Request to Redesignate Kentucky Counties Located within the Cincinnati, OH-KY 2015 8-Hour Ozone Nonattainment Area

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1. Introduction

On October 26, 2015, the United States Environmental Protection Agency (EPA) revised both the primary and secondary ozone National Ambient Air Quality Standards (NAAQS) to a level of 0.070 parts per million (ppm), measured over an 8-hour period with the fourth-highest daily maximum averaged across three consecutive years.[1] The primary standard provides public health protection, while the secondary standard provides public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

The final area designations were published on June 4, 2018 and became effective August 3, 2018.[2] The current Cincinnati, OH-KY nonattainment area (hereinafter "the Area") for the 2015 8-hour ozone NAAQS includes the following counties: Butler, Clermont, Hamilton, and Warren in Ohio; and the northern portions of Boone, Campbell, and Kenton in Kentucky.[3] EPA used the 2008 ozone nonattainment boundaries, configured by census tracts, when designating the portions of Boone, Campbell, and Kenton counties as nonattainment for the 2015 8-hour ozone NAAQS. Final designations for the 2015 8-hour ozone NAAQS were based on 2014 – 2016 monitoring data.[4] The three northern counties divided into nonattainment and attainment/unclassifiable portions aredepicted in Figure 1.

Figure 1: Nonattainment Portions of Boone, Campbell, and Kenton Counties

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[1] 80 FR 65291

[2] 83 FR 25776

[3] Boone County (part): the entire county except for 2010 US Census Tracts 706.01 and 706.04. Campbell County (part): the entire county except for 2010 US Census Tracts 520.01 and 520.02. Kenton County (part): the entire county except for 2010 US Census Tracts 637.01 and 637.02.

[4] *Technical Support Document, Cincinnati, OH-KY-IN Final Area Designations for the 2015 Ozone National Ambient Air Quality Standards.*

The Clean Air Act (CAA) requires each state with areas failing to meet the 8-hour ozone NAAQS to develop a State Implementation Plan (SIP) to expeditiously attain and maintain the standard. Under Section 181(a)(1) of the CAA, Kentucky's marginal classification requires that the Area attain the standard within three years of the final designation's effective date (August 3, 2018), establishing a due date of August 3, 2021, for attainment.[5]

The current design values for the ambient monitoring data for the Boone County and Campbell County monitors are 0.061 ppm and 0.063 ppm. The current design values for the eight Ohio monitors (located in Butler, Clermont, Hamilton, and Warren counties) are 0.067 ppm, 0.066 ppm, 0.064 ppm, 0.066 ppm, 0.070 ppm, 0.067 ppm, 0.069 ppm and 0.070 ppm. The current design values are based on quality-assured data collected from 2019 to 2021 (Please refer to the 2.A. demonstration). The design values for all of the Area's monitors support Kentucky's request to EPA to redesignate the Kentucky portion of the Area from nonattainment to attainment. In addition, the state of Ohio submitted a request to redesignate their respective portion of the Area to attainment. Pursuant to Section 107(d)(3)(E) of the CAA, states may request nonattainment areas to be redesignated to attainment, provided specific criteria are met. The following criteria must be met in order for an area to be redesignatedfrom nonattainment to attainment:

1. The Administrator determines that the area has attained the ozone standard. (CAA Section 107(d)(3)(E)(i))
2. The Administrator has fully approved the applicable implementation plan for the area under Section 110(k). (CAA Section 107(d)(3)(E)(ii))
3. The Administrator determines that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the SIP, federal requirements, and other permanent and enforceable reductions. (CAA Section 107(d)(3)(E)(iii))
4. The Administrator has fully approved a maintenance plan, including a contingency plan, under Section 175A. (CAA Section 107(d)(3)(E)(iv))
5. The state has met all requirements under Section 110 and Part D of Title I of the Act. (CAA Section 107(d)(3)(E)(v))[6]

Each of these criteria are discussed in more detail in subsequent sections of this document.

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[5] 42 U.S.C. §7511(a)(1). *See also* Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements, 83 FR 62998, (Dec. 6, 2018; effective Feb. 4, 2019), [hereinafter *Implementation Rule*].

[6] 42 U.S.C. §7407(d)(3)(E).

2. Requirements for Redesignation

This redesignation request was prepared in accordance with CAA Section 107(d)(3)(E). An introductory explanation of each redesignation criterion, as it applies to the Area, is included in each part of this section (parts A-E).

A. <u>Demonstration of Attainment (CAA Section 107(d)(3)(E)(i))</u>

Part A of Section 2 provides detailed information demonstrating that Kentucky meets the requirements of CAA Section 107(d)(3)(E)(i).

The state must demonstrate to the Administrator that the area is attaining the applicable NAAQS by providing 3 years of clean ambient air quality data. The data should be the product of ambient monitoring that represents the area of highest concentration. The data should be collected and quality-assured in accordance with 40 CFR 58 and recorded in EPA's Air Quality System (AQS) database for it to be available to the public for review. Pursuant to 40 CFR 50.19, the 8-hour primary and secondary ozone ambient air quality standards are met at an ambient air monitoring site when the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.070 ppm, as determined in accordance with 40 CFR part 50, Appendix U.

Demonstration: The current design values of the ambient monitoring data for the Boone County and Campbell County monitors are 0.061 ppm and 0.063 ppm respectively. The current design values of the ambient monitoring data for the eight Ohio monitors (located in Butler, Clermont, Hamilton, and Warren counties) are 0.067 ppm, 0.066 ppm, 0.064 ppm, 0.066 ppm, 0.070 ppm, 0.067 ppm, 0.069 ppm and 0.070 ppm. The current design values are based on quality-assured and certified data collected from 2019 to 2021.

<u>Requirement 1 of 4</u>

A demonstration that the 2015 8-hour Ozone NAAQS, as established in 40 CFR 50.19, has been attained.

Demonstration: The 8-hour Ozone NAAQS are met when the three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentrations is less than or equal to 0.070 ppm at an ambient air quality monitoring site. When this occurs, the site is said to be in attainment.

Currently, there are two ambient air monitors that measure ozone concentrations located within the Kentucky portion of the Area: one in Boone County and one in Campbell County. The 8-hour ozone data collected from 2019-2021 for the two ambientair quality monitoring sites results in a three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentrations of 0.061 ppm and 0.063 ppm. Both of thesedesign values are below the 0.070 ppm standard.

The 8-hour ozone nonattainment designation was based on ambient air quality data collected from 2014 through 2016 that exceeded the 2015 Ozone NAAQS of 0.070 ppm. Although the two monitors in Kentucky's portion of the Area were not violating the 8-hr ozone NAAQS, Boone, Campbell, and Kenton counties were included as part of the Area. The violating monitors for the Area were located in Hamilton, Butler, Clermont, and Warren Counties in Ohio. Current ambient air quality data from all monitoring sites in the Area are at or below 0.070 ppm and are attaining the 2015 8-hour ozone NAAQS. Design values for all monitors within the Area, included in the 2.A. demonstration, are shown in Table 1. Subsequently, all monitors in the entire Area are attaining the 2015 8-hour Ozone standard. Therefore, the data demonstrates that all monitors in the Area, including the Kentucky monitors in Boone and Campbell Counties, are in attainment of the 2015 8-hour Ozone standard.

Requirement 2 of 4

Ambient air monitoring data that has been quality assured in accordance with 40 CFR 58, Appendix A, is recorded in the EPA Air Quality System (AQS) database, and available for public view. Each state and local agency must develop a quality system to ensure that the monitoring results:

- meet a well-defined need, use, or purpose;
- provide data of adequate quality;
- satisfy stakeholder expectations;
- comply with applicable standard's specifications;
- comply with statutory/other requirements of society;
- reflect consideration of cost and economics

Furthermore, this demonstration must include data validation and quality assurance for all monitors in the area.

Demonstration: The Area includes nine monitors; seven are located in Ohio and are operated by the Southwest Ohio Air Quality Agency, while the remaining two monitors are located in Kentucky and are operated by the Kentucky Division for Air Quality (Division). All ambient air monitoring data shown in Table 1 has been quality- assured in accordance with 40 CFR 58, Appendix A and the data has been recorded into the EPAAQS database. Pursuant to 40 CFR § 58.15, each air monitoring agency must certify the previous year of AQS-submitted data as accurate by May 1 of the following year. On November18, 2021, the Division submitted a letter to EPA certifying that the 2021 ozone ambient concentration data and quality assurance data at four sites (including the Boone and Campbell County monitors) has been completely submitted to AQS. The 2021 ozone quality assured data is shown below in Table 1. This data demonstrates that ozone concentrations continue to decline in the Area.

Requirement 3 of 4

A showing that the three-year average of the fourth highest values, based on data from all monitoring sites in the area or its affected downwind environs, are below 0.070 ppm. The design value is based on three complete years of ozone monitoring data.

Demonstration: In 2019, the ambient air monitoring data for ozone in the Kentucky portion of Boone, Campbell and Kenton counties of the Area and the nonattainment portion of Butler, Clermont, Hamilton, and Warren counties in Ohio indicated no further exceedance of the 2015 8-hour standard as seen in Table 1. Furthermore, the Area's monitors did not show any violations of the ozone NAAQS based on 2019-2021 data. Design value trends from 2014 (the nonattainment base year) through 2021 can be seen in Table 2 and Figure 2. Additionally, data demonstrating the annual fourth-highest daily maximum trends for 2014-2021can be seen in Table 3 and Figure 3.

Table 1
Annual 4th Maximum High Trend for 8-Hour Ozone
(parts per million)

Site ID	County	2019	2020	2021	2019-2021 Design Value
21-015-0003	Boone, KY	0.062	0.062	0.061	0.061
21-037-3002	Campbell, KY	0.062	0.063	0.064	0.063
39-017-0018	Butler, OH	0.067	0.070	0.064	0.067
39-017-0023	Butler, OH	0.067	0.067	0.066	0.066
39-017-9991	Butler, OH	0.065	0.064	0.063	0.064
39-025-0022	Clermont, OH	0.071	0.064	0.065	0.066
39-061-0006	Hamilton, OH	0.072	0.070	0.070	0.070
39-061-0010	Hamilton, OH	0.067	0.070	0.064	0.067
39-061-0040	Hamilton, OH	0.071	0.068	0.069	0.069
39-165-0007	Warren, OH	0.070	0.071	0.069	0.070

Table 2
Design Values for 8 Hour Ozone
2014-2021
(parts per million)

Site ID	County	2014	2015	2016	2017	2018	2019	2020	2021
21-015-0003	Boone, KY	0.065	0.061	0.063	0.062	0.064	0.062	0.062	0.061
21-037-3002	Campbell, KY	0.075	0.071	0.070	0.069	0.067	0.062	0.063	0.064
39-017-0018	Butler, OH	0.073	0.069	0.070	0.071	0.073	0.071	0.071	0.067
39-017-0023	Butler, OH	0.073	0.069	0.072	0.072	0.073	0.070	0.069	0.066
39-017-9991	Butler, OH	0.074	0.068	0.069	0.069	0.070	0.068	0.066	0.064
39-025-0022	Clermont, OH	0.075	0.068	0.070	0.070	0.070	0.069	0.068	0.066
39-061-0006	Hamilton, OH	0.075	0.070	0.072	0.073	0.075	0.074	0.074	0.070
39-061-0010	Hamilton, OH	0.073	0.069	0.072	0.070	0.072	0.070	0.070	0.067
39-061-0040	Hamilton, OH	0.073	0.069	0.071	0.071	0.072	0.071	0.070	0.069
39-165-0007	Warren, OH	0.072	0.069	0.072	0.071	0.072	0.071	0.072	0.070

Each design value was calculated with the average of the 4th maximum high of the 3 most recent years.

Figure 2
Design Value Trend for 8-Hour Ozone
2014-2021
(parts per million)

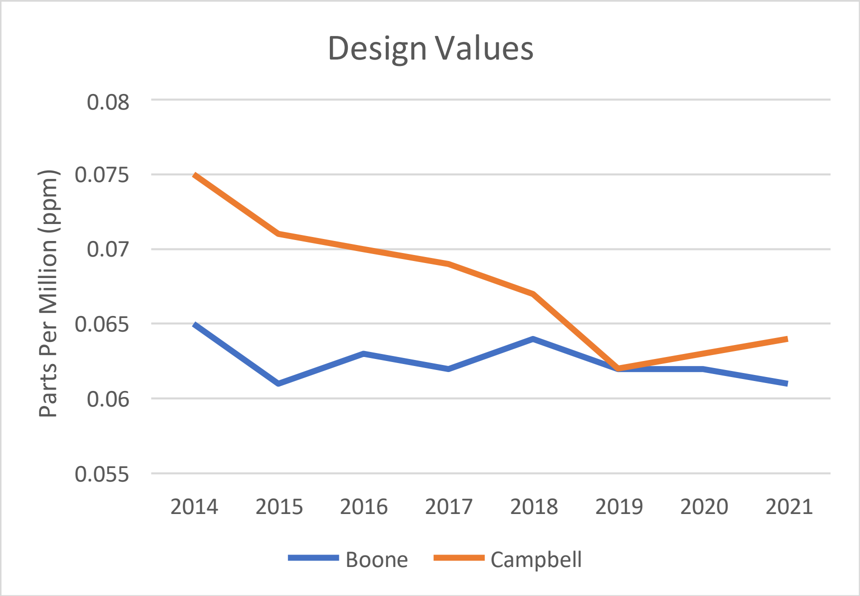
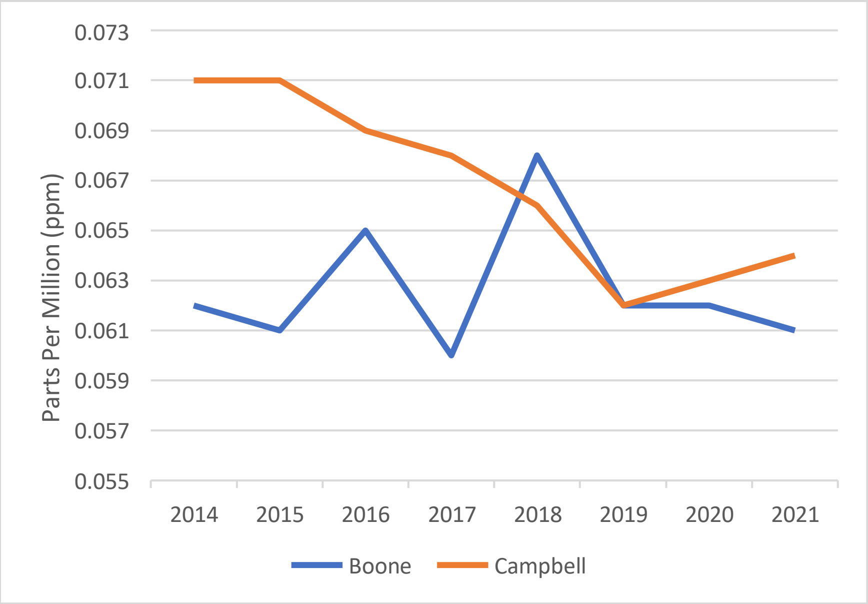


Table 3
Annual 4th Maximum High Trend for 8-Hour Ozone 2014-2021
(parts per million)

Site ID	**County**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
21-015-0003	Boone, KY	0.062	0.062	0.065	0.060	0.068	0.062	0.062	0.061
21-037-3002	Campbell, KY	0.071	0.071	0.069	0.068	0.066	0.062	0.063	0.064
39-017-0018	Butler, OH	0.069	0.070	0.073	0.070	0.076	0.067	0.070	0.064
39-017-0023	Butler, OH	0.070	0.070	0.076	0.072	0.073	0.067	0.067	0.066
39-017-9991	Butler, OH	0.069	0.068	0.071	0.069	0.070	0.065	0.064	0.063
39-025-0022	Clermont, OH	0.068	0.070	0.073	0.068	0.069	0.071	0.064	0.065
39-061-0006	Hamilton, OH	0.071	0.072	0.075	0.072	0.080	0.072	0.070	0.070
39-061-0010	Hamilton, OH	0.073	0.070	0.073	0.068	0.075	0.067	0.070	0.064
39-061-0040	Hamilton, OH	0.069	0.071	0.073	0.071	0.072	0.071	0.068	0.069
39-165-0007	Warren, OH	0.071	0.071	0.074	0.068	0.075	0.070	0.071	0.069

Figure 3
Annual 4th Maximum High Trend for 8-Hour Ozone
2014-2021
(parts per million)



Requirement 4 of 4

A commitment that once redesignated, the state will continue to operate an appropriate monitoring network to verify the maintenance of the attainment status.

Demonstration: Kentucky will continue to operate an ambient air quality monitoring network consistent with the network plan and assessments required by 40 CFR 58.10 and 40 CFR 58, Appendix D. Any modification to the network will be conducted in accordance with 40 CFR 58.14. As required by 40 CFR 58.16, all data collected will be recorded in the AQS database and will therefore be available to the public.

B. Fully Approved Implementation Plan (CAA Section 107(d)(3)(E)(ii))

The SIP for the area must be fully approved under section 110(k) and must satisfy all requirements that apply to the area.

Demonstration: Kentucky submitted a final SIP documenting the CAA requirements of Section 110(a) infrastructure provisions for the 2015 8-hour ozone NAAQS on January 11, 2019. On June 1, 2020, EPA took final action to approve the infrastructure elements, but did not take action regarding the provisions for interstate transport, prevention of significant deterioration (PSD) and air quality modeling requirements.[7] In a separate action on October 2, 2020, EPA approved the provisions for PSD and modeling requirements.[8] However, on February 22, 2022, EPA proposed to disapprove the interstate transport portion of the infrastructure requirements for the 2015 8-hour ozone NAAQS.[9]

In final actions to redesignate both the Knoxville, TN[10] and Charlotte-Rock Hill, NC[11] 2008 8-hour Ozone nonattainment areas, EPA determined that it is not necessary to have the interstate transport requirements approved in order for an area to be redesignated to attainment. "EPA believes that the requirements linked with a particular nonattainment area's designation and classifications are the relevant measures to evaluate in reviewing a redesignation request. The transport SIP submittal requirements, where applicable, continue to apply to a state regardless of the designation of any one particular area in the state. Thus, EPA does not believe that the CAA's interstate transport requirements should be construed to be applicable requirements for purposes of redesignation."[12] Therefore, Kentucky meets the requirements of CAA 107(d)(3)(E)(ii) and requests redesignation of the Kentucky portion of the Area to attainment.

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[7] 85 FR 33021 *Air Plan Approval; Kentucky; Infrastructure Requirements for the 2015 8-Hour Ozone National Ambient Air Quality Standard*

[8] 85 FR 54507 *Air Plan Approvals; KY; Prevention of Significant Deterioration and Modeling Infrastructure Requirements for 2015 Ozone NAAQS*

[9] EPA, Air Plan Disapproval; Kentucky; Interstate Transport Requirements for the 2015 8-Hour Ozone National Ambient Air Quality Standards, 87 FR 9498 (proposed Feb. 22, 2022).

[10] 80 FR 29237 *Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; Tennessee; Redesignation of the Knoxville 2008 8-Hour Ozone Nonattainment Area to Attainment*

[11] 80 FR 29250 *Approval and Promulgation of Implementation Plans and Designation of Areas; North Carolina; Redesignation of the Charlotte-Rock Hill, 2008 8-Hour Ozone Nonattainment Area to Attainment*

[12] 80 FR 29242 *Approval and Promulgation of Implementation Plans and Designation of Areas for Air Quality Planning Purposes; Tennessee; Redesignation of the Knoxville 2008 8-Hour Ozone Nonattainment Area to Attainment; Proposed Rule*

C. Permanent and Enforceable Reductions in Emissions (CAA Section 107(d)(3)(E)(iii))

Part C discusses the emissions inventory portion of this submittal and demonstrates that Kentucky meets the requirements of CAA Section 107(d)(3)(E)(iii).

The Calcagni memo states that states should estimate emissions reductions achieved from federal and state measures, and also states that "[a]ttainment resulting from temporary reductions in emission rates (e.g., reduced production or shutdown due to temporary adverse economic-conditions) or unusually favorable meteorology would not qualify as an air quality improvement due to permanent and enforceable emission reductions."[13] Part C demonstrates how Kentucky's improvement in air quality is attributed to emission reductions which are permanent and enforceable, as opposed to reductions from temporary conditions.

Pursuant to the CAA, a demonstration must show that the improvement in air quality between the year that violations occurred and the year that attainment was achieved is based on permanent and enforceable emission reductions. To verify the emission reductions are permanent and enforceable, Kentucky is submitting a comprehensive inventory of ozone precursor emissions (VOC and NOx) representative of the nonattainment year (2014). The year 2019 was selected as the attainment year due to it being one of the years from the attaining three-year average design values for the Area which were calculated with 2019-2021 data.

Point source emissions data for 2014 and 2019 were obtained from the Kentucky Emissions Inventory database and Ohio's Emissions Inventory System database. Ohio-Kentucky-Indiana Regional Council of Governments (OKI) provided the on-road emissions inventory. OKI, Ohio EPA, and the Division had frequent communication and consultation to ensure the Area's emissions inventory was accurate and consistent among all three states.

Requirement 1 of 3

A comprehensive emission inventory of ozone completed for the base year and attainment year.

Demonstration: An emissions inventory was prepared for base year (2014) NOx and VOC emissions in the Area. The point source emissions were obtained from Kentucky and Ohio state emissions inventory databases (KYEIS and OHEIS). Area and nonroad emissions data were derived by interpolating between the 2016 and projected 2026 emissions from EPA's 2016v2 emissions platform, and 2019 onroad emissions were obtained from MOVES3 (Motor Vehicle Emissions Simulator). The 2014 base year inventory represents a comprehensive, accurate, and current inventory of actual emissions from all sources of the relevant pollutants in the Area. For the attainment year, 2019 was selected since the design values for the 2019-2021 period show attainment of the 20158-hour ozone NAAQS.

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[13] Calcagni Memo, supra note 9 at 4.

The emissions inventory is broken down into five emission categories: Electric Generating Unit (EGU), Non-EGU, Non-road, Area and On-road. The emission totals for the Kentucky portion of the Area are partial county totals for all emission categories. The following sections describe how data for each emission category was obtained and used.

Point Sources

Actual point source emissions data for 2014 and 2019 for EGUs and non-EGUs were collected from the Kentucky and Ohio state databases. It should be noted that the point source emissions data does not include biogenic emissions. The EGU and Non-EGU source information from the two state databases was located specifically within the nonattainment area, so the area apportionment percentage noted in Table 4 was not applied to the point source category. The point source emissions inventory is located in Appendix B.

Mobile (On-road) Sources

Mobile source (on-road) emissions data were developed by OKI from emission factors produced by EPA's MOVES3 software program and data extracted from the region's updated travel-demand model. OKI is the metropolitan planning organization for the Greater Cincinnati area. This updated data for mobile source emissions is located in Appendix C.

Area Sources/Non-Road Mobile Sources

Emissions modeling platform 2014v7.1 (version 2014fd) was used with data collected for the 2014 year. Emissions Modeling platform 2016v2 (versions 2016fj, 2023fj, 2026fj, and 2023fj) was used with data collected for the 2016 base year and the 2023, 2026 and 2032 EPA-projected inventories. The 2014v7.1 modeling platform was selected to represent actual emissions data in the base year 2014. The 2016v2 modeling platform was used since it included the best available inventory for the projected years.

The 2014 base year emissions were derived from 2014 emissions from the 2014v7.1 (2014fd) platform, without modification. The 2019 attainment year emissions were derived by interpolating between the 2016 and projected 2023 emissions from the 2016v2 (2016fj and 2023fj) platform. The Division used census tract population data to determine an approximate percentage that accounts for nonroad and area sources in the nonattainment portion of each county, as demonstrated in Table 4. Since only a portion of each county is involved for all three northern Kentucky counties, these emissions were determined by multiplying the emissions for the entire county by the percentage of the county that is in the nonattainment area. Emissions from the county portions were then projected out to the appropriate future years. This method of calculating emissions for partial counties was applied because the majority of the area in each of the three northern Kentucky counties is included in the nonattainment area. Additionally, the Division chose to perform this alternative method to calculate partial emissions due to this being the most reliable and effective method with the resources available at this time.[14] This same percentage calculation method has also been used by the Division for estimating nonroad and area source emissions for prior SIP purposes.

Summarized in Table 4 are the county area percentages used to estimate the area and non-highway mobile emissions for Kentucky. The county area percentages were only applied to the area/non-road source category because the data for this source category was obtained from the 2017 NEI, which does not account for partial counties.

Table 4
County Area Percentages for Northern Kentucky Ozone Nonattainment Area (NAA) Area and Non-Highway Mobile Sources

Kentucky County	NAA Percentage
Boone	95%
Campbell	92%
Kenton	95%

The application of these percentages to the total county emissions for area and non-highway mobile emission sources resulted in the representation of emissions from the applicable Census Tracts. Area and non-highway mobile emissions data can be found in Appendix B.

Comparing the base year (2014) and attainment year (2019) emissions shows reductions of both NOX and VOCs in every county and across most categories of emissions sources. Tables 5-18 give a complete comparison of 2014 and 2019 emissions broken down by county, source category, and pollutant. Furthermore, Tables 19 and 20 contain the total NOx emissions reductions and VOC emissions reductions for the Kentucky portion of the Area. The reductions in emissions demonstrate that the improvement in air quality is the result of permanent and enforceable measures at the federal and state level.

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[14] EPA, Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, available at https://www.epa.gov/sites/default/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf.

Table 5
Boone County, Kentucky 2015 8-Hour Ozone Nonattainment Area VOC Emissions (TSD)

VOC	Boone	
Sector	**2014**	**2019**
EGU	0.27	0.33
Non-EGU	1.68	2.42
Non-road	2.70	1.49
Area	9.28	7.29
On-road	1.60	1.30
TOTAL	**15.53**	**12.83**

Table 6
Campbell County, Kentucky 2015 8-Hour Ozone Nonattainment Area VOC Emissions (TSD)

VOC	Campbell	
Sector	**2014**	**2019**
EGU	0.00	0.00
Non-EGU	0.49	0.40
Non-road	0.68	0.52
Area	2.48	2.23
On-road	0.90	0.80
TOTAL	**4.55**	**3.95**

Table 7
Kenton County, Kentucky 2015 8-Hour Ozone Nonattainment Area VOC Emissions (TSD)

VOC	Kenton	
Sector	**2014**	**2019**
EGU	0.00	0.00
Non-EGU	0.46	0.43
Non-road	0.98	0.74
Area	4.03	4.11
On-road	1.60	1.50
TOTAL	**7.07**	**6.78**

Table 8
Butler County, Ohio 2015 8-Hour Ozone Nonattainment Area
VOC Emissions
(TSD)

VOC	Butler	
Sector	**2014**	**2019**
EGU	0.02	0.04
Non-EGU	2.91	2.37
Non-road	3.26	2.52
Area	13.38	12.28
On-road	6.10	3.90
TOTAL	**25.67**	**21.11**

Table 9
Clermont County, Ohio 2015 8-Hour Ozone Nonattainment Area
VOC Emissions
(TSD)

VOC	Clermont	
Sector	**2014**	**2019**
EGU	0.28	0.11
Non-EGU	0.39	0.35
Non-road	2.51	2.17
Area	6.26	6.84
On-road	3.50	2.20
TOTAL	**12.94**	**11.67**

Table 10
Hamilton County, Ohio 2015 8-Hour Ozone Nonattainment Area
VOC Emissions
(TSD)

VOC	Hamilton	
Sector	**2014**	**2019**
EGU	0.35	0.30
Non-EGU	2.41	1.91
Non-road	8.39	6.15
Area	31.81	27.26
On-road	13.70	8.40
TOTAL	**56.66**	**44.02**

Table 11
Warren County, Ohio 2015 8-Hour Ozone Nonattainment Area
VOC Emissions
(TSD)

VOC	Warren	
Sector	**2014**	**2019**
EGU	0.00	0.00
Non-EGU	0.51	0.74
Non-road	2.89	2.49
Area	8.91	8.88
On-road	3.70	2.40
TOTAL	**16.01**	**14.51**

Table 12
Boone County, Kentucky 2015 8-Hour Ozone Nonattainment Area
NOx Emissions
(TSD)

NO_x	Boone	
Sector	**2014**	**2019**
EGU	12.65	5.65
Non-EGU	0.31	0.34
Non-road	1.61	0.74
Area	3.65	2.54
On-road	7.10	4.70
TOTAL	**25.32**	**13.97**

Table 13
Campbell County, Kentucky 2015 8-Hour Ozone Nonattainment Area
NOx Emissions
(TSD)

NO_x	Campbell	
Sector	**2014**	**2019**
EGU	0.00	0.00
Non-EGU	0.28	0.29
Non-road	0.60	0.38
Area	1.65	0.92
On-road	2.50	2.20
TOTAL	**5.03**	**3.79**

Table 14
Kenton County, Kentucky 2015 8-Hour Ozone Nonattainment Area
NOx Emissions
(TSD)

NO_x	Kenton	
Sector	**2014**	**2019**
EGU	0.00	0.00
Non-EGU	0.28	0.28
Non-road	1.19	0.57
Area	1.48	1.53
On-road	5.90	5.30
TOTAL	**8.85**	**7.68**

Table 15
Butler County, Ohio 2015 8-Hour Ozone Nonattainment Area
NOx Emissions
(TSD)

NO_x	Butler	
Sector	**2014**	**2019**
EGU	0.36	0.91
Non-EGU	10.70	7.72
Non-road	4.21	2.01
Area	2.46	2.26
On-road	12.40	7.00
TOTAL	**30.13**	**19.90**

Table 16
Clermont County, Ohio 2015 8-Hour Ozone Nonattainment Area
NOx Emissions
(TSD)

NO_x	Clermont	
Sector	**2014**	**2019**
EGU	44.88	15.87
Non-EGU	0.03	0.00
Non-road	2.33	1.43
Area	1.14	1.09
On-road	6.90	3.80
TOTAL	**55.28**	**22.19**

Table 17
Hamilton County, Ohio 2015 8-Hour Ozone Nonattainment Area NOx Emissions (TSD)

NO_x	Hamilton	
Sector	**2014**	**2019**
EGU	19.03	33.76
Non-EGU	4.10	2.40
Non-road	8.19	5.90
Area	7.70	5.34
On-road	32.60	18.00
TOTAL	**71.62**	**65.40**

Table 18
Warren County, Ohio 2015 8-Hour Ozone Nonattainment Area NOx Emissions (TSD)

NO_x	Warren	
Sector	**2014**	**2019**
EGU	0.00	0.00
Non-EGU	0.94	2.08
Non-road	3.21	2.01
Area	1.03	1.04
On-road	11.00	6.20
TOTAL	**16.18**	**11.33**

Table 19
Kentucky Portion of the Cincinnati, OH-KY 2015 8-Hour Ozone Nonattainment Area TOTAL NOx Emissions (TSD)

County	2014 Base	2019 Attainment
Boone, KY	25.32	13.97
Campbell, KY	5.03	3.79
Kenton, KY	8.85	7.68
TOTAL NOx	**39.2**	**25.44**

Table 20
Kentucky Portion of the Cincinnati, OH-KY 2015 8-Hour Ozone Nonattainment Area TOTAL VOC Emissions (TSD)

(TSD)County	2014 Base	2019 Attainment
Boone, KY	15.53	12.83
Campbell, KY	4.55	3.95
Kenton, KY	7.07	6.78
TOTAL VOC	**27.15**	**23.56**

The following programs have shown, or are expected to show, reductions in VOC and NOx emissions due to regulatory measures implemented by both the EPA and Kentucky. Monitoring, recordkeeping, and reporting requirements are incorporated into Kentucky's air permits to ensure ongoing compliance. Kentucky has an active enforcement program to address violations identified by field office staff. These programs, serving as control measures, will ensure that the Area maintains the 2015 8-hour ozone NAAQS. Additionally, the Division will implement the following control measures which were contained in the SIP for the Area before redesignation of the Area as an attainment area.

Federal Control Measures

Tier 2 Emission Standards for Vehicles and Gasoline Sulfur Standards

EPA finalized a federal rule in 2000 to reduce emissions from passenger vehicles in each manufacturer's fleet to meet an average standard of 0.07 grams of NOx per mile.[15] Additionally, in January 2006, the sulfur content of gasoline was required to be on average 30 parts per million (ppm), which assisted in lowering NOx emissions. EPA estimated that the reduction of NOx emissions ranged from 77 percent for cars to 86 percent for minivans, light trucks, and small SUVs. VOC emissions were also reduced, ranging from 12 percent for cars up to 18 percent for minivans, light trucks, and small SUVs. These emission reductions are federally enforceable.

Tier 3 Emission Standards for Vehicles and Gasoline Sulfur Standards

On June 27, 2014, the EPA promulgated Tier 3 emission standards for light duty (and some larger) motor vehicles.[16] Light duty vehicles include cars, SUVs, vans, and most pickup trucks. Phase-in of the standards began with Model Year 2017. EPA has projected that by the time the Tier 3 standards are fully implemented in Model Year 2025, light duty vehicles will be required

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[15] EPA, Control of Air Pollution From New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards andGasoline Sulfur Control Requirements, 65 FR 6697 (Feb. 10, 2000; effective Apr. 10, 2000).

[16] 79 FR 23414

to reduce about 80% of their tailpipe emissions of VOC and NO_x (both of which contribute to the formation of ground-level ozone) and about 70% of their tailpipe emissions of particulates.

Like the Tier 2 standards, which were promulgated in 2000 and phased in between Model Years 2004 and 2009, the Tier 3 standards treat vehicles and fuels as a system: reductions in vehicle emissions are easier to achieve if the fuel used contains less sulfur. The Tier 3 standards require that gasoline contains no more than 10 ppm sulfur on an annual average basis, which is reduced from 30 ppm under the Tier 2 program. Further, the rule extends the required useful life of emission control equipment from 120,000 miles to 150,000 miles and has set standards for heavier duty gasoline-powered vehicles. The Tier 3 standards also require about a 50% reduction in evaporative emissions. The lower gasoline sulfur standard alone has already and will continue to enable more stringent vehicle emissions standards and more effective emissions control systems.

Tier 3 vehicle and fuel standards were primarily set in place to reduce emissions of NO_x, VOC, $PM_{2.5}$, and air toxics. EPA has estimated that in 2030, Tier 3 vehicles will make up the majority of the fleet and vehicle miles traveled. It is predicted that on-highway related NOx and VOC emissions will be reduced by about 21 percent, and carbon monoxide (CO) emissions by 24 percent. Additionally, other air toxics related to on-highway vehicles will also be reduced by approximately 10 to 30 percent nationally. Vehicle improvements and reduced emissions will continue beyond 2030 as more of the fleet is composed of vehicles meeting the fully phased-in Tier 3 standards.

Heavy-Duty Gasoline and Diesel Highway Vehicle Standards & Ultra Low-Sulfur Diesel Rule

In 2001, EPA established a comprehensive national control program to regulate heavy-duty vehicles and their fuel as a single system, with standards beginning to take effect in model year 2007. EPA estimated the program would “reduce particulate matter and oxides of nitrogen emissions from heavy duty engines by 90 percent and 95 percent below current standard levels, respectively.”[17] Like other motor vehicle and fuel standards, because the rules are phased in over time and vehicle fleet turnover continues over a timeline of years and decades, the rules continue to contribute to further reductions in emissions, and therefore in attainment of the 2015 ozone NAAQS for the Area.

Tier 4 Nonroad Engine Standards

On May 11, 2004, EPA signed the final rule introducing Tier 4 nonroad engine standards, which were phased-in from 2008-2015. Engine manufacturers were required to produce new engines with advanced emission control technologies. Exhaust emissions from these engines were predicted to decrease by more than 90 percent. When the full inventory of older non-road engines are replaced by Tier 4 engines, annual emission reductions are estimated at 738,000 tons of NOx and 129,000 tons of PM.

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[17] EPA, Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, 66 FR 5001 (Jan. 18, 2001; effective Mar. 19, 2001).

Clean Air Interstate Rule

Significant emissions reductions from coal-fired EGUs have contributed to the region's reduction in emissions and significant improvement in air quality. On May 12, 2005, the EPA promulgated the Clean Air Interstate Rule (CAIR). CAIR required 27 eastern states as well as the District of Columbia to achieve SO_2 and NOx emission reductions for new and existing EGUs. CAIR utilized a cap-and-trade system to reduce SO_2 and NOx emissions. The CAIR NO_x ozone season and annual programs began in 2009, while the CAIR SO_2 annual program began in 2010. The United States Court of Appeals D.C. Circuit remanded CAIR without vacatur on December 23, 2008. The December 23, 2008, court ruling left CAIR and the CAIR FIPs, including the CAIR trading programs, in place until the EPA issued a new rule to replace CAIR in accordance with the July 11, 2008 decision.

Kentucky developed regulations 401 KAR 51:210, 401 KAR 51:220, and 401 KAR 51:230 (effective February 2, 2007) in response to CAIR. However, reductions due to these regulations and CAIR were not included in the inventory and its projections for the Kentucky portion of the Area.

Cross-State Air Pollution Rule

EPA issued the Cross-State Air Pollution Rule (CSAPR) in July 2011 to significantly improve air quality by reducing power plant emissions that cross state lines and contribute to ozone and fine particle pollution in other states. CSAPR was scheduled to replace CAIR starting on January 1, 2012. However, the timing of CSAPR's implementation was affected by U.S. Court of Appeals D.C. Circuit actions that stayed and then vacated CSAPR before implementation. Accordingly, CSAPR Phase I implementation began January 1, 2015, and Phase II began in 2017.

On September 7, 2016, the EPA finalized an update to the Cross-State Air Pollution Rule (CSAPR) for the 2008 ozone NAAQS, reducing summertime NO_x emissions from power plants in 22 states in the eastern U.S. beginning May 2017.[18] The rule would reduce air quality impacts of ozone pollution that crosses state lines and would help downwind areas meet and maintain the 2008 ozone air quality standard. On September 13, 2019, the U.S. Court of Appeals D.C. Circuit remanded the CSAPR Update, stating it allowed significant contributions from upwind states past downwind attainment deadlines.[19] On March 15, 2021, EPA finalized the Revised Cross-State Air Pollution Rule Update, which took effect in the 2021 ozone season. The revised rule required further reductions of NO_x emissions from power plants in 12 states and will also require new or upgraded NO_x combustion controls in the 2022 ozone season.

Kentucky developed regulations 401 KAR 51:240 and 401 KAR 51:250 (effective July 5, 2018) in response to CSAPR. 401 KAR 51:240 established requirements for controlling annual NO_x emissions from large boilers and turbines in power plants pursuant to the CSAPR NO_x annual trading program. 401 KAR 51:250 established requirements for controlling ozone season NO_x emissions from large boilers and turbines in power plants pursuant to the CSAPR NO_x ozone season group 2 trading program.

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[18] 80 FR 75706

[19] *Wisconsin v. EPA*, 938 F. 3d 303 (D.C. Cir. 2019)

National GHG Emissions Standards for Passenger Cars and Light Trucks

EPA finalized federal GHG emissions standards for passenger cars and light trucks for model years 2023-2026 on December 30, 2021. The final standards will leverage advances in clean car technology, which will reduce climate pollution, improve public health, and save Americans money on gasoline. The standards should also result in avoiding more than 3 billion tons of GHG emissions, including NO_x emissions, through 2050. The standards for reductions in emissions of air pollutants from new motor vehicles will be federally enforceable.[20]

Utility Mercury Air Toxics Standards (MATS) and New Source Performance Standards (NSPS)

On February 16, 2012, the EPA published final rules for both the (1) MATS for new and existing coal- and oil-fired EGUs and (2) NSPS for fossil-fuel fired electric utility, industrial-commercial-institutional and small industrial-commercial-institutional steam generating units. The MATS rule is expected to reduce both NOx and SO_2 emissions, in addition to mercury and other air toxic emissions. MATS applies to EGUs larger than 25 megawatts that burn coal or oil for the purpose of generating electricity for sale and distribution through the national electric grid to the public. For the NSPS, the EPA revised the standards that new coal- and oil-fired power plants must meet for NOx, SO_2, and particulate matter (PM). The emission reductions associated with the MATS and the revised NSPS are federally enforceable.

Boiler and Reciprocating Internal Combustion Engine (RICE) National Emissions Standards for Hazardous Air Pollutants (NESHAP)

The NESHAP for industrial, commercial, and institutional boilers[21] and the NESHAP for reciprocating internal combustion engines[22] are projected to reduce VOC emissions.
The NESHAP for industrial, commercial, and institutional boilers and process heaters applies to boiler and process heaters located at major sources of hazardous air pollutants (HAP) that burn natural gas, fuel oil, coal, biomass, refinery gas, or other gas. The compliance deadline for existing boilers was January 31, 2016. The NESHAP includes work practice standards such as regular boiler tune-ups and a one-time energy assessment, emission limitations for pollutants including filterable PM, hydrochloric acid (HCl), mercury, and carbon monoxide (CO), and operating limitations for control devices. The emission limits and operating limits only apply to larger boilers of at least 10 million BTU/hr that burn fuels other than natural gas, refinery gas, or other gas 1 fuels (gaseous fuel containing no more than 10 $\mu g/m^3$ mercury).

The NESHAP for reciprocating internal combustion engines (RICE) applies to existing, new, or reconstructed stationary RICE located at major or area sources of HAP, excluding stationary RICE being tested at a stationary RICE test cell/stand.

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[20] 86 FR 74434

[21] National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, 40 CFR Part 63 Subpart DDDDD.

[22] National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, 40 CFR Part 63 Subpart ZZZZ

The compliance date for existing stationary RICE, excluding existing non-emergency stationary compression ignition (CI) RICE, with > 500 brake HP located at a major source of HAP emissions was June 15, 2007. The compliance date for existing non-emergency stationary CI RICE with > 500 brake HP located at a major source of HAP, existing stationary CI RICE with ≤ 500 brake HP located at a major source of HAP, or existing stationary CI RICE located at an area source of HAP was May 3, 2013. The compliance date for existing stationary spark ignition (SI) RICE with ≤ 500 brake HP located at a major source of HAP emissions, or an existing stationary SI RICE located at an area source of HAP emissions was October 19, 2013. The NESHAP includes work practice standards such as engine maintenance, fuel requirements, regular performance testing, operating limitations, and emission limitations for pollutants including formaldehyde and CO.

NOx SIP Call in Surrounding States

In October 1998, the EPA made a finding of significant contribution of NOx emissions from certain states and published a rule that set ozone season NOx budgets for the purpose of reducing regional transport of ozone.[23] This rule, referred to as the NOx SIP Call, called for ozone season controls to be put on utility and very large industrial boilers, as well as internal combustion engines in 22 states in the Eastern United States. A NOx emissions budget was set for each state and the states were required to develop rules that would allow them to meet their budget. A NOx trading program was established, allowing sources to buy credits to meet their NOx budget as opposed to actually installing controls.[24] The emission budgets were to be met by May of 2004. While the NO_x budget trading program ended in 2008, the NO_x SIP Call requirements for surrounding affected states still apply to states that elected to impose control measures on large EGUs or large non-EGUs. The NO_x SIP Call requirements included an enforceable control mechanism and monitoring, record keeping and reporting.[25] Even with the NO_x trading program, the amount of ozone season NOx emissions have decreased significantly in and around Kentucky.

State Control Measures

All state measures relied on in this section have been adopted into the Kentucky State Implementation Plan (SIP) at 40 C.F.R. Part 52, Subpart S.[26] Furthermore, the Division is implementing and will continue to implement all measures with respect to the control of ozone which were contained in the SIP for the Area before redesignation of the Area as an attainment area.

NOx SIP Call Rule

In response to the EPA's NOx SIP call, Kentucky adopted 401 KAR 51:150 and 401 KAR 51:160 to control the emissions of NOx from EGUs and large stationary combustion sources (75 FR 54755). These regulations cover: (1) fossil fuel-fired stationary boilers, combustion turbines, and combined cycle systems serving a generator with a nameplate capacity greater than 25 megawatts and selling any amount of electricity; (2) fossil fuel-fired stationary boilers, combustion turbines, and combined cycle systems having a maximum design heat input greater

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[23] 63 FR 57356

[24] 68 FR 37418

[25] 40 CFR 51.121

[26] *Available at* https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-52/subpart-S.

than 250 million British thermal units per hour; and (3) reciprocating stationary internal combustion engines rated at equal or greater than 2400 brake horsepower (3000 brake horsepower for diesel engines and 4400 brake horsepower for dual fuel engines). As part of the NOx SIP call, the EPA rules established a NOx budget for sources in Kentucky and other states.

Other Sources

The Division regulates NO_X emissions from cement kilns, setting a limit of 6.6 lbs per ton of clinker produced, averaged over a 30-day period.[27]

The Division has specific regulations for new and existing sources in a variety of other source categories, including various limits on emissions of NO_X and VOCs in Chapters 59 and 61 of Title 401 of the Kentucky Administrative Regulations (KAR).[28]

Open Burning Bans

401 KAR 63:005 *Open Burning* was first incorporated into the Kentucky SIP on July 12, 1982.[29] The latest revision to the open burning regulation was finalized on October 17, 2007, which addressed problems involving the disposal of debris from storms, mixed household garbage and clarified when open burning is permitted.[30] Kentucky's open burning regulations prohibit most types of open burning in areas that have been or are currently in violation of the 8-hour ozone NAAQS within Kentucky during the period of May-September when ozone development is most likely. This requirement continues in the Northern Kentucky area.

Requirement 2 of 3

A demonstration that improvement in air quality between the year violations occurred and the year attainment was achieved is based on permanent and enforceable emission reductions and not on temporary adverse economic conditions or unusually favorable meteorology.

Demonstration:

Meteorological conditions were not unusually favorable for low ozone levels during the three-year attainment period according to data collected by the Lake Michigan Air Director's Consortium (LADCO) on behalf of Ohio EPA. LADCO analyzed the fourth-high eight-hour ozone values against the average May to September temperatures between the years 2005 to 2021. This analysis determined that while the average summer temperatures have remained steady, the ozone concentrations have decreased, as shown in Figure 4. Lastly, LADCO performed a classification and regression tree (CART) analysis to demonstrate the improvement in air quality is not based on unusually favorable meteorology. The results of this analysis demonstrate that mean ozone concentrations have decreased from 2005 to 2020 in the Area. Appendix C includes the full CART analysis document, which provides additional details and methodology regarding the analysis.

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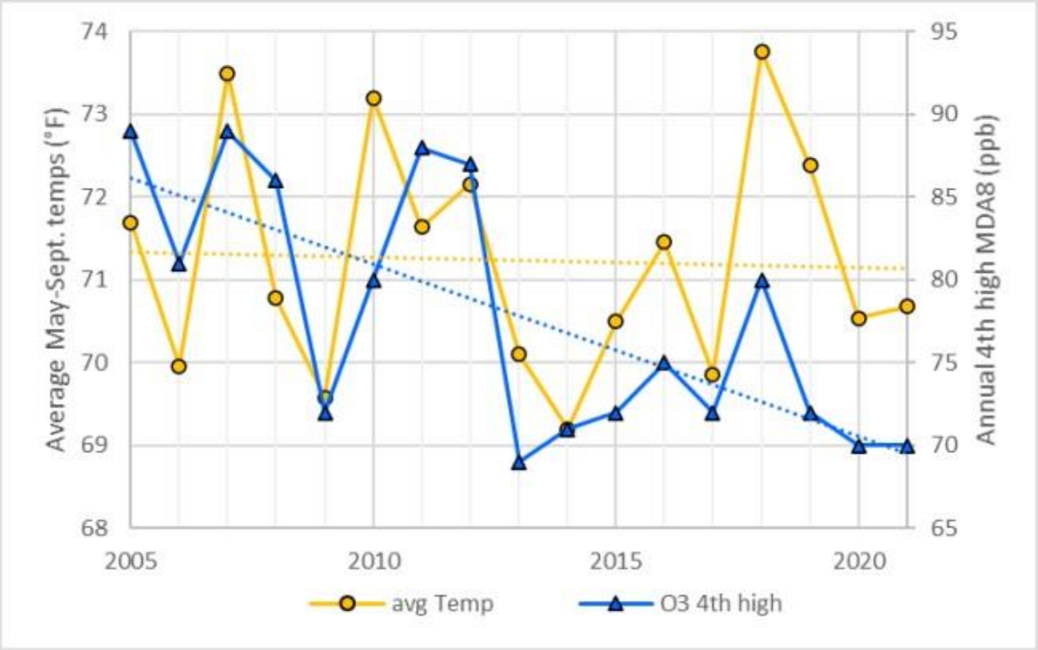
[27] 401 KAR 51:170.

[28] All Division regulations are available at https://eec.ky.gov/Environmental-Protection/Air/Pages/Air-Quality-Regulations.aspx.

[29] 47 FR 30059; 63 FR 67586

[30] 72 FR 58759

Figure 4
Annual 4th High Maximum Daily Eight-Hour Ozone Concentrations versus Average Summer Temperatures



Moreover, while the COVID-19 pandemic began in earnest in 2020 and did cause temporary adverse economic conditions beginning in March 2020, indicators show that sources of emissions mostly rebounded by mid-2020. One of the most affected emissions sectors during the pandemic were traffic volumes. Although other emissions sectors beyond traffic volumes were affected, currently no data is readily available pertaining to other NOx emissions sectors. While the Cabinet acknowledges that traffic volumes are not a total representation of all emissions, it is a sector that demonstrated a temporary improvement in air quality rather than a permanent improvement; therefore, the temporary decrease in traffic volumes cannot be attributed to permanent and enforceable reduction measures.

Traffic volumes measured by the Ohio Kentucky Indiana Regional Council of Governments (OKI) indicate a rebound from an average of 556,583 vehicles per day in January 2019 before the first COVID-19 peak to 544,583 vehicles per day in December 2021 after the second COVID-19 peak as shown in Figure 5.[31] Because the traffic volume decreases were brief (approximately 2 months in duration), they did not influence emissions on a long enough timescale to affect the Area's attainment design values. Monitoring data in the Area demonstrates that the annual 4th maximum 8-hour design values did not dramatically change between 2019 and 2021 when compared to previous years, as shown in Table 3. Therefore, the Cabinet believes that the COVID-19 pandemic has had little effect on the monitored levels of ozone.

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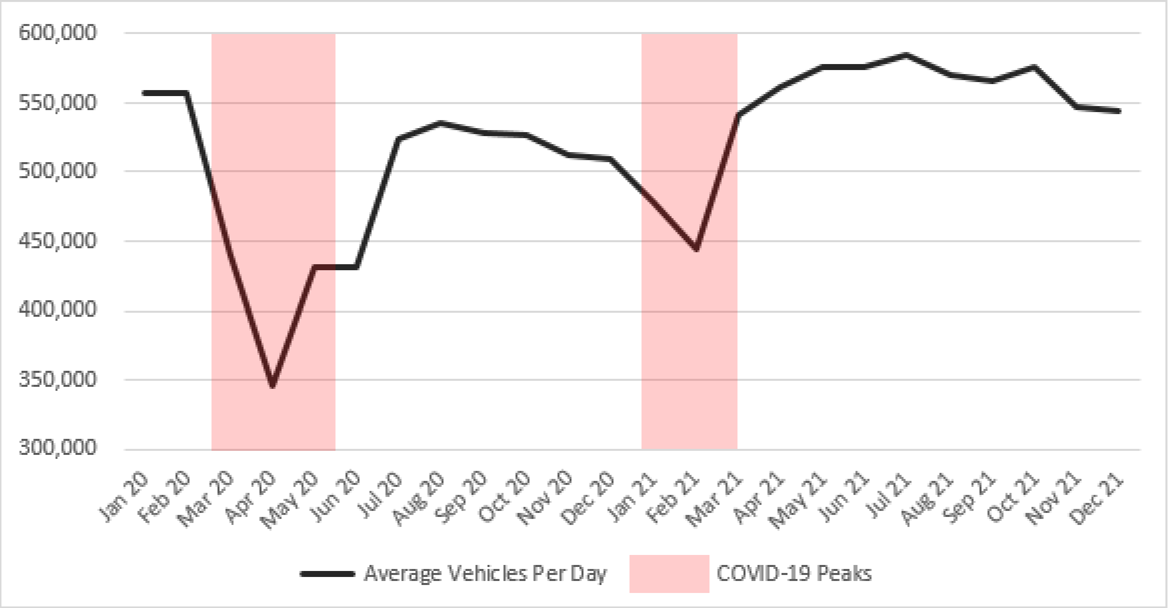
[31] Please see Appendix C for OKI traffic data.

Figure 5
Traffic Volumes and COVID-19



Requirement 3 of 3

Provisions for future annual updates of the inventory to enable tracking of the emission levels, including an annual emission statement from major sources.

Demonstration: Point sources that are 25 tons or more are required to submit annual air emissions data to comply with the annual emissions statement requirement. All major and minor point sources have been captured in Kentucky's database of annual air emissions, in accordance with EPA's Air Emissions Reporting Requirements (AERR). Kentucky's database of annual air emissions will be used to prepare ozone precursor inventories for future years, as necessary, to comply with the inventory reporting requirements established in the CFR. Emissions information will be compared to the 2019 attainment year and the 2035 projected maintenance year inventories to assess emission trends, as necessary, and to assure continued compliance with the ozone standard.

D. Section 110 and Part D requirements (CAA Section 107(d)(3)(E)(v))

For purposes of redesignation, a state must meet all requirements of Section 110 State Implementation Plans for National Primary and Secondary Ambient Air Quality Standards and Part D Plan Requirements for Nonattainment Areas that were applicable prior to submittal of the complete redesignation request.

Demonstration: This document demonstrates that the Kentucky portion of the Area meets the requirements of CAA Section 110 and PartD, and therefore, is eligible to be redesignated to attainment. In addition, the following list of prior actions further provide assurance of Kentucky's commitment to meet the requirements of CAA Section 110 and Part D.

Emissions Inventory (CAA Section 172(c)(3) & 182(a)(1))

The Division submitted an emissions inventory SIP for the Cincinnati, OH-KY and Louisville, KY-IN nonattainment areas on December 22, 2021. EPA's proposed approval of this SIP was published in the federal register on July 26, 2022.[32]

Emissions statements (CAA Section 182(a)(3)(B))

The Division submitted a SIP revision on October 16, 2020 demonstrating its existing rules met the requirements to collect emissions statements for the 2015 8-hour ozone NAAQS for the Area. The submittal was promulgated on May 26, 2022.[33]

New Source Review (CAA Section 182(a)(2)(C) & 182(b))

The Division also submitted a certification on October 15, 2020, that its existing Nonattainment New Source Review (NNSR) program meets the nonattainment planning requirements for the 2015 8-hour ozone NAAQS for the Louisville, KY-IN and Cincinnati, OH-KY nonattainment areas. The submittal was promulgated on May 5, 2022.[34]

Reasonably Available Control Measures & Reasonably Available Control Technology (RACM/RACT) (CAA Section 172(c)(1) & 182(a)(2)(A)

Section 182(a)(2)(A) of the 1990 CAA Amendments requires states with marginal nonattainment areas to submit a SIP revision that includes provisions to correct requirements in (or add requirements to) the plan concerning reasonably available control technologies (RACT).[35]

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[32] 87 FR 44310

[33] EPA, *Air Plan Approval; KY; Emissions Statement Requirements for the 2015 8-Hour Ozone Standard Nonattainment Area,* 87 FR 24429 (Apr. 26, 2022; effective May 26, 2022).

[34] EPA, *Air Plan Approval; Kentucky; 2015 8-Hour Ozone Nonattainment New Source Review Permit Program Requirements,* 87 FR 19649 (Apr. 5, 2022; effective May 5, 2022).

[35] 42 U.S.C. §7511a(a)(2)(A).

The Division has regulations in place that were previously adopted into the SIP. The Division promulgated rules requiring RACT for ozone from stationary sources for particular source categories. The RACT requirements can be found in 401 KAR Chapter 59 for new sources and 401 KAR Chapter 61 for existing sources. For those sources that are not subject to RACT requirements in 401 KAR Chapters 59 or 61, the generally applicable Kentucky RACT rules for ozone can be found in 401 KAR 50:012.

E. Maintenance plans (CAA Section 107(d)(3)(E)(iv))

Section 107(d)(3)(E)(iv) requires that for an area to be redesignated, EPA must fully approve a maintenance plan that meets the requirements of CAA Section 175A. The maintenance plan constitutes a SIP revision and must provide for maintenance of the relevant NAAQS in the area for at least ten years after redesignation, along with a commitment to review the plan. Section 175A also requires that the plan shall contain additional measures, if any, as may be necessary to ensure such maintenance with the standard.

Part E discusses the maintenance plan requirements and demonstrates Kentucky's compliance with the requirements of CAA Section 107(d)(3)(E)(iv). Part C of this submittal, regarding emissions inventory, demonstrates that the ozone precursor of emissions of nitrogen oxides (NOx) and volatile organic compounds (VOC) declined over time and that these reductions are due to permanent and enforceable emission reductions. Other emission inventory related information in Part E includes a projection of the emission inventory to a year at least 10 years following redesignation; a demonstration that the projected level of emissions is sufficient to maintain the 8-hour ozone standard; and a commitment to provide future updates of the inventory to enable tracking of emission levels during the 10-year maintenance period.

The maintenance plan shall also contain such contingency measures, as the Administrator deems necessary, to ensure prompt correction of any violation of the NAAQS. At a minimum, the contingency measures must include a requirement that the state will implement all measures contained in the nonattainment SIP prior to redesignation.

Requirement 1 of 6

A demonstration that the projected level of emissions is sufficient to maintain the ozone standard, which includes a projection of the emission inventory to a year at least 10 years following redesignation. Maintenance is demonstrated either by showing that future levels of ozone will not exceed the level of the attainment inventory, or by modeling to show that the future mix of sources and emission rates will not cause a violation of the NAAQS.

Demonstration: A maintenance demonstration requires a comparison of the projected emissions inventory with the attainment year inventory. If the projected emissions remain at or below the attainment year emissions, there is a demonstration of maintenance. If, however, the projected emissions are above the attainment year emissions, then additional control measures are required to ensure the projected emissions will remain at or below the attainment year emissions. The inventory for the base year, attainment year and annual projections for all pollutant sources can be found in Appendix B.

Tables 21 through 34 detail the projected tons per summer day (TSD) emissions through 2035 for all counties within the Area. Tables 35 and 36 demonstrate summaries of the total projected NOx and VOC emissions within the Area. The 2035 projected emissions totals (VOC and NOx) for Boone, Campbell, and Kenton Counties are below the 2019 emissions totals, thus demonstrating continued maintenance of the 8-hour ozone standard.

For the emissions collected from the Emissions Modeling platforms, tons per summer day emissions were derived by dividing July emissions by the number of days in July (i.e., the average July day). For emissions from the state inventory database, tons per summer day emissions were derived from the Emissions Modeling platform 2016v2 as the ratio of the average July day to annual emissions for the point sector. July emissions were chosen to calculate tons per summer day in both instances because tons per summer day is supposed to represent the average summer day emissions and July is the most representative month for an average summer day. Separate conversion factors were derived for the EGUs, non-EGUs, and point oil and gas sectors.

To demonstrate that emissions are sufficient to maintain the NAAQS, the emissions inventory has been projected for the years 2026 and 2035. Using 2019 as the attainment year, the subsequent years were chosen at appropriate intervals and project maintenance for at least a 10-year period. The 2026 projected emissions were derived from 2026 EPA-projected emissions from the 2016v2 (2026fj) platform without modification.

The 2035 projected emissions for area, non-road and non-EGUs were derived by extrapolating from the 2032 EPA-projected emissions from the 2016v2 (2032fj) using the TREND function in Microsoft Excel. The 2035 projected emissions for EGUs were derived by extrapolating from the 2030 EPA-projected emissions from the 2016v2 (2030fj) using the TREND function in Microsoft Excel. If the TREND function resulted in a negative value, the emissions were assumed to be the same is in 2030. If a 2030 projection was missing, the emissions were assumed to be the same as in 2026.

The TREND function uses linear interpolation and least-squares regression to interpolate or extrapolate from known points. Linear regression was chosen because it is both the simplest and most accessible method available for projecting emissions.

Table 21
Boone County, Kentucky 2015 8-Hour Ozone Nonattainment Area
Projected VOC Emissions
(TSD)

VOC	**Boone**		
Sector	**2019**	**2026**	**2035**
EGU	0.33	0.25	0.25
Non-EGU	2.42	1.43	1.43
Non-road	1.49	1.28	1.25
Area	7.29	8.21	8.99
On-road	1.30	1.00	0.80
TOTAL	**12.83**	**12.17**	**12.72**

Table 22
Campbell County, Kentucky 2015 8-Hour Ozone Nonattainment Area
Projected VOC Emissions
(TSD)

VOC	**Campbell**		
Sector	**2019**	**2026**	**2035**
EGU	0.00	0.00	0.00
Non-EGU	0.40	0.42	0.42
Non-road	0.52	0.40	0.37
Area	2.23	2.22	2.22
On-road	0.80	0.50	0.30
TOTAL	**3.95**	**3.54**	**3.31**

Table 23
Kenton County, Kentucky 2015 8-Hour Ozone Nonattainment Area
Projected VOC Emissions
(TSD)

VOC	**Kenton**		
Sector	**2019**	**2026**	**2035**
EGU	0.00	0.00	0.00
Non-EGU	0.43	0.64	0.64
Non-road	0.74	0.71	0.72
Area	4.11	4.21	4.28
On-road	1.50	1.00	0.70
TOTAL	**6.78**	**6.56**	**6.34**

Table 24
Butler County, Ohio 2015 8-Hour Ozone Nonattainment Area
Projected VOC Emissions
(TSD)

VOC	**Butler**		
Sector	**2019**	**2026**	**2035**
EGU	0.04	0.01	0.01
Non-EGU	2.37	1.74	1.71
Non-road	2.52	2.24	2.18
Area	12.28	12.47	12.65
On-road	3.90	2.90	2.10
TOTAL	**21.11**	**19.36**	**18.65**

Table 25
Clermont County, Ohio 2015 8-Hour Ozone Nonattainment Area Projected VOC Emissions (TSD)

VOC	Clermont		
Sector	**2019**	**2026**	**2035**
EGU	0.11	0.13	0.00
Non-EGU	0.35	0.06	0.06
Non-road	2.17	1.68	1.54
Area	6.84	7.41	7.87
On-road	2.20	1.60	1.20
TOTAL	**11.67**	**10.88**	**10.67**

Table 26
Hamilton County, Ohio 2015 8-Hour Ozone Nonattainment Area Projected VOC Emissions (TSD)

VOC	Hamilton		
Sector	**2019**	**2026**	**2035**
EGU	0.30	0.17	0.00
Non-EGU	1.91	1.29	1.29
Non-road	6.15	5.53	5.46
Area	27.26	26.21	25.54
On-road	8.40	6.00	4.50
TOTAL	**44.02**	**39.20**	**36.79**

Table 27
Warren County, Ohio 2015 8-Hour Ozone Nonattainment Area Projected VOC Emissions (TSD)

VOC	Warren		
Sector	**2019**	**2026**	**2035**
EGU	0.00	0.00	0.00
Non-EGU	0.74	0.82	0.82
Non-road	2.49	1.86	1.67
Area	8.88	10.14	11.18
On-road	2.40	1.80	1.40
TOTAL	**14.51**	**14.62**	**15.07**

Table 28
Boone County, Kentucky 2015 8-Hour Ozone Nonattainment Area Projected NOx Emissions (TSD)

NO_x	Boone		
Sector	**2019**	**2026**	**2035**
EGU	5.65	1.82	2.03
Non-EGU	0.34	0.31	0.32
Non-road	0.74	0.58	0.54
Area	2.54	3.22	3.85
On-road	4.70	2.60	2.00
TOTAL	**13.97**	**8.53**	**8.74**

Table 29
Campbell County, Kentucky 2015 8-Hour Ozone Nonattainment Area Projected NOx Emissions (TSD)

NO_x	Campbell		
Sector	**2019**	**2026**	**2035**
EGU	0.00	0.00	0.00
Non-EGU	0.29	0.28	0.28
Non-road	0.38	0.29	0.26
Area	0.92	0.70	0.58
On-road	2.20	0.90	0.60
TOTAL	**3.79**	**2.17**	**1.72**

Table 30
Kenton County, Kentucky 2015 8-Hour Ozone Nonattainment Area Projected NOx Emissions (TSD)

NO_x	Kenton		
Sector	**2019**	**2026**	**2035**
EGU	0.00	0.00	0.00
Non-EGU	0.28	0.29	0.30
Non-road	0.57	0.41	0.37
Area	1.53	1.22	1.06
On-road	5.30	2.40	1.60
TOTAL	**7.68**	**4.32**	**3.33**

Table 31
Butler County, Ohio 2015 8-Hour Ozone Nonattainment Area Projected NOx Emissions
(TSD)

NO_x	Butler		
Sector	**2019**	**2026**	**2035**
EGU	0.91	0.28	0.21
Non-EGU	7.72	8.79	8.52
Non-road	2.01	1.46	1.26
Area	2.26	2.02	1.90
On-road	7.00	4.40	3.30
TOTAL	**19.90**	**16.95**	**15.19**

Table 32
Clermont County, Ohio 2015 8-Hour Ozone Nonattainment Area Projected NOx Emissions
(TSD)

NO_x	Clermont		
Sector	**2019**	**2026**	**2035**
EGU	15.87	10.42	0.00
Non-EGU	0.00	0.01	0.01
Non-road	1.43	1.07	0.90
Area	1.09	0.93	0.81
On-road	3.80	2.30	1.60
TOTAL	**22.19**	**14.73**	**3.32**

Table 33
Hamilton County, Ohio 2015 8-Hour Ozone Nonattainment Area Projected NOx Emissions
(TSD)

NO_x	Hamilton		
Sector	**2019**	**2026**	**2035**
EGU	33.76	11.00	0.00
Non-EGU	2.40	2.72	2.77
Non-road	5.90	4.12	3.60
Area	5.34	5.03	4.69
On-road	18.00	11.30	8.60
TOTAL	**65.40**	**34.17**	**19.66**

Table 34
Warren County, Ohio 2015 8-Hour Ozone Nonattainment Area Projected NOx Emissions (TSD)

NO_x	Warren		
Sector	**2019**	**2026**	**2035**
EGU	0.00	0.00	0.00
Non-EGU	2.08	2.23	2.05
Non-road	2.01	1.44	1.20
Area	1.04	1.00	0.95
On-road	6.20	4.00	3.00
TOTAL	**11.33**	**8.67**	**7.20**

Table 35
Cincinnati, OH-KY
2015 8-Hour Ozone Nonattainment Area
TOTAL Projected NO_x Emissions
(TSD)

County	2019 Attainment	2026 Interim	2035 Maintenance
Boone, KY	13.97	8.53	8.74
Campbell, KY	3.79	2.17	1.72
Kenton, KY	7.68	4.32	3.33
Butler, OH	19.90	16.95	15.19
Clermont, OH	22.19	14.73	3.32
Hamilton, OH	65.40	34.17	19.66
Warren, OH	11.33	8.67	7.20
TOTAL NOx	**144.26**	**89.54**	**59.16**

Ohio projections from Ohio’s redesignation request (87 FR 35104)

Table 36
Cincinnati, OH-KY
2015 8-Hour Ozone Nonattainment Area
TOTAL Projected VOC Emissions
(TSD)

County	2019 Attainment	2026 Interim	2035 Maintenance
Boone, KY	12.83	12.17	12.72
Campbell, KY	3.95	3.54	3.31
Kenton, KY	6.78	6.56	6.34
Butler, OH	21.11	19.36	18.65
Clermont, OH	11.67	10.88	10.67
Hamilton, OH	44.02	39.20	36.79
Warren, OH	14.51	14.62	15.07
TOTAL VOC	**114.87**	**106.33**	**103.55**

Ohio projections from Ohio's redesignation request (87 FR 35104)

Motor Vehicle Emissions Budget (CAA §176(c))

The transportation conformity regulation, 40 CFR Part 93.124(a), *Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved under Title 23 U.S.C. or the Federal Transit Laws*, requires that mobile source emissions submitted or approved to a state's SIP be used in determining conformity of transportation plans for the area. This regulation also allows the addition of a safety margin to the mobile emissions budgets. Per 40 CFR 93.101, the safety margin is defined as "the amount by which the total projected emissions from all sources of a given pollutant are less than the total emissions that would satisfy the applicable requirement for reasonable further progress, attainment or maintenance." In accordance with 40 CFR 93.105, interagency consultation was used to select an interim year of 2026.

Table 37 demonstrates the emission estimation totals for on-road mobile sources within the Kentucky portion of the Area. Table 38 demonstrates the emission estimation totals for on-road mobile sources for the entire Area. Table 39 contains the emissions budgets for on-road mobile sources within the Kentucky portion of the Area for 2026 and 2035. These projected budgets were used to calculate safety margins, which are also included in Table 39. Safety margins were calculated by taking 15 percent of the total on-road mobile source emission estimates for the Kentucky portion of the Area.

For 2026, the total safety margin for the Kentucky portion of the Area added to the highway mobile source VOC emissions budget is 0.38 TSD. Also, for 2026, the total safety margin for the Kentucky portion of the Area added to the highway mobile source NOx emissions budget is 0.90 TSD. For 2035, the total safety margin for the Kentucky portion of the Area added to the highway mobile source VOC emissions budget is 0.29 TSD. Also, for 2035, the total safety margin for the Kentucky portion of the Area added to the highway mobile source NOx emissions budget is 0.63 TSD.

Ohio EPA consulted with EPA and determined a 15 percent safety margin was appropriate for the Area. The agreed upon safety margin for the Area was a part of the interagency consultation process according to 40 CFR Part 93.105. Kentucky participated in this determination by taking part in the interagency consultation process. The emission estimates are derived from the travel demand model and MOVES3.

Table 37
Cincinnati, OH-KY
2015 8-Hour Ozone Nonattainment Area – Kentucky Counties Emission Estimation Totals for On-road Mobile Sources

	2014	2019	2026	2035
VOC (TSD)	4.19	3.71	2.56	1.96
NOx (TSD)	15.63	12.31	6.02	4.21
VMT (miles/day)	9,323,791	9,834,728	10,670,456	11,589,528

Table 38
Cincinnati, OH-KY
2015 8-Hour Ozone Nonattainment Area – Emission Estimation Totals for On-Road Mobile Sources for the Cincinnati OH-KY Area

	2014	2019	2026	2035
VOC (TSD)	32.13	21.28	15.43	11.64
NOx (TSD)	79.19	47.75	28.16	21.01
VMT (miles/day)	50,246,680	51,809,403	54,226,163	57,030,673

Table 39
Kentucky Portion of the Cincinnati, OH-KY
2015 8-Hour Ozone Nonattainment Area
Highway Mobile Emission Budgets with Safety Margins
(TSD)

	2026 Estimated Emissions	2026 Mobile Safety Margin Allocation*	2026 Total Mobile Budget	2035 Estimated Emissions	2035 Mobile Safety Margin Allocation*	2035 Total Mobile Budget
VOC (TSD)	2.56	0.38	2.94	1.96	0.29	2.25
NOx (TSD)	6.02	0.90	6.92	4.21	0.63	4.84
VMT (miles/ day)	10,670,456	-	-	11,589,528	-	-

*The 15 percent margin of safety was calculated by taking 15 percent of the mobile source emission estimates.

Table 40
Cincinnati, OH-KY
2015 8-Hour Ozone Nonattainment Area Comparison of 2019 Attainment Year and Projected Emission Estimates (TSD)

	2019	2026	2026 Projected Decrease	2035	2035 Projected Decrease
VOC	114.87	106.33	8.54	103.55	11.32
NOx	144.26	89.54	54.72	59.16	85.10

As demonstrated in Table 40 above, VOC emissions in the Area are projected to decrease by 8.54 TSD in 2026 and 11.32 TSD in 2035. Furthermore, NOx emissions in the Area are projected to decrease by 54.72 TSD in 2026 and 85.10 TSD in 2035.

Requirement 2 of 6

Section 182(a)(2)(A) of the 1990 CAA Amendments requires states with marginal nonattainment areas to submit a SIP providing for implementation of all reasonably available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonable available control technology (RACT).

Demonstration: Section 172(c) requires the plans for all nonattainment areas to provide for the implementation of all reasonably available control measures (RACM) as expeditiously as practicable and to provide for attainment of the NAAQS. However, the Area is a marginal nonattainment area and is not required to implement RACT/RACM. Additionally, the Area has achieved attainment of the 2015 8-hour Ozone standard, therefore additional control measures are not needed to provide for attainment.[36]

Even though there are no further measures needed to provide for attainment in the Area, Kentucky has regulations in place that were previously adopted into the SIP. Kentucky promulgated rules requiring RACM for ozone from stationary sources for particular source categories. The RACT requirements can be found in 401 KAR Chapter 59 for new sources and 401 KAR Chapter 61 for existing sources. Statewide RACT rules have been applied to all major sources of VOCs located in a county or portion of a county which is designated ozone nonattainment, for any nonattainment classification except marginal. For thosesources that are not subject to RACT requirements in 401 KAR Chapters 59 or 61, the generally applicable Kentucky RACT rules for ozone can be found in 401 KAR 50:012.

Additionally, the Area is not subject to the Section 182(a)(2) RACT "fix up" requirement since the Area was designated as nonattainment for the 2015 ozone NAAQS after the enactment of the 1990 CAA amendments. The Area also complied with this requirement under the prior 1-hour ozone NAAQS.[37]

Requirement 3 of 6

Section 182(a)(3)(B) of the CAA requires states to ensure they have an emission reporting program in place, requiring stationary sources of NOx or VOCs to submit an annual emission statement certifying that the information contained in the statement is accurate to the best knowledge of the individual certifying the statement.

1. **Demonstration:** Kentucky first implemented an Emissions Statement Program in response to a nonattainment designation of the 1997 ozone NAAQS. Since that time, the original regulation has been changed. Kentucky does not have a stand-alone regulation for the emissions statement requirements of CAA Section 182(a)(3)(B). The emissions statement is listed within Kentucky's permitting regulations. Regulations 401 KAR 52:020 *Title V permits*, 52:030 *Federally enforceable permits for nonmajor sources*, 52:040 *State-origin permits*, and 52:070 *Registration of designated sources* require that an emission certification be submitted to the Division annually. Kentucky submitted an emissions statement SIP revision to EPA on October 15, 2020. EPA published final approval for this revision on April 26, 2022, with a promulgation date of May 26, 2022.[38]

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[36] 81 FR 95041; *See* the Ohio Utility Group, et al v. EPA, et al, Case No. 16-1441

[37] 59 FR 32343 and 60 FR 31087

[38] 87 FR 24429

Requirement 4 of 6

Section 172(c)(2) of the 1990 CAA Amendments requires SIPs for nonattainment areas to show reasonable further progress (RFP). Section 171(1) defines RFP as “such annual incremental reductions in emissions of the relevant air pollutant as are required by this part or may reasonably be required by the Administrator for the purpose of ensuring attainment of the applicable national ambient air quality standard by the applicable date."

Demonstration: Kentucky's RFP provisions are covered in 401 KAR 51:052 *Review of new sources in or impacting upon nonattainment areas*. In a federal register, Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements, released February 4, 2019, EPA stated that upon a determination that an area is attaining the standard, the requirements for the area to submit RFP plans and other attainment-related planning requirements shall be suspended for as long as the area continues to attain the standard (83 FR 62998). On June 1, 2020, EPA articulated in "Air Plan Approval; Kentucky; Infrastructure Requirements for the 2015 8-Hour Ozone National Ambient Air Quality Standard" that the Commonwealth of Kentucky met the infrastructure requirements of the CAA for the 2015 8-hour ozone NAAQS (85 FR 33021). Subsequently, EPA took final action to approve the PSD and modeling requirements on October 2, 2020.[39] On February 22, 2022, EPA proposed to disapprove the interstate transport portion of the infrastructure requirements for the 2015 8-hour ozone NAAQS.[40] However, quality-assured and certified data demonstrates that the Kentucky portion of the Area is in attainment for the 2015 8-hour ozone NAAQS for the years 2019-2021, and Kentucky anticipates EPA final approval in a separate rulemaking action. The requirements for RFP and other measures needed for attainment do not apply for redesignations because they only have meaning for areas not attaining the standard.[41] Therefore, Kentucky is not required to demonstrate RFP for the 2015 Ozone NAAQS.

Requirement 5 of 6

Acceptable provisions to provide for new source review (NSR). The requirements of the NSR program will be replaced by the prevention of significant deterioration (PSD) program once the Area has been redesignated; therefore, to ensure the PSD program will become fully effective immediately upon redesignation, the state must establish that it has the proper provisions in place.

Demonstration: Kentucky has a longstanding and fully implemented NSR program. This is addressed in 401 KAR 51:052.[42] Additionally, 401 KAR Chapter 51 includes provisions for the PSD permitting program (401 KAR 51:017). Kentucky's NSR and PSD programs were revised

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[39] 85 FR 54507 *Air Plan Approvals; KY; Prevention of Significant Deterioration and Modeling Infrastructure Requirements for 2015 Ozone NAAQS*

[40] 87 FR 9498

[41] John Calcagni, “Procedures for Processing Requests to Redesignate Areas to Attainment”, September 4, 1992: 6

[42] http://www.lrc.ky.gov/kar/401/051/052.htm

and approved into Kentucky’s SIP on September 15, 2010.[43] Both programs were found applicable to the 2015 ozone NAAQS. On October 15, 2020, Kentucky submitted a SIP revision addressing the NNSR requirements for the 2015 8-hour ozone NAAQS for Kentucky's 2015 8-hour ozone Marginal nonattainment areas. EPA published final approval for this revision on April 5, 2022, with a promulgation date of May 5, 2022.[44]

Any facility that is not listed in the 2014 emission inventory, or for the closing of which credit was taken in demonstrating attainment, will not be allowed to construct, reopen, modify, or reconstruct without meeting all applicable NSR requirements. Once the Area is redesignated, Kentucky will implement NSR through the PSD program.

Requirement 6 of 6

Section 172(c)(6) requires other plan provisions, such as control measures, to provide for attainment of the standard.

Demonstration: Since the Area has already attained the standard, no additional measures are needed to provide for attainment. However, control measures already in place, or being implemented over the next few years, will continue to reduce stationary point, highway mobile, and non-road mobile source emissions. Table 41 demonstrates that emissions will decrease between the attainment year and the 2035 maintenance year. VOC emissions in the Area are projected to decrease by 11.32 TSD while NO_x emissions are projected to decrease by 85.10 TSD. These reductions reflect the integration of programs that will continue to reduce emissions. The Tier 4 nonroad engine standards, the national program for greenhouse gas (GHG) emissions, and fuel economy standards are a few examples of the federal programs that will continue to ensure permanent and enforceable emissions reductions over time.

Table 41
Cincinnati, OH-KY 2015
8-Hour Ozone Nonattainment Area
Emission Reductions
(TSD)

	2019	2035	Total Reductions
VOC	114.87	103.55	**11.32**
NOx	144.26	59.16	**85.10**

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[43] 75 FR 55988
[44] 87 FR 19649

Contingency Measures

This section provides detailed information regarding contingency measures, as required by CAA Section 107(d)(3)(E)(iv).

Requirement 1 of 3

A commitment to submit a revised plan eight years after redesignation.

Demonstration: Section 175A(b) of the CAA requires that eight years after formal redesignation, the state continues to provide for maintenance of the standard by submitting another maintenance plan that covers an additional 10 years. Kentucky commits to submit to EPA a plan for future maintenance of the standard in Boone, Campbell and Kenton Counties as required.

Requirement 2 of 3

A commitment to expeditiously enact and implement additional contingency control measures in response to exceeding specified predetermined levels (triggers) or in the event that future violations of the ambient standard occur.

Demonstration: Future reviews of actual emissions for this redesignated area will be performed using the latest emission factors, models, and methodologies. For these periodic inventories, Kentucky will review the assumptions made for the purpose of the maintenance demonstration concerning projected growth of activity levels. If any of these assumptions appear to have changed substantially, Kentucky will re-project emissions.

If an annual fourth high monitored value of 0.071 ppm or greater occurs in a single ozone season or if periodic emission inventory updates reveal excessive or unanticipated growth greater than 10% in ozone precursor emissions within the maintenance area, the Division will evaluate existing control measures to see if any further emission reduction measures should be implemented at that time. Implementation of necessary controls will take place as expeditiously as possible, but in no event later than 12 months from a monitored value of 0.071 ppm or greater at the conclusion of the most recent ozone season (October 31).

If a three-year average fourth high monitored value of 0.071 ppm or greater (i.e., a violation of the standard) occurs within the maintenance area, an action level response will take effect. Kentucky, in conjunction with the metropolitan planning organization or regional council of governments, will determine additional control measures needed to assure future attainment of the NAAQS for ozone. Contingency measures will be adopted and implemented within 24 months of a triggered violation.

Requirement 3 of 3

A list of potential contingency measures that would be implemented in such an event.

Demonstration: In the event of a monitored violation of the 8-hour ozone NAAQS standard in the Area, Kentucky commits to adopt, within nine months, one or more of the following contingency measures to re-attain the standard. All regulatory programs will be implemented within 24 months after the triggering monitored violation.

- Implementation of a program to require additional emission reductions on stationary sources;
- Restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high-occupancy vehicles;
- Trip-reduction ordinances;
- Employer-based transportation management plans, including incentives;
- Programs to limit or restrict vehicle use in downtown areas, or other areas of emission concentration, particularly during periods of peak use;
- Programs for new construction and major reconstructions of paths or tracks for use by pedestrians or by non-motorized vehicles when economically feasible and in the public interest.

The selection of contingency measures will be based on three main factors: cost effectiveness, emission reduction potential, and economic and social considerations. The Division will complete any necessary analyses and submit to the EPA. Contingency measures will be adopted and implemented as quickly as possible and no later than 24 months after the triggering event. In the event that an area returns to attainment prior to the implementation of the contingency measure(s), those measures may not be implemented.

Kentucky also reserves the right to implement other contingency measures if new control programs should be developed and deemed more advantageous for the Area. Prior to the implementation of any contingency measure(s) not listed, the Commonwealth of Kentucky will solicit input from all interested and affected parties in the Area. No contingency measure will be implemented without notification to and approval granted by EPA.

3. Public Participation

In accordance with 40 CFR 51.102, the SIP revision was available for public review and comment from June 13, 2022, through July 19, 2022.

The SIP revision package was made available on the Division's website during the 37-day comment period from June 13, 2022, until July 19, 2022. A public hearing was scheduled for July 19, 2022. The Division received written comments from EPA during the public comment period and no other comments were received. The Division's response to those comments is provided in Appendix D along with a copy of the public hearing notice.

4. Conclusion

The most recent three years of ozone monitoring data (2019-2021) for the Cincinnati, OH-KY nonattainment area demonstrate compliance with the 2015 8-hour ozone NAAQS. There have been many major programs enacted that have led to significant emissions reductions since the Area was first designated as nonattainment. Since that time, the air quality has improved significantly and has attained the ozone NAAQS. Additionally, the maintenance plan demonstrates that the projected emissions inventories for all future projected years, including the final year of the maintenance plan (2035) are all less than the base year emissions inventory. Therefore, maintenance of the 2015 8-hour ozone NAAQS has also been demonstrated.

Kentucky hereby requests that the Cincinnati, OH-KY 2015 8-hour Ozone nonattainment area be redesignated to attainment simultaneously with EPA approval of the maintenance plan provisions contained herein.

APPENDIX A

Monitoring Data

COMMONWEALTH OF KENTUCKY

ANDY BESHEAR
GOVERNOR

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

REBECCA W. GOODMAN
SECRETARY

ANTHONY R. HATTON
COMMISSIONER

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601
TELEPHONE: 502-564-2150
TELEFAX: 502-564-4245

November 18, 2021

Ms. Caroline Y. Freeman, Director
Air and Radiation Division
US EPA Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street. SW
Atlanta, GA 30303

Dear Ms. Freeman:

Pursuant to 40 CFR 58.15, each air monitoring agency must certify the previous year of AQS-submitted data as accurate by May 1 of the following year. The Kentucky Division for Air Quality (Division) is respectfully submitting 2021 ozone pollutant data collected at four sites for early certification. The data for which certification is requested are outlined below, as well as on the attached AQS-generated AMP600 report:

- Hourly-averaged ozone data (parameter code 44201)
    - NKU: 21-037-3002
    - East Bend: 21-015-0003
    - Shepherdsville: 21-029-0006
    - Buckner: 21-185-0004

I hereby certify that the ambient concentration data and the quality assurance data are completely submitted to AQS. I also certify that, to the best of my knowledge, the ambient air concentration data are accurate, taking into consideration the quality assurance findings.

If there are any questions or concerns, please contact Ms. Jenna Nall, Environmental Scientist with our Technical Services Branch, at (502) 782-7353.

Sincerely,

Melissa Duff

Melissa Duff,
Director

MKD/jfm
Enclosures

Electronic Copy:

- -Daniel Garver, USEPA Region 4
- -Anthony Bedel, USEPA Region 4
- -Rachael Hamilton, LMAPCD
- -Holly Kaloz, OH EPA
- -Leslie Poff, KDAQ

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: JNALL

CERTIFICATION EVALUATION AND CONCURRENCE

Report Request ID: 1972742

Report Code: AMP600

Nov. 18, 2021

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	21	015	0003								
	21	029	0006								
	21	037	3002								
	21	185	0004								

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
CRITERIA	44201		

SELECTED OPTIONS

Option Type	Option Value
AGENCY ROLE	CERTIFYING
MERGE PDF FILES	YES

DATE CRITERIA

Start Date	End Date
2021	2021

Data Evaluation and Concurrence Report Summary

Nov. 18, 2021

Certification Year: 2021

Certifying Agency (CA): Kentucky Division For Air Quality (0584)

Pollutants in Report:

Parameter Name	Code	Monitors Evaluated	Monitors Recommended for Concurrence by AQS	Monitors NOT Recommended for Concurrence by AQS
Ozone	44201	4	4	0

PQAOs in Report:

PQAO Name	PQAO Code	TSA Date
Kentucky Division For Air Quality	0584	05/21/18

Summary of 'N' flags for all pollutants:

	Parameter			AQS Recommended	Cert. Agency Recommended	
PQAO	Code	AQS Site-ID	POC	Flag	Flag	Reason for AQS Recommendation

Signature of Monitoring Organization Representative: Melissa Duff

Data Evaluation and Concurrence Report for Gaseous Pollutants

Certifying Year 2021

Certifying Agency Code Kentucky Division For Air Quality (0584)
Parameter Ozone (44201) (ppm)

PQAO Name Kentucky Division For Air Quality (0584)
QAPP Approval Date 08/27/2019

NPAP Audit Summary:

Number of Passed Audits	NPAP Bias	Criteria Met
5	4.59392	Y

			Routine Data						One Point Quality Check			Annual PE		NPAP			Concur. Flag		
AQS Site ID	POC	Monitor Type	Mean	Min	Max	Exceed. Count	Outlier Count	Perc. Comp.	Precision	Bias	Complete	Bias	Complete	Bias	PQAO Level Criteria	QAPP Appr.	Aqs Rec Flag	CA Rec Flag	Epa Concur
21-015-0003	1	SLAMS	0.046	0.010	0.075	0	0	95	1.17	+/-1.18	100	- 2.46	100		Y	Y	Y	Y	S
21-029-0006	1	SLAMS	0.046	0.015	0.106	0	0	92	1.63	+2.14	100	0.01	100	5.05	Y	Y	Y	Y	S
21-037-3002	1	SLAMS	0.045	0.010	0.082	0	0	93	2.04	+/-1.52	94	- 0.11	100		Y	Y	Y	Y	S
21-185-0004	1	SLAMS	0.047	0.017	0.095	0	0	95	1.66	+4.30	100	1.43	100		Y	Y	Y	Y	S

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: JNALL

DESIGN VALUE REPORT

Report Request ID: 1976421

Report Code: AMP480

Dec. 9, 2021

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	21	015									
	21	037									

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
DESIGN VALUE	44201		

SELECTED OPTIONS

Option Type	Option Value
WORKFILE DELIMITER	,
SINGLE EVENT PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS
QUARTERLY DATA IN WORKFILE	NO
AGENCY ROLE	PQAO
USER SITE METADATA	STREET ADDRESS
MERGE PDF FILES	YES
USE LINKED SITES	YES

DATE CRITERIA

Start Date	End Date
2019	2021

APPLICABLE STANDARDS

Standard Description
Ozone 8-hour 2015

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM

PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 9, 2021

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2019

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Kentucky

			2019		4th	Cert&	2018		4th	Cert&	2017		4th	Cert&	3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**Max**	**Eval**	**Valid Days**	**Percent Complete**	**Max**	**Eval**	**Valid Days**	**Percent Complete**	**Max**	**Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
21-015-0003		KY 338 & LOWER RIVER ROAD	237	97	.062	Y	241	98	.068	S	221	90	.060	Y	95	.063	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2020

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Kentucky

			2020		4th	Cert&	2019		4th	Cert&	2018		4th	Cert&	3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	Max	Eval	Valid Days	Percent Complete	Max	Eval	Valid Days	Percent Complete	Max	Eval	Percent Complete	Design Value	D. V. Validity
21-015-0003		KY 338 & LOWER RIVER ROAD	239	98	.062	Y	237	97	.062	Y	241	98	.068	S	98	.064	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 9, 2021

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2021

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Kentucky

			2021				2020				2019				3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
21-015-0003		KY 338 & LOWER RIVER ROAD	243	99	.061	Y	239	98	.062	Y	237	97	.062	Y	98	.061	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

CERTIFICATION EVALUATION AND CONCURRENCE FLAG MEANINGS

FLAG	MEANING
M	The monitoring organization has revised data from this monitor since the most recent certification letter received from the state.
N	The certifying agency has submitted the certification letter and required summary reports, but the certifying agency and/or EPA has determined that issues regarding the quality of the ambient concentration data cannot be resolved due to data completeness, the lack of performed quality assurance checks or the results of uncertainty statistics shown in the AMP255 report or the certification and quality assurance report.
S	The certifying agency has submitted the certification letter and required summary reports. A value of "S" conveys no Regional assessment regarding data quality per se. This flag will remain until the Region provides an "N" or "Y" concurrence flag.
U	Uncertified. The certifying agency did not submit a required certification letter and summary reports for this monitor even though the due date has passed, or the stateTs certification letter specifically did not apply the certification to this monitor.
X	Certification is not required by 40 CFR 58.15 and no conditions apply to be the basis for assigning another flag value
Y	The certifying agency has submitted a certification letter, and EPA has no unresolved reservations about data quality (after reviewing the letter, the attached summary reports, the amount of quality assurance data submitted to AQS, the quality statistics, and the highest reported concentrations).

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

User ID: JNALL

DESIGN VALUE REPORT

Report Request ID: 1995673

Report Code: AMP480

Mar. 4, 2022

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	21	037									

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
DESIGN VALUE	44201		

SELECTED OPTIONS

Option Type	Option Value
SINGLE EVENT PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS
MERGE PDF FILES	YES
AGENCY ROLE	PQAO
USER SITE METADATA	STREET ADDRESS
QUARTERLY DATA IN WORKFILE	NO
WORKFILE DELIMITER	,
USE LINKED SITES	YES

DATE CRITERIA

Start Date	End Date
2019	2021

APPLICABLE STANDARDS

Standard Description
Ozone 8-hour 2015

Selection Criteria Page 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Mar. 4, 2022

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2019
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Kentucky

			2019		4th	Cert&	2018		4th	Cert&	2017		4th	Cert&	3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	Max	Eval	Valid Days	Percent Complete	Max	Eval	Valid Days	Percent Complete	Max	Eval	Percent Complete	Design Value	D. V. Validity
21-037-3002		524A JOHNTS HILL ROAD	237	97	.062	Y	239	98	.066	S	227	93	.068	Y	96	.065	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Mar. 4, 2022

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2020

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Kentucky

			2020				2019				2018				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
21-037-3002		524A JOHNTS HILL ROAD	237	97	.063	Y	237	97	.062	Y	239	98	.066	S	97	.063	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Mar. 4, 2022

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2021

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Kentucky

			2021		4th	Cert&	2020		4th	Cert&	2019		4th	Cert&	3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	Max	Eval	Valid Days	Percent Complete	Max	Eval	Valid Days	Percent Complete	Max	Eval	Percent Complete	Design Value	D. V. Validity
21-037-3002		524A JOHNTS HILL ROAD	237	97	.064	Y	237	97	.063	Y	237	97	.062	Y	97	.063	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

CERTIFICATION EVALUATION AND CONCURRENCE FLAG MEANINGS

FLAG	MEANING
M	The monitoring organization has revised data from this monitor since the most recent certification letter received from the state.
N	The certifying agency has submitted the certification letter and required summary reports, but the certifying agency and/or EPA has determined that issues regarding the quality of the ambient concentration data cannot be resolved due to data completeness, the lack of performed quality assurance checks or the results of uncertainty statistics shown in the AMP255 report or the certification and quality assurance report.
S	The certifying agency has submitted the certification letter and required summary reports. A value of "S" conveys no Regional assessment regarding data quality per se. This flag will remain until the Region provides an "N" or "Y" concurrence flag.
U	Uncertified. The certifying agency did not submit a required certification letter and summary reports for this monitor even though the due date has passed, or the stateTs certification letter specifically did not apply the certification to this monitor.
X	Certification is not required by 40 CFR 58.15 and no conditions apply to be the basis for assigning another flag value
Y	The certifying agency has submitted a certification letter, and EPA has no unresolved reservations about data quality (after reviewing the letter, the attached summary reports, the amount of quality assurance data submitted to AQS, the quality statistics, and the highest reported concentrations).

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: HKALOZ

MAXIMUM VALUES REPORT

Report Request ID: 1976435

Report Code: AMP440

Dec. 9, 2021

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	39	017									
	39	025									
	39	061									
	39	165									
	21	015									
	21	037									

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
CRITERIA	44201		

SELECTED OPTIONS

Option Type	Option Value
AGENCY ROLE	PQAO
EVENTS PROCESSING	REPORT ALL EVENT RECORDS
MERGE PDF FILES	YES

SORT ORDER

Order	Column
1	PARAMETER_CODE
2	STATE_CODE
3	DURATION_CODE
4	DATES
5	COUNTY_CODE
6	SITE_ID
7	POC
8	EDT_ID

DATE CRITERIA

Start Date	End Date
2019	2021

APPLICABLE STANDARDS

Standard Description
Ozone 8-hour 2015

EXCEPTIONAL DATA TYPES

EDT	DESCRIPTION
0	NO EVENTS
1	EVENTS EXCLUDED
2	EVENTS INCLUDED
5	EVENTS WITH CONCURRENCE EXCLUDED

UNITED STATES ENVIRONMENTAL PROCTECTION AGENCY
AIR QUALITY SUBSYSTEM
MAXIMUM VALUES REPORT

Dec. 9, 2021

Ozone (44201)

State: Kentucky
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name		Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
21-015-0003	1	Boone	087		.064	.062	.062	.062	.059	4066	0	0
		Not in a city			08/04:11	07/13:10	08/02:10	08/03:11	09/20:11			
					.058	.058	.058	.057	.056			
					07/14:10	09/10:11	09/21:10	08/01:11	03/28:14			

Ozone (44201)

State: Kentucky
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name		Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
21-037-3002	1	Campbell	087		.073	.064	.063	.062	.062	4095	1	0
		Highland Heights			07/13:11	08/03:11	08/05:11	07/10:10	07/14:10			
					.062	.061	.061	.059	.059			
					09/11:11	06/26:10	09/10:13	07/28:11	08/01:11			

Ozone (44201)

State: Kentucky
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name		Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
21-015-0003	1	Boone	087		.066	.066	.065	.062	.062	4097	0	0
		Not in a city			06/17:10	06/20:10	07/29:11	07/02:11	07/04:10			
					.061	.061	.061	.060	.059			

UNITED STATES ENVIRONMENTAL PROCTECTION AGENCY
AIR QUALITY SUBSYSTEM
MAXIMUM VALUES REPORT

Dec. 9, 2021

06/19:11 07/03:10 08/08:11 07/07:10 06/06:11

Ozone (44201)

State: Kentucky
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 3

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

UNITED STATES ENVIRONMENTAL PROCTECTION AGENCY
AIR QUALITY SUBSYSTEM
MAXIMUM VALUES REPORT

Dec. 9, 2021

Ozone (44201)

State: Kentucky
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 4

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
21-037-3002	1	Campbell	087	.068	.066	.065	.063	.063	4060	0	0
		Highland Heights		08/08:12	07/03:10	06/20:10	06/06:10	07/29:13			
				.061	.061	.060	.059	.059			
				06/19:11	07/07:10	07/17:10	05/02:12	06/05:12			

Ozone (44201)

State: Kentucky
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
21-015-0003	1	Boone	087	.067	.066	.061	.061	.060	4151	0	0
		Not in a city		06/14:12	07/27:10	07/23:11	08/24:10	07/22:11			
				.060	.059	.059	.058	.058			
				09/29:12	04/05:11	06/05:10	04/27:11	05/24:10			

Ozone (44201)

State: Kentucky
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
21-037-3002	1	Campbell	087	.071	.067	.065	.064	.063	4069	1	0
		Highland Heights		07/27:11	06/14:12	07/24:11	08/24:10	05/24:13			
				.062	.061	.061	.060	.059			

04/05:12 04/04:13 07/26:11 08/06:13 05/22:11

Ozone (44201)

State: Kentucky
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 5

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

UNITED STATES ENVIRONMENTAL PROCTECTION AGENCY
AIR QUALITY SUBSYSTEM
MAXIMUM VALUES REPORT

Dec. 9, 2021

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name	Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name		6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-017-0018	1	Butler	087	.071	.069	.069	.067	.067	4094	1	0
		Middletown		08/19:11	06/04:10	07/10:11	06/28:09	07/14:11			
				.066	.066	.066	.065	.065			
				06/06:11	06/29:10	07/26:11	06/27:11	08/04:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name	Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name		6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-017-0023	1	Butler	087	.071	.069	.067	.067	.065	4156	1	0
		Hamilton		07/26:11	08/19:11	06/06:10	07/14:12	06/28:11			
				.065	.065	.064	.064	.063			
				07/10:11	08/04:11	06/26:13	06/27:12	05/06:12			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name	Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name		6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-017-9991	1	Butler	047	.067	.065	.065	.065	.064	5933	0	0
		Not in a city		06/06:12	06/04:11	07/26:12	09/19:11	07/14:12			
				.062	.062	.061	.061	.060			

Dec. 9, 2021

07/09:12 08/04:10 05/06:12 08/03:10 06/29:09
Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name		Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name			6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-025-0022	1	Clermont	087		.082	.072	.071	.071	.070	4122	4	0
		Batavia			07/13:11	08/05:11	06/26:11	07/14:11	07/12:11			
					.067	.067	.067	.066	.065			
					06/29:10	07/01:11	09/12:11	09/11:11	06/30:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name		Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name			6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-061-0006	1	Hamilton	087		.076	.075	.072	.072	.071	4113	6	0
		Blue Ash			07/14:10	07/10:11	07/13:10	08/19:11	08/05:10			
					.071	.070	.069	.069	.069			
					09/10:11	06/27:12	05/07:11	06/28:10	08/03:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name		Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name			6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-061-0010	1	Hamilton	087		.070	.069	.069	.067	.067	4156	0	0
		Cleves			06/06:10	07/14:11	08/05:11	08/04:11	08/19:11			
					.066	.066	.065	.065	.064			

07/09:11 07/13:10 08/02:10 08/03:10 06/26:11

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-061-0040	1	Hamilton	087	.074	.073	.072	.071	.070	6119	4	0
		Cincinnati		07/13:10	07/14:10	07/10:10	08/05:10	09/20:11			
				.068	.068	.067	.067	.067			
				08/03:11	08/19:11	06/26:11	07/27:11	08/04:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-165-0007	1	Warren	087	.077	.074	.071	.070	.070	4023	3	0
		Lebanon		07/10:11	09/20:11	08/19:11	05/07:11	07/14:11			
				.070	.069	.068	.067	.067			
				08/05:11	08/16:11	09/10:11	05/06:11	09/21:11			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-017-0018	1	Butler	087	.078	.072	.072	.070	.068	4031	3	0
		Middletown		07/17:12	06/20:11	07/08:11	07/15:10	08/09:10			
				.067	.064	.064	.064	.063			

Dec. 9, 2021

06/17:11 07/03:11 07/05:11 07/09:10 06/02:12

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2019

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name	Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name		6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-017-0023	1	Butler	087	.077	.069	.068	.067	.064	4157	1	0
		Hamilton		07/17:12	07/08:11	06/20:11	06/17:11	07/01:12			
				.064	.064	.063	.063	.062			
				07/05:11	08/09:10	07/09:10	07/15:10	06/06:12			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name	Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name		6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-017-9991	1	Butler	047	.069	.064	.064	.064	.064	6192	0	0
		Not in a city		06/20:10	06/02:12	06/17:11	07/17:12	08/09:10			
				.063	.063	.062	.062	.062			
				06/06:11	07/05:12	06/05:12	07/03:11	07/15:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name	Methods	1st Max	2nd Max	3rd Max	4th Max	5th Max	Num	Num	EDT
		City Name		6th Max	7th Max	8th Max	9th Max	10th Max	Obs	Exc	ID
39-025-0022	1	Clermont	087	.070	.066	.065	.064	.064	4162	0	0
		Batavia		06/20:09	06/19:11	06/06:11	06/02:11	08/08:11			
				.063	.063	.062	.062	.061			

Dec. 9, 2021

06/05:12 07/17:10 07/03:10 07/04:09 06/17:10

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-061-0006	1	Hamilton	087	.078	.077	.072	.070	.069	4142	3	0
		Blue Ash		07/29:12	07/17:11	08/08:11	07/09:10	06/20:10			
				.068	.067	.067	.067	.066			
				08/09:11	07/03:10	07/08:10	07/25:11	06/02:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-061-0010	1	Hamilton	087	.077	.076	.072	.070	.070	4151	3	0
		Cleves		07/08:11	07/17:10	06/20:10	07/01:11	08/09:10			
				.069	.069	.068	.067	.066			
				07/04:11	07/29:11	06/17:11	07/05:10	06/06:11			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-061-0040	1	Hamilton	087	.075	.070	.069	.068	.068	6061	1	0
		Cincinnati		08/08:12	07/17:10	06/20:10	07/03:11	07/08:10			
				.067	.067	.064	.064	.062			

UNITED STATES ENVIRONMENTAL PROCTECTION AGENCY
AIR QUALITY SUBSYSTEM
MAXIMUM VALUES REPORT

Dec. 9, 2021

07/04:10 07/29:12 06/06:10 06/17:11 07/07:11

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2020

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name		Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-165-0007	1	Warren	087		.075	.071	.071	.070	.068	4148	3	1
		Lebanon			07/29:11	07/17:12	08/08:12	08/09:11	07/08:10			
					.067	.067	.066	.066	.065			
					07/03:10	07/21:11	06/02:12	07/04:11	07/05:11			

Maximum Values

Site ID	POC	County Name City Name		Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-165-0007	1	Warren	087		.075	.075	.071	.071	.070	4158	4	2
		Lebanon			06/20:10	07/29:11	07/17:12	08/08:12	08/09:11			
					.068	.067	.067	.066	.066			
					07/08:10	07/03:10	07/21:11	06/02:12	07/04:11			

Maximum Values

Site ID	POC	County Name City Name		Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-165-0007	1	Warren	087		.075	.075	.071	.071	.070	4158	4	5
		Lebanon			06/20:10	07/29:11	07/17:12	08/08:12	08/09:11			
					.068	.067	.067	.066	.066			
					07/08:10	07/03:10	07/21:11	06/02:12	07/04:11			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

UNITED STATES ENVIRONMENTAL PROCTECTION AGENCY
AIR QUALITY SUBSYSTEM
MAXIMUM VALUES REPORT

Dec. 9, 2021

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-017-0018	1	Butler	087	.068	.068	.065	.064	.062	4149	0	0
		Middletown		06/14:11	08/24:11	06/17:11	06/05:10	04/27:11			
				.061	.061	.060	.060	.060			
				05/20:10	05/21:11	05/15:11	05/25:11	06/04:12			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-017-0023	1	Butler	087	.071	.069	.068	.066	.066	4015	1	0
		Hamilton		06/14:12	08/05:11	07/23:11	06/17:12	07/27:11			
				.065	.063	.063	.063	.062			
				06/05:10	05/25:12	06/13:12	08/06:08	05/20:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-017-9991	1	Butler	047	.072	.070	.064	.063	.063	4601	1	0
		Not in a city		07/23:13	06/14:11	06/04:12	06/13:11	07/27:10			
				.062	.062	.062	.062	.061			

Dec. 9, 2021

04/05:12 06/05:10 06/18:13 08/05:11 04/27:12
Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-025-0022	1	Clermont	087	.069	.067	.066	.065	.064	4130	0	0
		Batavia		06/14:11	07/06:10	05/24:10	06/04:11	05/22:11			
				.063	.063	.063	.063	.061			
				06/13:11	07/28:10	08/07:10	09/28:11	07/29:11			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-061-0006	1	Hamilton	087	.082	.074	.070	.070	.069	4148	2	0
		Blue Ash		08/24:11	07/27:11	06/05:11	06/14:11	05/25:12			
				.067	.066	.065	.064	.064			
				07/24:12	06/17:11	06/13:11	05/24:11	08/06:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-061-0010	1	Hamilton	087	.077	.070	.066	.064	.063	4151	1	0
		Cleves		07/23:11	06/14:12	08/20:11	06/17:11	06/05:10			
				.063	.063	.061	.060	.060			

Dec. 9, 2021

07/27:11 08/05:11 08/24:10 04/27:11 05/22:11

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-061-0040	1	Hamilton	087	.078	.074	.071	.069	.068	5149	3	0
		Cincinnati		08/24:11	07/27:11	06/14:11	05/25:11	06/05:10			
				.068	.067	.067	.065	.065			
				07/24:12	05/24:11	06/12:10	06/13:10	06/17:10			

Ozone (44201)

State: Ohio
Duration: 8-HR RUN AVG BEGIN HOUR
Year: 2021

Primary: .07
Secondary: .07
Unit: Parts per million

Maximum Values

Site ID	POC	County Name City Name	Methods	1st Max 6th Max	2nd Max 7th Max	3rd Max 8th Max	4th Max 9th Max	5th Max 10th Max	Num Obs	Num Exc	EDT ID
39-165-0007	1	Warren	087	.076	.071	.070	.069	.069	4160	2	0
		Lebanon		08/24:11	06/05:10	07/24:11	06/17:11	07/27:11			
				.068	.068	.068	.064	.063			
				05/25:11	06/14:11	08/06:11	05/21:10	06/04:12			

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: JNALL

DESIGN VALUE REPORT

Report Request ID: 2033971

Report Code: AMP480

Jul. 18, 2022

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	39	017	0018								
	39	017	0023								
	39	017	9991								
	39	025	0022								
	39	061	0006								
	39	061	0010								
	39	061	0040								
	39	165	0007								

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
DESIGN VALUE	44201		

SELECTED OPTIONS

Option Type	Option Value
SINGLE EVENT PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS
MERGE PDF FILES	YES
AGENCY ROLE	PQAO
USER SITE METADATA	STREET ADDRESS
QUARTERLY DATA IN WORKFILE	NO
WORKFILE DELIMITER	,
USE LINKED SITES	YES

DATE CRITERIA

Start Date	End Date
2014	2021

APPLICABLE STANDARDS

Standard Description
Ozone 8-hour 2015

Selection Criteria Page 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Jul. 18, 2022

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2014

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Ohio

			2014		4th	Cert&	2013		4th	Cert&	2012		4th	Cert&	3 - Year		
Site ID	Pc	STREET ADDRESS	Valid Days	Percent Complete	Max	Eval	Valid Days	Percent Complete	Max	Eval	Valid Days	Percent Complete	Max	Eval	Percent Complete	Design Value	D. V. Validity
39-017-0018		1707 Runway Drive, Room #4	210	98	.069	Y	213	100	.068	U	202	94	.084	Y	97	.073	Y
39-017-0023		2200 HENSLEY AVE.	212	99	.070	Y	209	98	.068	U	213	100	.083	Y	99	.073	Y
39-017-9991		Ecology Research Center, Miami University, Oxford, Ohio 45056	203	95	.069	Y	203	95	.069	Y	199	93	.085	Y	94	.074	Y
39-025-0022		2400 CLERMONT CENTER DR.	211	99	.068	Y	211	99	.066	U	211	99	.091	Y	99	.075	Y
39-061-0006		11590 GROOMS RD	208	97	.071	Y	205	96	.069	U	206	96	.087	Y	96	.075	Y
39-061-0010		6950 RIPPLE RD.	212	99	.073	Y	207	97	.064	U	186	87	.083	Y	94	.073	Y
39-061-0040		250 WM. HOWARD TAFT	213	100	.069	Y	213	100	.069	U	213	100	.082	Y	100	.073	Y
39-165-0007		430 S EAST ST.	213	100	.071	Y	212	99	.067	U	213	100	.080	Y	100	.072	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Jul. 18, 2022

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2015

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Ohio

			2015				2014				2013				3 - Year		
Site ID	**Pc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
39-017-0018		1707 Runway Drive, Room #4	212	99	.070	Y	210	98	.069	Y	213	100	.068	U	99	.069	Y
39-017-0023		2200 HENSLEY AVE.	201	94	.070	Y	212	99	.070	Y	209	98	.068	U	97	.069	Y
39-017-9991		Ecology Research Center, Miami University, Oxford, Ohio 45056	188	88	.068	Y	203	95	.069	Y	203	95	.069	Y	93	.068	Y
39-025-0022		2400 CLERMONT CENTER DR.	210	98	.070	Y	211	99	.068	Y	211	99	.066	U	99	.068	Y
39-061-0006		11590 GROOMS RD	209	98	.072	Y	208	97	.071	Y	205	96	.069	U	97	.070	Y
39-061-0010		6950 RIPPLE RD.	212	99	.070	Y	212	99	.073	Y	207	97	.064	U	98	.069	Y
39-061-0040		250 WM. HOWARD TAFT	211	99	.071	Y	213	100	.069	Y	213	100	.069	U	100	.069	Y
39-165-0007		430 S EAST ST.	213	100	.071	Y	213	100	.071	Y	212	99	.067	U	100	.069	Y

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Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2016

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:**.07 **State:** Ohio

			2016				2015				2014				3 - Year		
Site ID	**Pc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
39-017-0018		1707 Runway Drive, Room #4	210	98	.073	S	212	99	.070	Y	210	98	.069	Y	98	.070	Y
39-017-0023		2200 HENSLEY AVE.	204	95	.076	S	201	94	.070	Y	212	99	.070	Y	96	.072	Y
39-017-9991		Ecology Research Center, Miami University, Oxford, Ohio 45056	201	94	.071	Y	188	88	.068	Y	203	95	.069	Y	92	.069	Y
39-025-0022		2400 CLERMONT CENTER DR.	211	99	.073	S	210	98	.070	Y	211	99	.068	Y	99	.070	Y
39-061-0006		11590 GROOMS RD	211	99	.075	S	209	98	.072	Y	208	97	.071	Y	98	.072	Y
39-061-0010		6950 RIPPLE RD.	211	99	.073	S	212	99	.070	Y	212	99	.073	Y	99	.072	Y
39-061-0040		250 WM. HOWARD TAFT	212	99	.073	S	211	99	.071	Y	213	100	.069	Y	99	.071	Y
39-165-0007		430 S EAST ST.	207	97	.074	S	213	100	.071	Y	213	100	.071	Y	99	.072	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2017

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Ohio

			2017				**2016**				**2015**				**3 - Year**		
Site ID	**Pc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
39-017-0018		1707 Runway Drive, Room #4	244	100	.070	S	210	98	.073	S	212	99	.070	Y	99	.071	Y
39-017-0023		2200 HENSLEY AVE.	244	100	.072	S	204	95	.076	S	201	94	.070	Y	96	.072	Y
39-017-9991		Ecology Research Center, Miami University, Oxford, Ohio 45056	212	87	.069	Y	201	94	.071	Y	188	88	.068	Y	90	.069	Y
39-025-0022		2400 CLERMONT CENTER DR.	240	98	.068	S	211	99	.073	S	210	98	.070	Y	98	.070	Y
39-061-0006		11590 GROOMS RD	244	100	.072	S	211	99	.075	S	209	98	.072	Y	99	.073	Y
39-061-0010		6950 RIPPLE RD.	229	93	.068	S	211	99	.073	S	212	99	.070	Y	97	.070	Y
39-061-0040		250 WM. HOWARD TAFT	365	100	.071	S	212	99	.073	S	211	99	.071	Y	99	.071	Y
39-165-0007		430 S EAST ST.	240	98	.068	S	207	97	.074	S	213	100	.071	Y	98	.071	Y

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Jul. 18, 2022

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2018

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:**.07 **State:** Ohio

			2018				2017				2016				3 - Year		
Site ID	Pc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
39-017-0018		1707 Runway Drive, Room #4	243	99	.076	S	244	100	.070	S	210	98	.073	S	99	.073	Y
39-017-0023		2200 HENSLEY AVE.	233	95	.073	S	244	100	.072	S	204	95	.076	S	97	.073	Y
39-017-9991		Ecology Research Center, Miami University, Oxford, Ohio 45056	239	98	.070	Y	212	87	.069	Y	201	94	.071	Y	93	.070	Y
39-025-0022		2400 CLERMONT CENTER DR.	243	99	.069	S	240	98	.068	S	211	99	.073	S	99	.070	Y
39-061-0006		11590 GROOMS RD	241	98	.080	S	244	100	.072	S	211	99	.075	S	99	.075	Y
39-061-0010		6950 RIPPLE RD.	242	99	.075	S	229	93	.068	S	211	99	.073	S	97	.072	Y
39-061-0040		250 WM. HOWARD TAFT	361	99	.072	S	365	100	.071	S	212	99	.073	S	99	.072	Y
39-165-0007		430 S EAST ST.	238	97	.075	S	240	98	.068	S	207	97	.074	S	97	.072	Y

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Jul. 18, 2022

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2019

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Ohio

			2019				2018				2017				3 - Year		
Site ID	**Pc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
39-017-0018		1707 Runway Drive, Room #4	240	98	.067	Y	243	99	.076	S	244	100	.070	S	99	.071	Y
39-017-0023		2200 HENSLEY AVE.	244	100	.067	Y	233	95	.073	S	244	100	.072	S	98	.070	Y
39-017-9991		Ecology Research Center, Miami University, Oxford, Ohio 45056	230	94	.065	S	239	98	.070	Y	212	87	.069	Y	93	.068	Y
39-025-0022		2400 CLERMONT CENTER DR.	241	98	.071	Y	243	99	.069	S	240	98	.068	S	98	.069	Y
39-061-0006		11590 GROOMS RD	241	98	.072	Y	241	98	.080	S	244	100	.072	S	99	.074	Y
39-061-0010		6950 RIPPLE RD.	243	99	.067	Y	242	99	.075	S	229	93	.068	S	97	.070	Y
39-061-0040		250 WM. HOWARD TAFT	360	99	.071	Y	361	99	.072	S	365	100	.071	S	99	.071	Y
39-165-0007		430 S EAST ST.	235	96	.070	Y	238	97	.075	S	240	98	.068	S	97	.071	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Jul. 18, 2022

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2020

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Ohio

			2020				2019				2018				3 - Year		
Site ID	Pc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
39-017-0018		1707 Runway Drive, Room #4	235	96	.070	Y	240	98	.067	Y	243	99	.076	S	98	.071	Y
39-017-0023		2200 HENSLEY AVE.	243	99	.067	Y	244	100	.067	Y	233	95	.073	S	98	.069	Y
39-017-9991		Ecology Research Center, Miami University, Oxford, Ohio 45056	244	100	.064	S	230	94	.065	S	239	98	.070	Y	97	.066	Y
39-025-0022		2400 CLERMONT CENTER DR.	244	100	.064	Y	241	98	.071	Y	243	99	.069	S	99	.068	Y
39-061-0006		11590 GROOMS RD	242	99	.070	Y	241	98	.072	Y	241	98	.080	S	98	.074	Y
39-061-0010		6950 RIPPLE RD.	243	99	.070	Y	243	99	.067	Y	242	99	.075	S	99	.070	Y
39-061-0040		250 WM. HOWARD TAFT	355	97	.068	Y	360	99	.071	Y	361	99	.072	S	98	.070	Y
39-165-0007		430 S EAST ST.	244	100	.071	Y	235	96	.070	Y	238	97	.075	S	98	.072	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015

Design Value Year: 2021

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

Statistic: Annual 4th Maximum **Level:** .07 **State:** Ohio

			2021				2020				2019				3 - Year		
Site ID	Pc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
39-017-0018		1707 Runway Drive, Room #4	242	99	.064	Y	235	96	.070	Y	240	98	.067	Y	98	.067	Y
39-017-0023		2200 HENSLEY AVE.	234	96	.066	Y	243	99	.067	Y	244	100	.067	Y	98	.066	Y
39-017-9991		Ecology Research Center, Miami University, Oxford, Ohio 45056	241	98	.063	S	244	100	.064	S	230	94	.065	S	97	.064	Y
39-025-0022		2400 CLERMONT CENTER DR.	241	98	.065	Y	244	100	.064	Y	241	98	.071	Y	99	.066	Y
39-061-0006		11590 GROOMS RD	242	99	.070	Y	242	99	.070	Y	241	98	.072	Y	99	.070	Y
39-061-0010		6950 RIPPLE RD.	242	99	.064	Y	243	99	.070	Y	243	99	.067	Y	99	.067	Y
39-061-0040		250 WM. HOWARD TAFT	362	99	.069	Y	355	97	.068	Y	360	99	.071	Y	98	.069	Y
39-165-0007		430 S EAST ST.	244	100	.069	Y	244	100	.071	Y	235	96	.070	Y	99	.070	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk (T*T).

CERTIFICATION EVALUATION AND CONCURRENCE FLAG MEANINGS

FLAG	MEANING
M	The monitoring organization has revised data from this monitor since the most recent certification letter received from the state.
N	The certifying agency has submitted the certification letter and required summary reports, but the certifying agency and/or EPA has determined that issues regarding the quality of the ambient concentration data cannot be resolved due to data completeness, the lack of performed quality assurance checks or the results of uncertainty statistics shown in the AMP255 report or the certification and quality assurance report.
S	The certifying agency has submitted the certification letter and required summary reports. A value of "S" conveys no Regional assessment regarding data quality per se. This flag will remain until the Region provides an "N" or "Y" concurrence flag.
U	Uncertified. The certifying agency did not submit a required certification letter and summary reports for this monitor even though the due date has passed, or the stateTs certification letter specifically did not apply the certification to this monitor.
X	Certification is not required by 40 CFR 58.15 and no conditions apply to be the basis for assigning another flag value
Y	The certifying agency has submitted a certification letter, and EPA has no unresolved reservations about data quality (after reviewing the letter, the attached summary reports, the amount of quality assurance data submitted to AQS, the quality statistics, and the highest reported concentrations).

APPENDIX B

Emissions Inventory

poll NOX
county Butler Co

Sector	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin
EGU	0.36	0.91	0.28	0.21	0.70
Non-EGU	10.70	7.72	8.79	8.10	-0.38
Area	2.46	2.26	2.02	1.90	0.36
Non-road	4.21	2.01	1.46	1.26	0.75
On-road	12.32	6.54	2.96	1.94	4.60
Total	30.05	19.44	15.51	13.41	6.03

poll NOX
county Clermont Co

Sector	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin
EGU	44.88	15.87	10.42	0.00	15.87
Non-EGU	0.03	0.00	0.01	0.01	-0.01
Area	1.14	1.09	0.93	0.81	0.28
Non-road	2.33	1.43	1.07	0.90	0.53
On-road	6.59	3.51	1.41	0.87	2.64
Total	54.97	21.90	13.84	2.59	19.31

poll NOX
county Hamilton Co

Sector	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin	
EGU	19.03	33.76	11.00	0.00	33.76	Miami Fort
Non-EGU	4.10	2.40	2.72	2.66	-0.26	
Area	7.70	5.34	5.03	4.69	0.65	
Non-road	8.19	5.90	4.12	3.60	2.30	
On-road	30.53	17.10	7.34	5.22	11.88	
Total	69.55	64.50	30.21	16.17	48.33	

poll NOX
county Warren Co

Sector	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	0.00
Non-EGU	0.94	2.08	2.23	2.05	0.03
Area	1.03	1.04	1.00	0.95	0.09

Non-road	3.21	2.01	1.44	1.20	0.81
On-road	7.69	4.75	1.83	1.25	3.50
Total	12.87	9.88	6.50	5.45	4.43

poll NOX
county Boone Co

Sector	**2014 Base**	**2019 Attainment**	**2026 Interim**	**2035 Maintenance**	**Safety Margin**	
EGU	12.65	5.65	1.82	2.03	3.62	
Non-EGU	0.31	0.34	0.31	0.32	0.02	
Area	3.65	2.54	3.22	3.85	-1.31	largely CVG
Non-road	1.61	0.74	0.58	0.54	0.20	
On-road	8.22	4.61	2.56	1.85	2.76	
Total	26.44	13.88	8.49	8.59	5.29	

poll NOX
county Campbell Co

Sector	**2014 Base**	**2019 Attainment**	**2026 Interim**	**2035 Maintenance**	**Safety Margin**
EGU	0.00	0.00	0.00	0.00	0.00
Non-EGU	0.28	0.29	0.28	0.28	0.01
Area	1.65	0.92	0.70	0.58	0.34
Non-road	0.60	0.38	0.29	0.26	0.12
On-road	3.74	1.94	1.01	0.69	1.25
Total	6.27	3.53	2.28	1.81	1.72

poll NOX
county Kenton Co

Sector	**2014 Base**	**2019 Attainment**	**2026 Interim**	**2035 Maintenance**	**Safety Margin**
EGU	0.00	0.00	0.00	0.00	0.00
Non-EGU	0.28	0.28	0.29	0.30	-0.02
Area	1.48	1.53	1.22	1.06	0.47
Non-road	1.19	0.57	0.41	0.37	0.20
On-road	7.89	4.21	2.33	1.69	2.52
Total	10.84	6.59	4.25	3.42	3.17

NOx Total

County	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin
Butler	30.05	19.44	15.51	13.41	6.03
Clermont	54.97	21.90	13.84	2.59	19.31
Hamilton	69.55	64.50	30.21	16.17	48.33
Warren	12.87	9.88	6.50	5.45	4.43
Boone	26.44	13.88	8.49	8.59	5.29
Campbell	6.27	3.53	2.28	1.81	1.72
Kenton	10.84	6.59	4.25	3.42	3.17
TOTAL NO	210.99	139.72	81.08	51.44	88.28

VOC and NOx

County	2019	2026	2026 Projected Decrease	2035	2035 Projected Decrease
VOC	113.37	103.04	10.33	100.68	12.69
NOx	139.72	81.08	58.64	51.44	88.28

ONROAD	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance
Ohio	57.13	31.90	13.54	9.28
KY	19.85	10.76	5.90	4.23
Total	76.98	42.66	19.44	13.51

OH

2026 Estimated Emissions		2026 Mobile Safety Margin Allocation*	2026 Total Mobile Budget	2035 Estimated Emissions	2035 Mobile Safety Margin Allocation*	2035 Total Mobile Budget
VOC (TSD	9.28	1.39	10.67	6.59	0.99	7.58
NOx (TSD)	13.54	2.03	15.57	9.28	1.39	10.67
VMT (miles/day)		-	-		-	-

KY

2026 Estimated Emissions		2026 Mobile Safety Margin Allocation*	2026 Total Mobile Budget	2035 Estimated Emissions	2035 Mobile Safety Margin Allocation*	2035 Total Mobile Budget
VOC (TSD	2.23	0.33	2.56	1.60	0.24	1.84
NOx (TSD)	5.90	0.89	6.79	4.23	0.63	4.86
VMT (miles/day)		-	-		-	-

totals	1.73	1.23
	2.92	2.03

poll VOC
county Butler Co

Sector	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin
EGU	0.02	0.04	0.01	0.01	0.03
Non-EGU	2.91	2.37	1.74	1.66	0.71
Area	13.38	12.28	12.47	12.65	-0.37
Non-road	3.26	2.52	2.24	2.18	0.34
On-road	7.21	3.80	2.21	1.54	2.26
Total	26.78	21.01	18.67	18.04	2.97

poll VOC
county Clermont Co

Sector	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin
EGU	0.28	0.11	0.13	0.00	0.11
Non-EGU	0.39	0.35	0.06	0.06	0.29
Area	6.26	6.84	7.41	7.87	-1.03
Non-road	2.51	2.17	1.68	1.54	0.63
On-road	4.00	2.01	1.21	0.88	1.13
Total	13.44	11.48	10.49	10.35	1.13

poll VOC
county Hamilton Co

Sector	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin
EGU	0.35	0.30	0.17	0.00	0.30
Non-EGU	2.41	1.91	1.29	1.28	0.63
Area	31.81	27.26	26.21	25.54	1.72
Non-road	8.39	6.15	5.53	5.46	0.69
On-road	14.60	7.69	4.50	3.14	4.55
Total	57.56	43.31	37.70	35.42	7.89

poll VOC
county Warren Co

Sector	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	0.00
Non-EGU	0.51	0.74	0.82	0.82	-0.08
Area	8.91	8.88	10.14	11.18	-2.30

Non-road	2.89	2.49	1.86	1.67	0.82
On-road	3.85	2.08	1.36	1.03	1.05
Total	16.16	14.19	14.18	14.70	-0.51

poll VOC
county Boone Co

Sector	**2014 Base**	**2019 Attainment**	**2026 Interim**	**2035 Maintenance**	**Safety Margin**	
EGU	0.27	0.33	0.25	0.25	0.08	
Non-EGU	1.68	2.42	1.43	1.43	0.99	
Area	9.28	7.29	8.21	8.99	-1.70	largely CVG
Non-road	2.70	1.49	1.28	1.25	0.24	
On-road	2.46	1.30	0.86	0.63	0.67	
Total	16.39	12.83	12.03	12.55	0.28	

poll VOC
county Campbell Co

Sector	**2014 Base**	**2019 Attainment**	**2026 Interim**	**2035 Maintenance**	**Safety Margin**
EGU	0.00	0.00	0.00	0.00	0.00
Non-EGU	0.49	0.40	0.42	0.42	-0.02
Area	2.48	2.23	2.22	2.22	0.01
Non-road	0.68	0.52	0.40	0.37	0.15
On-road	1.58	0.73	0.47	0.33	0.40
Total	5.23	3.88	3.51	3.34	0.54

poll VOC
county Kenton Co

Sector	**2014 Base**	**2019 Attainment**	**2026 Interim**	**2035 Maintenance**	**Safety Margin**
EGU	0.00	0.00	0.00	0.00	0.00
Non-EGU	0.46	0.43	0.64	0.64	-0.21
Area	4.03	4.11	4.21	4.28	-0.17
Non-road	0.98	0.74	0.71	0.72	0.02
On-road	2.97	1.39	0.90	0.64	0.75
Total	8.44	6.67	6.46	6.28	0.39

VOC Total

County	**2014 Base**	**2019 Attainment**	**2026 Interim**	**2035 Maintenance**	**Safety Margin**

Butler	26.78	21.01	18.67	18.04	2.97
Clermont	13.44	11.48	10.49	10.35	1.13
Hamilton	57.56	43.31	37.70	35.42	7.89
Warren	16.16	14.19	14.18	14.70	-0.51
Boone	16.39	12.83	12.03	12.55	0.28
Campbell	5.23	3.88	3.51	3.34	0.54
Kenton	8.44	6.67	6.46	6.28	0.39
TOTAL VO	144.00	113.37	103.04	100.68	12.69

ONROAD	**2014 Base**	**2019 Attainment**	**2026 Interim**	**2035 Maintenance**
Ohio	29.66	15.58	9.28	6.59
KY	7.01	3.42	2.23	1.60
Total	36.67	19.00	11.51	8.19

Numbers are higher than 2008 standard redes due to different methodology in converting annual to TSD

NOx

Sector	**State**	**County**	**Facility ID**	**Facility Name**
EGU	KY	Boone	2101500029	Duke Energy KY East Bend
EGU	KY	Boone	2101500138	East KY Power Coop - Bavarian Substation
EGU	OH	Butler	1409000896	Duke Energy Indiana, Madison Generating Station
EGU	OH	Butler	1409001151	NTE Ohio, LLC
EGU	OH	Butler	1409010078	Dicks Creek Energy Facility
EGU	OH	Butler	1409040243	City of Hamilton Department of Public Utilities
EGU	OH	Butler	1409040897	OMEGA JV2 Hamilton Peaking Station
EGU	OH	Butler	1409120656	Duke Energy Kentucky, Woodsdale Generating Station
EGU	OH	Clermont	1413090154	Zimmer Power Station
EGU	OH	Clermont	1413100008	Duke Energy Ohio, W.C. Beckjord Station
EGU	OH	Hamilton	1431350093	Miami Fort Power Station
nonEGU	KY	Boone	2101500004	Aristech Surfaces LLC
nonEGU	KY	Boone	2101500010	Greif Industrial Packaging & Services LLC
nonEGU	KY	Boone	2101500011	Lingo Manufacturing Co
nonEGU	KY	Boone	2101500018	HDT Expeditionary Systems Inc
nonEGU	KY	Boone	2101500019	Duro Hilex Poly LLC
nonEGU	KY	Boone	2101500025	Crane Composites Inc
nonEGU	KY	Boone	2101500028	Clarios LLC
nonEGU	KY	Boone	2101500043	Ticona Polymers Inc
nonEGU	KY	Boone	2101500062	Delta Air Lines
nonEGU	KY	Boone	2101500069	Camco Chemical Co Inc
nonEGU	KY	Boone	2101500077	Southern Graphic Systems LLC
nonEGU	KY	Boone	2101500081	Ernst Enterprises Inc
nonEGU	KY	Boone	2101500082	R R Donnelley - Florence Facility
nonEGU	KY	Boone	2101500086	Duro Hilex Poly LLC
nonEGU	KY	Boone	2101500088	The Hennegan Co
nonEGU	KY	Boone	2101500091	Eaton Asphalt Plant No 3
nonEGU	KY	Boone	2101500102	Sweco Inc
nonEGU	KY	Boone	2101500106	International Paper Company
nonEGU	KY	Boone	2101500113	Waltex NKY LLC
nonEGU	KY	Boone	2101500114	Arandell Kentucky LLC
nonEGU	KY	Boone	2101500115	Levi Strauss & Co
nonEGU	KY	Boone	2101500120	SFC Global Supply Chain Inc
nonEGU	KY	Boone	2101500124	Mubea Inc Bldg 8252
nonEGU	KY	Boone	2101500125	Safran Landing Systems Kentucky LLC
nonEGU	KY	Boone	2101500126	Ferrara Candy Company
nonEGU	KY	Boone	2101500128	Michels Paving Co Inc
nonEGU	KY	Boone	2101500129	Zotefoams Inc
nonEGU	KY	Boone	2101500133	Toyota Motor Sales USA Inc
nonEGU	KY	Boone	2101500140	Bavarian Trucking Co Inc
nonEGU	KY	Boone	2101500142	Abrapower Inc
nonEGU	KY	Boone	2101500146	Zumbiel Packaging
nonEGU	KY	Boone	2101500148	Cincinnati Northern KY International Airport (CVG)
nonEGU	KY	Boone	2101500150	Givaudan Flavors Corp

nonEGU	KY	Boone	2101500152	Arvin Meritor Inc
nonEGU	KY	Boone	2101500153	Len Riegler Blacktop Inc
nonEGU	KY	Boone	2101500155	Duke Energy
nonEGU	KY	Boone	2101500161	Belleview Sand & Gravel
nonEGU	KY	Boone	2101500165	WestRock - Southern Container LLC
nonEGU	KY	Boone	2101500166	The United States Playing Card Co
nonEGU	KY	Boone	2101500170	DHL Express
nonEGU	KY	Boone	2101500171	GE Engine Services Dist Center
nonEGU	KY	Boone	2101500172	Saint Elizabeth Medical Center
nonEGU	KY	Boone	2101500174	Eagle Manufacturing
nonEGU	KY	Boone	2101500178	Pamarco Global Graphics
nonEGU	KY	Boone	2101500181	AmeriPride Services Inc
nonEGU	KY	Boone	2101500188	KY Dept of Military Affairs - Burlington Readiness Center
nonEGU	KY	Boone	2101500189	American Tower Corp - Union Cell Tower Engine
nonEGU	KY	Boone	2101500207	Bonfiglioli USA
nonEGU	KY	Boone	2101500239	KBCB LLC
nonEGU	KY	Boone	2101509048	Bluegrass Paving Inc - Portable Asphalt Plant
nonEGU	KY	Campbell	2103700060	Barrett Paving Materials
nonEGU	KY	Campbell	2103700066	SEGEPO-FSM Inc
nonEGU	KY	Campbell	2103700074	Hillshire Brands - Claryville Plant
nonEGU	KY	Campbell	2103700090	Continental Silver Grove LLC
nonEGU	KY	Campbell	2103700095	Northern KY University (NKU)
nonEGU	KY	Campbell	2103700096	Wendling Printing
nonEGU	KY	Campbell	2103700098	Boruske Brothers Collision Center Inc
nonEGU	KY	Campbell	2103700100	Dept Of Veterans Affairs
nonEGU	KY	Campbell	2103700104	Saint Elizabeth Medical Center - Ft Thomas
nonEGU	KY	Campbell	2103700109	AT&T Mobility - Highland Heights
nonEGU	KY	Kenton	2101500215	Wild Flavors Inc - Olympic
nonEGU	KY	Kenton	2111700005	Duro Paper Bag Manufacturing Co
nonEGU	KY	Kenton	2111700012	OYSTAR North America - Covington Inc
nonEGU	KY	Kenton	2111700022	MPLX Terminals LLC - Covington Terminal
nonEGU	KY	Kenton	2111700086	Interplastic Corp
nonEGU	KY	Kenton	2111700140	A O Smith Corp
nonEGU	KY	Kenton	2111700141	Mazak Corp
nonEGU	KY	Kenton	2111700144	Firestone Building Products Co - Division of BFS Diversified Prod
nonEGU	KY	Kenton	2111700147	Graham Packaging PET Technology Inc
nonEGU	KY	Kenton	2111700154	Progress Rail
nonEGU	KY	Kenton	2111700163	Wild Flavors Inc
nonEGU	KY	Kenton	2111700171	Signode Industrial Group LLC
nonEGU	KY	Kenton	2111700173	White Castle Distributing Inc
nonEGU	KY	Kenton	2111700183	American Metal Products Inc
nonEGU	KY	Kenton	2111700184	Thomas More College
nonEGU	KY	Kenton	2111700185	Hosea Project Movers LLC
nonEGU	KY	Kenton	2111700186	Saint Elizabeth Medical Center - Edgewood
nonEGU	KY	Kenton	2111700170	Loreal USA
nonEGU	KY	Kenton	2111700204	Newly Weds Foods Inc
nonEGU	OH	Butler	1409000037	Metal Coaters

nonEGU	OH	Butler	1409000353	Molson Coors USA LLC
nonEGU	OH	Butler	1409000411	THE SHEPHERD COLOR COMPANY
nonEGU	OH	Butler	1409000687	AdvancePierre Foods
nonEGU	OH	Butler	1409000859	Georgia Pacific Corrugated LLC
nonEGU	OH	Butler	1409010006	AK Steel Corporation
nonEGU	OH	Butler	1409010021	Graphic Packaging International, LLC
nonEGU	OH	Butler	1409010043	Essity Operations Wausau LLC
nonEGU	OH	Butler	1409010131	Barrett Paving - Middletown Asphalt
nonEGU	OH	Butler	1409011031	Middletown Coke Company, LLC
nonEGU	OH	Butler	1409030042	Mt Pleasant Asphalt Company Inc.
nonEGU	OH	Butler	1409030403	MB MANUFACTURING CORPORATION
nonEGU	OH	Butler	1409030900	Koch Foods, Inc.
nonEGU	OH	Butler	1409030976	Pacific Manufacturing Ohio, Inc.
nonEGU	OH	Butler	1409040883	Trans-Acc, Inc.
nonEGU	OH	Butler	1409040987	Amylin Ohio LLC
nonEGU	OH	Butler	1409070344	Worthington Steel Company
nonEGU	OH	Butler	1409070866	BP Pipelines (North America) Inc. - Todhunter Station
nonEGU	OH	Butler	1409090081	Miami University
nonEGU	OH	Clermont	1413000571	Cintas - 9 Milford Rntl (1413000571)
nonEGU	OH	Clermont	1413020004	Milacron Plastics Technologies Group LLC
nonEGU	OH	Clermont	1413080483	Bzak Landscaping Maintenance Inc.
nonEGU	OH	Hamilton	1431004597	Valley Asphalt #23
nonEGU	OH	Hamilton	1431010054	INEOS ABS (USA) Corporation
nonEGU	OH	Hamilton	1431050879	Schlage Lock Company LLC
nonEGU	OH	Hamilton	1431052206	H.B. Fuller Co.
nonEGU	OH	Hamilton	1431070001	Solvay USA, Inc.
nonEGU	OH	Hamilton	1431070035	BASF Corp
nonEGU	OH	Hamilton	1431070039	DyStar Hilton Davis Corp.
nonEGU	OH	Hamilton	1431070132	Christ Hospital
nonEGU	OH	Hamilton	1431070624	Kao USA Inc.
nonEGU	OH	Hamilton	1431070662	Keebler Company
nonEGU	OH	Hamilton	1431070849	University of Cincinnati
nonEGU	OH	Hamilton	1431070914	Givaudan Flavors Corporation
nonEGU	OH	Hamilton	1431070944	Mill Creek WWTP
nonEGU	OH	Hamilton	1431070952	Rock-Tenn Converting Company
nonEGU	OH	Hamilton	1431071006	Caraustar Mill Group, Inc.
nonEGU	OH	Hamilton	1431071395	Cincinnati Children's Hospital Medical Center
nonEGU	OH	Hamilton	1431072069	LITTLE MIAMI, WWTP
nonEGU	OH	Hamilton	1431073227	Buckeye Terminals LLC Cincinnati Terminal
nonEGU	OH	Hamilton	1431073342	Cast-Fab Technologies, Inc.
nonEGU	OH	Hamilton	1431073386	Valley Asphalt #19
nonEGU	OH	Hamilton	1431074118	Cincinnati Renewable Fuels, LLC
nonEGU	OH	Hamilton	1431074278	Emery Oleochemicals LLC
nonEGU	OH	Hamilton	1431092049	Rumpke Sanitary Landfill, Inc.
nonEGU	OH	Hamilton	1431093220	GSF ENERGY, LLC
nonEGU	OH	Hamilton	1431140014	Barrett Paving Materials Inc
nonEGU	OH	Hamilton	1431140861	Ford Motor Company

nonEGU	OH	Hamilton	1431150060	General Electric Aviation, Evendale Plant
nonEGU	OH	Hamilton	1431150801	Formica Corporation - Evendale
nonEGU	OH	Hamilton	1431151190	WHITE CASTLE SYSTEM, INC.
nonEGU	OH	Hamilton	1431170674	Consolidated Packaging Group
nonEGU	OH	Hamilton	1431244104	Village of Indian Hill
nonEGU	OH	Hamilton	1431260066	Sawbrook Steel Casting LLC
nonEGU	OH	Hamilton	1431340460	B-Way Corporation
nonEGU	OH	Hamilton	1431340977	Kyocera SENCO Industrial Tools, Inc.
nonEGU	OH	Hamilton	1431341269	Barrett Paving - Newtown Asphalt
nonEGU	OH	Hamilton	1431342852	Valley Asphalt #14
nonEGU	OH	Hamilton	1431350064	Trammo Nitrogen Products, Inc.
nonEGU	OH	Hamilton	1431350817	Veolia North America Regeneration Services, LLC
nonEGU	OH	Hamilton	1431370150	SHEPHERD CHEMICAL CO
nonEGU	OH	Hamilton	1431370790	FUSITE DIVISION-EMERSON ELECTRIC CO.
nonEGU	OH	Hamilton	1431371235	Rumpke of Ohio, Inc.
nonEGU	OH	Hamilton	1431380075	PMC Cincinnati, Inc.
nonEGU	OH	Hamilton	1431380503	Patheon Pharmaceuticals Inc.
nonEGU	OH	Hamilton	1431390903	The Procter and Gamble Co.
nonEGU	OH	Hamilton	1431391306	KLOSTERMAN'S BAKING CO
nonEGU	OH	Hamilton	1431394148	DTE St. Bernard, LLC
nonEGU	OH	Hamilton	1431400140	Valley Asphalt
nonEGU	OH	Hamilton	1431400175	GM Cereals Properties, Inc.
nonEGU	OH	Hamilton	1431404130	EI Ceramics LLC
nonEGU	OH	Hamilton	1431420875	First Highland Mgmt & Devel Corp
nonEGU	OH	Hamilton	1431443377	Barrett Paving - Reading Asphalt
nonEGU	OH	Hamilton	1431473393	Bruewer Woodwork Mfg. Co.
nonEGU	OH	Hamilton	1431483219	FLINT GROUP PIGMENTS
nonEGU	OH	Warren	1431004484	Valley Asphalt #28
nonEGU	OH	Warren	1483000144	Dominion Energy Transmission, Inc. - Lebanon Station
nonEGU	OH	Warren	1483000170	MARATHON PETROLEUM COMPANY LP - LEBANON
nonEGU	OH	Warren	1483040077	Sonoco Flexible Packaging Co Inc
nonEGU	OH	Warren	1483040158	Atlas Roofing Corporation - Felt Plant
nonEGU	OH	Warren	1483040201	Atlas Roofing Corporation, Franklin Roofing Facility
nonEGU	OH	Warren	1483040446	Burrows Paper Corporation
nonEGU	OH	Warren	1483060328	Texas Eastern Transmission - Lebanon
nonEGU	OH	Warren	1483060393	PFB Manufacturing, LLC
nonEGU	OH	Warren	1483090257	Mauser-USA
nonEGU	OH	Warren	1483090334	Procter & Gamble Mason Business Center
nonEGU	OH	Warren	1483110113	Valley Asphalt #5
nonEGU	OH	Warren	1483140455	Klosterman Hearth Grain Bakery LLC
nonEGU	OH	Warren	1483980486	Barrett Paving - South Lebanon Asphalt

VOC

Sector	**State**	**County**	**Facility ID**	**Facility Name**
EGU	KY	Boone	2101500029	Duke Energy KY East Bend
EGU	KY	Boone	2101500138	East KY Power Coop - Bavarian Substation
EGU	OH	Butler	1409000896	Duke Energy Indiana, Madison Generating Station
EGU	OH	Butler	1409001151	NTE Ohio, LLC
EGU	OH	Butler	1409010078	Dicks Creek Energy Facility
EGU	OH	Butler	1409040243	City of Hamilton Department of Public Utilities
EGU	OH	Butler	1409040897	OMEGA JV2 Hamilton Peaking Station
EGU	OH	Butler	1409120656	Duke Energy Kentucky, Woodsdale Generating Station
EGU	OH	Clermont	1413090154	Zimmer Power Station
EGU	OH	Clermont	1413100008	Duke Energy Ohio, W.C. Beckjord Station
EGU	OH	Hamilton	1431350093	Miami Fort Power Station
nonEGU	KY	Boone	2101500004	Aristech Surfaces LLC
nonEGU	KY	Boone	2101500010	Greif Industrial Packaging & Services LLC
nonEGU	KY	Boone	2101500011	Lingo Manufacturing Co
nonEGU	KY	Boone	2101500018	HDT Expeditionary Systems Inc
nonEGU	KY	Boone	2101500019	Duro Hilex Poly LLC
nonEGU	KY	Boone	2101500025	Crane Composites Inc
nonEGU	KY	Boone	2101500028	Clarios LLC
nonEGU	KY	Boone	2101500043	Ticona Polymers Inc
nonEGU	KY	Boone	2101500062	Delta Air Lines
nonEGU	KY	Boone	2101500068	Lykins BP Bulk Plant #0642
nonEGU	KY	Boone	2101500069	Camco Chemical Co Inc
nonEGU	KY	Boone	2101500073	Former Braxtons Cleaners
nonEGU	KY	Boone	2101500077	Southern Graphic Systems LLC
nonEGU	KY	Boone	2101500082	R R Donnelley - Florence Facility
nonEGU	KY	Boone	2101500084	Kool Breeze LLC dba Superior Cleaners
nonEGU	KY	Boone	2101500086	Duro Hilex Poly LLC
nonEGU	KY	Boone	2101500088	The Hennegan Co
nonEGU	KY	Boone	2101500089	Braxtons Inc
nonEGU	KY	Boone	2101500091	Eaton Asphalt Plant No 3
nonEGU	KY	Boone	2101500102	Sweco Inc
nonEGU	KY	Boone	2101500106	International Paper Company
nonEGU	KY	Boone	2101500113	Waltex NKY LLC
nonEGU	KY	Boone	2101500114	Arandell Kentucky LLC
nonEGU	KY	Boone	2101500115	Levi Strauss & Co
nonEGU	KY	Boone	2101500119	Magni Industries Inc
nonEGU	KY	Boone	2101500120	SFC Global Supply Chain Inc
nonEGU	KY	Boone	2101500124	Mubea Inc Bldg 8252
nonEGU	KY	Boone	2101500125	Safran Landing Systems Kentucky LLC
nonEGU	KY	Boone	2101500126	Ferrara Candy Company
nonEGU	KY	Boone	2101500128	Michels Paving Co Inc
nonEGU	KY	Boone	2101500130	Flint Group North America Corp
nonEGU	KY	Boone	2101500140	Bavarian Trucking Co Inc
nonEGU	KY	Boone	2101500142	Abrapower Inc
nonEGU	KY	Boone	2101500146	Zumbiel Packaging
nonEGU	KY	Boone	2101500148	Cincinnati Northern KY International Airport (CVG)

nonEGU	KY	Boone	2101500150	Givaudan Flavors Corp
nonEGU	KY	Boone	2101500151	Toyota Motor Engineering & Mfg N America Inc
nonEGU	KY	Boone	2101500152	Arvin Meritor Inc
nonEGU	KY	Boone	2101500153	Len Riegler Blacktop Inc
nonEGU	KY	Boone	2101500155	Duke Energy
nonEGU	KY	Boone	2101500163	Printograph Inc
nonEGU	KY	Boone	2101500165	WestRock - Southern Container LLC
nonEGU	KY	Boone	2101500166	The United States Playing Card Co
nonEGU	KY	Boone	2101500169	Fusion Paperboard US Inc
nonEGU	KY	Boone	2101500170	DHL Express
nonEGU	KY	Boone	2101500172	Saint Elizabeth Medical Center
nonEGU	KY	Boone	2101500173	Shire LLC
nonEGU	KY	Boone	2101500174	Eagle Manufacturing
nonEGU	KY	Boone	2101500178	Pamarco Global Graphics
nonEGU	KY	Boone	2101500180	Alstom Power Inc
nonEGU	KY	Boone	2101500181	AmeriPride Services Inc
nonEGU	KY	Boone	2101500188	KY Dept of Military Affairs - Burlington Readiness Center
nonEGU	KY	Boone	2101500190	Flexicon Corp
nonEGU	KY	Boone	2101500192	A-One Pallet Distributing Inc
nonEGU	KY	Boone	2101500207	Bonfiglioli USA
nonEGU	KY	Boone	2101500211	Meggitt (Erlanger) LLC
nonEGU	KY	Boone	2101500225	Diversified Structural Composites
nonEGU	KY	Boone	2101500239	KBCB LLC
nonEGU	KY	Boone	2101500601	Valair Parking
nonEGU	KY	Boone	2101500602	Loveland Petroleum Inc
nonEGU	KY	Boone	2101500606	8039 Burlington Florence LLC
nonEGU	KY	Boone	2101500607	Walton Travel Center
nonEGU	KY	Boone	2101500611	National Car Rental
nonEGU	KY	Boone	2101500612	Clark Refining & Marketing
nonEGU	KY	Boone	2101500621	Avis Rent A Car System LLC
nonEGU	KY	Boone	2101500622	Budget Rent A Car System Inc
nonEGU	KY	Boone	2101500625	Brophys Chevron USA
nonEGU	KY	Boone	2101500627	Florence HOP Shop
nonEGU	KY	Boone	2101500629	Day & Night Stop
nonEGU	KY	Boone	2101500630	Walton Marathon
nonEGU	KY	Boone	2101500632	McElroys BP Carryout LLC
nonEGU	KY	Boone	2101500634	Marathon of Florence
nonEGU	KY	Boone	2101500637	Swifty Station #273
nonEGU	KY	Boone	2101500639	Speedway #5348
nonEGU	KY	Boone	2101500646	7961 US Hwy 42 Florence LLC
nonEGU	KY	Boone	2101500649	Thorntons Inc #556
nonEGU	KY	Boone	2101500652	Florence Travel Center
nonEGU	KY	Boone	2101500653	Speedway #1220
nonEGU	KY	Boone	2101500654	Pilot Travel Center #321
nonEGU	KY	Boone	2101500656	Valor-Florence Bulk Plant
nonEGU	KY	Boone	2101500661	Ameristop Food Mart 29081
nonEGU	KY	Boone	2101500662	Ameristop Express 809

nonEGU	KY	Boone	2101500662	Richwood Shell
nonEGU	KY	Boone	2101500663	Shreeji Oil LLC
nonEGU	KY	Boone	2101500664	Thorntons Inc #72
nonEGU	KY	Boone	2101500665	Fast Track Food Mart
nonEGU	KY	Boone	2101500665	IGA Express
nonEGU	KY	Boone	2101500667	Hertz Rent-A-Car
nonEGU	KY	Boone	2101500668	Hebron Corner Mart
nonEGU	KY	Boone	2101500669	United Dairy Farmers #119
nonEGU	KY	Boone	2101500671	Speedway #7402
nonEGU	KY	Boone	2101500672	Pilot Travel Center #278
nonEGU	KY	Boone	2101500673	Murphy Express #8711
nonEGU	KY	Boone	2101500674	Speedway #9692
nonEGU	KY	Boone	2101500675	Blue Pantry #1
nonEGU	KY	Boone	2101500676	Blue Pantry #2
nonEGU	KY	Boone	2101500677	Blue Pantry
nonEGU	KY	Boone	2101500678	Hebron Park BP
nonEGU	KY	Boone	2101500679	Sankeerh Inc
nonEGU	KY	Boone	2101500680	JDs Food Mart
nonEGU	KY	Boone	2101500681	Speedway #9727
nonEGU	KY	Boone	2101500682	Speedway #7401
nonEGU	KY	Boone	2101500683	United Dairy Farmers #019
nonEGU	KY	Boone	2101500684	Speedway #7403
nonEGU	KY	Boone	2101500685	United Dairy Farmers #142
nonEGU	KY	Boone	2101500686	Speedway #7400
nonEGU	KY	Boone	2101509048	Bluegrass Paving Inc - Portable Asphalt Plant
nonEGU	KY	Boone	2101500690	Jay Grocery (Ameristop Development Co)
nonEGU	KY	Boone	2101500699	Speedway #5252 (Speedway Superamerica Llc)
nonEGU	KY	Campbell	2103700006	IPSCO Tubulars Inc
nonEGU	KY	Campbell	2103700060	Barrett Paving Materials
nonEGU	KY	Campbell	2103700066	SEGEPO-FSM Inc
nonEGU	KY	Campbell	2103700067	Atlas Dry Cleaners Co Inc
nonEGU	KY	Campbell	2103700068	Sunshine Cleaners Inc
nonEGU	KY	Campbell	2103700071	Schraders Cleaners Inc
nonEGU	KY	Campbell	2103700073	Hiland Cleaners
nonEGU	KY	Campbell	2103700074	Hillshire Brands - Claryville Plant
nonEGU	KY	Campbell	2103700082	CCL Label Corp
nonEGU	KY	Campbell	2103700090	Continental Silver Grove LLC
nonEGU	KY	Campbell	2103700095	Northern KY University (NKU)
nonEGU	KY	Campbell	2103700096	Wendling Printing
nonEGU	KY	Campbell	2103700098	Boruske Brothers Collision Center Inc
nonEGU	KY	Campbell	2103700100	Dept Of Veterans Affairs
nonEGU	KY	Campbell	2103700103	Graphic Village LLC
nonEGU	KY	Campbell	2103700104	Saint Elizabeth Medical Center - Ft Thomas
nonEGU	KY	Campbell	2103700109	AT&T Mobility - Highland Heights
nonEGU	KY	Campbell	2103700601	Town & Country Center
nonEGU	KY	Campbell	2103700602	Shell Food Mart
nonEGU	KY	Campbell	2103700605	BP Oil Co

nonEGU	KY	Campbell	2103700606	One Stop Fuel Mart LLC
nonEGU	KY	Campbell	2103700607	BP Highland Heights
nonEGU	KY	Campbell	2103700610	Speedway #9583
nonEGU	KY	Campbell	2103700612	Clark Refining & Marketing
nonEGU	KY	Campbell	2103700617	Speedway #9721
nonEGU	KY	Campbell	2103700621	Neltners Inc
nonEGU	KY	Campbell	2103700632	Fort Thomas Carryout
nonEGU	KY	Campbell	2103700638	Parkside Carryout
nonEGU	KY	Campbell	2103700641	Fort Thomas Shell
nonEGU	KY	Campbell	2103700649	Circle K #3320
nonEGU	KY	Campbell	2103700650	Equilon Enterprises LLC
nonEGU	KY	Campbell	2103700651	Cold Spring Mini Mart
nonEGU	KY	Campbell	2103700652	South Side Deli Mart
nonEGU	KY	Campbell	2103700655	Highland Heights Marathon
nonEGU	KY	Campbell	2103700660	Pangallos 27 Auto Service
nonEGU	KY	Campbell	2103700662	Moyer Property
nonEGU	KY	Campbell	2103700664	United Dairy Farmers #132
nonEGU	KY	Campbell	2103700665	Alexandria Carry Out
nonEGU	KY	Campbell	2103700666	Speedway #5550
nonEGU	KY	Campbell	2103700667	R & M Petroleum
nonEGU	KY	Campbell	2103700668	Grants Lick Market
nonEGU	KY	Campbell	2103700669	Speedway #7408
nonEGU	KY	Campbell	2103700671	Speedway #7407
nonEGU	KY	Campbell	2103700672	Ameristop Development Co
nonEGU	KY	Campbell	2103700099	Plastic Printing Manufacturing Co Inc
nonEGU	KY	Campbell	2103700670	Brinkman Oil Fairlane Dvision (Brinkman Oil Co) (Fairline Oil Co
nonEGU	KY	Campbell	2103700688	Speedway #9601 (Speedway Superamerica Llc)
nonEGU	KY	Kenton	2101500215	Wild Flavors Inc - Olympic
nonEGU	KY	Kenton	2111700004	Transmontaigne Operating Company LP - Greater Cincinnati Te
nonEGU	KY	Kenton	2111700005	Duro Paper Bag Manufacturing Co
nonEGU	KY	Kenton	2111700012	OYSTAR North America - Covington Inc
nonEGU	KY	Kenton	2111700016	BP Products North America Inc - Bromley Pipeline
nonEGU	KY	Kenton	2111700022	MPLX Terminals LLC - Covington Terminal
nonEGU	KY	Kenton	2111700086	Interplastic Corp
nonEGU	KY	Kenton	2111700115	Wagner Oil Co of KY
nonEGU	KY	Kenton	2111700117	Community Cleaners
nonEGU	KY	Kenton	2111700118	Hytone Cleaners
nonEGU	KY	Kenton	2111700119	Mauri Lou Dry Cleaners Inc
nonEGU	KY	Kenton	2111700121	Swift Cleaners
nonEGU	KY	Kenton	2111700123	A F Riedinger & Sons
nonEGU	KY	Kenton	2111700124	L & L Dry Cleaners
nonEGU	KY	Kenton	2111700126	Reliable Dry Cleaners
nonEGU	KY	Kenton	2111700127	Pharo Enterprises Inc
nonEGU	KY	Kenton	2111700128	Lookout Heights Dry Cleaners
nonEGU	KY	Kenton	2111700131	Main St Cleaners
nonEGU	KY	Kenton	2111700133	Tex Craft Cleaners
nonEGU	KY	Kenton	2111700135	Top Quality Cleaners

nonEGU	KY	Kenton	2111700140	A O Smith Corp
nonEGU	KY	Kenton	2111700141	Mazak Corp
nonEGU	KY	Kenton	2111700142	Prestige Cleaners
nonEGU	KY	Kenton	2111700144	Firestone Building Products Co - Division of BFS Diversified Prod
nonEGU	KY	Kenton	2111700147	Graham Packaging PET Technology Inc
nonEGU	KY	Kenton	2111700150	Esco Group LLC - Covington
nonEGU	KY	Kenton	2111700154	Progress Rail
nonEGU	KY	Kenton	2111700163	Wild Flavors Inc
nonEGU	KY	Kenton	2111700171	Signode Industrial Group LLC
nonEGU	KY	Kenton	2111700173	White Castle Distributing Inc
nonEGU	KY	Kenton	2111700183	American Metal Products Inc
nonEGU	KY	Kenton	2111700184	Thomas More College
nonEGU	KY	Kenton	2111700185	Hosea Project Movers LLC
nonEGU	KY	Kenton	2111700186	Saint Elizabeth Medical Center - Edgewood
nonEGU	KY	Kenton	2111700601	The Gas Hole Food Mart
nonEGU	KY	Kenton	2111700604	610 West 4th Covington LLC
nonEGU	KY	Kenton	2111700607	2447 Anderson Crescent Springs LLC
nonEGU	KY	Kenton	2111700608	4301 Winston Covington LLC
nonEGU	KY	Kenton	2111700611	Lusbys Enterprises
nonEGU	KY	Kenton	2111700612	Express Mart 2
nonEGU	KY	Kenton	2111700614	Sunoco
nonEGU	KY	Kenton	2111700615	Speedway #9663
nonEGU	KY	Kenton	2111700619	Speedway SuperAmerica LLC 9521
nonEGU	KY	Kenton	2111700620	Speedway #9541
nonEGU	KY	Kenton	2111700621	Speedway #9534
nonEGU	KY	Kenton	2111700624	K & M Petroleum Inc
nonEGU	KY	Kenton	2111700638	Thorntons Inc #73
nonEGU	KY	Kenton	2111700639	Speedway #8513
nonEGU	KY	Kenton	2111700641	Fort Mitchell Shell
nonEGU	KY	Kenton	2111700642	BP Ft Wright
nonEGU	KY	Kenton	2111700646	506 Commonwealth Erlanger LLC
nonEGU	KY	Kenton	2111700649	Former Fort Wright Marathon
nonEGU	KY	Kenton	2111700650	Circle K #3319
nonEGU	KY	Kenton	2111700651	Speedy Food Mart
nonEGU	KY	Kenton	2111700652	Convenience Real Estate #4 LLC dba Ameristop #29004
nonEGU	KY	Kenton	2111700653	Duke & Long Distributing Co Inc
nonEGU	KY	Kenton	2111700654	Kwik Trip
nonEGU	KY	Kenton	2111700655	Erlanger Tobacco & Food
nonEGU	KY	Kenton	2111700656	Ft Mitchell Food Mart
nonEGU	KY	Kenton	2111700657	Rons Sunoco
nonEGU	KY	Kenton	2111700659	Dudley Road Shell #45
nonEGU	KY	Kenton	2111700661	Schwartes Service Center
nonEGU	KY	Kenton	2111700662	Rons Food Mart Covington
nonEGU	KY	Kenton	2111700665	Lances Service
nonEGU	KY	Kenton	2111700668	Warsaw Carwash dba Covington Gulf
nonEGU	KY	Kenton	2111700673	Covington Marathon
nonEGU	KY	Kenton	2111700677	Richardson Rd Sunoco

nonEGU	KY	Kenton	2111700680	Speedway #7406
nonEGU	KY	Kenton	2111700681	Latonia Shell
nonEGU	KY	Kenton	2111700682	Shell Food Mart
nonEGU	KY	Kenton	2111700683	Speedway #7405
nonEGU	KY	Kenton	2111700684	Ft Wright Shell
nonEGU	KY	Kenton	2111700685	Johnson Oil Co Inc
nonEGU	KY	Kenton	2111700688	Marathon Express
nonEGU	KY	Kenton	2111700690	Edgewood Superette
nonEGU	KY	Kenton	2111700691	Terry Plasters
nonEGU	KY	Kenton	2111700692	Madison Ave Marathon #47
nonEGU	KY	Kenton	2111700693	Speedway #9702
nonEGU	KY	Kenton	2111700694	In & Out Market South
nonEGU	KY	Kenton	2111700695	3 W Corp
nonEGU	KY	Kenton	2111700696	Visalia Market
nonEGU	KY	Kenton	2111700698	RT 17 IGA Express
nonEGU	KY	Kenton	2111700699	United Dairy Farmers #021
nonEGU	KY	Kenton	2111700169	Regal Beloit America Inc
nonEGU	KY	Kenton	2111700204	Newly Weds Foods Inc
nonEGU	KY	Kenton	2111700630	Drawbrige Citgo Foodmart (Harper Properties)
nonEGU	KY	Kenton	2111700703	Blue Pantry (Deters Company The)
nonEGU	OH	Butler	1409000037	Metal Coaters
nonEGU	OH	Butler	1409000070	OPW FUELING COMPONENTS
nonEGU	OH	Butler	1409000353	Molson Coors USA LLC
nonEGU	OH	Butler	1409000411	THE SHEPHERD COLOR COMPANY
nonEGU	OH	Butler	1409000675	DEE SIGN COMPANY
nonEGU	OH	Butler	1409000687	AdvancePierre Foods
nonEGU	OH	Butler	1409000716	Chase Industries, Inc
nonEGU	OH	Butler	1409000859	Georgia Pacific Corrugated LLC
nonEGU	OH	Butler	1409000935	Agean Marble Mfg Inc
nonEGU	OH	Butler	1409010006	AK Steel Corporation
nonEGU	OH	Butler	1409010021	Graphic Packaging International, LLC
nonEGU	OH	Butler	1409010043	Essity Operations Wausau LLC
nonEGU	OH	Butler	1409010131	Barrett Paving - Middletown Asphalt
nonEGU	OH	Butler	1409011031	Middletown Coke Company, LLC
nonEGU	OH	Butler	1409030042	Mt Pleasant Asphalt Company Inc.
nonEGU	OH	Butler	1409030403	MB MANUFACTURING CORPORATION
nonEGU	OH	Butler	1409030581	R L Industries
nonEGU	OH	Butler	1409030683	TEDIA COMPANY INC
nonEGU	OH	Butler	1409030749	SUPERIOR OIL COMPANY INC
nonEGU	OH	Butler	1409030900	Koch Foods, Inc.
nonEGU	OH	Butler	1409030956	Flint Group North America Corporation
nonEGU	OH	Butler	1409030976	Pacific Manufacturing Ohio, Inc.
nonEGU	OH	Butler	1409040302	GRK Manufacturing Co.
nonEGU	OH	Butler	1409040850	Plas-Tanks Industries, Inc.
nonEGU	OH	Butler	1409040883	Trans-Acc, Inc.
nonEGU	OH	Butler	1409040987	Amylin Ohio LLC
nonEGU	OH	Butler	1409070344	Worthington Steel Company

nonEGU	OH	Butler	1409070634	Hy-Blast, Inc.
nonEGU	OH	Butler	1409070866	BP Pipelines (North America) Inc. - Todhunter Station
nonEGU	OH	Butler	1409090081	Miami University
nonEGU	OH	Clermont	1413000402	HDT Expeditionary Systems Inc.
nonEGU	OH	Clermont	1413000550	Composite Engineering LLC.
nonEGU	OH	Clermont	1413000571	Cintas - 9 Milford Rntl (1413000571)
nonEGU	OH	Clermont	1413010362	Eagle Specialty Vehicles. LLC dba Eagle Coach Company
nonEGU	OH	Clermont	1413020004	Milacron Plastics Technologies Group LLC
nonEGU	OH	Clermont	1413020232	Clermont Steel Fabricators LLC
nonEGU	OH	Clermont	1413020248	Core Composites Cincinnati, LLC
nonEGU	OH	Clermont	1413020501	Freeman Enclosure System
nonEGU	OH	Clermont	1413020513	Multi-Color Corporation
nonEGU	OH	Clermont	1413080483	Bzak Landscaping Maintenance Inc.
nonEGU	OH	Hamilton	1431004457	StandardAero Component Services, Inc.
nonEGU	OH	Hamilton	1431004502	Mane Inc
nonEGU	OH	Hamilton	1431004597	Valley Asphalt #23
nonEGU	OH	Hamilton	1431004632	Queen City Foam, Incorporated
nonEGU	OH	Hamilton	1431010054	INEOS ABS (USA) Corporation
nonEGU	OH	Hamilton	1431050879	Schlage Lock Company LLC
nonEGU	OH	Hamilton	1431050909	Trans-Acc
nonEGU	OH	Hamilton	1431052206	H.B. Fuller Co.
nonEGU	OH	Hamilton	1431053385	ITW Evercoat, a division of Illinois Tool Works, Inc.
nonEGU	OH	Hamilton	1431053871	Wingate Packaging, Inc.
nonEGU	OH	Hamilton	1431054014	Wittrock Woodworking & Mfg.
nonEGU	OH	Hamilton	1431070001	Solvay USA, Inc.
nonEGU	OH	Hamilton	1431070035	BASF Corp
nonEGU	OH	Hamilton	1431070039	DyStar Hilton Davis Corp.
nonEGU	OH	Hamilton	1431070118	KM Phoenix Holdings LLC - Cincinnati North Terminal
nonEGU	OH	Hamilton	1431070132	Christ Hospital
nonEGU	OH	Hamilton	1431070324	ART WOODWORKING & MFG CO
nonEGU	OH	Hamilton	1431070383	Champion Graphics Corporation
nonEGU	OH	Hamilton	1431070624	Kao USA Inc.
nonEGU	OH	Hamilton	1431070662	Keebler Company
nonEGU	OH	Hamilton	1431070849	University of Cincinnati
nonEGU	OH	Hamilton	1431070914	Givaudan Flavors Corporation
nonEGU	OH	Hamilton	1431070944	Mill Creek WWTP
nonEGU	OH	Hamilton	1431070952	Rock-Tenn Converting Company
nonEGU	OH	Hamilton	1431071006	Caraustar Mill Group, Inc.
nonEGU	OH	Hamilton	1431071007	Wine Cellar Innovations
nonEGU	OH	Hamilton	1431071395	Cincinnati Children's Hospital Medical Center
nonEGU	OH	Hamilton	1431071557	MPLX Terminals LLC - Cincinnati Terminal
nonEGU	OH	Hamilton	1431072036	Queen City Terminals LLC
nonEGU	OH	Hamilton	1431072038	Teva Women's Health
nonEGU	OH	Hamilton	1431072069	LITTLE MIAMI, WWTP
nonEGU	OH	Hamilton	1431072125	Consolidated Metal Products
nonEGU	OH	Hamilton	1431072600	Spring Grove Resource Recovery Inc
nonEGU	OH	Hamilton	1431073227	Buckeye Terminals LLC Cincinnati Terminal

nonEGU	OH	Hamilton	1431073342	Cast-Fab Technologies, Inc.
nonEGU	OH	Hamilton	1431073386	Valley Asphalt #19
nonEGU	OH	Hamilton	1431074053	Sims-Lohman
nonEGU	OH	Hamilton	1431074118	Cincinnati Renewable Fuels, LLC
nonEGU	OH	Hamilton	1431074278	Emery Oleochemicals LLC
nonEGU	OH	Hamilton	1431092049	Rumpke Sanitary Landfill, Inc.
nonEGU	OH	Hamilton	1431093220	GSF ENERGY, LLC
nonEGU	OH	Hamilton	1431140014	Barrett Paving Materials Inc
nonEGU	OH	Hamilton	1431140861	Ford Motor Company
nonEGU	OH	Hamilton	1431150060	General Electric Aviation, Evendale Plant
nonEGU	OH	Hamilton	1431150801	Formica Corporation - Evendale
nonEGU	OH	Hamilton	1431151190	WHITE CASTLE SYSTEM, INC.
nonEGU	OH	Hamilton	1431152467	Univar Solutions USA, Inc.
nonEGU	OH	Hamilton	1431154016	Alro Steel Inc
nonEGU	OH	Hamilton	1431170674	Consolidated Packaging Group
nonEGU	OH	Hamilton	1431184120	Custom Cast Marbleworks, Evendale
nonEGU	OH	Hamilton	1431224051	F & M Mafco Inc.
nonEGU	OH	Hamilton	1431244104	Village of Indian Hill
nonEGU	OH	Hamilton	1431260066	Sawbrook Steel Casting LLC
nonEGU	OH	Hamilton	1431302438	Greater Cincinnati Asphalt Terminal 2
nonEGU	OH	Hamilton	1431340460	B-Way Corporation
nonEGU	OH	Hamilton	1431340977	Kyocera SENCO Industrial Tools, Inc.
nonEGU	OH	Hamilton	1431341269	Barrett Paving - Newtown Asphalt
nonEGU	OH	Hamilton	1431342852	Valley Asphalt #14
nonEGU	OH	Hamilton	1431350064	Trammo Nitrogen Products, Inc.
nonEGU	OH	Hamilton	1431350817	Veolia North America Regeneration Services, LLC
nonEGU	OH	Hamilton	1431370116	MCC-Norwood, LLC
nonEGU	OH	Hamilton	1431370150	SHEPHERD CHEMICAL CO
nonEGU	OH	Hamilton	1431370602	EMD Millipore Corporation
nonEGU	OH	Hamilton	1431370790	FUSITE DIVISION-EMERSON ELECTRIC CO.
nonEGU	OH	Hamilton	1431371235	Rumpke of Ohio, Inc.
nonEGU	OH	Hamilton	1431380075	PMC Cincinnati, Inc.
nonEGU	OH	Hamilton	1431380503	Patheon Pharmaceuticals Inc.
nonEGU	OH	Hamilton	1431390903	The Procter and Gamble Co.
nonEGU	OH	Hamilton	1431391306	KLOSTERMAN'S BAKING CO
nonEGU	OH	Hamilton	1431394112	J.M. Smucker Company - Crisco Facility
nonEGU	OH	Hamilton	1431394137	St. Bernard Soap Company
nonEGU	OH	Hamilton	1431394148	DTE St. Bernard, LLC
nonEGU	OH	Hamilton	1431400140	Valley Asphalt
nonEGU	OH	Hamilton	1431400175	GM Cereals Properties, Inc.
nonEGU	OH	Hamilton	1431404130	EI Ceramics LLC
nonEGU	OH	Hamilton	1431420497	AMPAC Packaging LLC
nonEGU	OH	Hamilton	1431420875	First Highland Mgmt & Devel Corp
nonEGU	OH	Hamilton	1431431877	Sherwin-Williams Company
nonEGU	OH	Hamilton	1431443377	Barrett Paving - Reading Asphalt
nonEGU	OH	Hamilton	1431473393	Bruewer Woodwork Mfg. Co.
nonEGU	OH	Hamilton	1431473443	Bond Road Landfill

nonEGU	OH	Hamilton	1431480237	SUN CHEMICAL CORP CINCINNATI INK
nonEGU	OH	Hamilton	1431483219	FLINT GROUP PIGMENTS
nonEGU	OH	Hamilton	1431484126	Tri-County Furniture
nonEGU	OH	Hamilton	1431484151	CHC Manufacturing, Inc.
nonEGU	OH	Warren	1431004484	Valley Asphalt #28
nonEGU	OH	Warren	1483000144	Dominion Energy Transmission, Inc. - Lebanon Station
nonEGU	OH	Warren	1483000170	MARATHON PETROLEUM COMPANY LP - LEBANON
nonEGU	OH	Warren	1483000550	INX International Ink Co.
nonEGU	OH	Warren	1483040077	Sonoco Flexible Packaging Co Inc
nonEGU	OH	Warren	1483040158	Atlas Roofing Corporation - Felt Plant
nonEGU	OH	Warren	1483040201	Atlas Roofing Corporation, Franklin Roofing Facility
nonEGU	OH	Warren	1483040399	A&B Foundry and Machining, LLC
nonEGU	OH	Warren	1483040411	Marble Arch Products Inc.
nonEGU	OH	Warren	1483040446	Burrows Paper Corporation
nonEGU	OH	Warren	1483060076	Midmark Corporation
nonEGU	OH	Warren	1483060110	Enterprise Refined Products Company LLC
nonEGU	OH	Warren	1483060328	Texas Eastern Transmission - Lebanon
nonEGU	OH	Warren	1483060393	PFB Manufacturing, LLC
nonEGU	OH	Warren	1483060488	Mane, Inc.
nonEGU	OH	Warren	1483090257	Mauser-USA
nonEGU	OH	Warren	1483090295	Mitsubishi Electric Automotive America
nonEGU	OH	Warren	1483090334	Procter & Gamble Mason Business Center
nonEGU	OH	Warren	1483090487	Armor Metal Group
nonEGU	OH	Warren	1483110113	Valley Asphalt #5
nonEGU	OH	Warren	1483140150	High Concrete Group LLC
nonEGU	OH	Warren	1483140455	Klosterman Hearth Grain Bakery LLC
nonEGU	OH	Warren	1483980486	Barrett Paving - South Lebanon Asphalt

2014	**2019**	**2026**	**2035**
12.44	5.30	1.49	1.70
0.21	0.35	0.32	0.32
0.11	0.25	0.06	0.01
	0.21	0.12	0.12
0.01	0.04	0.03	0.03
0.16	0.02	0.02	0.02
0.01	0.01	0.03	0.01
0.07	0.40	0.03	0.03
33.61	15.87	10.42	0.00
11.26			
19.03	33.76	11.00	0.00
0.01	0.02	0.02	0.02
0.01	0.01		
0.00	0.00		
0.00	0.00	0.00	0.00
0.00	0.00		
0.00	0.00	0.00	0.00
	0.01		
0.01	0.02	0.02	0.02
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.01	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
	0.00		
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.04	0.01	0.04	0.04
0.00	0.05		
0.06	0.08	0.06	0.06
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.02	0.00	0.00
	0.00	0.00	0.00
0.00	0.00		
0.02	0.01	0.02	0.02
0.02	0.02	0.02	0.02

0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
	0.00		
0.01	0.00	0.01	0.01
0.03	0.00	0.04	0.04
0.00	0.00	0.00	0.00
0.01		0.01	0.01
0.00		0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.02		0.02	0.02
0.00	0.00	0.00	0.00
0.00	0.00		
	0.01		
	0.01		
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.02	0.02	0.02	0.02
0.22	0.21	0.22	0.22
0.03	0.02	0.03	0.03
0.00	0.00	0.00	0.00
0.00	0.00		
	0.01	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
	0.00		
0.00			
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.02	0.02	0.02	0.03
0.22	0.20	0.22	0.22
0.00	0.00	0.00	0.00
ucts LLC		0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.00	0.01	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.02	0.02	0.02	0.02
		0.00	0.00
		0.00	0.00
0.03	0.03	0.00	0.00

0.39	0.04	0.06	0.06
	0.11		
0.05	0.12	0.04	0.04
0.01	0.01	0.01	0.01
7.95	5.38	5.85	5.74
0.10	0.10	0.09	0.09
1.29	0.93	0.99	0.82
0.00	0.01	0.01	0.01
0.61	0.90	1.52	1.10
0.01	0.00	0.00	0.00
0.03		0.03	0.03
	0.00	0.11	0.11
0.00	0.00	0.00	0.00
0.00			
0.02	0.02	0.02	0.02
0.00	0.01	0.00	0.00
0.00			
0.19	0.05	0.07	0.07
		0.00	0.00
0.00	0.00	0.01	0.01
0.02			
	0.02		
0.35	0.27	0.37	0.42
0.01	0.01	0.01	0.01
0.01	0.00	0.01	0.01
0.02	0.03	0.02	0.02
0.01	0.00	0.01	0.01
0.01	0.01	0.01	0.01
0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.01
0.03	0.03	0.03	0.03
0.24	0.24	0.36	0.23
0.01	0.01	0.01	0.01
0.03	0.03	0.03	0.03
0.16			
0.14	0.14	0.14	0.13
0.05	0.07	0.06	0.06
0.00			
0.00	0.01	0.00	0.00
0.01			
0.00	0.00	0.00	0.00
0.02	0.03	0.05	0.04
0.32	0.31	0.36	0.39
0.03	0.00		
	0.01		
0.00	0.00		
0.07	0.03	0.05	0.05

0.45	0.45	0.53	0.53
0.05	0.06	0.04	0.04
	0.00	0.00	0.00
	0.00		
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.01	0.03	0.02	0.02
0.00	0.00	0.00	0.00
0.00	0.01	0.00	0.00
0.01	0.01	0.01	0.01
0.05	0.04	0.06	0.06
0.01	0.01	0.02	0.02
	0.00		
0.00	0.01	0.00	0.00
0.00	0.00		
0.00			
0.04	0.04	0.04	0.04
0.00		0.00	0.00
0.00		0.01	0.01
1.81	0.42	0.40	0.39
0.05			
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00			
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01			
	0.00		
0.75	1.21	1.73	1.57
	0.00		
0.01			
0.03	0.03	0.03	0.03
0.01	0.01	0.01	0.01
0.06	0.06	0.07	0.07
	0.63	0.33	0.30
0.00	0.00	0.00	0.00
0.00	0.00		
0.06	0.10	0.07	0.07
0.00	0.01		
0.00	0.00	0.00	0.00
0.00	0.02		

VOC

2014	2019	2026	2035
0.14	0.15	0.05	0.05
0.13	0.18	0.20	0.20
0.01	0.03	0.01	0.00
	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.01	0.00	0.00
0.21	0.11	0.13	0.00
0.07			
0.35	0.30	0.17	0.00
0.02	0.11	0.02	0.02
0.17	0.16		
0.02	0.01	0.01	0.01
0.02	0.00	0.02	0.02
0.04	0.02		
0.02	0.01	0.02	0.02
0.00	0.04	0.00	0.00
0.03	0.03	0.03	0.03
0.00	0.01	0.00	0.00
0.02	0.02	0.02	0.02
0.05	0.03	0.05	0.05
0.00	0.00		
0.04	0.07	0.04	0.04
0.04	0.00	0.04	0.04
0.01	0.01		
0.11	0.06	0.00	0.00
0.06	0.07	0.06	0.06
0.00	0.00		
0.00	0.02	0.00	0.00
0.04	0.02	0.04	0.04
0.04	0.03	0.04	0.04
0.00	0.00	0.00	0.00
0.04	0.01	0.04	0.04
0.00	0.00	0.00	0.00
0.00	0.04	0.00	0.00
0.09	0.07	0.09	0.09
0.01	0.02		
0.04	0.36	0.04	0.04
0.04	0.06	0.03	0.03
0.00	0.00	0.00	0.00
0.02	0.02	0.02	0.02
0.03	0.01	0.03	0.03
	0.21	0.17	0.17
0.13	0.15	0.12	0.12
0.00	0.00	0.00	0.00

0.02	0.03	0.02	0.02
0.00			
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.03	0.02		
0.03	0.03	0.03	0.03
0.06	0.06	0.06	0.06
0.00	0.00	0.00	0.00
0.00		0.00	0.00
0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00		0.00	0.00
0.00	0.00	0.00	0.00
	0.00		
0.00	0.03		
	0.05		
0.03	0.03	0.03	0.03
	0.13		
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00		0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.02	0.02
0.02	0.02		
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.02	0.02	0.01	0.01
0.01	0.01	0.01	0.01
	0.00	0.00	0.00
0.00	0.00		
		0.01	0.01

0.01			
0.01	0.01	0.01	0.01
0.02	0.02	0.02	0.02
0.00	0.00		
		0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.06	0.06	0.06	0.06
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.01	0.01		
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.01	0.02	0.02
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
	0.01		
		0.00	0.00
		0.01	0.01
0.16	0.04	0.13	0.13
0.00	0.00	0.00	0.00
0.02	0.01	0.00	0.00
0.00	0.00		
0.00	0.00		
0.00	0.00		
0.00	0.00		
0.04	0.05	0.04	0.04
0.01	0.01	0.01	0.01
0.09	0.14	0.09	0.09
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
	0.00	0.00	0.00
0.02	0.00	0.02	0.02
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01

	0.01	0.01	0.01	0.01
	0.01	0.01	0.01	0.01
	0.01	0.01		
	0.00	0.00	0.00	0.00
	0.01	0.01	0.01	0.01
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	0.00	0.00		
	0.00	0.00	0.00	0.00
	0.01	0.01	0.01	0.01
	0.01	0.01	0.01	0.01
	0.00	0.00	0.00	0.00
	0.01	0.01	0.01	0.01
	0.01	0.01	0.01	0.01
	0.01	0.01	0.01	0.01
	0.00	0.00	0.00	0.00
			0.00	0.00
Inc)			0.00	0.00
			0.01	0.01
		0.00		
	0.00	0.00	0.00	0.00
	0.00	0.00		
	0.00	0.00	0.00	0.00
	0.01	0.02	0.01	0.01
	0.06	0.04	0.06	0.06
	0.02	0.02	0.02	0.02
	0.00	0.00	0.00	0.00
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		
	0.00	0.00		

0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00		
0.00	0.00	0.20	0.20
0.01	0.01	0.01	0.01
0.03	0.01	0.03	0.03
0.02	0.01	0.02	0.02
0.01	0.02	0.01	0.01
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.02	0.02	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00		
0.00	0.00	0.00	0.00

0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.02	0.02
0.03	0.03	0.03	0.03
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.02	0.02	0.02	0.02
0.00	0.00	0.00	0.00
0.00	0.00		
0.00	0.00	0.00	0.00
		0.00	0.00
		0.01	0.01
		0.00	0.00
		0.01	0.01
0.02	0.02	0.00	0.00
0.02	0.01	0.01	0.01
0.18	0.24	0.27	0.27
	0.01		
0.02	0.00		
0.19	0.10	0.14	0.14
0.01	0.01		
0.00	0.01	0.00	0.00
0.01	0.01	0.01	0.01
2.09	1.60	1.07	1.04
0.07	0.07	0.01	0.00
0.14	0.11	0.06	0.06
0.01	0.02	0.01	0.01
0.00	0.00	0.06	0.00
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.00	0.00	0.00
0.00	0.01	0.00	0.00
0.01	0.01	0.01	0.01
	0.05	0.04	0.04
0.02	0.02	0.03	0.03
0.01	0.01	0.00	0.00
0.02	0.01		
0.03	0.02	0.02	0.02
0.01	0.00		
0.00	0.00	0.00	0.00
0.02	0.02	0.00	0.00

0.01	0.01		
0.00			
0.00	0.00	0.00	0.00
0.00	0.00		
0.02	0.02	0.02	0.02
		0.01	0.01
0.06			
0.06	0.04	0.00	0.00
0.05	0.04		
0.05	0.07	0.02	0.02
0.02	0.07		
0.13	0.11		
0.00			
	0.01		
	0.01		
	0.01		
	0.01		
0.09	0.12	0.08	0.08
0.29	0.24	0.00	0.00
0.01	0.01		
0.01	0.00	0.02	0.02
0.01	0.02	0.00	0.00
	0.04		
0.01	0.01		
0.00	0.00	0.00	0.00
0.07	0.02	0.08	0.08
0.00	0.01	0.00	0.00
0.02	0.06	0.03	0.03
0.00	0.00	0.00	0.00
	0.01		
	0.00		
0.00	0.00	0.00	0.00
0.14	0.06	0.10	0.10
0.01	0.03	0.03	0.02
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.05			
0.02	0.06	0.07	0.07
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.07	0.08	0.08	0.08
	0.03		
0.00	0.00	0.00	0.00
0.00			
0.02	0.02		
0.01	0.01	0.01	0.01
0.01	0.06	0.03	0.03

0.05			
0.00	0.00	0.01	0.01
0.03	0.03	0.04	0.04
0.02	0.01	0.01	0.01
0.06	0.07	0.08	0.08
0.45	0.20		
	0.00		
0.00	0.00		
0.20	0.12	0.12	0.12
0.01	0.01	0.01	0.01
0.03	0.04	0.00	0.00
	0.00	0.12	0.12
0.00	0.01	0.02	0.02
0.01	0.00		
0.05	0.01	0.01	0.01
0.02			
0.01	0.01		
0.00	0.00	0.00	0.00
0.02	0.01	0.01	0.01
0.00	0.01	0.00	0.00
0.05	0.02	0.00	0.00
0.03	0.04	0.00	0.00
0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.10	0.04		
	0.00		
0.00	0.01	0.01	0.01
0.00	0.00	0.00	0.00
0.01	0.00		
0.00			
0.02	0.03	0.01	0.01
0.03	0.03	0.03	0.03
0.08		0.12	0.12
0.01	0.01	0.01	0.01
0.08	0.08	0.06	0.06
0.01	0.01	0.01	0.01
0.02			
0.00	0.01	0.00	0.00
0.01	0.01	0.01	0.01
0.04	0.08		
0.00			
	0.00		
0.01	0.02	0.04	0.04
0.01	0.01		
0.00	0.00		

0.00	0.00	0.00	0.00
0.02			
0.02	0.02		
0.00	0.00		
	0.01		
0.11	0.05	0.18	0.19
0.10	0.09	0.08	0.07
	0.13	0.03	0.03
0.03	0.03		
0.00	0.01	0.11	0.11
0.00	0.09	0.12	0.12
0.00	0.00	0.00	0.00
0.00		0.00	0.00
0.01	0.02	0.01	0.01
0.01	0.01	0.01	0.01
0.08	0.02	0.04	0.04
0.01	0.05	0.05	0.05
0.02	0.07	0.04	0.04
0.01	0.03	0.04	0.04
0.00	0.01		
0.00			
0.01	0.01	0.01	0.01
0.00	0.01		
0.00	0.00		
0.00	0.00	0.00	0.00
0.09	0.08	0.09	0.09
0.01	0.02		

APPENDIX C

Mobile Budgets,
LADCO Analysis,
OKI data

REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR THE 2015 OZONE STANDARD FOR THE CINCINNATI-HAMILTON OH-KY AREA FOR NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) – TECHNICAL DOCUMENTATION FOR MOBILE SOURCE EMISSIONS

December 13, 2021

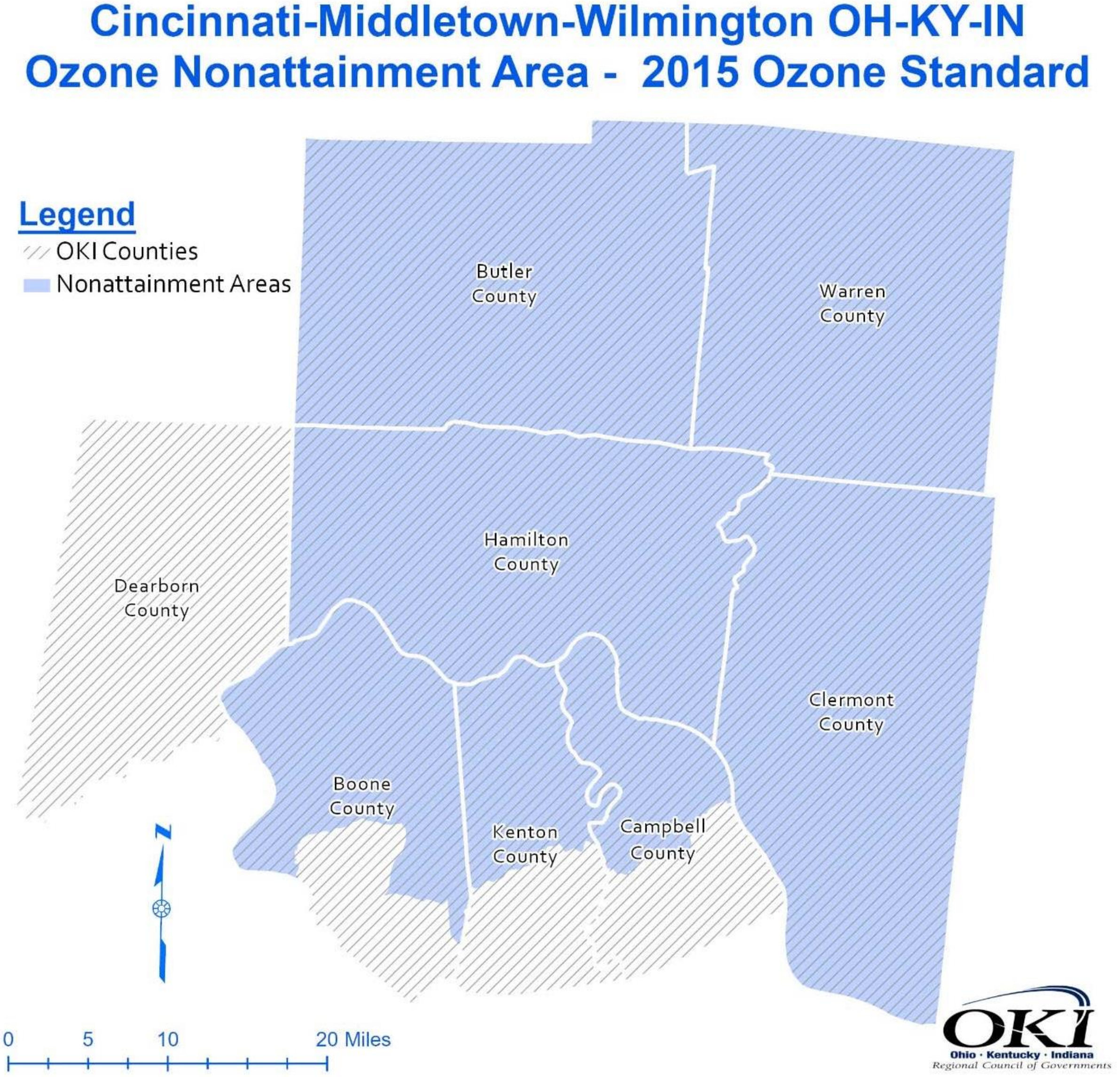
OKI
Ohio · Kentucky · Indiana
Regional Council of Governments

BACKGROUND

This report documents the redesignation request and maintenance plan process used by OKI to develop mobile emissions inventories for the 2015 ozone standard for the State Implementation Plans (SIP) of Ohio, Kentucky and Indiana which complies with the Clean Air Act.

In April 2018, the U.S. Environmental Protection Agency (EPA) designated portions of seven counties in the Cincinnati area as a nonattainment area for ozone under the 2015 ozone standard (Figure 1). The 2015 Cincinnati ozone nonattainment area includes portions of the Kentucky counties of Boone, Campbell and Kenton, and the Ohio counties of Butler, Clermont, Hamilton and Warren.

Figure 1



Cincinnati-Middletown-Wilmington OH-KY-IN Ozone Nonattainment Area - 2015 Ozone Standard

OKI'S MOBILE EMISSIONS INVENTORY PROCESS

The mobile emissions inventory involves the process of estimating mobile source emissions of volatile organing compounds (VOC) and oxides of nitrogen (NOx) resulting from the transportation system for various years described below. This is accomplished by estimating vehicle miles of travel and vehicle speed of travel using travel demand models in conjunction with the EPA MOVES3 model. Central to travel demand forecasting are the transportation networks (highway and transit) as well as demographic data.

Transportation networks

OKI's highway and transit networks include the existing transportation system plus all regionally significant projects in OKI's Metropolitant Transportation Plan and TIP that would normally be subject to air quality conformity requirements (non-exempt), regardless of funding source. A list of non-exempt projects included in each transportation network is included in Appendix A.

The networks specifically developed for use in this conformity process represented a base year of 2014, attainment year (2019), an interim year (2026) and the maintenance year (2035).

- The 2014 Base Year (Nonattainment emissions)
- The 2019 Attainment Year
- The 2026 Interim Year
- The 2035 Maintenance Year

Demographic Data

Values for an array of socioeconomic variables are estimated (base year) and projected (intermediate and horizon years) as input into trip generation, distribution, and modal choice components of the OKI travel demand model. These data are geographically recorded by transportation analysis zone (TAZ) which permits quantifying the amount of trip generating activity by zones of origin and destination.

The socioeconomic data are prepared for the base year to assist in validating the travel demand model to replicate current traffic conditions and for the analysis year to determine the travel demands to be accommodated within the planning period. The point in time for which the travel demand model is calibrated and validated is a normal weekday and the annual average weekday.

Demographic data files are prepared for a base year (usually a year ending in 0 or 5) and a long-range horizon year which is specified in the federal guidelines to be at least 20 years in the future. The number of TAZs currently being used is 2,067 and place holding zones are included for each county to permit expansion of the database as needed in the future.

The base year for this database is 2015 with a 2050 horizon year for the 2020 metropolitan transportation plan update.

Data has been developed and finalized for the 2015 base year, as well as intermediate years of 2020, 2030, 2040, and 2050. It should also be noted that a few variables will not have values in some TAZs due to the absence of households, employment or workers in the base year data set. The TAZs should be checked in the future year to confirm that land uses have not changed the nature of the TAZ (thus requiring the determination of a value).

A complete discussion of demographic data development is available in *OKI Travel Demand Model Demographic Input Methodology for Preparing the Zonal Demographic Database April 2020 Update*. A summary explanation of base year and future year planning data follows. All of the variables represent the latest OKI planning assumptions.

Population

Base and Future Year Data: Population data for base year 2015 and future years 2020 (interpolated), 2030, 2040 and 2050 originate with the 2010 Census of Population and Housing. Utilizing ArcGIS, population data at the zonal level for 2015 was derived from the area proportion allocation of block group level population.

As a tri-state regional planning agency, OKI uses the most current county level population projections as prepared by the respective state data centers (Ohio Development Services Agency Department of Research, Kentucky State Data Center and Indiana Business Research Center) as control totals. Projections based on the 2010 census for years 2020 to 2050 were released by the Ohio and Indiana state data centers in 2018. The Kentucky state data center in 2016, released population projections that go out to 2040. Growth rates for the decade of 2030 to 2040 were factored and adjusted based on age cohorts to ocme up with a 2050 projection for Kentucky counties. Population projections at the zonal level are calculated by multiplying household size by the projected zonal households. Household size is factored so that, in each county, the sum of the zonal populations equals the county control total.

Households

Base Year Data: Household data for base year 2015 originates with the 2010 Census of Population and Housing (revised May 2014). To advance the number of households from 2010 to2015, new residential construction information was obtained. Individual permit records for newresidential construction were acquired for the period January 1, 2010 through December 2014. Under the assumption that it takes about four months to build a house, permits issued in December 2014 would result in a completed structure in “the spring” of 2015.

The permit locations were aggregated to TAZs using ArcGIS. Then two factors were applied to convert the housing units to households – unbuilt but permitted housing units and vacancy rates. About two percent of permitted units are not built (per the US Census Bureau) and about 20.2 percent of owner-occupied residences and 10.1 percent of multi-family housing units are vacant (per the US Census Bureau) in the Cincinnati Metropolitan Statistical Area in 2015. These adjustments to the new housing units by TAZ result in the conversion of housing units to households.

Then the existing decennial year 2010 households in each TAZ were added to the newly aggregated households to establish the 2015 base year households.

In sum, households by TAZ for 2015 equals the 2010 households plus additional new housing units minus demolitions and vacancies.

Future Year Data: The preparation of household projections was accomplished by calculating the number of households for a projected county population using ratios of householders to total population by age specific cohorts derived from the 2010 Census for each analysis year. Disaggregation to TAZs was determined by historical trends, existing and future land use, topography, flood plain information, availability of land, local knowledge, and other factors.

Total Vehicles and Average Household Car Ownership

Base and Future Year Data: Base and future year household vehicle data were obtained from the 2010-2014 American Community Survey. Average vehicles per household were calculated for block groups then applied to the TAZs associated with each block group. For the horizon year, the year 2015 vehicles per household could be retained. According to the 2009 National Household Travel Survey, the number of vehicles per household in 2009 almost equaled the number of licensed drivers. Therefore, an increase in the vehicles per household could produce an inflated number of trips in the model.

School Enrollment

Base Year Data: Enrollment of elementary and secondary schools were obtained from each school directly and included in the socioeconomic database. Postsecondary educational institution enrollment was obtained from the National Center for Education Statistics website, then geocoded in ArcMap and assigned to a TAZ. Special circumstances such as part-time enrollment and on-line courses were accounted for in the model.

Future Year Data: Future year elementary and high school enrollments by TAZ were based on the change in numbers of elementary age and high school age children between 2015 and each future year by county. The base year 2015 data and future year data was taken from the Ohio, Kentucky and Indiana state data centers' population projections by age. The percent changes between the base year and future year for elementary and high school children at the county level were applied to all the TAZs in the county. Schools that were closed in 2015 were removed and those which were built since 2015 were added. Projections of enrollment for the larger institutions can be found in media articles or master plans. These projections are used when available; otherwise, the base year enrollment is retained.

Labor Force

Base and Future Year Data: The OKI labor force is a function of the population as determined by a labor force participation rate (the number of employed persons in the labor force per persons 16 and over). Labor force data for base year 2015 originates with 2010-2014 American Community Survey. Utilizing the geographic information system ArcGIS, household data at the zonal level for 2010 was derived from the area proportion allocation of block group level employed labor force. Future year labor force projections were based on the most recent projections of national labor force participation rates by age and sex cohorts from the U.S.

Department of Labor, Bureau of Labor Statistics for each of those years. These rates were then applied to the projected county age/sex cohorts and adjusted to eliminate the unemployed to arrive at a county employed labor force control total. Employed labor force at the zonal level is calculated by multiplying the labor force participation rate by the zonal population. The labor force participation rate is adjusted so that, in each county, the sum of the zonal labor force counts equals the control total.

Employment

Base Year Data: Quarterly Census of Employment and Wages (QCEW) data for the first quarter of 2015 was utilized as the primary tool to calculate base year employment at the zonal level in Ohio and Kentucky. In Indiana, InfoUSA data for 2015 was utilized. Individual business records containing physical location, number of employees and North American Industry Classification System (NAICS) code were geocoded in ArcGIS and aggregated to the TAZ level. This data set was supplemented by other sources of data to complete the commuting employment picture in the OKI region. Each zone's employment was divided into 11 categories based on two-digit NAICS sector codes. The categories represent sectors grouped according to their similarity in generating trips.

Future Year Data: For future year employment projection, calculation was first made of the employment at the regional level. At the regional level, employment is a calculation of the region's employed labor force minus workers who live in the region but commute out to work, plus workers who live outside the region but commute in to work. The regional total was disaggregated first to the county level based on historic trends and expected changes in the county's share of the region's employment and then to the TAZ level. Disaggregation to TAZs was determined by historical trends, existing and future land use, topography, flood plain information, availability of land, local knowledge and other factors.

Area Type

Base and Future Year Data: For each analysis year, each TAZ is assigned an area type designation as CBD, Urban, Suburban or Rural based on population and employment densities.

OKI Travel Demand Model

Vehicle miles traveled and vehicle hours were estimated using the OKI Travel Demand Model. The OKI model is an Activity-Based Model (ABM). The OKI ABM utilizes the CUBE based Coordinated Travel – Regional Activity Based Modeling Platform (CT-RAMP) to simulate the travel pattern of all individual travelers in the region. The ABM estimates a schedule and itinerary of daily activities for members of every household in the region based on detailed information for individuals, households, trips, and highway and transit systems. Travel behavior modeling at fine spatial-temporal resolution improves the accuracy of travel pattern estimates and enables the model to evaluate conventional highway and transit projects as well as to test a variety of policies and scenarios, including the adoption of connected and autonomous vehicles, tolling and congestion pricing, implementation of High-Occupancy-Vehicle (HOV) lanes, and land use planning.

Model Validation

OKI's Travel Demand Model has been validated to observed travel pattern and behavior data for the model base year 2015. The modeling network encompasses the entire ozone Maintenance area with the exception of Clinton County, Ohio. The modeling network also includes Greene, Miami and Montgomery counties in Ohio and the remainder of Dearborn County Indiana.

OKI incorporates a variety of sources of local data to both improve and confirm the accuracy of VMT, as well as other travel-related parameters. Free flow speeds used on the highway and transit networks are based on travel time studies performed locally and the NPMRDS data. The 2015 Base Year model was validated against observed data, including 2015 traffic counts, StreetLight Origin-Destination (O-D) and travel distance data, and the 2012-2016 Census Transportation Planning Products (CTPP) Journey-to-work flow and residence and workplace data.

A summary of the assigned and observed VMT in the base year by facility type is included in Table 1. The difference between estimated vehicle miles traveled (VMT) and 2015 observed VMT is about 16 percent. A percent difference of -36 percent between the observed and model data is found for local streets. This is partially due to the fact that only part of local streets are coded in the model highway network. The modeled arterial VMT is about 22 percent lower than the observed data. The differences between the estimated and observed data are relatively small for interstates and collectors, which are -7% and -4%, respectively.

Table 1 - Vehicle miles traveled by facility type

Functional Classification	Vehicle Miles Traveled		
	Observed	Model 2015	Percent Difference
Interstate	19,702,223	18,340,913	-7%
Freeway/Expressway	1,457,640	1,202,947	-17%
Arterial	18,712,550	14,532,332	-22%
Collector	8,512,898	8,211,699	-4%
Local	9,645,161	6,205,343	-36%
Total	**58,030,472**	**48,493,234**	**-16%**
Collector and Above Total	**48,385,310**	**42,287,891**	**-13%**

The model highway network includes about 1,540 links with daily and time-of-day traffic counts collected by Ohio Department of Transportation (ODOT), Kentucky Transportation Cabinet (KYTC), Indiana Department of Transportation (INDOT), and OKI. The assigned volumes are compared with the observed counts by volume group, facility type, and area type at the regional level to ensure the validation results are acceptable.

The assigned and observed volumes by volume group are shown in Table 2. The volume-to-count (VOL/CNT) ratio for each group is also included. For most of the volume groups, the volume to count ratio is close to 1. The total volume to count ratio of 1.04 and the overall percent root mean square error (%RMSE) of 36.3% indicates a good accuracy of the traffic assignment output.

Table 2 - Volume statistics by volume group

Volume Goup	Observations	Total Counts	Total Volume	VOL/CNT Ratio	RMSE	%RMSE
<2500	229	395,394	579,793	1.47	1,814	105.10%
2500 - 4999	361	1,328,369	1,642,230	1.24	3,155	85.80%
5000 - 7499	273	1,705,234	1,840,595	1.08	3,302	52.90%
7500 - 14999	338	3,541,787	3,759,864	1.06	4,885	46.60%
15000 - 24999	141	2,701,706	2,949,974	1.09	5,706	29.80%
25000 - 49999	85	3,252,139	2,966,747	0.91	9,370	24.50%
50000 - 74999	106	6,680,539	6,654,934	1.00	8,039	12.80%
>75000	7	541,106	498,667	0.92	10,299	13.30%
Total	**1,540**	**20,146,274**	**20,892,804**	**1.04**	**4,748**	**36.30%**

Table 3 compares the traffic assignment results to the observations by facility type. The freeway and expressway volume to count ratio of 0.98 and 1.00 and the corresponding %RMSE of 18.2% and 29.5% indicates that the model is accurate in replicating counts on freeways and expressways. The estimated volumes are close to the counts for other facility types except for ramps.

Table 3 - Volume statistics by facility type

Facility Type	Observations	Total Counts	Total Volume	VOL/CNT Ratio	RMSE	%RMSE
Freeway	270	11,756,006	11,561,980	0.98	7,938	18.20%
Expressway	66	941,392	943,140	1	4,203	29.50%
Ramp	272	1,794,387	2,370,307	1.32	4,575	69.30%
Arterial	573	4,447,010	4,677,590	1.05	4,106	52.90%
Collector	287	990,209	1,092,397	1.1	1,897	55.00%
Local	72	217,270	247,390	1.14	1,900	63.00%
Total	**1,540**	**20,146,274**	**20,892,804**	**1.04**	**4,748**	**36.30%**

Table 4 compares the traffic assignment results by area type, including CBD, urban, suburban, and rural, with observed counts. Results show that the model is more accurate in suburban areas than in other areas. However, the overall volume to count ratios that are close to 1 demonstrate that the model replicates counts reasonably well across all area types in the region.

Table 4 - Volume statistics by area type

Area Type	Observations	Total Counts	Total Volume	VOL/CNT Ratio	RMSE	%RMSE
Rural	168	1,013,868	1,104,406	1.09	2,020	53.80%
Suburban	813	11,456,370	11,647,988	1.02	15,567	9.00%
Urban	544	7,406,333	7,857,181	1.06	8,062	29.60%
CBD	15	269,703	283,230	1.05	643	136.60%
Total	**1,540**	**20,146,274**	**20,892,805**	**1.04**	**4,748**	**36.30%**

The raw 15-minute traffic counts from INDOT, KYTC, ODOT, and OKI are also summarized by time periods of AM Peak, Midday, PM Peak, and Evening/Night Time (defined in the Chapter 1). Table 5 presents time-of-day distributions for traffic volumes and traffic counts. The time-of-day share of traffic volumes matches well with the time-of-day distribution of the traffic counts.

Table 5 - Volume time-of-day distribution

Time-of-Day	Total Counts	Count % Share	Total Volumes	Model Volume % Share	VOL/CNT Ratio
AM Peak	3,721,289	18.30%	4,262,864	20.10%	1.15
Midday	6,545,879	32.20%	6,536,203	30.90%	1.00
PM Peak	5,841,385	28.70%	5,685,779	26.90%	0.97
Evening/Night	4,245,166	20.90%	4,680,490	22.10%	1.10
Total	**20,353,719**	**100.00%**	**21,165,335**	**100.00%**	**1.04**

A screen-line analysis was another validation process that compares the screenline observed and simulated traffic volume discrepancies with the ODOT standard of maximum desirable deviation. The comparison shows that all screen-line volume deviations are below the ODOT desired maximum deviation curve indicating that the model replicates the traffic counts reasonably well. For the calibration, OKI used over a thousand traffic counts collected in 2015 byOKI, ODOT, KYTC, and INDOT and local governments. Table 6 shows the comparisons of model volumes and counts at the defined screen-lines. The model volume deviations are included and compared with the ODOT desired maximum volume deviations.

Table 6 - Screen-line summary

Screenline	Counts	Volumes	Deviation Model vs. Counts	ODOT Desired Max Deviation
A	338,506	379,085	12.0%	18.0%
B	534,756	564,629	6.0%	15.8%
C	118,670	99,284	16.0%	24.2%
D	429,148	407,833	5.0%	16.8%
E	584,233	546,077	7.0%	15.4%
F	262,894	245,590	7.0%	19.3%
G	240,285	260,594	8.0%	19.8%
H	226,005	216,793	4.0%	20.2%

Screenline	Counts	Volumes	Deviation Model vs. Counts	ODOT Desired Max Deviation
I	506,530	496,050	2.0%	16.1%
J	181,223	155,256	14.0%	21.5%
K	810,728	795,786	2.0%	14.1%
L	317,497	329,405	4.0%	18.3%
M	221,881	213,215	4.0%	20.3%
N	401,077	384,506	4.0%	17.2%
O	289,422	322,656	11.0%	18.8%
P	424,550	464,664	9.0%	16.9%
Q	206,261	224,824	9.0%	20.7%
R	189,102	213,073	13.0%	21.2%
S	186,189	213,868	15.0%	21.3%
T	80,764	92,995	15.0%	27.0%
U	75,513	73,358	3.0%	27.5%
V	76,141	91,416	20.0%	27.4%
W	40,144	42,261	5.0%	32.8%
X	143,110	157,193	10.0%	22.9%
Y	86,922	101,897	17.0%	26.4%
Z	110,903	102,197	8.0%	24.7%

Post-Model Processing

During post-processing, the loaded highway networks are used to generate VMT and speed distribution input for the MOVES. Model VMTs are first adjusted with the factors that were developled using 2019 county reported VMT and the model VMT estimates. Annual VMT by vehicle type by county is then developed using the Highway Performance Monitoring System (HPMS) data and the county vehicle registration data. VMT monthly, daily, and hourly fraction factors are estimated through the traffic counts from the permanent traffic count stations located in the OKI region. The speed bin input is generated from the model time-of-day travel time and speed.

Emission Factor Models

OKI's conformity assessment utilized U.S.EPA's emission model MOVES3 to develop emissions for VOC's and NOx. The MOVES input files contain local parameters, developed through consultation with state partners, for temperature, fuel programs, fuel characteristics, and vehicle fleet composition. The local parameters are combined with the VMT and speed data from the OKI ABM to produce emission measured in grams for the appropriate analysis year. The methodologies incorporated into MOVES for estimating emissions are based on methods and research conducted by U.S.EPA. OKI's development of MOVES input values were guided by the U.S.EPA's document *"MOVES3 Technical Guidance: Using MOVES to Prepare Emission Inventoriesfor State Implementation Plans and Transportation Conformity", November 2020.*

Table 7 summarizes the settings used in the MOVES run specification file. Table 8 lists the data and sources used in the MOVES County-Data Manager.

Table 7 - MOVES Run specification file

MOVES RunSpec Parameter	Settings
MOVES3.0.1	
Scale	County, Inventory
Time Span	Time aggregation = Hour July weekday, Monthly meteorological data All hours of day selected Weekdays only
Geographic Bounds	Custom Domains for each county in Ohio (Butler, Clermont, Hamilton, Warren), Indiana (Dearborn), and Kentucky (Boone, Campbell, Kenton)
Vehicles/Equipment	All source types available for gasoline and diesel.
Road Type	All road types including off-network
Pollutants and Processes	VOC; hydrocarbons; Non-Methane Organic Gases; Total Organic Gases; Methane; CO; NO; NO2; N20; PM2.5 Total; PM2.5: Composite NonECPM, Elemental Carbon, Organic Carbon, Sulfate Particulate; PM2.5 – Brakewear Particulate; PM2.5 – Tirewear Particulate; SO2; Total Energy Consumption; Fossil Fuel Energy Consumption; Atmosphere CO2; and CO2 Equivalent
Strategies	Default
General Output	Units= grams, joules and miles
Output Emissions	Time = 24-Hour day, Geographic = county, on-road emission by road type and source use type
Advanced Performance	none

Table 8 - MOVES County-Data manager data and sources

MOVES County Data Manager	Data Source
Source Type Population	Local. County motor vehicle registration data from KYTC (2019) and ODOT (2014 and 2017). Dearborn County data are estimated through the vehicle and population distribution data in Butler County. Model year data are estimated through the population ratio between the Base and model years.
Vehicle Type VMT	Local. County DVMT (daily vehicle mile traveled, 2019) from ODOT, KYTC, and INDOT. Model year VMTs are estimated through the ratio between the observed and the data from OKI 2019 travel demand model. MonthVMTFraction, dayVMTFraction, and hourVMTFraction are estimated

MOVES County Data Manager	Data Source
	through the traffic counts from ODOT permanent traffic count stations in OKI region.
I/M Programs	No I/M Program for Kentucky and Indiana counties. Default setting for Ohio counties.
Fuel Supply	For Ohio, low RVP fuel and for Kentucky, RFG fuel is used as an input for 2014. Default for other model years and areas.
Meteorology Data	Local. CVG average numbers from 1999 to 2019.
Ramp Fraction	Local. OKI travel demand model.
Road Type Distribution	Local. OKI travel demand model.
Age Distribution	Local. County vehicle age data from ODOT (2014 and 2017) and KYTC (2019). Future year distributions are estimated through EPA's vehicle age estimation tool.
Average Speed Distribution	Local. OKI travel demand model.

Complete MOVES input and output files are available electronically upon request.

MOBILE EMISSIONS INVENTORY FOR THE OHIO AND KENTUCKY 2015 OZONE NONATTAINMENT AREA

OKI's quantitative mobile inventory for ozone-forming emissions of volatile organic compounds (VOC) and oxides of nitrogen (NO_x) in the Ohio, Kentucky and Indiana portion of the ozone maintenance area are found in Tables 9 and 10. Daily VMT is provided in Table 11.

Table 9 - Mobile Inventory of Volatile Organic Compound (VOC) Emissions (tons per day) for the Cincinnati Ohio and Kentucky 2015 Ozone Area

County	State	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance
Butler	OH	6.1	3.9	2.9	2.1
Clermont	OH	3.5	2.2	1.6	1.2
Hamilton	OH	13.7	8.4	6.0	4.5
Warren	OH	3.7	2.4	1.8	1.4
Ohio counties		27.0	16.9	12.3	9.2
Boone	KY	1.6	1.3	1.0	0.8
Campbell	KY	0.9	0.8	0.5	0.3
Kenton	KY	1.6	1.5	1.0	0.7
Kentucky counties		4.1	3.6	2.5	1.8
TOTAL VOC		31.0	20.5	14.8	11.1

Table 10 - Mobile Inventory of Oxides of Nitrogen (NOx) Emissions (tons per day) for the Cincinnati Ohio and Kentucky 2015 Ozone Area

County	State	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance
Butler	OH	12.4	7.0	4.4	3.3
Clermont	OH	6.9	3.8	2.3	1.6
Hamilton	OH	32.6	18.0	11.3	8.6
Warren	OH	11.0	6.2	4.0	3.0
Ohio counties		62.9	35.0	22.0	16.5
Boone	KY	7.1	4.7	2.6	2.0
Campbell	KY	2.5	2.2	0.9	0.6
Kenton	KY	5.9	5.3	2.4	1.6
Kentucky counties		15.5	12.2	5.9	4.2
TOTAL NOx		78.4	47.2	27.9	20.7

Table 11 – Daily Vehicle Miles Traveled for the Cincinnati Ohio and Kentucky 2015 Ozone Area

County	State	2014 Base	2019 Attainment	2026 Interim	2035 Maintenance
Butler	OH	7,433,071	7,715,257	8,050,104	8,479,144
Clermont	OH	4,549,230	4,688,049	4,886,566	5,120,760
Hamilton	OH	21,421,278	21,701,729	22,279,551	22,974,741
Warren	OH	6,404,117	6,697,640	7,075,539	7,504,246
Ohio counties		39,807,696	40,802,675	42,291,760	44,078,891
Boone	KY	4,176,758	4,405,993	4,913,560	5,502,537
Campbell	KY	2,081,255	2,210,838	2,286,443	2,396,275
Kenton	KY	4,077,451	4,285,838	4,626,518	4,944,889
Kentucky counties		10,335,464	10,902,669	11,826,521	12,843,701
TOTAL DVMT		50,143,160	51,705,344	54,118,281	56,922,592

APPENDIX A
Non-Exempt Project Listing

Table A1 Non-Exempt Projects in Transportation Improvement Plan (added to 2026 Interim Year network)

PID	State	County	Facility	Location	Description
6-439	KY	Boone	Ted Bushelman Blvd	Ted Bushelman Blvd	Widen to 4 lanes with two-way left turn lane (TWLTL)
6-78.00	KY	Boone	I-275	At Graves Rd	New interchange at IR 275 and Graves Rd
6-80150	KY	Boone	KY 717	KY 1017 to KY 236	Widen from 2 to 4 lanes
6-8105.00	KY	Campbell	I-275/AA Connector	Between I-275 and the AA Highway (KY 9)	New road connecting the AA highway to the Northern Kentucky University
6-352	KY	Campbell	KY 536	US 27 to AA Highway (KY 9)	Extension of existing roadway
6-162.10	KY	Kenton	KY 1303	KY 536 to Beechgrove Elementary	Reconstruct and widen to 4 lanes with TWLTL
6-162.20	KY	Kenton	KY 536	Boone County Line to KY 1303	Widen to 4-lane divided roadway
6-162.3	KY	Kenton	KY 536	KY 1303 to Williamswood Rd/Calvary Dr	Widen to 2 lanes each direction
6-162.4	KY	Kenton	KY 536	Williamswood Rd/Calvary Dr to KY 17	Widen to 2 lanes each direction
104195	OH	Butler	BUT SR 129 25.00 Liberty Way	SR-129 interchange with Liberty Way and IR-75; Cox Road north of Liberty Way	Reconfigure the interchange of SR 129 with Liberty Way and IR 75. Extend SR 129 east to tie into Cox Rd, north of Liberty Way. Reconfigure existing ramps connections
NP-CMAQ3	OH	Clermont	US 52	within Village of New Richmond	Convert 4 lanes of US 52 into 2 lanes and provide bike/ped path at former SB lanes. Convert intersections at Front, Sycamore, Walnut and Augusta Streets into roundabouts
103953	OH	Clermont	CLE CR 388 (Bach Buxton)	Bach Buxton Rd to Marina Dr	Reconstruct Bach Buxton Rd to align with proposed SR 32 interchange
103954	OH	Clermont	CLE 32-3.50	Near intersection with Bach Buxton Rd	New interchange at SR 32 and Bach Buxton Rd
103955	OH	Clermont	CLE CR 171 (Old SR74)	Old SR 74 Schoolhouse to SR 32	Old SR 74 improvements to allow the proposed interchange at Bach Buxton
103957	OH	Clermont	CLE 32-2.33	Glen Este Withamsville ramps and CD Road	CD Road and partial ramps at Glen Este Withamsville Rd
103958	OH	Clermont	CLE CR 55 Overpass	Glen Este Withamsville Overpass over SR32	Glen Este Withamsville Overpass over SR 32
103959	OH	Clermont	CLE 32-2.88	EB SR 32 ramp to Clepper Ln	New ramp from EB SR 32 to Clepper Ln
76256	OH	Hamilton	IR 75	Glendale Milford Road to IR 275	Phase 8 of Thru the Valley Project--Add 4th lane each direction with an auxiliary lane where warranted, upgrade interchanges
77889	OH	Hamilton	IR 75	Begin south of SR 562 interchange and at the SR 126 interchange, 7.85 to 10.30	Phase 8 of the Mill Creek Expressway Project. Project will widen for additional through lanes, rehabilitate existing pavement and bridges. Reconstruct SR 562 interchange, remove the Towne Ave. interchange
88124	OH	Hamilton	IR 75	1010 Bridge over Mill creek to Galbraith Road (phase 3)	Phase 3 of the Thru the Valley Project--add 4th lane in each direction and associated improvements
88132	OH	Hamilton	IR 75	Between Galbraith Rd and Shepherd Ln, SB only	Phase 5 of the Thru the Valley Project-add 4th lane (includes part of Phase 7)
88133	OH	Hamilton	IR 75	Between Galbraith Rd and Shepherd Ln, NB only	Phase 6 of the Thru the Valley Project--add 4th lane and auxiliary lane (includes part of Phase 7)
82288	OH	Hamilton	IR 75	0.3 mi S of Shepherd Ln to 0.2 mi N of Glendale-Milford Rd	Phase 1 of Thru the Valley Project-reconstruct IR 75 between Shepherd Ln and Glendale-Milford Rd
104668	OH	Hamilton	IR 74	West of Colerain interchange with I-74 to I-75	Reconfigure Interchange and I-75 ramps to I-74 WB
104844	OH	Warren	IR 71	Mason Montgomery Rd to SB I-71	New 2-lane ramp, improve signals, sidewalk on west side of MM Rd near Escort Dr, enhanced bus stop
112909	OH	Warren	SR 48	Nunner Rd to north of Ridgeview Ln/Saddle Creek Ln	Add 1 lane each direction. Add second SB SR 48 left turn lane onto EB US 22/SR 3
112121	OH	Warren	WAR SR63	Between Union Rd and east of the SR 741 intersection	Widening of SR 63
NP-STBG8	OH	Warren	SR 741	Between Cox-Smith Road and Spy Glass Hill Road	Widen to 2 lanes each direction with traffic calming medians and left turn lanes at all intersections
103753	OH	Warren	SR 741	from Spy Glass Hill (SLM 2.19) to Weldon Drive (SLM 3.06)	Widen SR 741 to 2 lanes each direction with a TWLTL from Spy Glass Hill to Weldon Dr

Table A2 Non-exempt Projects in 2050 Metropolitan Transportation Plan (added to 2035 maintenance year network)

PID	State	County	Facility	Location	Description
9749	IN	Dearborn	SR 1	Ridge Ave to Oberting Rd	Widen SR 1 bridge from the Bellview Rd & SR 1 intersection. Add a multi-use trail on the east side of the bridge
9750	IN	Dearborn	SR 1	US 50 to Ridge Ave	Realign and add one lane each direction
9574	KY	Boone	KY 842 (Richardson Rd)	US 25 (Dixie Hwy) to Boone County Line	Widen to 2 lanes each direction; include multi-use path
9577	KY	Boone	KY 18 (Burlington Pike)	Springfield Boulevard to KY 338 (Jefferson Street)	Widen to 2 lanes each direction with multi-use path to improve safety
9867	KY	Boone	Mall Rd Connector	KY 237 (Pleasant Valley Rd) to Mall Rd/IR 75 Interchange	New route/extension to provide East-West Connectivity and improve mobility
9871	KY	Boone	KY 18	KY 842 and Mall Rd intersections	Add 1 lane each direction with grade separated interchanges
9874	KY	Boone	KY 236	KY 842 (Houston Rd) to KY 3076 (Mineola Pike)	Widen to 2 lanes each direction
9908	KY	Boone	KY 3076	KY 236 to IR 275	Widen to 2 lanes each direction with TWLTL
9826	KY	Kenton	KY 1303	IR 275 EB ramp to Thomas More Blvd	Realign Town Center Blvd and Thomas More Pkwy into single intersection. Add 1 lane SB from IR 275 EB ramp to Town Center Blvd
9829	KY	Kenton	KY 536	East end of the NS RR bridge to KY 1303	Reconstruct and widen to 4-lane divided highway
9863	KY	Kenton	IR 71/75 (Brent Spence Bridge)	US 25 to Brent Spence Bridge	Highway widening of 5 lanes SB and 4 lanes NB
9899	KY	Kenton	KY 536	KY 16 (Taylor Mill Rd) to KY 177 (Decoursey Pike)	Widen to 2 lanes each direction
9910	KY	Kenton	KY 8	Bridge over Licking River	Reconstruct and widen to 4 lanes; Include multi-use path
9601	OH	Butler	Cincinnati Dayton Rd	Liberty One Dr to Bethany Rd	Widen to 2 lanes each direction with TWLTL
9635	OH	Butler	North Hamilton Crossing Phase 1	NW Washington Blvd to US 127	New route/extension
9636	OH	Butler	North Hamilton Crossing Phase 2	US 127 to SR 4	New route/extension
9643	OH	Butler	S. Gilmore Rd	Resor Rd to Mack Rd	Add 1 lane SB (2 lanes each direction)
9648	OH	Butler	SR 4	Muhlhauser to Crescentville	Widen to 3 lanes SB
9666	OH	Butler	Wayne Madison Rd	Great Miam River to SR 73	Widen to 2 lanes each direction with TWLTL
9965	OH	Butler	IR 75	New interchange at Millikin Rd	New interchange & widening of Milliken Rd from Cin-Day to Butler-Warren Rd to 4 lanes
9737	OH	Clermont	SR 32	Glen Este-Withamsville Rd overpass	New overpass carrying Glen Este-Withamsville Rd over SR32
9738	OH	Clermont	SR 32	Glen Este-Withamsville Rd ramps	Ramps to new Glen Este-Withamsville overpass
9712	OH	Hamilton	Red Bank Rd	Erie Ave to Duck Creek Rd	Red Bank widening (3 lanes each direction) and local street improvements
9784	OH	Hamilton	IR 275 WB	Winton Rd to Colerain Ave	Add 1 lane
9787	OH	Hamilton	Fields Ertel Rd	Snider to I-71	Widen to 2 lanes each direction with TWLTL
9930	OH	Hamilton	SR 32	Round Bottom Rd to Little Dry Run	Widen to 2 EB through lanes from Round Bottom Rd to Little Dry Run and add a TWLTL to the eastern corp. of the Village of Newtown
9953	OH	Hamilton	IR 71	SR 126 to Pfeiffer	Add NB auxiliary lane
9968	OH	Hamilton	I-71/75 (Brent Spence Bridge)	Ohio River to Western Hills Viaduct	Bridge replacement and highway improvements
9974	OH	Hamilton	IR 75 SB	Shepherd Rd to Galbraith Rd	TTV Phase 5 (PID 88132) Reconstruct SB IR 75 from Shepherd to Galbraith, adding a 4th lane. Construct a collector-distributor road to provide ramps to and from Anthony Wayne and Galbraith
9975	OH	Hamilton	IR 75 NB	Galbraith Rd to Shepherd Rd	TTV Phase 6. Reconstruct NB IR 75 from Galbraith Rd to Shepherd Ln adding a 4th lane. Construct a ramp from WB SR 126 to NB IR 75
10001	OH	Hamilton	SORTA Bus Rapid Transit Phase I	Glenway Ave and Reading Rd	Two BRT routes on Glenway Ave and Reading Rd
10001	OH	Hamilton	SORTA Bus Rapid Transit Phase II	Montgomery Rd and Hamilton Ave	Two BRT routes on Montgomery Rd and Hamilton Ave
9946	OH	Warren	US 22/3	Old Mill Rd to SR 48	Widen to 2 lanes each direction with TWLTL
9961	OH	Warren	SR 48	Mason-Morrow-Millgrove Rd to Stephens Rd	Widen to 2 lanes each direction with TWLTL
9962	OH	Warren	SR-63	Union Rd to SR 741	Widen to 2 lanes each direction
10030	OH	Warren	US 22/3	SR 48 to West Rd	Widen to 2 lanes each direction
10031	OH	Warren	US 22/3	West Rd to Zoar Rd	Widen to 2 lanes each direction
10037	OH	Warren	SR 63	SR 741 to Neil Armstrong Way	Widen to 2 lanes each direction with TWLTL
10042	OH	Warren	SR 741	I-71 to Center Dr	Widen to 3 lanes each direction
10051	OH	Warren	Kings Mills Rd	I-71 to Oak St	Widen to 2 lanes each direction with TWLTL
10056	OH	Warren	Mason-Morrow-Millgrove Rd	US 42 to Columbia Rd/Mason-Morrow-Milgrove Rd	Widen to 2 lanes each direction
10058	OH	Warren	Snider Rd	Western Row to US 42	Widen to 2 lanes each direction with TWLTL
10060	OH	Warren	Kings Island Dr	Great Wolf Dr to Kingsview Dr	Widen to 3 lanes NB between Great Wolf Dr to Kings Mill. Widen to 2 lanes SB from Kings Mill to Kingsview Dr
10062	OH	Warren	Gateway Blvd	Gateway Blvd to Butler-Warren Rd and Cox Extension	New extension with 2 lanes each direction and TWLTL

LADCO | LAKE MICHIGAN AIR DIRECTORS CONSORTIUM

MEMORANDUM

Subject: CLASSIFICATION AND REGRESSION TREE (CART) ANALYSIS FOR LADCO OZONE NONATTAINMENT AREAS
Date: OCTOBER 2021
To: LADCO Ozone Technical Workgroup
From: Angie Dickens (dickens@ladco.org), LADCO
Cc: LADCO Air Directors and Technical Oversight Committee
Attachment: Appendices 1-9

Please direct questions/comments to dickens@ladco.org.

Overview of CART Analyses

A classification and regression tree (CART) analysis is a statistical tool to classify data. Here, it is applied to 8-hour ozone and meteorological data to determine the meteorological conditions most commonly associated with high ozone days in ozone nonattainment areas in the LADCO region. Once days are classified by their unique, shared meteorological characteristics, ozone concentration trends among days with similar meteorological conditions can be examined. CART analysis normalizes the influence of year-to-year meteorological variability on ozone concentrations, and any remaining trend is assumed to be the result of non-meteorological factors, such as reductions in emissions of ozone precursors.

LADCO conducted the CART analyses using 8-hour ozone monitoring data from regulatory monitors in the ozone nonattainment areas and daily meteorological data from airport weather stations. The analysis included data from the years 2005 through 2020 to identify the trends in ambient, surface ozone concentrations after adjustment for meteorology. This analysis does not include data for either 2015 or 2021. We excluded 2015 because of quality issues that we identified in the data; we excluded 2021 because the meteorological data for this year is not yet complete.[1] The goal of the CART analysis was to determine the meteorological conditions associated with high ozone episodes in the nonattainment areas and to construct trends for the days identified as sharing similar meteorological characteristics.

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[1] The meteorological data used in the CART analysis requires significant processing by the National Oceanic and Atmospheric Administration (NOAA), the National Weather Service, the Environmental Protection Agency (EPA) and LADCO. This processing is time-consuming and results in a lag between the end of the year and when the data is available for use.

The CART analysis processed multiple meteorological variables for each day to determine which variables are the most effective at predicting ozone concentrations. Surface meteorological data (daily average temperature, midday average relative humidity, etc.) were taken from National Weather Service (NWS) stations and processed by the U.S. Environmental Protection Agency (EPA).[2] Meteorological parameters related to transport of air masses (southerly transport distance, transport direction, etc.) were determined based on LADCO runs of the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model. The meteorological variables included in the CART analysis are listed in Table 1.

LADCO developed regression trees to classify each summer day (May – September) by a common set of meteorology variables. Each branch in a regression tree describes the meteorological conditions associated with different ozone concentrations. We assigned meteorologically similar days to day-type groups (known in CART as "nodes"), which are equivalent to branches of the regression tree. Grouping days with similar meteorology normalizes the influence of meteorological variability on the underlying trend in ozone concentrations. The remaining trend in ozone concentrations can be presumed to be due to trends in non-meteorological predictors, such as precursor emissions. We then plotted the ozone trends for each of the different CART nodes.

Description of CART Analysis Results

Appendices 1 through 8 present the results of the CART analyses for each ozone nonattainment area in the LADCO region. These appendices present the results in three different forms: CART trees, trends in ozone concentrations over time within the high-ozone CART nodes, and the importance of different meteorology variables associated with ozone concentrations. Below, we explain how to interpret each type of analysis and, as an example, discuss figures for the Louisville, KY/IN ozone nonattainment area.

Classification and Regression Tree figures

Figure 1 shows an example CART analysis "tree" for Louisville. This tree shows the variables used to split the data (in circles), the p-value for the split (in the same circle) and the values used for each split (the numbers listed along the lines leading from the circles). The "terminal nodes" are shown at the bottom of the figure and are the final groups of meteorologically similar days used for the trends analysis. The boxplots at the very bottom show the distribution of ozone concentrations on days within each final group of meteorologically similar days (terminal node). You can track how CART classifies the data in each of the branches of the tree by starting at the top and moving downward through the different splits in the data to reach

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[2] Upper air observations were not included in this analysis (unlike in previous years) because EPA is no longer processing this data.

the terminal nodes at the bottom. Note that nodes are labeled with numbers to allow easy reference to each node, but the node numbers themselves are not inherently meaningful.

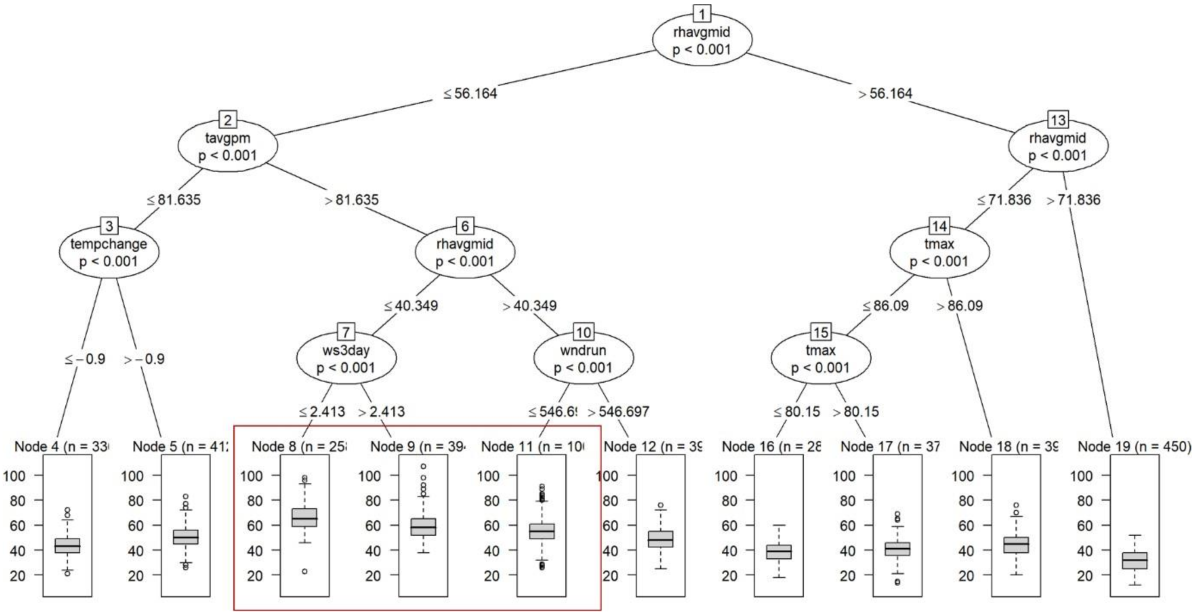

Figure 1. Example Classification and Regression Tree (CART) for the Louisville monitors. The boxplots[3] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 for a description of the different variables.

In the tree shown for Louisville, the first split is made based on average midday relative humidity (“rhavgmid”), shown at the top of the tree. All of the 2005-2020 data are divided into two bins based on whether the average midday relative humidity was above or below 56.164%. The data for days that are below this value (the branch on the left) are then split according to whether the average afternoon temperatures (“tavgpm”) are above or below 81.635 °F. Each resulting group of days continues to be split until either the tree reaches the maximum specified vertical number of splits, the group has too few days to be further split, or the resulting nodes don’t contain enough days. Note that we defined all of these limits when we configured the CART analysis. The Louisville CART analysis resulted in 10 terminal nodes, such as node 8 (day type “8”), which is the highest ozone concentration node. The days in node 8 have an average ozone concentration of 66 ppb, average midday relative humidity below 40.349% (≤56.164% and ≤40.349%), average afternoon temperatures above 81.635 °F, and 3-day average wind speeds slower than 2.413 m/s.

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[3] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

Trends in ozone concentrations over time

Figure 2 shows an example plot of ozone concentrations trends over time for high-ozone nodes for Louisville. These nodes were determined using the CART analysis shown in Figure 1 and represent groups of days with similar meteorology. The average ozone concentration and meteorological characteristics for each high-ozone node are listed in Table 2.

The CART analysis for Louisville determined that there were three types of days from the Louisville monitors that had average ozone concentrations of greater than 50 parts per billion (ppb). Day type “8” was the only CART node that had average ozone concentrations over 60 ppb. The meteorology on these days is described in the previous section. The other types of high-ozone days all had high temperatures and low to moderate relative humidity and variable wind speeds or transport distances. Figure 2 shows that ozone concentrations for all three high-ozone day types have decreased over the last 16 years. This analysis demonstrates that, on days with similar meteorology, ozone concentrations on high-ozone days at Louisville monitors have decreased substantially since 2005.

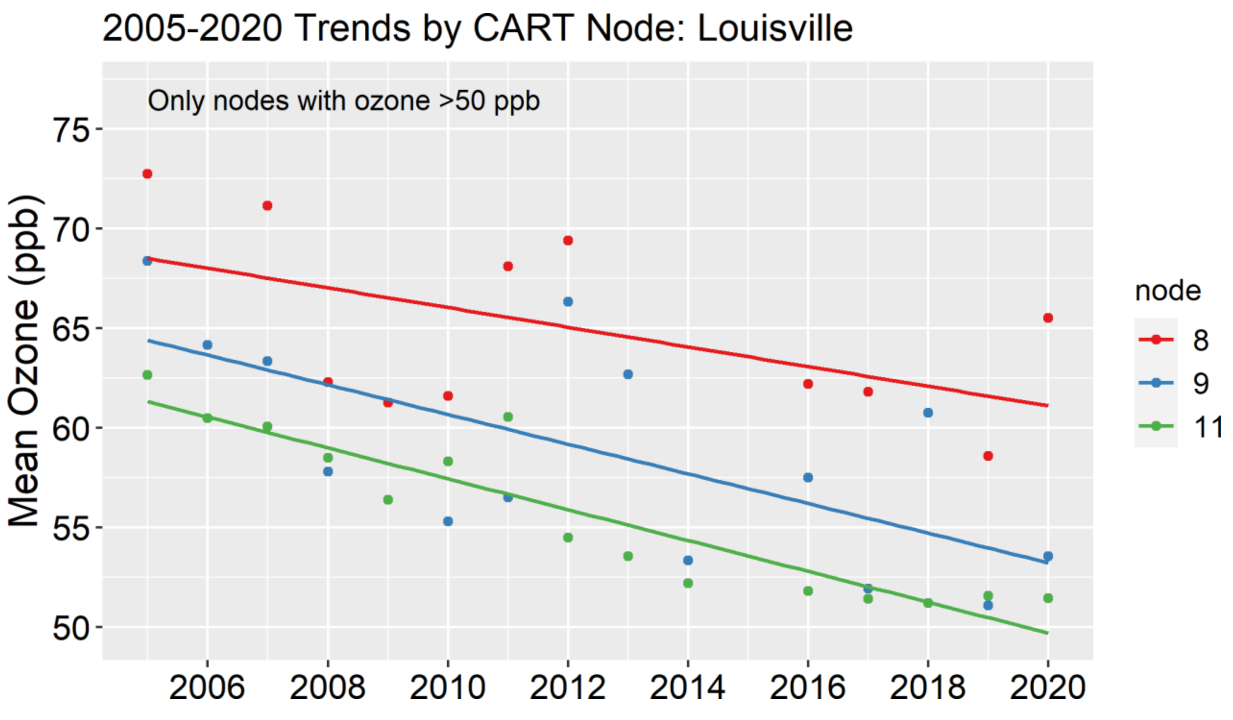

Figure 2. Trends in average (mean) ozone in high-ozone nodes for the Louisville monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table 2. Description of each high-ozone node for the Louisville monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 8	**Node 9**	**Node 11**
66 ppb O_3	59 ppb O_3	56 ppb O_3
Midday RH <40%	Midday RH <40%	Midday RH <56% & >40%
PM Temp >82 °F	PM Temp >82 °F	PM Temp >82 °F
3-day winds <2.4 m/s	3-day winds >2.4 m/s	24-hour wind run (transport) <547 km

→ Node name

→ Average ozone concentration

Meteorological characteristics of days in each group

Variable importance plots

Figure 3 shows the relative importance of the different meteorological parameters associated with the average ozone concentrations for the example Louisville analysis.[4] For this analysis, the relationship between each variable and ozone concentrations is considered independent of the other variables, and this importance is then ranked. The importance of the most impactful variable is normalized to a value of 100, and the importance of all other variables is adjusted to this value. It is important to note that this analysis is determined separately from the splitting of variables in the CART analysis. Accordingly, the most important variables in this analysis may or may not be used as splitting variables in the CART analysis, and less important variables may be used to split data in the CART analysis.

For Louisville, the top three most important variables impacting ozone concentrations were all relative humidity-based parameters (average midday, whole day, and nighttime relative humidity). Temperature parameters were also very important, with the average afternoon temperatures and maximum temperatures being the fourth and fifth most important variables. A number of parameters related to wind speed and transport distance also appear in the top 20 most important variables, along with the number of hours with rain and southerly transport/winds.

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[4] The importance of each predictor is evaluated individually, and a loess smoother is fit between the outcome and the predictor. The R^2 statistic is calculated for this model against the intercept-only null model. This number is returned as a relative measure of variable importance. https://topepo.github.io/caret/variable-importance.html

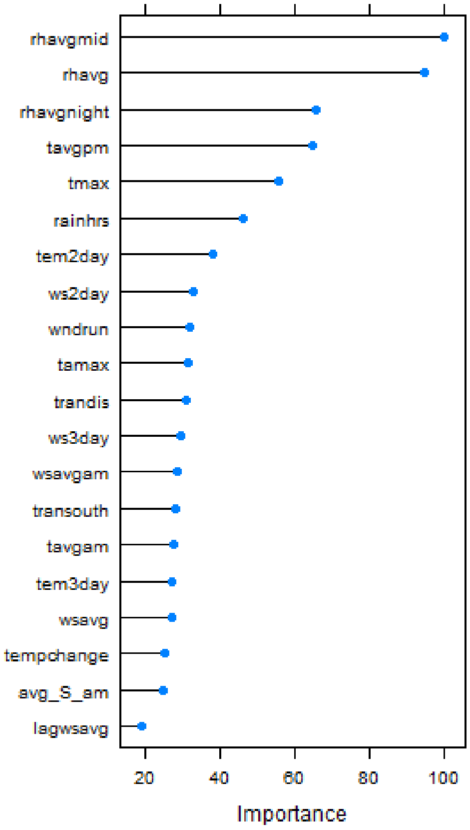

Figure 3. Rankings of the importance of different variables in the CART analysis for the Louisville monitors. Only the top-20 most important variables are shown. See Table 1 for a description of the different variables.

Data Sources & Analytical Methods.

EPA processed surface meteorological data at all airports in the U.S. for the years 2005 through 2020 and provided these data to LADCO. EPA also processed HYSPLIT data for the years 2005 through 2019; LADCO processed the HYSPLIT data for 2020 because EPA is no longer processing these data. Comparisons of 2019 HYSPLIT data prepared by EPA and LADCO demonstrated that LADCO's analysis exactly reproduced EPA's analysis for the variables used here. The meteorological parameters used in the analysis are listed in Table 1. LADCO dropped all 2015 meteorological data because of apparent issues with the temperature data provided by EPA, as described in Appendix 9.

LADCO downloaded daily maximum 8-hour average (MDA8) ozone concentrations for regulatory monitors from EPA's Air Data website (https://aqs.epa.gov/aqsweb/airdata/download_files.html). Ozone data were only included for monitors with long-term records, defined as monitors that were missing no more than one year of data from 2005 to 2020.

LADCO conducted the CART analyses in *R* using the *ctree* function from the package *partykit*. *Ctree* is a non-parametric class of regression tree that avoids overfitting data by applying a statistical approach using a significance test (using a p-value) for each split. We pruned the regression trees using the *ctree_control* options: *maxdepth, minsplit* and *minbucket*, with *maxsurrogate* set to 3; these options control the maximum depth of the tree, the minimum number of days in a node to allow it to be further split, the minimum number of days in a terminal node, and the number of surrogate splits allowed in case of missing data, respectively. The values for these parameters used in each CART analysis are listed in Appendix 10. The variable importance was calculated using the *train* (with *ctree*) and *varImp* functions from the *caret* package. The aim was to produce a tree that (1) had at least one node with relatively high average ozone concentrations (65 to greater than 70 ppb), such that days in this node would impact attainment of the 2015 ozone NAAQS, (2) was not too complicated; ideally, the trees would contain 14 or fewer terminal nodes, however, some trees contained up to 18 terminal nodes, and (3) contained relatively complete records, ideally with data for each node in every year, but minimally missing just a few year-node combinations. Data for nodes with fewer than 3 days in a year were dropped from the trends figures for that year.

Table 1. Daily meteorological parameters used in the CART analysis.

Parameter	Description	Units
avg_S_am	Average Morning Wind South (v) Vector	meters/second (m/s)
avg_S_pm	Average Morning Wind South (v) Vector	meters/second (m/s)
avg_S_win	Average Wind South (v) Vector	meters/second (m/s)
avg_W_am	Average Morning Wind West (u) Vector	meters/second (m/s)
avg_W_pm	Average Afternoon Wind West (u) Vector	meters/second (m/s)
avg_W_win	Average Wind West (u) Vector	meters/second (m/s)
dpavg	Average Daily Dew Point Temperature	Degrees Fahrenheit (°F)
dpmax	Maximum Daily Dew Point Temperature	Degrees Fahrenheit (°F)
foghrs	Hours of Fog	Hours
hazehrs	Hours of Haze	Hours
lag_S_wn	Previous Day Wind South (V) Vector	meters/second (m/s)
lag_W_wn	Previous Day Wind West (U) Vector	meters/second (m/s)
lagstpavg	Previous Day Station Pressure	millibars (mb)
lagtmax	Previous Day Max Temp	Degrees Fahrenheit (°F)
lagwsavg	Previous Day Avg Wind Speed	meters/second (m/s)
mrmax	Maximum Water Vapor Mixing Ratio	grams/kilogram (g/kg)
precip	24-hour Precipitation	inches
presschange	24-hour Pressure Change	millibars (mb)
rainhrs	Hours of Rain	hours
rhavg	Average Daily Relative Humidity	Percent (%)
rhavgmid	Average Midday Relative Humidity	Percent (%)
rhavgnight	Average Nighttime Relative Humidity	Percent (%)
slpavg	Average Sea Level Pressure	millibars (mb)
stpavg	Average Station Pressure	millibars (mb)
taavg	Average Apparent Temperature	Degrees Fahrenheit (°F)
tamax	Maximum Apparent Temperature	Degrees Fahrenheit (°F)
tamin	Minimum Apparent Temperature	Degrees Fahrenheit (°F)
tavgam	Average Morning Temperature	Degrees Fahrenheit (°F)
tavgpm	Average Afternoon Temperature	Degrees Fahrenheit (°F)
tem2day	Average 2-day Temperature	Degrees Fahrenheit (°F)
tem3day	Average 3-day Temperature	Degrees Fahrenheit (°F)
tempchange	24-hr Temperature Change"	Degrees Fahrenheit (°F)
tmax	Maximum Daily Temperature	Degrees Fahrenheit (°F)
trandir	24-hr Transport Direction	Degrees (°)
trandis	24-hr Transport Distance	kilometers (km)
transouth	Southerly (v) Component of 24-hr Transport Vector	kilometers (km)
tranw	Vertical (z) Component of 24-hr Transport Vector	kilometers (km)
tranwest	Westerly (u) Component of 24-hr Transport Vector	kilometers (km)

Table 1 continued.

Parameter	Description	Units
wdavg	Average Daily Wind Direction	Degrees (°)
wdavgam	Average Morning Wind Direction	Degrees (°)
wdavgpm	Average Afternoon Wind Direction	Degrees (°)
weekday	Day of Week	
wndrun	24-hr Scalar Wind Run	kilometers (km)
ws2day	Average 2-day Wind Speed	meters/second (m/s)
ws3day	Average 3-day Wind Speed	meters/second (m/s)
wsavg	Average Daily Wind Speed	meters/second (m/s)
wsavgam	Average Morning Wind Speed	meters/second (m/s)
wsavgpm	Average Afternoon Wind Speed	meters/second (m/s)

CLASSIFICATION AND REGRESSION TREE (CART) ANALYSIS FOR LADCO OZONE NONATTAINMENT AREAS

APPENDICES

OCTOBER 2021

Produced by the Lake Michigan Air Directors Consortiums (LADCO)

Please direct questions/comments to dickens@ladco.org.

Appendix 1

CART analysis results for the Chicago 2008 and 2015 ozone nonattainment areas

Contents:

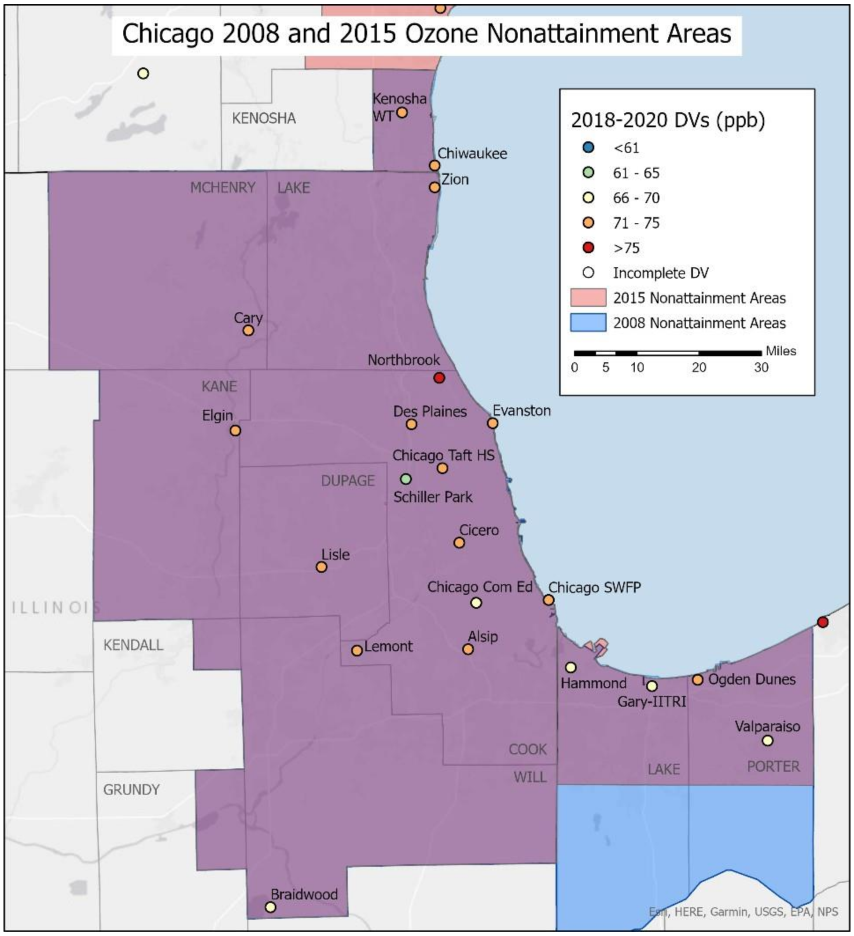

Figure A1.1. Map of the Chicago 2008 and 2015 ozone nonattainment areas.

CART analysis results for the Kenosha (WI) and Lake (IL) County monitors

Data used in the analysis:

Ozone monitors: 170971007 (Zion, IL) and 550590019 (Chiwaukee Prairie, WI)

Meteorological station: Chicago O'Hare International Airport (ORD)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Kenosha and Lake County monitors generally have hot temperatures and low relative humidity (Figure A1.2 and Table A1.1). Some of the nodes are also influenced by southerly transport, which also appear as important variables (Figure A1.4). Temperature-based parameters are the most important variables. Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A1.3).

APPENDIX 1: CART analysis results for Chicago

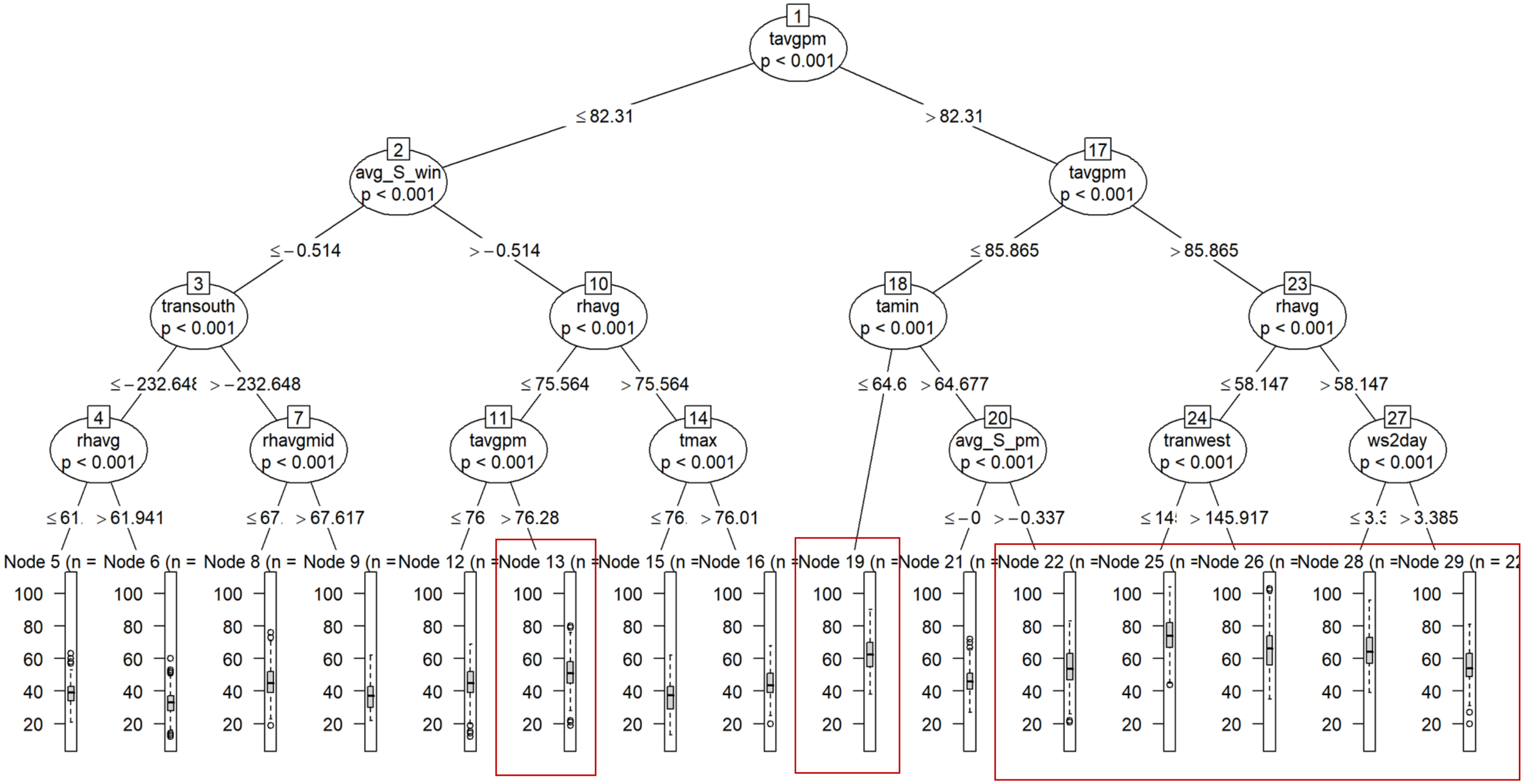

Figure A1.2. Classification and Regression Tree (CART) for the Kenosha (WI) and Lake (IL) County monitors. The boxplots[1] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[1] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

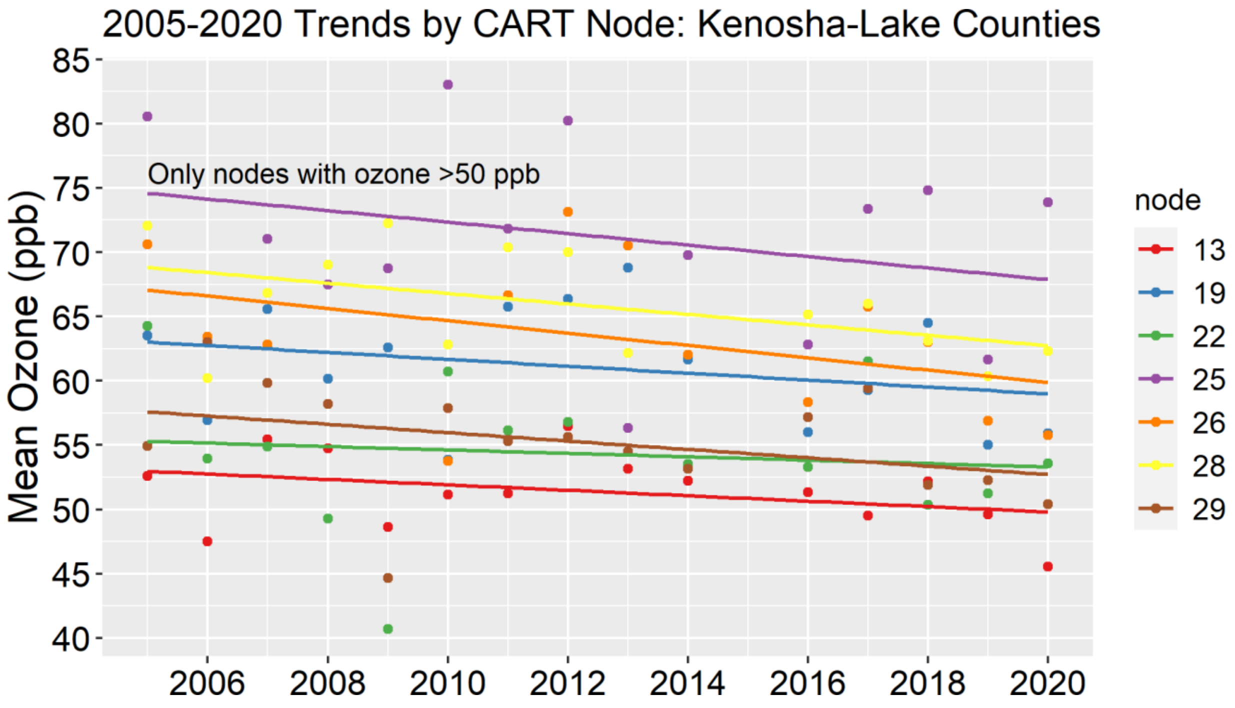

Figure A1.3. Trends in average (mean) ozone in high-ozone nodes for the Kenosha (WI) and Lake (IL) County monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A1.1. Description of each high-ozone node for the Kenosha (WI) and Lake (IL) County monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 25	**Node 28**	**Node 26**	**Node 19**	**Node 29**	**Node 22**	**Node 13**
74 ppb O_3	65 ppb O_3	66 ppb O_3	62 ppb O_3	55 ppb O_3	54 ppb O_3	51 ppb O_3
PM Temp >86 °F	PM Temp >86 °F	PM Temp >86 °F	PM Temp >82 & <86 °F	PM Temp >86 °F	PM Temp >82 & <86 °F	PM Temp <82 °F
RH <58%	RH >58%	RH <58%	Minimum apparent Temp <65 °F	RH >58%	Minimum apparent Temp >65 °F	Southerly winds
Little westerly transport[2]	2-day winds <3.4 m/s	More westerly transport[1]		2-day winds >3.4 m/s	PM southerly winds	RH <75% PM T >76 °F

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[2] “Little westerly transport” = less than 146 km in 24 hours. “More westerly transport” = more than 146 km in 24 hours.

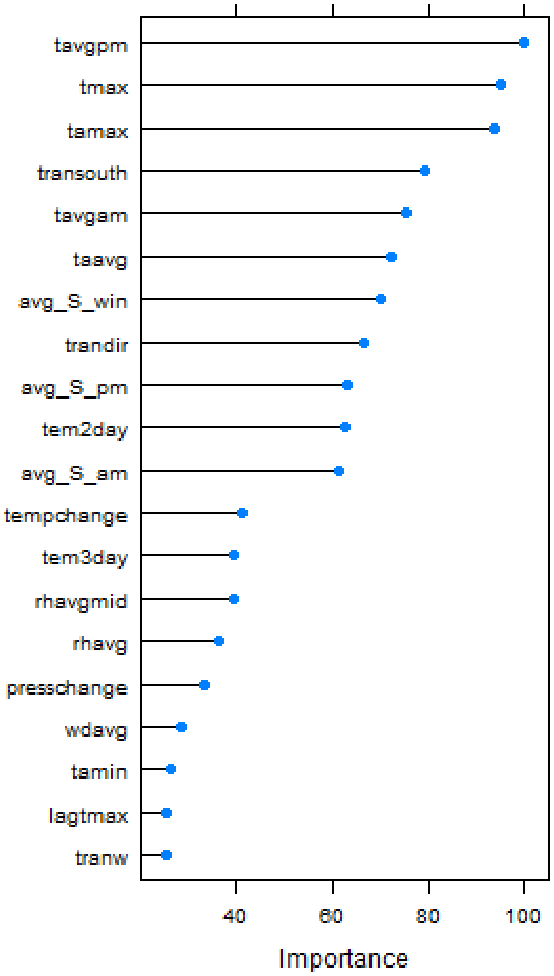

Figure A1.4. Rankings of the importance of different variables in the CART analysis for the Kenosha (WI) and Lake (IL) County monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

CART analysis results for the Cook County (IL) monitors

Data used in the analysis:

Ozone monitors: 170310001 (Alsip), 170310032 (Chicago SWFP), 170310076 (Chicago Com Ed), 170311003 (Chicago Taft HS), 170311601 (Lemont), 170314002 (Cicero), 170314007 (Des Plaines), 170314201 (Northbrook), 170317002 (Evanston)

Meteorological station: Chicago O'Hare International Airport (KORD)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Cook County monitors generally have hot temperatures and low relative humidity (Figure A1.5 and Table A1.2). Some of the nodes are also influenced by southerly transport, which also appears as important variables (Figure A1.7), although southerly transport is less important for the Cook County monitors than for the Kenosha and Lake County monitors to the north (Figure A1.4). Temperature-based parameters are the most important variables. Mean ozone concentrations in most of the high-ozone nodes have increased from 2005 to 2020 (Figure A1.6).

APPENDIX 1: CART analysis results for Chicago

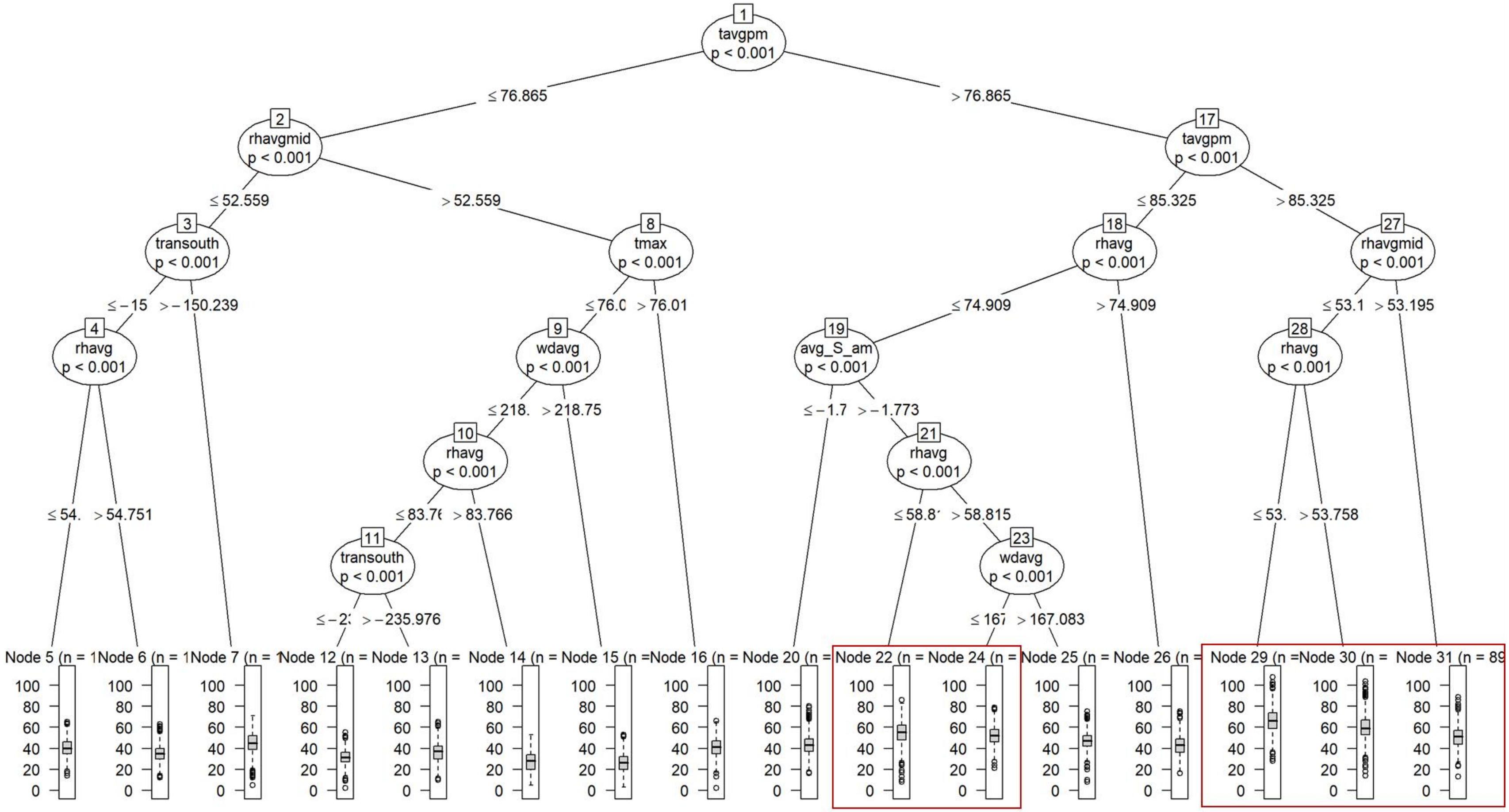

Figure A1.5. Classification and Regression Tree (CART) for the Cook County (IL) monitors. The boxplots[3] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[3] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

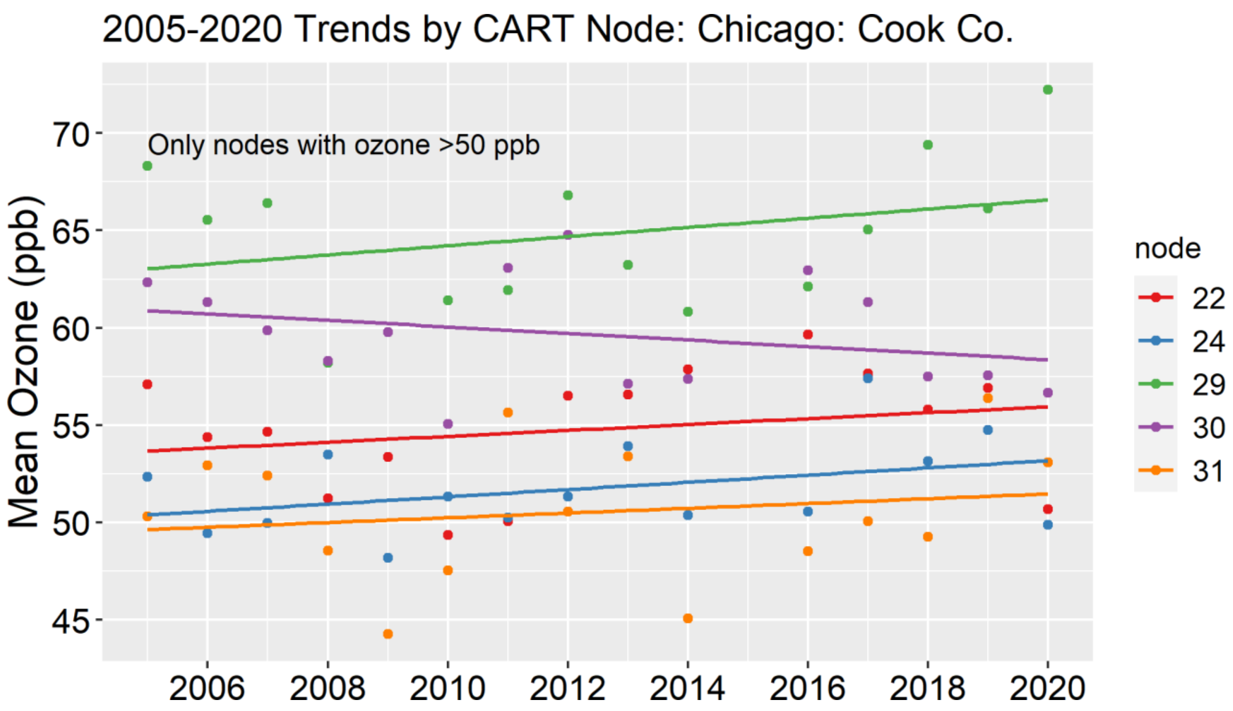

Figure A1.6. Trends in average (mean) ozone in high-ozone nodes for the Cook County (IL) monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A1.2. Description of each high-ozone node for the Cook County (IL) monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 29	**Node 30**	**Node 22**	**Node 24**	**Node 31**
66 ppb O_3	60 ppb O_3	55 ppb O_3	52 ppb O_3	51 ppb O_3
PM Temp >85 °F	PM Temp >85 °F	PM Temp >77 & <85 °F	PM Temp >77 & <85 °F	PM Temp >85 °F
Midday RH <53%	Midday RH <53%	Average RH <55%	Average RH >59% & <75%	Midday RH >53%
Average RH <54%	Average RH >54%	AM southerly winds (>-1.8 m/s)	AM southerly winds (>-1.8 m/s)	
			Easterly winds (wind direction <167°)	

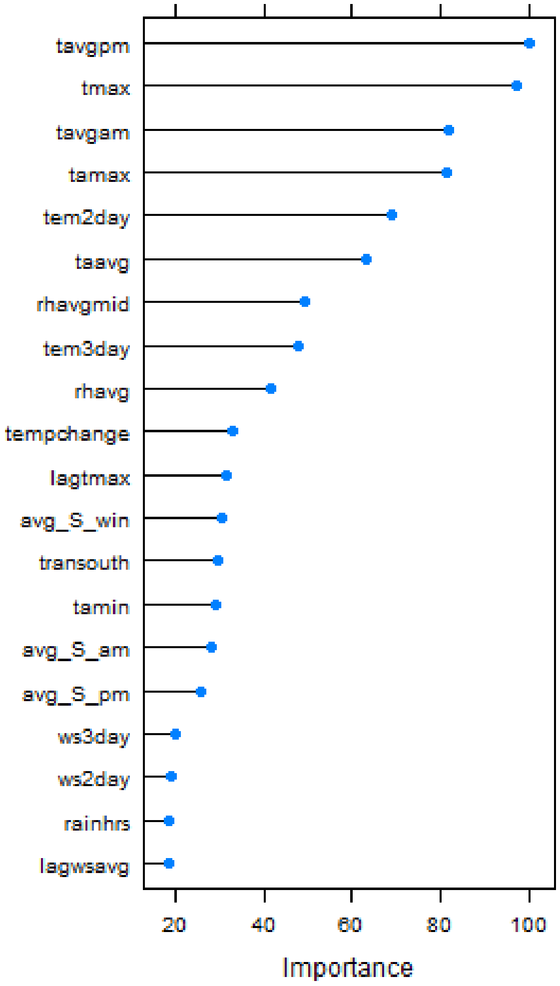

Figure A1.7. Rankings of the importance of different variables in the CART analysis for the Cook County (IL) monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

CART analysis results for the Lake and Porter County (IN) monitors

Data used in the analysis:

Ozone monitors: 180890022 (Gary-IITRI), 180892008 (Hammond), 181270024 (Ogden Dunes), 181270026 (Valparaiso)

Meteorological station: Chicago O'Hare International Airport (KORD)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Lake and Porter County monitors generally have hot temperatures and low relative humidity (Figure A1.8 and Table A1.3). Some of the nodes are also influenced by wind speeds and southerly transport, which also appears as important variables (Figure A1.10). Temperature-based parameters are the most important variables. Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A1.9).

APPENDIX 1: CART analysis results for Chicago

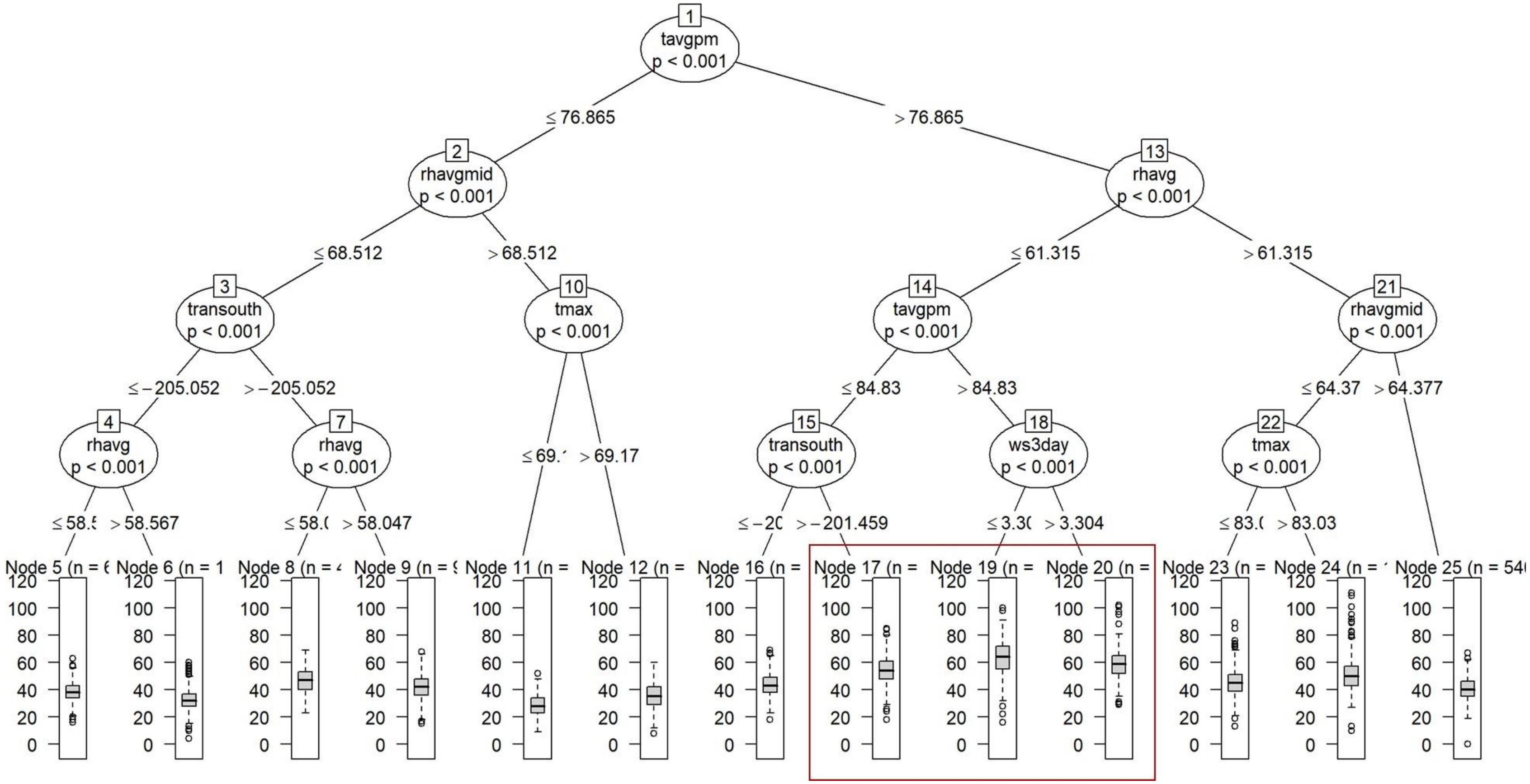

Figure A1.8. Classification and Regression Tree (CART) for the Lake and Porter County (IN) monitors. The boxplots[4] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[4] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

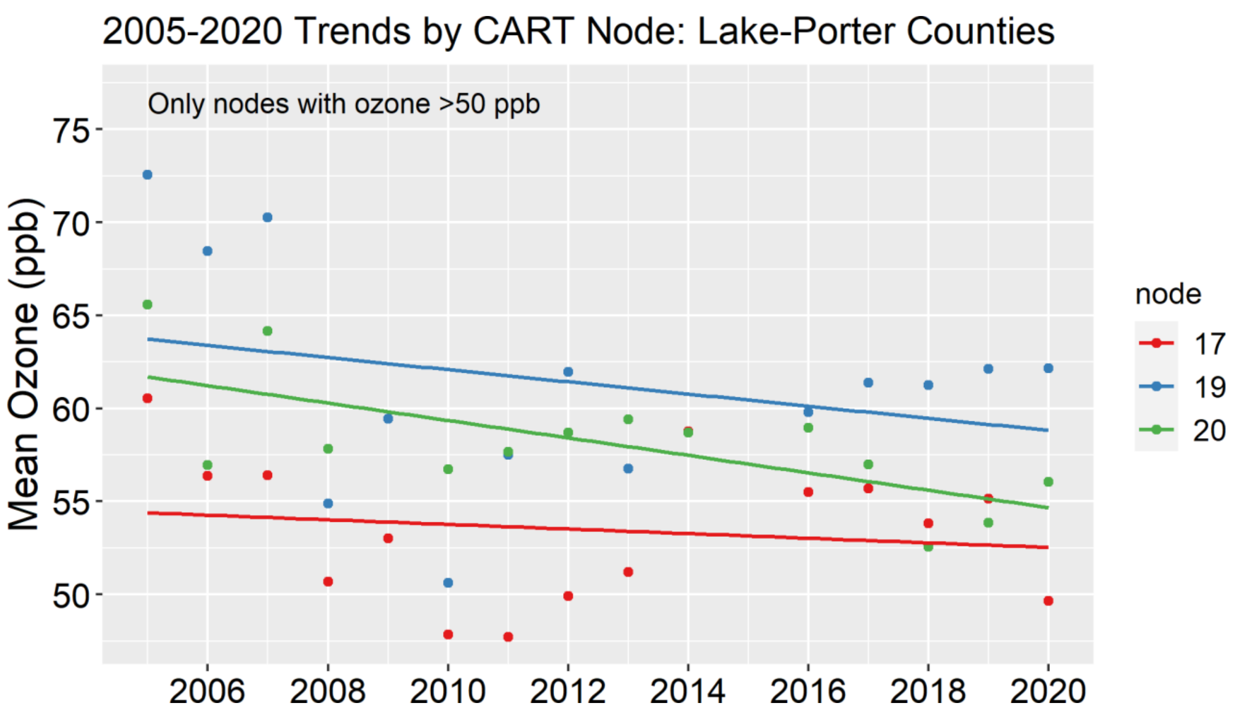

Figure A1.9. Trends in average (mean) ozone in high-ozone nodes for the Lake and Porter County (IN) monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A1.3. Description of each high-ozone node for the Lake and Porter County (IN) monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 19	**Node 20**	**Node 17**
63 ppb O_3	59 ppb O_3	54 ppb O_3
PM Temp >85 °F	PM Temp >85 °F	PM Temp >77 & <85 °F
Average RH <61%	Average RH <61%	Average RH <61%
3-day wind speed <3.3 m/s	3-day wind speed >3.3 m/s	24-hour southerly transport (>-200 km)

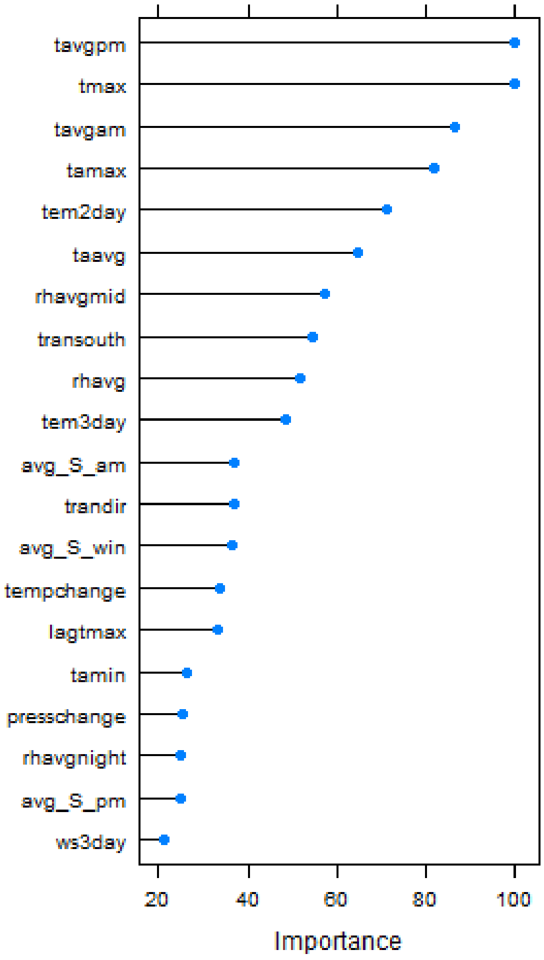

Figure A1.10. Rankings of the importance of different variables in the CART analysis for the Lake and Porter County (IN) monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

Appendix 2

CART analysis results for the Cincinnati 2015 ozone nonattainment area

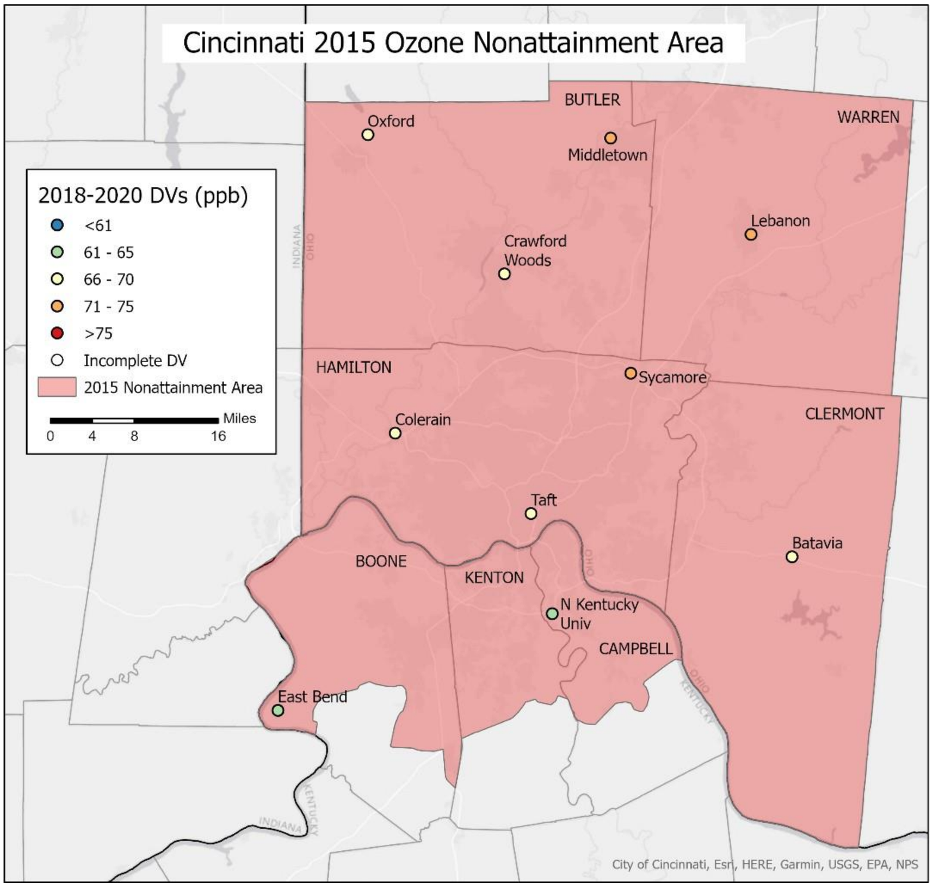

Figure A2.1. Map of the Cincinnati 2015 ozone nonattainment areas.

Data used in the analysis:

<u>Ozone monitors</u>: 390610006 (Sycamore), 390610010 (Colerain), and 390610040 (Taft)

<u>Meteorological station</u>: Cincinnati Municipal Airport-Lunken Field (LUK)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Cincinnati monitors generally have hot temperatures and low relative humidity (Figure A2.2 and Table A2.1). Some of the nodes are also influenced by transport distances, which also appears as an important variable, along with wind speeds (Figure A2.4). Temperature- and relative humidity-based parameters are the most important variables. Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A2.3).

APPENDIX 2: CART analysis results for Cincinnati

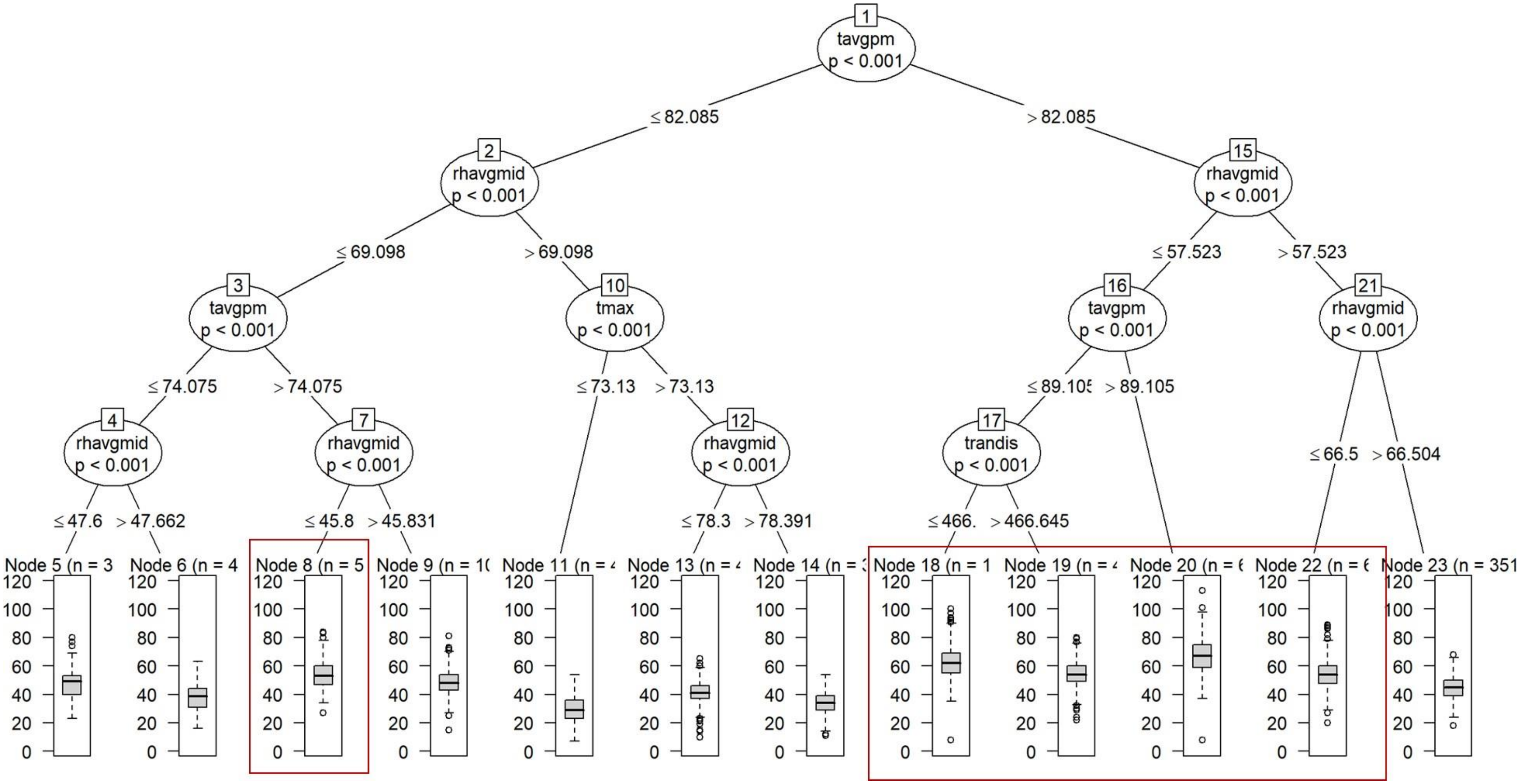

Figure A2.2. Classification and Regression Tree (CART) for the Cincinnati monitors. The boxplots[5] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[5] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

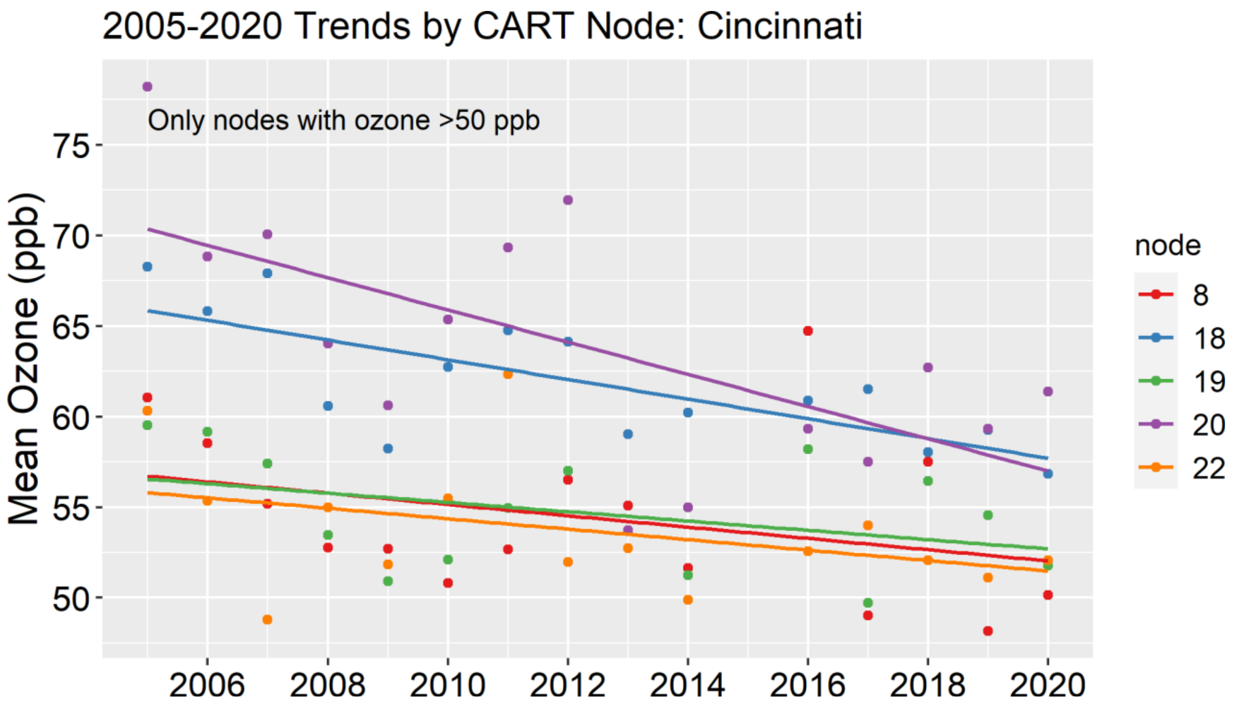

Figure A2.3. Trends in average (mean) ozone in high-ozone nodes for the Cincinnati monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A2.1. Description of each high-ozone node for the Cincinnati monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 20	**Node 18**	**Node 19**	**Node 8**	**Node 22**
67 ppb O_3	62 ppb O_3	54 ppb O_3	54 ppb O_3	54 ppb O_3
PM Temp >89 °F	PM Temp >82 & <89 °F	PM Temp >82 & <89 °F	PM Temp >74 & <82 °F	PM Temp >82 °F
Midday RH <58%	Midday RH <58%	Midday RH <58%	Midday RH <46%	Midday RH >58% & <66%
	24-hour transport <466 km	24-hour transport >466 km		

APPENDIX 2: CART analysis results for Cincinnati

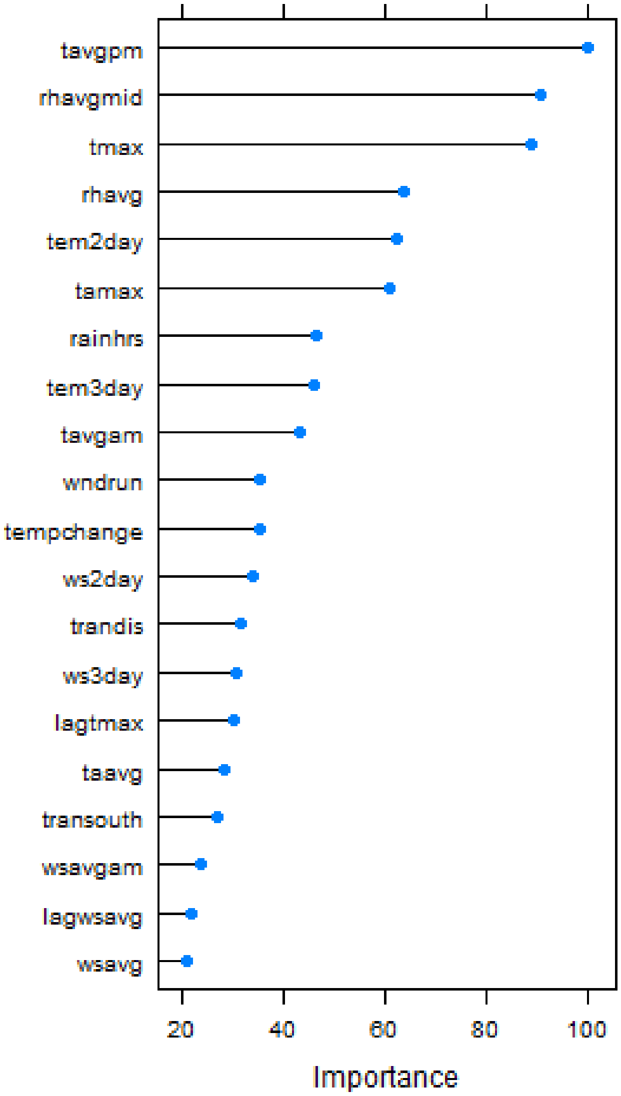

Figure A2.4. Rankings of the importance of different variables in the CART analysis for the Cincinnati monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

Appendix 3

CART analysis results for the Cleveland 2015 ozone nonattainment area

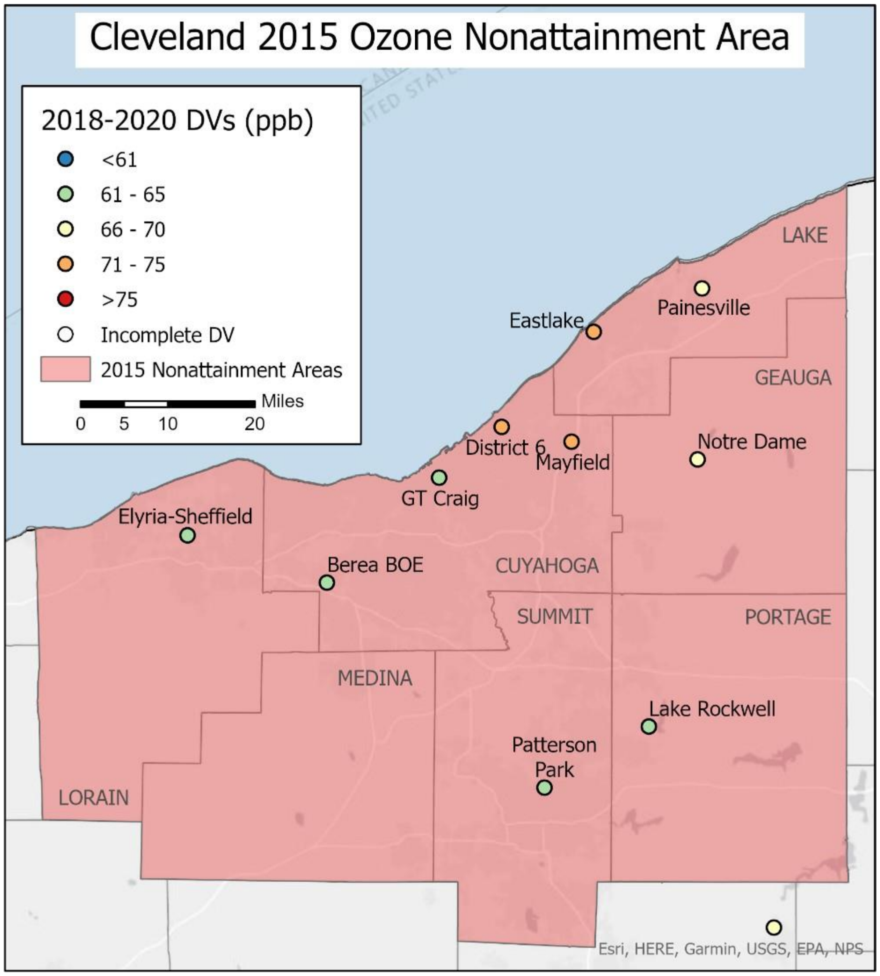

Figure A3.1. Map of the Cleveland 2015 ozone nonattainment areas.

Data used in the analysis:

<u>Ozone monitors</u>: 390350034 (District 6), 390350064 (Berea BOE), 390355002 (Mayfield), and 390850003 (Eastlake)

<u>Meteorological station</u>: Cleveland Hopkins International Airport (CLE)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Cleveland monitors generally have hot temperatures and low relative humidity (Figure A3.2 and Table A3.1). The highest ozone nodes also have low wind speed, which also appears as an important variable, along with southerly transport (Figure A3.4). Temperature-based parameters are the most important variables. Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A3.3).

APPENDIX 3: CART analysis results for Cincinnati

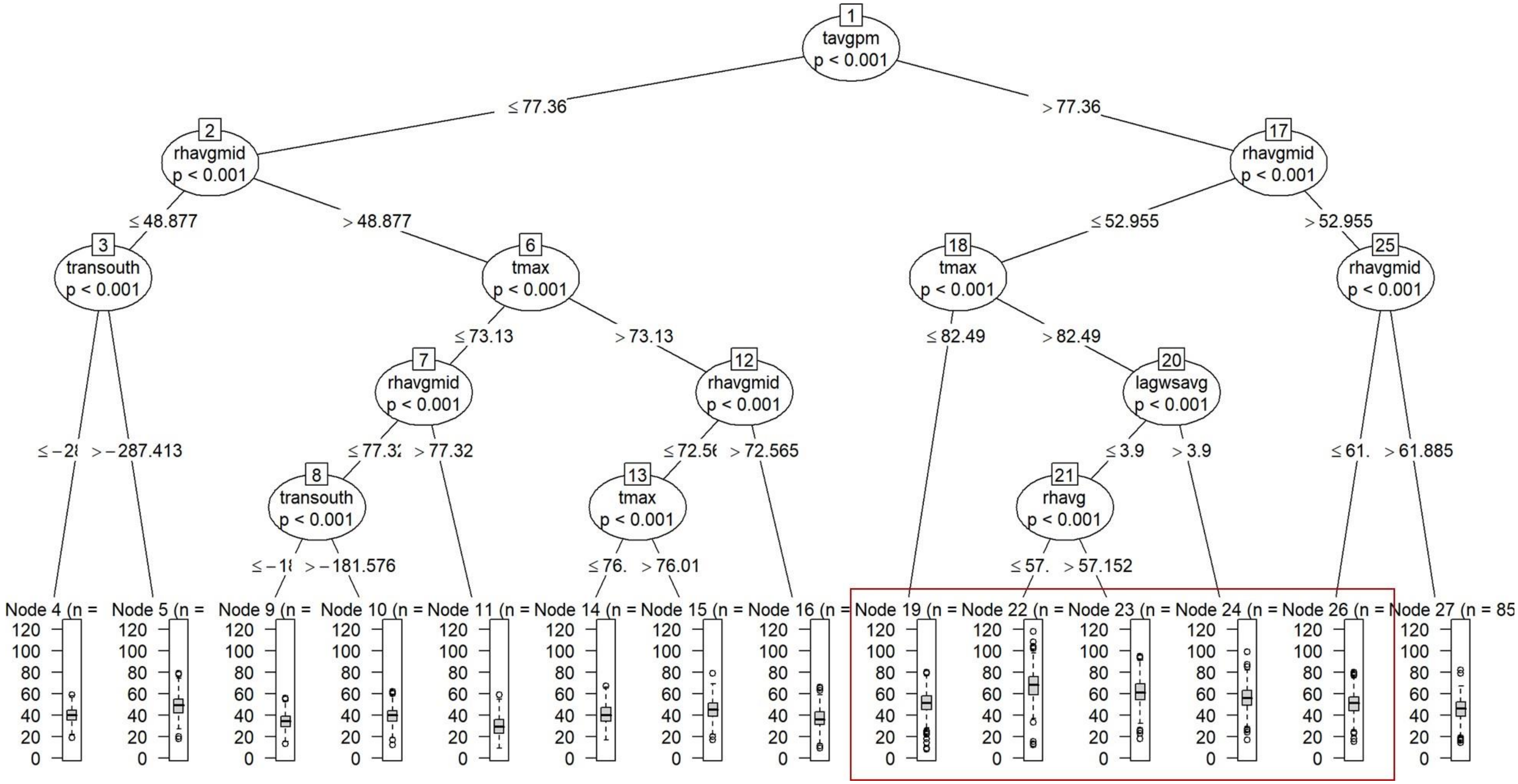

Figure A3.2. Classification and Regression Tree (CART) for the Cleveland monitors. The boxplots[6] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

---

[6] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

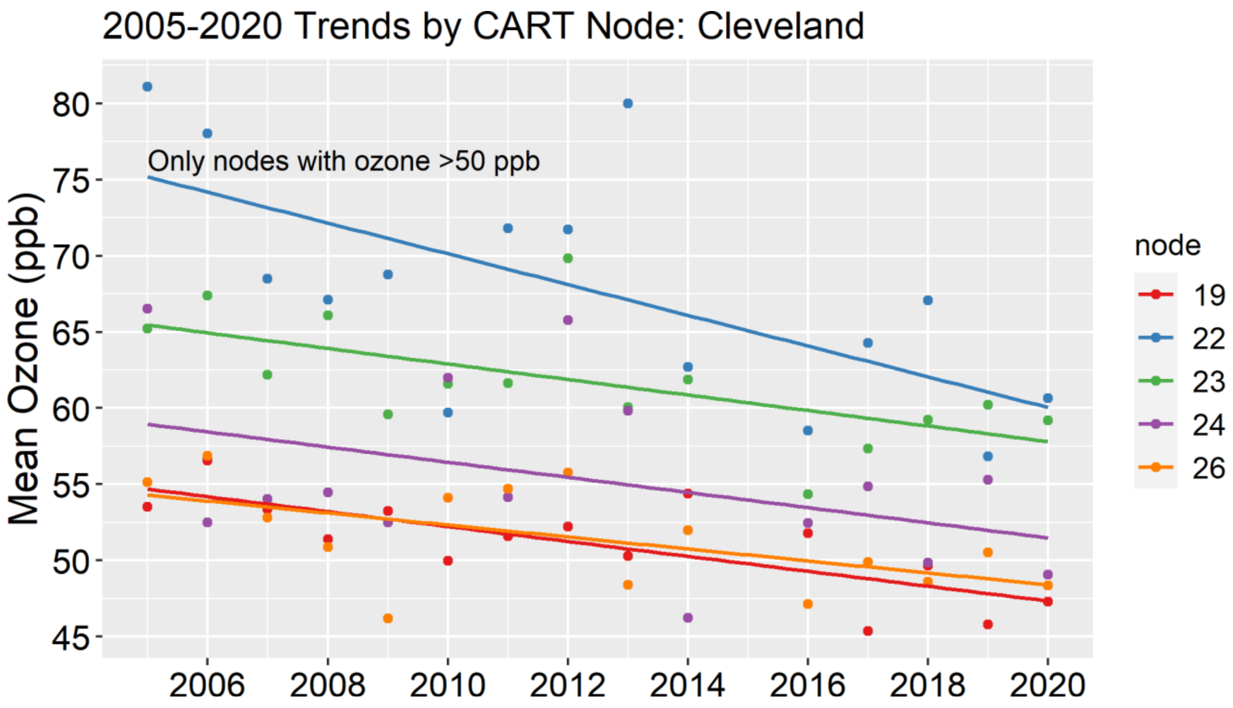

Figure A3.3. Trends in average (mean) ozone in high-ozone nodes for the Cleveland monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A3.1. Description of each high-ozone node for the Cleveland monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 22	**Node 23**	**Node 24**	**Node 26**	**Node 19**
67 ppb O_3	61 ppb O_3	56 ppb O_3	51 ppb O_3	51 ppb O_3
PM Temp >77 °F	PM Temp >77 °F	PM Temp >77 °F	PM Temp >77 °F	PM Temp >77 °F
Midday RH <53%	Midday RH <53%	Midday RH <53%	Midday RH >53% & <62%	Midday RH <53%
Max. Temp >82 °F	Max. Temp >82 °F	Max. Temp >82 °F		Max. Temp <82 °F
Previous day winds <3.9 m/s	Previous day winds <3.9 m/s	Previous day winds >3.9 m/s		
Average RH <57%	Average RH >57%			

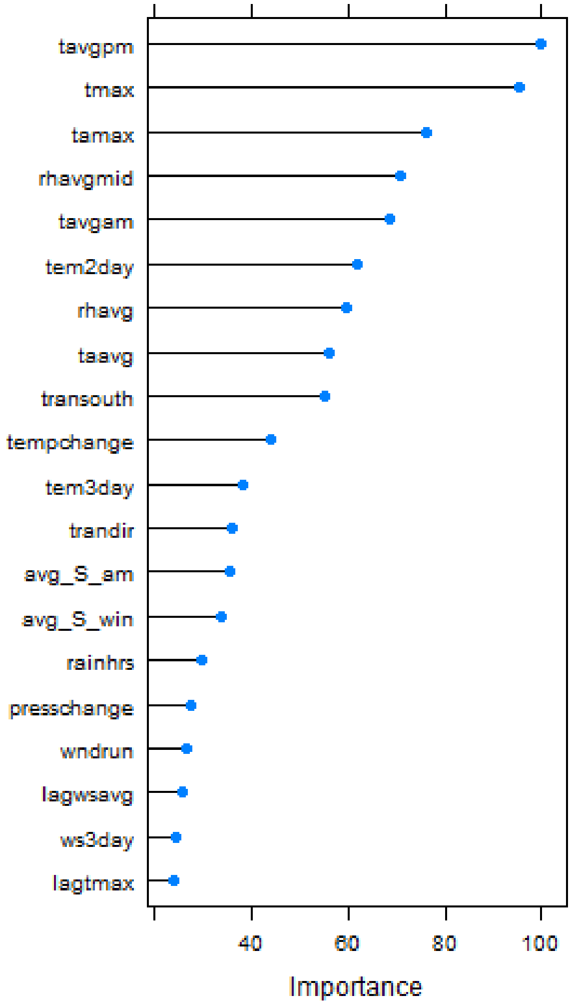

Figure A3.4. Rankings of the importance of different variables in the CART analysis for the Cleveland monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

Appendix 4

CART analysis results for the Detroit 2015 ozone nonattainment area

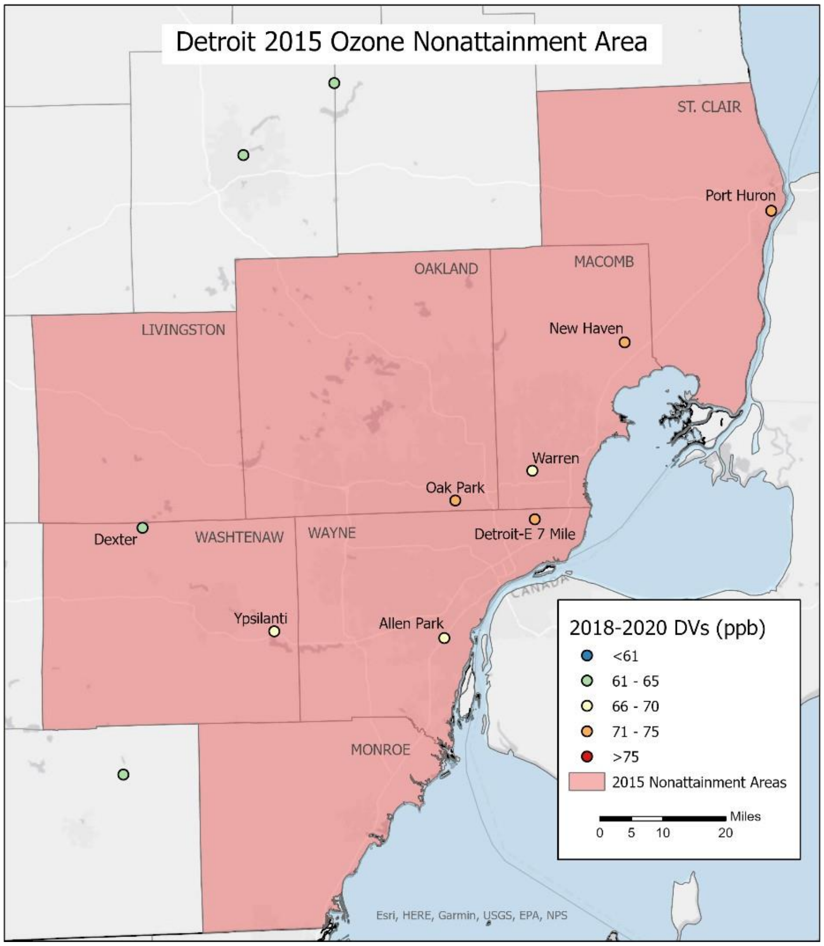

Figure A4.1. Map of the Detroit 2015 ozone nonattainment areas.

Data used in the analysis:

<u>Ozone monitors</u>: 260990009 (New Haven), 260991003 (Warren), 261250001 (Oak Park), 261630001 (Allen Park), 261630019 (Detroit-E 7 Mile)

<u>Meteorological station</u>: Detroit Metropolitan Wayne County Airport (DTE)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Detroit monitors generally have hot temperatures and low relative humidity (Figure A4.2 and Table A4.1). The highest ozone nodes also have winds from the east to south-southwest, and other high-ozone nodes have low wind speeds. Southerly winds and transport appear as important variables (Figure A4.4). Temperature-based parameters are the most important variables. Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A4.3).

APPENDIX 4: CART analysis results for Detroit

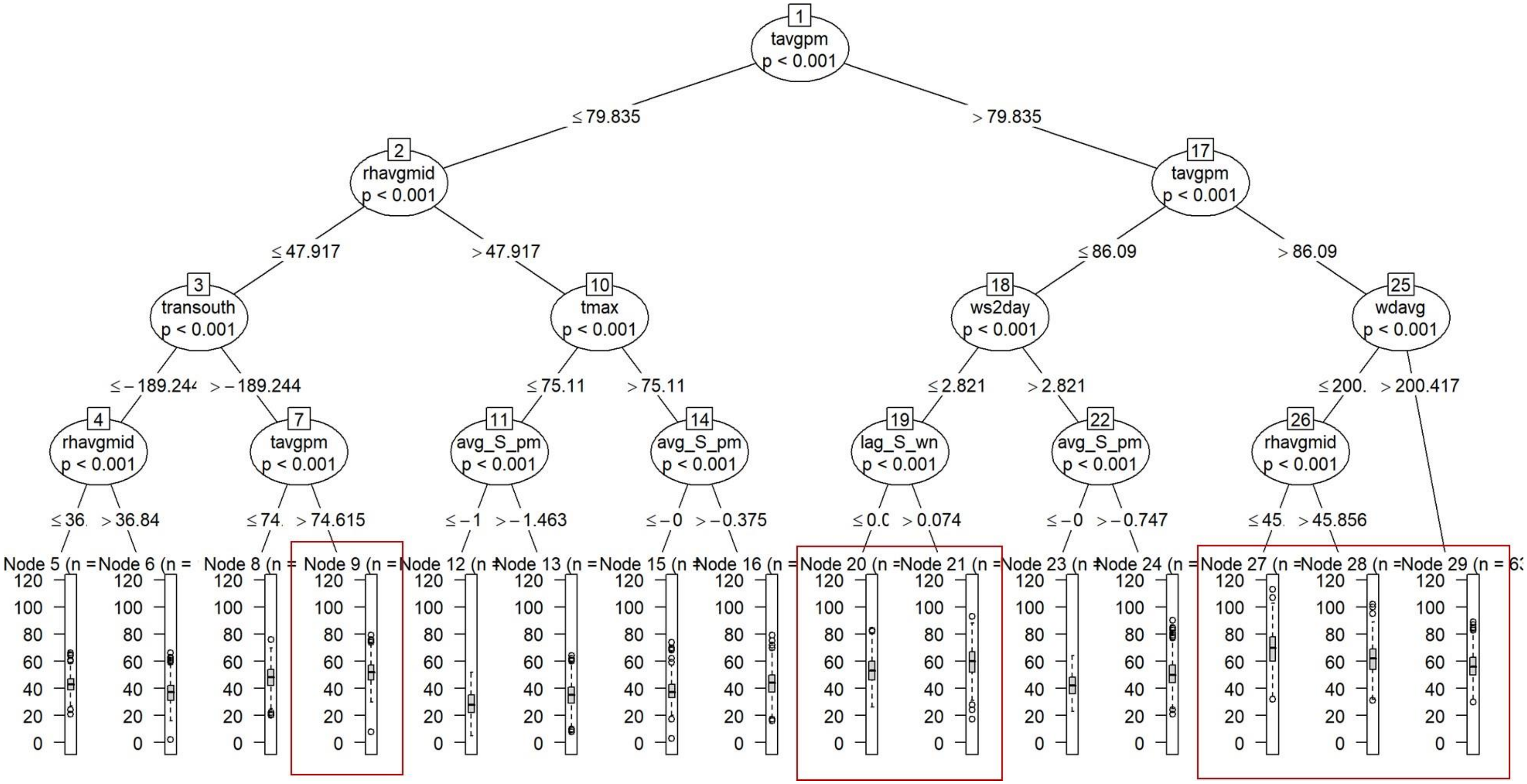

Figure A4.2. Classification and Regression Tree (CART) for the Detroit monitors. The boxplots[7] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[7] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

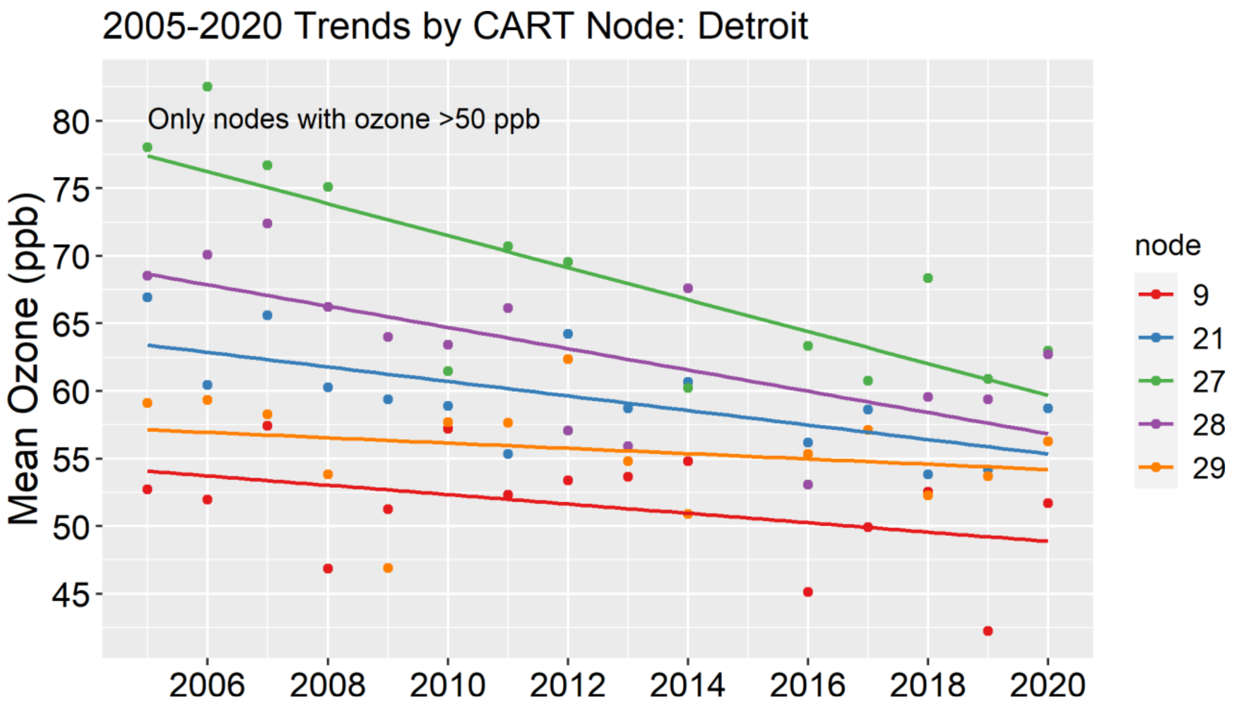

Figure A4.3. Trends in average (mean) ozone in high-ozone nodes for the Detroit monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A4.1. Description of each high-ozone node for the Detroit monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 27	**Node 28**	**Node 21**	**Node 29**	**Node 9**
69 ppb O_3	62 ppb O_3	60 ppb O_3	57 ppb O_3	52 ppb O_3
PM Temp >86 °F	PM Temp >86 °F	PM Temp >80 & <86 °F	PM Temp >86 °F	PM Temp >75 & <80 °F
Average wind direction <200°	Average wind direction <200°	2-day winds <2.8 m/s	Average wind direction >200°	Midday RH <48%
Midday RH <46%	Midday RH >46%	Previous day winds from the south		24-hour southerly transport (>-189 km)

APPENDIX 4: CART analysis results for Detroit

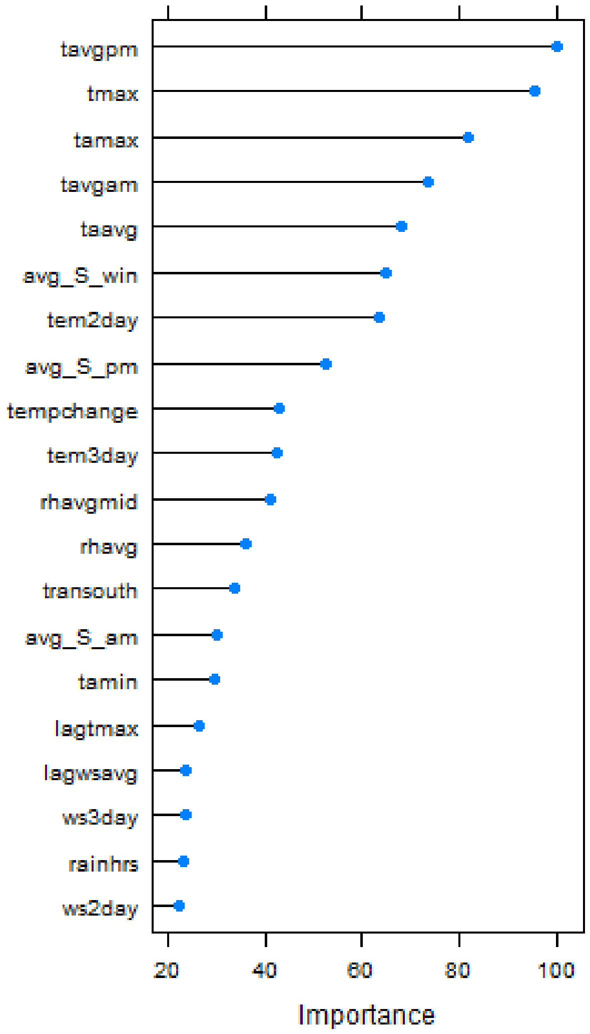

Figure A4.4. Rankings of the importance of different variables in the CART analysis for the Detroit monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

Appendix 5

CART analysis results for the Louisville 2015 ozone nonattainment area

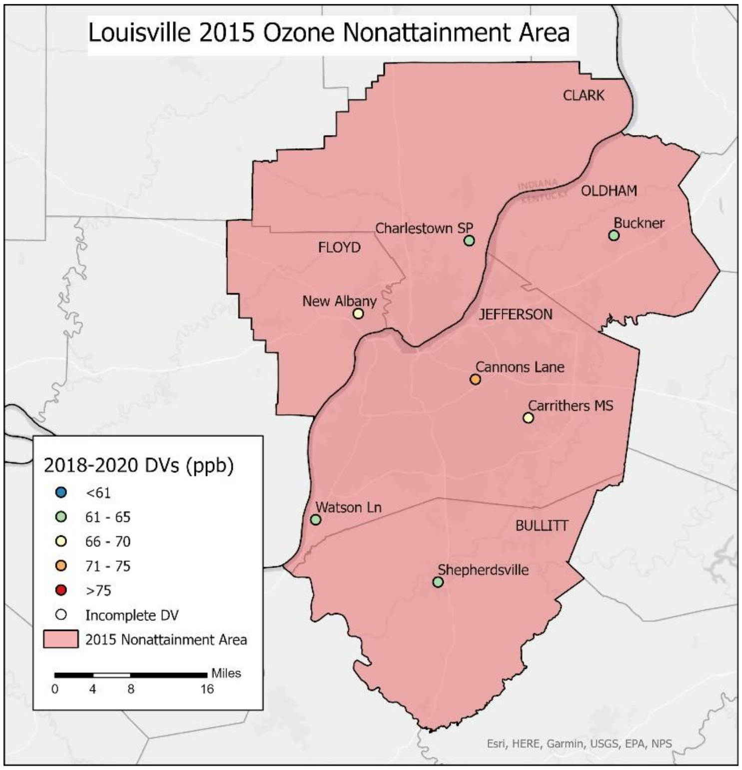

Figure A5.1. Map of the Louisville 2015 ozone nonattainment areas.

Data used in the analysis:

<u>Ozone monitors</u>: 211110027 (Bates, 2005-2017), 211110051 (Watson Ln), 211110080 (Carrithers MS, 2018-2020). (The Bates monitor was relocated to nearby Carrithers MS in 2018.)

<u>Meteorological station</u>: Louisville Muhammad Ali International Airport (SDF)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Louisville monitors generally have low relative humidity, hot temperatures, and gentle winds or shorter transport distances (Figure A5.2 and Table A5.1). These factors also appear as important variables, with relative humidity-related parameters being the most important (Figure A5.4). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A5.3).

APPENDIX 5: CART analysis results for Louisville

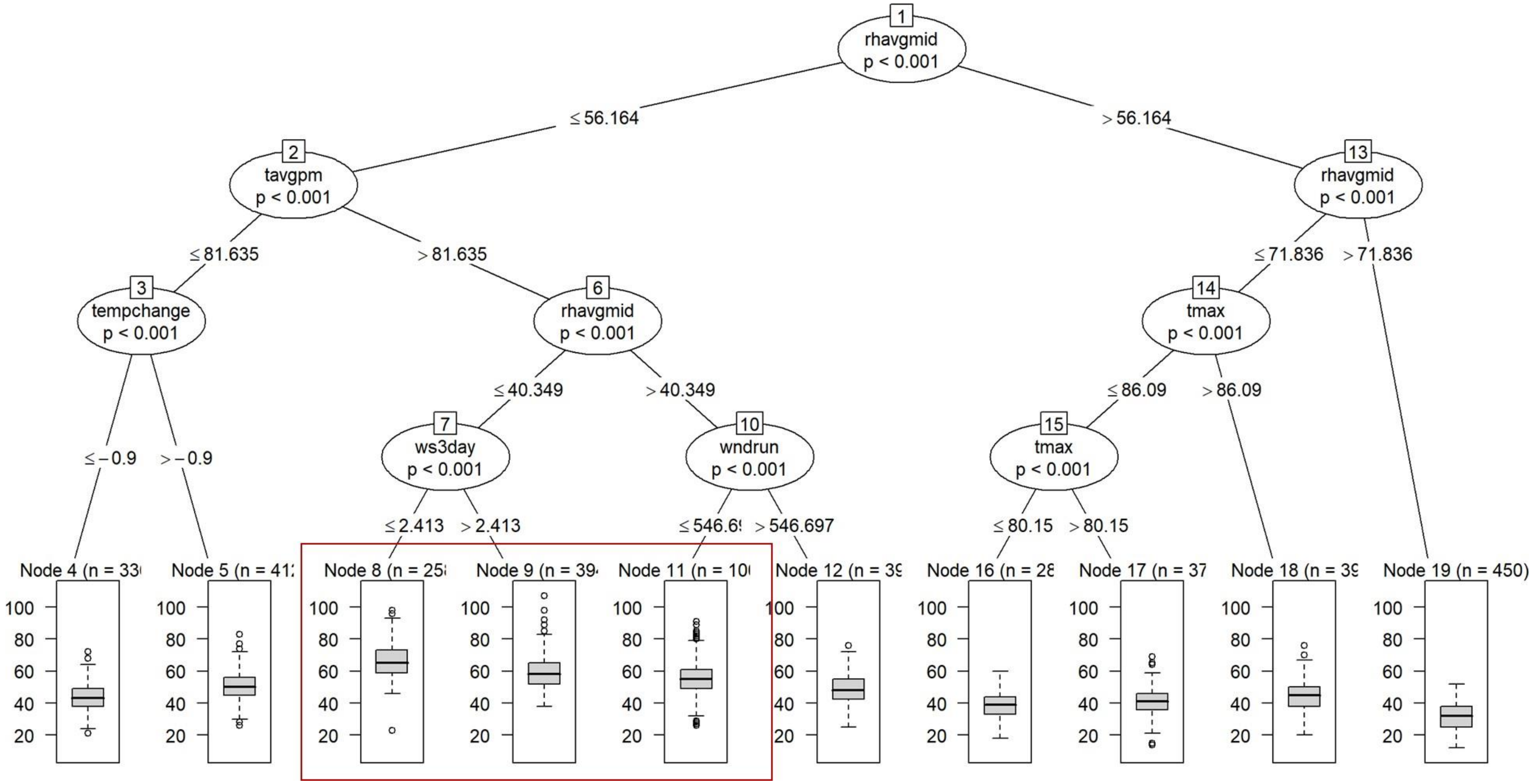

Figure A5.2. Classification and Regression Tree (CART) for the Louisville monitors. The boxplots[8] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

---

[8] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

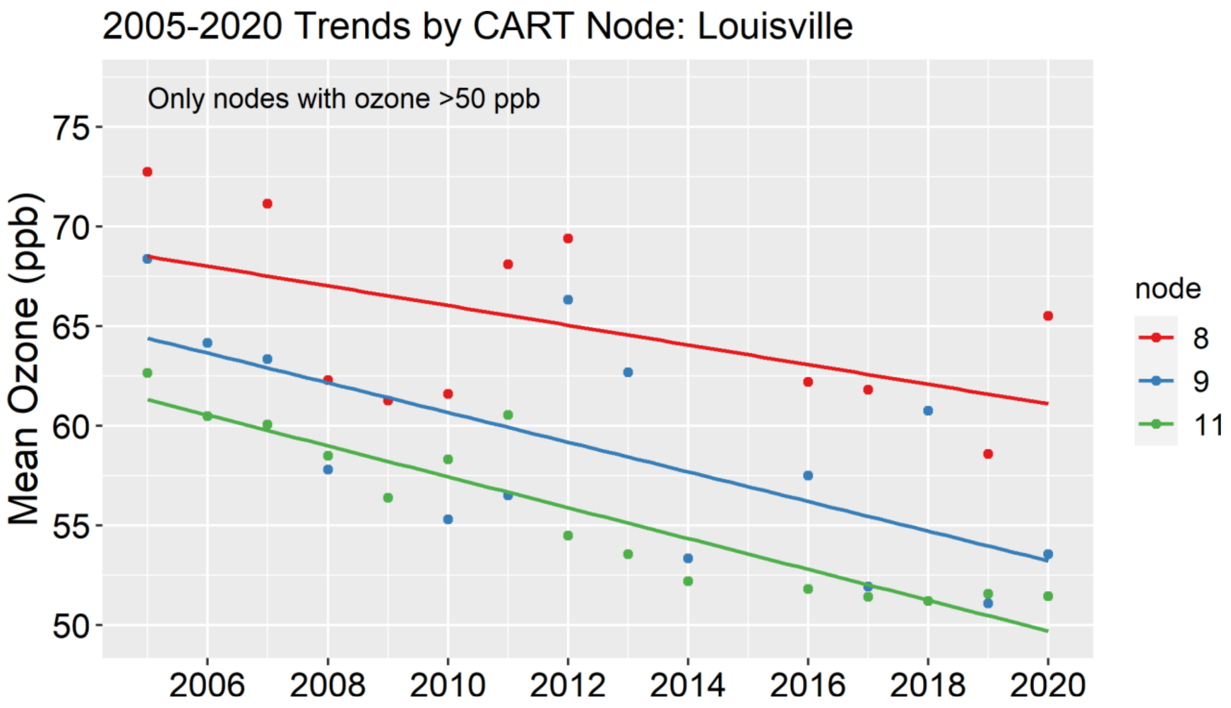

Figure A5.3. Trends in average (mean) ozone in high-ozone nodes for the Louisville monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A5.1. Description of each high-ozone node for the Louisville monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 8	**Node 9**	**Node 11**
66 ppb O_3	59 ppb O_3	56 ppb O_3
Midday RH <40%	Midday RH <40%	Midday RH <56% & >40%
PM Temp >82 °F	PM Temp >82 °F	PM Temp >82 °F
3-day winds <2.4 m/s	3-day winds >2.4 m/s	24-hour wind run (transport) <547 km

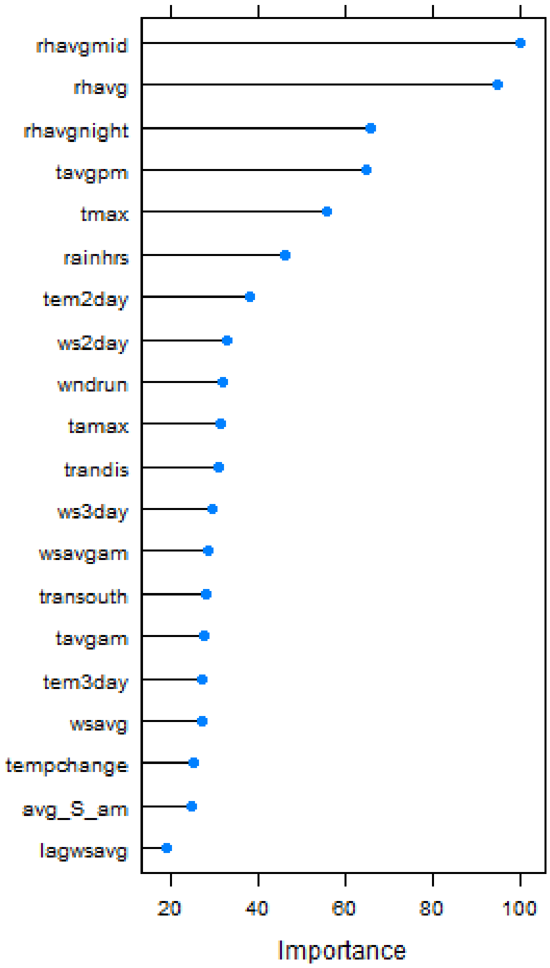

Figure A5.4. Rankings of the importance of different variables in the CART analysis for the Louisville monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

Appendix 6

CART analysis results for the St. Louis 2015 ozone nonattainment area

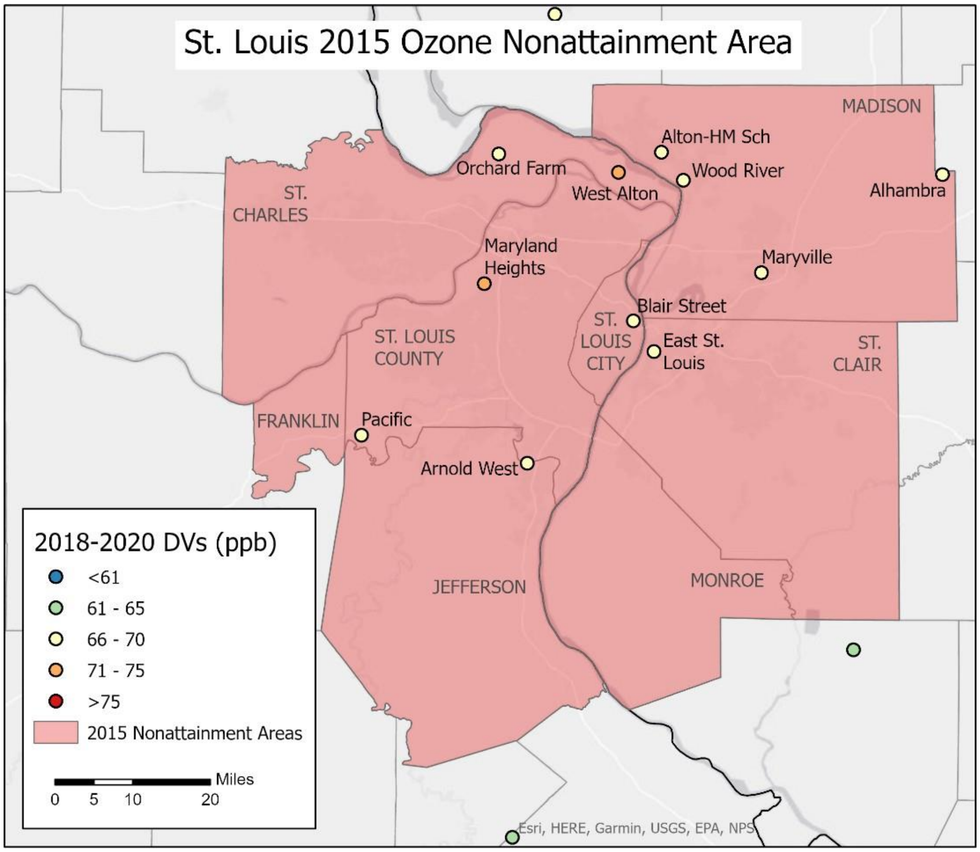

Figure A6.1. Map of the St. Louis 2015 ozone nonattainment areas.

Data used in the analysis:

<u>Ozone monitors</u>: 171190008 (Alton-Clara Barton Sch), 171191009 (Maryville), 171193007 (Wood River), 291831002 (West Alton), 291831004 (Orchard Farm), 291890005 (Pacific), 291890014 (Maryland Heights), 295100085 (Blair Street), 171190120 (Alton-HM Sch)

<u>Meteorological station</u>: St. Louis Lambert International Airport (STL)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Louisville monitors generally have low relative humidity, hot temperatures (Figure A6.2 and Table A6.1). The highest ozone nodes also have gentle winds or shorter transport distances. These factors also appear as important variables, with relative humidity-related parameters being the most important (Figure A6.4). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A6.3).

APPENDIX 6: CART analysis results for St. Louis

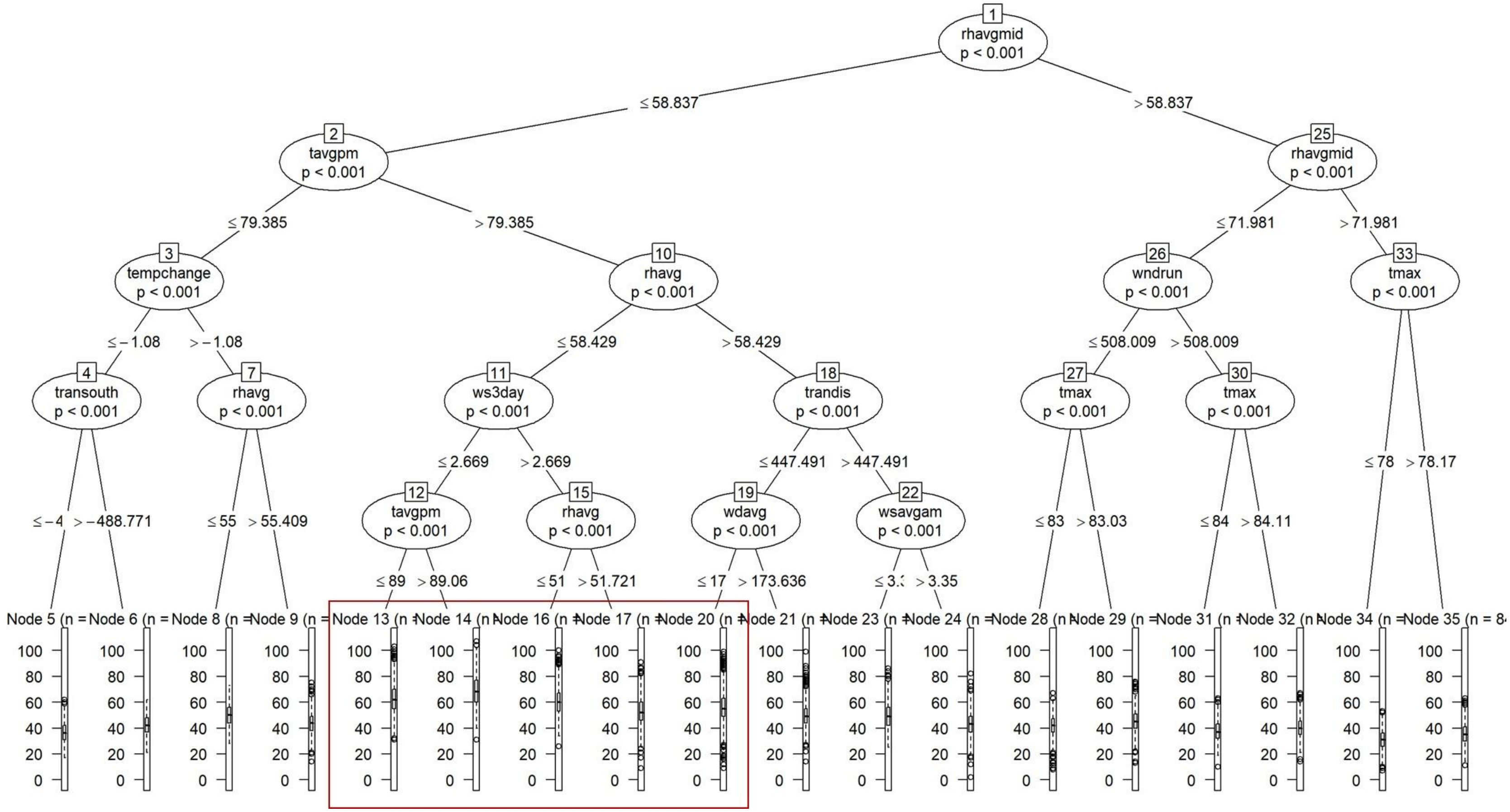

Figure A6.2. Classification and Regression Tree (CART) for the St. Louis monitors. The boxplots[9] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

---

[9] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

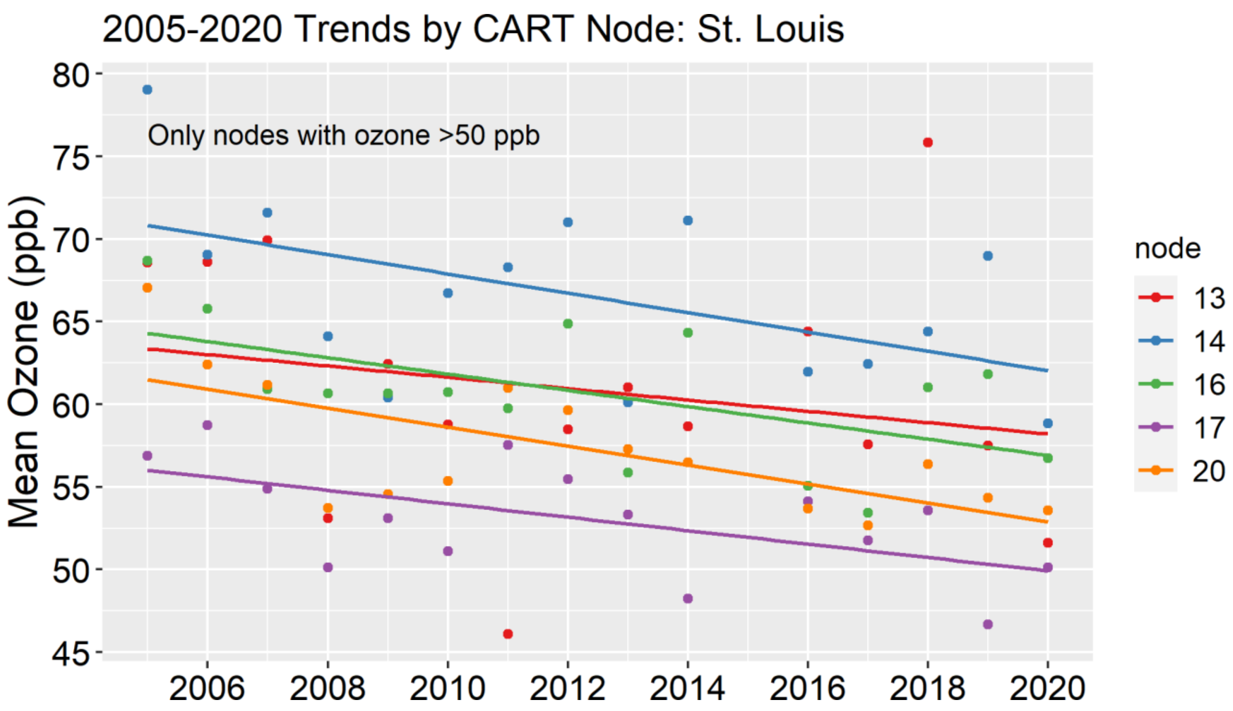

Figure A6.2. Trends in average (mean) ozone in high-ozone nodes for the St. Louis monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A6.1. Description of each high-ozone node for the St. Louis monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 14	**Node 13**	**Node 16**	**Node 20**	**Node 17**
69 ppb O_3	62 ppb O_3	61 ppb O_3	56 ppb O_3	53 ppb O_3
Midday RH <59%	Midday RH <59%	Midday RH <59%	Midday RH <59%	Midday RH <59%
PM Temp >89 °F	PM Temp >79 & <89 °F	PM Temp >79 °F	PM Temp >79 °F	PM Temp >79 °F
Average RH <58%	Average RH <58%	Average RH <52%	Average RH >58%	Average RH >52% & <58%
3-day winds <2.7 m/s	3-day winds <2.7 m/s	3-day winds >2.7 m/s	24-hour transport <447 km	3-day winds >2.7 m/s
			Average wind direction from east (<174 °)	

APPENDIX 6: CART analysis results for St. Louis

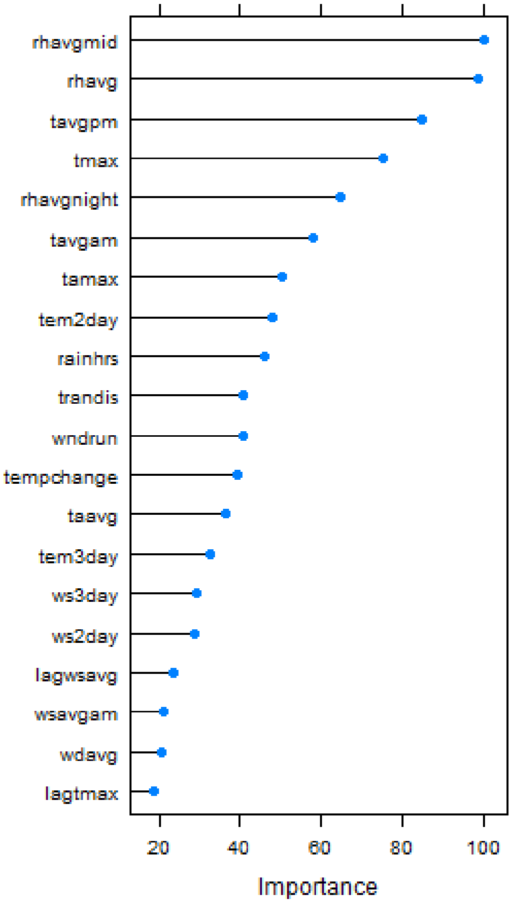

Figure A6.4. Rankings of the importance of different variables in the CART analysis for the St. Louis monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

Appendix 7

CART analysis results for the Western Michigan 2015 ozone nonattainment areas

Contents:

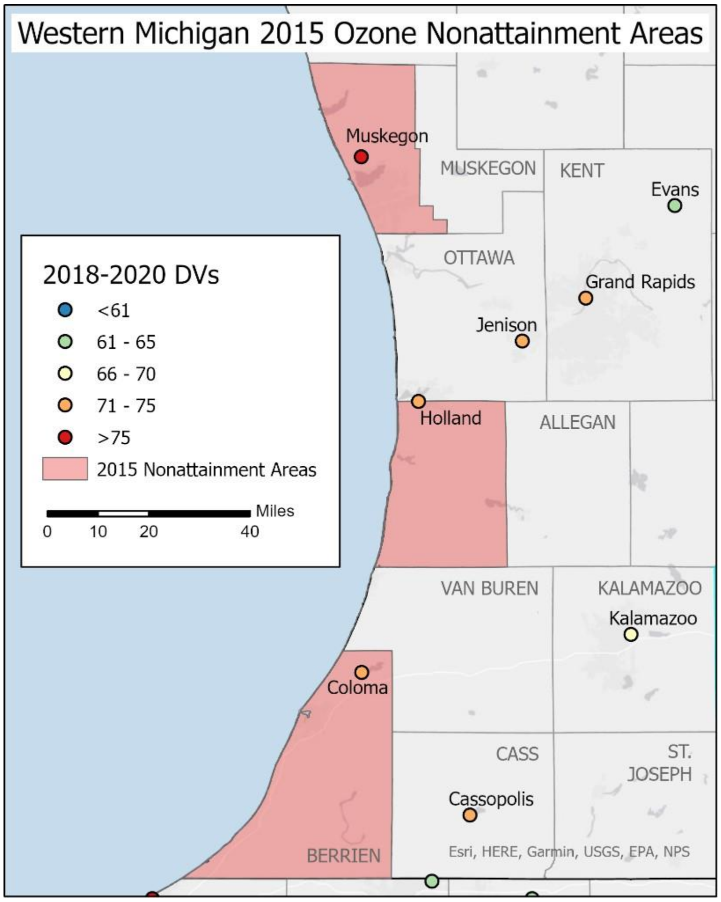

Figure A7.1. Map of the Western Michigan 2015 ozone nonattainment areas.

CART analysis results for the combined Western Michigan monitors

Data used in the analysis:

Ozone monitors: 260050003 (Holland), 260210014 (Coloma), and 261210039 (Muskegon)

Meteorological station: Muskegon County Airport (MKG)

Brief description of the results:

The high-ozone nodes from the CART analysis for the combined Western Michigan monitors generally have southerly transport, hot temperatures, and westerly transport (Figure A7.2 and Table A7.1). All of these factors appear as important variables, with southerly transport being the most important (Figure A7.4). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A7.3).

APPENDIX 7: CART analysis results for Western Michigan

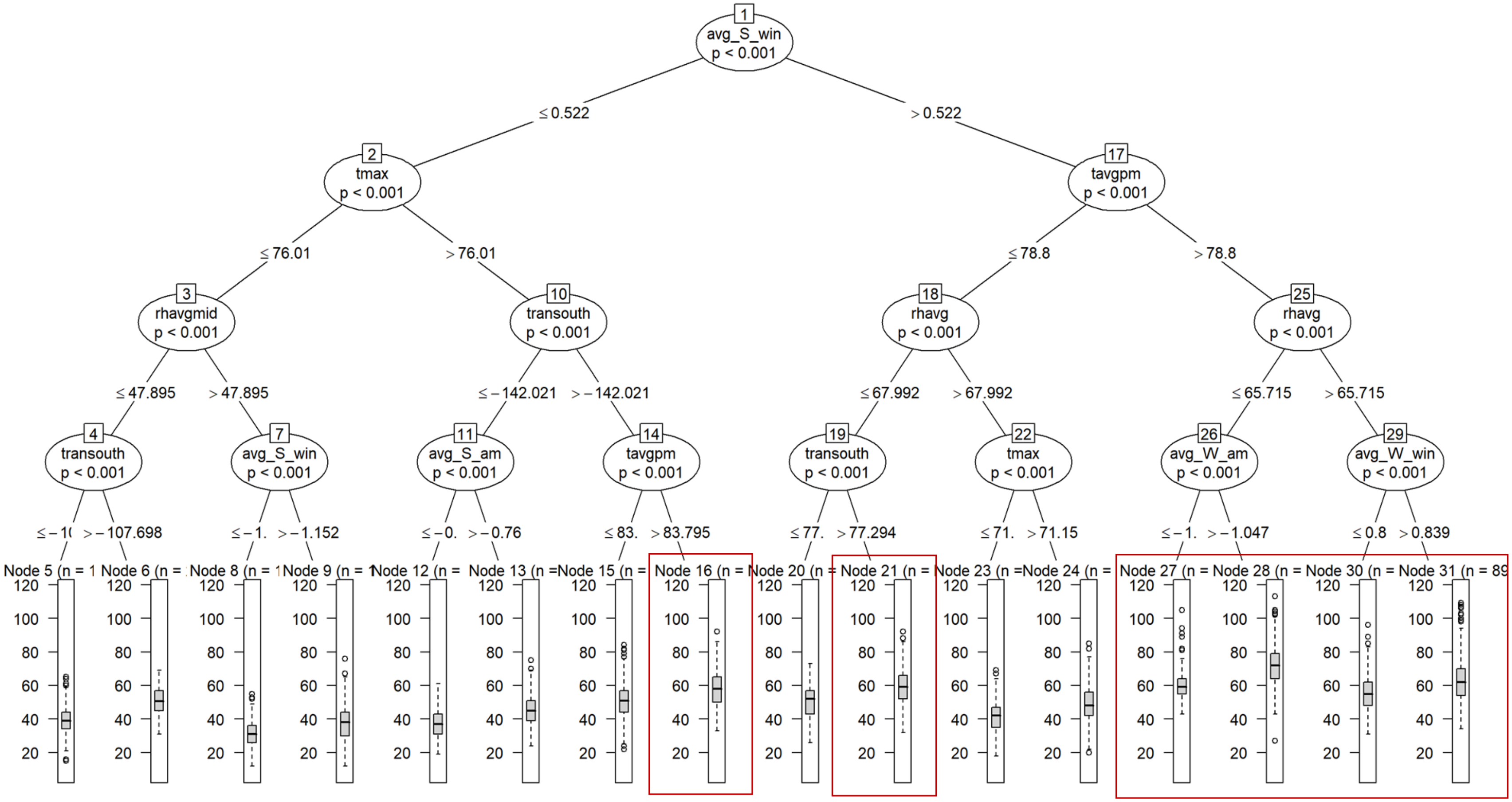

Figure A7.2. Classification and Regression Tree (CART) for the combined Western Michigan monitors. The boxplots[10] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[10] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

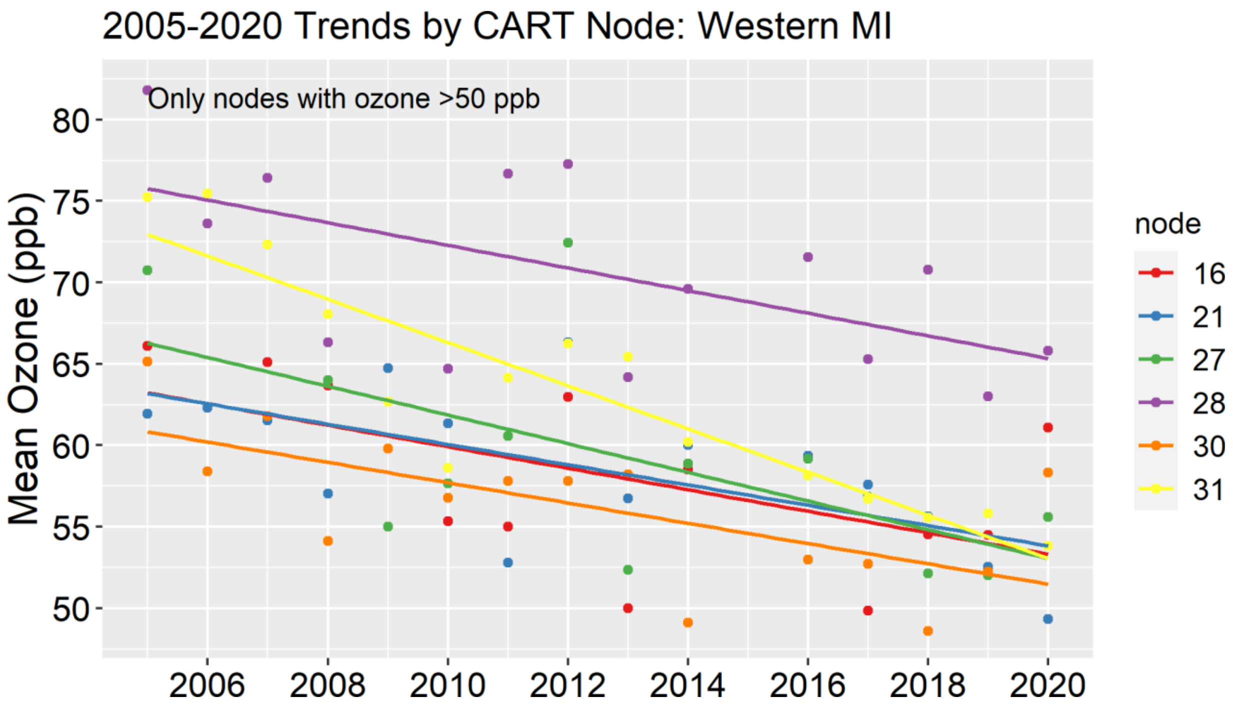

Figure A7.3. Trends in average (mean) ozone in high-ozone nodes for the combined Western Michigan monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A7.1. Description of each high-ozone node for the combined Western Michigan monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 28	**Node 31**	**Node 27**	**Node 21**	**Node 16**	**Node 30**
72 ppb O_3	63 ppb O_3	60 ppb O_3	59 ppb O_3	59 ppb O_3	55 ppb O_3
Southerly winds (>0.5 m/s)	Southerly winds (>0.5 m/s)	Southerly winds (>0.5 m/s)	Southerly winds (>0.5 m/s)	Northerly winds or very weak southerly winds	Southerly winds (>0.5 m/s)
PM Temp >79 °F	PM Temp >79 °F	PM Temp >79 °F	PM Temp <79 °F	Max Temp >76 °F	PM Temp >79 °F
RH <66%	RH >66%	RH <66%	Average RH <68%	24-hr southerly transport >-142 km	RH >66%
AM westerly winds (>-1 m/s)	Westerly winds (>0.8 m/s)	AM easterly winds	24-hr southerly transport >77 km	PM Temp >84 °F	Easterly winds or very weak westerly winds

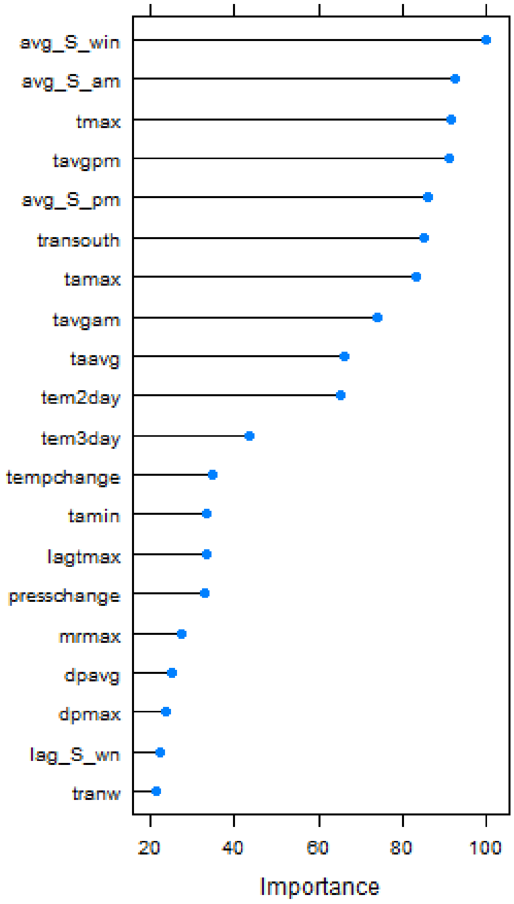

Figure A7.4. Rankings of the importance of different variables in the CART analysis for the combined Western Michigan monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

CART analysis results for the Muskegon County 2015 ozone nonattainment area

Data used in the analysis:

Ozone monitor: 261210039 (Muskegon)

Meteorological station: Muskegon County Airport (MKG)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Muskegon County monitor generally have southerly transport, hot temperatures, and low relative humidity (Figure A7.5 and Table A7.2). Southerly transport-related variables are the most important variables, with temperature also being important. (Figure A7.7). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A7.6).

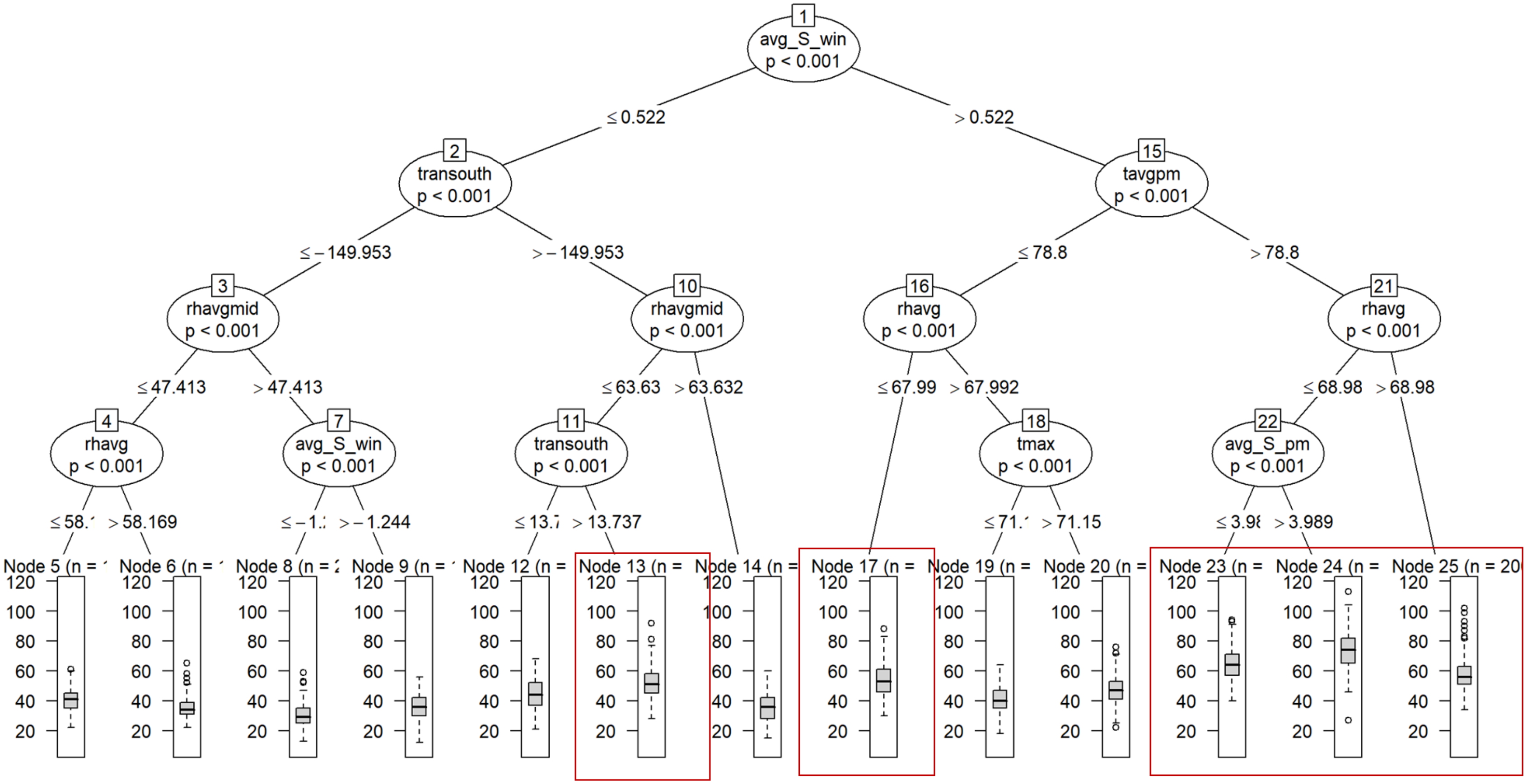

Figure A7.5. Classification and Regression Tree (CART) for the Muskegon County monitor. The boxplots[11] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[11] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

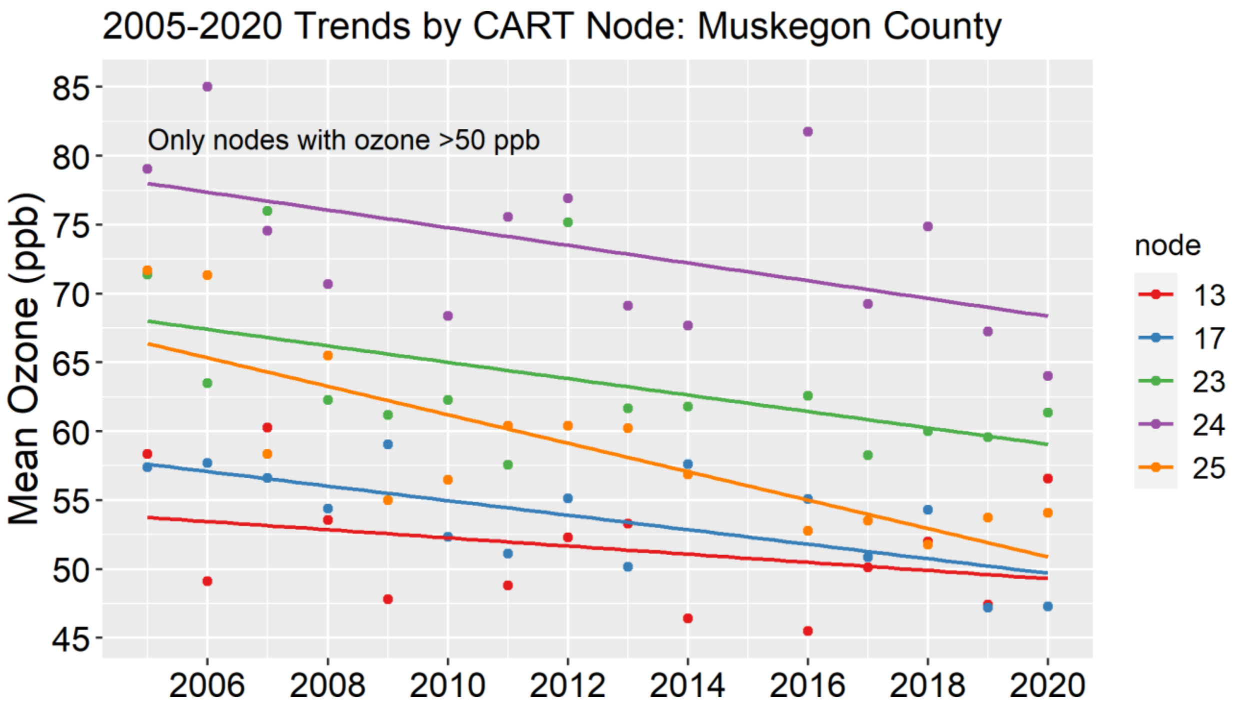

Figure A7.6. Trends in average (mean) ozone in high-ozone nodes for the Muskegon County monitor. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A7.2. Description of each high-ozone node for the Muskegon County monitor, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 24	**Node 23**	**Node 25**	**Node 17**	**Node 13**
74 ppb O_3	65 ppb O_3	58 ppb O_3	54 ppb O_3	52 ppb O_3
Southerly winds (>0.5 m/s)	Southerly winds (>0.5 m/s)	Southerly winds (>0.5 m/s)	Southerly winds (>0.5 m/s)	Northerly winds or very weak southerly winds
PM Temp >79 °F	PM Temp >79 °F	PM Temp >79 °F	PM Temp <79 °F	24-hr Southerly transport (>14 km)
RH <69%	RH <69%	RH >69%	Average RH <68%	Midday RH <64%
PM southerly winds >4 m/s	PM southerly winds <4 m/s			

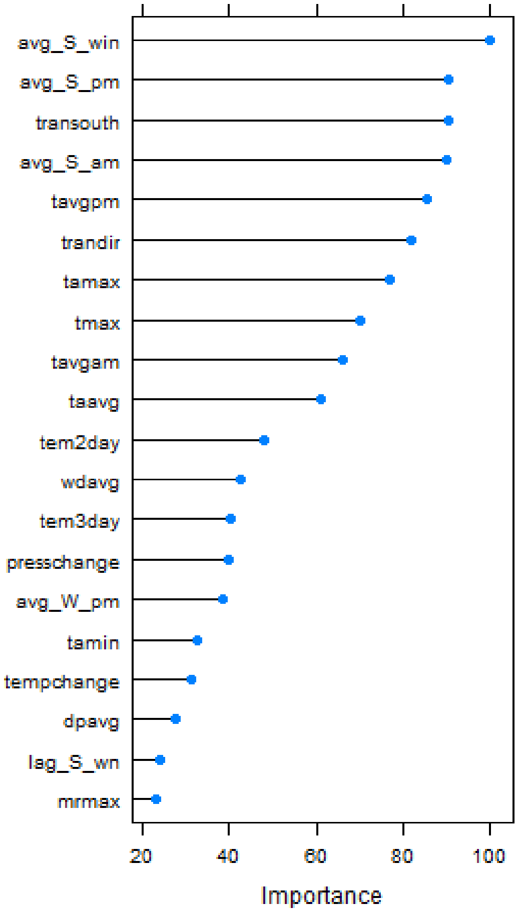

Figure A7.7. Rankings of the importance of different variables in the CART analysis for the Muskegon County monitor. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

CART analysis results for the Allegan County 2015 ozone nonattainment area

Data used in the analysis:

Ozone monitor: 260050003 (Holland)

Meteorological station: Muskegon County Airport (MKG)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Allegan County monitor generally have southerly transport and hot temperatures (Figure A7.8 and Table A7.3). The highest ozone node also has westerly winds. Southerly transport-related variables are the most important variables, with temperature also being important. (Figure A7.10). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A7.9).

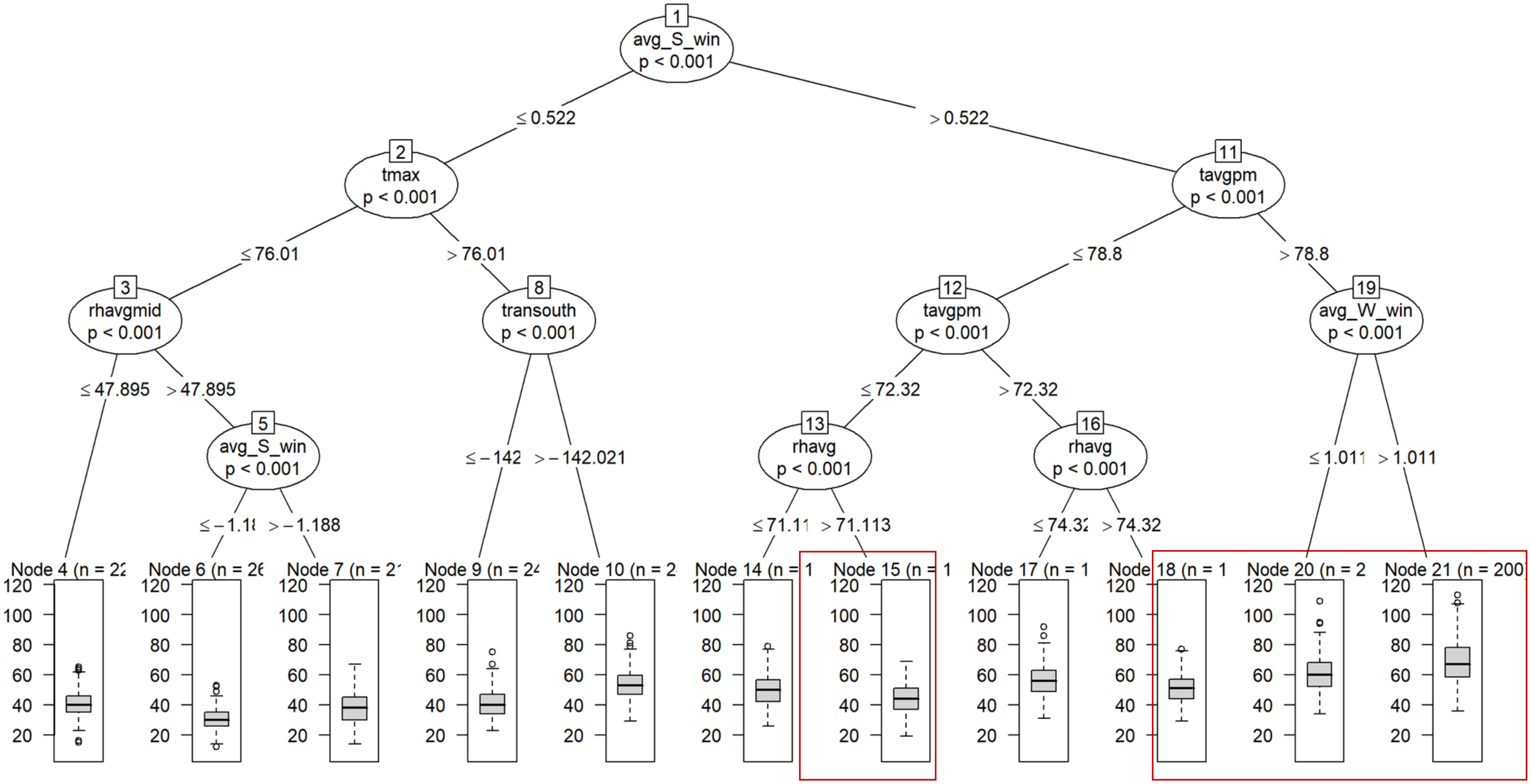

Figure A7.8. Classification and Regression Tree (CART) for the Allegan County monitor. The boxplots[12] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

---

[12] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

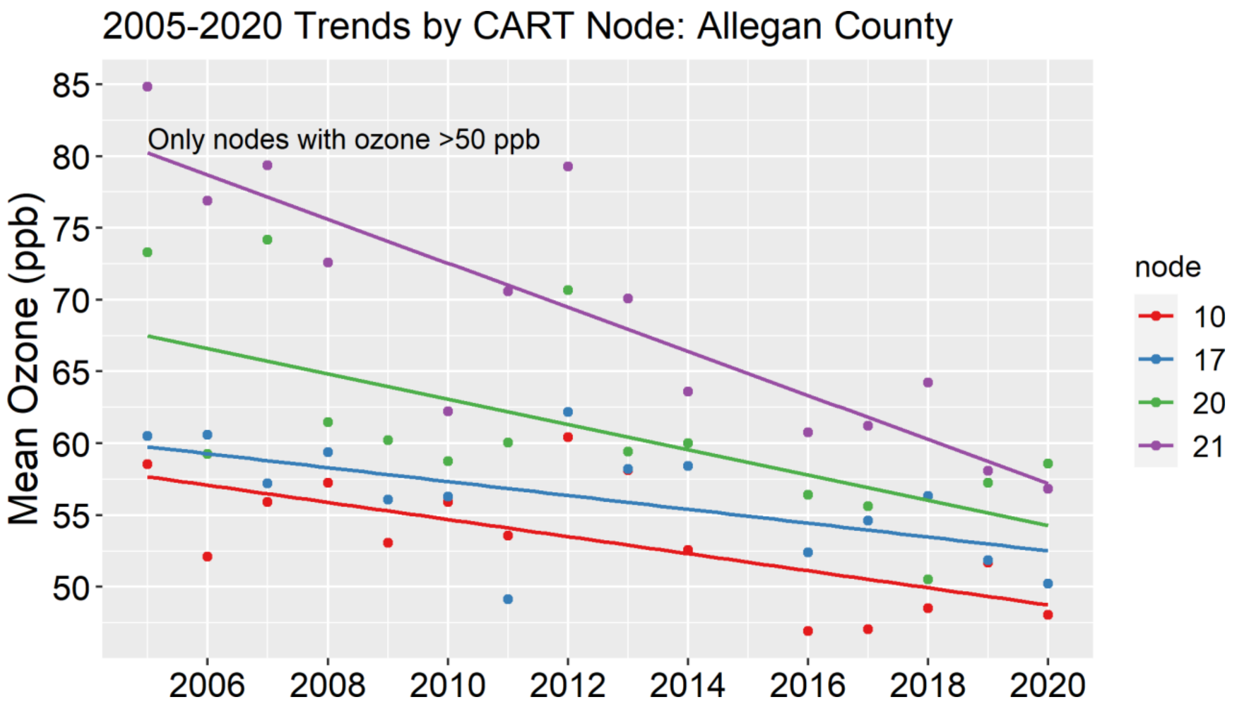

Figure A7.9. Trends in average (mean) ozone in high-ozone nodes for the Allegan County monitor. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A7.3. Description of each high-ozone node for the Allegan County monitor, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 21	**Node 20**	**Node 17**	**Node 10**
69 ppb O_3	61 ppb O_3	56 ppb O_3	53 ppb O_3
Southerly winds (>0.5 m/s)	Southerly winds (>0.5 m/s)	Southerly winds (>0.5 m/s)	Northerly winds or very weak southerly winds
PM Temp >79 °F	PM Temp >79 °F	PM Temp >72 & <79 °F	Maximum Temp >76 °F
Westerly winds >1.0 m/s	Westerly winds <1.0 m/s	RH >74%	24-hr southerly transport >-142 km

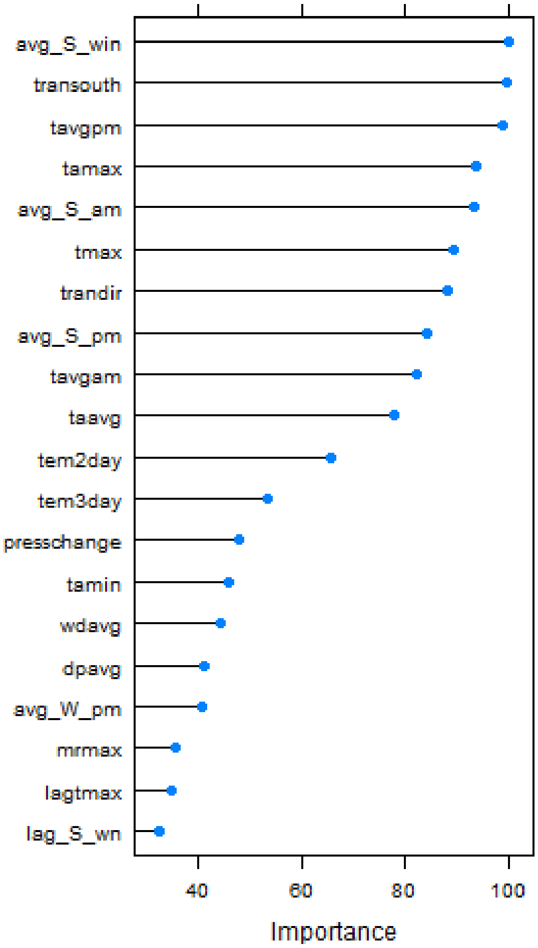

Figure A7.10. Rankings of the importance of different variables in the CART analysis for the Allegan County monitor. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

CART analysis results for the Berrien County 2015 ozone nonattainment area

Data used in the analysis:

Ozone monitor: 260210014 (Coloma)

Meteorological station: South Bend International Airport (SBN)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Berrien County monitor generally have hot temperatures and low relative humidity (Figure A7.11 and Table A7.4). Several nodes also have southerly winds or transport. Temperature-related variables are the most important variables, unlike in Muskegon and Allegan counties, where southerly transport variables were the most important (Figure A7.13). Mean ozone concentrations in all but one of the high-ozone nodes have decreased from 2005 to 2020 (Figure A7.12); the one node whose concentrations have remained steady has a mean ozone concentration of 53 ppb, so these days are unlikely to contribute to ozone nonattainment.

APPENDIX 7: CART analysis results for Western Michigan

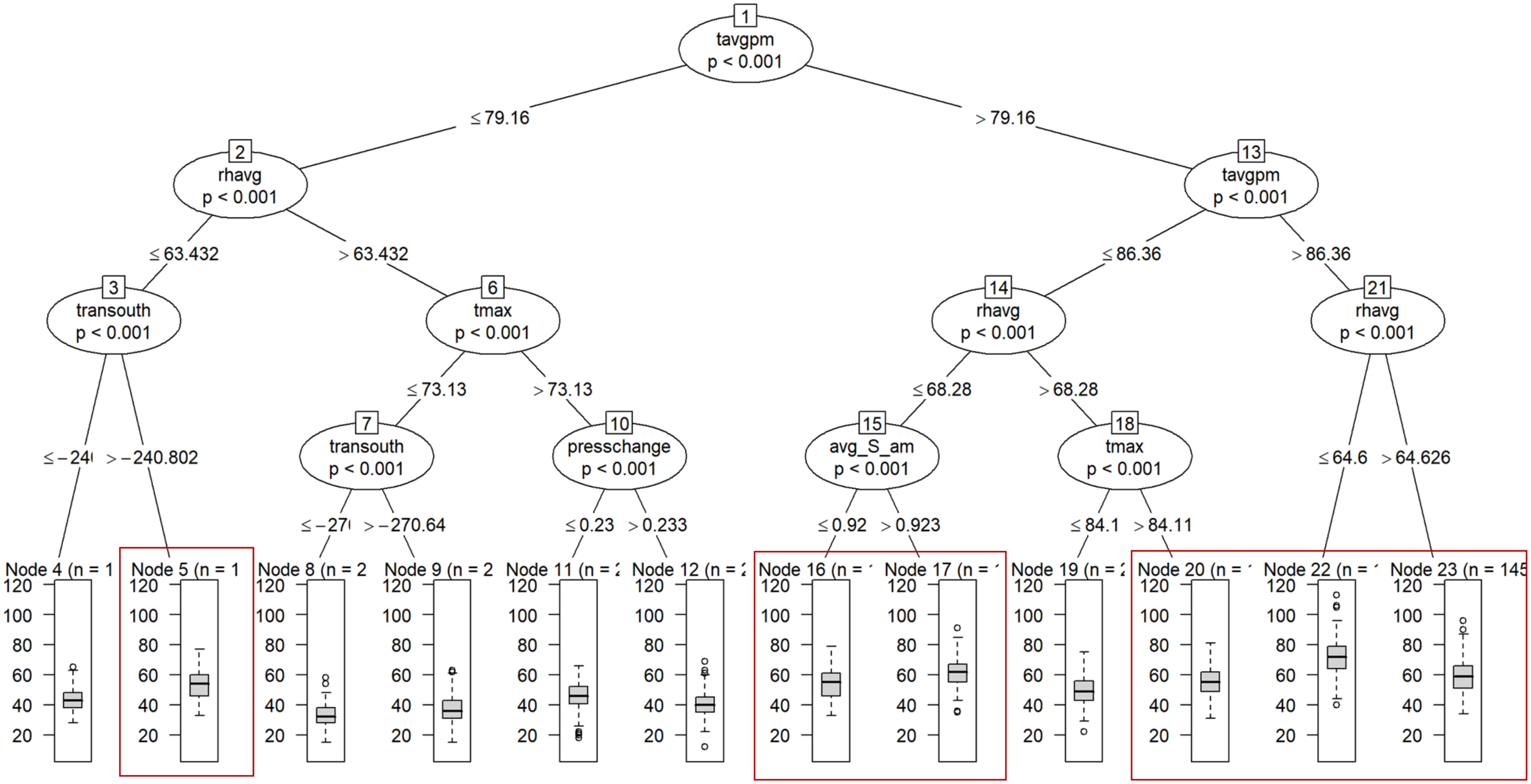

Figure A7.11. Classification and Regression Tree (CART) for the Berrien County monitor. The boxplots[13] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[13] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

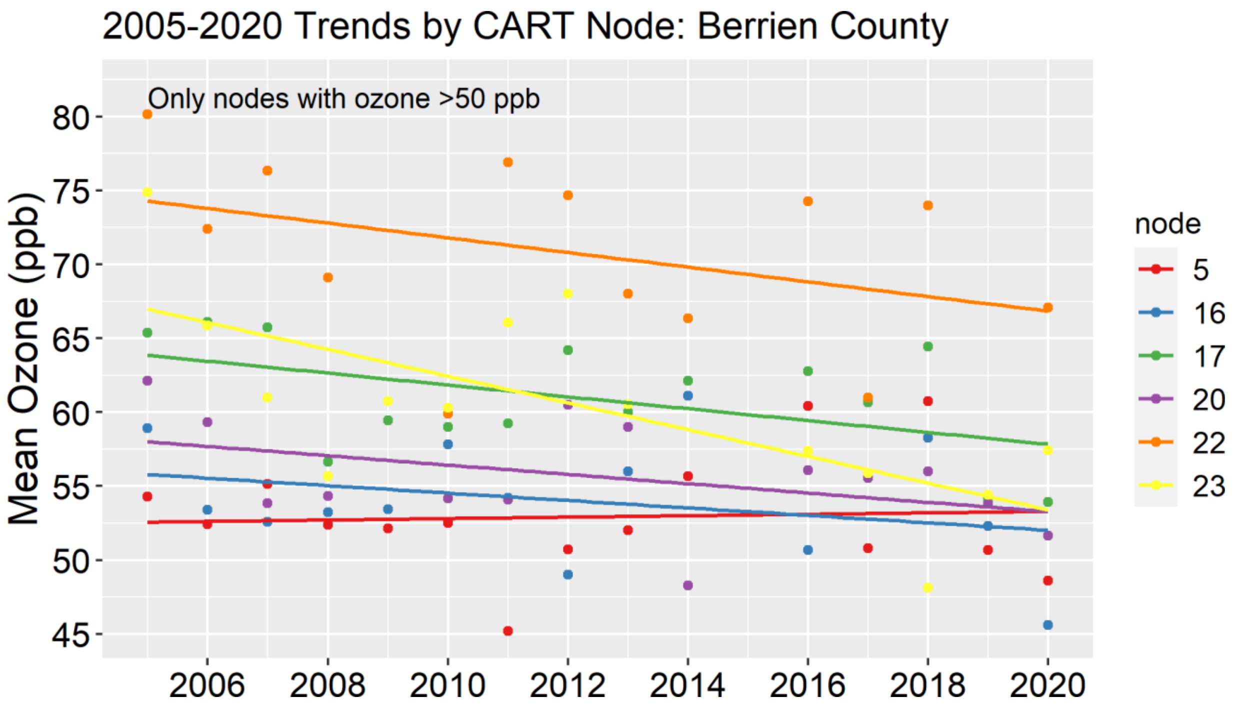

Figure A7.12. Trends in average (mean) ozone in high-ozone nodes for the Berrien County monitor. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A7.4. Description of each high-ozone node for the Berrien County monitor, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 22	**Node 17**	**Node 23**	**Node 20**	**Node 16**	**Node 5**
72 ppb O_3	61 ppb O_3	60 ppb O_3	55 ppb O_3	54 ppb O_3	53 ppb O_3
PM Temp >86 °F	PM Temp >79 & <86 °F	PM Temp >86 °F	PM Temp >79 & <86 °F	PM Temp >79 & <86 °F	PM Temp <79 °F
Average RH <65%	Average RH <68%	Average RH >65%	Average RH >65%	Average RH <68%	Average RH <63%
	AM southerly winds (>0.9 m/s)		Maximum Temp >84 °F	AM northerly or very weak southerly winds	24-hr southerly transport (>-241 km)

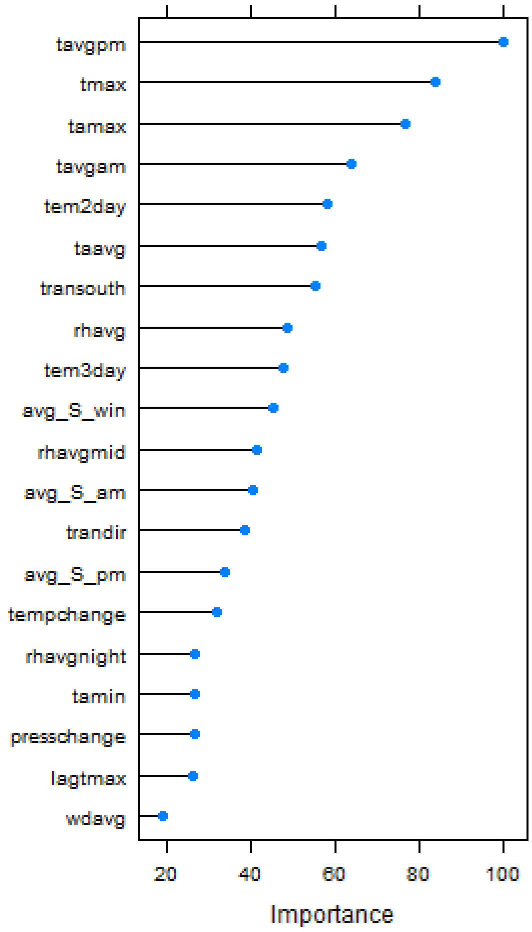

Figure A7.13. Rankings of the importance of different variables in the CART analysis for the Berrien County monitor. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

Appendix 8

CART analysis results for the Wisconsin lakeshore 2015 ozone nonattainment areas

Contents:

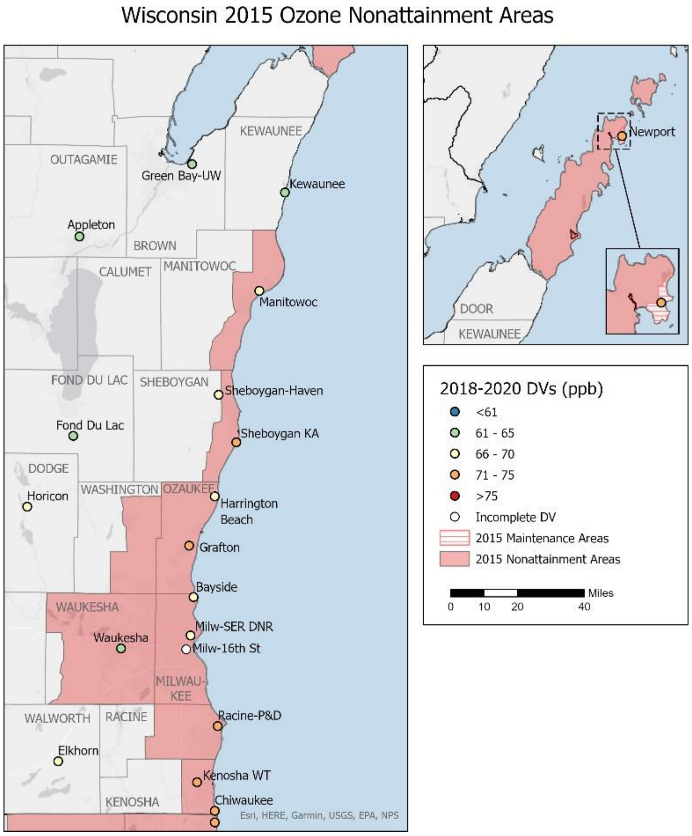

Figure A8.1. Map of the Wisconsin lakeshore 2015 ozone nonattainment areas.

CART analysis results for the Milwaukee 2015 ozone nonattainment area

Data used in the analysis:

Ozone monitors: 550790010 (Milw-16th St), 550790026 (Milw-SER DNR), 550790085 (Bayside), 550890008 (Grafton), 550890009 (Harrington Beach)

Meteorological station: Milwaukee Mitchell International Airport (MKE)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Milwaukee monitors generally have hot temperatures and southerly winds (Figure A8.2 and Table A8.1). The highest ozone node also has winds that are either weak from the west (<2.0 m/s) or from the east. Southerly transport- and temperature-related variables are the most important variables (Figure A8.4). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A8.3).

APPENDIX 8: CART analysis results for the Wisconsin lakeshore

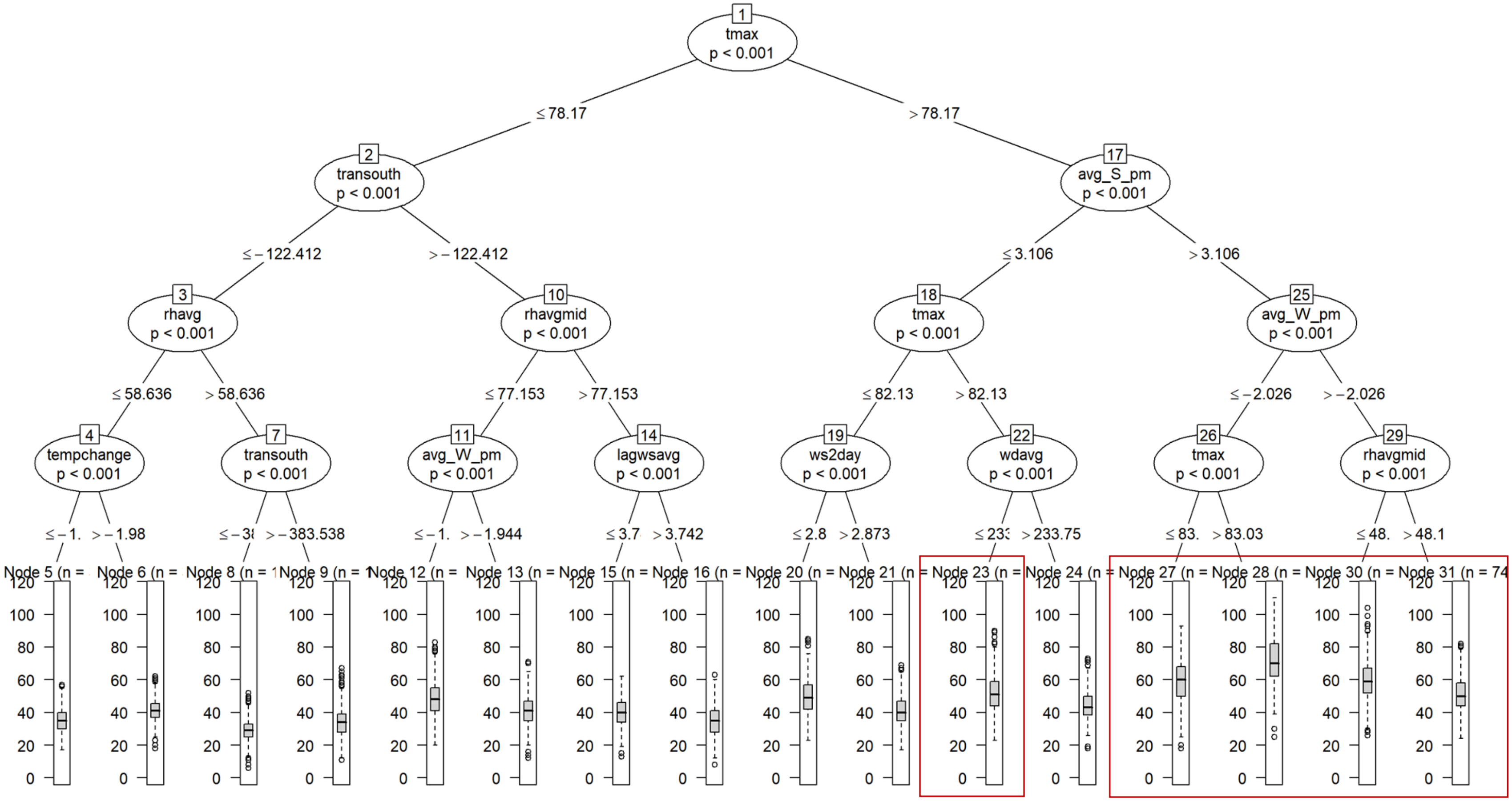

Figure A8.2. Classification and Regression Tree (CART) for the Milwaukee monitors. The boxplots[14] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[14] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

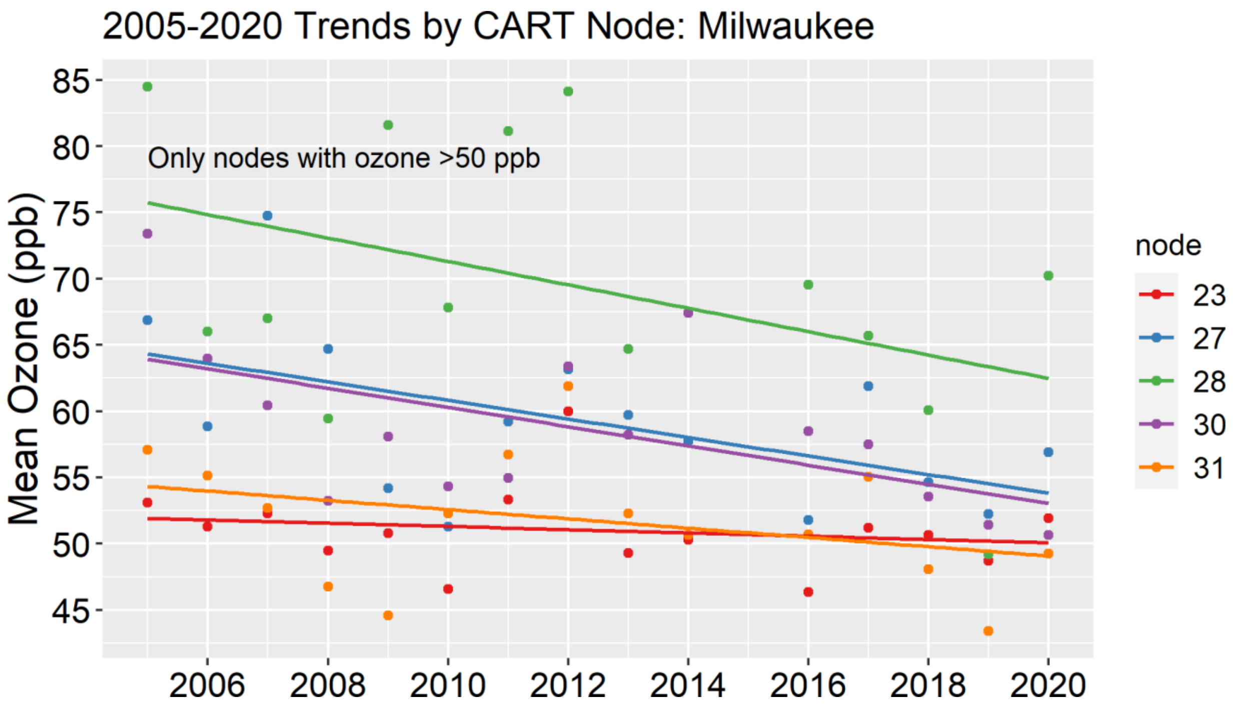

Figure A8.3. Trends in average (mean) ozone in high-ozone nodes for the Milwaukee monitors. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A8.1. Description of each high-ozone node for the Milwaukee monitors, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 28	**Node 27**	**Node 30**	**Node 31**	**Node 23**
72 ppb O_3	60 ppb O_3	59 ppb O_3	51 ppb O_3	51 ppb O_3
Maximum Temp >83 °F	Maximum Temp >78 & <83 °F	Maximum Temp >78 °F	Maximum Temp >78 °F	Maximum Temp >82 °F
PM southerly winds >3.1 m/s	PM southerly winds >3.1 m/s	PM southerly winds >3.1 m/s	PM southerly winds >3.1 m/s	PM southerly winds <3.1 m/s
PM westerly winds <2.0 m/s	PM westerly winds <2.0 m/s	PM westerly winds >2.0 m/s	PM westerly winds >2.0 m/s	Average wind direction <234° (southwesterly to easterly)
		Midday RH <48%	Midday RH >48%	

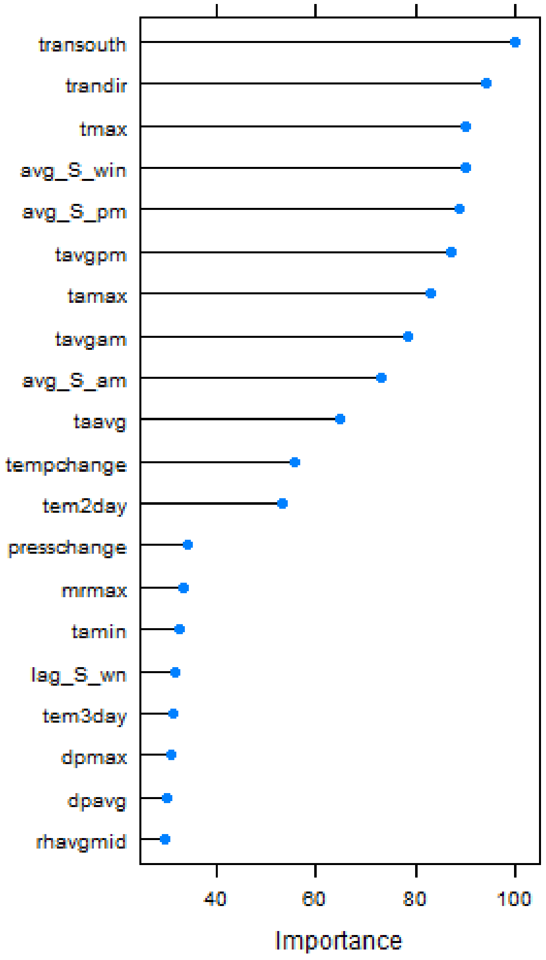

Figure A8.4. Rankings of the importance of different variables in the CART analysis for the Milwaukee monitors. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

CART analysis results for the Sheboygan County 2015 ozone nonattainment area

Data used in the analysis:

Ozone monitors: 551170006 (Sheboygan KA)

Meteorological station: Manitowoc County Airport (MTW)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Sheboygan County monitor generally have southerly winds/transport and hot temperatures (Figure A8.5 and Table A8.2). Southerly transport-related parameters are the most important variables, along with atmospheric pressure and precipitation (Figure A8.7). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A8.6).

APPENDIX 8: CART analysis results for the Wisconsin lakeshore

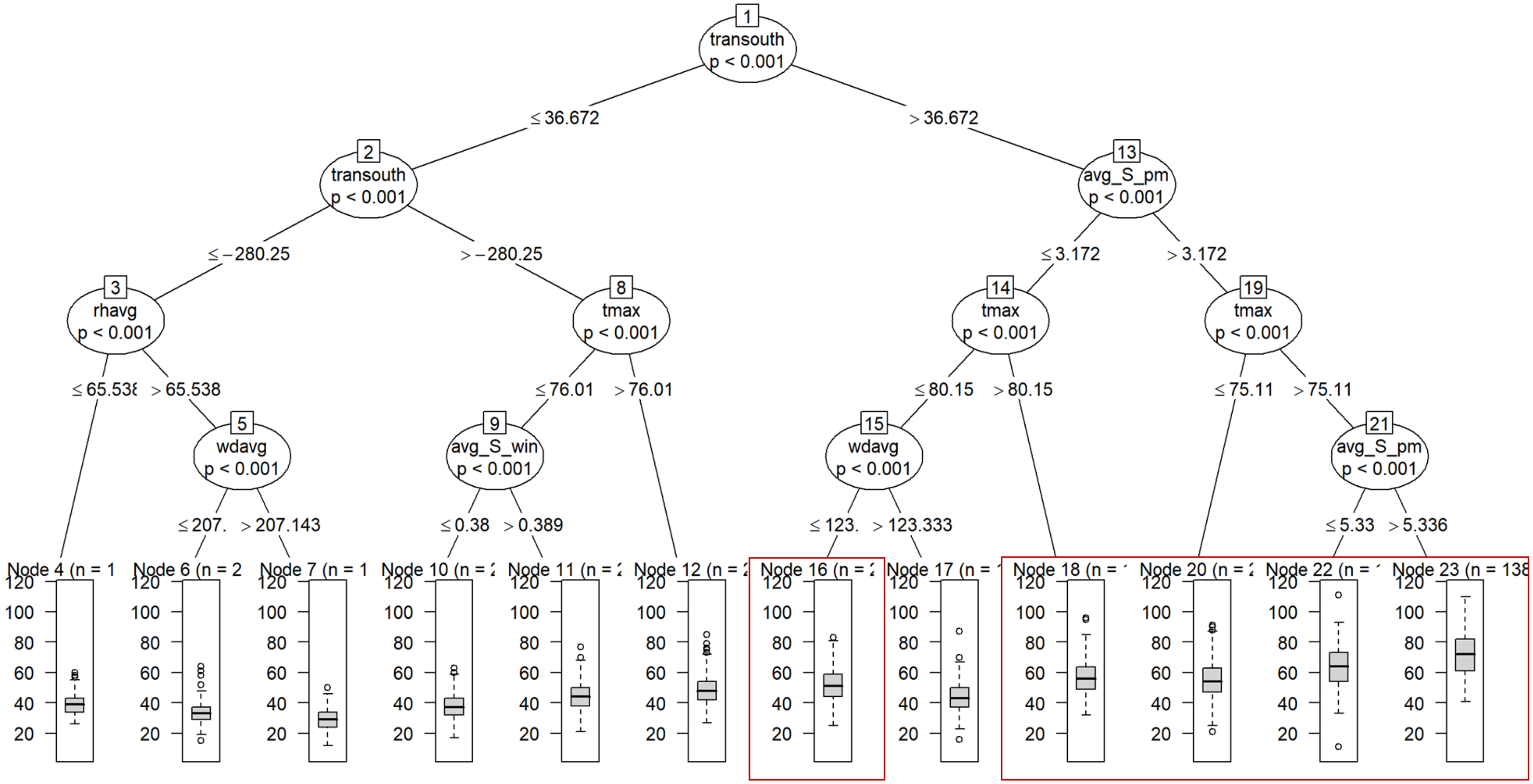

Figure A8.5. Classification and Regression Tree (CART) for the Sheboygan County monitor. The boxplots[15] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[15] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

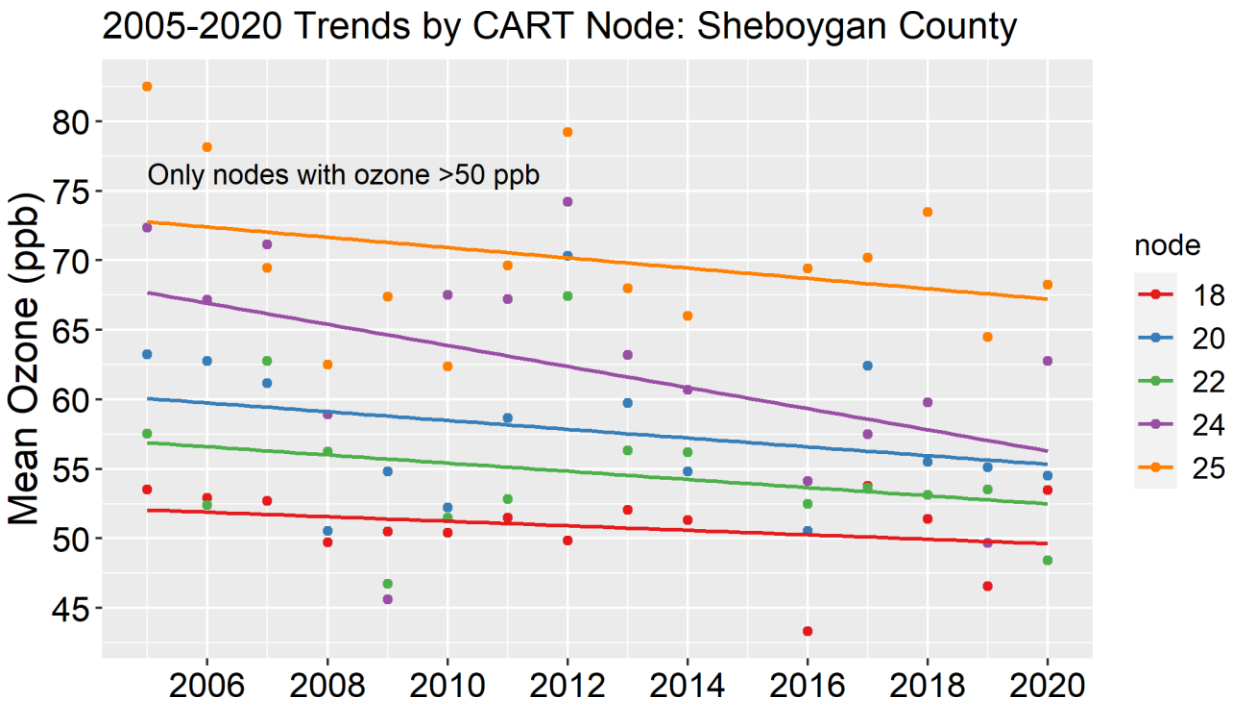

Figure A8.6. Trends in average (mean) ozone in high-ozone nodes for the Sheboygan County monitor. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A8.2. Description of each high-ozone node for the Sheboygan County monitor, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 25	**Node 24**	**Node 20**	**Node 22**	**Node 18**
72 ppb O_3	64 ppb O_3	58 ppb O_3	55 ppb O_3	51 ppb O_3
24-hr southerly transport (>37 km)	24-hr southerly transport (>37 km)	24-hr southerly transport (>37 km)	24-hr southerly transport (>37 km)	24-hr southerly transport (>37 km)
Southerly winds >3.2 m/s	Southerly winds >3.2 m/s	Southerly winds <3.2 m/s	Southerly winds >3.2 m/s	Southerly winds <3.2 m/s
Maximum Temp >75 °F	Maximum Temp >75 °F	Maximum Temp >80 °F	Maximum Temp <75 °F	Maximum Temp <80 °F
AM Temp >75 °F	AM Temp <75 °F			Wind direction from <123° (easterly)

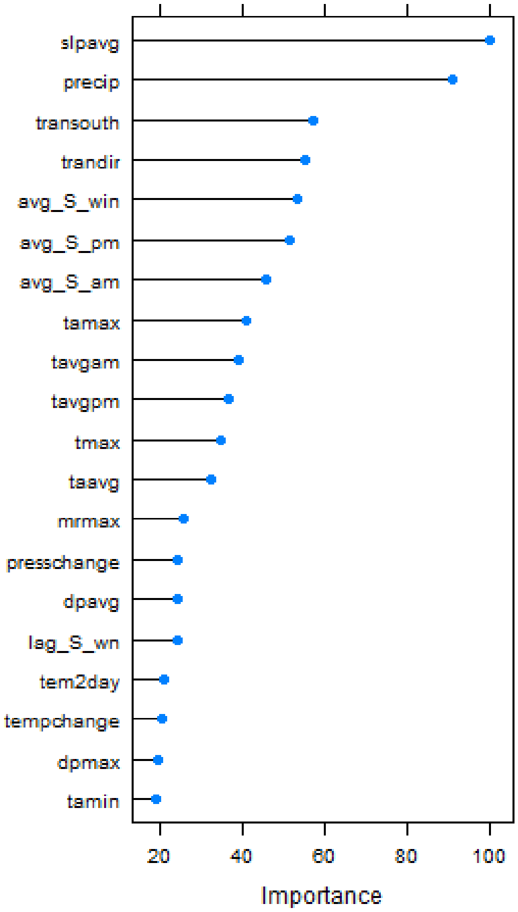

Figure A8.7. Rankings of the importance of different variables in the CART analysis for the Sheboygan County monitor. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

CART analysis results for the Manitowoc County 2015 ozone nonattainment area

Data used in the analysis:

Ozone monitors: 550710007 (Manitowoc)

Meteorological station: Manitowoc County Airport (MTW)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Manitowoc County monitor generally have southerly winds/transport and hot temperatures (Figure A8.8 and Table A8.3). Southerly transport-related parameters are the most important variables, along with atmospheric pressure and precipitation (Figure A8.10). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A8.9).

APPENDIX 8: CART analysis results for the Wisconsin lakeshore

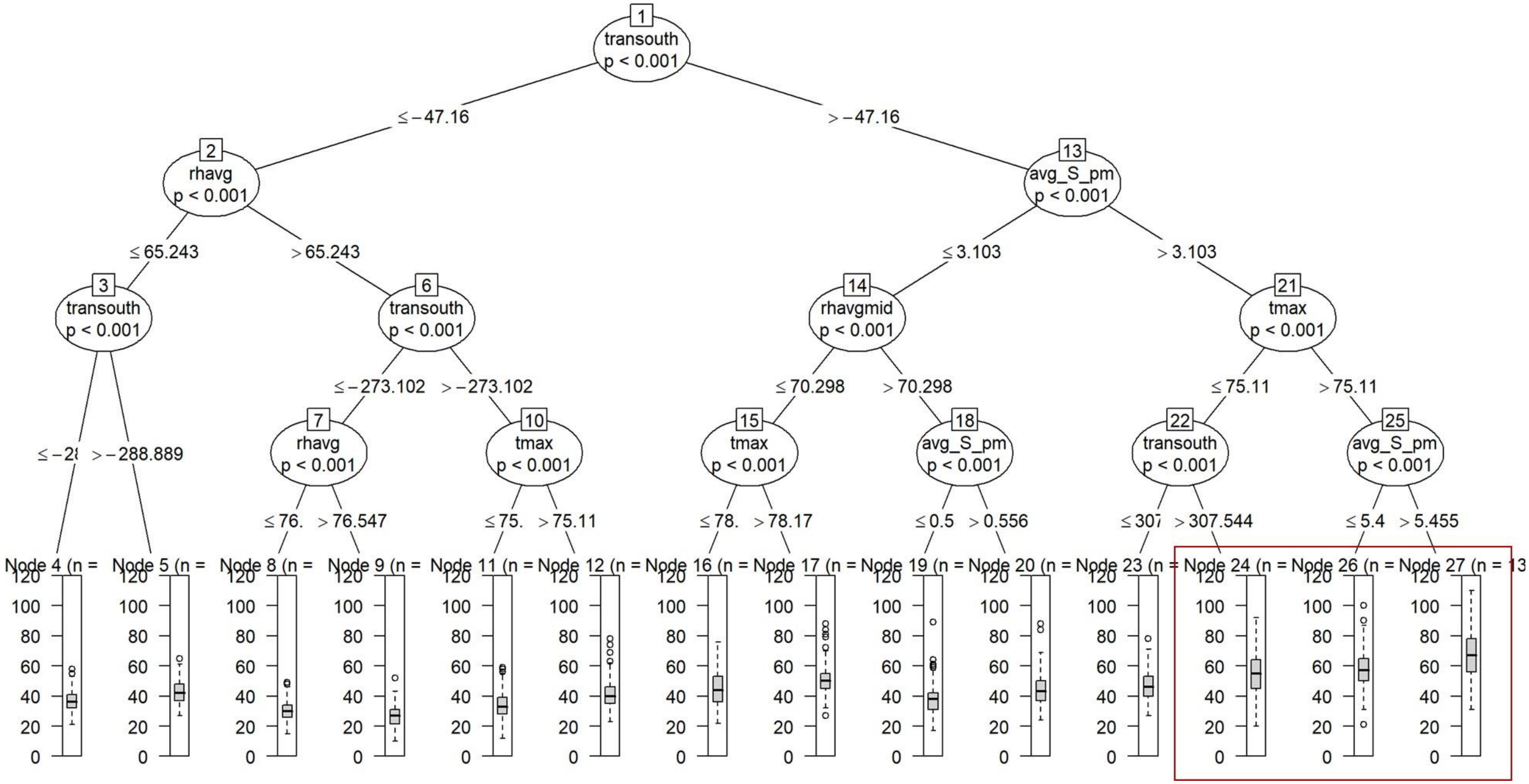

Figure A8.8. Classification and Regression Tree (CART) for the Manitowoc County monitor. The boxplots[16] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[16] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

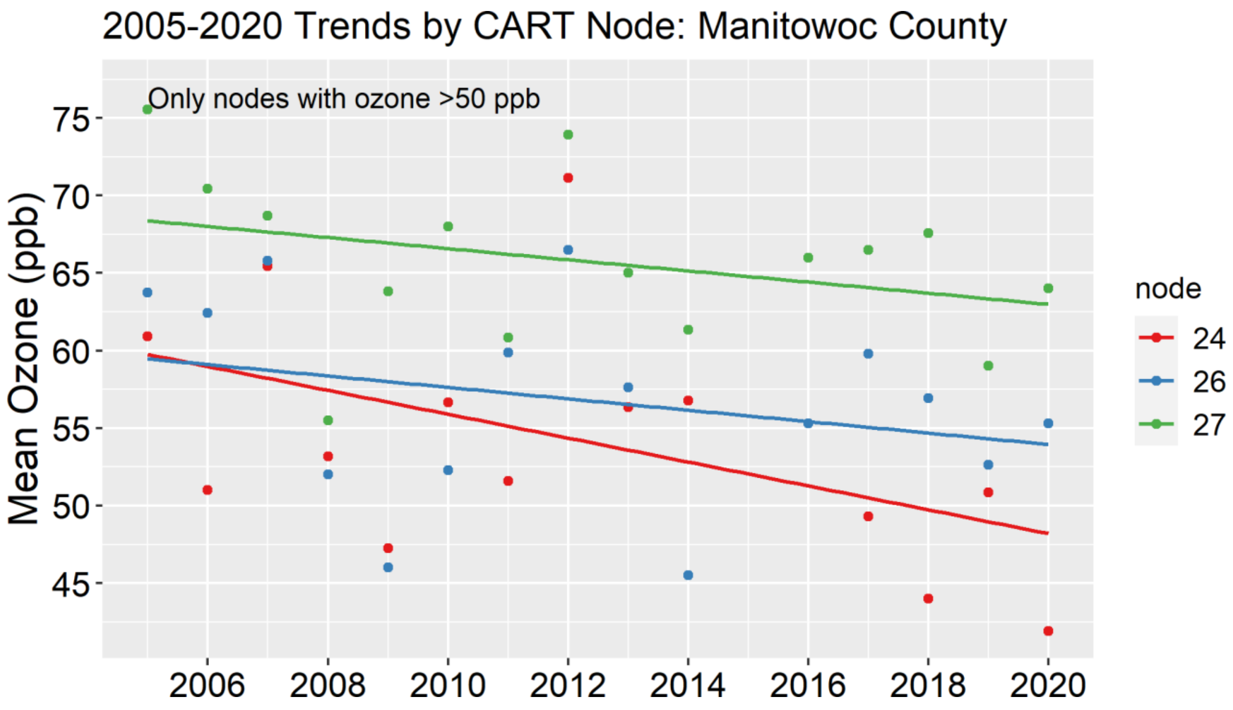

Figure A8.9. Trends in average (mean) ozone in high-ozone nodes for the Manitowoc County monitor. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A8.3. Description of each high-ozone node for the Manitowoc County monitor, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 27	**Node 26**	**Node 24**
68 ppb O_3	58 ppb O_3	55 ppb O_3
24-hr southerly transport (>-47 km)	24-hr southerly transport (>-47 km)	24-hr southerly transport (>308 km)
PM southerly winds >5.5 m/s	PM southerly winds >3.1 & <5.5 m/s	Southerly winds >3.1 m/s
Maximum Temp >75 °F	Maximum Temp >75 °F	Maximum Temp <75 °F

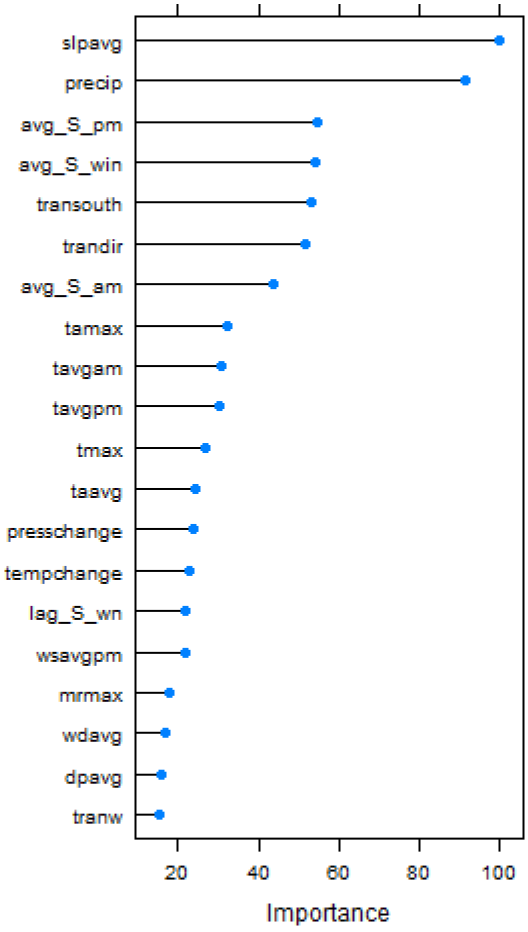

Figure A8.10. Rankings of the importance of different variables in the CART analysis for the Manitowoc County monitor. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

CART analysis results for the Door County-Revised 2015 ozone nonattainment area

Data used in the analysis:

<u>Ozone monitors</u>: 550290004 (Newport)

<u>Meteorological station</u>: Door County Cherryland Airport (SUE)

Brief description of the results:

The high-ozone nodes from the CART analysis for the Door County monitor generally have southerly winds/transport and hot temperatures (Figure A8.11 and Table A8.4). Southerly transport-related parameters are the most important variables, along with atmospheric pressure and precipitation (Figure A8.13). Mean ozone concentrations in all of the high-ozone nodes have decreased from 2005 to 2020 (Figure A8.12).

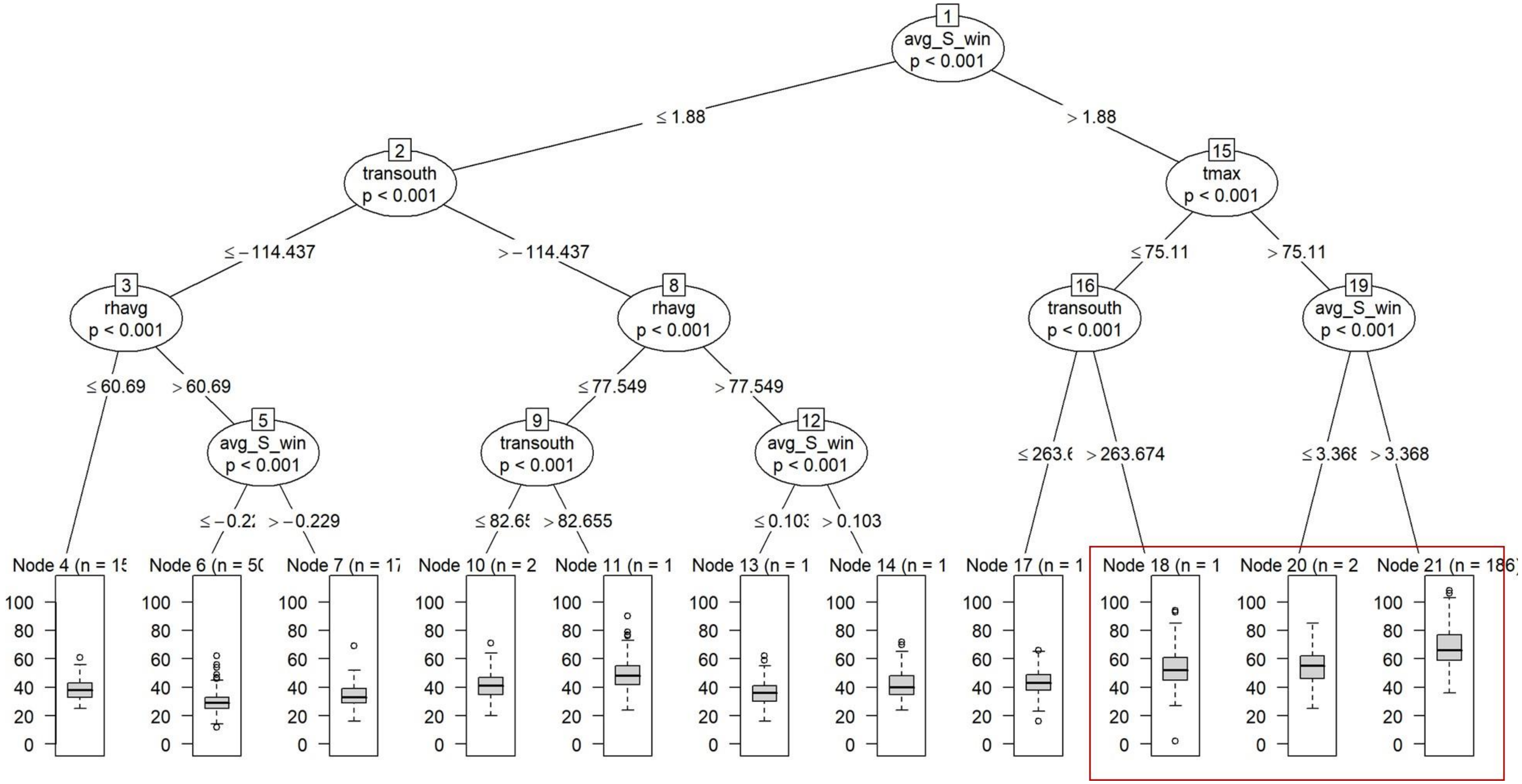

Figure A8.11. Classification and Regression Tree (CART) for the Door County monitor. The boxplots[17] at the bottom show the distribution of ozone concentrations on the different days in each node. The high-ozone nodes shown in the trends figure below (mean ozone >50 ppb) are outlined by the red boxes. See Table 1 in the main document for a description of the different variables.

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[17] The line in the middle of each box shows the median ozone concentration value, the gray box encloses the middle 50% of values, and the dashed line and circles show the whole range of values in this node.

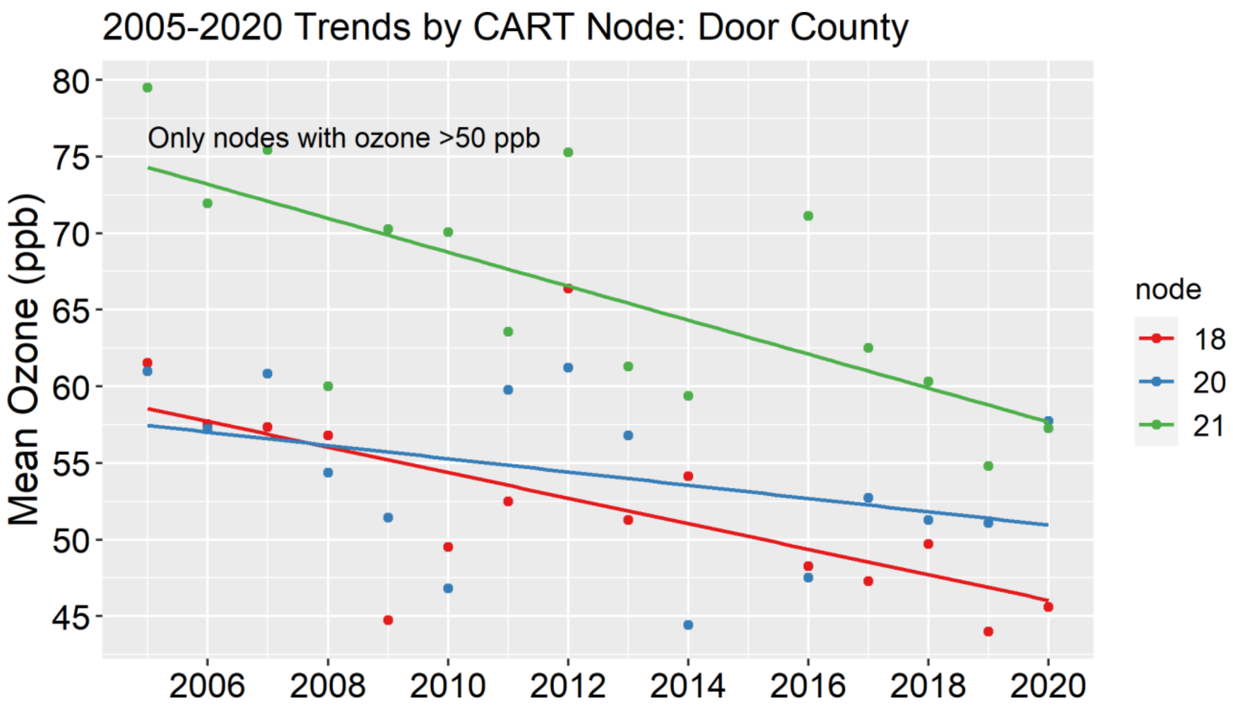

Figure A8.12. Trends in average (mean) ozone in high-ozone nodes for the Door County monitor. High-ozone nodes are those with mean ozone concentrations over 50 ppb.

Table A8.4. Description of each high-ozone node for the Door County monitor, including its average ozone concentration and the meteorological characteristics of days within the node. Nodes are color-coded to match the colors in the previous figure and are arranged from highest (left) to lowest (right) ozone concentrations.

Node 21	**Node 20**	**Node 18**
68 ppb O_3	55 ppb O_3	53 ppb O_3
Southerly winds >3.4 m/s	Southerly winds >1.9 & <3.4 m/s	Southerly winds >1.9 m/s
Maximum Temp >75 °F	Maximum Temp >75 °F	Maximum Temp <75 °F
		24-hr southerly transport >264 km

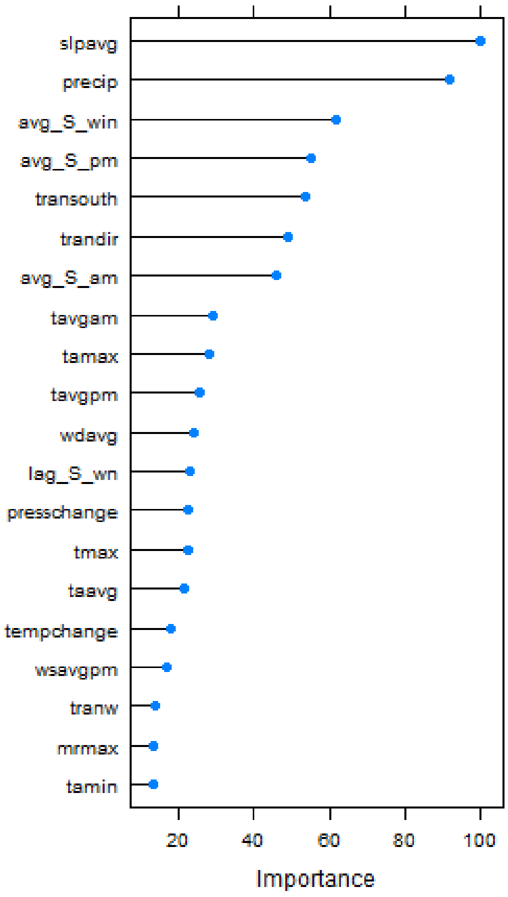

Figure A8.13. Rankings of the importance of different variables in the CART analysis for the Door County monitor. Only the top-20 most important variables are shown. See Table 1 in the main document for a description of the different variables.

Appendix 9

Temperature analysis supporting exclusion of 2015 meteorology

Temperatures at airports in the LADCO region provided by U.S. EPA for the year 2015 seem to be skewed either high or low. For example, Figure A9.1 shows that temperatures skewed high at Chicago O'Hare, with peak temperatures in the 90s (°F). No other year shown has peak temperatures in the 90s. 2015 summer temperatures were below average in the Chicago area (Figure A9.3), so this distribution seems highly unlikely. Figure A9.2 shows that temperatures skewed low at Cincinnati Municipal Airport, with peak temperatures in the mid- to low-70s. While summer temperatures in Cincinnati were 1-2 °F below average, the temperatures in 2009 and 2014 were even lower, and these years had peak temperatures in the upper 70s to low 80s. It appears likely that these temperatures were incorrect as well.

LADCO has excluded this data from the CART analyses because of the apparent issues with this data.

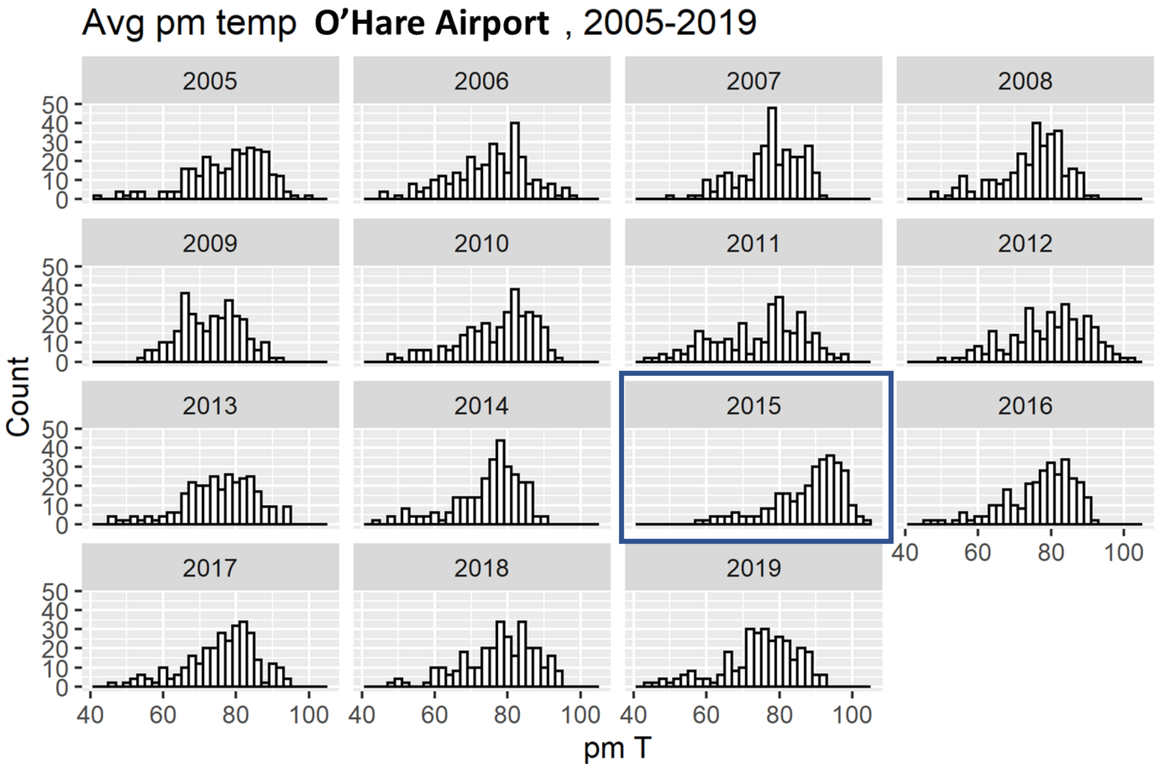

Figure A9.1. Annual afternoon temperature distributions at Chicago O'Hare International Airport, with 2015 data highlighted.

APPENDIX 9: Temperature analysis supporting exclusion of 2015 meteorology

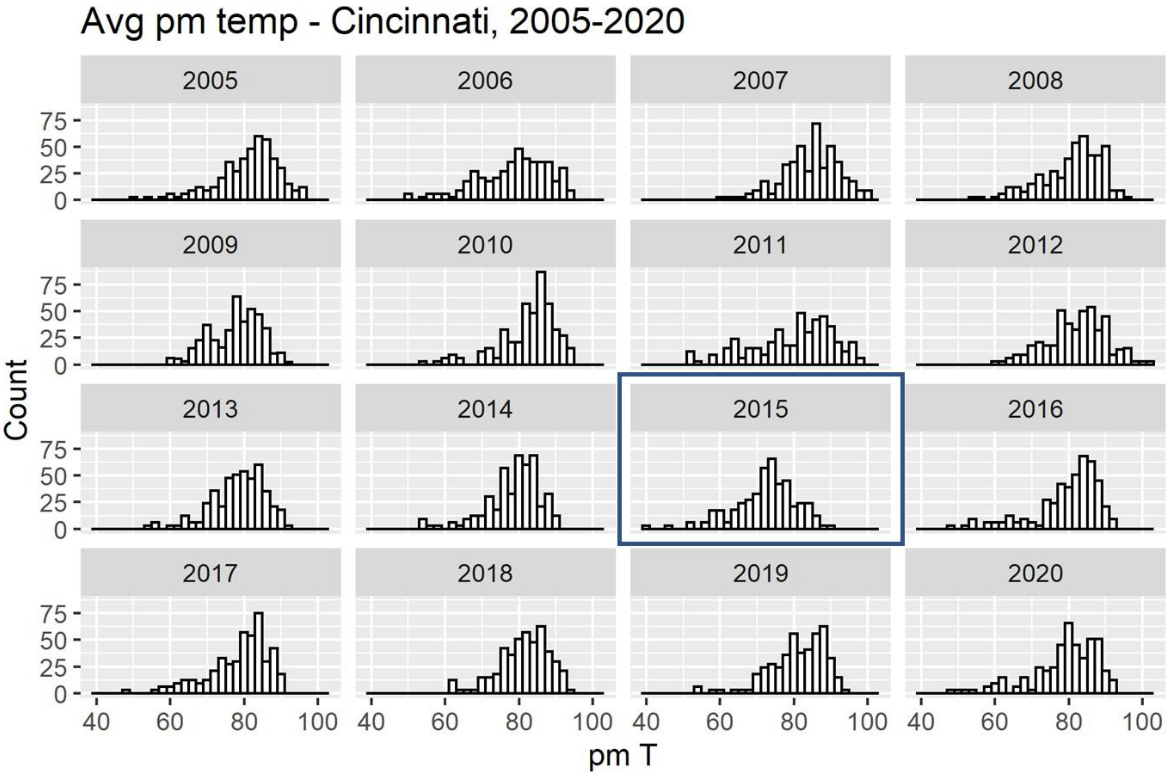

Figure A9.2. Annual afternoon temperature distributions at Cincinnati Municipal Airport-Lunken Field, with 2015 data highlighted.

APPENDIX 9: Temperature analysis supporting exclusion of 2015 meteorology

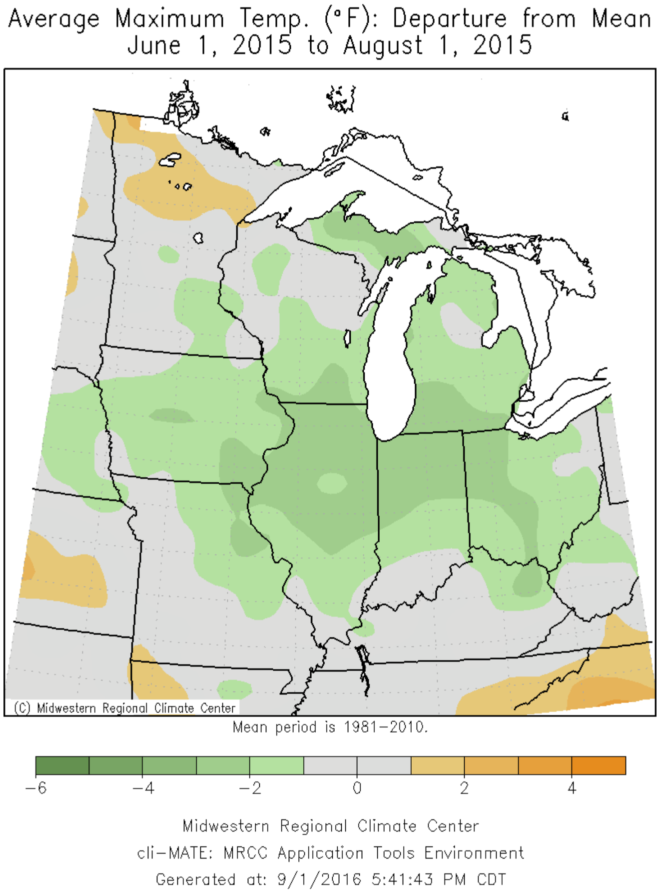

Figure A9.3. Average maximum temperature for June through August 2015, shown as the departure from the mean (in °F).

Appendix 10

Ctree_control settings used for each CART analysis

As discussed in the main document, we adjusted the values of three different parameters under *ctree_control* in the partykit package in *R*: *maxdepth, minsplit* and *minbucket*. We set *maxsurrogate* to 3 for all of the CART runs. *Maxdepth* limits the maximum depth of the tree, *minsplit* sets the minimum number of days in a node to allow it to be further split, and *minbucket* sets the minimum number of days allowed in a terminal node. Table A10.1 lists the values of these parameters for each CART analysis. Values were adjusted in part based on the number of monitors used in the analysis: analyses with more monitors generally had higher values of *minsplit* and *minbucket*.

Table A10.1. Values of *ctree_control* parameters used in different CART analyses.

CART analysis	*maxdepth*	*minsplit*	*minbucket*
Chicago: Kenosha-Lake	4	300	150
Chicago: Cook	6	2500	700
Chicago: Lake-Porter	4	800	400
Cincinnati	4	700	350
Cleveland	5	1000	350
Detroit	4	800	400
Louisville	4	500	250
St. Louis	6	1400	700
West MI: Combined	4	400	200
West MI: Muskegon	4	240	120
West MI: Allegan	4	300	150
West MI: Berrien	4	260	130
WI: Milwaukee	6	600	300
WI: Sheboygan	6	260	130
WI: Manitowoc	4	260	130
WI: Door-Revised	4	300	150

OKI Data

Year	Vehicle Emission - OKI 2015 Ozone - Full County (Tons, summer weekday daily)					
	Ohio/Indiana		Northern Kentucky		OKI	
	NOx	VOC	NOx	VOC	NOx	VOC
2014	66.7486534	28.9942961	17.3421908	4.6508022	84.0908442	33.6450983
2019	37.2392229	18.2294607	13.6697275	4.1184143	50.9089504	22.347875
2026	23.245068	13.3415766	6.6829136	2.8465877	29.9279816	16.1881643
2035	17.6365937	10.046729	4.6731729	2.1721425	22.3097666	12.2188715

Year	OKI Plan2050 Emissions - Partial County (summer weekday daily)					
	Ohio/Indiana		Northern Kentucky		OKI	
	NOx	VOC	NOx	VOC	NOx	VOC
2014	64.32991203	28.19482966	15.62913759	4.185980843	79.95904962	32.38081051
2019	35.87580305	17.73247255	12.3063361	3.705811828	48.18213915	21.43828438
2026	22.40659536	12.97989788	6.021755262	2.562884219	28.42835062	15.5427821
2035	16.99442827	9.771487323	4.213190834	1.956754332	21.2076191	11.72824166

Ohio/Inidana -Full County (Tone, summer weekday daily)

NOx	VOC
66.7486534	28.9942961
37.2392229	18.2294607
23.245068	13.3415766
17.6365937	10.046729

Ohio/Inidana - Partial County (summer weekday daily)

NOx	VOC
64.32991203	28.19482966
35.87580305	17.73247255
22.40659536	12.97989788
16.99442827	9.771487323

Northern Kentucky -Full County (Tone, summer weekday daily)

NOx	*VOC*
17.3421908	4.6508022
13.6697275	4.1184143
6.6829136	2.8465877
4.6731729	2.1721425

Northern Kentucky - Partial County (summer weekday daily)

NOx	*VOC*
15.62913759	4.185980843
12.3063361	3.705811828
6.021755262	2.562884219
4.213190834	1.956754332

Year	Vehicle Emission - OKI 2015 Ozone - Full County (summer weekday daily																	
	Dearborn		Hamilton		Butler		Clermont		Warren		Boone		Campbell		Kenton		OKI Total	
	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC
2014	3.1856	1.0529	32.966	14.186	12.543	6.3262	7.0009	3.5989	11.054	3.8303	7.8804	1.7677	2.8252	0.9953	6.6365	1.8878	84.091	33.645
2019	1.7957	0.6546	18.248	8.7191	7.0867	4.0471	3.844	2.3279	6.265	2.4808	5.1433	1.4747	2.4569	0.8841	6.0695	1.7596	50.909	22.348
2026	1.1043	0.4764	11.424	6.2949	4.4238	2.9774	2.302	1.6985	3.9915	1.8945	2.9157	1.1328	1.0509	0.5742	2.7162	1.1396	29.928	16.188
2035	0.8458	0.3625	8.7273	4.7141	3.3757	2.2434	1.6365	1.251	3.0513	1.4756	2.1971	0.9423	0.6445	0.4018	1.8315	0.828	22.31	12.219

Year	Vehicle Emission - OKI 2015 Ozone - Partial County (summer weekday daily)																	
	Dearborn		Hamilton		Butler		Clermont		Warren		Boone		Campbell		Kenton		OKI Total	
	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC
2014	0.7669	0.2535	32.966	14.186	12.543	6.3262	7.0009	3.5989	11.054	3.8303	7.1573	1.6055	2.5153	0.8861	5.9565	1.6943	79.959	32.381
2019	0.4323	0.1576	18.248	8.7191	7.0867	4.0471	3.844	2.3279	6.265	2.4808	4.6713	1.3394	2.1874	0.7871	5.4476	1.5793	48.182	21.438
2026	0.2658	0.1147	11.424	6.2949	4.4238	2.9774	2.302	1.6985	3.9915	1.8945	2.6482	1.0288	0.9357	0.5112	2.4379	1.0228	28.428	15.543
2035	0.2036	0.0873	8.7273	4.7141	3.3757	2.2434	1.6365	1.251	3.0513	1.4756	1.9955	0.8559	0.5738	0.3577	1.6438	0.7432	21.208	11.728

Ohio/Indiana - Full County

NOx	VOC
66.7486534	28.9942961
37.2392229	18.2294607
23.245068	13.3415766
17.6365937	10.046729

Ohio/Indiana - Partial County

NOx	VOC
64.32991203	28.19482966
35.87580305	17.73247255
22.40659536	12.97989788
16.99442827	9.771487323

Northern Kentucky - Full County

NOx	VOC
17.3421908	4.6508022
13.6697275	4.1184143
6.6829136	2.8465877
4.6731729	2.1721425

Northern Kentucky - Partial County

NOx	VOC
15.62913759	4.185980843
12.3063361	3.705811828
6.021755262	2.562884219
4.213190834	1.956754332

Table A1 Non-Exempt Projects in Transportation Improvement Plan

PID	State	County	Facility	Location
6-439	KY	Boone	Ted Bushelman Blvd	Ted Bushelman Blvd
6-78.00	KY	Boone	I-275	At Graves Rd
6-80150	KY	Boone	KY 717	KY 1017 to KY 236
6-8105.00	KY	Campbell	I-275/AA Connector	Between I-275 and the AA Highway (KY 9)
6-352	KY	Campbell	KY 536	US 27 to AA Highway (KY 9)
6-162.10	KY	Kenton	KY 1303	KY 536 to Beechgrove Elementary
6-162.20	KY	Kenton	KY 536	Boone County Line to KY 1303
6-162.3	KY	Kenton	KY 536	KY 1303 to Williamswood Rd/Calvary Dr
6-162.4	KY	Kenton	KY 536	Williamswood Rd/Calvary Dr to KY 17
104195	OH	Butler	BUT SR 129 25.00 Liberty Way	SR-129 interchange with Liberty Way and IR-75; Cox Road north of Liberty Way
NP-CMAQ3	OH	Clermont	US 52	within Village of New Richmond
103953	OH	Clermont	CLE CR 388 (Bach Buxton)	Bach Buxton Rd to Marina Dr
103954	OH	Clermont	CLE 32-3.50	Near intersection with Bach Buxton Rd
103955	OH	Clermont	CLE CR 171 (Old SR74)	Old SR 74 Schoolhouse to SR 32
103957	OH	Clermont	CLE 32-2.33	Glen Este Withamsville ramps and CD Road
103958	OH	Clermont	CLE CR 55 Overpass	Glen Este Withamsville Overpass over SR32

103959	OH	Clermont	CLE 32-2.88	EB SR 32 ramp to Clepper Ln
76256	OH	Hamilton	IR 75	Glendale Milford Road to IR 275
77889	OH	Hamilton	IR 75	Begin south of SR 562 interchange and at the SR 126 interchange, 7.85 to 10.30
88124	OH	Hamilton	IR 75	1010 Bridge over Mill creek to Galbraith Road (phase 3)
88132	OH	Hamilton	IR 75	Between Galbraith Rd and Shepherd Ln, SB only
88133	OH	Hamilton	IR 75	Between Galbraith Rd and Shepherd Ln, NB only
82288	OH	Hamilton	IR 75	0.3 mi S of Shepherd Ln to 0.2 mi N of Glendale-Milford Rd
104668	OH	Hamilton	IR 74	West of Colerain interchange with I-74 to I-75
104844	OH	Warren	IR 71	Mason Montgomery Rd to SB I-71
112909	OH	Warren	SR 48	Nunner Rd to north of Ridgeview Ln/Saddle Creek Ln
112121	OH	Warren	WAR SR63	Between Union Rd and east of the SR 741 intersection
NP-STBG8	OH	Warren	SR 741	Between Cox-Smith Road and Spy Glass Hill Road
103753	OH	Warren	SR 741	from Spy Glass Hill (SLM 2.19) to Weldon Drive (SLM 3.06)

Table A2 Non-exempt Projects in 2050 Metropolitan Transportation Plan (Projects before 2040)

PID	State	County	Facility	Location
9749	IN	Dearborn	SR 1	Ridge Ave to Oberting Rd
9750	IN	Dearborn	SR 1	US 50 to Ridge Ave
9574	KY	Boone	KY 842 (Richardson Rd)	US 25 (Dixie Hwy) to Boone County Line
9577	KY	Boone	KY 18 (Burlington Pike)	Springfield Boulevard to KY 338 (Jefferson Street)
9867	KY	Boone	Mall Rd Connector	KY 237 (Pleasant Valley Rd) to Mall Rd/IR 75 Interchange
9871	KY	Boone	KY 18	KY 842 and Mall Rd intersections
9874	KY	Boone	KY 236	KY 842 (Houston Rd) to KY 3076 (Mineola Pike)
9908	KY	Boone	KY 3076	KY 236 to IR 275
9826	KY	Kenton	KY 1303	IR 275 EB ramp to Thomas More Blvd
9829	KY	Kenton	KY 536	East end of the NS RR bridge to KY 1303
9863	KY	Kenton	IR 71/75 (Brent Spence Bridge)	US 25 to Brent Spence Bridge
9899	KY	Kenton	KY 536	KY 16 (Taylor Mill Rd) to KY 177 (Decoursey Pike)
9910	KY	Kenton	KY 8	Bridge over Licking River
9601	OH	Butler	Cincinnati Dayton Rd	Liberty One Dr to Bethany Rd
9635	OH	Butler	North Hamilton Crossing Phase 1	NW Washington Blvd to US 127
9636	OH	Butler	North Hamilton Crossing Phase 2	US 127 to SR 4
9643	OH	Butler	S. Gilmore Rd	Resor Rd to Mack Rd
9648	OH	Butler	SR 4	Muhlhauser to Crescentville

9666	OH	Butler	Wayne Madison Rd	Great Miam River to SR 73
9965	OH	Butler	IR 75	New interchange at Millikin Rd
9737	OH	Clermont	SR 32	Glen Este-Withamsville Rd overpass
9738	OH	Clermont	SR 32	Glen Este-Withamsville Rd ramps
9712	OH	Hamilton	Red Bank Rd	Erie Ave to Duck Creek Rd
9784	OH	Hamilton	IR 275 WB	Winton Rd to Colerain Ave
9787	OH	Hamilton	Fields Ertel Rd	Snider to I-71
9930	OH	Hamilton	SR 32	Round Bottom Rd to Little Dry Run
9953	OH	Hamilton	IR 71	SR 126 to Pfeiffer
9968	OH	Hamilton	I-71/75 (Brent Spence Bridge)	Ohio River to Western Hills Viaduct
9974	OH	Hamilton	IR 75 SB	Shepherd Rd to Galbraith Rd
9975	OH	Hamilton	IR 75 NB	Galbraith Rd to Shepherd Rd
10001	OH	Hamilton	SORTA Bus Rapid Transit Phase I	Glenway Ave and Reading Rd
10001	OH	Hamilton	SORTA Bus Rapid Transit Phase II	Montgomery Rd and Hamilton Ave
9946	OH	Warren	US 22/3	Old Mill Rd to SR 48
9961	OH	Warren	SR 48	Mason-Morrow-Millgrove Rd to Stephens Rd
9962	OH	Warren	SR-63	Union Rd to SR 741
10030	OH	Warren	US 22/3	SR 48 to West Rd
10031	OH	Warren	US 22/3	West Rd to Zoar Rd
10037	OH	Warren	SR 63	SR 741 to Neil Armstrong Way
10042	OH	Warren	SR 741	I-71 to Center Dr
10051	OH	Warren	Kings Mills Rd	I-71 to Oak St
10056	OH	Warren	Mason-Morrow-Millgrove Rd	US 42 to Columbia Rd/Mason-Morrow-Milgrove Rd
10058	OH	Warren	Snider Rd	Western Row to US 42
10060	OH	Warren	Kings Island Dr	Great Wolf Dr to Kingsview Dr
10062	OH	Warren	Gateway Blvd	Gateway Blvd to Butler-Warren Rd and Cox Extension

Description
Widen to 4 lanes with two-way left turn lane (TWLTL)
New interchange at IR 275 and Graves Rd
Widen from 2 to 4 lanes
New road connecting the AA highway to the Northern Kentucky University
Extension of existing roadway
Reconstruct and widen to 4 lanes with TWLTL
Widen to 4-lane divided roadway
Widen to 2 lanes each direction
Widen to 2 lanes each direction
Reconfigure the interchange of SR 129 with Liberty Way and IR 75. Extend SR 129 east to tie into Cox Rd, north of Liberty Way. Reconfigure existing ramps connections
Convert 4 lanes of US 52 into 2 lanes and provide bike/ped path at former SB lanes. Convert intersections at Front, Sycamore, Walnut and Augusta Streets into roundabouts
Reconstruct Bach Buxton Rd to align with proposed SR 32 interchange
New interchange at SR 32 and Bach Buxton Rd
Old SR 74 improvements to allow the proposed interchange at Bach Buxton
CD Road and partial ramps at Glen Este Withamsville Rd
Glen Este Withamsville Overpass over SR 32
New ramp from EB SR 32 to Clepper Ln

Phase 8 of Thru the Valley Project--Add 4th lane each direction with an auxiliary
lane where warranted, upgrade interchanges
Phase 8 of the Mill Creek Expressway Project. Project will widen for additional through lanes, rehabilitate existing pavement and bridges. Reconstruct SR 562 interchange, remove the Towne Ave. interchange
Phase 3 of the Thru the Valley Project--add 4th lane in each direction and associated improvements
Phase 5 of the Thru the Valley Project-add 4th lane (includes part of Phase 7)
Phase 6 of the Thru the Valley Project--add 4th lane and auxiliary lane (includes part of Phase 7)
Phase 1 of Thru the Valley Project-reconstruct IR 75 between Shepherd Ln and Glendale-Milford Rd

Description
Widen SR 1 bridge from the Bellview Rd & SR 1 intersection. Add a multi-use trail on the east side of the bridge
Realign and add one lane each direction
Widen to 2 lanes each direction; include multi-use path
Widen to 2 lanes each direction with multi-use path to improve safety
New route/extension to provide East-West Connectivity and improve mobility
Add 1 lane each direction with grade separated interchanges
Widen to 2 lanes each direction
Widen to 2 lanes each direction with TWLTL
Realign Town Center Blvd and Thomas More Pkwy into single intersection. Add 1 lane SB from IR 275 EB ramp to Town Center Blvd
Reconstruct and widen to 4-lane divided highway
Highway widening of 5 lanes SB and 4 lanes NB
Widen to 2 lanes each direction
Reconstruct and widen to 4 lanes; Include multi-use path
Widen to 2 lanes each direction with TWLTL
New route/extension
New route/extension
Add 1 lane SB (2 lanes each direction)
Widen to 3 lanes SB
Widen to 2 lanes each direction with TWLTL
New interchange & widening of Milliken Rd from Cin-Day to Butler-Warren Rd to 4 lanes

New overpass carrying Glen Este-Withamsville Rd over SR32
Ramps to new Glen Este-Withamsville overpass
Red Bank widening (3 lanes each direction) and local street improvements
Add 1 lane
Widen to 2 lanes each direction with TWLTL
Widen to 2 EB through lanes from Round Bottom Rd to Little Dry Run and add a TWLTL to the eastern corp. of the Village of Newtown
Add NB auxiliary lane
Bridge replacement and highway improvements
TTV Phase 5 (PID 88132) Reconstruct SB IR 75 from Shepherd to Galbraith, adding a 4th lane. Construct a collector-distributor road to provide ramps to and from Anthony Wayne and Galbraith
TTV Phase 6. Reconstruct NB IR 75 from Galbraith Rd to Shepherd Ln adding a 4th lane. Construct a ramp from WB SR 126 to NB IR 75
Two BRT routes on Glenway Ave and Reading Rd
Two BRT routes on Montgomery Rd and Hamilton Ave
Widen to 2 lanes each direction with TWLTL
Widen to 2 lanes each direction with TWLTL
Widen to 2 lanes each direction
Widen to 2 lanes each direction
Widen to 2 lanes each direction
Widen to 2 lanes each direction with TWLTL
Widen to 3 lanes each direction
Widen to 2 lanes each direction with TWLTL
Widen to 2 lanes each direction
Widen to 2 lanes each direction with TWLTL
Widen to 3 lanes NB between Great Wolf Dr to Kings Mill. Widen to 2 lanes SB from Kings Mill to Kingsview Dr
New extension with 2 lanes each direction and TWLTL

Annual VMT

County	2014	2019	2026	2035
DEARBORN	580,440,972	615,610,103	657,046,622	719,408,813
HAMILTON	7,833,883,110	7,936,255,794	8,147,216,972	8,400,837,262
BOONE	1,525,066,182	1,609,051,010	1,794,998,911	2,010,590,169
CAMPBELL	760,268,147	807,493,599	835,063,113	875,055,261
KENTON	1,494,304,776	1,570,255,662	1,694,607,874	1,810,534,193
BUTLER	2,719,846,725	2,822,981,034	2,945,710,626	3,102,625,065
CLERMONT	1,665,056,622	1,715,749,139	1,788,353,660	1,873,717,541
WARREN	2,341,612,709	2,448,645,853	2,586,598,319	2,742,836,148

Daily VMT

County	2014	2019	2026	2035
DEARBORN	1,590,249	1,686,603	1,800,128	1,970,983
HAMILTON	21,462,693	21,743,167	22,321,142	23,015,992
BOONE	4,178,264	4,408,359	4,917,805	5,508,466
CAMPBELL	2,082,926	2,212,311	2,287,844	2,397,412
KENTON	4,093,986	4,302,070	4,642,761	4,960,368
BUTLER	7,451,635	7,734,195	8,070,440	8,500,343
CLERMONT	4,561,799	4,700,683	4,899,599	5,133,473
WARREN	6,415,377	6,708,619	7,086,571	7,514,620
	51,836,929	53,496,006	56,026,291	59,001,656

Partial County VMT - Year

County	2014	2019	2026	2035
BOONE	1,385,126,109	1,461,404,489	1,630,289,811	1,826,098,415
CAMPBELL	676,874,334	718,919,626	743,465,040	779,070,449
KENTON	1,341,183,366	1,409,351,564	1,520,961,405	1,625,008,754

Partial County VMT - Daily

County	2014	2019	2026	2035
BOONE	3,794,866	4,003,848	4,466,547	5,003,009
CAMPBELL	1,854,450	1,969,643	2,036,891	2,134,440
KENTON	3,674,475	3,861,237	4,167,018	4,452,079

APPENDIX D

Public Notice
and
Statement of
Consideration

KENTUCKY DIVISION FOR AIR QUALITY
PUBLIC NOTICE FOR
REQUEST TO REDESIGNATE THE KENTUCKY COUNTIES LOCATED WITHIN THE CINCINNATI, OH-KY 2015 8-HOUR OZONE NONATTAINMENT AREA

The Kentucky Energy and Environment Cabinet (Cabinet) is proposing a redesignation request for the Kentucky counties located in the Cincinnati, OH-KY 2015 8-hour O_3 Nonattainment Area. On August 3, 2018, the United States Environmental Protection Agency (EPA) designated the Kentucky counties of Boone (partial), Campbell (partial), and Kenton (partial), and the Ohio counties of Butler, Clermont, Hamilton, and Warren as marginal nonattainment for the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS). The draft SIP revision proposes that the Cincinnati, OH-KY 2015 8-hour ozone nonattainment area be redesignated to attainment, due to improved air quality and attainment and maintenance of the ozone NAAQS.

In accordance with 40 CFR 51.102, the Cabinet is making this proposed plan available for public inspection and provides the opportunity for public comment. The proposed plan can be found at https://eec.ky.gov/Environmental-Protection/Air/Pages/Public-Notices.aspx**.** The publiccomment period will be open from June 13, 2022 through July 19, 2022. Comments should be submitted in writing to the contact person by either mail or email.

The Kentucky Energy and Environment Cabinet will conduct a virtual public hearing on July 19, 2022, at 10:00 a.m. (Eastern Time). This hearing will be held to receive comments on the proposed redesignation request. This hearing is open to the public and all interested persons will be given the opportunity to present testimony. To assure that all comments are accurately recorded, the Division requests that oral comments presented at the hearing are also provided in written form, if possible. It is not necessary that the hearing be held or attended in order for persons to comment on the proposed administrative regulation. If no request for a public hearing is received by July 12, 2022, the hearing will be cancelled, and notice of the cancellation will be posted at https://eec.ky.gov/Environmental-Protection/Air/Pages/Public-Notices.aspx. Written comments should be sent to the contact person and must be received by July 19, 2022, to be considered part of the public record.

Please note that registration is required to participate in this hearing. You must either email your name and mailing address to ashlee.smither@ky.gov or mail this information to Ashlee Smither, Division for Air Quality, 300 Sower Building, 2nd Floor, Frankfort, KY 40601. Please put “Registration for Cincinnati, OH-KY Redesignation Request Public Hearing” as the subject line, and state in the body of the message if you plan to speak during the hearing.

CONTACT PERSON: Ashlee Smither, Environmental Scientist III, Evaluation Section, Division for Air Quality, 300 Sower Boulevard, Frankfort, Kentucky 40601. Phone: (502) 782-4716; Email: ashlee.smither@ky.gov.

The Energy and Environment Cabinet does not discriminate on the basis of race, color, national origin, sex, age, religion or disability and provides, upon request, reasonable accommodation including auxiliary aids and services necessary to afford an individual with a disability an equal opportunity to participate in all services, programs and activities.

STATEMENT OF CONSIDERATION
Relating to Proposed SIP To Redesignate the Kentucky portion of the Cincinnati, OH-KY nonattainment area

Energy and Environment Cabinet
Kentucky Department for Environmental Protection
Division for Air Quality

From June 13, 2022, until July 19, 2022, the Cabinet provided an opportunity for comments on the proposed State Implementation Plan (SIP) submittal requesting that the Kentucky portion of the Cincinnati, OH-KY nonattainment area be redesignated to attainment for the 2015 8- hour Ozone National Ambient Air Quality Standards (NAAQS). The public notice announcing the public comment period included an opportunity to request a public hearing. No request for a public hearing was received; therefore, the scheduled public hearing was cancelled.

During the public comment period, the only comments received were from the U.S. Environmental Protection Agency (U.S. EPA). The comments and responses are listed below.

Response to Comments for the proposed SIP submittal requesting Boone, Campbell, and Kenton Counties, KY be redesignated to attainment for the 2015 8-hour Ozone NAAQS.

1. Comment: Page 11, Section C – This section must identify the permanent and enforceable measures responsible for the improvement in air quality. Currently, the only section of the submittal that lists federal and state measures addresses Clean Air Act (CAA) section 172(c)(6). Furthermore, to the extent that Kentucky is relying on state rules to support its section 107(d)(3)(E)(iii) demonstration, it needs to show that these measures are in the state implementation plan (SIP).
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. Additional documentation of permanent and enforceable measures, as well as language regarding their inclusion in the state SIP, is now included throughout section C within Kentucky's submittal. Please see Pages 18-25.

2. Comment: Please include an explanation of how the tons per summer day (TSD) were calculated in Tables 21-36 and why only the average July emissions were used to calculate the TSD from the 2016v2 modeling platform and not the entire summer season. Also, please include both Kentucky and Ohio counties in Tables 35 and 36.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. A statement has been added to Kentucky's narrative to explain why the July emissions were used to calculate the TSD, as well as how TSD was calculated. Please see Page 29.

3. Comment: Please double-check how TSD of on-road nitrogen oxide and volatile organic compound emissions were calculated, revise if necessary, and then provide an explanation as to how they were calculated. The estimates provided in the submittal appear consistently lower than the emissions calculated by MOVES.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. MOVES was rerun by the Ohio Kentucky Indiana Regional Council of Governments (OKI), which resulted in slightly higher emission estimates of on-road NO_x and VOC emissions. The previous emission estimates contained in Tables 37, 38 and 39 have been replaced with the revised emission estimates.

4. Comment: Looking into the Vehicle Miles Traveled (VMT) per vehicle of certain vehicle types in the MOVES runs, it appears that the same VMT per vehicle was assumed for Highway Performance Monitoring System (HPMS) vehicle types 10, 25, and 40 despite the expectation that each of these vehicle types would have very different VMT per year per vehicle type. Please explain why this assumption was made.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. OKI's travel demand model does not model motorcycles (vehicle type 11) explicitly and observed travel length data is not available for motorcycle trips. Motorcycles are combined with passenger cars and assumed to have a similar travel length. OKI has calculated and included VMT for transit buses (vehicle type 40) separately in the MOVES rerun.

5. Comment: Please explain why the Auxiliary Power Exhaust, Refueling Displacement Vapor Loss, and Refueling Spillage Loss processes were not included in the MOVES runs.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. OKI has included the Auxiliary Power Exhaust, Refueling Displacement Vapor Loss, and Refueling Spillage Loss processes in the MOVES rerun.

6. Comment: Please include a statement that the Commonwealth will implement all measures with respect to the control of ozone which were contained in the SIP for the area before redesignation of the area as an attainment area or, alternatively, a statement that all measures in the SIP are being implemented.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. Additional documentation to address the comment is now included in Kentucky's submittal. Please see Page 18.

7. Comment: Page 31, Safety Margins – This section must discuss the on-road emissions and the motor vehicle emissions budgets and then discuss the safety margin calculations. A suggestion would be to rename the section. The section should also include what the safety margin is and what the remaining safety margin will be after the allocation.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. The section has been renamed "Motor Vehicle Emissions Budget (CAA §176(c))." Additional clarification on how the safety margins were calculated, as well as the actual estimations, have been added to the narrative. Table 38 has been added to show estimated future emissions for the entire nonattainment area. Table 39 has been updated to reflect emissions data for the entire nonattainment area, demonstrating the projected safety margins for the years 2026 and 2035. Table 40 has been added to demonstrate that emissions in the nonattainment area are projected to decrease in 2026 and 2035. Please see Pages 35-37.

8. Comment: Page 2, 2nd paragraph – Please include monitoring data from all monitors in the nonattainment area, including the Ohio monitors, when making the statement that monitoring data supports Kentucky's request to redesignate the Kentucky portion of the Cincinnati, OH-KY area from nonattainment to attainment. The area is attaining the 2015 ozone NAAQS based on the 2019- 2021 data from all of the ozone monitors in the area, not just from the Kentucky ozone monitors.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. Ohio's monitoring data has been added to Kentucky's narrative. The Kentucky and Ohio monitoring data is representative of all monitors in the nonattainment area. Please see Page 2.

9. Comment: Page 3, Section 2.A., Requirement 1 of 4, Demonstration – This paragraph concludes "Therefore, the data demonstrates that all monitors in the nonattainment area, including the Kentucky monitors in Boone and Campbell Counties, are in attainment." However, the sentences prior to this reference only the Kentucky monitors. To make this concluding statement, the narrative needs to summarize Kentucky's review of data from all of the monitors in the area, not just from the Kentucky monitors.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. A statement has been added to Kentucky's narrative that this conclusion is derived from the monitoring data of all monitors in the nonattainment area. Please see Page 4.

10. Comment: Page 6 and 7 – Please provide the 4th maximum and design value data from 2014 through 2021 for all the monitors in the area, including the Ohio monitors.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment and has amended Tables 2 and 3 to reflect the 2014-2021 ozone design values for all the monitors in the area. Please see Pages 6-7.

11. Comment: Page 11, Part C – Choosing 2019 for the attainment year is appropriate, but the description that the area achieved attainment in 2019 is not accurate. Please correct the document to state that you chose 2019 for your attainment year because it is one of the years from the attaining 3-year average design value for the area.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment and provided clarification in the narrative specifying why 2019 was chosen. Please see Page 11.

12. Comment: Page 12 – The document states "The 2019 attainment year emissions were derived by interpolating between the 2016 and projected 2026 emissions from the 2016v2 (2016fd and 2023fd) platform." Please clarify whether 2026 or 2023 emissions were used considering the document references 2023fd.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. Upon review, the 2019 attainment year emissions were derived by interpolating between the 2016 and projected 2023 emissions from the 2016v2 (2016fj and 2023fj) platform. Please see page 11.

13. Comment: Page 12 – The document states "The Division used census tract population data to determine an approximate percentage that accounts for sources in the nonattainment portion of each county, as demonstrated in Table 4." Please provide a more thorough explanation for the reasoning of using census tract population data to determine the percentages of each county verses using methods described in the Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. Further explanation regarding the use of census tract population data has been added to the narrative. Please see Pages 11-12.

14. Comment: Page 20, Requirement 2 of 3 – The EPA appreciates the Table 5 Traffic Volumes data that Kentucky provides related to the COVID-19 pandemic. To further support the Commonwealth's conclusion that the COVID-19 pandemic has had little effect on the monitored level of ozone, please further explain how the rebound of traffic volumes cited from January 2019 before COVID-19 to December 2021 after the second COVID-19 peak correlates to little effect on the monitored ozone levels. Also, if there are additional significant nitrogen oxide (NOx) sources for which COVID-19 related reductions were temporary, please provide supporting data for that as well (e.g., aviation sector or, if appropriate, another NOx emission sector other than transportation).
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. To support the conclusion that the COVID-19 pandemic had little effect on the monitored level of ozone, the Division added analysis of the annual 4th maximum 8-hour observations from monitoring sites within the nonattainment area. Please see Page 24. Additionally, no new COVID-19 trends for other sectors or sources of NOx have become readily available since the redesignation request was proposed. A statement regarding this has been added to the narrative. Please see page 24.

15. Comment: Page 23, Section D. – Please provide further explanation as to how Kentucky has met CAA section 110 and Part D requirements (CAA Section 107(d)(3)(E)(v)).
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. Additional clarification on how Kentucky has met CAA section 110 and Part D requirements has been added to the narrative. Please see Page 26-27.

16. Comment: Page 25 – The submittal states "The 2035 projected emissions were derived by extrapolating from the 2032 U.S. EPA-projected emissions from the 2016v2 (2032fd) using the TREND function in Microsoft Excel." Please provide a more thorough explanation for the process in extrapolating the 2035 projected emissions, including assumptions made, years used for the trend, and justification for use of the TREND function.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. Additional rationale for extrapolating the 2035 projected emissions with the use of the TREND function has been added to the narrative. Please see Page 29.

17. Comment: Page 33, Demonstration 3 of 6 – Please revise to state that the final EPA approval of Kentucky's emissions statement SIP was published on April 26, 2022, changing Footnote 16 to "87 FR 24429" with the revision to April 26, 2022, final approval.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. The citation has been amended to reflect the final approval date. Please see Footnote 38 on Page 38.

18. Comment: Page 34, Demonstration 5 of 6 – Please revise to state that the final EPA approval of Kentucky's Nonattainment New Source Review SIP was published on April 5, 2022, changing Footnote 22 to "87 FR 19649" with the revision to April 5, 2022, final approval.
(Lynorae Benjamin, U.S. EPA)

Response: The Division acknowledges this comment. The publication dates have been updated to reflect the April 5th, 2022 final approval action. Please see Footnote 44 on Page 40.