Missouri State Implementation Plan Revision

Interstate Transport Provisions for the 2015 Ozone Standard

Prepared for the
Missouri Air Conservation Commission

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Division of Environmental Quality
Air Pollution Control Program
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Table of Contents

List of Figures

List of Tables

Executive Summary

The purpose of the State Implementation Plan (SIP) revision included in this document is to address Missouri's interstate air pollution transport obligations for the 2015 ozone National Ambient Air Quality Standard (NAAQS). Specifically, this SIP revision addresses Missouri's requirements under Clean Air Act (CAA) Section 110(a)(2)(D)(i)(I) for the 2015 ozone NAAQS. This section of the CAA requires states to include adequate provisions in their SIPs to prohibit emissions that will contribute significantly to nonattainment, or interfere with maintenance, in any downwind state with respect to any NAAQS. These interstate air pollution transport obligations help ensure that emissions in one state are not causing or contributing to air pollution problems in another state, and are often referred to as good neighbor SIPs.

Missouri's good neighbor SIP under the 2015 ozone NAAQS follows the U.S. Environmental Protection Agency (EPA)'s four-step approach and corresponding memorandums for determining obligations for upwind states to limit transported air pollution to downwind states. The analysis and conclusions in this document stem largely from modeling performed by EPA to determine ozone concentrations across the country and the corresponding contributions from upwind states in the year 2023. This future year corresponds to the year before the attainment deadline for areas designated as moderate nonattainment areas under the 2015 ozone NAAQS. Based on this analysis, after implementation of all on-the-books control measures in Missouri and other upwind states, emissions from Missouri will not contribute significantly to nonattainment or interfere with maintenance of the 2015 ozone NAAQS in any downwind states.

Through the SIP revision and corresponding technical demonstration included in this document, the Missouri Department of Natural Resources' Air Pollution Control Program (air program) is requesting EPA to fully approve Missouri's SIP under CAA Section 110(a)(2)(D)(i)(I) with respect to the 2015 ozone NAAQS.

1. Background

On October 26, 2015, the EPA finalized a revised NAAQS for ground-level ozone.[1] The revision strengthened the primary and secondary standards, decreasing them from 0.075 parts per million (ppm) to 0.070 ppm, based on the 3-year average of the annual fourth-highest 8-hour daily maximum concentrations.

Ozone is a secondary pollutant formed when precursor emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react under the presence of sunlight. In some cases, these precursor emissions can travel tens or hundreds of miles downwind from the emission source before reaching an area where the precursor emissions mix and the atmospheric conditions lead to a build-up of ground-level ozone concentrations. For this reason, determining upwind state contributors to downwind state ozone problems is a highly technical and complex problem to solve. Since EPA promulgated the first 8-hour ground-level ozone NAAQS in 1997, the states and EPA have made numerous attempts to implement CAA Section 110(a)(2)(D)(i)(I) in an effort to solve the problem of transported ozone pollution. The federal judicial system, including the United States Supreme Court, has heard numerous cases concerning this very problem and the states and EPA have implemented numerous state and federal regulations over the years in an effort to address ozone transport, particularly in the eastern half of the country.

These efforts have resulted in dramatic improvement in ozone concentrations across the eastern U.S., and have led to a four-step process for determining an upwind state's contribution to downwind state ozone nonattainment and maintenance problems along with the corresponding obligations of such upwind states. This process continues to improve and evolve, and under the 2015 ozone standard, EPA has provided invaluable technical support and guidance documents to aide states in determining their obligations under the CAA's good neighbor provision for this standard.

1.1. Good Neighbor Obligations for the 1997 and 2008 Ozone NAAQS

Under the 1997 ozone standard, EPA promulgated numerous federal rulemakings including the NO_x SIP Call, the NO_x Budget Program, the Clean Air Interstate Rule (CAIR), and ultimately the Cross-State Air Pollution Rule (CSAPR). While the NO_x SIP Call remains in effect, the NO_x Budget Program and CAIR were replaced CSAPR. These three programs all aimed to address CAA good neighbor obligations under the 1997 ozone standard for over twenty states located in the eastern half of the country primarily through the establishment of a multi-state cap and trade program that reduced NO_x emissions from power plants and other large NO_x emission sources located in these eastern states that contributed to ozone problems in downwind states. The U.S. Supreme Court has upheld the general framework and process to inform the federal CSAPR, and states across the country are now using this framework to inform their good neighbor SIPs under the 2015 ozone standard.

[1] 80 FR 65291, October 1, 2015

1.1.1. Cross-State Air Pollution Rule

On July 6, 2011, EPA finalized the Cross-State Air Pollution Rule (CSAPR) to address air pollution from upwind states that crosses state lines and affects air quality in downwind states.[2] This rule requires certain states in the eastern half of the U.S. to improve air quality by reducing power plant NO_x emissions that cross state lines and contribute to ground-level ozone pollution in downwind states. The CSAPR reduced air quality impacts of ozone pollution that crossed state lines and helped downwind areas meet and maintain the 1997 ozone standard.

1.1.2. Cross-State Air Pollution Rule Update

On October 26, 2016, EPA finalized the CSAPR Update rule to address CAA good neighbor obligations under the 2008 ozone NAAQS.[3] The CSAPR Update rule largely replaced the original CSAPR ozone season NO_x program as of May 1, 2017. The CSAPR Update rule further reduced summertime NO_x emissions from power plants in 22 states, including Missouri. At the time of issuing the CSAPR Update rule, EPA was unable to conclude that the rule would fully address good-neighbor obligations under the 2008 standard for all states participating in the program. However, in October 2017, EPA released modeling results showing there would be no remaining nonattainment or maintenance receptors in the CSAPR region by 2023 relative to the 2008 ozone standard.

On December 21, 2018, EPA finalized a rule in which they determined with respect to the 2008 ozone standard that there is no need to establish additional ozone transport reduction requirements for sources in CSAPR-region states, nor is there a need for CSAPR-region states to submit State Implementation Plans establishing additional requirements to control ozone transport under the 2008 ozone standard beyond the CSAPR Update rule.[4] The EPA concluded that the emission reductions from the CSAPR Update rule along with all on-the-books control measures were sufficient to address the CAA good neighbor obligations for all CSAPR region states with respect to the 2008 ozone standard.

1.2. EPA Good Neighbor Framework and SIP Guidance for the 2015 Ozone NAAQS

1.2.1. CAA 110(a)(2)(D)(i)(I) and EPA's 4-Step Process

Due to the complex nature of determining good neighbor SIP obligations for secondary pollutants like ozone, EPA has developed a four-step process to determine upwind states that contribute to problems in downwind states and the requisite level of emission control necessary for upwind states to address their CAA good neighbor provisions for these pollutants. The air program followed this four-step process in developing this SIP revision –

1. Identify areas in the country that are projected to have trouble attaining and maintaining compliance with the relevant NAAQS;

[2] 76 FR 48208, August 8, 2011
[3] 81 FR 74504, October 26, 2016
[4] 83 FR 65878, December 21, 2018

2. Identify which upwind states are contributing to the air pollution problems in downwind states identified in step 1;
3. Identify the requisite level of emission control necessary to address the upwind state contribution to the air pollution problem in the downwind states; and
4. Develop enforceable control requirements to ensure the requisite level of emission control identified in step 3.

Based on EPA's four-step process, if there are no areas identified in step 1, the exercise is complete, and a state's SIP is approvable without further control requirements. If there are areas identified in step 1, but in step 2, a particular state can demonstrate they are not contributing to the problem in any downwind state, then that particular state's SIP is approvable without further control requirements. This means that states can skip steps 3 and 4 if there are no air quality problems for the applicable NAAQS in any downwind states or if the state can demonstrate that they are not contributing to the air quality problems identified in any downwind state.

1.2.2. EPA 2023 Ozone Transport Modeling

On March 27, 2018, EPA released a memorandum (the EPA March memo) from Peter Tsirigotis titled *Information on the Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards under Clean Air Act Section 110(a)(2)(D)(i)(I).* In this memo, EPA provided states with its modeling predictions for 8-hour ozone design values in 2023, along with state contributions to those ozone monitors, which the modeling predicted would violate (nonattainment) or would be in danger of violating (maintenance) the 2015 8-hour ozone NAAQS. EPA also sought state feedback on certain approaches or flexibilities that EPA was considering to allow states to utilize in developing their good neighbor SIPs.

The EPA March memo identified projected ozone design values at potential nonattainment and maintenance receptors for the year 2023. Included in these modeling results was an analysis of the modeled differences of including or not including photochemical modeling grid cells that contain 50 percent or more water when determining the modeled relative response factor for receptors located near water and their corresponding future year projected design values. The modeling results also provided each upwind state's modeled contributions to each of the projected nonattainment and maintenance monitors for the 2023 future year.

1.2.3. EPA Memo - 1 percent vs. 1 ppb Threshold and Significant Captured Percentage

On August 31, 2018, EPA released another memorandum (the EPA August memo) from Peter Tsirigotis titled *Analysis of Contribution Thresholds for Use in Clean Air Act Section 110(a)(2)(D)(i)(I) Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards* . EPA conducted post-processing analysis of its ozone transport modeling results and compared several different significant contribution threshold levels to determine the amount of overall upwind state contributions that various significance thresholds would capture. The analysis in the memo concluded the difference between a 1 parts per billion (ppb) threshold and a 1 percent of the 8-hour ozone NAAQS (0.7

ppb) threshold resulted in small differences in the overall contributions captured at step 2 of the good neighbor SIP framework process. Specifically, EPA states in the memo the overall capture at a significance threshold of 0.7 ppb is 77 percent of total upwind state contribution and 70 percent for a 1 ppb threshold.

Based on their analysis, EPA concluded the use of the 1 ppb threshold is appropriate for use by states in step 2 of their good neighbor SIP analyses for determining significant contribution to nonattainment or maintenance receptors. Missouri supports this analysis and corresponding memorandum that EPA performed and also notes that certain nonattainment and maintenance receptors capture a similarly high overall percentage of upwind state contributions at even higher contribution thresholds. This means the rationale used by EPA in this memo may support the use of even higher contribution thresholds for particular monitors where the relative contribution from neighboring upwind states to a particular receptor are far more significant than the collective contribution from more distant upwind states.

1.2.4. EPA Memo – Alternative Methods of Identifying Maintenance Monitors

On October 19, 2018, EPA released a third memorandum (the EPA October memo) from Peter Tsirigotis titled *Considerations for Identifying Maintenance Receptors for Use in Clean Air Act Section 11 0(a)(2)(D)(i)(I) Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards*. In this memo, EPA provides potential alternative methods of identifying maintenance monitors to be addressed in their good neighbor SIPs for the 2015 ozone NAAQS even if the 2023 maximum modeled 8-hour ozone design value is larger than 70.9 ppb. Specifically, EPA states in the memo that states may not need to address identified maintenance monitors in their good neighbor SIPs if the maintenance monitors in question meet certain criteria based on further analysis. These criteria include an analysis showing that the monitor in question would attain the 2015 ozone NAAQS using an alternative base year, an analysis showing the meteorological conditions in the alternative base period were conducive to ozone formation, a demonstration that ozone concentrations have been trending downward at the monitor since 2011, and a demonstration showing that ozone precursor emissions in the upwind and downwind states have decreased since 2011 and are expected to continue to decline out to the attainment date for the receptor.

1.3. Missouri's Infrastructure SIP for the 2015 Ozone NAAQS

Within three years of the promulgation of any new or revised NAAQS, CAA, section 110(a)(1) requires states to submit a SIP revision to provide for the implementation, maintenance, and enforcement of the NAAQS. Such revisions are commonly referred to as "Infrastructure SIPs" (I-SIPs). In Missouri, most of these I-SIP requirements were addressed through Missouri's I-SIP revision for the 2015 ozone NAAQS, which is scheduled for adoption by the Missouri Air Conservation Commission in March 2019. However, that I-SIP revision did not address Missouri's good neighbor SIP requirements under the 2015 ozone standard. Chapters 2 and 3 of this document provide a demonstration showing that Missouri's SIP fully addresses its good neighbor SIP obligations according to EPA's four-step framework and corresponding guidance and memorandums.

2. EPA Step 1 - Nonattainment and Maintenance Monitor Sites

Under EPA's framework, step 1 is to identify all nonattainment and maintenance receptors with respect to the 2015 ozone standard. The EPA March memo provided air quality modeling results for ozone in 2023, including projected ozone concentrations at potential nonattainment and maintenance sites for the 2015 ozone NAAQS and projected upwind state contribution data. EPA selected 2023 as the analytic year for evaluating the anticipated attainment year for moderate ozone nonattainment areas. Missouri agrees with EPA's selection of 2023 as a reasonable analytic year for evaluating ozone transport problems with respect to the 2015 ozone NAAQS, as it aligns with the last full ozone season before the attainment year for moderate ozone nonattainment areas.

According to EPA's four-step framework, a monitor is classified as a nonattainment receptor if the average modeled design value (DV) in 2023 exceeds 70.9 ppb. Maintenance monitors are those receptors with maximum-modeled DVs in 2023 exceeding 70.9 ppb. Table 1 provides a list of all nonattainment and maintenance receptors identified in the EPA March memo. The table also includes the 2023 average and maximum DVs along with the average and maximum actual DVs from 2009-2013 for the convenience of comparison. The units for all DVs listed in Table 1 are parts per billion (ppb).

Table 1. List of Nonattainment and Maintenance Monitors Based on EPA's Modeling Results

Site	State	County	2009-2013 Avg DV	2009-2013 Max DV	2023 Avg DV	2023 Max DV
40130019	Arizona	Maricopa	76.7	79	69.3	71.4
40131004	Arizona	Maricopa	79.7	81	69.8	71.0
60190007	California	Fresno	94.7	95	79.2	79.4
60190011	California	Fresno	93.0	96	78.6	81.2
60190242	California	Fresno	91.7	95	79.4	82.2
60194001	California	Fresno	90.7	92	73.3	74.4
60195001	California	Fresno	97.0	99	79.6	81.2
60250005	California	Imperial	74.7	76	73.3	74.6
60251003	California	Imperial	81.0	82	79.0	80.0
60290007	California	Kern	91.7	96	77.7	81.3
60290008	California	Kern	86.3	88	71.3	72.8
60290014	California	Kern	87.7	89	74.1	75.2
60290232	California	Kern	87.3	89	73.7	75.2
60295002	California	Kern	90.0	91	75.9	76.8
60296001	California	Kern	84.3	86	70.9	72.4
60370002	California	Los Angeles	80.0	82	73.3	75.1
60370016	California	Los Angeles	94.0	97	86.1	88.9

Site	State	County	2009-2013 Avg DV	2009-2013 Max DV	2023 Avg DV	2023 Max DV
60371201	California	Los Angeles	90.0	90	79.8	79.8
60371701	California	Los Angeles	84.0	85	78.1	79.1
60372005	California	Los Angeles	79.5	82	72.3	74.6
60376012	California	Los Angeles	97.3	99	85.9	87.4
60379033	California	Los Angeles	90.0	91	76.3	77.2
60392010	California	Madera	85.0	86	72.1	72.9
60470003	California	Merced	82.7	84	69.9	71.0
60650004	California	Riverside	85.0	85	76.7	76.7
60650012	California	Riverside	97.3	99	83.6	85.1
60651016	California	Riverside	100.7	101	85.2	85.5
60652002	California	Riverside	84.3	85	72.4	73.0
60655001	California	Riverside	92.3	93	79.5	80.1
60656001	California	Riverside	94.0	98	78.3	81.6
60658001	California	Riverside	97.0	98	87.0	87.9
60658005	California	Riverside	92.7	94	83.2	84.4
60659001	California	Riverside	88.3	91	73.7	75.9
60670012	California	Sacramento	93.3	95	74.5	75.9
60675003	California	Sacramento	86.3	88	69.9	71.3
60710005	California	San Bernardino	105.0	107	96.2	98.1
60710012	California	San Bernardino	95.0	97	84.1	85.8
60710306	California	San Bernardino	83.7	85	76.2	77.4
60711004	California	San Bernardino	96.7	98	89.8	91.0
60712002	California	San Bernardino	101.0	103	93.1	95.0
60714001	California	San Bernardino	94.3	97	86.0	88.5
60714003	California	San Bernardino	105.0	107	94.1	95.8
60719002	California	San Bernardino	92.3	94	80.0	81.4
60719004	California	San Bernardino	98.7	99	88.4	88.7
60990006	California	Stanislaus	87.0	88	74.8	75.7
61070006	California	Tulare	81.7	85	69.1	71.9
61070009	California	Tulare	94.7	96	76.1	77.2
61072002	California	Tulare	85.0	88	68.9	71.4
61072010	California	Tulare	89.0	90	73.1	73.9
61112002	California	Ventura	81.0	83	70.5	72.2
80050002	Colorado	Arapahoe	76.7	79	69.3	71.3
80350004	Colorado	Douglas	80.7	83	71.1	73.2
80590006	Colorado	Jefferson	80.3	83	71.3	73.7
80590011	Colorado	Jefferson	78.7	82	70.9	73.9
80690011	Colorado	Larimer	78.0	80	71.2	73.0
81230009	Colorado	Weld	74.7	76	70.2	71.4

Site	State	County	2009-2013 Avg DV	2009-2013 Max DV	2023 Avg DV	2023 Max DV
90010017	Connecticut	Fairfield	80.3	83	68.9	71.2
90013007	Connecticut	Fairfield	84.3	89	71.0	75.0
90019003	Connecticut	Fairfield	83.7	87	73.0	75.9
90099002	Connecticut	New Haven	85.7	89	69.9	72.6
240251001	Maryland	Harford	90.0	93	70.9	73.3
260050003	Michigan	Allegan	82.7	86	69.0	71.7
261630019	Michigan	Wayne	78.7	81	69.0	71.0
360810124	New York	Queens	78.0	80	70.2	72.0
361030002	New York	Suffolk	83.3	85	74.0	75.5
480391004	Texas	Brazoria	88.0	89	74.0	74.9
481210034	Texas	Denton	84.3	87	69.7	72.0
482010024	Texas	Harris	80.3	83	70.4	72.8
482011034	Texas	Harris	81.0	82	70.8	71.6
482011039	Texas	Harris	82.0	84	71.8	73.5
484392003	Texas	Tarrant	87.3	90	72.5	74.8
550790085	Wisconsin	Milwaukee	80.0	82	71.2	73.0
551170006	Wisconsin	Sheboygan	84.3	87	72.8	75.1

3. EPA Step 2- Missouri Linkage to Nonattainment and Maintenance Monitor Sites

Under EPA's framework, step 2 is to determine upwind states that are expected to contribute to downwind state nonattainment and maintenance monitors. EPA's modeling from the EPA March memo included source apportionment modeling results that provided the contribution from all anthropogenic emissions in each state to each monitor included in the analysis. In previous ozone transport analyses, EPA used a significant contribution threshold of one percent of the level of the NAAQS. This means EPA considers an upwind state linked to a downwind state air pollution problem if the modeling shows an upwind state's anthropogenic emissions in the future year will contribute to ozone pollution at a downwind state nonattainment or maintenance receptor in excess of one percent of the level of the NAAQS.

In Missouri's analysis, the air program started by determining all of the nonattainment and maintenance monitors to which Missouri is projected to contribute more than one percent of the level of the 2015 ozone NAAQS (0.7 ppb). These monitors, along with their 2009-2013 and 2023 average and maximum DVs, and Missouri's projected contribution to the future year DVs are listed in Table 2. The monitor sites highlighted in orange represent nonattainment receptors, where Missouri's projected contribution to the 2023 DV is greater than 0.7 ppb. The two monitors in Michigan are maintenance receptors, which the EPA modeling projects Missouri's contribution to the 2023 ozone DVs will be greater than 0.7 ppb. The 2015-2017 DVs are also included to show the improvement in ozone concentrations at each of these monitors over the

past several years. As seen in the table, current (2015-2017) ozone DVs for each of these monitors are between 4 ppb and 15 ppb lower than the average weighted DVs from 2009-2013.

Table 2. Downwind Monitors with Missouri Contributions Larger than 0.7 ppb

Site ID	State	County	2009-2013 Avg. (ppb)	2009-2013 Max (ppb)	2023 "3×3" Avg. (ppb)	2023 "3×3" Max (ppb)	RRF[5]	Missouri Cont. (ppb)	2015-2017 DV (ppb)
260050003	Michigan	Allegan	82.7	86	69.0	71.7	0.834	2.61	73
261630019	Michigan	Wayne	78.7	81	69.0	71.0	0.877	0.92	72
480391004	Texas	Brazoria	88.0	89	74.0	74.9	0.841	0.88	75
482011039	Texas	Harris	82.0	84	71.8	73.5	0.876	0.88	67
550790085	Wisconsin	Milwaukee	80.0	82	71.2	73.0	0.890	0.93	71
551170006	Wisconsin	Sheboygan	84.3	87	72.8	75.1	0.864	1.37	80

Missouri has reviewed EPA's guidance and memos relating to good neighbor SIPs under the 2015 ozone NAAQS. Based on these guidance and memos, Missouri has developed a weight of evidence analysis for each of these monitors to determine the level of Missouri's contribution and how it relates to contribution from other upwind states, contribution from international emissions, and other relevant factors. The following sections of this document provide this weight of evidence analysis for each of the monitors listed in Table 2.

3.1. Texas Monitors

There are two nonattainment receptors in Texas showing Missouri contributions to their 2023 ozone DVs above 0.7 ppb. EPA's modeling results show that Missouri contributes 0.88 ppb to both monitors in Brazoria County (Brazoria, Site ID: 480391004) and Harris County (Harris, Site ID: 482011039), which is over one percent of the 2015 ozone standard.

Further analysis of the EPA March memo modeling results shows that total upwind state contribution is only approximately 13 ppb to both Texas monitors. Texas' in-state contribution to these two monitors is 26 ppb to Brazoria and 22.6 ppb to Harris. If you combine the initial boundary conditions and the contribution from biogenic emissions, the contribution from these two categories is over 52 ppb, for these two monitors. Based on this, the ozone problems at these two monitors are not caused by upwind U.S. state anthropogenic emissions. Instead, in-state contributions, natural ozone concentrations, and international emissions are the likely significant contributors to the problem at these two monitors.

Further, according to the EPA August memo, EPA plans to generally afford states the flexibility of using 1 ppb as the significant contribution threshold in step 2 of their framework because this alternative contribution threshold generally captures a substantial amount of transported contribution from upwind states to the downwind monitors. Missouri's contribution to these two monitors' 2023 projected ozone DVs is 0.88 ppb, which is below this alternative 1 ppb threshold from the EPA August memo. Based on all of these factors, Missouri will not contribute

[5] Relative Response Factor = Avg. (2023)/Avg. (2009-2013)

significantly to these nonattainment receptors in 2023. Therefore, Missouri's SIP is sufficiently addressing the good neighbor obligation for the 2015 ozone NAAQS with respect to these two monitors based on this step 2 weight of evidence analysis.

3.2. Milwaukee, Wisconsin Monitor

From Table 2, Missouri contributes 0.93 ppb to one of the Milwaukee, Wisconsin monitors (Milwaukee, Site ID: 550790085). This monitor is a modeled nonattainment monitor in 2023. Missouri's projected contribution to this monitor's 2023 DV is above 0.7 ppb, but below the alternative threshold contribution level of 1 ppb from the EPA August memo. According to EPA's contribution threshold analysis in the EPA August memo, the 0.7 ppb threshold for this monitor captures 86.6 percent of the total contribution from all upwind states and the one ppb threshold captures 79.4 percent of the total contribution from all upwind states. Further, the contribution captured by the 1 ppb threshold is 83 percent of the amount captured by the 0.7 ppb threshold. This provides confidence that the 1 ppb threshold will capture a substantial amount of total upwind states' contribution to ozone concentrations at this monitor, which will lead to meaningful emission reductions that will help ensure the monitor will attain the NAAQS in 2023. Therefore, Missouri's SIP is sufficiently addressing the good neighbor obligation for the 2015 ozone NAAQS with respect to this monitor based on this step 2 weight of evidence analysis.

3.3. Wayne, Michigan Monitor

Similar to the analysis provided above in section 3.2, EPA's updated modeling results show Missouri contributes 0.92 ppb to the 2023 ozone DV at the Wayne, Michigan monitor (Wayne, Site ID: 261630019). According to the modeling results, this monitor represents a maintenance receptor in 2023. Missouri's projected contribution to this monitor's 2023 DV is above 0.7 ppb, but below the alternative threshold contribution level of 1 ppb from the EPA August memo. EPA's contribution threshold analysis from the EPA August memo shows that a 0.7 ppb threshold would capture 67 percent of total upwind state contributions and the 1 ppb threshold would capture 61.8 percent of total upwind state contributions. In this case, the contribution captured by the 1 ppb threshold occupies 92.2 percent of the total contribution captured by the 0.7 ppb threshold. This provides confidence that the 1 ppb threshold will capture a substantial amount of upwind states' contribution to the ozone concentrations at this monitor, which will lead to meaningful emission reductions that will help ensure the monitor will attain the NAAQS in 2023. Therefore, Missouri's SIP is sufficiently addressing the good neighbor obligation for the 2015 ozone NAAQS with respect to this monitor based on this step 2 weight of evidence analysis.

3.4. Sheboygan County, Wisconsin Monitor

According to the EPA's modeling results, the Sheboygan monitor in Wisconsin (Sheboygan, Site ID: 551170006) is a nonattainment receptor to which Missouri's projected contribution to the 2023 ozone DV is 1.37 ppb. This projected contribution is above the 1 percent of the NAAQS threshold (0.7 ppb) and the alternative 1 ppb threshold identified in the EPA August memo. However, further analysis of this particular monitor reveals the rationale behind EPA's threshold

analysis in the EPA August memo may apply to a higher threshold for this particular monitor. According to the EPA August memo, a 1 ppb threshold would capture approximately 70 percent of total upwind state contributions to nonattainment and maintenance receptors based on the national average, and a 2 ppb threshold would only capture 51 percent of the total upwind state contribution on average. However, this is not the case for this Sheboygan monitor site where a 1 ppb threshold would capture 79.4 percent of the total upwind contributions and a 2 ppb threshold would capture 68.2 percent of the total upwind state contributions. The 2 ppb threshold at this monitor would capture 85.9 percent of the upwind state contributions captured under a 1 ppb threshold. Based on the logic and rationale in the EPA August memo, this provides confidence that for this particular monitor, a 2 ppb threshold is appropriate at step 2 as it will still capture nearly 70 percent of the total upwind state contributions and result in meaningful emission reductions that will help the monitor attain by 2023.

For this particular monitor, which is located in the shoreline of Lake Michigan, the primary contributors to the ozone concentrations include the Chicago metropolitan area in Illinois and Northwest Indiana, and the Milwaukee, Wisconsin combined statistical area. These three states' total contribution to the 2023 ozone DV at the Sheboygan monitor is 31.93 ppb with 15.73 ppb from IL, 9.09 ppb from WI, and 7.11 ppb from IN. The Lake Michigan Air Director's Consortium's (LADCO's) interstate transport modeling results for the 2015 ozone NAAQS[6] also show that the ozone levels at the Wisconsin shoreline of Lake Michigan are heavily affected by the emissions from Illinois, Indiana, and Wisconsin. The areas in closer proximity to the Lake shoreline display the most frequent and most elevated ozone concentrations.[7] The other monitor (551170009) in Sheboygan County, which is a few miles more inland than the nonattainment receptor evaluated in this analysis, has no projected problems with attaining and maintaining compliance with the 2015 ozone NAAQS. This provides evidence that the nonattainment receptor in Sheboygan is also heavily influenced by local transport emissions and lake breeze effects over Lake Michigan.

Based on this weight of evidence analysis, a 2 ppb threshold is appropriate and follows the rationale included in the EPA August memo. This threshold will capture the significant contributors to the ozone problem experienced at this monitors and lead to upwind state emission reductions that will provide meaningful improvement in the ozone concentrations recorded by the monitor. For all of these reasons, Missouri's SIP is sufficiently addressing the good neighbor obligation for the 2015 ozone NAAQS with respect to this monitor based on this step 2 weight of evidence analysis.

[6] See Interstate Transport Modeling for the 2015 Ozone National Ambient Air Quality Standard, the technical support document (TSD), https://www.ladco.org/wp-content/uploads/Documents/Reports/TSDs/O3/LADCO_2015O3iSIP_TSD_13Aug2018.pdf

[7] Attainment Plan for Sheboygan County, WI NAA for 2008 Ozone NAAQS

3.5. Allegan County, Michigan Monitor

The modeling data provided by EPA for the monitor in Allegan County, Michigan (Allegan, Site ID 260050003) is listed in Table 3. All units are in ppb.

Table 3. Summary of EPA Modeling Results on Allegan, Michigan

Site ID, County, State	2023en Average	2023en Maximum	Total Upwind State Contribution	Missouri Contribution	Canada & Mexico Contribution	Initial & Boundary
260050003, Allegan, MI	69.0	71.7	42.90	2.61	0.54	11.85

The 2023 average DV for the Allegan monitor is below 71 ppb, which means this site is assumed to demonstrate attainment by 2023. However, the maximum modeled design value in 2023 is 0.7 ppb above 71 ppb. Because the projected maximum 2023 ozone design value is above 71 ppb, the monitor is classified as a maintenance receptor with respect to the 2015 ozone NAAQS. Subsection 3.5.1., below, discusses how this monitor meets the criteria for an alternative approach of identifying maintenance monitors in step 1 of EPA's framework, which would eliminate this monitor as a maintenance receptor according to the EPA October memo. Subsections 3.5.2. and 3.5.3 provide further considerations with respect to this monitor including a consideration of international emissions, and other considerations relevant to Missouri's obligations to address ozone contributions to this particular monitor.

3.5.1. Allegan Monitor Meets the Criteria in the EPA October Memo to Justify Exclusion as a Maintenance Receptor

As discussed in subsection 1.4.4. of this document, the EPA October Memo affords states in developing their good neighbor SIPs an alternative option for identifying maintenance receptors that states must address in their plans. If the alternative approach shows that a maintenance receptor identified using a previous method would not be a maintenance receptor under the alternative method, this flexibility would allow states to exclude that monitor from further analysis in step 1 of EPA's framework. The memo states that EPA plans to allow this flexibility if the monitors in question would attain the 2015 ozone NAAQS using an alternative base period and also meets the following three conditions:

1. Meteorological conditions in the area of the monitoring site were conducive to ozone formation during the alternative base period design value used for projections;
2. Ozone concentrations have been trending downward at the site since 2011 (and ozone precursor emissions of NO_x and VOCs have also decreased); and
3. Emissions are expected to continue to decline in the upwind and downwind states out to the attainment date of the receptor.

According to EPA's modeling projections, the Allegan monitor would indeed attain the 2015 ozone NAAQS by 2023 if an alternative base period was selected. In EPA's modeling they included a 5-year base period (2009-2013) for determining the average and maximum ozone

DVs to which they applied the modeled relative response factor to calculate the projected DV in 2023. The 3-year base period of 2009-2011 falls fully within the 2009-2013 base period. As shown in Table 4, if the base period selected is 2009-2011, the monitor demonstrates attainment by 2023 with a projected 2023 DV of 66.3 ppb.

Table 4. Allegan County Ozone Design Value from 2009 – 2011 and Corresponding 2023 Design Value

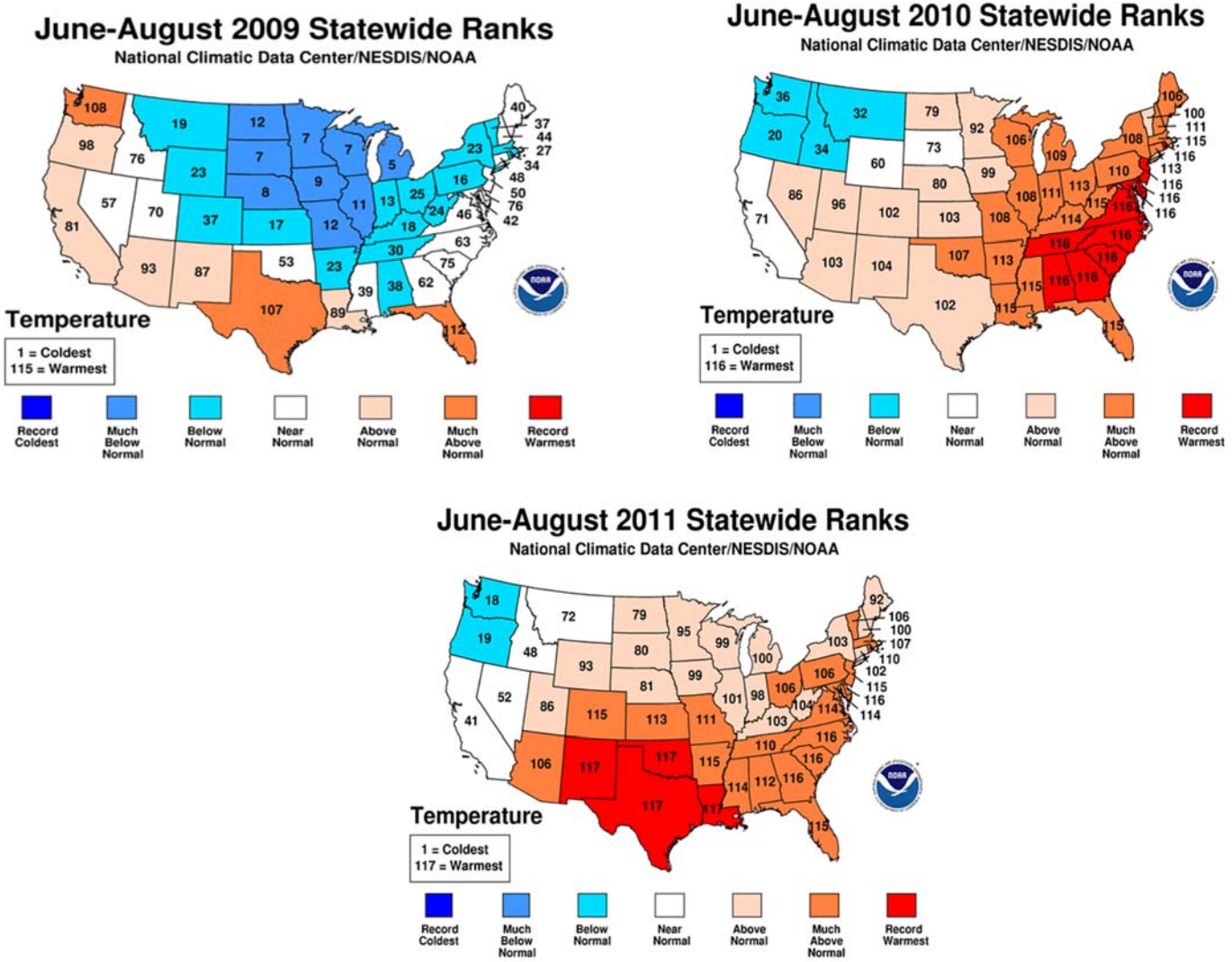
	2009-2011
Base Period DV (ppb)	78
Relative Response Factor	0.858
2023 Projected DV (ppb)	66.3

Using the alternative base period of 2009-2011, the Allegan monitor meets the first requirement for further consideration according to the EPA October memo. The next step according to the EPA October memo is to determine if the Allegan monitor also meets the other three criteria provided in the memo. Parts 3.5.1.1 – 3.5.1.3 below, discuss how the other three criteria from the EPA October memo relate to the Allegan monitor.

3.5.1.1 2009-2011 Meteorology was Conducive to Ozone Formation

The first criteria listed in EPA's October memo, is that the meteorological conditions during the alternative base period were conducive to ozone formation. The EPA October memo provided temperature analyses across the entire country for many years since 2009. Figure 1, below, shows the temperature rankings for each state during the years 2009-2011. As seen in the figure, the summer temperatures in Michigan during 2009 were below average, meaning that year's meteorological conditions were not conducive to ozone formation. However, the summer temperatures in Michigan during the years 2010 and 2011 included well above average temperatures, meaning the meteorology during those years was clearly conducive to ozone formation. The summer of 2010 was the 8th warmest in 116 years in Michigan, and the summer of 2011 in Michigan was the 18th warmest in 117 years. Therefore, the inclusion of these two years in the alternative base period means that the base period as a whole did include meteorology that was conducive to ozone formation. Therefore, the 2009-2011 alternative base period meets the first criteria of the EPA October memo.

Figure 1. National Temperature Rankings from 2009 through 2011



3.5.1.2 *Ozone Concentrations at the Allegan Monitor Have Been Trending Downward Since 2011*

The second criteria listed in the EPA October memo requires states to show that ozone concentrations at the monitor in question have been trending downward at the site since 2011, and that ozone precursor emissions in the upwind and downwind states have also been decreasing since that time. Figure 2, below, includes the ozone design values starting with the three-year period of 2009-2011 and going through 2015-2017. While the ozone design values at the monitor have fluctuated some, the overall trend (indicated by the dotted blue-line in the figure) shows a clear negative slope, meaning ozone design values have been trending downward at this monitor through 2017 (the latest year of available certified monitoring data).

Figure 3 includes the 4th high daily 8-hour average ozone concentration each year at this monitor from 2011 through 2017. Again, while the 4th high daily 8-hour ozone concentrations fluctuate from year to year, the trend is clearly downward, meaning ozone concentrations at this monitor are improving. If future ozone concentrations follow this recent trend line, the monitor will achieve compliance with the 2015 ozone standard in the near future years. Based on these trends in ozone concentration reductions over the last seven years, the Allegan monitor is on pace to attain the 2015 ozone standard by 2023.

Figure 2. Ozone Design Value Trends for Allegan, MI in Years

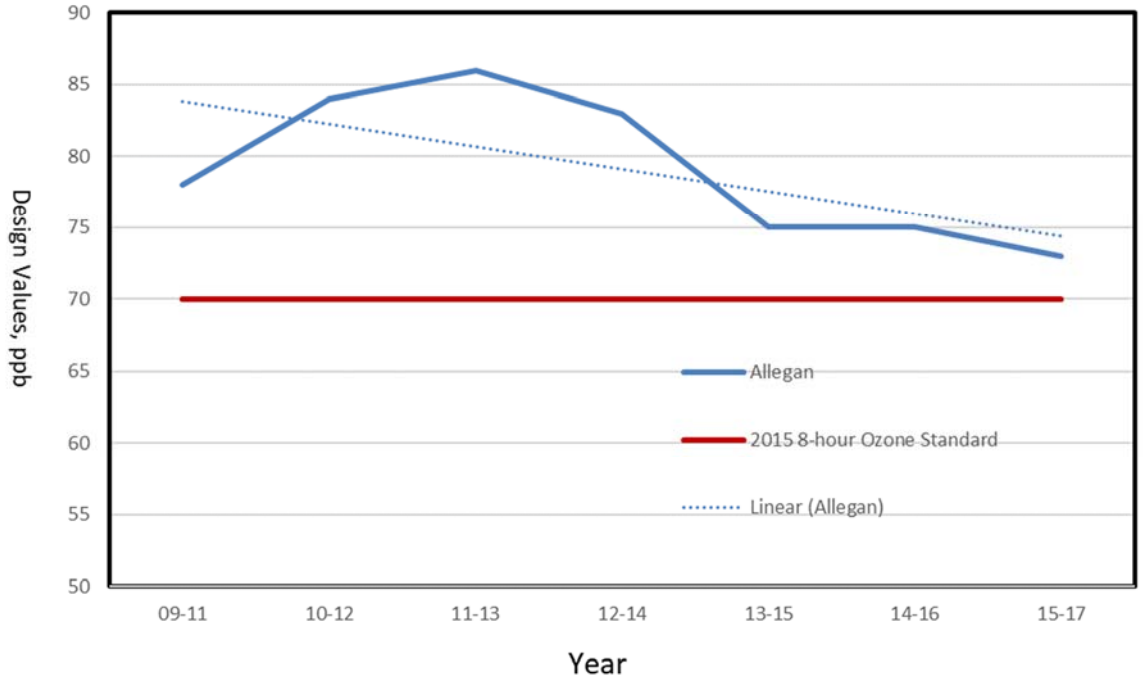
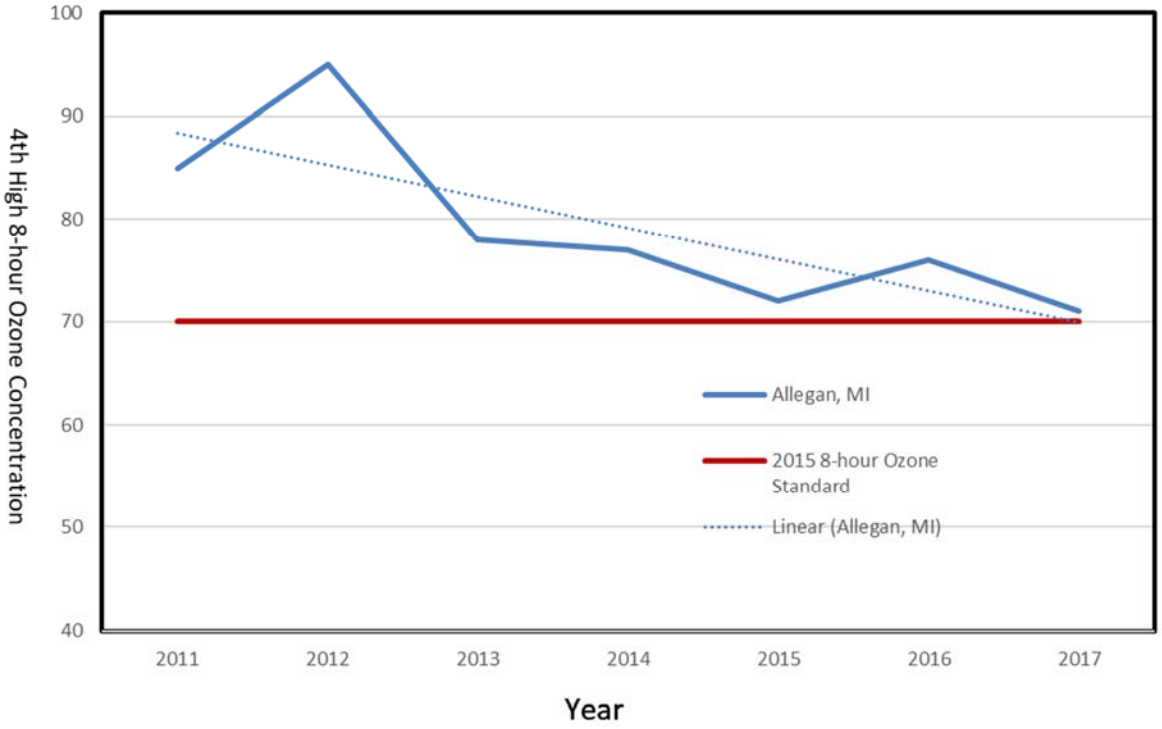


Figure 3. Ozone 4th High Concentration Trends for Allegan, MI in Years



This second criteria of the EPA October memo, requires that in addition to a downward trend in ozone concentrations since 2011, precursor emissions in both the upwind and downwind states must have also been trending downward during that timeframe. This requirement from the memo ensures that the ozone concentration reductions are not due to favorable meteorology, but rather true emission reductions leading to the improved air quality levels. Table 4, below, provides the total statewide anthropogenic NO_x and VOC emissions in Michigan, Missouri, and two neighboring upwind states from the Allegan monitor during 2011 and 2017. As seen in the table, ozone precursor emissions in all four of these states have reduced during this time period. Based on this analysis, the Allegan monitor meets the second criteria of the EPA October memo.

Table 4. Summary of Statewide Anthropogenic NO_x and VOC Emissions

State	NO_x		VOC	
	2011	**2017**	**2011**	**2017**
Michigan	443,936	296,009	450,276	350,937
Missouri	376,256	237,246	377,268	331,054
Indiana	444,421	317,558	284,378	226,734
Illinois	506,607	354,086	372,137	320,543

3.5.1.1. Emissions are expected to continue to decline in the upwind and downwind states

The third and final criteria listed in the EPA October memo requires that ozone precursor emissions in both the upwind and downwind states will continue to decline based on engineering growth projections and on-the-books control measures.

Based on the EPA's modeling platform used to develop the 2023 future year ozone design values, Missouri's statewide NO_x and VOC emissions are projected to decline 18.7 percent and 7.1 percent for NO_x and VOC, respectively from 2017 to 2023. This means Missouri's ozone precursor emissions are projected to continue their downward trend through 2023, and Missouri meets the third criteria listed in the EPA October memo.

Table 5 below provides the 2017 and the projected 2023 NO_x and VOC emissions in Michigan, Missouri, and two neighboring upwind states from the Allegan monitor. As seen in the table, all of these states are showing projected emission reductions in NO_x and VOC emissions between now and 2023. Therefore, the Allegan monitor meets the third criteria listed in the EPA October memo. According to the memo, this means Missouri need not consider the Allegan monitor a maintenance receptor under step 1 of EPA's framework.

Table 5. Comparison of Statewide Anthropogenic NOx and VOC Emissions in 2017 and Projected in 2023

State	NO_x		VOC	
	2017	**2023**	**2017**	**2023**
Michigan	296,009	228,242	350,937	301,599
Missouri	237,246	192,990	331,054	307,386
Indian	317,558	243,954	226,734	200,827
Illinois	354,086	293,450	320,543	294,087

3.5.2. Other Considerations Regarding the Allegan Monitor

As discussed above in subsection 3.5.1 of this document, according to the EPA October memo, the Allegan monitor meets the criteria to qualify for the flexibilities associated with the alternative methods for identifying maintenance receptors in Step 1 of the good neighbor SIP framework. However, even if this were not the case, there are several other considerations with respect to this monitor that show that Missouri is addressing its good neighbor obligation with respect to the Allegan monitor. The remainder of this subsection provides a discussion on these other considerations.

3.5.2.1. Missouri's Share of Emission Reduction Obligations for the Allegan Monitor

Based on EPA's modeling, Missouri is projected to contribute 2.61 ppb to the 2023 ozone design value at the Allegan monitor. The total upwind state modeled contribution to this monitor is 42.90 ppb, meaning Missouri's contribution only occupies 6.1 percent of the total upwind state contribution.

Table 6 shows an analysis using EPA's modeling conducted to determine the amount of necessary reduction from those upwind states whose contribution is above 1 ppb to the Allegan 2023 DV in order to bring the Allegan maximum DV from 71.7 down to 70.9 ppb, which would demonstrate attainment. According to the analysis, Missouri would be required to reduce its

ozone contribution by 0.06 ppb. This small reduction requirement constituting Missouri's share of required contribution reductions is below the level even confidently measurable by federal reference or equivalent method monitors. When attempting to determine the level of emission reductions needed to address this contribution obligation with a photochemical emission model, the picture becomes even less clear. The latest version of the photochemical models used by EPA in their 2023 modeling analyses are subject to modeling errors of plus or minus 5 ppb. The 0.06 ppb reduction required by Missouri to address its share of the of the required reduction to bring this maintenance receptor into full-modeled attainment status is well below the modeling error and therefore the detectable level of the modeling tools used by EPA in their 2023 modeling analyses.

Table 6. Required Reduction Calculation for Allegan, MI to Attain 2015 Standard

Site ID	County	State	2023 Max DV (ppb)
260050003	Allegan	MI	71.7 ppb
Required Reduction to Attain Standard for Max DV	0.8 ppb		
Significant States at 1 ppb	Contribution (ppb)	Contribution Portion	Required Reduction (ppb)
AR	1.64	4%	0.03
IL	19.62	54%	0.43
IN	7.11	19%	0.15
MO	2.61	7%	0.06
OK	1.31	4%	0.03
TX	2.39	7%	0.06
WI	1.95	5%	0.04
Total	36.63	100%	0.80

In addition, several retirements of coal-fired boilers will occur within Missouri over the next several years, but these coal-fired power plant emissions were included in the EGU section of EPA's 2023 modeling that informed their analyses. These anticipated retirements are listed below in Table 7. These listed EGU emission reductions and other future reductions expected from sources within Missouri will be true emission reductions that likely will address any remaining doubt that Missouri emission reductions will address the state's miniscule ozone contribution obligation for the Allegan monitor of 0.06 ppb by 2023.

Table 7. Missouri EGUs Over-modeled Emissions for Future Years in the EPA Modeling

Facility Name	Units	NO_x Reduced from EPA 2023_en (tons)	Expected Year for Retirement
EMPIRE DISTRICT ELECTRIC CO-ASBURY PLANT	1	1052	2019
KANSAS CITY POWER AND LIGHT CO-LAKE ROAD PLANT	GT5	30	2020
KANSAS CITY POWER AND LIGHT CO-LAKE ROAD PLANT	6	418	2020
AMEREN MISSOURI-MERAMEC PLANT	CT01	7	2022
AMEREN MISSOURI-MERAMEC PLANT	CT2A	5	2022
AMEREN MISSOURI-MERAMEC PLANT	CT2B	5	2022
CITY UTILITIES OF SPRINGFIELD MISSOURI-JAMES RIVER POWER PLANT	5	40	2018
CITY UTILITIES OF SPRINGFIELD MISSOURI-JAMES RIVER POWER PLANT	GT2	39	2018
CITY UTILITIES OF SPRINGFIELD MISSOURI-JAMES RIVER POWER PLANT	GT1	36	2018
CITY UTILITIES OF SPRINGFIELD MISSOURI-JAMES RIVER POWER PLANT	4	27	2018
Total Anticipated Emission Reductions		1,659	

3.5.2.2. International and Initial and Boundary (I&B) Contributions

The EPA March memo states "EPA recognizes that a number of non-U.S. and non-anthropogenic sources contribute to downwind nonattainment and maintenance receptors". Therefore, it is appropriate to apply some flexibility to address upwind state responsibilities for the interstate transport of ozone. As seen in Table 8, below, if the Canada-Mexico contribution and just 2 percent of the initial/boundary conditions contribution to the Allegan monitor (of which a significant percentage can be attributed to international emissions) were excluded from the modeling analysis, the Allegan monitor's maximum 2023 design value would comply with the 2015 ozone NAAQS, meaning, it would no longer be a maintenance receptor. The proportional emission reduction obligation analysis above in part 3.5.2.1. ignored these international contributions and assigned all responsibility for addressing the nonattainment or maintenance monitors to upwind U.S. states. Unfortunately, this approach would result in unnecessary over-control, because based on EPA's own modeling results, the monitor would attain and maintain the NAAQS but for a small fraction of contribution from international ozone precursor emissions.

Table 8. Allegan Maximum Concentration after Subtracting International and a Fraction of the Initial Boundary Contribution

Canada & Mexico Contribution	2% of I&B	Canada & Mexico with 2% of I&B	2023en Maximum	Maximum after subtracting combined contribution
0.54	11.85 × 2% = 0.24	0.54 + 0.24 = 0.78	71.7	71.7 - 0.78 = 70.92

3.5.3. Step 2 Conclusion for the Allegan Monitor

As discussed in the beginning of this section, EPA's modeling results project the Allegan monitor site as a maintenance receptor in 2023. However, as discussed in subsection 3.5.1., the Allegan monitor meets all the criteria listed in the EPA October memo relating to alternative methods for identifying maintenance monitors. Specifically, the monitor would attain by 2023 using an alternative base period; the meteorological conditions during this alternative base period were conducive to ozone formation; ozone concentrations at the monitor have been trending downward since the 2011 base year; ozone precursor emissions in Michigan and the upwind states have been trending downward since the 2011 base year; and ozone precursor emission in Michigan and the upwind states, including Missouri, are projected to continue declining through 2023 based on engineering projections and on-the-books control measures. Further, and in addition to this flexibility from the EPA October memo, the monitor in question would not even be a maintenance receptor based on EPA's 2023 modeling if the contributions from international emissions and a small fraction (2 percent) of the initial boundary conditions were excluded from the analysis. Finally, the EPA modeling did not include further emission reductions expected from Missouri due to anticipated or announced shutdowns from major NO_x emission sources. These shutdowns alone, would likely address the 0.06 ppb proportional contribution obligation from Missouri to the Allegan monitor. Based on this full analysis, Missouri's SIP is fully addressing the CAA good neighbor obligation with respect to the Allegan monitor.

4. Public Participation

In accordance with Section 110(a)(2) of the CAA, the Missouri Air Conservation Commission (MACC) will hold a public hearing prior to adoption of this SIP revision and the subsequent submittal to EPA. The air program notified the public and other interested parties of the public hearing and comment period at least thirty days prior to the public hearing for this SIP revision. Specifically –

- Notice of availability of the proposed SIP revision and announcement of the public hearing was posted on the air program website by February 25, 2019.

- The MACC will hold a public hearing to receive comments for the proposed SIP revision on March 28, 2019 beginning at 9:00 am at 1730 E. Elm St. - lower level Bennett Spring conference rooms.

- The air program opened a public comment period after posting the SIP revision on the air program's website on February 25, 2019. The public comment period will close on April 4, 2019, seven (7) days after the public hearing.

Conclusion

Missouri has numerous control measures in place to address ozone precursor emissions within the state, just like many other states around the country. These measures have resulted in significant improvement in ground-level ozone concentrations both within Missouri and in other upwind and downwind states across the country. Missouri's emissions of NO_x and VOC continue to decline, and modeling projections show further emission reductions from Missouri in the future. These reductions are the result of on-the-books state and federal control measures, and demonstrate Missouri's commitment to improving air quality not just within the state, but also in areas downwind from Missouri that are struggling to attain and maintain compliance with the 2015 ozone NAAQS.

Based on the analyses included in this document, Missouri's SIP is adequately addressing the state's obligation under CAA Section 110(a)(2)(D)(i)(I) (the good neighbor provision) with respect to the 2015 ozone NAAQS. The air program's analyses focused on all potential downwind areas where Missouri emissions may impact ozone concentrations and adequately demonstrates Missouri's SIP ensures that emissions in Missouri will not significantly contribute to nonattainment or interfere with maintenance of the 2015 ozone NAAQS in any downwind state.