June 29, 2022

Debra Shore Regional Administrator U.S. EPA, Region 5 77 West Jackson Blvd. Chicago, Illinois 60604

Re: Ohio’s 2022 Annual SO₂ Emissions Review

Dear Administrator Shore:

I am writing to submit Ohio’s 2022 Annual SO₂ Emissions Review, in accordance with Data Requirements Rule for the 2010 SO₂ standard [80 FR 51052, August 21, 2015]. This rule established ongoing data review requirements including, for areas where modeling of actual SO₂ emissions served as the basis for an unclassifiable/attainment designation, an annual review of emissions data and submittal of a report recommending whether updated modeling is necessary due to emissions increases.

Ohio’s annual SO₂ emissions review for 2022, based on a review of emissions data reported through 2021, indicates that updated modeling is necessary for the Miami Fort facility in Hamilton County and the Carmeuse Lime Maple Grove facility in Seneca County due to increased SO₂ emissions. Ohio EPA will be performing the updated modeling and provide the results to U.S. EPA by no later than the next annual review.

Ohio EPA notified the public of the availability of the draft emissions review on May 10, 2022. No comments were received during the public comment period.

If you have questions, please contact Jennifer Van Vlerah in our Division of Air Pollution Control at (614) 644-3696.

Sincerely,

Laurie A. Stevenson
Director

Cc: Robert Hodanbosi, Chief, Ohio EPA DAPC
State of Ohio Environmental Protection Agency
Division of Air Pollution Control

Ohio’s 2022 Annual
Sulfur Dioxide (SO₂) Emissions Review

Prepared by:
The Ohio Environmental Protection Agency
Division of Air Pollution Control

June 2022
Background

The United States Environmental Protection Agency (U.S. EPA) promulgated the revised National Ambient Air Quality Standard (NAAQS) for sulfur dioxide (SO$_2$) 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 SO$_2$ standard was published on June 22, 2010 (75 FR 35520) and became effective on August 23, 2010. The standard is based on the 3-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, first round, SO$_2$ nonattainment area designations for the 1-hour SO$_2$ standard across the country based upon areas with monitored violations (effective October 4, 2013). On March 2, 2015, the U.S. District Court for the Northern District of California accepted as an enforceable order an agreement between the U.S. EPA and Sierra Club and the Natural Resources Defense Council to resolve litigation concerning the deadline for completing designations. As explained in U.S. EPA’s March 20, 2015 memorandum *Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard*, the court’s order directs U.S. EPA to complete the remaining designations in three steps: round two by July 2, 2016; round three by December 31, 2017 and round four by December 31, 2020.

As part of round two of designations, U.S. EPA identified areas with newly monitored violations of the standard, or areas that contain stationary sources that emitted more than 16,000 tons of SO$_2$ in 2012 or emitted more than 2,600 tons of SO$_2$ and had an emission rate of at least 0.45 lbs SO$_2$/MMBtu in 2012. The U.S. EPA identified two facilities in Ohio as meeting one or more of the emissions thresholds: the General James M. Gavin Plant and the W.H. Zimmer Generating Station. On July 12, 2016, U.S. EPA published (81 FR 45039) final second round designations for these source areas.

Ohio submitted recommendations for round three designations on January 13, 2017. U.S. EPA finalized designations for these areas on January 9, 2018 (83 FR 1098). Round three and four designations are informed by U.S. EPA’s August 21, 2015 *Data Requirements Rule for the 2010 1-hr Sulfur Dioxide (SO$_2$) Primary National Ambient Air Quality Standard (NAAQS); Final Rule* [80 FR 51052] (herein referred to as the DRR), which required characterization of sources with actual emissions greater than 2,000 tons per year (TPY) of SO$_2$ through either modeling or monitoring.

The DRR also established ongoing data review requirements including, for areas where modeling of actual SO$_2$ emissions served as the basis for an unclassifiable/attainment designation, an annual review of emissions data and submittal of a report recommending whether updated modeling is necessary due to emissions increases. The annual emissions review is due to U.S. EPA Region 5 by July 1, annually, beginning the calendar year after the effective date of designation. This document is Ohio's 2022 annual emissions review and recommendations for whether updated modeling is necessary. The
2022 review is due to U.S. EPA by July 1, 2022 and uses emissions data available through 2021.

Ongoing data requirements apply to all areas for which the initial modeling was based on actual emissions and the area was designated as attaining. Ongoing data requirements do not apply to sources where designations were based on 1) modeling using allowable emissions, or 2) enforceable emissions limits providing for an unclassifiable/attainment designation using modeling with updated allowable emissions limits.

The 2022 annual emissions review includes the following areas:
- William H. Zimmer facility (in the portion of Clermont County excluding Pierce Township), designated unclassifiable/attainment under round two designations.
- Carmeuse Lime Maple Grove (Seneca County), designated unclassifiable/attainment under round three designations.
- Miami Fort Station (Hamilton County) designated unclassifiable/attainment under round three designations.
- Bay Shore Power Plant (Lucas County) designated unclassifiable/attainment under round three designations.

An emissions review for facilities designated under round one is not required as designations were based on monitored violations, as opposed to violations based on modeling of actual emissions. The area surrounding the General James M. Gavin and Kyger Creek Power Plants (Gallia County in its entirety and the portion of Meigs County including Bedford, Columbia, Rutland, Salem, Salisbury, and Scipio Townships), which was designated unclassifiable under round two, is not included in this review as it was monitored and a request for an attainment/unclassifiable designation was submitted under round four.

After discussion and agreement with U.S. EPA, ongoing review for the following areas has been terminated:
- First Energy W.H. Sammis (the portion of Jefferson County including Brush Creek, Island Creek, Knox, Mount Pleasant, Ross, Salem, Saline, Smithfield, Springfield, and Wayne Townships), as described in Ohio’s Recommended Area Designations for Round 3 submitted on January 13, 2017.
- American Electric Power Conesville Power Plant (Coshocton County), as described in Ohio’s Recommended Area Designations for Round 3 submitted on January 13, 2017.
- J.M. Stuart and Killen facilities (Adams County) as described in Ohio’s 2019 Annual SO2 Emissions Review submitted on June 19, 2019.
Analytical Methodology

1. Determining if emissions have increased

To determine if an emissions increase has occurred since the initial modeling, Ohio EPA compared the total annual sum of modeled hourly actual emissions to more recent annual SO\textsubscript{2} emissions data obtained from the Clean Air Markets Division (CAMD) where available, and from the state inventory database (i.e., Ohio’s EIS database which serves as the basis for the National Emissions Inventory).

For the initial modeling, Ohio EPA attempted to use variable emissions at the finest temporal scale available for each unit. As described in Ohio’s designation modeling protocol (Appendices to Ohio’s Recommended Source Area Designation submittals), and in accordance with U.S. EPA’s February 2016 draft SO\textsubscript{2} NAAQS Designations Modeling Technical Assistance Document (Modeling TAD), Part 75 emissions reporting data was used for the majority of hourly emissions, with data substitutions for some hours.

The Modeling TAD recognizes the unique and case-by-case nature of modeling analyses conducted for the purposes of designations. With respect to emissions, Section 5.2.1 of the Modeling TAD recommends that the reviewing authority work closely with each facility to determine the accuracy of emissions data. The guidance is not prescriptive with respect to substitution methodologies, but suggests averages of surrounding non-missing hours, peak emissions substitutions, use of emission factors, and others. Ohio EPA understands that data substitutions performed for the fulfillment of Part 75 monitoring and reporting requirements are in many instances conservative. To ensure that modeling presents the most accurate surrogate to monitoring for the purposes of designation, Ohio EPA used a case-by-case approach to data substitution, including, but not limited to, Part 75 substitutions, valid hour-before hour-after averaging, mathematical interpolation across valid surrounding hours, and engineering methods.

Ohio EPA’s initial analysis to determine if emissions increased compares the modeled emissions to more recent annual SO\textsubscript{2} emissions data obtained from the Clean Air Markets Division (CAMD) where available, and from the state inventory database (i.e., Ohio’s EIS database which serves as the basis for the National Emissions Inventory). Data reported to CAMD is done so for the accounting of emission allowance consumption, in accordance with Part 75 monitoring and reporting requirements. Accordingly, the data tends to overstate emissions when there are errors in the monitoring equipment or periods of missing data, as described in the Part 75 monitoring and reporting requirements. The data substitution methodologies employed via Part 75 requirements can lead to overestimations of emissions data. Therefore, this will provide a conservative estimate of the change in emissions, without necessitating the extensive analysis and substitution of variable emissions performed for the modeling. If it appeared based on this conservative analysis that emissions have increased and updated modeling may be warranted, Ohio EPA more closely evaluated the actual variable emissions and performed appropriate substitutions.
Ohio EPA also reviewed SO\textsubscript{2} emissions for any new sources and existing sources not explicitly modeled within 50 kilometers of the modeled source to determine if additional analysis is warranted.

2. Determining if updated modeling is warranted

If an emissions increase occurred, Ohio EPA describes the reason for emissions increases from the previous year and recommends whether the emissions increase warrants updated modeling. Whether an emissions increase necessitates modeling is determined on case-by-case basis.

U.S. EPA generally recommends updated modeling if:
- Original modeling was greater than or equal to 90\% of standard (\geq 176.58 \text{ µg/m}^3) and there is any increase in emissions; or
- Original modeling is 50-90\% of standard (98.1-176.58 \text{ µg/m}^3) and emissions increased by 15\% or more.

Some additional considerations noted by U.S. EPA include:
- If the emissions increase is substantial and previous modeling was just under the standard, modeling should be updated; and
- If the emissions increased only slightly and previous modeling was well below the standard, judgment may be exercised.

There are other factors that might be considered on a case-by-case basis. For example, Ohio EPA relied upon other factors for an analysis in Ohio’s Recommended Area Designations for Round 3, for Dayton Power and Light J.M. Stuart and Killen Stations (p 63-66). These included:
- Which year’s emissions would dominate the three-year design value, and how the increased emissions are relative to that year (i.e., whether replacement of the current year’s data with data used in the modeling would be likely to lead to significant increase in modeled design values); and
- Assessing the sensitivity of modeled impacts to changes in emissions (i.e., estimate how much the maximum design value would be increased by the increase in emissions).

William H. Zimmer facility

The area surrounding the William H. Zimmer facility (the portion of Clermont County excluding Pierce Township) was designated unclassifiable/attainment under round two
designations by U.S. EPA effective September 12, 2016 (81 FR 45039) based on modeling using actual emissions and is therefore subject to the ongoing data requirements of the DRR.

Modeling was based on hourly variable emissions data for the 2012-2014 period submitted to Ohio EPA by Dynegy Zimmer, LLC for all SO\textsubscript{2} sources at the William H. Zimmer facility. Modeled SO\textsubscript{2} emissions for 2012 to 2014 and reported SO\textsubscript{2} emissions from 2019 to 2021 are shown in Table 1 and Figure 1. The vast majority of emissions are contributed by Unit 1 (B006). As shown in Table 2, facility total emissions decreased (38.1\%) for the 2019-2021 time period compared to the 2012-2014 modeled emissions.

Table 1. William H. Zimmer Annual SO\textsubscript{2} Emissions (Tons)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Modeled SO\textsubscript{2} Emissions</th>
<th>Reported SO\textsubscript{2} Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>1 (B006)</td>
<td>10,094.79</td>
<td>18,399.83</td>
</tr>
<tr>
<td>Aux A (B007)</td>
<td>18.53</td>
<td>6.73</td>
</tr>
<tr>
<td>Aux B (B008)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility total</td>
<td>10,113.32</td>
<td>18,406.56</td>
</tr>
</tbody>
</table>
In the original modeling, the maximum modeled 3-year design value for 2012-2014 was 118.2265 µg/m³ (147.0025 µg/m³, with background). An area meets the standard of 75 ppb if a concentration of 196.2 µg/m³ or lower is modeled. Therefore, the original modeling was 75% of the standard. For original modeling results between 50 and 90% of the standard, U.S. EPA generally recommends updated modeling if emissions increase by 15% or more. Emissions have not increased by 15% or more for any individual unit or for the facility as a whole.

The original analysis showed a design value of 25% below the standard. Lower 2019-2021 emissions mean that any new modeling would likely show even lower concentrations. The source configuration and release characteristics at the Zimmer
facility have not changed significantly from those modeled. Additionally, there were no new sources or changes in existing sources not explicitly modeled within 50 kilometers that warrant additional analysis, with the exception of Carmeuse Lime Black River (Facility ID 2119100002) located 3.5 km from Zimmer in Pendleton County, KY. Emissions at this facility increased from 651.31 tons in 2014 to 1,136.96 tons in 2020 (2021 emissions are not yet available). Emissions from this facility were accounted for in the background concentration. Previously performed dispersion modeling of a similar facility, the Carmeuse Lime Maple Grove facility in Seneca County, indicated that a maximum impact of 146 µg/m³ occurred 850 meters away from the source (see Appendix P of Ohio's 2010 Revised Sulfur Dioxide National Ambient Air Quality Standard Recommended Area Designations Round 3, submitted January 13, 2017). The Carmeuse Lime Black River facility in Pendleton County, KY that is in question here is approximately 5 times smaller than the source modeled in Seneca County, based on actual emissions in 2020, indicating that the maximum impact of the Pendleton County facility would roughly be in the 30 µg/m³ range. As noted above, emissions from the Zimmer facility decreased by 38.1%, which scales to a maximum impact of roughly 90 µg/m³. Even if the maximum impacts from these two facilities coincide at the same location, which is unlikely given the size of the Carmeuse Lime Black River facility and distance between the two facilities, updated modeling would still not likely model an exceedance. The tallest stack at the Carmeuse Lime Black River facility in Pendleton County, KY is 36 meters high. Ohio EPA's experience indicates that the maximum SO₂ 1-hour impacts occur within a distance of approximately 10 times the tallest stack height. Thus, the maximum impact would likely occur within approximately 400 meters of the Carmeuse Lime Black River facility, well short of the point of Zimmer’s maximum impact.

Given the significant decrease in emissions at the Zimmer facility and the initial modeling 25% below the standard, Ohio does not believe modeling would show nonattainment. Therefore, Ohio EPA does not recommend updated modeling.

**Carmeuse Lime Maple Grove**

The area surrounding the Carmeuse Lime Maple Grove facility (Seneca County) was designated unclassifiable/attainment under round three designations by U.S. EPA effective April 9, 2018 (83 FR 1098) based on modeling using actual emissions and is therefore subject to the ongoing data requirements of the DRR.

Originally, modeling was conducted using hourly variable emissions data from the 2012-2014 time period. However, under the 2019 annual review conducted by Ohio EPA, emissions increased by 61% (exceeding the 15% threshold) from the original 2012-2014 modeling necessitating updated modeling. The new modeling conducted subsequent to the 2019 annual review was based on hourly variable emissions data for the 2016-2018 time period submitted to Ohio EPA by Carmeuse for all SO₂ sources at the facility and is the new baseline from which annual reviews shall be compared. This modeling was included in Appendix A of the 2020 SO₂ Annual Emissions Review.
Modeled SO₂ emissions for 2016 to 2018 and reported SO₂ emissions from 2019 to 2021 are shown in Table 3 and Figure 2. Both units (P003 and P004) share a combined stack, so were not modeled individually. As shown in Table 4, facility total emissions increased for the 2019-2021 time period (16.1%) compared to the 2016-2018 modeled emissions.

**Table 3. Carmeuse Lime Maple Grove Annual SO₂ Emissions (Tons)**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Modeled SO₂ Emissions</th>
<th>Reported SO₂ Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P003</td>
<td>5,247.90</td>
<td>6,361.30</td>
</tr>
<tr>
<td>P004</td>
<td>3,234.00</td>
<td>2,839.69</td>
</tr>
<tr>
<td>Facility total</td>
<td>5,247.90</td>
<td>6,361.30</td>
</tr>
</tbody>
</table>

**Figure 2. Carmeuse Lime Maple Grove Annual SO₂ Emissions (Tons)**

**Table 4. Percent Change in Annual SO₂ Emissions**

<table>
<thead>
<tr>
<th>Unit</th>
<th>2016-2018 Total modeled emissions (Tons)</th>
<th>2019-2021 total emissions (Tons)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility total</td>
<td>17,837.10</td>
<td>20,716.83</td>
<td>16.1%</td>
</tr>
</tbody>
</table>
The source configuration and release characteristics at the Carmeuse Lime facility have not changed significantly from those modeled. Additionally, there were no new sources or changes in existing sources not explicitly modeled within 50 kilometers that warrant additional analysis, except for Sunny Farms Landfill (Facility ID 0374010199), located 21.5 km southwest of the Carmeuse Lime facility. Sunny Farms Landfill emitted 460.48 tons of \( \text{SO}_2 \) in 2018 and emitted 2,855.57 tons of \( \text{SO}_2 \) in 2020, representing an increase of 520.1%. However, this increase in \( \text{SO}_2 \) emissions in 2020 was largely the result of temporary, emergency-like conditions stemming from \( \text{SO}_2 \) control equipment issues and is unlikely to occur again. Additionally, dispersion modeling of \( \text{SO}_2 \) emissions from the flare at Sunny Farms Landfill under the worst-case scenario conditions showed that the impact of the \( \text{SO}_2 \) emissions from Sunny Farms Landfill would be limited to an incremental increase in \( \text{SO}_2 \) concentration at the Carmeuse Lime facility of 0.7 µg/m\(^3\), equivalent to less than 10% of the Significant Impact Level (SIL) for \( \text{SO}_2 \) (7.9 µg/m\(^3\)).

In the 2016-2018 modeling, the maximum modeled 3-year design value for that time period was 173.27101 µg/m\(^3\), including background concentration. This modeling was 88% of the standard. For original modeling results between 50 and 90% of the standard, U.S. EPA generally recommends updated modeling if emissions increase by 15% or more. As emissions from the Carmeuse Lime facility increased above the 15% threshold, Ohio EPA recommends updated modeling. The DRR indicates that U.S. EPA will consider this recommendation and may require submittal of updated modeling within 12 months. Ohio EPA is currently in the process of preparing updated modeling in anticipation of this requirement. Ohio EPA will be considering whether other facilities warrant inclusion in this future modeling given the change in emissions that has occurred in this area overall.

**Miami Fort Station**

The area surrounding Miami Fort Station (Hamilton County) was designated unclassifiable/attainment under round three designations by U.S. EPA effective April 9, 2018 (83 FR 1098) based on modeling using actual emissions and is therefore subject to the ongoing data requirements of the DRR.

Originally, modeling was conducted using hourly variable emissions data from the 2012-2014 time period. However, under the 2021 annual review conducted by Ohio EPA, emissions increased by 26% (exceeding the 15% threshold) from the original 2012-2014 modeling, necessitating updated modeling. The new modeling conducted subsequent to the 2021 annual review was based on hourly variable emissions data for the 2018-2020 time period submitted to Ohio EPA by Miami Fort for all \( \text{SO}_2 \) sources at the facility and is the new baseline from which annual reviews shall be compared. A report detailing this modeling is included in Appendix A of this document.

The new modeling is based on hourly variable emissions data for the 2018-2020 time period submitted to Ohio EPA by Miami Fort for two \( \text{SO}_2 \) sources at the facility: Unit 7
(B015) and Unit 8 (B016) coal fired boilers. Modeled SO$_2$ emissions for 2018-2020 time period and reported SO$_2$ emissions from the 2019-2021 time period are shown in Table 5 and Figure 3. As shown in Table 6, facility total emissions had an increase (26.2%) in the 2019-2021 time period compared to the 2018-2020 modeled emissions.

Table 5. Miami Fort Station Annual SO$_2$ Emissions (Tons)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Modeled SO$_2$ Emissions</th>
<th>Reported SO$_2$ Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 7 (B015)</td>
<td>4,288.35</td>
<td>7,694.19</td>
</tr>
<tr>
<td>Unit 8 (B016)</td>
<td>4,692.48</td>
<td>6,206.58</td>
</tr>
<tr>
<td>Facility total (excluding Unit 6)</td>
<td>8,980.83</td>
<td>13,900.77</td>
</tr>
</tbody>
</table>

Figure 3. Miami Fort Station Annual SO$_2$ Emissions (Tons)
Table 6. Percent Change in Annual SO\textsubscript{2} Emissions

<table>
<thead>
<tr>
<th>Unit</th>
<th>2018-2020 Total modeled emissions (Tons)</th>
<th>2019-2021 Total emissions (Tons)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 7 (B015)</td>
<td>21,847.37</td>
<td>28,020.04</td>
<td>28.3%</td>
</tr>
<tr>
<td>Unit 8 (B016)</td>
<td>16,880.95</td>
<td>20,843.78</td>
<td>23.5%</td>
</tr>
<tr>
<td>Facility total (excluding Unit 6)</td>
<td>38,728.32</td>
<td>48,863.83</td>
<td>26.2%</td>
</tr>
</tbody>
</table>

In the updated modeling conducted subsequent to the 2021 annual review, the maximum modeled 3-year design value for SO\textsubscript{2} for time period 2018-2020 was 153.7349 \(\mu\text{g/m}^3\), including background. An area meets the standard of 75 ppb if a concentration of 196.2 \(\mu\text{g/m}^3\) or lower is modeled. Therefore, the modeling was 78.4% of the standard. For original modeling results between 50 and 90% of the standard, U.S. EPA generally recommends updated modeling if emissions increase by 15% or more. Emissions have increased again during this review period by 26.2% for the facility as a whole.

The modeling analysis showed a design value of 21.6% below the standard. The source configuration and release characteristics at the Miami Fort facility have not changed significantly from those modeled. There were no new sources or changes in existing sources not explicitly modeled within 50 kilometers that warrant additional analysis.

As emissions from Miami Fort increased above the 15% threshold again during this review period, with reported emissions for 2021 being nearly double the modeled emissions for 2018, Ohio EPA recommends updated modeling again. The DRR indicates that U.S. EPA will consider this recommendation and may require submittal of updated modeling within 12 months. Ohio EPA is currently in the process of preparing updated modeling in anticipation of this requirement.

**Bay Shore Power Plant**

The area surrounding the Bay Shore Power Plant (Lucas County) was designated unclassifiable/attainment under round three designations by U.S. EPA effective April 9, 2018 (83 FR 1098) based on modeling using actual emissions and is therefore subject to the ongoing data requirements of the DRR.

Modeling was based on hourly variable emissions data for the 2012-2014 time period submitted to Ohio EPA by First Energy for the single SO\textsubscript{2} source at the facility (B006 circulating fluidized bed pet-coke fired boiler). The coal fired boilers located at the Bay Shore plant permanently ceased operation in September of 2012 and were therefore not included in Ohio EPA’s modeling analysis. The modeling also included two nearby sources: the BP Husky facility, located approximately 2.5 kilometers to the southwest of the Bay Shore plant and an additional source, Chemtrade Refinery Solutions, which is co-located with the BP Husky facility.
Modeled SO\textsubscript{2} emissions for 2012-2014 time period and reported SO\textsubscript{2} emissions from 2019-2021 time period are shown in Table 7 and Figure 4. As shown in Table 8, facility total emissions at the Bay Shore Power Plant decreased in the 2019-2021 time period (12.6\%) compared to the 2012-2014 modeled emissions. Area-wide total emissions for all facilities included in the modeling decreased (30.4\%) in the 2019-2021 time period compared to modeled emissions.

**Table 7. Bay Shore Power Plant, BP Husky, and Chemtrade Refinery Solutions Annual SO\textsubscript{2} Emissions (Tons)**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Modeled SO\textsubscript{2} Emissions</th>
<th>Reported SO\textsubscript{2} Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>Bay Shore Power Plant (B006)</td>
<td>2,546.78</td>
<td>2,824.60</td>
</tr>
<tr>
<td>BP Husky (Facility Total)</td>
<td>1,016.80</td>
<td>1,436.69</td>
</tr>
<tr>
<td>Chemtrade Refinery Solutions (Facility Total)</td>
<td>34.57</td>
<td>34.57</td>
</tr>
<tr>
<td>Area total</td>
<td>3,598.15</td>
<td>4,295.86</td>
</tr>
</tbody>
</table>

**Figure 4. Bay Shore Power Plant, BP Husky, and Chemtrade Refinery Solutions Annual SO\textsubscript{2} Emissions (Tons)**
### Table 8. Percent Change in Annual SO₂ Emissions

<table>
<thead>
<tr>
<th>Unit</th>
<th>2012-2014 Total modeled emissions (Tons)</th>
<th>2019-2021 Total emissions (Tons)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay Shore Power Plant (B006)</td>
<td>7,369.90</td>
<td>6,438.99</td>
<td>-12.6%</td>
</tr>
<tr>
<td>BP Husky (Facility Total)</td>
<td>4,053.18</td>
<td>1,510.99</td>
<td>-62.7%</td>
</tr>
<tr>
<td>Chemtrade Refinery Solutions (Facility Total)</td>
<td>103.71</td>
<td>78.09</td>
<td>-24.7%</td>
</tr>
<tr>
<td>Area total</td>
<td>11,526.79</td>
<td>8,028.07</td>
<td>-30.4%</td>
</tr>
</tbody>
</table>

In the original modeling, the maximum modeled 3-year design value for 2012-2014 was 175.29812 µg/m³, including background. An area meets the standard of 75 ppb if a concentration of 196.2 µg/m³ or lower is modeled. Therefore, the original modeling was 89.3% of the standard. For original modeling results between 50 and 90% of the standard, U.S. EPA generally recommends updated modeling if emissions increase by 15% or more. Emissions have not increased by 15% or more for the entire combined area. The original analysis showed a design value of 10.7% below the standard. Lower 2019-2021 emissions mean that any new modeling would likely show even lower concentrations.

The source configuration and release characteristics at the Bay Shore Power Plant, BP Husky or Chemtrade facilities have not changed significantly from those modeled. Additionally, there were no new sources or changes in existing sources not explicitly modeled within 50 kilometers that warrant additional analysis, except for the Evergreen Recycling and Disposal Facility (Facility ID 0387000259) in Northwood, OH and Carleton Farms Landfill (Facility ID N5986) in Wayne County, MI. Evergreen Recycling, located 11.5 km southwest of the Bay Shore facility, experienced an increase in SO₂ emissions to 74.34 tons in 2020, up from 2 tons in 2014. Carleton Farms Landfill, located 45.0 km north of the Bay Shore Power Plant, emitted 20.62 tons of SO₂ in 2014 and emitted 117.56 tons of SO₂ in 2020, representing an increase of 470.1%. Emissions from these facilities were accounted for in the background concentration. Given the distance and small magnitude of these increases relative to the total modeled emissions, Ohio EPA does not expect significantly different modeled results. Therefore, Ohio EPA does not recommend updated modeling.

### Public Participation

Ohio published solicitation for public comment concerning the draft 2022 Annual Sulfur Dioxide (SO₂) Emissions on May 10, 2022. The public comment period closed on June 10, 2022. No public comments were received during this public comment period. Appendix B includes a copy of the public notice.
Appendix A:

Dispersion Modeling Analysis for Miami Fort Station 2010 SO2 NAAQS Continued Compliance Demonstration
Dispersion Modeling Analysis for Miami Fort Station
2010 SO₂ NAAQS Continued Compliance Demonstration
April 18, 2022

Introduction

Pursuant to the third round of designations and in accordance with the August 21, 2015 Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO₂) Primary National Ambient Air Quality Standard (NAAQS); Final Rule (DRR), Ohio EPA is submitting an analysis demonstrating continued compliance of the original and promulgated designation for the Miami Fort Station source area based on refined dispersion modeling.

Per U.S. EPA’s guidance (February 2016 Draft SO₂ NAAQS Designations Modeling Technical Assistance Document (herein referred to as “Modeling TAD”), “The primary objective of the modeling would be to determine whether an area currently meets the SO₂ NAAQS”. Ohio EPA is including this refined dispersion modeling analysis in accordance with the DRR, in which a source for which the original modeling demonstrated impacts between 50 to 90% of standard (98.1-176.58 µg/m³) and emissions increased by 15% or more from the original modeling might necessitate re-modeling to demonstrate continued compliance with the NAAQS. The original modeling for the Miami Fort Station facility was 81% of the standard (159.08418 µg/m³) using total 2012 – 2014 modeled emissions of 31,954.94 tons (Appendix S of the State of Ohio 2010 Revised Sulfur Dioxide National Ambient Air Quality Standard, Recommended Area Designations, Round 3, submitted to U.S. EPA January 13, 2017). Total reported emissions for the 2018 - 2020 period were 40,401.51 tons, an increase of approximately 26%.

The dispersion modeling analysis was conducted for the 2018-2020 period, using actual hourly variable emissions from the Miami Fort Station facility. This was done per the Modeling TAD, in which U.S. EPA recommends modeling the most recent 3 years of actual emissions.

Temporally varying emissions were modeled to determine the contribution of emissions from each source in the modeling domain. Ohio EPA used variable emissions at the finest temporal scale available for each unit included in the modeling domain. Hourly variable emissions data for the 2018-2020 period were submitted to Ohio EPA by Miami Fort Station for all SO₂ sources at the Miami Fort facility. As described in Ohio’s designation modeling protocol (Appendix B of the State of Ohio 2010 Revised Sulfur Dioxide National Ambient Air Quality Standard, Recommended Area Designations, Round 3, submitted to U.S. EPA on January 13, 2017), hourly SO₂ emissions for Miami Fort Station were based primarily on Part 75 emissions reporting data. Only two SO₂ sources are present at the Miami Fort Station facility.
Modeling Approach

Per U.S. EPA’s Modeling TAD,

“Since the purpose here pertains to designations, this guidance supports analyses of existing air quality rather than analyses of emissions limits necessary to provide for attainment. Consequently, the guidance in this TAD differs in selected respects from the guidance published in Appendix W. These differences include:

- Placement of receptors only in areas where it is feasible to place a monitor vs. all ambient air locations (NSR, PSD, and SIP)
- Use of the most recent 3 years of actual emissions (designations) vs. maximum allowable emissions (NSR, PSD, and SIP)
- Use of 3 years of meteorological data (designations) vs. one to five years (NSR, PSD, and SIP)
- Use of actual stack height for designations using actual emissions vs. Good Engineering Practice (GEP) stack height for other regulatory applications (NSR, PSD, and SIP)”

Ohio EPA incorporated the differences listed above and followed Appendix W guidance where applicable to modeling for designation purposes. The averaging period for the 2010 SO₂ NAAQS is the 99th percentile of maximum monitored daily 1-hour values, averaged over three years. Per the Modeling TAD, three years of National Weather Service data is sufficient to allow the modeling to simulate a monitor. Thus, the modeled form of the standard is expressed as the 99th percentile of maximum daily 1-hour values averaged over three years (herein referred to as “design value”) for the purposes of demonstrating continuing compliance with the NAAQS and the promulgated designation.

The recommended dispersion model for modeling for SO₂ designations 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, Ohio EPA utilized the AERMINUTE module to incorporate 1-minute and 5-minute ASOS meteorological data into the hourly surface input file. Ohio EPA utilized the most up-to-date versions of AERMOD and the associated preprocessors available at the time of the modeling analyses. These are as follows: AERMOD version 21112, AERMET version 21112, AERMINUTE version 15272, and AERMAP version 18081. All dispersion modeling for this submittal was conducted following Ohio EPA’s original designations modeling protocol. AERMOD and all associated preprocessors were run in the default regulatory mode.
Meteorological Data

In order to generate meteorological input data for use with AERMOD, AERMET, along with AERMINUTE and AERSURFACE preprocessing for the modeling domain was conducted to generate the surface (.sfc) and profile (.pfl). Ohio EPA used the AERMINUTE pre-processing module. This module accepts as input 1-minute and 5-minute ASOS meteorological surface observations, calculates an hourly average for each hour in the modeled time period, and substitutes any missing values from the co-located ISHD surface data. Use of AERMINUTE reduces the number of calm hours present in the input files, and these enhanced hourly files are therefore considered more representative of local meteorological conditions.

Meteorological data from 2018-2020 from surface station #93814 located at the Cincinnati-Norther Kentucky Airport (KCVG) and upper air station #13841 located at the Wilmington Airborne Park (KILN) were used in these analyses. These sites were determined to be representative of Hamilton County, OH and the Miami Fort Station facility. AERSURFACE was run using twelve sectors and monthly surface characteristics, centered on the location of the surface meteorological station. Monthly precipitation values, years 2018-2020 from the surface station were compared to the 30-year climatological averages to inform monthly surface characteristics. A composite wind-rose of annual trends and distribution of wind directions, years 2018-2020 from the surface station are shown in Figure 1, below.
Figure 5: Wind rose, years 2018-2020, Cincinnati met station
The predominant wind directions were used, in part, to inform which facilities within 50 kilometers may potentially impact ambient SO₂ concentrations in the Miami Fort Station source area not accounted for by background and therefore necessitate inclusion in the dispersion modeling analysis. As shown in Figure 1, the predominant winds in the source area originate from the south and southwest. Figure 2 shows the location of all facilities within 50 kilometers of the Miami Fort Station facility, as well as a composite wind rose, years 2012-2014, from the Cincinnati meteorological station. The 2012-2014 wind rose is nearly identical to the 2018-2020 wind rose shown in Figure 1, above. Ohio EPA will therefore apply the same rationale used for the 2012-2014 analysis submitted previously to this modeling exercise.

![Map of Miami Fort Station source area with wind rose](image)

**Figure 6: SO₂ sources in the Miami Fort Station source area, with 2012-2014 composite wind rose.**

Considering the predominant wind directions, Ohio does not conclude that the emissions from the smaller sources located to the east and west of the Miami Fort Station facility impact ambient SO₂ concentrations in Hamilton County beyond what is accounted for in background. The Duke Energy KY East Bend facility is situated such that prevailing winds would likely carry emissions to the area impacted by Miami Fort Station. Given the relatively low emissions from this facility (1,755.68 tons, year 2020) and distance (23.5 kilometers) from Miami Fort Station, Ohio does not conclude that emissions from this source impact ambient SO₂ concentrations beyond the background level accounted for in the refined dispersion modeling analysis.
Ohio concludes that the primary source of SO₂ in Hamilton County is the Miami Fort Station facility, and that the impact of those facilities in Table 2 not explicitly modeled or shutdown prior to promulgation of a designation are represented adequately and conservatively by the background concentration included in the Factor 1 modeling analysis. Ohio EPA notes that multiple facilities in the source area have shuttered or drastically reduced emissions since the original analysis was conducted for the 2012-2014 period.

**Background**

Background concentrations of SO₂ were obtained for 2018-2020 from the same monitor (39-061-0010) used in the previous SO₂ DRR modeling for the Miami Fort Station facility, which is located approximately 14.5 kilometers to the northeast of the facility. Seasonal and hour-of-day variable backgrounds were used, consistent with the form of background concentrations used in the previous modeling.

**Emission Sources**

The two SO₂ emission sources at the Miami Fort Station facility were included in the designation modeling analysis as two egress points. These egress points represent the two stacks for the two coal-fired boilers (Unit 7 and Unit 8) at the facility. Variable emissions for each egress point were included in the model via the HOUREMIS input pathway, years 2018-2020. Ohio EPA utilized the 1-hour SO₂ design value output option internal to the AERMOD code to simplify post processing and eliminate the need to generate large hourly output files. Ohio EPA included background as a separate source in the model, to simplify the inclusion of the background applied in the modeling domain. The relevant release point parameters for the two egress points included in the analysis are presented in Table 1, below. Both emission sources were included in the modeling as point sources.

<table>
<thead>
<tr>
<th>Source ID</th>
<th>Easting (X)</th>
<th>Northing (Y)</th>
<th>Base Elevation</th>
<th>Stack Height</th>
<th>Temperature</th>
<th>Exit Velocity</th>
<th>Stack Diameter</th>
<th>SO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT7</td>
<td>689801.8</td>
<td>4331830</td>
<td>149.19</td>
<td>243.84</td>
<td>Variable</td>
<td>Variable</td>
<td>7.15</td>
<td>Variable</td>
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<tr>
<td>UNIT8</td>
<td>690125.4</td>
<td>4331565</td>
<td>149.85</td>
<td>243.84</td>
<td>Variable</td>
<td>Variable</td>
<td>7.15</td>
<td>Variable</td>
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</tbody>
</table>

Table 9: Modeled source parameters, Miami Fort Station source area, 2018-2020.

As part of the five-factor analysis, Ohio EPA examined those sources surrounding the Miami Fort Station and Hamilton County, Ohio. Ohio EPA inventoried all SO₂ sources with 2020 emissions greater than or equal to 1 ton per year in the following three Ohio counties: Hamilton, Butler, and Clermont. This area of Ohio borders Kentucky and Indiana and, based on a 50-kilometer buffer around Miami Fort Station, Ohio EPA considered sources located in Dearborn County, Indiana, and the Counties of Boone, Carroll, and Gallatin in Kentucky. Ohio EPA considered all sources with 2020 SO₂ emissions for this analysis, with a particular focus on those sources with the potential to cause a significant concentration gradient in the source area beyond what is accounted
for in background. This inventory, inclusive of 2020 SO\textsubscript{2} emissions and distance from the Miami Fort Station facility are summarized in Table 2.

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>Facility ID</th>
<th>Facility Name</th>
<th>2020 SO\textsubscript{2} Emissions (tpy)</th>
<th>Distance from Miami Fort Station (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH</td>
<td>Hamilton</td>
<td>1431350093</td>
<td>Dynegy, LLC Miami Fort Station</td>
<td>17,737.82</td>
<td>N/A</td>
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<tr>
<td>OH</td>
<td>Hamilton</td>
<td>1431350817</td>
<td>Veolia North America Regeneration Services, LLC</td>
<td>122.18</td>
<td>0.8</td>
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<tr>
<td>OH</td>
<td>Hamilton</td>
<td>1431070849</td>
<td>University of Cincinnati</td>
<td>1.36</td>
<td>25.3</td>
</tr>
<tr>
<td>OH</td>
<td>Hamilton</td>
<td>1431070001</td>
<td>Solvay USA, Inc.</td>
<td>7.00</td>
<td>28.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Hamilton Total</strong></td>
<td><strong>17,868.36</strong></td>
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<tr>
<td>OH</td>
<td>Butler</td>
<td>1409010006</td>
<td>Cleveland-Cliffs Steel Corporation</td>
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<td>54.7</td>
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<td>OH</td>
<td>Butler</td>
<td>1409011031</td>
<td>SunCoke Energy Middletown</td>
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<td>OH</td>
<td>Butler</td>
<td>1409010043</td>
<td>Wausau Paper Towel &amp; Tissue, LLC</td>
<td>304.14</td>
<td>56.8</td>
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<td>OH</td>
<td>Butler</td>
<td>1409030403</td>
<td>MB MANUFACTURING CORP.</td>
<td>1.062</td>
<td>35.6</td>
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<td></td>
<td></td>
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<td><strong>Butler Total</strong></td>
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<td>OH</td>
<td>Clermont</td>
<td>1413090154</td>
<td>Zimmer Power Company LLC</td>
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<td>IN</td>
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<td>7</td>
<td>Anchor Glass Container Corp.</td>
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<tr>
<td>IN</td>
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<td>33</td>
<td>Lawrenceburg Power Plant</td>
<td>17.69</td>
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<td><strong>Clermont Total</strong></td>
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<td>KY</td>
<td>Boone</td>
<td>2101500029</td>
<td>Duke Energy East Bend</td>
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<td>23.5</td>
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<tr>
<td>KY</td>
<td>Boone</td>
<td>2101500138</td>
<td>East KY Power Coop - Bavarian Substation</td>
<td>38.44</td>
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<td></td>
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<td><strong>Boone Total</strong></td>
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<tr>
<td>KY</td>
<td>Carroll</td>
<td>2104100010</td>
<td>KY Utilities Co - Ghent Station</td>
<td>11,059.99</td>
<td>45.1</td>
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<tr>
<td>KY</td>
<td>Carroll</td>
<td>2104100034</td>
<td>North American Stainless</td>
<td>1.71</td>
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<td><strong>Carroll Total</strong></td>
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<td>KY</td>
<td>Gallatin</td>
<td>2107700031</td>
<td>Mississippi Lime Co - Verona Plant</td>
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<td>31.9</td>
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<tr>
<td>KY</td>
<td>Gallatin</td>
<td>2107700018</td>
<td>Nucor Steel Gallatin LLC</td>
<td>28.61</td>
<td>42.5</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Gallatin Total</strong></td>
<td><strong>73.52</strong></td>
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</tr>
</tbody>
</table>

Table 10: SO\textsubscript{2} sources and 2020 emissions within 50 km of Miami Fort Station.
A substantial number of sources are inventoried in Table 2. Of those sources located within 50 kilometers of Miami Fort Station, Ohio EPA understands that relatively few of these sources are significant enough to warrant consideration. These sources, as identified by Ohio EPA are:

- Duke Energy East Bend (1,755.68 TPY, 23.5 kilometers distant)
- Kentucky Utilities Company, Ghent Station (11,060 TPY, 45.1 kilometers distant)

Those sources not listed above have emissions low enough or are located sufficient distant from Miami Fort Station that they are unlikely to impact the area surrounding the Miami Fort Station beyond what is accounted for in background. Of the remaining two sources, Duke Energy East Bend and Ghent Station, Ohio does not believe that either source is located sufficient close to the area impacted by Miami Fort Station to above what is accounted for in background. While Ghent Station emissions are significant, it still remains unlikely that, at a distance of 45 kilometers, emissions from this facility will interact with those of Miami Fort Station or cause a significant concentration gradient in Hamilton County, Ohio. Further, Ohio EPA understands that the Ghent Station has been subject to ambient air quality characterization under the Data Requirements Rule.

Analysis

The continuing-compliance modeling analysis consisted of a single modeling run, years 2018-2020. The results of this analysis are to be used to demonstrate that the Miami Fort Station source area is continuing to comply with the 1-hour SO₂ NAAQS after an increase in annual emissions sufficient to trigger re-modeling. The annual total emissions from the hourly emissions file used in this analysis are as follows; 2018: 8,981 tons; 2019 13,901 tons; 2020: 15,847 tons. It should be noted that modeled annual emissions differ from those reported to Ohio EPA’s emissions inventory system as the methodology for determining hourly emissions suitable for modeling is a more refined and accurate approach. For this analysis, Continuous Emissions Monitoring System (CEMS) data from Units 7 and 8 at Miami Fort Station were used without Part 75 substitutions and data adjustments. Part 75 substitutions and data adjustments provide for a conservative approach to emissions reporting suitable for cap-and-trade programs but are not appropriate for accurate and realistic modeling of actual emissions.

Receptors

A total of 36,443 receptors were included in the modeling domain for the purposes of this modeling, extending to 50 km from the facility fenceline. The modeling grid consisted of several nested receptor grids, with increased spacing for grids located further from the source. 50 meters spacing was used along the fenceline Miami Fort Station facility. A 50 meter spacing to 3 kilometers from the fenceline was also used, with maximum modeled
impacts occurring in this dense grid. Beyond 3 kilometers, modeled concentrations rapidly become dominated by background concentration.

**Results**

The dispersion modeling analysis evaluated the impact of the Miami Fort Station facility as a design value when modeled using hourly variable SO\(_2\) emissions. Any maximum impact exceeding 196.2 \(\mu g/m^3\) would represent a modeled exceedance, inclusive of background, which was included as a source in the modeling domain. For this analysis, the maximum modeled 3-year design value, years 2018-2020, was 153.73491 \(\mu g/m^3\). Thus, no exceedance of the standard was modeled. The results of this analysis are shown in Figure 3. Note that for clarity, only design values of 145 \(\mu g/m^3\) or greater are displayed.

![Figure 7: Maximum SO\(_2\) impacts, Miami Fort Station facility, 2018-2020. Concentrations in \(\mu g/m^3\), including background.](image)

The maximum modeled concentration, 153.73491 \(\mu g/m^3\), or 58.8 ppb including background, is located approximately 1.6 kilometers from Miami Fort Station. Modeled 3-year design values greater than or equal to 145 \(\mu g/m^3\) did not extend beyond approximately 2.6 kilometers from the modeled sources.

The dispersion modeling analysis for the area surrounding Miami Fort Station inclusive of a conservative background demonstrates no modeled exceedances of the 2010 SO\(_2\) standard based on the 2018-2020 period. Further, dispersion modeling performed with the AERMOD model accounts for multiple aspects of the five-factor analysis emphasized by U.S. EPA in designating areas. As such, Ohio EPA asserts that the modeling results
presented here should carry significant weight in demonstrating the continued compliance of the facility with the 2010 1-hr SO$_2$ NAAQS.
Appendix B:

Public Notice
Public Notice
Ohio Environmental Protection Agency
Annual Review of Sulfur Dioxide (SO₂) Data Requirements Rule Source Emissions

The Ohio Environmental Protection Agency (Ohio EPA) is soliciting comments on the draft 2022 Annual Sulfur Dioxide (SO₂) Emissions Review. On August 21, 2015, the United States Environmental Protection Agency (U.S. EPA) finalized the Data Requirements Rule for the 2010 SO₂ standard [80 FR 51052]. This rule established ongoing data review requirements including, for areas where modeling of actual SO₂ emissions served as the basis for an unclassifiable/attainment designation, an annual review of emissions data and submittal of a report recommending whether updated modeling is necessary due to emissions increases. The annual emissions review is due to U.S. EPA Region 5 by July 1, annually, beginning the calendar year after the effective date of designation.

Ohio EPA is now soliciting comments on the draft annual SO₂ emissions review for 2022. Preliminary results based on a review of emissions data reported through 2021 indicate that updated modeling is not necessary, with the exception of the Miami Fort facility in Hamilton County and the Carmeuse Lime Maple Grove facility in Seneca County, where updated modeling is recommended due to increases of SO₂ emissions. The comments received will be used to formulate the State’s formal recommendation to U.S. EPA.

These actions must be noticed to allow public comment and to satisfy U.S. EPA requirements for public involvement in state implementation plan related activities. Comments should be submitted on or before Friday, June 10, 2022 at the following address:

E-mail: DAPC-Comments@epa.ohio.gov

Mailing address: Reyna Knight
Ohio Environmental Protection Agency, DAPC
Lazarus Government Center
P.O. Box 1049
Columbus, Ohio 43215

Phone: (614) 644-1961

All comments submitted by the close of business on June 10, 2022 will be considered by Ohio EPA prior to submittal of this annual review. Comments submitted after June 10, 2022 may be considered as time and circumstances permit but will not be part of the official record.

The draft 2022 Annual Sulfur Dioxide (SO₂) Emissions Review is available on Ohio EPA DAPC’s web page for electronic downloading at: https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans/state-implementation-plan-sip-2010-one-hour-so2-standard.

Questions regarding accessing the web site should be directed to Paul Braun at (614) 644-3734, Paul.Braun@epa.ohio.gov; other questions or comments about this document should be directed to either Reyna Knight at (614) 644-1961, Reyna.Knight@epa.ohio.gov or Jennifer Van Vlerah at (614) 644-3696, Jennifer.VanVlerah@epa.ohio.gov or mailed to Reyna Knight or Jennifer Van Vlerah at the above address.