

# Technical Support Document:

## Chapter 25

### Final Round 3 Area Designations for the 2010 1-Hour SO<sub>2</sub> Primary National Ambient Air Quality Standard for Nebraska

#### 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<sub>2</sub>) primary national ambient air quality standard (NAAQS) (2010 SO<sub>2</sub> NAAQS). Our Notice of Availability (NOA)<sup>1</sup> and our Technical Support Document<sup>2</sup> for our intended designations for the round of designations we are required to complete by December 31, 2017, provided background on the relevant CAA definitions and the history of the designations for this NAAQS. Chapter 1 of this TSD for the final designations explains the definitions we are applying in the final designations. The TSD for the intended Round 3 area designations also described Nebraska’s recommended designations, assessed the available relevant monitoring, modeling, and any other information, and provided our intended designations.

This TSD for the final Round 3 area designations for Nebraska addresses any change in Nebraska’s recommended designations since we communicated our intended designations for areas in Nebraska. It also provides our assessment of additional relevant information that was submitted too close to the signature of the NOA to have been considered in our intended designations, or that has been submitted by Nebraska or other parties since the publication of the NOA. This TSD does not repeat information contained in the TSD for our intended designations except as needed to explain our assessment of the newer information and to make clear the final action we are taking and its basis, but that information is incorporated as part of our final designations. If our assessment of the information already considered in our TSD for our intended designations has changed based on new information and we are finalizing a designation based on such change in our assessment, this TSD also explains that change. For areas of Nebraska, not explicitly addressed in this chapter, we are finalizing the designations described in our 120-day letters and the TSD for the intended Round 3 area designations. All the final designations are listed in Table 1 below.

For the areas in Nebraska that are part of the Round 3 designations process, Table 1 identifies the EPA’s final designations and the counties or portions of counties to which they apply. It also lists Nebraska’s current recommendations, which are the same as Nebraska’s January 12, 2017

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<sup>1</sup> EPA Responses to Certain State Designation Recommendations for the 2010 Sulfur Dioxide Primary National Ambient Air Quality Standard: Notification of Availability and Public Comment Period, September 5, 2017 (82 FR 41903).

<sup>2</sup> Technical Support Document: Intended Round 3 Area Designations for the 2010 1-Hour SO<sub>2</sub> Primary National Ambient Air Quality Standard, August 2017. <https://www.epa.gov/sulfur-dioxide-designations/initial-technical-support-documents-area-designations-round-3>.

recommendation. The EPA’s final designations for these areas are based on an assessment and characterization of air quality through ambient air quality data, air dispersion modeling, other evidence and supporting information, or a combination of the above.

**Table 1. Summary of the EPA’s Final Designations and the Designation Recommendations by Nebraska**

<b>Area/ County</b>	<b>Nebraska’s Recommended Area Definition</b>	<b>Nebraska’s Recommended Designation</b>	<b>EPA’s Intended Designation</b>	<b>EPA’s Final Area Definition<sup>+</sup></b>	<b>EPA’s Final Designation<sup>3</sup></b>
Whelan Energy Center located in Adams County, Nebraska	Area around the Whelan Energy Center	Attainment	Unclassifiable	All of Adams County	Attainment/ Unclassifiable
Remaining Undesignated Areas to Be Designated in this Action <sup>*</sup>	The state made no recommendation	Unclassifiable (in 2011 submittal)	Unclassifiable/ Attainment	Each county in Nebraska with the exception of Adams, Lincoln, Lancaster, Otoe, and Douglas Counties, as separate designated areas	Attainment/ Unclassifiable

<sup>+</sup>Our final designated areas include all tribal lands within these counties. The EPA is not determining the boundaries of any area of Indian country in this document, including any area of Indian country located in a larger designation area. The inclusion of any Indian country in the designation area is not a determination that the state has regulatory authority under the Clean Air Act for such Indian country.

<sup>\*</sup> Except for the area that is associated with the source for which Nebraska elected to install and timely began operation of a new, approved SO<sub>2</sub> monitoring network meeting EPA specifications referenced in the EPA’s SO<sub>2</sub> DRR (Douglas County), the EPA is designating the remaining undesignated counties (or portions of counties) in Nebraska as attainment/unclassifiable. These remaining areas that we are designating as attainment/unclassifiable (those to which this row of this table is applicable) are identified more specifically in section 4 of Chapter 25 of the TSD for our intended designations.

Areas for which Nebraska elected to install and began operation of a new, approved SO<sub>2</sub> monitoring network are listed in Table 2. The EPA is required to designate these areas, pursuant to a court ordered schedule, by December 31, 2020. Table 2 also lists the SO<sub>2</sub> emissions sources around which each new, approved monitoring network has been established.

<sup>3</sup> Refer to Chapter 1 of Technical Support Document: Final Round 3 Area Designations for the 2010 1-Hour SO<sub>2</sub> Primary National Ambient Air Quality Standard for definitions of the designation categories and the terminology change from Unclassifiable/Attainment to Attainment/Unclassifiable.

**Table 2 – Undesignated Area Which the EPA Is Not Addressing in this Round of Designations and Associated Source**

<b>Area</b>	<b>Source</b>
Douglas County	OPPD North Omaha Station

## 2. Technical Analysis of New Information for the Adams County, Nebraska Area

### 2.1. Introduction

The EPA must designate the Adams County, Nebraska, area by December 31, 2017, because the area has not been previously designated and Nebraska has not installed and begun timely operation of a new, approved SO<sub>2</sub> monitoring network to characterize air quality in the vicinity of any source in Adams County.

Nebraska's attainment recommendation for the area around the Whelan Energy Center was based on a modeling assessment submitted on January 12, 2017. The EPA informally reviewed the January 12, 2017, modeling assessment and identified two issues, specifically the state's chosen modeling receptor grid and the hourly emissions data used for Whelan, and requested Nebraska to address these two issues. In April 2017, Nebraska provided new modeling that appeared to only address the state's chosen modeling receptor grid. Because we determined that the hourly emissions data issue resulted in us being unable to determine whether the area did or did not meet the NAAQS, we informed the state on August 22, 2017, that we intended to designate Adams County unclassifiable. However, on August 24, 2017, Nebraska staff clarified during a conference call with the EPA that the April 2017 modeling did, in fact, address and update the emissions data for Whelan. A memorandum summarizing this conference call is included in the docket. This final TSD re-addresses and re-evaluates the change in the emissions data included in Nebraska's April 2017 modeling analysis and all other aspects of this modeling analysis.

### 2.2. Summary of Information Reviewed in the TSD for the Intended Round 3 Area Designations

In the 120-day letter notification to the governor of Nebraska, and further explained in Chapter 25 of the TSD for the intended Round 3 area designations, the EPA proposed a designation of unclassifiable based on all available information, including modeling information and all relevant monitoring information.

The following Table 3 identifies all the modeling assessments evaluated for the 120-day letters and discussed in the TSD for the intended Round 3 area designations. Additional details can be found in the TSD for the Intended Round 3 Area Designations, Chapter 25.

**Table 3 –Modeling Assessments Evaluated in the TSD for the Intended Designation for the Adams County Area**

<b>Organization Submitting Assessment</b>	<b>Date of the Assessment</b>	<b>Identifier used in the TSD for the Intended Round 3 Area Designations, Chapter 25</b>	<b>Distinguishing or Otherwise Key Features</b>	<b>Designator in this Document</b>
Nebraska	January 12, 2017 (EPA-HQ-OAR-2017-0003-0112)	Adams County Area of Analysis	None	Original analysis
Nebraska	Revision dated April 13, 2017 (EPA-HQ-OAR-2017-0003-0561)x	Adams County Area of Analysis	Revised receptor grid and hourly emission inputs	Updated Whelan Grid and Emissions modeling analysis

The EPA considered all available information for the Adams County, Nebraska, area, which included the modeling assessment provided by the state on January 12, 2017, as revised on April 13, 2017, and received by the EPA on April 18, 2017, that updated the modeling receptor grid for the Adams County area. The April 13, 2017, revised report presented new modeling results but did not contain a full explanation of the modeling inputs. Based on our review of the information that was known to us in August 2017, we were unable to determine whether there was or was not a violation of the NAAQS in Adams County because we believed that the modeled emissions inputs used for Whelan did not accurately reflect the facility’s actual emissions. Therefore, our intended designation for this area was unclassifiable. However, Nebraska subsequently clarified that the April 2017 modeling did, in fact, address and update the emissions data for Whelan. This final TSD re-addresses and re-evaluates the change in the emissions data included in Nebraska’s April 2017 modeling analysis and all other aspects of this modeling analysis.

### 2.3. Assessment of New Air Quality Monitoring Data for the Adams County Area

This factor considers the SO<sub>2</sub> air quality monitoring data in the area of Adams County. Our TSD for the intended area designations did not consider monitoring data through 2016 since there was not a monitor located in Adams County or any other area where the maximum impact from the Whelan Energy Center would be expected to occur. We have no new monitoring information relevant to the designation of the Adams County area.

## 2.4. Assessment of New Air Quality Modeling Analysis for the Adams County Area Addressing Whelan Energy Center

### 2.4.1. Introduction

This section 2.4 presents all the available air quality modeling information for a portion of Adams County that includes the Whelan Energy Center. (This portion of Adams County will often be referred to as “the Whelan area” within this section 2.4.) This area contains the following SO<sub>2</sub> source, the source around which Nebraska was required by the DRR to characterize SO<sub>2</sub> air quality:

- The Gerald Whelan Energy Center facility emitted 2,000 tons or more annually. Specifically, Whelan emitted 2,899 tons of SO<sub>2</sub> in 2014. This source meets the DRR criteria and thus is on the SO<sub>2</sub> DRR Source list, and Nebraska has chosen to characterize it via modeling.

On April 18, 2017, Nebraska submitted a new modeling analysis for the area surrounding the Whelan Energy Center. Although the EPA reviewed this modeling prior to the issuance of our intended designation of unclassifiable for this area, the state of Nebraska has since clarified that the EPA did not properly consider the change in the emissions rates that were included in this modeling analysis. Therefore, the EPA will provide our re-analysis of this modeling in the remainder of this TSD chapter.

Nebraska’s April 2017 modeling assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing a mixture of actual and allowable emissions. The area that the state has assessed via air quality modeling is located in south-central Nebraska near the city of Hastings (population ~ 25,000) in Adams County. After re-evaluating the modeling assessment submitted by Nebraska in April 2017 taking into consideration the clarifications provided by Nebraska, the EPA has determined that Nebraska’s analysis supports a different designation than the EPA’s intended designation for this area. Specifically, the EPA expressed an intent to designate the area as unclassifiable whereas Nebraska’s modeling analysis supports a designation as attainment/unclassifiable.

As seen in Figure 1 below, the Whelan facility is located 5 kilometers (km) east from Hastings, Nebraska. Also included in the figure are other nearby emitters of SO<sub>2</sub>.<sup>4</sup> These are Chief Ethanol located 0.5 km to the northwest of Whelan, Ag Processing Inc. (AGP) located 2.5 km to the northwest of Whelan, and Platte Generating Station located 30 km to the north of Whelan. There are no other emitters above 100 tons per year (tpy) of SO<sub>2</sub> in Adams County.

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<sup>4</sup> All other SO<sub>2</sub> emitters based on information in the 2014 NEI are shown in Figure 1. Nebraska included all SO<sub>2</sub> sources within 40 km of Whelan in the modeling analysis.

The EPA’s final designation boundary for the Adams County attainment/unclassifiable area is not shown in this figure, but is shown in a figure in the section below that summarizes our final designation.

**Figure 1. Map of Adams County and Surrounding Area Addressing the Whelan Energy Center. The location of the Whelan Energy Center DRR facility is identified by the red circle while the locations of the nearby facilities included in the modeling are identified by blue circles**



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 cited in Chapter 1 of this TSD, as appropriate.

For this area, the EPA reconsidered the modeling assessments listed in Table 1. The concentration results in the April 13, 2017, document are considered the applicable modeling

results, but the narrative in the January 12, 2017, document provides useful explanation of some aspects of how the modeling analysis was conducted.

#### *2.4.2. Modeling Analysis Provided by the State*

Although the state did not provide any new dispersion modeling for this area in response to our intended designation, the state did clarify the basis of the emission rates that were used for Updated Whelan Grid and Emissions modeling analysis.

##### *2.4.2.1. Differences Among and Relevance of the Modeling Assessments*

As previously stated, the EPA did not receive any new modeling in response to our 120-day letter. However, Nebraska did clarify to the EPA the basis for the emission rates that were used in the Updated Whelan Grid and Emissions modeling analysis. Therefore, all further discussion of state modeling results reflects evaluation of the Updated Whelan Grid and Emissions modeling analysis, taking into consideration the clarifications provided by Nebraska.

##### *2.4.2.2. Model Selection and Modeling Components*

The EPA's Modeling TAD notes that for area designations under the 2010 SO<sub>2</sub> 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
- BPIPFRM: 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 with the regulatory default options, the most recent at the time of the state's initial modeling analysis that was submitted on January 12, 2017. The Updated Whelan Grid and Emissions modeling analysis also used version 15181 instead of the most recent version of 16216r. The state chose to use version 15181 in its Updated Whelan Grid and Emissions modeling analysis to remain consistent with its initial submittal, and the EPA agrees that version 15181 is acceptable for use in the new modeling analysis since we do not expect any significant differences between the two versions since the default options were selected. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.



#### *2.4.2.3. 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<sub>2</sub> modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO<sub>2</sub> 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, the state determined that it was most appropriate to run the model in rural mode. As previously mentioned, Whelan is located 5 km east of the Hastings, Nebraska, and the land around the Whelan facility is predominately farmland. Thus, the EPA agrees with the state that rural mode is appropriate for this analysis. This component and the EPA’s analysis did not change from the prior TSD chapter for the intended designations.

#### *2.4.2.4. Modeling Parameter: Area of Analysis (Receptor Grid)*

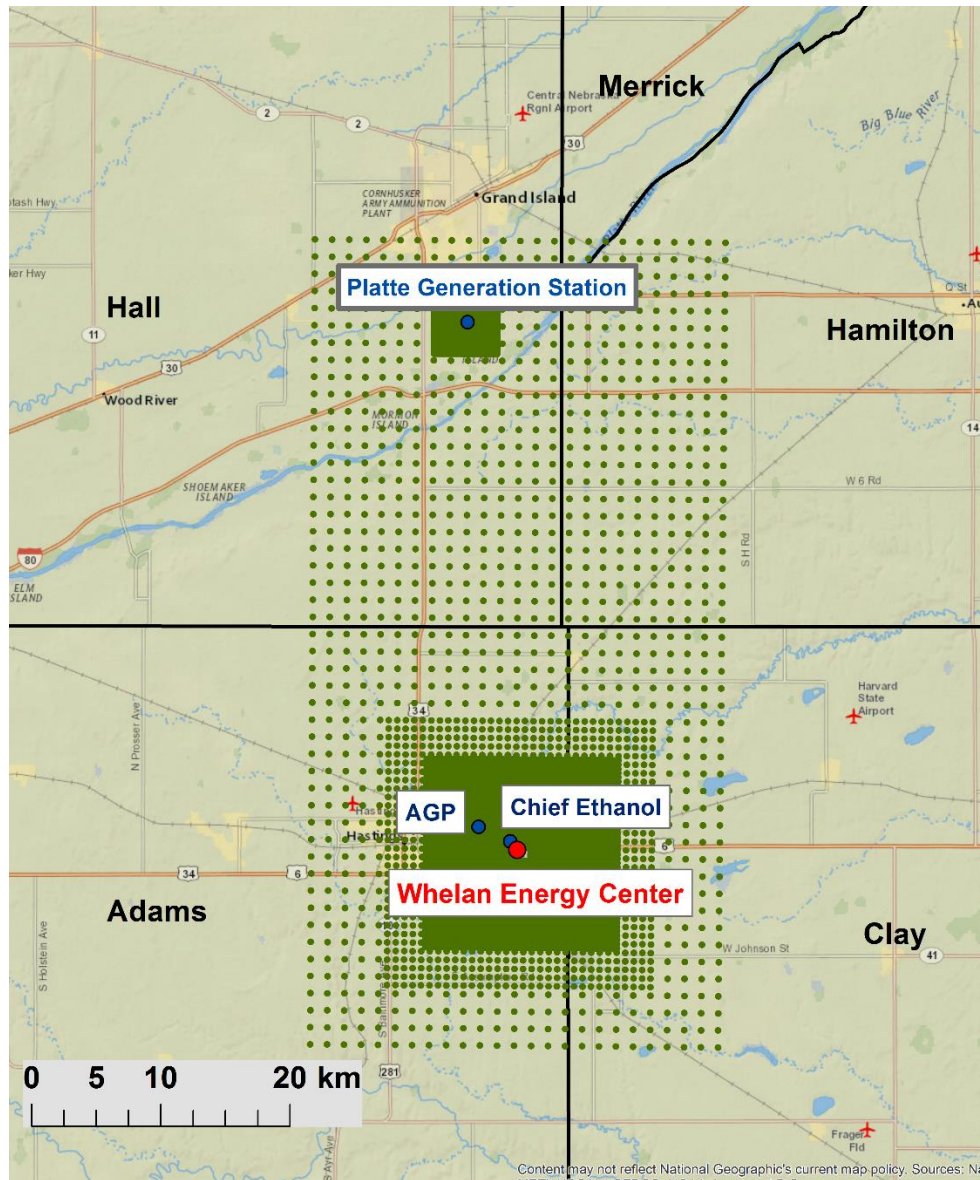
The Modeling TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO<sub>2</sub> 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<sub>2</sub> concentrations. The source of SO<sub>2</sub> emissions subject to the DRR in this area is described in the introduction to this section.

For the Whelan area, the state included three other emitters of SO<sub>2</sub> within 40 km of Whelan in any direction. The state determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO<sub>2</sub> NAAQS exceedances in the area of analysis and any potential impact on SO<sub>2</sub> air quality from other sources in nearby areas. In addition to Whelan, the other emitters of SO<sub>2</sub> included in the area of analysis are as follows: Chief Ethanol (Chief) located 0.5 km to the northwest of Whelan, Ag Processing Inc. (AGP) located 2.5 km to the northwest of Whelan, and Platte Generating Station (PGS) located 30 km to the north of Whelan, in Hall County. No other sources beyond 40 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. The grid receptor spacing for the Whelan area of analysis is shown in Figure 2 and described by the state in its submittal as follows:

- 50-meter spacing on the fence line
- 50-meter spacing from the fence to 1 kilometer from the fence
- 100-meter spacing from 1 kilometer to 2 kilometers from the fence
- 250-meter spacing from 2 kilometers to 5 kilometers from the fence
- 500-meter spacing from 5 kilometers to 7 kilometers from the fence
- 1000-meter spacing from 7 to 40 kilometers in the north direction from the fence and from 7 to 10 km in all other direction.

In addition to the grid centered on Whelan as described above, an enhanced density grid of additional receptors is placed around the nearby sources of AGP, Chief and PGS. The grids at AGP, Chief and PGS extend out to at least 10 kilometers from each facility. The receptor network contained 12,045 receptors, and the network covered the portions of four counties: the northeastern portion of Adams County, the northwestern portion of Clay County, the southwestern portion of Hamilton County and the southeastern portion of Hall County. Figure 2 was produced by the EPA from the modeling outputs provided by the state. The state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to the Whelan facility, including other facilities' property (AGP, Chief, PGS). Receptors were excluded within the Whelan Facility property, which restricts public access via a fence that the EPA verified through satellite imagery. The EPA concludes that the receptors used in the Nebraska submittal are appropriate for characterizing the air quality around the Whelan facility. This component and the EPA's analysis did not change from the prior TSD chapter for the intended designations.

**Figure 2: Area of Analysis and Receptor Grid for the Whelan Area**



#### 2.4.2.5. 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 good engineering practice (GEP) policy with allowable emissions.

As mentioned previously, the state explicitly modeled the Whelan facility along with all sources of SO<sub>2</sub> within 40 km of Whelan, including Chief, AGP, and PGS. The state used actual stack heights in conjunction with actual emissions for the Whelan facility. The state also followed the EPA's GEP policy in conjunction with allowable emissions limits modeled for the nearby sources of Chief and AGP. For Chief and AGP, the state modeled using allowable emissions

with actual stack heights since the actual stack heights are below the GEP stack height. For PGS, the state modeled allowable emissions with the actual stack height (~125 meters), which counters the recommendations of the modeling TAD. The actual stack height for PGS is 6 meters above the post 1979 GEP formula stack height of 119 meters. The difference in modeled stack height versus formula GEP stack height would cause minimal impacts in the area around Whelan, which, as mentioned above, is 40 km away.

Based on review of available information, the state adequately characterized Whelan's and AGP's building layout and location. The AERMOD component BPIPFRM was used to assist in addressing building downwash. No building information was provided for Chief. It appears the state correctly characterized additional stack parameters for all modeled facilities, e.g., exit temperature, exit velocity, location, and diameter. This component and the EPA's analysis did not change from the prior TSD chapter for intended designations.

#### *2.4.2.6. 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<sub>2</sub> 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<sub>2</sub> 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 Whelan and three other emitters of SO<sub>2</sub> within 40 km in the area of analysis. For this area of analysis, the state has opted to use a hybrid approach, where emissions from certain facilities are expressed as actual emissions, and those from other facilities

are expressed as PTE rates. The facilities in the state’s modeling analysis and their associated actual or PTE rates are summarized below.

For Whelan, the state modeled annual actual SO<sub>2</sub> emissions between 2013 and 2015. This information is summarized in Table 3.

**Table 3. Actual SO<sub>2</sub> Emissions Between 2013 – 2015 from Whelan Energy Center in Adams County**

Facility Name	SO <sub>2</sub> Emissions (tpy)		
	2013	2014	2015
Whelan Energy Center	2,131	2,899	1,903

As discussed in the EPA’s TSD for the intended designations, the state’s January 12, 2017, original modeling used emissions for Whelan that the EPA observed had discrepancies between the CEMs data used in the modeling compared to hourly CEMs obtained directly from CAMD for the period October 2014 – December 2014. The hourly emissions data reported by CAMD were consistently greater than the hourly modeled rates for this time period. This unexplained discrepancy between the modeled CEMs emissions and the reported CAMD emissions for Whelan was the main technical reason the EPA could not rely on the state’s modeling and formed the basis for the EPA’s intended unclassifiable designation.

As noted in Section 2.1, the state has since clarified that in its Updated Whelan Grid and Emissions modeling analysis, the state used emission rates that were reported to CAMD. Thus, the Updated Whelan Grid and Emissions modeling analysis eliminates the discrepancy in modeled emissions that was discussed in the intended TSD. The EPA reviewed the updated modeling inputs, and verified that the Updated Whelan Grid and Emissions modeling used the emissions reported to CAMD. The EPA finds the hourly modeled emission rates modeled at Whelan in the state’s Updated Whelan Grid and Emissions Modeling submittal appropriate.

For the Chief, AGP, and PGS facilities, the state used PTE values in the Updated Whelan Grid and Emissions modeling. This information is summarized in Table 4. A description of how the state obtained hourly emission rates is given below this table.

**Table 4. SO<sub>2</sub> Emissions based on PTE from Other Facilities in the Area of Analysis for the Adams County Area. For comparison, the facilities' actual emissions from the 2014 NEI are also provided.**

<b>Facility Name</b>	<b>SO<sub>2</sub> Emissions (tpy, based on PTE)</b>	<b>Actual SO<sub>2</sub> Emissions (tpy) for 2014</b>
Chief Ethanol (Chief)	289	239
Ag Processing (AGP)	184	21
Platte Generating Station (PGS)	5,508	1,452
Total Emissions from These Other Facilities in the Area of Analysis Modeled Based on PTE	5,981	N/A

The PTE in tons per year for each of Chief, AGP, and PGS was determined by the state based on its existing permitted emissions limit. For AGP and Chief, the state determined hourly emissions corresponding to this annual allowable emission value by assuming constant emissions for each hour of the year (annual PTE / 8760 hours). For PGS, the constant hourly emission input was set equal to the permitted 3-hour average emission rate in lb/MMBtu multiplied by the capacity of the boiler in MMBtu/hour.

The state's modeling for nearby sources in the Whelan area were based on allowable permitted emissions and developed into 1-hr modeled rates with the most detailed information available to the state.

- The modeled rates are based on an assumption of constant hourly allowable emissions for AGP and Chief, for which no SO<sub>2</sub> CEMS is in place (Chief) or hourly CEMS-based data are not available to the state (AGP), with the sum of hourly emission inputs over the year equal to the permitted limit on annual emissions. It is not known if the state had additional information (e.g., operating schedule for the boilers) at Chief and AGP that could have been used to temporally vary the annual emissions. In the TSD for the intended designations, we identified the assumption of constant hourly emissions as a source of uncertainty in the modeling. However, taking into consideration the correction of the Whelan facility's emissions to the more conservative CAMD values in combination with the fact that the hourly modeled rates were developed from annual PTE values that, for the most part, are well above the 2014 actual emissions for these facilities, we conclude that the state's development of the emission rates for Chief and AGP does not prevent us from relying on the Updated Whelan Grid and Emissions modeling to support a final designation of attainment/unclassifiable.
- The hourly emission inputs for PGS were based on a permitted emission limit that has a 3-hr averaging period, and in this case the EPA accepts a 3-hour averaging period as sufficient to prevent wide variations in hourly emissions. The EPA's acceptance of this value is supported by the fact that the 2014 actual annual emissions for PGS were about 26% of the facility's PTE. This difference between the 2014 actual emissions and PTE indicates that the emission rate used in the model for PGS is likely more conservative than the actual emissions from the facility, which the EPA's modeling TAD indicates would have been acceptable to use in the modeling.

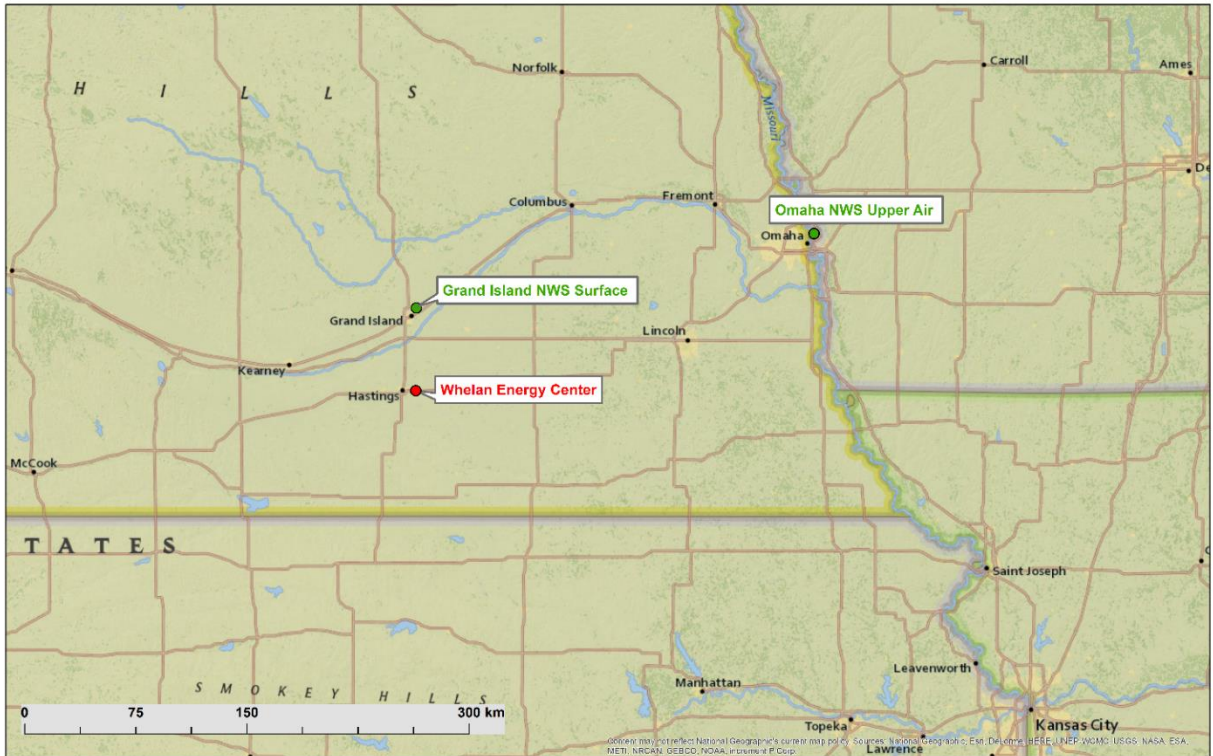
#### *2.4.2.7. Modeling Parameter: Meteorology and Surface Characteristics*

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 Whelan area, the state selected the surface meteorology from the NWS station in Grand Island, Nebraska, located at [40.961320°N, 98.313040°W], 40 km to the north of Whelan and coincident upper air observations from a different NWS station, located in Omaha, Nebraska, at [41.30°N, 95.90°W], 215 km to the northeast of Whelan as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the Grand Island, Nebraska, NWS station to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness ( $z_0$ )) 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 “ $z_0$ ”) of the area of analysis. The state estimated values for 12 spatial sectors out to 1 km at seasonal temporal resolution for average moisture conditions. In Figure 4, generated by the EPA, the locations of the surface and upper air NWS stations are shown relative to the area of analysis.

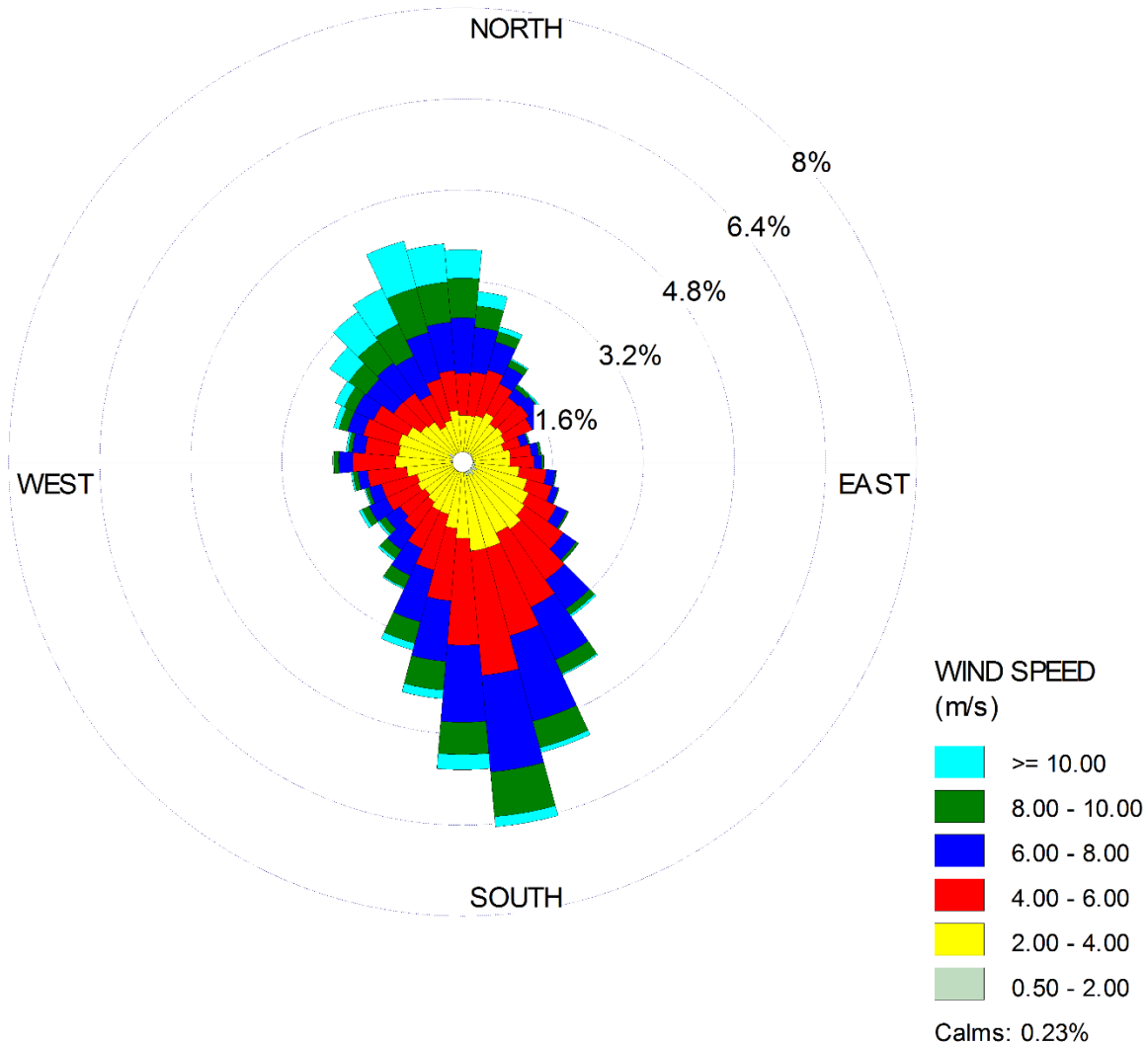
**Figure 4: Area of Analysis and the NWS stations in the Adams County Area. The surface meteorology NWS is located in Grand Island, Nebraska, and the upper air meteorology NWS is located in Omaha, Nebraska.**



As part of its recommendation, the state provided the 3-year surface wind rose for the Grand Island, Nebraska, NWS site. In Figure 5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Typical of the Great Plains region, the winds have a predominant north or south direction and strong winds (i.e., wind speeds  $> 8$  m/s) occurred on approximately 15% of the observations.



**Figure 5: Adams County Area Cumulative Annual Wind Rose 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 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 Section 8.3 of Appendix W to 40 CFR Part 51 titled, “Guideline on Air Quality Models” in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-

minute duration was provided from the Grand Island, Nebraska, NWS but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. 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 believes the NWS stations used are representative for the meteorological conditions near the Whelan facility. Overall, the methodology used by the state to process the meteorological data for input in AERMOD follows EPA guidance (e.g., use of AERSURFACE, AERMINUTE, etc.). This component and the EPA's analysis did not change from the prior intended designation TSD.

#### *2.4.2.8. 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 with occasional rolling hills and small river or creek valleys. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. The source of the elevation data incorporated into the model is from the USGS National Elevation Dataset (NED). The state appropriately inputted terrain surrounding the Whelan facility using the NED data based on North American Datum (NAD) 83 for horizontal locations and NAVD88 for elevation. This component and the EPA's analysis did not change from the prior intended designation TSD.

#### *2.4.2.9. Modeling Parameter: Background Concentrations of SO<sub>2</sub>*

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO<sub>2</sub> 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<sup>th</sup> percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose the "tier 1" approach, and based the background concentration on the 2013-2015 design

value from the Van Buren County, Iowa, monitor (AQS site ID: 191770006). The location of the Van Buren site in comparison to the Whelan facility is shown in Figure 6.

The single value of the background concentration for this area of analysis was determined by the state to be 8 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ), equivalent to 3 ppb when expressed without significant figures,<sup>5</sup> and that value was incorporated into the final AERMOD results.

Figure 6 shows the potential sites of monitors that could be used to characterize background concentrations of  $\text{SO}_2$  for the Whelan facility modeling analysis.  $\text{SO}_2$  monitoring is limited in the rural areas surrounding the Whelan facility, with the closest monitor located over 200 km away in urban Omaha, Nebraska. The state decided to use the Van Buren County, Iowa, monitor for two primary reasons. One, no  $\text{SO}_2$  monitors are located in the state of Nebraska outside of the two located in Omaha, Nebraska. The two sites in Omaha are influenced by local emissions from coal-fired EGUs and would not represent the rural area around Whelan. Second, the Van Buren site is used by the state of Iowa as its default  $\text{SO}_2$  background concentration for its state-run New Source Review permitting program.<sup>6</sup> The Van Buren site is not located near any sources of  $\text{SO}_2$  emissions and provides a regional representation of natural background levels. The state of Nebraska also chose the Van Buren site as representative background for the Whelan area since Nebraska and Iowa share similar characteristics (e.g., land-use, meteorology, etc.).

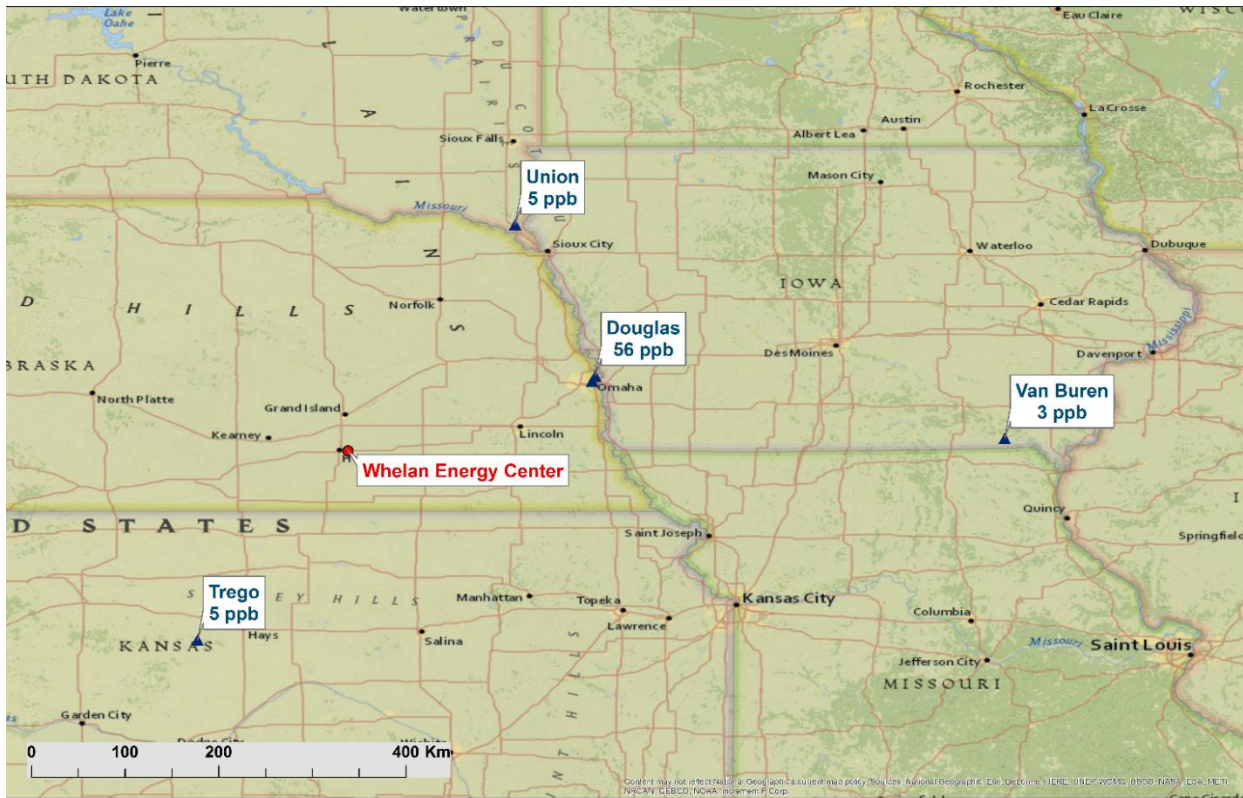
The Van Buren, Iowa, site is over 500 km away from the Whelan facility. Two regional  $\text{SO}_2$  monitors do exist within 250 and 300 km. The Trego County, Kansas, monitor (design value of 5 ppb) is 275 km to the southwest and the Union County, South Dakota monitor (design value of 5 ppb) is 250 km to the northeast of Whelan. Both of these monitors would have represented a slightly more conservative background when compared to the Van Buren site (design value of 3 ppb), but there are large distances between these three monitors and the Adams County Area and the EPA finds the state's use of the Van Buren site acceptable. This component and the EPA's analysis did not change from the prior intended designation TSD.

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<sup>5</sup> The  $\text{SO}_2$  NAAQS level is expressed in ppb but AERMOD gives results in  $\mu\text{g}/\text{m}^3$ . The conversion factor for  $\text{SO}_2$  (at the standard conditions applied in the ambient  $\text{SO}_2$  reference method) is 1ppb = approximately  $2.619 \mu\text{g}/\text{m}^3$ .

<sup>6</sup> Iowa Department of Natural Resources (IDNR) Technical Support Document for Background Concentrations used in dispersion modeling (<http://www.iowadnr.gov/Environmental-Protection/Air-Quality/Modeling/Dispersion-Modeling/Background-Data>).

**Figure 6: Background monitor locations and 1-hr SO<sub>2</sub> Design Values (ppb) in the vicinity of Adams County Area of Analysis. The state chose the Van Buren County, Iowa, monitor to characterize background concentrations for the Whelan modeling analysis.**



2.4.2.10. *Summary of Modeling Inputs and Results*

The AERMOD modeling input parameters for the Adams County area of analysis are summarized below in Table 5.

**Table 5: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Adams County Area**

<b>Input Parameter</b>	<b>Value</b>
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	4
Modeled Stacks	6
Modeled Structures	35
Modeled Fencelines	2
Total receptors	12,045
Emissions Type	Mix of actual and allowable
Emissions Years	2013-2015 for actuals
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Grand Island, Nebraska
NWS Station Upper Air Meteorology	Omaha, Nebraska
NWS Station for Calculating Surface Characteristics	Grand Island, Nebraska
Methodology for Calculating Background SO <sub>2</sub> Concentration	Tier 1 Van Buren County, Iowa, 2013-2015 Design Value (AQS ID: 191770006)
Calculated Background SO <sub>2</sub> Concentration	8 µg/m <sup>3</sup>

The results presented below in Table 6 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

**Table 6: Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO<sub>2</sub> Concentration for the Area of Analysis for the Adams County Area**

Averaging Period	Data Period	Receptor Location [UTM zone 14]		99 <sup>th</sup> percentile daily maximum 1-hour SO <sub>2</sub> Concentration (µg/m <sup>3</sup> )	
		UTM/Latitude	UTM/Longitude	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013-2015	557950	4493250	191.2	196.4*

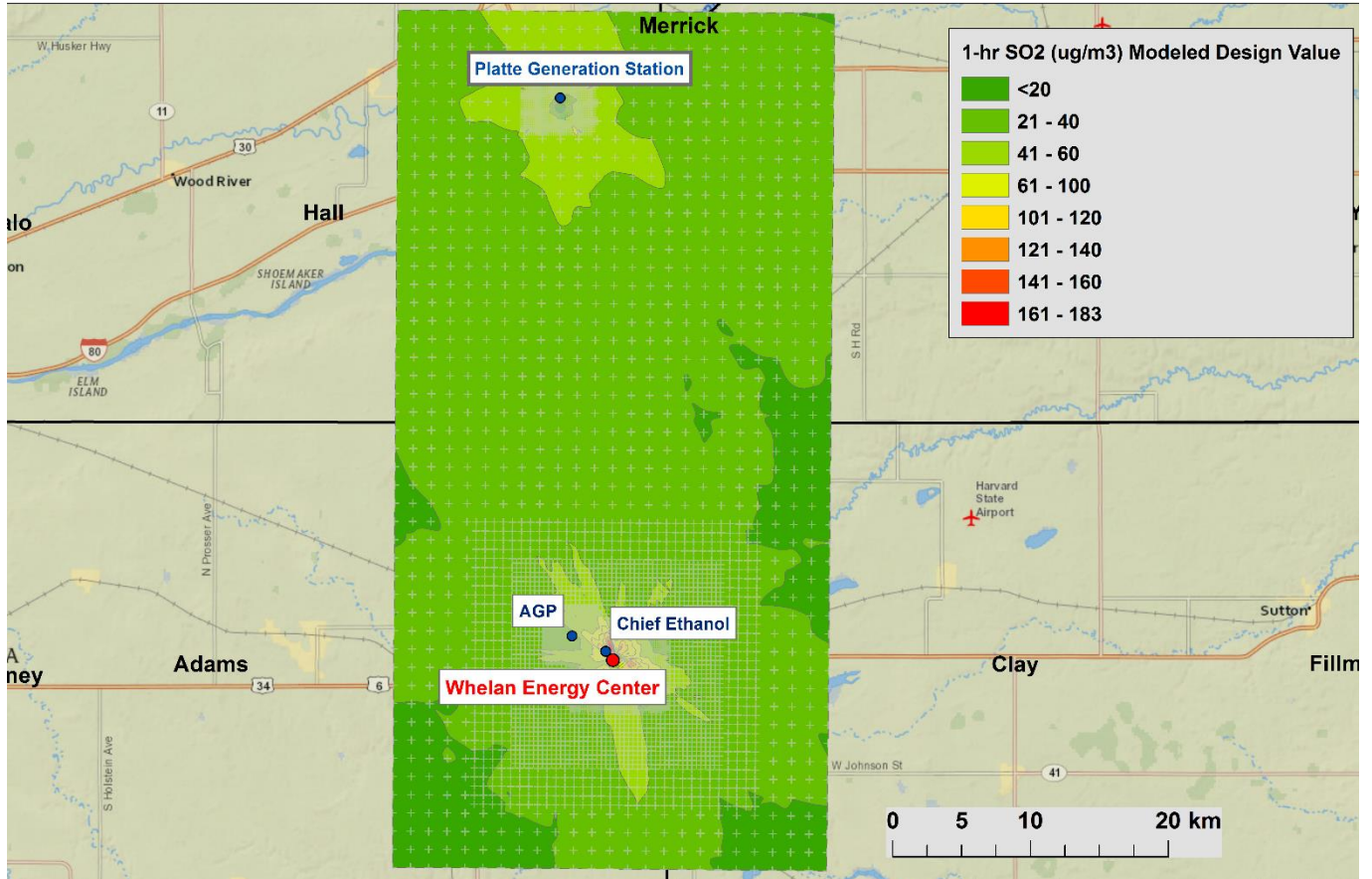
\*Equivalent to the 2010 SO<sub>2</sub> NAAQS of 75 ppb using a 2.619 µg/m<sup>3</sup> conversion factor.

The state’s modeling indicates that the highest predicted 99<sup>th</sup> percentile daily maximum 1-hour concentration within the chosen modeling domain is 191.2 µg/m<sup>3</sup>, equivalent to 73.0 ppb. This modeled concentration included the background concentration of SO<sub>2</sub>, and is based on a mixture of actual and permitted allowable emissions from the facilities.<sup>7</sup>

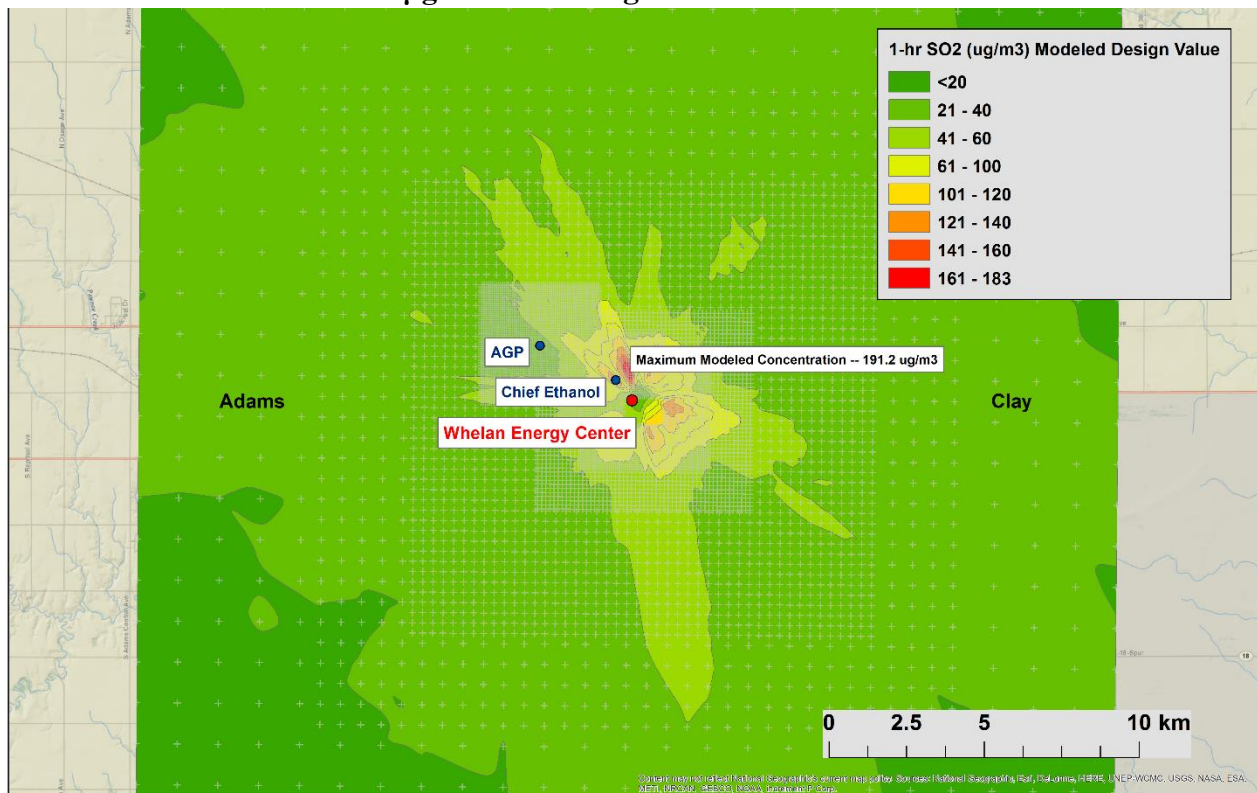
Figure 7 shows the modeling results throughout the 40-km receptor grid and Figure 8 provides the results around the Whelan facility and indicates that the maximum predicted value occurred about 0.8 km to the north-northwest of the Whelan facility. The state’s receptor grid is also shown in Figure 7 and 8. Figure 7 and Figure 8 were produced by the EPA from the modeling outputs provided by the state.

<sup>7</sup> In Table 6 of Chapter 25 of the TSD for the intended designations, the maximum concentration was stated to be 188.7 µg/m<sup>3</sup>. This was an error on the part of the EPA. Table 2 of the April 12, 2017, revised modeling report indicates that the maximum modeled concentration is 191.2 µg/m<sup>3</sup>.

**Figure 7: Maximum Predicted 99<sup>th</sup> Percentile Daily Maximum 1-Hour SO<sub>2</sub> Concentrations for the Area of Analysis for the Whelan Area. The modeled receptor locations are shown with “+”. The maximum modeled design value is 0.8 km to the north of Whelan at 191.2 µg/m<sup>3</sup> with background concentration.**



**Figure 8: Similar to Figure 7 except zoomed into area around Whelan. The modeled receptor locations are shown with “+”. The maximum modeled design value is 0.8 km to the north of Whelan at 191.2  $\mu\text{g}/\text{m}^3$  with background concentration.**



#### 2.4.2.11. *The EPA’s Assessment of the Modeling Information Provided by the State*

The state has submitted modeling demonstrating the Adams County, Nebraska, area is meeting the NAAQS and the EPA believes that the aspects of the modeling adequately conform to the modeling TAD. The state used CAMD-substituted CEMs data for Whelan in its modeling assessment that likely reflect either the actual emissions or, due to the CAMD data substitution methodology, rates that are greater than the actual emissions from this facility during 2013-2015. The prior emission inputs used for Whelan in the January 12, 2017, modeling that the EPA could not accurately verify have been corrected in the state’s April 13, 2017, revised modeling. Further, we conclude that the state’s use of PTE to develop the constant hourly emission rates used in the modeling for Chief and AGP is acceptable and allows us to rely on the state’s modeling assessment. The EPA is relying on this modeling run to inform our final designation for Adams County.

### 2.5. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Adams 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.

## 2.6. Jurisdictional Boundaries in the Adams County Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Adams County, Nebraska. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The state did not provide specific jurisdictional boundaries in its designation recommendation, only recommending "the area around the Whelan Energy Center" be designated attainment. The modeling analysis included all sources of SO<sub>2</sub> within Adams County and nearby counties greater than 100 tons per year and the EPA believes using the existing Adams County boundary is appropriate.

## 2.7. Other Additional Information Relevant to the Designations for the Adams County Area

In August 2017, Nebraska clarified that the state's April 13, 2017, revised modeling used substituted CAMD hourly emissions for the timeframe of October – December, 2014, alleviating the EPA's concerns of the discrepancy of modeled emissions noted in our intended designations. The EPA is therefore revising our assessment of the area to inform our final designation based on this new information.

No additional 3<sup>rd</sup> party modeling or analysis was received on our intended designation for this area.

## 2.8. The EPA's Assessment of the Available Information for the Adams County Area

The state has submitted modeling demonstrating the Adams County area is meeting the NAAQS and the EPA believes that all aspects of the latest modeling adequately conform to the modeling TAD. Nebraska's clarification that the April 18, 2017, modeling submittal used revised CEMs data from CAMD addresses the most important basis for the EPA's intended designation of unclassifiable. Further, we conclude that the assumption of constant hourly emissions used to convert PTE from Chief and AGP to hourly emission inputs to the modeling is not a source of uncertainty large enough to prevent reliance on the modeling results. The EPA therefore finds that the April 2017 modeling supports a designation of attainment/unclassifiable.

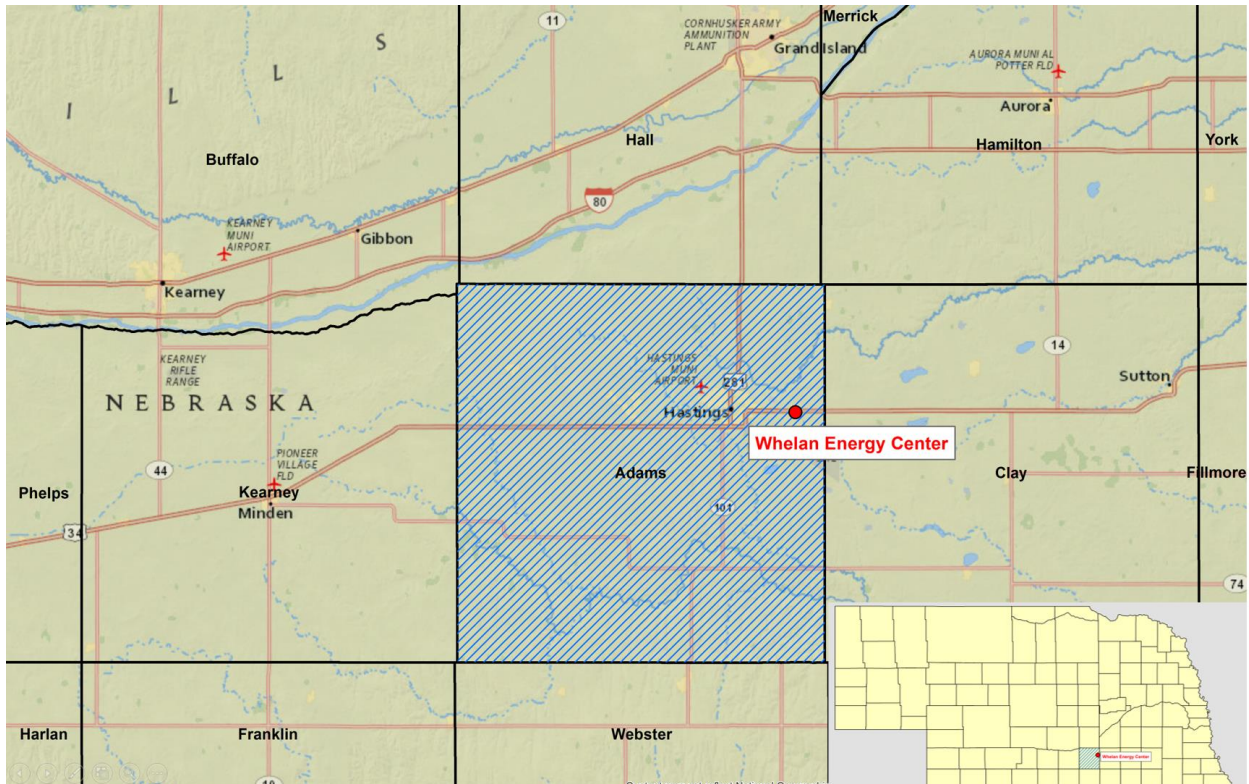
The EPA believes that our final attainment/unclassifiable area, bounded by the entirety of Adams County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our final attainment/unclassifiable area.

## 2.9. Summary of Our Final Designation for the Adams County Area

After careful evaluation of the state’s recommendation and supporting information, as well as all available information, the EPA is designating Adams County as attainment/unclassifiable for the 2010 SO<sub>2</sub> NAAQS because the area does not violate the NAAQS, nor does available information indicate that the area contributes to a violation of the NAAQS in a nearby area. Specifically, the boundaries are comprised of the entirety of Adam County.

Figure 9 shows the boundary of this final designated area.

**Figure 9. Boundary of the Final Adams County Attainment/Unclassifiable Area**



At this time, our final designations for the state only apply to this area and the other areas presented in the TSD for the intended designations. The EPA intends in a separate action to evaluate and designate Douglas County, Nebraska, by December 31, 2020.