Draft Technical Support Document

Kentucky
Area Designations for the 2010 SO_2 Primary National Ambient Air Quality Standard

Summary

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

The Commonwealth of Kentucky (hereafter referred to as "the Commonwealth") submitted updated recommendations on September 16, 2015, ahead of a July 2, 2016, deadline for the EPA to designate certain areas. This deadline is the first of three deadlines established by the U.S. District Court for the Northern District of California for the EPA to complete area designations for the 2010 SO_2 NAAQS. Table 1 below lists Kentucky's recommendations and identifies the counties or portions of counties in Kentucky that the EPA intends to designate by July 2, 2016, based on an assessment and characterization of air quality through ambient air quality data, air dispersion modeling, other evidence and supporting information, or a combination of the above.

Table 1. Kentucky's Recommended and the EPA's Intended Designations

Area	Kentucky's Recommended Area Definition	Kentucky's Recommended Designation	The EPA's Intended Area Definition	The EPA's Intended Designation
Ohio County, KY	Ohio County in its entirety	Attainment	Same as Commonwealth's Recommendation	Unclassifiable
Pulaski County, KY	Pulaski County in its entirety	Attainment	Same as Commonwealth's Recommendation	Unclassifiable

Background

On June 3, 2010, the EPA revised the primary (health based) SO_2 NAAQS by establishing a new one-hour standard at a level of 75 parts per billion (ppb) which is attained when the three-year average of the 99th percentile of one-hour daily maximum concentrations does not exceed 75 ppb. This NAAQS was published in the Federal Register on June 22, 2010 (75 FR 35520) and is codified at 40 CFR 50.17. The EPA determined this is the level necessary to protect public health with an adequate margin of safety, especially for children, the elderly and those with asthma. These groups are particularly susceptible to the health effects associated with breathing SO_2. The

two prior primary standards of 140 ppb evaluated over 24 hours, and 30 ppb evaluated over an entire year, codified at 40 CFR 50.4, remain applicable.[1] However, the EPA is not currently designating areas on the basis of either of these two primary standards. Similarly, the secondary standard for SO_2, set at 500 ppb evaluated over 3 hours has not been revised, and the EPA is also not currently designating areas on the basis of the secondary standard.

General Approach and Schedule

Section 107(d) of the CAA requires that not later than one year after promulgation of a new or revised NAAQS, state governors must submit their recommendations for designations and boundaries to EPA. Section 107(d) also requires the EPA to provide notification to states no less than 120 days prior to promulgating an initial area designation that is a modification of a state's recommendation. If a state does not submit designation recommendations, the EPA will promulgate the designations that it deems appropriate. If a state or tribe disagrees with the EPA's intended designations, they are given an opportunity within the 120 day period to demonstrate why any proposed modification is inappropriate.

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

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

According to the court-ordered schedule, the EPA must complete the remaining designations by that contains three specific deadlines. By no later than July 2, 2016 (16 months from the court's order), the EPA must designate two groups of areas: (1) areas that have newly monitored violations of the 2010 SO_2 NAAQS and (2) areas that contain any stationary sources that had not been announced as of March 2, 2015 for retirement and that according to the EPA's Air Markets Database emitted in 2012 either: (i) more than 16,000 tons of SO_2 or (ii) more than 2,600 tons of SO_2 with an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). Specifically, a stationary source with a coal-fired unit that as of

[1] 40 CFR 50.4(e) provides that the two prior primary NAAQS will no longer apply to an area one year after its designation under the 2010 NAAQS, except that for areas designated nonattainment under the prior NAAQS as of August 22, 2010, and areas not meeting the requirements of a SIP Call under the prior NAAQS, the prior NAAQS will apply until that area submits and the EPA approves a SIP providing for attainment of the 2010 NAAQS. The two Kentucky areas are not designated nonattainment under the prior NAAQS nor are they areas not meeting the requirements of a SIP Call under the prior NAAQS.

January 1, 2010 had a capacity of over 5 megawatts and otherwise meets the emissions criteria, is excluded from the July 2, 2016 deadline if it had announced through a company public announcement, public utilities commission filing, consent decree, public legal settlement, final state or federal permit filing, or other similar means of communication, by March 2, 2015, that it will cease burning coal at that unit.

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

Updated designations guidance was issued by the EPA through a March 20, 2015 memorandum from Stephen D. Page, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Air Division Directors, U.S. EPA Regions 1-10. This memorandum supersedes earlier designation guidance for the 2010 SO_2 NAAQS, issued on March 24, 2011, and it identifies factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The guidance also contains the factors the EPA intends to evaluate in determining the boundaries for all remaining areas in the country, consistent with the court's order and schedule. These factors include: 1) Air quality characterization via ambient monitoring or dispersion modeling results; 2) Emissions-related data; 3) Meteorology; 4) Geography and topography; and 5) Jurisdictional boundaries. This guidance was supplemented by two technical assistance documents intended to assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling or ambient air quality monitoring for sources that emit SO_2. Notably, the EPA released its most recent versions of documents titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and "SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document" (Monitoring TAD) in December 2013.

Based on ambient air quality data collected between 2012 and 2014, no monitored violations of the 2010 SO_2 NAAQS have been recorded in any undesignated part of the state.[2] However, there are two sources in the state meeting the emissions criteria of the consent decree for which the EPA must complete designations by July 2, 2016. In this draft technical support document, the EPA discusses its review and technical analysis of Kentucky's updated recommendations for the

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

areas that we must designate. The EPA also discusses any intended modifications from the state's recommendation based on all available data before us.

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

1) 2010 SO_2 NAAQS – The primary NAAQS for SO_2 promulgated in 2010. This NAAQS is 75 ppb, based on the three year average of the 99th percentile of the annual distribution of daily maximum one-hour average concentrations. See 40 CFR 50.17.
2) Design Value - a statistic computed according to the data handling procedures of the NAAQS (in 40 CFR part 50 Appendix T) that, by comparison to the level of the NAAQS, indicates whether the area is violating the NAAQS.
3) Designated nonattainment area – an area which the EPA has determined has violated the 2010 SO_2 NAAQS or contributed to a violation in a nearby area. A nonattainment designation reflects considerations of state recommendations and all of the information discussed in this document. The EPA's decision is based on all available information including the most recent 3 years of air quality monitoring data, available modeling analysis, and any other relevant information.
4) Designated unclassifiable area – an area which the EPA cannot determine based on all available information whether or not it meets the 2010 SO_2 NAAQS.
5) Designated unclassifiable/attainment area – an area which the EPA has determined to have sufficient evidence to find either is attaining or is likely to be attaining the NAAQS. The EPA's decision is based on all available information including the most recent 3 years of air quality monitoring data, available modeling analysis, and any other relevant information.
6) Modeled violation – a violation based on air dispersion modeling.
7) Recommended attainment area – an area a state or tribe has recommended that the EPA designate as attainment.
8) Recommended nonattainment area – an area a state or tribe has recommended that the EPA designate as nonattainment.
9) Recommended unclassifiable area – an area a state or tribe has recommended that the EPA designate as unclassifiable.
10) Recommended unclassifiable/attainment area – an area a state or tribe has recommended that the EPA designate as unclassifiable/attainment.
11) Violating monitor – an ambient air monitor meeting all methods, quality assurance and siting criteria and requirements whose valid design value exceeds 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.

Technical Analysis for the Plant D.B. Wilson – Ohio County Area

Introduction

The Ohio County Area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 lbs SO_2/mmBTU. As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the D.B. Wilson Power Plant (Plant Wilson) emitted 7,387 tons of SO_2, and had an emissions rate of 0.45 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 court-ordered schedule, the EPA must designate the area surrounding the facility by July 2, 2016.

In its submission, the Commonwealth of Kentucky (hereafter referred to as "the Commonwealth") recommended that the area surrounding Plant Wilson, specifically the entirety of Ohio County, be designated as attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. This assessment and characterization were performed using air dispersion modeling software, i.e., AERMOD, analyzing allowable emissions. The assessment and characterization were originally conducted by Trinity Consultants and prepared for the Big Rivers Electric Corporation (BREC). The Commonwealth then reviewed and submitted the information to the EPA.[3]

After careful review of the Commonwealth's assessment, supporting documentation, and all available data, the EPA intends to designate Ohio County in its entirety as unclassifiable[4] because the EPA does not have necessary information at this time to determine the attainment status of the Ohio County Area. Specifically, the future allowable emission limit for Plant Wilson used to model attainment for the Ohio County Area has not been established as federally-enforceable[5] by the Commonwealth. In order for the EPA to consider the future allowable emission limit of 0.85 lbs SO_2/mmBTU for Plant Wilson for the designations to be finalized no later than July 2, 2016, the Commonwealth will have to ensure that these limits are federally-enforceable (and the EPA has confirmed such) by the time this round of designations is complete. Regarding the Plant Wilson future emission limit, if a limit with an averaging time

[3] Throughout this document the Commonwealth will be referred to as having assessed air quality in the area because the Commonwealth agreed with the BREC's air quality assessment and characterization of the area of analysis, officially submitting the report to the EPA to support their designation recommendation.

[4] Pursuant to the EPA's April 23, 2014 memorandum entitled "Guidance for the 1-Hour SO_2 Nonattainment Area SIP Submissions."

[5] Consistent with past interpretations of legal requirements, control measures, emission limits and other curtailments need to be installed, operational and federally-enforceable to be considered when informing final designation decisions. The mechanisms for establishing federally enforceable emission limits, control measures, or curtailments for the purpose of informing SO_2 designations include: a source-specific state implementation plan (SIP)-approved by the EPA, a minor new source review permit, a title v permit or a consent decree established through Federal civil litigation.

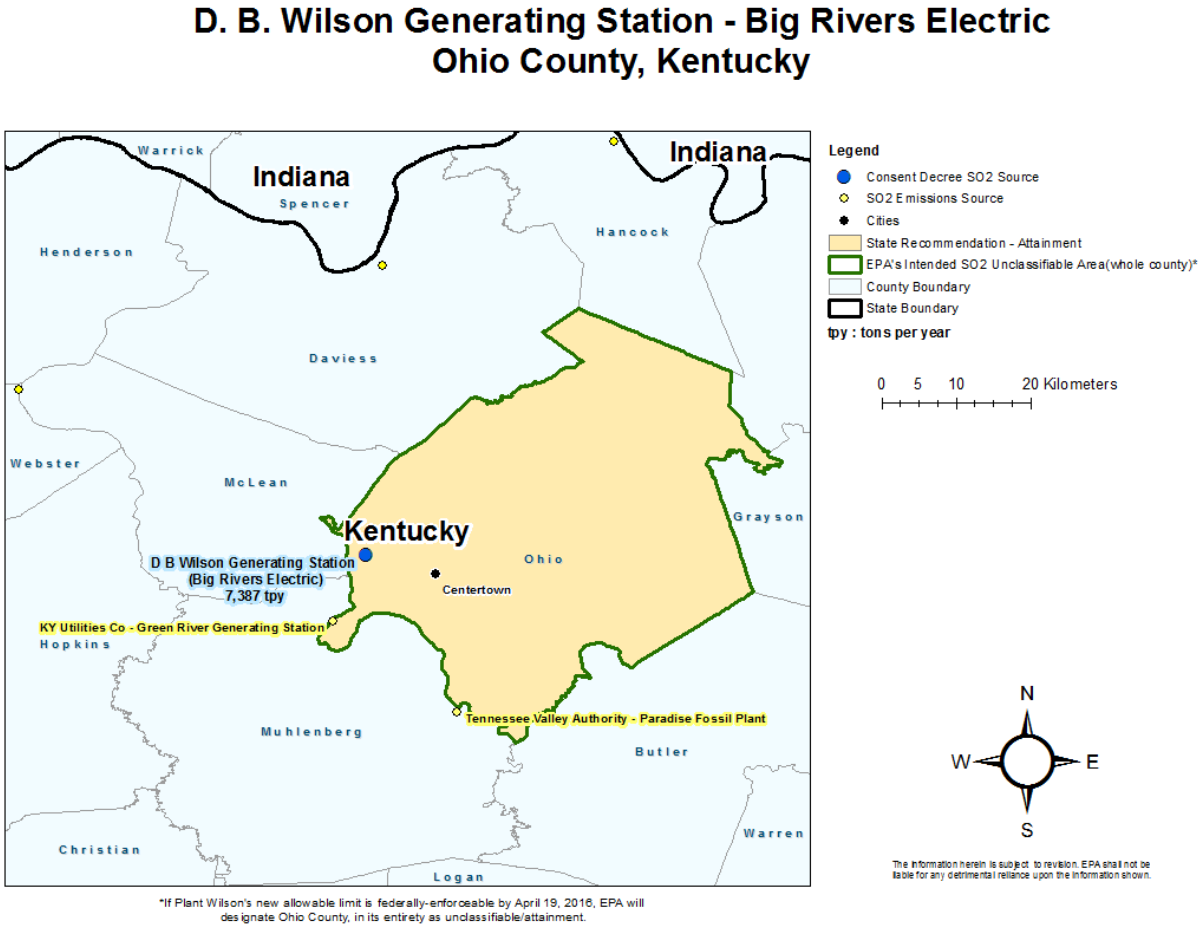
longer than 1-hour is desired, supporting technical information will also need to include explanation, of whether the longer term average limit, that the EPA determines is comparatively stringent to a 1-hour limit at the critical emission value, ensures attainment of the SO_2 NAAQS.

Also, the EPA needs additional information regarding the operating status of Units 1 and 2 at the Tennessee Valley Authority's (TVA's) - Paradise Fossil Plant in Muhlenberg County to determine if Units 1 and 2 at the source are shut down.[6] If the TVA - Paradise Fossil Plant is not shutdown, additional explanation would be necessary as to why these emissions were not included in the modeling for this area. If the Commonwealth cannot provide supporting documentation to confirm the permanent retirement of Units 1 and 2 at the TVA - Paradise Fossil Plant, including actual historical emissions for these units in the modeling is an option for complete characterization in relation to the proposed Ohio County designation from Kentucky.

Plant Wilson is located in western Kentucky in the western portion of Ohio County. As seen in Figure 1 below, the facility is located approximately 8 kilometer (km) northwest of the center of Centertown, KY. Also included in the figure are nearby emitters of SO_2, the Commonwealth's recommended area for the attainment designation, and the EPA's intended unclassifiable/attainment designation for the area.

[6] Emissions for the TVA: Paradise Fossil Plant are important to the characterization of Ohio County because the source, while in Muhlenberg County, is immediately across the border from Ohio County. The Commonwealth included consideration of emissions from Unit 3 at the TVA: Paradise Fossil Plant in support of their recommendation of attainment for Ohio County.

Figure 1. The EPA's intended designation for Ohio County, Kentucky



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

Detailed Assessment

Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding Plant Wilson. The facility is located in Ohio County, and the Commonwealth included monitoring data from the closest monitors: Baskett Fire House (21-101-0014), Evansville-Buena Vista in Indiana (18-163-0021), Mammoth Cave National Park (21-061-0501), and Owensboro Primary (21-059-0005), to the facility in its recommendation. The closest monitor is Owensboro Primary, located at 716 Pleasant Valley Rd, Owensboro, KY 42303 (37.78077, -87.0753) in Daviess County, and is 35 km away from Plant Wilson. Data collected at this monitor is considered indicative of population exposure but is not representative of the expected background concentrations in the

area surrounding the Plant Wilson. The Baskett Fire House monitor, located at Baskett Fire Department, 7492 Dr. Hodge Rd, Henderson, KY 42420 (37.8712, -87.46375) is located within 25 km to several sources to the northwest of Plant Wilson, and the predominant wind direction indicates that this monitor is reasonably expected to capture the regional effects of these sources. Table 2 below summarizes the local monitors and design values from recent years in within 100 km of Plant Wilson.

Table 2: Historical Ambient Air Quality Data for Nearby Monitors

Monitor	AQS ID	County	2010–2012 Design Value ($\mu g/m^3$)	2011–2013 Design Value ($\mu g/m^3$)	2012–2014 Design Value ($\mu g/m^3$)
Baskett Fire House	21-101-0014	Henderson	65.5	71.5	71.5
Evansville-Buena Vista	18-163-0021	Vanderburgh	47.1	47.1	57.6
Mammoth Cave	21-061-0501	Edmonson	31.4	26.2	26.2
Owensboro Primary	21-059-005	Daviess	125.7	107.42	112.6

Model Selection and Modeling Components

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

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

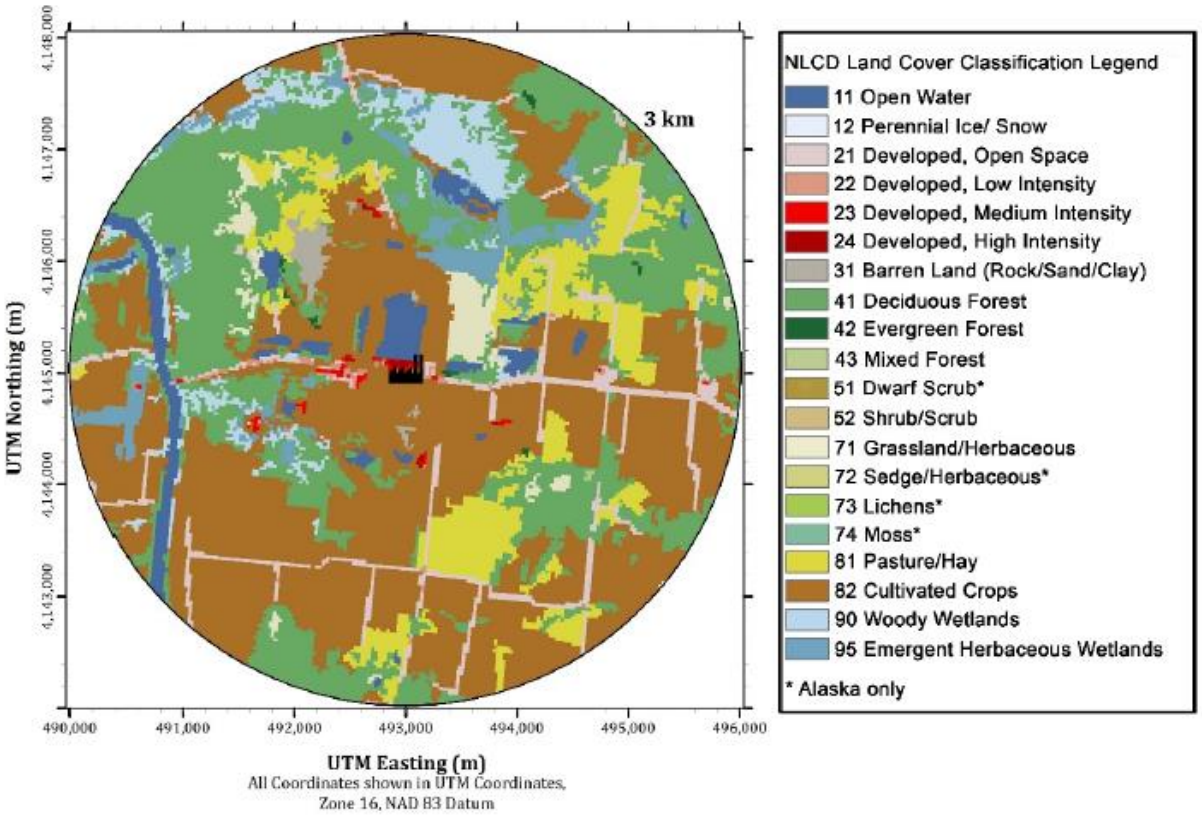
The Commonwealth used AERMOD version 15181, and, as appropriate, a discussion of the individual components will be referenced in the corresponding discussion.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling

analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, the Commonwealth determined that it was most appropriate to run the model in rural mode. The Commonwealth used the Auer's land use methodology to determine the classification. Land use within a 3 km radius of Plant Wilson was examined and quantified. Based on the visual inspection of the land use types, the Commonwealth determined that the area is predominantly rural by a margin of 99.2 percent and therefore determined that is was most appropriate to run the model with rural dispersion coefficients. See Figure 2 below for a depiction of land-use around Plant Wilson.

Figure 2. Distribution of Land Use within 3-km of Wilson Station - Source: "Air Dispersion Modeling Report Wilson Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the Big Rivers Electric Corporation, August 25, 2015.



Modeling Parameter: Area of Analysis (Receptor Grid)

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

County Area, major sources of SO_2 emissions within a 20 km range were considered and larger sources within a 20-50 km range that were believed to potentially contribute significant concentrations to the area of analysis. The Commonwealth determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. Sources within these ranges include: Century Aluminum of Kentucky, LLC (Hancock County), Reid/Henderson Station II Generating Station and BREC Landfill[7] (Webster County), Owensboro Municipal Utilities - Elmer Smith Station (Daviess County), (TVA-Paradise Station, and Green River Generating Station-Kentucky Utilities Company (Muhlenberg County).

TVA-Paradise Fossil Plant is approximately 22 km southeast of Plant Wilson, and had SO_2 emissions of 19654.55 tpy in 2014[8]. Units 1 and 2 at the facility are scheduled to shut down by June 2017, according to an annual report developed by the Energy Information Administration (EIA)[9] which legally requires direct reporting via survey for all energy generating units at or greater than 1 megawatt capacity. The TVA website also projects a 2017 date for the retirement of Units 1 and 2.[10] The modeling report prepared for the Commonwealth presents inconsistent information, stating that a public announcement indicating TVA-Paradise Fossil Plant Units 1 and 2 are slated for retirement by April 2016. The Commonwealth decided not to evaluate actual emissions from TVA-Paradise Fossil Plant Units 1 and 2 because of their scheduled retirement. In order for the shutdown to be considered for the designations which must be finalized by July 2, 2016, the EPA will need confirmation from the Commonwealth that this shutdown is in effect prior to final designations.[11]

Because Unit 3 at TVA-Paradise Fossil Plant is not scheduled for shut down, its hourly 2012-2014 continuous emissions monitoring systems (CEMS) data from the EPA Air Markets Program Data were considered in the modeling analysis for Plant Wilson. However, the unit's temperature and gas exit velocity were not available from this database and were therefore set equal to data available in Kentucky's emissions data archive.

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[7] Comprised of Reid/Henderson Generating Station. The Big Rivers Electric Corporation landfill is located at Reid/Henderson Station II just south of the generating plant and is not a separate source.

[8] All 2014 emissions data was accessed via the Emissions Inventory System (EIS) gateway, in which states report emissions pursuant to 40 CFR Part 51, Subpart A. The EIS gateway can be accessed via: http://www3.epa.gov/ttnchie1/eis/gateway/.

[9] U.S. Energy Information Administration, "Electric Power Monthly with Data for November 2015," January 2016. See http://www.eia.gov/electricity/monthly/pdf/epm.pdf.

[10] See, e.g., https://www.tva.com/Energy/Our-Power-System/Fossil-Fuel-Generation/Paradise-Fossil-Plant

[11] The EPA is required to characterize the current air quality around Plant Wilson by July 2, 2016, according to the terms of the court ordered consent decree. Therefore, unless the Commonwealth can provide documentation that Units 1 and 2 are permanently retired by that time to the EPA in advance of the promulgation of final designations, the EPA cannot consider the shutdown emissions and instead actual emissions for these units from 2012-2014 should be accounted for in any modeling to characterize the air quality around the Plant Wilson area of analysis.

All units at Green River Generating Station have been retired as of October 2015.[12].The remaining sources listed above are at least 35 km or more from Plant Wilson which is distant enough that their impacts would be significantly reduced in terms of impacts overlapping with those of Plant Wilson. The modeling analysis performed and submitted by the Commonwealth included only future allowable emissions from Plant Wilson and actual emissions from Unit 3 of TVA-Paradise Fossil Plant.

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

- 50-meter intervals along the fence line
- 100-meter spaced receptors extending to 3 km from the center of the property and beyond the fence line
- 250-meter spaced receptors extending from 3 km to 5 km
- 500-meter spaced receptors extending from 5 km to 10 km
- 1,000-meter spaced receptors extending from 10 km to 20 km
- 2,000-meter spaced receptors extending from 20 km to 50 km

The receptor network contained 6,922 receptors, and the network covered a large area spanning 50 km in each direction surrounding Plant Wilson, stretching from the southern edge of Indiana to the northern edge of Tennessee.

Figures 3 through 5, included in the Commonwealth's recommendation, show the Commonwealth's chosen area of analysis surrounding Plant Wilson, as well as receptor grid for the area of analysis. Consistent with the Modeling TAD, receptors for the purposes of this designation effort were placed only in areas where it would also be feasible to place a monitor and record ambient air impacts. The impacts of the area's geography and topography will be discussed later within this document.

[12] The Commonwealth's modeling report indicated that remaining Units 3 and 4 at Green River Generating station were expected to shutdown by April 2016 (based on http://www.coalage.com/news/latest/4152-green-river-coal-plant-will-remain-in-operation-until-april-2016.html#.VckdfflVhBc). However, more recent reports (https://lge-ku.com/our-company/community/neighbor-neighbor/green-river-generating-station) indicate remaining Units 3 and 4 retirement date was September 30, 2015 and the EIA January 2016 Electric Power Monthly report (http://www.eia.gov/electricity/monthly/pdf/epm.pdf) tracked Units 3 and 4 as permanently retired effective October 2015. Furthermore, no emissions were reported to the EPA Air Markets Database beginning in October 2015 for any federal programs for which Units 3 and 4 would have been subject.

Figure 3: Ohio County Area of Analysis Source: "Air Dispersion Modeling Report Wilson Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the Big Rivers Electric Corporation, August 25, 2015.

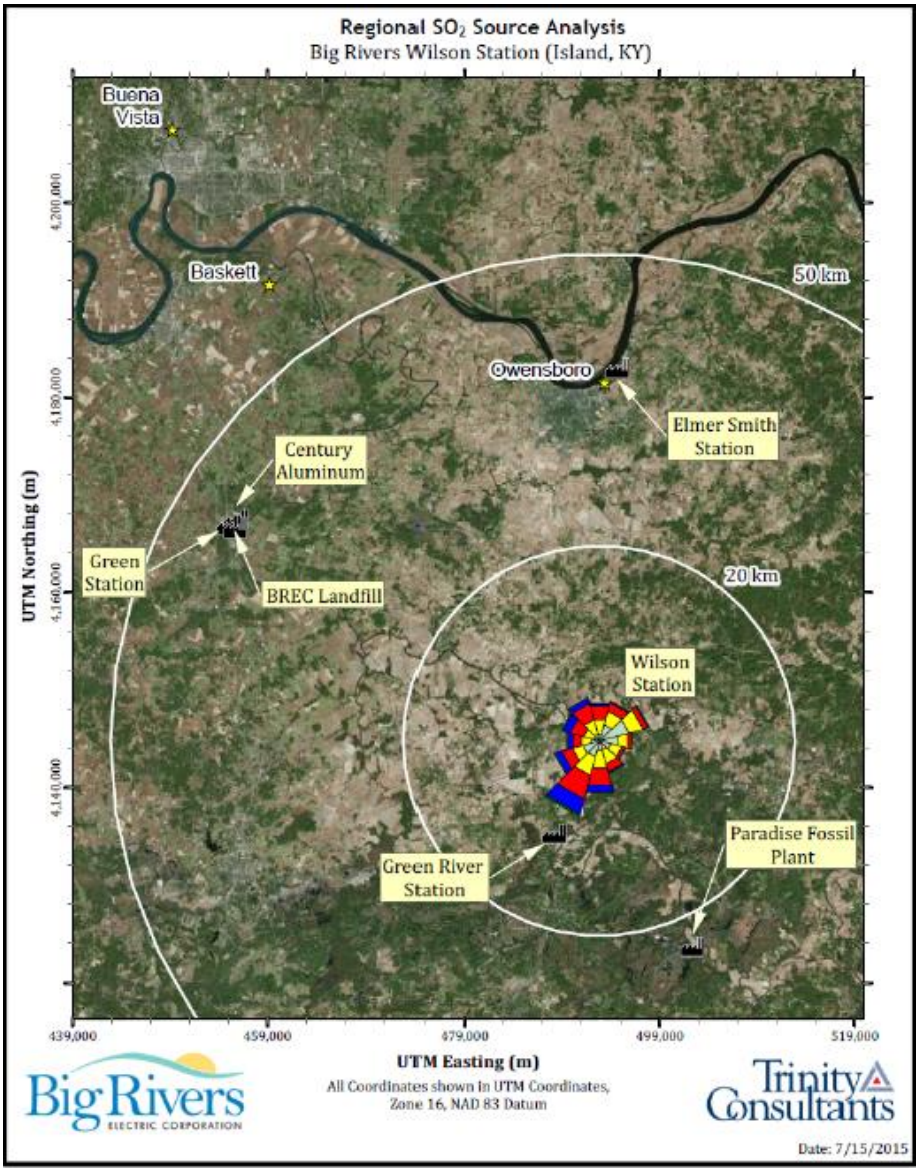


Figure 4: Innermost Portion of Modeling Receptor Grid for the Ohio County Area of Analysis - Source: "Air Dispersion Modeling Report Wilson Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the Big Rivers Electric Corporation, August 25, 2015.

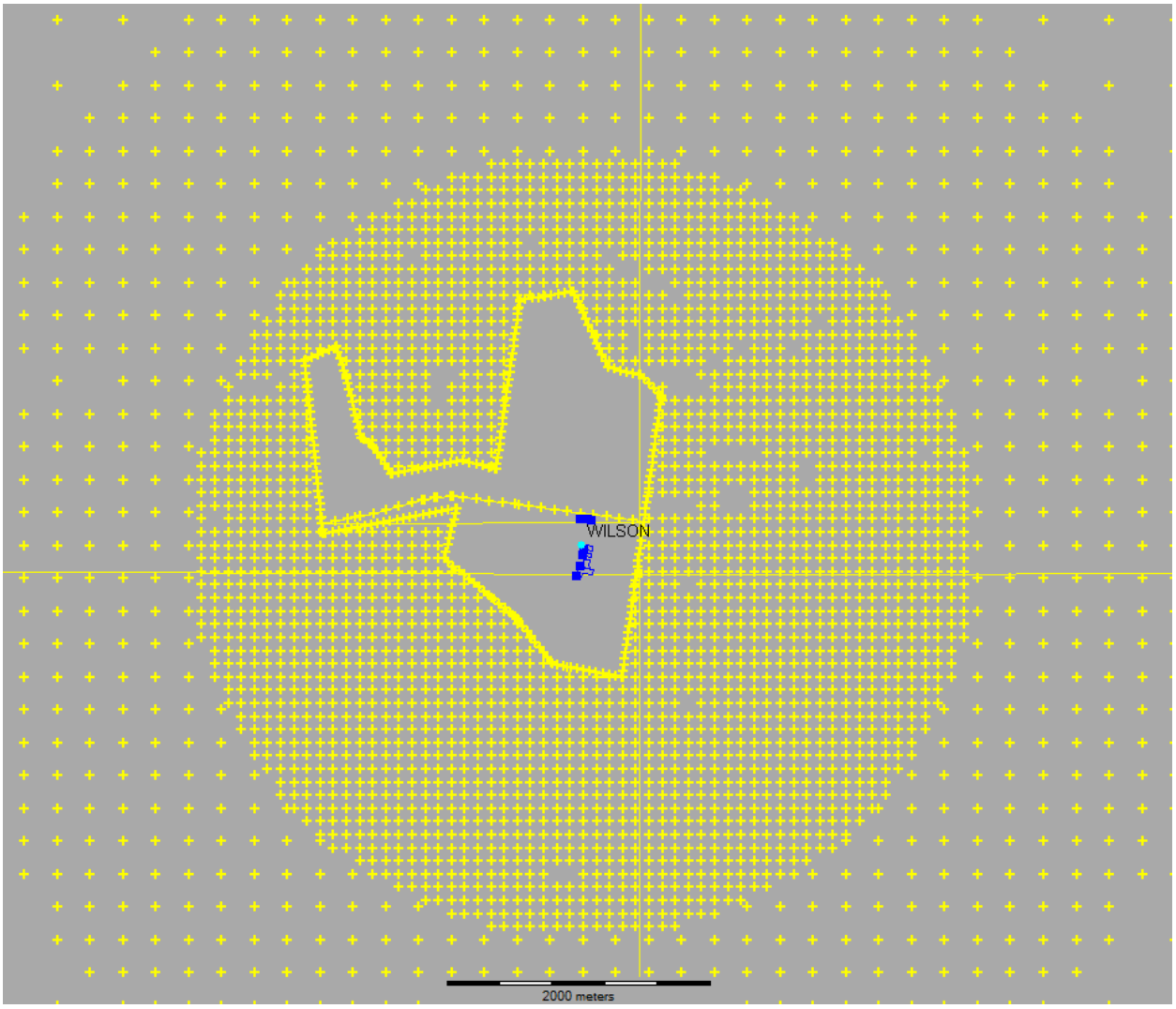
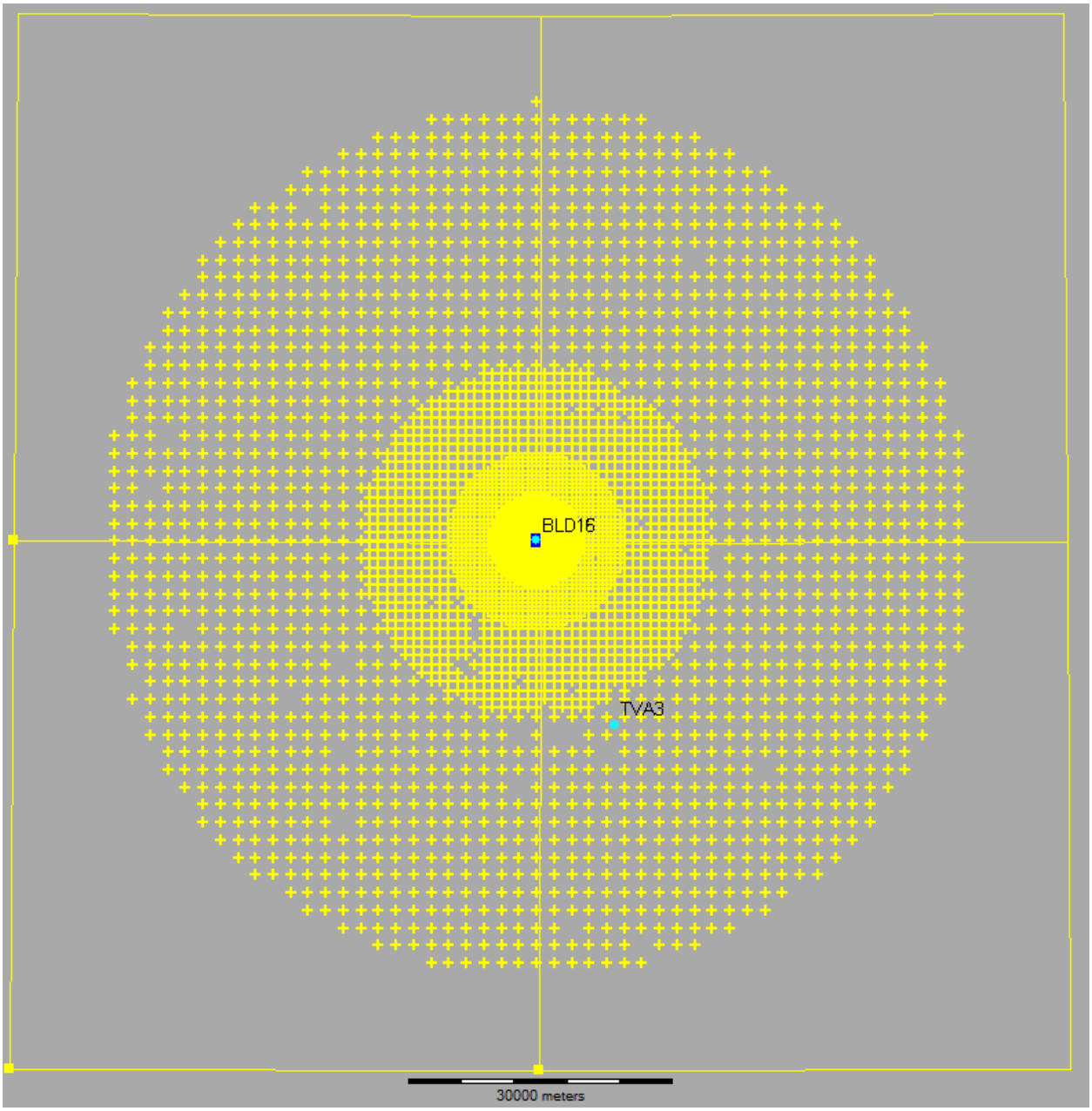


Figure 5: Overall Modeling Receptor Grid for Wilson Air Dispersion Modeling Report Wilson Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the Big Rivers Electric Corporation, August 25, 2015.



Modeling Parameter: Source Characterization

The Commonwealth characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the Commonwealth followed the EPA's good engineering practices (GEP) policy in conjunction with actual emissions for TVA-Paradise Fossil Plant Unit 3, and future allowable emissions limits for Plant Wilson. The Commonwealth 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 BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

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

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

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

As previously noted, the Commonwealth included Plant Wilson and one other emitter of SO_2, that is expected to continue operating, i.e., Unit 3 at TVA-Paradise Fossil Plant, within 20-50 km in the area of analysis. The Commonwealth considered major sources of SO_2 emissions within a 20 km range and larger sources within a 20-50 km range that were believed to potentially contribute significant concentrations to the area of analysis. The Commonwealth selected this distance and facilities because it believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the sources which might contribute to those concentrations. Plant Wilson is the only major SO_2 emitting source in Ohio County over 100 tpy. Sources the Commonwealth identified within the 20-50 km range other than TVA-Paradise Fossil Plant included Century Aluminum of Kentucky, Reid/Henderson Station II Generating Station and BREC Landfill, Elmer Smith Station and Green River Station.

TVA-Paradise Fossil Plant in Muhlenberg County is located approximately 22 km southeast of Plant Wilson, and had SO_2 emissions of 1,9654.55 tpy in 2014. Units 1 and 2 at the facility are

scheduled to shut down by June 2017, according to report by the EIA and information from the TVA website. However, this information is not consistent with the data for Units 1 and 2 provided in the modeling report which indicates the units are expected to retire by April 2016. Because of the anticipated retirement, the Commonwealth did not evaluate actual emissions from TVA-Paradise Fossil Plant Units 1 and 2 nor are the source's 2012-2014 emissions accounted for the in the background concentration selected for the area. Therefore, unless the Commonwealth can provide documentation to the EPA in advance of the promulgation of final designations scheduled for July 2, 2016, that Units 1 and 2 will permanently retire, the EPA may not be able to consider these shutdown and believes that actual emissions for these units from 2012-2014 should be accounted for in any modeling to characterize the air quality around Plant Wilson for the Ohio County Area. The EPA is required to characterize the current air quality around Plant Wilson by July 2, 2016, according to the terms of the court ordered consent decree. Therefore because of the uncertainty of the timing of the permanent shutdown of Units 1 and 2 and the fact that 2012-2014 actual historic emissions were not considered in the modeling analysis for Plant Wilson, the EPA does not have sufficient information to accurately evaluate the source's impact on the Ohio County Area, and thus intends to designate this area.

The EPA notes that the Green River Generating Station also in Muhlenberg County is located approximately 10 km from Plant Wilson and less than 0.5 km from the Ohio County border. The source reported 21976.19 tons of SO_2 in 2014 but according to reports from EIA, the last remaining Units 3 and 4 were permanently retired in October 2015[13] resulting in zero potential to emit. Green River Station was not explicitly included in the modeling analysis for Plant Wilson due to permanent shutdown and zero potential to emit SO_2 emissions. However, the source was considered in the background concentrations accounting for impacts from nearby sources including historic actual emissions. Considering the source's zero potential to emit and the cumulative impacts captured in the background concentrations, the EPA does not have reason to believe that emissions from this now non-operational facility are causing or contributing to a violation of the SO_2 NAAQS in the Ohio County Area.

Other SO_2 emitters the Commonwealth assessed within the 20-50 km range that reported SO_2 emissions over 100 tpy included: Century Aluminum of Kentucky, LLC (Hancock County), Elmer Smith Station (Daviess County), Reid/Henderson Station II Generating Station and BREC Landfill (Webster County). These sources were not explicitly included in the modeling analysis because they are all located 35 km or greater from Plant Wilson (as well as Ohio County Area) which the Commonwealth determined to be far enough that impacts from the facility relative to Plant Wilson. Therefore, the Commonwealth assessed that these sources would not potentially contribute significant concentrations to the area of analysis.

The EPA notes that the BREC's sources, Green Station (Webster County) and Coleman Station (Hancock County) and Owensboro Grain Company (Daviess) also reported 2014 emissions over 100 tpy year. But similar to those sources considered by the Commonwealth, these are also

[13] No emissions were reported to the EPA Air Markets Database beginning in October 2015 for any federal programs for which Green River Generating Station Units 3 and 4 would have been subject. Also, EIA's US Energy Information Administration "Electric Power Monthly" annual report for January 2016, tracked Units 3 and 4 as permanently retired as of October 2015.

located over 35 km away from Plant Wilson and Ohio County line. Based on the distance from Plant Wilson and Ohio County border (>35 km), the EPA has reason to believe that these sources would not cause significant concentration gradients within the area of analysis or Ohio County. The EPA notes that other sources in counties within the 20-50 km range cumulatively emitted less than 100 tpy of SO_2 emissions according to 2014 actual emissions.

For this area of analysis, the Commonwealth opted to use a hybrid approach, where emissions from certain facilities are expressed as actual emissions, and those from other facilities are expressed as PTE rates. For the following facility in the area of analysis, the Commonwealth included annual actual SO_2 emissions between 2012 and 2014. This information is summarized below.

Table 3: Actual SO_2 Emissions Between 2012 – 2014 from Facilities in the Ohio County, Kentucky Area of Analysis

	SO_2 Emissions (tons per year (tpy))		
Facility Name	2012	2013	2014
TVA: Paradise Fossil Plant Unit 3	4,400	2,700	5,000

For Unit 3 at TVA- Paradise Station the Commonwealth used actual emissions from the most recent 3-year data set, i.e., 2012 – 2014. These emissions data were obtained from EPA's Air Markets Program Data. Temperature and gas exit velocity were not available and were set equal to that in the Kentucky Department of Air Quality's archive data (CEMS).

For the following facility in the area of analysis, the Commonwealth has chosen to model the facility using a future federally enforceable PTE limit for SO_2. The facility in the Commonwealth's area of analysis and its associated PTE rate are summarized below.

Table 4: SO_2 Emissions based on PTE from Facilities in the Ohio County Area of Analysis

Facility Name	SO_2 Emissions (tpy, based on PTE)
D.B Wilson Power Station	TPY value not provided by the Commonwealth, future limit is 0.853 lbs SO_2/mmBTU

The PTE limit of 0.853 lbs SO_2/mmBTU for Plant Wilson was proposed by BREC and modeled to show attainment for the 1-hour SO_2 NAAQS.

Modeling Parameter: Meteorology and Surface Characteristics

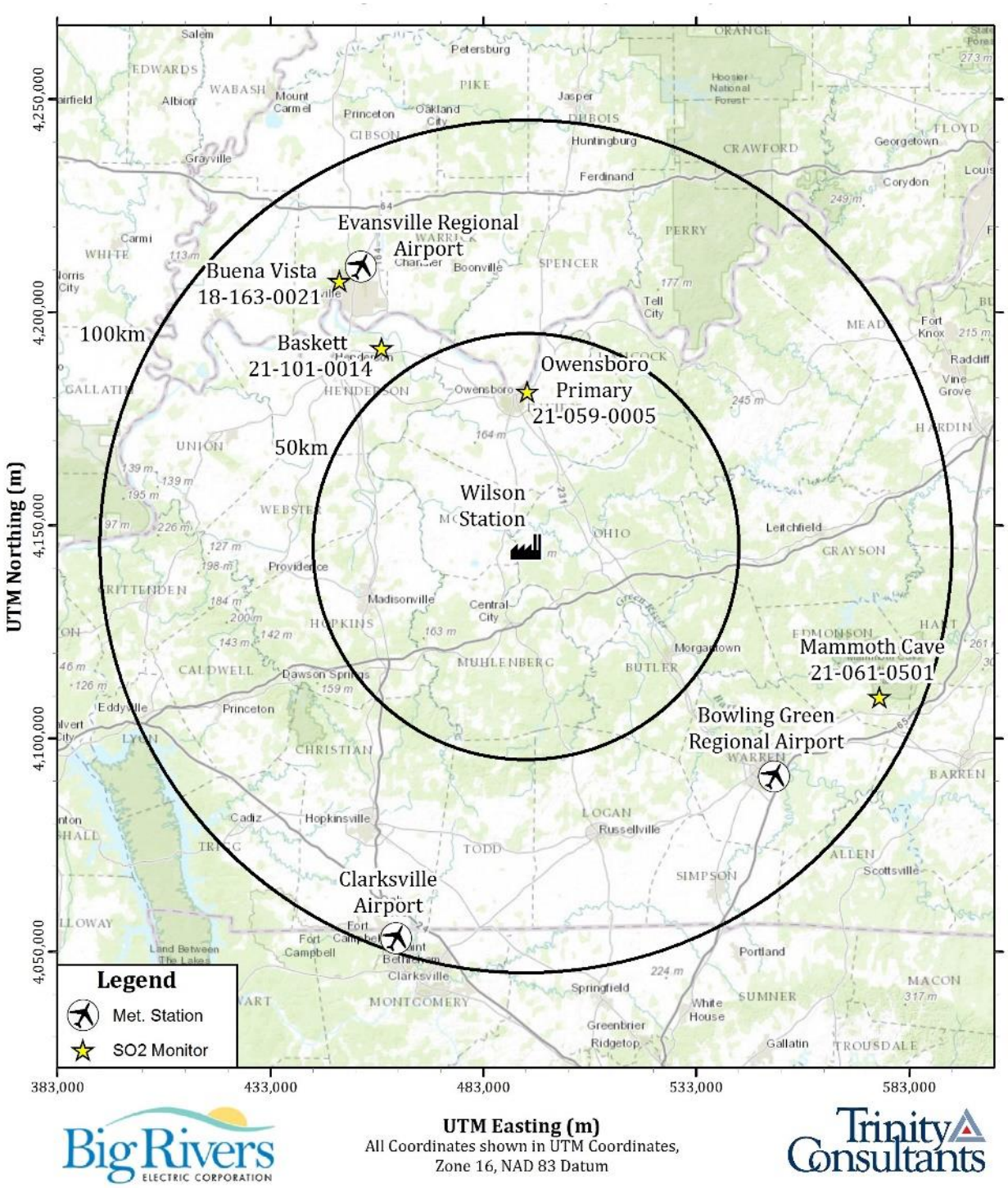
The most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. As noted in the Modeling TAD, the selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

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

For the Ohio County Area of analysis, surface meteorology from the U.S. National Climatic Data Center (NCDC) for the Evansville Regional Airport, 76.5 km to the northwest, and coincident upper air observations from the nearest U.S. NWS radiosonde equipped station, the Nashville International Airport, 151.7 km to the southeast were selected as best representative of meteorological conditions within the area of analysis.

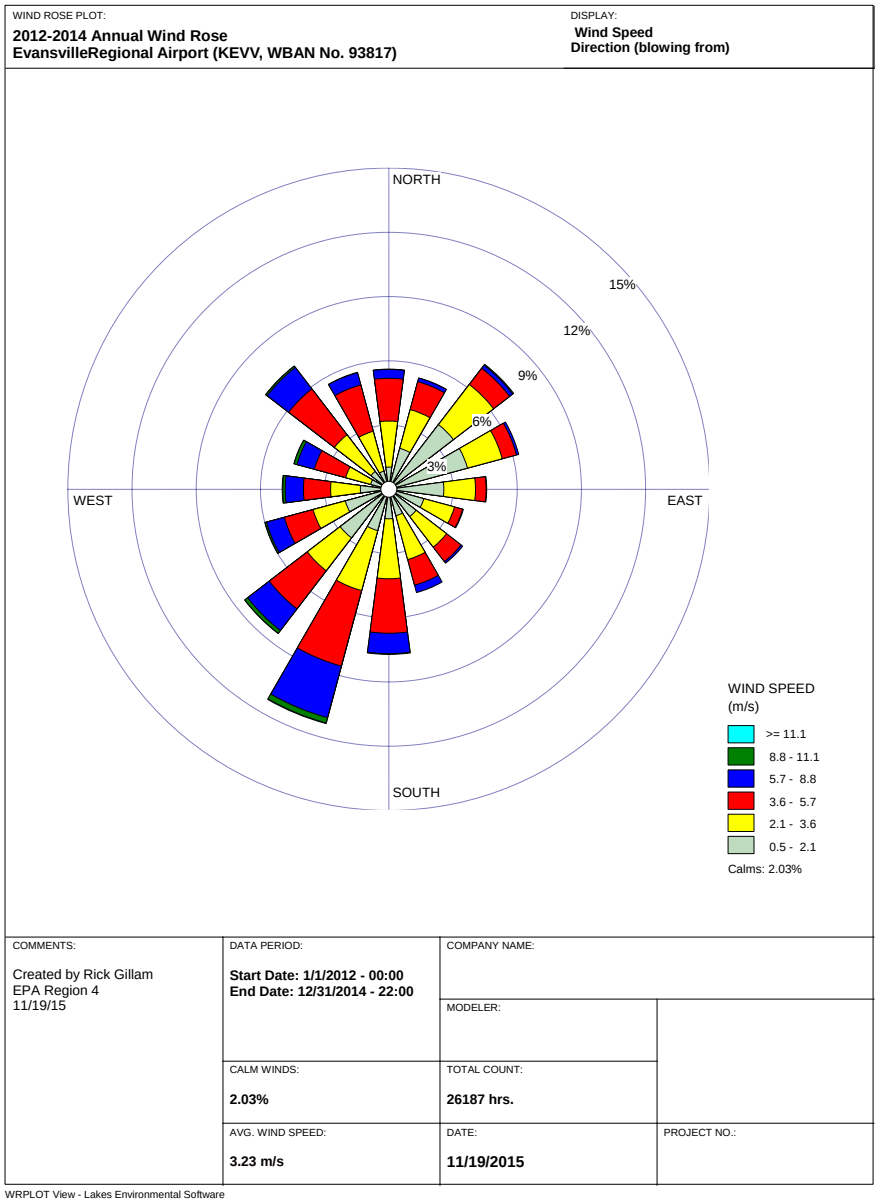
The Commonwealth used AERSURFACE version 13016 using data from the Evansville Regional Airport in Evansville, Indiana (located at 38.044, -87.521) to estimate the surface characteristics of the area of analysis. The Commonwealth estimated values for 12 spatial sectors out to 1 km at a seasonal temporal resolution for dry conditions. The Commonwealth also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo"). In the figure below, which was included in the Commonwealth's recommendation, the location of the Evansville Regional Airport is shown relative to the Plant Wilson area of analysis.

Figure 6: Plant Wilson Area of Analysis and the Evansville Regional Airport Source: "Air Dispersion Modeling Report Wilson Station SO_2 Designations Analysis Revision1" prepared by Trinity Consultants for the Big Rivers Electric Corporation, August 25, 2015



The 3-year surface wind rose for Evansville Regional Airport is depicted in Figure 7. In Figure 7, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The wind rose indicates that the winds blow predominately from the south-southeast, at low to mid-level wind speeds of 2.1- 5.7 meters/second. Additionally, winds blow from the northeast and northwest a significant amount of time.

Figure 7: Evansville Regional Airport Cumulative Annual Wind Rose for Years 2012 – 2014



Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The Commonwealth followed the methodology and settings presented in standard U.S. EPA meteorological processing guidance as outlined in a recent memorandum[14] as well as other AERMET and associated preprocessor documentation in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the Commonwealth set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

Modeling Parameter: Geography and Terrain

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

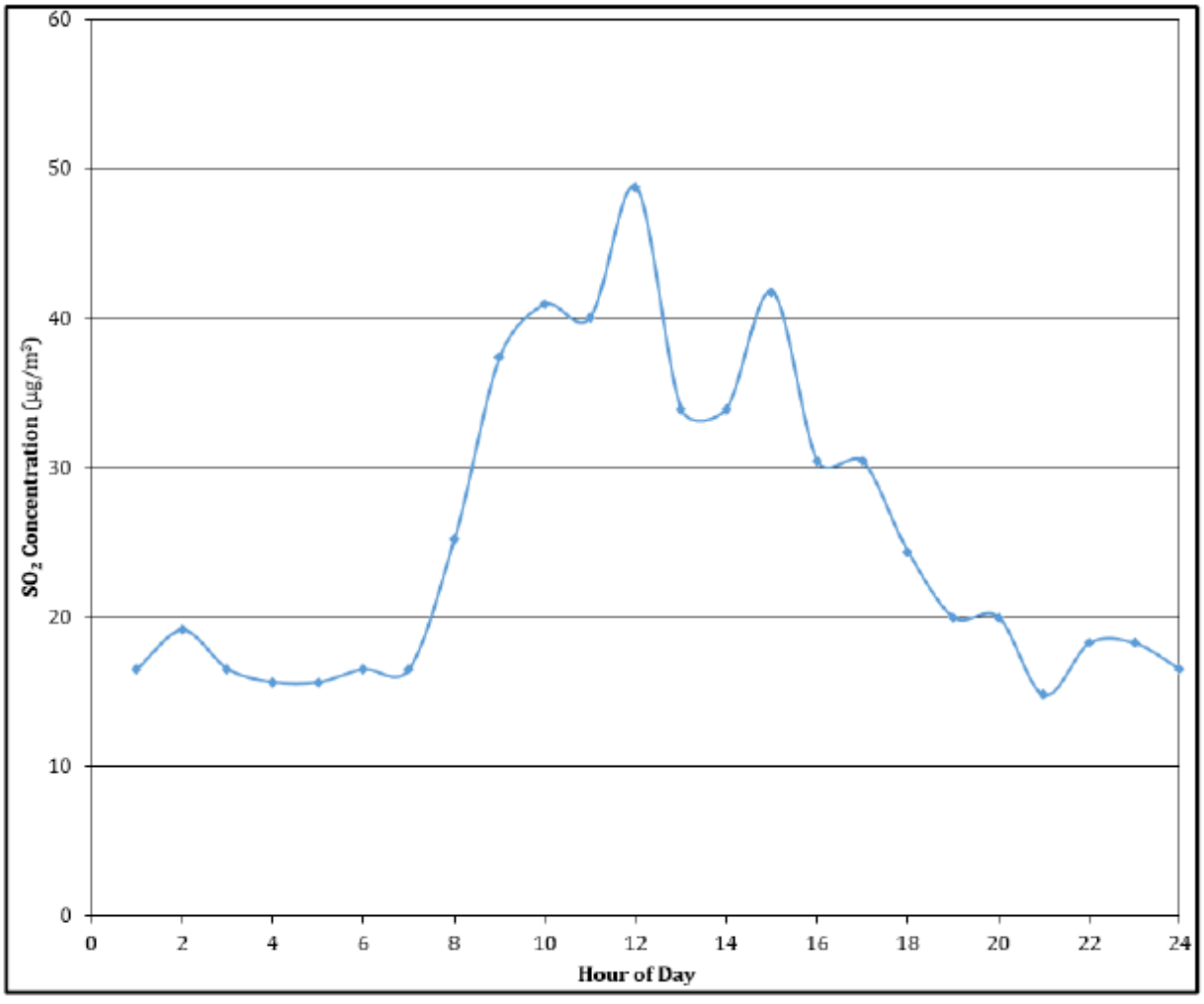
Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Ohio County area of analysis, the Commonwealth chose the method which uses the 3-year averages of the 99th percentiles by hour of day (across all seasons). This was chosen based on the review of the 99th

[14] Fox, Tyler, U.S. Environmental Protection Agency. 2013. "Use of ASOS Meteorological Data in AERMOD Dispersion Modeling." Available Online: http://www.epa.gov/ttn/scram/guidance/clarification/20130308_Met_Data_Clarification.pdf

percentile hourly values across 2012-2014, which shows a diurnal variation of lowest SO_2 concentrations at night and highest in the day. The Baskett Fire House Monitor (Site No. 21-101-0014) was determined to be the representative background monitor for the area. The Basket monitor is classified as a general "population exposure" monitor located about 8-9 km southeast of Evansville, Indiana and about 55 km northwest of Plant Wilson. This monitor was determined to adequately reflect impacts from the SO_2 emissions sources to the northwest of Plant Wilson. The ambient SO_2 concentrations used as background in the modeling vary from 15 – 50 $\mu g/m^3$ (see Figure 8 below).

Figure 8: 99th Percentile SO_2 Averages by Hour of Day for Baskett Fire House Monitor (21-101-0014). Source: "Air Dispersion Modeling Report Wilson Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the Big Rivers Electric Corporation, August 25, 2015.



Summary of Modeling Results

The AERMOD modeling parameters for the Ohio County Area of analysis provided by the Commonwealth are summarized below in Table 5.

Table 5: AERMOD Modeling Parameters for the Ohio County Area of Analysis

Ohio County Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	2
Modeled Structures	8
Modeled Fencelines	1
Total receptors	6,922
Emissions Type	PTE
Emissions Years	TBD[15]/Effective year of new limits for PTE
Meteorology Years	2012-2014
Surface Meteorology Station	Evansville, Indiana
Upper Air Meteorology Station	Nashville, Tennessee
Methodology for Calculating Background SO_2 Concentration	Temporal Varying
Calculated Background SO_2 Concentration	Temporally varying between 15 – 50 $\mu g/m^3$ (see figure 8 above)

The results presented below in Table 6 show the magnitude and geographic location of the highest predicted modeled concentration based on PTE emissions from Plant Wilson and actual emissions from TVA: Paradise Fossil Plant.

Table 6: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Ohio County Area of Analysis Based on PTE and actual emissions.

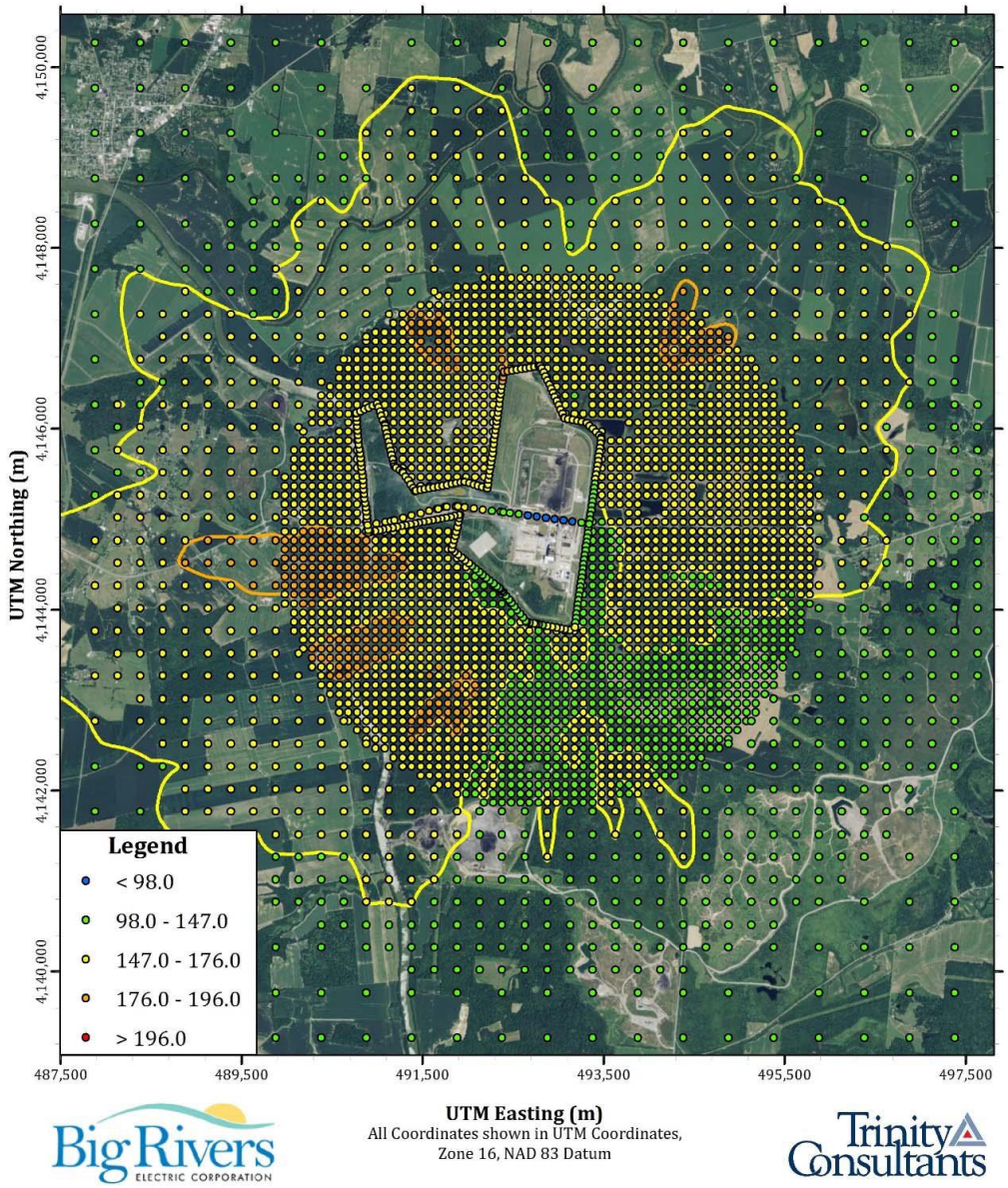
Averaging Period	Data Period	Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
		UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	[2012-2014]	490583	4144568	186.5	196.5*

[15] Provided the new modeled allowable limit of 0.85 lb SO_2/mmBTU is federally-enforceable by the time that the EPA finalizes the designation for this area and, as applicable, includes a longer term average limit that is comparatively stringent to a 1-hour limit at the critical emission value.

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

The Commonwealth's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 186.5 $\mu g/m^3$, or 71.2 ppb. This modeled concentration included the background concentration of SO_2 of and is based on actual emissions from TVA-Paradise Fossil Plant Unit 3, a future allowable limit of 0.85 lbs SO_2/mmBTU for Plant Wilson, and an assumed zero PTE due to scheduled shutdown of TVA-Paradise Units 1 and 2. Figure 9 below was included as part of the Commonwealth's recommendation, and indicates that the predicted value occurred approximately 2.3 km west of the Plant Wilson. The Commonwealth's receptor grid is also shown in the figure.

Figure 9: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the Ohio County Area of Analysis Based on PTE Emissions Source: "Air Dispersion Modeling Report Wilson Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the Big Rivers Electric Corporation, August 25, 2015



Regarding Plant Wilson's modeled future allowable limit the Commonwealth did not provide specific information concerning the federal enforceability nor indicate the averaging time and how it was derived. Consistent with past interpretations of legal requirements, control measures, emission limits and other curtailments need to be installed, operational and federally enforceable to be considered when informing final designation decisions. The mechanisms for establishing federally enforceable emission limits, control measures, or curtailments for the purpose of informing SO_2 designations include: a source-specific SIP approved by the EPA, a minor new source review permit, a title v permit or a consent decree established through a federal civil

litigation. There was no documentation provided by the Commonwealth on whether the averaging time for the future allowable limit is a 1-hour limit or if a longer-term averaging period (e.g., 30-day rolling average) was established that is comparatively stringent to a 1-hour limit at the critical emission value (pursuant to the EPA's SO_2 Nonattainment Guidance).[16] Furthermore, the Commonwealth's decision to exclude actual emissions from 2012-2014 from TVA-Paradise Station Units 1 and 2 was based upon a future retirement of these units which questions whether the model configuration accounts for impacts to the area should these retirements not occur prior to the final designations scheduled for July 2, 2016.

The EPA notes inconsistent information on the timing of the retirement of TVA-Paradise Fossil Plant Units 1 and 2 (i.e., whether this will occur by April 2016 or June 2017). The EPA is required to characterize the current air quality around Plant Wilson by July 2, 2016, according to the terms of the court ordered consent decree. Therefore based on the uncertainty on the permanent shutdown of Units 1 and 2 and the fact that 2012-2014 actual historic emissions were not considered in the modeling analysis for Plant Wilson, the EPA does not have sufficient information to consider the source's impact on the Ohio County Area. Unless the Commonwealth can provide documentation that Units 1 and 2 will permanently retire in advance of the July 2, 2016, designations to the EPA for consideration prior to the promulgation of final designations, the EPA cannot consider these shutdowns and instead believes that it is more appropriate for the Commonwealth to account for actual emissions for these units from 2012-2014 in any modeling to characterize the air quality around Plant Wilson for the Ohio County Area.

Because Plant Wilson's future allowable limit is not yet federally-enforceable and there is no indication of a 1-hour averaging time or a comparatively stringent longer term averaging period, coupled with the uncertainty surrounding the shutdown of TVA Paradise Station Units 1 and 2, the EPA intends to designate the Ohio County Area as unclassifiable due to the absence of relevant information.

However, if the Commonwealth can: (1) establish Plant Wilson's new allowable limit of 0.85 lb SO_2/mmBTU as federally-enforceable(through an appropriate mechanism), by April 19, 2016; (2) document the 1-hour averaging time or as applicable, includes a longer term average limit that the EPA determines is comparatively stringent to a 1-hour limit at the critical emission value (pursuant to the SO_2 Nonattainment Guidance); (3) confirm and document that TVA-Paradise Fossil Plant Units 1 and 2 will be permanently retired for the purposes of validating the modeling submitted for the area of analysis and informing final designations scheduled July 2, 2016; (4) notify the EPA of these conditions in advance of our promulgation of final designations, the EPA

[16] See the EPA's "Guidance for 1-hour SO_2 Nonattainment Area SIP Submissions," dated April 23, 2014 available at: http://www3.epa.gov/airquality/sulfurdioxide/pdfs/20140423guidance.pdf. Previous EPA guidance, has suggested that averaging times for SIP emission limits should not exceed the averaging time of the applicable NAAQS the limit is intended to support attainment(i.e. the averaging time for an emission limit for complying with the 1-hour primary SO_2 NAAQAS should not exceed 1-hour). (*See* $S0_2$ Guideline Document, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711, EPA-452/R-94-008, February 1994. *(See http://www. epa. govlttnl oarpg/t 1 pgm. htm* I). The EPA has established a procedure for establishing longer term averaging times (up to 30-days) that is comparatively stringent to a 1-hour limit at the critical emission value.

may be able to consider a designation of unclassifiable/attainment for the entirety of Ohio County.

Jurisdictional Boundaries:

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

For the Ohio County Area, the Commonwealth considered major sources of SO_2 emissions within a 20 km range and larger sources within a 20-50 km range that were believed to potentially contribute significant concentrations to the area of analysis. The Commonwealth determined that this was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 from Plant Wilson are expected.

The surrounding counties captured in Plant Wilson's area of analysis includes Ohio, Webster Henderson, Daviess, and Muhlenberg, none of which have been designated nonattainment for the 1-hour SO_2 NAAQS. Furthermore, none of these counties, with the exception of Daviess County, have been designated nonattainment for any other NAAQS. Additionally, the large sources evaluated within the 20-50 km range additionally included portions of Grayson, Breckinridge, Hancock, Henderson, Webster, Hopkins and Butler counties.

TVA-Paradise Fossil Plant in Muhlenberg County is located approximately 22 km southeast of Plant Wilson, and had SO_2 emissions of 1,9654.55 tpy in 2014. Actual emissions data from Unit 3 at TVA-Paradise Fossil Plant were included in the modeling analysis for the area around Plant Wilson. The Commonwealth did not model 2012-2014 actual emissions for Units 1 and 2 but rather assumed a zero PTE based upon a future retirement of these units. The EPA notes inconsistent information on the timing of the retirement of TVA- Paradise Station Units 1 and 2, whether this will occur by April 2016 or June 2017. Therefore, unless the Commonwealth can provide documentation to the EPA that Units 1 and 2 have permanently retired in advance of the promulgation of final designations, the EPA cannot consider these shutdowns and instead believes that the Commonwealth should account for actual emissions for these units from 2012-2014 in the modeling analysis characterizing the air quality around Plant Wilson for the Ohio County Area.

The Green River Generating Station also in Muhlenberg County is located approximately 10 km from Plant Wilson and less than 0.5 km from the Ohio County border. The source reported 2,1976.19 tons of SO_2 in 2014 but according to reports from EIA, the last remaining Units 3 and 4 were permanently retired in October 2015[17] resulting in zero PTE. Green River Station was not

[17] No emissions were reported to the EPA Air Markets Database beginning in October 2015 for any federal programs for which Green River Generating Station Units 3 and 4 would have been subject. Also,

explicitly included in the modeling analysis for Plant Wilson due to permanent shutdown and zero potential to emit SO_2. However, the source was considered in the background concentrations accounting for impacts from nearby sources including historic actual emissions. Considering the source's zero PTE and the cumulative impacts captured in the background concentrations, the EPA does not have reason to believe that emissions from this now non-operational facility are causing or contributing to a violation of the SO_2 NAAQS in the Ohio County Area.

Other SO_2 emitters the Commonwealth assessed within the 20-50 km range that reported SO_2 emissions over 100 tpy included: Century Aluminum of Kentucky, LLC (Hancock County)(EPA notes this source is just beyond 50 km), Elmer Smith Station (Daviess County), Reid/Henderson Station II Generating Station and BREC Landfill (Webster County). These sources were not explicitly included in the modeling analysis because they're all located approximately 35 km or greater from Plant Wilson and/or the Ohio County Area which the Commonwealth determined to be far enough that impacts from the facility relative to Plant Wilson. Based on the Commonwealth's assessment considering distance from Ohio County Area, the EPA has reason to believe these sources would not cause or contribute to a violation of the SO_2 NAAQS within the Ohio County Area.

The EPA notes that two BREC's sources Green Station (Webster County) and Coleman Station (Hancock County) and Owensboro Grain Company (Daviess) also reported 2014 emissions over 100 tpy year but similar to those sources considered by the Commonwealth are also located over 35 km away from Plant Wilson and Ohio County Area. Based on the distance from Plant Wilson and Ohio County border (>35 km), the EPA has reason to believe that these sources would not cause significant concentration gradients within the area of analysis or Ohio County. The EPA notes that other sources in counties within the 20-50 km range cumulatively emitted less than 100 tpy of SO_2 emissions according to 2014 actual emissions.

Any area in Kentucky not designated by July 2, 2016, will be designated by either December 31, 2017, or December 31, 2020, consistent with the deadlines prescribed in the final consent decree. The Commonwealth's review of other SO_2 emitting sources in terms of distance from Plant Wilson, potential impacts of other SO_2 emitting sources within Ohio County, and scheduled shut downs that can be credited for the July 2, 2016, round of designations support the Commonwealth's recommendation to designate the entirety of Ohio County.

The EPA's observation of the Commonwealth's review of nearby sources in and outside of Ohio County revealed that larger sources are far enough away that their impacts would be significantly reduced in terms of its impacts overlapping with those of Plant Wilson. Green River Generating Station in Muhlenberg County has permanently retired its remaining Units 3 and 4 as of October 2015, however, there is uncertainty surrounding the shutdown of TVA-Paradise Fossil Plant Units 1 and 2. Furthermore, because Plant Wilson's future allowable limit is not yet federally enforceable and there is no indication of a 1-hour averaging time or a comparatively stringent longer term averaging period, the EPA intends to designate the Ohio County Area as

EIA's US Energy Information Administration "Electric Power Monthly" annual report for January 2016, tracked Units 3 and 4 as permanently retired as of October 2015.

unclassifiable. The intended unclassifiable designation consisting of Ohio County in its entirety constitutes a clearly defined legal boundary.

Other Relevant Information

The Commonwealth's recommended designation of attainment for Ohio County is based on air dispersion modeling analysis of a future allowable limit of 0.85 lb SO_2/ mmBTU for Plant Wilson which is less than the current permitted limit of 1.2 lb SO_2/mmBTU. This lower limit was proposed by BREC and modeled to show attainment for the 1-hour SO_2 NAAQS.

Consistent with past interpretations of legal requirements, control measures, emission limits and other curtailments need to be installed, operational and federally enforceable to be considered when informing final designation decisions. The mechanisms for establishing federally enforceable emission limits, control measures, or curtailments for the purpose of informing SO_2 designations include: a source-specific SIP approved by the EPA, a minor new source review permit, a title v permit or a consent decree established through a federal civil litigation. Therefore, the Commonwealth of Kentucky must ensure this new allowable limit is federally enforceable by April 19, 2016 for the purpose of informing final designations and as applicable, include a longer term average limit that is comparatively stringent to a 1-hour limit at the critical emission value pursuant to the EPA's April 23, 2014 1-hour SO_2 nonattainment guidance.[18] Furthermore, the Commonwealth's decision to exclude actual emissions from 2012-2014 from Units 1 and 2 and TVA-Paradise Fossil Plant was based upon a future retirement of these units. However, the EPA is required to characterize the current air quality around the Plant Wilson source by July 2, 2016. The EPA notes conflicting information on the timing of the retirement of TVA-Paradise Fossil Plant Units 1 and 2, specifically, whether this will occur by April 2016 or June 2017. The Commonwealth and Plant Wilson must ensure that the units will be officially retired by April 19, 2016 for the purposes of validating the modeling submitted for the area of analysis and informing final designations.

The EPA received no additional information regarding Plant Wilson or its surrounding area.

Conclusion.

The Commonwealth of Kentucky recommended a designation of attainment for the entirety of Ohio County based on Plant Wilson's air dispersion modeling (using AERMOD Model Version 15181) analysis which considered a future allowable emission limit of 0.85 lb SO_2/mmBTU at the facility, actual emissions from the TVA-Paradise Station Unit 3 (located just southeast of Plant Wilson in Muhlenberg Count) and background concentrations based on rural and natural background sources as well as regional impacts from distance large SO_2 sources, and assumed that TVA-Paradise Units 1 and 2 would be retired. Additional SO_2-emitting sources were identified within the analysis area, which extended 50 km out from Plant Wilson. But Plant Wilson determined that certain sources (i.e., TVA-Paradise Units 1 and 2 and Green River

[18] EPA's "Guidance for 1-hour SO_2 Nonattainment Area SIP Submissions," dated April 23, 2014 available at: http://www3.epa.gov/airquality/sulfurdioxide/pdfs/20140423guidance.pdf

Station) would be shut down before final designations, and that based on the distance (at least 35 km) from Plant Wilson and from the boundary of Ohio County (at least 20 km), the impacts from remaining sources would be significantly reduced in terms of potential overlap with those from Plant Wilson. The areas in other counties surrounding these sources will be designated by one of the other deadlines prescribed by the final consent decree, i.e., December 31, 2017, or December 31, 2020. Based on these factors, Plant Wilson's modeled 1-hour design value for its 20 km area of analysis, covering the entirety of Ohio County, is 186.5 $\mu g/m^3$, or 71 ppb. This modeled concentration is below the level of the 2010 SO_2 NAAQS. Plant Wilson's modeling parameters, assumptions and inputs were in compliance with the Agency's Modeling TADs after careful evaluation of the Commonwealth's recommendation and supporting information, as well as all available relevant information.

It is unclear in the documentation provided by the Commonwealth whether Plant Wilson's new allowable emission limit will be a 1-hour limit or whether there is some longer-term averaging period (e.g., 30-day rolling average) for the limit. As noted above, the EPA has developed SO_2 nonattainment implementation guidance which indicates that modeling to determine attainment with the 1-hour SO_2 NAAQS should use a higher 1-hour "critical value" to account for hourly emissions variability in a 30-day rolling average allowable limit. The details for the EPA's recommended procedure for calculating the adjustment factor between the 1-hour critical value and an equivalent longer-term average emissions limit are provided in Appendices B and C of the EPA's SO_2 Implementation Guidance. The EPA has informed Kentucky that an appropriate 1-hour critical value should be used in the modeling if the future allowable limit includes an averaging period longer than 1-hour.

The EPA notes conflicting information on the timing of the retirement of TVA-Paradise Fossil Plant Units 1 and 2, specifically, whether this will occur by April 2016 or June 2017. Therefore, it is unclear these units will be officially retired prior to the final promulgation of the July 2, 2016 designation of the area surrounding Plant Wilson. Consequently, the EPA intends to designate the area around Plant Wilson Power Station comprised of Ohio County as unclassifiable for the 2010 SO_2 NAAQS.

However, if Plant Wilson's new allowable limit of 0.85 lbs SO_2/mmBTU is federally-enforceable and, as applicable, includes a longer term average limit that the EPA determines is comparatively stringent to a 1-hour limit at the critical emission value; and the Commonwealth confirms that TVA-Paradise Fossil Plant Units 1 and 2 will be permanently retired prior to the July 2, 2016, deadline for designations, and notifies the EPA of these conditions in advance of our promulgation of final designations, the EPA anticipates may be able to designate Ohio County unclassifiable/attainment.

Based on all available information, including the reasons discussed above, the EPA is unable at this time to determine whether the area is meeting or not meeting the NAAQS. At this time, our intended designations for the Commonwealth only applies to this area (Ohio County) and the other area (Pulaski County) presented in this technical support document. Consistent with the conditions in the March 2, 2015 court-ordered consent decree schedule, the EPA will evaluate and designate all remaining undesignated areas in Kentucky by either December 31, 2017, or December 31, 2020.

Technical Analysis for the Plant Cooper – Pulaski County Area

Introduction

The Pulaski County Area contains a stationary source that according to the EPA's Air Markets Database emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 lbs SO_2/mmBTU. As of March 2, 2015, this stationary source had not met the specific requirements for being "announced for retirement." Specifically, in 2012, the Cooper Power Station emitted 7,428 tons of SO_2, and had an emissions rate of 1.07 lbs SO_2/mmBTU. Pursuant to the March 2, 2015 court-ordered schedule, the EPA must designate the area surrounding the facility by July 2, 2016.

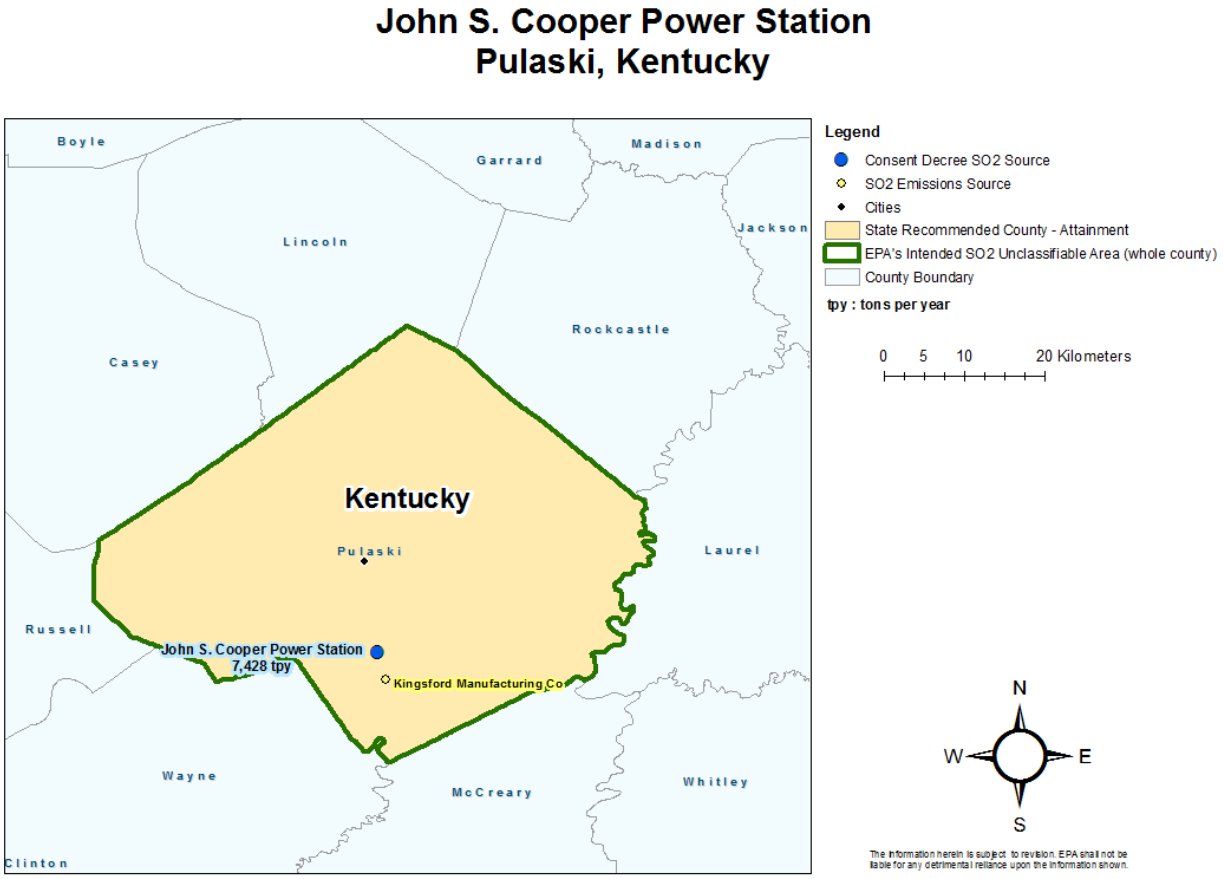
In its submission, Kentucky recommended that the area surrounding the Cooper Power Station (Cooper Station), specifically the entirety of Pulaski County, be designated as attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions in part and allowable emissions in part. The assessment was originally carried out by Trinity Consultants and prepared for the East Kentucky Power Cooperative. The Commonwealth then reviewed and submitted the information to the EPA.[19]

After careful review of the Commonwealth's assessment, supporting documentation, and all available data, the EPA intends to designate the area as unclassifiable. However, if the Commonwealth provides notification of the following to the EPA prior to the promulgation of the July 2, 2016 designation, the EPA may consider designating the entirety of Pulaski County as unclassifiable/attainment, provided that are no outstanding technical issues: 1) assurance that the Cooper Station's new PTE limit of 0.165 lb SO_2/mmBTU for Unit 1 is federally-enforceable, and, as applicable, includes a longer term average limit that the EPA determines is comparatively stringent to a 1-hour limit at the critical emission value; 2) the modeling for Units 1 and 2 at the facility are matched (e.g., PTE emissions or actual emissions over a common time period); and 3) the updated modeling shows that the new PTE limit on Unit 1 or modeled actual emissions will ensure attainment of the NAAQS.

Cooper Station is located in the southern portion of Pulaski County. As seen in Figure 10 below, the facility is located approximately 10 km north of the center of Somerset. The power station is located near the Cumberland River, and there is medium to high land use development in the surrounding area. Also included in the figure are nearby emitters of SO_2, the Commonwealth's recommended area for the attainment designation, and the area the EPA intends to designate as unclassifiable.

[19] Throughout this document the Commonwealth will be referred to as having assessed air quality in the area because the Commonwealth agreed with the East Kentucky Power Cooperative's air quality assessment and characterization of the area of analysis, officially submitting the report to the EPA to support their designation recommendation.

Figure 10. The EPA's intended designation for Pulaski County, Kentucky



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

Detailed Assessment

Air Quality Data

This factor considers the SO_2 air quality monitoring data in the area surrounding Cooper Station. The facility is located in Pulaski County, and the Commonwealth included monitoring data from the closest monitors: Nicholasville (21-113-0001), Lexington (21-067-0012), and Mammoth Cave National Park (21-061-0501), to the facility in its recommendation. The closest monitor is Nicholasville, located at KYTC Maintenance Garage, 260 Wilson Drive, Nicholasville, KY 40356 (37.89147, -84.58825) in Jessamine County, and is 99 km away from Cooper Power Station. Data collected at this monitor is considered indicative of population exposure but is not representative of the expected background concentrations in the area surrounding the Cooper

Station. The Mammoth Cave monitor, located at Alfred Cook Road, Park City, KY 42160 (37.131944, -86.14778) is thought to be representative of rural areas with similar influences to the air quality around Cooper Station. Table 7 below summarizes the local monitors and design values within 150 km of Cooper Station.

Table 7: Historical Ambient Air Quality Data for Nearby Monitors

Monitor	AQS ID	County	2010–2012 Design Value ($\mu g/m^3$)	2011–2013 Design Value ($\mu g/m^3$)	2012–2014 Design Value ($\mu g/m^3$)
Nicholasville	21-113-0001	Jessamine	68.1	41.9	39.3
Lexington	21-067-0012	Fayette	68.1	44.5	34.0
Mammoth Cave	21-061-0501	Edmonson	31.4	26.2	26.2

Model Selection and Modeling Components

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

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

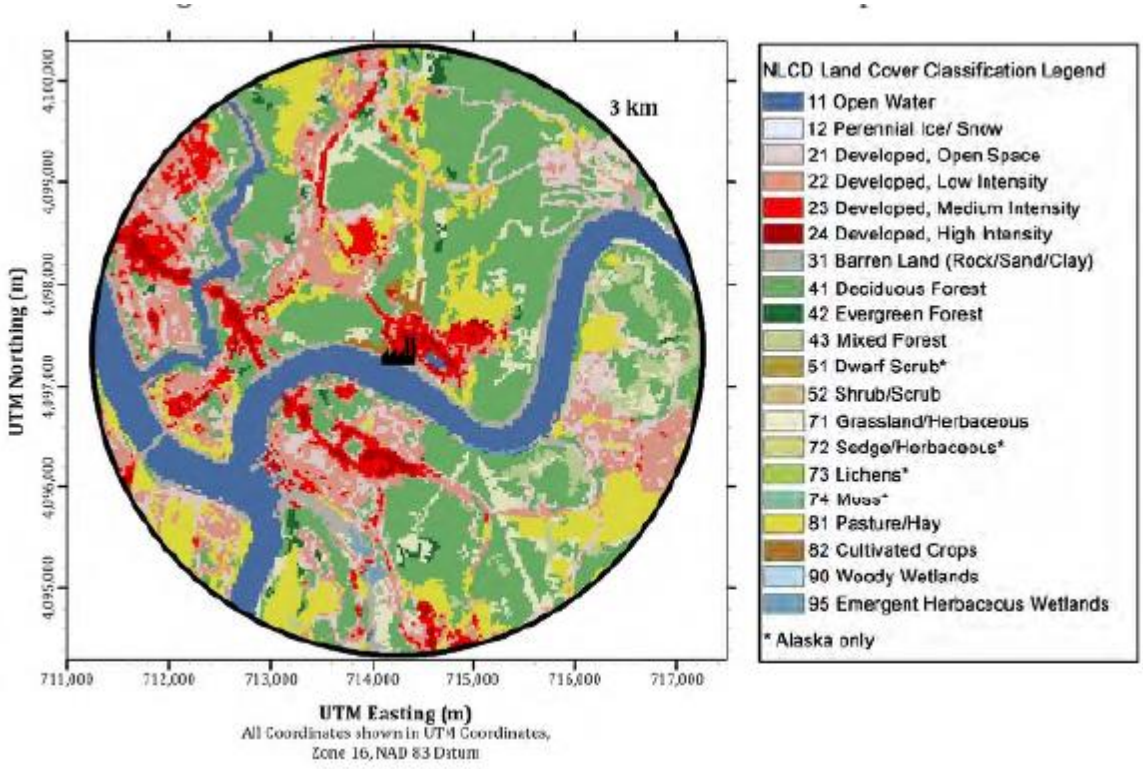
The Commonwealth used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows, as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50 percent of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50 percent of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, the Commonwealth determined that it was most appropriate to run the model in rural mode. This determination was based on an analysis of land use within 3 km of the Cooper Power Station. Figure 11 below depicts land use within 3 km of the facility where greens, yellows and browns

are farmland, forests, and grasses, pinks are non-urban developed lands, and red and dark red are urban areas. As can be seen in Figure 11, the area is predominantly rural by an overwhelming margin. Therefore the Commonwealth determined that is was most appropriate to run the model with rural dispersion coefficients

Figure 11. Distribution of Land Use Within 3 km of Cooper Station - Source: "Air Dispersion Modeling Report Cooper Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the East Kentucky Power Cooperative, September 1, 2015



Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Cooper Station is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations. For the Pulaski County Area, the Commonwealth has included 1 other emitter of SO_2 within 20 km of Cooper Station in any direction. For the Pulaski County Area, the Commonwealth evaluated offsite SO_2 sources within 50 km of the facility in any direction and determined that it was only necessary to include one offsite source within 20 km of the facility in order to adequately characterize air quality on the vicinity of Cooper Station. This determination was based on the actual and potential 2013 emissions at each facility and the distance of each facility from Cooper Power Station. Table B-1.2 of the September 1, 2015, modeling report provided to the

Commonwealth via East Kentucky Power Cooperative on September 2, 2015, details this screening assessment. The Commonwealth confirmed that a receptor grid extending 20 km in all directions from Cooper Station was the appropriate distance in order to adequately characterize air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO_2 are expected. In addition to Cooper Station, the only other emitter of SO_2 included in the area of analysis is Kingsford Manufacturing Company (KMC), located approximately 3 km south of the facility. The grid receptor spacing for the area of analysis chosen by the Commonwealth is as follows:

- "Fence Line" receptors at 50 meter (m) spacing along the main fence line for the facility
- 100 m spacing out to 3 km
- 250 m spacing from 3 km out to 5 km
- 500 m spacing from 5 km to 10 km
- 1000 m spacing from 10 km to 20 km

The receptor network contained 4,948 receptors, and the network covered the southern two-thirds of Pulaski County in Kentucky, extreme northwestern McCreary County in Kentucky, and extreme northeastern Wayne County in Kentucky.

Figures 12 and 13, included in the Commonwealth's recommendation, show the Commonwealth's chosen area of analysis surrounding the Cooper Station, as well as receptor grid for the area of analysis.

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

Figure 12: Pulaski County Area of Analysis - Source: "Air Dispersion Modeling Report Cooper Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the East Kentucky Power Cooperative, September 1, 2015

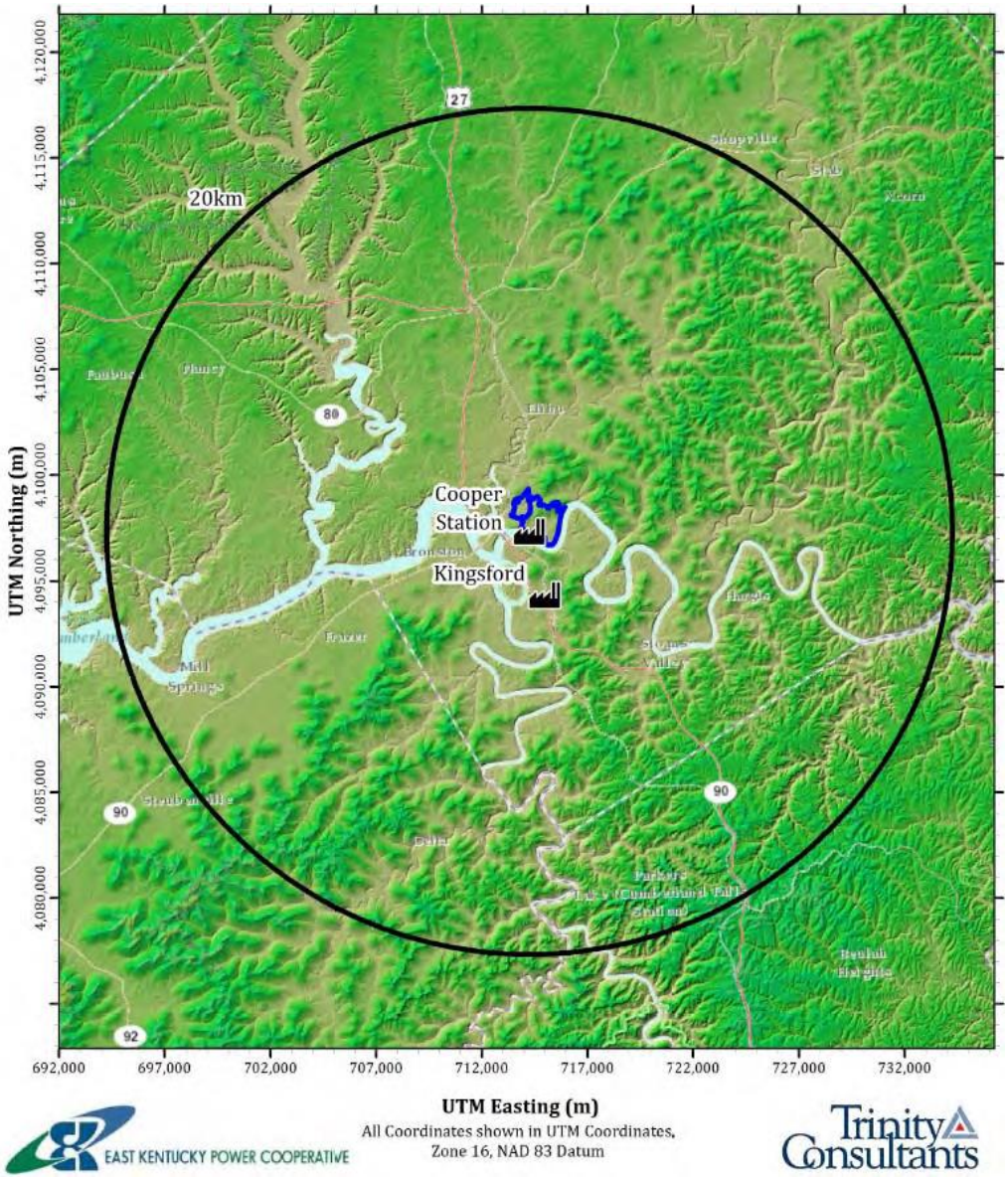
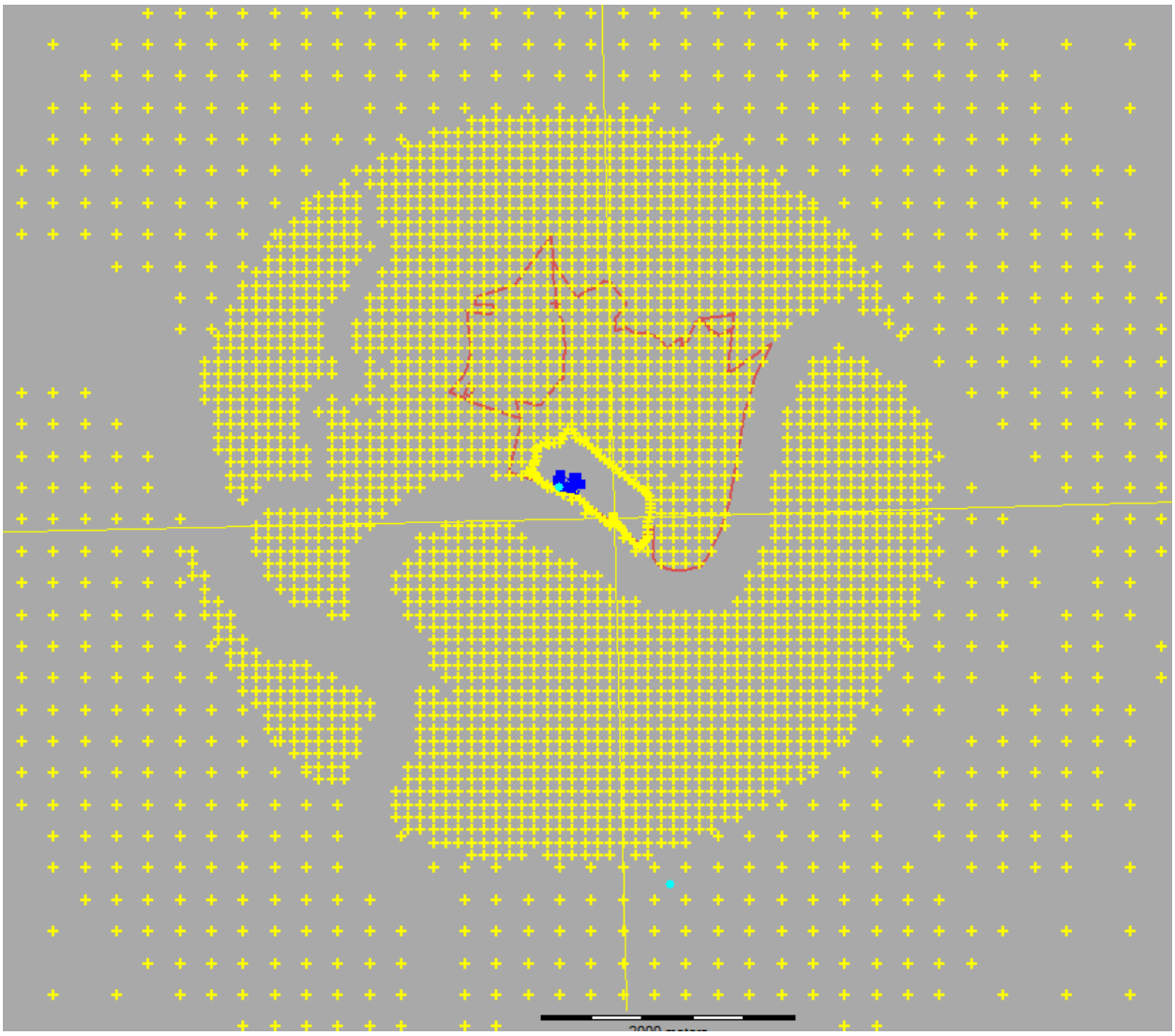


Figure 13: Innermost Portion of Modeling Receptor Grid for the Pulaski County Area of Analysis - Source: "Air Dispersion Modeling Report Cooper Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the East Kentucky Power Cooperative, September 1, 2015



Modeling Parameter: Source Characterization

The Commonwealth characterized the sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the Commonwealth used actual stack heights in conjunction with future allowable emissions limits for Cooper Station Unit 1 and actual emission rates for Cooper Station Unit 2. Units 1 and 2 share a common stack. The actual stack height does not exceed the GEP stack height. The Commonwealth also adequately characterized the sources building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

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

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

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

As previously noted, the Commonwealth included Cooper Station and one other emitter of SO_2 within the 20 km area of analysis, i.e., KMC. This distance and these facilities were selected because the Commonwealth believes that this area of analysis adequately represents the area where maximum concentrations of SO_2 are expected and adequately includes the sources which might contribute to those concentrations. Of the 16 facilities emitting SO_2 within 20 km of the Cooper Station, only KMC has actual annual SO_2 emissions greater than 2.5 tpy (37.97 tpy in 2014[20]). No other sources beyond 50 km were determined by the Commonwealth to have the potential to cause significant concentration gradient impacts within the area of analysis.

For Cooper Station, the Commonwealth chose a hybrid approach for its analysis. Unit 1 operated with a 24-hour emission limit during the years considered, but a project at the facility will tie Unit 1 in with an existing dry flue gas desulfurization (DFGD) system for Unit 2 prior to the July 2, 2016 deadline for characterizing and designating this area. The Commonwealth anticipates that both Units 1 and 2 will meet the federally enforceable emission limit currently in place for

[20] Unless otherwise noted, all 2014 data was accessed via the Emissions Inventory (EIS) gateway, which states report emissions to in accordance with 40 CFR Part 51, Subpart A. The EIS gateway can be accessed via: http://www3.epa.gov/ttnchie1/eis/gateway/

Unit 2 after the project is complete. Therefore, Unit 1 is modeled at its future allowable emission rate[21] to reflect the future installation of SO_2 emissions controls on that unit. Unit 2 is modeled with three years of actual emissions from July 1, 2012, through June 30, 2015 obtained from CEMS, reflecting the time for which its DFGD system was operational and its federally enforceable emission limit in effect. Actual emissions from July 31, 2012 through June 30, 2014 for all units (Units 1 and 2) at Cooper Station are summarized in Table 8.

Table 8: Actual SO_2 Emissions Between mid-2012 – mid-2015 from Cooper Station

Facility Name	Unit #	SO_2 Emissions (tpy)[a]			
		2012[b]	2013	2014	2015[c]
Cooper Station	1	1406.25	2812.09	2681.48	566.27
	2	1862.96	1791.62	1642.37	682.58

[a] Data from EPA's Air Markets Database.
[b] Beginning July 1, 2012.
[c] Ending June 30, 2015.

For KMC in the area of analysis, the Commonwealth has chosen to model the facility using the most recent federally enforceable PTE limits for SO_2. The facilities included in the Commonwealth's area of analysis and their associated PTE rate is shown below.

Table 9: SO_2 Emissions based on PTE from Facilities in the Pulaski County Area of Analysis

Facility Name	SO_2 Emissions (tpy, based on PTE)
Kingsford Manufacturing Company	136
All Facilities	136

The PTE limit for Kingsford Manufacturing reflects existing emissions limits.

Modeling Parameter: Meteorology and Surface Characteristics

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

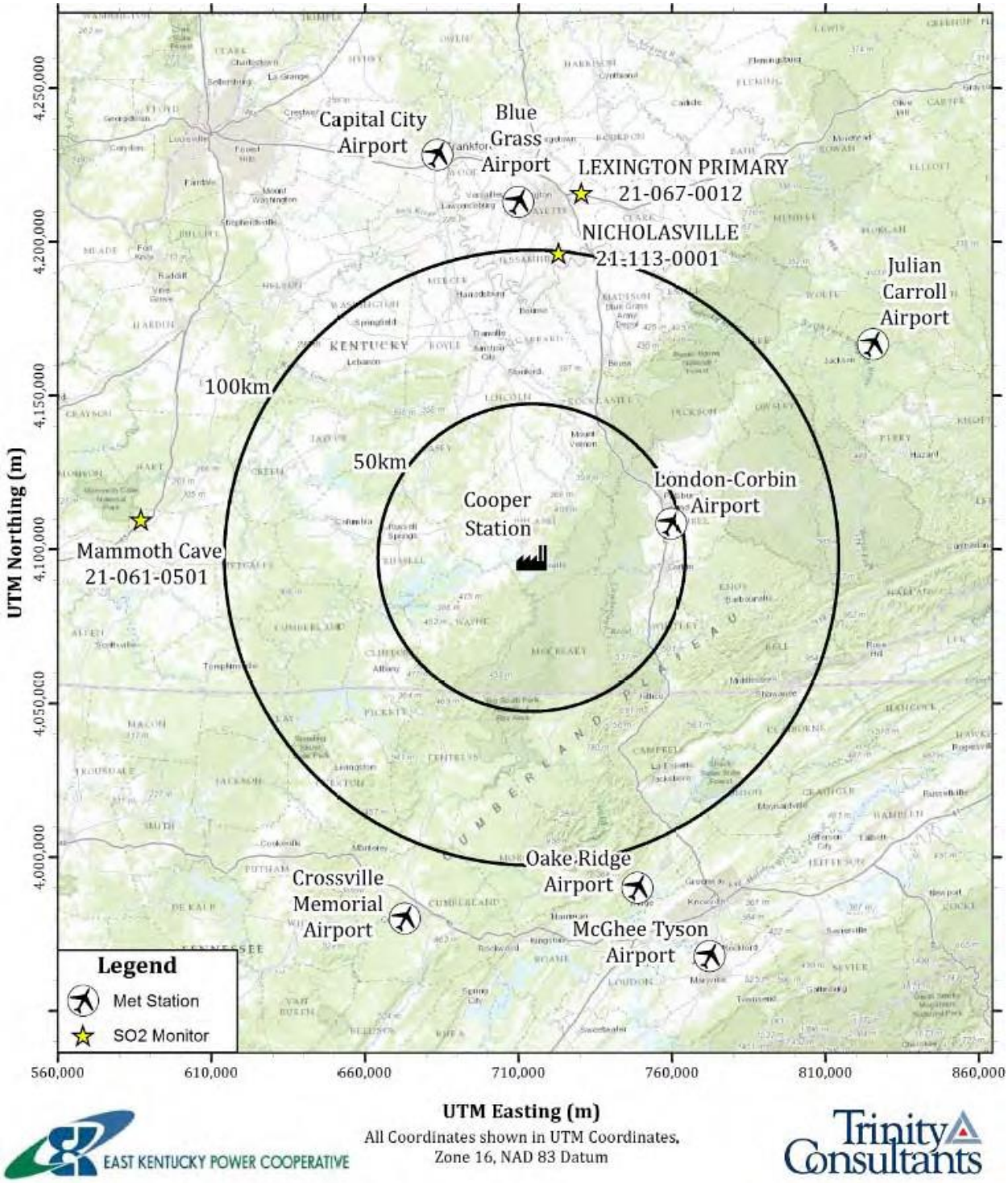
[21] Cooper Station Unit 1 is undergoing modification to tie-in its exhaust gases into the existing DFGD system currently serving Unit 2. This modification is expected to be completed by January 1, 2016. For Cooper Station Unit 1, the Commonwealth modeled an allowable emission rate of 178 pounds per hour (.165 pounds per million BTU (lbs/mmBtu)). This was derived from the existing Title V permit limit of 3.3 pounds SO_2 per million BTU (24-hour average) by assuming a 95 percent reduction in emissions of SO_2 and operating at 1080 mmBtu/hr year round (8,760 hours). A 95 percent reduction was applied to the existing permit limit because the Commonwealth expects the facility to meet a federally enforceable SO_2 emission limit of 95% removal efficiency (30-day rolling average) or .1 lbs SO_2 per mmBtu (30-day rolling average) on both Cooper Units once the tie in of Unit 1 into the Unit 2 DFGD is complete. The Title V permit is expected to be revised by July 2, 2016 to reflect these limits.

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

For the Pulaski County Area of analysis, surface meteorology from the NWS station in London, Kentucky, 64 km to the east, and coincident upper air observations from the NWS station in Nashville, Tennessee, 260 km to the southeast were selected as best representative of meteorological conditions within the area of analysis.

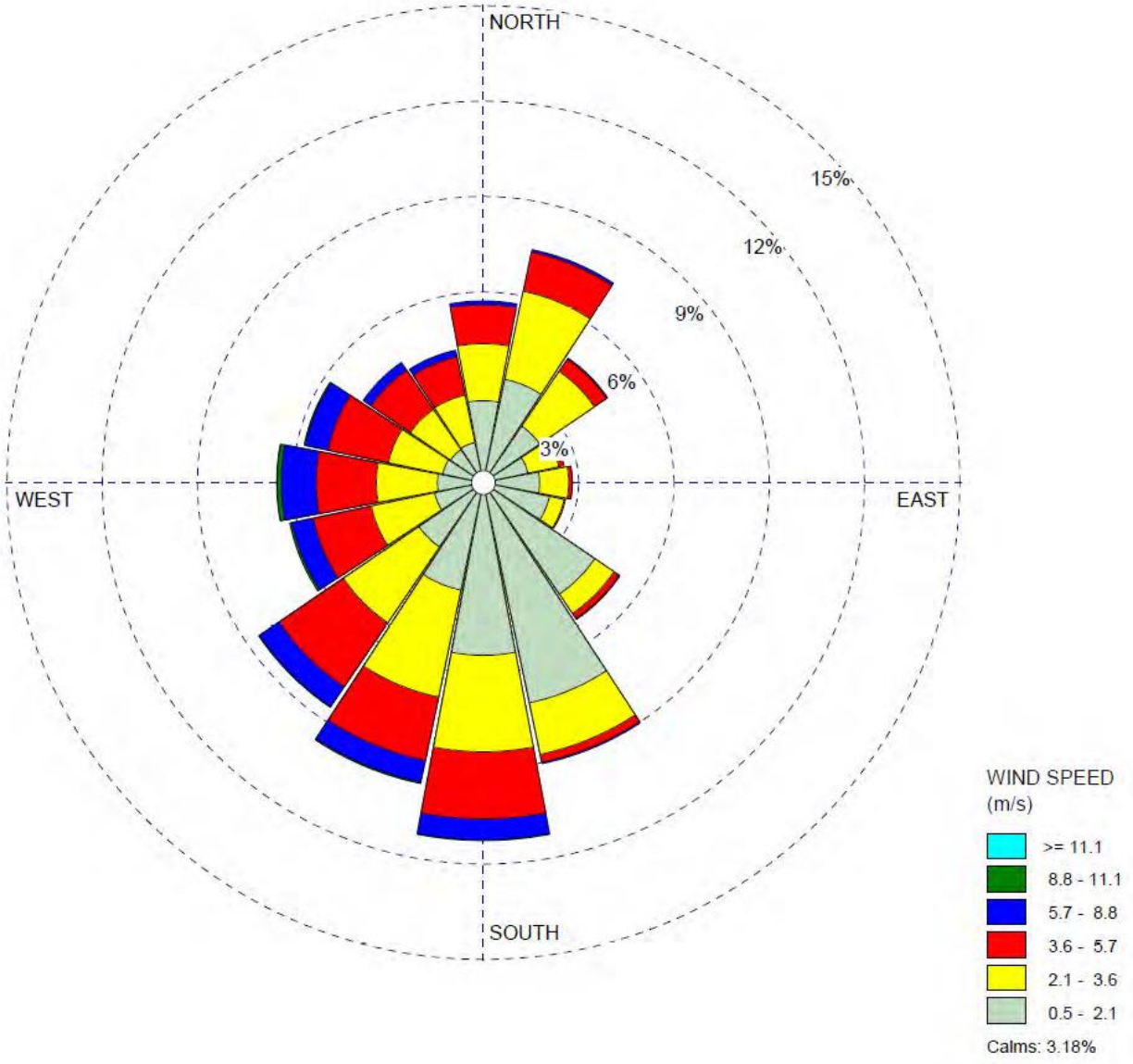
The Commonwealth used AERSURFACE version 15181 using data from the NWS station in London, Kentucky (located at Latitude 37.087 North, Longitude 84.077 West) to estimate the surface characteristics of the area of analysis. The Commonwealth estimated values for 12 spatial sectors out to 1 km at a seasonal temporal resolution for average conditions. The Commonwealth also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as "Zo"). In the figure below, the location of the London, Kentucky NWS station is shown relative to the Pulaski County Area of analysis.

Figure 14: Cooper Power Station Area and the Nearby Meteorological Stations - Source: "Air Dispersion Modeling Report Cooper Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the East Kentucky Power Cooperative, September 1, 2015



As part of its recommendation, the Commonwealth provided the 3-year surface wind rose for the London-Corbin Airport NWS. In Figure 15, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. As shown in Figure 15, the predominant winds blow from the south at low to mid-level wind speeds of 0.5 to 5.7 meters/second.

Figure 15: London-Corbin Airport Cumulative Annual Wind Rose from July 2012 – June 2015



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

U.S. EPA meteorological processing guidance as outlined in a recent memorandum[22] as well as other AERMET and associated preprocessor documentation in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. The Commonwealth selected the beta option ADJ_U* for AERMET. The EPA notes that the use of beta options, such as ADJ_U* and LOWWIND3, in AERMOD for any regulatory applications requires adherence with Appendix W, Section 3.2.2. This is further explained in the EPA's December 10, 2015 Memorandum titled, "Clarification on the Approval Process for Regulatory Application of the AERMOD Modeling System Beta Options." Among other conditions, the use of beta options requires consultation with the appropriate EPA Regional Offices. Upon concurrence by the EPA's Modeling Clearinghouse, the EPA Regional Offices may approve the use of these beta options for regulatory applications as an alternative model. However, the Commonwealth provided air dispersion modeling intended to characterize air quality as a result of SO_2 emissions from Cooper Station without prior approval from the EPA Region 4, and therefore has not met the applicable regulatory requirements contained in Appendix W, Section 3.2.2. As a result, the air quality modeling results obtained from the use of these beta options cannot be used as a reliable indicator of attainment status in the Pulaski County Area until appropriate alternative model approval is granted or these beta options are promulgated as regulatory options in AERMOD through the EPA rulemaking. The modeling documentation submitted by the Commonwealth provides information to justify use of the beta ADJ_U* option for this application. The EPA Region 4 will work with the EPA's Model Clearinghouse to evaluate the use of beta ADJ_U* prior to the final designation of the area.

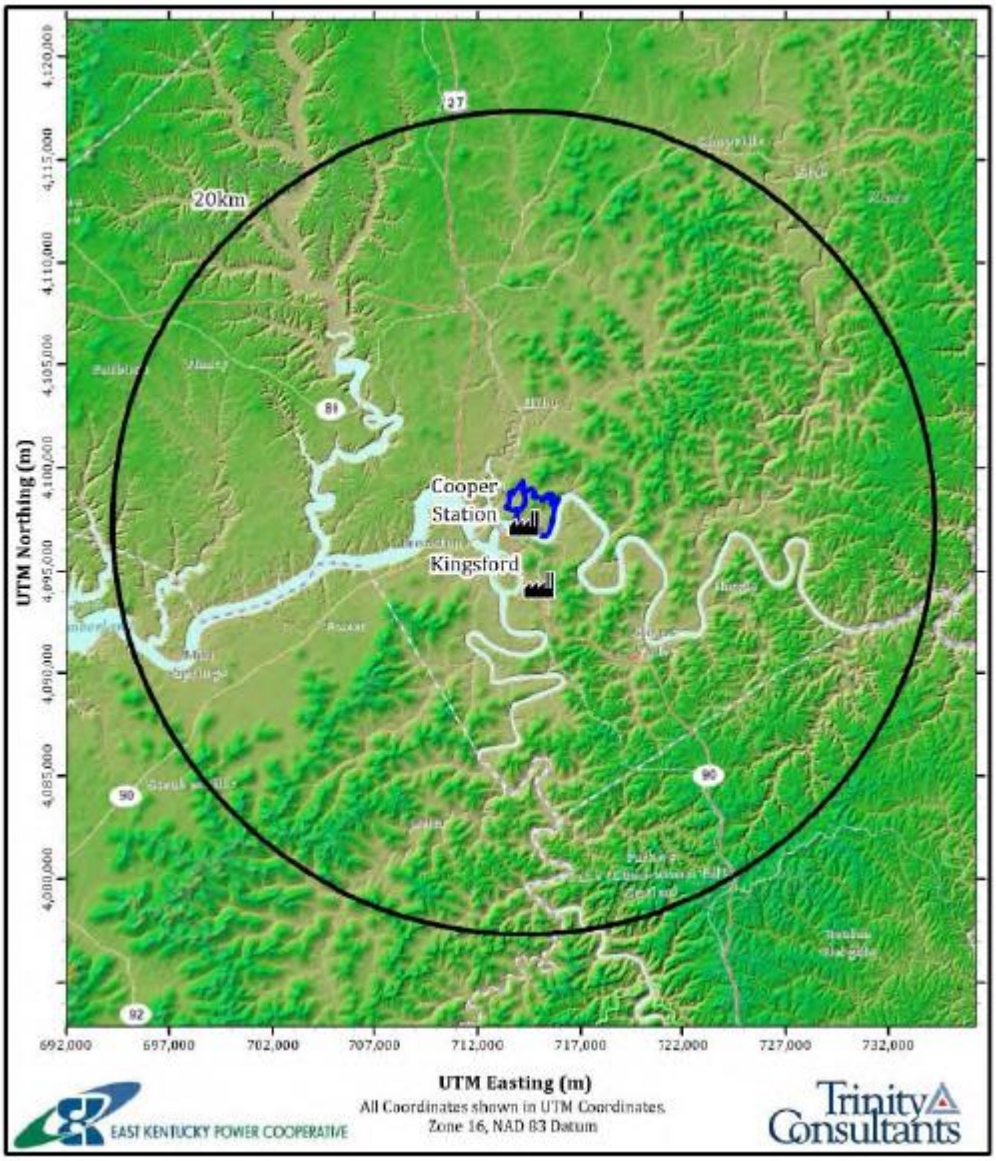
Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of one minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the Commonwealth set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the one minute wind data.

[22] Fox, Tyler, U.S. Environmental Protection Agency. 2013. "Use of ASOS Meteorological Data in AERMOD Dispersion Modeling." Available Online: http://www.epa.gov/ttn/scram/guidance/clarification/20130308_Met_Data_Clarification.pdf

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as complex to hilly. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the United States Geological Survey National Elevation Database. Figure 16 provided in the Commonwealth's recommendation shows a relief map of the terrain within 20 km of the Cooper facility.

Figure 16. Relief map of the terrain within 20 km of the Cooper facility - Air Dispersion Modeling Report Cooper Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the East Kentucky Power Cooperative, September 1, 2015



Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Pulaski County Area of analysis, the Commonwealth chose to use a first tier approach using the 2012-2014 design value from the Mammoth Cave National Park ambient SO_2 monitoring site located approximately 139 km west of Cooper Station. Two other nearby monitors, summarized in Table 7, considered for this purpose were Nicholasville (99 km from Cooper Station) and Lexington (119 km from Cooper Station). These monitors were deemed inappropriate to represent background concentrations near Cooper Station due to their local settings and a relative emissions inventory that compared SO_2 emissions from sources within 20 and 50 km of each monitor and compared with those within the same distances from Cooper Station. The Mammoth Cave site has the most comparable nearby emissions to Cooper Station. In addition, due to predominant wind patterns in the area, the Mammoth Cave site is expected to represent emissions from small sources in the Bowling Green-Glasgow combined statistical area (CSA). That CSA has a similar population to the Cooper Station. The Mammoth Cave site has a monitoring objective of general/background without a specified measurement scale. Due to its background status, this monitor is thought to be representative of rural areas with similar influences to the air quality around Cooper Station. The background concentration for this area of analysis was determined by the Commonwealth to be 26.9 $\mu g/m^3$, or 10.3 ppb,[23] and that value was incorporated into the final AERMOD results.

Summary of Modeling Results

The AERMOD modeling parameters for the Pulaski County Area of analysis are summarized below in Table 10.

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

Table 10: AERMOD Modeling Parameters for the Pulaski County Area of Analysis

Cooper Station Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	6
Modeled Structures	11
Modeled Fencelines	1
Total receptors	4,948
Emissions Type	Actual & PTE
Emissions Years	7-1-2012 thru 6-30-2015
Meteorology Years	Same as Emissions Years
Surface Meteorology Station	London, Kentucky
Upper Air Meteorology Station	Nashville, Tennessee
Methodology for Calculating Background SO_2 Concentration	1st tier – Monitored Design Value
Calculated Background SO_2 Concentration	10.3 ppb or 26.9 $\mu g/m^3$

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

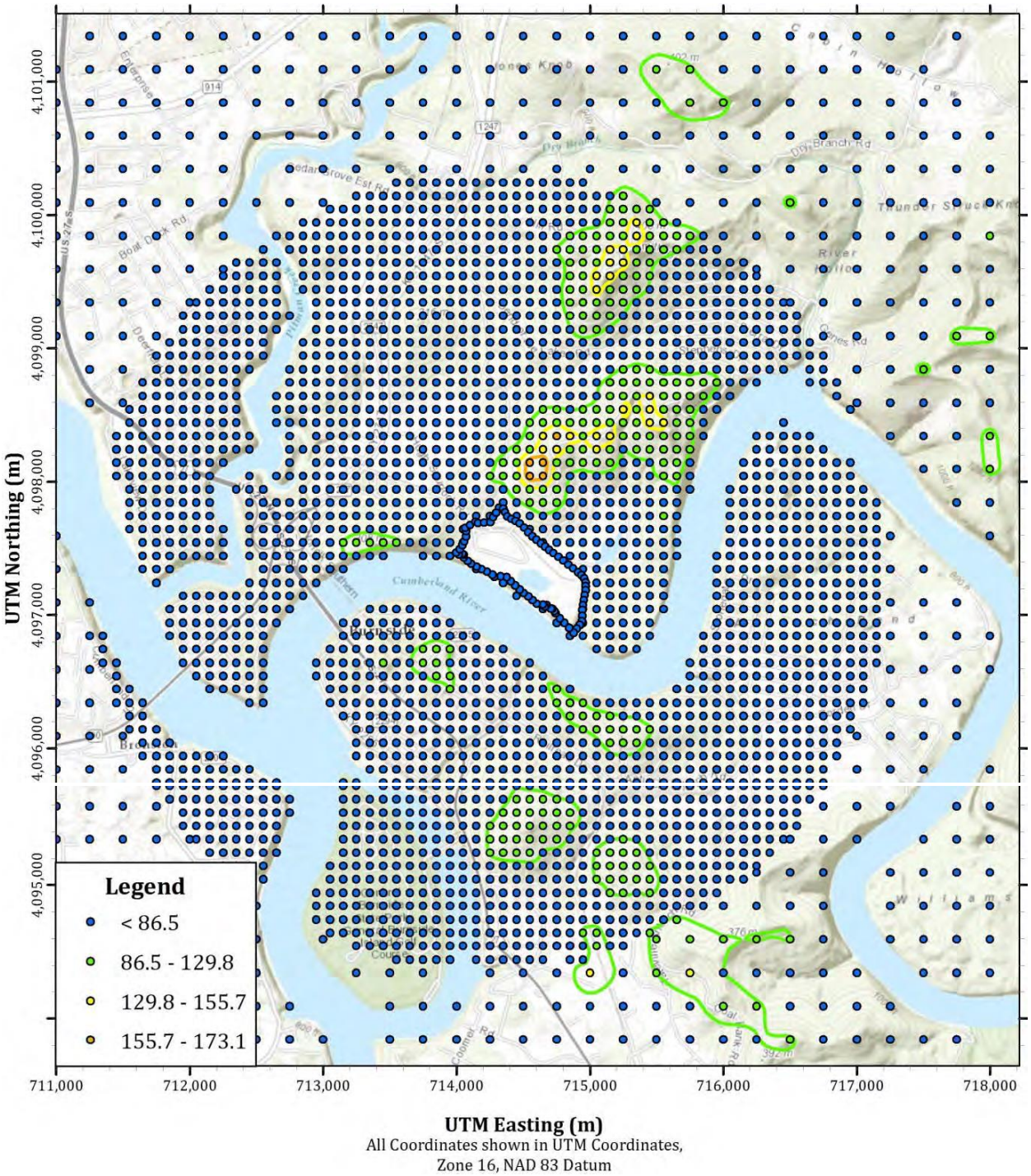
Table 11: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Pulaski County Area of Analysis Based on Actual and Expected Future PTE Emissions

Averaging Period	Data Period	Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
		UTM East	UTM North	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	7-1-2012-6-30-2015	714,550	4,098,043	173.1	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

The Commonwealth's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 173.1 $\mu g/m^3$, or 66.1 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual and expected future PTE emissions from the facilities. This predicted value occurred just northeast of Cooper Station, and is graphically represented along with all the other receptors below in Figure 17.

Figure 17: Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the Pulaski County Area of Analysis Based on Actual and PTE Emissions – Source Air Dispersion Modeling Report Cooper Station SO_2 Designations Analysis Revision 1" prepared by Trinity Consultants for the East Kentucky Power Cooperative, September 1, 2015



Jurisdictional Boundaries:

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

Within the 20 km area of analysis around Cooper Station, 16 SO_2 emitting sources were identified, all within Pulaski County. Only one source, i.e., KMC, has actual annual emissions greater than 2.5 tpy, based on 2013 actual emissions via the Kentucky Emissions Inventory System (KYEIS). With the exception of KMC, the cumulative annual SO_2 emissions from all sources within 20 km of Cooper Station are 8.5 tpy on an actual emissions basis and 40 tpy on a potential emissions basis (KYEIS 2013). In comparison to the modeled SO_2 emission rates from Cooper Station Units 1 and 2, the EPA does not believe that these smaller sources emit SO_2 in quantities that would significantly alter the modeled concentration of SO_2 within the area of analysis. Furthermore, the vast majority of these sources are located to the north of Cooper Station which is in a low frequency wind sector for wind directions causing transport from the regional source locations to the area of highest impacts for Cooper Station.. See Figure 15 above.

An additional review of 38 sources located between 20 and 50 km from Cooper Station, which includes portions of McCleary, Wayne, Russel, Casey, Lincoln, Rockcastle, Laurel, and Whitley Counties resulted in only one source with actual SO_2 emissions above 5 tpy. Specifically, theEKPC Laurel Ridge Landfill-Gas-to-Energy facility (EKPC) has actual annual SO_2 emissions of 36.1 tpy based on the 2013 KYEIS and allowable emissions of 41.3 tpy. EKPC is located approximately 45 km east of the Cooper Station, and approximately 19 km from the Pulaski County border. The London-Corbin airport meteorological station wind rose in Figure 15 above indicates a very low frequency of winds from this direction. Based on the low emissions from this facility in conjunction with the distance from the Pulaski County border, the EPA does not believe that EKPC's emissions are causing or contributing to a violation of the NAAQS in Pulaski County.

The intended unclassifiable area, consisting of the entirety of Pulaski County constitutes a clearly defined legal boundary, and the EPA finds this boundary to be a suitably clear basis for defining our intended unclassifiable area.

Other Relevant Information

The EPA has conducted a review of the modeling performed by Trinity Consultants for the East Kentucky Power Cooperative and provided by the Commonwealth to support their designation recommendation. The EPA's review has identified a number of unresolved concerns regarding the procedures and data used in the modeling which have led to the recommendation of unclassifiable for the Pulaski County Area. The following is a brief summary of significant issues identified in the EPA's review of the modeling:

- The EPA's modeling TAD gives the option of modeling 3-years of actual emissions or allowable emissions. Cooper Power Station operates two coal-fired boilers with

emissions ducted to a common stack. A scrubber was installed in 2012 and put into operation for Unit 2, which has a maximum heat input of 2,089 mmBtu/hr. Emissions from Unit 1, which has a maximum heat input of 1,080 mmBtu/hr, are currently in the process of being ducted to the same scrubber. Cooper modeled Unit 2 with July 2012-July 2015 actual emissions combined with new expected future allowable emissions for Unit 1, using calculated design stack flow rates and temperatures for the two units operating together since they are emitted from a single, common stack. The EPA has determined that using a combination of actual and allowable emissions is not appropriate since the emissions from the two units are combined and emitted from a common stack. The EPA has recommended to the Commonwealth and Cooper Station that the modeling be revised to either use the new expected future allowable (PTE) limits from both units, if made federally enforceable in time to inform the final designation, or to use actual emissions from a common 3-year time period for both units.

- The EPA's review of the modeling documentation indicates that Cooper used the 30-day rolling average allowable emission limit for Unit 1 directly as the 1-hour emission rate input into the AERMOD model. The EPA has developed SO_2 nonattainment implementation guidance[24] which indicates that modeling to determine attainment with the 1-hour SO_2 NAAQS should use a higher 1-hour "critical value" to account for hourly emissions variability in 30-day rolling average allowable limit. The details for the EPA's recommended procedure for calculating the adjustment factor between the 1-hour critical value and the equivalent 30-day rolling average emissions limit are provided in Appendices B and C of the EPA's SO_2 Implementation Guidance. The EPA has informed Kentucky that an appropriate 1-hour critical value must be used if Cooper Station decides to revise their modeling to use allowable (PTE) emissions for both units as discussed above.

The EPA received no additional information regarding Cooper Station or its surrounding area.

Conclusion

The Commonwealth of Kentucky recommended a designation of attainment for the entirety of Pulaski County based on Cooper Station's air dispersion modeling (using AERMOD Model Version 15181) analysis which considered a future allowable emission limit of 0.165 lb SO_2/mmBTU at Unit 1 and actual emissions Unit 2, assuming background concentrations based on rural and natural background sources as well as regional impacts from distance large SO_2 sources. Additional SO_2-emitting sources were identified within the analysis area, which extended 50 km out from Cooper Station. But Cooper Station determined that certain sources that based on the relatively low emissions for sources within 20 km of Cooper Station (less than 2.5 tpy) and for sources outside of Pulaski County, between 20 and 50 km from Cooper Station (less than 5 tpy), the impacts from remaining sources would be significantly reduced in terms of potential overlap with those from Cooper Station. The areas in other counties surrounding these sources will be designated by one of the other deadlines prescribed by the final consent decree,

[24] EPA's "Guidance for 1-hour SO2 Nonattainment Area SIP Submissions," dated April 23, 2014 available at: http://www3.epa.gov/airquality/sulfurdioxide/pdfs/20140423guidance.pdf

i.e., December 31, 2017, or December 31, 2020. Based on these factors, Cooper Station's modeled 1-hour design value for its 50 km area of analysis, covering the entirety of Pulaski County, is 173.1 µg/m^3, or 66 ppb. This modeled concentration is below the level of the 2010 SO_2 NAAQS.

However, it is unclear in the documentation provided by Kentucky and the East Kentucky Power Cooperative whether Cooper Station's new allowable emission limit at Unit 1 will be in place and federally-enforceable prior to final designation of the area around Cooper Station. Furthermore, as indicated above, the EPA would also need to evaluate the emission limit for its applicability for demonstrating compliance with the 1-hour standard due to its identification as a 30-day rolling average.

The EPA has determined that if the new PTE limit at Cooper Station's Unit 1 is federally-enforceable prior to the promulgation of final air quality designations and is consistent with guidance on longer-term average limits, Cooper Station's modeling parameters, assumptions and inputs may still not in compliance with the Agency's Modeling TADs. After careful evaluation of the Commonwealth's recommendation and supporting information, as well as all available relevant information, the EPA believes that the modeling for this Area should be updated. Specifically, the Commonwealth should provide modeling that uses PTE limits for both Units 1 and 2, or actual emissions from both units over a common three-year period.

The EPA intends to designate the area around Cooper Station as unclassifiable for the 2010 SO_2 NAAQS. Specifically, the boundary is comprised of the entirety of Pulaski County, Kentucky. However, if the Commonwealth provides notification of the following to the EPA prior to the promulgation of the July 2, 2016 designation, the EPA may consider designating the entirety of Pulaski County as unclassifiable/attainment, provided that are no outstanding technical issues: 1) assurance that the Cooper Station's new PTE limit of 0.165 lb SO_2/mmBTU for Unit 1 is federally-enforceable, and, as applicable, includes a longer term average limit that the EPA determines is comparatively stringent to a 1-hour limit at the critical emission value; 2) the modeling for Units 1 and 2 at the facility are matched (e.g., PTE emissions or actual emissions over a common time period); and 3) the updated modeling shows that the new PTE limit on Unit 1 or modeled actual emissions will ensure attainment of the NAAQS.

Based on all available information, including the reasons discussed above, the EPA is unable at this time to determine whether the area is meeting or not meeting the NAAQS. At this time, our intended designations for the Commonwealth only apply to this area (Pulaski County) and the other area presented in this technical support document (Ohio County). Consistent with the conditions in the March 2, 2015, court-ordered schedule, the EPA will evaluate and designate all remaining undesignated areas in Kentucky by either December 31, 2017, or December 31, 2020.