Technical Support Document:

Chapter 32
Final Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for Ohio

1. Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (the EPA, we, or us) must designate areas as either "nonattainment," "attainment," or "unclassifiable" for the 2010 1-hour sulfur dioxide (SO_2) primary national ambient air quality standard (NAAQS) (2010 SO_2 NAAQS). Our Notice of Availability (NOA)[1] and our Technical Support Document[2] for our intended designations for the round of designations we are required to complete by December 31, 2017, provided background on the relevant CAA definitions and the history of the designations for this NAAQS. Chapter 1 of this TSD for the final designations explains the definitions we are applying in the final designations. The TSD for the intended Round 3 area designations also described Ohio's recommended designations, assessed the available relevant monitoring, modeling, and any other information, and provided our intended designations.

This TSD for the final Round 3 area designations for Ohio addresses any change by Ohio to Ohio's recommended designations since we communicated our intended designations for areas in Ohio. It also provides our assessment of additional relevant information that were submitted too close to the signature of the NOA to have been considered in our intended designations, or that have been submitted by Ohio or other parties since the publication of the NOA. This TSD does not repeat information contained in the TSD for our intended designations except as needed to explain our assessment of the newer information and to make clear the final action we are taking and its basis, but that information is incorporated as part of our final designations. If our assessment of the information already considered in our TSD for our intended designations has changed based on new information and we are finalizing a designation based on such change in our assessment, this TSD also explains that change. For areas of Ohio not explicitly addressed in this chapter, we are finalizing the designations described in our 120-day letters and the TSD for the intended Round 3 area designations. All the final designations are listed in Table 1 below.

The EPA is finalizing designations different from our intended designations for Cuyahoga County and Lorain County, based on our analysis of submittals and comments from the state. Ohio submitted a final permit for Charter Steel in Cuyahoga County. This permit supports the modeling analysis Ohio previously submitted to demonstrate that monitored violations in the

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[1] EPA Responses to Certain State Designation Recommendations for the 2010 Sulfur Dioxide Primary National Ambient Air Quality Standard: Notification of Availability and Public Comment Period, September 5, 2017 (82 FR 41903)

[2] Technical Support Document: Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard, August 2017. https://www.epa.gov/sulfur-dioxide-designations/initial-technical-support-documents-area-designations-round-3

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area were due to uncharacteristic fugitive emissions at Charter Steel and that the new permit restrictions will prevent further violations and yield current compliance with the 2010 SO_2 NAAQS.

ArcelorMittal, another facility in Cuyahoga County, also submitted comments on the intended designation for Cuyahoga County. Those comments are addressed in the response to comments document associated with this final action. Similar comments from Ohio are also addressed in the response to comments document.

Ohio and a power company (GenOn) submitted comments on the EPA's intended designations to justify the operating scenarios which had been modeled for Lorain County as representing worst case allowable emissions. The EPA's analysis of these comments led the EPA to conclude that the results of the Lorain County modeling analysis were representative of current air quality and supported a final designation of attainment/unclassifiable for that area.

For the areas in Ohio that are part of the Round 3 designations process, Table 1 identifies the EPA's final designations and the counties or portions of counties to which they apply. It also lists Ohio's current recommendations. The EPA's final designations for these areas are 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.

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Table 1. Summary of the EPA's Final Designations and the Designation Recommendations by Ohio

Area/County	Ohio's Recommended Area Definition	Ohio's Recommended Designation	EPA's Intended Designation	EPA's Final Area Definition	EPA's Final Designation[3]
Adams	Entire County	Unclassifiable/ Attainment	Unclassifiable/ Attainment	Same as State's	Attainment/ Unclassifiable
Coshocton	Entire County	Unclassifiable/ Attainment	Unclassifiable/ Attainment	Same as State's	Attainment/ Unclassifiable
Cuyahoga	Entire County	Unclassifiable/ Attainment	Nonattainment[a]	Same as State's	Attainment/ Unclassifiable
Hamilton	Entire County	Unclassifiable/ Attainment	Unclassifiable/ Attainment	Same as State's	Attainment/ Unclassifiable
Jefferson (p)	Partial County[b]	Unclassifiable/ Attainment	Unclassifiable/ Attainment	Same as State's	Attainment/ Unclassifiable
Lorain	Entire County	Unclassifiable/ Attainment	Unclassifiable	Same as State's	Attainment/ Unclassifiable
Lucas	Entire County	Unclassifiable/ Attainment	Unclassifiable/ Attainment	Same as State's	Attainment/ Unclassifiable
Ottawa, Sandusky	Entire Counties	Unclassifiable/ Attainment	Unclassifiable/ Attainment	Same as State's	Attainment/ Unclassifiable
Seneca	Entire County	Unclassifiable/ Attainment	Unclassifiable/ Attainment	Same as State's	Attainment/ Unclassifiable
Remaining Areas in State[c]	All full or partial counties not yet designated	Unclassifiable/ Attainment	Unclassifiable/ Attainment	Same as State's	Attainment/ Unclassifiable

[a]Intended nonattainment designation applied to a portion of three municipalities, as described in the TSD for the intended designations; the intended designation for the remainder of the county was unclassifiable/attainment.
[b]All townships except Cross Creek, Steubenville, Warren, and Wells Townships and Steubenville City.
[c] The EPA is designating the remaining undesignated counties (or portions of counties) in Ohio as separate "attainment/unclassifiable" areas. These areas that we are designating as attainment/unclassifiable (those to which this row of this table is applicable) are identified more specifically in Section 12 of Chapter 32 (applicable to Ohio) of the TSD for the intended designations.

[3] Refer to Chapter 1 of Technical Support Document: Final Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for definitions of the designation categories and the terminology change from Unclassifiable/Attainment to Attainment/Unclassifiable.

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2. Technical Analysis of New Information for Cuyahoga County

2.1. Introduction

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

Cuyahoga County has one source on the DRR source list, namely Medical Center. Medical Center opted to replace its two coal-fired boilers with a natural gas boiler by January 13, 2017. The facility's new SO_2 emission limit is 1.18 tons per year (tpy). Ohio has revised the federally enforceable permit-to-install for Medical Center to reflect the new boiler, limits, and fuel. Ohio submitted this permit, which was effective on October 5, 2015, to the EPA. Therefore, Ohio submitted no modeling of the impacts of this source.

However, recent monitoring data indicated a violation of the SO_2 NAAQS. Specifically, the 2014-2016 design value for a monitor located in Newburgh Heights was 168 ppb. Ohio submitted modeling and other analyses demonstrating that this violation was predominantly due to fugitive SO_2 emissions from Charter Steel during limited time periods. Ohio also issued a draft permit to Charter Steel with emission limits and provisions to control the fugitive emissions, which Ohio believes will prevent recurrence of the monitored violations. The TSD for the intended Round 3 area designations reviewed these analyses and concluded that in absence of a final permit, the area must be designated nonattainment, but also stated that final issuance of a suitable permit and evidence of compliance with that permit, in combination with evidence that the final permit requires the conditions that Ohio modeled (or, alternatively, revised modeling reflecting any revised terms in the final permit) would warrant a final designation of unclassifiable/attainment for Cuyahoga County.

Ohio has since issued a final permit for Charter Steel and provided it to the EPA along with evidence of compliance with the permit. The primary purpose of this subsection of this Chapter is to review whether this final permit warrants a final designation of attainment/unclassifiable for this area.

2.2. Summary of Information Reviewed in the TSD for the Intended Round 3 Area Designations

In the 120-day letter notification to the governor of Ohio, and further explained in Chapter 32 of the TSD for the Intended Round 3 Area Designations (hereafter, "the intended designations TSD for Ohio "), the EPA proposed a designation of nonattainment for a specified portion of Cuyahoga County based on all available information, most notably based on data from a monitor measuring a violation of the SO_2 standard and also based on review of other relevant modeling

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and monitoring information.

On June 28, 2017, the Ohio Environmental Protection Agency submitted various evidence linking the monitored violation with emissions from a steel manufacturing source known as Charter Steel, along with modeling intended to demonstrate that a draft permit that Ohio issued on June 12, 2017, if issued in final form, would assure that this area within Cuyahoga County would attain the standard. For convenience, this modeling analysis will be referred to here as Ohio's attainment modeling for the Charter Steel area. The following table, Table 2, identifies this analysis.

Table 2. Modeling Assessments Evaluated in the TSD for the Intended Designation for the Charter Steel Area

Organization Submitting Assessment	Date of the Assessment	Identifier used in the TSD for the Intended Round 3 Area Designations, Chapter 32	Distinguishing or Otherwise Key Features
Ohio	June 28, 2017	Ohio's Charter Steel attainment modeling	Reflects compliance with new, then-draft permit

In summary, while three monitors in Cuyahoga County indicate attainment of the SO_2 standard, a monitor in Newburgh Heights, monitor number 39-035-0065, recorded a design value for 2014 to 2016 of 168 ppb. This monitor is approximately 300 meters north of Charter Steel. As stated in the intended designations TSD for Ohio, "The facility has a sizable opening, called the West End Door, through which the company brings in scrap metal and other materials for charging into its electric arc furnace. As a result of high winds during this period, the door of this opening was stuck in the open position, resulting in unusual air flow within the building during the winter month of February 2016. Charter Steel's emissions are generated as fugitive emissions, at the surface of the steel within the furnace vessel. Ordinarily a high volume capture system is highly efficient at capturing these emissions, but Ohio hypothesized that the open door disrupted this capture, resulting in a substantial fraction of the emissions escaping out this door." Ohio provided various evidence in support of this hypothesis, including modeling demonstrating that an increase of fugitive emissions up to "5 percent of the facility's emissions could reasonably result in concentrations at the Newburgh Heights monitoring location similar to those monitored in February 2016." Based on these findings, Ohio issued a draft permit for Charter Steel, imposing restrictions on operation of the West End Door and establishing emission limits designed to assure attainment.

The modeling that Ohio submitted on June 28, 2017, was designed to characterize air quality expected near Charter Steel once terms specified in a draft permit (issued on June 12, 2017) were

final, federally enforceable, and in effect. This analysis used AERMOD version 16216, urban dispersion characteristics, a suitable receptor network, source characteristics, and appropriate consideration of area meteorology, topography, and background concentrations. However, the EPA did not concur with the emission rates and distribution of emissions between stack emissions and fugitive emissions used in this analysis. In particular, while the Modeling TAD offers an option of modeling allowable conditions (e.g., as here, considering constraints that will yield less fugitive emissions than occurred in 2016), the requirements that are reflected in Ohio's analysis were not yet required because Ohio had not yet issued a final permit establishing those requirements. Nevertheless, the intended designations TSD for Ohio stated that "issuance of a final permit for Charter Steel with [these] limitations [and fully addressing EPA comments on the draft permit] would make Ohio's treatment of allowable emissions in the modeling from Charter Steel fully in accordance with the Modeling TAD."

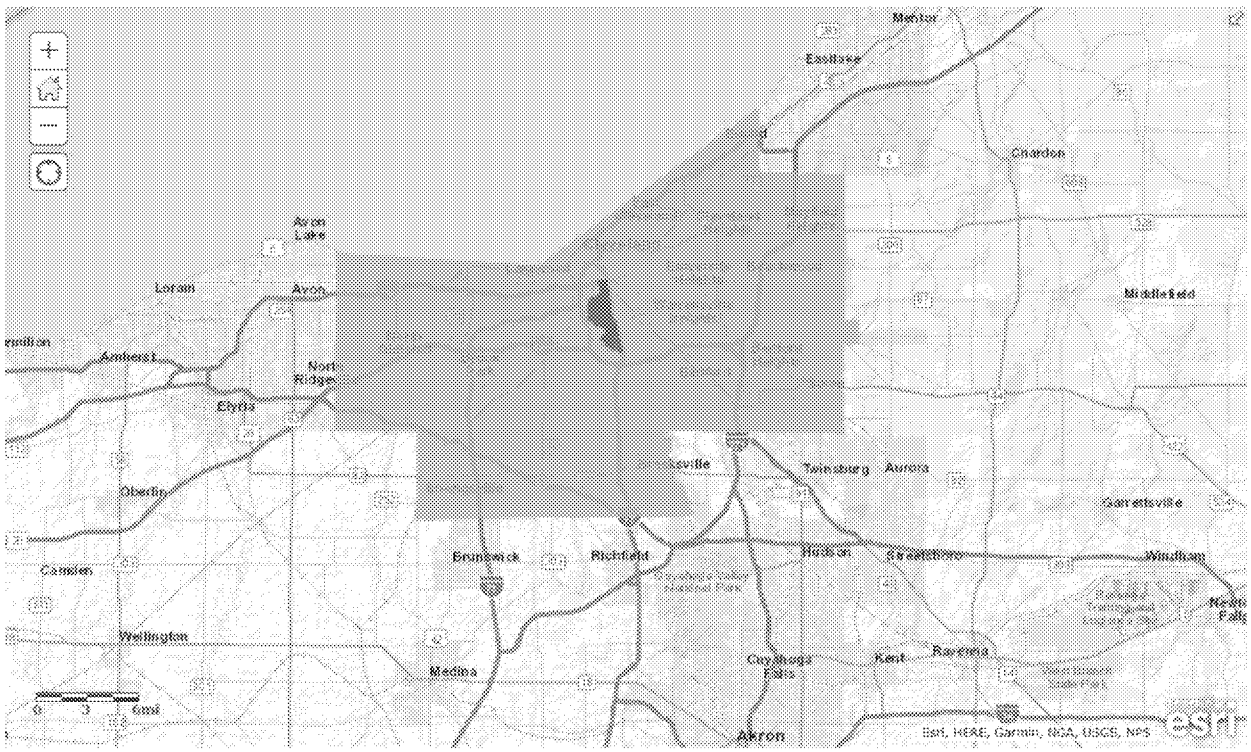
At issue in this area is how to weigh arguably conflicting monitoring information and modeling information, where the monitoring data unequivocally identify a violation of the SO_2 standard for 2014 to 2016 but where a modeling analysis indicates that compliance with terms of a permit will yield attainment. The intended designations TSD for Ohio fully describes this issue:

> "When designating areas, the EPA does not consider anticipated future emission reductions that are not yet federally effective and in force. The EPA believes that the currently available monitoring evidence of nonattainment represents the most reliable indicator of air quality in the Newburgh Heights area. The Modeling TAD offers two options for modeling air quality, including one option that considers actual air quality over the most recent three-year period and one option that considers more recent allowable air quality, but the Modeling TAD does not speak to how modeling of either type is to be weighed against monitored air quality. Nevertheless, the EPA interprets its Modeling TAD to provide that if a source is complying with emission limits that have been shown to assure that the area is attaining the standard, the area may be designated accordingly, even if the source has reduced emissions too recently to make possible the collection of three years of monitoring data reflecting the reduced emission conditions. The Modeling TAD offers this approach as an alternative to modeling actual emissions over the most recent available three-year period. This approach would also require that the state provide persuasive evidence that enforceable changes in circumstances have changed air quality sufficiently now to reflect the air quality modeled to occur with allowable emissions. The EPA believes that Ohio has provided adequate evidence that the high exceedances monitored in 2016 were attributable in substantial part to a malfunction at Charter Steel's West End Door and the consequential substantial fugitive emissions, and the EPA believes further that replacement of this door and restrictions on door operation (mitigating fugitive emissions) in combination with establishment of suitable emission limits will result in considerable improvement in air quality in accordance with Ohio's modeling of allowable emissions. Consequently, if Ohio issues a permit that imposes emission limits and door limitations that are suitably enforceable that mandate the conditions reflected in the already submitted modeling analysis (or, alternatively, that impose adjusted limitations that an adjusted modeling analysis shows

will yield attainment), and if Ohio certifies that Charter Steel is complying with these limitations by the end of the period for state responses to the EPA's 120-day letter, the EPA anticipates designating this area as unclassifiable/attainment." *See* Technical Support Document: Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard, Chapter 32 (addressing Ohio), pages 66-67.

Given that no final permit for Charter Steel had been issued by the time the EPA sent its 120-day letter to Ohio, the remainder of the Cuyahoga section of the intended designations TSD for Ohio reviewed the appropriate boundaries of the intended nonattainment area based on the monitored violation. Other monitors in Cuyahoga County are monitoring attainment, and the EPA determined that the area either violating the standard or contributing to those violations was a limited area including Charter Steel, the violating monitor, and a neighboring source, namely ArcelorMittal. The intended boundaries of this area were identified as the portions of the Cities of Cleveland, Newburgh Heights, and Cuyahoga Heights that are south of I-490, west of I-77, and east of the Cuyahoga River. A map of this intended nonattainment area is shown in Figure 1 below, replicating Figure 5-7 of the intended designations TSD for Ohio.

Figure 1. The EPA's Intended Designation for Cuyahoga County



2.3. Assessment of New Air Quality Monitoring Data for the Cuyahoga County Area

This factor considers the SO_2 air quality monitoring data in the area of Cuyahoga County. The intended designations TSD for Ohio considered available data through 2016 for four monitoring sites. We do not have certified data for any additional complete calendar years at any site, and we have no new monitoring information of any other type that warrants revising our prior analysis of available monitoring data. As noted above, these data indicate a monitored violation in Newburgh Heights (at monitor number 39-035-0065) for the 2014 to 2016 period, which must be weighed along with available modeling data. Nevertheless, quality assured and uncertified data for the first 9 months of 2017 indicate a highest concentration at this site of 37 ppb, consistent with Ohio's finding that control measures at Charter Steel have resulted in this area attaining the standard.

2.4. Assessment of New Modeling-Related Information Regarding Air Quality in Cuyahoga County

As noted above, neither Ohio nor any other party submitted new modeling for Cuyahoga County. Instead, Ohio submitted a copy of a final permit it issued to Charter Steel on October 2, 2017, effective October 9, 2017, along with reiteration of its rationale that the limits in this permit have now controlled the fugitive emissions that were the primary cause of the monitored violations and assured that the area is now attaining the SO_2 standard.

This new information requires a revised evaluation of whether Ohio's modeling analysis reflects appropriate model inputs for source characterization and emissions. An earlier evaluation was provided in sections Section 5.3.6 of the intended designations TSD for Ohio, addressing the emissions that Ohio modeled. In that evaluation, the EPA noted the absence at that time of a final permit for Charter Steel, so that the modeling was relying on permit limitations that were not effective or federally enforceable. Similarly, Section 5.3.11, describing the EPA's assessment of Ohio's modeling information, noted how the issuance of a final permit to Charter Steel could potentially change the EPA's evaluation of whether it could rely on the state's modeling to characterize air quality in this portion of Cuyahoga County. These issues are fully reanalyzed below, addressing the EPA's current view of the appropriateness of the emissions that Ohio modeled and the overall suitability of Ohio's modeling analysis, respectively, in the new context of Ohio having issued a final permit to Charter Steel.

The state modeling reviewed in the intended designations TSD for Ohio remains the only modeling analysis of air quality near Charter Steel, and neither Ohio nor any party has commented on other elements of the analysis or provided information to warrant reevaluation of any of the other elements of Ohio's modeling analysis. The EPA's final analysis of these other elements of Ohio's modeling remain as described in the intended designations TSD for Ohio and as repeated below. Specifically, the following sections of the intended designations TSD for Ohio are repeated in the corresponding sections below:

Section 5.3.2 – Model Selection and Modeling Components
Section 5.3.3 – Modeling Parameter: Rural or Urban Dispersion

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Section 5.3.4 – Modeling Parameter: Area of Analysis (Receptor Grid)
Section 5.3.5 – Modeling Parameter: Source Characterization
Section 5.3.7 – Modeling Parameter: Meteorology and Surface Characteristics
Section 5.3.8 – Modeling Parameter: Geography, Topography and Terrain
Section 5.3.9 – Modeling Parameter: Background Concentrations of SO_2

The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance cited in Chapter 1 of this TSD, as appropriate.

2.4.1. Model Selection and Modeling Components

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

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

The state used AERMOD version 16216r in the regulatory default mode. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows. AERMOD version 16216r is the current regulatory version of AERMOD. The modeling for the Newburgh Heights area did not use the adjusted surface friction velocity (ADJ_U*) parameter in AERMET, for consistency with other analyses of this area.

2.4.2. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Ohio evaluated land use in the area and determined that the area should be considered urban for modeling purposes. Ohio used the population of the Cleveland metropolitan area, 2.3 million, as an indicator of the degree of urban heat island. Given the industrialized nature of the immediate area, and the urban character of Cleveland and neighboring Newburgh Heights, the EPA concurs that this area warrants being modeled as an urban area.

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

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

The state used a grid of receptors focused on impacts from Charter Steel. The grid included a total of 4,479 receptors. Receptors were placed every 50 m along the fenceline of Charter Steel extending out either to 400 m (north and east, the predominant wind directions) or to 300 m (west of the source). Receptors were placed at 100 m intervals out an additional 600 m. South of the source, receptors were placed every 100 m out to 400 m from the source. Beyond this grid, receptors were placed every 200 m out an additional 4 km in all directions. Figure 2 shows the state's receptor grid.

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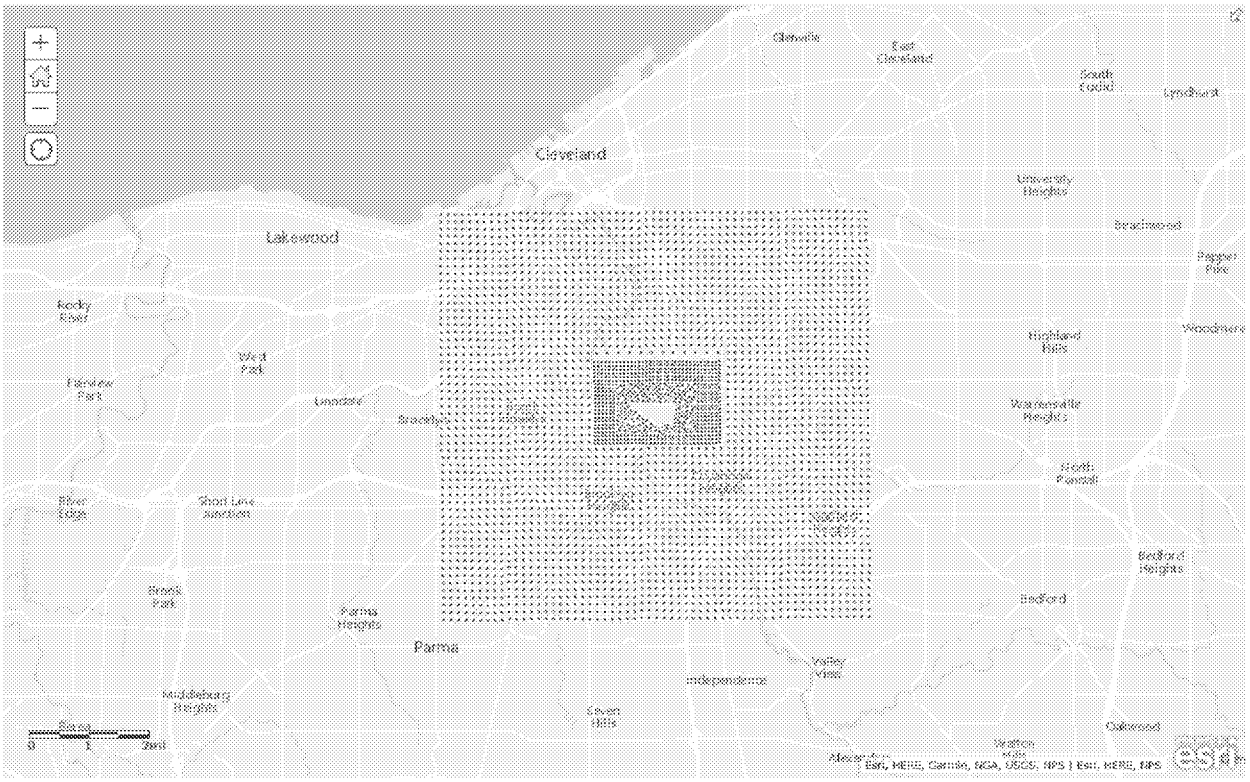
Figure 2. Receptor Grid for the Newburgh Heights Area of Analysis



This receptor grid is smaller than Ohio's other receptor grids. The maximum concentration is expected to be close to Charter Steel, because the emission release heights are low, the source is small, and the modeling only included one source. As discussed below, this receptor grid was adequate to include the area of maximum concentrations near Charter Steel. The EPA believes that this receptor grid was adequate to assess whether any portion of the area near Charter Steel is violating the standard.

Figure 3, included in the state's recommendation, show the state's chosen area of analysis surrounding Charter Steel along with nearby monitoring sites.

Figure 3: Newburgh Heights Area of Analysis

2.4.4. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions or following GEP policy with allowable emissions. As discussed below, the state modeled only Charter Steel in its analysis, as the impact of other sources in the area were determined by the state to be adequately represented as part of the background concentration.

The state characterized Charter Steel in accordance with the best practices outlined in the Modeling TAD. The primary releases from Charter Steel are from its two baghouse stacks, for both of which the actual height of 45.7 m is also the GEP height. The state modeled these GEP stack heights in conjunction with allowable emissions for the electric arc furnace emissions that are vented from these furnaces. The state modeled fugitive (uncaptured) emissions from the facility's operations as volume sources, using a 14 m release height for emissions escaping the roof vents and a 4 m release height for emissions escaping the west end door. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The AERMOD component BPIPPRM 04274 was used to assist in addressing building downwash.

2.4.5. Modeling Parameter: Emissions

Ohio's response to the EPA's 120-day letter provided a copy of the final permit for Charter Steel, issued on October 2, 2017, and effective October 9, 2017. Ohio's response also included a document responding to comments that Ohio received from the EPA and from Charter Steel regarding the draft permit. In Section 5.3.6 of the intended designations TSD for Ohio, the EPA expressed concern that the modeled Charter Steel emission levels reflected draft emission limits that were not effective or enforceable. Now that Ohio has issued its final permit for Charter Steel, the EPA reviews, later in this section, whether the emission rates that Ohio modeled may be considered to correspond to effective and federally enforceable limitations on Charter Steel.

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

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

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emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models." Further discussion of the use of allowable emissions for characterizing air quality is provided in Section 5.4 of the Modeling TAD.

For Charter Steel, the state utilized this option to model then anticipated allowable SO_2 emissions. Specifically, the draft permit established an emission limit of 166.1 pounds per hour, which corresponds to the allowable emission level summarized in Table 3, and which Ohio used in its modeling analysis.

Table 3. Charter Steel Allowable SO_2 Emissions

Facility Name	Allowable SO_2 Emissions (tpy)
Charter Steel	728[4]

These allowable emissions were premised on a final permit being issued that mirrored the draft permit Ohio issued to Charter Steel on June 12, 2017. The final permit mandated the same emission limit as was contained in the draft permit, and so the modeled emission rate now corresponds to a federally enforceable emission limit that was effective as of October 9, 2017.

The Charter Steel permit also specifies requirements for proper operation of a large door in the facility, known as the "West End Door," through which the company brings in iron scrap for processing. Ohio's investigation into causes of high concentrations monitored at the Newburgh Heights site in February 2016 determined that malfunctioning of this door appeared to be a critical factor in why elevated SO_2 concentrations occurred. Since SO_2 emissions originate in the steelmaking vessel as fugitive emissions, with a high volume emissions capture system designed to capture a high percentage of these emissions (and the associated particulate matter emissions), a disturbance in the airflow in the building caused by a large building opening being open (perhaps particularly in the winter) has the potential to have significant effects on capture efficiency and thus on the proportion of emissions that are emitted as fugitive emissions rather than as stack emissions. Modeling in Ohio's June 28, 2017, submittal addressed the impact of 5 percent of SO_2 emissions being emitted as fugitive emissions rather the 0.05 percent that Ohio estimated to be emitted when emission capture is occurring normally. This modeling showed concentrations at levels comparable to the violating levels monitored in February 2016, unlike the attaining levels observed during normal conditions.

During February 2016, the West End Door was stuck open. This door has since been replaced by a sturdier door that is less prone to malfunction and remain open. The permit imposes various requirements designed to assure that the door is open for the minimum possible time when scrap is coming through the door, generally less than five minutes per episode. Since the process of

[4] The TSD for the intended Ohio designations mistakenly listed allowable emissions as 706 tons of SO_2 per year. Since Ohio modeled 728 tons per year of allowable emissions, this mistake does not affect the EPA's review of Ohio's analysis or the final designation for the area.

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steelmaking involves a limited number of occasions of scrap being brought into the building, and since Charter Steel therefore opens the door only a few times per hour, these requirements effectively assure that the door will be closed the great majority of the time. These requirements help minimize disruption to airflow in the building and thus may be considered requirements that limit allowable fugitive emissions. Although fugitive emissions by definition cannot be measured by stack test methods, and although therefore it is infeasible to establish a precise quantity of fugitive emissions that any particular set of work practice requirements allow, the EPA finds that Ohio has reasonably estimated that the requirements for the West End Door to be open only for minimal periods (in combination with opacity limits that require high emissions capture efficiency) will require that fugitive emissions be no more than 0.05 percent of total emissions.[5]

On July 18, 2017, the EPA provided comments to Ohio regarding the draft permit, including recommendations for improving the enforceability of the proposed limitations. These comments included a recommendation that Ohio establish an upper limit on the sulfur content of the steel that Charter Steel produces or otherwise establish constraints that assure that 166.1 pounds of SO_2 per hour is the maximum emissions that Charter Steel will emit. Such a limit would help assure that tests for compliance can be more effectively designed to assess compliance under worst case conditions. The EPA had no comments on the requirements relating to door operation.[6]

In its 120-day letter to Ohio, the EPA stated an intent to designate an area near Charter Steel as nonattainment based on evidence available at that time (notably including an absence of a final permit making necessary limitations enforceable), but the EPA also stated an expectation that it would designate the area as unclassifiable/attainment if Ohio met specified conditions for assuring attainment in the area. Specifically, Section 5.7 of the intended designations TSD for Ohio stated, "if Ohio issues a final permit for Charter Steel requiring the conditions that Ohio has modeled as yielding attainment, and Ohio certifies that Charter Steel is required to comply and has complied with these requirements by the end of the state response period, the EPA anticipates designating this area as unclassifiable/attainment." The EPA sought this evidence in order to support a finding that current air quality is as good or better than the air quality modeled with allowable emissions.

On October 2, 2017, Ohio issued a final permit to Charter Steel, effective October 9, 2017. The final permit establishes the requirements as proposed in the draft permit, with clarifications to address the EPA's comments regarding enforceability. The stack emission limit in this permit, 166.1 pounds of SO_2 per hour, corresponds to the allowable emission level that Ohio modeled. The final permit clarifies that the maximum sulfur content of steel that Charter Steel will be producing shall be 0.35 percent sulfur. The restrictions on door operation have the effect of limiting fugitive emissions, and may be considered to restrict fugitive emissions to the 0.05 percent level that Ohio modeled. In its October 20, 2017, letter, Ohio certifies that Charter Steel

[5] The estimate of 0.05 percent of emissions escaping capture is not dependent on the West End Door always being shut. This estimate reflects a view that occasional brief periods of the West End Door being open will not seriously disrupt emission capture at the furnace, which (as is common in the steel industry) is a high efficiency capture system.

[6] The permit to Charter Steel was for a major modification in a $PM_{2.5}$ nonattainment area. A majority of the EPA's comments pertained to requirements applicable to such permits, and were not germane to whether the permit would appropriately limit stack and fugitive emissions.

replaced its malfunctioning door in July 2016, Ohio certifies that the applicable limitations are effective and that any future noncompliance would result in enforcement action as appropriate, and more generally Ohio certifies to the best of its knowledge that Charter Steel is complying with the limitations in the permit. Based on this evidence, the EPA concludes that the modeling that Ohio provided on June 20, 2017, may now be considered to reflect appropriate estimates of allowable emissions at Charter Steel, and the EPA finds that this modeling provides a conservative assessment of current air quality.

Several other Cuyahoga County facilities have reduced their SO_2 emissions in recent years. The Medical Center Company (MCCo), a local heating and energy supplier, was Cuyahoga County's only DRR source. Its 2014 SO_2 emissions were 2,403 tons. MCCo opted to replace its two coal-fired boilers with a natural gas boiler by January 13, 2017. The facility's new SO_2 emission limit is 1.18 tpy. Ohio has revised the federally enforceable permit-to-install for MCCo to reflect the new boiler, limits, and fuel. Ohio submitted this permit, which included limits effective on October 5, 2015, to the EPA.

Cleveland Electric Illuminating Co., (FirstEnergy Generation, LLC) Lake Shore Plant, a coal-fired power plant, permanently shut down on December 17, 2015. Its 2014 SO_2 emissions were 665 tons. Ohio submitted a letter dated December 17, 2015, verifying this enforceable shutdown to the EPA.

Cleveland Thermal LLC, which emitted 1,063 tons in 2014, opted to retire its coal-fired boilers and all but two of its oil-fired boilers by January 13, 2017. Cleveland Thermal LLC has entered into a federal consent decree which mandates the new boiler configuration, limits, and allowable fuels, which establishes a federally enforceable requirement for the largest units at this plant, historically emitting about 99 percent of the facility's emissions, to be shut down by January 13, 2017. Ohio included a copy of this December 29, 2015, consent decree, in its January 13, 2017, submittal to the EPA.

The combination of the emission reductions at these three facilities brings Cuyahoga County's emissions below 2,000 tpy as a whole. Table 4 identifies the sources in Cuyahoga County that have taken an annual emissions limit of 2,000 tpy or below (including one source listed under the DRR) and sources that have shut down or ceased coal combustion through federally enforceable measures that are in effect.

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Table 4. Sources Taking an Emissions Limit or Shutting Down in Cuyahoga County

County	Facility	New PTE/Limit	Annual SO_2 Emissions (tpy)		
			2014	2015	2017 expected
Cuyahoga	The Medical Center Company	1.18 tpy	2,403	2,322	<1
Cuyahoga	Cleveland Thermal LLC	Shut coal boilers 01/13/2017	1,063	821	11
Cuyahoga	Cleveland Electric Illuminating Co., Lake Shore Plant	Shut down 12/17/2015	665	<1	0
County Total (includes other facilities)			**5,792**	**4,767**	**1,635**

Table 5 shows Charter Steel and other sources in Cuyahoga County along with their 2014 emission levels and their distance from Charter Steel. Aside from Charter Steel, this table only shows sources with 2014 emissions of over 100 tpy, and this table does not show Medical Center or other sources that have federally enforceable limits or fuel switches that result in allowable emissions below this emission level as described previously.

Table 5. Significant Sources in Cuyahoga County in Relation to Charter Steel

Facility	Municipality	2014 Emissions (tpy)	Distance, Direction from Charter Steel
Charter Steel	Cuyahoga Heights	84	--
ArcelorMittal	Cleveland	981	2 km, N
DiGeronimo Aggregates	Cleveland	514	10 km, SE

In developing inputs for modeling the area near Charter Steel and the Newburgh Heights monitor, Ohio needed to determine whether to model the emissions of ArcelorMittal explicitly, or whether instead to address the impacts of ArcelorMittal as part of the background concentration. Ohio conducted an extensive analysis of conditions under which the Newburgh Heights monitor violates the standard. Ohio concluded that violations at this monitor occur with winds generally from the southern quadrant, during which time emissions from ArcelorMittal (located north of the monitor) would not influence monitored concentrations. On this basis, Ohio determined that modeling to address concentrations in the area of the Newburgh Heights monitor should focus on impacts of Charter Steel and need not explicitly model the impacts of ArcelorMittal, so long as potential impacts of ArcelorMittal are reflected in an appropriately determined background concentration. More generally, Ohio examined available monitoring data from the four monitors in Cuyahoga County and determined that the primary area with a

potential to violate the standard was a relatively limited area near Charter Steel (an area that includes the Newburgh Heights monitor). While the purpose of Ohio's modeling is to determine air quality throughout the relevant area, not just at the Newburgh Heights monitoring site, Ohio concluded that the concentrations in this area were most strongly influenced by emissions by Charter Steel, and a reasonable assessment of concentrations in this area could be conducted by modeling only Charter Steel explicitly, so long as ArcelorMittal's potential impacts were included by means of an appropriate background concentration.

As discussed in section 2.4.8 below, Ohio used the design value from a monitor located just northeast of ArcelorMittal (site number 39-035-0045, a monitor at 4950 Broadway in Cleveland) to determine a background concentration for this analysis and thereby to represent impacts from ArcelorMittal and any other SO_2 emissions in the area other than from Charter Steel. This design value is 23 ppb (60.2 $\mu g/m^3$). Given that this value is prone to overstate the impacts of ArcelorMittal and other background sources in the area near Charter Steel, the EPA finds that use of the design value at the Broadway monitor as the background concentration in Ohio's modeling analysis adequately accounts for the impacts of ArcelorMittal and other background sources in the area near Charter Steel without modeling the other sources explicitly. The EPA thus concludes that Ohio's analysis appropriately directly models only the emissions of Charter Steel.

2.4.6. Modeling Parameter: Meteorology and Surface Characteristics

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

For the Newburgh Heights area of analysis, the state selected the surface meteorology from the NWS site at Cleveland's Hopkins International Airport (KCLE, NWS station number 14820), approximately 16 km west of the source, and coincident upper air observations from the Buffalo, New York Airport (KBUF, NWS station number 14733), approximately 291 km northeast of the source, as best representative of meteorological conditions within the area of analysis.

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

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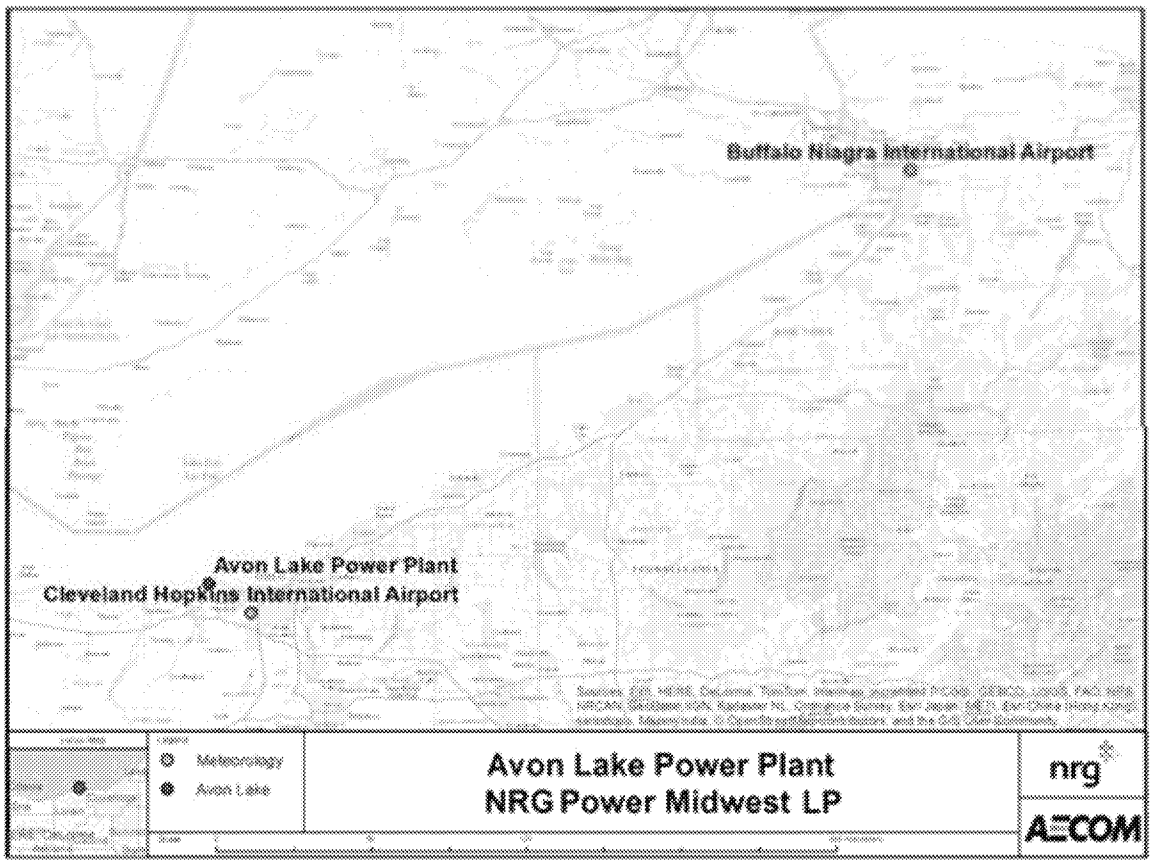
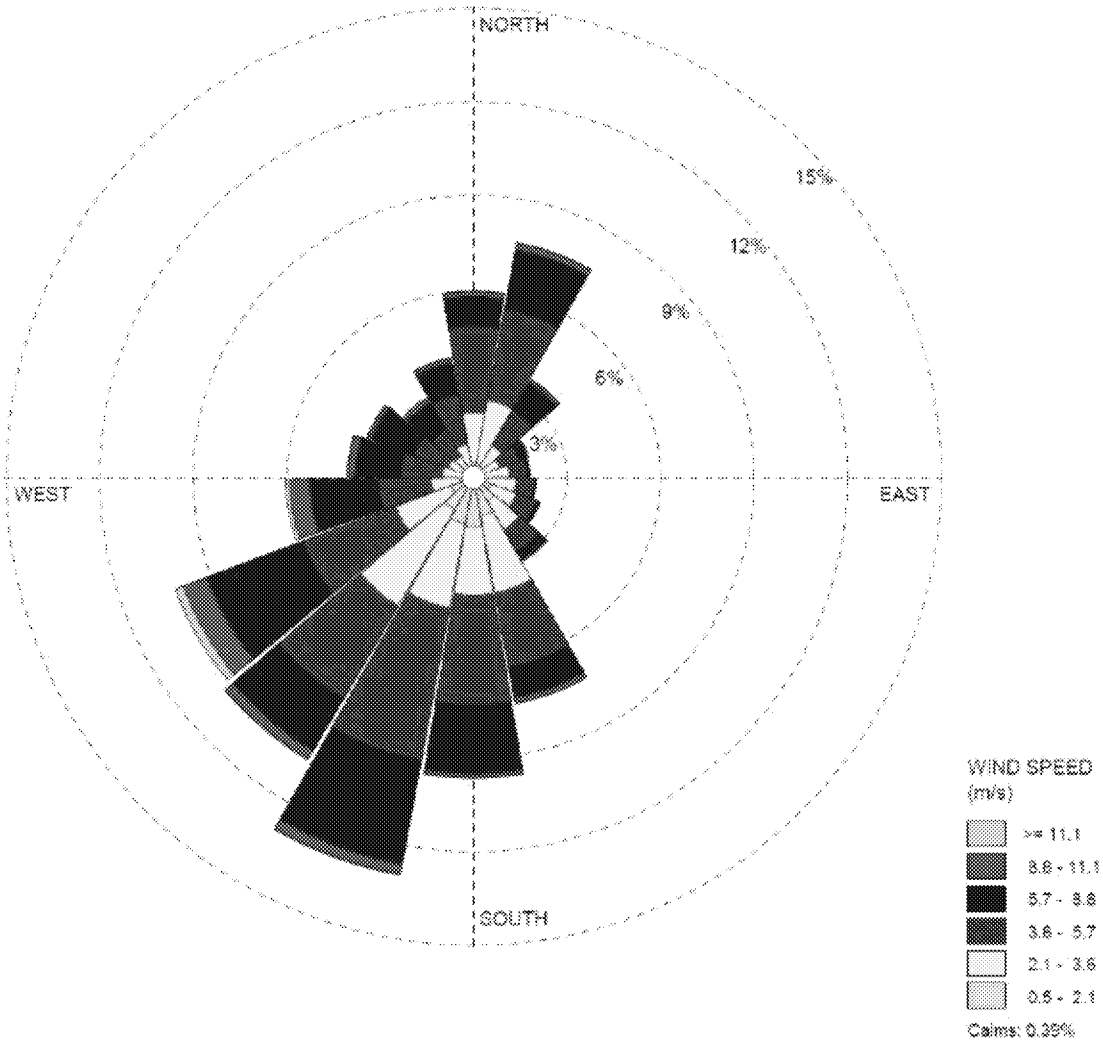
County analysis, the Cleveland analysis uses the same meteorological data as the Lorain County analysis, so the same figure is helpful for illustrating the data used in both analyses. For reference, the Newburgh Heights monitor is approximately 33 km east of the Avon Lake source in Lorain County)

Figure 4. NWS station location for the Newburgh Heights Area of Analysis



As part of its recommendation, the state provided the 3-year surface wind rose for the Cleveland Airport. In Figure 5, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The wind rose shows a very strong southwest component. Winds are less frequent from the east than from the west and north.

Figure 5: Cleveland Airport Wind Rose for 2012-2014



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET version 16216 processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in the SO_2 Modeling TAD and the SO_2 Designation Guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. Ohio did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. In order to best represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Cincinnati Northern Kentucky Airport and was processed with the AERMINUTE preprocessor. These data

were subsequently input into AERMET to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and are less prone to over-report calm wind conditions than standard NWS hourly data. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data. The EPA concurs with the meteorological data and surface characteristics components of Ohio's modeling assessment.

2.4.7. Modeling Parameter: Geography, Topography and Terrain

Charter Steel is in the Cuyahoga River Valley, an area with moderate terrain features. Nevertheless, the geographical and topographical features of the area are not considered to significantly influence air pollution transport or dispersion. To account for these terrain changes, the AERMAP version 11103 terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. The EPA concurs with Ohio's treatment of the local terrain.

2.4.8. Modeling Parameter: Background Concentrations of SO_2

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

Since Ohio was modeling only the impact of Charter Steel, and the primary background source (not explicitly modeled) was ArcelorMittal in Cleveland, Ohio used a background concentration equal to the design value at the monitoring site just northeast of ArcelorMittal, site number 39-035-0045, located in Cleveland approximately 2 kilometers north of Charter Steel. Given this purpose of obtaining a conservative (prone to overstate) representation of impacts from ArcelorMittal (and other Cleveland sources) at the areas of maximum concentrations near Charter Steel, Ohio made no exclusions by wind direction. The EPA concurs with this approach. The background concentration for this area of analysis determined by this means was 23 ppb, which is equivalent to 60.2 $\mu g/m^3$.[7] While this is a higher background concentration than would normally be used if secondary sources were modeled directly, this background value is appropriate here given that the concentration is designed to include the impacts of ArcelorMittal and other sources that were not directly included in this modeling analysis.

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

2.4.9. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for Ohio's June 20, 2017, modeling submittal of the Newburgh Heights area of analysis are summarized below in Table 6, which are identical to those included in the intended designations TSD for Ohio except for editing to reflect that pertinent limits for Charter Steel are now in place.

Table 6. Summary of AERMOD Modeling Input Parameters for the Newburgh Heights Area of Analysis

Input Parameter	Value
AERMOD Version	16216r (default)
Dispersion Characteristics	Urban (Population: 2.3 million)
Modeled Sources	1
Modeled Stacks	2 point and 4 volume sources
Modeled Structures	2
Modeled Fencelines	1
Total receptors	4,479
Emissions Type	Allowable
Emissions Years	--
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Cleveland Airport (KCLE, 14820)
NWS Station Upper Air Meteorology	Buffalo, NY (KBUF, 14733)
NWS Station for Calculating Surface Characteristics	Cleveland Airport (14820)
Methodology for Calculating Background SO_2 Concentration	Tier 1 Site: 39-035-0045
Calculated Background SO_2 Concentration	23 ppb

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

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

Averaging Period	Data Period	Receptor Location UTM zone 17		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	445,187	4,588,212	165.4	196.4*

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

The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 165.4 $\mu g/m^3$, equivalent to 63.2 ppb. This modeled concentration included the background concentration of SO_2, and is based on allowable emissions from Charter Steel. Figure 6 below was developed by the EPA from the state's modeling results, and indicates that the highest predicted design value occurred about 350 m east of the primary emission sources of Charter Steel, about 600 m southeast of the Newburgh Heights monitor. Figure 6 shows the modeled results throughout the domain. The modeling submitted by the state indicates that the emission limits that have now been imposed on Charter Steel provide for the SO_2 standard to be attained throughout the modeled area. This Figure 6 also shows the area included in Ohio's analysis (a square area extending near the north, west, and south edges of this figure) and, as a replicate of the figure in the intended designations TSD for Ohio, also shows a line outlining the area that the EPA previously intended to designate as nonattainment.[8]

[8] In this figure, the area in red is an area with concentrations estimated to be between 96.8 $\mu g/m^3$, and 165 $\mu g/m^3$, unlike other maps where a red color typically signifies violations.

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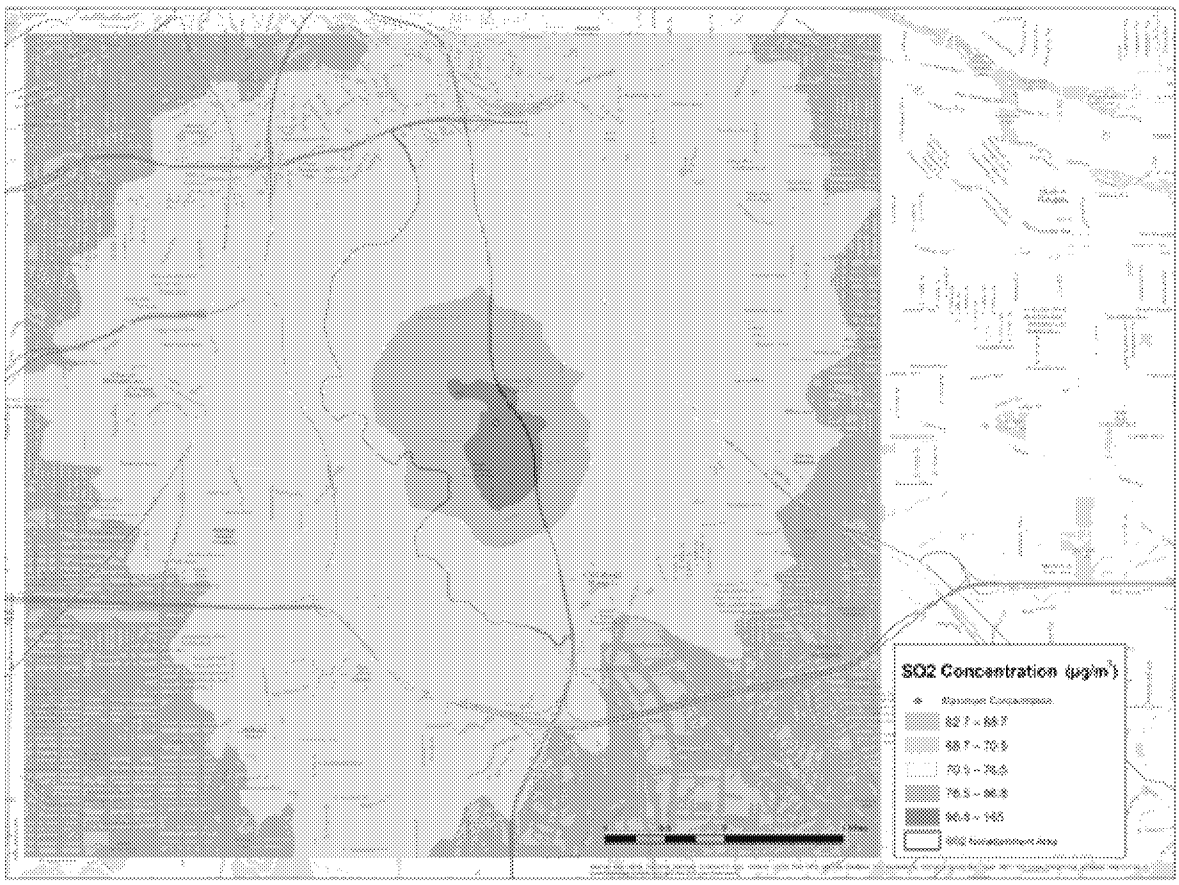
Figure 6: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Newburgh Heights Area of Analysis



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

Ohio's modeling for the Newburgh Heights area was premised on issuance of a permit that at the time had only been issued in draft form. However, a final permit has now been issued, and the EPA now finds that the allowable emission rates in the modeling (including both the stack emissions and the fugitive emissions) appropriately reflect allowable emission levels. More generally, the EPA now finds that the modeling provided by Ohio is fully consistent with the Modeling TAD. Given that the applicable limitations are now in effect and federally enforceable, and given that available evidence is that Charter Steel is currently complying with these limitations, Ohio's modeling indicates that the area is currently meeting the 2010 SO_2 NAAQS.

2.5. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for Cuyahoga County

These factors have been incorporated into the air quality modeling efforts and results discussed above and in the intended designations TSD for Ohio. The EPA is giving consideration to these

factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling. As discussed above with respect to emissions and as discussed in the intended designations TSD for Ohio with respect to meteorology, geography, and topography, the EPA finds that Ohio's modeling analysis appropriately considers these factors.

2.6. Jurisdictional Boundaries in Cuyahoga County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Cuyahoga County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. Ohio recommended a designation of unclassifiable/attainment for an area consisting of the entirety of Cuyahoga County. The EPA agrees this area has well defined boundaries.

2.7. Other Additional Information Relevant to the Designation for Cuyahoga County

The EPA received comments from both Ohio EPA and ArcelorMittal regarding the inclusion of ArcelorMittal in the area intended to be designated nonattainment. Ohio EPA states expressly that "Ohio EPA only wishes U.S. EPA to take this information into consideration if U.S. EPA continues to promulgate a nonattainment designation" for the Charter Steel area. Further discussion of these comments is provided in the response to comments document associated with this final action. However, since, for reasons summarized below, the EPA is promulgating a designation of this area (along with the remainder of Cuyahoga County) as attainment/unclassifiable, these comments are moot, and no further review of these comments is necessary. Aside from the information provided by Ohio regarding the final permit for Charter Steel, the EPA received no other additional information regarding the designation for Cuyahoga County.

2.8. The EPA's Assessment of the Available Information for Cuyahoga County

Assessing air quality in the Newburgh Heights area requires weighing multiple types of information addressing two different time periods. Specifically, the EPA must weigh monitoring evidence, most significantly including monitoring data from the Newburgh Heights site showing a violation during the 2014 to 2016 period, against modeling evidence indicating that modeling of recently adopted emission limits governing current and future air quality demonstrates that the area is meeting the SO_2 standard. Ohio's view is that changes at Charter Steel warrant a finding that modeling of allowable emissions (based on limits effective October 9, 2017) is a better indicator of current air quality than the most recent three years of monitoring data, based on data collected from 2014 to 2016. In reviewing Ohio's recommendation to rely more heavily on modeling information, the EPA must analyze Ohio's rationale for reconciling these two types of evidence. Ohio hypothesized that the high concentrations at the Newburgh Heights site during

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2016 may be attributed to Charter Steel having an unusually high fraction of fugitive emissions escaping through a large door that was stuck open during that period. Ohio provided modeling to test this hypothesis, indicating that significant fugitive emissions from Charter Steel, for example 5 percent of the total SO_2 emissions from the facility, could reasonably be expected to yield the concentrations monitored at Newburgh Heights in February 2016. This result indicates that modeling and monitoring provide reasonably consistent evidence, namely that both approaches indicate that the area was violating the standard during the 2014 to 2016 period. Ohio also provides evidence that, if one excludes the period in February 2016 when Charter Steel was known to have a malfunctioning West End Door, both monitoring and modeling also give reasonably consistent results, in both cases not violating the standard for the remaining periods.

Furthermore, the significance of the West End Door malfunctions may be inferred by comparing the results of Ohio's modeling of high fugitive emissions against the results of Ohio's modeling of conditions with more normal levels of fugitive emissions, as well as from additional reviews Ohio conducted of monitoring data during periods with versus without the door problems observed in February 2016. This evidence indicates that current air quality, reflecting correction of West End Door malfunctions and establishment of an emission limit, is quite different from air quality in 2016, when the malfunctions were occurring. The EPA's review of monitoring data generally relies on three-year data sets. Thus, while the monitoring data for the period after correction of the West End Door malfunction (reportedly in July 2016) are consistent with the view that the area is now attaining the standard, insufficient monitoring data are available to provide a reliable 3-year assessment of air quality post correction of the malfunction. Therefore, in this context, modeling provides more reliable evidence as to current air quality than monitoring.

The Modeling TAD offers two modeling approaches. The first approach is to model actual emissions. Under this approach, the EPA advises that states model three years of actual emissions, with the design and intent of using modeling to evaluate what three years of monitoring at an exhaustive network of sites would find. For example, if 2014 to 2016 are the most recent years of available modeling inputs, the modeling using these inputs would be intended to assess what concentrations would be observed if a monitoring network were measuring concentrations for 2014 to 2016 at this array of locations. The second option is based on current allowable emissions. Under this option, the modeling also uses the three most recent years of available meteorological data, but the modeling uses the current allowable emission rate, irrespective of whether emissions during the most recent three-year period might have been higher. This modeling may be considered to reflect worst case current air quality under federally enforceable and in effect emissions limits.

In the case of the Newburgh Heights area, the available evidence unequivocally indicates that the area was violating the SO_2 standard in the 2014 to 2016 period. The Newburgh Heights monitoring data show a design value for this period that is well over the standard, and Ohio's modeling of 2016 conditions provides supporting evidence that high concentrations in the area likely resulted from unusually high fugitive emissions from Charter Steel during that period.

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Conversely, modeling of now-effective allowable emission rates, based on recent issuance of currently federally enforceable limitations for Charter Steel, indicates that worst case current allowable air quality (subsequent to the 2014 to 2016 modeled period, but before the EPA promulgates final designations by December 31, 2017) is attaining the standard in the area near Charter Steel and does not indicate the area contributes to ambient air quality in a nearby area that does not meet the NAAQS.

For the remainder of Cuyahoga County, several monitors are measuring design values below the standard, but, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality. However, the EPA also has no evidence that any violations of the standard outside the Newburgh Heights area are occurring. The remainder of Cuyahoga County is an area that was not required to be characterized under 40 CFR 51.1203(c) or (d) for which available information does not indicate that the area violates the NAAQS or contributes to ambient air quality in a nearby area that does not meet the NAAQS. Although neighboring Lake County is designated nonattainment, the closest source in Cuyahoga County emitting over 100 tons of SO_2 per year (ArcelorMittal) is nearly 20 km away, with emissions just under 1,000 tons of SO_2 per year. The EPA does not have available information indicating that this or any other source in Cuyahoga County is contributing to nonattainment in Lake County. The remainder of the county meets the definition of an "attainment/unclassifiable" area. The EPA proposed to designate the remainder of Cuyahoga County outside the intended nonattainment area as unclassifiable/attainment. The EPA received no comments and no new evidence regarding air quality in the remainder of Cuyahoga County, and the EPA continues to believe that the remainder of Cuyahoga County warrants a designation of attainment/unclassifiable.

The EPA has more evidence regarding air quality near Charter Steel than it does in the remainder of the county, so that the rationales for designating these respective portions of Cuyahoga County as attainment/unclassifiable are somewhat different. Nevertheless, Ohio has recommended a designation of unclassifiable/attainment for a single area consisting of the entirety of Cuyahoga County. Designation of the entire county as a single area is also administratively more convenient, using optimally clear boundaries. Therefore, a designation of attainment/unclassifiable for a single area including the entirety of Cuyahoga County is warranted.

2.9. Summary of Our Final Designation for Cuyahoga County

Modeling using allowable emissions pursuant to limits that are federally enforceable and in effect shows the area near Charter Steel currently to be attaining the NAAQS (notwithstanding monitoring data showing a violation for the 2014 to 2016 period). Cuyahoga County was an area not required to be characterized under 40 CFR 51.1203(c) or (d) and, apart from the area near Charter Steel, for which available information does not indicate that the area violates the NAAQS or contributes to ambient air quality in a nearby area that does not meet the NAAQS. For these reasons, after careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA is designating the entirety of Cuyahoga County as attainment/unclassifiable for the 2010 SO_2 NAAQS.

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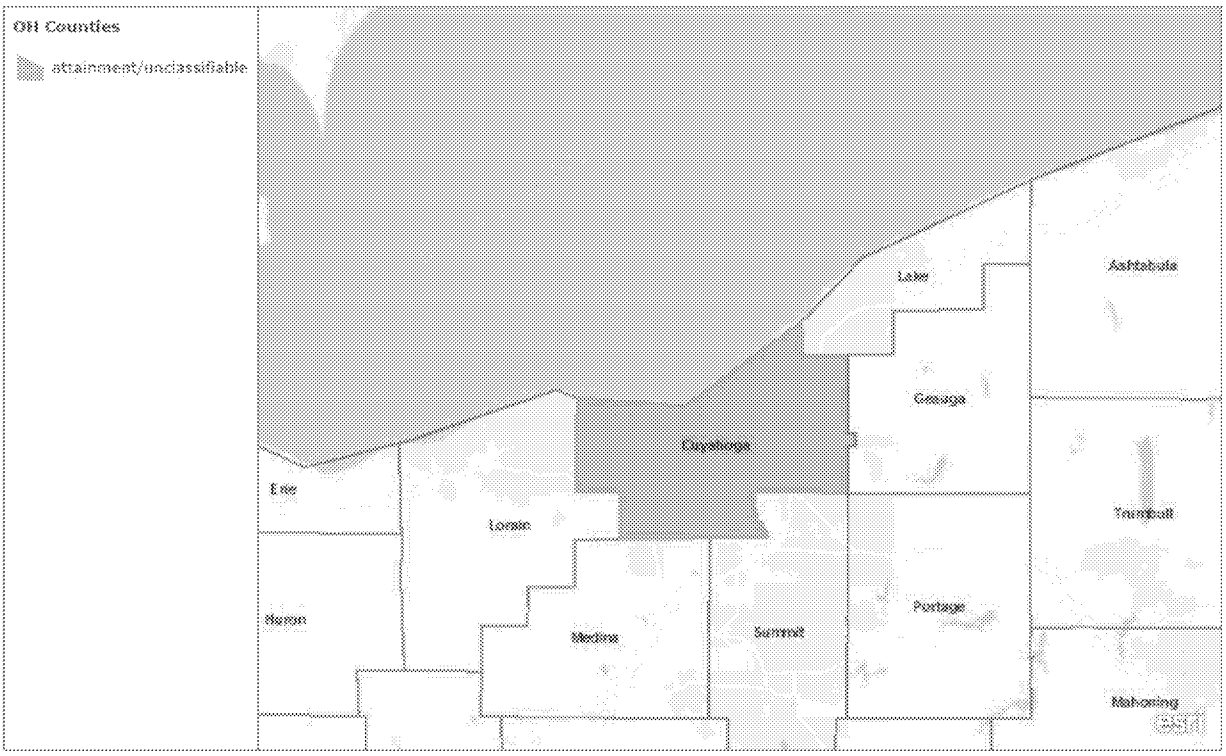
Figure 7 shows the boundary of this final designated area.

Figure 7. Boundary of the Final Cuyahoga County Attainment/Unclassifiable Area



3. Technical Analysis of New Information for Lorain County

3.1. Introduction

The EPA must designate the Lorain County, Ohio, area by December 31, 2017, because the area has not been previously designated and Ohio has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any source in Lorain County. The NRG Power Midwest LP Avon Lake Power Plant (Avon Lake) is a power plant located in Lorain County, in northern Ohio near Lake Erie. Avon Lake emitted 34,935 tons of SO_2 in 2014, and therefore, Ohio was required by the DRR to characterize SO_2 air quality around it. Ohio established federally enforceable emission limits for Avon Lake and modeled those limits to address the DRR air quality characterization requirements.

In the 120-day letter notification to the governor of Ohio, and further explained in Chapter 32, section 8 of the TSD for the intended Round 3 area designations, the EPA proposed a designation of unclassifiable for the entirety of Lorain County based on all available information, including modeling information and all relevant monitoring information. The EPA proposed to designate Lorain County as unclassifiable for the 2010 SO_2 NAAQS because the EPA could not determine whether the Avon Lake emission limits assure attainment in all operating scenarios.

On October 5, 2017, GenOn Energy, Inc., (GenOn) submitted comments on the EPA's intended designation for Lorain County. NRG Power Midwest LP is a wholly-owned subsidiary of GenOn Energy, Inc. On October 20, 2017, Ohio submitted comments with additional information to address the EPA's intended designation for Lorain County. This section assesses information and clarifications provided in these comments.

3.2. Summary of Information Reviewed in the TSD for the Intended Round 3 Area Designations

In its January 13, 2017, Round 3 submittal for Lorain County, Ohio submitted air quality modeling conducted by a consultant on the behalf of Avon Lake. Because the modeling was submitted as part of the state's official recommendation, it will from here on be referred to as the state's modeling. This was the only analysis that the EPA received for this area. Additional details can be found in the TSD for the Intended Round 3 Area Designations, Chapter 32, section 8.

Table 8 identifies the modeling assessment evaluated for the 120-day letters and discussed in the TSD for the intended Round 3 area designations.

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Table 8. Modeling Assessment Evaluated in the TSD for the Intended Designation for Lorain County

Organization Submitting Assessment	Date of the Assessment	Identifier used in the TSD for the Intended Round 3 Area Designations, Chapter 32	Distinguishing or Otherwise Key Features
Ohio	October 2016	State's modeling	Modeling performed by source's consultant, subsequently submitted to the EPA by Ohio

3.3. Assessment of Air Quality Monitoring Data for Lorain County

There are no SO_2 air quality monitors in Lorain County, and no monitors in neighboring counties provide information on whether Lorain County is attaining the standard. No new relevant monitoring information of any other type was submitted or became available.

3.4. Assessment of New Information Related to the Air Quality Modeling Analysis for Lorain County Addressing Avon Lake

3.4.1. Introduction

This section presents all the newly available information regarding the characterization of Lorain County. The state did not submit a new modeling analysis for Lorain County. However, the state and Avon Lake's parent company provided comments to clarify certain aspects of the Avon Lake modeling analysis and to address the EPA's intended unclassifiable designation.

The EPA fully evaluated Ohio's modeling analysis for Lorain County in Chapter 32, section 8 of the TSD for the intended Round 3 area designations. In most respects, the EPA's evaluation of this modeling has not changed. Only sections 3.4.6 and 3.4.11 below reflect revised evaluations based on the new information that the EPA has received. Nevertheless, for administrative convenience, the EPA is repeating most of the text contained in the TSD for our intended designations for Ohio here. The following lists the sections repeated from the TSD for the intended designations without substantive change:

Section 8.3.3 - Model Selection and Modeling Components
Section 8.3.4 - Modeling Parameter: Rural or Urban Dispersion
Section 8.3.5 - Modeling Parameter: Area of Analysis (Receptor Grid)
Section 8.3.6 - Modeling Parameter: Source Characterization
Section 8.3.8 - Modeling Parameter: Meteorology and Surface Characteristics
Section 8.3.9 - Modeling Parameter: Geography, Topography and Terrain
Section 8.3.10 - Modeling Parameter: Background Concentrations of SO_2

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The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance cited in Chapter 1 of this TSD, as appropriate.

3.4.2. Model Selection and Modeling Components

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

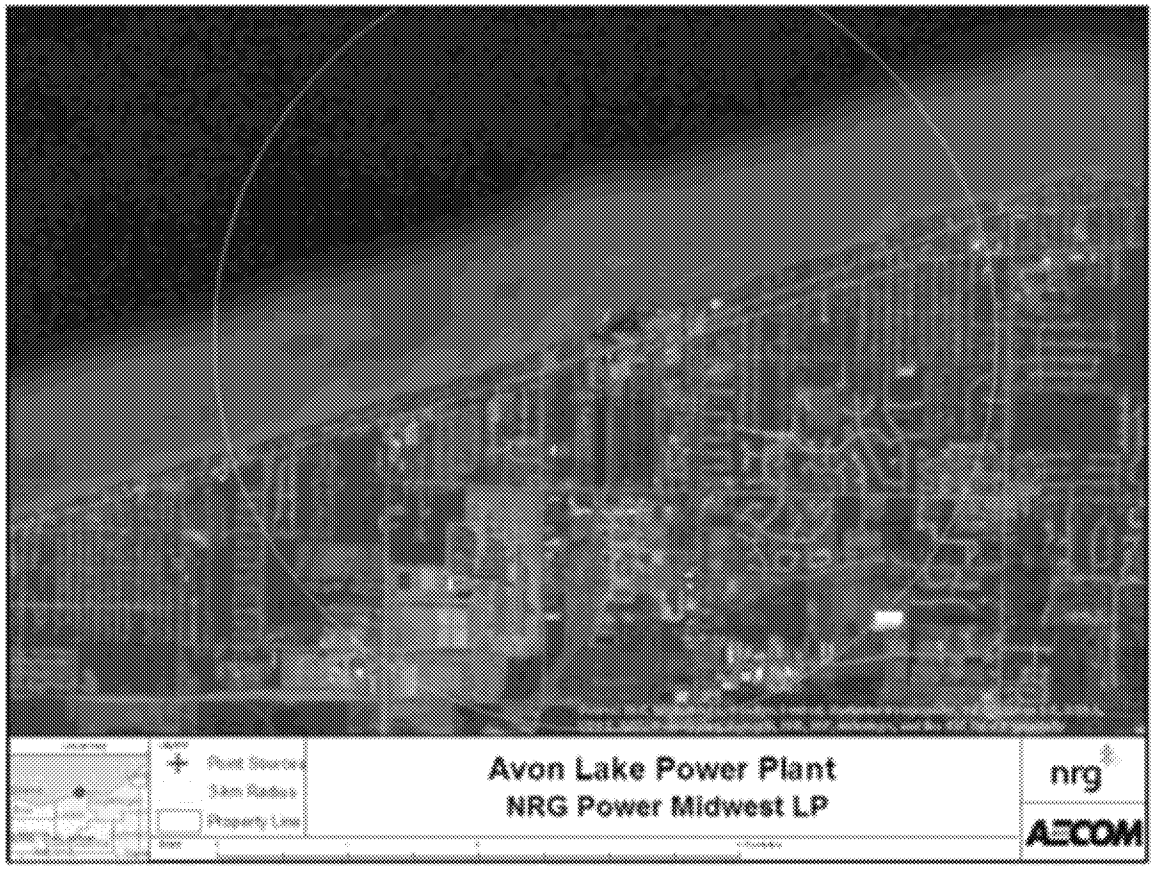
- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the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

The state's modeling used AERMOD version 15181 in the regulatory default mode. A discussion of the approach to the individual components of the modeling system is provided in the corresponding discussion that follows. The current regulatory version of AERMOD is 16216r. This version was released on January 17, 2017. A previous version (16216) was released on December 20, 2016. The modeling for the Avon Lake area had been completed prior to mid-December. A significant difference between version 15181 and version 16216r applies to the use of the adjusted surface friction velocity (ADJ_U*) parameter in AERMET. The Avon Lake area modeling did not use this non-default regulatory option. Therefore, the results of this modeling are not expected to significantly differ had this modeling effort used 16216r instead of 15181.

3.4.3. Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source is in an "urban" or "rural" area is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is also important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source is urban or rural based on land use or population density. For the purpose of performing the modeling for the area of analysis, the consultant used mapping software to determine that the land use within a 3 km radius of Avon Lake is more than 50% rural, and therefore the consultant determined that it was appropriate to run the model in rural mode. The 3-kilometer radius around Avon Lake, shown here in Figure 8, is roughly half Lake Erie and half residential with some light industry. The EPA concurs with the decision to model the Avon Lake area as rural.

Figure 8. Map of the Avon Lake Area of Lorain County (with 3 km radius shown).



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

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

For Lorain County, no sources other than Avon Lake were determined by the state to have the potential to cause concentration gradients within the area of analysis that merited explicit inclusion in modeling. Oberlin College, approximately 27 km from Avon Lake, emitted 230 tpy in 2014, but permanently shut down both of its coal boilers in April of 2014. Republic Steel, approximately 9 km from Avon Lake, emitted 23 tpy in 2014. West Lorain Plant, which emitted 73 tpy in 2014, is approximately 20 km from Avon Lake. Kokosing Materials-Plant 503 emitted less than 3 tons in 2014. The other facilities in Lorain County emitted between 3 to 15 tons each and are all over 20 km from Avon Lake. Therefore, only Avon Lake was explicitly modeled, and

any impacts from nearby sources are addressed by the background concentration. Figure 9, provided by the state, shows the location of Avon Lake and other facilities in Lorain County. The EPA agrees that these other sources have sufficiently low emissions at sufficient distance from the expected area of maximum concentrations that the impacts of these sources may reasonably be represented as part of the background concentration.

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Figure 9. Lorain County SO_2 Sources.

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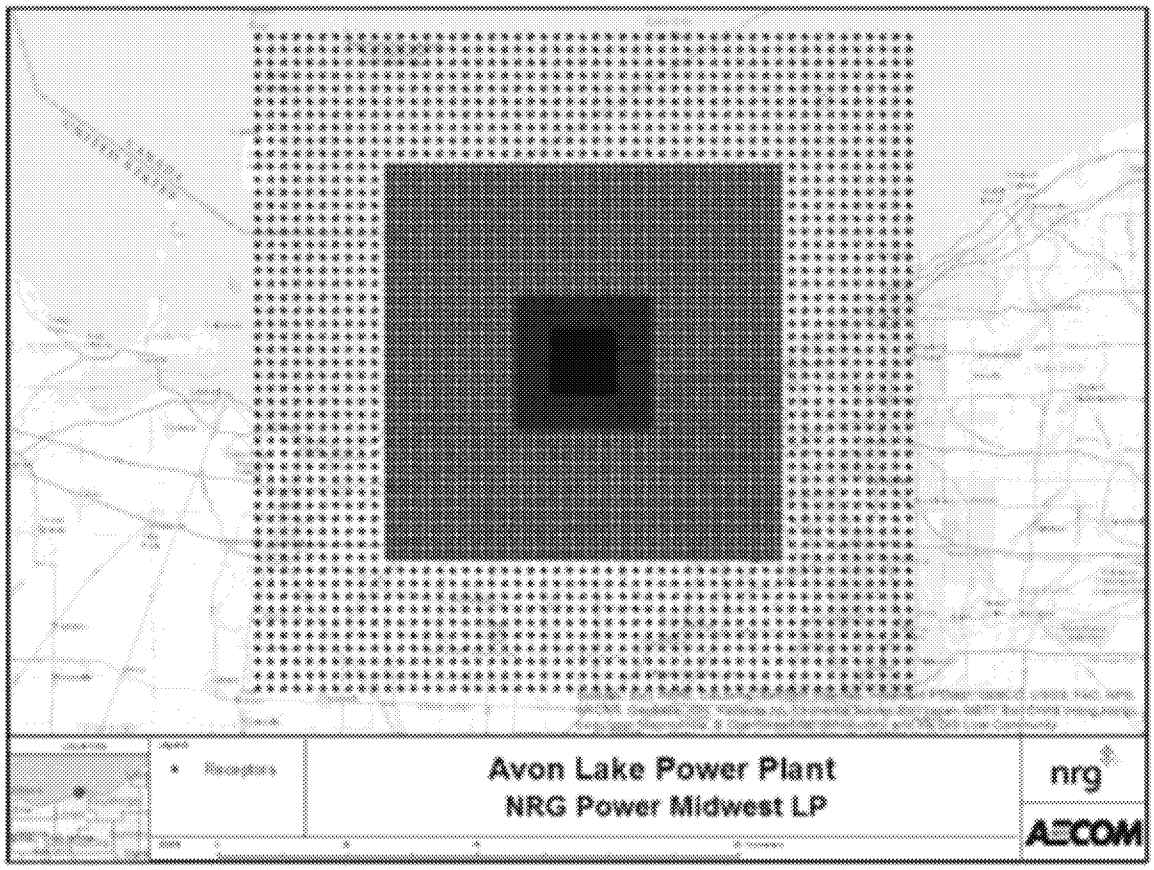
The receptor network for the Avon Lake modeling analysis contained 11,582 receptors, covering the northeastern portion of Lorain County. Consistent with the Modeling TAD, the state placed receptors for the purposes of this designation effort in locations that would be considered ambient air to the modeled facility. The state opted to include receptors over Lake Erie. The state excluded receptors within the facility fenceline. Maximum concentrations were reported separately for both overwater and land-based receptors.

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

- Every 50 meters along the facility fenceline.
- 100-meter spacing to 3 km
- 200-meter spacing to 5 km
- 500-meter spacing to 10 km
- 1000-meter spacing to 30 km.

Figure 10, included with the state's recommendation, shows the receptor grid used for the Avon Lake analysis.

Figure 10: Receptor Grid for the Avon Lake Area



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3.4.5. Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash, and following GEP policy when modeling allowable emissions.

Only Avon Lake was modeled in this analysis. The state characterized this source in accordance with the best practices outlined in the Modeling TAD. The state followed the EPA's good engineering practices (GEP) policy in conjunction with modeling allowable emissions limits. The stack for Boiler 12/Unit 9 was built before 1971, so it meets the grandfather provisions and was therefore allowed to be modeled at its actual height. The stack for Boiler 10/Unit 7 was rebuilt in the 1970s. Its GEP height was calculated based on the controlling Boiler 12/Unit 9 building, and found to be greater than the actual Boiler 10/Unit 7 stack height. Therefore, Boiler 10/Unit 7 was also modeled at its actual height. The state also adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The AERMOD component BPIPPRM, version 04274, was used

to assist in addressing GEP stack height and building downwash. The EPA concurs with this aspect of the state's analysis.

3.4.6. Modeling Parameter: Emissions

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

For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state may calculate emission rates using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models." According to Table 8-1, a primary source should be modeled at its maximum allowable emission limit, at its actual or design capacity.

On November 23, 2016, Ohio issued a federally enforceable permit to Avon Lake, revising its SO_2 emission limits to provide for NAAQS attainment. The permit requires the facility to comply with the revised emission limits as of January 13, 2017. The permit, Permit Number P0121748, was provided as part of Ohio's submittal. Ohio's Lorain County modeling analysis considered Avon Lake's January 13, 2017, PTE limits in accordance with the Modeling TAD, addressing the operating restrictions and new emission limits which became federally enforceable and in effect on the same date that Ohio made its Round 3 submittal to the EPA.

The Avon Lake power plant has two coal-fired boilers (Boiler 12/B012 and Boiler 10/B010), one oil-fired combustion turbine (B013), and two package boilers which use natural gas or fuel oil (B015 and B016). Boiler 12 has a nominal heat input of 6,040 million British Thermal Units per hour (MMBtu/hr), and Boiler 10 has a nominal heat input of 1,131 MMBtu/hr. The January 13, 2017, federally enforceable limits for Avon Lake restrict the five SO_2 emission sources to a total of 9,600 pounds per hour (lb/hr) on a 1-hour average basis. The new limits also require that Boilers 10 and 12 (B010 and B012), combined, must not exceed 1.59 pounds per million British Thermal Units (lb/MMBtu) on a rolling 30-day average. This replaced the previous limit of 4.65 lb/MMBtu for each coal-fired boiler.

Since the enforceable 9,600 lb/hr limit extends across multiple units, an evaluation of the efficacy of the emission limit must show that attainment can be expected under the full range of operational options that comply with this multi-unit limit, either by modeling all scenarios or by identifying and addressing the potential scenario(s) with the highest ambient impacts. The SO_2 emissions from units B013, B015, and B016 at the Avon Lake facility are typically much lower than the coal-fired units' emissions, due to their lower heat input capacities (B013: 468.9 MMBtu/hr; B015 and B016: 219.5 MMBtu/hr each) and their restriction to lower-sulfur

fuels (oil and natural gas). As an example, between 2012 and 2014, the actual emissions from these three units totaled less than 0.5 tons per year. Therefore, the state's modeling analysis focused on scenarios in which the higher-emitting units B010 and B012 were operating. Four scenarios were presented in the state's analysis. Three cases consider Boiler 12 operating alone at either a minimum, mid-range, or maximum heat input rate, and one case addresses the Boiler 12 startup scenario, in which Boiler 12 begins operations assisted by additional steam from Boiler 10. This fourth scenario was modeled with Boiler 12 operating at 50% capacity and Boiler 10 operating at a 30% heat input rate (339.3 MMBtu/hr). In practice, Boiler 10 only operates at the 30% capacity rate early in the startup sequence, providing less steam as Boiler 12 increases its load, until Boiler 12 reaches its minimum sustainable load conditions. The scenario in which Boiler 12 operates alone at its maximum heat input, 6,040 MMBtu/hr, was found to have the largest ambient impact. The state's load analysis was initially used to determine the level of allowable SO_2 emissions which would provide for attainment; the same scenarios were used for the final demonstration of attainment submitted by Ohio. With the final permitted emission limits, all four modeled scenarios provide for attainment of the SO_2 NAAQS.
In the 120-day letter, the EPA questioned whether Ohio's modeling addressed all potential operating conditions, so as to demonstrate that the facility's limits provide for attainment even in the worst case distribution of emissions. Specifically, the EPA believed that the maximum impacts of Boiler 10 had not been fully evaluated, either alone or in combination with other operating emission units. The Avon Lake emission limits appeared to allow Boiler 10 to operate up to its full 1,131 MMBtu/hr heat input rate, as long as the 1.59 lb/MMBtu limit and the overall 9,600 lb/hr limit were met. No scenario with full load on Boiler 10 is modeled, and Ohio had not otherwise demonstrated that this scenario would not be the "worst case" scenario for air quality characterization of the area. For this reason, the EPA believed that Ohio had not fully demonstrated that emissions in compliance with the limit would result in attainment of the standard.

Ohio and GenOn addressed this issue in their October 2017 responses to the 120-day letter and the EPA's intended designations for Ohio. Both parties stated that Boiler 10 is no longer used as an electric generating unit; instead, it is now a limited use boiler as defined in 40 CFR 63, Subpart DDDDD, National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, at 40 CFR 63.7575. Ohio issued a final permit (Permit Number P0120245) to Avon Lake on April 19, 2016, which restricted Boiler 10 to 10% of its annual rated heat input. The10% annual capacity restriction is federally enforceable, and was included in Avon Lake's Permit Number P0121748 in November 2016. It does allow Boiler 10 to operate occasionally at 30% of its rated heat input in order to provide support to Boiler 12 during short term startup operations, but Boiler 10 cannot operate continually at that rate or at its maximum rate and comply with the 10% annual capacity factor. GenOn confirmed that Boiler 10's current role in the facility is to support Boiler 12 during startup, and to provide steam for facility heating. GenOn also confirmed that Boiler 10 is no longer connected to electric generating equipment, and Avon Lake is no longer configured to handle the amount of steam Boiler 10 would generate if it ran at its rated maximum heat input capacity. The steam could not be utilized and would have to be vented. As an example of Boiler 10's current usage, Ohio stated that in the 14 months from May 2016 to June 2017, after becoming a limited use boiler, Boiler 10 only operated 306 hours, emitting a total of 28.6 tons of SO_2. Since Boiler 10 is required to limit its operations pursuant to a federally enforceable

requirement and since GenOn can only use the boiler for startup support and plant heating in its current physical configuration, Ohio and GenOn do not believe that modeling Boiler 10 at its maximum heat input capacity is reasonable or necessary.

As stated in the Modeling TAD, the EPA believes the most appropriate data to use for comparison to the 1-hour SO_2 NAAQS are based on emissions scenarios that are continuous enough or frequent enough to contribute significantly to the annual distribution of maximum daily 1-hour concentrations. Given the statements from GenOn regarding Boiler 10's current role, and the federally enforceable permit conditions applicable to Boiler 10, the EPA concurs that Boiler 10 is no longer able to operate continuously at levels well above 10% of its rated heat input. Consequently, the EPA finds that the Avon Lake modeling analysis need not include higher heat input conditions for Boiler 10, as they would be infrequent if they occurred at all, while Boiler 10 is complying with its federally enforceable annual heat input limits. After consideration of the comments from Ohio and GenOn, the EPA finds that the state's analysis properly addressed Boiler 10's maximum potential impacts by considering its operations during Boiler 12's startups, and the EPA finds more generally that Ohio has provided modeling indicating that Lorain County is attaining the NAAQS under all scenarios that warrant consideration.

3.4.7. Modeling Parameter: Meteorology and Surface Characteristics

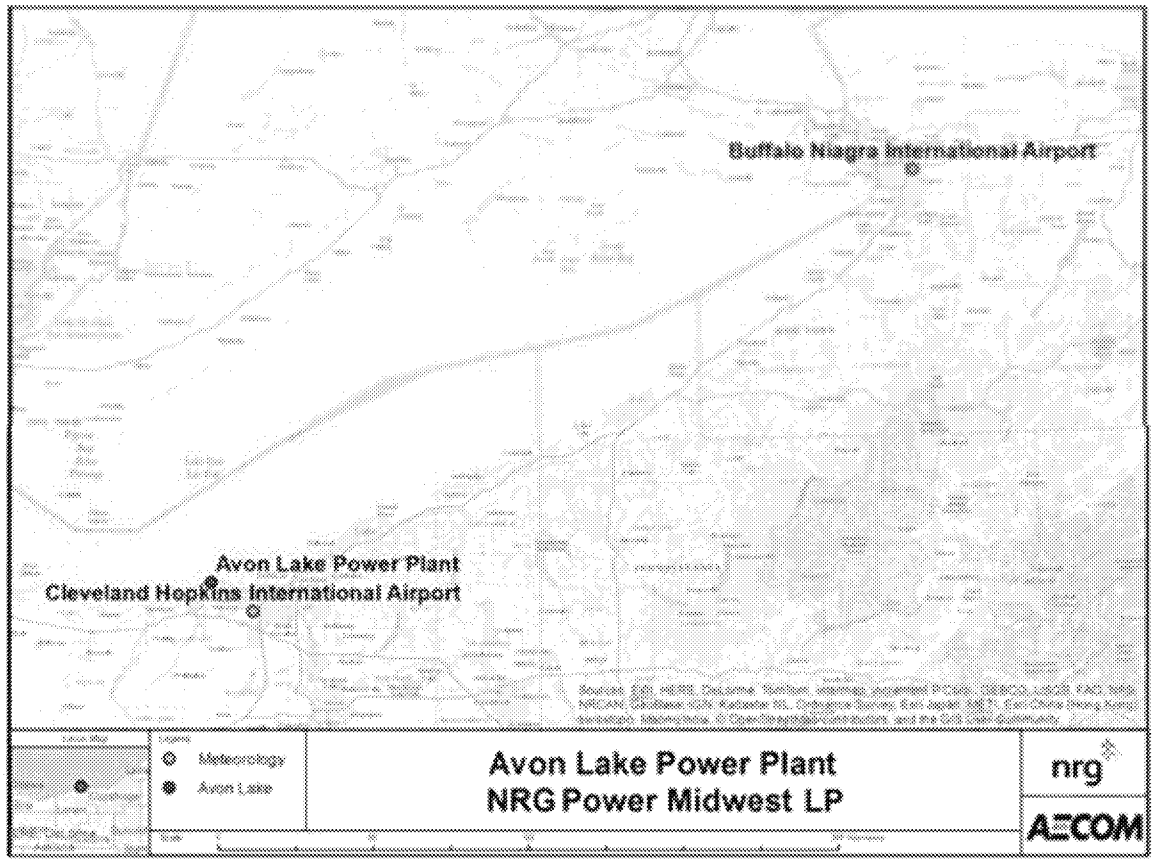
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of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

For the area of analysis for Avon Lake, the state selected the surface meteorology from the NWS station at Cleveland Hopkins International Airport (KCLE), located approximately 20 km southeast of Avon Lake, and coincident upper air observations from the NWS station at Buffalo Niagara International Airport (KBUF), approximately 315 km northeast of Avon Lake, as best representative of meteorological conditions within the area of analysis.

The consultant used AERSURFACE version 13016 to estimate the surface characteristics (albedo, Bowen ratio, and surface roughness (z_o)) of the area of analysis. Albedo is the fraction of solar energy reflected from the earth back into space, the Bowen ratio is the method generally used to calculate heat lost or heat gained in a substance (and were determined from the most recent 30-year precipitation normal for the surface station), and the surface roughness is sometimes referred to as "z_o." The state estimated surface roughness values for 12 spatial sectors out to one km at a monthly temporal resolution for dry, wet, and average conditions.

In Figure 11, included in the analysis provided with the state's recommendation, the location of the surface and upper air NWS stations are shown relative to the area of analysis.

Figure 11. Location of Meteorological Stations Relative to Avon Lake



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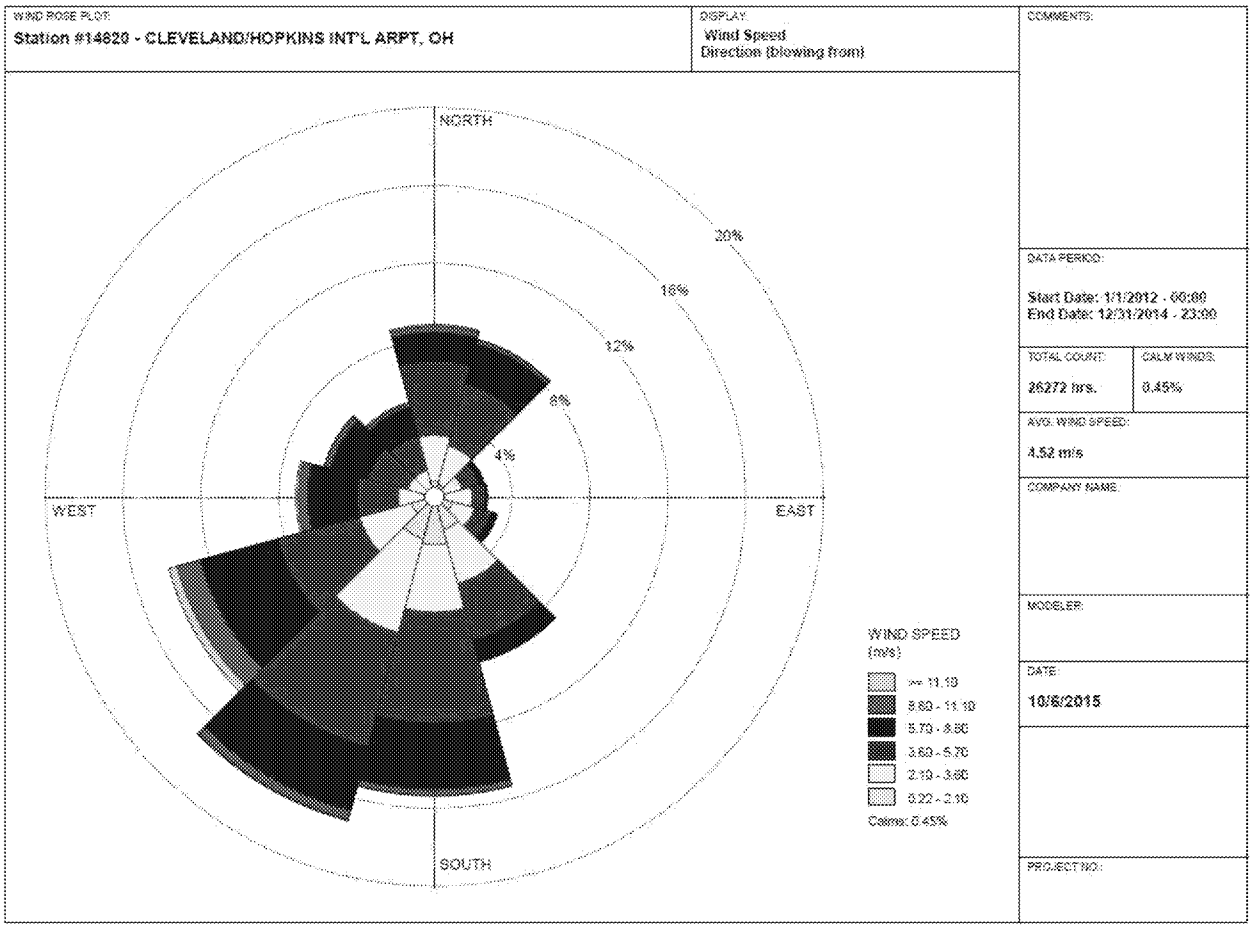
As part of its documentation, the state provided the 3-year 2012-2014 surface wind rose for Cleveland Hopkins International Airport. In Figure 12, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The meteorological data shows a dominant flow from the southwest, and significant flow from the northeast.

Figure 12: Cleveland Hopkins International Airport Cumulative Annual Wind Rose for Years 2012-2014



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Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The state followed the methodology and settings presented in the SO_2 Modeling TAD and the SO_2 Designation Guidance in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. The state did not use the adjusted surface friction velocity (ADJ_U*) option in its modeling.
The state used AERMINUTE version 14337 to process 1-minute data from Cleveland Hopkins International Airport. This data was subsequently processed with AERMET version 15181 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, compared to standard hourly NWS data. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the state set a minimum threshold of 0.5 meters per

second in processing meteorological data for use in AERMOD. Wind speeds lower than this value are treated as calms and not used for determining concentrations.

The EPA finds the state adequately selected and processed meteorological data for the area.

3.4.8. Modeling Parameter: Geography, Topography and Terrain

The terrain in the area of analysis is best described as mostly flat. Nevertheless, the AERMAP terrain program within AERMOD, version 11103, was used to specify terrain elevations for all the receptors, based on 30 meter USGS National Elevation Data. The EPA concurs with this treatment of local terrain data.

3.4.9. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state chose the tier 2 approach. The analysis of background concentrations for Avon Lake used ambient air monitoring data collected at the Eastlake site, site number 39-085-0003, for the period April 16, 2015, through June 30, 2016. This time period was chosen because this monitor could better represent Lorain background air quality after the nearby Eastlake power plant, which had been emitting between 20,000 and 50,000 tpy of SO_2, had shut down just previously. The Eastlake monitor is located on Lake Erie, 56 km east of Avon Lake. The city of Cleveland lies between Avon Lake and the Eastlake monitor site, but the set of small sources near Eastlake is similar to the set of small sources in Lorain County other than Avon Lake. Background concentrations from the dataset were developed using the procedure defined in the Modeling TAD. These background concentrations ranged from 2 to 11 ppb, corresponding to 5 to 29 $\mu g/m^3$.[9] The EPA concurs that these are appropriate representations of background concentrations for the area.

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

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3.4.10. Summary of Modeling Inputs and Results

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

Table 9. Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Avon Lake Area

Input Parameter	Value
AERMOD Version	15181 (default mode)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	2
Modeled Structures	6
Modeled Fencelines	1
Total receptors	11,582
Emissions Type	PTE
Emissions Years	PTE limits, effective 1/13/2017
Meteorology Years	2012-2014
NWS Station for Surface Meteorology	Cleveland Hopkins International Airport (KCLE)
NWS Station Upper Air Meteorology	Buffalo Niagara International Airport (KBUF)
NWS Station for Calculating Surface Characteristics	Cleveland Hopkins International Airport
Methodology for Calculating Background SO_2 Concentration	Tier 2, Season/hour of day, using data from site number 39-085-0003
Calculated Background SO_2 Concentration	2-11 ppb

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

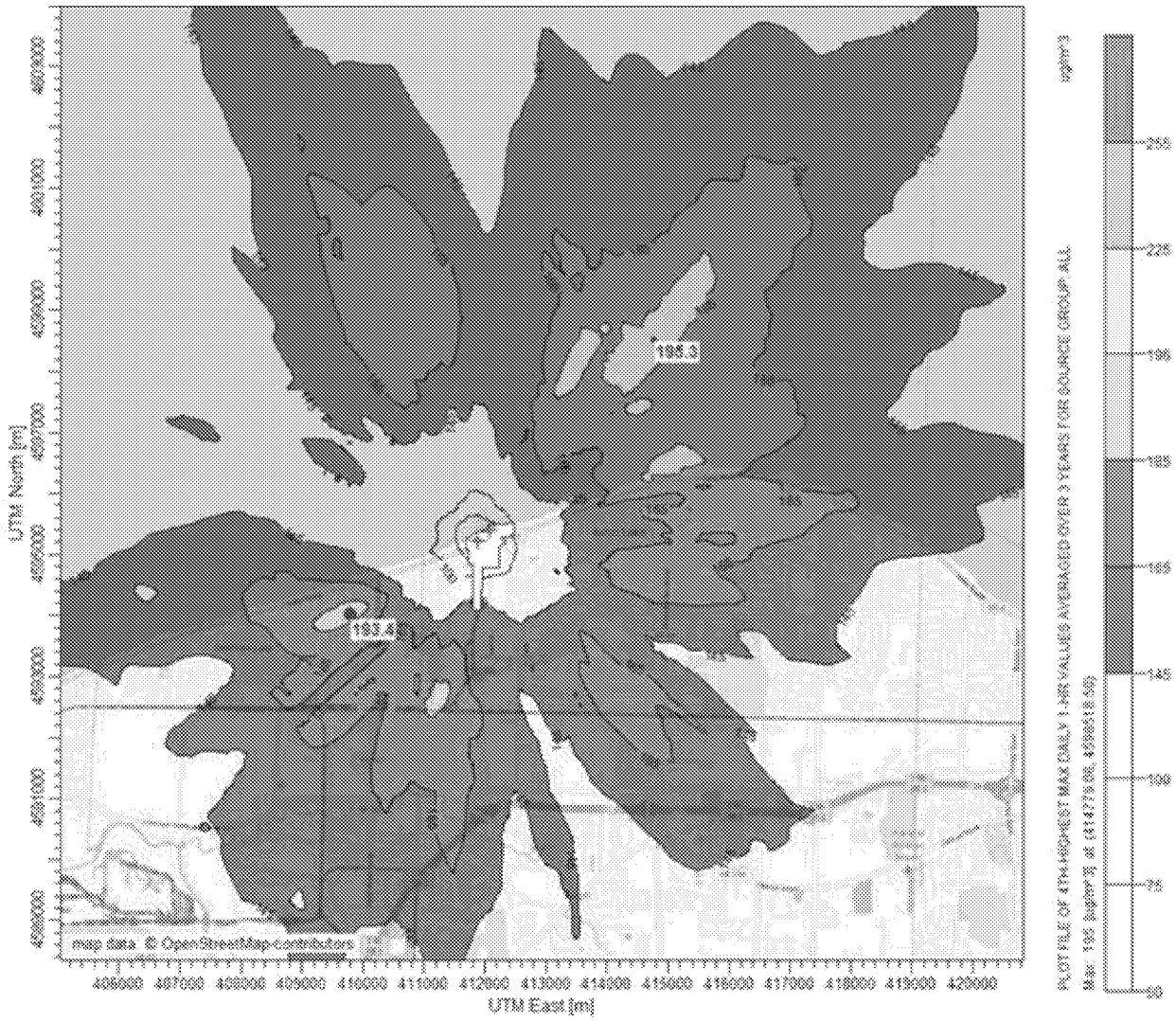
Table 10. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Avon Lake Area

Averaging Period	Data Period	Receptor Location UTM zone 17		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting (m)	UTM Northing (m)	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2012-2014	409800	4594000	193.4	196.4*

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

The modeling results indicate that the highest predicted 99th percentile daily maximum 1-hour concentration within the on-land portion of the chosen modeling domain is 193.4 $\mu g/m^3$, equivalent to 73.8 ppb. This modeled concentration included a background concentration and is based on new PTE emission limits from the facility, as incorporated into a permit that Ohio provided with its submittal. The degree to which the modeling reflects allowable emissions was discussed in prior sections. Figure 13 below was included as part of the state's recommendation, and indicates that the predicted value occurred approximately 2 km southwest of Avon Lake. In addition, modeling with receptors over Lake Erie, which under the recommendations of the Modeling TAD are optional, found a maximum concentration of 195.3 $\mu g/m^3$, equivalent to 74.6 ppb, 4.2 km northeast of the plant.

Figure 13: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Avon Lake Area of Analysis



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The modeling for Avon Lake indicates that the 1-hour SO_2 NAAQS is attained at all receptors in the area.

3.4.11. The EPA's Assessment of the Modeling Information Provided by Ohio

After careful review of Ohio's analysis of Lorain County, and after consideration of the state's explanation of Boiler 10's current allowable emissions, the EPA finds that Ohio's analysis of Lorain County has demonstrated that the area around Avon Lake is attaining the 2010 SO_2 NAAQS, given Avon Lake's federally enforceable and in effect emission limits. In addition, available information does not indicate that Lorain County is contributing to a NAAQS violation in a nearby area. Therefore, the EPA is designating Lorain County as attainment/unclassifiable.

3.5. Jurisdictional Boundaries in Lorain County

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for Lorain County. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable. The EPA is designating the entirety of Lorain County as attainment/unclassifiable. The EPA believes that our final attainment/unclassifiable area bounded by Lorain County's borders will have clearly defined legal boundaries, and we find the county boundaries to be a suitable basis for defining our final attainment/unclassifiable area.

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

With the additional information from Ohio and GenOn, clarifying that the current and future feasible operations of Boiler 10 had been properly characterized in the Lorain County modeling analysis, the EPA finds that the state's modeling analysis demonstrates the area is attaining the 2010 SO2 NAAQS, based on limits at Avon Lake that are federally enforceable emission and in effect.

The EPA here is also addressing a comment by Ohio pertinent to a statement that the EPA made in the 120-day letter notification to the governor of Ohio. In this letter, the EPA had stated that we were unable to determine whether compliance with Avon Lake's limits would result in attainment, since it was not clear that Ohio's submittal fully addressed worst case allowable emissions and since the EPA did not have modeling of actual emissions to rely upon. Ohio expressed concern at the appearance that the EPA was requiring analyses both with allowable emissions and with actual emissions. (*See* Ohio's response to the 120-day letter, dated October 20, 2017, Appendix D, page 2.)

Ohio appropriately understands the EPA's guidance but misunderstands the EPA's statement in the TSD for its intended designations. Ohio is correct that the EPA's guidance is for states to provide information either based on allowable emissions or based on actual emissions. Since the EPA believed it did not have adequate modeling reflecting the potential impacts of the multi-unit allowable emissions limit on the area's air quality, due diligence required that the EPA assess the availability of other information indicative of air quality in Lorain County, in particular the availability of information on air quality impacts of actual emissions. The EPA believed that currently available information was not complete or reliable for either option for assessing air quality, leading to a belief that air quality in Lorain County was unclassifiable. The EPA did not intend to imply that Ohio was required to provide analyses for both options; the EPA instead was examining the availability of modeling based on actual emissions only as part of an assessment of whether it had adequate information for characterizing Lorain County air quality based on either option. The EPA now concludes that Ohio's analysis based on federally enforceable and in effect allowable (PTE) emissions provides adequate support for the EPA's final SO_2 designation for Lorain County, and the question regarding the availability of an analysis based on actual emissions is no longer germane.

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Among areas currently designated nonattainment or being designated nonattainment in Round 3, the area nearest to Lorain County is Lake County, Ohio. Avon Lake is about 50 km from the nearest edge of Lake County. Considering the magnitude of emissions from Avon Lake, this distance, and other relevant factors, the EPA also finds that available information does not indicate that Lorain County is contributing to nonattainment in any nearby area. The EPA believes that our final attainment/unclassifiable area, the entirety of Lorain County, will have clearly defined legal boundaries, and we find these boundaries to be a suitable basis for defining our final attainment/unclassifiable area.

3.7. Summary of Our Final Designation for Lorain County

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA is designating Lorain County as attainment/unclassifiable for the 2010 SO_2 NAAQS because the EPA has determined the available information indicates the area meets the NAAQS and does not indicate the area contributes to ambient air quality in a nearby area that does not meet the NAAQS. Specifically, the boundary of the attainment/unclassifiable area is comprised of the entirety of Lorain County. Figure 14 shows the boundary of this final designated area.

Figure 14. Boundary of the Final Lorain County Attainment/Unclassifiable Area

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