Draft Technical Support Document

Missouri
Area Designations for the 2010 SO_2 Primary National Ambient Air Quality Standard

Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA, or the Agency) must designate areas as either "unclassifiable," "attainment," or "nonattainment" for the 2010 one-hour sulfur dioxide (SO_2) primary national ambient air quality standard (NAAQS). The CAA defines a nonattainment area as one that does not meet the NAAQS or that contributes to a violation in a nearby area. An attainment area is defined as any area other than a nonattainment area that meets the NAAQS. Unclassifiable areas are defined as those that cannot be classified on the basis of available information as meeting or not meeting the NAAQS.

July 2, 2016, is the deadline for the EPA to designate certain areas established by the U.S. District Court for the Northern District of California. This deadline is the first of three deadlines established by the court for the EPA to complete area designations for the 2010 SO_2 NAAQS. This deadline applies to certain areas in Missouri because three emission sources meet the conditions of the court's order.

Missouri submitted updated recommendations on September 25, 2015. Table 1 below lists Missouri's recommendations and identifies the counties or portions of counties in Missouri that the EPA intends to designate by July 2, 2016, based on an assessment and characterization of air quality through ambient air quality data, air dispersion modeling, other evidence and supporting information, or a combination of the above.

Table 1: Missouri's Recommended and the EPA's Intended Designations

Area	Missouri's Recommended Area Definition	Missouri's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Franklin County, Missouri	No recommendation	Unclassifiable	The eastern and western boundaries are Boone and Boles Township boundaries in St. Charles and Franklin Counties respectively. The northern boundary is Missouri Route D and Highway 94 in St. Charles. The	Nonattainment

			southern boundary is Interstate 44 in Franklin.	
Jackson County, Missouri	Within Jackson County: The northern boundary is the county line separating Jackson County from Clay and Ray Counties. The Eastern boundary is the county line separating Jackson County from Lafayette County. The Southern boundary is Interstate 70 and 470. The Western boundary is Missouri Highway 291.	Attainment	Same as Missouri's Recommendation	Unclassifiable
Scott County, Missouri	Scott County	Attainment	Same as Missouri's Recommendation	Unclassifiable/ Attainment

Background

On June 3, 2010, the EPA revised the primary (health based) SO_2 NAAQS by establishing a new 1-hour standard at a level of 75 parts per billion (ppb) which is attained when the three-year average of the 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb. This NAAQS was published in the *Federal Register* on June 22, 2010 (75 FR 35520) and is codified at 40 CFR 50.17. The EPA determined this is the level necessary to protect public health with an adequate margin of safety, especially for children, the elderly and those with asthma. These groups are particularly susceptible to the health effects associated with breathing SO_2. The two prior primary standards of 140 ppb evaluated over 24 hours, and 30 ppb evaluated over an entire year, codified at 40 CFR 50.4, remain applicable.[1] However, the EPA is not currently designating areas on the basis of either of these two primary standards. Similarly, the secondary

[1] 40 CFR 50.4(e) provides that the two prior primary NAAQS will no longer apply to an area one year after its designation under the 2010 NAAQS, except that for areas designated nonattainment under the prior NAAQS as of August 22, 2010, and areas not meeting the requirements of a SIP Call under the prior NAAQS, the prior NAAQS will apply until that area submits and EPA approves a SIP providing for attainment of the 2010 NAAQS. No areas in Missouri were designated nonattainment for the prior NAAQS as of August 22, 2010.

standard for SO_2, set at 500 ppb evaluated over 3 hours has not been revised, and the EPA is also not currently designating areas on the basis of the secondary standard.

General Approach and Schedule

Section 107(d) of the Clean Air Act requires that not later than 1 year after promulgation of a new or revised NAAQS, state governors must submit their recommendations for designations and boundaries to EPA. Section 107(d) also requires the EPA to provide notification to states no less than 120 days prior to promulgating an initial area designation that is a modification of a state's recommendation. If a state does not submit designation recommendations, the EPA may promulgate the designations that it deems appropriate without prior notification to the state, although it is our intention to provide such notification when possible. If a state or tribe disagrees with the EPA's intended designations, they are given an opportunity within the 120 day period to demonstrate why any proposed modification is inappropriate. The EPA is required to complete designations within 2 years after promulgation of a new or revised NAAQS, unless we determine that sufficient information is not available, in which case the deadline is extended to 3 years. The 3-year deadline for the revised SO_2 NAAQS was June 2, 2013.

On August 5, 2013, the EPA published a final rule establishing air quality designations for 29 areas in the United States for the 2010 SO_2 NAAQS, based on recorded air quality monitoring data from 2009 - 2011 showing violations of the NAAQS (78 FR 47191). In that rulemaking, the EPA committed to address, in separate future actions, the designations for all other areas for which the Agency was not yet prepared to issue designations. The EPA designated portions of Jefferson County and Jackson County, Missouri, as nonattainment in this set of designations.

Following the initial August 5, 2013 designations, three lawsuits were filed against the EPA in different U.S. District Courts, alleging the Agency had failed to perform a nondiscretionary duty under the CAA by not designating all portions of the country by the June 2, 2013 deadline. In an effort intended to resolve the litigation in one of those cases, plaintiffs Sierra Club and the Natural Resources Defense Council and the EPA filed a proposed consent decree with the U.S. District Court for the Northern District of California. On March 2, 2015, the court entered the consent decree and issued an enforceable order for the EPA to complete the area designations according to the court-ordered schedule.

According to the court-ordered schedule, the EPA must complete the remaining designations by three specific deadlines. By no later than July 2, 2016 (16 months from the court's order), the EPA must designate two groups of areas: (1) areas that have newly monitored violations of the 2010 SO_2 NAAQS and (2) areas that contain any stationary sources that had not been announced as of March 2, 2015 for retirement and that according to the EPA's Air Markets Database emitted in 2012 either (i) more than 16,000 tons of SO_2 or (ii) more than 2,600 tons of SO_2 with an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). Specifically, a stationary source with a coal-fired unit that as of January 1, 2010 had a capacity of over 5 megawatts and otherwise meets the emissions criteria, is excluded from the July 2, 2016 deadline if it had announced through a company public announcement, public utilities commission filing, consent decree, public legal settlement, final

state or federal permit filing, or other similar means of communication, by March 2, 2015, that it will cease burning coal at that unit.

The last two deadlines for completing remaining designations are December 31, 2017, and December 31, 2020. The EPA has separately promulgated requirements for state and other air agencies to provide additional monitoring or modeling information on a timetable consistent with these designation deadlines. We expect this information to become available in time to help inform these subsequent designations. These requirements were promulgated on August 21, 2015 (80 FR 51052), in a rule known as the SO_2 Data Requirements Rule (DRR).

Updated designations guidance was issued by the EPA through a March 20, 2015 memorandum from Stephen D. Page, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Air Division Directors, U.S. EPA Regions 1-10. This memorandum supersedes earlier designation guidance for the 2010 SO_2 NAAQS, issued on March 24, 2011, and it identifies factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The guidance also contains the factors the EPA intends to evaluate in determining the boundaries for all remaining areas in the country, consistent with the court's order and schedule. These factors include: 1) Air quality characterization via ambient monitoring or dispersion modeling results; 2) Emissions-related data; 3) Meteorology; 4) Geography and topography; and 5) Jurisdictional boundaries. This guidance was supplemented by two technical assistance documents intended to assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling or ambient air quality monitoring for sources that emit SO_2. Notably, the EPA released its most recent versions of documents titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and "SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document" (Monitoring TAD) in December 2013.

Based on ambient air quality data collected between 2012 and 2014, no violations of the 2010 SO_2 NAAQS have been recorded in any undesignated part of the state.[2] However, there are three sources in the state meeting the emissions criteria of the consent decree for which the EPA must complete designations by July 2, 2016. In this draft technical support document, the EPA discusses its review and technical analysis of Missouri's updated recommendations for the areas that we must designate. The EPA also discusses any intended modifications from the state's recommendation based on all available data before us.

The following are definitions of important terms used in this document:

[2] For designations based on ambient air quality monitoring data that violates the 2010 SO_2 NAAQS, the consent decree directs the EPA to evaluate data collected between 2013 and 2015. Absent complete, quality assured and certified data for 2015, the analyses of applicable areas for the EPA's intended designations will be informed by data collected between 2012 and 2014. States with monitors that have recorded a violation of the 2010 SO_2 NAAQS during these years have the option of submitting complete, quality assured and certified data for calendar year 2015 by April 19, 2016 to the EPA for evaluation. If after our review, the ambient air quality data for the area indicates that no violation of the NAAQS occurred between 2013 and 2015, the consent decree does not obligate the EPA to complete the designation. Instead, we may designate the area and all other previously undesignated areas in the state on a schedule consistent with the prescribed timing of the court order, i.e., by December 31, 2017, or December 31, 2020.

1) 2010 SO_2 NAAQS – The primary NAAQS for SO_2 promulgated in 2010. This NAAQS is 75 ppb, based on the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. See 40 CFR 50.17.
2) Design Value – a statistic computed according to the data handling procedures of the NAAQS (in 40 CFR part 50 Appendix T) that, by comparison to the level of the NAAQS, indicates whether the area is violating the NAAQS.
3) Designated nonattainment area – an area which the EPA has determined has violated the 2010 SO_2 NAAQS or contributed to a violation in a nearby area. A nonattainment designation reflects considerations of state recommendations and all of the information discussed in this document. The EPA's decision is based on all available information including the most recent 3 years of air quality monitoring data, available modeling analysis, and any other relevant information.
4) Designated unclassifiable area – an area which the EPA cannot determine based on all available information whether or not it meets the 2010 SO_2 NAAQS.
5) Designated unclassifiable/attainment area – an area which the EPA has determined to have sufficient evidence to find either is attaining or is likely to be attaining the NAAQS. The EPA's decision is based on all available information including the most recent 3 years of air quality monitoring data, available modeling analysis, and any other relevant information.
6) Modeled violation – a violation based on air dispersion modeling.
7) Recommended attainment area – an area a state or tribe has recommended that the EPA designate as attainment.
8) Recommended nonattainment area – an area a state or tribe has recommended that the EPA designate as nonattainment.
9) Recommended unclassifiable area – an area a state or tribe has recommended that the EPA designate as unclassifiable.
10) Recommended unclassifiable/attainment area – an area a state or tribe has recommended that the EPA designate as unclassifiable/attainment.
11) Violating monitor – an ambient air monitor meeting all methods, quality assurance and siting criteria and requirements whose valid design value exceeds 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.

Technical Analysis for the Franklin County, Missouri Area

Proposed Designation Summary

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Ameren Labadie Energy Center as nonattainment for the 2010 SO_2 NAAQS. Specifically, the proposed boundaries are:

> The eastern and western boundaries are Boone and Boles Township boundaries in St. Charles and Franklin Counties respectively. The northern boundary is Missouri Route D and Highway 94 in St. Charles. The southern boundary is Interstate 44 in Franklin County.

This nonattainment designation is based on an analysis of modeling provided by the State of Missouri, an analysis of Sierra Club's modeling, and an analysis of Ameren's modeling using regulatory defaults.

Introduction

The Franklin County area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). Specifically, in 2012, the Ameren Labadie Energy Center emitted 42,236 tons of SO_2 and had a facility-wide emissions rate of 0.571 lbs SO_2/mmBTU. As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Pursuant to the March 2, 2015, court-ordered schedule, the EPA must designate the area surrounding the facility by July 2, 2016.

In its submission, Missouri recommended that the area surrounding the Ameren Labadie Energy Center (Labadie) be designated as unclassifiable based on varying modeling results from their own modeling, Ameren's modeling, and Sierra Club's modeling. MDNR's assessment included characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected along with an evaluation of historic and recent monitoring around the facility. This modeling assessment and characterization was performed using air dispersion modeling software, specifically AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA does not agree with the state's recommendation for the area and intends to designate the area as nonattainment.

The Ameren Labadie Energy Center is located in the eastern portion of Missouri in the northern portion of Franklin County. As seen in Figure 1 below, the facility is located approximately 50 km west of downtown St. Louis, Missouri. EPA intends to designate the area around Labadie Energy Center as nonattainment with the nonattainment area based on an initial proposed boundary from MDNR as seen in Figure 2. As seen in Figure 1, the Labadie Energy Center is located along the Missouri River, in the river bottom, with terrain features both to the north and

south of the river bottom. Labadie sits at an elevation of approximately 475 feet, with surrounding hills at around 800 feet elevation approximately 3-4 km away. Also included in Figure 2 are nearby emitters of SO_2, along with the state's recommended area boundary for the proposed nonattainment designation in MDNR's "Proposed Options for Area Boundary Recommendations" document, which was provided to EPA, that supported MDNR's August 27, 2015, public hearing, and the EPA's intended nonattainment designation for the area.

Figure 1: Labadie Energy Center location.

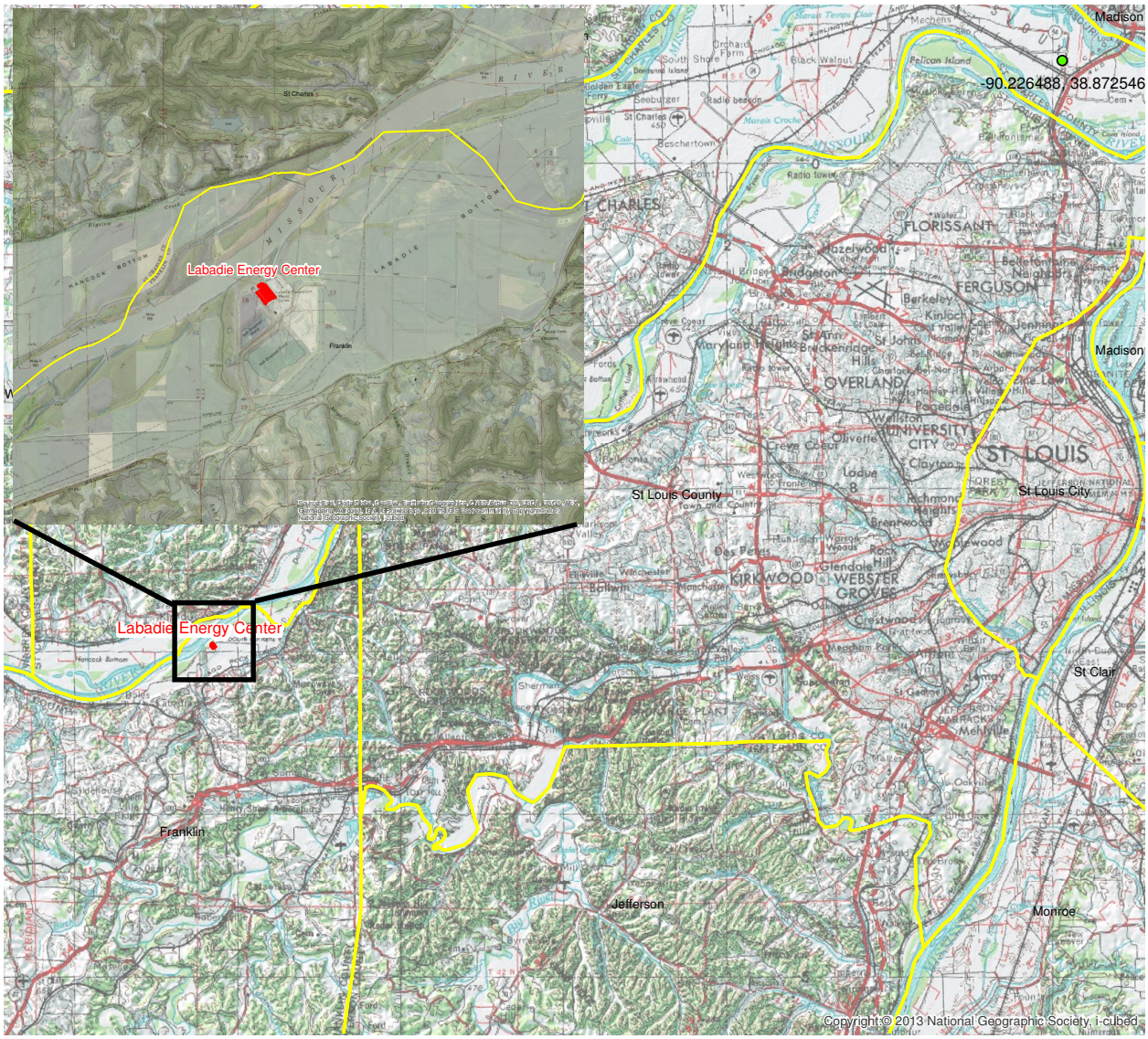
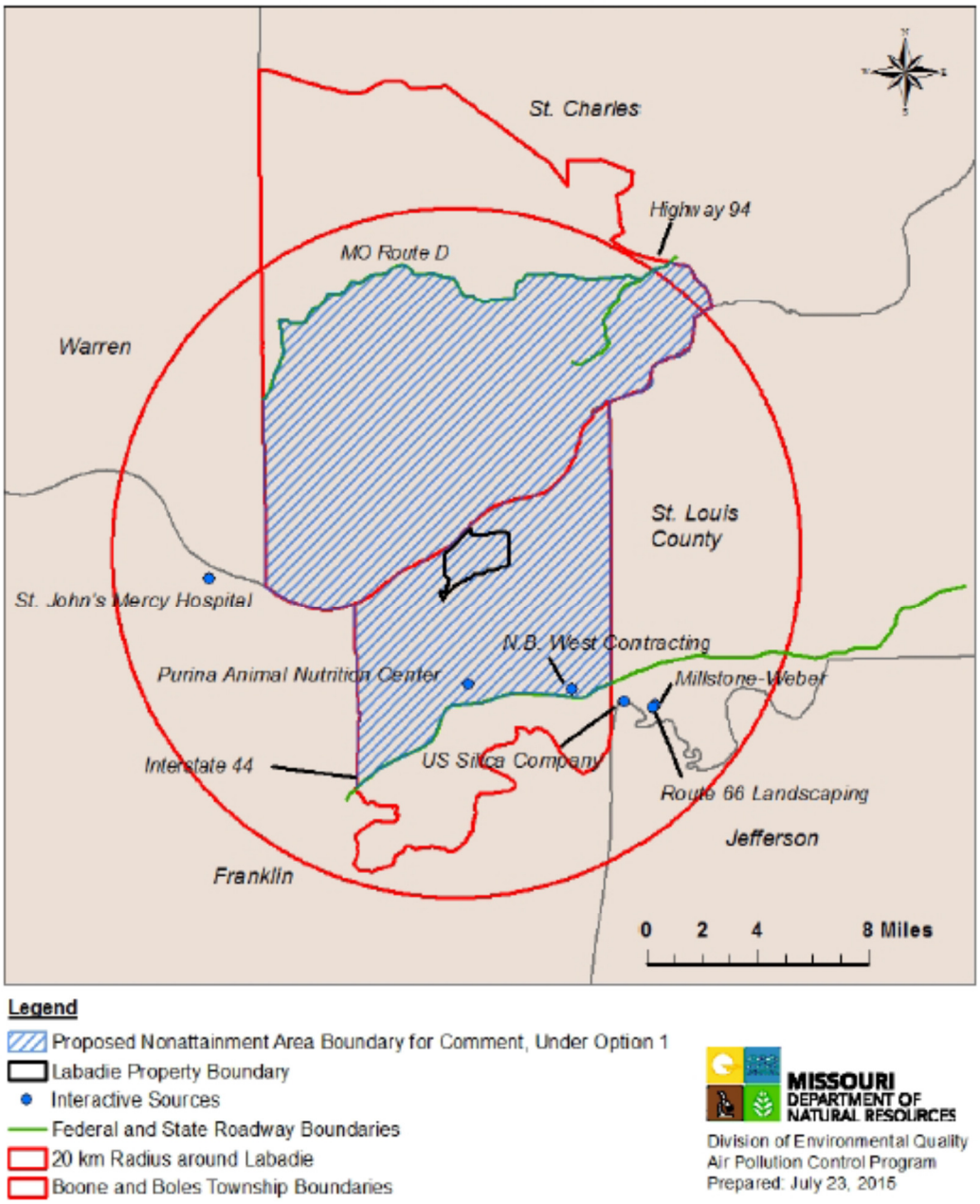


Figure 2: The EPA's intended designation for portion of Franklin County and St. Charles County, Missouri



The discussion and analysis that follows below references the state's use of the Modeling TAD, the EPA's assessment of the state's modeling in accordance with the Modeling TAD, and the factors for evaluation contained in the EPA's March 20, 2015 guidance, as appropriate.

Detailed Assessment

Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. In some instances the recommended model may be a model other than AERMOD, such as the BLP model for buoyant line sources. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRIME: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The state used AERMOD version 14134, the most recent AERMOD version at the time their analysis was performed, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. This determination was made by analyzing the land use surrounding the area around Labadie which is predominately rural.

Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Labadie Energy Center is to determine the extent of the area of analysis, i.e., the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The grid receptor spacing for the area of analysis chosen by the state is as follows:

- Origin to 1 km, 100 m spacing
- 1 km to 3.5 km, 250 m spacing
- 3.5 km to 10 km, 500 m spacing
- 10 km to 20 km, 1000 m spacing

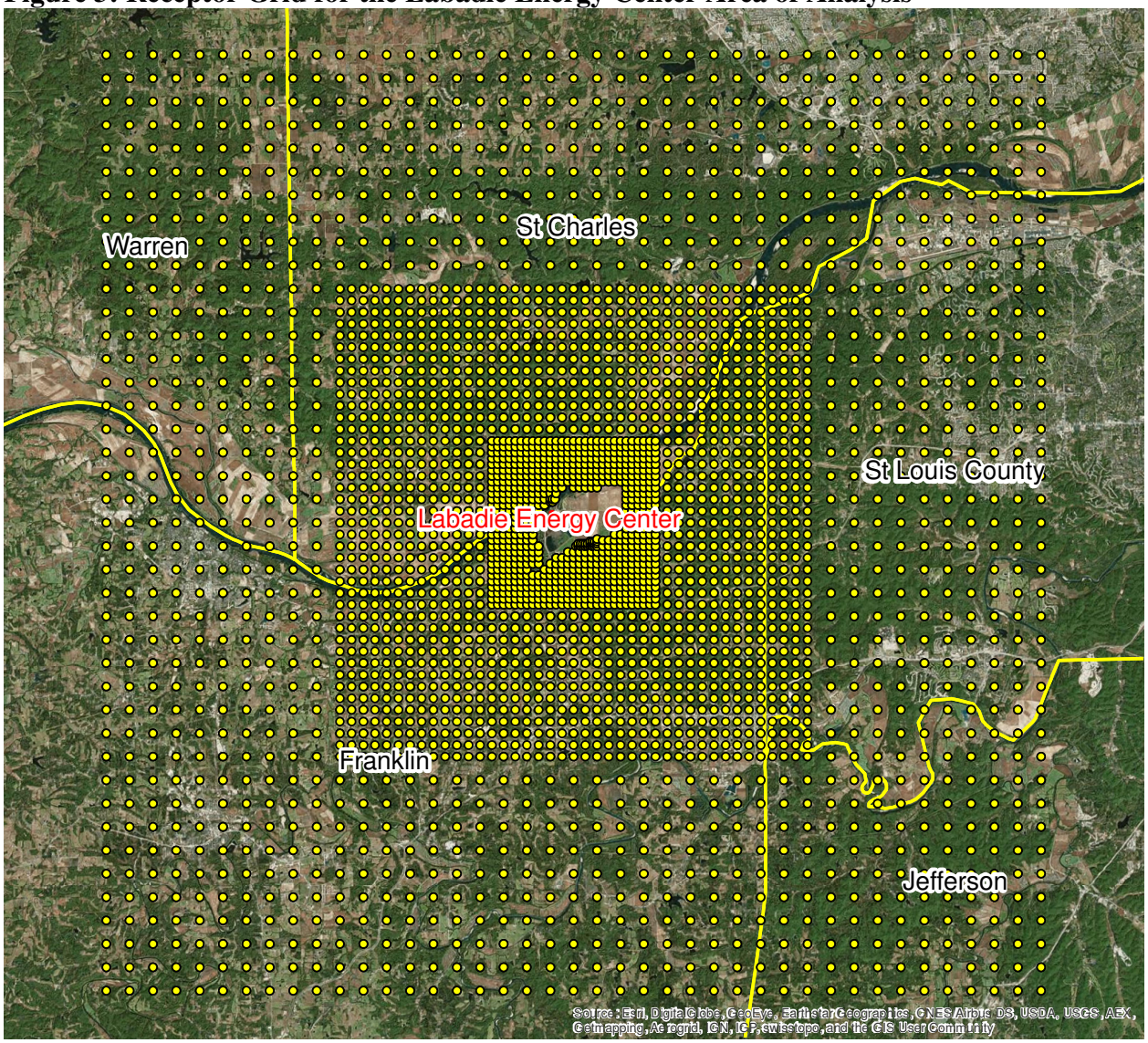
Where the origin was defined at the center of the facility property.

The receptor network contained 5,628 receptors and covered the northern portion of Franklin County in Missouri, the eastern portion of Warren County in Missouri, the western portion of St. Louis County in Missouri, and the southern portion of St. Charles County in Missouri.

Figure 3, which was included in the state's recommendation, shows the state's chosen area of analysis surrounding the Labadie Energy Center, as well as a receptor grid for the area of analysis. Consistent with the Modeling TAD, receptors for the purposes of this designation effort were placed only in areas where it would also be feasible to place a monitor and record ambient impacts. The impacts of the area's geography and topography will be discussed later within this document.

For the Labadie area, the state analyzed six other SO_2 sources in the area and included two of the six other SO_2 sources that are within 20 kilometers (km) of Labadie Energy Center in any direction. These six sources represent all the permitted SO_2 sources within the 20 km radius. The state offered no further analysis for sources beyond the 20 km radius. EPA does note that the Ameren Missouri Meramec Energy Center is the nearest DRR source and resides approximately 47 km to the southeast of the Labadie Energy Center. No other DRR sources are within 50 km of Labadie. The state determined that 20 km was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. In addition to the Labadie Energy Center, the other emitters of SO_2 included in the modeling analysis are: N.B West Contracting Company Inc. Pacific Plant and Purina Animal Nutrition Center. The four permitted sources omitted in the modeling within the 20 km radius emitted less than 0.2 tons/yr respectively and are expected to be represented in the background value.

Figure 3: Receptor Grid for the Labadie Energy Center Area of Analysis



Modeling Parameter: Source Characterization

The state characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions for Labadie. The state also adequately characterized Labadie's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purposes of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD does provide for the

flexibility of using allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information when it is available and that these data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA believes that detailed throughput, operating schedules, and emissions information from the impacted source(s) should be used.

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. Specifically, a facility may have recently adopted a new federally enforceable emissions limit, been subject to a federally enforceable consent decree, or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS. These new limits or conditions may be used in the application of AERMOD. In these cases, the Modeling TAD notes that the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations should contain the necessary emissions information for designations-related modeling. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state included Labadie Energy Center and two other emitters of SO_2 within 20 km in the area of analysis. This distance and these facilities were selected because the state believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the sources which might contribute to those concentrations. No other sources beyond 20 km were determined by the state to have the potential to cause significant concentration gradient impacts within the area of analysis. EPA does note the Ameren Missouri Meramec Energy Center, a DRR source, is 47 km to the southeast of Labadie Energy Center. The facilities in the area of analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized in Table 2 below.

Table 2: Actual SO_2 Emissions Between 2012 and 2014 from Facilities in the Labadie, Missouri Area of Analysis

Facility Name	SO_2 Emissions (tons per year)		
	2012	2013	2014
Ameren Labadie Energy Center	42,236	38,384	33,091
Purina Animal Nutrition Center	1.43	1.43	1.43
N.B. West Contracting Co Inc.	3.58	3.58	5.43
Total Emissions	42,241	38,389	33,098

For the Ameren Labadie Energy Center in the area of analysis, the state used actual emissions from the most recent 3-year data set, i.e., 2012 – 2014. These emissions data were obtained from CEMS for Labadie. The other two sources did not have CEMS and those facilities' hourly emissions data were derived from operational parameters in the MDNR emission inventory system. It is noted that these sources emit at much lower rates than Labadie Energy center and have minor impacts in the modeling performed.

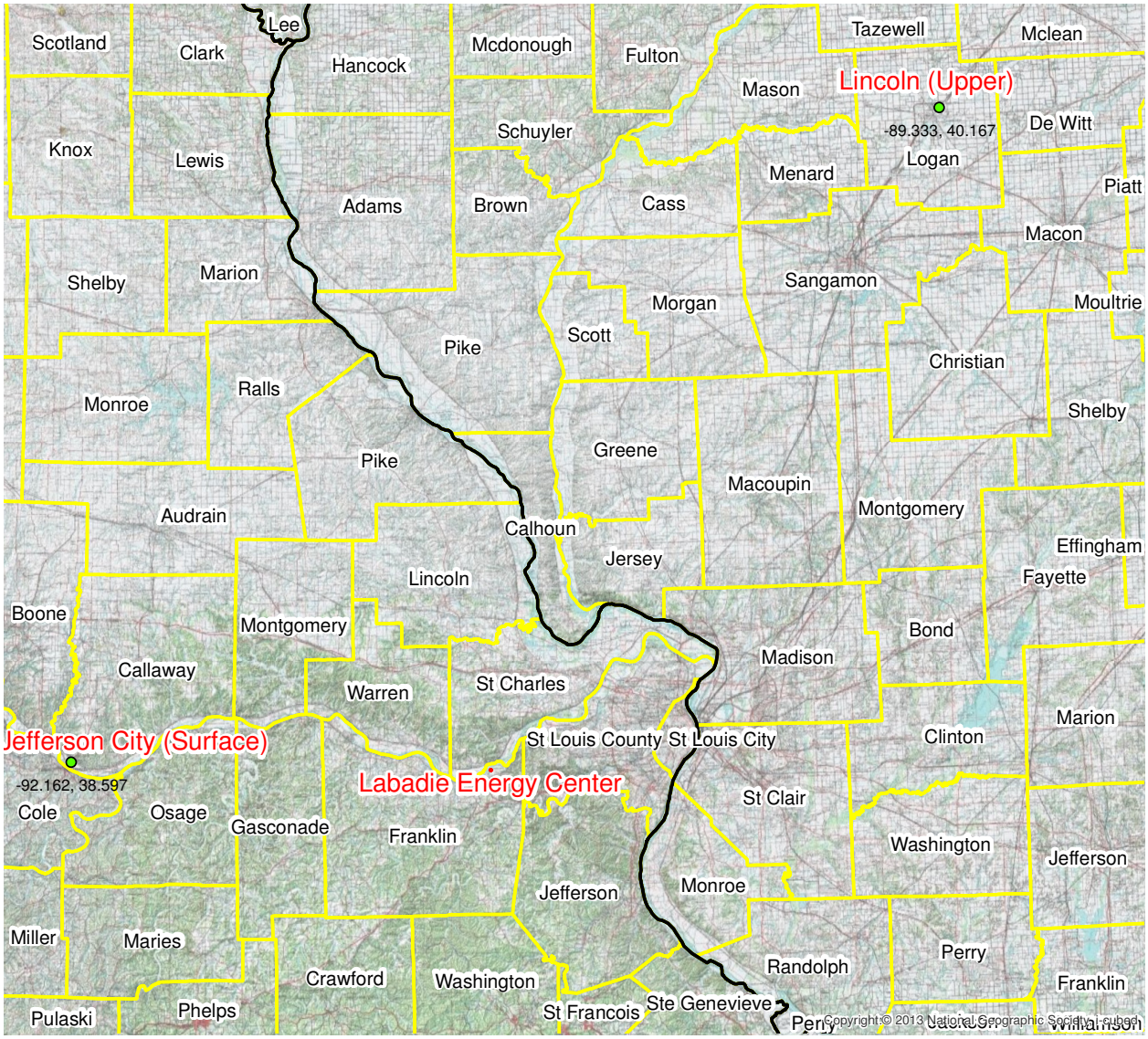
Modeling Parameter: Meteorology and Surface Characteristics

The most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. As noted in the Modeling TAD, the selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data are based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the Labadie area of analysis, surface meteorology from the Jefferson City NWS station in Callaway, Missouri, 117 km to the west, and coincident upper air observations from the NWS station in Lincoln, Illinois, 220 km to the northeast, were selected by MDNR as the best representation of meteorological conditions within the area of analysis.

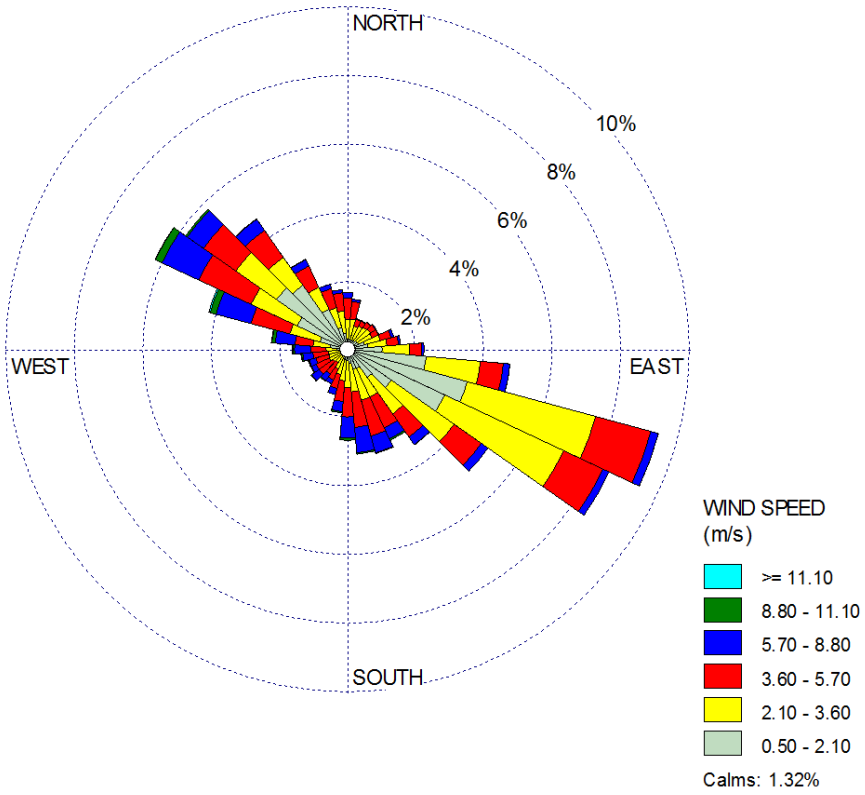
The state used AERSURFACE version 13016 using data from the NWS station in Jefferson City, Missouri located at latitude 38.597N and longitude 92.162W to estimate the surface characteristics of the area of analysis. For surface roughness (sometimes referred to as "Zo") the state estimated values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, or average conditions for each respective year. The state also used a 10 km by 10 km area centered on the site and estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance). In Figure 4 below, the location of the Jefferson City, Missouri, NWS surface station is shown relative to the Labadie Energy Center area of analysis along with the Lincoln, Illinois, NWS upper air station.

Figure 4: Labadie Area of Analysis and the Jefferson City, Missouri and Lincoln, Illinois, NWS sites



As part of its recommendation, the state provided the 3-year surface wind rose for Jefferson City. In Figure 5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Surface winds generally follow the river valley in Jefferson City and are predominately from the southeast and northwest.

Figure 5: Jefferson City Cumulative Annual Wind Rose for Years 2012 – 2014



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in their protocol to process the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by

AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with a March 8, 2013, EPA memo titled, "Use of ASOS meteorological data in AERMOD dispersion Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as gently rolling with a 300-400 feet elevation difference between the Missouri river bottom and hills beyond the river bottom. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Labadie area of analysis, the state chose a constant design value from a nearby monitor in East St. Louis that excluded wind direction sectors impacted by sources explicitly included in the modeling analysis, which is consistent with the "first tier" approach. The background concentration for this area of analysis was determined by the state to be 23.6 micrograms per cubic meter ($\mu g/m^3$), or 9 ppb,[3] and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

The AERMOD modeling parameters for the Labadie area of analysis are summarized below in Table 3.

Table 3: AERMOD Modeling Parameters for the Labadie Area of Analysis

Labadie Area of Analysis	
AERMOD Version	14134
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	9
Modeled Structures	13
Modeled Fencelines	1
Total receptors	5628

[3] The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.62 $\mu g/m^3$.

Emissions Type	Actual CEMS for Labadie, hourly estimates based on actual annual emissions for two other sources
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Jefferson City, Missouri
Upper Air Meteorology Station	Lincoln, Illinois
Methodology for Calculating Background SO_2 Concentration	Design Value excluding specific sectors
Calculated Background SO_2 Concentration	9 ppb or 23.6 $\mu g/m^3$

The results presented below in Table 4 show the magnitude and geographic location of the highest predicted modeled concentration based on actual CEMS emissions and hourly estimates based on actual annual emissions.

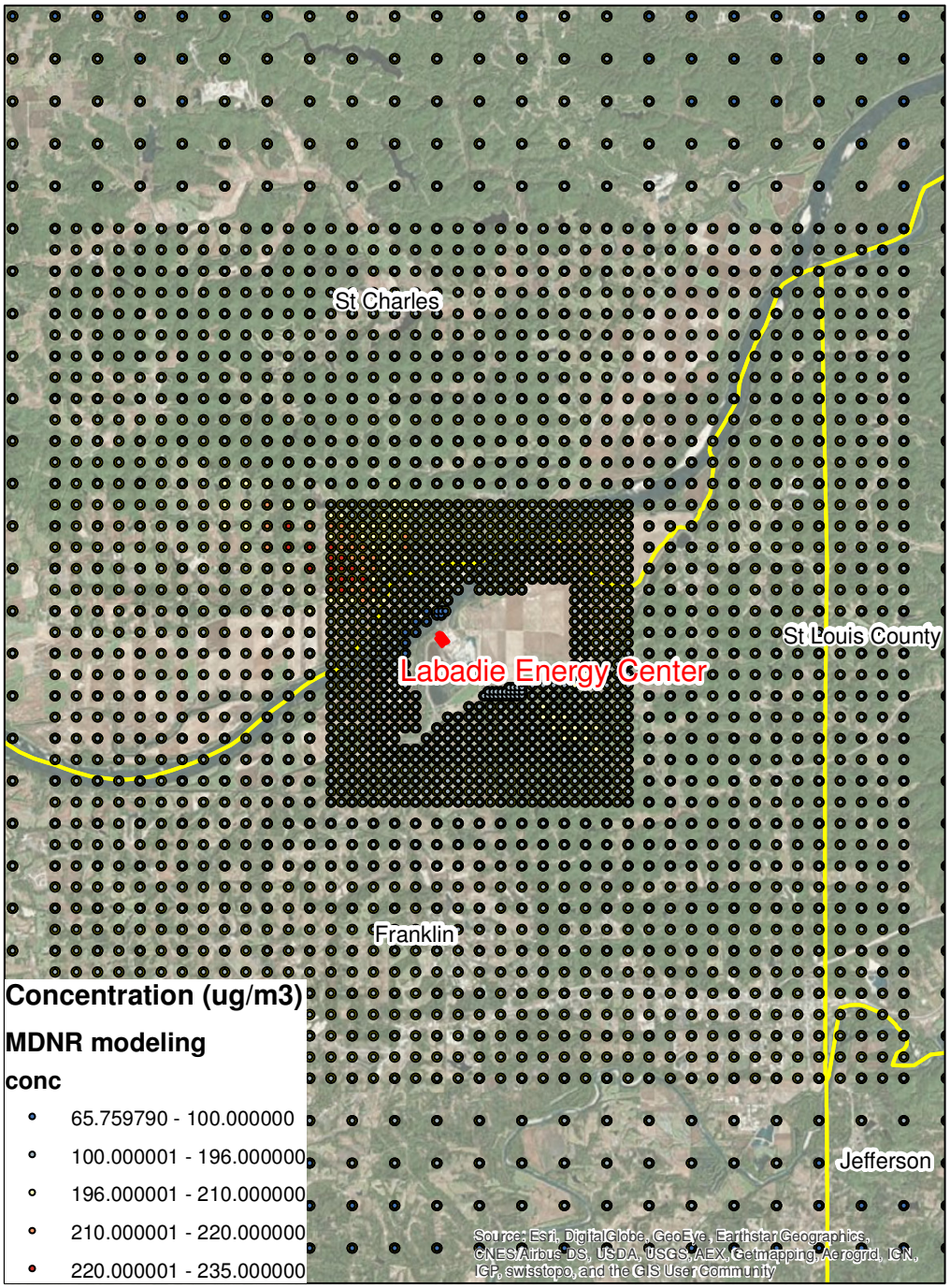
Table 4: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Labadie Area of Analysis Based on Actual Emissions

		Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	686096.4	4272076	234.5	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

The modeling conducted and provided by the state indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 234.5 $\mu g/m^3$, or 89 ppb. This modeled concentration included the background concentration of SO_2 and is based on actual emissions from the facilities. Figure 6 below was included as part of the state's recommendation and indicates that the predicted value occurred northwest of the facility. The state's receptor grid is also shown in the figure.

Figure 6: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the Labadie Area of Analysis Based on Actual Emissions



Jurisdictional Boundaries:

Once the geographic area of analysis associated with the Labadie Energy Center, other nearby sources, and background concentration is determined, existing jurisdictional boundaries are considered for the purpose of informing our intended nonattainment area, specifically with respect to clearly defined legal boundaries.

Based on the analysis in the initial MDNR proposed nonattainment area boundary, EPA proposes to determine that the area defined as follows represents an area that contains the modeled nonattainment receptors using actual emissions and the source causing these modeled violations, namely the Labadie Energy Center:

> The eastern and western boundaries are Boone and Boles Township boundaries in St. Charles and Franklin Counties respectively. The northern boundary is Missouri Route D and Highway 94 in St. Charles. The southern boundary is Interstate 44 in Franklin.

The EPA believes that our intended nonattainment area, consisting of portions of Franklin and St. Charles counties in Missouri, is comprised of clearly defined legal boundaries and we find these boundaries to be a suitably clear basis for defining our intended nonattainment area. The three sources included in the modeling analysis are also contained within the proposed EPA boundary. The four permitted sources omitted in the modeling within the 20 km radius emitted less than 0.2 tons/yr respectively and are expected to be represented in the background value and are not expected to significantly contribute to modeled violations.

Other Relevant Information

The EPA has received six additional sets of modeling files for the Labadie Energy Center. Two were from the Sierra Club. One Sierra Club modeling analysis used allowable emission rates and one used actual emissions. EPA also received four additional modeling runs from Ameren that were conducted by Ameren's consultant, all using actual emissions but with varying meteorological and modeling options. These additional modeling runs are briefly described below with additional discussion of EPA's interpretation of these runs and how this information factored into our designation decision.

The Sierra Club submitted a modeling demonstration evaluating compliance with the 1-hour SO_2 NAAQS for the Labadie Energy Center as part of a September 17, 2015, submittal to the EPA. Several documents were enclosed with the Sierra Club modeling files. One of those documents was an evaluation document describing the modeling Sierra Club provided, prepared by Wingra Engineering. Sierra Club also provided several Washington University School of Law comment letters addressed to both MDNR and EPA, including a September 18, 2015, supplemental letter addressed to EPA Region 7, that addressed Ameren's modeling presented during the MDNR public hearing. The Sierra Club provided the modeling files for this modeling analysis of Labadie Energy Center and also provided comments describing their evaluation of Ameren's modeling.

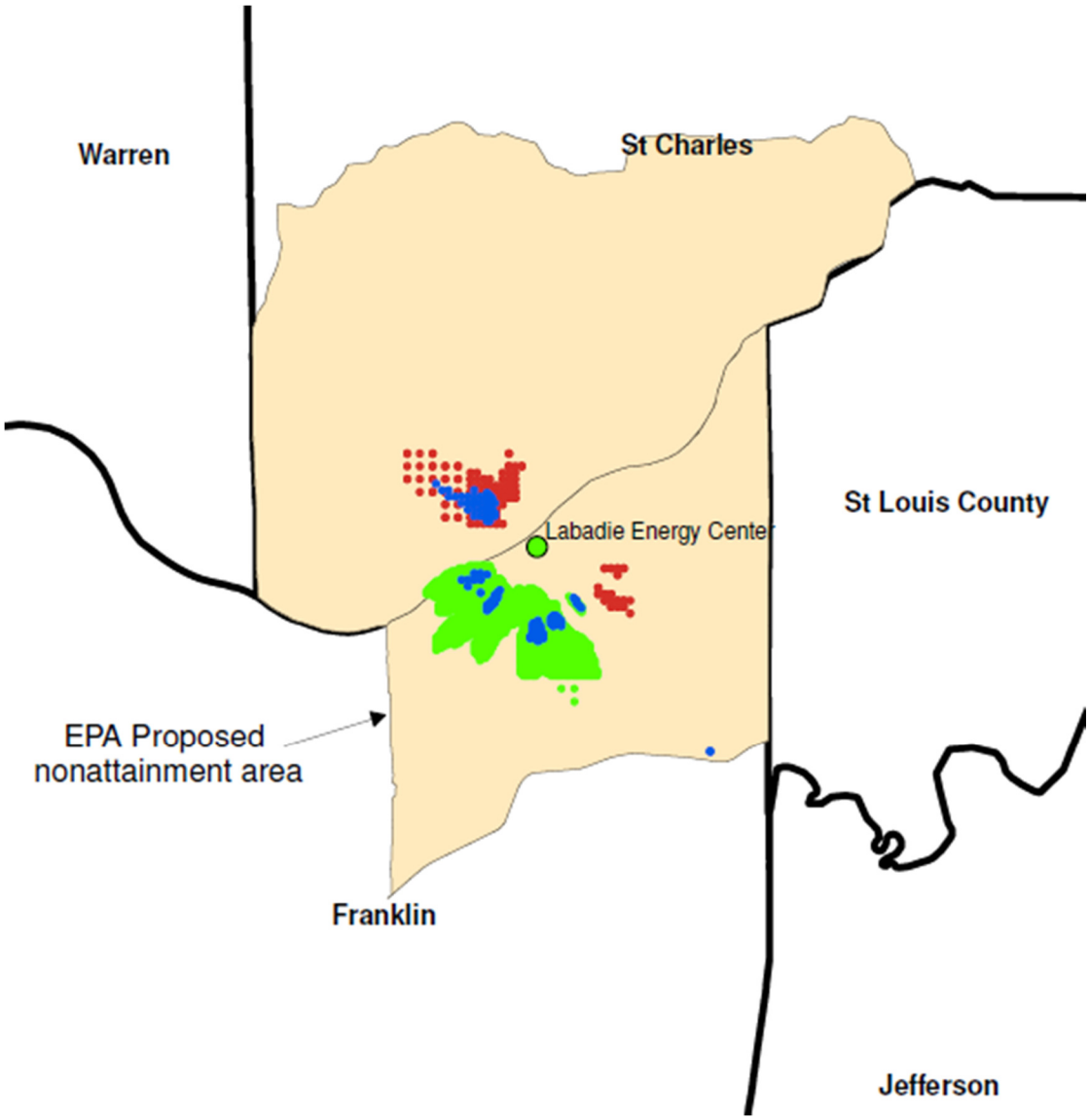
EPA reviewed but is not considering the modeling submitted by Sierra Club that relied upon allowable emissions, as the EPA modeling TAD allows designations to be made using actual

emissions, and a full and accurate assessment of the area's status can be made based on the actual emissions-based modeling in this case. Therefore, no further discussion of the Sierra Club's allowable emissions modeling will be provided.

EPA reviewed the Sierra Club modeling analysis that used actual emissions and we find that this modeling analysis meets the EPA modeling TAD guidance and Appendix W. This Sierra Club modeling analysis used the current regulatory models at the time of their submittal and was similar to what MDNR provided to EPA as described above. Notable differences between the Sierra Club modeling and MDNR modeling include a different surface meteorology site, no building downwash, and flagpole receptors at 1.5 meter height. The Sierra Club indicated they believe the Spirit of St. Louis NWS surface site is appropriate because of its proximity to Labadie and the surface characteristics at the Spirit of St. Louis NWS surface site are similar to the Labadie site.

The Sierra Club modeling, using actual CEMS emissions, indicates magnitudes of impact that are comparable to the MDNR modeling. The Sierra Club's modeling indicates a 235.7 $\mu g/m^3$ 99^{th} percentile impact, which included a 23.5 $\mu g/m^3$ background value. This impact is almost identical to the MDNR modeling impact of 234.5 $\mu g/m^3$. Because the Sierra Club used a different meteorological dataset, the location of peak impacts differed from that of the MDNR modeling. The Sierra Club's modeled maximum impacts were to the south and west of the Labadie Energy Center, while the MDNR's modeled maximum impacts were to the northwest of the plant. Overall, EPA believes the Sierra Club modeling supports and complements the MDNR modeling analysis, with the overall conclusion supporting a nonattainment recommendation. As seen in Figure 7 all modeled violating receptors in both the MDNR and Sierra Club modeling using actual emissions are contained within the proposed nonattainment boundary. However, EPA does not find compelling evidence that the Sierra Club modeling is more representative than the MDNR modeling or vice versa.

Figure 7: Proposed nonattainment area (shaded) and modeled violating receptors (MDNR – red receptors, Sierra Club – green receptors, Ameren using two meteorological datasets – blue receptors)



MDNR also included modeling that Ameren provided as part of the MDNR public comment process in Appendix G of Missouri's designation recommendation submittal. The Ameren modeling, performed by AECOM, uses the latest version 15181 of AERMOD and includes four model runs, two runs using beta options currently not approved for use in regulatory decision making without prior approval and justification and two runs using default regulatory options. For each pair of runs, two surface meteorological datasets were used, one at Jefferson City NWS site and one at the Spirit of St. Louis NWS site. Notable differences between this Ameren

modeling and MDNR modeling are Ameren's modeling uses a newer version of AERMOD, incorporates hourly varying stack temperatures and flow rates, an hourly varying background value from Nillwood, Illinois, and the merging of adjacent Labadie Stacks 3 and 4 in the hourly varying emission input file.

EPA received a request from MDNR to consider the use of beta options to model the emissions from the Labadie Energy Center on December 9, 2015. The EPA notes that the usage of beta options, such as ADJ_U* and LOWWIND3, in AERMOD for any regulatory application requires adherence with Appendix W, Section 3.2.2. This is further explained in the EPA's December 10, 2015 Memorandum titled, "Clarification on the Approval Process for Regulatory Application of the AERMOD Modeling System Beta Options." Specific to LOWWIND3, this beta option currently has only one reasonable pathway for appropriate EPA Regional Office approval with EPA's Model Clearinghouse concurrence. This pathway, specifically contained as condition number 2 in Appendix W, Section 3.2.2(b), is one in which an application specific statistical performance evaluation is conducted. In an application specific statistical performance evaluation, air quality modeling for the particular type of facility in question would have to be evaluated against representative air quality monitors that are appropriately sited for the given application. However, LOWWIND3 at this time has not yet fully received scientific peer-review, i.e., criteria "i" for condition number 3 of Appendix W, Section 3.2.2(e) and requires more rigor in its approval as an alternative model. Through a proposed rulemaking to revise Appendix W and promulgate new regulatory options in AERMOD, we have received a number of public comments specific to the LOWWIND3 beta options and are working to complete our review of those comments and then to finalize the appropriate LOWWIND3 option with the necessary peer-reviewed journal articles as part of final Appendix W rulemaking package. Due to the potential changes that may occur prior to finalization of the Appendix W rulemaking package in conjunction with the fact that, at this time, LOWWIND3 has not been demonstrated to have statistically improved performance over that of the regulatory default version of AERMOD for the particular type of facility or has not yet fully received scientific peer-review, the EPA does not believe that the air quality modeling results obtained from the use of this beta option can be used at this time as a reliable indicator of attainment status in the area around the Labadie Energy Center.

The Sierra Club provided comments on Ameren's modeling approaches to EPA on September 18, 2015, and noted as part of their comments that Ameren had run AERMOD with their inputs in a regulatory default mode and the result using Jefferson City NWS data was 282 $\mu g/m^3$. This Ameren modeling using regulatory defaults was provided to EPA and we note the 282 $\mu g/m^3$ was a 1st high value, while the 99th percentile concentration was 226.9 $\mu g/m^3$, which is similar in magnitude to the MDNR and the Sierra Club modeling and still above the NAAQS. EPA believes the Ameren default regulatory option modeling also provided weight of evidence supporting a nonattainment designation. However, EPA is not relying on this Ameren modeling for establishing nonattainment boundaries or designations as we believe further justification would be needed to support the background value used and the merging of adjacent stacks.

MDNR also included as part of their designation recommendation submittal monitoring data in the vicinity of Labadie. Historic monitoring occurred at two locations including the Augusta site

from 1987-1994 and the Augusta Quarry site from 1994-1998. In addition, two new monitors were installed at different locations than the historic monitors (Northwest and Valley) and began collecting data on April 22, 2015. The data collected from the new monitors are for a short period and the resulting monitoring data have not yet been quality assured by Ameren, the entity responsible for operating these special purpose monitors. Because the monitoring data from the monitors are not yet quality assured and are for a limited period, the EPA performed no further analysis on these monitoring data for designation purposes. EPA Region 7 did perform an analysis of the historic monitoring data by looking at hourly emission rates during periods of elevated hourly concentrations to better understand the historic conditions that led to these elevated hourly SO_2 readings. Based on this analysis, the EPA determined that, although annual emissions decreased around the 1997 timeframe, the ambient SO_2 concentrations were impacted by several factors independent of annual emissions, including hourly emission rates and meteorological conditions. EPA further determined that the conditions that led to the historic elevated concentrations still exist. For example, a maximum hourly SO_2 reading of 80 ppb was measured on March 16, 1997, when the average Ameren Labadie emission rate was 6,813 lb SO_2 per hour. An emission rate of 6,813 lb SO_2 per hour is well within Ameren Labadie's current hourly emission rates and would equate to less than 30,000 tons of SO_2 per year. Thus, based on our analysis, EPA determined that it is possible that exceedences and even violations could occur despite the reductions in annual SO_2 emission that have occurred.

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Ameren Labadie Energy Center as nonattainment for the 2010 SO_2 NAAQS. Specifically, the proposed boundaries are:

> The eastern and western boundaries are Boone and Boles Township boundaries in St. Charles and Franklin Counties respectively. The northern boundary is Missouri Route D and Highway 94 in St. Charles. The southern boundary is Interstate 44 in Franklin County.

This nonattainment designation is based on an analysis of modeling provided by the state of Missouri, and is supported by further analysis of Sierra Club's modeling and an analysis of Ameren modeling using regulatory defaults which also indicate nonattainment. Nonattainment boundaries are supported by the modeling MDNR has performed and this modeling indicates all modeled violating receptors are included within the proposed EPA boundary. The three sources included in the modeling analysis are also contained within the proposed EPA boundary. The four permitted sources omitted in the modeling within the 20 km radius emitted less than 0.2 tons/yr respectively and are expected to be represented in the background value and are not expected to significantly contribute to modeled violations. Although MDNR has not relied upon their modeling in their final recommendation to EPA, other than to state they believe there is uncertainty with their modeling conclusions, we find that the MDNR modeling followed the recommended EPA TAD modeling guidance for the designation process. We also considered modeling submitted to EPA by the Sierra Club and Ameren which also indicated modeled violations of the NAAQS at magnitudes similar to the MDNR modeling. We did not rely upon

these modeling runs to establish a boundary, although we did verify modeled violating receptors in the Sierra Club modeling are contained within the proposed boundary. EPA will consider any additional information submitted by MDNR in making a final designation.

At this time, our intended designations for the state only apply to this area and the other areas presented in this technical support document. Consistent with the conditions in the March 2, 2015, consent decree, the EPA will evaluate and designate all remaining undesignated areas in Missouri by either December 31, 2017, or December 31, 2020.

Technical Analysis for the Jackson County, Missouri (Sibley) Area

Proposed Designation Summary

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Sibley Generating Station as unclassifiable for the 2010 SO_2 NAAQS. Specifically, the area is the portion of Jackson County, Missouri, that is bounded by the Jackson County line on the north from Clay and Ray Counties, the county line separating Jackson County from Lafayette County on the east, Interstate 70 and 470 on the south, and Missouri Highway 291 on the west.

This designation is based on an evaluation of the MDNR modeling submitted in support of an attainment recommendation with additional consideration of Sierra Club's modeling that also supported the MDNR conclusion around the Sibley Generating Station but not elsewhere.

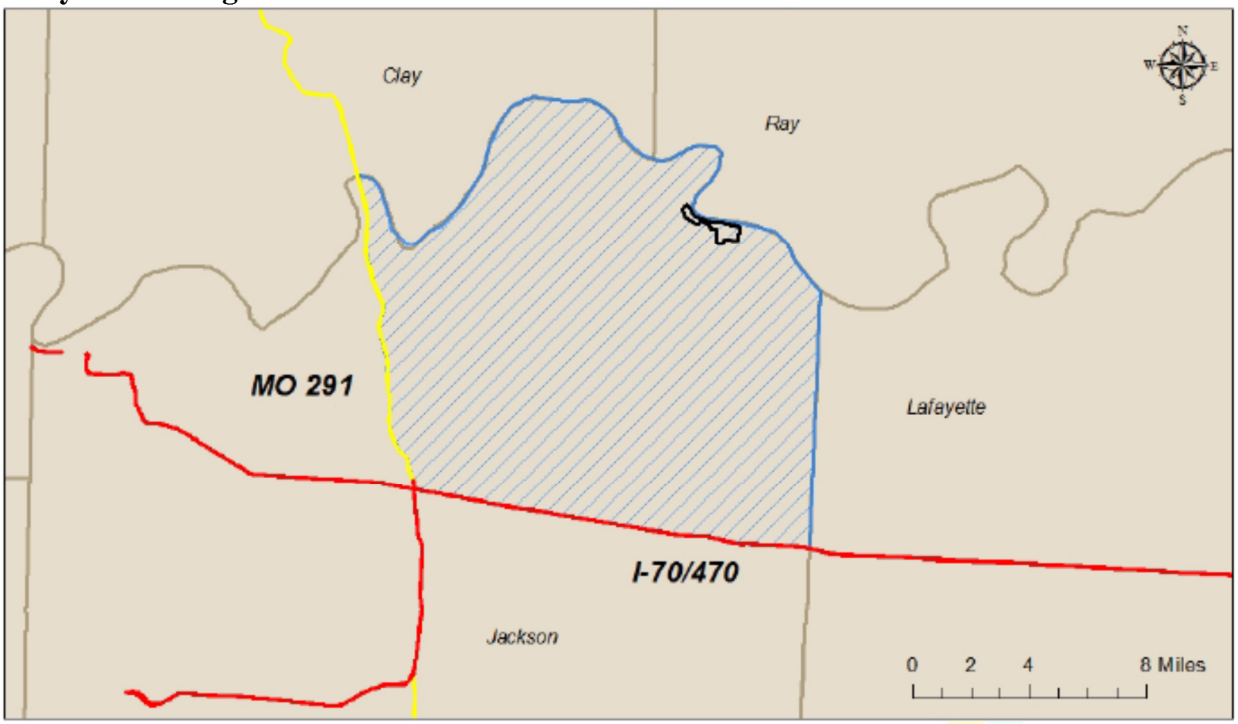
Introduction

Jackson County, Missouri, contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). Specifically, in 2012, the Sibley Generating Station emitted 6,095 tons of SO_2 and had a facility wide emissions rate of 0.550 lbs SO_2/mmBTU. As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Pursuant to the March 2, 2015 court-ordered schedule, the EPA must designate the area surrounding the facility by July 2, 2016.

In its submission, Missouri recommended that the area surrounding the Sibley Generating Station, specifically a portion of Jackson County, be designated as attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. This assessment and characterization was performed using air dispersion modeling software, specifically AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA does not agree with the state's recommendation for the area and intends to designate the area as unclassifiable.

The Sibley Generating Station is located in western Missouri in the eastern portion of Jackson County, approximately 36 km east of downtown Kansas City, Missouri, right along the Missouri River with Ray County, Missouri, directly to the northeast. Figure 8 depicts the state's recommended area for the attainment designation around Sibley and EPA's intended unclassifiable designation for the area.

Figure 8: The EPA's intended designation for Jackson County, Missouri, area around Sibley Generating Station



The discussion and analysis that follows below references the state's use of the Modeling TAD, the EPA's assessment of the state's modeling in accordance with the Modeling TAD, and the factors for evaluation contained in the EPA's March 20, 2015 guidance, as appropriate.

Detailed Assessment

Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. In some instances the recommended model may be a model other than AERMOD, such as the BLP model for buoyant line sources. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRIME: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The state used AERMOD version 14134, the most recent AERMOD version at the time their analysis was performed and the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. This determination was made by analyzing the land use in the area around the Sibley Generating Station which is predominately rural.

Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Sibley Generating Station is to determine the extent of the area of analysis, i.e., the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The grid receptor spacing for the area of analysis chosen by the state is as follows:

- Origin to 1 km, 100 m spacing
- 1 km to 3.5 km, 250 m spacing
- 3.5 km to 10 km, 500 m spacing
- 10 km to 20 km, 1000 m spacing

Where the origin was defined at the center of the facility property.

The receptor network contained 4,022 receptors and covered the northeastern portion of Jackson County in Missouri, the southeastern portion of Platt County in Missouri, the southwestern portion of Ray County in Missouri, and the northwestern portion of Lafayette County in Missouri.

Figures 9 and 10 show the state's chosen area of analysis surrounding the Sibley Generating Station, as well as the receptor grid for the area of analysis. While the Modeling TAD allows receptors for the purposes of this designation effort to be placed only in areas where it would also be feasible to place a monitor and record ambient impacts, the state chose to leave all receptors in the analysis, including receptors located in areas where monitors would not normally be placed. The impacts of the area's geography and topography will be discussed later within this document.

For the Sibley area, the state has included 11 other emitters of SO_2 that are permitted to emit SO_2 within 20 kilometers (km) of the Sibley Generating Station and an additional four other SO_2

emitters over 10 tons within 50 km in any direction. No other SO_2 sources with emissions over 10 tons per year were identified by the state within 50 km. Although the state's analysis included sources of emissions out to 50 km, the modeling receptor grid extended out to 20 km. The state determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. In addition to the Sibley Generating Station, the other emitters of SO_2 included in the area of analysis are: Blue Valley Station, Missouri City Station, Little Blue Valley Sewer District, Missouri Rock, Alliant Tech Systems Inc., St. Mary's Hospital of Blue Springs, Audubon Materials Sugar Creek Plant, Kansas City Aggregate LLC Independence Quarry, Courtney Ridge Landfill, the two APAC-Kansas Sugar Creek plants, KCPL Hawthorn, Veolia Energy, BPU Quindaro, and BPU Nearman.

Figure 9: Sibley 20 km Area of Analysis

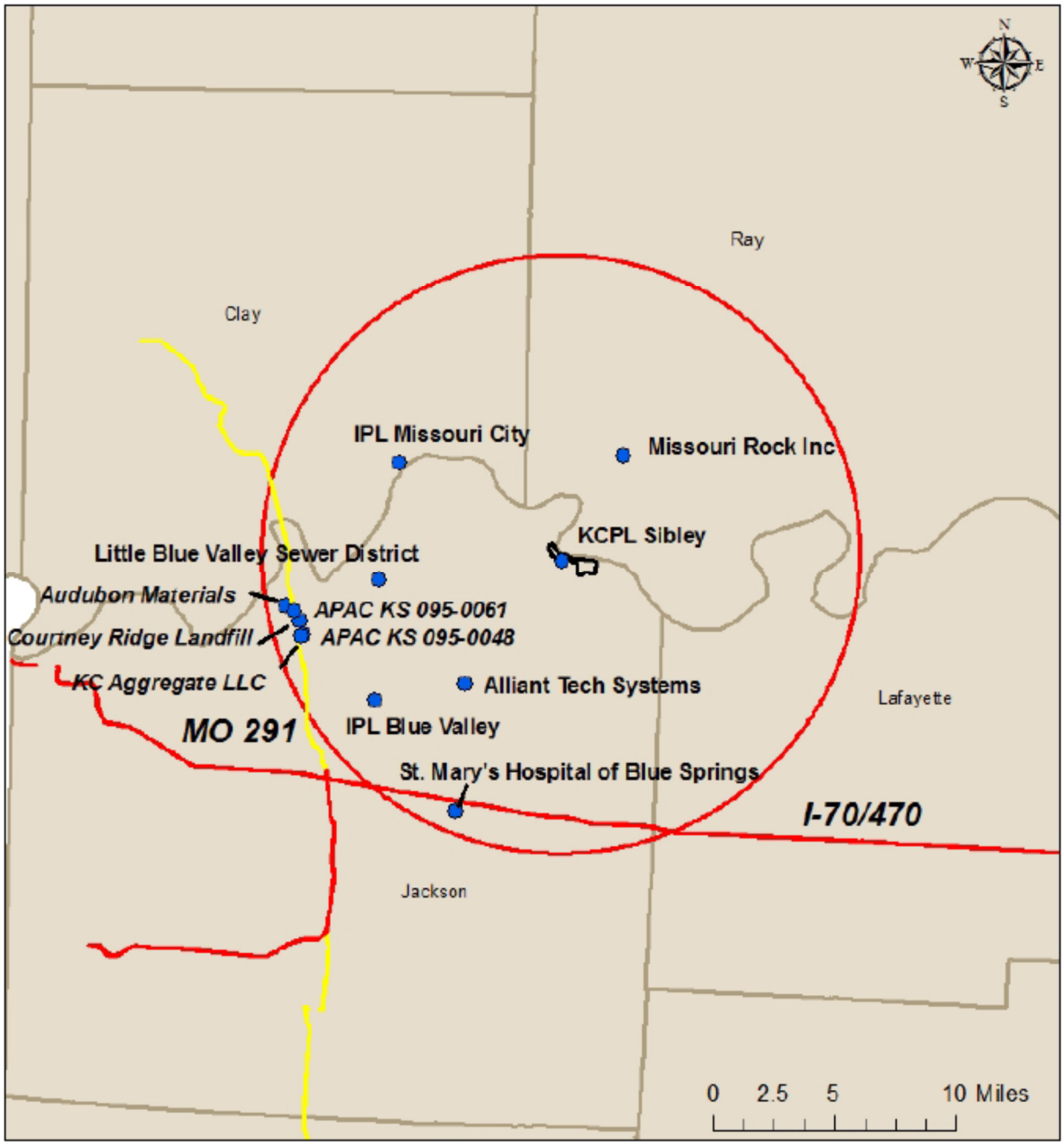
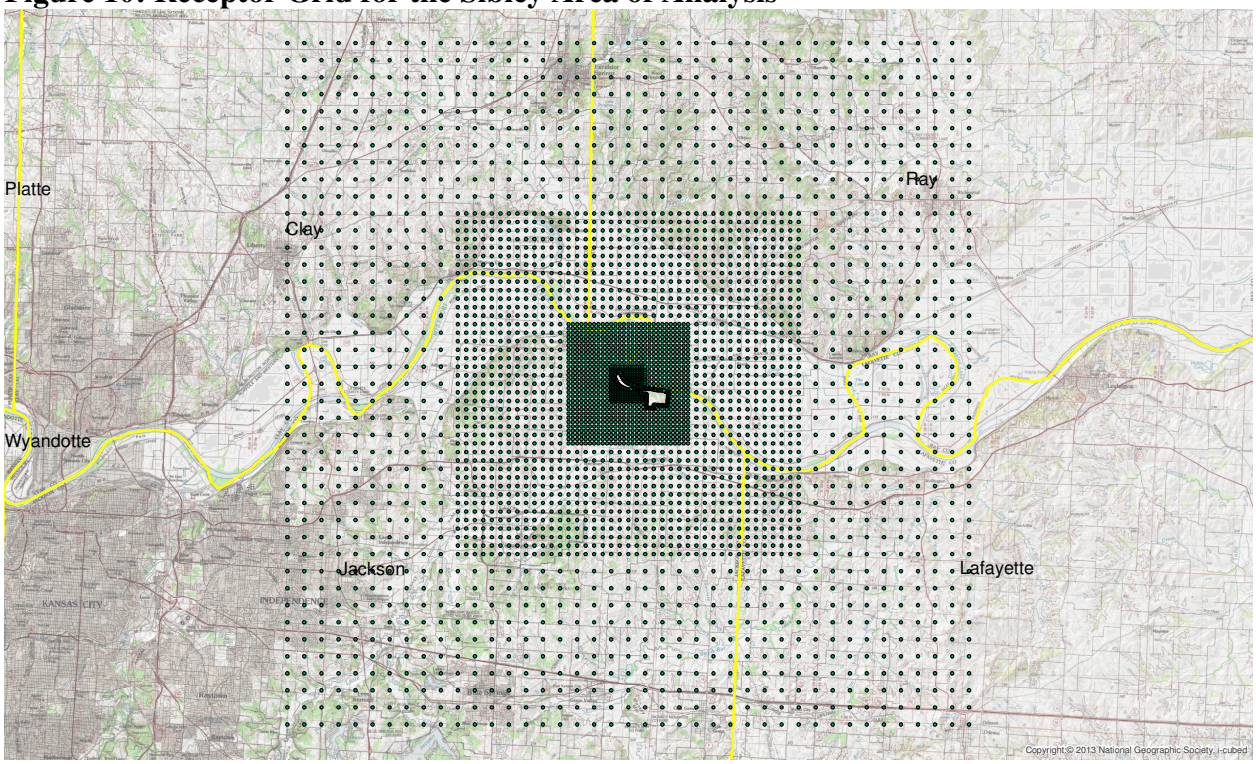


Figure 10: Receptor Grid for the Sibley Area of Analysis



Modeling Parameter: Source Characterization

The state characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purposes of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD does provide for the flexibility of using allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information when it is available and that these data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA believes that detailed throughput, operating schedules, and emissions information from the impacted source(s) should be used.

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. Specifically, a facility may have recently adopted a new federally enforceable emissions limit, been subject to a federally enforceable consent decree, or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS. These new limits or conditions may be used in the application of AERMOD. In these cases, the Modeling TAD notes that the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations should contain the necessary emissions information for designations-related modeling. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state included Sibley Generating Station, 10 other emitters of SO_2 within 20 km of the area of analysis, and four other sources within 50 km of the area of analysis. Fifty kilometers is the maximum extent AERMOD can reliably provide model predictions. This distance and these facilities were selected because the state believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and this set of sources adequately includes the sources which might contribute to those concentrations. No other sources were determined by the state to have the potential to cause significant concentration gradient impacts within the area of analysis. The facilities in the area of analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below.

Table 5: Actual SO_2 Emissions Between 2012 and 2014 from Facilities in the Sibley Area of Analysis

Facility Name	SO_2 Emissions (tons per year)		
	2012	2013	2014
Sibley Generating Station	6,095	6,218	4,847
Blue Valley Station	4,608	3,787	2,105
Missouri City Station	684	741	0
Missouri Rock Inc.	1	1	1
Little Blue Valley Sewer District	2	2	0
Alliant Tech Systems Inc.	2	1	1
St. Mary's Hospital of Blue Springs	0	0	0
Audubon Materials Sugar Creel Plant	115	83	117
Kansas City Aggregate LLC	2	2	2
APAC-Kansas Sugar Creek (095-0048)	1	1	1
Courtney Ridge Landfill	0	0	1
APAC-Kansas Sugar Creek (095-0061)	3	3	3
KCPL Hawthorn	1,576	1,727	1,441
Veolia Energy	6,702	7,934	7,782
BPU Quindaro	2,757	2,905	3,684

BPU Nearman	4,611	4,928	5,332
Total Emissions	27,160	28,334	25,318

For Sibley, BPU Nearman, BPU Quindaro, and KCPL Hawthorn, the state used actual hourly emissions from the most recent 3-year data set, i.e., 2012 – 2014. These emissions data were obtained from CEMS. For Veolia Energy, which is located in a separate SO_2 nonattainment area, the state used actual emissions from 2014, as reported to the state emission inventory, and calculated a constant emission rate for all periods modeled. Note that the Veolia hourly emission rate was derived by taking the annual emissions and spreading those over 8760 hours which may not represent actual hourly emissions during certain periods. Blue Valley Station has three coal fired boilers and is required, in Missouri Rule 10 CSR 10-6.261, to switch to natural gas by January 1, 2017. In addition, Blue Valley is subject to the boiler MACT and has indicated to Missouri they will switch to natural gas by January 21, 2016, well ahead of the July 2, 2016 designation date, therefore PTE emissions reflecting natural gas were modeled. It is noted that Missouri Rule 10 CSR 10-6.261 has an initial compliance date after July 2, 2016. This rule was submitted to EPA for incorporation into Missouri's SIP on October 9, 2015 but has not yet been acted on by EPA.. Blue Valley has stated it intends to complete the fuel switch before July 2, 2016, but this requirement is not contained in a federally enforceable document, thus EPA is not accepting the MDNR attainment modeling that relies upon this fuel switch assumption. Missouri City Station ceased burning coal in 2013 and intends to shut down in 2016 and was not included in the state's modeling although it did emit SO_2 in 2012 and 2013 and does not have a federally enforceable requirement to shutdown. Little Blue Valley Sewer District, Missouri Rock, Alliant Tech Systems Inc., St. Mary's Hospital of Blue Springs, Audubon Materials Sugar Creek Plant, Kansas City Aggregate LLC Independence Quarry, Courtney Ridge Landfill, and the two Kansas APAC plants were all modeled at actual emissions.

Modeling Parameter: Meteorology and Surface Characteristics

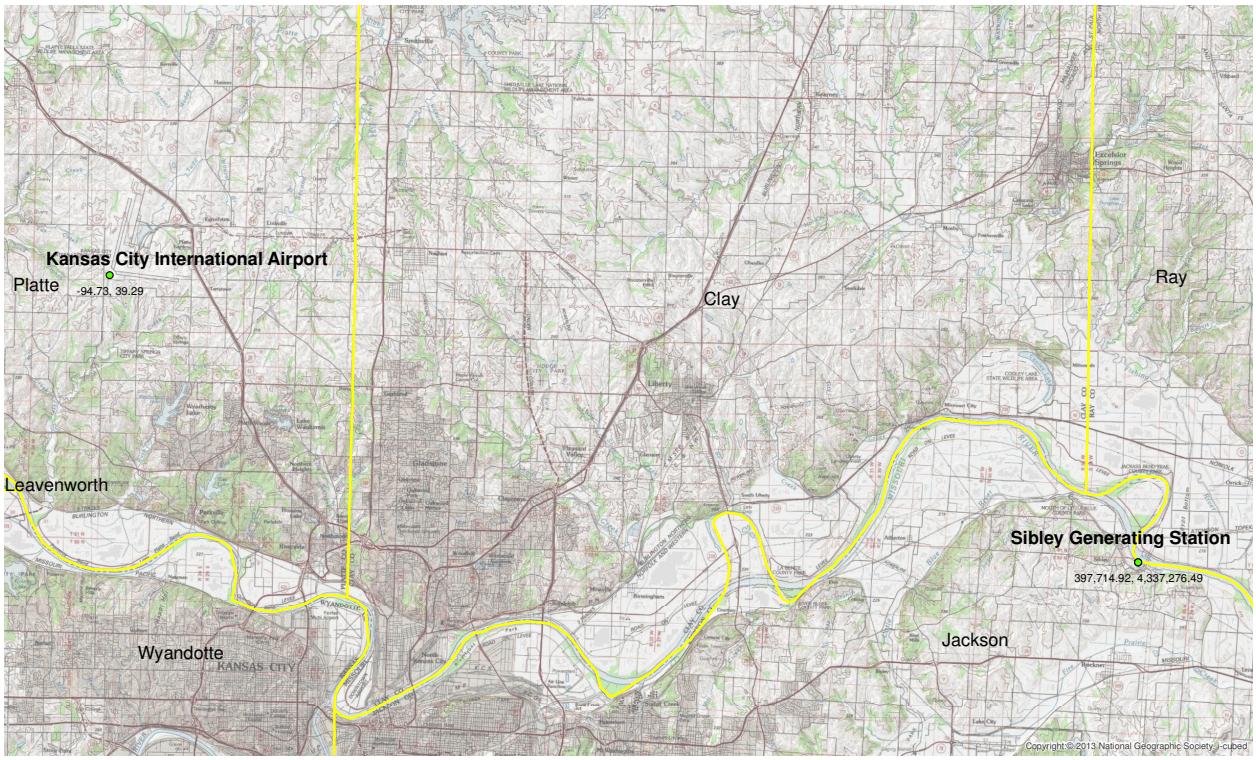
The most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. As noted in the Modeling TAD, the selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data are based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the Sibley area of analysis, surface meteorology from the NWS station at the Kansas City International Airport, Missouri, 50 km to the west-northwest, and coincident upper air observations from the NWS in Topeka, Kansas, 126 km to the west-southwest were selected as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the NWS station at Kansas City International Airport, Missouri, located at latitude 39.29 and longitude -94.73, to estimate the surface characteristics of the area of analysis. For surface roughness (sometimes referred to as

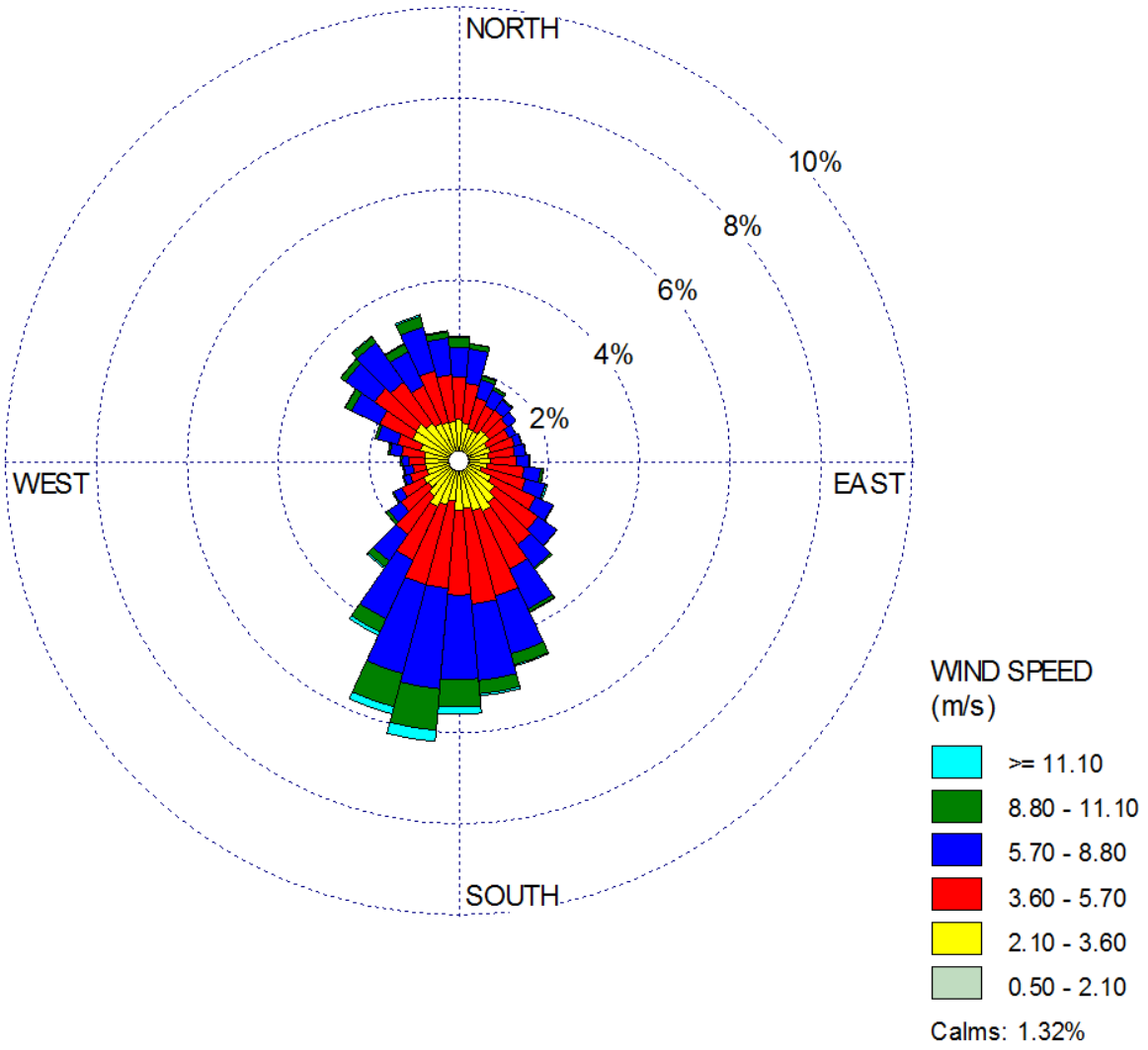
"Zo") the state estimated values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, or average conditions for each respective year. The state also used a 10 km by 10 km area centered on the site and estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance). In the figure below, the location of the Kansas City International Airport NWS station is shown relative to the Sibley Generating Station area of analysis.

Figure 11: Sibley Generating Station Area of Analysis and the Kansas City International Airport, Missouri NWS



As part of its recommendation, the state provided the 3-year surface wind rose for Kansas City International Airport. In Figure 12, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Winds are predominantly from the SSW and NNW.

Figure 12: Kanas City International Airport Cumulative Annual Wind Rose for Years 2012 – 2014



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in the EPA modeling TAD in the processing of the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always

portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with a March 8, 2013 EPA memo titled, "Use of ASOS meteorological data in AERMOD dispersion Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as gently rolling with the Sibley Generation Station located within the Missouri river valley at a base elevation of 728 feet, with surrounding terrain approaching 950 feet. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Sibley area of analysis, the state chose a first tier approach. The state performed a sector based analysis on the JFK monitor located in Wyandotte County, Kansas in the Kansas City metropolitan area. The state's approach was to exclude those sectors where this monitor was impacted by sources explicitly included in the modeling. Their analysis indicated a 180-200 degree sector best represented an air shed not impacted by sources being explicitly modeled and a 4th high value of 13 ppb was derived from this sector. The background concentration for this area of analysis was determined by the state to be 34.1 micrograms per cubic meter ($\mu g/m^3$), or 13 ppb,[4] and that value was incorporated into the final AERMOD results. EPA has reviewed the state's sector based analysis and agrees that using a background value from the JFK monitor is representative of the area and excluding those impacts from explicitly modeled sources is allowed for in Appendix W and the modeling TAD.

[4] The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.62 $\mu g/m^3$.

Summary of Modeling Results

The AERMOD modeling parameters for the Sibley area of analysis are summarized below in Table 6.

Table 6: AERMOD Modeling Parameters for the Sibley Area of Analysis

Sibley Area of Analysis	
AERMOD Version	14134
Dispersion Characteristics	Rural
Modeled Sources	15
Modeled Stacks	60
Modeled Structures	11
Modeled Fencelines	1
Total receptors	4022
Emissions Type	Actual CEMS for Sibley, BPU Nearman, BPU Quindaro, and KCPL Hawthorn; various for others
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Kanas City International Airport, Missouri
Upper Air Meteorology Station	Topeka NWS, Kansas
Methodology for Calculating Background SO_2 Concentration	Design Value excluding specific sectors
Calculated Background SO_2 Concentration	13 ppb or 34.1 $\mu g/m^3$

The results presented below in Table 7 show the magnitude and geographic location of the highest predicted modeled concentration based on actual emissions.

Table 7: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Sibley Area of Analysis Based on Actual Emissions

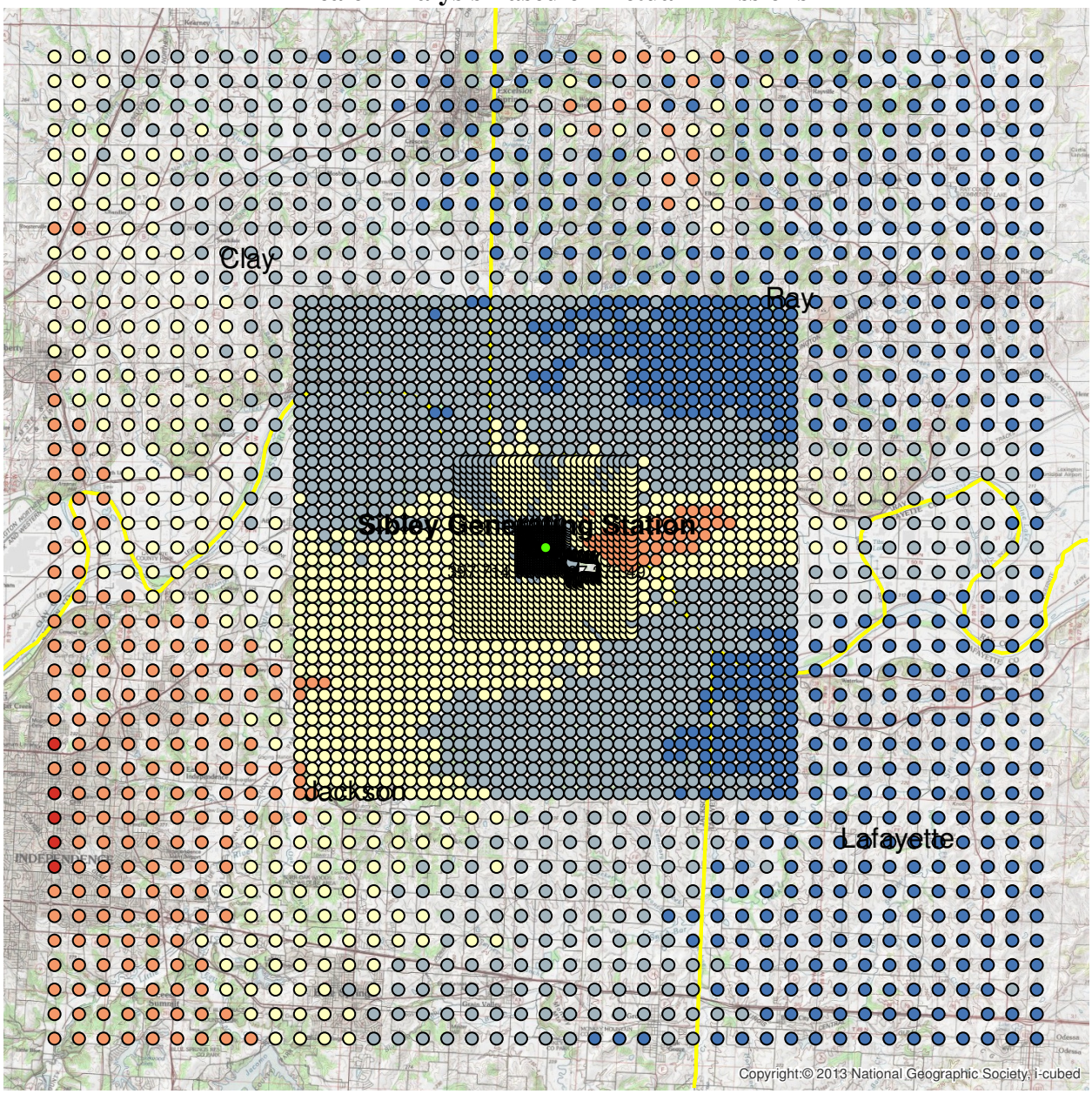
		Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	377714.91	4328276.50	167.1	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

The state's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 167.1 $\mu g/m^3$, or 63.8 ppb. This modeled concentration

included the background concentration of SO_2 and is based on actual emissions from the facilities. This highest predicted value occurred on the western edge of the receptor domain where impacts from the Veolia Energy source appear to dominate. Sibley Generating Station also has its highest modeled impacts to the east 1-5 km from the facility and to the north approximately 15 km from the facility in an area of elevated terrain. The impacts from Sibley are all below the NAAQS with modeled peaks from Sibley Generating Station at approximately 100 $\mu g/m^3$. Figure 13 below was included as part of the state's recommendation and indicates the highest predicted value. The state's receptor grid is also shown in the figure.

Figure 13: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the Sibley Area of Analysis Based on Actual Emissions



Jurisdictional Boundaries:

Once the geographic area of analysis associated with the Sibley Generating Station, other nearby sources, and background concentration is determined, existing jurisdictional boundaries are considered for the purpose of informing our intended unclassifiable area, specifically with respect to clearly defined legal boundaries.

In the case of Sibley Generating Station there is a nearby nonattainment area to the southwest approximately 27 km away. This nonattainment area, which is also located in Jackson County, Missouri, contains Veolia Energy, the primary source contributing to monitored nonattainment and the source impacting the western boundary of the Sibley monitoring domain. Because this nonattainment area is being addressed in a separate SIP action, and all nearby sources, including other sources in areas subject to the court-ordered deadline for designation on July 2, 2016, and potential DRR sources, are accounted for in the MDNR modeling for Sibley Generating Station, EPA believes the state's recommended boundary described earlier is appropriate and justified.

The EPA believes that our intended unclassifiable area, consisting of the partial Jackson County area in Missouri, is comprised of clearly defined legal boundaries and we find these boundaries to be a suitably clear basis for defining our intended unclassifiable area.

Other Relevant Information

The Sierra Club submitted modeling demonstrations evaluating compliance with the 1-hour SO_2 NAAQS for the Sibley Generating Station as part of a September 17, 2015 package submittal to EPA. Included with the modeling files were several comment letters including an evaluation document describing the modeling Sierra Club provided, prepared by Wingra Engineering, asserting that violations of the NAAQS are present in the area around Sibley Generating Station. Two Sierra Club modeling demonstrations were provided, one using actual emissions and another using allowable emissions. Both Sierra Club modeling scenarios show violations of the 1-hr SO_2 NAAQS, although the Sierra Club's modeling scenario using actual emissions indicate violations around the Veolia Energy Center only.

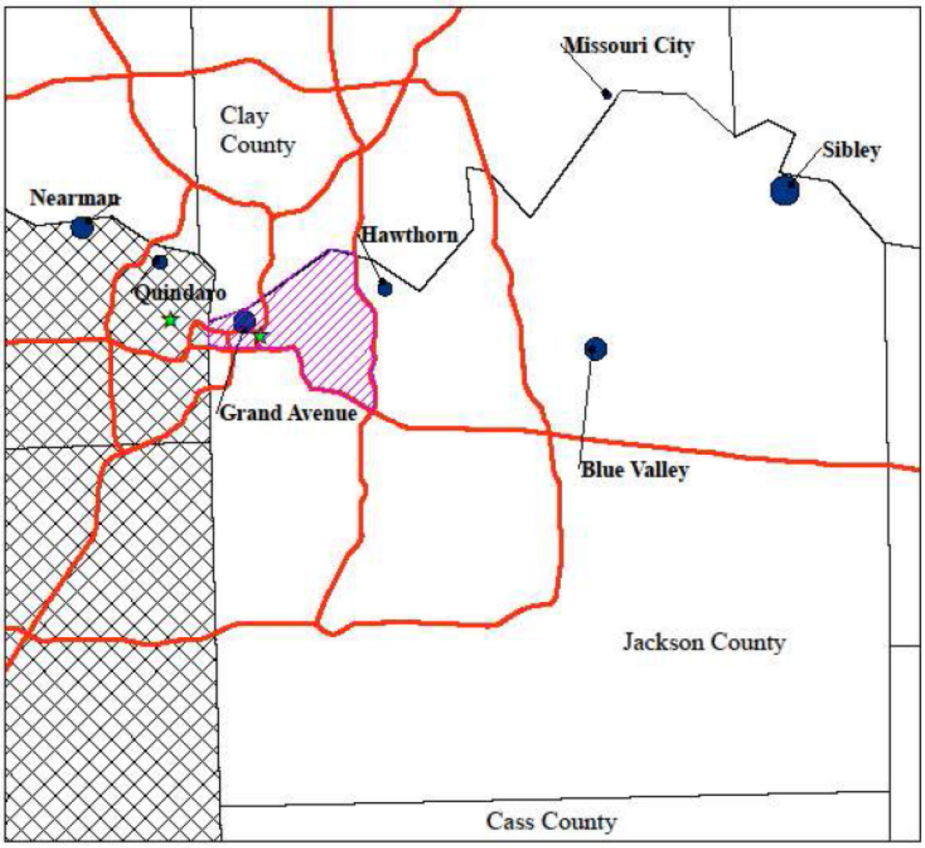
Although Sierra Club submitted modeling based on allowable emission rates, we have concerns that the allowable modeling, as presented, does not represent true SO_2 concentrations in the area, and we are unable to reliably determine whether the area is in attainment or nonattainment based on the allowable modeling. While the modeling TAD does not preclude the use of allowable emissions, for designations allowable emissions are generally used in the case where controls and limits have been recently established, and not to establish actual SO_2 concentrations a monitor might record.[5]

[5] Designations are intended to address current actual air quality (i.e., modeling simulates a monitor), and, thus, are unlike attainment plan modeling, which must provide assurances that attainment will occur. For the purposes of designations, modeling can be used as a surrogate to ambient monitoring to characterize air quality for the designations process. The EPA recommends modeling the most recent 3 years of actual emissions. Emissions Input section (Page 9)
http://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf

The Sierra Club modeling used the Kansas City Downtown NWS for surface data and the Topeka NWS station for upper air data and included 1-minute ASOS data in their AERMET runs. The most significant difference between the Sierra Club analysis and the MDNR analysis for AERMET processing was that the Sierra Club used the Kansas City Downtown NWS data while MDNR chose to use the Kansas City International Airport data. Both the Sierra Club and MDNR used Topeka as the upper air station. The Sierra Club contends that the Kansas City Downtown NWS is more appropriate because of its proximity to Sibley and other important sources in the modeling area. The MDNR meanwhile contends that the site characteristics between their surface station choice and Sibley are more representative. EPA notes the merit of both arguments but is not making a formal determination on which dataset is more representative in this analysis. Other differences identified in the Sierra Club modeling include no inclusion of building downwash as Sierra Club did not have access to this information, 1.5 meter flagpole receptors, and fewer emission points than the MDNR modeling demonstration, the most notable being BPU Quindaro which was included in the MDNR run.

For the AERMOD runs, Sierra Club chose to use a much larger area of analysis that included a receptor grid out to 50 km from the Sibley Generating Station, well beyond the 20 km distance that MDNR chose. While a 50 km receptor domain is permitted in the AERMOD modeling system, this Sierra Club grid also includes receptors in an existing 1-hr SO_2 nonattainment area in Jackson County MO. As seen in Figure 14, the existing nonattainment area in Jackson County, Missouri is an area approximately 13 km to the southeast of Nearman and 40 km to the southwest of the Sibley Station.

Figure 14: Existing Jackson County Missouri SO_2 Nonattainment area (hashed in magenta) with Kansas and Nearman to the West.



The Jackson County, Missouri nonattainment area is being addressed under a separate nonattainment SIP that will require a demonstration that the area demonstrates and maintains compliance with the NAAQS. MDNR submitted the nonattainment SIP for Jackson County to EPA on October 9, 2015, and the agency is currently reviewing this SIP. In establishing the current Jackson County nonattainment area, the emissions from Sibley Station were considered and it was determined that Sibley Station contributions did not warrant an expanded nonattainment area that would include the Sibley Station. Although Sierra Club asserts in their comments significant contributions from Sibley Station, it is unclear from the Sierra Club modeling analysis what the actual Sibley Station source contributions are, or where they occur, when predicted exceedances occur in the nonattainment area and the area south of the Sibley Station. Without further description and analysis of both when and where Sibley Station contributions occur, we cannot determine if Sibley Station should be included in a separate nonattainment area. What is clear from the Sierra Club analysis is that no modeled violations appear to exist within 20 km surrounding the Sibley Station facility.

EPA notes that the Sierra Club provided a table with maximum 99th percentile modeled impacts and individual facility impacts as well as impacts from all facilities combined, but it does not address contribution at the time of modeled exceedances. Table 8 contains the Sierra Club

modeling summary provided in their comments and the table indicates that impacts from Sibley emissions alone (Sibley boilers 50, 60, 70) are below the NAAQS across all receptors. However, as Table 8 indicates, when actual emissions from Veolia Energy and other Kansas City sources are included (All with Sibley boilers 50, 60, 70), the model predictions indicate NAAQS exceedances around the Veolia Energy Center due mainly to Veolia emissions. Overall the Sierra Club model results extending out 20 km around the Sibley Generating Station are similar to the MDNR modeling.

While EPA believes the Sierra Club modeling meets the requirements of the EPA modeling TAD in terms of inputs and model settings, as previously stated the existing nonattainment area is being addressed by the nonattainment SIP and the Sierra Club did not provide enough information for EPA to determine the Sibley Station's and other nearby sources' impact on the area 20+ km southwest of the Sibley Station. Because EPA does not have the maximum daily contributions files (MAXDCONT) as part of the modeling outputs from Sierra Club, EPA cannot directly determine if the Sibley Generating Station and other nearby sources in the area contribute during those periods of modeled violations around the Veolia Energy Center. It is also clear the area MDNR recommends as attainment, and which EPA is proposing to designate as unclassifiable, models attainment in both the Sierra Club and MDNR modeling. For these reasons, EPA is not relying upon the Sierra Club modeling for determining contributions outside the proposed boundary for the Sibley area, but rather is relying on the MDNR analysis because EPA believes the area addressed is appropriate in the MDNR demonstration given the information available at this time.

Table 8: Sierra Club Modeling Results presented for the Sibley Area

Emission Rates	Averaging Period	99th Percentile 1-hour Daily Maximum (µg/m3)				Complies with NAAQS?
		Impact	Background	Total	NAAQS	
Allowable	Sibley Boiler 70	1,197.1	23.5	1,220.6	196.2	No
Actual		47.8	23.5	71.3	196.2	Yes
Allowable	Sibley Boilers 50, 60 & 70	1,411.9	23.5	1,435.4	196.2	No
Actual		50.8	23.5	74.3	196.2	Yes
Allowable	Hawthorne	379.7	23.5	403.2	196.2	No
Actual		23.5	23.5	47.0	196.2	Yes
Allowable	Nearman Creek	126.3	23.5	149.8	196.2	Yes
Actual		81.4	23.5	104.9	196.2	Yes
Allowable	Veolia	1,614.5	23.5	1,638.0	196.2	No
Actual		407.6	23.5	431.1	196.2	No
Allowable	All With Sibley Boiler 70	1,706.5	23.5	1,730.0	196.2	No
Actual		411.7	23.5	435.2	196.2	No
Allowable	All With Sibley Boilers 50, 60 & 70	1,739.0	23.5	1,762.5	196.2	No
Actual		411.7	23.5	435.2	196.2	No

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Sibley Generating Station as unclassifiable for the 2010 SO_2 NAAQS. Specifically, the boundaries are the Jackson County line on the north from Clay and Ray Counties, the county line separating Jackson County from Lafayette County on the east, Interstate 70 and 470 on the south, and Missouri Highway 291 on the west.

This conclusion is based on an evaluation of the MDNR modeling submitted in support of an attainment recommendation with additional consideration of Sierra Club modeling that also supported the MDNR conclusion regarding the impacts extending out 20 km around the Sibley Generating Station but not elsewhere. EPA believes all contributing sources are addressed in the MDNR modeling and that the boundary area proposed by MDNR is appropriate. However, although MDNR modeling indicates attainment, not all sources have federally enforceable limits for the emission rates assumed in MDNR's modeling and EPA therefore is proposing unclassifiable for this area. EPA is unable at this time, based on available information, to determine whether the area is meeting or not meeting the NAAQS. Should MDNR submit additional information documenting that the limits used in the modeling represent federally enforceable limits, EPA believes the MDNR modeling would support an unclassifiable/attainment designation.

At this time, our intended designations for the state only apply to this area and the other areas presented in this technical support document. Consistent with the conditions in the March 2, 2015, consent decree, the EPA will evaluate and designate all remaining undesignated areas in Missouri by either December 31, 2017, or December 31, 2020.

Technical Analysis for the Scott County, Missouri (Sikeston) Area

Proposed Designation Summary

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Sikeston Power Station as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the area is comprised of the entirety of Scott County, Missouri.

This conclusion is based on the MDNR modeling submittal which demonstrates attainment throughout the entirety of Scott County.

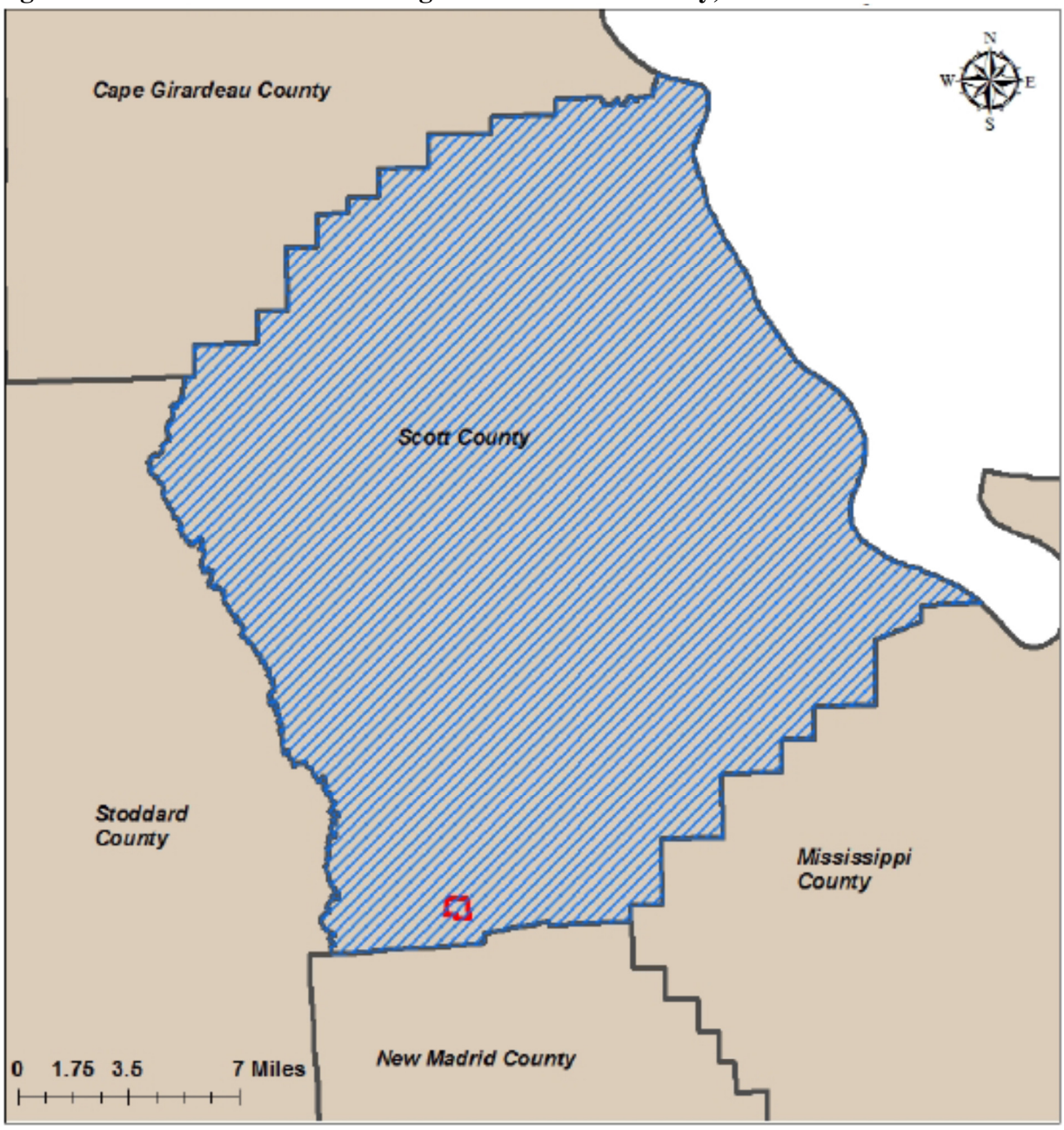
Introduction

Scott County, Missouri contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). Specifically, in 2012, the Sikeston Power Station emitted 5,242 tons of SO_2 and had a facility wide emissions rate of 0.620 lbs SO_2/mmBTU. As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Pursuant to the March 2, 2015 court-ordered schedule, the EPA must designate the area surrounding the facility by July 2, 2016.

In its submission, Missouri recommended that the area surrounding the Sikeston Power Station, specifically the entirety of Scott County, be designated as attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. This assessment and characterization was performed using air dispersion modeling software, specifically AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees that the area is attaining the standard, and intends to designate Scott County as unclassifiable/attainment.

The Sikeston Power Station is located in eastern Missouri in the southern portion of Scott County. As seen in Figure 15 below, the facility is located approximately 30 km west of Illinois and just west of Sikeston, Missouri. Also included in this figure is the state's recommended area for the attainment designation and the EPA's intended unclassifiable/attainment designation for the area.

Figure 15: The EPA's intended designation for Scott County, Missouri



The discussion and analysis that follows below references the state's use of the Modeling TAD, the EPA's assessment of the state's modeling in accordance with the Modeling TAD, and the factors for evaluation contained in the EPA's March 20, 2015 guidance, as appropriate.

Detailed Assessment

Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. In some instances the recommended model may be a model other than AERMOD, such as the BLP model for buoyant line sources. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRIME: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The state used AERMOD version 14134 and a discussion of the individual components follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. This determination was made by analyzing the land use in the area surrounding the Sikeston Power Station, which is predominately rural.

Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Sikeston Power Station is to determine the extent of the area of analysis, i.e., the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The grid receptor spacing for the area of analysis chosen by the state is as follows:

- Origin to 1 km, 100 m spacing
- 1 km to 3.5 km, 250 m spacing
- 3.5 km to 10 km, 500 m spacing
- 10 km to 20 km, 1000 m spacing
- Beyond 20 km to northern and eastern edges of Scott County, 1000 m spacing

Where the origin was defined at the center of the facility property.

The receptor network contained 5,326 receptors and covered all of Scott County in Missouri, the northeastern portion of Mississippi County in Missouri, the northern portion of New Madrid County in Missouri, the northwestern portion of Stoddard County in Missouri, and the southern portion of Cape Girardeau County in Missouri.

For the Sikeston area, the state has included five other emitters of SO_2 between 20 and 50 kilometers (km) of Sikeston Power Station. Fifty kilometers is the maximum extent AERMOD can reliably provide model predictions. No other facilities were included within 20 km of Sikeston Power station because the only sources in this zone use natural gas. The state determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. In addition to the Sikeston Power Station, the other emitters of SO_2 included in the area of analysis are: Buzzi Unicem, QC Corp., Havco Wood Products, Noranda Aluminum, and AECI New Madrid Plant.

Figures 16 and 17, which were included in the state's recommendation, show the state's chosen area of analysis surrounding the Sikeston Power Station, as well as the receptor grid for the area of analysis. Receptors for the purposes of this designation effort were placed uniformly, including in areas where it would not be feasible to place a monitor and record ambient impacts. The impacts of the area's geography and topography will be discussed later within this document.

Figure 16: Sikeston 20 km Area of Analysis ("Interactive sources" are those identified by the EPA's interactive mapping tool for SO_2 emission sources)

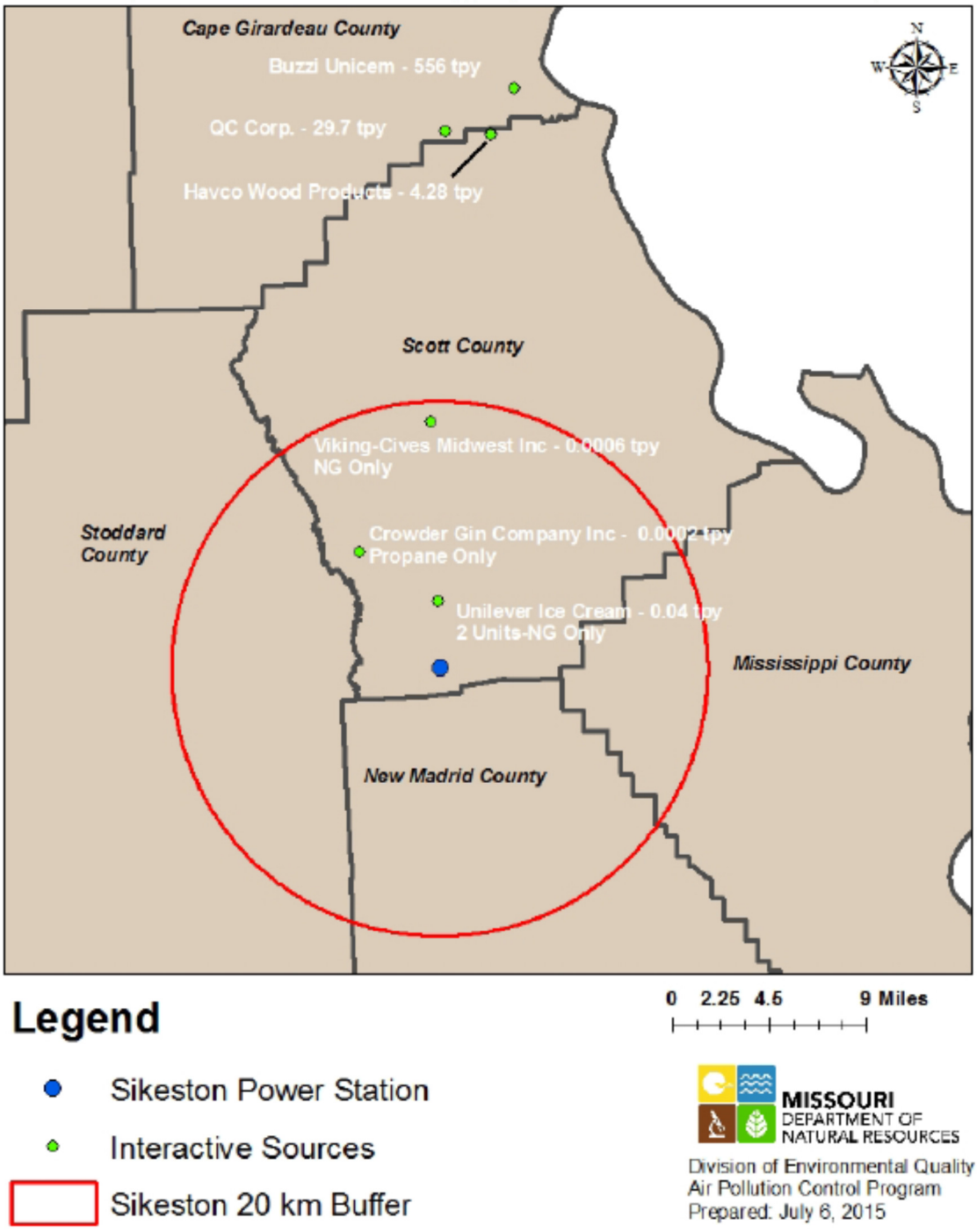
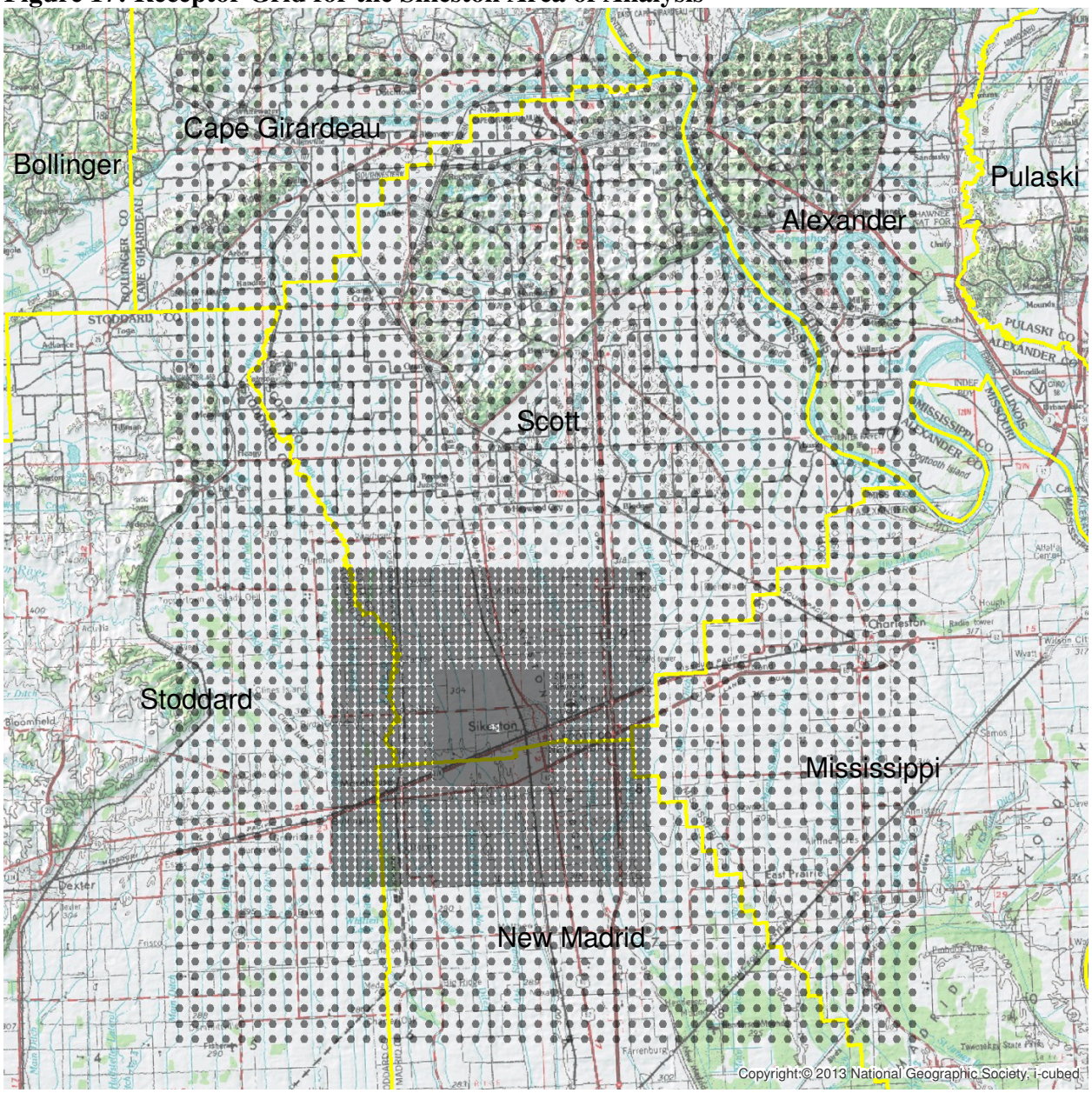


Figure 17: Receptor Grid for the Sikeston Area of Analysis



Modeling Parameter: Source Characterization

The state characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purposes of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD does provide for the flexibility of using allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information when it is available and that these data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA believes that detailed throughput, operating schedules, and emissions information from the impacted source(s) should be used.

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. Specifically, a facility may have recently adopted a new federally enforceable emissions limit, been subject to a federally enforceable consent decree, or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS. These new limits or conditions may be used in the application of AERMOD. In these cases, the Modeling TAD notes that the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations should contain the necessary emissions information for designations-related modeling. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state included the Sikeston Power Station and five other emitters of SO_2 within 50 km of the Sikeston Power Station. Of the five other facilities, three are close to the northern edge of the Scott County boundary and two are located to the south in New Madrid County Missouri. This 50 km distance and these facilities were selected because the state believes that its selected area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and the 50 km distance adequately includes the sources which might contribute to those concentrations. No other sources were determined by the state to have the potential to cause significant concentration gradient impacts within the area of analysis. The facilities in the area of analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below. Note the natural gas-fired sources below with zero actual emissions were evaluated but not included in the modeling because of a lack of SO_2 emissions.

Table 9: Actual SO_2 Emissions Between 2012 and 2014 from Facilities in the Sikeston Area of Analysis

Facility Name	SO_2 Emissions (tons per year)		
	2012	2013	2014
Sikeston Power Station	5,242	5,967	6,651
Unilever Ice Cream	0	0	0

Viking-Cives Midwest Inc.	0	0	0
Crowder Gin Company Inc.	0	0	0
Havco Wood Products Inc.	4	4	4
Q.C. Corporation	30	30	30
Buzzi Unicem Cape Girardeau	916	655	557
Noranda Aluminum	5,260	5,062	5,323
AECI New Madrid Plant	14,400	16,822	16,672
Total Emissions	25,852	28,539	29,237

For Sikeston Power Station and the AECI New Madrid Plant, the state used actual hourly emissions from the most recent 3-year data set, i.e., 2012 – 2014. These emissions data were obtained from CEMS. For the remaining sources all but Noranda Aluminum were modeled at their respective actuals. Noranda Aluminum was modeled at allowable emissions based on a recent PSD permit application. http://dnr.mo.gov/env/apcp/permits/docs/noranda-stjude2010cp.pdf

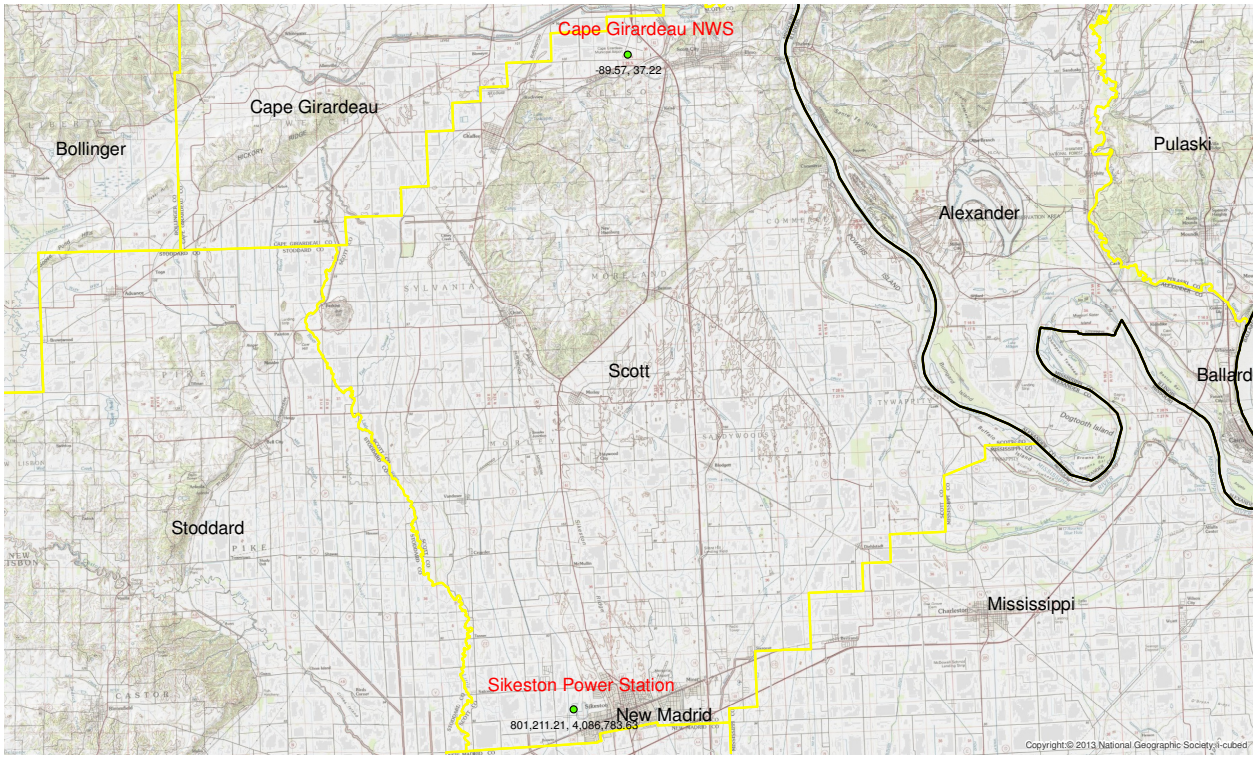
Modeling Parameter: Meteorology and Surface Characteristics

The most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. As noted in the Modeling TAD, the selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data are based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the Sikeston area of analysis, surface meteorology from the NWS station at the Cape Girardeau NWS, Missouri, 38 km to the north, and coincident upper air observations from the NWS in Springfield, Missouri, approximately 330 km to the west were selected as best representative of meteorological conditions within the area of analysis.

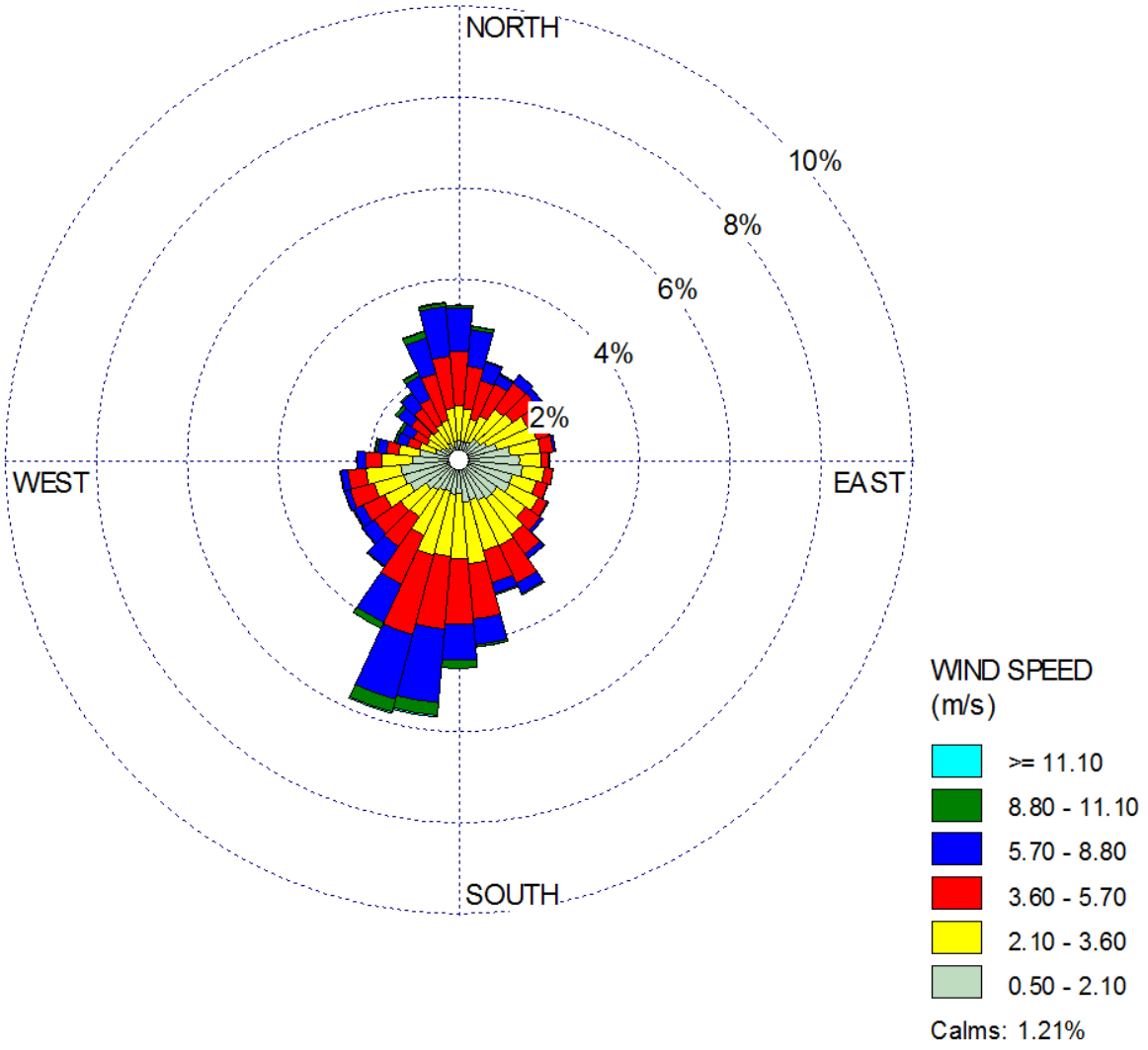
The state used AERSURFACE version 13016 using data from the NWS station at Cape Girardeau, Missouri, located at latitude 37.22 and longitude -89.57, to estimate the surface characteristics of the area of analysis. For surface roughness (sometimes referred to as "Zo") the state estimated values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, or average conditions for each respective year. The state also used a 10 km by 10 km area centered on the site and estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance). In the figure below, the location of the Cape Girardeau NWS station is shown relative to the Sikeston Power Station area of analysis.

Figure 18: Sikeston Power Station Area of Analysis and the Cape Girardeau, Missouri NWS



As part of its recommendation, the state provided the 3-year surface wind rose for the Gape Girardeau NWS Kansas City International Airport. In Figure 19, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Winds are predominantly from the SSW and NNW.

Figure 19: Cape Girardeau NWS Cumulative Annual Wind Rose for Years 2012 – 2014



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in the EPA modeling TAD in the processing of the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data

may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with a March 8, 2013 EPA memo titled, "Use of ASOS meteorological data in AERMOD dispersion Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as gently rolling, with the Sikeston Power Station located within the Missouri river valley at a base elevation of 728 feet and surrounding terrain approaching 950 feet. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Sikeston area of analysis, the state chose a first tier approach. The background concentration for this area of analysis was determined by the state to be 23.6 micrograms per cubic meter ($\mu g/m^3$), or 9 ppb,[6] and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

The AERMOD modeling parameters for the Sikeston area of analysis are summarized below in Table 10.

Table 10: AERMOD Modeling Parameters for the Sikeston Area of Analysis

Sikeston Area of Analysis	
AERMOD Version	14134

[6] The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.62 $\mu g/m^3$.

Dispersion Characteristics	Rural
Modeled Sources	6
Modeled Stacks	39
Modeled Structures	14
Modeled Fencelines	1
Total receptors	5,326
Emissions Type	Actual CEMS for Sikeston and AECI New Madrid Plant
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Cape Girardeau, Missouri
Upper Air Meteorology Station	Springfield, Missouri
Methodology for Calculating Background SO_2 Concentration	Design Value excluding specific sectors
Calculated Background SO_2 Concentration	9 ppb or 23.6 $\mu g/m^3$

The results presented below in Table 11 show the magnitude and geographic location of the highest predicted modeled concentration based on actual emissions.

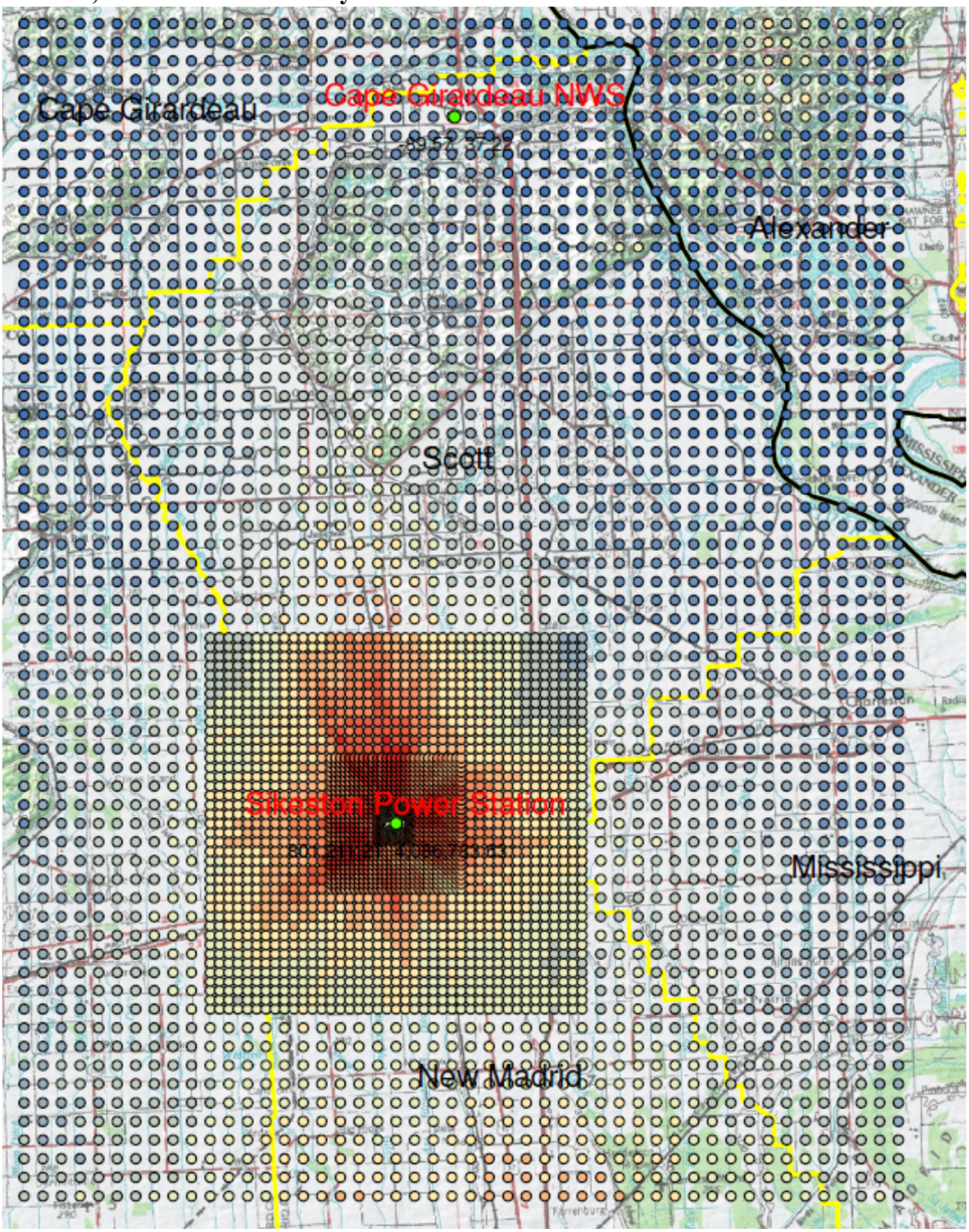
Table 11: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Sikeston Area of Analysis Based on Actual Emissions

		Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	799209.50	4085535.25	97.6	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

The state's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 97.6 $\mu g/m^3$, or 37.2 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities modeled, except for Noranda which used allowable emissions. Figure 20 below was included as part of the state's recommendation and indicates that the predicted value occurred approximately 2-3 km away to the southwest. The state's receptor grid is also shown in the figure.

Figure 20: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the Sikeston, Missouri Area of Analysis Based on Actual Emissions



Jurisdictional Boundaries:

Once the geographic area of analysis associated with the Sikeston Power Station, other nearby sources, and background concentration is determined, existing jurisdictional boundaries are considered for the purpose of informing our intended unclassifiable/attainment area, specifically with respect to clearly defined legal boundaries.

The Sikeston area has no former designation boundaries. The analysis provided by MDNR has addressed all significant sources close to the state's recommended boundaries. The analysis included the Sikeston Power Station and demonstrated through dispersion modeling that the entirety of Scott County is in attainment. No other CD or DRR sources exist within the recommended attainment boundary.

The EPA believes that our intended unclassifiable/attainment area, consisting of the entirety of Scott County, has clearly defined legal boundaries, and we find these boundaries to be a suitably clear basis for defining our intended unclassifiable/attainment area.

Other Relevant Information

EPA received no other information from 3rd parties for the Sikeston area.

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Sikeston Power Station as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the area is comprised of the entirety of Scott County, Missouri.

The rationale for this conclusion is based on the MDNR modeling submittal which demonstrates attainment throughout the entirety of Scott County. This demonstration includes all surrounding SO_2 sources, including sources just outside of Scott County that could potentially contribute significantly to SO_2 concentrations within Scott County. The recommended unclassifiable/attainment area also includes Sikeston Power Station within its boundary. No consideration was given to other information as EPA did not receive 3rd party information for this area.

At this time, our intended designations for the state only apply to this area and the other areas presented in this technical support document. Consistent with the conditions in the March 2, 2015, court-ordered schedule, the EPA will evaluate and designate all remaining undesignated areas in Missouri by either December 31, 2017, or December 31, 2020.