Technical Support Document:

Chapter 13
Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for Indiana

1. Summary

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

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

[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.

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 installed and began timely operating a new SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 Data Requirements Rule (DRR). (80 FR 51052). The EPA is required to designate those remaining undesignated areas by December 31, 2020.

Indiana submitted its first recommendation regarding designations for the 2010 1-hour SO_2 NAAQS on May 11, 2011, requesting all areas without a violating monitor be designated as unclassifiable. Indiana supplied subsequent submittals in January 2012, April 2012, January 2013, and March 2013, after which the EPA designated four areas in the state as nonattainment in an action published August 5, 2013. The state submitted information for five additional "Round 2" areas on September 16, 2015, after which the EPA designated these five areas as unclassifiable/attainment in an action published July 12, 2016. More recently, focusing on areas required to be addressed with modeling and to be designated in this Round 3, Indiana has provided updated information for eight areas, which it submitted on January 13, 2017. These recommendations are shown in Table 1. Indiana has also supplemented this submittal with additional information, most notably including new modeling for Lake County, submitted on May 10, 2017. On June 23, 2017, Indiana also forwarded a protocol for modeling the Alcoa area, provided by a consultant to Alcoa. In our intended designations, we have considered all the submissions from the state, except where a recommendation in a later submission regarding a particular area indicates that it replaces an earlier recommendation for that area, in which case we have considered the recommendation in the later submission.

The EPA has received no other recent submittals of modeling analyses or other analyses of air quality in the areas addressed in this chapter. However, during the review of Round 2 designations, the Sierra Club submitted comments on the designation of Posey County, Indiana, (the area including the A.B. Brown facility) including modeling showing violations of the primary SO_2 standard in Warrick County, Indiana. This modeling is discussed below as part of the discussion regarding the Warrick County intended designation, in Section 10.

For the presently undesignated areas in Indiana, Table 1 identifies the EPA's intended designations and the counties or portions of counties to which they would apply. This table also lists Indiana'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, and could change based on changes to this information (or the availability of new information) that alters the EPA's assessment and characterization of air quality.

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

Table 1. Summary of the EPA's Intended Designations and Indiana's Designation Recommendations for Presently Undesignated Areas

Area/County	Indiana's Recommended Area Definition	Indiana's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Gallagher/Floyd County	Floyd County	Attainment	Same as State's recommendation	Unclassifiable/ Attainment
U.S. Mineral Products/ Huntington County	Huntington County	Unclassifiable	Huntington Township	Nonattainment
NIPCSO-R.M. Schahfer/ Jasper County	Kankakee Township	Attainment	Jasper County	Unclassifiable/ Attainment
ArcelorMittal, Cokenergy, U.S. Steel/ Lake County	Calumet, North Townships	Attainment	Lake County	Unclassifiable/ Attainment
SABIC Innovative Plastics/ Posey County	Black Township	Attainment	Black, Point Townships	Unclassifiable/ Attainment
Hoosier Energy Merom/ Sullivan County	Gill Township	Attainment	Sullivan County	Unclassifiable/ Attainment
Duke-Cayuga/ Vermillion County	Eugene, Vermillion Townships	Attainment	Same as State's recommendation	Unclassifiable/ Attainment
Alcoa Warrick Power Plant, Alcoa Warrick Operations/ Warrick County	Anderson Township	Attainment	Anderson, Boon, and Ohio Townships	Nonattainment*
Remaining areas in Indiana except for Porter County**		Attainment		Unclassifiable/ Attainment

*The EPA intends to designate the remainder of the county as unclassifiable/attainment.

**Except for areas that are associated with sources for which Indiana elected to install and began timely operation of a new SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 DRR (i.e., Porter County), the

EPA intends to designate the remaining undesignated counties (or portions of counties) in Indiana as separate "unclassifiable/attainment" areas as these areas were not required to be characterized by the state under the DRR and cannot be classified on the basis of available information as meeting or not meeting the NAAQS. These areas are addressed in more detail in Section 11 of this Indiana chapter of this TSD.

The Porter County, Indiana, area is an area for which the state elected to install and began timely operation of a new, approved SO_2 monitoring network. This area is centered around the ArcelorMittal-Burns Harbor facility, which is a source listed as subject to the DRR, though the area also includes NIPSCO's Bailly Station, which is a smaller source that is not listed as subject to the DRR. Pursuant to the court ordered schedule, the EPA is required to designate such areas by December 31, 2020.

The four areas in Indiana that the EPA designated nonattainment in Round 1 (*see* 78 FR 47191) and the five areas in Indiana that the EPA designated unclassifiable/attainment in Round 2 (*see* 81 FR 45039) are not affected by the designations in Round 3 and are not listed in Table 1. Figure 62, in section 11 below, illustrates the designations that the EPA intends, in conjunction with the designations that the EPA has already promulgated.

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).

[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.

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 EPA specifications referenced in 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 EPA-approved and valid monitoring networks. The areas to be designated by December 31, 2017, include the areas associated with 8 sources in Indiana meeting DRR emissions criteria for which the state has chosen to characterize air quality using air dispersion modeling, one area associated with 2 sources which Indiana recommended be designated primarily on the basis of existing monitoring data, and one area associated with one source that Indiana argued did not warrant listing as subject to the DRR and for which the state provided no air quality characterization. Indiana imposed no emissions limitations on sources to restrict their SO_2 emissions to less than 2,000 tons per year (tpy) as a means of addressing DRR requirements, for no sources did Indiana choose monitoring for the DRR but fail to timely meet the approval and operating deadline, and no areas in Indiana have newly monitored violations requiring designation in Round 3. Areas not specifically required to be characterized by the state under the DRR must also be designated by December 31, 2017.

Because many of the intended designations have been informed by available modeling analyses, this preliminary TSD is structured based on the availability of such modeling information. In each of Sections 3 and 5 through 9, there is discussion of an area for which modeling information is available. Sections 4 and 10 each address areas for which the state provided no air quality modeling information, notwithstanding the applicability of the DRR and the selection by the state of the modeling option to meet the DRR requirements. Finally, the remaining to-be-designated counties and portions of counties which do not contain sources listed as subject to DRR requirements are addressed together in section 11.

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

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

1) 2010 SO_2 NAAQS – The primary NAAQS for SO_2 promulgated in 2010. This NAAQS is 75 ppb, based on the 3-year average of the 99^{th} percentile of the annual distribution of daily maximum 1-hour average concentrations. See 40 CFR 50.17.
2) Design Value - a statistic computed according to the data handling procedures of the NAAQS (in 40 CFR part 50 Appendix T) that, by comparison to the level of the NAAQS, indicates whether the area is violating the NAAQS.
3) Designated Nonattainment Area – an area that, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined either: (1) does not meet the 2010 SO_2 NAAQS, or (2) contributes to ambient air quality in a nearby area that does not meet the NAAQS.
4) Designated Unclassifiable/Attainment Area – an area that either: (1) based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; or

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

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

3. Technical Analysis for the Floyd County (Gallagher) Area

3.1. Introduction

The EPA must designate the Floyd County, Indiana, area by December 31, 2017, because the area has not been previously designated and Indiana 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 the area. This county includes one source listed and subject to the air quality characterization requirements of the DRR, namely Duke Energy's Gallagher Station (Gallagher). Accordingly, Indiana chose to provide a modeling analysis for the area near this facility to meet the DRR requirement, which the EPA reviews in a following subsection.

3.2. Air Quality Monitoring Data for the Floyd County Area

This factor considers the SO_2 air quality monitoring data in the area of Floyd County. The state provided data for one of the monitors in the area (for site number 18-041-1004) but did not recommend any conclusions to be drawn from this information, nor did the state assess how well placed the area monitors are for indicating peak concentrations in the area of Gallagher Station or elsewhere in Floyd County. Table 2 shows the monitors that are located in Floyd County or elsewhere within 10 kilometers (km) of Gallagher Station.

Table 2. Monitors near Gallagher Station

AQS ID	County, State	Distance from Gallagher (km)	Direction from Gallagher	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
18-043-0004	Floyd, IN	11.6	N	41	35*
18-043-1004	Floyd, IN	4.9	N	30	27
21-111-1041	Jefferson, KY	3.7	SSE	34.6	27

*This monitor did not meet completeness criteria in 2016 so it does not have a valid design value for 2014-2016.

While Indiana did not analyze whether these monitors are located in areas where maximum concentrations would be expected, the EPA finds these monitors do add to the weight of evidence supporting that this area is attaining the standard.

3.3. Indiana's Air Quality Modeling Analysis for the Floyd County Area, Addressing Duke Energy's Gallagher Station

3.3.1. Introduction

This section 3.3 presents all the available air quality modeling information for the portion of Floyd County that includes Gallagher Station as well as for nearby Jefferson County, Kentucky. Gallagher Station is listed as subject to DRR requirements, which require either that Indiana characterize SO_2 air quality or alternatively establish an SO_2 emissions limitation of less than

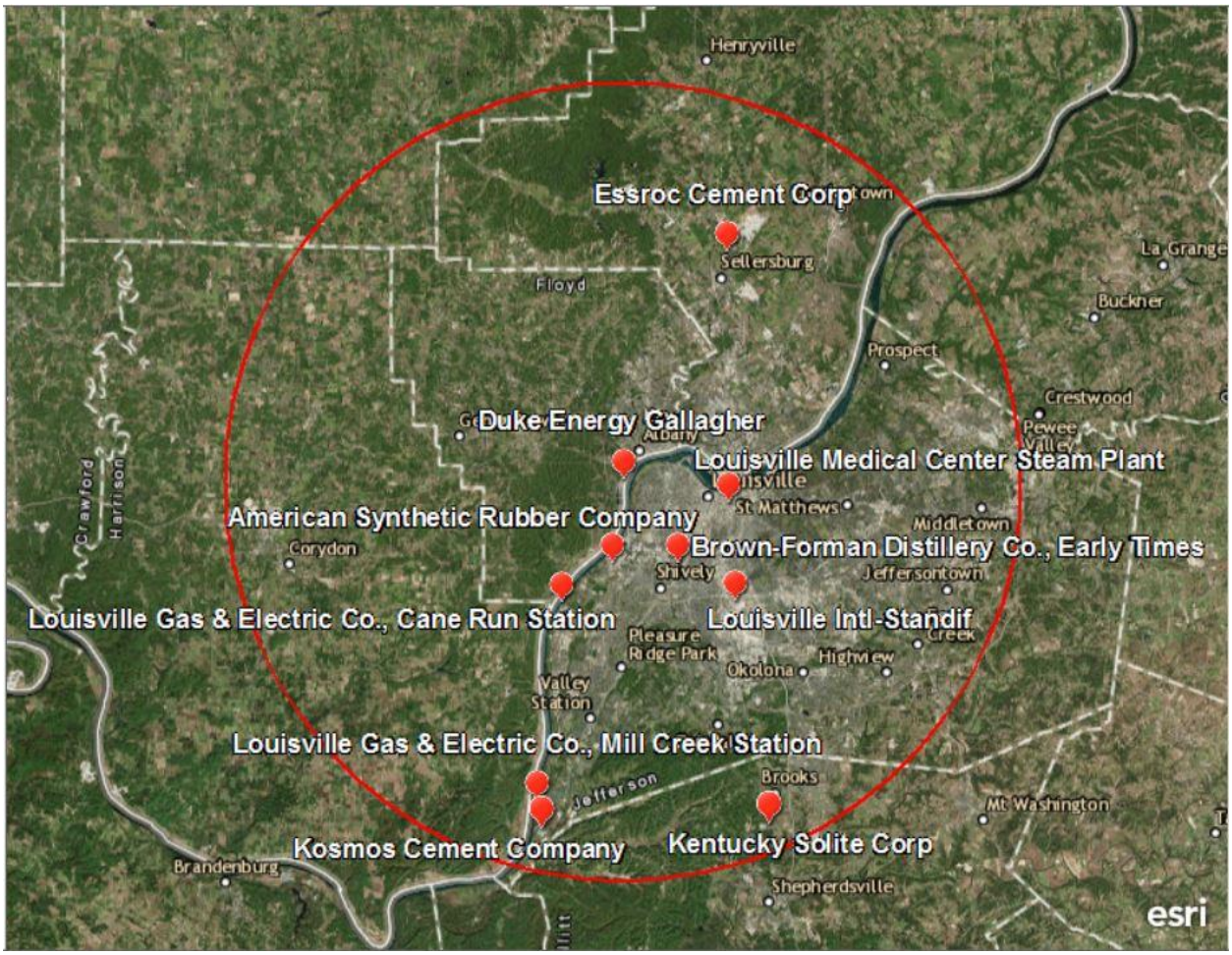
2,000 tons per year. Gallagher Station was listed as subject to DRR requirements because its 2014 emissions were 3,524 tons, and Indiana has chosen to characterize it via air dispersion modeling. Floyd County includes no other source emitting over 100 tons per year of SO_2. Neighboring Jefferson County, Kentucky, includes two power plants with emissions over 2,000 tons per year in 2014, including a nonattainment area containing Louisville Gas and Electric's Mill Creek Station, which in 2014 emitted 28,149 tons of SO_2, and an undesignated area containing Louisville Gas and Electric's Cane Run Station, which in 2014 emitted 8,762 tons of SO_2. These emissions for Cane Run Station led Kentucky to list this facility as subject to the DRR. As discussed further below, Kentucky opted to address the DRR requirements for Cane Run Station by limiting emissions to below 2,000 tons of SO_2 per year.

Indiana recommended that the entirety of Floyd County be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing 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 Floyd County as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after the relevant available information is presented.

The area that the state has assessed via air quality modeling is approximately a 30 km square area that includes nearly the entirety of Floyd County and portions of neighboring Clark and Harrison Counties in Indiana and Jefferson County in Kentucky, centered on Gallagher. As seen in Figure 1 below, Gallagher is located along the Ohio River a little under 3 km south of New Albany. Also included in the figure are the other nearby emitters of at least 100 tons per year of SO_2, namely the Cane Run and Mill Creek facilities noted above. As shown in this figure, the Mill Creek facility is within an area in Jefferson County that is designated nonattainment. This nonattainment area was promulgated on August 5, 2013 (78 FR 47191), resulting in a requirement that Kentucky develop a plan providing for attainment for this area. Kentucky has not yet submitted this required plan. Nevertheless, as discussed below, Kentucky has established federally enforceable and effective limits for these Kentucky sources, which Indiana's modeling reflects.

The figure also shows county boundaries; Indiana recommended that the entirety of Floyd County (the county that contains Gallagher) be designated attainment. As will be shown in a figure in the section below that summarizes our intended designation, the EPA intends to apply a designation of unclassifiable/attainment to the same area.

Figure 1. Map of the Floyd County, Indiana, Area



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 only a modeling assessment from the state. The EPA has not conducted its own modeling of this area, and the EPA has received no modeling of this area from any other parties.

3.3.2. Model Selection and Modeling Components

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

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

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

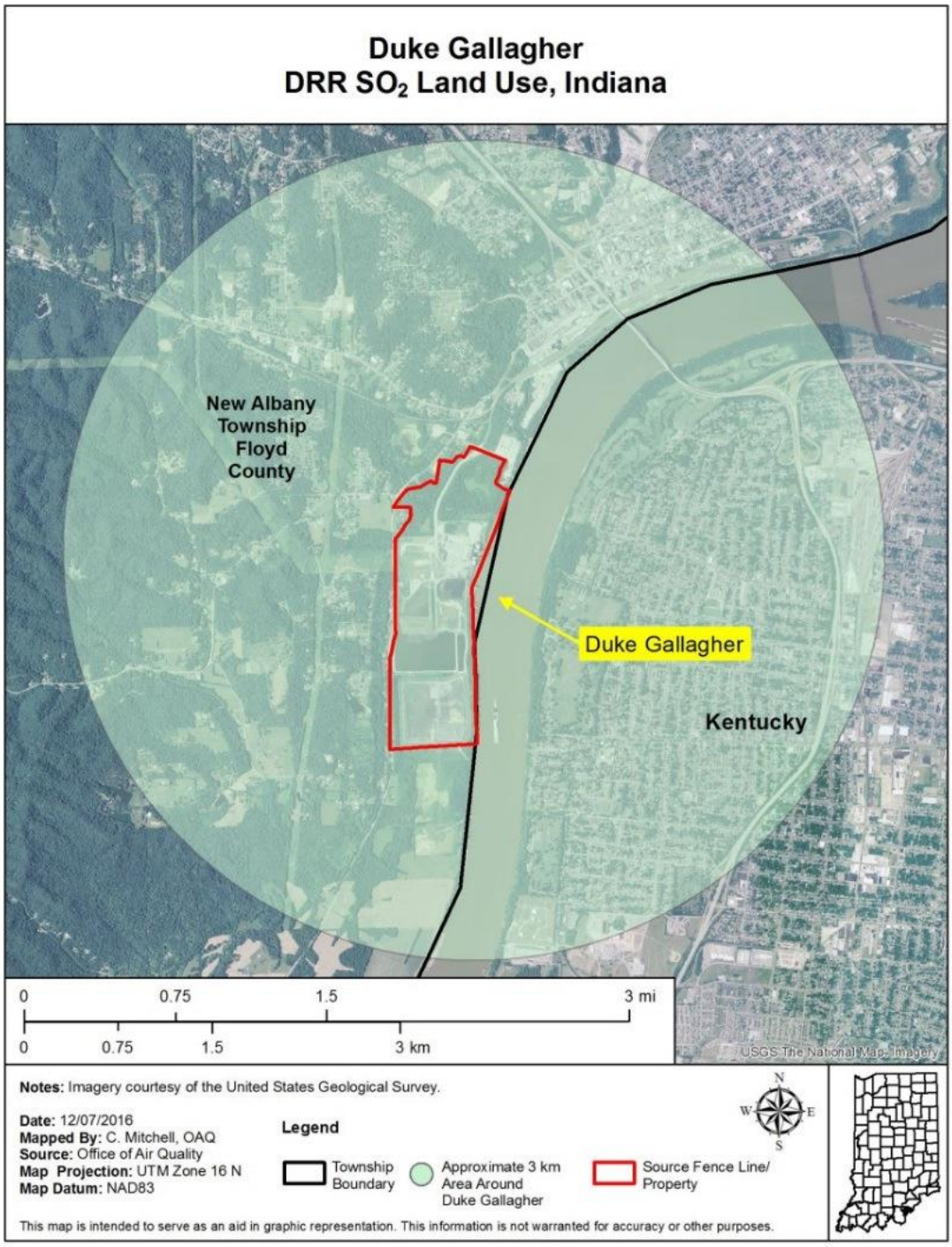
The state originally used AERMOD version 15181 with default options. A review of the original modeling prompted several questions from the EPA, specifically regarding the emissions used for a nearby source (Kosmos/ESSROC). It was originally modeled using 2015 emissions based on changes at the facility in 2014. In response to the questions, the state conducted remodeling using AERMOD version 16216r with default options. The state's updated modeling used an average of actual annual emissions for this nearby source for the modeled period, 2013-2015. This section reviews the updated modeling submitted by the state. A discussion of the state's modeling approach to the individual components, reflecting this remodeling, is provided in the corresponding discussion that follows, as appropriate.

3.3.3. Modeling Parameter: Rural or Urban Dispersion

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

For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. This determination was based on results from an Auer's land use classification approach. While no specific tables or charts were provided, the area is clearly rural based on a visual inspection using satellite imagery. A map provided by the state is included in Figure 2 below. While a portion of the nearby environs of Gallagher is in presumably urban portions of Louisville, a greater fraction of the nearby environs of Gallagher are in areas in Indiana that would be considered rural. The EPA agrees with the rural characterization of this modeled area.

Figure 2. Land Use in the Area Surrounding the Duke Gallagher Plant



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

The TAD recommends that the first step towards characterization of air quality in the area

around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of 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 primary source of SO_2 emissions in this analysis, Gallagher, is described in the introduction to this section. For the Floyd County area, the state has included four other emitters of SO_2 within roughly 25 km of Gallagher in any direction, namely ESSROC Cement Corporation, Louisville Gas and Electric – Cane Run, Louisville Gas and Electric – Mill Creek, and Louisville Medical Center. The state determined that these sources had the potential for impact on SO_2 concentrations in the area of interest around the Gallagher plant. Three other Kentucky sources, located 6 to 12 km to the southeast, with emissions ranging from 100 to 220 tons per year, were not included in the modeling analysis. These sources could have been included, however, their contribution to the design value concentration would likely have been relatively small. No other sources were determined by the state to have the potential to cause concentration gradients within the area of analysis. The EPA finds that Indiana has included all sources with the potential to cause significant concentration gradients in the area of maximum concentrations, and the EPA finds that the impacts of the other sources are suitably represented as part of the background concentrations.

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

- 50 m spacing along fence/property line
- 100 m spacing out to a distance of 3 km
- 250 m spacing out to a distance of 5 km
- 500 m spacing out to a distance of 10 km

The receptor network contained 9,063 receptors, and the network covered 10 townships within three Indiana counties, Floyd, Clark, and Harrison Counties. The network also extended into Jefferson County, Kentucky.

Figure 3, included in the state's recommendation, show the state's chosen area of analysis surrounding Gallagher, 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 each modeled facility, including other facilities' property. The state receptor grid only excluded receptors from the area within the Gallagher facility. Inside the Cartesian grid employed by the state, receptors were retained over the Ohio River and over other modeled sources. The submittal describes the Gallagher facility as being surrounded by a combination of fencing, natural boundaries, and security patrols. The natural boundaries consist of a river bordering the east edge of the facility. It's unclear from the submittal the extent of fencing around the facility. The submittal states that receptors were placed along the property boundary where any public access is not precluded. The modeling submitted by the state shows a peak design value of 99.5 µg/m3 roughly 2 km north of

the facility. This is beyond the northern boundary of the facility property, so that the precise boundaries of the facility may be presumed not to affect the reliability of the modeling including maximum concentrations in the area. The modeling submitted by the state shows downwash was applied for the two Gallagher stacks. However, downwash at these stacks should be relatively insignificant with stacks heights of 167 meters and building heights of approximately 45 meters. Consequently, the receptor grid is expected to capture the peak concentrations from the facility.

Figure 3: Area of Analysis for the Floyd County Area

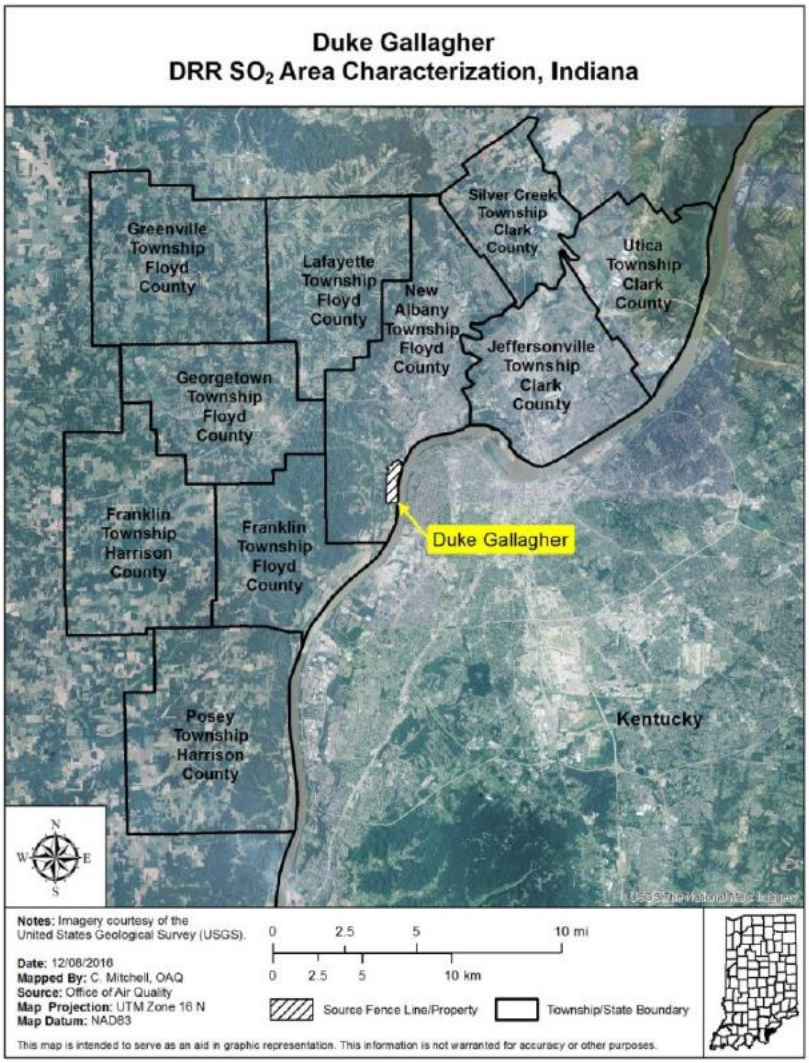
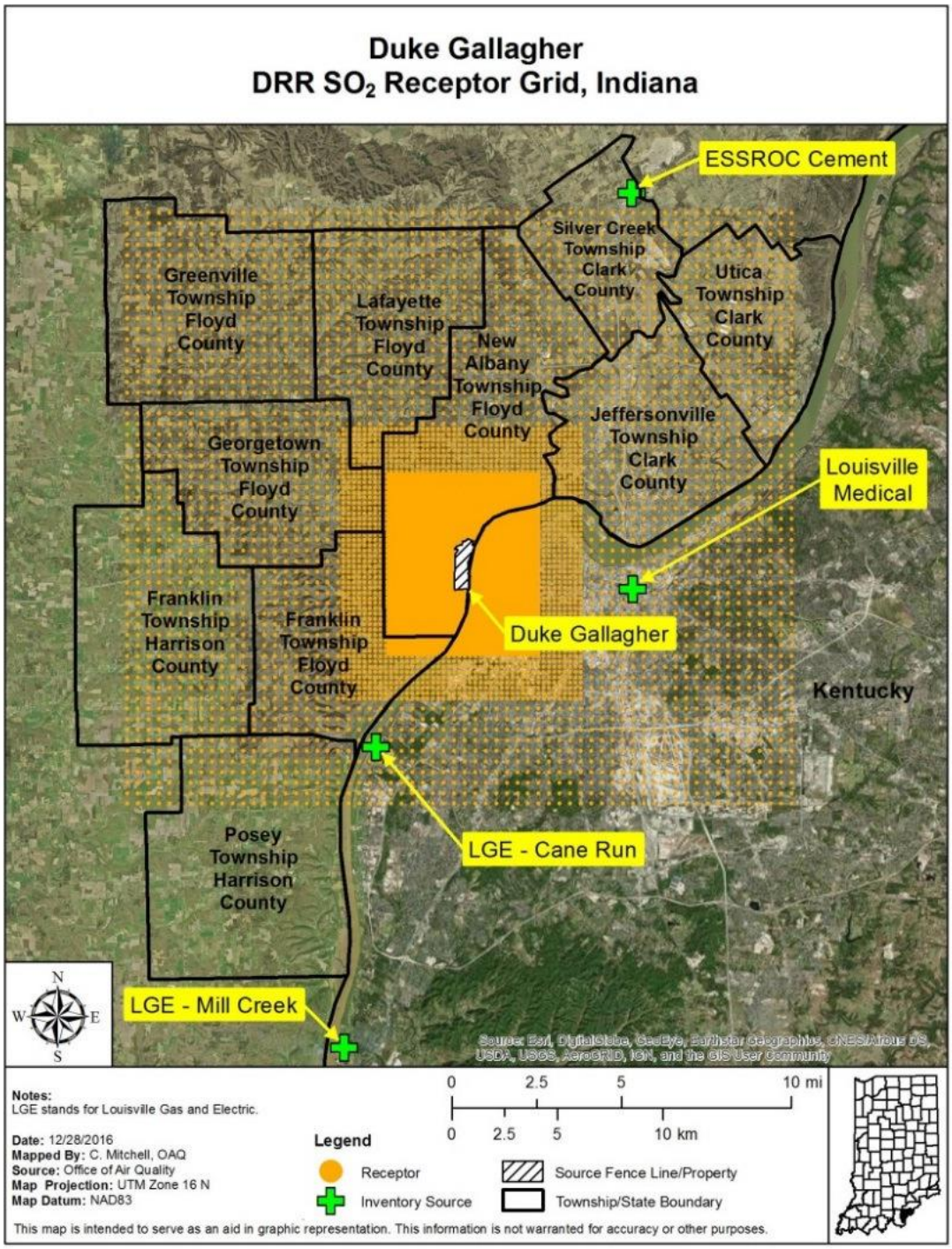


Figure 4: Receptor Grid and Sources for the Floyd County Area



3.3.5. Modeling Parameter: Source Characterization

As noted above, the state's modeling included four sources in addition to Gallagher. The four sources are Kosmos Cement Corporation (formerly ESSROC), Louisville Gas and Electric-Cane Run, Louisville Gas and Electric-Mill Creek, and Louisville Medical Center. These sources were included because of their potential contribution to SO_2 concentrations in the area around Gallagher.

The state characterized these sources within the area of analysis in general accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. However, permitted limits were modeled for the two Louisville Gas and Electric sources. More detailed information on these two sources is provided in the emissions section below. The state also adequately characterized the DRR source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Hourly parameters were used for the Gallagher plant. Temperatures were fixed while exit velocity varied by hour. Where appropriate, the AERMOD component BPIPPRM (Version 04274) was used to assist in addressing building downwash. Due to the distance from the DRR source area of interest, downwash was not modeled for the Louisville Medical Center nor the Louisville Gas and Electric – Cane Run plant.

The EPA finds that the state adequately characterized the dispersion parameters from the sources included in the modeling.

3.3.6. Modeling Parameter: Emissions

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

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

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, a state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for

designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions data 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 Gallagher and four other emitters of SO_2 in the area's modeling analysis. The state has opted to use a hybrid emissions approach, where emissions from certain facilities are expressed as actual emissions, and those from other facilities are expressed as PTE or permitted rates. The facilities in the state's modeling analysis and their associated actual or PTE rates are summarized below.

For Gallagher, Indiana used actual hourly emissions data. For Kosmos and Louisville Medical Center Steam Plant, the state used a fixed emission rate equal to the average actual SO_2 emissions between 2013 and 2015. This information is summarized in Table 3. Although the Modeling TAD recommends using more time resolved emissions information where available, the EPA finds that, given the likely modest impacts of these sources and the margin by which this area is estimated to be below the NAAQS, the use of average emissions for this three-year period does not materially affect the reliability of Indiana's analysis as to whether this area is attaining the standard.

Table 3. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Area of Analysis for the Floyd County Area

	SO_2 Emissions (tpy)			
Facility Name	**2013**	**2014**	**2015**	**Distance from Gallagher (km)**
Kosmos Cement	416	416	416	26
Louisville Medical Center	415	415	415	8
Gallagher	2,498	3,528	2,178	--
Total Emissions from All Facilities in the Area Based on Actual Emissions	3,329	4,359	2,909	

For the two Louisville Gas and Electric plants, permit limits were used. This information is summarized in Table 4. Cane Run has converted to use of natural gas, as is now required by a permit issued to the source. The EPA approved this permit into the Kentucky SIP in an action published August 30, 2016, at 81 FR 59488. Thus, this requirement, estimated to result in the annual emissions shown in Table 4, is federally enforceable and effective. As a result, emissions from LG&E's Cane Run Generating Station have been reduced over 99 percent from 7,823 TPY in 2011 to a potential of 20.7 TPY in 2016. Mill Creek continues to burn coal. This facility is subject to the requirements of the Mercury and Air Toxics Standards (MATS). The SO_2 nonattainment planning guidance recommends that while the MATS requirements for acid gases may be met either by compliance with an SO_2 emission limit (0.20 pounds per million British Thermal Units) or a hydrogen chloride emission limit, a source for which the Title V permit

specifies the applicability of the SO_2 emission limit (irrespective of hydrogen chloride emissions) may be considered to be subject to this permanent and federally enforceable SO_2 emission limit under MATS. The Title V permit for this source specifies that compliance with MATS for this source shall mean compliance with the MATS SO_2 limit, so that this limit may be considered federally enforceable and permanent. Therefore, Indiana modeled emissions from Mill Creek in accordance with this federally enforceable emission limit.

Table 4. SO_2 Emissions based on Permitted Limits from Facilities in the Area of Analysis for the Floyd County Area

Facility Name	SO_2 Emissions (tpy, based on Permit limits)	Distance from Gallagher (km)
Louisville Gas and Electric – Cane Run	21	10
Louisville Gas and Electric – Mill Creek	13,472	24
Total Emissions from Facilities in the Area of Analysis Modeled Based on PTE	13,493	

The emission limit for Mill Creek is based on a 30-operating-day average. The EPA's SO_2 nonattainment planning guidance advises that a 30-day average limitation may be considered a creditable limitation on SO_2 emissions, but also advises that such a limit should be set at a downward adjusted level, so as to be comparably stringent to the 1-hour limit that would otherwise be set to assure attainment. Conversely, the guidance advises that the air quality impact of an existing 30-day average limit be evaluated by modeling as if a comparably stringent, upward adjusted 1-hour limit were set. Indiana does not apply such an adjustment and does not address the degree of adjustment that would be appropriate. Appendix D to the EPA's Nonattainment Area guidance states that an average adjustment factor for boilers controlled with flue gas desulfurization, like Mill Creek, is 0.71, the inverse of which would mean modeling an emission rate that is 41 percent higher than the 30-day average limit. The potential impact of this issue is discussed below. Otherwise, the EPA finds that the emissions used in the Gallagher area assessment modeling adequately represent the relevant emissions in the area in addition to the SO_2 background concentration.

3.3.7. Modeling Parameter: Meteorology and Surface Characteristics

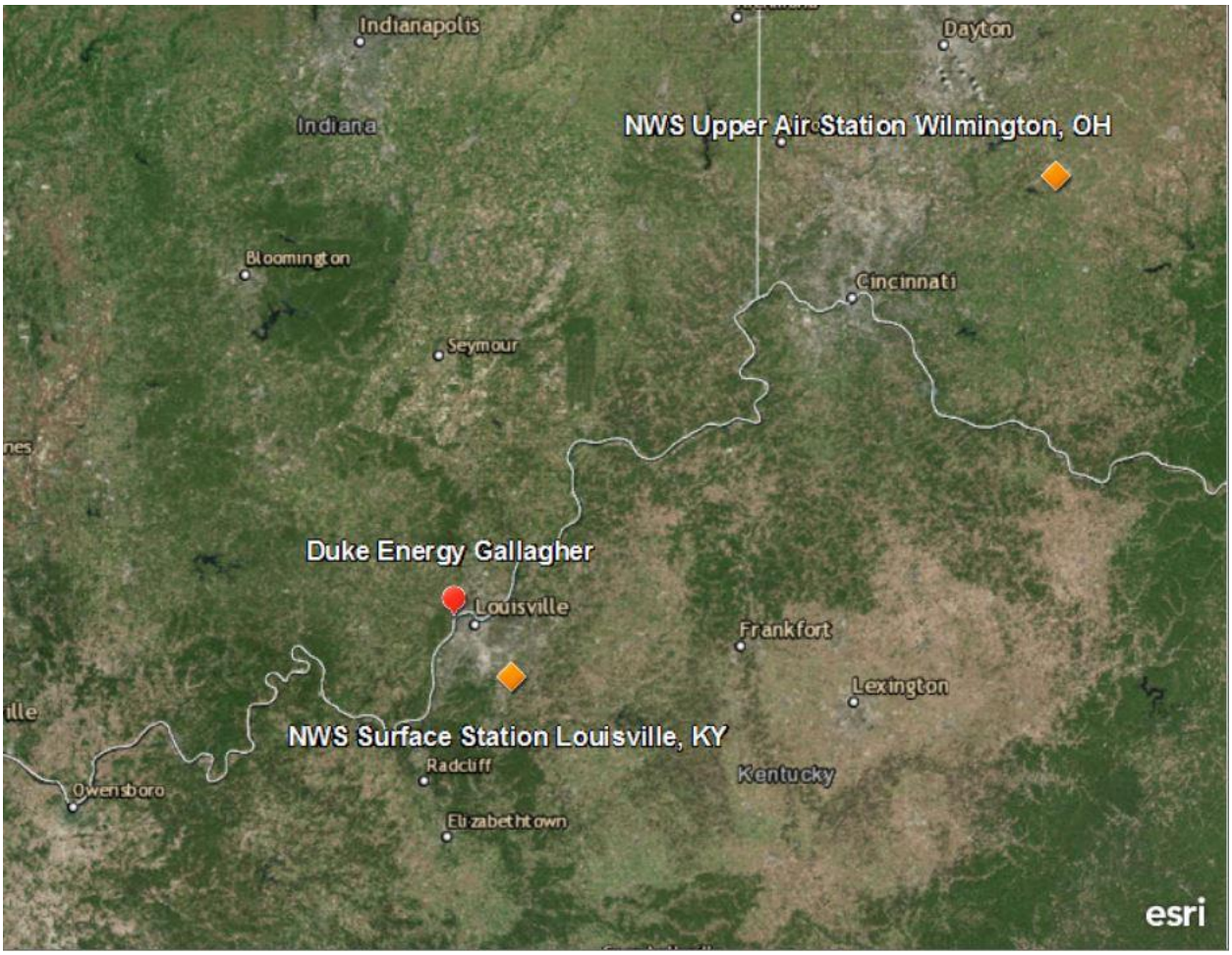
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

For the area of analysis for the Floyd County area, the state selected 2013 to 2015 surface meteorology from the Louisville International Airport (KSDF) in Louisville, Kentucky located at 38.18 N and 85.74approximately 13 km to the southeast of the source, and coincident upper air observations from the Wilmington Airborne Park (KILN) in Wilmington, Ohio, located at 39.42 N and 83.82 W, approximately 220 km to the northeast of the source. These were judged to be stations most representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the Louisville, Kentucky, NWS station to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the ratio of sensible to latent heat flux, and the surface roughness is a measure of the roughness at the surface based on the type of land cover and terrain. The state estimated surface roughness values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, and average conditions.

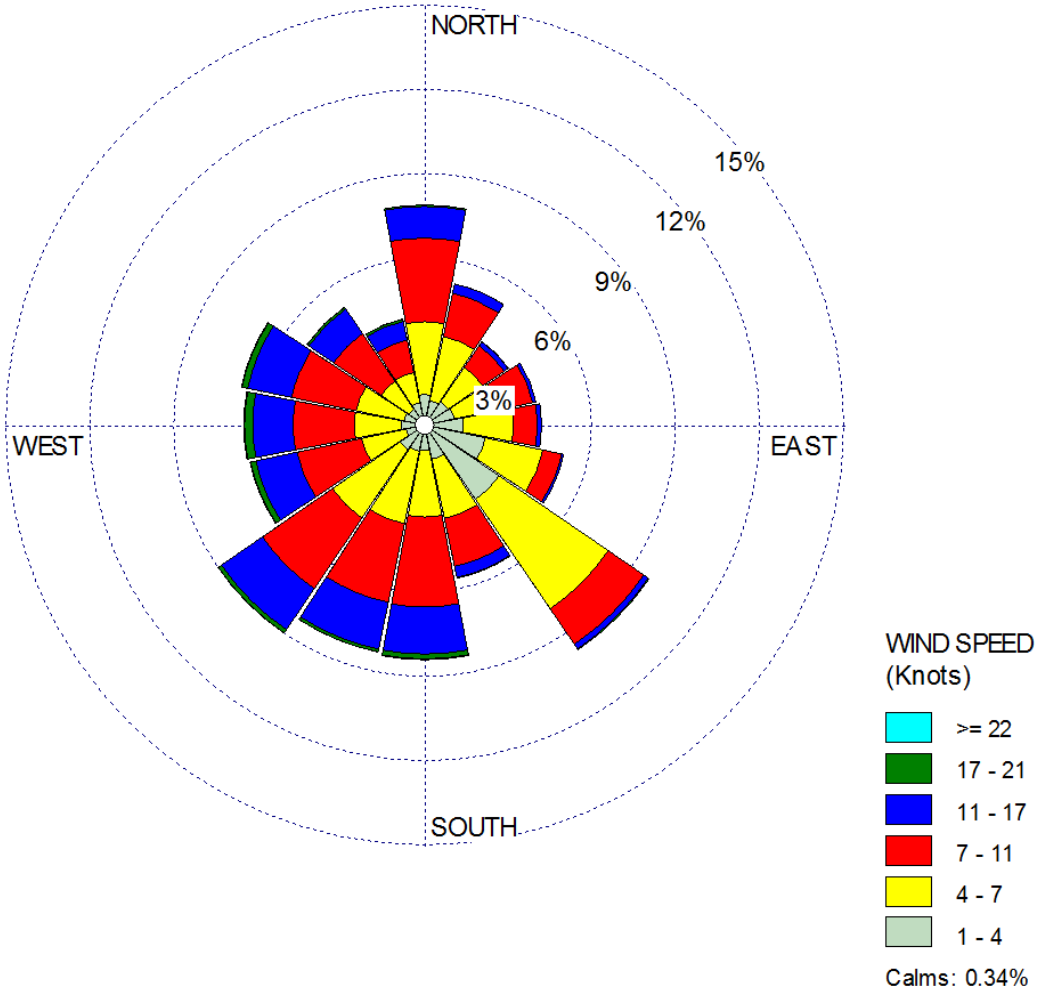
In Figure 5 below, generated by the EPA, the location of these NWS stations are shown relative to the area of analysis.

Figure 5. Area of Analysis and Representative NWS stations in the Floyd County Area



As part of its recommendation, the state provided the 3-year surface wind rose for the Louisville, Kentucky, NWS station. In Figure 6, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Predominant winds are from the south to southwest, although the wind blows from all directions for a significant percentage of time. The majority of wind speeds are in the 4 to 11 knot range, with overall lighter winds from the easterly direction. Less than 1 percent of the hours are reported as calm.

Figure 6: Louisville, Kentucky, NWS Cumulative Annual Wind Rose for Years 2013 – 2015



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor (version 15181). The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in the AERMET User's Guide and in the Region 5 Meteorological Data Processing Protocol document in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE (version 13016) to best represent surface characteristics. Specifically, 12 wind direction sectors were used with a default radius of 1 kilometer. Albedo and Bowen ratio were adjusted for abnormally wet or dry soil moisture conditions on a monthly basis. Surface roughness values were adjusted for the winter months of December, January, and February. For months with more than half of the days with at least one inch of snow cover, the state used the continuous snow cover value. Otherwise, a value representing no continuous snow cover was used. Compliance with the detailed recommendations of the Region 5 Meteorological Data

Processing Protocol helps assure consistency with the recommendations of the Modeling TAD for optimizing the accuracy of various meteorological inputs.

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 Louisville, Kentucky, surface station, noted above, and processed with a separate preprocessor, AERMINUTE (Version 15272). These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The Gallagher facility is located along the Ohio river with modest terrain increases of 50-60 m generally to the west. A high point of a 100 m increase occurs about 8-9 km to the west of the facility. Higher elevations occur even further to the west. Other directions are relatively flat, particularly to the east and south. The stack at Gallagher is roughly 160 m tall, well above the terrain influences, so that pertinent winds should be adequately represented by data from the Louisville NWS site. Consequently, the EPA finds that the meteorological data used in the Gallagher area modeling analysis is adequately representative of the weather conditions in the area.

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

As noted above, the terrain in the area of analysis is best described as rolling with elevation increases of about 60 m within a few km to the west, and up to about 100 m rises 8-9 km to the west. Terrain to the east is relatively flat to gently rolling. To account for these terrain changes, the AERMAP (version 11103) terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983.

The EPA finds that the terrain surrounding the Gallagher plant was adequately represented in the state modeling analysis of the area.

3.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state used a "tier 2" approach where the 99th percentile background concentrations were developed on a seasonal and hour of day basis. The state used SO_2 monitoring data from the Green Valley monitor (AQS #18-043-1004) located in Floyd County for the years 2013-2015. The monitor is located approximately 5 km to the north of the Gallagher facility. Data which was influenced by the facility were removed prior to generating a background concentration. The monitored data was paired with the corresponding hourly meteorological conditions. Pollution roses were created and used to identify the wind directions from which the modeled source was contributing to the monitored concentrations. The hours containing concentrations impacted from the modeled source, at a level above 10 ppb, were removed. The background concentrations for this area are shown in Table 5 below.

There is an additional monitor located 3.7 km south of Gallagher, in Jefferson County, Kentucky. Both this monitor and the monitor in Floyd County detailed above had valid 2014-2016 design values of 27 ppb. However, this monitor was judged to be less reliable for determining background concentrations near Gallagher.

Table 5. Temporally Varying Background Values Near Gallagher (ppb)[5]

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	7.27	6.90	6.40	5.80	5.82	6.69	4.36	7.85
Spring	8.01	7.38	4.23	7.32	4.86	3.90	4.28	6.25
Summer	5.60	3.46	4.10	3.47	2.57	1.89	2.30	3.70
Fall	3.70	3.76	4.23	4.06	3.13	3.30	6.33	7.51

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	7.24	9.10	8.98	10.66	9.42	6.60	9.96	9.70
Spring	8.39	8.87	9.50	16.88	13.04	15.89	9.10	14.09
Summer	7.70	8.10	13.52	13.08	13.15	8.94	8.57	7.78
Fall	6.96	9.52	9.46	8.82	8.87	9.06	13.28	8.62

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	10.21	9.54	8.78	8.45	7.77	8.32	7.92	6.43
Spring	15.33	9.21	9.63	9.94	8.06	7.24	7.70	8.15
Summer	6.22	8.08	6.56	4.87	3.73	3.47	4.16	3.46
Fall	11.71	6.29	6.93	6.42	5.47	3.60	3.53	5.31

The EPA finds that the background values used in the Gallagher modeling assessment are based on data from a suitably located monitor and are analyzed appropriately, and thus are adequately representative of the SO_2 contribution of non-modeled sources in the area.

3.3.10. Summary of Modeling Inputs and Results

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

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

Input Parameter	Value
AERMOD Version	16216r
Dispersion Characteristics	Rural
Modeled Sources	5

[5] 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 1 ppb = approximately 2.619 $\mu g/m^3$.

Input Parameter	Value
Modeled Stacks	10
Modeled Structures	107
Modeled Fencelines	1
Total receptors	9,063
Emissions Type	Mixed actual and allowable
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Louisville, KY NWS (KSDF)
NWS Station Upper Air Meteorology	Wilmington, OH NWS (KILN)
NWS Station for Calculating Surface Characteristics	Louisville, KY NWS (KSDF)
Methodology for Calculating Background SO_2 Concentration	Used site ID: 18-043-1004 to generate "tier 2" season by hour-of-day values
Calculated Background SO_2 Concentration	Values ranged from 1.89 ppb to 16.88 ppb

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

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

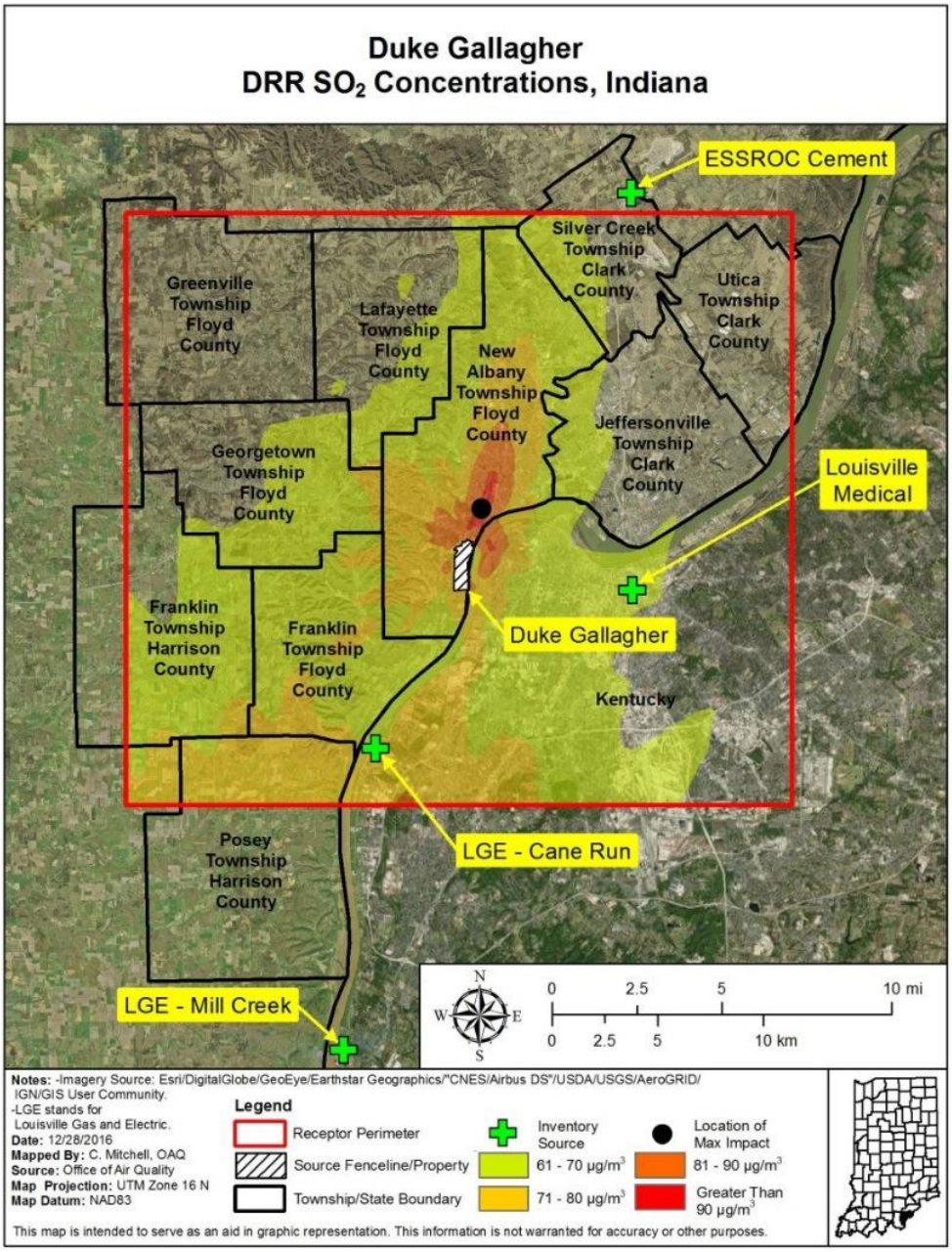
Averaging Period	Data Period	Receptor Location UTM zone 16		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013-2015	602300	4238000	99.5	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 99.5 $\mu g/m^3$, equivalent to 38.0 ppb. This modeled concentration included the background concentration of SO_2, and is based on a mix of actual and allowable emissions from the included facilities. Figure 7 below was included as part of the state's recommendation, and indicates that the predicted value occurred approximately 2

km north northeast of Gallagher. The state's receptor grid extent and contours are also shown in the figure. The overall spatial distribution of impacts to the northeast of Gallagher indicates that sources in Floyd County do not contribute to the nonattainment area in Jefferson County, Kentucky, located to the southwest of the modeled area.

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



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all receptors in the area.

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

The modeling conducted by the state for the area around the Gallagher facility mostly followed the recommendations in the TAD. The important components of a modeling assessment, i.e., models used, meteorology, most aspects of the emission estimates, nearby sources modeled, and background concentrations, all adequately comply with the TAD and with general modeling expectations. While the EPA guidance would suggest modeling Louisville Gas & Electric's Mill Creek at an emission rate 41 percent higher than the applicable 30-day average limit, this facility is sufficiently distant from the area of maximum concentrations that such an adjustment to the modeled emission rate would be unlikely to alter the modeled design value significantly. Furthermore, the modeled design value is well below the SO_2 NAAQS threshold of 196.4 $\mu g/m^3$, at approximately 50% of the standard. Indiana has reasonably treated the impacts of selected sources as part of the background concentration rather than explicitly modeling these impacts. Additionally, since the maximum concentration is estimated to occur 2 km from the modeled fenceline, inclusion of receptors on Gallagher plant property would likely not have altered the maximum estimated concentration.

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

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

3.5. Jurisdictional Boundaries in the Floyd County Area

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

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

The EPA has received no third party modeling for this area. Floyd County adjoins Jefferson County, Kentucky, a portion of which was designated nonattainment in the EPA's Round 1 designations.

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

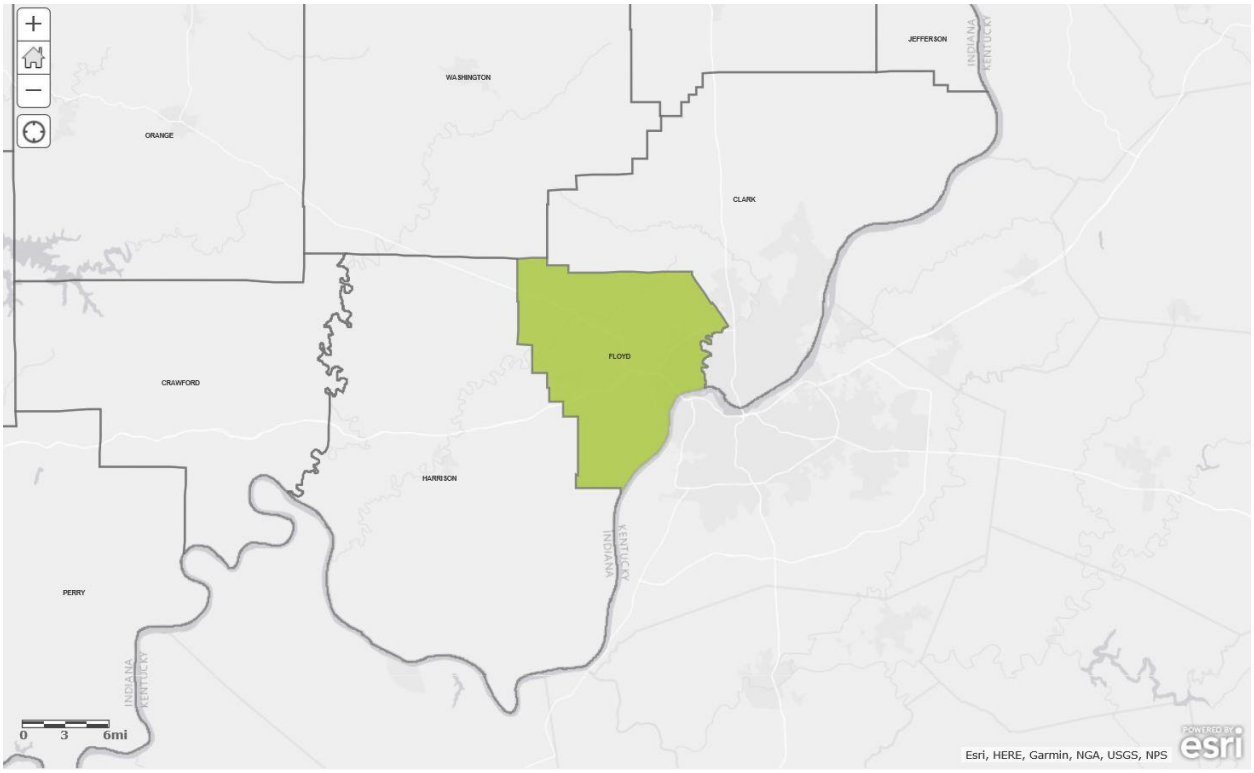
The most reliable evidence regarding air quality in Floyd County is in Indiana's modeling. This modeling uses detailed information on emissions, meteorology, and topography mostly in accordance with EPA's Modeling TAD, thereby obtaining a reliable assessment of air quality in the area. Indiana's evaluation estimated concentrations well below the standard. Indiana modeled federally enforceable and effective limits on a pair of sources in neighboring Jefferson County, Kentucky, that have been required to implement significant emission reductions. The limits modeled for one of these sources was not adjusted appropriately but due to its distance from the expected peak impacts and because the modeled peak was only 50% of the standard, it is not expected that modeling of an appropriately adjusted limit would yield a different result for the area other than modeled attainment. Additionally, the monitors in the area, which have design concentrations below the standard, further support the model's assessment of the area's air quality. Although there is an existing nonattainment area in neighboring Jefferson County, Kentucky, southwest of Floyd County, there is no indication that sources in Floyd County contribute to that area given the previously discussed spatial distribution of impacts focused to the northeast of modeled sources and that monitors located between Gallagher and the nonattainment area are showing attainment.

Indiana's modeling includes receptors in almost the entirety of Floyd County, sufficient to conclude that the entire county is attaining the standard and, as noted above, Floyd County sources are not contributing to the nonattainment area in Jefferson County, Kentucky. Therefore, the EPA believes that Indiana has suitably justified its recommendation that the area to be designated pursuant to this modeling include the entirety of Floyd County. The EPA believes that our intended unclassifiable/attainment area, including the entirety of Floyd 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.

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

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA finds that Floyd County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; and therefore intends to designate the entirety of Floyd County as unclassifiable/attainment for the 2010 SO_2 NAAQS. Figure 8 shows the boundary of this intended designated unclassifiable/attainment area.

Figure 8. Boundary of the Intended Floyd County Unclassifiable/Attainment Area



4. Technical Analysis for the Huntington County (Isolatek) Area

4.1. Introduction

The EPA must designate the Huntington County, Indiana, area by December 31, 2017, because the area has not been previously designated and Indiana 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 the area. This county includes one source listed and incurring the air quality characterization requirements of the DRR, namely the U.S. Mineral Products facility, also known as Isolatek.

The EPA exercised its discretion to list the Isolatek source as subject to the DRR. Indiana did not agree with the emissions or reasoning for listing the source as subject to the DRR. The state did not submit a modeling analysis for the area nor did the state install a new monitoring network to characterize air quality in the area. In the absence of a new monitoring network, the EPA must designate the Huntington County area by December 31, 2017. Regardless of whether Isolatek was listed as subject to the DRR, this designation must reflect the best available information regarding air quality in this area. At this time, the best available information regarding Huntington County air quality is the modeling that led the EPA to list Isolatek as subject to DRR requirements. Much of the following discussion reviews this modeling information that underpinned the EPA's decision to list Isolatek as subject to the DRR.

4.2. Air Quality Monitoring Data for the Huntington County Area

This factor considers the SO_2 air quality monitoring data in the area of Huntington County. No monitors are located in or sufficiently near to Huntington County to inform the characterization of SO_2 air quality in the county.

4.3. Air Quality Modeling Analysis for the Huntington County Area Addressing Isolatek

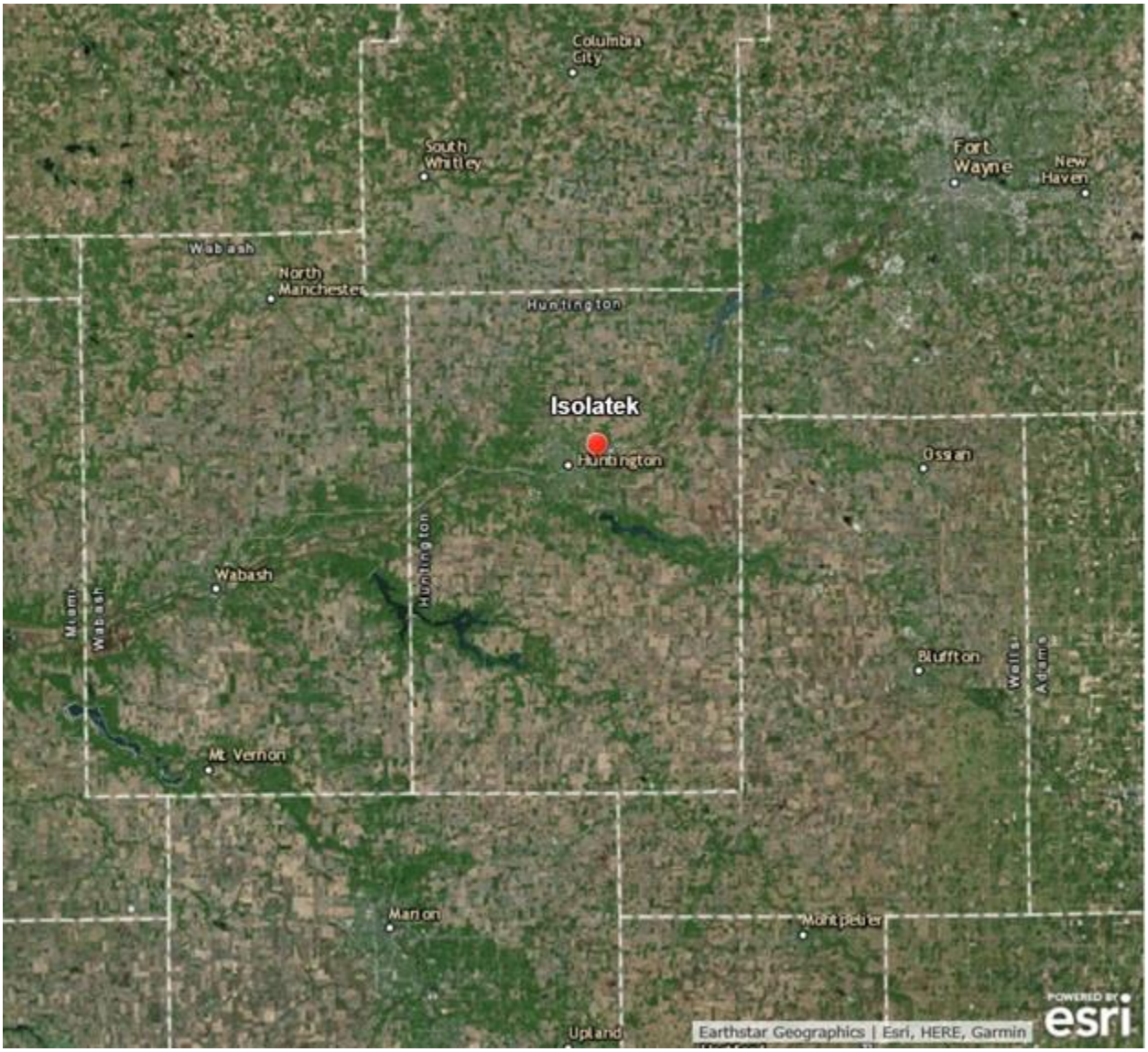
4.3.1. Introduction

This section 4.3 presents all the available air quality modeling information for Huntington County. This area contains Isolatek, which is the only source in Huntington County listed under the DRR. Isolatek does not emit 2,000 tons or more annually, but the EPA added this source on the basis of modeling in its possession indicating concentrations in the area well over the 2010 SO_2 standard. No other sources in Huntington County emit over 100 tons per year of SO_2.

For this area, the EPA received no modeling assessments from Indiana or from any other party. Thus, the only modeling presently available to the EPA for Huntington County is modeling which the EPA had already conducted during the course of enforcement action regarding the source. The remainder of this section 4.3.2 describes and reviews this modeling.

As seen in Figure 9 below, Isolatek is located near the center of Huntington County, just east of the City of Huntington. Figure 9 also shows the broad area included in the EPA's modeling analysis. This figure also shows county boundaries, including the boundaries for Huntington County, the county that contains Isolatek. In its January 2017 recommendation, Indiana did not expressly recommend a designation for Huntington County, and so no recommended designation area is shown in Figure 9. Indiana did recommend an unclassifiable designation for Huntington County in its May 11, 2011, recommendations.

Figure 9. Map of the Huntington County Area Addressing Isolatek



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

4.3.2. Model Selection and Modeling Components

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

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

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

The EPA conducted the modeling of Isolatek in 2015 (in conjunction with an enforcement investigation involving the source), using AERMOD and AERMET versions 14134. A discussion of the approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

There have been three revisions to AERMOD and two revisions to AERMET since the 14134 version. The changes have mostly consisted of bug fixes and enhancements that would not be expected to significantly change the concentrations produced by the 14134 versions in regulatory default mode. One change from the 14134 version of the models to the current version is the use of the adjusted surface friction velocity parameter (ADJ_U*) in AERMET. The ADJ_U* parameter was a beta option and not recommended for regulatory use when the modeling was conducted in 2015. The option was made a regulatory option in late 2016 in version 16216 and, if implemented, could change concentrations, though any reduction in concentration estimates resulting from use of this modification would likely be relatively modest.

4.3.3. Modeling Parameter: Rural or Urban Dispersion

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

For the purpose of performing the modeling for the area of analysis, the EPA determined that the area should be modeled as rural based on a visual inspection of the land use surrounding the facility using satellite imagery. The facility is located on the eastern edge of the small town of Huntington, Indiana, located in the northeast quadrant of the state.

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

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

The source of SO_2 emissions subject to the DRR in this area is described in the introduction to

this section. For the Huntington County area, the EPA only modeled the DRR source. The closest sources with SO_2 emissions greater than 100 tpy are approximately 30-35 km away and include Thermafiber, Inc. with about 500 tpy, and Steel Dynamics Incorporated with about 150 tpy. These sources are judged to have sufficiently low emissions that are sufficiently distant from the area of maximum concentrations so as to be likely to cause minimal concentration gradients in the area of interest.

The grid receptor spacing for the area consisted of several nests with decreasing resolution further away from the facility.

- 50 m spacing around the facility property boundary
- 100 m spacing out 500 m
- 250 m spacing out 1 km
- 500 m spacing transitioning to 2.5 km spacing out to 50 km.

. The receptor network contained 2,364 receptors, and the network covered all or parts of 14 counties, including most of the area shown in Figure 9 above. However, the source and the concentrations of interest are all contained in Huntington County.

Figure 10 shows the EPA's chosen area of analysis surrounding Isolatek as well as the receptor grid in the immediate area of the source. Figure 11 shows the full extent of the receptor grid used in the analysis for Isolatek.

Figure 10: Receptor Grid for the Immediate Area Around the Isolatek Facility in the Huntington County Area

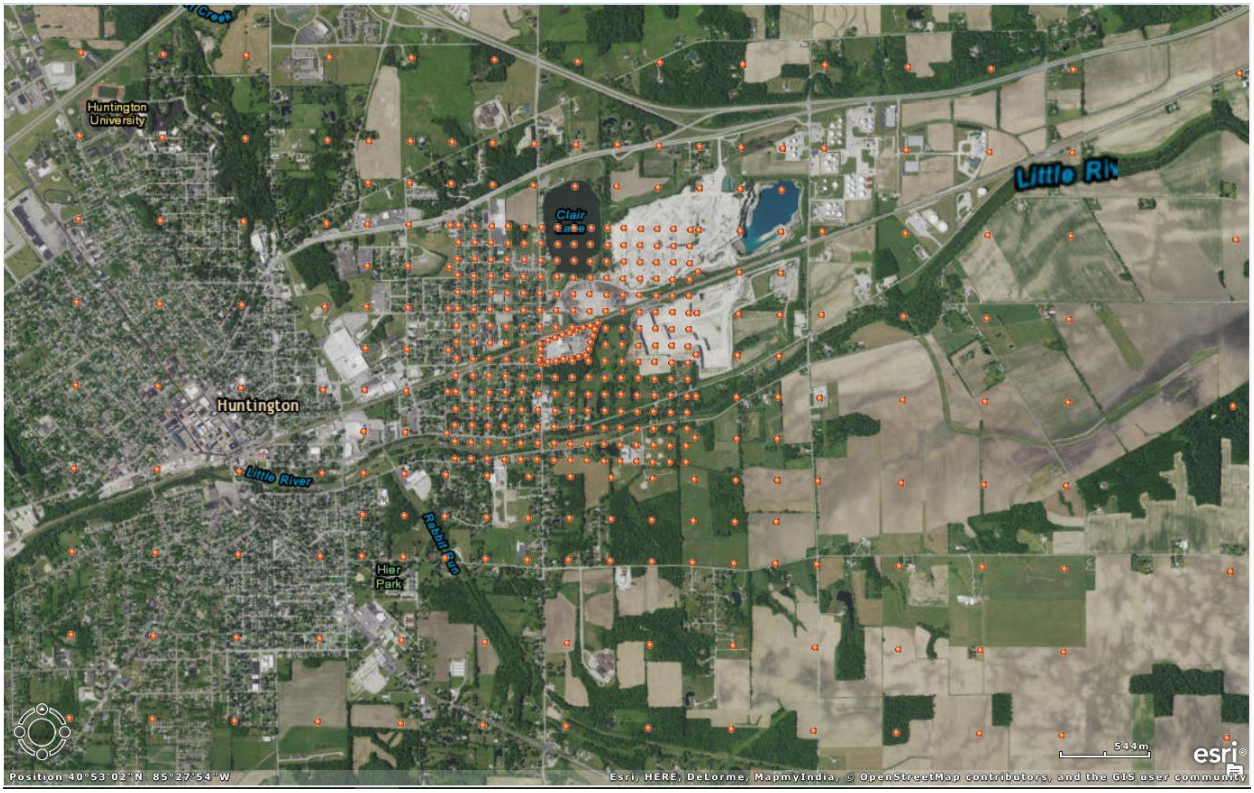
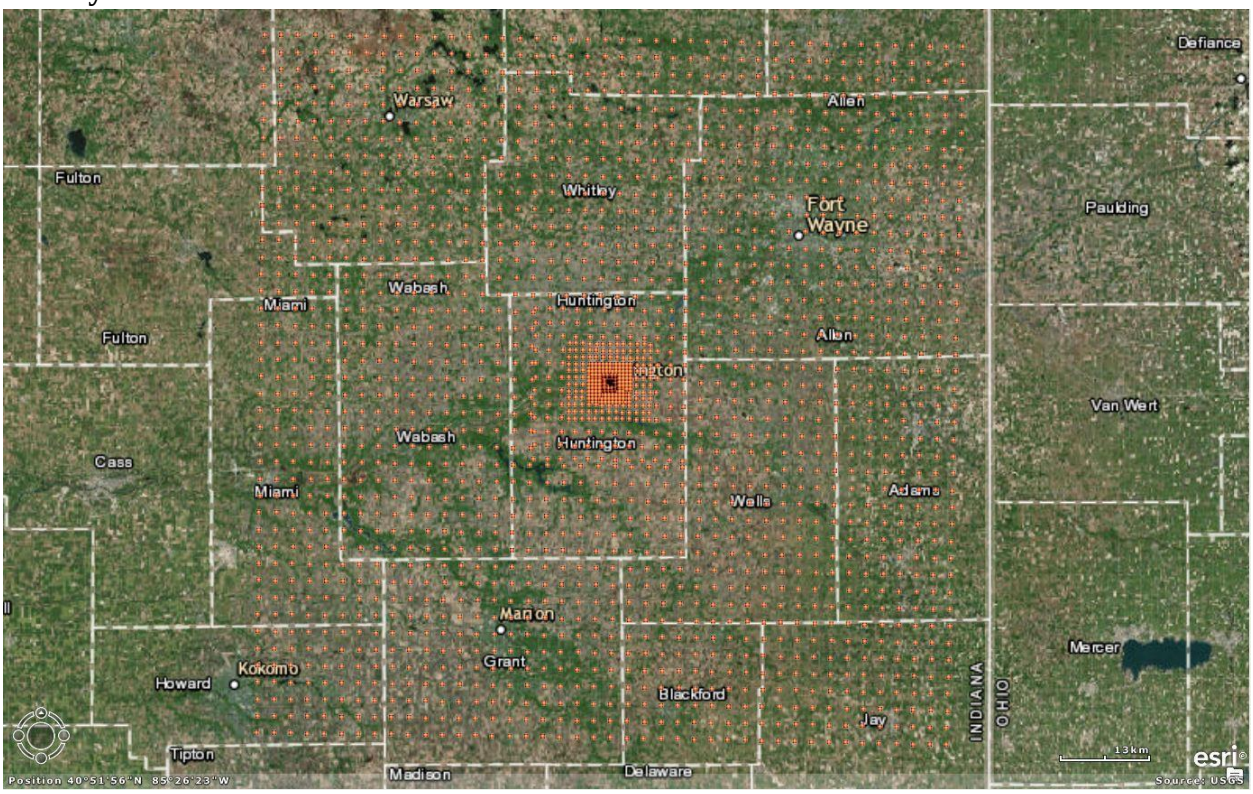


Figure 11. Full Receptor Grid for the Area Around the Isolatek Facility in the Huntington County Area



The receptor grid used in the EPA assessment adequately addresses whether peak concentrations caused by emissions from the facility are violating the NAAQS. Although it is unclear if a fence exists around the property, the placement of receptors just outside a facility structure to the north, where the peak values were modeled, show concentrations well above the standard, so that the addition of receptors within plant property would not alter the conclusion that the source is causing violations of the NAAQS.

4.3.5. Modeling Parameter: Source Characterization

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

The EPA generally characterized this source in accordance with standard modeling practices. However, since the work was conducted for enforcement purposes, emissions were estimated based on the latest stack test data for the cupola, maximum charge rate assumptions, continuous operation throughout the year, and state emission data for the two blow chambers. No other sources or background concentrations were added. Actual stack heights were modeled along with building downwash. For this source, emissions from the cupola are emitted through a stack. The

emissions from the blow chambers were characterized as volume sources.

4.3.6. Modeling Parameter: Emissions

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

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

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

As previously noted, the EPA used emissions representing recent stack test data, maximum charge rates, and continuous operations for the cupola process. Emissions for the two blow chambers were generated by the state, using a maximum feed rate of 4.0 tons of slag per hour and an AP-42 emission factor of 0.87 pounds SO_2 per ton of slag. The cupola emissions were generated based on a 2007 stack test at the facility. The resulting emission factor of 21.6 pounds of SO_2 per ton of slag was used, along with a potential charge rate of 126,144 tons of slag per year to produce annual emissions of 1,362 tons of SO_2 per year. Total annual emissions, as reflected in the modeling, are presented in Table 8 below.

Table 8. SO_2 Emissions Used to Model the Isolatek Facility in the Huntington County Area

Facility Name	SO_2 Emissions (tpy)
Isolatek - Cupola (point source)	1,362
Isolatek - 2 blow chambers (volume sources)	30
Total Emissions from All Modeled Facilities in the Area of Analysis	1,393

While the emissions used in the EPA modeling do not represent actual emissions from the most recent three years of operation, they do represent a conservative assessment of emissions from the facility.

In its rationale for listing Isolatek under the DRR, the EPA discussed estimates of actual emissions, which would support a better assessment of current air quality. Specifically, in its rationale, the EPA estimated actual emissions for 2014. In this estimate, the EPA relied on the production data underlying the emission estimate that Indiana provided for the National Emissions Inventory (NEI), but adjusted the estimate to reflect a more source-specific, more reliable emission factor. Whereas Indiana's emission estimate relied on the AP-42 emission factor of 8.0 pounds of emissions per ton of slag being processed, the EPA found that information from a stack test at the facility yielded an emission factor of 21.6 pounds of emissions per ton of slag. Mass balance calculations for the facility also yielded an emission factor estimate quite similar to the estimate based on the stack test (approximately 22 pounds per ton of slag), providing further support for that estimate. Adjusting the NEI emission estimate (164 tons in 2014) times the ratio of the stack-test-based emission factor versus the AP-42 emission factor (21.6/8.0) yields a 2014 emission estimate of 444 tons.

Indiana's submittal on January 13, 2017, provided information supporting lower emission estimates for Isolatek. Indiana cited a stack test supporting an emission factor of 9.3 pounds per ton of throughput. On this basis, Indiana recommended continued use of the 8.0 pound per ton emission factor from AP-42. The submittal also presented arguments that the prior stack test may have produced an unrepresentative emission factor, insofar as the test was conducted during a time with a deviation "from standard coke consumption and melt rate in the 10% - 20% order of magnitude." Also, although the EPA had judged that 2014 appeared to be a low production year, and that normal production (and therefore normal emissions) might be twice as high, Indiana provided a level of production "over the last few years" that it said "should be considered the current normal production at the facility."

Based on this information, the EPA finds that 444 tons per year represents the most reliable estimate of current emissions at Isolatek. The emission factor derived from the more recent stack test differs from the emission factor derived from the prior stack test substantially, by more than 10 to 20 percent. Since the emission factor estimate of 21.6 pounds per ton is consistent with the results of mass balance calculations (suggesting an emission factor of approximately 22 pounds

of SO_2 per ton of slag), this emission factor is likely more representative of typical emissions at the facility. The information on production that Indiana provided supports the conclusion that basing an emission estimate on 2014 production is an appropriate means of assessing current emission levels. Nevertheless, given the range in plausible emission factors, the EPA considered evidence as to air quality near Isolatek under a range of potential Isolatek emission levels. The EPA evaluated air quality based on an emission level of 444 tons per year. As an alternative, the EPA also evaluated air quality based on an emission rate of 191 tons per year, based on use of 2014 slag processing rates multiplied by the emission factor derived from the more recent stack test (9.29 pounds per ton of slag). A third basis for air quality evaluation was an emission rate of 164 tons per year, an estimate based on the AP-42 emission factor. Discussion of these evaluations is provided below.

The production rates underlying these three emission estimates may or may not be below normal production rates. Nevertheless, the available evidence suggests that the 2014 production rate, on which the above three emission estimates are based, is reasonably representative of production rates for the most recent three years and may be considered representative of current emission rates. Therefore, the EPA concluded that evaluation of air quality based on these 2014 production rates provides an appropriate basis for evaluating current air quality.

Section 4.3.10 discusses the consequences of these emission estimates, based primarily on the estimate that Isolatek currently emits 444 tons per year but also evaluating the impacts that would be estimated if alternate emission estimates were used.

4.3.7. Modeling Parameter: Meteorology and Surface Characteristics

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

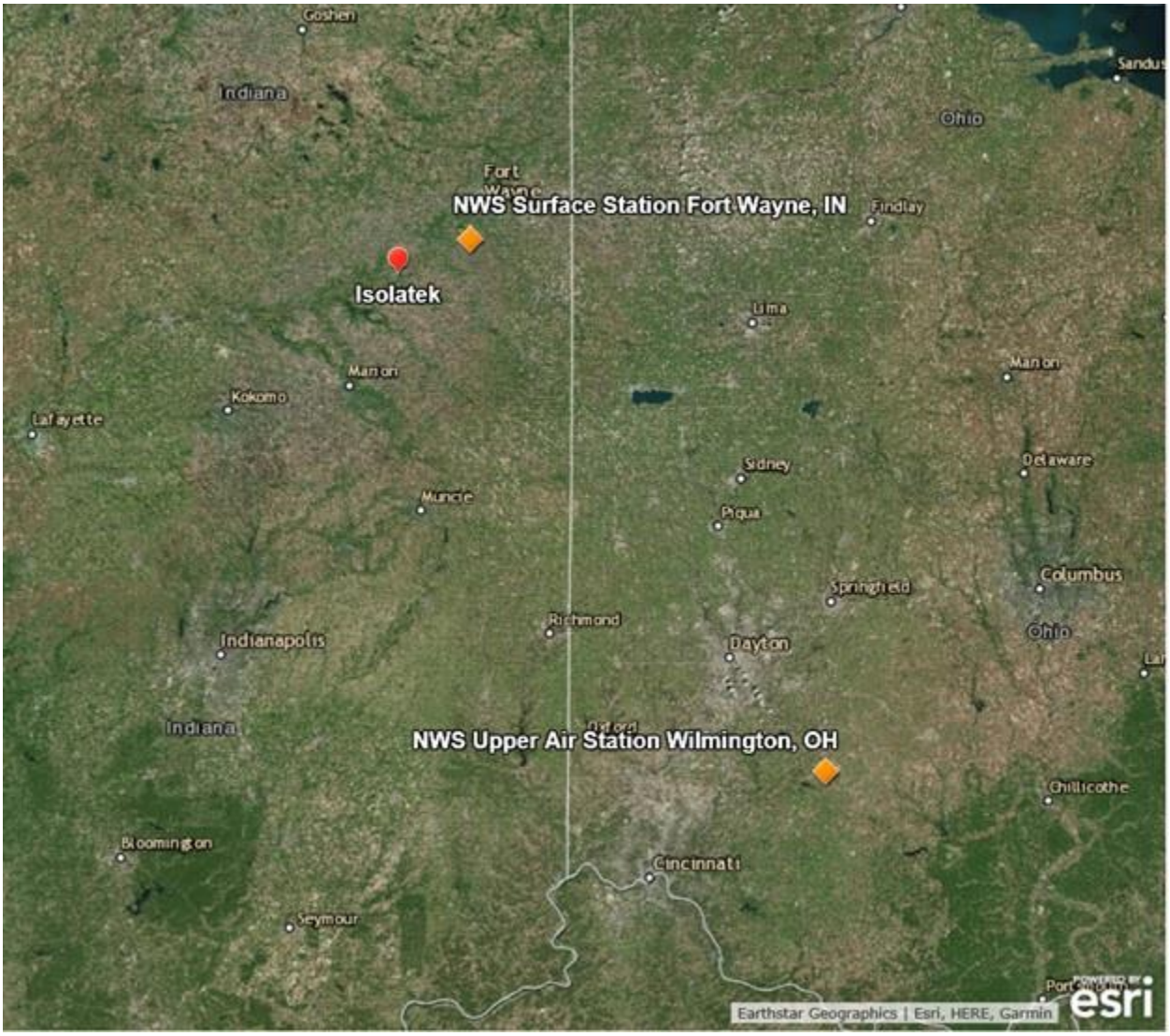
For the area of analysis around Isolatek, the EPA used five years of meteorological data supplied by the state of Indiana. The years covered were 2008 to 2012. Surface data were collected from the Fort Wayne International Airport (KFWA) in Fort Wayne, Indiana, located at 40.97 N and 85.21 W, roughly 25 km northwest of the facility. Upper air data were collected from the Wilmington Airborne Park (KILN) in Wilmington, Ohio, NWS station, located at 39.42 N and 83.82 W roughly 220 km southeast of the facility. These stations were selected as being the most representative of meteorological conditions within the area of analysis.

The meteorological surface and upper air data files were acquired from the state. Input files for the meteorological modeling are not available but the EPA believes that the state used

AERSURFACE (version 13016) to process the land use characteristics for the meteorological modeling.

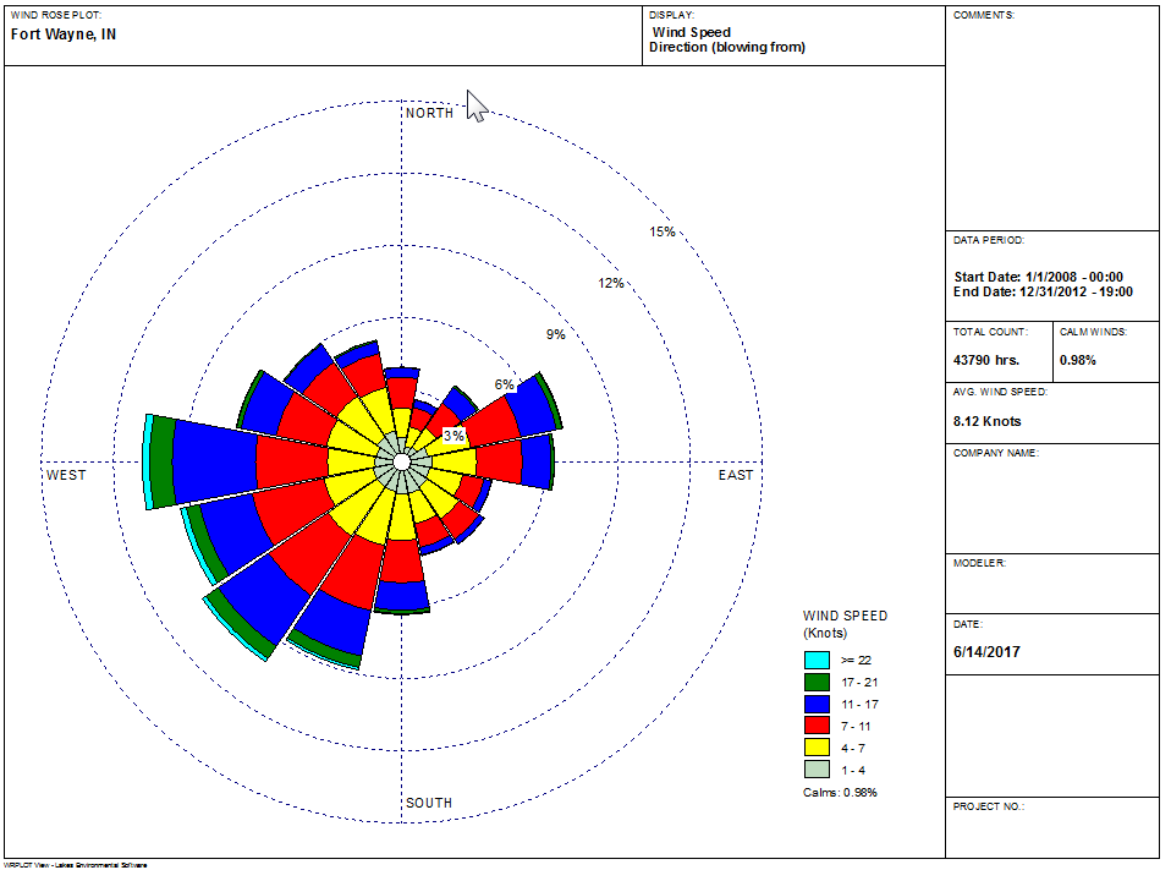
In figure 12 below, generated by the EPA, the location of this NWS surface station is shown relative to the area of analysis.

Figure 12. Area of Analysis and the NWS station used for the Huntington County, Indiana, Area



Below is a wind rose of the surface wind data collected at the Fort Wayne, Indiana, NWS station for 2008 to 2012.

Figure 13: Fort Wayne, Indiana, Cumulative Annual Wind Rose for Years 2008 – 2012



The wind rose shows that winds blow from all directions throughout the year, however, predominant wind directions are from the west and southwest. Typical wind speeds range from 7 to 17 mph with a higher frequency of winds from the west and southwest.

Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET (version 14134) processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs.

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 Fort Wayne NWS station, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-

ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The EPA used the meteorological data available at the time generated by the state. It's not clear what version of AERMINUTE was used. The surface and upper air meteorological data used by the EPA in this assessment were deemed to be adequately representative of the dispersive conditions around the Isolatek facility. Although this assessment used five years of meteorological data rather than three, the EPA believes that modeling using three years of meteorological data would have yielded very similar results.

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

The terrain in the area of analysis is best described as very gently rolling. Increases of about 20 m in elevation occur to the north and west. However, overall the terrain is relatively flat. To account for any terrain changes, the AERMAP (Version 11103) terrain program was used to specify terrain elevations for all the receptors.

The terrain was appropriately characterized in the modeling conducted by the EPA.

4.3.9. Modeling Parameter: Background Concentrations of SO_2

For the EPA's assessment of SO_2 emissions from the Isolatek facility, no background values were used. Using the average of the by-season by-hour background concentrations that Indiana determined for the Jasper County area, inclusion of background would likely have yielded concentration estimates about 6 ppb higher. Since, as discussed below, the modeled concentration is well above the standard, the precise magnitude of background concentrations will not affect the determination of whether the area is attaining the standard and will not materially affect the boundaries of the area that warrants being designated as nonattainment.

4.3.10. Summary of Modeling Inputs and Results

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

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

Input Parameter	Value
AERMOD Version	14134 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	1 stack / 2 volume sources
Modeled Structures	6
Modeled Fencelines	1
Total receptors	2,364
Emissions Type	Conservative actuals based on stack test and max feed rates/continuous operation.
Emissions Years	Derived 2014
Meteorology Years	2008-2012
NWS Station for Surface Meteorology	Fort Wayne, IN (KFWA)
NWS Station Upper Air Meteorology	Wilmington, OH (KILN)
NWS Station for Calculating Surface Characteristics	Fort Wayne, IN (KFWA)
Methodology for Calculating Background SO_2 Concentration	Background value not used.
Calculated Background SO_2 Concentration	Not applicable

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

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

		Receptor Location UTM Zone 16		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 (excluding background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2008-2012	629021	4527383	16,594	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The EPA's enforcement modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 16,594 μg/m^3, equivalent to 6,336 ppb. This predicted concentration occurs just meters on the downwind side of a significant downwash structure at the facility. The majority of the concentration is attributed to the two volume source blow chambers. However, the design value for the cupola stack alone is 3,187 μg/m^3, occurring at the same location. Figure 14 below shows the location of the peak concentration, indicated by the red star.

Figure 14: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Five Years for the Area of Analysis for the Huntington County Area (Zoomed)

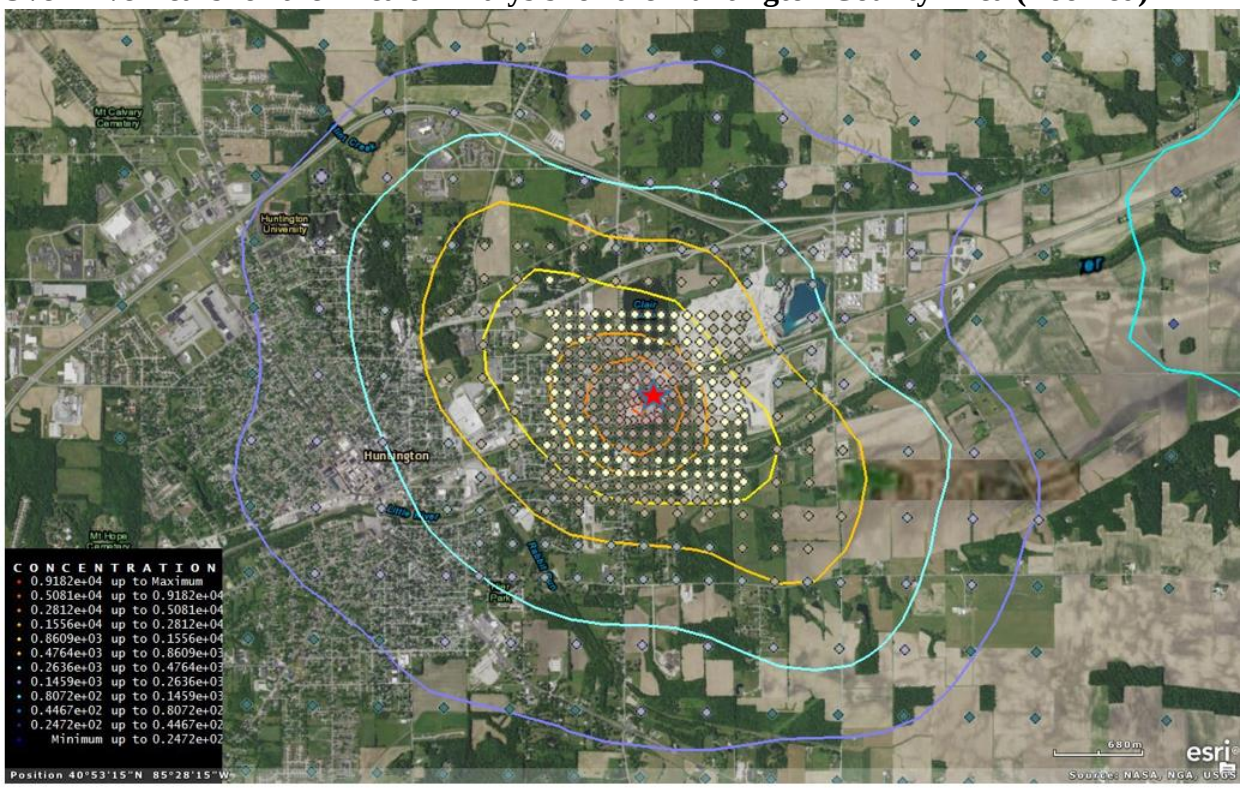
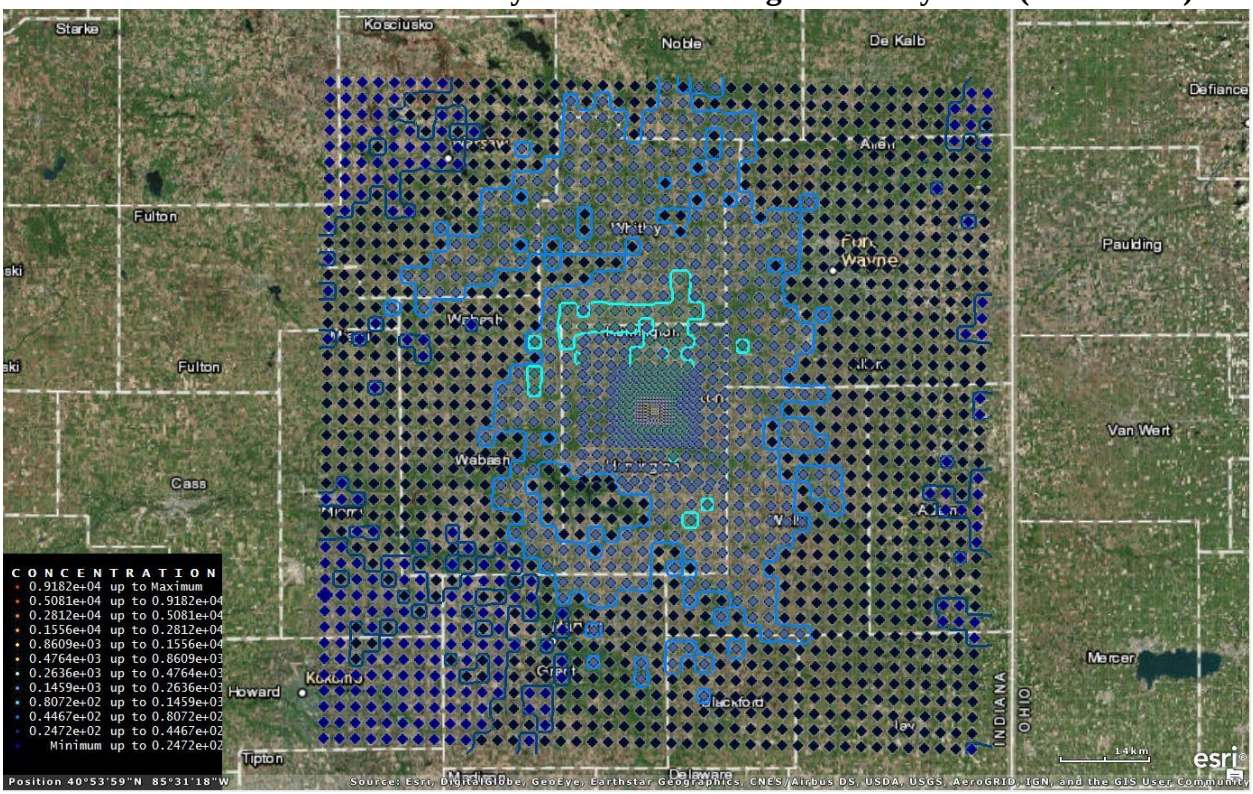


Figure 15. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Five Years for the Area of Analysis for the Huntington County Area (Full Extent)



For each emission point, air quality impacts are directly proportional to emissions. In addition, it is appropriate here to assume that the factors yielding different emission estimates will have similar effects on the emissions for all of the emission points at Isolatek, so that changing the plant total emission estimate by a given percentage would have the same percentage effect on the plant total air quality impact.

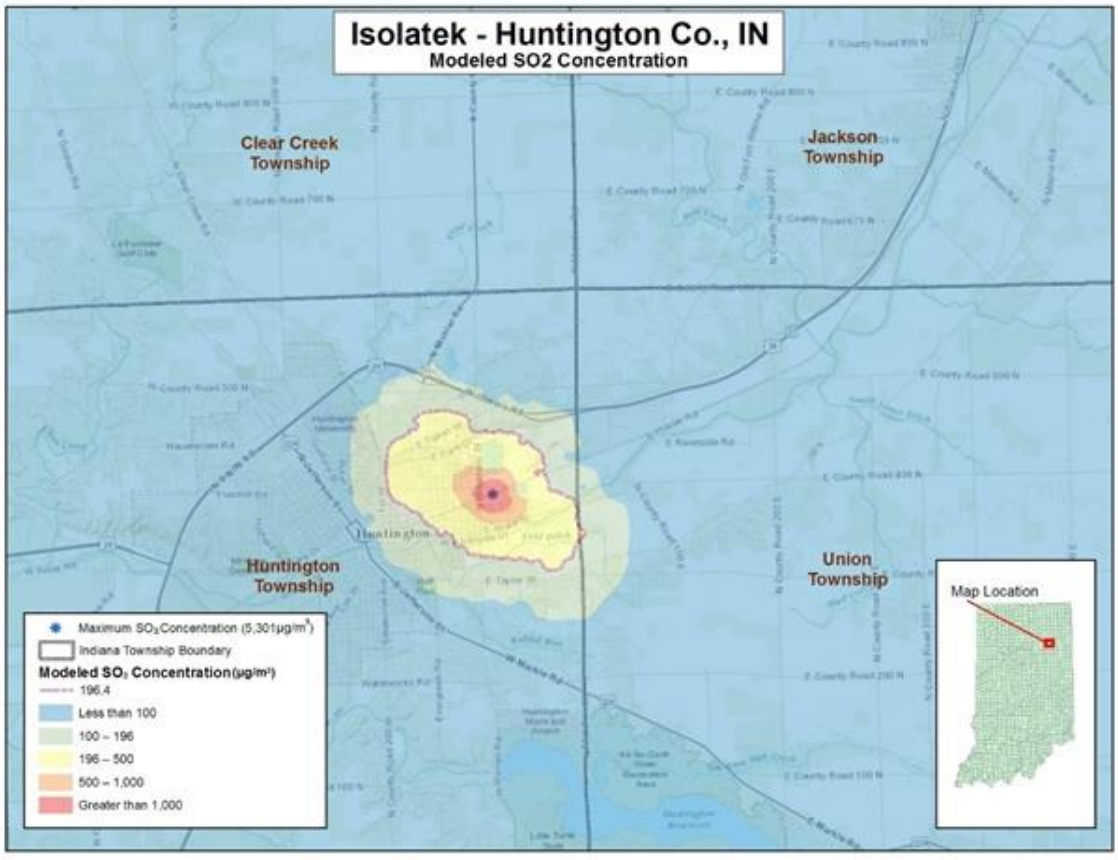
The modeled concentration listed above was based on an emission rate assuming maximum feed rates combined with stack test results. A more appropriate basis for designating this area would be modeled concentrations based on current actual emissions. As discussed above, the EPA finds that 444 tons per year, rather than 1,393 tons per year, represents the most reliable estimate of current emissions. That is, the EPA finds that the best estimate of current air quality near Isolatek would have a design value reflecting 32 percent of the maximum production-based design concentration noted above, which with the addition of background concentrations would be a design value of 5,300 $\mu g/m^3$ or 2,024 ppb.

Alternative emission estimates also yield estimated design concentrations well above the standard. For example, the lowest emission estimate recommended by Indiana, 164 tons per year (12 percent of the modeled emission rate) still yields a design concentration (including background) of 1,973 $\mu g/m^3$ (753 ppb). Similarly, modeling using the emission factor Indiana derived from the more recent facility stack test (9.3 pounds per ton of throughput), and the

resulting emission estimate of 191 tons per year (14 percent of the modeled emission rate) is estimated to yield a design concentration of 2,288 µg/m^3 or 874 ppb. While there is some uncertainty about whether blow chamber emission estimates and cupola emission estimates should be adjusted by the same percentage, which results in some uncertainty in the impact estimate, even the most extreme revision to the distribution of emissions (treating blow chamber emissions as zero, i.e. disregarding blow chamber impacts) still yields concentration estimates well over the standard. That is, within the plausible range of emission levels for each emission unit at Isolatek and for plant total emissions, SO_2 concentrations near Isolatek are clearly many times higher than the air quality standard.

Figure 16 shows a map of the area estimated to have a violation. This map reflects concentrations scaled to reflect the EPA's best estimate of current emissions, with addition of a background concentration of 6.3 ppb (16.6 µg/m^3). The modeling indicates that the 1-hour SO_2 NAAQS is violated. This map illustrates that peak concentrations are estimated to occur very near to the facility, however, concentrations above the NAAQS also occur a couple kilometers away. This figure indicates the expected violations (shown by the area within red dashed lines) extend to the boundary of Union Township, however, the primary source and overwhelming majority of estimated violations are contained within Huntington Township.

Figure 16. Map of Area in Huntington County Estimated to be Violating the SO_2 Standard



4.3.11. The EPA's Assessment of the Available Modeling

In most respects the EPA modeling is fully in accordance with the recommendations of the modeling TAD. Nevertheless, this modeling, conducted for enforcement purposes, uses inputs that in a few cases deviate from the recommendations in the SO_2 Modeling TAD guidance. Thus, the EPA must weigh how the uncertainties introduced by these deviations from optimal inputs compares to the margin by which the model results exceed the standard, to evaluate the degree of confidence the EPA can have in using these model results to determine the attainment status of Huntington County.

No hourly emission data were available, and Indiana and the EPA have differing views as to annual emissions at Isolatek. However, use of hourly emissions data could lead either to higher or to lower concentration estimates, and use of an annual average emission rate provides a reasonable approximation of the results that would be obtained using hourly emissions data. The effect of using differing annual emission estimates is discussed above, with the conclusion that any plausible estimate of emissions at this facility would yield concentration estimates well above the level of the standard.

The TAD recommends modeling three years of meteorology with concurrent actual emissions data, partly to consider relatively recent emissions information. The EPA's modeling used five years of meteorology, using a fixed emission rate for each emission release that appears to represent current emission rates; the EPA has no information indicating any changes in control levels at the facility or other changes in emission rates other than in accordance with fluctuations in production rates. Therefore, the use of five years of meteorology in this case introduces no biases and is likely to yield concentration estimates that are very similar to those that would be estimated using three years of meteorology.

The TAD recommends using hourly flows and stack temperatures where available. This information is not available here. Nevertheless, the use of average flows and stack temperatures is expected to yield reasonably reliable concentration estimates.

The TAD recommends using either a constant background concentration or a background concentration that varies by hour of the day and season of the year. The EPA's modeling did not include a background concentration. Using the information that Indiana developed for nearby Jasper County, the effect of this omission may be reasonably estimated to understate overall concentrations by approximately 6 ppb.

Nevertheless, the EPA finds that this modeling is a suitable basis for determining whether this portion of Huntington County violates the SO_2 standard. The selection of model, meteorological data, source building and release characteristics, and a range of other model inputs are fully in accordance with the recommendations of the Modeling TAD. Although emission estimates for the facility are subject to some uncertainty, the EPA has examined the effect of this uncertainty

on concentration estimates and found that concentrations would be estimated to be well over the standard for the full range of plausible emission estimates. Indeed, adjusting model results to reflect the most reliable estimate of plant total emissions yields a design value of 5,300 $\mu g/m^3$, significantly higher than the standard. Therefore, the EPA finds the modeling to provide adequately conclusive evidence that the area near Isolatek is violating the air quality standard.

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

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

4.5. Jurisdictional Boundaries in the Huntington County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. In 2011, Indiana recommended that the EPA designate the entirety of Huntington County as attainment but did not provide any supplemental analyses or recommendations for Huntington County in its January 13, 2017, submittal. The boundaries of Huntington County are well established and well known, so that these boundaries provide a good basis for defining the area being designated. This county also has well-defined township boundaries, which would also provide a good basis for defining designated areas.

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

The EPA has received no third party modeling for this area, and the EPA has no additional monitoring or other evidence indicative of air quality in Huntington County.

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

The EPA must consider all available evidence in determining the appropriate designation for Huntington County. The state did not provide modeling or other air quality characterization information, and no monitoring data are available that are indicative of SO_2 air quality in Huntington County. However, the EPA has available the results of modeling it performed for enforcement purposes that the EPA considered when determining that Isolatek needed to be listed under the DRR.

Based on the EPA's assessment of the modeling that it conducted for enforcement purposes, discussed in section 4.3.11 above, the EPA concludes that the area in Huntington County near Isolatek is violating the SO_2 standard. The purpose of this TSD chapter is to evaluate available

information to determine the appropriate designation for areas such as Huntington County. The modeling that the EPA conducted in most respects is fully in accordance with the recommendations in the Modeling TAD. While the treatment of emissions in this modeling does not provide an optimally reliable assessment of air quality in the area, particularly given the uncertainties in emission levels, the EPA has concluded that the degree of uncertainty in this analysis is considerably smaller than the margin by which the area is estimated to be violating the standard. Therefore, the EPA's technical analysis allows the EPA to reach a reliable conclusion as to whether relevant portions of Huntington County are violating the primary SO_2 standard.

The EPA has examined the area estimated to have violations of the primary SO_2 standard. The area with estimated violations appears to be entirely within Huntington Township. No other sources above 10 tpy are located in Huntington County or nearby. Therefore, the EPA concludes that a nonattainment area that includes Huntington Township in Huntington County suffices to include the entire area violating the standard or contributing to these violations.

The EPA believes that our intended nonattainment area, including Huntington Township within Huntington County, will have clearly defined legal boundaries, and we find these boundaries to be a suitable basis for defining our intended nonattainment area.

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

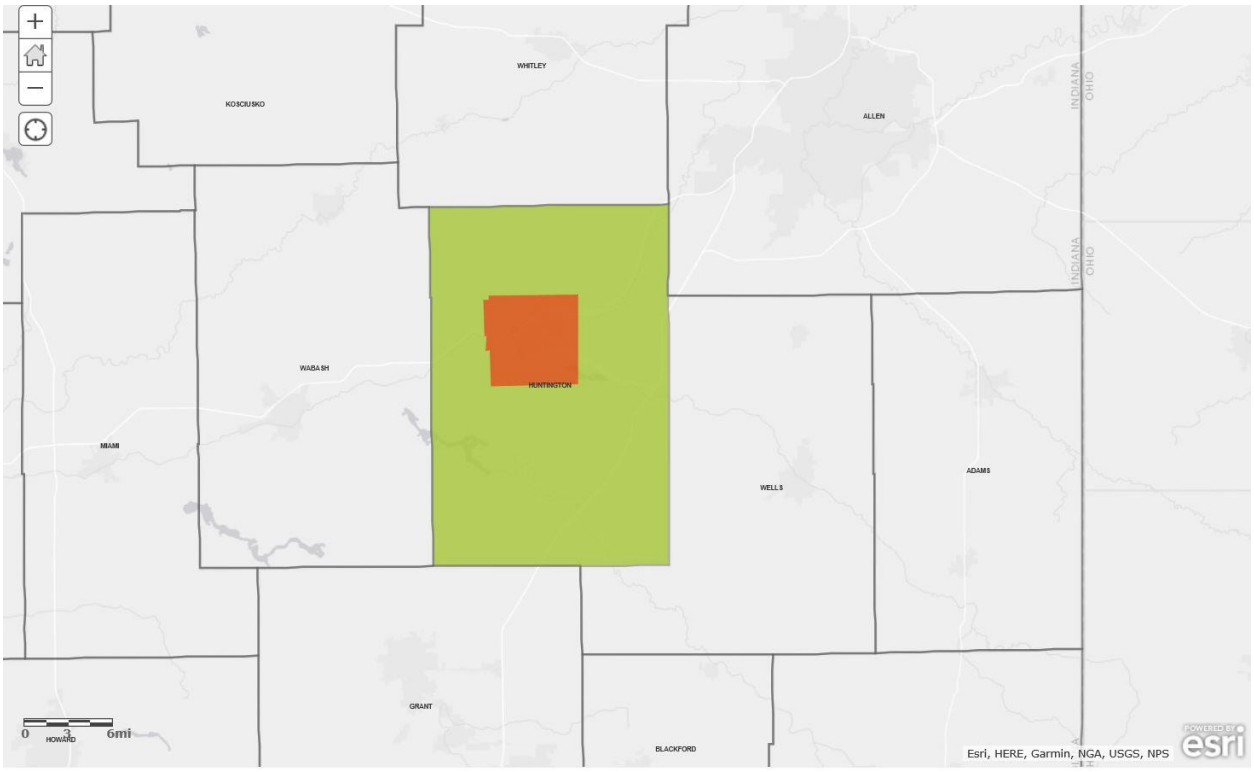
After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to modify the state's recommendation and intends to designate Huntington Township in Huntington County as nonattainment for the primary 2010 SO_2 NAAQS. Since the remainder of the county has no sources emitting over 10 tpy, and in particular because the remainder of the county has no sources that were subject to a requirement for air quality characterization and the EPA has no evidence that the remainder of the county is violating the standard, and because no other nonattainment area is nearby for the area to be considered to be contributing, the EPA intends to designate the remainder of Huntington County as unclassifiable/attainment. The remainder of Huntington County meets the EPA's definition of an unclassifiable/attainment area in that it 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.

Figure 16 shows the boundary of this intended designated areas in Huntington County. In this figure, the area in red shows the EPA's intended nonattainment area, and the area in green is intended to be designated unclassifiable/attainment.

Indiana has recommended a designation of unclassifiable for Huntington County. EPA regulations for implementing the SO_2 NAAQS require Indiana to characterize SO_2 air quality in this area. In considering the state's recommendation, we have taken into account all available information, including any current (2014-2016) air monitoring data, and any air dispersion

modeling analyses provided by Indiana or by a third party. The air dispersion modeling data, however, shows either that this area may be violating the 2010 primary SO_2 NAAQS or contains sources that may be contributing to air quality in a nearby area that may be violating the 2010 primary SO_2 NAAQS, which would require a modification of the recommended designation. We invite Indiana to review the available information and further discuss this issue with the EPA in order to inform an appropriate final designation.

Figure 16. Boundaries of the Intended Huntington County Nonattainment and Unclassifiable/Attainment Areas



5. Technical Analysis for the Jasper County (Schahfer) Area

5.1. Introduction

The EPA must designate the Jasper County, Indiana, area by December 31, 2017, because the area has not been previously designated and Indiana 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 the area. This county includes one source listed and subject to the air quality characterization requirements of the DRR, namely Northern Indiana Public Service Company's (NIPSCO's) R.M. Schahfer Station ("Schahfer"). Accordingly, Indiana provided a modeling analysis for the area near this facility, which the EPA reviews in subsection 5.3.

5.2. Air Quality Monitoring Data for the Jasper County Area

This factor considers the SO_2 air quality monitoring data in the area of Jasper County. The state operates one monitor in this area, at a site in Wheatfield at site number 18-073-0002. However, the state did not recommend any conclusions to be drawn from this information, nor did the state assess how well placed the area monitors are for indicating peak concentrations in the area of Schahfer or elsewhere in Jasper County. Table 11 shows relevant information for this monitor. No other monitor is located in Jasper County or elsewhere within 10 km of Schahfer.

Table 11. Monitors in the Jasper County Area Near Schahfer Station

AQS ID	County, State	Distance from Schahfer (km)	Direction from Schahfer	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
18-073-0002	Jasper, IN	4.1	SW	23	14

5.3. Air Quality Modeling Analysis for the Jasper County Area

5.3.1. Introduction

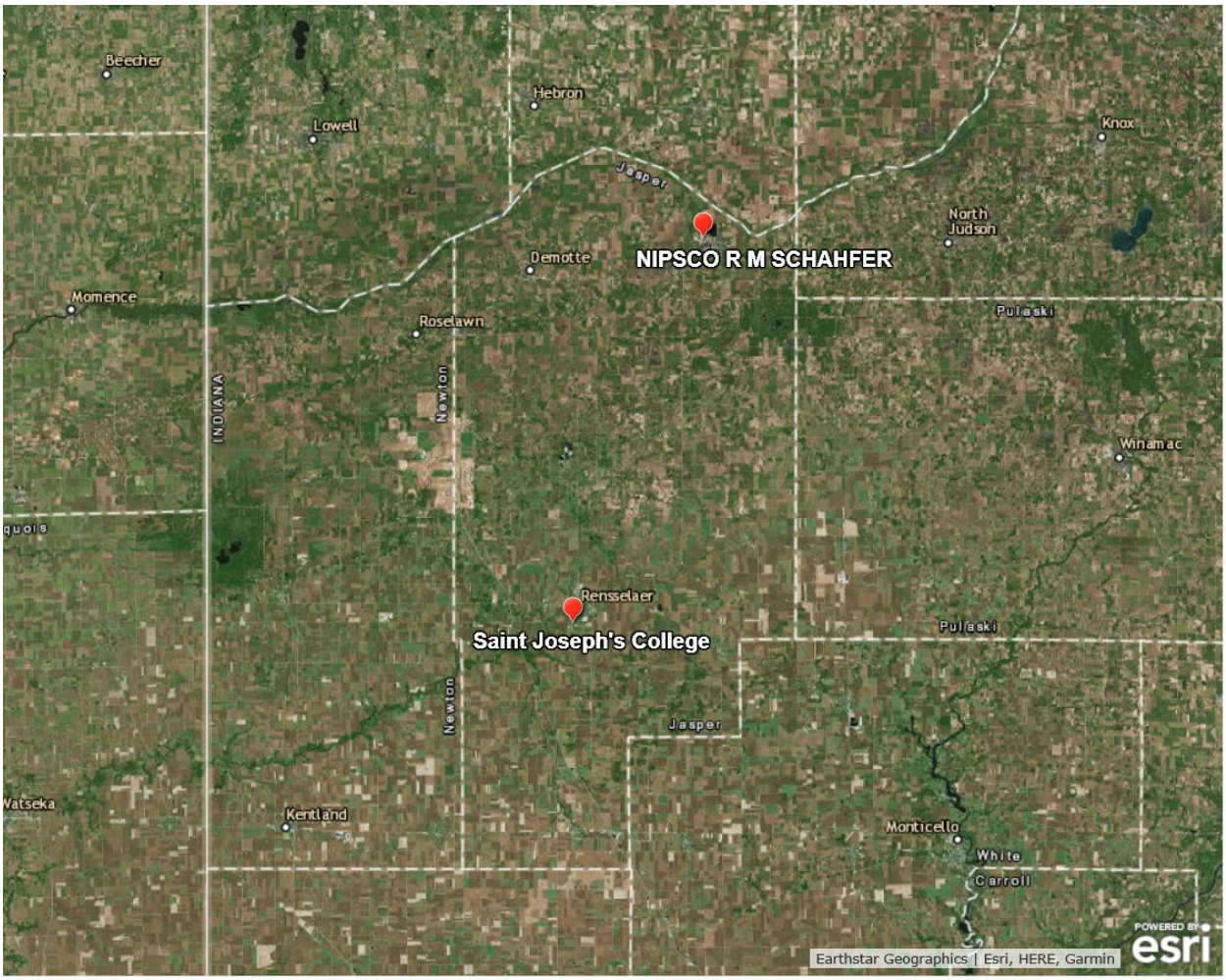
This section 5.3 presents all the available air quality modeling information for Jasper County. This area contains Schahfer which was listed as a source under the DRR based on its 2014 emissions exceeding 2,000 tons. Specifically, Schahfer emitted 8,412 tons of SO_2 in 2014. Indiana has chosen to characterize air quality near Schahfer through air dispersion modeling. As discussed further below, Jasper County also includes another source, Saint Joseph's College, which has substantially lower emissions than Schahfer and was not listed under the DRR.

In its 2017 submission, Indiana recommended that the EPA promulgate an attainment

designation for only the township in Jasper County that contains Schahfer, namely Kankakee Township, 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 that Kankakee Township is attaining the standard, but the EPA also believes that the remainder of Jasper County is attaining the standard as well. Therefore, the EPA intends to designate the entirety of Jasper County 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 centered on Schahfer, located northeast of Wheatfield in Jasper County. Based on this modeling, Indiana recommended that Kankakee Township be designated attainment. This area is shown in Figure 17 below. Also included in the figure is the other source in Jasper County emitting over 100 tons per year of SO_2, namely Saint Joseph's College. This figure also shows the Jasper County boundaries, which as discussed below delineate the area that the EPA intends to designate unclassifiable/attainment.

Figure 17. Map of the Jasper County Area Addressing Schahfer



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 only modeling by the state. The EPA has not conducted modeling for this area and has received no modeling from any other party.

5.3.2. Model Selection and Modeling Components

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

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

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

The state used AERMOD version 15181. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

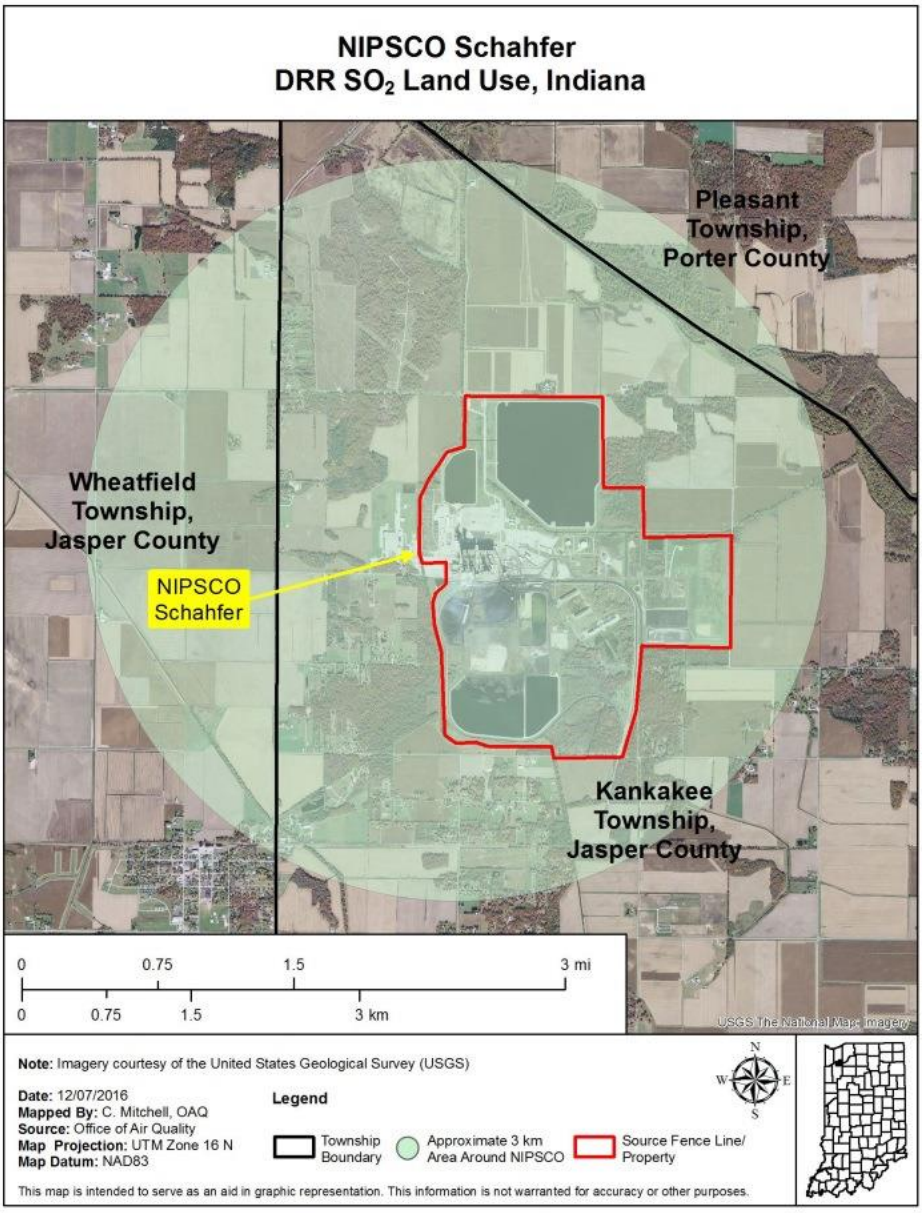
The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for Schahfer had been completed by mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted friction velocity parameter in AERMET. The Schahfer modeling did not use this option; therefore, it is not expected that any significant changes would occur in the modeled concentrations had the state used a later model version.

5.3.3. Modeling Parameter: Rural or Urban Dispersion

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

For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. This determination was based on results from an Auer's land use classification approach. While no specific tables or charts were provided, the area is clearly rural based on a visual inspection using satellite imagery. A map depicting area land use, provided by the state, is shown in Figure 18.

Figure 18. Land Use Near Schahfer



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

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

The source of SO_2 emissions subject to the DRR in this area is described in the introduction to this section. For the Jasper County area, the state has included sources within roughly 35 km of Schahfer in any direction, which included one other emitter of SO_2. 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 violations in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to Schahfer, the other emitter of SO_2 included in the area of analysis is St. Joseph College. No other sources beyond 35 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. The EPA concurs with these determinations.

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

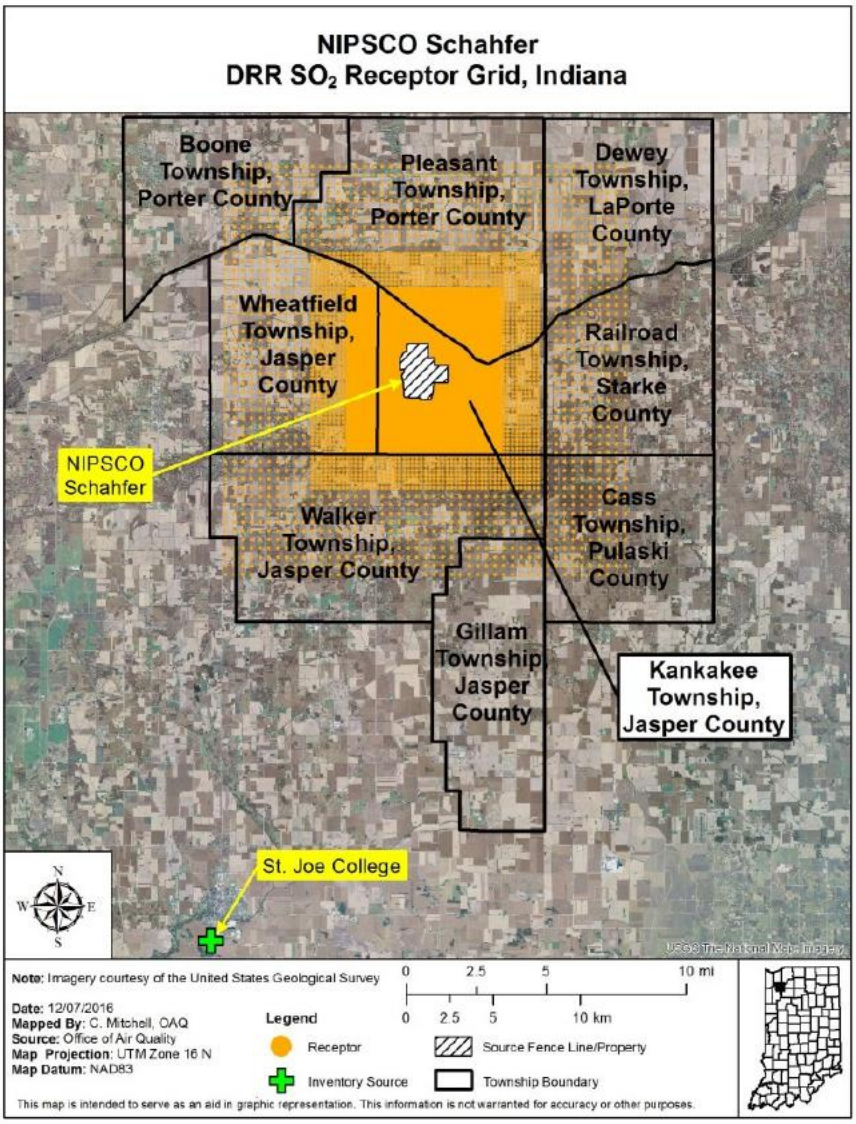
- 50 m spacing along fenceline
- 100 m spacing out to a distance of 3 km
- 250 m spacing out to a distance of 5 km
- 500 m spacing out to a distance of 10 km

The receptor network contained 11,083 receptors and covered 7 townships over three counties, Porter, LaPorte, and Jasper.

Figure 19, included in the state's recommendation, show the state's chosen area of analysis surrounding Schahfer 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 each modeled facility, including other facilities' property. The state only excluded receptors located within the Schahfer facility's fenceline. The state provided additional information detailing the fenced area compared to property boundary. The receptor grid used in the modeling placed receptors on Schahfer property but outside of the fenced area. Due to some uncertainty surrounding appropriate receptor exclusion associated with fencing and property boundaries, the EPA had some initial concerns regarding the selected receptor exclusions. As discussed below and shown in Figure 22, the maximum modeled design value for this area of analysis is located on the fence line of Schahfer. The potential concern was that the maximum modeled design value would be located on the property of Schahfer, where it is uncertain if public access is precluded, if receptors were not excluded from the modeling analysis. However, the EPA concludes that the maximum modeled design value would not be over the standard because the value at the fence line is less than 83% of the NAAQS and the isopleth suggests that the concentration gradient is sufficiently small to indicate that concentrations within Schahfer's fence line are below the NAAQS. Therefore, despite this potential issue, the EPA finds that the removal of these receptors does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area.

Figure 19: Area of Analysis for the Jasper County Area



The EPA has assessed Indiana's receptor grid for the Jasper County area of analysis and confirms that Indiana used receptor grid placements and exclusions adequate for purposes of determining whether this area is attaining the SO_2 standard.

5.3.5. Modeling Parameter: Source Characterization

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

The state included one additional source in the modeling. The source is St. Joseph College, in Rensselaer. This source was included because of its potential contribution to SO_2 concentrations in the area around Schahfer.

The state characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM (version 04274) was used to assist in addressing building downwash.

5.3.6. Modeling Parameter: Emissions

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

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

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

As previously noted, the state included Schahfer and one other emitter of SO_2 within 35 km in the area of analysis. The state has chosen to model these facilities using actual emissions. The facilities in the state's modeling analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below.

For Schahfer, the state provided annual actual SO_2 emissions between 2012 and 2014. This information is summarized in Table 12. A description of how the state obtained hourly emission

rates is given below this table.

Table 12. Actual SO_2 Emissions Between 2012 – 2014 from Facilities in the Jasper County Area

Facility Name	SO_2 Emissions (tpy)			
	2012	2013	2014	2015
NIPSCO - Schahfer	14,911	16,418	8,413	1,689
St. Joseph College	120.5	0	0	0
Total Emissions from All Modeled Facilities in the State's Area of Analysis	15,012	16,418	8,413	1,689

For Schahfer, the actual hourly emissions data were obtained from CEMS data submitted by the facility. The CEMS data also included fixed temperatures with varying emissions and exit velocities. Schahfer installed additional flue gas desulfurization late in 2014, resulting in approximately 90 percent emission reductions from the applicable unit. Therefore, the use of 2013 to 2015 or 2014 to 2016 emissions data would likely have yielded substantially lower concentration estimates. Table 12 includes the year 2015, to illustrate the impact of the use of wet limestone to control emissions at the previously highest emitting units. Consequently, Indiana's use of emission data from 2012 rather than 2015, is a conservative approach, in the sense that use of more recent data would have shown lower concentrations.

St. Joseph College is reported as no longer being a Title V source. The last year of reported emissions for St. Joseph College is 2012 where they had 120.5 tpy; as shown in Table 12, in subsequent years this facility had zero emissions. Nevertheless, as a conservative approach, Indiana modeled an annual average 2012 emission rate (3.466 grams per second) for all three years.

The EPA finds that Indiana adequately characterized the emission rates from the sources included in the modeling.

5.3.7. Modeling Parameter: Meteorology and Surface Characteristics

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

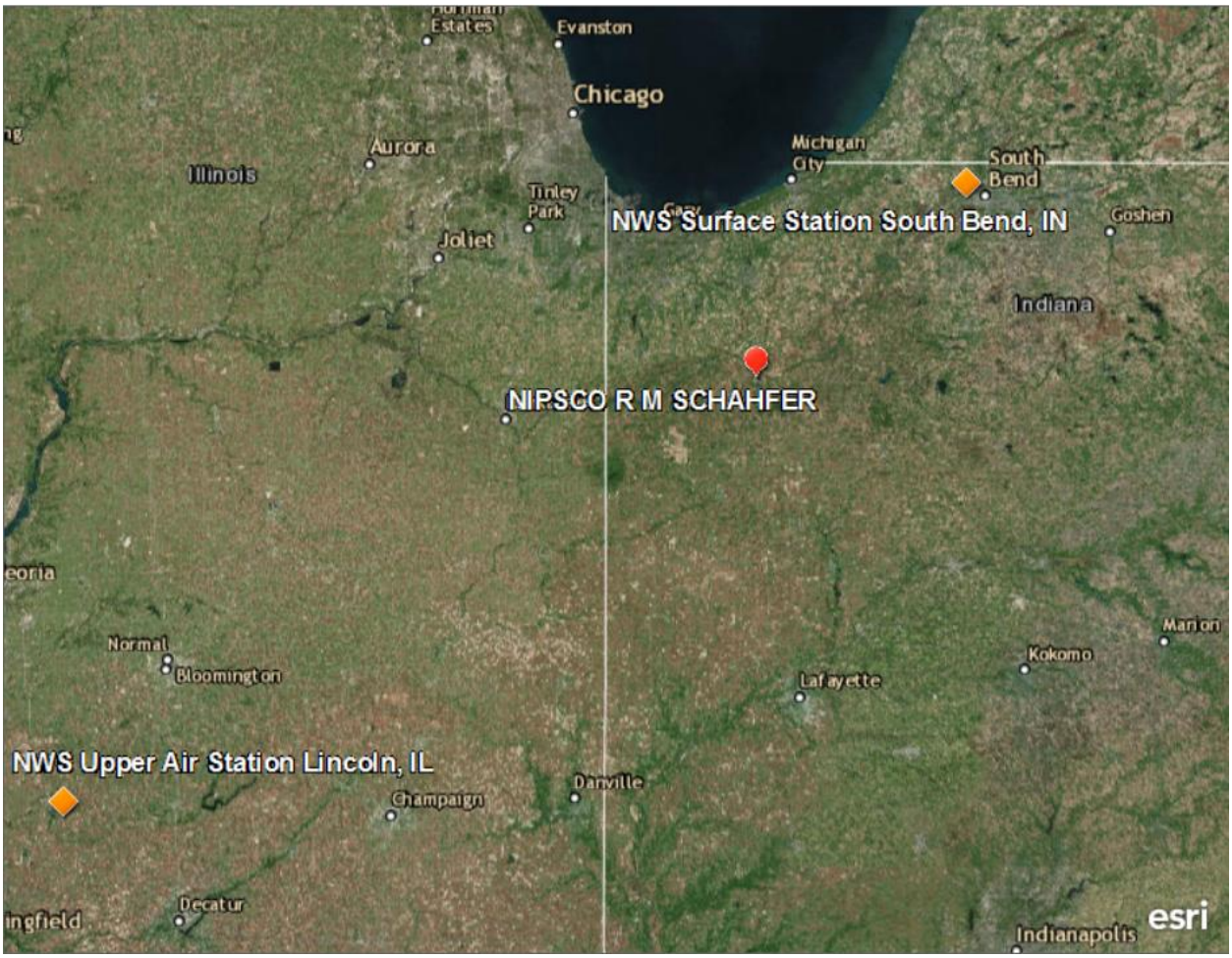
For the area of analysis around the Schahfer facility, the state selected the surface meteorology

from the South Bend, Indiana, NWS station, located approximately 80 km to the northeast of the source, and coincident upper air observations from the Lincoln, Illinois, NWS station, located approximately 230 km to the southwest of the source. These were judged to be stations most representative of meteorological conditions within the area of analysis.

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

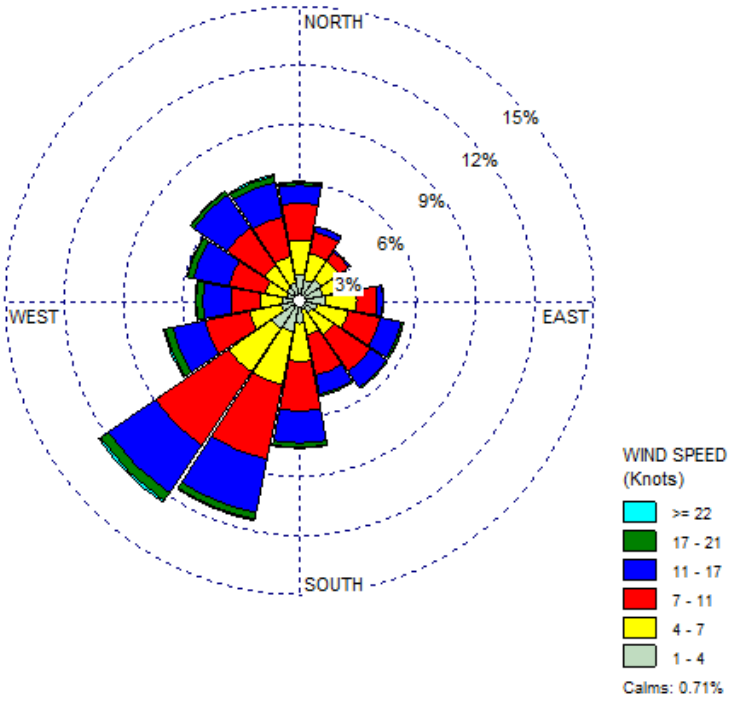
In Figure 20 below, generated by the EPA, the locations of these NWS stations are shown relative to the area of analysis.

Figure 20. Area of Analysis and the NWS stations in the Jasper County, Indiana Area



As part of its recommendation, the state provided the 3-year surface wind rose (2012 to 2014) for the South Bend, Indiana, NWS station. In Figure 21, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. While winds blow from every direction throughout the year, winds from the southwest occur at a higher frequency than other directions. The majority of wind speeds are in the 7 to 17 knot range. Less than 1 percent of the hours are reported as calm.

Figure 21: South Bend, Indiana, 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 (Version 15181) processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state largely followed the methodology and settings presented in the U.S. EPA Region 5 Regional Meteorological Data Processing Protocol document in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE (version 13016) to best represent surface characteristics. Specifically, 12 wind direction sectors were used with a default radius of 1 kilometer. Albedo and Bowen ratio were adjusted for abnormally wet or dry soil moisture conditions on a monthly basis. Surface roughness values were adjusted for the winter months of December, January, and February. For months with more than half of the days with at least one inch of snow cover, the state used the continuous snow cover value. Otherwise, a value representing no continuous snow cover was

used.

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 were provided from the South Bend, Indiana, NWS surface station, noted above, and processed in a separate preprocessor, AERMINUTE (Version 15272). 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 and missing wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The Schahfer facility is located in the northeast quadrant of the state and is in relatively flat terrain. The EPA finds that the meteorological data used in the Schahfer modeling analysis are adequately representative of the weather conditions in the area.

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

As noted above, the terrain in the area of analysis is best described as flat or very gently rolling with elevation changes of less than 15m within 25 km of the source. To account for these small terrain changes, the AERMAP terrain program (Version 11103) was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983.

The EPA finds that the terrain surrounding the Schahfer plant was adequately represented in the state modeling analysis of the area.

5.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99^{th} percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state used a tier 2 approach where the 99^{th} percentile background concentrations were developed on a seasonal and hour of day basis. The state used SO_2 monitoring data from the Wheatfield monitor

(AQS #18-073-0002) located in Jasper County for the years 2012-2014. The monitor is located about 3.5 km to the southwest of the Schahfer facility. Monitoring data which were influenced by the facility were removed prior to generating a background concentration. The monitored data were paired with the corresponding hourly meteorological conditions. Pollution roses were created and used to identify the wind directions from which the modeled source was contributing to the monitored concentrations. The hours containing concentrations impacted from the modeled source were removed. Only contributions above 10 ppb were removed. The background concentrations for this area are shown in Table 13 below.

Table 13 - Temporally Varying Background Values (ppb) for the Jasper County Area[6]

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	4.75	5.00	4.71	4.68	4.00	5.00	5.40	4.00
Spring	5.54	4.57	5.60	6.16	4.55	5.00	4.47	7.00
Summer	2.44	3.43	3.00	3.45	3.00	3.00	3.49	6.53
Fall	5.26	4.00	4.00	4.00	9.00	7.41	5.29	5.49

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	5.00	7.00	7.00	7.00	7.64	7.00	7.00	7.00
Spring	9.52	8.53	8.06	8.00	7.57	7.00	7.98	6.71
Summer	10.16	8.63	8.00	8.86	9.00	9.28	7.66	7.00
Fall	9.00	7.00	7.69	7.64	5.00	6.00	6.62	5.62

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	7.00	7.00	6.32	5.00	5.68	6.66	6.00	6.00
Spring	5.00	4.66	7.18	7.60	6.57	5.00	4.57	4.55
Summer	4.56	4.54	6.00	7.44	5.00	3.00	3.40	2.52
Fall	5.00	6.18	6.02	5.48	4.00	5.00	4.00	7.99

The EPA finds that the background values used in the Schahfer modeling assessment are adequately representative of the SO_2 contribution of non-modeled sources in the area.

5.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Schahfer/Jasper County area of analysis are summarized below in Table 14.

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

Table 14: Summary of AERMOD Modeling Input Parameters for the Analysis for the Jasper County Area

Input Parameter	Value
AERMOD Version	15181 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	7
Modeled Structures	15
Modeled Fencelines	1
Total receptors	11,083
Emissions Type	Actual (CEMS and annual average)
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	South Bend, IN NWS (KSBN)
NWS Station Upper Air Meteorology	Lincoln, IL NWS (KILX)
NWS Station for Calculating Surface Characteristics	South Bend, IN NWS (KSBN)
Methodology for Calculating Background SO_2 Concentration	Used site number 18-073-0002 to generate season by hour-of-day.
Calculated Background SO_2 Concentration	Values ranged from 2.44 ppb to 10.16 ppb

The results presented below in Table 15 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

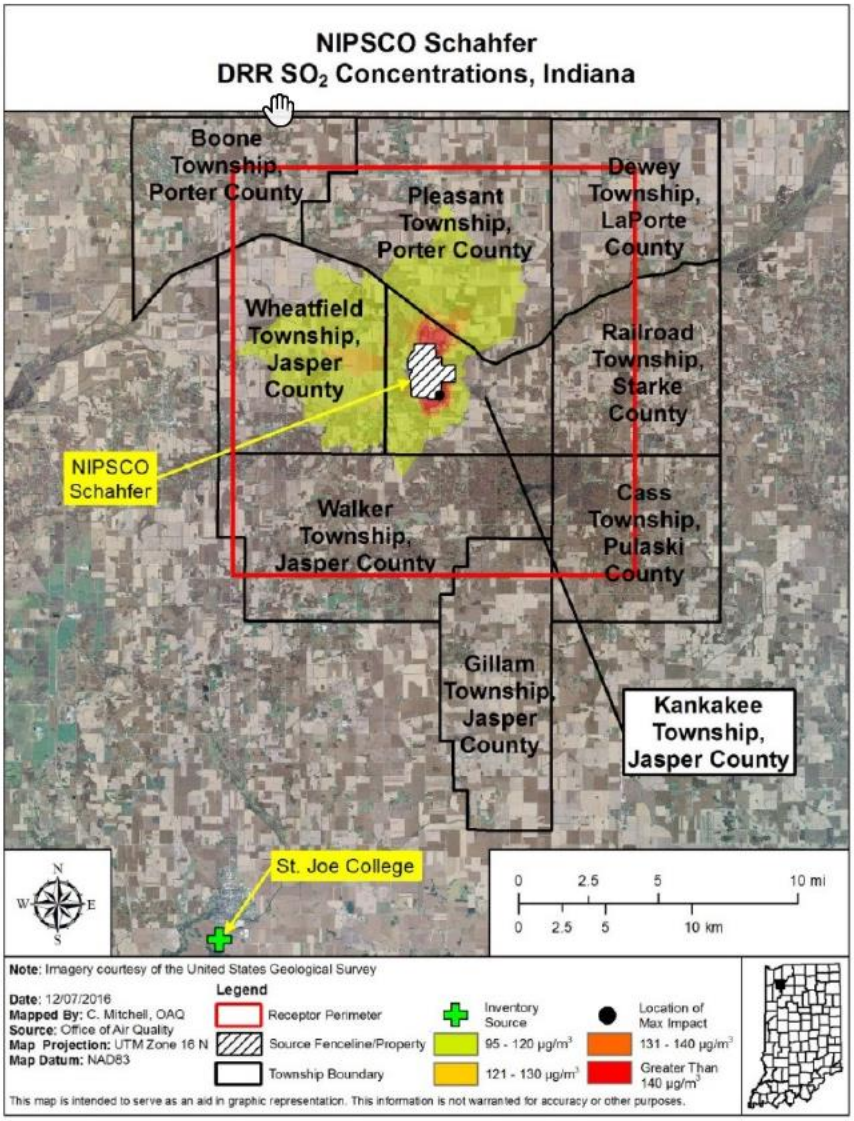
Table 15. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Jasper County Area

Averaging Period	Data Period	Receptor Location UTM zone 16		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	499354.60	4561322.60	162.7	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 162.7 µg/m^3, equivalent to 62.1 ppb. This modeled concentration includes the background concentration of SO_2, and is based on actual emissions from the facilities modeled. Figure 22 below was included as part of the state's recommendation, and indicates that the predicted value occurred on the fenceline boundary to the southeast of the Schahfer stacks.

Figure 22: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Jasper County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all modeled receptors in the area. Additionally, the modeling suggests that impacts from Schahfer are relatively localized so that it would not indicate any contribution to any nearby areas that

may not be meeting the NAAQS.

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

The modeling conducted by the state for the area around the Schahfer facility generally followed the recommendations in the TAD, except as otherwise noted in Section 5.3.4 regarding model receptor placement. The important components of a modeling assessment, i.e., models used, meteorology, emission estimates, nearby sources modeled, and background concentrations, all adequately comply with the TAD and with general modeling expectations, although Indiana in some cases modeled conservative emission rates (i.e., emission rates that would be prone to yield overly high concentration estimates). The model predicted design value is below the SO_2 NAAQS of 196.4 $\mu g/m^3$. During the review of Indiana's modeling analysis, the EPA identified one potential issue regarding the exclusion of receptors on Schahfer's property. As shown above in Figure 22, the maximum modeled design value for this area of analysis is located on the modeled fence line of Schahfer. The potential concern was that the maximum modeled design value would be located on the property of Schahfer, where it is uncertain whether public access is precluded, if receptors were not excluded from the modeling analysis. However, the EPA concludes that the maximum modeled design value would not be over the standard because the value at the fence line is less than 83% of the NAAQS and the isopleth suggests that the concentration gradient is sufficiently small to indicate that concentrations within Schahfer's fence line are below the NAAQS.

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

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

5.5. Jurisdictional Boundaries in the Jasper County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Indiana recommended that the EPA designate only Kankakee Township within Jasper County as attainment. The boundaries of this township are well established and well known, so that these boundaries provide a good basis for defining the area being designated. The EPA intends to designate the entirety of Jasper County as unclassifiable/attainment; the boundaries of Jasper County are also well established and well known, thus also providing a good basis for defining the area being designated.

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

The EPA has received no third party modeling or any other information from parties other than the state for this area.

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

The best available evidence regarding air quality in Jasper County is the modeling provided by Indiana. In selected respects, this analysis is more conservative than the approach recommended in the TAD. First, the analysis used emissions data for 2012 to 2014 rather than more recent emissions data. Since Schahfer installed flue gas desulfurization for its final unit late in 2014, resulting in approximately 90 percent emission reductions from that unit, the use of 2013 to 2015 or 2014 to 2016 emissions data would have yielded substantially lower concentration estimates. Second, Indiana modeled St. Joseph College at its 2012 emission rate, even though it is reported in more recent years to have zero emissions. Given the conservatism of these approaches, and given that Indiana estimated maximum design values below the standard, the use of less conservative inputs more consistent with the approaches recommended in the TAD clearly would also have shown the area to be attaining the standard.

Monitoring data in the area are located such that they do not provide a reliable assessment of maximum concentrations in the area.

While Indiana in its January 13, 2017, submittal provides a recommendation of attainment only for Kankakee Township in Jasper County, the EPA finds the remainder of the county also to be attaining the standard. Indiana has demonstrated that the impacts of Schahfer and St. Joseph College (as it was formerly emitting) do not cause violations of the standard, and the EPA finds, in absence of other relevant sources in the county, that the demonstration that the area near Schahfer is attaining serves also as adequate evidence that the remainder of the county is attaining the standard. As noted previously, the modeling also does not indicate any contribution to any other area that may not be meeting the NAAQS. As discussed in Section 11.3 below, even if violations are monitored in the future near ArcelorMittal-Burns Harbor in Porter County, Jasper County sources would be unlikely to be found to contribute to such violations, and Jasper County is not nearby to any current violations in Indiana.

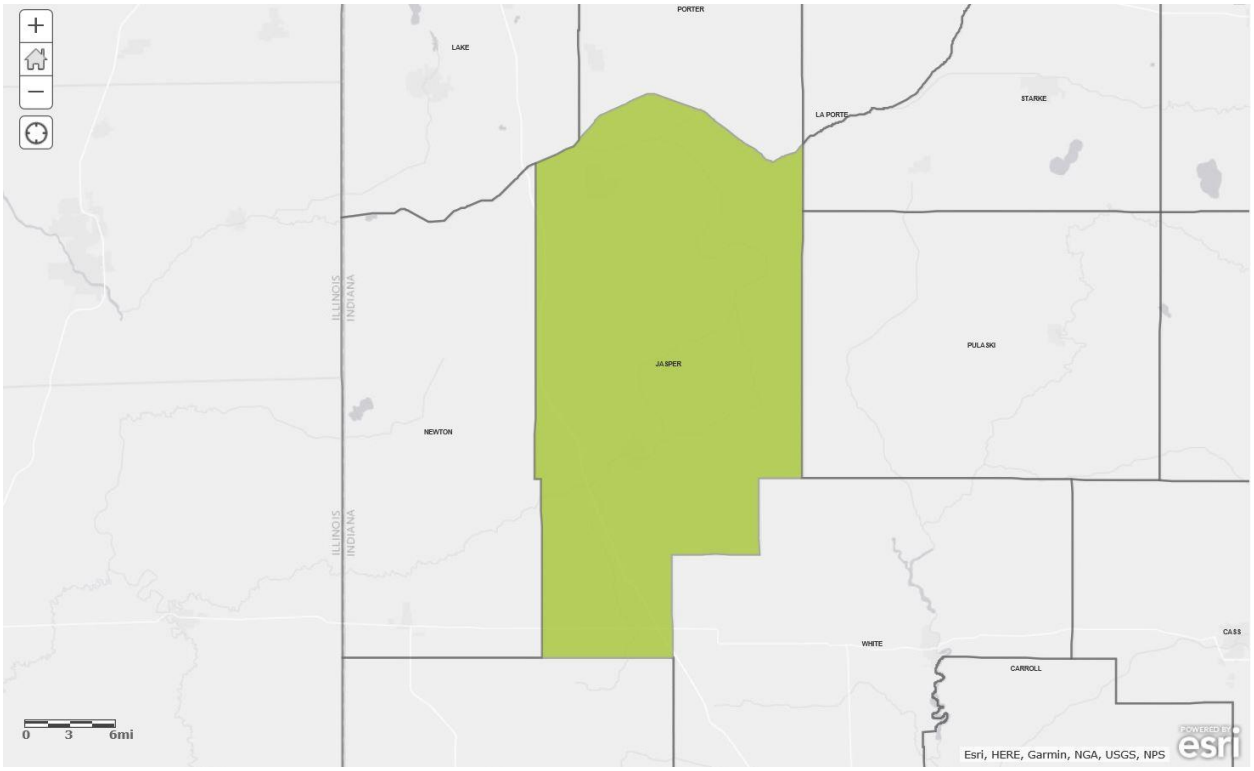
The EPA believes that our intended unclassifiable/attainment area, including the entirety of Jasper County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

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

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA finds that Jasper County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; and therefore intends to designate the entirety of Jasper County as

unclassifiable/attainment for the 2010 SO_2 NAAQS. Figure 23 shows the boundary of this intended designated area.

Figure 23. Boundary of the EPA's Intended Jasper County Unclassifiable/Attainment Area



6. Technical Analysis for the Lake County Area

6.1. Introduction

The EPA must designate the Lake County, Indiana, area by December 31, 2017, because the area has not been previously designated and Indiana 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 the area. This county includes three sources listed and subject to the air quality characterization requirements of the DRR, namely U.S. Steel-Gary Works, ArcelorMittal-Indiana Harbor, and Cokenergy. Accordingly, Indiana provided modeling analyses for the area near these facilities, which the EPA reviews in a following subsection.

6.2. Air Quality Monitoring Data for the Lake County Area

This factor considers the SO_2 air quality monitoring data in the area of Lake County. The state provided data for the two monitors in the area (for site numbers 18-089-0022 and 18-089-2008) but did not recommend any conclusions to be drawn from this information, nor did the state assess how well placed the area monitors are for indicating peak concentrations in the area of the various sources in Lake County. Table 16 shows the monitors that are located in Lake County.

Indiana currently operates a monitor in adjacent Porter County just east of the ArcelorMittal-Burns Harbor facility. Additionally, the company started operating a new monitor just west of the Burns Harbor facility at the beginning of 2017, approximately 6 km east of the border of Lake County with Porter County. Although these monitors are relatively nearby, they are not strongly indicative of the air quality in Lake County. No other monitors are located near to Lake County. As mentioned, the state is meeting its DRR characterization requirements for ArcelorMittal-Burns Harbor through a new monitoring network.

Table 16. Monitors in Lake County, Indiana

AQS ID	City, County, State	Distance/Direction from U.S. Steel - Gary (km)	Distance/Direction from ArcelorMittal -Indiana Harbor and Cokenergy (km)	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
18-089-0022	Gary, Lake, IN	0.5/SE	13/ESE	44	39
18-089-2008	Hammond, Lake, IN	16/W	5.0/SW	23	22

6.3. Air Quality Modeling Analysis for the Lake County Area

6.3.1. Introduction

This section 6.3 presents all the available air quality modeling information for Lake County. This county includes three sources listed under the DRR, requiring Indiana to characterize SO_2 air quality or alternatively to establish SO_2 emissions limitations of less than 2,000 tons per year. These three sources are Cokenergy, ArcelorMittal-Indiana Harbor, and U.S. Steel-Gary Works. These sources were listed on the basis of their 2014 SO_2 emissions. In 2014, Cokenergy emitted 4,952 tons, ArcelorMittal-Indiana Harbor emitted 2,163 tons, and U.S. Steel-Gary Works emitted 3,285 tons. As discussed below, this area also has numerous other sources which in 2014 emitted less than 2,000 tons of SO_2. Furthermore, just to the east of this area in adjacent Porter County is another source listed as subject to DRR requirements, namely ArcelorMittal-Burns Harbor, which in 2014 emitted 12,189 tons of SO_2. This facility is being characterized by a new monitoring network and while not addressed in this action is discussed for reference in a later section of this chapter. All of these sources were included in Indiana's modeling analysis.

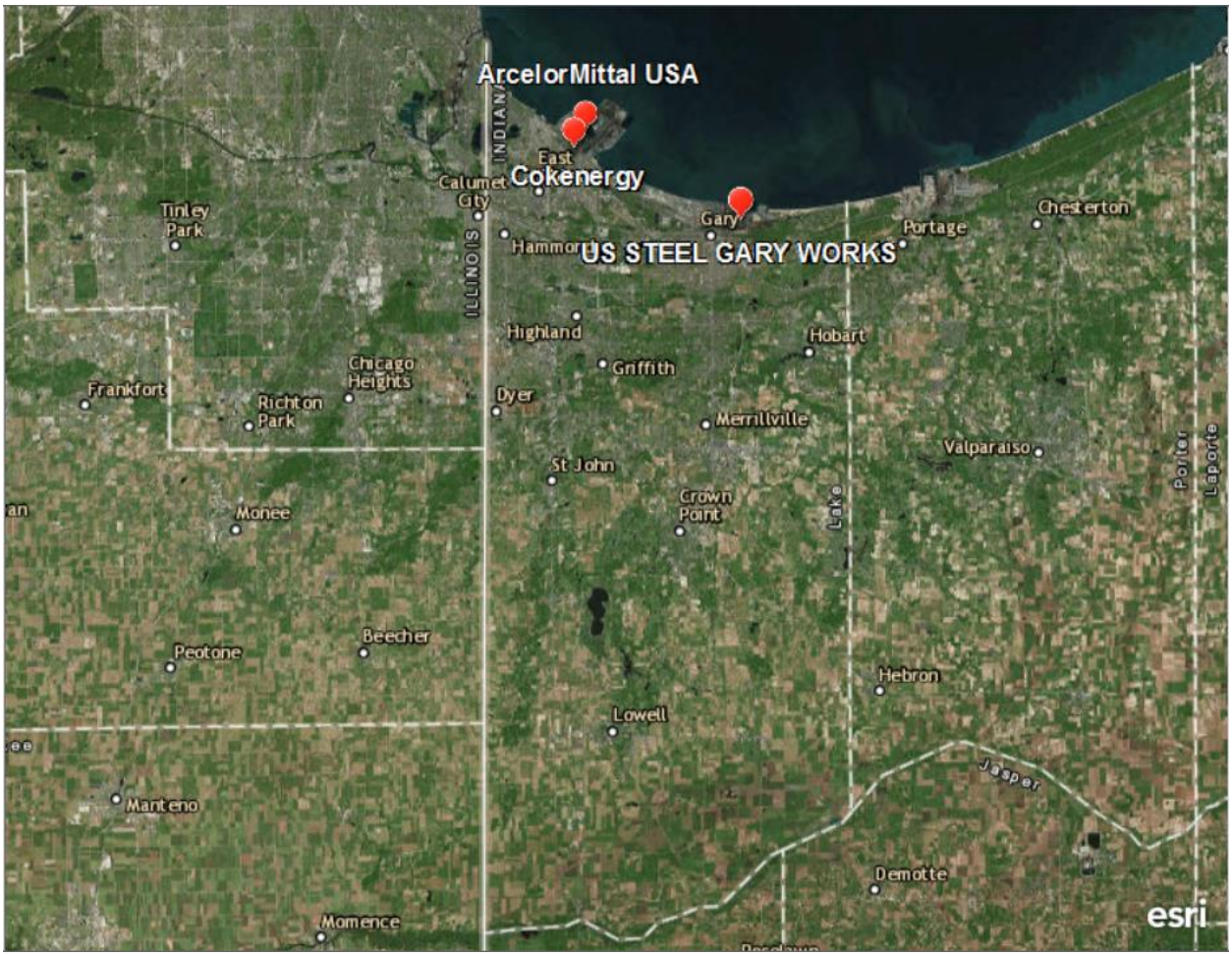
The state's submittal of January 13, 2017, included modeling using AERMOD version 15181. In this model run, the state utilized the non-default regulatory ADJ_U* option, a surface friction velocity option, in AERMET version 15181. However, the EPA released a memorandum on March 8, 2017, stating there was a bug associated with the use of that option with AERMET version 15181. Therefore, the state subsequently remodeled the Lake County area using AERMOD/AERMET version 16216r, thereby using a corrected form of the ADJ_U* option. The state submitted this revised analysis to the EPA on June 26, 2017. The remainder of this section reviews this latter replacement analysis.

In its submission, Indiana recommended that an area that includes the area surrounding the DRR sources, specifically Calumet and North Townships, be designated as attainment based in part on an assessment and characterization of air quality impacts from these facilities. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing a mixture of actual and 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, except that the EPA believes that the remainder of the county, which has no sources emitting over 100 tons of SO_2 per year outside of the area that Indiana modeled, will have better air quality than the northern portion of the county and, more specifically, may be judged to be attaining the standard based on the available evidence that the northern portion of the county is attaining the standard. Therefore, the EPA intends to designate the entirety of Lake County as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented. The remainder of Lake County also meets the EPA's definition of an unclassifiable/attainment area in that it 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.

The area that the state has assessed via air quality modeling is located in the northern portion of Lake County. Figure 24 shows the facilities emitting over 100 tons of SO_2 per year in Lake County. The most notable sources are U.S. Steel, located in Gary, and ArcelorMittal-Indiana Harbor (an integrated steel mill), Cokenergy (a metallurgical coke plant), Carmeuse (a lime kiln),

and British Petroleum (a refinery), located in East Chicago and Hammond. This figure also shows county boundaries, including the borders of Lake County, although Indiana only recommended that the townships in Lake County that abut Lake Michigan be designated attainment. As discussed further below, Carmeuse in particular was modeled at allowable emissions as required by an administrative order that Indiana submitted on December 22, 2016, and which the EPA approved via a direct final rulemaking with an effective date of July 10, 2017.

Figure 24. Map of the Lake County, Indiana, Area



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 only the modeling assessments from the state; the EPA has conducted no modeling analysis of its own and has received no assessments from any other parties.

6.3.2. Model Selection and Modeling Components

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

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

As noted above, the state originally used AERMOD and AERMET versions 15181. However, subsequent to discovery of bugs in the formulation of the ADJ_U* option in this version of AERMET, the state remodeled the area using AERMOD/AERMET version 16216(r). The following discussion reviews this more recent modeling submission.

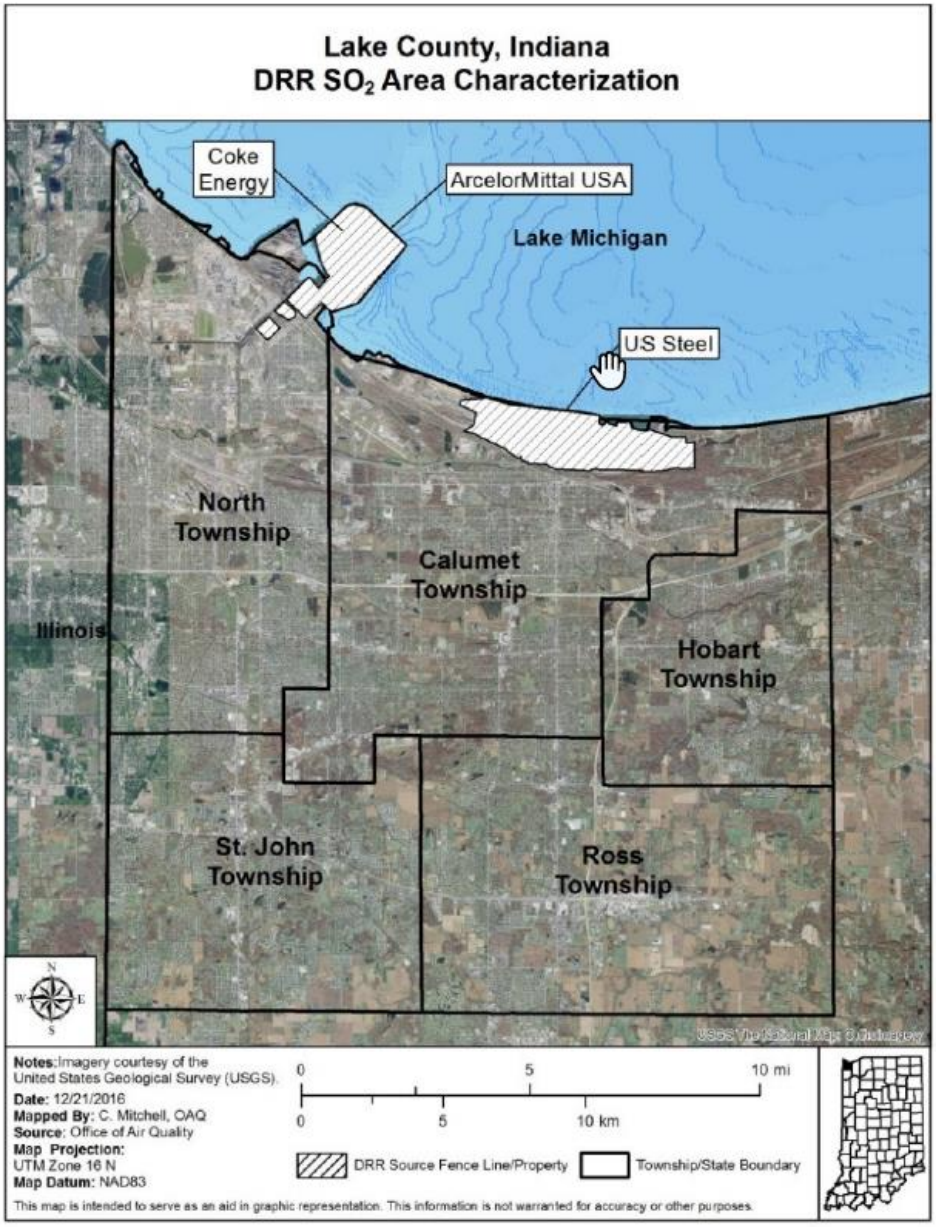
6.3.3. Modeling Parameter: Rural or Urban Dispersion

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

For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in urban mode. Indiana applies the population density criterion as the justification for using AERMOD's urban mode, based on a different approach than that recommended in Appendix W or the Modeling TAD. The location of the sources being modeled is in the heavily industrialized area of northwest Indiana, which is part of the Chicago area. The population near the facilities is very low, especially in the 3 km radius area noted in the guidance. Consequently, the state evaluated population density based on the non-industrial land area associated with the surrounding city of Gary. Indiana reports that the resulting population density meets the 750 people/square kilometer threshold. Indiana does not report any evaluation based on land use criteria. Clearly, the steel mills and coke facility represent moderate to heavy industrial land use that would fall under an urban designation. However, several of the sources are adjacent to Lake Michigan, so that for many candidate centers of 3-kilometer circles, the circles may contain enough of Lake Michigan to result in a finding of less than 50% urban land use. Nevertheless, this area is heavily industrialized, the sources (especially the major steel mills) are high temperature operations that are prone to enhance any present heat island effect, and so Indiana and the EPA historically have modeled this area as an urban area. The recently finalized version of Appendix W acknowledges the challenges associated with modeling non-population oriented urban areas and discusses the need to estimate an equivalent population to account for

the combined effects of industry and populated areas on dispersion. The state has endorsed an analysis of satellite infrared images to help determine the appropriate population to use in AERMOD to simulate the urban heat island impact. Using data from the satellite images, and established relationships between population and urban-rural temperature differences, a population of 1,000,000 was used to represent the heat island impact in the Lake County modeled area. The EPA concurs with modeling this area using urban dispersion coefficients and with the population selected. Figure 25 below shows the location of the primary DRR sources and also shows the generally urban character of the area.

Figure 25: Map Illustrating Urban Character of Northern Lake County



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

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

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Lake County area, the state has included 11 other emitters of SO_2 within a distance up to approximately 25 km. 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 the DRR sources of Cokenergy, ArcelorMittal-Indiana Harbor, and U.S. Steel-Gary Works, the other emitters of SO_2 included in the area of analysis are: ArcelorMittal-USA, BP Amoco, Safety Kleen, Eco Services, Ironside Energy, Carmeuse Lime, ArcelorMittal-Burns Harbor, NIPSCO Bailly, Lafarge, Indiana Harbor Coke, and Koppers. The area has no other sources emitting over 10 tpy, and the state determined that no other sources have the potential to cause significant concentration gradients within the area of analysis. The EPA finds the state's selection of sources appropriate.

To facilitate consideration of variations in background concentrations, the state modeling used two separate receptor grids, one focused on the eastern part of the modeled domain and the second focused on the western portion. All sources were modeled with each grid. The grid receptor spacing for the area of analysis chosen by the state is described as follows:

-50 m spacing at the fence line for each facility,
-100 m spacing beyond facility to 5 km,
-500 m spacing out to 10 km, and
-1000 m spacing beyond 10km to the south.

The east and west receptor networks contained 9,342 and 11,418 receptors, respectively. The combined networks covered 5 townships in northwest Indiana.

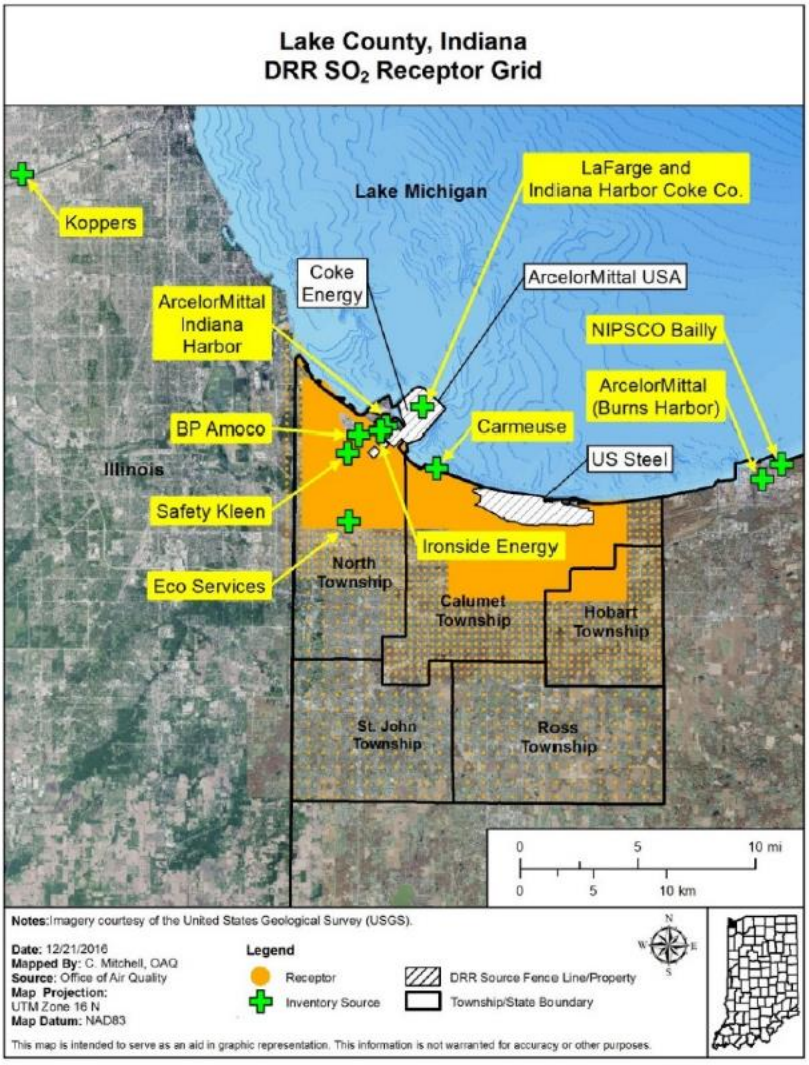
Figure 26 included in the state's recommendation, shows the state's chosen area of analysis, including modeled sources and the receptor grid. For this analysis, receptors were not placed over Lake Michigan, which is consistent with the Modeling TAD. However, potentially inconsistent with the Modeling TAD, it appears the state removed receptors located inside the fencelines of all modeled facilities in each grid. Specifically, for the east grid, receptors were removed from ArcelorMittal. For the west grid, receptors were removed from all remaining modeled facilities. The state submittal notes that ArcelorMittal-Indiana Harbor, Cokenergy, and U.S. Steel-Gary Works have fenced and gated areas with regular security patrols, along with natural boundaries that the state asserts keep unauthorized people off the property. The state did

not place receptors in other locations that it considered to not be ambient air based on the state's interpretation of the Modeling TAD recommendations.

The EPA's primary concern, regarding proper receptor placement and exclusions, is whether the state should have conducted analyses including receptors on plant property, for purposes of assessing whether other facilities are causing violations within the primary plant's boundaries.

However, due to the relatively low release characteristics and fugitive nature common to industrial sources, this issue is most likely to be a concern where two modeled facilities are immediately adjacent. Although some pairs of modeled facilities in this area are in fact immediately adjacent (notably ArcelorMittal-Indiana Harbor and Cokenergy), the highest modeled concentration occurred nearest to a facility that is somewhat apart from other facilities (Carmeuse). Since the combination of impacts from ArcelorMittal-Indiana Harbor and Cokenergy in Indiana's receptor grid were less than the impact of Carmeuse, and the concentrations near Carmeuse are less than the NAAQS, it is likely that the impact of just one of the two adjacent facilities on the other plant's property would also be less than the NAAQS. Therefore, the absence of receptors on plant property likely does not lead to overlooking any situation in which one plant causes violations on a neighboring plant's property. Additionally, with respect to the exclusion of receptors inside plant fencelines, the concentration gradients in the modeled area overall are such that in examining the spatial distribution of impacts, it appears that inclusion of receptors inside each facility's fenceline would not have shown SO_2 violations attributable to a neighboring facility. Therefore, despite the potential inconsistency with the Modeling TAD, the EPA finds that the removal of these receptors does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis for the purpose of assigning a designation.

Figure 26: Receptor Grid for the Lake County Area



The EPA has assessed Indiana's receptor grid for the Lake County area of analysis and confirms that Indiana used receptor grid placements and exclusions adequate for purposes of determining whether this area is attaining the SO_2 standard.

6.3.5. Modeling Parameter: Source Characterization

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

The state characterized 14 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, and the state followed good engineering practices policy in

determining stack heights for facilities modeled with allowable emission levels. One source was modeled at allowable emission levels, and for this source, the good engineering practice stack heights equaled the actual stack heights, all of which were between 24 and 30 meters. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM was used to assist in addressing building downwash. These aspects of the state's modeling are in accordance with the Modeling TAD.

6.3.6. Modeling Parameter: Emissions

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

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

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

As previously noted, the state included 3 DRR facilities and 11 other emitters of SO_2 within roughly 25 km of the main sources in the area of analysis. The state has opted to use a hybrid approach, where emissions from certain facilities are expressed as actual emissions, and those from other facilities are expressed as PTE rates. The facilities in the state's modeling analysis and their associated actual or PTE rates are summarized below.

For all sources except Carmeuse Lime and BP-AMOCO, the state provided annual actual SO_2 emissions between 2013-2015. For ArcelorMittal-Indiana Harbor, Cokenergy, and U.S. Steel-Gary Works, the state modeled combinations of emissions, consisting of CEMS data, 3-year annual average emissions, and temporally varying emissions. Other non-DRR sources were

modeled using combinations of CEMS data, temporally varying (daily or seasonal) emissions if data was available, or 3-year annual average emissions if no other data was available. All of these sources were modeled with actual emissions and actual stack heights for the time period 2013-2015. (For Carmeuse, which is to be modeled at its good engineering practice height, this height is equal to its actual height.) The resulting emission estimates are summarized in Table 17.

Emissions from the BP-Amoco refinery were affected by the Whiting Refinery Modernization Project, which was subject to a consent decree signed by the EPA, the company, and the state and filed on September 28, 2012.[7] The project was completed on May 10, 2014. The state modeled actual emissions from 2015, reflecting reductions due to the Modernization Project and associated consent decree. The approach used to model the BP-Amoco refinery does not follow the TAD recommendations because it only models one year of actual emissions representing conditions after the project and consent decree were in place. If three years of actual emissions had been modeled (i.e., 2013-2015), the average would have been 479 tons per year rather than the 400 tons per year actually modeled. Given the location of the BP-Amoco source relative to the Lake County modeled hotspots, and the relatively short stacks at the facility (i.e., less than 25m) it's unlikely the additional emissions would have affected the area's peak concentrations to any significant degree.

Table 17. Facility Total SO_2 Emissions Between 2013 – 2015 Based on Actual Emissions for the Lake County Area

Facility Name	SO_2 Emissions (tpy)			Emissions Approach
	2013	2014	2015	
Eco Services	255	255	255	3-yr avg.
Safety-Kleen Systems	62	62	62	3-yr avg.
ArcelorMittal-USA	1,843	1,987	2,323	CEMS
Indiana Harbor Coke	2,249	1,907	925	Mostly CEMS
Ironside Energy	220	273	104	CEMS

[7] Case number 2:12-cv-00207-PPS-APR.

Facility Name	SO_2 Emissions (tpy)			Emissions Approach
	2013	2014	2015	
ISPAT Inland LaFarge	98	98	98	3-yr avg.
ArcelorMittal-Burns Harbor	8,468	8,468	8,468	Mostly seasonally varying
NIPSCO Bailly Generating Station	2,419	1,095	515	CEMS
Koppers, Inc. (Illinois Source)	1,786	1,786	1,786	3-yr avg.
ArcelorMittal-Indiana Harbor	1,467	1,349	890	CEMS
U.S. Steel-Gary Works	3,245	3,245	3,245	Some seasonally varying, some 3-yr avg.
Cokenergy	4,653	4,940	6,104	CEMS
BP-AMOCO	400	400	400	2015 average
Total Emissions from All Facilities in the Area of Analysis Modeled Based on Actual Emissions	27,165	25,905	27,175	

Additional sources are located in neighboring Cook County, Illinois. However, these sources are either more distant from the maximum concentration areas in Lake County, Indiana, or have less emissions, or both. The EPA concurs with Indiana's determination that these other sources do not warrant inclusion in Indiana's analysis as explicitly modeled sources.

Carmeuse Lime was addressed on the basis of allowable emissions. For this facility, a non-DRR source, initial modeling showed violations near the facility, due to its own emissions. A Commissioner's Order was prepared that established SO_2 emission limits adequate to show attainment around the Carmeuse facility, considering nearby source emissions as well.

The SO_2 limits for the five Carmeuse Lime Kilns were determined by the state based on modeling. Modeling was conducted to determine limits that demonstrated compliance with the 1-hour SO_2 NAAQS. Each kiln has six stacks. The modeling determined that each kiln would need to be limited to 12 pounds of SO_2 per hour. The limit is written as a 30-day rolling average, and so, consistent with guidance in the EPA's, "Guidance for 1-hour SO_2 Nonattainment Area SIP Submissions," Indiana adopted a lower limit for each kiln designed to be comparably stringent to 12 pounds of SO_2 as a 1-hour limit. Specifically, Indiana set a limit for each kiln at 9.48 pounds of SO_2 per hour as a rolling 720-operating-hour average limit. This limit reflects an adjustment factor of 0.79, which is the average adjustment factor identified in this EPA guidance document for sources (specifically boilers) with no SO_2 control equipment. The EPA finds that modeling each kiln at Carmeuse as emitting 12 pounds of SO_2 per hour (or the critical emission value) is

an appropriate means of evaluating whether the 9.48 pounds per hour (30-day rolling average) limits are comparably stringent and provide for attainment. The EPA proposed to approve the administrative order containing these limits into the SIP on May 10, 2017, at 82 FR 21708, through direct final rulemaking. Because the EPA received no adverse comments on this action, these limits became federally enforceable as of July 10, 2017.

Table 18. SO_2 Emissions based on PTE from Facilities in the Area of Analysis for the Lake County Area

Facility Name	SO_2 Emissions (tpy, based on PTE)
Carmeuse Lime	263
Total Emissions from Facilities in the Area of Analysis Modeled Based on PTE	263

Aside from the relatively minor understatement of 2013-2015 emissions at BP-AMOCO, the emissions used in the Lake County assessment appear to be reasonable characterizations of actual emissions, combined with federally enforceable and effective limits for Carmeuse Lime.

6.3.7. Modeling Parameter: Meteorology and Surface Characteristics

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

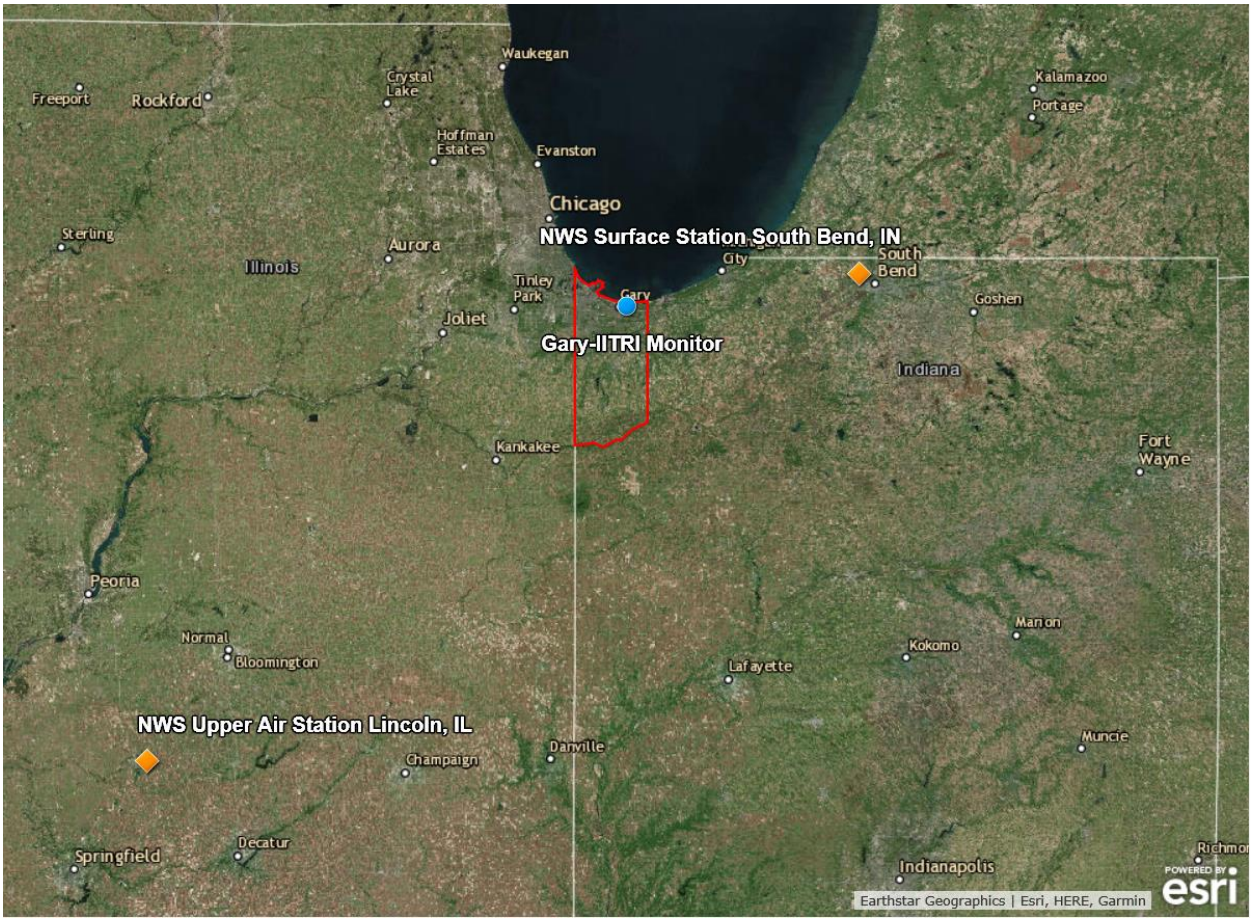
For the area of analysis for the Lake County area, the state selected the surface meteorology from the site at the Illinois Institute of Technology-Research Institute in Gary (Gary-IITRI), located at 41.6067 N and 87.3048 W. This location is just south of the US Steel facility. The state used the South Bend Airport in St. Joseph as a secondary source of surface data to substitute missing site-specific data. (KSBN, 41.7072, -86.3163) Coincident upper air observations from the Lincoln/Logan County Airport (KILX) in Lincoln, Illinois (40.16 N, 89.33W), were used. This station is located approximately 230 km to the southwest. The Gary-IITRI meteorological station is not a National Weather Service site but rather is operated by the State of Indiana and is part of their statewide monitoring network. The location of the meteorological tower is just south of the U.S. Steel – Gary Works facility and reflects the orientation of the important lake breeze/land breeze conditions in this area much better than the nearest available NWS data. While the Gary-IITRI site is not a NWS site, this site collects reliable meteorological data that is likely to be more representative of the meteorology in northern Lake County than any NWS site. These

stations were determined to be the most representative of meteorological conditions within the area of analysis.

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

Figure 27 below, generated by the EPA, shows the locations of these meteorological data stations relative to the area of analysis.

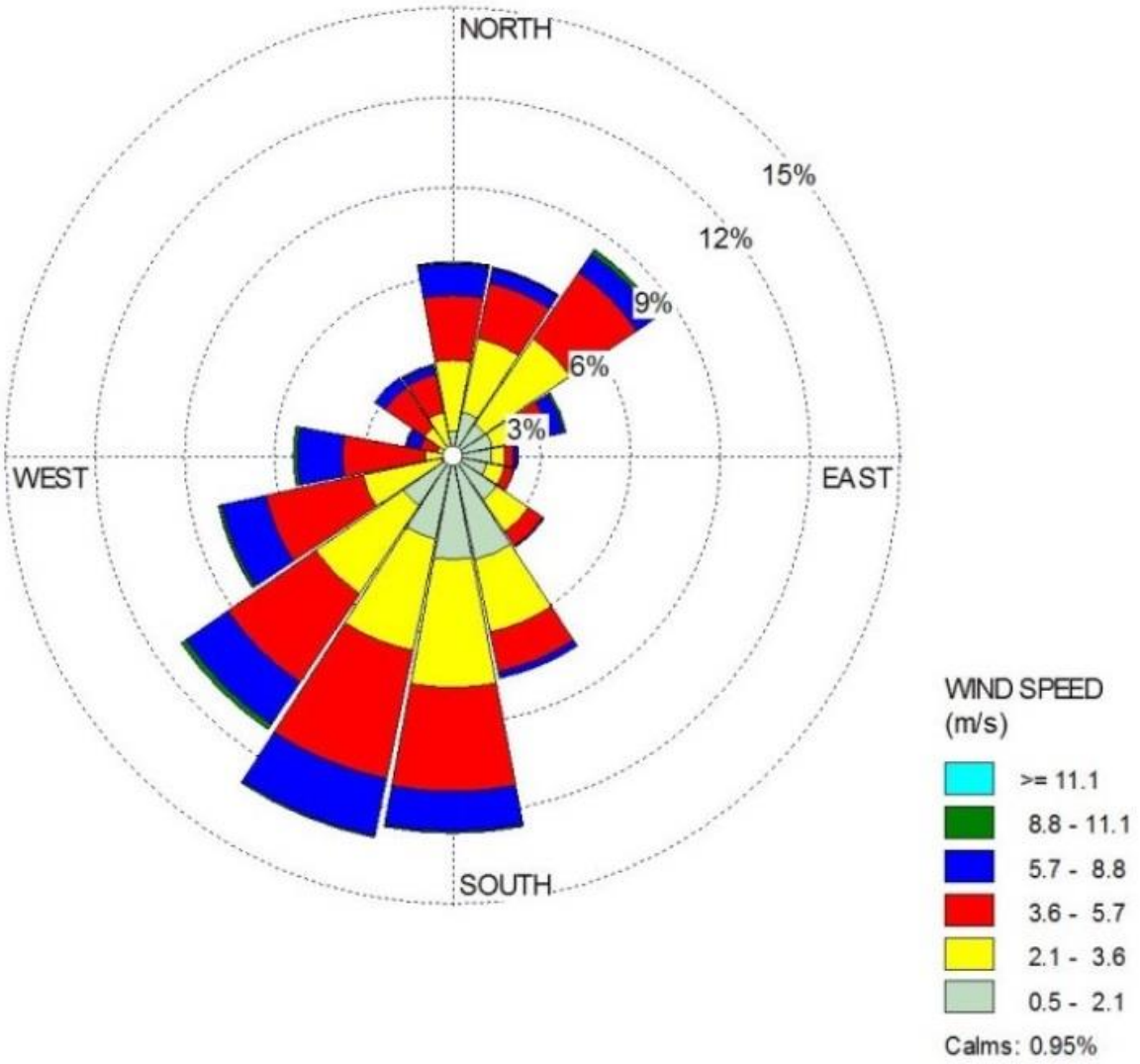
Figure 27. Area of Analysis and the Meteorological Data stations in the Lake County, Indiana Area



As part of its recommendation, the state provided the 3-year surface wind rose for the Gary-IITRI site. In Figure 28, the frequency and magnitude of wind speed and direction are defined in

terms of from where the wind is blowing. The wind is primarily from two directions; southwest and north-northeast. This is typical of land/lake breeze locations and is reflective of the orientation of the lake breeze expected in this area. The surface data file contains very few calm wind hours. The majority of wind speeds fall in the 2-6 m/s range.

Figure 28: Lake County, Indiana, Cumulative Annual Wind Rose for Years 2013 – 2015



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. Notably, the state utilized the ADJ_U* option in AERMET (Version 16216) when processing the meteorological data. This option enhances the surface friction velocity during light wind conditions to help address light wind situations when AERMOD may over predict concentrations. As stated above, the state originally used AERMET (Version 15181) to process the meteorological data with the ADJ_U* option.

However, the discovery of an error in the AERMET code when used with the version 15181 formulation of ADJ_U* necessitated the state rerunning the meteorological data with the newer version (16216). While turbulence data is collected at the Gary-IITRI meteorological site, this data was not used in conjunction with the ADJ_U* option. Evaluations of model performance have indicated that AERMOD can under predict when the ADJ_U* option is used with site-specific turbulence measurements. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in the AERMET User's Guide and Region 5's Meteorological Data Processing Protocol document in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE (version 13016) to best represent surface characteristics. Specifically, 12 wind direction sectors were used with a default radius of 1 kilometer. Albedo and Bowen ratio were adjusted for abnormally wet or dry soil moisture conditions on a monthly basis. Surface roughness values were adjusted for the winter months of December, January, and February. For months with more than half of the days with at least one inch of snow cover, the state used the continuous snow cover value. Otherwise, a value representing no continuous snow cover was used.

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 used in the analysis. This data is in a different formatted file to be processed by a separate preprocessor, AERMINUTE (Version 15272). For the Lake County analysis, AERMINUTE was only used for processing the South Bend NWS data which was substituted for missing data when needed. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The EPA finds that meteorological data used in the assessment is adequately representative of the important weather conditions in the area.

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

The terrain in the area of analysis is best described as relatively flat. To account for the minimal terrain changes, the AERMAP (Version 11103) terrain program within AERMOD was used to

specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is the National Elevation Dataset (NED) using the North American Datum 1983. The EPA finds that Indiana has suitably represented terrain in the area of analysis.

6.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state used a tier 2 approach where the 99th percentile background concentrations were developed on a seasonal and hour of day basis.

The state used temporarily varying SO_2 monitoring data from two area monitors, Hammond station (site number 18-089-0022) covering the western portion of the domain and Gary (site number 18-089-2008) covering the eastern portion. The data at each monitor was refined to generate a 99th percentile value that varied based on a season/hour-of-day basis.

Monitoring data which were influenced by nearby facilities were removed prior to generating a background concentration. The monitored data was paired with the corresponding hourly meteorological conditions. Pollution roses were created and used to identify the wind directions from which the modeled source(s) was contributing to the monitored concentrations. The hours containing concentrations impacted from the modeled source(s) were removed. Only contributions above 10 ppb were removed. This process was used for both the Hammond monitor in the west section and the Gary monitor in the east. The background concentrations for the western portion of the area (taken from the Hammond monitor) are shown in Table 19 below, and the background concentrations for the eastern portion of the area (taken from the Gary monitor) are shown in Table 20 below.[8] The EPA finds these values to provide an appropriate assessment of background concentrations in the pertinent portions of Lake County.

[8] 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 1 ppb = approximately 2.619 $\mu g/m^3$.

Table 19. Temporally Varying Background Values (ppb) for the Western Portion of the Lake County Area

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	5.4	5.7	5.94	6.08	6.12	6.18	5.8	6.14
Spring	5.74	5.53	5.44	5.34	5.6	6.07	6.4	7.03
Summer	4.87	4.63	4.6	4.8	5.57	5.28	6.01	6.57
Fall	5.03	4.13	5.34	3.84	4.61	6.35	6.1	6.28

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	6.73	7.03	8.76	7.72	7.89	7.18	8.78	7.84
Spring	8.27	8.43	9.19	7.68	8.2	8.09	8.14	8.86
Summer	8.97	7.54	8.77	8.31	9	7.96	8.95	6.51
Fall	8.1	8.04	8.11	6.84	8.08	7.52	8.16	7.74

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	6.9	6.18	6.44	5.74	5.58	5.74	5.68	5.58
Spring	8.85	9.4	9.24	7.76	7.9	6.84	7	7.84
Summer	7.76	7.87	7.97	6.31	6.04	8.07	5.69	5.14
Fall	8.91	6.81	7.12	7.31	6.75	5.37	4.9	3.8

Table 20. Temporally Varying Background Values (ppb) for the Eastern Portion of the Lake County Area

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	9.69	7.35	7.1	6.74	6.87	7.03	6.32	7.42
Spring	7.31	4.59	7.82	4.88	6.88	7.84	8.58	6.96
Summer	1.37	1	1	1	1	1	1	1
Fall	6.98	5.64	5.44	5.56	7.57	4.64	5.24	8.02

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	8.35	9.35	9.52	9.35	8.66	8.5	12.29	10.44
Spring	8.22	8.17	10.34	15.5	9.62	9.02	9.54	9.05
Summer	5.83	9.03	7.29	7.47	5.47	4.47	3.93	3.77
Fall	6.9	6.81	8.5	8.82	8.84	8.96	7	6.45

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	9.33	6.84	7.22	8.35	6.4	6.81	8.64	9.04
Spring	8.24	7.84	7.38	6.34	7.32	6.44	8.73	7.58
Summer	3.72	3.97	2.53	2.41	2.4	1	2.24	2.83
Fall	6.46	4.62	4.71	7.14	4.64	4.94	7.01	7.19

6.3.10. Summary of Modeling Inputs and Results –

The AERMOD modeling input parameters for the Lake County area of analysis are summarized below in Table 21.

Table 21: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Lake County Area

Input Parameter	**Value**
AERMOD Version	16216r (ADJ_U*)
Dispersion Characteristics	Urban (1,000,000 population)
Modeled Sources	14
Modeled Stacks	177
Modeled Structures	656
Modeled Fencelines	7
Total receptors	East: 9,342 and West: 11,418
Emissions Type	Hybrid
Emissions Years	2013-2015

Input Parameter	Value
Meteorology Years	2013-2015
Station for Surface Meteorology	Gary-IITRI (State operated) Substitution for Missing Data from South Bend, IN (KSBN)
NWS Station Upper Air Meteorology	Lincoln, IL (KILX)
Station for Calculating Surface Characteristics	Gary-IITRI
Methodology for Calculating Background SO_2 Concentration	Temporally varying. Season/Hour-of-day, from sites 18-089-0022 and 18-089-2008
Calculated Background SO_2 Concentration	1 to 15.5 ppb

The results presented below in Table 22 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 22. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Lake County Area

		Receptor Location UTM zone 16		**99th percentile daily maximum 1-hour SO_2 Concentration (µg/m³)**	
Averaging Period	**Data Period**	**UTM Easting (m)**	**UTM Northing (m)**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2013-2015	466100	4609900	188.5	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 188.5 µg/m³, equivalent to 72.0 ppb. This modeled concentration included the background concentration of SO_2, and is based on a mixture of actual and PTE emissions from the modeled facilities. Figure 29 below was included as part of the state's recommendation, and indicates that the predicted value occurred approximately 150 meters south of the Carmeuse facility. Additional local maximum concentrations, lower than the concentration near Carmeuse, occurred near the ArcelorMittal-Indiana Harbor/Cokenergy facilities and near U.S. Steel in Gary. The state's receptor grid is also shown in the figure.

Figure 29: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Lake County Area

The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all modeled receptors in the area

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

The modeling conducted by the state for the Lake County area generally followed the

recommendations in the Modeling TAD, except as otherwise noted in Section 6.3.4 regarding receptor placement and exclusion. The important components of a modeling assessment, i.e., models used, meteorology, emission estimates, nearby sources modeled, and background concentrations, sufficiently characterize the Lake County area as used in the air quality modeling. The emissions modeled were generated using a variety of estimation techniques, including direct of use of CEMS data, use of available temporally varying operation data, and averaging of tons per year totals. While the use of 3-year averaging of tons per year emissions introduces some uncertainty into the analysis, the approach was primarily used on the smaller units at a facility that did not have additional temporally varying information available to refine the estimates. Additionally, most of the facilities utilizing the yearly average approach (e.g., integrated steel mills and coke companies) typically operate continuously, so that emissions would be relatively steady throughout the year. While use of 2015 emissions for BP-AMOCO understates 2013-2015 emissions, the understatement is modest, and the source is sufficiently distant from maximum concentration areas that this understatement is not judged to affect the finding as to whether the area is attaining the standard. Consequently, the EPA finds that the modeling for Lake County provides a reliable determination that the area is attaining the standard. Additionally, as the modeled facilities' primarily exhibit localized impacts near their own respective fencelines, there is no indication of contribution from these sources to any nearby area that may not be meeting the NAAQS.

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

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

6.5. Jurisdictional Boundaries in the Lake County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Indiana recommended that the EPA designate two townships adjoining Lake Michigan as attainment. The boundaries of townships in Lake County are well established and well known, so that these boundaries provide a good basis for defining the area being designated. Similarly, the county boundaries are also well established and well known and thus provide for an appropriate alternative means of defining a designation area.

6.6. Other Information Relevant to the Designations for the Lake County Area

The EPA has received no third party modeling for this area. Lake County adjoins Porter County, Indiana, which includes ArcelorMittal's Burns Harbor facility. This facility, which emitted 12,189 tons of SO_2 in 2014, is subject to the air quality characterization requirements of the

DRR. Indiana is fulfilling these requirements by overseeing the company's operation of an additional monitor just west of the facility in Porter County, supplementing the existing monitor east of the facility.
The proximity of this DRR source, and the fact that three years of monitoring data from the new site will not be available until after the end of 2019, raises questions about what area may now be designated and what area to reserve to be designated separately no later than December 31, 2020 ("Round 4"). Indiana modeled ArcelorMittal-Burns Harbor, as well as NIPSCO's Bailly Station, just to the east, in its Lake County modeling. Indiana's receptor network for this modeling extended to very close to the Porter County border with Lake County. Furthermore, by including these Porter County sources in its Lake County modeling, Indiana has provided for a full assessment of air quality in the pertinent portion of Lake County, in a manner that accounts for the impact of these Porter County sources. As a result, the EPA concludes that Indiana has adequately justified a conclusion that the entirety of Northern Lake County, and thereby the entirety of Lake County, is attaining the standard and does not contribute to any nearby areas that may not be meeting the NAAQS.

The EPA intends to designate the area near ArcelorMittal-Burns Harbor, located in Porter County, in Round 4, no later than December 31, 2020, specifically the EPA will designate the entirety of Porter County in Round 4. This area, while not addressed in this action, is described in section 11.3 below for reference.

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

The best available evidence regarding air quality in Lake County is the modeling provided by Indiana. In selected respects, this analysis is more conservative than the approach recommended in the TAD. While the state's initial analysis used AERMOD version 15181 which was found to under predict concentrations when used with the ADJ_U* option, Indiana then submitted a replacement analysis that used AERMOD version 16216r, with a corrected formulation of the ADJ_U* option. This latter analysis is suitable and adequately reliable to support a determination that this area does not cause or contribute to any violations of the SO_2 standard.

Monitoring data in the area support a designation of unclassifiable/attainment, but the sites have not been shown to represent concentrations at expected peak concentration locations in the area. Therefore, Indiana's modeling provides a more reliable basis for determining the designation for Lake County than the existing monitoring data.

While Indiana in its January 13, 2017, submittal provides a recommendation of attainment only for Calumet and North Townships in Lake County, the EPA finds the remainder of the county also to be attaining the standard. Indiana has demonstrated that the impacts of the various sources in and near northern Lake County are not causing violations in northern Lake County, and the relative absence of sources in and near southern Lake County suggests that air quality is better in that part of the county. Therefore, the EPA finds that the demonstration that northern Lake County is attaining serves also as adequate evidence that the remainder of the county is attaining

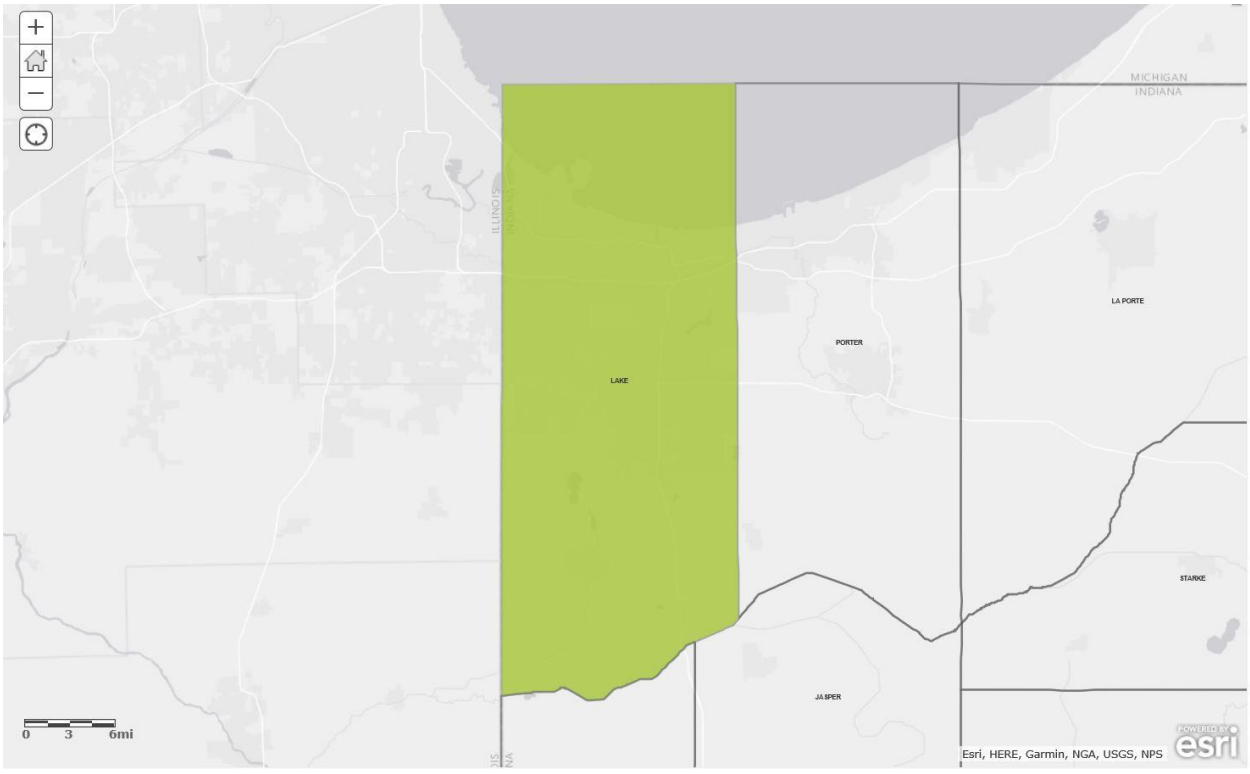
the standard as well. As discussed in Section 11.3 below, even if violations are in the future monitored near ArcelorMittal-Burns Harbor in Porter County, EPA finds that it would be unlikely that Lake County sources would contribute to such violations due to the size of Lake County sources and their distance from Porter County, and Lake County is not nearby to any areas currently violating the NAAQS. Additionally, EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the Lake County 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.

The EPA believes that our intended unclassifiable/attainment area, including the entirety of Lake County, has clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

6.8. Summary of Our Intended Designation for the Lake County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA finds that Lake County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. (Further discussion for why EPA does not believe Lake County sources contribute to violations that may in the future be measured by the new monitoring network in Porter County is provided in Section 11.3 below.) Therefore, the EPA intends to agree with the state's recommendation and intends to designate the entirety of Lake County as unclassifiable/attainment for the 2010 SO_2 NAAQS. Figure 30 shows the boundary of this intended designated area.

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



7. Technical Analysis for the Posey County, Indiana (SABIC), Area

7.1. Introduction

On July 12, 2016, the EPA promulgated a designation of unclassifiable/attainment for most of Posey County, specifically for eight townships designated primarily on the basis of Indiana modeling addressing impacts of the A.B. Brown power plant. However, the EPA concluded that it had insufficient information to designate the remaining two townships in Posey County, specifically Black and Point Townships.

The EPA must designate these remaining two townships in the Posey County, Indiana, area by December 31, 2017, because the area has not been previously designated and Indiana 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 the area. This area includes one source listed and subject to the air quality characterization requirements of the DRR, namely SABIC Innovative Plastics (SABIC). Accordingly, Indiana provided a modeling analysis for the area near this facility, which the EPA reviews in a following subsection. This analysis reflects an emission limit expressed in an Administrative Order that Indiana submitted to the EPA on December 5, 2016. The EPA published direct final approval of this order into the SIP on May 10, 2017 (82 FR 21703). Because the EPA received no adverse comments during the comment period on this action, this action became effective on July 10, 2017. For simplicity, this section will use the term "Posey County Area" to refer to the portion of Posey County near SABIC.

7.2. Air Quality Monitoring Data for the Posey County Area

This factor considers the SO_2 air quality monitoring data in the area of Posey County. No SO_2 monitors are currently being operated in Posey County. The nearest monitor, site number 18-163-0021 in neighboring Vanderburgh County, is about 33 km northeast of SABIC. Therefore, monitoring data provide little evidence as to air quality in the relevant portion of Posey County.

7.3. Air Quality Modeling Analysis for the Posey County Area

7.3.1. Introduction

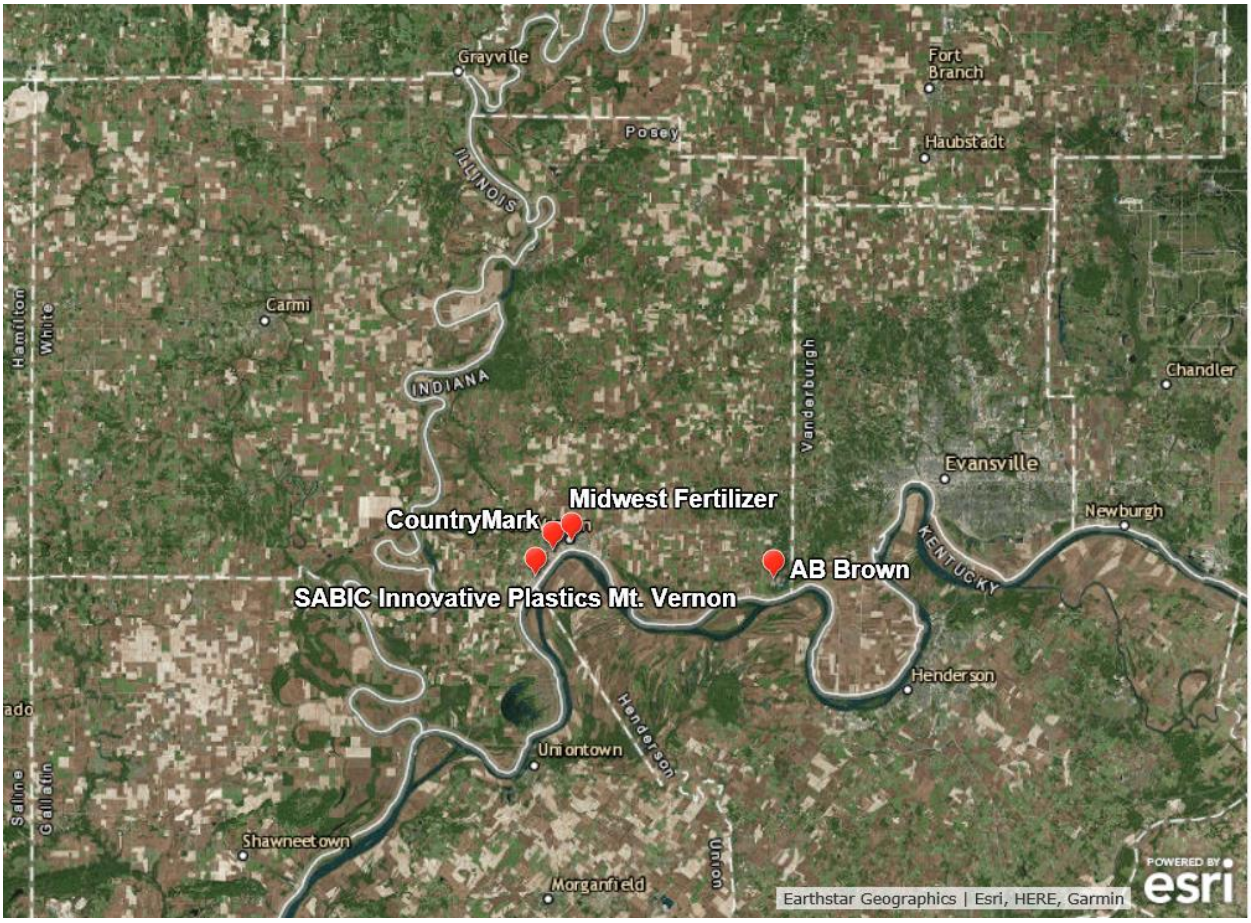
This section 7.3 presents all the available air quality modeling information for the portion of Posey County that includes SABIC. In addition to SABIC, this area also contains a source known as Countrymark Refining. In 2014, SABIC emitted 4,030 tons of SO_2, and Countrymark Refining emitted 476 tons of SO_2. SABIC was listed under the DRR, which Indiana elected to meet by modeling.

In conjunction with this modeling effort, Indiana also issued an administrative order limiting the emissions from SABIC, which the state submitted to the EPA for approval on December 5, 2016. As noted above, this administrative order is now approved as part of Indiana's SIP, so the terms of this order are now federally enforceable and effective. Indiana's modeling analysis is based in significant part on allowable emissions under this administrative order.

In its submission, Indiana recommended that the area near SABIC, specifically Black Township, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility and nearby facilities. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, using allowable emissions from SABIC and using actual emissions from CountryMark Refining. 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. Furthermore, the EPA notes that Indiana's receptor network extends into Point Township of Posey County, the state's modeling also indicates that Point Township is attaining, and so the EPA intends to designate Point Township as unclassifiable/attainment as well. Our reasoning for these conclusions 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 the southwestern corner of Indiana near the state border with Illinois and Kentucky. As seen in Figure 31 below, SABIC is located along the Ohio River southwest of Mount Vernon, Indiana. Countrymark Refining is located approximately 2.5 km northeast of SABIC. A.B. Brown is located approximately 18.5 km east of SABIC. Also included in the figure is the state's recommended attainment area. This figure also shows the Posey County boundaries, although most of the county, other than two townships in the southwest, has already been designated as unclassifiable/attainment in Round 2. The EPA's intended unclassifiable/attainment area for the Posey County/SABIC area is not shown in this figure, but is shown in a figure in the section below that summarizes our intended designation.

Figure 31. Map of the Posey County, Indiana Area



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.

The EPA has received no recent third party modeling for this area. As noted above, the EPA has previously designated the majority of Posey County as unclassifiable/attainment, based on an analysis that focused on the impacts of the A.B. Brown power plant. The purpose of this review is to determine the appropriate designation for the remainder of Posey County. Modeling that Sierra Club submitted during Round 2, which is analyzed in more detail in Section 10 of this chapter, includes receptors throughout Posey County and supports a finding that this portion of Posey County (like the rest of Posey County) is attaining the SO_2 NAAQS.

The following subsections review relevant elements of the state's analysis.

7.3.2. Model Selection and Modeling Components

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

The AERMOD modeling system contains the following components:

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

The state used AERMOD version 15181. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

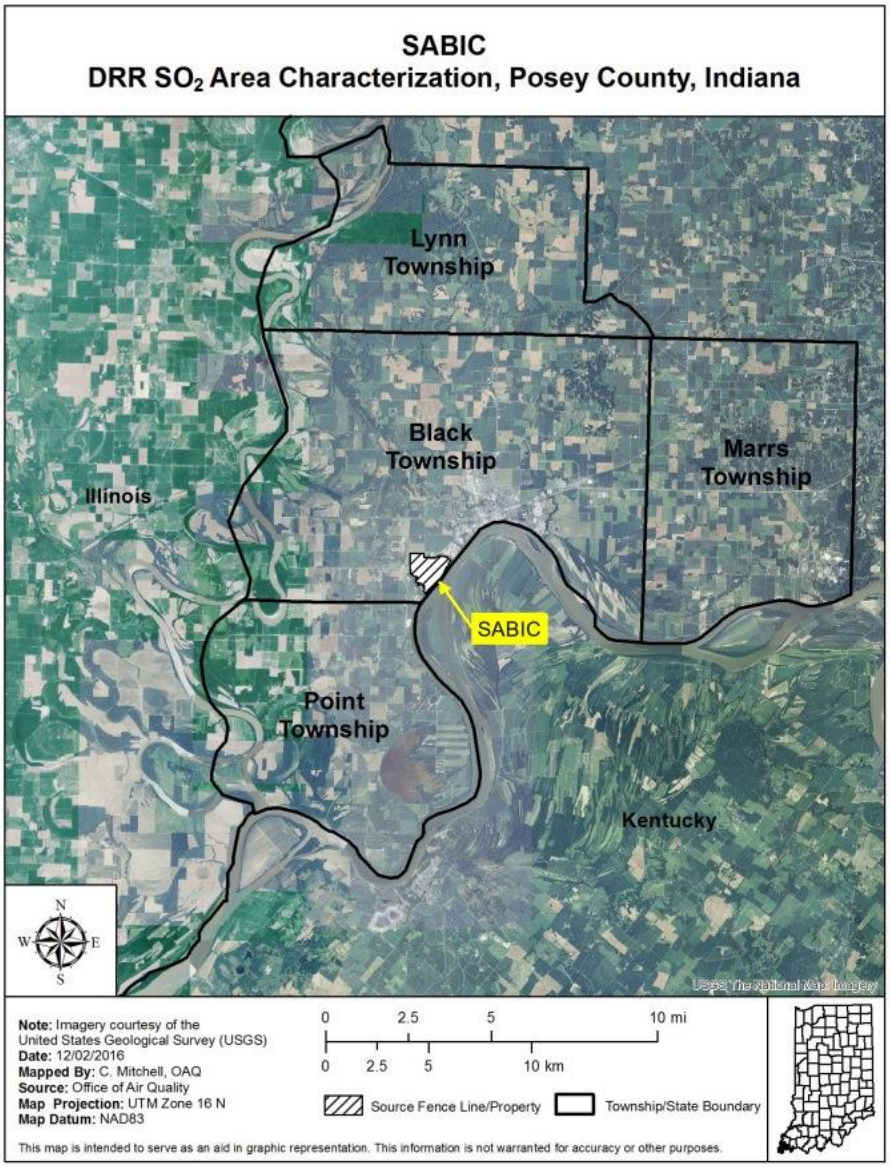
The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the SABIC facility had been completed by mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted friction velocity parameter in AERMET. The SABIC modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used version 16216r instead of version 15181.

7.3.3. Modeling Parameter: Rural or Urban Dispersion

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

For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural mode. This determination was based on results from an Auer's land use classification approach. While no specific tables or charts were provided, the area is clearly rural based on remote visual inspection of satellite imagery. A map provided by the state is included in Figure 32 below.

Figure 32: Land Use Near SABIC



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

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

The source of SO_2 emissions subject to the DRR in this area is described in the introduction to

this section. For the Posey County area, the state has included three other emitters of SO_2, the furthest is approximately 25 km from SABIC. In addition to SABIC, the other emitters of SO_2 included in the area of analysis are: Countrymark Refining, AB Brown, and Midwest Fertilizer. No other sources beyond 25 km were determined by the state to have the potential to cause concentration gradients within the area of analysis. The EPA concurs with the state's determination of sources to include explicitly in the modeling analysis.

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

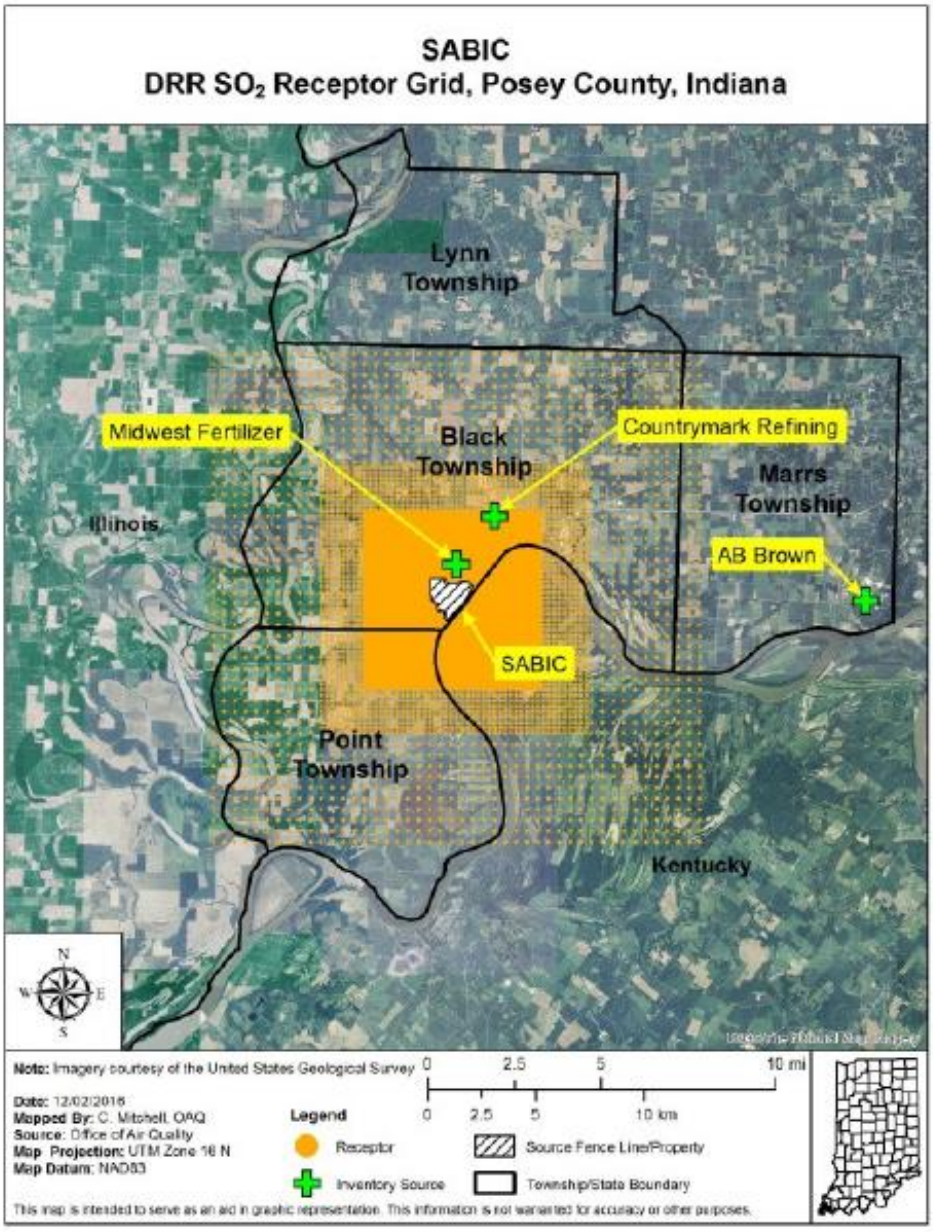
- 50 m spacing along fenceline
- 100 m spacing out to a distance of 3 km
- 250 m spacing out to a distance of 5 km
- 500 m spacing out to a distance of 10 km

The receptor network contained 9,629 receptors, and the network covered 4 townships in Indiana and extended into Kentucky and Illinois.

Figure 33, included in the state's recommendation, show the state's chosen area of analysis surrounding SABIC, 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 each modeled facility, including other facilities' property. The state receptor grid only excluded receptors from the SABIC facility. Inside the Cartesian grid employed by the state, receptors were retained over the Ohio River and over other modeled sources. The submittal describes the SABIC facility as being fully fenced with regular patrols.

Figure 33: Receptor Grid for the Posey County Area



7.3.5. Modeling Parameter: Source Characterization

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

The state included three other sources in the modeling, in addition to SABIC. The three sources are: Midwest Fertilizer, Countrymark Refining, and AB Brown. The sources were included because of their potential contribution to SO_2 concentrations in the area around SABIC.

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 a hybrid approach where actual stack heights were used in conjunction with actual emissions and allowable emissions were used with GEP equivalent stack heights. Permitted limits were modeled for SABIC, A.B. Brown, and Midwest Fertilizer, and consequently, GEP stack heights were used. (In all cases, the actual stack heights were found to be fully creditable as GEP.) The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM (Version 04274) was used to assist in addressing building downwash.

The EPA finds the state adequately characterized the dispersion parameters from the sources included in the modeling.

7.3.6. Modeling Parameter: Emissions

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

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

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

As previously noted, the state included SABIC and 3 other emitters of SO_2 in the area of analysis. The state has opted to use a hybrid approach, where emissions from certain facilities are expressed as actual emissions, and those from other facilities are expressed as PTE rates. The facilities in the state's modeling analysis and their associated actual or PTE rates are summarized

below.

For SABIC, A.B. Brown, and Midwest Fertilizer, the state modeled allowable SO_2 emissions. For SABIC, the pertinent limits are in an administrative order that the EPA approved into the SIP on May 10, 2017, effective July 10, 2017. For AB Brown, the limits are in an administrative order that the EPA approved on May 6, 2016 (at 81 FR 27330), in conjunction with the Round 2 designations. For Midwest Fertilizer, the limits are in an already effective construction permit. Countrymark was initially modeled using emission rates that reflected reductions that had occurred by 2015, but then the state conducted remodeling using a fixed average actual emissions level representing the average emissions in the years 2013 to 2015. The emissions information for SABIC, AB Brown, and Midwest Fertilizer is summarized in Table 23, and the emissions information for Countrymark Refining is summarized in Table 24

Table 23. SO_2 Emissions based on Permitted Limits from Facilities in the Area of Analysis for the Posey County Area

Facility Name	SO_2 Emissions (tpy, based on allowable emissions)
SABIC	2,100
AB Brown	9,443
Midwest Fertilizer	1.3
Total Emissions from Facilities in the Area of Analysis Modeled Based on PTE	~11,500

Table 24. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Area of Analysis for the Posey County Area

	SO_2 Emissions (tpy)		
Facility Name	**2013**	**2014**	**2015**
Countrymark Refining	475	476	66
Total Emissions from All Facilities in the Area of Analysis Modeled Based on Actual Emissions	475	476	66

Table 24 shows actual emissions for Countrymark Refining for each of the listed years, but, as mentioned above, Countrymark was modeled using the average actual emissions across these three years, i.e., 339 tpy. While this is not a recommended approach under the Modeling TAD, the lower emissions for this facility as compared to other facilities' emissions and the distance and direction from the expected area of maximum concentrations is such that use of more accurately time-resolved emission estimates would likely not materially affect the maximum modeled concentration for the area.

The EPA finds that the emissions estimates used in the final modeling from Indiana are adequately representative of emissions from sources in the Posey County area around SABIC.

7.3.7. Modeling Parameter: Meteorology and Surface Characteristics

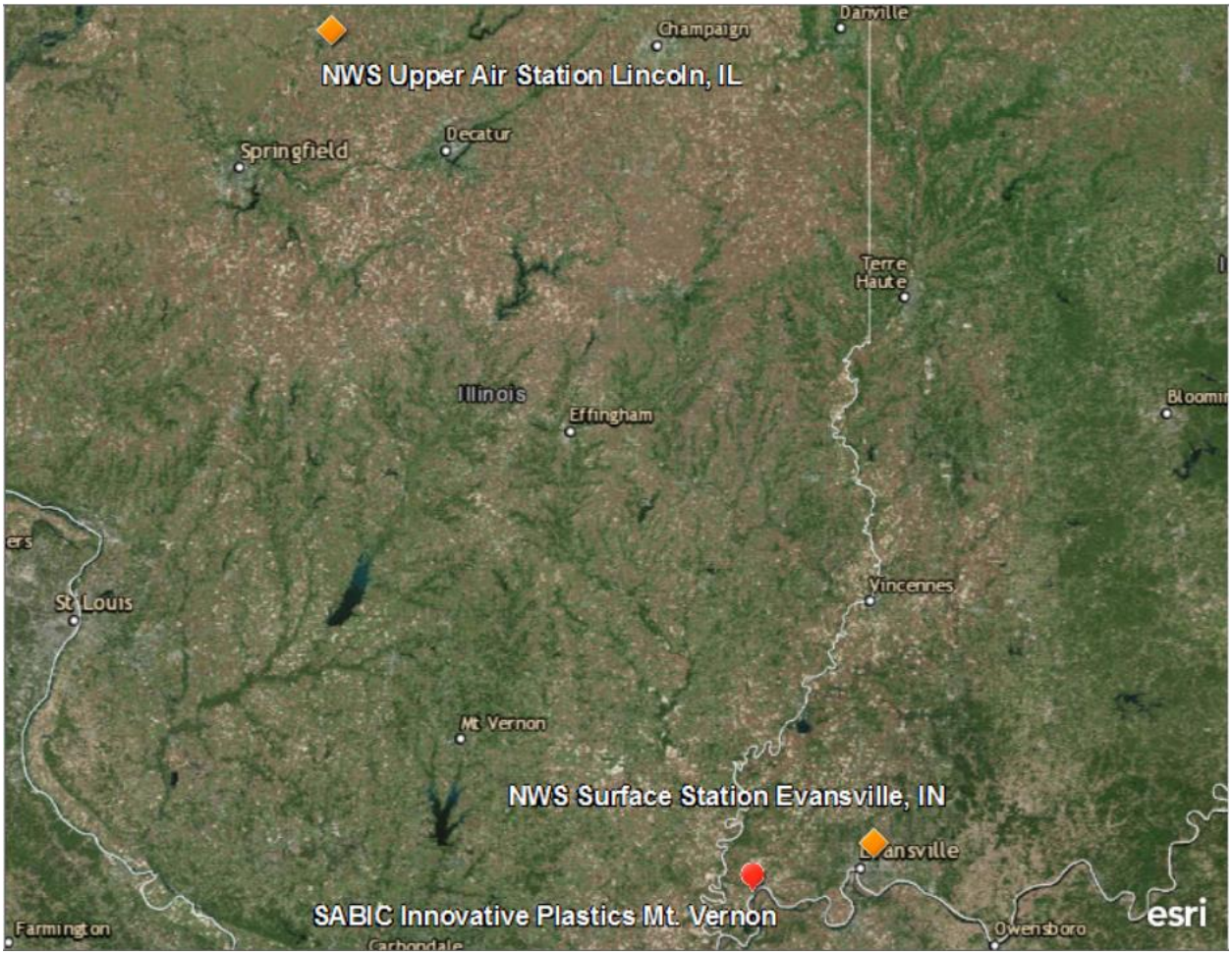
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

For the area of analysis for the Posey County/SABIC area, the state selected the surface meteorology from the Evansville, Indiana, NWS station, located approximately 40 km to the northeast of the source, and coincident upper air observations from the Lincoln, Illinois, NWS station, located approximately 280 km to the northwest of the source. These were judged to be stations most representative of meteorological conditions within the area of analysis.

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

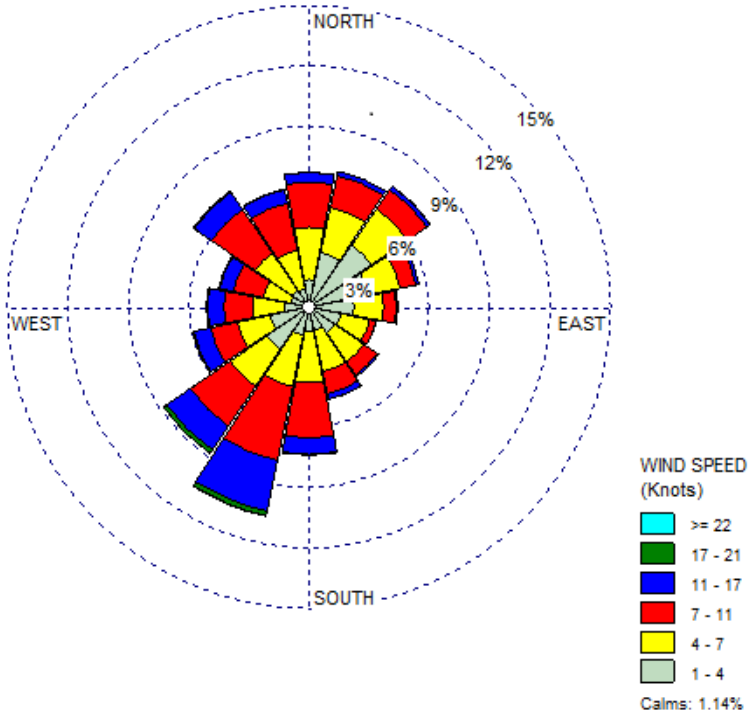
In Figure 34 below, generated by the EPA, the locations of these NWS stations are shown relative to the area of analysis.

Figure 34. Area of Analysis and the NWS stations in the Posey County Area



As part of its recommendation, the state provided the 3-year surface wind rose for the Evansville, Indiana, NWS station. In Figure 35, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Predominant winds are from the south to southwest, although the wind blows from all directions for a significant percentage of time. The majority of wind speeds are in the 4 to 11 knot range. Approximately 1.14 percent of the hours are reported as calm.

Figure 35: Evansville, Indiana, NWS Cumulative Annual Wind Rose for Years 2013 – 2015



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET (version 15181) processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state generally followed the methodology and settings presented in the AERMET and AERSURFACE User's Guides as well as recommendations in the Region 5 Meteorological Data Processing Protocol document, in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE (version 13016) 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 Evansville, Indiana, surface station, noted above, and processed a separate preprocessor, AERMINUTE (Version 15272). These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of

concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The SABIC facility is located along the Ohio river with generally flat to rolling terrain. Consequently, the meteorological data used in the SABIC area modeling analysis is considered adequately representative of the weather conditions in the area.

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

As noted above, the terrain in the area of analysis is best described as flat to rolling with elevation increases of generally less than 30 m in any direction out to about 10 km. To account for the terrain changes, the AERMAP (Version 11103) terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983.

The EPA finds that the terrain surrounding the SABIC plant was adequately represented in the state modeling analysis of the area.

7.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state used a tier 2 approach where the 99th percentile background concentrations were developed on a seasonal and hour of day basis. The state used SO_2 monitoring data from the Evansville – Buena Vista (AQS #18-163-0021) for the years 2013-2015. A wind direction analysis was conducted to remove values impacted from large sources directly upwind of the monitor and included in the monitoring. The monitored data was paired with the corresponding hourly meteorological conditions. Pollution roses were created and used to identify the wind directions from which the modeled source was contributing to the monitored concentrations. The hours containing concentrations impacted from the modeled source were removed. Only contributions above 10 ppb were removed. The monitor is located about 30 km to the northeast of the SABIC facility. The background concentrations for this area are shown in Table 25 below.

Table 25 - Posey County Temporally Varying Background Values (ppb) [9]

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	6.30	4.83	4.63	4.36	5.77	4.84	4.70	7.39
Spring	5.12	3.89	4.09	3.98	3.40	4.20	6.83	7.59
Summer	2.70	2.48	1.00	1.00	1.96	2.65	2.80	5.55
Fall	4.44	4.52	4.50	4.50	4.80	4.60	4.97	5.70

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	9.29	10.42	9.20	10.67	11.55	17.57	8.71	16.01
Spring	9.99	9.84	11.89	11.65	7.94	9.89	8.39	8.55
Summer	9.93	11.05	8.50	9.02	7.34	5.65	5.49	5.16
Fall	7.55	10.68	11.37	11.21	10.39	12.92	9.11	7.56

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	9.94	16.85	8.28	6.67	5.74	6.58	6.79	7.98
Spring	11.04	12.53	9.99	8.40	5.81	3.92	7.04	6.65
Summer	4.11	6.99	5.88	4.05	3.36	2.45	3.58	2.19
Fall	8.20	6.95	5.23	8.60	5.70	4.68	4.46	4.40

The EPA finds that the background values used in the SABIC modeling assessment adequately represent the SO_2 contribution of non-modeled sources in the area.

7.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Posey County area of analysis are summarized below in Table 26.

Table 26: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Posey County Area

Input Parameter	Value
AERMOD Version	15181 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	4
Modeled Stacks	68

[9] 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 1 ppb = approximately 2.619 $\mu g/m^3$.

Input Parameter	Value
Modeled Structures	145
Modeled Fencelines	1
Total receptors	9,629
Emissions Type	Mixed actual and allowable
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Evansville, IN NWS (KEVV)
NWS Station Upper Air Meteorology	Lincoln, IL NWS (KILX)
NWS Station for Calculating Surface Characteristics	Evansville, IN NWS (KEVV)
Methodology for Calculating Background SO_2 Concentration	Used site 18-063-0021 to generate season by hour-of-day.
Calculated Background SO_2 Concentration	Values ranged from 1.00 ppb to 11.65 ppb

The results presented below in Table 27 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

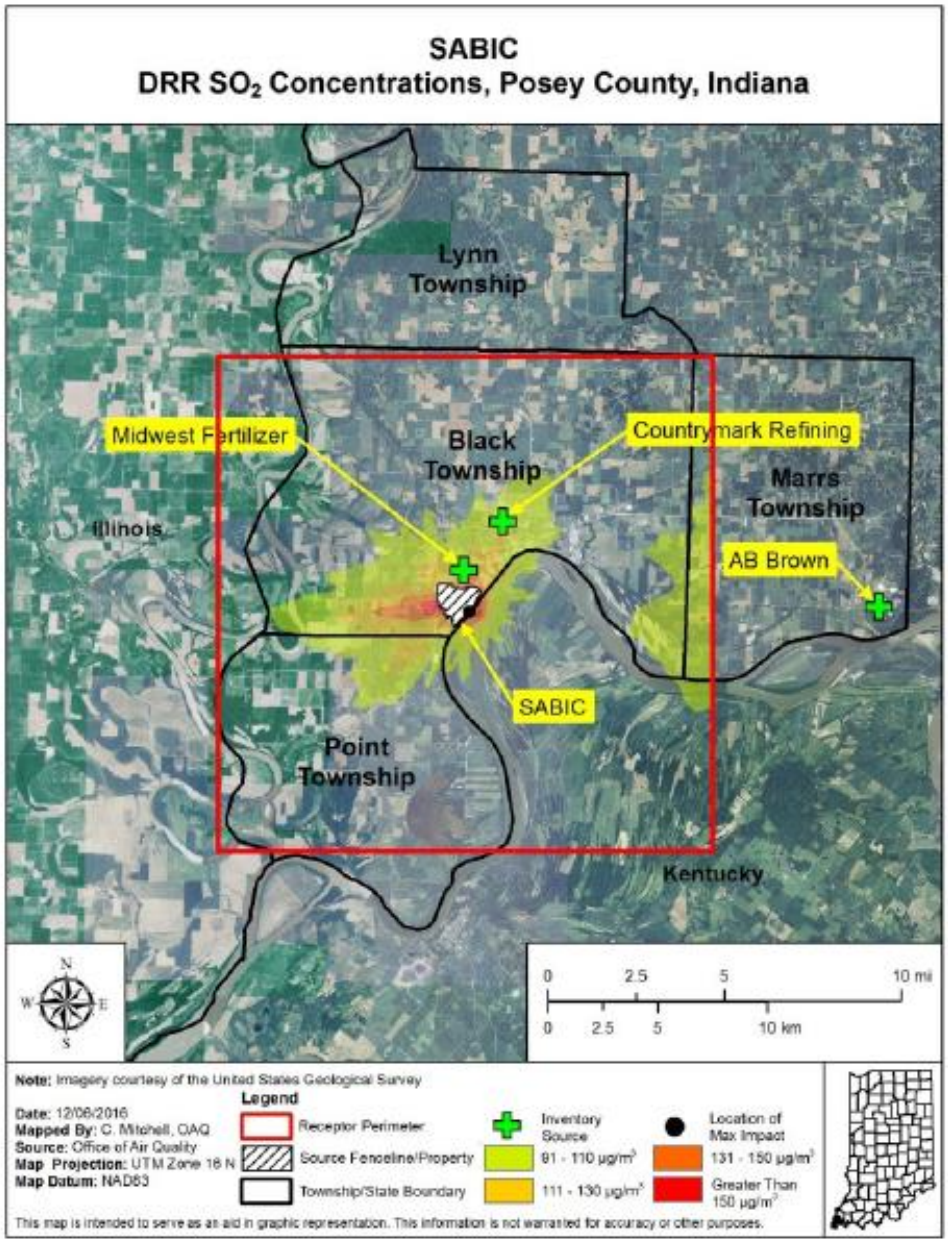
Table 27. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Posey County Area

Averaging Period	Data Period	Receptor Location UTM zone 16		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	2013-2015	418467	4195409	191.92	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 191.92 $\mu g/m^3$, equivalent to 73.3 ppb. This modeled concentration included the background concentration of SO_2, and is based on a mix of actual and allowable emissions from the modeled facilities. Figure 36 below was included as part of the state's recommendation, and indicates that the predicted value occurred near the southeast fenceline of SABIC. The state's receptor grid extent and contours are also shown in the figure.

Figure 36: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Posey County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all modeled receptors in the area.

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

The modeling conducted by the state for the area around the SABIC facility followed the

recommendations in the TAD. The important components of a modeling assessment, i.e., models used, meteorology, emission estimates, nearby sources modeled, and background concentrations, all adequately comply with the TAD and with general modeling expectations. The design value predicted in the compliance run is below the SO_2 NAAQS.

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

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

7.5. Jurisdictional Boundaries in the Posey County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Indiana recommended that the EPA designate Black Township within Posey County as attainment. The EPA intends in addition to designate Point Township. The boundaries of townships in Posey County are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

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

The EPA has received no recent third party modeling for this area. As noted above, the EPA has previously designated the majority of Posey County as unclassifiable/attainment, based on an analysis that focused on the impacts of the A.B. Brown power plant. The purpose of this review is to determine the appropriate designation for the remainder of Posey County. Modeling that Sierra Club submitted during Round 2, which is analyzed in more detail in Section 10 of this chapter, includes receptors throughout Posey County and supports a finding that this portion of Posey County (like the rest of Posey County) is attaining the SO_2 NAAQS.

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

The best available evidence regarding air quality in Posey County is the modeling provided by Indiana. For SABIC and for most of the other sources, Indiana relied on allowable emission levels; for Countrymark, Indiana relied on actual emission levels. As noted above, the EPA approved the administrative order limiting SABIC emissions into the SIP on May 10, 2017, effective July 10, 2017. On May 6, 2016, the EPA approved an administrative order into the SIP limiting emissions from A.B. Brown, which was a key factor in designating the area around that facility as unclassifiable/attainment in Round 2. The modeling reflected the recommendations of the TAD and provides a reliable assessment that supports Indiana's recommended finding that the Posey County/SABIC area does not cause or contribute to violations of the 1-hour SO_2

NAAQS.

No monitoring data are available close enough to this area to provide reliable evidence in the assessment of air quality in this area.

While Indiana in its January 13, 2017, submittal provides a recommendation only for Black Township in Posey County, the EPA also finds that Point Township, the other as yet undesignated portion of Posey County, is also attaining the standard. Indiana has demonstrated that the impacts of SABIC and other nearby sources do not cause violations of the standard in either of these as yet undesignated townships in Posey County. As discussed in Section 10 below, the EPA believes that Posey County sources do not contribute to violations in Warrick County, which are attributable to localized source impacts. No other violations are found within 100 km to be evaluated for contribution from this area.

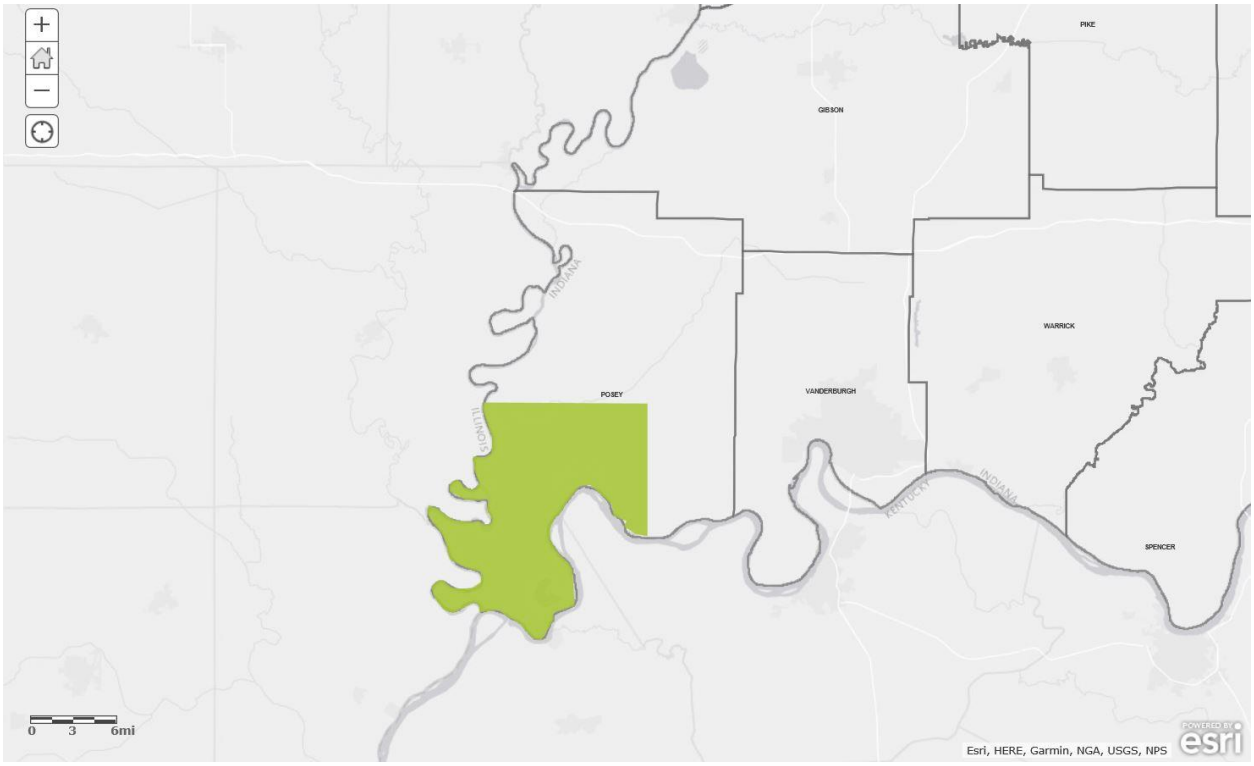
Therefore, the EPA intends to designate both townships as unclassifiable/attainment. The EPA believes that our intended unclassifiable/attainment area, including Black and Point Townships in Posey County, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

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

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA finds that the pertinent portion of Posey County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS, and so the EPA intends to designate the portions of Posey County not previously designated, i.e., Black and Point Townships, as unclassifiable/attainment for the 2010 SO_2 NAAQS.

Figure 37 shows the boundary of this intended designated area.

Figure 37. Boundary of the Intended Posey County Unclassifiable/Attainment Area



8. Technical Analysis for the Sullivan County (Merom) Area

8.1. Introduction

The EPA must designate the Sullivan County, Indiana, area by December 31, 2017, because the area has not been previously designated and Indiana 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 the area. This county includes one source listed and subject to the air quality characterization requirements of the DRR, namely Hoosier Energy's Merom Station (Merom). Accordingly, Indiana provided a modeling analysis for the area near this facility, which the EPA reviews in a following subsection.

8.2. Air Quality Monitoring Data for the Sullivan County Area

This factor considers the SO_2 air quality monitoring data in the area of Sullivan County. No SO_2 monitors are currently being operated in or near Sullivan County. Therefore, monitoring data provide little evidence as to air quality in Sullivan County.

8.3. Air Quality Modeling Analysis for the Sullivan County Area

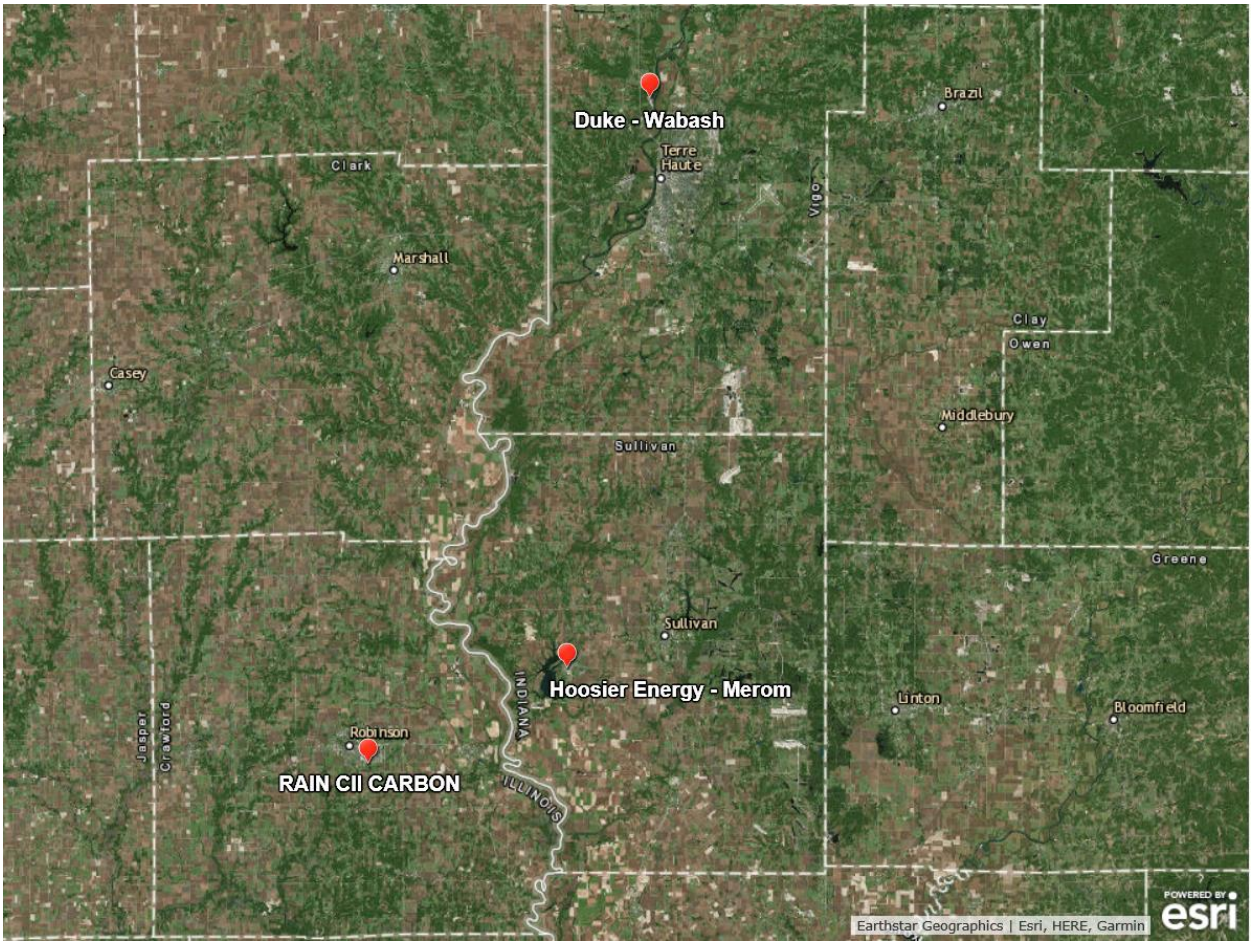
8.3.1. Introduction

This section 8.3 presents all the available air quality modeling information for a portion of Sullivan County that includes Merom. In 2014, Merom emitted 3,318 tons of SO_2. Therefore, this source was listed under the DRR. Indiana elected to address the resulting DRR requirements by modeling. This county includes no other sources emitting more than 100 tons of SO_2 per year.

In its submission, Indiana recommended that the EPA designate only the township that contains Merom, Gill Township, 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 intends to designate the area as unclassifiable/attainment, except that the EPA intends to designate the entire county 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 Sullivan County. As seen in Figure 38 below, Merom is located east of the municipality of Merom, just east of the southern portion of the Illinois-Indiana border. The figure also shows county boundaries, including boundaries for Sullivan County (the county that contains Merom), although Indiana recommended that only the one townships that contains Merom be designated attainment. The EPA's intended unclassifiable/attainment area boundaries for this area are not shown in this figure, but this figure does show the county boundaries, which is the area that EPA intends to designate unclassifiable/attainment, and the EPA's intended designated area is shown more directly in a figure in the section below that summarizes our intended designation.

Figure 38. Map of the Sullivan County Area Addressing Merom



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 only a modeling assessment from the state; the EPA has conducted no modeling analysis of its own and has received no assessments from any other parties. The following subsections review relevant elements of the state's analysis.

8.3.2. Model Selection and Modeling Components

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

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface

observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

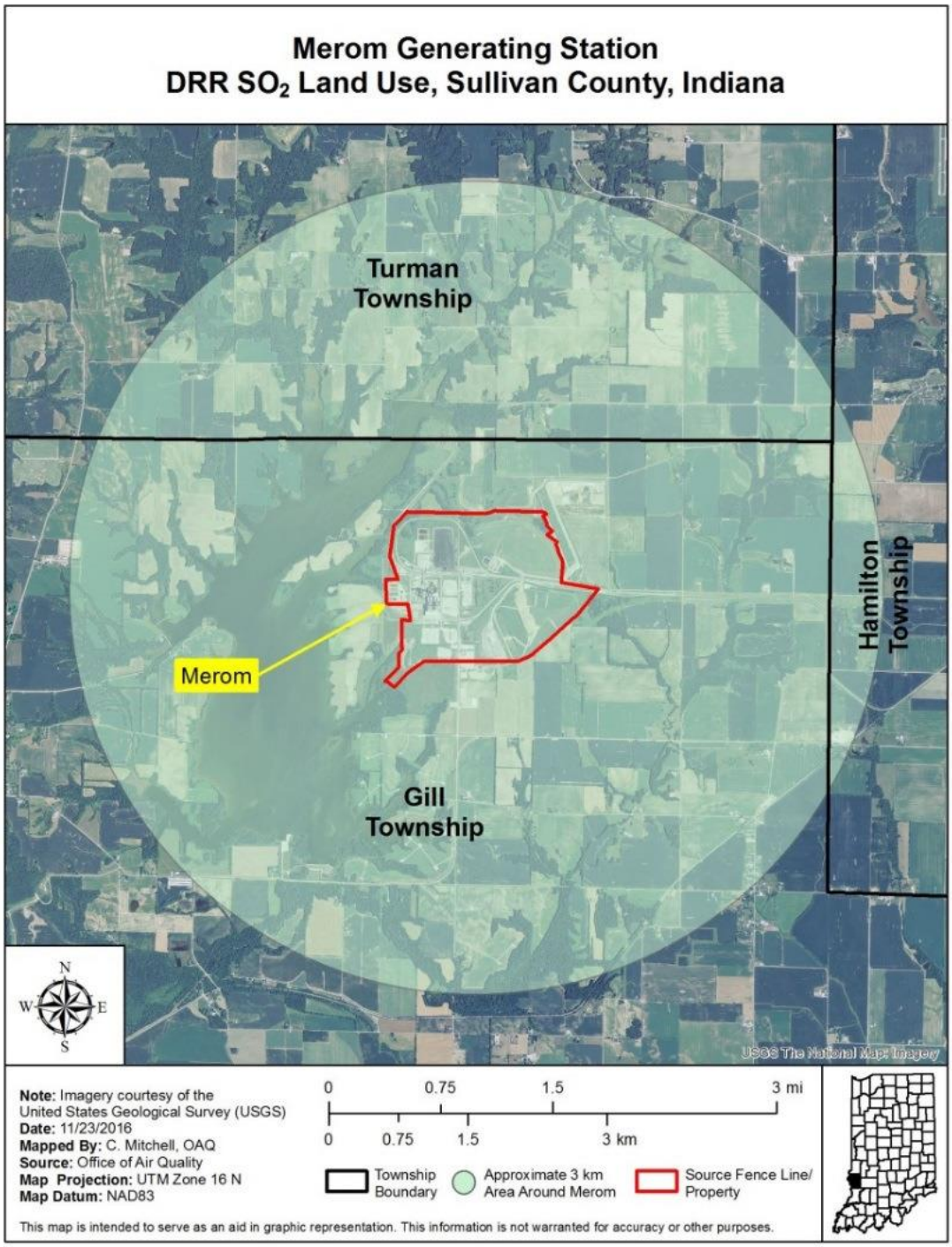
The state initially used AERMOD version 15181 with default options. The EPA found an inconsistency in the state's initial modeling submittal with regards to the array of seasonally varying background concentrations. The state remodeled using version 16216r with default options. The latter modeling submittal is reviewed here. Both submissions show no violations of the standard. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

8.3.3. Modeling Parameter: Rural or Urban Dispersion

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

For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural model. This determination was based on results from an Auer's land use classification approach. While no specific tables or charts were provided, the area is clearly rural based on a visual inspection using satellite imagery. A map provided by the state is included in Figure 39 below. The EPA concurs that this area warrants being modeled as rural.

Figure 39. Land Use in Sullivan County Near Merom



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

The TAD recommends that the first step towards characterization of air quality in the area

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

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Sullivan County area, the state has included two other emitters of SO_2, the furthest source located 50 km to the north. 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 violations in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to Merom, the other emitters of SO_2 included in the area of analysis are: Rain CII Carbon and Duke – Wabash. No other sources within or beyond 50 km were determined by the state to have the potential to cause significant concentration gradients within the area of analysis. The EPA believes that the state has made appropriate judgments about which sources are likely to cause significant concentration gradients in the area of interest and concurs with the state's determination of appropriate sources to model explicitly.

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

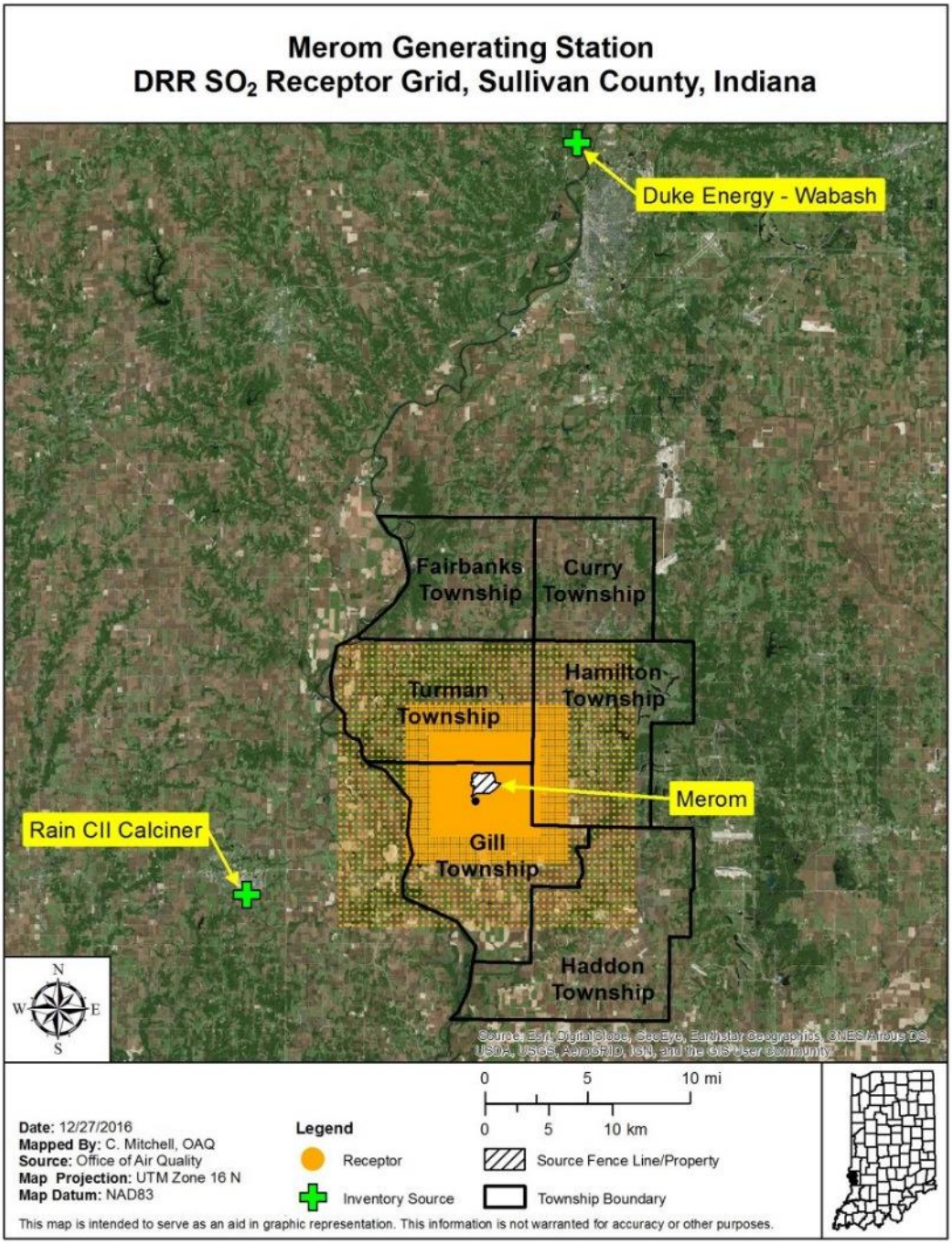
- 50 m spacing along fenceline
- 100 m spacing out to a distance of 3 km
- 250 m spacing out to a distance of 5 km
- 500 m spacing out to a distance of 10 km

The receptor network contained 9,775 receptors, and the network covered 6 townships in Indiana and extends into extreme eastern Illinois.

Figure 40, included in the state's recommendation, shows the state's chosen area of analysis 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 each modeled facility. The state only excluded receptors from the Merom facility property. The state documentation notes that "Merom has a fence surrounding the property with security gates restricting public access." They further state that natural barriers surround the property to the west and north. Indiana provided no further support for the exclusion of the on-property receptors. However, the peak modeled concentration did not occur on the fenceline but rather about 1 km to the north of their stated property boundary. With respect to the exclusion of receptors inside the Merom fence line, the concentration gradients in the modeled area overall are such that in examining the spatial distribution of impacts, it appears that inclusion of receptors inside the Merom fence line (potential ambient air boundary) would not have shown SO_2 violations. Therefore, despite the potential inconsistency with the Modeling TAD, the EPA finds that the removal of these receptors does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area.

Figure 40: Area of Analysis and Receptor Grid for the Sullivan County Area



The receptor network submitted by the state is adequate to determine peak concentrations from emissions in the area surrounding the Merom facility.

8.3.5. Modeling Parameter: Source Characterization

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

The state modeled the DRR source, Merom, along with two other sources; Rain CII Carbon and Duke – Wabash. The state characterized these source(s) 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 characterized the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The Merom facility modeled hourly varying emissions with a uniform temperature and varying exit velocities. The Rain CII Carbon facility was also modeled using hourly varying emissions and used a fixed velocity and variable temperatures. Where appropriate, the AERMOD component BPIPPRM (Version 04274) was used to assist in addressing building downwash. Building downwash was modeled for the Merom facility, however, downwash was not modeled for the Rain CII Carbon plant or the Duke-Wabash facility given the distance of those sources to the Merom area of interest.

The EPA finds that the modeled values used in the Merom area modeling for these parameters are reasonable.

8.3.6. Modeling Parameter: Emissions

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

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

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

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

As previously noted, the state included Merom and two other emitters of SO_2 within 50 km of the area of analysis. The state has chosen to model these facilities using actual emissions. The facilities in the state's modeling analysis and their associated annual actual SO_2 emissions between 2013 and 2015 are summarized below.

For Merom, Rain CII Carbon, and Duke – Wabash, the state did not provide annual actual SO_2 emissions for the years 2013 to 2015. Data from the NEI was examined and is shown in Table 28 below. A description of how the state obtained hourly emission rates is given below this table.

Table 28. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Sullivan County Area

	SO_2 Emissions (tpy)		
Facility Name	**2013**	**2014**	**2015**
Hoosier Energy - Merom	2,815	3,317	2,578
Rain CII Carbon *	2,958	3,134	2,160
Duke – Wabash River	29,038	26,828	28,596
Total Emissions from All Modeled Facilities in the State's Area of Analysis	34,811	33,279	33,334

* Emissions are taken from Illinois EPA (IEPA) DRR submittal for Rain CII Carbon. Actual hourly emissions were provided to IEPA by Rain CII Carbon based on hourly operating data and variable feed and coke sulfur levels.

For the Merom facility, the actual hourly emissions data were obtained from CEMS data provided by the facility. While these numbers are slightly lower than the total of the emissions reported to CAMD, the difference appears to be a reasonable result of treating occasions of data substitution more accurately and less conservatively than is required in reporting data to CAMD. The Rain CII Carbon emissions were derived from hourly CEMS data on the two calciner units and used in the modeling. The Duke – Wabash facility ceased operation on April 16, 2016. Also, at 50 km, it is beyond the distance Indiana typically used for considering nearby sources. However, since it is near the monitor to be used for background, its emissions were included in the modeling but its impacts on the nearby monitor were excluded. The approach used to determine the background concentration is discussed later in Section 8.3.9.

The emissions used in the modeling of the Sullivan County area relied on actual emissions. For the DRR source, Merom, and the closest nearby source, Rain CII Carbon, CEMS data was used. For the distant nearby source, Duke-Wabash River, annual average emissions were spread across the 3-year period. While this approach introduces more uncertainty than methods preferred under the TAD that better reflect emissions variability, this facility is sufficiently distant from the maximum concentration areas in Sullivan County that this approach does not likely affect peak modeled impacts or the likelihood that Sullivan County is attaining the standard. The EPA finds

that the characterization of emissions in and near Sullivan County is adequate to evaluate SO_2 concentrations for comparison to the NAAQS for this assessment.

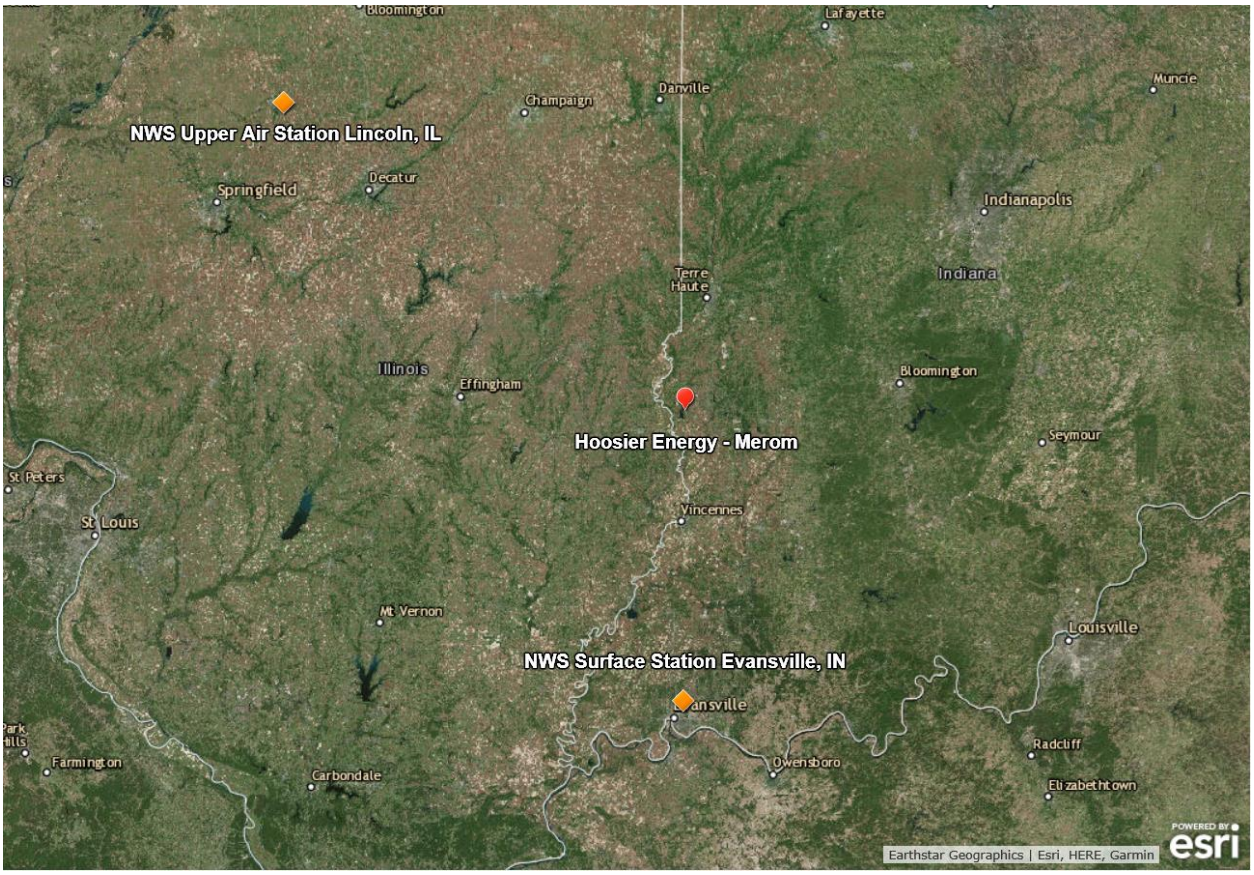
8.3.7. Modeling Parameter: Meteorology and Surface Characteristics

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

For the area of analysis for the Sullivan County area, the state selected the surface meteorology from the Evansville, Indiana, NWS station, located roughly 120 km to the south of Merom. Coincident upper air observations were from the Lincoln, Illinois, NWS station, located roughly 200 km to the northwest. These two stations were determined to be the most representative of meteorological conditions within the area of analysis.

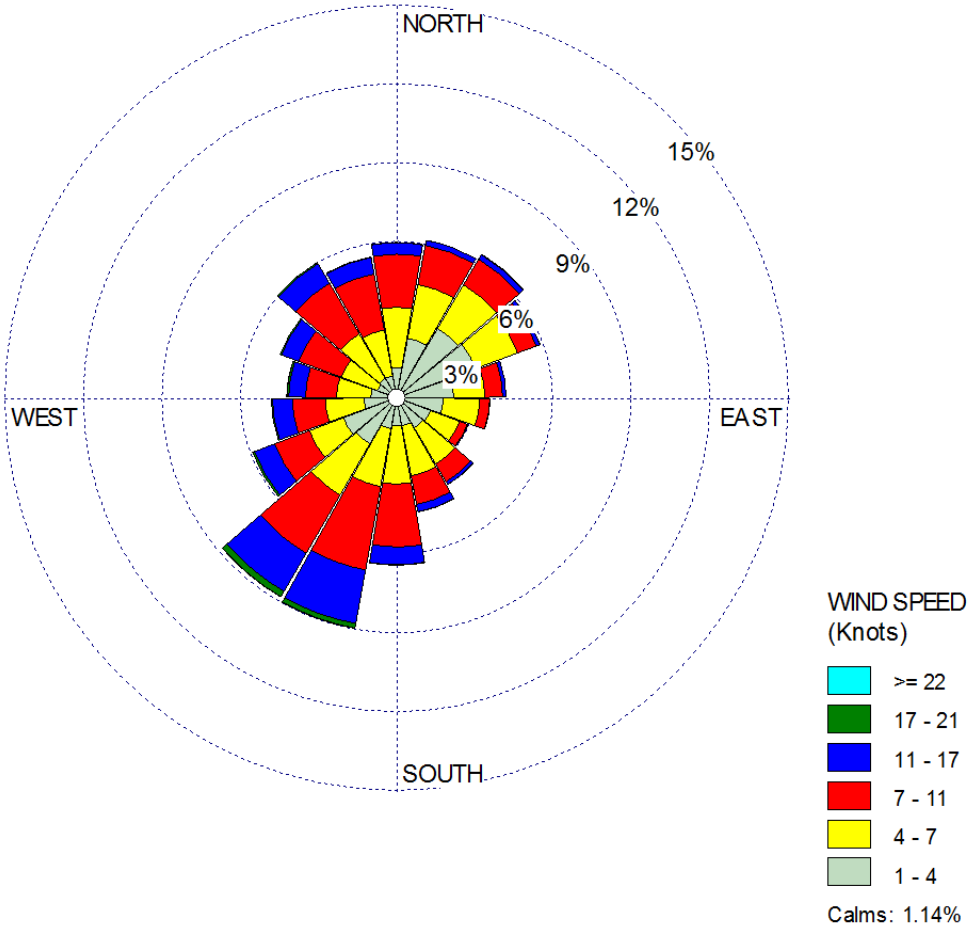
In Figure 41 below, generated by the EPA, the locations of these NWS stations are shown relative to the area of analysis.

Figure 41. Area of Analysis and the NWS stations in the Sullivan County Area



As part of its recommendation, the state provided the 3-year surface wind rose for the Evansville NWS site. In Figure 42, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The surface meteorological data used by the state to model the Merom area shows that the highest frequency of wind direction is from the southwest, followed by winds from the northeast. This pattern, as illustrated in the Evansville NWS data, is common in the Midwest, particularly in areas that are not heavily influenced by terrain features, such as the Merom area. The largest percentage of winds fall in the 4-11 knot wind speed range with some higher winds coming from the southwest. Lighter winds, less than 4 knots, come from the northeast most frequently. The EPA finds that meteorological data used by the state to model the Merom area adequately represents the local dispersion conditions.

Figure 42: Sullivan County Area Cumulative Annual Wind Rose for Years 2013 – 2015



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor (Version 15181). The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state generally followed the methodology and settings presented in the AERMET User's Guide and the Region 5 Meteorological Data Processing Protocol Document in the processing of the raw meteorological data into an AERMOD-ready format.

The state used AERSURFACE version 13016 using data from the Evansville, Indiana, NWS site to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness

values for 12 spatial sectors out to 1 km at a monthly temporal resolution for dry, wet, and average conditions. Specifically, 12 wind direction sectors were used with a default radius of 1 kilometer. Albedo and Bowen ratio were adjusted for abnormally wet or dry soil moisture conditions on a monthly basis. Surface roughness values were adjusted for the winter months of December, January, and February. For months with more than half of the days with at least one inch of snow cover, the state used the continuous snow cover value. Otherwise, a value representing no continuous snow cover was used.

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 Evansville, Indiana NWS station, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE (Version 15272). These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

As mentioned, the EPA finds that meteorological data and the processing approach used by the state to model the Merom area to be appropriate.

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

The terrain in the area of analysis is best described as gently rolling, with very modest elevation changes (e.g. 20-30 m) occurring within approximately 20 km of the facility. To account for these terrain changes, the AERMAP terrain program (Version 11103) was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is the National Elevation Dataset (NED) using the North American Datum (NAD) 1983. The EPA finds the processing of terrain features for this modeling analysis acceptable.

8.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99^{th} percentile

monitored concentrations by hour of day and season or month. For this area of analysis, the state chose to generate their background values using the "tier 2" 99th percentile value based on a season, hour-of-day approach. The state used the Terre Haute – Lafayette Road monitor (AQS# 18-067-0018). This monitor is located approximately 50 km to the north of the Merom facility. It is significantly influenced by the Duke – Wabash River facility. Impacts from the Duke facility were removed prior to generating the season, hour-of-day 99th percentile values. The monitored data was paired with the corresponding hourly meteorological conditions. Pollution roses were created and used to identify the wind directions from which the modeled source was contributing to the monitored concentrations. The hours containing concentrations impacted from the modeled source were removed. Only contributions above 10 ppb were removed. The background values used by the state are shown in Table 29 below.

Table 29. Temporally Varying Background Values (ppb) for Sullivan County[10]

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	4.99	5.61	5.59	5.17	5.56	5.96	6.30	6.69
Spring	5.25	6.70	7.97	4.37	6.82	4.37	5.46	4.78
Summer	2.78	2.54	2.69	2.17	1.81	2.13	2.71	3.81
Fall	8.21	5.06	5.17	4.07	5.87	3.72	3.81	4.35

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	6.22	5.45	9.07	11.45	10.06	9.25	7.76	8.97
Spring	6.86	6.29	24.67	11.51	14.16	10.08	6.30	9.29
Summer	4.44	8.83	8.55	10.09	8.43	24.15	26.75	29.68
Fall	6.35	6.03	34.92	18.80	11.22	14.39	7.32	15.27

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	10.45	16.58	8.77	8.84	7.05	6.47	8.66	6.99
Spring	8.60	16.86	5.33	4.59	8.55	4.05	5.73	6.31
Summer	12.49	6.59	5.55	3.94	6.82	4.93	4.07	2.74
Fall	5.14	5.22	5.23	5.65	9.28	7.68	9.08	8.03

The EPA finds that the approach used by the state to generate background values for use in the analysis for the Merom area is acceptable.

[10] 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 1 ppb = approximately 2.619 $\mu g/m^3$.

8.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Sullivan County area of analysis are summarized below in Table 30.

Table 30: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Sullivan County Area

Input Parameter	Value
AERMOD Version	16216r (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	8
Modeled Structures	42
Modeled Fencelines	1
Total receptors	9,775
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Evansville, IN (KEVV)
NWS Station Upper Air Meteorology	Lincoln, IL (KILX)
NWS Station for Calculating Surface Characteristics	Evansville, IN (KEVV)
Methodology for Calculating Background SO_2 Concentration	Tier 2: 99th percentile based on season and hour-of-day from site 18-067-0018
Calculated Background SO_2 Concentration	Varies from 1.81 to 34.92 ppb

The results presented below in Table 31 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

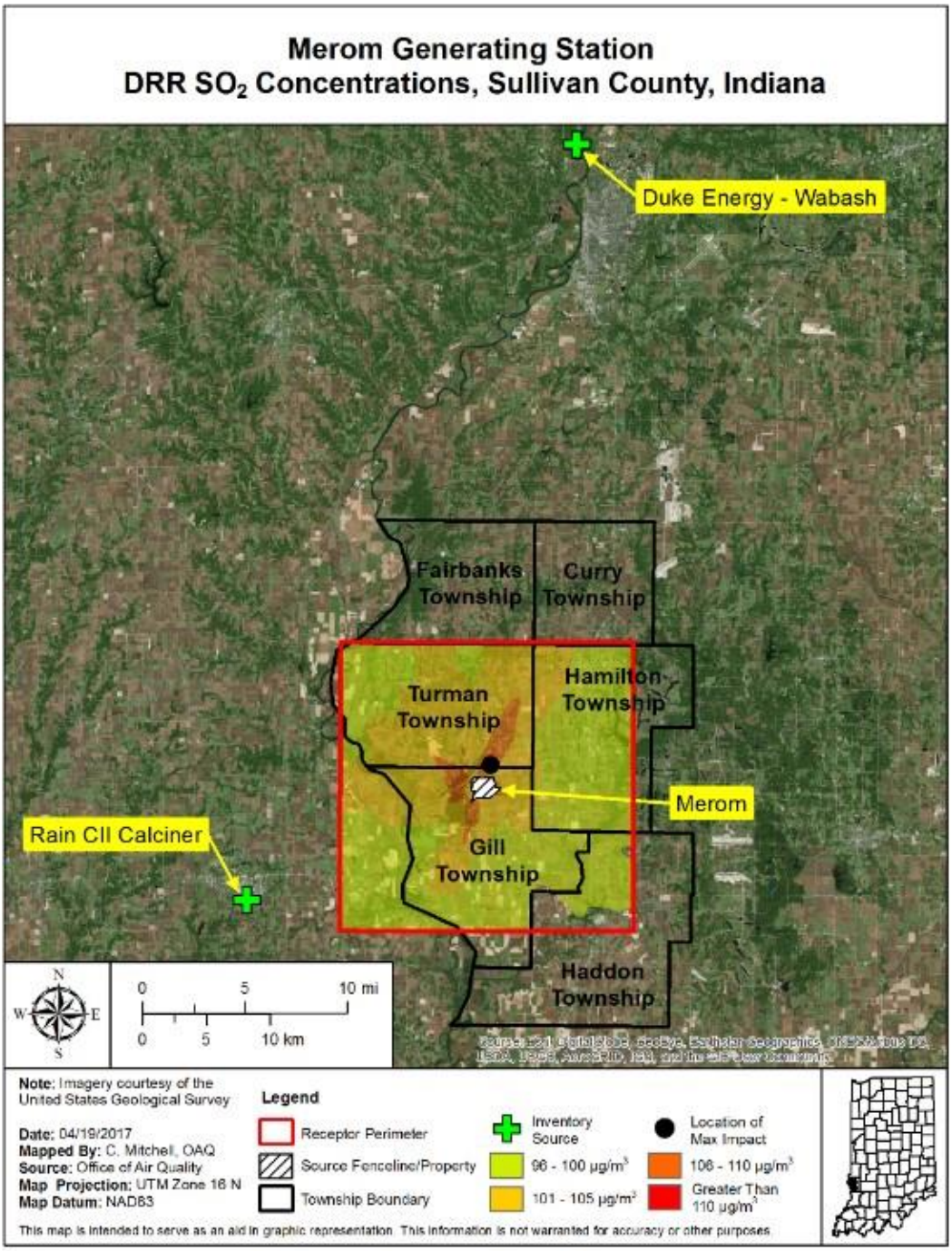
Table 31. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Sullivan County Area

Averaging Period	Data Period	Receptor Location UTM zone 16		99th percentile daily maximum 1-hour SO_2 Concentration (µg/m^3)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013-2015	456600	4326600	112.4	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 112.4 µg/m^3, equivalent to 42.9 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 43 indicates that the predicted value occurred nearby approximately 1 km to the north of the facility property boundary.

Figure 43: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Sullivan County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all receptors in the area.

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

The modeling conducted by the state for the area around the Merom facility followed the recommendations in the TAD. The important components of a modeling assessment, i.e., models used, meteorology, emission estimates, nearby sources modeled, and background concentrations, all adequately comply with the TAD, Appendix W, and with general modeling expectations. The design value predicted in this modeling analysis is below the SO_2 NAAQS.

8.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Sullivan County Area

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

8.5. Jurisdictional Boundaries in the Sullivan County Area

The EPA's goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Indiana recommended that the EPA designate one township within Sullivan County as attainment. The boundaries of townships in Sullivan County are well established and well known, so that these boundaries provide a good basis for defining the area being designated. As an alternative, the full Sullivan County boundaries are also well established and well known and would serve as a good basis for an alternative designated area.

8.6. Other Information Relevant to the Designations for the Sullivan County Area

The EPA has received no third party modeling or any other information from parties other than the state for this area.

8.7. The EPA's Assessment of the Available Information for the Sullivan County Area

The best available evidence regarding air quality in Sullivan County is the modeling provided by Indiana. The modeling reflected the recommendations of the TAD and provides a reliable assessment that supports Indiana's recommended finding that the Sullivan County area is attaining the standard.

No monitoring data are available close enough to this area to use in the assessment of air quality in this area.

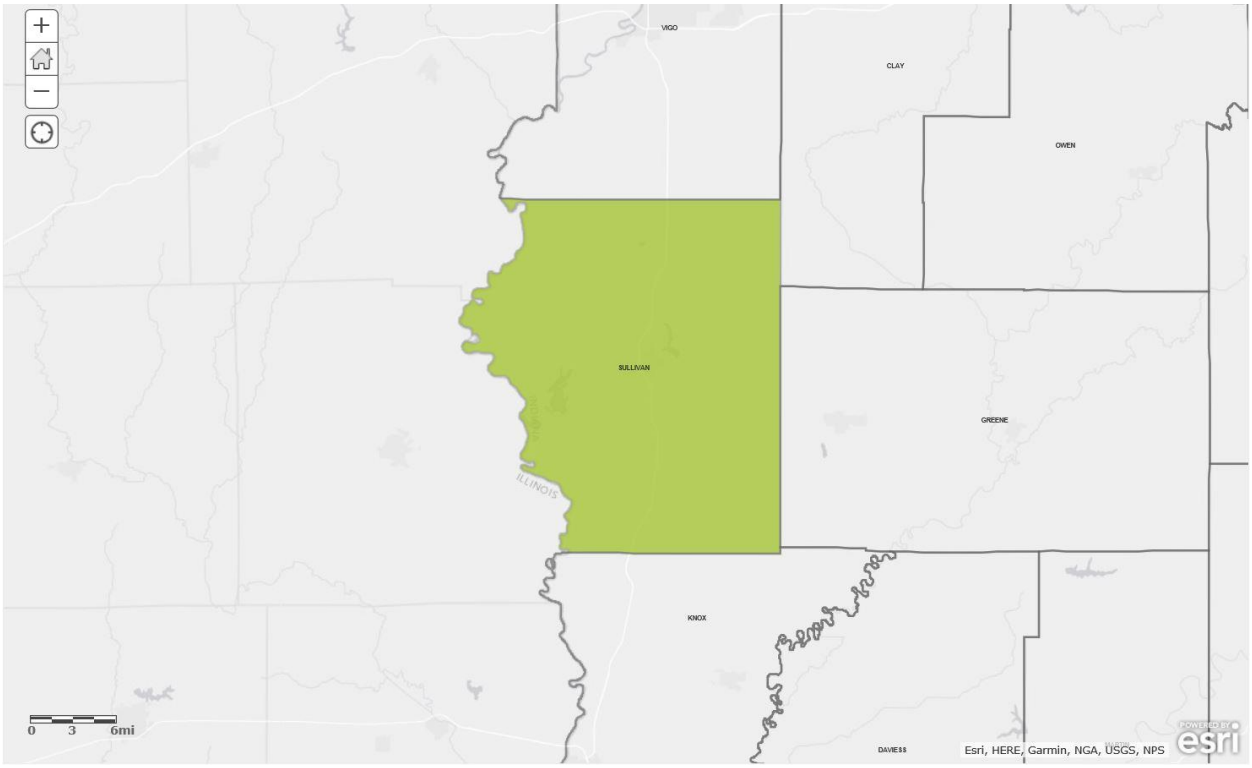
While Indiana in its January 13, 2017, submittal provides a recommendation only for Gill Township in Sullivan County, the EPA finds the remainder of the county also to be attaining the standard. Indiana has demonstrated that the impacts of Merom and other sources within 50 km do not cause violations of the standard in the modeled area, and the EPA finds, in absence of other sources with SO_2 emissions greater than 100 tons in the county, that the demonstration that the area near Merom is attaining serves also as adequate evidence that the remainder of the county is attaining the standard as well. Furthermore, no violations or existing nonattainment areas are found within 60 km to be evaluated for contribution from this area. Therefore, the modeling of Merom demonstrates that the area does not cause or contribute to violations of the standard in any nearby area. Additionally, the remainder of Sullivan County is expected to have even better air quality than the modeled portion of Sullivan County, and is less likely to contribute to any other violations, so that the remainder of Sullivan County also meets the EPA's definition of an unclassifiable/attainment area.

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

8.8. Summary of Our Intended Designation for the Sullivan County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA finds that Sullivan County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS, and therefore intends to designate the entirety of Sullivan County as unclassifiable/attainment for the 2010 SO_2 NAAQS. Figure 44 shows the boundary of this intended designated area.

Figure 44. Boundary of the Intended Unclassifiable/Attainment Area



9. Technical Analysis for the Vermillion County (Cayuga) Area

9.1. Introduction

The EPA must designate the Vermillion County, Indiana, area by December 31, 2017, because the area has not been previously designated and Indiana 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 the area. This county includes one source listed and subject to the air quality characterization requirements of the DRR, namely Duke Energy's Cayuga Station ("Cayuga"). Accordingly, Indiana provided a modeling analysis for the area near this facility, which the EPA reviews in a following subsection.

9.2. Air Quality Monitoring Data for the Vermillion County Area

This factor considers the SO_2 air quality monitoring data in the Vermillion County area. Although no SO_2 monitors are currently being operated in Vermillion County, a monitor is currently being operated in Fountain County, 4.9 km north of Cayuga. The 2013-2015 and 2014-2016 design values for this monitor is shown in Table 32.

Table 32. Monitors near Cayuga

AQS ID	County, State	Distance from Cayuga (km)	Direction from Cayuga	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
18-045-0001	Fountain, IN	4.9	N	25	19

Indiana has not addressed how well this monitor is located to monitor maximum concentrations from Cayuga. Thus, it is unclear the strength of this evidence that this portion of the county is attaining the standard.

9.3. Air Quality Modeling Analysis for the Vermillion County Area

9.3.1. Introduction

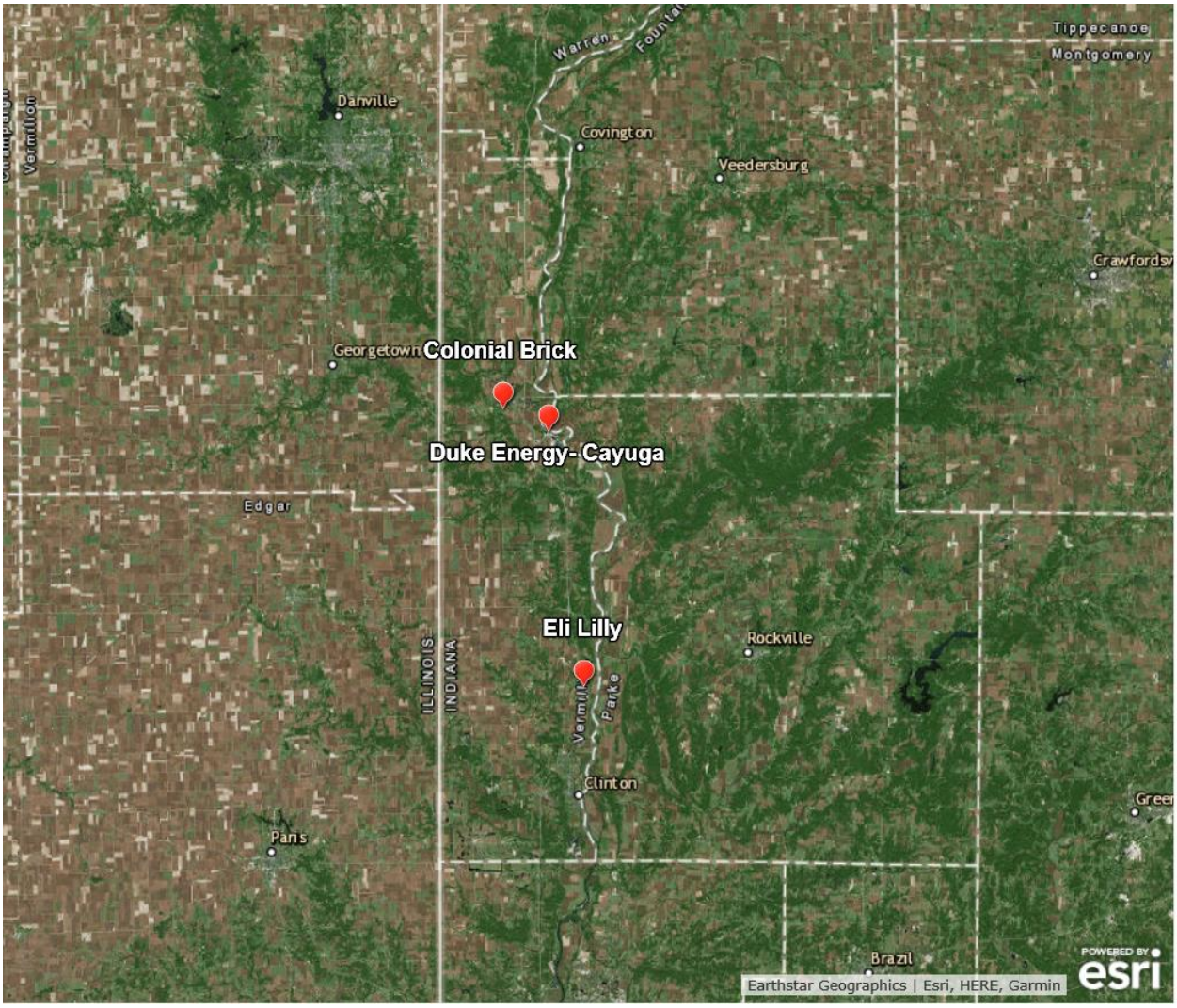
This section 9.3 presents all the available air quality modeling information for Vermillion County, in particular modeling focused on the impact of Cayuga. In its submission, Indiana recommended that an area that includes the area surrounding Cayuga, specifically Eugene and Vermillion Townships, be designated 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, after all the available information is presented.

The area that the state has assessed via air quality modeling is a square receptor grid extending 10 km in each cardinal direction from Cayuga, covering much of the northern portion of Vermillion County.

As seen in Figure 45 below, Cayuga is located in the northern portion of Vermillion County, about 5 km southeast of the town of Cayuga. This figure also shows Eli Lilly, located approximately 21 km to the south of Cayuga, as well as Colonial Brick, located approximately 4 km to the west of Cayuga. Indiana's initial submittal modeled all three facilities. However, on January 5, 2017, Colonial Brick requested that their permit be revoked, and Indiana took this action on January 13, 2017, resulting in zero allowable emissions. As a result, while Indiana's initial modeling analysis included all three sources, Indiana then submitted a replacement analysis that only modeled Cayuga and Eli Lilly. This latter analysis is the primary basis for the EPA's intended designation for Vermillion County.

The EPA's intended unclassifiable/attainment area in Vermillion County is not shown in this figure, but the EPA intends to designate an unclassifiable/attainment area covering the same area that Indiana recommended be designated attainment.

Figure 45. Map of the Vermillion County, Indiana, Area Addressing Cayuga



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 only the modeling assessment from the state; the EPA has conducted no modeling analysis of its own and has received no assessments from any other parties. The following subsections review relevant elements of the state's analysis.

9.3.2. Model Selection and Modeling Components

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

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

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

The state used AERMOD version 15181 in regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

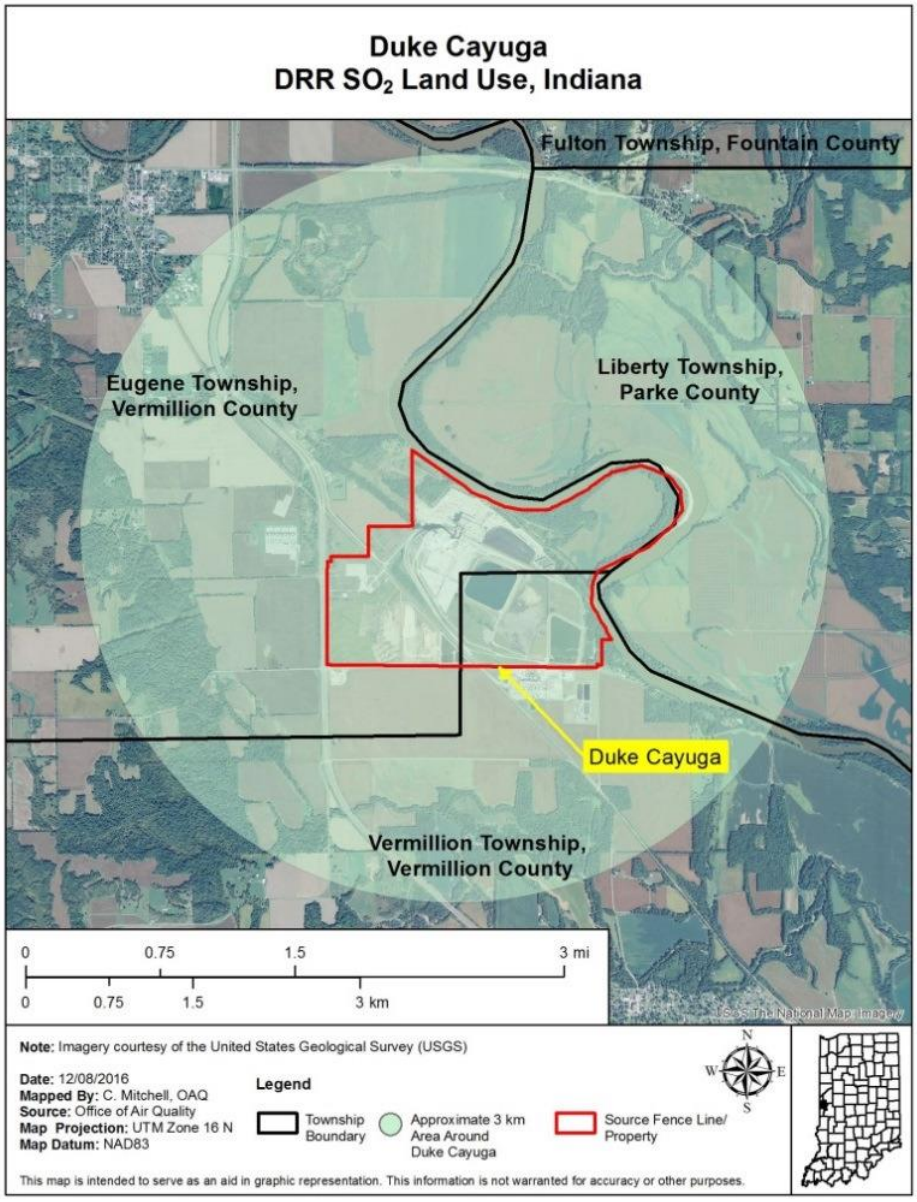
The current version of AERMOD (16216r) was released on January 17, 2017. A previous version (16216) was released in December, 2016 but was modified in January. The modeling for the Cayuga facility had been completed by mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted friction velocity parameter in AERMET. The Cayuga modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

9.3.3. Modeling Parameter: Rural or Urban Dispersion

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

For the purpose of performing the modeling for the area of analysis, the state determined that it was most appropriate to run the model in rural. This determination was based on results from an Auer's land use classification approach. While no specific tables or charts were provided, the area is clearly rural based on a visual inspection using satellite imagery. A map provided by the state is included in Figure 46 below.

Figure 46. Land Use in Vermillion County Near Cayuga



The EPA finds that the use of rural dispersion in the AERMOD modeling is appropriate for the analysis for the area surrounding the Cayuga facility.

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

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

coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area was described in the introduction to this section. For the Vermillion County area, the state has included one other emitter of SO_2, a source roughly 20 km away. (The state's initial analysis included a third source, Colonial Brick, but this source has since shut down through a federally enforceable permit requirement.) No other sources with emissions greater than 100 tons of SO_2 exist within 40 km in any direction. The state determined that the sources included in the modeling adequately characterized emissions with the potential to contribute to any SO_2 NAAQS exceedances in the area of analysis. In addition to Duke-Cayuga, the other emitter of SO_2 included in the area of analysis is Eli Lilly. No other sources were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. The EPA concurs with this determination of the sources that warrant being explicitly modeled.

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

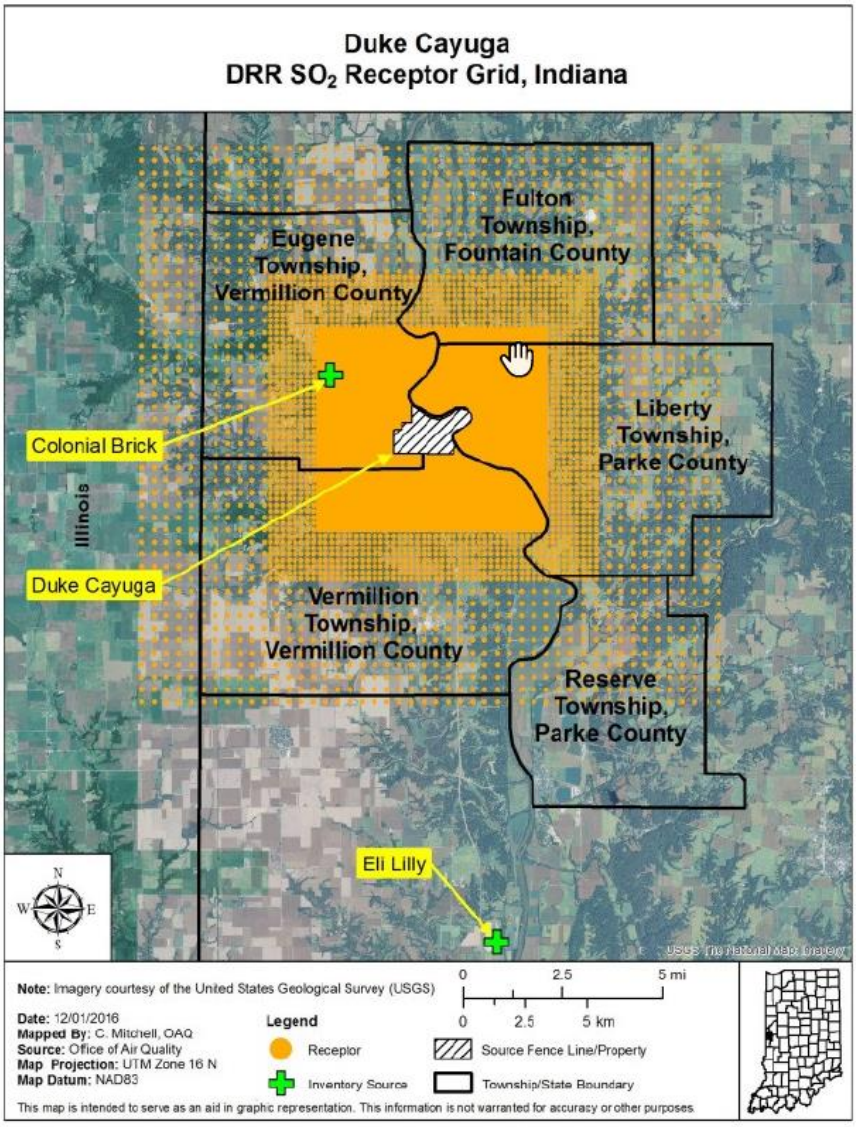
- 50 m spacing along Cayuga's fenceline
- 100 m spacing out to a distance of 3 km
- 250 m spacing out to a distance of 5 km
- 500 m spacing out to a distance of 10 km

The receptor network contained 10,522 receptors, and the network covered 5 townships in Indiana.

Figure 47, included in the state's recommendation, shows the state's chosen area of analysis surrounding Cayuga, 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 the state considered would be considered ambient air. The state removed receptors from the Cayuga facility property. Text in the submittal states "Duke – Cayuga is largely fenced and has regular security patrols to keep unauthorized people off the property." Since the maximum concentration is estimated to occur well off plant property, the exclusion of receptors is judged not to affect the determination of whether the area is violating the SO_2 NAAQS.

Figure 47: Area of Analysis and Receptor Grid for the Vermillion County Area



As is evident from Figure 47, the modeled area does not include receptors near Eli Lilly. Thus, the modeling analysis does not characterize air quality in the southern portion of Vermillion County.

9.3.5. Modeling Parameter: Source Characterization

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

The state originally included 3 sources in the modeling for the area around Duke-Cayuga. The

Cayuga facility was modeled along with the Eli Lilly plant 20 km to the south and a Colonial Brick facility, located about 4 km to the northwest. These sources were determined to have the ability to contribute to the concentrations generated primarily by the Cayuga plant. Subsequently, as noted above, Indiana revoked the permit for Colonial Brick, and submitted revised modeling excluding this source and including only Cayuga and Eli Lilly.

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. The state characterized the stack parameters for Cayuga using CEMS data. That data had hourly varying emissions and velocities, however, the temperatures for both units were fixed. Other units at Cayuga, such as power turbines and auxiliary boilers, were modeled using fixed actual emissions and release parameters. Additionally, building downwash, using BPIPPRM version 04274, was modeled for all Cayuga sources. Downwash was not included for Eli Lilly. Indeed, Indiana did not model concentrations near to Eli Lilly, where the greatest impact of any downwash from this facility would be expected to occur. The absence of consideration of downwash at Eli Lilly is unlikely to have a significant effect on concentrations estimated within the state's selected receptor area, and more particularly the absence of consideration of downwash at Eli Lilly is unlikely to have a significant effect on the maximum concentrations in the receptor area.

9.3.6. Modeling Parameter: Emissions

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

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

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

Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state's latest submittal included Cayuga and one other source of SO_2 within 50 km of the area of analysis. The state has chosen to model these facilities using actual emissions. The facilities in the state's modeling analysis and their associated annual actual SO_2 emissions between 2012 and 2014 are summarized below. These three years were used because CEMS emissions from Cayuga for 2015 were about half of their emissions for the previous three years. In order to be conservative, emissions from the years 2012 to 2014 were used in the analysis, since emissions for Cayuga were higher in this period. The Colonial Brick facility is excluded from this table because it has federally enforceably shut down due to its permit being revoked. The Colonial Brick facility was therefore treated as having zero allowable emissions.

The state did not provide yearly annual actual SO_2 emissions for the years 2012-2014. Table 33 below is populated with emissions from the EPA's Emission Inventory System database. Data for 2015 is included for comparison. A description of how the state obtained hourly emission rates for modeling is given below this table.

Table 33. Actual SO_2 Emissions Between 2012 – 2015 from Facilities in the Vermillion County Area

	SO_2 Emissions (tpy)			
Facility Name	**2012**	**2013**	**2014**	**2015**
Cayuga	3,223	4,628	3,448	1,832
Eli Lilly	1,004	2,001	1,851	1,723
Total Emissions from All Modeled Facilities in the State's Area of Analysis	4,227	5,629	5,299	3,555

For Cayuga, the actual hourly emissions data for the two units were obtained from CEMS data submitted by the facility. The annual totals from the submitted CEMS match the annual totals obtained from the CAMD database. The emissions for Eli Lilly were determined using "a short-term emission rate for the three-year (2012-2014) average" according to the state documentation. The emission rate in the modeling for Eli Lilly was 48.6 grams/second which totals 1,687 tons per year, slightly higher than the 2012-2014 average using the values included in the table above.

The EPA finds that the emissions used in the assessment of the Cayuga area are appropriate for determining whether the Vermillion County area is attaining the SO_2 1-hour NAAQS.

9.3.7. Modeling Parameter: Meteorology and Surface Characteristics

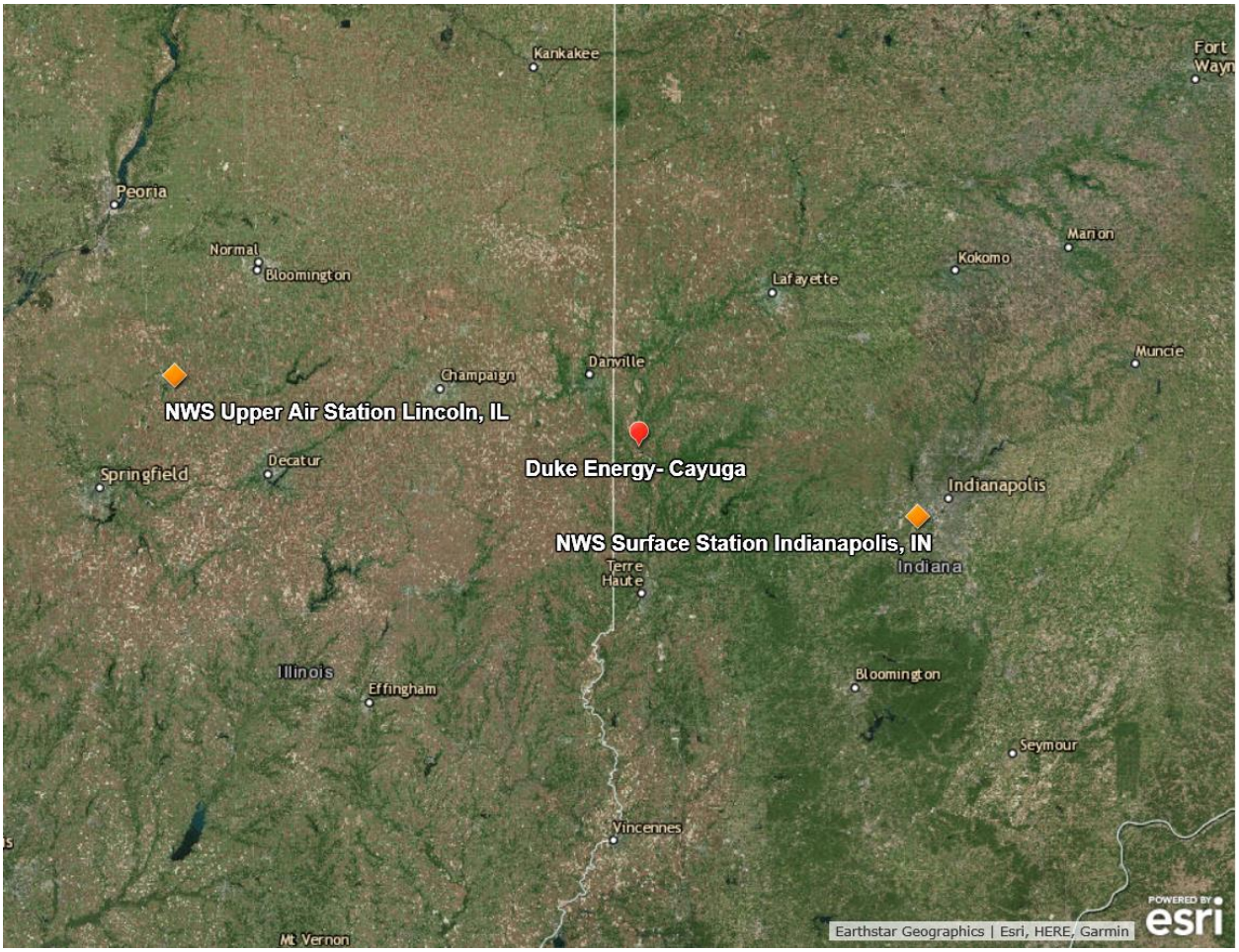
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

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

For the area of analysis for the Vermillion County area around Cayuga, the state selected the surface meteorology from the Indianapolis, Indiana, NWS station, located approximately 100 km west-southwest of the facility. Upper air observations were taken from the Lincoln, Illinois, NWS station, located approximately 160 km to the west of the facility. These stations were determined to be the most representative of meteorological conditions within the area of analysis.

In Figure 48 below, generated by the EPA, the locations of these NWS stations are shown relative to the area of analysis.

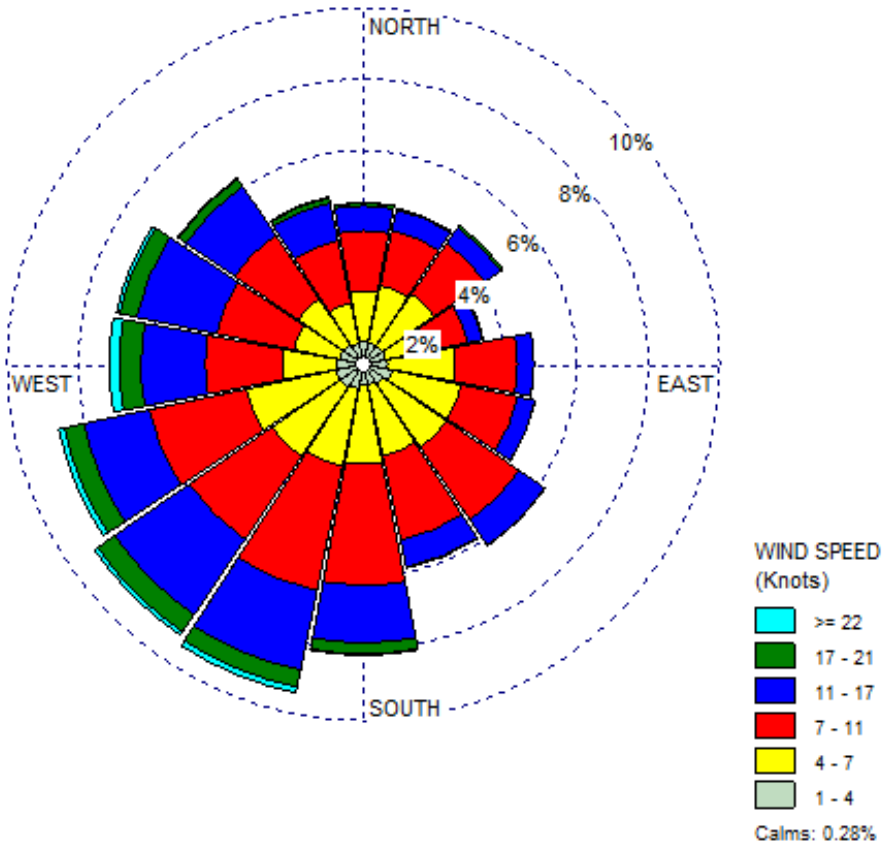
Figure 48. Area of Analysis and the NWS stations in the Vermillion County Area



As part of its recommendation, the state provided the 3-year surface wind rose for the Indianapolis, Indiana, NWS station data. In Figure 49, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The wind rose

shows a predominance for the winds to blow from the southwest. This is common in the Midwest for stations unaffected by significant terrain features. The majority of wind speeds fall in the 7 to 17 knot category; however, many hours have winds in the 4-7 knot range. Stronger winds tend to blow from the southwest while light winds are equally distributed in each direction. Less than 1 percent of the 3-year data was identified as calm. The terrain around Cayuga could be described as rolling with increases in elevation on the order of 40 m at distances of 30-50 km in the east, south, and west direction. The terrain is generally flat to the north.

Figure 49: Vermillion County Area Cumulative Annual Wind Rose for Years 2013 – 2015



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor (Version 15181). The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state generally followed the methodology and settings presented in the AERMET User's Guide and the Region 5 Meteorological Data Processing Protocol document. in the processing of the raw meteorological data into an AERMOD-ready

format.

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

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 Indianapolis, Indiana, NWS station, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE (Version 15272). These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

The EPA finds that the meteorology used for the modeling of the area around Duke-Cayuga was appropriate and adequately represents local dispersive conditions.

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

The terrain in the area of analysis is best described as rolling. As noted above, terrain increases of approximately 40 m occur at distances from 30 to 50 km from the source in the east, west, and south directions. To account for any terrain changes, the AERMAP terrain program (Version 11103) 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 using the North American Datum 1983.

The EPA finds that the terrain in the area of Cayuga was adequately characterized.

9.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state used a "tier 2" temporally varying season by hour-of-day approach to generate background values. Concentrations were taken from the Fountain County monitor (AQS 18-045-0001) located about 4.5 km to the north of the Cayuga facility. Concentrations generated with wind directions from the Cayuga facility (generally from the south) were removed prior to the development of the 99th percentile, season and hour-of-day values. The monitored data was paired with the corresponding hourly meteorological conditions. Pollution roses were created and used to identify the wind directions from which the modeled source was contributing to the monitored concentrations. The hours containing concentrations impacted from the modeled source were removed. Only contributions above 10 ppb were removed. The background concentrations for this area of analysis are shown in Table 34 below (in ppb).

Table 34. Temporally Varying Background Values for Vermillion County (ppb) [11]

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	7.76	7.52	7.00	6.49	8.00	7.00	6.00	6.51
Spring	7.69	8.00	7.55	8.00	8.00	7.53	7.54	6.56
Summer	4.50	5.00	4.00	3.48	3.42	3.00	3.00	3.00
Fall	6.58	5.62	6.00	5.00	7.56	6.57	7.18	6.55

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	8.55	9.60	9.98	9.00	9.00	8.26	7.65	8.30
Spring	8.63	9.00	10.00	8.00	8.63	9.00	9.00	7.64
Summer	6.22	7.24	8.62	8.00	9.00	8.00	6.57	6.60
Fall	6.60	6.63	9.00	8.67	8.00	7.62	9.00	8.68

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	6.00	8.42	8.62	11.00	8.00	8.18	8.85	8.00
Spring	8.00	8.00	9.00	8.60	9.00	7.00	8.00	7.38
Summer	6.58	5.56	6.58	5.00	4.00	4.00	6.52	4.00
Fall	8.63	8.14	7.55	7.56	6.48	7.53	8.00	7.53

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

The EPA finds that the background concentrations used in the modeling to evaluate 1-hour SO_2 impacts against the NAAQS were appropriate.

9.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Vermillion County area of analysis are summarized below in Table 35.

Table 35: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Vermillion County Area

Input Parameter	Value
AERMOD Version	15181 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	5
Modeled Structures	9
Modeled Fence lines	1
Total receptors	10,542
Emissions Type	Actual
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Indianapolis, IN, NWS (KIND)
NWS Station Upper Air Meteorology	Lincoln, IL, NWS (KILX)
NWS Station for Calculating Surface Characteristics	Indianapolis, IN, NWS (KIND)
Methodology for Calculating Background SO_2 Concentration	Tier 2, Season by Hour-of-day from site 18-045-0001
Calculated Background SO_2 Concentration	Varies between 3 and 11 ppb

The results presented below in Table 36 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

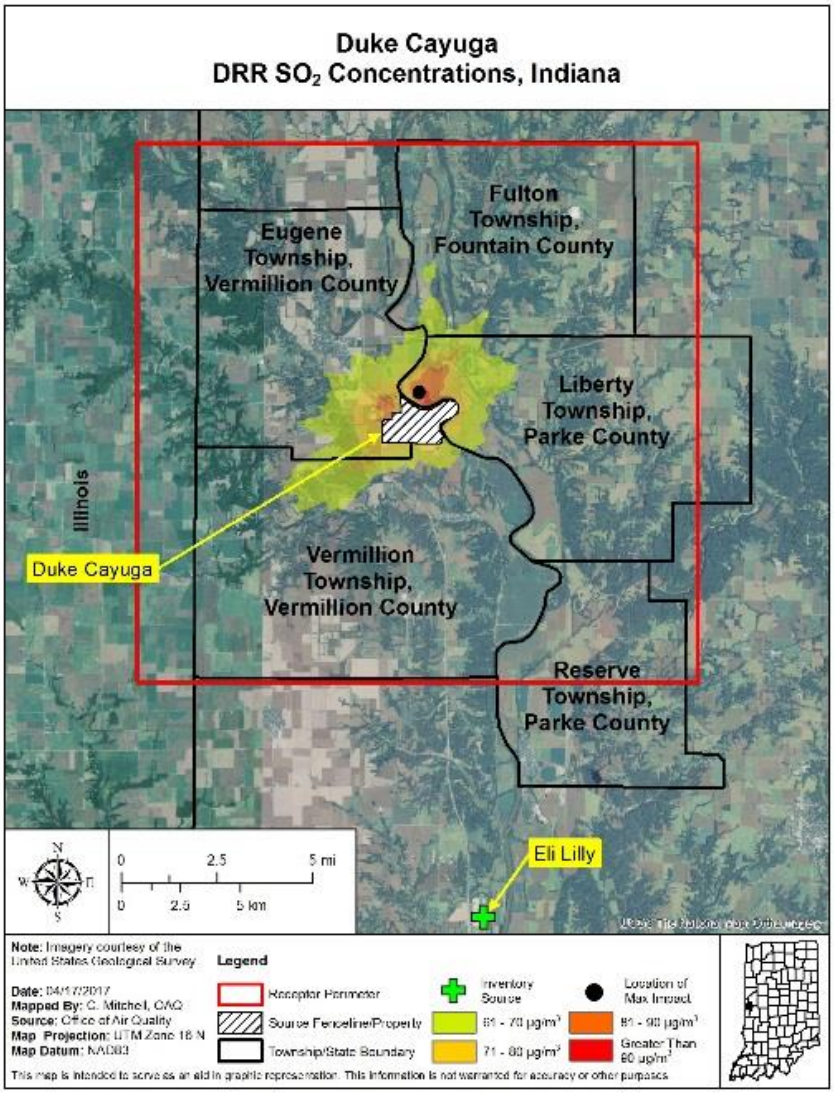
Table 36. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Vermillion County Area

		Receptor Location UTM zone 16		99th percentile daily maximum 1-hour SO_2 Concentration (µg/m^3)	
Averaging Period	**Data Period**	**UTM Easting (m)**	**UTM Northing (m)**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2012-2014	463800	4420200	94.2	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 94.2 µg/m^3, equivalent to 36.0 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. As seen in Figure 50, the maximum concentration is approximately 0.5 km north of the Cayuga Generating Station property boundary.

Figure 50. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Vermillion County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all modeled receptors in the area.

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

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

The modeling by the state to evaluate concentrations of 1-hour SO_2 in the area around the

Cayuga facility showed that the NAAQS were not violated. Three years of emissions and meteorology were used to represent the contribution from the DRR source along with one other facility to the concentrations in the area. The design concentration for the analysis occurs just to the north of Cayuga.

9.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Vermillion County Area

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

9.5. Jurisdictional Boundaries in the Vermillion County Area

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

9.6. Other Information Relevant to the Designations for the Vermillion County Area

The EPA has received no third party modeling or any other information from parties other than the state for this area.

9.7. The EPA's Assessment of the Available Information for the Vermillion County Area

The best available evidence regarding air quality in Vermillion County is the modeling provided by Indiana. The modeling reflected the recommendations of the TAD and provides a reliable assessment that supports Indiana's recommended finding that the modeled portion of this area is attaining the standard. Monitoring data is available in nearby Fountain County, but the monitoring site is a few km away from the area in Vermillion County that the modeling suggests is observing the highest concentrations in the area. Furthermore, given that the sources in Vermillion County emitting over 100 tpy are more than 20 km from the Vigo County nonattainment area, and considerably more distant from any other violating or potentially violating area, the EPA has no information to suggest that any part of Vermillion County contributes to this or any other nonattainment area.

Indiana, in its January 13, 2017, submittal, provides a recommendation only for Eugene and Vermillion Township in Vermillion County. The southern portion of Vermillion County includes a source with somewhat substantial emissions (Eli Lilly, emitting approximately 1,800 tons per

year) for which Indiana did not characterize nearby air quality. Since Indiana's analysis only addresses the northern portion of Vermillion County, the EPA concurs with the state's recommendation, based on this analysis, to designate Eugene and Vermillion Townships as unclassifiable/attainment.

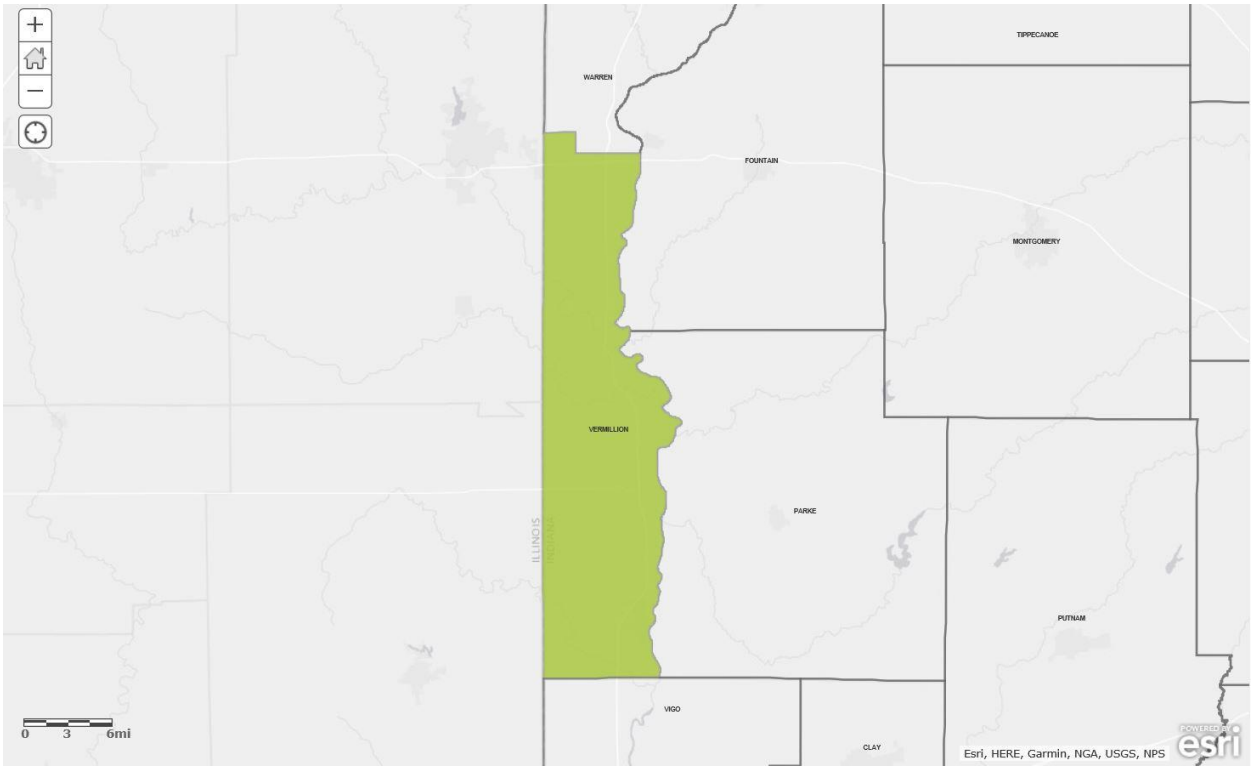
The remainder of the county is addressed in section 11 of this Chapter of this TSD. For reasons described in that section, the EPA also intends to designate the remainder of Vermillion County as unclassifiable/attainment as well. Therefore, for administrative convenience, notwithstanding the separate rationales for addressing the different portions of this county, the EPA intends to designate a combined area, including the entirety of Vermillion County, as an unclassifiable/attainment area.

The EPA believes that our intended unclassifiable/attainment area, including Eugene and Vermillion Townships in Vermillion County but also including the remainder of the county, has clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

9.8. Summary of Our Intended Designation for the Vermillion County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA finds that the pertinent portion of Vermillion County (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS, and that the remaining portion of Vermillion County (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. Therefore, the EPA intends to designate Eugene and Vermillion Townships in Vermillion County, along with the remainder of Vermillion County, as unclassifiable/attainment for the 2010 SO_2 NAAQS. Figure 51 shows the boundary of this intended designated area.

Figure 51. Boundary of the Intended Unclassifiable/Attainment Area



10. Technical Analysis for the Warrick County Area

10.1. Introduction

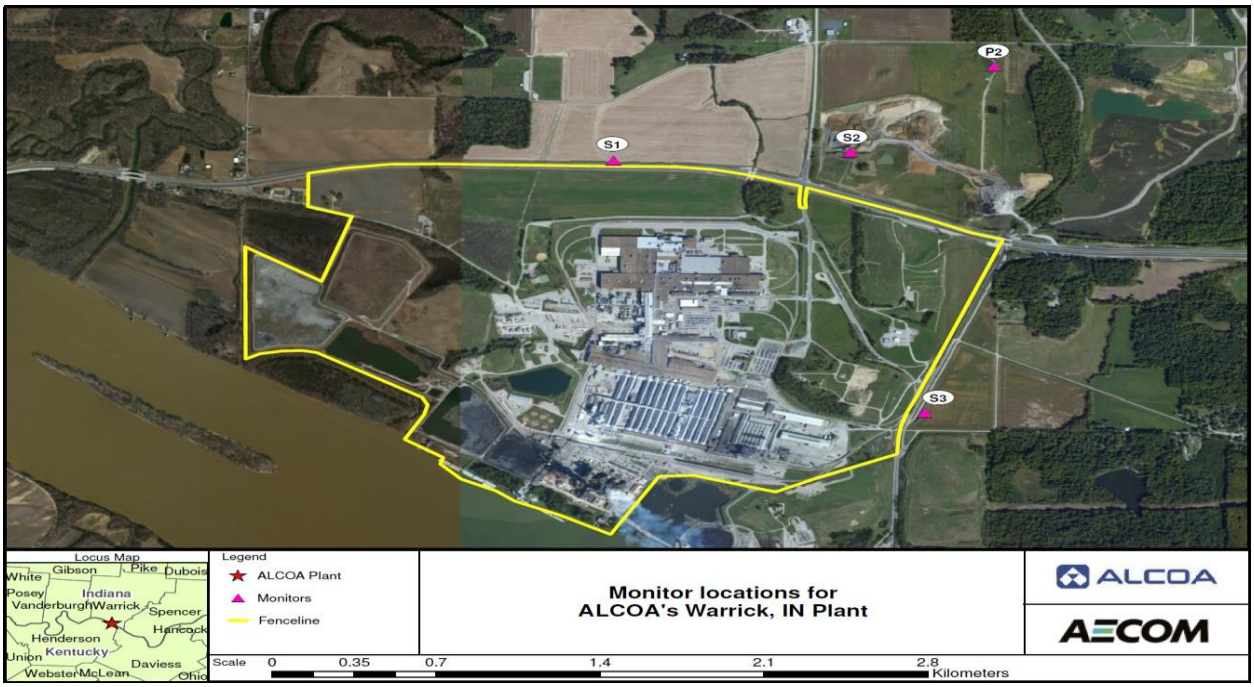
The EPA must designate the Warrick County, Indiana, area by December 31, 2017, because the area has not been previously designated and Indiana has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in the area. This county includes two adjacent sources listed and subject to the air quality characterization requirements of the DRR, namely Alcoa-Warrick Operations and Alcoa Allowance Management. (For simplicity, these facilities will be referred to collectively as "Alcoa" or "Alcoa facilities.")

Indiana's January 13, 2017, submittal did not include modeling of this area, and instead included a review of monitoring data in the area. Additional information in the EPA's possession is a modeling analysis provided by the Sierra Club during Round 2 of designations under the 2010 SO_2 NAAQS. Although this modeling was submitted as a comment on the intended designation of the area near the A.B. Brown plant in Posey County, the modeling also included the emissions of the Alcoa facilities and estimated concentrations near these facilities in Warrick County. The EPA reviews this analysis in subsequent subsections.

10.2. Air Quality Monitoring Data for the Warrick County Area

This factor considers the SO_2 air quality monitoring data in the area of Warrick County. One monitor, site number 18-173-0002, had a long history of monitoring SO_2, starting in 1977, but the site stopped monitoring SO_2 at the end of 2010. More recently, following discussions of the monitoring that would be necessary to evaluate non-regulatory modeling approaches, the company restarted operating site number 18-173-0002 and started operation of three additional sites, starting in mid-July 2015. A map of these monitoring sites is shown in Figure 52, showing sites identified as P2, S1, S2, and S3. However, in association with termination of aluminum smelting operations at the facility, the company stopped operating these four monitors in February 2016. Thus, while site 18-173-0002 has plentiful historical data, through the end of 2010, more recent data are only available for this site and for the new sites for approximately 7.5 months.

Figure 52. Monitors operating in Warrick County, Indiana, from July 2015 to February 2016



Appendix T to 40 CFR 50, which prescribes data handling procedures for assessments of attainment of the 2010 primary SO_2 NAAQS, provides criteria for judging the completeness of data. In general, a dataset cannot be judged complete and does not yield a valid design value unless all four quarters of three consecutive years have at least 75 percent complete data. Under limited circumstances, data substitution may be used to find the data sufficient to judge whether the data indicate whether the area is attaining or violating the standard, but these procedures may not be used if any quarter has less than 50 percent data capture. Thus, subsequent to 2010, none of these Warrick County monitors provides a valid design value.

The state provided summaries of the monitoring data that do exist for this area, including reporting the 99th percentile of maximum daily concentrations for each year for each monitor that reported any data, without regard to completeness. For 2008 to 2010, site 18-173-0002 recorded a design value of 55.7 ppb. A summary of data recorded after 2010, i.e. in 2015 and 2016, is shown in Table 37, along with the number of days for which the monitor has at least 18 hours of valid data. For each of the pertinent four monitors, only the third and fourth quarters of 2015 have at least 75 percent of days meeting this completeness criterion, and the first quarter of 2016 has more than 50 percent of days but less than 75 percent of days meeting this completeness criterion. All other quarters in 2014 to 2016 have no data whatsoever. The state also provided data from neighboring Vanderburgh County, but because this monitor is about 24 km from Alcoa, these data are not representative of the area and are not shown in Table 37.

Table 37. Monitors in Warrick County

AQS ID	Distance and Direction from Alcoa Operations	2015		2016	
		# complete days	99th %-ile (ppb)	# complete days	99th %-ile (ppb)
18-173-0002	2.0 km/NE	161	23	60	36
18-173-0004	1.1 km/N	172	63	49	57
18-173-0005	1.4 km/NE	171	46	49	42
18-173-0012	1.1 km E	161	59	49	62

Important context for reviewing these monitoring data is the emissions of the Alcoa facilities at different times. The four units of the Alcoa power plant all became controlled by flue gas desulfurization at various times in 2008. Accordingly, the 2008 to 2010 design value reflects 99th percentile daily maximum concentrations of 111 ppb in 2008, of 38 ppb in 2009, and of 18 ppb in 2010. The EPA has no evidence of any significant variations in emissions of Alcoa-Warrick Operations until aluminum smelting ended in early 2016. Thus, the variations in concentrations observed at monitor site 18-173-0002 appear to be most influenced by changes in emissions at the Alcoa power plant.

The limited data available for 2015-2016 suggest that the new sites are more likely to observe maximum concentrations in the area around the Alcoa facilities than the historical monitor, site number 18-173-0002. The network including these new sites appears to be an adequate network for characterizing air quality in this area. However, the amount of data available from this network falls well short of complete, so that the available data cannot be considered to provide a valid design value. Therefore, the available monitoring data are insufficient to provide an indication of the attainment status of this area.

In its submission, Indiana recommended that the Alcoa facilities area, specifically Anderson Township in Warrick County, be designated as attainment, based on its review of the above limited monitoring data. After careful review of the state's assessment, supporting documentation, and all available data, as well as of Sierra Club's modeling analysis as discussed below, the EPA intends to modify the state's recommendation and intends to designate the area (including Anderson Township and two other townships in Warrick County) as nonattainment. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

10.3. Air Quality Modeling Analysis for the Warrick County Area

10.3.1. Introduction

This section 10.3 presents all the available air quality modeling information for Warrick County, including the Alcoa facilities. The DRR requires Indiana to characterize SO_2 air quality or,

alternatively, to establish an SO_2 emissions limitation of less than 2,000 tons per year.[12] In a letter dated June 30, 2016, the state elected to characterize air quality around Alcoa through the modeling pathway. However, as noted above, Indiana instead submitted limited monitoring data for the area to characterize air quality, and did not provide modeling for the area. On the other hand, the EPA has modeling information addressing this area that was submitted by Sierra Club during Round 2 of SO_2 designations. Thus, the modeling that this section 10.3 describes is the modeling that Sierra Club submitted.

The two sources in Sierra Club's modeling that are most pertinent to the results in and near Warrick County are the two Alcoa facilities, i.e. Alcoa-Warrick Operations, engaging in aluminum smelting, and Alcoa Allowance Management, engaging in electricity generation. These facilities were listed under the DRR on the basis of 2014 SO_2 emissions of 3,500 tons and 4,993 tons, respectively. Because we have available results of air quality modeling in which these sources are modeled together, and because this pair of sources are immediately adjacent, the area around this pair of sources is being addressed in this section with consideration given to the impacts of all these sources.

In addition to the Alcoa facilities, Sierra Club's modeling run also includes A.B. Brown Station, located 34 km to the west, in Posey County. Sierra Club's modeling further includes Southern Indiana Gas and Electric Company's (SIGECO's) F.B. Culley Station (Culley), located adjacent to Alcoa in Warrick County as well as additional facilities in neighboring Henderson County, Kentucky. Sierra Club submitted this modeling in response to the EPA's March 2016 proposal for the designation of pertinent portions of Posey County. This modeling did not show violations in Posey County; instead, this modeling showed violations in Warrick County, Indiana, and in neighboring Henderson County, Kentucky. In its Round 2 action on the Posey County designation,[13] the EPA found that Sierra Club "has not provided persuasive evidence that [Posey County] is above rather than just below the standard." The EPA continued by noting that the area that Sierra Club modeled as violating the standard are "generally in Warrick County." The EPA stated further, "EPA will designate the Warrick County area in a subsequent round of designations." Indeed, the EPA must now designate Warrick County and the modeling that Sierra Club provided is now timely information for informing the EPA's designation of the Alcoa facilities area. As will be discussed further below, if the EPA concludes that the Alcoa facilities area warrants a nonattainment designation, the EPA must also evaluate the appropriate area to designate as nonattainment. Nonattainment areas must include the area that is judged to be violating the standard and the area that includes any nearby sources that are contributing to the violations, as well as any nearby areas that are violating the NAAQS to which the area contributes, so that in particular a finding of violations would necessitate an evaluation of whether A.B. Brown Station is a nearby source that contributes to the violations.

The Sierra Club modeling addresses a broad area along the Ohio River in Southern Indiana and

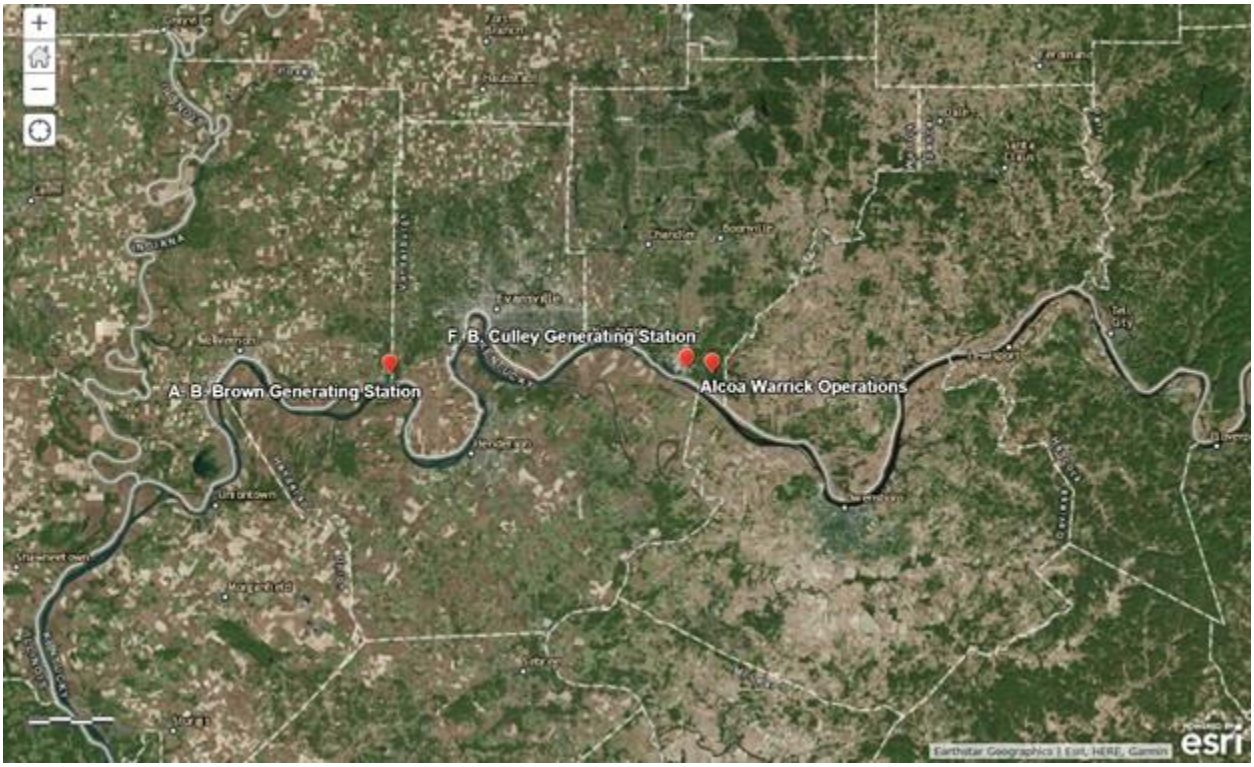
[12] Questions about whether this alternative would require that the total SO_2 emissions of the pair of facilities be limited to under 2,000 tons per year, e.g. whether the EPA would interpret 40 CFR 51.1203(b) to require air quality characterization unless combined emissions are limited to under 2,000 tons per year, are moot here, because Indiana has not selected the emission limit option for this area.

[13]Responses to Significant Comments on the Designation Recommendations for the 2010 Sulfur Dioxide Primary National Ambient Air Quality Standard (NAAQS), pp 46-48. https://www.epa.gov/sites/production/files/2016-07/documents/so2d-r2-response-to-comments-06302016.pdf

Northern Kentucky in the general area of Evansville, Indiana, extending from Posey County to Warrick County in Indiana and Henderson County in Kentucky. As seen in Figure 53 below, the Alcoa facilities are located near the Ohio River about 7 km southeast of the town of Newburgh and about 11 km southeast of Evansville and the border of Vanderburgh and Warrick Counties. Figure 53 also shows neighboring Culley as well as A.B. Brown Station in Posey County.

Also included in Figure 53 is the state's recommended area for the recommended attainment designation (the county boundary of Warrick County). The EPA's intended nonattainment designation boundary for the Warrick County area is not shown in this figure, but is shown in a figure in the section below that summarizes our intended designation.

Figure 53. Map of the Warrick County Area Addressing the Alcoa Facilities



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.

As noted above, Indiana did not provide any timely dispersion modeling for this area. On June 23, 2017, Indiana provided a protocol, prepared by Alcoa's consultant, describing modeling procedures intended to be used to provide further characterization of air quality in this area. The EPA has not had the opportunity for a full review of this modeling protocol, and so no review of modeling conducted in accordance with this modeling protocol is included in this chapter.

On the other hand, Sierra Club submitted modeling on March 31, 2016 that included the Alcoa facilities and characterizes air quality in the Alcoa facilities area. The following subsections

review relevant elements of the Sierra Club's analysis.

10.3.2. Model Selection and Modeling Components

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

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

The Sierra Club used AERMOD version 15181 using regulatory defaults. The AERMET version was also 15181. A discussion of Sierra Club's approach to the individual components is provided in the corresponding discussion that follows, as appropriate. While the purpose of the Sierra Club modeling was primarily to assess the impact from A.B. Brown, this modeling discussion will focus on the parameters impacting the area around the Alcoa Warrick facilities, which were modeled as a nearby source.

The current version of AERMOD is 16216r, along with AERMET version 16216. The latest version of AERMOD was released on January 17, 2017. AERMET version 16216 was available in December 2016. The 15181 version of AERMOD was the current version when Sierra Club was conducting and finalized the modeled assessment. The primary difference between the two versions arises with the use of the adjusted surface friction velocity parameter. Sierra Club did not employ that non-default regulatory option in their modeling.

10.3.3. Modeling Parameter: Rural or Urban Dispersion

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

For the purpose of performing the modeling for the area of analysis, Sierra Club determined that it was most appropriate to run the model in rural mode. This determination was based on an examination of the land use surrounding the A.B. Brown facility. The report notes that less than 50% of the land use classified as urban, so rural dispersion was selected. The EPA has examined land use in Warrick County near Alcoa and finds that this information supports the use of rural mode for characterizing dispersion near these facilities as well.

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

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

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the A.B. Brown analysis, the Sierra Club modeled additional sources, including the Alcoa Warrick facility operations and power plant.

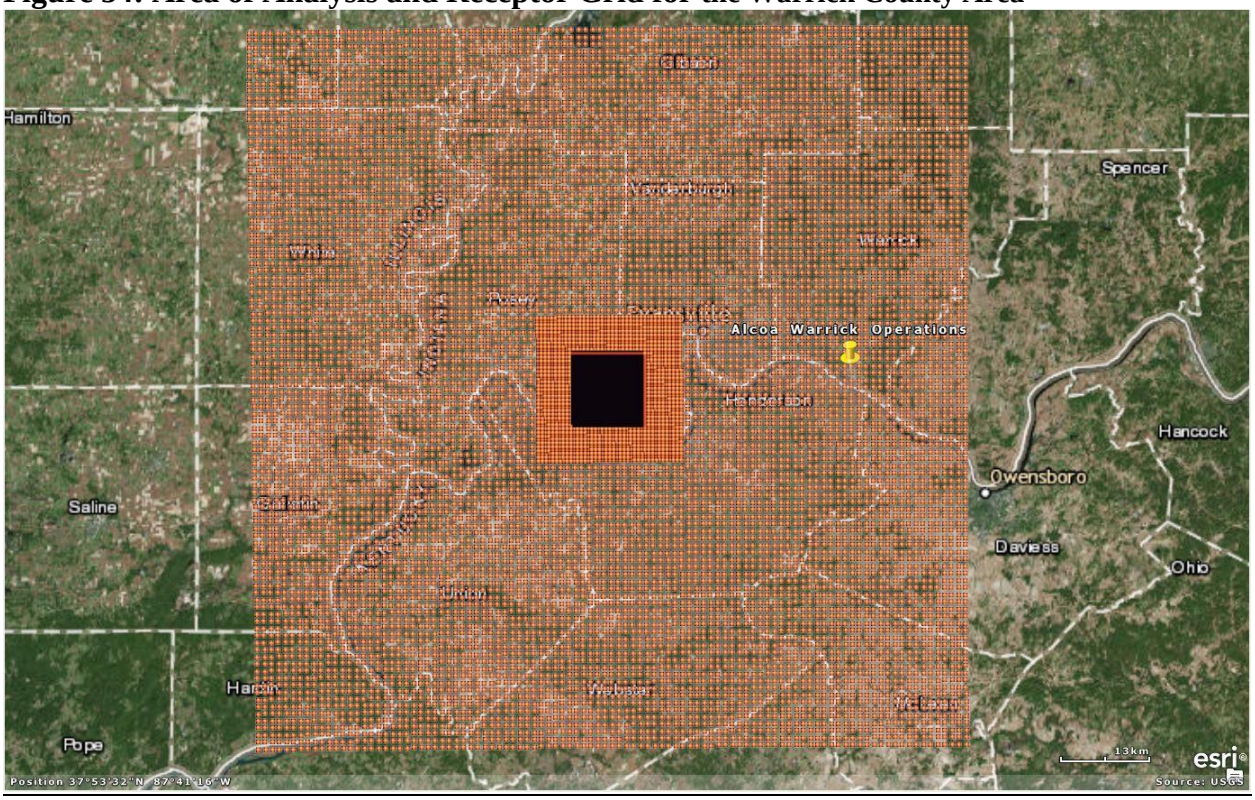
The grid receptor spacing for the entire area of analysis chosen by Sierra Club, centered on A.B. Brown, is described as follows:

- 100 m spacing out to 5 km
- 500 m spacing out to 10 km
- 1000 m spacing out to 50 km

Figure 54, generated by the EPA, shows the Sierra Club's area of analysis and receptor grid surrounding the Alcoa/Warrick facility. As noted previously, this modeling was focused on the AB Brown plant, with the grid centered on that facility. Thereby, the grid spacing near Alcoa is more coarsely spaced. However, the extent of receptors is adequate to determine if violations are occurring in the area surrounding Alcoa.

Consistent with the Modeling TAD, the Sierra Club placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to the modeled facility. Receptors don't appear to have been removed from any locations. Nevertheless, maximum estimated concentrations appear to be in locations that would be in ambient air, where receptors are appropriately placed. Modeled receptors used a 1.5 m height. The EPA's modeling guidance recommends modeling using a ground-level receptor elevation. However, modeling at this receptor height appears unlikely to have a significant effect on estimated concentrations.

Figure 54: Area of Analysis and Receptor Grid for the Warrick County Area



10.3.5. Modeling Parameter: Source Characterization

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

The Sierra Club did not include buildings in the modeling for any of the Alcoa/Warrick County facilities. Emissions from the Alcoa power plant facility were represented through four stacks. Hourly emissions were used based on continuous emissions data from EPA's Emissions Modeling Clearinghouse Data. Potline operations at Alcoa were represented through the use of five stacks in addition to a baking ring furnace stack. More detailed emissions information is discussed below.

Modeling Alcoa without building downwash is likely to lead to underestimation of concentrations near to the facility. The simplification of the potline stack configuration is likely to yield an estimate of concentrations that reasonably approximates the concentration that would be estimated with more detailed source characterization. Due to the magnitude of modeled violations, it is unlikely changes in these modeling assumptions would affect the model results enough to not indicate violations of the standard.

10.3.6. Modeling Parameter: Emissions

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

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

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

The Sierra Club chose to model the Alcoa facility using actual emissions. Alcoa power plant emissions were distributed among four stacks, three with stack heights of 116.3 meters and one with a stack height of 152.4 m. The EPA's understanding of the power plant configuration is that there are four units venting to 2 separate 116 m stacks. The total emissions in the Sierra Club modeling is nearly equal to the reported yearly tons per year emissions in the NEI. It is unclear from the documentation how the potline stack emissions were determined. However, the total of the potline stack emissions is only slightly less (approximately 5%) than the total actual emissions reported from those operations in the NEI, which for years 2012, 2013, and 2014 are 3,747 tpy, 3,852 tpy, and 3,500 tpy, respectively. Modeling with an overly tall stack would be expected to yield underestimated nearby concentrations, as would modeling with slightly understated potline emissions. Therefore, in these respects, the Sierra Club modeling appears to somewhat understate the likelihood of violations. However, as previously mentioned, due to the magnitude of the model-predicted violations, it is unlikely that any effects of these modeling assumptions would change the intended designation of the area. Table 38 shows emissions from sources in Warrick County that emit at least 100 tons of SO_2 per year, which are the sources that are likely to have the most significant impacts in this area. Although Sierra Club also modeled other sources in Posey and Gibson Counties, Indiana, and Henderson County, Kentucky, these

sources are somewhat distant from the maximum modeled concentrations, are less determinative of Warrick County air quality, and thus are not included in Table 38.

For Culley, Sierra Club modeled recent actual hourly varying emissions (from CEMS) as available from the EPA's CAMD database for the years, 2012-2014. The annual total as summed from the hourly emission file is shown in Table 38. Figure 55 below indicates the location of the Culley plant in relation to the Alcoa facilities. As shown in the figure, the properties of Culley and Alcoa are adjacent.

Table 38. Actual SO_2 Emissions Between 2012 – 2014 from Facilities in the Warrick County Portion of the Area

Facility Name	SO_2 Emissions (tpy)*		
	2012	2013	2014
Alcoa Power Plant Totals*	5,172	5,710	4,995
Alcoa Potline Totals**	3,494	3,494	3,494
Culley Power Plant*	2,116	1,948	1,896
Total Emissions from All Modeled Facilities in the Warrick County Portion of the Area of Analysis	10,782	11,152	10,385

* Based on HOUREMIS file submitted with the modeling

** Based on AERMOD modeled emission rates.

Figure 55. Satellite Imagery of Culley and Alcoa Properties

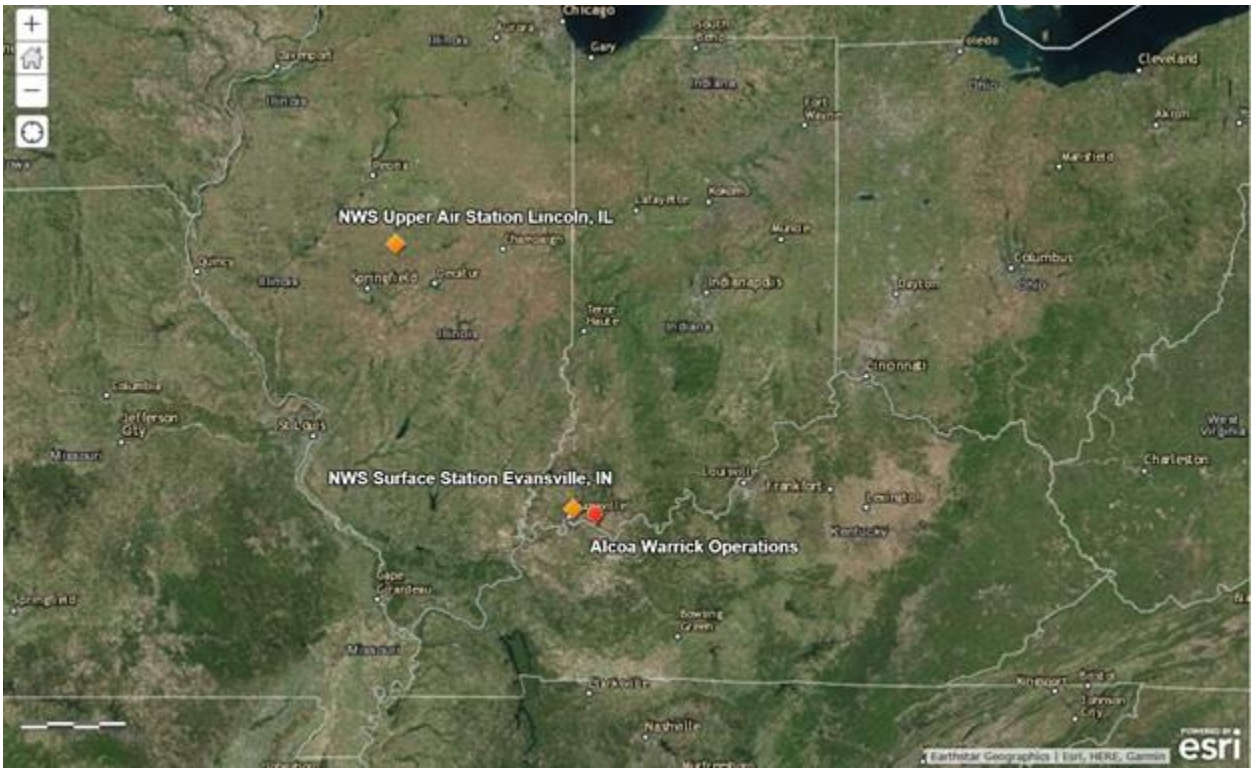
10.3.7. Modeling Parameter: Meteorology and Surface Characteristics

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

For the area of analysis for the A.B. Brown assessment, including the Alcoa Facility, the Sierra Club selected the surface meteorology from the Evansville, Indiana, Regional Airport NWS site, located roughly 20 km northwest of the Alcoa facility. Upper air observations were taken from the Lincoln, Illinois, NWS site, located approximately 300 km northwest of the facility. Sierra Club used preprocessed meteorological data provided by Indiana.

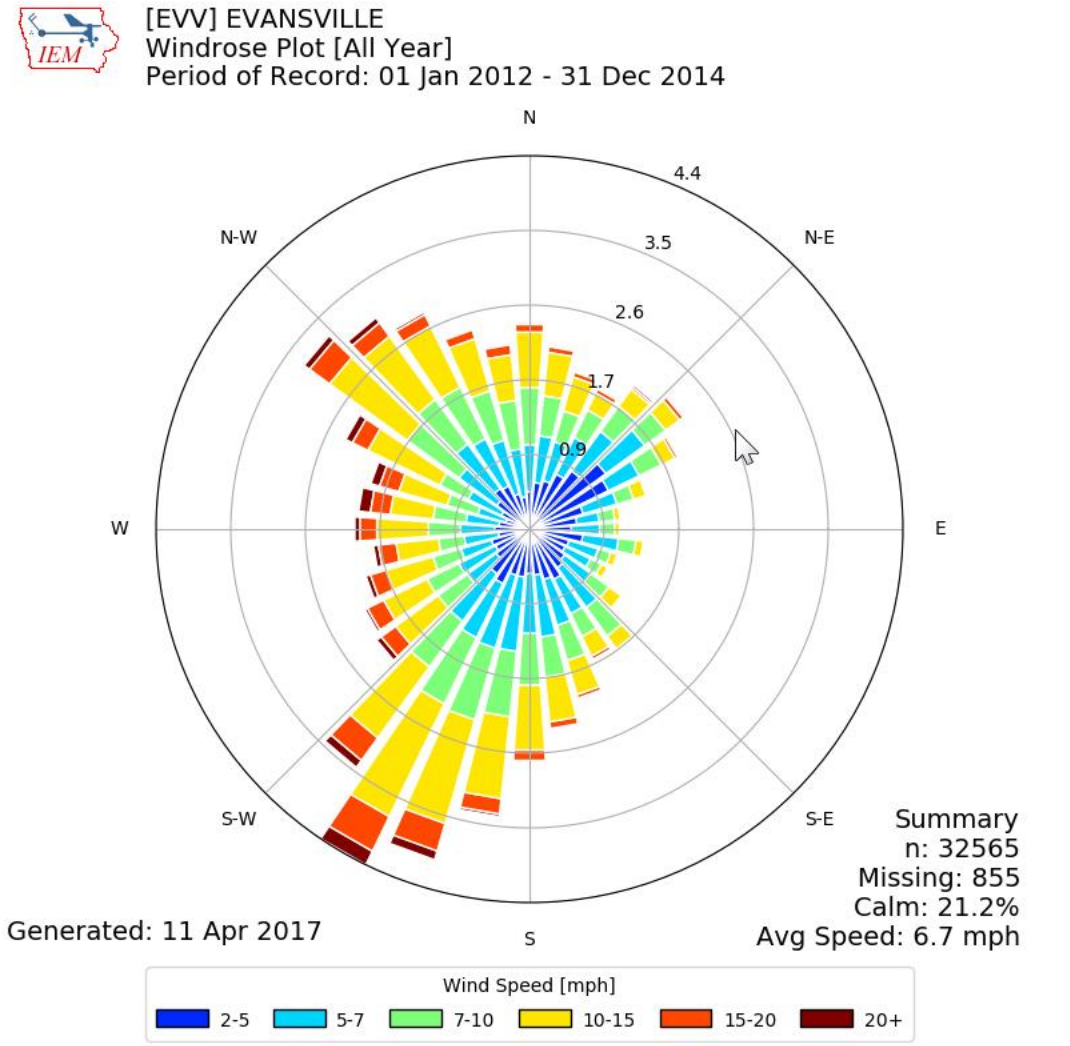
Indiana used AERSURFACE version 13016 using data from the Evansville, Indiana, Regional Airport NWS site, to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance, and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to 1 km at a monthly temporal resolution. Figure 56 shows the area included in the Sierra Club's analysis and the NWS sites from which its meteorological data were obtained.

Figure 56. Area of Analysis and the NWS stations in the Warrick County Area



In Figure 57, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Winds are predominantly from the southwest and northwest. The average wind speed is 6.7 miles per hour. The majority of hours have wind speeds in the 7 – 15 mph range with a higher percentage of stronger winds coming from the westerly directions. The plot below shows a relatively high level of calm winds. However, when the Evansville NWS hourly data is augmented with 1-minute wind data as discussed below, the number of calm hours drops dramatically (i.e., less than 5%).

Figure 57: Evansville, Indiana, 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 (Version 15181) The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The Sierra Club used meteorological provided by Indiana. Indiana generally follows the guidance for processing meteorological data as provided in the AERMET User's Guide and the Region 5 Meteorological Data Processing Protocol document.

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 Evansville, Indiana, NWS station but in a different formatted file to be processed by a separate preprocessor, AERMINUTE (version 15272). These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

Given the relatively flat terrain in this portion of Indiana/Kentucky and the proximity of the surface station to the Alcoa facility, the meteorological data used in the modeling is expected to be adequately representative of the conditions at the facility. The EPA concurs with this selection of meteorological data.

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

The terrain in the area of analysis is best described as gently rolling. Elevations rise roughly 40-50 meters in a limited area to the northeast, within 5-10 km. The terrain is relatively flat in all other directions. To account for these terrain changes, the AERMAP (version 11103) terrain program was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the 30-meter resolution National Elevation Database (NED). The EPA finds this to be an appropriate method of accounting for nearby terrain.

10.3.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99^{th} percentile monitored concentrations by hour of day and season or month. For this area of analysis, the Sierra Club used the same background data as that used by Indiana in the A.B. Brown analysis. In that analysis, the state used a "tier 2" approach using a value that varies by season/hour-of-day. The monitor used is the Buena Vista monitor in Evansville (site number 18-163-0005). The monitor is located roughly 25 km west-northwest of the Alcoa Facility. The values ranged from 1.0 to 19.48 ppb. The EPA finds this range of background values to be an adequate representation of background concentrations in rural southern Indiana.

10.3.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the A.B. Brown/Alcoa facility area of analysis are summarized below in Table 39.

Table 39: Summary of AERMOD Modeling Input Parameters for the A.B. Brown Analysis with a focus on the Alcoa facility Area

Input Parameter	Value
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	6
Modeled Stacks	22
Modeled Structures	5
Modeled Fencelines	0
Total receptors	21,201
Emissions Type	Actual and Allowable
Emissions Years	2012-2014
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Evansville, IN NWS (KEVV)
NWS Station Upper Air Meteorology	Lincoln, IL NWS (KILX)
NWS Station for Calculating Surface Characteristics	Evansville, IN Tower (KEVV)
Methodology for Calculating Background SO_2 Concentration	Tier 2 - Values varying by season/hour-of-day from site 18-163-0005
Calculated Background SO_2 Concentration	Range from 1.0 to 19.48 ppb

The results presented below in Table 40 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 40. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Warrick County Area

		Receptor Location UTM zone 16		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	2012-2014	474153	4198593	1,197	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb

The Sierra Club modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 1,197 $\mu g/m^3$, equivalent to 457 ppb. This modeled concentration included the background concentration of SO_2, and is based on the highest hour of actual emissions from the facility over a 3-year period. Figure 58 below was included as part of the Sierra Club's analysis, and indicates that the predicted value occurred about 0.5 km to the northeast of the Alcoa facility. A satellite image developed by the EPA, shown in Figure 59, is also included.

Figure 58: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of A.B. Brown Analysis

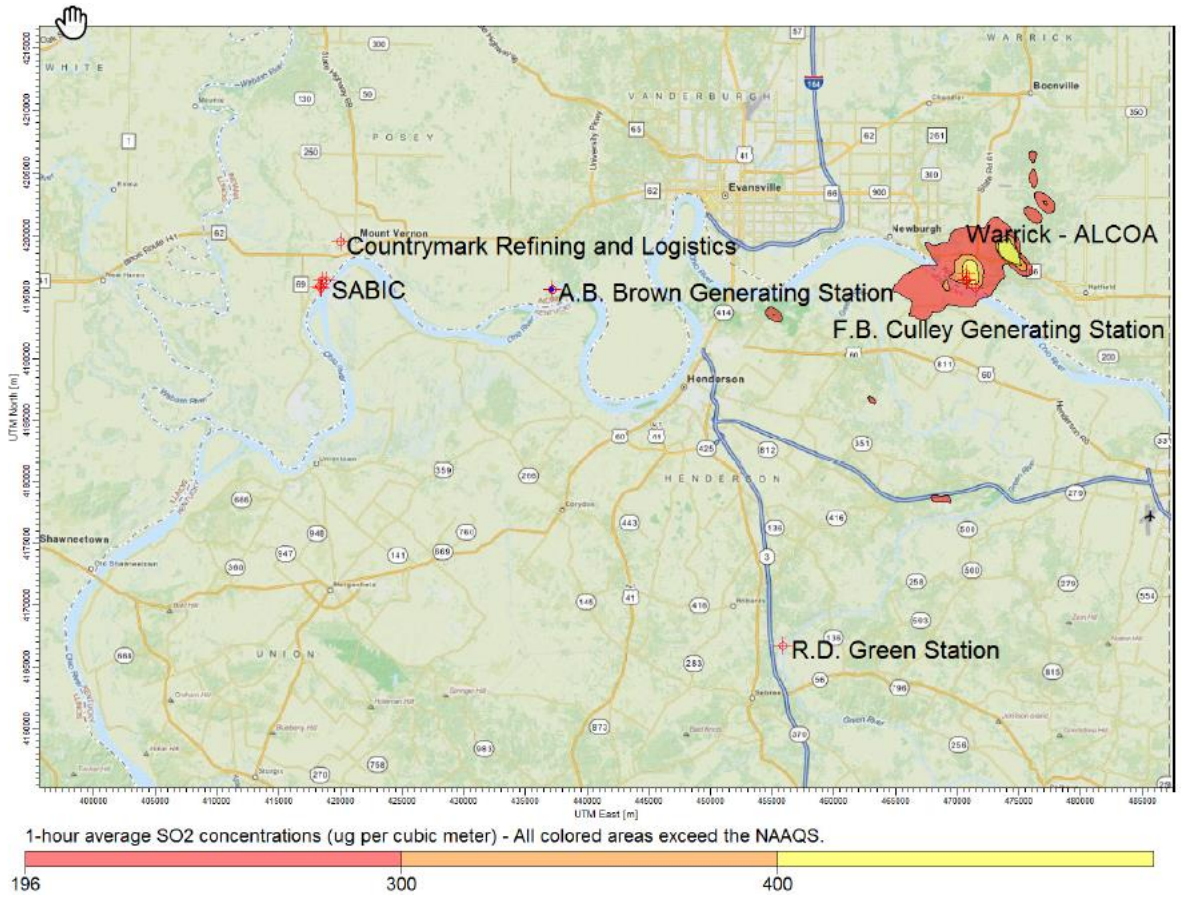
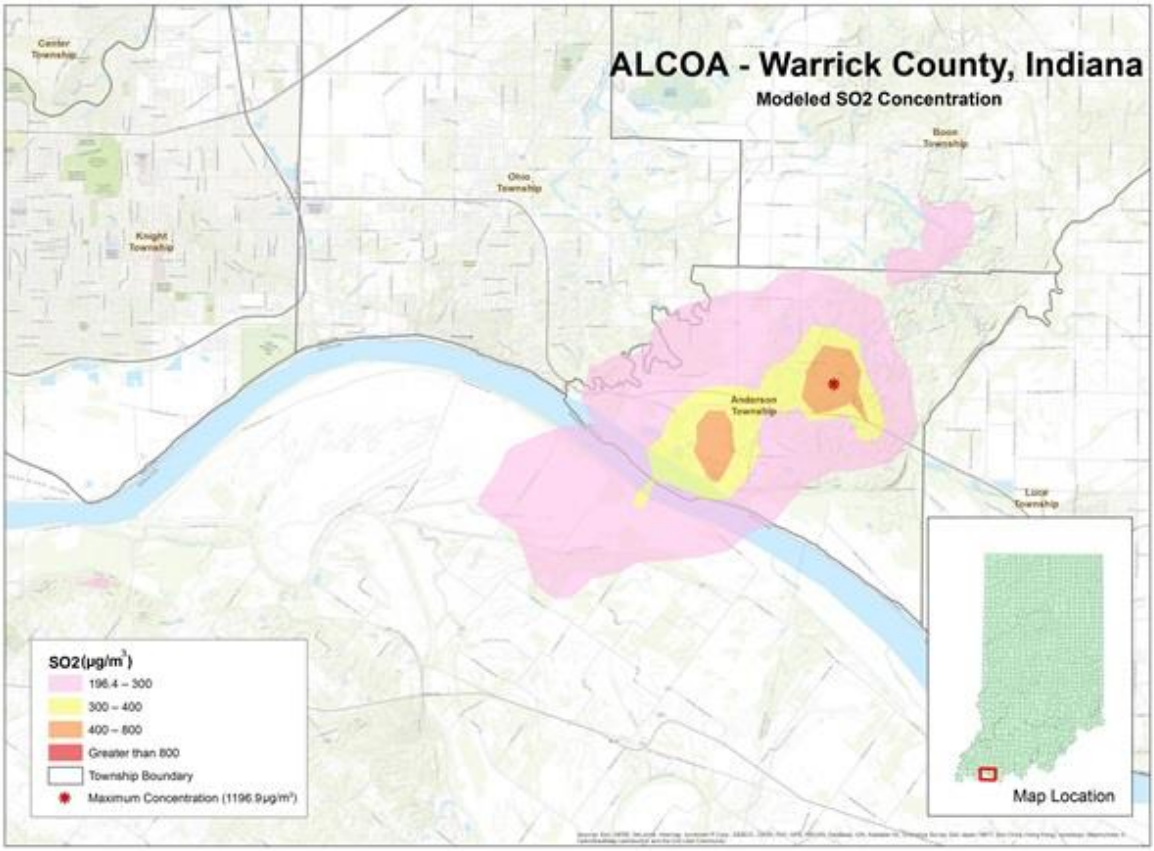


Figure 59. Satellite Image of Alcoa and Modeled Design Value Location

10.3.11. The EPA's Assessment of the Modeling Information Provided by Sierra Club

The modeling submitted by Sierra Club indicates that the 1-hour SO_2 NAAQS is violated at numerous receptors surrounding the Alcoa facilities. The modeling results indicate the area in which a NAAQS violation was modeled, information that is relevant to the selection of the boundaries of the area that will be designated. Figure 60 shows the results of this modeling. In particular, this modeling indicates that violations are primarily estimated to be occurring in Anderson Township, in Warrick County, Indiana, but this modeling also suggests that small portions of Ohio and Boon Townships in Warrick County and portions of Henderson County, Kentucky could be experiencing violations as well.

Figure 60: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Warrick County Area



The Sierra Club modeling was generally conducted in accordance with the recommendations of the Modeling TAD. In selected respects (e.g., stack heights at the Alcoa power plant and emissions from the Alcoa potlines), the inputs appear to deviate from best estimates of the relevant parameters in a manner that is prone to underestimate concentrations. Other deviations include, receptor heights other than at ground-level, and the coarseness of the receptor grid around Alcoa. However, despite these inconsistencies, the Sierra Club modeling appears to provide reliable evidence as to whether the area immediately surrounding the Alcoa facilities is violating the SO_2 standard.

Nevertheless, for various reasons, the EPA finds that the modeling is less reliable for determining whether violations are occurring in portions of Henderson County, Kentucky, than in determining whether violations are occurring in Warrick County, Indiana. A more complete discussion of the factors the EPA considered and the reasons for reaching this finding are discussed in the chapter for Kentucky.

10.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Warrick County Area

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

10.5. Jurisdictional Boundaries in the Warrick County Area

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

The modeling evidence provided by Sierra Club indicates that violations are occurring in a slightly broader area than just Anderson Township. Section 10.7 discusses the area that the EPA believes is either violating the standard or contributing to violations of the standard. Nevertheless, the EPA agrees with the element of Indiana's recommendation that recommends defining the designated area within the state on the basis of townships.

As noted above, the EPA finds that Sierra Club's modeling provides uncertain evidence as to whether violations extend into a portion of Henderson County, Kentucky. A more complete discussion of air quality in Henderson County, Kentucky, is provided in the Kentucky-specific chapter.

10.6. Other Information Relevant to the Designations for the Warrick County Area

The EPA has received no other information addressing SO_2 air quality in this area. The EPA has only recently received a modeling protocol from a consultant for Alcoa, which the EPA has not yet had the opportunity to fully review.

10.7. The EPA's Assessment of the Available Information for the Warrick County Area

The EPA has both monitoring data and modeling information to evaluate in determining the appropriate designation for this area. Unfortunately, while monitoring data for the 2008 to 2010 period are available at one site, this site appears not to be at a location of maximum concentrations in the area. In addition, while this site resumed operation in mid-2015, and while three additional sites began operation at that time, these sites all stopped operating in February 2016, so that none of these sites collected complete data for any year after 2010, and no valid

design value may be computed from these data.

Therefore, a more reliable basis for determining air quality in the Alcoa facilities area is the modeling provided by Sierra Club. The Sierra Club modeling indicates concentrations in Warrick County, Indiana that are well over the standard. The EPA finds this modeling to be adequately reliable to conclude that this area is violating the standard.

Given this finding that the Alcoa facilities area is violating the standard, a final element of the EPA's task is to determine the appropriate area to designate as nonattainment. Under Clean Air Act section 107(d)(1)(A), the EPA must designate as nonattainment "any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet)" the NAAQS. As noted above, within Indiana, Sierra Club's modeling estimates violations to be occurring mostly in Anderson Township but extending slightly into Ohio and Boon Townships. Thus, at a minimum, the nonattainment area must include these areas. Within Kentucky, as discussed in the chapter specific to Kentucky, the EPA finds that it is unclear whether this area is violating the SO_2 NAAQS.

The question then is whether any additional nearby sources contribute to these violations so as to warrant including the associated source area in the nonattainment area. In interpreting section 107(d)(1)(A), the criteria for "nearby" vary by pollutant, reflecting varying degrees to which distant sources influence pollutant concentrations. Unlike pollutants that are formed by atmospheric chemical reactions, for which pollutant concentrations generally reflect the combination of impacts from numerous sources spread over broad areas, SO_2 concentrations at any particular location tend to be dominated by impacts from sources within a modest distance. In the case of the violations within and near Warrick County, the violations are modeled within a few km of the three sources in the area, i.e. the two Alcoa facilities and Culley, and these sources appear to have a dominant impact on these concentrations. Table 41 lists sources emitting over 100 tons of SO_2 per year within 50 km of the Alcoa facilities.

Table 41. Facilities Emitting at least 100 tons of SO_2 Per Year Within 50 km of the Alcoa Facilities

Facility Name	County	2014 SO_2 Emissions (tpy)	Distance from Alcoa (km)
Owensboro Grain	Daviess	438	25
Rockport Station	Spencer	54,979	26
Owensboro Muni – Elmer Smith Station	Daviess	5,741	27
Century Aluminum Sebree	Henderson, KY	4,739	31
Big River/Robert D. Green Station	Webster, KY	3,999	33
Big River/Robert A. Reid Station	Webster, KY	12,202	33
A.B. Brown Station	Posey, IN	8,080	34
Big River/Coleman Station	Hancock	923	47
Century Aluminum	Hancock	2,224	48

These sources are all at considerable distance from the Alcoa facilities. Furthermore, given that the estimated violations in and near Warrick County are limited to an area quite near to the Alcoa facilities (as commonly occurs for SO_2), it appears unlikely that the sources in Table 41 have impact SO_2 concentrations in the Alcoa facilities area. Although the emissions from Rockport are especially substantial, more recent emission levels are about half of 2014 levels (29,889 and 24,341 tons of SO_2 in 2015 and 2016, respectively), the area around this plant was found to attain the standard in Round 2 (suggesting reduced potential for impacts 26 km away), and winds at times when maximum concentrations occur near the Alcoa facilities are blowing Rockport emissions away rather than toward the Alcoa facilities area. Therefore, the EPA believes that the sources in Table 41 should not be considered nearby contributors to the estimated violations within and near Warrick County. That is, the only sources that warrant being considered nearby contributors to the violations, namely the two Alcoa facilities and Culley, are within the area estimated to be violating the standard. As a result, the area defined above as including the area that contains the violations within and near Warrick County also includes all the nearby sources likely to be contributing to these violations. In addition, no other violating areas are nearby, so there is no indication that the remainder of Warrick County contributes to any nearby violations.

10.8. Summary of Our Intended Designation for the Warrick 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 portions of Warrick County, Indiana, as nonattainment for the 2010 SO_2 NAAQS. In particular, the EPA intends to designate a nonattainment area that includes Anderson, Boon, and Ohio Townships in Warrick County, Indiana. As discussed in more detail in the Kentucky chapter, the EPA intends to designate the relevant portion of Henderson County as unclassifiable.

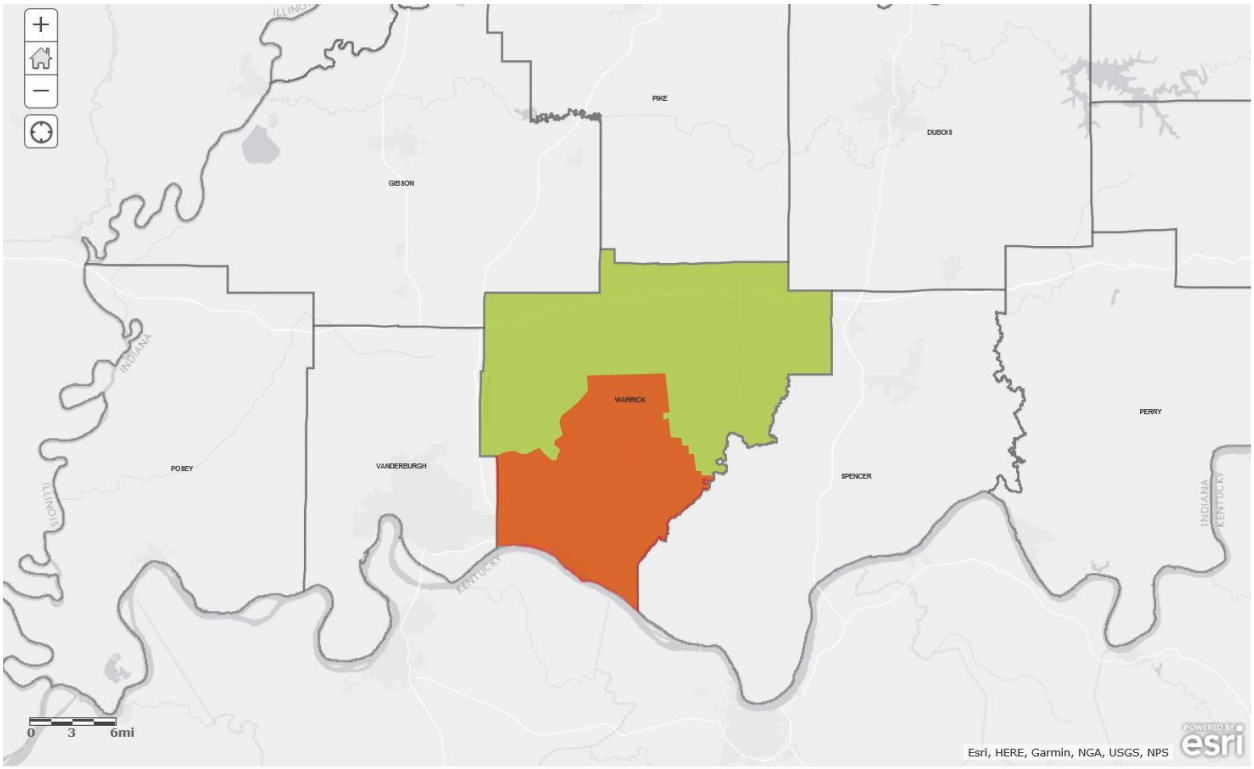
The available modeling indicates that no violations are occurring elsewhere in Warrick County,

and the remainder of Warrick County has no sources over 10 tpy that could be considered potentially contributing to the violations that have been identified in the southern portion of Warrick County. In addition, the remaining portion of Warrick County meets the EPA's definition of an unclassifiable/attainment area in that it 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. Specifically, the remainder of Warrick County, as described previously, does not contain sources expected to cause or contribute to violations of the standard.

Figure 61 shows the boundary of the intended designated area. The red indicates the intended nonattainment area and the green indicates the intended unclassifiable/attainment area, both of which make up the entirety of Warrick County.

Indiana has recommended a designation of attainment for a portion of Warrick County. EPA regulations for implementing the SO_2 NAAQS require Indiana to characterize SO_2 air quality in this area. In considering the state's recommendation, we have taken into account all available information, including any current (2014-2016) air monitoring data, and any air dispersion modeling analyses provided by Indiana or by a third party. The air dispersion modeling data, however, show either that this area may be violating the 2010 primary SO_2 NAAQS or contains sources that may be contributing to air quality in a nearby area that may be violating the 2010 primary SO_2 NAAQS, which would require a modification of the recommended designation. We invite Indiana to review the available information and further discuss this issue with the EPA in order to inform an appropriate final designation.

Figure 61. The EPA's Intended Warrick County Area



11. Analysis for Remainder of Indiana

11.1. Introduction

The state has installed and begun operation of a new, approved SO_2 monitoring network by January 1, 2017, for the area near ArcelorMittal-Burns Harbor, in Porter County but has not done so for any other sources of SO_2 emissions. Accordingly, the EPA must designate all remaining counties and portions of counties in Indiana that have not previously been designated for the 2010 SO_2 standard other than the ArcelorMittal-Burns Harbor area in Porter County by December 31, 2017.

In Rounds 1 and 2, published on August 5, 2013, (78 FR 47191) and July 12, 2016, (81 FR 45039) respectively, the EPA designated two full counties and portions of eight additional counties in Indiana. Sections 3 to 10 above address four additional full counties and portions of four additional counties (one of which is to address the remainder of Posey County). Therefore, of the 92 counties in Indiana, a total of seven whole counties and portions of eleven additional counties have been addressed either in Rounds 1 or 2 or in Sections 3 to 10 above, and remaining portions of the eleven partially addressed counties and all of the other 74 counties are to be addressed in this Section 11.

For the area near the ArcelorMittal-Burns Harbor facility, the EPA is authorized and intends to designate this area during Round 4. Accordingly, Section 11.3 below will address the EPA's intended extent of the area for which no designation will be promulgated in Round 3.

At this time, there are no air quality modeling results available to the EPA for these counties and portions of counties. In addition, there are no air quality monitoring data that indicate any violation of the 1-hour SO_2 NAAQS. The EPA is designating the pertinent counties and portions of counties in the state as "unclassifiable/attainment" since these areas were not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. Table 42 lists the areas that the EPA intends for these reasons to designate as unclassifiable/attainment. This table in particular identifies those counties for which the EPA intends in Round 3 to designate only a portion of the county as unclassifiable/attainment, either because the EPA intends to designate portions of the county as nonattainment or because the EPA has previously designated a portion of the county (in Round 1 or 2). Accordingly, in those counties for which Table 42 identifies the area to be addressed as "Rest of county," the area that the EPA intends to designate as unclassifiable/attainment will include all of the county except for, respectively, the portion of the county that the EPA intends to designate as nonattainment or the portion of the county that the EPA has already designated.

Table 42. Counties and Partial Counties that the EPA Intends to Designate Unclassifiable/Attainment

County or Partial County (p)	Indiana's Recommended Area Definition	Indiana's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Adams County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Allen County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Bartholomew County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Benton County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Blackford County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Boone County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Brown County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Carroll County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Cass County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Clark County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment

County or Partial County (p)	Indiana's Recommended Area Definition	Indiana's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Clay County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Clinton County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Crawford County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Daviess County	Rest of county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Dearborn County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Decatur County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
DeKalb County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Delaware County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Dubois County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Elkhart County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Fayette County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Fountain County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Franklin County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Fulton County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Grant County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Greene County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Hamilton County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Hancock County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Harrison County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Hendricks County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Henry County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Howard County	Full county	Unclassifiable	Same as	Unclassifiable/

County or Partial County (p)	Indiana's Recommended Area Definition	Indiana's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
			State's	Attainment
Huntington County	Full county	Unclassifiable	Rest of County	Unclassifiable/ Attainment
Jackson County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Jay County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Jefferson County	Rest of county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Jennings County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Johnson County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Knox County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Kosciusko County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
LaGrange County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Lawrence County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Madison County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Marion County	Rest of county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Marshall County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Martin County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Miami County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Monroe County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Montgomery County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Morgan County	Rest of county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Newton County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Noble County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Ohio County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment

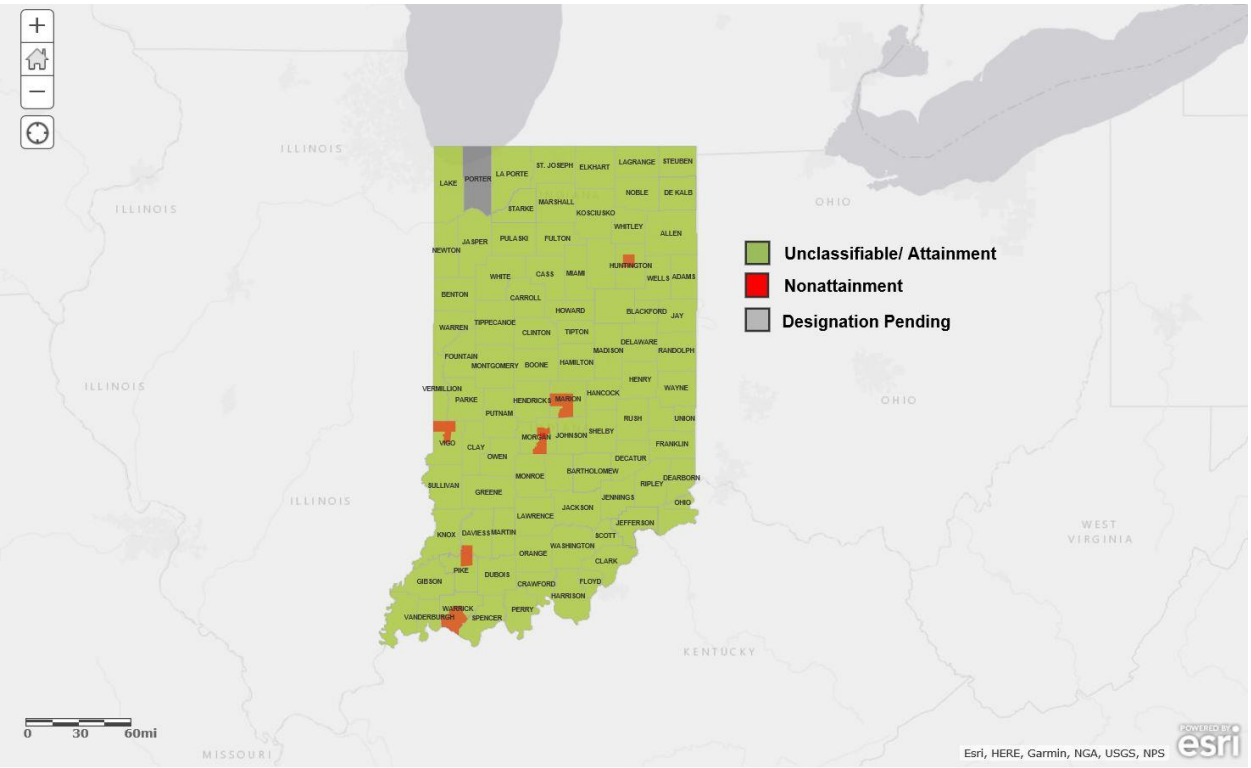
County or Partial County (p)	Indiana's Recommended Area Definition	Indiana's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Orange County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Owen County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Parke County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Perry County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Pike County	Rest of county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Pulaski County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Putnam County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Randolph County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Ripley County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Rush County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
St. Joseph County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Scott County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Shelby County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Spencer County	Rest of county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Starke County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Steuben County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Switzerland County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Tippecanoe County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Tipton County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Union County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Vanderburgh County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Vermillion	Rest of county*	Unclassifiable	Same as	Unclassifiable/

County or Partial County (p)	Indiana's Recommended Area Definition	Indiana's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
County			State's	Attainment
Vigo County	Rest of county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Wabash County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Warren County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Warrick County	Rest of County	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Washington County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Wayne County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Wells County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
White County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment
Whitley County	Full county	Unclassifiable	Same as State's	Unclassifiable/ Attainment

*See discussion below.

Table 42 also summarizes Indiana's recommendations for these areas. Specifically, in its 2011 submission, for all areas other than those addressed above or that were designated in Rounds 1 or 2, Indiana recommended a designation of unclassifiable. After careful review of the state's assessment, supporting documentation, and all available data, the EPA intends to modify the state's recommendation and intends to designate these areas as unclassifiable/attainment. Figure 62 shows these intended designations, in conjunction with the intended designations described above and the designations that have already been promulgated.

Figure 62. Summary of Designations and Intended Designations in Indiana



11.2. Air Quality Monitoring Data

This Indiana chapter addresses areas in Indiana that have not been addressed in Rounds 1 or 2. In those areas in Round 3 with a DRR source, the area-specific discussion above has already discussed monitoring data in or near to the pertinent county. The EPA plans to address current monitoring in Porter County in Round 4 in conjunction with evaluation of data obtained at the newly established site. Thus, this section 11.2 is limited to discussing monitoring data available for areas being addressed in Round 3 that are not located in the same county or nearby to a DRR source. Indiana's monitoring network includes four such monitors. Table 43 shows the locations of these four monitors and their design values for 2013 to 2015 and for 2014 to 2016.

Table 43. Monitors in Counties Without DRR Sources

AQS ID	County	City	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
18-005-0007	Bartholomew	Hope	16	12
18-163-0021	Vanderburgh	Evansville	23	21
18-177-0006	Wayne	Richmond	19	25
18-183-0003	Whitley	None	10	10

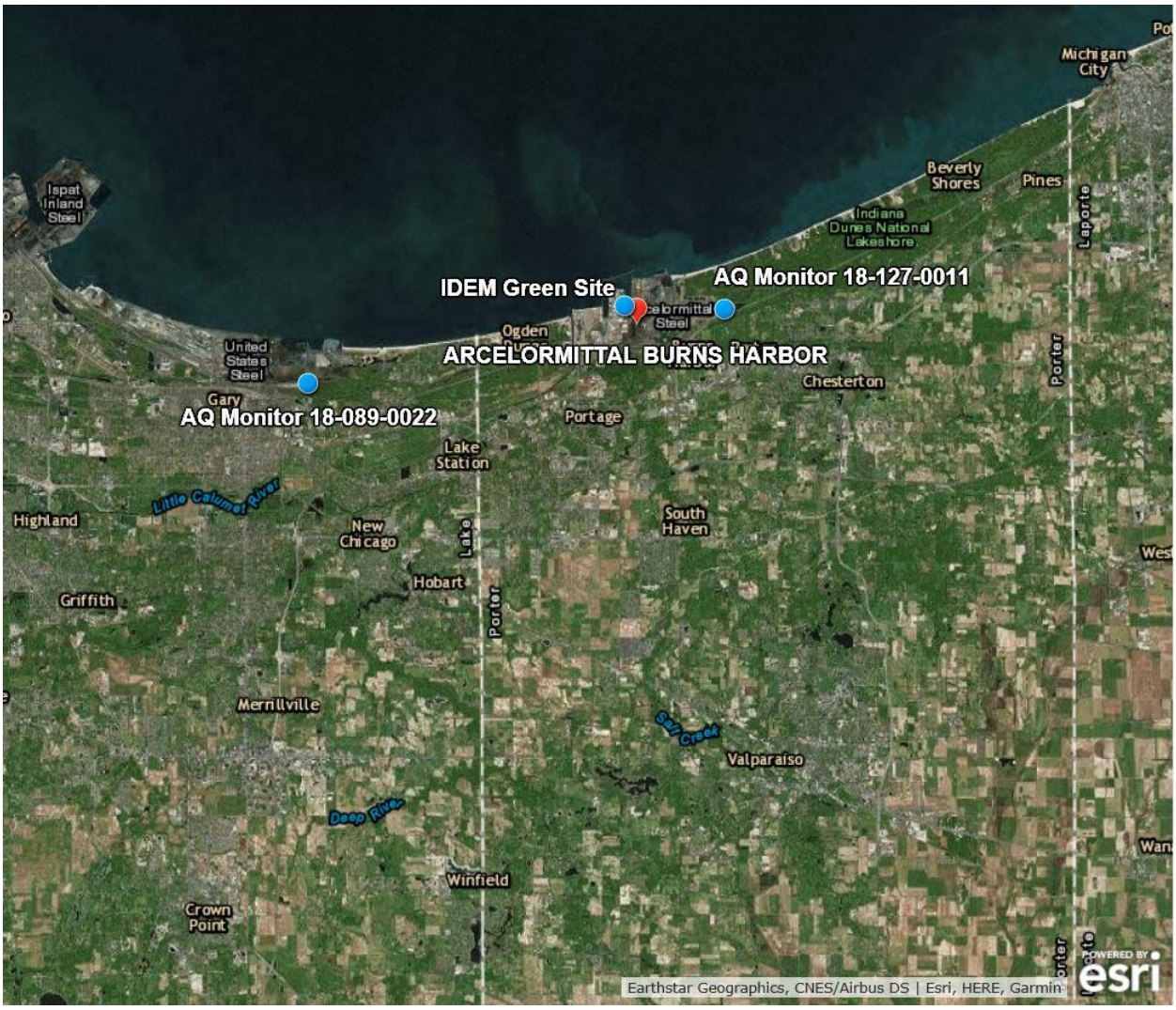
Design values for this period at these four sites were below the NAAQS. These data were available to the EPA for consideration in the designations process however, since it is unclear if these monitors are located in the areas of maximum concentration, it is unclear if the data are representative of the broader area's actual air quality.

11.3. Porter County

In fulfillment of obligations pursuant to the listing of ArcelorMittal-Burns Harbor as an applicable source under the DRR, the source began operating an additional monitor just west of the facility (site number 18-127-0028) by January 1, 2017, supplementing an existing monitor just east of the facility (site number 18-127-0011). As a result, the EPA is not required to designate this area until Round 4, by December 31, 2020.

Figure 63 shows the location of ArcelorMittal-Burns Harbor and the neighboring NIPSCO-Bailly Station, as well as the two pertinent monitoring sites, in relation to the borders of Porter County with neighboring Lake, Jasper, and LaPorte Counties. Specifically, the ArcelorMittal-Burns Harbor facility is 6.5 km from the Lake County border, 17 km from the LaPorte County border, and 38 km from the Jasper County border. In 2014, ArcelorMittal-Burns Harbor emitted 12,189 tons of SO_2 and NIPSCO-Bailly Station emitted 1,117 tons of SO_2.

Figure 63. Porter County Area



The modeling that Indiana submitted for Lake County includes receptors that extend fully to the border of Lake County with Porter County. Therefore, as discussed in Section 6 above, the EPA has adequate information to determine air quality in Lake County now, without waiting for data from the new Porter County monitors. The new Porter County monitors are sufficient distance from any sources in LaPorte County and Jasper County that the new monitoring data is not expected to be indicative of air quality around the sources in these other counties.

If monitoring in Porter County identifies violations, it will be necessary at that time to identify the areas that contribute to those violations. The EPA is not required to designate in this immediate round areas that timely commenced operating an appropriate new monitoring network. While the EPA is not at this time required to designate the Porter County area, the EPA must now designate other parts of Indiana. Consequently, the EPA is evaluating whether areas nearby to Porter County are or are not potentially contributing to any future-indicated violations

near ArcelorMittal-Burns Harbor in Porter County, or whether the inadequacy of available information prevents the EPA from being able to make such a determination.

Porter County is adjoined by Jasper, LaPorte, and Lake Counties. The nearest edge of Jasper and LaPorte Counties are considerable distance from Arcelor-Mittal-Burns Harbor—17 and 38 kilometers, respectively—and the nearest sources emitting over 100 tpy in those counties are even more distant. Lake County is closer but still somewhat distant from ArcelorMittal-Burns Harbor: the county border is 6.5 km away, and the nearest source emitting over 100 tpy, U.S. Steel-Gary Works, is 14 km away. At these distances, and given that Indiana has demonstrated (as discussed in Section 6 above) that concentrations near this source and others in Lake County are below the SO_2 NAAQS, it appears unlikely that Lake County would contribute to any violations near ArcelorMittal-Burns Harbor should such violations be monitored in the future. Thus, more generally, it appears unlikely that any part of Indiana (or any other state) would contribute to any future monitored violation in the Porter County area, and it is appropriate for the EPA to determine that these areas do not contribute to a nearby area that does not meet the NAAQS even though EPA is not yet prepared to determine whether the Porter County area in fact meets the NAAQS. The EPA will make that determination for the entire Porter County area no later than December 31, 2020.

11.4. Jurisdictional Boundaries in Indiana

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

In its 2011 submission, for all areas other than those addressed above or that were designated in Rounds 1 or 2, Indiana recommended a designation of unclassifiable.

11.5. Conclusions Regarding Designations for Areas Not Addressed in Sections 3 to 10 or Previously Designated

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate each county in the rest of Indiana as a separate unclassifiable/attainment area for the 2010 SO_2 NAAQS. Specifically, the boundaries are generally comprised of county boundaries except where a portion of the county has previously been designated or where (as discussed in sections 4 and 10 above, addressing Huntington and Warrick Counties, respectively) the EPA intends to designate a portion of the county as nonattainment. In these latter areas, the area that the EPA intends to designate as unclassifiable/attainment is the remainder of the county.

The EPA intends to designate the entirety of Vermillion County as unclassifiable/attainment. The portion of this county that is near Cayuga is demonstrated to attain the NAAQS based on modeling evidence provided by Indiana, and the remainder of Vermillion County was not

required to have an air quality characterization under the DRR and the EPA has no evidence indicating that the area is violating the standard. In Posey County, where most of the county was designated in Round 2, the EPA intends in Round 3 to designate only the remaining portions of the county (i.e., Black and Point Townships). The ultimate result would be the entirety of the county being designated unclassifiable/attainment.

Table 42 above describes the area in each county that the EPA intends to designate unclassifiable/attainment. Where the area being addressed is "Full county," the EPA intends to designate the entire county as unclassifiable/attainment. For those counties in Table 42 that were partially designated in Round 1 or Round 2, the EPA intends to designate as unclassifiable/attainment those remaining portions of the county that have not yet been designated. For those counties in Table 42 for which partial county designations of nonattainment are described in Sections 3 to 10 above, the EPA intends to designate as unclassifiable/attainment the remaining portions of those counties beyond the portions addressed in the applicable section above.

At this time, our intended designations for the state only apply to these areas and the other areas presented in this chapter. The EPA intends to evaluate and designate all remaining undesignated areas in Indiana, specifically Porter County, by December 31, 2020.