Technical Support Document (TSD) for the

Emission Inventories for the

"*State of Maryland 1-Hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standard (NAAQS) State Implementation Plan for the Anne Arundel County and Baltimore County, MD ("Wagner") Nonattainment Area*"

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I. Introduction

The purpose of this document is to provide a technical summary of the Air Quality and Analysis Branch (AQAB) review of the emissions inventories submitted with the Anne Arundel County and Baltimore County, MD 2010 SO2 NAAQS Nonattainment Area (NAA) submitted by the Maryland Department of the Environment (MDE). The NAA consists of portions of Anne Arundel and Baltimore County in Maryland. Under the Clean Air Act (CAA) section 172(c)(3) states are required to submit emissions inventory information for all relevant sources for the areas that are designated nonattainment. The attainment demonstration also calls for a projected attainment year inventory that includes estimated emissions for all the emissions sources of SO_2 in the NAA for the year in which the area is expected to attain the standard. Any questions pertaining to this technical summary should be directed to Alice Chow, Branch Chief, Air Quality and Analysis Branch, at 215-814-2144 or via email at chow.alice@epa.gov.

II. Background

In 2010, the EPA issued a notice of final rulemaking that revised the primary SO2 NAAQS (75 FR 35520; June 22, 2010) after review of the existing primary SO2 standards promulgated on April 30, 1971 (36 FR 8187). The EPA established the revised primary SO2 NAAQS at 75 parts per billion (ppb) which is attained when the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb. On July 25, 2013 EPA designated the first round of nonattainment areas. The second round of SO2 designations, were completed in actions published on July 12, 2016 (81 FR 45039), and December 13, 2016 (81 FR 89870). The Anne Arundel County and Baltimore County NAA was designated as nonattainment during this round of designations based on air quality modeling.

III. 2014 Base Year Inventory

Under section 172(c)(3) states are required to submit a comprehensive, accurate, current accounting of actual emissions from all sources (point, nonpoint, nonroad, and onroad) of the relevant pollutant or pollutants in the nonattainment area. This inventory provides a detailed accounting of actual annual emissions of sulfur dioxide ($SO_{2)}$. EPA's SO_2 Nonattainment Area Guidance[1] states that the emissions inventory should be consistent with the Air Emissions Reporting Requirements (AERR)[2]. The base year inventory is one of the three years that contributed to the three-year design value used for the nonattainment designation and includes emissions estimates from point, nonpoint, onroad, and nonroad sources. The area was

[1] EPA's SO_2 Nonattainment Area Guidance - https://www.epa.gov/sites/production/files/2016-06/documents/20140423guidance_nonattainment_sip.pdf

[2] AERR – EPA's emission reporting requirements codified in 40 CFR part 51, subpart A - https://www.epa.gov/air-emissions-inventories/air-emissions-reporting-requirements-aerr#rule-summary

designated nonattainment based on air quality modeling using emissions data from 2013-2015 and Maryland chose the year 2014 as the base year. The NAA is composed portions of Anne Arundel and Baltimore Counties. This TSD will document the review of the emissions submitted with the SIP revision.

Point sources in the NAA account for over 91% of the emissions from all sources in the NAA. Point source emissions are reported to MDE annually in accordance with the Code of Maryland Regulations (COMAR). Maryland then reports these emissions to EPA through the Emissions Inventory System (EIS) consistent with the AERR. The largest sources of SO_2 in the NAA are Brandon Shores Generating Station (Brandon Shores), Charles P. Crane Generating Station (Crane), and Herbert A. Wagner Generating Station (Wagner). The table below shows the 2014 emissions from the point sources within the NAA. Emissions from the smaller point sources in the NAA, including BWI (quasi-point source) have been summed together. All source emissions were reported by source category code (SCC) in tons per year (tpy).

Table 1: 2014 Point Source Emissions

Facility	2014 Emissions (tpy)*
Brandon Shores	3,145.09
C.P. Crane	1,887.16
Wagner	9,610.26
All other sources	154.26
Total	**14,797.46**

*Emissions submitted by MDE

Emissions for the nonpoint (area), marine-air-rail (MAR), nonroad, and onroad sources were submitted for the 2014 base year in tons per year by SCC. Maryland submitted emissions for these sources at the county-level instead of proportioning the emissions to the jurisdictions in the NAA. This was done because the contribution of SO_2 emissions from these sources is relatively small and this is a conservative approach to reporting the emissions.

MAR source emissions are estimated by looking at fuel consumption from the sources and have been aggregated to the county level. Nonroad emissions were calculated using the most current version of EPA's NONROAD2008a model that is incorporated into EPA's Motor Vehicle Emission Simulator (MOVES) 2014a model. Onroad emissions were calculated using MOVES2014a and were based on local emissions factors and location vehicle activity data. The table below gives a summary of emissions for the NAA. More information on the methodologies used to develop the base year inventories can be found in Appendix A1-9 of the SIP submittal.

Table 2 – 2014 Base Year SO_2 Emissions in the NAA

Emission Source Category	2014 SO_2 Emissions (tpy)*
Point Sources	14,675.76
Quasi-Point Source	121.70
Nonpoint Sources	960.59
Nonroad Sources	11.42
MAR Sources	227.29
Onroad Sources	96.55
Total	**16,093.31**

***Emissions submitted by MDE

EPA has reviewed the procedures and methodologies used for the development of the base year inventory and found them to be acceptable. EPA has also compared the emissions in the base year with the emissions in the 2014 National Emissions Inventory (NEI) v2 and found them to be consistent.

IV. 2021 Projected Attainment Inventory

A 2021 projection year inventory was submitted for the Anne Arundel County and Baltimore County NAA. The projection year inventory uses growth factors and growth surrogates to projection emissions from the base year into the future.

Point source emission projections for facilities in the NAA have been developed based on anticipated operational activity for the facilities. The Maryland Department of Labor, Licensing and Regulation (DLRR), Maryland Industry Projections[3] data was correlated to North American Industry Classification System (NAICS) industry employment codes to determine growth surrogates for facilities.

As discussed in the base year, the largest sources of SO_2 emissions are Brandon Shores, C.P. Crane, and Wagner. The projection inventories for these electric generating units (EGUs) have been adjusted to account for the conditions set forth in the consent agreements for the units. Brandon Shores has two primary coal-fired emission generating units that are each equipped with flue gas desulfurization (FGD) control technology for the removal of SO_2 from the flue gas. No additional reductions are expected at the facility so MDE projected the emissions at the same total as the base year. C.P. Crane has two coal-fired units that have a combined critical emission value of 2,900 lbs/hr. In order to project the 2021 emissions, MDE looked at the combined hourly emissions from both units for 2014 and analyzed hours that had emissions that were over 2,900 lbs/hr. The combined hourly emissions over 2,900 pounds were summed and considered to be reductions in 2021. Wagner has two coal-fired electric generating units (Units 2 and 3), one #6 fuel oil-fired unit (Unit 4), and one dual fuel unit (Unit 1). The 2021 emissions for Wagner Units 1 and 4 were calculated using the same methodologies as C.P. Crane with the

[3] Maryland DLLR Website - http://www.dllr.state.md.us/lmi/iandoproj/industry.shtml

restrictions that Wagner Unit 1 cannot emit more than 480 lbs/hr and Wagner Unit 4 cannot emit more than 1,350 lbs/hr. Unit 2 at Wagner will either be shut down or converted to natural by July 2020, and the projected 2021 emissions reflect these changes. Wagner Unit 3 has a limit to emit no more than 1,904 lbs/hr on a rolling 30-day average, and to estimate the 2021 emissions, MDE used the same methodologies as the other units but using the 30-day average as the limiting emission total each day. The table below shows the projected 2021 emissions.

Table 3 – 2021 Point Source SO_2 Emissions (tpy)

Facility	2014 Emissions*	2021 Emissions*
Brandon Shores Unit 1	1,669.90	1,669.90
Brandon Shores Unit 2	1,475.19	1,475.19
Wagner Unit 1	72.62	58.91
Wagner Unit 2	1,938.99	10.00
Wagner Unit 3	7,276.12	4,626.72
Wagner Unit 4	322.53	242.84
C.P. Crane Unit 1	573.38	1,566.49
C.P. Crane Unit 2	1,313.78	
All other Point Sources	33.26	33.92
Total	**14,675.76**	**9,683.98**

*Emissions submitted by MDE

EPA reviewed these emissions along with more recent hourly emission data from EPA's Clean Air Markets Division (CAMD)[4] Part 75 emission database for Brandon Shores, C.P. Crane, and Wagner. The table below shows a summary of hourly emissions from each unit using the emissions found in CAMD. This shows a general downward trend in emissions through the year 2019, further showing that the emission projections made for 2021 are conservative.

Table 4 – CAMD Emissions (tpy) for Years 2014-2019

Facility	2014	2015	2016	2017	2018	2019
Brandon Unit 1	1,670.07	1,310.84	1,449.76	1,097.65	1,746.60	546.50
Brandon Unit 2	1,475.46	1,642.74	1,269.55	1,417.57	1,785.24	953.67
Wagner Unit 1	72.60	65.00	26.50	2.50	6.10	15.30
Wagner Unit 2	1,939.81	1,187.68	163.03	116.88	229.46	88.85
Wagner Unit 3	7,277.25	8,754.45	7,574.62	1,245.24	2,733.38	1,123.46
Wagner Unit 4	322.50	185.20	74.80	60.80	198.60	39.90
C.P. Crane Unit 1	573.55	381.52	412.25	379.09	392.05	0.00
C.P. Crane Unit 2	1,315.49	945.56	637.77	449.26	475.19	0.00
Total	**14,646.74**	**14,472.97**	**11,608.28**	**4,768.99**	**7,566.62**	**2,767.66**

[4] CAMD Website - https://www.epa.gov/airmarkets

Nonpoint source emissions were projected using appropriate growth factors based on Maryland housing, population, and employment projections for the year 2021.

MAR Source emissions were projected using surrogate economic or operational data. Marine vessel and locomotive emissions were developed by growing the emissions based on the Energy Information Administration (EIA) Annual Energy Outlook (AEO)[5] marine shipment data and rail data, respectively. Aircraft emissions for 2021 were grown using the Federal Aviation Administration (FAA) Aircraft Operations Forecasts.

Nonroad and onroad emissions were developed using the same methodologies as the base year inventory but using control strategies and growth assumptions for the future. More information on the methodologies used to develop the projection year inventories can be found in Appendix A1-9 of the SIP submittal.

Table 5 – 2021 Projection Year SO_2 Emissions in the NAA

Emission Source Category	2021 SO_2 Emissions (tpy)*
Point Sources	9,683.98
Quasi-Point Source	149.42
Nonpoint Sources	983.48
Nonroad Sources	5.81
MAR Sources	261.56
Onroad Sources	48.00
Total	**11,132.25**

*Emissions submitted by MDE

EPA has reviewed the procedures and methodologies used for the development of the projection year inventory and found them to be acceptable.

[5] EIA AEO Website - https://www.eia.gov/analysis/