Technical Support Document
Texas
Area Designations for the 2010 SO_2 Primary National Ambient Air Quality Standard

Summary

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

Texas submitted updated recommendations on September 18, 2015, ahead of a July 2, 2016, deadline for the EPA to designate certain areas established by the U.S. District Court for the Northern District of California. This deadline is the first of three deadlines established by the court for the EPA to complete area designations for the 2010 SO_2 NAAQS. Table 1 below lists Texas's recommendations and identifies the counties or portions of counties in Texas that the EPA intends to designate by July 2, 2016 based on an assessment and characterization of air quality through ambient air quality data, air dispersion modeling, other evidence and supporting information, or a combination of the above.

Table 1: Texas' Recommended and EPA's Intended Designations

Area	Texas' Recommended Area Definition	Texas' Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Atascosa County, Texas	Atascosa County	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Fort Bend County, Texas	Fort Bend County	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable
Freestone-Anderson Counties, Texas	Freestone County	Unclassifiable/ Attainment	Portions of Freestone and Anderson Counties. The area bound by the following UTM coordinates* (NAD 83 Datum, UTM Zone 14): X Y 762752, 3540333 762752, 3510333 789753, 3510333 789753, 3540333	Nonattainment

			*EXCLUDING portions of Navarro County that fall within this UTM-based boundary.	
Goliad County, Texas	Goliad County	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Lamb County, Texas	Lamb County	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Limestone County, Texas	Limestone County	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
McLennan County, Texas	McLennan County	Attainment	Same as State's Recommendation	Unclassifiable
Milam County, Texas	Milam County	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable
Potter County, Texas	Potter County	Unclassifiable	Same as State's Recommendation	Unclassifiable
Robertson County, Texas	Robertson County	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Rusk-Gregg-Panola Counties, Texas	Rusk County	Unclassifiable/ Attainment	Portions of Rusk, Gregg, and Panola Counties. The area bounded by the following UTM coordinates* (NAD 83 Datum, UTM Zone 15): X Y 336067, 3585315 336067, 3558314 361568, 3558314 361568, 3585315 * EXCLUDING the portion of Harrison County that fall within this UTM-based boundary.	Nonattainment

Titus County, Texas	Titus County	Unclassifiable/ Attainment	Portions of Titus County. The area bounded by the following UTM Coordinates* (NAD 83 Datum, UTM Zone 15): X Y 302329, 3666971 302329, 3660770 313530, 3660770 313530, 3666971 * EXCLUDING portions of Camp County, Texas that fall within this UTM-based boundary.	Nonattainment

Background

On June 3, 2010, the EPA revised the primary (health based) SO_2 NAAQS by establishing a new one-hour standard at a level of 75 parts per billion (ppb) which is attained when the three-year average of the 99th percentile of one-hour daily maximum concentrations does not exceed 75 ppb. This NAAQS was published in the Federal Register on June 22, 2010 (75 FR 35520) and is codified at 40 CFR 50.17. The EPA determined this is the level necessary to protect public health with an adequate margin of safety, especially for children, the elderly and those with asthma. These groups are particularly susceptible to the health effects associated with breathing SO_2. The two prior primary standards of 140 ppb evaluated over 24 hours, and 30 ppb evaluated over an entire year, codified at 40 CFR 50.4, remain applicable.[1] However, the EPA is not currently designating areas on the basis of either of these two primary standards. Similarly, the secondary standard for SO_2, set at 500 ppb evaluated over 3 hours has not been revised, and the EPA is also not currently designating areas on the basis of the secondary standard.

General Approach and Schedule

Section 107(d) of the Clean Air Act requires that not later than one year after promulgation of a new or revised NAAQS, state governors must submit their recommendations for designations and boundaries to EPA. Section 107(d) also requires the EPA to provide notification to states no less than 120 days prior to promulgating an initial area designation that is a modification of a state's recommendation. If a state does not submit designation recommendations, the EPA will promulgate the designations that it deems

[1] 40 CFR 50.4(e) provides that the two prior primary NAAQS will no longer apply to an area one year after its designation under the 2010 NAAQS, except that for areas designated nonattainment under the prior NAAQS as of August 22, 2010, and areas not meeting the requirements of a SIP Call under the prior NAAQS, the prior NAAQS will apply until that area submits and EPA approves a SIP providing for attainment of the 2010 NAAQS. There are no currently designated nonattainment areas in Texas under the previous SO_2 NAAQS, and no part of the state is subject to a SIP Call under the prior NAAQS.

appropriate. If a state or tribe disagrees with the EPA's intended designations, they are given an opportunity within the 120 day period to demonstrate why any proposed modification is inappropriate.

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

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

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

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

Updated designations guidance was issued by the EPA through a March 20, 2015 memorandum from Stephen D. Page, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Air Division Directors, U.S. EPA Regions I-X. This memorandum supersedes earlier designation guidance for the 2010 SO_2 NAAQS, issued on March 24, 2011, and it identifies factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The guidance also contains the factors the EPA intends to evaluate in determining the boundaries for all remaining areas in the country, consistent with the court's order and schedule. These factors include: 1) Air quality characterization via ambient monitoring or dispersion modeling results; 2) Emissions-related data; 3) Meteorology; 4) Geography and topography; and 5) Jurisdictional boundaries. This guidance was supplemented by two

technical assistance documents intended to assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling or ambient air quality monitoring for sources that emit SO_2. Notably, the EPA released its most recent versions of documents titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and "SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document" (Monitoring TAD) in December 2013.

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

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 three year average of the 99th percentile of the annual distribution of daily maximum one-hour average concentrations. See 40 CFR 50.17.
2) Design Value - a statistic computed according to the data handling procedures of the NAAQS (in 40 CFR part 50 Appendix T) that, by comparison to the level of the NAAQS, indicates whether the area is violating the NAAQS.
3) Designated nonattainment area – an area which the EPA has determined has violated the 2010 SO_2 NAAQS or contributed to a violation in a nearby area. A nonattainment designation would reflect considerations of state recommendations and all of the information discussed in this document. The EPA's decision would be based on all available information including the most recent 3 years of air quality monitoring data, available modeling analysis, and any other relevant information.
4) Designated unclassifiable area – an area which the EPA cannot determine based on all available information whether or not it meets the 2010 SO_2 NAAQS.
5) Designated unclassifiable/attainment area – an area which the EPA has determined to have sufficient evidence to find either is attaining or is likely to be attaining the NAAQS. The EPA's decision would be based on all available information including the most recent 3 years of air quality monitoring data, available modeling analysis, and any other relevant information.
6) Modeled violation – a violation based on air dispersion modeling.
7) Recommended attainment area – an area a state or tribe has recommended that the EPA designate as attainment.

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

8) Recommended nonattainment area – an area a state or tribe has recommended that the EPA designate as nonattainment.
9) Recommended unclassifiable area – an area a state or tribe has recommended that the EPA designate as unclassifiable.
10) Recommended unclassifiable/attainment area – an area a state or tribe has recommended that the EPA designate as unclassifiable/attainment.
11) Violating monitor – an ambient air monitor meeting all methods, quality assurance and siting criteria and requirements whose valid design value exceeds 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.

Technical Analysis for the Coleto Creek Power Station in Goliad County, Texas

Introduction

The Goliad County, Texas area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Coleto Creek Power Station (Coleto Creek station) emitted 16,218 tons of SO_2, and had an emissions rate of 0.615 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

In its submission, Texas recommended that the area surrounding the Coleto Creek station, specifically the entirety of Goliad County, be designated as unclassifiable/attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. The state's assessment and characterization were performed following the notion that any areas without appropriately cited and qualified monitors should be considered unclassifiable or attainment based on lack of evidence that a violation of the NAAQS has occurred and the results of air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees that the area is attaining the standard, and intends to designate Goliad County as unclassifiable/attainment. The EPA did receive additional modeling information from industry for the area surrounding Coleto Creek Power Station, as discussed in the "Other Relevant Information" section of this document. While the industry modeling is also supportive of an unclassifiable/attainment designation, our intended designation for Goliad County is based on the modeling submitted by the state on the basis that this analysis was more consistent with current EPA modeling guidance, including the Modeling TAD.

The Coleto Creek station is located in southern Texas in the eastern portion of Goliad County. As seen in Figure 1 below, the facility is located approximately 24 km southwest of Victoria, Texas. The station is located near the Coleto Creek Reservoir. Figure 1 also shows the Goliad County boundary, which is the state's and EPA's recommended area for the unclassifiable/attainment designation. Figure 2 below shows Coleto Creek station and other nearby, large emitters of SO_2.

Figure 1. The EPA's intended designation for
Coleto Creek Power Station

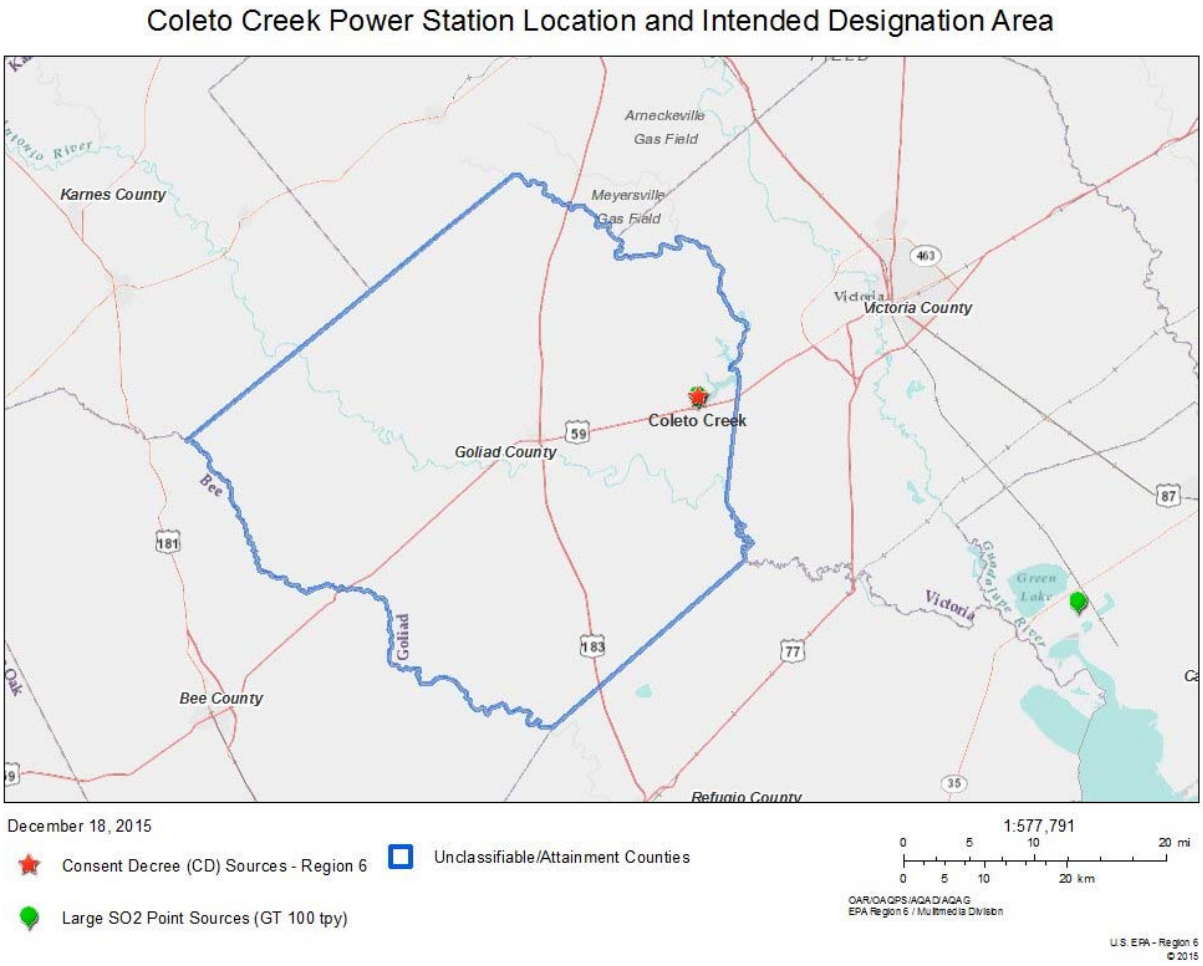
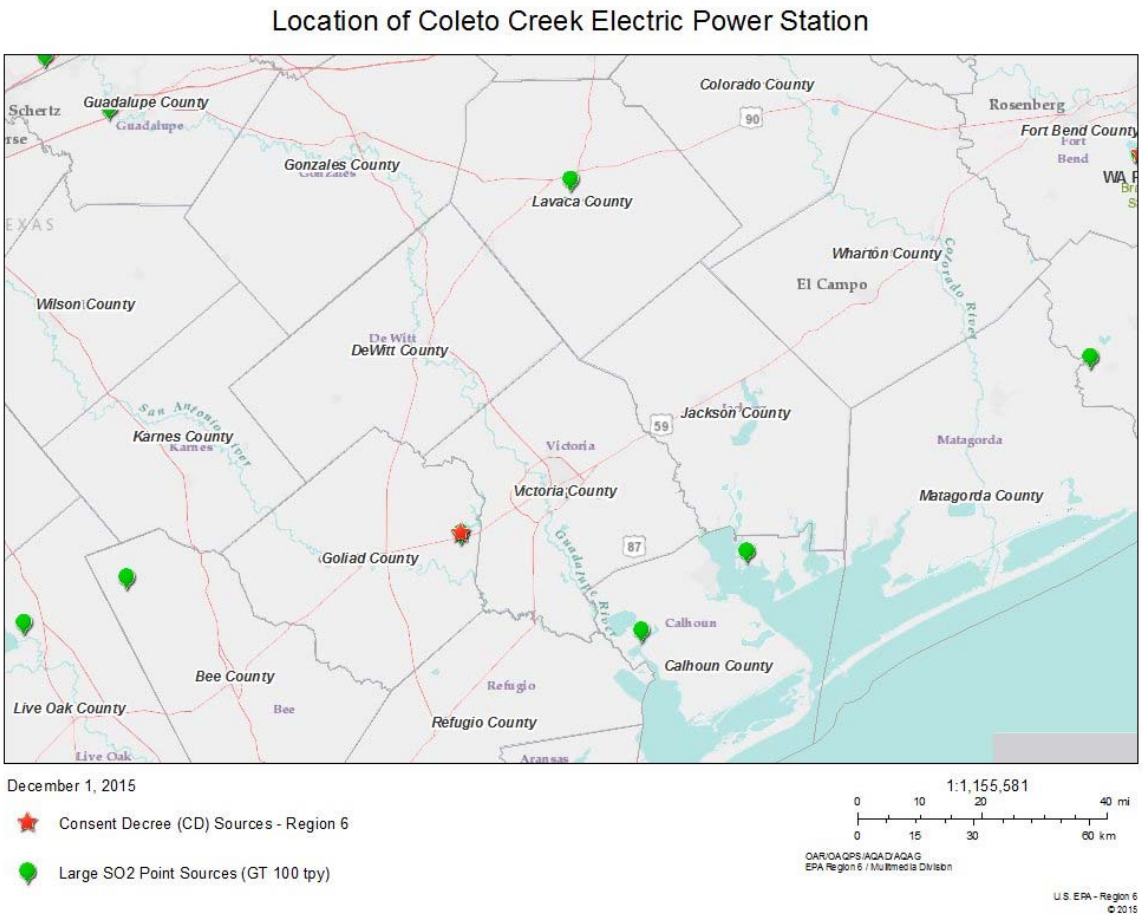


Figure 2: Coleto Creek Power Station and Nearby Large SO_2 Emitters



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

Detailed Assessment

Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding Coleto Creek station. The facility is located in Goliad County; however, there are no ambient air quality monitors located in this county. The table below shows information related to the monitors located closest to the site. The design values were confirmed through the EPA's 2014 design value report for SO_2.[3] While the monitored data is instructive, the distance of the monitors from Coleto Creek station likely limits its value in this analysis and cannot be considered representative of the area around Coleto Creek station for

[3] The design value report for SO_2, as well as each of the other NAAQS, can be found at this link: http://www3.epa.gov/airtrends/values.html

designations purposes. More specifically, the absence of a violating monitor when considering the distance from the facility is not a sufficient technical justification to rule out that an exceedance of the 2010 SO_2 NAAQS may occur in the immediate vicinity of the facility.

Table 1: Available Air Quality Data for the Area Closest to the Coleto Creek Power Station

County	Air Quality Systems (AQS) Monitor ID	Monitor Location	Distance to Coleto Creek station (km)	2012 – 2014 SO_2 Design Value (ppb)
Nueces	48-355-0026	Corpus Christi Tuloso	103.5	4
Nueces	48-355-0032	Corpus Christi Huisache	103.0	7
Nueces	48-355-0025	Corpus Christi West	107.7	0

Model Selection and Modeling Components

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

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

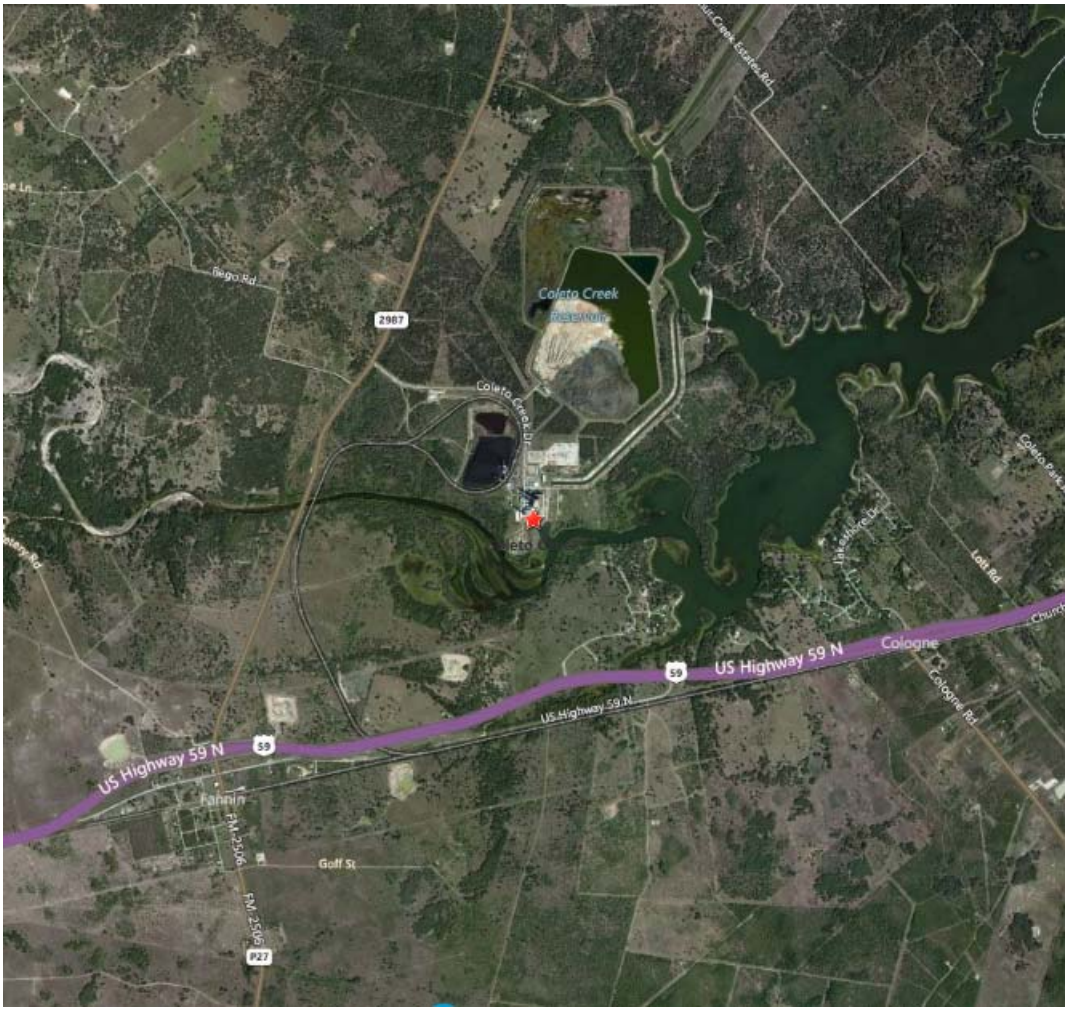
The state used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

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

In their submittal, the state indicated that the source is relatively isolated and based on our review of aerial photography of the area surrounding the facility provided as part of the state's recommendation, the determination to run the model in rural mode appears appropriate. The figure below provide an aerial image of the area surrounding the Coleto Creek station.

Figure 3: Aerial Image of Area Surrounding Coleto Creek Power Station



Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Coleto Creek station is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. For the Coleto Creek area, the state did not include any other emitters of SO_2 within their analysis. The state determined that this was the appropriate approach in order to adequately characterize air quality from the facility.

The State modeled a grid of 50 km around the Coleto Creek facility.[4] 50 kilometers is the nominal distance for SO_2 accuracy in AERMOD. The state determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. Based on our review of the area of analysis, the jurisdictional boundaries relied upon in our intended designation, and the proximity of nearby large SO_2 emitters to the Coleto Creek facility, we agree that the grid is appropriate to characterize the air quality in the vicinity of the facility. The grid receptor spacing for the area of analysis chosen by the state is as follows:

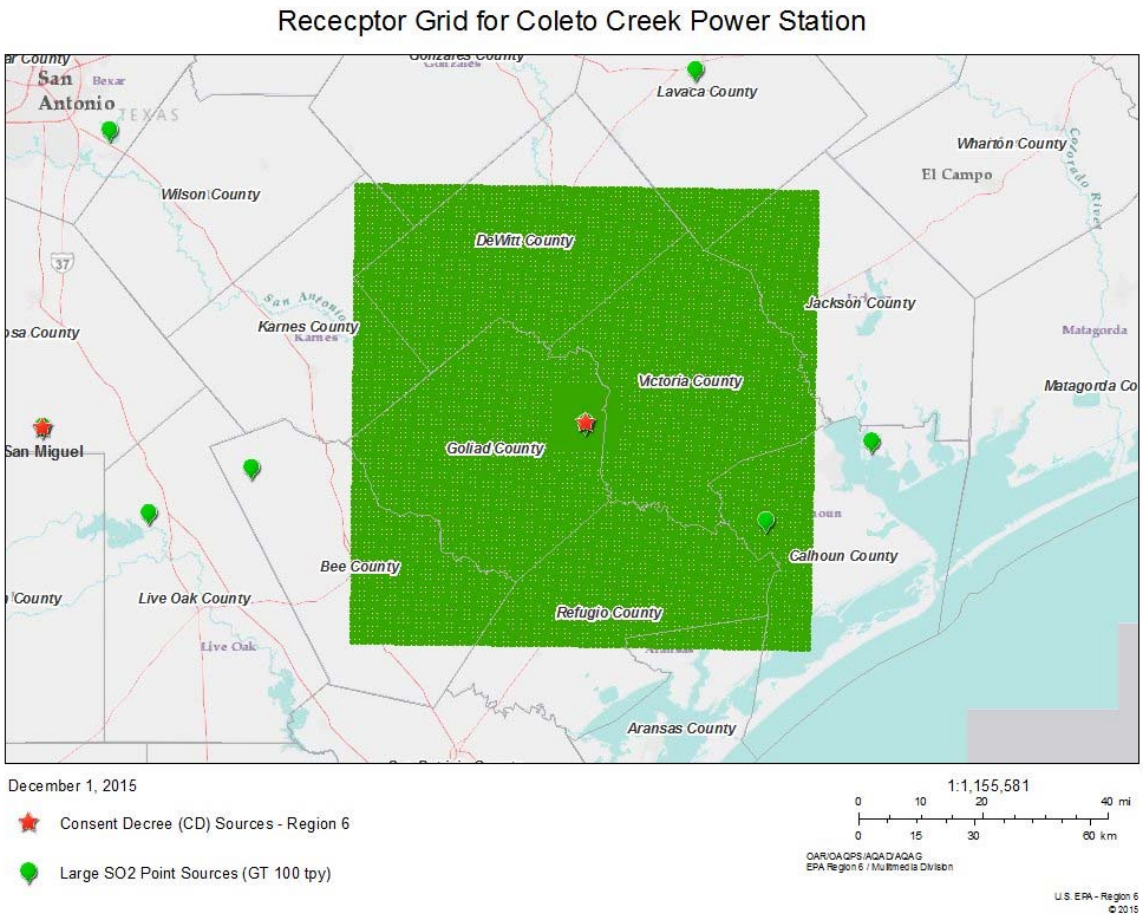
- 100 meter grid from the property fence line Coleto Creek station out to approximately 1 km,
- 500 meter grid from the property fence line Coleto Creek station out to approximately 5 km, and
- 1000 meter (1 km) grid from the property fence line Coleto Creek station out to approximately 50 km.

The receptor network contained 12,801 receptors, and the network covered all of Goliad County, the majority of Victoria County, the southern portion of Dewitt County, western portions of Jackson and Calhoun Counties, the northern portions of Aransas and Refugio Counties, and the eastern portions of Bee and Karnes Counties.

Figure 4 shows the state's chosen area of analysis surrounding the Coleto Creek station, as well as receptor grid for the area of analysis. Receptors were placed throughout the modeled area, which is a conservative approach and consistent with EPA guidance. The impacts of the area's geography and topography will follow in the appropriate section.

[4] AERMOD is a Gaussian Plume Air Dispersion Model, 50km is the useful distance to which most steady-state Gaussian plume models are considered accurate for setting emission limits per SCRAM guidance.

Figure 4: Receptor Grid for the Coleto Creek Power Station



Modeling Parameter: Source Characterization

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 correctly characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

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

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information when it is available, and that these data are available for many electric

generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS or the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA believes that detailed throughput, operating schedules, and emissions information from the impacted source should be used.

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

As previously noted, the state included Coleto Creek station and no other emitters of SO_2 in the area of analysis. No other sources beyond the area of analysis were determined by the state to have the potential to cause significant concentration gradient impacts within the area of analysis. The state reviewed nearby SO_2 emitters and determined that based on the magnitude of emissions and proximity of those emitters to Coleto Creek station, the nearby sources are not expected cause significant concentration gradients and would be represented via background monitor concentrations. We reviewed nearby large SO_2 emitters located within the area of analysis that were not explicitly included in the state's modeling analysis. Seadrift Coke LP is located in the southeastern portion of the area of analysis approximately 46 km from Coleto Creek station and emitted 400 tons of SO_2 based on 2011 National Emissions Inventory (NEI) data. Based on the magnitude of emissions from Seadrift Coke LP, its proximity to Coleto Creek station, and the magnitude of modeled impacts from Coleto Creek station in the vicinity of Seadrift (less than 20 $\mu g/m^3$), we do not expect the inclusion of this emission source to impact the assessment of air quality in the Goliad County area of analysis or our intended designation

Table 2: Actual SO_2 Emissions Between 2012 – 2014 from the Coleto Creek Power Station.

Company ID	Facility Name	SO_2 Emissions (tons per year)		
		2012	2013	2014
GDF Suez Energy, NA	Coleto Creek Power Station	16,218	14,344	16,942

Modeling Parameter: Meteorology and Surface Characteristics

The most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. As noted in the Modeling TAD, the selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data are based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during

which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the Coleto Creek station area of analysis, surface meteorology from the NWS station in Victoria, Texas, 64 km to the east, and coincident upper air observations from the NWS station in Corpus Christi, Texas, 105 km to the south southwest were selected as best representative of meteorological conditions within the area of analysis. The state used AERSURFACE version 13016 using data from the NWS station in Victoria, Texas (located at latitude 28.867, longitude -96.933) to estimate the surface characteristics of the area of analysis. The state estimated values for 1 spatial sector out to 1 km at an annual temporal resolution for average conditions. The state also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo"). In the figures below, the location of the Victoria, Texas NWS station and Corpus Christi, Texas NWS are shown relative to the Coleto Creek station.

Figure 5: Coleto Creek Power Station Area of Analysis and the Victoria, Texas NWS

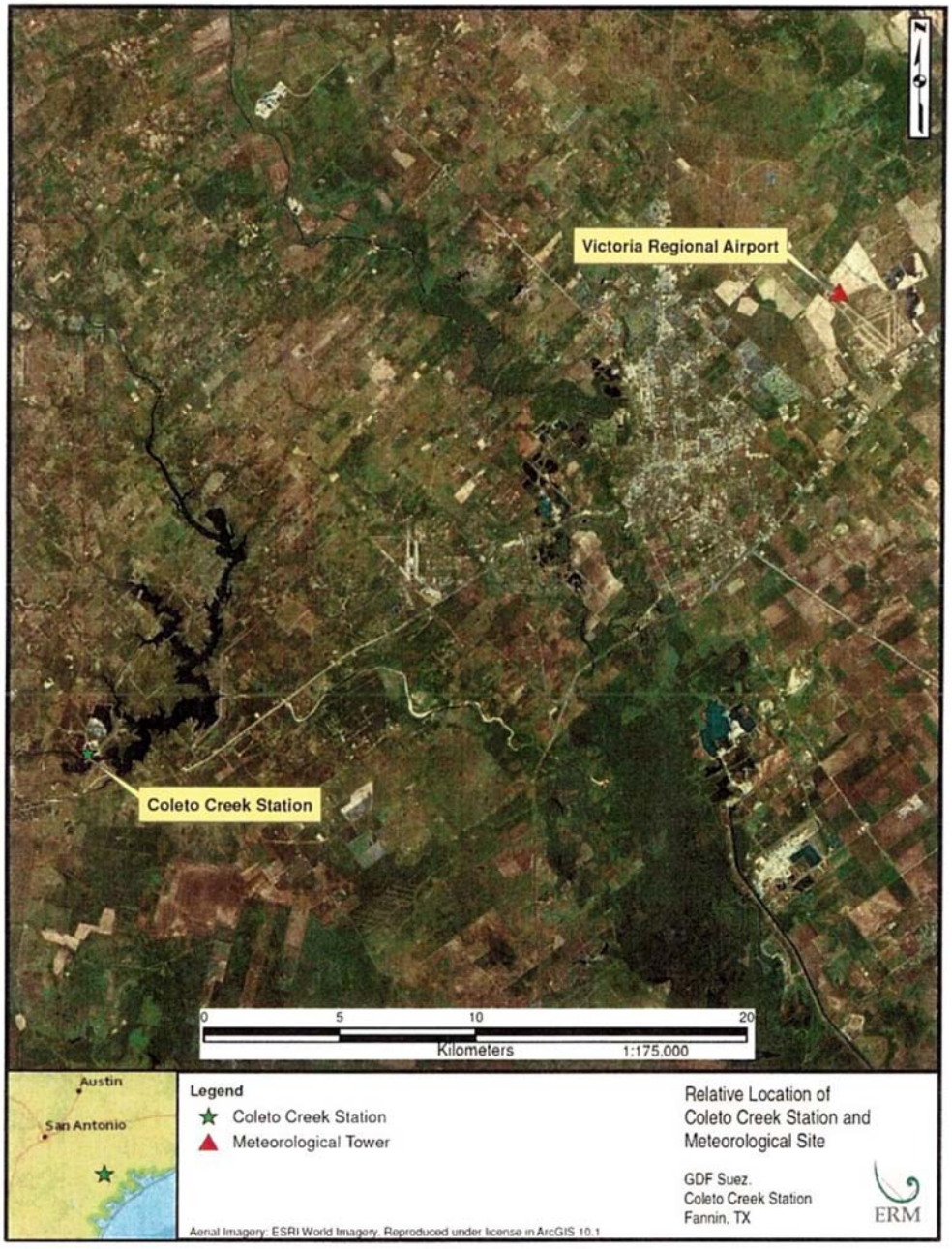
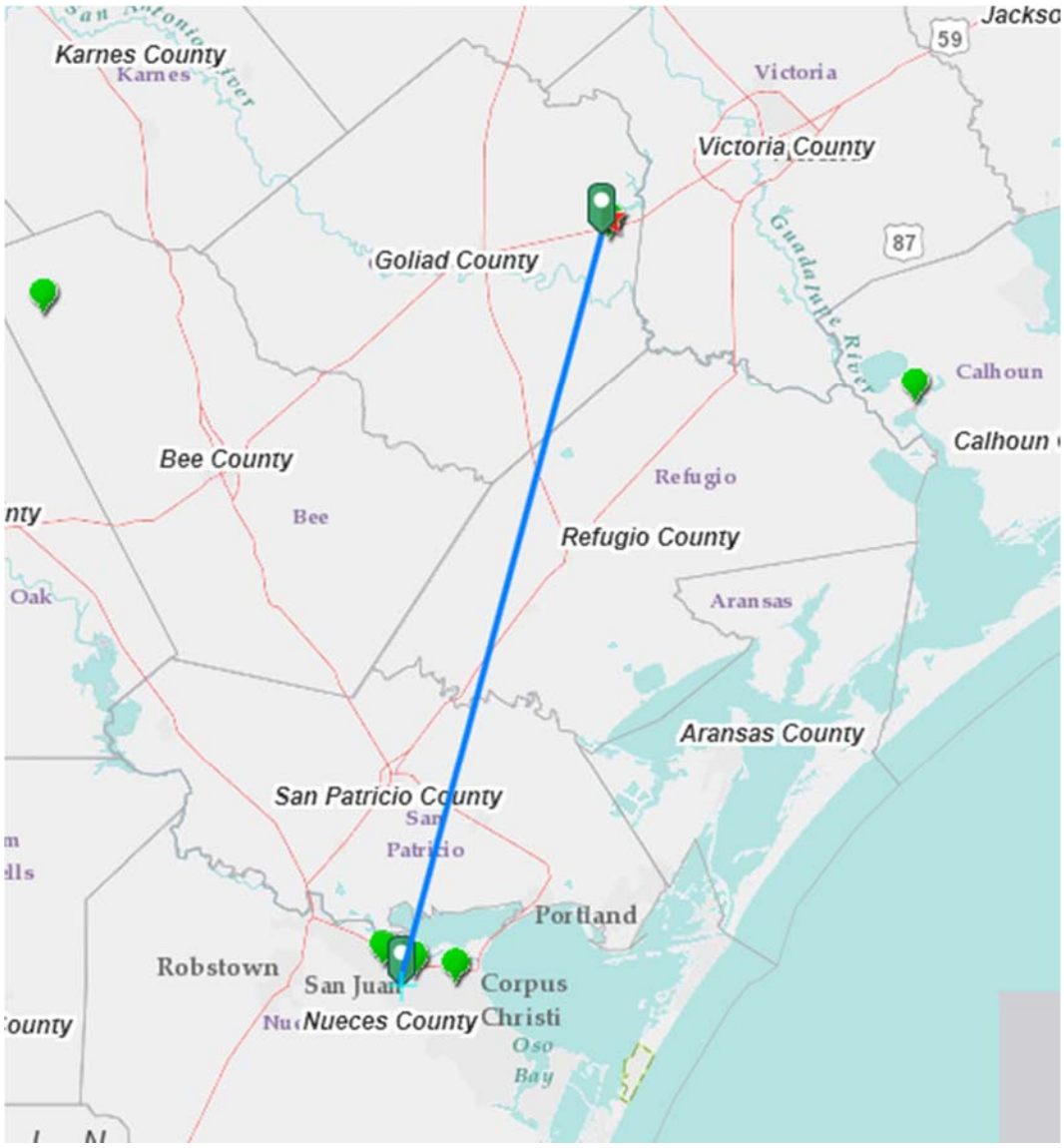
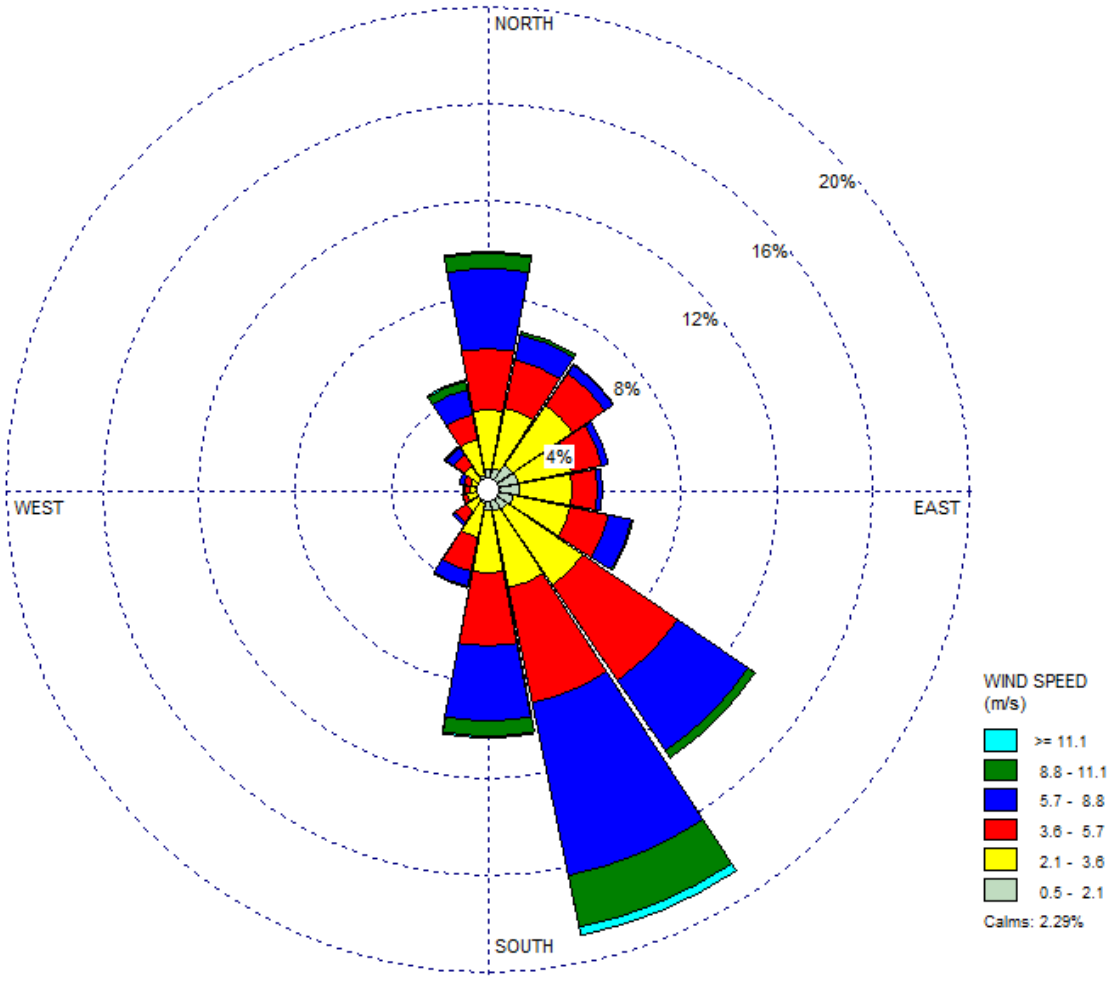


Figure 6: Coleto Creek Power Station Area of Analysis and the Corpus Christi, Texas NWS



The 3-year surface wind rose for Victoria, Texas is depicted in Figure 7 below. In this figure, the frequency and magnitude of wind speed and direction are defined in terms of where the wind is blowing. The wind rose shows the predominant pattern is a south southeast wind about 22% of the time with a secondary dominant northerly wind about 12 % of the time. The average wind speed is 4.37 m/s, with calm hours accounting for approximately 3% of the overall measured time.

Figure 7: Victoria, Texas NWS Wind Rose for Years 2012 – 2014



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in the EPA's SO_2 TAD in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final

hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with a March 2013 EPA memo titled, "Use of ASOS meteorological data in AERMOD dispersion Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as gently rolling. 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 data.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Goliad County area of analysis, the state chose the first tier approach. The background concentration for this area of analysis was determined by the state to be 15 micrograms per cubic meter ($\mu g/m^3$), and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

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

Table 3: AERMOD Modeling Parameters for the Coleto Creek Power Station Area of Analysis

Coleto Creek Power Station Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	1
Modeled Structures	17
Modeled Fencelines	1
Total receptors	12801
Emissions Type	Actual
Emissions Years	2012-2014

Meteorology Years	2012-2014
Surface Meteorology Station	Victoria, Texas
Upper Air Meteorology Station	Corpus Christi, Texas
Methodology for Calculating Background SO_2 Concentration	1st Tier/used design value from Corpus Christi Monitor 483550032
Calculated Background SO_2 Concentration	15 $\mu g/m^3$

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

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

		Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	Data Period	UTM/Easting (meters)	UTM/Northing (meters)	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	673515.5	3179025.3	100	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.62 $\mu g/m^3$.

The state's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 100 $\mu g/m^3$, or 38.2 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facility. This predicted value occurred near the western boundary of the facility property line.

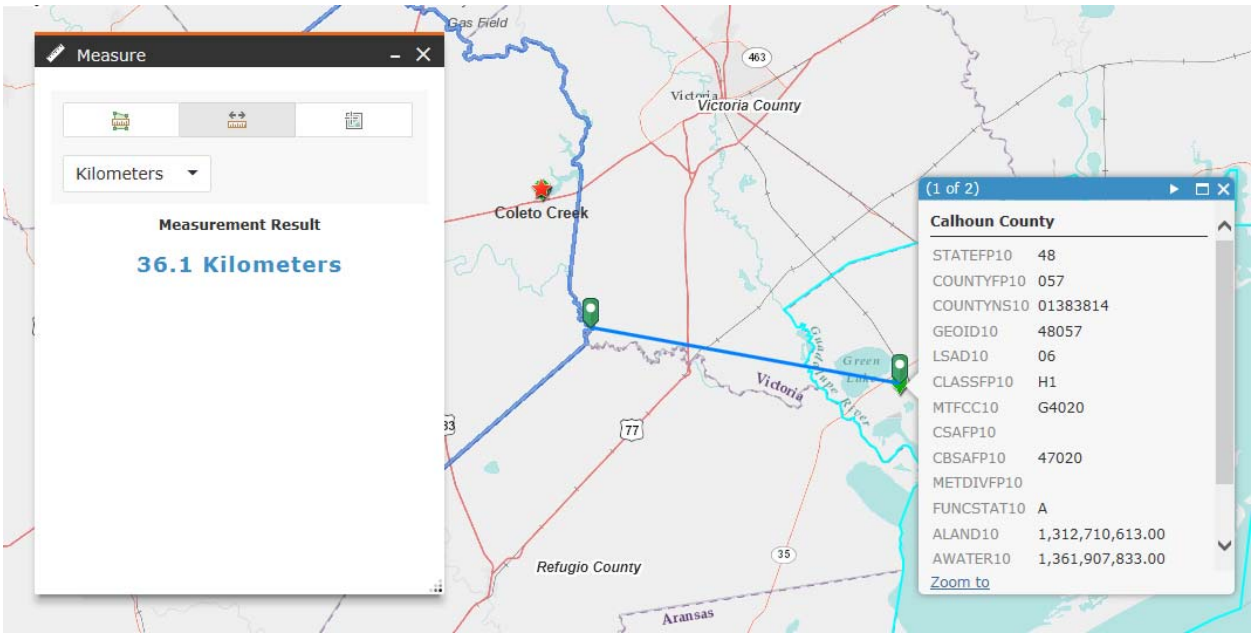
Jurisdictional Boundaries:

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

The EPA believes that our intended unclassifiable/attainment area, consisting of Goliad County, is comprised of clearly defined legal boundaries, and we find these boundaries to be a suitably clear basis for defining our intended unclassifiable area. Other than Coleto Creek station, there are no other sources in Goliad County or near the county boundary emitting at or above 100 tpy. The only 100+ tpy emitter of SO_2 within 50 km of Coleto Creek station is the Seadrift Coke LP facility located in Calhoun County. (Shown in Figure 8 below.) The EPA notes that although the state did not include emissions from Seadrift Coke (410 tpy of SO_2) in Calhoun County in the modeling analysis for the study area, we believe that due to this facility's relatively low emissions in comparison to Coleto Creek station, the fact

that the wind patterns in the area, as shown by Figure 7, infrequently blow from the Seadrift facility to Coleto Creek station, the distance from the Seadrift Coke facility to the Goliad County border, i.e., approximately 36 km, and the fact that the highest modeled impacts from Coleto Creek station is approximately 50% of the 2010 SO_2 NAAQS, it is unlikely the emissions from Seadrift Coke are causing or contributing to a violation of the NAAQS within Goliad County. We do not believe inclusion of emissions from the Seadrift Coke Facility would change our determination of the attainment status for Goliad County and the surrounding area.

Figure 8: Location of Seadrift Coke Facility in Relation to Coleto Creek Power Station and Goliad County Boundary.



Other Relevant Information

The EPA did receive additional dispersion modeling for the Goliad County area of analysis from industry. Industry's submittal dated September 17, 2015 included modeling results showed impacts less than the 1-hour SO_2 NAAQS supporting a designation of unclassifiable/attainment similar to Texas' recommendation.[5] We reviewed industry's submittal and identified areas in the modeling approach that were inconsistent with the Modeling TAD. Specifically, industry processed the NWS surface station meteorological data based on the surface characteristics of the facility, instead of the meteorological station. We also identified instances where the hourly emissions input data was inconsistent with CAMD. The EPA participated in conference calls with industry to discuss the findings of our review and the noted inconsistencies with the Modeling TAD. Industry did not submit a revised modeling analysis based on our comments. Therefore, because of the noted deficiencies, our intended designation

[5] Industry's submittal included a maximum modeled concentration of 111.0 µg/m^3 (42.4 ppb) including a seasonal, diurnal background concentration.

in based solely on the state's submittal and does not rely on industry's modeling analysis. However, for reference the facility's modeling submittal, including modeling files and associated modeling report, are available for review as part of the docket for the SO_2 designations action.

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Coleto Creek station as an unclassifiable/attainment area for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the jurisdictional boundaries of Goliad County, Texas. This intended designation with associated boundaries is based on the state's modeling of actual emissions reported from the facility during the 2012 to 2014 calendar years. An analysis of the modeling data indicates it was performed in accordance with appropriate EPA modeling guidance using conservative assumptions. Additionally, the EPA has confirmed that there are no other sources in Goliad County or near its borders that are likely to cause or contribute to a violation of the NAAQS within Goliad County.

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

Technical Analysis for the San Miguel Electric, Lignite Fired Power Plant,

Atascosa County, Texas Area

Introduction

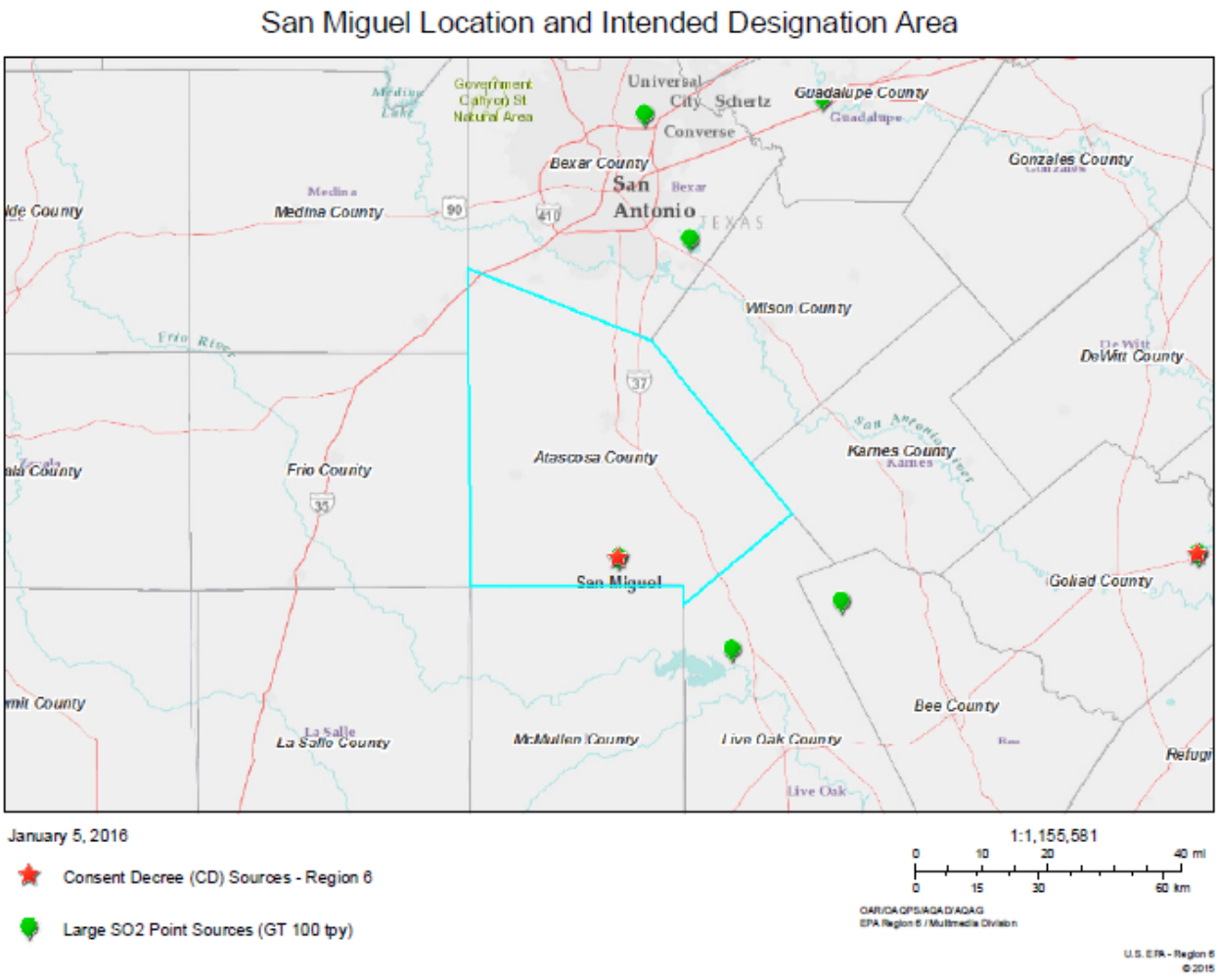
The Atascosa County area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 in 2012 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the San Miguel Lignite Fired Power Plant (San Miguel Power Plant) emitted 10,950 tons of SO_2, and had an emissions rate of 0.63 SO_2/MMBTU. Pursuant to the March 2, 2015 court-ordered schedule, the EPA must designate the area surrounding the facility by July 2, 2016.

In its submission, Texas recommended that the area surrounding the San Miguel Power Plant, specifically the entirety of Atascosa County, be designated as unclassifiable/attainment based on assessment and characterization of air quality from the facility and nearby sources that may have a potential impact in the area where maximum concentrations of SO_2 are expected. In this technical support document, the EPA discusses its review and technical analysis of industry's assessment of the area surrounding the San Miguel Power Plant, which was included as an attachment to Texas' designation recommendation. [6] 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, supporting documentation, and all available data, the EPA agrees that the area is attaining the standard, and intends to designate Atascosa County as unclassifiable/attainment.

The San Miguel Power Plant is located in in the town of Christine, Texas. The station is located about 6 miles south-southeast of downtown Christine. The site is accessed by FM 3387 south of Christine, TX. The station is approximately 50 miles south of San Antonio, Texas and 90 miles northwest of Corpus Christi, Texas. Approximate site coordinates are 28.704° North Latitude, 98.477° West Longitude. The base elevation of the facility is 325' (99.06m) above sea level. The facility is located approximately 25 km south-southeast of the center of Atascosa. Figure 1 below presents the location of the facility, other nearby emitters of SO_2, the state's recommended area, and the EPA's intended area for the unclassifiable/attainment designation.

[6] URS submitted a support document for industry to the State of Texas which was then supplied to the EPA, throughout this technical support document we will refer to this submission as Texas' or the state's.

Figure 1: The EPA's intended designation for San Miguel Lignite Fired Power Plant



Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding San Miguel Power Plant. The facility is located in Atascosa County, and in its recommendation the state included the most recent 3 years of monitoring data, i.e., 2012-2014, in the supporting information from facility modeling. The table below shows information related to the monitors located in Atascosa County, which was provided by the facility.

Table 1: Available Air Quality Data for the Area Closest to San Miguel Power Plant

County	State Recommendation	Air Quality Systems (AQS) Monitor ID	Monitor Location	Distance to San Miguel (km)	2012 – 2014 SO_2 Design Value in ppb
Bexar	Unclassifiable/Attainment	48-029-0059	Calaveras Lake - north of San Miguel	65.4	3
Bexar	Unclassifiable/Attainment	48-029-0622	Heritage Middle School -north of San Miguel	73.3	3
McLennan	Attainment	48-309-1037	Waco – northeast of San Miguel	354.6	6

Based on available ambient air quality collected between 2012 and 2014, the counties surrounding San Miguel Power Plant do not show monitored violations of the 2010 SO_2 NAAQS. However, the absence of a violating monitor when considering the distances from the facility is not a sufficient technical justification to rule out that an exceedance of the 2010 SO_2 NAAQS may occur in the immediate vicinity of the facility.

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

Detailed Assessment

Model Selection and Modeling Components

The EPA received air dispersion modeling results from San Miguel Electric Cooperative Inc., conducted by Environmental Resources Management (ERM) Consultants, indicating that the SO_2 emissions from San Miguel's Electric Generating Unit when combined with representative background concentrations result in maximum predicted impacts below the 1-hour SO_2 National Ambient Air Quality Standard and recommending an attainment designation for Atascosa County and the surrounding area. These modeling results were also included as part of the state's unclassifiable/attainment recommendation for the area submitted on September 18, 2015. Following receipt of Texas' submittal, industry did request feedback from the EPA on the modeling conducted for San Miguel Power Plant. Following discussions regarding the initial modeling analysis, industry did revise their modeling analysis and resubmitted to the EPA on December 29, 2015. This revised modeling addressed the EPA's comment regarding the calculation of surface characteristics for use in processing meteorological input for the dispersions modeling. Specifically, industry reprocessed the met data based on surface characteristics calculated at the meteorological station instead of the facility, as was done in the initial modeling. The analysis

discussed in the following sections of this technical support document are based on the most recent modeling received from industry on December 29, 2015.

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

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

The latest version of EPA's AERMOD model (v.15181) was used for predicting ambient impacts for 1-hour SO_2. An initial AERMOD report dated August 2015 was provided by the industry where the EPA found issue regarding appropriate use of AERSURFACE. Industry revised the initial modeling in accordance with the EPA's comments and submitted updated modeling and a revised report dated December 2015. The modeling details outlined in this TSD reference the most recent modeling submitted by industry in December 2015. Regulatory default options were used in the analysis. Model predicted impacts were combined with ambient background concentrations and compared to the 1-hour SO_2 NAAQS to determine the recommended attainment status of the area in the vicinity of the facility. The individual components of the modeling analysis will be referenced as appropriate in the corresponding discussion that follows.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, the industry determined that it was most appropriate to run the model in rural mode. Rural mode was determined by analyzing satellite imagery. Aerial views showed a region dominated by sparsely populated farmland and no topographic features.

Modeling Parameter: Area of Analysis (Receptor Grid)

A comprehensive Cartesian receptor grid extending out to approximately 50 kilometers (km) from San Miguel Power Plant was used in the AERMOD modeling analysis to assess maximum ground-level 1-

hour SO_2 concentrations. The SO_2 Modeling TAD states that the receptor grid must be sufficient to determine ambient air in the vicinity of the source being studied. The 50-kilometer receptor grid is sufficient to resolve the maximum 1-hour SO_2 impacts, and it clearly illustrates decreasing SO_2 concentration gradients in relation to the plant in all directions out to the edge of the grid.[7]

The Cartesian receptor grid consisted of the following receptor spacing:

- 25-meter spacing along the facility fence line;
- 25-meter spacing extending from the fence line to 300 meters;
- 100-meter spacing extending from 300 meters to 1 kilometer;
- 500-meter spacing extending from 1 to 5 kilometers; and
- 1,000-meter spacing extending from 5 to 50 kilometers.

The receptor network contained 15,458 receptors, and the network covered most of Atascosa County, most of McMullen and Live Oak Counties, eastern portions of Frio and La Salle Counties, and portions of San Antonio, Wilson, Karnes, and Bee Counties.

Figure 2, shows the chosen area of analysis surrounding San Miguel Power Plant, and the receptor grid for the area of analysis.

[7] AERMOD is a Gaussian Plume Air Dispersion Model, 50km is the useful distance to which most steady-state Gaussian plume models are considered accurate for setting emission limits per SCRAM guidance.

Figure 2: Receptor Grid for San Miguel Lignite Fired Power Plant Area of Analysis

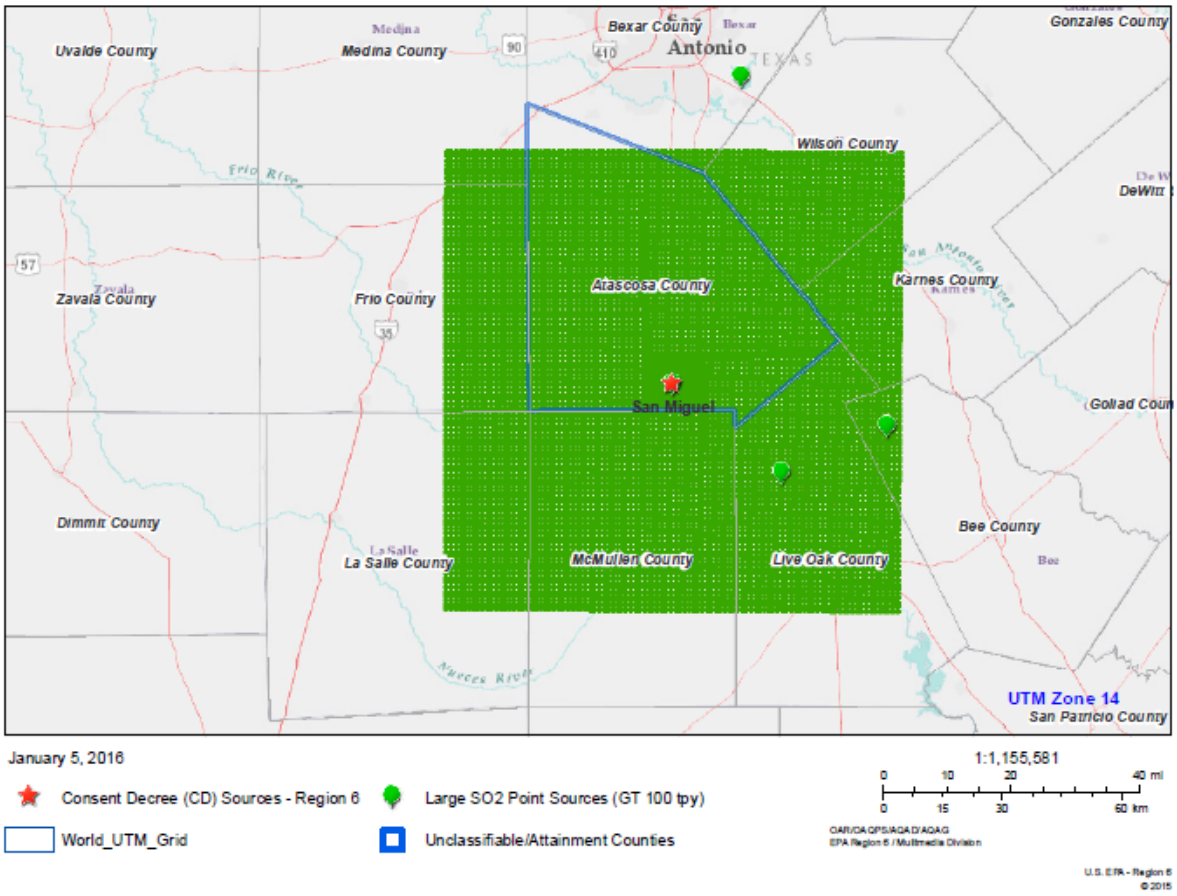


Figure 3: Receptors used in San Miguel Power Plant SO_2 modeling (within 5 km)

Figure 4: Receptors used in San Miguel Power Plant SO_2 modeling (50 km)

Figures 3 and 4, included in the information submitted by San Miguel Power Plant to the EPA, show San Miguel Power Plant's chosen area of analysis surrounding the San Miguel Power Plant, as well as the receptor grid for the area of analysis within 5 km and 50 km, respectively. Consistent with the Modeling TAD, receptors for the purposes of this designation effort were placed only in areas where it would also be feasible to place a monitor and record ambient air impacts. The impacts of the area's geography and topography will be discussed later within this document.

Modeling Parameter: Source Characterization

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

Modeling Parameter: Emissions

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

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

In certain instances, states and other interested parties may find it is more advantageous or simpler to use PTE rates as part of their modeling runs. Specifically, a facility may have recently adopted a new federally enforceable emissions limit, been subject to a federally enforceable consent decree, or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS. These new limits or conditions may be used in the application of AERMOD. In these cases, the Modeling TAD notes that the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations should contain the necessary emissions information for designations-

related modeling. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

Evidence of SO_2 emissions from the source meeting the emissions criteria of the March 2, 2015 consent decree, i.e., San Miguel Power Plant, is an important factor for determining whether the immediate area is experiencing elevated levels of SO_2 concentrations. Other considerations for this factor include county level SO_2 emissions data and data for sources located within 50 km.

The analysis did not include any annual emissions data for point sources in Atascosa County, nor did the state include any annual emissions data from point sources in neighboring counties. No other nearby sources were identified by the state as having the potential to cause significant concentration gradient impacts within the area of analysis.

The actual emissions data used in the modeling are described below:

- Boiler Stack (Source ID: STACK). This unit is a coal fired utility boiler that produces steam for the generation of electricity. For this unit, three years (2012-2014) of actual hourly emissions, stack temperature, and exhaust flow rate data were input into the model. These data were provided by San Miguel Power Plant based on CEMS data collected at the site. As per the TAD, the actual height of the stack was represented in the model.

Other sources at the site include emergency engines and fire pumps. These sources are used exclusively in emergency situations except for approximately one hour/week testing. Therefore, in accordance with EPA guidance for intermittent sources, the emergency generator and fire pump engine were not included in the modeling demonstration for the 1-hour SO_2 NAAQS.

The 2011 EPA National Emissions Inventories (NEI) was reviewed to determine candidate major sources. For the purpose of modeling analysis, all major sources of SO_2 within 50 kilometers of San Miguel Power Plant that had at least 2,000 tons of SO_2 emissions were considered for inclusion in the modeling. No facilities within 50 kilometers were found to have emitted at least 2,000 tons of SO_2 in 2011. In fact, the only sources with greater than 100 tons of SO_2 within 50 km of San Miguel Power Plant were the Pawnee Gas Plant and the Choke Canyon Amine Plant. Choke Canyon is located in Live Oak County and reported 101 tpy of SO_2 according to the 2011 NEI, and is located approximately 15 km southeast of Atascosa County. Based on its emissions and distance from Atascosa County, the EPA does not believe that Choke Canyon Amine Plant is likely to cause or contribute to a violation of the NAAQS within Atascosa County. Pawnee Gas Plant, located 48.6 km away in Pawnee, TX, emitted 480 tons. Industry indicated that Pawnee Gas Plant and Choke Canyon Amine Plant were not explicitly included in the modeling for the following reasons:

- Due to the low emissions from Pawnee Gas Plant in conjunction with the distance from San Miguel Power Plant, industry concluded in their submittal that the impacts from the facility's emissions could be represented as background concentration in the San Miguel Power Plant area of analysis.
- The March 1, 2011 EPA clarification memorandum for modeling NO_2 states that "Even accounting for some terrain influences on the location and gradients of maximum 1-hour concentrations, these considerations suggest that the emphasis on determining which nearby sources to include in the modeling analysis should focus on the area within about 10 kilometers of the project location in most cases…" Pawnee Gas Plant is more than 4 times that distance from San Miguel Power Plant.
- The relative locations of the facilities: Wind blowing from San Miguel Power Plant to Pawnee Gas Plant is on a bearing of 110 degrees, while wind blowing from Pawnee Gas Plant to San Miguel Power Plant would be on a bearing of 281 degrees. A review of the 3 years of wind data (2012-2014) used in the modeling shows that the wind blows between the two facilities only about 4 percent of the time, and of that 4 percent none of the hours during the 3 years of data had sufficient wind speed (13.4 m/s) to carry a plume from one facility to the other in one hour. The wind data review also shows how infrequently wind would influence Choke Canyon Amine Plant emissions combining with San Miguel Power Plant. This fact along with the relatively small size of the Choke Canyon emissions, leads the EPA to believe it will not impact San Miguel Power Plant's air quality designation status.
- The concentration gradient from San Miguel Power Plant impacts drops sharply to the east of the facility (see Figure 4), such that the impacts from San Miguel Power Plant would not be expected to interact with those from Pawnee Gas Plant.
- The Waco ambient monitor was determined to be representative of the SO_2 emissions in the area around San Miguel Power Plant.

Therefore, industry did not include any other facilities in the modeling. Based on the magnitude of emissions from these two facilities, their proximity to San Miguel Power Plant and the predominant wind patterns in the area, and the concentration gradient of the impacts from San Miguel Power Plant, we do not believe that the inclusion of Choke Canyon Amine Plant and the Pawnee Gas Plant would significantly impact the predicted concentrations in the area surrounding San Miguel Power Plant or change our intended designation or associated area boundaries.

The appropriate seasonal diurnal ambient concentration from the Waco monitor was added to the impacts from San Miguel Power Plant to represent other sources in the area (see the section below titled *Modeling Parameter: Background Concentrations of SO_2*). Table 2 presents actual 2012-2014 emissions from facilities in the San Miguel Power Plant area of analysis.

Table 2: Actual 2012-2014 SO_2 Emissions from Facilities in the San Miguel Power Plant Area of Analysis

Facility Name	SO_2 Emissions (tons per year)		
	2012	2013	2014
San Miguel Power Plant	10,950	10,169	6,909

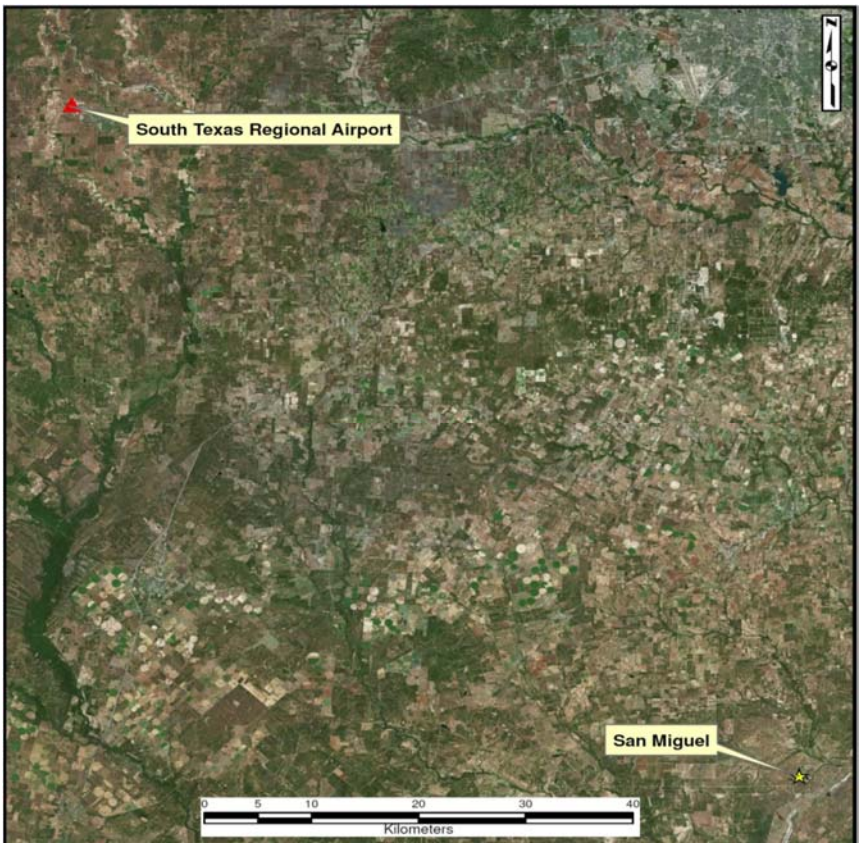
As previously noted, the state included San Miguel Power Plant and no other sources of SO_2 in the area of analysis. This facility was selected because the state believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the source which might cause these concentrations. No other sources beyond were determined by the state to have the potential to cause significant concentration gradient impacts within the area of analysis.

Modeling Parameter: Meteorology and Surface Characteristics

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

For the San Miguel Power Plant area of analysis, surface meteorology from the NWS station in South Texas Regional Airport in Hondo, TX (WBAN No. 12962) and concurrent upper air data from Corpus Christi, TX (WBAN No. 12924) indicate winds blow predominantly from the north. The analysis used AERSURFACE version 13016 using data from the NWS station in South Texas Regional Airport (located at 29.367 latitude, -99.167 longitude). Figure 5 shows the location of the South Texas Regional Airport in Hondo relative to San Miguel Power Plant.

Figure 5: Relative distance between South Texas Regional Airport and San Miguel Area of analysis



Three years (2012-2014) of surface observations from the NWS tower at South Texas Regional Airport in Hondo, TX (WBAN No. 12962) and concurrent upper air data from Corpus Christi, TX (WBAN No. 12924) were processed with AERMET (v.15181), the meteorological preprocessor for AERMOD, along with the two pre-processors to AERMET: AERSURFACE (v.13016) and AERMINUTE (v.14237). AERMET was applied to create the two meteorological data files required for input to AERMOD.

AERMET requires specification of site characteristics including surface roughness (zo), albedo (r), and Bowen ratio (Bo). These parameters were developed according to the guidance provided by the state using AERSURFACE. The area within 1 km of the facility was analyzed to determine the surface characteristics around the main stack. AERMET uses the surface characteristics in the sector from which the wind approaches the stack as part of the meteorological data processing for each hour.

In AERSURFACE, the various land cover categories are linked to a set of seasonal surface characteristics. As such, AERSURFACE requires specification of the seasonal category for each month of the year. The following five seasonal categories are offered by AERSURFACE:

1. Midsummer with lush vegetation;
2. Autumn with unharvested cropland;
3. Late autumn after frost and harvest, or winter with no snow;
4. Winter with continuous snow on ground; and
5. Transitional spring with partial green coverage or short annuals.

The AERSURFACE run was performed using the annual temporal resolution option. The seasonal default values were broken down as follows:

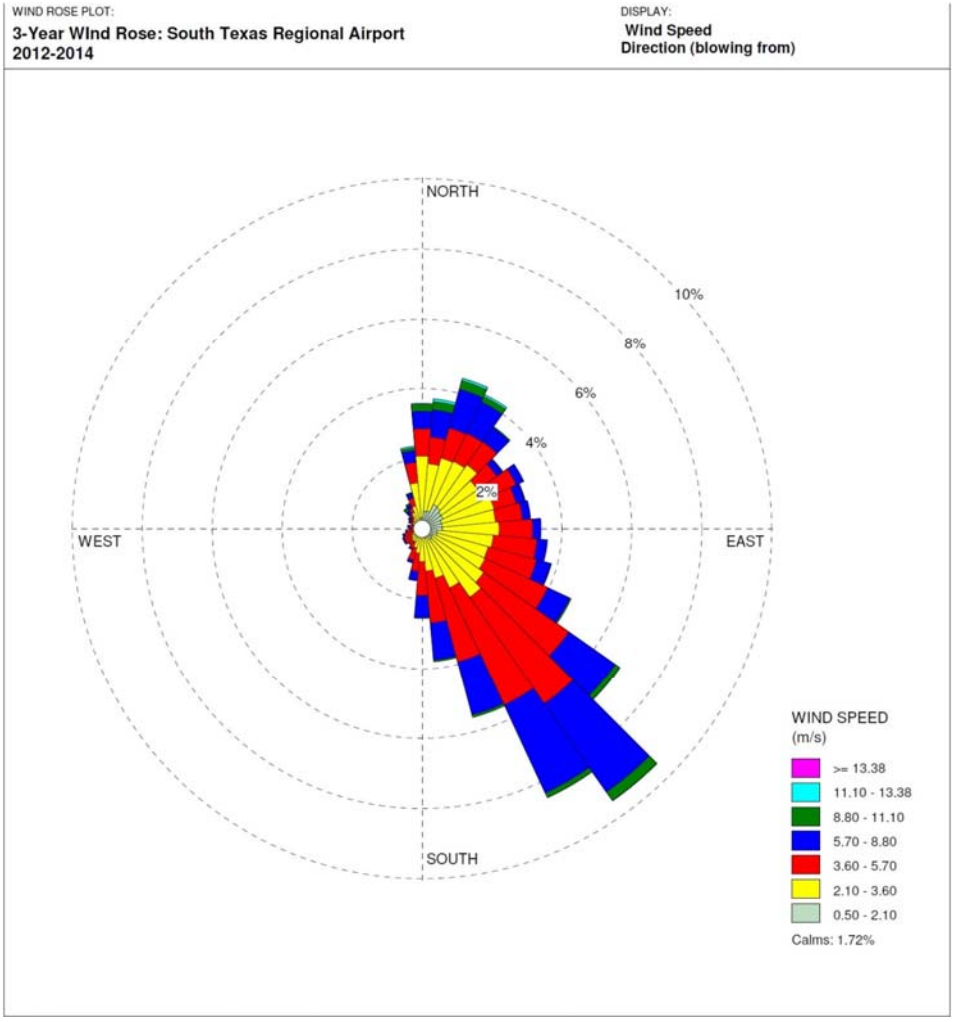
- January, December, February: Winter with no snow.
- March, April, May: Transitional spring.
- June, July, August: Midsummer
- September, October, November: Autumn

The precipitation was assigned to "Average" for the purpose of Bowen Ratio calculations during each month. Additionally, 1-minute ASOS wind data, collected at the South Texas Regional Airport meteorological tower, were processed using the AERMINUTE pre-processor for AERMET. The data characteristics of South Texas Regional Airport are shown in Table 3. Figure 4 shows the relative location of South Texas Regional Airport and San Miguel Power Plant, and Figure 6 shows the 3-year wind rose for South Texas Regional Airport. As shown in Figure 4, the geographic and topographic features of the facility and the surface meteorological station are similar with no significant geographic features located between the two. Therefore, we expect the meteorological conditions at the South Texas Regional Airport to be representative of the facility. Furthermore, the Texas Commission on Environmental Quality (TCEQ) has specified that the meteorological stations used in the analysis are the preferred stations for Atascosa County.

Table 3: Characteristics of the South Texas Regional Airport Meteorological Data

Distance from San Miguel Power Plant	61.8 miles
Average Wind Speed	4.14 m/s
Percent Calm Hours	1.72%
Data Completeness	98.75%

Figure 6: The 3-year (2012-2014) wind rose for South Texas Regional Airport



Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as complex to gently rolling. 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 National Elevation Data (NED) from USGS and the data were processed using the most recent version of AERMAP (v.11103) to develop the receptor terrain elevations required by AERMOD. NED data files contain profiles of terrain elevations, which in conjunction with receptor locations, are used to generate receptor height scales. The height scale is the terrain elevation in the vicinity of a receptor that has the greatest influence on dispersion at that location and is used for model computations in complex terrain areas.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Atascosa area of analysis, San Miguel Power Plant chose to account for other sources of SO_2 in the area by adding an ambient background concentration to model-predicted impacts from San Miguel Power Plant for comparison to the NAAQS. The modeling was performed with a set of seasonal diurnal values developed using the methodology described in the EPA March 1st, 2011 Clarification Memorandum for 1-hour NO_2 Modeling. Though this memorandum primarily addresses NO_2 modeling, page 20 describes the process for developing seasonal diurnal background values for SO_2 as well. The seasonal diurnal values that were used in the modeling are shown on the in Table 4.

Table 4: Seasonal Diurnal Ambient SO_2 Concentrations ($\mu g/m^3$)

Hour	Winter	Spring	Summer	Fall
1	3.05	3.23	3.40	4.80
2	2.70	2.88	3.75	9.60
3	2.97	2.97	3.32	9.07
4	1.83	1.66	2.36	2.53
5	2.18	1.40	2.36	2.70
6	1.92	1.48	2.01	3.23
7	1.83	1.40	1.83	2.62
8	2.70	2.09	4.19	3.75
9	4.01	4.19	7.33	7.77
10	11.34	5.32	6.54	13.44
11	13.26	3.40	4.80	9.07
12	12.74	3.14	5.24	7.68
13	12.13	4.28	5.06	8.99
14	7.07	4.01	4.01	7.15
15	8.73	4.19	3.66	7.33
16	8.64	3.75	4.10	6.81
17	6.81	3.66	3.40	7.07
18	7.77	3.49	3.75	6.81
19	4.54	6.63	4.80	9.34
20	4.54	6.63	4.80	9.34
21	4.54	4.45	8.81	7.33
22	3.05	4.89	6.02	6.20
23	3.75	5.93	4.36	5.50

24	2.88	3.58	3.66	8.46
Note: Hours in AERMOD are defined as hour-ending. i.e., hour 1 is the period from midnight through 1 AM, etc.				

Summary of Modeling Results

The AERMOD modeling parameters for the San Miguel Power Plant area of analysis are summarized below in Table 5.

Table 5: AERMOD Modeling Parameters for the San Miguel Power Plant, Atascosa, Texas Area of Analysis

San Miguel Power Plant Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	1
Modeled Structures	54
Modeled Fence lines	8
Total receptors	15,458
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Hondo, TX
Upper Air Meteorology Station	Corpus Christi, TX
Methodology for Calculating Background SO_2 Concentration	Temporal Varying
Calculated Background SO_2 Concentration	5.8 $\mu g/m^3$ at modeled max concentration

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

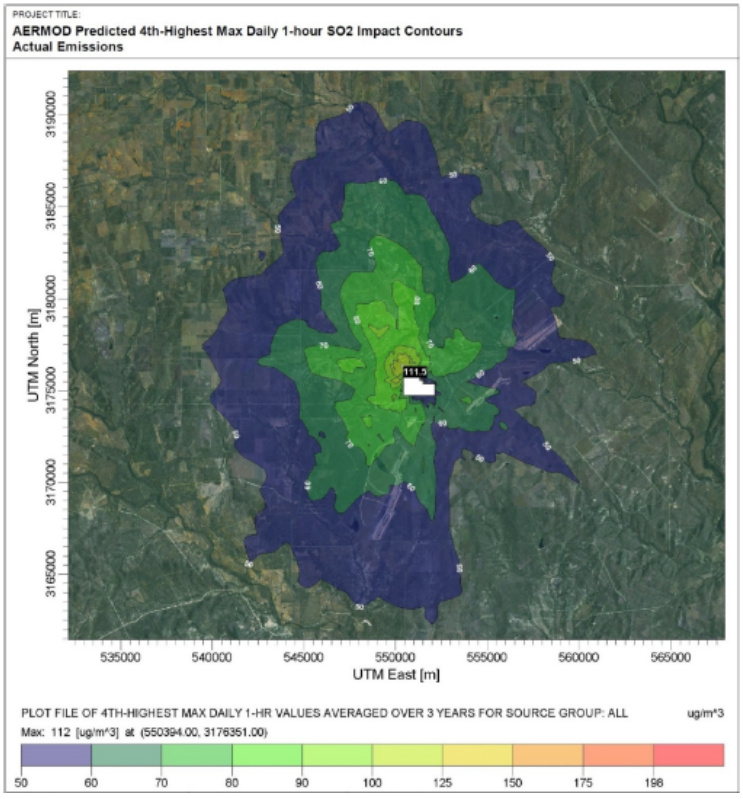
Table 6: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Atascosa, Texas Area of Analysis Based on Actual Emissions

		Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	550,394.00	3,176,351.00	111.5	196.4*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

The state's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 111.5 $\mu g/m^3$, or 42.6 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 7 below was included as part of San Miguel Power Plant's information submitted to the EPA, and indicates that the predicted value occurred using the most recent three years of actual emissions data and added to representative ambient background concentrations, are below the level of 1-hour SO_2 NAAQS of 75 ppb or 196.4 $\mu g/m^3$. San Miguel Power Plant's receptor grid is also shown in Figures 2 through 4.

Figure 7: San Miguel Power Plant 1-hr SO_2 NAAQS actual emissions



Jurisdictional Boundaries:

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

The EPA believes that our intended unclassifiable/attainment area, consisting of Atascosa County, is comprised of clearly defined legal boundaries, and we find these boundaries to be a suitably clear basis for defining our intended area. The EPA has confirmed that except for San Miguel Power Plant, whose emissions have been satisfactorily demonstrated to not cause or contribute to a violation of the NAAQS, there are no other large sources with reported 2011 NEI SO_2 emissions at or above 100 tpy within Atascosa County. Furthermore, there are only two sources with SO_2 emissions greater than 100 tpy within 20 km of Atascosa County's borders. Choke Canyon Amine Plant, located in Live Oak County reported 101 tpy of SO_2 according to the 2011 NEI, and is located approximately 15 km southeast of Atascosa County. Based on its emissions and distance from Atascosa County, the EPA does not believe that Choke Canyon Amine Plant is likely to cause or contribute to a violation of the NAAQS within Atascosa County. The Pawnee Gas Plant in Bee County is located approximately 20 km south of Atascosa County, and reported 480 tpy of SO_2 according to the 2011 NEI. Based on its emissions and distance from Atascosa County, the EPA does not believe that the Pawnee Gas Plant is likely to cause or contribute to a violation of the NAAQS within Atascosa County.

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information including the dispersion modeling submitted by industry, the EPA intends to designate the area around San Miguel Power Plant as unclassifiable/attainment area for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of Atascosa County, Texas. This recommendation is made based on the modeling of actual emissions collected via CEMS that were reported from the facility during the 2012 to 2014 calendar years. An examination of the modeling analysis indicates it was performed in accordance with appropriate EPA modeling guidance and using conservative assumptions. The EPA has also confirmed, based on available information, that there are no other sources in or near Atascosa County or in nearby areas that are likely to cause or contribute to a violation of the NAAQS within Atascosa County.

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

Technical Analysis for the Tolk Electric Station in Lamb County, Texas

Introduction

The Lamb County area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Tolk Electric Station (Tolk station) emitted 19,168 tons of SO_2, and had an emissions rate of 0.52 lbs/ SO_2/mmBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

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

The Tolk station is located in West Texas in the northwestern portion of Lamb County. As seen in Figure 1 below, the facility is located approximately 14.5 km northwest of the center of Lamb County, and there are no other large emitters of SO_2 in the county. Also included in the figure are the state's recommended area for the unclassifiable/attainment designation, and the EPA's intended unclassifiable/attainment designation for the area

Figure 1. Tolk Electric Station —Lamb County

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

Detailed Assessment

Model Selection and Modeling Components

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

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRIME: the building input processor

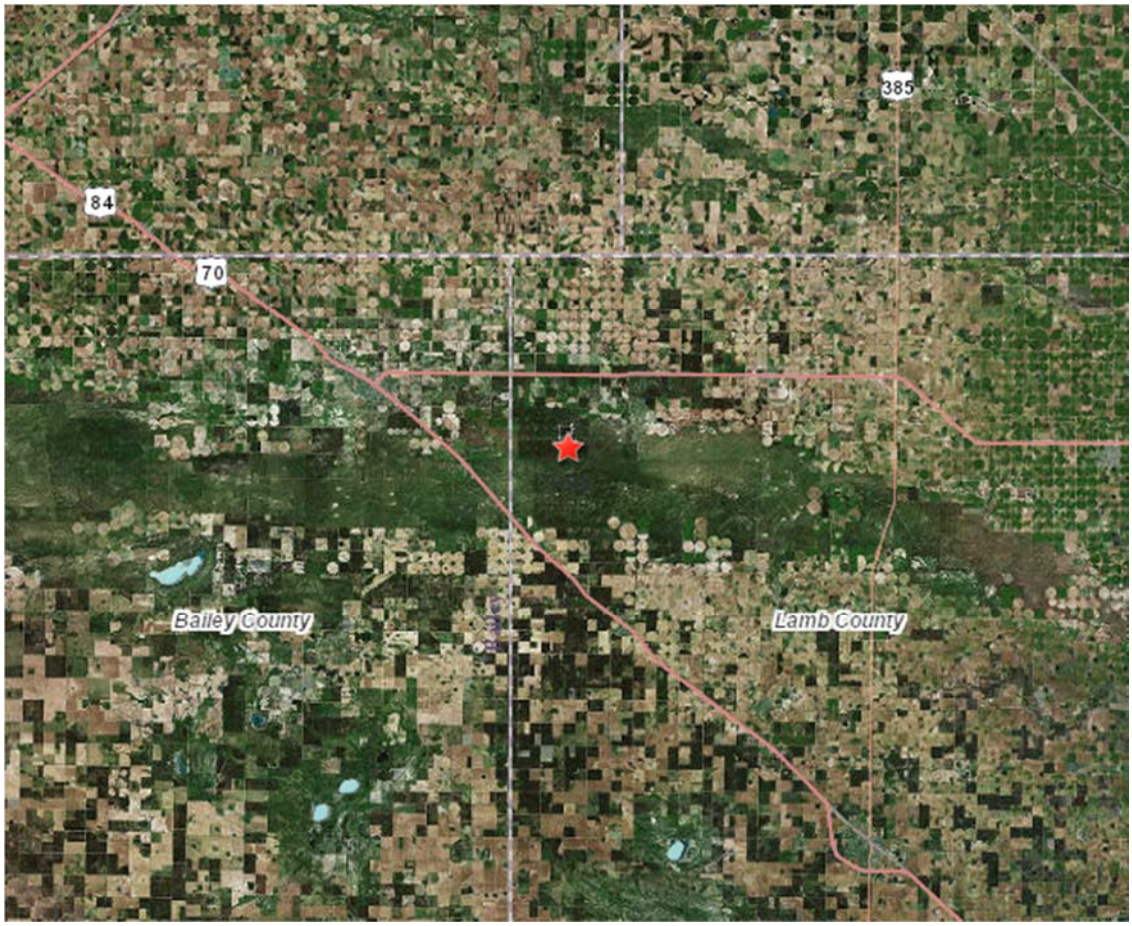
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The state used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows, as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. Figure 2 shown below is an aerial map showing the region surround Tolk station. The land is mainly flat and devoid of any geographic features.

Figure 2: Aerial Map of the land surrounding Tolk Electric Station



Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding Tolk station is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. For the Tolk station area, the state considered two sources located 24 km east and 80 km north-northwest of the Tolk facility. The state ascertained that these sources, emitting 5 and 63 tons of SO_2 in 2013 respectively, would not be expected to cause significant concentration gradients in the vicinity of Tolk station and are represented in the modeling via monitored background concentrations. The State modeled a grid of 50 km around the facility.[8] The state determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. The grid receptor spacing for the area of analysis chosen by the state is as follows:

- 100 meter grid from center of Tolk station out to 1 km,
- 500 meter grid centered on Big Brown out to 5 km, and
- 1000 meter (1 km) grid centered on Big Brown out to 50 km.

The receptor network contained 12,894 receptors, and the network covered the following Texas counties: Lamb County, Baily County, portions of western Swisher, and western Hale County, large portions of both Parmer County and Castro County, northern portions of both Hockley County and Cochran County, and the northwestern portions of Lubbock County. The network extended into Curry and Roosevelt Counties in New Mexico.

Figures 3 and 4 show the state's chosen area of analysis surrounding the Tolk station, as well as receptor grid for the area of analysis. Consistent with the Modeling TAD, receptors for the purposes of this designation effort were placed only in areas where it would also be feasible to place a monitor to record ambient impacts. The impacts of the area's geography and topography will follow in the appropriate section.

[8] AERMOD is a Gaussian Plume Air Dispersion Model, 50km is the useful distance to which most steady-state Gaussian plume models are considered accurate for setting emission limits per SCRAM guidance.

Figure 3: Tolk Electric Station Area of Analysis

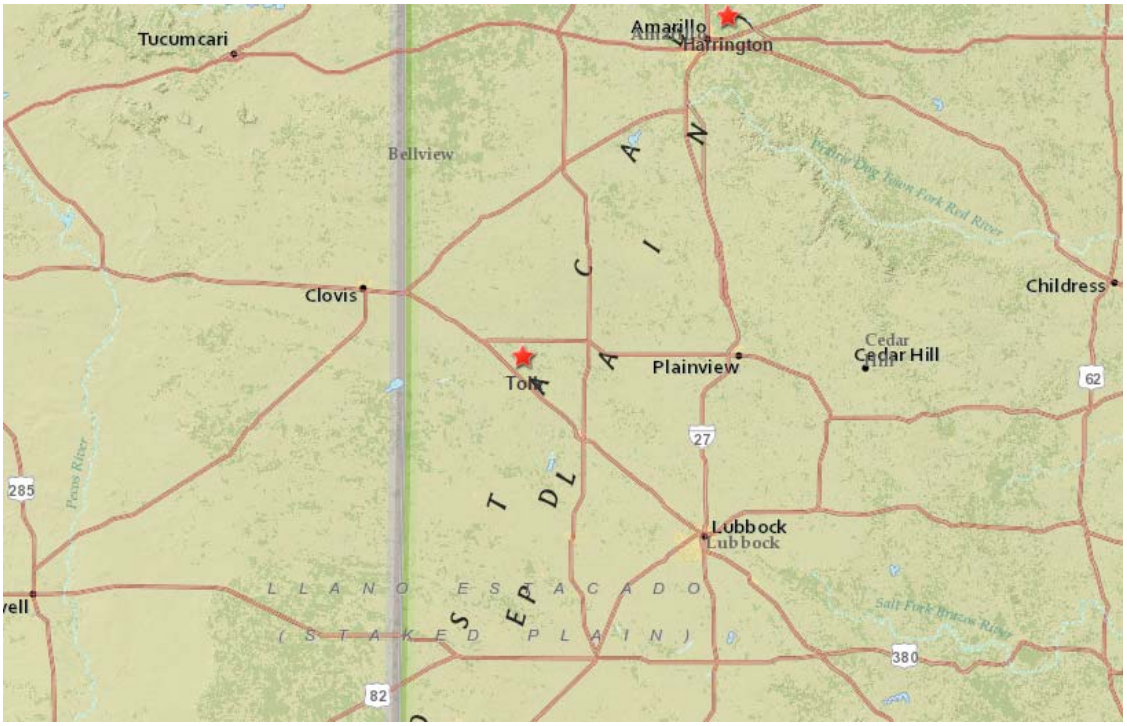
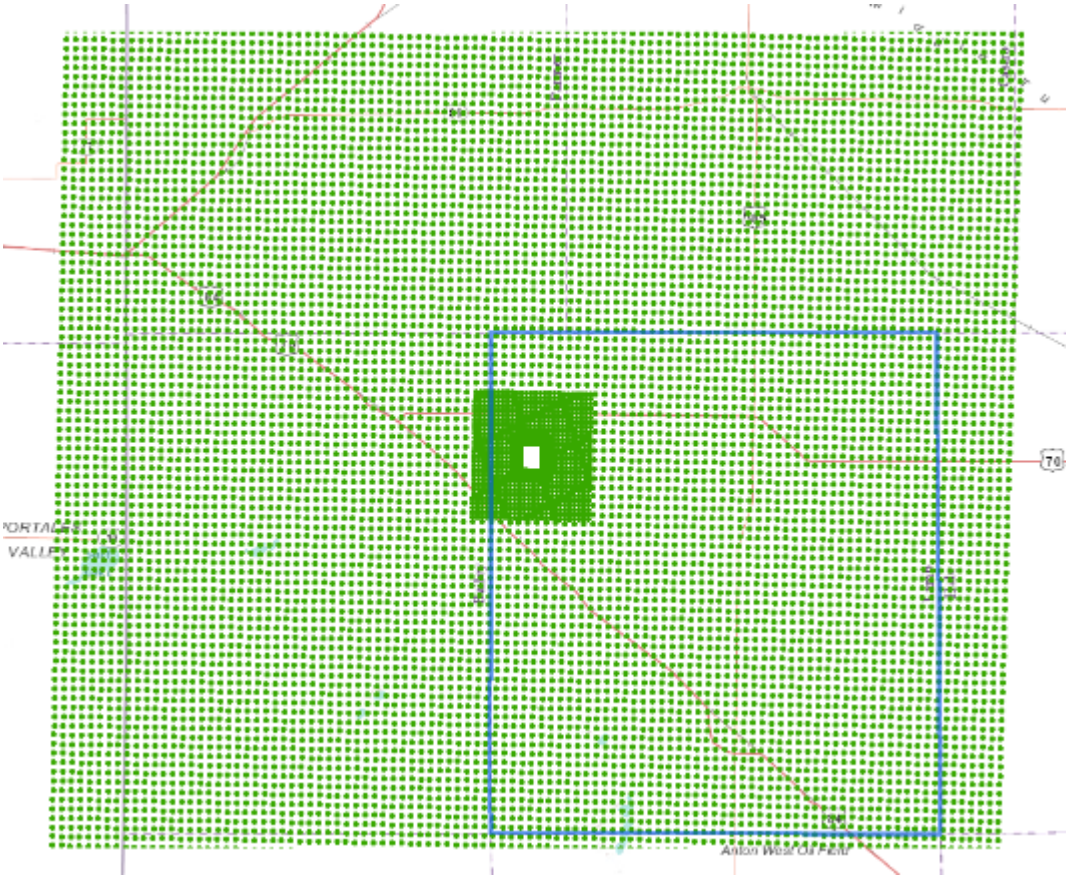


Figure 4: Receptor Grid for the Tolk Electric Station Area of Analysis



Modeling Parameter: Source Characterization

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

Modeling Parameter: Emissions

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

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information when it is available, and that these data are available

for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS or the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA believes that detailed throughput, operating schedules, and emissions information from the impacted sources should be used.

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

As previously noted, the state only modeled the Tolk station source and no other emitters of SO_2 in the area of analysis. This distance was selected because the state believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the source which might cause these concentrations. No sources beyond were determined by the state to have the potential to cause significant concentration gradient impacts within the area of analysis. Tolk station is a relatively isolated source. TCEQ emissions inventory data from 2013 were reviewed and there is a source located approximately 15 km east of the facility with five tons of SO_2 emissions. There is another source located approximately 50 km north-northwest of the facility with 63 tons of SO_2 emissions. Given the distance and magnitude of emissions, these sources would not be expected to cause significant concentration gradients in the vicinity of Tolk station and are represented in the modeling via monitored background concentrations. An emissions summary of Tolk station from 2012 to 2014 is provided below in Table 1.

Table 1: Actual SO_2 Emissions Between 2012 – 2014 from the Tolk Electric Station.

Facility Name	SO_2 Emissions (tons per year)		
	2012	2013	2014
Tolk Electric Station	19,168	19,454	16,759

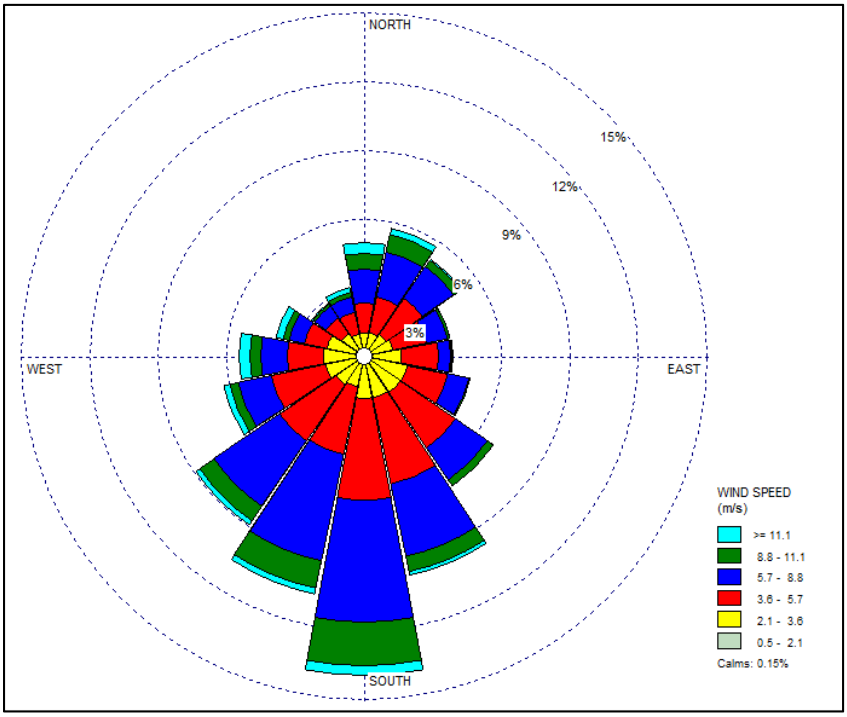
Modeling Parameter: Meteorology and Surface Characteristics

The most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. As noted in the Modeling TAD, the selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data are based on: 1) the proximity of the meteorological

monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the Tolk station area of analysis, surface meteorology from the NWS station in Lubbock, Texas, 95 km to the southeast, and coincident upper air observations from the NWS station in Amarillo, Texas, 260 km to the north-northeast were selected as best representative of meteorological conditions within the area of analysis. See Figure 5 for a wind rose plot showing predominant winds at the Lubbock meteorological station based on 2012-2014 data.

Figure 5: Wind Rose for Lubbock, Texas Surface Meteorological Station (2012-2014)



The state used AERSURFACE version 13016 using data from the NWS station in Lubbock, Texas (Station #: 23042) to estimate the surface characteristics of the area of analysis. The state estimated values for 1 spatial sectors out to 1 km at an annual temporal resolution for average conditions. The state also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo").

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

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

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as flat with no significant terrain barriers. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Tolk station area of analysis, the state chose 2012-2014 monitored design values from Waco, Texas because there are no SO_2 monitors in Lamb County, TX. The Waco monitor was also most representative of the background SO_2 conditions for Tolk station. The background concentration for this area of analysis was determined by the state to be 16 micrograms per cubic meter ($\mu g/m^3$), or 6.11 ppb,[9] and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

The AERMOD modeling parameters for the Tolk station area of analysis are summarized below in Table 2.

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

Table 2: AERMOD Modeling Parameters for the Tolk Electric Station Area of Analysis

Tolk Electric Station Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	2
Modeled Structures	0
Modeled Fencelines	4
Total receptors	12894
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Lubbock, Texas
Upper Air Meteorology Station	Amarillo, Texas
Methodology for Calculating Background SO_2 Concentration	Waco, Texas monitor, 2012-2014 design values
Calculated Background SO_2 Concentration	16 $\mu g/m^3$

The results presented below in Table 3 show the magnitude and geographic location of the highest predicted modeled concentration based on actual emissions.

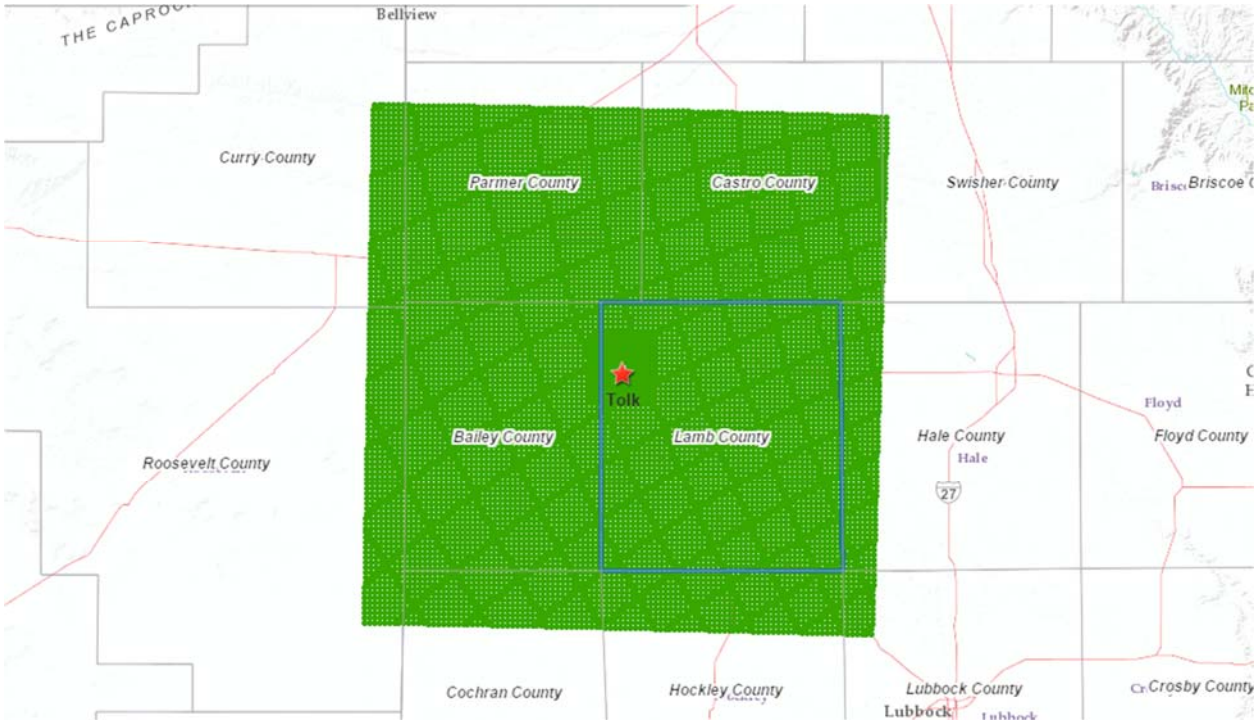
Table 3: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Tolk Station Area of Analysis Based on Actual Emissions

		Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	723614	3783986	166	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

The state's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 166 $\mu g/m^3$, or 63.4 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. This predicted value occurred at UTM Zone 13N, 723614 easting and 3783986 northing, and is graphically represented along with all the other receptors below in Figure 6.

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



Jurisdictional Boundaries:

Once the geographic area of analysis associated with the Tolk station is determined, existing jurisdictional boundaries are considered for the purpose of informing our intended unclassifiable/attainment area, specifically with respect to clearly defined legal boundaries.

The EPA has confirmed that there are no additional sources of SO_2 emitting 100 tpy or above within Lamb County or near its borders. The closest SO_2 emitter above 100 tpy is Slaughter Gasoline Plant in neighboring Hockley County. This facility had reported SO_2 emissions of 820 tpy according to the 2011 NEI, and is approximately 80 km from the Lamb County border. Due to its emissions and distance from the county border, based on available information the EPA does not believe that this source has the potential to cause or contribute to a violation of the NAAQS within Lamb County.

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

Other Relevant Information

The EPA did not receive any additional relevant information with respect to the area surrounding Tolk station.

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Tolk station as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of Lamb County. This recommendation is made based on the modeling of actual emissions reported from the facility during the 2012 to 2014 calendar years. An analysis of the modeling data indicates it was performed in accordance with appropriate EPA modeling guidance and using conservative assumptions. Additionally, the EPA has confirmed that there are no other sources in Lamb County or near its borders that are likely to cause or contribute to a violation of the NAAQS within Lamb County.

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

Technical Analysis for the Limestone Power Station in Limestone County, Texas

Introduction

The Limestone area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Limestone Power Station emitted 20,671 tons of SO_2, and had an emissions rate of 0.36 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

In its submission, Texas recommended that the area surrounding the Limestone Power Station, specifically the entirety of Limestone County, be designated as attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. In its recommendation provided to the EPA on September 17, 2015, the Texas Commission on Environmental Quality (TCEQ) included modeling completed by industry for the Limestone Power Station as Attachment F.[10]

After the EPA had completed its review and analysis of the modeling submitted by the state, industry submitted a supplemental modeling report on December 1, 2015. This supplemental report presents the results of additional dispersion modeling completed to address comments and requests for additional information. Notably, the EPA participated in numerous conference calls and meetings to discuss potential model input errors and inconsistencies in the modeling compared to the procedures described in the EPA's Modeling TAD. In response to those discussions, industry provided the December 1, 2015 supplement, which was submitted to address the following:

1. Correct errors in the hourly SO_2 emissions and parameter input file;
2. Examine the effect on modeled concentrations of correcting and using land use information for the Corsicana airport, which was used to develop meteorological inputs to AERMOD; and
3. Examine the effect on modeled concentrations of the use of two options within AERMOD that are currently designated as "beta" options requiring justification, but which EPA has proposed to designate as "default" options.

[10] The State of Texas relied on the supporting documentation by Environmental Resources Management, submitted on behalf of the NRG Limestone Power Station.

Following review of the supplement modeling report, the EPA requested additional information regarding the revised Limestone modeling analysis. Specifically, the EPA requested that industry review the stack parameter information included as model inputs and confirm their accuracy. In response to our request, industry submitted the January 25, 2016 supplement,[11] to provide Verification of stack parameters as requested by the EPA. Industry indicated that the stack parameters included in the December 1, 2015 submittal were accurate and representative of the emission sources at the Limestone Power Station.

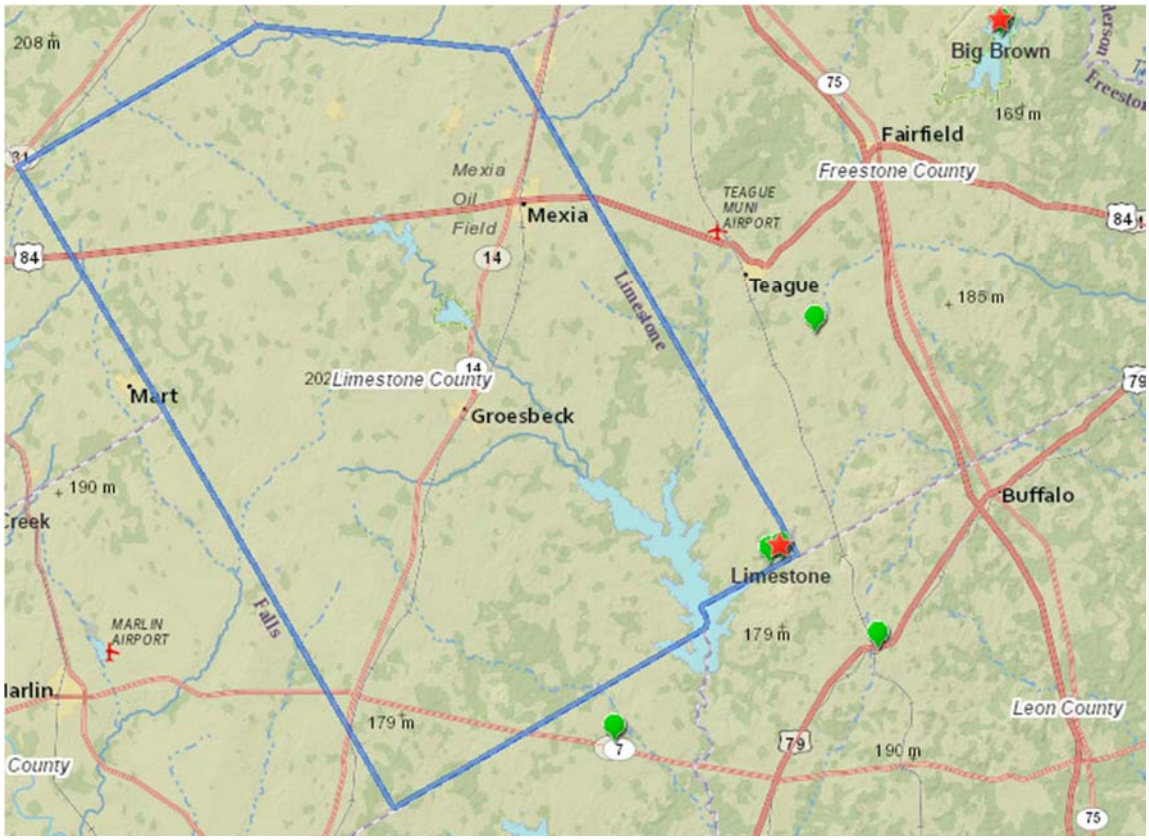
As discussed later in the "Additional Relevant Information – Sierra Club" section of this TSD, the EPA received dispersion modeling results from the Sierra Club, asserting that the area around the Limestone Power Station experiences violations of the NAAQS, and urging the EPA to designate the area as nonattainment. The Sierra Club submitted two modeling analyses (dated September 17, 2015; and December 15, 2015) showing modeled violations of the 1-hour SO_2 NAAQS.

After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees that the area is attaining the standard, and intends to designate Limestone County as unclassifiable/attainment.

The Limestone Power Station is located in east Texas in the southeastern most portion of Limestone County. As seen in Figure 1 below, the facility is located approximately 34 km southeast of the center of Limestone County, and 8 km east of Lake Limestone. Also included in the figure are nearby large emitters of SO_2, the state's recommended area for the unclassifiable/attainment designation, and the EPA's intended unclassifiable/attainment designation boundary for the area.

[11] Electronic report providing response to the EPA's request for stack parameter verification was provided via email on January 25, 2016.

Figure 1. The EPA's intended designation(s) for Limestone County, Texas



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

Detailed Assessment: Texas' Submittal

Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding Limestone Power Station. The facility is located in Limestone County; however, there are no ambient air quality monitors located in this county. The state included the most recent 3 years of monitoring data, i.e., 2012 – 2014 in its recommendation from the Waco site in McLennan County. These data are presented in Table 1.

Table 1: Available Air Quality Data for the Monitors Closest to Limestone Power Station

County	State Recommendation	Air Quality Systems (AQS) Monitor ID	Monitor Location	Distance to Limestone Power Station (km)	2012 – 2014 SO_2 Design Value in ppb
Navarro	Unclassifiable/ Attainment	48-349-1051	Corsicana	69.5	35
McLennan	Unclassifiable/ Attainment	48-309-1037	Waco	82.2	6

Based on available ambient air quality collected between 2012 and 2014, the monitors located closest to the Limestone Power Station do not show a violation of the 2010 SO_2 NAAQS. However, considering the distance from the facility for the non-violating Navarro and McLennan County monitors, it is not a sufficient technical justification to rule out that an exceedance of the 2010 SO_2 NAAQS may occur in the immediate vicinity of the facility.

Emissions and Emissions-Related Data

To determine whether the immediate area around the source is meeting the emissions criteria of the March 2, 2015 consent decree, i.e., whether Limestone County is experiencing elevated ambient SO_2 concentrations, the state gathered evidence of SO_2 emissions from the source, as well as county level SO_2 emissions data, and data for sources located within 50 km.

As part of its recommendation, Texas referenced modeling completed by industry that included the emissions for all sources in Limestone County emitting at or above 1,000 tons per year (tpy) of SO_2. Sources less than 1,000 tpy were evaluated and determined that they would have negligible impact on NAAQS attainment status. Additionally, modeling included the emissions for all sources emitting at or above 1,000 tpy of SO_2 in neighboring Freestone and Robertson Counties. Texas obtained the data for these emissions from the 2011 National Emissions Inventory (NEI).[12] The 2011 EPA NEI was reviewed to determine candidate major sources. These emissions data are summarized in Table 2 below.

[12] Detailed information for the 2011 NEI can be found at this link: http://www3.epa.gov/ttnchie1/net/2011inventory.html

Table 2: SO_2 Emissions from Other Local Sources

County	Facility Name	Facility Subject to the Emissions Criteria of the March 2, 2015 consent decree?	Distance to Facility that Meets the Consent Decree Criteria in km	Facility Total SO_2 Emissions (tpy) 2011 NEI
Freestone	Big Brown	Yes	47.9	64,198
Robertson	Oak Grove	Yes	34.9	4,911

Note: No source in Leon County emitted greater than 100 tons of SO_2 in 2011 according to the 2011 NEI.

Emissions Controls

The EPA recognizes that control strategies implemented on the sources above that occurred after the release of the 2011 NEI may not be reflected, or may warrant further discussion. The EPA has not received any additional information on emissions reductions resulting from controls put into place after 2011.

Meteorology (Weather & Transport Patterns)

Evidence of source-receptor relationships between specific emissions sources and high SO_2 concentrations in the surrounding area is another important factor in determining the appropriate extent of the EPA's intended unclassifiable/attainment area. As discussed below in the section titled, "Other Relevant Information", meteorological records for the nearest National Weather Service meteorological station from the Corsicana Municipal Airport indicate winds blow predominantly from the south, south-east with a secondary northerly flow component.

Geography and Topography (Mountain Ranges or Other Air Basin Boundaries)

The area is generally flat, rural and agricultural, without mountain ranges or restrictive geological features likely to affect predictive air impacts of SO_2.

Jurisdictional Boundaries

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

As discussed below in the section titled, "Other Relevant Information: State and Industry Submittals," the area around Limestone Power Station has been modeled by industry to show

compliance with the NAAQS. This modeling included emissions from one source, i.e., Big Brown Power Station in Freestone County also impacted by the court-ordered July 2, 2016 deadline for the EPA to promulgate designations.

Another source impacted by the court-ordered July 2, 2016 deadline, i.e., Sandy Creek Energy Station in McLennan County, is discussed elsewhere in this document. While the EPA intends to designate the area around Sandy Creek Energy Station as unclassifiable (discussed elsewhere in this technical support document), the distance between the facility and the Limestone County border (17 km) leads the EPA to believe that it is unlikely for its emissions to cause or contribute to a violation of the NAAQS within Limestone County. For comparison purposes, the EPA intends to designate the area around Big Brown Power Station in Freestone County as nonattainment (also discussed elsewhere in this technical support document). The Big Brown Power Station's 2012 emissions were more than 12 times those from Sandy Creek Energy Station, and air dispersion modeling indicates compliance with the NAAQS at distances of 15 km from Big Brown Power Station. As a result, the EPA does not believe that it is likely for the emissions from any of the off-site inventory sources in the Limestone Power Station area of analysis to cause or contribute to a violation in Limestone County.

Additionally, the EPA intends to designate the area around Twin Oaks Power Station as unclassifiable/attainment. This facility is also impacted by the July 2, 2016 court-ordered deadline, and is located approximately 17 km from the Limestone County Border. As discussed elsewhere in this technical support document, the emissions in the Twin Oaks area of analysis have been modeled to show attainment with the NAAQS. Therefore, the EPA does not believe that emissions in the Twin Oaks area are likely to cause or contribute to a violation of the NAAQS within Limestone County.

The EPA has also confirmed that there are no other sources in Limestone County that according to the 2011 NEI emit at or above 100 tpy of SO_2. There are several sources of SO_2 that are not impacted by the July 2, 2016 court-ordered deadline that emit at or above 100 tpy within 20 km of Limestone County's borders: Teague Gas Plant (Freestone County), Nucor Steel (Leon County), BOA Gas Plant (Robertson County), and Oak Grove Power Station (Robertson County). Oak Grove's emissions were included in the Limestone area of analysis, both of which were modeled to show compliance with the standard. Nucor Steel's emissions of 273 tpy along with its distance from the Limestone County border (10km) lead the EPA to believe that it is unlikely to cause or contribute to a violation of the NAAQS within Limestone County. Similarly, the EPA believes that the emissions and distances to the Limestone County border from the other facilities, i.e., Teague Gas Plant (213 tpy, 12 km) and BOA Gas Plant (123 tpy, 4 km), make them unlikely to cause or contribute to a violation of the NAAQS in Limestone county.

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

Modeling Information: State and Industry Submittals

The EPA received a submittal from the state containing modeling conducted by industry, indicating SO_2 emissions from Limestone Power Station, when considered alone or in tandem with other local sources, are not causing a violation of the NAAQS. Based on EPA's initial review, industry did provide supplemental modeling and reports characterizing the air quality in the vicinity of the Limestone Power Station. A discussion and review of the most recent modeling performed by industry follows below, with references to the EPA's Modeling TAD as appropriate. This modeling was discussed in the December 1, 2015 supplemental report submitted by industry to the EPA.

Model Selection and Modeling Components

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

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

Industry used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

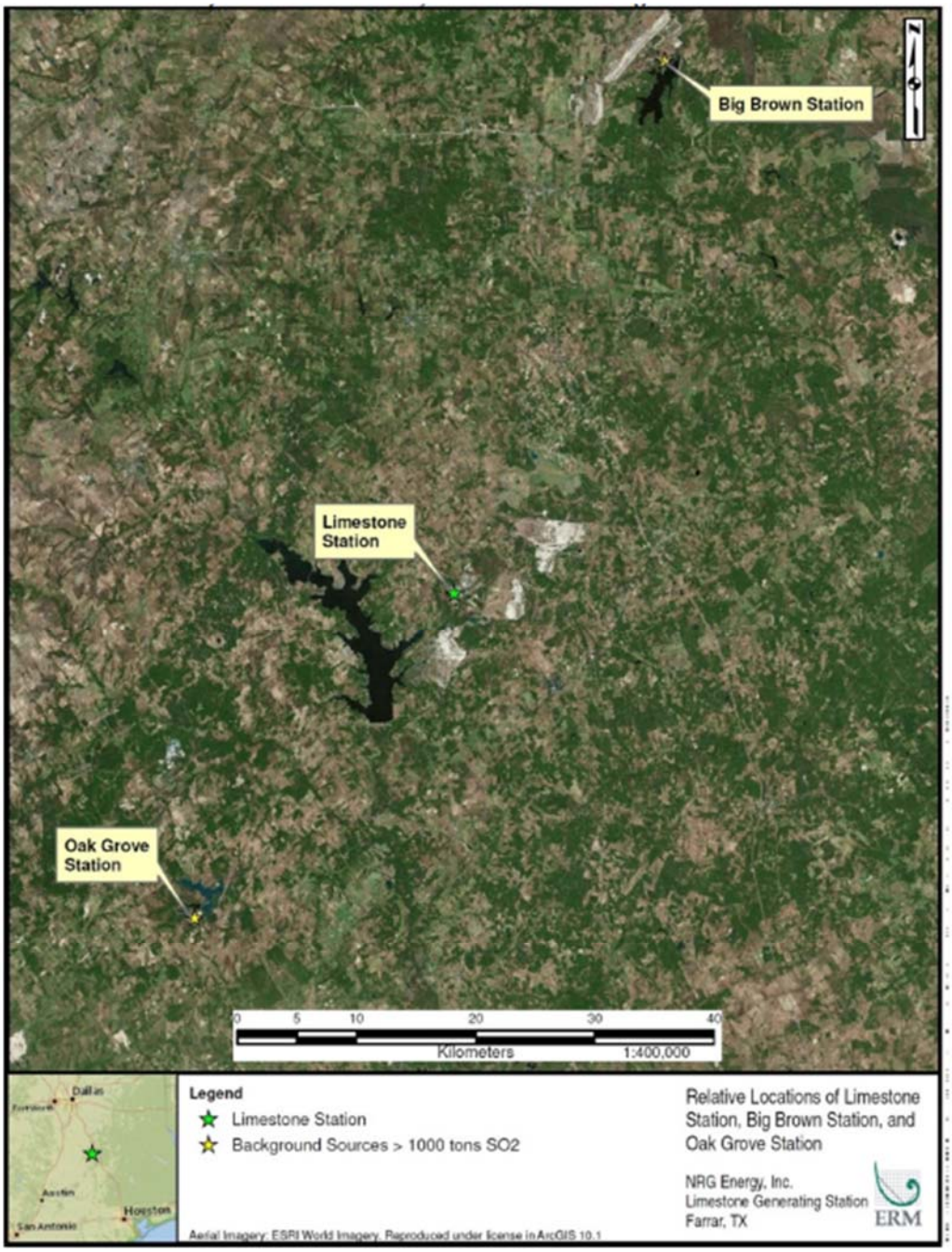
Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural.

Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, industry determined that it was most appropriate to run the model in rural mode.

Based on our review of aerial photography of the area surrounding the facility provided as part of the state's recommendation as presented in Figure 2, below, the determination to run the model in rural mode appears appropriate.

Figure 2: Industry's Area of Analysis for Limestone



Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Limestone Power Station is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of

significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. Industry included 2 other sources of SO_2 within 50 kilometers (km) of Limestone Power Station. The nominal distance for modeled near-field accuracy using AERMOD is 50 km.[13] Industry utilized a grid spacing out to 20 km because the source concentration gradient decreased well below the NAAQS even at this distance. Industry determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources that may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. In addition to the Limestone Power Station, the other emitters of SO_2 included in the area of analysis are: Big Brown Power Station and Oak Grove Power Station. The grid receptor spacing for the area of analysis chosen by industry is as follows:

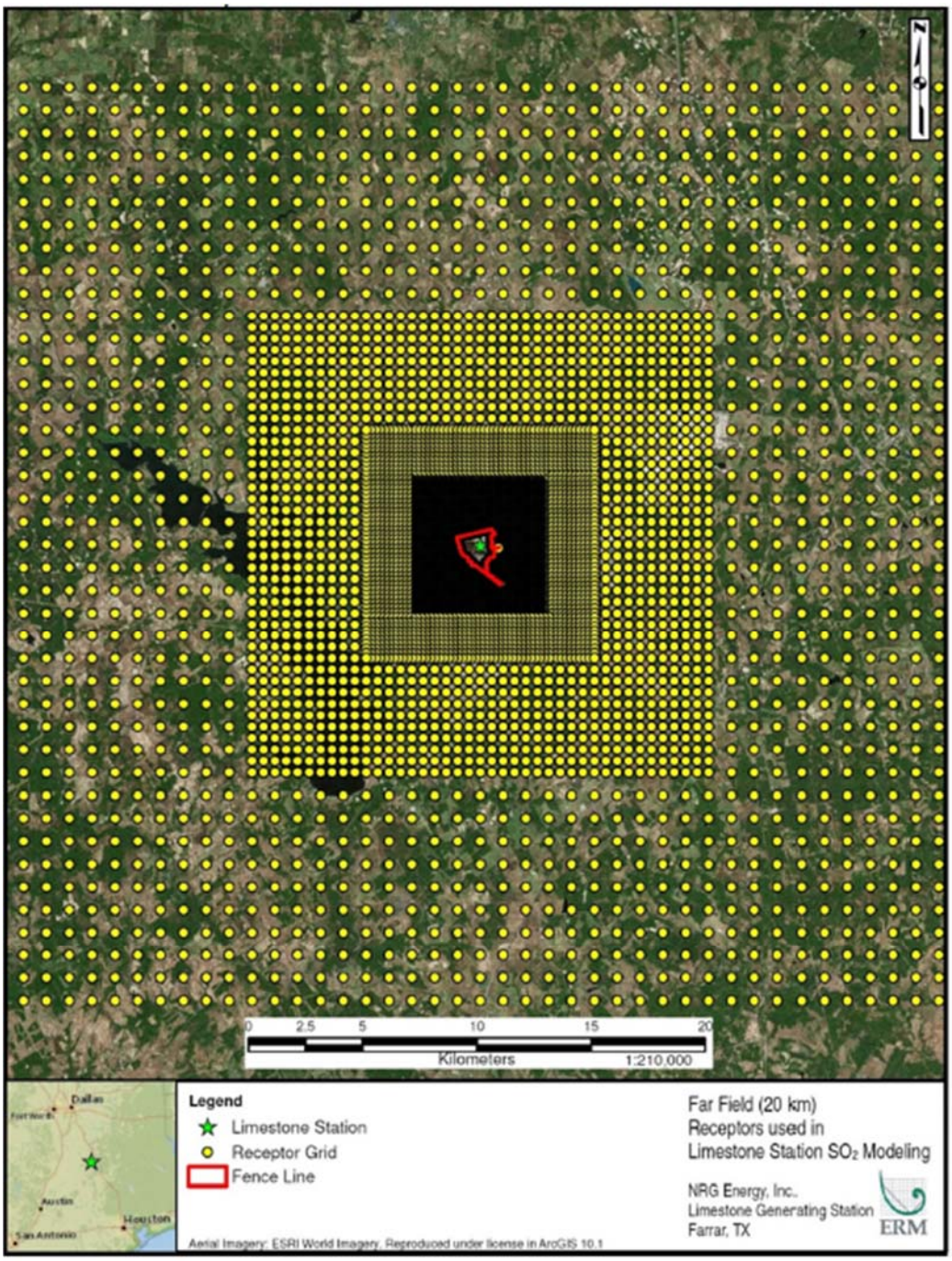
- 50 meter grid along the facility fence line,
- 100 meter grid extending from the fence line to 3 km,
- 200 meter grid extending from 3 to 5 km,
- 500 meter grid extending from 5 to 10 km, and
- 1,000 meter grid extending from 10 to 20 km.

The receptor network contained 7,841 receptors, and the network covered the majority of southeast Limestone, and southwest Freestone County. Northwest Leon County, as well as the northeastern Robertson County are also included. All locations are within east, central Texas.

Figures 2 and 3 show the chosen area of analysis surrounding the Limestone Power Station, as well as receptor grid for the area of analysis. Consistent with the Modeling TAD, receptors for the purposes of this designation effort were placed only in areas where it would also be feasible to place a monitor. The impacts of the area's geography and topography will follow in the appropriate section.

[13] AERMOD is a Gaussian Plume Air Dispersion Model, 50 km is the useful distance to which most steady-state Gaussian plume models are considered accurate for setting emission limits per SCRAM guidance.

Figure 3: Industry's Receptor Grid for the Limestone Area of Analysis



Modeling Parameter: Source Characterization

Industry's modeling, which was included in the state's submittal, characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, it used actual stack heights in conjunction with actual emissions. The modeling

also correctly characterized the sources' building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

As previously mentioned, the EPA requested additional clarification and confirmation from industry regarding the modeled stack parameters for the on-site sources the Limestone Power Station. Industry reviewed the information and confirmed that the stack parameters included in their most recent modeling were accurate.

Modeling Parameter: Emissions

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

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

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

Industry included Limestone Power Station and 2 other emitters of SO_2 within 50 km in the area of analysis. This distance and these facilities were selected because they believed that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and

adequately includes the sources which might contribute to those concentrations. No other sources beyond 50 km were determined by industry to have the potential to cause significant concentration gradient impacts within the area of analysis. The facilities in the area of analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below and were used for the modeling input analysis.

Table 3: Actual SO_2 Emissions Between 2012 – 2014 from Facilities in the Limestone, Texas Area of Analysis, Provided by the State

		SO_2 Emissions (tpy)		
	Facility Name	2012	2013	2014
	Big Brown	60,681	62,494	57,460
	Oak Grove	4,911	6,531	7,404
Total Emissions	All Facilities	65,592	69,025	64,864

For the Limestone area of analysis, the modeling included actual emissions from the most recent 3-year data set, i.e., 2012 – 2014. These emissions data were obtained from hourly emissions data for each EGU at all three stations were downloaded from the Clean Air Markets database for use in the modeling, and stack parameters for each unit were provided by TCEQ via email on July 16, 2015. These methods have been accepted by the EPA.

Modeling Parameter: Meteorology and Surface Characteristics

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

For the Limestone area of analysis, surface meteorology from the NWS station at Corsicana Municipal Airport in Corsicana, Texas, 42.8 miles to the north, and coincident upper air observations from the NWS station in Fort Worth, Texas, about 110 miles to the northwest, were selected by industry as best representative of meteorological conditions within the area of analysis.

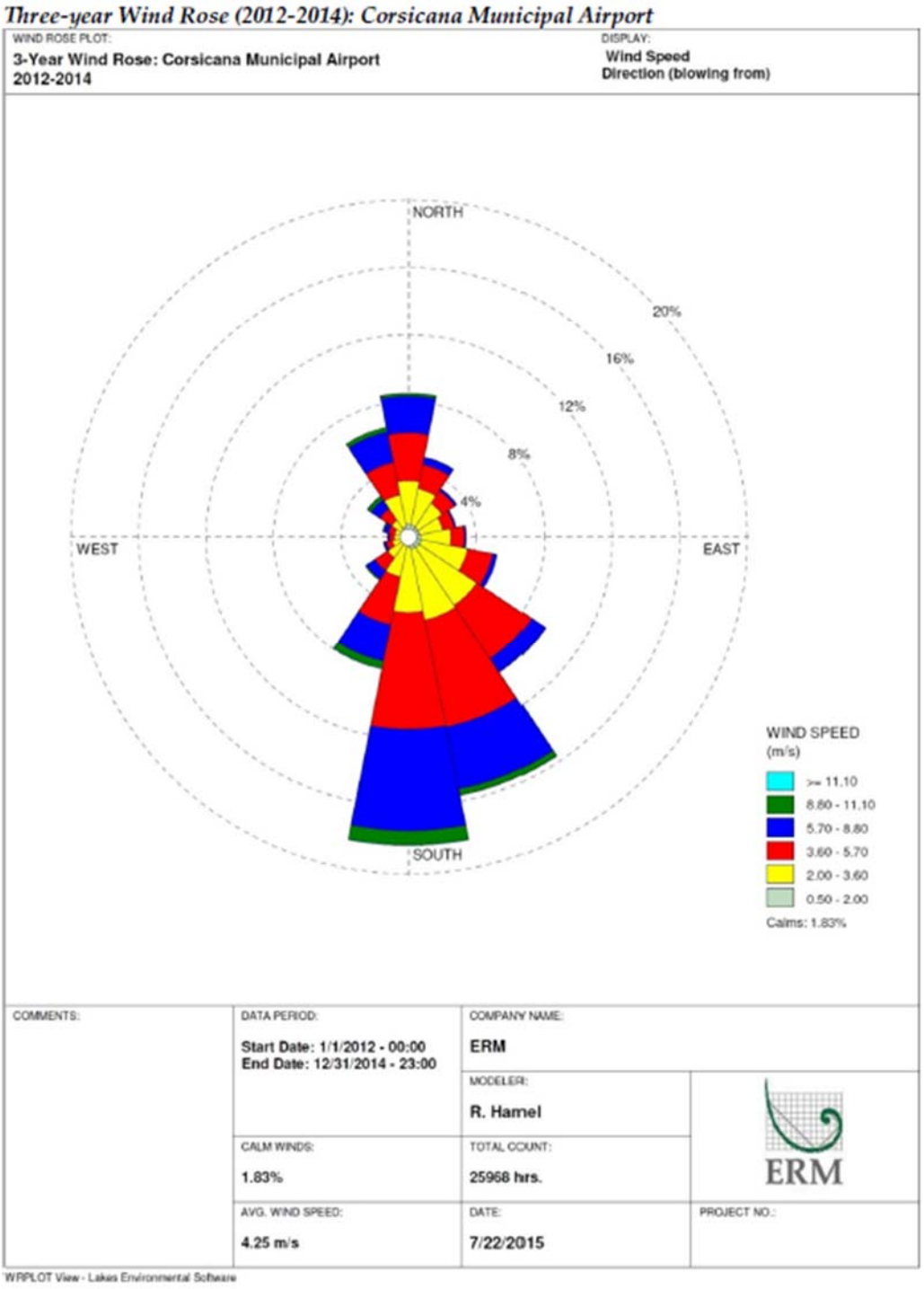
Industry used AERSURFACE version 13016 from the NWS station in Corsicana, Texas (WBAN No. 53912) to estimate the surface characteristics of the area of analysis. In the figure below, the

location of the Corsicana, Texas NWS station is shown relative to the Limestone Power Station area of analysis.

Figure 4: Limestone Power Station Area of Analysis and the Corsicana, Texas NWS

Industry provided the 3-year surface wind rose for Corsicana, Texas. In this figure, the frequency and magnitude of wind speed and direction are defined in terms of where the wind is blowing from predominantly the south, south-east with a secondary northerly flow component.

Figure 5: Corsicana, Texas Cumulative Annual Wind Rose for Years 2012 – 2014



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD

modeling runs. Industry followed the methodology and settings presented in the most recent versions of meteorological preprocessing files of AERMOD, and are approved by EPA guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

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

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as flat with no significant terrain barriers. To account for these terrain changes, the AERMAP terrain program was used to specify terrain elevations for all the receptors. The elevation data incorporated into the model is from the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99^{th} percentile monitored concentrations by hour of day and season or month. For the Limestone area of analysis, industry chose a temporally varying approach based on seasonality from the Waco background monitors that most appropriately represented sources not explicitly included in the modeling runs. EPA guidance allows simulation of background values that vary by season and hour of day that could simulate a lower value than the 99th percentile. The modeling was

performed with a set of seasonal diurnal values developed using the methodology described in the EPA's March 1, 2011 Clarification Memorandum titled, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard." While this memo primarily addresses NO_2, portions also address SO_2.[14]

Table 4: Background Seasonal Diurnal SO_2 values for the Area of Analysis

Hour[1]	Winter	Spring	Summer	Fall
1	3.05	3.23	3.40	4.80
2	2.70	2.88	3.75	9.60
3	2.97	2.97	3.32	9.07
4	4.01	1.83	3.32	6.98
5	1.83	1.66	2.36	2.53
6	2.18	1.40	2.36	2.70
7	1.92	1.48	2.01	3.23
8	1.83	1.40	1.83	2.62
9	2.70	2.09	4.19	3.75
10	4.01	4.19	7.33	7.77
11	11.34	5.32	6.54	13.44
12	13.26	3.40	4.80	9.07
13	2.74	3.14	5.24	7.68
14	12.13	4.28	5.06	8.99
15	7.07	4.01	4.01	7.15
16	8.73	4.19	3.66	7.33
17	8.64	3.75	4.10	6.81
18	6.81	3.66	3.40	7.07
19	7.77	3.49	3.75	6.81
20	4.54	6.63	4.80	9.34
21	4.54	4.45	8.81	7.33
22	3.05	4.89	6.02	6.20
23	3.75	5.93	4.36	5.50
24	2.88	3.58	3.66	8.46

1. Hours in AERMOD are defined as hour-ending. i.e., Hour 1 is the period from midnight through 1 AM, etc.

Summary of Modeling Results

The AERMOD modeling parameters for the Limestone area of analysis, as provided by the State, are summarized below in Table 5.

[14] See http://www3.epa.gov/scram001/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf, p 19 - 20

Table 5: AERMOD Modeling Parameters for the Limestone Area of Analysis,

Limestone, Texas Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	6
Modeled Stacks	
Modeled Structures	38
Modeled Fencelines	
Total receptors	7841
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Corsicana, Texas
Upper Air Meteorology Station	Fort Worth, Texas
Methodology for Calculating Background SO_2 Concentration	Seasonal Diurnal Values
Calculated Background SO_2 Concentration	Seasonal Diurnal Values Used (See Table 4)

The results presented below in Table 6 show the magnitude and geographic location of the highest predicted modeled concentration of SO_2 based on actual emissions.

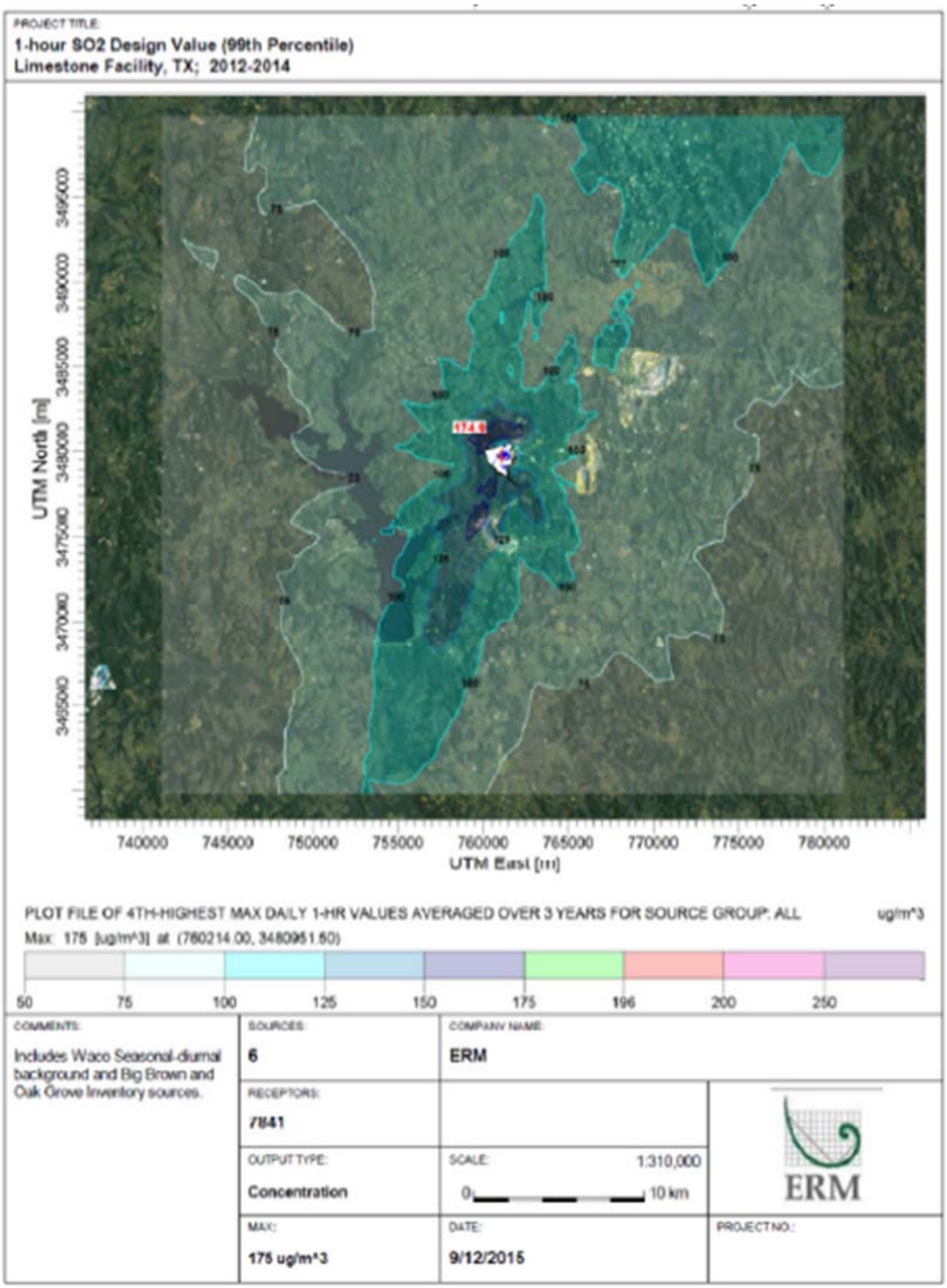
Table 6: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Limestone, Texas Area of Analysis Based on Actual Emissions, Provided by Industry

		Receptor Location		SO_2 Concentration ($\mu g/m^3$) Based on Actual Emissions	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	[2012-2014]			174.9	196.5*

* Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

Industry's submitted modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 174.9 $\mu g/m^3$, or 66.76 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. This predicted value occurred northwest of the facility and is graphically represented along with all the other receptors below in Figure 6.

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



Other Relevant Information: Sierra Club

The EPA received air dispersion modeling results from Sierra Club, asserting that SO_2 emissions from Limestone Power Station, when considered alone or in tandem or other local sources, are causing a violation of the NAAQS. A discussion and review of the modeling performed by Sierra Club follows below, with references to the EPA's Modeling TAD as appropriate.

The EPA received air dispersion modeling from Sierra Club, asserting that SO_2 emissions from Limestone Power Station, when considered alone or cumulatively with other nearby sources, are causing a violation of the NAAQS. The latest modeling for the Limestone Power Station submitted by the Sierra Club was dated December 15, 2015. This supplemental modeling was provided to correct input errors in previous modeling and to update the model input to include variable stack temperatures and velocities and building downwash based on the initial modeling submitted by the state on September 17, 2015. As noted above, industry submitted supplemental modeling on November 30, 2015 to correct errors in the July 24, 2015 state recommendation. Therefore, the latest modeling from Sierra Club does contain those input errors and is not as representative as the November 30, 2015 modeling submitted by industry. In addition, industry utilized additional modeling refinements allowed by the Modeling TAD and EPA modeling guidance that were not utilized by Sierra Club (i.e., 2nd tier SO_2 seasonal, diurnal background concentrations; revised land use date inputs for meteorological data processing). Because of the model input errors and the availability of more refined modeling that indicates that modeled impacts from the Limestone Power Station do not exceed the standard, the EPA is not proposing a designation of nonattainment based on Sierra Club's modeling for the area surrounding the facility.

Model Selection and Modeling Components

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

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- BPIPPRIME: the building input processor
- AERMET: the meteorological data processor for AERMOD
- 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

Sierra Club used AERMOD version 15181 as available from the Support Center for Regulatory Atmospheric Modeling (SCRAM) website, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

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

The determination to run the model in rural mode appears appropriate as described in the previous section based on our review of aerial photography of the area surrounding the facility.

Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Limestone Power Station is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. For the Limestone area, Sierra Club has included 3 other sources of SO_2 within 50 kilometers (km) of Limestone Power Station in any direction. Sierra Club determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. The nominal distance for modeled near-field accuracy using AERMOD is 50 km. In addition to the Limestone Power Station, the other emitters of SO_2 included in the area of analysis are: Big Brown Power Station, Oak Grove Power Station, and Twin Oaks Power Station. The grid receptor spacing for the area of analysis chosen by Sierra Club is as follows:

- 100 meter grid from center of Limestone Power Station out to 5 km,
- 500 meter grid centered on Limestone Power Station out to 10 km, and
- 1000 meter (1 km) grid centered on Limestone Power Station out to 50 km.

The receptor network contained 21,201 receptors, and the network covered the majority of Limestone, Leon, and Freestone County, as well as the northern half of Robertson County. All

locations are within east, central Texas. Sierra Club modeling used a slightly elevated flagpole receptor height, but if this was correct to EPA's recommended height we would expect only a slight change in the modeled numbers and the area of exceedances and magnitude of the values would be basically the equivalent and not change our proposed action.

Figures 7 and 8 show Sierra Club's chosen area of analysis surrounding the Limestone Power Station, as well as receptor grid for the area of analysis. Consistent with the Modeling TAD, receptors for the purposes of this designation effort were placed only in areas where it would also be feasible to place a monitor. The impacts of the area's geography and topography will follow in the appropriate section.

Figure 7: Sierra Club's Area of Analysis for Limestone, Texas

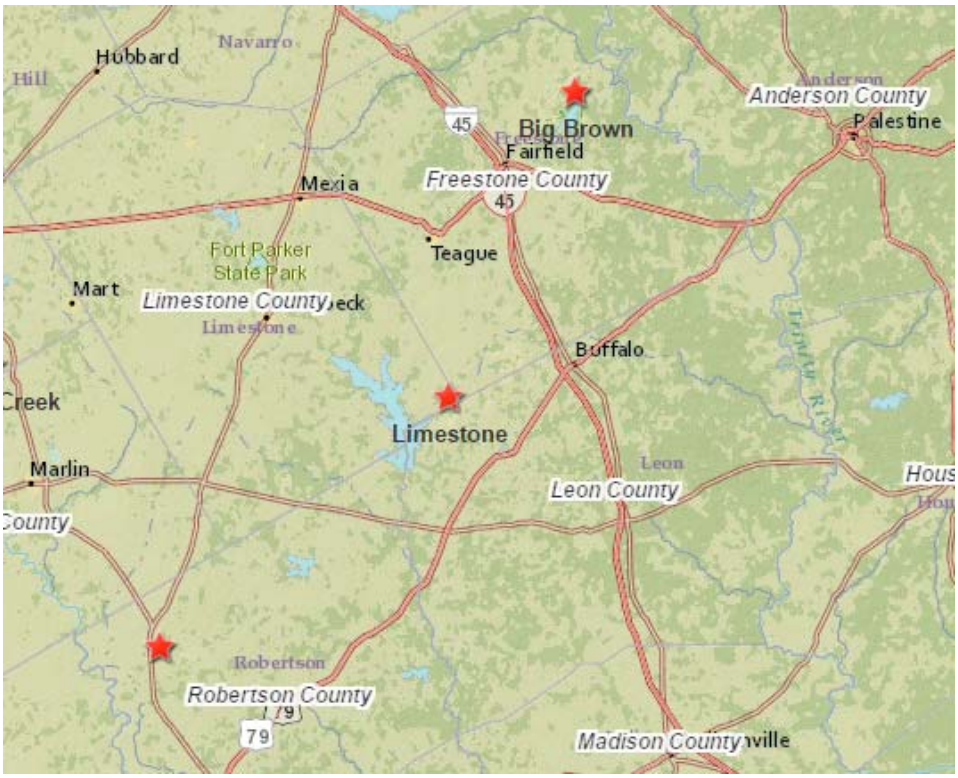
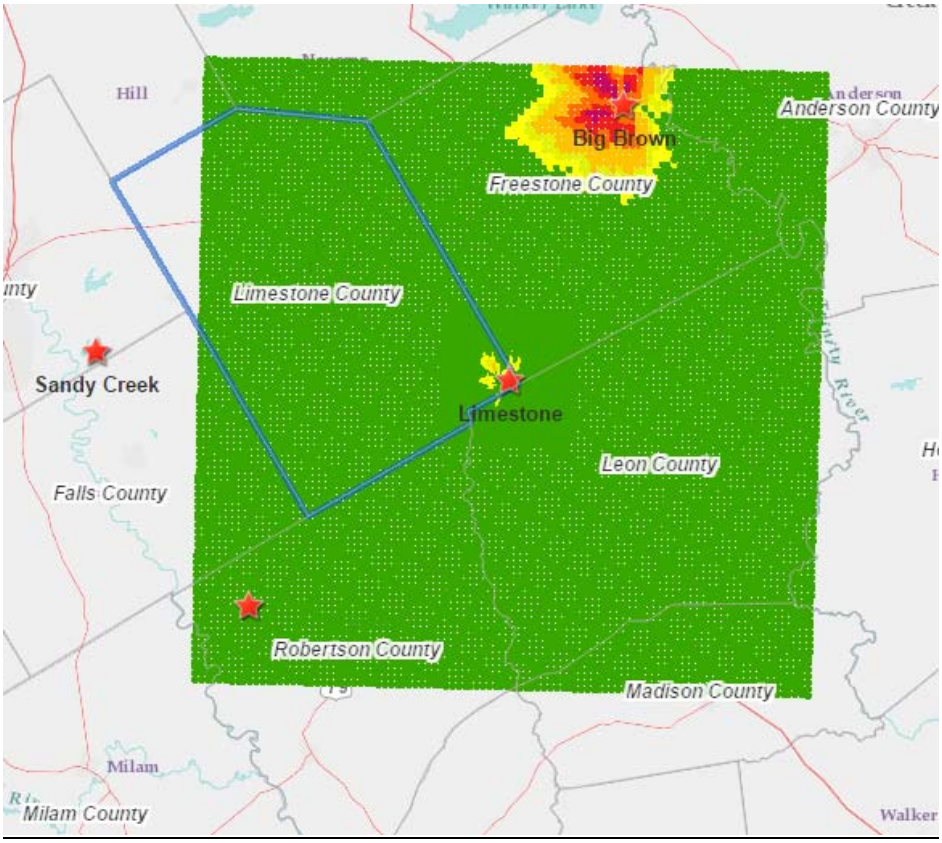


Figure 8: Sierra Club's Receptor Grid for the Limestone, Texas Area of Analysis



Modeling Parameter: Source Characterization

Sierra Club characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, it used actual stack heights in conjunction with actual emissions. Sierra Club also correctly characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Some of these stack parameters originally had flaws which were later recognized, however Sierra Club did not remodel with the updated parameters. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

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

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

As previously noted, Sierra Club included Limestone Power Station and 3 other emitters of SO_2 within 50 km in the area of analysis. This distance and these facilities were selected because Sierra Club believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the sources which might contribute to those concentrations. No other sources beyond 50 km were determined by Sierra Club to have the potential to cause significant concentration gradient impacts within the area of analysis.

For Limestone Power Station and the other power plants in the area of analysis, Sierra Club used actual emissions from the most recent available 3-year period, i.e., 2012 – 2014. These emissions data were obtained from allowable and measured actual emissions. Sierra Club's modeling showed exceedances of the NAAQS by the plant using allowable and actual emissions. Allowable is the peak emission rate from each unit as approved by the current air quality operation permit for the facility. Actual emissions are the measured emissions for each hour between January 1, 2012 and December 31, 2014 as taken from USEPA Air Markets Program Data.

For Limestone, Sierra Club provided modeling that used actual hourly temperatures and stack velocities. For the remaining sources, Sierra club used stack temperatures and velocities estimated based on 100% load.

Modeling Parameter: Meteorology and Surface Characteristics

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

For the Limestone area of analysis, surface meteorology from the NWS station at Corsicana Municipal Airport in Corsicana, Texas, 42.8 miles to the north, and coincident upper air observations from the NWS station in Fort Worth, Texas, about 110 miles to the northwest, were selected by Sierra Club as best representative of meteorological conditions within the area of analysis.

Sierra Club used AERSURFACE version 13016 from the NCDC station in Corsicana, Texas to estimate the surface characteristics of the area of analysis. Sierra Club estimated values for 12 spatial sectors out to 1 km at a seasonal temporal resolution for average conditions. Sierra Club also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo").

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

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

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as flat with no significant terrain barriers. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to

specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Limestone area of analysis, Sierra Club chose to preserve the form of the 1-hour SO2 standard, based on the 99th percentile of the annual distribution of daily maximum 1-hour concentrations averaged across the number of years modeled, the background fourth-highest daily maximum 1-hour SO2 concentration was added to the modeled fourth-highest daily maximum 1-hour SO2 concentration. Background concentrations were based on the 2011-13 design value measured by the ambient monitors located in El Paso, Texas. The background concentration for this area of analysis was determined to be 7.8 μg/m^3, or 2.98 ppb,[15] and that value was incorporated into the final AERMOD results. Sierra Club also used the Harris County, Texas monitor in another scenario, where the background concentration was 23.5 μg/m^3. The Harris County monitor is directly upwind of the prevailing wind direction for Leon County. The second background concentration used for the modeling analysis is 23.5 μg/m^3, which is the lowest measured design value for 2011-2013 from the nine ambient monitors located in Harris County, Texas (i.e., Monitor Site ID 482010046). The monitors in Harris County measured concentrations from 23.5 to 107.5 μg/m^3 with an average of 59.9 μg/m^3.

Summary of Modeling Results

The AERMOD modeling parameters for the Limestone area of analysis, as provided by Sierra Club, are summarized below in Table 7.

Table 7: AERMOD Modeling Parameters for the Limestone Area of Analysis, Provided by Sierra Club

Limestone Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	8
Modeled Stacks	8
Modeled Structures	0

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

Modeled Fencelines	0
Total receptors	21,201
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Corsicana Municipal Airport NCDC
Upper Air Meteorology Station	Fort Worth, Texas
Methodology for Calculating Background SO_2 Concentration	Design Values
Calculated Background SO_2 Concentration	7.8 $\mu g/m^3$

The results presented below in Table 8 show the magnitude and geographic location of the highest predicted modeled concentration of SO_2 based on actual emissions.

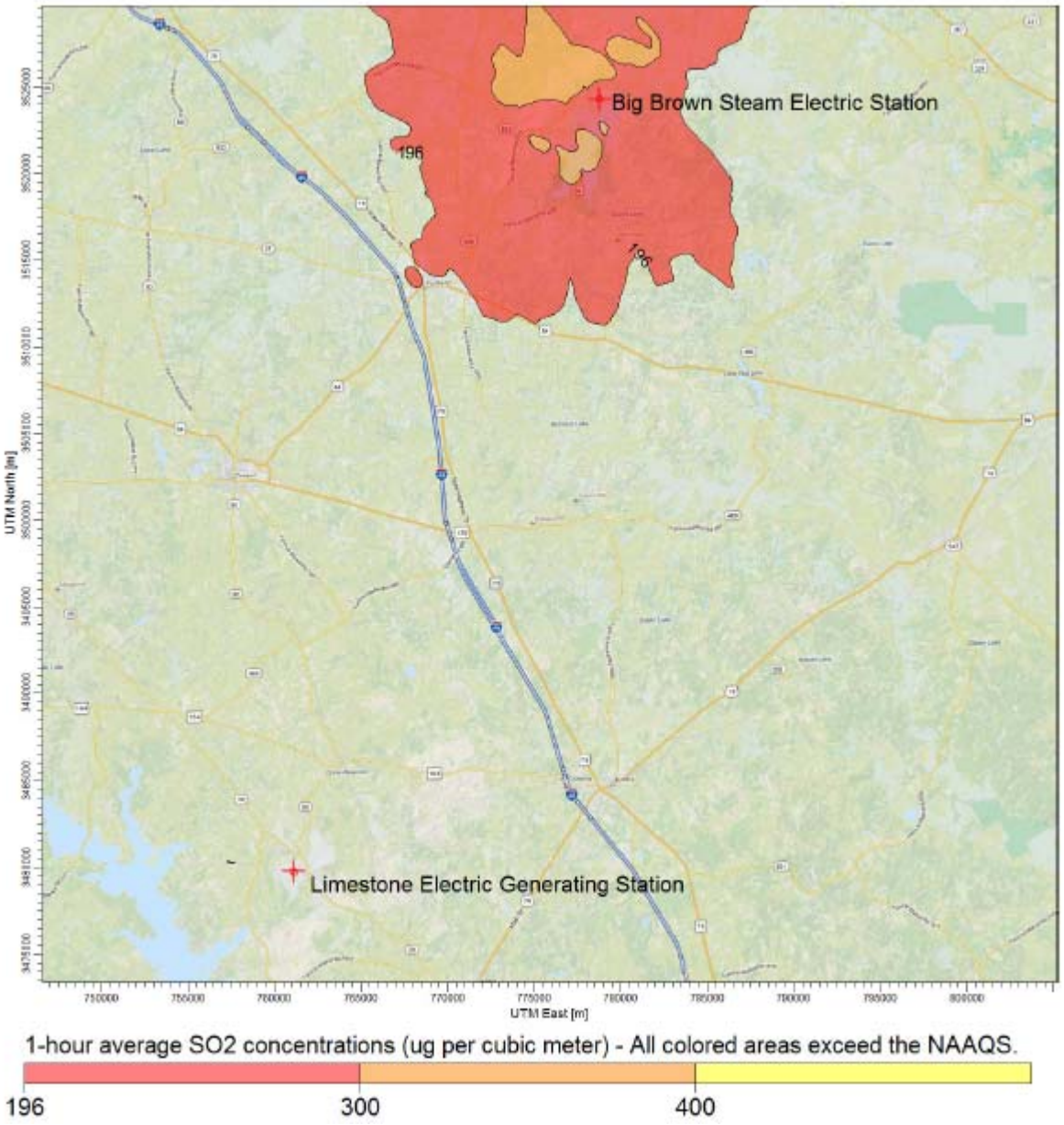
Table 8: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Limestone Area of Analysis Based on Actual Emissions, Provided by Sierra Club

		Receptor Location		SO_2 Concentration ($\mu g/m^3$) Based on Actual Emissions	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	775,099	3,525,813	373.7*	196.5**

*Represents impacts from all modeled sources, with majority of contribution from the Big Brown facility. Impacts from Limestone alone were 197.6 □g/m^3 (75.4 ppb).
** Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

Sierra Club's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 373.7 $\mu g/m^3$, or 142.6 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. This predicted maximum value occurred to the north and east of the facility near the Big Brown facility and is graphically represented along with all the other receptors below in Figure 9.

Figure 9: Sierra Club's Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the Limestone Area of Analysis Based on Actual Emissions with Corsicana Meteorology and El Paso Background DV



Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information including modeling provided by Sierra Club, the EPA intends to designate the area around Limestone Power Station as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of Limestone County. This intended

designation is based on the modeling of actual emissions reported from the facility during the 2012 to 2014 calendar years. An analysis of the modeling analysis submitted by the state and supplement by industry indicates it was performed in accordance with appropriate EPA modeling guidance and using conservative assumptions.

While nonattainment is asserted in the modeling analysis completed by Sierra Club, various issues concerning this modeling lead us to believe this modeling is less reliable than the modeling provide by industry. Sierra Club relied on hourly emission rates, stack velocities and temperatures provided by NRG that were later found to have flaws and NRG corrected for this in subsequent model submittals. These flaws caused some of the data to be matched to the wrong hours and thus to the wrong meteorological conditions. The Sierra Club modeling was also less refined than the NRG modeling because the NRG modeling used updated surface characteristics. Finally, NRG used more refined seasonal estimates of background. As discussed in this technical support document, in the most recent submittal from Sierra Club we have identified model input errors and additional areas in the modeling approach that could be further refined in order to be consistent with the Modeling TAD. Therefore, we do not believe that the submittals received from Sierra Club contain sufficient information to indicate that the area of analysis should be designated nonattainment.

The state and industry's submissions have been reviewed and show no exceedances in the county or nearby counties. The EPA does not believe that emissions from any source in Limestone County or within 20 km of its borders are likely to cause or contribute to violations of the NAAQS in Limestone County.

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

Technical Analysis for the Twin Oaks Power Station,
Robertson County, Texas
Area

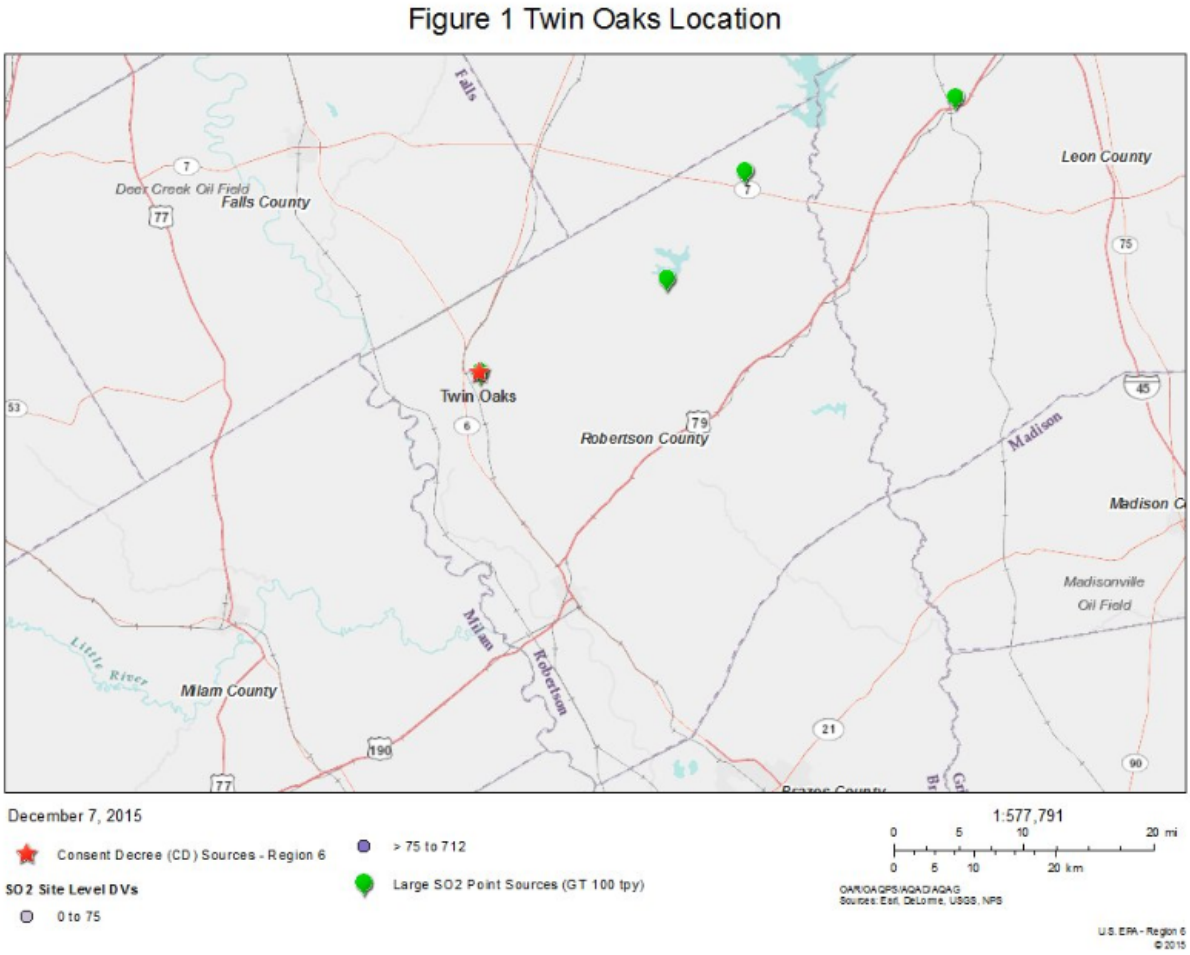
Introduction

The Robertson County area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/MMBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Twin Oaks Power Station emitted 4,038 tons of SO_2, and had an emissions rate of 0.51 lbs SO_2/MMBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

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

The Twin Oaks Power Station is located in southern Texas in the western northern portion of Robertson County. As seen in Figure 1 below, the facility is located approximately 22 km northwest of the center of Robertson County. Also included in the figure are nearby emitters of SO_2, the state's recommended area for the unclassifiable/attainment designation, and the EPA's intended unclassifiable/attainment designation for the area.

Figure 1: The EPA's intended designation(s) for Robertson County, Texas



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

Detailed Assessment

Model Selection and Modeling Components

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

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD

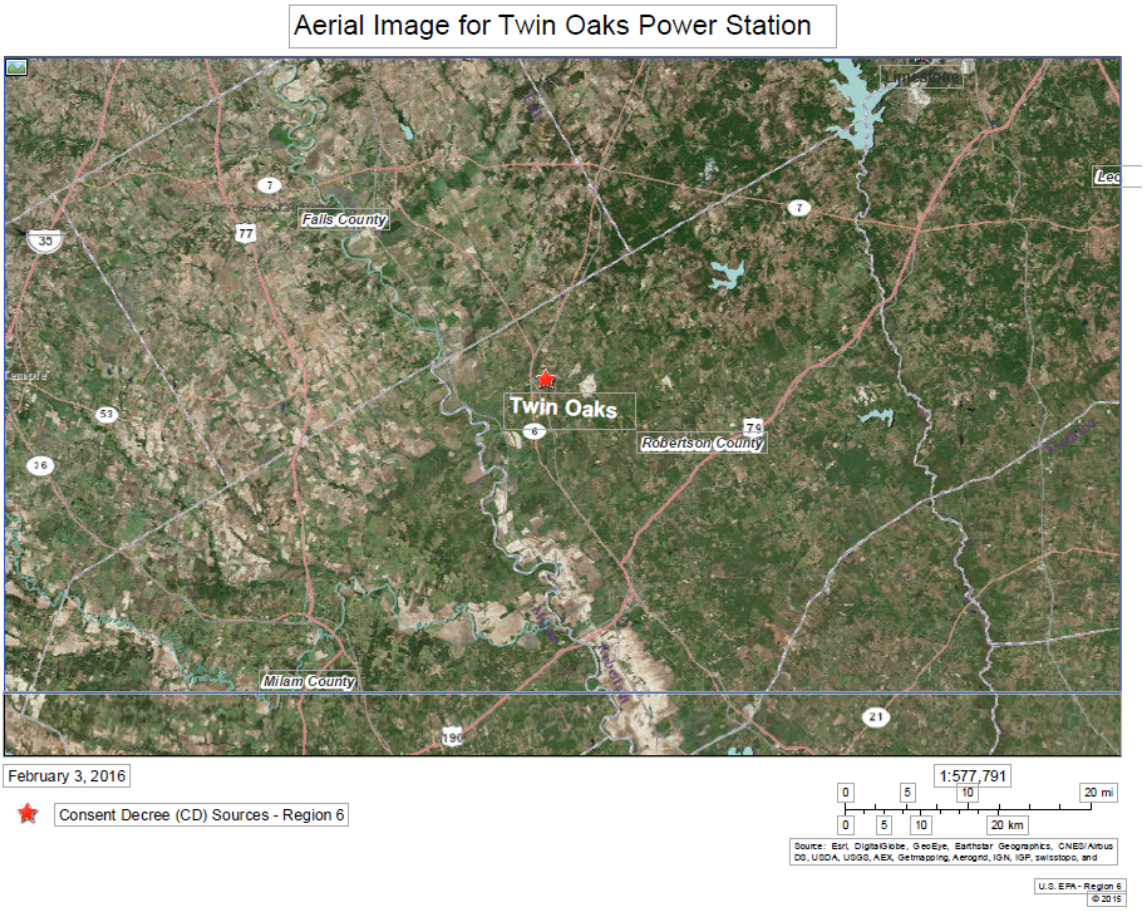
- AERMET: the meteorological data processor for AERMOD
- BPIPPRIME: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening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

The state used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. Rural mode was confirmed by analyzing satellite imagery. Aerial views showed no topographic features in the vicinity of Twin Oaks Power Station and the area is mostly dominated by farm/ranch land as shown in Figure 2 below.

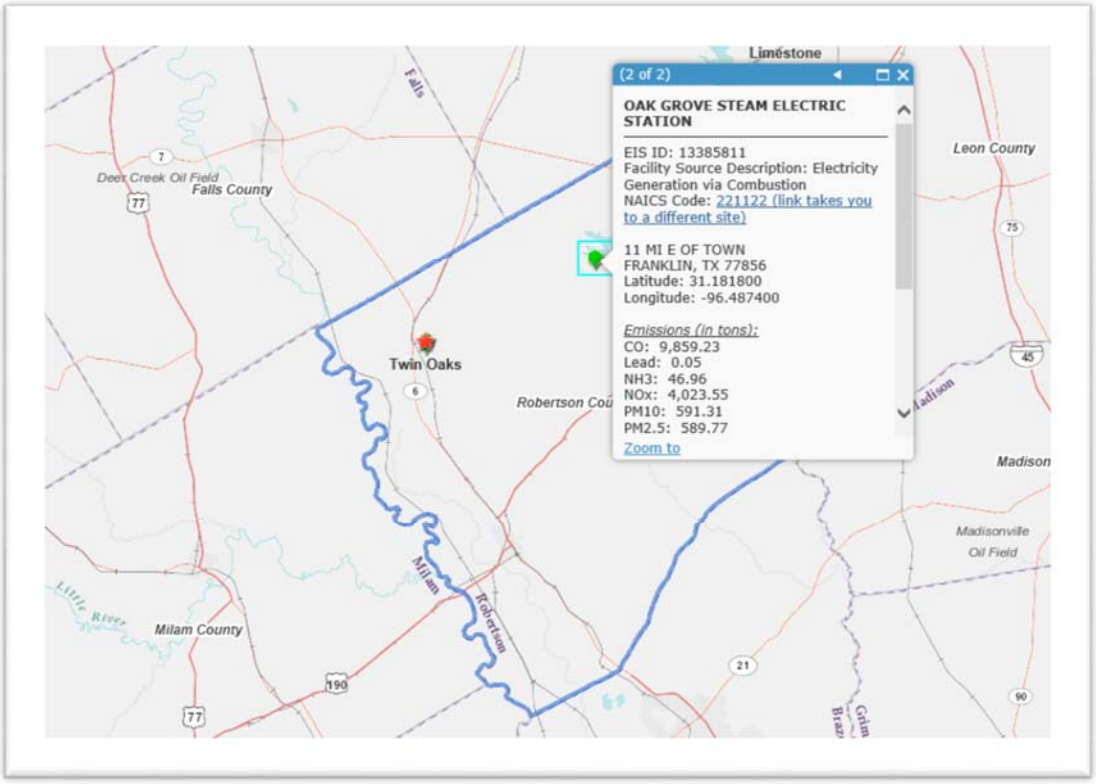
Figure 2: Aerial Image for Twin Oaks Power Station



Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Twin Oaks Power Station is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. For the Twin Oaks area, the state has included the nearest SO_2 source (Oak Grove Steam Electric Station) located within 21 kilometers away from the Twin Oaks Power Station. The Oak Grove Steam Electric Station, reported 6,950 tons of SO_2 in 2013. Although the state suggested that this source would be unlikely to cause a significant concentration gradient in the vicinity of the Twin Oaks Power Station, it was included in the state modeling. Figure 3 shows the location of Twin Oaks Power Station and Oak Grove Steam Electric Station.

Figure 3: Location of Twin Oaks Power Station and Oak Grove Steam Electric Station.



The State modeled a grid of 50 km around the Twin Oaks facility.[16] 50 kilometers is the nominal distance for SO_2 accuracy in AERMOD. The state determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. The grid receptor spacing for the area of analysis chosen by the state is as follows:

- 100 meter spacing along the fence line out to 1 km
- 500 meter spacing out to 5 km
- 1 km spacing out to 50 km

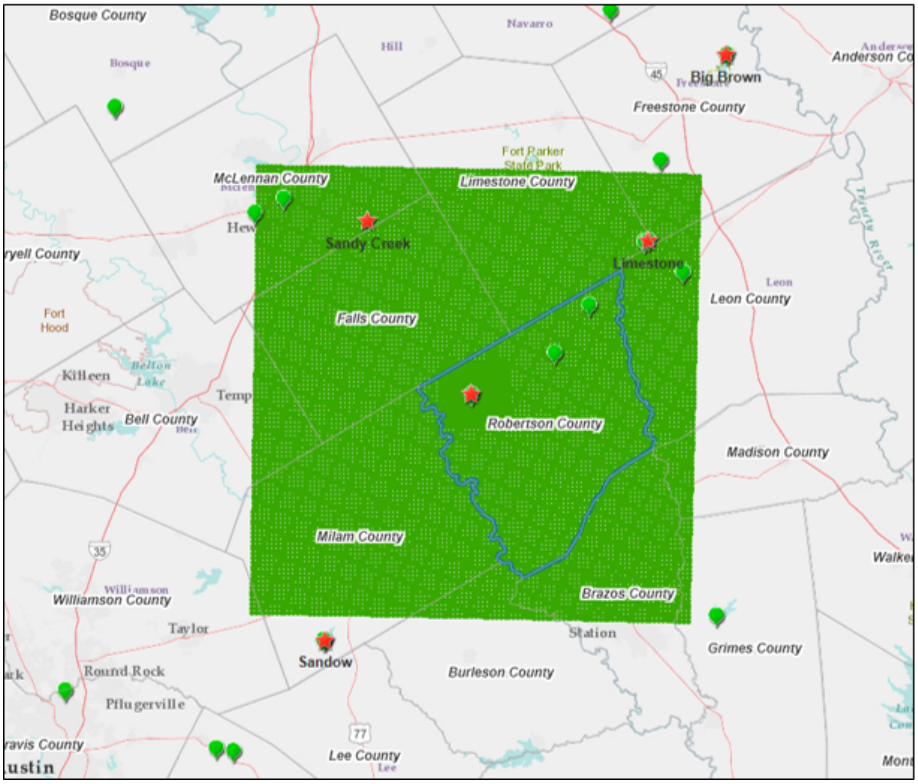
The receptor network contained 13,862 receptors, and the network covered all of Robertson County in Texas, most of Milam County, Falls County, the northeastern portion of McLennan County, in addition to portions of Limestone, Leon, Madison, Brazos, and Burleson Counties.

Figure 4 shows the state's chosen area of analysis surrounding the Twin Oaks Power Station, as well as receptor grid for the area of analysis.

[16] AERMOD is a Gaussian Plume Air Dispersion Model, 50km is the useful distance to which most steady-state Gaussian plume models are considered accurate for setting emission limits per SCRAM guidance.

Consistent with the Modeling TAD, receptors for the purposes of this designation effort were placed only in areas where it would also be appropriate to place a monitor and record ambient air impacts. The impacts of the area's geography and topography will follow in the appropriate section.

Figure 4: Receptor Grid for the Twin Oaks, Texas Area of Analysis



Modeling Parameter: Source Characterization

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

Modeling Parameter: Emissions

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

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

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

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

As previously noted, the state included Oak Grove Steam Electric Station in the modeling analysis, the area of analysis. The emissions data for Oak Grove Steam Electric Stations were obtained from the EPA's Acid Rain Program database and included in the hourly emissions file. The modeled emission rates represent the actual 1-hour average emission rates reported. The modeled 50 km receptor grid was selected because the state believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the source which might cause these concentrations. With respect to any additional nearby sources of SO_2, TCEQ reviewed emission inventory data and the nearest sources are located 29-35 kilometers east of the site with a total of 69 tons of SO_2 emission. Given the distance and magnitude of emissions, these sources were determined by the state not to cause significant concentration gradient impacts within the area of analysis and are represented in the modeling via monitored background concentrations. Table 1 below shows the 2012-2014 actual SO_2 emissions for Twin Oaks Power Station and Oak Grove Steam Electric Station in the Robertson County Area of Analysis.

Table 1: Actual SO_2 Emissions 2012 – 2014 in the Robertson County Area of Analysis

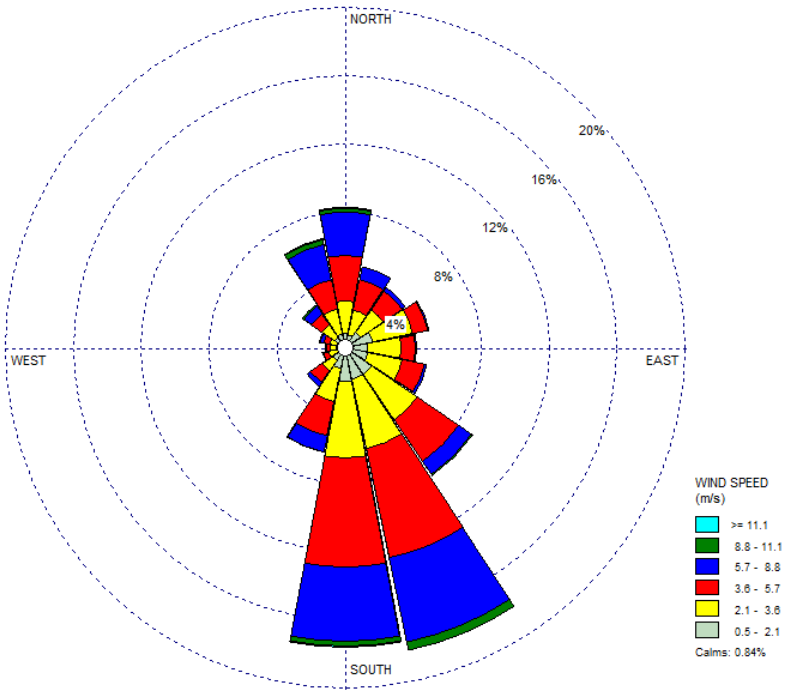
Company	Facility Name	SO_2 Emissions (tons per year)		
		2012	2013	2014
Major Oak Power, LLC	Twin Oaks Power Station	4,038	5,334	5,762
Oak Grove Management Company, LLC	Oak Grove Steam Electric Station	6,531	6,950	7,404

Modeling Parameter: Meteorology and Surface Characteristics

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

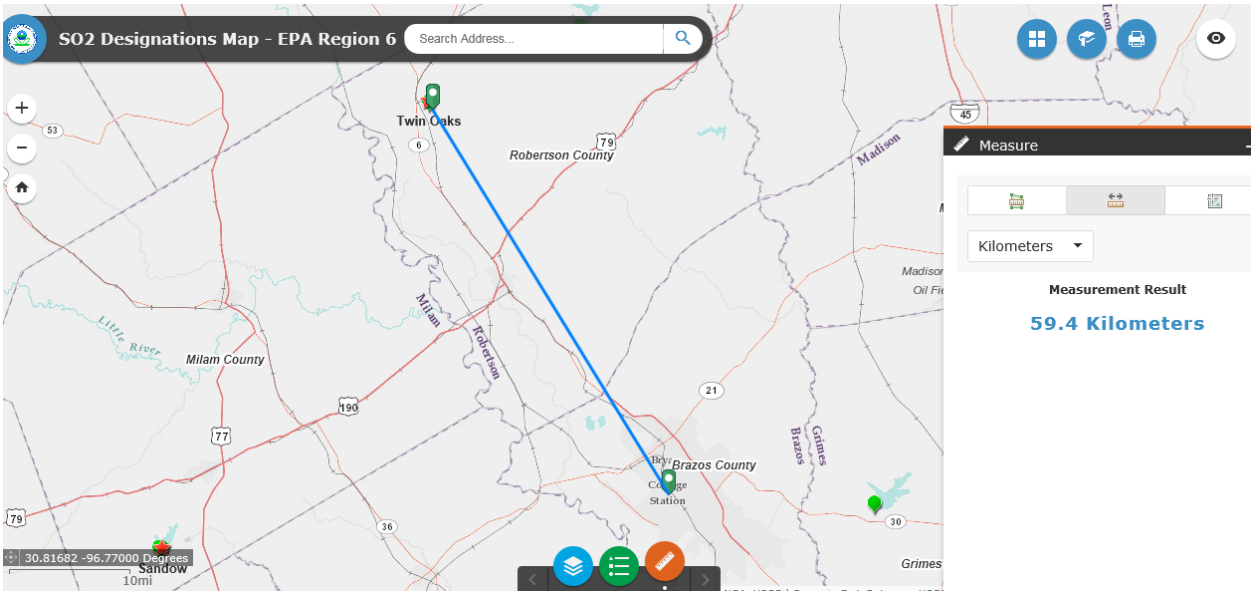
For the Twin Oaks Power Station area of analysis, surface meteorology from the NWS station in College Station Texas (Station # 3904) and concurrent upper air station Fort Worth, TX (Station # 3990) were selected as nearest stations to Twin Oaks Power Station and are best representative of meteorological conditions within the area of analysis. Figure 5 includes the wind rose for the meteorological data from the College Station meteorological station.

Figure 5: Wind Rose for College Station, Texas NWS Site (2012-2014)



The state used AERSURFACE version 13016 using data from the NWS station in College Station, Texas (located at 30.589 latitude-96.365 longitude to estimate the surface characteristics of the area of analysis. The state also estimated values for albedo 0.17 (the fraction of solar energy reflected from the earth back into space), the Bowen ratio 0.70 (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness 0.043 meters (sometimes referred to as "Zo"). In the figure below, the location of the College Station NWS station is shown relative to the Twin Oaks Power Station site.

Figure 6: Twin Oaks Power Station Area of Analysis and the College Station NWS



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in guidance given in the AERMOD Implementation Guide (March 19, 2009) in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with a March 2013 EPA memo titled, "Use of ASOS meteorological data in AERMOD dispersion

Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Parameter: Geography and Terrain

Terrain elevations from National Elevation Data ("NED") from USGS were processed using the most recent version of AERMAP (v.11103) to develop the receptor terrain elevations required by AERMOD. NED data files contain profiles of terrain elevations, which in conjunction with receptor locations are used to generate receptor height scales. The height scale is the terrain elevation in the vicinity of a receptor that has the greatest influence on dispersion at that location and is used for model computations in complex terrain areas.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Twin Oaks site area of analysis, the state chose background concentrations for SO_2 from the EPA Aerometric Information Retrieval System (AIRS) monitor 483091037 located at 4472 Mazaneck Road, Waco McLennan County. The three average (2012-2014) of the 99th percentile of the annual distribution of the maximum daily 1-hour concentration was used for the 1-hr value. The background concentration for this area of analysis was determined by the state to be 16 micrograms per cubic meter ($\mu g/m^3$), or 6.1 ppb,[17] and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

The AERMOD modeling parameters for the Twin Oaks area of analysis are summarized below in Table 2.

Table 2: AERMOD Modeling Parameters for the Twin Oaks, Robertson, Texas Area of Analysis

Twin Oaks Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	2
Modeled Fence lines	1

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

Total receptors	13,862
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	College Station, TX
Upper Air Meteorology Station	Fort Worth, TX
Methodology for Calculating Background SO_2 Concentration	Averaging 99th percentile of the annual distribution of the maximum daily 1-hour concentration was used for the 1-hr value
Calculated Background SO_2 Concentration	16 μg/m^3

The results presented below in Table 3 show the magnitude and geographic location of the highest predicted modeled concentration based on actual emissions.

Table 3: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Twin Oaks, Texas Area of Analysis Based on Actual Emissions

		Receptor Location		SO_2 Concentration (μg/m^3)	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	719635	3443500	100	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb using 2.62 conversion

The state's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 100 μg/m^3, or 38.2 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. This predicted value occurred using the most recent three years of actual emissions data and added to representative ambient background concentrations, are below the level of 1-hour SO_2 NAAQS of 75ppb or 196.5 μg/m^3, and is graphically represented along with all the other receptors in Figure 4 above.

Jurisdictional Boundaries:

Once the geographic area of analysis associated with the Twin Oaks Power Station, nearby sources and background concentration is determined, existing jurisdictional boundaries are

considered for the purpose of informing our intended unclassifiable/attainment area, specifically with respect to clearly defined legal boundaries.

The EPA believes that our intended unclassifiable/attainment area, consisting of Robertson county, is comprised of clearly defined legal boundaries, and we find these boundaries to be a suitably clear basis for defining our intended unclassifiable area. As previously described, emissions from the Twin Oaks Power Station and Oak Grove Steam Electric Station were modeled to show compliance with the NAAQS. The EPA has confirmed that there is only one additional emitter of SO_2 within Robertson County with 2011 NEI SO_2 emissions above 100 tpy. The BOA Gas Treatment Plant is located approximately 35 km to the east of Twin Oaks Power Station, and when its relative location is combined with its reported emissions of 123 tpy, the EPA does not believe it has the potential to influence the maximum modeled concentration in the Twin Oaks Power Station area of analysis. Additionally, the EPA does not believe that emissions from the BOA Gas Treatment Plant are likely to cause or contribute to a violation of the NAAQS elsewhere in Robertson County.

There are 2 facilities located within 15 km of Robertson County's borders with reported emissions of 100 tpy or greater. Nucor Steel in neighboring Leon County, had a reported SO_2 emissions of 273 tpy according to the 2011 NEI. This facility is approximately 15 km from the Robertson County border, but due to its relatively low emissions, the EPA does not believe its emissions are likely to cause or contribute to a violation of the NAAQS within Robertson County.

Limestone Generating Station, located approximately 10 km to the northeast of the Limestone County/Robertson County border is being addressed in a separate portion of this technical support document. We intend to designate the area around the facility as unclassifiable/attainment as emissions within the area of analysis has been modeled to show compliance with the NAAQS. As a result, the EPA does not believe it is likely for emissions from Limestone Generating Station to cause or contribute to a violation of the NAAQs within Robertson County.

Other Relevant Information

The EPA did not receive any additional information with respect to the immediate area around Twin Oaks Power Station.

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Twin Oaks Power Station as unclassifiable/attainment area for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of Robertson County, Texas. This recommendation is made based on the modeling of actual emissions reported from the facility during the 2012 to 2014 calendar years.

An analysis of the modeling data indicates it was performed in accordance with appropriate EPA modeling guidance and using conservative assumptions. Additionally, the EPA has confirmed that there are no other sources in Robertson County or near its borders that are likely to cause or contribute to a violation of the NAAQS within Robertson County.

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

Technical Analysis for the W.A. Parish Electric Generating Station
Fort Bend County, Texas Area

Introduction

The Fort Bend County area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/MMBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the W.A. Parish Electric Generating Station (W.A. Parish station) emitted 37,861 tons of SO_2, and had an emissions rate of 0.49 lbs SO_2/MMBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

Texas recommended that the area surrounding the W.A. Parish station, specifically the entirety of Fort Bend County, be designated as unclassifiable/attainment based on an assessment and characterization of air quality from the facility and other nearby sources, which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. In its recommendation provided to the EPA on September 17, 2015, the Texas Commission on Environmental Quality (TCEQ) included modeling completed by industry for the W.A. Parish station as Attachment F.[18]

After the EPA had completed its review and analysis of the modeling submitted by the state, industry submitted supplemental modeling reports on December 1, 2015, and January 25, 2016. These supplemental reports present the results of additional dispersion modeling completed to address comments and requests for additional information. Notably, the EPA participated in numerous conference calls and meetings to discuss potential model input errors and inconsistencies in the modeling compared to the procedures described in the EPA's Modeling TAD. In response to those discussions, industry provided the December 1, 2015 supplement, which was submitted to address the following:

4. Correct errors in the hourly SO_2 emissions and parameter input file;
5. Examine the effect on modeled concentrations of correcting and using land use information for the Sugar Land airport, which was used to develop meteorological inputs to AERMOD; and
6. Examine the effect on modeled concentrations of the use of two options within AERMOD that are currently designated as "beta" options requiring justification, but which EPA has proposed to designate as "default" options.

[18] The State of Texas relied on the supporting documentation by Environmental Resources Management, submitted on behalf of the NRG W.A. Parish Electric Generating Station.

As discussed later in the "Additional Relevant Information – Sierra Club" section of this TSD, the EPA received dispersion modeling results from the Sierra Club, asserting that the area around the W.A. Parish station experiences violations of the NAAQS, and urging the EPA to designate the area as nonattainment. The Sierra Club submitted three separate modeling analyses (dated August 2, 2015; September 17, 2015; and December 15, 2015) showing modeled violations of the 1-hour SO_2 NAAQS.

On January 7, 2016, the EPA received a letter from the Sierra Club that included an independent review of the initial modeling completed by industry, which identified potential issues and errors in industry's modeling analysis. The EPA provided a copy of the comments to industry and requested additional information from industry regarding the Sierra Club's review. Specifically, the EPA requested that industry review the stack parameter information included as model inputs and confirm their accuracy. In response to our request, industry submitted the January 25, 2016 supplement,[19] which included the following:

1. Verification of stack parameters as requested by the EPA and submittal of updated modeling results for the facility based on the verified stack parameters;
2. Analysis of the Sierra Club's January 7, 2016 comments on the 1-hour SO_2 NAAQS attainment demonstration for the facility; and
3. Analysis of the Sierra Club's December 15, 2015 SO_2 modeling reports for the facility.

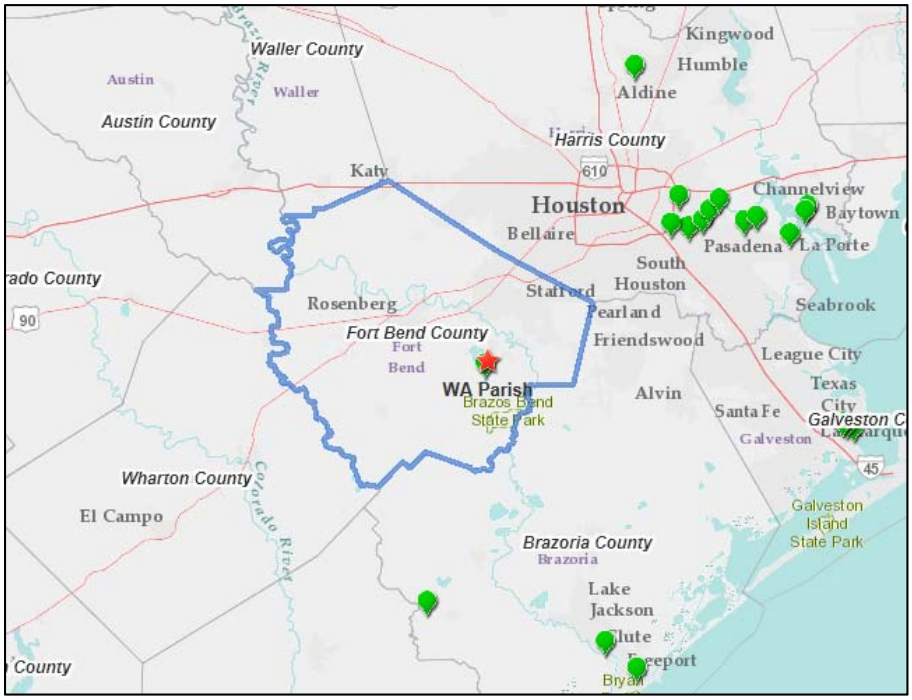
After careful review of the state's assessment, supporting and supplemental documentation, and all available modeling analyses submitted by industry and the Sierra Club, the EPA disagrees with the state's recommendation for the area, and intends to designate the areas as unclassifiable on the basis that we do not have sufficient information available to designate the area as meeting or not meeting the NAAQS. Based on our current review of all available analyses, we believe that the latest modeling from industry may support a designation of unclassifiable/attainment and is more consistent with the modeling approaches and refinements outlined in the EPA's Modeling TAD. However, due to the date of receipt of the latest modeling from industry relative to our scheduled timeline for proposing designations in order to meet the court-ordered deadline, we have not had sufficient time to thoroughly review the January 25, 2016 submittal to determine if the modeling is sufficient to support a designation of unclassifiable/attainment. The EPA will continue our review of industry's January 25, 2016 submittal and will take it into consideration in our final designation for the area around W.A. Parish station.

The W.A. Parish station is located in the town of Thompson in the southeastern part of Fort Bend

[19] Electronic report providing response to the EPA's request for stack parameter verification and to Sierra Club's review, along with a summary of revised modeling results, were provided via email on January 25, 2016. The EPA received the associated modeling files on January 27, 2016.

County, Texas. The station is located about 25 miles southwest of downtown Houston, Texas and approximately 40 miles from the Gulf of Mexico. As seen in Figure 1 below, the facility is located approximately 5 miles away from Brazos Bend State Park, and approximately 4 miles to the southwest of Brazos River. Also included in the figure are nearby emitters of SO_2 and the EPA's intended boundaries for the unclassifiable area.

Figure 1: The EPA's Intended Boundaries for Fort Bend County, Texas



The discussion and analysis that follows below will reference the industry's use of the Modeling TAD in its modeling analyses, which were originally submitted by the state as part of the designations recommendation, Sierra Club's use of the Modeling TAD in its analyses, the EPA's assessment of the competing modeling in accordance with the Modeling TAD, and the factors for evaluation contained in the EPA's March 20, 2015 guidance, as appropriate.

Detailed Assessment

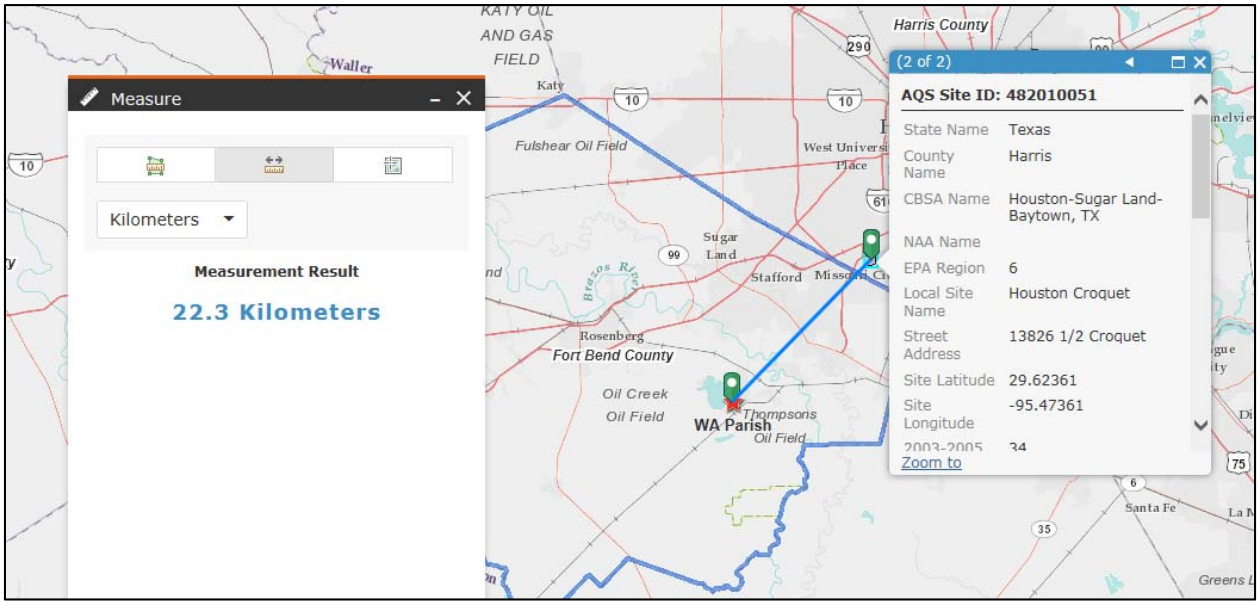
Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding W.A. Parish station. The facility is located in Fort Bend County, and the state included the most recent 3 years of monitoring data, i.e., 2012 – 2014 in its recommendation. Table 1below shows information provided by the state related to the monitor located in Harris County, approximately 13.9 miles from W.A. Parish station in Fort Bend County. Monitor's location relative to the W.A. Parish facility shown in Figure 2.

Table 1: Available Air Quality Data for the Area Closest to W.A. Parish Station

County	State Recommendation	Air Quality Systems (AQS) Monitor ID	Monitor Location	Distance to W.A. Parish Station (km)	2012-2014 SO_2 Design Value (ppb)
Harris	Unclassifiable/ Attainment	482010051	Houston – Croquet, Harris County	22.3	19

Figure 2: Air Quality Data for area closest to W.A. Parish Electric Generating Station



Based on available ambient air quality collected between 2012 and 2014, the county surrounding W.A. Parish station does not show a violation of the 2010 SO_2 NAAQS at its monitor. However, the absence of a violating monitor when considering the distance from the facility is not a sufficient technical justification to rule out that an exceedance of the 2010 SO_2 NAAQS may occur in the immediate vicinity of the facility.

Emissions and Emissions-Related Data

Evidence of SO_2 emissions from the source meeting the emissions criteria of the March 2, 2015 consent decree, i.e., W.A. Parish station, is an important factor for determining whether the immediate area is experiencing elevated levels of SO_2 concentrations. Other considerations for this factor include county level SO_2 emissions data, and data for sources located within 50 km.

As part of its recommendation, Texas referenced modeling completed by industry that included the emissions for all sources in Fort Bend County emitting at or above 100 tons per year of SO_2. The W.A. Parish station is the only source located in Fort Bend County that emitted at or above 100 tons per year based on 2011 NEI data. Additionally, the state has included the annual emissions for all sources emitting at or above 100 tons per year of SO_2 in neighboring counties and located within 50 km of W.A. Parish station. Texas obtained the data for these emissions from the 2011 National Emissions Inventory (NEI).[20] These emissions data are summarized below.

Table 2: SO_2 Emissions from Other Nearby Sources

County	Facility Name	Facility Subject to the Emissions Criteria of the March 2, 2015 consent decree?	Distance to Facility that Meets the Consent Decree Criteria (km)	Facility Total SO_2 Emissions (2011 NEI tons/yr)
Harris	Rhodia - Houston Plant	Yes	44.6	3755.3

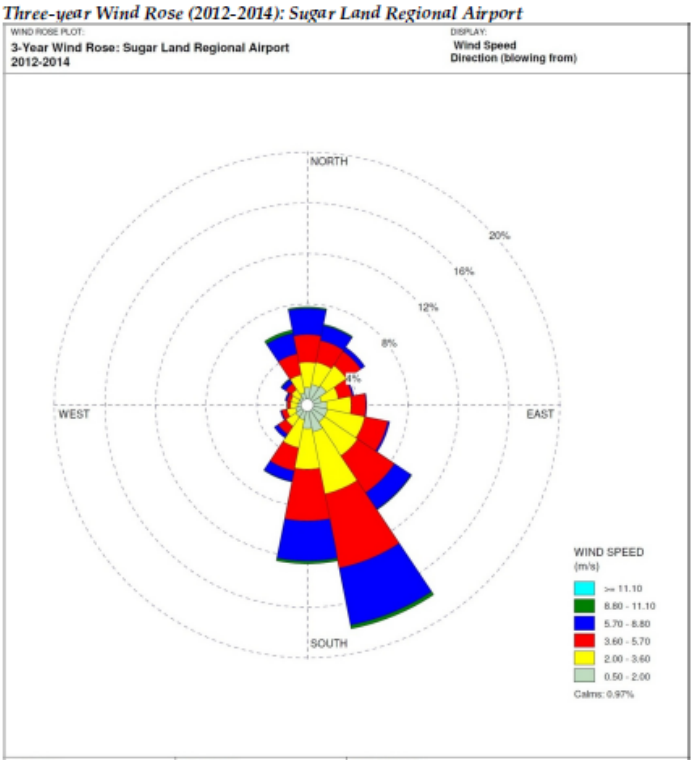
Emissions Controls

The EPA recognizes that control strategies implemented on the sources above that occurred after the release of the 2011 NEI may not be reflected, or may warrant further discussion. The EPA has not received any additional information on emissions reductions resulting from controls put into place after 2011.

Meteorology (Weather & Transport Patterns)

Evidence of source-receptor relationships between specific emissions sources and high SO_2 concentrations in the surrounding area is another important factor in determining the appropriate extent of the EPA's intended unclassifiable area. As shown below in Figure 3, meteorological records for the nearest National Weather Service meteorological tower at Sugar Land Regional Airport in Sugar Land, TX (WBAN No.12977) and concurrent upper air data from Lake Charles, LA (WBAN No. 03937) station indicate winds blow predominantly from south-southeast flow, with secondary northerly flow. This is typical of many locations in east Texas and is thus indicative that the winds measured at the airport are representative of a large area.

Figure 3: Three year Wind Rose (2012-2014) Sugar Land Regional Airport



Geography and Topography (Mountain Ranges or Other Air Basin Boundaries)

This area of Texas is predominantly flat; the airport is only about 3 meters higher in elevation than the facility. There are no intervening terrain features that could significantly affect wind flow. No geological features are likely to affect predictive air impacts of SO_2.

Jurisdictional Boundaries

Once the geographic area associated with the immediate area surrounding W.A. Parish station, and any nearby areas which may potentially be contributing to elevated levels of SO_2 around the facility are determined, existing jurisdictional boundaries are considered for the purpose of informing our intended unclassifiable area, specifically with respect to clearly defined legal boundaries.

The EPA has confirmed that aside from the W.A. Parish station, there are no other sources in Fort Bend County or within 20 km of its borders that according to the 2011 NEI, have reported SO_2 emissions of 100 tpy or greater. As a result, the EPA believes that it is unlikely for any sources in a neighboring county to cause or contribute to a violation of the NAAQS in Fort Bend County.

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

Other Relevant Information – State and Industry Submittals

As previously discussed, the EPA has received three submittals containing air dispersion modeling completed by industry for the W.A. Parish station. A discussion of the most recent modeling performed by industry follows below, with references to the EPA's Modeling TAD as appropriate. While we believe industry's modeling is more representative of the concentrations surrounding the W.A. Parish station based on corrected model inputs and additional refinements, the EPA has not completed a thorough review of industry's latest modeling due to its late submittal and is not able to determine that a designation of unclassifiable/attainment is appropriate. As stated previously, we will continue to review industry's January 25, 2016 submittal and consider this information, as well as any additional information received during the comment period as part of our final designations determination.

Model Selection and Modeling Components

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

BLP model for buoyant line sources. The AERMOD modeling system contains the following components:

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

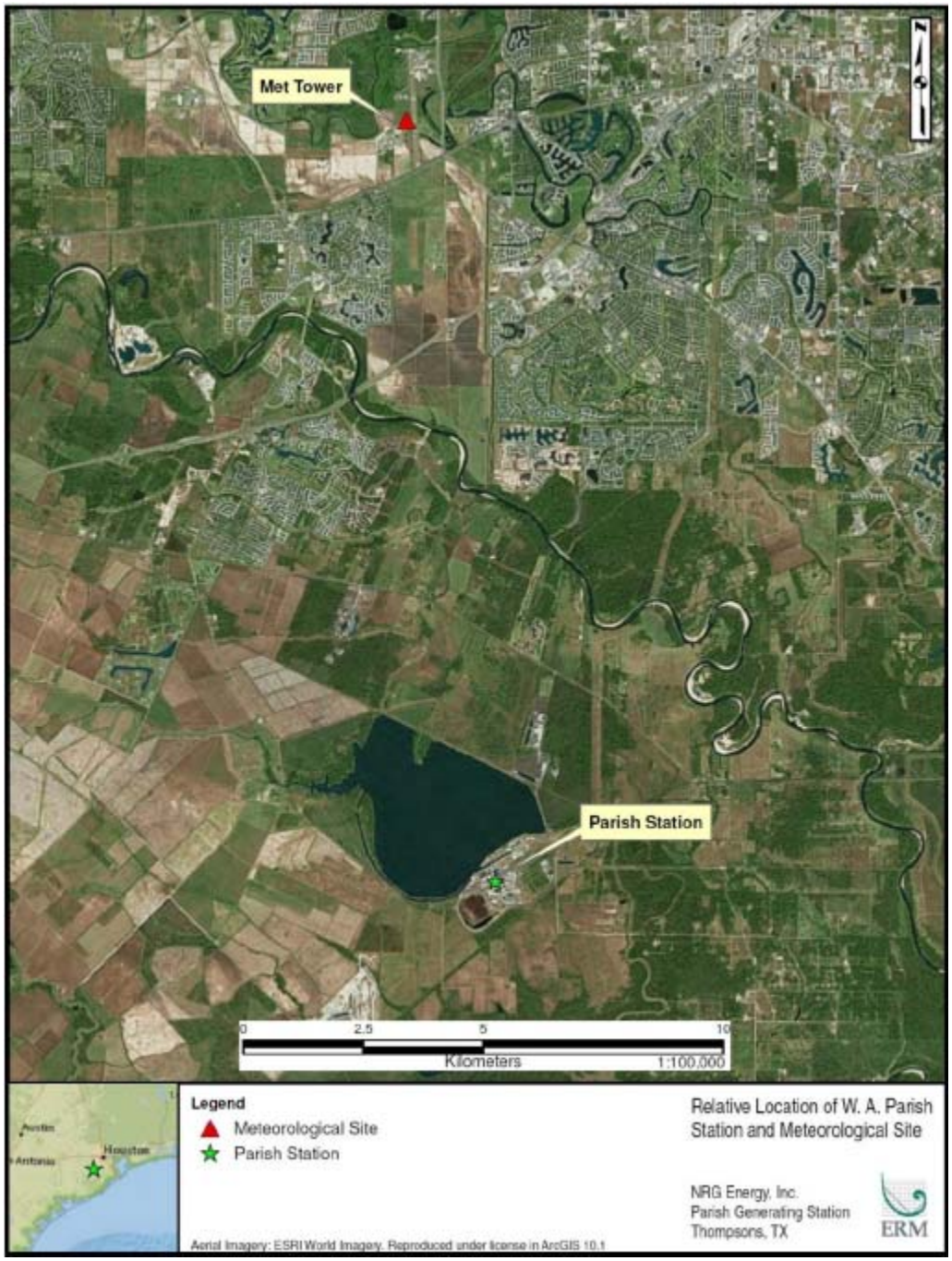
Industry used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

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

Based on our review of aerial photography of the area surrounding the facility provided as part of the state's recommendation as presented in Figure 4, below, the determination to run the model in rural mode appears appropriate.

Figure 4: Aerial Image Showing W.A. Parish Station and Surrounding Area



Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the W.A. Parish station is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the

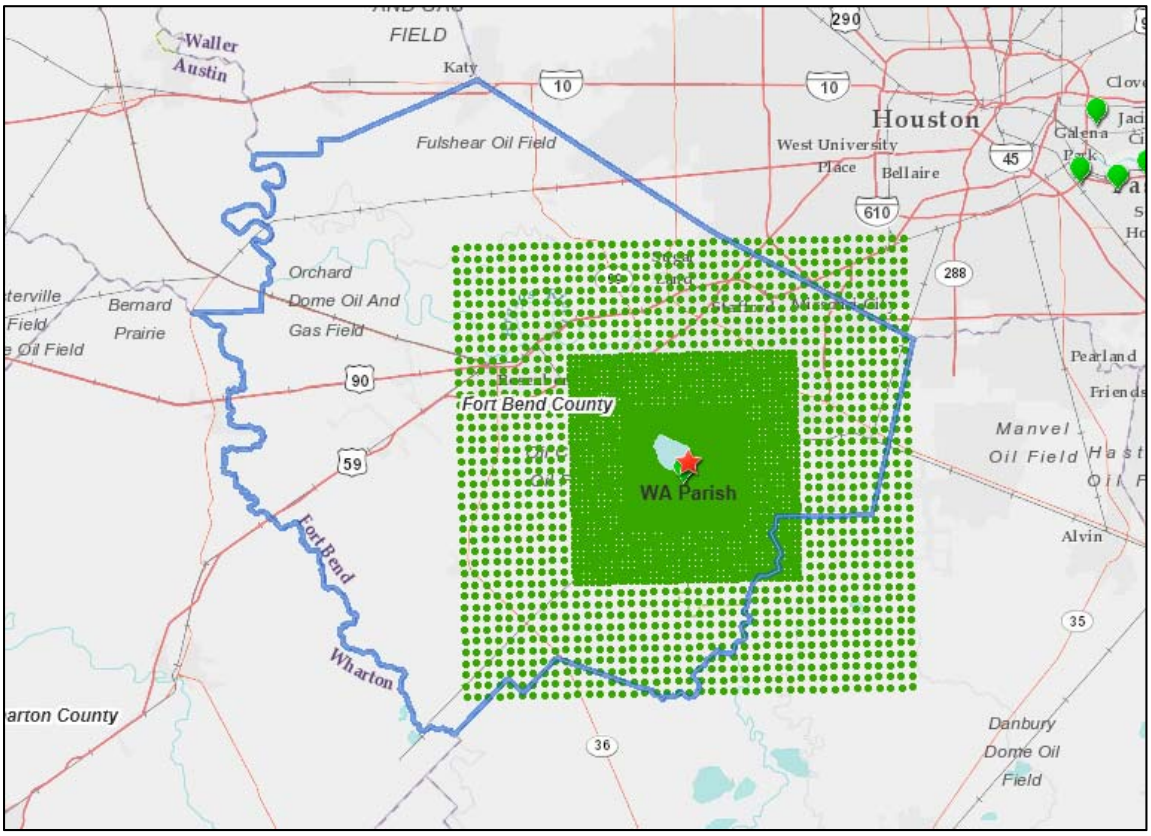
location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

Industry's modeling analysis used a receptor grid extending approximately 20 kilometers from the W.A. Parish station. Industry utilized a grid spacing out to 20 km because the source concentration gradient decreased well below the NAAQS even at this distance. They determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources that may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. Industry's modeling submittal indicated that beyond approximately 15 km, modeled impacts drop below 100 μg/m3. Based on the modeled concentration gradient coupled with the fact that the closest 100+ tpy SO_2 source is more than 40 km away from the W.A. Parish station, we find that the use of the 20 km receptor grid is appropriate to characterize the ambient air quality surrounding the W.A. Parish facility. The receptor grid consisted of the following receptor spacing:

- 50-meter spacing along the facility fence line;
- 100-meter spacing extending from the fence line to 3 kilometers;
- 200-meter spacing extending from 3 to 5 kilometers;
- 500-meter spacing extending from 5 to 10 kilometers; and
- 1,000-meter spacing extending from 10 to 20 kilometers.

In the facility's modeling, the receptor network contained 6,909 receptors and the network covered the majority of Fort Bend County and small portions southwest of Harris County and northwest of Brazoria County, as shown below in Figure 5. Industry conservatively did not exclude any receptors from the modeling based on the Modeling TAD's option to not include those locations where it would not be feasible to place a monitor and record ambient impacts. The impacts of the area's geography and topography will follow in the appropriate section.

Figure 5: Industry's modeling receptor network



Industry reviewed the locations of all major sources of SO_2 within 50 kilometers of W.A. Parish station to determine what off-site sources may need to be included in the modeling analysis. It concluded that the closest source emitting at least 2,000 tons was the Rhodia Chemical Plant in Houston located 44.6 km to the northeast of the W.A. Parish station. After further review of the following factors industry did not include the Rhodia facility from the modeling due to:

- Distance from W.A. Parish station;
- Direction upwind and downwind of W.A. Parish station and frequency that the wind blows in those directions; and
- The presence of a significant concentration gradient in the direction of the sources being considered.

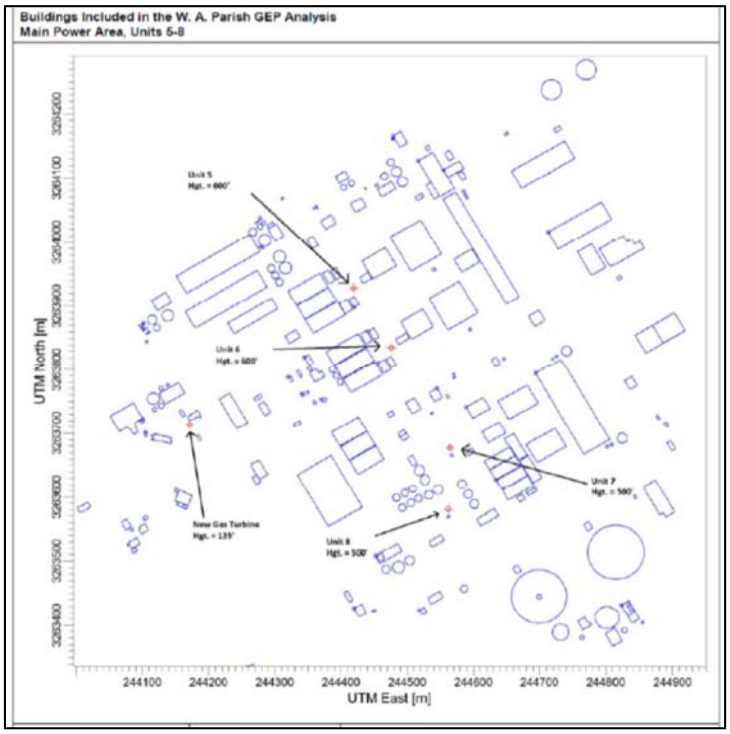
Sierra Club did include the Rhodia facility in their cumulative modeling analysis. However, comparison of the SO_2 modeling results shown in the December 15, 2015 submittal both with and without Rhodia emissions included does not show any difference in the maximum modeled impacts. Industry also noted that Sierra Club's modeling including Rhodia was conservative and not representative of the facility's emissions because they included modeled emission rates based on the facility's 2012 operating permit, which do not reflect the SO_2 controls installed after 2012.

Industry stated that current emission rates from Rhodia are lower than the emission rates that Sierra Club modeled and that the 2014 emissions were less than 1,000 tpy.

Modeling Parameter: Source Characterization

Industry characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, it used actual stack heights in conjunction with actual emissions. Industry also characterized the facility's building layout and locations, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The locations of the structures included in the modeling for downwash purposes are shown in Figure 6 below, taken from the modeling report submitted by industry. The EPA is still reviewing the most recent modeling analysis to confirm that source characterizations are accurate and representative of the facility. However, based on initial review, the general approach used appears to be consistent with the Modeling TAD's best practices.

Figure 6: Structures included in W.A. Parish Station Modeling Analysis



During the EPA's review of industry's initial modeling submittals, we identified modeled source parameters that appeared to contain potential errors and requested that industry confirm the

values and update the modeling, as necessary, to reflect the actual stack parameters. The most recent modeling received from industry contained updated modeling results based on revisions to various stack heights and diameters for sources located at the W.A. Parish station. As discussed previously, this revised modeling is still under review by the EPA and will be considered as part of final designation of the area surrounding the W.A. Parish station.

Modeling Parameter: Emissions

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

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

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

The original modeling analysis prepared by industry for the W.A. Parish station submitted by the state on September 17, 2015, included actual hourly SO_2 emissions, stack temperature, and exhaust velocity for three years (2012-2014) to coincide with the meteorological data. Following discussions with the EPA, industry submitted a supplemental modeling analysis and report on December 1, 2015 addressing inconsistencies with hourly SO_2 emissions data reported to EPA's Clean Air Markets Division (CAMD) archive. The identified inconsistencies included:

- 1-hour time difference between the NRG dataset and the CAMD data for 2014;
- Differences between hourly emissions when a unit was operating only part of an hour; and
- The NRG dataset, not applying a bias adjustment factor (based on a RATA test) of 1.037 to the emissions for Unit 5 for the time period 3/16/2012 through 1/22/2013. These discrepancies have been corrected and hourly emissions in the modeled data set were aligned with the CAMD data.

Following the December 1, 2015 submittal, additional inconsistencies in modeled stack parameters were identified (incorrect stack heights and diameters for some of the W.A. Parish station sources). A second supplemental report and revised modeling to address these errors were submitted by industry on January 25, 2016, which is still under by the EPA.

Modeling Parameter: Meteorology and Surface Characteristics

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

For the Fort Bend County area of analysis, surface meteorology from the NWS station at Sugar Land Regional Airport in Sugar Land, TX (WBAN No. 12977) and concurrent upper air data from Lake Charles, LA (WBAN No. 03937) were selected by industry as best representative of meteorological conditions within the area of analysis.

Industry used AERSURFACE version 13016 and land use data from the NWS station in Sugar Land, Texas (located at 29.6197,-95.6575) to estimate the surface characteristics of the area of analysis. Industry estimated values for 12 spatial sectors out to 1 km at a monthly temporal resolution for moisture conditions defined by month. It also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo"). In Figure 4, the location of the Sugar Land Regional Airport NWS station is shown relative to the W.A. Parish station.

When completing the AERSURFACE analysis, industry did make adjustments to the NLCD 1992 land use category information to be more consistent with the current conditions and surface

types at the Sugar Land Airport. Figure 7 below shows the initial 1992 land use definitions alongside the revised land use definitions superimposed on a current aerial photograph of the meteorological station.

Figure 7: 1992 NLCD Land Use and Updated Land Use for Sugar Land Airport

Meteorological data from the stated surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. Texas followed the methodology and settings presented in the most recent versions of meteorological preprocessing files of AERMOD, and is consistent with EPA

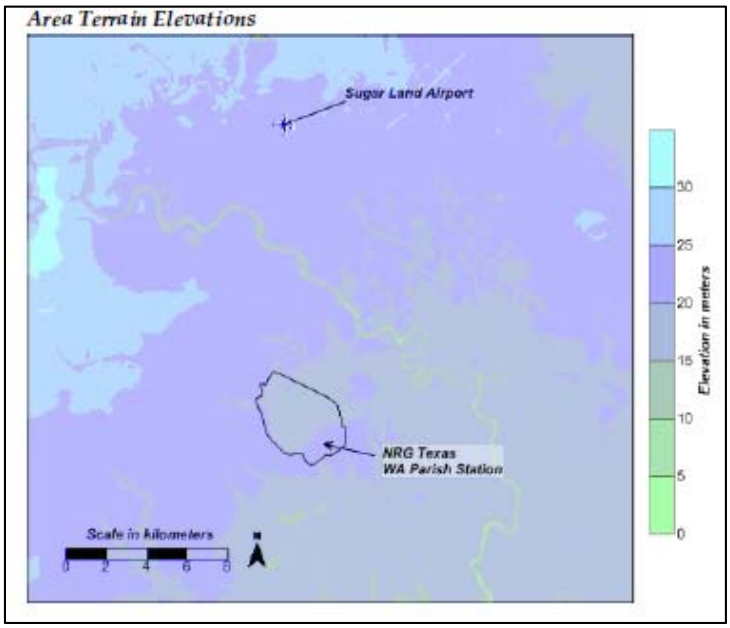
guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

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

Modeling Parameter: Geography and Terrain

Figure 8 provides a depiction of terrain elevations surrounding the airport and the W.A. Parish station. This terrain in this area of Texas is flat; the airport's location is only about 3 meters higher in elevation than the W.A. Parish station, and as the following figure shows there are no intervening terrain features that could significantly affect wind flow.

Figure 8: Area Terrain Elevation surrounding W.A. Parish Electric Generating Station



As shown earlier in Figure 3 of this technical support document, the predominant wind pattern is south to south-southeast flow, with secondary northerly flow, is typical of many locations in East Texas and is thus indicative that the winds measured at the airport are representative of a large area. The terrain in the area of analysis is best described as flat with no significant terrain barriers. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Fort Bend area of analysis, the industry used 2nd tier seasonal variable diurnal profiles for the background concentrations from data collected at Italy, Texas, located about 320 km WNW of the W.A. Parish station. Table 3 contains the seasonal, diurnal SO_2 concentrations for the Italy monitor. These background concentrations were incorporated into the final AERMOD results.

Table 3: Seasonal, Diurnal 1-hour SO_2 Concentrations for the Italy, Texas Monitor

Hour[1]	*Winter*	*Spring*	*Summer*	*Fall*
1	3.66	2.70	3.23	3.05
2	2.62	2.27	2.18	2.88
3	2.53	2.44	2.36	3.32
4	2.62	2.18	2.09	3.66
5	2.18	1.75	1.48	2.97
6	2.27	1.66	1.40	3.32
7	2.18	1.57	1.75	2.18
8	2.36	2.36	3.05	4.01
9	3.58	3.32	3.66	6.37
10	4.71	6.20	6.02	10.38
11	7.33	5.24	6.98	9.77
12	8.73	4.54	6.28	16.93
13	9.16	5.85	5.06	10.30
14	7.42	5.76	5.06	9.77
15	7.33	5.76	6.02	8.20
16	9.07	4.36	4.28	8.73
17	6.46	3.75	3.66	13.26
18	8.38	4.28	5.24	8.20
19	4.89	3.58	5.67	4.89
20	13.00	4.19	8.55	6.54
21	4.01	2.62	6.72	6.02
22	2.79	2.53	5.15	4.54
23	2.27	3.32	2.88	5.06
24	2.36	2.79	2.88	4.62

1. Hours in AERMOD are defined as hour-ending. i.e., Hour 1 is the period from midnight through 1 AM, etc.

Summary of Modeling Results

The AERMOD modeling parameters used by industry for the Fort Bend area of analysis are summarized below in Table 4.

Table 4: AERMOD Modeling Parameters for the Fort Bend, Texas Area of Analysis

Fort Bend County Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	14
Modeled Structures	353
Modeled Fencelines	Yes, W.A. Parish Station Fenceline
Total receptors	6,909

Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Sugar Land Regional Airport, TX
Upper Air Meteorology Station	Lake Charles, LA
Methodology for Calculating Background SO_2 Concentration	Seasonal diurnal values
Calculated Background SO_2 Concentration	See Table 6

Industry's modeling results are shown in Table 8 below. The design value represents the modeled 3-year average of the 99th percentile, maximum daily 1-hour average impact, consistent with the form of the SO_2 1-hour NAAQS. The first row in this table shows the results that were presented in the initial September 17, 2015 submittal. The second and third rows show results from the subsequently revised modeling analyses submitted by industry to correct errors to model inputs. In all cases, the predicted total ambient concentration when the seasonal diurnal background is added demonstrates attainment of the 1-hour SO_2 NAAQS. The corresponding predicted impacts in ppb for the values listed in Table 5 are as follows: 64.6 ppb (September 17, 2015 modeling), 70.3 ppb (November 30, 2015 modeling), and 70.3 ppb (January 22, 2016 modeling).[21] As discussed previously, the latest modeling submittal is still under review by the EPA and will be considered as part of our final designations action.

Table 5: 1-hour SO_2 Modeling Results for W.A. Parish Station and Background ($\mu g/m^3$), Provided by Industry

Source	*Parish Station Only* ($\mu g/m^3$)	*Parish and Background* ($\mu g/m^3$)	*1-hr.SO_2 NAAQS* ($\mu g/m^3$)	*Below NAAQS?*
September 17, 2015 modeling	163.2	168.6	196.5	Yes
November 30, 2015 modeling	178.407	184.182	196.5	Yes
January 22, 2016 modeling	178.409	184.184	196.5	Yes

Other Relevant Information – Sierra Club Submittals

The EPA received air dispersion modeling from Sierra Club, asserting that SO_2 emissions from W.A. Parish station, when considered alone or cumulatively with other nearby sources, are

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

causing a violation of the NAAQS. The latest modeling for the W.A. Parish station submitted by the Sierra Club was dated December 15, 2015. This supplemental modeling was provided to correct input errors in previous modeling and to update the model input to include variable stack temperatures and velocities and building downwash based on the initial modeling submitted by the state on September 17, 2015. As noted above, industry submitted supplemental modeling on December 1, 2015 to correct errors in the September 17, 2015 state recommendation. Therefore, the latest modeling from Sierra Club does contain those initial model input errors and is not as representative as the December 1, 2015 modeling submitted by industry. In addition, industry utilized additional modeling refinements recommended by the Modeling TAD and consistent EPA modeling guidance that were not utilized by Sierra Club (i.e., 2nd tier SO_2 seasonal, diurnal background concentrations; revised land use date inputs for meteorological data processing). Based on our comparison of Sierra Club's modeling and industry's modeling, we expect that if the Sierra Club's modeling were revised to account for these two differences the modeled impacts would be reduced. It is unclear what would be the magnitude of the reductions. Because of the model input errors, the availability of more refined modeling that indicates that modeled impacts from the W.A. Parish station do not exceed the standard, and the need for EPA to perform a more detailed analysis of this recent modeling, the EPA's current intended designations is not nonattainment based solely on Sierra Club's modeling for the area surrounding the facility. Specifically, the EPA does not believe that the current Sierra Club modeling provides a basis to support a nonattainment designation for the area of analysis because of the more recent modeling industry submitted without apparent model input errors that requires further review by EPA. A discussion of the most recent modeling performed by Sierra Club follows below, with references to the EPA's Modeling TAD as appropriate.

Model Selection and Modeling Components

Sierra Club used AERMOD version 15181 as available from the Support Center for Regulatory Atmospheric Modeling (SCRAM) website, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

Similar to the industry modeling, Sierra Club determined that it was most appropriate to run the model in rural mode. Specifically, Sierra Club conducted an evaluation to determine if the modeled facility was located in a rural or urban setting using USEPA's methodology outlined in Section 7.2.3 of the Guideline on Air Quality Models.[22] For urban sources, the URBANOPT option was used in conjunction with the urban population from an appropriate nearby city and a default surface roughness of 1.0 meter. Sierra Club used AERSURFACE v. 13016 and Geographic Information System (GIS) to determine whether rural or urban dispersion

[22] USEPA, Revisions to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and other Revisions, Appendix W to 40 CFR Part 51, November 9, 2005, Section 7.2.3.

coefficients apply to a site Land use within a three-kilometer radius circle surrounding the facility was considered. USEPA guidance states that urban dispersion coefficient are used if more than 50% of the area within 3 kilometers has urban land uses. Otherwise, rural dispersion coefficients are appropriate. Based on AERSURFACE analysis, Sierra Club concluded that the rural option would be used for the modeling of W.A. Parish facility.

The determination to run the model in rural mode appears appropriate based on our review of aerial photography of the area surrounding the facility.

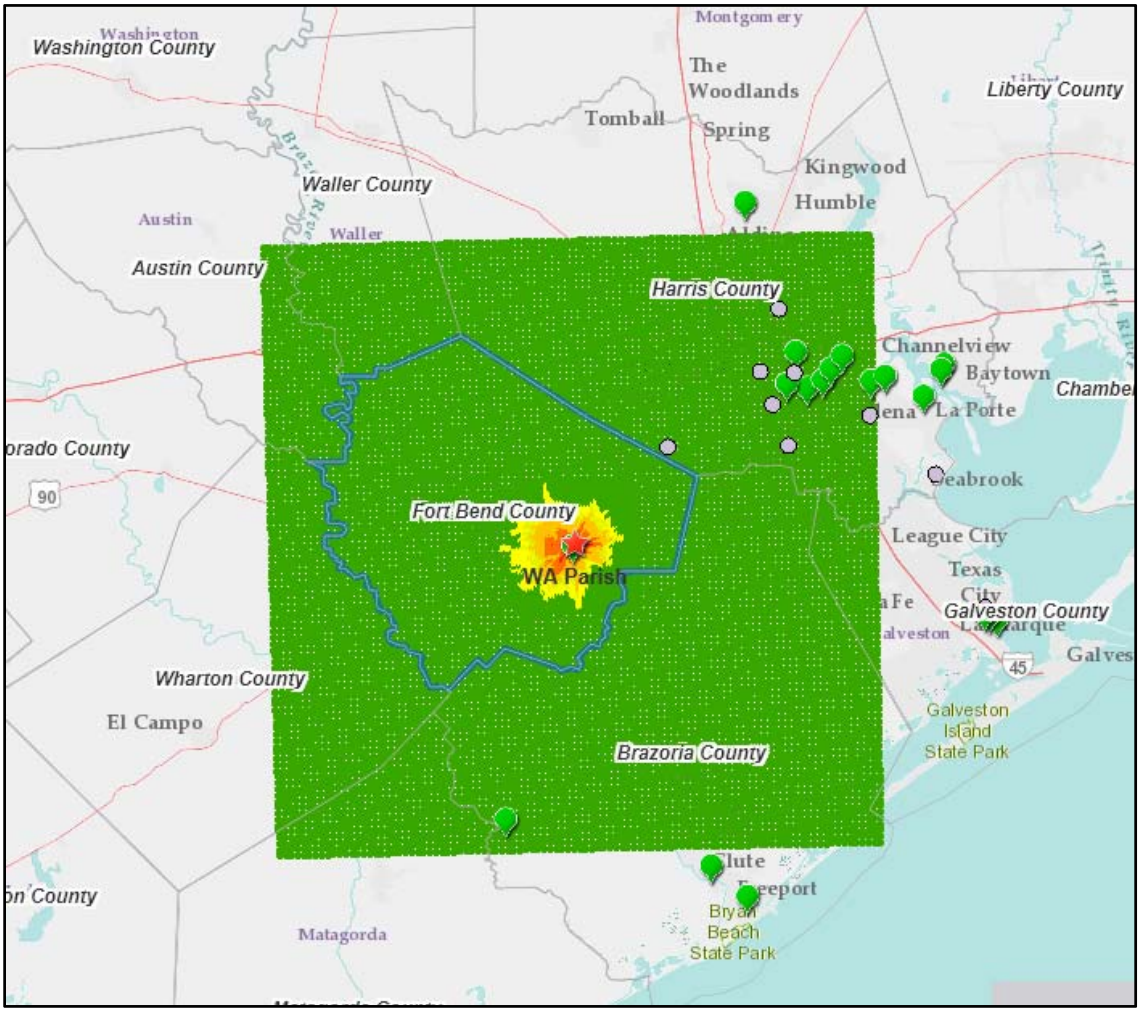
Modeling Parameter: Area of Analysis (Receptor Grid)

For the Fort Bend area, Sierra Club included other emitters of SO_2 within 50 kilometers (km) of W.A. Parish station in any direction. Sierra Club determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. In addition to the W.A. Parish station, the other emitter of SO_2 included in the area of analysis is Rhodia Houston Plant. The grid receptor spacing for the area of analysis chosen by Sierra Club is as follows:

- 100 meter grid from center of W.A. Parish station out to 5 km;
- 500 meter grid from center of W.A. Parish station out to 10 km; and
- 1,000 meter grid from center of W.A. Parish station out to 50 km.

The Sierra Club modeling receptor network contained 21,201 receptors, and the network covered all of the Fort Bend county and majority/portion of adjacent counties as shown in Figure 9 below. Sierra Club modeling used a slightly elevated flagpole receptor height, but if this was corrected to EPA's recommended ground level height we would expect only a slight change in the modeled numbers.

Figure 9: Sierra Club's Modeled Receptors in Area of Analysis



Modeling Parameter: Source Characterization

Sierra Club characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, it used actual stack heights in conjunction with actual emissions. Sierra Club also correctly characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Some of these stack parameters originally had flaws which were later recognized and revised by industry in their supplemental modeling. The most recent Sierra Club modeling was submitted prior to the latest supplement from industry; and therefore, did not include the updated parameters that Sierra Club did not previously have access to. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

In addition to the W.A. Parish station emissions sources, Sierra Club included emissions from Rhodia's Houston Plant, located within 50 kilometers of the Parish facility. This distance and these facilities were selected because Sierra Club believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the sources which might contribute to those concentrations. No other sources beyond 50 km were determined by Sierra Club to have the potential to cause significant concentration gradient impacts within the area of analysis. As discussed previously, industry determined that no additional sources needed to be included in the area of analysis based on the distance between W.A. Parish station and the closest nearby large SO_2 emitters, the concentration gradient of impacts from W.A. Parish station in the direction of those emitters, and the examination of predominant wind patterns and the frequency of occurrence that winds would result in overlap of W.A. Parish station emissions with off-site sources. Based on these same factors, we agree that the inclusion of Rhodia's emissions would not significantly impact the modeled concentrations in the area of analysis. The modeling results provided by Sierra Club support this determination, in that, the maximum impacts from the combined impacts from W.A. Parish station and Rhodia are only 0.1 $\mu g/m^3$ more than the impacts of W.A. Parish station alone. While, there would be more interaction between the emissions at receptors located along the northeast edges of the receptor grid in the direction of the Rhodia Houston Plant, the maximum modeled values including background from industry's latest modeling submittal in this area of the receptor grid are less than 65 $\mu g/m^3$ (24.8 ppb), or 25% of the NAAQS. Based on these relatively low impacts from the W.A. Parish facility, we expect that even with the addition of Rhodia's emissions the cumulative impacts would remain well below the 1-hour standard.

For the W.A. Parish station, Sierra Club used actual measured emissions for each hour between January 1, 2012 and December 31, 2014 as taken from USEPA Air Markets Program Data. For the Rhodia Plant, actual emissions are the annual average of those reported to the TCEQ for calendar year 2014. When modeling the actual hourly emissions from the W.A. Parish station, hourly stack exit temperatures and velocities were based on information provided by USEPA, which were taken from industry's initial modeling submittals. Stack parameters for Rhodia emission sources were based on 100% operating load using maximum exhaust flow rates and temperatures.

Modeling Parameter: Meteorology and Surface Characteristics

For the Fort Bend area of analysis, surface meteorology from the NWS station at Sugar Land Regional Airport in Sugar Land, TX (WBAN No. 12977) and concurrent upper air data from Lake Charles, LA (WBAN No. 03937) were selected by Sierra Club as best representative of meteorological conditions within the area of analysis. These are the same meteorological stations chosen by industry in their modeling analysis.

Sierra Club used AERSURFACE version 13016 at the NWS station in Sugar Land, TX (located at 29.620, -95.658) to estimate the surface characteristics of the area of analysis. Sierra Club estimated values for 12 spatial sectors out to 1 km at an annual temporal resolution for average conditions. Sierra Club also estimated values for albedo (the fraction of solar energy reflected

from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo").

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

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

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as flat with no significant terrain barriers. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

For the Fort Bend area of analysis, Sierra Club used a background concentration of 7.8 $\mu g/m^3$ which is the 2011-2013 design value for El Paso County, Texas, and that value was incorporated into the final AERMOD results. Sierra Club state that the DV from El Paso was the lowest value for all monitoring stations in Texas for that time period.

Sierra Club also included a supplemental analysis that included background concentration values from a monitor located in Harris County, which they identified as being the closest county to the W.A. Parish station that contained SO_2 monitors. They referenced the lowest DV for 2011-2013 for all Harris County monitors as being 23.5 $\mu g/m^3$. However they did not provide any additional information besides proximity to demonstrate that the Harris County monitor was representative of background in the Fort Bend County area of analysis. For example, they did not address if the magnitude of emissions in the vicinity of the monitor was similar to that in the area of analysis. Without additional it is unclear if the monitor is appropriate for characterizing the background concentration surrounding the W.A. Parish station.

Summary of Modeling Results

The AERMOD modeling parameters for the Fort Bend area of analysis, as provided by Sierra Club, are summarized below in Table 6.

Table 6: AERMOD Modeling Parameters for the Fort Bend Area of Analysis, Provided by Sierra Club

Fort Bend Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	6
Modeled Structures	Yes; downwash based on initial industry modeling
Modeled Fencelines	No; however, report indicated that maximum modeled impacts occur off property
Total receptors	21,201
Emissions Type	Actuals
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Sugar Land Regional Airport, TX
Upper Air Meteorology Station	Lake Charles, LA
Methodology for Calculating Background SO_2 Concentration	2011-2013 Design Values measured at ambient monitors in TX
Calculated Background SO_2 Concentration	7.8 $\mu g/m^3$ (El Paso monitor DV)

The results presented below in Table 7 show the magnitude and geographic location of the highest predicted modeled concentration of SO_2 based on actual emissions.

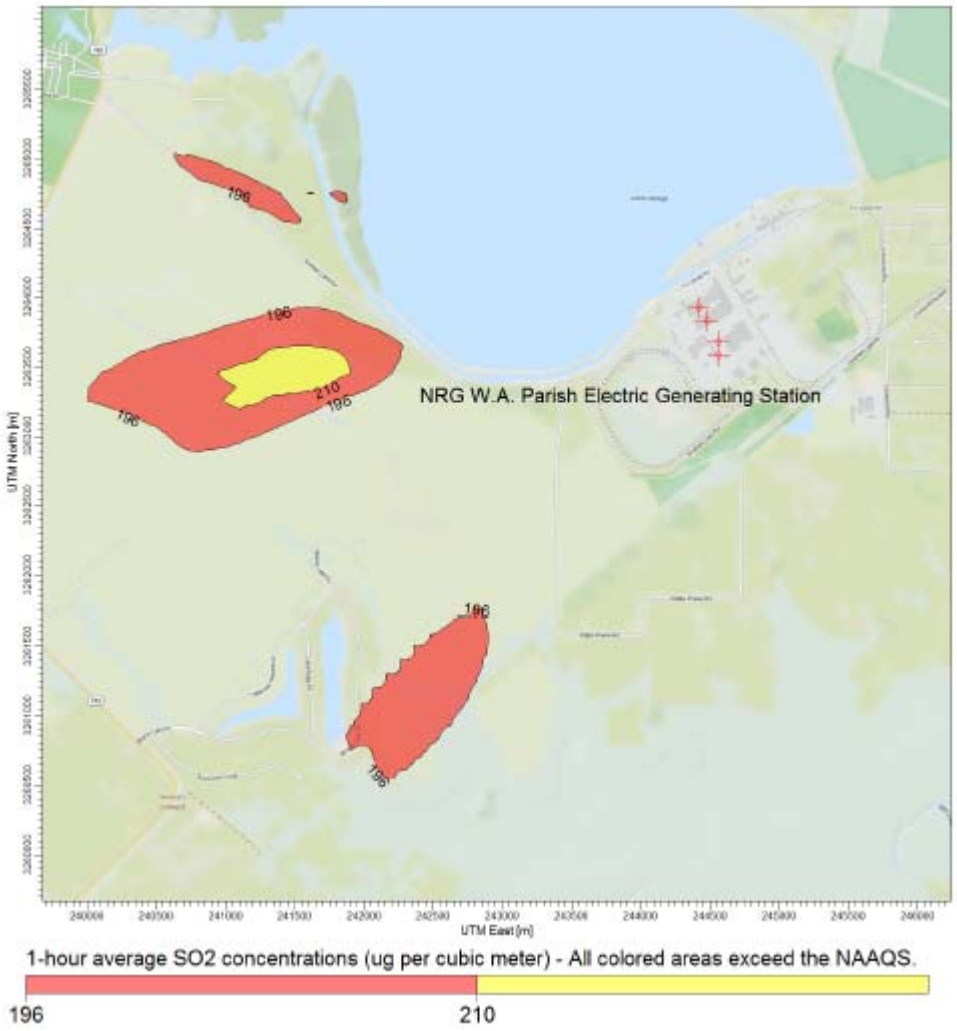
Table 7: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the W.A. Parish Station Area of Analysis Based on Actual Emissions, Provided by Sierra Club

		Receptor Location		SO_2 Concentration ($\mu g/m^3$) Based on Actual Emissions	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)*	NAAQS
99th Percentile 1-Hour Average	2012-2014	241,606.75	3,263,457.75	215.5	196.5**

* Sierra Club's submittal indicated that highest predicted concentration occurred off facility property so the absence of fenceline and removal of on-site receptors did not impact their final determination regarding NAAQS exceedances.
** Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

Sierra Club's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 215.5 $\mu g/m^3$, or 82.3 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. The area of maximum impacts, including the overall maximum, is located to the southwest of the facility as illustrated in the following figure.

Figure 10: Sierra Club's Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the W.A. Parish Area of Analysis Based on Actual Emissions and El Paso Background DV



As stated in the previous section, the EPA has identified several areas in Sierra Club's most recent modeling that contain model input errors and areas where further refinements are necessary to be most consistent with the modeling approaches found in the Modeling TAD and EPA guidance. Specifically, stack parameters for several of the W.A. Parish station sources contain errors because they were based on inaccurate information included my industry in their early modeling submittals. While Sierra Club did not have the most recent stack parameters corrections made by industry prior to their modeling submittal, the current modeling as provided by Sierra Club does not accurately represent the W.A. Parish facility's emission sources. Sierra Club also did not utilize all of the model refinements that were used by industry (i.e., seasonal, diurnal background concentrations; updates to land use date to account for current land use for AERSURFACE calculations), which are consistent with the Modeling TAD and EPA guidance. Because the EPA had received more accurate and refined modeling data that disputes, Sierra

Club's recommendation for nonattainment, the current Sierra Club modeling is not sufficient to support a nonattainment designation for the Fort Bend County area of analysis.

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around W.A Parish station as unclassifiable for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of Fort Bend County.

For the analysis area surrounding the W.A. Parish station, the EPA has received three modeling analysis submittals from Sierra Club, and three modeling analysis submittals from industry, and one modeling analysis submittal from the state as prepared by industry. As discussed in this technical support document, in the most recent submittal from Sierra Club we have identified model input errors that later were identified and corrected by industry in their January 25, 2015 submittal (i.e., stack parameters for several on-site sources were determined by industry to contain errors and not accurately reflect the actual stack parameters) and additional areas in the modeling approach that could be further refined (i.e., seasonal, diurnal background concentrations; updates to land use data so that calculated surface characteristics are more representative of current surface characteristics) in order to be consistent with the Modeling TAD. Therefore, we do not believe that the submittals received from Sierra Club contain sufficient information to indicate that the area of analysis should be designated nonattainment. Same as the three Sierra Club modeling submittals, the two initial modeling submittals received from industry contained errors in model inputs (i.e., errors in hourly emissions input data and modeled stack parameters) and utilized modeling approaches (i.e., AERSURFACE analysis conducted at facility instead of meteorological station) that were inconsistent with the Modeling TAD and other EPA modeling guidance. On January 25, 2016, however, the EPA received the third revised modeling submittal from industry that was provided to address the model inputs errors and the modeling approaches contained in its September and November 2015 modeling. The EPA's review of this latest modeling is currently underway. Based on our current review of all available analyses, we preliminarily believe that the latest modeling from industry is more consistent with the modeling approach and refinements outlined in the Modeling TAD. However, due to the date of receipt of the latest modeling from industry relative to our scheduled timeline for proposing designations in order to meet the court-ordered deadline, we have not had sufficient time to thoroughly review the January 25, 2016 submittal to determine if the modeling is sufficient to support a designation of unclassifiable/attainment as it requests. The EPA will continue our review of industry's January 25, 2016 submittal and will take it into consideration in our final designation for the area around W.A. Parish station. Therefore, the EPA is intends to designate the area surrounding the W.A. Parish station as unclassifiable.

At this time, our intended designations for the state only apply to this area and the other areas presented in this technical support document. Consistent with the conditions in the March 2,

2015 consent decree, the EPA will evaluate and designate all remaining undesignated areas in Texas by either December 31, 2017, or December 31, 2020.

Technical Analysis for the Sandy Creek Energy Station,
McLennan, Texas
Area

Introduction

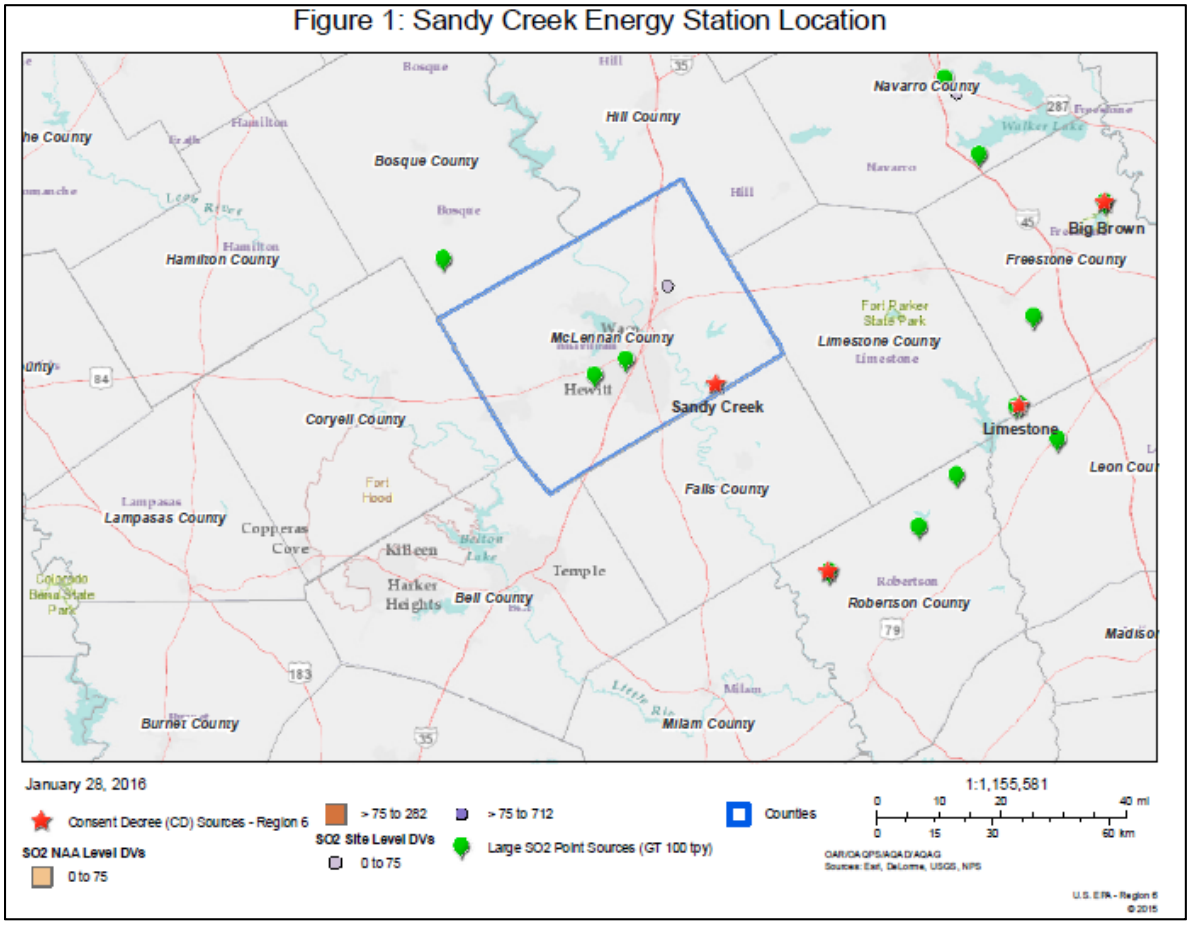
McLennan County, Texas contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Sandy Creek Energy Station emitted 4,955 tons of SO_2, and had an emissions rate of 1.41 lbs SO_2/mmBTU based on EPA's Air Markets Database. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.[23]

In its submission, Texas recommended that the area surrounding the Sandy Creek Energy Station, specifically the entirety of McLennan County, be designated as attainment based on an assessment and characterization of air quality from the facility. This assessment and characterization was based on historical modeling performed in 2011 by the facility using air dispersion modeling software, i.e., AERMOD, analyzing permitted emissions and review of available monitor data.[24] After careful review of the state's assessment, supporting documentation, and all available data, the EPA does not agree with the state's recommendation for the area, and intends to designate McLennan County as unclassifiable.

The Sandy Creek Energy Station is located in Texas in the eastern southern portion of McLennan County close the border of McLennan and Falls county. As seen in Figure [1] below, the facility is located approximately 23 km east of the center of McLennan County. Also included in the figure are nearby emitters of SO_2, the state's recommended area for the attainment designation (McLennan County), and the EPA's recommended area for the intended unclassifiable designation.

[23] TCEQ and Sandy Creek Energy Station have provided information that the EPA's Air Markets Database emission data for 2012 for the facility is substituted emissions data and not measured emission data. On April 5, 2013 Sandy Creek Energy Station submitted a petition for an alternate methodology for reporting substituted emissions data. Based on this alternate methodology, revised reported emissions for the facility for 2012 would be 2,280 tpy, below the 2600 tpy threshold for CD sources. EPA has not acted on that petition at this time. If the petition is approved and the Air Market's Database is updated to reflect this change by the deadline for designations, the EPA consent decree obligation to designate this area by July 2, 2016 would not apply.
[24] Waco Manzac Monitor located 14 miles northwest of the facility.

Figure 1. The EPA's intended designation(s) for McLennan County, Texas



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 document titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) in December 2013. The discussion and analysis that follows below will reference the state's use of the Modeling TAD, the EPA's assessment of the state's modeling in accordance with the Modeling TAD, and the factors for evaluation contained in the EPA's March 20, 2015 guidance, as appropriate.

Detailed Assessment

Model Selection and Modeling Components

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

BLP model for buoyant line sources. The AERMOD modeling system contains the following components:

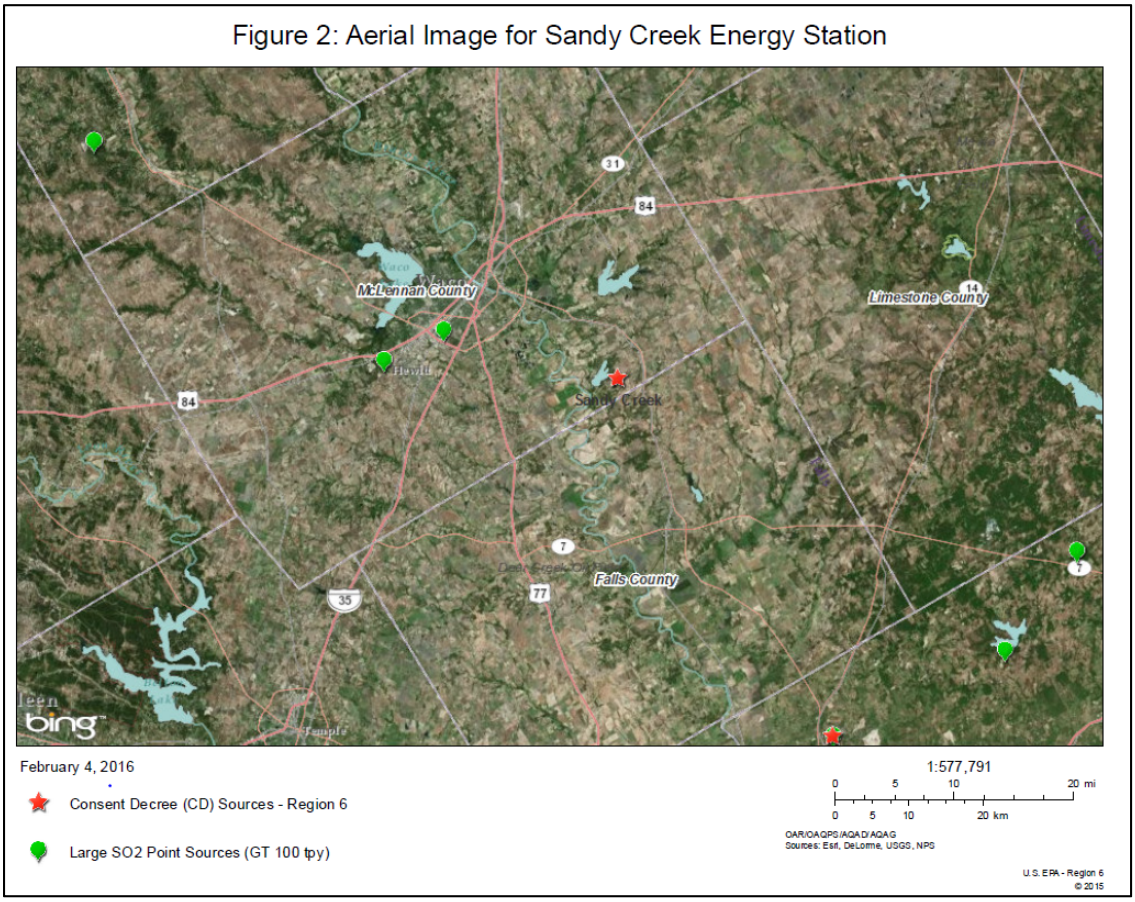
- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRIME: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: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

Texas relied on historical modeling performed by the facility in 2011 that utilized AERMOD version 11103. A discussion of the individual components will be referenced in the corresponding discussion that follows, as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, industry determined that it was most appropriate to run the model in rural mode. Based on our review of aerial photography of the area surrounding the Sandy Creek Energy Station, the determination of modeling using rural mode is appropriate as shown in Figure 2 below.

Figure 2: Aerial Image Showing Immediate Area Surrounding Sandy Creek Energy Station



Modeling Parameter: Area of Analysis (Receptor Grid)

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

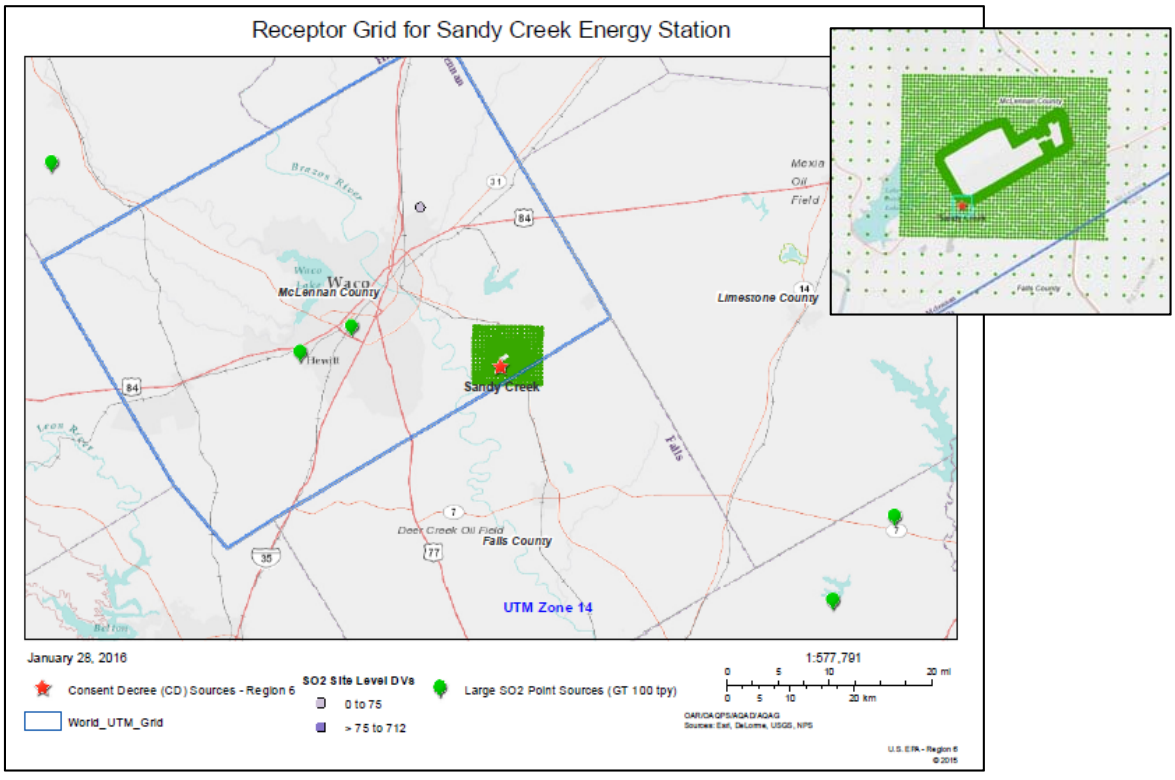
For the area surrounding Sandy Creek Energy Station, the location of the highest one-hour concentrations predicted by the facility's 2011 AERMOD modeling analysis are northwest and northeast of the facility, all within 700 meters of the property line, with the highest concentration predicted to occur 350 meters beyond the property line to the northwest. Concentrations predicted for receptors from 350 meters to 5,000 meters from any property boundary steadily decreased with distance in every direction. The facility determined that running AERMOD to predict concentrations for receptors located beyond 5,000 meters for the property line was

unwarranted. The concentration gradients due to nearby sources (see Figure 1) were not considered in the modeling analysis. The grid receptor spacing for the area of analysis chosen by the facility is as follows:

- Receptors spaced 25 meters apart, extending to 200 meters from the legal property boundary
- Receptors spaced 100 meters apart, extending to 1,000 meters from the legal property boundary
- Receptors spaced 500 meters apart, extending to 5,000 meters from the legal property boundary

The receptor network contained 5,900 receptors located within 5 kilometers of the Sandy Creek facility's property line. The receptor network covered portions of McLennan County, and a small portion of Falls County. Figure 3, shows the receptor grid in the chosen area of analysis surrounding Sandy Creek Energy Station.

Figure 3: Receptor Grid for Sandy Creek Energy Station Area of Analysis



According to the TAD, selection of modeling domain is important in terms of how many sources to explicity model and what kind of receptor network to create depending on the number and locations of sources that meet or exceed the EPA determined emissions threshold, to be

established in the future data requirement rule. Figure 2 above shows the receptor grid for Sandy Creek Energy Station area of analysis and other nearby large SO_2 sources (>100 tons/yr.). The size of the receptor network selected and used in the modeling analysis for Sandy Creek Energy Station was limited to only 10% (5 km) of how large AERMOD models domain (up to 50 km) can be established. The receptor network should cover the modeling domain and generally follow the recommendations of Section 7.2.2 of Appendix W with the exception of areas to exculde based on feasibility of monitor placement. No technical or receptor placement feasibility justifications were mentioned in the modeling analysis for using limited size receptor network. Also, if modeling indicates elevated levels of SO_2 near the edge of receptor grid, expanding the grid or conducting an additional modeling run centered on the area of concern should be considered to ensure that maximum impacts are captured by the modeling to clearly support desgination of the area. While the modeling results included in the Sandy Creek analysis showed impacts below the NAAQS through the entire modeled domain, the modeling approach as discussed in the following sections is not consistent with the modeling TAD. Revised modeling completed consistent with the TAD may result in modeled areas of concern within the relatively small receptor grid that would require the inclusion of additional receptors to ensure that the area potentially impacted by Sandy Creek Energy Station and large nearby SO_2 emitters does not show predicted violations of the 1-hour SO_2 NAAQS.

Modeling Parameter: Source Characterization

The analysis characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter, as discussed below. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash. The facility used "BEE-Line BEEST for Windows" computer interface to run the BIPPRM subroutine (Version 04274) in order to calculate downwash parameter values for the analysis.

Modeling Parameter: Emissions

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

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information when it is available, and that these data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD

highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS or the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA believes that detailed throughput, operating schedules, and emissions information from the impacted source(s) should be used.

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

As previously noted, the state included Sandy Creek Energy Station and no other emitters of SO_2 in the area of analysis which included receptors out to 5 km in all directions from the facility. This distance was selected because the state believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the source which might cause these concentrations. No other nearby sources were identified by the state as having the potential to cause significant concentration gradient impacts within the area of analysis.

Table 1: Actual SO_2 Emissions 2012-2014 in McLennan County Area of Analysis

Company ID	Facility Name	SO_2 Emissions (tons per year)[25]		
		2012	2013	2014
Sandy Creek Services LLC	Sandy Creek Energy Station	4,955	9,680	2,648

For Sandy Creek Energy Station, the source modeled hourly emission rates, presented in Table 2 below. The modeled emission rates are based on permit allowable emissions rates. For Emission Point Number (EPNs) for Emergency Diesel Fuel-Fired Fire Water Pump and Booster Pump, S33 and S34 do not match current permit allowable emission rates; however, since these sources are considered intermittent due to their emergency status, these sources were modeled using annual average SO_2 emission rates in lieu of the permit allowable hourly rates.

[25] Data from EPA's Air Markets Database.

Table 2: Sandy Creek Point Sources and Modeled Hourly Emission Rates

EPN	Source description	Modeled Hourly emission rate (lb/hr)
S01	Pulverized Coal Boiler	2,892
S02	Auxiliary Boiler	0.17
S33	Diesel-fired Emergency Generator	0.029
S34	Emergency Diesel Fuel-Fired Firewater Pump	0.029
S40	Emergency Diesel Fuel Fired Firewater Booster Pump	0.029

Table 3 presents modeled stack exit parameter values for Sandy Creek Energy Station sources. All combustion sources were modeled as point sources using constant values for exhaust parameters (i.e., stack exit velocities, diameters, and temperatures). All combustion exhaust was treated in the modeling analysis as being released vertically.

Table 3: Modeled Stack Parameters for Contributing Sources in Area of Analysis

EPN	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Exit Height (ft)	Exit Temperature (°F)	Exit Velocity (fps)	Exit Diameter (ft)
S01	694,227	3,484,006	146.6	360.0	165.0	65.0	27.80
S02	694,071	3,484,039	146.6	265.0	300.0	135.0	5.00
S33	693,999	3,483,915	146.6	35.0	835.0	254.9	0.92
S34	694,086	3,484,098	146.6	13.0	844.0	160.4	0.50
S40	694,025	3,483,924	146.6	13.0	846.0	34.7	0.50

Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding Sandy Creek Energy Station. The table below shows information related to the monitor located in McLennan County. Based on available ambient air quality collected between 2012 and 2014, the county containing Sandy Creek Energy Station does not show a violation of the 2010 SO_2 NAAQS at its monitor. However, the absence of a violating monitor when considering the distance from the facility is not a sufficient technical justification to rule out that an exceedance of the 2010 SO_2 NAAQS may occur in the immediate vicinity of the facility.

Table 4: Available Air Quality Data for the Area Closest to Sandy Creek Energy Station

County	State Recommendation	Air Quality Systems (AQS) Monitor ID	Monitor Location	Distance to San Miguel (km)	2012 – 2014 SO_2 Design Value (ppb)
McLennan	Attainment	483091037	Waco Mazanec	24.5	6

Modeling Parameter: Meteorology and Surface Characteristics

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

For the Sandy Creek Energy Station area of analysis, surface meteorology from the NWS surface data from Waco Regional Airport (Station #13959) and NWS upper air data from Stephenville, TX (Station #13091) were selected as nearest stations to Sandy Creek Energy Station and are best representative of meteorological conditions within the area of analysis. The analysis utilized pre-processed AERMOD meteorological data sets available from TCEQ for "medium surface roughness" (0.1-0.7 m surface roughness) for five years (1985, 1987, 1988, 1989, and 1990). Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The "medium surface roughness" data was selected based on AERSURFACE estimation, using USGS NLCD 1992 data, of surface roughness at the Sandy Creek Energy Station site of 0.135 m. The modeling analysis does not provide information on surface characteristics at the NWS site where the meteorological data were recorded.

The Modeling TAD recommends steps to characterize "current" air quality based on actual emissions for the most recent years for a source of interest and for any nearby sources, which may influence the air quality of the area for the purpose of designation. The Sandy Creek Energy Station submittal included historical modeling analysis performed in 2011, which was not performed in accordance with current EPA modeling guidance and the modeling TAD. Significant deviations from current guidance include the use of a much earlier version of AERMOD, inclusion of outdated meteorological data when more recent data is available from the meteorological stations, and the calculation of surface characteristics at the facility location and not the meteorological site. Because of the deviations from modeling guidance, particularly with respect to the meteorological data, which will directly impact plume rise and track, the modeled SO_2 concentrations are not clearly reliable in characterizing current air quality in the area of analysis. As further discussed in this document, the identified inconsistencies in the modeling as compared with EPA guidance result in Sandy Creek Energy Station's analysis being insufficient to support a determination that the area of McLennan County is in compliance with the 1-hour SO_2 NAAQS.

Parameter: Geography and Terrain

Terrain elevations from Digital Elevation Map Data ("DEM") from U.G. Geological Survey (USGS) were processed using AERMAP to determine elevations for the emission sources and structures capable of down washing source plumes at the site, as well as elevations of the off property locations (receptors) at which ambient air SO_2 concentrations were calculated. The DEM files, each with a 30-meter resolution, were obtained from the Texas Natural Resources Information System (TNRIS).

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Sandy Creek Energy Station site area of analysis, the state chose background concentrations for SO_2 from the EPA Aerometric Information Retrieval System (AIRS) monitor 48-309-1037 located at 4472 Mazaneck Road, Waco-McLennan County. The three-year average of the most recent data available at the time of the analysis (2008-2010) of the 99th percentile of the annual distribution of the maximum daily 1-hour concentration was used for the 1-hour value. The background concentration for this area of analysis was determined by the state to be 16.8 micrograms per cubic meter ($\mu g/m^3$) (6.4 ppb), and that value was incorporated into the final AERMOD results. The background concentration calculated for the modeling analysis is presented in Table 5.

Table 5: Background Concentration Calculated for the Modeling Analysis

Pollutant	Monitor Station	County	Averaging Period	Concentration ($\mu g/m^{3)}$	Averaging Method for Concentration
SO_2	Waco Mazanec	McLennan	1-Hour	16.8 (6.4 ppb)	Three-year average of 99th percentile of the daily one-hour maximum concentration for the period 2008-2010

Summary of Modeling Results

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

Table 6: AERMOD Modeling Parameters for the Sandy Creek, McLennan County Area of Analysis

McLennan County Area of Analysis	
AERMOD Version	11103
Dispersion Characteristics	Not provided
Modeled Sources	1
Modeled Stacks	5
Modeled Structures	Yes
Modeled Fence lines	Yes (see Figure 3)
Total receptors	5,900
Emissions Type	PTE
Emissions Years	--
Meteorology Years	1985, 1987-1990
Surface Meteorology Station	Waco, TX
Upper Air Meteorology Station	Stephenville, TX
Methodology for Calculating Background SO_2 Concentration	Three-year average of 99th percentile of the daily one-hour maximum concentration for the period 2008-2010
Calculated Background SO_2 Concentration	16.8 $\mu g/m^3$ (6.4 ppb)

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

Table 7: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration from Sandy Creek, McLennan County Area of Analysis Based on Actual Emissions

Averaging Period	Data Period	Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
		UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	PTE; 1985, 1987-1990	693,200	3,484,200	134	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

The facility's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 134 μg/m^3, or 51.12 ppb. This modeled concentration included the background concentration of SO_2, and is based on permitted emissions from the facility and constant stack parameters.

Jurisdictional Boundaries:

Once the geographic area of analysis associated with the Sandy Creek Energy Station is determined, existing jurisdictional boundaries are considered for the purpose of informing our intended unclassifiable area, specifically with respect to clearly defined legal boundaries.

The EPA believes that our intended unclassifiable area, consisting of McLennan county, Texas, is comprised of clearly defined legal boundaries, and we find these boundaries to be a suitably clear basis for defining our intended unclassifiable area.

The EPA has confirmed that the Sandy Creek Energy Station is the only large source of SO_2 emissions within a 50 km radius, and that there is only one emitter of SO_2 in any county neighboring McLennan County with emissions above 100 tpy. Specifically, the Chemical Lime Clifton Plant in Bosque County is located approximately 10 km from the McLennan County border. Its 2011 NEI reported SO_2 emissions were 383 tpy. Due to its low emissions and distance from the McLennan County border and based on all available information, the EPA does not believe that emissions from the plant are likely to cause or contribute to a violation of the NAAQS within McLennan County.

Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Sandy Creek Energy Station as unclassifiable for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the jurisdictional boundaries of McLennan County, Texas. This intended designation and associated boundaries are based on review of available modeling submitted by industry.

As discussed in this technical support document, the EPA reviewed the modeling submitted by Sandy Creek Energy Station and identified several areas where the modeling is inconsistent with our modeling guidance. Based on our review these inconsistencies are significant enough that the submitted modeling does not adequately indicate that the area surrounding Sandy Creek Energy Station is attaining the 2010 1-hour SO2 NAAQS. Based on all available information, and the reasons listed above, the EPA is unable at this time to determine whether the area is meeting or not meeting the NAAQS, and we intend to designate McLennan County as unclassifiable.

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

Technical Analysis for the Milam County Area

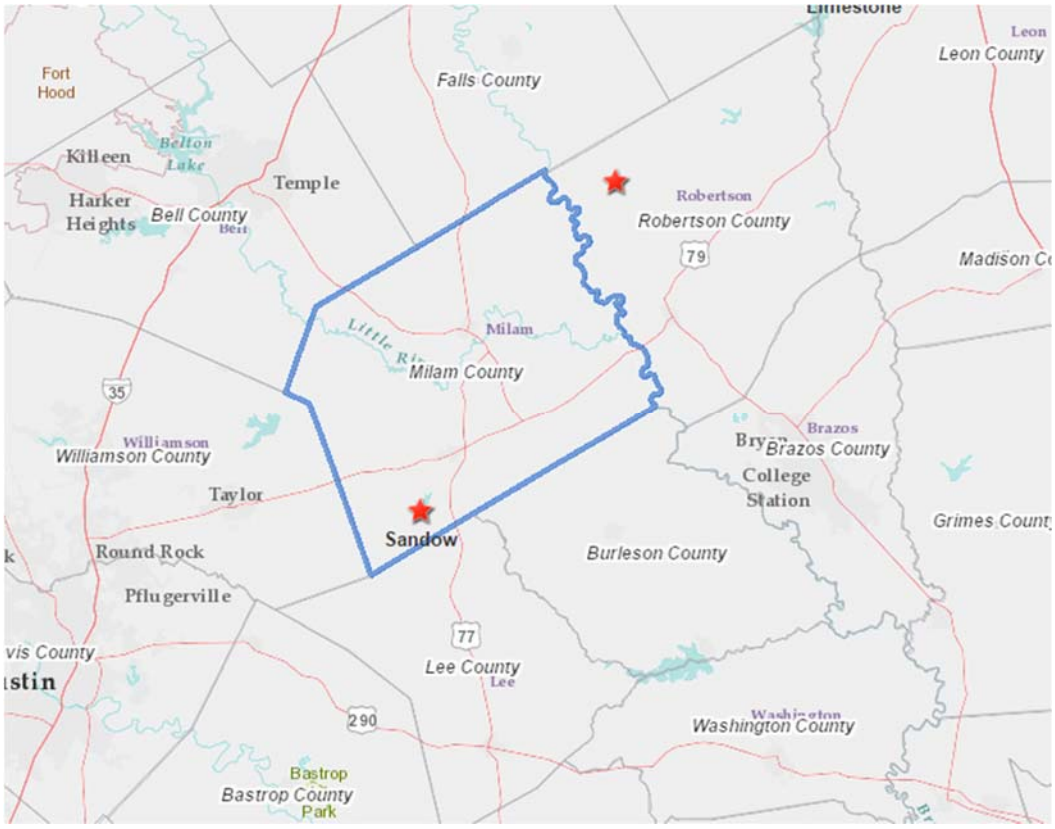
Introduction

Milam County, Texas contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Sandow Power Plant emitted 22,511 tons of SO_2, and had an emissions rate of 1.00 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

Texas provided no formal recommendation for the area surrounding the Sandow Power Plant. Instead, as part of its September 18, 2015 submittal, Texas provided a general recommendation of unclassifiable/attainment for the 243 counties, including Milam County, located in the state that do not have any operational SO_2 regulatory monitors. This general recommendation for Milam County was not accompanied by modeling, monitoring or other relevant technical information for that area that could be used to inform the attainment status of Milam County. After review of the state's submittal and based on the lack of information regarding the attainment status of the area surrounding the Sandow Power Plant, the EPA does not agree with the state's recommendation for the area, and since the area cannot be classified on the basis of available information as meeting or not meeting the NAAQS, intends to designate Milam County as unclassifiable.

The Sandow Power Plant is located in east Texas in the southwest portion of Milam County. As seen in Figure 1 below, the facility is located approximately 74 km from Austin, Texas, and approximately 1 km southeast of Alcoa Lake. The figure also shows other nearby, large emitters of SO_2, and the EPA's intended unclassifiable designation for the area, which are the geographic boundaries for Milam County, Texas.

Figure 1. The EPA's intended designation(s) for Milam County



Jurisdictional Boundaries

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

Other Relevant Information

The EPA did not receive any additional information about the area in the immediate vicinity of the Sandow Power Plant.

Conclusion

The EPA did not receive any supporting documents or analyses from either the state or other third parties regarding the designation of the area surrounding the Sandow Power Plant. Based on all available information, the EPA is unable at this time to determine whether the area is meeting or not meeting the NAAQS. Therefore, due to the lack of modeling and monitoring data or other relevant information, the EPA intends to designate Milam as unclassifiable for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the jurisdictional boundaries of

Milam County. On the basis of available information, the EPA is also unable to determine whether nearby areas contribute to ambient air quality impacts within Milam County. Texas.

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

Technical Analysis for the Potter County Area

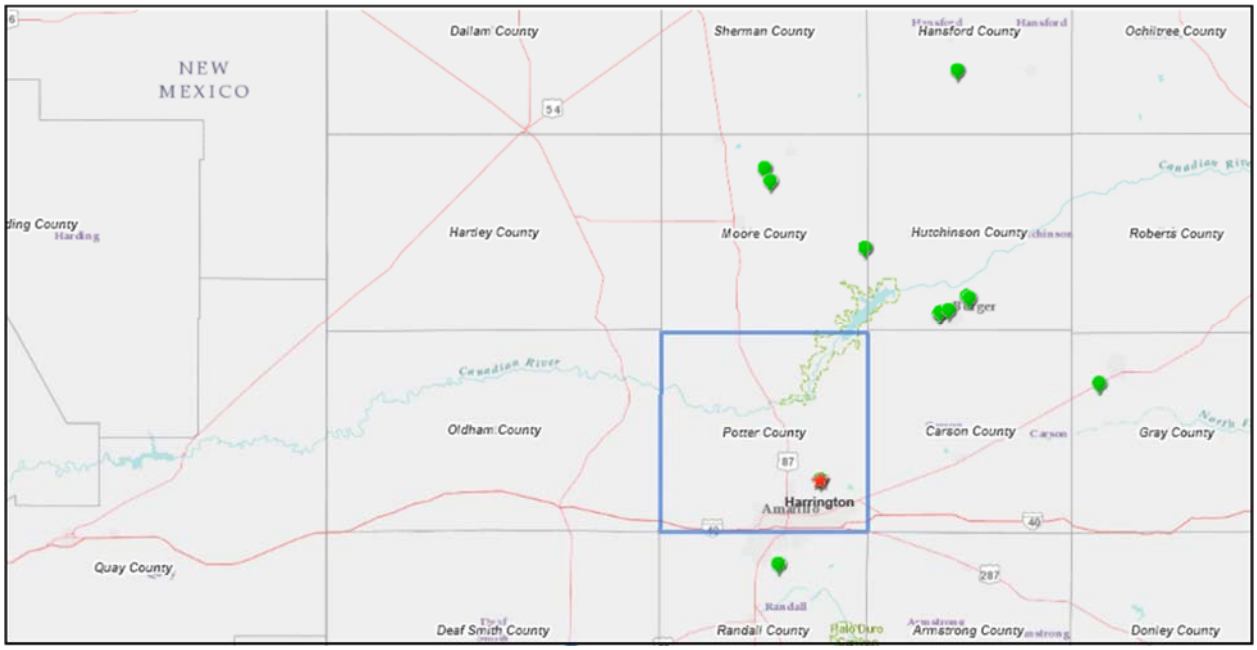
Introduction

Potter County, Texas contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Harrington Power Station emitted 15,383 tons of SO_2, and had an emissions rate of 0.46 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

Texas provided no formal recommendation for the area surrounding the Harrington Power Station. Instead, as part of their September 18, 2015 submittal, Texas provided a general recommendation of unclassifiable/attainment for the 243 counties located in the state, including Potter County, that do not have any operational SO_2 regulatory monitors. This general recommendation for Potter County was not accompanied by modeling, monitoring, or other technical information to inform our decision regarding the attainment status of the area. After review of the state's submittal and based on the lack of information regarding the attainment status of the area surrounding the Harrington Power Station, the EPA does not agree with the state's recommendation for the area, and, since the area cannot be classified on the basis of available information as meeting or not meeting the NAAQS, intends to designate the area as unclassifiable.

The Harrington Power Station is located in north Texas in the southeast portion of Potter County. As seen in Figure 1 below, the facility is located approximately 12 km from Amarillo, TX. Alternatively, Harrington Power Station is approximately 40 km south of Lake Meredith.

Figure 1. The EPA's intended designation(s) for Potter County



Also included in the figure are nearby emitters of SO_2, and the EPA's intended unclassifiable designation for the area.

Jurisdictional Boundaries

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

Other Relevant Information

The EPA did not receive any additional information about the area in the immediate vicinity of Harrington Power Station.

Conclusion

The EPA did not receive any supporting documents or analyses from either the state or other third parties regarding the designation of the area surrounding Harrington Power Station. Based on all available information, the EPA is unable at this time to determine whether the area is meeting or not meeting the NAAQS. Therefore, due to lack of modeling and monitoring data or other relevant information, the EPA intends to designate the area around Harrington Power Station as unclassifiable for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of Potter County. On the basis of available information, the EPA is also unable to determine whether nearby areas contribute to ambient air quality impacts within Potter County.

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

Technical Analysis for the Martin Lake Electrical Station in Rusk County, Texas

Introduction

The Rusk County area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Martin Lake Electrical Station (Martin Lake station) emitted 43,093 tons of SO_2, and had an emissions rate of 0.5504 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

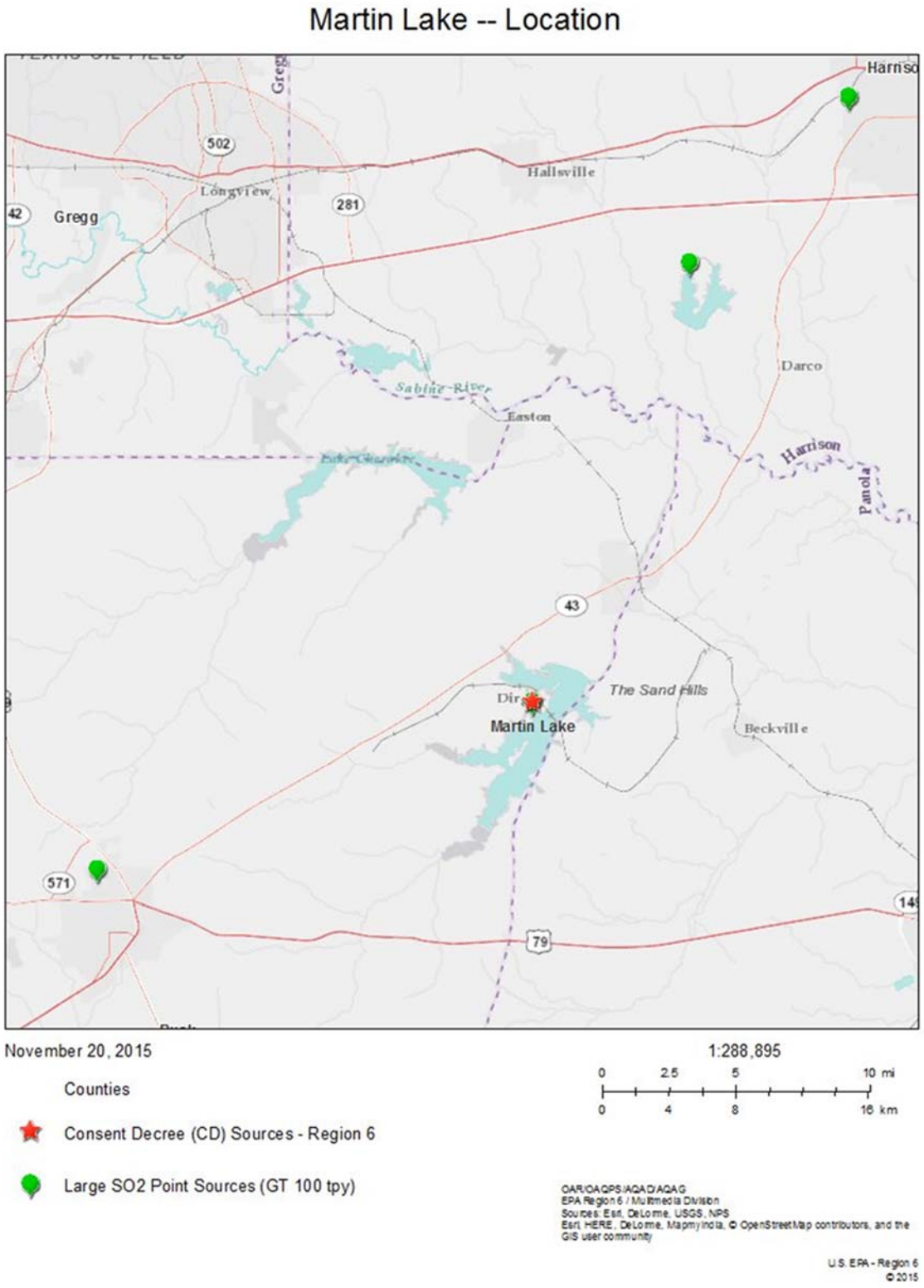
In its submission, Texas recommended that the area surrounding Martin Lake station, specifically Rusk County, be designated as unclassifiable/attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. This assessment and characterization was performed using the logic that any areas without appropriately cited and qualified monitors should be considered unclassifiable or attainment based on lack of evidence that a violation of the NAAQS has occurred. After careful review of the state's assessment, supporting documentation, and all available data, the EPA does not agree with the state's recommendation for this area, and intends to designate the area as nonattainment. Specifically, our intended nonattainment area consists of the area bounded by the following Universal Transverse Mercator (UTM) coordinates in meters (NAD83 Datum, Zone 15):

X	Y
336067,	3585315
336067,	3558314
361568,	3558314
361568,	3585315

However, our intended nonattainment area excludes the portions of Harrison County, Texas that fall within this UTM-based boundary on the basis that none of the modeled receptors in Harrison County show violations of the NAAQS. As discussed below, our intended designation for Rusk County is based on the technical analysis, including dispersion modeling, performed by Sierra Club and submitted to the EPA for review.

Martin Lake station is located in East Texas in the eastern portion of Rusk County. As seen in Figure 1 below, the facility is located approximately 30 km southeast of Longview, Texas. The station is located on the northwest shore of Martin Lake and is substantially surrounded by the waters of this lake. Figure 1 also shows nearby large sources of SO_2 emissions in the area.

Figure 1. The Location of the Martin Lake Electrical Station and Other Large Sources of SO_2 in the Area



The discussion and analysis that follows below will reference the factors contained in the EPA's March 20, 2015 guidance, as appropriate.

Detailed Assessment

Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding Martin Lake station. The facility is located in Rusk County; however, there are no ambient air quality monitors located in this county. The state included the most recent 3 years of monitoring data, i.e., 2012 – 2014 in its recommendation for the closest neighboring county, i.e., Gregg County. The table below shows information related to the monitor located in Gregg County, which was provided by the state.

Table 1: Available Air Quality Data for the Area Closest to Martin Lake Electrical Station

County	Air Quality Systems (AQS) Monitor ID	Monitor Location	Distance to Martin Lake Electrical Station (km)	2012 – 2014 SO_2 Design Value (ppb)
Gregg	48-183-0001	South of Longview, Texas	19	50

Based on available monitored ambient air quality data collected between 2012 and 2014, the county near Martin Lake station does not show a violation of the 2010 SO_2 NAAQS at its monitor. However, the absence of a violating monitor, when considering the distance from the facility is not a sufficient technical justification to rule out that an exceedance of the 2010 SO_2 NAAQS may occur in the immediate vicinity of the facility.

Emissions and Emissions-Related Data

Evidence of SO_2 emissions from the source meeting the emissions criteria of the March 2, 2015 consent decree, i.e., Martin Lake station, is an important factor for determining whether the immediate area is experiencing elevated levels of SO_2 concentrations. Other considerations for this factor include county level SO_2 emissions data, and data for sources located within 50 km.

Texas did not include any annual emissions data for sources in Rusk County, nor did the state include any annual emissions data from sources in neighboring Cherokee, Gregg, Harrison Nacogdoches, Panola, Shelby and Smith Counties. The EPA therefore believes that it is reasonable to evaluate data obtained from the 2011 National Emissions Inventory (NEI). [26] The annual SO_2 emissions data for sources emitting at or above 100 tons per year in Rusk County and neighboring Harrison County are summarized below in Table 2. There were no other sources listed as emitting SO_2 at or above 100 tons per year within 50 km. We note that Texas, through

[26] Detailed information for the 2011 NEI can be found at this link: http://www3.epa.gov/ttnchie1/net/2011inventory.html

its environmental agency the Texas Commission on Environmental Quality (TCEQ) included the H.W. Pirkey Power Plant (Pirkey) in their list of sources subject to the SO_2 Data Requirements Rule (DRR), with 2014 SO_2 emissions of 2,916 tpy (DRR List Letter from Richard A. Hyde, TCEQ to Ron Curry, EPA; January 15, 2016).

Table 2: 2011 NEI SO_2 Emissions from Other Nearby Sources

County	Facility Name	Facility Subject to the Emissions Criteria of the March 2, 2015 consent decree?	Distance to Facility that Meets the Consent Decree Criteria (km)	Facility Total SO_2 Emissions (tons)
Rusk	Henderson Plant 1	No	23.8	122.5
Harrison	AEP H.W. Pirkey Power Plant	No	23.7	7255.4
Harrison	Marshall Plant, Chemical Plant	No	34.5	752.6

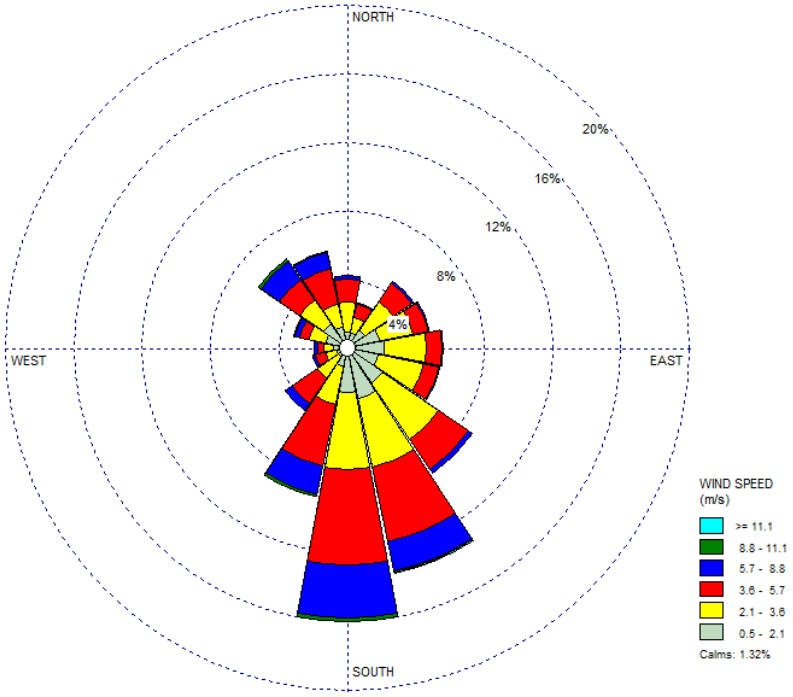
Emissions Controls

The EPA recognizes that control strategies implemented on the sources above that occurred after the release of the 2011 NEI may not be reflected, or may warrant further discussion. The EPA has not received any additional information on emissions reductions resulting from controls put into place after 2011.

Meteorology (Weather & Transport Patterns)

Evidence of source-receptor relationships between specific emissions sources and high SO_2 concentrations in the surrounding area is another important factor in determining the appropriate extent of the EPA's intended nonattainment area. As discussed below in the section titled, "Other Relevant Information", meteorological records for the nearest National Weather Service meteorological station at the Longview Texas Regional Airport and upper air meteorological data from NWS station in Shreveport, Louisiana, were used by Sierra Club to model the effects of meteorology and emission on the area surrounding Martin Lake station. Figure 2 provides a wind rose for the Longview Texas Regional Airport station.

Figure 2. Wind Rose for Longview Texas Regional Airport (2012-2014)



Geography and Topography (Mountain Ranges or Other Air Basin Boundaries)

The area is generally flat, rural and agricultural, without mountains ranges or restrictive geological features likely to affect predictive air impacts of SO_2. Martin Lake station is surrounded on three sides by an artificial water reservoir, Martin Lake, which will likely affect the location of the highest meaningful impact of modeled SO_2 emissions.

Jurisdictional Boundaries

Once the geographic area associated with the immediate area surrounding Martin Lake station, and any nearby areas which may potentially be contributing to elevated levels of SO_2 around the facility are determined, existing jurisdictional boundaries are considered for the purpose of informing our intended nonattainment area, specifically with respect to clearly defined legal boundaries.

Modeling provided by Sierra Club asserts that portions of Gregg, Panola and Rusk Counties are in exceedance of the 2010 SO_2 1-hr standard. There are two other larger emitters of SO_2 located in neighboring Harrison County. Pirkey was the largest, with greater than 7,200 tons of SO_2 in 2011, and more than 2,900 tons emitted in 2014. Harrison County, along with any other undesignated areas in Texas, will be designated by either December 31, 2017, or December 31, 2020, consistent with the deadlines of the final consent decree.

The EPA believes that our intended nonattainment area designation, consisting of portions of Gregg, Panola, and Rusk Counties, has a clearly defined legal boundary, and we find it to be a suitably clear basis for defining our intended nonattainment area.

Other Relevant Information

As noted above, the EPA received air dispersion modeling results from Sierra Club, asserting that SO_2 emissions from Martin Lake station have associated impacts that exceed the 1-hr NAAQS. The discussion and analysis that follows below will reference Sierra Club's use of the Modeling TAD, the EPA's assessment of Sierra Club's modeling in accordance with EPA's December 2013 SO_2 NAAQS Designations Technical Assistance Document (Modeling TAD), and the factors for evaluation contained in the EPA's March 20, 2015 guidance, as appropriate.

Model Selection and Modeling Components

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

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

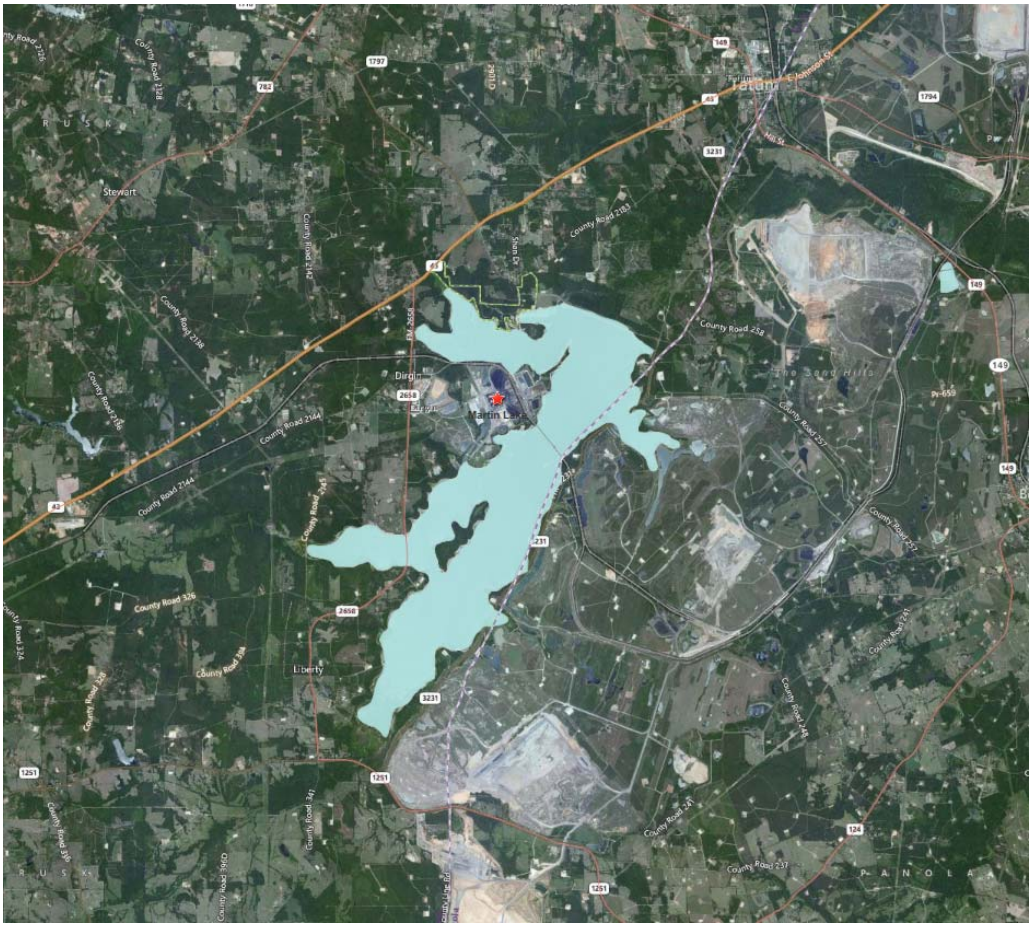
Sierra Club used AERMOD version 14134, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate. While the version of AERMOD used in Sierra Club's modeling is not the latest version of the model available, the EPA does not believe that updating the model version and rerunning with the same model inputs and options would result in significantly different modeled impacts or change our intended designation for the area of analysis. The EPA conducts tests cases for newly released versions of AERMOD to document the differences in several "standard" test case scenarios to compare results with previous releases of the model.[27] Review of version 15181 test case results and comparison with version 14134 shows that the updated model version impacts modeled results for only a small subset of the test scenarios (capped and horizontal stacks and multiple urban areas), which are not applicable to Martin Lake station. Therefore, we do not anticipate that rerunning the model with the later model version would significantly impact the modeled concentrations, especially considering the magnitude Sierra Club's modeling results relative to the NAAQS.

[27] AERMOD test case information available at the following website: http://www3.epa.gov/ttn/scram/dispersion_prefrec.htm.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, Sierra Club determined that it was most appropriate to run the model in rural mode. Based on review of aerial images of the area surrounding Martin Lake station, we agree with Sierra Club's determination that the area is best defined as rural. Figure 3 includes an aerial image showing the area surrounding Martin Lake station.

Figure 3: Area Surrounding Martin Lake Electrical Station



Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding Martin Lake station is to determine the extent of the area of analysis, i.e., receptor

grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. For the Martin Lake area, Sierra Club has included Pirkey, which is within 24 km of the facility in the area of analysis. Sierra Club determined that this was appropriate in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. Sierra Club included receptors out to 50 km, which is the nominal distance for SO_2 in AERMOD. The grid receptor spacing for the area of analysis chosen by the state is as follows:

- 100 meter grid from center of Martin Lake station out to 5 km,
- 500 meter grid centered on Martin Lake station out to 10 km, and
- 1000 meter (1 km) grid centered on Martin Lake station out to 50 km.

The receptor network contained 21,201 receptors and covered Rusk, Panola, Harrison and Gregg Counties, Texas. The network also covered portions of southern Upshur and Marion Counties, northeastern Cherokee County, northern Nacogdoches County and northwestern Shelby County, Texas. Sierra Club modeling used a slightly elevated flagpole receptor height, but if this was corrected to EPA's recommended height we would expect only a slight change in the modeled numbers and the area of exceedances and magnitude of the values would be basically the equivalent and not change our proposed action.

Figure 4 shows Sierra Club's chosen area of analysis surrounding Martin Lake station, and the receptor grid for the area of analysis. Figure 5 shows Sierra Club's predicted impacts for the 2012 – 2014 actual emissions from the facility. The impacts of the area's geography and topography will follow in the appropriate section.

Figure 4: Sierra Club's Modeling Grid for Martin Lake Electrical Station Area of Analysis

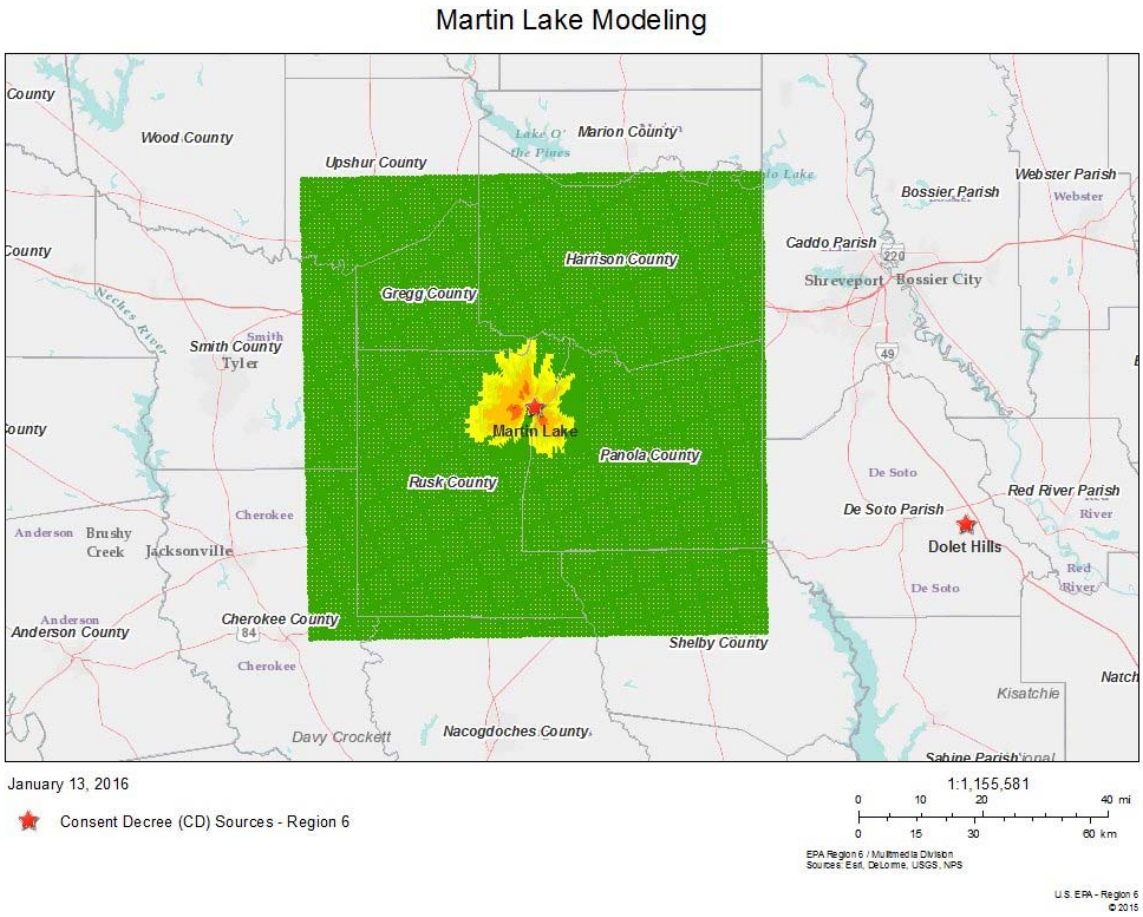
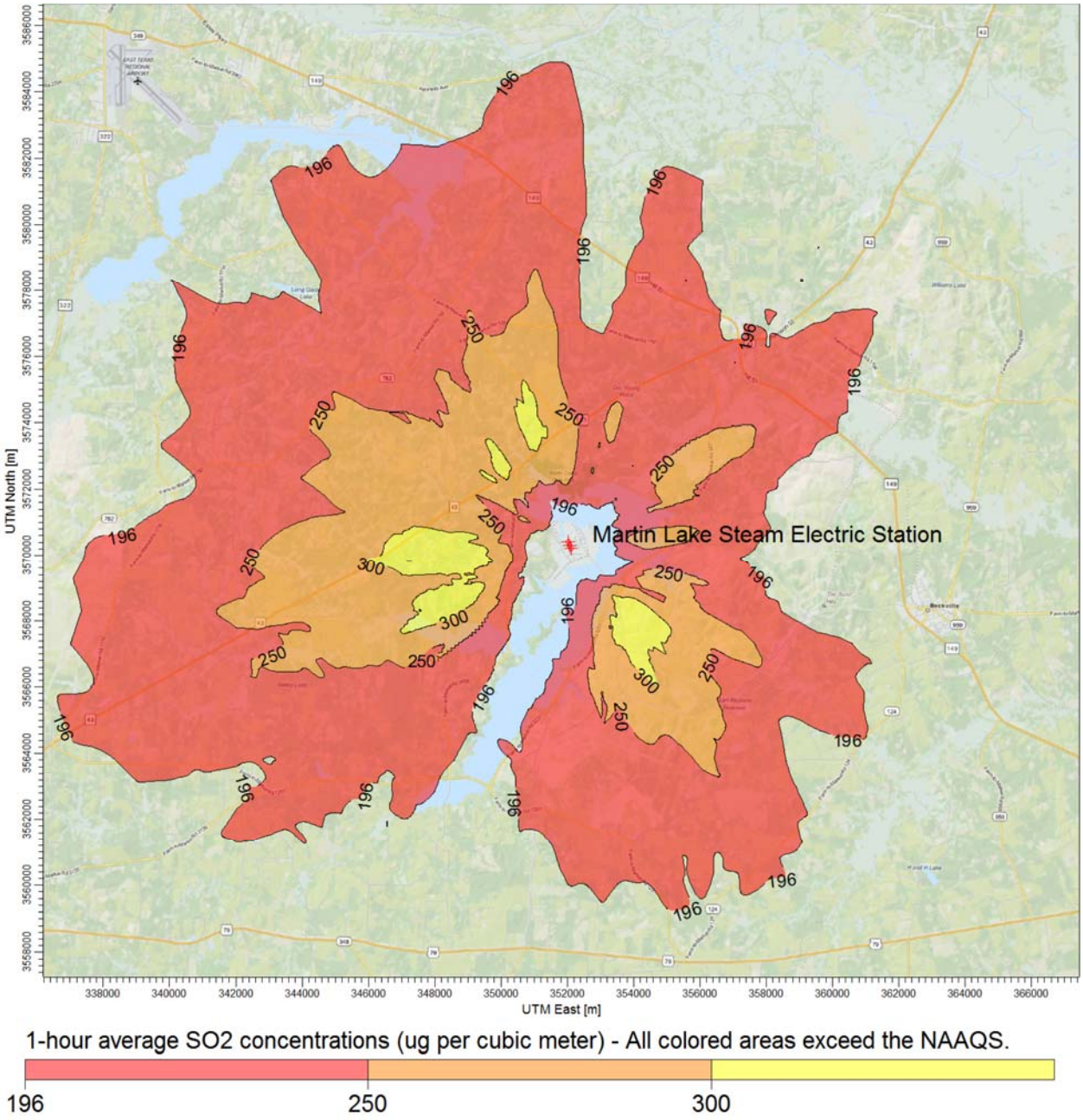


Figure 5: Sierra Club's Predicted Impact for the Martin Lake Electrical Station Area of Analysis



Modeling Parameter: Source Characterization

Sierra Club characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, it used actual stack heights in conjunction with actual emissions. Variable stack temperatures and velocities were not included because they are not publically available for use by Sierra Club. Similar to variable stack parameters, building information was not publically available. Therefore, Sierra Club did not include building downwash in their analysis stating that this was the conservative approach and would likely

underestimate impacts from emissions. While, we do not agree with Sierra Club's assertion that exclusion of downwash is conservative in all cases, we do not believe that inclusion of building information and associated downwash in this analysis would change our recommended designation of nonattainment. The modeling values are sufficiently above the standard and inclusion of downwash often leads to higher concentrations closer to the source but even in situations we have seen where this did not occur, any decreases in maximum modeled values from inclusion of downwash were relatively small and not expected to be enough of a decrease to resolve all modeled exceedance values in Rusk County.

Modeling Parameter: Emissions

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

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

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

As previously noted, Sierra Club included Martin Lake station and Pirkey, which is within 24 km of Martin Lake station, in the area of analysis. This distance and these facilities were selected because Sierra Club believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the sources which might contribute to those concentrations. No other sources beyond were determined by Sierra Club to have the potential to cause significant concentration gradient impacts within the area of analysis. The facilities in the area of analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below in Table 3.

Table 3: Actual SO_2 Emissions from Facilities in the Martin Lake Electrical Station Area of Analysis 2012 – 2014, Provided by Sierra Club

Company ID	Facility Name	SO_2 Emissions (tons per year)		
		2012	2013	2014
EFH	Martin Lake Electrical Station	43,093	62,735	53,656
AEP	H.W. Pirkey Power Plant	3,853	7,339	2,916
Total Emissions	All Facilities	46,946	70,074	56,572

For Martin Lake station and Pirkey, Sierra Club used actual emissions from the most recent 3-year data set, i.e., 2012 – 2014. This emissions data was obtained from emissions data reported to the EPA Air Markets Program Data.

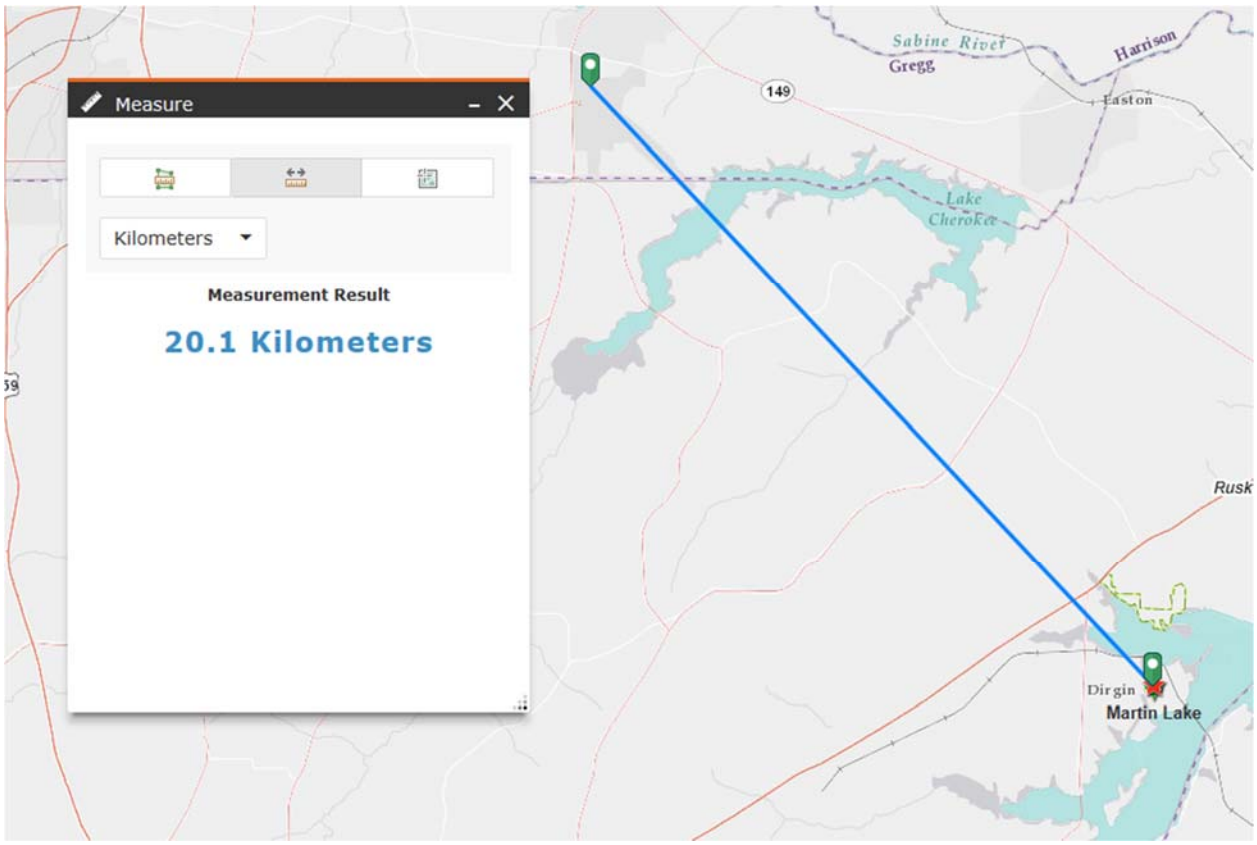
Modeling Parameter: Meteorology and Surface Characteristics

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

For the Martin Lake area of analysis, surface meteorology from Longview Texas Regional Airport, and coincident upper air observations from the NWS station in Shreveport, Louisiana were selected by Sierra Club as best representative of meteorological conditions within the area of analysis.

Sierra Club used AERSURFACE version 13016 from the NWS station in Longview, Texas (located at latitude 32.390920 N, longitude 94.713940 W) to estimate the surface characteristics of the area of analysis. Sierra Club estimated values for twelve spatial sectors out to 1.0 km at a seasonal temporal resolution for average conditions. Sierra Club also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo"). In Figure 6 below, the location of the Longview, Texas NWS station is shown relative to Martin Lake station.

Figure 6: Martin Lake Electrical Station and the Longview, Texas NWS



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The Sierra Club analysis was conducted in adherence to all available EPA guidance for evaluating source impacts on attainment of the 1-hour SO_2 NAAQS via aerial dispersion modeling, including the AERMOD Implementation Guide; EPA's Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010; modeling guidance promulgated by EPA in Appendix W to 40 CFR Part 51; EPA's March 2011 Modeling Guidance for SO_2 NAAQS Designations; and EPA's Modeling TAD in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-

ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, Sierra Club set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with EPA's March 8, 2013 memo entitled, "Use of ASOS Meteorological Data in AERMOD Dispersion Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as to rural and gently rolling. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Rusk County area of analysis, the Sierra Club used the 2011-13 design value for El Paso. The Sierra Club stated that this was the lowest background for the entire state and was therefore a conservative assumption. The background concentration for this area of analysis was determined by SC to be 7.8 micrograms per cubic meter ($\mu g/m^3$), or 20.4 ppb,[28] and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

The AERMOD modeling parameters for the Martin Lake area of analysis, as provided by Sierra Club, are summarized below in Table 4.

Table 4: AERMOD Modeling Parameters for the Martin Lake Electrical Station Area of Analysis, Provided by Sierra Club

Martin Lake Electric Station Area of Analysis	
AERMOD Version	14134
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	4

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

Modeled Structures	0
Modeled Fencelines	0*
Total receptors	21,201
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Longview, Texas
Upper Air Meteorology Station	Shreveport, Louisiana
Methodology for Calculating Background SO_2 Concentration	Design Value
Calculated Background SO_2 Concentration	7.8 $\mu g/m^3$

*While the Sierra Club modeling did not specifically include a fenceline in their modeling analysis, the EPA did compare the modeled results with fenceline information from previous industry dispersion modeling to confirm that the modeled exceedances of the NAAQS shown in Sierra Club's analysis did occur in ambient air.

The results presented below in Table 5 show the magnitude and geographic location of the highest predicted modeled concentration of SO_2 based on actual emissions.

Table 5: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Martin Lake Electrical Station Area of Analysis Based on Actual Emissions, Provided by Sierra Club

Averaging Period	Data Period	Receptor Location		SO_2 Concentration ($\mu g/m^3$) Based on Actual Emissions	
		UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	348067.310	3570214.750	347.71	196.5*

* Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

Sierra Club's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 347.71 $\mu g/m^3$, or 132.7 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. This highest predicted values occurred to the east of the facility, with concentrations above 300 $\mu g/m^3$ predicted to the southwest and north of the facility as well. The modeled concentrations are graphically represented along with all the other receptors in Figures 4 and 5, above.

Sierra Club also included individual modeled results for the two facilities (Martin Lake station and Pirkey) in their submittal using source group based model outputs. The maximum modeled

impacts from Pirkey alone, not including background, were 40.9 μg/m^3, or 15.6 ppb. The maximum modeled impacts from Martin Lake station alone, not including background, were 339.8 μg/m^3, or 129.7 ppb. Based on the relatively low modeled impacts from Pirkey; the fact that impacts from Martin Lake station alone are only 0.1 μg/m^3 lower than the combined impacts (339.9 μg/m^3, excluding background); and the fact the closest receptor showing a modeled NAAQS violation is approximately 12 km from this Harrison County facility, it is not clear that the Pirkey Station contributes to the modeled exceedances. While Sierra Club's submittal did include information about the overall maximum impacts from Pirkey, it did not include a source contribution analysis or model output necessary to further examine the magnitude of contributions from this facility to each of the modeled violations surrounding Martin Lake station. Therefore, as previously mentioned, our intended nonattainment boundary excludes Harrison County. It is important to note that Pirkey was identified by Texas as a source subject to the SO_2 DRR, and it and the surrounding area in Harrison County will be specifically addressed in the next rounds of SO_2 designations.

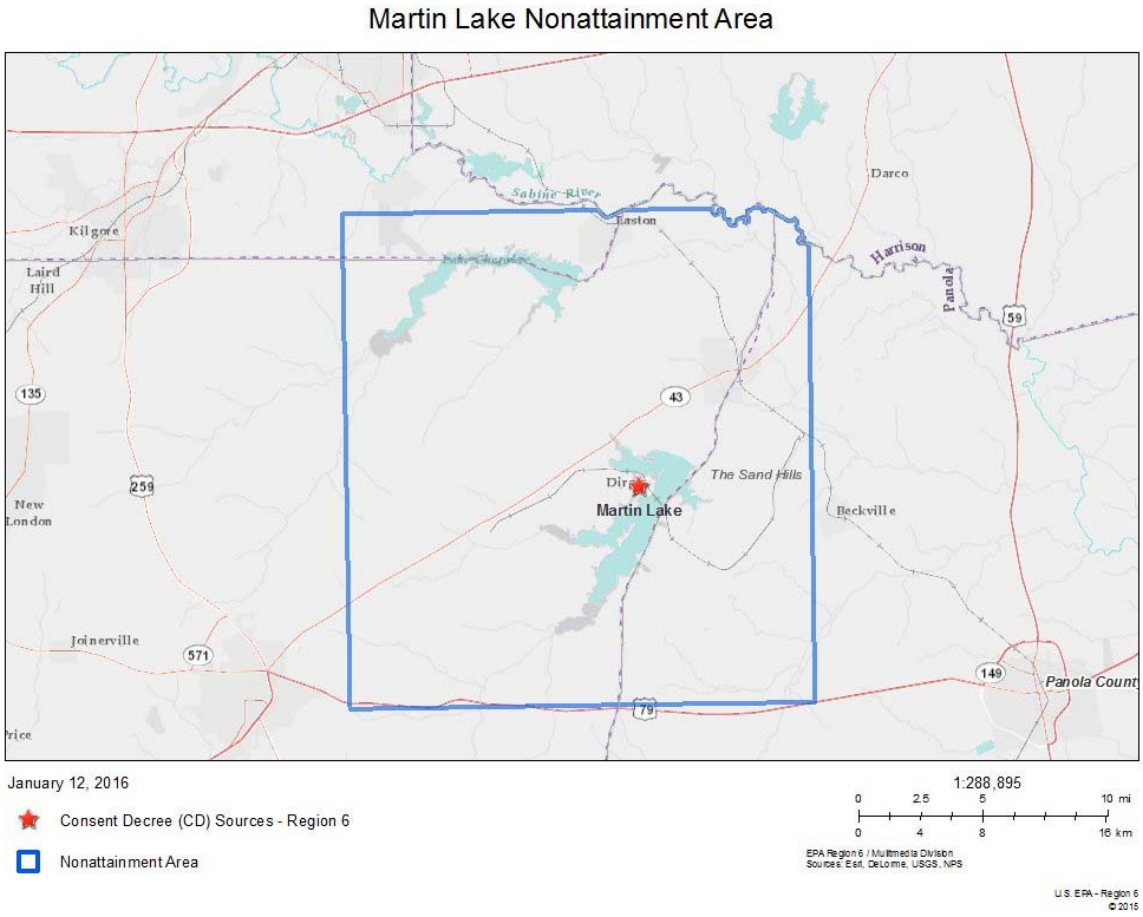
Conclusion

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information including the Sierra Club's modeling, the EPA intends to designate portions of Rusk, Gregg, and Panola Counties, Texas as nonattainment for the 2010 SO_2 NAAQS. Specifically, the intended nonattainment is comprised of the area bounded by the following UTM coordinates in meters (NAD83 Datum, Zone 15):

X	Y
336067,	3585315
336067,	3558314
361568,	3558314
361568,	3585315

The nonattainment area excludes the portions of Harrison County, Texas that fall within the area bounded by the listed UTM coordinates. Harrison County is excluded from the nonattainment area on the basis that none of the modeled receptors in this county were shown to violate the 2010 SO_2 NAAQS. Figure 7 below graphically illustrates our intended nonattainment area.

Figure 7: Proposed Nonattainment Area for Martin Lake Electrical Station



Our intended designation is made based on the modeling of actual emissions reported from the facility during the 2012 to 2014 calendar years. An analysis of the modeling data, performed by Sierra Club, indicates it was performed substantially in accordance with appropriate EPA modeling guidance and using generally conservative assumptions.

The modeling did not include building downwash or variable stack temperature and velocity, since Sierra Club did not have access to information needed to support such inclusion. Building downwash will generally, though not always, increase the predicted maximum modeled concentrations. Sierra Club used stack velocity and temperatures consistent with 100% load. This, coupled with actual hourly emission rates, should provide conservative estimates of actual concentrations because higher temperatures and velocities of 100% load when paired with lower emissions of less than 100% load should provide an overestimation of the dispersion and thus an underestimation of maximum concentrations. Given that modeled concentrations are almost double the standard, the inclusion of building downwash and variable stack parameters, etc. in the modeling would not result in values near or below the standard, therefore the modeling is sufficient for a determination of nonattainment. In addition to adequately characterizing Martin

Lake station, the Sierra Club modeling took into account emissions from other nearby facilities as well as a background concentration of SO_2.

Therefore, the EPA believes that Sierra Club's modeling is relevant information that must be considered in our designation decision. We received no additional relevant technical information from the state or other parties, besides that previously discussed. Based on the information available showing that the area in the vicinity of Martin Lake station does not meet the 1-hr SO_2 standard, we intend to designate the area as nonattainment. EPA's intended boundaries for the nonattainment area encompass the area shown to be in violation of the standard and the source that contributes to the violation.

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

Technical Analysis for the Monticello Steam Electric Station,

Titus County, Texas

Introduction

The Titus County, Texas area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Monticello Steam Electric Station (Monticello station) emitted 31,447.2 tons of SO_2, and had an emissions rate of 0.784 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

In its submission, Texas recommended that the area surrounding Monticello station, specifically Titus County, be designated as unclassifiable/attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. The state's assessment and characterization was performed following the notion that any areas without appropriately cited and qualified monitors should be considered unclassifiable or attainment based on lack of monitored evidence that a violation of the NAAQS has occurred. After careful review of the state's assessment, supporting documentation, and all available data, the EPA does not agree with the state's recommendation for this area, and intends to designate the areas as nonattainment. Specifically, the boundaries for our intended nonattainment area are comprised of the portion of Titus County bounded by the following Universal Transverse Mercator (UTM) Coordinates in meters (NAD83 Datum, Zone 15):

X	Y
302329,	3666971
302329,	3660770
313530,	3660770
313530,	3666971

However, our intended nonattainment area does not include the portions of Camp County that fall within the area bounded by these UTM Coordinates on the basis that the modeled impacts at all receptors located in Camp County included in the area of analysis were less than the 1-hr SO_2 NAAQS. As discussed below, our intended designation for Titus County is based on the technical analysis, including dispersion modeling performed by Sierra Club and submitted to the EPA for review.

Monticello station is located in Northeast Texas in the central portion of Titus County. As seen in Figure 1 below, the facility is located approximately 10 km southwest of the center of Mount Pleasant, Texas. The closest nearby emitters of SO_2 are also shown in this figure. The facility is substantially surrounded by the waters of Lake Bob Sandlin to the west and south of the location. In Figure 2, the jurisdictional boundaries of Titus County, Texas, which is the state's recommended area for the unclassifiable/attainment designation are shown. The EPA's intended

designated nonattainment area and the affected counties are shown later in this document in Figure 8.

Figure 1. The Location of the Monticello Steam Electric Station.

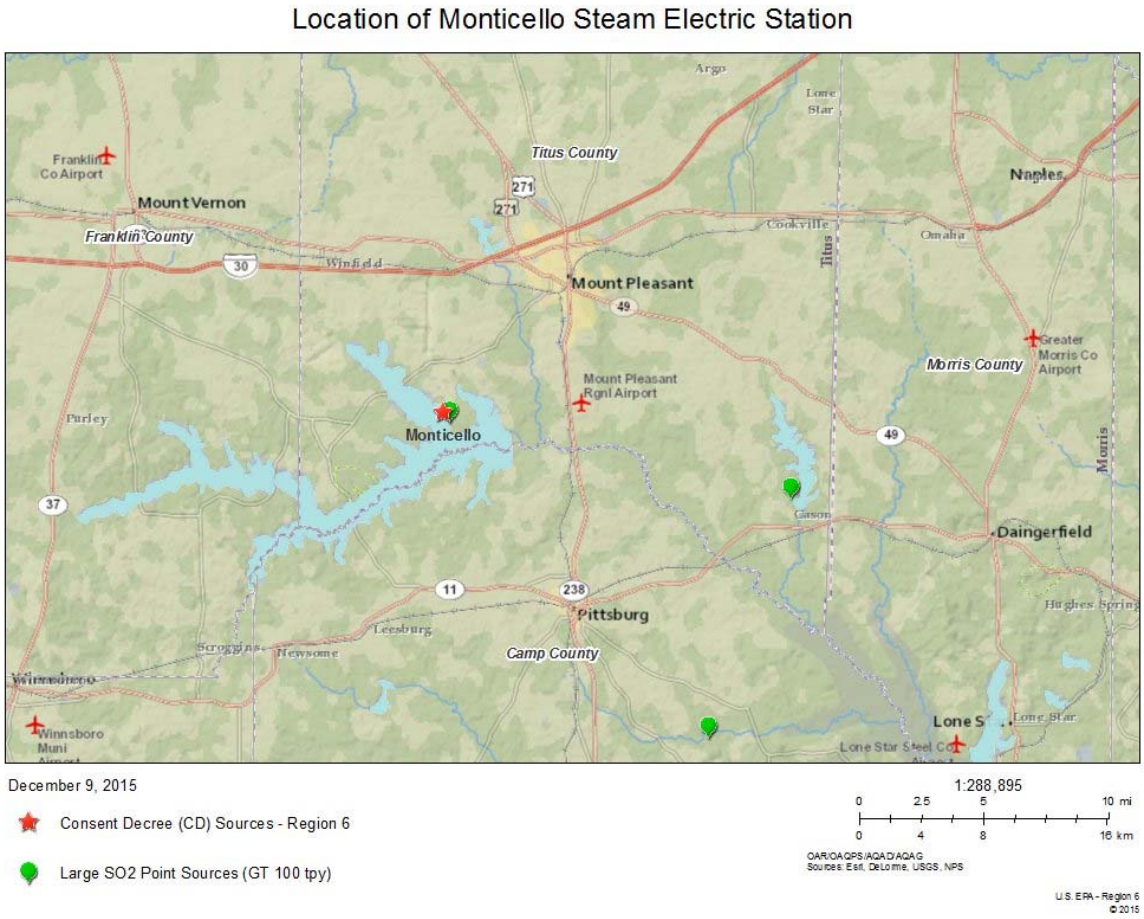
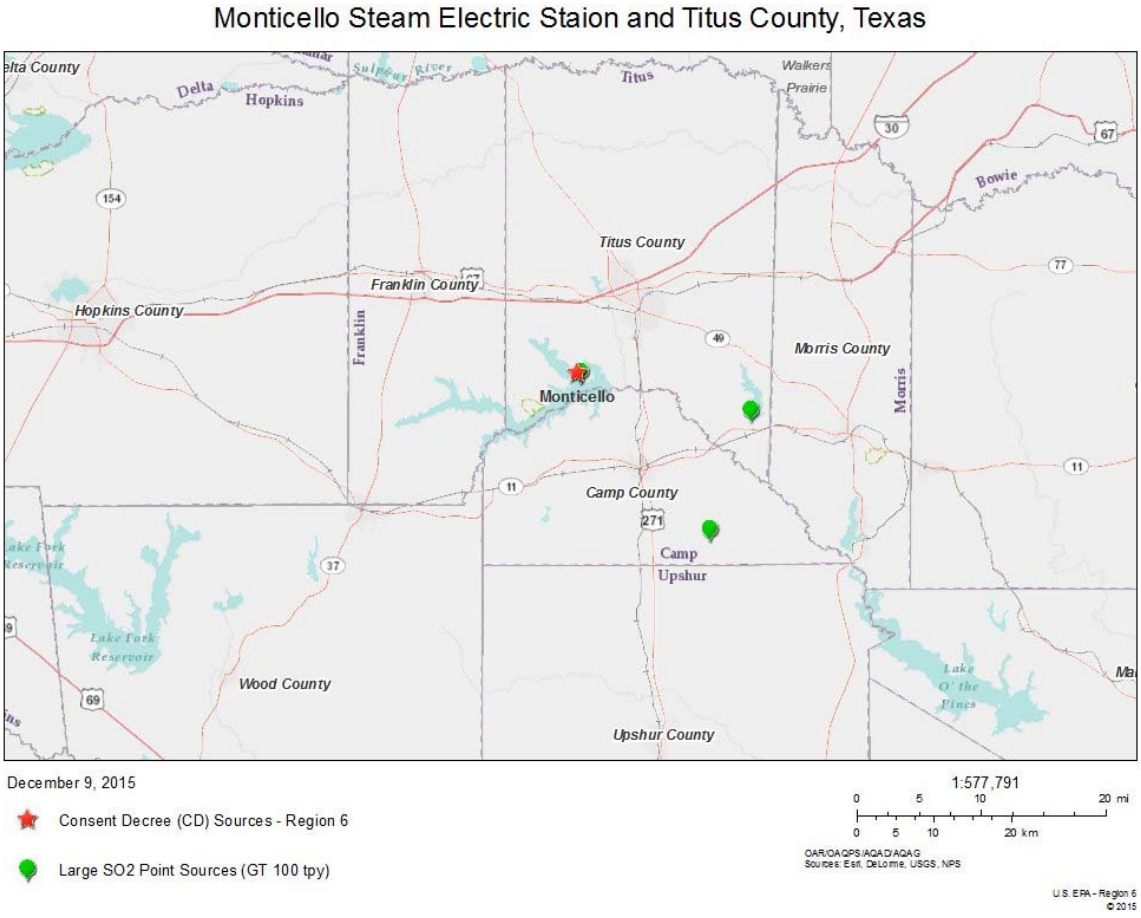


Figure 2. The Monticello Steam Electric Station, Nearby Large SO_2 Emitters, and Titus County, Texas Boundaries.



The discussion and analysis that follows below will reference the factors contained in the EPA's March 20, 2015 guidance, as appropriate.

Detailed Assessment

Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding Monticello station. The facility is located in Titus County; however, there are no ambient air quality monitors located in this county. The state did include the most recent 3 years of monitoring data, i.e., 2012 – 2014 in its recommendation for the closest neighboring county, i.e., Gregg County. Table 1 below shows information related to the monitor located in Gregg County, the closest

monitor to the Monticello site. The design value was confirmed through the EPA's 2014 design value report for SO_2.[29]

Table 1: Available Air Quality Data for the Area Closest to the Monticello Steam Electric Station County

County	Air Quality Systems (AQS) Monitor ID	Monitor Location	Distance to Monticello (km)	2012 – 2014 SO_2 Design Value (ppb)
Gregg	48-183-0001	Longview, Texas	85	50

Based on available ambient air quality collected between 2012 and 2014, the nearest county with a SO_2 monitor does not show a monitored violation of the 2010 SO_2 NAAQS. However, the absence of a violating monitor when considering the distance from the facility is not a sufficient technical justification to rule out that an exceedance of the 2010 SO_2 NAAQS may occur in the immediate vicinity of the facility.

Emissions and Emissions-Related Data

Evidence of SO_2 emissions from the source meeting the emissions criteria of the March 2, 2015 consent decree, i.e., Monticello station is an important factor for determining whether the immediate area is experiencing elevated levels of SO_2 concentrations. Other considerations for this factor include county level SO_2 emissions data, and data for sources located within 50 km.

Texas did not include any annual emissions data for sources in Titus County, nor did the state include any annual emissions data from sources in neighboring counties. The EPA therefore believes that it is reasonable to evaluate data obtained from the 2011 National Emissions Inventory (NEI).[30] The annual SO_2 emissions data for sources emitting at or above 100 tons per year in Titus and Camp Counties are summarized in Table 2 below. No emissions sources with SO_2 emissions at or above 100 tons per year were located in any of the other surrounding counties.

[29] The design value report for SO_2, as well as each of the other NAAQS, can be found at this link: http://www3.epa.gov/airtrends/values.html

[30] Detailed information for the 2011 NEI can be found at this link: http://www3.epa.gov/ttnchie1/net/2011inventory.html

Table 2: 2011 NEI SO_2 Emissions from Other Local Sources

County	Facility Name	Facility Subject to the Emissions Criteria of the March 2, 2015 consent decree?	Distance to Facility that Meets the Consent Decree Criteria in km	Facility Total SO_2 Emissions (Tons, based on 2011 NEI data)
Titus	Welsh Power Plant	No*	19	25,622.1
Camp	Pittsburg Gas Plant	No	22	104.9

*Welsh is under consent decree to shut down its unit 2 no later than December 31, 2016. Consequently, the EPA is not required under the court order to designate the area surrounding this source solely due to its amount of emissions, but may consider the source's impacts in designating other areas that it may affect.

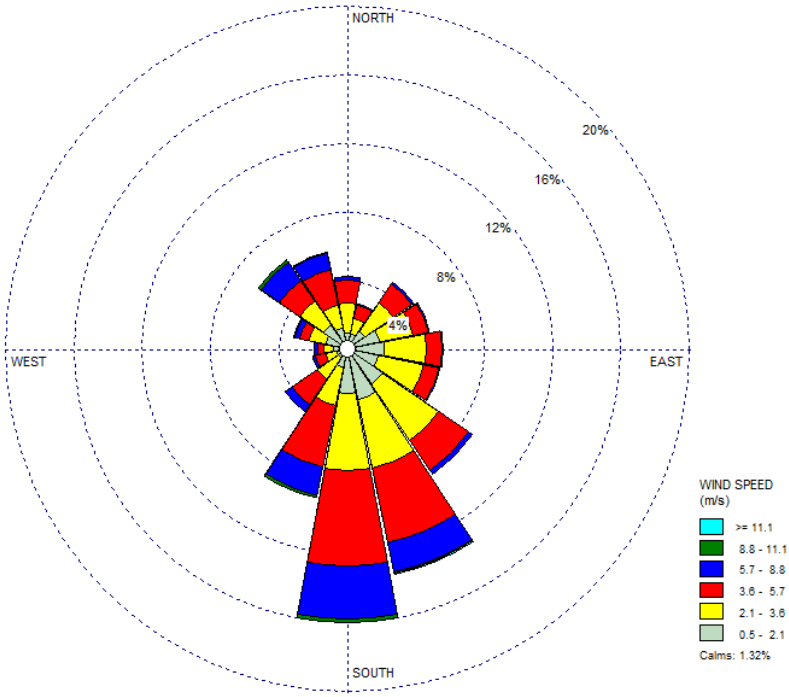
Emissions Controls

The EPA recognizes that control strategies implemented on the sources above that occurred after the release of the 2011 NEI may not be reflected, or may warrant further discussion. The EPA has not received any additional information on emissions reductions resulting from controls put into place after 2011.

Meteorology (Weather & Transport Patterns)

Evidence of source-receptor relationships between specific emissions sources and high SO_2 concentrations in the surrounding area is another important factor in determining the appropriate extent of the EPA's intended nonattainment area. As discussed below in the section titled, "Other Relevant Information", surface meteorological records for the nearest National Weather Service (NWS) meteorological station at the Longview Texas Regional Airport and upper air meteorological data from NWS station in Shreveport, Louisiana, were used by Sierra Club to model the effects of meteorology and emission on the area surrounding Monticello station. Figure 3 provides a wind rose for the Longview Texas Regional Airport station.

Figure 3. Wind Rose for Longview Texas Regional Airport (2012-2014)



Geography and Topography (Mountain Ranges or Other Air Basin Boundaries)

The area is rural in nature without any confining geographical features to consider in the analysis. The station is located next to a recreational lake and the company property is relatively large encompassing several service yards.

Jurisdictional Boundaries

Once the geographic area associated with the immediate area surrounding Monticello station, and any nearby areas which may potentially be contributing to elevated levels of SO_2 around the facility are determined, existing jurisdictional boundaries are considered for the purpose of informing our intended unclassifiable area, specifically with respect to clearly defined legal boundaries.

Modeling provided by the Sierra Club asserts that portions of Titus County are in exceedance of the 2010 SO_2 1-hr standard. There are two other sources in Titus County with emissions greater than 100 tons of SO_2, according to the 2011 NEI. The larger of these is the Welsh Power Plant (Welsh), which emitted 25,622 tons of SO_2, and the smaller is the Pittsburg Plant (Pittsburg), which emitted 105 tons of SO_2. Both facilities are located approximately 20 km from Monticello station. Sierra Club included emissions from Welsh in their modeling analysis but excluded Pittsburg. Based on the magnitude of emissions from these two facilities and their distance from Monticello station, we agree with Sierra Club's approach to include the larger source in their

modeling because of the potential for this source to contribute to a potential violation in the area of analysis. We discuss later in the document how the intended nonattainment boundary was determined and the basis for excluding Welsh from the boundary.

The EPA believes that our intended nonattainment area, consisting of portions of Titus County in Texas comprise clearly defined legal boundaries, and we find these boundaries to be a suitably clear basis for defining our intended nonattainment area.

Other Relevant Information

As noted above, the EPA received air dispersion modeling results from Sierra Club asserting that violations of the NAAQS occur in the area around Monticello station. This initial modeling was provided to the EPA on September 11, 2015. The Texas Commission of Environmental Quality (TCEQ) submitted a letter on November 17, 2015, to the EPA to provide comments on the Sierra Club's modeling analysis for facilities in Texas, including Monticello station, noting that the initial Sierra Club modeling was conducted with only one year of meteorological data instead of three, modeled actual emission rates were not consistent with CAMD for certain hours, and that modeled maximum impacts occurred on-property. TCEQ also commented on the alternative modeling Sierra Club conducted using allowable emissions, as well as, on statements that Sierra Club included in their modeling report regarding contribution of specific sources to modeled violations without detailed analysis to support the claim. In response, Sierra Club updated its modeling for the area and submitted the results to the EPA on December 15, 2015. The review that follows is based on the December 15, 2015 modeling which asserts that SO_2 emissions from Monticello station have associated modeled impacts that exceed the 1-hr NAAQS. Our discussion and analysis will reference Sierra Club's use of the EPA's December 2013 SO_2 NAAQS Designations Technical Assistance Document (Modeling TAD), the EPA's assessment of Sierra Club's modeling in accordance with the Modeling TAD, and the factors for evaluation contained in the EPA's March 20, 2015 guidance, as appropriate.

Model Selection and Modeling Components

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

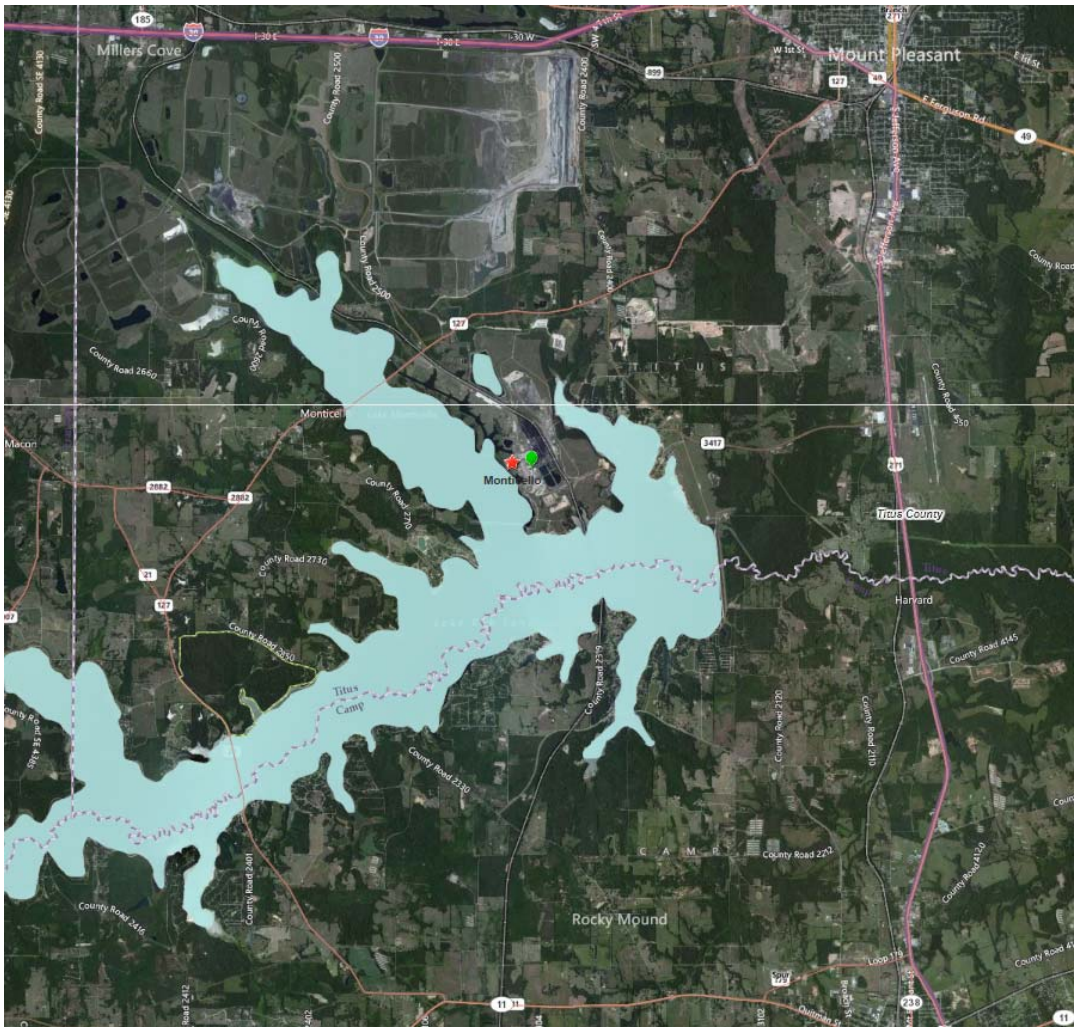
- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRIME: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: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

Sierra Club used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, Sierra Club determined that it was most appropriate to run the model in rural mode. Based on review of aerial images of the area surrounding Monticello station, we agree with Sierra Club's determination that the area is best defined as rural. Figure 4 includes an aerial image showing the area surrounding Monticello station.

Figure 4: Area Surrounding Monticello Steam Electrical Station



Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding Monticello station is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. For the area around Monticello station, Sierra Club has included one other emitter of SO_2 that has the potential to create concentration gradients in the area near Monticello station and within Titus, Camp and Morris Counties. Sierra Club determined that inclusion of Welsh emissions was appropriate in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. We agree that in addition to Monticello station, the Welsh facility had the ability to result in concentration gradients within Titus, Morris and Camp Counties (based on emissions, meteorology and proximity to the Monticello facility and Morris and Camp Counties) and should be included in the modeling for Titus County. Sierra Club included receptors out to 50 km, which is the nominal distance for SO_2 in AERMOD. The grid receptor spacing for the area of analysis chosen by the state is as follows:

- 100 meter grid from center of Monticello station out to 5 km,
- 500 meter grid centered on Monticello station out to 10 km, and
- 1000 meter (1 km) grid centered on Monticello station out to 50 km.

The receptor network contained 21,201 receptors, and the network covered a large portion of Northeast Texas including all of Titus, Franklin, Morris and Camp Counties. The network also covered portions of Hopkins, Delta, Lamar, Red River, Bowie, Cass, Marion, Harrison, Gregg, Upshur and Wood Counties. This is a larger grid than we might normally recommend but was also necessary to assess impacts of the Welsh facility emissions on Titus County. Sierra Club modeling used a slightly elevated receptor height, but if this was corrected to EPA's recommended height we would expect only a slight change in the modeled numbers and the area of exceedances and magnitude of the values would be basically the equivalent and not change our proposed action.

Figure 5 shows Sierra Club's chosen area of analysis surrounding Monticello station. Figure 6 shows Sierra Club's modeled impacts for the area of analysis. The impacts of the area's geography and topography will follow in the appropriate section.

Figure 5: Sierra Club's Modeling Grid for Monticello Steam Electric Station Area of Analysis

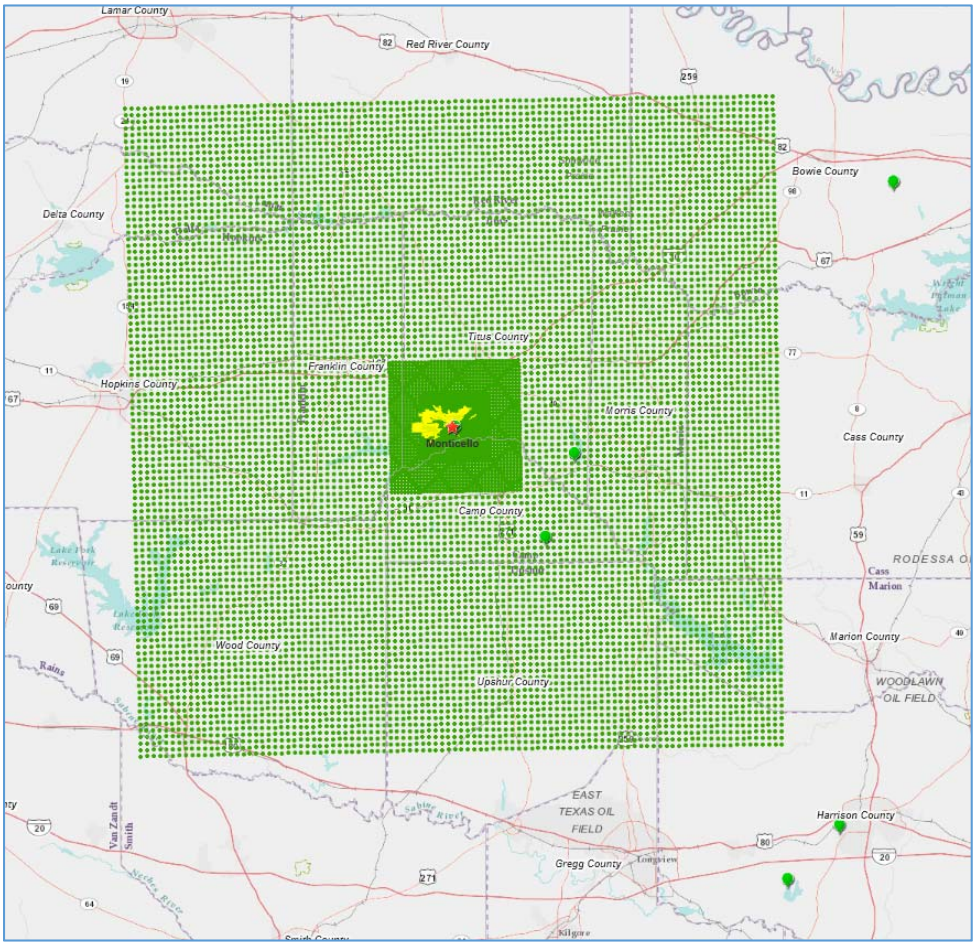
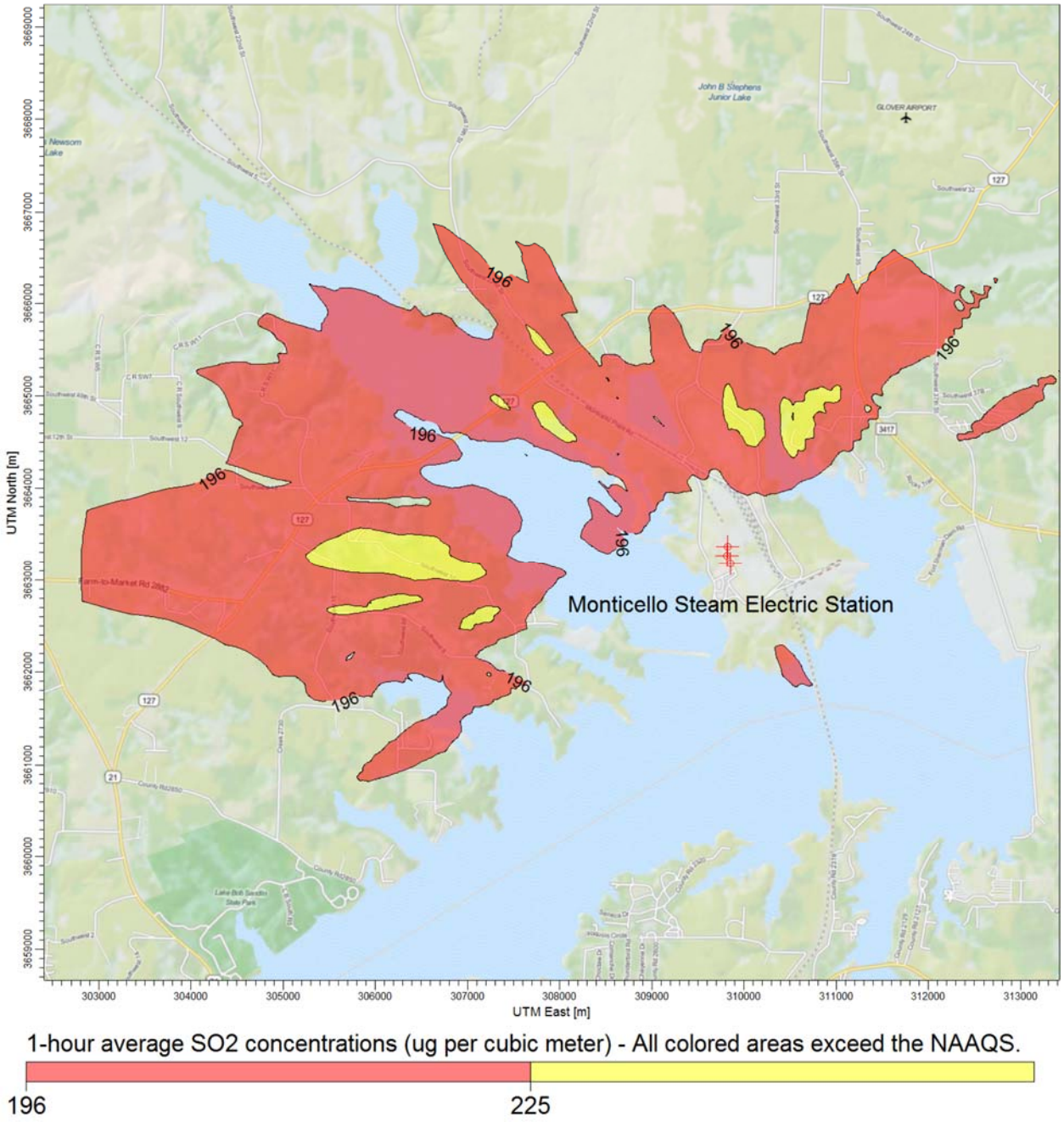


Figure 6: Sierra Club's Modeled Impacts using Actual Emissions from 2012 – 2014 for the Monticello Steam Electric Station Area of Analysis



Modeling Parameter: Source Characterization

Sierra Club characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Sierra Club characterized the source locations and stack parameters, e.g., exit temperature, exit velocity, and diameter. Variable stack temperatures and velocities were not included because they are not publically available for use by Sierra Club.

Similar to variable stack parameters, building information was not publically available. Therefore, Sierra Club did not include building downwash in their analysis stating that this was the conservative approach and would likely underestimate impacts from emissions resulting in lower modeled concentrations than modeling that included building downwash. While we do not agree with Sierra Club's assertion that exclusion of downwash is conservative in all cases, we do not believe that inclusion of building information and associated downwash in this analysis would change our recommended designation of nonattainment. The modeling values are sufficiently above the standard and inclusion of downwash often leads to higher concentrations closer to the source but even in situations we have seen where this did not occur, any decreases in maximum modeled values from inclusion of downwash were relatively small and not expected to be enough of a decrease to resolve all modeled exceedance values in Titus County.

Modeling Parameter: Emissions

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

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

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

As previously noted, Sierra Club included Monticello station and one other emitter of SO_2 within 50 km in the area of analysis. This distance and these facilities were selected because Sierra Club believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the sources which might contribute to those concentrations. No other sources beyond 50 km were determined by Sierra Club to have the potential to cause significant concentration gradient impacts within the area of analysis. The

facilities in the area of analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below.

For the following facilities in the area of analysis, Sierra Club included actual hourly SO_2 emissions rates between 2012 and 2014 taken from the EPA Air Markets Program Data. This information is summarized as annual emissions in Table 3 below.

Table 3: Actual SO_2 Emissions from Facilities in the Monticello Steam Electric Station Area of Analysis, 2012 – 2014. Provided by Sierra Club.

Company ID	Facility Name	SO_2 Emissions (tons per year)		
		2012	2013	2014
Luminant	Monticello Steam Electric Station	31,447	24,396	20,438
AEP/SWEPCO	Welsh Power Plant	23,212	19,720	18,225
Total Emissions	All Facilities	54,659	44,116	38,663

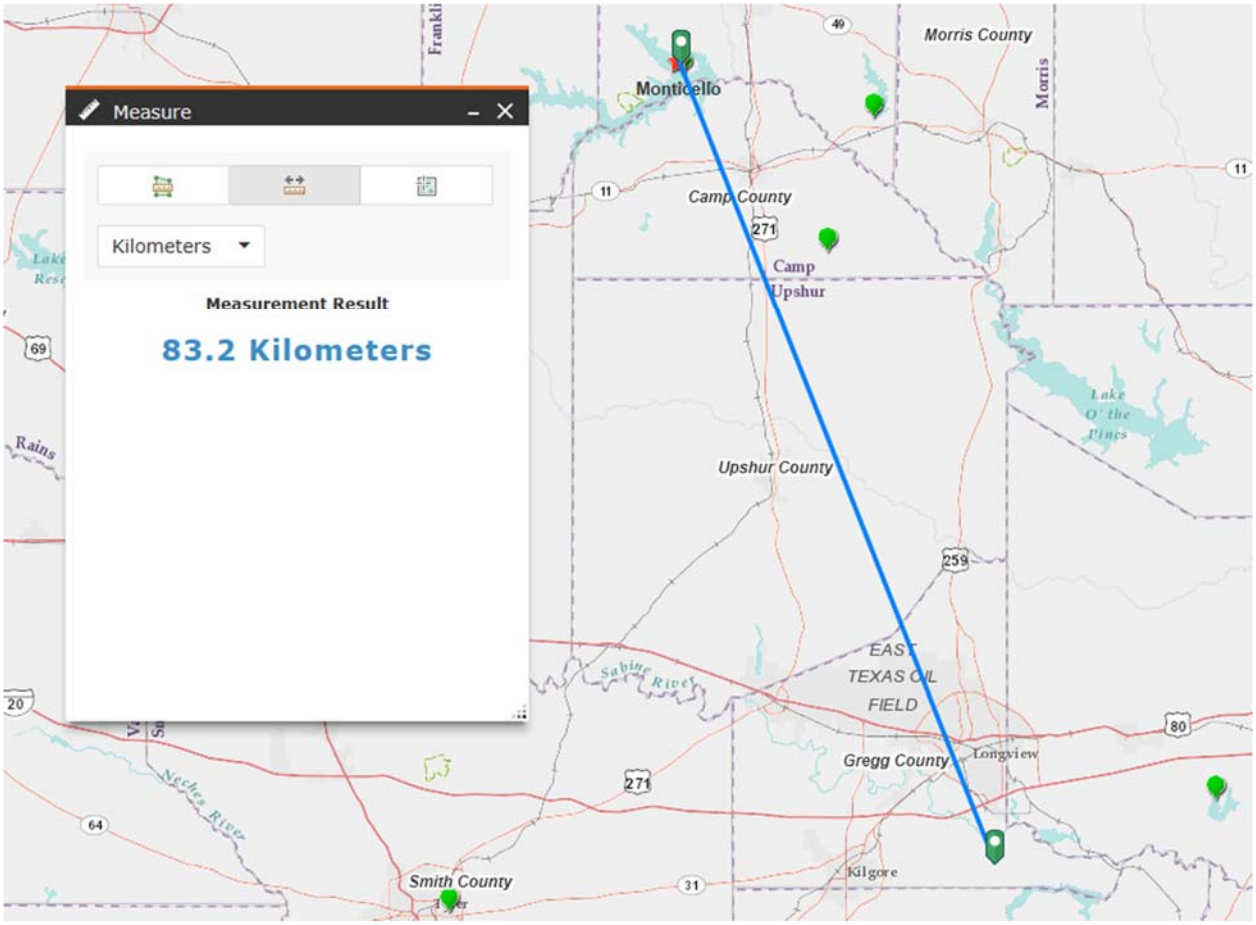
Modeling Parameter: Meteorology and Surface Characteristics

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

For the Monticello area of analysis, surface meteorology from the NWS station in Longview, Texas, 84 km to the south southeast, and coincident upper air observations from the NWS station in Shreveport, Louisiana, 134 km to the southeast were selected by Sierra Club as best representative of meteorological conditions within the area of analysis.

Sierra Club used AERSURFACE version 13036 from the NWS station in Longview, Texas (located at Latitude 32.390920 N and Longitude 94.713940 W) to estimate the surface characteristics of the area of analysis. Sierra Club estimated values for twelve spatial sectors out to one km at a seasonal temporal resolution for average moisture conditions. Sierra Club also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo"). In the figure below, the location of the Longview, Texas NWS station is shown relative to Monticello station.

Figure 7: Monticello Steam Electric Station Area of Analysis and the Longview, Texas NWS



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The Sierra Club analysis was conducted in adherence to all available EPA guidance for evaluating source impacts on attainment of the 1-hour SO_2 NAAQS via aerial dispersion modeling, including the AERMOD Implementation Guide; EPA's Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010; modeling guidance promulgated by EPA in Appendix W to 40 CFR Part 51; EPA's March 2011 Modeling Guidance for SO_2 NAAQS Designations; and EPA's Modeling TAD in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

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

minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, Sierra Club set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with EPA's March 2013 memo entitled, "Use of ASOS Meteorological Data in AERMOD Dispersion Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as gently rolling. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Titus, Camp and Franklin County area of analysis, the Sierra Club used the 2011-13 design value for El Paso. The Sierra Club stated that this was the lowest background for the entire state and was therefore a conservative assumption. The background concentration for this area of analysis was determined by the state to be 7.8 micrograms per cubic meter ($\mu g/m^3$), or 2.98 ppb,[31] and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

The AERMOD modeling parameters for the Monticello Steam Electric Station area of analysis, as provided by Sierra Club, are summarized below in Table 4.

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

Table 4: AERMOD Modeling Parameters for the Monticello Steam Electric Station Area of Analysis, Provided by Sierra Club

Monticello Steam Electric Station Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	5
Modeled Structures	0
Modeled Fencelines	0*
Total receptors	21,201
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Longview, Texas
Upper Air Meteorology Station	Shreveport, Louisiana
Methodology for Calculating Background SO_2 Concentration	Design Value
Calculated Background SO_2 Concentration	7.8 $\mu g/m^3$

*While the Sierra Club modeling did not specifically include a fenceline in their modeling analysis, the EPA did compare the modeled results with fenceline information from previous industry dispersion modeling to confirm that the modeled exceedances of the NAAQS shown in Sierra Club's analysis did occur in ambient air.

The results presented below in Table 5 show the magnitude and geographic location of the highest predicted modeled concentration of SO_2 based on actual emissions.

Table 5: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Monticello Steam Electric Station Area of Analysis Based on Actual Emissions, Provided by Sierra Club

		Receptor Location		SO_2 Concentration ($\mu g/m^3$) Based on Actual Emissions	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	310129.030	3664670.500	237.26	196.5*

* Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

Sierra Club's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 237.26 $\mu g/m^3$, or 90.7 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the

facilities. This highest predicted value occurred approximately 1.5 km to the north northeast of the facility center and is described in Table 5, above.

Sierra Club also included individual modeled results for the two facilities (Monticello station and Welsh) in their submittal using source group based model outputs. The maximum modeled impacts from Welsh alone, not including background, were 124.2 $\mu g/m^3$, or 47.4 ppb. The maximum modeled impacts from Monticello station alone, not including background, were 229.4 $\mu g/m^3$, or 87.6 ppb. Based on the fact that impacts from Monticello station alone are only 0.1 $\mu g/m^3$ lower than the combined impacts (229.5 $\mu g/m^3$, excluding background); the magnitude of modeled impacts from Welsh; and the and the fact the closest receptor showing a modeled NAAQS violation is approximately 16 km from the Welsh facility, it is not clear that Welsh contributes to the modeled NAAQS exceedances. While Sierra Club's submittal did include information about the overall maximum impacts from Welsh, it did not include a source contribution analysis or model output necessary to further examine the magnitude of contributions from this facility to each of the modeled violations surrounding Monticello station. Therefore, our intended nonattainment boundary does not include Welsh and is limited to the immediate area surrounding Monticello station. It is important to note that Welsh was identified by Texas as a source subject to the SO_2 DRR, and it and the surrounding area in Titus County will be specifically addressed in the next rounds of SO_2 designations.

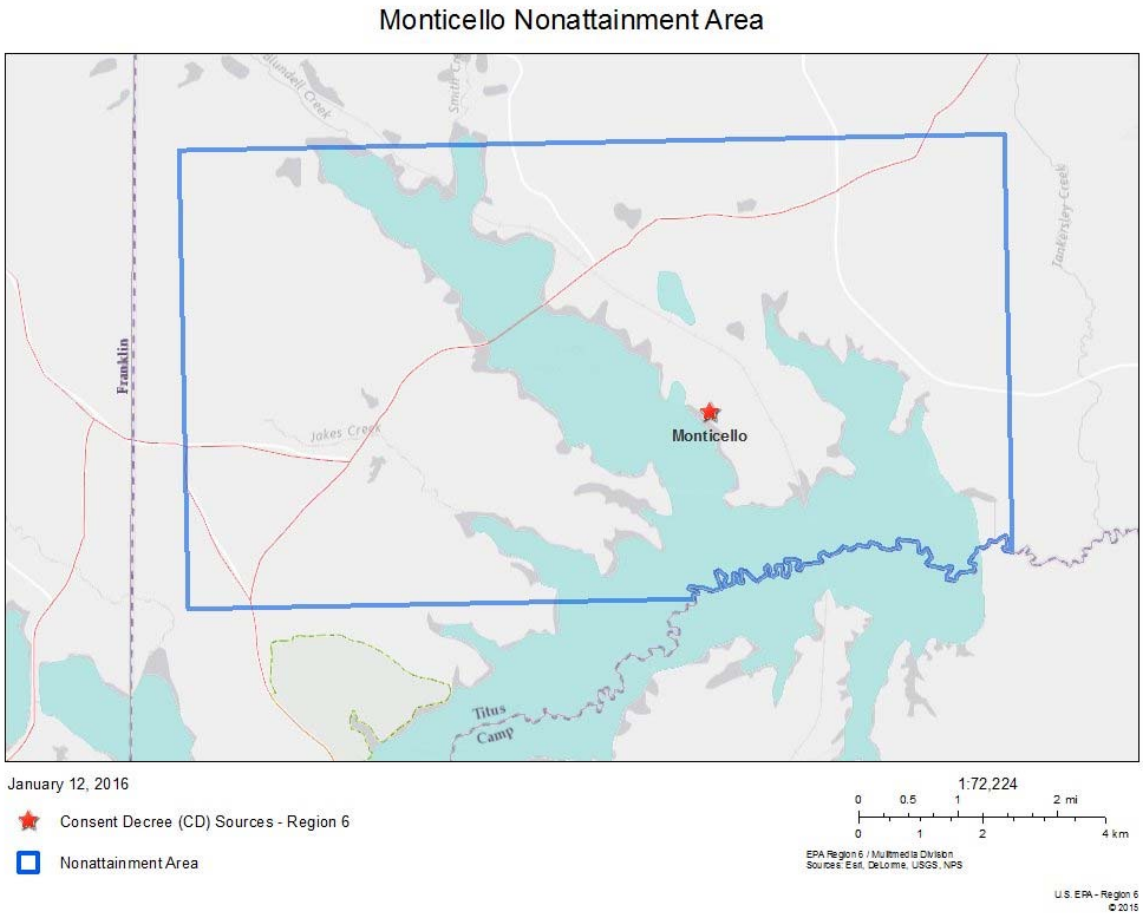
Conclusion

After careful evaluation of the Sierra Club's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around the Monticello station in Titus County, Texas as nonattainment for the 2010 SO_2 NAAQS. Specifically, the intended nonattainment area is comprised of the portion of Titus County bounded by the following UTM Coordinates in meters (NAD83 Datum, Zone 15):

X	Y
302329,	3666971
302329,	3660770
313530,	3660770
313530,	3666971

The nonattainment area excludes the portion of Camp County that falls within the area bounded by the listed UTM coordinates. Modeled impacts at all receptors located in Camp County included in the area of analysis were less than the 1-hr SO_2 NAAQS. Figure 8 below graphically illustrates our intended nonattainment area.

Figure 8: Monticello Nonattainment Area



Our intended designation is based on the modeling of actual emissions reported from the facilities during the 2012 to 2014 calendar years. An analysis of the modeling data, performed by Sierra Club, indicates it was performed substantially in accordance with appropriate EPA modeling guidance and using generally conservative assumptions.

The modeling did not include building downwash or variable stack temperature and velocity, since Sierra Club did not have access to information needed to support such inclusion. Building downwash will generally, though not always, increase the predicted maximum modeled concentrations. Sierra Club used stack velocity and temperatures consistent with 100% load. This, coupled with actual hourly emission rates, should provide conservative estimates of actual concentrations because higher temperatures and velocities of 100% load when paired with lower emissions of less than 100% load should provide an overestimation of the dispersion and thus an underestimation of maximum concentrations. Given that modeled concentrations are almost double the standard, the inclusion of building downwash and variable stack parameters, etc. in the modeling would not result in values near or below the standard, therefore the modeling is sufficient for a determination of nonattainment. In addition to adequately characterizing

Monticello station, the Sierra Club modeling took into account emissions from other nearby facilities as well as a background concentration of SO_2.

Therefore, the EPA believes that the Sierra Club modeling is relevant information that must be considered in our designation decision. While, TCEQ did provide comments on Sierra Club's initial modeling submittal, we received no additional relevant technical information from the state or other parties. In response, Sierra Club updated its modeling for the area addressing most of the concerns raised by TCEQ and submitted the results to the EPA on December 15, 2015. Based on the information available showing that the area in the vicinity of Monticello station does not meet the 1-hr SO_2 standard, we intend to designate the area as nonattainment. EPA's intended boundaries for the nonattainment area encompass the area shown to be in violation of the standard and the principal source that contributes to the violation.

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

Technical Analysis for the Big Brown Steam Electric Station in Freestone County, Texas

Introduction

The Freestone County area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Big Brown Steam Electric Station (Big Brown) emitted 60,681 tons of SO_2, and had an emissions rate of 1.59 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 consent decree, the EPA must designate the area surrounding the facility by July 2, 2016.

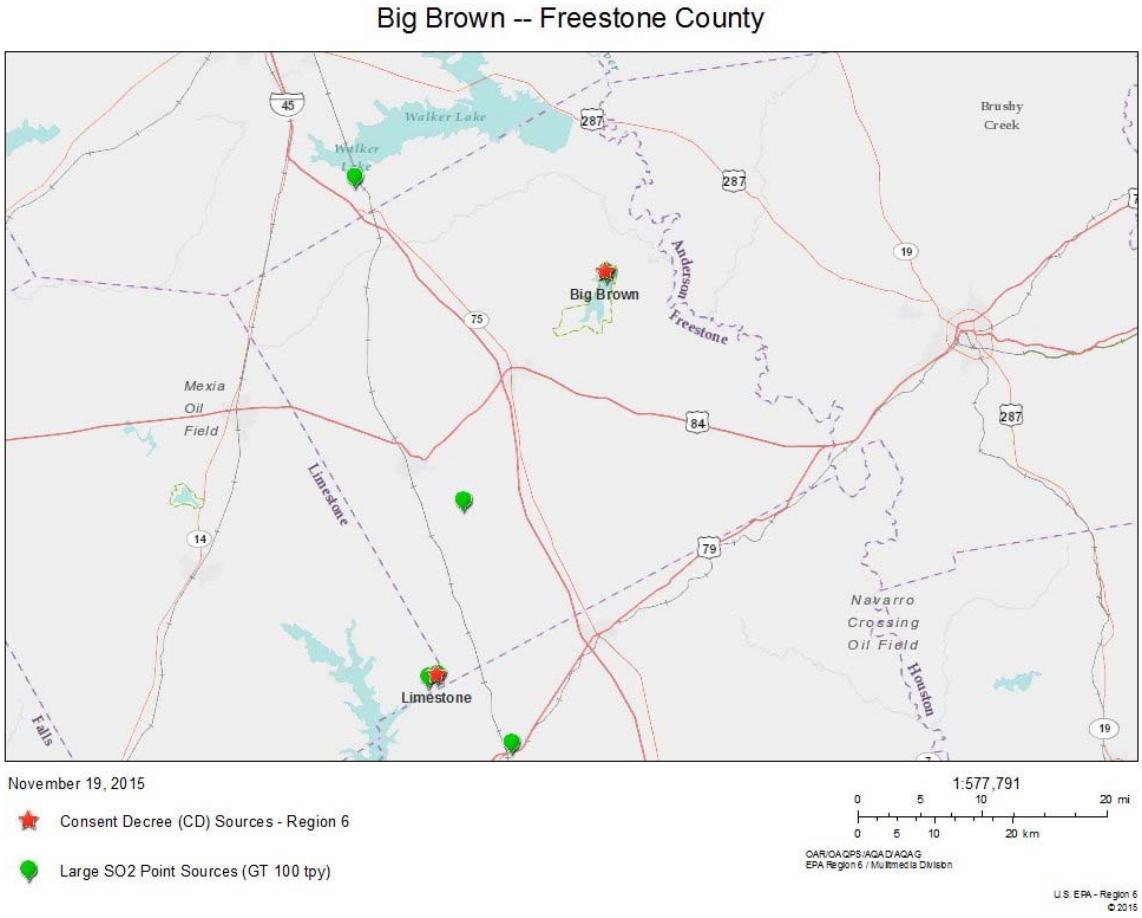
In its submission, Texas recommended that the area surrounding Big Brown, specifically Freestone County, be designated as unclassifiable/attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. The state's assessment and characterization was performed following the notion that any areas without appropriately cited and qualified monitors should be considered unclassifiable or attainment based on a lack of monitored evidence that a violation of the NAAQS has occurred. After careful review of the state's assessment, supporting documentation, and all available data, the EPA does not agree with the state's recommendation for this area, and intends to designate the areas as nonattainment. Specifically, the boundaries for our intended nonattainment area are comprised of portions of Freestone and Anderson Counties, bound by these UTM coordinates (NAD 83 Datum, UTM Zone 14):

X	Y
762752,	3540333
762752,	3510333
789753,	3510333
789753,	3540333

However, our intended nonattainment area excludes portions of Navarro County that fall within this UTM-based boundary. Modeled impacts at all receptors located in Navarro County included in the area of analysis were less than the 1-hr SO_2 NAAQS. As discussed below, our intended designation for Freestone County was informed by the technical analysis, including dispersion modeling, submitted to the EPA for review by Sierra Club.

Big Brown is located in central Texas in the eastern portion of Freestone County. As shown in Figure 1 below, the facility is located at Fairfield Lake, approximately 9.5 miles northeast of Fairfield, Texas. Figure 1 also includes nearby large sources of SO_2 emissions.

Figure 1. The Location of the Big Brown Steam Electric Station and Other Large Sources of SO_2 in the Area.



The discussion and analysis that follows below will reference the factors contained in the EPA's March 20, 2015 guidance, as appropriate. .

Detailed Assessment

Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding Big Brown. The facility is located in Freestone County; however, there are no ambient air quality monitors located in this county. The state did not include the most recent 3 years of monitoring data, i.e., 2012 – 2014 in its recommendation for the closest neighboring county, i.e., Navarro County. The table below shows information related to the monitors located in the nearby counties. The design values were confirmed through the EPA's 2014 design value report for SO_2.[32]

[32] The design value report for SO_2, as well as each of the other NAAQS, can be found at this link: http://www3.epa.gov/airtrends/values.html

Table 1: Available Air Quality Data for the Area Closest to the Big Brown Steam Electric Station

County	Air Quality Systems (AQS) Monitor ID	Monitor Location	Distance to Big Brown (mi)	2012 – 2014 SO_2 Design Value (ppb)
Navarro	48-349-1051	Corsicana	25	35
McLennan	48-309-1037	Waco	61	06

Based on available ambient air quality monitored data collected between 2012 and 2014, the counties surrounding Freestone County, where Big Brown is located, do not show a violation of the 2010 SO_2 NAAQS at the closest monitors. These monitors are in adjacent counties and were not sited such that they would represent either the maximum or highly elevated levels much closer to the Big Brown facility. In the absence of a violating monitor, when considering the location and distances of these monitors relative to the facility and that the monitors are not located to represent maximum/high impacts from Big Brown's emissions, is not by itself a sufficient technical justification to rule out that an exceedance of the 2010 SO_2 NAAQS may occur in the immediate vicinity of the facility.

Emissions and Emissions-Related Data

Evidence of SO_2 emissions from the source meeting the emissions criteria of the March 2, 2015 consent decree is an important factor for determining whether the immediate area is experiencing elevated levels of SO_2 concentrations. Other considerations for this factor include county level SO_2 emissions data, and data for sources located within 50 km. The 50 km distance is a relative conservative distance to collect any sources that may cause a concentration gradient in Freestone County.

Texas did not include any annual emissions data for sources in the vicinity of Big Brown. The EPA therefore must develop its own emissions information to inform the intended designation, and believes that it is reasonable to evaluate data obtained from the most recent publically available database, the NEI 2011 National Emissions Inventory (NEI).[33] The annual SO_2 emissions data for sources emitting at or above 100 tons per year in Freestone, and neighboring Anderson, Henderson, Leon, Limestone and Navarro Counties are summarized in Table 2 below.

Of the sources in Table 2, Sierra Club modeled Big Brown and the NRG Limestone Power Station (Limestone). The modeling results, dated September 11, 2015, assert there are modeled impacts in excess of the 1-hour SO_2 NAAQS in the area around the Big Brown facility. The 2011 data also included a few relatively small sources outside Freestone County (less than 300 tpy in this relative situation) at distances 30 km and greater from Big Brown that were not explicitly modeled by Sierra Club. Based on the amount of emissions, location of these sources in relation

[33] Detailed information for the 2011 NEI can be found at this link: http://www3.epa.gov/ttnchie1/net/2011inventory.html

to the area of concern we do not think these smaller sources would contribute to the concentration gradients around Big Brown and in Freestone County. The Teague Gas Plant facility is within Freestone County but is relatively small compared to Big Brown's emissions and would not be expected to have much of a concentration gradient in the area around Big Brown that has modeled exceedance levels in Freestone County.

While the Streetman facility is 29.5 km from Big Brown, it is potentially large enough to create concentration gradients within Freestone County and potentially be a contributor to the modeled exceedance levels so this facility should be included any future modeling. We note that Texas Commission of Environmental Quality (TCEQ) included the Streetman facility in their list of Data Requirements Rule (DRR) sources with 2014 emissions of 3350 tpy (DRR list Letter from Richard A. Hyde, TCEQ to Ron Curry, EPA; January 15, 2016). TCEQ also included the Big Brown facility (2014 emissions of 57,460 tpy) and Limestone facility (2014 emissions of 27,862 tpy) in a letter with a list of the sources subject to the SO_2 Data Requirements Rule (DRR).

Table 2: 2011 NEI SO_2 Emissions from Other Nearby Sources

County	**Facility Name**	**Facility Subject to the Emissions Criteria of the March 2, 2015 consent decree?**	**Distance to Facility that Meets the Consent Decree Criteria (km)**	**Facility Total SO_2 Emissions (tons), based on the 2011 NEI**
Limestone	Limestone Electric Generating Station	Yes	48.2 km	24,893.6 Tons
Navarro	Streetman Plant	No	29.5 km	3,505.7 Tons
Leon	Nucor Steel	No	53.4 km	272.7 Tons
Navarro	Guardian Industries, Corsicana	No	44.8 km	225.1 Tons
Henderson	Eustace Plant, (Gas Processing)	No	48.9 km	222.5 Tons
Freestone	Teague Gas Plant	No	30.0 km	213.1 Tons
Limestone	Farrar Treating Plant	No	44.3 km	205.2 Tons
Anderson	Ram Field Facility	No	62.9 km	129.2 Tons

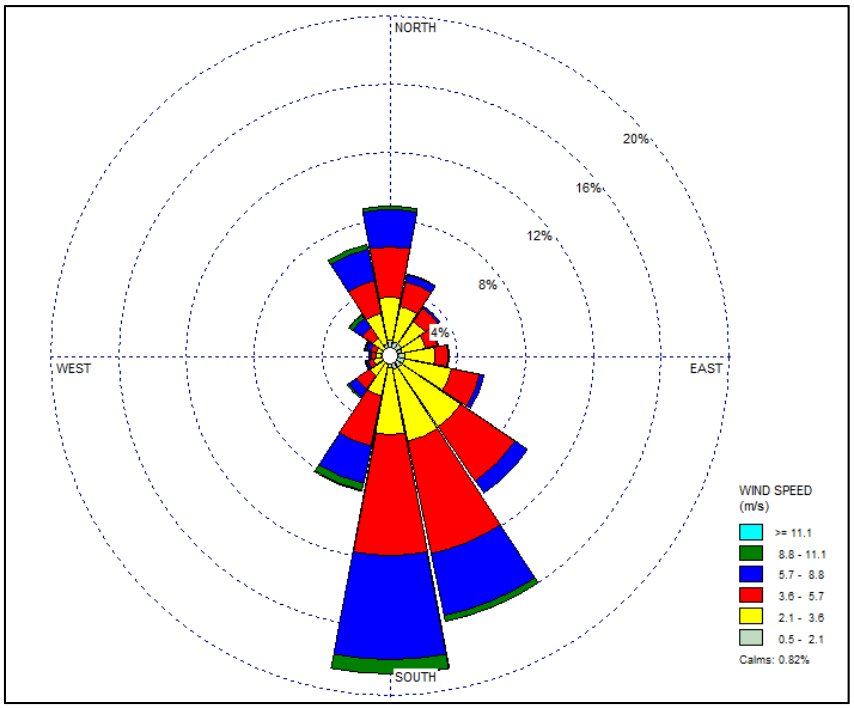
Emissions Controls

The EPA recognizes that control strategies implemented on the sources above that occurred after the release of the 2011 NEI may not be reflected, or may warrant further discussion. The EPA has not received any additional information on emissions reductions resulting from controls put into place after 2011.

Meteorology (Weather & Transport Patterns)

Evidence of source-receptor relationships between specific emissions sources and high SO_2 concentrations in the surrounding area is another important factor in determining the appropriate extent of the EPA's intended nonattainment area. As shown below in the section titled, "Other Relevant Information," surface meteorological records for the nearest National Weather Service meteorological station at Corsicana Campbell Field near Corsicana, Texas, and upper air meteorological data from NWS station in Fort Worth, Texas were used by Sierra Club to model the effects of meteorology and emission on the area surrounding Big Brown. Figure 2 includes the wind rose for the Corsicana Campbell Field meteorological station for 2012-2014.

Figure 2. Wind rose for Corsicana Campbell Field (2012 – 2014).



Geography and Topography (Mountain Ranges or Other Air Basin Boundaries)

The area is generally flat, rural and agricultural, without mountain ranges or restrictive geological features likely to affect predictive air impacts of SO_2.

Jurisdictional Boundaries

Once the geographic area associated with the immediate area surrounding Big Brown in Freestone County, and any nearby areas which may potentially be contributing to elevated levels of SO_2 around the facility are determined, existing jurisdictional boundaries are considered for the purpose of informing our intended nonattainment area, specifically with respect to clearly defined legal boundaries.

Modeling provided by Sierra Club asserts that portions of Freestone and Anderson Counties may experience violations of the 2010 SO_2 NAAQS. The EPA believes that our intended nonattainment area boundaries are comprised of clearly defined legal boundaries that adequately encompass all areas where violations of the NAAQS may occur. It should be noted that there is a facility in neighboring Limestone County, specifically Limestone, which is also impacted by the July 2, 2016 court-ordered deadline for the EPA to issue designations. The EPA intends to designate the area around Limestone as unclassifiable/attainment, and our analysis and evaluation of all available information is included in a separate section of this technical support document.

Other Relevant Information

As noted above, the EPA received air dispersion modeling results from Sierra Club. The submitter's initial modeling results, dated September 11, 2015, assert that there are impacts in excess of the 1-hour SO_2 NAAQS in the area surrounding Big Brown. The TCEQ submitted a letter on November 17, 2015, to the EPA to provide comments on the Sierra Club's modeling analysis for facilities in Texas, including Big Brown, noting that the initial Sierra Club modeling was conducted with only one year of meteorological data instead of three and that modeled maximum impacts occurred on-property. TCEQ also commented on the alternative modeling Sierra Club conducted using allowable emissions, and statements that Sierra Club included in their modeling report regarding contribution of specific sources to modeled violations without detailed analysis to support the claim. In response, Sierra Club updated its modeling for the area and submitted the results to the EPA on December 15, 2015. Our review of Sierra Club's modeling is based on what was submitted in December 2015. Specifically, Sierra Club's updated modeling asserts that SO_2 emissions from Big Brown have associated impacts that exceed the 1-hour SO_2 NAAQS, and was revised to use the most recent version of AERMOD, as well as, to include the full three years of meteorological data. The discussion and analysis that follows below will reference Sierra Club's use of the Modeling TAD, the EPA's assessment of Sierra Club's modeling in accordance with the Modeling TAD, and the factors for evaluation contained in the EPA's March 20, 2015 guidance, as appropriate.

Model Selection and Modeling Components

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

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

Sierra Club used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment with 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, Sierra Club determined that it was most appropriate to run the model in rural mode. Based on review of aerial images of the area surrounding Big Brown, we agree with Sierra Club's determination that the area is best defined as rural.

Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding Big Brown is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. For the Big Brown area, Sierra Club has included one other emitter of SO_2 that has the potential to create concentration gradients with the area around Big Brown and within Freestone County. Sierra Club included Limestone's emissions because they thought it was appropriate in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. We agree that in addition to Big Brown, the Limestone facility and potentially the Streetman Plant facility have the ability to result in concentration gradients within Freestone County (based on emissions, meteorology and proximity to Freestone County) and should be included in the

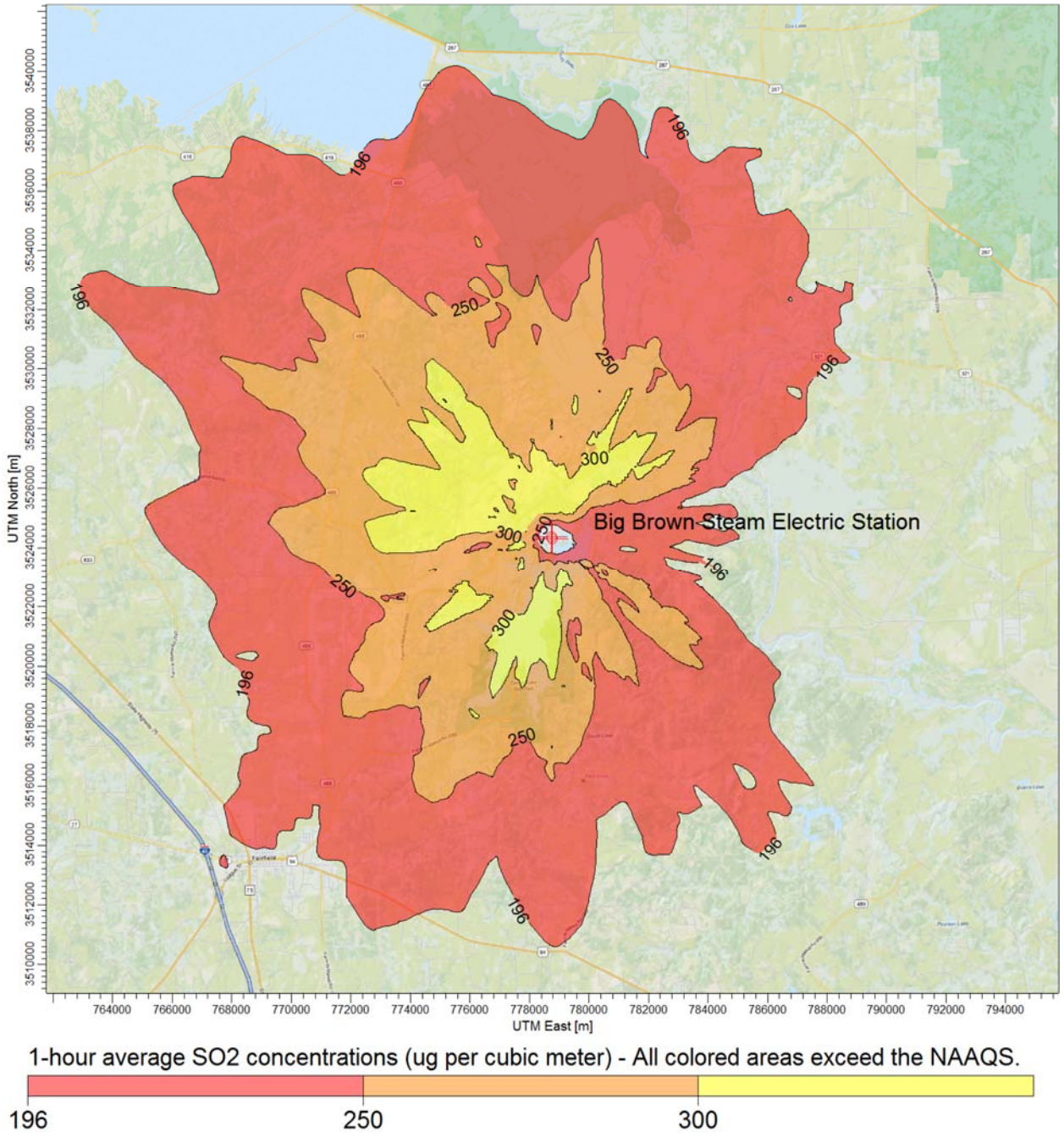
modeling for Freestone County. Limestone is a large source and is near the Freestone County border so it needed to be included for that reason, but it is 47 km from Big Brown which is close to the 50 km distance that we usually identify as a conservative distance for inclusion of sources. Sierra Club did not include the Streetman Plant in their modeling and TCEQ recently identified Streetman Plant as a source subject to the SO_2 DRR for future evaluation. We recommend that the Streetman Plant should be included in further modeling and analysis of SO_2 levels in Freestone County. The grid receptor spacing for the area of analysis chosen by the Sierra Club is as follows:

- 100 meter grid from center of Big Brown out to 5 km,
- 500 meter grid centered on Big Brown out to 10 km, and
- 1000 meter (1 km) grid centered on Big Brown out to 50 km.

The receptor network included 21,201 total receptors and covered the central and southwestern portions of Freestone County, the eastern portion of Anderson County, the southern portion of Henderson County and the central and northeastern portion of Limestone County. This is a larger grid than we might normally recommend, but also provided the ability to assess impacts of Limestone facility emissions on Freestone County and areas around Big Brown. Sierra Club modeling used a slightly elevated flagpole receptor height, but if this was corrected to EPA's recommended height we would expect only a slight change in the modeled numbers and the area of exceedances and magnitude of the values would be basically the equivalent and not change our proposed action.

As previously mentioned, Figure 1 shows the area surrounding Big Brown and location of Limestone. Figure 3 below shows the area of analysis and the modeled impacts from the Sierra Club modeling illustrating the areas with impacts above the 2010 SO_2 NAAQS.

Figure 3: Sierra Club's Area of Analysis for Big Brown and Limestone Stations Showing Modeled Impacts using Actual Emissions from 2012 - 2014.



Modeling Parameter: Source Characterization

Sierra Club characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, it used actual stack heights in conjunction with actual emissions. Sierra Club characterized the source locations and stack parameters, e.g.,

exit temperature, exit velocity, and diameter. Variable stack temperatures and velocities were not included because they are not publically available for use by Sierra Club. Similar to variable stack parameters, building information was not publically available. Therefore, Sierra Club did not include building downwash in their analysis stating that this was the conservative approach and would likely underestimate impacts from emissions resulting in lower modeled concentrations than modeling that included building downwash. While we do not agree with Sierra Club's assertion that exclusion of downwash is conservative in all cases, in our opinion the inclusion of building information and associated downwash in this analysis would not change our recommended designation of nonattainment. The modeling values are sufficiently above the standard and inclusion of downwash often leads to higher concentrations closer to the source but even in situations we have seen where this did not occur, any decreases in maximum modeled values from inclusion of downwash were relatively small and not expected to be enough of a decrease to resolve all modeled exceedance values in Freestone County.

In our review, the EPA did identify potential errors regarding the modeled locations of the main stacks at the Big Brown and Limestone facilities. It appears that Sierra Club may have inadvertently switched the UTM location information for Big Brown Stacks 1 and 2. Because of the close proximity of the two stacks and the locations relative to fenceline locations, the impact of this error in the model inputs on modeled concentrations is not expected to be significant nor change the resulting design value from violating to not violating the NAAQS. Therefore, our intended designation of nonattainment is not affected by this discrepancy. It appears that in Sierra Club's modeling for Big Brown a similar error was made in the modeled locations for the two off-site modeled stacks at the Limestone facility. Again, based on the proximity of Limestone's main stacks to each other coupled with their distance to the Freestone County, and the lack of impact on modeled exceedances, we do not expect this error in modeled impacts to change our determination regarding designation of the area.

Modeling Parameter: Emissions

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

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

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. Specifically, a facility may have recently adopted a new federally enforceable emissions limit, been subject to a federally enforceable

consent decree, or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS. These new limits or conditions may be used in the application of AERMOD. In these cases, the Modeling TAD notes that the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations should contain the necessary emissions information for designations-related modeling. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, Sierra Club included Big Brown and Limestone within 50 km in the area of analysis. The use of a 50 km radius in generating a list of sources to include in the modeling can be conservative, but Sierra Club only modeled the source(s) that it felt resulted in concentration gradients in the area of concern and not all of the sources. Sierra Club did not model all major sources of SO_2 (sources greater than 100 tpy) within 50 km of Big Brown, but did include the Limestone facility in the modeling as it could cause concentration gradients in Freestone County and potentially in the area of modeled exceedances. We agree that the Limestone facility does result in concentration gradients in Freestone County but as discussed below, initial analysis of the maximum impacts around Big Brown indicated that Big Brown was responsible for almost 100% of the impacts on the maximum, so we do not think Limestone contributes significantly to modeled exceedances. Therefore based on the information, No other sources within d 50 km were determined by Sierra Club to have the potential to cause significant concentration gradient impacts within the area of analysis. The facilities in the area of analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below.

Table 3: Actual SO_2 Emissions from Facilities in the Freestone Area of Analysis (2012 – 2014), Provided by Sierra Club

Company ID	Facility Name	SO_2 Emissions (tons per year)		
		2012	2013	2014
EFH	Big Brown	60681	62494	57460
NRG	Limestone	20671	25619	27862
Total Emissions	All Facilities Modeled	81352	88113	85322

For Big Brown and Limestone, Sierra Club used actual hourly emissions from the most recent 3-year data set, i.e., 2012 – 2014. This emissions data was obtained from USEPA Air Market Program Data.

Modeling Parameter: Meteorology and Surface Characteristics

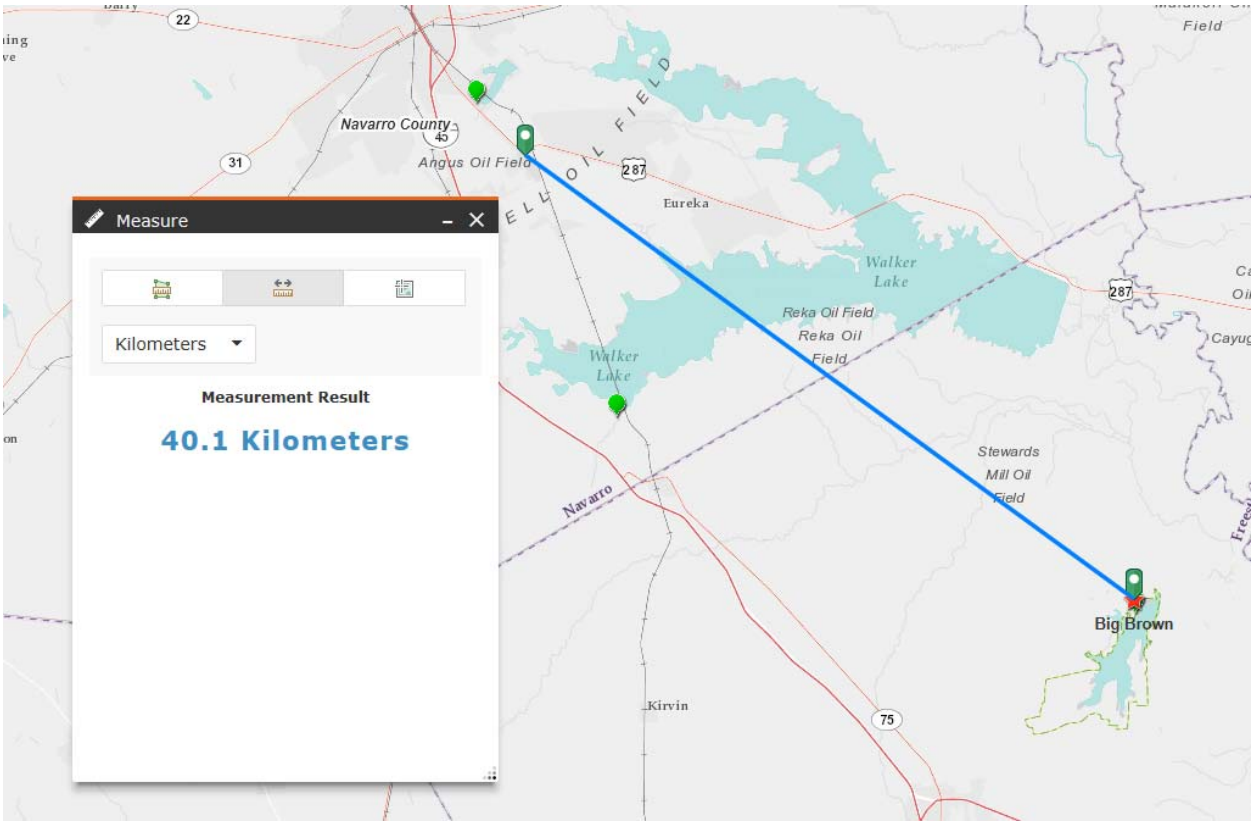
The most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. As noted in the Modeling TAD, the selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data are based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of

the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the Freestone County area of analysis, surface meteorology from the NWS station Corsicana Campbell Field near Corsicana, Texas, approximately 40 km to the northwest, and coincident upper air observations from the NWS station in Fort Worth, Texas, approximately 160 km to the northwest, were selected by Sierra Club as best representative of meteorological conditions within the area of analysis.

Sierra Club used AERSURFACE version 13016 from the NWS station in Corsicana Campbell Field, Texas (located at latitude 32.032 N, longitude 96.399 W) to estimate the surface characteristics of the area of analysis. Sierra Club estimated values for twelve spatial sectors out to 1.0 km at a seasonal temporal resolution for average conditions. Sierra Club also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo"). In Figure 4, below, the location of the Corsicana Campbell Field, Texas NWS station is shown relative to the Big Brown.

Figure 4: Big Brown Steam Electric Station and the Corsicana Campbell Field NWS



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The Sierra Club analysis was conducted in adherence to all available USEPA guidance for evaluating source impacts on attainment of the 1-hour SO_2 NAAQS via aerial dispersion modeling, including the AERMOD Implementation Guide; USEPA's Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010; modeling guidance promulgated by USEPA in Appendix W to 40 CFR Part 51; USEPA's March 2011 Modeling Guidance for SO_2 NAAQS Designations; and, USEPA's December 2013 SO_2 NAAQS Designations Technical Assistance Document in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processor 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, Sierra Club set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with a March 2013 EPA memo titled, "Use of ASOS meteorological data in AERMOD dispersion Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as gently rolling. 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.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Freestone County area of analysis, the Sierra Club used the 2011-13 monitored design value for El Paso. The Sierra Club

stated that this was the lowest background for the entire state and was therefore a conservative assumption. The background concentration for this area of analysis was determined by the state to be 7.8 micrograms per cubic meter ($\mu g/m^3$), or 2.98 ppb,[34] and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

The AERMOD modeling parameters for the Big Brown area of analysis, as provided by Sierra Club, are summarized below in Table 4.

Table 4: AERMOD Modeling Parameters for the Freestone County Area of Analysis, Provided by Sierra Club

Freestone County Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	4
Modeled Structures	0
Modeled Fencelines	0*
Total receptors	21,201
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Corsicana Campbell Field
Upper Air Meteorology Station	Fort Worth, Texas
Methodology for Calculating Background SO_2 Concentration	Design Value
Calculated Background SO_2 Concentration	7.8 $\mu g/m^3$

*While the Sierra Club modeling did not specifically include a fenceline in their modeling analysis, the EPA did compare the modeled results with fenceline information from previous industry dispersion modeling to confirm that the modeled exceedances of the NAAQS shown in Sierra Club's analysis did occur outside the fenceline and thus in ambient air.

The results presented below in Table 5 show the magnitude and geographic location of the highest predicted modeled concentration of SO_2 based on actual emissions.

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

Table 5: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Freestone County Area of Analysis Based on Actual Emissions, Provided by Sierra Club

		Receptor Location		SO_2 Concentration ($\mu g/m^3$) Based on Actual Emissions	
Averaging Period	Data Period	UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	775052.690	3525933.000	387.9	196.5*

* Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

Sierra Club's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 387.9 $\mu g/m^3$, or 148.1 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the modeled facilities. This highest predicted values occurred in a circular pattern from approximately one km from the facility center to as far 15 km to the northeast, and is graphically represented along with all the other receptors in Figures 5 and 6, below. The single highest value modeled was 387.9 $\mu g/m^3$ and is located approximately 4 km northwest of the center of the Big Brown facility. We evaluated the maximum impact around Big Brown and the modeling indicated that Big Brown was responsible for almost 100% of the impacts on the maximum (approximately 0.2 ppb from other sources), so we do not think Limestone contributes significantly to modeled exceedances. We also note that Limestone is almost 50 km away and the meteorological conditions that would result in the maximum Big Brown impacts would most likely not be the same conditions that would result in impacts from Limestone on the Big Brown driven exceedances.

Figure 5: Sierra Club's Modeling Grid for the 1-Hour SO_2 Concentrations in the Freestone County Area of Analysis Based on Actual Emissions

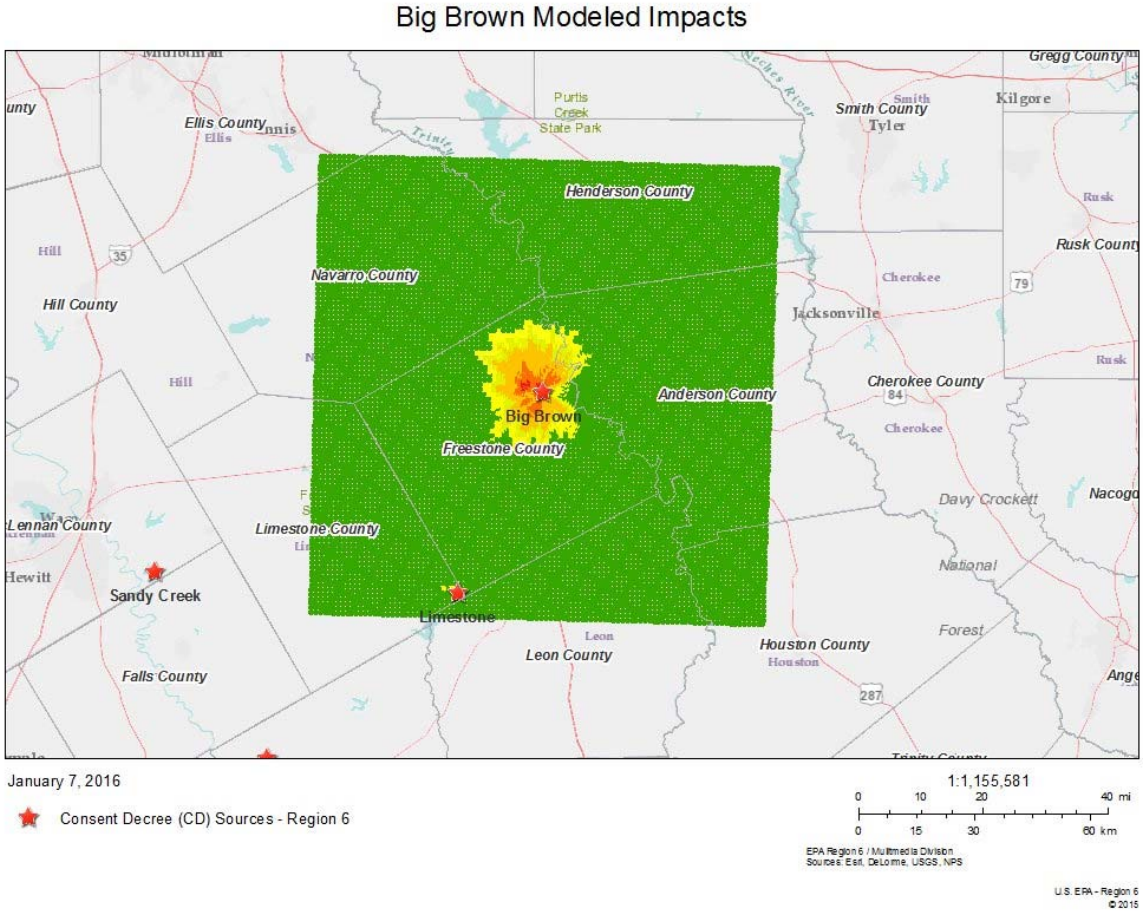
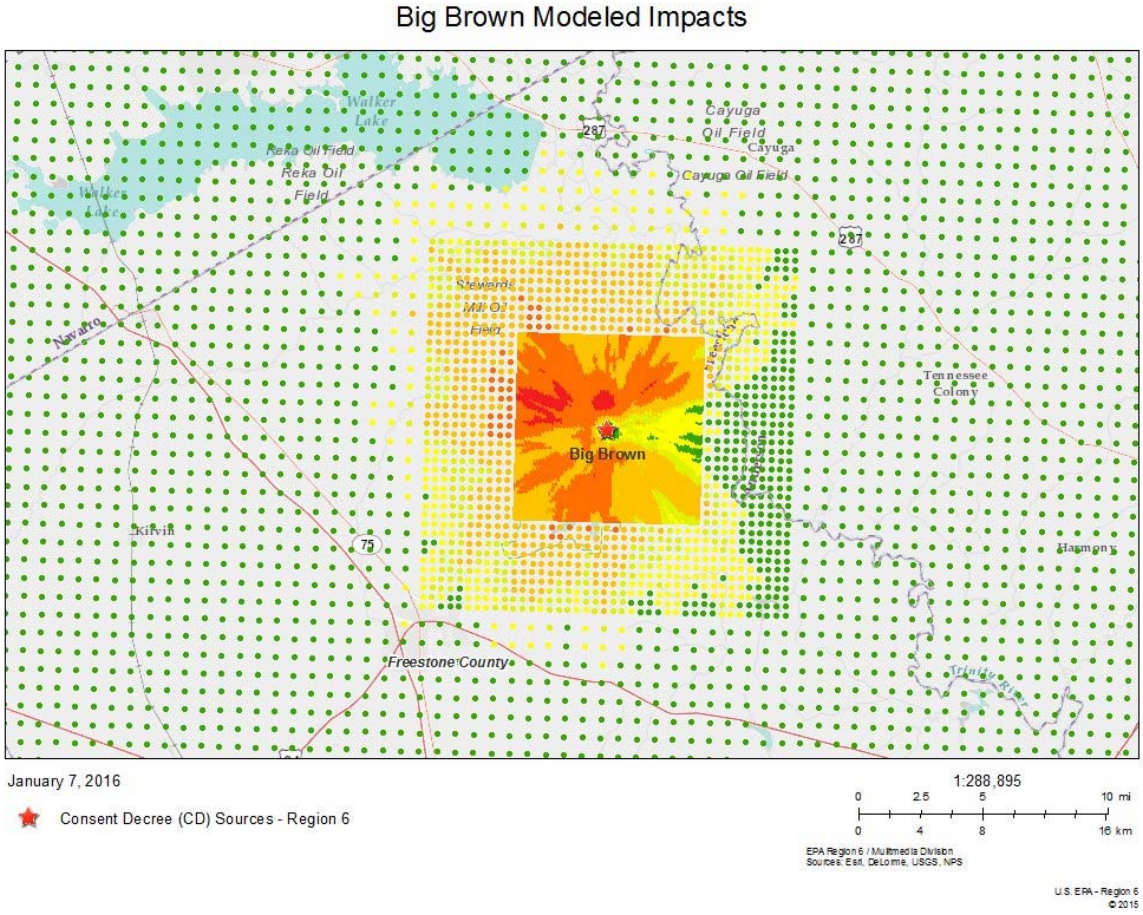


Figure 6: Sierra Club's Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the Freestone County Area of Analysis Based on Actual Emissions



Conclusion

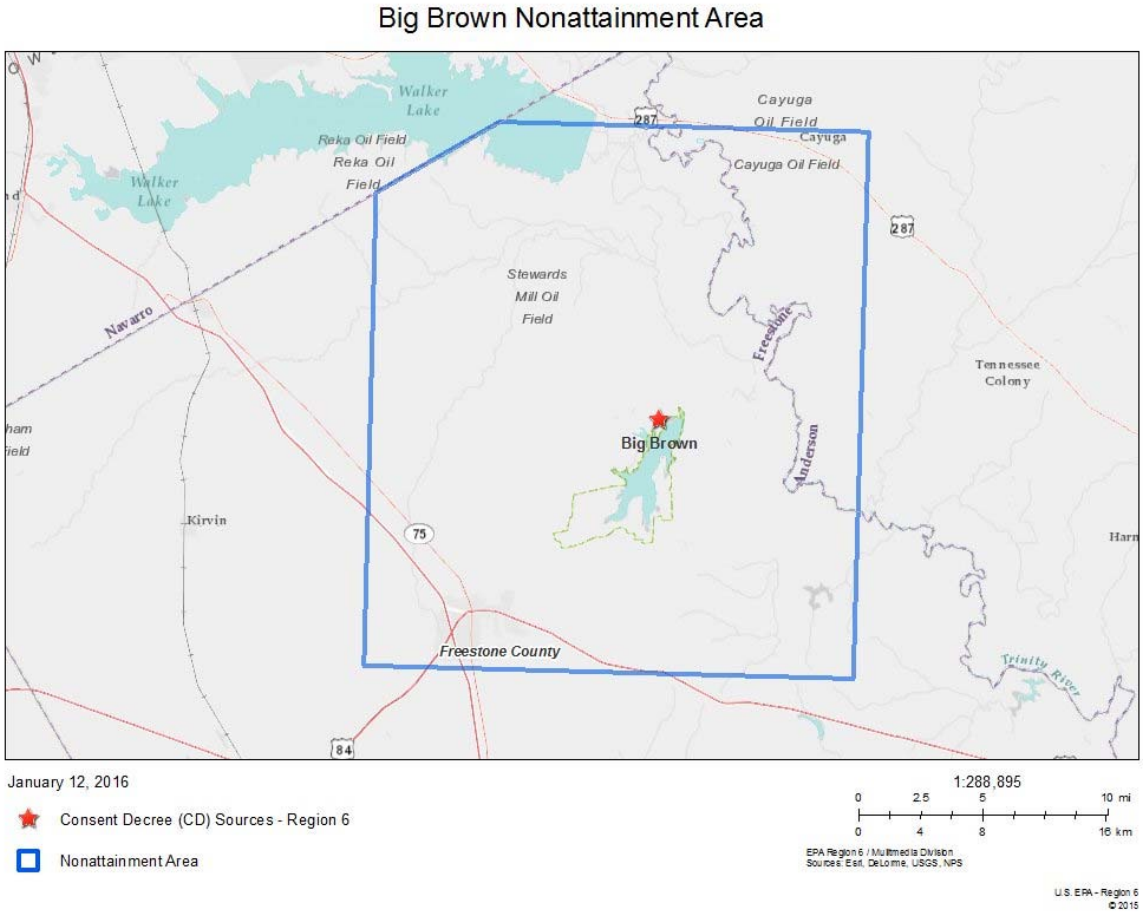
After careful evaluation of the information provided by Sierra Club, as well as available relevant information, the EPA intends to designate the area around Big Brown in Freestone County, Texas as nonattainment for the 2010 SO_2 NAAQS. Specifically, the intended nonattainment area is comprised of the portions of Freestone and Anderson Counties, Texas bounded by the following UTM coordinates in meters (NAD83 Datum, Zone 14):

X	Y
762752,	3540333
762752,	3510333
789753,	3510333
789753,	3540333

The nonattainment area excludes the portions of Navarro County that fall within the area bounded by the listed UTM coordinates on the basis that none of the modeled receptors in

Navarro County show modeled violations of the NAAQS. Figure 7 below graphically illustrates our intended nonattainment area.

Figure 7: Big Brown Nonattainment Area



Our intended designation is based on Sierra Club's modeling of actual emissions reported from the facilities during the 2012 to 2014 calendar years. An analysis of the modeling data indicates it was performed in accordance with appropriate EPA modeling guidance and using generally conservative assumptions.

The modeling did not include building downwash or variable stack temperature and velocity, since Sierra Club did not have access to information needed to support such inclusion. Building downwash will generally, though not always, increase the predicted maximum modeled concentrations. Sierra Club used stack velocity and temperatures consistent with 100% load. This, coupled with actual hourly emission rates, should provide conservative estimates of actual concentrations because higher temperatures and velocities of 100% load when paired with lower emissions of less than 100% load should provide an overestimation of the dispersion and thus an underestimation of maximum concentrations. Given that modeled concentrations are almost

double the standard, the inclusion of building downwash and variable stack parameters, etc. in the modeling would not result in values near or below the standard, therefore the modeling is sufficient for a determination of nonattainment.

Therefore, EPA believes that the Sierra Club modeling is relevant information that must be considered in our designation decision. While, TCEQ did provide comments on Sierra Club's initial modeling submittal, we received no additional relevant technical information from the State or other parties. In response, Sierra Club updated its modeling for the area addressing most of the concerns raised by TCEQ and submitted the results to the EPA on December 15, 2015. Based on the information available showing the area in the vicinity of Big Brown does not meet the 1-hr SO_2 standard, we intend to designate the area defined above as nonattainment.

EPA's intended boundaries for the nonattainment area encompass the area shown to be in violation of the standard and the principal source that contributes to the violation.

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