MDE Technical Support Document Regarding the Designation of the Area of the Herbert A. Wagner Generating Plant for 1-Hour Sulfur Dioxide

Introduction

The Maryland Department of the Environment (MDE, or "the Department") received the United States Environmental Protection Agency's (EPA) February 2016 "120-day letter" and draft technical support document (TSD) regarding the designation of the Herbert A. Wagner Generating Station (Wagner) area for the 1-hour, 75 parts per billion (ppb) sulfur dioxide National Ambient Air Quality Standard (NAAQS). In its letter and support document, the EPA disagreed with Governor Hogan's November 2015 recommendation of "attainment" for the designation of the Wagner 1-hour SO_2 area. The EPA indicated their preliminary intention to instead designate the Wagner area "nonattainment" based on their analyses of Sierra Club modeling.

Specifically, EPA intends to include in the nonattainment area portions of Anne Arundel County and Baltimore County that are within 35.5 kilometers of Herbert A. Wagner's Unit 3 stack. Baltimore City, which is located between them, would be designated "unclassifiable/attainment." The March 2, 2015, consent decree[1] between the EPA, Sierra Club, and the Natural Resources Defense Council (NRDC), required that by July 2, 2016, EPA must finalize its 1-hour SO_2 designation of the Wagner area as either "attainment" (same as "unclassifiable/attainment"), "nonattainment," or "unclassifiable."

Wagner is located in northern Anne Arundel County, and it is comprised of four steam electric generating units that burn a mix of fuels including natural gas, oil, and coal. The Brandon Shores Generating Station ("Brandon Shores"), adjacent to Wagner, has wet flue gas desulfurization (FGD) on all its units. In April 2015, for compliance with EPA's Mercury and Air Toxics Standards (MATS), Wagner Unit 2 began burning a lower chlorine coal that is also lower in sulfur content. In March 2016, Wagner Unit 3 began operating a dry sorbent injection system to comply with MATS. As a result of these changes to comply with the MATS rule, the Wagner area's 1-hour SO_2 emissions have decreased significantly, and the area around Wagner shows compliance with the 1-hour standard.

New MDE nitrogen oxide (NO_x) regulations (COMAR 26.11.38) that became effective on May 1, 2015, are also pushing changes that will reduce SO_2 emissions at the coal-fired electricity generating units in the Wagner area. By 2020, both of the coal-fired units at the C.P. Crane Generating Station (Crane) are **required** to convert to natural gas or retire, while Wagner's Unit 2 is expected to convert to natural gas or retire. All of the modeling conducted by different parties and discussed below shows that reducing the SO_2 emissions at Wagner 2 brings the area into attainment for the 1-hour SO_2 NAAQS.

[1] See Case No.: 3:13-cv-3953-SI, in the United States District Court for the Northern District of California, San Francisco Division, filed March 2, 2015, available at http://www.4cleanair.org/sites/default/files/resources/Litigation-SO2-Designations_Deadline_Suit-Final_CD-030215.pdf.

For quite some time, MDE has been working on characterizing Maryland's ambient air quality in reference to this new and unprecedented 1-hour standard. Raven Power has been working cooperatively with MDE on the issue since 2013. MDE thanks EPA for the opportunity to formally provide comments. A summary of our key positions is provided below:

1. An Attainment Designation is Supported by the Available Data and Analysis.

a. Modeling results for a 12-month period of post-MATS actual emissions for the Wagner facility show the area to be in attainment of the 1-hour SO_2 standard.

b. As found in the three-year study that MDE provided to EPA in January 2016, and as substantiated through additional modeling evidence produced since and described in this document, the Wagner area is currently attaining the 1-hour SO_2 NAAQS. This modeling takes into account emissions reductions achieved through compliance with EPA's MATS Rule and the application of some permissible AERMOD modeling options, as listed below:

(i) ADJUST U star (ADJ_U*)
(ii) LOWWIND3
(iii) Sector-specific 1-hour SO2 background concentrations
(iv) Variable actual emission rates, exit temperatures, and exit velocities

Also note that the MATS Rule emission limits will be incorporated into the facilities' Title V Operating Permits making them federally enforceable and therefore appropriate for use in this modeling demonstration.

2. The Sierra Club Modeling Demonstration is Deficient.

EPA primarily relied on Sierra Club's modeling of emissions from Wagner, Brandon Shores and the Crane as the basis for its preliminary recommendation of "nonattainment" for the Wagner area, the recommendation that was included in the February 16, 2016, 120-day letter. MDE found many deficiencies in the Sierra Club modeling, including issues with background concentrations, meteorological data processing, receptor locations and the use of constant stack exit temperatures. These errors in the Sierra Club modeling make it unsuitable for use in the designation process for the 1-hour SO_2 NAAQS.

3. Variations in Results Support an Unclassifiable Designation.

If EPA does not see an "attainment" designation as possible given the uncertainties raised by the significant amount of modeling that has been conducted over a relatively short time frame, then EPA should designate the Wagner area as "unclassifiable" for the 1-hour SO_2 standard. This would allow for additional time to address the modeling uncertainties, better capture the benefits of the MATS reductions and to potentially conduct additional monitoring.

4. The Large Nonattainment Area Proposed in the 120-Day Letter is Unjustified and Inconsistent with the Facts.

Although MDE strongly disagrees with a "nonattainment" designation, we feel compelled to comment on the size of the nonattainment area identified in the 120-day letter.
The extent of the nonattainment area preliminarily proposed by EPA (a 70 km wide area, centered on Wagner and extending far into both Anne Arundel and Baltimore Counties) is unjustified because the 1-hour SO_2 plume would not even make it to those receptors due to the low wind speeds during those hours identified as exceedances.

A more detailed explanation of MDE's key positions is provided below.

Comment 1 – An Attainment Designation is Supported by the Available Data

The Fort Smallwood electric generating power plant facility consists of the Wagner and Brandon Shores stations. The Wagner power plant station is owned by H.A. Wagner LLC, operated by Raven Power Fort Smallwood LLC ("Raven Power"), and is a subsidiary of Talen Energy Corp.

Modeling of 12 months of Actual Post-MATS Emissions

Wagner Unit 2 Emissions Characterization

In order to comply with MATS, the Wagner Unit 2 began burning a cleaner, lower chlorine and lower sulfur content coal in April 2015. The SO_2 emission rate from this unit has dropped by approximately 40% since then, which has significantly reduced the ambient SO_2 concentration around the plant. Raven has committed to continuing the use of that coal, which has an emission rate that does not exceed 1.0 lb SO_2 /MMBtu. As of March 2016, post-MATS controlled 1-hour SO_2 emissions are now available for an entire year.

Modeling results for the 12-month period of post-MATS actual emissions for the Wagner facility show the Wagner area to be in attainment of the 1-hour SO_2 standard. The modeling results were generated by AECOM for Raven Power and are included in Appendix A. The modeling used regulatory default options (no use of ADJ_U* or LOWWIND3) along with AERMOIST (Brandon Shores sources) to account for moisture in plume rise calculations. AERMOIST is a pre-processor to AERMOD that adjusts for the influence of ambient temperature and relative humidity on moist plume rise. These adjusted temperatures are then used as input to AERMOD to account for the effects of moist plume rise. The use of AERMOIST is not an alternative model, rather it is an approach to better characterize the source.

Considering that this modeling uses regulatory default options and AERMOIST to improve the characterization of the SO_2 plume and the modeling demonstrates attainment of the 1-hour SO_2 NAAQS; it can be concluded that the area of the Wagner facility already is in compliance with the 1-hour SO_2 NAAQS.

Modeling of 2012-2014 Emissions

EPA's "SO_2 NAAQS Designations Modeling Technical Assistance Document (TAD)" presents recommendations on how an air agency should model ambient air in proximity to or impacted by an SO_2 emission source. The primary objective of the modeling, as outlined in the TAD, would be to determine whether an area *currently* meets the 1-hour SO_2 NAAQS and through that, to inform the designation for the area. The TAD explicitly states, "guidance supports analyses of existing air quality rather than analyses of emission limits necessary to provide for attainment."[2]

[2] See "SO_2 NAAQS Designations Modeling Technical Assistance Document," U.S. EPA, Office of Air and Radiation, February 2016, p.4, available at https://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf.

As shown in the modeling demonstration above, the existing air quality at the facility meets the 1-hour SO_2 NAAQS.

The TAD also presents recommendations on the use of the most recent 3 years of actual emissions for designations compared with maximum allowable emissions for programs such as New Source Review (NSR), Prevention of Significant Deterioration (PSD) and State Implementation Plans (SIPs). The TAD also states that "the primary objective of the modeling would be to determine whether an area *currently* meets the SO_2 NAAQS."[3] In the Wagner case, 3 years of actual emissions with the facility complying with the MAT Standards are not available. Thus the use of 3 years of actual emissions would be at odds with the primary objective of the modeling, which is to determine whether the area *currently* meets the SO_2 NAAQS.

In order to fulfill the primary objective of the modeling, for modeling of 2012-2014 emissions, MDE along with Raven Power/Talen Energy and AECOM used the ratio method outlined in Section 5.2.3.3 of the TAD. This subsection states:

> "While the use of AP-42 factors or a simple ratio method can be used to calculate temporally varying emissions, if temporally varying emissions are already available from another method, it may be possible to use such emissions and format as AERMOD emission rate factors or hourly varying emissions."

Thus the approach used to model 2012-2014 emissions for Wagner Unit 2 only was to ratio the past emissions to the conservative peak value of 1.0 lb/MMBtu. This seems entirely reasonable considering the primary objective of the TAD.

Wagner 2 Emissions Characterization

In order to comply with MATS, Wagner began burning a cleaner, lower sulfur coal in Unit 2 in April 2015. The SO_2 emission rate from this unit has dropped by approximately 40% since then, which has significantly reduced the ambient 1-hour SO_2 concentration around the plant. Raven has committed to continuing the use of that coal, which has an emission rate that does not exceed 1.0 lb SO_2/MMBtu. Modeling with this upper limit emission rate is a more accurate characterization of *current* emissions than the use of obsolete emission rates from earlier years. The 1.0 lb/MMBtu rate represents the maximum potential rate at Wagner 2 given the physical capacity of the unit and the new low-sulfur coal. Based on this, the modeling is using a reasonably conservative approach for characterizing the *current* emissions from Wagner 2.

Modeling results for the 2012-2014 period with the *current* emissions from Wagner 2 conservatively characterized by the MATS peak emission rate of 1.0 lb SO_2/MMBtu shows the area to be in attainment of the 1-hour SO_2 standard. AECOM performed the modeling for Raven Power. The modeling files are included in Appendix B. The modeling used the following:

- Receptor grid expanded to 25 km in the latest model run

[3]See "SO_2 NAAQS Designations Modeling Technical Assistance Document," U.S. EPA, Office of Air and Radiation, February 2016, p.4, available at https://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf, p.2.

- Adjust U star (ADJ_U*) Option
    - EPA has acknowledged that this has been evaluated and approved; however, a formal request to the EPA Regional Administrator must be made for its use.
    - MDE has asked EPA to approve this model option for use in the SO_2 designation process (see Appendix C).
    - EPA has acknowledged that the option has been approved in another EPA region.

- LOWWIND3 Option
    - EPA has proposed in the notice of public rule making (NPRM) that the LOWWIND3 option be incorporated in the regulatory version of AERMOD[4]; a formal request must be made for its use at this time.
    - EPA has noted the apparent lack of a peer-reviewed journal article that supports the use of the LOWWIND3 modeling option. However, Raven Power's modeling consultant, AECOM, has published a peer-reviewed paper covering the ADJ_U* option and the LOWWIND2 option in the November 2015 issue of the *Journal of the Air & Waste Management Association*. A supplemental article to document further support for the LOWWIND3 option has been provided to the same journal, and approval for publication is expected in the near future. Raven Power's consultant AECOM has provided these documents for EPA review in recently-provided model and protocol reports.

The main problem with the approval of the use of LOWWIND3 is the timing of the modeling required for the Wagner area under the consent decree[5] compared with the timing of EPA's review of their own proposal for updating AERMOD. EPA is rejecting the use of these options on a technicality rather than on the merits of the scientifically-superior options.

Despite this technicality, AECOM believes (and has provided supporting evidence) that the low wind options are scientifically more accurate and will ultimately be approved. Therefore, EPA should consider this modeling with these non-regulatory default options as equal to if not better than submitted modeling that only relies on regulatory default options, and this modeling should be used in the designation decision.

- Local Sector-Specific Backgrounds Used
    - A peak value of 1.5 ppb during all conditions with wind directions between 70 and 130 degrees was measured during a 2013 monitoring study that included 2 monitors near Wagner and Brandon Shores, and 2 monitors near Crane.
    - Therefore, we have proposed the use of this peak monitored value as the appropriate background value for winds between 70 and 130 degrees.

[4] See the EPA presentation, "Proposed Updates to AERMOD Modeling System," by Roger W. Brode, at the 11th Modeling Conference, Research Triangle Park, NC, August 12, 2015, available at https://www.epa.gov/ttn/scram/11thmodconf/presentations/1-5_Proposed_Updates_AERMOD_System.pdf.

[5] See Case No.: 3:13-cv-3953-SI, in the United States District Court for the Northern District of California, San Francisco Division, filed March 2, 2015, available at http://www.4cleanair.org/sites/default/files/resources/Litigation-SO2-Designations_Deadline_Suit-Final_CD-030215.pdf.

Modeling of Attainment Conclusion

Modeling results, primarily using regulatory modeling defaults, for a 12-month period of post-MATS actual emissions for the Wagner facility shows the area to be in attainment of the 1-hour SO_2 standard. The result of the 3-year modeling demonstration that replicates the effect of the MATS Standard on the facility also shows the area to be in attainment of the 1-hour SO_2 standard. The TAD states, "the primary objective of the modeling would be to determine whether an area currently meets the SO_2 NAAQS."[6] The modeling objective, along with the model results, supports a designation of attainment for the area of the Wagner facility.

Comment 2 – The Sierra Club Modeling Showing Nonattainment is Deficient

Sierra Club Modeling is Deficient

EPA primarily relied on Sierra Club's modeling of SO_2 emissions from Wagner, Brandon Shores and Crane to make a preliminary recommendation of nonattainment for the Wagner area. Upon review of Sierra Club's modeling, MDE and Raven found the following deficiencies that raise serious doubts over using the Sierra Club modeling as the basis for a nonattainment designation:

Background Concentration

Sierra Club employed the 3-year (2011-2013) 99th percentile average (constant) background concentration of 10 ppb (26.2 µg/m³). This period does not align with the actual years of modeled data (2012-2014). Furthermore, EPA allows (and, in their Technical Support Documents posted at http://www3.epa.gov/so2designations/stater2.html, consistently recommends) the use of a seasonal hour-of-day background concentration to be added concurrently in AERMOD. An adequate analysis for purposes of a1-hour SO_2 designation should include this.

Meteorological Data Processing

In the processing of the meteorological data, the Sierra Club employed several switches in AERSURFACE that would need to be refined if the modeling is to be used in the SO_2 designation process. The Sierra Club assumed that the winter months of December, January and February were classified as "winter with continuous snow cover". Table 1 below shows the number of days per month that BWI reported snow cover in 2012-2015. Less than half of the days in each month reported snow cover; therefore, these months should be processed as "winter with no snow". Only February 2015 would be processed as "winter with snow".

[6] See "SO_2 NAAQS Designations Modeling Technical Assistance Document," U.S. EPA, Office of Air and Radiation, February 2016, p.4, available at https://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf, p.2.

Table 1 Number of Days with Snow Cover Reported at BWI

Year	December	January	February
2012	0	3	1
2013	4	3	0
2014	0	9	8
2015	0	6	14

In addition, AERSURFACE was processed incorrectly by the Sierra Club such that the albedo, Bowen ratio, and surface roughness were defined seasonally, and only average surface moisture was used to determine the Bowen ratio. The surface moisture condition for the site must be allowed to vary for each month and year modeled, depending on the meteorological data period for which the surface characteristics will be applied. AERSURFACE applies the surface moisture condition for the entire data period. Therefore, if the surface moisture condition varies significantly across the data period, then AERSURFACE must be run multiple times to account for those variations.

The Sierra Club did not do this, making their modeling unsuitable for use in the 1-hour SO_2 designation process. As such, the surface moisture condition for each season should be determined by comparing precipitation for the period of data to be processed to the 30-year climatological record, selecting "wet" conditions if precipitation is in the upper 30th-percentile, "dry" conditions if precipitation is in the lower 30th-percentile, and "average" conditions if precipitation is in the middle 40th- percentile. The 30-year precipitation data set should be taken from the National Climatic Data Center.[7]

Receptor Locations

The receptor grids surrounding Fort Smallwood and Crane Generating Stations include receptors over water where no monitoring equipment can be placed. Receptors were also placed within the plants' property line, an area that is not considered ambient air. As stated in EPA's SO_2 Technical Assistance Document for modeling, receptors in inaccessible areas such as over water and on Aberdeen Proving Ground should be removed from this modeling analysis. In addition, the receptors should be placed at ground level and not the flagpole height of 1.5 meters.

The Sierra Club's receptor grid extended to 50 km, which is "well beyond the recommended area of focus discussed in EPA's March 1, 2011 clarification memo"[8] (see the draft TSD, page 44). In fact, for many of the high predicted hours in Sierra Club's modeling, it is impossible for the plume to travel that distance within the model's 1-hour averaging time. Therefore, any predictions above the NAAQS at distances beyond a 1-hour travel time cannot be relied upon.

[7] See "Climate Data Online," National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental Information, at http://www.ncdc.noaa.gov/cdo-web/.

[8] See "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard," available at

This issue also makes the Sierra Club modeling unsuitable for use in the 1-hour SO_2 designation process.

Use of Constant Stack Exit Temperatures

The Sierra Club modeling used constant stack exit temperatures for Brandon Shores, Crane, and Wagner Units 2 and 3 instead of hourly varying stack exit temperatures that better represent actual conditions. This simplification by Sierra Club would most likely exaggerate 1-hour SO_2 concentrations around the Wagner area and make the modeling less suitable for purposes of designation of areas under the 1-hour SO_2 standard.

Merging of Stack Flues

The Sierra Club modeling did not model the Brandon Shores units correctly. The dual flues in the Brandon Shores common stack should be modeled as a combined (merged) flue. Sierra Club did not do this.

This approach, modeling a combined (merged) flue, is consistent with EPA guidance:

- EPA Model Clearinghouse Memo 91-II-01[3] indicates that stacks within 1 diameter of each other should be modeled as a combined stack.
- Especially for characterizing SO_2 concentrations through modeling as if the receptors were actual monitors, actual stack conditions should be provided to the model. The use of the merged flues is the appropriate realistic modeling approach.

This error by Sierra Club would most likely impact 1-hour SO_2 concentrations around the Wagner area. It makes the Sierra Club modeling less suitable for purposes of designations under the 1-hour SO_2 standard.

Comment 3 – Variations in Results Support an Unclassifiable Designation

If EPA does not see an "attainment" designation as possible given the uncertainties raised by the significant amount of modeling that has been conducted over a relatively short time frame, then EPA should designate the Wagner area as "unclassifiable" for the 1-hour SO_2 standard. This would allow for additional time to address the modeling uncertainties, to capture the benefits of the MATS controls and to potentially conduct additional monitoring.

Raven Power also submitted modeling on March 31, 2016. The Raven modeling has been incorporated into MDEs modeling submittal, but it also supports an "Attainment" designation.

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https://www3.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf and note that while the memo references the 1-hour NO_2 NAAQS, it is equally applicable to the 1-hour SO_2 standard.

Two different modeling analyses show that the area around Wagner is currently in attainment of the 1-hour, 75 ppb, SO_2 NAAQS. MDE is of the opinion that the modeling and analysis meet the primary objective of EPA's modeling TAD. EPA relied on Sierra Club's modeling of emissions from Wagner, Brandon Shores and Crane to propose its preliminary nonattainment designation. Many deficiencies have been found in the Sierra Club's modeling which would discount its use for the purposes of designation.

MDE understands that EPA is the final arbiter for designations and that EPA is being presented with three sets of modeling results with two of the demonstrations supporting attainment and one of the demonstrations indicating nonattainment.

If EPA does not choose to designate the area as attainment, based on the variability in the results presented and the issues in the modeling protocol that are being resolved, MDE believes it would be most appropriate to designate the area as "unclassifiable".

As cited in EPA's TSD, a "designated unclassifiable area" is "an area which EPA cannot determine based on all available information whether it meets the 2010 SO_2 NAAQS."[9] EPA has designated areas in other states as unclassifiable when conflicting information was presented or if modeling submitted from different parties showed results just under or over the NAAQS. Designating the area as unclassifiable will allow for more post-MATS implementation characterization to occur and for the outstanding modeling protocol issues to be resolved.

There are also monitoring data that indicate that the area may be in attainment. In 2007 Maryland adopted the Healthy Air Act (HAA), a law that dramatically cut annual SO_2 emissions by approximately 85%. Maryland generators invested approximately $2 billion dollars into SO_2 flue gas desulfurization (FGD) scrubbers because of the HAA. One-hour SO_2 concentrations at existing Maryland monitors dropped dramatically after implementation of the HAA SO_2 controls. At the monitor closest to the Wagner area, the Essex monitor, the design value for 1-hour SO_2 dropped from a 99 ppb 3-year SO_2 design value in 2007 to a 22 ppb 3-year design value in 2014. This was a result of the HAA controls. Prior to the HAA, the Essex Monitor was above the 1-hour SO_2 standard. After the implementation of the HAA, the Essex monitor has consistently measured attainment. For additional information on SO_2 emissions and air monitoring data, please see Appendix E.

Raven Power also conducted a voluntary measurement campaign in the summer of 2013 to measure 1-hour SO_2 levels in the Wagner area. This voluntary measurement campaign showed very low 1-hour SO_2 levels with one day of readings above the standard. Since that time, Wagner 2 has reduced SO_2 emissions significantly.

MDE believes that the supplemental air monitoring information, although not adequate for purposes of designations, clearly supports an "attainment" or "unclassifiable" designation.

[9] U.S. Environmental Protection Agency, "Draft Technical Support Document, Maryland Area Designations for the 2010 SO2 Primary National Ambient Air Quality Standard," page 4, provided as an attachment to the February 16, 2016, letter from EPA Region 3 Regional Administrator Shawn Garvin to Maryland Governor Larry Hogan.

Comment 4 – The Large Nonattainment Area EPA Proposed is Unjustified

Although MDE strongly disagrees with a "nonattainment" designation, we feel compelled to comment on the unrealistic size of the nonattainment area identified in the 120-day letter.

The large nonattainment area that was proposed is unjustified and inconsistent with the facts. The extent of the nonattainment area proposed by EPA (a 70 km wide area, centered on Wagner and extending far into both Anne Arundel and Baltimore Counties) is unjustified because the 1-hour SO_2 plume would not make it to those receptors due to the low wind speeds during the hours identified as modeled exceedances.

The Sierra Club's 500-meter receptor grid centered on the Fort Smallwood facility and Crane and extended out nearly 50 km in total distance. According to EPA, this distance is "well beyond the recommended area of focus discussed in EPA's March 1, 2011 clarification memo"[10] according to EPA's draft TSD, page 44.[11] In fact, for the distant receptor locations with the high predicted hours in Sierra Club's modeling, it is impossible for the plume to travel that distance within the model's 1-hour SO_2 averaging time.

Therefore, any predictions above the NAAQS at distances beyond a 1-hour SO_2 travel time cannot be relied upon and should not be used in determining the boundary of the nonattainment area. For example, the Sierra Club modeling showed exceedances at distances of 20 km to the west-northwest and 35 km to the northwest. The wind speeds for all modeled hours for the high -"1st-high" through high-"4th-high" at these receptors are less than 3 meters/second. The minimum wind speed for the plume to travel 20 km within 1 hour is 5.56 m/s. The minimum wind speed for the plume to travel 35 km within 1 hour is 9.72 m/s. Therefore, it is impossible for the impacts shown by Sierra Club to occur.

Modeling of 2013-2015 Actual Emissions

Although MDE strongly disagrees with a "nonattainment" designation, we feel compelled to try and mimic the Sierra Club modeling to show how much smaller the boundaries of a nonattainment area for the Wagner area would actually be, based upon the errors discussed above.

MDE performed a modeling scenario using 2013-2015 actual emissions similar to the Sierra Club modeling. The 2013 and 2014 actual emissions do not reflect the current reality of Wagner Unit 2 emissions post-MATS implementation. The model results showed receptors in northern Baltimore County as exceeding the NAAQS. As shown in the discussions above, these exceedances at

[10] See "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" at https://www3.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf, and note that while the memo references the 1-hour NO_2 NAAQS, it is equally applicable to the 1-hour SO_2 standard.

[11] U.S. Environmental Protection Agency, "Draft Technical Support Document, Maryland Area Designations for the 2010 SO_2 Primary National Ambient Air Quality Standard," page 4, provided as an attachment to the February 16, 2016, letter from EPA Region 3 Regional Administrator Shawn Garvin to Maryland Governor Larry Hogan.

distances beyond a 1-hour travel time cannot be relied upon.

The Department conducted a second modeling scenario, again using outdated, actual emissions from earlier years, with the only change being the use of the beta ADJ_U* option. Modeling results for the 2013-2015 period with actual emissions and the beta ADJ_U* option show a nonattainment area much smaller in size than that which EPA proposed. MDE generated the modeling files and these are included in Appendix D. The EPA has acknowledged that the beta ADJ_U* option has been evaluated and approved; however, a formal request must be made for its use. MDE has asked EPA to approve this model option for the use in the SO_2 designation process. The request for use letter and documentation are included as Appendix C.

If nonattainment is the only option for the Wagner area, MDE, while reserving our right to challenge a "nonattainment" designation, recommends the following boundaries for the nonattainment area:

Northern Boundary:

- Baltimore City/Anne Arundel County Line
- I-695

Western Boundary:

- Route 10 (Arundel Expressway)

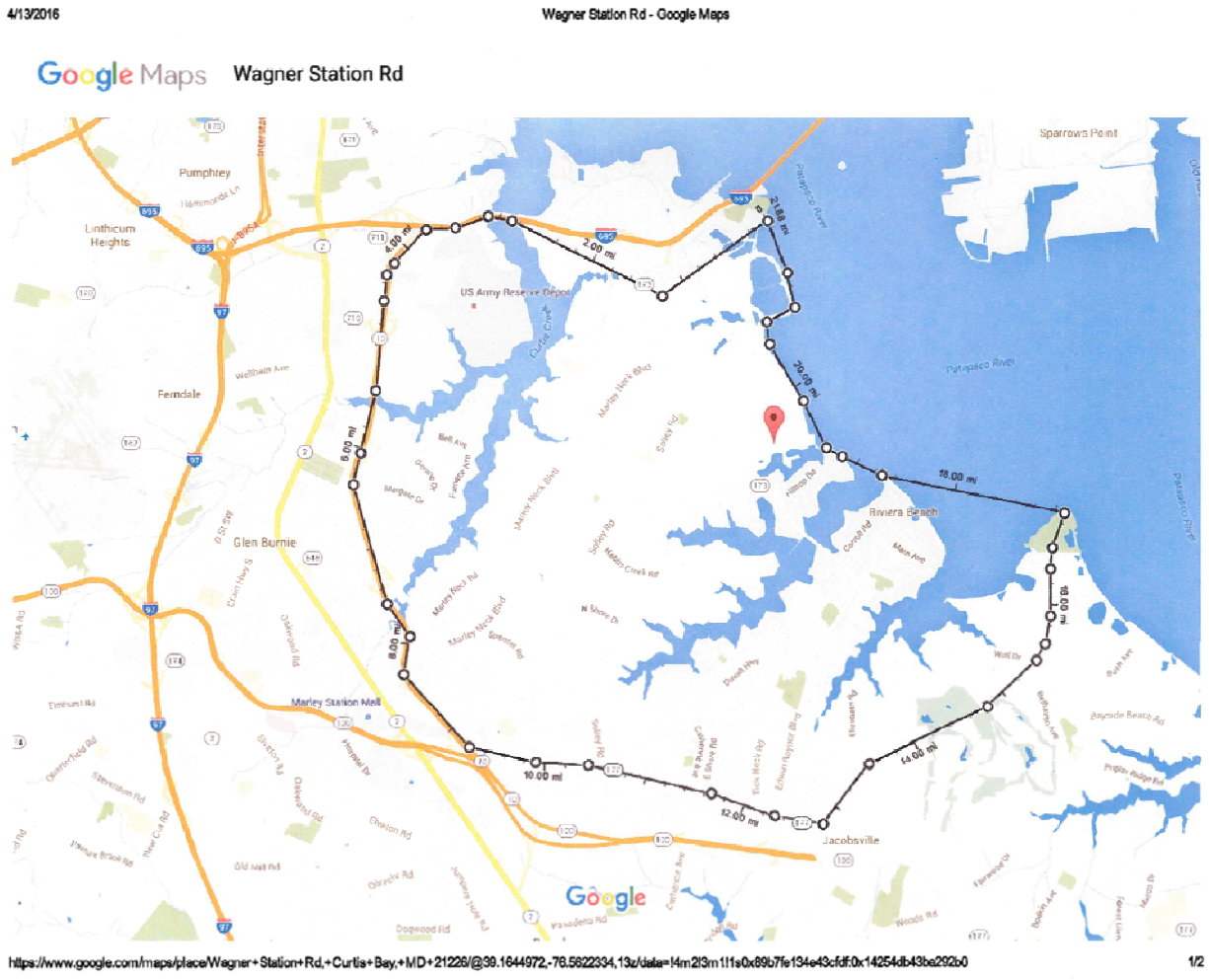
Southern Boundary:

- Route 177 (Mountain Road)
- Hogneck Road
- Route 173 (Fort Smallwood Road)

Eastern Boundary:

- Patapsco River/Chesapeake Bay/Anne Arundel County land/water interface

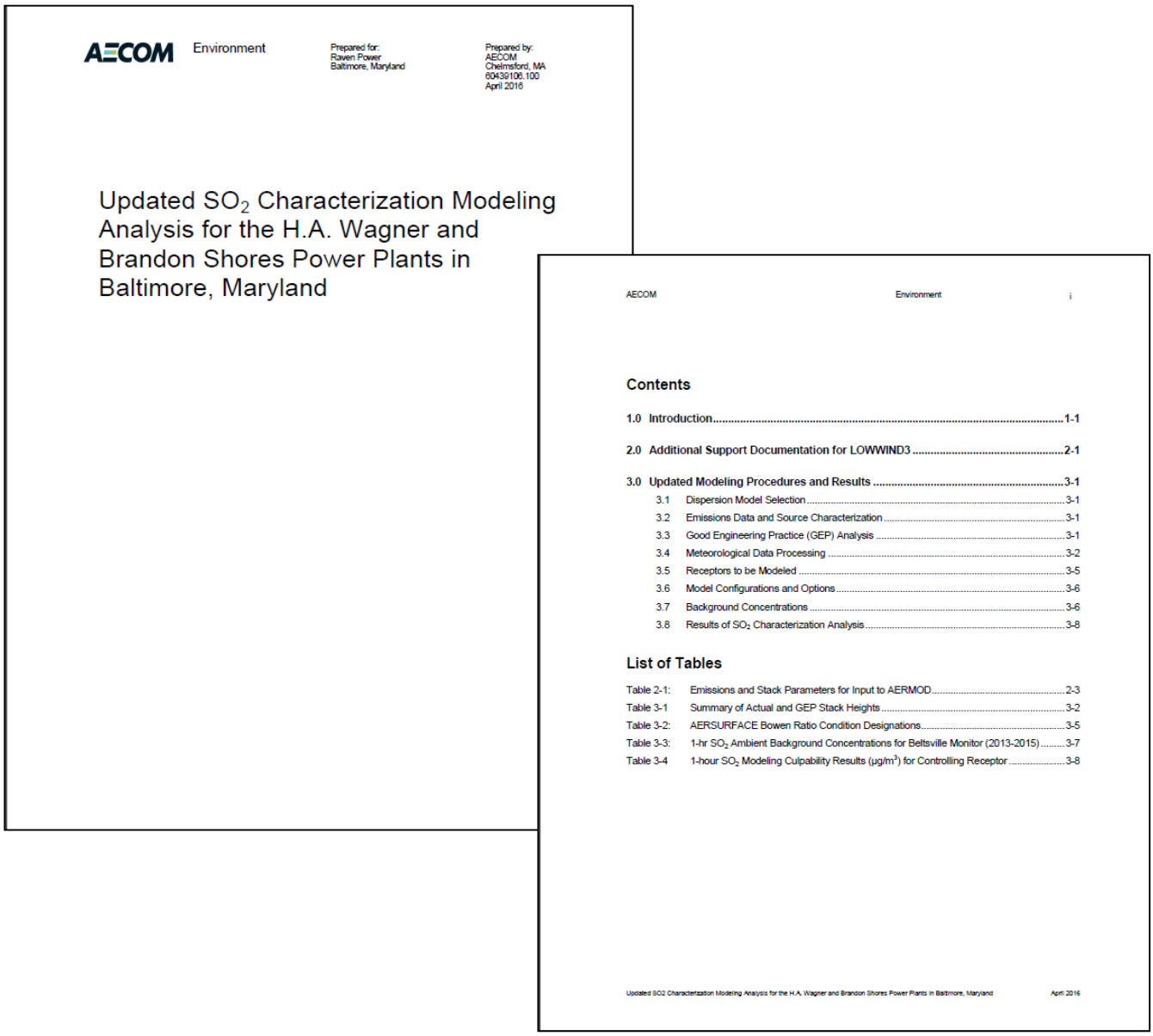
Figure 1: MDE Recommended H.A. Wagner Nonattainment Area



Appendix A:
12-month Post-MATS Attainment Modeling Demonstration

Appendix A contains the following:

1. Modeling report prepared by AECOM for Raven Power using post-MATS Wagner Unit 2 emissions for April, 2015 – March, 2016 (along with other sources), the model will be run in the regulatory default mode and use AERMOIST for the Brandon Shores sources.
2. Modeling input and output files.



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Updated SO_2 Characterization Modeling Analysis for the H.A. Wagner and Brandon Shores Power Plants in Baltimore, Maryland

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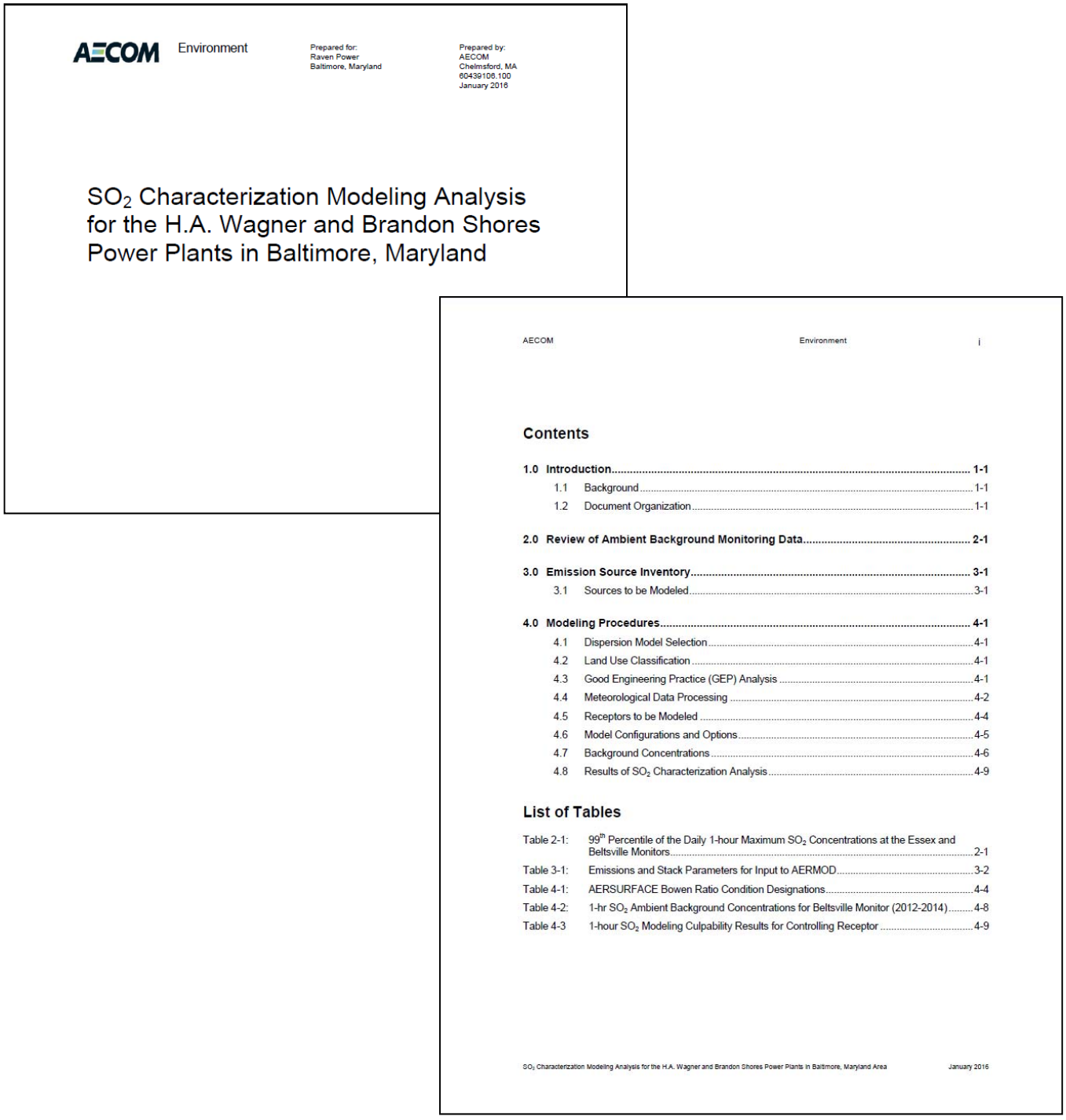
Appendix B:
2012-2014 Attainment Modeling Demonstration

Appendix B contains the following:

1. Modeling report prepared by AECOM for Raven Power
2. Modeling input and output files



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SO_2 Characterization Modeling Analysis for the H.A. Wagner and Brandon Shores Power Plants in Baltimore, Maryland

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Appendix C:
MDE Letter to EPA and Supporting Modeling Analysis Requesting Use of Beta ADJ_U* Option

Appendix C contains the following:

1. Copy of April 2016 MDE letter to EPA requesting the use of the beta ADJUST_U* option
2. Attachment A to the appendix, which is the supporting modeling analysis
3. Modeling input and output files

Maryland
Department of the Environment

Larry Hogan
Governor

Boyd Rutherford
Lieutenant Governor

Ben Grumbles
Secretary

April 14, 2016

Mr. Shawn M. Garvin
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Philadelphia, PA 19103-2029

Dear Mr. Garvin:

I am writing to you regarding the 1-hour SO_2 Characterization Modeling for the area around the H.A. Wagner and Brandon Shores power plants air quality modeling protocol that was recently submitted to the Maryland Department of the Environment (MDE), Air and Radiation Management Administration (ARMA). This modeling protocol was prepared to describe the approach being taken to demonstrate that the H.A. Wagner (Wagner) power plant located in Anne Arundel County, Maryland would be in attainment of the 1-hour SO_2 National Ambient Air Quality Standard (NAAQS).

On March 20, 2015, EPA informed Maryland that the Wagner Power Plant would be part of the expedited round of designations under the 1-hour SO_2 NAAQS due to terms of the SO_2 Consent Decree negotiated between the Sierra Club and EPA (Sierra Club *v.* McCarthy). The EPA intends to designate the Wagner Power Plant area as either unclassifiable/attainment, nonattainment or unclassifiable by July 2, 2016 after a review of available modeling or monitoring data to support the SO_2 concentration characterization.

The model selected for this modeling application is the EPA American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) modeling system version 15181, including the American Meteorological Society/Environmental Protection Agency Regulatory Improvement Committee (AERMIC) meteorological (AERMET) non-regulatory default/beta ADJ_U* option (EPA,2015a). EPA has indicated support for this change as part of their July 29, 2015 Appendix W proposal. In addition, Roger Brode's (USEPA) Proposed Updates to AERMOD Modeling System presentation (EPA, 2015b) delivered at the 11th Modeling Conference on August 12, 2015 indicated that the ADJ_U* option be incorporated into the regulatory versions of AERMOD and AERMET in the notice of proposed rulemaking (NPRM).

Section 3.2.2.b of Appendix W to 40 CFR Part 51, ("Revision to the Guideline on Air Quality Models", November 9, 2005), details the approach for approval of an alternative model. Specially, the request must meet one of the following three conditions:

Attachment A
Modeling Analysis to Support Use of ADJ_U* Option

This AERMOD modeling analysis was completed to demonstrate that use non-regulatory ADJ_U*is applicable in this instance.

1-hour SO_2 modeling completed using AERMOD with regulatory default options and variable hourly emissions resulted in modeled 4th high 1-hour SO_2 concentrations nearby the Wagner power plant (Wagner) area and approximately 35 km to the northwest of the Wagner area in Baltimore County (Figure 1A).

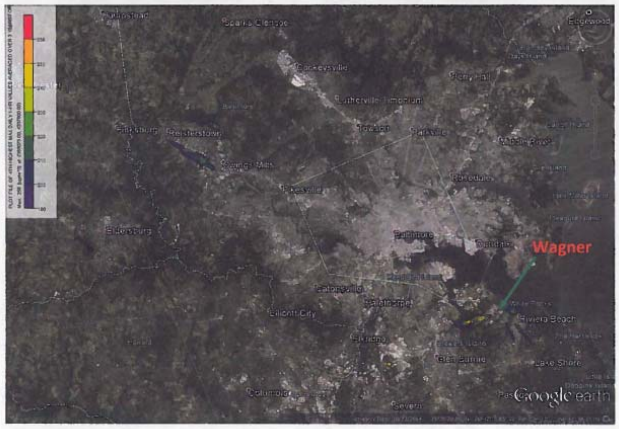


Figure 1A. Modeled 4th High 1-hour SO_2 Concentrations

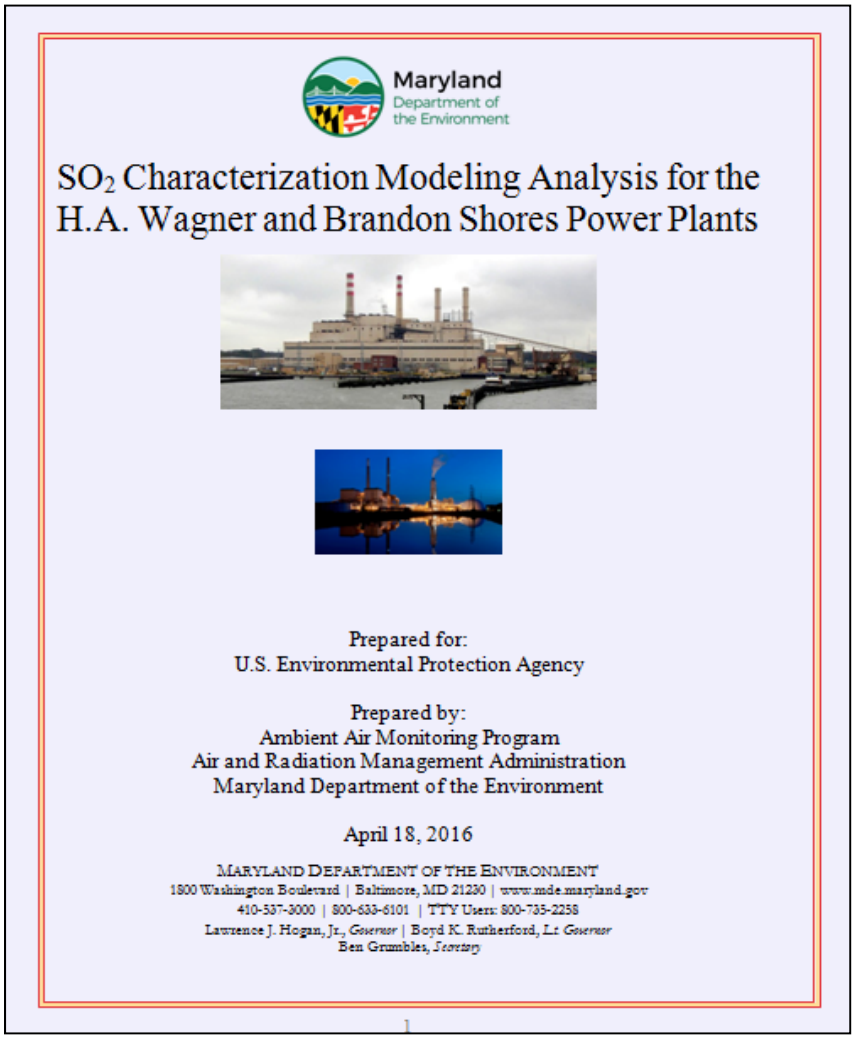
Within each of these areas of modeled 4th high 1-hour SO_2 concentrations, one or two of the highest reading receptors were chosen and closely looked at. The areas to the northwest of the Wagner area were assigned the letters A – H to represent the various modeled 4th high 1-hour SO_2 concentration areas. The group A-G receptors are shown in Figure 2A and Figure 3A shows the receptor group H. The receptors that will be further analyzed are represented by red dots. Areas of modeled 4th high 1-hour SO_2 concentrations located in the Wagner area are represented by receptor group's I-N as seen in Figure 4A.

A-1

Appendix D:
Modeling Inputs and Analysis Using Beta ADJ_U* Option & MDE Recommended Nonattainment Area Boundaries

This appendix covers the discussion points below and includes modeling input and output files:

1. Review of the ambient background monitor trends
2. Discussion of SO_2 emission sources considered for the modeling demonstration. The SO_2 emissions from major sources were modeled using actual hourly emission rates for the purpose of characterizing SO_2 concentrations in the Baltimore area
3. Outline of the modeling procedures used, including model options, meteorological data, receptors, and background concentrations, as well as the modeling results



Maryland
Department of the Environment

SO_2 Characterization Modeling Analysis for the H.A. Wagner and Brandon Shores Power Plants

Prepared for:
U.S. Environmental Protection Agency

Prepared by:
Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

April 18, 2016

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Lawrence J. Hogan, Jr., *Governor* | Boyd K. Rutherford, *Lt. Governor*
Ben Grumbles, *Secretary*

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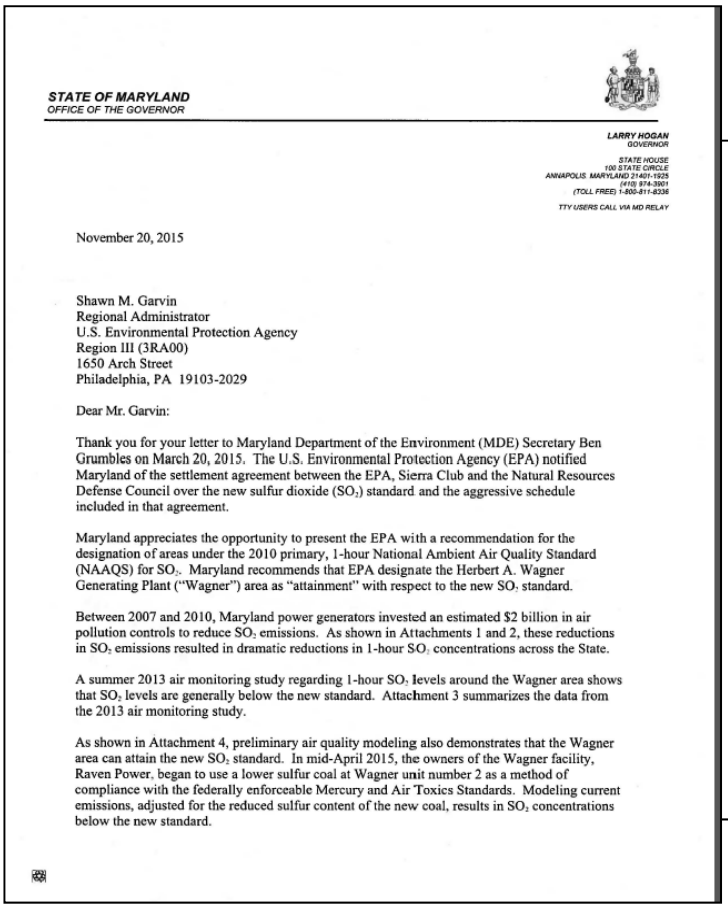
Appendix E:
Supplemental Emissions and Monitoring Data

Appendix E contains the following:

1. Copy of Maryland November 2015 letter to EPA with Maryland's updated recommendation regarding the designation of the 1-hour SO_2 Wagner area
2. Attachments 1-6, with supporting analyses, including emissions and monitoring data



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TTY USERS CALL VIA MD RELAY

November 20, 2015

Shawn M. Garvin
Regional Administrator
U.S. Environmental Protection Agency
Region III (3RA00)
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Garvin:

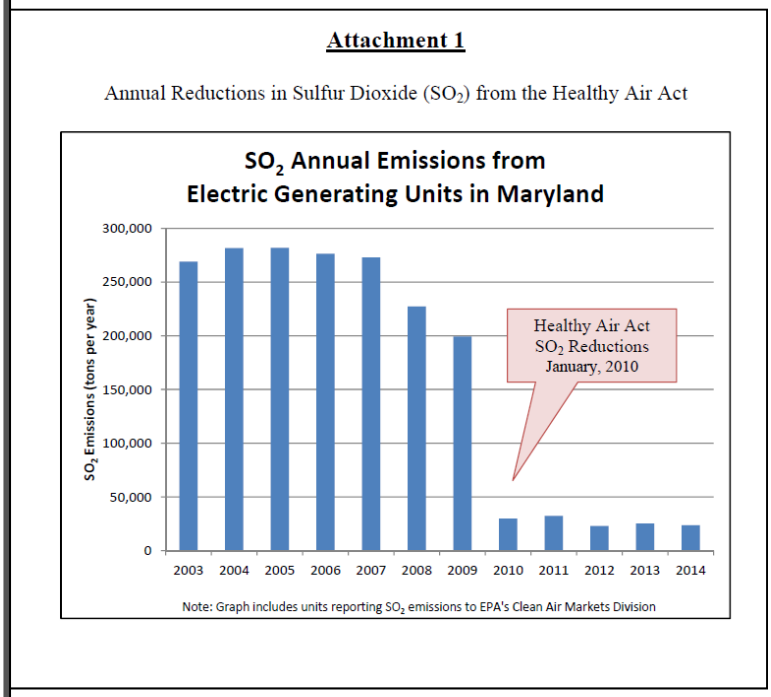
Thank you for your letter to Maryland Department of the Environment (MDE) Secretary Ben Grumbles on March 20, 2015. The U.S. Environmental Protection Agency (EPA) notified Maryland of the settlement agreement between the EPA, Sierra Club and the Natural Resources Defense Council over the new sulfur dioxide (SO_2) standard and the aggressive schedule included in that agreement.

Maryland appreciates the opportunity to present the EPA with a recommendation for the designation of areas under the 2010 primary, 1-hour National Ambient Air Quality Standard (NAAQS) for SO_2. Maryland recommends that EPA designate the Herbert A. Wagner Generating Plant ("Wagner") area as "attainment" with respect to the new SO_2 standard.

Between 2007 and 2010, Maryland power generators invested an estimated $2 billion in air pollution controls to reduce SO_2 emissions. As shown in Attachments 1 and 2, these reductions in SO_2 emissions resulted in dramatic reductions in 1-hour SO_2 concentrations across the State.

A summer 2013 air monitoring study regarding 1-hour SO_2 levels around the Wagner area shows that SO_2 levels are generally below the new standard. Attachment 3 summarizes the data from the 2013 air monitoring study.

As shown in Attachment 4, preliminary air quality modeling also demonstrates that the Wagner area can attain the new SO_2 standard. In mid-April 2015, the owners of the Wagner facility, Raven Power, began to use a lower sulfur coal at Wagner unit number 2 as a method of compliance with the federally enforceable Mercury and Air Toxics Standards. Modeling current emissions, adjusted for the reduced sulfur content of the new coal, results in SO_2 concentrations below the new standard.



Attachment 1

Annual Reductions in Sulfur Dioxide (SO_2) from the Healthy Air Act