Technical Support Document:

Chapter 12
Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for Illinois

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 Illinois for the 2010 SO_2 NAAQS. In previous final actions, the EPA has

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

issued designations for the 2010 SO_2 NAAQS for selected areas of the country.[2] The EPA is under a December 31, 2017, deadline to designate the areas addressed in this TSD as required by the U.S. District Court for the Northern District of California.[3] We are referring to the set of designations being finalized by the December 31, 2017, deadline as "Round 3" of the designations process for the 2010 SO_2 NAAQS. After the Round 3 designations are completed, the only remaining undesignated areas will be those where a state has installed and timely begun 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.

Illinois submitted its first recommendation regarding designations for the 2010 1-hour SO_2 NAAQS on June 2, 2011. The state submitted updated recommendations on September 18, 2015, April 19, 2016, and January 12, 2017. The state submitted an updated air quality analysis and recommendations specifically for the Madison County area around Granite City Steel and Gateway Energy Coke on July 6, 2017. 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 we have considered the recommendation in the later submission.

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

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

Area/County	Illinois' Recommended Area Definition	Illinois' Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Christian County	Christian, Macoupin, Montgomery, and Sangamon Counties	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Crawford County	Crawford County	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Lake County	Lake County	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment

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

Area/County	Illinois' Recommended Area Definition	Illinois' Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Randolph County	Monroe, Randolph, and St. Clair Counties	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Washington County	Perry and Washington Counties	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
Madison County	Chouteau (part), Nameoki, Granite City, and Venice Townships	Attainment	Same as State's Recommendation	Unclassifiable
Remaining Undesignated Areas to Be Designated in this Action*	All other counties except for Macon County and those counties already designated by the EPA	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment

* Except for areas that are associated with sources for which Illinois elected to install and began timely operation of a new SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 DRR (*see* Table 2), the EPA intends to designate the remaining undesignated counties (or portions of counties) in Illinois as "unclassifiable/attainment" 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 that we intend to designate as unclassifiable/attainment (those to which this row of this table is applicable) are identified more specifically in section 8 of this TSD.

Areas for which Illinois elected to install and began timely operation of a new, approved SO_2 monitoring network are listed in Table 2. The EPA is required to designate these areas, pursuant to a court ordered schedule, by December 31, 2020. Table 2 also lists the SO_2 emissions sources around which each new, approved monitoring network has been established.

Table 2. Undesignated Areas Which the EPA Is Not Addressing in this Round of Designations, and Associated Sources

Area	Source(s)
Macon County	Archer Daniels Midland Company/Tate & Lyle Ingredients Americas LLC

2. General Approach and Schedule

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

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

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

As specified by the March 2, 2015, court order, the EPA is required to designate by December 31, 2017, all "remaining undesignated areas in which, by January 1, 2017, states have not installed and begun operating a new SO_2 monitoring network meeting 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 six sources in Illinois meeting DRR emissions criteria that states have chosen to be characterized using air dispersion modeling, the areas associated with two sources in Illinois for which the state imposed emissions limitations on sources to restrict their SO_2 emissions to less than 2,000 tpy, and other areas not specifically required to be characterized by the state under the DRR.

Because many of the intended designations have been informed by available modeling analyses, this preliminary TSD is structured based on the availability of such modeling information. There is a section for each area for which modeling information is available. The remaining to-be-designated counties are addressed together in section 8.

[3] 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.

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 99th 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]
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.

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

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. Air Quality Modeling Analysis for the Christian County Area, Addressing Kincaid Generation LLC

3.1. Introduction

The EPA must designate the Christian County area by December 31, 2017, because the area has not been previously designated and Illinois 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 Christian County. This section presents all the available air quality modeling information for Christian County, particularly for Kincaid Generation LLC (Kincaid).

The Kincaid facility emits 2,000 tons or more annually. Specifically, Kincaid emitted 2,818.4 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Illinois has chosen to characterize it via modeling.

In its submission, Illinois recommended that an area that includes the area surrounding the Kincaid facility, specifically Christian, Macoupin, Montgomery, and Sangamon Counties, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees that modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is being attained in this area and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section of this Chapter, after all the available information is presented.

The area that the state has assessed via air quality modeling covers large portions of Christian and Sangamon Counties, the northern section of Montgomery County, and the northeast section of Macoupin County. As seen in Figure 1 below, the Kincaid facility is located four miles west of the town of Kincaid, along the southern end of Sangchris Lake in northwestern Christian County.

Also included in Figure 1 are all other sources within 45 km of Kincaid emitting over 100 tons per year of SO_2. These are City of Springfield's City Water Light & Power Station (CWLP) and Illinois Secretary of State's Capital Power Plant (CPP). The CWLP power plant is approximately 21 kilometers (km) northwest of the Kincaid power plant. The CPP facility, which provides steam to the Capitol complex for heating and air conditioning, is located approximately 29 km northwest of the Kincaid power plant.

Figure 1. Map of the Christian County Area Addressing Kincaid

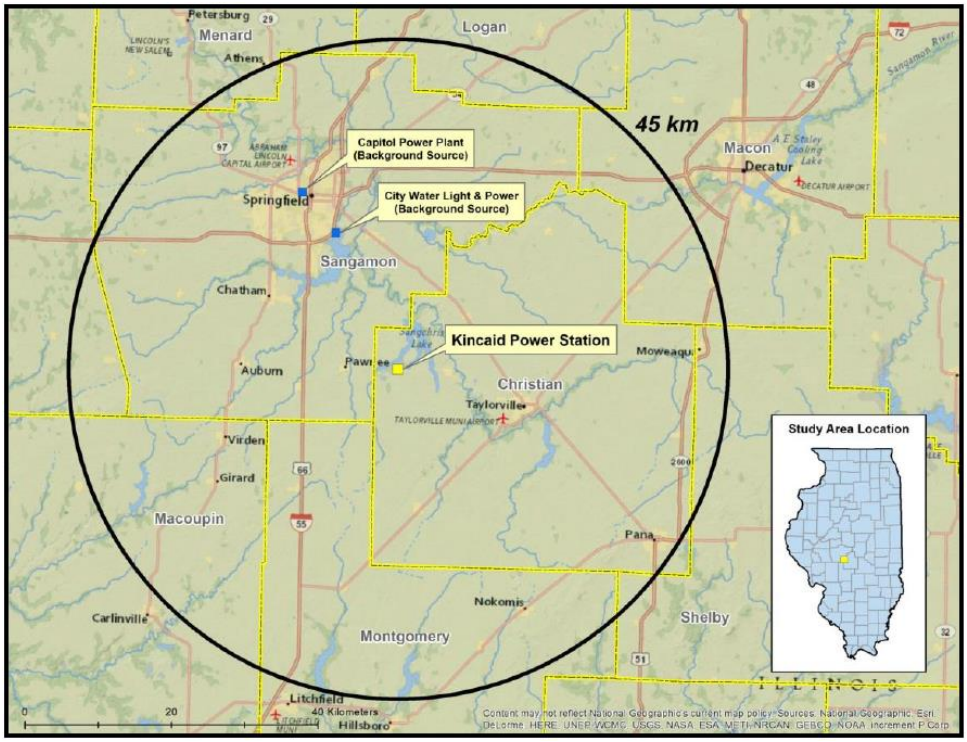
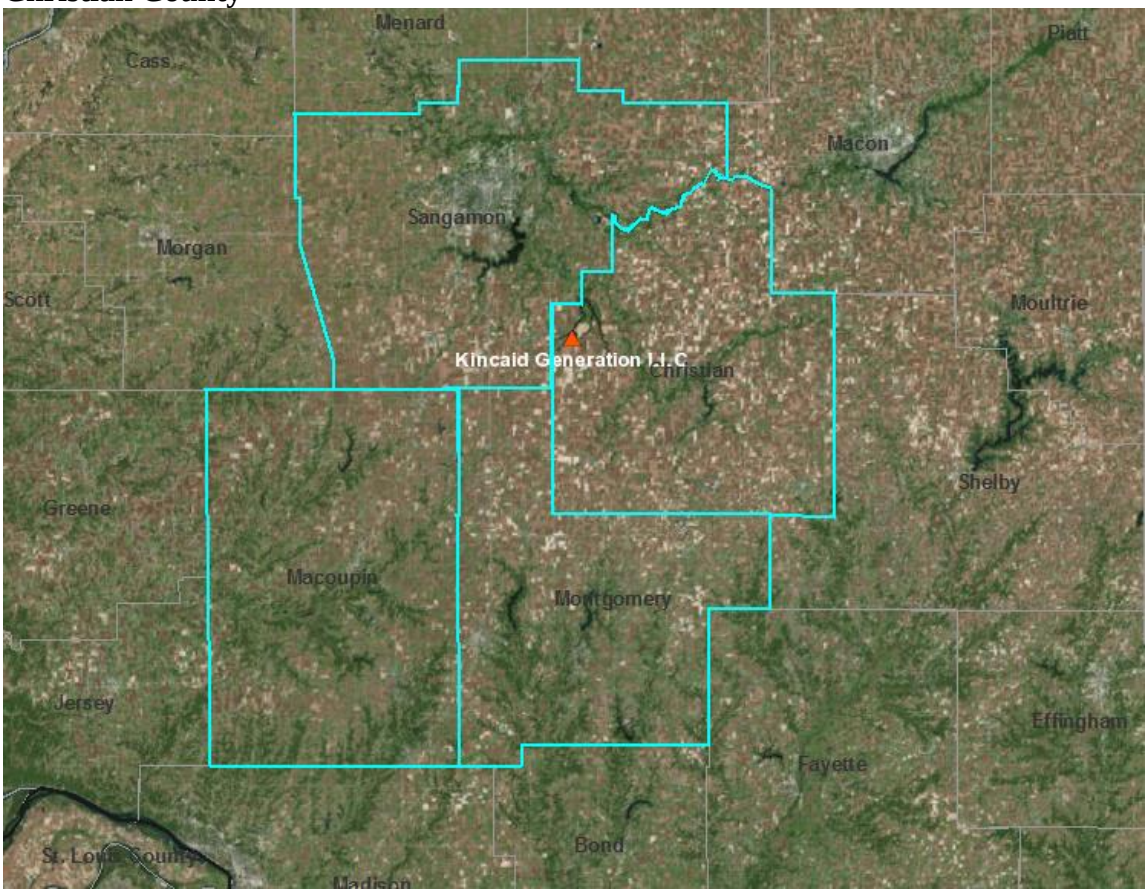


Figure 2 shows the counties in the Christian County area. Illinois recommended that four of the counties shown in this map be designated attainment, namely Christian, Macoupin, Montgomery, and Sangamon Counties. The EPA intends to designate this same area as unclassifiable/attainment.

Figure 2. Boundary of the EPA's Intended Unclassifiable/Attainment Area Containing Christian County



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

3.2. Air Quality Monitoring Data for the Christian County Area

This section considers the SO_2 air quality monitoring data in the Christian County area. There are two monitors in the area (site numbers 17-117-0002 and 17-167-0006), but Illinois 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 Christian County area. Table 3 shows the monitors that are located within 45 km of Kincaid Power Station.

Table 3. Monitors near Kincaid Power Station

AQS ID	County, State	Distance from Kincaid (km)	Direction from Kincaid	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
17-117-0002	Macoupin, IL	35	SW	8	7
17-167-0006	Sangamon, IL	25	NNW	13	--*

*No data collected after 2015.

Available design values at these two sites were below the NAAQS.

3.3. Modeling Analysis Provided by the State

3.3.1. Model Selection and Modeling Components

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

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

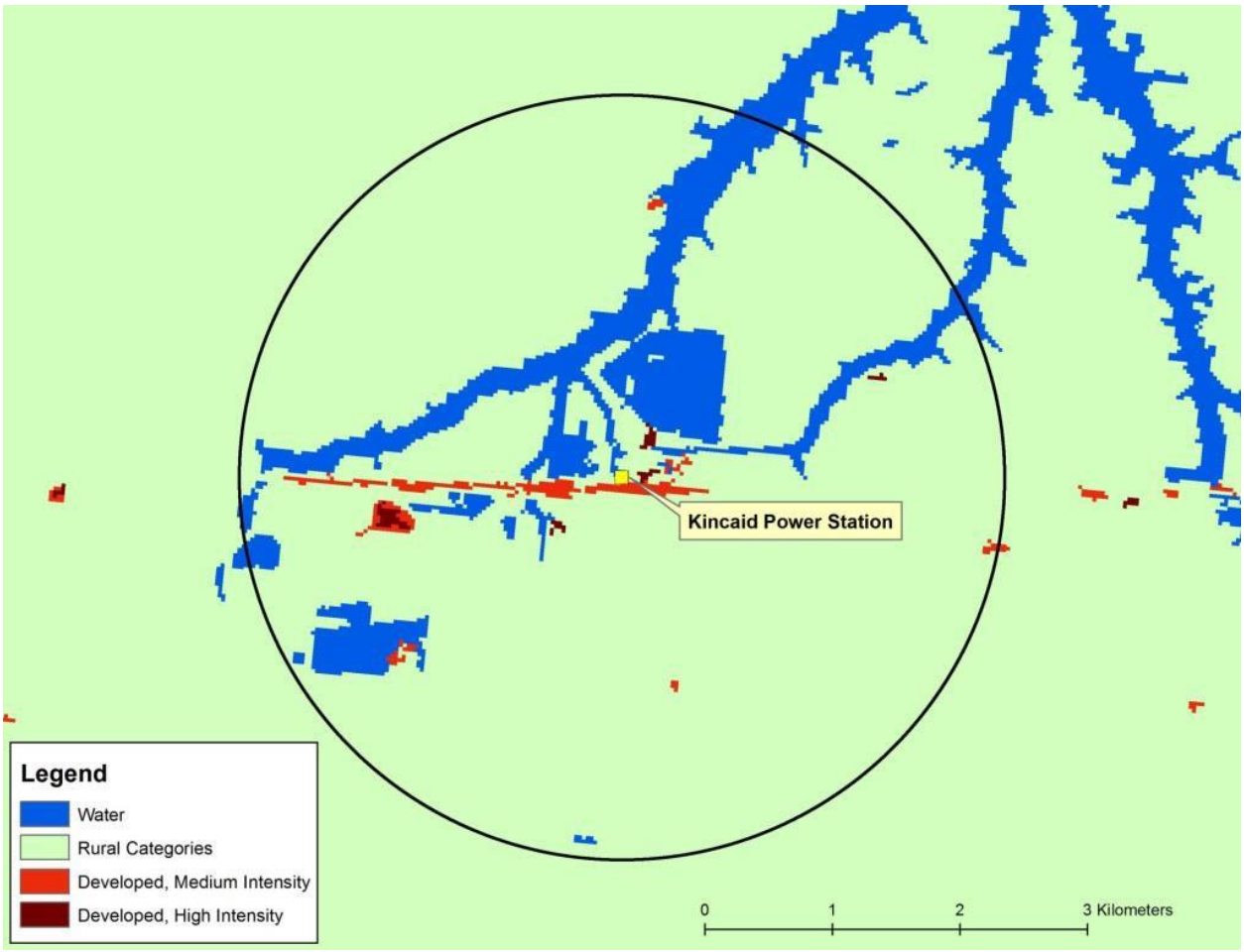
The state used AERMOD version 15181 with default regulatory options. The non-default surface friction velocity option (ADJ_U*) was not used for this modeling analysis. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

3.3.2. 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. An Auer's land use analysis was conducted by Illinois to determine that the rural mode was appropriate, resulting in the map shown in Figure 3. The area of analysis within a 3 km radius from Kincaid was determined to be 98.77% rural. The EPA agrees with Illinois' analysis and decision to the run the model in rural mode.

Figure 3. Land Use Near Kincaid



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

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

Kincaid, the source of SO_2 emissions subject to the DRR in this area, is described in the introduction to this section. For the Christian County area, the state has included the two other emitters of SO_2 that are within 45 km of Kincaid in any direction. The state determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to Kincaid, the other

emitters of SO_2 included in the area of analysis are CWLP and CPP. No other sources beyond 45 km 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 sources to model.

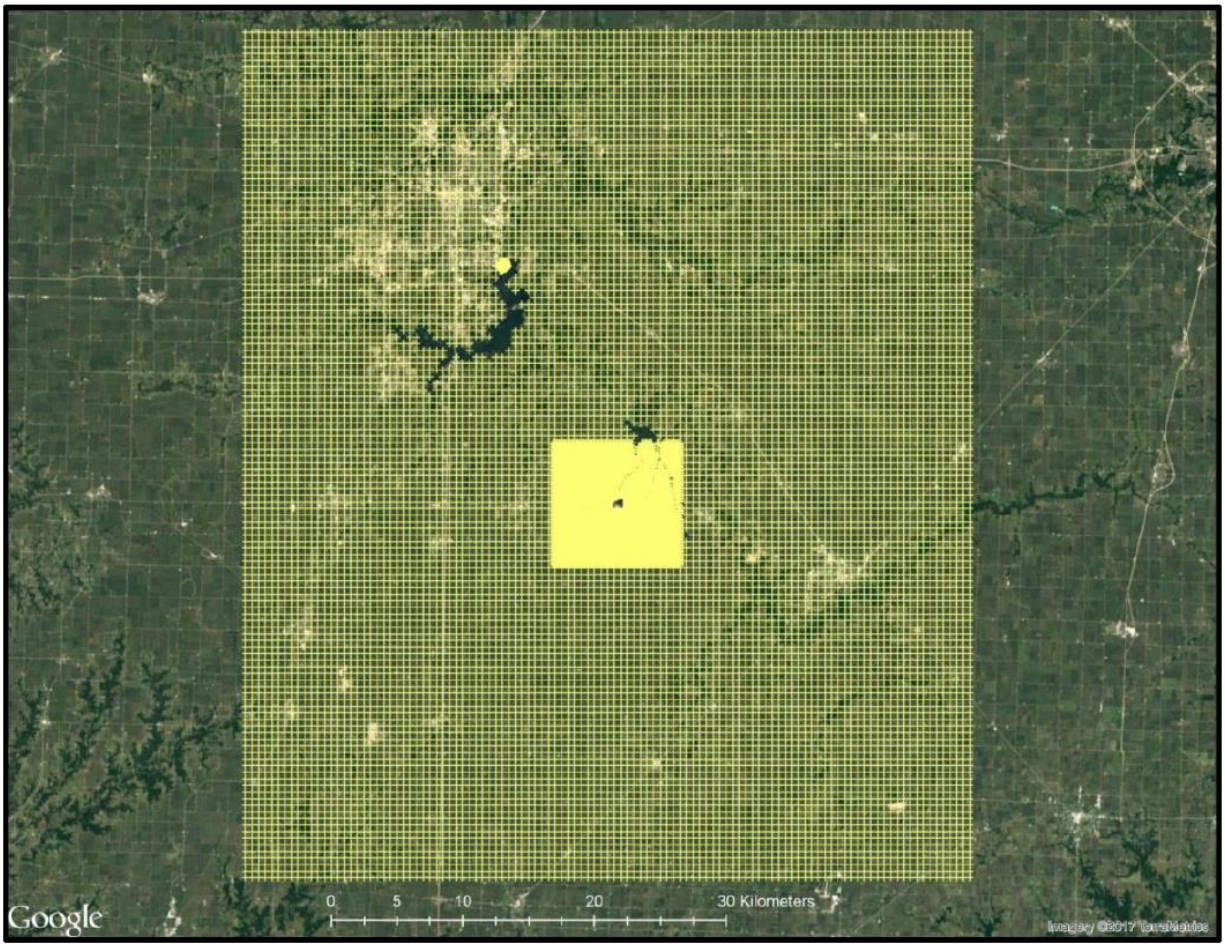
The grid receptor spacing for the area of analysis chosen by the state is as follows:

- 50 meters along the fencelines (Kincaid, CWLP, CPP)
- 100 meters from the Kincaid fenceline out to a distance of approximately 4 km
- 500 meters from 4 km out to a distance of approximately 26 km from Kincaid.

Figure 1 above, included in the state's recommendation, show the state's chosen area of analysis surrounding Kincaid. The receptor network, shown in Figure 4, also included in the state's recommendation, contained 22,409 receptors, and the network covered large portions of Christian and Sangamon Counties, and the northeast and northern sections of Macoupin and Montgomery Counties, respectively.

Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property with the exceptions of locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. Receptors were not placed over large bodies of water, specifically Lake Springfield and Sangchris Lake. The state also did not place receptors in other locations that it considered to not be ambient air relative to each modeled facility. Potentially inconsistent with the Modeling TAD, the state removed receptors located inside the fence lines of Kincaid, CWLP, and CPP. 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 fence lines of CWLP and CPP would not have shown SO_2 violations attributable to Kincaid. Additionally, with respect to the exclusion of receptors inside the Kincaid 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 Kincaid fence line 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 4: Receptor Grid for the Christian County Area



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

3.3.4. Modeling Parameter: Source Characterization

Kincaid, CWLP, and CPP were explicitly included as sources in the model. CWLP and CPP were included as regional emission sources within 45 km of the main source, Kincaid.

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

The EPA has assessed the source characterization conducted by Illinois and concludes that the sources in the modeling have been appropriately characterized for modeling.

3.3.5. Modeling Parameter: Emissions

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

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

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. 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 state implementation plan (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 Kincaid and two other emitters of SO_2 within 45 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 2013 and 2015 are summarized below in Table 4. A description of how the state obtained hourly emission rates is given below this table.

Table 4. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Christian County Area

Facility Name	SO_2 Emissions (tpy)		
	2013	**2014**	**2015**
Kincaid Generation, LLC	10,259.4	2,818.4	2,366.3
CWLP	1,174.7	1,209.5	820.9
CPP	298.5	289.0	229.2
Total Emissions from All Modeled Facilities in the State's Area of Analysis	**11,732.6**	**4,316.9**	**3,416.3**

For Kincaid, the actual hourly emissions data were obtained from Dynegy Midwest Generation Inc., the current owner of Kincaid. Dynegy provided Illinois with hourly-specific SO_2 emission rates obtained from CEMS for Boiler #1, Boiler #2, and the Auxiliary Boiler for calendar years 2012-2015.

For CWLP, plant staff provided Illinois with hourly SO_2 emissions for the coal-fired boiler for calendar years 2012-2015. The utility can also operate three distillate oil-fired engines that power electrical generators. These engine-generators generally function as a source of backup power to meet various on-site needs for electricity in the event of disruptions in the facility's internal power system. Illinois concluded that the emissions and operating hours for the engines and backup generators during this timeframe were sufficiently low and infrequent to have minimal effect on air quality, so that these sources did not need to be modeled explicitly in this modeling analysis. This is generally consistent with EPA's March 1, 2011, Clearinghouse Memo, which allows for exclusion of sources not expected to contribute significantly to the annual distribution of daily maximum 1-hour concentrations. The EPA agrees that exclusion of these emissions from the modeling analysis can be presumed not to have a significant effect on estimated air quality.

For CPP, daily SO_2 emission rates were developed by plant staff from fuel usage rates for calendar years 2013-2015. Emission rates were characterized for three coal-fired traveling grate stoker boilers and two gas-fired boilers with distillate fuel oil backup. Illinois adjusted these daily emission rates into hourly rates assuming uniform operation.

The EPA has checked that the sums of the hourly emissions were equal to the annual emission values provided by Illinois. The EPA has assessed Illinois' characterization of emission rates for the sources modeled in the analysis and concludes that the modeled emissions were determined in accordance with the Modeling TAD.

3.3.6. Modeling Parameter: Meteorology and Surface Characteristics

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

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

For the area of analysis for the Christian County area, the state selected the surface meteorology from the NWS station in Springfield, Illinois, located 20 miles to the northwest of the source, and coincident upper air observations from a different NWS station, located in Lincoln, Illinois, located 40 miles to the north-northeast of the source as best representative of meteorological conditions within the area of analysis.

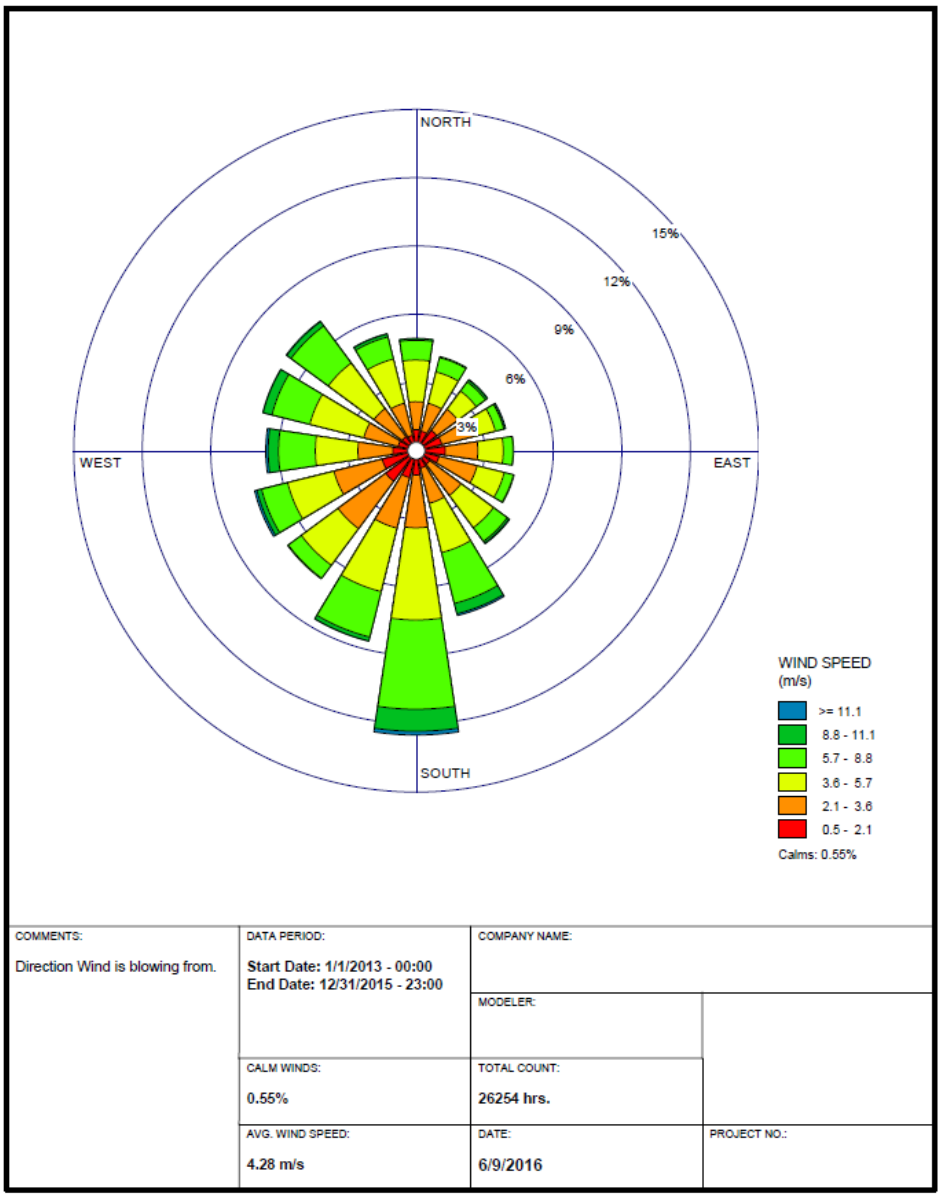
The state used AERSURFACE version 13016 using data from the Springfield, Illinois station to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio 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 one km at a monthly temporal resolution for wet, dry, and average moisture conditions.

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

Figure 5. Area of Analysis and the NWS stations in the Christian County, Illinois Area

As part of its recommendation, the state provided the 3-year surface wind rose for Abraham Lincoln Capital Airport in Springfield, Illinois. In Figure 6, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. According to Illinois' analysis, the most common wind direction during the three-year time period represented in the modeling is from the south, occurring approximately 12.5% of the time. The highest percentage wind speed range, occurring 31.3% of the time period, was in the 3.6 – 5.7 m/s range.

Figure 6: Christian County, Illinois 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

Regional Meteorological Data Processing Protocol, EPA Region 5 and States[6] in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Springfield, Illinois 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 has assessed the meteorological and surface characterization in Illinois' modeling, including the conclusions Illinois has drawn from the wind rose above, and concludes that this component of Illinois' modeling is appropriate and representative of the area of analysis.

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

The terrain in the area of analysis is best described as flat to gently rolling. To account for these 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 1999 USGS National Elevation Database. The EPA finds that Illinois has appropriately addressed terrain in this area.

The EPA has assessed this component of the state's modeling and concludes that it is appropriate.

3.3.8. Modeling Parameter: Background Concentrations of SO_2

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

[6] Draft – Regional Meteorological Data Processing Protocol. EPA Region 5 and States. August 2014.

concentrations developed from the Nilwood monitor (AQS site ID#: 17-117-0002), which is located approximately 22 miles southwest of the study area in northern Macoupin County. The background concentrations for this area of analysis were determined by the state to vary from 4.10 micrograms per cubic meter (μg/m^3), equivalent to 1.57 ppb[7], to 15.44 μg/m^3 (5.90 ppb), with an average value of 7.91 μg/m^3 (3.02 ppb). A table showing all 96 background SO_2 values is included below.

Table 5. Nilwood*, Illinois Monitor Seasonally and Hourly Varying Background SO_2**

Hour of Day	SO_2 Concentration (μg/m^3)			
	Winter	Spring	Summer	Fall
1	7.68	5.58	5.41	5.41
2	7.50	4.80	5.93	5.50
3	7.68	4.54	4.19	6.37
4	6.89	5.58	6.11	5.32
5	7.68	4.54	5.24	6.28
6	7.59	5.76	6.46	6.37
7	7.59	5.32	6.89	6.28
8	7.50	8.38	8.90	6.81
9	9.07	10.91	9.16	9.77
10	14.75	10.73	9.42	9.16
11	15.44	13.70	10.82	12.65
12	15.09	12.56	9.42	12.56
13	14.13	11.60	7.68	11.78
14	13.52	10.30	8.46	9.51
15	13.52	9.51	8.55	8.46
16	12.04	9.07	6.19	8.64
17	11.43	7.33	5.85	7.77
18	10.12	6.72	5.24	6.72
19	8.20	6.54	4.97	6.72
20	9.51	4.80	4.97	6.37
21	9.60	5.32	4.89	6.46
22	7.85	5.06	4.10	7.15
23	7.50	4.36	4.10	6.54
24	7.68	4.36	4.80	5.93

* Monitor Latitude/Longitude Coordinates: (+39.396075 –89.80974)

** Seasons defined as: Winter (Dec, Jan, Feb), Spring (Mar, Apr, May), Summer (Jun, Jul, Aug), Fall (Sep, Oct, Nov)

The EPA has assessed Illinois' characterization of background values and concludes that this component of the modeling is appropriate.

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

3.3.9. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Christian 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 Christian County Area

Input Parameter	Value
AERMOD Version	15181 (default)
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	8
Modeled Structures	72
Modeled Fencelines	3
Total receptors	22,409
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Springfield, Illinois
NWS Station Upper Air Meteorology	Lincoln, Illinois
NWS Station for Calculating Surface Characteristics	Springfield, Illinois
Methodology for Calculating Background SO_2 Concentration	Tier 2: temporally varying using 2013-2015 monitored values from Nilwood monitor in Macoupin County (AQS ID#: 17-117-0002)
Calculated Background SO_2 Concentration	4.10 – 15.44 $\mu g/m^3$

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

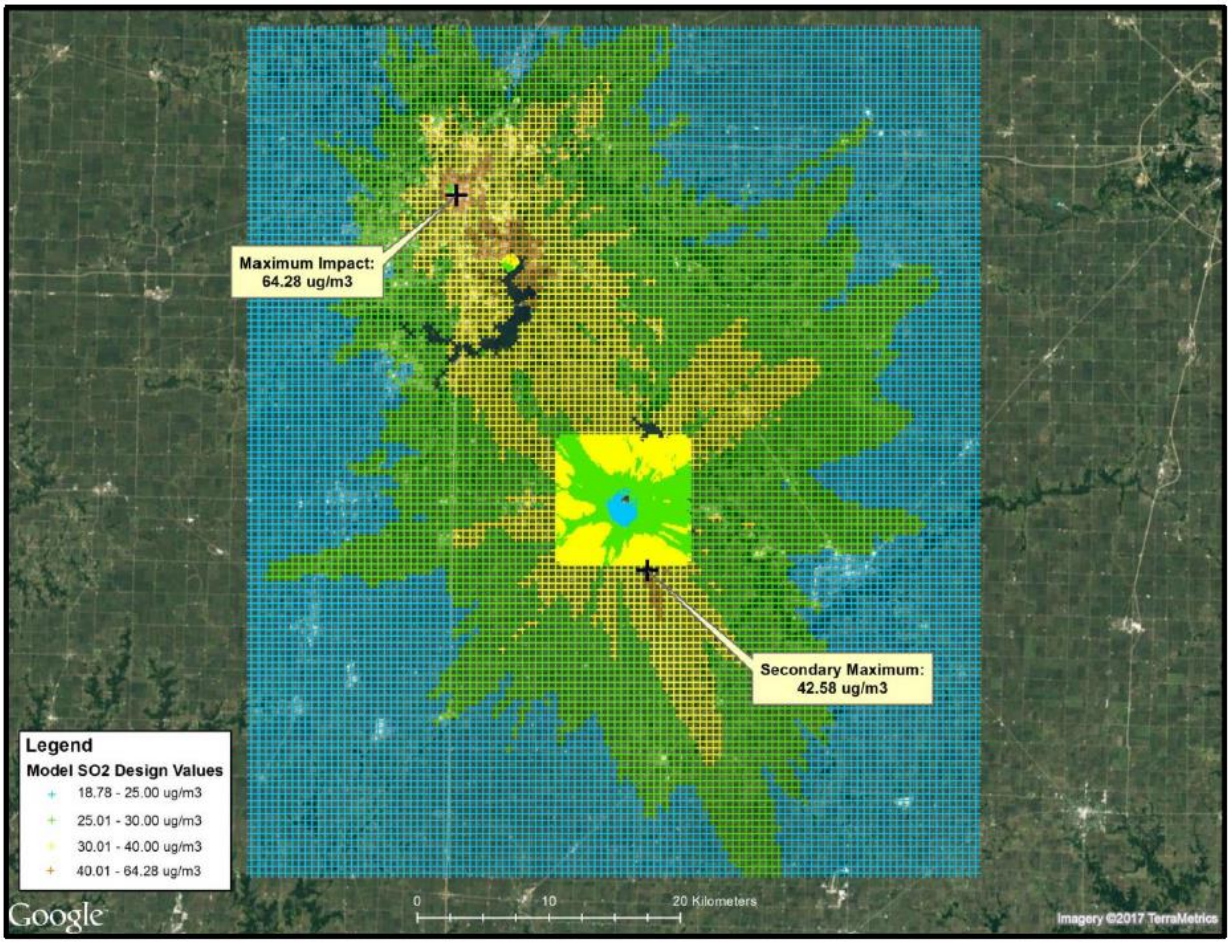
Table 7. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Christian County Area

Averaging Period	Data Period	Receptor Location [UTM zone 16]		99th percentile daily maximum 1-hour SO_2 Concentration (µg/m^3)	
		UTM/Easting	UTM/Northing	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013-2015	273000	4409000	64.28	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 64.28 µg/m^3, equivalent to 24.5 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 7 below was included as part of the state's recommendation, and indicates that the predicted value occurred 0.6 km southeast of CPP in Springfield, Illinois. The state's receptor grid is also shown in the figure.

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



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

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

Illinois' modeling for the Christian County area followed the recommendations in the Modeling TAD except as otherwise explained in section 3.3.3 regarding model receptor placement. As described previously, despite the potential inconsistency with the Modeling TAD regarding receptor placement, the EPA finds that the removal of the receptors within the fence lines of Kincaid, CWLP, and CPP does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area. The 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 Appendix W. Therefore, the EPA determines that the modeling is appropriate for assessing whether this area is meeting the NAAQS.

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

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

Illinois recommended that an area that includes the area surrounding the Kincaid facility, specifically Christian, Macoupin, Montgomery, and Sangamon Counties, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. County boundaries in Illinois are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

3.6. The EPA's Assessment of the Available Information for the Christian County Area

Based on Illinois' modeling evaluation of the Christian County area, the EPA intends to designate the area as unclassifiable/attainment because the EPA believes that the state's modeling sufficiently shows that no violations of the NAAQS are occurring in this area. Additionally, the state's modeling does not indicate any contribution to nearby nonattainment areas as there are no nearby nonattainment areas. The EPA reviewed the modeling parameters and methodology used for this analysis, and concludes that Illinois generally followed the EPA Modeling TAD, with a few exceptions that are explained above. There were no significant issues identified with Illinois' modeling analysis. There was no 3rd party modeling submitted for this area.

Illinois' modeling receptor domain does not fully cover the whole recommended boundary area, but the EPA finds that there is sufficient evidence to designate this whole area as unclassifiable/attainment. Although only small portions of Macoupin and Montgomery County are included in Illinois' receptor domain, the modeled concentration isopleths (see Figure 7) give strong evidence to indicate that the rest of the Macoupin and Montgomery County would be under the standard. The EPA also evaluated point sources with SO_2 emissions of 100 tons per year or more located near the periphery of the recommended boundary area for their potential to cause a violation within the Christian County area. The closest large source near the periphery of the Christian County area is the Ameren Missouri-Sioux Plant, which is located approximately 16 km southwest from the southwest corner of Macoupin County and approximately 103 km southwest from Kincaid. According to the 2014 NEI, the Ameren Missouri-Sioux Plant emitted

1,484.25 tons of SO_2. Based on the distance from Ameren to the edge of the recommended boundary area, the EPA concludes that the contribution from this source to the concentration levels within the Christian County area would not be large enough to cause a violation of the standard in the area of analysis. The EPA believes that our intended unclassifiable/attainment area, bounded by Christian, Macoupin, Montgomery, and Sangamon Counties, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment designation.

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

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA agrees with the state's recommendation and intends to designate the Christian County area as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (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. Specifically, the boundaries are comprised of Christian, Macoupin, Montgomery, and Sangamon Counties. These boundaries are the same as Illinois recommended, and are shown in Figure 2 above. The EPA is basing this conclusion predominantly on the modeling analysis provided by Illinois, which demonstrates that the area near Kincaid is attaining the SO_2 standard and there is no indication of contribution to existing nonattainment areas.

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

4. Air Quality Modeling Analysis for the Crawford County Area, Addressing Rain CII Carbon LLC

4.1. Introduction

The EPA must designate the Crawford County area by December 31, 2017, because the area has not been previously designated and Illinois 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 Crawford County. This section presents all the available air quality modeling information for Crawford County that includes Rain CII Carbon LLC (Rain CII Carbon).

The Rain CII Carbon facility emits 2,000 tons or more annually. Specifically, Rain CII Carbon is listed in the 2014 NEI as emitting 5,427 tons of SO_2 in 2014.[8] This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Illinois has chosen to characterize it via modeling.

In its submission, Illinois recommended that an area that includes the area surrounding the Rain CII Carbon facility, specifically Crawford County, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees that modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is being attained in this area and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

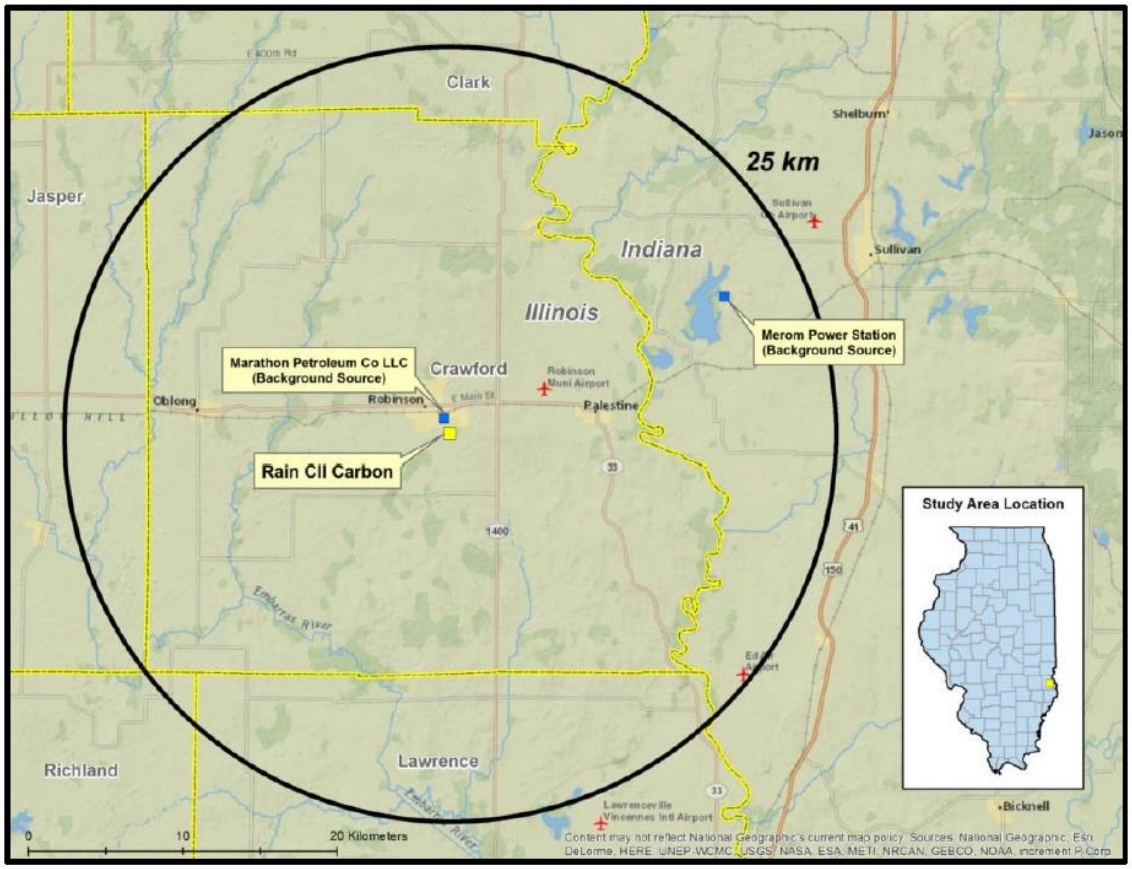
The area that the state has assessed via air quality modeling is contained entirely in Crawford County.

As seen in Figure 8 below, the Rain CII Carbon facility is located southeast of Robinson, Illinois, in eastern Crawford County, and within approximately seven to eight miles of the Illinois-Indiana state line. Also included in the figure are other nearby emitters of SO_2.[9] These are Marathon Petroleum Company LLC oil refinery (Marathon), and the Hoosier Energy – Merom electrical power generating station (Merom). Marathon is located directly north of Rain CII Carbon. Merom is located across the Illinois-Indiana border in Sullivan County, Indiana; northeast of Rain CII Carbon.[10]

[8] As discussed in section 4.2.5 below, more careful review indicates that this facility in 2014 emitted 3,134.1 tons of SO_2. In any case, this facility met the criteria for being on the SO_2 DRR source list.
[9] SO_2 emitters greater than 100 tpy within a 25 km radius are shown in Figure 8.
[10] Based on review of a separate analysis provided by Indiana, the EPA also intends to designate Sullivan County, Indiana, as unclassifiable/attainment.

Also included in the figure are the boundaries of Crawford County, which is the state's recommended area for the attainment designation. The EPA's intended unclassifiable/attainment designation boundary for the Crawford County area is the same area, and is shown again in the section below that summarizes our intended designation.

Figure 8. Map of the Crawford County Area Addressing Rain CII Carbon



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.

4.2. Modeling Analysis Provided by the State

4.2.1. Model Selection and Modeling Components

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

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- 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 with default regulatory options. The non-default surface friction velocity option (ADJ_U*) was not used for this modeling analysis. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

4.2.2. 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. An Auer's land use analysis was conducted by Illinois to determine that the rural mode was appropriate. The area of analysis within a 3 km radius from Rain CII Carbon was determined to be 90.70% rural. The EPA agrees with Illinois' analysis and decision to the run the model in rural mode.

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

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

The source of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Crawford county area, the state has included two other emitters of SO_2 within 25 km of Rain CII Carbon in any direction. The state determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to Rain CII Carbon, the other emitters of SO_2 included in the area of analysis are: Marathon and Merom. No other sources beyond 25 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis.

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

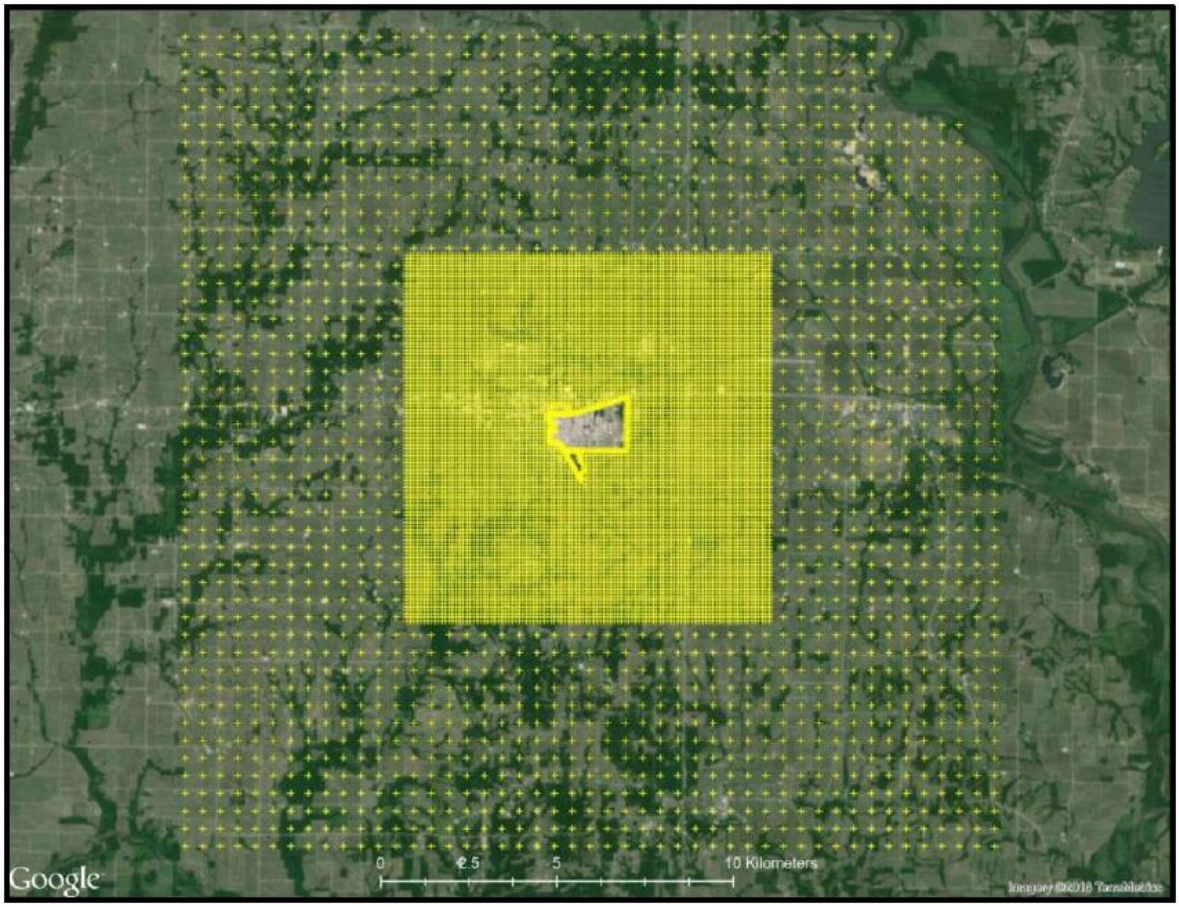
- 50 meters along the fencelines (Rain CII Carbon and Marathon)
- 100 meters from the Rain CII Carbon/Marathon fenceline out to a distance of approximately 4 km
- 500 meters from 4 km out to a distance of approximately 10 km from Rain CII Carbon

The receptor network contained 12,615 receptors, and the network is contained entirely in Crawford County.

Figure 8 above shows Illinois' area of analysis. Figure 9, below, included in the state's recommendation, shows the state's chosen area of analysis surrounding Rain CII Carbon, 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 with the exceptions of locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. However, potentially inconsistent with the Modeling TAD, the state removed receptors located inside the fence lines of Rain CII Carbon and Marathon. The Modeling TAD generally recommends treating plant property as ambient air with respect to other facilities, so that in this case receptors on Marathon property would be used to assess Rain CII Carbon's impacts. As shown below in Figure 12, the maximum modeled design value for this area of analysis is located on the fence line of Marathon, which is directly adjacent to Rain CII Carbon. A potential concern is that the maximum modeled design value would be located within the property boundaries of Marathon 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 65% of the NAAQS and the isopleth suggests that the concentration gradient is sufficiently small to indicate that concentrations within Marathon's fence line are below the NAAQS. Despite this 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. Finally, Illinois did not place receptors in Indiana. However, Indiana conducted its own analysis of concentrations in neighboring Sullivan County, Indiana, an analysis that considered the impacts of Illinois sources, so that Illinois' analysis of concentrations in Indiana was unnecessary. For more information on Indiana's analysis, see the Indiana Chapter of the TSD.

Figure 9: Receptor Grid for the Crawford County Area



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

4.2.4. Modeling Parameter: Source Characterization

Rain CII Carbon, Marathon, and Merom were explicitly included in the model. Marathon and Merom were included as regional emission sources within 25 km of the main source, Rain CII Carbon.

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 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 has assessed the source characterization conducted by Illinois' and concludes that the sources in the modeling have been appropriately characterized for modeling.

4.2.5. Modeling Parameter: Emissions

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

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

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

As previously noted, the state included Rain CII Carbon and two other emitters of SO_2 within 25 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 2013 and 2015 are summarized below in Table 8. A description of how the state obtained hourly emission rates is given below this table.

Table 8. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Crawford County Area

Facility Name	SO_2 Emissions (tpy)		
	2013	2014	2015
Rain CII Carbon	2,958.9	3,134.1	2,161.4
Marathon Petroleum	218.8	207.1	213.4
Merom Generating Station	2,816.2	3,315.9	2,579.4
Total Emissions from All Modeled Facilities in the State's Area of Analysis	**5,993.9**	**6,657.1**	**4,954.2**

For Rain CII Carbon, the actual hourly emissions data were obtained from the company. Rain CII Carbon provided Illinois with hourly-specific SO_2 emission rates calculated based on variable feed rates and coke sulfur levels. The emissions data provided by Rain CII Carbon were lower than the total emissions reported in the company's annual emission report and the emissions found in the Illinois EPA's emission inventory database (ICEMAN), which in turn were entered in the EPA's 2014 NEI. As explained by Rain CII Carbon, and in turn as reported by Illinois, the emissions reported in Illinois' reporting system and then entered into the 2014 NEI were estimated based on stack test conditions that represented operation during high/maximum feed rates. In order to more accurately characterize actual emissions, Rain CII Carbon modified the SO_2 emissions estimations by correlating emissions with actual operating data, instead of assuming a uniform emissions rate for all operating conditions. Therefore, Illinois asserts that the emissions data used in its analysis are more accurate than the estimates contained in the 2014 NEI. The EPA agrees that the data used in this analysis are more accurate and more appropriate to use in evaluating whether the Crawford County area is attaining the standard.

For Marathon, SO_2 emissions for the fluidized catalytic cracking unit, sulfur recovery units, and 1F1 crude atmospheric heater were obtained from CEMS. For Marathon's boilers and other heaters, hourly heat input rates and fuel gas emission factors (determined from CEMS for H_2S in refinery fuel gas) provided the basis of the hourly emissions. Flare emissions at Marathon were estimated to reflect the H_2S content and quantity of flared gases. Daily operations data, stack testing data, and horsepower ratings were used to estimate the stationary engines' emissions, which were allocated uniformly across all hours of each specific operating day.

For Merom, hourly data was provided to Illinois by the Indiana Department of Environmental Management (IDEM), and it reflects the CEMS data supplied to EPA's Clean Air Markets Division (CAMD) database.

The EPA has assessed Illinois' characterization of emission rates for the sources modeled in the analysis and concludes that the modeled emissions are appropriate.

4.2.6. Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection

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

For the area of analysis for the Crawford County area, the state selected the surface meteorology from the NWS station in Evansville, Indiana, located 65 miles to the south-southeast of the source, and coincident upper air observations from different NWS station, located in Lincoln, Illinois, located 115 miles to the north-northeast of the source as best representative of meteorological conditions within the area of analysis.

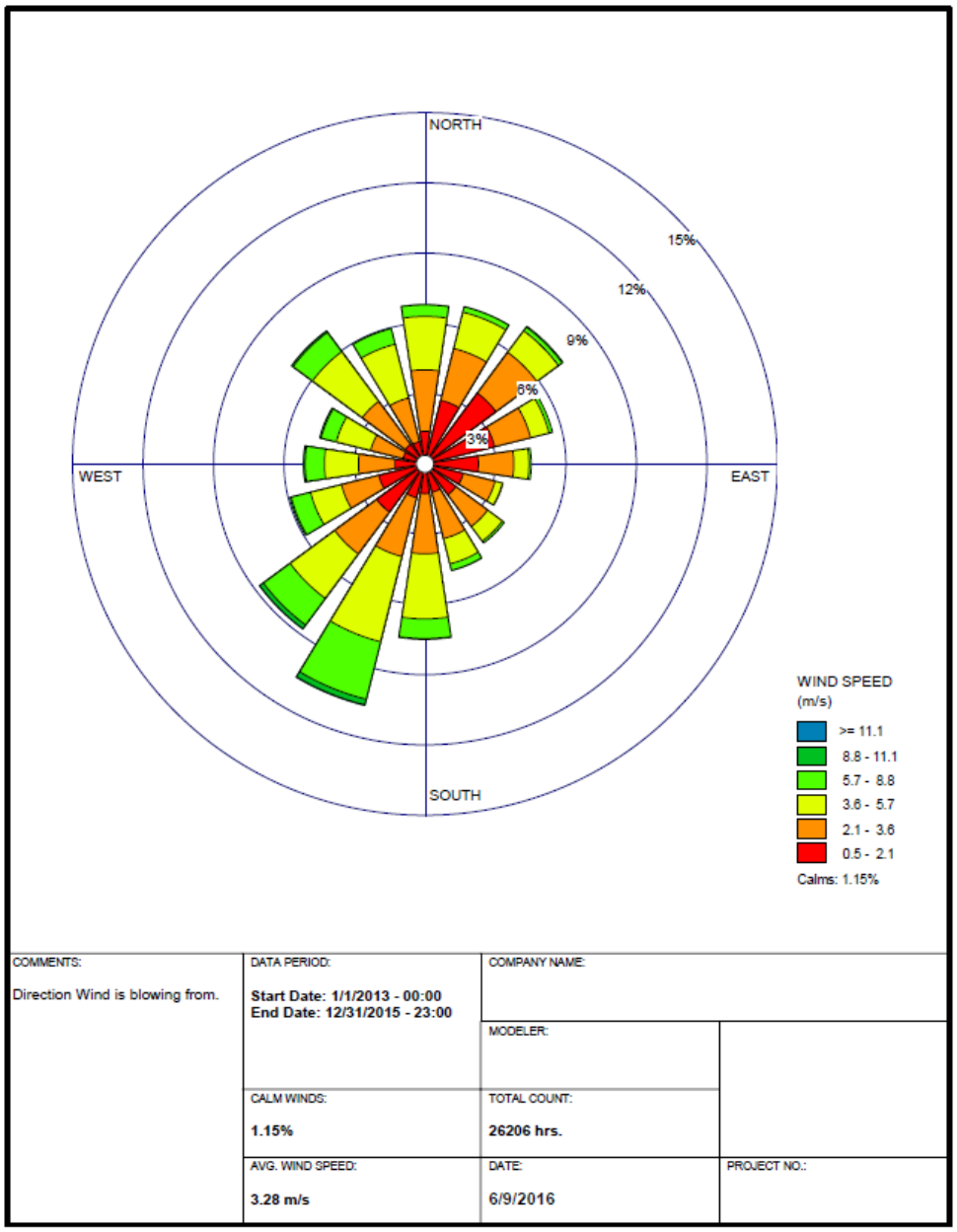
The state used AERSURFACE version 13016 using data from the Evansville, Indiana, station to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio 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 sectors out to one km at a monthly temporal resolution for dry, wet, and average moisture conditions.

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

Figure 10. Area of Analysis and the NWS station in the Crawford County, Illinois Area

As part of its recommendation, the state provided the 3-year surface wind rose for Evansville Regional Airport, Indiana. In Figure 11, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. According to Illinois' analysis, the predominant wind direction during the three-year time period represented in the modeling is from the south-southwest, occurring approximately 10.6% of the time. The highest percentage wind speed range, occurring 31.3% of the time period, was in the 2.1 – 3.6 m/s range.

Figure 11: Crawford County, Illinois 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 *Regional Meteorological Data Processing Protocol, EPA Region 5 and States*[11] in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

[11] Draft – Regional Meteorological Data Processing Protocol. EPA Region 5 and States. August 2014.

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.

The EPA has assessed the meteorological and surface characterization in Illinois' modeling, including the conclusions Illinois has drawn from the wind rose above, and concludes that this component of Illinois' modeling is appropriate.

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

The terrain in the area of analysis is best described as flat to gently rolling. To account for these 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 1999 USGS National Elevation Database. The EPA finds that Illinois has appropriately addressed terrain in this area.

The EPA has assessed this component of the state's modeling and concludes that it is appropriate.

4.2.8. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99^{th} percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose to use the tier 2 approach. Illinois incorporated temporally-varying background one-hour concentrations developed from the Nilwood monitor (AQS site ID#: 17-117-0002), which is located approximately 115 miles west-northwest of the study area in northern Macoupin County. The background concentrations for this area of analysis were determined by the state to vary

from 4.10 µg/m^3, equivalent to 1.57 ppb[12], to 15.44 µg/m^3 (5.90 ppb), with an average value of 7.91 µg/m^3 (3.02 ppb). A table showing all 96 background SO_2 values is included below.

Table 9. Nilwood*, Illinois Monitor Seasonally and Hourly Varying Background SO_2**

Hour of Day	SO_2 Concentration (µg/m^3)			
	Winter	Spring	Summer	Fall
1	7.68	5.58	5.41	5.41
2	7.50	4.80	5.93	5.50
3	7.68	4.54	4.19	6.37
4	6.89	5.58	6.11	5.32
5	7.68	4.54	5.24	6.28
6	7.59	5.76	6.46	6.37
7	7.59	5.32	6.89	6.28
8	7.50	8.38	8.90	6.81
9	9.07	10.91	9.16	9.77
10	14.75	10.73	9.42	9.16
11	15.44	13.70	10.82	12.65
12	15.09	12.56	9.42	12.56
13	14.13	11.60	7.68	11.78
14	13.52	10.30	8.46	9.51
15	13.52	9.51	8.55	8.46
16	12.04	9.07	6.19	8.64
17	11.43	7.33	5.85	7.77
18	10.12	6.72	5.24	6.72
19	8.20	6.54	4.97	6.72
20	9.51	4.80	4.97	6.37
21	9.60	5.32	4.89	6.46
22	7.85	5.06	4.10	7.15
23	7.50	4.36	4.10	6.54
24	7.68	4.36	4.80	5.93

* Monitor Latitude/Longitude Coordinates: (+39.396075 –89.80974)

** Seasons defined as: Winter (Dec, Jan, Feb), Spring (Mar, Apr, May), Summer (Jun, Jul, Aug), Fall (Sep, Oct, Nov)

The EPA has assessed Illinois' characterization of background values and concludes that this component of the modeling is appropriate.

4.2.9. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Crawford County area of analysis are summarized below in Table 10.

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

Table 10. Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Crawford County Area

Input Parameter	Value
AERMOD Version	15181 (default)
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	58
Modeled Structures	262
Modeled Fencelines	2
Total receptors	12,615
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Evansville, Indiana
NWS Station Upper Air Meteorology	Lincoln, Illinois
NWS Station for Calculating Surface Characteristics	Evansville, Indiana
Methodology for Calculating Background SO_2 Concentration	Tier 2: temporally varying using 2013-2015 monitored values from Nilwood monitor in Macoupin County (AQS ID#: 17-117-0002)
Calculated Background SO_2 Concentration	4.10 – 15.44 $\mu g/m^3$

The results presented below in Table 11 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

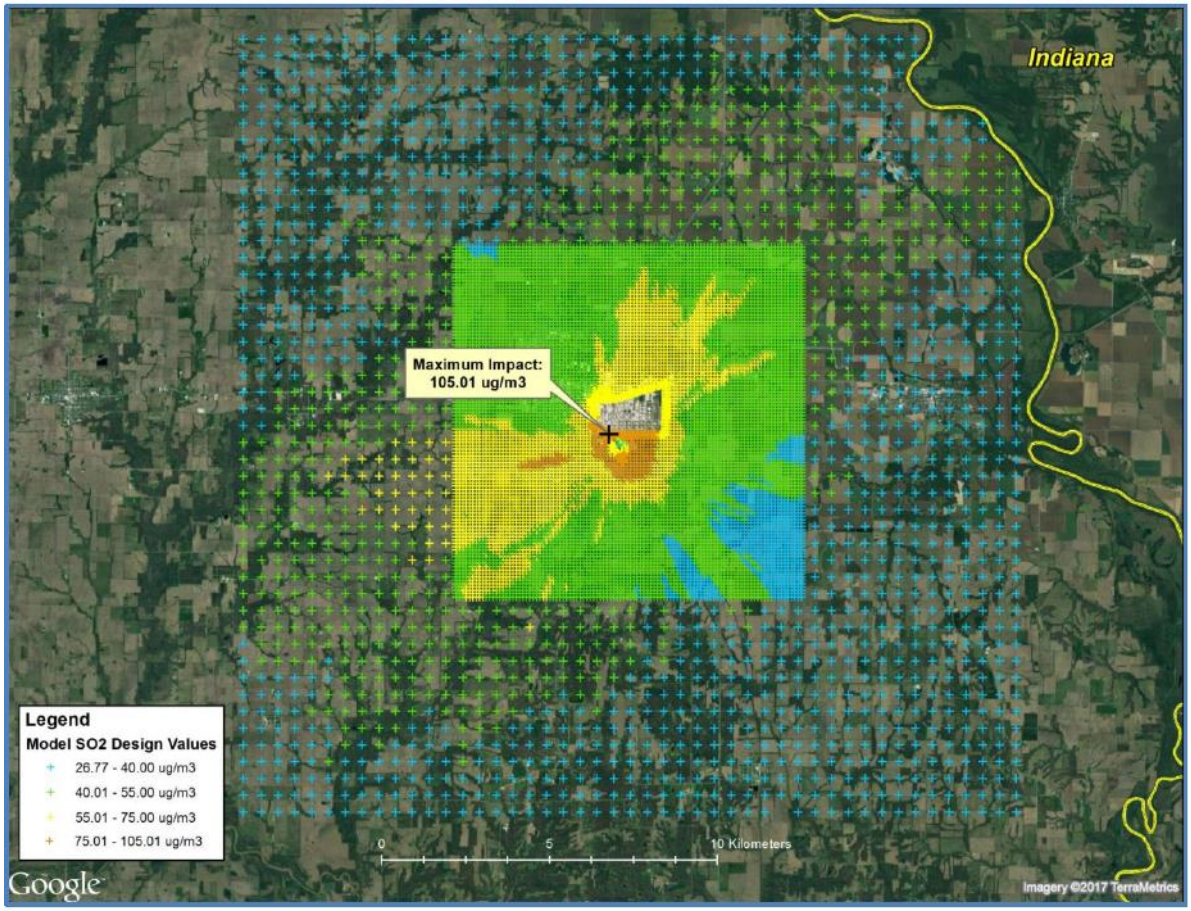
Table 11. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Crawford County Area

Averaging Period	Data Period	Receptor Location (UTM zone 16)		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting	UTM Northing	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013-2015	437364	4316246	105.01	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 105.01 μg/m^3, equivalent to 40.1 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 12 below was included as part of the state's recommendation, and indicates that the predicted value occurred 0.4 km northwest of Rain CII Carbon's northern pyro-scrubber stack. The state's receptor grid is also shown in the figure.

Figure 12: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Crawford County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all receptors in the area. While receptors were not placed for estimating the impact of Rain CII Carbon on Marathon property, the evidence from Illinois' analysis (as discussed above) supports the conclusion that this area is attaining the SO_2 NAAQS as well.

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

Illinois' modeling for the Crawford County area closely follows the recommendations in the Modeling TAD except as discussed in section 4.2.3 regarding model receptor placement. As described previously, despite the potential inconsistency with the Modeling TAD regarding receptor placement, the EPA finds that the removal of the receptors within the fence lines of Rain CII Carbon and Marathon does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area. The 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 Appendix W. Therefore, the EPA determines that the modeling is appropriate for assessing whether this area is meeting the NAAQS.

4.3. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Crawford 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.

4.4. Jurisdictional Boundaries in the Crawford County Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for the Crawford County area. 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 submission, Illinois recommended that an area that includes the area surrounding the Rain CII Carbon facility, specifically Crawford County, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. County boundaries in Illinois are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

4.5. The EPA's Assessment of the Available Information for the Crawford County Area

Based on Illinois' modeling evaluation of the Crawford County area, the EPA intends to designate the area as unclassifiable/attainment because the EPA believes that the state's modeling sufficiently shows that no violations of the NAAQS are occurring in this area along with no indication of contribution to nearby nonattainment areas. The EPA reviewed the modeling parameters and methodology used for this analysis, and concludes that Illinois

generally followed the EPA's Modeling TAD, with a few exceptions that are explained in the sections above. There are no SO_2 monitors located in Crawford County for comparison to the NAAQS. There was no third party modeling submitted for this area.

During the review of Illinois' modeling analysis, the EPA identified one potential issue regarding the exclusion of receptors over Marathon, a secondary source included in Illinois' modeling analysis. The Modeling TAD generally recommends treating plant property as ambient air with respect to other facilities, so that in this case receptors on Marathon property would be used to assess Rain CII Carbon's impacts. As shown above in Figure 12, the maximum modeled design value for this area of analysis is located on the fence line of Marathon, which is directly adjacent to Rain CII Carbon. The potential concern was that the maximum modeled design value would be located within the property boundaries of Marathon 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 65% of the NAAQS and the isopleth suggests that the concentration gradient is sufficiently small to indicate that concentrations within Marathon's fence line are below the NAAQS.

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

4.6. Summary of Our Intended Designation for the Crawford County Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the Crawford County area as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (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. Specifically, the area the EPA intends to designate is comprised of the entirety of Crawford County. Figure 13, generated by the EPA, shows the boundary of this county, which is the area included in this intended designated area. The EPA is basing this conclusion predominantly on the modeling analysis provided by Illinois, which demonstrates that the area near Rain CII Carbon is attaining the SO_2 standard and there is no indication of contribution to existing nonattainment areas.

Figure 13. Boundary of the Crawford County Intended Unclassifiable/Attainment Area

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

5. Air Quality Modeling Analysis for the Lake County Area, Addressing Midwest Generation LLC – Waukegan

5.1. Introduction

The EPA must designate the Lake County area by December 31, 2017, because the area has not been previously designated and Illinois 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 Lake County. This section presents all the available air quality modeling information for Lake County that includes Midwest Generation LLC - Waukegan (Waukegan Station).

The Waukegan Station facility emits 2,000 tons or more annually. Specifically, Waukegan Station emitted 5,792.4 tons of SO_2 in 2014.[13] This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Illinois has chosen to characterize it via modeling.

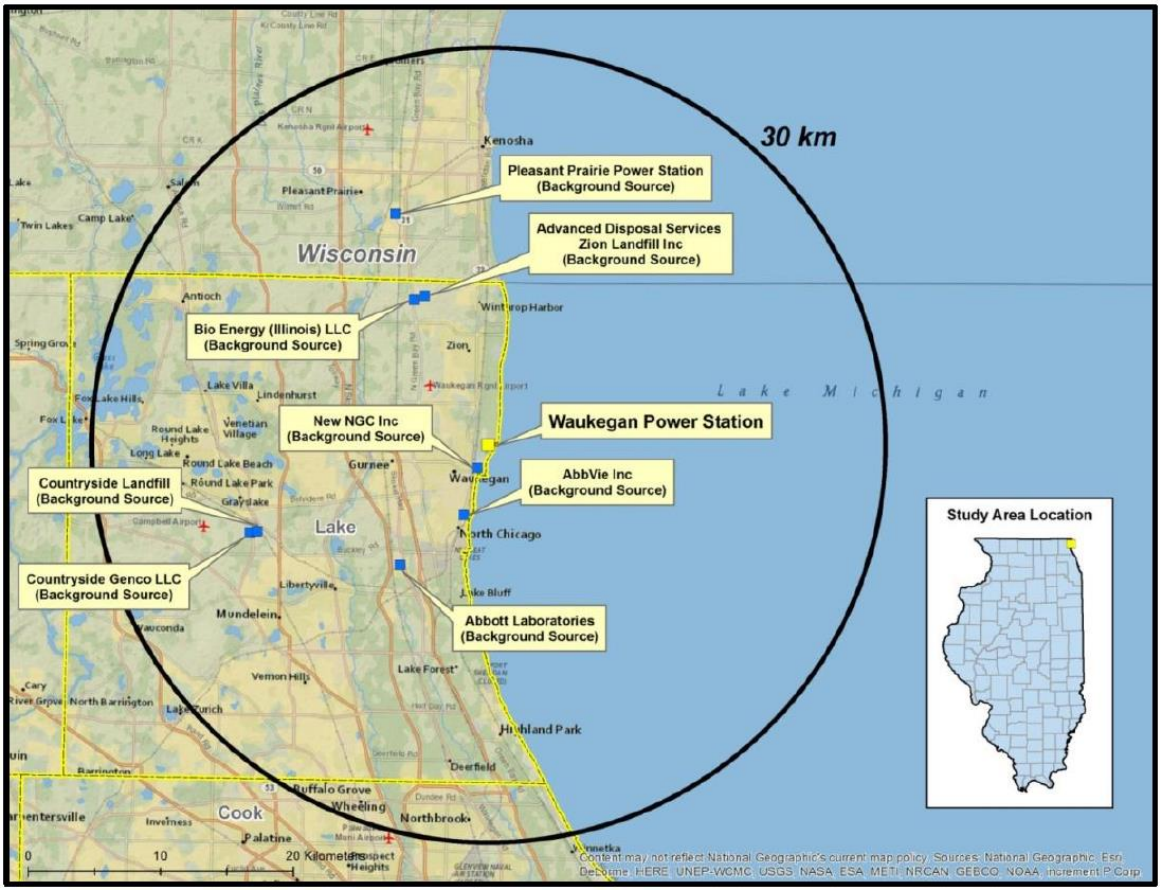
In its submission, Illinois recommended that an area that includes the area surrounding the Waukegan Station facility, specifically Lake County, be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees that modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is being attained in this area and intends to designate the area as unclassifiable/attainment. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

The area that the state has assessed via air quality modeling is contained entirely in Lake County and reflects the portion of Lake County that is likely to observe the highest concentrations. As seen in Figure 14 below, the Waukegan Station facility is located in Lake County, along a section of western Lake Michigan coast area in the City of Waukegan. Also included in the figure are other nearby emitters of SO_2.[14] These are Abbvie Inc., New NGC Inc., Advanced Disposal Services Zion Landfill Inc., Bio Energy (Illinois) LLC, Abbott Laboratories, Countryside Genco LLC, Countryside Landfill, and Wisconsin's Pleasant Prairie Generating Station.

[13] The 2014 NEI indicates that this facility emitted 7,683 tons of SO_2 in 2014. However, this facility is also required to report hourly emissions data to CAMD, and the total of 2014 SO_2 emissions that the facility reported to CAMD was 5,792.4 tons. Illinois modeled the latter amount, which the EPA considers a more accurate value.

[14] All other relevant SO_2 emitters within 25 km are shown in Figure 15. If no sources not named previously are shown, there are no additional SO_2 emitters in the vicinity of the named source.

Figure 14. Map of the Lake County Area Addressing Waukegan Station



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

5.2. Modeling Analysis Provided by the State

5.2.1. Model Selection and Modeling Components

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

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- 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 with default regulatory options. The non-default surface friction velocity option (ADJ_U*) was not used for this modeling analysis. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

5.2.2. 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. An Auer's land use analysis was conducted by Illinois to determine that the rural mode was appropriate. The area of analysis within a 3 km radius from Waukegan Station was determined to be 80.61% rural. The EPA agrees with Illinois' analysis and decision to the run the model in rural mode.

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

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

The source of SO_2 emissions subject to the DRR in this area is described in the introduction to this section. For the Lake county area, the state has included eight other emitters of SO_2 within 30 km of Waukegan Station in any direction. The state determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to Waukegan Station, the other emitters of SO_2 included in the area of analysis are: Abbvie Inc., New NGC Inc., Advanced Disposal Services Zion Landfill Inc., Bio Energy (Illinois) LLC, Abbott Laboratories, Countryside Genco LLC, Countryside Landfill, and Wisconsin's Pleasant Prairie Generating Station. No other sources beyond 30 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. The EPA has verified and agrees with the state, that there are no other sources that would have the potential to cause concentration gradient impacts within the area of analysis.

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

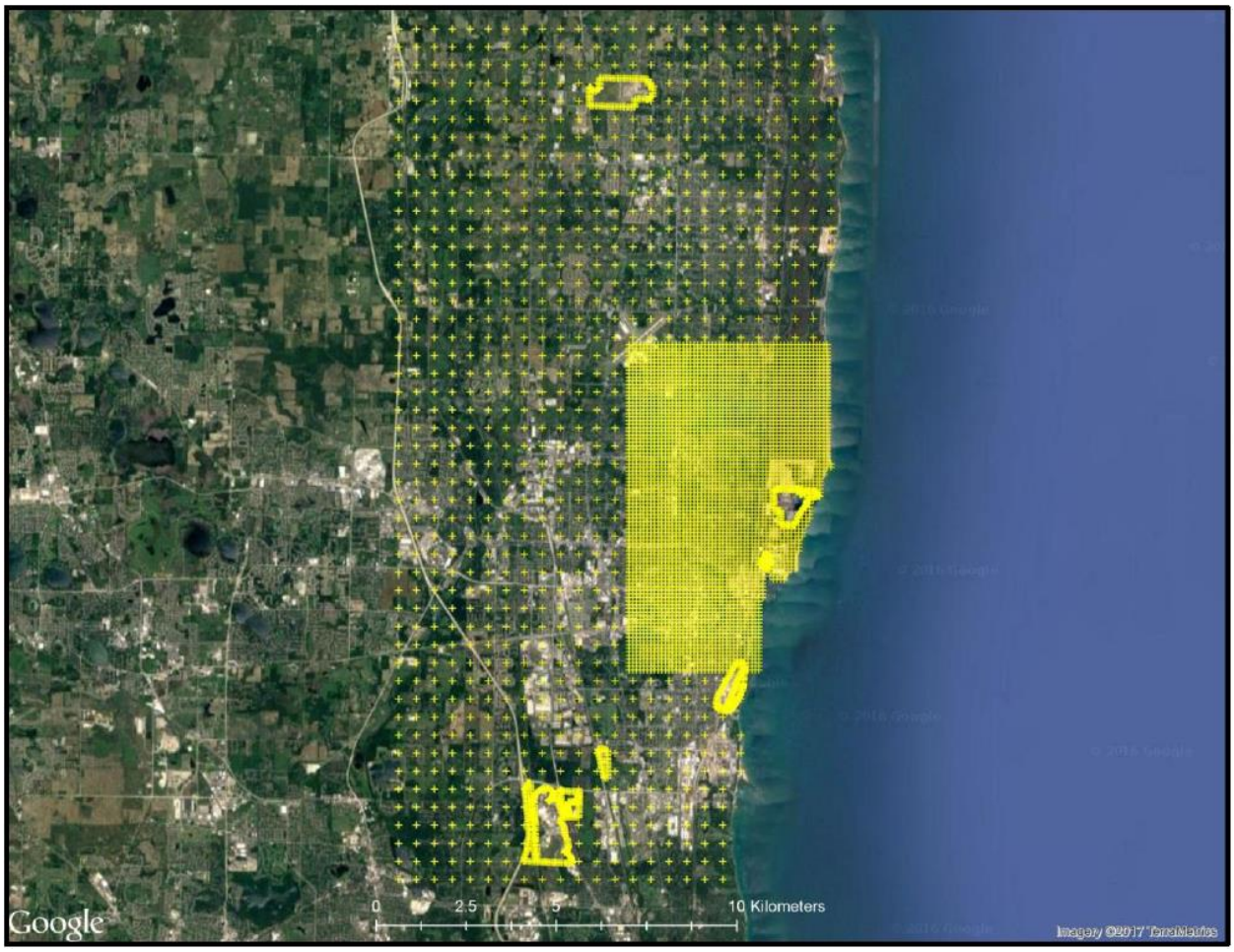
- 50 meters along the fence lines (Waukegan Station, New NGC, Abbvie, Abbott Laboratories, Advanced Disposal Services Zion Landfill, and Bio Energy (Illinois))
- 100 meters from the Waukegan Station fence line out to a distance of approximately 4 km
- 500 meters from 4 km out to a distance of approximately 10 km from Waukegan Station

The receptor network contained 6,098 receptors, and the network is contained entirely in Lake County.

Figure 14 above, included in the state's submittal, shows the state's chosen area of analysis surrounding the Waukegan Station, as well as the receptor grid for the area of analysis. Figure 15 below, also included in the state's submittal, shows the receptor grid in the state's 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 with the exceptions of locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. Per the recommendations of the Modeling TAD, the state did not place receptors on large bodies of water (Lake Michigan). The state also did not place receptors in other locations that it considered to not be ambient air relative to each modeled facility. However, potentially inconsistent with the Modeling TAD, the state removed receptors located inside the fence lines of Waukegan Station, New NGC, Abbvie, Abbott Laboratories, Advanced Disposal Services Zion Landfill, and Bio Energy (Illinois). The TAD recommends that an area within a facility should be considered ambient air with respect to the impacts from other facilities, such that receptors within a facility's fence line are recommended for purposes of assessing whether other facilities are causing violations within that fence line. However, 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 fence lines of New NGC, Abbvie, Abbott Laboratories, Advanced Disposal Services Zion Landfill, and Bio Energy (Illinois) would not have shown SO_2 violations attributable to Waukegan. Additionally, with respect to the exclusion of receptors inside the Waukegan 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 Waukegan fence line 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. Additionally, in this case, the EPA has concluded that these areas would have collective impacts from other facilities that would still be well below the standard. Specifically, the highest modeled concentration, at the fence line of Advanced Disposal Services, is less than 51% of the NAAQS, and the concentration isopleth provided by Illinois suggests that the concentration gradient near the property boundary is too small to indicate a risk of violation within the fence line.

Figure 15: Receptor Grid for the Lake County Area



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

5.2.4. Modeling Parameter: Source Characterization

Waukegan Station and the eight background sources within 30 km listed above were explicitly included in the model.

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

The EPA has assessed the source characterization conducted by Illinois' and concludes that the

sources in the modeling have been appropriately characterized for modeling.

5.2.5. Modeling Parameter: Emissions

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

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

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

As previously noted, the state included Waukegan Station and eight other emitters of SO_2 within 30 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 2013 and 2015 are summarized below 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 2013 – 2015 from Facilities in the Lake County Area

Facility Name	SO_2 Emissions (tpy)		
	2013	2014	2015
Midwest Generation LLC – Waukegan	7,749.9	5,792.4	2,339.3
New NGC Inc.	8.7	8.7	8.7
Countryside Genco LLC	27.1	53.1	41.5
Countryside Landfill	23.9	6.3	14.5
Abbott Laboratories	74.0	22.8	0.2
AbbVie Inc.	59.5	16.2	6.6
ADS Zion Landfill Inc.	48.1	28.4	26.7
Bio Energy (Illinois) LLC	40.9	24.7	22.3
Pleasant Prairie Generating Station	1,173.8	1,310.1	1,335.5
Total Emissions from All Modeled Facilities in the State's Area of Analysis	**9,205.9**	**7,262.7**	**3,795.3**

For Waukegan Station, the parent company NRG provided hourly-specific CEMS data for Unit #7 and Unit #8 for calendar years 2012-2015. NRG also provided annual SO_2 emission totals and total hours of operation for each of the turbine peaker units during the years 2012-2015. Illinois temporally adjusted the emission profiles for the turbine peaker to hourly rates by using seasonal operation and throughput information from annual emission reports to the state.

For Pleasant Prairie Generating Station, hourly emissions were developed with CEMS data.

For Abbvie Inc., ADS Zion Landfill Inc., Countryside Genco LLC, Countryside Landfill, and Bio Energy (Illinois) LLC; hourly emission profiles were based on seasonal operation/throughput from annual emission reports. Constant temperature and exit velocities were used to characterize these sources.

For boiler #4AP and boiler #5AP at Abbott Labs, hourly emission profiles were based on seasonal operation/throughput from annual emission reports. For boiler #6AP and boiler #7AP at Abbott Labs, seasonally-varied emissions were used, applying the worst-case emissions year to all modeled years.

For New NGC Inc., a constant, conservative emission rate was used to characterize each unit, based on the worst-case emissions year and seasonal throughput.

The EPA has checked that the sums of the hourly emissions were equal to the annual emission values provided by Illinois. The EPA has assessed Illinois' characterization of emission rates for the sources modeled in the analysis and concludes that they were appropriately characterized according to the Modeling TAD.

5.2.6. Modeling Parameter: Meteorology and Surface Characteristics

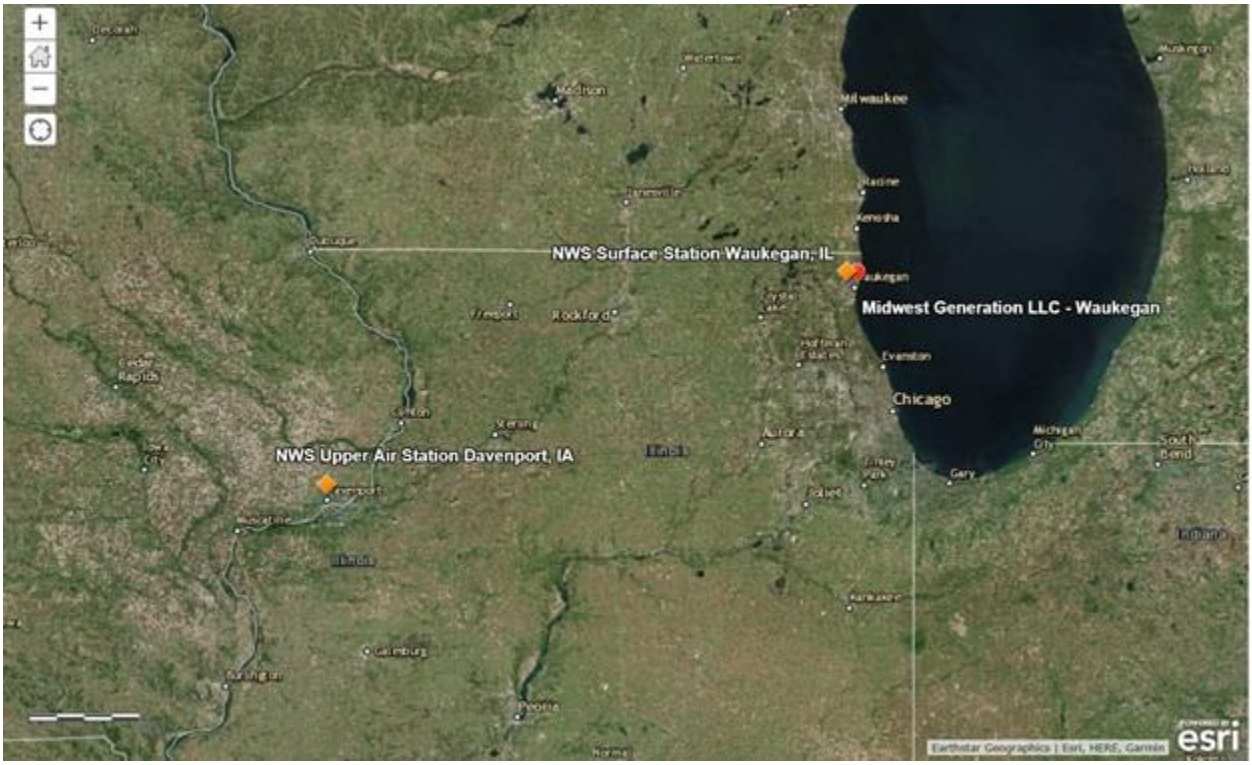
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

For the area of analysis for the Lake County area, the state selected the surface meteorology from the NWS station in Waukegan, Illinois, located 3.5 miles to the northeast of the source, and coincident upper air observations from different NWS station, located in Davenport, Iowa, located 152 miles to the southwest of the source as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the Waukegan, Illinois, 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 one km at a monthly temporal resolution for dry, wet, and average moisture conditions.

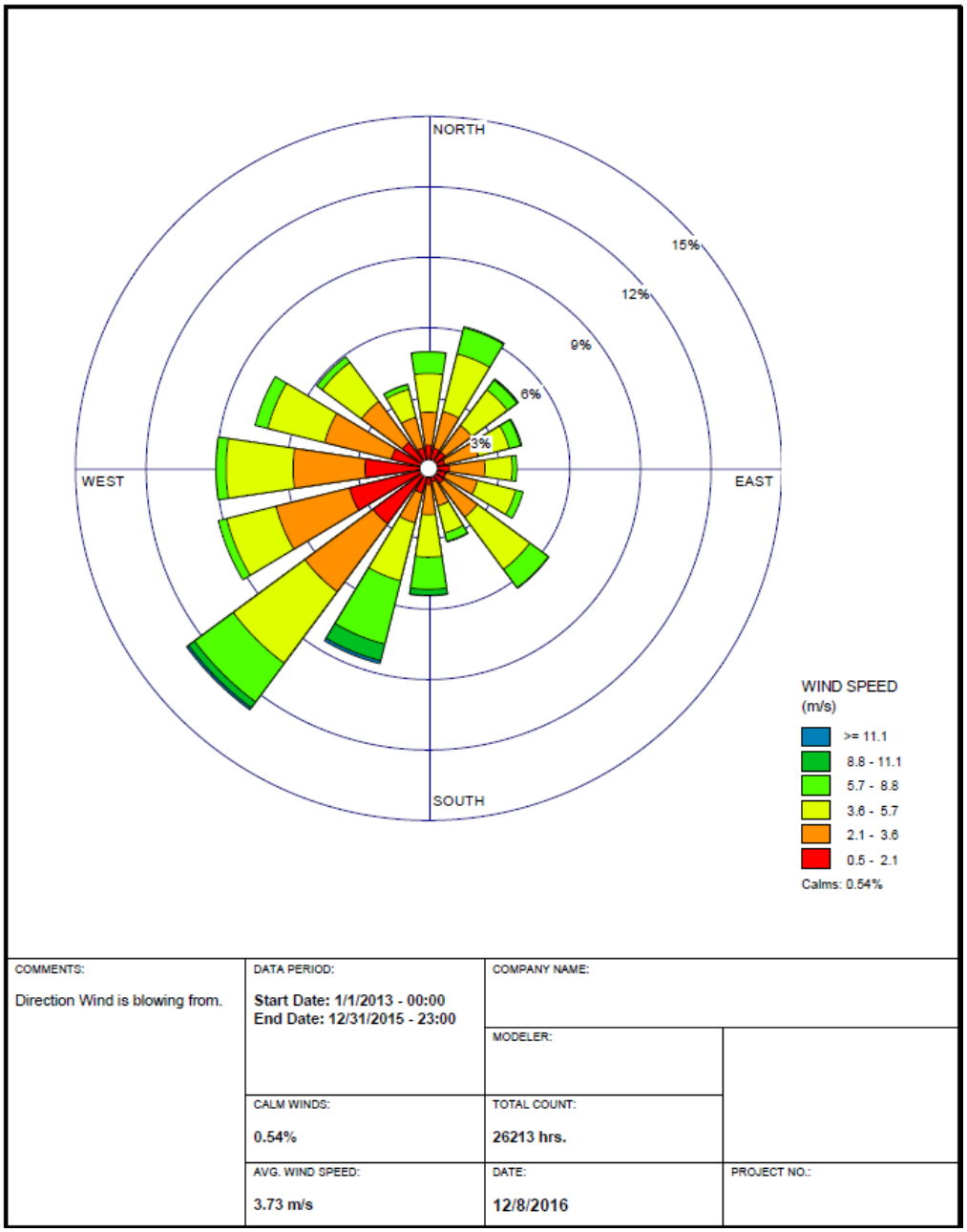
In the figure below, generated by the EPA, the location of this NWS station is shown relative to the area of analysis.

Figure 16. Area of Analysis and the NWS station in the Lake County, Illinois Area



As part of its recommendation, the state provided the 3-year surface wind rose for Waukegan National Airport, Illinois. In Figure 17, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. According to Illinois' analysis, the predominant wind direction during the three-year time period represented in the modeling is from the southwest, occurring approximately 12.7% of the time. The highest percentage wind speed range, occurring 33.0% of the time period, was in the 3.6 – 5.7 m/s range.

Figure 17: Lake County, Illinois 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 *Regional Meteorological Data Processing Protocol, EPA Region 5 and States*[15] in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

[15] Draft – Regional Meteorological Data Processing Protocol. EPA Region 5 and States. August 2014.

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 Waukegan, Illinois 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 has assessed the meteorological and surface characterization in Illinois' modeling, including the conclusions Illinois has drawn from the wind rose above, and concludes that this component of Illinois' modeling is appropriate.

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

The terrain in the area of analysis is best described as flat to gently rolling. To account for these 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 1999 USGS National Elevation Database.

The EPA has assessed this component of the state's modeling and concludes that Illinois has appropriately addressed terrain in this area.

5.2.8. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose to use the tier 2 approach. Illinois incorporated temporally-varying background one-hour concentrations developed from the Oglesby monitor (AQS site ID#: 17-099-0007), which is located approximately 98 miles southwest of the study area in LaSalle County. The background concentrations for this area of analysis were determined by the state to vary from 1.92 $\mu g/m^3$, equivalent to 0.73 ppb, to 15.09 $\mu g/m^3$ (5.76 ppb), with an average value of 7.67 $\mu g/m^3$ (2.93 ppb). A table showing all 96 background SO_2 values is included below.

Table 13. Oglesby*, Illinois Monitor Seasonally and Hourly Varying Background SO_2**

Hour of Day	SO_2 Concentration (µg/m^3)			
	Winter	Spring	Summer	Fall
1	5.76	6.63	4.62	5.85
2	6.46	8.03	5.06	5.24
3	5.24	8.20	3.32	4.45
4	5.76	6.72	2.44	4.80
5	6.72	5.76	1.92	7.15
6	6.98	7.15	2.27	7.85
7	6.46	6.28	4.10	6.11
8	7.85	8.46	8.03	5.50
9	9.69	10.91	10.47	6.19
10	12.22	11.52	10.56	9.77
11	12.74	11.95	10.21	11.78
12	14.13	12.91	6.72	10.30
13	15.09	9.95	7.68	8.20
14	15.01	9.95	7.50	8.38
15	12.22	8.03	6.46	7.50
16	11.26	7.24	5.85	6.98
17	10.64	8.46	6.37	7.33
18	9.95	7.42	6.37	7.24
19	9.25	9.77	7.59	4.71
20	8.29	7.85	4.62	7.33
21	8.81	9.16	4.28	7.68
22	7.15	10.38	4.97	6.89
23	6.72	8.20	4.97	4.97
24	6.54	6.72	3.93	5.50

* Monitor Latitude/Longitude Coordinates: (+41.29301 -89.04942)

** Seasons defined as: Winter (Dec, Jan, Feb), Spring (Mar, Apr, May), Summer (Jun, Jul, Aug), Fall (Sep, Oct, Nov)

The EPA has assessed Illinois' characterization of background values and concludes that this component of the modeling is appropriate.

5.2.9. Summary of Modeling Inputs and Results

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

Table 14. Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Lake County Area

Input Parameter	Value
AERMOD Version	15181 (default)
Dispersion Characteristics	Rural
Modeled Sources	9
Modeled Stacks	34
Modeled Structures	70
Modeled Fencelines	6
Total receptors	6,031
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Waukegan, Illinois
NWS Station Upper Air Meteorology	Davenport, Iowa
NWS Station for Calculating Surface Characteristics	Waukegan, Illinois
Methodology for Calculating Background SO_2 Concentration	Tier 2: temporally varying using 2013-2015 monitored values from Oglesby monitor in LaSalle county (AQS ID #: 17-099-0007)
Calculated Background SO_2 Concentration	1.92 – 15.09 $\mu g/m^3$

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

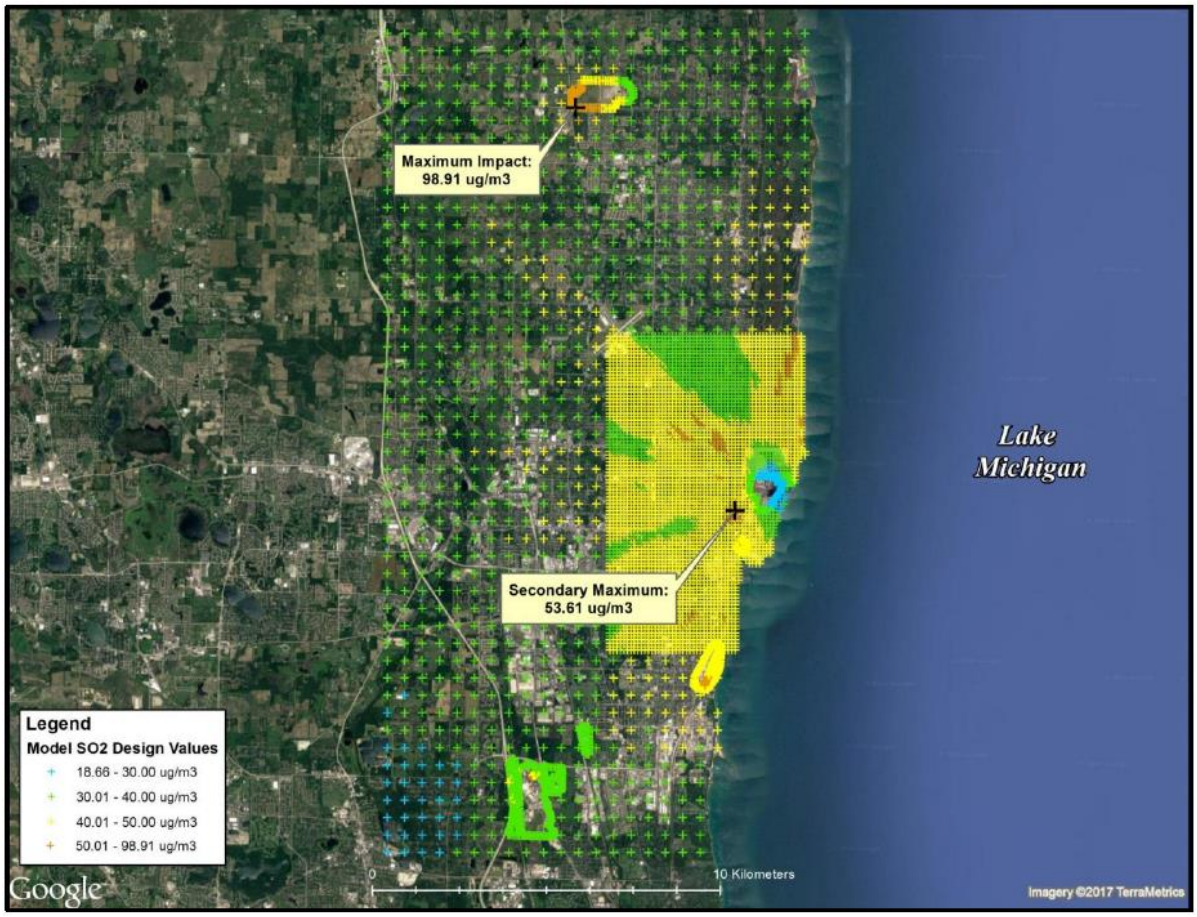
Table 15. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Lake County Area

		Receptor Location [UTM zone 16]		**99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)**	
Averaging Period	**Data Period**	**UTM Easting**	**UTM Northing**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2013-2015	427419	4703366	98.91	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 98.91 μg/m^3, equivalent to 37.8 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 18 below was included as part of the state's recommendation, and indicates that the predicted value occurred 12.3 km northwest of the Waukegan Station, in Zion, Illinois. This maximum impact is adjacent to property of Advance Disposal Services, and reflects local impacts from this facility.[16] The state's receptor grid is also shown in the figure. A secondary maximum impact of 53.6 μg/m^3, equivalent to 20.5 ppb, occurred approximately 2 km southwest of the Waukegan power plant.

Figure 18: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Lake County Area



[16] As discussed above, although receptors were not placed within the property of Advance Disposal Services, the gradients are sufficiently small and the maximum estimated concentration is sufficiently below the standard that the EPA believes modeling at receptors within this property would not show violations. Furthermore, to the extent these concentrations are attributable to Advance Disposal Services, these impacts would not be included in an assessment of concentrations within the property of this facility, since within this property is not ambient air with respect to this facility's impacts.

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

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

Illinois' modeling for the Lake County area in general follows the recommendations in the Modeling TAD except as discussed in section 5.2.3 regarding model receptor placement. As described previously, despite the potential inconsistency with the Modeling TAD regarding receptor placement, the EPA finds that the removal of the receptors within the fence lines of the modeled sources does not prevent us from being able to use these technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area. The 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 Appendix W. While Illinois did not put receptors on the property of secondary facilities in the area, Illinois has provided adequate evidence that these locations would not have been estimated to have violations of the 1-hour SO_2 standard. Therefore, the EPA determines that the modeling is appropriate for assessing whether this area is meeting the NAAQS.

5.3. 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.

5.4. Jurisdictional Boundaries in the Lake County Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for the Lake County area. 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 submission, Illinois recommended that the entirety of Lake County be designated as attainment based in part on an assessment and characterization of air quality impacts from this facility and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. County boundaries in Illinois are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

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

Based on Illinois' modeling evaluation of the Lake County area, the EPA intends to designate the area as unclassifiable/attainment. The EPA reviewed the modeling parameters and methodology

used for this analysis, and concludes that Illinois's modeling was performed generally in accordance with the EPA's Modeling TAD, with a few exceptions that are explained in the sections above, and can be used to assess whether the area is attaining the standard. There are no SO_2 monitors located in Lake County for comparison to the NAAQS. There was no 3rd party modeling submitted for this area.

While Illinois did not model the entirety of Lake County, Illinois modeled all of the sources in and near the Lake County area expected to contribute to concentration gradients in that area, and the portions of Lake County that Illinois did not model can reasonably be expected to observe lower concentrations than the portion of the county Illinois did model. Therefore, the EPA believes that the entirety of Lake County is attaining the standard along with no indication of contribution to nearby nonattainment areas.

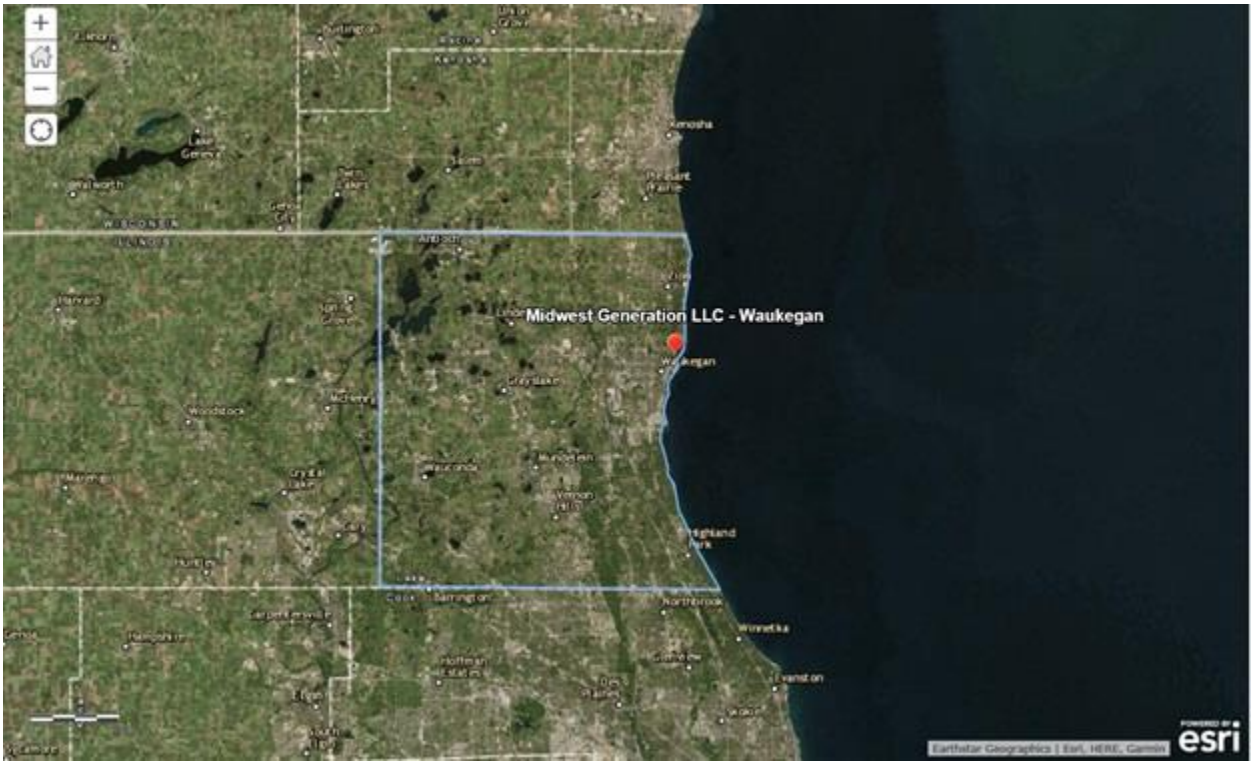
During the review of Illinois' modeling analysis, the EPA identified one potential issue regarding the exclusion of receptors over secondary sources included in Illinois' modeling analysis. The Modeling TAD generally recommends treating plant property as ambient air with respect to other facilities. As shown above in Figure 18, the maximum modeled design value for this area of analysis is located on the fence line of Advanced Disposal Services. The potential concern was that the maximum modeled design value would be located within the property boundaries of Advance Disposal Services if receptors were not excluded from the modeling analysis. Although there is a high probability that a maximum modeled design value would be found within Advanced Disposal Services' fence line if receptors were not excluded, 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 51% of the NAAQS and the isopleth suggests that the concentration gradient is sufficiently small to indicate that concentrations within the fence line would still be below the NAAQS.

The EPA believes that our intended unclassifiable/attainment area, including the entirety of Lake 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.

5.6. 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 agrees with the state's recommendation and intends to designate the Lake County area as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (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. Specifically, the intended area includes the entirety of Lake County. Figure 19 shows the boundary of Lake County, the intended designated area. The EPA is basing this conclusion predominantly on the modeling analysis provided by Illinois, which demonstrates that the area near Waukegan is attaining the SO_2 standard and there is no indication of contribution to existing nonattainment areas.

Figure 19. Boundary of the Intended Lake County Unclassifiable/Attainment Area



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

6. Analysis for the Madison County Area, Addressing U.S. Steel – Granite City/Gateway Energy & Coke

6.1. Introduction

The EPA must designate the area containing U.S. Steel's Granite City Works and the Gateway Energy & Coke facility in Madison County, because the area has not been previously designated and Illinois 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 this area. This section presents all the available air quality modeling information for this area. Although U.S. Steel Corporation and Gateway Energy & Coke Company LLC are separate companies, their respective facilities are contiguous and involved in the same general industrial category, and Illinois treats these two facilities as a single source for permitting purposes. Therefore, Illinois listed this pair of facilities as a single source for DRR purposes. According to the 2014 NEI, the U.S. Steel portion of this source emitted 1,335 tons of SO_2 in 2014, and the Gateway Energy & Coke portion of this source emitted 1,180 tons of SO_2 in 2014, so that the combined source emitted 2,415 tons of SO_2 in 2014. As a result, this source met the DRR listing criteria and is on the SO_2 DRR Source list, and Illinois has chosen to characterize the source via modeling. For convenience, this document will refer to this pair of facilities as the Granite City source.

Illinois' January 12, 2017, submittal did not include an analysis of air quality in the Madison County area. However, Illinois provided a supplemental submittal on July 6, 2017, that did provide such an analysis.[17] The focus of this section of the Illinois chapter is a review of this supplemental material.

The EPA has already designated portions of Madison County in the Round 2 of SO_2 designations. In particular, in an action published on July 12, 2016, at 81 FR 45039, the EPA designated a portion of Alton Township as nonattainment and designated Wood River Township and a portion of Chouteau Township as unclassifiable/attainment. Illinois' recent submittal analyzed air quality in the portion of Madison County that is south of the previously designated portions of the county. In its submission, Illinois recommended that an area including Venice, Granite City, and Nameoki Townships and the southern, undesignated portion of Chouteau Township be designated attainment, based predominantly on an assessment and characterization of air quality impacts from these facilities and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. This submittal provided no recommendations for the undesignated portions of Madison County north, east, or southeast of the previously designated area. These unaddressed portions of Madison County include the remainder of Alton Township and all of the following townships: Alhambra, Collinsville, Edwardsville, Fort Russell, Foster, Godfrey, Hamel, Helvetia, Jarvis, Leef, Marine, Moro, New Douglas, Olive, Omphghent, Pin Oak, Saline, and St. Jacob Townships.

[17] The letter submitting the supplemental analysis is undated. The technical support document that is attached to the letter is dated June 29, 2017. However, the submittal was mailed on July 6, 2017. For convenience, therefore, the EPA is treating the material as being submitted July 6, 2017.

This TSD chapter does not address or recommend any revisions to the designation for any previously designated portion of Madison County. This Section 6 focuses on the four townships or portions of townships that Illinois recommended be designated attainment. For convenience, this section will refer to these four townships as the Madison County area. Section 8 addresses the remainder of Madison County, along with the remainder of the state.

After careful review of the state's assessment, supporting documentation, and all available data, the EPA finds the modeling submitted by the state cannot be relied upon to demonstrate that the 1-hour SO_2 NAAQS is currently being attained in this area. The modeling provided by Illinois reflects a revision to the emission release characteristics at Amsted Rail, a revision that was not characteristic of the source during the modeled period and which appears not to be enforceable until June 2018. As discussed further below, the modeling for Amsted Rail used inappropriate release characteristics, and so the modeling does not provide reliable evidence as to whether the 1-hour SO_2 NAAQS is currently being attained near this facility. The EPA is unable to determine whether correction of this model input would result in modeled violations. A designation of "unclassifiable" indicates 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. This area meets this definition, therefore, the EPA intends to designate the area as unclassifiable. Our reasoning for this conclusion is explained in a later section, after all the available information is presented.

However, Illinois has informed the EPA that Amsted Rail is currently beginning work under a state-issued construction permit on the redirecting of its emissions and expects to complete this work by the end of August 2017. Illinois further informed the EPA that once this work is completed, the redirection of the emissions will be a mandatory feature of the facility thereafter. That is, notwithstanding the nominal June 2018 deadline for this work, Illinois expects the redirection of the emissions to be permanent and enforceable as soon as the construction is complete, which is expected by the end of August 2017. After that point, based on currently available information the EPA would consider Illinois' modeling to include a proper reflection of an enforceable, implemented redirection of emissions from the pertinent stack at Amsted Rail, and more generally the EPA could then conclude that the state's modeling justifies a designation of unclassifiable/attainment for the area in advance of final designations by December 31, 2017.

As seen in Figure 20 below, the Granite City source is in Granite City, Illinois. This figure shows five other sources in the area, none of which emit more than 100 tons per year. These facilities include Abengoa Bioenergy, Amsted Rail, Chain of Rocks Recycling & Disposal, Milam Recycling & Disposal, and Afton Chemical. Figure 21 shows the state's recommended area for the attainment designation. The EPA's intended unclassifiable area includes the same area.

Figure 20. Map of the Madison County Area Addressing U.S. Steel-Granite City/Gateway Energy & Coke

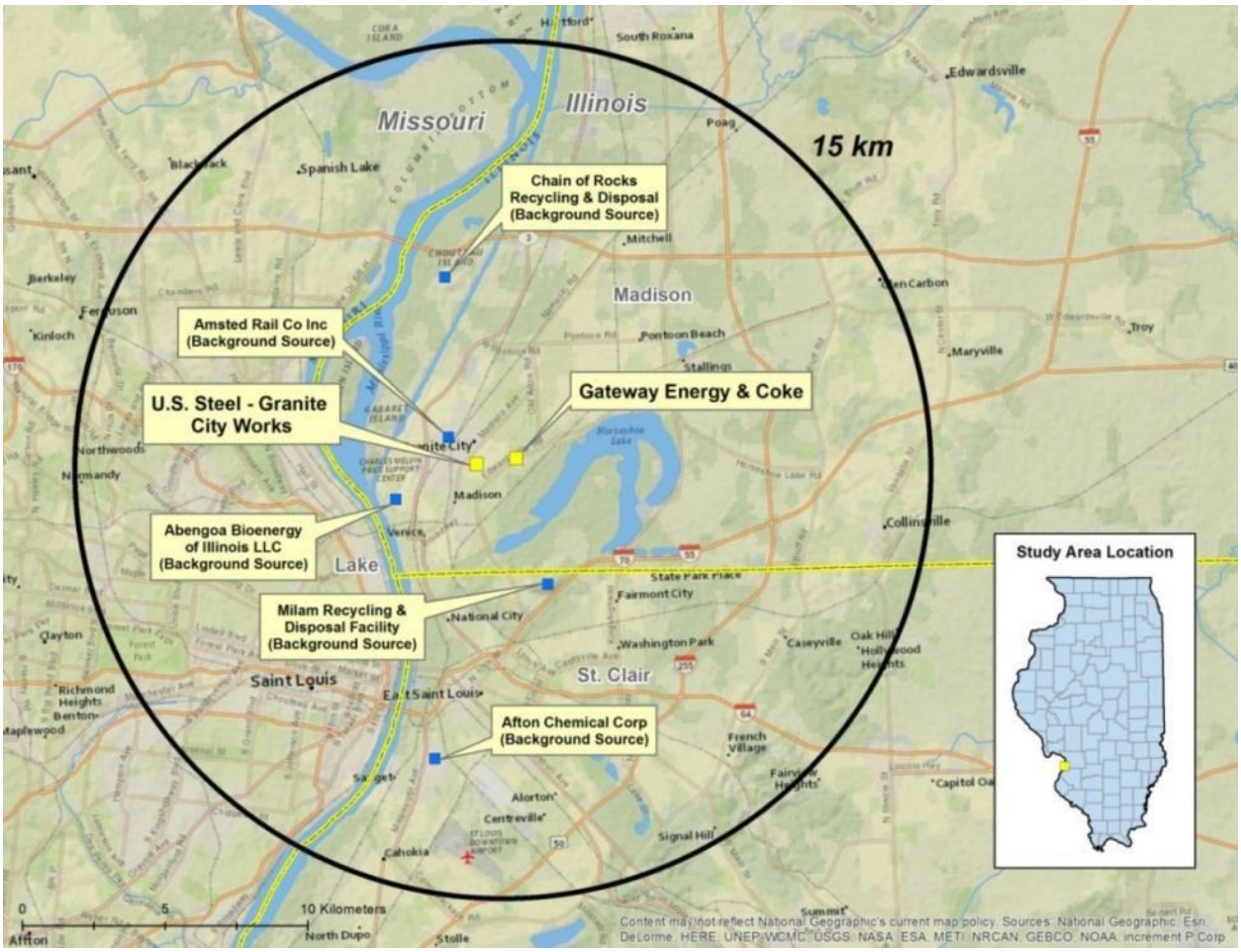
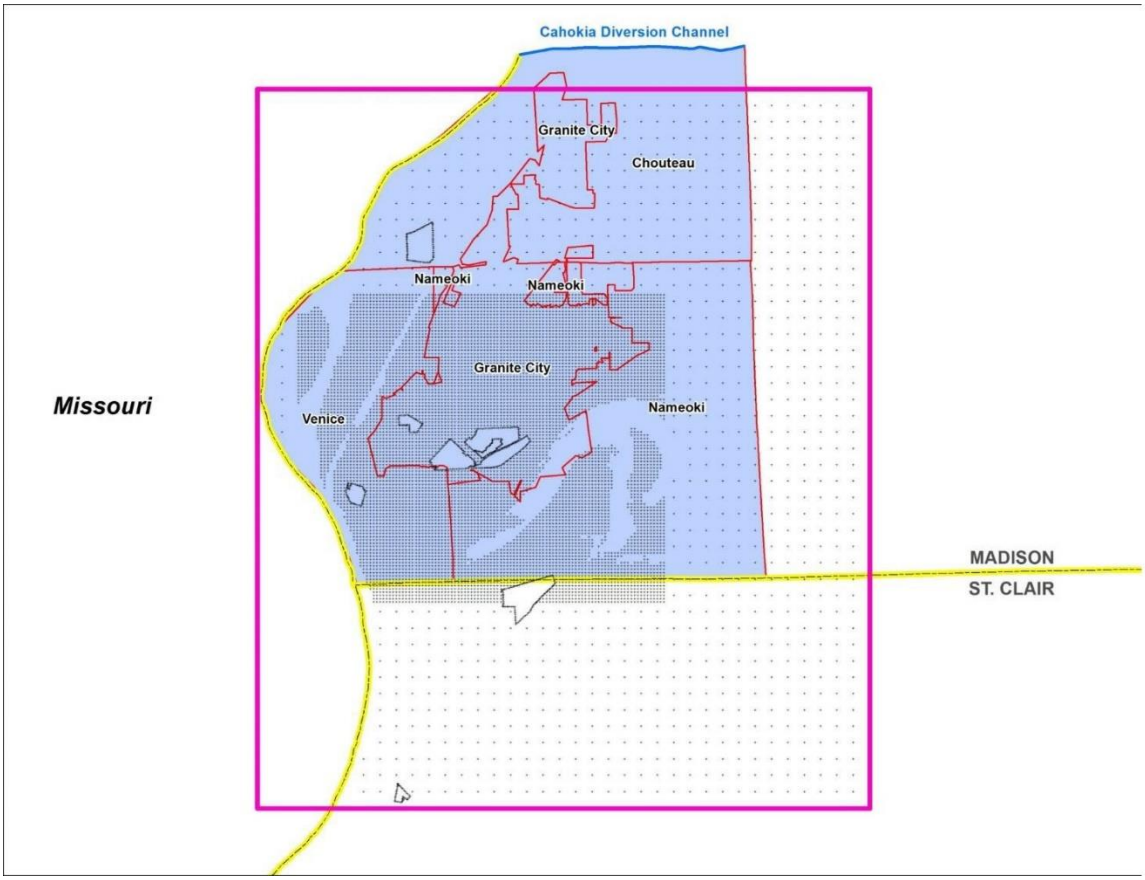


Figure 21. Illinois' Recommended Attainment Area



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.

6.2. Air Quality Monitoring Data for the Madison County Area

This section considers the SO_2 air quality monitoring data in the Madison County area. There are two monitors in the area (site numbers 17-119-1010 and 17-119-3009) but Illinois 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. Table 16 shows the monitors that are located in or near the Madison County area.

Table 16. Monitors near Granite City

AQS ID	County, State	Distance from Granite City	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
17-119-1010	S. Roxana, Madison, IL	17	18	15*
17-119-3007	Wood River, Madison, IL	19	26	25

*This value is not a valid design value due to incomplete data in 2016.
Available design values for these periods at these two sites were below the NAAQS.

6.3. Modeling Analysis Provided by the State

6.3.1. Model Selection and Modeling Components

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

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- 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 with default regulatory options. The non-default surface friction velocity option (ADJ_U*) was not used for this modeling analysis. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

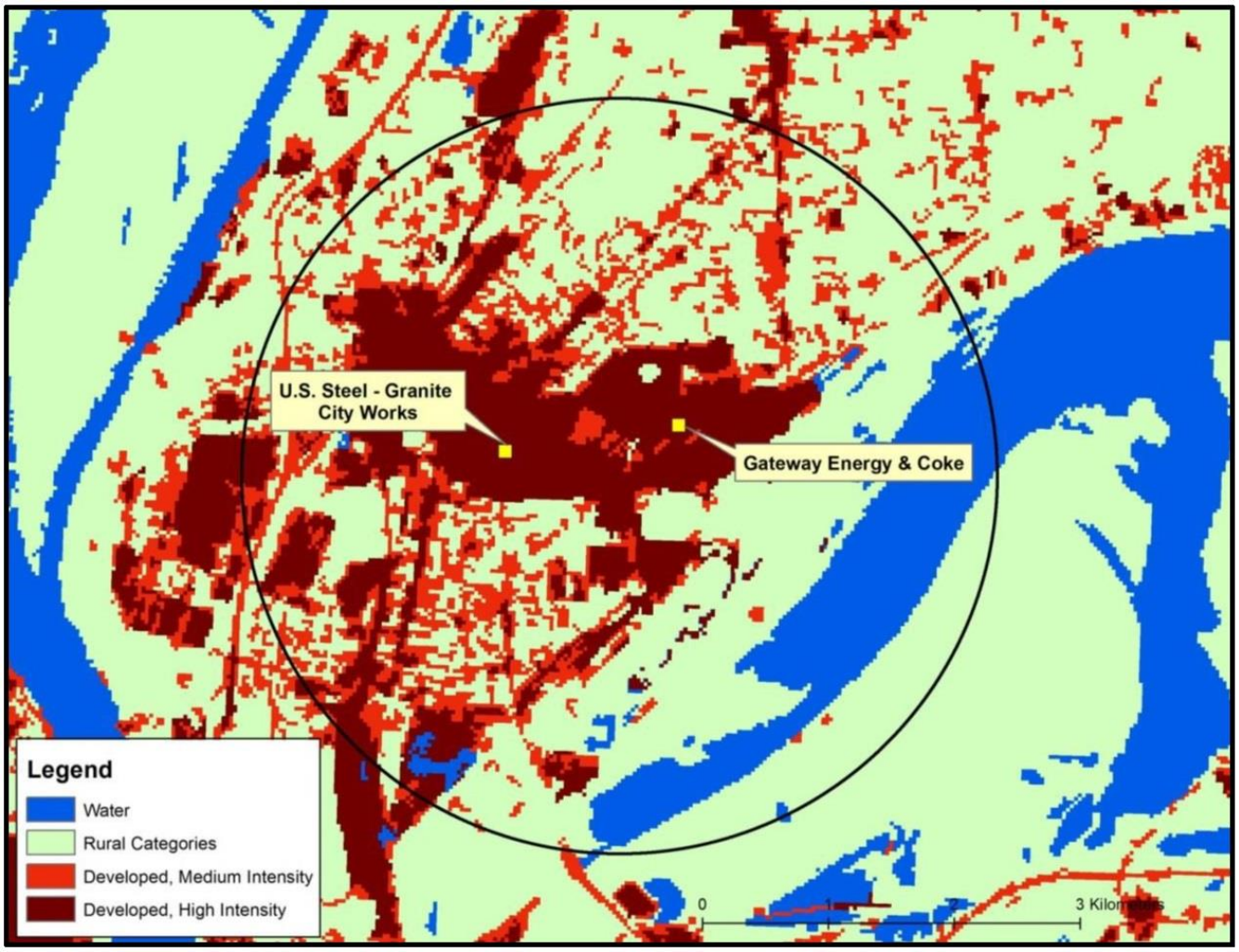
6.3.2. Modeling Parameter: Rural or Urban Dispersion

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. Illinois conducted an Auer's land use analysis to determine that the rural mode was appropriate. Figure 22 shows the results of Illinois' analysis. The area of analysis within a 3 km radius from the Granite City sources was determined

to be 61 percent rural. The EPA agrees with Illinois' analysis and decision to the run the model in rural mode.

Figure 22. Land Use in the Granite City Area



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

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

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Madison County area, the state selected a domain extending 15 km from the

Granite City sources. As noted above, this area included no other sources emitting over 100 tons of SO_2 per year but included five facilities with SO_2 emissions emitting under 100 tons per year that Illinois modeled. This area is shown in Figure 21 above. 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. Further discussion of the additional sources in the area is provided in section 6.2.6 below. No other sources beyond 15 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. The EPA agrees with the state's selection of sources within the area of analysis.

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

- 50 meters along the fence lines of the modeled sources
- 100 meters from the Granite City source fence lines out to a distance of approximately 4 km
- 500 meters from 4 km out to a distance of approximately 20 km from the Granite City source.

The receptor network contained 10,073 receptors, and the network encompasses portions of Madison and St. Clair Counties. Figure 23, included in the state's submittal, shows the state's receptor grid for the area of analysis.

Figure 23. Illinois' Receptor Grid for the Madison County Area

As recommended in 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 with the exception of locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. Per the recommendations of the Modeling TAD, the state did not place receptors on large bodies of water (Mississippi River, Horseshoe Lake, and Canteen Lake). The state also did not place receptors in other locations that it considered to not be ambient air relative to each modeled facility. However, potentially inconsistent with the Modeling TAD, the state removed receptors located inside the fence lines of the modeled facilities. While the Modeling TAD recommends including receptors within the fence line of secondary sources, for purposes of assessing whether other facilities are causing violations within that area, the EPA has adequate evidence that no violations are being caused by any source in this area on the property of any other source. 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 fence lines would not have shown SO_2 violations attributable to the primary Granite City sources. Specifically, due to the low release characteristics of the modeled sources, the highest impacts of each source are primarily at its own fence line and estimated concentrations decline sufficiently with distance from the source to support the

conclusion that impacts on other sources' properties are well below the standard. 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 assess air quality in the modeled area of analysis.

The EPA has assessed Illinois' receptor grid for the Madison County area of analysis and agrees that the receptor grid provides for adequate assessment of air quality in the area, given the availability of evidence that areas within the fence lines of modeled facilities would not be expected to show violations caused by other facilities.

6.3.4. Modeling Parameter: Source Characterization

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

The Granite City sources and five other sources listed above were explicitly included in the model. Of particular interest are the release characteristics modeled for Amsted Rail. For most of the modeled period, the release of emissions from the two primary emission units at this facility was horizontal. However, a permit issued on June 30, 2017, provides for "converting the ductwork from the baghouse that controls the arc furnace [Arc Furnace 2] from a horizontal discharge to a vertical discharge." Illinois' modeling uses release characteristics that reflect vertical discharge from this unit. Illinois modeled the other primary emission unit, Arc Furnace 1, as having horizontal discharge.

The nominal compliance date for this conversion for Arc Furnace 2 requires completion no later than June 30, 2018. As such, the revision to the stack configuration at this arc furnace is not creditable in evaluating current air quality for the purpose of designations. The Modeling TAD recommends that allowable emissions may be considered in lieu of actual emissions only so long as the reduction of emissions is required adequately in advance of the date by which the designation decision is made, so that the reduced emissions can be argued to be more determinative of current air quality than emissions during the prior three years. By similar reasoning, a requirement for revisions to stack characteristics that is not mandated until June 30, 2018, cannot be considered to influence current air quality as of December 31, 2017.[18]

For other sources, the state characterized these sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, for other sources, 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

[18] The enforceability of the revision to stack characteristics at Amsted Rail's Arc Furnace 2 is unclear. The permit states, "This permit authorizes a change to the stack configuration for the baghouse for Arc Furnace 2." On the other hand, the permit states that "The Permittee has committed to this project," and states that "This permit makes this commitment enforceable," and the permit has an effective date no later than August 5, 2017, and states that "This project shall be completed by no later than June 30, 2018." However, because this revision to stack characteristics is not creditable in the evaluation of the designation of this area, the enforceability of this revision is moot.

temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM version 04274 was used to assist in addressing building downwash.

The EPA has assessed the source characterization conducted by Illinois and concludes that for sources other than Amsted Rail, the sources in the modeling have been appropriately characterized for modeling. Nevertheless, the use of release characteristics at Amsted Rail that cannot be considered reflective of current conditions (and reflect conditions that will not be required until June 2018) makes the modeling inappropriate for use as a basis for characterizing current air quality or for use as a basis for area designations. However, if the redirection of emissions at this facility is completed and thereby becomes permanent and enforceable in the near future, as Illinois expects, the modeling that Illinois has provided could then reflect an appropriate treatment of source characteristics in this area.

6.3.5. Modeling Parameter: Emissions

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

The EPA believes that CEMS data provide acceptable historical emissions information, when they are available. These data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS, or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).
In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state included the Granite City sources and five other emitters of SO_2 within 15 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 2013 and 2015 are summarized below in Table 17. A description of how the state obtained hourly emission rates is given below this table.

Table 17. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Madison County Area

Facility Name	SO_2 Emissions (tpy)		
	2013	2014	2015
U.S. Steel – Granite City	864	961	828
Gateway Energy & Coke	1,128	1,241	1,188
Abengoa Bioenergy	7	8	8
Amsted Rail	3	5	6
Afton Chemicals	102	97	98
Milam Recycling & Disposal	29	29	18
Chain of Rocks Recycling & Disposal	5	5	5
Total Emissions from All Modeled Facilities in the State's Area of Analysis	2,137	2,345	2,150

For U.S. Steel – Granite City, the company provided monthly emission information including data on fuel used and operational data. Emissions from units burning natural gas or rarely used emergency equipment were found to have negligible emissions. Since steelmaking is a 24 hour per day operation, hourly emission estimates were then obtained by dividing monthly emissions by the total number of operating hours in the month. Fixed, representative values were used for stack temperatures and exit velocities.

Similarly, for Gateway Energy and Coke, monthly emission rates were obtained, which were used to estimate hourly average emission rates. Exhaust temperatures and exit velocities were identified on a monthly basis. Estimates of bypass stack emissions were based on a May 2010 stack test and adjusted according to data on the number of malfunction hours and hours of maintenance in each year.

Notably, these emission estimates for U.S. Steel – Granite City and Gateway Energy & Coke differ from the emission estimates for these facilities in the 2014 NEI. While the emission estimates in the 2014 NEI were adequate for purposes of deciding to list the facilities as subject to DRR requirements, Illinois conducted a more thorough assessment of the emissions of these facilities for purposes of its analysis of nearby air quality. Thus, while the 2014 NEI indicates that 2014 SO_2 emissions from these facilities were 1,334.9 tons and 1,180.1 tons, respectively, a more careful review finds the 2014 emission totals above, namely 961 tons and 1,241 tons, respectively. The EPA considers the emission estimates in Table 17, which Illinois used in its analysis, to be a more reliable basis for assessing current air quality in the Madison County area.

For Amsted Rail, the emission rate used in Illinois' modeling analysis is about half the emission rate reflected in the 2014 NEI. The revised emission estimates were based on recent stack testing conducted at the facility. For other facilities, emission estimates are comparable to the estimates in the 2014 NEI.

The EPA has assessed Illinois' characterization of emission rates for the sources modeled in the

analysis and concludes that the modeled emissions are appropriate.

6.3.6. Modeling Parameter: Meteorology and Surface Characteristics

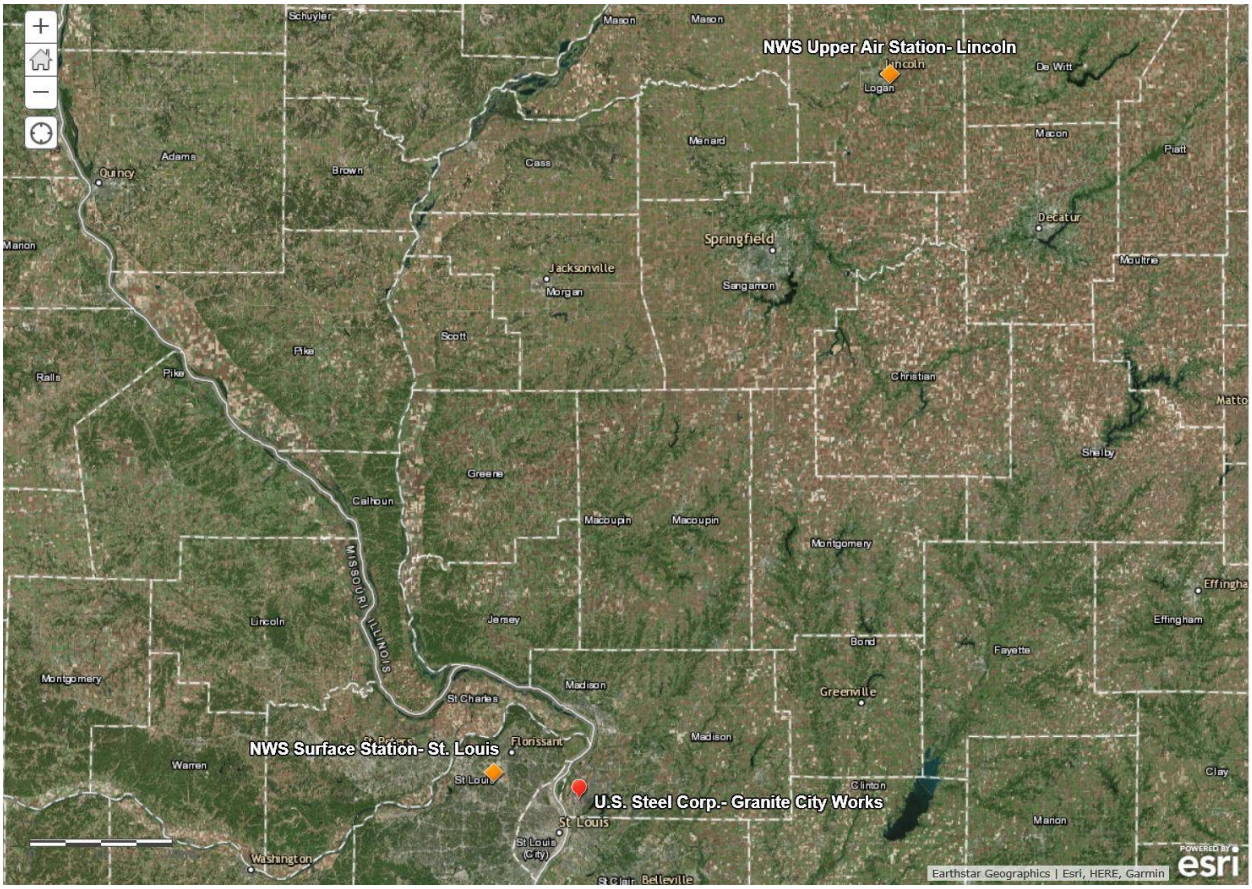
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

For the Madison County area of analysis, the state selected the surface meteorology from the NWS station in St. Louis, Missouri, located 21 km to the northwest of the sources, and coincident upper air observations from the NWS station in Lincoln, Illinois, located 171 miles to the north-northeast of the sources, as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the St. Louis, Missouri, 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 one km at a monthly temporal resolution for dry, wet, and average moisture conditions.

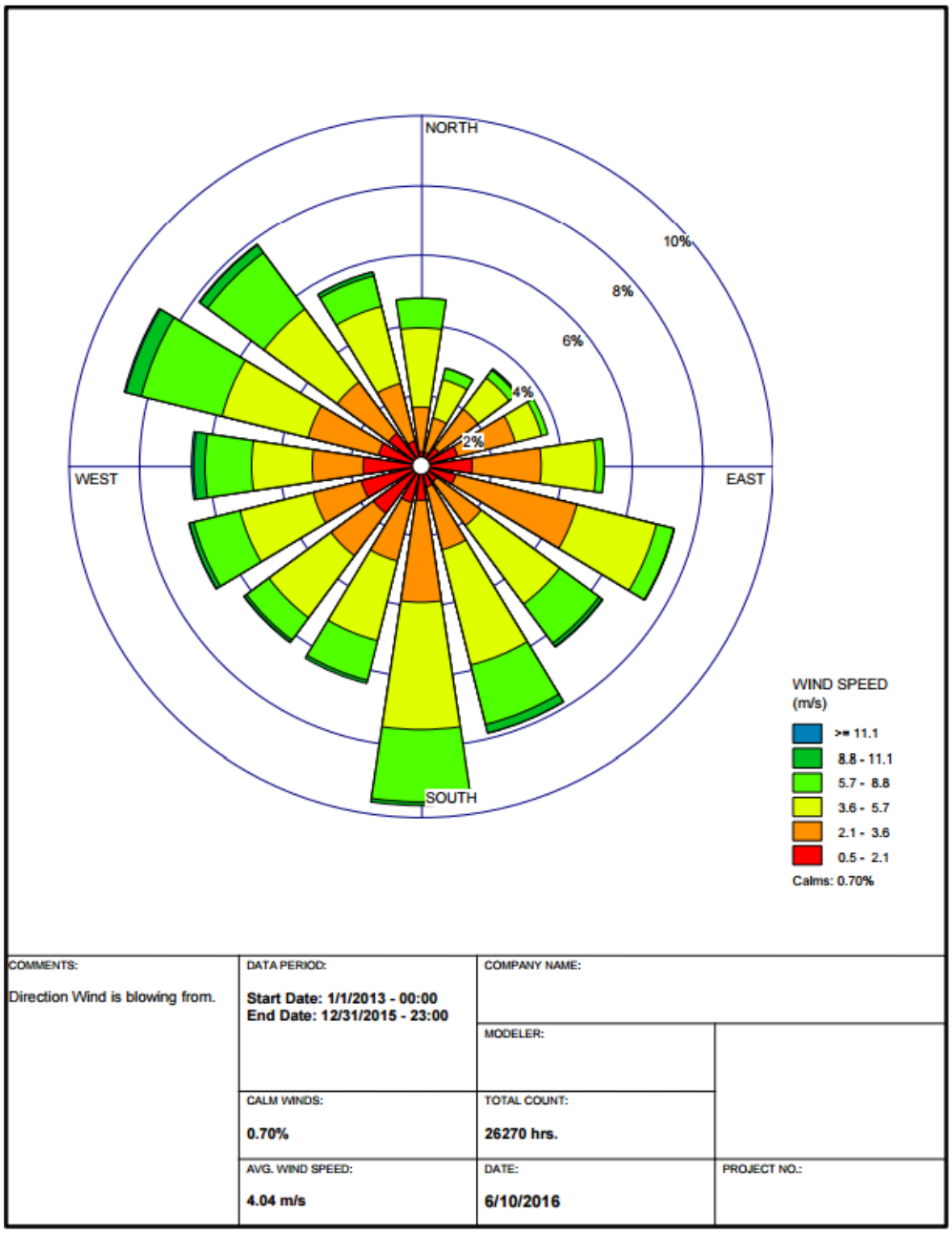
In the figure below, generated by the EPA, the locations of the NWS stations are shown relative to the area of analysis.

Figure 24. Area of Analysis and the NWS station near the Madison County Area



As part of its recommendation, the state provided the 3-year surface wind rose for Lambert – St. Louis International Airport, Missouri. In Figure 25, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. According to Illinois' analysis, the most common wind direction during the three-year time period represented in the modeling is from the south, occurring approximately 9.6% of the time. The highest percentage wind speed range, occurring 34.6% of the time period, was in the 3.6 – 5.7 m/s range.

Figure 25: Madison County, Illinois 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 *Regional Meteorological Data Processing Protocol, EPA Region 5 and States*[19] in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

[19] Draft – Regional Meteorological Data Processing Protocol. EPA Region 5 and States. August 2014.

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 St. Louis, Missouri 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 has assessed the meteorological and surface characterization in Illinois' modeling, including the conclusions Illinois has drawn from the wind rose above, and concludes that this component of Illinois' modeling is appropriate.

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

The terrain in the area of analysis is best described as flat to gently rolling. To account for these 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 1999 USGS National Elevation Database.

The EPA has assessed this component of the state's modeling and concludes that Illinois has appropriately addressed terrain in this area.

6.3.8. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose to use the tier 2 approach. Illinois incorporated temporally-varying background one-hour concentrations developed from the East St. Louis monitor (AQS site ID#: 17-163-0010), which is located in northwestern St. Clair County, approximately 16 km south of the study area. The background concentrations for this area of analysis were determined by the state to vary from 7.07 $\mu g/m^3$, equivalent to 2.70 ppb, to 34.29 $\mu g/m^3$ (13.09 ppb), with an average value of 15.84 $\mu g/m^3$ (6.05 ppb). A table showing all 96 background SO_2 values is included below.

Table 18. East St. Louis*, Illinois Monitor Seasonally and Hourly Varying Background SO_2**

Hour of Day	SO_2 Concentration ($\mu g/m^3$)			
	Winter	Spring	Summer	Fall
1	21.73	14.57	7.50	10.56
2	17.28	11.87	18.32	11.08
3	9.60	13.26	17.63	14.40
4	11.26	17.36	12.91	12.13
5	12.13	22.34	13.79	11.43
6	10.38	13.44	10.30	9.25
7	9.60	17.71	11.69	11.43
8	12.83	15.53	19.98	21.81
9	14.48	16.93	31.85	22.95
10	19.98	23.12	27.05	34.29
11	28.53	27.75	24.78	25.83
12	23.03	19.54	19.54	19.89
13	31.32	16.40	18.67	16.23
14	24.26	15.97	17.10	19.98
15	19.02	16.75	15.01	15.71
16	18.15	13.79	17.71	14.22
17	17.89	17.63	12.91	13.79
18	18.06	14.40	13.52	14.57
19	15.71	14.57	10.64	12.48
20	10.38	12.22	9.51	9.16
21	10.56	10.47	14.57	7.07
22	14.83	9.51	9.34	9.86
23	17.54	9.95	8.29	7.24
24	28.10	13.87	8.81	7.94

* Monitor Latitude/Longitude Coordinates: (+38.61203 -90.16048)

** Seasons defined as: Winter (Dec, Jan, Feb), Spring (Mar, Apr, May), Summer (Jun, Jul, Aug), Fall (Sep, Oct, Nov)

The EPA has assessed Illinois' characterization of background values and concludes that this component of the modeling is appropriate.

6.3.9. Summary of Modeling Inputs and Results

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

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

Input Parameter	Value
AERMOD Version	15181 (default)
Dispersion Characteristics	Rural
Modeled Sources	7
Modeled Stacks	61 stacks, 52 volume releases
Modeled Structures	409
Modeled Fence lines	7
Total receptors	10,073
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	St. Louis, Missouri
NWS Station Upper Air Meteorology	Lincoln, Illinois
NWS Station for Calculating Surface Characteristics	St. Louis, Missouri
Methodology for Calculating Background SO_2 Concentration	Tier 2: temporally varying using 2013-2015 monitored values from East St. Louis monitor in St. Clair County (AQS ID #: 17-163-0010)
Calculated Background SO_2 Concentration	7.07 – 34.29 $\mu g/m^3$

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

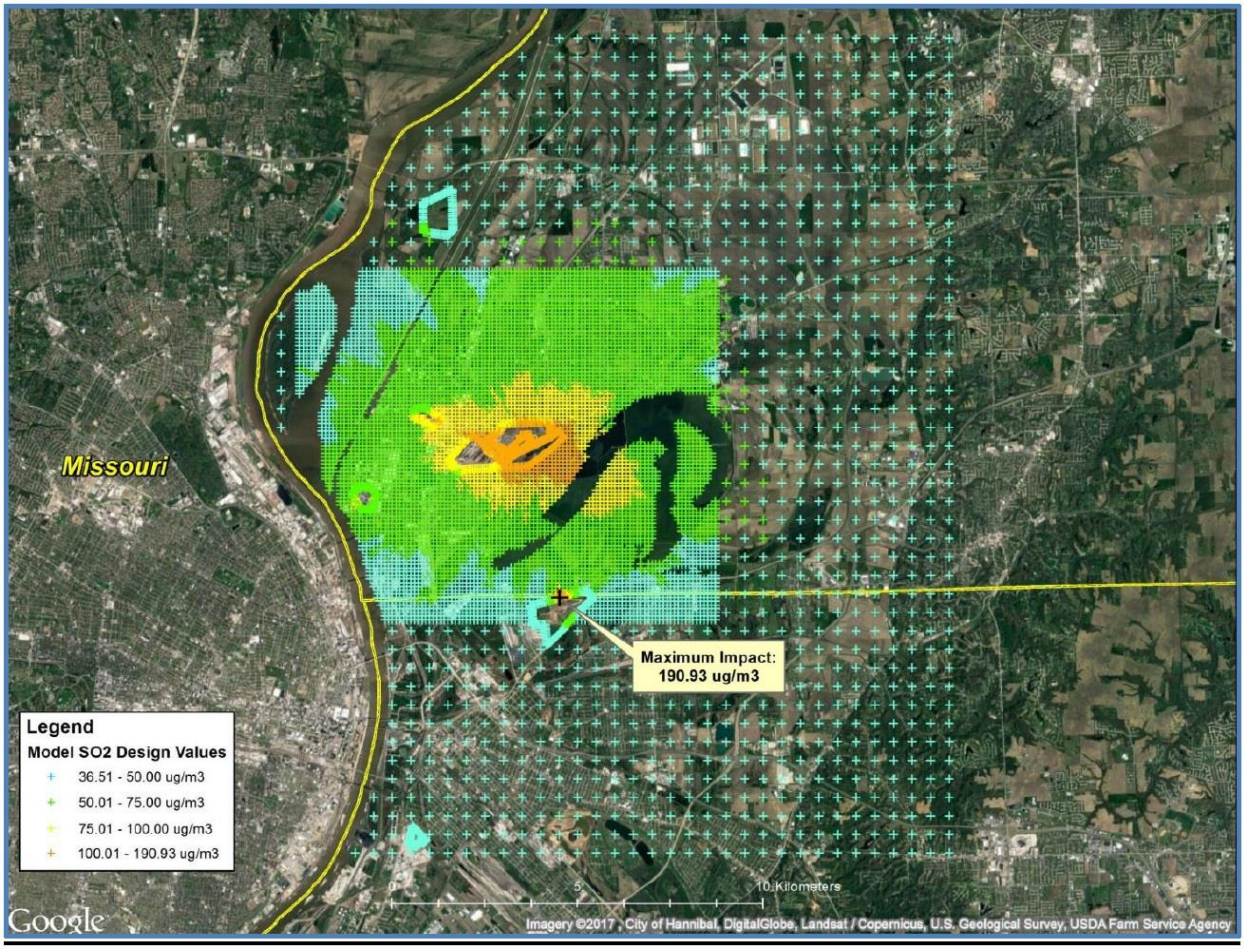
Table 20. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Madison County Area

		Receptor Location (UTM zone 16)		**99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)**	
Averaging Period	**Data Period**	**UTM Easting**	**UTM Northing**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2013-2015	750513 m	4282895 m	190.9	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 190.9 µg/m^3, equivalent to 72.9 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 26 below was included as part of the state's recommendation, and indicates that the predicted value occurred on the northern fence line of Milam Recycling, located 4 km south of the Granite City source. The highest concentration near the Granite City source is 177.8 µg/m^3, or 67.9 ppb, estimated on the northwest fence line of the source, and the highest concentration near Amsted Rail is 142.6 µg/m^3, or 54.5 ppb, estimated on the south-southeast fence line of that facility. The state's receptor grid is also shown in the figure.

Figure 26: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Madison County Area



The modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is attained at all receptors in the area. However, because the modeling for Amsted Rail used inappropriate release characteristics, the modeling does not provide reliable evidence as to whether the 1-hour SO_2 NAAQS is currently being attained near this facility.

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

Illinois' modeling for the Madison County area generally follows the recommendations in the Modeling TAD, except as discussed previously regarding improper source characterization and model receptor placement. Many components of the modeling assessment, including models used, meteorology, emission estimates, nearby sources modeled, and background concentrations, adequately comply with the TAD and with Appendix W. However, the modeling reflects a vertical release of emissions from Arc Furnace 2 at Amsted Rail, which is not required until June 2018, and is thus not appropriate for this analysis of current air quality. Since modeling with one electric arc furnace emitting horizontally estimated relatively high concentrations, the available evidence suggests a potential for violations had both electric arc furnaces been modeled as emitting horizontally. Therefore, the EPA determines that the modeling does not provide a reliable assessment of whether this area is currently meeting the NAAQS.

However, if as described previously, the modeled release of emissions from Amsted Rail becomes permanent and enforceable, the modeling could serve as a reliable assessment of current air quality in the area. As noted, Illinois' modeling indicates that the area is attaining the NAAQS. As detailed above, the highest impacts attributable to each facility were predicted to occur on or near to the facility's fence line with a sufficient decrease in impacts as distance from the facility increased. This supports the finding that no violations attributable to other facilities would be found within a different facility's fence line but also supports the finding that the modeled facilities are not contributing to violations in any nearby areas not attaining the NAAQS. This may be attributed to the primarily low release characteristics and localized impacts of the modeled sources. Therefore, if the modeled release characteristics at Amsted Rail become permanent and enforceable, the EPA could find that Illinois' modeling then demonstrates that the modeled sources in the Madison County area do not cause or contribute to violations of the NAAQS and be designated as unclassifiable/attainment.

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

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for the Madison County area. 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 submission, Illinois recommended that specific, previously undesignated townships and portions of townships within Madison County be designated as attainment based in part on an assessment and characterization of air quality impacts from the Granite City source and from

other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. County and township boundaries in Illinois are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

6.6. The EPA's Assessment of the Available Information for the Madison County Area

After careful review of the state's assessment, supporting documentation, and all available data, the EPA finds the modeling submitted by the state cannot be relied upon to demonstrate that the 1-hour SO_2 NAAQS is currently being attained in this area. The modeling provided by Illinois reflects a revision to the emission release characteristics at Amsted Rail, a revision that was not characteristic of the source during the modeled period and which appears not to be enforceable until June 2018. As discussed, the modeling for Amsted Rail used inappropriate release characteristics, and so the modeling does not provide reliable evidence as to whether the 1-hour SO_2 NAAQS is currently being attained near this facility. The EPA is unable to determine whether correction of this model input would result in modeled violations. A designation of "unclassifiable" indicates 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. This area meets this definition, therefore, the EPA intends to designate the area as unclassifiable.

However, as described above, based on information from Illinois, the EPA anticipates that notwithstanding the nominal June 2018 compliance date for redirection of emissions at Amsted Rail, this work will be completed in the near future. At that time, the revised stack characteristics at this source will be an enforceable requirement. Specifically, the completed redirection of emissions would then be a permanent and enforceable feature of the facility that could then only change if again authorized through a state-issued permit. Under these circumstances, Illinois' analysis of air quality in this area, indicating that the area is attaining the standard, will be an appropriate analysis of air quality in the area. Under these circumstances, the EPA anticipates promulgating a final designation of unclassifiable/attainment for this area.

Based on Illinois' modeling evaluation of the Madison County area, the EPA intends to modify the state's recommendation and intends to designate the area as unclassifiable because the EPA believes that the state's modeling is an insufficient basis for determining whether this area is currently attaining the standard. The EPA reviewed the modeling parameters and methodology used for this analysis, and concludes that while Illinois' modeling is mostly in accordance with the EPA's Modeling TAD, the use of inappropriate release characteristics at Amsted Rail is a significant departure from the recommendations of the Modeling TAD that renders the EPA unable to determine whether the area is attaining the standard. Illinois' modeling uses release characteristics for emissions from Arc Furnace 2 that are neither reflective of conditions during

the modeled three-year period nor required to be in place by the EPA's deadline for promulgating these designations. Therefore, the EPA is unable to determine whether this area is currently attaining the 2010 SO_2 NAAQS. On the other hand, based on information from Illinois, the EPA anticipates that the redirection of emissions will be completed by mid-August, after which the redirection will be a permanent and enforceable characteristic of the facility. Under those circumstances, the EPA anticipates that it could then find that the state's modeling appropriately characterizes current air quality demonstrating that the area does not cause or contribute to violations of the 1-hour SO_2 NAAQS and could designate the area as unclassifiable/attainment, consistent with the state's recommendation.

The EPA believes that our intended unclassifiable area, as described in the above paragraphs, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable area. If the EPA finds in final action that the emissions redirection has been completed and has become enforceable as anticipated, the EPA anticipates applying a designation of unclassifiable/attainment to the same area as described above.

6.7. Summary of Our Intended Designation for the Madison 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 Venice, Granite City, and Nameoki Townships and the currently undesignated portion of Chouteau Township (that portion of the township south of the Cahokia Diversion Channel) as unclassifiable. The area that the EPA intends to designate unclassifiable is shown in Figure 21 above, and is the same as the area that Illinois recommended be designated attainment. On the other hand, as discussed, if the emissions redirection at Amsted Rail is completed and becomes permanently enforceable in advance of final designations, the EPA anticipates designating this area as unclassifiable/attainment by December 31, 2017.

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

7. Air Quality Modeling Analysis for the Area Containing Randolph and Washington Counties, Addressing Dynegy Midwest Generation – Baldwin and Prairie State Generating Company

7.1. Introduction

The EPA must designate the area containing Randolph and Washington Counties by December 31, 2017, because the area has not been previously designated and Illinois 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 Randolph and Washington Counties. This section presents all the available air quality modeling information for Randolph and Washington Counties that include Dynegy Midwest Generation Inc. – Baldwin Power Plant (DMG-Baldwin) and Prairie State Generating Company (PSGC) power plant. The DMG-Baldwin and the PSGC facilities each emit 2,000 tons or more annually. Specifically, DMG-Baldwin emitted 4,409.5 tons of SO_2 in 2014, and PSGC emitted 5,696.0 tons of SO_2 in 2014. These sources meet the DRR listing criteria and thus are on the SO_2 DRR Source list, and Illinois has chosen to characterize both facilities via modeling.

In its submission, Illinois recommended that an area that includes the area surrounding the DMG-Baldwin and PSGC facilities, specifically Randolph, Monroe, St. Clair, Washington, and Perry Counties, be designated as attainment based in part on an assessment and characterization of air quality impacts from these facilities and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions.

After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees that modeling submitted by the state indicates that the 1-hour SO_2 NAAQS is being attained in this area and intends to designate the area as unclassifiable/attainment. The area that the state has assessed via air quality modeling encompasses portions of Randolph, Monroe, Washington, St. Clair, and Perry Counties in Illinois. Figure 27 shows these counties, other nearby counties in Illinois, and nearby counties in Missouri, along with some of the relevant sources in this area.

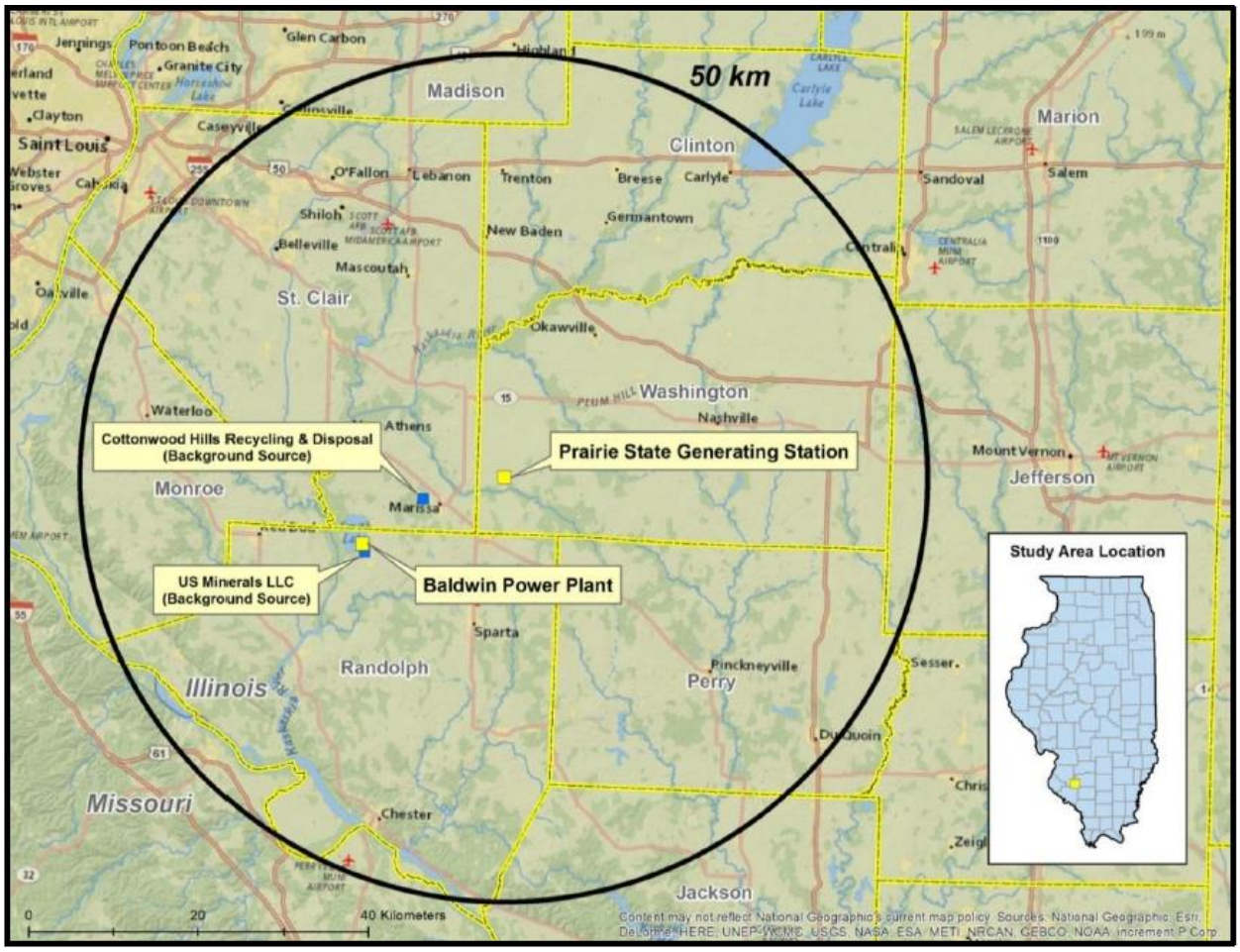
Figure 27. Area in Illinois and Missouri Surrounding the Washington and Randolph County Area

Some portions of the area that Illinois recommended be designated attainment are relatively close to sources in Missouri. However, most of these sources are in parts of Missouri that the EPA intends to designate as unclassifiable/attainment. Part of this area in Illinois is next to an area in Missouri that is designated nonattainment, but the EPA has published a clean data determination for this area. See 82 FR 28605, June 23, 2017. Therefore, given the air quality characterization provided by Illinois and the air quality characterization information provided by Missouri, the EPA believes that no violations are occurring anywhere in the area that Illinois recommends be designated as attainment. Our reasoning for this conclusion regarding air quality in Illinois is explained in a later section of this TSD, after all the available information is presented. Further discussion of air quality in Missouri is provided in the Missouri Chapter of the TSD.

Figure 28, taken from Illinois' submittal, shows a map that is more focused on Illinois' area of analysis. As seen in this figure, DMG-Baldwin is located just outside the community of Baldwin, in Randolph County, and PSGC is located approximately 25 km east-northeast of DMG-Baldwin, near Lively Grove in Washington County. Also included in the figure are other nearby relevant emitters of SO_2.[20] These are Cottonwood Hills Recycling and Disposal, and US Minerals LLC. Illinois did not include any Missouri sources in its analysis.

[20] All other relevant SO_2 emitters within 50 km are shown in Figure 28. If no sources not named previously are shown, there are no additional relevant SO_2 emitters in the vicinity of the named sources.

Figure 28. Map of the Area Containing Randolph and Washington Counties Addressing DMG-Baldwin and PSGC



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

7.2. Air Quality Monitoring Data for the Area Containing Randolph and Washington Counties

This section considers the SO_2 air quality monitoring data in the area containing Randolph and Washington Counties. There are two monitors in the area (for site number 17-157-0001 and 17-163-0010) but Illinois 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. Table 16 shows the monitors that are located in the area containing Randolph and Washington Counties.

Table 16. Monitors near PSGC

AQS ID	County, State	Distance from PSGC (km)	Direction from PSGC	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
17-157-0001	Randolph, IL	15	SW	11	--*
17-163-0010	St. Clair, IL	57	NW	21	21

*This monitor was shut down after 2015.

Available design values for these periods at these two sites were below the NAAQS.

7.3. Modeling Analysis Provided by the State

7.3.1. Model Selection and Modeling Components

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

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- 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 with default regulatory options. The non-default surface friction velocity option (ADJ_U*) was not used for this modeling analysis. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

7.3.2. 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. An Auer's land use analysis was conducted by Illinois to determine that the rural mode was appropriate. The area of analysis within a 3 km radius from PSGC was determined to be 98.11% rural. The EPA agrees with Illinois' analysis and decision to the run the model in rural mode.

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

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

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the area containing Randolph and Washington Counties, the state has included two other emitters of SO_2 within 50 km of PSGC. 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 DMG-Baldwin and PSGC, the other emitters of SO_2 included in the area of analysis are: Cottonwood Hills Recycling and Disposal, and US Minerals LLC. No other sources within or beyond 50 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. The EPA has verified that all relevant secondary sources within 50 km of PSGC were included in the modeling analysis, and the EPA agrees with the state's selection of sources within the area of analysis.

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

- 50 meters along the fence lines (DMG – Baldwin, PSGC, U.S. Minerals, and Cottonwood Hills)
- 100 meters from the DMG – Baldwin and PSGC fence lines out to a distance of approximately 4 km
- 500 meters from 4 km out to a distance of approximately 20 km from both main power plants.

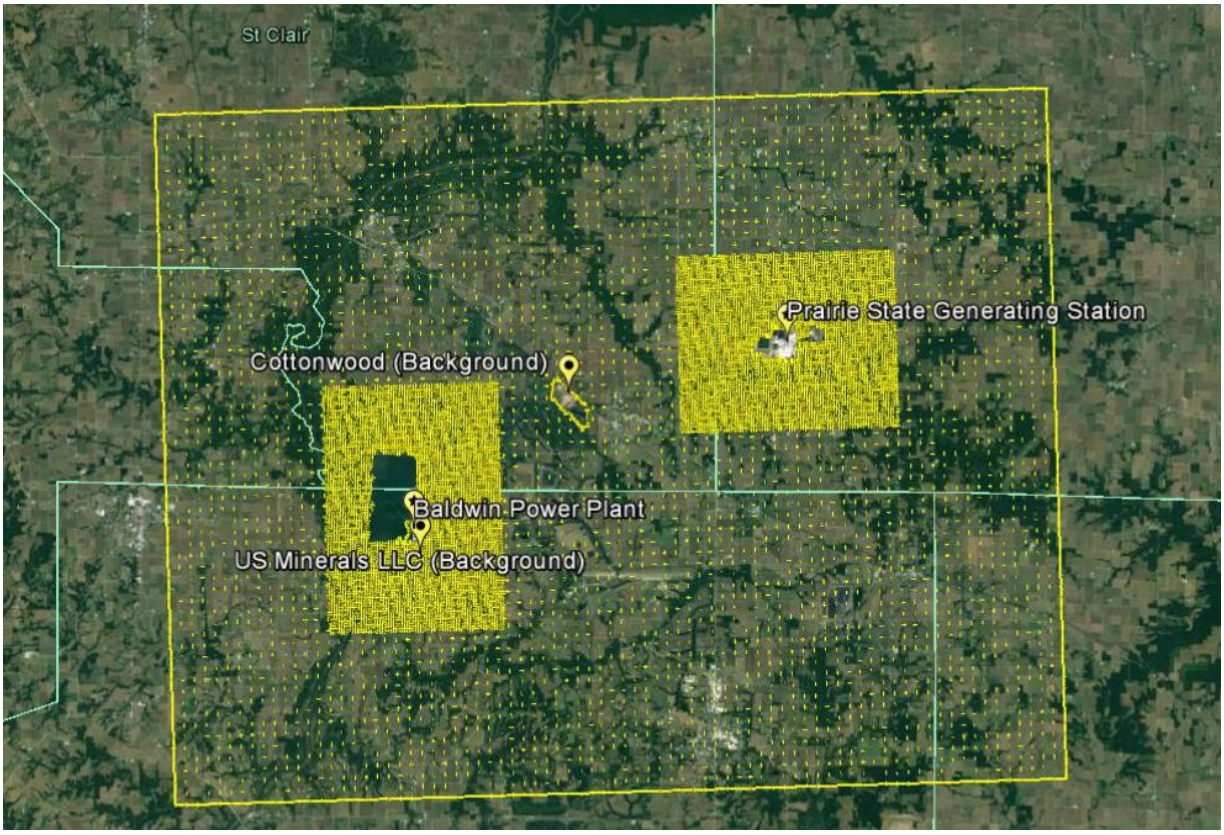
The receptor network contained 20,485 receptors, and the network encompasses portions of Randolph, Washington, St. Clair, and Perry Counties.

Figure 29, included in the state's recommendation, shows the state's chosen area of analysis surrounding DMG-Baldwin and PSGC, 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 with the exception of locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor. Per the recommendations of the Modeling TAD, the state did not place receptors on large bodies of water (i.e. Mississippi River and Lake Baldwin). The state also did not place receptors in other locations that it considered to not be ambient air relative to each modeled facility. However,

potentially inconsistent with the Modeling TAD, the state removed receptors located inside the fence lines of DMG-Baldwin, PSGC, U.S. Minerals, and Cottonwood Hills. While the Modeling TAD recommends including receptors within the fence line of secondary sources, for purposes of assessing whether other facilities are causing violations within that area, the EPA has adequate evidence that violations are not occurring on the property of secondary sources in this area. 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 fence lines of U.S. Minerals, and Cottonwood Hills would not have shown SO_2 violations attributable to PSGC or DMG-Baldwin. Additionally, with respect to the exclusion of receptors inside the PSGC and DMG-Baldwin fence lines, 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 PSGC or DMG-Baldwin fence lines 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. Specifically, after assessing the modeling results, the EPA concludes that the maximum modeled design value is located sufficiently far away from the fence lines of any secondary sources for this issue to raise any concern of a potential for violation within these property boundaries. In addition, the maximum modeled concentration is less than 40% of the NAAQS and the concentration gradients based on the provided isopleths do not indicate any potential for violations within the boundaries of any modeled facilities.

Figure 29: Receptor Grid for the Randolph and Washington County Area



The EPA has assessed Illinois' receptor grid for the area of analysis containing Randolph and Washington Counties and confirms that Illinois used receptor grid placements and exclusions adequate for purposes of determining whether this area is attaining the SO_2 standard.

7.3.4. Modeling Parameter: Source Characterization

DMG-Baldwin, PSGC, and two other sources within 50 km listed above were explicitly included in the model.

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 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 has assessed the source characterization conducted by Illinois and concludes that the sources in the modeling have been appropriately characterized for modeling.

7.3.5. Modeling Parameter: Emissions

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

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

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

As previously noted, the state included DMG-Baldwin, PSGS, and two other emitters of SO_2 within 50 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 2013 and 2015 are summarized below in Table 17. A description of how the state obtained hourly emission rates is given below this table.

Table 17. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Area Containing Randolph and Washington Counties

	SO_2 Emissions (tpy)		
Facility Name	**2013**	**2014**	**2015**
DMG-Baldwin	4,803.4	4,409.5	4,160.0
Prairie State Generating Station	4,719.5	5,696.0	7,847.6
U.S. Minerals Inc.	3.1	3.5	1.0
Cottonwood Hills Recycling & Disposal	17.0	21.8	24.3
Total Emissions from All Modeled Facilities in the State's Area of Analysis	**9,543.0**	**10,130.8**	**12,032.9**

For DMG-Baldwin, the company provided hourly-specific SO_2 emission rates for Boiler #1, Boiler #2, and Boiler #3 for calendar years 2012-2015. Based on monthly fuel usage and operating time data, Illinois deemed emissions from the auxiliary heating boiler, diesel engines, and fire pumps too low and intermittent to be applicable for the analysis, and therefore did not include these units in the model. The EPA concurs that the emissions from these sources are sufficiently low and infrequent as to be expected to have minimal impact on ambient air quality.

Prairie State Generating Company provided hourly-specific temperature, flow rate, and emissions data for both of the pulverized coal-fired boilers (Unit #1 and Unit #2), and hourly emissions data computed from gas consumption records and AP-42 emission factors for the auxiliary boiler. Emission estimates for the emergency diesel fire pump and the emergency diesel generator were calculated based upon emission factors from the company's annual emissions report. Illinois concluded that the emissions and operating hours for these units during this timeframe were sufficiently low and infrequent to have minimal effect on air quality, so that these sources did not need to be modeled explicitly in this modeling analysis. This is generally consistent with EPA's March 1, 2011, Clearinghouse Memo, which allows for exclusion of sources not expected to contribute significantly to the annual distribution of daily maximum 1-hour concentrations. The EPA concurs that the emissions from these sources are sufficiently low and infrequent as to be expected to have minimal impact on ambient air quality.

For the Rotary Dryer #4 Fuel Oil Combustion unit at U.S. Minerals Inc., and the flare unit at Cottonwood Hills Recycling & Disposal, hourly emission profiles were developed based on seasonal operation and throughput information from annual emission reports. For the crusher unit at Cottonwood, an hourly emission profile was developed based on the worst-case emissions year and seasonal throughput information.

For U.S. Minerals Inc. and Cottonwood Hills Recycling & Disposal, constant emission rates were used based on the actual annual emissions. While this approach is not recommended by the Modeling TAD, the EPA does not expect these relatively small emission sources to have a significant effect on maximum concentrations in the area.

The EPA has assessed Illinois' characterization of emission rates for the sources modeled in the analysis and concludes that the modeled emissions are appropriate.

7.3.6. Modeling Parameter: Meteorology and Surface Characteristics

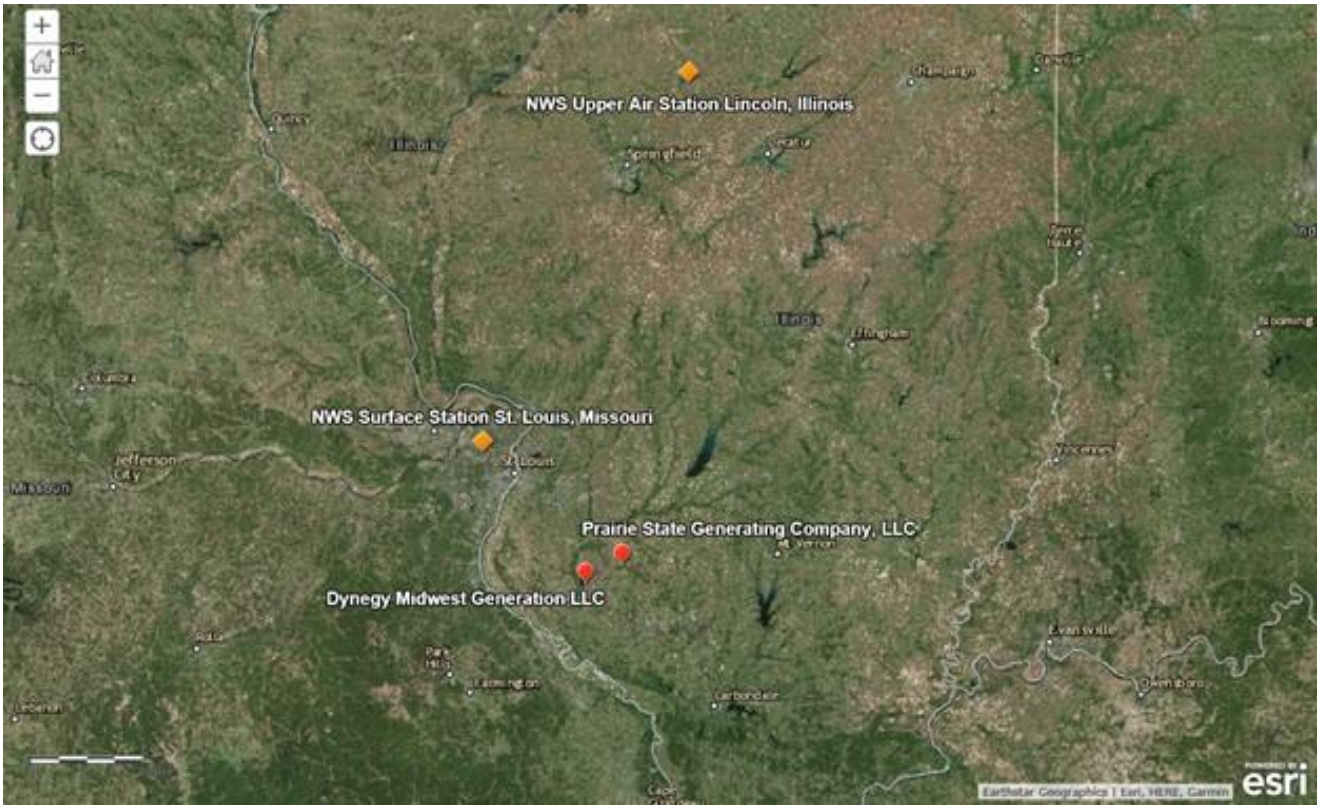
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

For the area of analysis containing Randolph and Washington Counties, the state selected the surface meteorology from the NWS station in St. Louis, Missouri, located 50 miles to the northwest of the sources, and coincident upper air observations from different NWS station, located in Lincoln, Illinois, located 130 miles to the north-northeast of the sources as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version 13016 using data from the St. Louis, Missouri, 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 one km at a monthly temporal resolution for dry, wet, and average moisture conditions.

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

Figure 30. Area of Analysis and the NWS stations in the Area Containing Randolph and Washington Counties, Illinois



For this analysis for Randolph and Washington Counties, Illinois chose to use the same surface data, from the St. Louis NWS station, that it used in its analysis for Madison County. Thus, the 3-year surface wind rose that Illinois provided as part of its submittal for Randolph and

Washington Counties is identical to the wind rose for the Madison County area. This wind rose is provided in Figure 25 above, in the discussion for Madison County. As stated above in section 6.3.6, Illinois found that the most common wind direction during the three-year time period represented in the modeling is from the south, occurring approximately 9.6% of the time. The highest percentage wind speed range, occurring 34.6% of the time period, was in the 3.6 – 5.7 m/s range.

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 *Regional Meteorological Data Processing Protocol, EPA Region 5 and States*[21] in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the St. Louis, Missouri 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 has assessed the meteorological and surface characterization in Illinois' modeling, including the conclusions Illinois has drawn from the wind rose above, and concludes that this component of Illinois' modeling is appropriate.

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

The terrain in the area of analysis is best described as flat to gently rolling. To account for these 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 1999 USGS National Elevation Database.

[21] Draft – Regional Meteorological Data Processing Protocol. EPA Region 5 and States. August 2014.

The EPA has assessed this component of the state's modeling and concludes that Illinois has appropriately addressed terrain in this area.

7.3.8. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose to use the tier 2 approach. Illinois incorporated temporally-varying background one-hour concentrations developed from the East St. Louis monitor (AQS site ID#: 17-163-0010), which is located approximately 35 miles northwest of the study area in northwestern St. Clair County. The background concentrations for this area of analysis were determined by the state to vary from 7.07 μg/m^3, equivalent to 2.70 ppb, to 34.29 μg/m^3 (13.09 ppb), with an average value of 15.84 μg/m^3 (6.05 ppb). A table showing all 96 background SO_2 values is included below.

Table 18. East St. Louis*, Illinois Monitor Seasonally and Hourly Varying Background SO_2**

Hour of Day	SO_2 Concentration ($\mu g/m^3$)			
	Winter	Spring	Summer	Fall
1	21.73	14.57	7.50	10.56
2	17.28	11.87	18.32	11.08
3	9.60	13.26	17.63	14.40
4	11.26	17.36	12.91	12.13
5	12.13	22.34	13.79	11.43
6	10.38	13.44	10.30	9.25
7	9.60	17.71	11.69	11.43
8	12.83	15.53	19.98	21.81
9	14.48	16.93	31.85	22.95
10	19.98	23.12	27.05	34.29
11	28.53	27.75	24.78	25.83
12	23.03	19.54	19.54	19.89
13	31.32	16.40	18.67	16.23
14	24.26	15.97	17.10	19.98
15	19.02	16.75	15.01	15.71
16	18.15	13.79	17.71	14.22
17	17.89	17.63	12.91	13.79
18	18.06	14.40	13.52	14.57
19	15.71	14.57	10.64	12.48
20	10.38	12.22	9.51	9.16
21	10.56	10.47	14.57	7.07
22	14.83	9.51	9.34	9.86
23	17.54	9.95	8.29	7.24
24	28.10	13.87	8.81	7.94

* Monitor Latitude/Longitude Coordinates: (+38.61203 -90.16048)

** Seasons defined as: Winter (Dec, Jan, Feb), Spring (Mar, Apr, May), Summer (Jun, Jul, Aug), Fall (Sep, Oct, Nov)

The EPA has assessed Illinois' characterization of background values and concludes that this component of the modeling is appropriate.

7.3.9. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the area of analysis containing Randolph and Washington Counties are summarized below in Table 19.

Table 19. Summary of AERMOD Modeling Input Parameters for the Area of Analysis Containing Randolph and Washington Counties

Input Parameter	Value
AERMOD Version	15181 (default)
Dispersion Characteristics	Rural
Modeled Sources	4
Modeled Stacks	9
Modeled Structures	143
Modeled Fencelines	4
Total receptors	20,485
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	St. Louis, Missouri
NWS Station Upper Air Meteorology	Lincoln, Illinois
NWS Station for Calculating Surface Characteristics	St. Louis, Missouri
Methodology for Calculating Background SO_2 Concentration	Tier 2: temporally varying using 2013-2015 monitored values from East St. Louis monitor in St. Clair County (AQS ID #: 17-163-0010)
Calculated Background SO_2 Concentration	7.07 – 34.29 $\mu g/m^3$

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

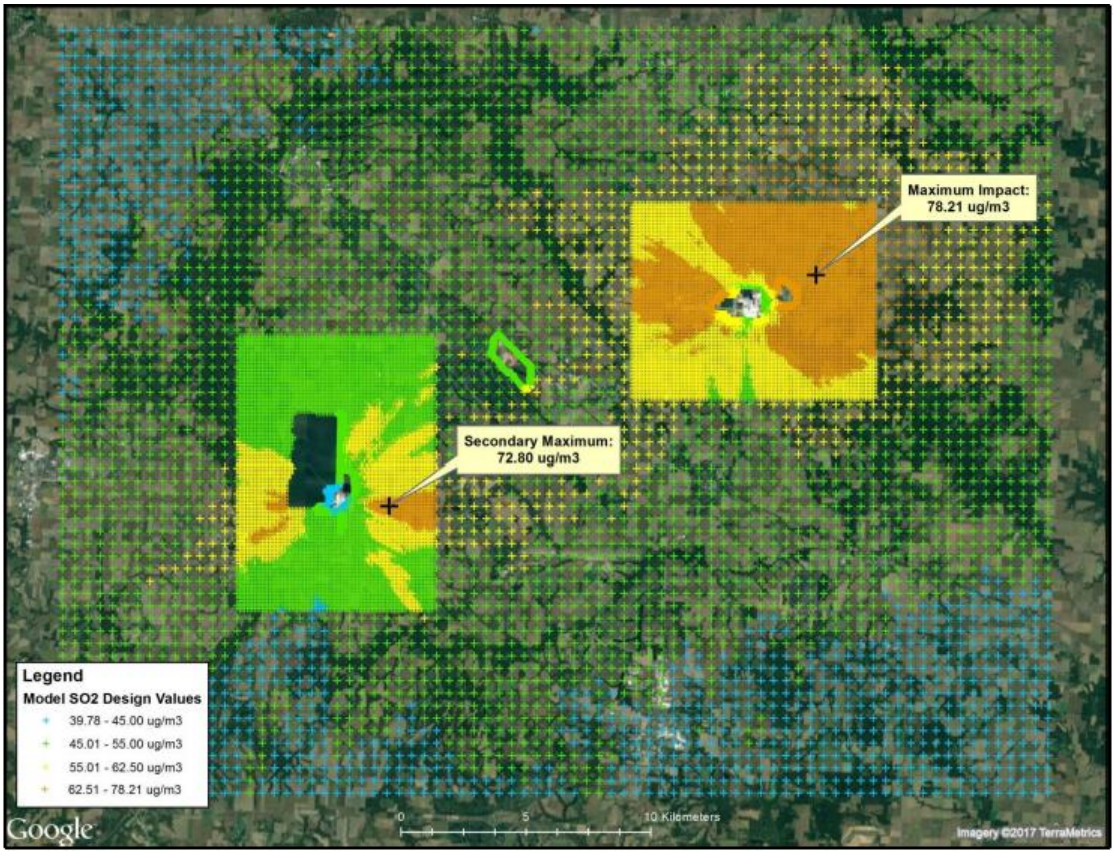
Table 20. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Area Containing Randolph and Washington Counties

		Receptor Location (UTM zone 16)		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	**Data Period**	**UTM Easting**	**UTM Northing**	**Modeled concentration (including background)**	**NAAQS Level**
99th Percentile 1-Hour Average	2013-2015	269200	4241200	78.21	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 78.21 µg/m^3, equivalent to 29.9 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facilities. Figure 31 below was included as part of the state's recommendation, and indicates that the predicted value occurred 2.8 km northeast of PSGC. The state's receptor grid is also shown in the figure.

Figure 31: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Area Containing Randolph and Washington Counties



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

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

Illinois' modeling for the area containing Randolph and Washington Counties generally follows the recommendations in the Modeling TAD, except as discussed in section 7.3.3 regarding model receptor placement. As described previously, despite the potential inconsistency with the Modeling TAD regarding receptor placement, the EPA finds that the removal of the receptors within the fence lines of the modeled sources does not prevent us from being able to use these

technical data and modeling results to fully assess air quality in the modeled area of analysis and therefore make an accurate designation for this area. The 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 Appendix W. Therefore, the EPA determines that the modeling is appropriate for assessing whether this area is meeting the NAAQS.

7.4. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Area Containing Randolph and Washington Counties

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 Area Containing Randolph and Washington Counties

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for the area containing Randolph and Washington Counties. 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 submission, Illinois recommended that the entirety of Randolph, Washington, St. Clair, Monroe, and Perry Counties be designated as attainment based in part on an assessment and characterization of air quality impacts from Baldwin and PSGC, and other nearby sources that may have a potential impact in the area where the 2010 SO_2 NAAQS may be exceeded. County boundaries in Illinois are well established and well known, so that these boundaries provide a good basis for defining the area being designated.

7.6. The EPA's Assessment of the Available Information for the Area Containing Randolph and Washington Counties

Based on Illinois' modeling evaluation of the area containing Randolph and Washington Counties, the EPA agrees with the state's recommendation and intends to designate the area as unclassifiable/attainment because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (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. The EPA finds the state's modeling sufficiently shows that violations of the NAAQS are not occurring in this area and indicates no contribution to any nearby nonattainment areas. The EPA reviewed the modeling parameters and methodology used for this analysis, and concludes that Illinois' modeling was performed sufficiently in accordance with the EPA's Modeling TAD to use to assess whether the area is attaining the standard.

The EPA intends to designate all of Randolph, Washington, St. Clair, Monroe, and Perry Counties as unclassifiable/attainment. Initially, the EPA had some concerns regarding certain

nearby sources in Missouri and how they might affect the air quality in Illinois, particularly Monroe County. Monroe County borders Jefferson County in Missouri, of which a significant portion was designated as nonattainment in the initial round of SO_2 designations on July 25, 2013. On June 23, 2017, the EPA published a proposed rule approving a clean data determination for the Jefferson County nonattainment area (82 FR 28605). This determination was based on complete, quality assured, and certified ambient air monitoring data from 2014-2016, associated dispersion modeling for the 2013-2015 emission years, and supplemental emissions inventory information, that altogether demonstrate that the nonattainment area is not violating the SO_2 NAAQS.

In addition to the Jefferson County nonattainment area, the EPA was also potentially concerned about the emissions from the Ameren Missouri-Meramec Energy Center (Meramec), and its effect on air quality in neighboring Monroe County. Meramec is a coal-fired electric generating facility subject to the DRR, and it is located less than a kilometer away from the Monroe County border. Modeling conducted by Missouri for the Round 3 designations showed a maximum modeled concentration of 165.9 $\mu g/m^3$, or 63.3 ppb, for the area surrounding Meramec, demonstrating that the standard was being attained in the area. Further details regarding the modeling in the Meramec area of analysis can be found in the Missouri Chapter to the TSD.

The clean data determination for the Jefferson County nonattainment area, along with the modeling conducted for the Meramec area of analysis, show that Missouri sources near the Monroe County border do not likely cause or contribute to violations in Monroe County. And likewise, as mentioned previously, Illinois' modeling demonstrates that the modeled area is attaining the standard and does not contribute to violations in nearby areas. Therefore, the EPA finds that there is adequate evidence to agree with Illinois' recommended unclassifiable/attainment designation boundary for this area of analysis.

There is one SO_2 monitor located in St. Clair County and one SO_2 monitor located in Randolph County. The design values at these monitors are below the SO_2 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 areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality. There was no 3rd party modeling submitted for this area.

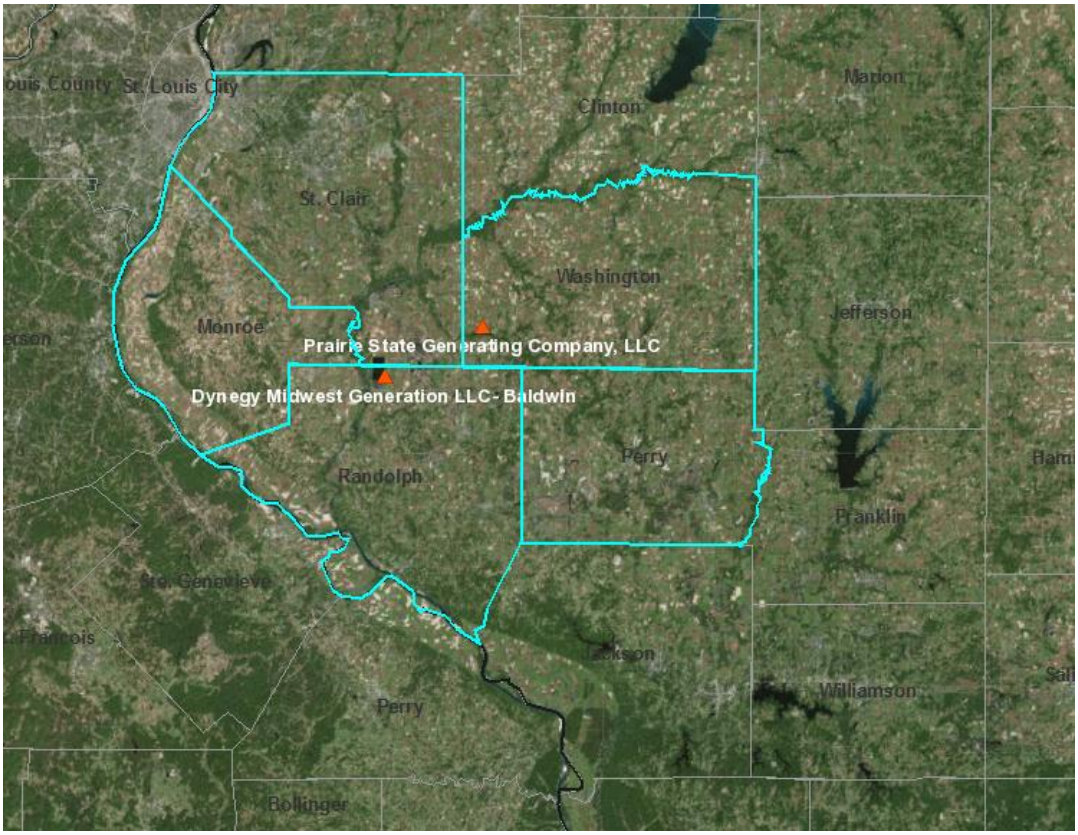
The EPA believes that our intended unclassifiable/attainment areas, as described in the above paragraphs, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area.

7.7. Summary of Our Intended Designation for the Area Containing Randolph and Washington Counties

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate all of Randolph, Washington, St. Clair, Monroe, and Perry Counties as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined the area (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. These counties are shown in Figure 32. The EPA is basing this conclusion predominantly on the modeling analysis provided by Illinois, which demonstrates that the area near Baldwin and PSGC is attaining the SO_2 standard and there is no indication of contribution to existing nonattainment areas.

Figure 32. Boundary of the EPA's Intended Unclassifiable/Attainment Area Containing Randolph, Washington, Monroe, Perry, and St. Clair Counties



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

8. Analysis for the Rest of Illinois

8.1. Introduction

Illinois has not installed and begun operation of a new, approved SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 DRR for any sources of SO_2 emissions in the counties identified in Table 21. Accordingly, the EPA must designate these counties by December 31, 2017. At this time, there are no air quality modeling results available to the EPA for these counties and portions of counties. In addition, there is no air quality monitoring data that indicate any violation of the 1-hour SO_2 NAAQS. The EPA is designating the counties and portions of counties in Table 21 in the state as "unclassifiable/attainment" since these counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

In Rounds 1 and 2, published on August 5, 2013, (78 FR 47191) and July 12, 2016, (81 FR 45039) respectively, the EPA designated five full counties and portions of five additional counties in Illinois. Sections 3 to 7 above address 11 additional full counties and a portion of the area in Madison County not designated in Round 2. Therefore, of the 102 counties in Illinois, a total of 16 whole counties and portions of five additional counties have been addressed either in Rounds 1 or 2, or in Sections 3 to 7 above. One county will be addressed in Round 4. The remaining portions of the five partially addressed counties and all of the other 80 counties are to be addressed in this Section 8.

Table 21 lists the areas that the EPA intends for these reasons to designate as unclassifiable/attainment. This table also 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 unclassifiable or because the EPA has previously designated a portion of the county (in Round 1 or 2). Accordingly, in those counties for which Table 21 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 unclassifiable or the portion of the county that the EPA has already designated.

Table 21. Counties and Partial Counties that the EPA Intends to Designate Unclassifiable/Attainment

County or Partial County (p)	Area to be Addressed
Adams County	Full County
Alexander County	Full County
Bond County	Full County
Boone County	Full County
Brown County	Full County
Calhoun County	Full County
Carroll County	Full County

County or Partial County (p)	Area to be Addressed
Cass County	Full County
Champaign County	Full County
Clark County	Full County
Clay County	Full County
Clinton County	Full County
Coles County	Full County
Cook County (p)	Rest of County
Cumberland County	Full County
Dekalb County	Full County
Dewitt County	Full County
Douglas County	Full County
Dupage County	Full County
Edgar County	Full County
Edwards County	Full County
Effingham County	Full County
Fayette County	Full County
Ford County	Full County
Franklin County	Full County
Fulton County	Full County
Gallatin County	Full County
Greene County	Full County
Grundy County	Full County
Hamilton County	Full County
Hancock County	Full County
Hardin County	Full County
Henderson County	Full County
Henry County	Full County
Iroquois County	Full County
Jackson County	Full County
Jefferson County	Full County
Jersey County	Full County
Jo Daviess County	Full County
Johnson County	Full County
Kane County	Full County
Kankakee County	Full County
Kendall County	Full County
Knox County	Full County
Lasalle County	Full County
Lawrence County	Full County
Lee County	Full County
Livingston County	Full County
Logan County	Full County
Madison County (p)	Rest of County
Marion County	Full County
Marshall County	Full County
Mason County	Full County
Mcdonough County	Full County

County or Partial County (p)	Area to be Addressed
McHenry County	Full County
Mclean County	Full County
Menard County	Full County
Mercer County	Full County
Morgan County	Full County
Moultrie County	Full County
Ogle County	Full County
Peoria County (p)	Rest of County
Piatt County	Full County
Pike County	Full County
Pope County	Full County
Pulaski County	Full County
Richland County	Full County
Rock Island County	Full County
Saline County	Full County
Schuyler County	Full County
Scott County	Full County
Shelby County	Full County
Stark County	Full County
Stephenson County	Full County
Tazewell County (p)	Rest of County
Union County	Full County
Vermilion County	Full County
Wabash County	Full County
Warren County	Full County
Wayne County	Full County
White County	Full County
Whiteside County	Full County
Will County (p)	Rest of County
Winnebago County	Full County
Woodford County	Full County

8.2. Air Quality Monitoring Data for the Rest of Illinois

This Illinois Chapter to the TSD addresses areas in Illinois hat 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 Macon County in Round 4 in conjunction with evaluation of data obtained at the newly established site. Thus, this section 8.2 focuses on monitoring data available for areas being addressed in Round 3 that are not located in the same county or nearby to a DRR source. Illinois's monitoring network includes five such monitors. Table 22 shows the locations of these five monitors and their design values for 2013 to 2015 and for 2014 to 2016.

Table 22. Air Quality Data in the Rest of Illinois

AQS ID	County	City	2013 – 2015 design value (ppb)	2014 – 2016 design value (ppb)
17-019-1001	Champaign	Champaign	14	10
17-031-0076	Cook	Chicago	13	13
17-099-0007	La Salle	Oglesby	9	11
17-143-0024	Peoria	Peoria	31	29
17-185-0001	Wabash	Mt. Carmel	50	46

Design values for these periods at these 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 areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality.

In accordance with approved revisions to its monitoring plan, Illinois installed and began operation of a new monitoring network near a pair of DRR sources in Macon County by January 1, 2017. As authorized under the court-ordered designation schedule, the EPA plans to designate this area (Macon County) using three years (2017-2019) of quality-assured data to be collected from this network by December 31, 2020.

8.3. Jurisdictional Boundaries for the Rest of Illinois

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.

For all areas other than those addressed above or that were designated in Rounds 1 or 2, Illinois recommended a designation of attainment. County and township boundaries in Illinois are well established and well known, so that these boundaries provide a good basis for defining the areas being designated.

8.4. The EPA's Assessment of the Available Information for the Rest of Illinois

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

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

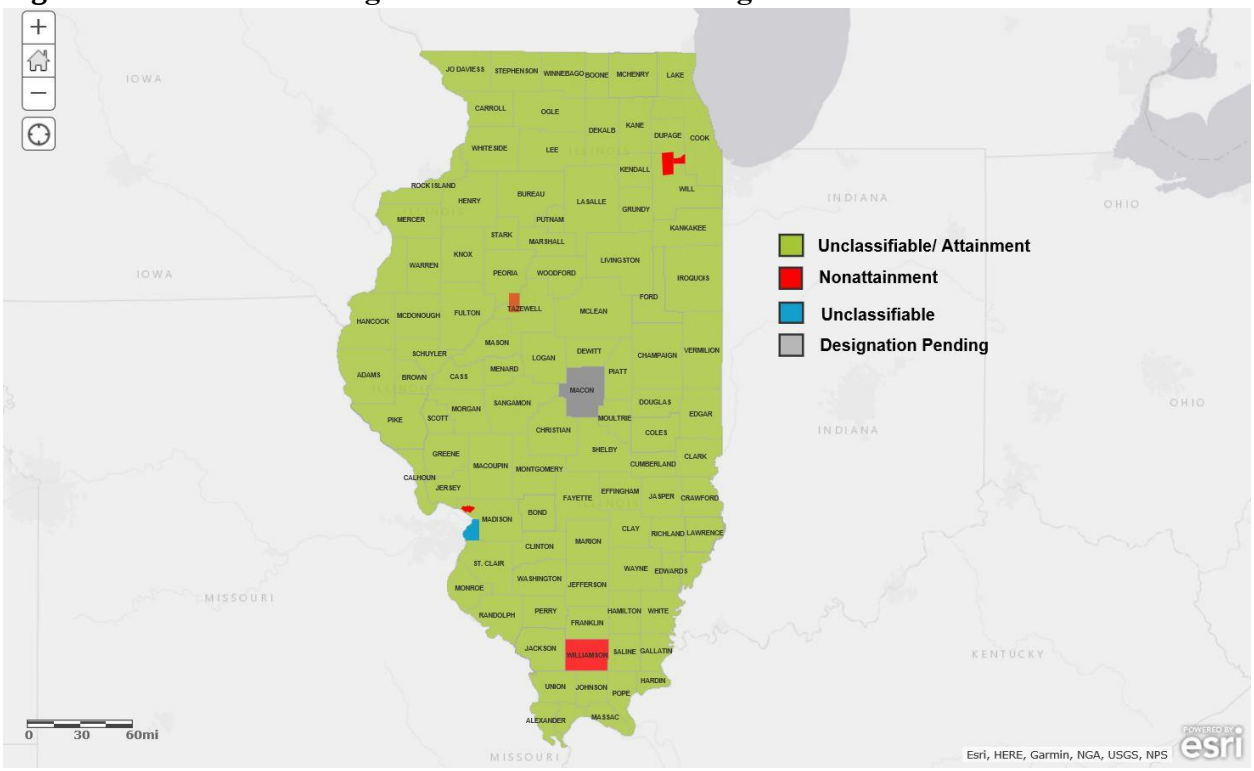
8.5. Summary of Our Intended Designation for the Rest of Illinois

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 Illinois 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.

Table 21 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 21 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. In the case of Madison County, aside from the portions of the county already designated in Round 2 (including a portion designated nonattainment and a portion designated unclassifiable/attainment), the EPA intends to designate the portion of the county described in Section 6 above as unclassifiable, and the EPA intends to designate the remainder of the county as unclassifiable/attainment.

Figure 33 above shows the location of these areas within Illinois.

Figure 33. The EPA's Designations and Intended Designations for Counties in Illinois



At this time, our intended designations for the state only apply to these areas and the other areas presented in this technical support document. The EPA intends to evaluate and designate all remaining undesignated areas in Illinois, i.e., Macon County, by December 31, 2020.