Technical Support Document:

Chapter 20
Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for Minnesota

1. Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (the EPA, we, or us) must designate areas as either "nonattainment," "attainment," or "unclassifiable" for the 2010 1-hour sulfur dioxide (SO_2) primary national ambient air quality standard (NAAQS) (2010 SO_2 NAAQS). The CAA defines a nonattainment area as an area that does not meet the NAAQS or that contributes to a nearby area that does not meet the NAAQS. An attainment area is defined by the CAA as any area that meets the NAAQS and does not contribute to a nearby area that does not meet the NAAQS. Unclassifiable areas are defined by the CAA as those that cannot be classified on the basis of available information as meeting or not meeting the NAAQS. In this action, the EPA has defined a nonattainment area as an area that the EPA has determined violates the 2010 SO_2 NAAQS or contributes to a violation in a nearby area, based on the most recent 3 years of air quality monitoring data, appropriate dispersion modeling analysis, and any other relevant information. An unclassifiable/attainment area is defined by the EPA as an area that either: (1) based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS[1]. An unclassifiable area is defined by EPA as an area that either: (1) was required to be characterized by the state under 40 CFR 51.1203(c) or (d), has not been previously designated, and on the basis of available information cannot be classified as either: (i) meeting or not meeting the 2010 SO_2 NAAQS, or (ii) contributing or not contributing to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and EPA does have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

This technical support document (TSD) addresses designations for nearly all remaining undesignated areas in Minnesota for the 2010 SO_2 NAAQS. In previous final actions, the EPA

[1] The term "attainment area" is not used in this document because the EPA uses that term only to refer to a previous nonattainment area that has been redesignated to attainment as a result of the EPA's approval of a state-submitted maintenance plan.

has issued designations for the 2010 SO_2 NAAQS for selected areas of the country.[2] The EPA is under a December 31, 2017, deadline to designate the areas addressed in this TSD as required by the U.S. District Court for the Northern District of California.[3] We are referring to the set of designations being finalized by the December 31, 2017, deadline as "Round 3" of the designations process for the 2010 SO_2 NAAQS. After the Round 3 designations are completed, the only remaining undesignated areas will be those where a state has installed and begun timely operating a new SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 Data Requirements Rule (DRR). (80 FR 51052) The EPA is required to designate those remaining undesignated areas by December 31, 2020. However, Minnesota has no such areas.

Minnesota submitted its first recommendation regarding designations for the 2010 1-hour SO_2 NAAQS on May 23, 2011. The state recommended attainment for all counties that contain only sources with a potential to emit less than 100 tons and unclassifiable for all remaining counties. The state submitted updated air quality analyses and recommendations on January 13, 2017. In our intended designations, we have considered all the submissions from the state, except where a later submission indicates that it completely replaces an element of an earlier submission.

The Fond du Lac Band (Fond du Lac) submitted its recommendation regarding designations for the 2010 1-hour SO_2 NAAQS on August 8, 2011, for the Fond du Lac Reservation, which spans Carlton and St. Louis Counties. Fond du Lac recommended unclassifiable for the reservation, consistent with Minnesota's recommendation for those counties, in Minnesota's original submittal.

For the areas in Minnesota that are part of the Round 3 designations process, Table 1 identifies EPA's intended designations and the counties or portions of counties to which they would apply. It also lists Minnesota's current recommendations. The EPA's final designations for these areas will be 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, and could change based on changes to this information (or the availability of new information) that alters EPA's assessment and characterization of air quality.

Table 1: Summary of the EPA's Intended Designations and the Designation Recommendations by Minnesota

Area/County	Minnesota's Recommended Area Definition	Minnesota's Recommended Designation	EPA's Intended Area Definition[+]	EPA's Intended Designation
Goodhue County, Minnesota	Goodhue County	Unclassifiable	Same as State's Recommendation	Nonattainment
Cook County, Minnesota	Cook County	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment

[2] A total of 94 areas throughout the U.S. were previously designated in actions published on August 5, 2013 (78 FR 47191), July 12, 2016 (81 FR 45039), and December 13, 2016 (81 FR 89870).
[3] *Sierra Club v. McCarthy*, No. 3-13-cv-3953 (SI) (N.D. Cal. Mar. 2, 2015).

Area/County	Minnesota's Recommended Area Definition	Minnesota's Recommended Designation	EPA's Intended Area Definition+	EPA's Intended Designation
Itasca County, Minnesota	Itasca County	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Otter Tail County, Minnesota	Otter Tail County	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Sherburne County, Minnesota	Sherburne County	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Remaining Undesignated Areas*	All other not yet designated counties	Attainment or Unclassifiable	All other not yet designated counties	Unclassifiable/ Attainment

*The EPA intends to designate the remaining undesignated counties in Minnesota as "unclassifiable/attainment" as these areas were not required to be characterized by the state under the DRR and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the areas may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS These areas that we intend to designate as unclassifiable/attainment (those to which this row of this table is applicable) are identified more specifically in section 8 of this chapter.
+Includes areas of Indian country geographically located within the county, unless otherwise noted.

2. General Approach and Schedule

Updated designations guidance documents were issued by the EPA through a July 22, 2016, memorandum and 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 I-X. These memoranda supersede earlier designation guidance for the 2010 SO_2 NAAQS, issued on March 24, 2011, and identify factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The documents also contain the factors that the EPA intends to evaluate in determining the boundaries for designated areas. 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.

To assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling for sources that emit SO_2, the EPA released its most recent version of a draft document titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) in August 2016.[4]

[4] https://www.epa.gov/sites/production/files/2016-06/documents/so2modelingtad.pdf. In addition to this TAD on modeling, the EPA also has released a technical assistance document addressing SO_2 monitoring network design, to advise states that have elected to install and begin operation of a new SO_2 monitoring network. See Draft SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, February 2016, https://www.epa.gov/sites/production/files/2016-06/documents/so2monitoringtad.pdf.

Readers of this chapter of this TSD should refer to the additional general information for the EPA's Round 3 area designations in Chapter 1 (Background and History of the Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard) and Chapter 2 (Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for States with Sources Not Required to be Characterized).

As specified by the March 2, 2015, court order, the EPA is required to designate by December 31, 2017, all "remaining undesignated areas in which, by January 1, 2017, states have not installed and begun operating a new SO_2 monitoring network meeting the EPA specifications referenced in the EPA's" SO_2 DRR (80 FR 51052). The EPA will therefore designate by December 31, 2017, areas of the country that are not, pursuant to the DRR, timely operating the EPA-approved and valid monitoring networks. The areas to be designated by December 31, 2017, include the areas associated with four sources in Minnesota meeting DRR emissions criteria that states have chosen to be characterized using air dispersion modeling, the areas for which air agencies imposed emissions limitations on sources to restrict their SO_2 emissions to less than 2,000 tpy (none of which are in Minnesota), sources that met the DRR requirements by demonstrating shut down of the source (none of which are in Minnesota), areas for which the states chose monitoring for the DRR but did not timely meet the approval and operating deadline (none of which are in Minnesota), and other areas not specifically required to be characterized by the state under the DRR.

Because many of the intended designations have been informed by available modeling analyses, this preliminary TSD is structured based on the availability of such modeling information. There is a section for each county for which modeling information is available. The remaining to-be-designated counties are then addressed together in section seven.

The EPA does not plan to revise this TSD after consideration of state and public comment on our intended designation. A separate TSD will be prepared as necessary to document how we have addressed such comments in the final designations.

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

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 99^{th} 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 that, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined either: (1) does not meet the 2010 SO_2 NAAQS, or (2) contributes to ambient air quality in a nearby area that does not meet the NAAQS.

4) Designated Unclassifiable/Attainment Area – an area that either: (1) based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.
5) Designated Unclassifiable Area – an area that either: (1) was required to be characterized by the state under 40 CFR 51.1203(c) or (d), has not been previously designated, and on the basis of available information cannot be classified as either: (i) meeting or not meeting the 2010 SO_2 NAAQS, or (ii) contributing or not contributing to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.
6) Modeled Violation – a violation of the SO_2 NAAQS demonstrated by air dispersion modeling.
7) Recommended Attainment Area – an area that a state, territory, or tribe has recommended that the EPA designate as attainment.
8) Recommended Nonattainment Area – an area that a state, territory, or tribe has recommended that the EPA designate as nonattainment.
9) Recommended Unclassifiable Area – an area that a state, territory, or tribe has recommended that the EPA designate as unclassifiable.
10) Recommended Unclassifiable/Attainment Area – an area that a state, territory, or tribe has recommended that the EPA designate as unclassifiable/attainment.
11) Violating Monitor – an ambient air monitor meeting 40 CFR parts 50, 53, and 58 requirements whose valid design value exceeds 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.
12) We, our, and us – these refer to the EPA.

3. Technical Analysis for the Goodhue County Area

3.1. Introduction

The EPA must designate the Goodhue County area by December 31, 2017, because the area has not been previously designated and Minnesota has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Goodhue County. On May 1, 2017, the EPA received a letter from the USG-Red Wing facility ("USG") accompanying a modeling report for the 2010 SO_2 NAAQS. USG-Red Wing is not a source that was required to be characterized under the EPA's SO_2 Data Requirements Rule (DRR), however, during initial designations, the EPA considers all available relevant information. USG's modeling report did not recommend a specific boundary or designation. In an August 2, 2017, letter, in response to USG-Red Wing's modeling report, Minnesota supplemented its recommendation for the Goodhue County area to recommend unclassifiable/attainment, or unclassifiable if the EPA is not able to agree with that designation. Minnesota explained that the modeling was submitted for a reason unrelated to the designation process, but since learning about the modeled violations, Minnesota has been actively working with USG to address the modeled violations. USG has committed to Minnesota to restrict public access to the area with predicted violations.

3.2. Air Quality Monitoring Data for the Goodhue County Area

This factor considers the SO_2 air quality monitoring data in the area of Goodhue County. There are no SO_2 air quality monitors in Goodhue County. The closest monitor is in neighboring Dakota County, 47 km away from USG-Red Wing, and 25 km from the county border. The monitor is therefore not appropriate for characterizing air quality in Goodhue County.

3.3. Air Quality Modeling Analysis for the Goodhue County Area Addressing USG-Red Wing

3.3.1. Introduction

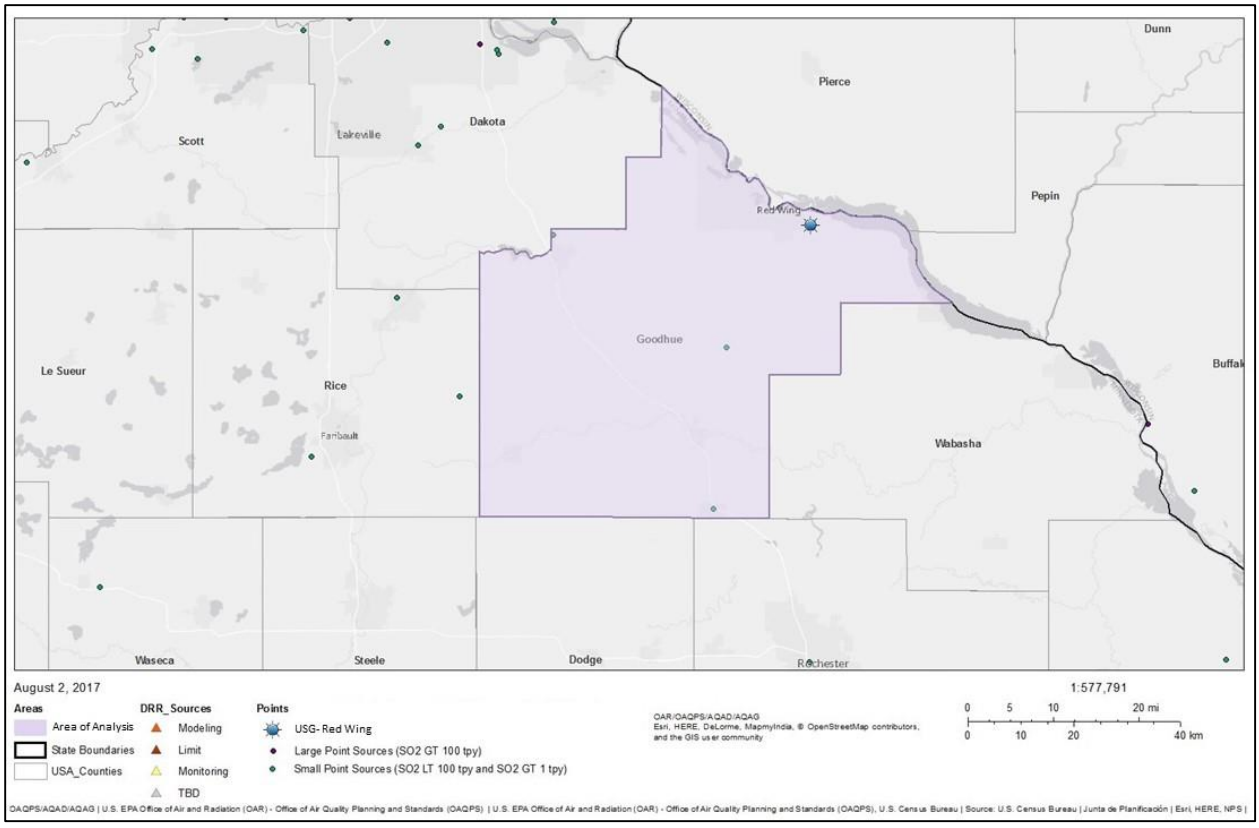
This section 3.3 presents all the available air quality modeling information for a portion of Goodhue County that includes USG-Red Wing. The USG-Red Wing facility is not on the SO_2 DRR Source list. In 2014, the EPA conducted a modeling analysis of USG-Red Wing for enforcement purposes. The EPA's modeling showed a violation of the standard using a stack test and assuming constant operation. The facility responded by conducting their own modeling using actual emissions following the recommendations of the EPA's Modeling TAD which the EPA enforcement modeling generally did not follow. The EPA considers the facility's updated modeling to be the most recent and relevant modeling, and is reviewed below.

This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, USG's supporting documentation, and all available data, the EPA intends to modify the state's

recommendation for the area, and designate the area as nonattainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

The area that USG has assessed via air quality modeling is located in the eastern portion of Goodhue county, along the Mississippi River as seen below in Figure 1. No other sources were considered in USG's modeling.

Figure 1: Map of the Red Wing Area Addressing USG-Red Wing



The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

3.3.2. 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. 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
- BPIPPRM: 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

USG used AERMOD version 16216r, the current regulatory version of the model with the adjusted surface friction velocity (ADJ_U*) parameter. A discussion of USG's approach to the individual components is provided in the corresponding discussion that follows, as appropriate. Modeling files were not provided to the EPA, so all the information below is based on the modeling reports provided to the EPA on July 19, 2016, and updated on May 1, 2017.

3.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the "urban" or "rural" determination of a source is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density.

For the purpose of performing the modeling for the area of analysis, USG ran the model using rural dispersion based on information submitted in their report. In EPA's enforcement modeling, it was determined that rural was appropriate given the lack of any heavy industry or high-density population in the surrounding area. The EPA agrees that rural mode is appropriate for this area.

3.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of 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 concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

For the Goodhue County area, USG has not included any other emitters of SO_2 in the modeling analysis. USG stated that their receptor network was nearly identical to the network used by the EPA in its 2014 enforcement modeling. USG stated that the only difference was excluding non-ambient air receptors over their property. The nested Cartesian receptor grid used by the EPA in its 2014 enforcement modeling, that USG stated they duplicated except for the difference noted above, is as follows:

- Spacing of 20m extending 250m from the source fence line in each direction.
- Spacing of 50m extending from 250m to 500m in each direction
- Spacing of 100m extending from 500m to 1km in each direction
- Spacing of 200m extending from 1km to 2km in each direction
- Spacing of 500m extending from 2km to 15km in each direction

The receptor network contained 5,500 receptors, and the network covered the northeastern portion of Goodhue County extending into Wisconsin.

Figure 2, included in USG's modeling report, shows the receptor grid for the area of analysis.

Consistent with the Modeling TAD, USG placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property, though chose not to exclude receptors from locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. USG did not include receptors within a small area of their fenced property, but did include receptors over water.

Figure 2: Receptor Grid for the Goodhue County Area

The EPA finds the receptor grid spacing and excluded receptors to be appropriate for characterizing the ambient air quality near this facility.

3.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

USG did not include any other sources of SO_2 in the modeling. No other sources of SO_2 over 100 tpy are located anywhere in the county. ADM – Red Wing is 5 km away from USG-Red Wing and emitted 6 tons of SO_2 in 2014. The next closest source of SO_2 over 100 tpy is Flint Hills Resources, which emitted 690 tons of SO_2 in 2014, located 50 km northwest of USG-Red Wing in Dakota County.

USG characterized this source within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, USG used actual stack heights in conjunction with actual emissions. USG 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 BPIPPRM (version 04274) was used to assist in addressing building downwash.

Although the nearby source was not included, the background monitor, which will be discussed below in section 3.3.9, is located near the larger Flint Hills Resources facility. Therefore, the EPA agrees that the addition of a representative background concentration accounts for potential impacts from this facility. The EPA finds USG appropriately characterized its emission points in the modeling analysis.

3.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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, USG did not include any other emitters of SO_2 in the area of analysis. USG has chosen to model using actual emissions. USG's modeling analysis used annual actual SO_2 emissions between 2014 and 2016 which are summarized in Table 2 below. A description of how USG obtained hourly emission rates is given below this table.

Table 2. Actual SO_2 Emissions Between 2014 – 2016 from USG.

	SO_2 Emissions (tpy)		
Facility Name	**2014**	**2015**	**2016**
USG-Red Wing	451.6	527.2	464.9

For USG, the actual hourly emissions data were obtained by creating hourly emissions inventories from multiplying actual hourly melt tonnage by emissions factors determined by stack tests for the cupolas and the blow chamber stacks. Stack parameters were held constant and duplicated from the EPA's 2014 enforcement modeling. The EPA finds USG's emissions were adequately characterized.

3.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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.

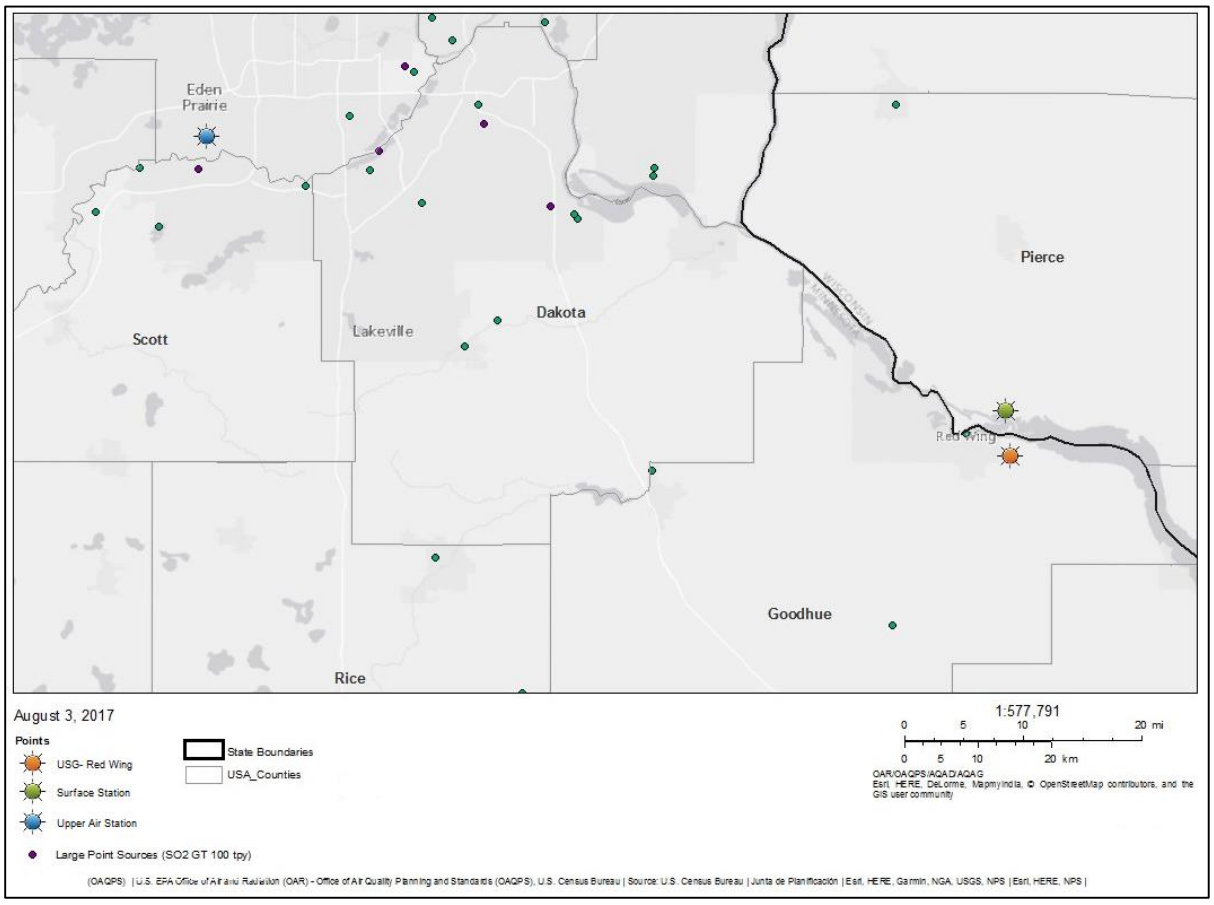
For the area of analysis for the Goodhue County area, USG selected the surface meteorology from the Red Wing Regional Airport in Bay City, Wisconsin, (KRGK), located just across the Mississippi river, about 3 km north of the USG facility. Upper air observations were from the Chanhassen NWS site (KMPX), located roughly 90 km to the west-northwest of the USG facility. While the Red Wing Airport NWS site is certainly representative from a location standpoint, it was found to be missing a considerable amount of wind data. Based on the USG report, the surface data had 26 percent of the wind parameters listed as missing. The company supplemented the missing data using prognostic meteorological data generated by the MM5 (5th Generation Penn State/NCAR Mesoscale Model) meteorological model. The MM5 model was run by a third party and the required meteorological parameters were extracted from the grid cell centered on the USG main stack location. Specific information about how the MM5 model was run and how well it performs in the area was not provided to the EPA. While the EPA has

concerns about the use of the prognostic meteorology in this modeling analysis, it does allow for a reasonable estimate of air concentrations showing a violation of the SO_2 NAAQS in the area.

While it is likely USG used AERSURFACE in the development of the meteorological data set, no information on the parameters or conditions selected was provided in the modeling report provided to the EPA.

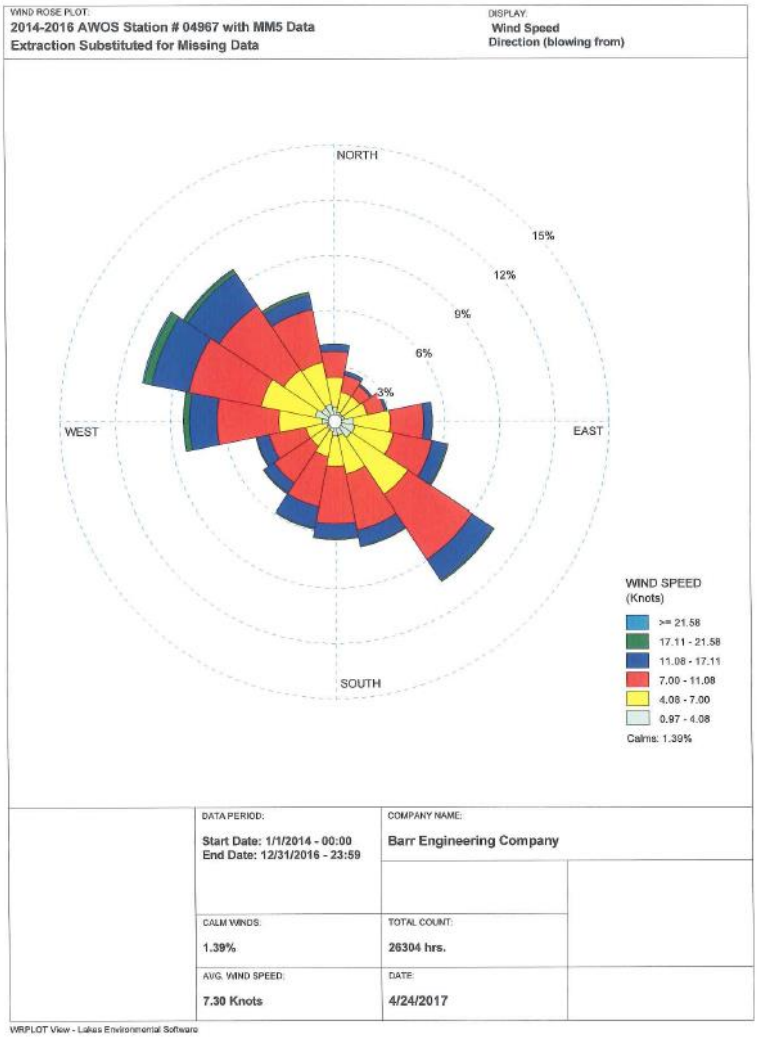
In the figure below, generated by the EPA, the locations of these NWS stations is shown relative to the area of analysis.

Figure 3: Area of Analysis and the NWS stations in the Goodhue County Area



As part of its analysis, USG provided the 3-year surface wind rose for the Red Wing Regional Airport, supplemented by MM5 prognostic data. In Figure 4, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. While winds blow from all directions during the year, the wind rose shows a predominantly northwest-southeast oriented direction. USG attributes the orientation of the predominant winds primarily to the nearby river valley. This certainly contributes significantly to the orientation, however, it's interesting to note the predominant large scale wind direction in this part of Minnesota is also a northwest-southeast orientation. The number of calm hours in the surface data drops from over 20% to just over 1% with the addition of the MM5 wind parameters.

Figure 4. Goodhue County Cumulative Annual Wind Rose for Years 2014 – 2016



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor (version 16216). The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. No specific information was provided by USG regarding the detailed methodology followed in processing the meteorological data.

As noted above, USG did not provide specific details regarding the processing of their meteorological data. In general, their approach involved use of the nearby Red Wing Regional Airport NWS site for surface meteorological parameters. This set includes a significant percentage of missing data. The surface file missing hours were augmented using parameters generated by the MM5 prognostic meteorological model. While we continue to have concerns about how the meteorological data was generated and used, the results provide a reasonable assessment that emissions from USG show modeled violations of the 1-hour SO_2 NAAQS.

3.3.8. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as moderately complex. Elevation increases within a couple kilometers to the east, west, and south are in the 100 m range. To the north, a hill rises roughly 70 m about 0.5 km away from the facility. While USG indicated that they used AERMAP to generate the receptor elevations, no details regarding the inputs to AERMAP were provided to the EPA.

3.3.9. 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 "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99^{th} percentile monitored concentrations by hour of day and season or month. For this area of analysis, USG chose a tier 2 approach based on a monitor in Dakota County (AQS ID 27-037-0443) using data from 2013-2015. This monitor is located about 1.6 km to the southwest of the Flint Hills Resources refinery. Specific maximum and minimum background values were not included in the report. An example concentration for the area is 2 ppb for February for 10 am to 11 am. While the EPA does not have the full set of background values used by USG, the EPA did confirm the valid design value for this monitor for 2014-2016 was 3 ppb which is a reasonable background concentration for this area of rural Minnesota. Given the example concentration provided of 2 ppb is very close to the design value, the EPA finds the approach followed by USG is likely adequate for characterizing the background concentrations for the area.

3.3.10. Summary of Modeling Inputs and Results

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

Table 3: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Goodhue County Area

Input Parameter	Value
AERMOD Version	16216r (with ADJ_U*)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	3
Modeled Structures	Downwash was modeled but number of structures is unknown.
Modeled Fencelines	1
Total receptors	5,500
Emissions Type	Actual
Emissions Years	2014-2016
Meteorology Years	2014-2016
NWS Station for Surface Meteorology	Red Wing Regional Airport in Bay City, WI (KRGK) with prognostic (MM5) data
NWS Station Upper Air Meteorology	Chanhassen NWS site (KMPX)
NWS Station for Calculating Surface Characteristics	Unknown
Methodology for Calculating Background SO_2 Concentration	Tier 2 based on Dakota County (AQS Site No. 27-037-0443)
Calculated Background SO_2 Concentration	Variable (Range unknown)

The results presented below in Table 4 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 4: Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over 3 Years for the Area of Analysis for the Goodhue County Area

		Receptor Location UTM zone 15		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	**Data Period**	**UTM Easting (m)**	**UTM Northing (m)**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2014-2016	541073.9	4934015.5	219.5	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 $\mu g/m^3$ conversion factor

USG's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 219.5 µg/m^3, equivalent to 83.81 ppb. This modeled concentration included a background concentration of SO_2, and is based on actual emissions from the facility. Figure 5 below was included as part of USG's submittal, and indicates that the predicted design value occurred about 200 meters north of the facility. A portion of USG's receptor grid is also shown in the figure.

Figure 5: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over 3 Years for the Area of Analysis for the Goodhue County Area

The modeling submitted by USG indicates that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration. The modeling results also include the area in which a NAAQS violation was modeled, information that is relevant to the selection of the boundaries of the area that will be designated.

3.3.11. The EPA's Assessment of the Modeling Information Provided by USG

Although the EPA did not have access to the actual modeling files to verify the inputs or results of the modeling, from the information available in the modeling report, the EPA believes that USG appropriately followed the Modeling TAD and Appendix W in most respects, including important components of a modeling assessment such as models used, emission estimates, and background concentrations. The main areas that EPA does not have enough information to agree

with USG on is the data set used for meteorological data and the variable background concentrations used. However, overall, the EPA believes this is a reasonable characterization for Goodhue County that demonstrates a violation of the standard.

3.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Goodhue County Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

3.5. Jurisdictional Boundaries in the Goodhue County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Minnesota recommended that the EPA designate Goodhue County as either unclassifiable or unclassifiable/attainment. The boundaries of Goodhue County are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

3.6. Other Information Relevant to the Designations for the Goodhue County Area

The modeling originally conducted by the EPA for enforcement purposes used AERMOD version 15181 and AERMET version 14134. Emissions used in the modeling were generated from stack test data and modeled as a continuous emission rate. Stack parameters were also determined from the stack test results. A receptor grid consisting of 5,500 receptors, including terrain elevations was utilized. This is the same receptor grid used by USG except for minor revisions as noted in Section 3.3.4. The meteorology used in the EPA modeling was processed by the state and consisted of surface data collected at the Minneapolis/St. Paul NWS station with upper air data collected at the Chanhassen NWS site. Five years of meteorology was used in the EPA modeling. Information on how surface characteristics were processed in AERSURFACE is unavailable. The predicted 99^{th} percentile daily maximum concentration averaged over 5 years was 903.4 $\mu g/m^3$. This value did not include a background concentration.

USG's modeling was in response to the enforcement modeling conducted by the EPA in 2014. USG's modeling is a more refined and accurate characterization of actual emissions for the area that more closely followed the Modeling TAD. Therefore, this chapter review focused on the USG modeling as most representative of current air quality in the area. USG's modeling report did mention a second run using the unapproved LOWWIND3 beta modeling option. However, this is an alternate non-regulatory model option and USG did not receive the necessary EPA concurrence to use it for regulatory purposes, therefore that modeling run was not considered in

this document. The use of the LOWWIND3 option was the only difference in USG's subsequent modeling runs.

3.7. The EPA's Assessment of the Available Information for the Goodhue County Area

Initial EPA modeling conducted for enforcement purposes showed a violation of the SO_2 NAAQS. Based primarily on refined emission estimates, the best available evidence regarding current air quality in Goodhue County is the modeling provided by USG. There is no available nearby monitoring information. The modeling mostly follows the recommendations in the Modeling TAD and Appendix W. Despite the model component where the EPA does not have sufficient information to fully agree with USG's modeling, the source of meteorological data, for the reasons explained in Section 3.3.7, the EPA finds the available modeling is still an adequate characterization of air quality for the area showing violations of the standard.

The modeling domain included the northeastern portion of the county. However, the EPA did not find any other sources of SO_2 in or near the county that were likely to cause or contribute to a violation of the standard within the county.

On August 2, 2017, Minnesota supplemented their recommendation for the Goodhue County area to recommend unclassifiable/attainment, or unclassifiable if the EPA is not able to agree with that designation. Minnesota's recommendation is based on progress Minnesota has made in working with USG to address the modeled violations.

The EPA believes that our intended nonattainment area, bounded by Goodhue County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended nonattainment area.

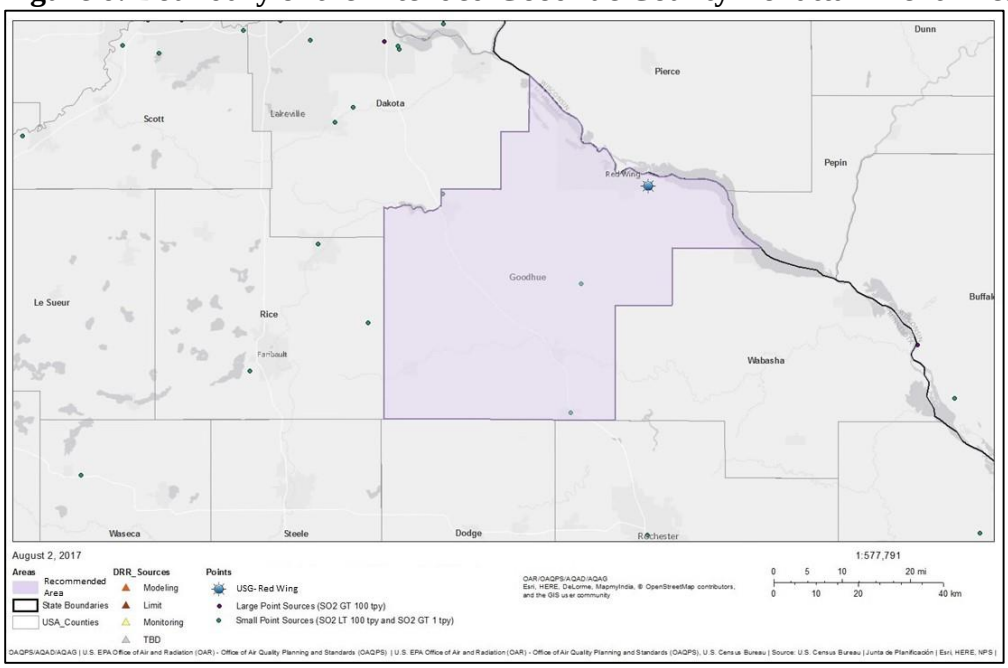
3.8. Summary of Our Intended Designation for the Goodhue County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to modify the state's recommendation to designate the Goodhue County area as nonattainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of Goodhue County. Figure 6 shows the boundary of this intended designated area. The EPA finds that based on USG's analysis, Goodhue County meets the EPA's definition of a nonattainment area since, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area either: (1) does not meet the 2010 SO_2 NAAQS, or (2) contributes to ambient air quality in a nearby area that does not meet the NAAQS.

Minnesota has recommended a designation of attainment/unclassifiable for Goodhue County. In considering the state's recommendation, we have taken into account all available information, including any current (2014-2016) air monitoring data, and any air dispersion modeling analyses provided by Minnesota or by a third party. The air dispersion modeling data show either that Goodhue County may be violating the 2010 primary SO_2 NAAQS or contains sources that may

be contributing to air quality in a nearby area that may be violating the 2010 primary SO_2 NAAQS, which would require a modification of the recommended designation. We invite Minnesota to review the available information and further discuss this issue with EPA in order to inform an appropriate final designation.

Figure 6: Boundary of the Intended Goodhue County Nonattainment Area



4. Technical Analysis for the Cook County Area

4.1. Introduction

The EPA must designate the Cook County, Minnesota, area by December 31, 2017, because the area has not been previously designated and Minnesota has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Cook County.

4.2. Air Quality Monitoring Data for the Cook County Area

This factor considers the SO_2 air quality monitoring data in the area of Cook County. There are no SO_2 air quality monitors in Cook County or any of the surrounding counties.

4.3. Air Quality Modeling Analysis for the Cook County Area

4.3.1. Introduction

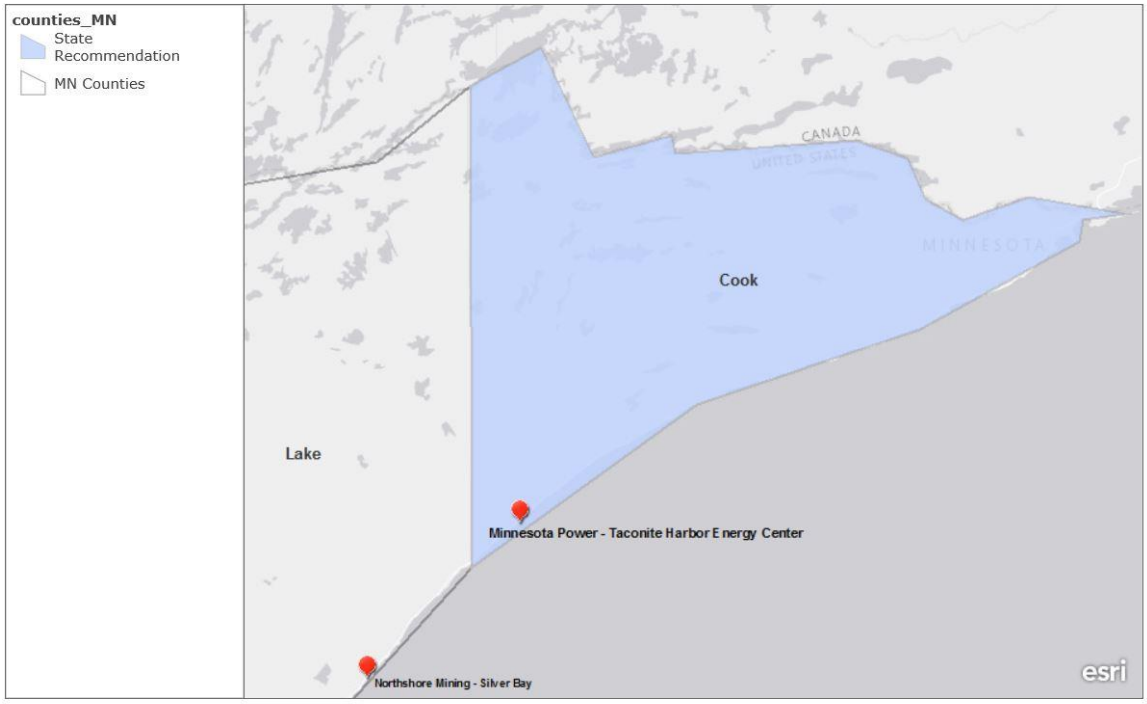
This section 4.3 presents all the available air quality modeling information for Cook County. This area contains Minnesota Power's Taconite Harbor Energy facility ("Tac Harbor") which emits 2,000 tons or more annually. Specifically, Tac Harbor emitted 2,944 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Minnesota has chosen to characterize it via modeling. No other party has submitted modeling or other information regarding SO_2 air quality near this facility.

In its submission, Minnesota recommended that an area that includes the area surrounding Tac Harbor, specifically the entirety of Cook County, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing allowable emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

The area that the state has assessed via air quality modeling is located in Cook County, the northeastern most county in Minnesota, bordered by Lake Superior and Canada.

As seen in Figure 7 below, Tac Harbor is located in Schroeder, Minnesota, in the southwestern corner of Cook County along Lake Superior. The next closest source of SO_2 with emissions over 100 tpy is 38 km away and was not included in the modeling. Section 4.3.4 discusses the state's selected area of analysis and rationale for not explicitly modeling this source. Also included in the figure is the state's recommended area for the attainment designation.

Figures 7: Map of the Cook County, Minnesota Area Addressing Tac Harbor and State Designation Recommendation



Minnesota reviewed and submitted modeling conducted by a contractor on the behalf of Tac Harbor. Because the modeling was submitted as part of the state's official recommendation, it will from here on be referred to as the state's modeling. The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

4.3.2. 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. 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
- BPIPPRM: 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

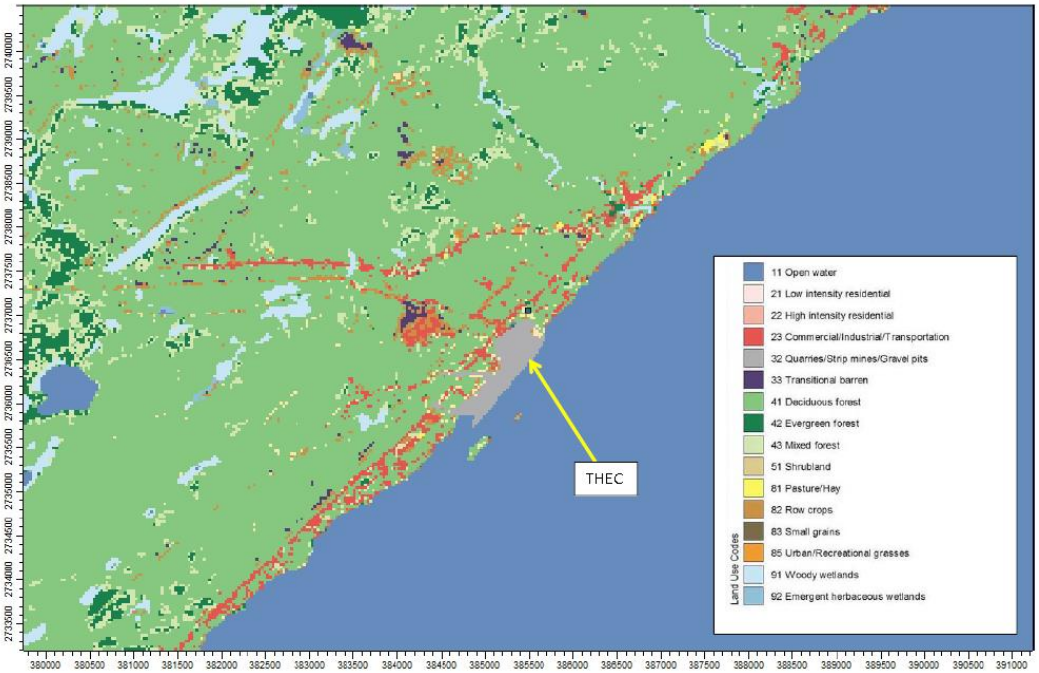
The state used AERMOD version 12345. The state relied on modeling that was submitted to EPA in 2015. The current version of AERMOD at the time was used in the modeling. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A significant difference between version 16216r and older versions applies to the use of the adjusted friction velocity (ADJ_U*) parameter in AERMET. The Cook County area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

4.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. The state included a land use figure seen below in Figure 8, to support this conclusion. The figure shows that the area around the facility is free of any high density population or heavily industrialized regions. The image supports the use of rural dispersion in modeling for this facility. The EPA finds the state's use of rural dispersion characteristics appropriate for this area.

Figure 8: Land Use Near Tac Harbor



4.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of 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 due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Cook County area, the state did not include any other nearby emitters of SO_2. The state determined that there were no emitters of SO_2 near the source or area of characterization. The next closest source is Northshore Mining-Silver Bay, located 38 km from Tac Harbor, in neighboring Lake County. Northshore Mining emitted 2,369 tons in 2014, it was originally listed as subject to the DRR for emissions greater than 2,000 tons. The state requested that it be delisted because its 2015 emissions were 1,586 tons, and under a new state administrative order and power agreement the operations and thereby emissions would sharply decrease over the next few years. In a June 22, 2016, letter to the state, the EPA concurred with removing the source from DRR characterization obligations because of the measures taken by the state and source. Specifically, because Northshore Mining is sufficiently distant to the area of expected maximum impacts near Tac Harbor, because emissions from Northshore Mining are already sharply declining and are expected to continue to decline, and because, as described in the state's January 2017 submittal, the local wind patterns are such that areas of combined impacts are not likely to occur, the state did not explicitly model this source with Tac Harbor and instead characterized it as part of the background concentration. For these reasons, the EPA finds the state's area of analysis and selected sources adequate for characterizing air quality around Tac Harbor.

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

-25 m spacing along the fence line and on non-fenced property
-20 m spacing from the facility boundary to 0.5km from facility
-50 m spacing from 0.5km to 3.5 km
-100 m spacing from 3.5km to 5.5 km
-250 m spacing from 5.5 km to 10.5 km
-500 m spacing from 10.5 km to 20.5 km

The receptor network contained 9,674 receptors, and the network covered a 20 km radius from the facility covering the southwestern portion of Cook County and extends into the southeastern portion of Lake County.

Figure 9, included in the state's recommendation, shows the state's chosen area of analysis surrounding Tac Harbor, as well as the receptor grid for the area of analysis. Figure 10, also provided by the state is a close up of the receptor grid near the facility.

Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air. While Section 4.2 of the Modeling TAD supports exclusion of receptors over water bodies, for Tac Harbor the state elected to include receptors over Lake Superior. In response to EPA comments regarding adequate fencing around the facility, the state conducted supplemental modeling to include receptors on Tac Harbor property. The results of the modeling showed concentrations on property were well below the NAAQS and that the design value concentration continued to be located off the property to the northeast.

Figure 9: Receptor Grid for the Cook County Area

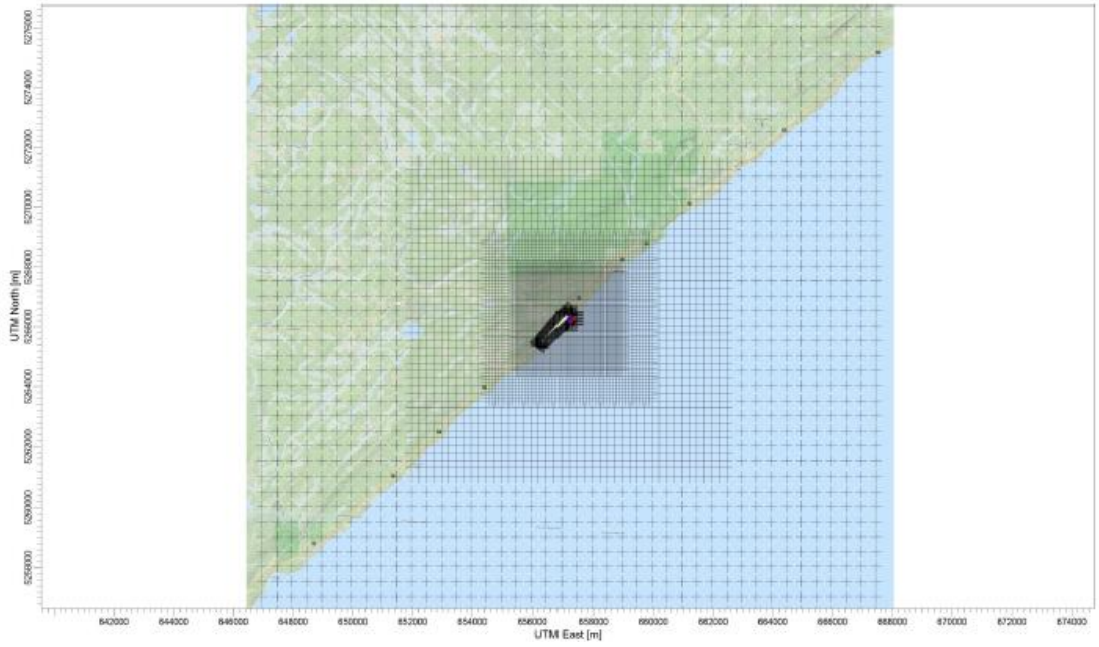
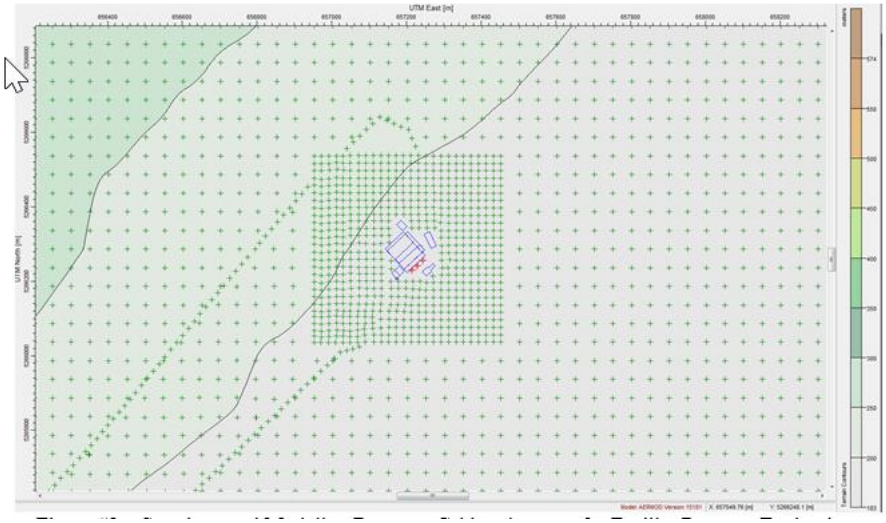


Figure 10: Supplemental Receptor Grid on Facility Property



The EPA finds the receptor grid spacing and receptor placement to be appropriate for characterizing the ambient air quality near this facility.

4.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

For this area, only Tac Harbor was included in the area modeling. No other sources of SO_2 over 100 tpy are located within Cook County. The next closest source of SO_2 is North Shore Mining, 38 km away from Tac Harbor, which emitted 1,586 tons of SO_2 emissions in 2015. At a distance of 38 km, the modeled contribution to the Tac Harbor area is expected to be minimal.

The state characterized Tac Harbor within the area of analysis in accordance with the best practices outlined in the Modeling TAD. The state did not model stack heights that exceeded the GEP stack height, following the EPA's GEP policy in conjunction with allowable 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 BPIPPRM (version 04274) was used to assist in addressing building downwash. The EPA found the source characterization used in this model to be appropriate.

4.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most

recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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 Tac Harbor and no other emitters of SO_2 within the area of analysis. The state has chosen to model this facility using the most recent federally enforceable PTE limits for SO_2 emissions. The facility in the state's modeling analysis and its associated PTE rates are summarized below in Table 5. A description of how the state obtained hourly emission rates is given below this table.

Table 5: SO_2 Emissions based on PTE from Facilities in the Cook County Area

Facility Name	SO_2 Emissions (tpy, based on PTE)
Minnesota Power- Taconite Harbor Energy	2,895
Total Emissions from All Modeled Facilities in the Area of Analysis	2,895

The PTE in tons per year for Tac Harbor was determined by the state based on modeling the permitted emissions rate limit of 330.48 lbs/hr for each unit twenty-four hours a day for 365 days a year. Emissions were assumed to be the same in each modeled year. This limit was effective in a federally enforceable permit issued September 1, 2016. The limit was issued as a Title I condition in the facility's Title V operating permit[5], which, in Minnesota, means the limit is permanent and federally enforceable even if the operating permit expires. The EPA finds the use of these allowable emissions for Tac Harbor an appropriate emissions characterization for the Cook County area.

4.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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.

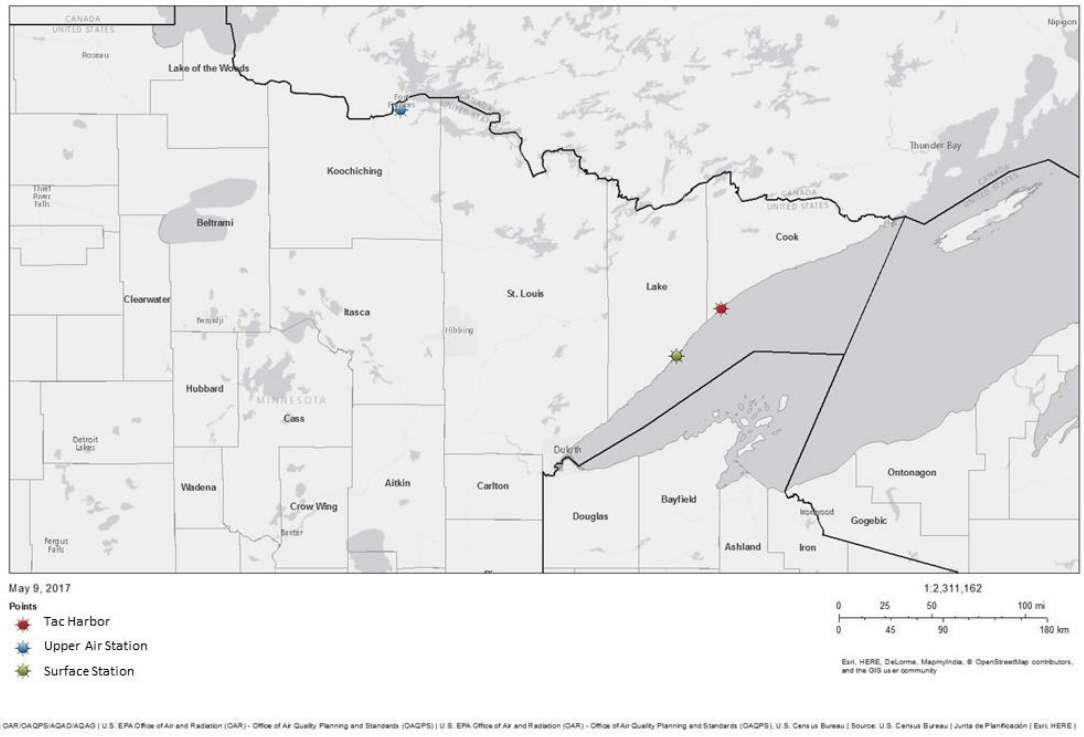
[5] Permit No. 03100001-009

For the area of analysis for the Cook County area, the state used data from the surface meteorological station that is on the site of Northshore Mining in Silver Bay, Minnesota, located at 47.2855 N and 91.2539 W, 37 km southwest of Tac Harbor, and coincident upper air observations from Falls International Airport, in International Falls, Minnesota, located at 48.561389 N, 93.398056 W, 135 km northwest of Tac Harbor, as best representative of meteorological conditions within the area of analysis. Based on information from the state, the North Shore Mining meteorological station is operated by the facility with the data being forwarded to the state. The state was involved in the setup to ensure it met EPA standards.

The state used AERSURFACE version 13016 using data from the Northshore Mining station to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, and average conditions as well as monthly characterization of snow cover. Albedo and Bowen ratio were generated for a 10 km by 10 km area centered on the meteorological tower. Yearly averaged moisture conditions were used to aid in the determination of the Bowen ratio. All parameters were generated using 1992 USGS land use, land cover data.

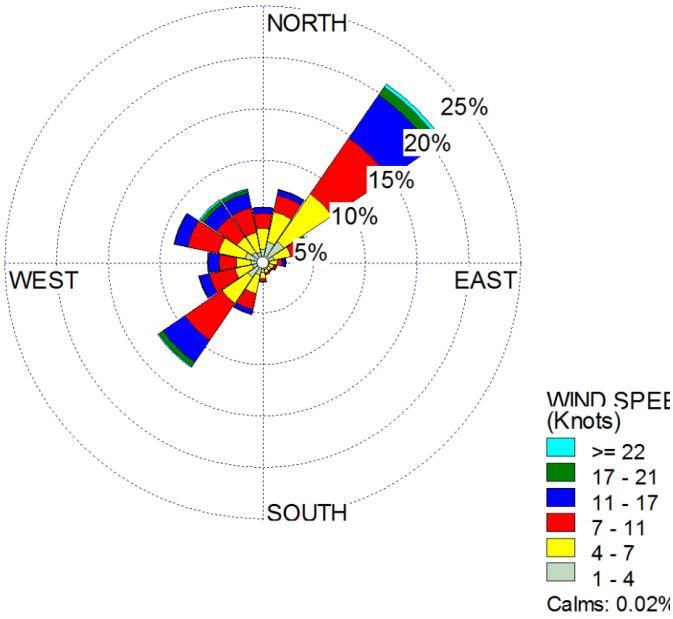
In the figure below, generated by the EPA, the locations of the surface meteorological data station in Silver Bay and the upper air station in International Falls are shown relative to the Cook County area of analysis.

Figure 11: Area of Analysis and the Surface and Upper Air Stations in the Cook County Area



In Figure 12, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing for the Northshore Mining station. Winds occur most frequently from the northeast.

Figure 12: Cook County Area Cumulative Annual Wind Rose for Years 2008 – 2012



Meteorological data from the above site-specific surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor (version 12345). The was the latest AERMET version available when the meteorological data was processed by the state in the spring of 2014. No beta options were used in the processing of the meteorological data. 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 AERMET User's Guide, Appendix W and the Region 5 Meteorological Data Processing Protocol document in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. As noted above, the state used surface meteorological data collected at a location roughly 23 miles from the facility. The state examined all available meteorological stations in the region, and based on distance from the facility, proximity to Lake Superior, and similarity of land use characteristics, chose the North Shore Mining meteorological data as the most representative.

The state used five years of meteorological data, from 2008 to 2012. Ordinarily, modeling three years results in less reliance on older emissions data, thus providing a more current assessment of air quality. However, this advantage of a shorter modeling period does not apply here, because Minnesota was modeling allowable emissions. Thus, modeling five years is a fully appropriate means of assessing the potential for violations in Cook County.

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 1-minute duration was provided from the Northshore Mining Station, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. AERMINUTE was not used for processing the meteorological data for this facility because site-specific data was used and inappropriately classified calm and missing hours were not an issue. As illustrated in the wind rose above, less than 1% of the hours are classified as calm. The EPA finds the weather station selection, processing of the met data, and duration of modeled period to be reasonable and appropriate to be representative of the area.

4.3.8. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as flat to gently rolling. To account for these terrain changes, the AERMAP (version 11103) 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. The EPA finds this to be an appropriate processing of the simple terrain in the area.

4.3.9. 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 "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose a tier 1 approach. However, since there are no monitors near Tac Harbor, an average of two monitors near the Flint Hill Refinery (monitors FHR 442 and FHR 443) was used for the 2011 to 2013 period. These are monitors located in Dakota County, south of St. Paul, in the vicinity of the refinery. There are two additional monitors in the Dakota County area but both are sited about 1 km or less from the refinery in the predominant downwind directions. The monitors selected for background, while still close to the refinery, should be more reflective of regional background conditions. The single value of the background concentration for this area of analysis was determined by the state to be 6.5 micrograms per cubic meter ($\mu g/m^3$), equivalent to 2.5 ppb when expressed in two significant figures,[6] and that value was incorporated into the final AERMOD results. As detailed in Section 4.3.4, the state did not explicitly include in the modeling the one nearby source, Northshore Mining, and instead elected to characterize it through the background concentration for the area. For the reasons explained in that section, the EPA concurs with the state's decision to not explicitly model Northshore Mining. The EPA finds the approach explained above to be adequate for characterizing the background concentrations for the area.

[6] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 $\mu g/m^3$.

4.3.10. Summary of Modeling Inputs and Results

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

Table 6: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Cook County Area

Input Parameter	Value
AERMOD Version	12345 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	3
Modeled Structures	5
Modeled Fencelines	1
Total receptors	9,674
Emissions Type	PTE
Emissions Years	Effective September 1, 2016
Meteorology Years	2008-2012
Station for Surface Meteorology	Northshore Mining On-Site
NWS Station Upper Air Meteorology	International Falls Airport (KINL)
Station for Calculating Surface Characteristics	Northshore Mining On-Site
Methodology for Calculating Background SO_2 Concentration	Tier 1, averaged between two monitors (FHR 442-443)
Calculated Background SO_2 Concentration	2.5 ppb

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

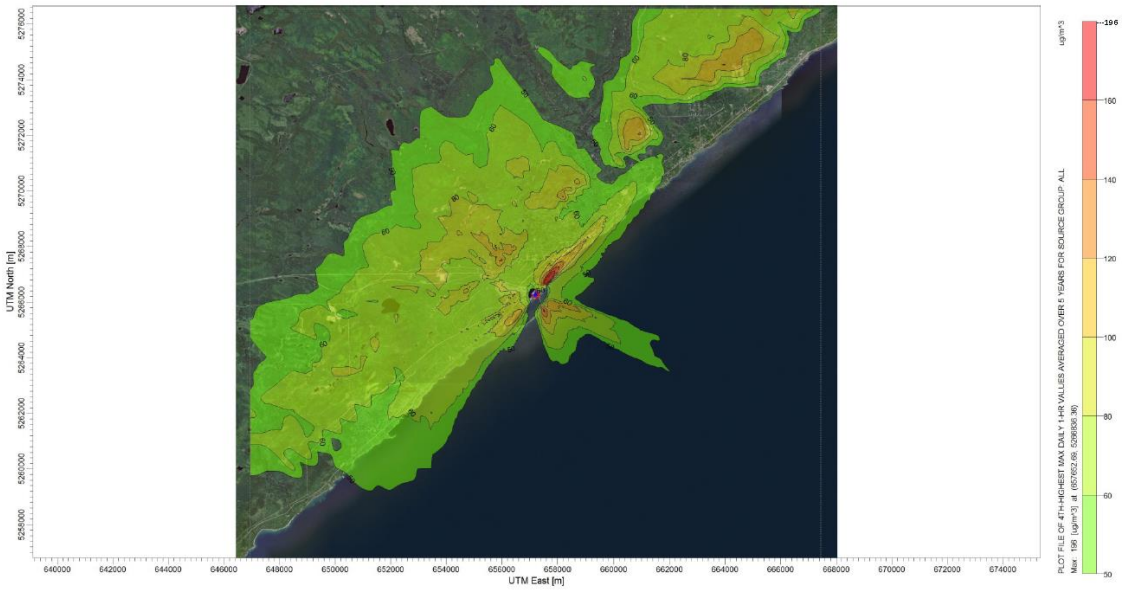
Table 7. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over 5 Years for the Area of Analysis for the Cook County Area

Averaging Period	Data Period	Receptor Location UTM zone 15		99th percentile daily maximum 1-hour SO_2 Concentration($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2008-2012	657652.69	5266836.36	196.1	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 $\mu g/m^3$ conversion factor.

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 196.1 $\mu g/m^3$, equivalent to 74.9 ppb. This modeled concentration included the background concentration of SO_2, and is based on PTE emissions from the facility. Figure 13 below was included as part of the state's recommendation, and indicates that the predicted value occurred 0.67 km north east of Tac Harbor.

Figure 13: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over 5 Years for the Area of Analysis for the Cook County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is not violated in this area.

4.3.11. The EPA's Assessment of the Modeling Information Provided by the State

The modeling conducted by the state for the area around Tac Harbor followed the recommendations in the Modeling TAD. The important components of a modeling assessment, i.e., models used, meteorology, emission estimates, nearby sources modeled, and background concentrations, all adequately comply with the TAD and with general modeling expectations.

4.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Cook County Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

4.5. Jurisdictional Boundaries in the Cook County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Minnesota recommended that the EPA designate Cook County as attainment. The boundaries of Cook County are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

4.6. Other Information Relevant to the Designations for the Cook County Area

The EPA has received no third party modeling or other relevant information for this area.

4.7. The EPA's Assessment of the Available Information for the Cook County Area

The best available evidence regarding air quality in Cook County is the modeling provided by Minnesota. The modeling reflected the recommendations of the TAD and provides a reliable assessment that supports Minnesota's recommended finding that the modeled portion of this area is attaining the standard. There is no available nearby monitoring information.

In its January 13, 2017, submittal, Minnesota provided a recommendation of attainment for the entirety of Cook County. This recommendation was supported by modeling of allowable emissions that were effective in September 2016. The modeling domain included the southwestern portion of the county. There are no other sources of SO_2 in or near the county that were required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may not be meeting the NAAQS, or contribute to ambient air quality in a nearby area that does not meet the NAAQS. And for the reasons explained in the above sections, the nearest source, Northshore Mining, was not explicitly modeled but was treated as part of the background concentration, which the EPA concurs is a reasonable approach. The EPA believes, as a result, that Minnesota's modeling, showing southwestern Cook County to be attaining, also supports a conclusion that the remainder of Cook County attains the standard as well. The closest existing nonattainment areas or remaining undesignated areas are over 200 km away, and therefore too far for emissions in Cook County to constitute any contribution to existing nonattainment areas or remaining undesignated areas. Therefore, the EPA concurs with the state's recommendation and intends to designate the entirety of Cook County as unclassifiable/attainment.

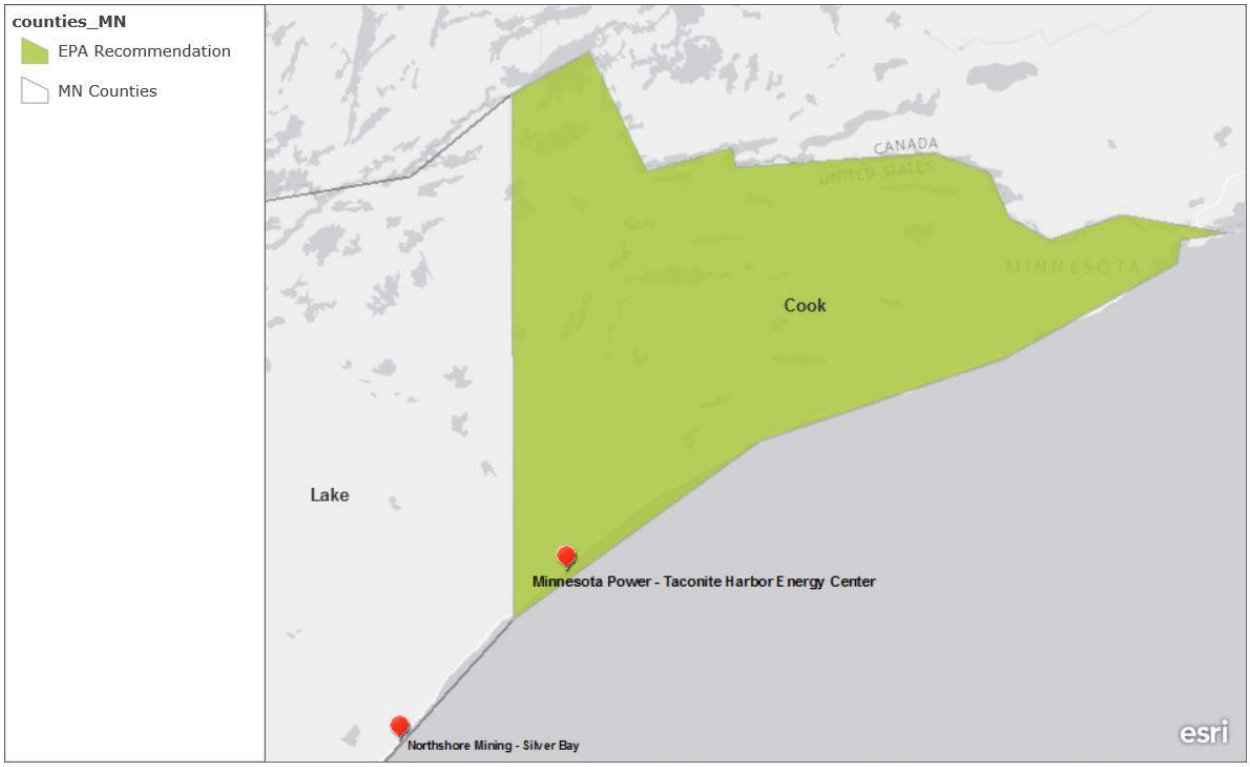
The EPA believes that our intended unclassifiable/attainment area, bounded by Cook County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

4.8. Summary of Our Intended Designation for the Cook County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA agrees with the state's recommendation and intends to designate Cook County, Minnesota, as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of Cook County. Figure 14 shows the boundary of this intended designated area.

As described, based on Minnesota's modeling analysis, the EPA finds that based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined Cook County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS.

Figure 14. Boundary of the Intended Cook County Unclassifiable/Attainment Area



Esri, HERE, Garmin, NGA, USGS, NPS | Esri, HERE, NPS

5. Technical Analysis for the Itasca County Area

5.1. Introduction

The EPA must designate the Itasca County, Minnesota, area by December 31, 2017, because the area has not been previously designated and Minnesota has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Itasca County.

5.2. Air Quality Monitoring Data for the Itasca County Area

This factor considers the SO_2 air quality monitoring data in the area of Itasca County. There are no SO_2 air quality monitors in Itasca County or any of the surrounding counties.

5.3. Air Quality Modeling Analysis for the Itasca County Area

5.3.1. Introduction

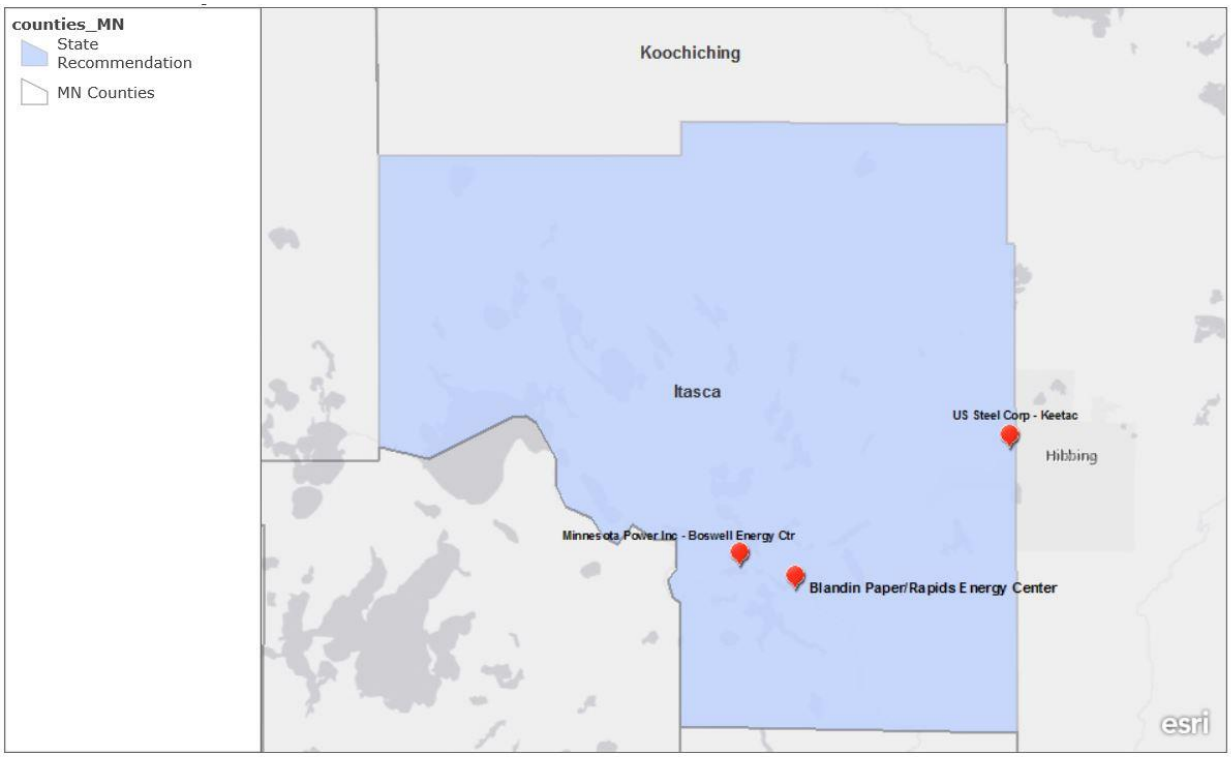
This section 5.3 presents all the available air quality modeling information for Itasca County. This area contains Minnesota Power's Boswell Energy Center ("Boswell"), which emits 2,000 tons or more annually. Specifically, Boswell emitted 2,503.57 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Minnesota has chosen to characterize it via modeling. No other party has submitted modeling or other information regarding SO_2 air quality near this facility.

In its submission, Minnesota recommended that an area that includes the area surrounding Boswell, specifically the entirety of Itasca County, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing allowable emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

The area that the state has assessed via air quality modeling is located in Itasca County, slightly northeast of central Minnesota.

As seen in Figure 15 below, Boswell is located in Cohasset, Minnesota, located in the southern portion of Itasca County. Also included in the figure is the state's recommended area for the attainment designation.

Figure 15. Map of the Itasca County, Minnesota Area Addressing Boswell



Minnesota reviewed and submitted modeling conducted on the behalf of Boswell. Because the modeling was submitted as part of the state's official recommendation, it will from here on be referred to as the state's modeling. The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

5.3.2. 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. 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
- BPIPPRM: 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 12345. The modeling was conducted in June of 2014 in response to Title V requirements. An updated version of AERMOD was available in December of 2013. That version contained miscellaneous bug fixes and enhancements and would not likely have had any significant effect on this modeling. Additionally, the state did not use any beta options in the modeling. The modeling was conducted using allowable emissions and the state determined this modeling is still appropriate. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

5.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. The state did not submit specific information regarding how the rural determination was made. However, examination of the aerial images submitted with the protocol clearly shows that use of either the land use or population density procedure would result in a rural characterization. The EPA finds the use of rural dispersive characteristics appropriate for this area.

5.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of 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 due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Itasca County area, the state has included two other emitters of SO_2 located within 50 km of Boswell. There are no other sources over 10 tpy located within 50 km of Boswell. The state determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to Boswell, the other emitters of SO_2 included in the area of analysis are: U.S. Steel Keewatin Taconite ("Keetac") and Blandin Paper/ Rapids Energy Center ("Blandin Paper"). No other sources were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis.

The grid receptor spacing, using a combination polar and Cartesian grid system, for the area of analysis chosen by the state is as follows:

-10m spacing along the fenceline,
-25m spacing out to a radius of 200m,
-50m spacing out to radius of 500m,
-100m spacing out to a radius of 1km,
-200m spacing out to radius of 2km,
-500m spacing out to radius of 5km,
-1km spacing out to radius of 10km, and
-10km spacing out to radius of 50km.

The receptor network contained 2,307 receptors on a polar grid system, and the network covered the majority of Itasca County and a portion of the neighboring Cass County. Figures 16 and 17 below show the receptor grid across the entire modeled region and a closer view of the grid surrounding the facility.

Figure 16. Full Extent of Receptor grid for the Boswell Area Modeling Domain

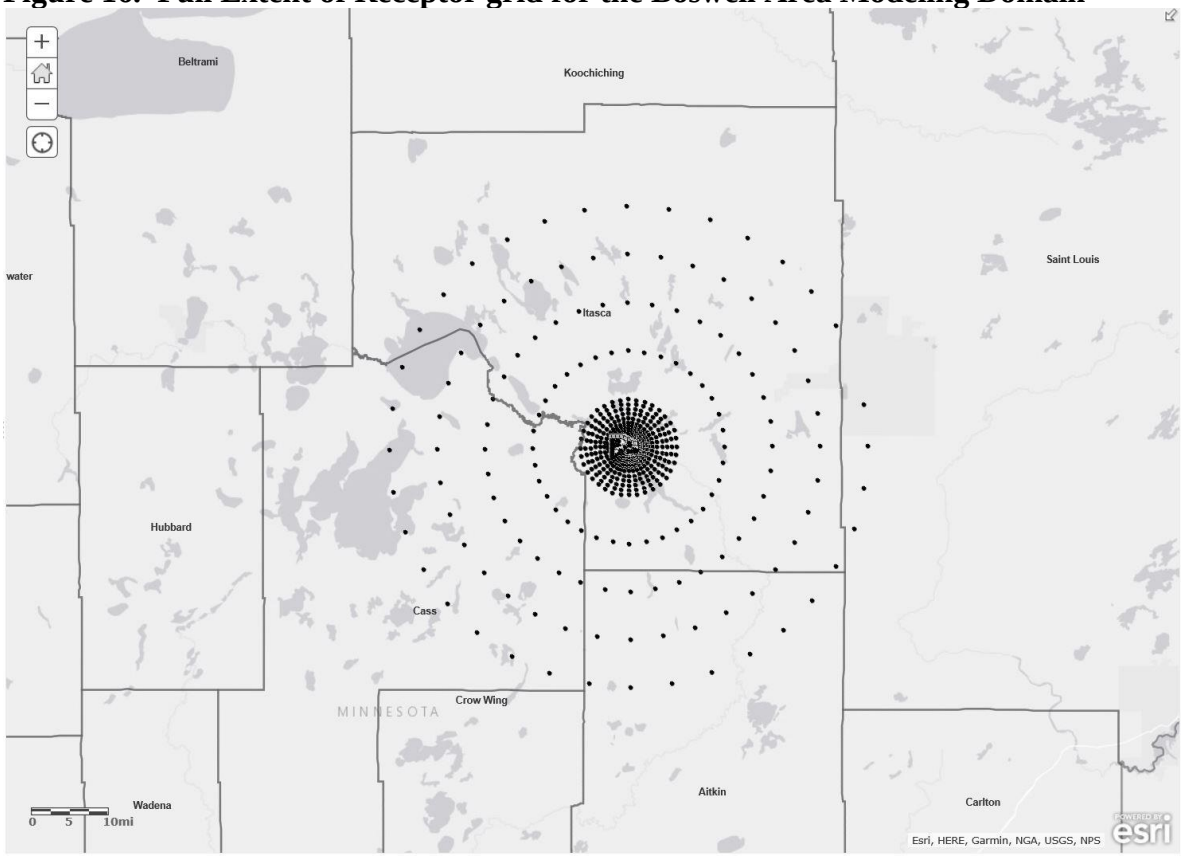
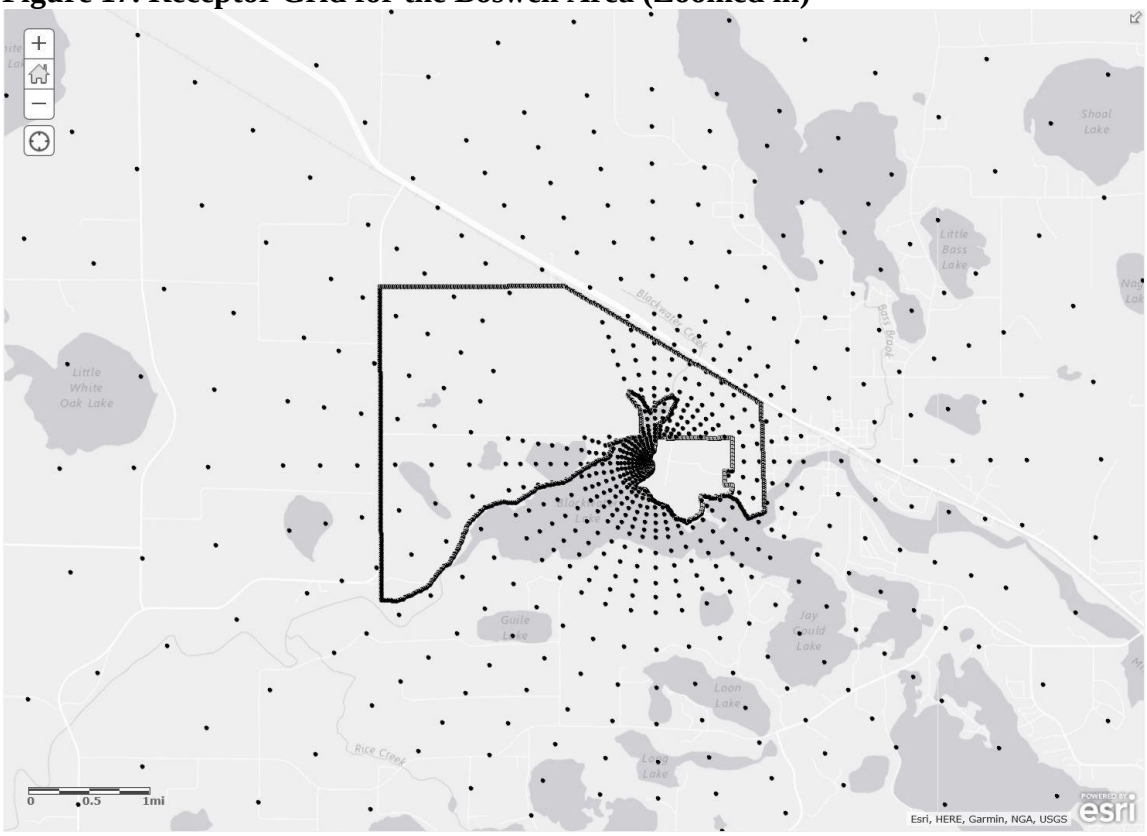


Figure 17. Receptor Grid for the Boswell Area (Zoomed in)



Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property with the exceptions of locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. Based on the state documentation, receptors around Boswell were not included over the ash ponds. According to documentation, the ponds are also surrounding by ash berms which serve to prevent any public access. The state placed receptors at other facility locations. For Boswell, receptors were not included on plant property. While it's unclear from the documentation whether the entire area is fenced, thereby precluding public access, the tall stacks and buoyant plumes result in peak concentrations occurring roughly 3.5 kilometers away, well removed from the property boundary. Specifically, with respect to the exclusion of receptors inside the property boundary, the concentration gradients in the modeled area overall are such that in examining the spatial distribution of impacts, it appears that inclusion of receptors inside the Boswell property boundary would not have shown SO_2 violations. Therefore, the EPA finds that the removal of these receptors does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area.

The receptor grid featured high resolutions receptors near the facility with lower resolution spacing further away. The spacing at the location of the maximum concentration is 500m on a

polar grid. The grid was originally designed for both SO_2 and $PM_{2.5}$ modeling. Although the spacing is not as dense as normally seen in SO_2 modeling in the area of maximum concentration, around 3 km, given the very flat terrain in the area, it's not expected that concentrations would change significantly if a tighter grid had been used. Because the terrain near Boswell is generally flat the EPA finds the receptor grid spacing and excluded receptors to be appropriate for characterizing ambient SO_2 concentrations near this facility.

5.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

For this area, Boswell and two other sources were included in the area modeling. No other sources of SO_2 with emissions over 10 tpy are located within Itasca County. One of the modeled sources, Keetac, is located in neighboring St. Louis County on the county border with Itasca County, but is 47 km from Boswell. The next closest sources of SO_2 are over 50 km away. Modeled impacts from sources located 47 km away are expected to be very small and are near the limit of the distance at which AERMOD is appropriate. However, the state elected to include these sources despite their distance.

The state characterized these sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. The state followed the EPA's good engineering practices (GEP) policy in conjunction with allowable emissions limits. 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 BPIPPRM (version 04274) was used to assist in addressing building downwash. The EPA found the source characterization used in this model to be appropriate.

5.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, a state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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 Boswell and two other emitters of SO_2. The state has chosen to model these facilities using the most recent federally enforceable PTE limits for SO_2 emissions. The facilities in the state's modeling analysis and their associated PTE rates are summarized below.

For Boswell, Keetac, and Blandin Paper, the state provided PTE values. This information is summarized in Table 8. A description of how the state obtained hourly emission rates is given below this table.

Table 8: SO_2 Emissions based on PTE from Facilities in the Itasca County Area

Facility Name	**SO_2 Emissions (tpy, based on PTE)**
Boswell	22,438
Blandin Paper	2,600
Keetac	1,271
Total Emissions from All Modeled Facilities in the Area of Analysis	26,308

The PTE in tons per year for Boswell was determined based on pounds per hour rates that were calculated from maximum heat input multiplied by emission rates (in lb/MMBTU) in their operating permit that are included as Title I conditions. In Minnesota, Title I conditions are federally enforceable and cannot expire even if the operating permit does. Emissions were assumed to be the same in each modeled year. This is an appropriate emissions characterization that follows PSD modeling requirements via Appendix W.

The PTE in tons per year for Blandin Paper was determined by a facility wide summary in a PSD permit. The boiler limits are permanent Title I conditions, and are based on the SO_2 New Source Performance Standards for Fossil-Fuel-Fired Steam Generators (40 CFR §60.43). Emissions were assumed to be the same in each modeled year. This is an appropriate emissions characterization that follows PSD modeling requirements via Appendix W.

The PTE in tons per year for Keetac was determined by converting grams per second rates from NAAQS modeling for PSD purposes to tons per year. The grams per second rates were derived from Title I conditions in their operating permit from the PSD project. Emissions were assumed to be the same in each modeled year. This is an appropriate emissions characterization that follows PSD modeling requirements via Appendix W.

5.3.7. Modeling Parameter: Meteorology and Surface Characteristics

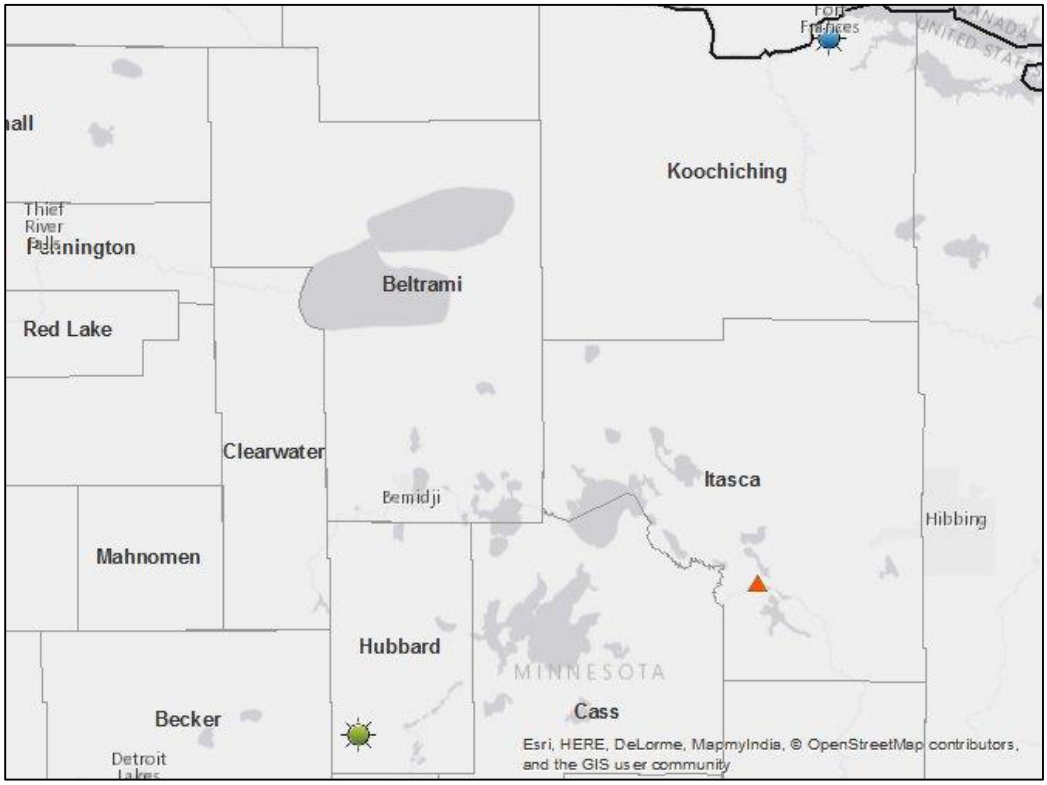
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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 area of analysis for the Itasca County area, the state selected the surface meteorology from the Park Rapids Municipal Airport (KPKD), located at 46.90056 N and 95.06778 W, 113 km southwest of Boswell, and coincident upper air observations from International Falls International Airport (KINL), located at 48.561389 N, 93.398056 W, 144 km north of Boswell, as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the Park Rapids Municipal Airport to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface characteristics for 12 spatial sectors at a monthly temporal resolution using annual estimates for dry, wet, and average conditions. Monthly information on snow cover and vegetative cover was also included. Surface roughness was generated using a radius of 1km from the meteorological tower while Bowen ratio and albedo were calculated for a 10km by 10km area around the tower.

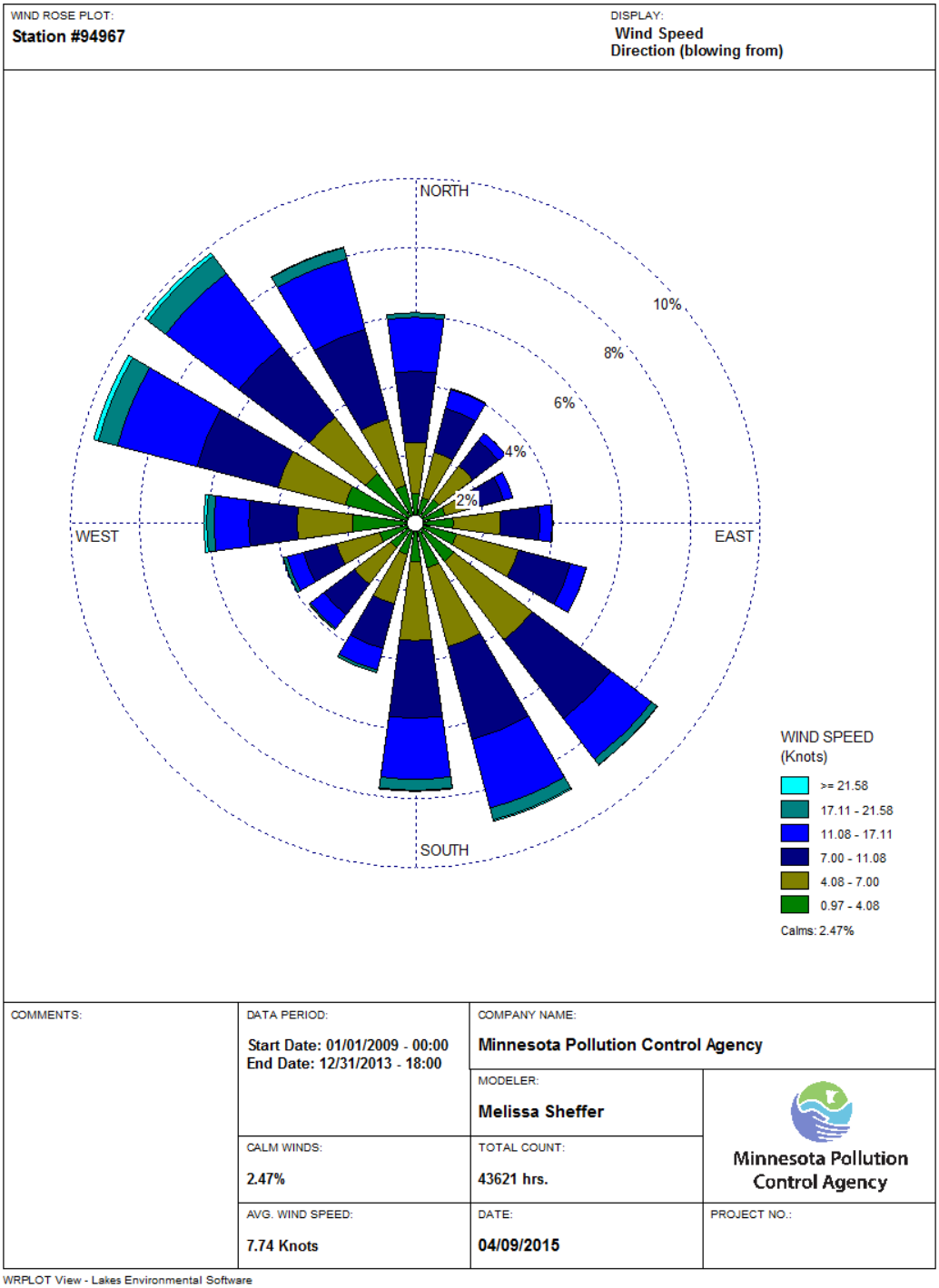
In the figure below, generated by the EPA, the locations of the NWS stations are shown relative to the area of analysis.

Figure 18: Area of Analysis and the NWS stations in the Itasca County Area



In Figure 19, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing for the Park Rapids station. Winds occur from multiple directions, most frequently from the northwest.

Figure 19: Itasca County, MN Cumulative Annual Wind Rose for Years 2009 – 2013



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET (version 14134) 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 presented the AERMET User's Guide, in Appendix W in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. As noted above, the state used NWS surface meteorological data collected at a location roughly 115 miles from the facility. The state examined all available meteorological stations in the region and based on distance from the facility and similarity of land use characteristics, chose the Park Rapids Municipal Airport data as the most representative.

The state used five years of meteorological data, from 2009 to 2013. Ordinarily, modeling three years results in less reliance on older emissions data, thus providing a more current assessment of air quality. However, this advantage of a shorter modeling period does not apply here, because Minnesota was modeling allowable emissions. Thus, modeling five years is a fully appropriate means of assessing the potential for violations in Itasca County. Additionally, five years of meteorological data is considered to be adequate to cover the variety of meteorological conditions expected to exist in an area. The years of data used are recent enough that no significant differences would be expected between current meteorology and the meteorology used in the analysis.

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 1-minute duration was provided from the Park Rapids Station, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. It's unclear from the documentation the version of AERMINUTE used by the state. 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. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data. The EPA finds the weather station selection and processing of the meteorological data to be reasonable and appropriate to be representative of the area.

5.3.8. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as flat to gently rolling. To account for these terrain changes, the AERMAP terrain program, version 11103 was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the National Elevation Database. The EPA finds the approach used to account for terrain elevations in the Boswell modeling appropriate.

5.3.9. 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 "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. The state utilized a "tier 1" approach to determining a representative background concentration for the area of analysis. The single value of the background concentration for this area of analysis was determined by the state to be 23.58 micrograms per cubic meter ($\mu g/m^3$), equivalent to 9.0 ppb when expressed in two significant figures,[7] and that value was incorporated into the final AERMOD results. The background value was selected from a monitor located in Duluth, Minnesota (AQS ID No. 27-137-0018). All other SO_2 monitors in the state of Minnesota are located in the Minneapolis/St. Paul area, with several of those monitors sited near petroleum refineries. The Duluth monitor is closer to the area of analysis but only has valid data for the year 2010. Also, the Duluth monitor should be conservative because it was sited about 1 km from the Duluth Steam plant, an SO_2 source with about 300 tpy of emissions. It's likely the Duluth monitor was significantly impacted by the Duluth Steam facility. Generally, three years of data are used to calculate a design value for background purposes. One year of data was available for the Boswell assessment. However, given the magnitude of the value selected, and the fact that it's very likely conservative, the concentration used is reasonable. The state used the 99th percentile value of that year of data to represent background for the Boswell area, located roughly 100 km to the northwest. The EPA finds the monitored concentration utilized by the state to be adequate for characterizing the background concentrations for the area.

5.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Itasca County area of analysis are summarized below in Table 9.

[7] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 $\mu g/m^3$.

Table 9: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Itasca County Area

Input Parameter	Value
AERMOD Version	12345 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	27
Modeled Structures	45
Modeled Fencelines	1
Total receptors	2,307
Emissions Type	PTE
Emissions Years	PTE with various effective dates
Meteorology Years	2009-2013
NWS Station for Surface Meteorology	Park Rapids Municipal Airport (KPKD)
NWS Station Upper Air Meteorology	International Falls Airport (KINL)
NWS Station for Calculating Surface Characteristics	Park Rapids Municipal Airport
Methodology for Calculating Background SO_2 Concentration	Tier 1 for Duluth Monitor, (AQS ID No. 27-137-0018)
Calculated Background SO_2 Concentration	23.58 $\mu g/m^3$, 9.0 ppb

The results presented below in Table 10 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

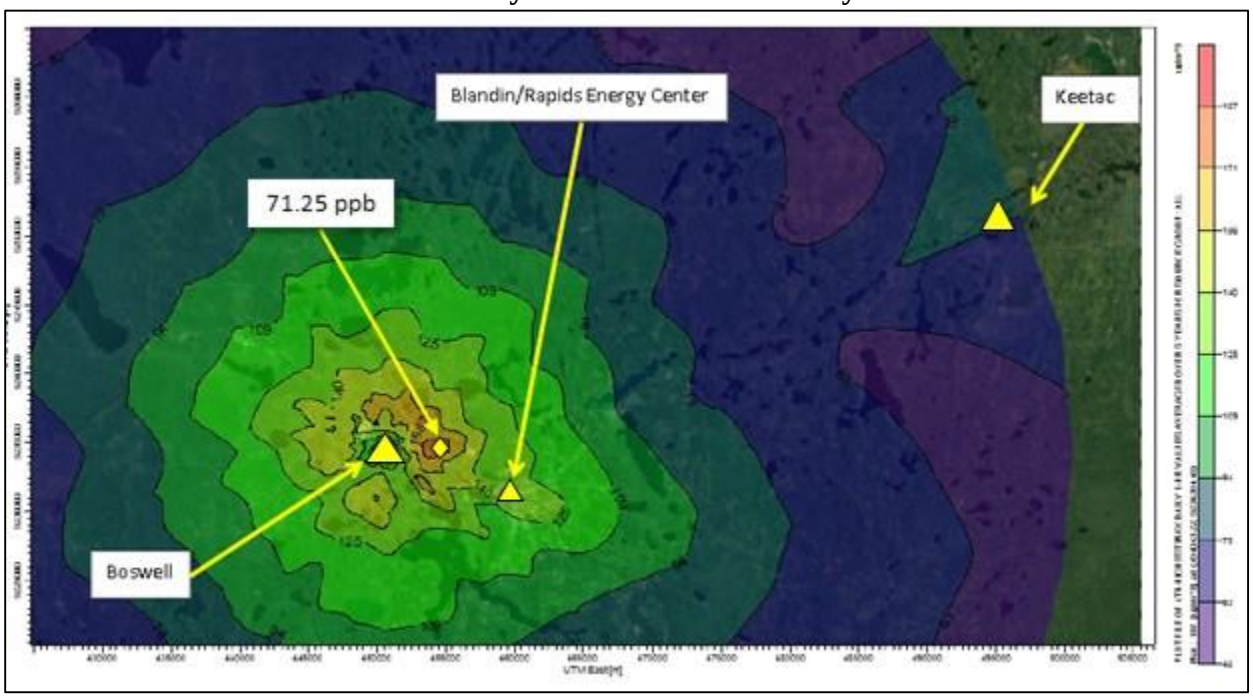
Table 10: Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Five Years for the Area of Analysis for the Itasca County Area

		Receptor Location UTM zone 15		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	**Data Period**	**UTM Easting (m)**	**UTM Northing (m)**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2006-2010	454043.22	5234354.49	186.60	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 $\mu g/m^3$ conversion factor

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 186.60 μg/m^3, equivalent to 71.25 ppb. This modeled concentration included the background concentration of SO_2, and is based on allowable emissions from the modeled facilities. Figure 20 below was included as part of the state's recommendation, and indicates that the predicted value occurred 3.3 km east of Boswell.

Figure 20. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Five Years for the Area of Analysis for the Itasca County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is not violated in this area.

5.3.11. The EPA's Assessment of the Modeling Information Provided by the State

The modeling conducted by the state for the area around Boswell followed the recommendations of Appendix W for PSD modeling and, despite predating the Modeling TAD, was generally consistent with the Modeling TAD recommendations. The modeling was conducted in 2014 and therefore used an earlier version of AERMOD and AERMET. The other sources included in the modeling were appropriately selected and characterized. In fact, it's likely conservative (i.e. overestimating concentrations) to include the Keetac source given it is more than 45 km away. Receptor grid placement is consistent with the TAD recommendations with receptors not being placed over water bodies, including the plant's ash ponds. These areas are also reported to preclude public access through physical boundaries (ash berms). Receptor grid spacing, while not as dense as typically seen, is likely adequate given the release characteristics (tall stack, buoyant plumes) and the expected distance to the maximum concentrations given the flat terrain. The state provided additional analysis to show maximum impacts were not expected to occur on

facility property, so the exclusion of receptors within the fenced property was appropriate. An additional consideration is the analysis relied on potential emissions for all sources modeled. Actual emissions for all sources are much lower (in 2014, 4,576 tpy for Boswell, 141.8 tpy for Blandin, and 669 tpy for Keetac), about 80 percent lower than the modeled emissions. In addition, in a Federal Consent Decree (CASE 0:14-cv-02911-ADM-LIB), Boswell has even more stringent limits that have not been incorporated into the modeling. The new limits will reduce Boswell's PTE from 22,438 tpy to 7,157 tpy. Even without the additional reductions, the EPA finds this modeling of allowable emissions to be an appropriate basis for characterizing air quality in the area.

5.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Itasca County Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

5.5. Jurisdictional Boundaries in the Itasca County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Minnesota recommended that the EPA designate Itasca County as attainment. The boundaries of Itasca County are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

5.6. Other Information Relevant to the Designations for the Itasca County Area

The EPA has received no third party modeling or other relevant information for this area.

5.7. The EPA's Assessment of the Available Information for the Itasca County Area

The best available evidence regarding air quality in Itasca County is the modeling provided by Minnesota as discussed in this section. The modeling reflected the recommendations of Appendix W and generally followed the Modeling TAD, even though it was developed for permitting as opposed to designation purposes. The modeling is generally consistent with accepted modeling approaches and provides a reliable assessment that supports Minnesota's recommended finding that the modeled portion of this area is attaining the standard. There is no available nearby monitoring information.

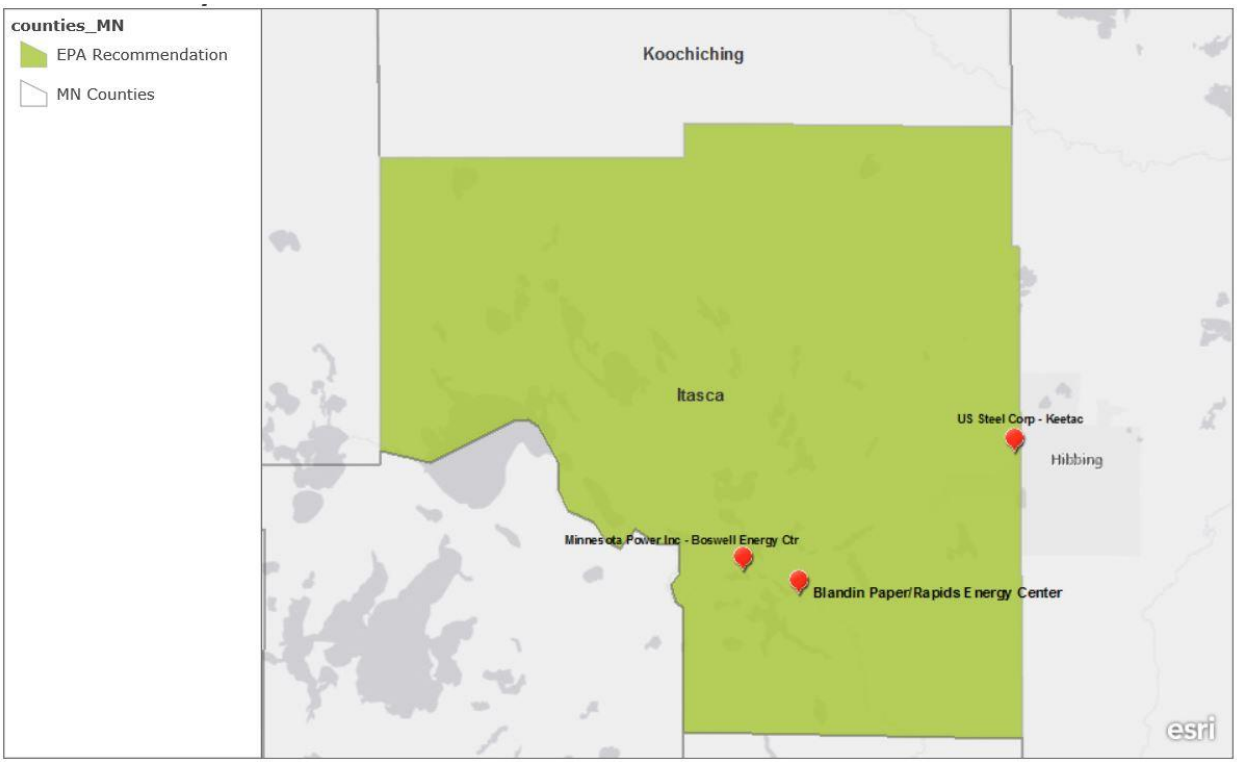
Minnesota, in its January 13, 2017, submittal, provided a recommendation for Itasca County. This recommendation was supported by modeling, that simulated air quality using allowable emissions. The modeling domain included the majority of the county except the northern most portion. The closest neighboring source, Keetac, was included in the modeling. The other sources in the neighboring county are located more than 50 km from Boswell and the surrounding areas were not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may not be meeting the NAAQS, or contribute to ambient air quality in a nearby area that does not meet the NAAQS. The EPA believes, as a result, that Minnesota's modeling, showing southern Itasca County to be attaining, also supports a conclusion that the remainder of Itasca County attains the standard as well. The closest nonattainment area is about 350 km away, and therefore too far for any contribution to any existing nonattainment areas. Therefore, the EPA agrees with the state's recommendation and intends to designate the entirety of Itasca County as unclassifiable/attainment.

The EPA believes that our intended unclassifiable/attainment area, bounded by Itasca County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

5.8. Summary of Our Intended Designation for the Itasca County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate Itasca County as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of Itasca County. Figure 21 shows the boundary of this intended designated area. Based on the state's analysis of this area, the EPA has determined Itasca County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS.

Figure 21: Boundary of the Intended Itasca County Unclassifiable/Attainment Area



Esri, HERE, Garmin, NGA, USGS, NPS | Esri, HERE, NPS

6. Technical Analysis for the Otter Tail County Area

6.1. Introduction

The EPA must designate the Otter Tail County, Minnesota, area by December 31, 2017, because the area has not been previously designated and Minnesota has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Otter Tail County.

6.2. Air Quality Monitoring Data for the Otter Tail County Area

This factor considers the SO_2 air quality monitoring data in the area of Otter Tail County. There are no SO_2 air quality monitors in Otter Tail County or any of the surrounding counties.

6.3. Air Quality Modeling Analysis for the Otter Tail County Area

6.3.1. Introduction

This section 6.3 presents all the available air quality modeling information for Otter Tail County. This area contains Otter Tail Power's Hoot Lake Plant ("Hoot Lake") which emits 2,000 tons or more annually. Specifically, Hoot Lake emitted 2,422 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Minnesota has chosen to characterize it via modeling. No other party has submitted modeling or other information regarding SO_2 air quality near this facility.

In its submission, Minnesota recommended that an area that includes the area surrounding Hoot Lake, specifically the entirety of Otter Tail County, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing allowable emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later, after all the available information is presented.

The area that the state has assessed via air quality modeling is located in Otter Tail County, in west central Minnesota near the state border with North Dakota.

As seen in Figure 22 below, Hoot Lake is located in Fergus Falls, Minnesota, near the southwestern corner of Otter Tail County. There are no other sources of SO_2 with annual emissions over 10 tons within the county or within 40 km of Hoot Lake. Also included in the figure is the state's recommended area for the attainment designation.

Figure 22: Map of the Otter Tail County Area Addressing Hoot Lake

Minnesota reviewed and submitted modeling conducted by a contractor on the behalf of Hoot Lake. Because the modeling was submitted as part of the state's official recommendation, it will from here on be referred to as the state's modeling. The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

6.3.2. 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. 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
- BPIPPRM: 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 15181 and AERMET version 14134. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

The current version of AERMOD is 16216r, along with AERMET version 16216. The latest version of AERMOD was released on January 17, 2017. AERMET version 16216 was available in December, 2016. The 15181 version of AERMOD was the current version when the state was conducting and finalized the modeled assessment. The primary difference between the two versions involves the use of the adjusted surface friction velocity parameter. The state did not employ this non-default regulatory parameter in the modeling. The changes to AERMET from version 14134 to 16216 included several bug fixes and some enhancements. The descriptions are available on EPA's SCRAM website. The changes are not expected to have any significant impact on the meteorological files or resulting concentration estimates produced by the state.

6.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

For the purpose of 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 based on an examination of the land use surrounding the facility. No detailed information was provided regarding the assessment. However, examination of satellite images shows the 3-km area around the facility does not feature heavily industrialization or high-intensity residential property. The area around the facility is clearly best described through the use of rural dispersion parameters. The EPA finds the use of rural dispersive characteristics appropriate for this area.

6.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of 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 due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area is described in the introduction to this section. For the Otter Tail County area, the state only modeled the Hoot Lake Power facility. No other sources over 10 tons exist within a 40 km radius of the plant. Two Wahpeton facilities exist to the west in North Dakota, approximately 45 km away, with total emissions of about 300

tpy. The modeled impact at that distance to the Hoot Lake area would be minimal and it's expected their impact would be represented by the background concentration.

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

- 10 m spacing along the fenceline.
- 50 m spacing from fenceline to 1 km,
- 100 m spacing from 1 km to 2.5 km,
- 500 m spacing from 2.5 km to 10 km,
- 1km spacing from 10 km to 50 km.

The receptor network contained 15,755 receptors, and the network covered the area surrounding the Otter Tail-Hoot Lake facility. The grid covered most of Otter Tail, Wilkin, Grant, and Douglas Counties in Minnesota and extends slightly into North and South Dakota.

Figures 23 and 24, generated by the EPA, show the full and zoomed in receptor grid for the Hoot Lake area of analysis.

Figure 23. Hoot Lake Area of Analysis and Receptor Grid

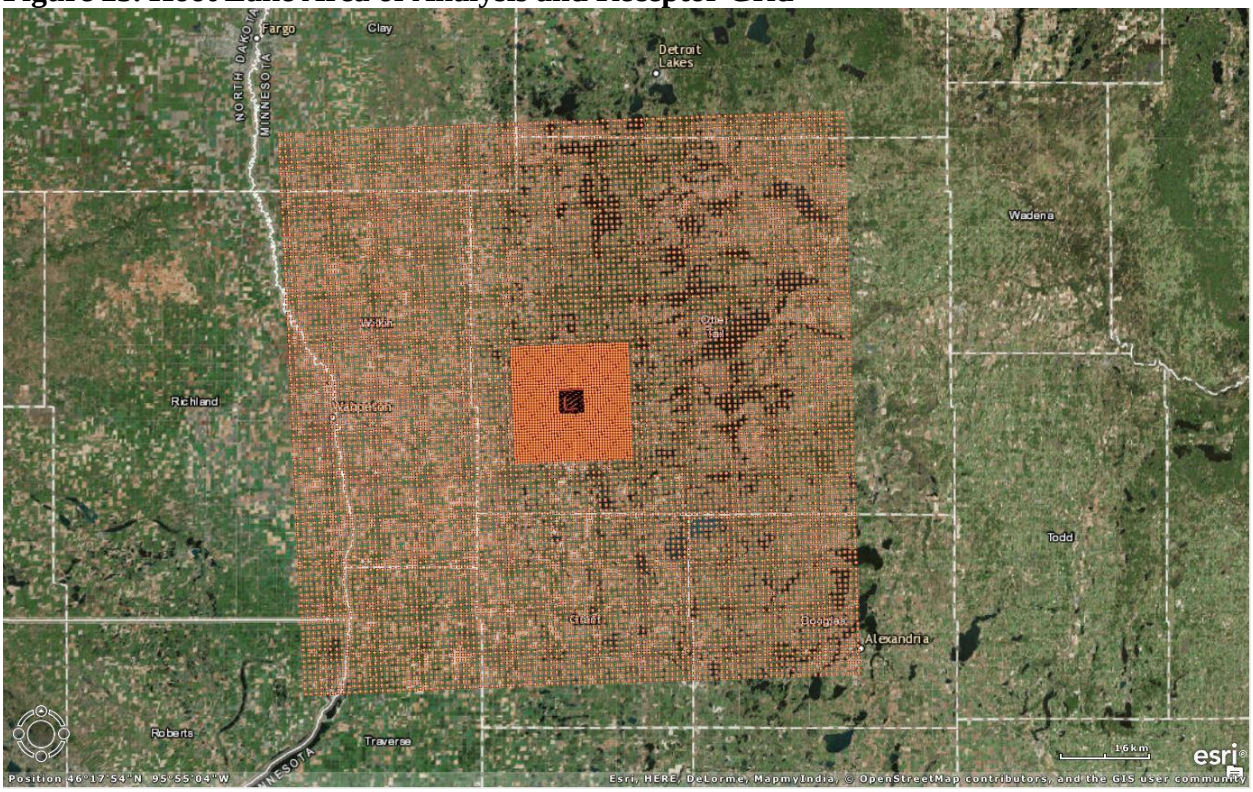
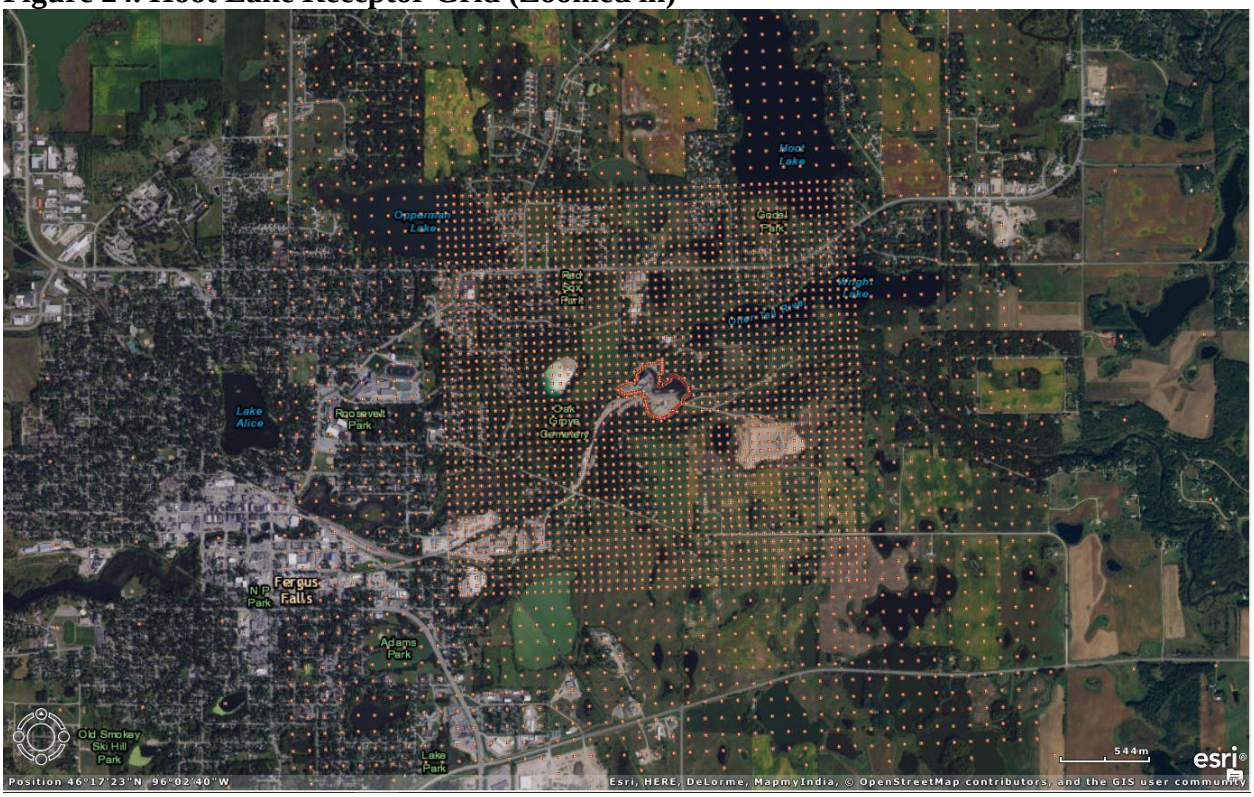


Figure 24. Hoot Lake Receptor Grid (Zoomed in)



Consistent with the Modeling TAD, the state placed receptors for the purpose of this designation effort in locations that would be considered ambient air relative to the modeled facility. Receptors were excluded on the Hoot Lake property due to the restriction of public access as described below. The state further discusses the facility fenceline in their submitted documentation.

The receptor grid used by the state adequately covers the area of concern around the Otter Tail facility. The company submitted information describing their ambient air boundary as a combination of fencing and natural boundaries. There is substantial fencing on the north and west side of the property. The otter tail river bounds the property on the south and east side and a substantial coal pile also border the property on the north. Additionally, because the maximum modeled concentrations occur well to the southeast of the facility property, the receptor grid is considered to adequately capture the maximum concentrations. The EPA finds that the receptor grid spacing and excluded receptors allow for the accurate reflection of maximum concentrations and for characterizing the ambient air quality in this area.

6.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

For this area, only Hoot Lake was included in the area modeling. No other sources of SO_2 with emissions greater than 100 tpy are located in Otter Tail County. The next closest sources of SO_2 with emissions greater than 100 tpy are located approximately 45 km away in North Dakota and each emitted under 200 tons in 2014.

The state characterized the source 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. The modeled emission rate was the highest CEMS hourly rate from the period 2011-2013. For the Hoot Lake stack, the AERMOD component BPIPPRM (version 04274) was used to assist in addressing building downwash. The EPA found the source characterization used in this model analysis to be appropriate.

6.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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 Hoot Lake and no other emitters of SO_2 in the modeling analysis. The state has chosen to model this facility using actual emissions. The facility included in the state's modeling analysis and its associated annual actual SO_2 emissions between 2011 and

2013 are summarized below in Table 11. A description of how the state obtained hourly emission rates is given below this table.

Table 11: Actual SO_2 Emissions Between 2011 – 2014 from Facilities in the Otter Tail County Area

Facility Name	SO_2 Emissions (tpy)*		
	2011	2012	2013
Otter Tail – Hoot Lake	3,414	2,650	3,476
Total Emissions from All Modeled Facilities in the State's Area of Analysis	3,414	2,650	3,476

The emission rate used in the modeling for the Otter Tail – Hoot Lake facility was 1606 lb/hr which was converted into grams per second for modeling. As noted above, this rate is the highest hourly rate for the period 2011-2013. That level of emissions results in an annual ton per year value more than twice the actual tons per year of SO_2 emitted from the facility for any of the emission years in the 2011-2013 period. Additionally, annual emissions from the facility for the years 2014 through 2016 have decreased from the level of emissions during 2011-2013. The highest actual rate was then matched up with actual meteorology for the same time period. While this approach is not recommended by the TAD, this is a more conservative approach (i.e. overestimation of emissions) than using variable actual emissions rates. Therefore, the EPA finds the use of the single highest hourly emission rate from these years of actual emissions to be a reasonable emissions characterization for the Otter Tail County area.

6.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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.

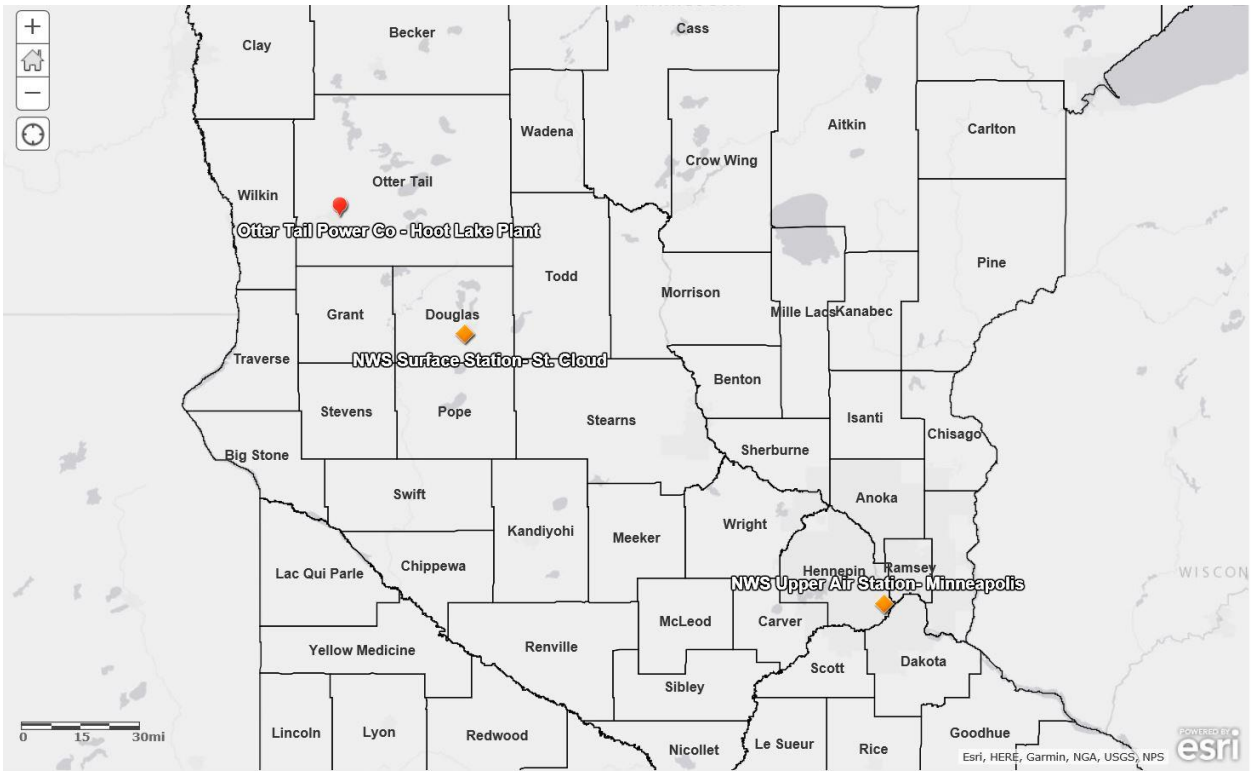
For the area of analysis for the Hoot Lake modeling, the state selected the surface meteorology from the NWS site at Alexandria Municipal Airport in St. Cloud, Minnesota, located at 45.868 N and 95.394 W, roughly 65 km southeast of the facility. Upper air observations were taken from the NWS site in Minneapolis, Minnesota, located at 44.886 N and 93.231 W, approximately 280 km southeast of the facility. These sites were considered by the state to be the most representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the Alexandria NWS tower site to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area

of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to 1 km. They also examined monthly snow cover values and vegetation. Annual precipitation was used to address wet, dry, or average surface moisture conditions.

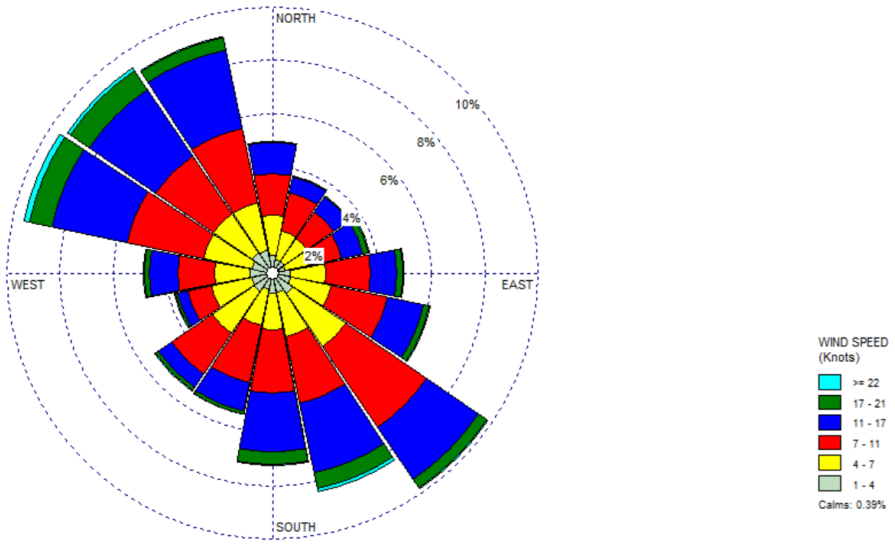
In Figure 25, generated by the EPA, the locations of these NWS stations are shown relative to the area of analysis.

Figure 25: Area of Analysis and the NWS stations in the Otter Tail County Area



In Figure 26, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing for the Alexandria Municipal Airport station. Winds occur from multiple directions, most frequently from the northwest and southeast.

Figure 26: Otter Tail County, MN Cumulative Annual Wind Rose[8] for Years 2011-2013



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET (version 14134) 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 general guidance for processing meteorological data as provided in the AERMET User's Guide and the Region 5 Meteorological Data Protocol document.

The state used three years of meteorological data, from 2011 to 2013. 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 1-minute duration was provided from the Alexandria NWS station but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. It's unclear from the documentation which version of AERMINUTE was used. 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. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

[8] Lakes Environmental WRPLOT Software

Given the relatively flat terrain in this portion of Minnesota and the proximity of the surface station to the Otter Tail – Hoot Lake facility, the meteorological data used in the modeling is expected to be adequately representative of the conditions at the facility.

6.3.8. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as gently rolling. Elevations rise roughly 20-30 meters to the east and north, and fall 10-20 meters to west and south within a 10 kilometer distance. To account for these small terrain changes, the AERMAP (version 11103) terrain program was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the National Elevation Database (NED). The EPA finds this to be an appropriate processing of the simple terrain in the area.

6.3.9. 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 "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state applied a Tier 1 approach and used an SO_2 monitor located near Fargo, North Dakota (38-017-1004). The monitor is located roughly 100 km to the northwest of the Otter Tail – Hoot Lake facility and is in a similar meteorological and topographical regime. The design value concentration for the 2011-2013 period, used in the modeling, was 3.97 ppb (10.4 µg/m^3) when expressed in three significant figures.[9] The EPA finds this approach reasonable for characterizing the background concentrations for the are given the lack of any sizeable population or SO_2 point sources in the area.

6.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Otter Tail County area of analysis are summarized below in Table 12.

[9] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in µg/m^3. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 µg/m^3.

Table 12: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Otter Tail County Area

Input Parameter	Value
AERMOD Version	15181 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	1
Modeled Structures	16
Modeled Fencelines	1
Total receptors	15,755
Emissions Type	Actual
Emissions Years	Hourly High from 2011-2013
Meteorology Years	2011-2013
NWS Station for Surface Meteorology	Alexandria, MN NWS (KAXN)
NWS Station Upper Air Meteorology	Minneapolis, MN NWS (KMPX)
NWS Station for Calculating Surface Characteristics	Alexandria, MN NWS
Methodology for Calculating Background SO_2 Concentration	Tier 1 from (38-017-1004) Fargo, North Dakota
Calculated Background SO_2 Concentration	4 ppb (10.4 µg/m^3)

The results presented below in Table 13 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

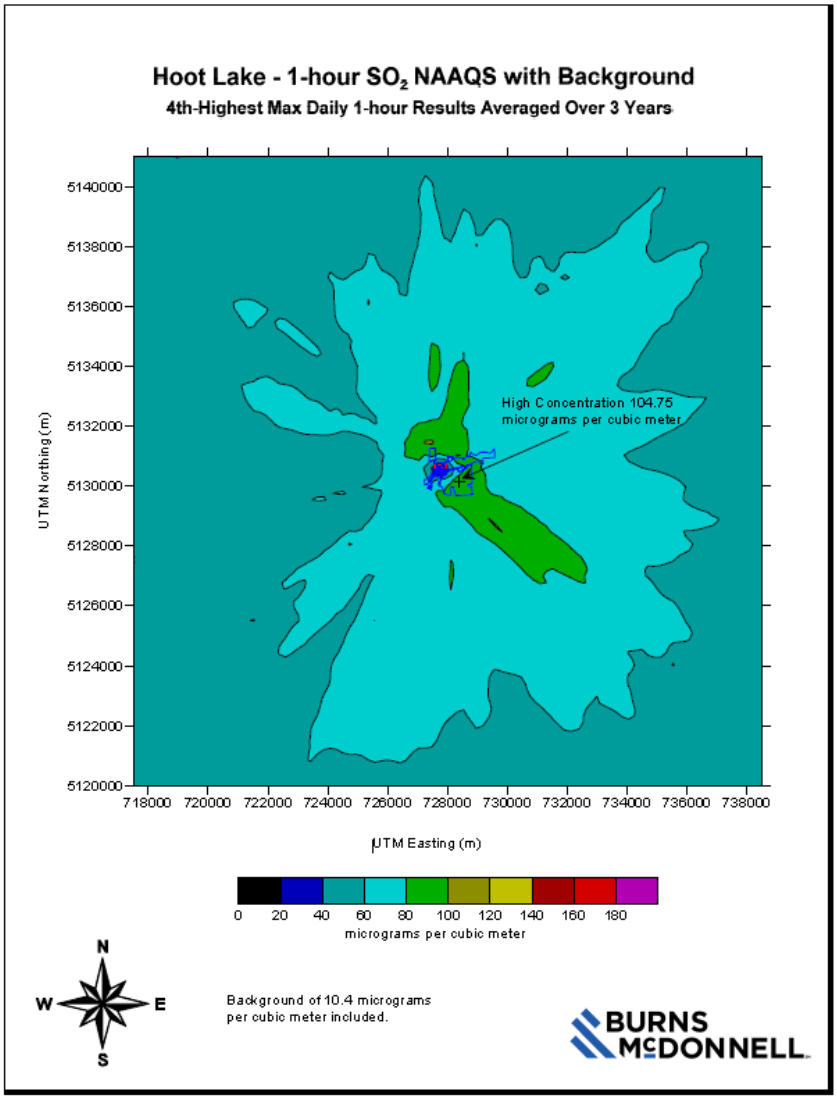
Table 13: Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Otter Tail County Area

		Receptor Location, UTM zone 15		99th percentile daily maximum 1-hour SO_2 Concentration (µg/m^3)	
Averaging Period	**Data Period**	**UTM Easting (m)**	**UTM Northing (m)**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2011-2013	266150	5130350	146.2 µg/m^3	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 µg/m^3 conversion factor

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 146.2 µg/m^3, equivalent to 55.8 ppb. This modeled concentration included the background concentration of SO_2, and is based on the highest hour of actual emissions from the facility over a 3-year period. Figure 27 below was included as part of the state's recommendation and indicates that the predicted value occurred about 0.5 kilometers to the southeast of the boundary of the facility.

Figure 27: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Otter Tail County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is not violated in this area.

6.3.11. The EPA's Assessment of the Modeling Information Provided by the State

The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is not violated at the receptor with the highest modeled concentration. With the exception of the state opting to model with the more conservative maximum hourly emission rate rather than using the complete CEMS data, the modeling followed the recommendations in the TAD and was conducted using the appropriate modeling suite of tools. All other important components of a modeling assessment, i.e., models used, meteorology, nearby sources modeled, and background concentrations, all adequately comply with Appendix W and with general modeling expectations.

6.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Otter Tail County Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

6.5. Jurisdictional Boundaries in the Otter Tail County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Minnesota recommended that the EPA designate Otter Tail County as attainment. The boundaries of Otter Tail County are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

6.6. Other Information Relevant to the Designations for the Otter Tail County Area

The EPA has received no third party modeling or other relevant information for this area.

6.7. The EPA's Assessment of the Available Information for the Otter Tail County Area

The best available evidence regarding air quality in Otter Tail County is the modeling provided by Minnesota. The modeling reflected the recommendations of the TAD, or conservative alternatives, and provides a reliable assessment that supports Minnesota's recommended finding that the modeled portion of this area is attaining the standard. There is no available nearby monitoring information.

Minnesota, in its January 13, 2017 submittal, provided a recommendation of attainment for the entirety of Otter Tail County. This recommendation was supported by modeling, that simulated air quality using actual emissions. The modeling domain, centered in the southwestern portion of

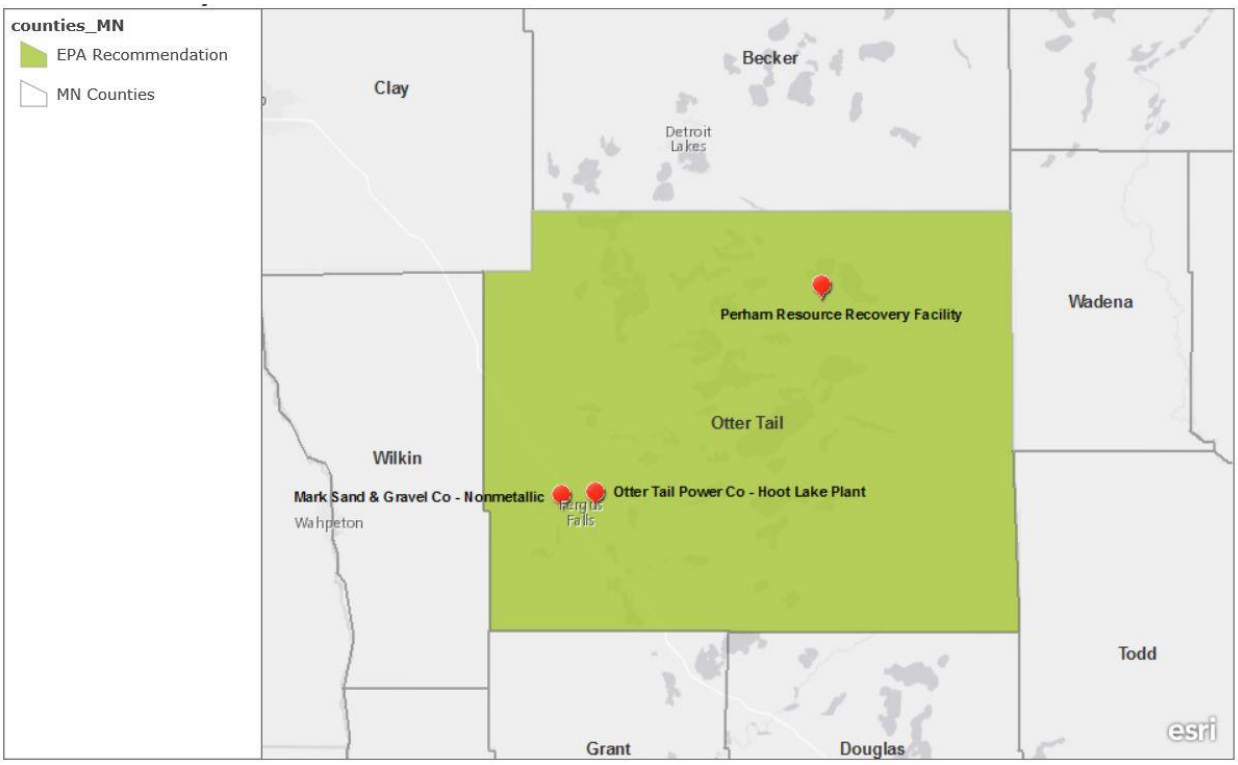
the county, covered the majority of the county. However, the EPA did not find any other sources of SO_2 within or near the county that were required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may not be meeting the NAAQS, or contribute to ambient air quality in a nearby area that does not meet the NAAQS. The EPA believes, as a result, that Minnesota's modeling, showing western Otter Tail County to be attaining, also supports a conclusion that the remainder of Otter Tail County attains the standard as well. There are no existing nonattainment areas, remaining undesignated areas, or intended nonattainment areas within 100 km. Specifically, the closest nonattainment area is about 500 km away, and therefore too far to indicate contribution to any existing nonattainment areas or remaining undesignated areas. Therefore, the EPA concurs with the state's recommendation and intends to designate the entirety of Otter Tail County as unclassifiable/attainment.

The EPA believes that our intended unclassifiable/attainment area, bounded by Otter Tail County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

6.8. Summary of Our Intended Designation for the Otter Tail County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the Otter Tail County, Minnesota, area as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of Otter Tail County. Figure 28 shows the boundary of this intended designated area. Based on the state's analysis of this area, the EPA has determined Otter Tail County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS.

Figure 28: Boundary of the Intended Otter Tail County Unclassifiable/Attainment Area



7. Technical Analysis for the Sherburne County Area

7.1. Introduction

The EPA must designate the Sherburne County, Minnesota, area by December 31, 2017, because the area has not been previously designated and Minnesota has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Sherburne County.

7.2. Air Quality Monitoring Data for the Sherburne County Area

This factor considers the SO_2 air quality monitoring data in the area of Sherburne County. There are no SO_2 air quality monitors in or near Sherburne County.

7.3. Air Quality Modeling Analysis for the Sherburne County Area

7.3.1. Introduction

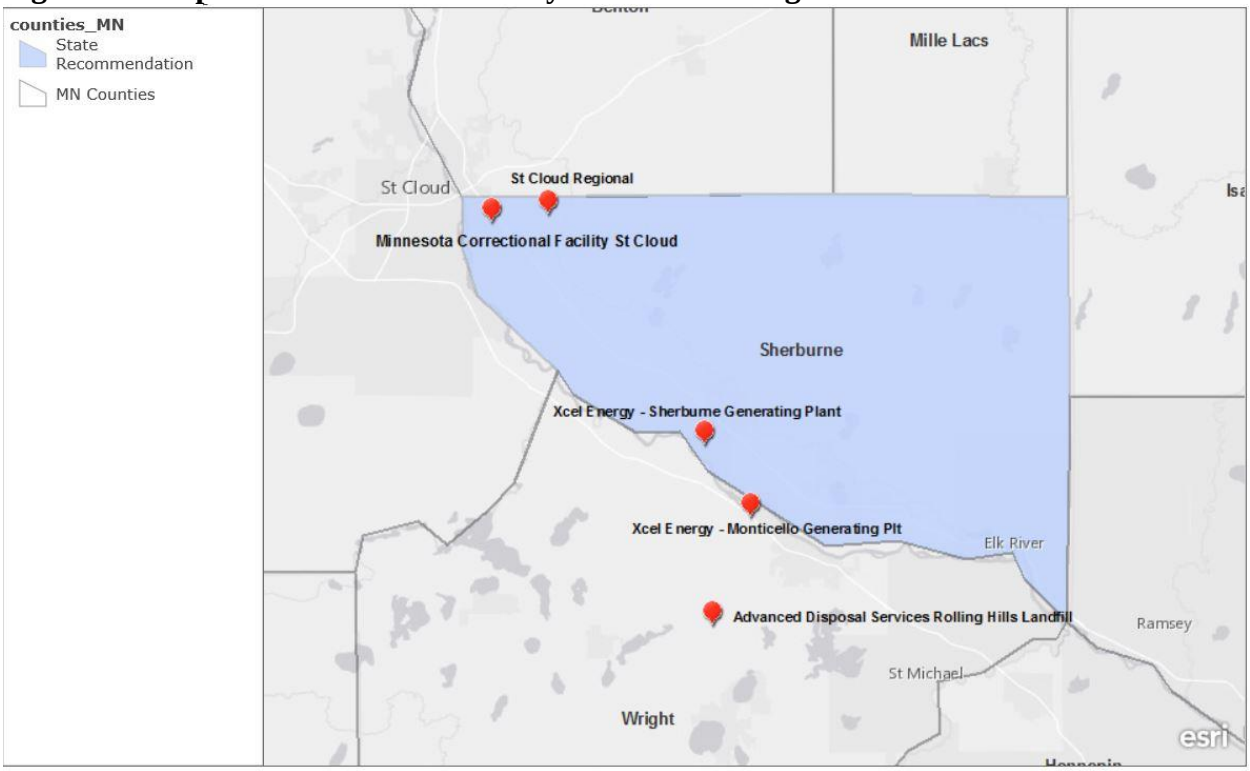
This section 6.3 presents all the available air quality modeling information for a portion of Sherburne County that includes Xcel Energy-Sherburne County Generating Station ("Sherco") which emits 2,000 tons or more annually. Specifically, Sherco emitted 11,459 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Minnesota has chosen to characterize it via modeling. No other party has submitted modeling or other information regarding SO_2 air quality near this facility.

In its submission, Minnesota recommended that an area that includes the area surrounding Sherco, specifically the entirety of Sherburne County, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing allowable emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

The area that the state has assessed via air quality modeling is located in Sherburne County, which is located approximately 65 km northwest of Minneapolis.

As seen in Figure 29 below, Sherco is located in Becker, Minnesota, on the western side of Sherburne County near the border of Wright County. There are no other emitters of SO_2 over 100 tpy within 50km of the source. Also included in the figure is the state's recommended area for the attainment designation.

Figure 29. Map of the Sherburne County Area Addressing Sherco



Minnesota reviewed and submitted modeling on the behalf of Sherco. Because the modeling was submitted as part of the state's official recommendation, it will from here on be referred to as the state's modeling. The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

7.3.2. 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. 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
- BPIPPRM: 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 15181. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

The current version of AERMOD is 16216r. It was released on January 17, 2017. The 15181 version of AERMOD was the current version when the state was conducting and finalized the modeled assessment. The current version of AERMOD is 16216r, along with AERMET version 16216. The latest version of AERMOD was released on January 17, 2017. AERMET version 16216 was available in December, 2016. The 15181 version of AERMOD and AERMET was the current version when the state was conducting and finalized the modeled assessment. The primary difference between the two versions involves the use of the adjusted surface friction velocity parameter. The state did not employ this non-default regulatory parameter in the modeling. The descriptions are available on EPA's SCRAM website. The overall changes are not expected to have any substantial impact on the meteorological files or resulting concentration estimates produced by the state.

7.3.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

For the purpose of 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 based on an examination of the land use surrounding the facility. No specific information was provided regarding an assessment, however, examination of satellite images show the area is not heavily industrialized nor is it characterized by high density population and would clearly be best represented by rural dispersion coefficients. Figure 30 below, generated by the EPA, shows the rural nature of the area. The EPA finds the use of rural dispersive characteristics appropriate for this area.

Figure 30: Land use around Sherco facility.

7.3.4. Modeling Parameter: Area of Analysis (Receptor Grid)

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of 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 due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Sherburne County area, the state did not include any other nearby emitters of SO_2. The state determined that there were no sizeable emitters of SO_2 within 50km of the source. The nearest, largest source is roughly 20 tpy and is roughly 30 km to the northwest.

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

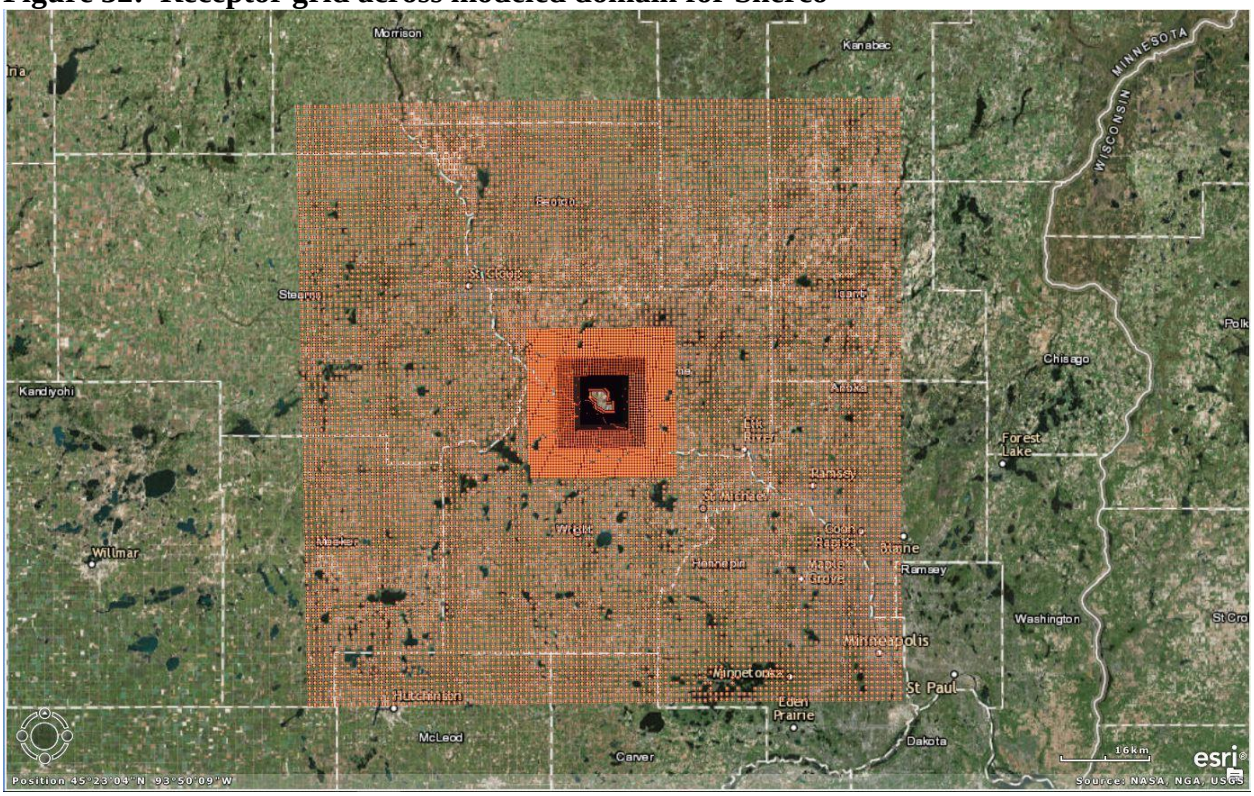
- 10 m spacing along the fenceline.
- 50 m spacing from fenceline to 1 km,
- 100 m spacing from 1 km to 2 km,
- 250 m spacing from 2 km to 5 km,

- 500 m spacing from 5 km to 10 km, and
- 1,000 m spacing from 10 km to edge of domain (approx. 50 km).

The receptor network contained 40,473 receptors, and the network covered the area surrounding the Sherco facility. The receptor grid covered the entirety of Sherburne and Wright Counties and extended into portions of Stearns, Benton, Mille Lacs, Isanti, Anoka, Hennepin, Kanabec, Carver, McLeod, and Meeker Counties. Image of the receptor grid around the Sherco facility and across the entire grid are shown below in Figures 31 and 32, respectively.

Figure 31: Receptor grid near the Sherco facility.

Figure 32: Receptor grid across modeled domain for Sherco



Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to the modeled facility. Receptors were excluded on the Sherco facility property. The state further discusses the facility fenceline in their submitted documentation. There is three-strand wire around the facility with access points to adjacent farm fields. Larger chain-link fencing surrounds the area of the power plant and waste-disposal facilities. Additionally, a residence is located within the plant property. Additional receptors were placed at the location of the residence. The power plant stacks are 198 m tall resulting in the peak modeled concentration occurring over 3 km north of the Sherco plant, about 1.5 km beyond these fencelines. Specifically, with respect to the exclusion of receptors inside the fence line, the concentration gradients in the modeled area overall are such that in examining the spatial distribution of impacts, it appears that inclusion of receptors inside the Sherco fence line would not have shown SO_2 violations. Therefore, the EPA finds that the removal of these receptors does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area.

7.3.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions.

For this area, only Sherco was included in the area modeling. No other sources of SO_2 with emissions greater than 5 tpy are located anywhere in the county. Further, there are no sources of SO_2 with emissions greater than 5 tpy within 30 km of Sherco. The closest sources of SO_2 with emissions greater than 100 tpy are over 70 km away.

The state characterized the source 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. The CEMS hourly emissions file used in the Sherco modeling included hourly varying temperature and exit velocity. For the three Sherco stacks, the AERMOD component BPIPPRM (version 04274) was used to assist in addressing building downwash. The EPA finds the source characterization used in this model to be appropriate.

7.3.6. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose 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 also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. 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 the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

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. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. 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 Sherco and no other emitters of SO_2 in the area of analysis. The state has chosen to model this facility using actual emissions. The facility included in the state's modeling analysis and its associated annual actual SO_2 emissions between 2013 and

2015 are summarized below in Table 14. A description of how the state obtained hourly emission rates is given below this table.

Table 14: Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Sherburne County Area

Facility Name	SO_2 Emissions (tpy)		
	2013	2014	2015
Sherco	7,706	11,459	7,775
Total Emissions from All Modeled Facilities in the State's Area of Analysis	7,706	11,459	7,775

For Sherco, the actual hourly emissions data were obtained from CEMS data submitted by the facility for the years 2013-2015. The EPA finds the use of these years of actual emissions an appropriate emissions characterization for the Sherburne County area.

7.3.7. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined 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.

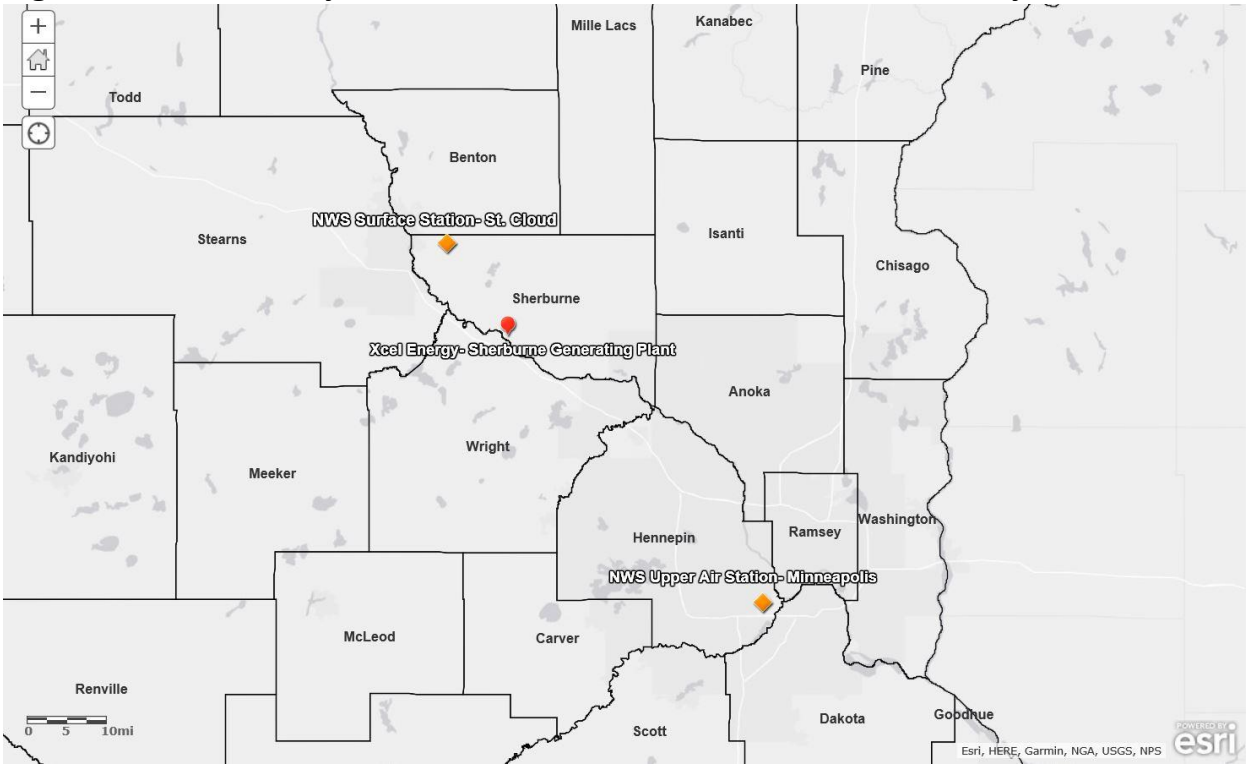
For the area of analysis for the Sherco modeling, the state selected the surface meteorology from the St. Cloud, Minnesota, NWS site, located at 45.544 N and 94.052 W, roughly 25 km northwest of the facility. Upper air observations were taken from the Minneapolis, Minnesota, NWS site, located at 44.886 N and 93.231 W, approximately 80 km southeast of the facility. These sites were considered by the state to be the most representative of meteorological conditions within the area of analysis. These sites are shown relative to the state's chosen area of analysis in Figure 33.

The state used AERSURFACE version 13016. Based on the AERSURFACE input/output files, it appears the AERSURFACE land use characteristics were generated centered on the Sherco plant rather than on the St. Cloud NWS tower site. Guidance in the TAD and in the Region 5 Meteorological Data Processing Protocol both note that the land use characteristics, most importantly the surface roughness, should be based on the NWS tower site. The source location and the NWS site are about 25 km apart. Both locations are surrounded primarily by grassland

and cultivated land with relatively few trees. There are some buildings associated with the Sherco facility along with a few buildings at the NWS location. Both Bowen ratio and albedo are more regional parameters and calculated over a larger 10km by 10km area. The facility presented an analysis of surface roughness values comparing the facility location to 5 other available NWS sites. All of the NWS locations exhibited lower surface roughness than the Sherco facility location. The St. Cloud location was selected because it was closest to the roughness at the Sherco facility site. Current guidance continues to recommend use of the NWS station for generation of surface characteristics. However, given the reasonable comparability of the locations, combined with the tall stack release, it's not expected that the use of facility area surface values would substantially change the modeled concentrations or the modeling conclusions.

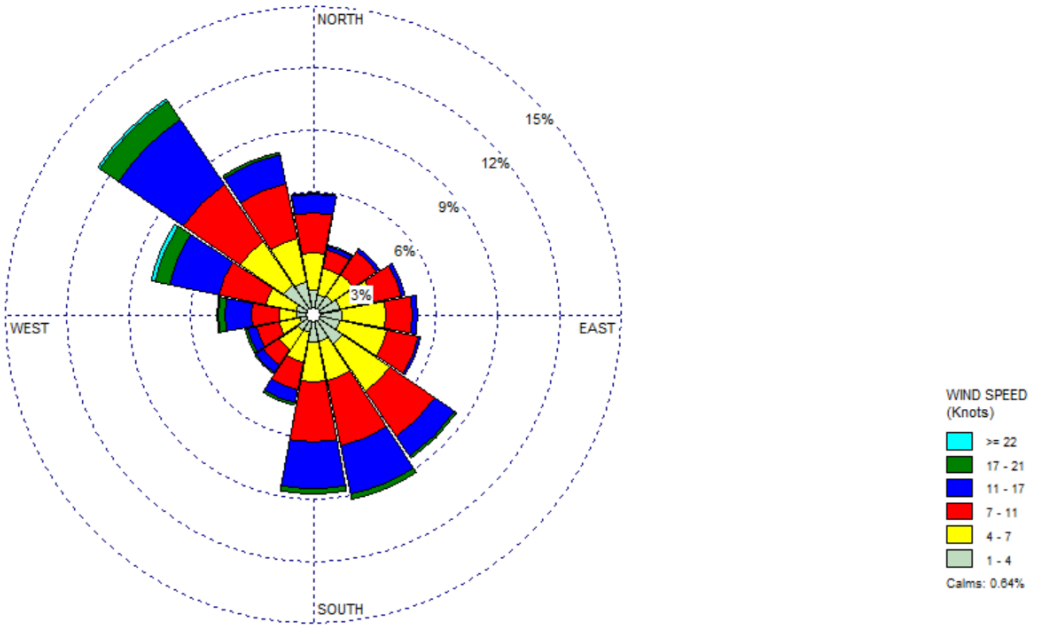
As noted above, the state used AERSURFACE version 13016 using data from the Sherco facility site to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to 1 km using monthly temporal resolution for snow cover and vegetation. Bowen ratio and albedo were calculation over a 10km by 10km region. Surface moisture was characterized based on annual precipitation to determine dry, wet, and average conditions.

Figure 33. Area of Analysis and the NWS stations in the Sherburne County Area



In Figure 34, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing for the St. Cloud, Minnesota, NWS site. Winds occur from multiple directions, most frequently from the northwest and south-southeast. There is a low occurrence of calm winds, less than 1 percent. The largest percentage of winds speeds fall within the 7-17 knot category with the lighter winds most often occurring when winds are from the northwest or southeast.

Figure 34: Sherburne County, MN Cumulative Annual Wind Rose[10] for Years 2013 – 2015



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET (version 15181) 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 general guidance for processing meteorological data except for the center location for generating the surface characteristics through AERSURFACE. The AERSURFACE portion of the modeling was instead centered on the Sherco facility. As discussed above, while the surface roughness values calculated at the facility are larger than those generated at the nearby St. Cloud NWS station, given the overall similarity between the Sherco site and the NWS site, and the tall stack releases, it's not expected that values generated by AERSURFACE for this analysis would have a substantial impact on predicted concentrations or on the modeled conclusions.

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 1-

[10] Lakes Environmental WRPlot Software

minute duration was provided from the St. Cloud NWS station, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. It's not clear from the information provided which version of AERMINUTE was used. 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. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

Although the surface characteristics for use in AERMET were generated through AERSURFACE centered at the facility site and not the NWS surface station site, an inconsistency with the TAD, for the reasons discussed above, the EPA finds the weather station selection and processing of the meteorological data to be reasonable and expects that it is adequately representative of the area.

7.3.8. Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as gently rolling. To account for these terrain changes, the AERMAP (version 11103) 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 National Elevation Database (NED). The EPA finds this approach appropriate to account for terrain elevations in the Sherco modeling.

7.3.9. 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 "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state took a tier 1 approach using the two nearby monitors with the highest design values and averaging them. The monitors selected were FHR 420 (AQS 270370020) located in Rosemount and Saint Paul Park (AQS 271630436) with values of 14 and 10 ppb, respectively. The average value of 12 ppb when expressed in two significant figures,[11] was used as a single background value added to the modeling. Both monitors are sited next to refinery operations and should

[11] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 $\mu g/m^3$.

represent conservative background values compared to the area surrounding Sherco. The EPA finds this approach reasonable for characterizing the background concentrations for the area.

7.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Sherburne County area of analysis are summarized below in Table 15.

Table 15: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Sherburne County Area

Input Parameter	Value
AERMOD Version	15181 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	3
Modeled Structures	45
Modeled Fencelines	1
Total receptors	40,473
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	St. Cloud, MN NWS (KSTC)
NWS Station Upper Air Meteorology	Minneapolis, MN NWS (KMPX)
Site Used for Calculating Surface Characteristics	Sherco Plant
Methodology for Calculating Background SO_2 Concentration	Tier 1, Average of two highest DV's in the area. (AQS 270370020-Rosemount/AQS 271630436 – St. Paul Park)
Calculated Background SO_2 Concentration	12 ppb

The results presented below in Table 16 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

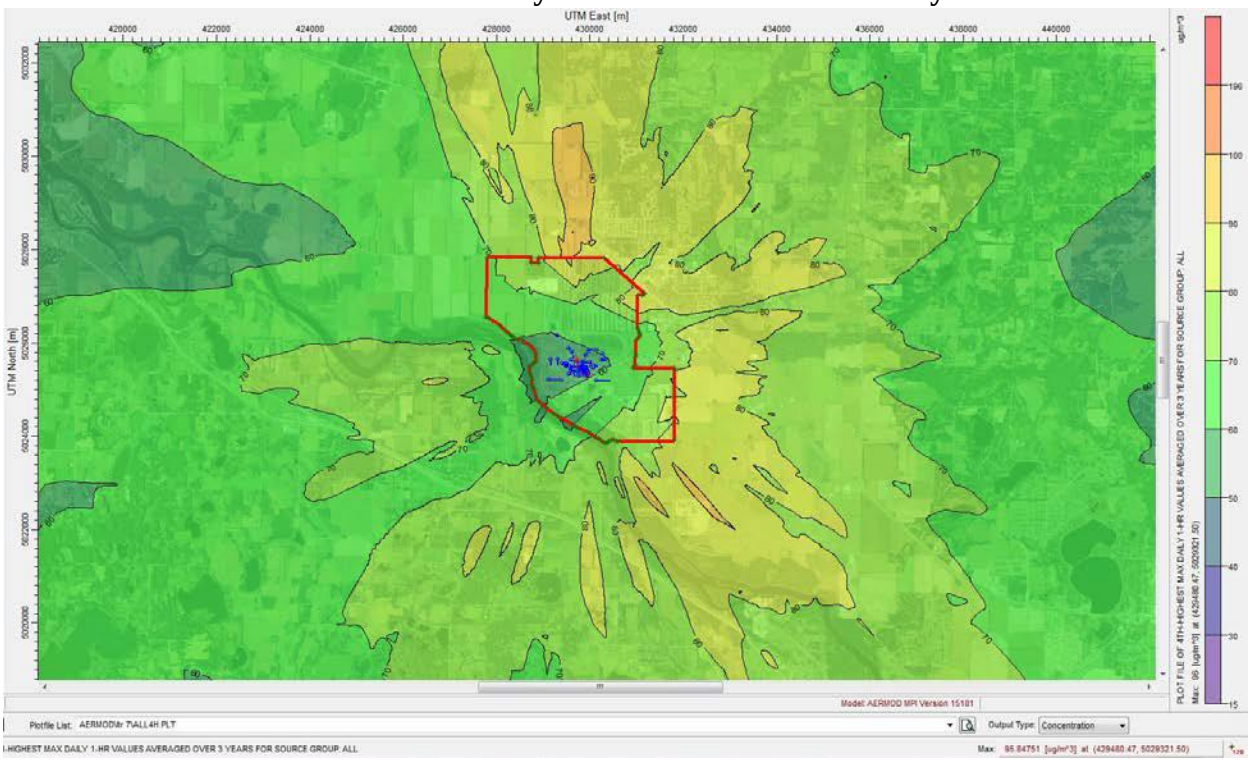
Table 16. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Sherburne County Area

		Receptor Location UTM zone 15		99th percentile daily maximum 1-hour SO_2 Concentration (µg/m^3)	
Averaging Period	**Data Period**	**UTM Easting (m)**	**UTM Northing (m)**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2013-2015	429480.47	5029321.5	95.8 µg/m^3	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 µg/m^3 conversion factor.

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 95.8 µg/m^3, equivalent to 36.6 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facility. Figure 35 below was included as part of the state's recommendation. The predicted design value occurred 3.5 km north of Sherco.

Figure 35: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Sherburne County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is not violated in this area.

7.3.11. The EPA's Assessment of the Modeling Information Provided by the State

Except as discussed above in the AERSURFACE processing section, the modeling conducted by the state for the area around Sherco followed the recommendations in the Modeling TAD. The important components of a modeling assessment, i.e., models used, meteorology, emission estimates, nearby sources modeled, and background concentrations, all adequately comply with the TAD and with general modeling expectations.

7.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Sherburne County Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

7.5. Jurisdictional Boundaries in the Sherburne County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Minnesota recommended that the EPA designate Sherburne County as attainment. The boundaries of Sherburne County are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

7.6. Other Information Relevant to the Designations for the Sherburne County Area

The EPA has received no third party modeling or other relevant information for this area.

7.7. The EPA's Assessment of the Available Information for the Sherburne County Area

The best available evidence regarding air quality in Sherburne County is the modeling provided by Minnesota. The modeling reflected the recommendations of the TAD, with the notable exception of AERSURFACE values being generated at the facility site. However, as discussed above, the impact of the deviation in the AERSURFACE method is expected to be small, and given the relatively low modeled design value, the modeling approach used provides a reasonably reliable assessment that supports Minnesota's recommended finding that the modeled portion of this area is attaining the standard. There is no available nearby monitoring information.

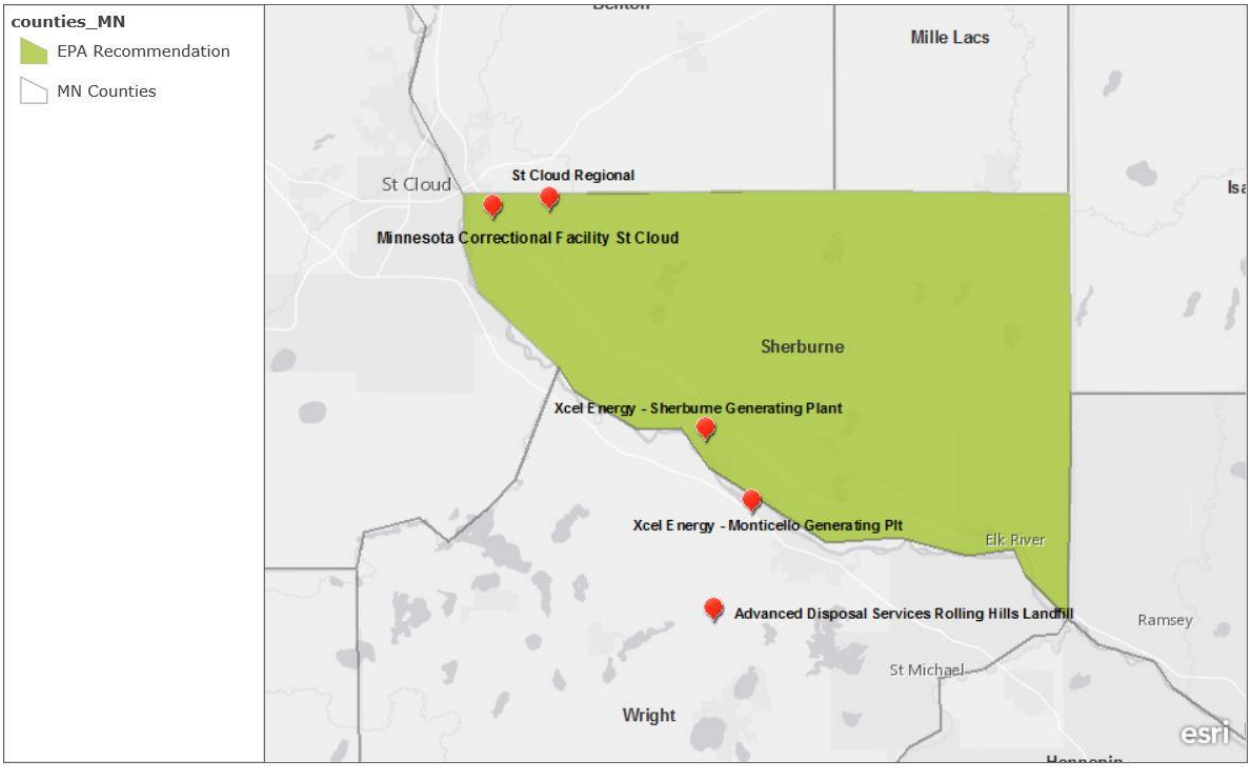
Minnesota, in its January 13, 2017 submittal, provided a recommendation of attainment for the entirety of Sherburne County. This recommendation was supported by modeling, that simulated air quality using actual emissions from 2013 through 2015. The modeling domain covered the entirety of the county. Also, the EPA did not find any other sources of SO_2 within or near the county that were required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may not be meeting the NAAQS, or contribute to ambient air quality in a nearby area that does not meet the NAAQS. Minnesota's modeling, showed the entirety of Sherburne County to be attaining the standard. There are no existing nonattainment areas or remaining undesignated areas or intended nonattainment areas within 100 km of Sherburne County. Specifically, the closest nonattainment area is about 342 km away, and therefore too far to indicate contribution to any existing nonattainment areas or remaining undesignated areas. Therefore, the EPA intends to agree with the state's recommendation and intends to designate the entirety of Sherburne County as unclassifiable/attainment.

The EPA believes that our intended unclassifiable/attainment area, bounded by Sherburne County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

7.8. Summary of Our Intended Designation for the Sherburne County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the Sherburne County area as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of Sherburne County. Figure 36 shows the boundary of this intended designated area. Based on the state's analysis of this area, the EPA has determined Sherburne County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS.

Figure 36. Boundary of the Intended Sherburne County Unclassifiable/Attainment Area



8. Technical Analysis for the Remainder of Minnesota

8.1. Introduction

The state has not timely installed and begun operation of a new, approved SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 DRR for any sources of SO_2 emissions in the counties identified in Table 17 below. Accordingly, the EPA must designate these counties by December 31, 2017. At this time, there are no air quality modeling results available to the EPA for these counties. In addition, there is no air quality monitoring data that indicate any violation of the 1-hour SO_2 NAAQS. The EPA is designating the counties and portions of counties in Table 17 in the state as "unclassifiable/attainment" since these counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

Table 17: Counties that the EPA Intends to Designate Unclassifiable/Attainment

Minnesota's Recommended Definition County	Minnesota's Recommended Designation	EPA's Intended Area Definition County[+]	EPA's Intended Designation
Aitkin County	Unclassifiable or Attainment	Aitkin County	Unclassifiable/ Attainment
Anoka County	Unclassifiable or Attainment	Anoka County	Unclassifiable/ Attainment
Becker County	Unclassifiable or Attainment	Becker County	Unclassifiable/ Attainment
Beltrami County	Unclassifiable or Attainment	Beltrami County	Unclassifiable/ Attainment
Benton County	Unclassifiable or Attainment	Benton County	Unclassifiable/ Attainment
Big Stone County	Unclassifiable or Attainment	Big Stone County	Unclassifiable/ Attainment
Blue Earth County	Unclassifiable or Attainment	Blue Earth County	Unclassifiable/ Attainment
Brown County	Unclassifiable or Attainment	Brown County	Unclassifiable/ Attainment
Carlton County	Unclassifiable or Attainment	Carlton County*	Unclassifiable/ Attainment
Carver County	Unclassifiable or Attainment	Carver County	Unclassifiable/ Attainment
Cass County	Unclassifiable or Attainment	Cass County	Unclassifiable/ Attainment
Chippewa County	Unclassifiable or Attainment	Chippewa County	Unclassifiable/ Attainment

Minnesota's Recommended Definition County	Minnesota's Recommended Designation	EPA's Intended Area Definition County[+]	EPA's Intended Designation
Chisago County	Unclassifiable or Attainment	Chisago County	Unclassifiable/ Attainment
Clay County	Unclassifiable or Attainment	Clay County	Unclassifiable/ Attainment
Clearwater County	Unclassifiable or Attainment	Clearwater County	Unclassifiable/ Attainment
Cottonwood County	Unclassifiable or Attainment	Cottonwood County	Unclassifiable/ Attainment
Crow Wing County	Unclassifiable or Attainment	Crow Wing County	Unclassifiable/ Attainment
Dakota County	Unclassifiable or Attainment	Dakota County	Unclassifiable/ Attainment
Dodge County	Unclassifiable or Attainment	Dodge County	Unclassifiable/ Attainment
Douglas County	Unclassifiable or Attainment	Douglas County	Unclassifiable/ Attainment
Faribault County	Unclassifiable or Attainment	Faribault County	Unclassifiable/ Attainment
Fillmore County	Unclassifiable or Attainment	Fillmore County	Unclassifiable/ Attainment
Freeborn County	Unclassifiable or Attainment	Freeborn County	Unclassifiable/ Attainment
Grant County	Unclassifiable or Attainment	Grant County	Unclassifiable/ Attainment
Hennepin County	Unclassifiable or Attainment	Hennepin County	Unclassifiable/ Attainment
Houston County	Unclassifiable or Attainment	Houston County	Unclassifiable/ Attainment
Hubbard County	Unclassifiable or Attainment	Hubbard County	Unclassifiable/ Attainment
Isanti County	Unclassifiable or Attainment	Isanti County	Unclassifiable/ Attainment
Jackson County	Unclassifiable or Attainment	Jackson County	Unclassifiable/ Attainment
Kanabec County	Unclassifiable or Attainment	Kanabec County	Unclassifiable/ Attainment
Kandiyohi County	Unclassifiable or Attainment	Kandiyohi County	Unclassifiable/ Attainment
Kittson County	Unclassifiable or Attainment	Kittson County	Unclassifiable/ Attainment
Koochiching County	Unclassifiable or Attainment	Koochiching County	Unclassifiable/ Attainment

Minnesota's Recommended Definition County	Minnesota's Recommended Designation	EPA's Intended Area Definition County[+]	EPA's Intended Designation
Lac qui Parle County	Unclassifiable or Attainment	Lac qui Parle County	Unclassifiable/ Attainment
Lake County	Unclassifiable or Attainment	Lake County	Unclassifiable/ Attainment
Lake of the Woods County	Unclassifiable or Attainment	Lake of the Woods County	Unclassifiable/ Attainment
Le Sueur County	Unclassifiable or Attainment	Le Sueur County	Unclassifiable/ Attainment
Lincoln County	Unclassifiable or Attainment	Lincoln County	Unclassifiable/ Attainment
Lyon County	Unclassifiable or Attainment	Lyon County	Unclassifiable/ Attainment
McLeod County	Unclassifiable or Attainment	McLeod County	Unclassifiable/ Attainment
Mahnomen County	Unclassifiable or Attainment	Mahnomen County	Unclassifiable/ Attainment
Marshall County	Unclassifiable or Attainment	Marshall County	Unclassifiable/ Attainment
Martin County	Unclassifiable or Attainment	Martin County	Unclassifiable/ Attainment
Meeker County	Unclassifiable or Attainment	Meeker County	Unclassifiable/ Attainment
Mille Lacs County	Unclassifiable or Attainment	Mille Lacs County	Unclassifiable/ Attainment
Morrison County	Unclassifiable or Attainment	Morrison County	Unclassifiable/ Attainment
Mower County	Unclassifiable or Attainment	Mower County	Unclassifiable/ Attainment
Murray County	Unclassifiable or Attainment	Murray County	Unclassifiable/ Attainment
Nicollet County	Unclassifiable or Attainment	Nicollet County	Unclassifiable/ Attainment
Nobles County	Unclassifiable or Attainment	Nobles County	Unclassifiable/ Attainment
Norman County	Unclassifiable or Attainment	Norman County	Unclassifiable/ Attainment
Olmsted County	Unclassifiable or Attainment	Olmsted County	Unclassifiable/ Attainment
Pennington County	Unclassifiable or Attainment	Pennington County	Unclassifiable/ Attainment
Pine County	Unclassifiable or Attainment	Pine County	Unclassifiable/ Attainment

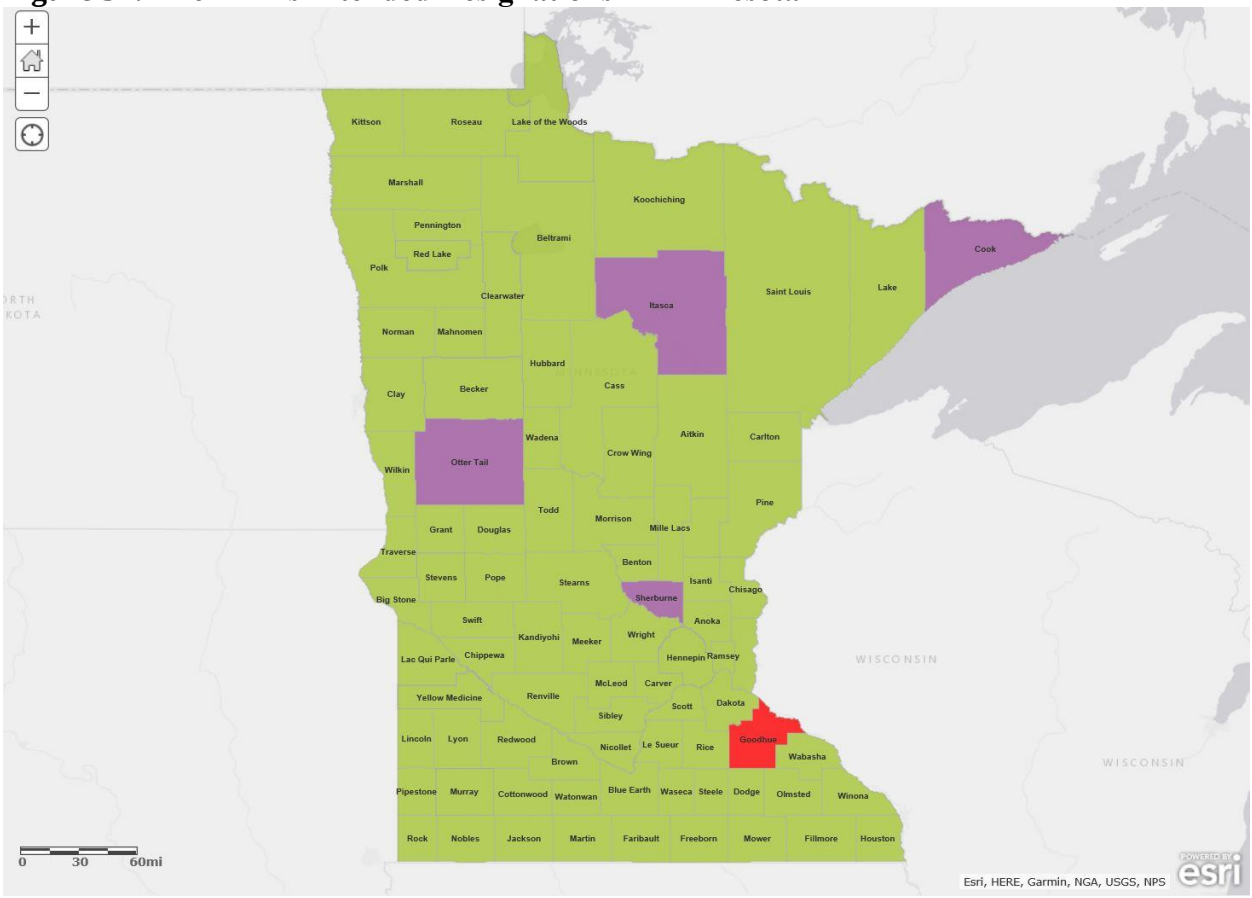
Minnesota's Recommended Definition County	Minnesota's Recommended Designation	EPA's Intended Area Definition County+	EPA's Intended Designation
Pipestone County	Unclassifiable or Attainment	Pipestone County	Unclassifiable/ Attainment
Polk County	Unclassifiable or Attainment	Polk County	Unclassifiable/ Attainment
Pope County	Unclassifiable or Attainment	Pope County	Unclassifiable/ Attainment
Ramsey County	Unclassifiable or Attainment	Ramsey County	Unclassifiable/ Attainment
Red Lake County	Unclassifiable or Attainment	Red Lake County	Unclassifiable/ Attainment
Redwood County	Unclassifiable or Attainment	Redwood County	Unclassifiable/ Attainment
Renville County	Unclassifiable or Attainment	Renville County	Unclassifiable/ Attainment
Rice County	Unclassifiable or Attainment	Rice County	Unclassifiable/ Attainment
Rock County	Unclassifiable or Attainment	Rock County	Unclassifiable/ Attainment
Roseau County	Unclassifiable or Attainment	Roseau County	Unclassifiable/ Attainment
Saint Louis County	Unclassifiable or Attainment	Saint Louis County*	Unclassifiable/ Attainment
Scott County	Unclassifiable or Attainment	Scott County	Unclassifiable/ Attainment
Sibley County	Unclassifiable or Attainment	Sibley County	Unclassifiable/ Attainment
Stearns County	Unclassifiable or Attainment	Stearns County	Unclassifiable/ Attainment
Steele County	Unclassifiable or Attainment	Steele County	Unclassifiable/ Attainment
Stevens County	Unclassifiable or Attainment	Stevens County	Unclassifiable/ Attainment
Swift County	Unclassifiable or Attainment	Swift County	Unclassifiable/ Attainment
Todd County	Unclassifiable or Attainment	Todd County	Unclassifiable/ Attainment
Traverse County	Unclassifiable or Attainment	Traverse County	Unclassifiable/ Attainment
Wabasha County	Unclassifiable or Attainment	Wabasha County	Unclassifiable/ Attainment
Wadena County	Unclassifiable or Attainment	Wadena County	Unclassifiable/ Attainment

Minnesota's Recommended Definition County	Minnesota's Recommended Designation	EPA's Intended Area Definition County+	EPA's Intended Designation
Waseca County	Unclassifiable or Attainment	Waseca County	Unclassifiable/ Attainment
Washington County	Unclassifiable or Attainment	Washington County	Unclassifiable/ Attainment
Watonwan County	Unclassifiable or Attainment	Watonwan County	Unclassifiable/ Attainment
Wilkin County	Unclassifiable or Attainment	Wilkin County	Unclassifiable/ Attainment
Winona County	Unclassifiable or Attainment	Winona County	Unclassifiable/ Attainment
Wright County	Unclassifiable or Attainment	Wright County	Unclassifiable/ Attainment
Yellow Medicine County	Unclassifiable or Attainment	Yellow Medicine County	Unclassifiable/ Attainment

*Including land that is part of the Fond du Lac Reservation.
+Includes areas of Indian country geographically located within the county, unless otherwise noted.

Table 17 also summarizes Minnesota's recommendations for these areas. Specifically, in 2011, Minnesota recommended that the remainder of the state be designated as unclassifiable or attainment. Minnesota's support for this recommendation was providing SO_2 monitoring data and an analysis of counties with no sources of SO_2 over 100 tpy. Minnesota also indicated that it had satisfied the requirements of the DRR. Fond du Lac also submitted a recommendation for their reservation of "unclassifiable" based on no available modeling or monitoring information. After careful review of the state and tribe's assessments, supporting documentation, and all available data, the EPA intends to designate the areas as "unclassifiable/attainment." Figure 37 shows the locations of these areas within Minnesota in green. The purple and red areas are the areas described previously in this document. Purple represents intended unclassifiable/attainment and red indicates intended nonattainment.

Figure 37: The EPA's Intended Designations in Minnesota



As referenced in the introduction, no area in Minnesota installed and begun timely operation of a new, approved SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 DRR, which would have been designated by December 31, 2020. Minnesota does not have any areas that were designated in Round 1 (78 FR 47191) or Round 2 (81 FR 45039, 81 FR 89870). Following the completion of these Round 3 designations, there will be no remaining undesignated areas in Minnesota.

8.2. Air Quality Monitoring Data for the Remainder of Minnesota

As indicated in Table 18, the monitors below with sufficient valid data for 2013-2015 and 2014-2016 indicate that there was no violation of the 2010 SO_2 NAAQS at the monitoring site in that period. These data were available to the EPA for consideration in the designations process, however, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality.

Table 18: Air Quality Date for Remainder of Minnesota

Location	2013-2015 DV (ppb)	2014-2016 DV (ppb)
Dakota County (FHR 420)	11	12
Dakota County (FHR 423)	5	5
Dakota County (FHR 443)	2	3
Washington County (436)	10	7
Hennepin County (954)	9	5
Olmsted County (5008)	--*	2

*Monitor did not begin operation until 2014.

Air quality design values for all monitors can be found at https://www.epa.gov/air-trends/air-quality-design-values.

8.3. Jurisdictional Boundaries in the Remaining Counties in Minnesota

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for all other counties. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. County boundaries are well established boundaries that are appropriate for defining areas to be designated.

8.4. The EPA's Assessment of the Available Information for the Remainder of Minnesota

These counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. These counties therefore meet the definition of an "unclassifiable/attainment" area.

Our intended unclassifiable/attainment areas, bounded by county and state boundaries, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment areas.

Following the completion of these Round 3 designations, there will be no remaining undesignated areas in Minnesota that will be addressed in Round 4.

8.5. Summary of Our Intended Designation for the Remainder of Minnesota

After careful evaluation of the state's and tribe's recommendations and supporting information, as well as all available relevant information, the EPA intends to designate all other counties in Minnesota including areas of Indian country (except for those specifically listed for intended

designation elsewhere in this chapter)[12] as unclassifiable/attainment for the 2010 SO_2 NAAQS. Figure 37 above shows the location of these areas within Minnesota.

[12] Goodhue, Cook, Itasca, Otter Tail, and Sherburne counties.