Technical Support Document:

Chapter 37
Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for South Carolina

1. Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (the EPA, we, or us) must designate areas as either "nonattainment," "attainment," or "unclassifiable" for the 2010 1-hour sulfur dioxide (SO_2) primary national ambient air quality standard (NAAQS) (2010 SO_2 NAAQS). The CAA defines a nonattainment area as an area that does not meet the NAAQS or that contributes to a nearby area that does not meet the NAAQS. An attainment area is defined by the CAA as any area that meets the NAAQS and does not contribute to a nearby area that does not meet the NAAQS. Unclassifiable areas are defined by the CAA as those that cannot be classified on the basis of available information as meeting or not meeting the NAAQS. In this action, the EPA has defined a nonattainment area as an area that the EPA has determined violates the 2010 SO_2 NAAQS or contributes to a violation in a nearby area, based on the most recent 3 years of air quality monitoring data, appropriate dispersion modeling analysis, and any other relevant information. An unclassifiable/attainment area is defined by the EPA as an area that either: (1) based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined (i) meets the 2010 SO2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.[1] An unclassifiable area is defined by the EPA as an area that either: (1) was required to be characterized by the state under 40 CFR 51.1203(c) or (d), has not been previously designated, and on the basis of available information cannot be classified as either: (i) meeting or not meeting the 2010 SO_2 NAAQS, or (ii) contributing or not contributing to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

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

This technical support document (TSD) addresses designations for nearly all remaining undesignated areas in South Carolina for the 2010 SO_2 NAAQS. In previous final actions, the EPA has issued designations for the 2010 SO_2 NAAQS for selected areas of the country.[2] The EPA is under a December 31, 2017, deadline to designate the areas addressed in this TSD as required by the U.S. District Court for the Northern District of California.[3] We are referring to the set of designations being finalized by the December 31, 2017 deadline as "Round 3" of the designations process for the 2010 SO_2 NAAQS. After the Round 3 designations are completed, the only remaining undesignated areas will be those where a state has installed and begun timely operating a new SO_2 monitoring network meeting the EPA specifications referenced in EPA's SO_2 Data Requirements Rule (DRR) (80 FR 51052). The EPA is required to designate those remaining undesignated areas by December 31, 2020.

South Carolina submitted its recommendations regarding designations for the 2010 1-hour SO_2 NAAQS on June 2, 2011. In its submission, South Carolina recommended that each county in the State be designated attainment, including Berkeley, Richland, and York Counties, based in part on an assessment and characterization of air quality impacts from facilities in those counties. This assessment and characterization was performed using air dispersion modeling software, i.e. AERMOD, analyzing actual and potential emissions. After careful review of the State's assessment, supporting documentation, and all available data, the EPA agrees with the State's recommendation for the area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

For the areas in South Carolina that are part of the Round 3 designations process, Table 1 identifies the EPA's intended designations and the counties or portions of counties to which they would apply. It also lists South Carolina's current recommendations. The EPA's final designation for these areas will be based on an assessment and characterization of air quality through ambient air quality data, air dispersion modeling, other evidence and supporting information, or a combination of the above.

Table 1. Summary of the EPA's Intended Designations and the Designation Recommendations by South Carolina

Area/County	South Carolina's Recommended Area Definition	South Carolina's Recommended Designation	The EPA's Intended Area Definition	The EPA's Intended Designation
Berkeley County	Entire County	Attainment	Berkeley County	Unclassifiable/ Attainment

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

Area/County	South Carolina's Recommended Area Definition	South Carolina's Recommended Designation	The EPA's Intended Area Definition	The EPA's Intended Designation
Richland County	Entire County	Attainment	Richland County	Unclassifiable/Attainment
York County	York County	Attainment	York County	Unclassifiable/ Attainment
Remaining Undesignated Areas to Be Designated in this Action*	Rest of the State (all other counties)	Attainment	Rest of the State (all other counties)	Unclassifiable/ Attainment

* The EPA intends to designate the remaining undesignated counties (or portions of counties) in South Carolina as "unclassifiable/attainment" as these areas were not required to be characterized by the state under the DRR and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the areas may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. These areas that we intend to designate as unclassifiable/attainment (those to which this row of this table is applicable) are identified more specifically in section 6 of this chapter.

Areas that the EPA previously designated unclassifiable in Round 1 (*see* 78 FR 47191) and Round 2 (*see* 81 FR 45039 and 81 FR 89870) are not affected by the designations in Round 3 unless otherwise noted.

2. General Approach and Schedule

Updated designations guidance documents were issued by the EPA through a July 22, 2016, memorandum and a March 20, 2015, memorandum from Stephen D. Page, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Air Division Directors, U.S. EPA Regions I-X. These memoranda supersede earlier designation guidance for the 2010 SO_2 NAAQS, issued on March 24, 2011, and identify factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The documents also contain the factors that the EPA intends to evaluate in determining the boundaries for designated areas. These factors include: 1) air quality characterization via ambient monitoring or dispersion modeling results; 2) emissions-related data; 3) meteorology; 4) geography and topography; and 5) jurisdictional boundaries.

To assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling for sources that emit SO_2, the EPA released its most recent version of a

draft document titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) in August 2016.[4]

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

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

Because many of the intended designations have been informed by available modeling analyses, this TSD is structured based on the availability of such modeling information. There is a section for each county for which modeling information is available. For some counties, multiple portions of the county have modeling information available and the section on the county is divided accordingly. South Carolina does not have any air quality monitoring data that indicates a NAAQS violation. The remaining to-be-designated counties are then addressed together in section 6.

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

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

1) 2010 SO_2 NAAQS – The primary NAAQS for SO_2 promulgated in 2010. This NAAQS is 75 parts per billion (ppb), based on the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. See 40 CFR 50.17.

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

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

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

3. Technical Analysis for the Berkeley County Area

3.1. Introduction

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

There are two DRR sources in Berkeley County, South Carolina – Century Aluminum of South Carolina, Incorporated and Santee Cooper Cross Generating Station. These two sources were modeled separately and available modeling analysis for each area will be presented in this section. The discussion of these two sources in the TSD will consider the aggregation of modeling results when determining the intended designation and boundary recommendations or the areas surrounding the two DRR sources in Berkeley County.

3.2. Air Quality Monitoring Data for the Berkeley County Area

This factor considers the SO_2 air quality monitoring data in the area of Berkeley County. South Carolina did not include monitoring data for this area. The EPA reviewed the available air quality monitoring data in the Air Quality System (AQS) database and found the following nearby data:

- The Jenkins Avenue Fire Station SO_2 monitor (AQS ID: 45-019-0003) is located at 32.882289, -79.977538 in Charleston County. The monitor is located in North Charleston, South Carolina, 12 miles (19 kilometers [km]) southwest of Century Aluminum. Data collected by this monitor is comparable to the NAAQS, and indicates that the most recent SO_2 levels are below the 1-hr NAAQS. The most recent three years of complete, quality-assured, certified data from this monitor (2014-2016) indicate a 1-hour SO_2 design value of 9 ppb. However, this monitor was not sited to characterize the maximum 1-hr SO_2 concentrations near Century Aluminum. South Carolina provided an air quality modeling analysis to characterize the maximum 1-hr SO_2 concentrations in the area (see the air quality modeling section immediately below).

In reviewing the available air quality monitoring data in AQS, the EPA determined that other than the data described above, there is no additional relevant data in AQS collected in or near Berkeley County that could inform the intended designation action. The most recent SO_2 design values for all areas of the country are available at https://www.epa.gov/air-trends/air-quality-design-values.

3.3. Air Quality Modeling Analysis for the Berkeley County Area Addressing Century Aluminum of South Carolina, Inc. (Century)

3.3.1. Introduction

This section 3.3 presents all the available air quality modeling information for a portion of Berkeley County that includes Century Aluminum facility. (This portion of Berkeley county will often be referred to as "the Century area" within this section 3.3). This area contains the following SO_2 source, principally the sources around which South Carolina is required by the DRR to characterize SO_2 air quality, or alternatively to establish an SO_2 emissions limitation of less than 2,000 tpy:

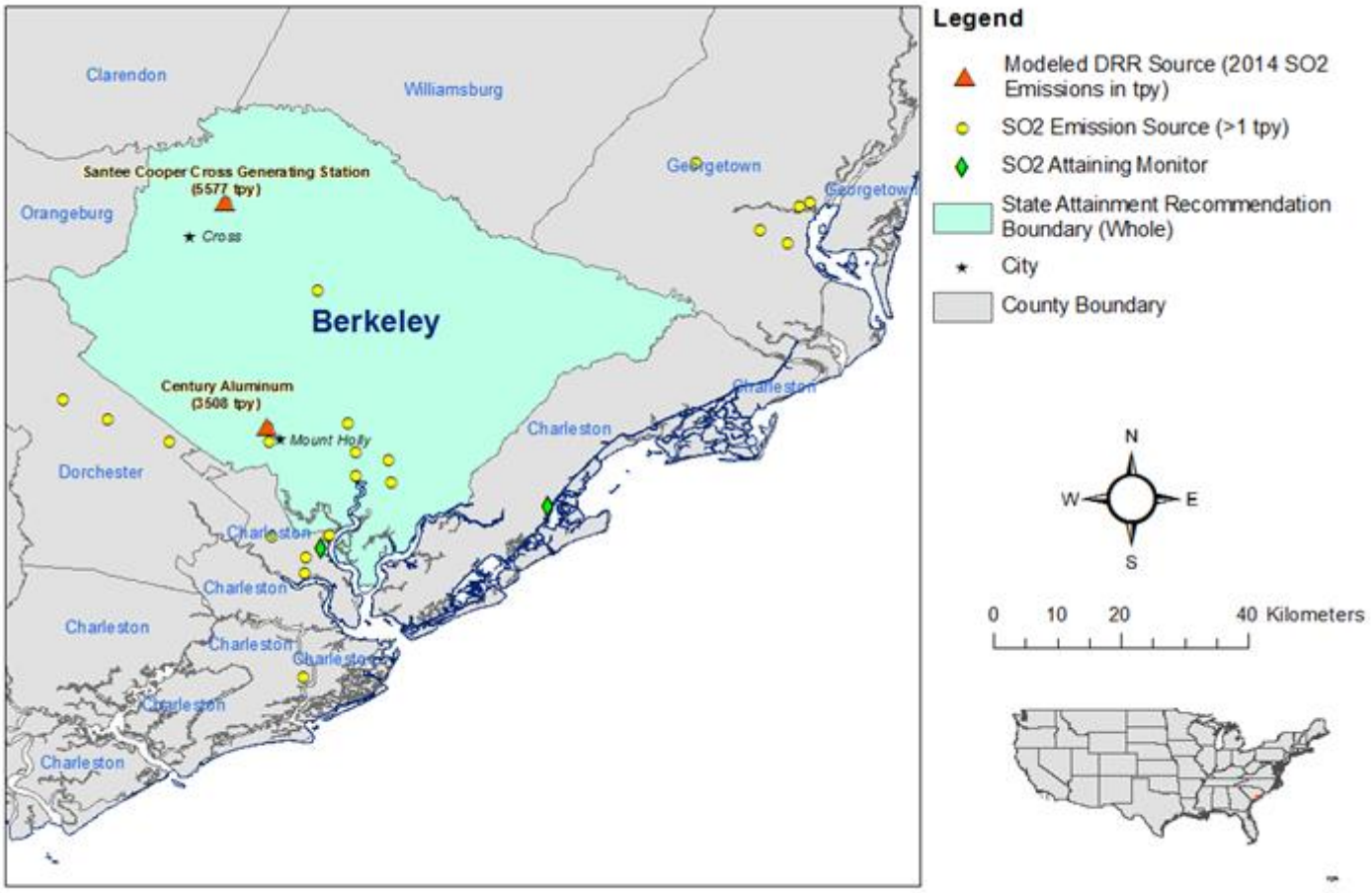
- The Century Aluminum facility emitted 2,000 tons or more annually. Specifically, Century Aluminum emitted 3,508 tons of SO_2 in 2014 and 2,795 tons in 2015. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and South Carolina has chosen to characterize it via modeling.

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

The area that the State has assessed via air quality modeling is located in Goose Creek in Berkeley County, South Carolina. The facility is approximately 6 km north-northwest of the intersection of Highways 52 and 176 and approximately 2 km north of Old Mt. Holly Road. See Figure 1 below. Also included in the figure are other nearby emitters of SO_2.[6] These are Cooper River Partners, LLC, Kapstone Charleston Kraft, LLC (North Charleston), DAK Americas LLC, SCE&G Williams, Nucor Steel Berkeley, McAlister-Smith Funeral Home, Argos Cement LLC, Showa Denko Carbon, Inc, Giant Cement, Holcim, Inc. The Santee Cooper Cross Generating Station DRR source is also located within a 50 km radius of Century. Also included in the figure is the State's recommended area for the attainment designation. The EPA's intended unclassifiable/attainment designation boundary for the entirety of Berkley County area is not shown in this figure, but is shown in a figure in the section below that summarizes our intended designation.

[6] All other SO_2 emitters of 20 tpy or more within 10 km of Century Aluminum (based on the inventory of sources from the State of South Carolina) are shown in Figure 1.

Figure 1. Map of the Berkeley County Area Addressing Century Aluminum



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

For this area, the EPA received and considered two modeling assessments from the State. No assessment from other parties was received. To avoid confusion in referring to these assessments, the following table lists them, indicates when they were received, provides an identifier for the assessment that is used in the discussion of the assessments that follow, and identifies any distinguishing features of the modeling assessments.

Table 2. Modeling Assessments for the Berkeley County Area

Assessment Submitted by	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
South Carolina*	December 2016	Century Aluminum Modeling Report	State submittal
South Carolina*	April 7, 2017	Revised Century Aluminum Modeling Report	State submittal

*South Carolina forwarded the assessment prepared by Exponential, Inc.

3.3.2. Modeling Analysis Provided by the State

3.3.2.1. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPPRM: 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, the most up-to-date version at the time of modeling, using all regulatory default options. AERMOD version 16216r has since become the regulatory model version. There were no updates from 15181 to 16216r that would significantly affect the concentrations predicted here. A discussion of the State's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

The current version of AERMOD, version 16216r, includes updates to 40 CFR part 51, Appendix W, "Guideline of Air Quality Models," published on January 17, 2017 (82 FR 5203). This version of AERMOD also includes fixes to bugs that were inadvertently included in version 16216. South Carolina chose to use version 15181 of AERMOD because the State is using the regulatory default settings for version 15181 available at the time of its modeling preparation and is not making use of any previously alternative modeling options included in version 16216r and the update to Appendix W.

3.3.2.2. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the "urban" or "rural" determination of a source is important in determining the boundary layer characteristics that affect the model's prediction of

downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density.

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. The State analyzed the land use types within a 3 km radius from Century Aluminum as shown in Figure 2 based on the GIS land use tool which uses 2001 National Land Cover Database (NLCD) data. As shown in Table 3 below, over 80 percent of the area surrounding Century is rural. For the purpose of performing the modeling for the area of analysis, the State determined that it was most appropriate to run the model with rural dispersion coefficients or in rural mode and the EPA concurs with this assessment.

Figure 2. Plot of land use surrounding Century Aluminum. Source: Modeling Report for Century Aluminum of South Carolina, Inc., prepared for Century Aluminum December 2016.

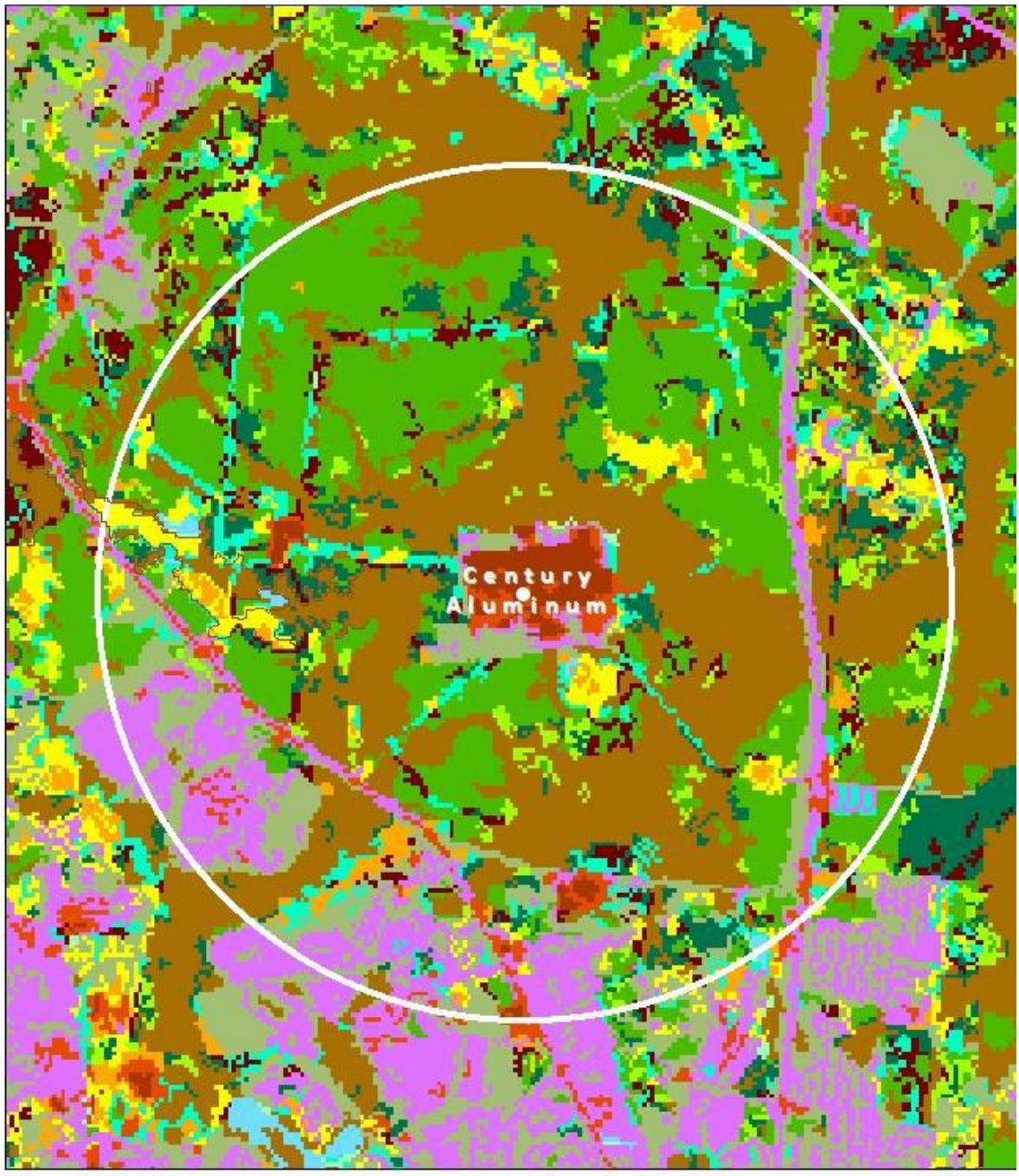


Table 3. Land use percentage within 3 km of Century Aluminum

Land use Class	Percentage of Total (%)
Open water	0.2%
Developed, Open Space	8.1%
Developed, Low Intensity	7.8%
Developed, Medium Intensity	2.2%
Developed, High Intensity	1.8%
Deciduous Forest	6.0%
Evergreen Forest	25.6%
Mixed Forest	2.9%
Scrub/Shrub	3.3%
Grassland/Herbaceous	4.3%
Pasture/Hay	3.5%
Cultivated Crops	1.7%
Woody Wetlands	32.5%
Emergent Herbaceous Wetland	0.1%

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

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Century area, the State has included no other emitters of SO_2 within 50 km of Century Aluminum in any direction. No other sources beyond 50 km were determined by the State to have the potential to cause concentration gradient impacts within the area of analysis. The State determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas.

The State considered actual emission rates and proximity to the primary source as factors for identifying nearby sources. A screening area extending 50 km from Century was used to identify potential nearby sources. Initial screening was conducted to identify current allowable emissions for all facilities with air permits. The State identified 83 permitted facilities within 50 km of Century. Actual annual SO_2 emission rates for the years 2012, 2013, and 2014 were obtained for each of the candidate facilities and then analyzed for the emission rate in the most recent year for which data was available (2014). Figure 3 below shows sources with emissions greater than 10 tpy within 50 km of Century and is coded to reflect the actual annual facility-wide emission rate in 2014. Figure 3 shows sources greater than 10 tpy within 20 km of Century. The methodology used by South Carolina for screening nearby sources for potential inclusion into the cumulative impact modeling analysis is the "20D" methodology which allows for candidate nearby sources to be excluded from the cumulative analysis if their facility-wide actual emission rates, in tpy, are less than 20D, where D is the distance in km between the candidate nearby source and the primary source.[7] Five sources DAK Americas (11 km away), SCE&G Williams (12 km away), Kapstone (19 km away), Showa Denko (27 km away), and Santee Cooper (35 km away) were identified based on the 20D screening methodology. South Carolina stated that given the locations of these five facilities relative to Century, their plumes would not be expected to merge or interact in the vicinity of Century. Showa Denko Carbon Inc. is located 27 km to the west, Santee Cooper is located 35 km to the north, and Kapstone Charleston Kraft LLC North Charleston is located 19 km to the south-southeast. These three facilities are isolated relative to each other and Century. Relative to Century, DAK Americas LLC Cooper River Plant is located 11 km to the east, and South Carolina Electric & Gas Williams Station (SCE&G Williams) is located 12 km to the east-southeast. Relative to SCE&G Williams, DAK Americas is located 5 km to the north-northwest. Given the relative locations of these two facilities, the State determined that it is not expected that their plumes would experience overlap at the location of Century from any upwind direction. No clusters of large candidate background facilities are located far from Century in the same upwind direction such that the plumes would be expected to merge or overlap substantially at the location of Century; therefore, emissions from each of these facilities was considered separately in determining Q in the Q/D calculation.

After application of the 20D screening methodology, the five remaining sources considered were: DAK Americas (11 km away), SCE&G Williams (12 km away), Kapstone (19 km away), Showa Denko (27 km away), and Santee Cooper (35 km away). Century conducted additional analyses that examined the concentration gradients predicted between each candidate source and Century. In each case, the gradients are highest near the candidate source and generally decrease with downwind distance. The state determined that results indicated that the concentration gradients from the candidate background sources in the vicinity of Century are such that the background sources do not need to be included explicitly in the cumulative impact modeling analyses. Figures for the concentration gradient analyses can be found on pages 39-48 of the December 2016 modeling report for Century Aluminum submitted by the State of South Carolina and prepared by Exponent Atmospheric Sciences.

[7] The State performed an analysis of emissions data and spatial proximity for all nearby sources to determine which sources to include in the modeling demonstration using the screening tool known as 20d. This New Source Review method provides that if a source's annual emissions in tons (Q) is less than its distance from the primary source in kilometers (d) multiplied by 20, then it is unlikely to have a significant concentration gradient in the area of concern. (EPA's "Screening Threshold" Method for PSD Modeling Memo, 1985.)

For all five candidate background facilities, the impacts at Century predicted by the gradient analysis are well below the 1-hour SO_2 background monitor design value of 23.6 micrograms per cubic meter ($\mu g/m^3$) at the North Charleston monitor. The plumes from the five candidate background facilities would not be expected to overlap or interact with Century from any upwind direction. For this reason, based on this criterion, the State determined that these sources do not need to be included explicitly in the cumulative impact modeling analyses. The EPA concurs with this determination.

To summarize, the results of the concentration gradient analysis discussed above indicated that the concentration gradients from the candidate background sources in the vicinity of Century are such that the background sources do not need to be included explicitly in the cumulative impact modeling analyses. In each case, the gradients are highest near the candidate source and generally decrease with downwind distance. For all five candidate background facilities, the concentration gradient analysis predicted impacts at Century that are well below the 1-hour SO_2 background monitor design value of 23.6 $\mu g/m^3$ at the North Charleston monitor. Also, the plumes from the five candidate background facilities would not be expected to overlap or interact with Century from any upwind direction. Based on these factors, the EPA concurs with the determination that no background sources need to be include in the modeling.

The grid receptor spacing for the area of analysis chosen by the State is as follows:
An inner grid of 6,181 receptors with a spacing of 100 meters (m) extends outward from the facility boundary to a distance of approximately 1 km and covers an area of approximately 9 km x 9 km. An intermediate grid of 3,392 receptors with a spacing of 250 m extends from the outer edge of the 100 m spaced receptor grid out to a distance of approximately 5 km from the facility, and the outer boundary covers an area of approximately 17 km x 17 km. An outer grid of 1,800 receptors with a spacing of 500 m extends from the outer edge of the 250m spaced receptor grid out to a distance of approximately 10 km from the facility, and the outer boundary covers an area of approximately 27 km x 27 km. Receptors within the Century facility property boundary were excluded. Additionally, 1,171 receptors at a spacing of no greater than 25 m were placed along the Century facility property line.

The receptor network contained a total of 12,544 receptors, and covered southern Berkeley and extreme northern Charleston counties in South Carolina.

Figures 3 and 4, included in the State's recommendation, show the State's chosen area of analysis surrounding the Century Aluminum facility, as well as the receptor grid for the area of analysis.

Consistent with the Modeling TAD, the State placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to Century Aluminum. Other than the receptors located on Century Aluminum plant property, no other receptor locations were excluded from the defined receptor network. The property line is defined in a manner consistent with prior modeling analyses that have been submitted to DHEC BAQ and represents a fence that precludes public access to the areas enclosed within.

Figure 3. Background sources within 20 km of Century Aluminum with emissions greater than 10 tpy. Source: Modeling Report for Century Aluminum of South Carolina, Inc., prepared for South Carolina, December 2016.

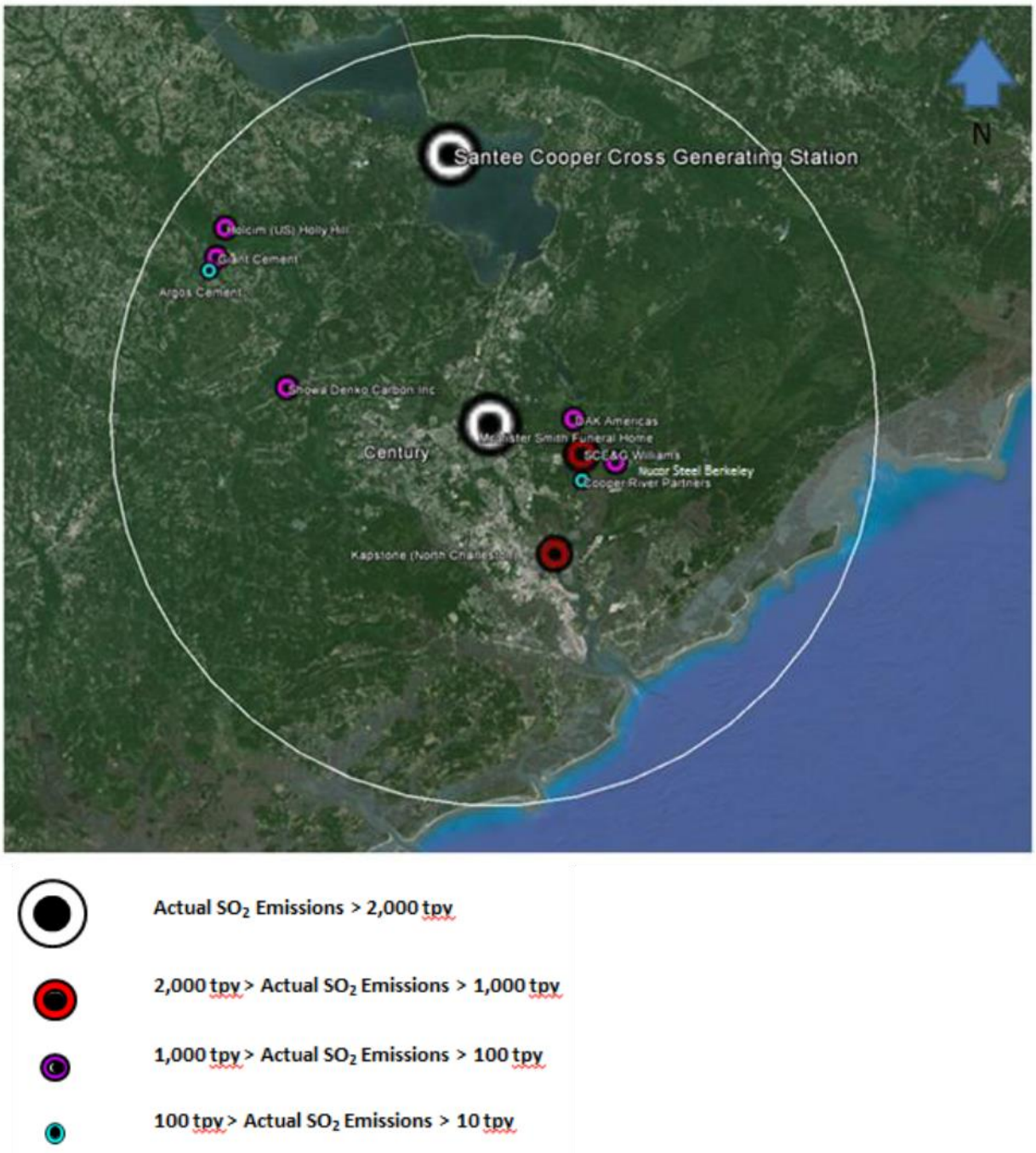
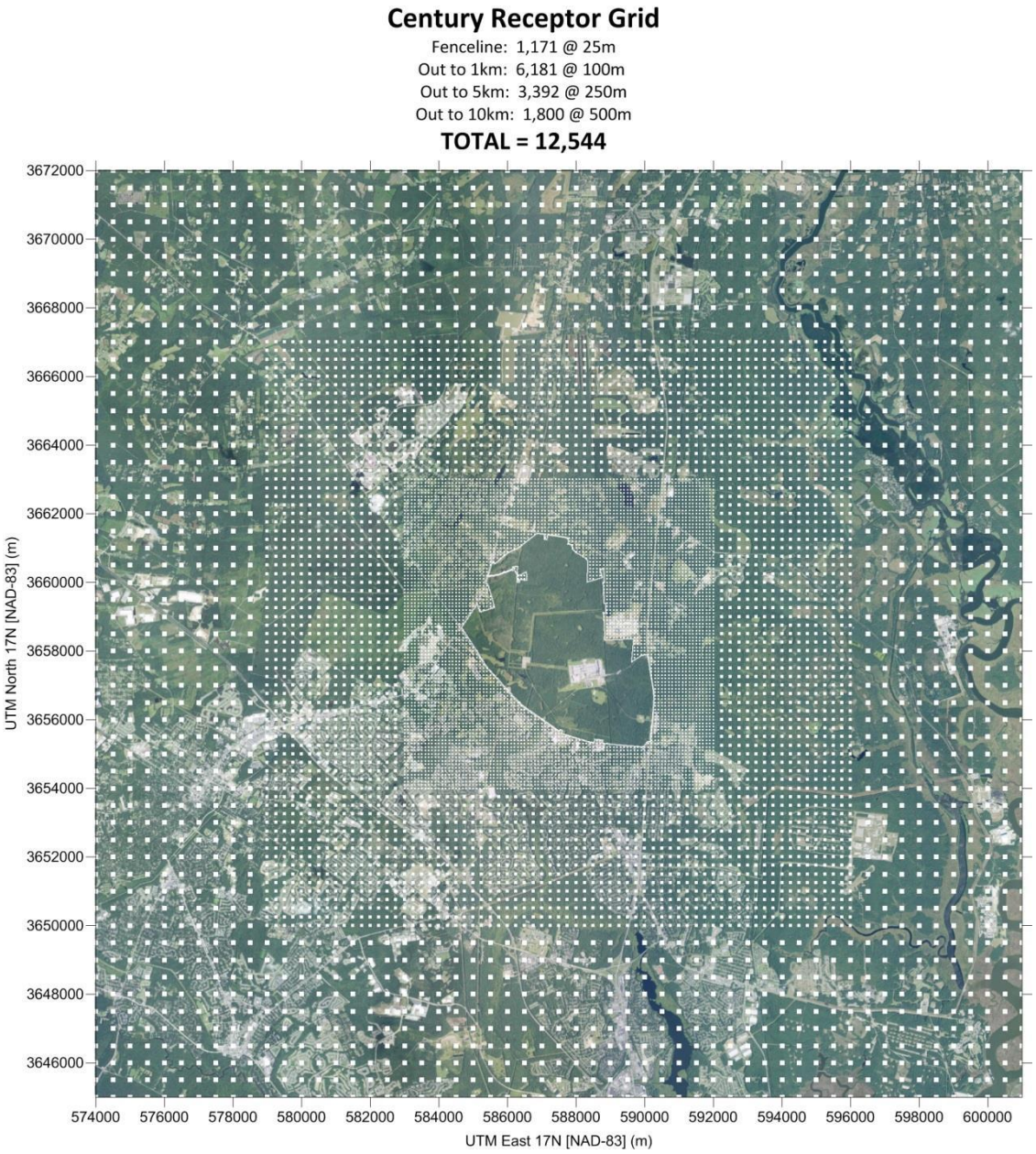


Figure 4. Receptor Grid for Century Aluminum. Source: Modeling Report for Century Aluminum of South Carolina, Inc., prepared for South Carolina, December 2016.



The EPA agrees with the State on the final receptor grid used including those areas excluded from the modeling because these locations were located within the fence line of Century and did not represent ambient air. The final receptor grid, therefore, can be expected to adequately characterize SO_2 impacts from the facility.

3.3.2.4. Modeling Parameter: Source Characterization

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

Century Aluminum is an aluminum smelter. The primary source of SO_2 emissions at the facility is the potlines. There are numerous other smaller sources of SO_2 emissions at the facility that were included in the modeling including the green carbon plant, the baked carbon plant and the cast house. Intermittent sources of SO_2 at the facility were excluded from the modeling analysis because they did not operate frequently enough to contribute to the annual distribution of maximum daily 1-hour SO_2 concentrations. Additional information on these sources is shown in the table below.

Table 4. Century Aluminum Intermittent and Insignificant Sources

Unit ID	Description	Fuel	Other Information
IA-73026	5 Pit Filter Preheaters	Natural Gas	Very small units (0.5 Million BTU/hr each) to preheat filters in casting pits
IA-60028	Space Heaters	Natural Gas	Very small units used for comfort heat only
IA-04005	3 Steam Cleaners	Natural Gas	Very small units (0.45 Million BTU/hr each) used for maintenance activities
IA-40370	Emergency Fire Pump	Diesel Fuel	255 hp; provides firefighting water for emergency situations; operates less than 25 hours per year for testing and maintenance purposes
IA-81807/81809/N/A	Anode Preheater/Cathode Bar Heater/Cast Iron Pouring Ladle Heater	Natural Gas	Very small units (0.7, 0.8, and 1.5 Million BTU/hr) used to preheat/heat/evaporate moisture
IA-N/A	Portable Light Stands	Diesel Fuel or Gasoline	Small portable units used to provide emergency lighting
IA-N/A	Mobile Mixer	Gasoline	Small portable 11 hp mixing unit
IA-19040	Emergency Generator #1	Diesel Fuel	500 kW; provides emergency backup power to critical plant operations during rare extended power outages; operates less than 25 hours per year for testing and maintenance purposes
IA-N/A	Small Portable Generators	Gasoline	Very small portable units to provide emergency power for critical maintenance activities during an extended power outage
IA-N/A	5 Portable Crucible Heaters	Natural Gas	Small mobile 4.4 Million BTU/hr heaters used for crucibles moving from Potlines to Cast House
IA-GEN-19050	Bldg 138 Lift Station Emergency Generator	Diesel Fuel	50.7 kW; provides emergency backup power to lift station to prevent backup/spills of sanitary wastewater in the event of an extended power outage; operates less than 25 hours per year for testing and maintenance purposes

Based on the methodology outlined in section 3.3.1, the State of South Carolina determined that no other sources other than Century Aluminum should be included in the analysis. For all five candidate background facilities that were evaluated by the State for potential inclusion in the modeling analysis, the predicted impacts at Century are well below the 1-hour SO_2 background monitor design value of 23.6 $\mu g/m^3$ at the North Charleston monitor. The concentration gradient analyses performed by the State indicated that for each facility evaluated, the concentration gradients are highest near the candidate source and generally decrease with downwind distance. Finally, the plumes from the five candidate background facilities would not be expected to overlap or interact with Century from any upwind direction. Based on these factors, the EPA concurs with this determination. The State characterized this source within the area of analysis in accordance with the best practices outlined in the Modeling TAD. The State also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPPRM was used to assist in addressing building downwash.

Because potential to emit (PTE) emissions were used in this modeling analysis, the stack heights modeled were consistent with the GEP Policy. All stacks were less than 65 m in height. Any stack with an actual height of less than 65 m is modeled at its actual stack height and is consistent with the GEP rule.[8] The EPA concurs with the exclusion of intermittent sources at Century because they did not operate frequently enough to contribute to the annual distribution of maximum daily 1-hour SO_2 concentrations and, as shown in the table above, most of these sources have a very low BTU or horsepower rating or are operated on natural gas or gasoline. The units that can use diesel fuel are either very small or operate less than 25 hours per year. As discussed in the previous paragraph the EPA agrees with the determination that no background sources need to be included explicitly in the modeling. The EPA agrees that this component of the modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD.

3.3.2.5. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

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

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. Specifically, a facility that has recently

[8] 40 CFR section 51.100.

adopted a new federally-enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a State should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the State included Century Aluminum and no other emitters of SO_2 within 50 km in the area of analysis. The State has chosen to model this facility using the most recent federally enforceable and effective PTE limits for SO_2 emissions[9]. The facility in the State's modeling analysis and its associated PTE rates are summarized below.

For Century Aluminum, the State provided PTE values. This information is summarized in Table 5. A description of how the State obtained hourly emission rates is given below this table.

Table 5. SO_2 Emissions based on PTE for Century Aluminum

Facility Name	SO_2 Emissions (tpy, based on PTE)
Century Aluminum	4,088
Total Emissions from All Modeled Facilities in the Area of Analysis	4,088

The PTE in tpy for Century Aluminum was determined by the EPA by multiplying the maximum allowable hourly emission rates (PTE) for each unit by 8,760 hours in a year. Century Aluminum was modeled by the state using maximum allowable emissions and corresponding stack parameters consistent with the GEP Policy (see GEP discussion in Section 3.3.2.4). Emissions were assumed to be the same in each modeled year.

The EPA concurs with this component of the modeling assessment. Allowable emissions were used in the modeling for Century Aluminum and the GEP Policy was followed.

[9] South Carolina Title V permit, dated 9/27/2005, and a construction permit issued on 1/3/2008.

3.3.2.6. Modeling Parameter: Meteorology and Surface Characteristics

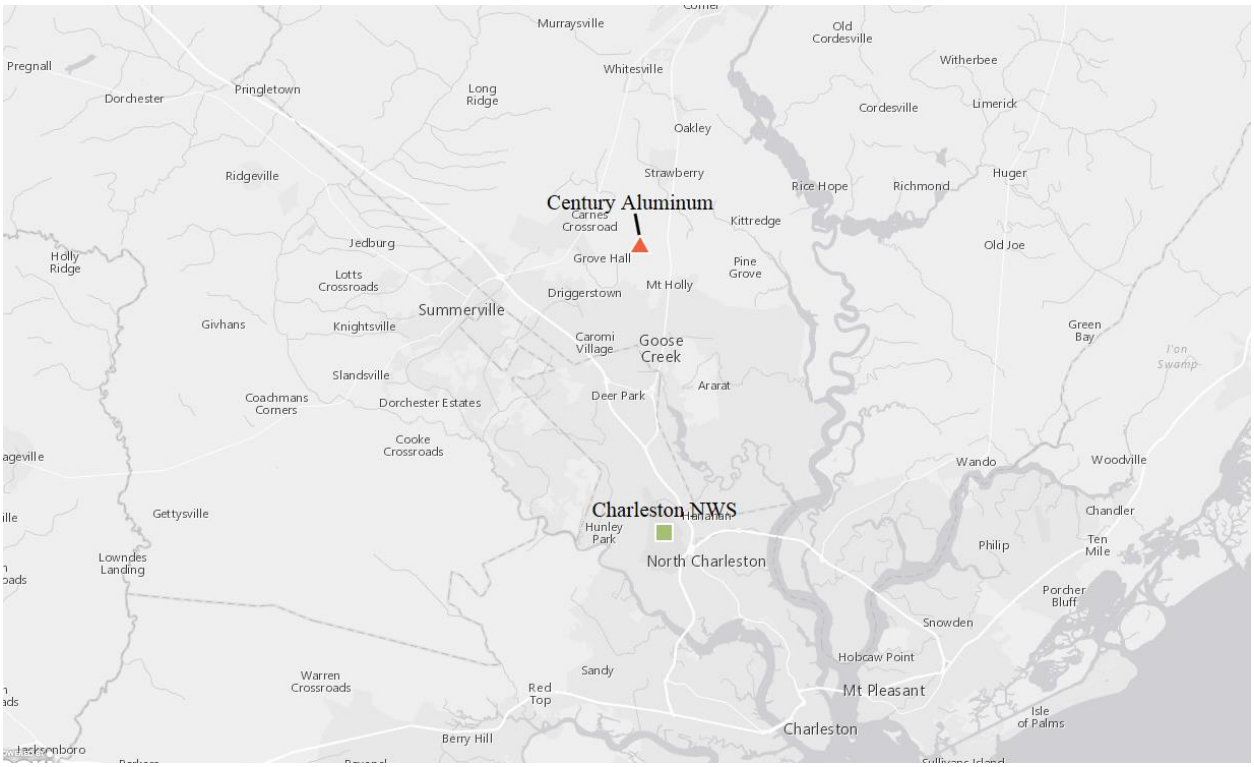
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

For the area of analysis for the Century area, the State selected the surface meteorology from the NWS station in Charleston, South Carolina, located at 32.89 N, 80.04 W, 17 km to the south of the source, and coincident upper air observations from the same NWS station as best representative of meteorological conditions within the area of analysis.

The State used AERSURFACE version 13016 using data from the Charleston, South Carolina NWS site to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (zo)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as “zo” The state estimated surface roughness values for 12 spatial sectors out to 1km at a seasonal temporal resolution for average conditions.

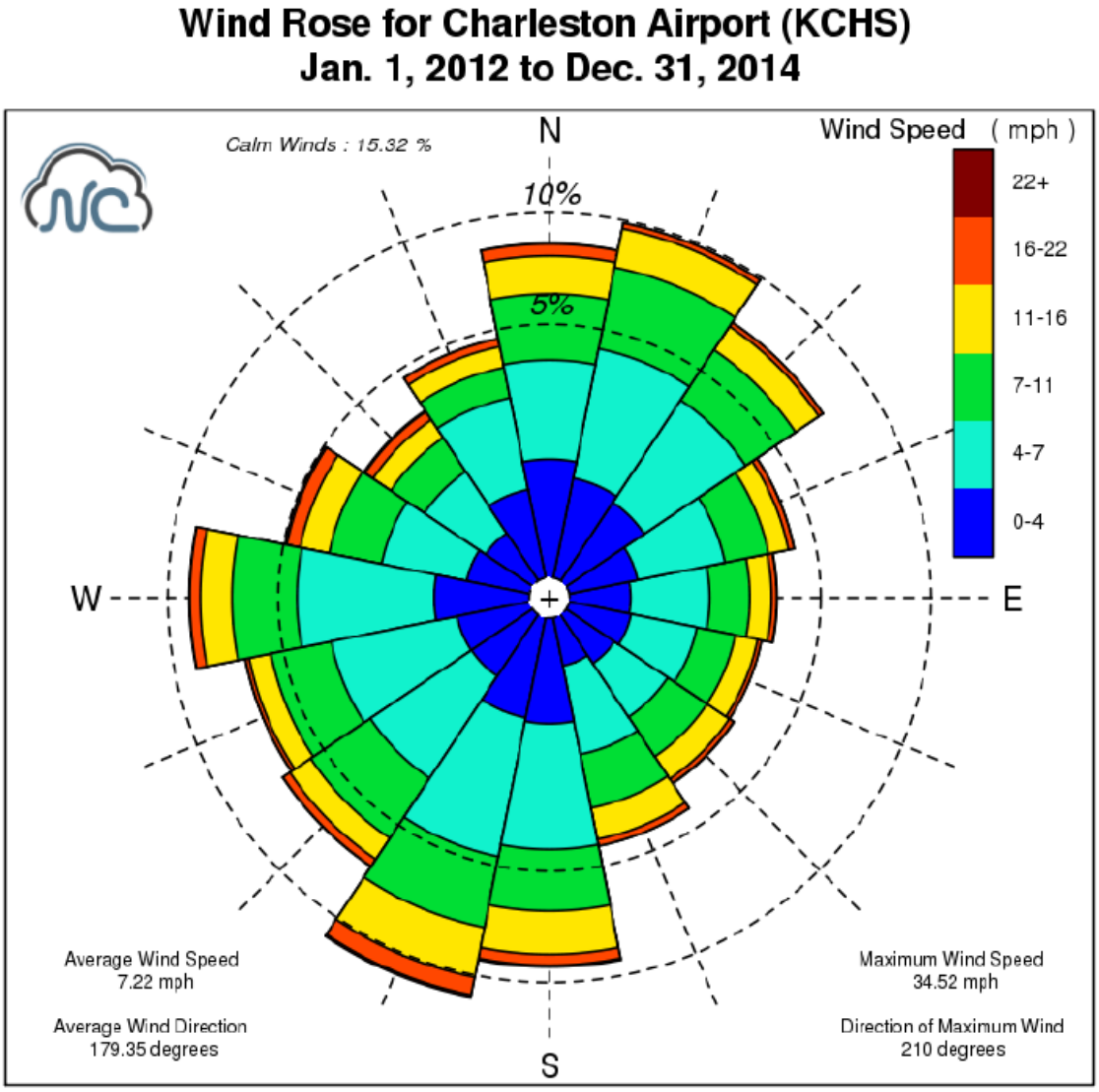
In the figure below, generated by the EPA, the location of this NWS station is shown relative to the area of analysis.

Figure 5. Area of Analysis and the NWS station in the Berkeley County Area for Century Aluminum



As part of its recommendation, the State provided the 3-year surface wind rose for the Charleston, South Carolina NWS site. In Figure 6 the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Analysis of the NWS data indicate winds blow predominately from the north-northeast, and south-southwest with a secondary maximum from the west.

Figure 6. Berkeley County, South Carolina Cumulative Annual Wind Rose for Years 2012-2014. Source: Modeling Report for Century Aluminum of South Carolina, Inc., Prepared for South Carolina, December 2016.



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

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the NWS station mentioned above, 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 (m/s) in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The EPA concurs with the surface and upper air meteorological data selected by the State for use in this analysis. Also, the data were processed in a manner consistent with the AERMOD Implementation Guidance. The EPA believes that the wind rose indicates that impacts from Century Aluminum are reasonably expected to most frequently occur generally north-northeast and south-southwest of Century, but that impacts could be seen in other directions as well.

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

The terrain in the area of analysis is best described as flat terrain with small hills. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. The EPA agrees that this component of the modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD.

3.3.2.8. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the State elected to use a "tier 1" approach. Data was obtained from the years 2012-2014 for AQS Site: 45-019-003 which is located just northwest of Charleston at the Jenkins Avenue Fire Station about 20 km south-southeast of Century. This monitor is referred to as the "North Charleston monitor." The single value of the background concentration for this area of analysis was determined by the State to be 37.5 μg/m^3, equivalent to 14.3 ppb when expressed in 3 significant figures,[10] and that value was incorporated into the final AERMOD results.

Subsequent to the original modeling report submitted on January 13, 2017, South Carolina determined that the 2012-2014 SO_2 ambient air data from North Charleston monitor is incomplete. On April 7, 2017, South Carolina submitted additional documentation containing a revised analysis for the Century facility using more recent 2014-2016 background data from the North Charleston monitor.[11] The 2014-2016 single value of the background concentration was determined by the State to be 23.6 μg/m^3, equivalent to 9 ppb when expressed in 2 significant figures,[12] and that value was incorporated into the final AERMOD results (107.5 μg/m^3 + 23.6 μg/m^3 = 131.1 μg/m$^{3)}$.

The EPA concurs with the SO_2 monitor selected for use as a background monitor in the modeling analysis. This component of the modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD. Use of the most recent SO_2 background concentration is acceptable even if the monitoring data years do not match the emissions and meteorological data years modeled. Section 8.1 of the Modeling TAD states that use of a "…uniform monitored background concentration based on the monitored design values for the latest 3-year period, regardless of the years of meteorological data used in the modeling…" is an acceptable approach.

[10] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in μg/m^3. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 μg/m^3.
[11] Letter from Rhonda B. Thompson, Chief, Bureau of Air Quality, South Carolina Department of Health and Environmental Control to V. Anne Heard, Acting Regional Administrator, U.S. EPA Region 4, dated April 7, 2017.
[12] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in μg/m^3. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 μg/m^3.

3.3.2.9. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Berkeley County (Century Area) area of analysis are summarized below in Table 6.

Table 6. Summary of AERMOD Modeling Input Parameters for Century Aluminum in the Berkeley County Area

Input Parameter	Value
AERMOD Version	15181 (default regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	21
Modeled Structures	72
Modeled Fencelines	1
Total receptors	12,546
Emissions Type	PTE
Emissions Years	PTE
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Charleston, SC
NWS Station Upper Air Meteorology	Charleston, SC
NWS Station for Calculating Surface Characteristics	Charleston, SC
Methodology for Calculating Background SO_2 Concentration	Tier 1 approach using AQS site: 45-019-003 for 2014-2016
Calculated Background SO_2 Concentration	23.6 $\mu g/m^3$

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

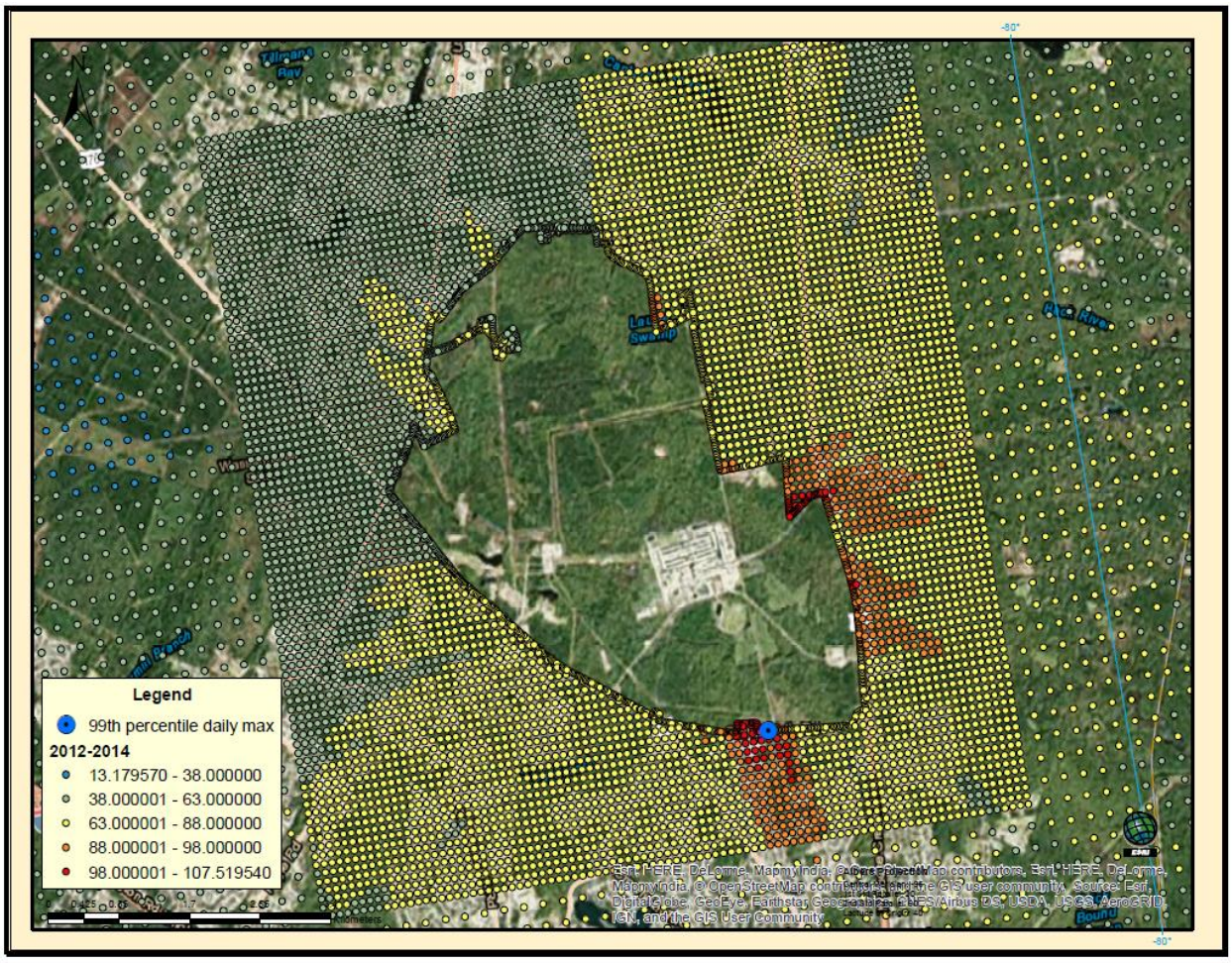
Table 7. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged over Three Years for the Century Aluminum Area of Analysis in the Berkeley County Area

Averaging Period	Data Period	Receptor Location [UTM zone 17]		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	588907.8	3655303.2	131	196.4*

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

The State's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 131 $\mu g/m^3$, equivalent to 50 ppb. This modeled concentration included the background concentration of SO_2, and is based on PTE emissions from the facility. Figure 7 below was included as part of the State's recommendation, and indicates that the predicted value occurred just southeast of the Century. The State's receptor grid is also shown in the figure.

Figure 7: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Century Aluminum Area of Analysis in the Berkeley County Area.



The modeling submitted by the State does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

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

The EPA concurs that the modeling for Century Aluminum has been performed in a manner consistent with the SO_2 Modeling TAD. The EPA concurs with inclusion of only Century Aluminum in the modeling and with the background monitor and concentration used. The modeling domain used should be sufficient to resolve maximum concentrations in the Berkeley County area. The State's selection of surface and upper air meteorological stations and surface characteristics for the area are also appropriate to make a valid modeling demonstration. The State adequately represented the topography of the area with the model and its preprocessors. EPA also agrees with the selection of the North Charleston background monitor for use in the analysis and also concurs with the use of the more recent 2014-16 design value from that site. The modeling utilized federally enforceable and effective PTE for Century and predicted no violations of the 1-hour SO_2 NAAQS and the EPA concurs with this determination.

3.4. Air Quality Modeling Analysis for the Berkeley County Area Addressing Santee Cooper Cross Generating Station (Santee Cooper)

3.4.1. Introduction

This section 3.4 presents all the available air quality modeling information for a portion of Berkeley County that includes the Santee Cooper Cross Generating Station. (This portion of Berkeley County will often be referred to as "the Santee Cooper area" within this section 3.4). This area contains the following SO_2 source, principally the sources around which South Carolina is required by the DRR to characterize SO_2 air quality, or alternatively to establish an SO_2 emissions limitation of less than 2,000 tpy:

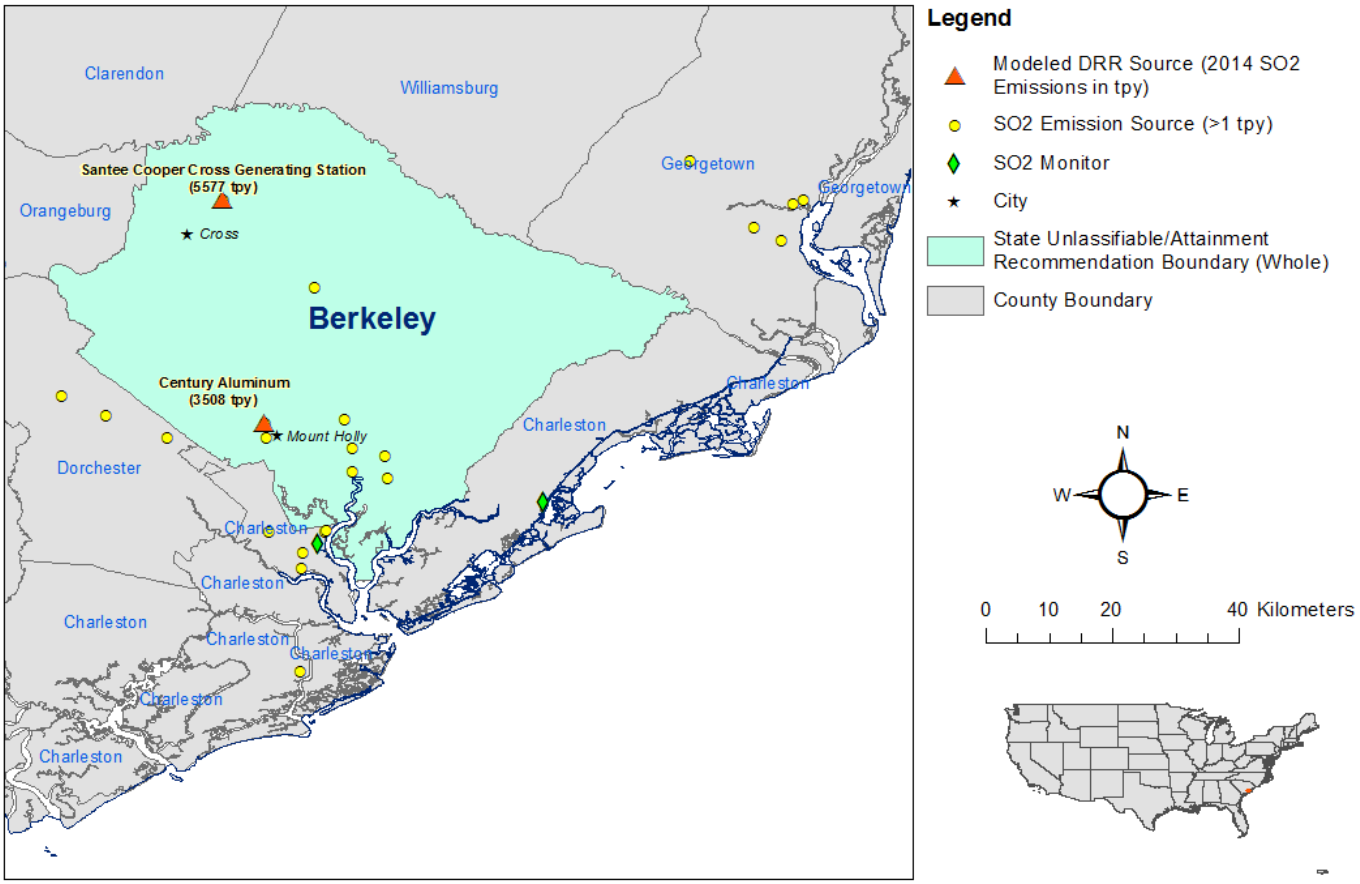
- The Santee Cooper facility emitted 2,000 tons or more annually. Specifically, Santee Cooper emitted 5,577 tons of SO_2 in 2014, 3,914 tons in 2015 and 4,603 tons in 2016. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and South Carolina has chosen to characterize it via modeling.

In its submission, South Carolina recommended that each county in the State be designated attainment including Berkeley. Specifically, the State recommended that an area that includes the area surrounding the Santee Cooper be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the State's assessment, supporting documentation, and all available data, the EPA agrees with the State's recommendation for the area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

Santee Cooper is a coal-fired power station located in Berkeley County. The facility consists of four dry bottom utility steam boilers (Units 1 thru 4) fired on bituminous coal. The area that the State has assessed via air quality modeling is located between Lake Marion and Lake Moultrie,

off South Carolina Highway 45, southwest of Pineville, South Carolina. As seen in Figure 8 below, the facility is approximately 1 km from Lake Moultrie and 2 km from Lake Marion. Also included in the figure are other nearby emitters of SO_2.[13] These are Santee Cooper Jefferies, SCE&G Williams, BP-Amoco Cooper River, DAK Americas LLC Cooper River, Cooper River Partners, LLC, Giant Cement Co., Argos Cement, Showa Denko Carbon, Inc., and Holcim Holly Hill. The Century Aluminum DRR source is also located within 50 km of the Santee Cooper facility. Also included in the figure is the State's recommended area for the unclassifiable/attainment designation. The EPA's intended unclassifiable/attainment designation boundary for the Berkeley County area is not shown in this figure, but is shown in a figure in the section below that summarizes our intended designation.

Figure 8. Map of the Berkeley County Area Addressing Santee Cooper Cross Generating Station



[13] All other SO_2 emitters with PTE greater than 20D (20 times the distance in km from the candidate source to Cross (based on information in the State of South Carolina emissions inventory are shown in Figure 8. There are no additional SO_2 emitters above this emission level in the vicinity of the named source(s).

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

For this area, the EPA received and considered two modeling assessments from the State and no assessment from other parties. To avoid confusion in referring to these assessments, the following table lists them, indicates when they were received, provides an identifier for the assessment that is used in the discussion of the assessments that follow, and identifies any distinguishing features of the modeling assessments.

Table 8. Modeling Assessments for the Santee Cooper Area

Assessment Submitted by	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
South Carolina*	January 2017	Santee Cooper Cross Generating Station Modeling Report	Submittal from the State of SC.
South Carolina*	April 7, 2017	Santee Cooper Cross Generating Station Modeling Report	Revised Submittal from the State of SC.

* South Carolina forwarded the assessment prepared by Trinity Consultants.

3.4.1.1. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPPRM: 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, the most up-to-date version at the time of modeling, using all regulatory default options. AERMOD version 16216r has since become the regulatory model version. There were no updates from 15181 to 16216r that would significantly affect the

concentrations predicted here. A discussion of the State's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

The current version of AERMOD, version 16216r, includes updates to 40 CFR part 51, Appendix W, "Guideline of Air Quality Models," published on January 17, 2017 (82 FR 5203). This version of AERMOD also includes fixes to bugs that were inadvertently included in version 16216. South Carolina chose to use version 15181 of AERMOD because the State is using the regulatory default settings for version 15181 available at the time of its modeling preparation and is not making use of any previously alternative modeling options included in version 16216r and the update to Appendix W.

3.4.1.2. Modeling Parameter: Rural or Urban Dispersion

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

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. The State analyzed the land use types within 3 km of Santee Cooper as shown in Figure 9. The AERSURFACE output data show that half of the area surrounding the facility is either open water or woody wetlands and the remainder of the land use is forest and cropland. Over 90 percent of the area surrounding Santee Cooper is rural therefore, the area surrounding the Santee Cooper facility may be classified as predominantly rural. For the purpose of performing the modeling for the area of analysis, the State determined that it was most appropriate to run the model with rural dispersion coefficients or in rural mode and the The EPA concurs that it is appropriate to run the model in rural model for this modeling analysis. Figure 9 below depicts land use in the Santee Cooper area. Table 9 below depicts the percentage of the land use categories within 3 km of Santee Cooper.

Figure 9 – Land Use Within 3 km of the Santee Cooper Facility. Source: 1-Hour Sulfur Dioxide NAAQS Compliance Demonstration Modeling for Santee Cooper Cross Generating Station prepared for South Carolina, January 2017

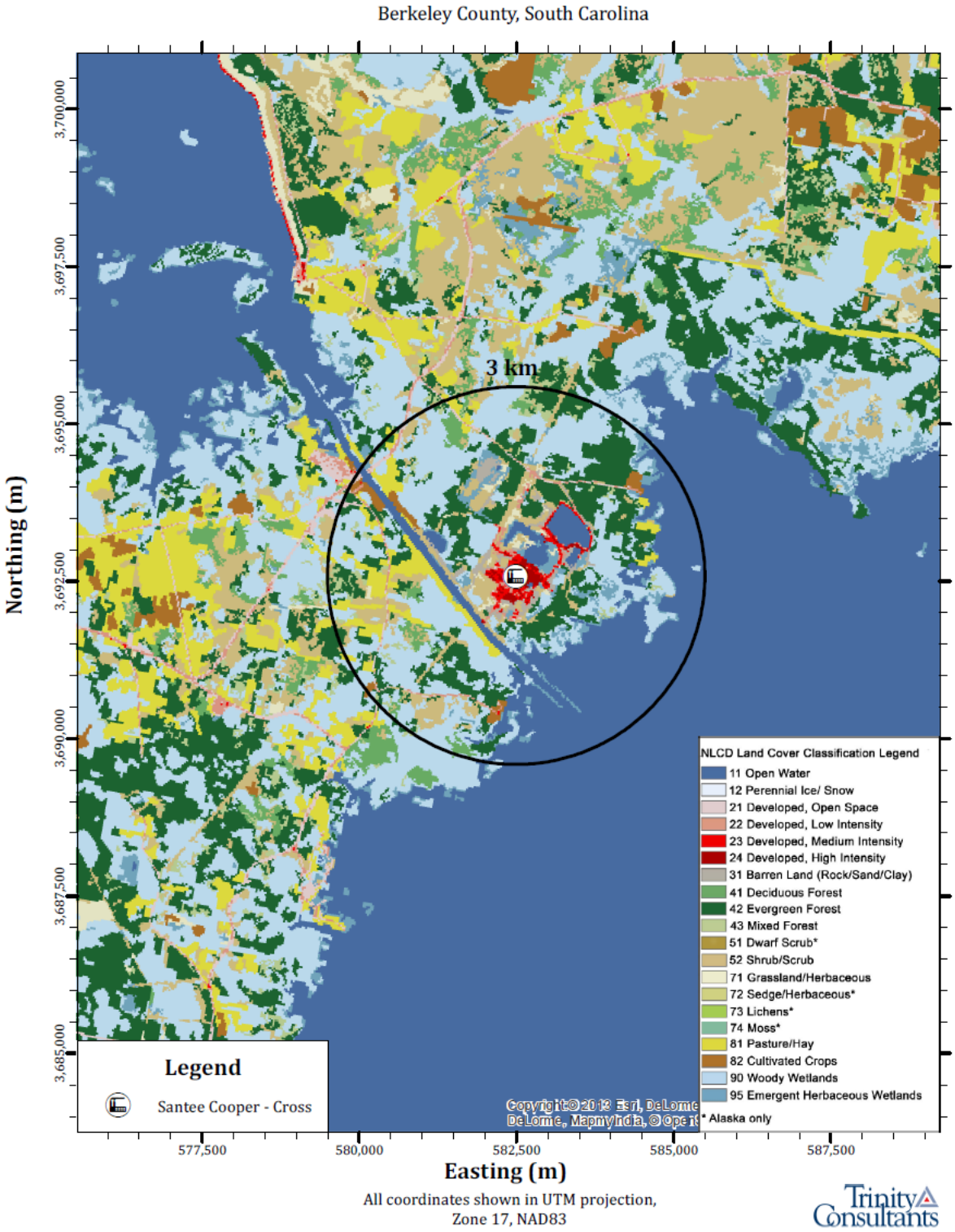


Table 9. Land use within 3 km of Santee Cooper. Source: 1-Hour Sulfur Dioxide NAAQS Compliance Demonstration Modeling for Santee Cooper Cross Generating Station prepared for South Carolina, January 2017

Land Use Class	Percentage of Total
Missing, Out-of-Bounds, or Undefined	0%
Open Water	25%
Perennial Ice/Snow	0%
Low Intensity Residential	0%
High Intensity Residential	0%
Commercial/Industrial/Transp	0%
Bare Rock/Sand/Clay	1%
Quarries/Strip Mines/Gravel	0%
Transitional	2%
Deciduous Forest	12%
Evergreen Forest	11%
Mixed Forest	9%
Shrubland	0%
Orchards/Vineyard/Other	0%
Grasslands/Herbaceous	0%
Pasture/Hay	1%
Row Crops	3%
Small Grains	0%
Fallow	0%
Urban/Recreational Grasses	7%
Woody Wetlands	28%
Emergent Herbaceous Wetlands	1%

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

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the

extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Santee Cooper area, the State has included no other emitters of SO_2 within 50 km of Santee Cooper facility in any direction. The State determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. No other sources beyond 50 km were determined by the State to have the potential to cause concentration gradient impacts within the area of analysis.

The State considered actual emission rates and proximity to the primary source as factors for identifying nearby sources. A screening area extending 50 km from Santee Cooper was used to identify potential nearby sources. Initial screening was conducted to identify current allowable emissions for all facilities with air permits. The State identified 54 permitted facilities within 50 km of Santee Cooper. Actual annual SO_2 emission rates for the years 2012, 2013, and 2014 were obtained for each of the candidate facilities and then analyzed for the emission rate in the most recent year for which data was available (2014).

The methodology used by South Carolina for screening nearby sources for potential inclusion into the cumulative impact modeling analysis is the "20D" methodology (a specific variant of the Q/D screening method) which allows for candidate nearby sources to be excluded from the cumulative analysis if their facility-wide emission rates, in tpy, are less than 20D, where D is the distance in km between the candidate nearby source and the primary source.

Ten candidate facilities remained based on the 20D analysis using allowable annual emissions. The sources, except for Santee Cooper Jefferies, where the coal boilers ceased operation at the end of 2012, were further screened using actual annual SO_2 emissions from 2014. The nine remaining sources considered for further analysis were: Century Aluminum (35 km away), Showa Denko (38 km away), SCE&G Williams (43 km away), BP Amoco (49 km away), DAK Americas (38 km away), Cooper River Partners (46 km away), Giant Cement Co. (34 km away), Argos Cement (35 km away), and Holcim (US) Holly Hill (31 km away).

Santee Cooper conducted additional analyses that examined the concentration gradients predicted for each of the remaining candidate sources. In each case, the gradients are highest near the candidate source and generally decrease with downwind distance. For the purpose of this gradient concentration gradient analysis, Century Aluminum and Showa Denko were modeled individually while SCE&G Williams, BP Amoco, DAK Americas, and Cooper River Partners were modeled together in a "south/southeast" grouping and Giant Cement Company, Argos Cement and Holcim were modeled together in a "west/southwest" grouping. The results of this modeling indicated that the concentration gradients from the individual candidate background sources, and geographic groupings of candidate background sources in the vicinity of Santee Cooper are such that the background sources do not need to be included explicitly in the cumulative impact modeling analyses. The results of the gradient concentration analysis are

depicted in Appendix B of the January 2017 modeling report prepared by Trinity and submitted by the State of South Carolina.

For all of the candidate background facilities, and geographic groupings of candidate background sources, the predicted impacts at Santee Cooper are well below the 2014-2016 1-hour SO_2 monitor design value of 23.6 $\mu g/m^3$ at the Jenkins Avenue Fire Station (North Charleston monitor). For this additional reason, the State concluded that these sources do not need to be included explicitly in the cumulative impact modeling analyses and the EPA concurs with this determination.

For each candidate background source, and geographic grouping, the State's modeling demonstrates that the predicted 1-hour SO_2 impacts at the location of Santee Cooper are well below the 1-hour background monitor design value. Also, the concentration gradient analysis shows that the concentration gradients from each candidate facility are highest near the candidate facility and generally decrease with downwind distance. Each candidate source is greater than 30 km from the Santee Cooper Cross facility. Therefore, the State concluded that these candidate sources do not need to be explicitly included in the cumulative impact analysis. The EPA concurs with this determination.

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

The Santee Cooper facility developed a receptor grid with 100 m spacing for up to 1 km beyond the furthest extent of the ambient air boundary, 250 m spacing between 1 and 5 km, and 500 m spacing from 5 km to 10 km.

The receptor network contained 7,040 receptors, and the network covered northwestern Berkeley County.

Figures 10 and 11 included in the State's recommendation, show the State's chosen area of analysis surrounding the Santee Cooper facility, as well as the receptor grid for the area of analysis.

Consistent with the Modeling TAD, the State placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to the Santee Cooper Santee Cooper generating station. No other receptor locations were excluded from the analysis including those located over water. The Santee Cooper facility is located between two lakes and adjacent to a canal that connects the lakes. The state asserted that the ambient air boundary is comprised of a combination of fencing, locked gates, a staffed main access gate, the dike along the canal, and regular security patrols.

Figure 10. Map of the Berkeley County, South Carolina Area Addressing the Santee Cooper Cross Generating Station. Source: 1-Hour Sulfur Dioxide NAAQS Compliance Demonstration Modeling for Santee Cooper Cross Generating Station prepared for South Carolina, January 2017

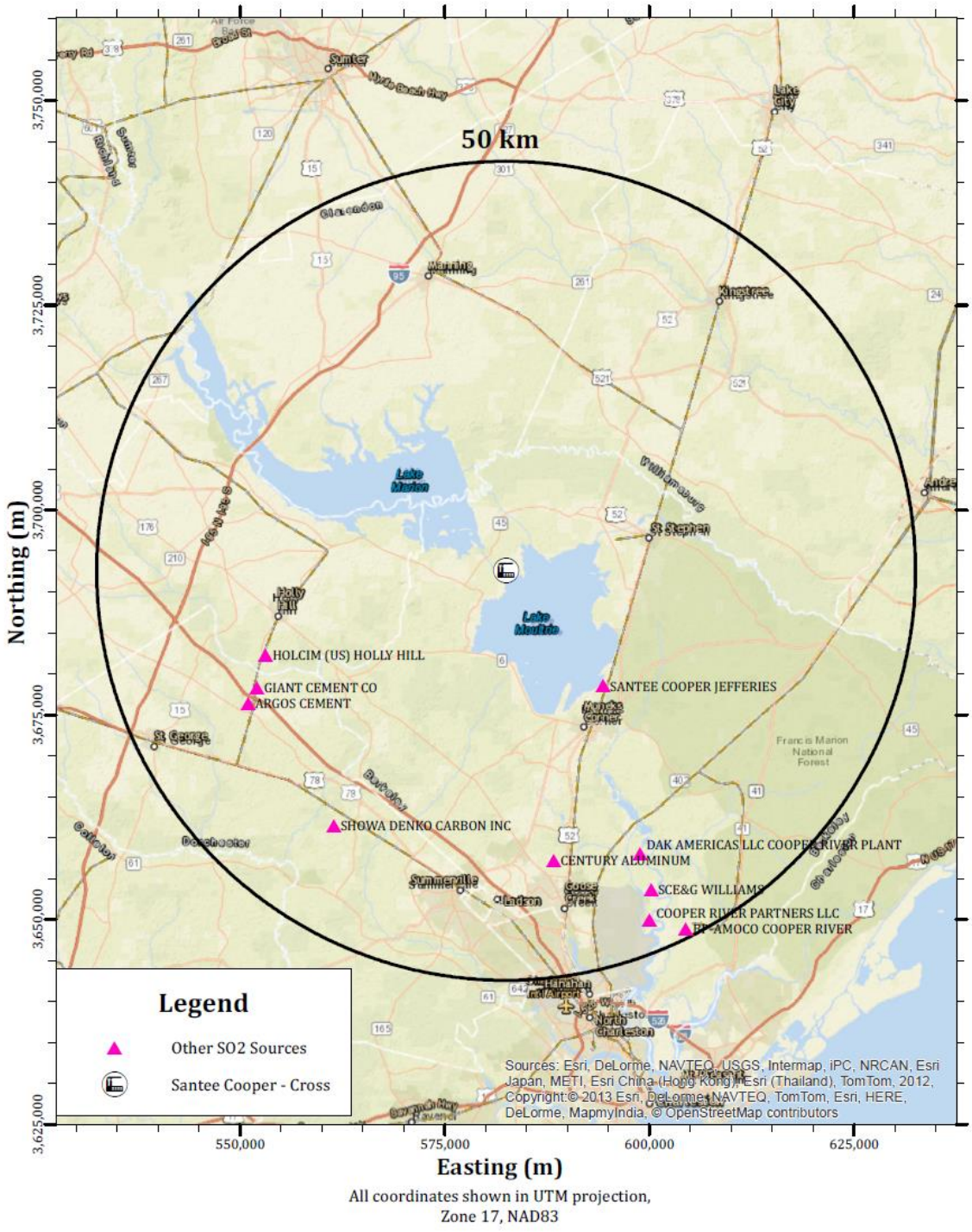
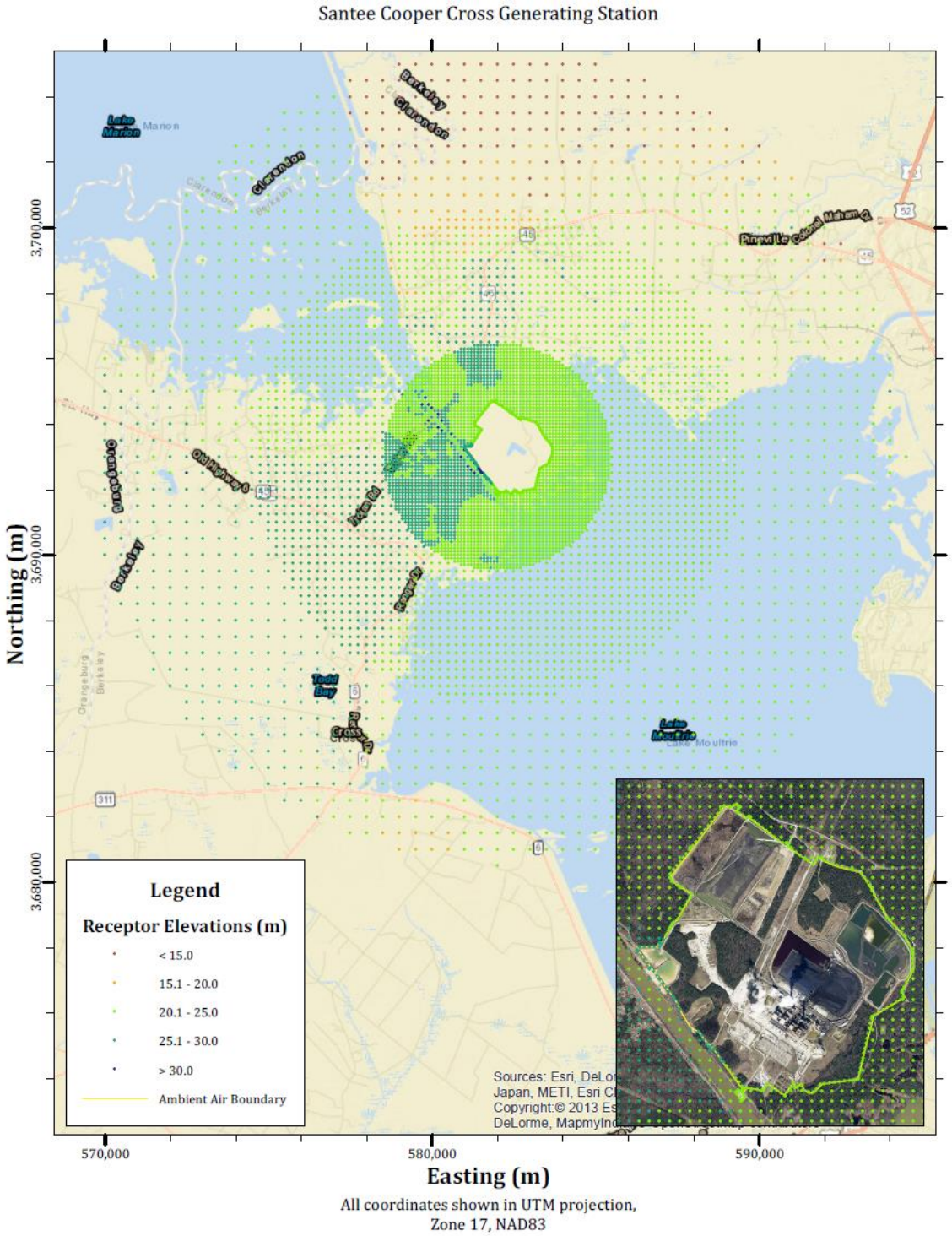


Figure 11. Receptor Grid for the Santee Cooper Area. Source: 1-Hour Sulfur Dioxide NAAQS Compliance Demonstration Modeling for Santee Cooper Cross Generating Station prepared for South Carolina, January 2017



The EPA agrees with the State on the final receptor grid used. The EPA notes that the maximum concentration modeled appears to be about 300 meters north of the northernmost edge of what the state asserted was the facility's ambient air boundary. The final receptor grid, therefore, can be expected to adequately characterize SO_2 impacts from the facility.

3.4.1.4. Modeling Parameter: Source Characterization

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

The Santee Cooper facility consists of four (4) dry bottom utility steam boilers (Units 1, 2, 3, and 4) fired on bituminous coal; the boilers can also combust coal blended with petcoke (up to 30 percent petcoke, by weight). Each boiler is equipped with an electrostatic precipitator for particulate matter emissions control, a wet scrubber for SO_2 emissions control, and a selective catalytic reduction system for oxides of nitrogen (NOx) control. Units 1 and 2 are paired in one concrete chimney and Units 3 and 4 are paired in the another chimney.

In addition, the Santee Cooper facility has a number of stationary diesel and propane engines onsite that are considered intermittent emissions sources. Consistent with Section 5.5 of the SO_2 Modeling TAD, intermittent emissions sources are not included in the modeling because they do not operate continuously or frequently enough to contribute to the annual distribution of daily maximum 1-hour SO_2 concentrations. Actual operating hours for 2015 (a representative year) are 26 for the emergency generators assigned to each boiler, 43 for the emergency fire pump engines, and 61 for the guard house generator. The guard house generator is propane-fired, while the remainder are fired on ultra-low sulfur diesel oil.

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

The EPA concurs with this component of the modeling analysis including the exclusion of all nearby SO_2 sources from being explicitly included in the modeling based on the factors discussed in Section 3.4.1.3, the intermittent sources excluded from the analysis and the use of actual emission rates with actual stack heights.

3.4.1.5. Modeling Parameter: Emissions

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

would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

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

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a State should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the State included the Santee Cooper facility and no other emitters of SO_2 within 50 km in the area of analysis. The State has chosen to model this facility using actual emissions. This facility in the State's modeling analysis and its associated annual actual SO_2 emissions between 2012 and 2014 are summarized below.

For the Santee Cooper facility, the State provided annual actual SO_2 emissions between 2012 and 2014. This information is summarized in Table 10. A description of how the State obtained hourly emission rates is given below this table.

Table 10. Actual SO_2 Emissions Between 2012 – 2014 from Facilities in the Santee Cooper Area

	SO_2 Emissions (tpy)		
Facility Name	**2012**	**2013**	**2014**
Santee Cooper Facility	8,018	6,687	5,577
Total Emissions from All Modeled Facilities in the State's Area of Analysis	8,018	6,687	5,577

For the Santee Cooper facility, the actual hourly emissions data were obtained from CEMs.

The EPA agrees with South Carolina's use of past actual emissions for the Santee Cooper facility. The EPA also agrees with the use of 2012-2014 emissions despite the currently availability of emissions from a more recent period. According to data from the Clean Air Markets Division, emissions in 2015 (3,914 tons) and 2016 (4,603 tons) were lower than any of the years from the 2012-14 period shown in the table above. Thus, the use of emissions data from the 2012-2014 period in this modeling analysis should provide for a conservative (or higher) representation of any possible SO_2 impacts in the area. This component of the modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD.

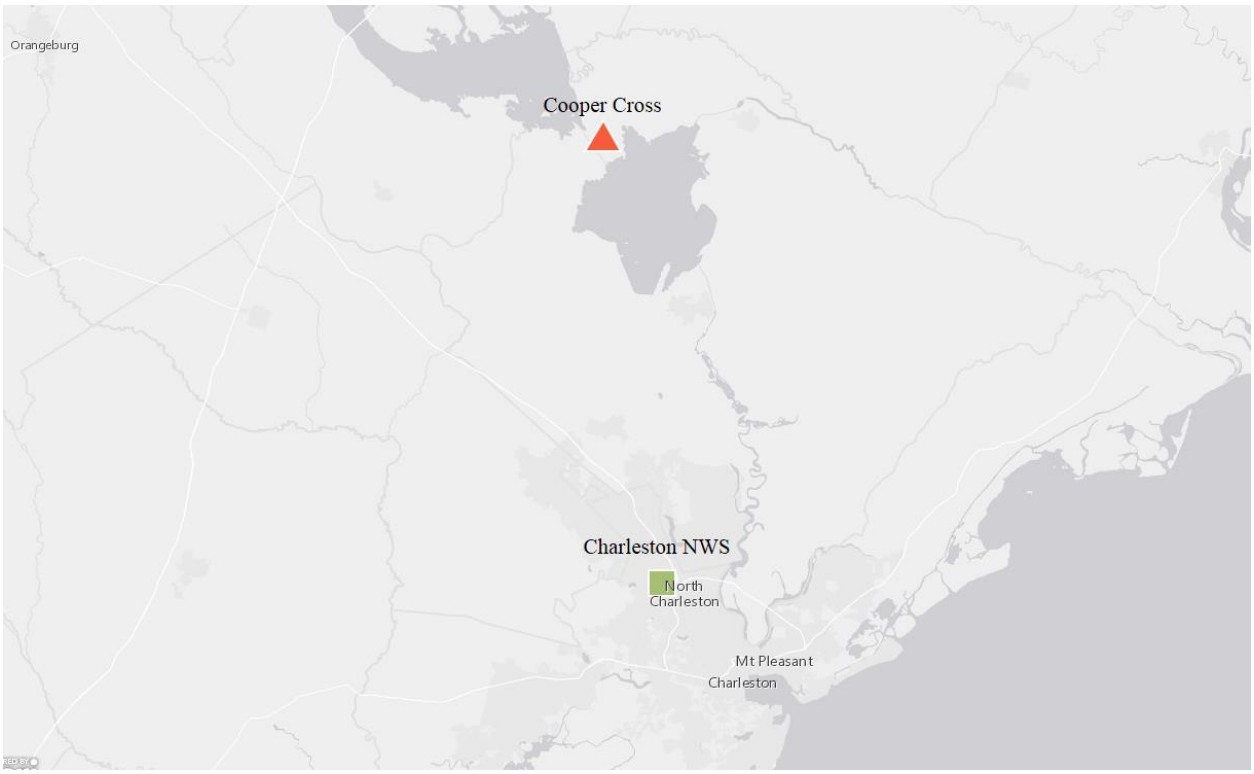
3.4.1.6. Modeling Parameter: Meteorology and Surface Characteristics

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

For the area of analysis for the Santee Cooper area, the State selected the surface meteorology from the NWS station in Charleston, South Carolina, located at 32.89 N, 80.04 W, 50 km to the south of the source, and coincident upper air observations from the same NWS station as best representative of meteorological conditions within the area of analysis.

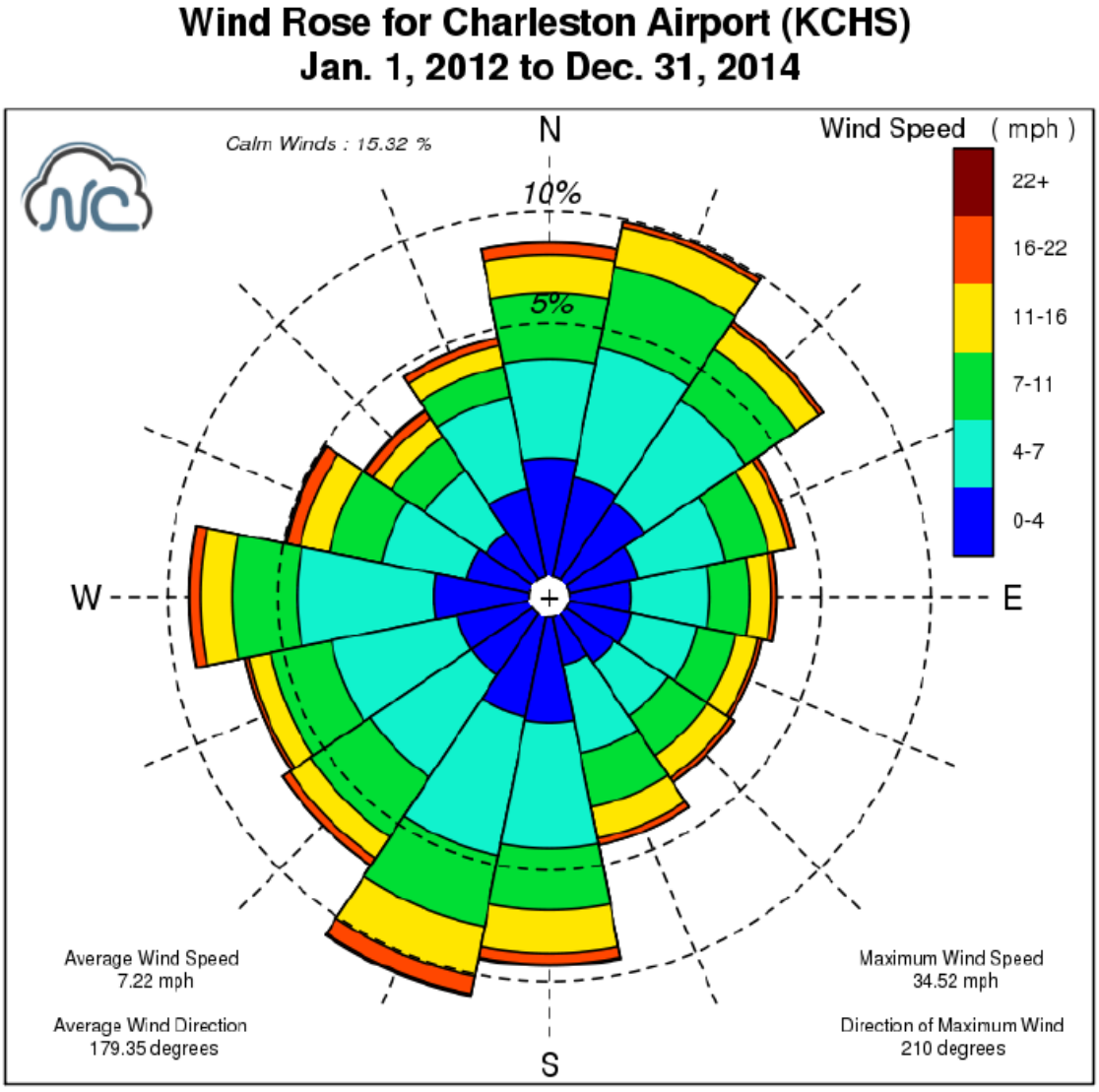
The State used AERSURFACE version 13016 using data from the Charleston, SC NWS site to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (zo)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "zo" The state estimated surface roughness values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, or average conditions, as appropriate, based on a comparison of observed rainfall for 2012-2014 at the Charleston Airport to 30 year normals. In the figure below, generated by the EPA, the location of this NWS is shown relative to the area of analysis.

Figure 12. Area of Analysis and the NWS station in the Berkeley County Area for the Santee Cooper Cross Generating Station



As part of its recommendation, the State provided the 3-year surface wind rose for the Charleston, South Carolina NWS station. In Figure 13, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Analysis of the NWS data indicates winds blow predominately from the north-northeast, south-southwest and a secondary max from the west directions.

Figure 13. Berkeley County, South Carolina Cumulative Annual Wind Rose for Years 2012-2014. Source: 1-Hour Sulfur Dioxide NAAQS Compliance Demonstration Modeling for Santee Cooper Cross Generating Station prepared by Trinity Consultants January 2017



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The State followed the methodology and settings presented in the AERMOD Implementation 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 1-minute duration was provided from the NWS station mentioned above, 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 m/s in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The EPA concurs with the use of surface and upper air meteorological data from Charleston for use in the modeling analysis. The meteorological data has been processed in a manner consistent with Section 7 of the SO_2 Modeling TAD. The EPA believes that the wind rose indicates that impacts from the Santee Cooper facility are reasonably expected to most frequently occur generally north-northeast and south-southwest of Santee Cooper, but that impacts could be seen in other directions as well.

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

The terrain in the area of analysis is best described as residential areas and woods. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. The EPA concurs with this component of the modeling analysis.

3.4.1.8. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the State elected to use a "tier 2" approach and developed seasonal hourly background concentrations. Data was obtained from 2012-2014 for AQS Site #45-019-003 which is located near North Charleston approximately 55 km south-southeast of Santee Cooper. The hourly background concentrations for this area of analysis were determined by the State to vary from 3.5 μg/m^3, equivalent to 1.3 ppb when expressed in 2 significant figures,[14] to 26.1 μg/m^3 (10 ppb), with an average value of 10.8 μg/m^3 (4.1 ppb).

Subsequent to the original modeling report submitted on January 13, 2017, South Carolina determined that the 2012-2104 SO_2 ambient air data from North Charleston monitor is incomplete. On April 7, 2017, South Carolina submitted additional documentation containing a revised analysis for the Santee Cooper Cross facility using more recent 2014-2016 background data from North Charleston monitor that is complete.[15] South Carolina's additional analysis conservatively adds the 2014-2016 design value from the North Charleston monitor to maximum concentration from the modeling submitted in January 2017 which already includes seasonal-hourly varying background data. This procedure is effectively double counting the background value as a conservative approach for compensating for the 2012-2014 North Charleston data which is incomplete. The 2014-2016 single value of the background concentration from the North Charleston monitor was determined by the State to be 23.6 μg/m^3, equivalent to 9 ppb when expressed in 2 significant figures,[16] and that value was added to the final AERMOD results (87.7 μg/m^3 + 23.6 μg/m^3 = 111.3 μg/m^3).

The EPA agrees that the background concentration used in South Carolina's analysis provides a conservative accounting (or over-estimate) of potential impacts from nearby natural and anthropogenic SO_2 sources that have not been explicitly included in the modeling. The analysis is conservative because the background concentrations are likely "double counted."

[14] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in μg/m^3. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 μg/m^3.
[15] Letter from Rhonda B. Thompson, Chief, Bureau of Air Quality, South Carolina Department of Health and Environmental Control to V. Anne Heard, Acting Regional Administrator, U.S. EPA Region 4, dated April 7, 2017.
[16] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in μg/m^3. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 μg/m^3.

3.4.1.9. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Berkeley County (Santee Cooper Area) area of analysis are summarized below in Table 11.

Table 11. Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Santee Cooper Area

Input Parameter	Value
AERMOD Version	15181 (regulatory default options)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	6
Modeled Structures	12
Modeled Fencelines	1
Total receptors	7,040
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Charleston, SC
NWS Station Upper Air Meteorology	Charleston, SC
NWS Station for Calculating Surface Characteristics	Charleston, SC
Methodology for Calculating Background SO_2 Concentration	Tier 2 approach using AQS site: 45-019-003 for 2012-2014 + 2014-2016 design value
Calculated Background SO_2 Concentration	3.5 – 26.1 $\mu g/m^3$ + 23.6 $\mu g/m^3$

The results presented below in Table 12 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

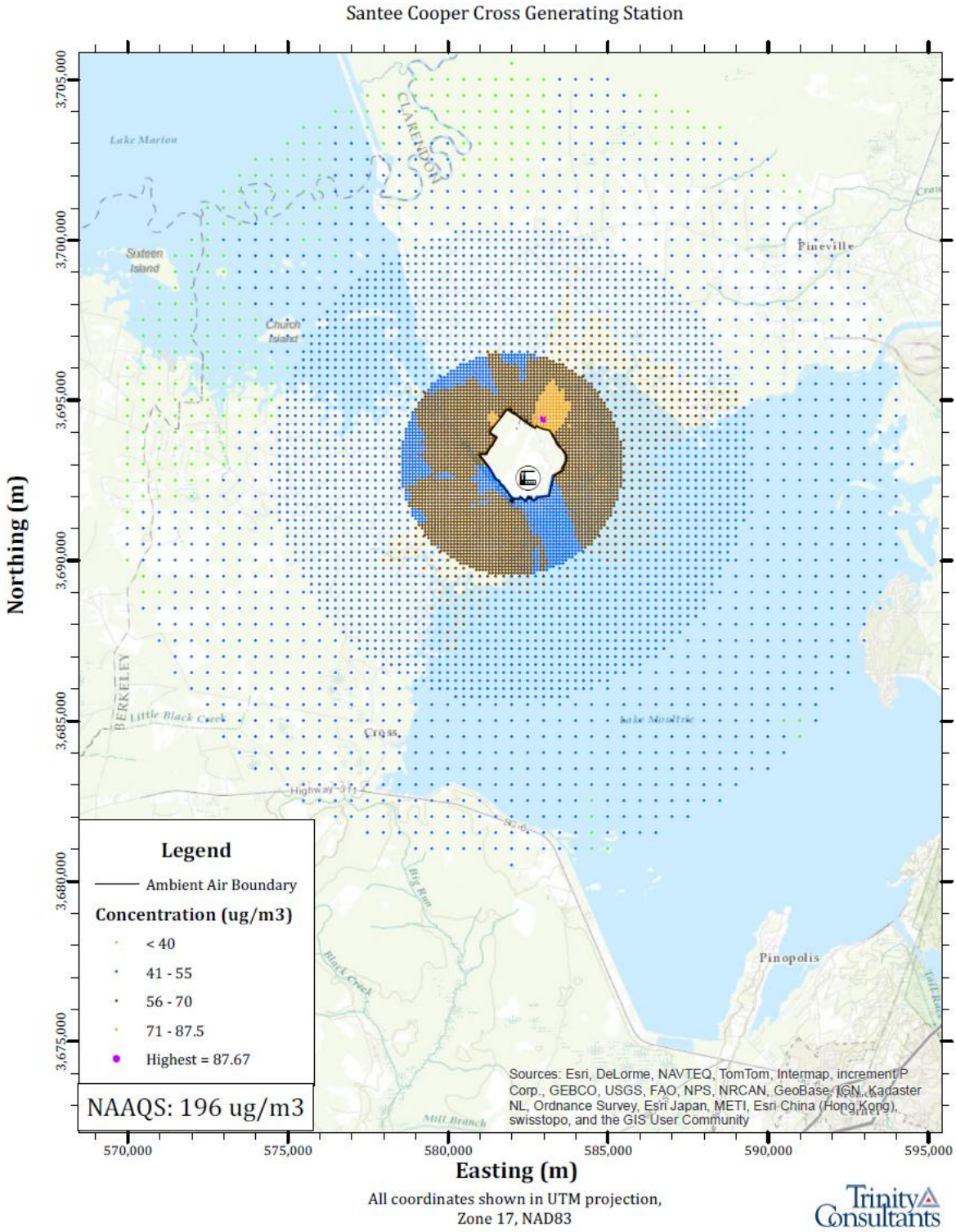
Table 12. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Santee Cooper Area

Averaging Period	Data Period	Receptor Location [Zone 17]		99th percentile daily maximum 1-hour SO_2 Concentration (µg/m3)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	583,000	3,694,400	111.3	196.4*

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

The State's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 111.3 µg/m^3, equivalent to 42.5 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facility. Figure 14 below was included as part of the State's recommendation, and indicates that the predicted value occurred just north of the Santee Cooper site. The State's receptor grid is also shown in the figure.

Figure 14. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Santee Cooper Area. Source: 1-Hour Sulfur Dioxide NAAQS Compliance Demonstration Modeling for Santee Cooper Cross Generating Station prepared for South Carolina, January 2017



The modeling submitted by the State does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

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

The EPA concurs with the modeling analysis performed by the State of South Carolina for the Santee Cooper Cross Generating Station and agrees with the conclusion that the modeling does not show a violation of the 1-hour SO_2 NAAQS in the area of analysis. The State determined that it was not necessary to include any nearby sources of SO_2 in the analysis and the EPA agrees with this determination. The surface and upper air meteorological data and surface characteristics selected for use in this analysis should provide for a valid modeling demonstration. The State adequately represented the topography in the area with the AERMOD model and its pre-processors. The State chose to model emissions from the Santee Cooper facility using emissions from 2012-2014 rather than using the most recent emissions. This departure from the SO_2 Modeling TAD is acceptable because emissions during 2015 and 2016 were lower than the years from the 2012-2014 period modeled. The EPA also agrees with the background concentration data used in the analysis as well as the use of a more recent design value from the 2014-2016 period from the monitor. The overall modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD.

3.5. Jurisdictional Boundaries in the Berkeley County Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Berkeley County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

South Carolina requested that every county in the State be designated attainment, including Berkeley County, based on an assessment and characterization of air quality from the Century Aluminum and Santee Cooper Cross Generating Station DRR sources and other nearby sources. The State did not provide a specific boundary recommendation for the modeled areas around Century Aluminum and Santee Cooper. Berkeley County is bounded to the northeast by Georgetown County; to the northwest by Williamsburg County; to the south by Charleston County; to the west by Dorchester County; to the southwest by Orangeburg County; and to the northwest by Clarendon County.

For the Century Aluminum DRR source, the State recommends that the area surrounding Goose Creek, South Carolina, be designated attainment for the 1-hour NAAQS for SO_2. The dispersion modeling effort focuses on the area surrounding the Century Aluminum of South Carolina, Inc. facility located in Goose Creek, in Berkeley County, South Carolina.

For the Santee Cooper DRR source, the State recommends that the area surrounding the source be designated attainment for the 1-hour NAAQS for SO_2. The dispersion modeling effort focuses on the area surrounding the Santee Cooper located between Lake Marion and Lake Moultrie, off South Carolina Highway 45, southwest of Pineville, South Carolina. Both DRR sources are located wholly within Berkeley County, South Carolina.

SC DHEC assessed nearby sources within a 20 km area of analysis from both the Century Aluminum and Santee Cooper facilities in all directions and considered this sufficient to resolve the maximum impacts and any potential impact areas. These areas of analyses cover a majority of Berkeley County. Based upon screening methodology conducted by DHEC, none of the nearby sources were included in the modeling analyses for Century and Santee Cooper. The rest of Berkeley County includes those nearby sources discussed above in sections 3.3.2.3 and 3.4.1.3.

Relative to Century, DAK Americas LLC Cooper River Plant is located 11 km to the east, and South Carolina Electric & Gas Williams Station (SCE&G Williams) is located 12 km to the east-southeast. Relative to SCE&G Williams, DAK Americas is located 5 km to the north-northwest. Given the relative locations of these two facilities, the State determined that it is not expected that their plumes would experience overlap at the location of Century from any upwind direction. No clusters of large candidate background facilities are located far from Century in the same upwind direction such that the plumes would be expected to merge or overlap substantially at the location of Century; therefore, emissions from each of these facilities was considered separately in determining Q in the Q/D calculation.

Santee Cooper conducted additional analyses that examined the concentration gradients predicted for each of the remaining candidate sources. In each case, the gradients are highest near the candidate source and generally decrease with downwind distance. For the purpose of this gradient concentration gradient analysis, Century Aluminum and Showa Denko were modeled individually while SCE&G Williams, BP Amoco, DAK Americas and Cooper River Partners were modeled together in a "south/southeast" grouping and Giant Cement Company, Argos Cement and Holcim were modeled together in a "west/southwest" grouping. The results of this modeling indicated that the concentration gradients from the individual candidate background sources, and geographic groupings of candidate background sources, are such that the background sources do not need to be included explicitly in the cumulative impact modeling analyses.

3.6. The EPA's Assessment of the Available Information for the Berkeley County, South Carolina Area

The EPA intends to designate the Berkeley County in its entirety unclassifiable/attainment. We believe that South Carolina's modeling analysis, and the monitoring data for both DRR sources located within the county, support the conclusion that there are no expected violations of the 2010 SO_2 NAAQS in the area. The State's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 111.3 $\mu g/m^3$ or 42.5 ppb for Santee Cooper and 131.1 $\mu g/m^3$ or 50.1 ppb for Century Aluminum, which demonstrates compliance with the 2010 SO_2 NAAQS in this Berkeley County area.

The EPA reviewed available air quality monitoring data in the AQS database. For the areas surrounding Century Aluminum and Santee Cooper, the Jenkins Avenue Fire Station (North Charleston) SO_2 monitor, located 19 km southwest of Century Aluminum and 55 km south of Santee Cooper, indicates that the most recent SO_2 levels are below the 1-hour NAAQS. The 2014 – 2016 DV for the monitor is 9 ppb. However, this monitor was not located to characterize the maximum 1-hr SO_2 concentrations near the Century and/or Santee Cooper facilities. Rather, South Carolina provided air quality modeling analyses to characterize the maximum 1-hr SO_2 concentrations in the areas.

In reviewing the available air quality monitoring data in AQS, the EPA determined that other than the data described above, there is no additional relevant data in AQS collected in or near Berkeley County that could inform the intended designation action.

Based on the air quality characterization conducted within the Berkeley County area of analysis in accordance with the EPA's Modeling TAD, the State concluded that the areas surrounding the two DRR sources, Century Aluminum and Santee Cooper, should be designated unclassifiable/attainment. This recommendation is based on South Carolina's assessment that Century Aluminum and Santee Cooper Cross Generating Station are the main sources thought to significantly impact the area.

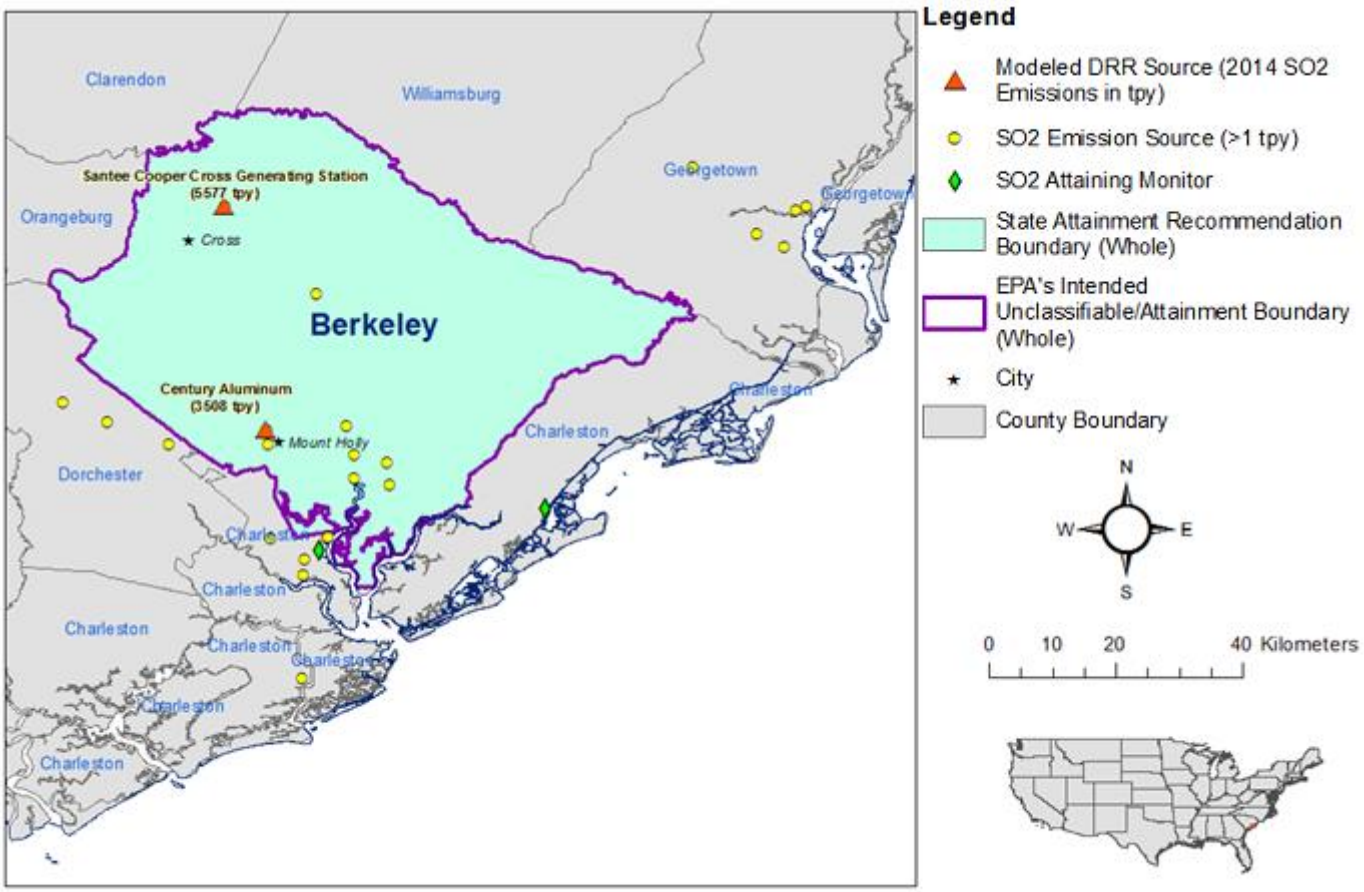
As discussed in the introduction section (sections 3.3.2.3 and 3.4.1.3), the State considered various factors in determining that other sources within 50 km of the Century and Santee Cooper facilities did not need to be included in the cumulative impact modeling analysis based on an emissions and spatial proximity analysis. Thus, the State asserted that these sources (Century Aluminum and Santee Cooper) were the only sources in the Berkeley County that needed to be explicitly modeled to demonstrate compliance with the 1-hour SO_2 NAAQS based on emissions data and spatial proximity analysis. The EPA agrees with the technical explanation for the State's treatment of nearby SO_2 sources included in the December 2016 (Century Aluminum) and January 2017 (Santee Cooper), modeling reports. We believe the modeling of Century Aluminum and Santee Cooper facilities adequately represents the Berkeley County area. Based on the modeling analyses performed by the State of South Carolina for the Berkley County area, the EPA has reason to believe that there are no additional sources in Berkeley County or neighboring counties that are likely to cause or contribute to a violation of the 1-hour SO_2 NAAQS in the area of analysis. The EPA notes there are no 2010 SO_2 NAAQS nonattainment areas in South Carolina or any neighboring states. Therefore, the EPA believes Berkley County does not contribute to an area that does not meet the standard. In performing the modeling analyses for the Century Aluminum and Santee Cooper facilities, the State of South Carolina evaluated sources up to 50 km from each facility for potential inclusion in the AERMOD modeling (See Section 3.3.2.3 of this TSD for Century Aluminum and Section 3.4.1.3 of this TSD for Santee Cooper). This evaluation concluded that no background sources needed to be included in the modeling for either facility and the EPA concurs with this determination. The AERMOD modeling performed, with receptor grids extending out to 13 km for Century Aluminum and 10 km for Santee Cooper, concludes that the air quality within these receptor grids is not expected to violate the 1-hour SO_2 NAAQS. It is not anticipated that either of these facilities contribute to nonattainment in the nearby area just outside of the receptor grids. There will be no remaining portions of Berkeley County that remain to be characterized.

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the areas around Century Aluminum and Santee Cooper as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of Berkeley County. There will be no remaining portion of Berkeley County that remain to be. Additionally, there is no evidence of violations of the 1-hour SO_2 NAAQS in the remainder of Berkeley County in the vicinity of other nearby sources. Therefore, the EPA believes Berkeley County in its entirety should be designated unclassifiable/attainment area.

3.7. Summary of Our Intended Designation for the Berkeley County Area

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate Berkeley County in its entirety as unclassifiable/attainment for the 2010 SO_2 NAAQS. Based on the available information, including (but not limited to) appropriate modeling analyses the EPA has determined that this area meets the 2010 SO_2 NAAQS, and does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. Specifically, the boundaries are comprised of the entirety of Berkeley County. Figure 15 shows the boundary of this intended designated area.

Figure 15. Boundary for the Intended Berkeley County Unclassifiable/Attainment Area



At this time, our intended designations for the State only apply to this area and the other areas presented in this technical support document. The EPA intends in a separate action to evaluate and designate all remaining undesignated areas in South Carolina by December 31, 2020.

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

4. Technical Analysis for the Richland County Area

4.1. Introduction

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

4.2. Air Quality Monitoring Data for the Richland County Area Addressing International Paper - Eastover Mill and South Carolina Electric & Gas - Wateree Station.

This factor considers the SO_2 air quality monitoring data in the area of Richland County. South Carolina did not include monitoring data for this area. The EPA reviewed the available air quality monitoring data in the AQS database and found the following nearby data summarized in the table below:

Table 13. Air Quality Monitoring Data for the Richland County Area

AQS Site ID	Years	County	Latitude	Longitude	Site Name	Design Value (ppb)	Design Value Validity	99th Percentile Daily Maximum 1-hr SO_2 (ppb)		
								2016	2015	2014
45-079-0007	2014-2016	Richland	34.09396	-80.9623	Parklane	8	Y	3	6	15
45-079-0021	2014-2016	Richland	33.81468	-80.7811	Congaree Bluff	12	N	3.8*	5.8*	25*
45-063-0008	2014-2016	Lexington	34.051017	-81.15495	Irmo	29	Y	4.4	21.2	62

* The Congaree Bluff monitor did not collect complete data in 2014, 2015, or 2016.

The Congaree Bluff (AQS ID: 45-079-0021) SO_2 monitor is the closest monitor to both sources, and is located 9.2 miles west of South Carolina Electric & Gas Wateree Station, and 9.6 miles southwest of International Paper Eastover Mill. Data collected by both monitors in the table above are comparable to the NAAQS, and all indicate that the most recent SO_2 levels are below the 1-hr NAAQS. The most recent three years of complete, quality-assured, certified data from these monitors (2014-2016) indicate a maximum incomplete 1-hr SO_2 design value of 12 ppb in Richland County and a complete design value of 29 ppb in neighboring Lexington County. However, none of these monitors were located to characterize the maximum 1-hr SO_2 concentrations near these two SO_2 sources. South Carolina provided an air quality modeling analysis to characterize the maximum 1-hr SO_2 concentrations in the area (see the section immediately below).

In reviewing the available air quality monitoring data in AQS, the EPA determined that other than the data described above, there is no additional relevant data in AQS collected in or near Richland County that could inform the intended designation action. The most recent SO_2 design values for all areas of the country are available at https://www.epa.gov/air-trends/air-quality-design-values.

4.3. Air Quality Modeling Analysis for the Richland County Area Addressing International Paper - Eastover Mill (IP-Eastover Mill) and South Carolina Electric & Gas (SCE&G) - Wateree Station (SCE&G-Wateree Station)

4.4. Introduction

This section 4.4 presents all the available air quality modeling information for a portion of Richland County that includes International Paper – Eastover Mill and South Carolina Electric & Gas (SCE&G) - Wateree Station (This portion of Richland County will often be referred to as "the Richland County area" within this section 4.4). This area contains the following SO_2 sources, principally the sources around which South Carolina is required by the DRR to characterize SO_2 air quality, or alternatively to establish an SO_2 emissions limitation of less than 2,000 tpy:

- The IP-Eastover Mill (Eastover Mill) emitted 2,000 tons or more annually. Specifically, in 2014, IP-Eastover Mill emitted 3,315 tons of SO_2.

- SCE&G-Wateree Station (Wateree Station) emitted 2,000 tons or more annually. Specifically, in 2014, SCE&G-Wateree Station emitted 6,550 tons of SO_2.

- These sources are subject to the DRR and the state chose to air dispersion modeling to characterize both sources.

Because we have available results of air quality modeling in which these sources are modeled together, the area around this group of sources is being addressed in this section with consideration given to the impacts of all these sources.

In its submission, South Carolina recommended that each county in the State be designated unclassifiable/attainment including Richland. Specifically, the State recommended that an area that includes the area surrounding the IP-Eastover Mill and SCE&G Wateree Station be designated as attainment based in part on an assessment and characterization of air quality impacts from both sources. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing allowable emissions. After careful review of the State's assessment, supporting documentation, and all available data, the EPA agrees with the State's recommendation for this area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

The area that the State has assessed via air quality modeling is located in Eastover, in Richland County, South Carolina. Eastover Mill are located slightly west of the Wateree River, which forms the boundary between Richland County and Sumter County, and to the east of McCords Ferry Road, also referred to as Route 601 as depicted in Figure 16. Figure 16 also includes other nearby emitters of SO_2.[17] These include Invista Sarl, CMC Steel South Carolina, Pilgrims Pride Corporation, Hanson Brick Columbia Plant, Albemarle Corporation, Santee Cooper Lee County Landfill, New South Lumber Company Camden Plant, DAK Americas LLC Columbia

[17] All other SO_2 emitters of 1 tpy or more (based on information in the South Carolina emissions inventory are shown in Figure 16. There are no additional SO_2 emitters above this emission level in the vicinity of SCE&G Wateree and IP Eastover.

Site, Devro Inc., Santee Print Works, US Army Fort Jackson, USC Columbia Campus Energy Facility, Santee Cooper RC Landfill Gas Site, Council Energy, Inc., Intertape Polymer Corporation, Lee County Landfill SC, LLC, Northeast Landfill Kemira Chemicals, Specialty Minerals, Inc. Allowable emissions for each of these facilities can be found in Table 16 of the May 2017 Modeling Report submitted by the State of South Carolina. Lastly, Figure 16 shows the State's attainment designation recommendation and the location of the monitoring sites mentioned in section 4.2, relative to Eastover Mill and Wateree Station.

The EPA's intended unclassifiable/attainment designation boundary for the Richland County area is not shown in this figure, but is shown in a figure in the section below that summarizes our intended designation. Figure 17 shows the nearby sources with SO_2 emissions greater than 1 tpy within 50 km of the two DRR sources.

Figure 16. Map of the Richland County Area Addressing IP-Eastover Mill and SCE&G Wateree Station

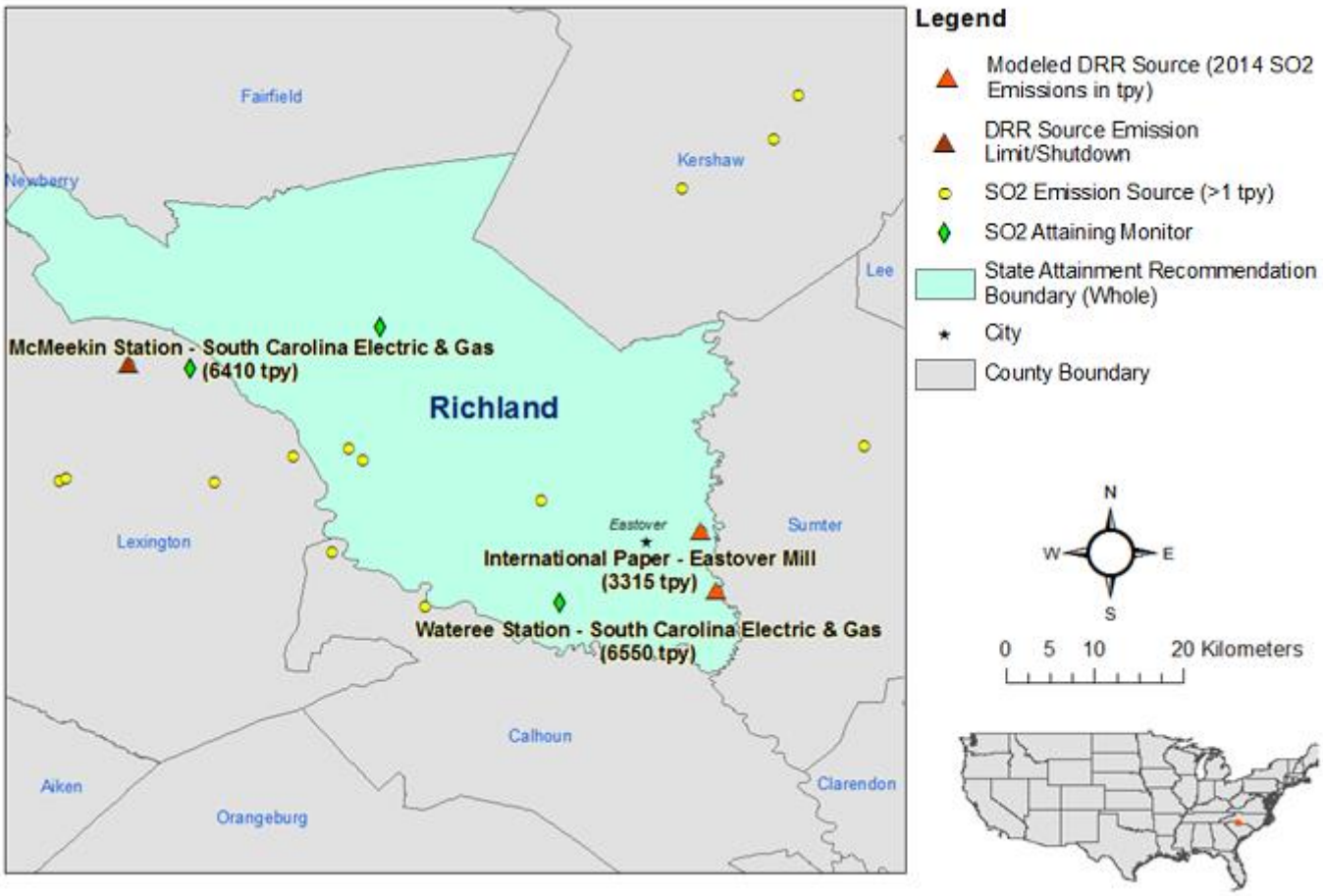
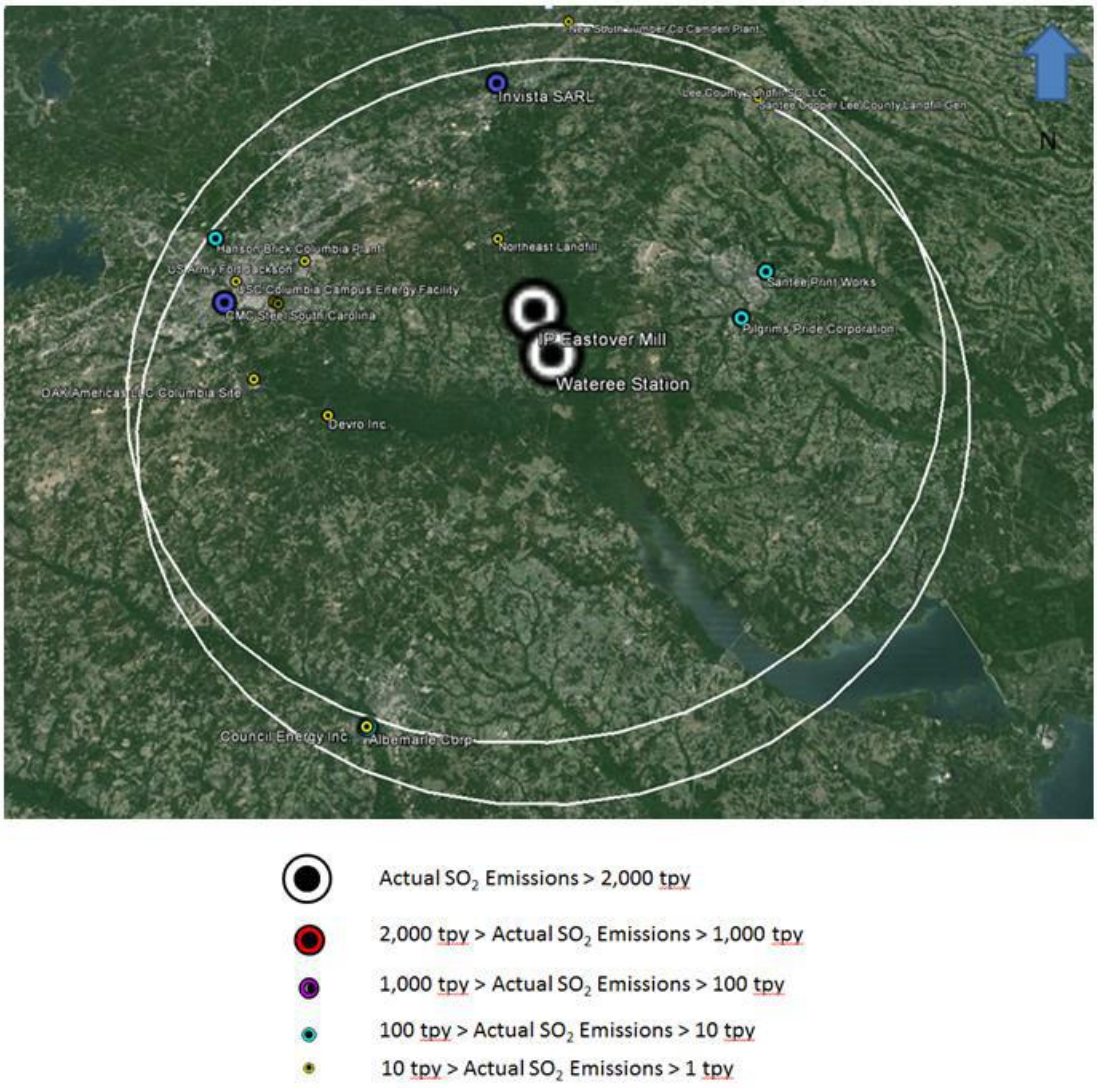


Figure 17. Candidate sources with emissions greater than 1 tpy located within 50 km of the Eastover Mill and Wateree Station. Source: Modeling Report for SCE&G Wateree Station and IP-Eastover Mill South Carolina, Inc., Prepared by Exponent, Inc, for IP-Eastover Mill and SCE&G December 2016



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

For this area, the EPA received and considered two modeling assessments from the State and no assessments from other parties. To avoid confusion in referring to these assessments, the following table lists them, indicates when they were received, provides an identifier for the assessment that is used in the discussion of the assessments that follow, and identifies any distinguishing features of the modeling assessments.

Table 14. Modeling Assessments for the Richland County Area

Assessment Submitted by	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
South Carolina*	December 2016	SCE&G Wateree and International Paper Eastover Mill Modeling Report	Initial State submittal
South Carolina*	May 2017	SCE&G Wateree and International Paper Eastover Mill Modeling Report	Revised State submittal

* South Carolina submitted the assessment prepared by Exponent, Inc.

4.4.1.1. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPPRM: 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 initial modeling assessment provided by the State used AERMOD version 15181 with the LOWWIND3 beta option. Revised modeling provided by the State used AERMOD version 16216 without the LOWWIND3 option.[18] The revised modeling used current regulatory default

[18] The modeling submitted by the State on January 13, 2017, used the LOWWIND3 beta option in AERMOD version 15181, which constitutes an alternative modeling approach subject to Section 3.2.2 of the EPA's Guideline on Air Quality Models (GAQM) contained in 40 CFR Part 51, Appendix W. The information submitted by SCE&G-Wateree Station and IP-Eastover Mill also included a document containing information to justify use of LOWWIND3. Following a thorough review of the information that was provided, the EPA decided not to approve use of the LOWWIND3 alternative model option for this modeling demonstration. The EPA notified the State of our decision not to approve use of the LOWWIND3 beta-option in a letter from Beverly H. Banister, Director of the Air, Pesticides and Toxics Management Division to Rhonda Thompson, Chief of the Bureau of Air Quality, South Carolina

options. The remainder of this section only addresses the revised modeling provided by the State. A discussion of the State's approach to the individual modeling components is provided in the corresponding discussion that follows, as appropriate.

4.4.1.2. Modeling Parameter: Rural or Urban Dispersion

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

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. The State analyzed the land use types within a 3 km radius from each facility as shown in Table 15 based on the GIS land use tool which uses 2001 NLCD data. The analysis concluded that the area surrounding both facilities is predominantly rural and the non-developed land use classes total about 71% for both IP Eastover Mill and SCE&G Wateree Station. The State determined that it was most appropriate to run the model with rural dispersion coefficients or in rural mode and the EPA concurs with this assessment as the area is approximately 71 percent rural.

Department of Health and Environmental Control, dated March 24, 2017. Details of the EPA's rationale for not approving use of the LOWWIND3 beta-option are included in this letter. South Carolina subsequently submitted revised modeling for SCE&G Wateree Station and IP-Eastover Mill on May 11, 2017.

Table 15. Land use within 3 km of IP-Eastover Mill and SCE&G Wateree Station

Land use Class	IP Eastover Mill	SCE&G Wateree Station
Open water	17.55%	17.36%
Developed, Open Space	4.80%	4.50%
Developed, Low Intensity	8.88%	9.17%
Developed, Medium Intensity	10.38%	10.25%
Developed, High Intensity	4.99%	4.94%
Barren Land	1.93%	0.02%
Deciduous Forest	5.60%	1.07%
Evergreen Forest	5.85%	10.40%
Mixed Forest	0.07%	0.08%
Scrub/Shrub	0.16%	0.13%
Grassland/Herbaceous	11.86%	6.18%
Pasture/Hay	1.90%	1.79%
Cultivated Crops	4.12%	3.08%
Woody Wetlands	16.15%	24.74%
Emergent Herbaceous	5.76%	6.30%

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

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Richland County area, the State has included one other emitter of SO_2 within 50 km of IP-Eastover Mill and SCE&G-Wateree Station in any direction. The State determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to IP-Eastover

Mill and SCE&G-Wateree Station, the other emitter of SO_2 in the area of analysis include Specialty Minerals Inc. No other sources beyond 50 km were determined by the State to have the potential to cause concentration gradient impacts within the area of analysis.

The State considered actual emission rates and proximity to the primary source as factors for identifying nearby sources. A screening area extending 50 km from each of the two primary sources was used to identify potential nearby sources. Initial screening was conducted to identify current allowable emissions for all facilities with air permits. The State identified 124 permitted facilities within 50 km of the two primary sources (IP-Eastover Mill and SCE&G-Wateree Station). Actual annual SO_2 emission rates for the years 2012, 2013, and 2014 were obtained for each of the candidate facilities and then analyzed for the emission rate in the most recent year for which data was available (2014).

South Carolina used the 20D screening methodology (a specific variant of the Q/D screening method)[19] to determine potential nearby sources to include in the cumulative impact modeling analysis. Candidate nearby sources are excluded from the cumulative analysis if their facility-wide emission rates, in tpy, are less than 20D, where D is the distance in km between the candidate nearby source and the primary source.

Six candidate facilities remained based on the 20D analysis using allowable annual emissions. For four of the remaining sources (Santee Print works, DAK, Columbia Energy Center, and SCE&G Coit), actual annual SO_2 emissions were obtained from information provided by SC DHEC BAQ. The 20D analysis was then repeated for the remaining facilities using actual annual SO_2 emissions from 2014. Utilizing the 2014 emissions for the 20D calculations resulted in these four sources being excluded from the cumulative impact analysis.
Actual emissions were not available for two sources - Specialty Minerals, Inc. and Kemira Chemicals. Kemira Chemicals comes close to screening out with 20D when using allowable SO_2 emissions which are based on a sulfur in oil limit of 0.05 percent. However, information provided by SCDHEC BAQ indicates that Kemira Chemicals is firing ultra-low sulfur diesel with a maximum sulfur content of 15 ppm (0.0015 percent). If the calculations are revised for the actual fuel used, the resulting actual emission rate of 0.727 tpy allows Kemira Chemicals to screen out with 20D. Therefore, Kemira Chemicals was excluded from the cumulative impact analysis. Specialty Minerals, Inc. is collocated with IP-Eastover Mill and is included explicitly in the cumulative impact analysis.

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

An inner grid of approximately 10,000 receptors with a spacing of 100 m extends outward from each primary facility boundary to a distance of approximately 1 km and covers an area of approximately 7 km x 16.5 km. An intermediate grid of approximately 3,000 receptors with a spacing of 250 m extends from the outer edge of the 100m spaced receptor grid out to a distance of approximately 5 km from the two facilities, and the outer boundary covers an area of approximately 15 km x 21 km. An outer grid of approximately 2,000 receptors with a spacing of 500m extends from the outer edge of the 250 m spaced receptor grid out to a distance of approximately 10 km from the two facilities, and the outer boundary covers an area of

[19] EPA's "Screening Threshold" Method for PSD Modeling Memo, 1985.

approximately 25 km x 31 km. Receptors within the boundaries of SCE&G-Wateree Station or IP-Eastover Mill were excluded.

Additionally, receptors at a spacing of no greater than 25 m were placed along each of the primary facility property boundaries, with approximately 350 receptors along the Wateree Station property boundary and approximately 1,250 receptors along the Eastover Mill property boundary.

The receptor network contained 17,071 receptors, and the network covered eastern Richland and western Sumter counties in South Carolina.

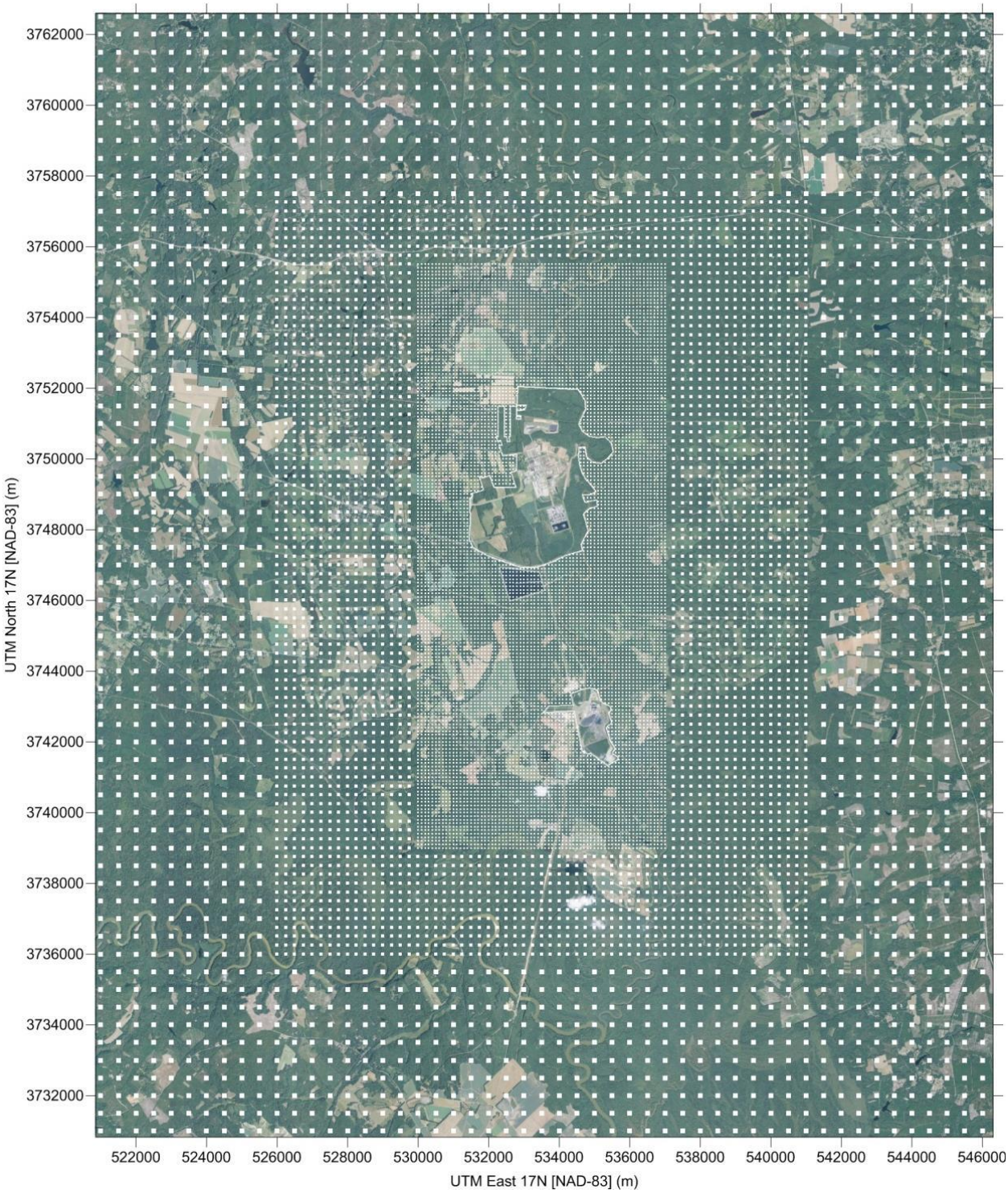
Figure 18, included in the State's recommendation, show the State's chosen area of analysis surrounding the IP-Eastover Mill and SCE&G-Wateree Station facilities, as well as the receptor grid for the area of analysis.

Other than portions of the Wateree Station and Eastover Mill facility properties, no other receptors were excluded from the modeling analysis. For Wateree, the ambient air boundary is comprised of the physical barrier of the Wateree River and fencing that is controlled/patrolled by security that is on-site 24 hours per day, 7 days per week (24/7). This ambient air boundary is the same as the ambient air boundary used in previous air dispersion modeling demonstrations.

For IP, the ambient air boundary is comprised of a combination of physical barriers including a river, steep embankments, underbrush, fencing, locked gates, drainage canals, signage, and areas that are controlled/patrolled by mill security that is on-site 24/7. The Eastover property is large and diverse. In addition to paper manufacturing, the facility includes an integrated wood yard, extensive log storage, and an onsite landfill. Non-industrial land use within the property includes the employee training center, landscaped areas, agricultural fields, forestry test plots, and actively managed forestlands. This ambient air boundary is the same as the ambient air boundary used in previous air dispersion modeling demonstrations.

According to the SO_2 Modeling TAD, the IP-Eastover plant property is considered ambient air relative to the Wateree Station, and vice-versa. These two facilities are located over 5 km apart. The maximum predicted SO_2 concentrations from each facility alone are occurring within 1 km to the north of each facility's ambient air boundary and well away from the ambient air boundary of the other facility. Therefore, the EPA agrees that the receptor grid used for this analysis is sufficient for resolving maximum SO_2 concentrations in the area from the two facilities individually and combined.

Figure 18. Receptor Grid for the Richland County Area. Source: Modeling Report for SCE&G Wateree Station and IP-Eastover Mill South Carolina, Inc., Prepared for South Carolina, December 2016



The EPA concurs with the modeling receptor grid used for this modeling analysis.

4.4.1.4. Modeling Parameter: Source Characterization

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

The State evaluated potential nearby source contributions to SO_2 impacts in the Richland County area by screening sources using a "20D" analysis as discussed in in detail in section 4.4.1.3. The "20D" analysis concluded that no nearby sources need to be included in the modeling. Specialty Minerals, which is collocated with the IP Eastover Mill, was included in the modeling analysis.

The State characterized these sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the State used actual stack heights in conjunction with actual emissions for SCE&G Wateree. Also, the State followed the EPA's GEP policy for modeling all sources at the IP Eastover facility because allowable emissions limits were modeled for some sources at the facility. All sources at IP with an actual stack height of greater than 65 m also had actual stack heights that were less than the GEP formula height for the stack as determined by the GEP formula height equation in 40 CFR 51.100(ii)(2)(ii). The State also adequately characterized the source's building layouts and locations, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPPRM was used to assist in addressing building downwash.

The EPA concurs with the source characterization portion of this modeling analysis. The assessment of nearby sources justifies the exclusion of all nearby sources with the exception of Specialty Minerals which was included in the modeling. The Parklane background monitor, discussed in Section 4.4.1.8, will capture the impacts from any sources not included in the modeling analysis. The stack heights used for all IP Eastover stacks were determined in accordance with the GEP policy because allowable emission rates were used for some sources at the facility. Actual stack heights along with actual emission rates were used for SCE&G Wateree sources. This component of the modeling analysis has been performed in a manner consistent with the SO_2 Modeling TAD.

4.4.1.5. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

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

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a State should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the State included IP-Eastover Mill, SCE&G-Wateree Station, and one other SO_2 emitter, Specialty Materials, within 50 km in the area of analysis. The State has chosen to model these facilities using a combination of actual SO_2 emissions for some sources and the most recent federally enforceable and effective PTE limits for other sources. The facilities in the State's modeling analysis and their associated PTE or actual emission rates are summarized below.

For IP-Eastover Mill and Specialty Minerals Inc., the State provided PTE values for all sources except for the #1 and #2 Recovery Furnaces at IP-Eastover. This information is summarized in Table 16. A description of how the State obtained hourly emission rates is given below this table.

Table 16. SO_2 Emissions based on PTE from Facilities in the Richland County Area

Facility Name	SO_2 Emissions (tpy, based on PTE)
IP-Eastover Mill Sources Modeled at PTE	5,324
IP-Eastover Mill #1 Recovery Furnace Modeled at 402.8 Lb/Hr 2014-16 Max Actual hourly = 21.9 Lb/Hr	1,764
IP-Eastover Mill #2 Recovery Furnace Modeled at 420.9 Lb/Hr 2014-16 Max Actual hourly = 23.3 Lb/Hr	1,844
IP-Eastover Mill Total	8,932
Specialty Minerals Inc.	11
Total Emissions from All Modeled Facilities in the Area of Analysis	8,943

PTE emission rates were used for the three sources at Specialty Minerals. The PTE in tpy for Specialty Minerals was determined by the EPA by multiplying the maximum allowable hourly emission rates for each unit by 8,760 hours in a year.

For IP-Eastover, the State used PTE rates for all sources except the #1 Recovery furnace and the #2 Recovery Furnace. The State used an hourly emission rate of 606.9 lb/hr for the stack that is shared by the #1 Recovery Furnace and the #1 Power Boiler. The PTE for the #1 Power Boiler is 204.1 lbs/hr. Therefore, the remaining 402.8 lb/hr (606.9-204.1) were used to account for emissions from the #1 Recovery Furnace. The maximum actual hourly emission rate for the #1 Recovery Furnace (computed from recorded monthly values) over 2014-2016 was 21.9 lb/hr which is substantially less than the modeled emission rate of 402.8 lb/hr.

The State used an hourly emission rate of 420.9 lb/hr for the stack that is shared by the #2 Recovery Furnace and the non-condensable gas (NCG) Incinerator. The State demonstrated that higher predicted ambient concentrations result if it is assumed that the NCGs are burned in the #2 Power Boiler, which was modeled at PTE, rather than the NCG incinerator. Therefore, the entire 420.9 lb/hr modeled for the combined stack is based entirely on the operation of the #2 Recovery Furnace. The maximum actual hourly emission rate for the #2 Recovery Furnace (computed from recorded monthly values) over 2014-16 was 23.3 lb/hr which is substantially less than the modeled emission rate of 420.9 lb/Hr. The EPA concurs with this methodology used to model sources at IP Eastover. The modeling documentation demonstrates that the modeled SO_2 emission rates for the IP Eastover sources provides a conservative (or higher) estimate of ambient impacts compared to actual emissions from these sources.

For SCE&G-Wateree Station, the State provided actual emissions values. This information is summarized in Table 17. A description of how the State obtained hourly emission rates is given below this table.

Table 17. Actual SO_2 Emissions from Facilities in the Richland County Area

Facility Name	2012 (tpy)	2013 (tpy)	2014 (tpy)
SCE&G	6,561	570	820
Total Emissions from All Modeled Facilities in the Area of Analysis	6,561	570	820

The emission rates modeled for SCE&G Wateree are based on CEMS data. The EPA concurs with the emission rates modeled for IP-Eastover, Specialty Minerals, and SCE&G using a combination of actual and PTE emission rates.

4.4.1.6. Modeling Parameter: Meteorology and Surface Characteristics

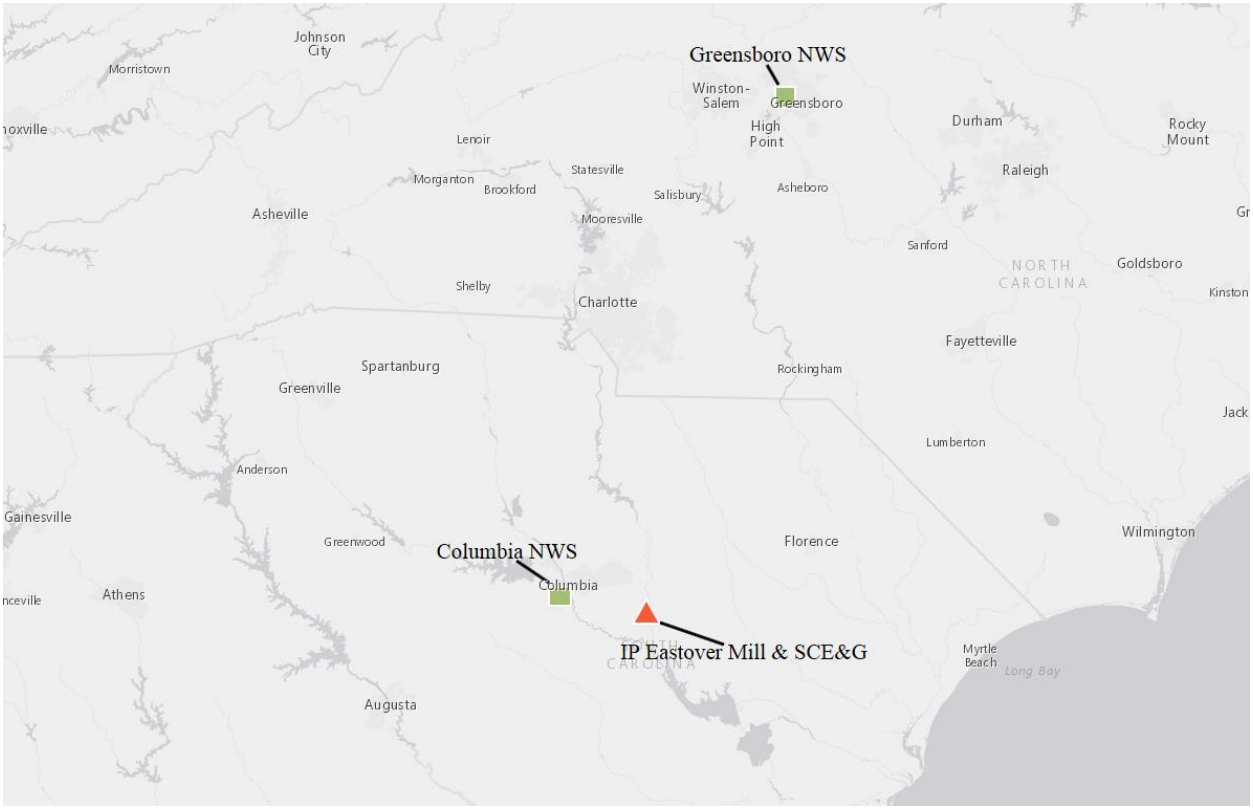
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

For the area of analysis for the Richland County area, the State selected the surface meteorology from the NWS station in Columbia, SC, located at 33.56 N, 81.07 W, 45 km to the west-northwest of the sources, and coincident upper air observations from a different NWS station, located in Greensboro, NC, located at 36.1 N, 79.94 W, as best representative of meteorological conditions within the area of analysis.

The State used AERSURFACE version 13016 using data from the Columbia, SC NWS site to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (zo)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "zo" The state estimated surface roughness values for 12 spatial sectors out to 1 km at a seasonal temporal resolution for average conditions.

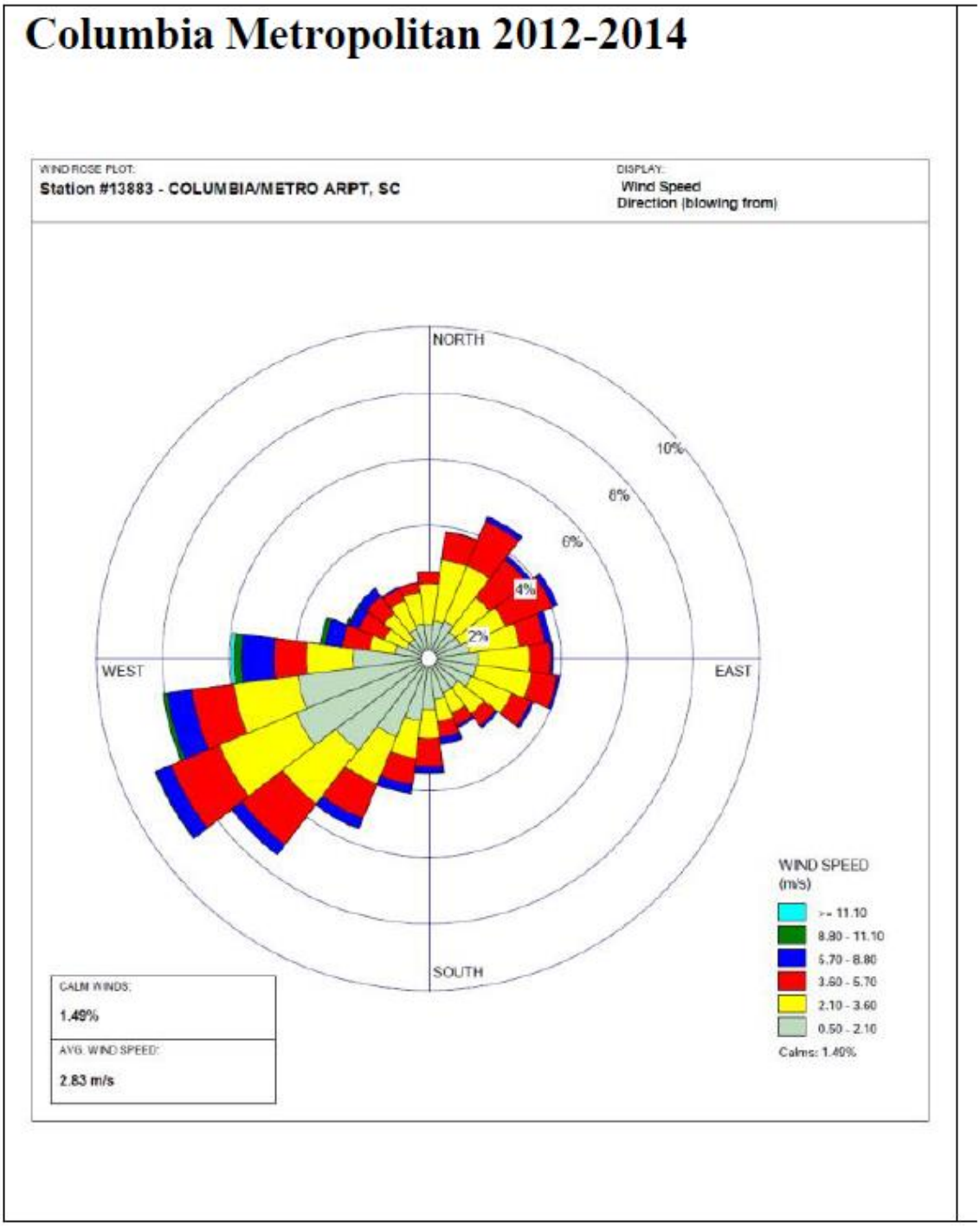
In the figure below, generated by the EPA, the locations of these NWS stations are shown relative to the area of analysis.

Figure 19. Area of Analysis and the NWS station in the Richland County, South Carolina Area



As part of its recommendation, the State provided the 3-year surface wind rose for the Columbia, South Carolina, NWS station. In Figure 20, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Analysis of the NWS data indicate winds blow predominately from the west, southwest and to a lesser extent the north, northeast directions.

Figure 20. Columbia, SC NWS Cumulative Annual Wind Rose for Years 2012-2014. Source: Modeling Report for SCE&G Wateree Station and IP-Eastover Mill South Carolina, Inc., Prepared for South Carolina, December 2016.



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The State followed the methodology and settings presented in AERMOD Implementation 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 1-minute duration was provided from the Columbia, South Carolina, NWS station mentioned above, 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 m/s in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The EPA concurs with the 2014-2016 surface and upper air meteorological data and surface characteristics selected for use in this analysis. This data was processed in a manner consistent with the AERMOD Implementation Guidance. The EPA believes that the wind rose indicates that impacts from the SCE&G and IP Eastover facilities are reasonably expected to most frequently occur generally east and northeast of the facilities, but that impacts could be seen in other directions as well.

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

The terrain in the area of analysis is best described as rolling with some nearby hills but no significant terrain features. 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. This component of the modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD.

4.4.1.8. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the State elected to use a "tier 2" approach based on the 99th percentile of monitored concentrations by season and hour of day. Data was obtained for 2014-2016 from the Parklane Monitor (AQS Site: 45-079-0007). The monitor is located approximately 40 km west-northwest of the two facilities near Springwood, South Carolina. The background concentrations for this area of analysis were determined by the State to vary from 2.1 μg/m^3, equivalent to 1.0 ppb when expressed in 2 significant figures,[20] to 15.9 μg/m^3 (6.1 ppb), with an average value of 5.6 μg/m^3 (2.1 ppb). Table 18 provides time-varying 1-hour SO_2 concentrations for the Parklane Monitor.

Table 18. Time-varying 1-hour SO_2 Concentrations by Season and Hour-of-day for the Parklane Monitor for 2014-2016. Source: Modeling Report for SCE&G Wateree Station and IP-Eastover Mill South Carolina, Inc., Prepared by Exponent, Inc, for IP-Eastover Mill and SCE&G, May 2017

Hour of Day	Season 1	Season 2	Season 3	Season 4
Start Time	Dec-Jan-Feb (μg/m^3)	Mar-Apr-May (μg/m^3)	Jun-Jul-Aug (μg/m^3)	Sep-Oct-Nov (μg/m^3)
1	12.4	6.9	2.7	2.1
2	6.2	5.0	4.0	2.4
3	6.0	3.6	3.9	2.4
4	7.9	3.3	2.9	2.4
5	7.7	3.2	3.7	2.1
6	5.1	3.1	2.2	2.4
7	5.5	4.2	2.4	2.7
8	7.5	5.7	5.9	4.0
9	8.2	5.9	10.4	5.1
10	13.3	4.4	8.6	4.5
11	14.4	7.0	6.8	4.6
12	9.6	4.3	5.8	5.1
13	8.6	3.3	4.4	3.2
14	7.4	3.0	4.3	2.4
15	8.7	4.1	3.7	2.1
16	11.2	5.8	4.8	3.0
17	10.4	6.5	5.4	3.0
18	8.6	8.4	8.6	3.2
19	9.0	8.4	6.2	3.5
20	9.9	9.8	8.1	2.4

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

Hour of Day Start Time	Season 1 Dec-Jan-Feb ($\mu g/m^3$)	Season 2 Mar-Apr-May ($\mu g/m^3$)	Season 3 Jun-Jul-Aug ($\mu g/m^3$)	Season 4 Sep-Oct-Nov ($\mu g/m^3$)
21	9.3	7.1	2.3	2.4
22	8.0	5.1	3.1	2.3
23	13.4	3.1	3.0	2.4
24	15.9	5.0	2.2	2.2

The EPA agrees with the background SO_2 monitor selected for this component of the modeling analysis. The seasonal hour of day background SO_2 concentrations utilized were developed in a manner consistent with the SO_2 Modeling TAD. Overall, the EPA agrees that the Parklane monitor is the best monitor to use for the ambient background concentrations for this 1-hour SO_2 NAAQS analysis. Use of the Congaree Bluff monitor would result in double-counting impacts from IP Eastover Mill and SCE&G Wateree Station, since both sources are included in the modeled component of the total estimated design concentration. In addition, data capture from the Congaree Bluff monitor is inadequate for 2014, while the Parklane monitor has strong data capture for all three years. Use of the Parklane monitor for 2014-2016 provides a conservative measure of ambient background SO_2 for this model application as these data are still influenced by SO_2 emissions from the SCE&G McMeekin Station. These emissions were reduced dramatically in March 2016 when the SCE&G McMeekin Station ceased coal usage and fully converted to natural gas.

4.4.1.9. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Richland County area of analysis are summarized below in Table 19.

Table 19. Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Richland County Area

Input Parameter	Value
AERMOD Version	16216
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	12
Modeled Structures	78
Modeled Fencelines	2
Total receptors	17,071
Emissions Type	PTE and actual
Emissions Years	2014-16
Meteorology Years	2014-16
NWS Station for Surface Meteorology	Columbia, SC
NWS Station Upper Air Meteorology	Greensboro, NC
NWS Station for Calculating Surface Characteristics	Columbia, SC
Methodology for Calculating Background SO_2 Concentration	Tier 2 approach using AQS site: 45-079-0007 for 2012-2014
Calculated Background SO_2 Concentration	2.1 – 15.9 $\mu g/m^3$

The results presented below in Table 20 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

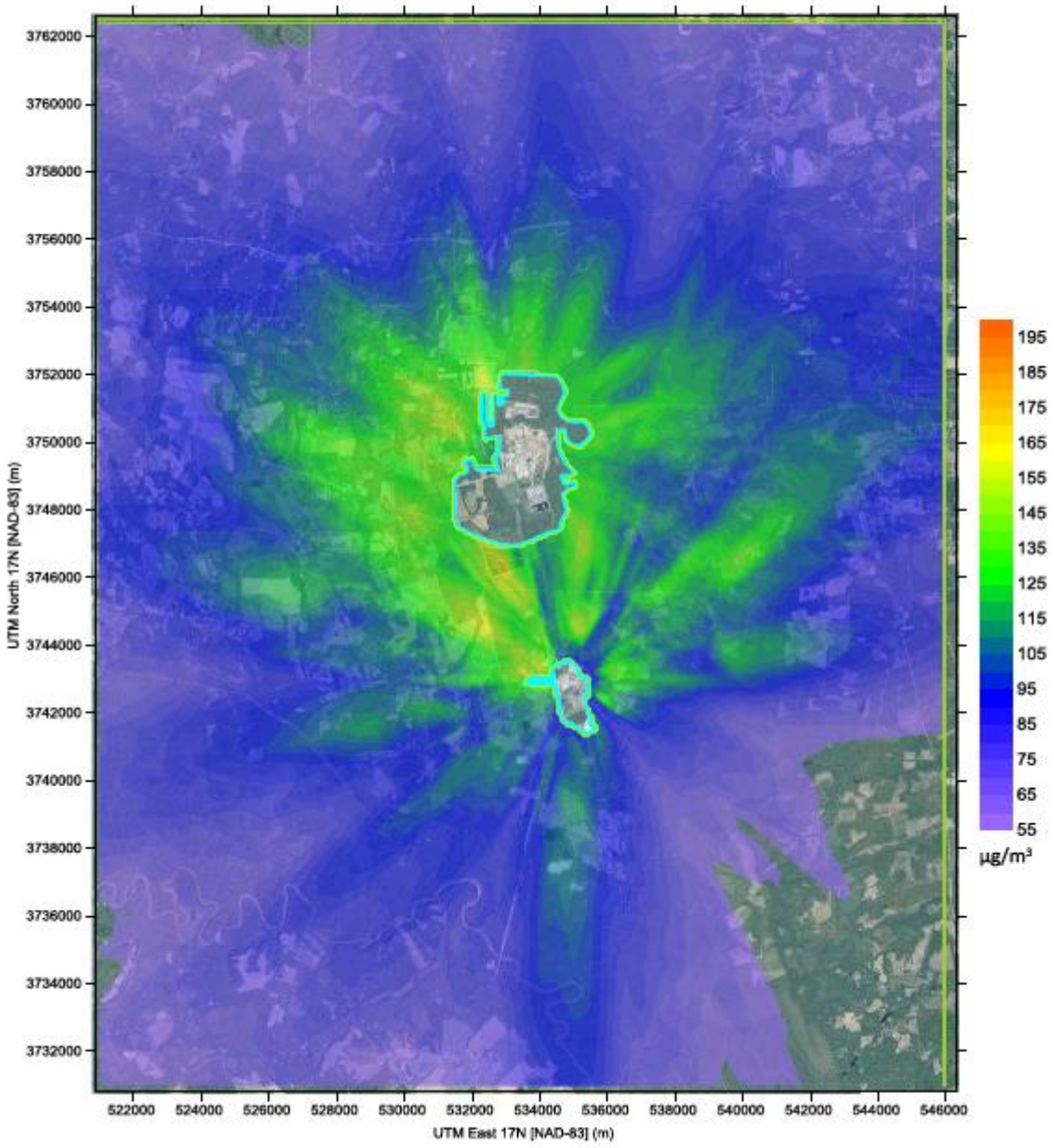
Table 20. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Richland County Area

		Receptor Location [UTM zone 17]		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	**Data Period**	**UTM Easting (m)**	**UTM Northing (m)**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2014-2016	533000	3746200	170.3	196.4*

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

The State's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 170.3 $\mu g/m^3$, equivalent to 65 ppb. This modeled concentration included the background concentration of SO_2, and is based on a combination of federally enforceable and effective PTE and actual emissions from the facilities modeled. Figure 21 below was included as part of the State's recommendation, and indicates that the predicted value occurred just south of the IP Eastover Mill Plan property boundary.

Figure 21. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Richard County Area. Source: Revised Modeling Report for SCE&G Wateree Station and IP-Eastover Mill South Carolina, Inc., Prepared by Exponent, Inc, for IP-Eastover Mill and SCE&G December 2017.



The modeling submitted by the State does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

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

The EPA has determined that this modeling analysis has been performed in a manner mostly consistent with the SO_2 Modeling TAD. There were, however, two slight deviations from the

TAD. EPA has concluded that neither of these deviations from the TAD will have an impact on the conclusion of the analyses. One of the deviations from the TAD involved the receptor grid used in the analysis. According to the SO_2 Modeling TAD, IP-Eastover plant property is considered ambient air relative to Wateree Station, and vice-versa. These two facilities are located over 5 km apart. Maximum predicted SO_2 concentrations from each facility alone are occurring within 1 km to the north of each facility's ambient air boundary and well away from the ambient air boundary of the other facility. Therefore, the EPA agrees that the receptor grid used for this analysis is sufficient for resolving maximum SO_2 concentrations in the area from the two facilities both individually and combined. The other slight deviation from the Modeling TAD involved the emissions rates used for two sources at IP Eastover. For IP-Eastover, the State used PTE rates for all sources except the #1 Recovery Furnace and the #2 Recovery Furnace. For these two sources, the State used emissions rates much higher than the maximum actual hourly emissions rate for these two sources during the 2014-16 period. Therefore, the approach used resulted in higher predicted ambient impacts than would have been predicted had the maximum actual hourly emission rates from 2014-16 for these sources been used. Again, the EPA has determined that neither of these deviations from the TAD will have an impact on the conclusion of the analyses.

The State chose to include one other nearby source in the modeling other than IP Eastover and SCE&G and the EPA concurs with this decision. The surface and upper air meteorological data and surface characteristics selected for use in this analysis are sufficient for a valid modeling demonstration. The EPA also agrees with the background monitor and data selected for use in this analysis.

4.5. Jurisdictional Boundaries in the Richland County, South Carolina Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for city/county/parish. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

South Carolina requested that every county in the State be designated attainment, including Richland County, based on an assessment and characterization of air quality from the IP-Eastover Mill and SCE&G-Wateree Station DRR sources and other nearby sources. The State did not provide a specific boundary recommendation for the modeled areas around IP-Eastover Mill and SCE&G-Wateree station. Richland County is bounded to the north by Fairfield County; to the northeast by Kershaw County; to the east by Sumter County; to the south by Calhoun County; to the west by Lexington County, and to the northwest by Newberry County.

IP-Eastover Mill and SCE&G Wateree Station are less than 7 km apart. Both sources are located on the southeastern portion of the county near the Sumter County lines.

In the modeling assessment report for the IP-Eastover Mill and SCE&G-Wateree Station DRR sources, the State recommends the region surrounding Eastover, Richland County, South Carolina be designated attainment for the 1-hour NAAQS for SO_2. The dispersion modeling effort focuses on the area surrounding these two DRR sources located in Eastover, Richland County, South Carolina.

SC DHEC assessed nearby sources within a 50 km area of analysis from both the IP-Eastover Mill and SCE&G-Wateree Station facilities in all directions and considered this sufficient to resolve the maximum impacts and any potential impact areas. These areas of analyses cover a majority of Richland County. Based upon screening methodology conducted by SC DHEC, none of the nearby sources except for Specialty Minerals, Inc., were included in the modeling analyses for IP-Eastover Mill and SCE&G-Wateree Station. Specialty Minerals, Inc. is collated with IP-Eastover Mill and was included in the modeling analysis.

4.6. The EPA's Assessment of the Available Information for the Richland County, South Carolina Area

The EPA intends to designate the Richland County area, in its entirety as unclassifiable/attainment for the 2010 SO_2 NAAQS. We believe that South Carolina's modeling analysis does not support the conclusion that there are no expected violations of the 2010 SO_2 NAAQS in the area.

The EPA reviewed available air quality monitoring data in AQS database. The Congaree Bluff (AQS ID: 45-079-0021) SO_2 monitor is the closest monitor to both sources, and is located 9.2 miles west of South Carolina Electric & Gas Wateree Station, and 9.6 miles southwest of International Paper Eastover Mill. Available valid data collected by two monitors in Table 13 are comparable to the NAAQS, and indicate that the most recent SO_2 levels are below the 1-hour NAAQS. The most recent three years of complete, quality-assured, certified data from these monitors (2014-2016) indicate a maximum incomplete 1-hr SO_2 design value of 12 ppb in Richland County and a complete design value of 29 ppb in neighboring Lexington County. These data were available to the EPA for consideration in the designations process, however, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality. As discussed in Section 4.3, the EPA has reviewed the revised modeling submitted by the State in May 2017 and has determined that it was performed in a manner mostly consistent with the SO_2 Modeling TAD.

As discussed in the introduction section (Section 4.4), the State considered various factors in determining if any other sources within 50 km of the of IP-Eastover Mill and SCE&G facilities needed to be included in the cumulative impact modeling analysis. Thus, the State asserted that these sources (SCE&G-Wateree Station and IP-Eastover Mill), along with Specialty Minerals, Inc., which is collocated with IP Eastover Mill, were the only sources in the Richland County area that needed to be modeled to demonstrate compliance with the 1-hour SO_2 NAAQS. The EPA agrees with the technical explanation for the State's treatment of nearby SO_2 sources included in the May 2017, modeling report. We believe the modeling of SCE&G-Wateree station and IP-Eastover Mill (including Specialty Minerals, Inc.) facilities adequately represents SO_2 emissions in the Richland County area along with the background SO_2 monitoring data. According to the 2014 NEI, there are no additional SO_2 sources in Richland County that emitted over 40 tpy in 2014. Additionally, there are no existing 2010 SO_2 nonattainment areas in South Carolina or any in neighboring states. Therefore, the EPA believes Richland County does not contribute to an area that does not meet the standard.

In performing the modeling analyses for the SCE&G Wateree and IP Eastover, the State of South Carolina evaluated sources up to 50 km from each facility for potential inclusion in the AERMOD modeling (See Section 4.4.1.3 of this chapter). This evaluation concluded that the only other facility that needed to be included in the modeling analysis is Specialty Minerals located on IP Eastover's property. No background sources needed to be included in the modeling for either facility and the EPA concurs with this determination. The AERMOD modeling performed, with receptor grids extending out to approximately 15 from the two facilities, concludes that the air quality within this receptor grid is not expected to violate the 1-

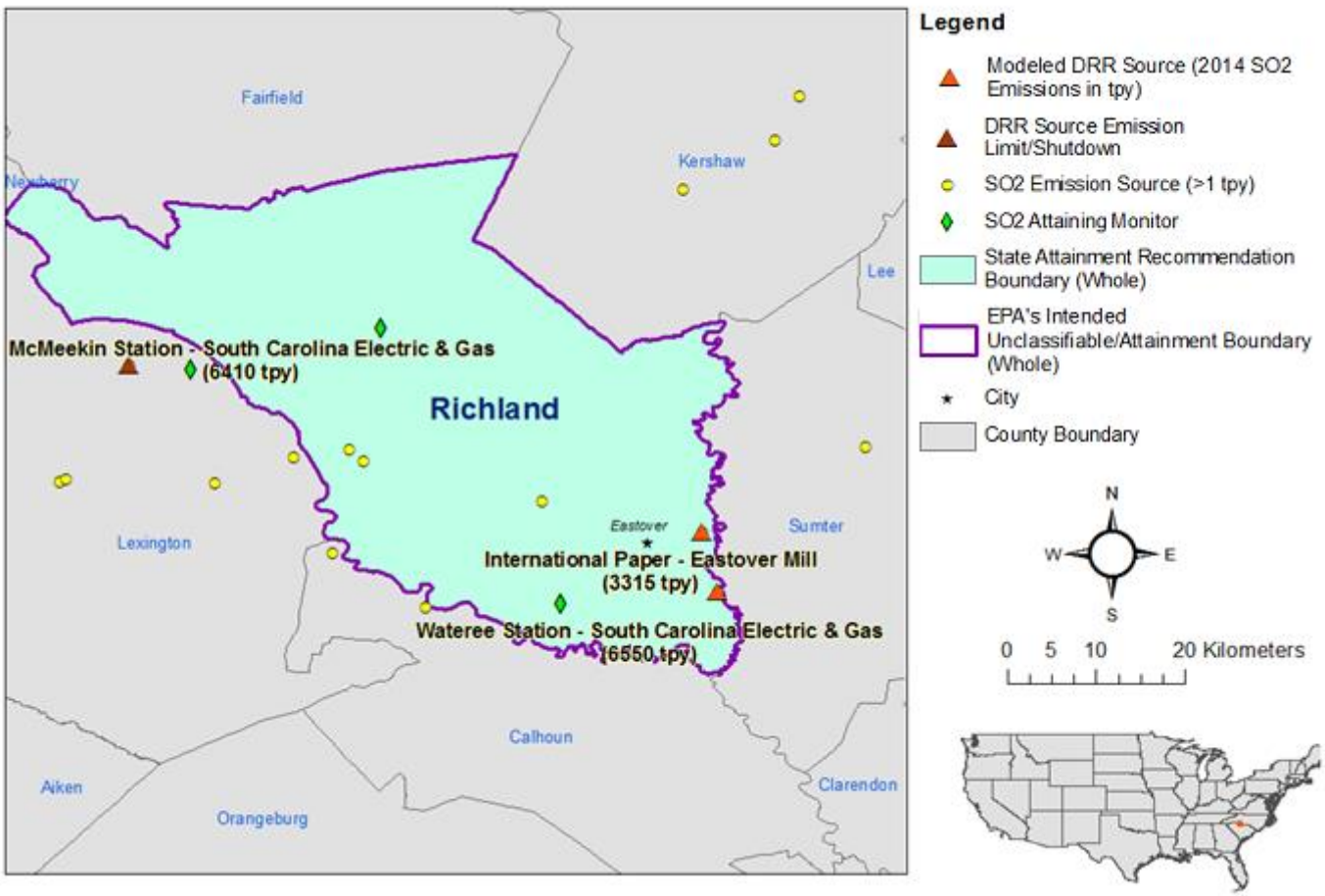
hour SO_2 NAAQS. In light of these determinations, which the EPA concurs with, it is not anticipated that either of these facilities contribute to nonattainment in the nearby area just outside of the receptor grids. The 2014 NEI v.1. indicates that there are no major sources of SO_2 just outside of the receptor grid modeled nor within 30 km of either source which further substantiates the likelihood that neither of these facilities contribute to nonattainment in the nearby area.

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the areas around SCE&G-Wateree Station and IP-Eastover Mill as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of Richland County. The EPA has determined that this area meets the 2010 SO_2 NAAQS, and does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. There will be no remaining portions of Richland County that remain to be characterized. The EPA believes that our intended unclassifiable/attainment area, bounded by the Richland County boundary, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

4.7. Summary of Our Intended Designation for the Richland County, South Carolina Area

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate Richland County as unclassifiable/attainment for the 2010 SO_2 NAAQS. Based on the available information, including (but not limited to) appropriate modeling analyses the EPA has determined that this area meets the 2010 SO_2 NAAQS, and does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. Specifically, the boundaries are comprised of the entirety of Richland County. Figure 22 shows the boundary of this intended designated area.

Figure 22. Boundary of the Intended Richland County Unclassifiable/Attainment Area



At this time, our intended designations for the State only apply to this area and the other areas presented in this TSD. The EPA intends in a separate action to evaluate and designate all remaining undesignated areas in South Carolina by December 31, 2020.

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

5. Technical Analysis for the York County Area

5.1. Introduction

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

5.2. Air Quality Monitoring Data for the York County Area Addressing Resolute Forest Products US Inc. Catawba Mill (Resolute)

This factor considers the SO_2 air quality monitoring data in the area of York County, South Carolina did not include monitoring data for this area. The EPA reviewed the available air quality monitoring data in the AQS database and found the following nearby data:

- The York CMS SO_2 monitor (AQS ID: 45-091-0006) is located at 34.935817, -81.228409 in York County. The monitor is located in 20 miles northwest of Resolute Forest Products. Data collected by this monitor is comparable to the NAAQS, and indicates that the most recent SO_2 levels are below the 1-hr NAAQS. The most recent three years of quality-assured, certified data from this monitor (2013-2015) indicate an incomplete 1-hr SO_2 design value of 4 ppb. The monitor was shut down in April 2015. Also, this monitor was not located to characterize the maximum 1-hr SO_2 concentrations near Resolute Forest Products. South Carolina provided an air quality modeling analysis to characterize the maximum 1-hr SO_2 concentrations in the area (see the air quality modeling section immediately below).

In reviewing the available air quality monitoring data in AQS, the EPA determined that other than the data described above, there is no additional relevant data in AQS collected in or near York County that could inform the intended designation action. The most recent SO_2 design values for all areas of the country are available at https://www.epa.gov/air-trends/air-quality-design-values.

5.3. Air Quality Modeling Analysis for the York County Area Addressing Resolute Forest Products US Inc. Catawba Mill

5.3.1. Introduction

This section 5.3 presents all the available air quality modeling information for a portion of York County that includes Resolute Forest Products US Inc. Catawba Mill (Resolute). (This portion of York County will often be referred to as "the York County area" within this section 5.3). This area contains the following SO_2 sources, principally the sources around which South Carolina is required by the DRR to characterize SO_2 air quality, or alternatively to establish an SO_2 emissions limitation of less than 2,000 tpy:

- The Resolute facility emitted 2,000 tons or more annually. Specifically, Resolute emitted 2,621 tons of SO_2 in 2014 and 2,386 tons in 2015. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and South Carolina has chosen to characterize it via modeling.

- Duke Energy Allen Steam Station, which is a listed SO_2 DRR Source in North Carolina, was also included. Allen Steam Station emitted 1,718 tons of SO_2 in 2014.

- The Winthrop University, General Chemicals, LLC, Guardian Industries, and Spring Industries – Leroy Plant facilities are not on the SO_2 DRR Source list.

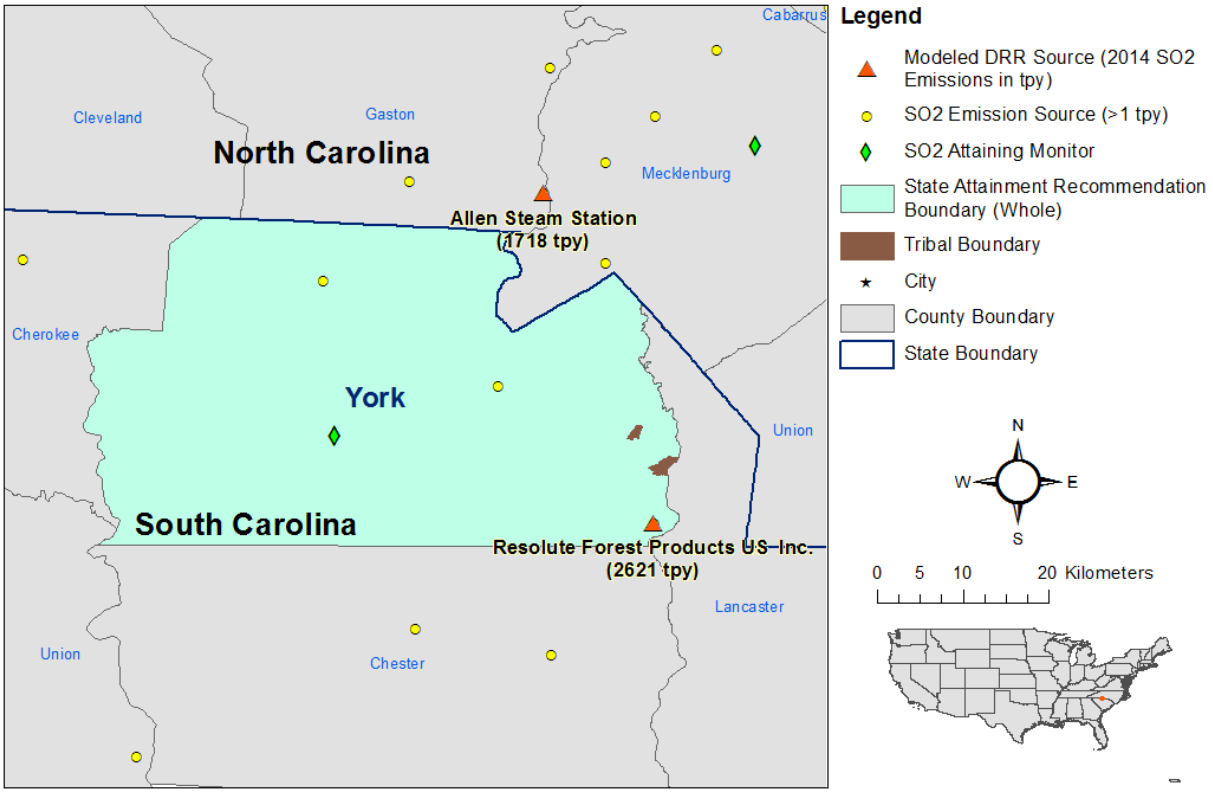
It should be noted that the five sources listed in the third bullet above, met the Q/20D criteria used by the State of South Carolina to determine which sources should be further evaluated for potential inclusion in the modeling analysis. Additionally, the state included in the modeling analysis all permitted SO_2 sources within 50 km of Resolute in the final modeling analysis. More detail regarding area of analysis and nearby sources are discussed in section 5.3.1.3.

Because we have available results of air quality modeling in which these sources are modeled together, the area around this group of sources is being addressed in this section with consideration given to the impacts of all sources.

In its submission, South Carolina recommended that each county in the State be designated attainment including York County. Specifically, the State recommended that an area surrounding the Resolute FP US, Inc. facility be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. 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 with the State's recommendation for the area, and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

The area the State has assessed via air quality modeling is located in Catawba, South Carolina, along the Catawba River and Cureton Ferry Road. See Figure 23. Also included in Figure 23 is the State's recommended attainment designation. The EPA's intended unclassifiable/attainment designation boundary for York County area is not shown in this figure, but is shown in a figure in the section below that summarizes our intended designation.

Figure 23. Map of the York County Area Addressing Resolute Facility



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

For this area, the EPA received and considered one modeling assessment from the State and no assessment from other parties. To avoid confusion in referring to this assessment, the following table lists it, indicates when it was received, provides an identifier for the assessment that is used in the discussion of the assessment that follows, and identifies any distinguishing features of the modeling assessment.

Table 21. Modeling Assessment for the York County (Resolute) Area

Assessment Submitted by	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
South Carolina*	November 2016	Resolute FP US, Inc. Modeling Report	State submittal

* South Carolina submitted the modeling assessment prepared by AECOM.

5.3.1.1. Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPPRM: 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

Initially, the State used AERMOD version 15181 with the Adjusted U* option. However, the State re-ran the modeling analysis using AERMOD version 16216 which contains bug fixes for the adjusted U* option in version 15181. Use of AERMOD version 16216 resulted in only slightly lower concentrations compared to the use of AERMOD version 15181. It should be noted that the current regulatory version of AERMOD, version 16216r, was not utilized by the State, probably because it was not available at the time the modeling was performed. Based on documentation of the bugs in AERMOD version 16216 that were corrected by version 16216r, it is not anticipated that application of AERMOD version 16216r would significantly alter the model predictions compared to the prediction of version 16216. This modeling analysis also contains a significant degree of conservatism (or double counting) as all permitted SO_2 sources within 50 km were explicitly modeled and the impact of many of these same sources is likely also accounted for in the background monitoring data utilized. A discussion of the State's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

5.3.1.2. Modeling Parameter: Rural or Urban Dispersion

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

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. The 2011 National Land Cover Database (NLCD) was utilized to determine if a 3 km area surrounding the Catawba Mill should be classified as rural or urban for the purposes of this modeling analysis. The 2011 NLCD data was downloaded for a 3+ km area surrounding the Mill from the Multi-Resolution Land Characteristics Consortium

website. The area of each land use class within a 3 km radius of the Mill was calculated and a percentage of the total was determined. This analysis concluded that the non-developed land use classes totaled about 93 percent rural. The area surrounding the Catawba Mill is predominately rural, therefore, it is appropriate to run the model in rural mode. See Table 22 below for percentage of land use near the Resolute facility. The EPA concurs that it is appropriate to run the model in rural mode for this modeling analysis. For the purpose of performing the modeling for the area of analysis, the State determined that it was most appropriate to run the model with rural dispersion coefficients or in rural mode and the EPA concurs with this assessment.

Table 22. Percentage of land use within 3 km of the Resolute

Land Use Class	Resolute Catawba Mill
Open Water	9.0%
Developed, Open Space	3.3%
Developed, Low Intensity	1.3%
Developed, Medium Intensity	1.3%
Developed, High Intensity	1.4%
Barren Land	1.1%
Deciduous Forest	31.2%
Evergreen Forest	21.2%
Mixed Forest	2.4%
Scrub/Shrub	3.4%
Grassland/Herbaceous	12.2%
Pasture/Hay	10.3%
Cultivated Crops	0.3%
Woody Wetlands	1.4%
Emergent Herbaceous Wetland	0.3%

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

The TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the York County area, the State has included all other emitters of SO_2 in North

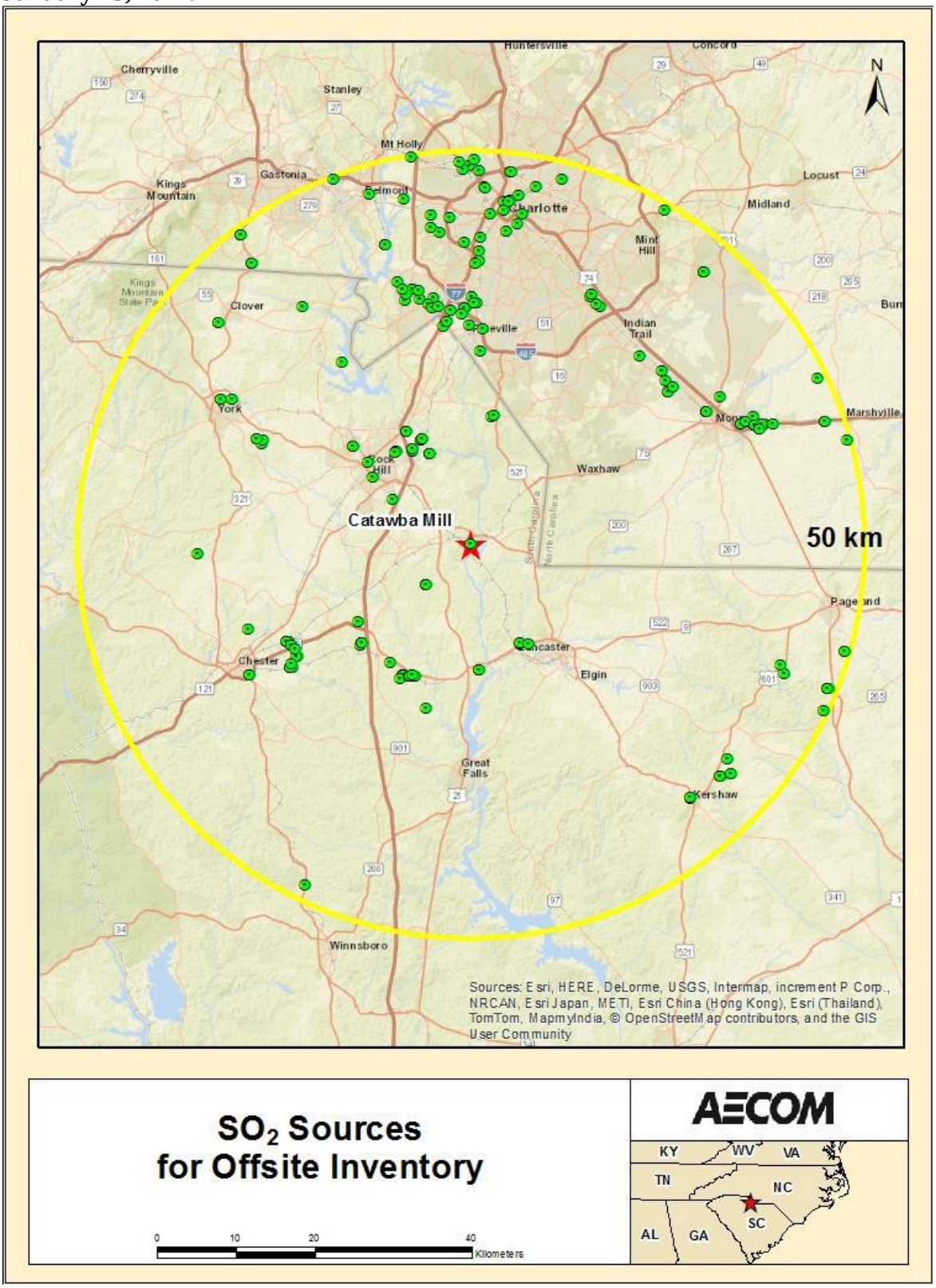
Carolina and South Carolina within 50 km of Resolute in any direction. The State determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. No other sources beyond 50 km were determined by the State to have the potential to cause concentration gradient impacts within the area of analysis.[21] The final modeling analysis performed by the State included all permitted SO_2 sources within 50 km of Resolute as shown in Figure 24.

The State initially intended to use the Q=20D[22] screening tool to evaluate sources within a screening area extending 50 km from Resolute to identify potential nearby sources for inclusion in the modeling analysis. Permitted emissions inventories for 2014 were obtained from the State of South Carolina (DHEC) for the six counties within 50 km of the Resolute Catawba Mill – York, Chester, Fairfield, Kershaw, Lancaster, and Chesterfield. In addition, actual emissions inventories for 2014 were obtained from the North Carolina Division of Air Quality (NCDAQ) for Union and Gaston Counties, North Carolina, and from the Mecklenburg County Air Quality for Mecklenburg County, North Carolina. The State identified 198 permitted facilities in the South Carolina counties and 208 permitted facilities in the North Carolina counties within 50 km of Resolute.

In the final modeling analysis, the State conservatively elected to include all SO_2 sources within 50 km of Resolute. On September 1, 2016, the EPA sent comments expressing concern that plumes from a group of distant sources in the same general upwind direction, and below the 20D threshold, may combine to act as one larger emissions source. Resolute and AECOM (modeling consultant for Resolute) believes the background concentration is representative of the contribution from all off-site sources less than 20D. However, in the interest of validating this assumption, Resolute & AECOM included all off-site sources within 50 km in the final modeling analysis to demonstrate there is no contribution to the design concentration from the sources less than 20D. In the case of Winthrop University, the maximum short-term emission rate when burning natural gas was entered into the model. Figure 24 shows the locations of all SO_2 sources in the off-site inventory. The Catawba Indian Nation has two non-contiguous areas of tribal land located approximately 6 km northeast and 10 km north of the Resolute facility within the State's area of analysis. No sources within the reservation were explicitly included in the modeling analysis for Resolute.

[22] The "20D" methodology allows for candidate nearby sources to be excluded from the cumulative analysis if their facility-wide emission rates, in tpy, are less than 20D, where D is the distance in km between the candidate nearby source and the primary source. (EPA's "Screening Threshold" Method for PSD Modeling Memo, 1985.)

Figure 24. Nearby Sources within 50 km of the Resolute Facility. Resolute FP US, Inc. Catawba, SC SO_2 Data Requirements Rule Modeling Report prepared for South Carolina, January 13, 2017.



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

The receptor grid consists of receptors spaced 50 m apart along what the state asserted was the Catawba Mill's Prevention of Significant Deterioration (PSD) ambient air boundary, and within this boundary in locations having public access. Public locations within the property boundary include Cureton Ferry Road and the rail lines of CSX and Norfolk Southern. Only the Norfolk Southern rail line crosses the PSD ambient air boundary. Receptors were placed along the section of the rail line crossing the PSD ambient air boundary at 50-meter intervals.

The PSD ambient air boundary is represented by fencing around the northern and eastern perimeter of the production area, landfill, and wastewater treatment ponds where public roads provide access to the Catawba Mill property. A combination of fencing and regularly patrolled private mill roads following the Catawba River and Abernathy Creek form the PSD ambient air boundary along the southern and western portions of the wastewater holding ponds. There are no public roads or other access crossing the Catawba River or Abernathy Creek leading into these areas of the Catawba Mill property, other than the Norfolk Southern rail line mentioned previously.

A spacing of 100 m was used for the receptors extending out to 3.0 km from the central point of the ambient air boundary. Between 3 and 7 km, a spacing of 500 m was used. Between 7 and 12 km, a spacing of 1,000 m was used.

The receptor network contained 7,502 receptors, and the network covered southeastern York, northeastern Chester, and northern Lancaster counties in South Carolina and western Union County in North Carolina.

Figures 25 and 26, included in the State's recommendation, show the State's chosen area of analysis surrounding the Resolute facility, as well as the receptor grid for the area of analysis.

Consistent with the Modeling TAD, the State placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to Resolute FP. Receptors were not excluded from any other areas of the modeling domain. Receptors located on the property of other facilities were included in the modeling and in locations over water where it is infeasible to locate a monitor.

Figure 25. Receptor Grid for the York County Area. Source: Resolute FP US, Inc. Catawba, SC SO_2 Data Requirements Rule Modeling Report prepared for South Carolina, AECOM January 13, 2017.

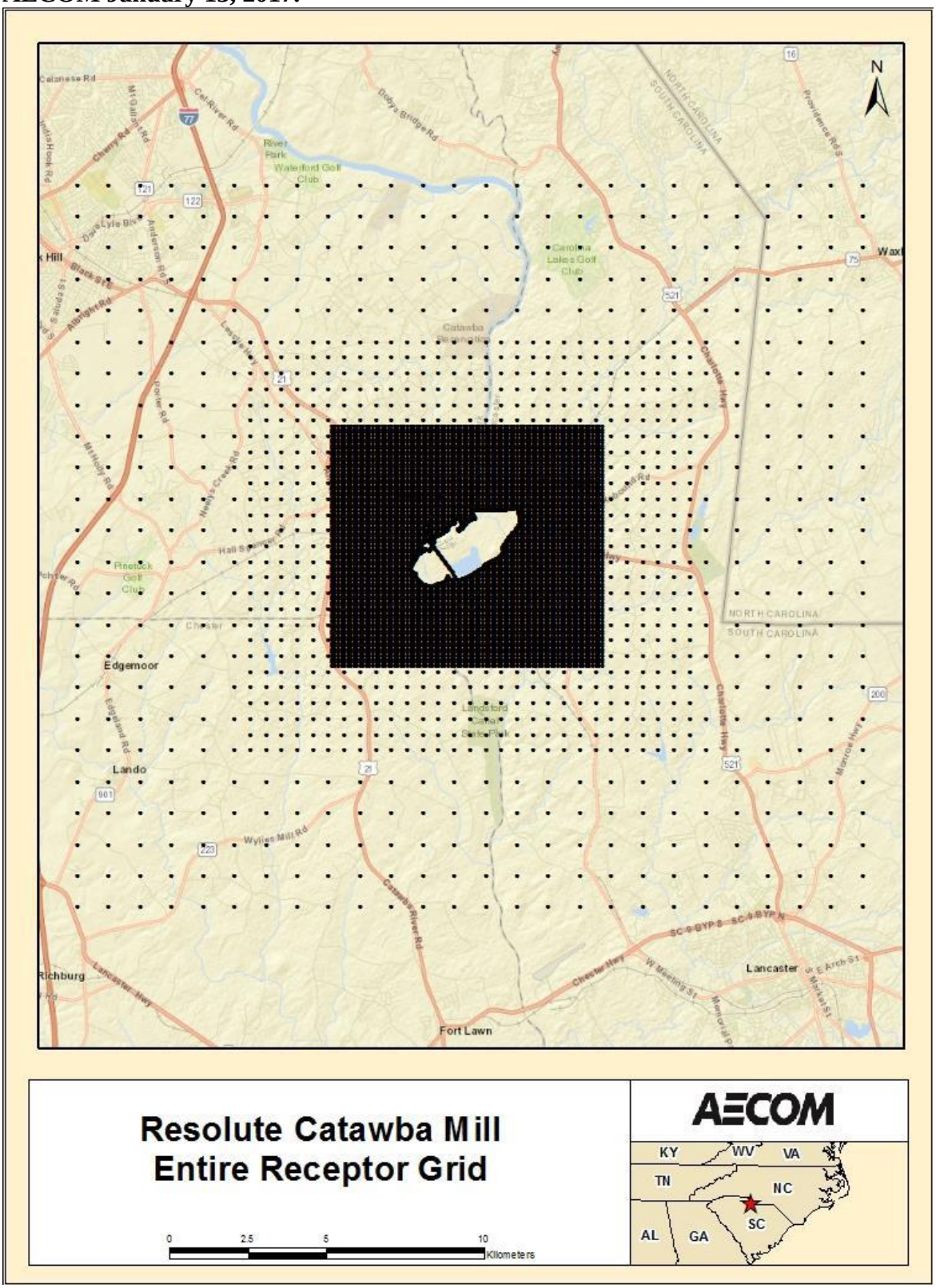
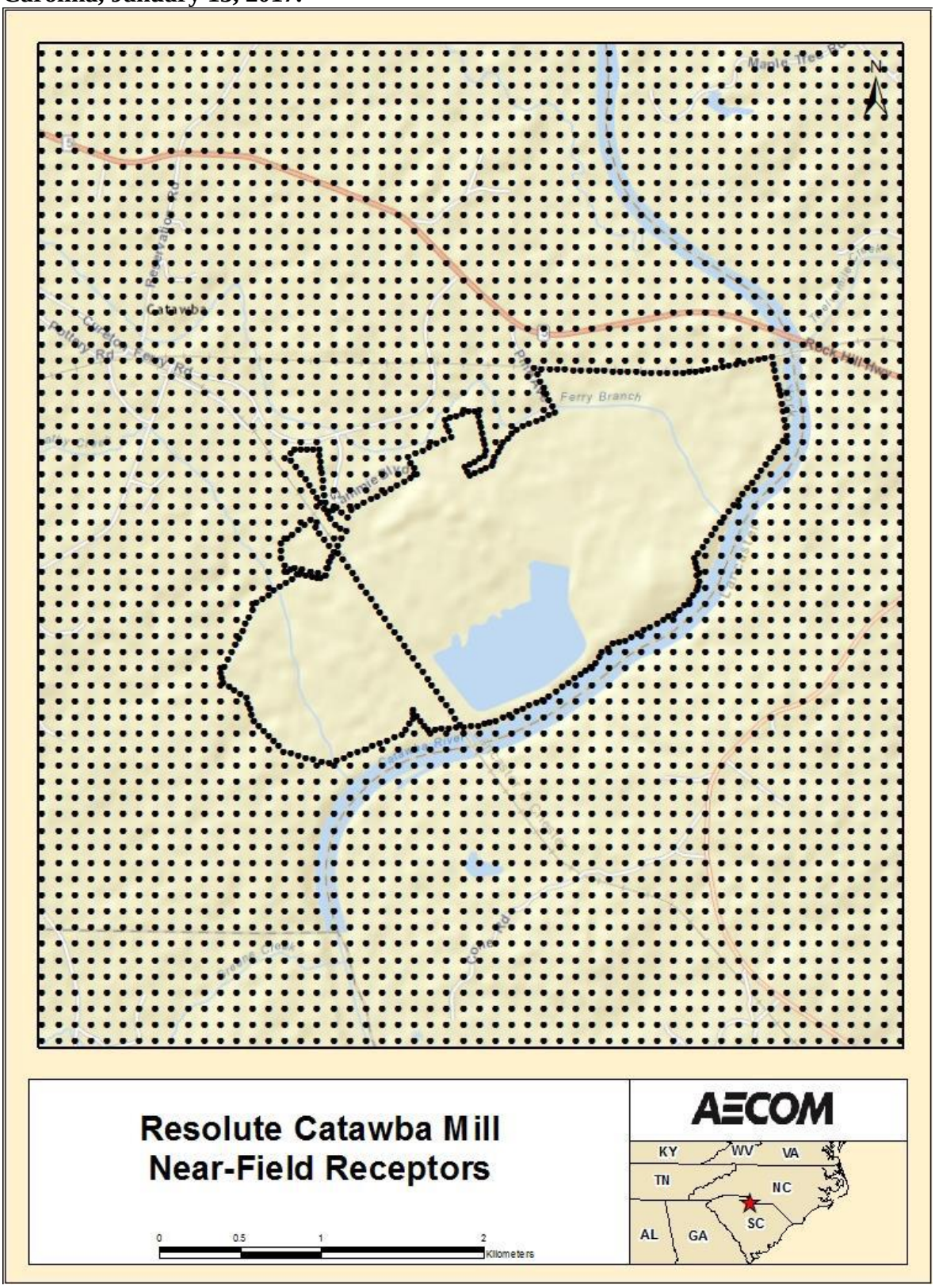


Figure 26. Receptor Grid for the York County Area – Zoomed in. Source: Resolute FP US, Inc. Catawba, SC SO_2 Data Requirements Rule Modeling Report prepared for South Carolina, January 13, 2017.



The receptor grid utilized in this modeling analysis was developed in a manner consistent with the SO_2 Modeling TAD. Receptors were placed in all areas of the modeling domain that are considered ambient air relative to Resolute. The EPA concurs with this component of the modeling analysis.

5.3.1.4. Modeling Parameter: Source Characterization

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

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

In the final modeling performed, the State elected to include all SO_2 sources within 50 km of Resolute. The EPA has determined that this component of the modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD.

5.3.1.5. Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

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

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2

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

As previously noted, the State included Resolute and all other emitters of SO_2 within 50 km in the area of analysis. For this area of analysis, the State has opted to use actual emissions from Resolute and all North Carolina permitted facilities within 50 km. The State has opted to use allowable emissions for all South Carolina permitted facilities within 50 km. The facilities in the State's modeling analysis and their associated actual emission rates are summarized below.

For Resolute, the State provided annual actual SO_2 emissions for five of their sources (Sources: FUTRF2, FUTRF3, FUTSB, FUTCB1 & FUTCB2) between 2012 and 2014. This information is summarized in Table 23. A description of how the State obtained hourly emission rates is given below this table.

Table 23. Actual SO_2 Emissions Between 2012 – 2014 from Facilities in the Area of Analysis for the York County Area

	SO_2 Emissions (tpy)		
Facility Name	**2012**	**2013**	**2014**
Resolute (Sources: FUTRF2, FUTRF3, FUTSB, FUTCB1 & FUTCB2)	1,155	1,084	1,373
Resolute (Point Sources: FUTST2, FUTST3, FUTLK2 & FUTNCG1; Area Sources: FUTPM1 – 3 & FUTAMU)	3,407	3,407	3,407
All permitted facilities within 50 km SC Permitted = 2,884 tpy NC Actual = 1,912 tpy	4,796	4,796	4,796
Total Emissions from All Facilities in the Area of Analysis Modeled Based on Actual Emissions	9,358	9,287	9,576

The primary source of SO_2 emissions from the Resolute Catawba Mill is combustion of No. 6 fuel oil. The modeling analysis uses hourly SO_2 emissions from No. 6 fuel oil combustion in each fuel burning source. The hourly emissions are calculated based on actual hourly fuel consumption records for each source. The only exception is for the lime kiln (FUTLK2), which is modeled using the maximum hourly SO_2 emissions from No. 6 fuel oil for all hours. The hourly No. 6 fuel oil combusted in each source is multiplied by the maximum sulfur content of 2.1 percent to estimate the actual hourly emissions from No. 6 fuel oil combustion.

The actual hourly SO_2 emissions from No. 6 fuel oil are then added to the maximum hourly emissions from all other fuels as a second layer of conservativism, over-estimating the actual hourly SO_2 emissions from each fuel burning source. This is a conservative or over-estimate of the SO_2 emissions for several reasons. First, the SO_2 emissions from other fuels are calculated based on the maximum fuel firing rates (or heat input rates) for each fuel, even though multiple fuels cannot be burned simultaneously at the maximum firing rate. Second, on an annual basis

the steam generated from burning No. 6 fuel oil in the recovery furnaces and combination boilers was 1.59% of the total steam generation in 2012, 1.18 percent in 2013, and 4.31 percent in 2014.

Another source of SO_2 emissions from the Catawba Mill is combustion of the pulp mill non-condensable gases (NCG's) in the combination boilers for compliance with the kraft pulp mill NSPS and MACT standards. The maximum hourly SO_2 emissions from NCG combustion are modeled for every hour as a conservative assumption. The SO_2 emissions from NCG combustion are modeled from the combination boiler No. 1 stack as done in previous Title V modeling analyses. Combination boiler No. 1 has a lower stack temperature and lower stack flow rate than combination boiler No. 2 and therefore is expected to exhibit less favorable dispersion characteristics and produce higher ground-level concentrations.

Similarly, other smaller sources of SO_2 emissions are modeled at the maximum hourly emission rate for all hours as a conservative assumption (rather than actual hourly values).

As previously noted, the State elected to include all SO_2 sources within 50 km of Resolute. For all South Carolina sources included in the modeling analysis, the State utilized permitted emissions. For all North Carolina sources included in the modeling analysis, the State utilized actual emissions by annualizing yearly actual emissions. The nearest North Carolina source included in the modeling appears to be over 20 km from Resolute (Figure 23).

The EPA agrees with the actual emission rates modeled in this analysis. Actual emissions from Resolute were lower in 2015 than in 2014. Therefore, if 2015 emissions had been modeled, predicted ambient impacts may have been lower than 2014. As of this writing, actual emissions data from 2016 are not yet available.

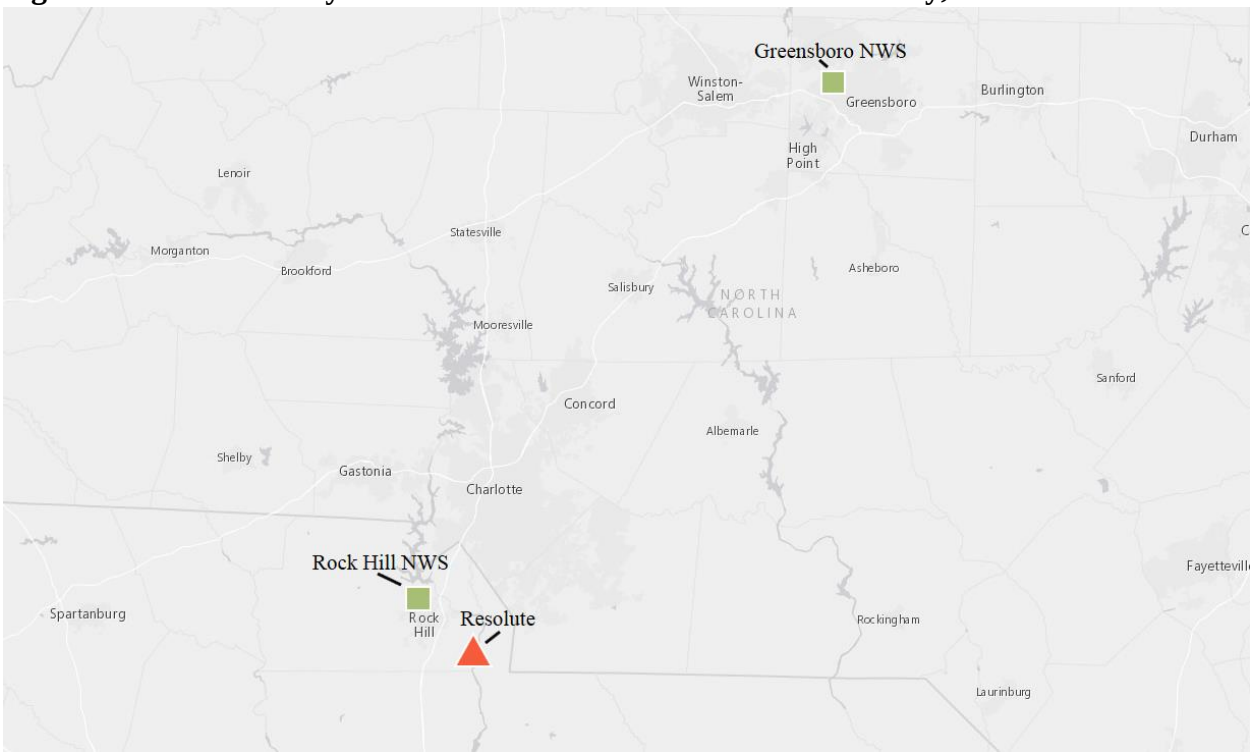
5.3.1.6. Modeling Parameter: Meteorology and Surface Characteristics

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

For the area of analysis for the York County area, the State selected the surface meteorology from the NWS station in Rock Hill, SC, located at 34.59 N, 81.03 W, 20 km to the northwest of the source, and coincident upper air observations from a different NWS station, located in Greensboro, North Carolina, located at 36.1 N, 79.94 W, as best representative of meteorological conditions within the area of analysis.

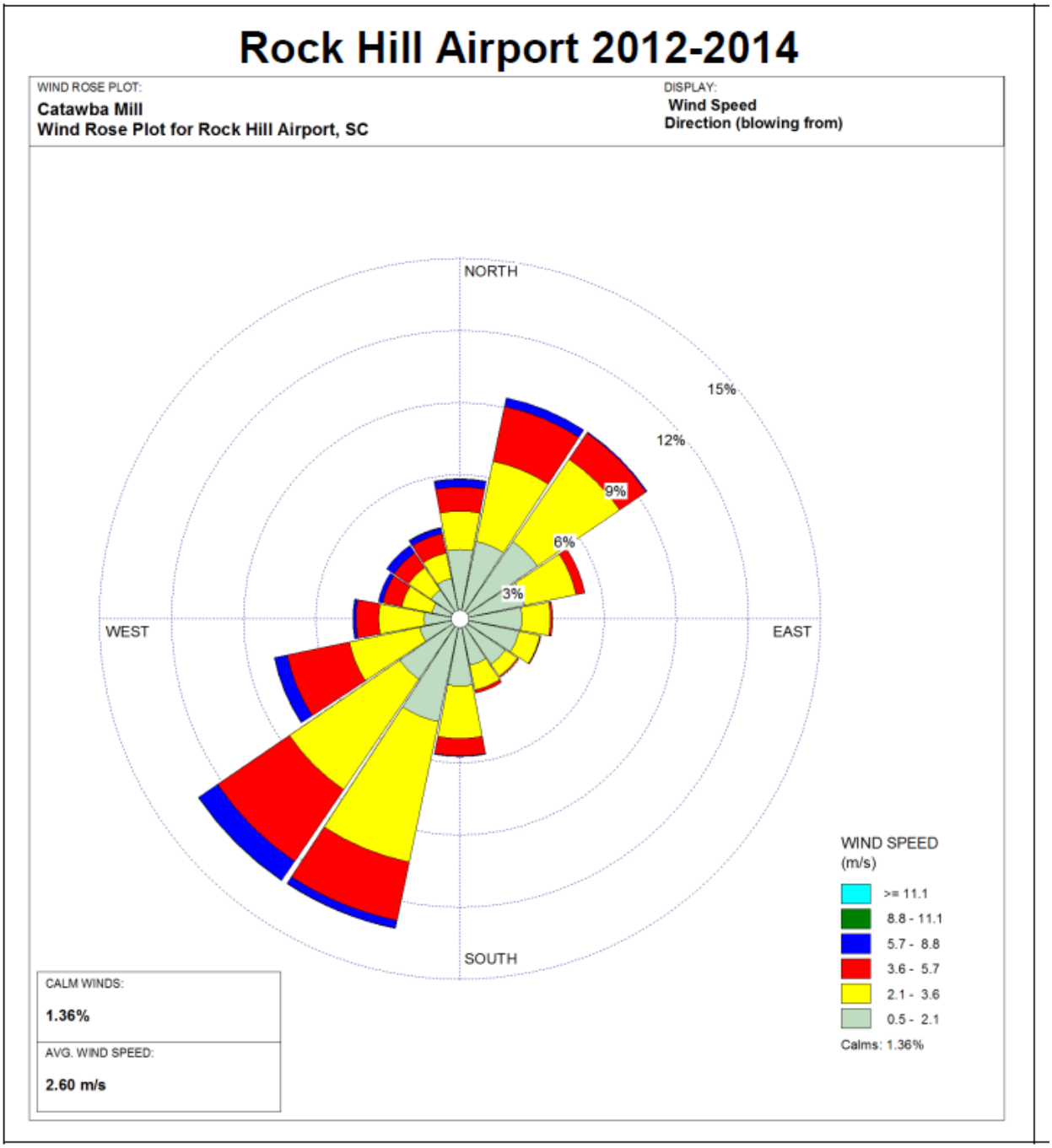
The State used AERSURFACE version 13016 using data from the Rock Hill, South Carolina NWS site to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (zo)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as “zo” The state estimated surface roughness values for 12 spatial sectors out to 1 km at a seasonal temporal resolution for average conditions. In the figure below, generated by the EPA, the locations of these NWS stations are shown relative to the area of analysis.

Figure 27. Area of Analysis and the NWS station in the York County, South Carolina Area



As part of its recommendation, the State provided the 3-year surface wind rose for the Rock Hill, South Carolina, NWS station. In Figure 28, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Analysis of the NWS data indicate winds blow predominately from the southwest and northeast directions.

Figure 28. Rock Hill, SC NWS Cumulative Annual Wind Rose for Years 2012-2014



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

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the NWS station mentioned above, 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 m/s in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The EPA agrees with the surface and upper air meteorological data selected for use in this modeling analysis. The data were processed in a manner consistent with the AERMOD Implementation Guidance. The EPA believes that the wind rose above indicates that impacts from Resolute and the other facilities included in the modeling are reasonably expected to most frequently occur generally northeast and southwest of the facilities modeled, but impacts could be seen in other directions as well.

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

The terrain in the area of analysis is best described as gently rolling with elevations changing up to several hundred feet within a few km of the plant site. 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.

This component of the modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD.

5.3.1.8. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the State elected to use a "tier 1" approach. Data was obtained from 2012-2014 for AQS Site: 45-045-0015. This site is located near Greenville, South Carolina. The single value of the background concentration for this area of analysis was determined by the State to be 13 $\mu g/m^3$, equivalent to 5 ppb when expressed in 2 significant figures,[23] and that value was incorporated into the final AERMOD results.

Subsequent to the original modeling report submitted on January 13, 2017, South Carolina determined that the 2012-2104 SO_2 ambient air data from Greenville monitor is incomplete. On April 7, 2017, South Carolina submitted additional documentation containing a revised analysis for the Resolute facility using background data from a regulatory monitor located in Charlotte, North Carolina.[24] The single value of the background concentration from the Charlotte monitor was determined by the State to be 13 $\mu g/m^3$, equivalent to 5 ppb when expressed in 2 significant figures,[25] and that value was incorporated into the final AERMOD results.

The EPA agrees with the Charlotte background monitor selected for use in this modeling analysis. The Charlotte monitor is located approximately 47 km north of Resolute. Use of the Charlotte monitor as a background site should be conservative in this case because the monitor is likely affected by many sources that were explicitly included in the modeling, including the Duke Allen power plant which is located approximately 20 km west of the Charlotte monitor. This component of the modeling analysis was performed in a manner consistent with the SO_2 Modeling TAD.

[23] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 $\mu g/m^3$.
[24] Letter from Rhonda B. Thompson, Chief, Bureau of Air Quality, South Carolina Department of Health and Environmental Control to V. Anne Heard, Acting Regional Administrator, U.S. EPA Region 4, dated April 7, 2017.
[25] The SO_2 NAAQS level is expressed in ppb but AERMOD gives results in $\mu g/m^3$. The conversion factor for SO_2 (at the standard conditions applied in the ambient SO_2 reference method) is 1ppb = approximately 2.619 $\mu g/m^3$.

5.3.1.9. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the York County area of analysis are summarized below in Table 24.

Table 24. Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the York County Area

Input Parameter	Value
AERMOD Version	16216 (regulatory defaults)
Dispersion Characteristics	Rural
Modeled Sources	169
Modeled Stacks	243
Modeled Structures	16
Modeled Fencelines	1
Total receptors	7,502
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Rock Hill, SC
NWS Station Upper Air Meteorology	Greensboro, NC
NWS Station for Calculating Surface Characteristics	Rock Hill, SC
Methodology for Calculating Background SO_2 Concentration	Tier 1 approach using Charlotte monitor for 2012-2014
Calculated Background SO_2 Concentration	13 $\mu g/m^3$

The results presented below in Table 25 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 25. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the York County Area

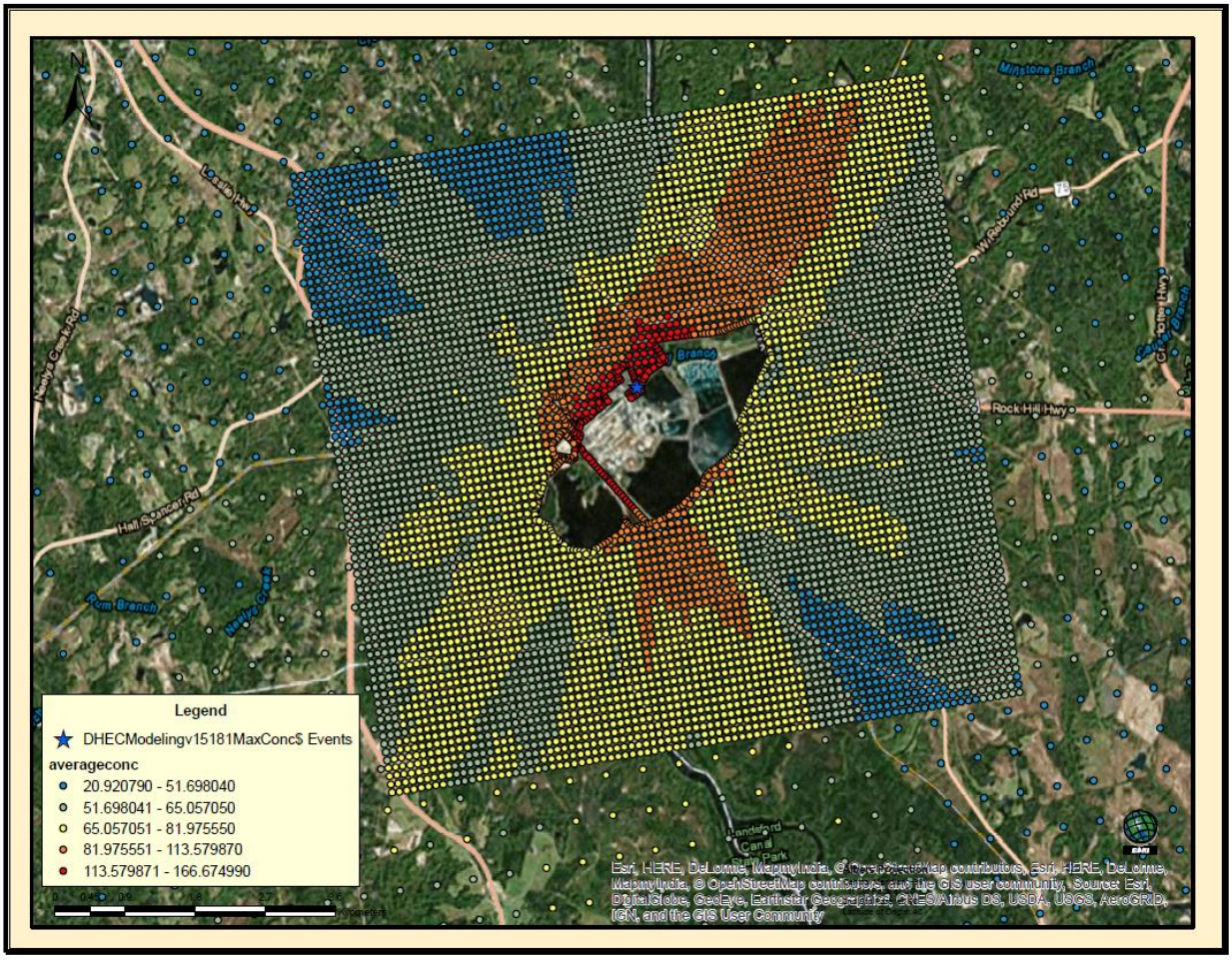
Averaging Period	Data Period	Receptor Location [Zone 17]		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)[26]	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	510,234	3,856,182	180	196.4*

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

The State's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 180 $\mu g/m^3$, equivalent to 69 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 29 below was included as part of the State's recommendation, and indicates that the predicted value occurred just north of Resolute FP property. The State's receptor grid is also shown in the figure.

[26] This concentration was predicted by AERMOD version 15181. The concentration predicted by AERMOD version 16216 was slightly lower. For conservatism, the higher of the two model predictions are reported here.

Figure 29. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the York County Area. Source: Resolute FP US, Inc. Catawba, SC SO_2 Data Requirements Rule Modeling Report prepared by AECOM January 13, 2017.



The modeling submitted by the State does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

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

The EPA agrees that the modeling analysis has been performed in a manner consistent with the SO_2 Modeling TAD. Initially, the State used AERMOD version 15181 with the Adjusted U* option. However, the State re-ran the modeling analysis using AERMOD version 16216 which contains bug fixes for the adjusted U* option in version 15181. Use of AERMOD version 16216 resulted in only slightly lower concentrations compared to the use of AERMOD version 15181. The higher concentration reported by AERMOD version 15181 is shown in the model results table above. It should be noted that the current version of AERMOD, version 16216r, was not utilized by the State, probably because it was not available at the time the modeling was performed. Based on documentation of the bugs in AERMOD version 16216 that were corrected by version 16216r, it is not anticipated that application of AERMOD version 16216r would significantly alter the model predictions compared to the prediction of version 16216.

The remaining components of the modeling analysis were also consistent with the SO_2 Modeling TAD. The State conservatively elected to include all permitted SO_2 sources within 50 km of Resolute in the modeling. This assumption, along with the air data from the Charlotte, North Carolina, background monitor discussed in Section 5.3.1.8, adds an additional layer of conservatism to this modeling analysis as the impacts from many of the sources explicitly modeled are also accounted for in the data from the background monitor. The EPA concurs with the background concentration monitor and data used in this analysis. The modeling domain is appropriate for to capture maximum predicted concentrations in the York County area. The surface and upper air meteorological data and surface characteristics selected for use in this analysis are sufficient for a valid modeling analysis. Therefore, the EPA agrees that the 1-hour SO_2 concentrations predicted by the modeling analysis are below the NAAQS for this area.

5.4. Jurisdictional Boundaries in the York County, South Carolina Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for York County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

South Carolina requested that every county in the State be designated attainment, including York County, based on an assessment and characterization of air quality from the Resolute FP DRR source and other nearby sources. The State did not provide a specific boundary recommendation for the modeled areas around Resolute FP. York County is bounded to the north by Gaston County, North Carolina; to the northeast by Mecklenburg County, North Carolina; to the east by Lancaster County, South Carolina; to the south by Chester County, South Carolina; to the southwest by Union County, South Carolina; to the west by Cherokee County, South Carolina; and to the northwest by Cleveland County, North Carolina.

In the modeling assessment report for the Resolute facility, the State recommends that the region surrounding this source be designated attainment for the 1-hour NAAQS for SO_2. The dispersion modeling effort focuses on the area surrounding the Resolute facility located in Catawba, in York County, South Carolina.

SC DHEC assessed nearby sources within a 50 km area of analysis from the Resolute FP facility in all directions and considered this sufficient to resolve the maximum impacts and any potential impact areas. This area of analysis covers a portion of York and Lancaster Counties in South Carolina and a portion of Gaston and Mecklenburg Counties in North Carolina. The Duke Energy Carolinas, LLC – Allen Steam Station is located in Gaston County, North Carolina and was included in the modeling analysis.

The Catawba Indian Nation has two non-contiguous areas of tribal land located approximately 6 km northeast and 10 km north of the Resolute facility within the State's area of analysis. No sources within the reservation were explicitly included in the modeling analysis for Resolute.

5.5. The EPA's Assessment of the Available Information for the York County, South Carolina Area

The EPA intends to designate the York County area, including York County in its entirety, as unclassifiable/attainment. We believe that South Carolina's modeling analysis, and the monitoring data for both DRR sources located within the county, support the conclusion that there are no expected violations of the 2010 SO_2 NAAQS in the area. The Catawba Indian Nation has two areas of tribal land located in York County approximately 6 km northeast and 10 km north of the Resolute FP facility and are included in EPA's intended unclassifiable/attainment designation.

In performing the modeling analyses for Resolute FP, the State of South Carolina included all permitted sources within 50 km of Resolute in the AERMOD modeling. The AERMOD modeling performed, with receptor grids extending out to approximately 12 km from the Resolute FP, concludes that the air quality within this receptor grid is not expected to violate the 1-hour SO_2 NAAQS. In addition, the Charlotte, North Carolina, monitor that was used for background concentrations, indicates concentrations well below the 1-hour SO_2 NAAQS. The nearest nonattainment or undesignated areas are greater than 100 km away, which indicates no contribution from York County to existing or future nonattainment areas. In light of these determinations, it is not anticipated that Resolute FP would cause or contribute to violations in any nearby areas and the EPA concurs with this determination.

The EPA reviewed available air quality monitoring in the AQS database. For the Resolute area, the York CMS SO_2 monitor (AQS ID: 45-091-0006), located 20 miles northwest of Resolute Forest Products, indicates that the most recent SO_2 levels are below the 1-hour NAAQS. The 2013-2015 DV for the monitor is 4 ppb. The monitor was shut down in 2015. This monitor was not located to characterize the maximum 1-hr SO_2 concentrations near the Resolute facility. Rather, South Carolina provided an air quality modeling analysis to characterize the maximum 1-hour SO_2 concentrations in the area.

In reviewing the available air quality monitoring data in AQS, the EPA determined that other than the data described above, there is no additional relevant data in AQS collected in or near York County that could inform the intended designation action.

Based on the air quality characterization conducted within the York County area of analysis in accordance with the EPA's Modeling TAD, the State concluded that the area surrounding the DRR source should be designated attainment. This recommendation is based on South Carolina's assessment that Resolute FP is the main source thought to impact the area.

As discussed in the introduction section (section 5.3.1.3), the State considered various factors in determining that other sources within 50 km of the Resolute facility should be included in the cumulative impact modeling analysis. The State included all other emitters of SO_2 in North Carolina and South Carolina within 50 km of Resolute in any direction. The State determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. No other sources beyond 50 km were determined by the State to have the potential to cause concentration gradient impacts within the area of analysis.[27] The final modeling analysis performed by the State included all permitted SO_2 sources within 50 km of Resolute. See Figure 24.

The EPA agrees with the technical explanation for the State's treatment of nearby SO_2 sources included in the November 2016 modeling report. The EPA has reason to believe that there are no additional sources in areas adjacent to our intended area that are likely to cause or contribute to a violation of the NAAQS in the area of analysis and therefore recommends that the York County in its entirety should be designated unclassifiable/attainment.

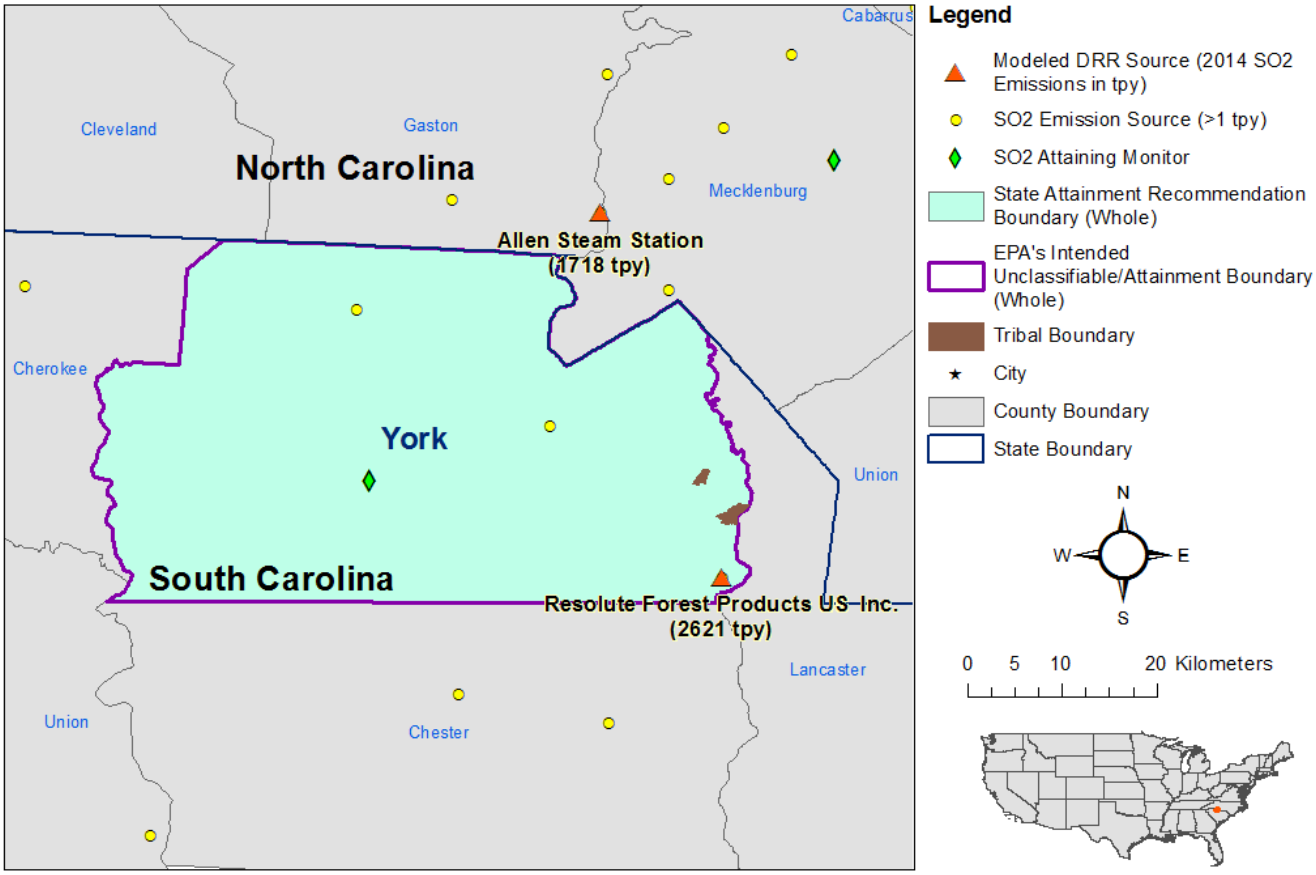
After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around Resolute FP US, Inc. as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of York County. The EPA has determined that this area meets the 2010 SO_2 NAAQS, and does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. There are no remaining portion of York County that remain to be characterized in the EPAs Round 4 of designations in 2020. This intended boundary includes the Catawba Indian Nation tribal lands.

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

5.6. Summary of Our Intended Designation for the York County, South Carolina Area

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate York County as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of York County. The Catawba Indian Nation reservation is located in York County, approximately 7 km northeast of the Resolute FP facility. There are no sources of SO_2 on the Catawba Indian Nation lands which were explicitly included in the modeling analysis for Resolute. The Catawba Indian Nation lands are being designated with York County.
Figure 30 shows the boundary of this intended designated area.

Figure 30. Boundary of the Intended York County Unclassifiable/Attainment Area



At this time, our intended designations for the State only apply to this area and the other areas presented in this technical support document. There will be no remaining portion of York County that remain to be characterized. The EPA believes that our intended unclassifiable/attainment area, bounded by York County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

6. Technical Analysis for the Remaining Areas in South Carolina

6.1. Introduction

The State of South Carolina has not installed and begun timely operation of a new, approved SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 DRR for any sources of SO_2 emissions in the State. Accordingly, the EPA must designate these counties by December 31, 2017. At this time, there are no air quality modeling results available to the EPA for these counties nor are there any air quality monitoring data that indicate any violation of the 1-hour SO_2 NAAQS. Furthermore, there is no evidence of violations of the 1-hour SO_2 NAAQS in these remaining counties. After careful review of the State's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation and intends to designate these remaining counties and portions of counties in Table 26 in the state as unclassifiable/attainment because the areas were not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the areas may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

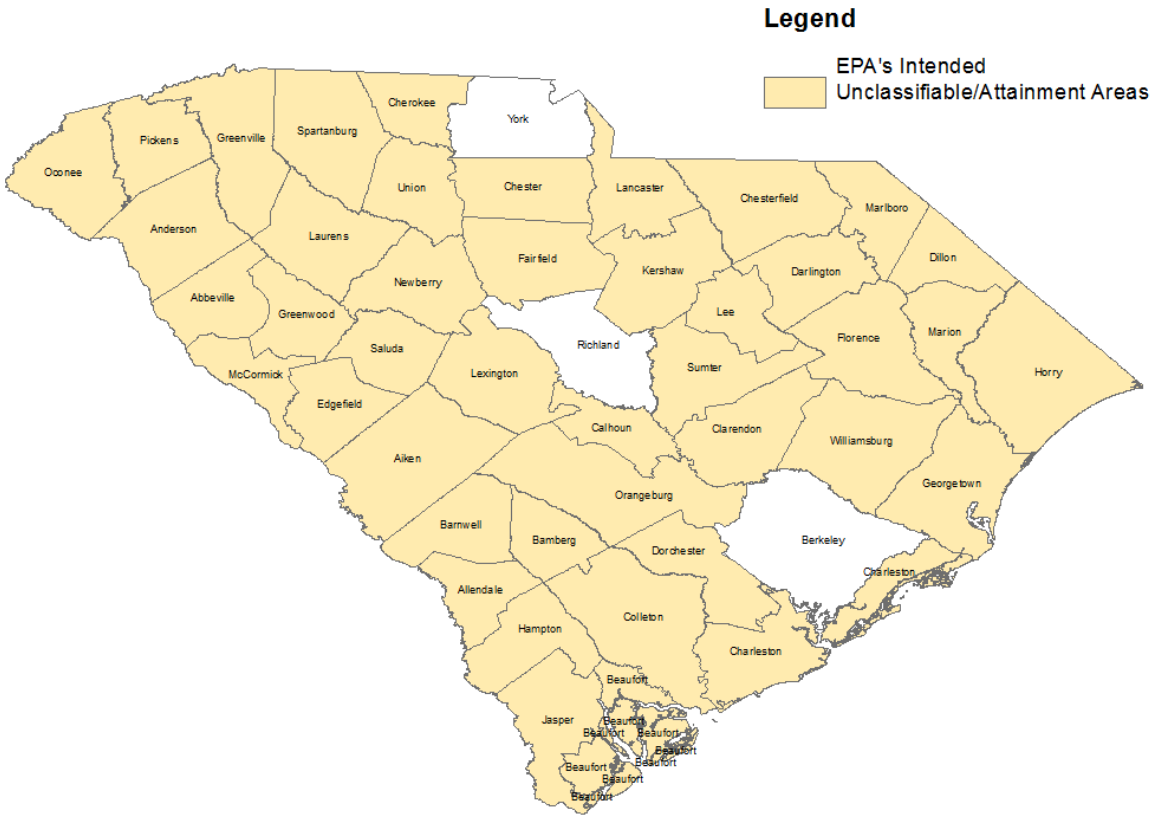
Table 26. Counties that the EPA Intends to Designate Unclassifiable/Attainment

County	South Carolina's Recommended Area Definition	South Carolina's Recommended Designation	The EPA's Intended Area Definition	The EPA's Intended Designation
Abbeville	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Aiken	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Allendale	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Anderson	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Bamberg	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Barnwell	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Beaufort	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Calhoun	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Charleston	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Cherokee	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Chester	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Chesterfield	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Clarendon	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Colleton	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Darlington	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Dillon	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Dorchester	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Edgefield	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Fairfield	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Florence	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Georgetown	Entire County	Attainment	Entire County	Unclassifiable/Attainment

County	South Carolina's Recommended Area Definition	South Carolina's Recommended Designation	The EPA's Intended Area Definition	The EPA's Intended Designation
Greenville	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Greenwood	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Hampton	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Horry	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Jasper	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Kershaw	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Lancaster	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Laurens	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Lee	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Lexington	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Marion	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Marlboro	Entire County	Attainment	Entire County	Unclassifiable/Attainment
McCormick	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Newberry	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Oconee	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Orangeburg	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Pickens	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Saluda	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Spartanburg	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Sumter	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Union	Entire County	Attainment	Entire County	Unclassifiable/Attainment
Williamsburg	Entire County	Attainment	Entire County	Unclassifiable/Attainment

Table 26 also summarizes South Carolina's recommendations for these areas. Specifically, the State recommended that the entirety of all Counties, be designated as attainment based on data that indicates that all monitors in the State provide design values that meet the 1-hour SO_2 NAAQS. In its January 13, 2017, submission, the State of South Carolina provided an assessment in support of its June 2, 2011, recommendation that the entire state be designated as attainment. This assessment and characterization is based on a review of emissions and air quality monitoring data in the counties and surrounding areas. After careful review of the State's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation and intends to designate these remaining counties in the state as unclassifiable/attainment. Figure 31 shows the locations of these areas within South Carolina.

Figure 31. The EPA's Intended Unclassifiable/Attainment Designation(s) for Counties in South Carolina



South Carolina does not have any counties for which new, approved SO_2 monitoring network has been installed and begun timely operation that are required to be designated by December 31, 2020. Furthermore, there are no counties in South Carolina that were previously designated Round 1 (*see* 78 *Federal Register* 4719) or Round 2 (*see* 81 *Federal Register* 45039). Therefore, the entire state of South Carolina will be designated by December 31, 2017.

6.2. Air Quality Monitoring Data for the Remaining areas in South Carolina

This factor considers the SO_2 air quality monitoring data in the remaining areas of South Carolina including Anderson and Lexington Counties. South Carolina did not include monitoring data for this area. In reviewing the available air quality monitoring data in AQS, the EPA determined that other than the data described, there are no additional relevant data in AQS collected in or near these counties that could inform the intended designation action. These data alone are not sufficient to support a conclusion that there is no NAAQS violation in any other portion of the area without sufficient information indicating that the monitors are located in the maximum concentration for the area. The most recent SO_2 design values for all areas of the country are available at https://www.epa.gov/air-trends/air-quality-design-values. The EPA reviewed the available air quality monitoring data in the AQS database and found the following nearby data:

6.2.1. Air Quality Monitoring Data for the Anderson County Area

- The Greenville ESC SO_2 monitor (AQS ID: 45-045-0015) is located at 34.843895, -82.414585 in Anderson County. The monitor is located in Greenville, South Carolina, 16.6 miles north of Duke Energy W.S. Lee Steam Station, a DRR source that restricted its SO_2 emissions to below 2,000 tpy (see section 6.3). Data collected by this monitor is comparable to the NAAQS, and indicates that the most recent SO_2 levels are below the 1-hr NAAQS. The most recent three years of complete, quality-assured, certified data from this monitor (2014-2016) indicate a 1-hr SO_2 design value of 3 ppb.

6.2.2. Air Quality Monitoring Data for the Lexington County Area

- The Irmo SO_2 monitor (AQS ID: 45-063-0008) is located at 34.051017, -81.15495 in Lexington County. The monitor is located in Irmo, South Carolina, 3.6 miles east of McMeekin Station, a DRR source that restricted its SO_2 emissions to below 2,000 tpy. Data collected by this monitor is comparable to the NAAQS, and indicates that the most recent SO_2 levels are below the 1-hr NAAQS. The most recent three years of complete, quality-assured, certified data from this monitor (2014-2016) indicate a 1-hr SO_2 design value of 29 ppb.

- The Parklane SO_2 monitor (AQS ID: 45-079-0007) is located at 34.093959, -80.962304 in neighboring Richland County. The monitor is located in Columbia, South Carolina, 14.8 miles east of McMeekin Station. Data collected by this monitor is comparable to the NAAQS, and indicates that the most recent SO_2 levels are below the 1-hr NAAQS. The most recent three years of complete, quality-assured, certified data from this monitor (2014-2016) indicate a 1-hr SO_2 design value of 8 ppb.

6.3. Jurisdictional Boundaries in the Remaining Areas in South Carolina.

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for all other counties in South Carolina. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The State of South Carolina recommends that each county be designated attainment for the 1-hour SO_2 NAAQS. The EPA notes that there are no other major SO_2 emitting sources in the remaining counties in the State that would cause or contribute to a violation of the NAAQS or contribute to an area that is not meeting the standard. Additionally, the EPA is not aware of any sources in neighboring states of North Carolina and Georgia that show potential SO_2 impacts indicating a violation of the 1-hour SO_2 NAAQS.

6.4. The EPA's Assessment of the Available Information for Remaining Areas in South Carolina.

These counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. These counties therefore meet the definition of an "unclassifiable/attainment" area. At this time, available information does not indicate that the air quality in the remaining counties in the state exceeds the 2010 SO_2 NAAQS. After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the remaining counties in South Carolina State listed in Table 26 as unclassifiable/attainment for the 2010 SO_2 NAAQS. Our intended unclassifiable/attainment designation will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable area.

6.5. Summary of Our Intended Designation for the Remaining areas in South Carolina

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate all other counties in South Carolina as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the entirety of the counties listed in the above Table 26.

Figure 31 above shows the location of these areas within South Carolina and the EPA's intended designation. For the counties in Table 26, the boundary of the unclassifiable/attainment area is the county boundary. The EPA believes that our intended unclassifiable/attainment areas, bounded by the county boundaries listed in the above Table 26, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment areas.