m^3$)

Additive (y) vs. Multiplicate (x) Bias

R (y) vs. FRM CCV (x)

Mean $PM_{2.5}$ ($\mu g/m^3$)

Dataset	N	FRM	Cont	Ratio (Cont/FRM)
AllData	**1020**	**11.0**	**10.2**	**0.93**
Winter	228	12.2	10.8	0.89
Spring	263	9.6	9.4	0.98
Summer	263	12.2	11.6	0.95
Fall	266	10.2	9.2	0.90
2013	342	11.1	10.4	0.93
2014	348	11.5	10.7	0.93
2015	330	10.4	9.6	0.92

Appendix A Statistics

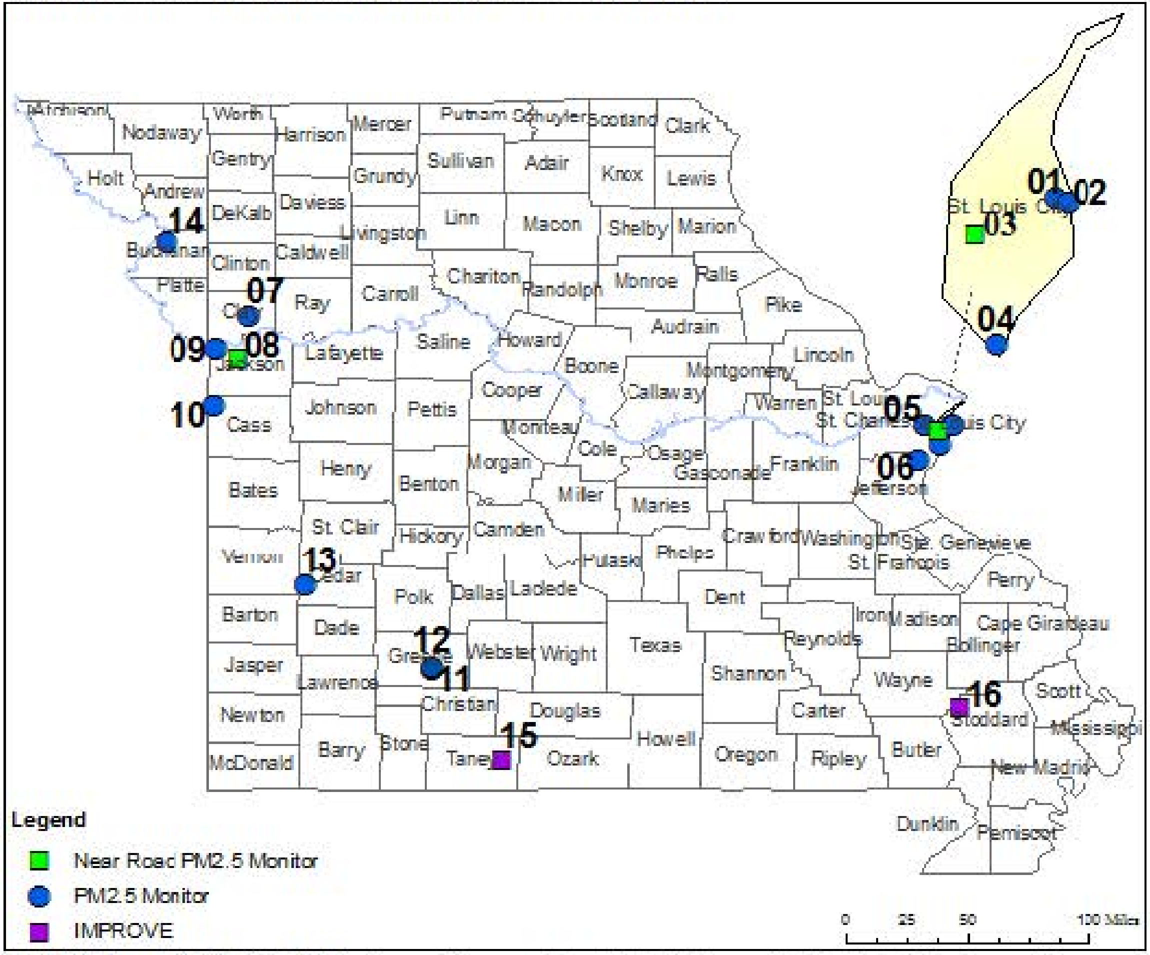
Dataset	N	Bias	N	Bias
	(all observations)		(only >= 3 ug/m^3)	
AllData	**1020**	**-7.9**	**980**	**-6.9**
Winter	228	-12	216	-11
Spring	263	-2.9	252	-1.5
Summer	263	-5.5	259	-5.3
Fall	266	-12	253	-10
2013	342	-8.5	329	-7.3
2014	348	-7.2	333	-6.2
2015	330	-8.0	318	-7.2

Data Source: EPA AQS Data Mart

Generated on: February 26, 2016

Missouri Statewide PM2.5 Monitoring Network, 2016

24-hour NAAQS = 35 ug/m^3 and Annual NAAQS = 12.0 ug/m^3



Site# SiteName (13-15 DV*: 24-hr, Annual Averages)

St. Louis Area
- 01 Blair Street (25, 11.0)
- 02 Branch Street** (25)
- 03 Forest Park (23, 9.9)
- 04 South Broadway (24, 10.6)
- 05 Ladue (24, 10.7)
- 06 Arnold West (24, 10.6)

Kansas City Area
- 07 Liberty (20, 8.6)
- 08 Blue Ridge, I-70 (18, 7.5)
- 09 Troost (20, 9.1)
- 10 Richard Gebaur-S (21, 9.4)

Site# SiteName (13-15 DV*: 24-hr, Annual Averages)

Springfield Area
- 11 Missouri State University^ (21, 8.8)
- 12 Hillcrest High School^^ (18, 7.3)

Outstate Area
- 13 El Dorado Springs (19, 7.9)
- 14 St. Joseph Pump Station (22, 10.5)
- 15 Hercules Glades
- 16 Mingo

**Quality assured data through Dec. 31st, 2015*
***Middle Scale; Not to be compared to the annual NAAQS*
^Relocated to Hillcrest High School
^^Began monitoring in 2015 (year-to-date averages)
No violations of the 24-hour & annual NAAQS

Missouri
Department of Natural Resources
Air Pollution Control Program
Monitoring Unit, April, 2016

IMPROVE Protocol Site; El Dorado Springs

The EPA conducted an assessment of the IMPROVE Protocol Sites in an effort to optimize the Chemical Speciation Network (CSN) and create a network that is sustainable going forward. As a result of this assessment, EPA recommended defunding a number of monitoring sites, including the IMPROVE protocol site at El Dorado Springs. Operation of that site was discontinued effective January 2016.

Missouri State University Site (MSU)

New construction on the campus of Missouri State University in Springfield required relocation of the MSU monitoring site in April 2015. The $PM_{2.5}$ and PM_{10} instrument at MSU was relocated to the Hillcrest High School site as discussed in the 2015 monitoring network plan.

4.2 $PM_{2.5}$ Chemical Speciation Network (CSN)

$PM_{2.5}$ speciation sampling is currently being conducted at two locations: Blair Street in St. Louis and Arnold West. Bonne Terre and Liberty were discontinued in January 2015 as per recommendation from the US EPA evaluation of the national speciation network. The sampling schedule at Arnold West was modified to every six days in February 2015.

REVISED $PM_{2.5}$ MONITORING NETWORK

Site	Schedule*	Type	Agency	Purpose
St. Louis				
1. Blair St.	3	Collocated FRM	ESP	Quality Assurance & NCore PM2.5 & PM10-2.5 particle mass
	3	Speciation	ESP	
	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
2. Branch St.	H	TEOM-1405-DF FEM	ESP	24 hr NAAQS/AQI, PM10-2.5 continuous (unique middle scale monitor†)
3. South Broadway	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
4. Ladue	6	Collocated FRM	ESP	Quality Assurance
	H	TEOM-1405-F FEM	ESP	24 hr & Annual NAAQS/AQI
5. Arnold West	6	Speciation	ESP	
	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
6. Forest Park (near-roadway)	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous (micro scale monitor)
Kansas City				
7. Liberty	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
8. Troost	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
9. Blue Ridge I-70 (near-roadway)	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous (micro scale monitor)
10. Richards-Gebaur South	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
Springfield				
11. Hillcrest High School	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
St. Joseph				
12. Pump Station	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
	H	Collocated TEOM-1405-DF FEM	ESP	Quality Assurance
Outstate				
13. El Dorado Springs	H	TEOM-1405-DF FEM	ESP	24 hr & Annual NAAQS/AQI, PM10-2.5 continuous
14. Mingo	3	IMPROVE	Fish & Wildlife	
15. Hercules Glades	3	IMPROVE	Forest Service	

* 3 = Every third day; 6 = Every sixth day; H = Continuous monitoring, hourly data reported.

† The Branch St. Monitor is a unique middle scale impact site and not eligible for comparison to the Annual $PM_{2.5}$ NAAQS consistent with 40 CFR 58.30.

5. Ozone Monitoring Network

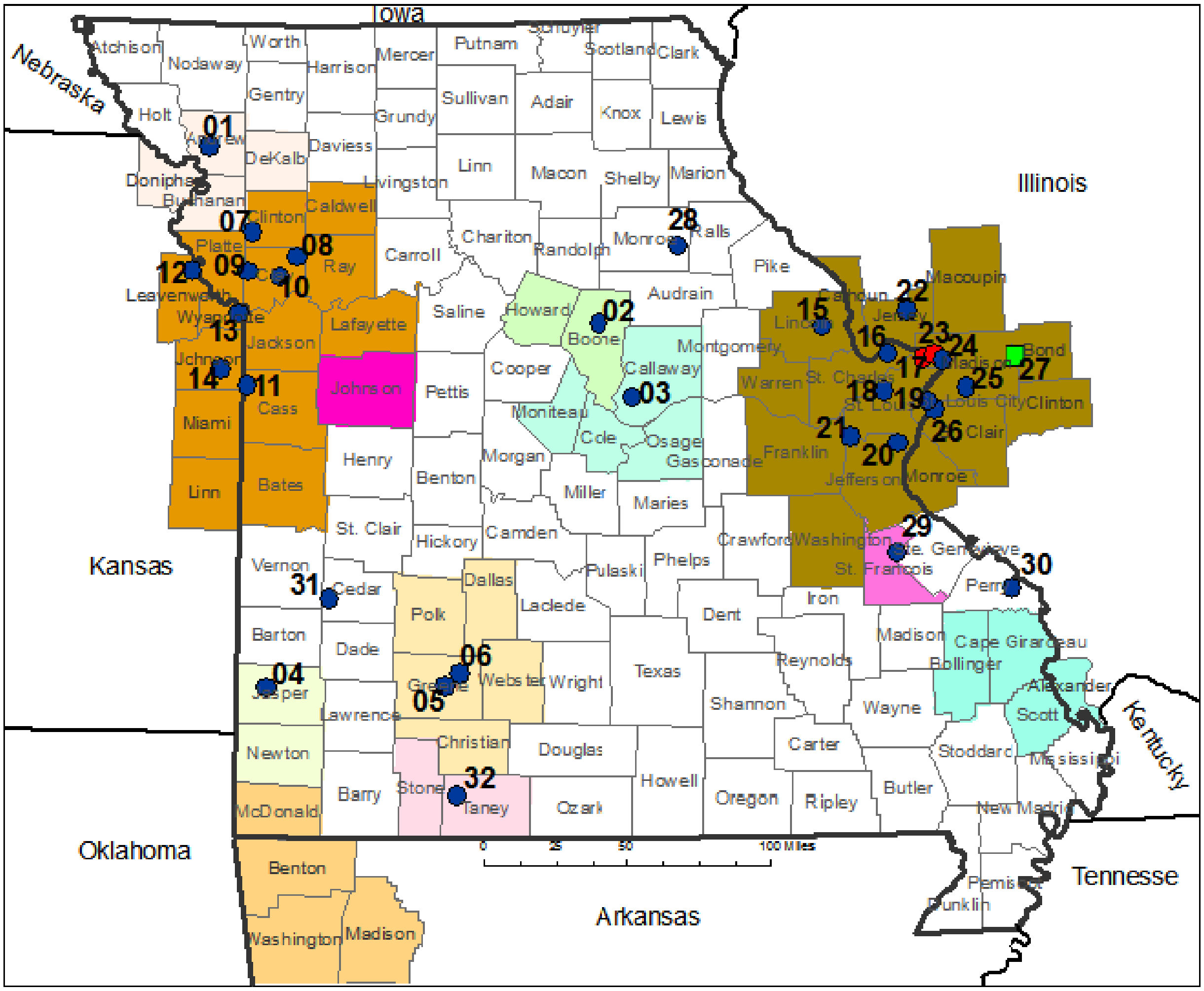
The Foley monitoring site (site no. 15 in the map below) will be relocated before the start of the 2017 ozone monitoring season in March 2017. This change is required for logistical reasons (change in property ownership). The site will be relocated to a new location within less than 4 kilometers of the current site and representative of the same air mass. In accordance with the system modification requirements of 40 CFR 58.14(c)(6) and consistent with the discussion of unanticipated network modifications in the Introduction to this document, details of this change will be communicated in writing as they become available to EPA Region VII staff, and the new location will be specifically identified in the next annual monitoring network plan.

There are no other planned changes to the ozone monitoring network, and ozone monitoring will continue to be conducted all year at the Mark Twain State Park (MTSP) site to collect ozone background concentrations need for PSD modeling projects and at Blair Street to meet the NCore ozone monitoring requirement. The current monitoring network is based on the current ozone standard and ground-level ozone air quality monitoring network design requirements.

Reduction of the ozone NAAQS to 70 ppb was published in the Federal Register in October 2015, effective in December 2015. That change also included extension of the ozone monitoring season in Missouri to include the month of March and a requirement for photochemical assessment monitoring stations (PAMS) at NCore sites in nonattainment areas starting in 2019.

Missouri Statewide Ozone (O_3) Monitoring Network, 2016

2015 Primary 8-hour NAAQS = 70 Parts per Billion (ppb)



Legend

OzoneMonitoringNetwork

● 59 - 70

● 71

🟩 CASTNET Monitor

***Year round monitoring*

SPM: Special Purpose Monitor

2010 Population

■ 52,595 (Warrensburg-MSA)

■ 65,359 (Farmington-MSA)

■ 83,877 (Branson-MSA)

■ 127,329 (St. Joseph-CBSA (MO-KS))

■ 135,466 (Cape Gir-Sikeston-Jackson-CBSA (MO-IL))

■ 149,807 (Jefferson-CBSA)

■ 172,786 (Columbia-CBSA)

■ 175,518 (Joplin-CBSA)

■ 436,712 (Springfield-CBSA)

■ 463,204 (Fayetteville-Springdale-Rogers-CBSA (MO-AR))

■ 2,035,331 (Kansas City-CBSA (MO-KS))

■ 2,807,807 (St. Louis-CBSA (MO-IL))

Missouri Department of Natural Resources
Air Pollution Control Program
Monitoring Unit, April, 2016

Site# SiteName (13-15DV)

St. Joseph, MO CBSA
- 01 Savannah (64)

Columbia City CBSA
- 02 Finger Lakes (63)

Jefferson City CBSA
- 03 New Bloomfield (63)

Joplin, MO CBSA
- 04 Alba (65)

Springfield CBSA
- 05 Hillcrest High Sch. (61)
- 06 Fellows Lake (61)

Kansas City CBSA, MO-KS
- 07 Trimble (67)
- 08 Watkins Mill (66)
- 09 Rocky Creek (68)
- 10 Liberty (64)
- 11 RG-South (64)
- 12 Leavenworth (64)
- 13 JFK (64)
- 14 Heritage Park (62)

Site# SiteName (13-15 DV)

St. Louis CBSA, MO-IL
- 15 Foley (68)
- 16 Orchard Farm (69)
- 17 West Alton (71)
- 18 Maryland Heights (70)
- 19 Blair Street** (65)
- 20 Arnold West (70)
- 21 Pacific (65)
- 22 Jerseyville (66)
- 23 Alton (71)
- 24 Wood River (69)
- 25 Maryville (69)
- 26 East St. Louis (66)
- 27 Alhambra-CASTNET (68)

Outstate Area
- 28 Mark Twain** (59)
- 29 Bonne Terre (65)
- 30 Farrar (66)
- 31 Eldorado Springs (63)
- 32 Branson-SPM (60)

6. PM_{10} Monitoring Network

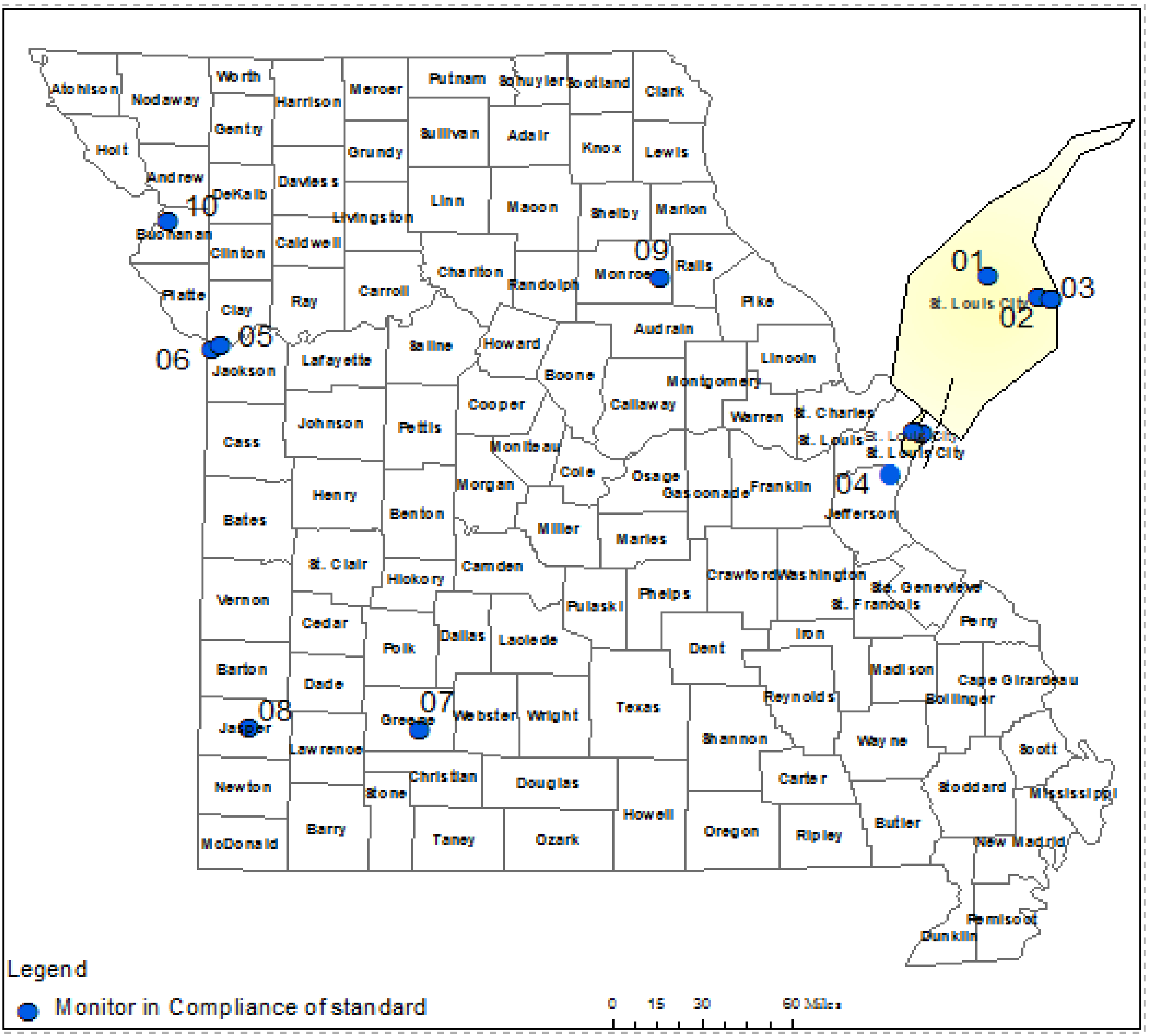
As discussed in Section 4, the TEOM-1405-DF monitor has the capability of reporting PM_{10} along with the $PM_{2.5}$ FEM measurements. The 1.71 firmware version has been integrated into the TEOM-1405-DF instruments, and the department is evaluating the performance of the monitors for PM_{10} measurement through data analysis. Once the PM_{10} data from these instruments is determined to be acceptable, the number of continuous PM_{10} monitors comparable to the NAAQS will increase by three (3) sites to include Blair Street, Ladue, and South Broadway in the St. Louis area. This will bolster the count of PM_{10} monitors in this CBSA to a total count of nine (9) monitors, more than enough to meet the minimum monitoring requirements specified in 40 CFR 58 Appendix D §4.6 (not including the microscale Forest Park site). The PM_{10} minimum monitoring requirement in the Kansas City CBSA is also being met currently by the Troost and Front Street sites in Missouri and the JFK site in Kansas. Pending successful integration of the 1.71 firmware into the TEOM 1405 DF's, the TEOM 1405 DF PM_{10} FEM channel can also be used for PM_{10} NAAQS compliance reporting at Hillcrest, Troost, St. Joseph Pump Station, Arnold West, and Branch Street. This would allow us to eventually replace the TEOM-1400ab instruments at Hillcrest, Branch St., and Arnold West.

As discussed in Section 4 above, the $PM_{2.5}$ and PM_{10} monitor at Missouri State University in Springfield was relocated to Hillcrest High School in April 2015. Also, as discussed in the 2014 Monitoring Network Plan, the PM_{10} monitor at Oakville was moved to Arnold West in July 2015.

A collocated PM_{10} TEOM-1400ab monitor has been installed at the Carthage site effective in April 2016. The PM_{10} low volume samplers at Troost and St. Joseph Pump Station will be replaced with TEOM-1400ab monitors. This will leave only the Blair Street site with a low-volume filter-based PM_{10} sampler and a collocated low-volume filter-based PM_{10} sampler, which meets the collocation requirement.

Missouri Statewide PM_{10} Monitoring Network, 2016

24-hour NAAQS = 150 Micrograms per Cubic Meter (µg/m^3



Site# Site Name (13-15 # of Expected Exceedances*)

St. Louis Area

01 Margaretta** (0.0)
02 Blair Street (0.0)
03 Branch Street** (1.0)
04 Arnold West**^^(0.0)

Kansas City Area

05 Front Street**(0.0)
06 Troost~(0.0)

Site# Site Name (13-15 # of Expected Exceedances*)

Springfield Area

07 Hillcrest High School**^ (0)

Outstate Area

08 Carthage**¥(0.3)
09 Mark Twain State Park** (0.0)
10 St. Joseph Pump Station~(0.0)

**Quality assured data through Dec. 31st, 2015*
^Relocated from MSU, April 2015 (year-to-date exceedance)
***Continuous monitor/~Proposed continuous monitor/¥Proposed to collocate*
^^Began monitoring Oct. 2015 (year-to-date exceedance)
**The 24-hour standard is attained when the expected number of exceedances is less than or equal to one when averaged over 3 calendar years.*
Red & Bold: Violation of the standard

Missouri
Department of Natural Resources
Air Pollution Control Program
Monitoring Unit, April, 2016

7. Nitrogen Dioxide (NO_2) Monitoring Network

Requirements for near-roadway NO_2 monitoring are being met in the St. Louis area by the Forest Park I-40/64 and Rider Trail 1-70 monitoring sites. The requirement for near roadway NO_2 monitoring in the Kansas City area is being met by the Blue Ridge I-70 site. The community-wide monitoring network requirement of 40 CFR 58 Appendix D, 4.3.3(a) is satisfied by the existing Troost and Margaretta monitoring sites.

EPA has identified the Margaretta NO_2 site as one of the minimum of forty additional NO_2 monitoring stations nationwide in any area, inside or outside of CBSAs, above the minimum monitoring requirements, with a primary focus on siting these monitors in locations to protect susceptible and vulnerable populations. This requirement is the responsibility of the respective Regional Administrators working with their respective states consistent with 40 CFR 58 Appendix D, 4.3.4(a). For additional information about this topic consult the following EPA website resource: http://www.epa.gov/ttn/amtic/svpop.html

The department added, in 2013, photolytic NO_2 monitors at the Blair Street NCore site and the Forest Park near-roadway site in St. Louis. Now that the evaluation project is complete, the photolytic NO_2 instrument from Forest Park has been moved to Blair Street and is the primary instrument. The Blair instrument is now a backup to the primary. Photolytic NO_2 monitoring is identified in EPA's long term monitoring strategy, and this monitoring supplement the required NOy monitoring being conducted at the NCore site.

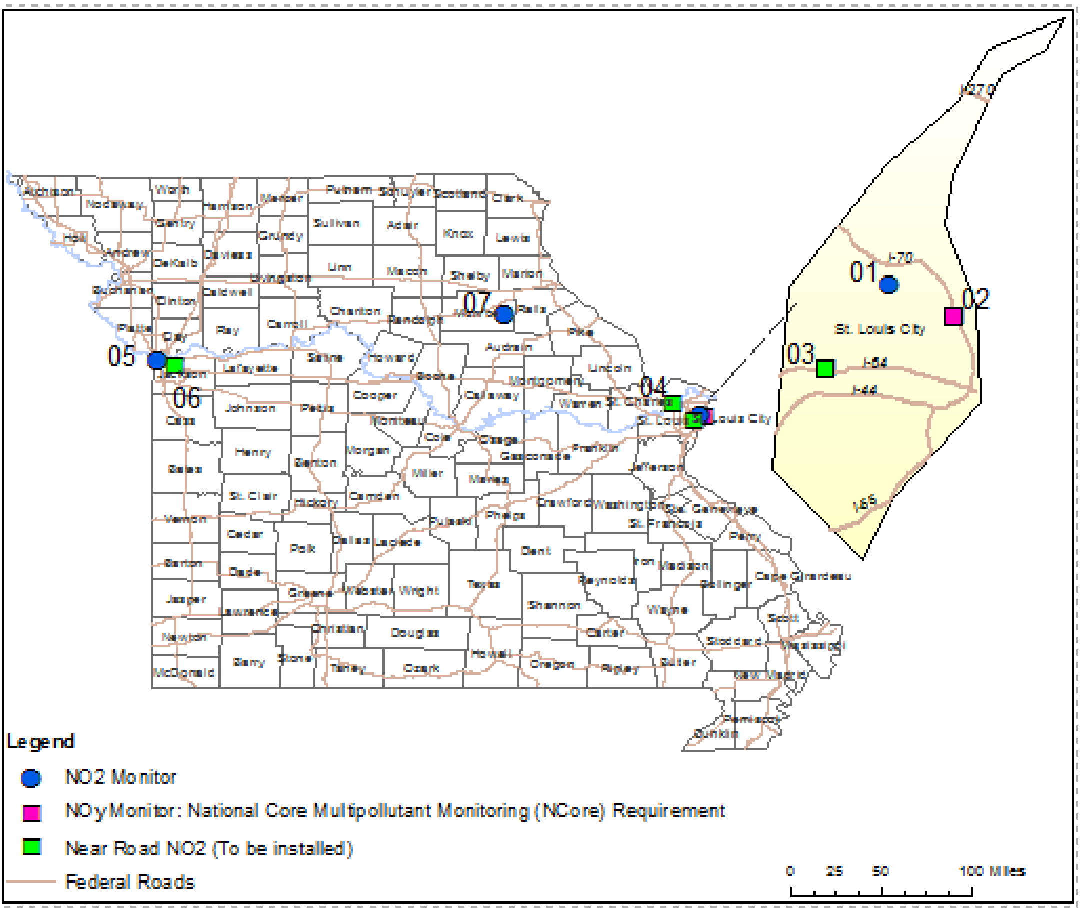
7.1 NO_2 Near-Roadway Monitoring

The final rule published in 2010 revising the NAAQS to add the 1-hour standard of 100 ppb (3-year average of annual 98th percentile) requires near-road NO_2 monitoring at two sites in the St. Louis CBSA (population 2.8 million) and one site in the Kansas City CBSA (population 2.0 million), based on population and traffic count. Sites were to be identified in the 2012 air monitoring network plan and begin operation by 1/1/2013. The schedule was revised in a rulemaking published in 2013 that required the first St. Louis area near-road site to begin operation in January 2014, the Kansas City area site to begin operation in January 2014, and the second St. Louis area site to begin operation in January 2015. Due in part to receipt of EPA funding for establishment of near-road sites, the department established the first St. Louis area site in January 2013, and the Kansas City area site was established in July 2013. The second near-roadway site in the St. Louis area was established in January 2015. The site selection process was described in the 2013 Monitoring Network Plan, http://dnr.mo.gov/env/apcp/2013monitoringnetworkplan.pdf.

The first St. Louis area near-roadway site, Forest Park, is located adjacent to I-64 west of downtown St. Louis. Air monitoring results at that site are consistent with commuter traffic, heaviest on weekday mornings. The second St. Louis area site, called Rider Trail S. I-70, is adjacent to Interstate 70 just west of Interstate 270. Interstate 70 extends across the United States and carries through traffic in addition to commuter traffic and other local traffic. Therefore, the fleet mix and congestion patterns relative to time of day and day of the week are expected to be different than at the first site.

Missouri Statewide Nitrogen Dioxide (NO_2) Monitoring Network, 2016

1-hour NAAQS = 100 ppb



Site# SiteName (13-15 DV*)

St. Louis Area

- 01 Margaretta (47)
- 02 Blair Street (44)
- 03 Forest Park (49)
- 04 Rider Trail, I-70 (44)^^

Kansas City Area

- 05 Troost (51)
- 06 Blue Ridge, I-70 (43)
- 07 Mark Twain State Park (11)^

**Quality assured data through Dec 31st, 2015*
^Began Monitoring on July 1, 2014
^^Began Monitoring on January 13, 2015
No violation of the 1-hour standard

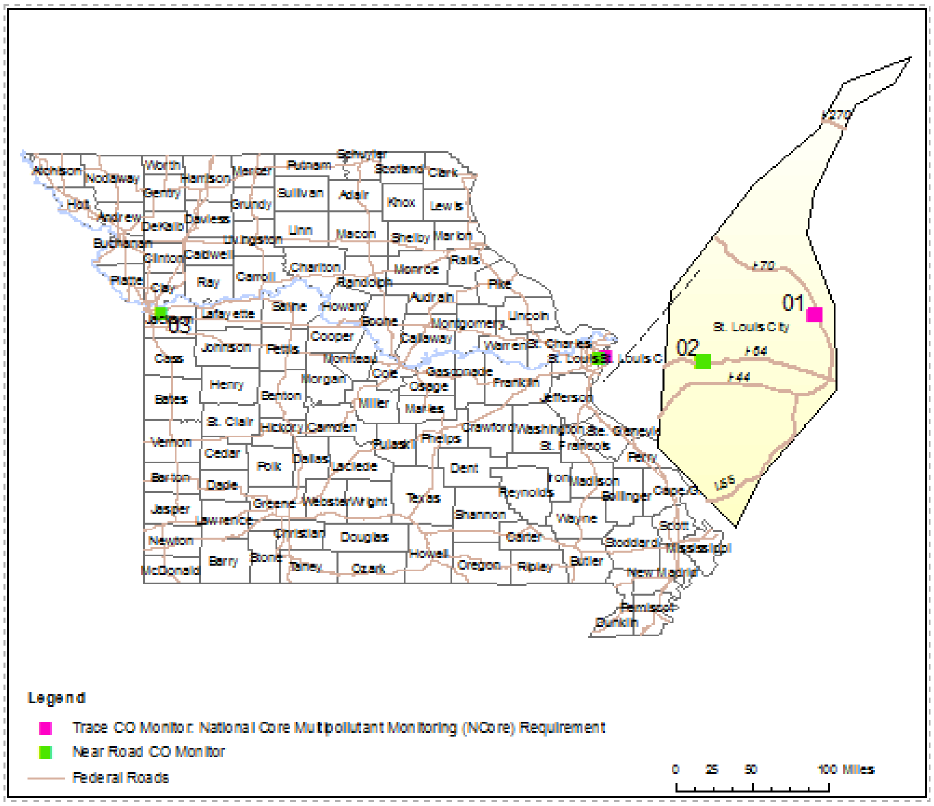
Missouri Department of Natural Resources
Air Pollution Control Program
Monitoring Unit, April, 2016

8. Carbon Monoxide (CO) Monitoring Network

On August 12, 2011, the EPA issued a decision to retain the existing NAAQS for CO. A final rule published on August 31, 2013 requires near-road CO monitoring at one site in the St. Louis CBSA by 1/2015 and one site in the Kansas City CBSA by 1/2017. The department established CO monitoring sites at the same time as the NO_2 monitoring sites at the two near-roadway sites described above. The department has added near-roadway CO monitors to the network at the Forest Park I-40/64 and Blue Ridge I-70 near-roadway monitoring sites. No additional changes to the CO monitoring network are proposed in this plan.

Missouri Statewide Carbon Monoxide (CO) Monitoring Network, 2016

1-hour NAAQS = 35 ppm
8-hour NAAQS = 9 ppm



Site# SiteName (2015 Second Highs: 1-hour, 8-hour Averages)

St. Louis Area
- 01 Blair Street (1.7, 1.4)
- 02 Forest Park (1.6, 1.2)
- 03 Blue Ridge, I-70 (1.3, 1.0)

^Quality assured data through Dec. 31st, 2015
No violations of the 1-hour and 8-hour standards

Missouri
Department of Natural Resources
Air Pollution Control Program
Monitoring Unit, April 2016

9. Rural National Core

EPA has expressed interest in pursuing the installation and operation of a rural NCore site in Missouri. Department staff has suggested that EPA evaluate the Mark Twain State Park Site as a candidate for consideration of the rural NCore site due to its location and the historically low PM_{10} and SO_2 concentrations measured at the site. The department is waiting for EPA to identify specifically what funding may become available for this project before committing additional resources to the project. The department will continue to work with EPA Region VII staff to pursue this project at some time in the future.

Currently the department is conducting background monitoring for SO_2, PM_{10}, ozone, and NO, NO_2, and NO_x. Data from monitors at the Mark Twain State Park Site provide background ambient air monitoring concentrations for Prevention of Significant Deterioration (PSD) permit projects and other potential modeling purposes and other analysis.

NETWORK DESCRIPTION/COMPONENTS

See Appendix 1 for the Network Description, which includes the following components.

Site Data

All ambient air monitoring sites are recorded in the EPA's Air Quality System database. Data includes location data such as latitude & longitude.

Air Quality System Site Code

The site code includes a numerical designation for State, county, and individual site. The state and county codes are assigned a number based on the alphabetical order of the State or county. Site numbers are assigned sequentially by date established in most counties. St. Louis County sites also have a division for municipality within St. Louis County.

Street Address

The official Post Office address of the lot where the monitors are located. Because not all sites are located in cities or towns, the street address is occasionally given as the intersection of the nearest streets or highways.

Geographical Coordinates

The coordinate system used by Missouri Department of Natural Resources is latitude and longitude.

Air Quality Control Region

Air Quality Control Regions, or AQCR, are defined by EPA and designates either urban regions, like St. Louis or Kansas City, or rural sections of a state, such as northeast or southwest Missouri.

AQCR	AQCR Name
070	Metropolitan St. Louis
094	Metropolitan Kansas City
137	Northern Missouri
138	SE Missouri
139	SW Missouri

Core Based Statistical Area

Core Based Statistical Areas, or CBSA are defined by the U.S. Census Bureau.

CBSA Code	CBSA Name
00000	Not in a CBSA
16020	Cape Girardeau-Jackson, MO-IL
17860	Columbia, MO
27620	Jefferson City, MO
27900	Joplin, MO
28140	Kansas City, MO-KS
41140	St. Joseph, MO-KS
41180	St. Louis, MO-IL

44180	Springfield, MO

Monitor Data

Each monitor is designed to detect a specific chemical pollutant or group of related pollutants. A site may have one or many monitors and not all sites will have the same monitors.

Pollutant

The common name of the pollutant. “Criteria” pollutants are defined by statute in the Clean Air Act.

Air Quality System Pollutant Code

Each pollutant has a specific numerical code to distinguish it from others.

Pollutant Code	Pollutant
14129	Lead – Local Conditions
42101	Carbon Monoxide
42401	Sulfur Dioxide
42406	Sulfur Dioxide 5-min
42600	Reactive Oxides of N (NOY)
42601	Nitric Oxide
42602	Nitrogen Dioxide
42603	Oxides of Nitrogen
44201	Ozone
61103	Resultant Wind Speed
61104	Resultant Wind Direct
62101	Outdoor Temperature
62107	Indoor Temperature
62201	Relative Humidity
63301	Solar Radiation
64101	Barometric Pressure
68105	Average Ambient Temperature
68108	Sample Baro Pressure
81102	PM_{10}
88313	Black Carbon-Local Condition
85101	PM_{10} - LC
85129	Lead PM10 LC - FRM/FEM
86101	PMCoarse - LC (FRM Diff)
88101	$PM_{2.5}$ FRM
88500	$PM_{2.5}$ Tot Atmospheric
88502	$PM_{2.5}$ AQI/Speciation
88503	$PM_{2.5}$ Reference
61106	Sigma Theta
62106	Temperature Difference
65102	Precipitation
88314	UV Carbon PM2.5-Local Condition

85102	Antimony
85103	Arsenic PM10 LC
85107	Barium PM10 LC
85109	Bromine PM10 LC
85110	Cadmium PM10 LC
85111	Calcium PM10 LC
85112	Chromium PM10 LC
85113	Cobalt PM10 LC
85114	Copper PM10 LC
85126	Iron PM10 LC
85128	Lead PM10 LC
85132	Manganese PM10 LC
85136	Nickel PM10 LC
85142	Mercury PM10 LC
85154	Selenium PM10 LC
85160	Tin PM10 LC
85161	Titanium PM10 LC
85164	Vanadium PM10 LC
85166	Silver PM10 LC
85167	Zinc PM10 LC
85173	Thallium PM10 LC
85180	Potassium PM10 LC
88160	Tin PM10 LC
88305	OC CSN Unadj PM2.5 LC TOT
88312	Total Carbon PM2.5 LC TOT
88316	Optical EC PM2.5 LC TOT

Parameter Occurrence Code

The Parameter Occurrence Code (POC) distinguishes between different monitors for the same pollutant, most often collocated monitors used for precision and quality assurance. For $PM_{2.5}$, different parameter occurrence codes are assigned to FRM, collocated FRM, continuous, and speciation monitors.

Collocated

Collocated monitors are used for precision and quality assurance activities, and for redundancy for critical pollutants such as ozone.

Sampling Frequency

Sampling frequency varies for each pollutant, depending on the nature of the NAAQS standard and the technology used in the monitoring method. Most gaseous pollutants, $PM_{2.5}$ and PM_{10} monitors use continuous monitoring FEM methods and are averaged over one hour. Some particulate pollutants are filter-based FRM methods and averaged over one day.

Scale of Representation

Each monitor is intended to represent an area with similar pollutant concentration. The scales range from only a few meters to many kilometers.

MIC	Microscale - defines the concentration in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
MID	Middle - defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometers.
NBR	Neighborhood - defines concentrations within an extended area of a city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers.
URB	Urban - defines an overall citywide condition with dimensions on the order of 4 to 50 kilometers.
REG	Regional - defines air quality levels over areas having dimensions of 50 to hundreds of kilometers.

Monitor Type

The monitor's administrative classification as determined by the purpose for the monitor in the agency sampling strategy. Assignment of monitor types “NCORE” and “PAMS” is limited to EPA Headquarters and is done only after a complete review and approval is done for all site/monitor metadata.

Code	Description
IMPROVE	IMPROVE or IMPROVE Protocol
INDEX SITE	(not currently used by MO)
INDUSTRIAL	Used to indicate sites operated by an industry Primary Quality Assurance Organization (PQAO)
NATTS	National Air Toxics Trends Station
NON-EPA FEDERAL	(not currently used by MO)
NON-REGULATORY	Not used for NAAQS Compliance
PAMS	(not currently used by MO)
PROPOSED NCORE	
QA COLLOCATED	Collocated to Satisfy 40 CFR Part 58, Appendix A
SLAMS	State or Local Air Monitoring Station
SPECIAL PURPOSE	Special Purpose Monitoring Station (SPM or SPMS)
SUPLMNTL SPECIATION	
TRENDS SPECIATION	
TRIBAL MONITORS	(not currently used by MO)
UNOFFICIAL PAMS	(not currently used by MO)

State Monitoring Objective

Each monitor has a distinct objective such as providing real-time data for public awareness or use in determining compliance with regulations. The state monitoring objective provides more information about the purpose of the monitoring in addition to the monitor objective required of 40 CFR 58.10(a)(6).

State Objective Code	Objective
AQI	Public Information
COM	NAAQS Compliance
MET	Meteorological Data
RES	Research
STA	State Standard

Units

The physical terms used to quantify the pollutant concentration, such as parts per million or micrograms per cubic meter.

Unit Code	Unit Description
001	μg/m^3
007	parts per million
008	parts per billion
011	meters per second
012	miles per hour
013	knots
014	degree, compass
015	degree Fahrenheit
016	millbars
017	degree Celsius
018	Langleys
019	percent humidity
021	inches
022	inches Mercury
025	Langleys per minute
059	Millimeter (Mercury)
073	Liters/minute STP-Flow
077	Micrograms
079	Watts/m^2
083	Cubic meter/minute
105	μg/m^3 LC
106	Minutes
107	Percent
118	Liters/minute LC-Flow
119	Cubic meters/minute LC-Flow
121	parts per trillion

Monitoring/Analytical Method

Each monitor relies on a scientific principle to determine the pollutant concentration, which is described by the sampling method. Each method code is specific for a particular pollutant; therefore a three numeral code may be used for different methods for different pollutants. This is required of 40 CFR 58.10(a)(3).

Monitoring Objective

This is the primary monitoring objective(s) for the monitoring parameter required of 40 CFR 58.10(a)(6). The monitoring Objective is specific to the pollutant. Some sites may have more than one monitoring objective, but the primary objective is listed first.

APPENDIX 1

Missouri Monitoring Network Description

Missouri Ambient Air Monitoring Network

MIC	*Microscale*	*Several meters up to about 100 meters*
MID	*Middle*	*100 meters to 0.5 kilometer*
NBR	*Neighborhood*	*0.5 to 4.0 kilometers range*
URB	*Urban*	*4 to 50 kilometers*
REG	*Regional*	*Tens to hundreds of kilometers*
COM	*National Ambient Air Quality Standards (NAAQS) Compliance*	
MET	*Meteorological Data*	
N/A	*Not Applicable*	
NCore	*National Multi-Pollutant Monitoring Stations*	
NON-A	*Non-Ambient Site*	
NON-R	*Non-Regulatory*	
PQAO	*Primary Quality Assurance Organization*	
RES	*Research*	
SLAMS	*State and Local Monitoring Stations*	
SIP	*State Implementation Plan*	
SPEC	*Speciation*	
STA	*State Standard*	
SPM	*Special Purpose Monitoring*	
SPP	*Special Purpose Project*	

Keep/Back-Up: 'Keep' a monitor under performance evaluation and data is not reported to EPA Air Quality System (AQS). 'Back-Up' a monitor where Quality Assurance/Quality Control is being performed but no data is reported to AQS unless the primary monitor does not produce a valid measurement.

Ameren Missouri (PQAO - 1440)

Labadie, North

AQS Site Number 29-183-9004

~150 ft. N of Terry Rd and ~600 ft. N Kingfisher Ct, Augusta, MO 63332

Latitude: 38.595578 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.828601 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 816

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented

Labadie, Northwest

AQS Site Number 29-183-9002

Rt. 94, Augusta, MO 63332 near the intersection with Schluersburg Road

Latitude: 38.5818 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.865528 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 550

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Outdoor Temperature	62101	Industrial	2	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (10m Probe Height)
Outdoor Temperature	62101	Industrial	3	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (2m Probe Height)

Outdoor Temperature Diff	62106	Industrial	1	☐	1	N/A	MET	116	Temp Diff deg C	041	Instrumental: Elect or Mach Avg Lev 2-Lev1	Other (10m - 2m Probe Heights)
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
WD - Sigma Theta (Horizontal)	61106	Industrial	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
WD - Sigma Theta (Vertical)	61107	Industrial	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
Wind Direction - Resultant	61104	Industrial	1	☐	1	N/A	MET	014	deg	020	Vector Summation	Other (10m Tower)
Wind Direction - Scalar	61102	Industrial	1	☐	1	N/A	MET	014	deg	063	Climatronics	Other (10m Tower)
Wind Speed - Resultant	61103	Industrial	1	☐	1	N/A	MET	011	m/s	020	Vector Summation	Other (10m Tower)
Wind Speed - Scalar	61101	Industrial	1	☐	1	N/A	MET	011	m/s	063	Climatronics	Other (10m Tower)

Wind Speed - Vertical	61109	Industrial	1	☐	1	N/A	MET	011	m/s	020	Electronic Averaging	Other (10m Tower)
WS - Sigma Theta (Vertical)	61110	Industrial	1	☐	1	N/A	MET	011	m/s	020	Arithmetic Standard Deviation	Other (10m Tower)

Labadie, Southwest *AQS Site Number* **29-183-9003**

~600 ft. NNE of junction of Maple Hill Rd. / Cedar Hill Dr., Labadie, MO 63055

Latitude: 38.52814 ***AQCR:*** 070 Metropolitan St. Louis

Longitude: -90.86326 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 630

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented

Labadie, Valley Site *AQS Site Number* **29-071-9001**

2901 Labadie Bottom Road, Labadie, MO 63055

Latitude: 38.572522 ***AQCR:*** 070 Metropolitan St. Louis

Longitude: -90.796911 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 525

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Barometric Pressure	64101	Industrial	1	☐	1	N/A	MET	016	Millbars	015	Instrumental-Barometric Press Transducer	Other

Outdoor Temperature	62101	Industrial	2	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (10m Probe Height)
Outdoor Temperature	62101	Industrial	3	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (2m Probe Height)
Outdoor Temperature Diff	62106	Industrial	1	☐	1	N/A	MET	116	Temp Diff deg C	041	Instrumental: Elect or Mach Avg Lev 2-Lev1	Other (10m - 2m Probe Heights)
Precipitation	65102	Industrial	1	☐	1	N/A	MET	021	inches	014	Heated Tipping Bucket	Other
Relative Humidity	62201	Industrial	1	☐	1	N/A	MET	019	%humidity	061	Met One 083D	Other
Solar Radiation	63301	Industrial	1	☐	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
WD - Sigma Theta (Horizontal)	61106	Industrial	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)

WD - Sigma Theta (Vertical)	61107	Industrial	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
Wind Direction - Resultant	61104	Industrial	1	☐	1	N/A	MET	014	deg	020	Vector Summation	Other (10m Tower)
Wind Direction - Scalar	61102	Industrial	1	☐	1	N/A	MET	014	deg	063	Climatronics	Other (10m Tower)
Wind Speed - Resultant	61103	Industrial	1	☐	1	N/A	MET	011	m/s	020	Vector Summation	Other (10m Tower)
Wind Speed - Scalar	61101	Industrial	1	☐	1	N/A	MET	011	m/s	063	Climatronics	Other (10m Tower)
Wind Speed - Vertical	61109	Industrial	1	☐	1	N/A	MET	011	m/s	020	Electronic Averaging	Other (10m Tower)
WS - Sigma Theta (Vertical)	61110	Industrial	1	☐	1	N/A	MET	011	m/s	020	Arithmetic Standard Deviation	Other (10m Tower)

Rush Island, Fults-Site, IL

AQS Site Number **17-133-9001**

Off Ivy Road, Fults, IL 62244

Latitude: 38.15908 ***AQCR:*** 138 SE Missouri

Longitude: -90.22728 ***MSA:*** 0000 Not in a MSA

Elevation (ft): 446

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*

Barometric Pressure	64101	Industrial	1	☑	1	N/A	MET	016	Millbars	015	Instrumental-Barometric Press Transducer	Other
Outdoor Temperature	62101	Industrial	2	☑	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (10m Probe Height)
Outdoor Temperature	62101	Industrial	3	☑	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (2m Probe Height)
Outdoor Temperature Diff	62106	Industrial	1	☑	1	N/A	MET	116	Temp Diff deg C	041	Instrumental: Elect or Mach Avg Lev 2-Lev1	Other (10m - 2m Probe Heights)
Precipitation	65102	Industrial	1	☑	1	N/A	MET	021	inches	014	Heated Tipping Bucket	Other
Relative Humidity	62201	Industrial	1	☑	1	N/A	MET	019	%humidity	061	Met One 083D	Other
Solar Radiation	63301	Industrial	1	☑	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other
Sulfur Dioxide	42401	Industrial	1	☑	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☑	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented

WD - Sigma Theta (Horizontal)	61106	Industrial	1	☑	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
WD - Sigma Theta (Vertical)	61107	Industrial	1	☑	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
Wind Direction - Resultant	61104	Industrial	1	☑	1	N/A	MET	014	deg	020	Vector Summation	Other (10m Tower)
Wind Direction - Scalar	61102	Industrial	1	☑	1	N/A	MET	014	deg	063	Climatronics	Other (10m Tower)
Wind Speed - Resultant	61103	Industrial	1	☑	1	N/A	MET	011	m/s	020	Vector Summation	Other (10m Tower)
Wind Speed - Scalar	61101	Industrial	1	☑	1	N/A	MET	011	m/s	063	Climatronics	Other (10m Tower)
Wind Speed - Vertical	61109	Industrial	1	☑	1	N/A	MET	011	m/s	020	Electronic Averaging	Other (10m Tower)
WS - Sigma Theta (Vertical)	61110	Industrial	1	☑	1	N/A	MET	011	m/s	020	Arithmetic Standard Deviation	Other (10m Tower)

Rush Island, Johnson Tall Tower

AQS Site Number 29-099-9008

600 Johnson Rd., Festus, MO 63028

Latitude:	38.11999	**AQCR:**	070	Metropolitan St. Louis
Longitude:	-90.28214	**MSA:**	7040	St. Louis, MO-IL
Elevation (ft):	656			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Outdoor Temperature	62101	Industrial	2	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (62.5m Probe Height)
Outdoor Temperature	62101	Industrial	3	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (132.5m Probe Height)
Outdoor Temperature Diff	62106	Industrial	1	☐	1	N/A	MET	116	Temp Diff deg C	041	Instrumental: Elect or Mach Avg Lev 2-Lev1	Other (132.5m-62.5m Probe Heights)
WD - Sigma Theta (Horizontal)	61106	Industrial	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (132.5m Probe Height)
WD - Sigma Theta (Horizontal)	61106	Industrial	2	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (62.5m Probe Height)
WD - Sigma Theta (Horizontal)	61106	Industrial	3	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (62.5m Probe Height)
WD - Sigma Theta (Horizontal)	61106	Industrial	4	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (62.5m Probe Height)
WD - Sigma Theta (Horizontal)	61106	Industrial	5	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (62.5m Probe Height)

WD - Sigma Theta (Horizontal)	61106	Industrial	6	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (62.5m Probe Height)
WD - Sigma Theta (Vertical)	61107	Industrial	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (132.5m Probe Height)
WD - Sigma Theta (Vertical)	61107	Industrial	2	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (62.5m Probe Height)
WD - Sigma Theta (Vertical)	61107	Industrial	3	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (132.5m Probe Height)
WD - Sigma Theta (Vertical)	61107	Industrial	4	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (132.5m Probe Height)
WD - Sigma Theta (Vertical)	61107	Industrial	5	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (132.5m Probe Height)
WD - Sigma Theta (Vertical)	61107	Industrial	6	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (132.5m Probe Height)
Wind Direction - Resultant	61104	Industrial	1	☐	1	N/A	MET	014	deg	020	Vector Summation	Other (132.5m Probe Height)
Wind Direction - Resultant	61104	Industrial	2	☐	1	N/A	MET	014	deg	020	Vector Summation	Other (62.5m Probe Height)
Wind Direction - Resultant	61104	Industrial	3	☐	1	N/A	MET	014	deg	020	Vector Summation	Other (62.5m Probe Height)

Wind Direction - Scalar	61102	Industrial	1	☐	1	N/A	MET	014	deg	063	Climatronics	Other (132.5m Probe Height)
Wind Direction - Scalar	61102	Industrial	2	☐	1	N/A	MET	014	deg	063	Climatronics	Other (62.5m Probe Height)
Wind Direction - Scalar	61102	Industrial	3	☐	1	N/A	MET	014	deg	063	Climatronics	Other (62.5m Probe Height)
Wind Speed - Resultant	61103	Industrial	1	☐	1	N/A	MET	011	m/s	020	Vector Summation	Other (132.5m Probe Height)
Wind Speed - Resultant	61103	Industrial	2	☐	1	N/A	MET	011	m/s	020	Vector Summation	Other (62.5m Probe Height)
Wind Speed - Resultant	61103	Industrial	3	☐	1	N/A	MET	011	m/s	020	Vector Summation	Other (62.5m Probe Height)
Wind Speed - Scalar	61101	Industrial	1	☐	1	N/A	MET	011	m/s	063	Climatronics	Other (132.5m Probe Height)
Wind Speed - Scalar	61101	Industrial	2	☐	1	N/A	MET	011	m/s	063	Climatronics	Other (62.5m Probe Height)
Wind Speed - Scalar	61101	Industrial	3	☐	1	N/A	MET	011	m/s	063	Climatronics	Other (62.5m Probe Height)
Wind Speed - Vertical	61109	Industrial	1	☐	1	N/A	MET	011	m/s	020	Electronic Averaging	Other (132.5m Probe Height)

Wind Speed - Vertical	61109	Industrial	2	☐	1	N/A	MET	011	m/s	020	Electronic Averaging	Other (62.5m Probe Height)
Wind Speed - Vertical	61109	Industrial	3	☐	1	N/A	MET	011	m/s	020	Electronic Averaging	Other (62.5m Probe Height)
WS - Sigma Theta (Vertical)	61110	Industrial	1	☐	1	N/A	MET	011	m/s	020	Arithmetic Standard Deviation	Other (132.5m Probe Height)
WS - Sigma Theta (Vertical)	61110	Industrial	2	☐	1	N/A	MET	011	m/s	020	Arithmetic Standard Deviation	Other (62.5m Probe Height)
WS - Sigma Theta (Vertical)	61110	Industrial	3	☐	1	N/A	MET	011	m/s	020	Arithmetic Standard Deviation	Other (62.5m Probe Height)

Rush Island, Natchez

AQS Site Number **29-099-9009**

917 Natchez Trace Drive, Bloomsdale, MO 63627

Latitude:	38.10525	**AQCR:**	070	Metropolitan St. Louis
Longitude:	-90.29842	**MSA:**	7040	St. Louis, MO-IL
Elevation (ft):	505			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented

Rush Island, Weaver-AA

AQS Site Number **29-099-9007**

802 Weaver Road, Festus, MO 63028

Latitude: 38.144972 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.304783 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 502

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	100	Ultra-violet Fluorescence	Source Oriented

City Utilities (PQAO - 1292)

James River South (Recommended for discontinuation)

AQS Site Number 29-077-0037

2251 East Evans Road, Springfield, MO 65804

Latitude:	37.104461	**AQCR:**	139	SW Missouri
Longitude:	-93.25339	**MSA:**	7920	Springfield, MO
Elevation (ft):	1227			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	3	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	3	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented

Doe Run Buick (PQAO - 1288)

County Road 75

AQS Site Number 29-093-9010

98 Iron County Road, Bixby, MO 65439

Latitude:	37.64876	**AQCR:**	138	SE Missouri
Longitude:	-91.14980	**MSA:**	0000	Not in a MSA
Elevation (ft):	1365			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented

Doe Run Buick - Buick NE

AQS Site Number 29-093-9008

346 Power Lane, Bixby West, MO 65439

Latitude:	37.65214	**AQCR:**	138	SE Missouri
Longitude:	-91.11689	**MSA:**	0000	Not in a MSA
Elevation (ft):	1423			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/6	MID	COM	105	ug/m^3-LC	113	Doe Run Mass Spectra ICAP	Source Oriented

Doe Run Buick - North #5 (NON-A)

AQS Site Number **29-093-0021**

Doe Run Buick - North#5, Buick, MO 65439

Latitude: 37.65178 **AQCR:** 138 SE Missouri

Longitude: -91.13094 **MSA:** 0000 Not in a MSA

Elevation (ft): 1443

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/6	MID	SIP	105	ug/m^3-LC	113	Doe Run Mass Spectra ICAP	Source Oriented

Doe Run Buick - South #1 (NON-A)

AQS Site Number **29-093-0016**

Doe Run Buick - South#1, Buick, MO 65439

Latitude: 37.62400 **AQCR:** 138 SE Missouri

Longitude: -91.12827 **MSA:** 0000 Not in a MSA

Elevation (ft): 1502

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/6	MID	SIP	105	ug/m^3-LC	113	Doe Run Mass Spectra ICAP	Source Oriented
Lead (TSP) - LC FRM/FEM	14129	Industrial	2	☐	1/6	MID	SIP	105	ug/m^3-LC	113	Doe Run Mass Spectra ICAP	Quality Assurance (Collocation)

Hwy 32 Northeast

AQS Site Number **29-093-9009**

1582 Highway 32, Bixby, MO 65439

Latitude: 37.65319 **AQCR:** 138 SE Missouri

Longitude: -91.12795 **MSA:** 0000 Not in a MSA

Elevation (ft): 1384

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented

West Entrance

AQS Site Number **29-093-9011**

18594 Hwy KK, Boss, MO 65440

Latitude: 37.63211 **AQCR:** 138 SE Missouri

Longitude: -91.13565 **MSA:** 0000 Not in a MSA

Elevation (ft): 1463

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented

Doe Run Glover (PQAO - 1289)

Doe Run Glover - Big Creek #5 (NON-A)

AQS Site Number **29-093-0029**

Doe Run Glover - Big Creek #5, Glover, MO 65439

Latitude:	37.47211	**AQCR:**	138	SE Missouri
Longitude:	-90.68919	**MSA:**	0000	Not in a MSA
Elevation (ft):	927			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/6	MID	SIP	105	ug/m^3-LC	189	Inter-Mountain Lab, Inc Mass Spectra ICAP	Source Oriented

Doe Run Glover - Post Office #2 (NON-A)

AQS Site Number **29-093-0027**

Doe Run Glover - Post Office #2, Glover, MO 65439

Latitude:	37.48532	**AQCR:**	138	SE Missouri
Longitude:	-90.68991	**MSA:**	0000	Not in a MSA
Elevation (ft):	927			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/6	MID	SIP	105	ug/m^3-LC	189	Inter-Mountain Lab, Inc Mass Spectra ICAP	Source Oriented
Lead (TSP) - LC FRM/FEM	14129	Industrial	2	☐	1/6	MID	SIP	105	ug/m^3-LC	189	Inter-Mountain Lab, Inc Mass Spectra ICAP	Quality Assurance (Collocation)

Doe Run Herculaneum (PQAO - 1290)

Herculaneum, Church Street (NON-A)

AQS Site Number 29-099-0024

951 Church St., Herculaneum, MO 63048

Latitude:	38.258667	**AQCR:**	070	Metropolitan St. Louis
Longitude:	-90.380889	**MSA:**	7040	St. Louis, MO-IL
Elevation (ft):	463			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/6	NBR	COM	105	ug/m^3-LC	192	Inductive Coupled Plasma Spectrometry	Source Oriented
Lead (TSP) - LC FRM/FEM	14129	Industrial	2	☐	1/6	NBR	COM	105	ug/m^3-LC	192	Inductive Coupled Plasma Spectrometry	Quality Assurance (Collocation)

Herculaneum, City Hall (Mott Street)

AQS Site Number 29-099-0020

Mott Street, Herculaneum, MO, 63048

Latitude:	38.263394	**AQCR:**	070	Metropolitan St. Louis
Longitude:	-90.379667	**MSA:**	7040	St. Louis, MO-IL
Elevation (ft):	468			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/1	MID	COM	105	ug/m^3-LC	192	Inductive Coupled Plasma Spectrometry	Source Oriented & Highest Concentration
Lead (TSP) - LC FRM/FEM	14129	Industrial	2	☐	1/3	MID	COM	105	ug/m^3-LC	192	Inductive Coupled Plasma Spectrometry	Quality Assurance (Collocation)

Herculaneum, Dunklin High School

AQS Site Number 29-099-9002

1 Black Cat Dr., Herculaneum, MO, 63048

Latitude: 38.26703 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.37875 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 445

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/3	NBR	COM	105	ug/m^3-LC	192	Inductive Coupled Plasma Spectrometry	Source Oriented & Population Exposure

Herculaneum, North Cross

AQS Site Number 29-099-0023

North Cross, Herculaneum, MO 63048

Latitude: 38.263378 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.381122 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 463

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	Industrial	1	☐	1/6	NBR	COM	105	ug/m^3-LC	192	Inductive Coupled Plasma Spectrometry	Source Oriented & Population Exposure

Herculaneum, Sherman

AQS Site Number 29-099-9004

460 Sherman St., Herculaneum, MO, 63048

Latitude: 38.27176 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.37648 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 462

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Lead (TSP) - LC FRM/FEM 14129	Industrial	1	☐	1/6	NBR	COM	105	ug/m^3-LC	192	Inductive Coupled Plasma Spectrometry	Source Oriented

Alba

AQS Site Number 29-097-0004

20400 Millwood Rd., Alba, MO 64755

Latitude: 37.2385 **AQCR:** 139 SW Missouri

Longitude: -94.42468 **MSA:** 3710 Joplin, MO

Elevation (ft): 965

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Max Ozone Concentration & Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

Arnold West: PM10-FEM not submitting AQS data

AQS Site Number 29-099-0019

1709 Lonedell Dr., Arnold, MO 63010

Latitude: 38.448581 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.398436 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 636

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Ammonium Ion PM2.5 LC	88301	SLAMS	6	☐	1/6	NBR	RES	105	ug/m^3-LC	812	Met One SASS Nylon	Population Exposure (UC-Davis)

Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
OP CSN_Rev Undj PM2.5 LC TOR	88378	SLAMS	6	☐	1/6	NBR	RES	105	ug/m^3-LC	842	URG 3000N w/Pall Quartz filter & Cyclone Inlet	Population Exposure (UC-Davis)
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	3	☐	1	NBR	COM	001	ug/m^3	079	R&P SA246B TEOM	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Population Exposure

PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Volatile Channel	88503	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Population Exposure
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (10m Tower)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (10m Tower)

Bills Creek (Recommended for discontinuation)

AQS Site Number **29-179-0001**

0.75 mile S. of 3229 County Rd., Boss, MO 65440

Latitude: 37.53467 ***AQCR:*** 138 SE Missouri

Longitude: -91.14857 ***MSA:*** 0000 Not in a MSA

Elevation (ft): 996

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

Blair Street: PM10-FEM not submitting AQS data

AQS Site Number **29-510-0085**

3247 Blair Street, St. Louis, MO 63107

Latitude: 38.656449 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.198548 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 450

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Ammonium Ion PM2.5 LC	88301	SLAMS	6	☐	1/3	NBR	RES	105	ug/m^3-LC	812	Met One SASS Nylon	Highest Concentration (UC-Davis)
Antimony	85102	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Arsenic PM10 LC	85103	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Barium PM10 LC	85107	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Barometric Pressure	64101	SLAMS	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Black Carbon PM2.5 LC	88313	SLAMS	1	☐	1	NBR	RES	105	ug/m^3-LC	894	Magee Scientific TAPI M633 Aethalometer	Population Exposure

Bromine PM10 LC	85109	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Cadmium PM10 LC	85110	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Calcium PM10 LC	85111	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Carbon Monoxide	42101	NCORE	1	☐	1	NBR	COM	007	ppm	055	Gas Filter Corr Thermo Electron 48C-TL	Population Exposure
Chromium PM10 LC	85112	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Cobalt PM10 LC	85113	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Copper PM10 LC	85114	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Indoor Temperature	62107	SLAMS	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other (Large Shelter)
Indoor Temperature	62107	SLAMS	2	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other (Small Shelter)

Iron PM10 LC	85126	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Lead PM10 LC	85128	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Lead PM10 LC - FRM/FEM	85129	SLAMS	6	☐	1/6	NBR	RES	108	ng/m^3-LC	907	R&P Partisol 2025 Teflon	Population Exposure (ERG)
Lead PM10 LC - FRM/FEM	85129	SLAMS	7	☐	1/6	NBR	RES	108	ng/m^3-LC	907	R&P Partisol 2025 Teflon	Population Exposure (ERG)
Manganese PM10 LC	85132	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Mercury PM10 LC	85142	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Nickel PM10 LC	85136	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Nitric Oxide	42601	NCORE	1	☐	1	NBR	COM	008	ppb	699	Teledyne API 200 EU/501	Population Exposure
Nitric Oxide	42601	SPM	2	☐	1	NBR	COM	008	ppb	200	Teledyne API T200UP Photolytic	Population Exposure
Nitrogen Dioxide	42602	SPM	2	☑	1	NBR	COM	008	ppb	200	Teledyne API T200UP Photolytic	Population Exposure

OC CSN Unadj PM2.5 LC TOT	88305	SLAMS	1	☐	1	NBR	RES	105	ug/m^3-LC	867	Sunset Labs	Population Exposure
OP CSN_Rev Undj PM2.5 LC TOR	88378	SLAMS	6	☐	1/3	NBR	RES	105	ug/m^3-LC	842	URG 3000N w/Pall Quartz filter & Cyclone Inlet	Highest Concentration (UC-Davis)
Optical EC PM2.5 LC TOT	88316	SLAMS	1	☐	1	NBR	RES	105	ug/m^3-LC	895	Sunset Lab	Population Exposure
Outdoor Temperature	62101	NCORE	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Oxides of Nitrogen	42603	SPM	2	☐	1	NBR	COM	008	ppb	200	Teledyne API T200UP Photolytic	Population Exposure
Ozone	44201	NCORE	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure
Ozone	44201	NCORE	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
PM10 - LC/FEM/NonFEM	85101	SLAMS	1	☐	1/3	NBR	COM	105	ug/m^3-LC	127	Lo-Vol R&P 2025 Sequential	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SLAMS	2	☐	1/6	NBR	COM	105	ug/m^3-LC	127	Lo-Vol R&P 2025 Sequential	Quality Assurance (Collocation)

PM10 - LC/FEM/NonFEM	85101	SLAMS	5	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	1	☐	1/3	NBR	COM	001	ug/m^3	127	Lo-Vol R&P 2025 Sequential	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	2	☐	1/6	NBR	COM	001	ug/m^3	127	Lo-Vol R&P 2025 Sequential	Quality Assurance (Collocation)
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 - LC FRM/FEM	88101	NCORE	2	☐	1/3	NBR	COM	105	ug/m^3-LC	145	R&P 2025 Sequential w/VSCC	Quality Assurance (Collocation)
PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 Tot Atmospheric	88500	SLAMS	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Volatile Channel	88503	SLAMS	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PMCoarse - LC FRM/FEM	86101	SLAMS	1	☐	1/3	NBR	COM	105	ug/m^3-LC	176	Thermo 2025 Sequential PM10-PM2.5	Population Exposure

PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Population Exposure
Potassium PM10 LC	85180	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Reactive Oxides of N (NOY)	42600	NCORE	1	☐	1	NBR	COM	008	ppb	699	Teledyne API 200 EU/501	Population Exposure
Relative Humidity	62201	NCORE	1	☐	1	N/A	MET	019	%humidity	014	Instrumental-Hygromer C94 Probe	Other
Selenium PM10 LC	85154	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Silver PM10 LC	85166	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Solar Radiation	63301	SLAMS	1	☐	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other
Sulfur Dioxide	42401	NCORE	1	☐	1	NBR	COM	008	ppb	600	Ultraviolet Fluorenscence API 100 EU	Population Exposure
Sulfur Dioxide Max 5-min Avg	42406	NCORE	1	☐	1	NBR	COM	008	ppb	600	Ultraviolet Fluorenscence API 100 EU	Population Exposure

Thallium PM10 LC	85173	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Tin PM10 LC	85160	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Titanium PM10 LC	85161	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
Total Carbon PM2.5 LC TOT	88312	SLAMS	1	☐	1	NBR	RES	105	ug/m^3-LC	867	Sunset Labs	Population Exposure
UV Carbon PM2.5 LC	88314	SLAMS	1	☐	1	NBR	RES	105	ug/m^3-LC	894	Magee Scientific TAPI M633 Aethalometer	Population Exposure
Vanadium PM10 LC	85164	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other
WD - Sigma Theta (Horizontal)	61106	SPM	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
Wind Direction - Resultant	61104	NCORE	1	☐	1	N/A	MET	014	deg	065	Instrumental: RM Young Model 05305	Other (10m Tower)
Wind Speed - Resultant	61103	NCORE	1	☐	1	N/A	MET	012	mph	065	Instrumental: RM Young Model 05305	Other (10m Tower)

Zinc PM10 LC	85167	SPM	1	☐	1	NBR	RES	108	ng/m^3-LC	820	Cooper Environmental Service Model Xact 620	Other

Blue Ridge, I-70: PM10-FEM not submitting AQS data

AQS Site Number **29-095-0042**

4018 Harvard Lane, Kansas City, MO 64133

Latitude: 39.047911 ***AQCR:*** 094 Metropolitan Kansas City

Longitude: -94.450513 ***MSA:*** 3760 Kansas City, MO-KS

Elevation (ft): 960

Pollutant	***AQS Code***	***AQS Monitor Type***	***AQS POC***	***Keep/ Back-Up***	***AQS Freq***	***AQS Scale***	***State-Obj***	***AQS Unit-Code***	***AQS Unit***	***AQS Method Code***	***AQS Method***	***AQS Monitor Objective***
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Black Carbon PM2.5 LC	88313	SPM	1	☐	1	MIC	COM	105	ug/m^3-LC	894	Magee Scientific TAPI M633 Aethalometer	Source Oriented
Carbon Monoxide	42101	SLAMS	1	☐	1	MIC	COM	007	ppm	055	Gas Filter Corr Thermo Electron 48C-TL	Source Oriented
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Nitric Oxide	42601	SPM	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented
Nitrogen Dioxide	42602	SLAMS	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented

Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Outdoor Temperature	62101	SPM	2	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (10m Probe Height)
Outdoor Temperature	62101	SPM	3	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (2m Probe Height)
Outdoor Temperature Diff	62106	SPM	1	☐	1	N/A	MET	116	Temp Diff deg C	041	Instrumental: Elect or Mach Avg Lev 2-Lev1	Other
Oxides of Nitrogen	42603	SPM	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	MIC	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	MIC	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Source Oriented
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	MIC	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Source Oriented
PM2.5 - LC FRM/FEM	88101	SPM	4	☐	1	MIC	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Source Oriented
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	MIC	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented

PM2.5 Volatile Channel	88503	SPM	1	☐	1	MIC	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	MIC	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Source Oriented
Precipitation	65102	SPM	1	☐	1	N/A	MET	021	inches	014	Heated Tipping Bucket	Other
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
Solar Radiation	63301	SPM	1	☐	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other
UV Carbon PM2.5 LC	88314	SPM	1	☐	1	MIC	COM	105	ug/m^3-LC	894	Magee Scientific TAPI M633 Aethalometer	Source Oriented
WD - Sigma Theta (Horizontal)	61106	SPM	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	065	Instrumental: RM Young Model 05305	Other (10m Tower)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	065	Instrumental: RM Young Model 05305	Other (10m Tower)

Bonne Terre

AQS Site Number 29-186-0005

15797 Highway D, Bonne Terre, MO 63628

Latitude: 37.90084

AQCR: 138 SE Missouri

Longitude: -90.42388

MSA: 0000 Not in a MSA

Elevation (ft): 840

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	REG	COM	007	ppm	047	Ultraviolet Photometric	Regional Transport
Ozone	44201	SLAMS	2	☑	1	REG	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
Solar Radiation	63301	SPM	1	☐	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Branch Street: PM10-FEM not submitting AQS data

AQS Site Number 29-510-0093

100 Branch St., St. Louis, MO 63102

Latitude: 38.65643 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.18977 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 422

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	MID	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	MID	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Source Oriented
PM10 - STP FRM/FEM	81102	SLAMS	3	☐	1	MID	COM	001	ug/m^3	079	R&P SA246B TEOM	Source Oriented
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	MID	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Source Oriented

PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	MID	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Source Oriented
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	MID	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented
PM2.5 Volatile Channel	88503	SPM	1	☐	1	MID	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	MID	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Source Oriented
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
WD - Sigma Theta (Horizontal)	61106	SPM	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	065	Instrumental: RM Young Model 05305	Other (10m Tower)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	065	Instrumental: RM Young Model 05305	Other (10m Tower)

Branson

AQS Site Number **29-213-0004**

251 SW. Outer Rd., Branson, MO 65616

Latitude: 36.70765 **AQCR:** 139 SW Missouri

Longitude: -93.22181 **MSA:** 0000 Not in a MSA

Elevation (ft): 1052

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SPM	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Max Ozone Concentration & Population Exposure
Ozone	44201	SPM	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Buick NE

AQS Site Number **29-093-0034**

346 Power Lane, Bixby West, MO 65439

Latitude: 37.65212 **AQCR:** 138 SE Missouri

Longitude: -91.11653 **MSA:** 0000 Not in a MSA

Elevation (ft): 1423

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	MID	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented & Highest Concentration
Lead (TSP) - LC FRM/FEM	14129	SLAMS	2	☐	1/6	MID	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Quality Assurance (Collocation)
Sulfur Dioxide	42401	SPM	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	SPM	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (6 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (6 meters)

Carthage

AQS Site Number **29-097-0003**

530 Juniper, Carthage, MO 64836

Latitude: 37.19822	***AQCR:***	139	SW Missouri
Longitude: -94.31702	***MSA:***	3710	Joplin, MO
Elevation (ft): 986			

Pollutant	***AQS Code***	***AQS Monitor Type***	***AQS POC***	***Keep/ Back-Up***	***AQS Freq***	***AQS Scale***	***State-Obj***	***AQS Unit-Code***	***AQS Unit***	***AQS Method Code***	***AQS Method***	***AQS Monitor Objective***

Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
PM10 - STP FRM/FEM	81102	SLAMS	3	☐	1	MID	COM	001	ug/m^3	079	R&P SA246B TEOM	Source Oriented
PM10 - STP FRM/FEM	81102	SLAMS	4	☐	1	MID	COM	001	ug/m^3	079	R&P SA246B TEOM	Quality Assurance (Collocation)
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	065	Instrumental: RM Young Model 05305	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	065	Instrumental: RM Young Model 05305	Other (5.5 meters)

El Dorado Springs: PM10-FEM not submitting AQS data

AQS Site Number **29-039-0001**

Highway 97 & Barnes Road, El Dorado Springs, MO 64744

Latitude:	37.70097	**AQCR:**	139	SW Missouri
Longitude:	-94.03474	**MSA:**	0000	Not in a MSA
Elevation (ft):	965			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other

Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Ozone	44201	SLAMS	1	☐	1	REG	COM	007	ppm	047	Ultraviolet Photometric	Regional Transport
Ozone	44201	SLAMS	2	☑	1	REG	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	REG	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Regional Transport
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	REG	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Regional Transport
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	REG	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Regional Transport
PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	REG	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Regional Transport
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	REG	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Regional Transport
PM2.5 Volatile Channel	88503	SPM	1	☐	1	REG	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Regional Transport
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	REG	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Regional Transport

Relative Humidity	62201	SPM	2	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Farrar *AQS Site Number* **29-157-0001**

County Rd. 342, Farrar, MO 63746

Latitude: 37.70264 ***AQCR:*** 138 SE Missouri

Longitude: -89.698640 ***MSA:*** 0000 Not in a MSA

Elevation (ft): 497

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Max Ozone Concentration & Extreme Downwind
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Fellows Lake

AQS Site Number **29-077-0042**

4208 E. Farm Rd. 66, Springfield, MO 65803

Latitude: 37.319444 **AQCR:** 139 SW Missouri

Longitude: -93.204444 **MSA:** 7920 Springfield, MO

Elevation (ft): 1346

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	URB	COM	007	ppm	047	Ultraviolet Photometric	Max Ozone Concentration & Population Exposure
Ozone	44201	SLAMS	2	☑	1	URB	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

Finger Lakes

AQS Site Number **29-019-0011**

1505 E. Peabody Road, Columbia, MO 65202

Latitude: 39.07803 **AQCR:** 137 Northern Missouri

Longitude: -92.31632 **MSA:** 1740 Columbia, MO

Elevation (ft): 726

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other

Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Max Ozone Concentration & Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

Fletcher

AQS Site Number **29-179-0002**

Forest Rd. 2236, Westfork, MO 64498

Latitude: 37.46889 ***AQCR:*** 138 SE Missouri

Longitude: -91.08847 ***MSA:*** 0000 Not in a MSA

Elevation (ft): 1256

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

Foley (to be relocated)

AQS Site Number **29-113-0003**

#7 Wild Horse, Foley, MO 63347

Latitude: 39.04512 ***AQCR:*** 137 Northern Missouri

Longitude: -90.86633 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 715

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Extreme Downwind

Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Forest City, Exide Levee

AQS Site Number **29-087-0008**

300 S. Washington St., Oregon MO, 64473

Latitude: 40.027222 **AQCR:** 137 Northern Missouri

Longitude: -95.235833 **MSA:** 0000 Not in a MSA

Elevation (ft): 904

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	MID	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

Forest Park: PM10-FEM not submitting AQS data

AQS Site Number **29-510-0094**

5600 Clayton Avenue, St. Louis, MO 63110

Latitude: 38.631057 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.281144 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 531

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other

Black Carbon PM2.5 LC	88313	SPM	1	☐	1	MIC	COM	105	ug/m^3-LC	894	Magee Scientific TAPI M633 Aethalometer	Source Oriented
Carbon Monoxide	42101	SLAMS	1	☐	1	MIC	COM	007	ppm	055	Gas Filter Corr Thermo Electron 48C-TL	Source Oriented
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Nitric Oxide	42601	SPM	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented
Nitrogen Dioxide	42602	SLAMS	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Outdoor Temperature	62101	SPM	2	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (10m Probe Height)
Outdoor Temperature	62101	SPM	3	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (2m Probe Height)
Outdoor Temperature Diff	62106	SPM	1	☐	1	N/A	MET	116	Temp Diff deg C	041	Instrumental: Elect or Mach Avg Lev 2-Lev1	Other (10m - 2m Probe Height)
Oxides of Nitrogen	42603	SPM	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented

PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	MIC	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	MIC	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Source Oriented
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	MIC	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Source Oriented
PM2.5 - LC FRM/FEM	88101	SPM	4	☐	1	MIC	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Source Oriented
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	MIC	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented
PM2.5 Volatile Channel	88503	SPM	1	☐	1	MIC	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Source Oriented
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	MIC	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Source Oriented
Precipitation	65102	SPM	1	☐	1	N/A	MET	021	inches	014	Heated Tipping Bucket	Other
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other

Solar Radiation	63301	SLAMS	1	☐	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other
UV Carbon PM2.5 LC	88314	SPM	1	☐	1	MIC	COM	105	ug/m^3-LC	894	Magee Scientific TAPI M633 Aethalometer	Source Oriented
WD - Sigma Theta (Horizontal)	61106	SPM	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	065	Instrumental: RM Young Model 05305	Other (10m Tower)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	065	Instrumental: RM Young Model 05305	Other (10m Tower)

Front Street

AQS Site Number 29-095-0018

1331 N. Jackson, Kansas City, MO 64120

Latitude: 39.13198 **AQCR:** 094 Metropolitan Kansas City

Longitude: -94.53128 **MSA:** 3760 Kansas City, MO-KS

Elevation (ft): 728

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
PM10 - STP FRM/FEM	81102	SLAMS	3	☐	1	NBR	COM	001	ug/m^3	079	R&P SA246B TEOM	Highest Concentration & Population Exposure

Glover

AQS Site Number 29-093-0033

Highway 49, approx. 0.4m South Highways 21/49/72 Intersection, Glover, 63620

Latitude:	37.48966	**AQCR:**	138	SE Missouri
Longitude:	-90.69246	**MSA:**	0000	Not in a MSA
Elevation (ft):	907			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Other

Herculaneum, Dunklin High School

AQS Site Number 29-099-0005

1 Black Cat Dr., Herculaneum, MO, 63048

Latitude:	38.26703	**AQCR:**	070	Metropolitan St. Louis
Longitude:	-90.37875	**MSA:**	7040	St. Louis, MO-IL
Elevation (ft):	445			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/3	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

Herculaneum, Mott Street

AQS Site Number 29-099-0027

Mott Street, Herculaneum, MO, 63048

Latitude:	38.263394	**AQCR:**	070	Metropolitan St. Louis
Longitude:	-90.379667	**MSA:**	7040	St. Louis, MO-IL
Elevation (ft):	468			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/1	MID	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented & Highest Concentration
Lead (TSP) - LC FRM/FEM	14129	SLAMS	2	☐	1/2	MID	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Quality Assurance (Collocation)
Sulfur Dioxide	42401	SLAMS	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented & Highest Concentration
Sulfur Dioxide Max 5-min Avg	42406	SPM	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented & Highest Concentration
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Herculaneum, Sherman

AQS Site Number 29-099-0013

460 Sherman St., Herculaneum, MO, 63048

Latitude:	38.27176	**AQCR:**	070	Metropolitan St. Louis
Longitude:	-90.37648	**MSA:**	7040	St. Louis, MO-IL
Elevation (ft):	462			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/3	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

Hillcrest High School: PM10-FEM not submitting AQS data AQS Site Number 29-077-0036

3319 N. Grant, Springfield, MO 65803

Latitude: 37.256069 ***AQCR:*** 139 SW Missouri

Longitude: -93.299692 ***MSA:*** 7920 Springfield, MO

Elevation (ft): 1321

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Ozone	44201	SLAMS	1	☐	1	URB	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure
Ozone	44201	SLAMS	2	☑	1	URB	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure

PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	3	☐	1	NBR	COM	001	ug/m^3	079	R&P SA246B TEOM	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Volatile Channel	88503	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Population Exposure
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other

Ladue

AQS Site Number **29-189-3001**

73 Hunter Ave., Ladue, MO 63124

Latitude: 38.65021 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.35036 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 528

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
PM2.5 - LC FRM/FEM	88101	SLAMS	1	☐	1	NBR	COM	105	ug/m^3-LC	181	PM2.5 VSCC FEM or Thermo Scientific 1405-F	Population Exposure
PM2.5 - LC FRM/FEM	88101	SLAMS	2	☐	1/6	NBR	COM	105	ug/m^3-LC	145	R&P 2025 Sequential w/VSCC	Quality Assurance (Collocation)
PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other

Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (10m Tower)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (10m Tower)

Liberty: PM10-FEM not submitting AQS data

AQS Site Number **29-047-0005**

Highway 33 & County Home Rd., Liberty, MO 64068

Latitude:	39.303056	***AQCR:***	094	Metropolitan Kansas City
Longitude:	-94.376389	***MSA:***	3760	Kansas City, MO-KS
Elevation (ft):	930			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Volatile Channel	88503	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Population Exposure
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
Solar Radiation	63301	SPM	1	☐	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other

Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Margaretta

AQS Site Number **29-510-0086**

4520 Margaretta, St. Louis, MO 63105

Latitude: 38.673172 ***AQCR:*** 070 Metropolitan St. Louis

Longitude: -90.239086 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 514

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Nitric Oxide	42601	SPM	1	☐	1	NBR	COM	008	ppb	074	Chemiluminescence	Population Exposure
Nitrogen Dioxide	42602	SLAMS	1	☐	1	NBR	COM	008	ppb	074	Chemiluminescence	Population Exposure
Oxides of Nitrogen	42603	SPM	1	☐	1	NBR	COM	008	ppb	074	Chemiluminescence	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	3	☐	1	MID	COM	001	ug/m^3	079	R&P SA246B TEOM	Population Exposure

Sulfur Dioxide	42401	SLAMS	1	☐	1	NBR	COM	008	ppb	060	Pulsed Fluorescent	Population Exposure
Sulfur Dioxide Max 5-min Avg	42406	SLAMS	1	☐	1	NBR	COM	008	ppb	060	Pulsed Fluorescent	Population Exposure

Mark Twain State Park

AQS Site Number **29-137-0001**

20057 State Park Office Rd., Stoutsville, MO 65283

Latitude: 39.47510 ***AQCR:*** 137 Northern Missouri

Longitude: -91.78899 ***MSA:*** 0000 Not in a MSA

Elevation (ft): 710

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Nitric Oxide	42601	SPM	1	☐	1	REG	COM	008	ppb	074	Chemiluminescence	General/Background
Nitrogen Dioxide	42602	SLAMS	1	☐	1	REG	COM	008	ppb	074	Chemiluminescence	General/Background
Oxides of Nitrogen	42603	SPM	1	☐	1	REG	COM	008	ppb	074	Chemiluminescence	General/Background
Ozone	44201	SLAMS	1	☐	1	REG	COM	007	ppm	047	Ultraviolet Photometric	General/Background

Ozone	44201	SLAMS	2	☑	1	REG	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
PM10 - STP FRM/FEM	81102	SPM	3	☐	1	REG	SIP	001	ug/m^3	079	R&P SA246B TEOM	General/Background
Sulfur Dioxide	42401	SPM	1	☐	1	NBR	COM	008	ppb	060	Pulsed Fluorescent	General/Background
Sulfur Dioxide Max 5-min Avg	42406	SPM	1	☐	1	NBR	COM	008	ppb	060	Pulsed Fluorescent	General/Background
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	065	Instrumental: RM Young Model 05305	Other (10m Tower)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	065	Instrumental: RM Young Model 05305	Other (10m Tower)

Maryland Heights *AQS Site Number* **29-189-0014**

13044 Marine Ave., Maryland Heights, MO 63146

Latitude: 38.7109 ***AQCR:*** 070 Metropolitan St. Louis

Longitude: -90.4759 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 633

Pollutant	***AQS Code***	***AQS Monitor Type***	***AQS POC***	***Keep/ Back-Up***	***AQS Freq***	***AQS Scale***	***State-Obj***	***AQS Unit-Code***	***AQS Unit***	***AQS Method Code***	***AQS Method***	***AQS Monitor Objective***
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other

Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

New Bloomfield

AQS Site Number **29-027-0002**

2625 Meadow Lake View, New Bloomfield, MO, 65063

Latitude: 38.70608 ***AQCR:*** 137 Northern Missouri

Longitude: -92.09308 ***MSA:*** 0000 Not in a MSA

Elevation (ft): 860

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Max Ozone Concentration & Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

Oates

AQS Site Number **29-179-0034**

13155 Highway KK, Boss, MO 65440

Latitude: 37.56485 ***AQCR:*** 138 SE Missouri

Longitude: -91.11423 ***MSA:*** 0000 Not in a MSA

Elevation (ft): 1134

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

Orchard Farm

AQS Site Number **29-183-1004**

2165 Highway V, St. Charles, MO 63301

Latitude: 38.8994
AQCR: 070 Metropolitan St. Louis
Longitude: -90.44917
MSA: 7040 St. Louis, MO-IL
Elevation (ft): 441

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	URB	COM	007	ppm	047	Ultraviolet Photometric	Extreme Downwind
Ozone	44201	SLAMS	2	☑	1	URB	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

Pacific

AQS Site Number **29-189-0005**

18701 Old Highway 66, Pacific, MO 63039

Latitude: 38.4902
AQCR: 070 Metropolitan St. Louis
Longitude: -90.7052
MSA: 7040 St. Louis, MO-IL
Elevation (ft): 524

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other

Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Pevely *AQS Site Number* 29-099-0009

500 Dow Industrial Dr., Pevely, MO 63070

Latitude: 38.2861 ***AQCR:*** 070 Metropolitan St. Louis

Longitude: -90.38094 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 409

Pollutant	***AQS Code***	***AQS Monitor Type***	***AQS POC***	***Keep/ Back-Up***	***AQS Freq***	***AQS Scale***	***State-Obj***	***AQS Unit-Code***	***AQS Unit***	***AQS Method Code***	***AQS Method***	***AQS Monitor Objective***
Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

Pevely North (Recommended for discontinuation) *AQS Site Number* 29-099-0026

Tiarre at the Abbey, Station 150N, Christine Drive, Pevely, MO 63070

Latitude: 38.296 ***AQCR:*** 070 Metropolitan St. Louis

Longitude: -90.393 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 582

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

Richards Gebaur-South: PM10-FEM not submitting AQS d *AQS Site Number* 29-037-0003

1802 E. 203rd Street, Belton, MO, 64012

Latitude: 38.75976 ***AQCR:*** 094 Metropolitan Kansas City

Longitude: -94.57997 ***MSA:*** 3760 Kansas City, MO-KS

Elevation (ft): 1031

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure

Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Volatile Channel	88503	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Population Exposure
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other

Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	065	Instrumental: RM Young Model 05305	Other (10m Tower)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	065	Instrumental: RM Young Model 05305	Other (10m Tower)

Rider Trail, I-70

AQS Site Number **29-189-0016**

13080 Hollenberg Drive, Bridgeton, MO 63044

Latitude: 38.75264 ***AQCR:*** 070 Metropolitan St. Louis

Longitude: -90.44884 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 488

Pollutant	***AQS Code***	***AQS Monitor Type***	***AQS POC***	***Keep/ Back-Up***	***AQS Freq***	***AQS Scale***	***State-Obj***	***AQS Unit-Code***	***AQS Unit***	***AQS Method Code***	***AQS Method***	***AQS Monitor Objective***
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Nitric Oxide	42601	SPM	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented
Nitrogen Dioxide	42602	SLAMS	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented
Outdoor Temperature	62101	SPM	2	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (10m Probe Height)
Outdoor Temperature	62101	SPM	3	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (2m Probe Height)

Outdoor Temperature Diff	62106	SPM	1	☐	1	N/A	MET	116	Temp Diff deg C	041	Instrumental: Elect or Mach Avg Lev 2-Lev1	Other (10m - 2m Probe Height)
Oxides of Nitrogen	42603	SPM	1	☐	1	MIC	COM	008	ppb	074	Chemiluminescence	Source Oriented
Precipitation	65102	SPM	1	☐	1	N/A	MET	021	inches	014	Heated Tipping Bucket	Other
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
Solar Radiation	63301	SPM	1	☐	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other
Sulfur Dioxide	42401	SPM	1	☑	1	MID	SPP	008	ppb	060	Pulsed Fluorescent	Population Exposure
Sulfur Dioxide Max 5-min Avg	42406	SPM	1	☑	1	MID	SPP	008	ppb	060	Pulsed Fluorescent	Population Exposure
WD - Sigma Theta (Horizontal)	61106	SPM	1	☐	1	N/A	MET	014	deg	020	Arithmetic Standard Deviation	Other (10m Tower)
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	065	Instrumental: RM Young Model 05305	Other (10m Tower)

Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	065	Instrumental: RM Young Model 05305	Other (10m Tower)

Rocky Creek

AQS Site Number 29-047-0006

13131 Highway 169 NE., Smithville, MO 64089

Latitude: 39.33188 **AQCR:** 094 Metropolitan Kansas City

Longitude: -94.5806 **MSA:** 3760 Kansas City, MO-KS

Elevation (ft): 993

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

Savannah

AQS Site Number 29-003-0001

11796 Highway 71, Savannah, MO 64485

Latitude: 39.9544 **AQCR:** 137 Northern Missouri

Longitude: -94.849 **MSA:** 7000 St. Joseph, MO

Elevation (ft): 1120

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other

Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Population Exposure
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

South Broadway: PM10-FEM not submitting AQS data

AQS Site Number **29-510-0007**

8227 South Broadway, St. Louis, MO 63111

Latitude:	38.5425	***AQCR:***	070	Metropolitan St. Louis
Longitude:	-90.263611	***MSA:***	7040	St. Louis, MO-IL
Elevation (ft):	452			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Barometric Pressure	64101	SLAMS	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Population Exposure

PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Volatile Channel	88503	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Population Exposure
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other

South Charleston (Recommended for discontinuation)

AQS Site Number **29-077-0026**

5012 S. Charleston, Springfield, MO 65804

Latitude: 37.122561 ***AQCR:*** 139 SW Missouri

Longitude: -93.263161 ***MSA:*** 7920 Springfield, MO

Elevation (ft): 1234

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other

Sulfur Dioxide	42401	SLAMS	1	☐	1	NBR	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	SLAMS	1	☐	1	NBR	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented

St. Joe State Park *AQS Site Number* **29-187-0007**

2800 Pimville Rd., Park Hills, MO 63601

Latitude: 37.81413 ***AQCR:*** 138 SE Missouri

Longitude: -90.50738 ***MSA:*** 0000 Not in a MSA

Elevation (ft): 937

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Lead (TSP) - LC FRM/FEM	14129	SPM	1	☐	1/6	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented

St. Joseph Pump Station: PM10-FEM not submitting AQS d *AQS Site Number* **29-021-0005**

S. Highway 759, St. Joseph, MO 64501

Latitude: 39.741667 ***AQCR:*** 094 Metropolitan Kansas City

Longitude: -94.858333 ***MSA:*** 7000 St. Joseph, MO

Elevation (ft): 845

Pollutant	*AQS Code*	*AQS Monitor Type*	*AQS POC*	*Keep/ Back-Up*	*AQS Freq*	*AQS Scale*	*State-Obj*	*AQS Unit-Code*	*AQS Unit*	*AQS Method Code*	*AQS Method*	*AQS Monitor Objective*
Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Barometric Pressure	64101	SPM	2	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other

Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Outdoor Temperature	62101	SPM	2	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SPM	6	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Quality Assurance (Collocation)
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SLAMS	9	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Quality Assurance (Collocation)
PM10 - STP FRM/FEM	81102	SLAMS	3	☐	1	NBR	COM	001	ug/m^3	079	R&P SA246B TEOM	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	9	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Quality Assurance (Collocation)

PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 - LC FRM/FEM	88101	SLAMS	5	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Quality Assurance (Collocation)
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Tot Atmospheric	88500	SPM	2	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Quality Assurance (Collocation)
PM2.5 Volatile Channel	88503	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Volatile Channel	88503	SPM	2	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Quality Assurance (Collocation)
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Population Exposure
PMCoarse - LC FRM/FEM	86101	SLAMS	9	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Quality Assurance (Collocation)
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
Relative Humidity	62201	SPM	2	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other

Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (5.5 meters)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (5.5 meters)

Trimble

AQS Site Number 29-049-0001

7536 SW. O Highway, Trimble, MO 64492

Latitude: 39.5306 **AQCR:** 137 Northern Missouri

Longitude: -94.556 **MSA:** 3760 Kansas City, MO-KS

Elevation (ft): 955

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	NBR	COM	007	ppm	047	Ultraviolet Photometric	Max Ozone Concentration
Ozone	44201	SLAMS	2	☑	1	NBR	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

Troost: PM10-FEM not submitting AQS data

AQS Site Number 29-095-0034

724 Troost (Rear), Kansas City, MO 64106

Latitude: 39.104722 **AQCR:** 094 Metropolitan Kansas City

Longitude: -94.570556 **MSA:** 3760 Kansas City, MO-KS

Elevation (ft): 971

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Barometric Pressure	64101	SPM	1	☐	1	N/A	MET	059	mm (Hg)	014	Instrumental-Barometric Sensor	Other
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Nitric Oxide	42601	SPM	1	☐	1	URB	COM	008	ppb	074	Chemiluminescence	Population Exposure
Nitrogen Dioxide	42602	SLAMS	1	☐	1	URB	COM	008	ppb	074	Chemiluminescence	Population Exposure
Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other (4m Probe Height)
Oxides of Nitrogen	42603	SPM	1	☐	1	URB	COM	008	ppb	074	Chemiluminescence	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SPM	5	☐	1	NBR	COM	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM10 - LC/FEM/NonFEM	85101	SLAMS	8	☑	1	NBR	COM	105	ug/m^3-LC	208	FMDS-Gravimetric 1405-DF	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	3	☐	1	NBR	COM	001	ug/m^3	079	R&P SA246B TEOM	Population Exposure
PM10 - STP FRM/FEM	81102	SLAMS	8	☑	1	NBR	COM	001	ug/m^3	208	FMDS-Gravimetric 1405-DF	Population Exposure

PM2.5 - LC FRM/FEM	88101	SLAMS	4	☐	1	NBR	COM	105	ug/m^3-LC	182	FMDS-Gravimetric 1405-DF	Population Exposure
PM2.5 Tot Atmospheric	88500	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PM2.5 Volatile Channel	88503	SPM	1	☐	1	NBR	AQI	105	ug/m^3-LC	790	FDMS-Gravimetric 1405-DF	Population Exposure
PMCoarse - LC FRM/FEM	86101	SLAMS	8	☐	1	NBR	COM	105	ug/m^3-LC	207	FMDS-Gravimetric 1405-DF	Population Exposure
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
Sulfur Dioxide	42401	SLAMS	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	SLAMS	1	☐	1	MID	COM	008	ppb	060	Pulsed Fluorescent	Source Oriented

Ursuline North

AQS Site Number **29-099-0025**

210 Glennon Heights Rd., Crystal City, MO 63019

Latitude: 38.243 ***AQCR:*** 070 Metropolitan St. Louis

Longitude: -90.37372 ***MSA:*** 7040 St. Louis, MO-IL

Elevation (ft): 578

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective

Lead (TSP) - LC FRM/FEM	14129	SLAMS	1	☐	1/6	NBR	COM	105	ug/m^3-LC	813	Inductively Coupled Plasma Mass Spectroscopy	Source Oriented & Upwind Background

Watkins Mill State Park

AQS Site Number 29-047-0003

Watkins Mill Road, Lawson, MO 64062

Latitude: 39.407419 **AQCR:** 094 Metropolitan Kansas City

Longitude: -94.265142 **MSA:** 3760 Kansas City, MO-KS

Elevation (ft): 1009

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	URB	COM	007	ppm	047	Ultraviolet Photometric	Extreme Downwind
Ozone	44201	SLAMS	2	☑	1	URB	BACK-UP	007	ppm	047	Ultraviolet Photometric	-

West Alton

AQS Site Number 29-183-1002

General Elecric Store, Highway 94, West Alton, MO 63386

Latitude: 38.8725 **AQCR:** 070 Metropolitan St. Louis

Longitude: -90.226389 **MSA:** 7040 St. Louis, MO-IL

Elevation (ft): 425

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Indoor Temperature	62107	SPM	1	☐	1	N/A	MET	017	deg C	013	Electronic Averaging	Other

Outdoor Temperature	62101	SPM	1	☐	1	N/A	MET	017	deg C	040	Electronic Averaging	Other
Ozone	44201	SLAMS	1	☐	1	URB	COM	007	ppm	047	Ultraviolet Photometric	Max Ozone Concentration & Population Exposure
Ozone	44201	SLAMS	2	☑	1	URB	BACK-UP	007	ppm	047	Ultraviolet Photometric	-
Relative Humidity	62201	SPM	1	☐	1	N/A	MET	019	%humidity	020	Instrumental-Computed (Indirect)	Other
Solar Radiation	63301	SPM	1	☐	1	N/A	MET	079	W/m^2	011	Instrumental-Pyranometer	Other
Wind Direction - Resultant	61104	SPM	1	☐	1	N/A	MET	014	deg	067	Instrumental: RM Young Model 05103	Other (10m Tower)
Wind Speed - Resultant	61103	SPM	1	☐	1	N/A	MET	012	mph	067	Instrumental: RM Young Model 05103	Other (10m Tower)

Noranda Aluminum, Inc. (PQAO - 0771)

Noranda Site #1

AQS Site Number 29-143-9001

Northeast of the facility

Latitude:	36.51364	**AQCR:**	138	SE Missouri
Longitude:	-89.56093	**MSA:**	0000	Not in a MSA
Elevation (ft):	297			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	000	To be determined	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	000	To be determined	Source Oriented

Noranda Site #2

AQS Site Number 29-143-9002

Southeast of the facility

Latitude:	36.50838	**AQCR:**	138	SE Missouri
Longitude:	-89.56074	**MSA:**	0000	Not in a MSA
Elevation (ft):	296			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	000	To be determined	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	000	To be determined	Source Oriented

Noranda Site #3

AQS Site Number 29-143-9003

Southwest of the facility

Latitude:	36.50899	**AQCR:**	138	SE Missouri
Longitude:	-89.57099	**MSA:**	0000	Not in a MSA
Elevation (ft):	298			

Pollutant	AQS Code	AQS Monitor Type	AQS POC	Keep/ Back-Up	AQS Freq	AQS Scale	State-Obj	AQS Unit-Code	AQS Unit	AQS Method Code	AQS Method	AQS Monitor Objective
Sulfur Dioxide	42401	Industrial	1	☐	1	MID	COM	008	ppb	000	To be determined	Source Oriented
Sulfur Dioxide Max 5-min Avg	42406	Industrial	1	☐	1	MID	COM	008	ppb	000	To be determined	Source Oriented

APPENDIX 2

Review of proposed SO_2 and meteorological monitoring stations around Ameren Missouri's Rush Island Energy Center

(Supplemental)

Supplemental Review
Rush Island Energy Center Project #2010-SO_2-3
Date: 05-13-2016

Review of proposed SO_2 and meteorological monitoring stations around Ameren Missouri's Rush Island Energy Center (Supplemental)

Purpose

The purpose of this supplemental is to provide additional evaluation of the SO_2 monitoring sites around Rush Island Energy Center through air dispersion modeling. In February 2016, the U.S. Environmental Protection Agency (EPA) released a revision to the technical assistance document entitled "*SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (February 2016)"* (TAD). The revision included an option for creating a relative prioritized list of receptor locations for consideration of monitoring sites using normalized design value (NDVs)[1] and frequency of having the 1-hour daily maximum concentration amongst the top-concentrated receptors. This supplement analysis is intended to update the modeling performed for the original report [2](i.e. the June 2015 report) to address EPA's revised guidance.

It should be noted that at the time that EPA released the revised guidance, two monitors had already been installed around the Rush Island Energy Center on the Missouri side. These monitors are currently considered operational.

Supplemental Analysis of Site Selection

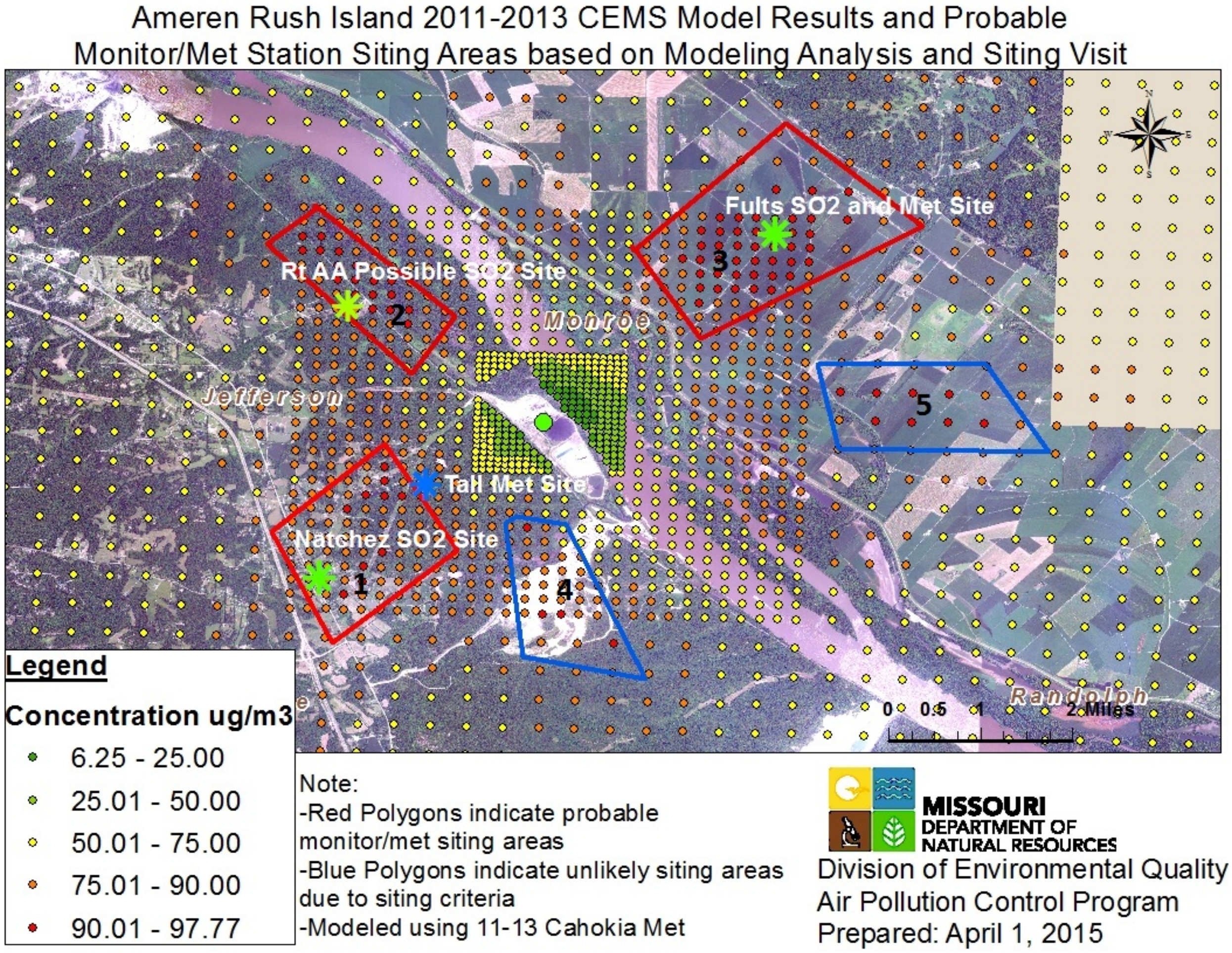
The June 2015 report used air dispersion modeling to determine the appropriateness of locations for possible monitor site locations. The parameters of the original modeling analysis were not changed with the exception of the model version. For this supplemental analysis, AERMOD version 15181 was used.

The modeling performed for the June 2015 report was based on the analysis of actual Continuous Emissions Monitoring System (CEMS) data for evaluating the monitoring sites in lieu of the normalized design value (NDV) method. Therefore the impacts are reported as actual modeled impact values. For reference, Figure 2 from the June 2015 report is duplicated here to show the areas of high concentration based on the 4th highest hourly SO_2 concentrations at each receptor (Figure S-1). This continues to be an appropriate method for evaluating possible monitoring sites. This method was only used for monitor siting and not for compliance determination.

---

[1] NDVs are calculated by modeling the normalized hourly SO_2 emissions.

[2] See Appendix 5 of Missouri Department of Natural Resources Air Pollution Control Program 2015 Monitoring Network Plan



Note:
-Red Polygons indicate probable monitor/met siting areas
-Blue Polygons indicate unlikely siting areas due to siting criteria
-Modeled using 11-13 Cahokia Met

Figure S-1 (Duplicated from June 2015 report Figure 2). High impact areas and probable SO_2/Meteorological (Met) station siting areas based on dispersion modeling

EPA details the NDV method as using a normalized emission rate for sources to result in an NDV at receptors. Details of the strategy for ranking the order of potentially siting permanent source-oriented SO_2 monitors can be found in EPA's Monitoring TAD[3].

Model results and discussion

The analysis presented in the original report prioritizes the locations for the installation of potential monitors based on the top density of high concentration receptors. However, based on the revised guidance, the site selection process also needs to account for the frequency with which a receptor registers a daily maximum concentration. In order to assess the frequency of occurrence of concentration maxima at a given receptor, an analysis was performed on the top

---

[3] US EPA document: SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (draft), pages A-7 and A-8, February 2016.

300 receptors. In AERMOD the MAXDAILY option was used to output the maximum 1-hour concentration for each receptor for each day. This output was used to rank the areas by the total number of days that an individual receptor had a 1-hour daily maximum concentration for the 36 modeled months as shown in Figure S-2. The larger diameter circles indicate a higher number of days that a receptor had the 1-hour daily maximum concentration. From most to least number of receptors, the areas are ranked as follows: 3>2>1>5.

The scoring strategy employed in the site selection process creates a relative prioritized list of receptor locations for monitor siting using NDV's and 1-hour daily maximum concentration frequencies. This strategy provides a list of receptor locations, ranked in general order of desirability with regard to potential siting of permanent source-oriented SO_2 monitors. Lower numerical scores indicate higher probability of capturing peak 1-hour SO_2 concentrations in the modeled domain as seen in Figure S-3. From lower to highest scores, the areas are ranked as follows: 3>2>1>5. For ease of comparing the number of receptors in each polygon, Table S-1 lists the data plotted in Figure S-3.

Table S-1. Number of ranked receptors in the five polygons

Polygon Identifier	**1**	**2**	**3**	**4**	**5**
# of receptors with score less than 175 (red)	3	4	16	Holcim property	5
# of receptors with 176 < score <246 (orange)	5	15	28		4
# of receptors with 247 < score <316 (yellow)	16	22	18		6
# of receptors with 317 < score <390 (light green)	22	7	8		1
# of receptors with 391 < score <519 (green)	4	2	5		6
Total number	50	50	75		22

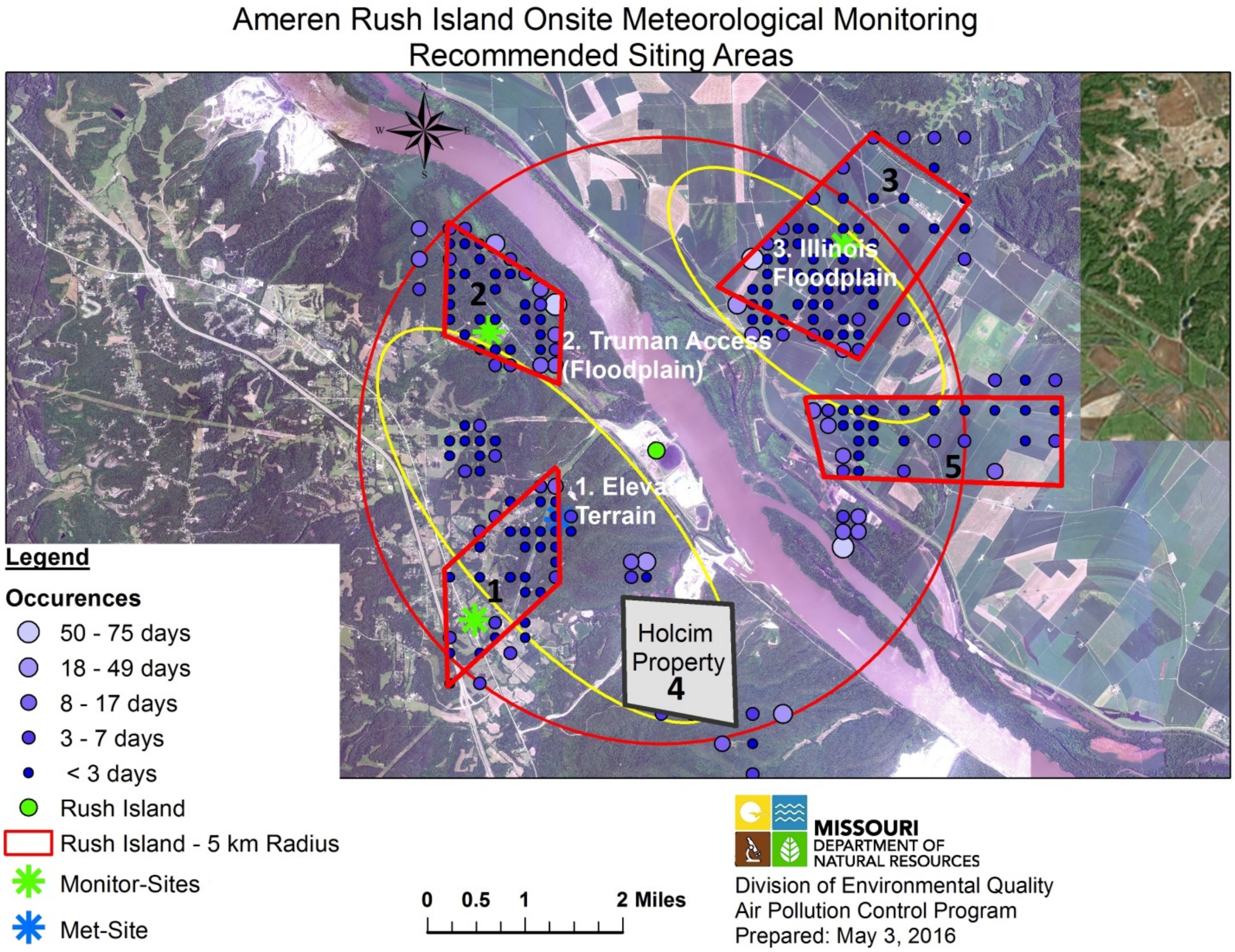


Figure S-2. Cumulative number of days that an individual receptor had the 1-hour daily maximum concentration among receptors.

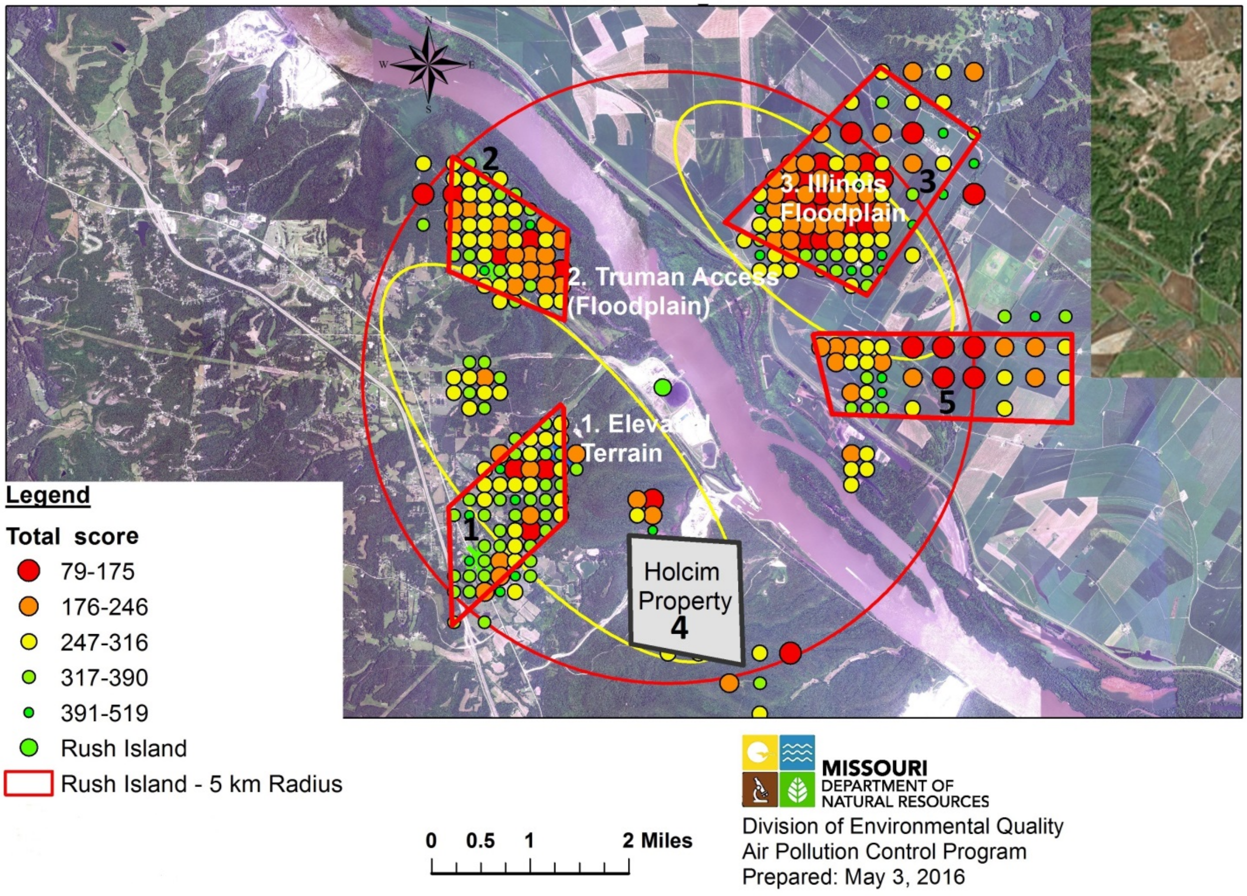


Figure S-3. Receptors ranked by relative score reflecting NDV and frequency of having the 1-hour daily maxima amongst all receptors. Lower numerical scores indicate higher probability of experiencing peak 1-hour SO2 concentrations in the modeled domain.

Conclusions

This supplemental analysis supports the conclusions from the June 2015 report. The locations for the proposed (installed) monitoring sites are reasonable and in agreement with the air program's analysis.

APPENDIX 3

Review of Proposed SO_2 Monitoring Stations around the Buick Resource Recycling Facility

Project #2010-SO_2-5-DRR
Doe Run Buick (093-0009)
Date: 05/18/2016

Review of Proposed SO_2 Monitoring Stations around the Buick Resource Recycling Facility

Introduction

The purpose of this review is to evaluate the proposed selection of SO_2 monitoring sites around the Doe Run Buick Resource Recycling Facility (BRRF) through air dispersion modeling. The intention is to determine if the proposed sites will adequately represent BRRF's SO_2 air quality impact. It should be noted that the evaluation of siting criteria under 40 CFR Part 51 is conducted separately through the Air Quality Analysis Section of the Air Pollution Control Program (Air Program).

To implement the 1-hour SO_2 National Ambient Air Quality Standard (NAAQS), the U.S. Environmental Protection Agency (EPA) finalized the SO_2 Data Requirements Rule (DRR) in August 2015. The DRR requires state air agencies to evaluate air quality around facilities that have emitted more than 2,000 tons of SO_2 through either dispersion modeling or new ambient air monitors installed by the facility. Using this information EPA intends to designate these areas as attaining or not attaining the 1-hour standard. The timetable for these designations is set by court order. In 2014 BRRF reported 1,649 tons of actual SO_2 emissions. BRRF's 2014 reported emissions are currently being reviewed for accuracy which may result in a change in BRRF's annual emissions. Due to the uncertainties surrounding BRRF's emissions data and the proximity of the reported emissions to the 2,000 ton threshold, the air program decided to include BRRF on the list of sources for further evaluation per the DRR. To comply with the DRR, BRRF is proposing to install at least two ambient monitors. The facility submitted a preliminary analysis of the proposed monitor locations to the Air Program on February 2, 2016[1]. New monitors must be operational no later than January 1, 2017.

BRRF is a secondary lead smelting/recycling plant operated by Doe Run near Boss, Missouri. BRRF is located in an area of relatively hilly terrain with mixed forest and grassy cover. BRRF recycles lead-acid batteries and other lead-bearing hazardous and non-hazardous wastes to recover the lead, trace metals, sulfuric acid and polyethylene plastic. The sulfuric acid is recycled and plastics are collected for shipment off-site for recycling.

Technical Analysis of Site selection

SO_2 Emission sources

BRRF has several small point sources and one main stack (P8- Main Stack). In MoEIS (Missouri Emission Inventory System), this emission release point is identified as EP8. The majority of SO_2 emission sources at the facility are vented to the main stack. Emissions are generated by

---

[1] BRRF submitted, on February 2, 2016, map of the SO_2 proposed monitoring sites entitled "SO_2 Monitor Siting-Prelim Model Results"

many types of equipment and processes, including but not limited to; smelting furnaces, and material handling and crushing. Emissions are characterized for modeling using their release parameters as stack, vent, or fugitive emissions. A table of all SO_2 emission sources is included in Attachment A

BRRF is required to collect hourly Continuous Emission Monitoring System (CEMS) data for the main stack, however this data has not been quality assured for the years 2013 – 2015 and was not used in this modeling analysis. The Air Program used modeling input data with normalized emission rates to inform the identification of potential source-oriented SO_2 monitoring sites.

It should be noted that BRRF's analysis used the facility data emissions rate as reported to MOEIS, not CEMs data, for the sources to establish monitoring locations. Because the air program used normalized emission rates, the concentration values between these two analyses are different.

There are no permitted SO_2 sources within 20 km of Buick; therefore no additional sources were included in the interactive inventory for this modeling analysis.

SO_2 Dispersion Modeling Program Selection

The location and number of ambient air quality monitors are dependent on several factors including topography and meteorology, which affect where areas of high concentration will be observed and how often those high concentrations will occur. Air dispersion modeling was used to account for these factors and determine the appropriateness of locations for possible monitor site locations.

AERMOD is EPA's preferred air dispersion model. The most recent version of AERMOD and its preprocessors were used in this analysis, as of March 2016. AERMOD can be used to evaluate time-dependent impacts of SO_2 emissions from stack driven point sources or fugitive releases.

Both the air program and BRRF based their analysis and evaluation of proposed monitoring sites on the SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document from EPA (February 2016 Draft) which describes the procedures for siting source oriented monitors.

Meteorological Data and Geographic influence

The choice of meteorological data used for dispersion modeling is described in the February 25, 2016 staff memorandum[2]. EPA guidance is followed to choose the most representative dataset to

---

[2] Memorandum from staff meteorologist in Air Program to file entitled "Recommendation for representative meteorological data set for Doe Run Buick" dated (February 25,2016)

characterize weather data at Buick. Understanding the influence of meteorology on an SO_2 source is critical. Meteorological inputs to the dispersion modeling influence how SO_2 emissions are dispersed and affects the location(s) of maximum ground-level concentrations. An Air Program staff meteorologist evaluated the terrain surrounding the BRRF plant and meteorological data from nearby National Weather Service (NWS) stations.

Representative Meteorological Data (dispersion modeling)

Both surface and upper air meteorological datasets are used in the modeling exercise. Surface data was chosen based on the availability of on-site data.

BRRF collects surface meteorological data as part of post-construction monitoring required by permit 012005-008, special condition 31, issued January 26, 2005, and continued through the 2013 Consent Judgment section V.9.C. The meteorological data is collected at the "Buick South" location, which is approximately 1,000 meters from the southern property line of the facility, and collocated with a lead sampler for ambient air. Figure 1 shows a wind rose plot of Buick Onsite Meteorological Data for the 4th Quarter 2013 through 1st Quarter 2015 time period. For upper air data, the Springfield, MO upper air station is closest to Buick at 205 km and best represents the vertical atmospheric characteristics of the region surrounding Buick.

Air Dispersion Modeling Results

The AERMOD model (version 15181) was executed using the onsite meteorological dataset for the period of 4th quarter 2013 through 1st quarter of 2015. The analysis shown in Figure 2 prioritizes the locations that should be evaluated to potentially establish a site monitor. In this evaluation, the primary objective is to find a sufficient number of feasible locations with predicted peak and/or relatively high SO_2 concentrations where a permanent monitoring site might be located.

In the Air Program modeling input file, all SO_2 point and volume sources, as identified in MOEIS, were represented in the modeling analysis using a relative percentage of hourly SO_2 emission rates to establish monitoring locations. The resulting modeled concentrations are called normalized design values (NDVs). NDVs do not indicate exceedance or compliance with the NAAQS, but provide a means to understanding the relative magnitude of ambient SO_2 concentrations across an area. The resulting 4th highest hourly SO_2 concentrations at each receptor were plotted to determine the areas of high concentration as shown in Figure 2. The results indicate several areas of frequently higher concentrations about 0.5 to 2 miles away from the facility center. These areas are outlined and numbered from 1 to 2 as depicted in Figure 2. These outlines were established to include all receptors with modeled concentrations in the top 10, 25,100, and 200 as shown in Figure 3; respectively. Within these outlines, we can rank the areas in order by the magnitude of the number of receptors with high concentration values. From areas of highest to lowest concentrations, the areas are ranked as follows: 1>2.

The site selection process also accounts for the frequency with which a receptor registers a daily maximum concentration. In order to assess the frequency of occurrence of concentration maxima at a given receptor, an analysis was performed on the top 200 receptors. In AERMOD the MAXDAILY option was used to output the maximum 1-hour concentration for each receptor for each day. This output was used to rank the areas by the total number of days that an individual receptor had a 1-hour daily maximum concentration for the 18 modeled months as shown in Figure 4. Darker colors indicate a higher number of days that a receptor had the 1-hour daily maximum concentration. From most to least number of receptors, the areas are ranked as follows: 1>2.

The scoring strategy employed in the site selection process creates a relative prioritized list of receptor locations for monitor siting using NDV's and 1-hour daily maximum concentration frequencies. This strategy will provide a list of receptor locations, ranked in general order of desirability with regard to potential siting of permanent source-oriented SO_2 monitors. Lower numerical scores indicate higher probability of capturing peak 1-hour SO_2 concentrations in the modeled domain as seen in Figure 5. From lower to highest scores, the areas are ranked as follows: 1>2.

Based on the location of available areas, 1and 2 are the two areas with the highest density of receptors with maximum daily concentrations and frequent highest 1-hour concentrations. These areas are ranked in order of highest to lowest. It should be noted that the modeling results in the area northeast of the main stack shows high NDV 1-hour concentrations and higher cumulative number of days. This can be attributed to the difference between smaller fugitive sources and higher point sources like main stack. The Air Program will consider the existing northeast state SO_2 monitoring site as a good candidate to monitor SO_2 for the specified area.

Based on the modeling results and the best available meteorological data, monitors placed in these two areas, marked 1, and 2 are expected to record the highest SO_2 air quality impacts from BRRF. In addition, the state SO_2 monitor will continue to be maintained to capture SO_2 impacts expected to be seen in this relatively high impact area.

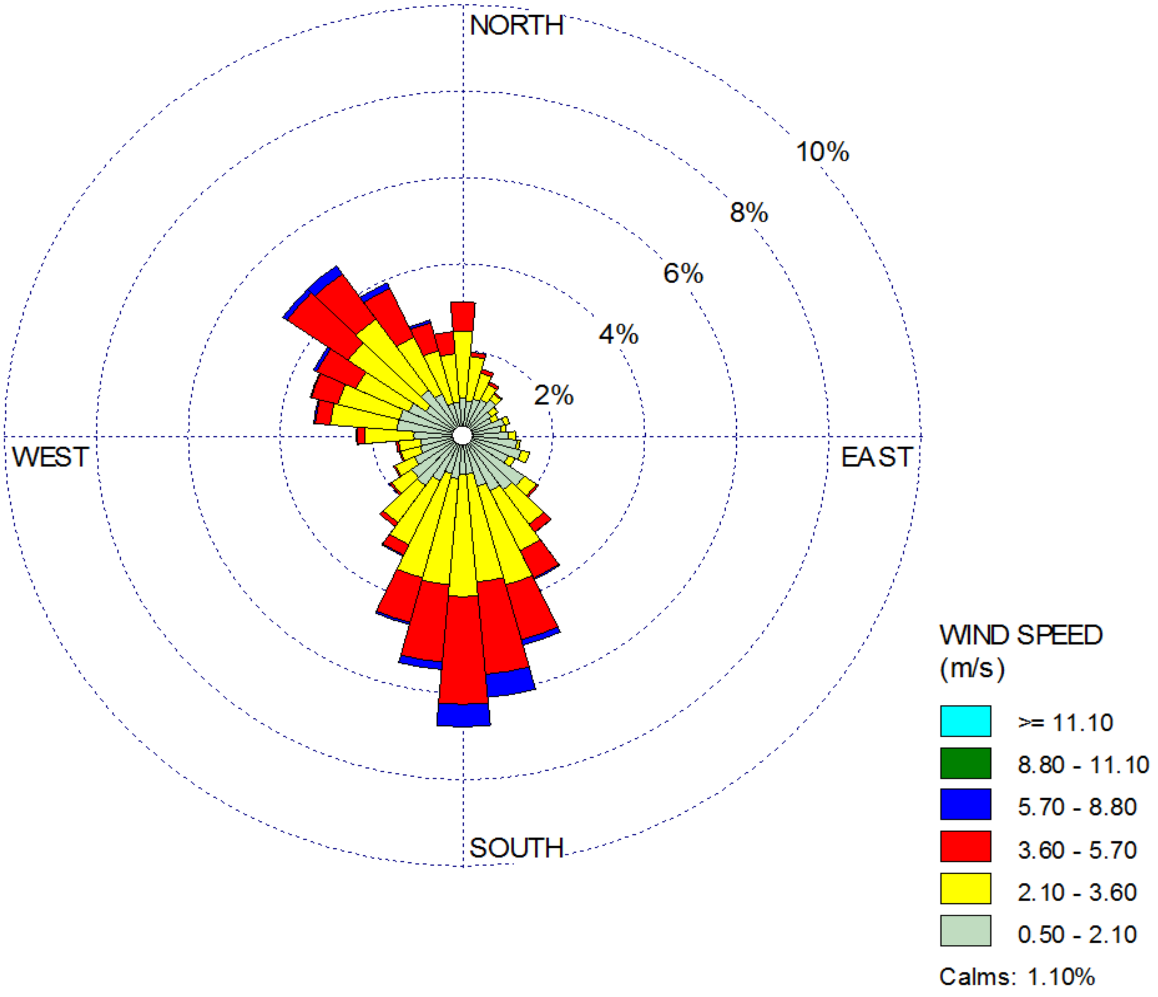


Figure 1. Wind rose plot of Buick Onsite Met Data 4th Quarter 2013- 1st Quarter 2015

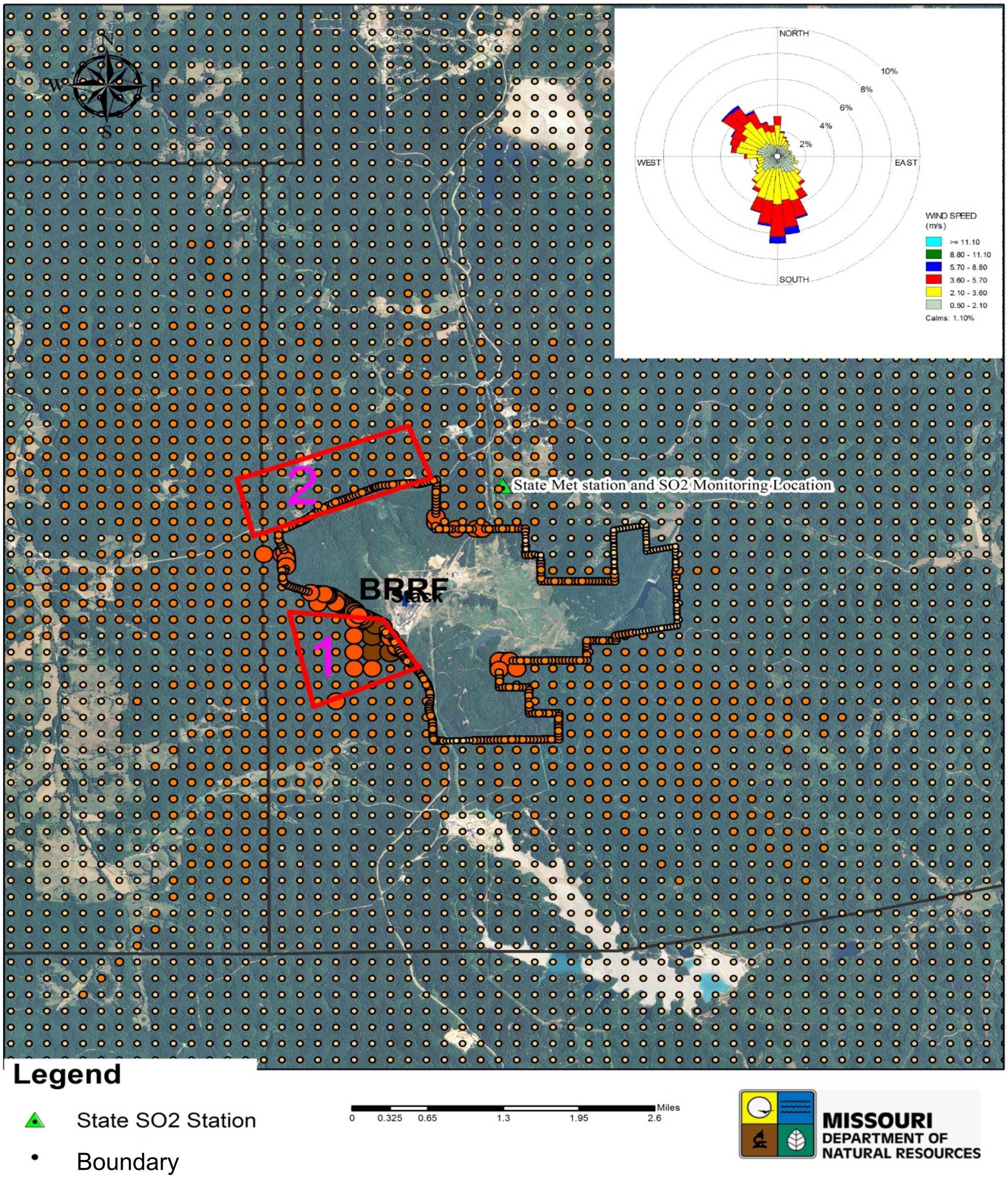


Figure 2. Normalized design values. NDV for each modeled receptor. The darker colors indicate relatively higher NDVs. 20 km Receptor Grid with Property Boundary as provided by facility.

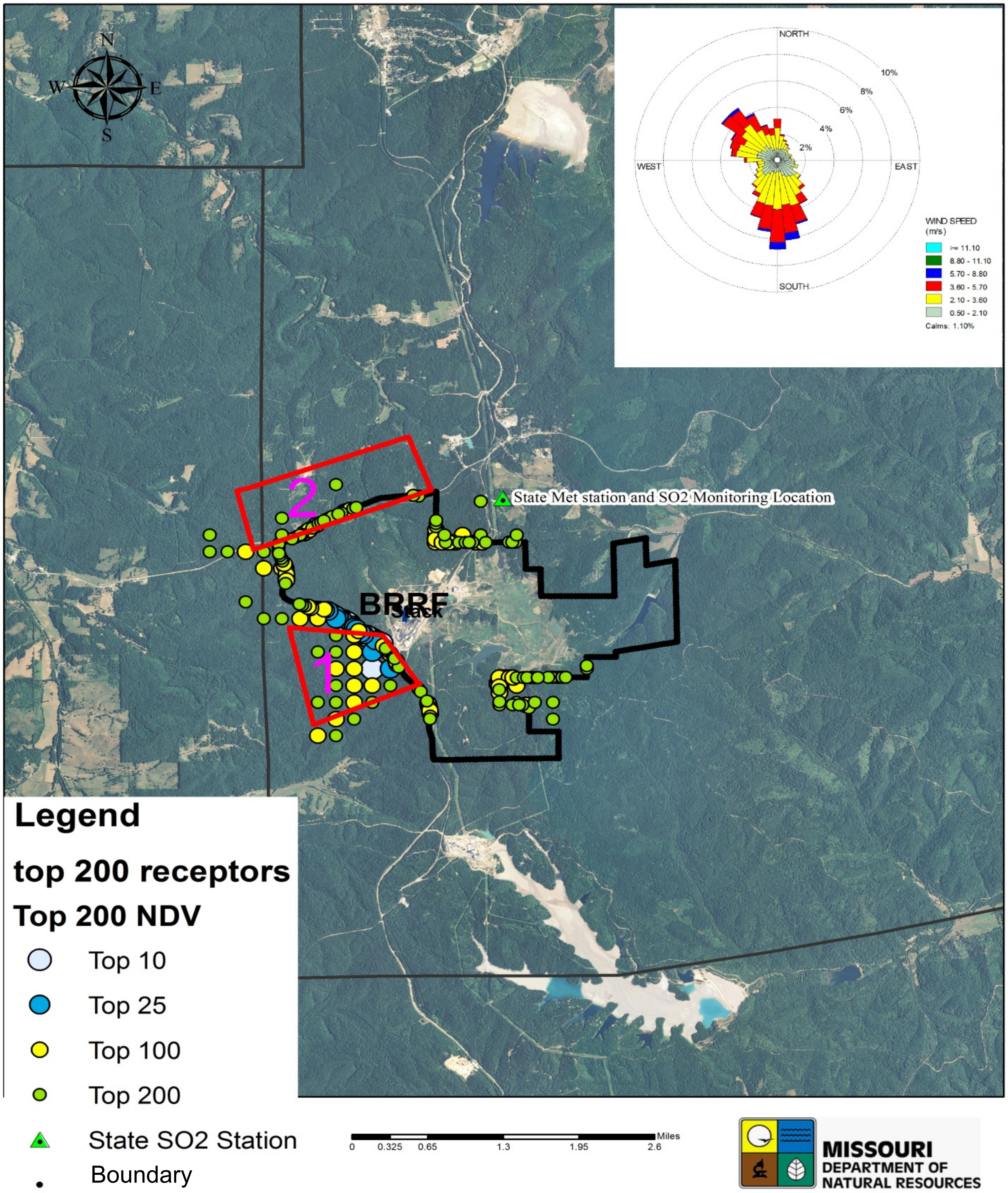
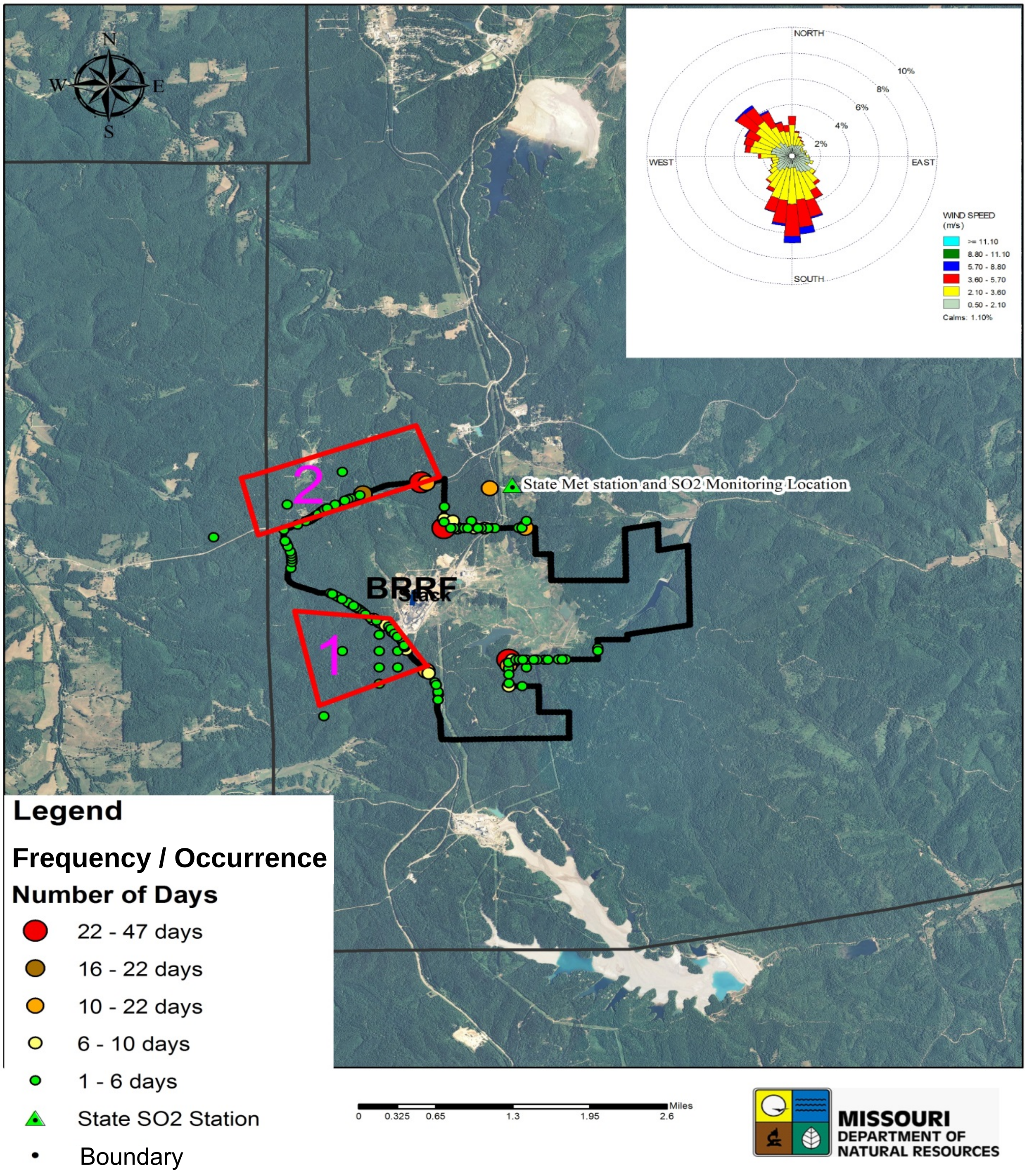


Figure 3. Maximum concentration locations of Top 10, 25, 100 and 200 normalized design values (NDV).



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Figure 4. Cumulative number of days that an individual receptor had the 1-hour daily maximum concentration among all receptors. Darker colors indicate an increasing number of days that a receptor had the 1-hour daily maximum concentration.

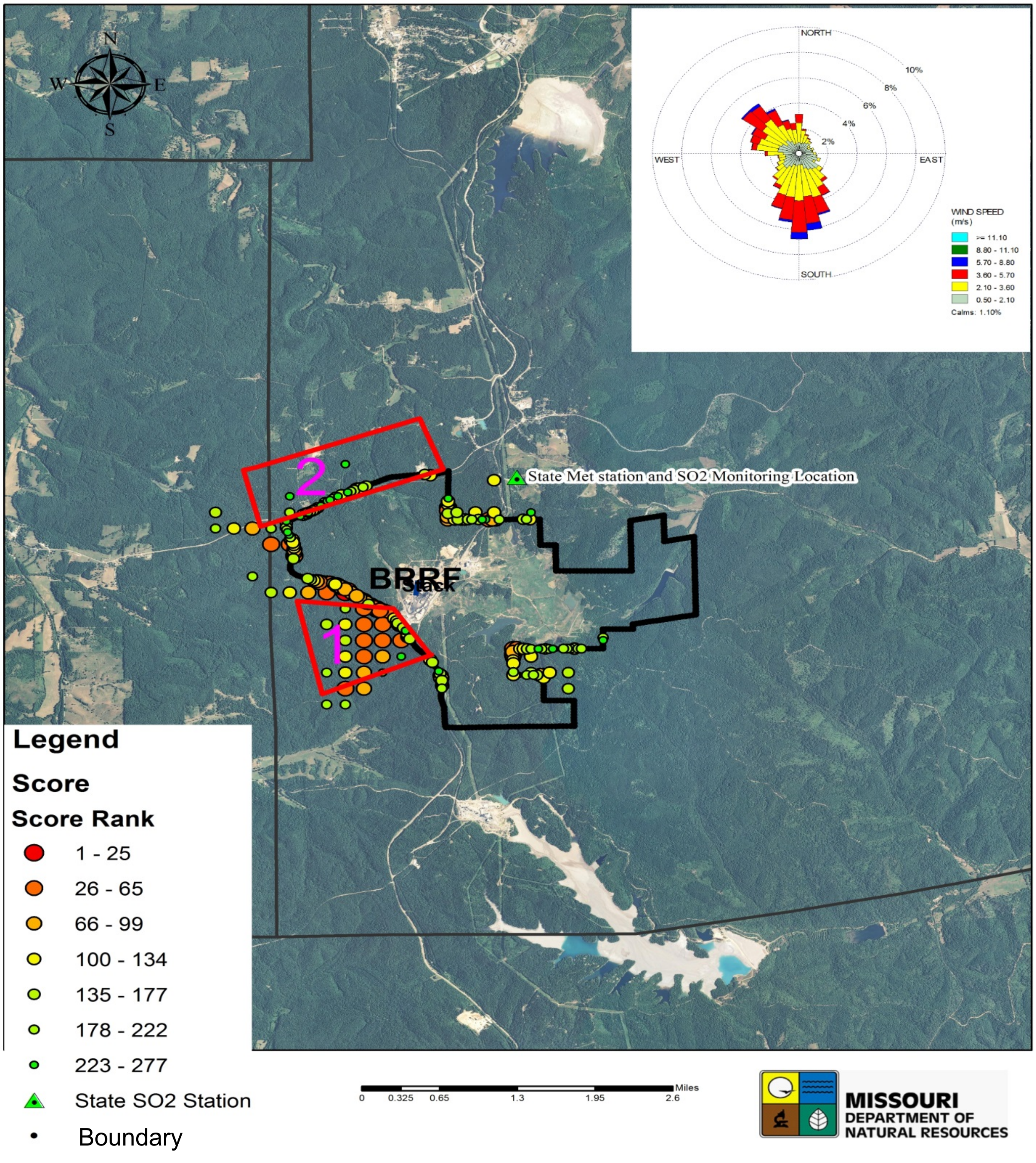


Figure 5. Receptors ranked by relative score reflecting NDV and frequency of having the 1-hour daily maxima amongst all receptors. Lower numerical scores indicate higher probability of experiencing peak 1-hour SO_2 concentrations in the modeled domain.

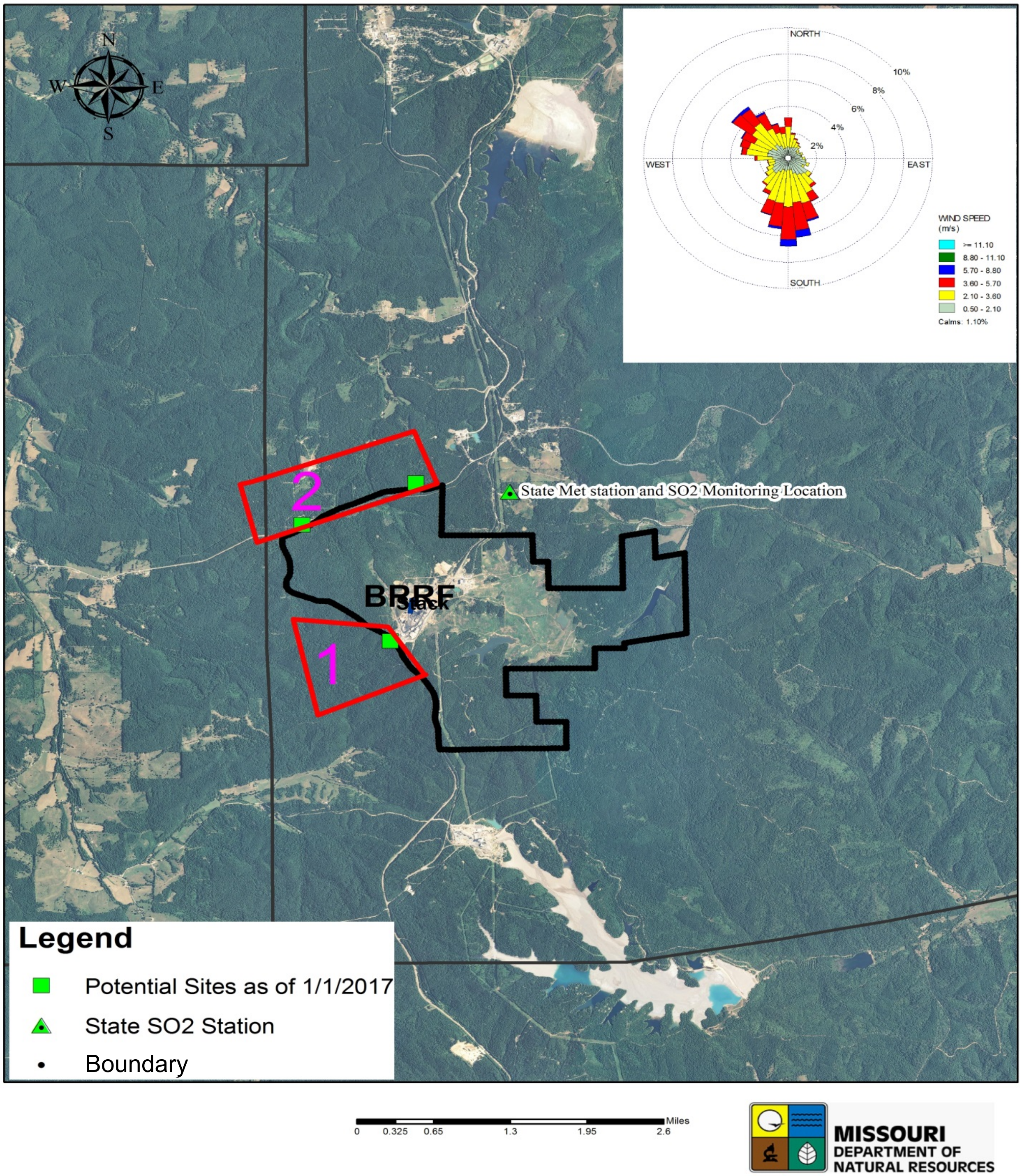


Figure 6. Probable SO_2 siting areas (1 and 2) and three potential SO_2 monitoring sites near the Doe Run BRRF based on dispersion modeling and siting visit.

Buick's proposed site selection

During a site visit to BRRF, three potential sulfur dioxide monitoring sites near the Doe Run BRRF were identified as shown in area 1 and 2. Based on the modeling results and availability of locations, BRRF proposed two ambient air SO_2 monitoring sites. The proposed SO_2 sites are shown in Figure 6. One proposed monitor is directly across from the facility's entrance off Hwy KK on Doe Run property (area 1). Additional monitors are proposed to be located near the northern and/or northwest ambient border, which is also on Doe Run property (area 2).
Doe Run BRRF's analysis used the onsite meteorological data from 2014-2015 and emission rates for all sources as reported in MOEIS.

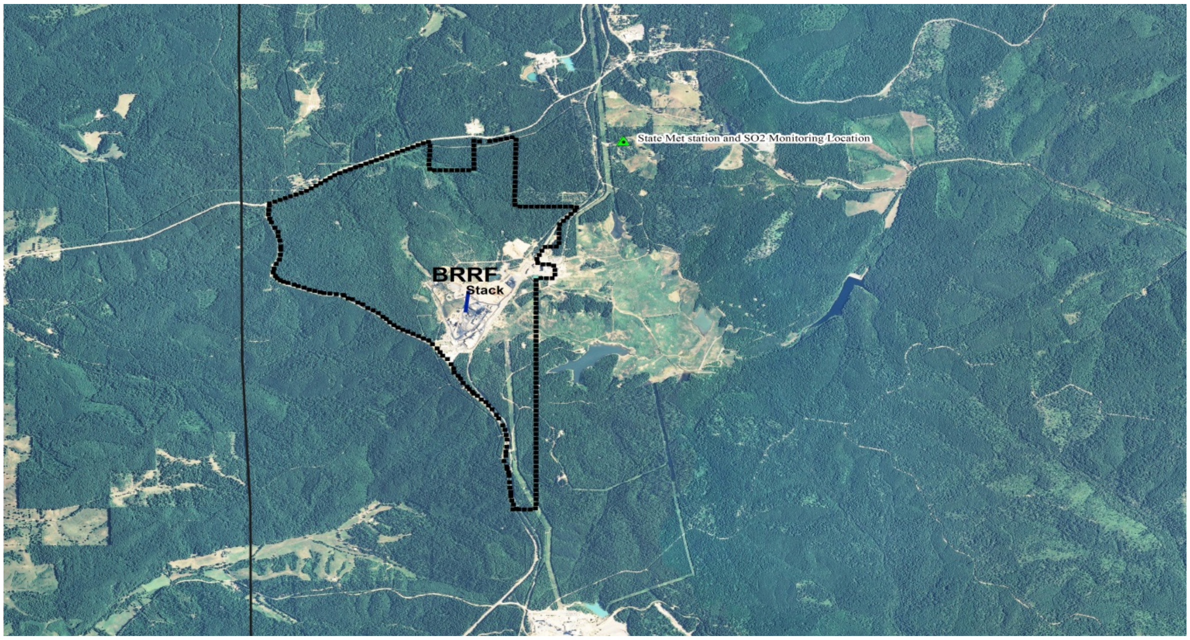
Buick's Updated Property Boundary

On April 25, 2016, BRRF updated their ambient boundary around their facility. Figure 7 shows the previous boundary and the updated boundary. According to BRRF, the updated boundary will be fenced by January 1, 2017 at which point it will no longer be considered ambient air. The analysis included in this report is based on the updated boundary. However, an evaluation using the previous boundary is included for reference in the event the ambient boundary remains unchanged. The modeling analysis and parameters are the same as discussed in this report with the only differences being the ambient boundaries. The results are illustrated in Figures 8 and 9.

Conclusions

From the analysis and evaluation of the updated boundary discussed above, areas 1 and 2 in Figure 6 will provide the greatest opportunity to monitor the highest concentrations of SO_2 emitted by the Doe Run BRRF. The SO_2 monitoring sites proposed by BRRF (area 1and area 2) are within these areas predicted to have the highest and most frequent modeled impacts. Based on the evaluation described in this document, the sites proposed by BRRF are reasonable and are in agreement with the APCP's analysis.

Previous BRRF boundary



Updated BRRF boundary as of 1/1/2017

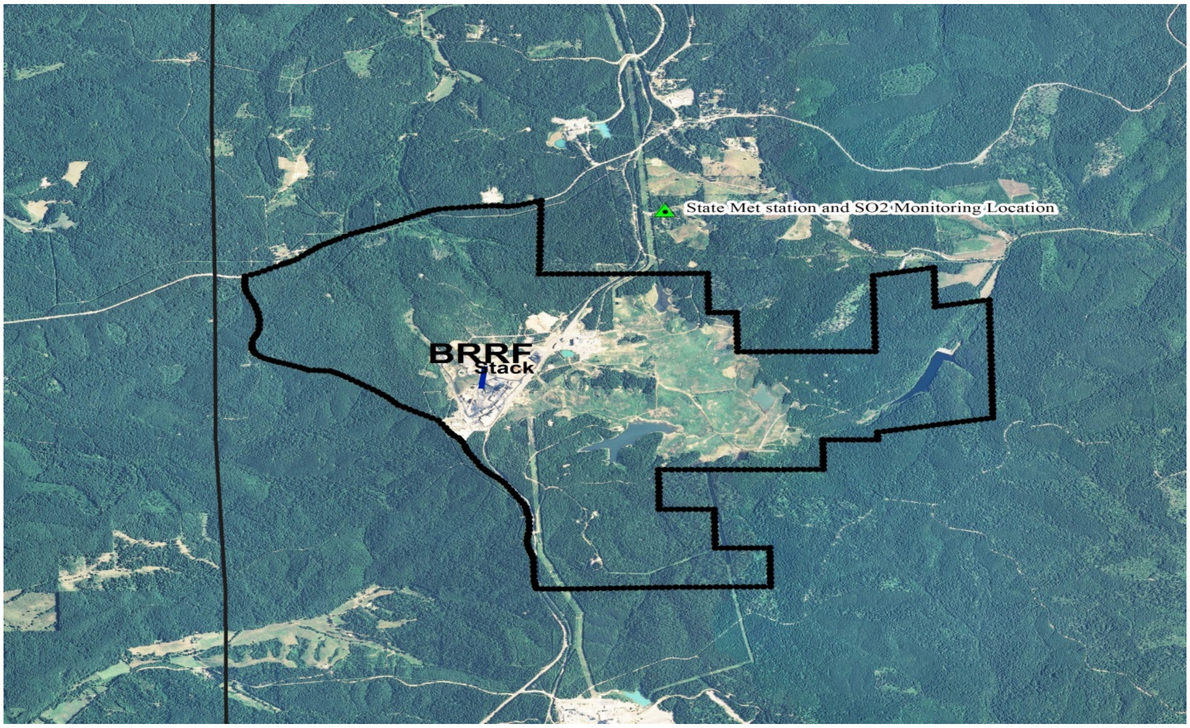


Figure 7. Comparison of BRRF boundaries

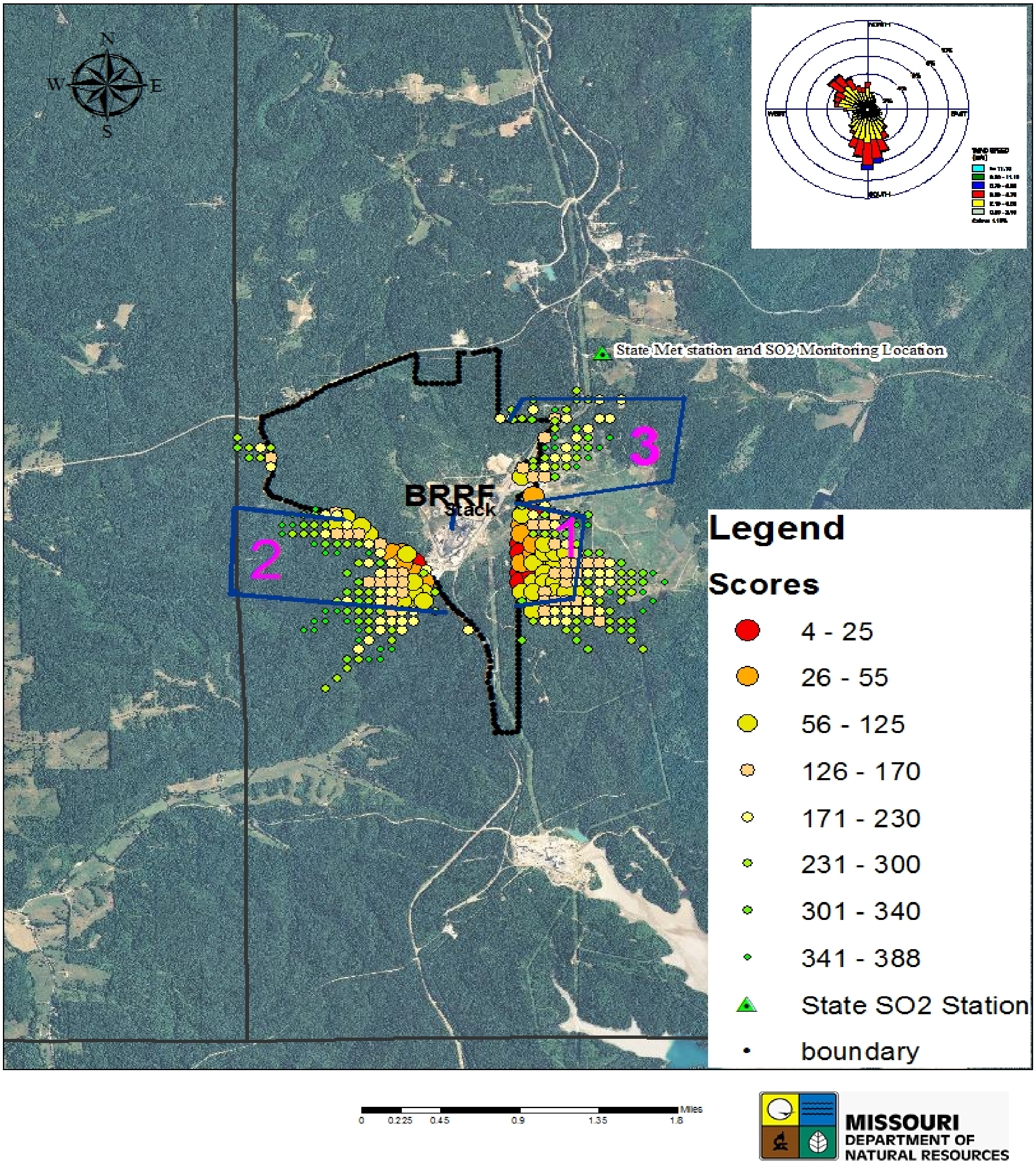


Figure 8. Based on the previous BRRF boundary, receptors ranked by relative score reflecting NDV and frequency of having the 1-hour daily maxima amongst all receptors. Lower numerical

scores indicate higher probability of experiencing peak 1-hour SO2 concentrations in the modeled domain.

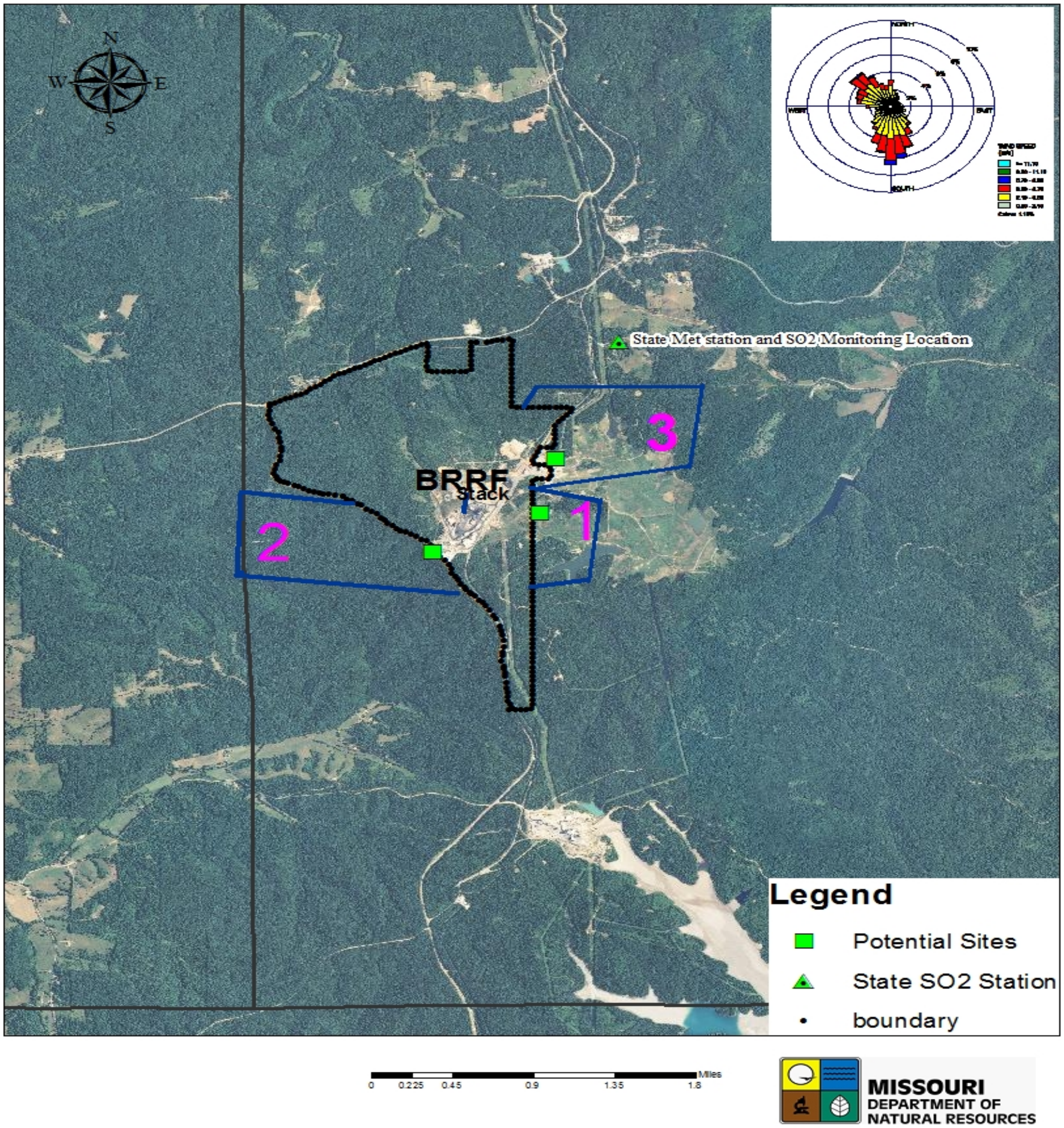


Figure 9. Probable SO$_2$ siting areas (1, 2, and 3) and three potential SO$_2$ monitoring sites near the Doe Run BRRF based on dispersion modeling , siting visit and the previous BRRF boundary .

Attachment A

Table with BRRF Emission Source parameters

Source ID	**Easting (UTM-m)**	**Northing (UTM-m)**	**Elevation (m-asl)**	**Stack Height (m)**	**Stack Temperature (K)**	**Stack Gas Exit Velocity (m/s)**	**Stack Diameter (m)**
EP8-POINT	664808	4167094	423.8	60.96	322.79	15.83	5.03
EP71 -POINT	664952	4167055	427.67	24.38	318.89	22.86	1.37
EP22-POINT	664960	4167092	427.41	30.78	561.11	3.87	0.76
EP23-POINT	664964	4167090	427.39	30.78	561.11	5.8	0.76
EP24-POINT	664971	4167085	427.42	30.78	561.11	4.94	0.76
EP25-POINT	664974	4167083	427.45	30.78	561.11	4.94	0.76
EP26-POINT	664979	4167080	427.51	30.78	561.11	4.94	0.76
EP27-POINT	664983	4167078	427.56	30.78	561.11	3.87	0.76
EP28-POINT	664987	4167074	427.74	30.78	561.11	3.61	0.76
EP33-POINT	664655.1	4166694	433	5.49	338.89	0.51	0.1
EP34-POINT	664818.7	4166815	426	10.67	338.89	0.51	0.1
EP21-POINT	664860.7	4166790	428.4	24.38	421.89	2.03	0.91
EP10-VOLUME	664896	4167042	427	2.9	0.85	1.35	

APPENDIX 4

Review of Proposed SO_2 and Meteorological Monitoring Stations around the Noranda New Madrid Plant

Project #2010-SO_2-5-DRR
Noranda Aluminum New Madrid Plant (143-0008)
Date: 5-13-2016

Review of Proposed SO_2 and Meteorological Monitoring Stations around the Noranda New Madrid Plant

Introduction

The purpose of this review is to evaluate the proposed selection of sulfur dioxide (SO_2) and meteorological monitoring sites around the Noranda Aluminum New Madrid plant (Noranda) through air dispersion modeling. The intention is to determine if the proposed sites will adequately represent 1) Noranda's SO_2 air quality impact and 2) the meteorological conditions surrounding Noranda. It should be noted that the evaluation of siting criteria under 40 CFR Part 51 is conducted separately through the Air Quality Analysis Section of the Air Pollution Control Program (air program).

To implement the 1-hour SO_2 National Ambient Air Quality Standard (NAAQS), the U.S. Environmental Protection Agency (EPA) finalized the SO_2 Data Requirements Rule (DRR) in August 2015. The DRR requires state air agencies to evaluate air quality around facilities that have emitted more than 2,000 tons of SO_2 through either dispersion modeling or new ambient air monitors installed by the facility. Using this information EPA intends to designate these areas as attaining or not attaining the 1-hour standard. The timetable for these designations is set by court order. Noranda emitted 5,323 tons SO_2 in 2014 and is therefore subject to the DRR. Noranda has elected to install new ambient air quality monitors in order to characterize the air quality surrounding their facility. New monitors must be operational no later than January 1, 2017.

Noranda is a facility that produces primary aluminum from raw alumina in aluminum smelting vessels. In order to extract aluminum from alumina, the raw material must be processed through an electrolytic reduction process, called the Hall-Heroult process. Thus, these smelters are also termed reduction cells or pots. In this process, baked carbon blocks, serving as anodes, are placed below the surface of the electrolyte in the pots, and the carbon lined shell, the cathode, contains molten cryolite that is used to dissolve oxides. Electricity is consumed in the extraction process and electric current is applied to the anode blocks (attached by metal rods) to pass through the extremely corrosive molten electrolytic bath. The oxygen from aluminum oxides reacts with carbon anodes to produce carbon dioxide that is subsequently released into the atmosphere. Each anode has a limited lifespan because the carbon anode will always be consumed during the aluminum extracting process. The anodes used by Noranda are produced from petroleum coke. Noranda maintains a carbon anode formation operation that is comprised of three carbon bake furnaces for calcination of the carbon anodes.

SO_2 Emission Sources

Throughout the production process, there are two primary SO_2 emission sources: the potlines and the carbon bake furnaces. SO_2 is generated in both sources through the oxidation of sulfur existing in raw materials. The materials include fresh coke and pitch containing sulfur, and alumina that may also contain sulfur. Permit #082010-003A limits Noranda's facility-wide SO_2 emissions to 6,077 tons in any consecutive 12 month period.

Noranda operates three potlines and each potline spans two identical rooms. There is a hood over each pot in each of the rooms to capture SO_2 exhaust from the pots. There is also some SO_2 that is not captured by the hood, which will release to the atmosphere through the roof vents of each potline building. Exhaust gas from potlines 1 and 2 is collected together from separate ducts and fed into a common stack, EP61, which emits to the ambient environment. However, the collection of exhaust gas from rooms E and F in potline 3 is divided into east and west manifolds. The stacks for the two manifolds are EP62 and EP63, respectively. According to the Missouri Emission Inventory System (MoEIS), EP61 emitted 2,705 tons of SO_2 and EP 62 and 63 each emitted 795.9 tons SO_2 in 2014. Although the individual emissions of potline 1 and 2 are unknown, some assumptions can be made to draw a conclusion. Assuming even distribution of emissions from potline 1 and 2, they would emit 1,352.5 tons of SO_2 each. Potline 3 emits a total of 1,591.8 tons of SO_2, which shows potline 3 contributes close to 18% more than the other two potlines to total SO_2 emissions. Since potline 3 is the largest emitter of all three potlines, it warrants extra consideration when choosing potential monitoring sites.

The potline roof vent SO_2 exhaust must also be considered for all three potlines. According to MoEIS, the roof vents of Potline 1 emitted 55.31 tons in 2014, and the roof vents of potline 2 and 3 emitted 52.41 tons and 63.39 tons, respectively. In MoEIS, these emission releases are identified as EP 59, EP 60, and EP 64 for potlines 1, 2, and 3, respectively. However, these emissions are currently difficult to measure quantitatively and are only estimated by mass balance of sulfur.

The carbon bake furnace exhaust is the other main source of SO_2 emissions, and Noranda operates three carbon bake furnaces. Each furnace has a dry scrubber system before SO_2 containing exhaust is released into the ambient atmosphere. However, the dry scrubber systems are not for SO_2 control. The exhaust stack ID's of EP98, EP99, EPAA are assigned to bake furnace system 1, 2, and 3, respectively. All three have the same reported emissions in 2014 of 284.99 tons.

A table of Noranda's emissions sources is included in Attachment A.

Technical Analysis of Site Selection

Noranda is located in New Madrid County in southeastern Missouri. There is an interactive SO_2 source nearby Noranda, which is Associated Electric Cooperative, Inc. (AECI) New Madrid power plant (143-0001). These two facilities share a property boundary, as shown in Figure 1. The AECI New Madrid power plant is required to operate a Continuous Emissions Monitoring System (CEMS) to record hourly emissions information which was utilized in this model analysis.

Noranda's supplied modeling performed as part of their 2008 Prevention of Significant Deterioration (PSD) permit application was used to support their proposed monitoring sites for the purposes of compliance with the DRR. The air program duplicated this modeling as discussed later in the report and included the AECI New Madrid power plant as a nearby interactive source. The AECI New Madrid power plant's emissions information is also included in Attachment A.

SO_2 Dispersion Modeling Program Selection

The location and number of ambient air quality monitors are dependent on several factors including topography and meteorology, which affect where areas of high concentration will be observed and how often those high concentrations will occur. Air dispersion modeling was used to account for these factors and determine the appropriateness of locations for possible monitor site locations.

AERMOD is EPA's preferred air dispersion model. The most recent version of AERMOD and its preprocessors were used in this analysis, as of May 2016 (version 15181). AERMOD can be used to evaluate time-dependent impacts of SO_2 emissions from stack driven point sources or fugitive releases. Thus, SO_2 exhaust from the potline stacks and carbon bake furnace stacks were modeled by AERMOD. However, Noranda, as an aluminum reduction facility, also has SO_2 exhaust from the roof vents of the potline houses. In accordance with 40 CFR Part 51 Appendix W, these roof vent exhausts were included in separate line sources using the Buoyant Line and Point (BLP) model. This complex and detailed modeling was performed as part of Noranda's 2008 PSD permit application, and since there have been no operational changes since that time; no changes to the modeling analysis were evaluated for this purpose. Since the AERMOD modeling analysis already results in high concentrations near the fenceline, the BLP impacts were not included in this evaluation. The BLP outputs would only fortify the high concentrations found near the fenceline as they have no exit velocity associated with their release.

The air program referenced the modeling guidelines laid out in EPA's SO_2 Source Oriented Monitoring Technical Assistance Document (TAD), draft February 2016[1]. The monitoring TAD describes receptor grid spacing used to site monitoring stations and this analysis follows those guidelines. Receptors were placed every 250 meters (m) from the facility center out to 10 kilometers (km) and every 500 m out to 20 km to form a tiered 40 km X 40 km grid, centered on the facility. No receptors were removed from the grid, i.e. on facility property or in bodies of water.

---

[1] EPA's SO_2 Source Oriented Monitoring Technical Assistance Document (TAD), draft February 2016. https://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2MonitoringTAD.pdf

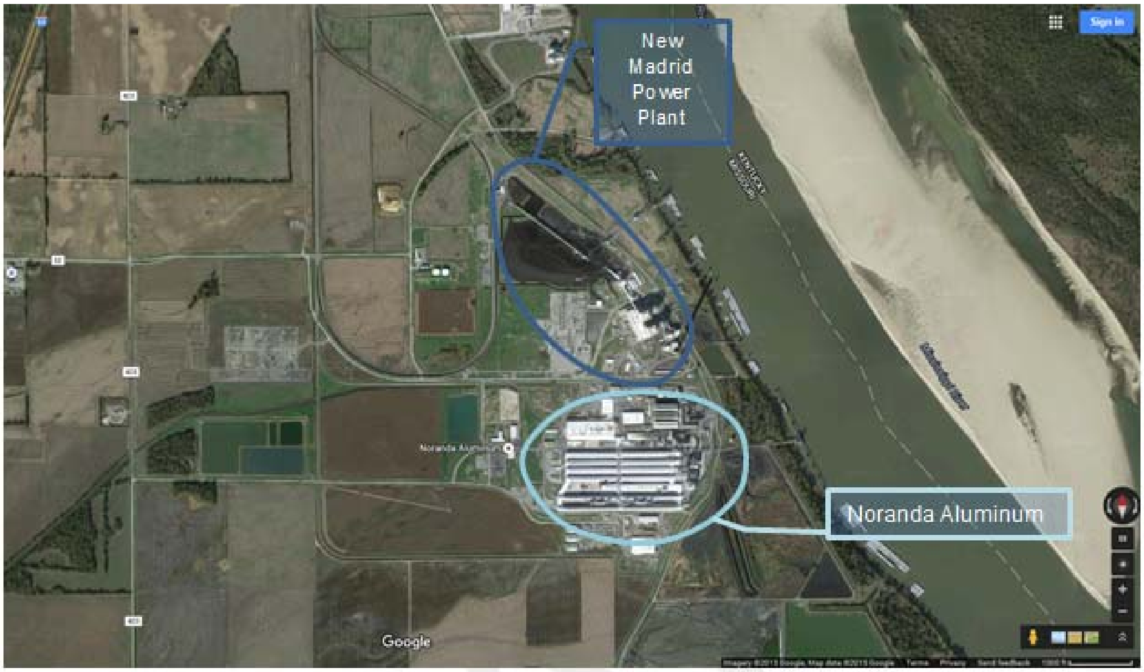


Figure 1. Satellite Image of Noranda and New Madrid Facilities

Meteorological Data and Geographic Influence

Understanding the influence of meteorology on an SO_2 source is critical. Meteorological inputs to the dispersion modeling influence how SO_2 emissions are dispersed and affects the location(s) of maximum ground-level concentrations. An air program staff meteorologist evaluated the terrain surrounding the Noranda New Madrid plant and meteorological data from nearby National Weather Service (NWS) stations and made recommendations on: 1) the meteorological data sets to be used in air dispersion modeling, and 2) the location of a meteorological monitoring site for the collection of data that accurately depicts meteorological conditions around Noranda.

Representative Meteorological Data (Used for Dispersion Modeling)

Noranda previously collected minimal onsite meteorological data. However, this on-site tower was only sited for preconstruction monitoring. This tower did not collect enough data parameters and was not sited properly for use in dispersion modeling exercises. As a result, representative NWS data was chosen for the dispersion modeling exercise since suitable on-site meteorological data is not currently available for Noranda. Analysis of land use and surface characteristics was performed to determine the most representative meteorological stations for the area. In addition, the wind rose plots from Noranda's historical on-site tower and Cape Girardeau Regional Airport were compared for similarities in wind patterns. Cape Girardeau's wind rose is shown in Figure 2 for reference. Surface elevation meteorological data from the Cape Girardeau, MO (KCGI) and upper air meteorological data from Springfield, MO (KSGF) were chosen as the most representative datasets for Noranda[2]. The most recent full three years of available meteorological data was used in the analysis, 2012-2014. The same period of available hourly varying emissions data was used for the AECI New Madrid power plant.

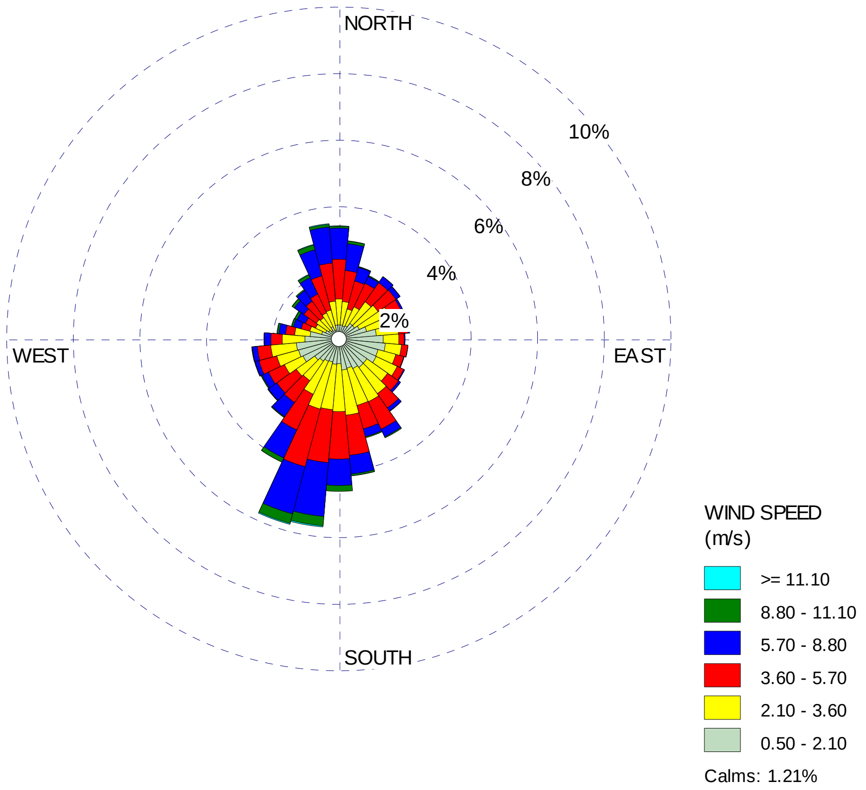


Figure 2. Wind Rose Plot for Cape Girardeau Regional Airport Surface Station Data (2012-2014)

Potential Meteorological Tower Locations (Possible Monitor Placement)

Although not required under the DRR, a meteorological monitoring station provides invaluable data that can potentially be used for many modeling purposes in the future, such as a model performance evaluation. An air program staff meteorologist prepared a full recommendation[3], summarized here, for Noranda if they decide to install a full suite of meteorological monitoring instruments suitable for modeling purposes. For a 10 meter meteorological tower, the recommended data fields, equipment, quality assurance and completeness are summarized in EPA's Quality Assurance Handbook for Air Pollutant Measurement Systems, Volume IV: Meteorological Measurements Version 2.0 (Final) March 2008, found

---

[2] Memorandum from staff meteorologist in APCP to file entitled "Recommendation for representative meteorological data set for New Madrid Power Station and Noranda Aluminum" (dated October 14, 2014).

[3] Memorandum from staff meteorologist in APCP to file entitled "Recommendation for meteorological tower location(s) near the New Madrid Power Plant and Noranda Aluminum Facilities" (dated September 21, 2015).

at: https://www3.epa.gov/ttn/amtic/qalist.html, Table 0-9 on pages 14-15 of section 0. The details of each piece of equipment and data are in the following sections of the guidance.

A surface weather station is recommended for placement within 1 to 2 km of both the New Madrid and Noranda facilities. Based on an evaluation of proximity, terrain, and exposure, the area is narrowed to the agricultural land-use area west of Noranda and south of the two round white storage buildings/tanks (see Figure 3).

Upper air data is not recommended to be collected on site. For this location, there are no concerns that upper air flow patterns are influenced by nearby topography. The regional nature of NWS upper air network should be sufficient to represent New Madrid/Noranda in modeling exercises.

Noranda proposed to collocate the meteorological station with monitoring site #3, near the southwest corner of Noranda's property. Noranda proposed a ten meter tower with minimum monitoring parameters. The proposed site is near the Noranda fenceline while also being removed enough from significant obstacles, such as terrain and vegetation. Noranda historically collected limited onsite meteorological parameters near this proposed site. This location is near the region recommended by our staff meteorologist depicted in Figure 3. If Noranda does not decide to install full meteorological monitoring instrumentation, at minimum we recommend measuring wind speed and wind direction at or near this location. This minimal data could still be used for wind pattern and pollution rose analyses.

Noranda sits on the western bank of the Mississippi river; its surrounding area is relatively flat, with no altitude changes greater than 15 meters. This simple nature of terrain will not have a significant influence on the dispersion of SO_2 emissions from Noranda.

Figure 3. Recommended Meteorological Monitoring Location

Air dispersion modeling results

Two independent modeling scenarios were executed: 1) Noranda and AECI New Madrid power plant combined; 2) AECI New Madrid power plant alone. It should be noted that the Noranda modeling scenario performed originated from their 2008 PSD permit application. The PSD modeling was chosen for evaluating the monitoring sites in lieu of the normalized design value (NDV) method, as outlined in EPA's Monitoring TAD, to take advantage of extensive modeling that had already been performed for the recent permitting action. Therefore the impacts are reported as actual modeled impact values. EPA details the NDV method as using a normalized emission rate for sources to result in a normalized design value at receptors. This method is only used for monitor siting and not for compliance determination. Baseline and/or Scenario 2 emission rates and existing release parameters from the PSD modeling were chosen for this analysis to capture the worst case SO_2 emissions. BLP model results were not included in this modeling analysis because numerous high concentrations were already being modeled near Noranda's fenceline. Adding the BLP results would yield even higher concentrations near the fenceline and potline buildings and is not expected to change the overall analysis conclusions.

An annual background concentration of 9 ppb was added linearly to the combined model scenario results. The level of the background concentration is the same as the concentration used in the Jefferson County Nonattainment Area (NAA) plan submitted to EPA in 2015. During the development of this plan, a thorough background concentration analysis was performed. This analysis yielded a rural background concentration of 9 ppb used for Jefferson County. Since the area surrounding Noranda is also rural, a background concentration of 9 ppb was utilized as the representative background concentration for modeling purposes.

Analysis of the AECI New Madrid power plant model scenario produces no violating receptors. There is one main region with concentrations greater than 90 µg/m^3. This region is located to the east within 5 km from the AECI New Madrid power plant, depicted in Figure 4 by blue triangles. The highest modeled SO_2 concentration from the AECI New Madrid power plant is 99.8 µg/m^3 which is less than 13% of the combined scenario's maximum modeled concentration. Both model scenarios include the 9 ppb background concentration. The highest modeled SO_2 concentration from the AECI New Madrid power plant is approximately 3.5 km away from the release point. This can be attributed to the fact that the AECI New Madrid power plant has much higher stacks than Noranda, which allow for more dispersion and longer travel time before deposition. In the combined modeling scenario, AECI New Madrid power plant's contributions are less compared to Noranda's modeled contributions along their fenceline. Thus, the AECI New Madrid power plant was also modeled alone to allow for proper evaluation of the single source's impacts. The expected influence from the AECI New Madrid power plant on the proposed monitoring sites is minimal.

Figure 4 graphically plots the results from both modeling scenarios. The results are differentiated by colors and shapes to represent the separate scenarios and modeled concentrations. For the combined model scenario, red dots represent concentrations greater than 350 µg/m^3 and yellow dots represent concentrations in the range of 196 -350 µg/m^3. The highest concentration is 783 µg/m^3. The predicted concentration nearest the position of proposed SO_2 monitoring site #3 in Figure 4 is 525 µg/m^3. The predicted concentration nearest the proposed SO_2 monitoring site #2 is 712 µg/m^3. The predicted concentration nearest the proposed SO_2 monitoring site #1 is 228 µg/m^3. The highest concentration receptors, denoted by red dots, are focused in an area close to the potlines. The proposed monitoring site #1 is located near and in the dominant wind direction to capture impacts from the carbon-bake furnaces. The proposed monitoring sites #2 and #3 are located near enough to capture impacts from the potlines.

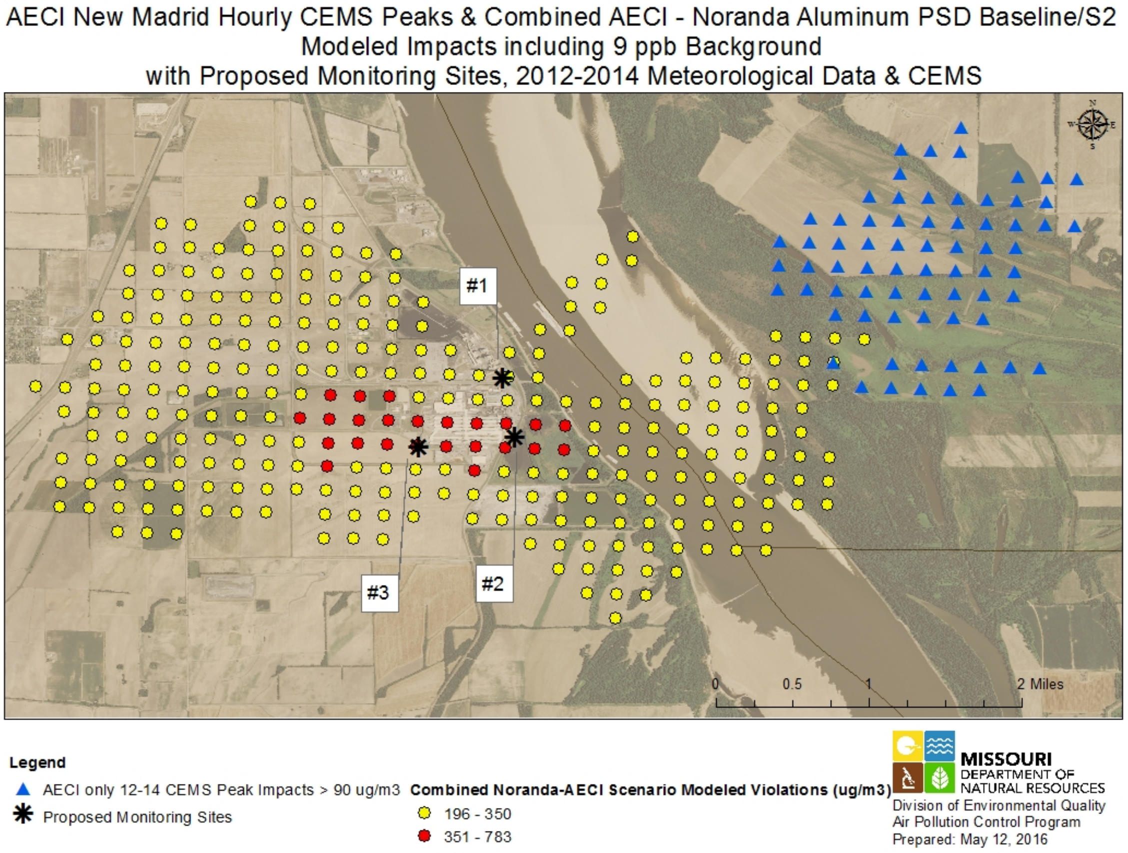


Figure 4. Noranda Aluminum and AECI New Madrid power plant combined model results with proposed monitoring sites

The model-predicted concentration decreases as the distance from the facility center increases. This can be attributed to the relatively low vertical releases and large amount of fugitive releases. The extent of high concentration receptors extends to 3 km to the west and the east from the facility center. For ease of reference, the high concentration receptors were divided into two levels: 1) red dots denote the highest peak concentrations (larger than 350 $\mu g/m^3$) and 2) yellow dots still denote high impacts but to a lesser extent.

The site selection process also accounts for the frequency with which a receptor registers a daily maximum concentration. In order to assess the frequency of occurrence of concentration maxima at a given receptor, an analysis was performed on the top 300 receptors. In AERMOD the MAXDAILY option was used to output the maximum 1-hour concentration for each receptor for each day. This output was used to rank the areas by the total number of days that an individual receptor had a 1-hour daily maximum concentration for the 36 modeled months as shown in Figure 5. The red dots indicate receptors that exhibited an overwhelming amount of the modeled maximum daily concentrations. Areas near Noranda's property boundary and potlines, exhibit the highest frequency of experiencing maximum daily concentrations which supports the monitors being sited near the property line and potlines specifically. This method is detailed in EPA's monitoring TAD.

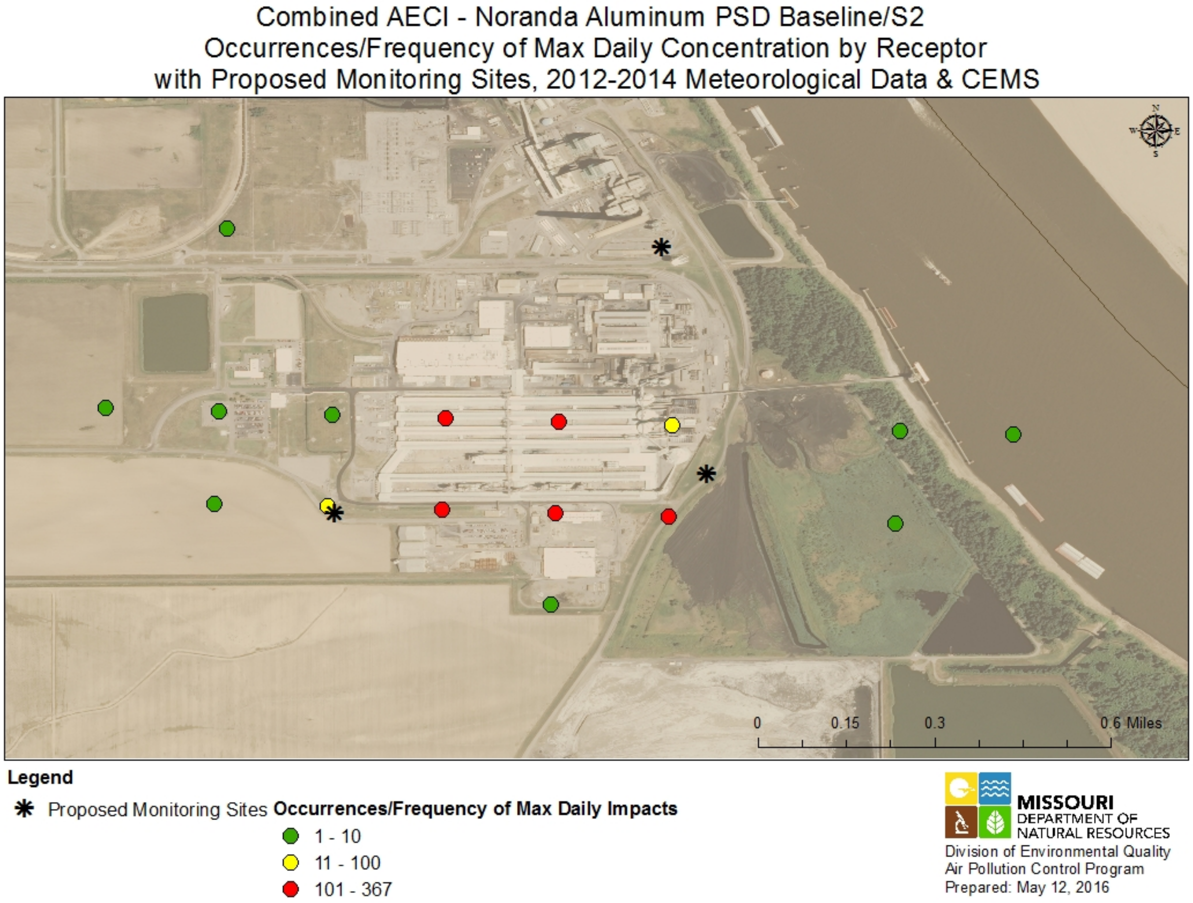


Figure 5. Frequency/Occurrences for receptors exhibiting daily maximum hourly concentrations for 2012-2014

Another method outlined in EPA's monitoring TAD entails scoring receptors. The scoring strategy employed in the site selection process creates a relative prioritized list of receptor locations for monitor siting using modeled peak impacts and 1-hour daily maximum concentration frequencies. The scoring takes into account both the highest modeled concentration at each receptor and the frequency or number of times that the receptor exhibits the daily maximum concentration. This strategy will provide a list of receptor locations, ranked in general order of desirability with regard to potential siting of permanent source-oriented SO_2 monitors. Lower numerical scores indicate higher probability of capturing peak 1-hour SO_2 concentrations in the modeled domain. Figure 6 shows the scores by receptor with the red dots having the most desirable score and blue dots a less desirable score. The area with the highest density of receptors with frequent maximum daily concentrations and highest 1-hour concentrations and therefore best scores is near the Noranda fenceline.

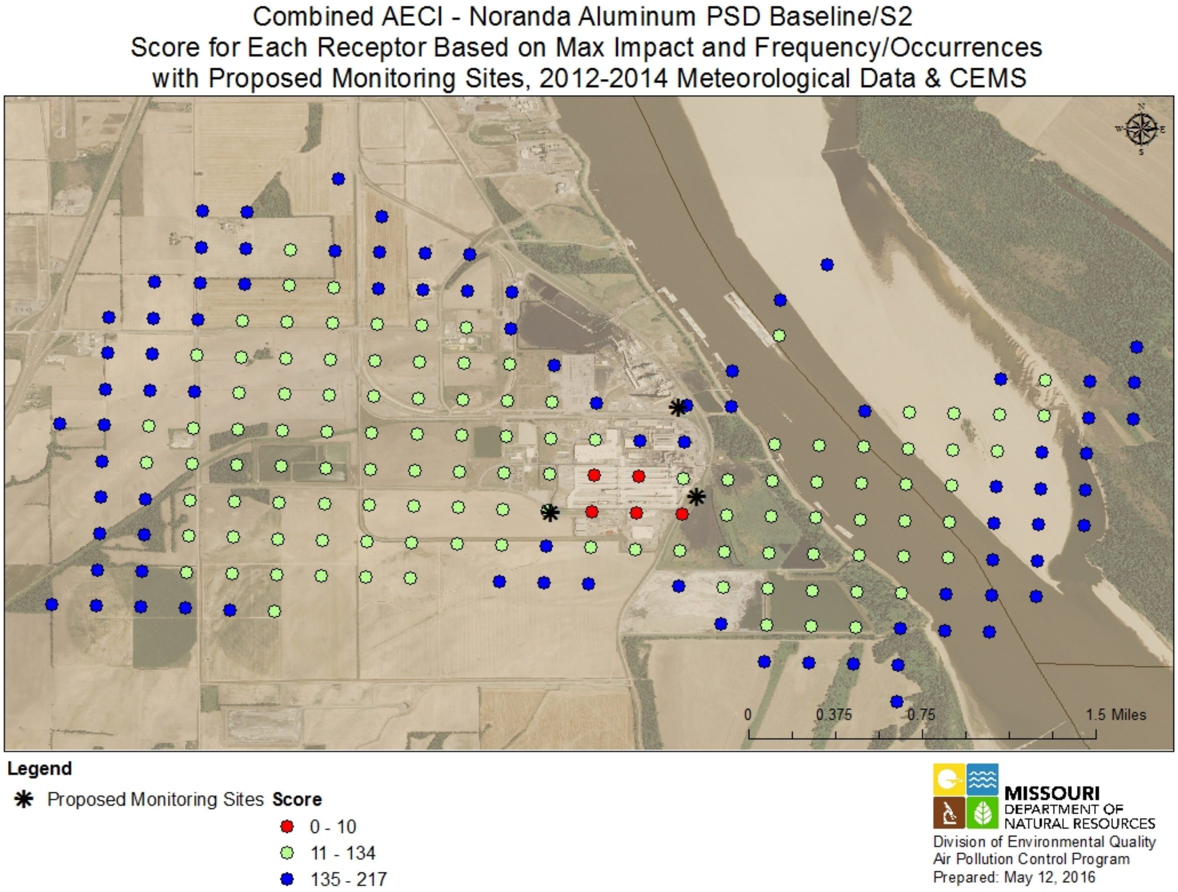


Figure 6. Scoring based on maximum modeled impact and frequency of exhibiting daily maximum hourly concentrations by receptor

<u>Noranda's Proposed Site Selection</u>

Noranda's proposed monitoring sites are all located near the area of frequent and high modeled concentrations near the facility fenceline. Monitors placed near the fenceline would be expected to capture Noranda's impacts on the surrounding area's air quality. From the analysis and evaluation detailed in this report, the regions with highest peak concentrations, frequency of high impacts, and therefore desirable scores will provide the greatest opportunity to monitor peak concentrations of SO_2 emitted by Noranda.

Based on the analysis of modeling results, the best available positions for installing monitors are near the Noranda property boundary because of the high frequency and peak modeled concentrations of SO_2. Monitors installed near receptors with frequently high modeled impacts have the best opportunity to capture peak concentrations of SO_2. Specifically, site #1 is proposed to be located near the northeast corner of the Noranda-AECI New Madrid fenceline, indicated in Figure 7. This position is expected to capture the highest impact from the carbon bake furnace emissions. According to the wind rose pattern, this location has a dominant wind direction in the northeast direction. Proposed site #2 is located along the eastern fenceline of Noranda just off the southeast corner of the potline 3 building. Proposed Site #3 is located near the southwest corner near potline 3 on Noranda's fenceline. All three proposed monitoring sites are near the Noranda fenceline; and are therefore expected to capture peak impacts from Noranda.

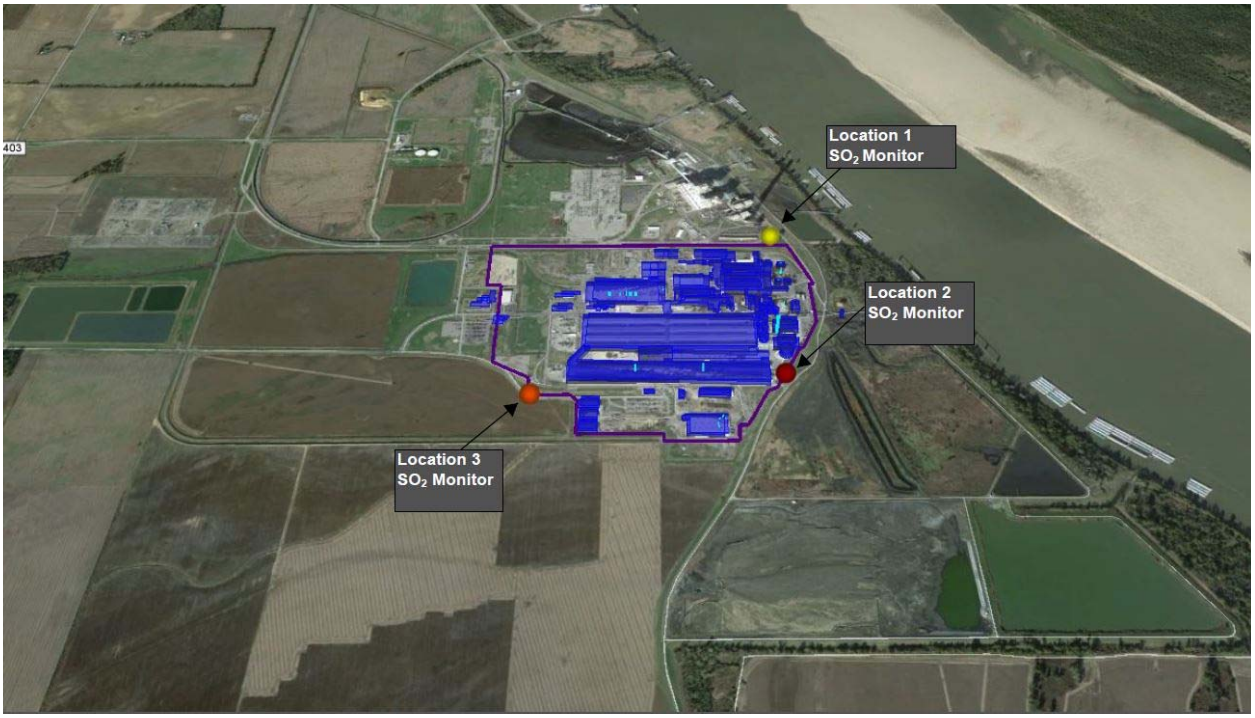


Figure 7. Aerial View of Noranda Aluminum and three Proposed SO_2 Monitoring Sites

Conclusions

From the modeling analysis and evaluation discussed above, monitors installed near the proposed site positions depicted in Figure 7 would provide the greatest opportunity to monitor high concentrations of SO_2 emitted by Noranda. The proposed sites are reasonable and in agreement with the air program's analysis given they meet minimum monitor siting criteria.

ATTACHMENT A. SO_2 Source Emissions Information

Noranda Aluminum Source Information (from Noranda's 2008 PSD permit application: Scenario 2 and Baseline Emissions Information used in modeling)

Noranda Aluminum, Inc.-Point Source Emission Rates and Stack Parameters

EP ID	Description	Model ID	Release Type	Easting	Northing	Elevation	Emission Rate		Stack Height		Stack Temperature		Stack Exit Velocity		Stack Diameter		Altered?		Comment
							(g/s)	*(lb/hr)*	*(Meters)*	*(Feet)*	*(Kelvin)*	*(Fahrenheit)*	*(m/s)*	*(ft/min)*	*(Meters)*	*(Feet)*	*(Yes)*	*(No)*	
					SO_2 NAAQS-1-Hour Emission Rates-Scenario 2														
EP61	Stack - Potline 1 & 2	EP61	POINT	807991.10	4045990.40	91.82	1.0713E+02	8.503E+02	72.030	236.319	360.370	188.996	11.711	2305.392	7.920	25.984		X	
EP62	Stack - Potline 3E	EP62	POINT	807771.10	4045812.90	91.06	3.1941E+01	2.535E+02	42.000	137.795	357.820	184.406	11.735	2310.000	4.360	14.304	X		Stack Height Decreased from 65 to 42 Meters
EP63	Stack - Potline 3W	EP63	POINT	807554.20	4045812.50	90.88	3.1941E+01	2.535E+02	42.000	137.795	359.480	187.394	11.735	2310.000	4.360	14.304	X		Stack Height Decreased from 65 to 42 Meters
EP94	Natural Gas Fired Boiler for Hot Oil System	EP94	POINT	807953.70	4046131.90	92.08	5.0400E-04	4.000E-03	6.401	21.001	298.150	77.000	5.000	984.252	0.610	2.001		X	
EP95	Natural Gas Fired Boiler for Hot Oil System	EP95	POINT	808018.80	4046106.80	91.52	4.5400E-04	3.603E-03	5.182	17.001	298.150	77.000	5.000	984.252	0.457	1.499		X	
EP96	Natural Gas Fired Boiler for Hot Oil System	EP96	POINT	808018.80	4046092.70	91.32	4.5400E-04	3.603E-03	4.572	15.000	298.150	77.000	5.000	984.252	0.366	1.201		X	
EP97	Carbon Rodding Aluminum Spray Furnace	EP97	POINT	807708.60	4046131.90	90.42	4.1300E-04	3.278E-03	3.050	10.007	298.150	77.000	5.000	984.252	0.430	1.411		X	
EPAAA	Proposed Carbon Bake Furnaces 1, 2 & 3	EPAAA	POINT	808011.70	4046226.34	92.85	2.0977E+00	1.665E+01	65.000	213.255	343.710	159.008	30.480	6000.000	2.180	7.152	X		Stack Height Decreased from 71 to 65 Meters
EP98	Existing Carbon Bake Stack Prior to Permit #082010-003	EP98	POINT	808034.20	4046184.00	85.00	6.9910E-01	5.549E+00	65.000	213.255	343.889	159.330	19.671	3872.244	1.676	5.499	X		To Be Decommisioned Upon Completion of EP-AAA
EP99	Existing Carbon Bake Stack Prior to Permit #082010-003	EP99	POINT	808011.70	4046211.10	85.00	6.9910E-01	5.549E+00	65.000	213.255	343.889	159.330	19.671	3872.244	1.676	5.499	X		To Be Decommisioned Upon Completion of EP-AAA
EPAA	Existing Carbon Bake Stack Prior to Permit #082010-003	EPAA	POINT	808030.00	4046254.90	85.00	6.9910E-01	5.549E+00	65.000	213.255	343.889	159.330	10.579	2082.480	2.286	7.500	X		To Be Decommisioned Upon Completion of EP-AAA
EPAB	Stack for Old Pig Melter	EPAB	POINT	807561.40	4046135.60	90.10	1.5840E-03	1.257E-02	30.480	100.000	866.483	1100.000	0.780	153.543	1.130	3.707		X	
EPAD	Stack for #1MP&S Melter	EPAD	POINT	807610.10	4046135.60	90.11	1.5840E-03	1.257E-02	30.480	100.000	866.483	1100.000	1.550	305.118	0.910	2.986		X	
EPAE	Stack for #1 MP&S Holder	EPAE	POINT	807623.10	4046134.80	90.12	9.3600E-04	7.429E-03	30.480	100.000	755.372	900.000	0.520	102.362	0.980	3.215		X	

EPAF	Stack for #2 MP&S Melter	EPAF	POINT	807596.80	4046135.60	90.10	1.5840E-03	1.257E-02	30.480	100.000	866.483	1100.000	1.550	305.118	0.910	2.986		X	
EPAG	Stack for #2 MP&S Holder	EPAG	POINT	807583.50	4046135.20	90.10	9.3600E-04	7.429E-03	30.480	100.000	755.372	900.000	0.520	102.362	0.980	3.215		X	
EPAH	Stack for #4 MP&S Melter	EPAH	POINT	807513.00	4046135.60	90.08	2.3620E-03	1.875E-02	30.480	100.000	866.483	1100.000	0.990	194.882	1.220	4.003		X	
EPAI	Stack for #4 MP&S Holder	EPAI	POINT	807500.50	4046135.60	90.08	9.3600E-04	7.429E-03	27.430	89.993	755.372	900.000	0.610	120.079	0.980	3.215		X	
EPAJ	Stack for Homogenizing Furnace #1	EPAJ	POINT	807644.80	4046166.00	90.10	1.0800E-04	8.572E-04	14.940	49.016	533.150	500.000	0.310	61.024	0.910	2.986		X	
EPAK	Stack for Homogenizing Furnace #2	EPAK	POINT	807645.20	4046182.70	90.08	1.0800E-04	8.572E-04	14.940	49.016	533.150	500.000	0.310	61.024	0.910	2.986		X	
EPAL	Stack for Homogenizing Furnace #3	EPAL	POINT	807645.60	4046196.50	90.07	1.0800E-04	8.572E-04	14.940	49.016	533.150	500.000	0.160	31.496	1.280	4.199		X	
EPAN	Stack for PIG Melter 2	EPAN	POINT	807529.70	4046135.60	90.09	2.0160E-03	1.600E-02	30.480	100.000	866.483	1100.000	0.780	153.543	1.130	3.707		X	
EPBA	Stack for Rod Mill #1 Melter	EPBA	POINT	807789.90	4045619.40	91.46	1.8720E-03	1.486E-02	15.240	50.000	866.483	1100.000	10.973	2160.000	1.130	3.707	X		Velocity & Diameter-Per 05/23/11 Email Trinity Consultant's, Inc.
EPBB	Stack for Rod Mill #1 Holder	EPBB	POINT	807790.30	4045599.40	91.57	7.2000E-04	5.714E-03	15.240	50.000	755.372	900.000	8.230	1620.000	1.130	3.707	X		Velocity & Diameter-Per 05/23/11 Email Trinity Consultant's, Inc.
EPBC	Stack for Rod Mill #2 Melter	EPBC	POINT	807813.20	4045619.40	91.38	1.8720E-03	1.486E-02	15.240	50.000	866.483	1100.000	10.973	2160.000	1.130	3.707	X		Velocity & Diameter-Per 05/23/11 Email Trinity Consultant's, Inc.
EPBD	Stack for Rod Mill #2 Holder	EPBD	POINT	807812.80	4045599.40	91.52	7.2000E-04	5.714E-03	15.240	50.000	755.372	900.000	8.230	1620.000	1.130	3.707	X		Velocity & Diameter-Per 05/23/11 Email Trinity Consultant's, Inc.
EPBH	#5 Rod Mill Holder	EPBH	POINT	807790.70	4045572.70	91.56	4.3200E-04	3.429E-03	15.240	50.000	866.483	1100.000	0.030	5.906	0.610	2.001		X	
EPBI	Natural Gas Fired Boiler for Office Heat	EPBI	POINT	807086.70	4046127.90	88.55	1.0400E-04	8.254E-04	5.486	17.999	298.150	77.000	0.208	40.945	0.183	0.600		X	
EPBJ	Natural Gas Fired Boiler for Locker Room Heat	EPBJ	POINT	807305.20	4046097.10	89.95	1.4700E-04	1.167E-03	5.791	18.999	298.150	77.000	0.132	25.984	0.213	0.699		X	
EPBK	Natural Gas Fired Boiler for Locker Room Heat	EPBK	POINT	807337.20	4046097.10	90.03	1.4700E-04	1.167E-03	5.791	18.999	298.150	77.000	0.122	24.016	0.305	1.001		X	
EP113	Holding Furnace	EP113	POINT	807789.80	4045590.50	91.44	1.4360E-03	1.140E-02	15.240	50.000	449.820	350.006	18.873	3715.157	0.914	3.000	X		Stack Exit Velocity Increase
EP114	Holding Furnace	EP114	POINT	807790.30	4045584.10	91.44	1.4360E-03	1.140E-02	15.240	50.000	449.820	350.006	12.190	2399.606	0.914	3.000		X	

SO2 Baseline Emissions[1]					
Emission Point Number	Modeled Emission Point Number	Description	Baseline Emissions (tpy)	Baseline Emissions (lb/hr)	Baseline Emissions (g/s)
EP-61	EP-61	Stack - Potline 1 & 2	2485.54	567.48	71.50
EP-62	EP-62	Stack - Potline 3E	740.74	169.12	21.31
EP-63	EP-63	Stack - Potline 3W	740.74	169.12	21.31

1. The baseline emissions have been updated based on a new mass balance approach that incorpates facility-wide SO2-impacting activities. Noranda will submit updated EIQs to reflect these changes.

SO2 Baseline Emissions[1]					
Emission Point Number	Modeled Emission Point Number	Description	Baseline Emissions (tpy)	Baseline Emissions (lb/hr)	Baseline Emissions (g/s)
EP-98	EP-98	Carbon Bake 1 Stacks (64 total)	459.83	104.98	13.28
EP-99	EP-99	Carbon Bake 2 Stacks (64 total)	459.83	104.98	13.28
EP-AA	EP-AA	Carbon Bake 3 Stacks (64 total)	459.83	104.98	13.28

1. The baseline emissions have been updated based on a new mass balance approach that incorpates facility-wide SO2-impacting activities. Noranda will submit updated EIQs to reflect these changes.

AECI New Madrid Source Information

Excerpt from Hourly CEMS Emission File:

	Year	**Month**	**Day**	**Hour**	**Unit**	**SO2 ER (g/s)**	**Temp (K)**	**Velocity (m/s)**
SO HOUREMIS	12	1	1	1	B1	262.553	579.2611111	29.49448
SO HOUREMIS	12	1	1	1	B2	0	581.4833333	29.22524
SO HOUREMIS	12	1	1	2	B1	268.046	579.2611111	29.49448
SO HOUREMIS	12	1	1	2	B2	0	581.4833333	29.22524

Source Information and Release Parameters:

Facility I.D.	**Facility Name**	**Site Name**	**Emission Point I.D.**	**Model ID**	**Description**	**Release Type**
143-0004	AECI	New Madrid Power Plant	EP01	B1	BOILER #1 - BITUMINOUS COAL - this is for Subbituminous Coal	Point
143-0004	AECI	New Madrid Power Plant	EP02	B2	BOILER #2 - BITUMINOUS COAL - this is for Subbituminous Coal	Point

Easting	**Northing**	**Base Elevation**	**Allowable Emission Rate**	**Actual Stack Height**	**Stack Temperature**	**Stack Exit Velocity**	**Stack Diameter**
Meters	*Meters*	*Meters*	*Grams/Second*	*Meters*	*Kelvin*	*Meters/Second*	*Meters*
807904.5	4046549	91.1352	337.9484895	243.84	579.2611111	29.49448	6.096
807911.6	4046555	91.1352	300.2954796	243.84	581.4833333	29.22524	6.096

APPENDIX 5

Review of Proposed Additional Southwest and North SO_2 Monitoring Stations Around the Labadie Energy Center

Southwest and North SO_2 Monitoring Station Network Enhancement Around the Labadie Energy Center

Introduction

On June 30, 2016, EPA designated the area around the Labadie Energy Center as unclassifiable. In a detailed response to comments document[1] and a technical support document (TSD)[2] for the second round of the 1-hour SO2 NAAQS designation process EPA reviewed and commented on technical information regarding SO_2 dispersion modeling and other analysis for the Labadie area.

In their response to comments document, EPA cites reviewing a total of 48 modeling runs submitted by Ameren Missouri, the Missouri Department of Natural Resources' Air Pollution Control Program (Air Program), and Sierra Club for the Labadie area. EPA concludes on page 26 in the designations TSD that for the Labadie area "…EPA's view is that the modeling results widely vary and greatly depend upon how the modeling was conducted, as discussed in this Technical Support Document. Because of the issues present in the modeling methodologies, the EPA does not have a clear basis to determine whether the area currently meets or does not meet the 2010 SO2 NAAQS based on all currently available information."

On page 84 of the response to comments document EPA states: "While EPA has indicated for MDNR's 2015 monitoring network plan that the monitors meet siting criteria for purposes of being away from obstructions, etc., EPA has not made any determinations of whether the monitors are in expected peak concentration locations as outlined by the 1-hr SO2 designations Monitoring Technical Assistance Document. Given our analysis of both the windrose and terrain information, along with factoring in historic monitoring locations, it appears that the current monitors are not likely sited in an area to measure the maximum concentrations."

As a result of the issues addressed in these EPA designation documents which were posted after the 2016 Monitoring Network Plan plan's public inspection period, Air Program worked with EPA to determine the additional monitoring plan changes that are needed to satisfy the 1-hour SO_2 Data Requirements Rule and revised the 2016 Monitoring Network Plan accordingly.

The following sections identify the information supporting the additional Labadie SO_2 monitoring network enhancement.

---

[1] Responses to Significant Comments on the Designation Recommendations for the 2010 Sulfur Dioxide Primary National Ambient Air Quality Standard (NAAQS), Docket Number EPA–HQ–OAR–2014–0464
U.S. Environmental Protection Agency, https://www.epa.gov/sites/production/files/2016-07/documents/so2d-r2-response-to-comments-06302016.pdf

[2] Final Technical Support Document Missouri Area Designations for the 2010 SO2 Primary National Ambient Air Quality Standard, https://www.epa.gov/sites/production/files/2016-07/documents/r7_mo_final_designation_tsd_07012016.pdf

Labadie, Southwest

On August 30, 2016, Ameren Missouri submitted to the Air Program a report titled "Evaluation for an Additional SO_2 Monitoring Site Around the Labadie Energy Center, August 30, 2016" This report is included at the end of this appendix.

After reviewing this report Air Program and EPA Region VII staff concurred with establishing a southwest monitor consistent with the report recommendations. On September 21, 2016 Air Program, EPA Region VII, and Ameren staff visited a candidate location in the area of maximum modeled impact and confirmed this location can be developed to meet the ambient air monitoring siting criteria of 40 CFR 58 Appendix E. This site is proposed as the Labadie, Southwest SO_2 monitoring site in revision 1 of 2016 Monitoring Network Plan.

Labadie, North

The Labadie Valley meteorological tower provided data from April 22, 2015 through June 30, 2016 except for the period from the end of December 2015 through late March 2016. This data gap was a result of flooding and instrument damage.

Due to the modeling uncertainties that occurred using various meteorological data substitution techniques discussed in the report, the Labadie SO_2 network has been enhanced by adding a site north of the Labadie energy center. The north site is located in an area of modeled maximum SO_2 impact using a meteorological monitoring data set comprising of the on-site Valley and Jefferson City Airport (KJEF) meteorological monitoring sites with actual plant emissions.

This model run yielded modeled impacts north of the Labadie Energy Center in a predominant wind direction and in an area of relatively high elevation. EPA Region VII staff supplied these modeling results to the Air Program in an HTML map file on October 17, 2016. Air Program, Ameren, and EPA Region VII staff visited several candidate north locations based on this analysis on October 21, 2016. Figure A shows two EPA proposed candidate locations, in addition to current and former monitoring sites.

Ameren subsequently located a property in the area of high modeled impact. This location can be developed to meet the ambient air monitoring siting criteria of 40 CFR 58 Appendix E and is identified on the map as Labadie, North site in the second revision of 2016 Monitoring Network Plan.

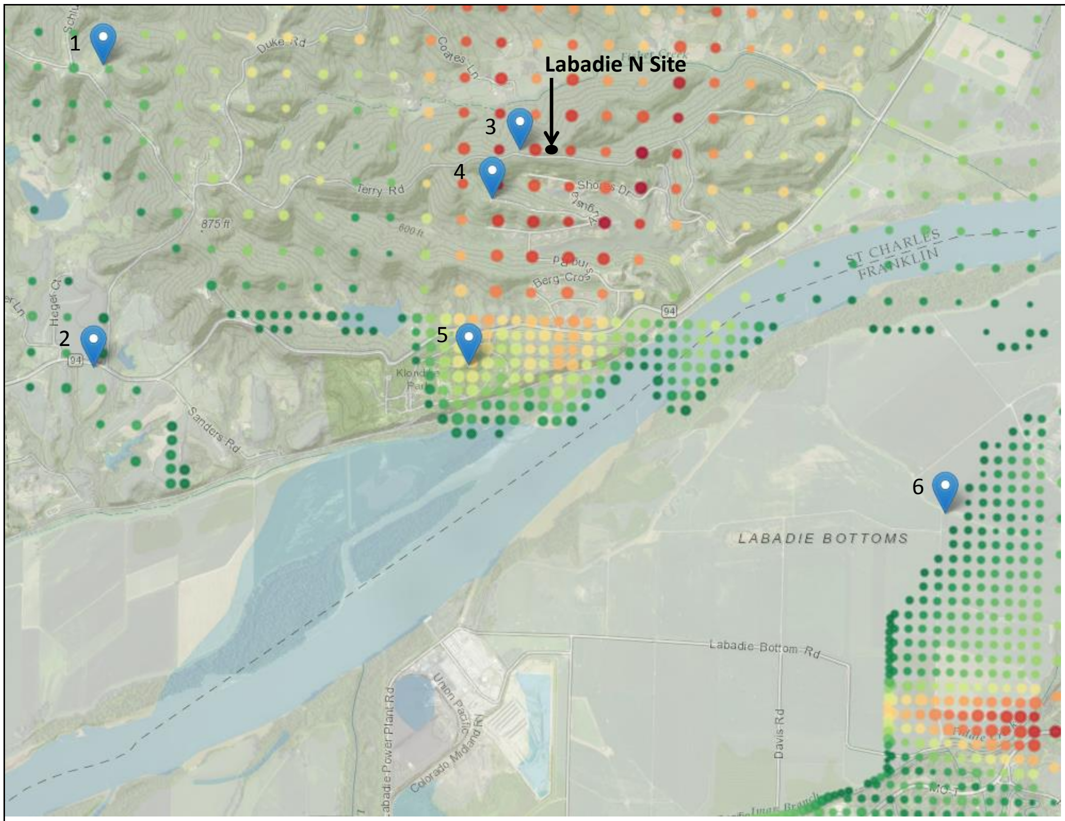


Figure A. Green, red, and yellow colors indicate modeling results. Monitoring sites (blue flags) are: 1. Augusta (former site), 2. NW (current site), 3. EPA2 (proposed site), 4. EPA1 (alternate proposed site), 5. Quarry (former site), 6. Valley (current site). The Black dot (and arrow) indicates the selected N site, near no. 3.

Evaluation for an Additional SO2 Monitoring Site Around the Labadie Energy Center
(August 30, 2016)

An evaluation for an additional monitoring site for the area around the Labadie Energy Center was performed using the methodology described in "SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, U.S. EPA, February 2016 (DRAFT)"(Monitoring TAD) utilizing predicted SO2 air quality Normalized Design Values (NDV). In addition a corroboratory analysis was performed by US EPA Region VII personnel. For these evaluations the following datasets were utilized.

Meteorology:

1) The Labadie Valley site data from April 22, 2015 through June 30, 2016; upper air data from Lincoln, IL (Kilx).
2) The Labadie Valley site data from April 22, 2015 through June 30, 2016 with data missing from the Valley site dataset filled with National Weather Service (NWS) data from the St. Louis Chesterfield Airport (Ksus); upper air data from Lincoln, IL (Kilx).
3) The Labadie Valley site data from April 22, 2015 through June 30, 2016 with data missing from the Valley site dataset filled with NWS data from the Jefferson City Airport (Kjef); upper air data from Lincoln, IL (Kilx)
4) Weather Research and Forecasting (WRF) model for the year 2015. The model configuration and description are illustrated in Appendix A.

Emissions:

1) Actual hourly stack temperature and stack flow rates with normalized SO2 emissions based on 100 g/s maximum per unit for all four Labadie Energy Center generating units.
2) Constant hourly stack temperature and stack flow rate (developed from the operating period January 1, 2013 through December 31, 2015) based on all four Labadie Energy Center generating units operating at > 500 Mw with normalized SO2 emissions of 100 g/s per unit; defined as a high load scenario.
3) Constant hourly stack temperature and stack flow (developed from the operating period January 1, 2013 through December 31, 2015) based on all four Labadie Energy Center generating units operating between 300 – 450 MW with normalized SO2 emissions of 100 g/s per unit; defined as a mid-load scenario.

Modeling Discussion:

Versions 15181 of AERMOD and AERMET along with version 15272 of AERMINUTE were utilized for this modeling analysis (see Appendix A for WRF processing). The modeling grid used was a telescoping 100, 250 and 500 m grid (out to 10 km) and is shown in Figure 1.

As expected, each meteorological dataset and operating scenario produced different results in terms of predicted monitor locations. For example, Figures 2 through5 provide an illustrative example of the various Score Ranks for the top 200 monitor locations developed from the four meteorological scenarios discussed above coupled with the actual normalized SO2 emissions scenario. As is evident from the figures, preferred additional monitor locations appear to range from north to southeast to southwest of the Labadie Energy Center.

Figure 1

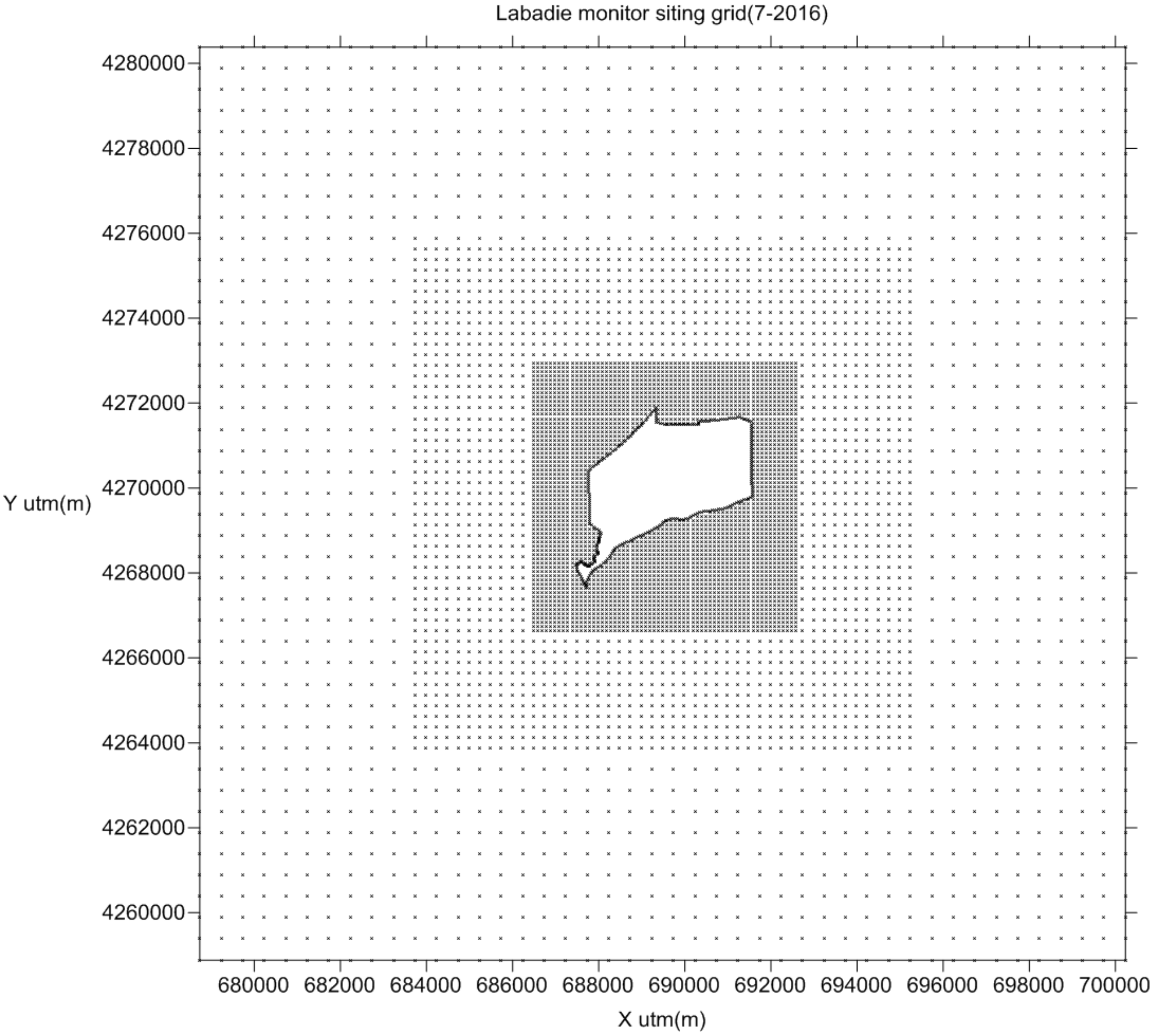


Figure 2

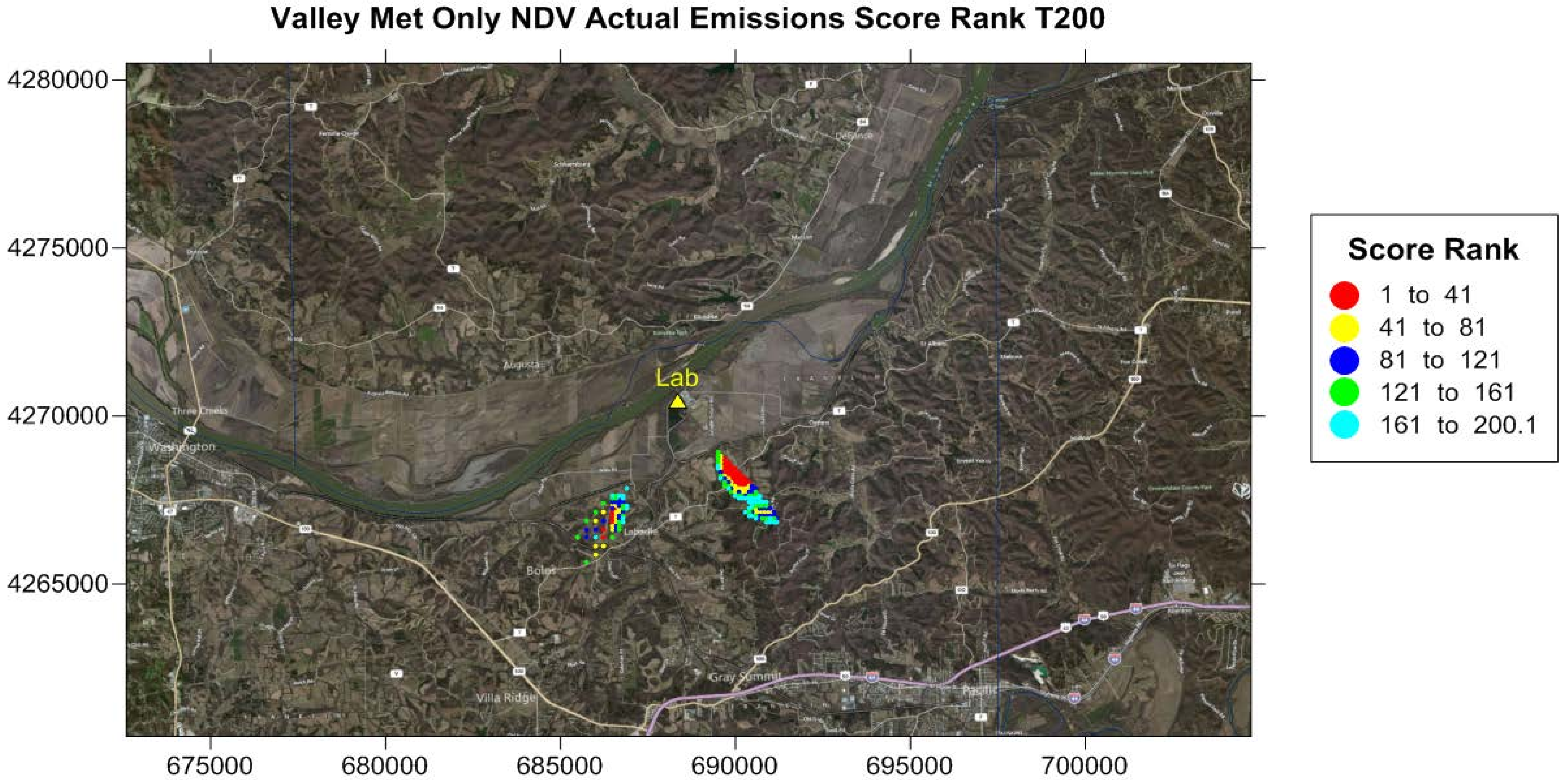
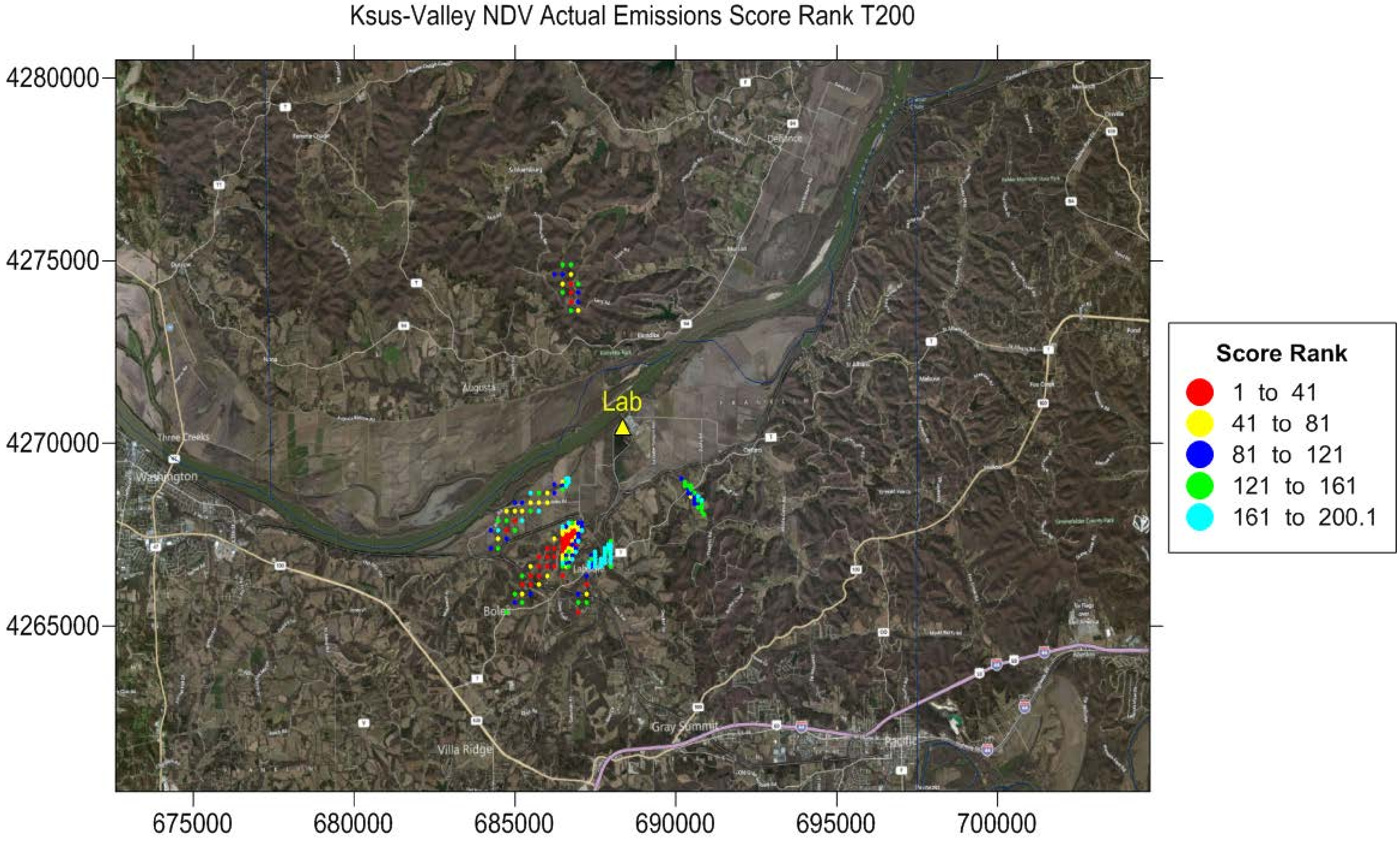

Valley Met Only NDV Actual Emissions Score Rank T200
4280000
4275000
4270000
4265000
675000
680000
685000
690000
695000
700000
Lab
Augusta
Defiance
Three Creeks
Washington
Labadie
Boles
Gray Summit
Villa Ridge
Pacific
Score Rank
1 to 41
41 to 81
81 to 121
121 to 161
161 to 200.1

Figure 3



Ksus-Valley NDV Actual Emissions Score Rank T200

Figure 4

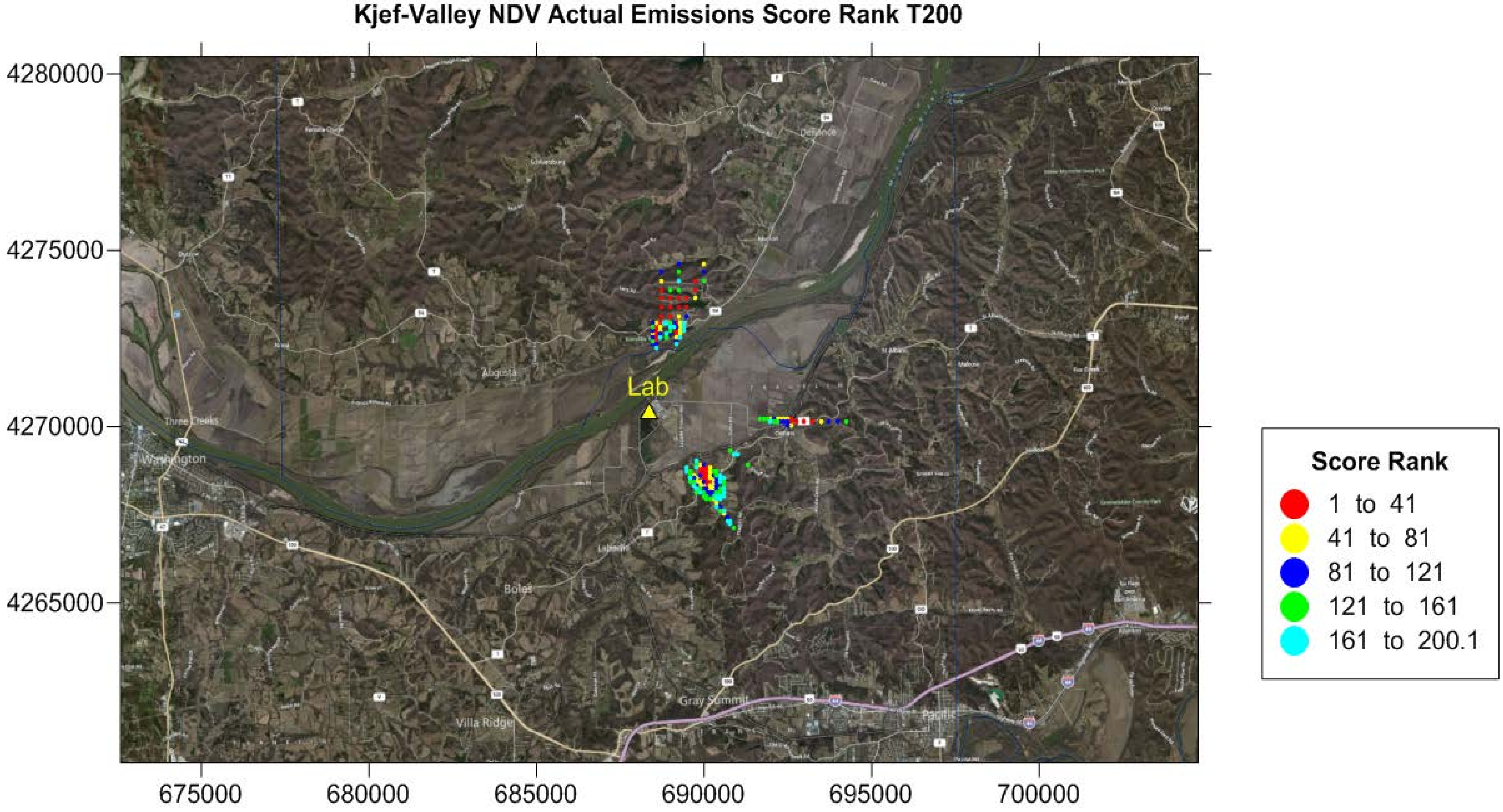
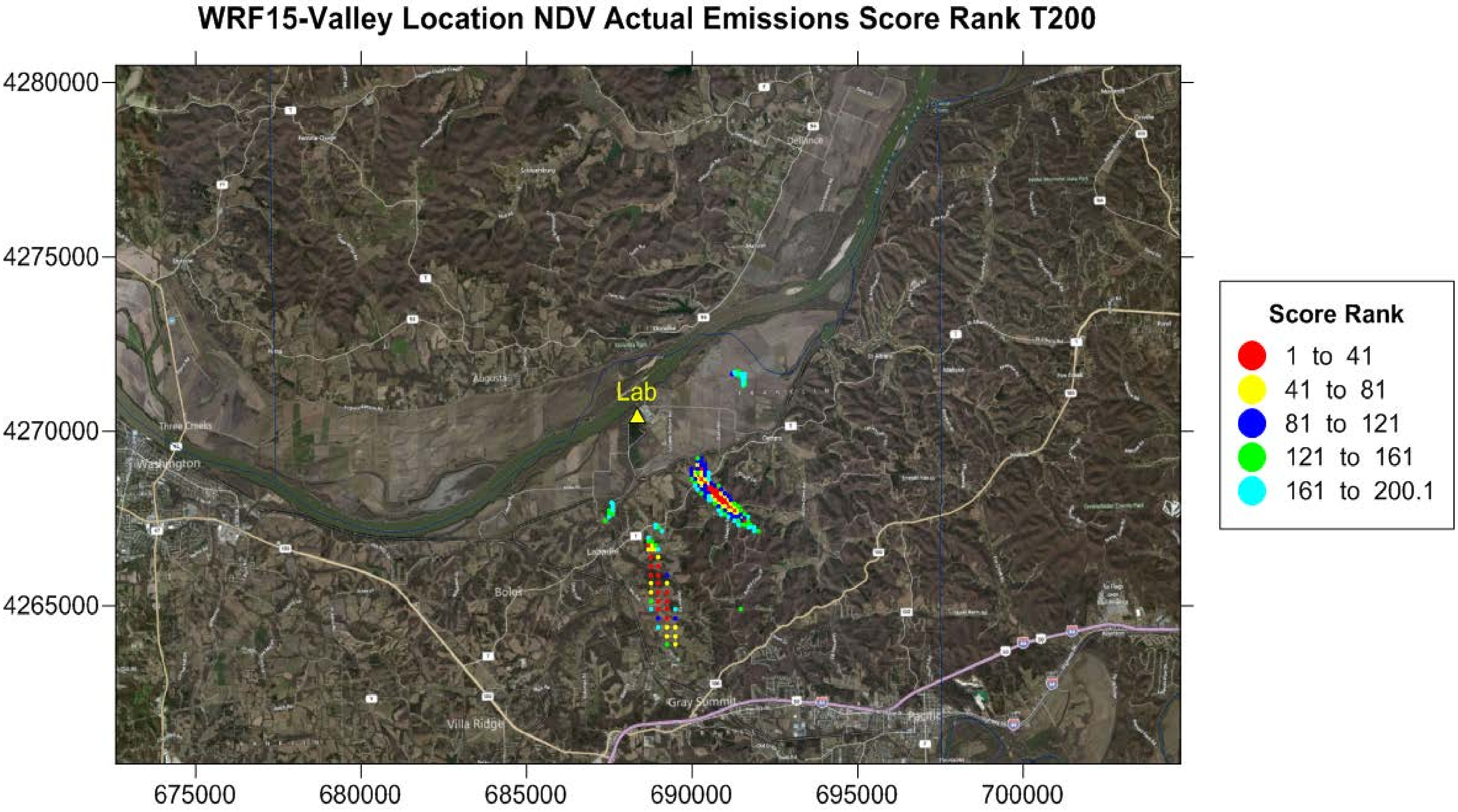

Kjef-Valley NDV Actual Emissions Score Rank T200
4280000
4275000
4270000
4265000
675000
680000
685000
690000
695000
700000
Lab
Augusta
Defiance
Three Creeks
Washington
Boles
Villa Ridge
Gray Summit
Pacific
Score Rank
1 to 41
41 to 81
81 to 121
121 to 161
161 to 200.1

Figure 5


WRF15-Valley Location NDV Actual Emissions Score Rank T200
4280000
4275000
4270000
4265000
675000
680000
685000
690000
695000
700000
Lab
Augusta
Three Creeks
Washington
Defiance
Labadie
Boles
Villa Ridge
Gray Summit
Score Rank
● 1 to 41
● 41 to 81
● 81 to 121
● 121 to 161
● 161 to 200.1

In order to better delineate a preferred monitor location from the different scenario predictions, further analysis was performed. The operating conditions from April 22, 2015 through June 30, 2016 (actual normalized, high load scenario and mid-load scenario) were compared to the 2013-2015 operating conditions to determine how well the April 22, 2015 through June 30, 2016 represented typical operating conditions for the four Labadie Energy Center generating units. Table 1 below shows a comparison between the April 22, 2015 through June 30, 2016 period and the period January 2013 through December 2015.

Table 1
Labadie Operating Comparison

Unit	Clock Hours 2013-15	Unit Operating Hours 2013-15	Unit Operating (Percent)	Unit Operating Time >500 Mw (Hr)	Unit Operating Time >500 Mw (Percent)	Unit Operating Time 300-450 Mw (Hr)	Unit Operating Time 300-450 Mw (Percent)
Lab1	26280	22722	86.46%	18688	82.25%	2862	12.60%
Lab2	26280	23197	88.27%	18488	79.70%	3248	14.00%
Lab3	26280	22935	87.27%	17097	74.55%	4207	18.34%
Lab4	26280	24801	94.37%	18783	75.73%	4173	16.83%
Plant	**105120**	**93655**	**89.09%**	**73056**	**78.01%**	**14490**	**15.47%**

Unit	Clock Hours 4-22-15 to 6-30-16	Unit Operating Hours 4-22-15 to 6-30-16	Unit Operating (Percent)	Unit Operating Time >500 Mw (Hr)	Unit Operating Time >500 Mw (Percent)	Unit Operating Time 300-450 Mw (Hr)	Unit Operating Time 300-450 Mw (Percent)
Lab1	10464	9981	95.38%	7279	72.93%	1874	18.78%
Lab2	10464	9029	86.29%	6208	68.76%	1989	22.03%
Lab3	10464	8999	86.00%	5571	61.91%	2424	26.94%
Lab4	10464	8335	79.66%	4987	59.83%	2532	30.38%
Plant	**41856**	**36344**	**86.83%**	**24045**	**66.16%**	**8819**	**24.27%**

As is evident from Table 1, the 2013-15 operating period had a higher percentage of operating time in the high load scenario than the period of April 22, 2015 through June 30, 2016. Conversely the mid-load operating scenario had a lower percentage of operating time than that of the April 22, 2015 to June 30, 2016 period. However, the overall unit percentage of unit operating time was similar for both operating periods. Based on the results shown in Table 1, further analysis was performed for the actual normalized emissions operating conditions and the high load normalized emissions operating conditions for the four meteorological scenarios.

To further refine a preferred monitor location from the scenario predictions, the top 200 NDV receptors for these two operating conditions were combined into individual files of 800 receptors (top 200 NDV receptors for each meteorological scenario). These receptors were then searched to see if any of the top 200 NDV receptors for each meteorological scenario were repeated. A list of receptors that occurred in at least two or more of the meteorological scenarios were compiled and the average score rank for those duplicate receptors was calculated. Those duplicate receptors were then ranked. This ranked list of receptors represents a consensus between the four different meteorological scenarios as to the best location to site an additional SO2 monitor.

Figure 6

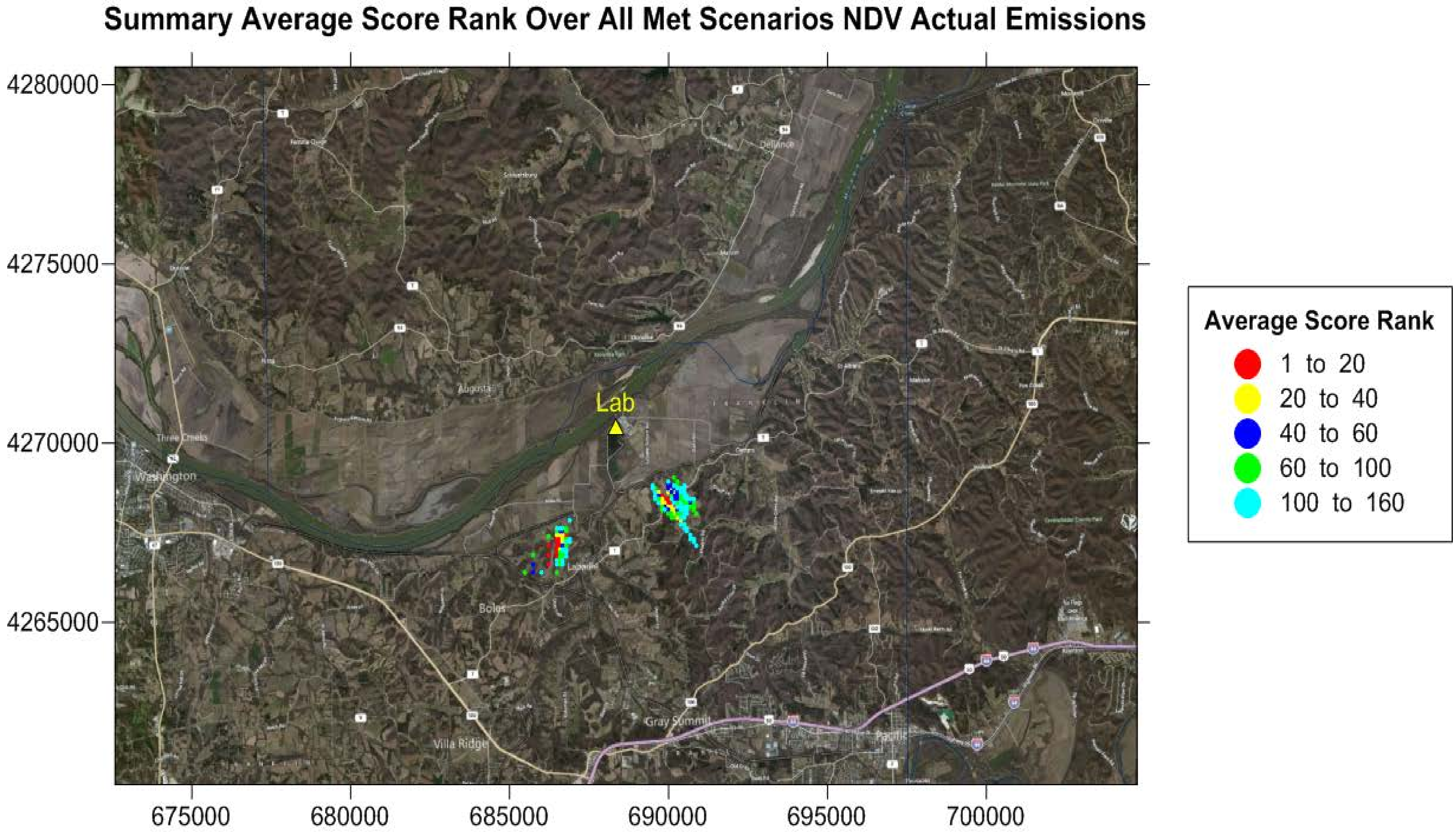
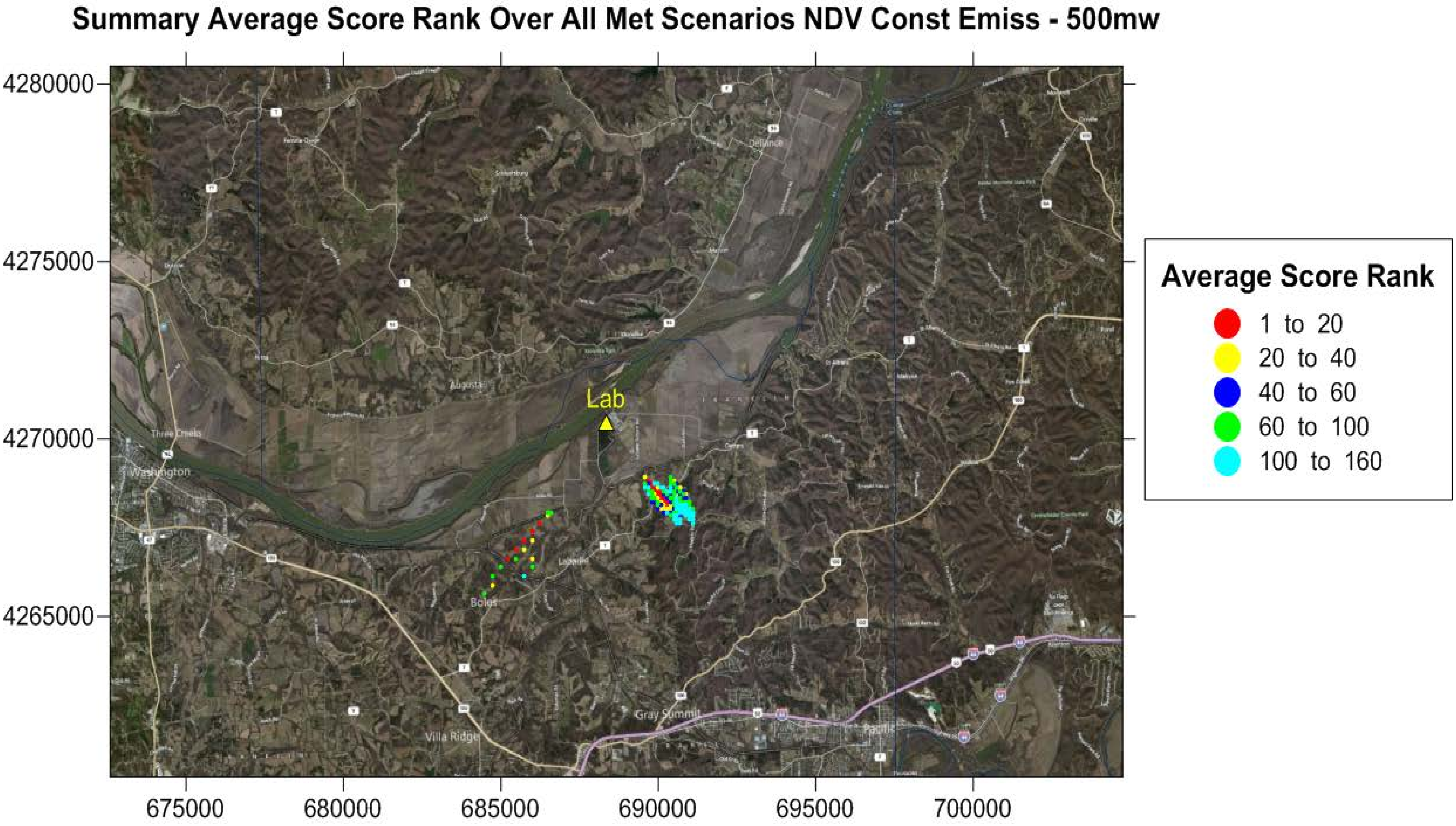

Summary Average Score Rank Over All Met Scenarios NDV Actual Emissions
4280000
4275000
4270000
4265000
675000
680000
685000
690000
695000
700000
Lab
Washington
Three Creeks
Augusta
Defiance
Labadie
Bolos
Villa Ridge
Gray Summit
Pacific
Average Score Rank
🟥 1 to 20
🟨 20 to 40
🟦 40 to 60
🟩 60 to 100
● 100 to 160

Figure 7


Summary Average Score Rank Over All Met Scenarios NDV Const Emiss - 500mw
4280000
4275000
4270000
4265000
675000
680000
685000
690000
695000
700000
Lab
Augusta
Defiance
Three Creeks
Washington
Labadie
Bolus
Villa Ridge
Gray Summit
Pacific
Average Score Rank
1 to 20
20 to 40
40 to 60
60 to 100
100 to 160

Figures 6 and 7 show the score rank for the actual normalized and high load normalized operating conditions, respectively. As can be seen from the figures, only locations to the southwest and southeast of the Labadie Energy Center remain as preferred SO2 monitoring locations. From these figures more of the higher ranking receptors (lower number rank) appear in the area to the southwest. Note that the area to the southwest appears as less dense than the area to the southeast. This is an artifact of the telescoping grid which changes from 100 m spacing to 250 m spacing in this area. Considering the lower score ranks, the area southwest of the Labadie Energy Center is the best location to site an additional SO2 monitor.

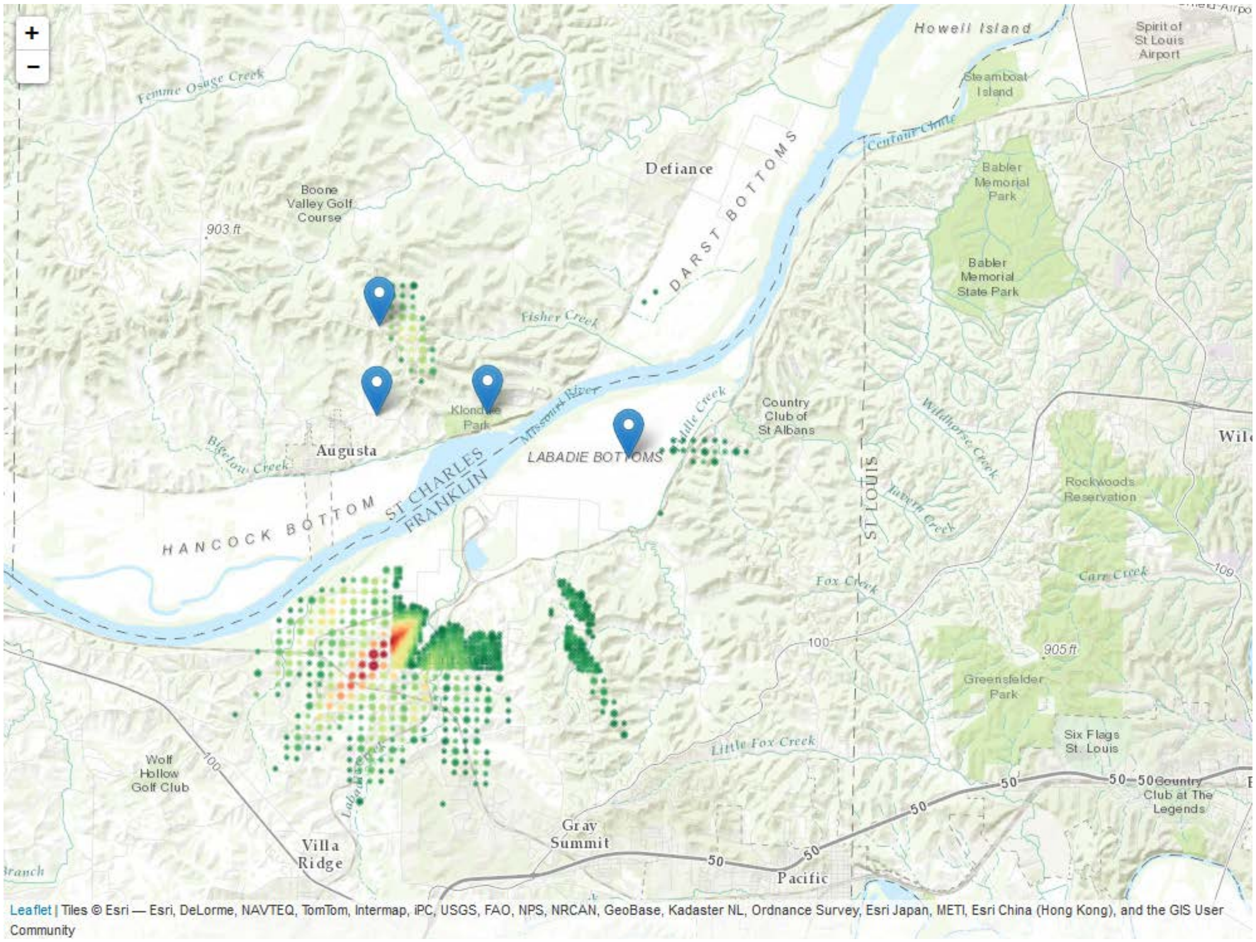
US EPA Region VII Analysis:

US EPA Region VII evaluated the analysis discussed above utilizing the same meteorological and emission inputs to AERMOD. However Region VII used a different statistic to evaluate the preferred area for site placement. The Region VII analysis considered the output from AERMOD in 3 different ways and is outlined below:

1) 4th highs – only those receptors greater than or equal to 50% of maximum 4th high concentration for each run
2) Sum of maximum daily concentrations at each receptor – only those receptors greater than or equal to 50% of maximum daily sum for each run
3) (Sum of maximum daily) * (4th highs ** 2) - only including receptors greater than or equal to 50% of the maximum of (Sum of maximum daily) * (4th highs ** 2).

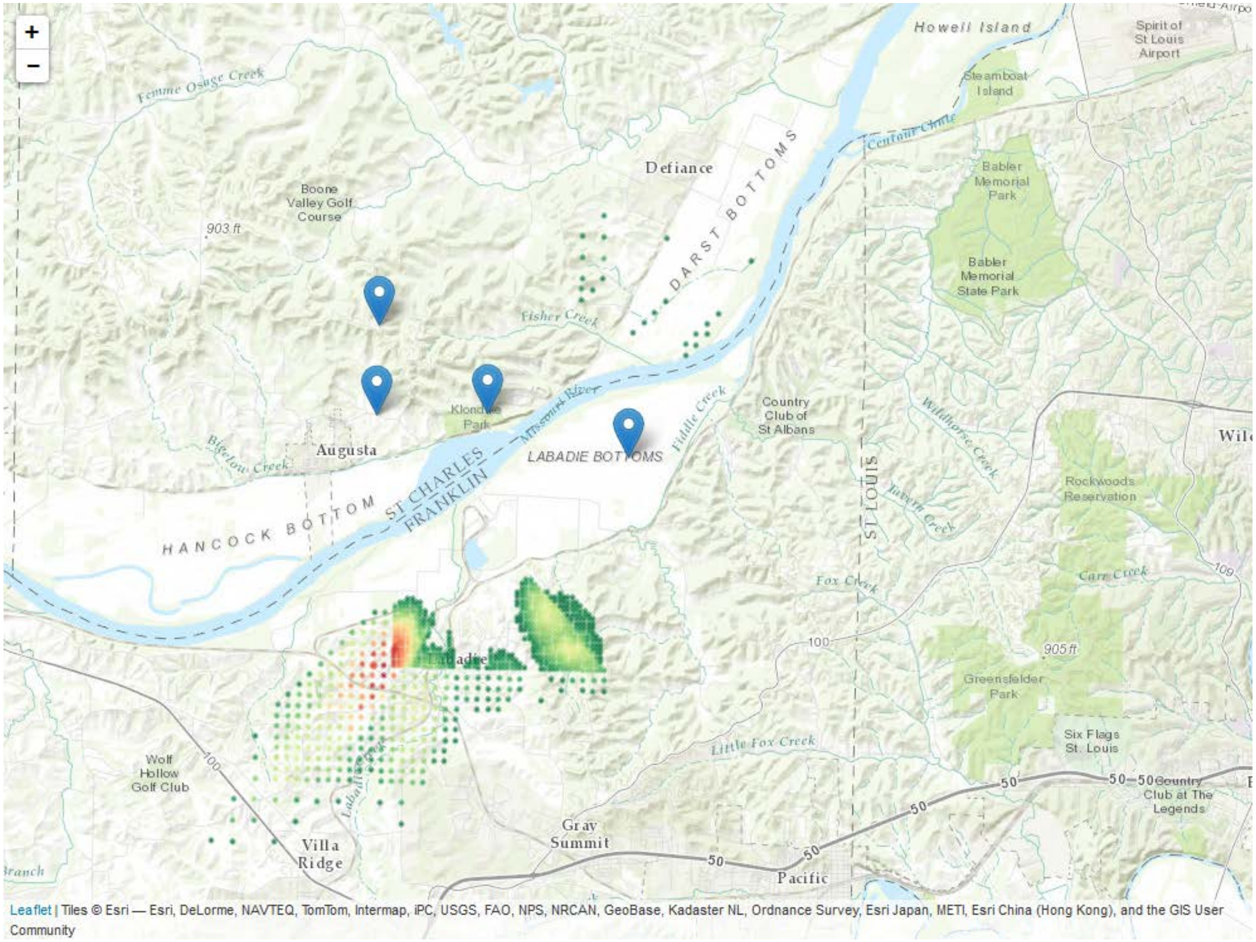
For the 12 different scenarios evaluated, the Region VII analysis was in agreement with the analysis discussed above which used the Monitoring TAD evaluation process. A comparison of Figure 8 below from Region VII's analysis to that of Figure 3 above is provided as an example. Both analyses use the Labadie Valley meteorological data with the Chesterfield Airport NWS data (Ksus) substituted for missing Labadie Valley meteorological data and the actual NDV emissions. Both of these figures indicate small impact areas to the north and southeast with a larger impact area to the southwest. Similarly, using the Labadie Valley meteorological data with actual NDV emissions and without any substitution for missing meteorological data is shown in Figure 2 and Figure 9. These figures again indicate similar results with a major impact area to the southwest of the Labadie Energy Center and smaller impact area to the southeast. Similar comparisons are seen with all twelve of the different meteorological and emission scenarios.

Figure 8
Ksus – Valley NDV Actual Emissions
EPA Region VII Analysis
(Sum of maximum daily) * (4th highs ** 2)



Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Figure 9
Valley Met Only NDV Actual Emissions
EPA Region VII Analysis
(Sum of maximum daily) * (4th highs ** 2)



Leaflet | Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

<u>Conclusion:</u>

Based on the analysis utilizing the Monitor TAD evaluation process and EPA Region VII's independent analysis, the best location for an additional SO2 monitor is in the identified area southwest of the Labadie Energy Center.

Appendix A

WRF/MMIF Model Processing and Description

The Weather Research and Forecasting Model (WRF) was executed for the entire year of 2015. A detailed report was submitted to Missouri Department of Natural Resources as well as the US Environmental Protection Agency; "Ameren 2015 WRF Model Application and Performance Evaluation Report, March 2016". Table A-1 below shows the physics options chosen and Table A-2 the vertical layer structure.

Table A-1
WRF Physics Options

Name	Value	Description
mp_physics	3	WRF Single-Moment 3-class water microphysics scheme
ra_lw_physics	4	RRTMG long-wave radiation scheme
ra_sw_physics	4	RRTMG short-wave radiation scheme
sf_sfclay_physics	1	Revised MM5 surface layer scheme
sf_surface_physics	2	Noah land-surface model
bl_pbl_physics	1	YSU planetary boundary layer scheme
cu_physics	5	New Grell (G3) cumulus scheme (36km and 12km only)

Table A-2
Vertical Layer Structure

WRF Layer	Height(m)	Pressure(100mb)	Sigma
35	17,556	5000	0.000
34	14,780	9750	0.050
33	12,822	14500	0.100
32	11,282	19250	0.150
31	10,002	24000	0.200
30	8,901	28750	0.250
29	7,932	33500	0.300
28	7,064	38250	0.350
27	6,275	43000	0.400
26	5,553	47750	0.450
25	4,885	52500	0.500
24	4,264	57250	0.550
23	3,683	62000	0.600
22	3,136	66750	0.650
21	2,619	71500	0.700
20	2,226	75300	0.740
19	1,941	78150	0.770
18	1,665	81000	0.800
17	1,485	82900	0.820
16	1,308	84800	0.840
15	1,134	86700	0.860
14	964	88600	0.880
13	797	90500	0.900
12	714	91450	0.910
11	632	92400	0.920
10	551	93350	0.930
9	470	94300	0.940
8	390	95250	0.950
7	311	96200	0.960
6	232	97150	0.970
5	154	98100	0.980
4	115	98575	0.985
3	77	99050	0.990
2	38	99525	0.995
1	19	99763	0.9975
Surface	0	100000	1.000

The WRF model was run with a nested grid structure of 36 km, 12 km, 4 km, 1.33 km and 444 m. The 444 m grids surround the Labadie and Rush Island Ameren Energy Centers. Figures A-1 and A-2 show this nested grid structure.

Figure A-1
Map of 36 km WRF Domain

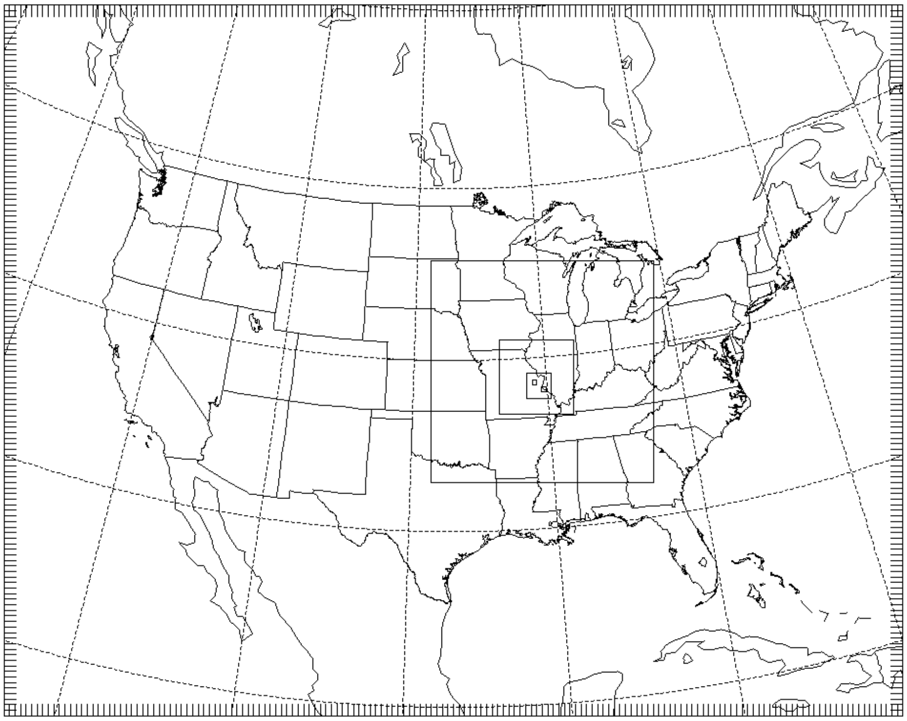
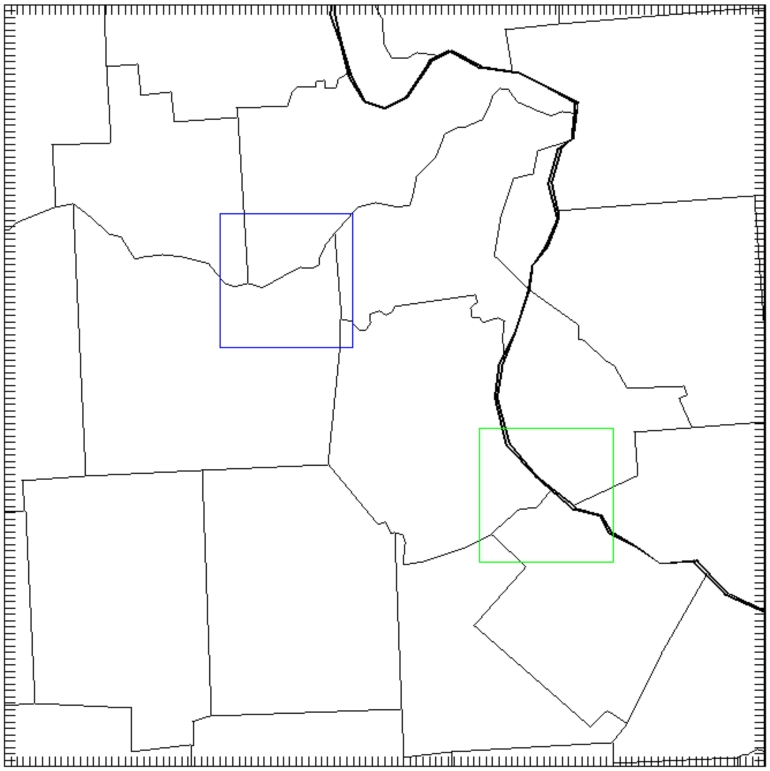


Figure A-2
Map of 1.33 km WRF Domain



The WRF data was processed with the Mesoscale Model Interface Program (MMIF) Version 3.2, 2015-07-24 according to US EPA guidance ("Guidance on the Use of the Mesoscale Model Interface Program (MMIF) for AERMOD Applications, July 2015") using 444 m grid (shown in blue above - Figure A-2). The grid cell enclosing Ameren's Labadie Valley SO2 and meteorological site was used for the extraction. The MMIF processor was run to develop inputs into US EPA's AERMOD Meteorological Preprocessor (AERMET Version 15181). The mid layer elevations chosen were 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000 meters according to US EPA guidance referenced above. MMIF generated files for the onsite data as well as the upper air data and surface characteristics representative of the Labadie Valley monitoring site.

APPENDIX 6

Comments and Responses on Proposed 2016 Monitoring Network Plan, Revision 0

COMMENTS AND RESPONSES ON
PROPOSED 2016 MONITORING NETWORK PLAN, REVISION 0

The public comment period for the proposed 2016 Missouri Monitoring Network Plan opened on May 27, 2016 and closed on June 28, 2016. The Missouri Department of Natural Resources' Air Pollution Control Program prepared the 2016 Monitoring Network Plan to address the requirements of 40 CFR 58.10 (a) (1) for annual submittal of a plan to provide information on current State or Local Air Monitoring Stations (SLAMS), other ambient air monitoring, and any proposed network changes for the upcoming year.

The following is a summary of comments received and the Missouri Department of Natural Resources' Air Pollution Control Program's (Air Program's) corresponding responses.

SUMMARY OF COMMENTS: During the public comment period for the proposed 2016 Monitoring Network Plan, the Air Program received comments from Steven C. Whitworth (Ameren Missouri) and Maxine I. Lipeles (Washington University School of Law on behalf of the Sierra Club).

The comments focus primarily on ambient air monitoring networks for the Ameren Missouri Labadie and Rush Island coal fired power plants and were generally related to the implementation approach of the 1-hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standards (NAAQS). The Air Program is responding to comments that relate specifically to ambient air monitoring issues as appropriate and applicable to the requirements of 40 CFR 58.10 (a) (1). Our responses follow the original comments identified in italics.

COMMENT #1: Both commenters addressed the issue of ambient air monitor classifications relative to 40 CFR 58 and EPA's SO_2 Data Requirements Rule (DRR) 40 CFR 51 Subpart BB.

Sierra Club commented: "*DNR erroneously relies on EPA's statement that state agencies may rely on data collected from third-party operated monitors provided the monitors comply with the data quality and assurance requirements of EPA's ambient monitoring regulations. However, DNR conveniently ignores EPA's statement that, regardless of whether an ambient source-oriented SO2 monitor is operated by a government, industry, or other third party, "[t]he critical issue is that the monitor or monitors must be either a SLAMS monitor or SLAMS-like monitor."*

Ameren commented: "*Ameren suggests that the Department should classify the Labadie and Rush Island monitoring networks as SLAMS in lieu of industrial SO2 monitors."*

<u>RESPONSE</u>: The Air Program relies on the recently promulgated revisions to 40 CFR 58 Appendix A (March 28, 2016) which indicates that the quality assurance requirements of 40 CFR 58 Appendix A are applicable to industrial monitors used for NAAQS compliance. "40 CFR 58 Appendix A, 1.1 Applicability. (a) This appendix specifies the minimum quality system requirements applicable to SLAMS and other monitor types whose data are intended to be used to determine compliance with the NAAQS (e.g., SPMs, tribal, CASTNET, NCore, industrial, etc.), unless the EPA Regional Administrator has reviewed and approved the monitor for exclusion from NAAQS use and these quality assurance requirements."

Since EPA specifically identifies industrial monitors as being applicable to NAAQS compliance, our reliance on the industrial monitor classification is appropriate and consistent with the ambient air monitoring regulations. As indicated in our 2016 Monitoring Network Plan, industrial monitors have been used in the Missouri ambient air monitoring network for decades. US EPA has relied on industrial monitors for area designations and other purposes. Any ambient air monitors that meet the quality assurance requirements of 40 CFR 58 Appendix A are indeed operated in a manner equivalent to SLAMS and are suitable for use as monitors to satisfy monitoring requirements of the SO_2 DRR, 40 CFR 51.1203(c).

The following are examples where EPA has used industrial monitors during a NAAQS designation process. These examples include but are not limited to the designation process for Round 1 of the 2010 Lead NAAQS which relied on industrial lead monitors in Iron county: https://www.epa.gov/sites/production/files/2016-04/documents/07_mo_epamod2.pdf and Round 1 of the 2010 1-hour SO_2 NAAQS which relied on an industrial SO_2 monitor in Greene County: https://www.epa.gov/sites/production/files/2016-03/documents/mo-epa-resp.pdf

No changes to the plan were made as a result of this comment.

COMMENT #2: Several Sierra Club comments address or are related to the issue of the minimum number of SO_2 monitors needed to satisfy the monitoring objectives of the 1-hour SO_2 DRR. "*With one or two possible exceptions, Ameren's monitors are not located in areas of expected peak ambient* SO_2 *concentrations.*"

RESPONSE: The Air Program addressed this issue in our response to Sierra Club's comments regarding the 2015 Monitoring Network Plan.

Neither the EPA Monitoring Technical Assistance Document (TAD) nor the DRR specifies a minimum number of monitoring sites needed to characterize sources for the 1-hour SO_2 NAAQS. The Preamble to the DRR states: "Potential ambient air monitoring costs are estimated based on the assumption that air quality for each of the 412 SO2 sources exceeding the 2,000 tpy threshold would be characterized through a single newly deployed air monitor. (Note, however, that the Monitoring TAD discusses situations where more than one monitor may be appropriate or necessary to properly characterize peak 1-hour SO_2 concentrations in certain areas, which would increase costs proportionally.)" Federal Register /Vol. 80, No. 162 / Friday, August 21, 2015 /Rules and Regulations 51085.

Consistent with the DRR, the department determined the number of monitoring sites for these areas using a case-by-case technical evaluation as described in the monitoring plans. The Characteristics and complexity of both areas indicates siting multiple monitoring sites is appropriate in these areas for additional spatial coverage as suggested in the EPA 1-hour SO_2 Monitoring TAD (Draft February 2016 version) page 15: "When multiple sites are under consideration, the network plan should consider the benefits including increased spatial representation, increased understanding of concentration gradients, increased understanding or verification of the frequency at which certain locations see SO_2 concentration maxima, and possibly increased population exposure coverage or representation. As stated previously, there is no particular minimum of SO_2 monitors that is universally applicable, and the appropriate number and location of any monitoring sites will be a case-by-case determination."

No changes to the plan were made as a result of this comment.

COMMENT #3: Most of the remaining Sierra Club comments relate to the following issues and various interpretations of EPA's SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (Monitoring TAD):

"- Ameren selected the monitoring locations at both Labadie and Rush Island. But according to Ameren's own modeling, most of Ameren's monitoring locations are not in areas of expected peak ambient SO2 concentrations.

- DNR has not done due diligence in reviewing and accepting Ameren's monitoring locations. DNR offers no independent support for Ameren's Labadie locations, and its purported support for the Rush Island locations actually undermines the propriety of those locations.

- Based on currently available modeling, one or both of the Labadie monitoring sites and two of the three Rush Island monitoring sites are unlikely to capture maximum ambient SO2 concentrations because they are not located in areas where peak ambient SO2 concentrations are expected to occur."

RESPONSE: The Labadie and Rush Island monitoring networks were developed following the EPA Monitoring TAD which has been revised from its original version. The Monitoring TAD provides states with flexibly in designing the monitoring network and describes three main approaches: "The three different potential approaches presented are to: 1) conduct new modeling to aid in monitoring site placement; 2) conduct exploratory monitoring to inform permanent monitor placement; and 3) take advantage of existing emissions data, existing monitoring data, and existing modeling, where possible, to determine permanent monitoring site placement." The Monitoring Network Plan follows elements of this guidance and describes the rationale the Air Program used to site the monitors to satisfy the DRR.

While it is true that the Labadie network was established based on modeling performed prior to the most recent revision of the monitoring TAD, the TAD allows the use of existing modeling. As the Sierra Club indicated, after following the most recent revision of the monitoring TAD in regards to design value and concentration frequency ranking they came to the same conclusion that Northwest monitor is located in an area of anticipated maximum modeled design values and high frequency impacts. As indicated in our response to comment #2, the Valley site is useful in understanding 1-hour SO_2 spatial representation and concentration gradients which is consistent with the monitoring TAD.

No changes to the plan were made as a result of this comment.

On June 30, 2016, EPA designated the area around the Labadie power plant as unclassifiable. In a detailed response to comments document[i] and a technical support document (TSD) [ii] for the second round of the 1-hour SO2 NAAQS designation process EPA reviewed and commented on technical information regarding SO_2 dispersion modeling and other analysis for the Labadie area.

In their response to comments document, EPA cites reviewing a total of 48 modeling runs submitted by Ameren Missouri, the Air Program, and Sierra Club for the Labadie area. EPA concludes on page 26 in the designations TSD that for the Labadie area "…EPA's view is that the modeling results widely vary and greatly depend upon how the modeling was conducted, as discussed in this Technical Support Document. Because of the issues present in the modeling methodologies, the EPA does not have a clear basis to determine whether the area currently meets or does not meet the 2010 SO_2 NAAQS based on all currently available information."

On page 84 of the response to comments document EPA states: "While EPA has indicated for MDNR's 2015 monitoring network plan that the monitors meet siting criteria for purposes of being away from obstructions, etc., EPA has not made any determinations of whether the monitors are in expected peak concentration locations as outlined by the 1-hr SO2 designations Monitoring Technical Assistance Document. Given our analysis of both the windrose and terrain information, along with factoring in historic monitoring locations, it appears that the current monitors are not likely sited in an area to measure the maximum concentrations."

As a result of the issues addressed in these EPA designation documents which were posted after the 2016 Monitoring Network Plan plan's public inspection period, Air Program will work with EPA to determine any additional monitoring plan changes that are needed and revise the 2016 Monitoring Network Plan accordingly.

---

[i] Responses to Significant Comments on the Designation Recommendations for the 2010 Sulfur Dioxide Primary National Ambient Air Quality Standard (NAAQS), Docket Number EPA–HQ–OAR–2014–0464
U.S. Environmental Protection Agency, https://www.epa.gov/sites/production/files/2016-07/documents/so2d-r2-response-to-comments-06302016.pdf

[ii] 1 Final Technical Support Document Missouri Area Designations for the 2010 SO2 Primary National Ambient Air Quality Standard, https://www.epa.gov/sites/production/files/2016-07/documents/r7_mo_final_designation_tsd_07012016.pdf

Washington University in St.Louis
SCHOOL OF LAW

Interdisciplinary Environmental Clinic

June 28, 2016

Missouri Department of Natural Resources
Air Pollution Control Program
Air Quality Analysis Section/Air Monitoring Unit
P.O. Box 176
Jefferson City, MO 65102
Via email to: cleanair@dnr.mo.gov

Re: 2016 Monitoring Network Plan

To whom it may concern:

Submitted on behalf of Sierra Club, these comments urge the Missouri Department of Natural Resources ("DNR") to revise its 2016 Monitoring Network Plan[1] to require Ameren to make significant changes to its sulfur dioxide ("SO_2") monitoring networks at the Labadie and Rush Island power plants. As DNR is expected to submit its 2016 Plan to the U.S. Environmental Protection Agency ("EPA") for review and approval shortly after the close of the comment period, these comments also urge EPA to reject most of the 2016 Plan's SO_2 monitoring locations at the Labadie and Rush Island plants. With one or two possible exceptions, Ameren's monitors are not located in areas of expected peak ambient SO_2 concentrations. Accordingly, they do not satisfy applicable requirements for "SLAMS … or SLAMS-like" monitors.[2]

This letter highlights the following key points:

- Ameren selected the monitoring locations at both Labadie and Rush Island. But according to Ameren's own modeling, most of Ameren's monitoring locations are not in areas of expected peak ambient SO_2 concentrations.
- DNR has not done due diligence in reviewing and accepting Ameren's monitoring locations. DNR offers no independent support for Ameren's Labadie locations, and its purported support for the Rush Island locations actually undermines the propriety of those locations.
- Based on currently available modeling, one or both of the Labadie monitoring sites and two of the three Rush Island monitoring sites are unlikely to capture maximum ambient SO_2 concentrations because they are not located in areas where peak ambient SO_2 concentrations are expected to occur.

---

[1] Missouri Department of Natural Resources, Air Pollution Control Program, 2016 Monitoring Network Plan (May 27, 2016) ("2016 Monitoring Network Plan" or "2016 Plan").

[2] U.S. Environmental Protection Agency ("EPA"), Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS); Final Rule ("DRR"), 80 Fed. Reg. 51052, 51072 (Aug. 21, 2015).

I. DNR's 2016 Monitoring Network Plan Does Not Comply With Applicable Legal Requirements.

Source-oriented ambient SO_2 monitors must be sited in areas of expected peak 1-hour SO_2 concentrations.[3] EPA guidance highlights the need for detailed analysis to support the appropriate location of ambient SO_2 monitors:

> The EPA suggests that the more data and analysis that goes into a source-oriented monitoring site evaluation process, the greater the confidence in how appropriate the resulting monitoring network proposal will be in supporting the objectives of the DRR. Air agencies electing to use monitoring as a means of satisfying the DRR or other source-oriented monitoring activity are expected to provide adequate reasoning in a monitoring network proposal. Such a network proposal would characterize an area around or impacted by an identified SO_2 source and include the identification of one or more locations where peak 1-hour SO_2 concentrations are expected to occur.[4]

In its 2015 Monitoring Network Plan, DNR labeled Ameren's Labadie and Rush Island SO_2 monitors as Special Purpose Monitors for the stated reason that the Data Requirements Rule had not yet been issued in final form, while making it clear that the monitors were intended to serve as SLAMS monitors. "Once the rule is finalized, it is the intention to convert these monitors to SLAMS."[5] In approving DNR's 2015 Monitoring Network Plan, EPA indicated that it had not evaluated Ameren's Labadie and Rush Island monitors but would do so after DNR acted on its stated intention to convert them to SLAMS monitors.[6]

DNR's 2016 Monitoring Network Plan changes course: "Despite EPA's previous recommendation to classify these monitors as SLAMS, … we have decided to classify the Labadie and Rush Island SO_2 monitors as industrial SO_2 monitors."[7] DNR erroneously relies on EPA's statement that state agencies may rely on data collected from third-party operated monitors provided the monitors comply with the data quality and assurance requirements of EPA's ambient monitoring regulations. However, DNR conveniently ignores EPA's statement that, regardless of whether an ambient source-oriented SO_2 monitor is operated by a government, industry, or other third party, "[t]he critical issue is that the monitor or monitors must be either a SLAMS monitor or SLAMS-like monitor."[8] EPA's numerous statements about the need for states to perform due diligence to support the location and number of monitors, and the need for discussing these items with EPA in advance of making decisions, underscores the fact that, if states plan to use third-party monitors for regulatory NAAQS designation or compliance

---

[3] 40 C.F.R. Part 58, Appendix D, § 1.1.1(a), (c); 40 C.F.R. § 51.1203(b); DRR, 80 Fed. Reg. at 51055, 51057, 51083, 51085; In the Matter of Union Electric Company d/b/a Ameren Missouri, No. APCP-2015-034, Consent Agreement between DNR and Ameren Missouri (Mar. 23, 2015), Appendix 1, ¶b (Appendix J to DNR's pending SIP for the Jefferson County Sulfur Dioxide Nonattainment Area). See also EPA, SO2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (Feb. 2016, Draft) ("Monitoring TAD") at i, 2, 10, 15.

[4] Monitoring TAD at 10.

[5] Missouri Department of Natural Resources, Air Pollution Control Program, 2015 Monitoring Network Plan (June 12, 2015) ("2015 Monitoring Network Plan") at 12.

[6] EPA, Region 7 (Mark Hague), letter to DNR (Kyra Moore) (Jan. 25, 2015).

[7] 2016 Monitoring Network Plan at 17.

[8] DRR at 51072.

decisions, the monitors must meet all of the substantive requirements of SLAMS monitors. Ameren's Labadie and Rush Island monitors do not, as they are not sited in areas of expected peak ambient SO_2 concentrations.

II. The Labadie Monitors Are Not Located In Areas of Expected Peak Ambient SO_2 Concentrations.

As demonstrated in comment letters previously submitted on behalf of Sierra Club, one or both of Ameren's Labadie monitors are not in areas of expected peak concentrations, and a third monitor is also needed.[9] Our previous comments, which are attached as Exhibits 1-5 and incorporated herein by reference, highlighted the following key points:

- Ameren's original modeling to site the monitors identified three distinct areas where peak 1-hour SO_2 concentrations are expected to occur. These areas are located northwest, northeast, and southeast of the plant and are shown in Figure 1. However, only one of the monitors – the Northwest monitor – is located in one of these areas. No monitor is located in either of the other two peak concentration areas. The Valley monitor is located between the two unmonitored peak concentration areas, at a site where the modeled concentration is approximately 20 percent lower than in the peak areas.
- DNR's modeling for its proposed Labadie designation recommendation, which used newer emissions and meteorological data than Ameren's original modeling, confirmed that the Valley monitor is not located in an expected peak concentration area and predicted an even lower concentration (relative to the peak) at the Valley monitoring site than Ameren's original modeling. This is shown in Figure 2.
- Early on-site meteorological data from the Valley site suggests that meteorological data from the Spirit of St. Louis Airport (KSUS) in nearby Chesterfield may be more representative of meteorological conditions at Labadie than data from the much more distant Jefferson City Memorial Airport (KJEF) in Jefferson City. Like Ameren, DNR used KJEF meteorological data in the modeling it performed for its proposed Labadie designation recommendation. However, if KSUS meteorological data are used instead in light of their greater similarity to the on-site met data, then DNR's modeling shows expected peak concentration areas located south and southwest of the plant. This is shown in Figure 3. Both the Northwest and Valley monitors are located well outside of these areas, where the modeled concentration is more than 25 percent lower than in peak areas.

---

[9] Comments on Ameren Missouri's Labadie Sulfur Reduction Project Quality Assurance Project Plan (April 13, 2015) (Ex.1); Comments on the 2015 Monitoring Network Plan (July 20, 2015) (Ex.2); Supplemental Comments on the 2015 Monitoring Network Plan (August 11, 2015) (Ex.3); Comments on the 2010 1-Hour Sulfur Dioxide Standard, Proposed Options for Area Boundary Recommendations, July 2016 Designations (September 3, 2015) (Ex.4); Comments on the Proposed Area Designation Under the 2010 SO_2 NAAQS for the Area Around the Labadie Energy Center in Franklin County, Missouri (March 31, 2016) (Ex.5).

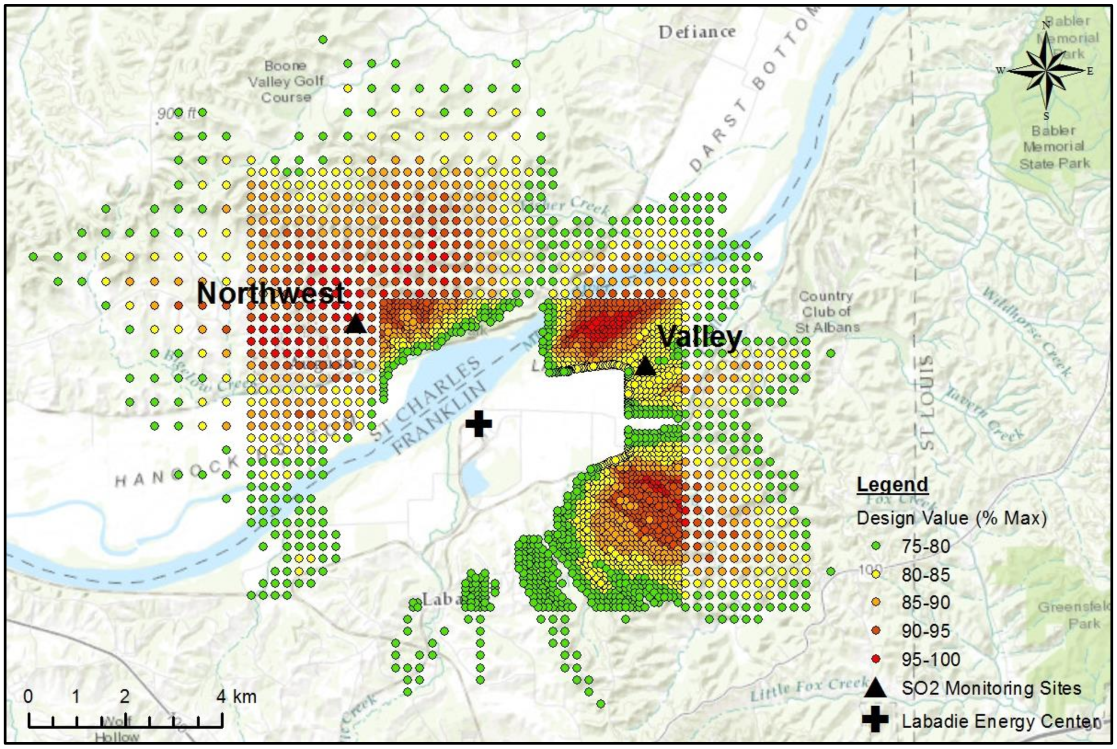


Figure 1. Expected peak concentration areas per Ameren's original modeling.

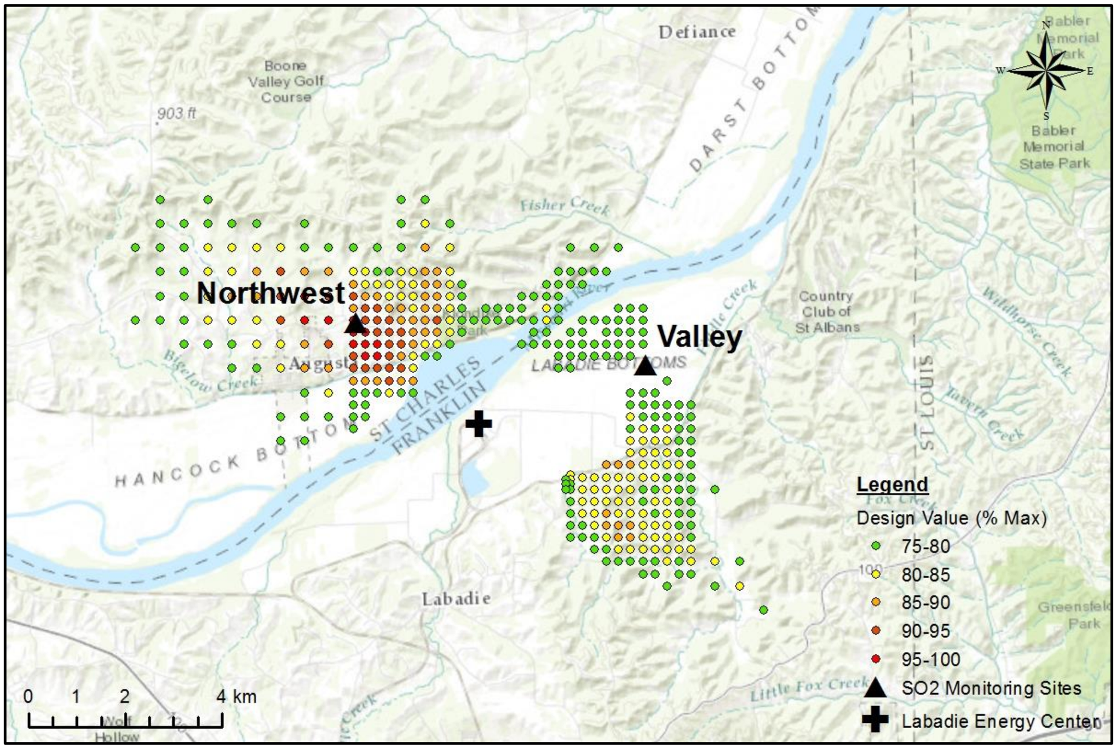


Figure 2. Expected peak concentration areas per DNR's Labadie designation recommendation modeling.

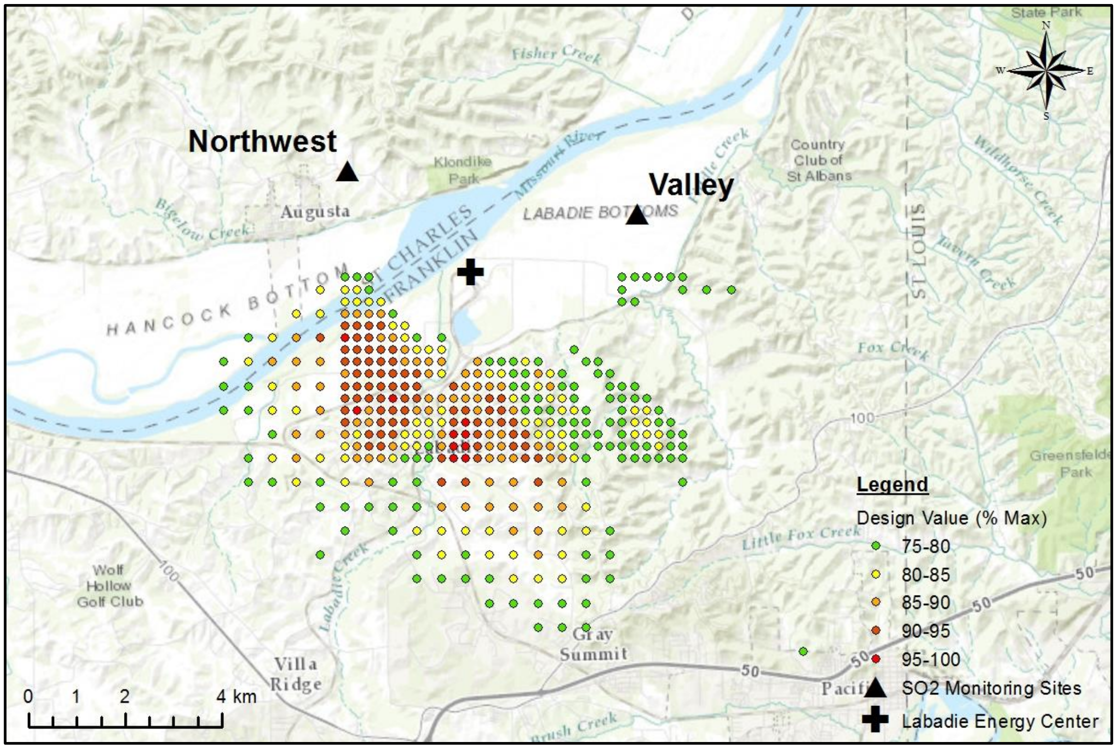


Figure 3. Expected peak concentration areas per DNR's Labadie designation recommendation modeling, using KSUS meteorological data.

III. DNR Has Not Conducted An Independent Modeling Analysis Of Ameren's Labadie Monitoring Sites.

Inexplicably, DNR has not performed an independent modeling analysis of the suitability of Ameren's Labadie monitoring sites. In its 2015 Monitoring Network Plan, DNR only provided Ameren's modeling analysis of the sites.[10] Even though DNR performed independent modeling last year related to its Labadie designation recommendation, it did not use that modeling to evaluate or attempt to justify the Labadie monitoring sites in the 2015 Monitoring Network Plan. And although DNR updated its modeling earlier this year in response to EPA's proposed Labadie designation decision, it still failed to use that updated modeling to assess the siting of Ameren's Labadie monitors in the 2016 Monitoring Network Plan.

Nor has DNR conducted a monitor siting analysis for Labadie using the receptor scoring strategy described in the Monitoring TAD, which was revised last February. This is curious given DNR's contention in the 2016 Monitoring Network Plan that its original Rush Island analysis needed to be updated because it focused solely on modeled design values, and "based on the revised guidance, the site selection process also needs to account for the frequency with which a receptor registers a daily maximum concentration."[11] Like DNR's original Rush Island analysis, Ameren's Labadie analysis did not account for frequency of having the highest 1-hour daily

---

[10] 2015 Monitoring Network Plan, Appendix 2.
[11] 2016 Monitoring Network Plan, Appendix 2 at 2.

maximum concentration amongst all receptors. Hence, if the revisions to the Monitoring TAD necessitated a supplemental analysis of the Rush Island monitoring sites on those grounds, it necessitates one for the Labadie sites as well. In light of the updated modeling that DNR performed earlier this year in connection with the pending Labadie designation, it needed only to perform an additional model run using the MAXDAILY output option in AERMOD to evaluate the sites using the scoring strategy described in the Monitoring TAD, as it did for the Rush Island monitoring sites.

DNR also should have reevaluated the Labadie monitoring sites in the 2016 Monitoring Network Plan due to various technical issues with Ameren's original analysis. As noted above, DNR relied from the outset on Ameren's modeling analysis, which Ameren provided in the Quality Assurance Project Plan ("QAPP") for what the company ironically dubbed its "Labadie Sulfur Reduction Project." However, Ameren's modeling used constant emission rates and therefore did not comport with the Monitoring TAD, as explained in our April 2015 comments on the QAPP (Ex. 1 attached hereto). It also used 2005-2009 meteorological data and was therefore conspicuously out of date even at the time of submittal.

DNR's approach to the Labadie monitoring sites cannot be squared with EPA's requirements:

> [R]esponsible air agencies are expected to establish a clear rationale for the number and placement of the monitors it is using to satisfy the requirements of the [DRR] rule. In this process, there is flexibility for the state to use professional judgment in determining what is appropriate for their individual situations, but *they are expected to perform due diligence in attempting to locate monitors in the most ideal locations possible*.[12]

IV. Analysis Of The Labadie Monitoring Sites Using The Scoring Strategy Described In The Monitoring TAD Demonstrates That The Valley Monitor Is Improperly Sited And That Additional Monitors Are Needed.

Per the Monitoring TAD, prioritization of receptor locations for consideration as permanent monitoring sites using normalized design values (NDVs) and frequency of having the highest 1-hour daily maximum concentration is accomplished using the following scoring strategy:[13]

1. Calculate the NDV at each receptor and rank from highest to lowest receptor. Rank of 1 means the highest design value.
2. Using the MAXDAILY output option in AERMOD, determine each day's highest normalized concentration and receptor. The MAXDAILY option in AERMOD outputs each receptor's highest concentration for each modeled day.
3. Using the output from step 2, determine the number of days each receptor has the highest concentration for the day among all receptors.
4. Rank the results from step 3 from highest to lowest number of days. Rank of 1 means the highest number of days having the highest daily maximum value.

---

[12] DRR, 80 Fed. Reg. at 51073 (emphasis supplied).

[13] Monitoring TAD, Appendix A.

5. For each receptor, add the concentration rank and the day rank. The lowest possible score is 2, meaning the receptor was the highest overall NDV and also had the highest number of days where the receptor was the highest concentration for the day amongst all receptors.

Ranking receptors by their resultant scores provides a list of locations ranked in general order of desirability with regard to monitor siting. Lower relative scores indicate a higher probability of experiencing peak 1-hour SO_2 concentrations.

Had DNR analyzed Ameren's Labadie monitoring sites using this strategy in either its original modeling, which used 2012-2014 emissions data, or its updated modeling, which used 2013-2015 emissions data and also included a new variant with a merged stack for units 3 and 4, it would have found – as shown in our comments on the 2015 Monitoring Network Plan (Ex. 2 attached hereto) – that the Valley monitor is not sited in an expected peak concentration area and needs to be relocated. We obtained DNR's original and updated modeling via Sunshine Law request and reviewed the results in order to identify the 300 receptors with the highest modeled design values. Next, as DNR did in its supplemental analysis of the Rush Island monitoring sites, we reran the models for the top 300 receptors using the MAXDAILY output option in AERMOD to determine the maximum 1-hour concentration for each receptor for each day and then tallied the number of days each receptor had the highest 1-hour daily maximum concentration among all receptors.[14] Then, we ranked the top 300 receptors by both design value (concentration rank) and the number of days each had the highest 1-hour daily maximum concentration (day rank) and calculated a score for each one by adding its concentration rank and its day rank. Finally, we ranked the receptors by their scores to create a list of receptor locations in general order of desirability with regard to monitor siting. Figures 4, 5, and 6 show modeled design values and receptor score ranks for the top 300 receptors for DNR's original and updated modeling.

Note that in these and most subsequent figures, receptor color indicates concentration (as a percentage of the maximum modeled design value) and receptor size denotes either frequency of having the highest 1-hour daily maximum concentration, score (concentration rank plus day rank), or score rank

---

[14] Like DNR, we used actual rather than normalized design values, but that does not affect the outcome of the analysis.

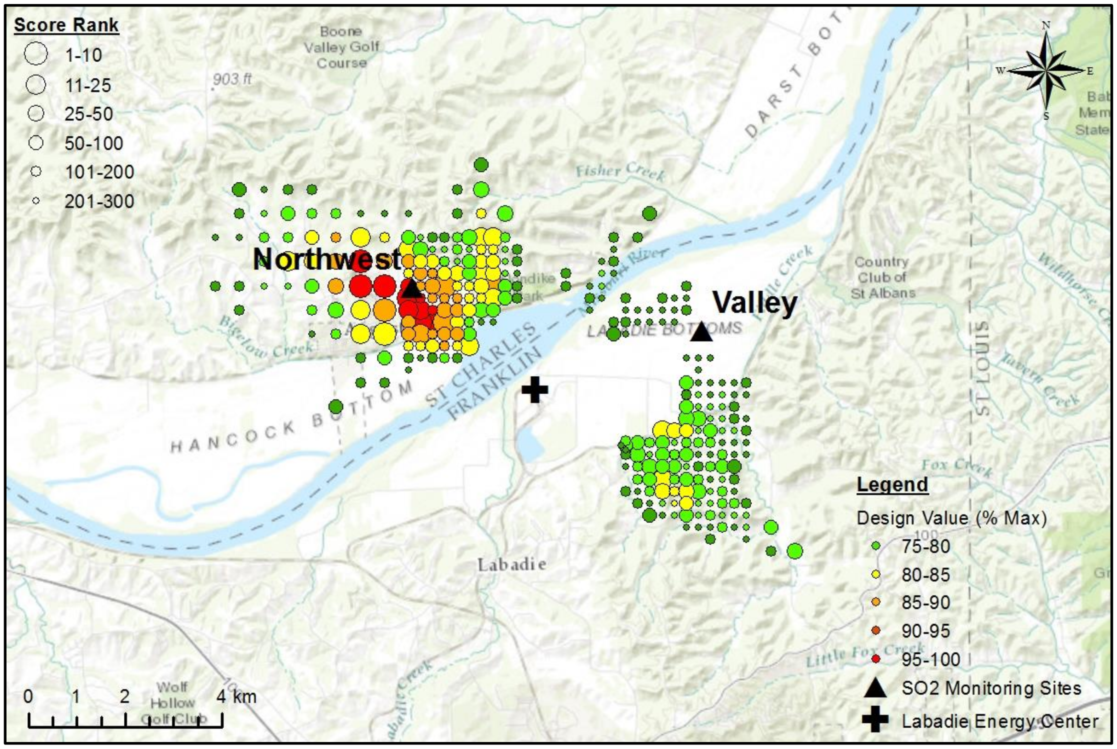


Figure 4. Design values and score ranks for the top 300 receptors, DNR modeling based on 2012-2014 emissions.

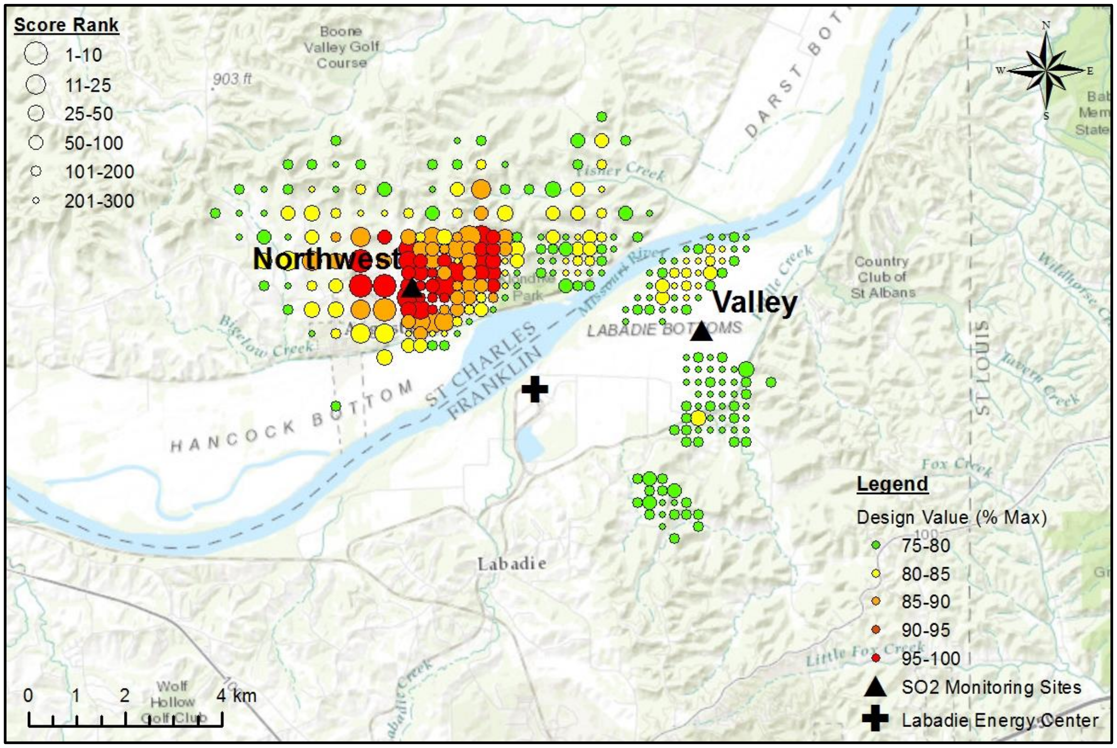


Figure 5. Design values and score ranks for the top 300 receptors, DNR modeling based on 2013-2015 emissions and separate stacks for units 3 and 4.

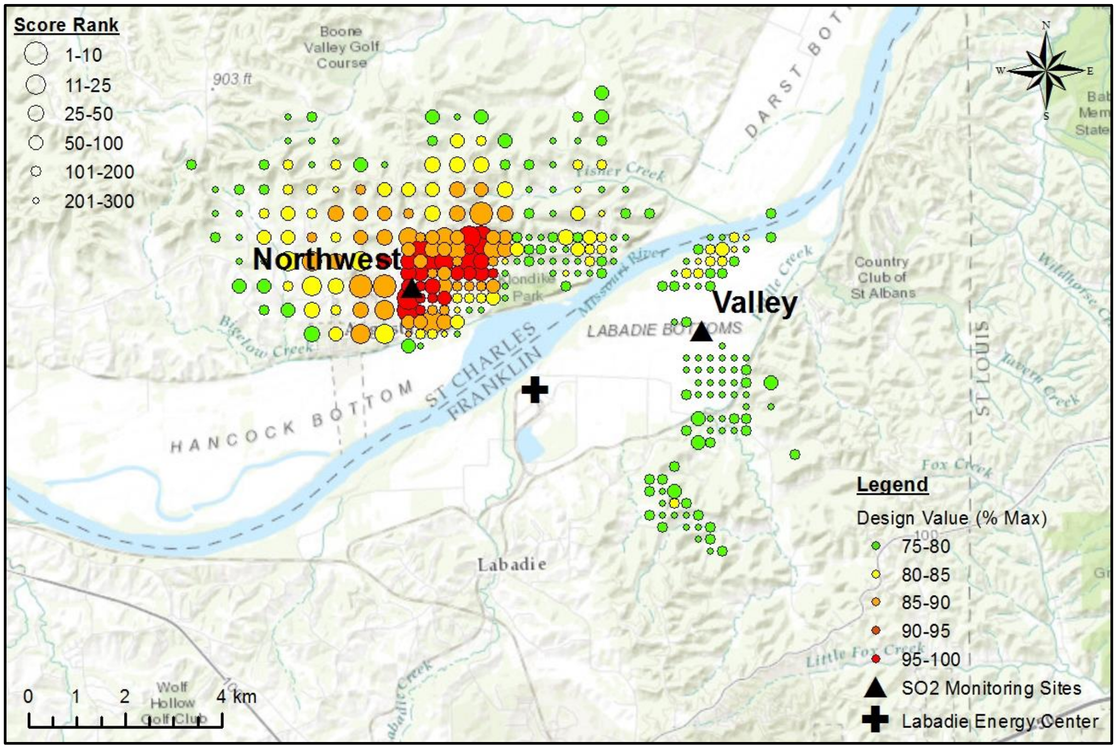


Figure 6. Design values and score ranks for the top 300 receptors, DNR modeling based on 2013-2015 emissions and merged stacks for units 3 and 4.

Figures 4, 5, and 6 all show that while the Northwest monitor is sited in an area with high modeled design values and numerous highly ranked receptors, the Valley monitor clearly is not. Regardless of which modeling is used in the analysis, the Valley monitor is sited in an area where there are no top 300 receptors and where the modeled design value is generally less than 75% of the maximum. As such, its location is not on the prioritized list of receptor locations for permanent monitoring sites developed using the scoring strategy described in TAD, and DNR should require that it be moved to a location that is. Figure 4 (based on DNR's modeling with 2012-2014 emissions) shows a large cluster of highly-ranked receptors, including several in the top 25 and many in the top 50, south of the Valley monitor, while Figures 5 and 6 (based on DNR's modeling with 2013-2015 emissions) show a smaller cluster of top 100/200 receptors north of the Valley monitor. It should be noted that, as we discussed in our April 2015 comments on the Labadie QAPP, Ameren's original analysis of the Labadie monitoring sites showed very high modeled design values in both of these areas, yet Ameren still chose to site the Valley monitor where modeled design values were considerably lower.

A similar analysis of Ameren's most recent modeling supports not only relocating the Valley monitor but also adding at least one monitor southwest of the plant. In late March, in response to the EPA's proposed nonattainment designation for Labadie, Ameren submitted a host of new modeling runs using 2013-2015 emissions data. Half of the new runs used a non-default beta option in AERMOD that EPA has not approved for use at Labadie. Therefore, we did not analyze those runs. Of the four remaining runs, all of which appropriately used AERMOD's regulatory default options, two used meteorological data from the same National Weather

Service ("NWS") station that DNR used (Jefferson City Memorial Airport (KJEF)). Figures 7 and 8 show modeled design values and receptor score ranks for the top 300 receptors for these runs. The other two runs used meteorological data from the NWS station at Spirit of St. Louis Airport (KSUS). Figures 9 and 10 show modeled design values and receptor score ranks for the top 300 receptors for these runs.

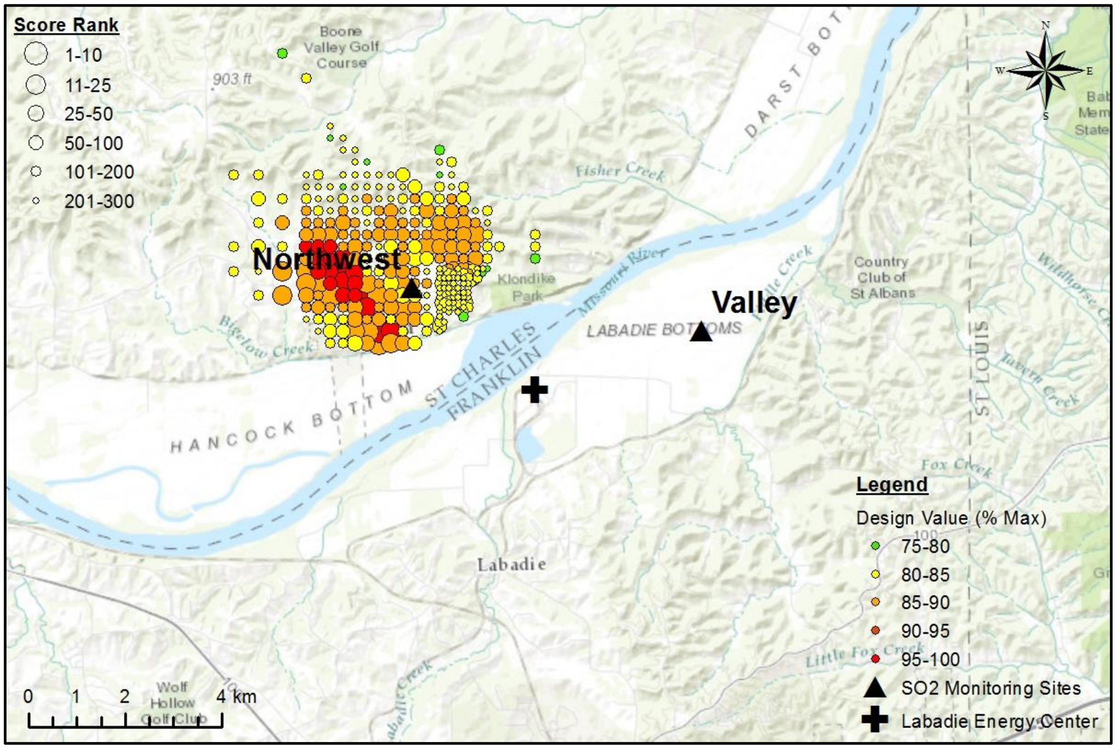


Figure 7. Design values and score ranks for the top 300 receptors, Ameren modeling based on 2013-2015 emissions, KJEF met, and East St. Louis background.

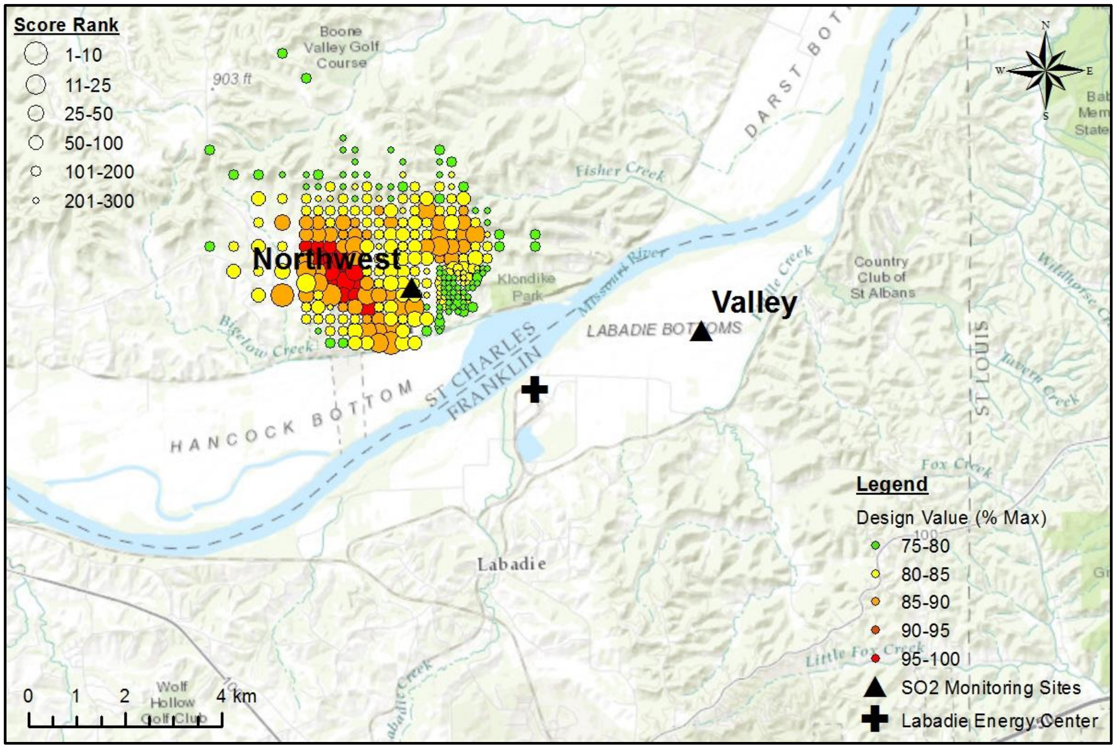


Figure 8. Design values and score ranks for the top 300 receptors, Ameren modeling based on 2013-2015 emissions, KJEF met, and Nilwood background.

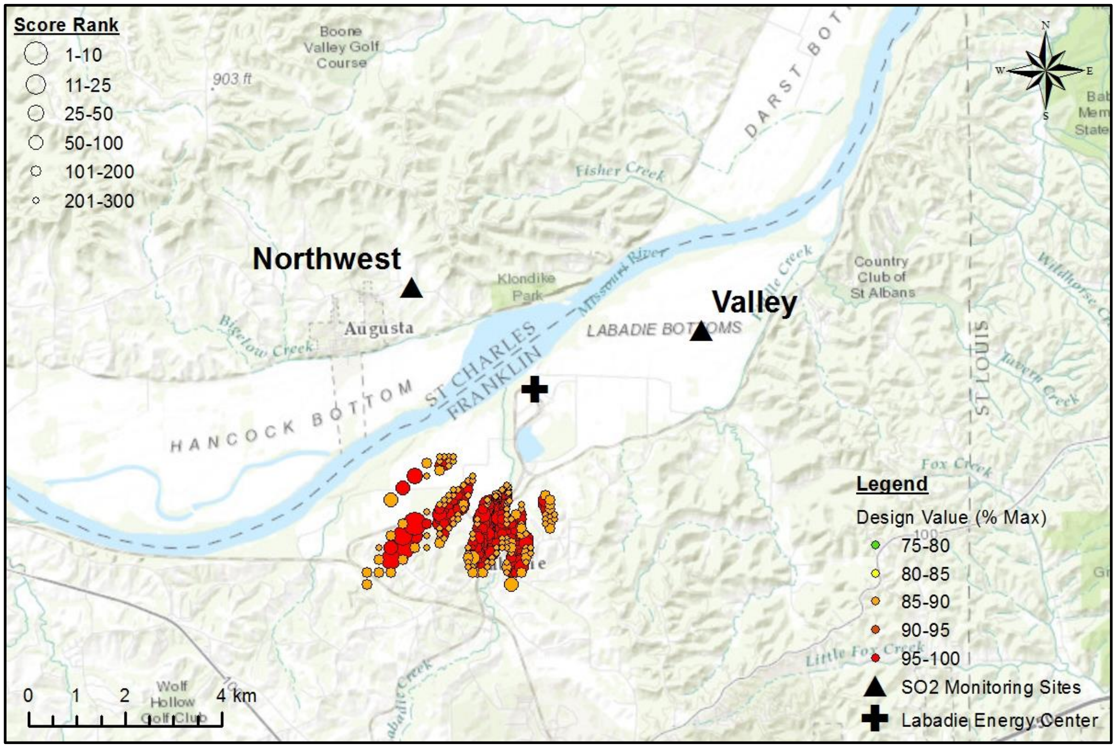


Figure 9. Design values and score ranks for the top 300 receptors, Ameren modeling based on 2013-2015 emissions, KSUS met, and East St. Louis background.

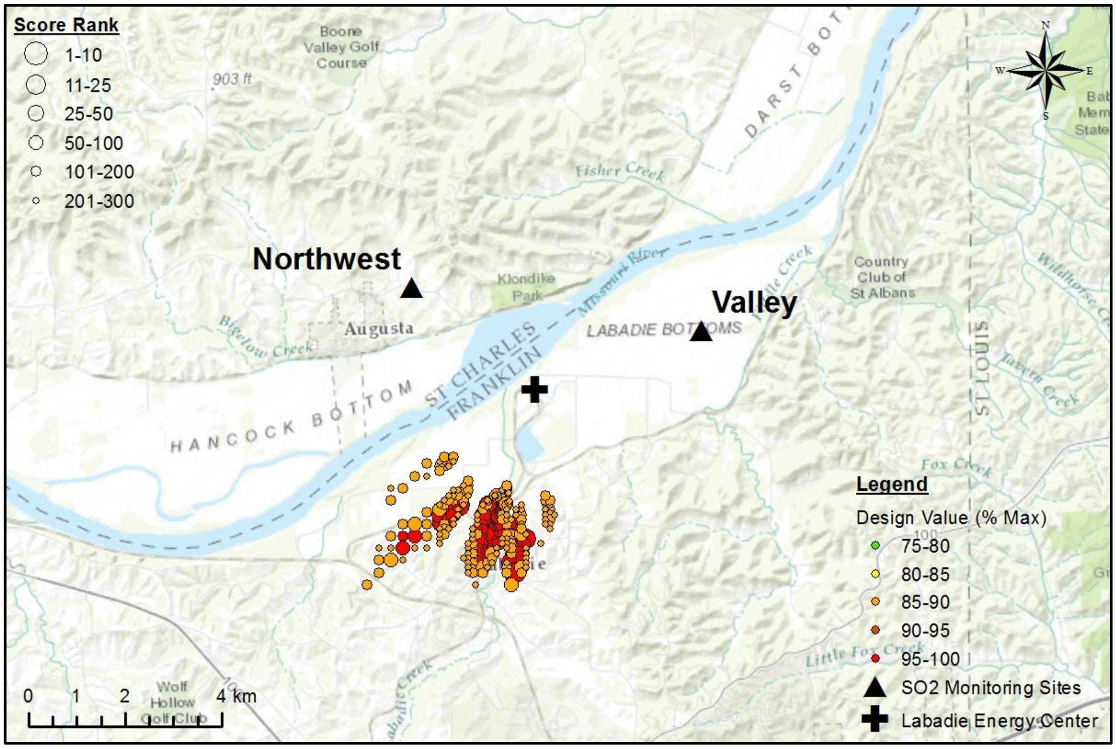


Figure 10. Design values and score ranks for the top 300 receptors, Ameren modeling based on 2013-2015 emissions, KSUS met, and Nilwood background.

Because Ameren used a much finer receptor spacing than DNR, Ameren's top 300 receptors are much more concentrated than DNR's, limiting to some degree the conclusions that can be drawn from Ameren's modeling without swapping out Ameren's receptor grid for DNR's and re-running Ameren's models. Still, Figures 7 and 8 show that based on Ameren's KJEF model runs, the Valley monitor is sited where there are no highly ranked receptors and the modeled design value is less than 75% of the maximum. Hence, these runs support the conclusion – drawn from our analysis of DNR's latest modeling – that the Valley monitor should be relocated.

Figures 9 and 10, on the other hand, show that based on Ameren's KSUS model runs, *neither* of the Labadie monitors is sited in an expected peak concentration area. The highest modeled design values, as well as the highest ranked receptors, are located south-southwest of the plant. There are no highly ranked receptors, and modeled design value are generally less than 75% of the maximum, at both the Valley and Northwest monitoring sites. As demonstrated in our supplemental comments on the 2015 Monitoring Network Plan (Ex. 3 attached hereto) preliminary meteorological data from the Valley site indicate that KSUS meteorological data is more representative of meteorological conditions at Labadie than KJEF meteorological data. Given that expected peak concentration areas are dramatically different when KSUS meteorological data are used, DNR should require one or more additional monitors in the peak concentration areas shown in Figures 9 and 10 in addition to the two existing monitors (one of which should be relocated). Failure to monitor these areas would result in failure to detect ground-level SO_2 concentrations maxima if KSUS meteorological data ultimately prove more representative of the area than KJEF meteorological data.

V. DNR's Supplemental Analysis Of The Rush Island Monitoring Sites Does Not Follow EPA Guidance.

The 2015 Monitoring Network Plan included Ameren's modeling and justification for the locations of three Rush Island monitors as well as an independent modeling analysis by DNR. DNR stated that it undertook its analysis to determine whether the monitors, which were sited by Ameren, "will adequately represent … Rush Island Energy Center's SO_2 air quality impact," and it concluded that they are "within … areas predicted to have the highest and most frequent modeled impacts" and are therefore "reasonable."[15] However, as demonstrated in comment letters previously submitted on behalf of Sierra Club, two of Ameren's Rush Island monitors are not in areas of expected peak concentrations.[16] Our previous comments, which are attached as Exhibits 2 and 6 and incorporated herein by reference, highlighted the following key points:

- Ameren's modeling for its analysis of SO_2 and meteorological monitoring sites around Rush Island identified one large and four smaller areas where peak 1-hour SO_2 concentrations are expected to occur. These areas are shown in Figure 11. However, none of the Rush Island monitors are located in the large peak concentration area south of the plant, which is also where the highest modeled concentrations occur. Furthermore, while two of the monitors – Fults and Natchez – are located on the periphery of two of the smaller expected peak concentration areas, the Weaver-AA monitor is not located in an expected peak concentration area at all.
- DNR's independent analysis of the Rush Island monitoring sites used a flawed methodology that biased the results. When corrected, DNR's analysis shows that only the Fults monitor is located in an expected peak concentration area and both the Natchez and Weaver-AA monitors are not.

---

[15] 2015 Monitoring Network Plan, Appendix 5 at 1, 7-8.

[16] Comments on the 2015 Monitoring Network Plan (July 20, 2015) (Ex.2); Comments on Ameren Missouri's Analysis of SO_2 and Meteorological Monitoring Stations Around Its Rush Island Energy Center (May 29, 2015) (Ex.6).

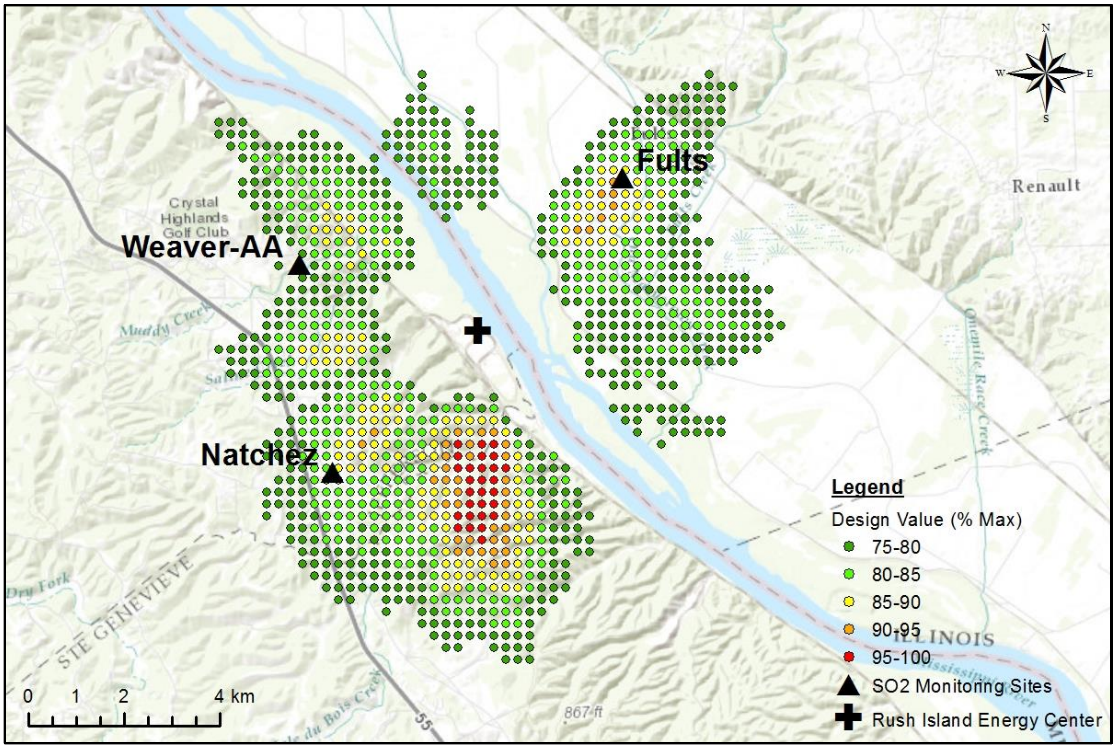


Figure 11. Expected peak concentration areas per Ameren's modeling for its analysis of SO_2 and meteorological monitoring sites around Rush Island.

The 2016 Monitoring Network Plan includes a supplemental analysis by DNR of the Rush Island monitoring sites. The purpose of the supplemental analysis was to update the modeling performed for DNR's original analysis to address the February 2016 revisions to the Monitoring TAD, which includes an option for creating a relative prioritized list of receptor locations for permanent monitoring sites using normalized design values (NDVs) and frequency of having the highest 1-hour daily maximum concentration amongst all receptors. According to DNR, it needed to update its modeling because its original analysis focused solely on modeled design values, and "based on the revised guidance, the site selection process also needs to account for the frequency with which a receptor registers a daily maximum concentration."[17] DNR's supplemental analysis concludes, "This … analysis supports the conclusions from the June 15 report [2015 Monitoring Network Plan]. The locations of the … monitoring sites are reasonable and in agreement with the air program's analysis."[18]

It is worth noting that the option to create a relative prioritized list of receptor locations for consideration of permanent monitoring sites using NDVs and frequency of having the highest 1-hour daily maximum concentration is not a new addition to the February 2016 version of the Monitoring TAD. It was in the previous (December 2013) version of the TAD as well, so DNR could have used it for its original analysis of the Rush Island monitoring sites. Why it chose not to and decided to focus instead only on modeled design values without any kind of assessment of

---

[17] 2016 Monitoring Network Plan, Appendix 2 at 2.

[18] *Id.* at 5.

the frequency with which receptors have the highest 1-hour daily maximum concentration was not explained in the 2015 Monitoring Network Plan.

More importantly, although DNR generally followed the strategy in its supplemental analysis of the Rush Island SO_2 monitoring sites,[19] it omitted the most crucial, final step – ranking receptors according to their score (the sum of concentration rank and day rank). As a result, it ignored the entire purpose of conducting the TAD-suggested prioritization analysis, and its supplemental analysis offers no support for the location of the Rush Island monitors. First, DNR reviewed the modeling performed for its original analysis and identified the 300 receptors with the highest modeled design values. These receptors are shown in Figure 12. Next, it reran its model for the top 300 receptors using the MAXDAILY output option in AERMOD to determine the maximum 1-hour concentration for each receptor for each day and then tallied the number of days each receptor had the highest 1-hour daily maximum concentration among all receptors. The frequency of having the highest 1-hour daily maximum concentration among the top 300 receptors is shown in Figure 13. Finally, it ranked the top 300 receptors by both design value (concentration rank) and the number of days each had the highest 1-hour daily maximum concentration (day rank) and calculated a score for each one by adding its concentration rank and its day rank. These scores are shown in Figure 14.

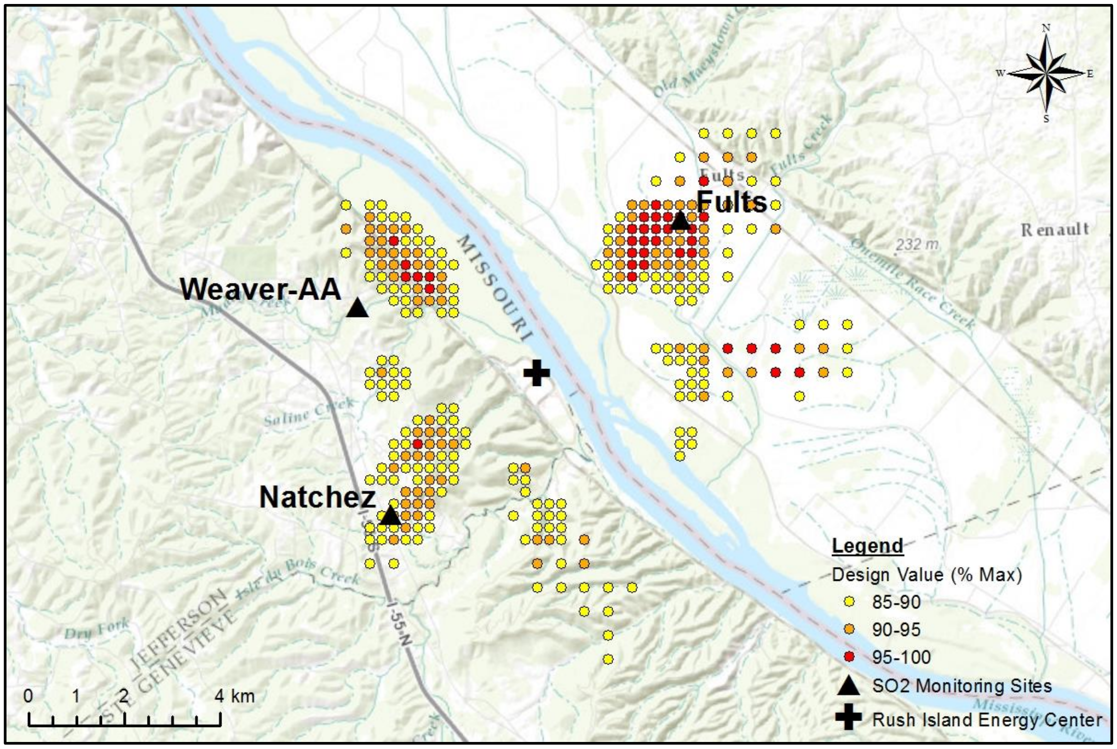


Figure 12. Top 300 receptors per DNR's original modeling.

---

[19] DNR used actual rather than normalized design values, but that does not affect the outcome of the analysis.

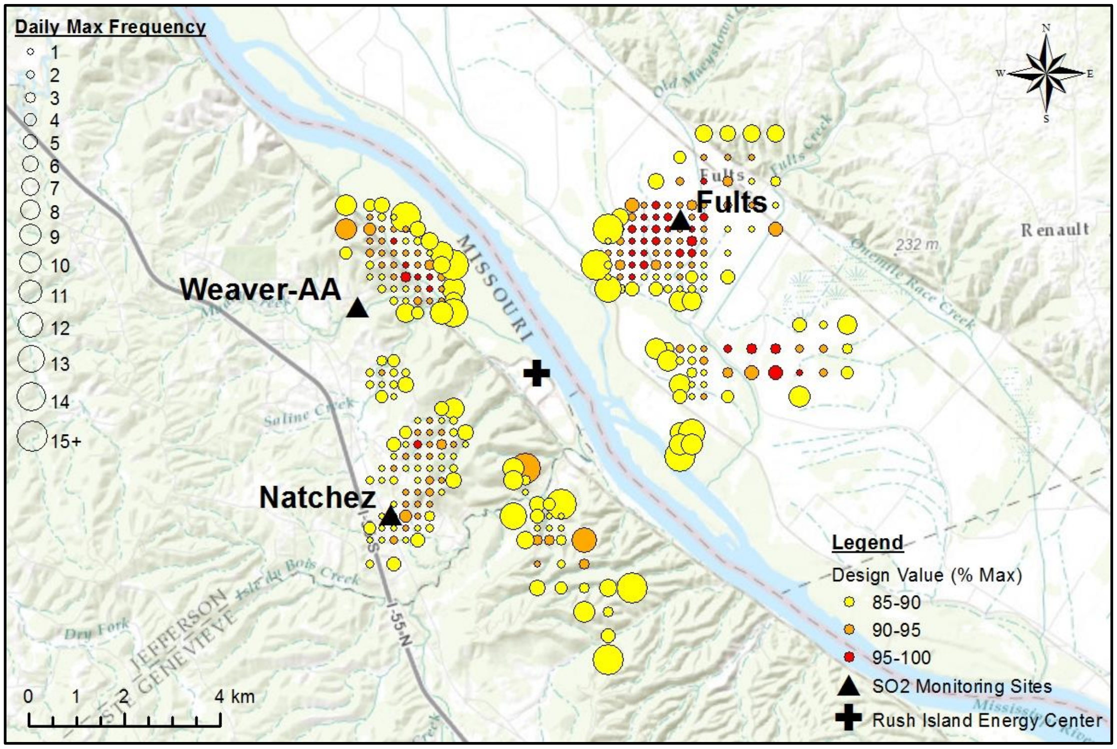


Figure 13. Frequency of having the 1-hour daily maximum concentration.

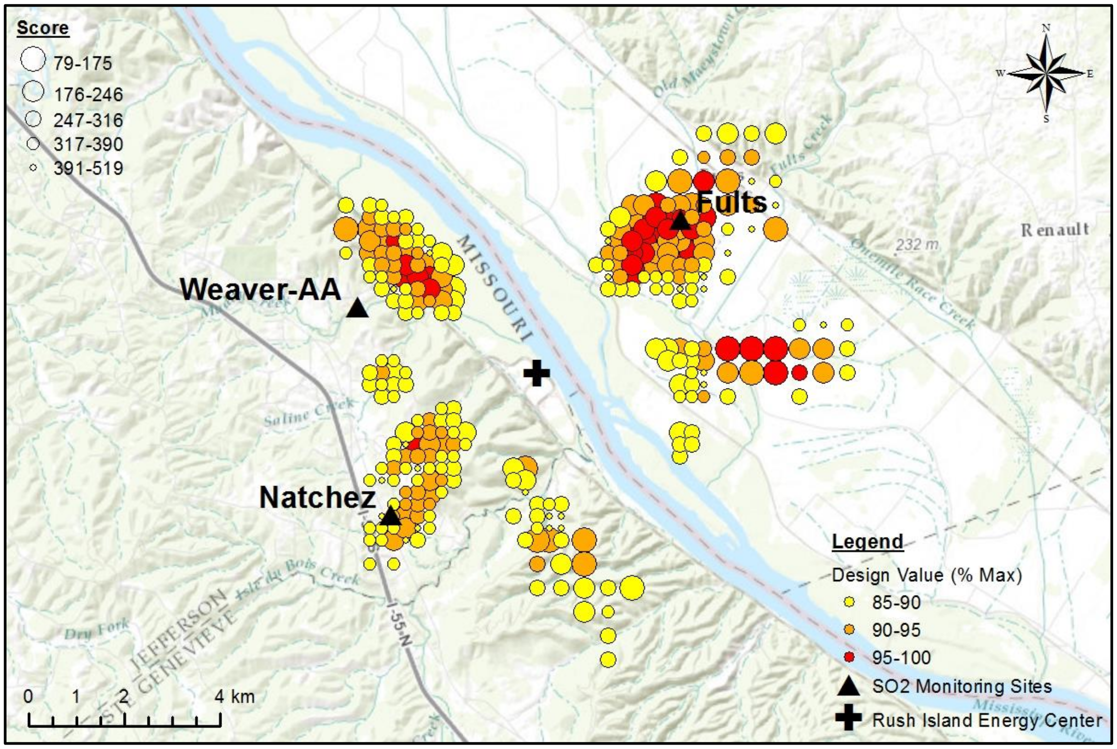


Figure 14. Receptor scores (concentration rank + day rank).

At this point, however, DNR abandoned the scoring strategy described in the Monitoring TAD. Instead of performing the final step and ranking receptors by their scores in order to provide a list of locations ranked in general order of desirability with regard to permanent monitor siting, it reverted to the flawed methodology used in its original analysis and counted the number of top receptors within five numbered polygons arrayed around the plant. These polygons are shown in Figure 15. It then ranked the polygons by the number of top receptors within each one and concluded, based on the fact that polygons 1, 2, and 3, where DNR Figures S-2 and S-3 show the monitors are located, contain the most top receptors, that the supplemental analysis supports its earlier conclusion that the siting of the monitors is reasonable.

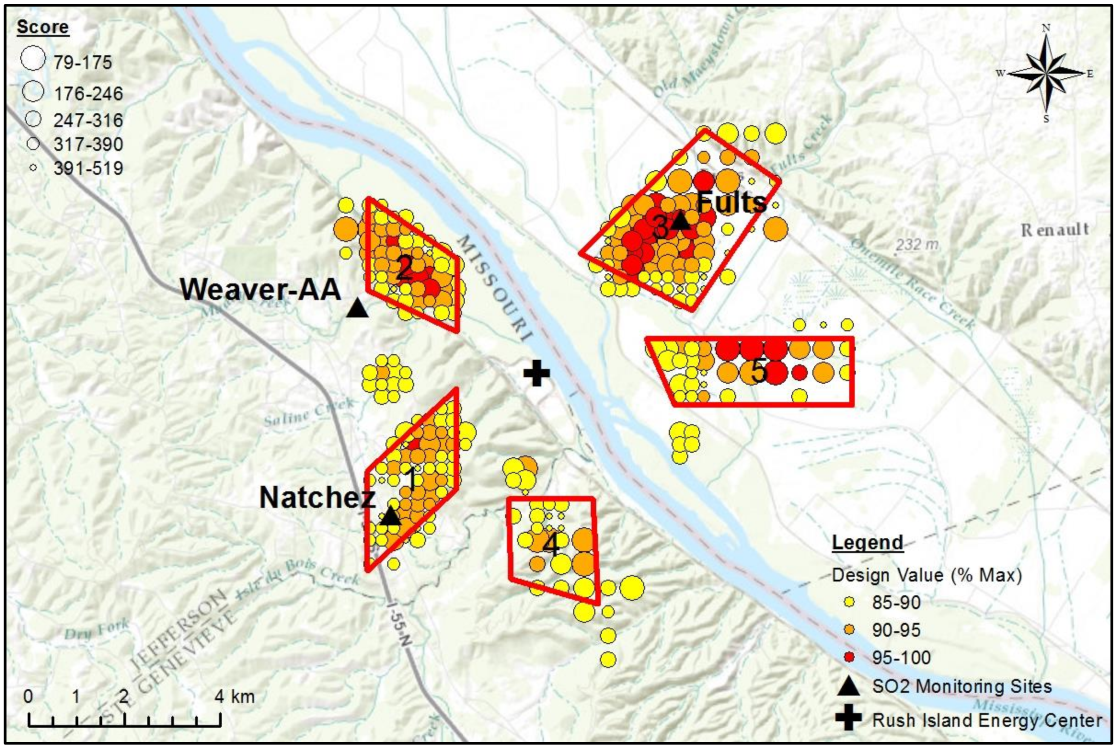


Figure 15. Polygons used in DNR's supplemental analysis.

There are several problems with this analysis:

1) DNR's use of a telescoping receptor grid results in biased counts of the number of receptors within each of the five polygons because the polygons are located in a region where the receptor spacing varies. As a result, some of the polygons contain more receptors than others simply because the receptors in those polygons are spaced more closely together.
2) The polygons used in DNR's supplemental analysis are a different size and shape than the ones used in its original analysis. This is shown in Figure 16. Setting aside the bias inherent in DNR's methodology owing to its use of a telescoping receptor grid, the supplemental analysis should use the same polygons as the original analysis if polygon rankings based on receptor counts are going to be compared.
3) The Weaver-AA monitoring site is located outside of polygon 2, so even if DNR's original conclusion that monitors placed in polygons 1, 2, and 3 are "the best options to

> represent Rush Island Energy Center's air quality impacts" were supported by its supplemental analysis, the Weaver-AA monitor still would not be properly sited.

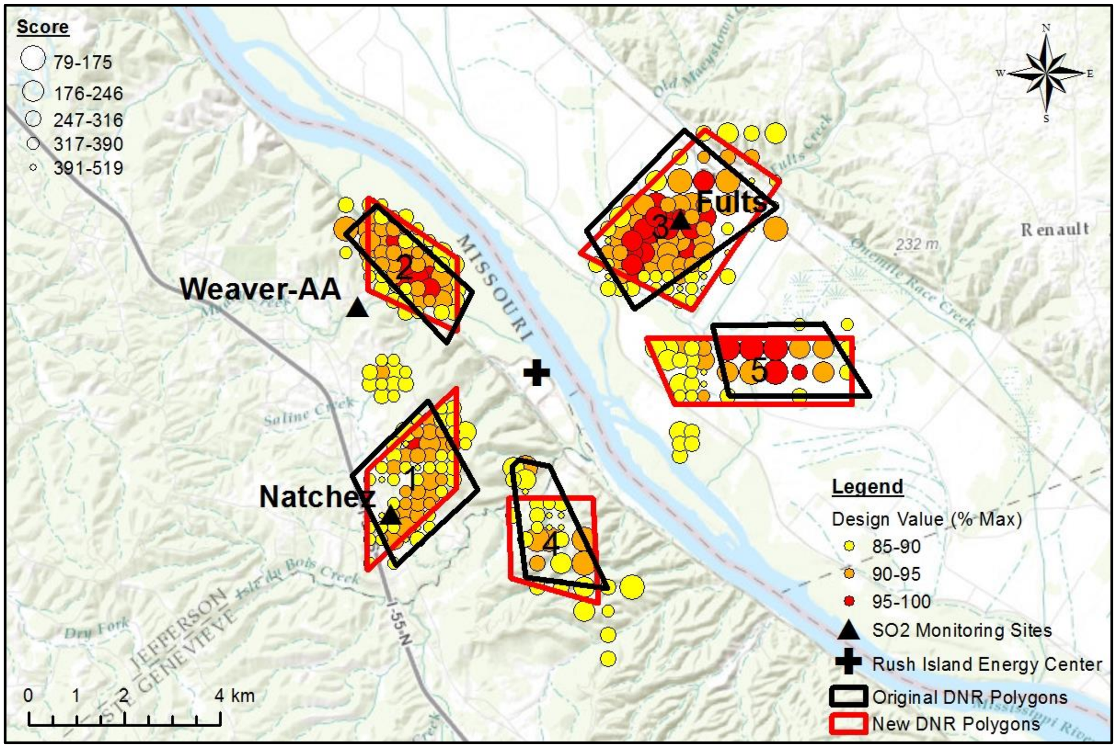


Figure 16. Comparison of polygons used in DNR's original and supplemental analyses.

The most serious problem with DNR's supplemental analysis, though, is that given the methodology used, it fails to fulfill its purported purpose, which is to also "account for the frequency with which a receptor registers a daily maximum concentration."[20] Accordingly, DNR's supplemental analysis provides no new information about whether the Rush Island SO_2 monitors are properly sited.

DNR performed the modeling necessary to determine the frequency with which a receptor registers a daily maximum concentration. It then calculated receptor scores, which account for this frequency as well as modeled design value. However, those scores did not have any bearing on the outcome of DNR's analysis because DNR ultimately ignored them and based its conclusions solely on the number of top receptors (i.e., those with the highest design values) in each of the five polygons shown in Figure 15. DNR did break out the number of top receptors in each polygon by score in Table S-1, listing the number of receptors in each of five scoring ranges, but it used *total* receptor counts to rank the polygons. Hence, receptor scores did not factor into the polygon ranks at all.

It is no surprise, then, that DNR's supplemental analysis supports the conclusions of its original analysis as they are, in fact, identical in that both base their conclusions solely on modeled design values. The supplemental analysis is just limited to the top 300 receptors, which has no

---

[20] 2016 Monitoring Network Plan, Appendix 2 at 2.

effect on the results because the high-concentration receptors DNR based its polygon rankings on originally were all top 300 receptors as well.

VI. A Supplemental Analysis Properly Conducted Pursuant To EPA's Monitoring TAD Demonstrates that the Natchez and Weaver-AA Monitors Are Not Properly Sited.

Had DNR followed the scoring strategy described in the TAD through to the end, and ranked receptors by their scores to come up with a list of locations ranked in general order of desirability with regard to monitor siting, its supplemental analysis would have reached a different conclusion regarding the siting of the Rush Island monitors. Figure 17 shows the 10, 25, 50, and 100 receptors with the highest score ranks superimposed on the peak concentration areas (design value >90 ug/m^3). The 10 receptors with the highest score ranks would be the most desirable monitor locations, and all but one are clustered in the three largest peak concentration areas, which are where the Rush Island SO_2 monitors should have been sited. The fact that almost all of the 10 highest ranked receptors – taking into account modeled design values *and* frequency of having the highest 1-hour daily maximum concentration – are located in these areas only reinforces that point. Similar results are obtained by looking further down the priority list at the 25, 50, and 100 highest ranked receptors, the vast majority of which are located in the same three peak concentration areas.

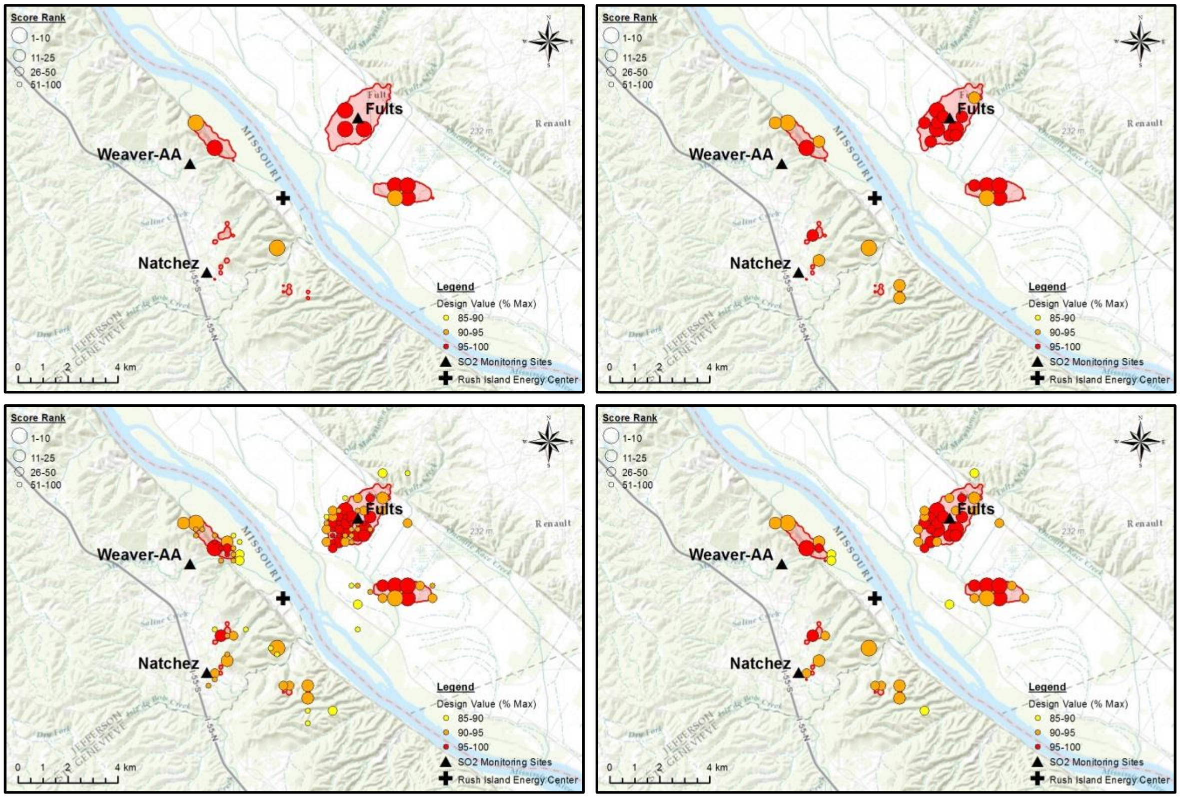


Figure 17. Receptors with the 10, 25, 50, and 100 highest score ranks (clockwise from upper left). Peak concentration areas (design value >90 ug/m^3) are shaded red.

Only one of the three Rush Island monitors is sited in these peak concentration areas. The Fults monitor is sited in the large peak concentration area located northeast of the plant, which contains three of the 10 highest ranked receptors and upwards of half of the 100 highest ranked receptors. The Natchez and Weaver-AA monitors, however, are located outside of the large peak concentration areas east and northwest of the plant, which collectively contain six of the 10 highest ranked receptors about 25 of the 100 highest ranked receptors. DNR should require Ameren to relocate the Natchez and Weaver-AA monitors to these areas, as they clearly represent – along with the area where the Fults monitor is located – the areas where peak concentrations are expected to occur based on DNR's own modeling and the receptor scoring strategy described in the TAD.

VII. Modeling Based On Updated Emissions And Meteorological Data Calls For At Least One Additional Monitor At Rush Island.

DNR used 2011-2013 emissions data in its analyses of the Rush Island monitoring sites. However, Rush Island's emissions profile has changed in recent years due to Ameren's switch to ultra-low sulfur coal at all of its un-scrubbed plants (Labadie, Meramec, and Rush Island). In recent comments to EPA on the agency's proposed nonattainment designation for Labadie, Ameren said the following regarding modeling of the plant's emissions: "[I]n 2011, Ameren entered into a long-term contract for the use of ultra-low sulfur coal at Labadie. Ameren began burning significant quantities of ultra-low sulfur coal in *2013*, and intends to continue to do so in the future ... Therefore, modeling that relies on emissions data from 2013 forward is far more representative of actual conditions at Labadie than pre-2013 data."[21] Given that Ameren is also burning ultra-low sulfur coal at Rush Island, data from 2013 forward should also be more representative of current conditions at Rush Island.[22] DNR's supplemental analysis did not evaluate the effect of using updated (2013-2015) emissions on the location of the Rush Island monitoring sites.

Updating DNR's modeling to use 2013-2015 emissions and meteorological data results in markedly different results from those obtained using 2011-2013 data. Figure 18 shows the 300 receptors with the highest modeled design values when 2013-2015 data are used; Figure 19 shows the frequency of having the highest 1-hour daily maximum concentration among these receptors; and Figure 20 shows their scores, which were calculated by adding their respective concentration ranks and day ranks per the scoring strategy described in the TAD.

---

[21] Ameren Missouri, Comments on EPA Responses to Certain State Designation Recommendations for the 2010 Sulfur Dioxide National Ambient Air Quality Standard: Notice of Availability and Public Comment Period (March 31, 2016) at 35.

[22] It is not clear whether current conditions are representative of future conditions, however, because Ameren's five-year contract for ultra-low sulfur coal will expire in 2017 and the provider of the coal, Peabody Energy, is now in bankruptcy and the nature and extent of its future operations is uncertain.

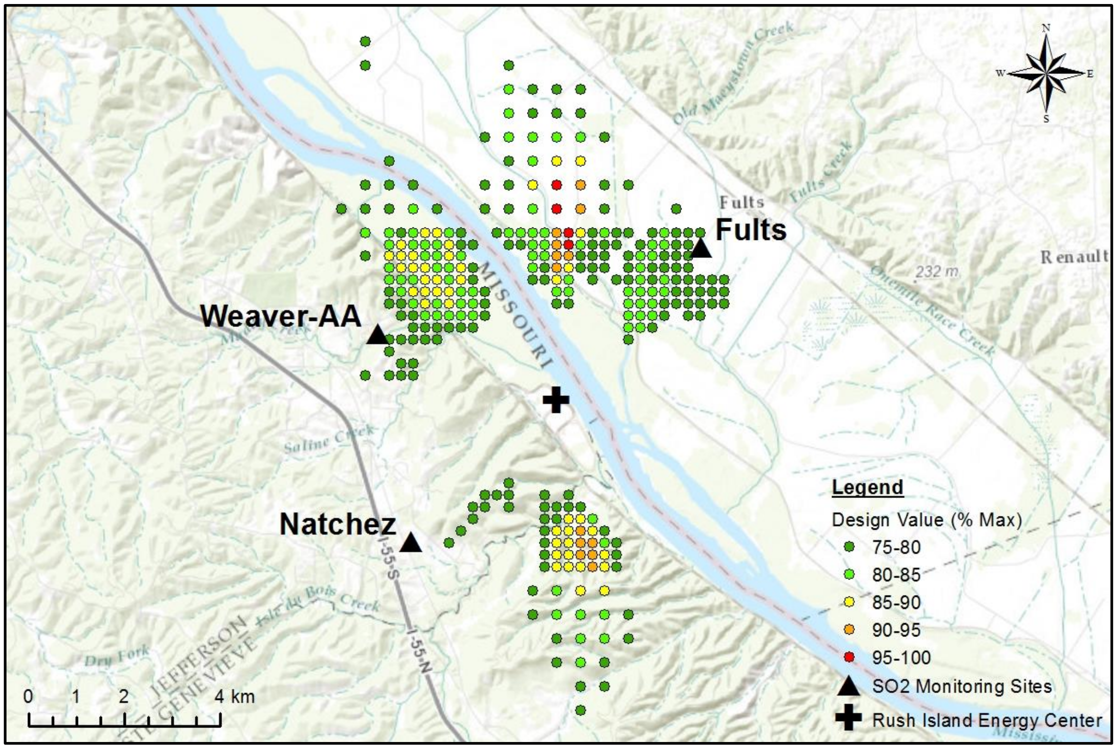


Figure 18. Top 300 receptors based on 2013-2015 data.

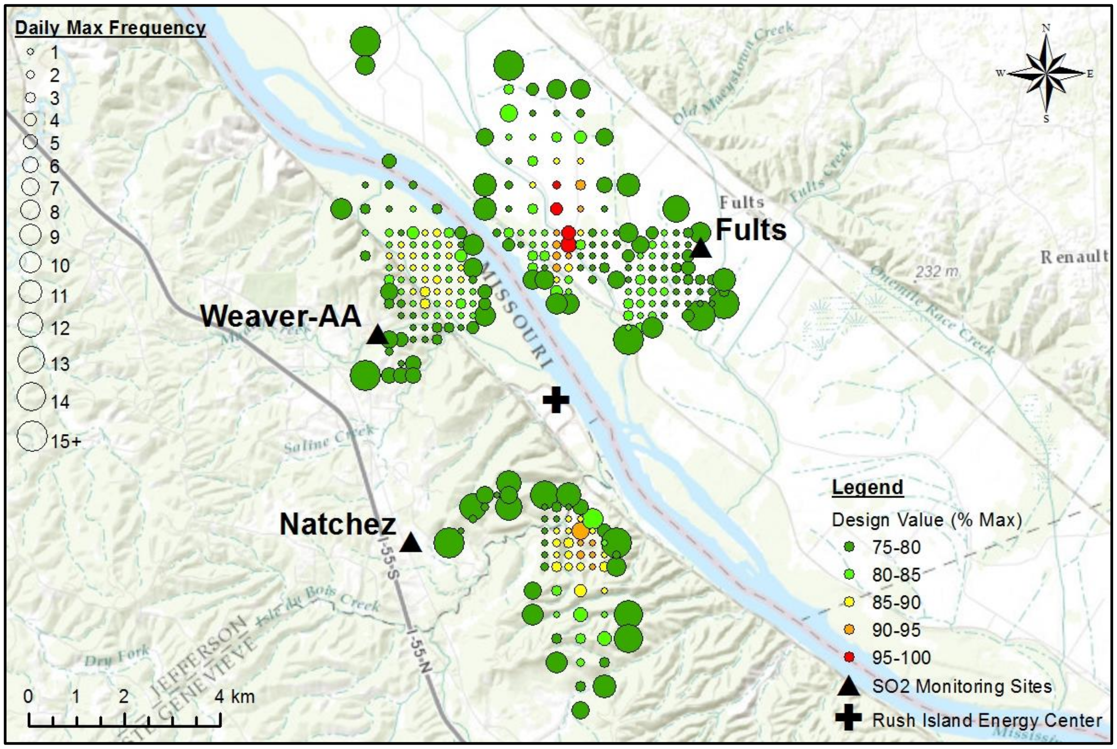


Figure 19. Frequency of having the 1-hour daily maximum concentration based on 2013-2015 data.

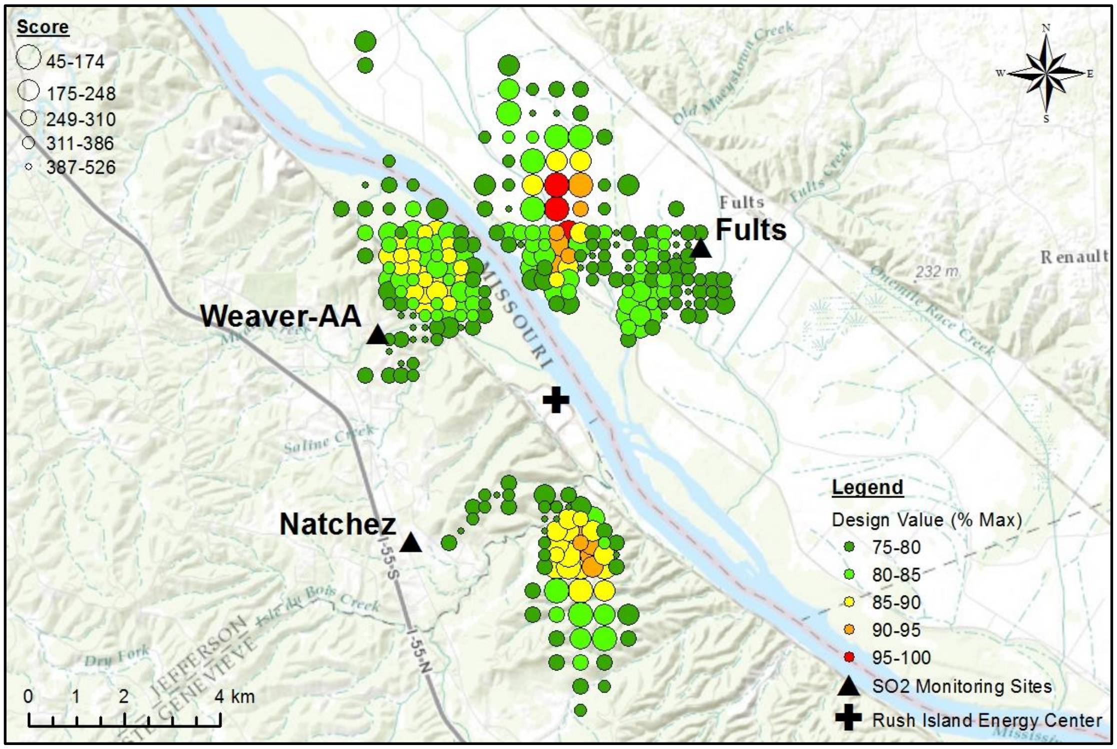


Figure 20. Receptor scores (concentration rank + day rank) based on 2013-2015 data.

When 2013-2015 data are used, the highest concentration areas shift and are located immediately north and south of the plant instead of to the east, northeast, and northwest, as shown in Figure 18. The receptors with the lowest scores – i.e., those with the highest combined concentration rank (based on modeled design value) and day rank (based on frequency of having the highest 1-hour daily maximum concentration) – are similarly located north and south of the plant, as shown in Figure 20. Furthermore, when the top receptors are ranked by score so as to provide a list ranked in general order of desirability with regard to siting monitors in accordance with the Monitoring TAD, there are no high-ranking receptors near any of the existing monitors. Figure 21 shows the 10, 25, 50, and 100 receptors with the highest score ranks based on modeling using 2013-2015 data.

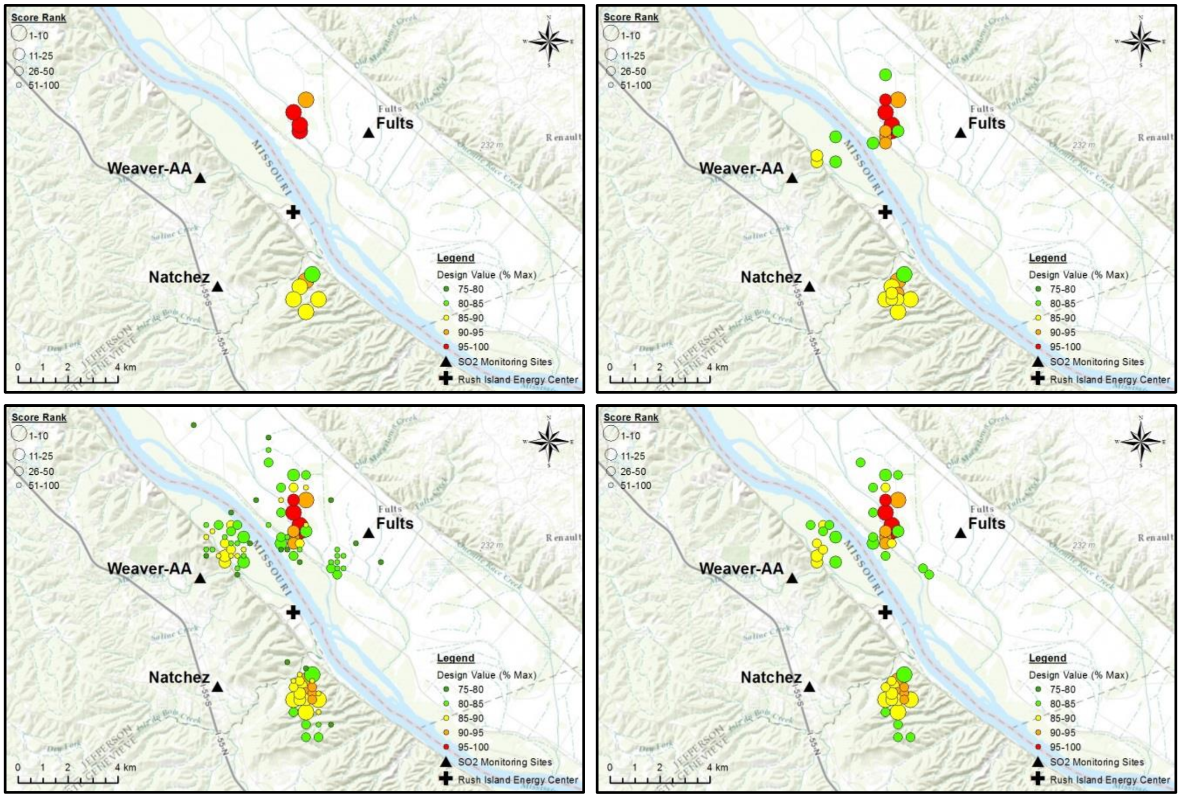


Figure 21. Receptors with the 10, 25, 50, and 100 highest score ranks (clockwise from upper left) based on 2013-2015 data

The significant difference in modeled peak concentration areas when 2013-2015 data are used in lieu of 2011-2013 data demonstrates one of the major drawbacks (besides providing data at only a limited number of discrete points) of using monitoring as a means of determining NAAQS compliance. As emissions and meteorological conditions change over time, peak concentration areas can shift, leaving monitors that may have been properly sited at one time in areas that are no longer appropriate. For example, the Fults monitor is appropriately sited based on modeling using 2011-2013 data but is not in a peak concentration area at all – let alone at a high priority location based on the scoring strategy described in the TAD – based on modeling using 2013-2015 data. This points to the need for additional monitors at Rush Island to ensure that the network is capable of adequately characterizing peak concentrations around the plant, which could easily shift again in the future. In addition to requiring relocation of the Natchez and Weaver-AA monitors to peak concentration areas as discussed above, DNR should require the addition of monitors immediately north and south of the plant, in peak concentration areas based on modeling using 2013-2015 data.

Conclusion

Ameren's Labadie and Rush Island power plants are the two largest sources of sulfur dioxide emissions in the State. While virtually all other plants of their size across the nation have already adopted or made binding commitments to adopt scrubber technology to dramatically reduce their sulfur dioxide emissions, Ameren instead has installed monitors designed not to capture peak

SO_2 concentrations around these two plants. Sierra Club urges DNR to require Ameren to relocate the existing monitors (except for the Northwest monitor at Labadie and the Fults monitor at Rush Island) and expand the monitoring networks at both plants as described above. Sierra Club also urges EPA to make clear to DNR that the existing monitoring networks at the Labadie and Rush Island plants do not satisfy the criteria for SLAMS monitors for source-oriented ambient SO_2 monitoring purposes and that data from the monitors will not be used for regulatory decision-making.

Sincerely yours,

Maxine I. Lipeles

Maxine I. Lipeles, Director
Kenneth Miller, P.G., Environmental Scientist
Interdisciplinary Environmental Clinic
Washington University School of Law
One Brookings Drive – CB 1120
St. Louis, MO 63130
314-935-5837 (phone); 314-935-5171 (fax)
milipele@wustl.edu

Attorneys for the Sierra Club

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Michael Jay, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Darcy Bybee, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

Exhibit 1

Washington University in St. Louis
SCHOOL OF LAW

Interdisciplinary Environmental Clinic

April 13, 2015

Ms. Patricia Maliro
Chief, Air Quality Monitoring Unit
Air Pollution Control Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176
Via email to patricia.maliro@dnr.mo.gov

Re: Comments on Ameren Missouri's Labadie Sulfur Reduction Project Quality Assurance Project Plan

Dear Ms. Maliro:

On behalf of the Sierra Club, we submit the following comments on Ameren Missouri's Labadie Sulfur Reduction Project Quality Assurance Project Plan (QAPP). The QAPP describes the methodology Ameren used to determine the locations of two proposed ambient sulfur dioxide (SO_2) monitoring stations around its Labadie Energy Center in connection with the 1-hour SO_2 National Ambient Air Quality Standard (NAAQS). We believe the QAPP should be disapproved because the proposed monitoring stations are improperly sited; they are outside areas where peak 1-hour SO_2 concentrations are expected to occur based on the modeling described in the QAPP. Furthermore, the modeling described in the QAPP does not comport with EPA guidance on characterizing ambient air quality in areas around or impacted by significant SO_2 emission sources such as the Labadie Energy Center and therefore may have failed to correctly identify areas of expected ambient, ground-level SO_2 concentration maxima.

I. Based on the Modeling Described in the QAPP, the Proposed Monitoring Stations are Improperly Sited Outside Areas Where Peak 1-Hour SO_2 Concentrations are Expected to Occur

Appendix 10 of the QAPP describes the modeling performed to determine the locations of the proposed ambient SO_2 monitoring stations around the Labadie Energy Center. The modeling was used to determine locations where peak 1-hour SO_2 concentrations are expected to occur due to the plant's SO_2 emissions given that the primary objective of source-oriented monitoring is to identify peak SO_2 concentrations in ambient air that are attributable to an identified emission source or group of sources.[1] Figure 1 shows all receptors with modeled design values greater than or equal to 75 percent of the maximum modeled design value. Figure 2 shows the receptors with the top 200, 100, 25, and 10 modeled design values.

---

[1] U.S. EPA, SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, at 2.

Exhibit 1

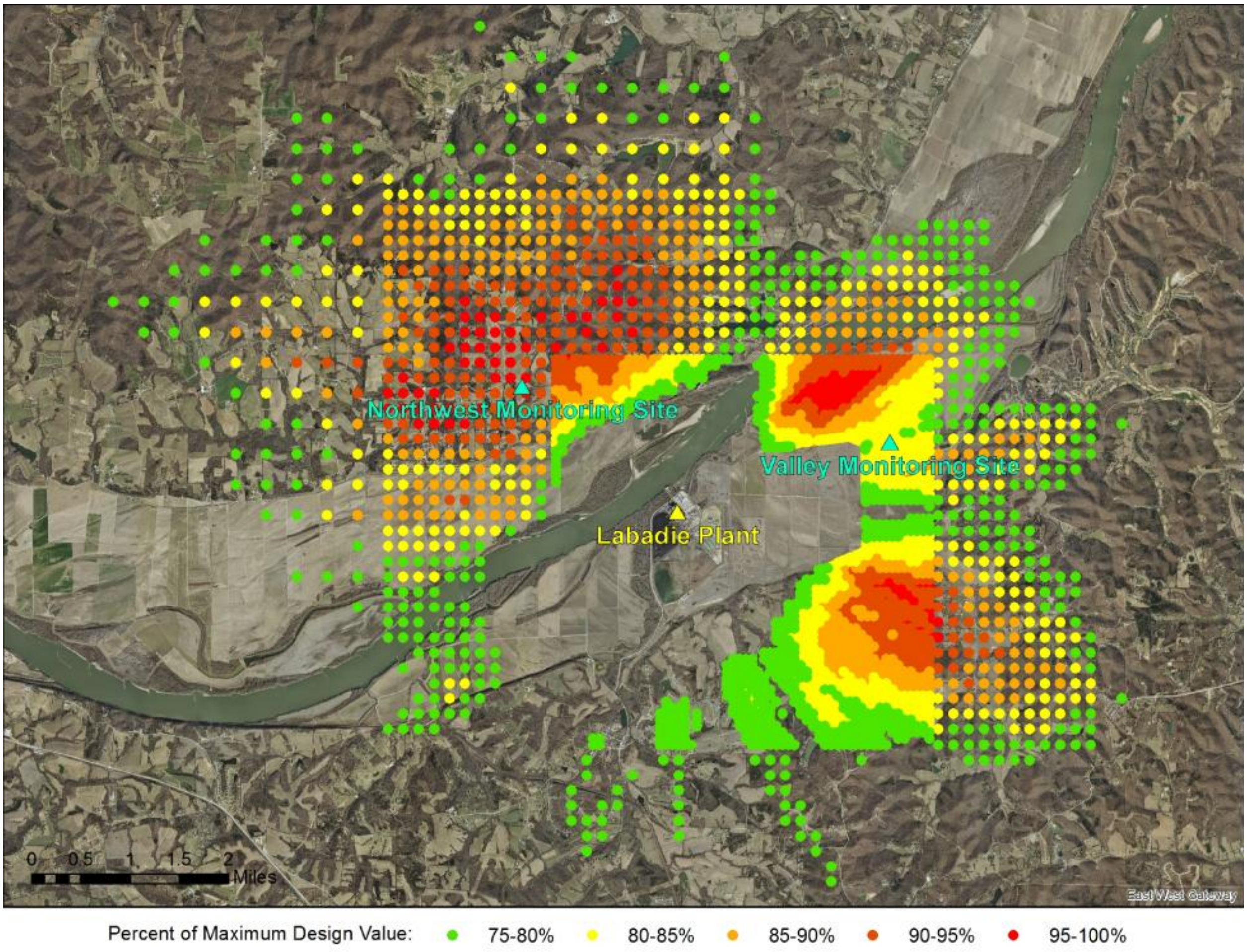


Figure 1. Receptors with modeled design values ≥75 percent of the maximum design value.

The modeling was also used to determine locations where elevated SO_2 concentrations are expected to occur most frequently given that the site selection process also needs to account for the frequency with which an area sees the daily maximum concentration.[2] Normally this involves counting the number of times each receptor sees the daily maximum 1-hour SO_2 concentration predicted by the model. However, the QAPP looks at it differently, counting instead the number of times the daily maximum 1-hour SO_2 concentration at each receptor exceeds 75 percent of the maximum modeled design value. Figure 3, which is reproduced from the QAPP,[3] shows the number of daily maximum 1-hour SO_2 concentrations at each receptor that exceed 75 percent of the maximum modeled design value.

---

[2] *Id.* at A-6.

[3] See Appendix 10, Figure 6, "Counts of Max Daily 1-Hour Concentrations Greater Than 75% of the Max Modeled Design Value* (Years 2005-2009)."

Exhibit 1

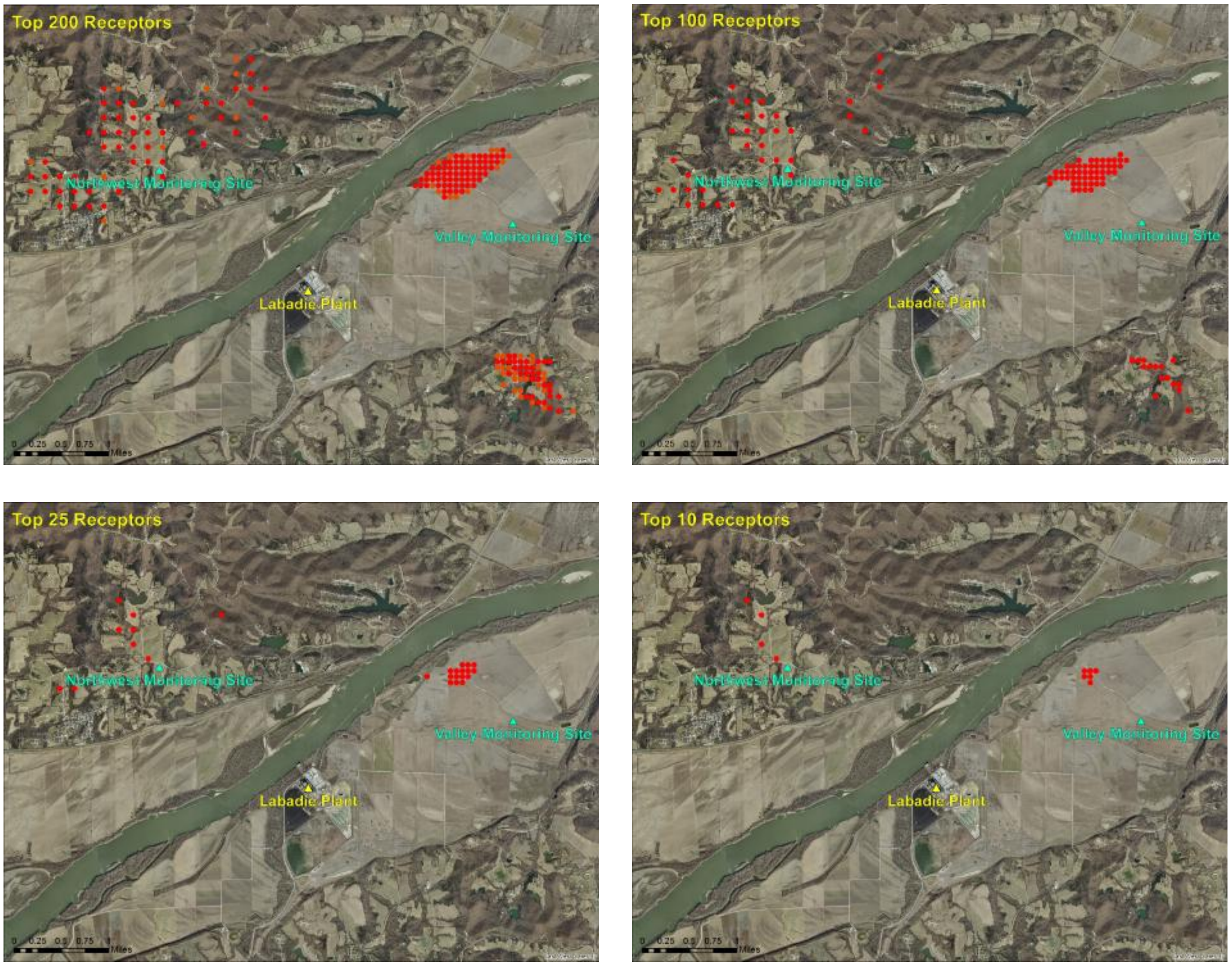


Figure 2. Receptors with the top 200, 100, 25, and 10 modeled design values.

Figures 1 and 2 reveal three distinct areas where modeled design values are in excess of 95 percent of the maximum modeled design value and where the majority of the top 200 receptors (and all of the top 100, 25 and 10 receptors) lie. These areas, located northwest, northeast, and southeast of the Labadie Energy Center, are where the modeling predicts peak 1-hour SO_2 concentrations are expected to occur. Furthermore, although a rigorous comparison is not possible without detailed receptor data, a simple visual comparison of Figures 1 and 3 indicates that the areas where peak 1-hour SO_2 concentrations are expected to occur (i.e., where modeled design values are in excess of 95 percent of the maximum modeled design value) overlap with the areas where daily maximum 1-hour SO_2 concentrations most frequently exceed 75 percent of the maximum modeled design value. Monitoring stations located in these areas would have the greatest chance of identifying peak SO_2 concentrations in ambient air, which is the primary objective of source-oriented monitoring and an absolute necessity when monitoring to assess compliance with the NAAQS.

Exhibit 1

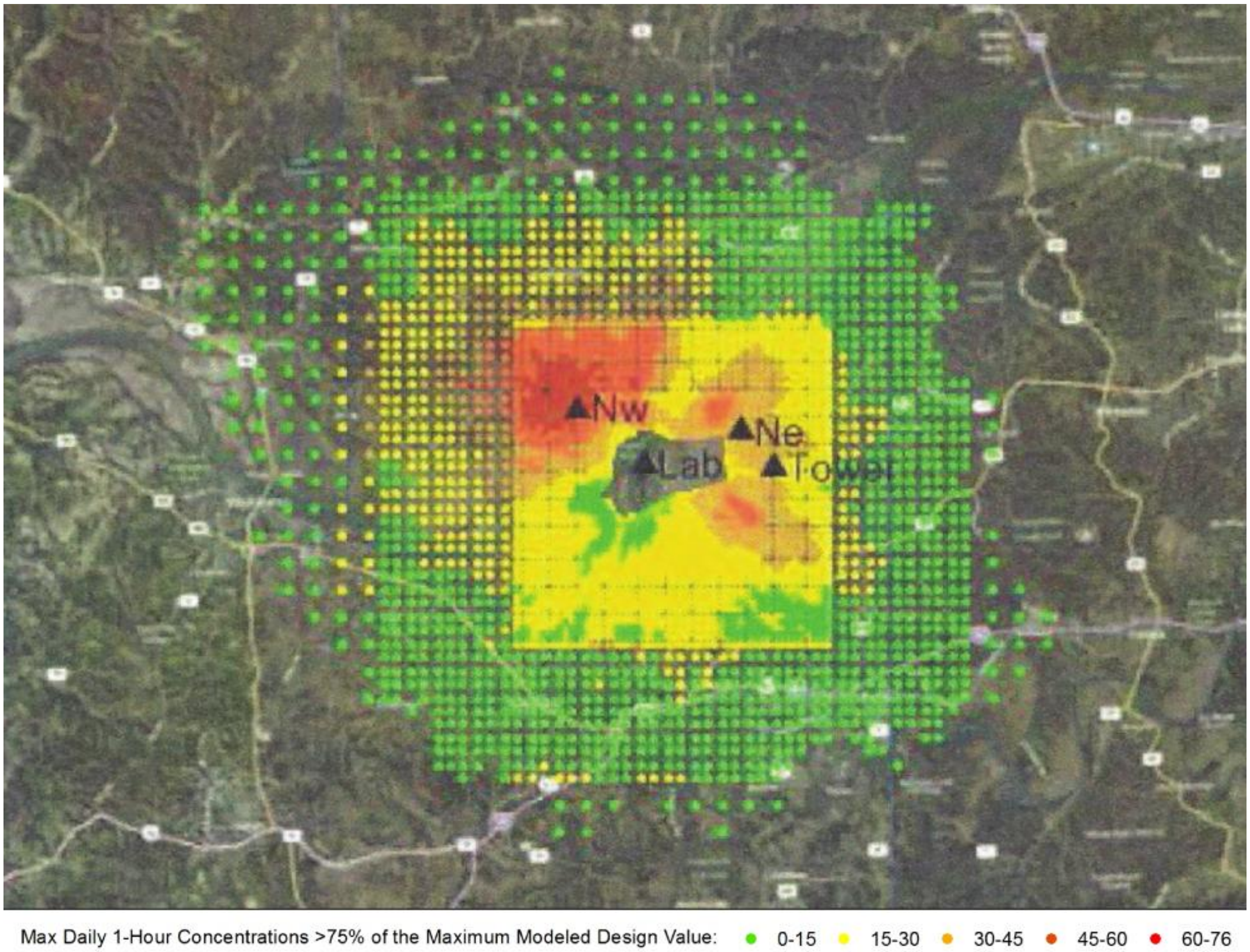


Figure 3. Number of maximum daily 1-hour SO_2 concentrations at each receptor that exceed 75 percent of the maximum modeled design value.

However, only one of Ameren's proposed monitoring sites, the northwest site, is located in one of the three peak concentration/high frequency areas predicted by the modeling (the one located northwest of the plant). No monitoring sites are proposed in the peak concentration/high frequency areas located northeast or southeast of the plant. Instead, Ameren's only other proposed monitoring site, the valley site, is located in an area where modeled design values are only about 80 percent of the maximum modeled design value and where daily maximum 1-hour SO_2 concentrations exceed 75 percent of the maximum modeled design value about half as often as they do in areas where this occurs with the greatest frequency. This makes the valley site an inappropriate site for a monitor to assess compliance with the NAAQS. Ameren's modeling predicts that ambient SO_2 concentrations will be as much as 25 percent higher in several areas around the plant than they will be at the valley site, meaning a monitoring station at the valley site could be in compliance with the NAAQS while significant violations were occurring nearby.

The QAPP states that a monitor could not be sited in the peak concentration/high frequency area northeast of the plant because it is an actively farmed area, physical access is almost impossible

Exhibit 1

without building additional infrastructure, and electric power is not available. These justifications do not stand up to the barest scrutiny. The entire Labadie Bottoms is an actively farmed area, accessible only by unimproved roads that severely limit vehicular access during wet weather conditions. As such, the proposed valley monitoring site is no more accessible than a site within the peak concentration/high frequency area northeast of the plant would be, and additional road infrastructure will likely be necessary for all-weather access regardless of where in the Labadie Bottoms the monitor is located.[4] Furthermore, electric power is not available anywhere within the Labadie Bottoms, including at the proposed valley monitoring site. Therefore, distribution infrastructure will have to be built to deliver power to any monitoring site in the Labadie Bottoms regardless of where it is located. The St. Albans Water and Sewer Authority/Franklin County PWSD #3 wastewater treatment facility, located approximately 1 kilometer east of the proposed valley monitoring site, appears to be the closest available source of electric power for monitoring sites in the Labadie Bottoms, and only a minimal amount of additional line would be necessary to deliver power to a monitor located in the peak concentration/high frequency area northeast of the plant compared to one located at the proposed valley monitoring site.

The QAPP's justification for not siting a monitor in the peak concentration/high frequency area southeast of the plant is equally flimsy. The QAPP states that the primary reason a monitor is not proposed in that area – despite the model predicting high design values and a high number of daily maximum 1-hour SO_2 concentrations in excess of 75 percent of the maximum modeled design value in that area – is because the elevated terrain there is similar to the terrain at the proposed northwest monitoring site and it was believed an additional elevated terrain site was not necessary. However, AERMOD accounts for terrain influences when calculating modeled design values, and variations in meteorological parameters, most notably wind direction, often result in peak 1-hour SO_2 concentrations occurring in different areas that have similar terrain (e.g., areas in different cardinal directions from the source). Therefore, the peak concentration/high frequency area southeast of the plant cannot be ignored simply because the terrain there is similar to the terrain in the peak concentration/high frequency area northwest of the plant. The purpose of an ambient SO_2 monitoring network is not to monitor different terrain types, but to monitor areas where peak 1-hour SO_2 concentrations are expected to occur regardless of the terrain in those areas. The QAPP also suggests that the high concentrations and frequencies predicted by the model southeast of plant are merely an artifact of the Jefferson City, MO Airport meteorology, which is influenced by the local orientation of the Missouri River valley at that met station. However, the wind roses provided in the QAPP for a number of met stations in eastern Missouri that are closer to Labadie, which the QAPP states better reflect the expected meteorology at Labadie, all show significant winds from the north or northwest, which is consistent with an area of peak concentration/high frequency southeast of the plant.

---

[4] The peak concentration/high frequency area northeast of the plant is arguably more accessible than the proposed valley monitoring site given its proximity to the agricultural levee adjacent to the south bank of the Missouri River. The road on the crest of this levee is higher and most likely drier than other unimproved roads in the Labadie Bottoms, including those roads leading to the proposed valley monitoring site.

Exhibit 1

II. The Modeling Described in the QAPP Does Not Comport With EPA's Source-Oriented SO_2 Monitoring Guidance and Therefore May Not Correctly Identify Areas of Expected Ambient, Ground-Level SO_2 Concentration Maxima

EPA's SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (TAD) provides guidance on how to "appropriately and sufficiently monitor ambient air in areas proximate to or impacted by an SO_2 emissions source to create ambient monitoring data for comparison to the SO_2 NAAQS" and presents "recommended steps to aid in identifying source-oriented SO_2 monitor sites."[5] The modeling described in the QAPP fails to adhere to the TAD in one critical respect: it does not use hourly emission rates, which are readily available for Labadie's boilers from EPA's online Air Markets Program Data tool. Instead it uses constant emission rates, which the QAPP states were "selected to produce rational ambient levels to be used for establishing monitoring locations and does not reflect actual emissions." The consequence of using constant rather than hourly emission rates is that the effects of the interaction between hourly emissions and hourly variations in meteorological parameters is ignored completely, so that the predicted areas of peak concentration and/or high frequency are primarily a function of the meteorology used. For example, if peak hourly emissions coincide with times when strong winds blow from a direction other than the prevailing wind direction, a model that uses hourly emission rates might predict high concentrations in different areas than the same model would predict using constant emission rates. Therefore, using hourly emissions allows the areas where peak 1-hour SO_2 concentrations are expected to occur to be determined with greater confidence.

III. DNR Should Not Deprive The Public and EPA of an Opportunity to Participate in the Monitoring Site Selection Process.

While the area around the Labadie plant will necessarily be evaluated for nonattainment designation purposes based on modeling in order to meet the July 2016 deadline set by *Sierra Club et al. v. McCarthy*, Civil Action No. 3:13–cv–3953–SI (N.D. Cal., March 2, 2015), it is difficult to imagine why DNR and Ameren would agree to install monitoring sites near the Labadie plant unless they expect to consider using the results for future NAAQS compliance evaluations. Monitoring sites used for such purposes must be included in the state's monitoring network plan, which must be proposed by DNR after public notice and the opportunity for public comment, and submitted to EPA for its review and approval. 40 CFR § 58.10.

Contrary to these requirements, DNR has been working with Ameren to select the Labadie monitoring sites and allow Ameren to commence monitoring at these inappropriate locations without public notice and opportunity for public comment, and without submitting the plans to EPA for its review and approval. Documents obtained recently from DNR suggest that Ameren is already preparing to construct the monitoring sites identified in the Labadie QAPP. In addition, the Consent Agreement attached as Appendix J to the proposed Jefferson County State Implementation Plan requires Ameren to submit "final network site recommendations" to DNR regarding the Rush Island plant by May 1, 2015, with equipment to be installed and calibrated by

---

[5] U.S. EPA, SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, at 2.

Exhibit 1

December 31, 2015 – with no provisions for public comment or for EPA review and approval. Unlike Labadie, where Ameren has provided documentation to DNR as to its (flawed) basis for monitoring site selection, Ameren appears to be developing its "final network site recommendations" for Rush Island without the prior submission to DNR of modeling data to support the site selection.[6]

DNR should not approve monitoring locations for the Labadie or Rush Island plants without first providing public notice and opportunity for comment, and without submitting the proposed locations to EPA for its review and approval.

Conclusion

Based on the modeling described in the QAPP, Ameren's proposed valley monitoring site is improperly located in an area where peak 1-hour SO_2 concentrations are **not** expected to occur. Furthermore, Ameren has failed to propose monitoring sites in peak concentration/high frequency areas located northeast and southeast of the Labadie Energy Center, citing justifications that don't withstand the barest scrutiny, despite the facts that there are numerous private residences within the peak concentration/high frequency area southeast of the plant and the peak concentration/high frequency area northeast of the plant is situated between the nearby communities of St. Albans and Augusta Shores. Therefore, we urge DNR to disapprove the QAPP and require Ameren to make the following changes:

1) Relocate the proposed valley monitoring site to the peak concentration/high frequency area northeast of the plant; and
2) Add a third monitoring site in the peak concentration/high frequency area southeast of the plant.

We also urge DNR to require Ameren to rerun the air dispersion model described in the QAPP using hourly emission rates in order to determine whether the model correctly identified the areas of expected ambient, ground-level SO_2 concentration maxima around the plant and to require a wholesale reevaluation of potential monitoring sites if the model used for the QAPP failed to correctly identify such areas.

Finally, we urge DNR to provide public notice and opportunity for comment, and to submit the proposed monitoring locations to EPA for its review and approval, in accordance with 40 CFR Part 58.

---

[6] On behalf of the Sierra Club, the Clinic has submitted Sunshine Law requests for documents related to possible SO_2 monitoring at Labadie and Rush Island. The most recent request to which DNR has responded (submitted on February 19, 2015, with responsive documents provided April 2, 2015), requested: "All documents regarding the possible installation of SO_2 monitors at the Labadie and/or Rush Island power plants, including but not limited to Quality Assurance Project Plans and all related documents, and all AERMOD input and output files used in any modeling analysis performed to determine the locations of any proposed SO_2 monitoring sites." As of DNR's latest response (April 2, 2015), it has not provided any documents discussing or attempting to justify the selection of possible modeling sites at the Rush Island plant.

Exhibit 1

Respectfully submitted,

Maxine I. Lipeles

Interdisciplinary Environmental Clinic
Washington University School of Law
Maxine I. Lipeles, J.D.
Ken Miller, P.G.*
Alexander Chang, Mo.Sup.Ct.R.13 certified law student
Danelle Gagliardi, Mo.Sup.Ct.R.13 certified law student

On behalf of the Sierra Club

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Josh Tapp, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Wendy Vit, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

*Engineering student Xiaodi “Daniel” Sun also participated in the preparation of this letter

Exhibit 2

Washington University in St. Louis

SCHOOL OF LAW

Interdisciplinary Environmental Clinic

July 20, 2015

Mr. Stephen Hall
Chief, Air Quality Analysis Section
Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102
Via email to: cleanair@dnr.mo.gov

Re: 2015 Monitoring Network Plan

Dear Mr. Hall:

On behalf of the Sierra Club, we urge the Missouri Department of Natural Resources ("DNR") to revise the proposed 2015 Monitoring Network Plan[1] in order to satisfy the requirements of the Clean Air Act. In particular, DNR should refrain from proposing new sulfur dioxide ("SO_2") monitoring sites near Ameren's Labadie power plant until EPA completes an area designation for the plant. Monitors near Labadie should be sited based on the modeling that is used to determine the nonattainment area boundary, which will identify areas of expected peak ambient SO_2 concentrations around the plant based on current EPA guidance. Should DNR persist in proposing new SO_2 monitoring sites near the Labadie plant in the 2015 Monitoring Network Plan, then based on currently-available modeling, one of the two proposed new monitoring sites near the plant is not located in an area where peak SO_2 concentrations are expected to occur and should be relocated. A third monitoring site should also be added southeast of the plant. Similarly, based on currently-available modeling, two of the three proposed new monitoring sites near Ameren's Rush Island plant are not located in areas where peak SO_2 concentrations are expected to occur and should be relocated.[2] These changes are necessary to ensure that the Labadie and Rush Island monitors capture maximum ambient SO_2 concentrations near these large sources.

This letter highlights the following key points:

- It is premature to site and install new SO_2 monitors at the Labadie plant until EPA completes an area designation for the plant.
- While DNR plans to use the proposed new Labadie and Rush Island monitors as State and Local Air Monitoring Stations ("SLAMS"),[3] it is not submitting them for EPA approval as required for SLAMS.

---

[1] MO DEP'T OF NATURAL RES. AIR POLLUTION CONTROL PROGRAM, 2015 MONITORING NETWORK PLAN, June 12, 2015 ("2015 Monitoring Network Plan").

[2] The three proposed new SO_2 monitoring sites that should be relocated, as discussed more fully below, are the Valley site near Ameren's Labadie plant and the Natchez and Weaver-AA sites near Ameren's Rush Island plant.

[3] 2015 Monitoring Network Plan at 12.

Exhibit 2

- Based on currently-available modeling, one of the two proposed new Labadie monitoring sites and two of the three proposed new Rush Island monitoring sites are unlikely to capture maximum ambient SO_2 concentrations because they are not located in areas where peak SO_2 concentrations are expected to occur.
- DNR has not adequately justified the locations of the proposed new Labadie and Rush Island monitoring sites. The support offered for the monitoring site locations in DNR's plan was provided by Ameren (Appendices 2 and 4). DNR visually observed the proposed sites at both plants but only performed independent modeling - which does not entirely support Ameren's proposed locations - regarding the Rush Island sites (Appendix 5). DNR did not perform independent modeling regarding the Labadie sites.

I. DNR Should Refrain From Proposing New SO_2 Monitoring Sites Near Ameren's Labadie Plant Until EPA Completes An Area Designation For The Plant.

It is premature to determine SO_2 monitoring site locations near the Labadie plant. DNR is about to propose a nonattainment area boundary recommendation for the Labadie plant,[4] and EPA must make a final area designation for the plant by July 2016.[5] While the Ameren modeling used to site the Labadie monitors in the 2015 Monitoring Network Plan was performed in a manner inconsistent with current EPA guidance, the modeling used to determine the nonattainment area boundary will identify areas of peak ambient SO_2 concentrations around the plant using current EPA guidance. It is likely that the Labadie monitors will ultimately be used to determine whether the nonattainment area comes into attainment, and they must be properly sited in order to provide reliable data.

The only modeling offered to support the proposed new Labadie monitoring sites was performed by Ameren in 2012.[6] Whereas DNR performed independent modeling to assess Ameren's proposed Rush Island monitoring sites (discussed in III.B. below), DNR did not perform independent modeling to assess Ameren's proposed Labadie monitoring sites. The 2015 Monitoring Network Plan states that DNR conducted "a review of relative dispersion modeling, local meteorological evaluation methodology submitted by Ameren UE, historical departmental SLAMS SO_2 monitoring data, nearby meteorological stations, and local topography."[7] However, only Ameren's modeling pointed to the proposed monitor locations. The other information either pointed to different locations or supported no particular monitoring site location. For example, the historical analysis of the former Augusta and Augusta Quarry monitors concluded where *not* to place monitors,[8] but did not point to a location that would accurately represent the highest ambient SO_2 concentration near the Labadie plant.[9] In addition, the analysis of wind

---

[4] DNR has announced that it will propose a Labadie designation by July 27, 2015.

[5] Sierra Club v. Gina McCarthy, No. 3:13-cv-3953-SI (Consent Decree, March 2, 2015).

[6] 2015 Monitoring Network Plan, Appendix 3.

[7] 2015 Monitoring Network Plan at 14.

[8] The Augusta Quarry data analysis suggests that the plant was responsible for high concentrations near the quarry. *Id.* at 15-19. Without comparative conditions between current proposed monitor locations and the historical monitor locations, the historical data is irrelevant to locating the proper sites for new monitors.

[9] *Id.*

Exhibit 2

direction through the valley points to placing monitor(s) either to the northeast or southwest of the plant,[10] but it is too vague to support any specific monitoring site location.

The reliance upon Ameren's modeling would not be so concerning if Ameren had proposed monitors in locations with the highest modeled SO_2 concentrations around Labadie. However, one of Ameren's two proposed monitoring sites is outside any of the three areas where its modeling predicted peak SO_2 concentrations are expected to occur, leaving two of the three peak concentration areas completely unmonitored. In addition, Ameren's modeling does not comport with EPA guidance.

In sum, DNR should not propose any Labadie monitoring sites until EPA completes an area designation for the plant because 1) DNR will have to perform modeling that comports with EPA guidance as part of the Labadie designation process; 2) DNR intends to use the Labadie monitoring data in assessing whether the nonattainment area ultimately comes into attainment;[11] and 3) the Clean Air Act requires that monitors sited for National Ambient Air Quality Standard ("NAAQS") compliance purposes be incorporated into the state's monitoring network, subject to EPA review and approval.[12]

II. DNR Should Seek EPA Approval For The Proposed New Labadie And Rush Island SO_2 Monitors Because It Intends To Use Them As SLAMS.

The 2015 Monitoring Network Plan adds two new SO_2 monitors near Ameren's Labadie plant[13] and three new SO_2 monitors near Ameren's Rush Island plant.[14] The plan labels these as Special Purpose Monitors ("SPMs"), but states that "it is the intention to convert these monitors to SLAMS" once EPA finalizes the proposed Data Requirements Rule.[15]

Because DNR plans to use data from these new monitors to assess compliance with the 2010 1-hour SO_2 NAAQS, and because the Rush Island monitors are part of the Jefferson County Nonattainment State Implementation Plan ("SIP"), the siting of these monitors should be subject to EPA approval as required for SLAMS.[16] Indeed, it is unclear why the 2015 Monitoring Network Plan does not formally propose these new monitors as SLAMS.

Ameren proposed the Labadie monitoring sites to DNR and then constructed and began operating them just before the 2015 Monitoring Network Plan was published.[17] DNR approved the Labadie monitoring sites without conducting an independent modeling analysis to determine whether they are located in areas where peak SO_2 concentrations are expected to occur, without

---

[10] *Id.* at 19-20.
[11] 2015 Monitoring Network Plan at 12.
[12] Clean Air Act § 110 (a)(2)(B), 42 U.S.C. § 7410(a)(2)(B); 40 CFR § 58.10.
[13] 2015 Monitoring Network Plan at 12-21.
[14] *Id.* at 22-23.
[15] EPA expects to publish the final Data Requirements Rule in October 2015. http://yosemite.epa.gov/opei/rulegate.nsf/byRIN/2060-AR19.
[16] 40 C.F.R. § 58.10(a)(2) and (e).
[17] DNR approved Ameren's proposed Labadie monitoring sites on May 1, 2015, and published the 2015 Monitoring Network Plan on June 12, 2015.

Exhibit 2

providing for public notice and comment, and without submitting the proposed monitor locations to EPA for its review and approval.

With respect to Rush Island, DNR submitted the Jefferson County Nonattainment SIP to EPA for review and approval on or about June 1. While it contained the requirement for Ameren to propose, build, and operate SO_2 monitoring sites at Rush Island, it did not identify the proposed Rush Island monitoring sites included in the 2015 Monitoring Network Plan published 11 days later on June 12, 2015.

Given DNR's stated intention to convert these monitors to SLAMS once EPA finalizes the proposed Data Requirements Rule – which it is expected to do in the next few months – the only salient difference between proposing them as SPMs rather than SLAMS in the 2015 Monitoring Network Plan is that EPA does not have to approve their locations. If DNR were to propose them as SLAMS in the 2015 Monitoring Network Plan or simply wait a few months and propose them as SLAMS after the final Data Requirements Rule is published, EPA *would* have to approve their locations. Proposing them as SPMs now when they will likely be converted to SLAMS in just a few months is suspect because, practically, it will be more difficult for EPA to object to the poor siting of the monitors and require that they be relocated after they are in operation.

The purpose of the NAAQS is to protect the public health.[18] Therefore, NAAQS compliance decisions must be based on properly-sited monitors designed to record maximum ambient SO_2 concentrations. Because one of the proposed new Labadie monitoring sites and two of the proposed new Rush Island monitoring sites are not located in areas of anticipated maximum ambient SO_2 concentrations (based on currently-available modeling), those monitors should be relocated – regardless of whether they are currently labeled SPMs or SLAMS. And EPA should notify DNR and Ameren that it will not accept data from those monitors for NAAQS compliance purposes unless they are appropriately relocated. Moreover, EPA should notify DNR and Ameren that it is premature to determine appropriate monitoring site locations for the Labadie plant until it completes an area designation for the plant.

III. Based On Currently-Available Modeling, Three Of The Five Proposed New Labadie And Rush Island Monitoring Sites Are Not Located In Areas Of Anticipated Maximum Ambient SO_2 Concentrations.

EPA regulations and guidance require ambient SO_2 monitors to be sited where peak concentrations are expected to occur.[19] With respect to source-oriented SO_2 monitoring, EPA guidance states:

> The primary objective is to place monitoring sites at the location or locations of expected peak concentrations.[20]

---

[18] Clean Air Act § 109(b)(1), 42 U.S.C. § 7409(b)(1).

[19] 40 C.F.R. Part 58, Appendix D, § 1.1.1(a), (c). See also U.S. EPA: OFFICE OF AIR AND RADIATION, OFFICE OF AIR QUALITY PLANNING AND STANDARDS, AIR QUALITY ASSESSMENT DIVISION, SO_2 NAAQS DESIGNATIONS SOURCE-ORIENTED MONITORING TECHNICAL ASSISTANCE DOCUMENT, Dec. 2013 ("SO_2 Monitoring TAD").

[20] SO_2 Monitoring TAD at 16.

Further, the Consent Agreement between DNR and Ameren that is included in both the Jefferson County SIP and the 2015 Monitoring Network Plan requires that the monitoring at Rush Island "represents ambient air quality in areas of maximum SO_2 impact from the Rush Island Energy Center."[21]

However, one of the two proposed new Labadie monitoring sites and two of the three proposed new Rush Island monitoring sites are not located in the areas where peak SO_2 concentrations are expected to occur based on Ameren's and DNR's modeling.

On behalf of the Sierra Club, we previously critiqued Ameren's proposed Labadie and Rush Island monitoring site locations in letters submitted to DNR. Those letters are attached as Exhibits 1 and 2 and hereby incorporated by reference.

A. Based On Currently-Available Modeling, One Of The Two Proposed New Labadie Monitoring Sites Should Be Relocated, And A Third Monitor Should Be Added Southeast of the Plant.

In our April 13, 2015 comments to DNR on Ameren's proposed new Labadie monitoring sites, attached as Exhibit 1, we demonstrated that one of the proposed sites – the Valley site – is not located in any of the areas where Ameren's modeling predicts peak SO_2 concentrations are expected to occur. Ameren's modeling identified three distinct areas where the highest SO_2 concentrations are expected to occur and where high concentrations are expected to occur most frequently. These areas are located northwest, northeast, and southeast of the plant and are shown in Figure 1 below. However, only one of the two proposed Labadie monitoring sites – the Northwest site – is located in one of these peak concentration areas (the one located northwest of the plant). The Valley site is located between the other two peak concentration areas, in an area where the modeled concentration is only about 80 percent of the maximum concentration predicted by the model. As a result, it is unlikely to capture maximum ambient SO_2 concentrations and should be relocated to the peak concentration area northeast of the plant.

In addition, DNR should also require the installation of a third monitor in the peak concentration area southeast of the plant lest anticipated maximum ambient SO_2 concentrations in this area – which are likely to have implications for NAAQS compliance – go undetected by the Labadie SO_2 monitoring network.

B. Two Of The Three Proposed New Rush Island Monitors Should Also Be Relocated.

In our May 29, 2015 comments to DNR on Ameren's proposed new Rush Island monitoring sites, attached as Exhibit 2, we demonstrated that all three of the proposed sites, but especially the Natchez and Weaver-AA sites, are located outside areas where Ameren's modeling predicts peak SO_2 concentrations are expected to occur. DNR has since performed an independent modeling evaluation of the proposed sites which follows EPA guidance more closely and is

---

[21] 2015 Monitoring Network Plan, Appendix 3, 2015 Ameren Missouri and Missouri Department of Natural Resources Consent Agreement, Appendix A, ¶ b, at 13 of 15.

Exhibit 2

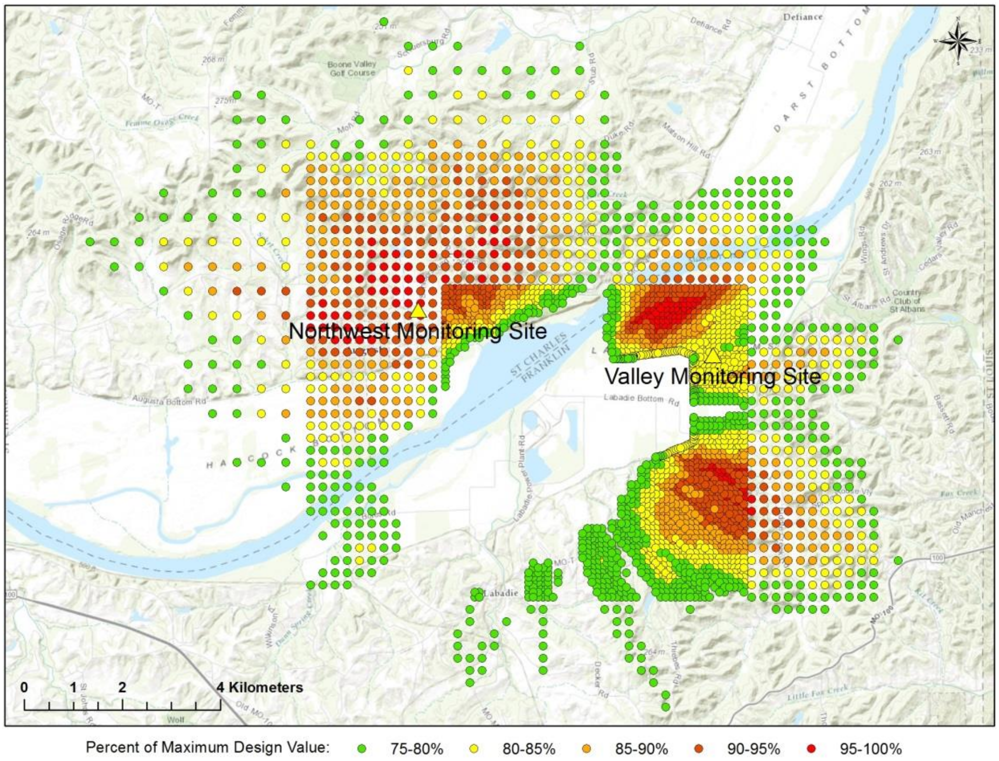


Figure 1. Modeled peak concentration areas near Ameren's Labadie plant.

therefore more reliable than Ameren's modeling. While DNR concluded that the proposed sites are properly located in areas where peak SO_2 concentrations are expected to occur, there is a significant flaw in DNR's analysis that, when corrected, confirms that the Natchez and Weaver-AA sites are located outside of peak concentration areas and should be relocated.

The stated purpose of DNR's evaluation of the proposed new Rush Island monitoring sites was to determine if the sites "will adequately represent Rush Island Energy Center's SO_2 air quality impact." DNR used hourly emission rates from EPA's Air Markets Program in its modeling as recommended in EPA's SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document whereas Ameren used constant emission rates.[22]

However, DNR's analysis of its modeling is based on a methodology that inherently biases the results. DNR used a telescoping receptor grid in its modeling; specifically, it used a 100-meter receptor spacing out to 1 kilometer, a 250-meter spacing out to 3.5 kilometers, a 500-meter spacing out to 10 kilometers, and a 1,000-meter spacing out to 50 kilometers. In order to identify areas where peak SO_2 concentrations are expected to occur, it plotted the predicted SO_2 design value at each receptor and drew polygons around high concentration areas by including all receptors with concentrations greater than 90 ug/m^3. This is shown in Figure 2 below. DNR then

---

[22] However, neither Ameren nor DNR included interactive sources as recommended by EPA guidance. See Exhibit 2 at 9.

Exhibit 2

counted the number of high concentration receptors (i.e., receptors with concentrations greater than 90 ug/m^3) in each polygon and ranked the polygons from highest to lowest in terms of the number of high concentration receptors they contained. The results of this analysis are summarized in Table 1 below.

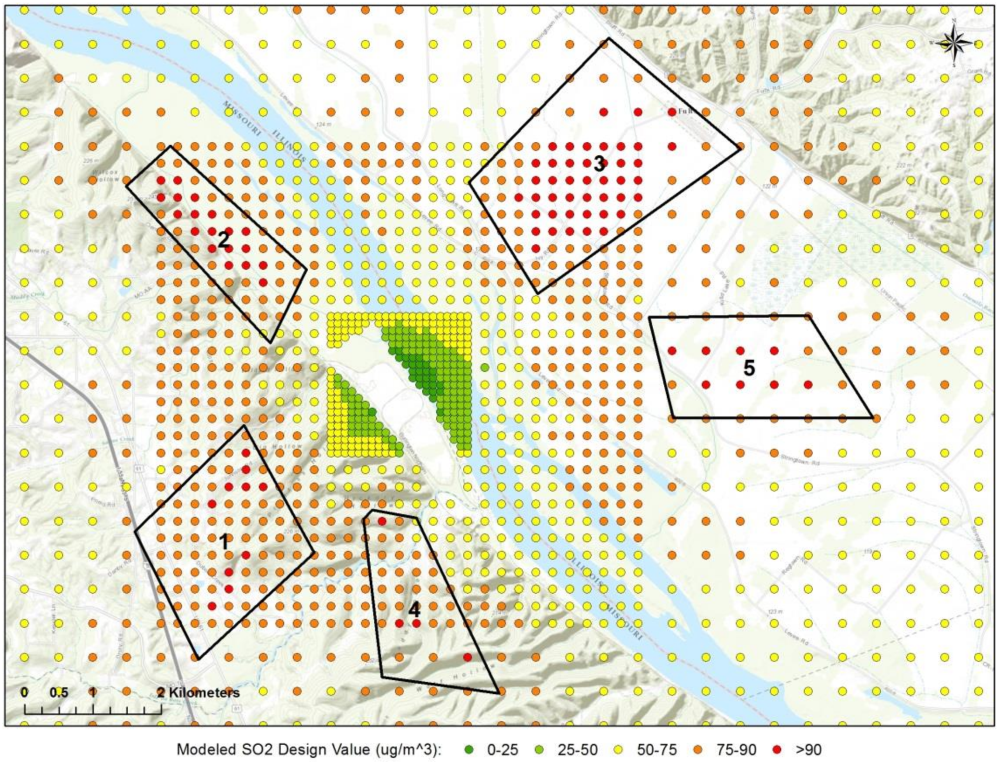


Figure 2. DNR model results and polygons drawn around high concentration areas.

Table 1. Number of high concentration receptors in DNR's polygons.

	Polygon 1	Polygon 2	Polygon 3	Polygon 4	Polygon 5
# of Receptors >90 ug/m^3	10	18	45	4	8
Ranking: 3>2>1>5>4					

Based on this analysis, DNR concluded that polygons 3 and 2, which contained the highest and second-highest number of high concentration receptors, represented "areas of maximum concentration" and were therefore "candidates for the location of SO_2 monitors."[23] It then determined, based on a qualitative analysis of wind speed and direction and the number of high

---

[23] 2015 Monitoring Network Plan, Appendix 5, Review of Proposed SO_2 and Meteorological Monitoring Stations Around Ameren Missouri's Rush Island Energy Center, at 4.

Exhibit 2

concentration receptors in the remaining three polygons (i.e., 1, 4 and 5), that polygon 1 was the best candidate of the remaining three for the location of a third SO_2 monitor. Based on these findings, DNR concluded that because the three new monitoring sites proposed by Ameren are located within polygons 1, 2 and 3, they are within areas where peak SO_2 concentrations are expected to occur and are therefore appropriately sited.

However, because DNR used a telescoping receptor grid, and because the polygons it drew to indicate areas of high concentration are located in a region where the receptor grid spacing varies from 250 to 500 meters, DNR's counts of high concentration receptors in each polygon and its subsequent ranking of the polygons based on those counts are significantly biased. Some of DNR's polygons are likely to have more high concentration receptors than others just by virtue of the fact that the receptors in those polygons are spaced more closely together than they are in other polygons. For example, almost all of the receptors in polygons 1 and 2 are spaced 250 meters apart, whereas all of the receptors in polygon 5 are spaced 500 meters apart. As a result there are many more receptors – including more high concentration receptors – in polygons 1 and 2 than in polygon 5 despite the fact that all three polygons are similar in size (polygon 5 is slightly larger than polygon 2 and slightly smaller than polygon 1).

One way to eliminate the counting bias resulting from DNR's use of a telescoping receptor grid is by ranking the polygons based on the percentage instead of the absolute number of high concentration receptors within each one. This effectively adjusts for the fact that certain polygons, e.g., polygons 1 and 2, are likely to have more high concentration receptors than others, e.g., polygon 5, just by virtue of the fact that the receptors in those polygons are spaced more closely together. The results of this analysis are summarized in Table 2 below. Polygon 3 is still ranked the highest. However, polygon 5 is ranked second-highest instead of polygon 2, which drops to third-highest – displacing polygon 1 from the top three.

Table 2. Percentage of high concentration receptors in DNR's polygons.

	Polygon 1	Polygon 2	Polygon 3	Polygon 4	Polygon 5
% of Receptors >90 ug/m^3	15	44	67	14	62
Ranking: 3>5>2>1>4					

A better way to eliminate the counting bias resulting from DNR's use of a telescoping receptor grid is to replace the telescoping grid with a uniform grid so the receptor spacing is the same in all five polygons. To determine how this would affect receptor counts and polygon ranks, we re-ran DNR's model using a uniform 250-meter receptor spacing and analyzed the results using DNR's methodology. The results are shown in Figure 3 below, and the number of high concentration receptors in each polygon and the ranking of polygons from highest to lowest in terms of the number of high concentration receptors they contain are summarized in Table 3 below. We also ranked the polygons based on the percentage instead of the absolute number of

Exhibit 2

high concentration receptors within each one. The results of this analysis are summarized in Table 4 below.

Figure 3. DNR model results for uniform 250-meter receptor grid.

Table 3. Number of high concentration receptors in DNR's polygons when modeled with a uniform receptor grid.

	Polygon 1	Polygon 2	Polygon 3	Polygon 4	Polygon 5
# of Receptors >90 ug/m^3	10	20	63	7	22
Ranking: 3>5>2>1>4					

Table 4. Percentage of high concentration receptors in DNR's polygons when modeled with a uniform receptor grid.

	Polygon 1	Polygon 2	Polygon 3	Polygon 4	Polygon 5
% of Receptors >90 ug/m^3	14	45	55	16	39
Ranking: 3>2>5>4>1					

Exhibit 2

When modeled with a uniform receptor grid, the three highest ranking polygons – both in terms of the number and percentage of high concentration receptors they contain – are 2, 3 and 5, **not** 1, 2 and 3 as DNR’s flawed analysis concluded. These are the areas predicted to have the highest modeled impacts and thus where SO_2 monitoring sites should be located. An analysis of the top 10, 25, and 50 receptors supports this conclusion. All but one of the top 10 receptors are located within polygon 3, all but one of the top 25 receptors are located within polygons 2 and 3, and all but one of the top 50 receptors are located within polygons 2, 3 and 5. This is shown in Figure 4 below, which includes a filled contour plot of modeled design values that clearly shows how much larger the peak concentration areas are in polygons 2, 3 and 5 compared to the other polygons.

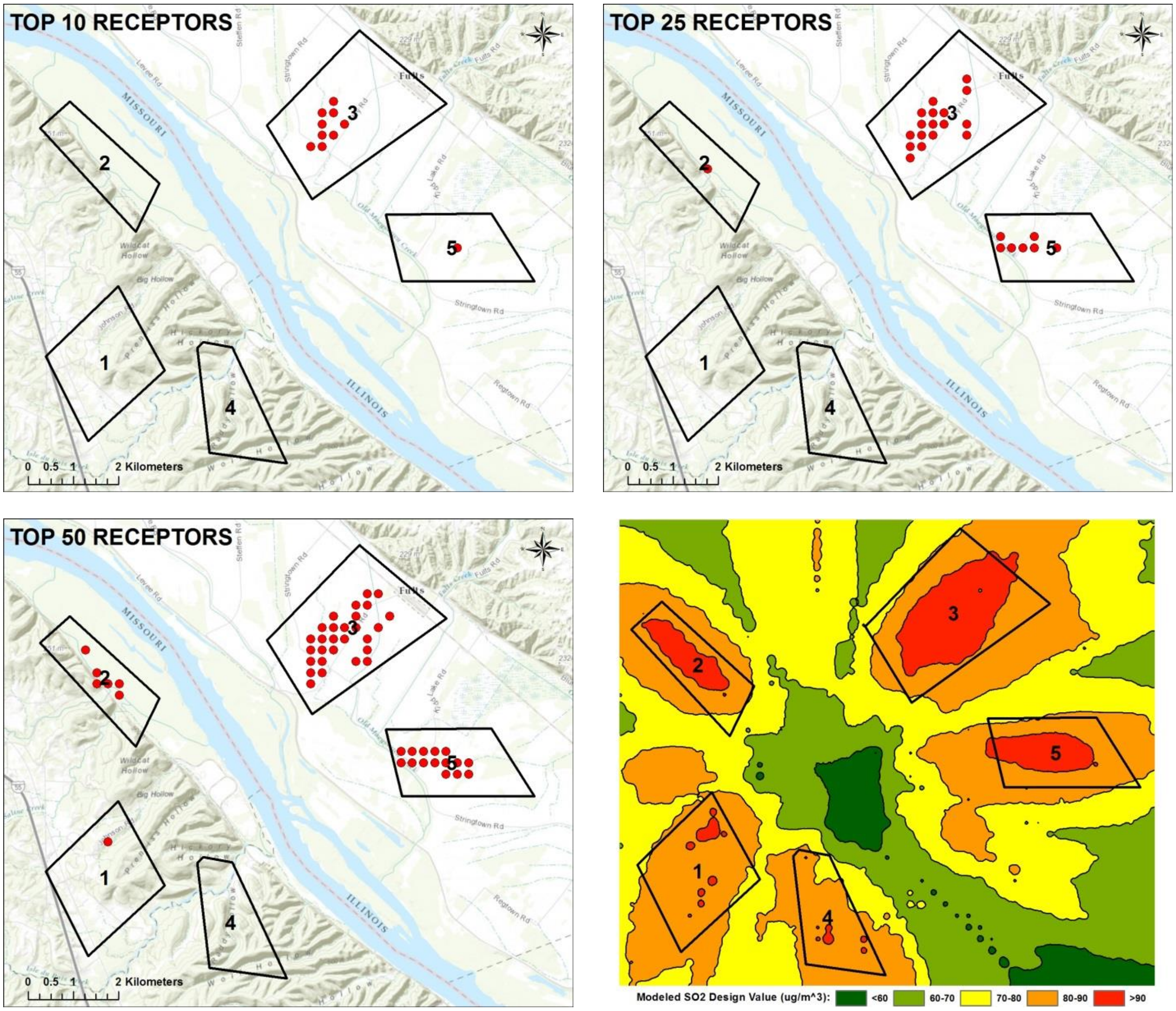


Figure 4. Top 10, 25 and 50 receptors and filled contour plot of modeled design values.

Exhibit 2

The locations of Ameren's proposed SO_2 monitoring sites – dubbed Fults, Natchez and Weaver-AA – relative to DNR's polygons are shown in Figure 5 below. Of the three proposed sites, only the Fults site, which is inside the peak concentration area within polygon 3, is properly located. The Weaver-AA site, which Figure 2 of Monitoring Network Plan Appendix 5 incorrectly shows being within polygon 2, is actually located outside of it based on the site coordinates provided in Plan Appendix 1. Hence it is not properly located. Nor is the Natchez site, which should be located within polygon 5 instead of polygon 1 because polygon 5 has higher modeled impacts.

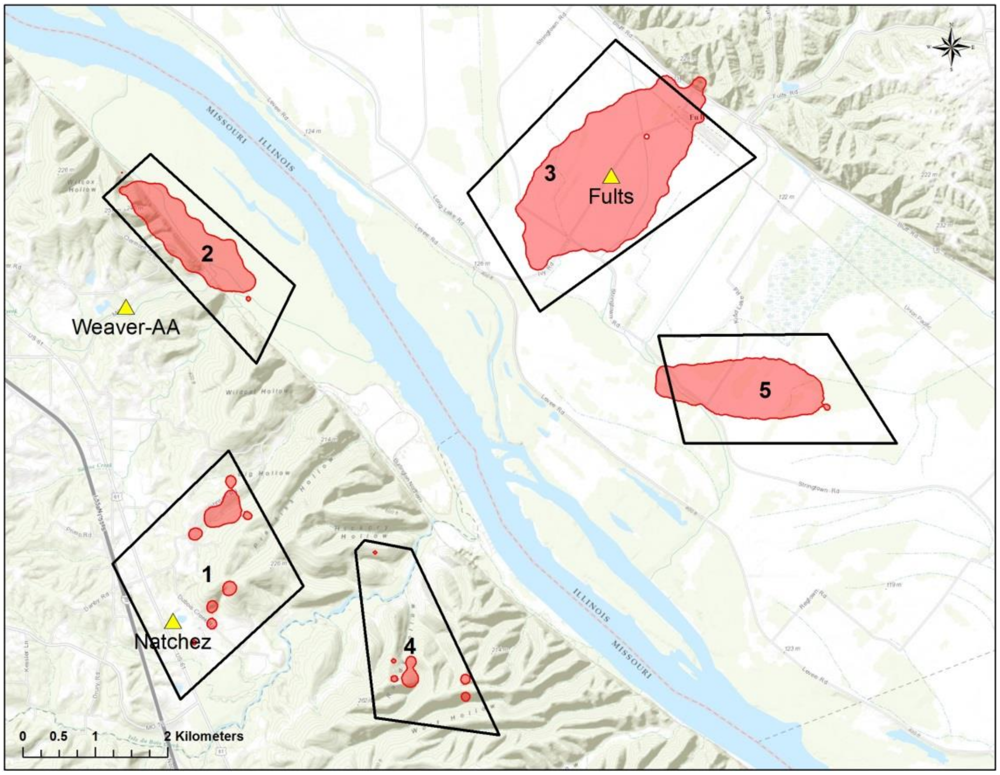


Figure 5. Ameren's proposed SO_2 monitoring sites relative to DNR's polygons. Peak concentration areas (>90 ug/m^3) are shaded red.

Because they are not properly located, neither the Natchez nor Weaver-AA monitoring sites will adequately represent Rush Island's SO_2 air quality impact. Therefore, both sites should be relocated. The Weaver-AA site should be located inside the peak concentration area within polygon 2 and the Natchez site should be located inside the peak concentration area within polygon 5 as shown in Figure 6 below. Alternatively, the Natchez site could be moved inside the peak concentration area within polygon 1 and a fourth monitor added inside the peak concentration area within polygon 5 as shown in Figure 7 below. The recommended monitor locations shown in Figures 6 and 7 are easily accessible and appear to meet EPA siting criteria and have ready access to power.

Exhibit 2

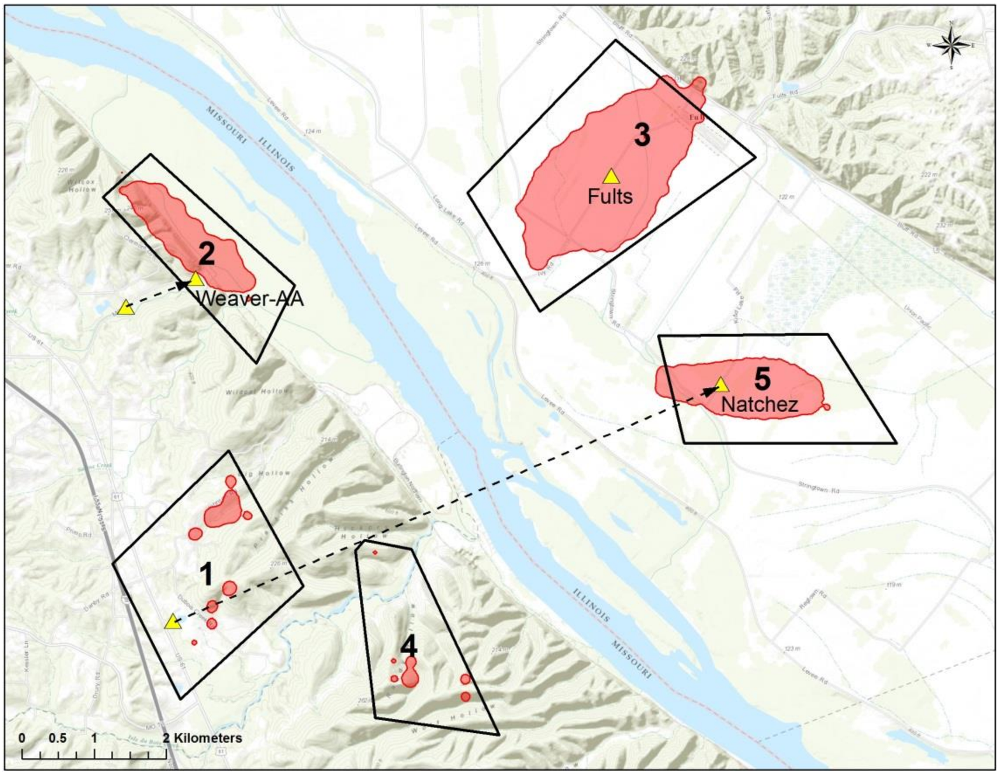


Figure 6. Appropriately located Rush Island monitors (three monitor configuration).

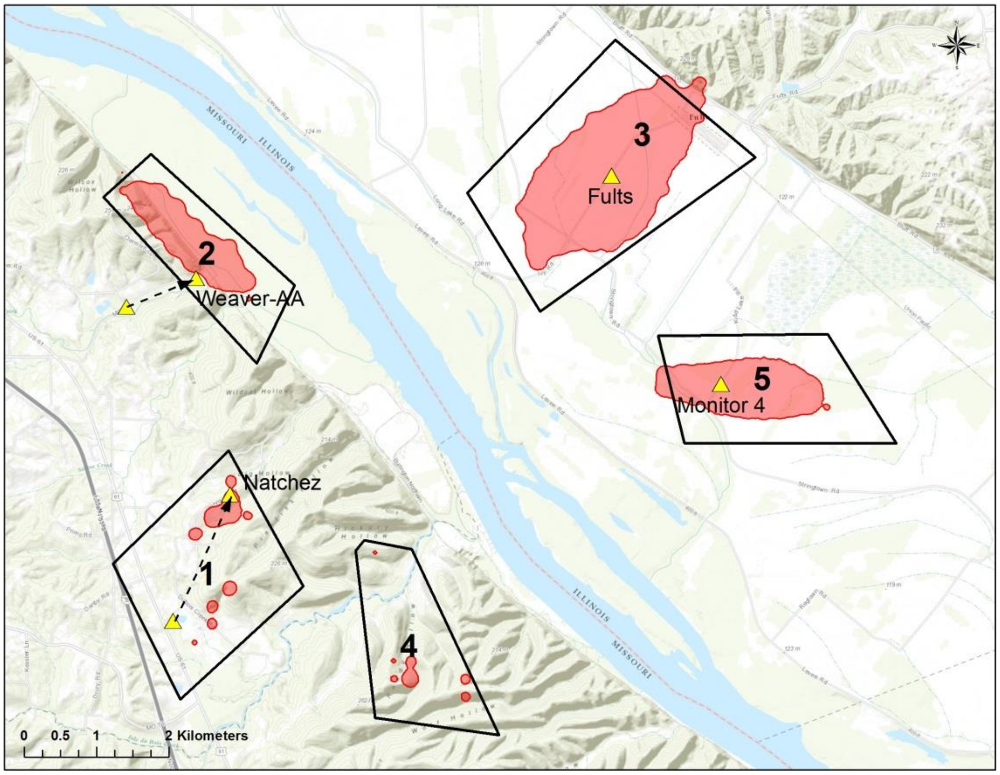


Figure 7. Appropriately located Rush Island monitors (four monitor configuration).

Exhibit 2

IV. Conclusion

For the reasons set forth above, DNR should withdraw the proposed Labadie SO_2 monitoring sites and EPA should not approve the 2015 Monitoring Network Plan with the inclusion of such sites pending the completion of the Labadie area designation process and the performance of appropriate modeling to determine the areas of peak ambient SO_2 concentrations around the plant using current EPA guidance. With respect to the Rush Island monitoring sites in the 2015 Monitoring Network Plan (and the Labadie monitoring sites if DNR does not withdraw them), DNR should not submit the plan to EPA, and EPA should not approve it, unless and until the proposed monitoring sites are relocated to areas of expected peak ambient SO_2 concentrations.

Sincerely yours,

Maxine I. Lipeles

Maxine I. Lipeles, Co-Director
Kenneth Miller, P.G., Environmental Scientist
Interdisciplinary Environmental Clinic
Washington University School of Law
One Brookings Drive – CB 1120
St. Louis, MO 63130
314-935-5837 (phone); 314-935-5171 (fax)
milipele@wustl.edu

Attorneys for the Sierra Club

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Josh Tapp, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Wendy Vit, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

Exhibit 3

Washington University in St. Louis
SCHOOL OF LAW

Interdisciplinary Environmental Clinic

August 11, 2015

Mr. Stephen Hall
Chief, Air Quality Analysis Section
Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102
Via email to: stephen.hall@dnr.mo.gov

Re: Supplemental Comments on 2015 Monitoring Network Plan

Dear Mr. Hall:

On behalf of the Sierra Club, we submit these supplemental comments on the Missouri Department of Natural Resources' ("DNR") proposed 2015 Monitoring Network Plan.[1] We previously submitted comments on the plan on July 20, 2015, urging DNR to refrain from proposing new sulfur dioxide ("SO_2") monitoring sites near Ameren's Labadie power plant until EPA completes an area designation for the plant by July 2016.

These supplemental comments are based on new information provided in DNR's proposed 2010 1-Hour Sulfur Dioxide Standard, Proposed Options for Area Boundary Recommendations, July 2016 Designations.[2] This information includes new modeling of Labadie's emissions performed by DNR, as well as new wind climatology data from a recently-installed meteorological monitoring station near the plant. The new DNR modeling confirms that at least one of the two new Labadie SO_2 monitoring sites is unlikely to capture maximum ambient SO_2 concentrations because it is not located in an area where peak SO_2 concentrations are expected to occur. The new wind climatology data calls into doubt the siting of the other Labadie SO_2 monitoring site as well and suggests that neither monitor may be appropriately sited for use in future NAAQS compliance evaluations. This further demonstrates why DNR should wait until EPA completes an area designation for Labadie before proposing new SO_2 monitoring sites near the plant.

I. New Modeling By DNR Confirms That The Valley Monitoring Site Is Not Located In An Area Where Peak SO_2 Concentrations Are Expected To Occur.

As described in our July 20, 2015 comments on the proposed 2015 Monitoring Network Plan, Ameren's modeling of Labadie's emissions for purposes of locating the new monitoring sites

---

[1] DNR, 2015 Monitoring Network Plan, June 12, 2015, available at http://dnr.mo.gov/env/apcp/docs/2015-monitoring-network-plan.pdf.

[2] DNR, 2010 1-Hour Sulfur Dioxide Standard, Proposed Options For Area Boundary Recommendations, July 2016 Designations, July 24, 2015 ("2016 Area Boundary Recommendations"), available at http://dnr.mo.gov/env/apcp/docs/2010-so2-options-for-july-2016-desig-aug-27-2015-pub-hrg.pdf.

Exhibit 3

identified three distinct areas where peak SO_2 concentrations are expected to occur. These areas, demarcated by orange and red receptors, are located northwest, northeast, and southeast of the plant and are shown in Figure 1 below. However, only one of the two new monitoring sites – the Northwest site – is located in a peak concentration area as modeled by Ameren. The Valley monitoring site is located between the other two Ameren-modeled peak concentration areas, in an area where the modeled concentration is only about 80 percent of the maximum concentration predicted by Ameren's model.

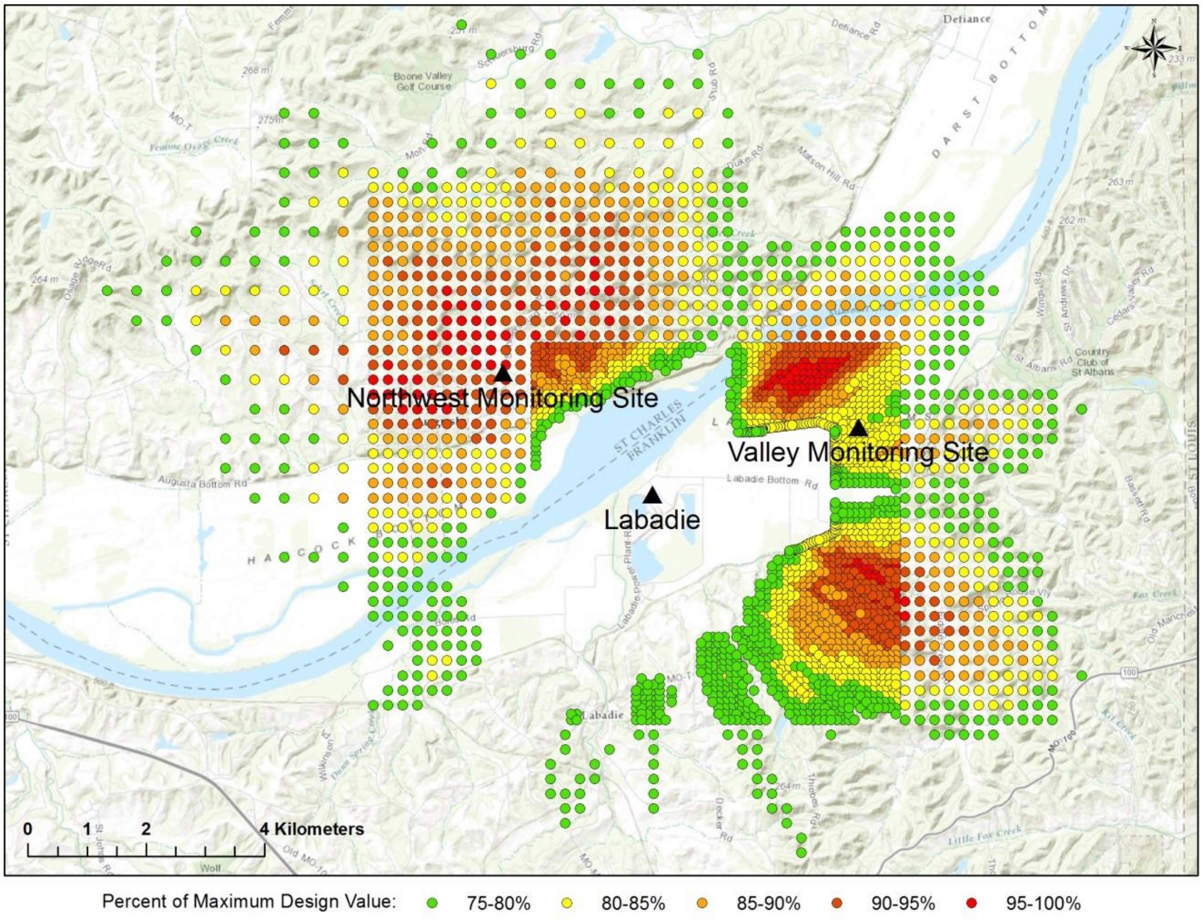


Figure 1. Expected peak SO_2 concentration areas per Ameren's modeling.

Moreover, Ameren's modeling was inconsistent with EPA guidance. In more detailed comments we submitted to DNR on April 13, 2015 critiquing Ameren's proposed monitoring site locations,[3] we noted that Ameren had failed to adhere to EPA's source-oriented SO_2 monitoring guidance in its modeling of the plant's emissions and therefore may have failed to correctly identify areas where peak concentrations are expected to occur. In particular, Ameren's modeling

---

[3] These comments were attached to and incorporated by reference into our July 20 comments on the 2015 Monitoring Network Plan.

Exhibit 3

used constant emission rates instead of hourly emission rates as recommended by EPA.[4] Using hourly emission rates, which are readily available from EPA's online Air Markets Program Data tool, allows areas where peak SO_2 concentrations are expected to occur to be determined with greater confidence because the interaction between hourly emissions and hourly variations in meteorological parameters is accounted for by the model. This interaction is ignored when constant emission rates are used.

In its recently-proposed 2010 1-Hour Sulfur Dioxide Standard, Proposed Options for Area Boundary Recommendations, July 2016 Designations ("2016 Area Boundary Recommendations"), DNR describes the modeling of Labadie's emissions that it performed for purposes of making an SO_2 area designation and boundary recommendation to EPA for the area around the plant. DNR's modeling is identical to Ameren's in most respects and uses meteorological data from the same National Weather Service site (Jefferson City Memorial Airport in Jefferson City, MO).[5] However, unlike Ameren, DNR used hourly emission rates per EPA guidance in its modeling. The peak concentration areas, demarcated by orange and red receptors, predicted by DNR's model are shown in Figure 2 (see next page). DNR's receptors violating the 2010 1-hour SO_2 NAAQS are shown in Figure 3 (see page 5).

DNR's modeling, as illustrated by Figures 2 and 3, confirms that the Valley monitoring site is not located in an area where peak SO_2 concentrations are expected to occur. To the contrary, the Valley site is in an area where the modeled concentration is less than 75 percent of the maximum concentration predicted by DNR's model. DNR's modeling also confirms that there is an expected peak concentration area southeast of the plant with considerably higher modeled SO_2 design values than at the Valley monitoring site, yet with no monitor. DNR's model predicts NAAQS exceedances in this other area, but not at the Valley site.

In summary, DNR's modeling – which, unlike Ameren's, adhered to EPA guidance as to the use of variable hourly emission rates – makes clear that the Valley site is not an appropriate location for an SO_2 monitor.

II. New Wind Climatology Data From the Valley Monitoring Site Demonstrates The Need To Collect Additional On-Site Meteorological Data Before DNR Proposes New SO_2 Monitors Near The Labadie Plant.

The Valley monitoring site, which began operating in April, includes both an ambient SO_2 monitor and a meteorological monitoring station that monitors various meteorological parameters including horizontal wind speed and direction. Preliminary data from the Valley meteorological monitoring station for the period April 22 – July 13, 2015 is included in Appendix F of DNR's 2016 Area Boundary Recommendations. Analysis of this data suggests

---

[4] U.S. EPA, SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, Dec. 2013 Draft, at 11, referencing U.S. EPA, SO2 NAAQS Designations Modeling Technical Assistance Document, Dec. 2013 Draft, at 10, available at http://epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf.

[5] DNR's modeling includes an emergency diesel generator at Labadie and a pair of interactive sources south of the plant that were not included in Ameren's modeling. However, these sources have very low emissions and do not contribute significantly to modeled concentrations near the plant.

Exhibit 3

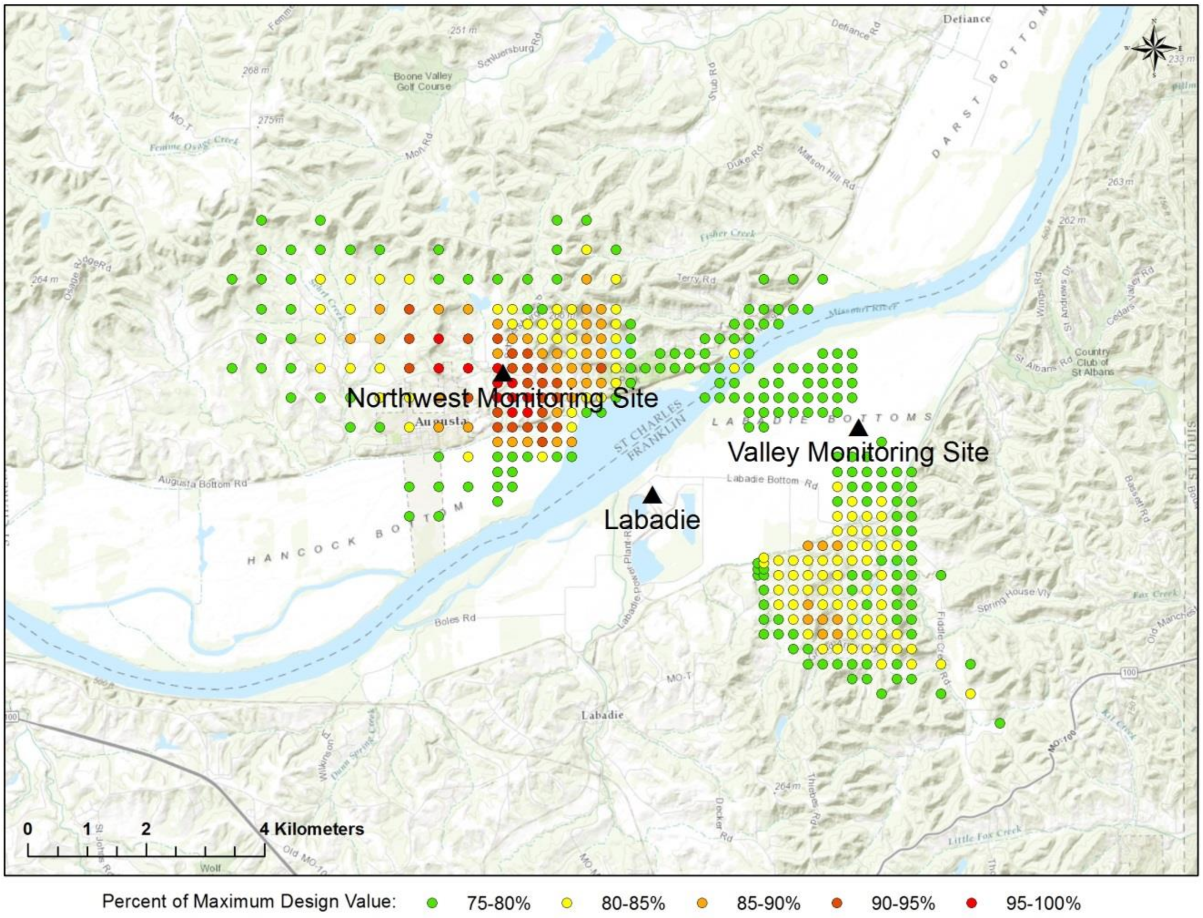


Figure 2. Expected peak SO_2 concentration areas per DNR's modeling.

that the surface meteorological data used in both Ameren's and DNR's modeling of Labadie's emissions may not be representative of the area.

Ameren and DNR both used surface meteorological data from the Jefferson City Memorial Airport ("KJEF"), located approximately 115 kilometers west of Labadie, in their modeling of the plant's emissions instead of data from the much closer Spirit of St. Louis Airport ("KSUS"), located just 19 kilometers northeast of the plant. In making the decision to use KJEF instead of KSUS surface meteorological data, DNR relied exclusively on a comparison of surface characteristics (surface roughness, Bowen ratio, and albedo) at each airport to surface conditions at Labadie. Despite stating in its 2016 Area Boundary Recommendations that "other meteorological parameters, including wind speed and direction as influenced by terrain, must also be used when choosing a representative meteorological site,"[6] DNR did not compare available wind climatology data from the Valley monitoring site to contemporaneous wind climatology data from KJEF and KSUS to see which airport's winds are most similar to those at Labadie.

---

[6] 2016 Area Boundary Recommendations at D-2.

Exhibit 3

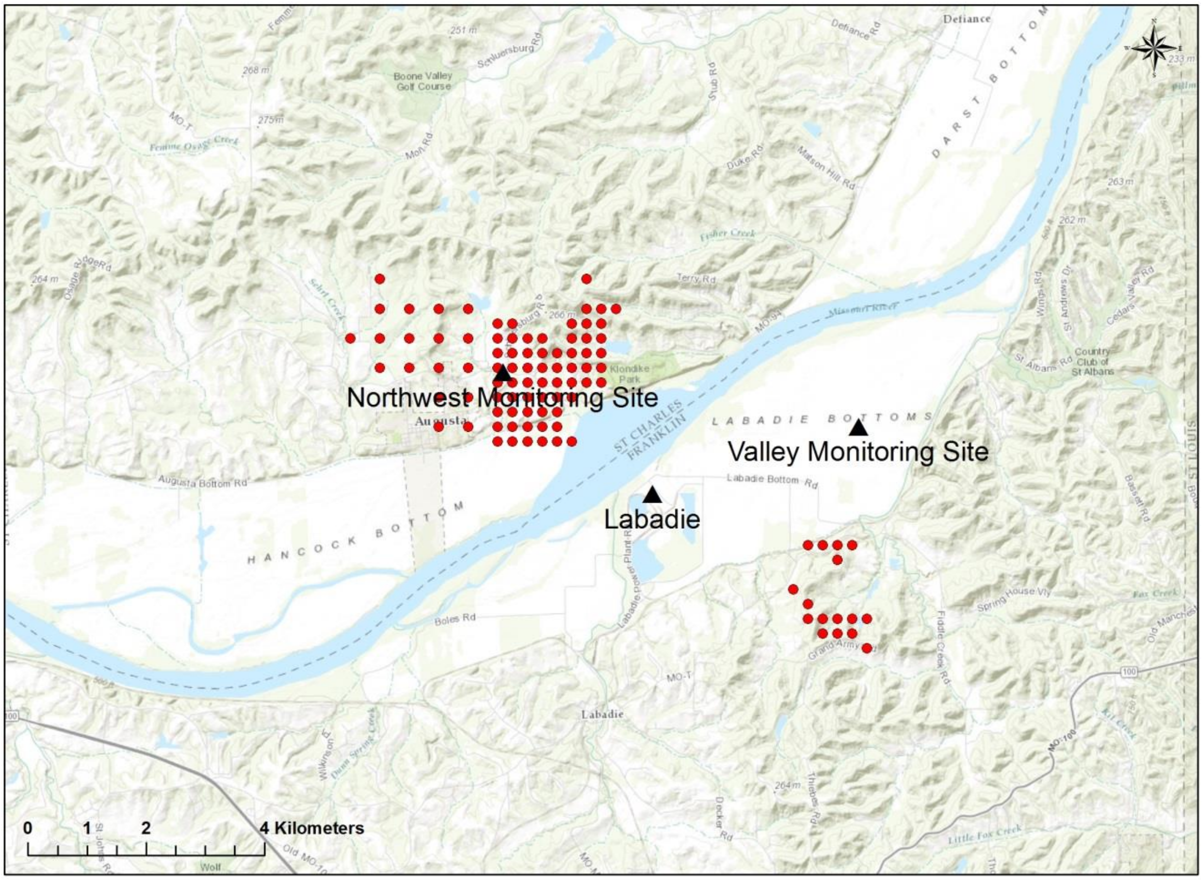


Figure 3. DNR receptors violating the 2010 1-hour SO_2 NAAQS.

Figures 4 and 5 (see next page) show the wind rose for the Valley monitoring site compared to the wind roses for KSUS and KJEF, respectively, for the period April 22 – July 13, 2015. As illustrated by Figures 4 and 5, during the first few months the Valley meteorological monitoring station was in operation, the most frequent winds at both Labadie and KSUS were from the south, south-southwest, and southwest, whereas the most frequent winds at KJEF were from the east and east-southeast. Furthermore, the strongest winds at both Labadie and KSUS were generally from the predominant wind directions whereas the strongest winds at KJEF were from the south and south-southwest, orthogonal to the predominant wind directions.

Therefore, the preliminary meteorological data from the Labadie area suggest that the winds at Labadie may be more similar to the winds at KSUS than the winds at KJEF, which in turn suggests that KSUS surface meteorological data may be more representative of the area and more appropriate for modeling Labadie’s emissions than KJEF data.

Exhibit 3

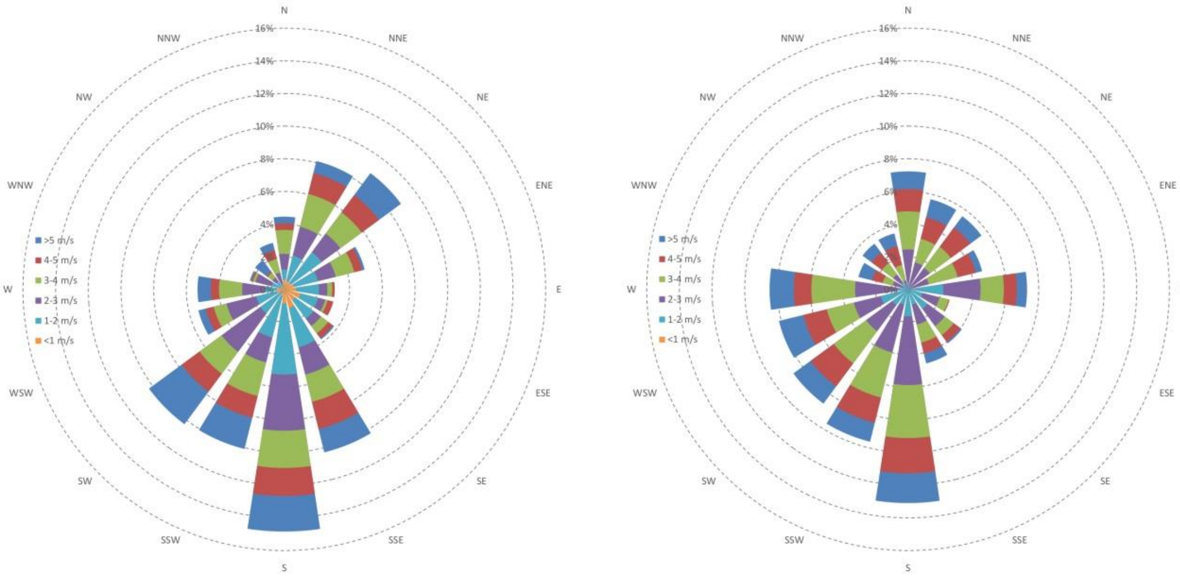


Figure 4. Valley monitoring site (left) and KSUS (right) wind rose comparison.

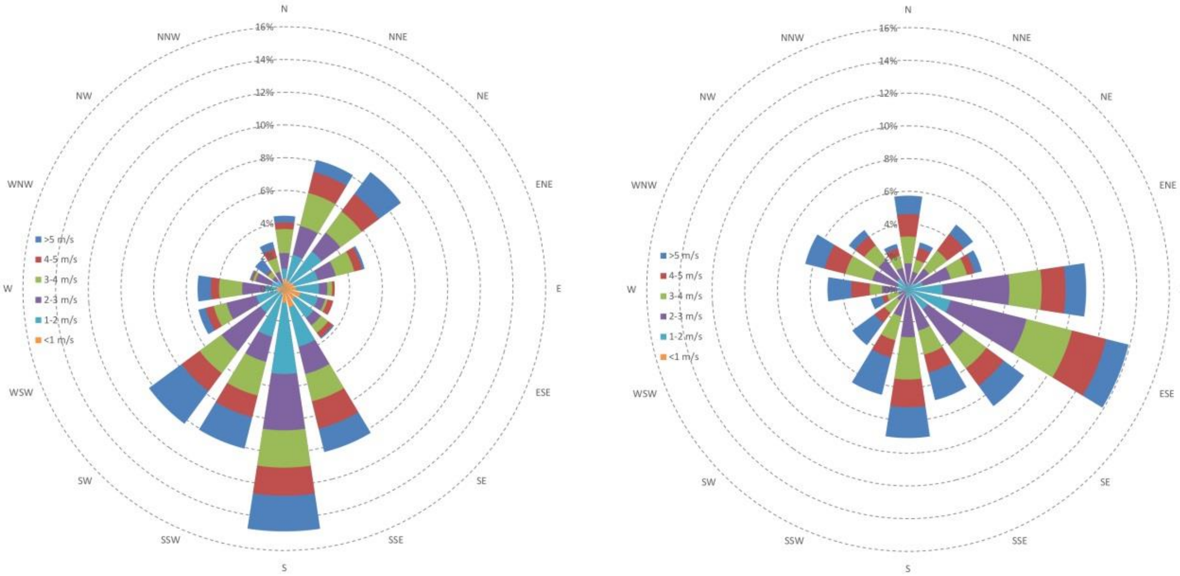


Figure 5. Valley monitoring site (left) and KJEF (right) wind rose comparison.

Figure 6 (see next page) shows peak concentration areas, demarcated by orange and red receptors, predicted by DNR’s model when KSUS surface meteorological data is used instead of KJEF data. The results are striking; *if KSUS data is in fact more representative of the area than KJEF data, then neither the Valley monitoring site nor the Northwest monitoring site is located in an area where peak SO_2 concentrations are expected to occur and neither is appropriately sited for use in future NAAQS compliance evaluations*.

Exhibit 3

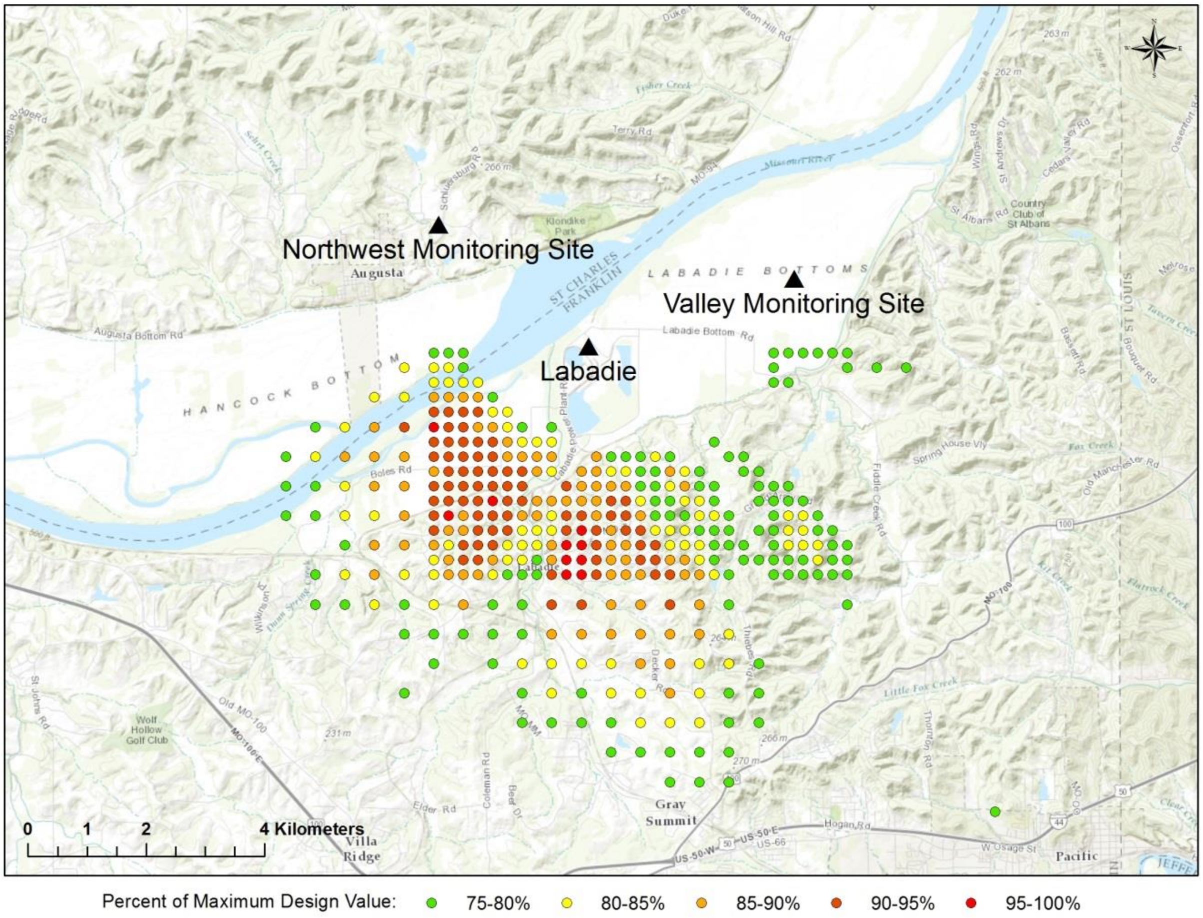


Figure 6. Expected peak SO_2 concentration areas per DNR's modeling using KSUS instead of KJEF surface meteorological data.

We recognize that the wind climatology data from the Valley meteorological monitoring site included in Appendix F of DNR's 2016 Area Boundary Recommendations is not yet quality assured and that, given the short-term nature of the data, it is by no means certain that the winds at Labadie will prove to be more similar to the winds at KSUS than at KJEF over the long term. However, this only demonstrates further why DNR should wait until EPA completes an area designation for Labadie before proposing new SO_2 monitoring sites near the plant. EPA must make a final area designation for the plant by July 2016.[7] By that time, DNR will have over a year of on-site meteorological data from the Valley monitoring site and a second meteorological monitoring station at the nearby Osage Ridge monitoring site,[8] which it can then use to model Labadie's emissions for monitor-siting purposes or to make a more definitive determination regarding which airport site has the most representative meteorological data and should be used in such modeling.

---

[7] *Sierra Club v. Gina McCarthy*, No. 3:13-cv-3953-SI (Consent Decree, March 2, 2015).

[8] No data from the Osage Ridge site was included in the 2016 Area Boundary Recommendations so it is unknown how winds at the site compare to winds at the Valley monitoring site, KSUS, or KJEF.

Exhibit 3

Conclusion

For the reasons set forth above and in our July 20 comments on the 2015 Monitoring Network Plan, DNR should withdraw both of the new Labadie SO_2 monitoring sites pending the completion of the Labadie area designation process, the collection of additional on-site meteorological data from the Valley and Osage Ridge meteorological monitoring stations, and the performance of additional modeling using the most representative surface meteorological data to determine the areas of expected peak ambient SO_2 concentrations around the plant. Furthermore, EPA should not approve the 2015 Monitoring Network Plan with the inclusion of the new Labadie SO_2 monitoring sites and should reject it pending their withdrawal by DNR.

Sincerely yours,

Maxine I. Lipeles

Maxine I. Lipeles, Director
Kenneth Miller, P.G., Environmental Scientist
Interdisciplinary Environmental Clinic
Washington University School of Law
One Brookings Drive – CB 1120
St. Louis, MO 63130
314-935-5837 (phone); 314-935-5171 (fax)
milipele@wustl.edu

Attorneys for the Sierra Club

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Josh Tapp, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Wendy Vit, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

Exhibit 4

Washington University in St. Louis

SCHOOL OF LAW

Interdisciplinary Environmental Clinic

September 3, 2015

Ms. Wendy Vit
Chief, Air Quality Planning Section
Air Pollution Control Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176
Via email to apcpsip@dnr.mo.gov

Re: 2010 1-Hour Sulfur Dioxide Standard, Proposed Options for Area Boundary Recommendations, July 2016 Designations

Dear Ms. Vit:

On behalf of the Sierra Club, we submit the following comments on the 2010 1-Hour Sulfur Dioxide Standard, Proposed Options for Area Boundary Recommendations, July 2016 Designations.[1] We strongly urge the Department of Natural Resources ("DNR") to propose and the Air Conservation Commission to adopt and submit to the Environmental Protection Agency ("EPA") a recommended designation of nonattainment based on modeling for the Ameren Labadie Energy Center in Franklin County, Missouri.

The Labadie plant is far-and-away the largest source of SO_2 pollution in the state. It is calculated to be responsible for more premature deaths than any other coal plant in the nation without scrubbers.[2] While Ameren has installed scrubbers – which are long-proven, highly-effective SO_2 controls – on its Sioux plant, it appears to be spending considerable money on consultants and poorly-sited monitors to try to avoid installing scrubbers at Labadie.

Because three years of source-oriented monitoring data are not available for the Labadie plant, the designation must be based on modeling in order to meet the July 2016 deadline in the March 2, 2015 federal Consent Decree for the next round of sulfur dioxide ("SO_2") designations.[3] DNR's modeling demonstrates that the area surrounding the Labadie plant is not attaining the 2010 1-hour SO_2 national ambient air quality standard ("NAAQS") based on the most recent three years of the Labadie plant's actual emissions.

---

[1] DNR, 2010 1-Hour Sulfur Dioxide Standard, Proposed Options for Area Boundary Recommendations, July 2016 Designations, July 24, 2015("Proposed 2016 Designation Options"), available at http://dnr.mo.gov/env/apcp/docs/2010-so2-options-for-july-2016-desig-aug-27-2015-pub-hrg.pdf.

[2] Environmental Integrity Project, *Net Loss: Comparing the Cost of Pollution vs. the Value of Electricity from 51 Coal-Fired Plants* (June 2012) at i-ii.

[3] *Sierra Club v. McCarthy*, No. 3:13-cv-3953-SI, Consent Decree filed March 2, 2015, available at http://www.epa.gov/so2designations/pdfs/201503FinalCourtOrder.pdf.

Exhibit 4

DNR's alternative option of an unclassifiable designation is not appropriate because unclassifiable only applies when there is insufficient data to support a nonattainment or attainment decision, and in this case DNR's modeling provides ample data to support a nonattainment designation. Ameren's suggestion that the area be designated attainment is directly refuted by DNR's modeling. Ameren's consultant made numerous questionable changes to DNR's modeling approach, without providing adequate justification or obtaining the necessary approval from EPA, for the apparent purpose of obtaining an attainment result. Ameren's modeling should be disregarded.

I. The Area Around The Labadie Energy Center Must Be Designated Nonattainment.

When the U.S. Environmental Protection Agency ("EPA") established the 1-hour SO_2 NAAQS in 2010, it emphasized the value of modeling in making area designations.

> [I]n areas without currently operating monitors but with sources that might have the potential to cause or contribute to violations of the NAAQS, we anticipate that the identification of NAAQS violations and compliance with the 1-hour SO2 NAAQS would primarily be done through refined, source-oriented air quality dispersion modeling analyses …
>
> Compared to other NAAQS pollutants, we would not consider ambient air quality monitoring alone to be the most appropriate means of determining whether all areas are attaining a short-term SO_2 NAAQS. Due to the generally localized impacts of SO_2, we have not historically considered monitoring alone to be an adequate, nor the most appropriate, tool to identify all maximum concentrations of SO_2.[4]

While EPA allows the use of modeling or monitoring to support a designation, a monitoring approach is only valid when it is based on three years of quality-assured data from appropriately-sited monitors.[5] Because the monitors at the Labadie plant[6] did not begin operating until April 2015, and the Consent Decree requires EPA to make an SO_2 designation for the Labadie plant by July 2, 2016, the Labadie designation must be based on modeling, not monitoring. EPA recognized this in Guidance issued shortly after the Consent Decree became final:

---

[4] EPA, Primary National Ambient Air Quality Standard for Sulfur Dioxide, Final Rule, 75 Fed. Reg. 35520, 35551 (June 22, 2010).

[5] EPA, Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS), Final Rule, 80 Fed. Reg. 51052 (Aug. 21, 2015); EPA, Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard (Mar. 20, 2015) ("Updated SO_2 Designations Guidance"), available at http://www.epa.gov/airquality/sulfurdioxide/pdfs/20150320SO2designations.pdf.

[6] The SO_2 monitors that Ameren recently constructed near the Labadie plant are not sited in areas of expected peak SO_2 concentrations and their locations were not approved by EPA. Therefore, the data they are generating should not in any event be relied upon for regulatory decisions. See comments previously submitted to DNR on behalf of the Sierra Club regarding the Ameren's "Labadie Sulfur Reduction Quality Assurance Project Plan," (Apr. 1, 2015), DNR's 2015 Monitoring Network Plan (July 20, 2015), and supplemental comments regarding the 2015 Monitoring Network Plan (Aug. 11, 2015). Copies of those letters are attached hereto as Exhibits 1, 2, and 3.

Exhibit 4

> We recognize that the timeline for designations by July 2, 2016, does not provide for establishment and use of data from new ambient monitors. Therefore, **we anticipate that in many areas the most reliable information for informing these designations will be source modeling**. The EPA has issued guidance on the use of source modeling for this purpose in the SO_2 NAAQS Designations Modeling Technical Assistance Document (Modeling TAD).[7]

Pursuant to EPA Guidance,[8] DNR performed dispersion modeling that compels a nonattainment designation. According to DNR:

> The area containing the Ameren Labadie Energy Center models violations of the 2010 1-hour SO_2 standard using actual emissions.[9]

Using 9 ppb as the regional background concentration, DNR's "maximum modeled concentration for the area was 234.5 µg/m^3 or 89 ppb, which is not in compliance with the 1-hour SO_2 standard of 75 ppb."[10] DNR also considered using the Mott Street monitor in Herculaneum for "a more conservative background concentration" of 18 ppb, which "would yield a maximum modeled concentration of 98 ppb."[11]

Sierra Club retained a modeling consultant to conduct independent modeling regarding the Labadie plant. Modeling performed by Wingra Engineering confirms that the area around the Labadie plant violates the 1-hour SO_2 NAAQS.[12]

Pursuant to section 107(d)(1) of the Clean Air Act and EPA guidance applicable specifically to the 1-hour SO_2 NAAQS, the area around the Labadie plant must be designated nonattainment.

II. The Unclassifiable Option in DNR's Proposal is Inappropriate.

The unclassifiable designation applies only "[i]n the absence of information clearly demonstrating a designation of 'attainment' or 'nonattainment.'"[13] Because DNR's modeling

---

[7] Updated SO_2 Designations Guidance at 3 (emphasis supplied).

[8] Updated SO_2 Designations Guidance and EPA, SO_2 NAAQS Designations Modeling Technical Assistance Document ("Modeling TAD"), available at http://www.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf.

[9] Proposed 2016 Designation Options at 26.

[10] *Id.* at 27.

[11] *Id.*

[12] The Wingra Engineering modeling report is submitted herewith as Exhibit 4. Wingra Engineering determined that meteorological data from the Spirit of St. Louis airport was more representative of site conditions than the Jefferson City airport data used by DNR in its modeling. Although the NAAQS exceedances modeled by Wingra Engineering are almost identical to those modeled by DNR, the area boundaries based on Wingra's modeling would differ in part from those proposed by DNR. The geographic scope of the appropriate nonattainment area boundary is discussed below.

[13] Updated SO_2 Designations Guidance at 5.

Exhibit 4

demonstrated NAAQS violations near the Labadie plant compelling a nonattainment designation, the unclassifiable option in DNR's proposal is inapplicable and inappropriate.

DNR's unclassifiable option relies on (1) three months of not quality-assured data from monitors recently constructed by Ameren near the Labadie plant and (2) monitoring data from long-inactive monitors that documented high concentrations of SO_2. DNR's suggestion that the monitoring data casts doubt on the conclusions of its modeling falls far short of the mark.

First, the Labadie monitoring data cannot and do not undermine the nonattainment designation compelled by DNR's modeling. *Three months* of preliminary data from the new Labadie monitors are meaningless; *three years* of quality-assured monitoring data are required in order to determine whether an area complies with the 1-hour SO_2 NAAQS.[14] Accordingly, EPA Guidance recognizes that modeling, not monitoring, will be the principal basis for making designations for areas subject to the July 2016 deadline.[15]

In addition, the fact that Ameren's Labadie monitors have not recorded any SO_2 concentrations above the NAAQS during their first three months of operation should come as no surprise to DNR. Using the MAXDAILY output option, DNR's modeling – which documents nonattainment for a three-year period – predicts no NAAQS exceedances during the three-month time period of the Labadie monitoring data in any of the modeled years at Ameren's Northwest monitoring site, and no NAAQS exceedances in two of the three modeled years (2013 and 2014) at Ameren's Valley monitoring site.

Moreover, the data from Ameren's Labadie monitors should not be relied upon for NAAQS compliance purposes because the monitors are not sited in areas of expected peak concentrations. The modeling conducted by DNR for the Proposed 2016 Designation Options (after Ameren sited its Labadie monitors) makes clear that the Valley monitor is not sited in an area of expected peak concentrations. Furthermore, preliminary meteorological data collected by Ameren at the Valley monitoring site suggests that the meteorological data used in DNR's modeling[16] is not as representative of site conditions as meteorological data collected at the Spirit of St. Louis Airport. Modeling conducted with meteorological data from the Spirit of St. Louis Airport demonstrates that neither of Ameren's monitors is located in an area of expected peak concentrations.[17]

Second, monitoring data from the long-inactive Augusta and Augusta Quarry SO_2 monitors similarly fail to undermine the nonattainment designation required by DNR's modeling. There is no indication that either of those monitors was sited in areas of expected peak concentrations caused by the Labadie plant's emissions. To the contrary, DNR's modeling indicates that they were not sited in areas of expected peak concentrations associated with Labadie's emissions. This is shown in Figure 1, below.

---

[14] The form of the 1-hour SO_2 NAAQS is the three-year average of the 99th percentile of 1-hour daily maximum concentrations.

[15] Updated SO2 Designations Guidance at 3.

[16] DNR used meteorological data collected at Jefferson City Memorial Airport in its modeling.

[17] See Exhibits 1, 2, and 3 submitted herewith.

Exhibit 4

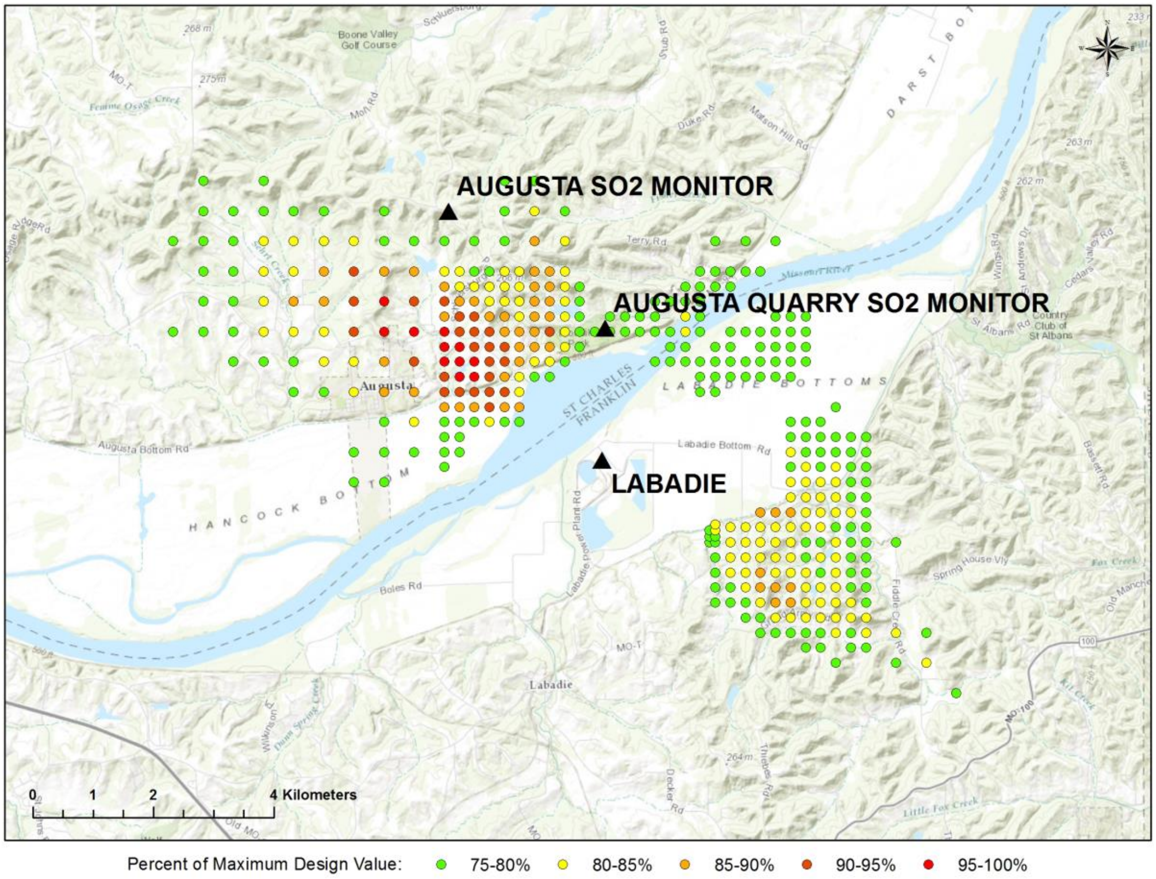


Figure 1. Augusta SO_2 monitors in relation to DNR's modeled peak concentration areas.

Furthermore, the data from the Augusta monitors reveal high 1-hour SO_2 concentrations, with consistent violations of the NAAQS. The Augusta monitor operated from July 1, 1987 until December 19, 1994. The design values for every three-year period during the monitor's operation were well above the 1-hour SO2 NAAQS – ranging from 259 ppb for 1987-1989 to 114 ppb for 1992-1994.[18] The Augusta Quarry site operated for three full years (1995-1997) and portions of two additional years (1994 and 1998). The design value for the only complete three-year period was 78 ppb, exceeding the 1-hour SO_2 NAAQS. The fourth-highest one-hour readings during two of the three complete data years were well above the 1-hour SO_2 NAAQS (86 ppb in 1995 and 80 ppb in 1997).[19]

In sum, there is no legitimate reason for an unclassifiable designation for the area around the Labadie plant.

---

[18] Proposed 2016 Designation Options, Appendix F, at F-3.

[19] *Id*. at F-2.

Exhibit 4

III. Ameren's Modeling Purporting To Support An Attainment Designation Actually Shows NAAQS Violations Near The Labadie Plant When Appropriate Inputs Are Used.

Ameren provided DNR with its own modeling using the latest release of AERMOD (v15181) that purports to support an attainment designation for the Labadie plant. We obtained a copy of Ameren's modeling data just before DNR's September 3 comment deadline, so our ability to comment on it in this letter is limited. Based on a cursory review and Ameren's consultant's description of it in his public hearing testimony at the August 27 Missouri Air Conservation Commission meeting, we believe that Ameren's modeling would actually show NAAQS violations near the Labadie plant if appropriate inputs were used. Therefore, it actually supports a nonattainment designation as DNR's option #1 proposes.

There are three key differences between Ameren's new modeling and DNR's. First, Ameren merged the emissions from Units 3 and 4 in a common stack, whereas DNR modeled the emissions from Units 3 and 4 separately. Second, Ameren used a pair of non-default beta options, ADJ_U* in AERMET and LowWind3 in AERMOD, which were added to the latest model release to address concerns regarding model performance under low wind speed conditions. Finally, Ameren used a background concentration based on a monitor in Nilwood, Illinois, that varies by season and hour-of-day instead of the uniform 9 ppb background concentration used by DNR, based on the monitor in East St. Louis.

As justification for merging the emissions from Units 3 and 4 in a common stack, Ameren cites EPA Model Clearinghouse Report 91-II-01. Model Clearinghouse Reports provide EPA's interpretation of modeling guidance as it applies to specific applications of air dispersion models. While often relevant to other, similar applications, Model Clearinghouse Reports do not serve as guidance of general applicability. EPA issues general guidance related to the Guideline on Air Quality Models ("Guideline") and technical aspects of dispersion models in formal "Clarification Memos." Furthermore, Model Clearinghouse Report 91-II-01 relates to the modeling of an unspecified stationary source using an unspecified model different from AERMOD.[20] Its relevance, if any, to the application of AERMOD to evaluate NAAQS compliance around the Labadie plant is speculative at best.[21] Therefore, it should not be relied upon as justification for merging the emissions from Units 3 and 4 in a common stack.

Regarding Ameren's use of non-default beta options in the latest release of AERMOD, EPA has acknowledged issues with the performance of AERMOD under low wind conditions and has proposed that these options be included as regulatory default options in a 2016 version of

---

[20] Development of AERMOD did not commence until 1991 and it was not adopted as EPA's preferred model for regulatory dispersion modeling until 2005. Therefore, it is inconceivable that AERMOD was used in the permit application that was the subject of Model Clearinghouse Report 91-II-01.

[21] The configuration of the stacks at the source discussed in the report was different from the configuration of the stacks at Labadie, and the report concluded that they could be merged based on an unverified assumption about the separation distance between the stacks relative to the lesser dimension of nearby structure(s), and only if the flow rates and temperatures were always the same for all three stacks. It is not known whether these conditions are met at Labadie.

AERMOD associated with a potential future final rule revising the Guideline.[22] However, they are only proposed options at this time, and EPA may or may not ultimately include either or both as regulatory defaults in the next version of AERMOD.[23] Furthermore, since they are non-default beta options in the latest release of AERMOD, their use presently requires an alternate model demonstration per Section 3.2.2 of the Guideline, which must be approved by the EPA Regional Administrator. Ameren's submission of its new modeling to DNR did not include an alternate model demonstration.

Apart from these questionable changes, the fatal flaw in Ameren's new modeling is the use of a cherry-picked "background" concentration below that used by DNR.

Ameren's background concentration is based on a monitor in Nilwood, Illinois, and varies by season and hour-of-day. This and other temporally-varying background options have been available in AERMOD since v11059. During most hours and seasons, Ameren's background concentration is significantly lower than DNR's uniform 9 ppb background concentration, which is the design value for the nearest ambient monitor (East St. Louis) based on readings for the sector with the least source influence.[24] (DNR also noted that it might be appropriate to use a more conservative background concentration of 18 ppb based on the fourth-high value of the Mott Street monitor in 2014.[25]) EPA guidance currently recommends using the overall highest hourly background SO_2 concentration from a representative monitor as a "first tier" background concentration,[26] which is a more conservative approach than DNR's. EPA's proposed revised Guideline regulations recommend using the design value as a uniform monitored background contribution across the project area, as DNR did. Ameren's use of temporally-varying background concentration does not comport with either EPA's current guidance or its proposed revised Guideline regulations.

In addition, it is noteworthy that the design value for the Nilwood monitor for the most recent three year period (2012-2014) was 9.3 ppb, slightly higher than the 9 ppb background concentration DNR used in its modeling. Previous design values for the Nilwood monitor were 8 ppb (2011-2013), 10 ppb (2010-2012), and 13 ppb (2009-2011).

The peak SO_2 concentration predicted by Ameren's new model is 73.7 ppb (approximately 193.3 ug/m^3) at a point roughly 3 kilometers northwest of the plant. This is slightly below the NAAQS, but only because Ameren used a less conservative background concentration than that used by DNR. **Using DNR's background concentration, the peak SO_2 concentration predicted by Ameren's new model exceeds the NAAQS.**

---

[22] EPA published a notice of proposed rulemaking proposing enhancements to the AERMOD dispersion modeling system and revisions to the Guideline on July 29, 2015. 80 Fed. Reg. 45399, available at http://www.gpo.gov/fdsys/pkg/FR-2015-07-29/pdf/2015-18075.pdf.

[23] George Bridgers, personal communication, September 1, 2015.

[24] Proposed 2016 Designation Options, Appendix A, at A-12.

25 Proposed 2016 Designation Options at 27.

[26] EPA, Applicability of Appendix W Modeling Guidance for the 1-hour $S0_2$ National Ambient Air Quality Standard, Aug. 23, 2010, at 3.

Exhibit 4

Ameren's new modeling appears to be "results-oriented" in that its inputs were apparently tailored to yield a desired result –the appearance of no NAAQS violations near the Labadie plant – and not to accurately determine the attainment status of the area. Most egregious is the substitution of a more favorable background concentration, in a form not sanctioned by EPA guidance or regulations, instead of the background concentration used by DNR. Ameren's request for an attainment designation based on its manipulated modeling should be rejected.

IV. DNR's Proposed Nonattainment Boundaries Should Be Modified.

In addition to recommending a designation of nonattainment around the Labadie plant, DNR should modify the proposed boundaries of the nonattainment area. Per EPA guidance, the analytical starting point for determining SO_2 nonattainment areas is county boundaries.[27] Modeled NAAQS violations due to Labadie occur in both Franklin and St. Charles Counties, making these counties the starting point for the nonattainment area boundary. Partial county boundaries are appropriate in this instance, however, due to the fairly limited geographic scope of the modeled violations. For defining partial county boundaries, EPA recommends the use of well-defined jurisdictional lines such as township borders or other geopolitical boundaries, immovable landmarks, and readily identifiable physical features.[28] DNR's proposed boundary includes only portions of the two townships containing the modeled violations – Boles Township in Franklin County and Boone Township in St. Charles County – cutting off portions of both townships along transecting roadways.[29] This results in dividing up the communities of Gray Summit and Pacific in the south and New Melle in the north, creating the potentially confusing situation where some portions of each community are inside the nonattainment area and other portions are outside. To avoid this situation, we recommend modifying the proposed boundaries of the nonattainment area to include all of Boone and Boles Townships. These townships encompass just 20 percent of the total combined area of Franklin and St. Charles Counties, and therefore represent reasonable partial county boundaries for the nonattainment area.

Alternatively, DNR should consider modifying the proposed boundaries of the nonattainment area to encompass a larger portion of northeast Franklin County, which DNR's modeling suggests encompasses most if not all modeled violations when potentially more representative meteorological data from the Spirit of St. Louis Airport in Chesterfield is used.[30] With Spirit of St. Louis Airport meteorological data, the locus of modeled violations shifts to the south and southwest of the plant. A more appropriate nonattainment area boundary based on these modeled violations would encompass Boles Township, a small portion of Boone Township (south of

---

[27] Updated SO_2 Designations Guidance at 5.

[28] *Id.* at 6.

[29] The northern portion of Boone Township is cut off by Missouri Route D and Highway 94; the southern portion of Boles Township is cut off by Interstate 44.

[30] Preliminary meteorological data from Ameren's Valley monitoring site suggest that the winds at Labadie may be more similar to the winds at Spirit of St. Louis Airport ("KSUS") in Chesterfield than the winds at Jefferson City Memorial Airport ("KJEF") in Jefferson City, which in turn suggests that KSUS surface meteorological data may be more representative of the area and more appropriate for modeling Labadie's emissions than KJEF data. See supplemental comments previously submitted to DNR on behalf of the Sierra Club regarding DNR's 2015 Monitoring Network Plan, attached hereto as Exhibit 3.

Exhibit 4

Missouri Highway 94), and the area west of Boles Township bounded by Missouri Route 47 and the municipal boundaries of Washington and Union, Missouri. This is shown in Figure 2, below.

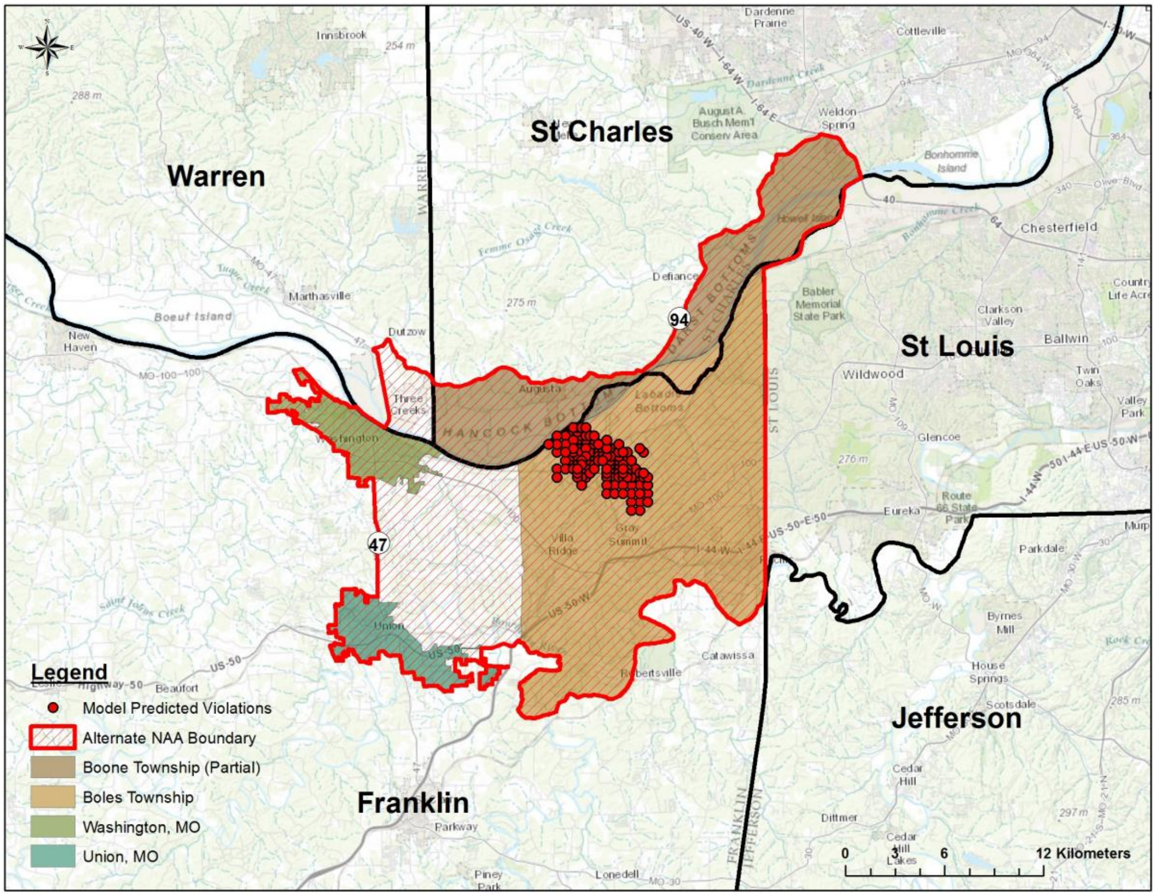


Figure 2. Alternative nonattainment area boundary based on Spirit of St. Louis Airport meteorological data.

Conclusion

We strongly urge the DNR to propose and the Air Conservation Commission to approve and submit to the EPA a recommended designation of nonattainment based on modeling for the Ameren Labadie Energy Center in Franklin County, Missouri. DNR's modeling demonstrates that the area surrounding the Labadie plant is not attaining the 2010 1-hour SO_2 national ambient air quality standard ("NAAQS") based on the most recent three years of actual emissions. This compels a nonattainment designation.

For the reasons set forth above, the unclassifiable designation option is inapplicable and inappropriate, and Ameren's suggestion for an attainment designation is fanciful.

Exhibit 4

Sincerely yours,

Maxine I. Lipeles

Maxine I. Lipeles, Director
Kenneth Miller, P.G., Environmental Scientist
Interdisciplinary Environmental Clinic
Washington University School of Law
One Brookings Drive – CB 1120
St. Louis, MO 63130
314-935-5837 (phone); 314-935-5171 (fax)
milipele@wustl.edu

Attorneys for the Sierra Club

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR

Exhibit 5

Washington University in St. Louis

SCHOOL OF LAW

Interdisciplinary Environmental Clinic

Appendix C—Sierra Club Comments on the Proposed Area Designation under the 2010 SO_2 NAAQS for the Area Around the Labadie Energy Center in Franklin County, Missouri

Summary of Comments—EPA Should Finalize Its Proposed Nonattainment Designation for Portions of Franklin and St. Charles Counties Located in Proximity to the Labadie Energy Center in Franklin County, Missouri

Sierra Club strongly supports the U.S. Environmental Protection Agency's ("EPA") intended designation of the area around Ameren Missouri's Labadie Energy Center, including portions of Franklin and St. Charles Counties, as a nonattainment area for the 2010 1-hour sulfur dioxide ("SO_2") National Ambient Air Quality Standard ("NAAQS"). The evidence supporting a nonattainment designation is overwhelming, and EPA should finalize its proposed decision so that residents living and recreating in the shadow of the Labadie plant—one of the largest unscrubbed coal-fired power plants in the country—can obtain the public health protection that the SO_2 NAAQS is designed to provide.

In order to protect public health with an adequate margin of safety, the EPA revised the SO_2 primary NAAQS in 2010, replacing 24-hour and annual standards with a 1-hour standard.[1] In an exposure analysis focused on at-risk populations in St. Louis, EPA found that SO_2 exposure for as short as 5-10 minutes can cause adverse health effects to asthmatics.[2] Based on the latest scientific and medical research, EPA determined that the 1-hour SO_2 NAAQS is necessary to protect public health and limit adverse respiratory effects on at-risk populations, including children, the elderly, and asthmatics.[3]

As EPA is well aware, short-term SO_2 exposure is associated with a variety of negative health effects, including narrowing of the airways which can cause difficulty breathing (bronchoconstriction) and increased asthma symptoms. These effects are particularly important for asthmatics during periods of faster or deeper breathing (e.g., while exercising or playing).[4] Studies also show an association between short-term SO_2 exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses – particularly in at-risk populations including children, the elderly, and asthmatics.[5]

---

[1] EPA, Primary National Ambient Air Quality Standard for Sulfur Dioxide; Final Rule, 75 Fed. Reg. 35520 (June 22, 2010).

[2] *Id.* at 35536.

[3] *Id.* at 35550.

[4] EPA, Fact Sheet: Revisions to the Primary National Ambient Air Quality Standard, Monitoring Network, and Data Reporting Requirements for Sulfur Dioxide, available at http://www.epa.gov/airquality/sulfurdioxide/pdfs/20100602fs.pdf.

[5] *Id.*

Exhibit 5

Additionally, SO_2 emissions contribute to the formation of fine particulate matter ($PM_{2.5}$), exposure to which is linked to numerous serious health effects and premature death. The public health threats posed by $PM_{2.5}$ pollution include aggravated asthma, heart attacks, difficulty breathing, and decreased lung function.[6] According to EPA, "evidence is sufficient to conclude that the relationship between long-term $PM_{2.5}$ exposures and mortality is causal."[7]

In the case of Labadie, concerns regarding the health impacts of SO_2 are heightened by the fact that the plant is far and away the largest source of SO_2 pollution in Missouri. According to EPA's Air Markets Program Data, Labadie's annual SO_2 emissions are nearly double those of the second-largest source in the state, Ameren's Rush Island plant in Jefferson County, and have been since 2011 when Ameren installed scrubbers on what had previously been the second-largest source, its Sioux plant in St. Charles County (the only plant in Ameren Missouri's fleet with any SO_2 controls installed).[8] Indeed, Labadie's annual SO_2 emissions are among the highest in the country. In 2015, Labadie's SO_2 emissions were the fifth-highest of all power plants nationwide, and its annual emissions have been in the top ten nationally for four of the past seven years (and ranked no lower than 16th in any of the other three).[9]

Labadie, which is the 14th largest coal-fired power plant in the country on the basis of capacity,[10] is unique among large coal plants in not having any SO_2 controls installed. Of the 39 largest coal plants in the country, Labadie is the only one that lacks SO_2 controls of any kind on any of its units.[11] Every other one of the 39 largest coal plants has scrubbers on some or all units except for one—Rockport in Indiana—which has dry sorbent injection and is under a Consent Decree to install scrubbers or close.[12] The next-largest coal plant without any SO_2 controls installed is Entergy's Independence plant near Newark, Arkansas, which has roughly a third less capacity than Labadie.[13] Therefore, it is not surprising that Labadie is calculated to be responsible for more premature deaths than any other coal plant in the nation without scrubbers.[14]

In light of the public health impacts of excessive SO_2 concentrations, Labadie's status as the largest coal plant in the country without SO_2 controls, and the fact that Ameren already anticipates installing scrubbers at Labadie,[15] it is remarkable that Ameren is spending untold

---

[6] EPA, Health information on Particulate Matter, available at http://www.epa.gov/pm/health.html.

[7] EPA, Integrated Science Assessment for Particulate Matter, EPA/600/R-08/139F (Dec. 2009), at 7-96, available at http://www.epa.gov/ncea/pdfs/partmatt/Dec2009/PM_ISA_full.pdf.

[8] EPA, Air Markets Program Data, available at https://ampd.epa.gov/ampd/ (Query: Program = Acid Rain Program (AMP); Data Set = Emissions, Unit Level; Time Frame = Annual, 2006-2015; Emissions Criteria = State, All States; Aggregate Criteria = Facility; Variables = State, Facility Name, Facility ID (ORISPL), Year, SO2 (tons)).

[9] *Id*.

[10] EPA, National Electric Energy Data System (NEEDS) database v.5.15 (Aug. 3, 2015), available at https://www.epa.gov/sites/production/files/2015-08/needs_v515.xlsx. Plant rankings based on aggregated dependable net summer capacity of individual units.

[11] *Id*.

[12] *Id*. Re Rockport, see also http://www.epa.gov/sites/production/files/2015-01/documents/aep-cdmod3.pdf; http://valleywatch.net/?p=3116; and http://www.power-eng.com/articles/2015/01/indiana-michigan-nears-permit-for-rockport-unit-1-scr-project.html.

[13] *Id*.

[14] Environmental Integrity Project, Net Loss: Comparing the Cost of Pollution vs. the Value of Electricity from 51 Coal-Fired Plants (June 2012) at i-ii.

[15] Ameren's construction permit application submitted to MDNR for a utility waste landfill ("UWL") at the Labadie plant states: "A new flue gas desulfurization (FGD) system is scheduled to be built at the plant in the future. The FGD

Exhibit 5

amounts on creative modeling ventures to avoid the nonattainment designation virtually compelled by the modeling performed not only by the Missouri Department of Natural Resources ("MDNR") and Sierra Club, but by Ameren itself using AERMOD's regulatory default options. The weight of the evidence considered by EPA solidly supports a nonattainment designation:

- Modeling performed by MDNR, using AERMOD's regulatory default options, shows nonattainment.
- Modeling performed by Sierra Club, using AERMOD's regulatory default options, shows nonattainment.
- Modeling performed by Ameren, using AERMOD's regulatory default options, shows nonattainment.

Apparently unsatisfied with a nonattainment result, Ameren is engaged in an ongoing modeling marathon to attempt to show that the air around its unscrubbed Labadie plant complies with the SO_2 NAAQS. This is no small task. To achieve its desired result, Ameren's modelers:

- Used the beta LOWWIND3 option in AERMOD and the beta ADJ_U* option in AERMET instead of the regulatory default options.
- Merged the emissions from units 3 and 4 and modeled them as a single release point.
- Used lower background concentration data from a remote, agriculturally-sited monitor.
- Calculated "actual" stack flows using temperatures not representative of likely exit temperatures, thereby exaggerating exit velocities and the extent of plume dispersion.

Without each and every one of these model alterations, Ameren's modeling could not and does not show attainment. As a result, Ameren is expending considerable effort in a vain attempt to justify its modeling, particularly its use of beta options. Notwithstanding Ameren's unrelenting effort to obtain approval for its use of beta options, the fact is that using them is not by itself enough to get to an attainment result. Neither MDNR's nor Sierra Club's modeling shows attainment when run with Ameren's proposed beta options. Only Ameren's beta options modeling does, thanks largely to the *other* model alterations listed above. Therefore, in addition to not approving Ameren's proposal to use beta options, EPA should continue to critically evaluate Ameren's modeling and should not rely on it for purposes of making its final designation decision.

---

will generate an estimated maximum of 280,000 additional dry tons of CCPs per year. The UWL design includes the capacity to manage the FGD byproduct, as well as the other CCPs (e.g., fly ash and bottom ash) currently being produced by the plant." Ameren Missouri Labadie Energy Center, Construction Permit Application for a Proposed Utility Waste Landfill, Jan. 2013, Revised Aug. 2013, Revised Nov. 2013, Section 1.1 (p. 1-2).. See also: "Ameren Missouri is planning to install air emissions controls on the coal-fired boilers at the Labadie Energy Center in the future consisting of FGD systems to reduce sulfur dioxide emissions. FGD systems will produce byproducts that may require disposal in the UWL." *Id.*, Section 3.5 (p. 3-16). See also Sections 3.1.2 (p. 3-3) and 3.2.1 (p.3-6). See also Ameren Missouri's 2014 Integrated Resource Plan, Ch. 5, Appendix B, filed with the Missouri Public Service Commission and available at https://q9u5x5a2.ssl.hwcdn.net/-/Media/Missouri-Site/Files/environment/renewables/irp/irp-chapter5-appendixb.pdf?la=en.

Exhibit 5

As discussed below and in our attached comments submitted to MDNR in advance of its designation recommendation,[16] EPA should finalize its intended nonattainment designation for the area around the Labadie plant.

I. All Modeling Using AERMOD's Regulatory Default Options Supports a Nonattainment Designation Around the Labadie Plant.

MDNR's and Sierra Club's modeling evaluations are straightforward exercises that adhere to EPA's SO_2 NAAQS Designations Modeling Technical Assistance Document ("Modeling TAD")[17] and also to the Guideline on Air Quality Models, 40 CFR Part 51 Appendix W ("Guideline" or "Appendix W"). Both use the regulatory default options in AERMET and AERMOD and, although they were performed independently of each other, generally use the same inputs. The only significant difference between them is the meteorological ("met") data used.[18] MDNR used met data from Jefferson City Memorial Airport in Jefferson City, Missouri, approximately 115 kilometers west of Labadie, while Sierra Club used met data from Spirit of St. Louis Airport in Chesterfield, Missouri, approximately 19 kilometers northeast of the plant.

Despite the difference in met data, MDNR's and Sierra Club's modeling predict very similar peak 99th percentile 1-hour average concentrations: 234.5 ug/m^3 and 235.7 ug/m^3, respectively. While the area of peak modeled impact is not identical, all violating receptors in both MDNR's and Sierra Club's modeling are within EPA's proposed nonattainment area boundary. Thus, as explained in EPA's Draft Technical Support Document ("TSD"), "[o]verall . . . the Sierra Club modeling supports and complements the MDNR modeling analysis, with the overall conclusion supporting a nonattainment recommendation."[19]

Ameren also performed modeling using the regulatory default options in AERMET and AERMOD. Although its inputs differ significantly from those used by MDNR and Sierra Club (as described above and discussed further below), Ameren's default options modeling also shows nonattainment with a predicted peak 99th percentile 1-hour average concentration of 282.9 ug/m^3.[20] EPA's Draft TSD (at 22) noted that while Ameren's "default regulatory option modeling also provided weight of evidence supporting a nonattainment designation," EPA did not rely on Ameren's modeling to support its intended nonattainment designation due to the

---

[16] Comments submitted to MDNR by the Washington University Interdisciplinary Environmental Clinic on behalf of Sierra Club, Sept. 3, 2016, together with Exhibits 1-4 submitted therewith, are attached hereto as Appendix C, Exhibit 1. Supplemental comments submitted to USEPA Region 7 on Sept. 18, 2016 are attached hereto as Appendix C, Exhibit 2.

[17] EPA, SO_2 NAAQS Designations Modeling Technical Assistance Document (Feb. 2016), available at https://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf.

[18] Other, less significant differences include Sierra Club's use of flagpole receptor heights and its omission of building downwash parameters.

[19] EPA, Draft Technical Support Document, Area Designations for the 2010 SO_2 Primary National Ambient Air Quality Standard (Feb. 2016) at 20, available at https://www3.epa.gov/airquality/sulfurdioxide/designations/round2/07_MO_tsd.pdf ("*Draft TSD*").

[20] The Draft TSD incorrectly characterizes this as a 1st rather than a 4th high value. While its occurrence near a minor source (N.B. West Contracting) suggests a problem with that source's release parameters, it is a 4th high value as indicated by the PLOTFILE keyword in the AERMOD input file (OU PLOTFILE 1 ALL 4 Labadie_SO2_1HR_34comb_12-14_JEF.PLT).

Exhibit 5

other alterations Ameren made—without adequate justification—to its default (and non-default beta options) modeling.

II. Ameren's Non-Default Beta Options Modeling Evaluation Suggests a Deliberate Effort to Achieve a Desired Result, Is Inadequately Supported, and Should Be Rejected.

Ameren's non-default beta options modeling evaluation differs significantly from MDNR's and Sierra Club's in several important respects. These include:

- Ameren used non-default beta options, specifically ADJ_U* in AERMET and LOWWIND3 in AERMOD, instead of regulatory default options.
- Ameren merged and modeled as a single release point the emissions from units 3 and 4, which have separate flues housed in a common shell.
- Ameren used temporally varying background concentrations based on an agriculturally-sited ambient monitor in Nilwood, Illinois, approximately 130 kilometers northeast of Labadie, instead of a uniform background concentration based on the much closer and more appropriately-sited East St. Louis monitor, approximately 60 kilometers east of the plant.
- Ameren used hourly stack parameters (temperature and exit velocity) instead of fixed values, with hourly exit velocities based on (calculated) "actual" flows instead of standard flows.

A. Use of Non-Default Beta Options Should Not Be Allowed.

We have commented on most of these changes in previous submittals to both MDNR and EPA. Our previous comments to EPA focused exclusively on Ameren's use of ADJ_U* and LOWWIND3, non-default beta options included in the latest versions of AERMET and AERMOD. EPA has proposed that these beta options be included as regulatory default options in a future version of the AERMOD modeling system expected to be released with a future final rule revising the Guideline.[21] However, they are only proposed options at this time, and EPA may change their formulation or decide not to include them as regulatory defaults in the next version of AERMOD when it finalizes its Appendix W rulemaking. Furthermore, since they are non-default beta options in the latest release of AERMOD, their use presently requires an alternate model demonstration per Section 3.2.2 of the Guideline, which must be approved by the Regional Administrator.

According to the Draft TSD, MDNR formally requested that EPA consider the use of beta options to model emissions from the Labadie Energy Center on December 9, 2015.[22] We find this curious given that MDNR did not use beta options in its own modeling evaluation. Clearly the request was aimed at getting EPA to consider Ameren's modeling, the results of which are at odds with MDNR's own modeling results. Nevertheless, the Draft TSD states that the beta

---

[21] EPA published a notice of proposed rulemaking proposing enhancements to the AERMOD dispersion modeling system and revisions to the Guideline on July 29, 2015. 80 Fed. Reg. 45399, available at http://www.gpo.gov/fdsys/pkg/FR-2015-07-29/pdf/2015-18075.pdf.

[22] *Draft TSD* at 22.

Exhibit 5

LOWWIND3 option has not been demonstrated to have statistically improved performance over the regulatory default option and has not yet fully received scientific peer review, and therefore cannot be used at this time "as a reliable indicator of attainment status in the area around the Labadie Energy Center."[23]

Sierra Club supports this decision and believes the use of LOWWIND3 should not be allowed under any circumstances until EPA has completed its Appendix W rulemaking following full scientific peer review and consideration of all comments received. Due to the potential changes to LOWWIND3 that may occur prior to finalization of the Appendix W rulemaking, any designation decision based on a case-specific approval to use LOWWIND3 granted before the rulemaking is finalized could be called into question later, as the final version of LOWWIND3—even if it is ultimately approved as a regulatory default—could yield different results from the version in the latest release of AERMOD. Furthermore, as noted in the Draft TSD, MDNR used a minimum wind speed threshold of 0.5 meters per second in processing its met data "as a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions."[24] Hence, MDNR took steps to improve the performance of its model under low wind conditions, which is the purpose of the beta LOWWIND3 option.

In its September 3, 2015 comments to MDNR on the state's proposed area designation and boundary recommendations, Ameren stated, "The AERMOD modeling data relied on by MDNR to support its proposed options for designation overestimates SO_2 ambient air emissions and, therefore, is too unreliable to serve as the primary or sole basis for a nonattainment designation recommendation . . . MDNR should use EPA's updated AERMOD modeling software. The current software – which is expected to become effective prior to EPA's July 2, 2016, designation deadline under its federal Consent Decree – produces modeling results concluding the Labadie area is attaining the 2010 SO_2 NAAQS" because it "corrects the tendency of the model to over-predict ambient SO_2 concentrations in low wind speed conditions."[25]

Ameren's statement is wrong. First, both the current version of AERMOD (15181) and the previous version (14134) produce identical results when run using the regulatory default options. Hence, even if MDNR had used the current version, its model still would have predicted a peak 99th percentile 1-hour average concentration of 234.5 ug/m^3.

Second, and most importantly**, even using the current version of AERMOD with the beta LOWWIND3 option employed, MDNR's model does not produce results concluding that the Labadie area is attaining the NAAQS**. On the contrary, using the current version of AERMOD with LOWWIND3 employed, MDNR's model predicts a peak 99th percentile 1-hour average concentration of 211.7 ug/m^3, which exceeds the NAAQS. Violating receptors under this

---

[23] *Id*.

[24] *Id*. at 15-16.

[25] Ameren Services, Ameren Missouri's Comments on Missouri Department of Natural Resources' Proposed Area Boundary and Designation Recommendations for the 2010 1-Hour Sulfur Dioxide National Ambient Air Quality Standard (Sept. 3, 2015) at 7-8, available at http://dnr.mo.gov/env/apcp/docs/appndx-g-modeling-reports.pdf (see pp. G-15, 16).

Exhibit 5

scenario are shown in Figure 1, below.[26] Sierra Club's modeling analysis also shows nonattainment using the current version of AERMOD with LOWWIND3 employed, predicting a peak 99th percentile 1-hour average concentration of 211.9 ug/m^3. Violating receptors under this scenario are shown in Figure 2, below.[27] This only reinforces EPA's conclusion that MDNR's and Sierra Club's modeling support a nonattainment recommendation.

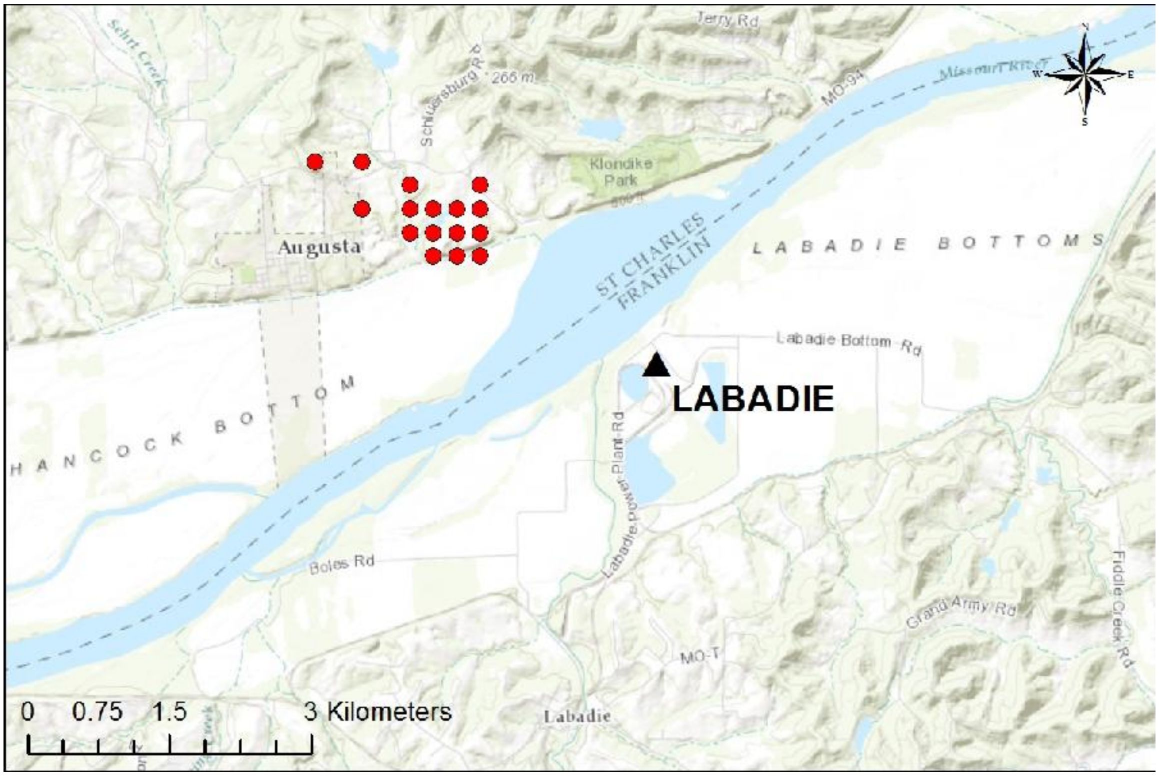


Figure 1. Violating receptors in MDNR's modeling of Labadie's emissions using the current version of AERMOD with the beta LOWWIND3 option employed.

---

[26] Modeling files that reflect MDNR's modeling with the use of beta options proposed by Ameren are attached hereto as Appendix C, Exhibit 3.

[27] Modeling files that reflect Sierra Club's modeling with the use of beta options proposed by Ameren are attached hereto as Appendix C, Exhibit 4

Exhibit 5

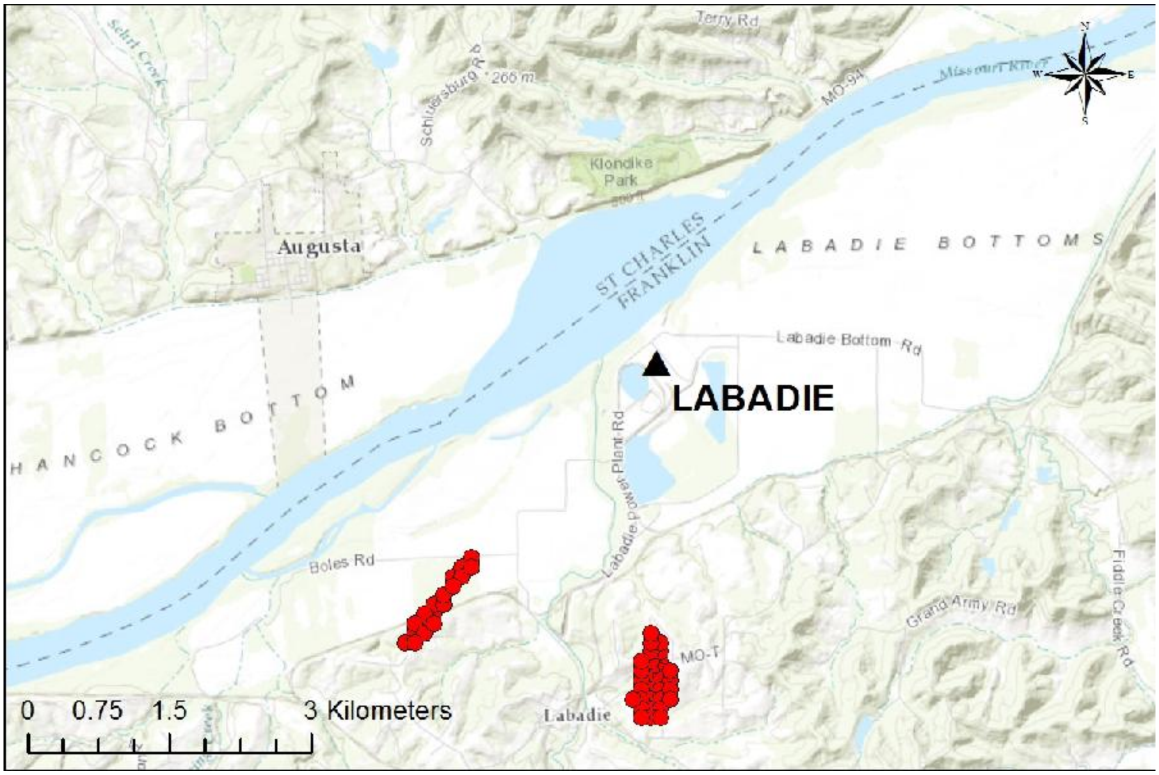


Figure 2. Violating receptors in Sierra Club's modeling of Labadie's emissions using the current version of AERMOD with the beta LOWWIND3 option employed.

B. Ameren's Modeling Inappropriately Relies Upon Other Changes to MDNR's Model, In Addition to the Use of Beta Options.

Favorable disposition of MDNR's request that EPA consider the use of beta options to model Labadie's emissions would not, by itself, get Ameren to its desired goal of an attainment (or unclassifiable) designation at Labadie. Ameren's modeling shows attainment not strictly because it used the beta options, but also because it made several other changes to MDNR's model in a seemingly deliberate effort to achieve its desired result. That is, it appears to have worked backwards from the result it wanted the model to show (i.e., attainment) to the inputs necessary to obtain those results. This is not how a legitimate modeling evaluation is performed, and EPA should reject it.

That Ameren may have worked backwards from its desired result is strongly suggested by the scant justification provided for two of the changes it made to MDNR's model. Ameren did not provide any justification for merging the emissions from units 3 and 4, which have separate flues housed in a common shell, and modeling them as a single release point. It simply stated that merging the flues "is allowed by EPA precedent" and cited EPA Model Clearinghouse Report 91-II-01.[28] However, Model Clearinghouse Reports provide EPA's interpretation of modeling

---

[28] Ameren Services, Key to Files, 1-Hour SO2 Modeling for Labadie Power Plant, Dispersion Modeling Files (Aug. 2015) at 1, available at http://dnr.mo.gov/env/apcp/docs/appndx-g-modeling-reports.pdf (see page G-352).

Exhibit 5

guidance as it applies to specific applications of air dispersion models. While often relevant to other, similar applications, they do not serve as guidance of general applicability. Furthermore, Model Clearinghouse Report 91-II-01 relates to the modeling of an unspecified stationary source using an unspecified model, years before AERMOD was developed and adopted as a preferred model by EPA.[29] Therefore, its relevance, if any, to merging the emissions from units 3 and 4 when using AERMOD to model Labadie's emissions for purposes of determining NAAQS compliance is speculative at best.[30]

Likewise, as justification for using background concentrations based on an ambient monitor in Nilwood, Illinois instead of the closer East St. Louis monitor used by MDNR, Ameren simply stated that because Labadie is in a rural area with no other nearby sources, "using background data from an urban monitor such as East St Louis is conservative," and that the Nilwood monitor "is located in a rural area of Illinois, similar to that of Labadie."[31] However, while Nilwood is in agricultural Macoupin County, manufacturing is the dominant industry in Franklin County.[32] Moreover, Labadie is just a few miles west of St. Louis County, the most populous county in the St. Louis Metropolitan Area, and directly south of St. Charles County, one of the fastest-growing counties in the country.[33] This suggests that background concentrations in the Labadie area may be influenced by nearby urban and manufacturing sources that do not affect the more distant, agriculturally-based Nilwood monitor, which would make background concentrations based on the Nilwood monitor unrepresentative of the Labadie area. Sierra Club believes MDNR's sector analysis effectively eliminated known SO_2 source influences on the East St. Louis monitor and that, given its closer proximity to Labadie, the East St. Louis monitor is more representative of background concentrations in the Labadie area than the Nilwood monitor.

Ameren's breezy explanation of its changes to MDNR's model inputs led EPA to state, "we believe further justification would be needed to support the background value used and the merging of adjacent stacks."[34] Sierra Club agrees.

In addition, further justification is needed to support Ameren's calculated hourly exit velocities. Sierra Club does not object to Ameren's use of hourly stack parameters (temperature and exit velocity). However, Ameren's hourly exit velocities were calculated from "actual" stack flows, which were calculated from standard stack flow data available from EPA's Emissions Modeling Clearinghouse using the formula:
$V_a = T_a*V_s/T_s$

---

[29] Development of AERMOD did not commence until 1991 and it was not adopted as EPA's preferred model for regulatory dispersion modeling until 2005. Therefore, it could not have been used in the permit application that was the subject of Model Clearinghouse Report 91-II-01.

[30] The configuration of the stacks at the source discussed in the report was different from the configuration of the stacks at Labadie, and the report concluded that they could be merged based on an unverified assumption about the separation distance between the stacks relative to the lesser dimension of nearby structure(s), and only if the flow rates and temperatures were always the same for all three stacks. It is not known whether these conditions are met at Labadie.

[31] AECOM, Characterization of 1-Hour SO_2 Concentrations in the Vicinity of the Labadie Energy Center (September 2015) at 2-2, available at http://dnr.mo.gov/env/apcp/docs/appndx-g-modeling-reports.pdf (see page G-260).

[32] St. Louis Regional Chamber, Demographics, available at http://www.stlregionalchamber.com/regional-data/demographics, attached hereto as Appendix C, Exhibit 5.

[33] *Id*.

[34] *Draft TSD* at 22.

Exhibit 5

where
V_a = actual stack flow (acfh)
V_s = standard stack flow (scfh)
T_a = actual stack temperature (absolute Rankine or Kelvin)
T_s = standard stack temperature (absolute Rankine or Kelvin)

Based on information provided by EPA, the stack temperatures Ameren used in its "actual" stack flow calculations were measured about half-way up the stack, at or near the center.[35] However, recent CEMS Relative Accuracy Test reports for Labadie generally show a decreasing temperature gradient from the center of the stack to the stack wall.[36] Temperatures in tall stacks also tend to decrease from base to tip.[37] Therefore, the stack temperatures Ameren used to calculate "actual" stack flows were most likely higher than true exit temperatures, resulting in artificially high "actual" stack flows. And because Ameren used its calculated "actual" stack flows to calculate its hourly exit velocities, those velocities are most likely artificially high as well, resulting in greater dispersion and lower modeled concentrations than is truly occurring. Sierra Club believes that absent accurate temperature data, standard stack flows should be used to calculate hourly exit velocities.

C. Absent Each and Every One of Ameren's Poorly-Justified Changes to MDNR's Model, Ameren's Beta Options Model Shows Nonattainment.

Unpacking Ameren's modeling reveals why, in addition to employing the beta options, Ameren made other poorly-justified changes to MDNR's model. It took using the current version of AERMOD with the beta LOWWIND3 option employed, coupled with merging the emissions from units 3 and 4, changing the background concentration data source to a remote, agriculturally-sited monitor, and calculating actual stack flows in a manner that inflates exit velocities and dispersion in order for Ameren's modeling to (just barely) suggest attainment. With these changes Ameren's model predicts a peak 99th percentile 1-hour average concentration of 193 ug/m^3, which is just 3.2 ug/m^3 below the NAAQS.

Reverse *any* of the changes Ameren made to MDNR's model and its demonstration of attainment collapses like a house of cards. We ran Ameren's beta options model three times using all of Ameren's inputs, except that we reversed, one at a time, the three changes Ameren made to MDNR's model (beyond the use of the current version of AERMOD with the beta options employed). When Ameren's model is run exactly as Ameren ran it, except that units 3 and 4 are modeled as separate release points, it predicts a peak 99th percentile 1-hour average concentration of 225.2 ug/m^3.[38] When Ameren's model is run exactly as Ameren ran it, except

---

[35] Lance Avey, personal communication, January 15, 2016.

[36] *Id.*

[37] *Id.*

[38] Modeling files that show Ameren's beta options model except that units 3 and 4 are modeled as separate release points are attached hereto as Appendix C, Exhibit 6. Because units 3 and 4 are combined in Ameren's hourly rate file, we do not have hourly stack temperatures and velocities (based on actual stack flows) for units 3 and 4, nor are we able to back-calculate them. Therefore, we used the hourly stack parameters for the combined stack ("lab34") for both units to evaluate the effect of modeling them separately. Given that the combined stack parameters were derived by averaging the parameters for units 3 and 4, this should provide a reasonable approximation.

Exhibit 5

that hourly velocities are calculated from standard stack flows from EPA's Emissions Modeling Clearinghouse, it predicts a peak 99th percentile 1-hour average concentration of 226.4 ug/m^3.[39] And when Ameren's model is run exactly as Ameren ran it, except using MDNR's background concentration based on the East St. Louis monitor, it predicts a peak 99th percentile 1-hour average concentration of 198 ug/m^3.[40] These results, all of which are above the NAAQS, are summarized in Table 1. Violating receptors under each scenario are shown in Figures 3, 4, and 5, below.

Table 1. Results of Ameren's Beta Options Model With Each Change Separately Reversed

Modeling Run	Emissions From Units 3 & 4	Flow Used to Calculate Exit Velocities	Background Monitor Used	Peak 99th Percentile 1-Hour Concentration (μg/m^3)	Attainment? (Yes/No)
Ameren's Modeling as Submitted	Merged	Actual	Nilwood, IL	193.0	Yes
Emissions From Units 3 & 4 Split	Split	Actual	Nilwood, IL	225.2	No See Figure 3
Standard Flow Used to Calculate Velocities	Merged	Standard	Nilwood, IL	226.4	No See Figure 4
MDNR Background Monitor	Merged	Actual	East St. Louis, IL	198.0	No See Figure 5

---

[39] Modeling files that show Ameren's beta options model except that hourly velocities are calculated from standard stack flows are attached hereto as Appendix C, Exhibit 7.

[40] Modeling files that show Ameren's beta options model except using MDNR's background concentrations from the East St. Louis monitor are attached hereto as Appendix C, Exhibit 8.

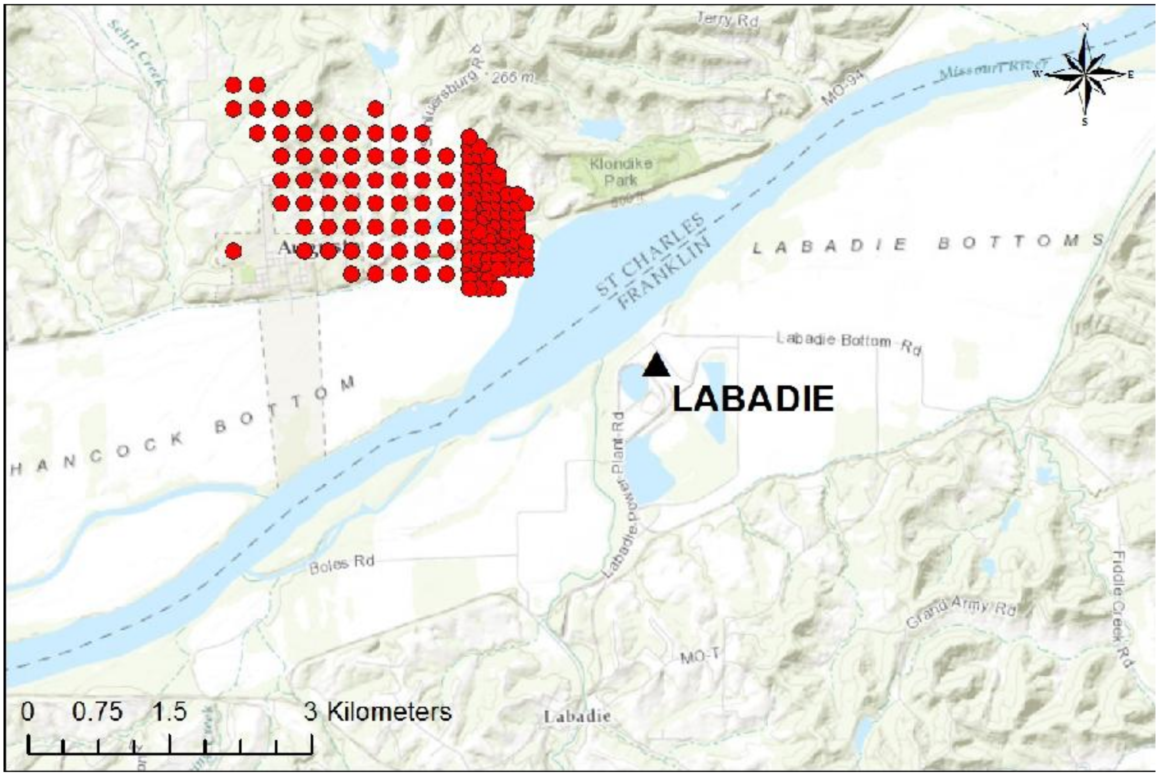


Figure 3. Violating receptors in Ameren's beta options modeling of Labadie's emissions when units 3 and 4 are modeled as separate release points.

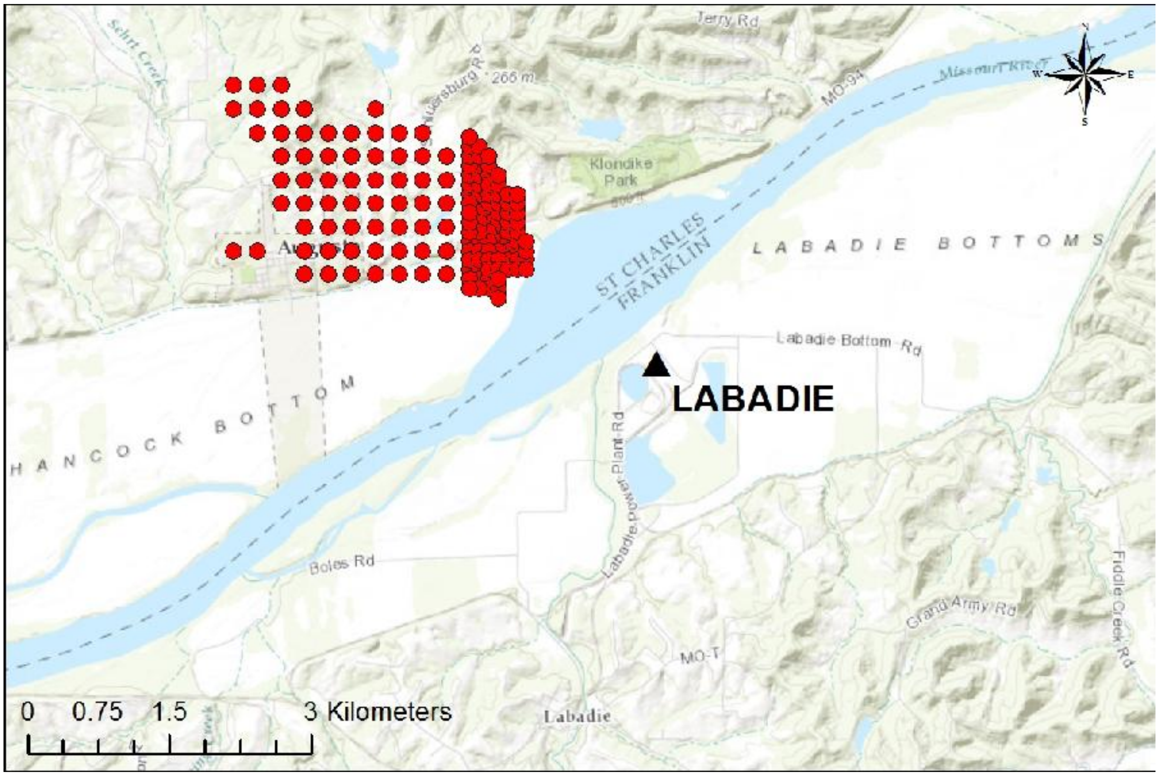


Figure 4. Violating receptors in Ameren's beta options modeling of Labadie's emissions when velocities calculated from standard stack flows are used.

Exhibit 5

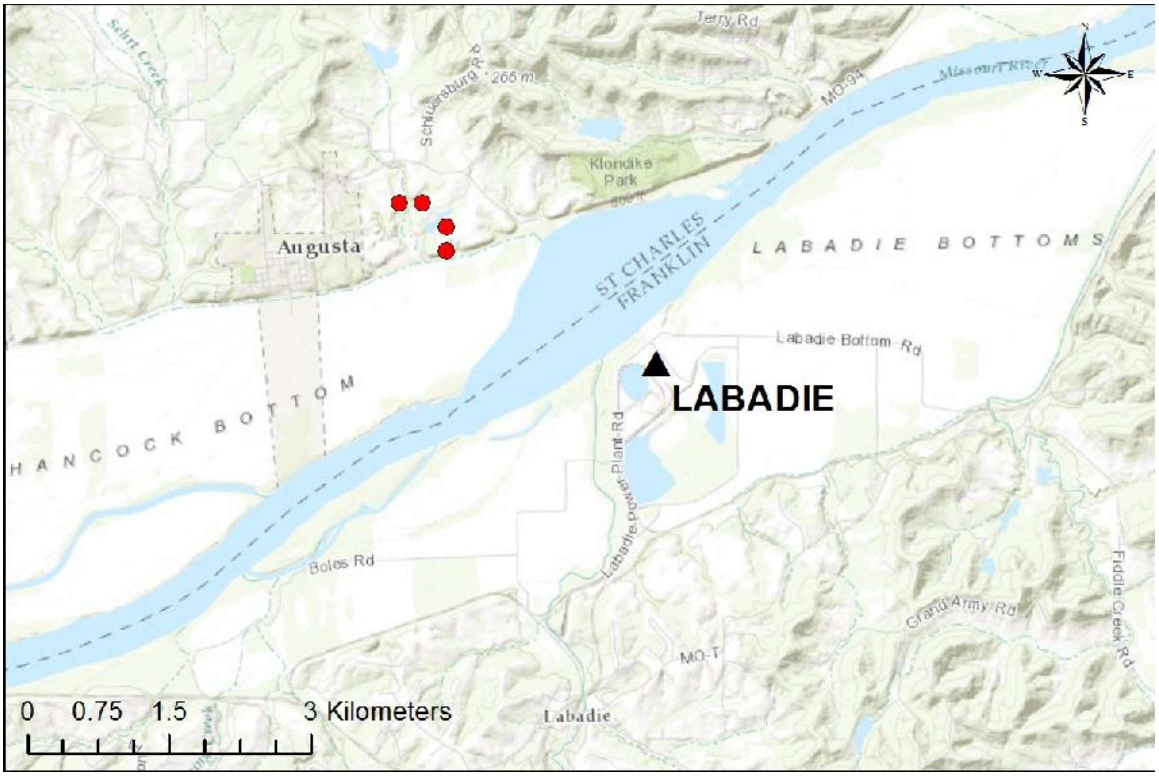


Figure 5. Violating receptors in Ameren's beta options modeling of Labadie's emissions when MDNR's fixed background based on the East St. Louis monitor is used.

III. Ameren's Monitoring Data Do Not Provide Convincing Evidence That The Area Around the Labadie Plant Is In Attainment.

In addition to modeling, Ameren is attempting to use limited monitoring data it has collected to characterize SO_2 concentrations around the Labadie plant and argue that the area is in attainment. Ameren has installed two monitors near Labadie—dubbed Valley and Northwest—and has been collecting ambient SO_2 data since April 2015. Ameren has also been collecting met data at the Valley site since that time.[41]

For the 8-month period ending in December 2015, neither the Valley nor the Northwest monitor recorded any 1-hour SO_2 concentrations above the NAAQS. The highest concentrations recorded at the Valley and Northwest sites during that time were 56 ppb and 38 ppb, respectively, levels Ameren claims "clearly indicate attainment by a wide margin."[42] However, eight months of monitoring data do not and cannot demonstrate attainment of the NAAQS. Because the form of the NAAQS is the three-year average of the 99th percentile of daily maximum 1-hour SO_2 concentrations, three full years of monitoring data are required to calculate a design value for comparison to the NAAQS. Hence, the eight months of data on which Ameren places great reliance is less than 25 percent of the data necessary to calculate a design value. If monitored

---

[41] The Valley monitor has not been in operation since late December 2015 due to flood damage.

[42] AECOM, Modeling and Monitoring SO_2 Characterization for the Labadie Energy Center (Feb. 9, 2016) at 6.

Exhibit 5

concentrations are higher in 2016 and/or 2017 than they were in 2015, the design value for one or both monitors could exceed the NAAQS once the requisite three years of data have been collected.

Furthermore, the Labadie monitors are not sited in areas of expected peak SO_2 concentrations – based on modeling performed by Ameren itself for monitor siting purposes and also based on the modeling performed more recently by MDNR for area designation purposes – and therefore should not be relied upon for determining NAAQS compliance.[43]

Ameren now claims that their monitor locations "correspond to distances and directions expected to be in peak impact locations based upon sectors of peak frequencies of wind data from an historical 85-m on-site meteorological tower."[44] It also claims that winds at the 94-m level predicted by recent Weather Research Forecast ("WRF") modeling for 2015 are consistent with the historical 85-m on-site wind data and that both data sets "support the selection of the monitor sites due to frequent winds from the south and the west."[45]

Not so. Wind roses for the historical on-site meteorological tower and the recent WRF modeling show that *the sectors of peak wind frequencies do not include either of the Labadie monitors*, further evidence that the monitors are not located in expected peak SO_2 concentration areas. These wind roses and the five peak wind frequency sectors for each are shown in Figures 6 and 7, below. The peak wind frequency sectors (N, NNE, NE, E, and NNW) collectively contain upwards of 50 percent of all hourly winds but do not include either of the monitors. The same wind roses and the wind frequency sectors that do include the monitors are shown in Figures 8 and 9, below. The two sectors that include the monitors each contain just 6 percent (+/-) of all hourly winds.

The wind rose for Ameren's Valley met station shows a similar pattern. This wind rose and the five peak wind frequency sectors for it are shown in Figure 10, below. The peak wind frequency sectors (N, NNE, NE, SSW, and NNW) are the same as the peak wind frequency sectors for the historical on-site meteorological tower and the recent WRF modeling with one exception—the the SSW sector replaces the E sector—and they collectively contain over 50 percent of all hourly winds but do not include either of the monitors. The same wind rose and the wind frequency sectors that do include the monitors are shown in Figure 11, below. The two sectors that include the monitors each contain closer to 5 percent of all hourly winds.

---

[43] In addition to the comments herein, Sierra Club's critique of the monitor locations are set forth in comments previously submitted to MDNR and attached hereto as Attachment C, Exhibit 9.

[44] AECOM, Modeling and Monitoring SO2 Characterization for the Labadie Energy Center (Feb. 9, 2016) at at 5.

[45] *Id*. at 12.

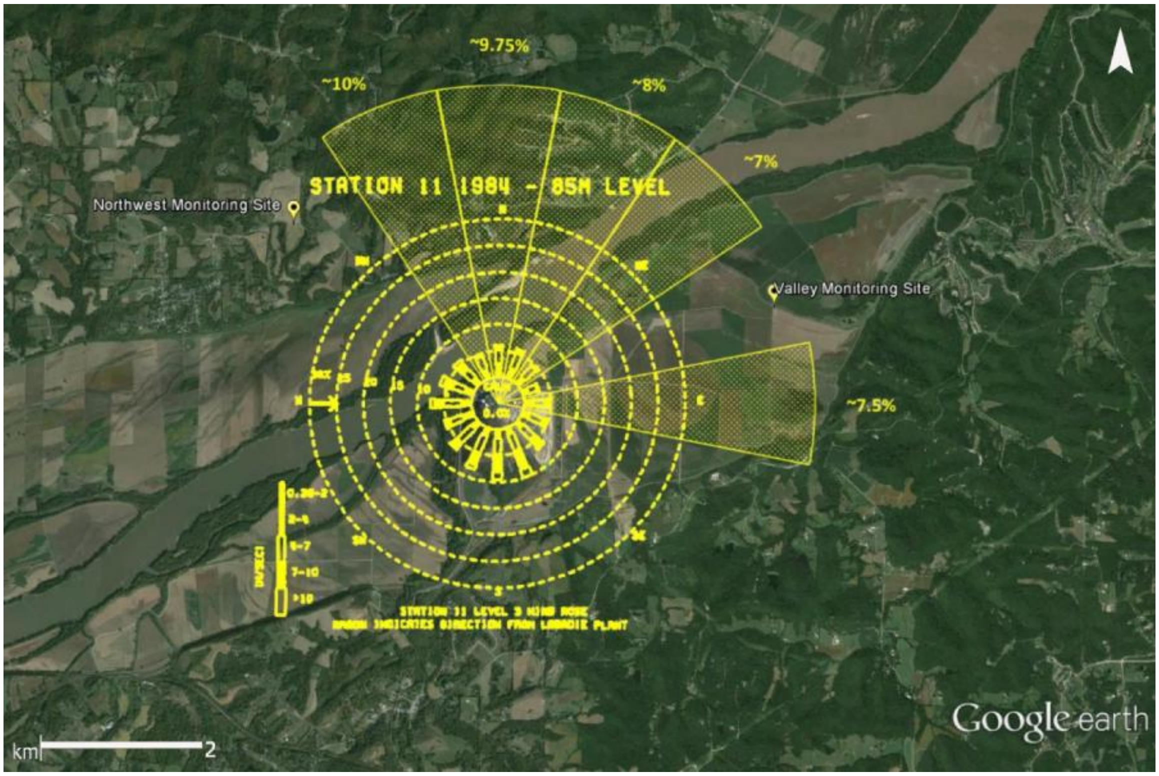


Figure 6. Wind rose for the historical on-site meteorological tower showing the five highest frequency wind sectors and the percent of hourly winds each sector contains.

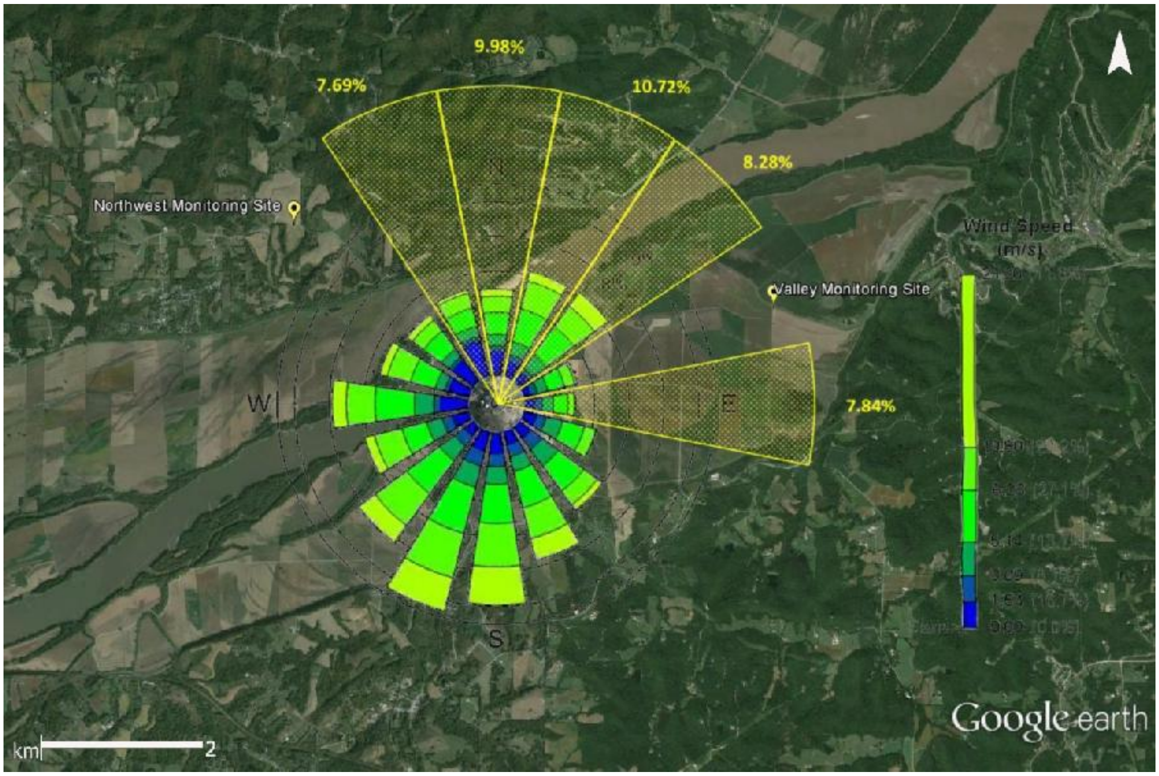


Figure 7. Wind rose for Ameren’s WRF modeling showing the five highest frequency wind sectors and the percent of hourly winds each sector contains.

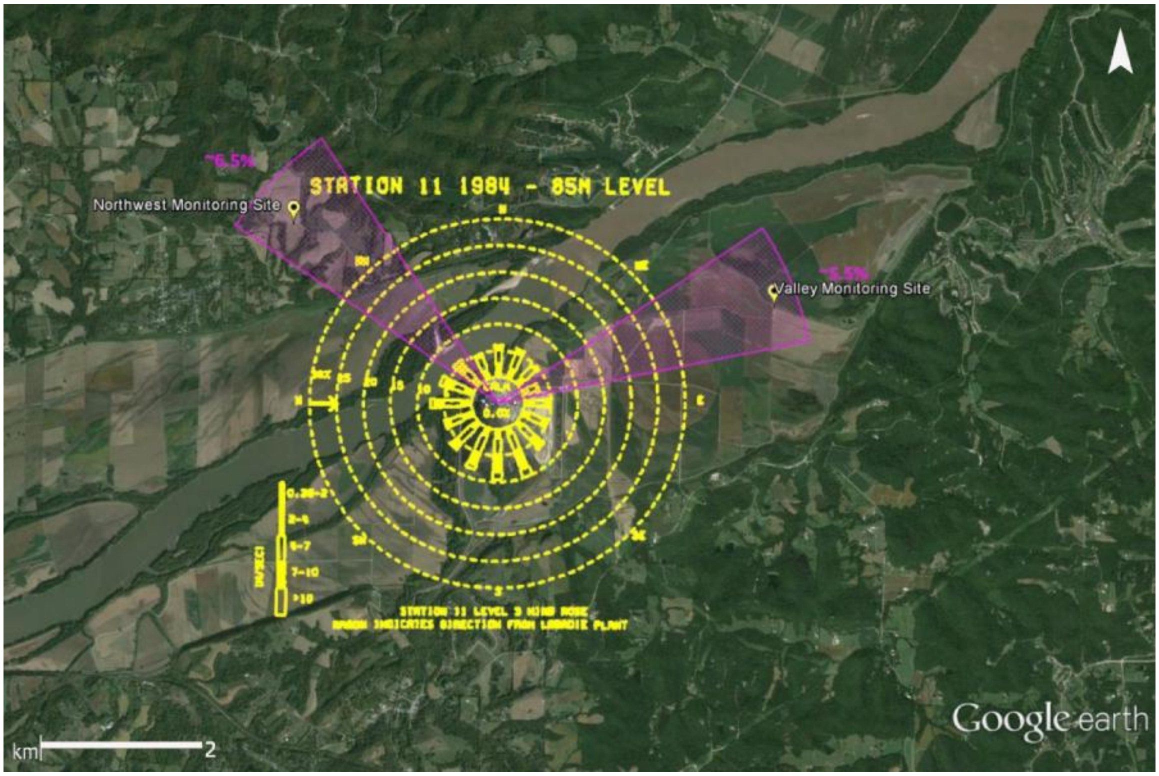


Figure 8. Wind rose for the historical on-site meteorological tower showing the wind frequency sectors containing the Labadie monitors and the percent of hourly winds those sectors contain.

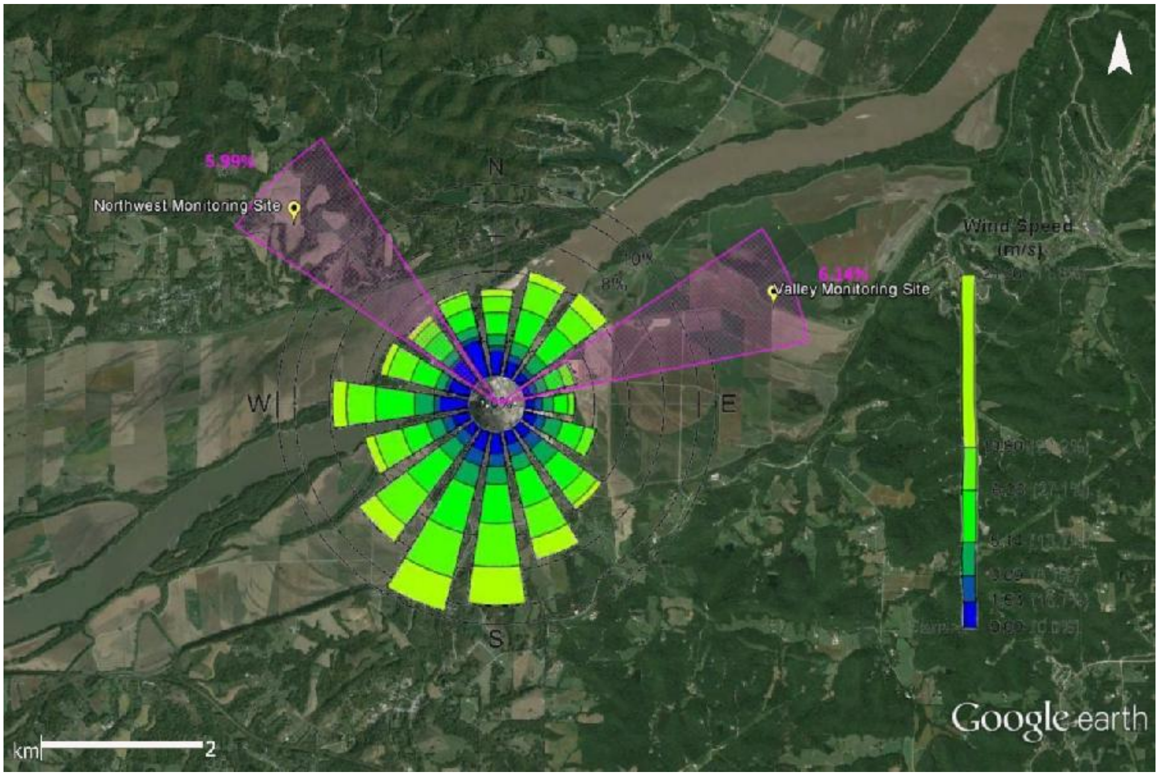


Figure 9. Wind rose for Ameren's WRF modeling showing the wind frequency sectors containing the Labadie monitors and the percent of hourly winds those sectors contain.

Exhibit 5

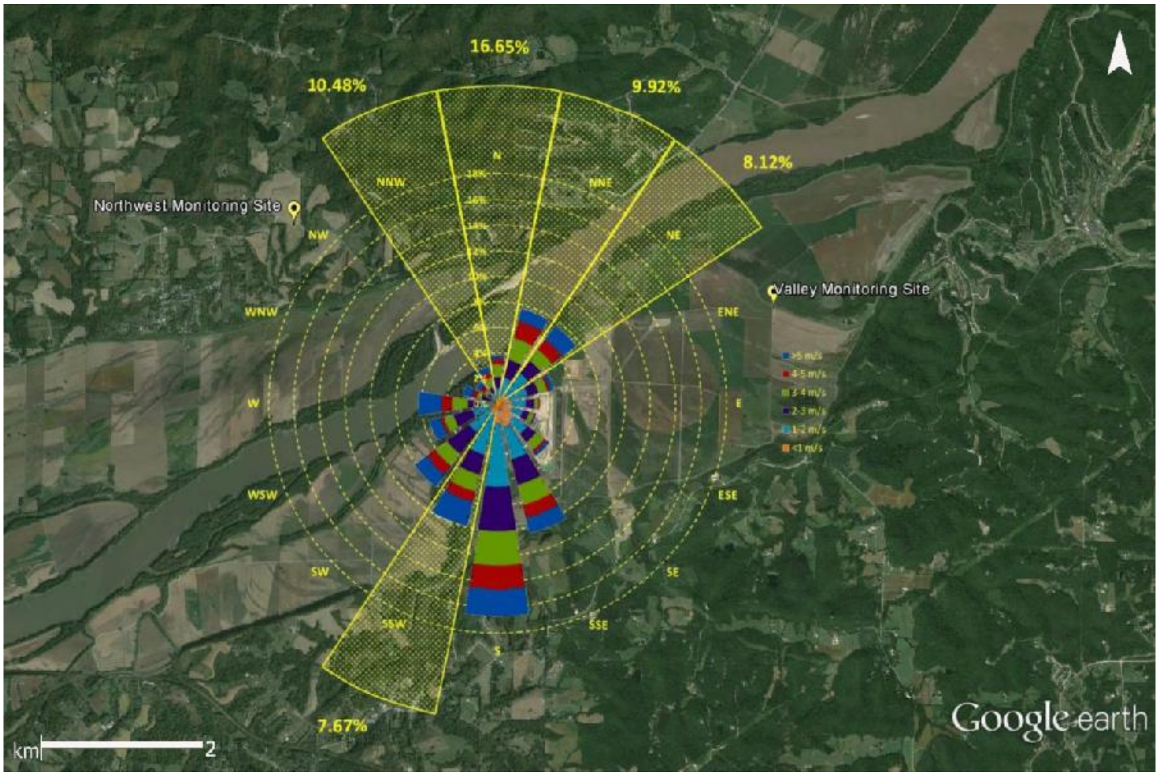


Figure 10. Wind rose for Ameren's Valley met station showing the five highest frequency wind sectors and the percent of hourly winds each sector contains.

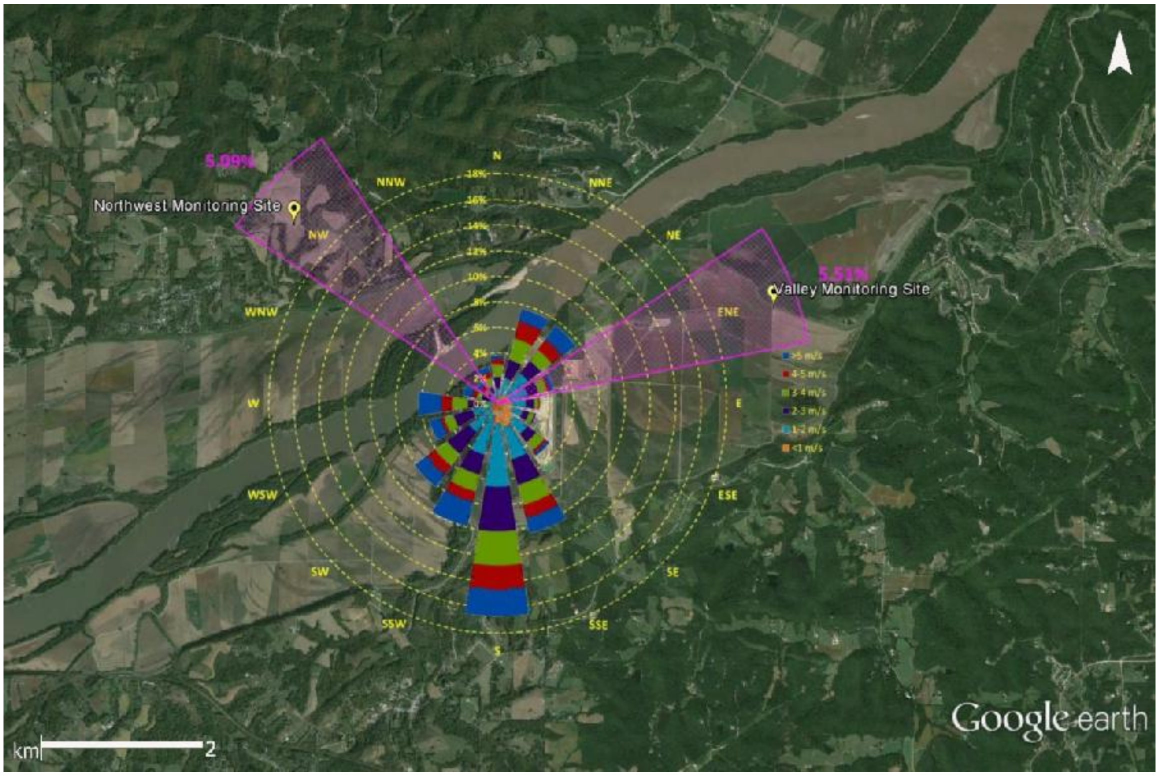


Figure 11. Wind rose for Ameren's Valley met station showing the wind frequency sectors containing the Labadie monitors and the percent of hourly winds those sectors contain.

Exhibit 5

Conclusion

The weight of evidence overwhelmingly supports EPA's proposed nonattainment designation of portions of Franklin and St. Charles Counties around the Labadie Energy Center for purposes of the 1-hour SO_2 NAAQS. The sound rationale set forth in EPA's Draft TSD is not undermined by Ameren's modeling machinations, using unapproved beta options as well as critical, unsupported changes to key model inputs, or by the limited monitoring data from Ameren's monitors, which are not sited in areas of expected peak SO_2 concentrations. Sierra Club urges EPA to finalize its proposed nonattainment designation for the area around the Labadie Energy Center.

Respectfully submitted,

Maxine I. Lipeles

Maxine I. Lipeles, Director
Kenneth Miller, P.G., Environmental Scientist
Interdisciplinary Environmental Clinic
Washington University School of Law
One Brookings Drive – CB 1120
St. Louis, MO 63130
314-935-5837 (phone); 314-935-5171 (fax)
milipele@wustl.edu

Attorneys for the Sierra Club

Exhibit 6

Washington University in St. Louis
SCHOOL OF LAW

Interdisciplinary Environmental Clinic

May 29, 2015

Ms. Patricia Maliro
Chief, Air Quality Monitoring Unit
Air Pollution Control Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176
Via email to patricia.maliro@dnr.mo.gov

Re: Comments on Ameren Missouri's Analysis of SO_2 and Meteorological Monitoring Stations Around Its Rush Island Energy Center

Dear Ms. Maliro:

On behalf of the Sierra Club, we submit the following comments on the report by Ameren Missouri titled Analysis of SO_2 and Meteorological Monitoring Stations Around Ameren Missouri's Rush Island Energy Center (Ameren's Monitoring Stations Analysis), which it submitted to DNR on or about April 29, 2015. The report describes the methodology Ameren used to determine the locations of three proposed ambient SO_2 monitoring stations and one meteorological monitoring station around its Rush Island Energy Center in Jefferson County, Missouri. Pursuant to a March 23, 2015 Consent Agreement with DNR, Ameren is required to install and begin operation of an SO_2 monitoring network around the Rush Island plant on or before December 31, 2015.

We believe Ameren's proposed monitoring sites should be rejected because they are located outside areas where peak 1-hour SO_2 concentrations are expected to occur based on the modeling described in Ameren's report. Furthermore, the modeling described in the report does not comport with EPA guidance on characterizing ambient air quality in areas around or impacted by significant SO_2 emission sources such as the Rush Island Energy Center and therefore may have failed to correctly identify areas of expected ambient, ground-level SO_2 concentration maxima. We also have concerns regarding the appropriateness of the meteorological data used in the modeling.

I. Based on the Modeling Described in Ameren's Report, the Proposed Monitoring Sites are Located Outside Areas Where Peak 1-Hour SO_2 Concentrations are Expected to Occur

The Consent Agreement (Appendix 1, ¶b) requires that "the number and location of SO_2 monitors and meteorological station(s) shall ensure that the approved SO_2 monitoring network represents ambient air quality in areas of maximum SO_2 impact from the Rush Island Energy Center." Ameren's Monitoring Stations Analysis (p. 3) describes the modeling it performed to

Exhibit 6

"delineate areas where maximum concentrations are expected to occur for this type of source and thus where SO_2 monitoring systems should be placed."

Unfortunately, the monitoring sites proposed by Ameren are not, in fact, located in "areas of maximum SO_2 impact from the Rush Island Energy Center," as required by the Consent Agreement.

Figures 1 through 4 below show the results of Ameren's modeling, which we derived using model input files provided by DNR. Figure 1 shows modeled SO_2 design values in the vicinity of the plant; Figure 2 shows receptors with modeled design values greater than or equal to 75 percent of the maximum modeled design value (146.1 ug/m^3); Figure 3 shows the number of times the model-derived maximum daily 1-hour concentration exceeded 75 percent of the maximum modeled design value at each receptor; and Figure 4 shows the receptors with the top 200, 100, 25, and 10 modeled design values. The locations of the plant and the proposed Fults, Natchez, and Weaver-AA SO_2 monitoring stations and the proposed Tall Tower meteorological monitoring station are shown on all figures for reference.

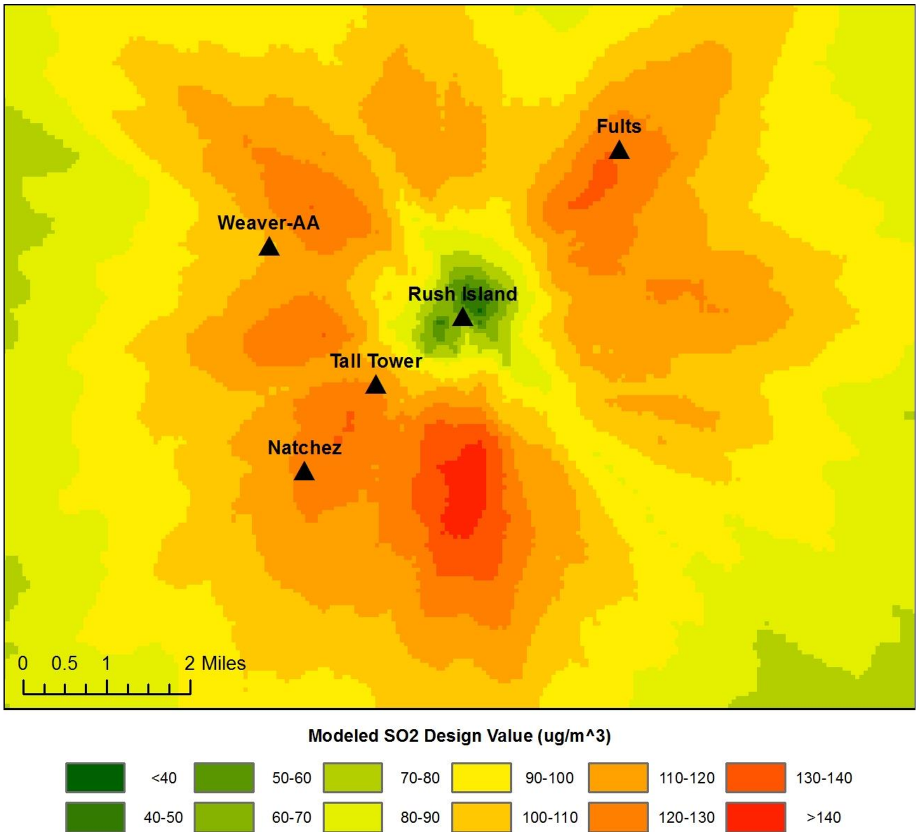


Figure 1. Modeled SO_2 design values in the vicinity of the Rush Island Energy Center.

Exhibit 6

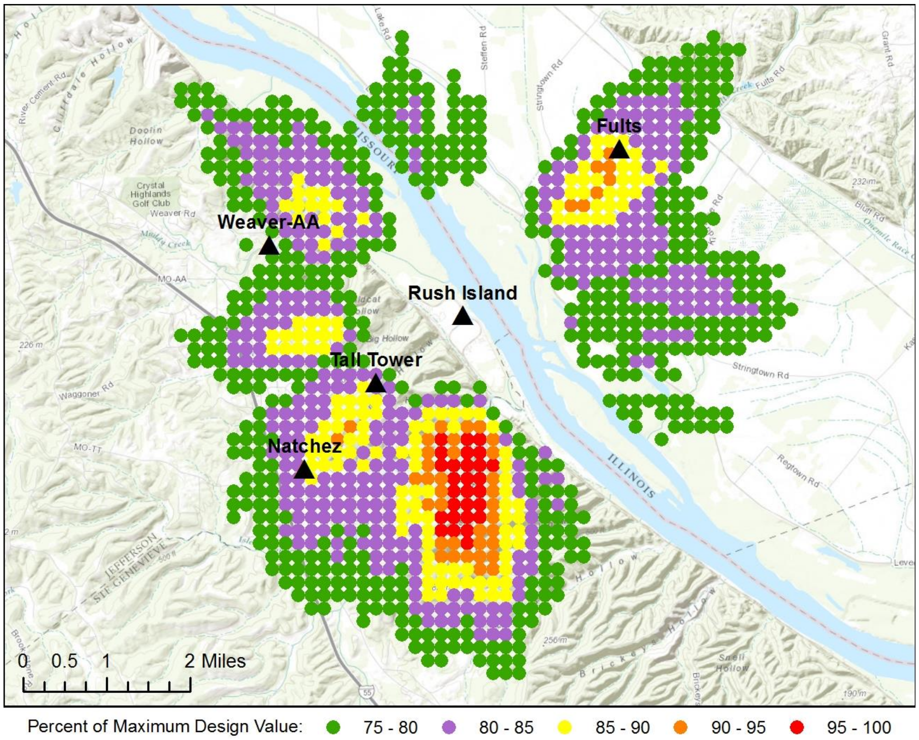


Figure 2. Receptors with modeled design values ≥75 percent of the maximum modeled design value.

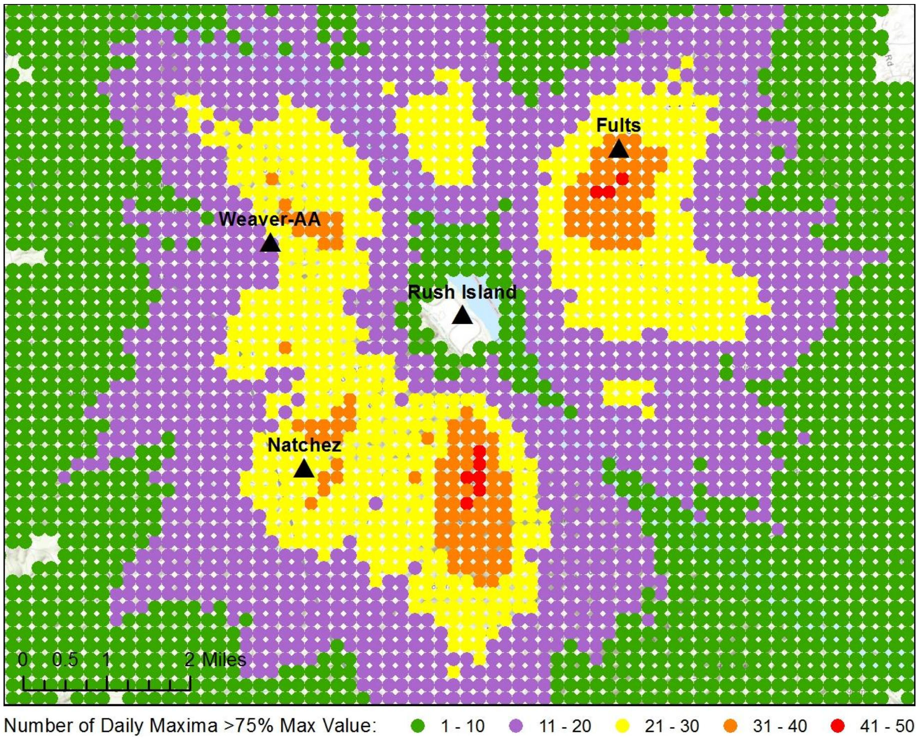
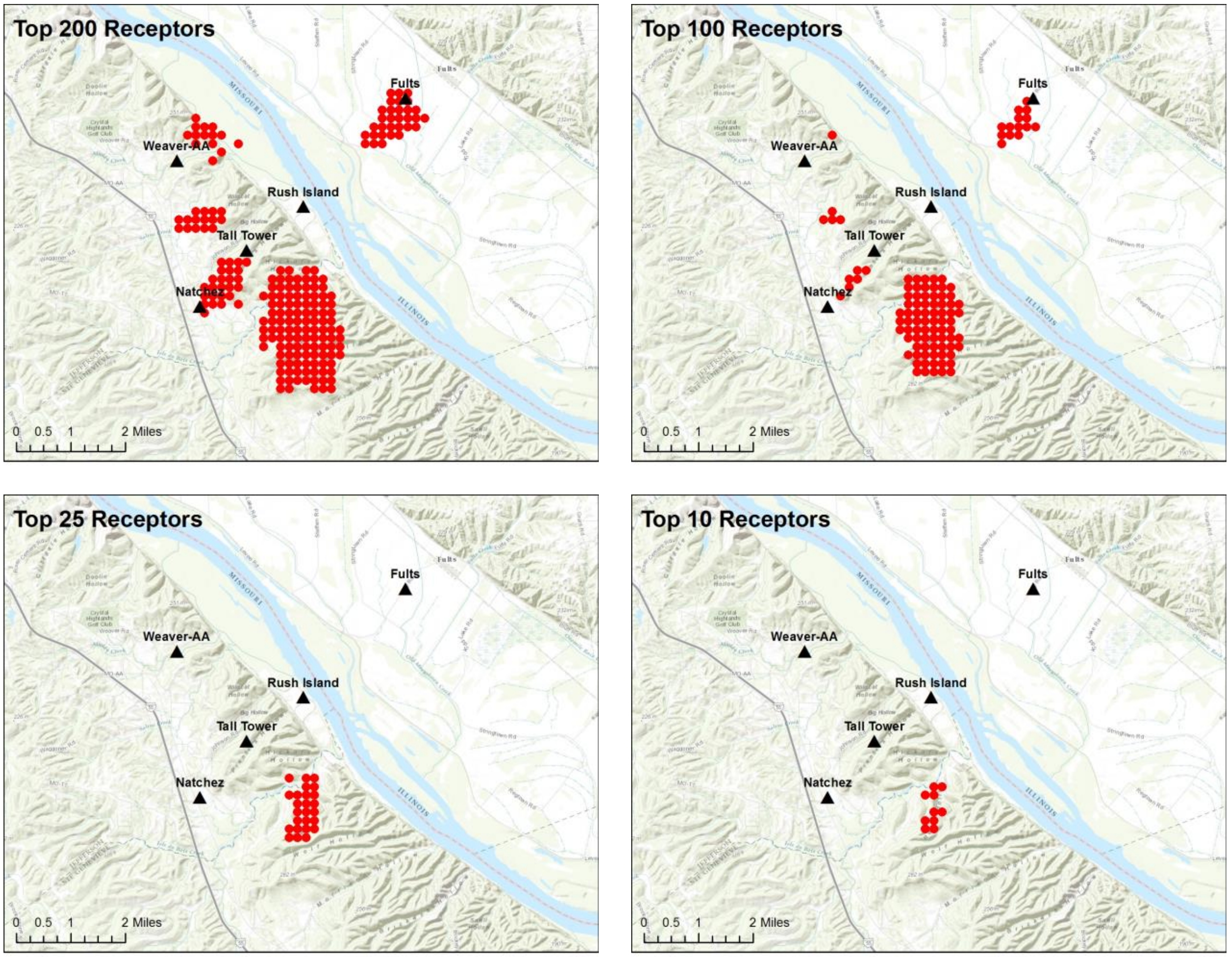


Figure 3. Number of maximum daily 1-hour concentrations ≥75 percent of the maximum modeled design value.

Exhibit 6



Top 200 Receptors

Top 100 Receptors

Top 25 Receptors

Top 10 Receptors

Figure 4. Receptors with the top 200, 100, 25, and 10 modeled design values.

Figures 1 through 4 all reveal a strikingly similar pattern regarding the areas where peak 1-hour SO_2 concentrations are expected to occur around the Rush Island Energy Center. There is a large area due south of the plant where modeled design values are the highest (in excess of 95 percent of the maximum modeled design value), where modeled maximum daily 1-hour concentrations frequently exceeded 75 percent of the maximum modeled design value, and where over half of the top 200 receptors (including all of the top 25 and three quarters of the top 100) are located. There are also four other areas where modeled design values are slightly lower but still very high (in excess of 85 percent of the maximum modeled design value), where modeled maximum daily 1-hour concentrations frequently exceeded 75 percent of the maximum modeled design value, and where the rest of the top 200 receptors are located. These four areas, located northeast, northwest, west, and southwest of the plant, plus the area south of the plant where modeled design values are the highest, are where Ameren's modeling predicts peak 1-hour SO_2 concentrations are expected to occur. Monitoring stations located in these areas would have the greatest chance of identifying peak SO_2 concentrations in ambient air, which is the primary objective of source-oriented monitoring and an absolute necessity when monitoring to assess

Exhibit 6

compliance with the NAAQS. However, none of Ameren's proposed monitoring stations is located in any of these areas of highest expected concentrations.

The most glaring omission is that there is no proposed monitoring station in the large area of highest expected concentrations south of the plant. This omission renders the proposed monitoring network inadequate for its intended purpose of assessing compliance with the NAAQS because a) NAAQS violations are most likely to occur in this area, and b) violations could occur in this area even when concentrations are below the NAAQS in other high concentration areas, given that the modeling predicts lower SO_2 concentrations in those areas. Ameren's Monitoring Stations Analysis claims that this area is "not accessible" because it hosts an industrial plant (Holcim). The Analysis does not indicate whether Ameren sought Holcim's permission to site a monitor on the Holcim property, and does not delineate the Holcim property boundary in terms of the modeling results. In other words, it does not document the claim that this large area of maximum expected concentrations is inaccessible for monitoring. Nor does it evaluate the nearest non-Holcim site that might be available.

While we understand that the Consent Agreement between DNR and Ameren calls for monitoring, it requires that such monitoring "represents ambient air quality in areas of maximum SO_2 impact from the Rush Island Energy Center." If no monitoring site is in fact accessible in this large area of the very highest expected concentrations, then the proposed monitoring network will not fulfill Ameren's obligation under the Consent Agreement. Instead, DNR should employ modeling, which provides 360-degree coverage and can predict concentrations at otherwise-inaccessible locations, to ensure that SO_2 emissions from the Rush Island plant do not cause or contribute to NAAQS exceedances either inside or outside of the Jefferson County nonattainment area.

Furthermore, two of the proposed monitoring stations – Fults and Natchez – are located near but outside of areas of modeled peak concentration/high frequency instead of near the center of such areas, where concentrations are expected to be higher. The third proposed station – Weaver-AA – is located entirely outside of modeled peak concentration/high frequency areas. Figure 5 shows the locations of the proposed monitoring stations on a hybrid basemap comprised of Figures 1 (modeled design values) and 2 (receptors with modeled design values ≥75 percent of the maximum design value). Receptors that are among the 200 with the highest modeled design values are outlined for reference. All three monitoring stations could easily be sited in areas where higher 1-hour SO_2 concentrations are expected to occur with greater frequency, thereby increasing their chances of detecting any NAAQS exceedances that might occur around the Rush Island Energy Center. As discussed below, we urge DNR to consider these proposed optimized locations in lieu of Ameren's proposed Fults, Natchez, and Weaver-AA locations.

Fults – Of the three proposed monitoring stations, the Fults monitoring station is closest to an area where peak 1-hour SO_2 concentrations are expected to occur. However, moving the monitor less than one kilometer southwest of its current location would move it from an area with modeled design values in the 120-130 ug/m^3 range to an area with modeled design values in the 130-140 ug/m^3 range and place it near the center of a small group of receptors with modeled design values equal to 90-95 percent of the maximum modeled design value (the receptors

Exhibit 6

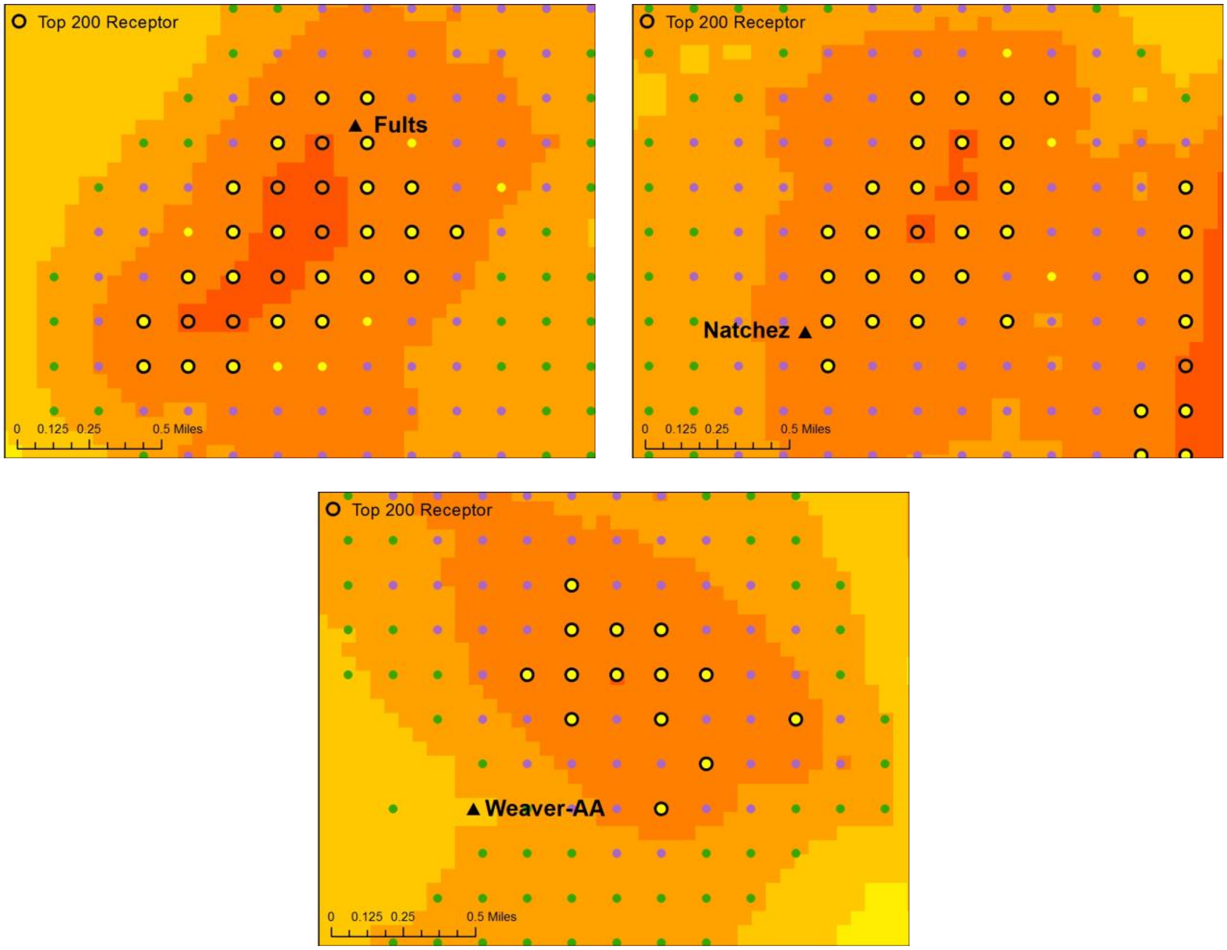


Figure 5. Modeled design values, receptors with design values ≥75 percent of the maximum modeled design value, and proposed monitoring station locations.

surrounding its current location generally have modeled design values equal to 85-90 percent of the maximum modeled design value). The entire area is floodplain/agricultural and Ivy Road, oriented northeast-southwest, runs through the middle of it, making the proposed optimized location as accessible as Ameren's proposed location and equally easy to provide power to.

Natchez – The Natchez monitoring station is outside/on the outer edge of an area where peak 1-hour SO_2 concentrations are expected to occur. Moving it approximately one kilometer northeast of its current location would move it from an area with modeled design values in the 120-130 ug/m^3 range to an area with modeled design values in the 130-140 ug/m^3 range, and place it between a pair of receptors with modeled design values equal to 90-95 percent of the maximum modeled design value (the receptors surrounding its current location have modeled design values equal to 80-90 percent of the maximum modeled design value). It would also move it to an area where higher concentrations are expected to occur with slightly greater frequency. The proposed optimized location is accessible via transmission right of way, and power is available along Dubois Creek Road to the south-southwest.

Exhibit 6

Weaver-AA – The Weaver-AA station is located completely outside of all areas where peak 1-hour SO2 concentrations are expected to occur. Modeled design values at its location are only in the 100-110 ug/m^3 range, and it is surrounded by receptors with modeled design values equal to just over 75 percent of the maximum modeled design value. Moving the monitor just over one kilometer east-northeast of its current location would place it in an area where modeled design values are 15-20 ug/m^3 higher, in the midst of a slightly dispersed group of receptors with modeled design values equal to 85-90 percent of the maximum modeled design value. At this optimized location, concentrations in excess of 75 percent of the maximum modeled design value are expected to occur roughly twice as often as at Ameren's proposed Weaver-AA location. The proposed optimized location is readily accessible via State Highway AA, and power is available along the highway.

Figure 6 compares the locations of Ameren's proposed Fults, Natchez, and Weaver-AA monitoring stations with optimized locations more likely to record maximum SO_2 concentrations in the area.

II. The Modeling Described in the Report Does Not Comport With EPA's Source-Oriented SO_2 Monitoring Guidance and Therefore May Not Correctly Identify Areas of Expected Ambient, Ground-Level SO_2 Concentration Maxima

EPA's SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (TAD) provides guidance on how to "appropriately and sufficiently monitor ambient air in areas proximate to or impacted by an SO_2 emissions source to create ambient monitoring data for comparison to the SO_2 NAAQS" and presents "recommended steps to aid in identifying source-oriented SO_2 monitor sites."[1] The modeling performed to determine the locations of the proposed ambient SO_2 monitoring stations around the Rush Island Energy Center fails to adhere to the TAD in two important respects: 1) it does not use hourly emission rates, which are readily available for Rush Island's boilers from EPA's online Air Markets Program Data tool; and 2) it does not include nearby sources that may contribute significantly to ambient SO_2 concentrations in the vicinity of the plant and therefore should be included in the modeling.

EPA suggests using hourly emissions when available in order to represent the variability of actual emissions as accurately as possible,[2] which is important given the short-term nature of the SO_2 NAAQS. However, instead of using readily-available hourly emissions as recommended by EPA's monitoring TAD, Ameren's modeling uses constant emission rates for Rush Island's boilers. The consequence of using constant rather than hourly emission rates is that the effects of the interaction between hourly emissions and hourly variations in meteorological parameters are not captured by the model, so that the predicted areas of peak concentration are primarily a function of the meteorology used. For example, if peak hourly emissions coincide with times when strong winds blow from a direction other than the prevailing wind direction, a model that uses hourly emission rates might predict peak concentrations in different areas than the same

---

[1] U.S. EPA, SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, Dec. 2013 Draft, at 2, available at http://epa.gov/airquality/sulfurdioxide/pdfs/SO2MonitoringTAD.pdf.

[2] *Id*. at 11, referencing U.S. EPA, SO_2 NAAQS Designations Modeling Technical Assistance Document, Dec. 2013 Draft, at 10, available at http://epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf.

Exhibit 6

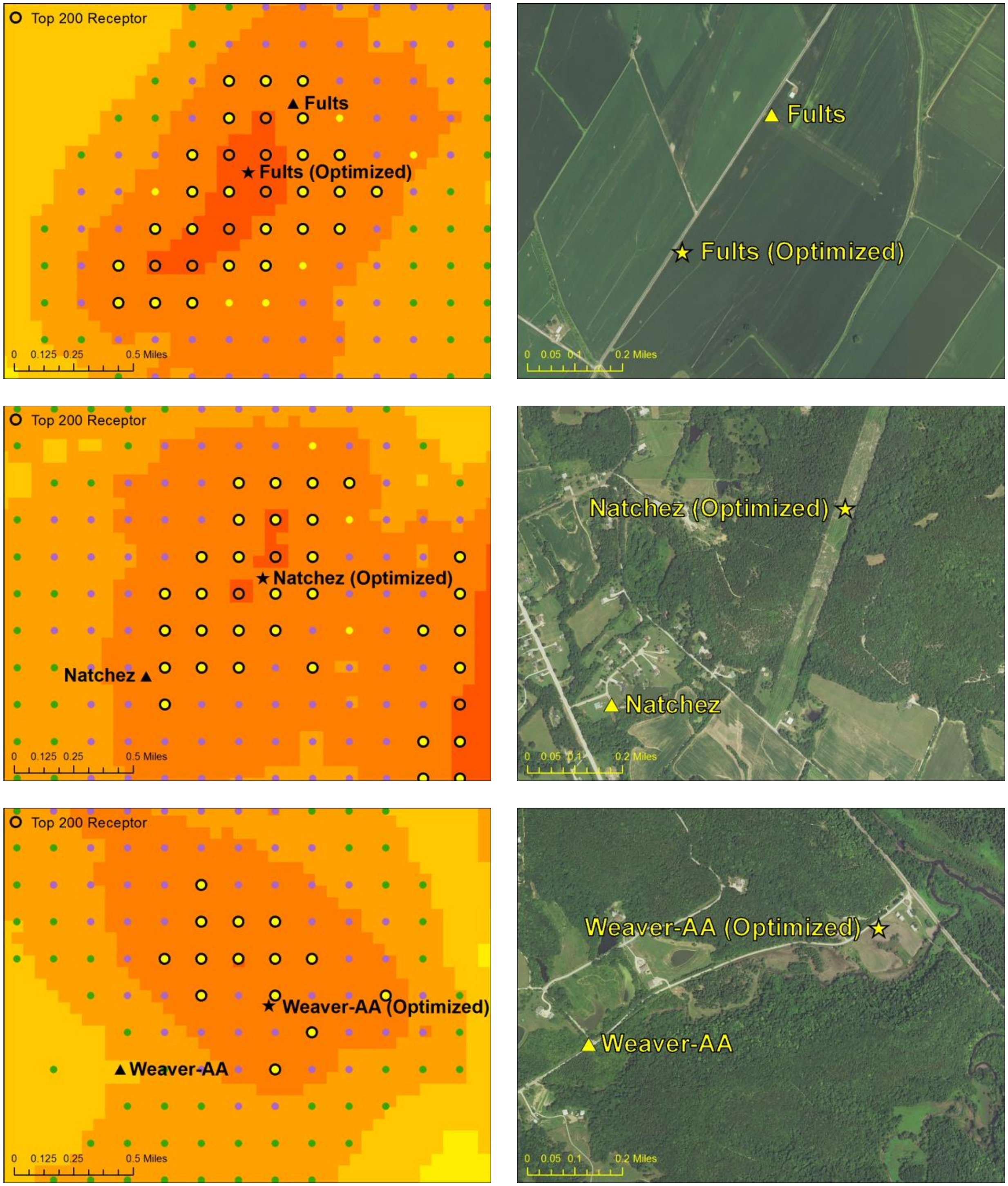


Figure 6. Current and optimized locations of the Fults, Natchez, and Weaver-AA monitoring stations

Exhibit 6

model would predict using constant emission rates. Therefore, using hourly emissions allows the areas where peak 1-hour SO_2 concentrations are expected to occur to be determined with greater confidence.

Regarding which sources to model, EPA suggests identifying and including all sources that may contribute significantly to ambient SO_2 concentrations – and thus to NAAQS exceedances – around the source of interest. The monitoring TAD notes that it is important to "understand the setting and surroundings of the SO_2 source" including determining "if the source is isolated or in an area with multiple SO_2 sources," and it affirms that the primary objective of monitoring is "to identify peak SO_2 concentrations in the ambient air that are attributable to an identified source *or group of sources*."[3] The Rush Island Energy Center is located in an SO_2 nonattainment area with numerous sources of varying magnitude. There are also a number of larger sources that are nearby but just outside of the nonattainment area, including River Cement, St. Gobain Containers, Holcim, Mississippi Lime, Dynegy's Baldwin Energy Complex, and Ameren's Meramec Energy Center. These sources may contribute significantly to ambient SO_2 concentrations in the vicinity of the Rush Island plant and should be included in the modeling unless it can be demonstrated that they do not have a significant influence on areas where peak 1-hour SO_2 concentrations are expected to occur.

III. The Meteorological Data Used in the Modeling May Not be Appropriate

Ameren's modeling uses National Weather Service (NWS) meteorological data from the Cahokia, Illinois airport located approximately 50 kilometers north of the plant. This is different from the meteorological data DNR used in its attainment demonstration modeling for the Jefferson County SO_2 nonattainment SIP. In its SIP modeling, DNR used onsite meteorological data from the now-closed Doe Run primary lead smelter in Herculaneum, approximately 18 kilometers northwest of the Rush Island plant. The Rush Island Energy Center is in the Jefferson County SO_2 nonattainment area, and the Jefferson County SIP states that the onsite meteorological data from Herculaneum is "considered more representative of the entire [nonattainment] area compared to a more distant NWS site."[4] Therefore, the Cahokia meteorological data used in Ameren's modeling may not be appropriate, particularly if – as suggested above – other nearby SO_2 sources are included in the modeling, given that DNR determined – based on the distribution of these sources – that the onsite Herculaneum meteorological data is more representative of the area that encompasses them.

Conclusion

Based on the modeling described in Ameren's report, the proposed locations of the Fults, Natchez, and Weaver-AA monitoring stations are not in modeled peak concentration/high frequency areas. Furthermore, Ameren has not proposed a monitoring station in the highest concentration area due south of the Rush Island Energy Center, citing the claimed but not

---

[3] *Id*. at 2, 4 (emphasis added).

[4] DNR, Nonattainment Plan for the 2010 1-Hour Sulfur Dioxide National Ambient Air Quality Standard, Jefferson County Sulfur Dioxide Nonattainment Area, May 28, 2015, at 26.

Exhibit 6

documented inaccessibility of potential monitoring sites in that area. The absence of a monitor in this large area of expected maximum concentration calls into question whether the proposed SO_2 monitoring network is an appropriate means of assessing compliance with the NAAQS in the area around the plant.

Ameren's proposed monitoring network does not fulfill its requirement under the Consent Agreement to install a monitoring network designed to record maximum expected SO_2 concentrations in the vicinity of the Rush Island plant. Nor is it designed to achieve Ameren's purported goal of obtaining "a good quality data set with representative SO_2 measurements and meteorological information"[5] or DNR's stated goal "to true-up modeling results further away from the Mott Street monitor … to confirm our assessment that the nonattainment area is in compliance with the 1-hour SO2 standard farther away from the violating monitor."[6]

We urge DNR to reject the proposed monitoring sites and require Ameren to add a monitoring station in the highest concentration area due south of the plant as well as to relocate the proposed Fults, Natchez, and Weaver-AA monitoring stations to the optimized locations shown in Figure 5. We also urge DNR to require Ameren to 1) rerun the air dispersion model described in the report using Rush Island's actual hourly emissions; 2) evaluate the effects of nearby interactive sources (including, at a minimum, River Cement, St. Gobain Containers, Holcim, Mississippi Lime, Dynegy's Baldwin Energy Complex, and Ameren's Meramec Energy Center) on modeled peak concentration/high frequency areas; and 3) evaluate the appropriateness of using meteorological data from the Cahokia, Illinois airport instead of Doe Run Herculaneum given DNR's determination that the latter is more representative of the modeled area.[7] We further urge DNR to require any necessary adjustments to the proposed monitoring network based on the results of these analyses.

Respectfully submitted,

Maxine I. Lipeles

Maxine I. Lipeles, J.D.
Ken Miller, P.G.
Interdisciplinary Environmental Clinic
Washington University School of Law

On behalf of the Sierra Club

---

[5] DNR, Comments and Responses on Proposed Revision to Missouri State Implementation Plan – Nonattainment Plan for the 2010 1-Hour Sulfur Dioxide National Ambient Air Quality Standard – Jefferson County Sulfur Dioxide Nonattainment Area, Comment #21, p. 10, available at http://dnr.mo.gov/env/apcp/docs/comments-and-responses-jeffco.pdf.

[6] *Id.*, Response to Comment #4, p. 3.

[7] This analysis should consider and make use of the corrected Herculaneum meteorological data set processed in AERMET with the Bulk Richardson Number option invoked.

Exhibit 6

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Josh Tapp, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Wendy Vit, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

Ameren

Ameren Services

June 28, 2016

Ms. Kyra Moore, Director
Air Pollution Control Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102

Re: Ameren's Comments on the MDNR 2016 Monitoring Network Plan

Dear Ms. Moore:

On behalf of Ameren Missouri, we appreciate this opportunity to comment on the "Missouri Department of Natural Resources, Air Pollution Control Program, 2016 Monitoring Network Plan" (monitoring plan) that details the establishment and maintenance of Missouri's air quality network.

After a careful review of the monitoring plan, Ameren offers these comments on the plan. Ameren fully supports the inclusion of the sulfur dioxide (SO2) monitoring networks for the Labadie and Rush Island Energy Centers. Ameren is committed to operate and maintain the monitoring networks consistent with requirements in federal regulation 40 CFR 58 as well as the state approved Quality Assurance Project Plans (QAPP) and the Department's Quality Management Plan (QMP). As indicated by the inclusion of the Labadie and Rush Island monitoring networks in the 2015 monitoring plan, the locations of the monitors are appropriate to determine compliance with the National Ambient Air Quality Standard (NAAQS) for SO2. The monitoring plan states on page 6 that: "For decades Missouri has overseen ambient air monitoring sites operated by industrial sources for NAAQS compliance." Ameren asserts that the primary purpose of the Labadie and Rush Island monitoring networks are to demonstrate compliance with the National Ambient Air Quality Standard for SO2.

Ameren would like to clarify that even though the Department has chosen not to classify the Labadie and Rush Island monitoring networks as State and Local Air Monitoring Stations (SLAMS), the monitoring networks fully meet the Network Design Criteria for Ambient Air Quality Monitoring in 40 CFR Part 58 Appendix D as well as the quality assurance provisions of 40 CFR Part 58 Appendix A. The Labadie and Rush Island monitoring networks meet the monitoring objectives and general criteria required of SLAMS ambient air quality monitoring stations as stated in Appendix D; the monitoring networks are designed to: (a) provide air pollution data to the general public in a timely manner; (b) support compliance with ambient air quality standards; (c) support air pollution research studies. Ameren suggests that the Department should classify the Labadie and Rush Island monitoring networks as SLAMS in lieu of industrial SO2 monitors. We make this assertion on the basis that the SO2 monitoring network design and Quality Assurance Project Plan, that meets the quality assurance provisions of 40 CFR Part 58 Appendix A, for both the Labadie and Rush Island SO2 monitoring networks were submitted to and approved by the MDNR prior to the promulgation of the revisions made to the provisions of 40 CFR 58 on March 28, 2016.

Specifically on page 18 of the monitoring plan states: "Regardless of EPA's designation status of the Labadie area, the department will continued to work with the Ameren UE to collect quality assured SO2 ambient air quality data and meteorological data near the Labadie Energy Center to provide quantifiable and useful technical information to supplement the ongoing 1-hour SO2 NAAQS implementation process." As you know the primary purpose of the Labadie monitoring network is to demonstrate compliance with the SO2 NAAQS. The monitoring network was in operation well in advance of the January 1, 2017 deadline under the final Data Requirements Rule (DRR).

Ameren would especially like to note that the one-hour SO2 ambient concentration data collected to date at each network are all below the SO2 NAAQS and have demonstrated a very high margin of compliance with the SO2 NAAQS.

Please contact me at your convenience if you have questions related to these comments or if you need any additional information.

Sincerely,

Steven C. Whitworth
Senior Director, Environmental Policy and Analysis

Cc: Patricia Maliro - MDNR

APPENDIX 7: COMMENTS AND RESPONSES ON PROPOSED 2016 MONITORING NETWORK PLAN, REVISION 1

The Missouri Department of Natural Resources’ Air Pollution Control Program (Air Program) posted the 2016 Monitoring Network Plan (initial plan) for public inspection May 27, 2016 through June 28, 2016. Due to several changes in the monitoring network, the Air Program provided a public inspection period from November 15, 2016 to December 15, 2016 for the 2016 Monitoring Network Plan Revision 1 (revised plan).

The Air Program prepared the 2016 Monitoring Network Plan (initial and revised plans) to address the requirements of 40 CFR 58.10 (a) (1) for annual submittal of a plan to provide information on current State or Local Air Monitoring Stations (SLAMS), other ambient air monitoring, and any proposed network changes for the upcoming year.

Based on comments received, no substantive changes were made to the revised plan. One change was made to a label in the map on page 18 of the plan. The Mark Twain State Park site label was corrected to “site #19” to match the map legend.

SUMMARY OF COMMENTS: The following is a summary of comments received on the revised plan and the Air Program’s responses. The Air Program appreciates all input and feedback received. However, several comments received were outside the scope of this plan and the responses are limited to the comments specifically on the monitoring activities described in the plan.

During the public inspection period of the revised plan, the Air Program received comments from Dr. Michael Garvey, St. Charles MO; Jeanne Clauson, Chesterfield MO; Maxine Lipeles (Washington University School of Law on behalf of the Sierra Club); Patricia Schuba, President, Labadie Environmental Organization; Steven C. Whitworth, Ameren Missouri; Daniel Hedrick, City of Springfield Utilities and Joe Brazil, St. Charles County Council.

COMMENT 1:
Dr. Michael V. Garvey commented: “*I appreciate the opportunity to make comment on the Labadie air quality analysis.*

We have a major public health air quality problem which is likely to become more of a problem in the immediate future with all coal fired emissions. The Labadie plant has been negatively impacting my public health, in addition to the health of my patients and neighbors now for 47 years. SO2 and small particulate contamination have real impacts on air quality as you are well aware. Ameren worked back in 1970 to quickly get the plant approved in the last year before "scrubbers" were required and have successfully been avoiding this most reasonable public health measure for 47 years!

I want to know specifically who from the MoDNR approved the "poor" prior locations of the two monitors Ameren placed? How could this have been done with the locations not in areas expected to pick up the SO2 based upon DNR's own modeling plan? Modeling, which is the best way to determine compliance scientifically, was fully expected to give a final "non-attainment" *designation. You do not place a monitor on the valley floor well below the top of the smoke stack! The second monitor was purposefully placed behind trees and high elevations which would block the SO2. These monitors are well away from the most likely locations as determined by the modeling done by MoDNR? I also want to know who from the MoDNR will approved the new locations of the two monitors?*

The best location would be on the first high bluffs down from the prevailing wind on the Missouri River flood plain. Ameren well knows how to Delay, Delay and Delay. Now we have another 3 years of delay before any decision will be made. They well intend to run that plant until is effective life is gone without scrubbers and the DNR are aiding them in this deceptive plan

Please include me in the emails sent out giving the actual SO2 emissions data results from all 4 monitors."

<u>COMMENT 2</u>:
Jeanne Clauson commented: "*Surely after so many years, the area of wind drift is known. Can you not insist that the equipment be located where the fallout of sulphur dioxide would be affecting people and ponds under the areas of wind drift?*

Ameren gets three more years before having to own up to sulphur dioxide pollution. They need to play fair and put the monitors where they belong if they are to enjoy any respect. Come on, they know and we know they aren't the only miracle plant in the country that doesn't need scrubbers.

Another side of Ameren played fair with me when I received the rebates for installing my solar panels 3 years ago. The intricate billing information I receive monthly shows the deductions for my solar contribution and keeps track of how my energy usage has changed from the previous year.

I hope that Ameren can come around and appreciate that they will gain some respect if they put their monitors where they should be placed. It is time to do that! Surely they will appreciate respect over scorn."

<u>RESPONSE TO COMMENTS 1 AND 2</u>:
The locations of the first two monitoring stations (Valley and Northwest) near the Labadie Energy Center were selected utilizing air quality modeling with meteorological data available at the time (see 2015 Monitoring Network Plan), http://dnr.mo.gov/env/apcp/docs/2015-monitoring-network-plan.pdf. The two new monitoring sites (Southwest and North) were selected utilizing modeling with new location-specific meteorological data obtained onsite from one of the first two monitoring stations (see Appendix 5). Modeling and the recommendation of potential monitoring sites were done collaboratively by Air Program and EPA staff. Specific locations consistent with these recommendations were then secured and developed by Ameren Missouri.

Although the Air Program does not email actual monitoring data on a weekly basis, the program does track and post concentrations of the six common pollutants, including $SO_{2,}$ on the following website weekly: http://dnr.mo.gov/env/apcp/airpollutants.htm

COMMENT 3 and 4:

The Sierra Club submitted four main comments regarding the monitoring surrounding Ameren Missouri Labadie and Rush Island Energy Centers. The comments below are the main points, quoted from the submittal. The complete Sierra Club comment document is attached to this appendix.

Sierra Club commented: "*Even with the two new monitors, the Revised Plan fails to cover an expected peak SO_2 concentration area southeast of Labadie. Ameren's own recent modeling, using on-site meteorological data, strongly supports a monitor in this location. The addition of a monitor southeast of Labadie is critical to monitoring all significant areas around Labadie where peak 1-hour SO_2 concentrations are expected to occur.*"

Sierra Club commented: *"The Revised Plan continues to include two monitors, the Valley and Northwest Monitors, which are not sited in areas of expected peak SO_2 concentrations and therefore are not suited for NAAQS compliance monitoring."*

RESPONSE TO COMMENT 3 and 4:

The Data Requirements Rule (DRR) and the EPA Monitoring Technical Assistance Document (TAD) do not specify a minimum number of monitoring sites needed to characterize sources for the 1-hour SO_2 National Ambient Air Quality Standard (NAAQS).

The Preamble to the DRR states: "Potential ambient air monitoring costs are estimated based on the assumption that air quality for each of the 412 SO_2 sources exceeding the 2,000 tpy threshold would be characterized through a single newly deployed air monitor. (The Monitoring TAD discusses situations where more than one monitor may be appropriate or necessary to properly characterize peak 1-hour SO_2 concentrations in certain areas, which would increase costs proportionally.)" Federal Register Vol. 80, No. 1621 Friday, August 21, 2015, page 51085.

Consistent with the Data Requirements Rule, the Air Program determined the number of monitoring sites for these areas using a case-by-case technical evaluation as described in the monitoring plan. The characteristics and complexity of the areas around the facilities indicate that multiple monitoring sites are appropriate in these areas for additional spatial coverage as suggested in the EPA Monitoring TAD Page A-10: "Even in situations where the measured concentrations at any given monitor are not the peak values that would be driving the design values in the area, the characterization of SO_2 concentrations around the SO_2 source are enhanced, furthering the understanding of exposures and dispersion in that area. This data will allow for a more complete understanding of the likely SO_2 concentration gradients in an area, increased understanding of the frequency at which certain locations see SO_2 concentration maxima, and increased detail and confidence in any NAAQS determination activity."

The Valley and Northwest sites were established utilizing air quality modeling with meteorological data available at the time (see the 2015 Monitoring Network Plan.), http://dnr.mo.gov/env/apcp/docs/2015-monitoring-network-plan.pdf. Subsequently, the Southwest and North sites were selected utilizing modeling with new location-specific meteorological data obtained onsite from one of the first two monitoring stations (see Appendix 5). As detailed in EPA's Monitoring TAD, monitors at sites other than the point of maximum modeled concentration are still useful in characterizing the air quality in an area. Therefore, the Labadie Valley and Northwest sites will continue operation in addition to the enhanced network that includes the two new locations, Southwest and North.

For additional information on this topic, please refer to the Air Program's responses to Sierra Clubs comments on the 2015 Monitoring Network Plan, http://dnr.mo.gov/env/apcp/docs/2015-monitoring-network-plan.pdf and on the initial 2016 Monitoring Network Plan.

COMMENT 5:
Sierra Club commented: *"In light of the requirement in the Data Requirements Rule that the monitors begin collecting data by January 1, 2017, we urge DNR to finalize and EPA to approve the Revised Plan expeditiously. We understand that DNR, EPA, and Ameren have already agreed to the two new monitor locations. While we support the location of the two new monitors based on currently-available information, we object that the public was excluded from the discussions regarding new monitor locations and that this public comment period comes far too late in the process for public input to be taken seriously."*

RESPONSE TO COMMENT 5:
The Air Program appreciates Sierra Club's support of the location of the two monitors around the Labadie plant and the recommendation that EPA approve the revised plan expeditiously.

The Air Program relies on and follows the federal regulation which requires making available the annual monitoring network plan for public inspection and comment for at least 30 days prior to submission to the EPA.

The Air Program appreciates all public input on our activities and strives to keep the public informed on our activities through email list serves and other communications. We reviewed numerous letters and comments received on this topic prior to the public inspection period. The Air Program gave regular updates on this issue to the Missouri Air Conservation, whose meetings are livestreamed with meeting minutes available on the web.

COMMENT 6:
Sierra Club commented: *"The Revised Plan makes no changes regarding the monitors around Ameren's Rush Island plant even though two of the monitors are not in peak concentration areas."*

RESPONSE TO COMMENT 6:
The Air Program addressed this issue in response to Sierra Club's comments regarding the 2015 Monitoring Network Plan, http://dnr.mo.gov/env/apcp/docs/2015-monitoring-network-plan.pdf, and in the response to comments on the initial 2016 Monitoring Network Plan.

The monitoring network around the Rush Island Energy Center is not designed to meet the requirements of the Data Requirements Rule. However, the guidelines for DRR monitoring may still be pertinent. The EPA Monitoring TAD Page A-10 states: "Even in situations where the measured concentrations at any given monitor are not the peak values that would be driving the design values in the area, the characterization of SO_2 concentrations around the SO_2 source are enhanced, furthering the understanding of exposures and dispersion in that area. This data will allow for a more complete understanding of the likely SO_2 concentration gradients in an area, increased understanding of the frequency at which certain locations see SO_2 concentration maxima, and increased detail and confidence in any NAAQS determination activity."

COMMENT 7:
Patricia Schuba commented: *"Please consider an additional SO2 monitor SE of the Ameren Labadie stacks given it is also an area of potential exceedence of the SO2 1 hr NAAQS, where many people live, and where many of us send our children to school. (The Fulton School, St. Albans). Previous modeling showed areas S and SE of the plant as also areas potentially exposed to maximal SO2 concentrations.*

The locations of the proposed monitors appear to be in areas of maximum SO2 concentrations (Monitors: SW, N) while the first two monitors sited by Ameren (Monitors: NW and Valley) are not in areas of maximum SO2 concentrations as acknowledged by US EPA.

Thank you for your time, service and consideration of our comments. Please think of the need for accurate and complete data and the obvious impact on our communities."

RESPONSE TO COMMENT 7:
Please see the response to Comment 1 through 4 above regarding the rationale for the number and location of monitoring sites.

COMMENT 8 and 9:
The complete Ameren comment letter is attached to this appendix.
Steven C. Whitworth commented (in summary): *Ameren supports the addition of two additional monitoring sites to the network around the Labadie Energy Center. Ameren is committed to continue to operate the networks around the Labadie and Rush Island Energy Centers consistent with the requirements of 40 CFR Part 58, the state-approved Quality Assurance Project Plans, and the Data Requirements Rule to determine whether the areas are in compliance with the* SO_2 *NAAQS. Ameren notes that* SO_2 *concentrations measured to date near both facilities are well below the level of the NAAQS.*

Daniel Hedrick commented: *"City Utilities of Springfield, Missouri (CUS) supports the Missouri Department of Natural Resources (MDNR) revisions to the Monitoring Network Plan. CUS believes the proposed changes are consistent with the quality-assured ambient air quality data. We appreciate this opportunity to submit comments on behalf of the utility. Thank you."*

RESPONSE TO COMMENTS 8 and 9:
The Air Program appreciates the support of the Monitoring Network Plan.

COMMENT 10:
Joe Brazil, St. Charles County Council, commented:
"The citizens in southern St. Charles county truly appreciate the EPA taking another look at the inclusion of two new monitors, one N of the plant in St Charles County and one SW of the plant

in Franklin County. These appear based on currently-available data to be in areas of maximum SO2 concentrations.
It should be seriously considered that one more monitor should be added to the SE of the plant, another area of maximum SO2 concentrations without any monitor coverage.
As EPA noted in its Response to Comments regarding the Labadie designation decision, the first two monitors previously sited by Ameren (labeled the Northwest and Valley monitors) are NOT in areas of maximum SO2 concentrations.

We also would like to see that immediate action for DNR to send the plan to EPA and for EPA to approve because the two new monitors must be online by Jan 1, 2017.
Again it is truly appreciated that you are working with us and that we can get some resolve on this issue.

RESPONSE TO COMMENTS 10
Please see the responses above to Comments 1 through 7.

Washington University in St.Louis
SCHOOL OF LAW

Interdisciplinary Environmental Clinic

December 14, 2016

Missouri Department of Natural Resources
Air Pollution Control Program
Air Quality Analysis Section/Air Monitoring Unit
P.O. Box 176
Jefferson City, MO 65102
Via email to: cleanair@dnr.mo.gov

Re: 2016 Monitoring Network Plan, Revision 1 (November 15, 2016)

To whom it may concern:

On behalf of the Sierra Club, we submit these comments on the Missouri Department of Natural Resources' ("DNR") 2016 Monitoring Network Plan, Revision 1 dated November 15, 2016 ("Revised Plan"). The Revised Plan adds sulfur dioxide ("SO_2") monitors southwest and north of the Labadie Energy Center that, based on the best information currently available, appear to be sited in areas of expected peak 1-hour SO_2 concentrations. We appreciate these additions to the monitoring network plan given our and EPA's[1] previously-stated position that neither of Ameren's current Labadie monitors is in an area of maximum SO_2 concentrations as required by EPA regulations.[2] Identifying areas of SO_2 nonattainment around the Labadie plant is critical because the plant is the largest coal plant in the nation without SO_2 controls and SO_2 poses significant public health risks for children, the elderly, and asthmatics.[3]

This letter makes four additional points:

1. Even with the two new monitors, the Revised Plan fails to cover an expected peak SO_2 concentration area southeast of Labadie. Ameren's own recent modeling, using on-site meteorological data, strongly supports a monitor in this location. The addition of a monitor southeast of Labadie is critical to monitoring all significant areas around Labadie where peak 1-hour SO_2 concentrations are expected to occur.

---

[1] EPA, Responses to Significant Comments on the Designation Recommendations for the 2010 Sulfur Dioxide Primary National Ambient Air Quality Standard (NAAQS), Docket Number EPA-HQ-OAR-2014-0464 (June 30, 2016) ("Response to Comments") at 79-87, available at https://www.epa.gov/sites/production/files/2016-07/documents/so2d-r2-response-to-comments-06302016.pdf.

[2] Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS), 80 Fed. Reg. 51052 (Aug. 21, 2015), *codified at* 40 C.F.R. §§ 51.1200 – 51.1205.

[3] EPA, Sulfur Dioxide Basics, available at https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#effects. SO_2 emissions also contribute to dangerous fine particle pollution. See, e.g., Clean Air Task Force, *The Toll From Coal* (Sept. 2010), available at http://www.catf.us/resources/publications/files/The_Toll_from_Coal.pdf ("Sulfur emissions from coal-fired power plants thus emerge as the chief driver of adverse health impacts from industrial sources of air pollution across much of the country." *Id*. at 8).

2. The Revised Plan continues to include two monitors, the Valley and Northwest Monitors, which are not sited in areas of expected peak SO_2 concentrations and therefore are not suited for NAAQS compliance monitoring.

3. In light of the requirement in the Data Requirements Rule that the monitors begin collecting data by January 1, 2017, we urge DNR to finalize and EPA to approve the Revised Plan expeditiously. We understand that DNR, EPA, and Ameren have already agreed to the two new monitor locations. While we support the location of the two new monitors based on currently-available information, we object that the public was excluded from the discussions regarding new monitor locations and that this public comment period comes far too late in the process for public input to be taken seriously.

4. The Revised Plan makes no changes regarding the monitors around Ameren's Rush Island plant even though two of the monitors are not in peak concentration areas.

I. A Monitor Is Necessary Southeast of Labadie To Address Expected Peak SO_2 Concentrations In That Area.

Ameren's recent modeling evaluation, which utilizes on-site meteorological data from the Valley monitoring site, strongly supports the need for an SO_2 monitor southeast of Labadie. According to EPA's SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document ("Monitoring TAD"), "the most valuable data for this application [monitoring site evaluations] are meteorological data collected very nearby or even on the property of an identified SO_2 emitting facility ... These on-site data typically have very good spatial representativeness of the area in which the identified SO_2 source is situated, and thus, provide the best information to understand the actual conditions in which SO_2 emissions are being dispersed."[4] Therefore, Ameren's recent modeling evaluation is more representative of conditions around Labadie than previous evaluations by both DNR and Ameren, which used airport data from the National Weather Service ("NWS") instead of on-site data.

The results of Ameren's recent modeling are shown in Figures 1-4. These figures show normalized design values ("NDVs") for all receptors exceeding 75 percent of the maximum NDV and score ranks for the top 200 receptors for all meteorological and emissions datasets used in the modeling.[5]

---

[4] EPA, SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (Feb. 2016, Draft) ("Monitoring TAD") at 6, available at https://www.epa.gov/sites/production/files/2016-06/documents/so2monitoringtad.pdf.

[5] Because the Valley monitoring site was flooded from the end of December 2015 until late March 2016 resulting in a gap in the on-site meteorological data, Ameren used four separate meteorological datasets in its modeling: 1) Valley site data from April 22, 2015 through June 30, 2016; 2) Valley site data from April 22, 2015 through June 30, 2016 with the gap filled with NWS data from Jefferson City Memorial Airport; 3) Valley site data from April 22, 2015 through June 30, 2016 with the gap filled with NWS data from Spirit of St. Louis Airport; and 4) Weather Research and Forecasting model data for the year 2015. Ameren also used three separate emissions datasets: 1) actual hourly emissions (normalized) with actual hourly stack temperatures and exit velocities; 2) a fixed emission rate with constant stack temperature and exit velocity based on all units operating at >500 MW ("high-load scenario"); and 3) a fixed emission rate with constant stack temperature and exit velocity based on all units operating between 300-450 MW ("mid-load scenario").

We calculated receptor score ranks, which provide a means of prioritizing receptor locations for consideration as permanent monitoring sites using NDVs and frequency of having the highest 1-hour daily maximum concentration, using the methodology described in Appendix A of the Monitoring TAD.

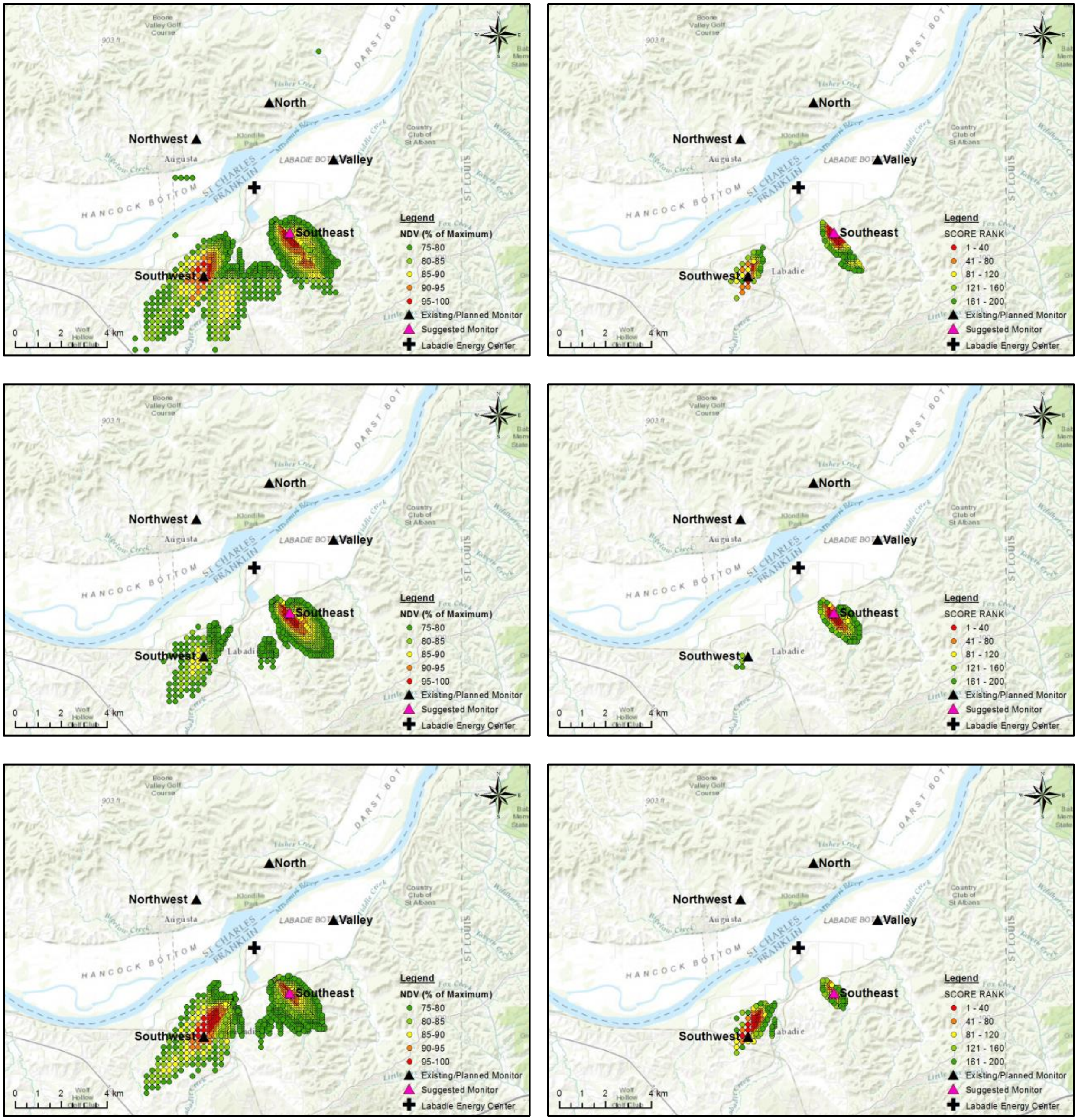


Figure 1: Normalized design values (left; all receptors exceeding 75% of the maximum NDV) and score ranks (right; top 200 receptors only) for modeling runs using meteorological data from the Valley site. The top, middle, and bottom rows show results for the actual hourly emissions scenario, the high-load scenario, and the mid-load scenario, respectively.

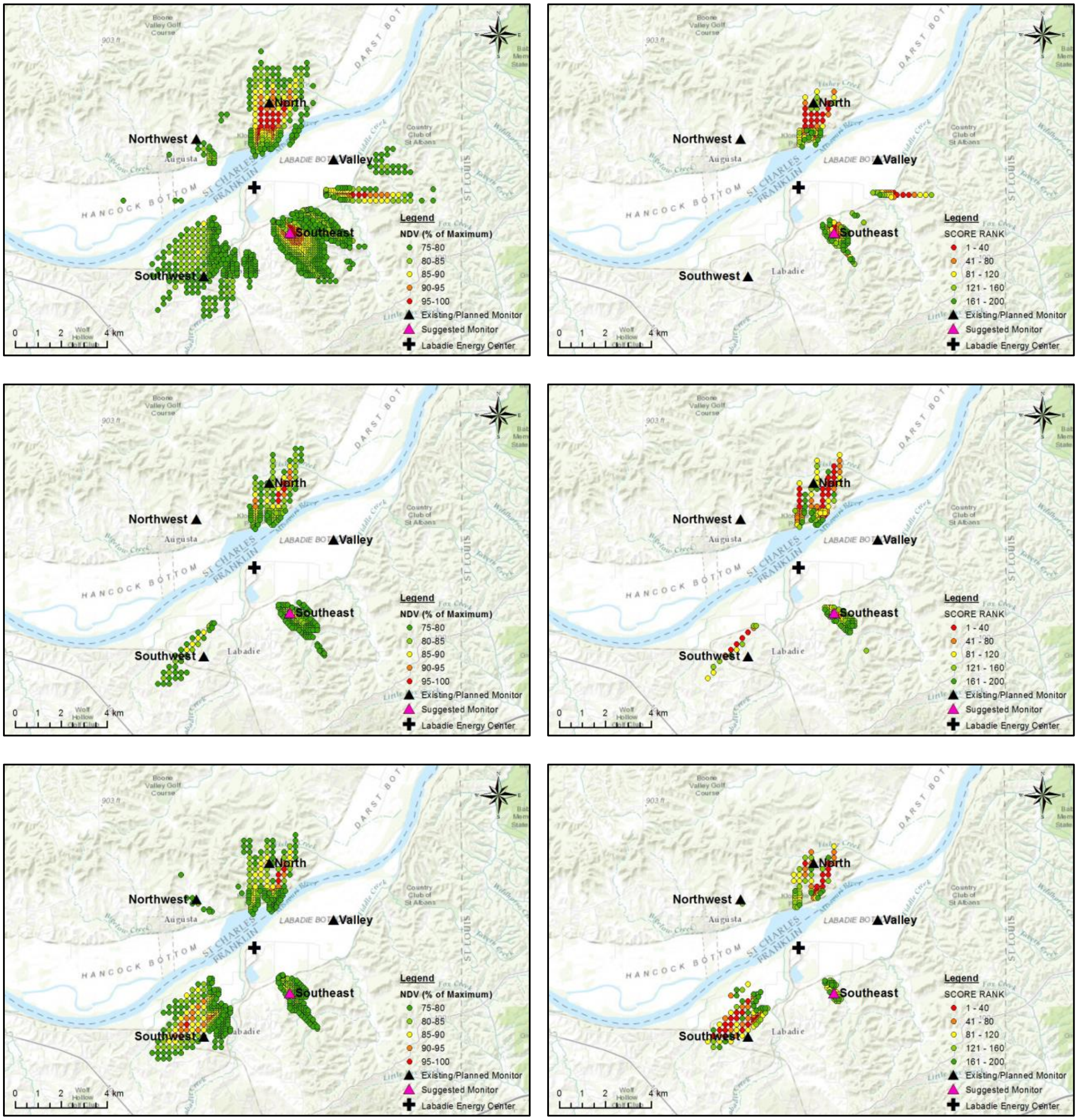


Figure 2: Normalized design values (left; all receptors exceeding 75% of the maximum NDV) and score ranks (right; top 200 receptors only) for modeling runs using meteorological data from the Valley site with the gap in on-site data filled with NWS data from Jefferson City Memorial Airport. The top, middle, and bottom rows show results for the actual hourly emissions scenario, the high-load scenario, and the mid-load scenario, respectively.

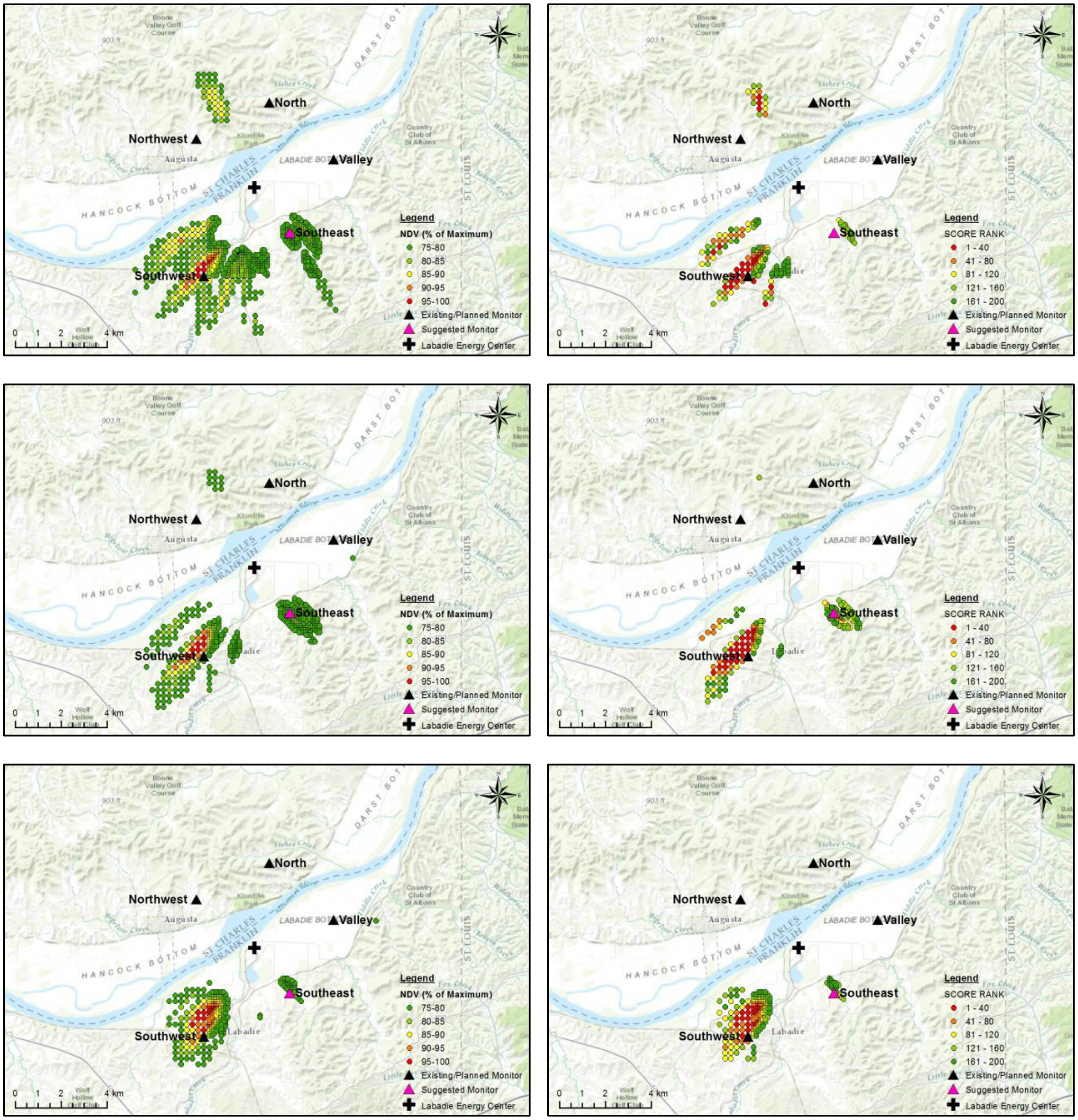


Figure 3: Normalized design values (left; all receptors exceeding 75% of the maximum NDV) and score ranks (right; top 200 receptors only) for modeling runs using meteorological data from the Valley site with the gap in on-site data filled with NWS data from Spirit of St. Louis Airport. The top, middle, and bottom rows show results for the actual hourly emissions scenario, the high-load scenario, and the mid-load scenario, respectively.

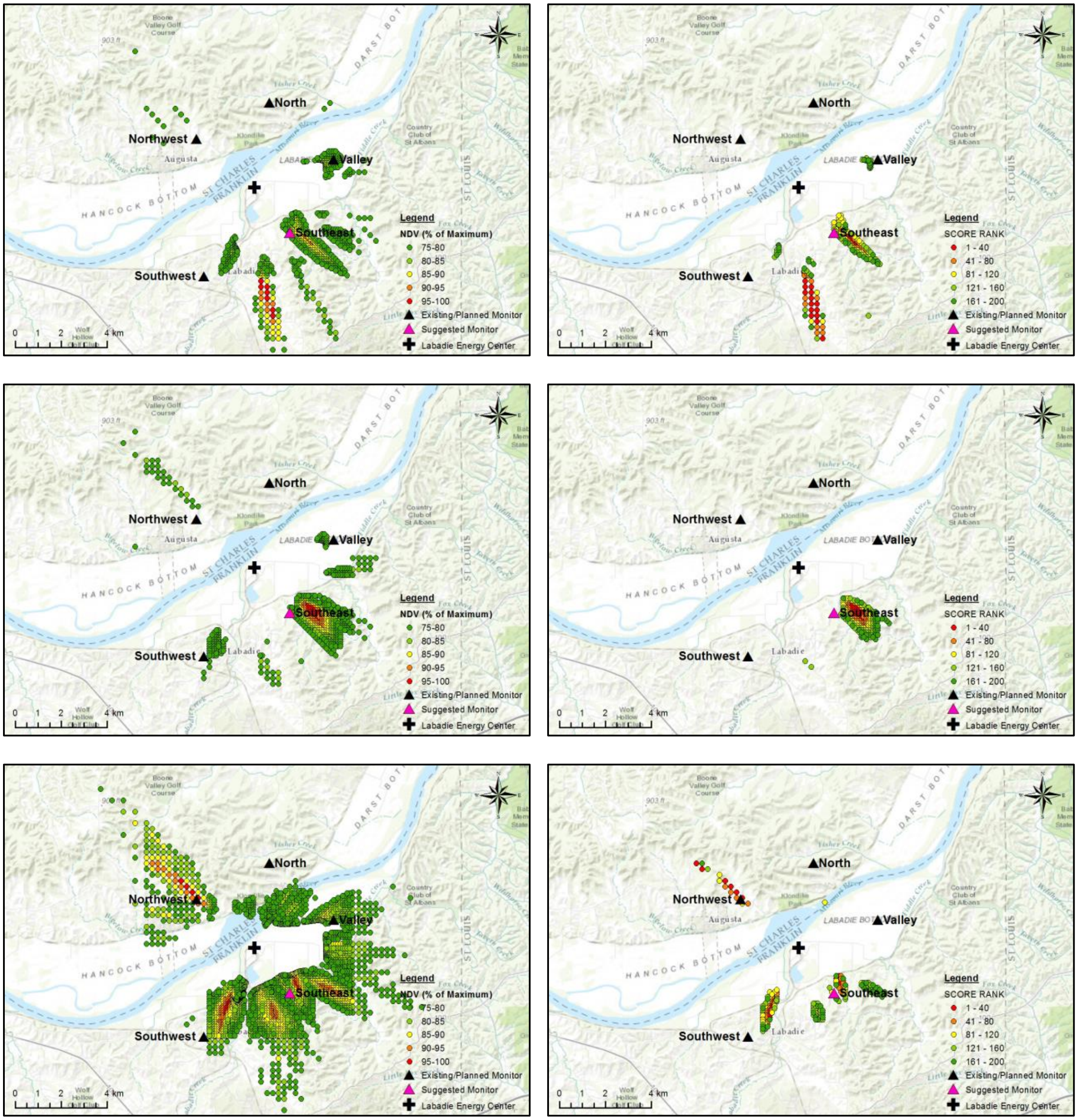


Figure 4: Normalized design values (left; all receptors exceeding 75% of the maximum NDV) and score ranks (right; top 200 receptors only) for modeling runs using Weather Research and Forecasting model meteorological data. The top, middle, and bottom rows show results for the actual hourly emissions scenario, the high-load scenario, and the mid-load scenario, respectively.

As Figures 1-4 clearly demonstrate, all of Ameren's recent modeling shows an area of high NDVs and/or highly ranked receptors southeast of Labadie. The size and exact locus of the area, modeled NDVs, and receptor ranks all vary somewhat depending on the meteorological and emissions datasets used. However, in every instance there is a grouping of top 200 receptors in the area that frequently includes some of the most highly ranked receptors. Further, modeled NDVs in the area are always greater than 75 percent of the maximum NDV and are greater than 90 or 95 percent of the maximum in over half of the runs. Hence the modeling strongly supports a monitor southeast of the plant.

In addition, Appendix 5 of the Revised Plan, "Review of Proposed Additional Southwest and North SO_2 Monitoring Stations Around the Labadie Energy Center," includes an analysis by Ameren that purports to combine the results of all modeling runs using the four different meteorological datasets (for the actual hourly and high-load emissions scenarios) in order to determine a preferred monitor location.[6] The results of Ameren's analysis are shown in Figures 5 and 6.[7]

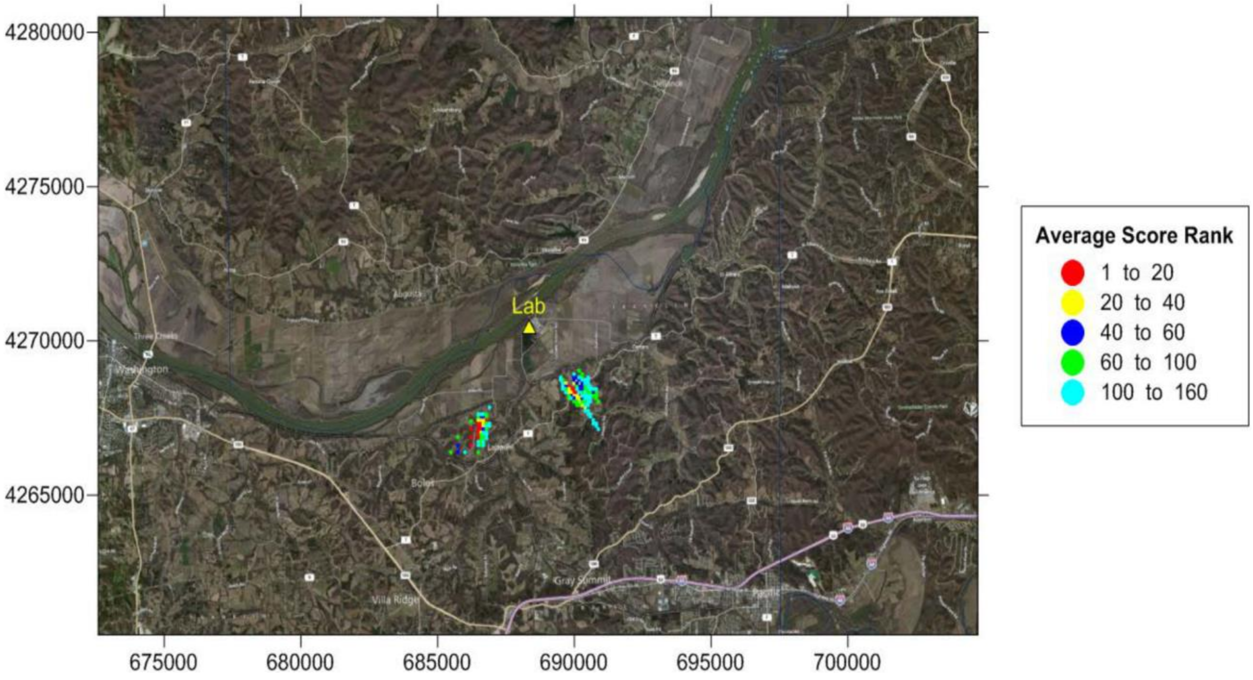


Figure 5. Summary average score rank over all met scenarios, actual hourly emissions scenario.

---

[6] Revised Plan at 172. ("To further refine a preferred monitor location from the scenario predictions, the top 200 NDV receptors for these two operating conditions were combined into individual files of 800 receptors (top 200 NDV receptors for each meteorological scenario). These receptors were then searched to see if any of the top 200 NDV receptors for each meteorological scenario were repeated. A list of receptors that occurred in at least two or more of the meteorological scenarios were compiled and the average score rank for those duplicate receptors was calculated. Those duplicate receptors were then ranked. This ranked list of receptors represents a consensus between the four different meteorological scenarios as to the best location to site an additional SO_2 monitor.")

[7] Figures 5 and 6 reproduce Figures 6 and 7, respectively, from Revised Plan, Revision 1, Appendix 5.

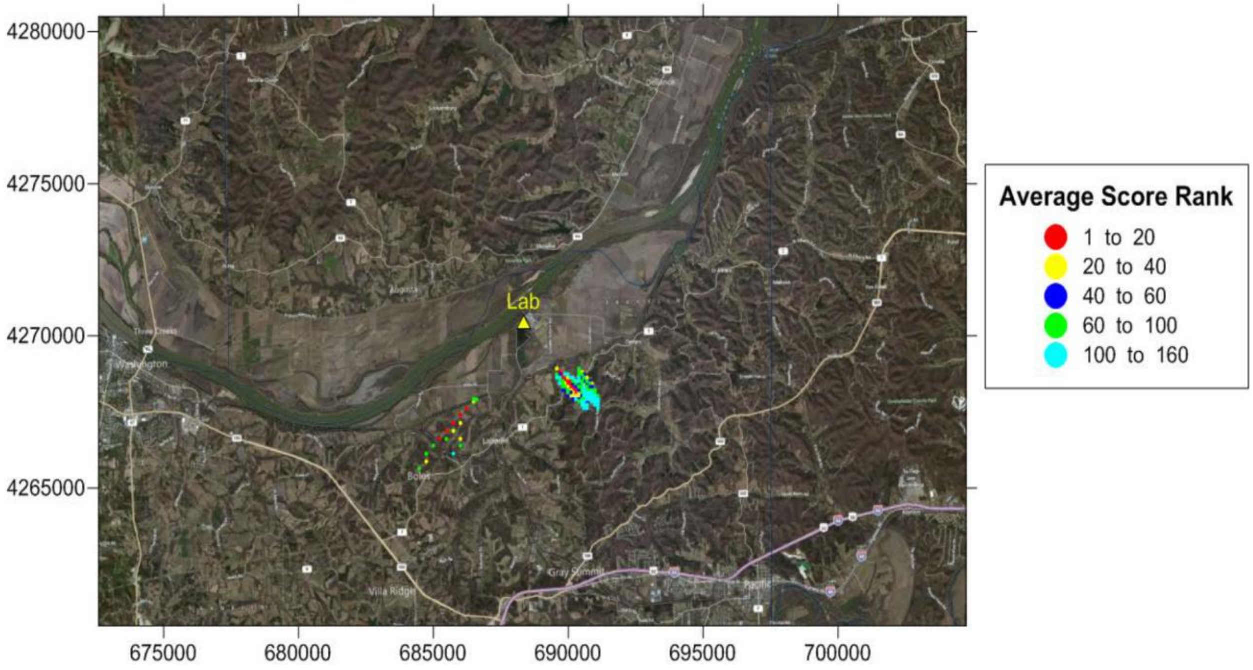


Figure 6. Summary average score rank over all met scenarios, high-load emissions scenario.

Figures 5 and 6 both show groupings of duplicate receptors with high average score ranks southeast and southwest of Labadie. This analysis provided Ameren's justification for the new Southwest monitor. However, it also clearly demonstrates the need for a monitor southeast of the plant, an area Ameren itself labeled a "preferred monitoring location" pursuant to its own analysis.[8] The addition of a southeast monitor is critical to monitoring all significant areas around Labadie where peak 1-hour SO_2 concentrations are expected to occur. Our suggested location, shown in Figures 1-4, was chosen due to the high modeled concentrations in the area, the lack of obstructions and easy access to utilities, and because it is out of the floodplain in elevated terrain with better exposure to Labadie's emissions.

II. The Valley and Northwest Monitors Are Not Sited In Areas of Peak SO_2 Concentrations And Therefore Should Not Be Used for NAAQS Compliance Monitoring.

The Valley and Northwest monitors are not sited in areas of peak SO_2 concentrations. As EPA previously concluded based on an analysis of wind rose information and historic monitoring locations, "… neither of the current monitoring site locations are placed in areas representative of maximum concentrations … The current monitors are not in the predominant wind directions, nor are they located at elevated terrain surrounding Labadie, like the historic monitors were."[9] Ameren's recent modeling evaluation, which is more representative than previous evaluations,

---

[8] Revised Plan at 176. ("As can be seen from the figures, only locations to the southwest and southeast of the Labadie Energy Center remain as preferred SO_2 monitoring locations.")

[9] Response to Comments at 82.

supports EPA's conclusion that the current monitors are not sited in areas of peak SO_2 concentrations. Figures 1-4 above show that the Valley and Northwest monitors are neither in areas with the highest NDVs nor in areas where the receptors with the highest score ranks (calculated per the scoring strategy in the Monitoring TAD) are located.

The Revised Plan states that the Sierra Club previously supported the location of the Northwest monitor.[10] That conclusion is outdated because it was based on an earlier modeling evaluation that used NWS airport data instead of on-site meteorological data. However, on-site meteorological data is now available and EPA's Monitoring TAD indicates that on-site data is typically "the most valuable data for this application."[11] Modeling using the best currently available data, including on-site meteorological data, demonstrates that the Northwest site is not an appropriate location as it is not in an area of expected peak SO_2 concentrations.

III. DNR Has Not Allowed For Meaningful Public Input.

There has been considerable and widespread public concern about the Labadie plant's air pollution and its health impacts for some time. Labadie is the 14th largest coal-burning power plant in the United States, the largest source of SO_2 emissions in Missouri, and the largest plant in the country without any SO_2 controls.

Reflecting these concerns, both St. Charles County and the City of Pacific (in Franklin County) adopted resolutions calling upon EPA "to ensure that a sufficient number of sulfur dioxide monitors are placed around the Labadie coal plant and that they are placed in locations where the highest levels of pollution are expected to be detected."[12]

Sierra Club has repeatedly questioned the adequacy of the Labadie monitors since they were first proposed by Ameren in its "Labadie Sulfur Reduction Project Quality Assurance Project Plan."[13] After EPA weighed in with similar concerns in connection with its June 30, 2016 designation decision[14] and it became clear that EPA, DNR, and Ameren were discussing possible additional monitoring locations, Sierra Club repeatedly requested that the public be included in those discussions. However, the discussions proceeded behind closed doors, and DNR and EPA have already approved the two new locations. Both agencies had approved the location of the Southwest monitor by late September,[15] just as DNR had approved Ameren's siting of the Northwest and

---

[10] Revised Plan, Comments and Responses On Proposed 2016 Monitoring Network Plan, Revision 0.

[11] Monitoring TAD at 6.

[12] St. Charles County Resolution No. 16-08 (Sept. 12, 2016); City of Pacific Resolution No. 2016-34 (Sept. 20, 2016).

[13] Letter from Clinic on behalf of Sierra Club to DNR (Patricia Maliro) with copies to EPA re Comments on Ameren Missouri's Labadie Sulfur Reduction Quality Assurance Project Plan (Apr. 13, 2015); Letter from Clinic on behalf of Sierra Club to DNR (Stephen Hall) with copies to EPA re 2015 Monitoring Network Plan (July 20, 2015); Letter from Clinic on behalf of Sierra Club to DNR (Stephen Hall) with copies to EPA re Supplemental Comments on 2015 Monitoring Network Plan (Aug. 11, 2015); Letter from Clinic on behalf of Sierra Club to DNR with copies to EPA re 2016 Monitoring Network Plan dated May 27, 2016 (June 28, 2016).

[14] Response to Comments at 79-87.

[15] E-mail chain between DNR (Kyra Moore) and EPA (Michael Jay) and within EPA (Michael Jay and Leland Grooms), with final email addressed to Ameren from DNR with copies to EPA (Sept. 23, 2016) (Exhibit 1).

Valley monitors before publication of the 2015 Monitoring Network Plan. In light of what is effectively agency pre-approval of the Revised Plan, and the fact that all monitors to be used for SO_2 NAAQs compliance monitoring must be operational by January 1, 2017, the current comment period does not serve as a bona fide request for public input on a decision with significant public health implications. While we support prompt EPA approval of the Revised Plan and expect the new Southwest and North monitors to be operating by no later than January 1, we note that the process by which these monitors were sited excluded the public and did not provide a timely opportunity for Sierra Club to advance its position that an additional monitor Southeast of the plant should be included in the Labadie monitoring network.

IV. The Rush Island Monitors Are Not Properly Sited.

The Revised Plan makes no changes regarding the monitors around Ameren's Rush Island plant. On behalf of the Sierra Club, we hereby reiterate and incorporate by reference our previous critique of those monitor locations.[16]

V. Conclusion

Ameren's Labadie and Rush Island power plants are the two largest sources of sulfur dioxide emissions in Missouri. While virtually all other plants of their size across the nation have already adopted or made binding commitments to adopt scrubber technology to dramatically reduce their sulfur dioxide emissions, Ameren instead has installed monitors that are not in expected peak SO_2 concentrations around these two plants. The Northwest and Valley monitors at Labadie and the Natchez and Weaver-AA monitors at Rush Island are not located in areas of peak SO_2 concentrations. Their inclusion in the Monitoring Network Plan is inconsistent with the regulatory requirements for SO_2 NAAQS compliance monitoring.

Sierra Club supports the addition of the Southwest and North monitors at Labadie, and urges EPA to approve the Revised Plan expeditiously to ensure that the monitors are fully operational by the January 1, 2017 deadline of the Data Requirements Rule. Sierra Club also supports the addition of another monitor to the Southeast, to ensure that all significant areas of peak concentration around this very large source of SO_2 pollution are monitored.

Sincerely yours,

Maxine I. Lipeles

Maxine I. Lipeles, Director
Kenneth Miller, P.G., Environmental Scientist

---

[16] Clinic letter to DNR (Patricia Maliro) with copies to EPA re Comments on Ameren Missouri's Analysis of SO_2 and Meteorological Monitoring Stations Around Its Rush Island Energy Center (May 29, 2015) (Exhibit 2); Letter from Clinic on behalf of Sierra Club to DNR (Stephen Hall) with copies to EPA re 2015 Monitoring Network Plan (July 20, 2015) (Exhibit 3); Letter from Clinic on behalf of Sierra Club to DNR with copies to EPA re 2016 Monitoring Network Plan dated May 27, 2016 (June 28, 2016) (Exhibit 4).

Interdisciplinary Environmental Clinic
Washington University School of Law
One Brookings Drive – CB 1120
St. Louis, MO 63130
314-935-5837 (phone); 314-935-5171 (fax)
milipele@wustl.edu

Attorneys for the Sierra Club

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Michael Jay, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Darcy Bybee, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

Exhibit 1

From:	Moore, Kyra
Sent:	Friday, September 23, 2016 2:36 PM
To:	'Whitworth, Steve C'
Cc:	Jay, Michael; Bybee, Darcy
Subject:	Ameren Labadie SW Monitoring Location
Attachments:	Possible SW Loc.pdf

Steve,
Although EPA and MDNR staff are still writing up the report of the monitoring site visit this week, this email confirms that the Southwest location (N 38.52814, W -90.86326) is appropriate for the use of a Data Requirements Rule Monitor and meets federal monitoring siting criteria. Please proceed with finalizing the details of this location.

As we discussed MDNR will add this site to our Monitoring Network Plan. As discussions regarding monitoring north of the plant are still ongoing, we will wait to re-public notice the plan until all monitoring decisions around the Labadie area are final.

If you have any questions, please let me know.
Thanks!
Kyra

Kyra L. Moore, Director
MDNR Air Pollution Control Program
1659 E. Elm Street
Jefferson City, MO 65102
(573) 751-7840
(573) 751-0303 direct line
(573) 680-2761 cell

Promoting, Protecting and Enjoying our Natural Resources. Learn more at dnr.mo.gov.

From: Jay, Michael [mailto:Jay.Michael@epa.gov]
Sent: Friday, September 23, 2016 1:23 PM
To: Moore, Kyra; Grooms, Leland
Cc: Davis, Michael; Hall, Stephen
Subject: RE: Results from site visit?

Kyra,

We can confirm that this map displaying the proposed site location is in the maximum modeled impact area to the southwest of the facility.

Mike Jay

Branch Chief
Air Planning and Development Branch
USEPA R7
913-551-7460

Exhibit 1

From: Grooms, Leland [mailto:Grooms.Leland@epa.gov]
Sent: Friday, September 23, 2016 10:23 AM
To: Jay, Michael
Cc: Davis, Michael; Moore, Kyra; Hall, Stephen
Subject: Re: Results from site visit?

Hey Mike

I am putting together a summary of the site visits from 9/21-9/22 that should be ready by Monday. However, I can say with full confidence that the SW location is a good site and fully meets all CFR criteria.

Leland

Leland Grooms, EPA Region 7
Monitoring & Environmental Sampling Branch (MESB)
Senior Environmental Scientist
Leader, Air Monitoring Team
913 551-5010/cp: 913 549-2266

From: Jay, Michael
Sent: Friday, September 23, 2016 9:37:00 AM
To: Grooms, Leland
Cc: Davis, Michael; Kyra Moore; Hall, Stephen
Subject: Results from site visit?

Lee,

The Air program would like to tentatively agree to the SW site if you are good with it? With this email Ameren would be willing to finalize lease agreement and install monitor in order to meet our Jan deadline under DRR. Kyra can u send map of this location?

Mike Jay

Branch Chief
Air Planning and Development Branch
USEPA R7
913-551-7460

Exhibit 2

Washington University in St. Louis
SCHOOL OF LAW

Interdisciplinary Environmental Clinic

May 29, 2015

Ms. Patricia Maliro
Chief, Air Quality Monitoring Unit
Air Pollution Control Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176
Via email to patricia.maliro@dnr.mo.gov

Re: Comments on Ameren Missouri's Analysis of SO_2 and Meteorological Monitoring Stations Around Its Rush Island Energy Center

Dear Ms. Maliro:

On behalf of the Sierra Club, we submit the following comments on the report by Ameren Missouri titled Analysis of SO_2 and Meteorological Monitoring Stations Around Ameren Missouri's Rush Island Energy Center (Ameren's Monitoring Stations Analysis), which it submitted to DNR on or about April 29, 2015. The report describes the methodology Ameren used to determine the locations of three proposed ambient SO_2 monitoring stations and one meteorological monitoring station around its Rush Island Energy Center in Jefferson County, Missouri. Pursuant to a March 23, 2015 Consent Agreement with DNR, Ameren is required to install and begin operation of an SO_2 monitoring network around the Rush Island plant on or before December 31, 2015.

We believe Ameren's proposed monitoring sites should be rejected because they are located outside areas where peak 1-hour SO_2 concentrations are expected to occur based on the modeling described in Ameren's report. Furthermore, the modeling described in the report does not comport with EPA guidance on characterizing ambient air quality in areas around or impacted by significant SO_2 emission sources such as the Rush Island Energy Center and therefore may have failed to correctly identify areas of expected ambient, ground-level SO_2 concentration maxima. We also have concerns regarding the appropriateness of the meteorological data used in the modeling.

I. Based on the Modeling Described in Ameren's Report, the Proposed Monitoring Sites are Located Outside Areas Where Peak 1-Hour SO_2 Concentrations are Expected to Occur

The Consent Agreement (Appendix 1, ¶b) requires that "the number and location of SO_2 monitors and meteorological station(s) shall ensure that the approved SO_2 monitoring network represents ambient air quality in areas of maximum SO_2 impact from the Rush Island Energy Center." Ameren's Monitoring Stations Analysis (p. 3) describes the modeling it performed to

Campus Box 1120, One Brookings Drive, St. Louis, MO 63130-4899
(314) 935-7238, FAX: (314) 935-5171; www.law.wustl.edu

Exhibit 2

"delineate areas where maximum concentrations are expected to occur for this type of source and thus where SO_2 monitoring systems should be placed."

Unfortunately, the monitoring sites proposed by Ameren are not, in fact, located in "areas of maximum SO_2 impact from the Rush Island Energy Center," as required by the Consent Agreement.

Figures 1 through 4 below show the results of Ameren's modeling, which we derived using model input files provided by DNR. Figure 1 shows modeled SO_2 design values in the vicinity of the plant; Figure 2 shows receptors with modeled design values greater than or equal to 75 percent of the maximum modeled design value (146.1 ug/m^3); Figure 3 shows the number of times the model-derived maximum daily 1-hour concentration exceeded 75 percent of the maximum modeled design value at each receptor; and Figure 4 shows the receptors with the top 200, 100, 25, and 10 modeled design values. The locations of the plant and the proposed Fults, Natchez, and Weaver-AA SO_2 monitoring stations and the proposed Tall Tower meteorological monitoring station are shown on all figures for reference.

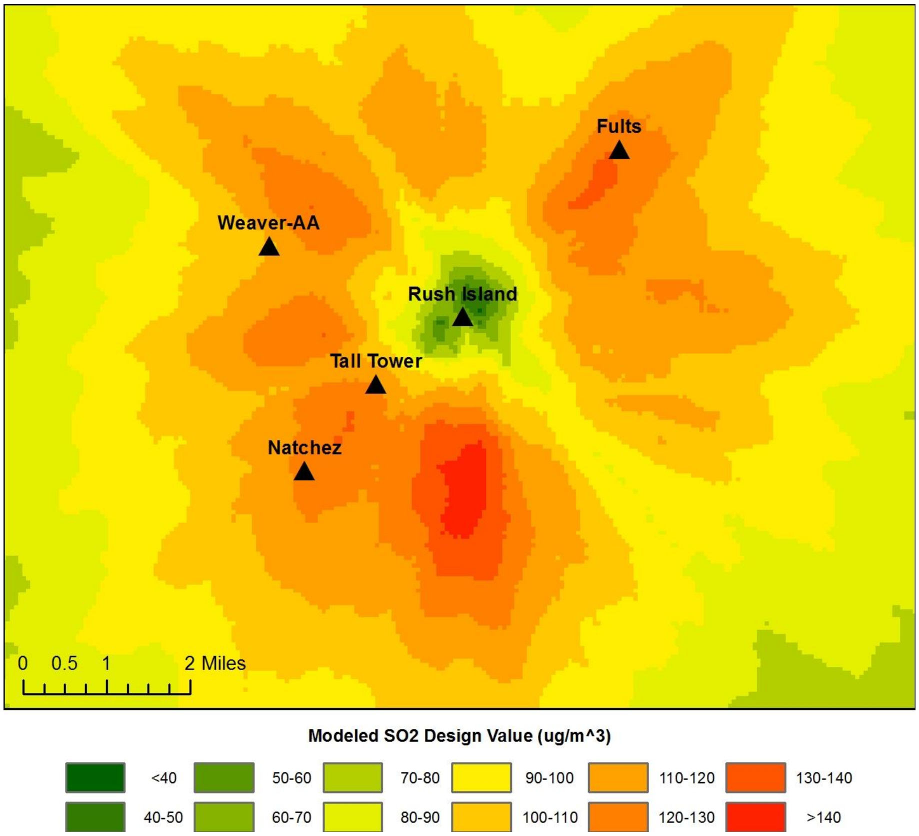


Figure 1. Modeled SO_2 design values in the vicinity of the Rush Island Energy Center.

Exhibit 2

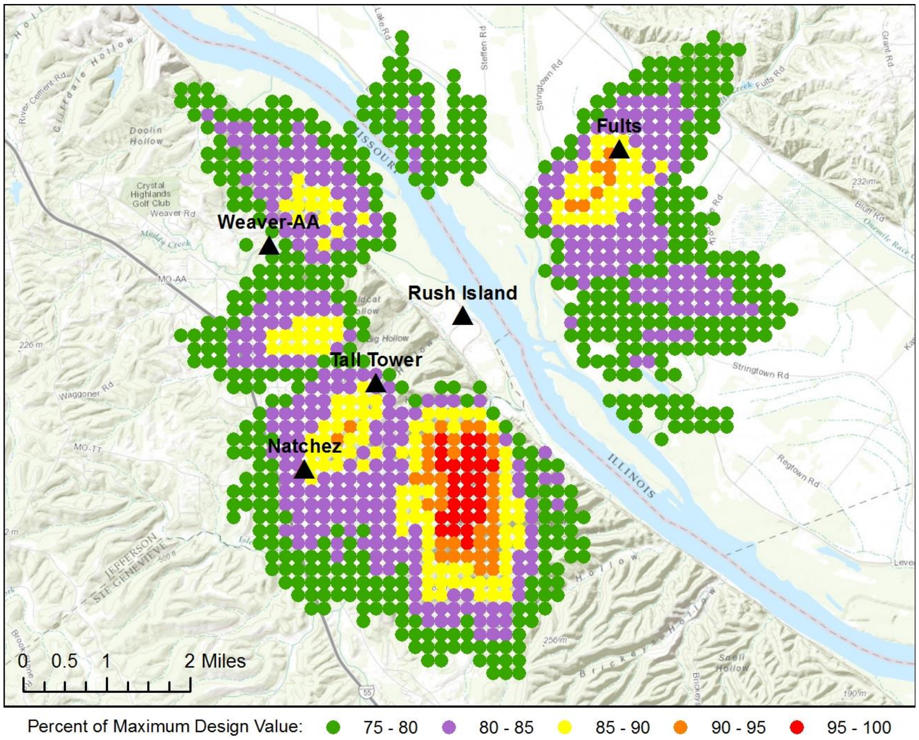


Figure 2. Receptors with modeled design values ≥75 percent of the maximum modeled design value.

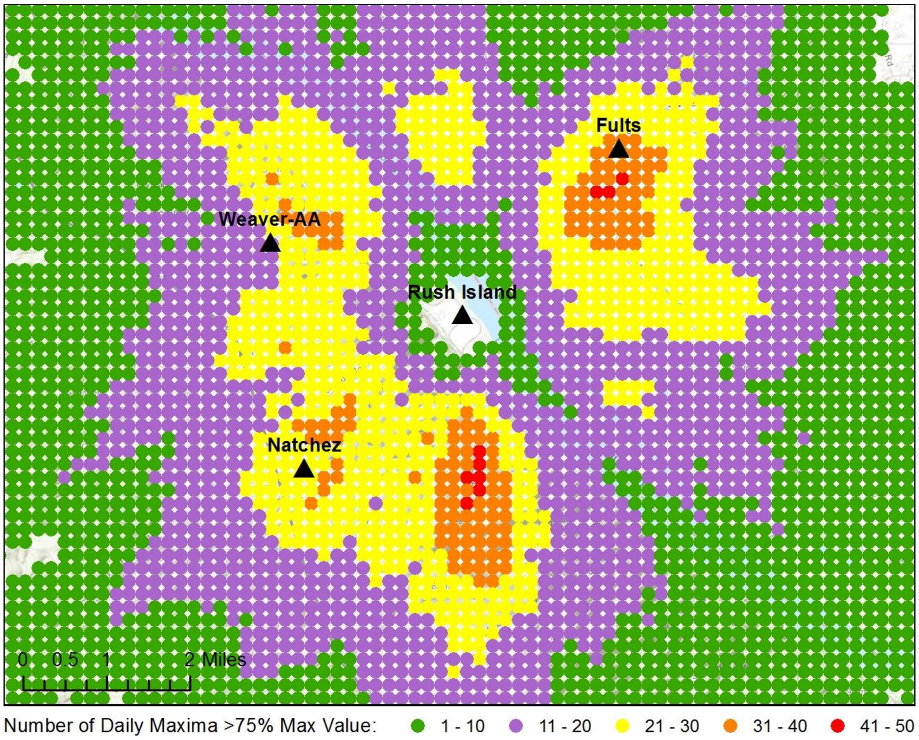


Figure 3. Number of maximum daily 1-hour concentrations ≥75 percent of the maximum modeled design value.

Exhibit 2

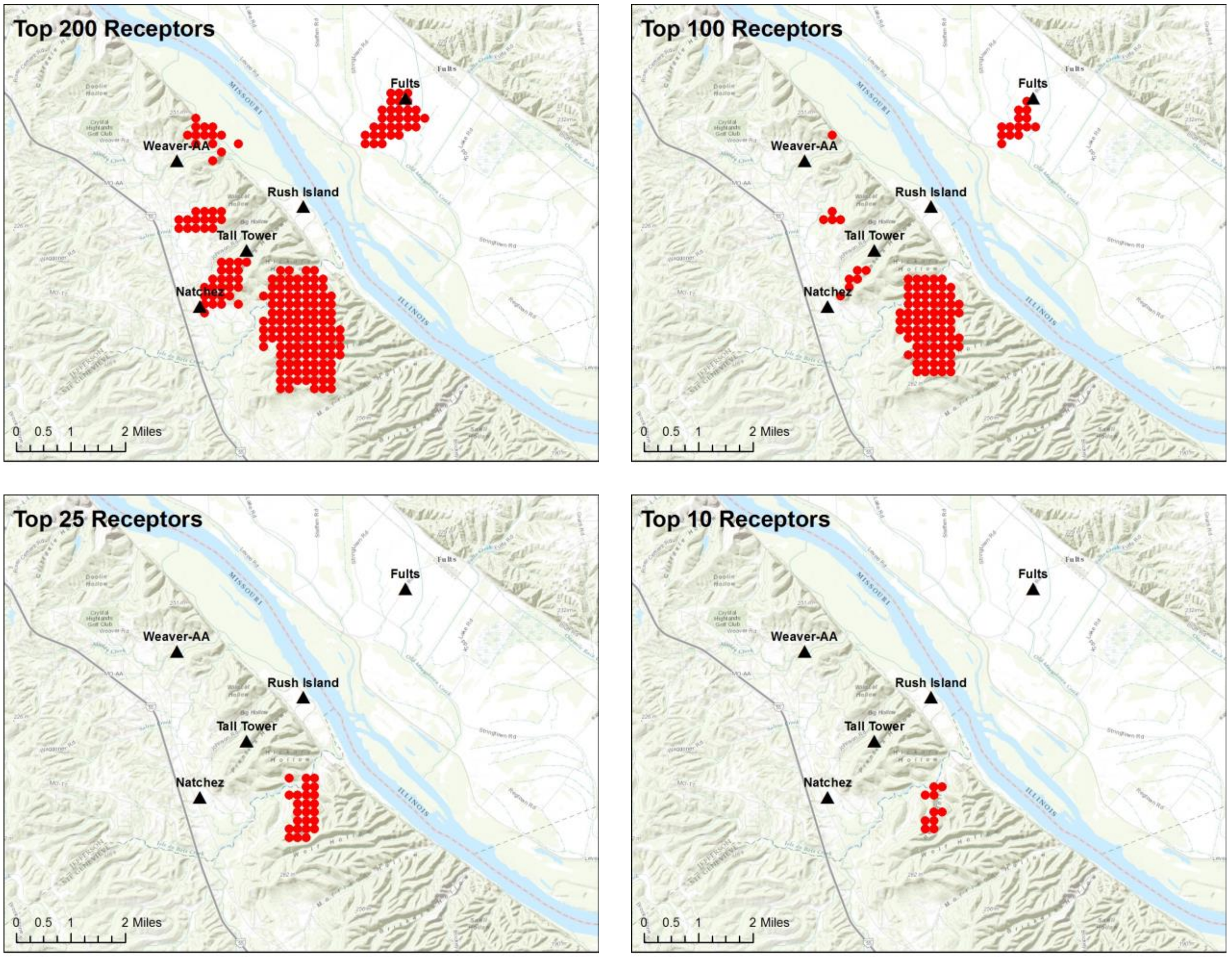


Figure 4. Receptors with the top 200, 100, 25, and 10 modeled design values.

Figures 1 through 4 all reveal a strikingly similar pattern regarding the areas where peak 1-hour SO_2 concentrations are expected to occur around the Rush Island Energy Center. There is a large area due south of the plant where modeled design values are the highest (in excess of 95 percent of the maximum modeled design value), where modeled maximum daily 1-hour concentrations frequently exceeded 75 percent of the maximum modeled design value, and where over half of the top 200 receptors (including all of the top 25 and three quarters of the top 100) are located. There are also four other areas where modeled design values are slightly lower but still very high (in excess of 85 percent of the maximum modeled design value), where modeled maximum daily 1-hour concentrations frequently exceeded 75 percent of the maximum modeled design value, and where the rest of the top 200 receptors are located. These four areas, located northeast, northwest, west, and southwest of the plant, plus the area south of the plant where modeled design values are the highest, are where Ameren's modeling predicts peak 1-hour SO_2 concentrations are expected to occur. Monitoring stations located in these areas would have the greatest chance of identifying peak SO_2 concentrations in ambient air, which is the primary objective of source-oriented monitoring and an absolute necessity when monitoring to assess

Exhibit 2

compliance with the NAAQS. However, none of Ameren's proposed monitoring stations is located in any of these areas of highest expected concentrations.

The most glaring omission is that there is no proposed monitoring station in the large area of highest expected concentrations south of the plant. This omission renders the proposed monitoring network inadequate for its intended purpose of assessing compliance with the NAAQS because a) NAAQS violations are most likely to occur in this area, and b) violations could occur in this area even when concentrations are below the NAAQS in other high concentration areas, given that the modeling predicts lower SO_2 concentrations in those areas. Ameren's Monitoring Stations Analysis claims that this area is "not accessible" because it hosts an industrial plant (Holcim). The Analysis does not indicate whether Ameren sought Holcim's permission to site a monitor on the Holcim property, and does not delineate the Holcim property boundary in terms of the modeling results. In other words, it does not document the claim that this large area of maximum expected concentrations is inaccessible for monitoring. Nor does it evaluate the nearest non-Holcim site that might be available.

While we understand that the Consent Agreement between DNR and Ameren calls for monitoring, it requires that such monitoring "represents ambient air quality in areas of maximum SO_2 impact from the Rush Island Energy Center." If no monitoring site is in fact accessible in this large area of the very highest expected concentrations, then the proposed monitoring network will not fulfill Ameren's obligation under the Consent Agreement. Instead, DNR should employ modeling, which provides 360-degree coverage and can predict concentrations at otherwise-inaccessible locations, to ensure that SO_2 emissions from the Rush Island plant do not cause or contribute to NAAQS exceedances either inside or outside of the Jefferson County nonattainment area.

Furthermore, two of the proposed monitoring stations – Fults and Natchez – are located near but outside of areas of modeled peak concentration/high frequency instead of near the center of such areas, where concentrations are expected to be higher. The third proposed station – Weaver-AA – is located entirely outside of modeled peak concentration/high frequency areas. Figure 5 shows the locations of the proposed monitoring stations on a hybrid basemap comprised of Figures 1 (modeled design values) and 2 (receptors with modeled design values ≥75 percent of the maximum design value). Receptors that are among the 200 with the highest modeled design values are outlined for reference. All three monitoring stations could easily be sited in areas where higher 1-hour SO_2 concentrations are expected to occur with greater frequency, thereby increasing their chances of detecting any NAAQS exceedances that might occur around the Rush Island Energy Center. As discussed below, we urge DNR to consider these proposed optimized locations in lieu of Ameren's proposed Fults, Natchez, and Weaver-AA locations.

Fults – Of the three proposed monitoring stations, the Fults monitoring station is closest to an area where peak 1-hour SO_2 concentrations are expected to occur. However, moving the monitor less than one kilometer southwest of its current location would move it from an area with modeled design values in the 120-130 ug/m^3 range to an area with modeled design values in the 130-140 ug/m^3 range and place it near the center of a small group of receptors with modeled design values equal to 90-95 percent of the maximum modeled design value (the receptors

Exhibit 2

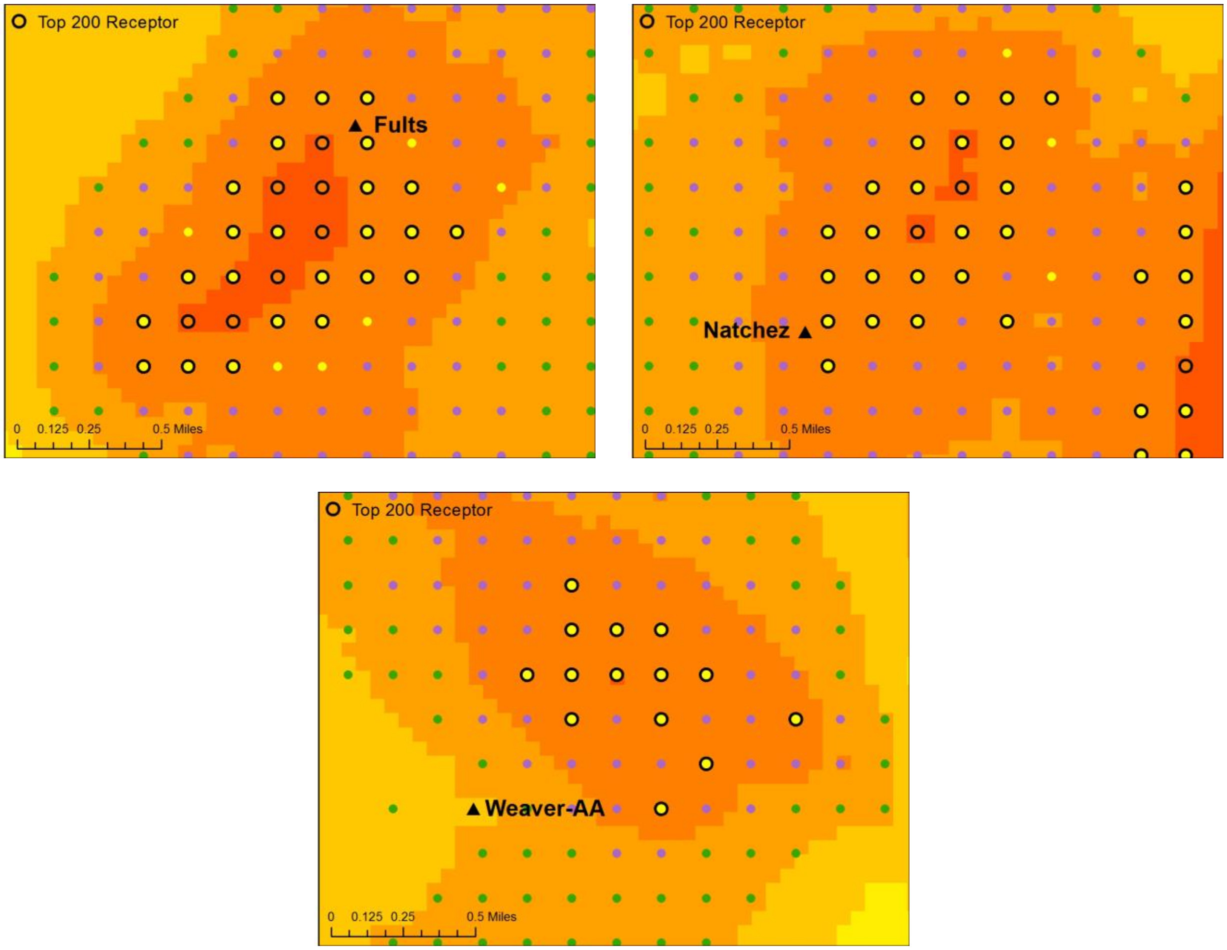


Figure 5. Modeled design values, receptors with design values ≥75 percent of the maximum modeled design value, and proposed monitoring station locations.

surrounding its current location generally have modeled design values equal to 85-90 percent of the maximum modeled design value). The entire area is floodplain/agricultural and Ivy Road, oriented northeast-southwest, runs through the middle of it, making the proposed optimized location as accessible as Ameren's proposed location and equally easy to provide power to.

Natchez – The Natchez monitoring station is outside/on the outer edge of an area where peak 1-hour SO_2 concentrations are expected to occur. Moving it approximately one kilometer northeast of its current location would move it from an area with modeled design values in the 120-130 ug/m^3 range to an area with modeled design values in the 130-140 ug/m^3 range, and place it between a pair of receptors with modeled design values equal to 90-95 percent of the maximum modeled design value (the receptors surrounding its current location have modeled design values equal to 80-90 percent of the maximum modeled design value). It would also move it to an area where higher concentrations are expected to occur with slightly greater frequency. The proposed optimized location is accessible via transmission right of way, and power is available along Dubois Creek Road to the south-southwest.

Exhibit 2

Weaver-AA – The Weaver-AA station is located completely outside of all areas where peak 1-hour SO2 concentrations are expected to occur. Modeled design values at its location are only in the 100-110 ug/m^3 range, and it is surrounded by receptors with modeled design values equal to just over 75 percent of the maximum modeled design value. Moving the monitor just over one kilometer east-northeast of its current location would place it in an area where modeled design values are 15-20 ug/m^3 higher, in the midst of a slightly dispersed group of receptors with modeled design values equal to 85-90 percent of the maximum modeled design value. At this optimized location, concentrations in excess of 75 percent of the maximum modeled design value are expected to occur roughly twice as often as at Ameren's proposed Weaver-AA location. The proposed optimized location is readily accessible via State Highway AA, and power is available along the highway.

Figure 6 compares the locations of Ameren's proposed Fults, Natchez, and Weaver-AA monitoring stations with optimized locations more likely to record maximum SO_2 concentrations in the area.

II. The Modeling Described in the Report Does Not Comport With EPA's Source-Oriented SO_2 Monitoring Guidance and Therefore May Not Correctly Identify Areas of Expected Ambient, Ground-Level SO_2 Concentration Maxima

EPA's SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (TAD) provides guidance on how to "appropriately and sufficiently monitor ambient air in areas proximate to or impacted by an SO_2 emissions source to create ambient monitoring data for comparison to the SO_2 NAAQS" and presents "recommended steps to aid in identifying source-oriented SO_2 monitor sites."[1] The modeling performed to determine the locations of the proposed ambient SO_2 monitoring stations around the Rush Island Energy Center fails to adhere to the TAD in two important respects: 1) it does not use hourly emission rates, which are readily available for Rush Island's boilers from EPA's online Air Markets Program Data tool; and 2) it does not include nearby sources that may contribute significantly to ambient SO_2 concentrations in the vicinity of the plant and therefore should be included in the modeling.

EPA suggests using hourly emissions when available in order to represent the variability of actual emissions as accurately as possible,[2] which is important given the short-term nature of the SO_2 NAAQS. However, instead of using readily-available hourly emissions as recommended by EPA's monitoring TAD, Ameren's modeling uses constant emission rates for Rush Island's boilers. The consequence of using constant rather than hourly emission rates is that the effects of the interaction between hourly emissions and hourly variations in meteorological parameters are not captured by the model, so that the predicted areas of peak concentration are primarily a function of the meteorology used. For example, if peak hourly emissions coincide with times when strong winds blow from a direction other than the prevailing wind direction, a model that uses hourly emission rates might predict peak concentrations in different areas than the same

---

[1] U.S. EPA, SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, Dec. 2013 Draft, at 2, available at http://epa.gov/airquality/sulfurdioxide/pdfs/SO2MonitoringTAD.pdf.

[2] *Id*. at 11, referencing U.S. EPA, SO_2 NAAQS Designations Modeling Technical Assistance Document, Dec. 2013 Draft, at 10, available at http://epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf.

Exhibit 2

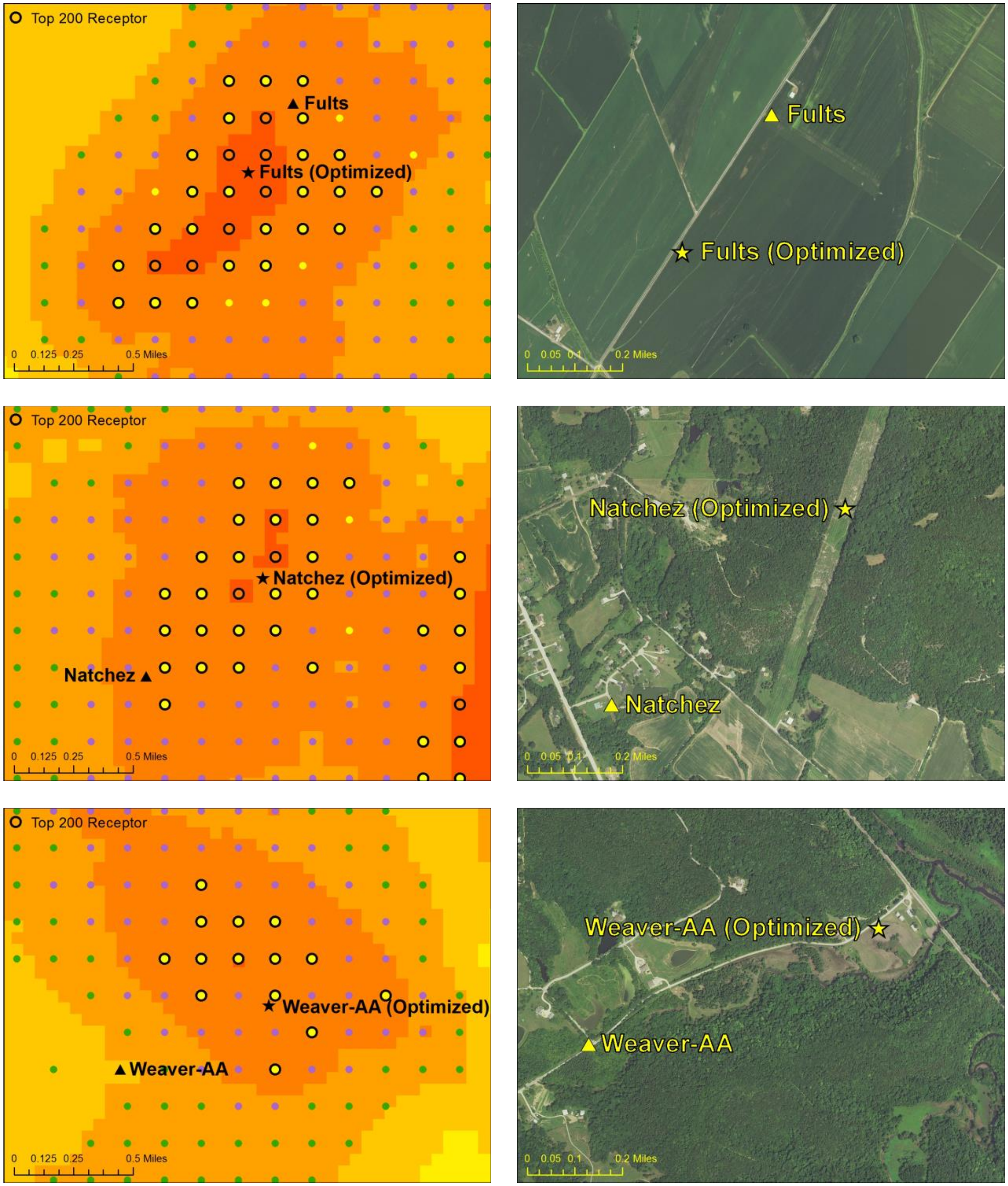


Figure 6. Current and optimized locations of the Fults, Natchez, and Weaver-AA monitoring stations

model would predict using constant emission rates. Therefore, using hourly emissions allows the areas where peak 1-hour SO_2 concentrations are expected to occur to be determined with greater confidence.

Regarding which sources to model, EPA suggests identifying and including all sources that may contribute significantly to ambient SO_2 concentrations – and thus to NAAQS exceedances – around the source of interest. The monitoring TAD notes that it is important to "understand the setting and surroundings of the SO_2 source" including determining "if the source is isolated or in an area with multiple SO_2 sources," and it affirms that the primary objective of monitoring is "to identify peak SO_2 concentrations in the ambient air that are attributable to an identified source *or group of sources*."[3] The Rush Island Energy Center is located in an SO_2 nonattainment area with numerous sources of varying magnitude. There are also a number of larger sources that are nearby but just outside of the nonattainment area, including River Cement, St. Gobain Containers, Holcim, Mississippi Lime, Dynegy's Baldwin Energy Complex, and Ameren's Meramec Energy Center. These sources may contribute significantly to ambient SO_2 concentrations in the vicinity of the Rush Island plant and should be included in the modeling unless it can be demonstrated that they do not have a significant influence on areas where peak 1-hour SO_2 concentrations are expected to occur.

III. The Meteorological Data Used in the Modeling May Not be Appropriate

Ameren's modeling uses National Weather Service (NWS) meteorological data from the Cahokia, Illinois airport located approximately 50 kilometers north of the plant. This is different from the meteorological data DNR used in its attainment demonstration modeling for the Jefferson County SO_2 nonattainment SIP. In its SIP modeling, DNR used onsite meteorological data from the now-closed Doe Run primary lead smelter in Herculaneum, approximately 18 kilometers northwest of the Rush Island plant. The Rush Island Energy Center is in the Jefferson County SO_2 nonattainment area, and the Jefferson County SIP states that the onsite meteorological data from Herculaneum is "considered more representative of the entire [nonattainment] area compared to a more distant NWS site."[4] Therefore, the Cahokia meteorological data used in Ameren's modeling may not be appropriate, particularly if – as suggested above – other nearby SO_2 sources are included in the modeling, given that DNR determined – based on the distribution of these sources – that the onsite Herculaneum meteorological data is more representative of the area that encompasses them.

Conclusion

Based on the modeling described in Ameren's report, the proposed locations of the Fults, Natchez, and Weaver-AA monitoring stations are not in modeled peak concentration/high frequency areas. Furthermore, Ameren has not proposed a monitoring station in the highest concentration area due south of the Rush Island Energy Center, citing the claimed but not

---

[3] *Id*. at 2, 4 (emphasis added).

[4] DNR, Nonattainment Plan for the 2010 1-Hour Sulfur Dioxide National Ambient Air Quality Standard, Jefferson County Sulfur Dioxide Nonattainment Area, May 28, 2015, at 26.

Exhibit 2

documented inaccessibility of potential monitoring sites in that area. The absence of a monitor in this large area of expected maximum concentration calls into question whether the proposed SO_2 monitoring network is an appropriate means of assessing compliance with the NAAQS in the area around the plant.

Ameren's proposed monitoring network does not fulfill its requirement under the Consent Agreement to install a monitoring network designed to record maximum expected SO_2 concentrations in the vicinity of the Rush Island plant. Nor is it designed to achieve Ameren's purported goal of obtaining "a good quality data set with representative SO_2 measurements and meteorological information"[5] or DNR's stated goal "to true-up modeling results further away from the Mott Street monitor … to confirm our assessment that the nonattainment area is in compliance with the 1-hour SO2 standard farther away from the violating monitor."[6]

We urge DNR to reject the proposed monitoring sites and require Ameren to add a monitoring station in the highest concentration area due south of the plant as well as to relocate the proposed Fults, Natchez, and Weaver-AA monitoring stations to the optimized locations shown in Figure 5. We also urge DNR to require Ameren to 1) rerun the air dispersion model described in the report using Rush Island's actual hourly emissions; 2) evaluate the effects of nearby interactive sources (including, at a minimum, River Cement, St. Gobain Containers, Holcim, Mississippi Lime, Dynegy's Baldwin Energy Complex, and Ameren's Meramec Energy Center) on modeled peak concentration/high frequency areas; and 3) evaluate the appropriateness of using meteorological data from the Cahokia, Illinois airport instead of Doe Run Herculaneum given DNR's determination that the latter is more representative of the modeled area.[7] We further urge DNR to require any necessary adjustments to the proposed monitoring network based on the results of these analyses.

Respectfully submitted,

Maxine I. Lipeles

Maxine I. Lipeles, J.D.
Ken Miller, P.G.
Interdisciplinary Environmental Clinic
Washington University School of Law

On behalf of the Sierra Club

---

[5] DNR, Comments and Responses on Proposed Revision to Missouri State Implementation Plan – Nonattainment Plan for the 2010 1-Hour Sulfur Dioxide National Ambient Air Quality Standard – Jefferson County Sulfur Dioxide Nonattainment Area, Comment #21, p. 10, available at http://dnr.mo.gov/env/apcp/docs/comments-and-responses-jeffco.pdf.

[6] *Id.*, Response to Comment #4, p. 3.

[7] This analysis should consider and make use of the corrected Herculaneum meteorological data set processed in AERMET with the Bulk Richardson Number option invoked.

Exhibit 2

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Josh Tapp, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Wendy Vit, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

Exhibit 3

Washington University in St. Louis
SCHOOL OF LAW

Interdisciplinary Environmental Clinic

July 20, 2015

Mr. Stephen Hall
Chief, Air Quality Analysis Section
Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102
Via email to: cleanair@dnr.mo.gov

Re: 2015 Monitoring Network Plan

Dear Mr. Hall:

On behalf of the Sierra Club, we urge the Missouri Department of Natural Resources ("DNR") to revise the proposed 2015 Monitoring Network Plan[1] in order to satisfy the requirements of the Clean Air Act. In particular, DNR should refrain from proposing new sulfur dioxide ("SO_2") monitoring sites near Ameren's Labadie power plant until EPA completes an area designation for the plant. Monitors near Labadie should be sited based on the modeling that is used to determine the nonattainment area boundary, which will identify areas of expected peak ambient SO_2 concentrations around the plant based on current EPA guidance. Should DNR persist in proposing new SO_2 monitoring sites near the Labadie plant in the 2015 Monitoring Network Plan, then based on currently-available modeling, one of the two proposed new monitoring sites near the plant is not located in an area where peak SO_2 concentrations are expected to occur and should be relocated. A third monitoring site should also be added southeast of the plant. Similarly, based on currently-available modeling, two of the three proposed new monitoring sites near Ameren's Rush Island plant are not located in areas where peak SO_2 concentrations are expected to occur and should be relocated.[2] These changes are necessary to ensure that the Labadie and Rush Island monitors capture maximum ambient SO_2 concentrations near these large sources.

This letter highlights the following key points:

- It is premature to site and install new SO_2 monitors at the Labadie plant until EPA completes an area designation for the plant.
- While DNR plans to use the proposed new Labadie and Rush Island monitors as State and Local Air Monitoring Stations ("SLAMS"),[3] it is not submitting them for EPA approval as required for SLAMS.

---

[1] MO DEP'T OF NATURAL RES. AIR POLLUTION CONTROL PROGRAM, 2015 MONITORING NETWORK PLAN, June 12, 2015 ("2015 Monitoring Network Plan").

[2] The three proposed new SO_2 monitoring sites that should be relocated, as discussed more fully below, are the Valley site near Ameren's Labadie plant and the Natchez and Weaver-AA sites near Ameren's Rush Island plant.

[3] 2015 Monitoring Network Plan at 12.

Exhibit 3

- Based on currently-available modeling, one of the two proposed new Labadie monitoring sites and two of the three proposed new Rush Island monitoring sites are unlikely to capture maximum ambient SO_2 concentrations because they are not located in areas where peak SO_2 concentrations are expected to occur.
- DNR has not adequately justified the locations of the proposed new Labadie and Rush Island monitoring sites. The support offered for the monitoring site locations in DNR's plan was provided by Ameren (Appendices 2 and 4). DNR visually observed the proposed sites at both plants but only performed independent modeling - which does not entirely support Ameren's proposed locations - regarding the Rush Island sites (Appendix 5). DNR did not perform independent modeling regarding the Labadie sites.

I. DNR Should Refrain From Proposing New SO_2 Monitoring Sites Near Ameren's Labadie Plant Until EPA Completes An Area Designation For The Plant.

It is premature to determine SO_2 monitoring site locations near the Labadie plant. DNR is about to propose a nonattainment area boundary recommendation for the Labadie plant,[4] and EPA must make a final area designation for the plant by July 2016.[5] While the Ameren modeling used to site the Labadie monitors in the 2015 Monitoring Network Plan was performed in a manner inconsistent with current EPA guidance, the modeling used to determine the nonattainment area boundary will identify areas of peak ambient SO_2 concentrations around the plant using current EPA guidance. It is likely that the Labadie monitors will ultimately be used to determine whether the nonattainment area comes into attainment, and they must be properly sited in order to provide reliable data.

The only modeling offered to support the proposed new Labadie monitoring sites was performed by Ameren in 2012.[6] Whereas DNR performed independent modeling to assess Ameren's proposed Rush Island monitoring sites (discussed in III.B. below), DNR did not perform independent modeling to assess Ameren's proposed Labadie monitoring sites. The 2015 Monitoring Network Plan states that DNR conducted "a review of relative dispersion modeling, local meteorological evaluation methodology submitted by Ameren UE, historical departmental SLAMS SO_2 monitoring data, nearby meteorological stations, and local topography."[7] However, only Ameren's modeling pointed to the proposed monitor locations. The other information either pointed to different locations or supported no particular monitoring site location. For example, the historical analysis of the former Augusta and Augusta Quarry monitors concluded where *not* to place monitors,[8] but did not point to a location that would accurately represent the highest ambient SO_2 concentration near the Labadie plant.[9] In addition, the analysis of wind

---

[4] DNR has announced that it will propose a Labadie designation by July 27, 2015.

[5] Sierra Club v. Gina McCarthy, No. 3:13-cv-3953-SI (Consent Decree, March 2, 2015).

[6] 2015 Monitoring Network Plan, Appendix 3.

[7] 2015 Monitoring Network Plan at 14.

[8] The Augusta Quarry data analysis suggests that the plant was responsible for high concentrations near the quarry. *Id.* at 15-19. Without comparative conditions between current proposed monitor locations and the historical monitor locations, the historical data is irrelevant to locating the proper sites for new monitors.

[9] *Id.*

Exhibit 3

direction through the valley points to placing monitor(s) either to the northeast or southwest of the plant,[10] but it is too vague to support any specific monitoring site location.

The reliance upon Ameren's modeling would not be so concerning if Ameren had proposed monitors in locations with the highest modeled SO_2 concentrations around Labadie. However, one of Ameren's two proposed monitoring sites is outside any of the three areas where its modeling predicted peak SO_2 concentrations are expected to occur, leaving two of the three peak concentration areas completely unmonitored. In addition, Ameren's modeling does not comport with EPA guidance.

In sum, DNR should not propose any Labadie monitoring sites until EPA completes an area designation for the plant because 1) DNR will have to perform modeling that comports with EPA guidance as part of the Labadie designation process; 2) DNR intends to use the Labadie monitoring data in assessing whether the nonattainment area ultimately comes into attainment;[11] and 3) the Clean Air Act requires that monitors sited for National Ambient Air Quality Standard ("NAAQS") compliance purposes be incorporated into the state's monitoring network, subject to EPA review and approval.[12]

II. DNR Should Seek EPA Approval For The Proposed New Labadie And Rush Island SO_2 Monitors Because It Intends To Use Them As SLAMS.

The 2015 Monitoring Network Plan adds two new SO_2 monitors near Ameren's Labadie plant[13] and three new SO_2 monitors near Ameren's Rush Island plant.[14] The plan labels these as Special Purpose Monitors ("SPMs"), but states that "it is the intention to convert these monitors to SLAMS" once EPA finalizes the proposed Data Requirements Rule.[15]

Because DNR plans to use data from these new monitors to assess compliance with the 2010 1-hour SO_2 NAAQS, and because the Rush Island monitors are part of the Jefferson County Nonattainment State Implementation Plan ("SIP"), the siting of these monitors should be subject to EPA approval as required for SLAMS.[16] Indeed, it is unclear why the 2015 Monitoring Network Plan does not formally propose these new monitors as SLAMS.

Ameren proposed the Labadie monitoring sites to DNR and then constructed and began operating them just before the 2015 Monitoring Network Plan was published.[17] DNR approved the Labadie monitoring sites without conducting an independent modeling analysis to determine whether they are located in areas where peak SO_2 concentrations are expected to occur, without

---

[10] *Id.* at 19-20.
[11] 2015 Monitoring Network Plan at 12.
[12] Clean Air Act § 110 (a)(2)(B), 42 U.S.C. § 7410(a)(2)(B); 40 CFR § 58.10.
[13] 2015 Monitoring Network Plan at 12-21.
[14] *Id.* at 22-23.
[15] EPA expects to publish the final Data Requirements Rule in October 2015. http://yosemite.epa.gov/opei/rulegate.nsf/byRIN/2060-AR19.
[16] 40 C.F.R. § 58.10(a)(2) and (e).
[17] DNR approved Ameren's proposed Labadie monitoring sites on May 1, 2015, and published the 2015 Monitoring Network Plan on June 12, 2015.

providing for public notice and comment, and without submitting the proposed monitor locations to EPA for its review and approval.

With respect to Rush Island, DNR submitted the Jefferson County Nonattainment SIP to EPA for review and approval on or about June 1. While it contained the requirement for Ameren to propose, build, and operate SO_2 monitoring sites at Rush Island, it did not identify the proposed Rush Island monitoring sites included in the 2015 Monitoring Network Plan published 11 days later on June 12, 2015.

Given DNR's stated intention to convert these monitors to SLAMS once EPA finalizes the proposed Data Requirements Rule – which it is expected to do in the next few months – the only salient difference between proposing them as SPMs rather than SLAMS in the 2015 Monitoring Network Plan is that EPA does not have to approve their locations. If DNR were to propose them as SLAMS in the 2015 Monitoring Network Plan or simply wait a few months and propose them as SLAMS after the final Data Requirements Rule is published, EPA *would* have to approve their locations. Proposing them as SPMs now when they will likely be converted to SLAMS in just a few months is suspect because, practically, it will be more difficult for EPA to object to the poor siting of the monitors and require that they be relocated after they are in operation.

The purpose of the NAAQS is to protect the public health.[18] Therefore, NAAQS compliance decisions must be based on properly-sited monitors designed to record maximum ambient SO_2 concentrations. Because one of the proposed new Labadie monitoring sites and two of the proposed new Rush Island monitoring sites are not located in areas of anticipated maximum ambient SO_2 concentrations (based on currently-available modeling), those monitors should be relocated – regardless of whether they are currently labeled SPMs or SLAMS. And EPA should notify DNR and Ameren that it will not accept data from those monitors for NAAQS compliance purposes unless they are appropriately relocated. Moreover, EPA should notify DNR and Ameren that it is premature to determine appropriate monitoring site locations for the Labadie plant until it completes an area designation for the plant.

III. Based On Currently-Available Modeling, Three Of The Five Proposed New Labadie And Rush Island Monitoring Sites Are Not Located In Areas Of Anticipated Maximum Ambient SO_2 Concentrations.

EPA regulations and guidance require ambient SO_2 monitors to be sited where peak concentrations are expected to occur.[19] With respect to source-oriented SO_2 monitoring, EPA guidance states:

> The primary objective is to place monitoring sites at the location or locations of expected peak concentrations.[20]

---

[18] Clean Air Act § 109(b)(1), 42 U.S.C. § 7409(b)(1).

[19] 40 C.F.R. Part 58, Appendix D, § 1.1.1(a), (c). See also U.S. EPA: OFFICE OF AIR AND RADIATION, OFFICE OF AIR QUALITY PLANNING AND STANDARDS, AIR QUALITY ASSESSMENT DIVISION, SO_2 NAAQS DESIGNATIONS SOURCE-ORIENTED MONITORING TECHNICAL ASSISTANCE DOCUMENT, Dec. 2013 ("SO_2 Monitoring TAD").

[20] SO_2 Monitoring TAD at 16.

Exhibit 3

Further, the Consent Agreement between DNR and Ameren that is included in both the Jefferson County SIP and the 2015 Monitoring Network Plan requires that the monitoring at Rush Island "represents ambient air quality in areas of maximum SO_2 impact from the Rush Island Energy Center."[21]

However, one of the two proposed new Labadie monitoring sites and two of the three proposed new Rush Island monitoring sites are not located in the areas where peak SO_2 concentrations are expected to occur based on Ameren's and DNR's modeling.

On behalf of the Sierra Club, we previously critiqued Ameren's proposed Labadie and Rush Island monitoring site locations in letters submitted to DNR. Those letters are attached as Exhibits 1 and 2 and hereby incorporated by reference.

A. Based On Currently-Available Modeling, One Of The Two Proposed New Labadie Monitoring Sites Should Be Relocated, And A Third Monitor Should Be Added Southeast of the Plant.

In our April 13, 2015 comments to DNR on Ameren's proposed new Labadie monitoring sites, attached as Exhibit 1, we demonstrated that one of the proposed sites – the Valley site – is not located in any of the areas where Ameren's modeling predicts peak SO_2 concentrations are expected to occur. Ameren's modeling identified three distinct areas where the highest SO_2 concentrations are expected to occur and where high concentrations are expected to occur most frequently. These areas are located northwest, northeast, and southeast of the plant and are shown in Figure 1 below. However, only one of the two proposed Labadie monitoring sites – the Northwest site – is located in one of these peak concentration areas (the one located northwest of the plant). The Valley site is located between the other two peak concentration areas, in an area where the modeled concentration is only about 80 percent of the maximum concentration predicted by the model. As a result, it is unlikely to capture maximum ambient SO_2 concentrations and should be relocated to the peak concentration area northeast of the plant.

In addition, DNR should also require the installation of a third monitor in the peak concentration area southeast of the plant lest anticipated maximum ambient SO_2 concentrations in this area – which are likely to have implications for NAAQS compliance – go undetected by the Labadie SO_2 monitoring network.

B. Two Of The Three Proposed New Rush Island Monitors Should Also Be Relocated.

In our May 29, 2015 comments to DNR on Ameren's proposed new Rush Island monitoring sites, attached as Exhibit 2, we demonstrated that all three of the proposed sites, but especially the Natchez and Weaver-AA sites, are located outside areas where Ameren's modeling predicts peak SO_2 concentrations are expected to occur. DNR has since performed an independent modeling evaluation of the proposed sites which follows EPA guidance more closely and is

---

[21] 2015 Monitoring Network Plan, Appendix 3, 2015 Ameren Missouri and Missouri Department of Natural Resources Consent Agreement, Appendix A, ¶ b, at 13 of 15.

Exhibit 3

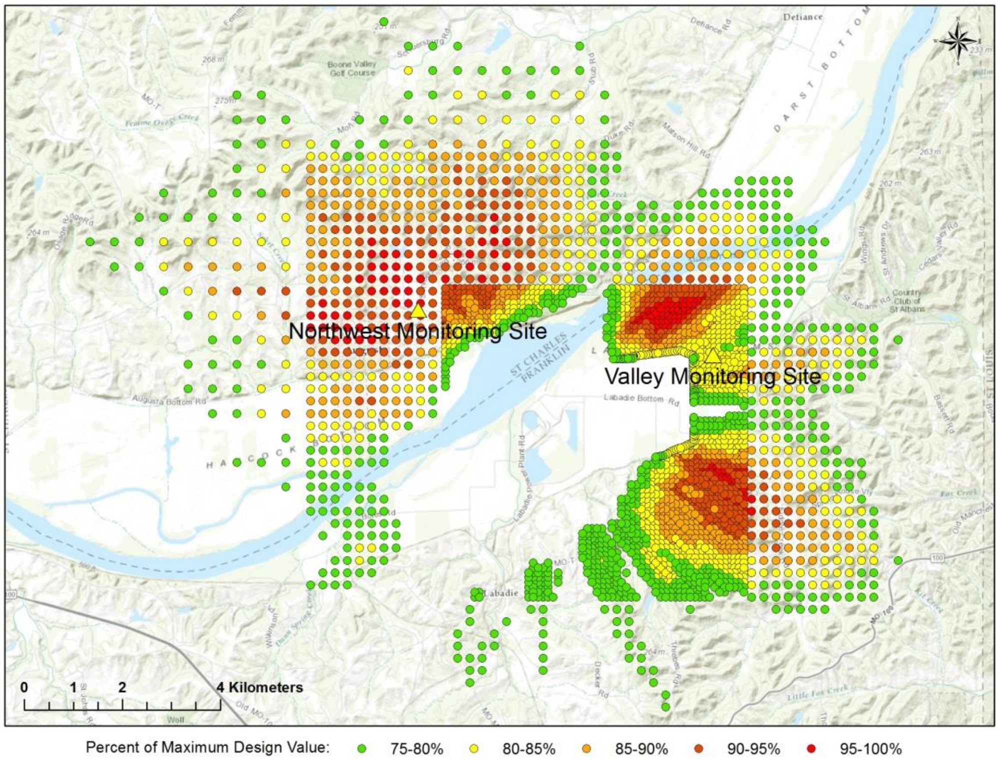


Figure 1. Modeled peak concentration areas near Ameren's Labadie plant.

therefore more reliable than Ameren's modeling. While DNR concluded that the proposed sites are properly located in areas where peak SO_2 concentrations are expected to occur, there is a significant flaw in DNR's analysis that, when corrected, confirms that the Natchez and Weaver-AA sites are located outside of peak concentration areas and should be relocated.

The stated purpose of DNR's evaluation of the proposed new Rush Island monitoring sites was to determine if the sites "will adequately represent Rush Island Energy Center's SO_2 air quality impact." DNR used hourly emission rates from EPA's Air Markets Program in its modeling as recommended in EPA's SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document whereas Ameren used constant emission rates.[22]

However, DNR's analysis of its modeling is based on a methodology that inherently biases the results. DNR used a telescoping receptor grid in its modeling; specifically, it used a 100-meter receptor spacing out to 1 kilometer, a 250-meter spacing out to 3.5 kilometers, a 500-meter spacing out to 10 kilometers, and a 1,000-meter spacing out to 50 kilometers. In order to identify areas where peak SO_2 concentrations are expected to occur, it plotted the predicted SO_2 design value at each receptor and drew polygons around high concentration areas by including all receptors with concentrations greater than 90 ug/m^3. This is shown in Figure 2 below. DNR then

---

[22] However, neither Ameren nor DNR included interactive sources as recommended by EPA guidance. See Exhibit 2 at 9.

Exhibit 3

counted the number of high concentration receptors (i.e., receptors with concentrations greater than 90 ug/m^3) in each polygon and ranked the polygons from highest to lowest in terms of the number of high concentration receptors they contained. The results of this analysis are summarized in Table 1 below.

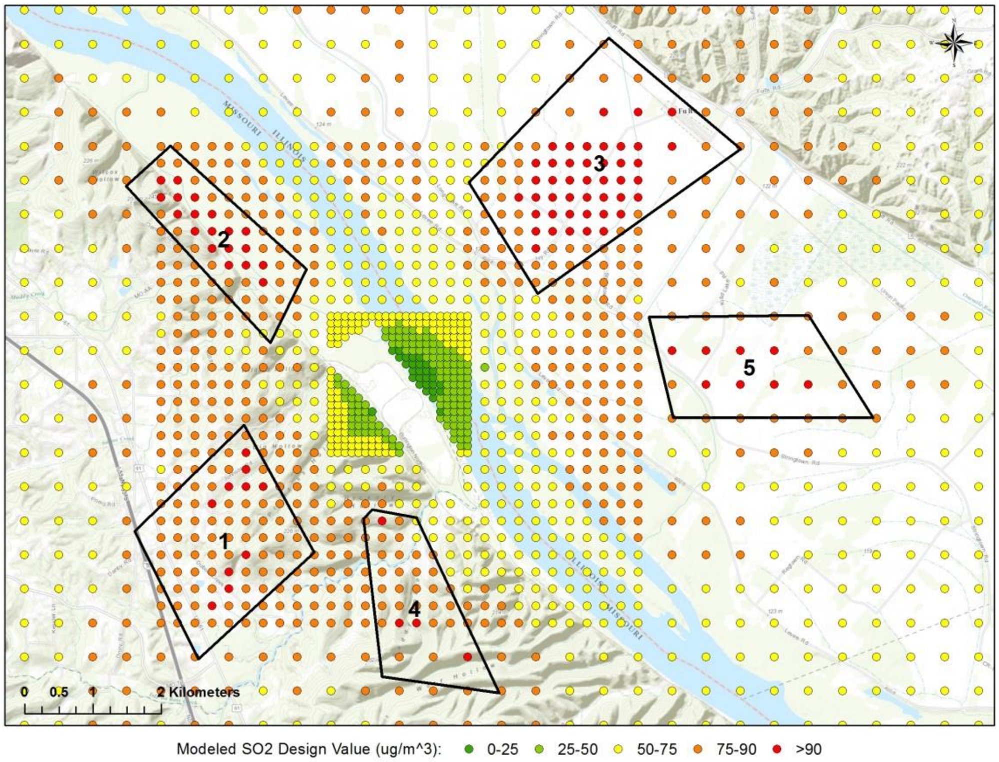


Figure 2. DNR model results and polygons drawn around high concentration areas.

Table 1. Number of high concentration receptors in DNR's polygons.

	Polygon 1	Polygon 2	Polygon 3	Polygon 4	Polygon 5
# of Receptors >90 ug/m^3	10	18	45	4	8
Ranking: 3>2>1>5>4					

Based on this analysis, DNR concluded that polygons 3 and 2, which contained the highest and second-highest number of high concentration receptors, represented "areas of maximum concentration" and were therefore "candidates for the location of SO_2 monitors."[23] It then determined, based on a qualitative analysis of wind speed and direction and the number of high

---

[23] 2015 Monitoring Network Plan, Appendix 5, Review of Proposed SO_2 and Meteorological Monitoring Stations Around Ameren Missouri's Rush Island Energy Center, at 4.

Exhibit 3

concentration receptors in the remaining three polygons (i.e., 1, 4 and 5), that polygon 1 was the best candidate of the remaining three for the location of a third SO_2 monitor. Based on these findings, DNR concluded that because the three new monitoring sites proposed by Ameren are located within polygons 1, 2 and 3, they are within areas where peak SO_2 concentrations are expected to occur and are therefore appropriately sited.

However, because DNR used a telescoping receptor grid, and because the polygons it drew to indicate areas of high concentration are located in a region where the receptor grid spacing varies from 250 to 500 meters, DNR's counts of high concentration receptors in each polygon and its subsequent ranking of the polygons based on those counts are significantly biased. Some of DNR's polygons are likely to have more high concentration receptors than others just by virtue of the fact that the receptors in those polygons are spaced more closely together than they are in other polygons. For example, almost all of the receptors in polygons 1 and 2 are spaced 250 meters apart, whereas all of the receptors in polygon 5 are spaced 500 meters apart. As a result there are many more receptors – including more high concentration receptors – in polygons 1 and 2 than in polygon 5 despite the fact that all three polygons are similar in size (polygon 5 is slightly larger than polygon 2 and slightly smaller than polygon 1).

One way to eliminate the counting bias resulting from DNR's use of a telescoping receptor grid is by ranking the polygons based on the percentage instead of the absolute number of high concentration receptors within each one. This effectively adjusts for the fact that certain polygons, e.g., polygons 1 and 2, are likely to have more high concentration receptors than others, e.g., polygon 5, just by virtue of the fact that the receptors in those polygons are spaced more closely together. The results of this analysis are summarized in Table 2 below. Polygon 3 is still ranked the highest. However, polygon 5 is ranked second-highest instead of polygon 2, which drops to third-highest – displacing polygon 1 from the top three.

Table 2. Percentage of high concentration receptors in DNR's polygons.

	Polygon 1	Polygon 2	Polygon 3	Polygon 4	Polygon 5
% of Receptors >90 ug/m^3	15	44	67	14	62
Ranking: 3>5>2>1>4					

A better way to eliminate the counting bias resulting from DNR's use of a telescoping receptor grid is to replace the telescoping grid with a uniform grid so the receptor spacing is the same in all five polygons. To determine how this would affect receptor counts and polygon ranks, we re-ran DNR's model using a uniform 250-meter receptor spacing and analyzed the results using DNR's methodology. The results are shown in Figure 3 below, and the number of high concentration receptors in each polygon and the ranking of polygons from highest to lowest in terms of the number of high concentration receptors they contain are summarized in Table 3 below. We also ranked the polygons based on the percentage instead of the absolute number of

Exhibit 3

high concentration receptors within each one. The results of this analysis are summarized in Table 4 below.

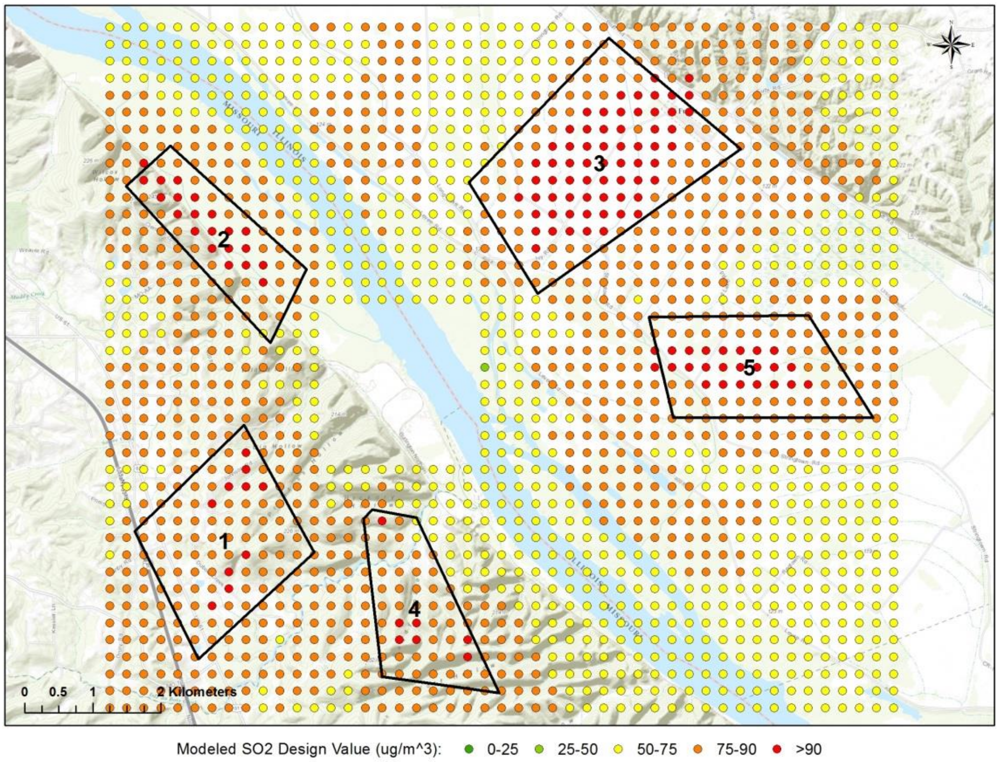


Figure 3. DNR model results for uniform 250-meter receptor grid.

Table 3. Number of high concentration receptors in DNR's polygons when modeled with a uniform receptor grid.

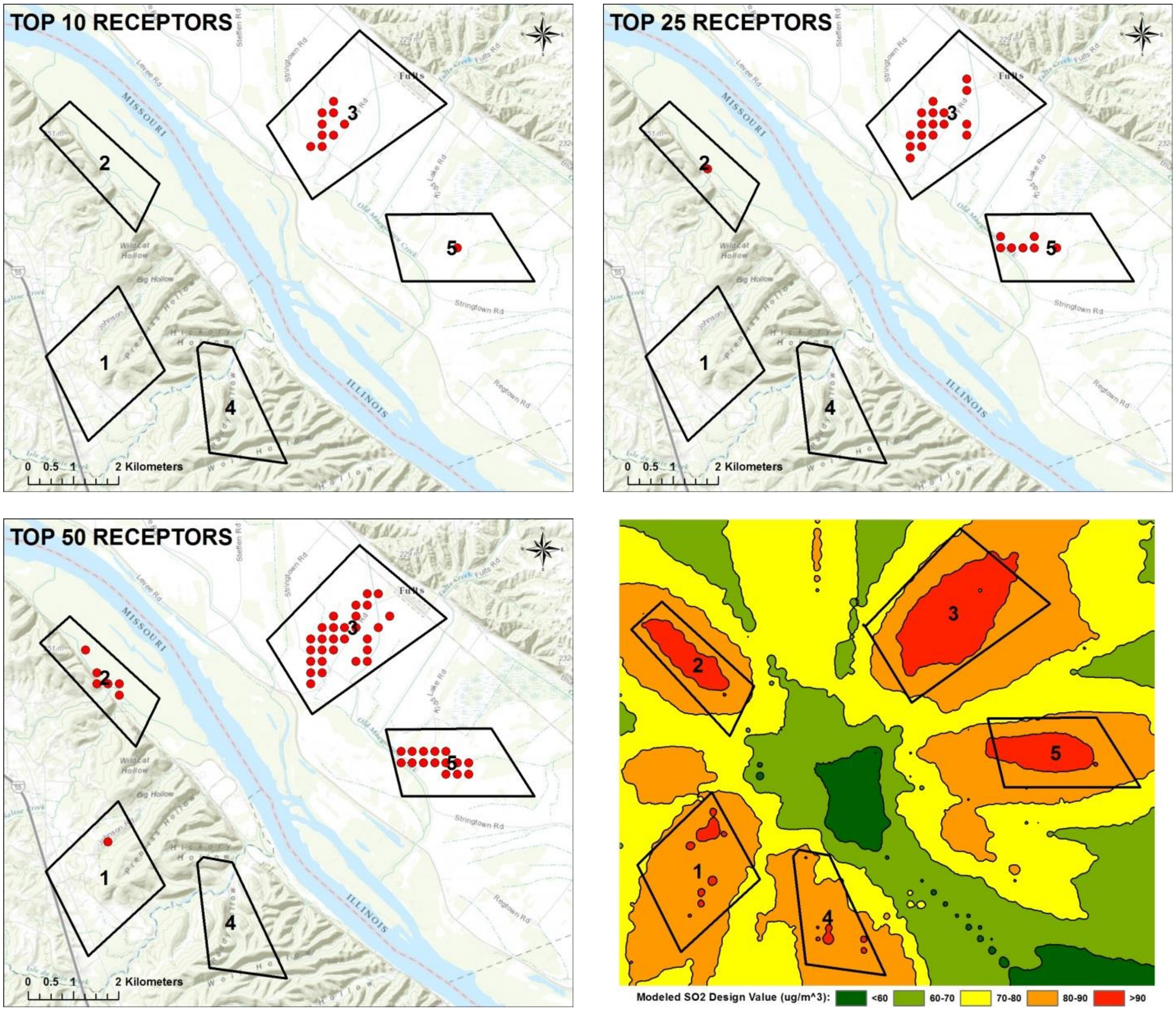
	Polygon 1	Polygon 2	Polygon 3	Polygon 4	Polygon 5
# of Receptors >90 ug/m^3	10	20	63	7	22
Ranking: 3>5>2>1>4					

Table 4. Percentage of high concentration receptors in DNR's polygons when modeled with a uniform receptor grid.

	Polygon 1	Polygon 2	Polygon 3	Polygon 4	Polygon 5
% of Receptors >90 ug/m^3	14	45	55	16	39
Ranking: 3>2>5>4>1					

Exhibit 3

When modeled with a uniform receptor grid, the three highest ranking polygons – both in terms of the number and percentage of high concentration receptors they contain – are 2, 3 and 5, **not** 1, 2 and 3 as DNR's flawed analysis concluded. These are the areas predicted to have the highest modeled impacts and thus where SO_2 monitoring sites should be located. An analysis of the top 10, 25, and 50 receptors supports this conclusion. All but one of the top 10 receptors are located within polygon 3, all but one of the top 25 receptors are located within polygons 2 and 3, and all but one of the top 50 receptors are located within polygons 2, 3 and 5. This is shown in Figure 4 below, which includes a filled contour plot of modeled design values that clearly shows how much larger the peak concentration areas are in polygons 2, 3 and 5 compared to the other polygons.



TOP 10 RECEPTORS

TOP 25 RECEPTORS

TOP 50 RECEPTORS

Figure 4. Top 10, 25 and 50 receptors and filled contour plot of modeled design values.

Exhibit 3

The locations of Ameren's proposed SO_2 monitoring sites – dubbed Fults, Natchez and Weaver-AA – relative to DNR's polygons are shown in Figure 5 below. Of the three proposed sites, only the Fults site, which is inside the peak concentration area within polygon 3, is properly located. The Weaver-AA site, which Figure 2 of Monitoring Network Plan Appendix 5 incorrectly shows being within polygon 2, is actually located outside of it based on the site coordinates provided in Plan Appendix 1. Hence it is not properly located. Nor is the Natchez site, which should be located within polygon 5 instead of polygon 1 because polygon 5 has higher modeled impacts.

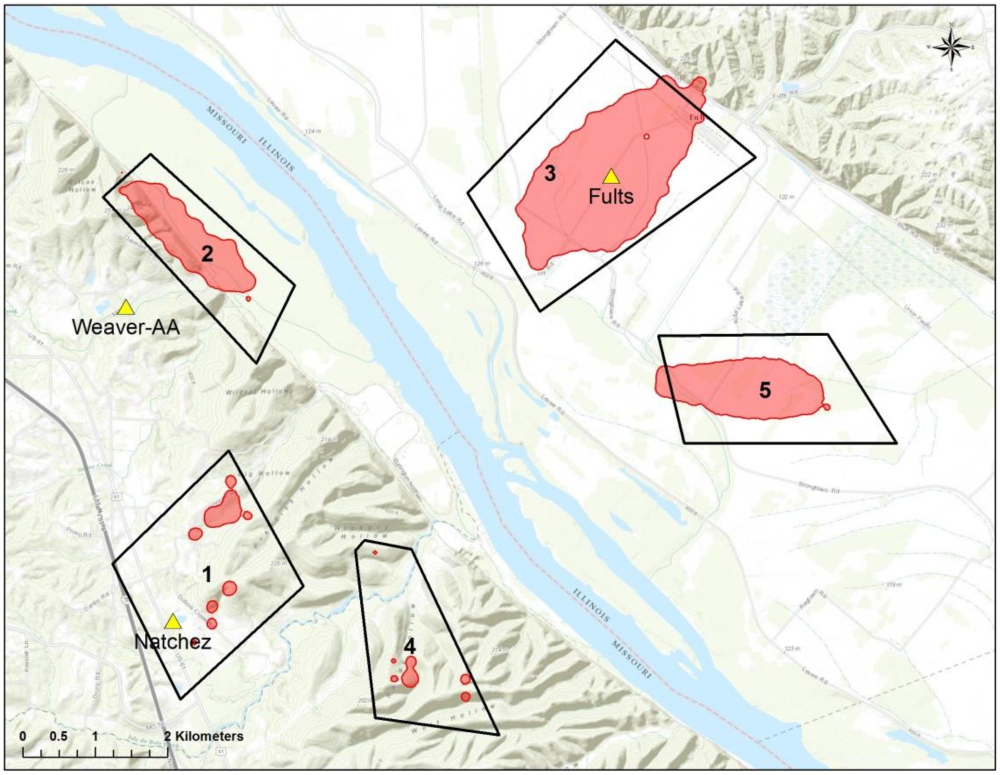


Figure 5. Ameren's proposed SO_2 monitoring sites relative to DNR's polygons. Peak concentration areas (>90 ug/m^3) are shaded red.

Because they are not properly located, neither the Natchez nor Weaver-AA monitoring sites will adequately represent Rush Island's SO_2 air quality impact. Therefore, both sites should be relocated. The Weaver-AA site should be located inside the peak concentration area within polygon 2 and the Natchez site should be located inside the peak concentration area within polygon 5 as shown in Figure 6 below. Alternatively, the Natchez site could be moved inside the peak concentration area within polygon 1 and a fourth monitor added inside the peak concentration area within polygon 5 as shown in Figure 7 below. The recommended monitor locations shown in Figures 6 and 7 are easily accessible and appear to meet EPA siting criteria and have ready access to power.

Exhibit 3

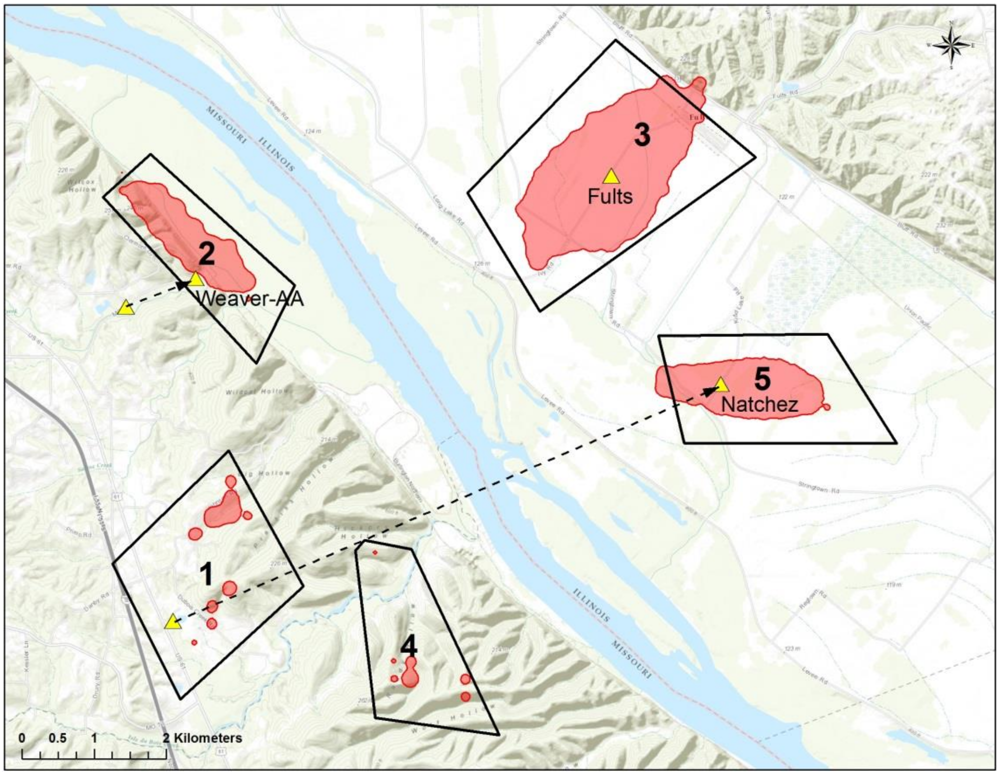


Figure 6. Appropriately located Rush Island monitors (three monitor configuration).

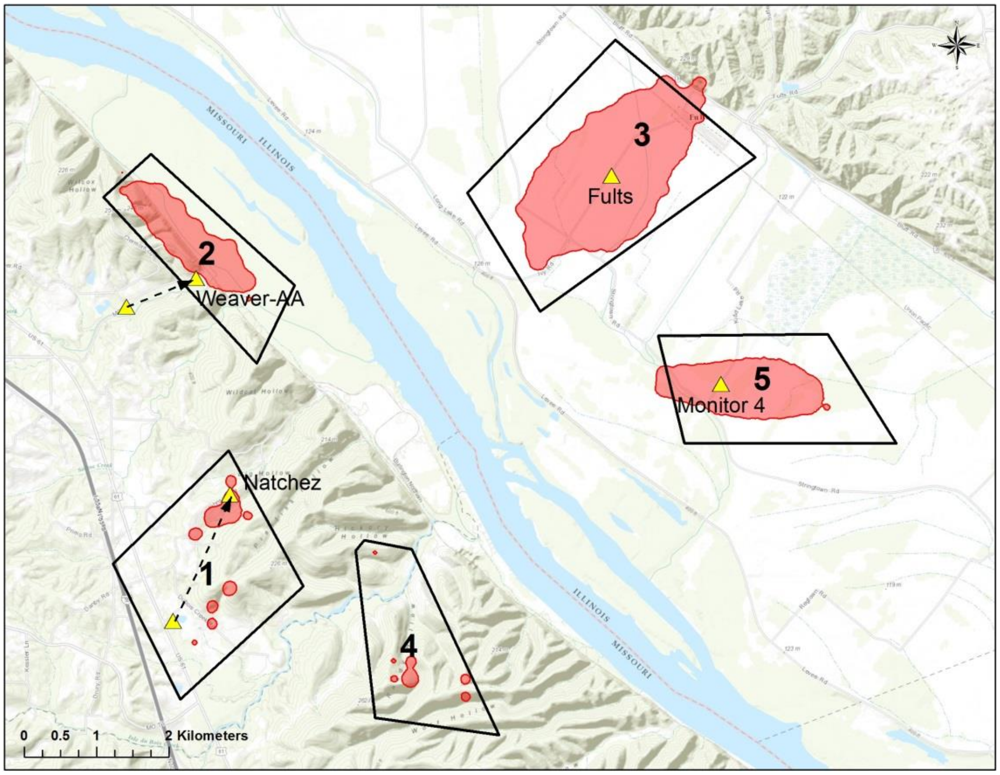


Figure 7. Appropriately located Rush Island monitors (four monitor configuration).

Exhibit 3

IV. Conclusion

For the reasons set forth above, DNR should withdraw the proposed Labadie SO_2 monitoring sites and EPA should not approve the 2015 Monitoring Network Plan with the inclusion of such sites pending the completion of the Labadie area designation process and the performance of appropriate modeling to determine the areas of peak ambient SO_2 concentrations around the plant using current EPA guidance. With respect to the Rush Island monitoring sites in the 2015 Monitoring Network Plan (and the Labadie monitoring sites if DNR does not withdraw them), DNR should not submit the plan to EPA, and EPA should not approve it, unless and until the proposed monitoring sites are relocated to areas of expected peak ambient SO_2 concentrations.

Sincerely yours,

Maxine I. Lipeles

Maxine I. Lipeles, Co-Director
Kenneth Miller, P.G., Environmental Scientist
Interdisciplinary Environmental Clinic
Washington University School of Law
One Brookings Drive – CB 1120
St. Louis, MO 63130
314-935-5837 (phone); 314-935-5171 (fax)
milipele@wustl.edu

Attorneys for the Sierra Club

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Josh Tapp, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Wendy Vit, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

Exhibit 4

Washington University in St. Louis

SCHOOL OF LAW

Interdisciplinary Environmental Clinic

June 28, 2016

Missouri Department of Natural Resources
Air Pollution Control Program
Air Quality Analysis Section/Air Monitoring Unit
P.O. Box 176
Jefferson City, MO 65102
Via email to: cleanair@dnr.mo.gov

Re: 2016 Monitoring Network Plan

To whom it may concern:

Submitted on behalf of Sierra Club, these comments urge the Missouri Department of Natural Resources ("DNR") to revise its 2016 Monitoring Network Plan[1] to require Ameren to make significant changes to its sulfur dioxide ("SO_2") monitoring networks at the Labadie and Rush Island power plants. As DNR is expected to submit its 2016 Plan to the U.S. Environmental Protection Agency ("EPA") for review and approval shortly after the close of the comment period, these comments also urge EPA to reject most of the 2016 Plan's SO_2 monitoring locations at the Labadie and Rush Island plants. With one or two possible exceptions, Ameren's monitors are not located in areas of expected peak ambient SO_2 concentrations. Accordingly, they do not satisfy applicable requirements for "SLAMS … or SLAMS-like" monitors.[2]

This letter highlights the following key points:

- Ameren selected the monitoring locations at both Labadie and Rush Island. But according to Ameren's own modeling, most of Ameren's monitoring locations are not in areas of expected peak ambient SO_2 concentrations.
- DNR has not done due diligence in reviewing and accepting Ameren's monitoring locations. DNR offers no independent support for Ameren's Labadie locations, and its purported support for the Rush Island locations actually undermines the propriety of those locations.
- Based on currently available modeling, one or both of the Labadie monitoring sites and two of the three Rush Island monitoring sites are unlikely to capture maximum ambient SO_2 concentrations because they are not located in areas where peak ambient SO_2 concentrations are expected to occur.

---

[1] Missouri Department of Natural Resources, Air Pollution Control Program, 2016 Monitoring Network Plan (May 27, 2016) ("2016 Monitoring Network Plan" or "2016 Plan").

[2] U.S. Environmental Protection Agency ("EPA"), Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS); Final Rule ("DRR"), 80 Fed. Reg. 51052, 51072 (Aug. 21, 2015).

Exhibit 4

I. DNR's 2016 Monitoring Network Plan Does Not Comply With Applicable Legal Requirements.

Source-oriented ambient SO_2 monitors must be sited in areas of expected peak 1-hour SO_2 concentrations.[3] EPA guidance highlights the need for detailed analysis to support the appropriate location of ambient SO_2 monitors:

> The EPA suggests that the more data and analysis that goes into a source-oriented monitoring site evaluation process, the greater the confidence in how appropriate the resulting monitoring network proposal will be in supporting the objectives of the DRR. Air agencies electing to use monitoring as a means of satisfying the DRR or other source-oriented monitoring activity are expected to provide adequate reasoning in a monitoring network proposal. Such a network proposal would characterize an area around or impacted by an identified SO_2 source and include the identification of one or more locations where peak 1-hour SO_2 concentrations are expected to occur.[4]

In its 2015 Monitoring Network Plan, DNR labeled Ameren's Labadie and Rush Island SO_2 monitors as Special Purpose Monitors for the stated reason that the Data Requirements Rule had not yet been issued in final form, while making it clear that the monitors were intended to serve as SLAMS monitors. "Once the rule is finalized, it is the intention to convert these monitors to SLAMS."[5] In approving DNR's 2015 Monitoring Network Plan, EPA indicated that it had not evaluated Ameren's Labadie and Rush Island monitors but would do so after DNR acted on its stated intention to convert them to SLAMS monitors.[6]

DNR's 2016 Monitoring Network Plan changes course: "Despite EPA's previous recommendation to classify these monitors as SLAMS, … we have decided to classify the Labadie and Rush Island SO_2 monitors as industrial SO_2 monitors."[7] DNR erroneously relies on EPA's statement that state agencies may rely on data collected from third-party operated monitors provided the monitors comply with the data quality and assurance requirements of EPA's ambient monitoring regulations. However, DNR conveniently ignores EPA's statement that, regardless of whether an ambient source-oriented SO_2 monitor is operated by a government, industry, or other third party, "[t]he critical issue is that the monitor or monitors must be either a SLAMS monitor or SLAMS-like monitor."[8] EPA's numerous statements about the need for states to perform due diligence to support the location and number of monitors, and the need for discussing these items with EPA in advance of making decisions, underscores the fact that, if states plan to use third-party monitors for regulatory NAAQS designation or compliance

---

[3] 40 C.F.R. Part 58, Appendix D, § 1.1.1(a), (c); 40 C.F.R. § 51.1203(b); DRR, 80 Fed. Reg. at 51055, 51057, 51083, 51085; In the Matter of Union Electric Company d/b/a Ameren Missouri, No. APCP-2015-034, Consent Agreement between DNR and Ameren Missouri (Mar. 23, 2015), Appendix 1, ¶b (Appendix J to DNR's pending SIP for the Jefferson County Sulfur Dioxide Nonattainment Area). See also EPA, SO2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (Feb. 2016, Draft) ("Monitoring TAD") at i, 2, 10, 15.

[4] Monitoring TAD at 10.

[5] Missouri Department of Natural Resources, Air Pollution Control Program, 2015 Monitoring Network Plan (June 12, 2015) ("2015 Monitoring Network Plan") at 12.

[6] EPA, Region 7 (Mark Hague), letter to DNR (Kyra Moore) (Jan. 25, 2015).

[7] 2016 Monitoring Network Plan at 17.

[8] DRR at 51072.

decisions, the monitors must meet all of the substantive requirements of SLAMS monitors. Ameren's Labadie and Rush Island monitors do not, as they are not sited in areas of expected peak ambient SO_2 concentrations.

II. The Labadie Monitors Are Not Located In Areas of Expected Peak Ambient SO_2 Concentrations.

As demonstrated in comment letters previously submitted on behalf of Sierra Club, one or both of Ameren's Labadie monitors are not in areas of expected peak concentrations, and a third monitor is also needed.[9] Our previous comments, which are attached as Exhibits 1-5 and incorporated herein by reference, highlighted the following key points:

- Ameren's original modeling to site the monitors identified three distinct areas where peak 1-hour SO_2 concentrations are expected to occur. These areas are located northwest, northeast, and southeast of the plant and are shown in Figure 1. However, only one of the monitors – the Northwest monitor – is located in one of these areas. No monitor is located in either of the other two peak concentration areas. The Valley monitor is located between the two unmonitored peak concentration areas, at a site where the modeled concentration is approximately 20 percent lower than in the peak areas.
- DNR's modeling for its proposed Labadie designation recommendation, which used newer emissions and meteorological data than Ameren's original modeling, confirmed that the Valley monitor is not located in an expected peak concentration area and predicted an even lower concentration (relative to the peak) at the Valley monitoring site than Ameren's original modeling. This is shown in Figure 2.
- Early on-site meteorological data from the Valley site suggests that meteorological data from the Spirit of St. Louis Airport (KSUS) in nearby Chesterfield may be more representative of meteorological conditions at Labadie than data from the much more distant Jefferson City Memorial Airport (KJEF) in Jefferson City. Like Ameren, DNR used KJEF meteorological data in the modeling it performed for its proposed Labadie designation recommendation. However, if KSUS meteorological data are used instead in light of their greater similarity to the on-site met data, then DNR's modeling shows expected peak concentration areas located south and southwest of the plant. This is shown in Figure 3. Both the Northwest and Valley monitors are located well outside of these areas, where the modeled concentration is more than 25 percent lower than in peak areas.

---

[9] Comments on Ameren Missouri's Labadie Sulfur Reduction Project Quality Assurance Project Plan (April 13, 2015) (Ex.1); Comments on the 2015 Monitoring Network Plan (July 20, 2015) (Ex.2); Supplemental Comments on the 2015 Monitoring Network Plan (August 11, 2015) (Ex.3); Comments on the 2010 1-Hour Sulfur Dioxide Standard, Proposed Options for Area Boundary Recommendations, July 2016 Designations (September 3, 2015) (Ex.4); Comments on the Proposed Area Designation Under the 2010 SO_2 NAAQS for the Area Around the Labadie Energy Center in Franklin County, Missouri (March 31, 2016) (Ex.5).

Exhibit 4

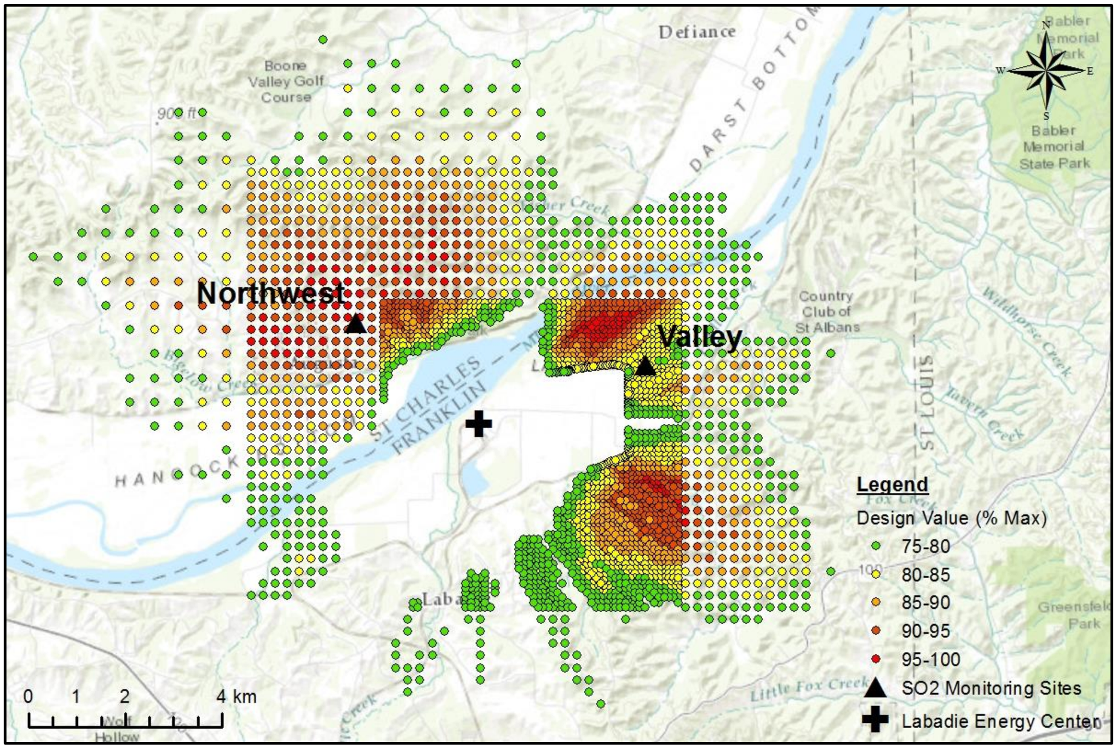


Figure 1. Expected peak concentration areas per Ameren's original modeling.

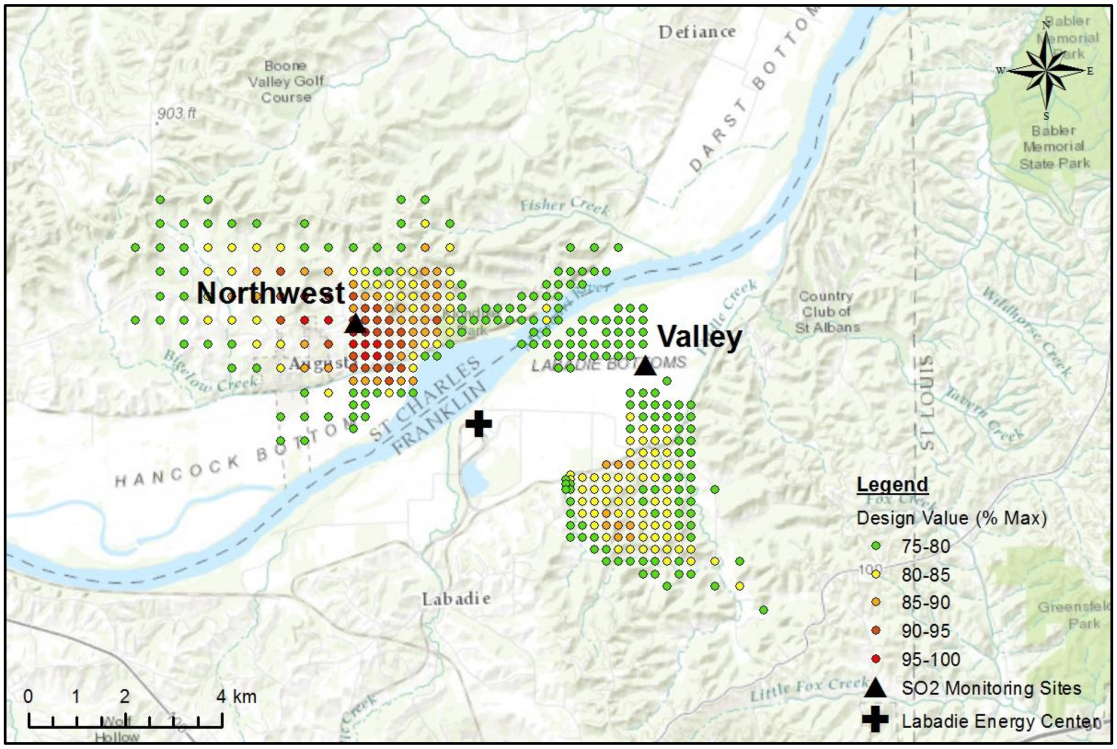


Figure 2. Expected peak concentration areas per DNR's Labadie designation recommendation modeling.

Exhibit 4

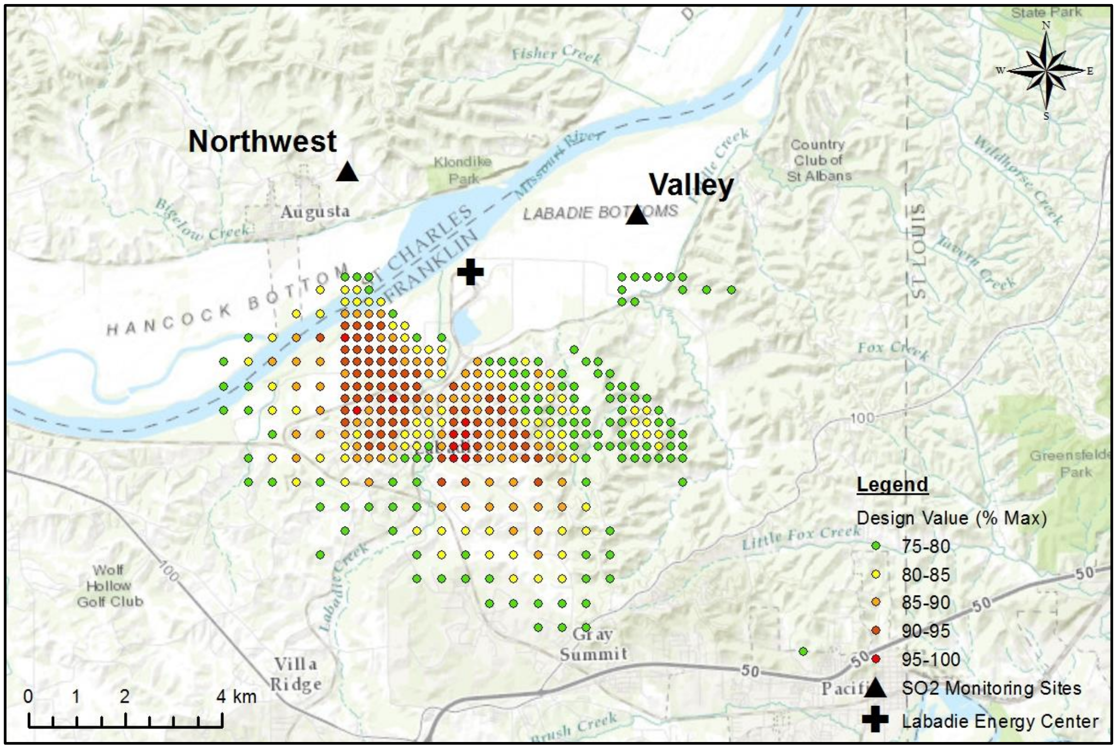


Figure 3. Expected peak concentration areas per DNR's Labadie designation recommendation modeling, using KSUS meteorological data.

III. DNR Has Not Conducted An Independent Modeling Analysis Of Ameren's Labadie Monitoring Sites.

Inexplicably, DNR has not performed an independent modeling analysis of the suitability of Ameren's Labadie monitoring sites. In its 2015 Monitoring Network Plan, DNR only provided Ameren's modeling analysis of the sites.[10] Even though DNR performed independent modeling last year related to its Labadie designation recommendation, it did not use that modeling to evaluate or attempt to justify the Labadie monitoring sites in the 2015 Monitoring Network Plan. And although DNR updated its modeling earlier this year in response to EPA's proposed Labadie designation decision, it still failed to use that updated modeling to assess the siting of Ameren's Labadie monitors in the 2016 Monitoring Network Plan.

Nor has DNR conducted a monitor siting analysis for Labadie using the receptor scoring strategy described in the Monitoring TAD, which was revised last February. This is curious given DNR's contention in the 2016 Monitoring Network Plan that its original Rush Island analysis needed to be updated because it focused solely on modeled design values, and "based on the revised guidance, the site selection process also needs to account for the frequency with which a receptor registers a daily maximum concentration."[11] Like DNR's original Rush Island analysis, Ameren's Labadie analysis did not account for frequency of having the highest 1-hour daily

---

[10] 2015 Monitoring Network Plan, Appendix 2.

[11] 2016 Monitoring Network Plan, Appendix 2 at 2.

maximum concentration amongst all receptors. Hence, if the revisions to the Monitoring TAD necessitated a supplemental analysis of the Rush Island monitoring sites on those grounds, it necessitates one for the Labadie sites as well. In light of the updated modeling that DNR performed earlier this year in connection with the pending Labadie designation, it needed only to perform an additional model run using the MAXDAILY output option in AERMOD to evaluate the sites using the scoring strategy described in the Monitoring TAD, as it did for the Rush Island monitoring sites.

DNR also should have reevaluated the Labadie monitoring sites in the 2016 Monitoring Network Plan due to various technical issues with Ameren's original analysis. As noted above, DNR relied from the outset on Ameren's modeling analysis, which Ameren provided in the Quality Assurance Project Plan ("QAPP") for what the company ironically dubbed its "Labadie Sulfur Reduction Project." However, Ameren's modeling used constant emission rates and therefore did not comport with the Monitoring TAD, as explained in our April 2015 comments on the QAPP (Ex. 1 attached hereto). It also used 2005-2009 meteorological data and was therefore conspicuously out of date even at the time of submittal.

DNR's approach to the Labadie monitoring sites cannot be squared with EPA's requirements:

> [R]esponsible air agencies are expected to establish a clear rationale for the number and placement of the monitors it is using to satisfy the requirements of the [DRR] rule. In this process, there is flexibility for the state to use professional judgment in determining what is appropriate for their individual situations, but *they are expected to perform due diligence in attempting to locate monitors in the most ideal locations possible*.[12]

IV. Analysis Of The Labadie Monitoring Sites Using The Scoring Strategy Described In The Monitoring TAD Demonstrates That The Valley Monitor Is Improperly Sited And That Additional Monitors Are Needed.

Per the Monitoring TAD, prioritization of receptor locations for consideration as permanent monitoring sites using normalized design values (NDVs) and frequency of having the highest 1-hour daily maximum concentration is accomplished using the following scoring strategy:[13]

1. Calculate the NDV at each receptor and rank from highest to lowest receptor. Rank of 1 means the highest design value.
2. Using the MAXDAILY output option in AERMOD, determine each day's highest normalized concentration and receptor. The MAXDAILY option in AERMOD outputs each receptor's highest concentration for each modeled day.
3. Using the output from step 2, determine the number of days each receptor has the highest concentration for the day among all receptors.
4. Rank the results from step 3 from highest to lowest number of days. Rank of 1 means the highest number of days having the highest daily maximum value.

---

[12] DRR, 80 Fed. Reg. at 51073 (emphasis supplied).

[13] Monitoring TAD, Appendix A.

Exhibit 4

5. For each receptor, add the concentration rank and the day rank. The lowest possible score is 2, meaning the receptor was the highest overall NDV and also had the highest number of days where the receptor was the highest concentration for the day amongst all receptors.

Ranking receptors by their resultant scores provides a list of locations ranked in general order of desirability with regard to monitor siting. Lower relative scores indicate a higher probability of experiencing peak 1-hour SO_2 concentrations.

Had DNR analyzed Ameren's Labadie monitoring sites using this strategy in either its original modeling, which used 2012-2014 emissions data, or its updated modeling, which used 2013-2015 emissions data and also included a new variant with a merged stack for units 3 and 4, it would have found – as shown in our comments on the 2015 Monitoring Network Plan (Ex. 2 attached hereto) – that the Valley monitor is not sited in an expected peak concentration area and needs to be relocated. We obtained DNR's original and updated modeling via Sunshine Law request and reviewed the results in order to identify the 300 receptors with the highest modeled design values. Next, as DNR did in its supplemental analysis of the Rush Island monitoring sites, we reran the models for the top 300 receptors using the MAXDAILY output option in AERMOD to determine the maximum 1-hour concentration for each receptor for each day and then tallied the number of days each receptor had the highest 1-hour daily maximum concentration among all receptors.[14] Then, we ranked the top 300 receptors by both design value (concentration rank) and the number of days each had the highest 1-hour daily maximum concentration (day rank) and calculated a score for each one by adding its concentration rank and its day rank. Finally, we ranked the receptors by their scores to create a list of receptor locations in general order of desirability with regard to monitor siting. Figures 4, 5, and 6 show modeled design values and receptor score ranks for the top 300 receptors for DNR's original and updated modeling.

Note that in these and most subsequent figures, receptor color indicates concentration (as a percentage of the maximum modeled design value) and receptor size denotes either frequency of having the highest 1-hour daily maximum concentration, score (concentration rank plus day rank), or score rank

---

[14] Like DNR, we used actual rather than normalized design values, but that does not affect the outcome of the analysis.

Exhibit 4

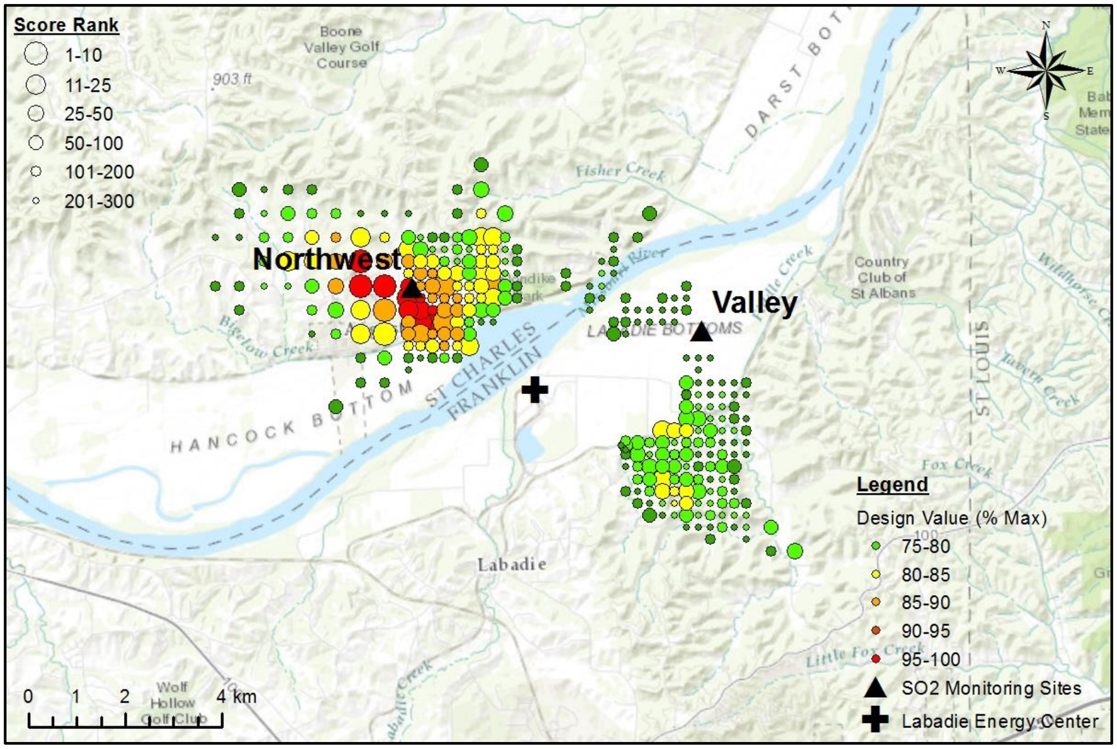


Figure 4. Design values and score ranks for the top 300 receptors, DNR modeling based on 2012-2014 emissions.

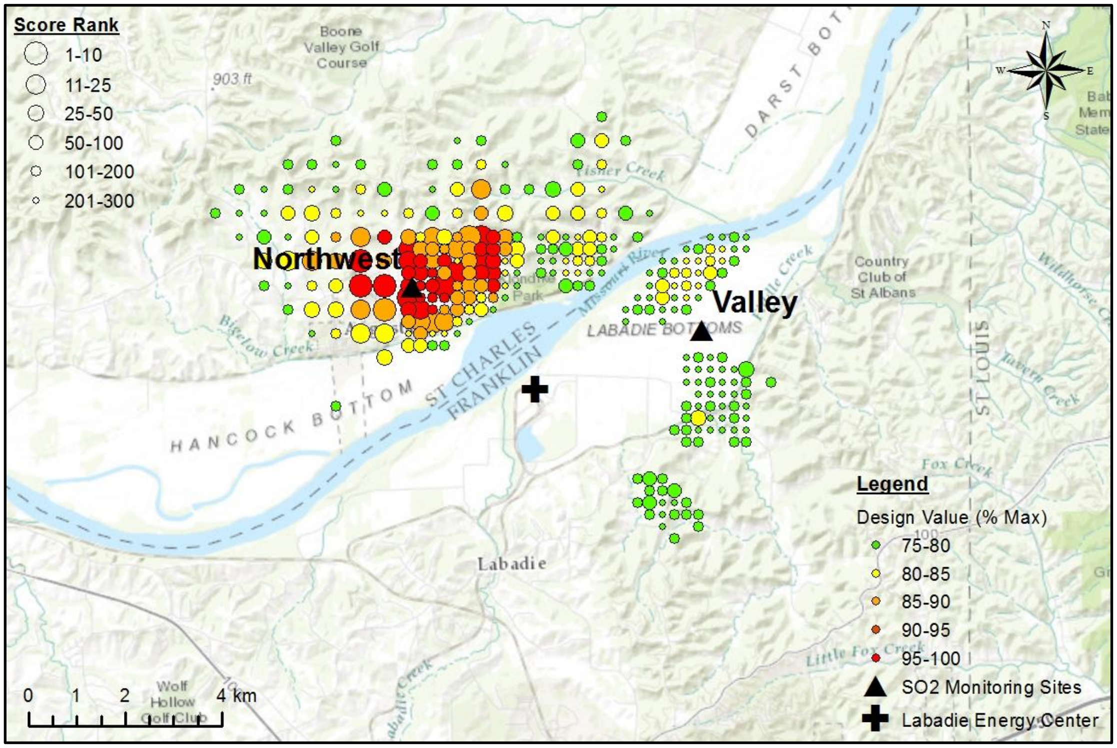


Figure 5. Design values and score ranks for the top 300 receptors, DNR modeling based on 2013-2015 emissions and separate stacks for units 3 and 4.

Exhibit 4

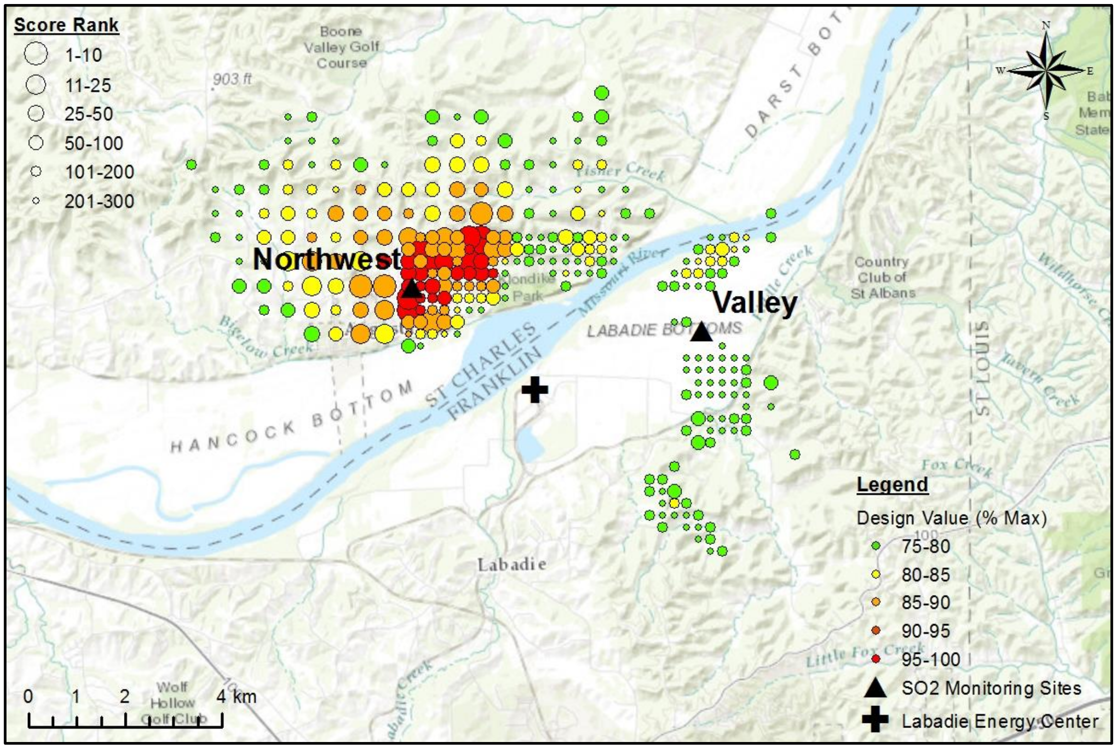


Figure 6. Design values and score ranks for the top 300 receptors, DNR modeling based on 2013-2015 emissions and merged stacks for units 3 and 4.

Figures 4, 5, and 6 all show that while the Northwest monitor is sited in an area with high modeled design values and numerous highly ranked receptors, the Valley monitor clearly is not. Regardless of which modeling is used in the analysis, the Valley monitor is sited in an area where there are no top 300 receptors and where the modeled design value is generally less than 75% of the maximum. As such, its location is not on the prioritized list of receptor locations for permanent monitoring sites developed using the scoring strategy described in TAD, and DNR should require that it be moved to a location that is. Figure 4 (based on DNR’s modeling with 2012-2014 emissions) shows a large cluster of highly-ranked receptors, including several in the top 25 and many in the top 50, south of the Valley monitor, while Figures 5 and 6 (based on DNR’s modeling with 2013-2015 emissions) show a smaller cluster of top 100/200 receptors north of the Valley monitor. It should be noted that, as we discussed in our April 2015 comments on the Labadie QAPP, Ameren’s original analysis of the Labadie monitoring sites showed very high modeled design values in both of these areas, yet Ameren still chose to site the Valley monitor where modeled design values were considerably lower.

A similar analysis of Ameren’s most recent modeling supports not only relocating the Valley monitor but also adding at least one monitor southwest of the plant. In late March, in response to the EPA’s proposed nonattainment designation for Labadie, Ameren submitted a host of new modeling runs using 2013-2015 emissions data. Half of the new runs used a non-default beta option in AERMOD that EPA has not approved for use at Labadie. Therefore, we did not analyze those runs. Of the four remaining runs, all of which appropriately used AERMOD’s regulatory default options, two used meteorological data from the same National Weather

Exhibit 4

Service ("NWS") station that DNR used (Jefferson City Memorial Airport (KJEF)). Figures 7 and 8 show modeled design values and receptor score ranks for the top 300 receptors for these runs. The other two runs used meteorological data from the NWS station at Spirit of St. Louis Airport (KSUS). Figures 9 and 10 show modeled design values and receptor score ranks for the top 300 receptors for these runs.

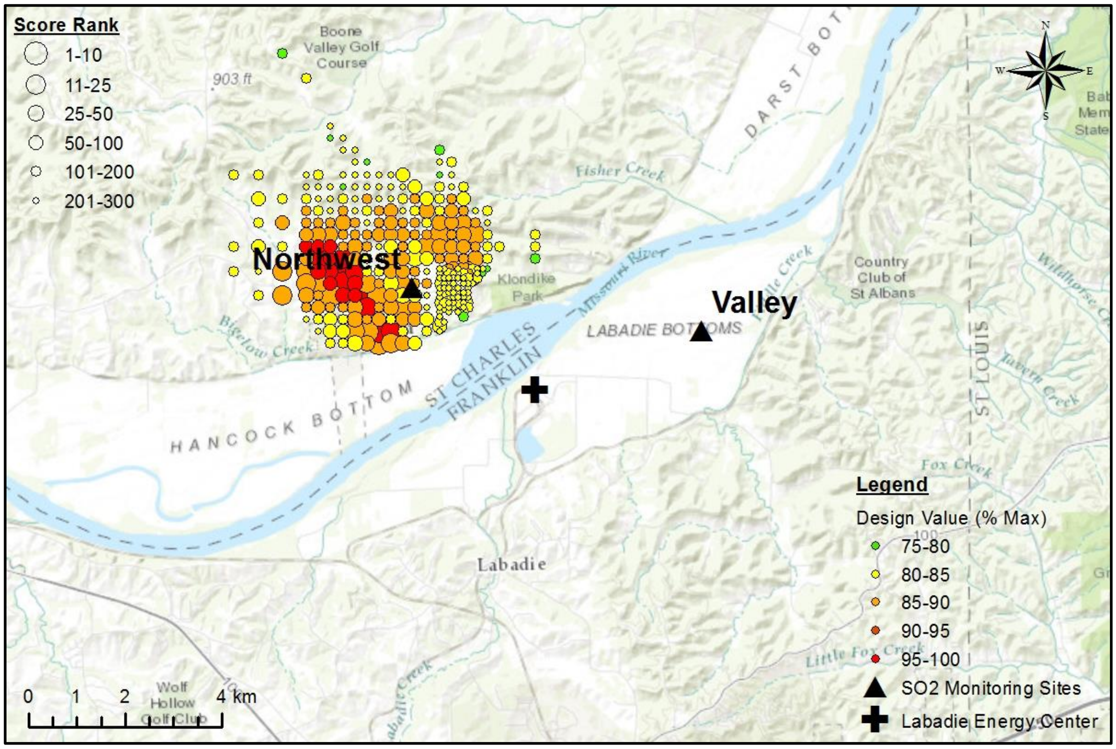


Figure 7. Design values and score ranks for the top 300 receptors, Ameren modeling based on 2013-2015 emissions, KJEF met, and East St. Louis background.

Exhibit 4

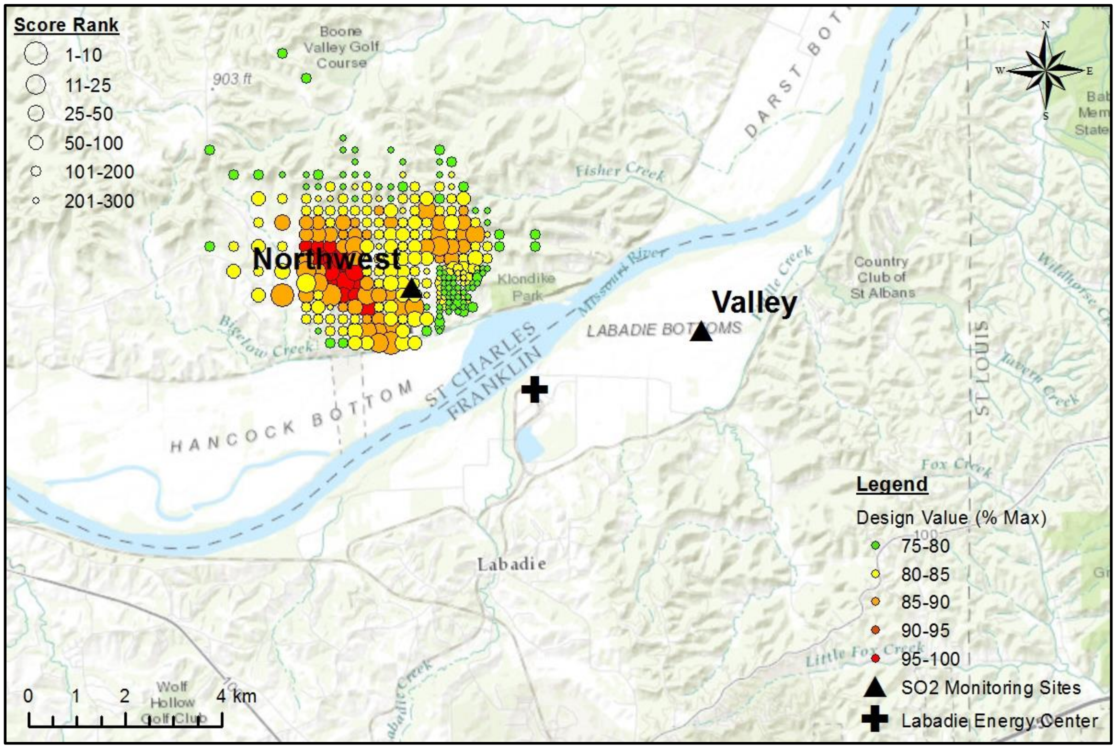


Figure 8. Design values and score ranks for the top 300 receptors, Ameren modeling based on 2013-2015 emissions, KJEF met, and Nilwood background.

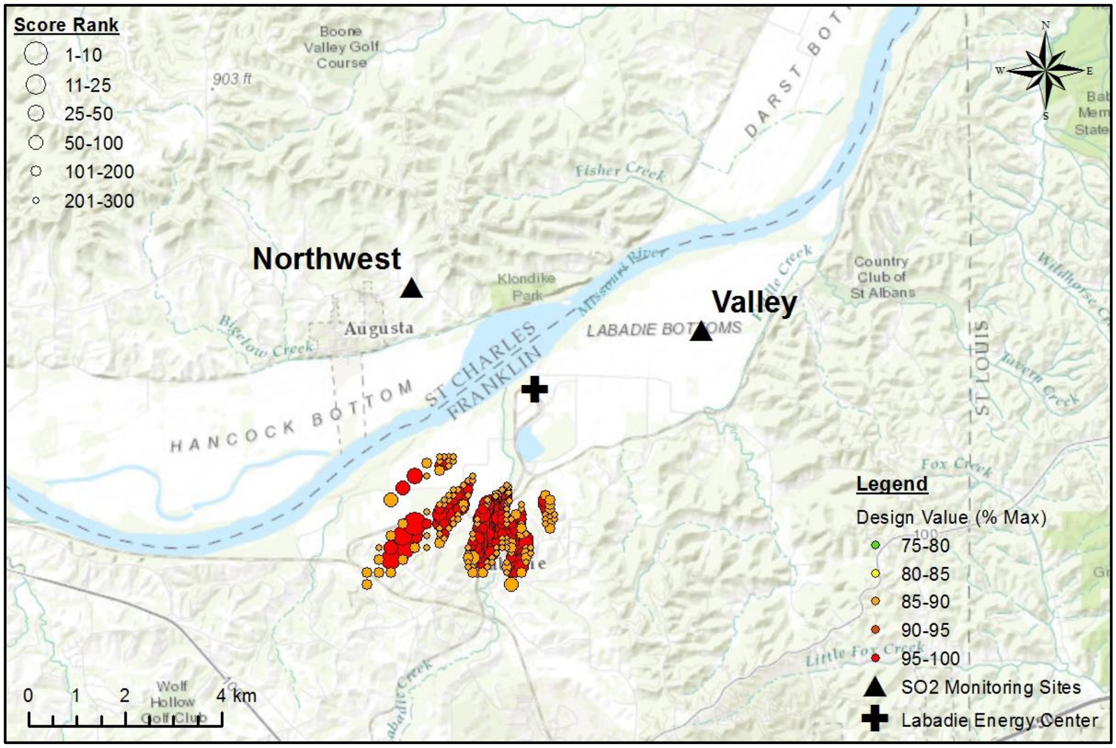


Figure 9. Design values and score ranks for the top 300 receptors, Ameren modeling based on 2013-2015 emissions, KSUS met, and East St. Louis background.

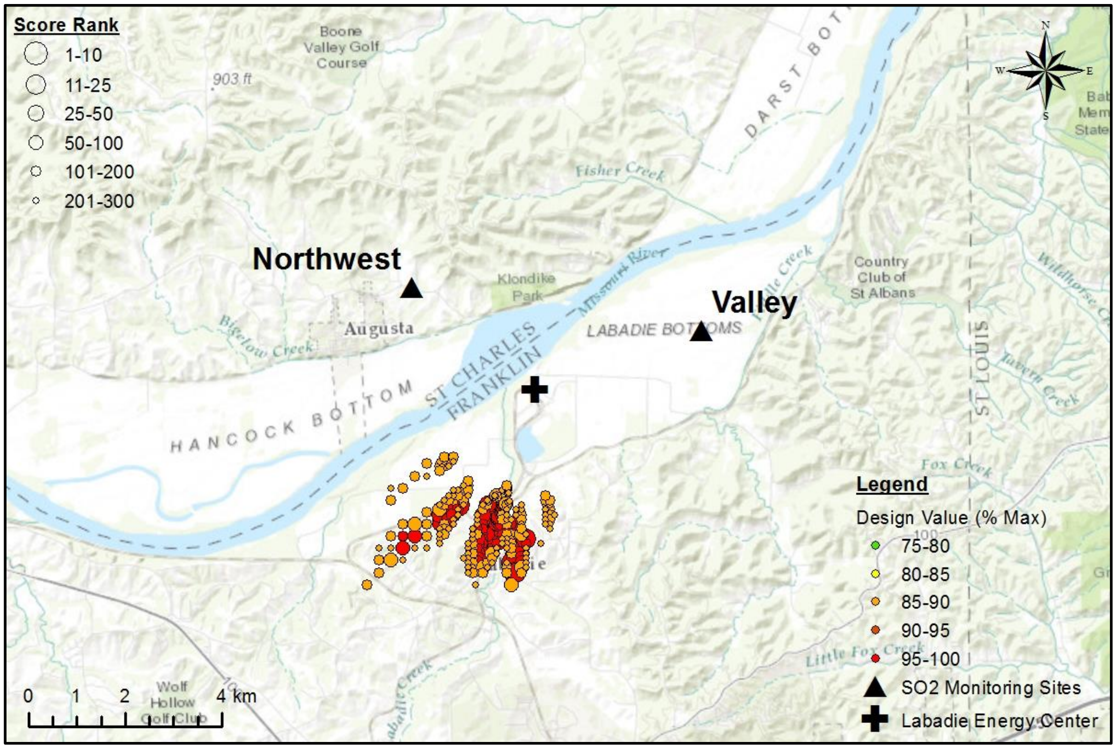


Figure 10. Design values and score ranks for the top 300 receptors, Ameren modeling based on 2013-2015 emissions, KSUS met, and Nilwood background.

Because Ameren used a much finer receptor spacing than DNR, Ameren's top 300 receptors are much more concentrated than DNR's, limiting to some degree the conclusions that can be drawn from Ameren's modeling without swapping out Ameren's receptor grid for DNR's and re-running Ameren's models. Still, Figures 7 and 8 show that based on Ameren's KJEF model runs, the Valley monitor is sited where there are no highly ranked receptors and the modeled design value is less than 75% of the maximum. Hence, these runs support the conclusion – drawn from our analysis of DNR's latest modeling – that the Valley monitor should be relocated.

Figures 9 and 10, on the other hand, show that based on Ameren's KSUS model runs, *neither* of the Labadie monitors is sited in an expected peak concentration area. The highest modeled design values, as well as the highest ranked receptors, are located south-southwest of the plant. There are no highly ranked receptors, and modeled design value are generally less than 75% of the maximum, at both the Valley and Northwest monitoring sites. As demonstrated in our supplemental comments on the 2015 Monitoring Network Plan (Ex. 3 attached hereto) preliminary meteorological data from the Valley site indicate that KSUS meteorological data is more representative of meteorological conditions at Labadie than KJEF meteorological data. Given that expected peak concentration areas are dramatically different when KSUS meteorological data are used, DNR should require one or more additional monitors in the peak concentration areas shown in Figures 9 and 10 in addition to the two existing monitors (one of which should be relocated). Failure to monitor these areas would result in failure to detect ground-level SO_2 concentrations maxima if KSUS meteorological data ultimately prove more representative of the area than KJEF meteorological data.

Exhibit 4

V. DNR's Supplemental Analysis Of The Rush Island Monitoring Sites Does Not Follow EPA Guidance.

The 2015 Monitoring Network Plan included Ameren's modeling and justification for the locations of three Rush Island monitors as well as an independent modeling analysis by DNR. DNR stated that it undertook its analysis to determine whether the monitors, which were sited by Ameren, "will adequately represent … Rush Island Energy Center's SO_2 air quality impact," and it concluded that they are "within … areas predicted to have the highest and most frequent modeled impacts" and are therefore "reasonable."[15] However, as demonstrated in comment letters previously submitted on behalf of Sierra Club, two of Ameren's Rush Island monitors are not in areas of expected peak concentrations.[16] Our previous comments, which are attached as Exhibits 2 and 6 and incorporated herein by reference, highlighted the following key points:

- Ameren's modeling for its analysis of SO_2 and meteorological monitoring sites around Rush Island identified one large and four smaller areas where peak 1-hour SO_2 concentrations are expected to occur. These areas are shown in Figure 11. However, none of the Rush Island monitors are located in the large peak concentration area south of the plant, which is also where the highest modeled concentrations occur. Furthermore, while two of the monitors – Fults and Natchez – are located on the periphery of two of the smaller expected peak concentration areas, the Weaver-AA monitor is not located in an expected peak concentration area at all.
- DNR's independent analysis of the Rush Island monitoring sites used a flawed methodology that biased the results. When corrected, DNR's analysis shows that only the Fults monitor is located in an expected peak concentration area and both the Natchez and Weaver-AA monitors are not.

---

[15] 2015 Monitoring Network Plan, Appendix 5 at 1, 7-8.

[16] Comments on the 2015 Monitoring Network Plan (July 20, 2015) (Ex.2); Comments on Ameren Missouri's Analysis of SO_2 and Meteorological Monitoring Stations Around Its Rush Island Energy Center (May 29, 2015) (Ex.6).

Exhibit 4

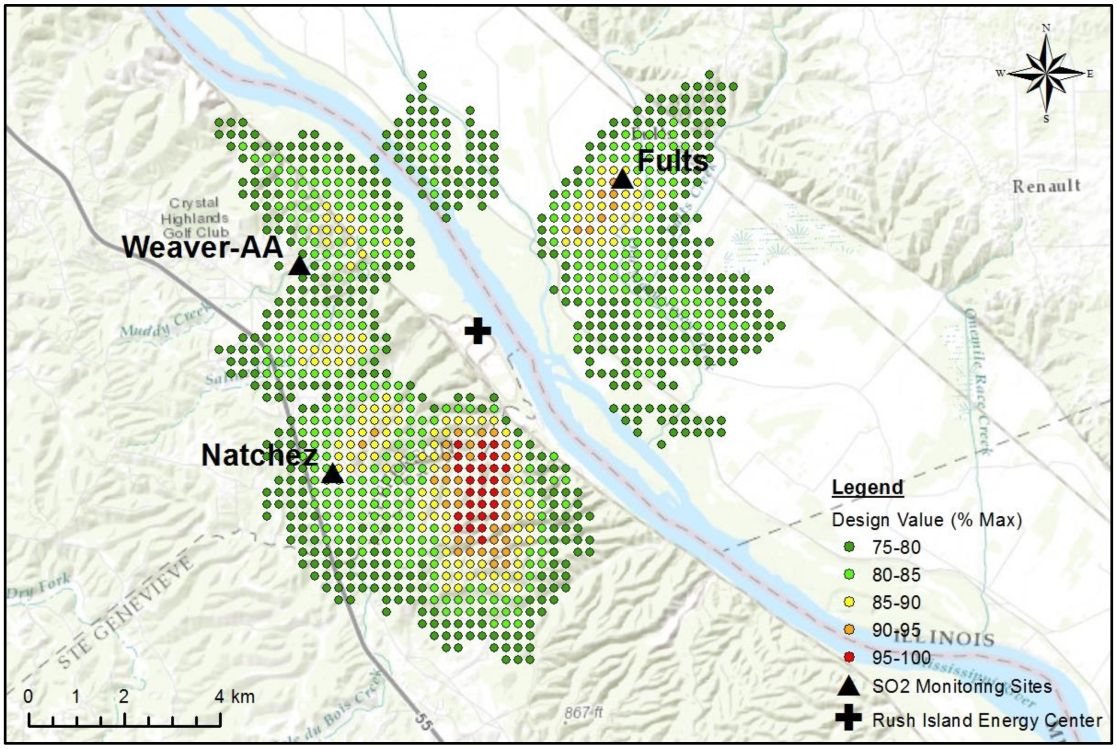


Figure 11. Expected peak concentration areas per Ameren's modeling for its analysis of SO_2 and meteorological monitoring sites around Rush Island.

The 2016 Monitoring Network Plan includes a supplemental analysis by DNR of the Rush Island monitoring sites. The purpose of the supplemental analysis was to update the modeling performed for DNR's original analysis to address the February 2016 revisions to the Monitoring TAD, which includes an option for creating a relative prioritized list of receptor locations for permanent monitoring sites using normalized design values (NDVs) and frequency of having the highest 1-hour daily maximum concentration amongst all receptors. According to DNR, it needed to update its modeling because its original analysis focused solely on modeled design values, and "based on the revised guidance, the site selection process also needs to account for the frequency with which a receptor registers a daily maximum concentration."[17] DNR's supplemental analysis concludes, "This … analysis supports the conclusions from the June 15 report [2015 Monitoring Network Plan]. The locations of the … monitoring sites are reasonable and in agreement with the air program's analysis."[18]

It is worth noting that the option to create a relative prioritized list of receptor locations for consideration of permanent monitoring sites using NDVs and frequency of having the highest 1-hour daily maximum concentration is not a new addition to the February 2016 version of the Monitoring TAD. It was in the previous (December 2013) version of the TAD as well, so DNR could have used it for its original analysis of the Rush Island monitoring sites. Why it chose not to and decided to focus instead only on modeled design values without any kind of assessment of

---

[17] 2016 Monitoring Network Plan, Appendix 2 at 2.
[18] *Id.* at 5.

Exhibit 4

the frequency with which receptors have the highest 1-hour daily maximum concentration was not explained in the 2015 Monitoring Network Plan.

More importantly, although DNR generally followed the strategy in its supplemental analysis of the Rush Island SO_2 monitoring sites,[19] it omitted the most crucial, final step – ranking receptors according to their score (the sum of concentration rank and day rank). As a result, it ignored the entire purpose of conducting the TAD-suggested prioritization analysis, and its supplemental analysis offers no support for the location of the Rush Island monitors. First, DNR reviewed the modeling performed for its original analysis and identified the 300 receptors with the highest modeled design values. These receptors are shown in Figure 12. Next, it reran its model for the top 300 receptors using the MAXDAILY output option in AERMOD to determine the maximum 1-hour concentration for each receptor for each day and then tallied the number of days each receptor had the highest 1-hour daily maximum concentration among all receptors. The frequency of having the highest 1-hour daily maximum concentration among the top 300 receptors is shown in Figure 13. Finally, it ranked the top 300 receptors by both design value (concentration rank) and the number of days each had the highest 1-hour daily maximum concentration (day rank) and calculated a score for each one by adding its concentration rank and its day rank. These scores are shown in Figure 14.

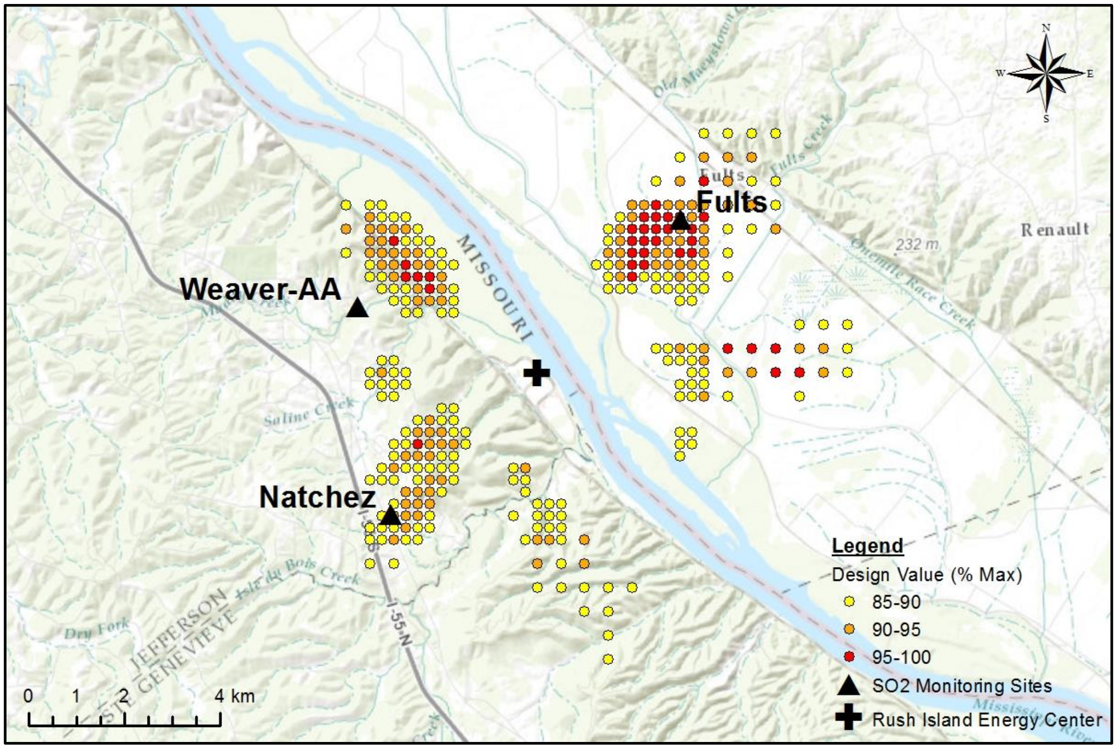


Figure 12. Top 300 receptors per DNR's original modeling.

---

[19] DNR used actual rather than normalized design values, but that does not affect the outcome of the analysis.

Exhibit 4

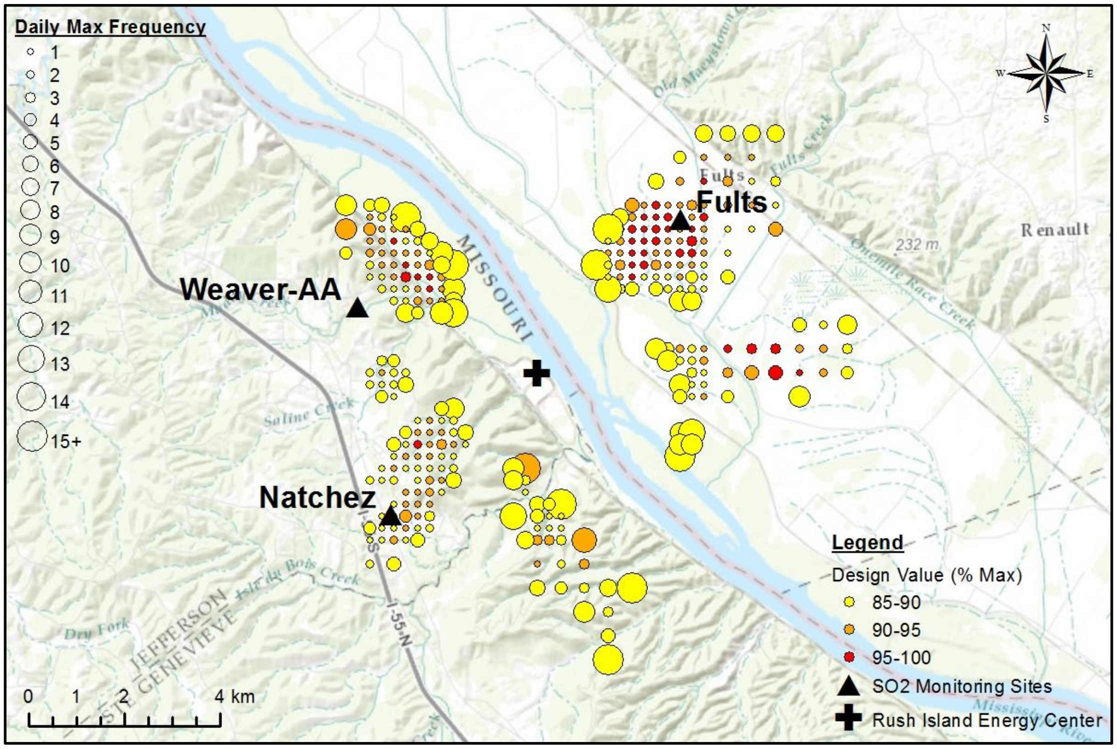


Figure 13. Frequency of having the 1-hour daily maximum concentration.

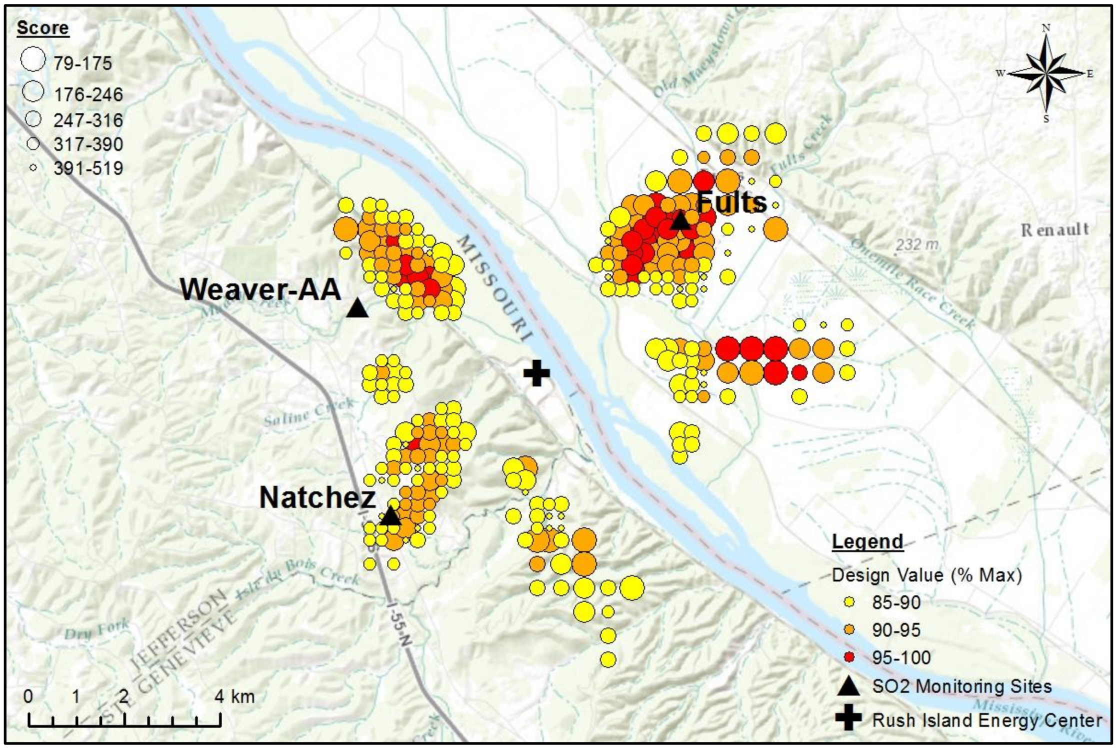


Figure 14. Receptor scores (concentration rank + day rank).

Exhibit 4

At this point, however, DNR abandoned the scoring strategy described in the Monitoring TAD. Instead of performing the final step and ranking receptors by their scores in order to provide a list of locations ranked in general order of desirability with regard to permanent monitor siting, it reverted to the flawed methodology used in its original analysis and counted the number of top receptors within five numbered polygons arrayed around the plant. These polygons are shown in Figure 15. It then ranked the polygons by the number of top receptors within each one and concluded, based on the fact that polygons 1, 2, and 3, where DNR Figures S-2 and S-3 show the monitors are located, contain the most top receptors, that the supplemental analysis supports its earlier conclusion that the siting of the monitors is reasonable.

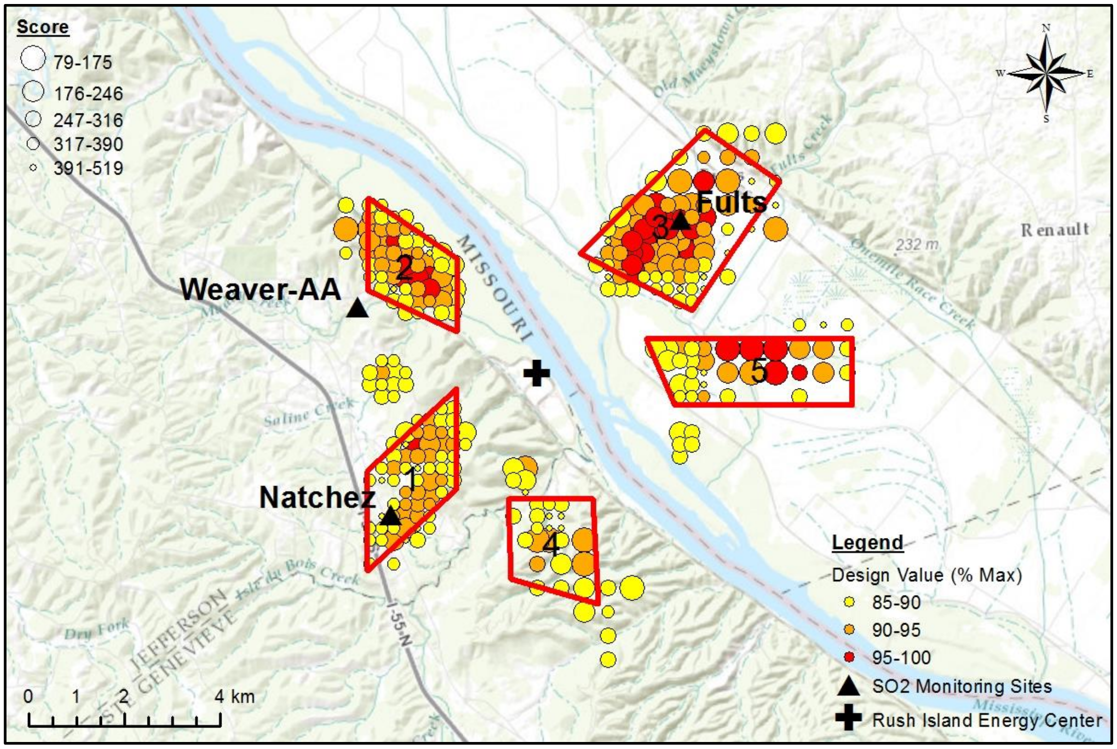


Figure 15. Polygons used in DNR's supplemental analysis.

There are several problems with this analysis:

1) DNR's use of a telescoping receptor grid results in biased counts of the number of receptors within each of the five polygons because the polygons are located in a region where the receptor spacing varies. As a result, some of the polygons contain more receptors than others simply because the receptors in those polygons are spaced more closely together.
2) The polygons used in DNR's supplemental analysis are a different size and shape than the ones used in its original analysis. This is shown in Figure 16. Setting aside the bias inherent in DNR's methodology owing to its use of a telescoping receptor grid, the supplemental analysis should use the same polygons as the original analysis if polygon rankings based on receptor counts are going to be compared.
3) The Weaver-AA monitoring site is located outside of polygon 2, so even if DNR's original conclusion that monitors placed in polygons 1, 2, and 3 are "the best options to

Exhibit 4

> represent Rush Island Energy Center's air quality impacts" were supported by its supplemental analysis, the Weaver-AA monitor still would not be properly sited.

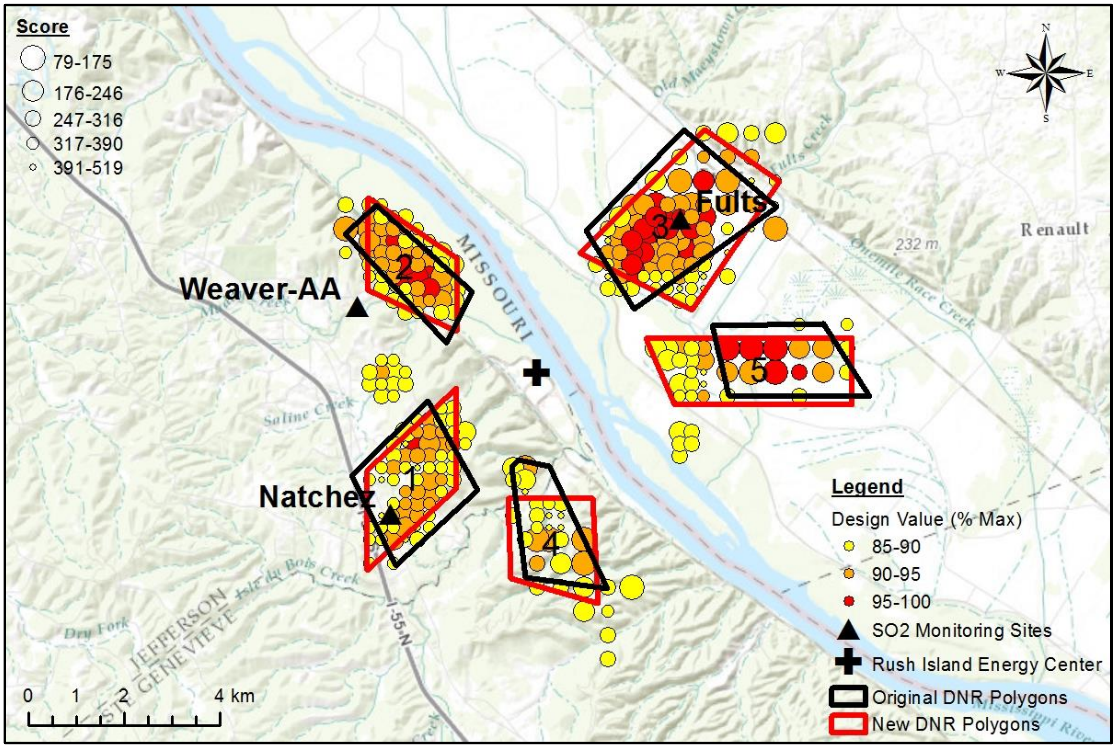


Figure 16. Comparison of polygons used in DNR's original and supplemental analyses.

The most serious problem with DNR's supplemental analysis, though, is that given the methodology used, it fails to fulfill its purported purpose, which is to also "account for the frequency with which a receptor registers a daily maximum concentration."[20] Accordingly, DNR's supplemental analysis provides no new information about whether the Rush Island SO_2 monitors are properly sited.

DNR performed the modeling necessary to determine the frequency with which a receptor registers a daily maximum concentration. It then calculated receptor scores, which account for this frequency as well as modeled design value. However, those scores did not have any bearing on the outcome of DNR's analysis because DNR ultimately ignored them and based its conclusions solely on the number of top receptors (i.e., those with the highest design values) in each of the five polygons shown in Figure 15. DNR did break out the number of top receptors in each polygon by score in Table S-1, listing the number of receptors in each of five scoring ranges, but it used *total* receptor counts to rank the polygons. Hence, receptor scores did not factor into the polygon ranks at all.

It is no surprise, then, that DNR's supplemental analysis supports the conclusions of its original analysis as they are, in fact, identical in that both base their conclusions solely on modeled design values. The supplemental analysis is just limited to the top 300 receptors, which has no

---

[20] 2016 Monitoring Network Plan, Appendix 2 at 2.

Exhibit 4

effect on the results because the high-concentration receptors DNR based its polygon rankings on originally were all top 300 receptors as well.

VI. A Supplemental Analysis Properly Conducted Pursuant To EPA's Monitoring TAD Demonstrates that the Natchez and Weaver-AA Monitors Are Not Properly Sited.

Had DNR followed the scoring strategy described in the TAD through to the end, and ranked receptors by their scores to come up with a list of locations ranked in general order of desirability with regard to monitor siting, its supplemental analysis would have reached a different conclusion regarding the siting of the Rush Island monitors. Figure 17 shows the 10, 25, 50, and 100 receptors with the highest score ranks superimposed on the peak concentration areas (design value >90 ug/m^3). The 10 receptors with the highest score ranks would be the most desirable monitor locations, and all but one are clustered in the three largest peak concentration areas, which are where the Rush Island SO_2 monitors should have been sited. The fact that almost all of the 10 highest ranked receptors – taking into account modeled design values *and* frequency of having the highest 1-hour daily maximum concentration – are located in these areas only reinforces that point. Similar results are obtained by looking further down the priority list at the 25, 50, and 100 highest ranked receptors, the vast majority of which are located in the same three peak concentration areas.

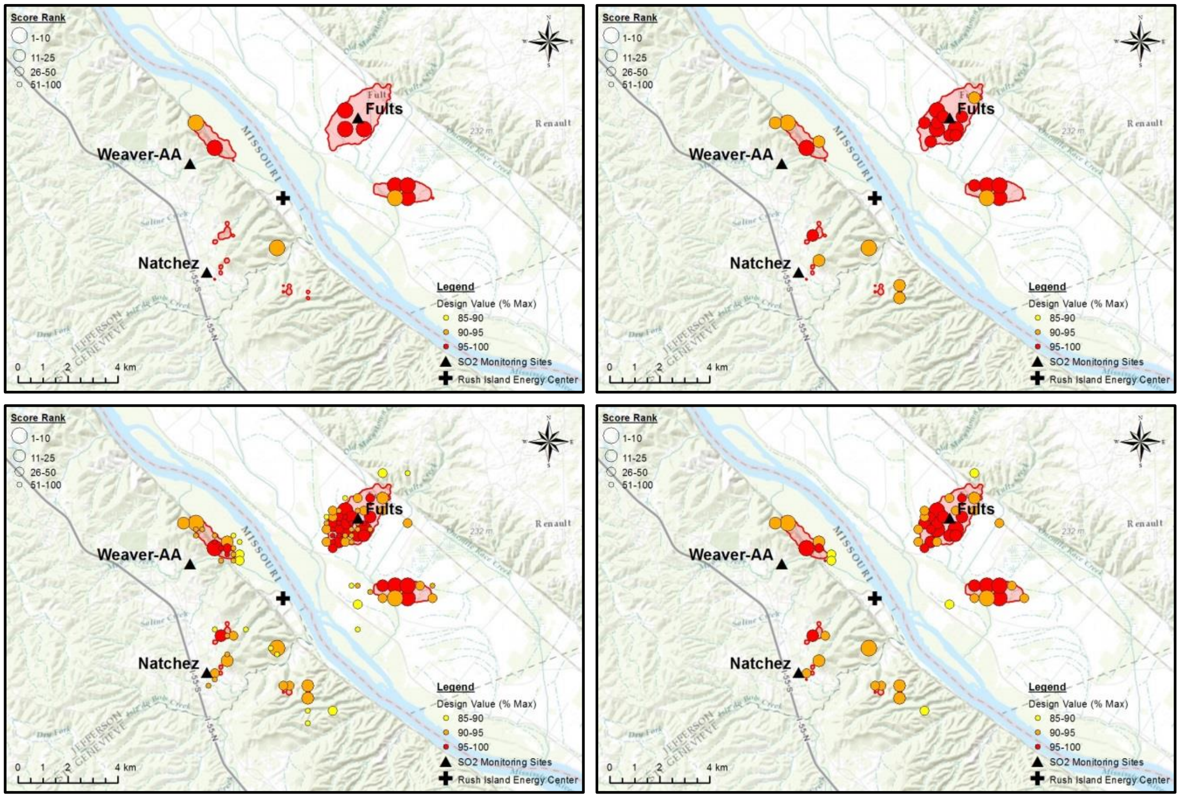


Figure 17. Receptors with the 10, 25, 50, and 100 highest score ranks (clockwise from upper left). Peak concentration areas (design value >90 ug/m^3) are shaded red.

Only one of the three Rush Island monitors is sited in these peak concentration areas. The Fults monitor is sited in the large peak concentration area located northeast of the plant, which contains three of the 10 highest ranked receptors and upwards of half of the 100 highest ranked receptors. The Natchez and Weaver-AA monitors, however, are located outside of the large peak concentration areas east and northwest of the plant, which collectively contain six of the 10 highest ranked receptors about 25 of the 100 highest ranked receptors. DNR should require Ameren to relocate the Natchez and Weaver-AA monitors to these areas, as they clearly represent – along with the area where the Fults monitor is located – the areas where peak concentrations are expected to occur based on DNR's own modeling and the receptor scoring strategy described in the TAD.

VII. Modeling Based On Updated Emissions And Meteorological Data Calls For At Least One Additional Monitor At Rush Island.

DNR used 2011-2013 emissions data in its analyses of the Rush Island monitoring sites. However, Rush Island's emissions profile has changed in recent years due to Ameren's switch to ultra-low sulfur coal at all of its un-scrubbed plants (Labadie, Meramec, and Rush Island). In recent comments to EPA on the agency's proposed nonattainment designation for Labadie, Ameren said the following regarding modeling of the plant's emissions: "[I]n 2011, Ameren entered into a long-term contract for the use of ultra-low sulfur coal at Labadie. Ameren began burning significant quantities of ultra-low sulfur coal in *2013*, and intends to continue to do so in the future ... Therefore, modeling that relies on emissions data from 2013 forward is far more representative of actual conditions at Labadie than pre-2013 data."[21] Given that Ameren is also burning ultra-low sulfur coal at Rush Island, data from 2013 forward should also be more representative of current conditions at Rush Island.[22] DNR's supplemental analysis did not evaluate the effect of using updated (2013-2015) emissions on the location of the Rush Island monitoring sites.

Updating DNR's modeling to use 2013-2015 emissions and meteorological data results in markedly different results from those obtained using 2011-2013 data. Figure 18 shows the 300 receptors with the highest modeled design values when 2013-2015 data are used; Figure 19 shows the frequency of having the highest 1-hour daily maximum concentration among these receptors; and Figure 20 shows their scores, which were calculated by adding their respective concentration ranks and day ranks per the scoring strategy described in the TAD.

---

[21] Ameren Missouri, Comments on EPA Responses to Certain State Designation Recommendations for the 2010 Sulfur Dioxide National Ambient Air Quality Standard: Notice of Availability and Public Comment Period (March 31, 2016) at 35.

[22] It is not clear whether current conditions are representative of future conditions, however, because Ameren's five-year contract for ultra-low sulfur coal will expire in 2017 and the provider of the coal, Peabody Energy, is now in bankruptcy and the nature and extent of its future operations is uncertain.

Exhibit 4

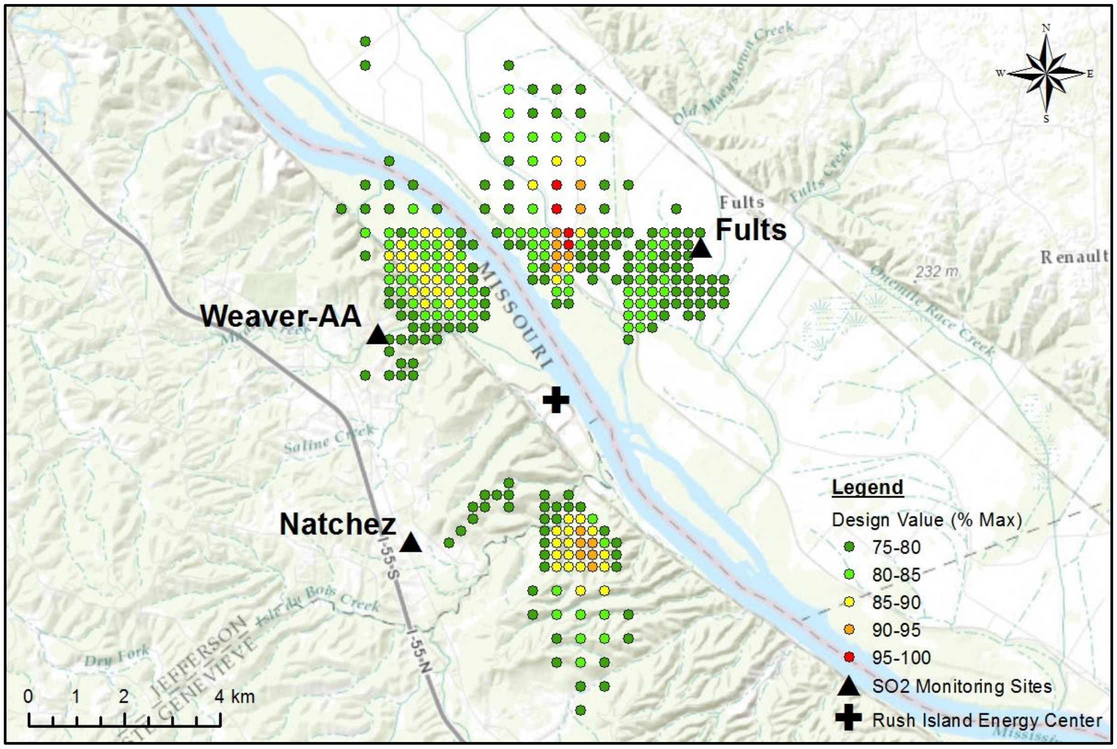


Figure 18. Top 300 receptors based on 2013-2015 data.

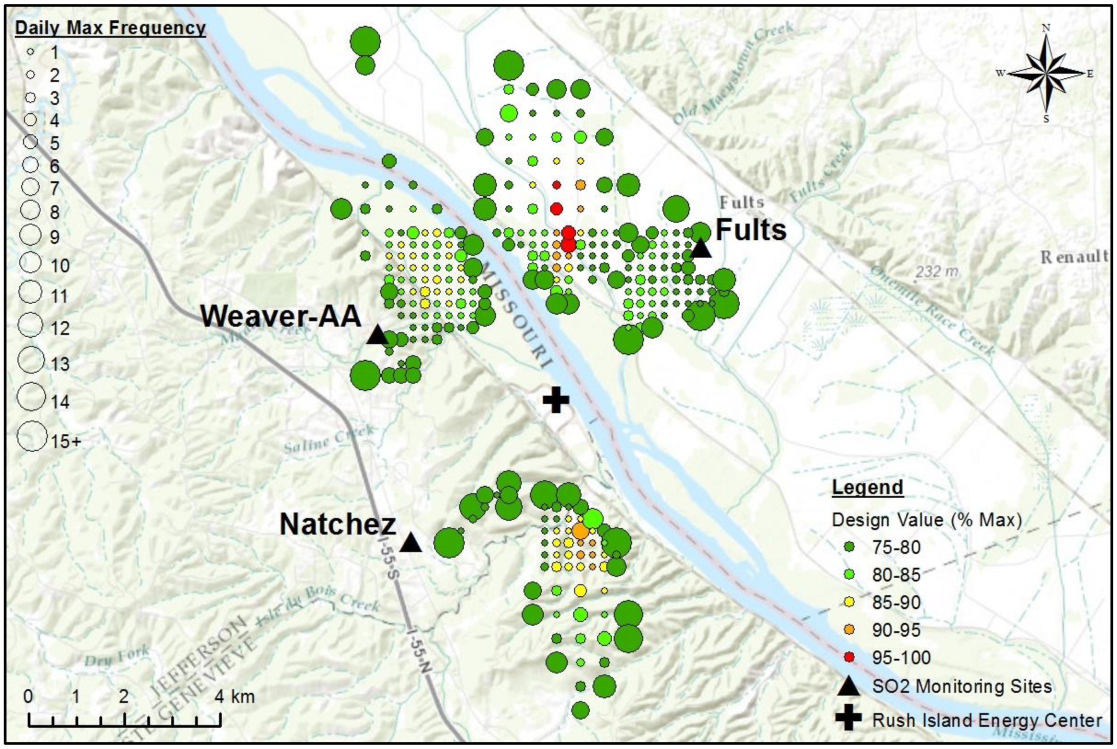


Figure 19. Frequency of having the 1-hour daily maximum concentration based on 2013-2015 data.

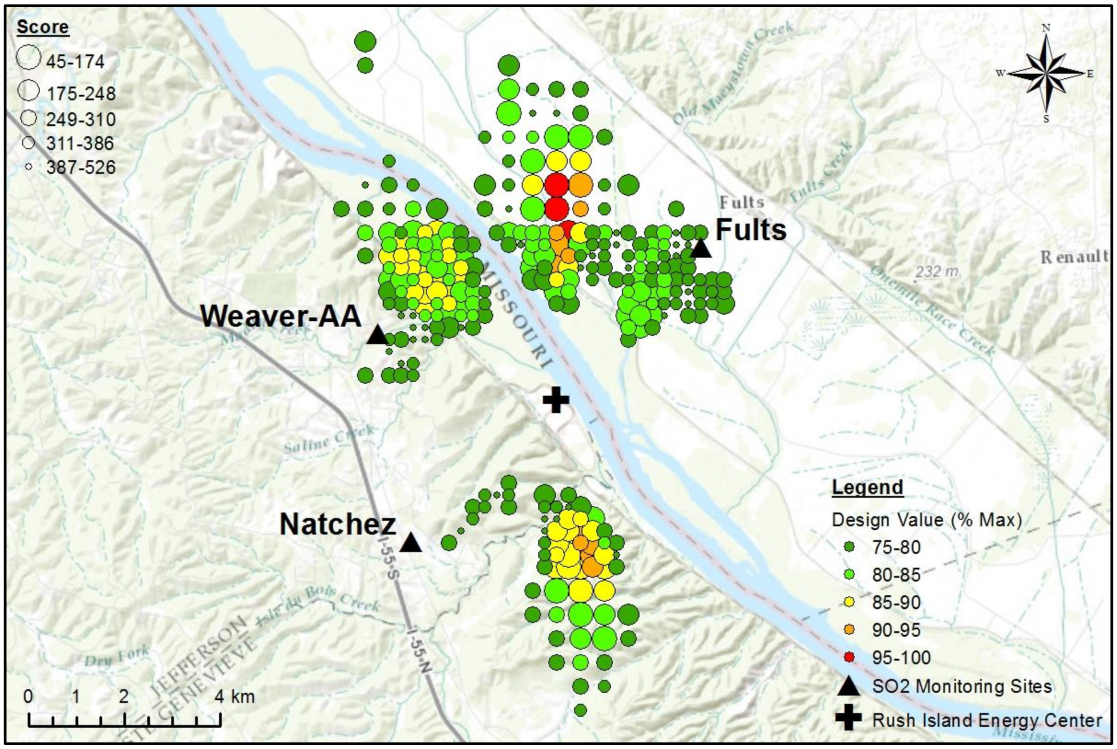


Figure 20. Receptor scores (concentration rank + day rank) based on 2013-2015 data.

When 2013-2015 data are used, the highest concentration areas shift and are located immediately north and south of the plant instead of to the east, northeast, and northwest, as shown in Figure 18. The receptors with the lowest scores – i.e., those with the highest combined concentration rank (based on modeled design value) and day rank (based on frequency of having the highest 1-hour daily maximum concentration) – are similarly located north and south of the plant, as shown in Figure 20. Furthermore, when the top receptors are ranked by score so as to provide a list ranked in general order of desirability with regard to siting monitors in accordance with the Monitoring TAD, there are no high-ranking receptors near any of the existing monitors. Figure 21 shows the 10, 25, 50, and 100 receptors with the highest score ranks based on modeling using 2013-2015 data.

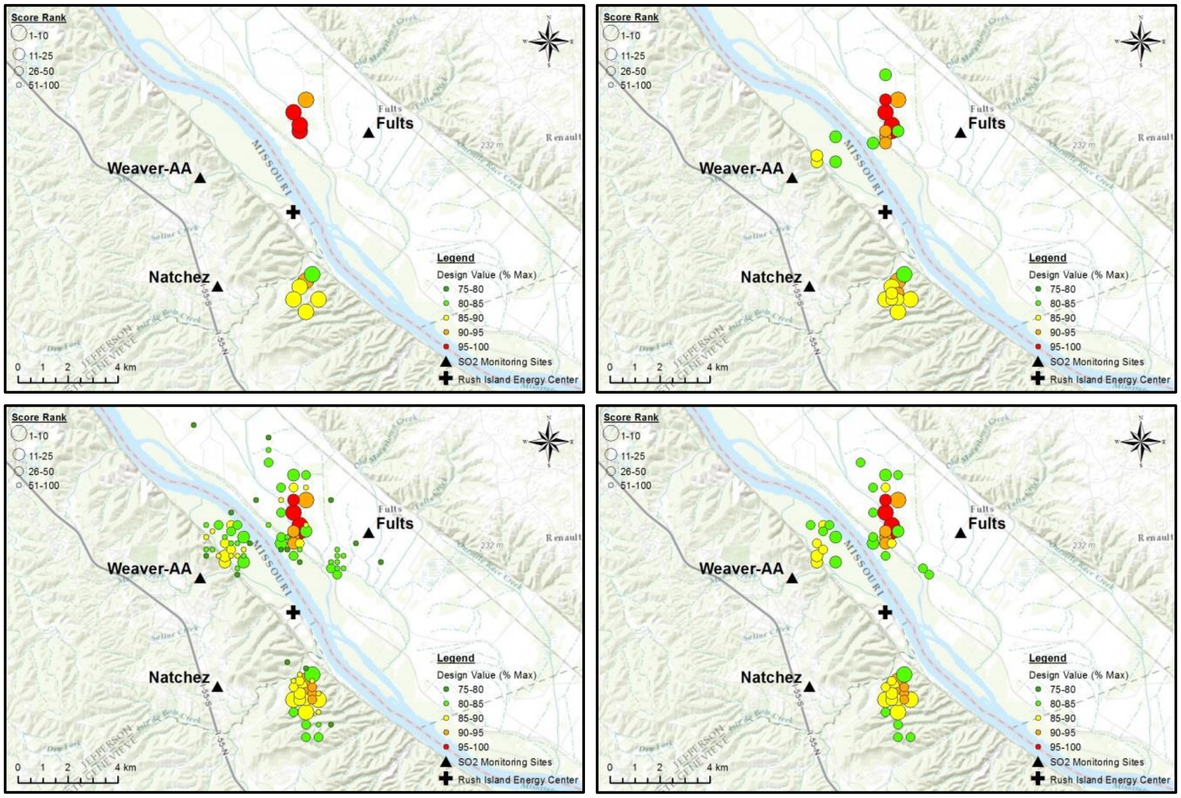


Figure 21. Receptors with the 10, 25, 50, and 100 highest score ranks (clockwise from upper left) based on 2013-2015 data

The significant difference in modeled peak concentration areas when 2013-2015 data are used in lieu of 2011-2013 data demonstrates one of the major drawbacks (besides providing data at only a limited number of discrete points) of using monitoring as a means of determining NAAQS compliance. As emissions and meteorological conditions change over time, peak concentration areas can shift, leaving monitors that may have been properly sited at one time in areas that are no longer appropriate. For example, the Fults monitor is appropriately sited based on modeling using 2011-2013 data but is not in a peak concentration area at all – let alone at a high priority location based on the scoring strategy described in the TAD – based on modeling using 2013-2015 data. This points to the need for additional monitors at Rush Island to ensure that the network is capable of adequately characterizing peak concentrations around the plant, which could easily shift again in the future. In addition to requiring relocation of the Natchez and Weaver-AA monitors to peak concentration areas as discussed above, DNR should require the addition of monitors immediately north and south of the plant, in peak concentration areas based on modeling using 2013-2015 data.

Conclusion

Ameren’s Labadie and Rush Island power plants are the two largest sources of sulfur dioxide emissions in the State. While virtually all other plants of their size across the nation have already adopted or made binding commitments to adopt scrubber technology to dramatically reduce their sulfur dioxide emissions, Ameren instead has installed monitors designed not to capture peak

Exhibit 4

SO_2 concentrations around these two plants. Sierra Club urges DNR to require Ameren to relocate the existing monitors (except for the Northwest monitor at Labadie and the Fults monitor at Rush Island) and expand the monitoring networks at both plants as described above. Sierra Club also urges EPA to make clear to DNR that the existing monitoring networks at the Labadie and Rush Island plants do not satisfy the criteria for SLAMS monitors for source-oriented ambient SO_2 monitoring purposes and that data from the monitors will not be used for regulatory decision-making.

Sincerely yours,

Maxine I. Lipeles

Maxine I. Lipeles, Director
Kenneth Miller, P.G., Environmental Scientist
Interdisciplinary Environmental Clinic
Washington University School of Law
One Brookings Drive – CB 1120
St. Louis, MO 63130
314-935-5837 (phone); 314-935-5171 (fax)
milipele@wustl.edu

Attorneys for the Sierra Club

Cc: Rebecca Weber, Director, Air & Waste Management Division, EPA Region 7
Michael Jay, Chief, Air Planning & Development Branch, EPA Region 7
Kyra Moore, Director, Air Pollution Control Program, DNR
Darcy Bybee, Chief, Air Quality Planning Section, Air Pollution Control Program, DNR

Ameren

Ameren Services

December 15, 2016

Ms. Kyra Moore, Director
Air Pollution Control Program
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102

Re: Ameren's Comments on the MDNR 2016 Monitoring Network Plan Update

Dear Ms. Moore:

On behalf of Ameren Missouri, we appreciate this opportunity to comment on the "Missouri Department of Natural Resources, Air Pollution Control Program, 2016 Monitoring Network Plan, Revision 1" (updated monitoring plan). As noted in the updated monitoring plan, two additional monitors have been added to the existing monitoring network for the Labadie Energy Center.

Ameren offers these comments on the updated monitoring plan. Ameren fully supports the inclusion of the two additional sulfur dioxide (SO2) monitoring locations to enhance the already robust monitoring network for the Labadie Energy Center. Ameren is committed to operate and maintain the enhanced monitoring networks consistent with requirements in federal regulation 40 CFR 58 as well as the state approved Quality Assurance Project Plans (QAPP) and the Department's Quality Management Plan (QMP). As indicated by the inclusion of the Labadie and Rush Island monitoring networks in the 2015 monitoring plan, the locations of the monitors are appropriate to determine compliance with the National Ambient Air Quality Standard (NAAQS) for SO2. The monitoring plan states on page 7 that: "For decades Missouri has overseen ambient air monitoring sites operated by industrial sources for NAAQS compliance." The Department has decided to classify both the Labadie and Rush Island SO2 monitors as industrial SO2 monitors and affirms on page 18 of the updated monitoring plan that "this is consistent with how we have handled industrial monitors used for NAAQS compliance in both our SO2 and lead ambient monitoring networks."

As you know the primary purpose of the Labadie monitoring network is to demonstrate compliance with the SO2 NAAQS. The monitoring network was in operation well in advance of the January 1, 2017 deadline under the final Data Requirements Rule (DRR). Both the existing and the enhanced monitoring networks are designed consistent with the requirement of the DRR.

Ameren would especially like to note that the one-hour SO2 ambient concentration data collected to date at each network are all below the SO2 NAAQS and have demonstrated a very high margin of compliance with the SO2 NAAQS.

Please contact me at your convenience if you have questions related to these comments or if you need any additional information.

Sincerely,

Steven C. Whitworth
Senior Director, Environmental Policy and Analysis