Technical Support Document for Final Designation

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

Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA, or the Agency) must designate areas as either "unclassifiable," "attainment," or "nonattainment" for the 2010 1-hour sulfur dioxide (SO_2) primary national ambient air quality standard (NAAQS). Section 107(d) of the CAA defines a nonattainment area as one that does not meet the NAAQS or that contributes to a violation in a nearby area, an attainment area as any area other than a nonattainment area that meets the NAAQS, and an unclassifiable area as any area that cannot be classified on the basis of available information as meeting or not meeting the NAAQS.

July 2, 2016 is the deadline for the EPA to designate certain areas established by the U.S. District Court for the Northern District of California. This deadline is the first of three deadlines established by the court for the EPA to complete area designations for the 2010 SO_2 NAAQS. This deadline applies to a certain area in Maryland because one emission source meets the conditions of the court's order.

Maryland submitted a designation recommendation on April 19, 2011, and an updated recommendation on November 20, 2015. On April 14, 2016, Maryland submitted an alternative model request for use of a non-regulatory default/beta Adjust U* option in their modeling analyses for the area surrounding Wagner. On April 19, 2016, Maryland submitted additional modeling analyses and information. Table 1 below lists Maryland's recommendations and identifies the counties in Maryland that the EPA is designating in order to meet the July 2, 2016, court-ordered deadline. These final designations 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.

Table 1. Maryland's Recommended and EPA's Final Designations

Area	State's Recommended Area Definition	State's Recommended Designation	EPA's Final Area Definition	EPA's Final Designation
Anne Arundel County and Baltimore County[1]	Area boundary not provided	Attainment	Portions of Anne Arundel and Baltimore Counties that are within 26.8 kilometers of Herbert A. Wagner's Unit 3 stack, which is located at	Nonattainment

[1] The EPA is finalizing our intended designation of nonattainment. However, the EPA is modifying the intended area definition from portions of Anne Arundel and Baltimore Counties that are with 35.5 kilometers of Wagner's

			39.17765N latitude, 76.52752W longitude (Anne Arundel County and Baltimore County, MD)	
Baltimore City[2]	Baltimore City	Unclassifiable	Same as State's Recommendation (Baltimore City, MD)	Unclassifiable/ Attainment

Background

On June 3, 2010, the EPA revised the primary (health based) SO_2 NAAQS by establishing a new 1-hour standard at a level of 75 parts per billion (ppb) which is met at an ambient air quality monitoring site when the 3-year average of the 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb. This NAAQS was published in the *Federal Register* on June 22, 2010 (75 FR 35520), and is codified at 40 CFR 50.17. The EPA determined this is the level necessary to protect public health with an adequate margin of safety, especially for children, the elderly, and those with asthma. These groups are particularly susceptible to the health effects associated with breathing SO_2. The two prior primary standards of 140 ppb evaluated over 24 hours, and 30 ppb evaluated over an entire year, codified at 40 CFR 50.4, remain applicable.[3] However, the EPA is not currently designating areas on the basis of either of these two primary standards. Similarly, the secondary standard for SO_2, set at 500 ppb evaluated over 3 hours, codified at 40 CFR 50.5, has not been revised, and the EPA is also not currently designating areas on the basis of the secondary standard.

General Approach and Schedule

Section 107(d) of the CAA requires that not later than 1 year after promulgation of a new or revised NAAQS, state governors must submit their recommendations for designations and boundaries to the EPA. Section 107(d) also requires the EPA to provide notification to states no less than 120 days prior to promulgating an initial area designation that is a modification of a state's recommendation. If a state does not submit designation recommendations, the EPA may promulgate the designations that it deems appropriate without prior notification to the state, although it is our intention to provide such notification when possible. If a state or tribe disagrees with the EPA's intended designations, it is given an opportunity within the 120-day period to demonstrate why any proposed modification is inappropriate. The EPA is required to complete designations within 2 years after promulgation of a new or revised NAAQS, unless the EPA

Unit 3 stack to portions of Anne Arundel and Baltimore Counties that are within 26.8 kilometers within Wagner's Unit 3 stack.

[2] The EPA is finalizing our intended area designation of unclassifiable/attainment and the boundary definition consisting of the city's jurisdictional boundary for Baltimore City.

[3] 40 CFR 50.4(e) provides that the two prior primary NAAQS will no longer apply to an area 1 year after its designation under the 2010 NAAQS, except that for areas designated nonattainment under the prior NAAQS as of August 22, 2010, and areas not meeting the requirements of a SIP Call under the prior NAAQS, the prior NAAQS will apply until that area submits and the EPA approves a SIP providing for attainment of the 2010 NAAQS. There are no areas in Maryland subject to this clause.

determines that sufficient information is not available, in which case the deadline is extended to 3 years. The 3-year deadline for the revised SO_2 NAAQS was June 2, 2013.

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

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

According to the court-ordered schedule, the EPA must complete the remaining designations by three specific deadlines. By no later than July 2, 2016 (16 months from the court's order), the EPA must designate two groups of areas: (1) areas that have newly monitored violations of the 2010 SO_2 NAAQS, and (2) areas that contain any stationary sources that had not been announced as of March 2, 2015, for retirement and that, according to the EPA's Air Markets Database, emitted in 2012 either (i) more than 16,000 tons of SO_2, or (ii) more than 2,600 tons of SO_2 with an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/MmBTU). Specifically, a stationary source with a coal-fired unit that, as of January 1, 2010, had a capacity of over 5 megawatts and otherwise meets the emissions criteria, is excluded from the July 2, 2016, deadline if it had announced through a company public announcement, public utilities commission filing, consent decree, public legal settlement, final state or federal permit filing, or other similar means of communication, by March 2, 2015, that it will cease burning coal at that unit.

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

Updated designations guidance was issued by the EPA through a March 20, 2015, memorandum from Stephen D. Page, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Air Division Directors, U.S. EPA Regions 1-10. This memorandum supersedes earlier designation guidance for the 2010 SO_2 NAAQS, issued on March 24, 2011, and it identifies factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The guidance also contains the factors the EPA intends to evaluate in determining the boundaries for all remaining areas in the country, consistent with the court's order and schedule. These

factors include: 1) Air quality characterization via ambient monitoring or dispersion modeling results; 2) Emissions-related data; 3) Meteorology; 4) Geography and topography; and 5) Jurisdictional boundaries. This guidance was supplemented by two non-binding technical assistance documents intended to assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling or ambient air quality monitoring for sources that emit SO_2. Notably, the EPA's documents titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and "SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document" (Monitoring TAD), were made available to states and other interested parties. Both of these TADs were most recently updated in February 2016.

Based on complete, quality assured and certified ambient air quality data collected between 2013 and 2015, no violations of the 2010 SO_2 NAAQS have been recorded at ambient air quality monitors in any undesignated part of Maryland. However, there one source in the state meeting the emissions criteria of the consent decree for which the EPA must complete designations by July 2, 2016. In this final technical support document (TSD), the EPA discusses its review and technical analysis of Maryland's April 19, 2016 submission for the area that we must designate. The EPA also discusses any final modifications from the state's recommendation based on all available data before us.

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

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

8) Recommended attainment area – an area a state or tribe has recommended that the EPA designate as attainment.
9) Recommended nonattainment area – an area a state or tribe has recommended that the EPA designate as nonattainment.
10) Recommended unclassifiable area – an area a state or tribe has recommended that the EPA designate as unclassifiable.
11) Recommended unclassifiable/attainment area – an area a state or tribe has recommended that the EPA designate as unclassifiable/attainment.
12) Violating monitor – an ambient air monitor meeting all methods, quality assurance, and siting criteria and requirements whose valid design value exceeds 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.

Technical Analysis for the Anne Arundel County and Baltimore County, Maryland Nonattainment Area

Introduction

The Anne Arundel County and Baltimore County, Maryland, area contains a stationary source that, according to the EPA's Air Markets Database, emitted in 2012 either more than 16,000 tons of SO_2 or more than 2,600 tons of SO_2 and had an annual average emission rate of at least 0.45 pounds of SO_2 per one million British thermal units (lbs SO_2/mmBTU). Specifically, in 2012, the Herbert A. Wagner Generating Station (Wagner, or the Facility), emitted 7,514 tons of SO_2 and had an emissions rate of 1.105 lbs SO_2/mmBTU. As of March 2, 2015, this stationary source had not met the criteria for being "announced for retirement." Pursuant to the March 2, 2015, court-ordered schedule, the EPA must designate the area surrounding this facility by July 2, 2016.

In its April 19, 2011, submission to the EPA for designations for the 2010 SO_2 NAAQS, Maryland recommended that an area that includes Wagner, specifically the entirety of Anne Arundel County, be designated as unclassifiable. The 2011 submission, however, did not include any supporting analyses. Subsequently, in its November 20, 2015, updated designation recommendation submission to the EPA, Maryland recommended that the area surrounding Wagner be designated as attainment. Maryland, however, did not recommend any particular boundary for the area in its November 20, 2015, submission. Maryland also stated that no monitors in Maryland violated the 1-hour SO_2 NAAQS, and the EPA has confirmed this. On January 15, 2016, Maryland submitted a supplement to its 2015 recommendation which included a modeling analysis for the area around Wagner. Additionally, this supplement included State comments on the air dispersion modeling dated January 4, 2016, submitted to the EPA by Sierra Club, asserting that violations of the NAAQS are present in the area around Wagner. After review of the Sierra Club modeling, the EPA agreed with the Sierra Club modeling and proposed to designate portions of Anne Arundel and Baltimore Counties as nonattainment for the SO_2 standard. Additionally, the EPA proposed to designate Baltimore City as unclassifiable/attainment based on the Sierra Club modeling.

On February 16, 2016, the EPA notified Maryland that we intended to designate the Anne Arundel County and Baltimore County, Maryland area as nonattainment, based on our view that the area was not meeting the NAAQS. Additionally, we informed Maryland that our intended boundary for the nonattainment area consisted of portions of Anne Arundel and Baltimore Counties that are within 35.5 kilometers of Herbert A. Wagner's Unit 3 stack, which is located at 39.17765N latitude, 76.52752W longitude. Our intended designation and associated boundaries were based on air dispersion modeling submitted by Sierra Club that was used in lieu of actual monitored data in order to designate the area. It provided evidence that 2010 SO_2 NAAQS violations are occurring within Baltimore County and Anne Arundel County. Furthermore, our intended designation and associated boundaries were also based on the EPA's analysis of emissions data, the lack of federally enforceable SO_2 emission controls at Wagner, and general wind patterns and topography. The EPA noted that Maryland's modeling analysis was not conducted in accordance with the EPA's Modeling TAD or Appendix W, and did not support a finding that the area was meeting the NAAQS and an attainment designation. Detailed rationale, analyses, and other information supporting our intended designation for this area can be found in the TSD for our intended designation in Maryland, and that document along with all others related to this rulemaking can be found in Docket ID EPA-HQ-OAR-2014-0464.

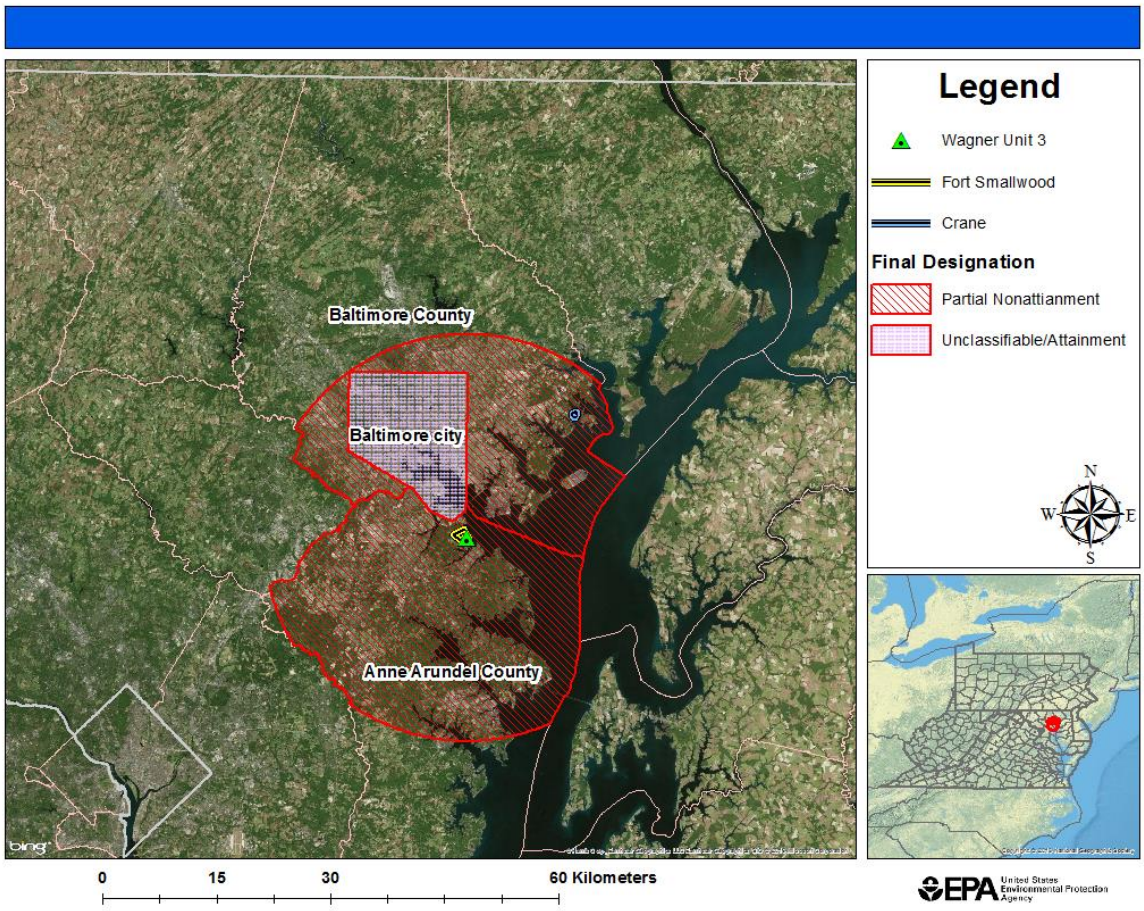
Assessment of New Information

In our February 16, 2016, notification to Maryland regarding our intended nonattainment designation for the Anne Arundel County and Baltimore County, Maryland, area, the EPA requested that any additional information that the Agency should consider prior to finalizing the designation should be submitted by April 19, 2016. On March 1, 2016, the EPA also published a notice of availability and public comment period in the *Federal Register*, inviting the public to review and provide input on our intended designations by March 31, 2016 (81 FR 10563).

The EPA is explicitly incorporating and relying upon the analyses and information presented in the TSD for our intended designation for the purposes of our final designation for this area, except to the extent that any new information submitted to the EPA or conclusions presented in this TSD for our final designation and our response to comments document (RTC), available in the docket, supersede those found in the preliminary technical support document.

As further detailed below, after carefully considering all available data and information, the EPA is designating the Anne Arundel County and Baltimore County, Maryland, area as nonattainment for the 2010 SO_2 NAAQS, but we are designating a smaller nonattainment area than we had identified in our February 16, 2016, notification. The boundaries for this nonattainment area consist of portions of Anne Arundel and Baltimore Counties that are within 26.8 kilometers of Herbert A. Wagner's Unit 3 stack, which is located at 39.17765N latitude, 76.52752W longitude, and are shown in the figure below. Also included in the figure are nearby emitters of SO_2. Additionally, as shown in the figure below and further detailed later in this document, the EPA is designating Baltimore City as unclassifiable/attainment.

Figure 1. EPA's Final Anne Arundel County and Baltimore County, Maryland Nonattainment Area



The EPA received substantive comments regarding our intended nonattainment designation for the Anne Arundel County and Baltimore County, Maryland area from citizens, citizen groups, Sierra Club, industry, and Maryland. Our responses to those comments are provided in the response to comments document (RTC), available in the docket.

Also, additional air dispersion modeling was submitted to the EPA during the state and public comment period in order to characterize air quality in the Anne Arundel County and Baltimore County, Maryland, area. Notably, Sierra Club provided additional air dispersion modeling information during the comment period asserting that the EPA should finalize the proposed nonattainment designation for the area surrounding Wagner. Additionally, Maryland submitted additional air dispersion modeling asserting that the EPA should designate the area surrounding Wagner as attainment, as a first option, or unclassifiable, as a second option, in the face of conflicting modeling analyses. Maryland also stated that if the EPA disagrees with Maryland's recommended designation and designates the area as nonattainment, the nonattainment area should be much smaller with a boundary description comprised of roads and a land/water

interface. This information was submitted by Maryland to support a modification to both our proposed designation and our proposed designation boundary for the area. The EPA disagrees with Maryland's recommendations of attainment and unclassifiable, as modeling analyses submitted by both Sierra Club and Maryland, that were conducted in accordance with the TAD and Appendix W, show violations in the area surrounding Wagner. Based on new information received during the comment period, the EPA agrees that the nonattainment area should be smaller; however, based on analyses of the 5 factors and a modeled contribution analysis, the EPA disagrees that the area should be comprised of the roads and land/water interface that Maryland suggested. Similarly to what was proposed, the EPA is finalizing a nonattainment area using a radius drawn from Wagner's unit 3 stack. The nonattainment area, however, is being reduced to a shorter radius drawn from Wagner's unit 3 stack, but is still inclusive of all modeled violations close in proximity to Wagner as well as sources the EPA has determined to be contributing to these modeled violations. The discussion and analysis of this new information that follow reference the Modeling TAD, Monitoring TAD, and the factors for evaluation contained in EPA's March 20, 2015, guidance, as appropriate and applicable.

Detailed Assessment of Sierra Club's and the State of Maryland's New Modeling

Summary of Recent Air-Dispersion Model Submissions

The EPA received multiple modeling analyses from Sierra Club and the State of Maryland. Sierra Club submitted four (4) AERMOD simulations for all coal-fired units at Brandon Shores, C.P Crane and Wagner, six (6) units overall. The State of Maryland submitted five (5) AERMOD simulations for the same units Sierra Club modeled but added two (2) oil units at Wagner and the Wheelabrator Baltimore Incinerator for a total of nine (9) units. Table 2 lists the modeling analyses that were considered in our final designation decision. Our final designations are based on modeling submitted by the State of Maryland (BETA Adjust U* modeling showing nonattainment submitted by Maryland and referred to as the Appendix D Modeling Analysis), though we determined a smaller boundary was appropriate than the State recommended with this modeling. The EPA finds that this modeling analysis is the most accurate as it best follows the modeling TAD and March 20, 2015 guidance, and in our technical judgement, appears most representative of actual air quality in the area surrounding Wagner.

Table 2. Summary of Model Analyses Considered for Final Designation

Submittal Package	Reference Document	Source Description	Mode	Period Modeled
Sierra Club	Appendix B Exibit 3	Hourly Emissions/Fixed Stack Rates	Regulatory Default	2012-14
Sierra Club	Appendix B Exibit 3	Hourly Emissions/Variable Stack Rates	Regulatory Default	2012-14
Sierra Club	Appendix B Exibit 3	Hourly Emissions/Fixed Stack Rates	Regulatory Default	2013-15
Sierra Club	Appendix B Exibit 3	Hourly Emissions/Variable Stack Rates	Regulatory Default	2013-15
State of Maryland	Appendix A	Hourly Emissions/Variable Stack Rates	Non-Default [1]	1 Apr 2015 - 31 Mar 2016
State of Maryland	Appendix A	Hourly Emissions/Variable Stack Rates	Non-Default [2]	1 Apr 2015 - 31 Mar 2016
State of Maryland	Appendix C	Hourly Emissions/Variable Stack Rates	Regulatory Default	2013-15
State of Maryland	Appendix C	Hourly Emissions/Variable Stack Rates	Non-Default [3]	2013-15
State of Maryland	Appendix D	Hourly Emissions/Variable Stack Rates	Non-Default [3]	2013-15

Regulatory Default, AERMOD version 15181 regulatory default mode

[1] AERMOIST, nondefault plume enhancement technique

[2] AERMOIST, nondefault plume enhancement technique; Adjust U* and LOWWIND 3 AERMOD BETA Options

[3] **Adjust U* AERMOD BETA Option. Approval sought and granted through June 20, 2016 Concurrence with Model Clearinghouse under Section 3.2 of Appendix W**

Sierra Club Modeling Summary

Sierra Club submitted modeling as part of comments submitted during the 30-day public comment period that closed on March 31, 2016. This modeling[4] was essentially an update of Sierra Club's previous submittal and included more recent hourly emissions data (2013-15), hourly varying stack flow rates, and updated background concentrations.

A total of four (4) AERMOD simulations were presented. Sierra Club modeled six (6) sources at allowable and actual hourly emission rates. Only the actual hourly emission rate runs were reviewed by the EPA since this is the recommended method outlined in the EPA's Modeling TAD. The modeled hourly emission rates were nearly identical to those pulled from the EPA's Clean Air Markets website.[5] Two (2) three-year periods were modeled: 2012-14 and 2013-15. Stack parameters for each three-year period were either set to fixed temperatures and flow rates for each modeled unit or used the same fixed temperature along with hourly varying flow rates derived from 2012-14 CEM data made available by the EPA. Background concentrations increased slightly (26.2 $\mu g/m^3$ versus 28.8 $\mu g/m^3$) reflecting a slight increase in the background monitor's most recent 3-year design value. The model receptor grid was identical to Sierra Club's previous submittal and was comprised of a 50km by 50km domain centered on the Brandon Shores/Crane/Wagner power plants and included over 97,000 individual (1.5 m flagpole) receptors. Meteorological data from the Baltimore/Washington International (BWI) and Dulles airports was processed in AERMET with supplemental 5-minute and 2-minute surface wind data using EPA's AERMINUTE program. Surface characteristics were processed seasonally with continuous winter season snow cover using AERSURFACE.

Sierra Club's updated modeling continued to show modeled violations surrounding Wagner with additional areas of violating receptors in portions of Baltimore County west and north of the City of Baltimore. Comparisons of the "fixed" and "variable" stack rate runs show that AERMOD concentrations are sensitive to stack flow rates. In general, the runs using the "fixed" stack rates yielded higher concentrations than the runs with "variable" stack rates.

The EPA is not relying upon Sierra Club's most recent modeling for designation purposes. The simulations generally followed EPA's Modeling TAD but produced modeled violations in areas of Baltimore County greater than 20 km from Wagner that seem questionable in reflecting this area's actual air quality based on the EPA's technical knowledge and judgment. Modeling completed by the State of Maryland using the same default version of AERMOD as Sierra Club produced modeled violations even farther away from Wagner than those modeled in Sierra Club's. Maryland extended the modeling domain outward from Sierra Club's to ensure all modeled violations were captured. The State of Maryland examined these new areas of modeled violations and noted they occurred during the overnight hours under stable atmospheric conditions with low wind speeds. The EPA developed and included the BETA Adjust U* option

[4] Sierra Club modeling described in report entitled *C.P. Crane Generating Station Chase, Maryland Brandon Shores & H.A. Wagner Generating Stations Fort Smallwood Complex, Maryland Evaluation of Compliance with the 1-hour NAAQS for SO2* dated March 23, 2016, from Wingra Engineering, S.C. Madison, Wisconsin.
[5] https://ampd.epa.gov/ampd/

within AERMOD (starting with version 12345) to address concerns with simulating concentrations under these conditions. A more thorough discussion of this can be found in the next section discussing the State of Maryland's modeling submission (specifically Appendix C modeling).

Commenter (0332-AB-Sierra Club) stated that, while Sierra Club believes that their 2015 modeling fully supports a nonattainment designation, they attached a supplemental modeling report (Appendix B Exhibit 3) demonstrating that the results of the 2015 modeling report are robust to the modeling years selected, the use of emission data from the EPA's Emissions Modeling Clearinghouse and to the inclusion of variable hourly exit velocities. Commenter stated that, consistent with these conclusions and with the supplemental information described in their letter and attachments, they urged the EPA to finalize its proposed nonattainment designation for the areas around the Wagner coal-fired power plant.

State of Maryland Modeling Summary

The State of Maryland submitted several sets of modeling analyses during their 60-day state response period, which ended April 19, 2016. Maryland's preferred recommendation for the Wagner area is attainment. Updated modeling was included in Appendix A, Appendix C, and Appendix D of their submittal. Each of these appendices will be briefly discussed in the following sections. The EPA believes that the modeling presented in Appendix D of Maryland's submittal best followed EPA's Modeling TAD and associated guidance and is the most likely to reflect actual air quality conditions in the Wagner area.

State of Maryland Appendix A Modeling Summary

Modeling submitted as part of Maryland's Appendix A was presented to support its preferred designation of attainment for the Wagner area. The modeling analyses in Appendix A were developed by Wagner's consultant and were an attempt to simulate conditions for a low-sulfur coal switch that recently took place for Wagner Unit 2 in response to the EPA's Mercury Air Toxics Standards (MATS). Two sets of modeling were presented with both simulations resulting in model concentrations below the 1-hour SO_2 NAAQS.

Both model simulations in Appendix A included one year of meteorological data developed with surface and upper air soundings from BWI and Dulles Airport respectively. This period extended from April 1, 2015, through March 31, 2016, and covered the period in which the fuel switch for MATS occurred at Wagner's Unit 2 coal-fired boiler.[6] Meteorological data was processed with supplemental 2-minute wind information from BWI using AERMINUTE and included monthly varying surface characteristics with no seasonal snow cover. The modeling domains covered the same area used by Sierra Club with an extension at the edge of the northwest corner to ensure the peak concentrations were captured. There were a little over 10,000 individual model receptors in Maryland's receptor grid. Receptors were excluded from areas where monitors could not be

[6] This unit is currently on PJM's Future Deactivation List. Its listed shutdown date is June 1, 2020. See: http://www.pjm.com/planning/generation-deactivation/gd-summaries.aspx.

sited, specifically over water bodies, as allowed in the EPA's Modeling TAD. Company-provided hourly CEM emission rates and stack parameters including both stack temperatures and stack flow rates were used. EPA finds that these actual rates are more accurate than information used in Sierra Club's "varying" stack rate simulations.

While both one-year simulations showed compliance with the 1-hour SO_2 NAAQS, the EPA finds that there were several deficiencies present that led us to conclude that these results do not support Maryland's preferred attainment designation for the Wagner Area. Appendix A model runs were split into a "default" AERMOD run and a non-default run. The EPA is providing the following comments to explain why these modeling runs are not appropriate for consideration in its final designation for the Wagner area.

AERMOIST creates an aberration that precludes this analysis from being considered Regulatory Default: AERMOIST is a plume enhancement technique that attempts to account for the impacts of moisture-laden plumes from Brandon Shore's Flue-Gas Desulfurization (FGD) units on final model plume rise. AERMOIST calculates latent heating in these moist plumes and then adjusts stack temperatures (upward). This is accomplished by feeding adjusted stack temperatures back into AERMOD through the hourly emission file. The EPA has thus far not determined the regulatory status of AERMOIST, so we currently cannot accept this component as part of the EPA's regulatory default AERMOD package.

Furthermore, an analysis of the output files shows that the Brandon Shore units were emitting during the hour which defined the simulation's 1-hr SO_2 design value (the 99^{th} %). Based on the EPA's knowledge of AERMOIST and analysis that this simulation's design value was 99.93% of the NAAQS and the Brandon Shore units were emitting at that time, it's very likely that AERMOIST contributed to the simulation showing compliance with the NAAQS. In other words, without AERMOIST this simulation would have most likely exceeded the NAAQS.

Use of only one year of met data is not necessarily reflective of the Wagner area's modeled design value. The EPA recognizes Maryland's attempt to project what current operations at Wagner would be given the facility's recent switch to lower sulfur coal in Unit 2. The EPA notes, however, that this coal switch was not federally enforceable. In addition, using only one year of simulation time would not accurately reflect what the area's design value would be, which is the purpose of the modeling analysis. A more accurate representation would have included three years of met data as outlined in EPA's Modeling TAD. Furthermore, given the closeness to the standard of Maryland's "default" run and the impact of the currently unapproved use of AERMOIST, it is highly likely that if Maryland had run the most recent three years of meteorological and emissions that the model results would have exceeded the 1-hour SO_2 NAAQS.

Maryland's non-default run included in Appendix A uses options that were not approved under Section 3.2.2 of Appendix W. The non-default run presented in Appendix A showed model concentrations in the Wagner area that were below the NAAQS. This run, however, utilized several BETA options within AERMOD that would

need approval under Section 3.2.2 of Appendix W. These included the BETA Adjust U* and Low Wind 3 options within AERMOD along with the previously mentioned AERMOIST component. No formal approval request was sought or given for these two BETA options, which is contrary to the EPA's December 10, 2015 Clearinghouse Memorandum,[7] meaning that it would not be appropriate for the EPA to rely upon the results from this run for the purpose of designating the area around the Wagner facility.

State of Maryland Appendix C Modeling Summary

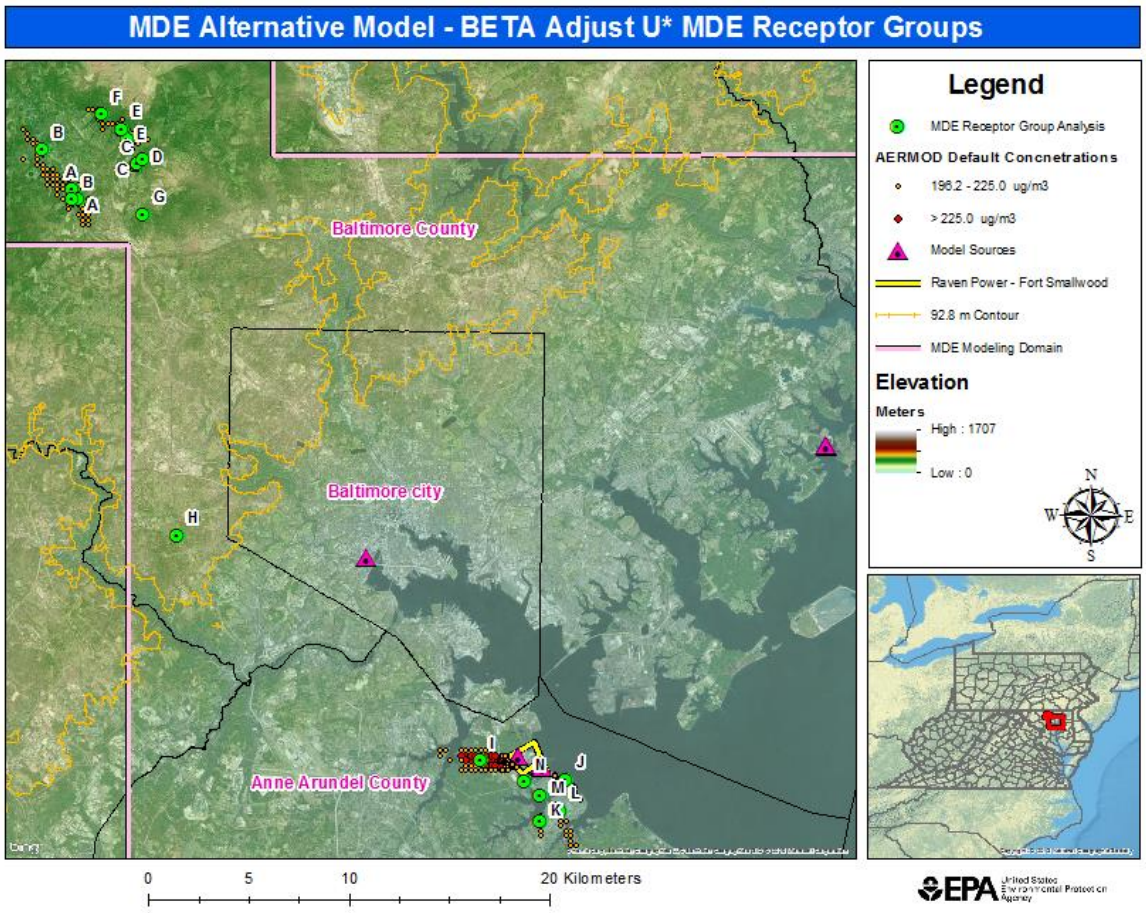
Two (2) AERMOD simulations, showing nonattainment, were included as part of Appendix C. This included a default AERMOD run and a run using EPA's BETA Adjust U* option. These runs were submitted as part of an official request to use an alternative model under Section 3.2.2 of Appendix W. This request was outlined in Maryland's April 14, 2016, letter to the EPA Region 3 Regional Administrator. After an internal technical review, a short summary was developed and a formal concurrence request was submitted to the EPA's Model Clearinghouse on May 13, 2016. The Model Clearinghouse granted approval of Maryland's request on June 20, 2016, and the approval memorandum is available in the docket under this rulemaking.

Maryland's default AERMOD run showed similar areas of modeled violations as Sierra Club's model simulations. Violations were clustered in the immediate area of the Wagner power plant as well as several areas in Baltimore County to the west and north of the City of Baltimore. Model violations extended out to almost 40 km from Wagner. Both AERMOD runs used three (3) years of surface and upper air soundings from BWI and Dulles airports for the 2013-2015 time period. Surface winds were supplemented with 2-minute surface wind data processed in AERMET using monthly varying surface characteristics including soil moisture with no seasonal snow cover via AERSURFACE. Hourly emissions, stack temperature, and flow rates were used for all units at Brandon Shores, C.P. Crane, and Wagner. Emission rates and stack parameters were held constant for the Wheelabrator Baltimore Incinerator.

Figure 2 shows the locations of the receptors in Maryland's default AERMOD run that exceeded the 1-hour SO_2 NAAQS in the extended Wagner area. This figure was included in the EPA's May 13, 2016 technical analysis that was sent the Model Clearinghouse for concurrence. Violating receptors can be generally broken into two (2) groups. Far away receptors (A-H) that occur in the elevated Piedmont terrain and close-in receptors (I-N) that reside on the Atlantic Coastal Plane. The 92.8m contour marks effective stack height for Wagner Unit 3.

Figure 2. AERMOD Default run violating receptors from Maryland's Appendix C run

[7] https://www3.epa.gov/ttn/scram/guidance/clarification/AERMOD_Beta_Options_Memo-20151210.pdf



Maryland examined the dates and times for several representative receptors (labeled A through N in Figure 2) from the group of violating receptors in its default AERMOD run. Receptors A through H had peak model concentrations occurring during the overnight hours under low wind speeds. Violating receptors near Wagner (receptors I through N) occurred during daytime hours with modestly higher wind speeds. Table 3 shows the dates and times for these representative violating receptors along with the hourly wind speed and U* values from the simulation's AERMET surface file. There are two sets of columns: one for the default AERMET run and one using the BETA Adjust U* run. The BETA U* values for receptors A through H increased while values for I through M did not change (there was a slight increase for receptor N). As explained earlier, EPA's BETA Adjust U* increases the U* value only in instances of stable (including overnight), low-wind speed conditions.

The EPA received comments from Sierra Club objecting to the modeling provided by AECOM to Maryland because the EPA has not formally approved the use of the ADJ_U* and LOWWIND3 options as the regulatory default under Appendix W and because AECOM failed to support the preferability of these options for modeling the Baltimore-area coal plants, especially for determining whether the area is attaining the 1-hour SO_2 NAAQS. Commenter provided discussion of this issue in their letter and attachments, including attached comments of

Camille Sears (Exhibit 4). Also see discussion of these options in section III.A.1 of this document.

Table 3. Change in representative violating receptor U* values using AERMET in default and BETA Adjust U* modes

							Default AERMET		BETA Adjust U*	
Group	X	Y	Elevation (m)	Year	Julian Day	Hour	Surface Friction Velocity (u*) (m/s)	Wind Speed	Surface Friction Velocity (u*) (m/s)	Wind Speed
A	344732.83	4366325.66	212.8	2014	247	20	0.081	2.25	0.15	2.25
A	344982.83	4365825.66	209.6	2014	247	20	0.081	2.25	0.15	2.25
B	343232.83	4368325.66	213.7	2014	247	20	0.081	2.25	0.15	2.25
B	343232.83	4368075.66	210.3	2014	55	22	0.026	0.79	0.095	0.79
C	347982.83	4367575.66	209.1	2014	19	5	0.036	1.08	0.095	1.08
C	347953.75	4367592.5	208.34	2014	19	5	0.036	1.08	0.095	1.08
D	348232.83	4367825.66	205.3	2014	60	22	0.031	0.86	0.097	0.86
E	347482.83	4368825.66	217.5	2014	19	5	0.036	1.08	0.095	1.08
E	347232.83	4369325.66	219.5	2014	273	19	0.05	1.37	0.095	1.37
F	346232.83	4370075.66	219.4	2014	19	5	0.036	1.08	0.095	1.08
G	348232.83	4365075.66	201.2	2015	128	20	0.069	1.94	0.126	1.94
H	349953.75	4349092.5	159.13	2014	273	20	0.047	1.3	0.094	1.3
I	365075	4337890	9.39	2014	358	13	0.118	1.55	0.118	1.55
J	369375	4336940	7.69	2014	363	13	0.179	1.99	0.179	1.99
K	368075	4334890	9.16	2014	61	16	0.165	2.04	0.165	2.04
I	369075	4335390	7.84	2014	64	10	0.094	0.69	0.094	0.69
M	368075	4336140	6.51	2015	33	13	0.118	1.3	0.118	1.3
N	367275	4336840	14.04	2014	274	6	0.148	3	0.187	3

Running the BETA Adjust U* option in AERMOD does not eliminate all violating receptors in Maryland's Appendix C runs. Model violations in close proximity (within 6 km) to Wagner continue to occur even with the BETA Adjust U* option. The BETA Adjust U* option appears to reduce the concentration peaks occurring in Baltimore County west and north of the City (i.e., the 'far away' receptors) of Baltimore such that there are no longer violating receptors in that area . These default AERMOD run violations are probably occurring due to AERMOD potentially over predicting concentrations during times of low wind/stable conditions. The EPA finds that the specified use of BETA Adjust U* in the latter Appendix C run provides a more realistic estimate of actual conditions in Anne Arundel County, Baltimore County, and the City of Baltimore surrounding the Wagner power plant.

State of Maryland Appendix D Modeling Summary

Modeling presented in Maryland's Appendix D is identical to the BETA Adjust U* run included in Appendix C. Maryland presented the results of this run to provide a possible alternative to their preferred Attainment designation for the Wagner area. Model results showed violating receptors were confined to areas within 6 km of Wagner. If the Appendix A model simulations were not acceptable, as the EPA has now determined that they are not, Maryland proposed defining a nonattainment area based on several road segments that enclosed the violating receptors.

Model Selection and Modeling Components for Modeling Used in Designation Decision

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

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

After reviewing modeling multiple analyses sent by Sierra Club and the State of Maryland, the EPA finds that the BETA Adjust U* AERMOD simulation included in Maryland's Appendix D most closely follows the Modeling TAD and the EPA's March 20, 2015, guidance and therefore more accurately represents true air quality in the Wagner area. As currently required, Maryland formally requested the use of the BETA Adjust U* option in AERMOD under Section 3.2.2 of Appendix W. After a concurrent technical review by Region 3 and the Model Clearinghouse, the EPA has provided a formal approval to use the BETA Adjust U* option within AERMOD. Concurrence was granted by the Model Clearinghouse on June 20, 2016 and it is available in the docket under this rulemaking.

Modeling used in Maryland's Appendix D was completed using a version of Lakes Environmental software that includes AERMOD's most recent version (15181). As noted previously, AERMOD was run using the non-default BETA Adjust U* option. As noted in EPA's *Addendum Users Guide for the AERMOD Meteorological Preprocessor (AERMET)* …"[T]he ADJ_U* "BETA" option is considered to be a non-Default option and is therefore subject to the alternative model provisions in Section 3.2 of Appendix W (40 CFR Part 51)."

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines contained in documents such as the Modeling TAD, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, Maryland determined that it was most appropriate to run the model using rural dispersion coefficients. Upon review of land use

surrounding the Wagner power plant, the EPA determined that Maryland's use of rural dispersion coefficients was appropriate in this model run.

Modeling Parameter: Area of Analysis (Receptor Grid)

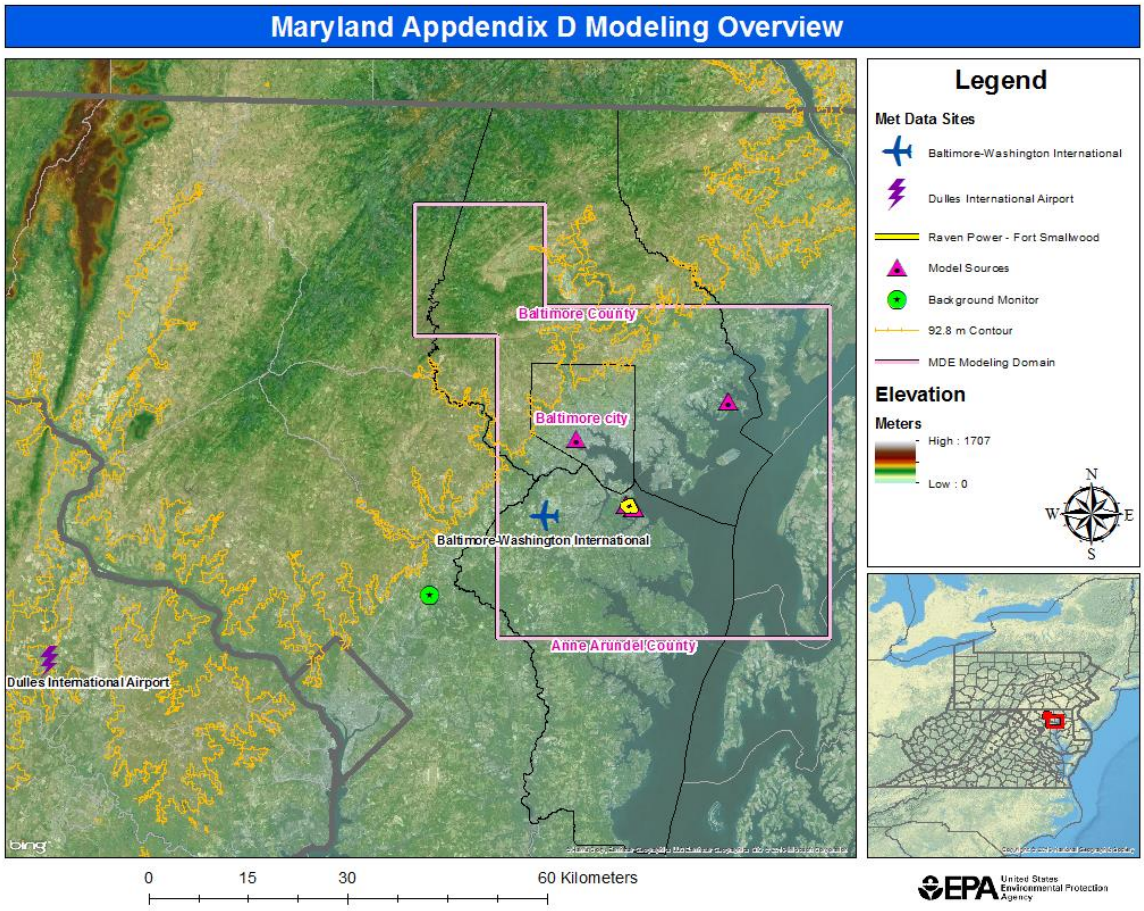
The EPA believes that a reasonable first step towards characterization of air quality in the area surrounding the Wagner power plant is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the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

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

- 25 meter spacing along the Fort Smallwood ambient boundary (Brandon Shores/Wagner)
- Irregular spacing along ambient boundary for C.P. Crane
- 100m spacing within the first 4 km from Fort Smallwood and C.P. Crane
- 250m spacing from 4 km to 10 km from Fort Smallwood and C.P. Crane
- 500m spacing for the remainder of domain outside of 10 km from Fort Smallwood and C.P. Crane
- 250m spacing for the 20 km by 20 km grid added onto northwest corner of Sierra Club modeling domain

The receptor network contained 17,000 individual receptors and covered portions of Anne Arundel and Baltimore counties as well as the City of Baltimore. Figure 3 shows the chosen area of analysis surrounding the Wagner power plant, which along with Brandon Shores is part of the Fort Smallwood complex, as well as the domain for the modeling analysis. Consistent with the Modeling TAD, receptors for the purposes of this designation effort were placed only in areas where it would also be feasible to place a monitor and record ambient air impacts. The impacts of the area's geography and topography will be discussed later within this document.

Figure 3. Overview of Modeling Domain for the Wagner Area of Analysis



For the area around the Wagner power plant, Maryland included emissions from Brandon Shores, which along with Wagner make up the Fort Smallwood complex, the Wheelabrator Baltimore Incinerator located in the City of Baltimore and C.P. Crane, a two (2) unit coal-fired power plant locate in the eastern part of Baltimore County. The Wheelabrator Baltimore Incinerator is located approximately 12.5 km northwest of Wagner, and C.P. Crane is located almost 22 km northeast of Wagner. These facilities represent the largest operating SO_2 sources in the Wagner area. The combination of Maryland's choice of sources to model and the extent and distribution of model receptor points within the modeling domain ensures that the modeling analysis will properly assess source impacts in the Wagner area.

Modeling Parameter: Source Characterization

Maryland characterized the sources within the area of analysis in accordance with practices outlined as acceptable in the Modeling TAD. Specifically, Maryland used actual stack heights in conjunction with actual emission rates. Hourly emission rates were used for the Brandon Shores, C.P. Crane, and Wagner based on CEM data for these units. Emission rates for the Wheelabrator Baltimore Incinerator were held constant throughout the model simulation. Buildings at the Fort Smallwood complex (Brandon Shores and Wagner) were included in the modeling analysis, allowing for downwash assessment to be included for the area immediately surrounding the Wagner power plant. This building information was processed using EPA's BPIP-PRIME (version 04274) program. Units at Brandon Shores are vented through a dual-flue stack. The modeling uses merged stack principles[8] when both units are operating simultaneously. In addition to hourly varying emission rates for Brandon Shores, C.P. Crane, and Wagner, stack temperatures and velocity rates varied on an hourly basis based on company provided CEM data.

Modeling Parameter: Emissions

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

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

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

As previously noted, Maryland included Wagner and three (3) other significant emitters of SO_2 within the City of Baltimore and Baltimore County. These included all of the major combustion units at Brandon Shores, C.P. Crane, and Wagner along with the Wheelabrator Baltimore Incinerator. Maryland believes the modeling domain adequately represents the area where

[8] See Section 2.2 of the EPA's *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources.*

maximum concentrations of SO_2 are expected to occur and includes all sources which might contribute to those concentrations. No other sources were determined by Maryland to have the potential to cause significant concentration gradient impacts within the area of analysis. The facilities in the area of analysis and their associated annual actual SO_2 emissions from 2013 to 2015 are summarized in Table 4. The emissions were summed from the hourly emission file used in the modeling analysis to represent hourly varying emissions from units at Brandon Shores, C.P. Crane, and Wagner. Summed emissions and actual hourly emissions were based on CEMS data provided by the operators and were verified using the EPA's Clean Air Markets Division[9] for these three sources. As noted previously, the Wheelabrator Baltimore Incinerator used a constant emission rate over the simulation period.

Table 4. Actual SO_2 Emissions in 2013-15 from Facilities in Maryland's Area of Analysis

Facility Name	SO_2 Emissions (tons per year or tpy)		
	2013	2014	2015
Brandon Shores Unit 1	1,389.0	1,669.9	1,310.1
Brandon Shores Unit 2	1,481.3	1,475.2	1,642.5
C.P. Crane Unit 1	831.3	573.4	387.9
C.P. Crane Unit 2	2,140.3	1,313.8	953.9
Wagner Unit 1	0.2	72.6	65.1
Wagner Unit 2	1,568.3	1,946.7	1,185.9
Wagner Unit 3	8,553.5	7,276.1	8,756.6
Wagner Unit 4	72.7	322.5	186.2
Wheelabrator Baltimore Incinerator	438.0	438.0	438.0
Total Emissions From All Facilities in Maryland's Area of Analysis	**16,474.6**	**15,088.2**	**14,926.2**

Modeling Parameter: Meteorology and Surface Characteristics

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

For the Wagner area of analysis, surface meteorology from the NWS station at the BWI airport, approximately 12 km west of the Fort Smallwood Complex and coincident upper air

[9] https://ampd.epa.gov/ampd/

observations from the NWS station at the Dulles Airport, approximately 91 km to the west-southwest were selected (*see* Figure 3). This data was considered representative of meteorological conditions within the area of analysis.

Maryland used AERSURFACE version 13016 using data from the BWI NWS station south of the City of Baltimore located at 39.1733 N latitude and 76.6841 W longitude to estimate the surface characteristics of the area of analysis. AERSURFACE was run using the standard twelve (12) 30° sectors. Surface characteristics included albedo (the fraction of solar energy reflected from the earth back into space), Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and surface roughness (sometimes referred to as "Zo"). These values varied monthly. Bowen ratios were adjusted based on precipitation values to be either wet, dry or average. Surface roughness was calculated based on land use categories from the 1992 USGS land cover database for Maryland out to 1 km from the BWI ASOS tower location.

Meteorological data from the BWI and Dulles Airport surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. Maryland generally followed the EPA's preferred methodology and settings in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1 minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, Maryland set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with a March 2013 EPA memo titled, "Use of ASOS meteorological data in AERMOD dispersion Modeling." 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.

Modeling Parameter: Geography and Terrain

The Fort Smallwood complex sits on the western shore of the Chesapeake Bay southeast of the City of Baltimore. Elevations are relatively flat in the immediate area of Wagner since it resides on the Atlantic Coastal Plain. Terrain rises to the northwest as the Atlantic Coastal Plain physiographic province gives way to the higher terrain of the Piedmont.

To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model was the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "first tier" approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Wagner area of analysis, Maryland chose to use a seasonally varying by wind sector background from the Beltsville SO_2 monitor. The Essex monitor is the closest monitor to the Wagner and Fort Smallwood complex (approximately 15 km northeast). Due to its close proximity to Wagner and other nearby large SO_2 sources, the Essex monitor is probably influenced by these sources bringing up the possibility of "double counting" where source contributions are being made in both the modeling analysis and the representative background concentration. Using Beltsville, located in Maryland's Prince George's County approximately 33 km southwest of Wagner and the Fort Smallwood Complex, minimizes this possibility. .

Summary of Modeling Results

The AERMOD modeling parameters, as supplied by additional information from Maryland during the comment period for the Wagner area of analysis are summarized below in Table 5.

Table 5. AERMOD Modeling Parameters for the Wagner Area of Analysis

Wagner, MD Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural
Modeled Sources	4
Modeled Stacks	9
Modeled Structures	16
Modeled Fence lines	2
Total receptors	17,000
Emissions Type	Actual (Hourly Varying)
Emissions Years	2013-15
Meteorology Years	2013-15
Surface Meteorology Station	BWI Airport, MD
Upper Air Meteorology Station	Dulles Airport, VA
Methodology for Calculating Background SO_2 Concentration	Wind Sector, Seasonal
Calculated Background SO_2 Concentration	Varies by Wind Sector and Season

The results presented below in Table 6 show the magnitude and geographic location of the highest predicted modeled concentration based on actual emissions.

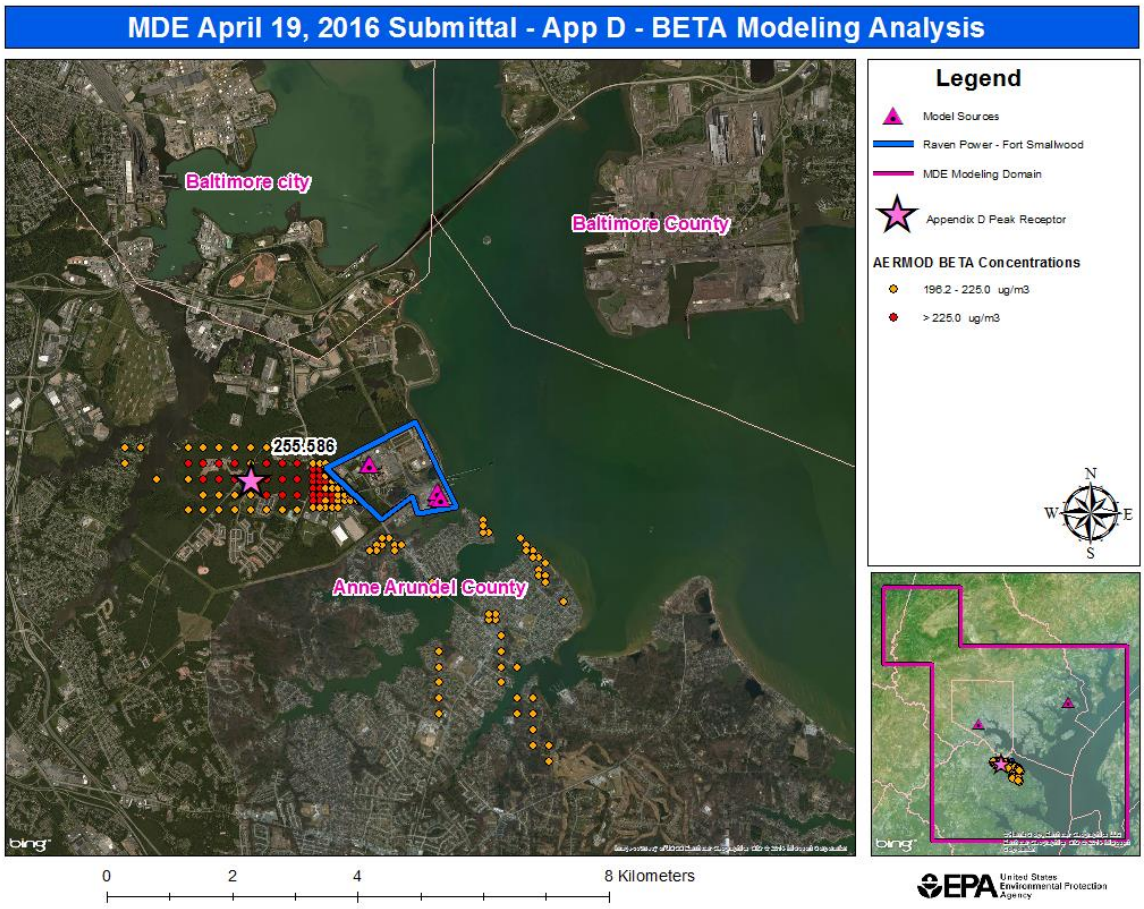
Table 6. Maximum Predicted 99th Percentile 1-Hour SO_2 Concentration in the Wagner Area of Analysis Based on Actual Emissions

		Receptor Location		SO_2 Concentration ($\mu g/m^3$)	
Averaging Period	Data Period	UTM z18 E (m)	UTM z18 N (m)	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2013-15	365075	4337890	255.586	196.5*

*Equivalent to the 2010 SO_2 NAAQS set at 75 ppb

Modeling included in Maryland's Appendix D indicates that the highest predicted 3-year average 99th percentile 1-hour average concentration within the chosen modeling domain is 255.6 $\mu g/m^3$, or ~98 ppb. This modeled concentration included a background SO_2 concentration, and is based on actual emissions from the Brandon Shores, C.P. Crane, Wagner, and the Wheelabrator Baltimore Incinerator. Figure 4 shows the model receptors that exceed the 1-hour SO_2 NAAQS. Violating model receptors in Maryland's Appendix D modeling analysis occur within 6 km of the Fort Smallwood Complex and Wagner. The model peak concentration occurs to the west of Wagner with additional violating receptors also located to the south and southwest.

Figure 4. Maximum Predicted 99th Percentile 1-Hour SO_2 Concentrations in the Wagner Area of Analysis Based on Actual Emissions



Emissions and Emissions-Related Data

A thorough discussion of emissions from Wagner and other nearby sources can be found in the TSD for our intended designation, however, some additional emissions and emissions-related information is provided in this final TSD. With regards to relevant emissions information, the EPA further considered the emission rates and limits of C.P. Crane and the Wheelabrator Baltimore Incinerator. Crane has a significantly higher hourly emission limits (Table 7) and actual hourly emission rates (Table 8) in comparison to the Baltimore Incinerator. While both Crane and the Baltimore Incinerator have similar annual emission limits, the hourly limit is more important due to the 1-hour SO_2 NAAQS. Furthermore, Crane does not have any SO_2 emission control devices installed and operating, whereas Wheelabrator operates with a "slaked lime" spray dryer absorber (SDA). Each of Crane's two (2) unit hourly emission limits are over 17 times greater than the Baltimore Incinerator's. Crane's maximum actual hourly emission rates are 8 to 14 times higher than the Baltimore Incinerator. Based on this emissions information, the impact of Crane's emissions on the area's air quality is likely much greater than that of the Baltimore Incinerator.

Table 7. Allowable Emission Limits based on Crane and Baltimore Incinerator Title V Permits

Source	Hourly Limit	Boiler Rating	Hourly Limit (lbs/hr)	Annual Limit (tpy)
Crane Unit 1	3.5 lbs/MmBTU	1,865MmBTU/hr	~6,527.50	1,532
Crane Unit 2	3.5 lbs/MmBTU	1,865MmBTU/hr	~6,527.50	1,646
Wheelabrator Baltimore Incinerator			375	1,478

Table 8. Modeled (Actual) Emission Rates

Source	Rate	lbs/hr	Total (tpy)		
			2013	2014	2015
Crane Unit 1	Variable	0.0 to 2,966.7	831.3	573.4	387.9
Crane Unit 2	Variable	0.0 to 5,409.7	2,140.3	1,313.8	953.9
Wheelabrator Baltimore Incinerator	Fixed	100	438	438	438

Maryland's BETA Adjust U* modeling analysis included a culpability analysis which showed source contribution for each receptor that exceeded the NAAQS; this area was confined to the area immediately surrounding Wagner (see Figure 4). Specifically, for violating receptors surrounding the Wagner generating station, modeled impacts from Crane Units 1 and 2 are four (4) times higher than modeled impacts from the Wheelabrator Baltimore Incinerator. Crane's maximum modeled impact to violating receptors in the Wagner area is 4.9 $\mu g/m^3$ versus the Baltimore Incinerators maximum modeled impact to violating receptors, which is 1.2 $\mu g/m^3$.

Additionally, Crane's modeled impact in the immediate Wagner area may be greater than currently stated. First, modeled impacts are based on actual emissions, which may not reflect Crane's impact if in the future it emits closer to its hourly permitted emission rates (see Table 7). Actual maximum hourly rates for Crane are only 45% of permitted limits for Unit 1 and 83% of permitted limits for Unit 2. This estimate may be conservative since no analysis was done to examine how often both of Crane's units operate during the same hour; Crane's combined actual hourly emission rates may be a much smaller fraction of its combined hourly permitted emission rate. Second, the actual hourly model rates for Crane may not have occurred during worst-case meteorological conditions. Crane's hourly emissions were set to zero (0) for nearly 60% of the hours in the model simulation. By contrast, the Baltimore Incinerator's model impacts were fully assessed since it emitted during all hours of the simulation, thus including worst-case meteorological conditions. With so many hours at Crane set to zero (0) there is no way of assuring the units were on during the worst-case meteorological conditions so modeled impacts for Crane could actually be much higher. For reasons outlined in this section, the EPA has

determined that it is appropriate to include Crane in the Anne Arundel County and Baltimore County nonattainment area.

Jurisdictional Boundaries

Once the geographic area of analysis associated with Wagner, other nearby sources of SO_2, and background concentration is determined, existing jurisdictional boundaries are considered for the purpose of informing our final nonattainment area, specifically with respect to clearly defined legal boundaries. Given that existing jurisdictional boundaries do not appear suitable for defining the nonattainment area surrounding Wagner (discussed in detail in the TSD for our intended designation, p. 47-49), the EPA's position is that an alternative to using jurisdictional boundaries is to draw a circle around the sources most impacting the area's air quality and all modeled violating receptors. Similar to the EPA's proposed nonattainment area boundary, and considering the new modeling analysis submitted by Maryland that uses the BETA Adjust U* option, the EPA finds that a circle drawn with a radius extending out 26.8 km from Wagner's Unit 3 stack (located at 39.17765N latitude, 76.52752W longitude) is an appropriate boundary. Such a circle encloses portions of Anne Arundel and Baltimore Counties, which contain all of the violating receptors and sources most impacting the area for the SO_2 NAAQS.

Maryland's April 19, 2016, submittal provided a recommended boundary around Wagner consisting of roads and a land/water interface. The EPA disagrees with such a boundary in that it only includes the modeled violations within approximately 6 kilometers of Wagner and does not include the impacts of the C.P. Crane power plant. Additionally, the EPA does not find such a boundary suitable because roads have the potential to shift, which could alter the nonattainment area boundary. The EPA finds that our final nonattainment area, consisting of portions of Anne Arundel and Baltimore Counties that are within 26.8 kilometers of Herbert A. Wagner's Unit 3 stack, which is located at 39.17765N latitude, 76.52752W longitude, are comprised of clearly defined legal boundaries, and we find these boundaries to be a suitably clear basis for defining our final nonattainment area.

Conclusion

After careful evaluation of the state's recommendations, all timely comments and information received during the state and public comment period, and additional relevant information as discussed in this document, the EPA determines that the area around Wagner is not meeting the NAAQS, and therefore is designating the area as nonattainment for the 2010 SO_2 NAAQS. Specifically, the area is comprised of portions of Anne Arundel and Baltimore Counties that are within 26.8 kilometers of Herbert A. Wagner's Unit 3 stack, which is located at 39.17765N latitude, 76.52752W longitude. After taking into consideration all of the air dispersion modeling analyses the EPA received both prior to and during the comment period, the EPA believes Maryland's modeling analysis, which uses the BETA Adjust U* option, showing SO_2 NAAQS violations occurring in the immediate vicinity of Wagner, to be most representative of actual air quality in the area. The EPA finds that Maryland's BETA Adjust U* AERMOD simulation included in Maryland's Appendix D most closely follows the Modeling TAD and EPA's March 20, 2015 guidance, and is therefore the most accurate representation currently available of air quality in the Wagner area.

Additionally, based on the weight of evidence of available source contribution information and emissions data, the EPA finds that the C.P. Crane power plant in neighboring Baltimore County contributes to the SO_2 NAAQS violations occurring in the immediate vicinity of Wagner, and as such, believes a nonattainment boundary which includes Crane is appropriate. Furthermore, the EPA has determined based on the weight of evidence of available source contribution information, emissions data, and an installed and operational emissions control device at Wheelabrator, that the Wheelabrator Baltimore Incinerator in neighboring Baltimore City should not be included in the nonattainment area.

At this time, our final designation for the state only applies to this area and the other area contained in this final TSD. Consistent with the court-ordered schedule, the EPA will evaluate and designate all remaining undesignated areas in Maryland by either December 31, 2017, or December 31, 2020.

Technical Analysis for Baltimore City, Maryland Unclassifiable/Attainment Area

Introduction

In its April 19, 2011, submission to the EPA for the initial designations for the 2010 SO_2 NAAQS, Maryland recommended that Baltimore City be designated as unclassifiable. Maryland did not update its recommendation for Baltimore City in its 2015 updated recommendation.

On February 16, 2016, the EPA notified Maryland that we intended to designate the Baltimore City, Maryland area as unclassifiable/attainment, based on our view that the area was meeting the NAAQS and not contributing to the violations occurring in Baltimore County and Anne Arundel County. Additionally, we informed Maryland that our intended boundary for Baltimore City for the unclassifiable/attainment area consisted of Baltimore City's jurisdictional boundary.

Our intended designation and associated boundaries were based on air dispersion modeling showing persuasive evidence that SO_2 NAAQS violations are not occurring in Baltimore City. Detailed rationale, analyses, and other information supporting our intended designation for this area can be found in the TSD for our intended designation for Maryland, and this document along with all others related to this rulemaking can be found in Docket ID EPA-HQ-OAR-2014-0464.

The EPA is explicitly incorporating and relying upon the analyses and information presented in the TSD for our intended designation for the purposes of our final designation for this area, except to the extent that any new information submitted to the EPA or conclusions presented in this final TSD and our response to comments document (RTC), available in the docket, supersede those found in the TSD for our intended designation. Namely, Maryland's new modeling analysis discussed earlier in this document which relied upon the BETA Adjust U* option shows no NAAQS violations in Baltimore City. The EPA finds that Maryland's BETA Adjust U* AERMOD simulation included in Maryland's Appendix D most closely follows the Modeling TAD and the EPA's March 20, 2015, guidance, and therefore continues to support an

unclassifiable/attainment designation for Baltimore City *(See* the "State of Maryland Appendix D Modeling Summary" section discussed above).

Given these modeling results and that there are no large SO_2 emissions sources located within Baltimore City that could be impacting areas outside of Baltimore City, as well as no violating monitors in the area and limited terrain, the EPA believes there is persuasive evidence to support a conclusion that Baltimore City is meeting the NAAQS and is not contributing to a nearby area that does not meet the NAAQS and that a designation of unclassifiable/attainment is appropriate. Therefore, the EPA designates Baltimore City as unclassifiable/attainment for the 2010 SO_2 NAAQS.

Jurisdictional Boundaries:

The EPA notes that our final unclassifiable/attainment area, consisting of Baltimore City is comprised of a clearly defined legal boundary, and we find this boundary to be a suitably clear basis for defining our final unclassifiable/attainment area.

Conclusion

After careful evaluation of the Maryland' recommendation, all timely comments and information received during the state and public comment period, and additional relevant information as discussed in this document, the EPA is designating Baltimore City as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the area is comprised of Baltimore City's jurisdictional boundary.