



STATE OF OHIO NONATTAINMENT
AREA STATE IMPLEMENTATION PLAN
AND DEMONSTRATION OF ATTAINMENT

SUPPLEMENT FOR MUSKINGUM RIVER
SO₂ NONATTAINMENT AREA

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STATE OF OHIO NONATTAINMENT AREA STATE IMPLEMENTATION PLAN AND DEMONSTRATION OF ATTAINMENT SUPPLEMENT FOR MUSKINGUM RIVER SO₂ NONATTAINMENT AREA

Background

The Clean Air Act (CAA), as amended, requires each state with areas failing to meet the 1-hour sulfur dioxide (SO₂) National Ambient Air Quality Standard (NAAQS) to develop State Implementation Plans (SIPs) to expeditiously attain and maintain the standard. The United States Environmental Protection Agency (U.S. EPA) promulgated the revised NAAQS for SO₂ on June 2, 2010. U.S. EPA replaced the 24-hour and annual standards with a new short-term 1-hour standard of 75 parts per billion (ppb). The new 1-hour SO₂ standard was published on June 22, 2010 (75 FR 35520) and became effective on August 23, 2010. The standard is based on the three-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

On August 15, 2013, U.S. EPA published (78 FR 47191) the initial SO₂ nonattainment area designations for the 1-hour SO₂ standard across the country (effective October 4, 2013). Unlike Subpart 2 of the CAA Amendments of 1990 which defined five ozone nonattainment classifications for the areas that exceed the NAAQS based on the severity of the ozone levels, SO₂ nonattainment designations are simply labeled “nonattainment.”

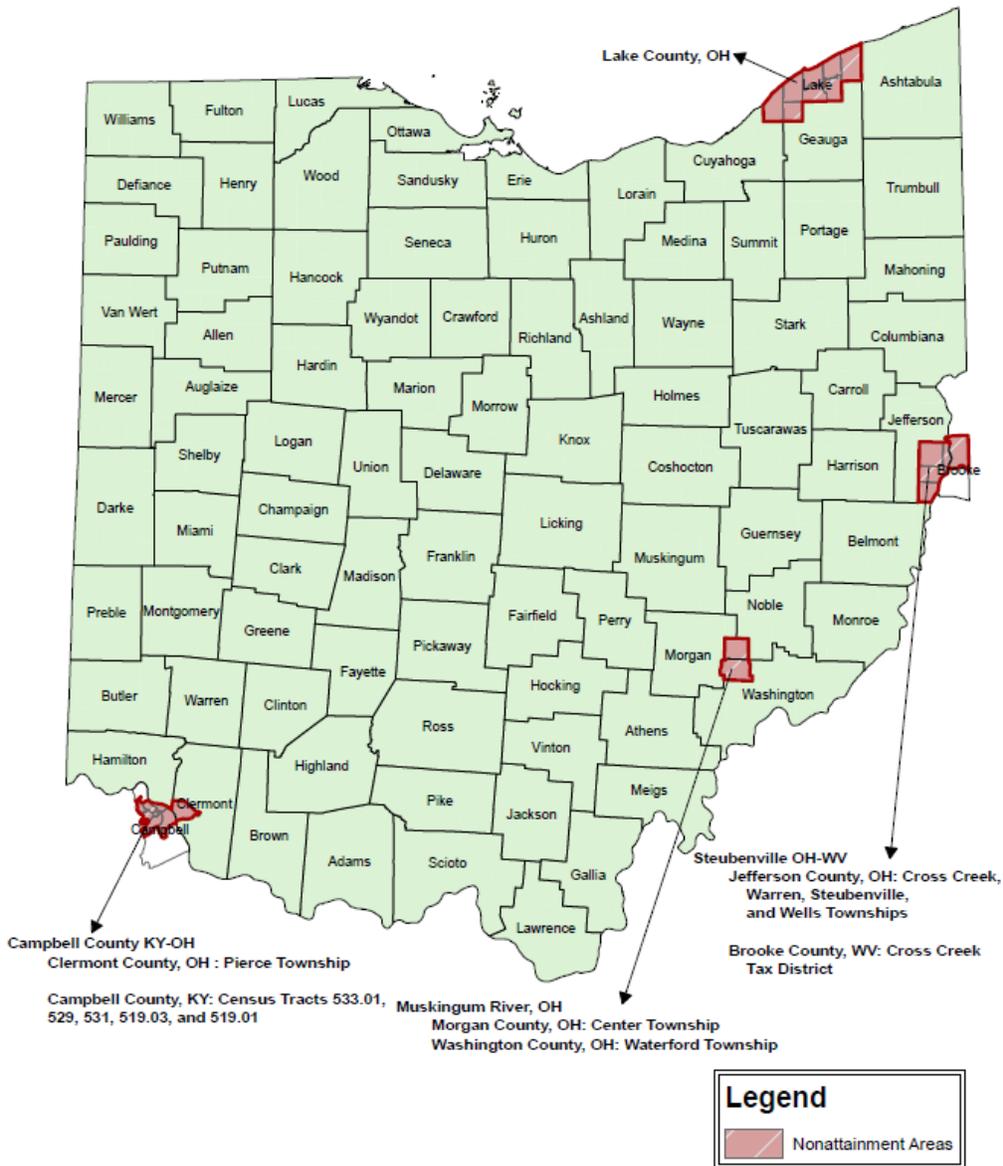
Section 172 of the CAA addresses general requirements for areas designated as nonattainment for all NAAQS while Section 191 and 192 of the CAA address nonattainment area requirements specific to SO₂. Specifically, Section 191(a) requires states with SO₂ nonattainment areas to submit a plan within eighteen months of the effective date of the designations (April 4, 2015) detailing how the SO₂ standard will be attained, as expeditiously as practicable, but no later than October 4, 2018 (referred to as a “nonattainment area SIP” and “attainment demonstration”). However, areas that attain before the required date for submitting a plan may be exempt from certain otherwise applicable requirements, including submittal of a full nonattainment area SIP and attainment demonstration.

Ohio EPA submitted its attainment demonstration SIP on April 3, 2015 and submitted revisions on October 13, 2015 and March 13, 2017. On June 25, 2019, Ohio EPA submitted a supplement to the attainment demonstration for the Steubenville, OH-WV nonattainment area.

Ohio is now submitting a supplement to the attainment demonstration for the Muskingum River nonattainment area. This supplement contains an updated Reasonably Available Control Measures/Reasonably Available Control Technology (RACM/RACT) analysis, along with an updated Attainment Demonstration/Control Strategy which includes SO₂ emission limits for Globe Metallurgical. This additional material should be considered as a supplement to Chapters 6 and 7 of the October 2015 submittal, respectively.

The Muskingum River, OH nonattainment area is located in southeastern Ohio and includes Center Township in Morgan County and Waterford Township in Washington County. This area was also designated nonattainment under the 1971 SO₂ standard from 1978 to 1993 (43 FR 45993, 43 FR 8962). The area was redesignated to attainment for the 1971 standard effective October 21, 1994 (59 FR 48403).

Figure 1. Ohio 2013 Nonattainment Area Designations



Ohio EPA DAPC Maps Available at: <http://www.epa.ohio.gov/dapc/general/naaqs.aspx>

Air Quality Trends

Nonattainment designations were first recommended by states based on 2008 to 2010 air quality data. By the time designations were finalized by U.S. EPA, 2009 to 2011 and 2010 to 2012 air quality data were also considered. Over that time period, SO₂ air quality improved in many areas. In the years since final designations, additional improvements have occurred. Table 1 identifies 2012 through 2019 air quality trends at the monitor located in the Muskingum River, OH nonattainment area. Appendix A includes the air quality data generated from U.S. EPA's Air Quality System (AQS).

At the time of the nonattainment designation, there were three EGU and one non-EGU sources in the Muskingum River, OH nonattainment area. Muskingum River Power Plant accounted for 99% of SO₂ emissions in this area. In 2011, Muskingum River Power Plant emitted 104,138.03 tons of SO₂ while the entire 2011 EGU and non-EGU inventory is comprised of 105,341.03 tons of SO₂. The remaining sources emitted 1,203.00 tons of SO₂.

The last coal fired boiler at the Muskingum River Power Plant ceased operating as of May 15, 2015 and all coal fired boilers were permanently shutdown effective May 31, 2015. The monitor in this area was historically sited to monitor maximum concentrations from Muskingum River Power Plant. Upon review of monitoring data for the area obtained from U.S. EPA's AQS, it is apparent that violations of the standard were due to operation of Muskingum River Power Plant. As shown in Table 1, this monitor is currently well below the standard.

Table 1. Monitoring data for Muskingum River Nonattainment Areas

Site	County	Year (ppb)								Design Value (ppb)					
		2012	2013	2014	2015	2016	2017	2018	2019	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019
39-115-0004	Morgan, OH	142	124	148	91	17	17	18	15	138	121	85	42	17	17

Insufficient data (less than 75 percent capture in at least one quarter)

Source: U.S. EPA Air Quality System (AQS); <http://www.epa.gov/ttn/airs/airsaqs/index.htm>

RACM/RACT

Supplement to Chapter 6 of the October 2015 Submittal for the Muskingum River, OH Nonattainment Area CAA Section 172(c)(1)

The Muskingum River Power Plant, which accounts for 99% of SO₂ emissions in this area, was the only source located in the area that impacted nonattainment. This facility permanently shut down all coal-fired boilers as of May 31, 2015. Therefore RACT/RACM was not necessary for this source.

After Ohio submitted the attainment demonstration SIP, U.S. EPA requested a RACT/RACM analysis for Globe Metallurgical, the only non-EGU source in the area. Ohio EPA worked with Globe Metallurgical who prepared a RACT/RACM analysis (Appendix B) and a supplement to the analysis (Appendix C). Upon review of the analysis, Ohio EPA concurred with Globe Metallurgical's determination that continuing the current use of low sulfur coal and low sulfur coke constitutes RACT/RACM and no additional control is technically or economically feasible. Globe Metallurgical evaluated SO₂ add-on control systems including Gore technology, as well as wet and dry scrubbing technology, and concluded that the use of these add-on control devices are not demonstrated feasible control options due to the high-volume flow and low SO₂ gas concentrations, as well as infrastructure challenges related to installation and operation of add-on SO₂ control equipment. Further, add-on controls for reduction of SO₂ emissions is not practiced at similar facilities in the industry. Ohio EPA submitted the RACT/RACM analysis to U.S. EPA on August 11, 2017 indicating our agreement with the analysis.

Subsequently, due to further requests from U.S. EPA, Globe performed additional technical and cost analyses regarding potential add-on SO₂ controls and the installation of stacks (Appendix D). Ohio EPA notes that this analysis goes well beyond established requirements for RACT/RACM for nonattainment areas. Ohio EPA concurs with Globe Metallurgical's determination that add-on SO₂ controls or the addition of stacks is not economically feasible.

Attainment Demonstration/Control Strategy

Supplement to Chapter 7 of the October 2015 Submittal for the Muskingum River, OH Nonattainment Area

CAA Sections 172(c)(1), 172(c)(6) and 172(c)(8)

The Muskingum River, OH nonattainment area is comprised of Center Township in Morgan County and Waterford Township in Washington County. The inventory was provided in Chapter 4 and Appendix B of the October 2015 SIP. At the time of the nonattainment designation, there were three EGU and one non-EGU sources in the Muskingum River, OH nonattainment area. Muskingum River Power Plant accounted for 99% of SO₂ emissions in this area. In 2011, Muskingum River Power Plant emitted 104,138.03 tons of SO₂ while the entire 2011 EGU and non-EGU inventory is comprised of 105,341.03 tons of SO₂. The remaining sources emitted 1,203.00 tons of SO₂.

The last coal fired boiler at the Muskingum River Power Plant ceased operating as of May 15, 2015 and all coal fired boilers were permanently shutdown effective May 31, 2015. Upon review of monitoring data for the area obtained from U.S. EPA's AQS, it was apparent that violations of the standard are due to operation of Muskingum River Power Plant. Therefore, Ohio EPA initially concluded that the permanent shutdown of Muskingum River Power Plant will provide for attainment of the standard in this area and no further analysis, including modeling, was warranted.

After further discussions with U.S. EPA Region 5 concerning one of the non-EGUs in the area, Globe Metallurgical, Ohio EPA is now supplementing this attainment demonstration and control strategy with additional analysis regarding Globe's emissions in conjunction with the shutdown of the Muskingum River Power Plant.

Ohio EPA worked with Globe Metallurgical and their consultant, ERM, to develop the attainment demonstration and control strategy described below. Additional detail is located in Appendices E (Director's Final Findings and Orders Establishing SO₂ Emission Limits for Globe Metallurgical) and F (Air Quality SO₂ Modeling Results).

Specifically, air quality modeling and analyses were conducted by ERM and SO₂ emission limits were established for Globe Metallurgical. On June 23, 2020, Ohio EPA issued Director's Final Findings and Orders (DFFOs) (Appendix E) to Globe Metallurgical establishing 24-hour average SO₂ emission limits that must be achieved by September 15, 2020.

The emission limits for Globe Metallurgical were derived from air quality modeling conducted by ERM and reviewed by Ohio EPA (Appendix F) to determine the final SO₂ attainment rates (critical values) that will provide for attainment and maintenance of the 2010 SO₂ NAAQS.

Per U.S. EPA's April 23, 2014 Memorandum "Guidance for 1-hour SO₂ Nonattainment

Area SIP Submissions” (April 23, 2014 SO₂ nonattainment area SIP guidance”,

“Appendix A of this document contains modeling guidance supplemental to that provided in the preamble to the final rulemaking promulgating the 2010 SO₂ NAAQS and in 40 CFR part 51, Appendix W. Appendix A of this document has also been updated to respond to issues raised during the comment period related to the September 2011 draft SO₂ Guidance Document. This guidance clarifies the EPA’s recommendations on how to conduct refined dispersion modeling under Appendix W to support the implementation of the 2010 SO₂ NAAQS.”

Modeling input data, including emission rates, are addressed in Section 8.0 of Appendix W and specifically for SO₂, in Appendix A of the Nonattainment SIP Guidance. The averaging period for the 2010 SO₂ NAAQS is the 99th percentile of maximum monitored daily values, averaged over three years. Per the Nonattainment SIP Guidance, five years of National Weather Service data or at least one year of on-site meteorological data is sufficient to represent attainment of the standard. Thus, the modeled form of the standard is expressed as the 99th percentile of maximum daily values averaged over the number of years of meteorological data used (herein referred to as “design value”).

The recommended dispersion model for SIP modeling for SO₂ is the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) modeling system. There are two input data processors that are regulatory components of the AERMOD modeling system: AERMET, a meteorological data preprocessor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP, a terrain data preprocessor that incorporates complex terrain using United States Geological Survey (USGS) Digital Elevation Data. Additionally, ERM utilized the AERMINUTE module to incorporate 1-minute ASOS meteorological data into the hourly surface input file. ERM utilized the most up-to-date versions of AERMOD and the associated preprocessors available at the time of the attainment modeling analyses. These are as follows: AERMOD version 19191, AERMET version 19191, AERMINUTE version 15272, and AERMAP version 18081.

Meteorological Data

As detailed in Appendix F of Ohio’s SIP submittal, ERM utilized National Weather Service surface meteorological data collected at the Parkersburg/Mid-Ohio Valley Regional Airport (KPKB, WBAN #03804) and upper air data from the Pittsburgh International Airport (KPIT, WBAN #94823), years 2014 - 2018. Per Ohio EPA recommendations, AERSURFACE was used to determine monthly surface characteristics at twelve sectors. Surface characteristics were informed by assessing monthly precipitation values at the Parkersburg Airport against 30-year climate norms.

Emission Sources

There are two baghouses at the Globe Metallurgical facility, as well as fugitive emissions from both Electric Arc Furnace (EAF) shops. ERM represented both baghouse sources as point sources and the fugitive emissions as volume sources. Note that emissions from

Baghouse 1 were treated as being released horizontally, using the POINTHOR option in the SO pathway of AERMOD. For each shop, 98% of total emissions was attributed to the baghouse and 2% to fugitive emissions. A complete description of the emission sources and characterization is provided in Appendix F of this submittal. Additional support for the 98% capture efficiency assumed in the modeling is provided in Appendix G.

Based on this modeling, a matrix of critical emission values for the two baghouses at the facility was identified, where each combination was modeled to demonstrate attainment and maintenance of the standard.

As described in the DFFOs (Appendix E), compliance with the emission limit sets in Table 2 will be determined through mass balance calculations, as implemented through a compliance assurance plan (CAP). Ohio EPA will approve the CAP in consultation with U.S. EPA. Compliance with the emission limits will also be determined through periodic compliance performance testing. Proposed methodology for the compliance performance testing will be submitted as part of the Intent-to-Test notification for the testing, which Ohio EPA will approve in consultation with U.S. EPA.

The material processing and sulfur content information needed for mass balance calculations is difficult and unduly burdensome to obtain on an hourly basis. Therefore, Ohio believes that establishment of the limits on a 24-hour basis, reflecting adjustment in accordance with the procedures outlined in U.S. EPA’s April 23, 2014 SO₂ nonattainment area SIP guidance, is warranted.

Ohio does not have a robust set of hourly emissions values at Globe from which to develop a source-specific assessment of the relationship between 24-hour emission averages and 1-hour emissions at this facility. Nevertheless, Ohio believes that the national average adjustment factors included in Appendix D of U.S. EPA’s 2014 guidance are an appropriate estimate of the degree of adjustment that is warranted for this facility. The adjustment factor that Ohio applied is 93 percent. With this adjustment, Ohio considers the 24-hour average emission limits to be of comparable stringency to the 1-hour limit at the critical emission value. The critical values and final SO₂ emission limits are shown in Table 2.

Table 2. Globe Metallurgical Modeled Attainment Rates (Critical Values) and Final Attainment SO₂ Emission Limits

Emission Limit Sets	Modeled 1-hour Emission Rate Combinations (lb/hr)		Modeled Design Value (µg/m ³)	Final Attainment 24-hour Average SO ₂ Emission Limit Combinations (lb/hr)	
	Shop 1 Baghouse: P902 (EAF 1) P903 (EAF 2) P904 (EAF 3)	Shop 2 Baghouse: P907 (EAF 5) P908 (EAF 7)		Shop 1 Baghouse: P902 (EAF 1) P903 (EAF 2) P904 (EAF 3)	Shop 2 Baghouse: P907 (EAF 5) P908 (EAF 7)
1	210.0	0.0	195.3	195.3	0.0

2	205.0	60.0	195.6	190.6	55.8
3	200.0	80.0	192.6	186.0	74.4
4	195.0	110.0	195.7	181.3	102.3
5	190.0	125.0	195.7	176.7	116.2
6	185.0	140.0	195.5	172.0	130.2
7	180.0	155.0	195.4	167.4	144.1
8	175.0	170.0	196.0	162.7	158.1
9	170.0	180.0	195.2	158.1	167.4
10	165.0	190.0	194.2	153.4	176.7
11	160.0	200.0	195.6	148.8	186.0
12	155.0	205.0	195.1	144.1	190.6
13	150.0	210.0	194.6	139.5	195.3
14	145.0	215.0	194.1	134.8	199.9
15	140.0	220.0	193.6	130.2	204.6
16	135.0	230.0	195.5	125.5	213.9
17	130.0	235.0	195.0	120.9	218.5
18	125.0	240.0	194.5	116.2	223.2
19	120.0	240.0	192.7	111.6	223.2
20	115.0	245.0	195.1	106.9	227.8
21	95.0	250.0	194.1	88.3	232.5
22	80.0	255.0	194.2	74.4	237.1
23	65.0	260.0	194.2	60.4	241.8
24	45.0	265.0	193.1	41.8	246.4
25	30.0	270.0	193.1	27.9	251.1
26	0.0	280.0	195.2	0.0	260.4

Where a calculated rate for one baghouse falls in-between the emission limits shown in Table 2, the applicable emission limit for the other baghouse will be the more stringent of the two corresponding emission limits for that baghouse.

Validation testing will be conducted to verify the accuracy of the mass balance calculations. In addition, a Capture Evaluation will be performed during the validation testing. This study will be conducted by a third party and will include observations of emissions capture during the validation testing period, an evaluation of emissions capture performance, and, if appropriate, recommendations for measures to improve capture, as well as operational parameter(s) and ranges that could serve as an indicator of ongoing performance of the capture system. Elements of the capture improvement study will be submitted as part of the Intent-to-Test notification for the validation testing, which Ohio EPA will approve in consultation with U.S. EPA.

The CAP will specify the monitoring, including sampling and analysis techniques, used to perform the mass balance calculations, as well as associated recordkeeping and

reporting. The CAP will also identify measures that will be implemented to improve capture efficiency along with a timeline to implement those measures, and the parameter(s) and ranges which will serve as an indicator of ongoing performance of the capture system.

Should the validation testing study be unable to adequately verify the mass balance calculations due to necessary capture improvements or other reasons, Ohio EPA may require additional validation testing to occur following the appropriate adjustments or improvements.

To provide an additional level of assurance that air quality standards are being met in the area, Globe will be required to install an SO₂ monitor. Ohio EPA will operate this monitor for a minimum of three years. This monitor will be designated as an industrial monitor, and will meet appropriate siting criteria and quality assurance requirements established in 40 CFR Part 58.

The DFFOs will remain in effect until requirements demonstrating attainment of the standard (including procedures for determining compliance) are incorporated into Ohio Administrative Code (OAC) Chapter 3745-18, the rules are approved into Ohio's SIP, and the requirements are incorporated into the facility's Title V operating permit.

The air quality modeling demonstrates the final control strategy at this source, as shown in Table 2, will provide for attainment and maintenance of the standard. As can be seen from the modeling results, impacts from the source are localized within the nonattainment area; therefore, Ohio EPA also ensured this final control strategy would not interfere with attainment and maintenance of the standard outside the boundaries of the nonattainment area.

Public Participation

Ohio published notification for the public comment period, including an opportunity to request a public hearing, concerning the supplement to Ohio's attainment demonstration for the Muskingum River, OH SO₂ nonattainment area in the widely distributed county publications on February 20, 2020.

The public comment period closed on April 2, 2020. No public hearing was held because no requests were received. Appendix H includes a copy of the public notice and a response to comments document.

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