Environmental Protection Agency

Ohio's State Implementation Plan Attainment Demonstration for the Cleveland, OH 2015 Serious Ozone Nonattainment Area

Prepared by:

The Ohio Environmental Protection Agency

Division of Air Pollution Control

December 2025

Table of Contents

Figures

Tables

Appendices

List of Abbreviations

AIM — Architectural and Industrial Maintenance

AMATS — Akron Metropolitan Area Transportation Study

AQS — Air Quality System

CAA — Clean Air Act

CAIR — Clean Air Interstate Rule

CAMx — Comprehensive Air Quality Model with Extensions

CARB — California Air Resources Board

CART — Classification and regression tree

CDAQ — Cleveland Division of Air Quality

CFR — Code of Federal Regulations

CI — Compression ignition

CISWI — Commercial/industrial solid waste incinerator

CMAQ — Congestion Mitigation and Air Quality

CNG — Compressed natural gas

CO — Carbon monoxide

CSAPR — Cross-State Air Pollution Rule

CTG — Control Technique Guideline

D.C. — District of Columbia

DEQ — Diesel Emission Quantifier

DERG — Diesel Emissions Reduction Grant

DMTF — Diesel Mitigation Trust Fund

DRR — Data Requirements Rule

DV — Design value

EGU — Electric generating unit

EIA — Energy Information Administration

EIS — Emission Inventory System

EMP — Enhanced Monitoring Plan

ERTAC — Eastern Regional Technical Advisory Committee

FIP — Federal Implementation Plan

FR — Federal Register

GHG — Greenhouse gas

GNP — Good Neighbor Plan

HAP — Hazardous air pollutant

HC — Hydrocarbons

hp — Horsepower

I/M — Inspection and maintenance

ICI — Industrial, commercial, and institutional

IPM — Integrated Planning Model

LADCO — Lake Michigan Air Directors Consortium

MAR — Marine, air, and rail

MATS — Mercury and Air Toxic Standards

MOVES — Motor Vehicle Emission Simulator

MPO — Metropolitan planning organization

MVEB — Motor vehicle emissions budget

MWe — Megawatt electrical

NAAQS — National Ambient Air Quality Standard(s)

NAICS — North American Industry Classification System

NEI — National Emissions Inventory

NESHAP — National Emissions Standard for Hazardous Air Pollutants

NHSM — Non-Hazardous Secondary Materials

NNSR — Nonattainment new source review

NOACA — Northeast Ohio Areawide Coordinating Agency

NOMAD — Nonpoint Method Advisory Committee

NO_x — Nitrogen oxides

NSPS — New Source Performance Standards

NSR — New source review

OAC — Ohio Administrative Code

ODOT — Ohio Department of Transportation

Ohio EPA — Ohio Environmental Protection Agency

OTC — Ozone Transport Commission

OTR — Ozone transport region

PAMS — Photochemical Assessment Monitoring Stations

PFC — Portable fuel canister

PM — Particulate matter

$PM_{2.5}$ — Particulate matter less than 2.5 microns in diameter

POTW — Publicly owned treatment works

ppb — Parts per billion

ppm — Parts per million

PSD — Prevention of Significant Deterioration

QA — Quality assurance

QC — Quality control

RACM — Reasonably available control measures

RACT — Reasonably available control technology

RFP — Reasonable further progress

RICE — Reciprocating internal combustion engine

ROP — Rate of progress

SAFE — Safer Affordable Fuel Efficient

SCC — Source Classification Code

SI — Spark ignition

SIP — State Implementation Plan

SMAT-CE — Software for the Modeled Attainment Test – Community Edition

SO_2 — Sulfur dioxide

SUV — Sport utility vehicle

TPOSD — Tons per ozone season day

TPY — Tons per year

TSD — Technical support document

U.S. EPA — United States Environmental Protection Agency

U.S.C. — United States Code

VMT — Vehicle miles traveled

VOC — Volatile organic compound(s)

1. Introduction

The 1990 Clean Air Act (CAA) Amendments require the United States Environmental Protection Agency (U.S. EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. In 2015, U.S. EPA established revisions to the primary and secondary NAAQS for ozone thereby replacing the 2008 ozone standards. The 2015 ozone NAAQS established a primary and secondary 8-hour ozone standard of 0.070 parts per million (ppm) (80 FR 65292).

Ground-level ozone is not directly emitted into the air. It is formed as a product of chemical reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOC), referred to as ozone precursors, in the presence of sunlight. Industrial facilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are a few examples of emission sources contributing to these ozone precursors. Ozone is a harmful pollutant at ground level and is of particular concern during the summer months when sunlight and hot weather can form harmful ozone concentrations which can trigger a variety of respiratory health problems.

The CAA defines five ozone nonattainment area classifications based on severity for areas that exceed the NAAQS. The nonattainment area classifications are as follows (in order of increasing severity): marginal, moderate, serious, severe, and extreme. The U.S. EPA "Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards" and "Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards" rules designated nonattainment and attainment/unclassifiable areas nationwide effective January 16, 2018 (82 FR 54232), and August 3, 2018 (83 FR 25776), respectively. On March 9, 2018, U.S. EPA published the "Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach" rule which established the air quality thresholds for classification categories that are assigned to all areas designated nonattainment for the 2015 ozone NAAQS according to the ''percent-above-the-standard'' methodology (83 FR 10376).

In Ohio, three nonattainment areas were designated for the 2015 ozone NAAQS: Cincinnati, Cleveland, and Columbus. These nonattainment areas, comprised of multiple counties, were each classified as marginal nonattainment based on design value (DV) criteria for each area. The Columbus, OH 2015 Ozone Nonattainment Area and the Cincinnati, OH 2015 Ozone Nonattainment Area have both since reached attainment and were redesignated on August 31, 2019 (84 FR 43508), and June 9, 2022 (87 FR 35104), respectively. The Cleveland, OH 2015

Ozone Nonattainment Area (hereinafter the "Cleveland Ozone Nonattainment Area"), however, did not attain the 2015 ozone NAAQS by the end of the 2020 ozone season (October 31) and U.S. EPA reclassified ("bumped up") this area to moderate nonattainment effective November 7, 2022 (87 FR 60897). The moderate classification extended the attainment date to August 3, 2024. The Cleveland Ozone Nonattainment Area subsequently failed to attain the 2015 ozone NAAQS by the end of the 2023 ozone season (October 31), and U.S. EPA reclassified this area to serious nonattainment (hereinafter the "Bump-Up Rule") effective January 16, 2025 (89 FR 101901). The Cleveland Ozone Nonattainment Area consists of Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit counties in Ohio.

Outside of the Cleveland Ozone Nonattainment Area, all other counties in Ohio have been designated as attainment/unclassifiable for the 2015 ozone NAAQS (82 FR 54232 and 83 FR 25776). U.S. EPA has historically used the "attainment/unclassifiable" category for areas that either have air quality monitors that demonstrate attainment or that do not have monitors and for which there is no reason to believe they are not in attainment or are contributing to nearby violations.

Attainment dates and State Implementation Plan (SIP) submission requirements are dependent upon the area's designation status. Under Section 182(c) of the CAA, serious nonattainment areas have up to 9 years from designation to attain the NAAQS and are required to submit an attainment demonstration. On January 17, 2025, U.S. EPA promulgated the "State Implementation Plan Submittal Deadlines and Implementation Requirements for Reclassified Nonattainment Areas Under the Ozone National Ambient Air Quality Standards" rule (hereinafter the "Reclassified Ozone Areas Rule"), effective February 18, 2025 (90 FR 5651). The Reclassified Ozone Areas Rule requires submittal of an attainment demonstration by January 1, 2026, demonstrating attainment by the attainment date of August 3, 2027. As the attainment date of August 3, 2027, is in the middle of that year's ozone season, which runs from March 1 to October 31 of each calendar year, attainment must be demonstrated using 2026 ozone season data.

This attainment demonstration is intended to satisfy the serious ozone nonattainment requirements for the Cleveland Ozone Nonattainment Area in accordance with the "Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements" rule (83 FR 62998) (hereinafter the "Implementation Rule"), as well as the Bump-Up Rule and the Reclassified

Ozone Areas Rule. The requirements for serious nonattainment areas are identified in the Implementation Rule and the Reclassified Ozone Areas Rule, in accordance with CAA Title 1 Part D Sections 172(c) and 182. These requirements include the following:

- A comprehensive, accurate, and current inventory of actual emissions from all sources in the nonattainment area, required by CAA sections 172(c)(3) and 182(a)(1), addressed in Section 3 of this document
- A transportation conformity demonstration, required by CAA section 176(c), also addressed in Section 3 of this document
- A description of the emissions reductions that will demonstrate reasonable further progress (RFP), required by CAA sections 172(c)(2) and 182(c)(2)(B), addressed in Section 4 of this document
- A source emission statement program, required by CAA 182(a)(3)(B), addressed in Section 5 of this document
- Implementation of reasonably available control measures (RACM) and reasonably available control technology (RACT), required by CAA sections 172(c)(1) and 182(b)(2), addressed in Section 6 of this document
- An enhanced vehicle inspection and maintenance (I/M) program, required by CAA section 182(c)(3), addressed in Section 7 of this document
- An attainment plan, required by CAA section 182(c)(2)(A), addressed in Section 8 of this document
- An approved nonattainment new source review (NNSR) program, required by CAA sections 172(c)(5) and 182(a)(2)(C), addressed in Section 9 of this document
- Changes to the permitting program, including the major source threshold, de minimis rules, special rules for modifications of sources meeting certain emissions threshold criteria, and NO_x and VOC emissions offsets for major sources, required by CAA sections 182(c), 182(c)(6), 182(c)(7), 182(c)(8), and 182(c)(10), also addressed in Section 9 of this document
- Contingency measures to be implemented in the event of failure to attain either the NAAQS or applicable RFP emissions reductions, required by CAA sections 172(c)(9) and 182(c)(9), addressed in Section 10 of this document

- Milestones and milestone compliance demonstrations, required by CAA section 182(g), also addressed in Section 10 of this document
- An enhanced monitoring plan, required by CAA section 182(c)(1), addressed in Section 11 of this document
- A clean fuel vehicle program or appropriate substitute, required by CAA section 182(c)(4), addressed in Section 12 of this document
- Transportation control demonstrations, required by CAA section 182(c)(5), addressed in Section 13 of this document

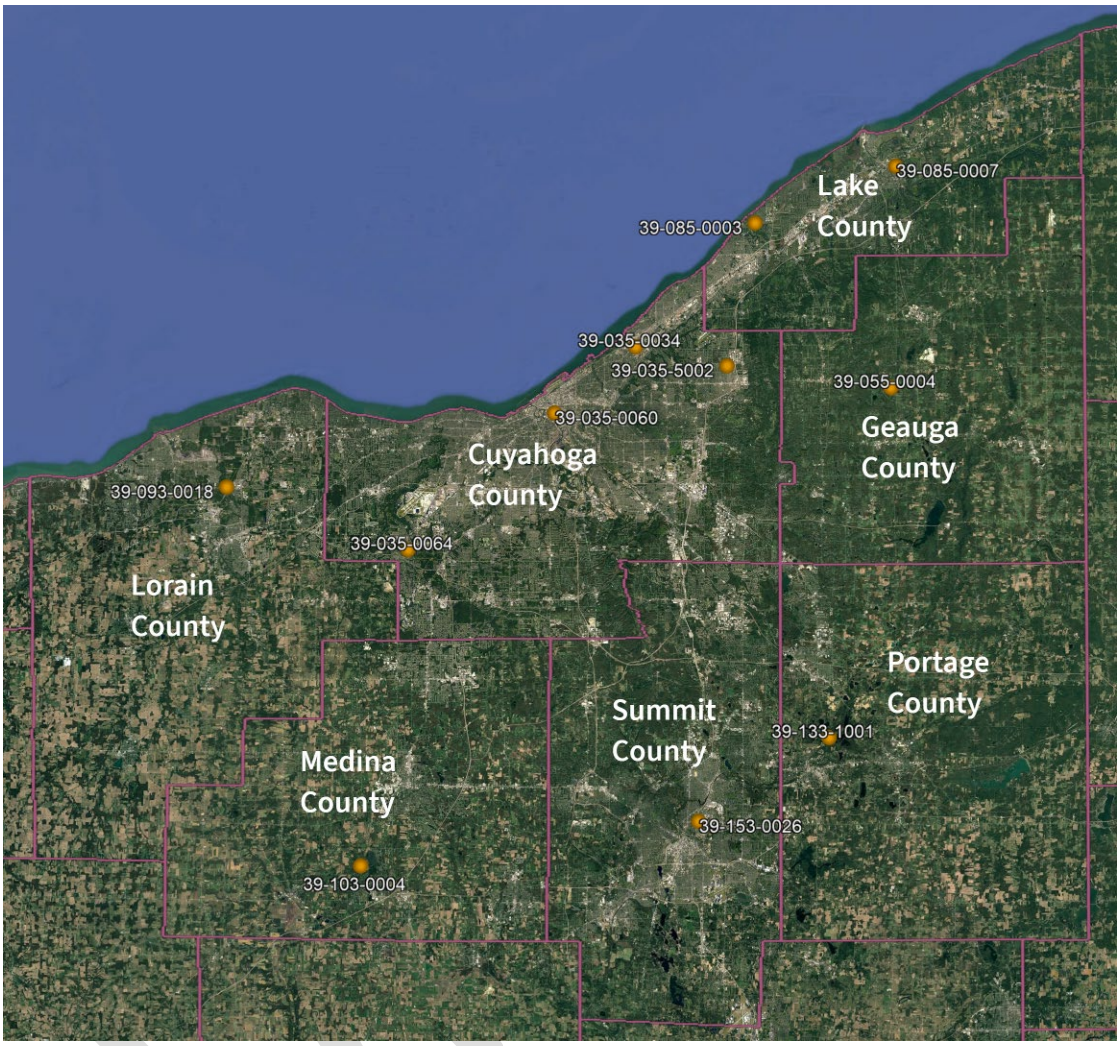
These required elements are addressed more fully in the following sections.

2. Background

2.1. Nonattainment Areas and Air Quality Data

The U.S. EPA "Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards" rule designated three nonattainment areas in Ohio (83 FR 25776). The Columbus, OH 2015 Ozone Nonattainment Area and the Cincinnati, OH 2015 Ozone Nonattainment Area have since been redesignated to attainment effective August 31, 2019 (84 FR 43508), and June 9, 2022 (87 FR 35104), respectively. The Cleveland Ozone Nonattainment Area was reclassified as serious nonattainment based on not attaining the NAAQS within the six years given under the moderate nonattainment designation. The Cleveland Ozone Nonattainment Area is comprised of a subset of seven counties in northeastern Ohio. Figure 1 shows the location of the counties and ozone monitoring sites included in the Cleveland Ozone Nonattainment Area. The Cleveland Ozone Nonattainment Area includes the following seven counties of Ohio: Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit. The Northeast Ohio Areawide Coordinating Agency (NOACA) is the metropolitan planning organization (MPO) that covers Cuyahoga, Geauga, Lake, Lorain, and Medina counties. The Akron Metropolitan Area Transportation Study (AMATS) is the MPO that covers Summit and Portage counties.

Figure 1. Ozone monitoring sites within the Cleveland Ozone Nonattainment Area.



Three complete years of ozone monitoring data are required to demonstrate attainment at a monitoring site. The eight-hour primary and secondary ozone NAAQS are met at an ambient air quality monitoring site 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. When this occurs, the site is said to be in attainment. Ozone concentrations are reported in ppm to the third decimal place, with additional digits to the right of the third decimal place truncated (truncating is performed at each step of the DV computation including one-hour, eight-hour, and three-year averaging). These data handling procedures are applied on an individual basis at each monitor in the area. An area is in compliance with the eight-hour ozone NAAQS if, and

only if, every monitoring site in the area meets the NAAQS. An individual site's three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentrations is also called the site's DV. Table 1 shows the annual fourth highest ozone values from certified monitoring data retrieved from the U. S. EPA Air Quality System (AQS) database for the Cleveland Ozone Nonattainment Area from 2015 to 2025, while Table 2 shows the 3-year ozone DVs in parts per billion (ppb) for the Cleveland Ozone Nonattainment Area from 2017 to 2025. The AQS database report is provided in Appendix A. It should be noted that the 2025 ozone data are complete through September 30, 2025, and have not yet been certified by the Ohio Environmental Protection Agency (Ohio EPA) and U.S. EPA.

Table 1. Cleveland Ozone Nonattainment Area monitoring site annual fourth highest ozone values.

Site ID	County	Annual 4th Highest Ozone Value (ppb)										
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
39-035-0034	Cuyahoga	68	69	69	72	68	74	70	73	71	72	*70*
39-035-0060		63	63	61	63	66	66	59	61	65	65	*68*
39-035-0064		66	68	64	66	63	66	69	65	75	65	*68*
39-035-5002		72	70	68	75	70	68	68	65	73	70	*56*
39-055-0004	Geauga	73	74	71	73	68	65*	67	64	66	66	*69*
39-085-0003	Lake	74	74	73	76	71	75	72	76	72	71	*71*
39-085-0007		70	69	72	69	69	68*	63	62	73	69	*70*
39-093-0018	Lorain	62	68	65	69	58	59	59	63	64	61	*66*
39-103-0004	Medina	63	66	64	66	54	64	65	67	72	65	*68*
39-133-1001	Portage	64	59	65	66	58	63	67	71	70	67	*70*
39-153-0017	Summit	—	—	—	59	—	—	—	—	—	—	—
39-153-0026		65	61	66	69	66	62	66	69	71	69	*66*

An asterisk and yellow highlighting indicate that there were insufficient site visits to perform quality control (QC) checks due to COVID-19 restrictions. QC checks that were performed indicated the monitors were operating within the proper ranges. Ohio EPA recommended certification of the data, but U.S. EPA did not concur. The monitor did meet data completeness requirements, but not certification requirements. Italicized values have not yet been certified by U.S. EPA.

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

Table 2. Cleveland Ozone Nonattainment Area monitoring site 3-year ozone design values.

Site ID	County	3-Year Ozone Design Value (ppb)								
		2015-2017	2016-2018	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023	2022-2024	2023-2025
39-035-0034	Cuyahoga	68	70	69	71	70	72	71	72	*71*
39-035-0060		62	62	63	65	63	62	61	63	*66*
39-035-0064		66	66	64	65	66	66	69	68	*69*
39-035-5002		70	71	71	71	68	67	68	69	*66*
39-055-0004	Geauga	72	72	70	68	66	65	65	65	*67*
39-085-0003	Lake	73	74	73	74	72	74	73	73	*71*
39-085-0007		70	70	70	68	66	64	66	68	*70*
39-093-0018	Lorain	65	67	64	62	58	60	62	62	*63*
39-103-0004	Medina	64	65	61	61*	61	65	68	68	*68*
39-133-1001	Portage	62	63	63	62	62	67	69	69	*69*
39-153-0017	Summit	—	59*	59*	59*	—	—	—	—	—
39-153-0026		64	65	67	65	64	65	68	69	*68*

An asterisk and green highlighting indicate that the DV is invalid due to insufficient data collection at the monitoring site (less than 90% of required days over the 3-year period). Italicized values have not yet been certified by U.S. EPA.
Source: U.S. EPA. Air Quality System (AQS); http://www.epa.gov/ttn/airs/airsaqs/index.htm

2.2. LADCO Conceptual Model for Ozone Formation in Cleveland, Ohio

In August 2021, the Lake Michigan Air Directors Consortium (LADCO) published the Conceptual Model for Ozone Formation in Cleveland, OH (Appendix B). This model showed that ozone concentrations decreased for the Cleveland Ozone Nonattainment Area from the early 2000s until 2013. Since 2013, there has been a slight increase in exceedance days, peaking in 2016 at fourteen exceedance days before returning to a declining trend. Statewide emissions of ozone precursors such as carbon monoxide (CO), NO_x, and VOC have decreased over the last twenty years, with VOC decreasing at a slower rate than the other two pollutants.

The meteorological conditions that lead to exceedances of the ozone NAAQS for the Cleveland region are warm, dry, sunny days with weak synoptic winds out of the west, southwest, or south, particularly when a lake breeze blows onshore from Lake Erie. The Cleveland area most frequently had ozone exceedances when impacted by dry moderate,

moist tropical and dry tropical air masses. Dry tropical weather type accounted for a third of high ozone days for Cleveland but only represents a small portion of overall weather types in the area. This suggests the hot and dry conditions that are associated with the dry tropical weather type are very conducive for ozone formation for the area. Often, high ozone days are accompanied by an anticyclone located to the east of Cleveland. This type of system brings subsidence, or largescale downward moving, stable air that provides clear skies, and a clockwise flow that transports moist tropical air from the south into the area. Multiple day ozone events often occur when this synoptic weather pattern propagates slowly across the eastern United States, resulting in a prolonged period of stagnation over the area. Lake breezes from Lake Erie transport ozone concentrations from over the lake onshore so that local areas observe ozone concentrations well above regional values inland. Source apportionment modeling showed the greatest contributions to Cleveland's ozone concentrations from Ohio, with smaller contributions from Indiana and Michigan.

3. Emissions Inventories

3.1. 2017 Base Year Inventory and 2026 Attainment Year Projected Inventory

Ozone nonattainment areas are required to submit a base year emissions inventory for the nonattainment area within 2 years of nonattainment designation (CAA Section 182(a)(1)). The base year inventory must be a "comprehensive, accurate, current inventory of actual emissions from sources of VOC and NO_x emitted within the boundaries of the nonattainment area" (83 FR 63033). In addition, CAA Section 182(a)(3)(A) requires that states submit periodic emissions inventories every 3 years after the initial base year inventory. Ohio commits to meeting the periodic emissions inventory requirements.

Ohio submitted a base year inventory for the Cleveland Ozone Nonattainment Area on July 24, 2020. On March 3, 2021, U.S. EPA approved the base year emissions inventory, effective April 2, 2021 (86 FR 12270).

The Implementation Rule specifies that "the inventory year shall be selected consistent with the baseline for the [Reasonable Further Progress] RFP plan" (83 FR 63035). At the time of the initial submittal, the Cleveland Ozone Nonattainment Area was designated marginal nonattainment and RFP was not required. Therefore, Ohio initially selected 2014 for the base year inventory as it was one of the years used to designate the area as nonattainment and was the most current quality-assured National Emissions Inventory (NEI) year available at the time development of the SIP submission began.

The Cleveland Ozone Nonattainment Area had since been reclassified to moderate nonattainment, triggering RFP requirements. To address the moderate nonattainment requirements for the Cleveland Ozone Nonattainment Area under the 2015 ozone NAAQS, Ohio EPA submitted a moderate attainment demonstration SIP revision for approval on December 21, 2022, which included an updated base year inventory. The final Implementation Rule specifies that the baseline emission inventory for RFP plans "shall be the emissions inventory for the most recent calendar year for which a complete triennial inventory is required to be submitted to the [U.S.] EPA under the provisions of subpart A of this part" (83 FR 63034). Ohio selected 2017 for the base year inventory as the most recent NEI year available for its December 21, 2022, SIP revision submittal. On July 7, 2025, U.S. EPA approved certain elements of Ohio's SIP revision submittal for moderate nonattainment in the Cleveland Ozone Nonattainment Area, including the updated base year emissions inventory for base year 2017, with an effective date of August 6, 2025 (90 FR 29742). Ohio is

continuing to use the approved 2017 base year inventory, with the exception of onroad emissions, under this demonstration, consistent with baseline already established for RFP under the moderate demonstration. Onroad emissions have been updated as discussed below.

In addition, Ohio has developed a projected inventory for 2026 to align with RFP requirements for serious ozone nonattainment. CAA Sections 172(c)(2) and 182(b)(1) require states with ozone nonattainment areas classified as moderate or higher to submit plans that show RFP towards attaining the NAAQS. The Implementation Rule defines RFP for moderate nonattainment areas with a VOC Rate of Progress (ROP) plan approved under a prior ozone NAAQS as a demonstration that there has been at least a 15% emission reduction between the baseline year (2017) and 6 years after the baseline year (2023) (83 FR 63034). Since U.S. EPA approved the ROP plan for the Cleveland Ozone Nonattainment Area under the 1997 ozone NAAQS (see 74 FR 47414), the RFP requirement for moderate nonattainment is a 15% reduction requirement between 2017 and 2023. This requirement can be satisfied with any combination of anthropogenic NO_x and VOC reductions. Biogenic emissions are not included in the RFP inventory in accordance with U.S. EPA's "May 2017 Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations" (hereinafter the "Emissions Inventory Guidance"). Additionally, the Implementation Rule defines RFP for serious nonattainment areas with a VOC ROP plan approved under a prior ozone NAAQS as a demonstration that shows an additional average emissions reduction of 3% per year for all remaining 3-year periods until the attainment date. To meet this additional requirement for the Cleveland Ozone Nonattainment Area, it must be demonstrated that emissions reductions between 2023 and 2026 total at least 9% of the emissions of the 2017 base year inventory. Ultimately, this means that it must be demonstrated that emissions reductions in the Cleveland Ozone Nonattainment Area between 2017 and 2026 total at least 24% of the emissions of the 2017 base year inventory.

At the time the 2017 emission inventory was evaluated, permitted Ohio facilities classified as Title V and synthetic minor were required to file annual emissions information in Ohio's Emission Inventory System (EIS). The EIS includes detailed emissions information as well as data about the egress points where pollutants are released into the air, including NO_x and VOC. Ohio EPA has the authority under Ohio Administrative Code (OAC) Chapter 3745-24 to

request and receive this information from regulated entities. Ohio's EIS database serves as the basis for the NEI.

A typical permitted facility may have multiple source types. For example, a refinery with numerous industrial processes would itself be a point source, the leaks from valves and the switch engine that moves tank cars on the railroad siding would be a nonroad mobile source. A typical permitted facility may also have more than one industrial classification. The refinery in the previous example is in one industrial category while the tank farm is in another. Quantities of emissions may be measured directly (at the stack); they may be calculated from engineering principles (e.g., mass balance); or they may be estimated (e.g., by assuming reasonable emission rates, times, etc.). Emissions can be expressed in terms of annual emissions, seasonal emissions or daily emissions. For the purpose of this submittal, the data presented have been quantified as ozone season day emissions (in tons per ozone season day, TPOSD). Annual emissions (in tons per year, TPY) are also included in the appendices.

Ohio EPA collected a comprehensive emissions inventory including point, nonpoint, nonroad, and biogenic sources for precursors of ozone (VOC and NO_x) for base year 2017 from U.S. EPA's 2017gb emissions modeling platform, which is based on the 2017 NEI. Supporting documentation for the NEI is available on U.S. EPA's website at https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data?adlt=strict. Supporting documentation for the 2017gb emissions modeling platform is available at https://www.epa.gov/air-emissions-modeling/2017-emissions-modeling-platform.

Ohio EPA also collected a comprehensive projected emissions inventory including point, nonpoint, and biogenic sources for precursors of ozone (VOC and NO_x) for projected attainment year 2026 from U.S. EPA's 2026hc projected emissions inventory within the 2022v1 emissions modeling platform. Supporting documentation for the 2022v1 emissions modeling platform is available at https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform. This is the same inventory used in attainment modeling demonstration discussed in Section 8.

Onroad emissions for both 2017 and 2026 were developed using the most recent version of U.S. EPA's Motor Vehicle Emission Simulator (MOVES) modeling system, MOVES5, by NOACA, AMATS, and the Ohio Department of Transportation (ODOT), in consultation with Ohio EPA and U.S. EPA Region 5.

For the 2017 base year emissions inventory, point sources are divided into two categories: electric generating units (EGUs) and non-EGUs. Fire emissions are not included in this 2017 base year emissions inventory due to low emissions (9 TPY NO_x and 145 TPY VOC in 2017). Marine, air, and rail (MAR) emissions, which have been separated out as a distinct category in some previous SIPs, remain as accounted for in the NEI. For example, emissions from airports and railyards are included in the point sector, while other components of MAR emissions may be included in the nonpoint or nonroad sectors, as allocated by U.S. EPA in the 2017gb inventory.

For the 2026 projected attainment year emissions inventory, point sources are also divided into EGUs and non-EGUs. Emissions in TPOSD, based on average May to September weekday emissions, were obtained from the 2026hc projected emissions inventory within the 2022v1 emissions modeling platform[1]. For consistency with the 2017 base year emissions inventory, emissions from airports and railyards have been included in the non-EGU point sector. Classification of facilities into the EGUs and non-EGUs categories was kept consistent with the 2017 base year emissions inventory. Fire emissions are not included in this 2026 projected attainment year emissions inventory due to low emissions (13.9 TPY NO_x and 134.5 TPY VOC in 2026).

The emissions collected from the 2017gb inventory were presented in terms of monthly or annual emissions. Where monthly data were available, ozone season day emissions in TPOSD were derived by dividing July emissions by the number of days in July. Where only annual data were available, ozone season day emissions in TPOSD were derived by applying a conversion factor to the annual emissions. The conversion factors used for the 2017 base year emissions inventory were derived from U.S. EPA's 2017gb emissions modeling platform[2] and are shown in Table 3.

1 "weekday_2026hc_may_through_september_sector_CAPS_average_county_report" file available at https://www.epa.gov/air-emissions-modeling/2022v1-emissions-modeling-platform (select 2022v1 Data Files and Summaries, then reports, then daily, then the specific file)

2 "2017gb_hapcap_county_monthly_report_CAPs_PEC_POC_09apr2021" file available at https://www.epa.gov/air-emissions-modeling/2017-emissions-modeling-platform (select 2017 Data Files and Summaries, then reports, then the specific file)

Table 3. Conversion factors for annual to ozone season day emissions (TPY to TPOSD) used for the 2017 base year emissions inventory[3].

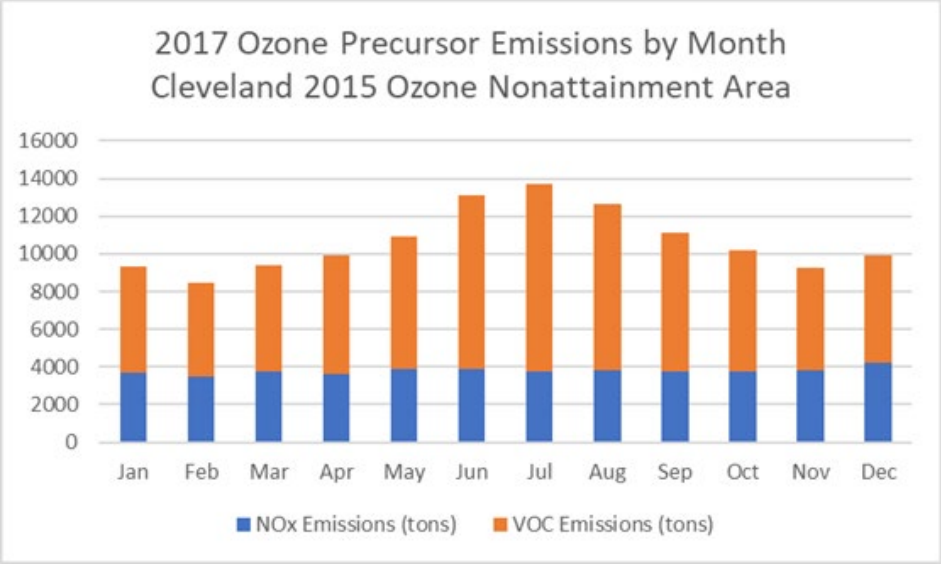
Sector	Subsector	NO_x	VOC
Nonpoint	ag	N/A	0.00518
	cmv_c1c2_12	0.00354	0.00362
	cmv_c3_12	0.00288	0.00216
	nonpt	0.00070	0.00276
	np_oilgas	0.00293	0.00319
	rail	0.00272	0.00272
	rwc	0.00066	0.00072
Nonroad	nonroad	0.00386	0.00458
Point	airports	0.00294	0.00294
	pt_oilgas	0.00274	0.00274
	ptegu	0.00265	0.00263
	ptnonipm	0.00270	0.00275

Separate conversion factors were determined by pollutant and subsector within the 2017 base year emissions inventory as identified below. The conversion factors were derived as the ratio of the 2017 average July day emissions to 2017 annual emissions. Average July day emissions were determined by dividing the July emissions by 31, the number of days in July. The conversion factor ratios were then applied to annual emissions to determine ozone season day emissions.

July was selected as representative of the ozone season as it is typically the warmest month and had the highest monthly emissions of NO_x and VOC combined in the 2017gb modeling platform, as shown in Figure 2.

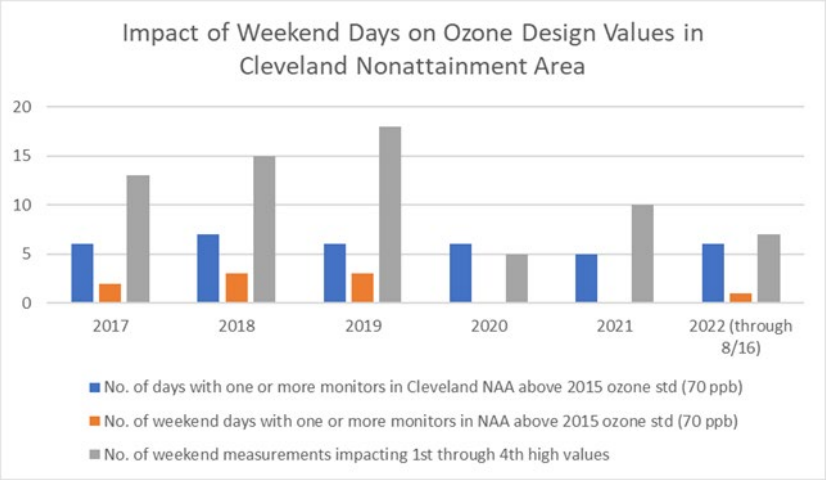
3 The conversion factors shown in the table have been rounded. The calculation resulting in the ozone season day emissions use unrounded values. Any differences in ozone season day emissions estimates found when applying the conversion factors in the table to annual emissions are due to rounding.

Figure 2. 2017 ozone precursor emissions by month.



Ozone season day emissions, as determined above, include weekend days. Ohio determined that this is appropriate because ozone values measured on weekend days have a significant impact on the monitor design values in the Cleveland Ozone Nonattainment Area. As shown in Figure 3, since 2017 the Cleveland Ozone Nonattainment Area has had between 5 and 7 days with one or more monitors over the 2015 ozone standard each year, with up to 3 of those days falling on a weekend. In addition, Figure 3 shows that between 5 and 18 of the 1st through 4th high values that contribute to the design value for a monitor occur on a weekend day during any given year. Even during 2020 and 2021, when no exceedance days fell on a weekend, weekend days contributed 5 and 10 of the values that contribute to the design value, respectively. As such, Ohio EPA determined it was appropriate to include weekend emissions in the calculation of ozone season day emissions for the 2017 base year emissions inventory.

Figure 3. Impact of weekend days on ozone design values in the Cleveland Ozone Nonattainment Area.



Ozone season day emissions of NO_x and VOC in the base year (2017) and the projected attainment year (2026) for each county by sector are shown in Tables 4 to 11 below. Overall, anthropogenic ozone precursor emissions in the nonattainment area are projected to decrease significantly between 2017 and 2026, with a 41% decrease in NO_x and a 25% decrease in VOC. Each county shows steady or decreasing emissions in both pollutants in all sectors except nonpoint and non-EGUs. While non-EGUs are projected to experience both increased and decreased emissions depending on the specific county and pollutant, emissions over the entire nonattainment area are projected to decrease for both NO_x and VOC. Emissions of NO_x from nonpoint sources over the entire nonattainment area are projected to increase slightly between 2017 and 2026.

Table 4. Cuyahoga County ozone precursor emissions in TPOSD.

Sector	2017 NO_x	2026 NO_x	2017-2026 NO_x change (%)	2017 VOC	2026 VOC	2017-2026 VOC change (%)
EGU	0.00	0.00	0%	0.00	0.00	0%
Non-EGU	7.38	5.50	-26%	3.20	2.44	-24%
Nonpoint	6.12	6.48	6%	53.46	37.49	-30%
Nonroad	9.95	6.62	-34%	12.49	10.19	-18%
Onroad	22.12	8.92	-60%	13.69	7.54	-45%
TOTAL ANTHROPOGENIC	45.59	27.51	-40%	82.85	57.66	-30%
Biogenic	0.59	0.56	-6%	22.33	20.87	-7%
TOTAL	46.17	28.07	-39%	105.18	78.53	-25%

Table 5. Geauga County ozone precursor emissions in TPOSD.

Sector	2017 NO_x	2026 NO_x	2017-2026 NO_x change (%)	2017 VOC	2026 VOC	2017-2026 VOC change (%)
EGU	0.00	0.00	0%	0.00	0.00	0%
Non-EGU	0.02	0.03	44%	0.08	0.11	34%
Nonpoint	0.16	0.46	200%	3.99	4.44	11%
Nonroad	1.43	0.90	-37%	2.46	1.62	-34%
Onroad	2.21	0.83	-62%	1.46	0.78	-47%
TOTAL ANTHROPOGENIC	3.82	2.22	-42%	8.00	6.95	-13%
Biogenic	0.59	0.61	3%	22.50	23.61	5%
TOTAL	4.41	2.83	-36%	30.50	30.56	0%

Table 6. Lake County ozone precursor emissions in TPOSD.

Sector	2017 NO_x	2026 NO_x	2017-2026 NO_x change (%)	2017 VOC	2026 VOC	2017-2026 VOC change (%)
EGU	0.05	0.01	-77%	0.00	0.00	0%
Non-EGU	1.70	1.54	-9%	0.77	0.81	6%
Nonpoint	2.51	2.24	-11%	10.83	8.65	-20%
Nonroad	3.57	1.77	-50%	3.62	1.67	-54%
Onroad	4.62	1.67	-64%	2.97	1.59	-47%
TOTAL ANTHROPOGENIC	12.45	7.23	-42%	18.19	12.72	-30%
Biogenic	0.34	0.31	-7%	14.50	13.88	-4%
TOTAL	12.79	7.55	-41%	32.69	26.60	-19%

Table 7. Lorain County ozone precursor emissions in TPOSD.

Sector	2017 NO_x	2026 NO_x	2017-2026 NO_x change (%)	2017 VOC	2026 VOC	2017-2026 VOC change (%)
EGU	3.05	0.77	-75%	0.13	0.12	-10%
Non-EGU	0.99	1.28	29%	0.81	0.85	5%
Nonpoint	2.95	2.61	-12%	10.26	9.09	-11%
Nonroad	3.42	1.85	-46%	3.96	2.27	-43%
Onroad	5.66	2.23	-61%	3.72	2.04	-45%
TOTAL ANTHROPOGENIC	16.07	8.74	-46%	18.88	14.38	-24%
Biogenic	1.10	1.16	5%	14.16	32.43	129%
TOTAL	17.17	9.90	-42%	33.04	46.81	42%

Table 8. Medina County ozone precursor emissions in TPOSD.

Sector	2017 NO_x	2026 NO_x	2017-2026 NO_x change (%)	2017 VOC	2026 VOC	2017-2026 VOC change (%)
EGU	0.00	0.00	0%	0.00	0.00	0%
Non-EGU	0.18	0.30	67%	0.35	0.40	14%
Nonpoint	0.87	0.99	14%	9.87	8.82	-11%
Nonroad	1.60	1.02	-36%	1.92	1.35	-30%
Onroad	5.02	1.68	-66%	2.93	1.48	-50%
TOTAL ANTHROPOGENIC	7.66	3.99	-48%	15.08	12.05	-20%
Biogenic	1.01	1.07	6%	13.16	28.16	114%
TOTAL	8.68	5.06	-42%	28.24	40.20	42%

Table 9. Portage County ozone precursor emissions in TPOSD.

Sector	2017 NO_x	2026 NO_x	2017-2026 NO_x change (%)	2017 VOC	2026 VOC	2017-2026 VOC change (%)
EGU	0.00	0.00	0%	0.00	0.00	0%
Non-EGU	0.29	0.31	5%	1.31	1.08	-17%
Nonpoint	1.80	2.00	11%	7.29	8.08	11%
Nonroad	1.97	1.06	-46%	4.39	1.89	-57%
Onroad	3.07	1.46	-52%	1.68	1.04	-38%
TOTAL ANTHROPOGENIC	7.13	4.83	-32%	14.66	12.09	-18%
Biogenic	0.97	1.00	3%	23.41	33.79	44%
TOTAL	8.10	5.82	-28%	38.07	45.88	21%

Table 10. Summit County ozone precursor emissions in TPOSD.

Sector	2017 NO_x	2026 NO_x	2017-2026 NO_x change (%)	2017 VOC	2026 VOC	2017-2026 VOC change (%)
EGU	0.00	0.00	0%	0.00	0.00	0%
Non-EGU	0.72	0.49	-33%	1.26	1.03	-19%
Nonpoint	2.08	2.40	16%	20.90	19.21	-8%
Nonroad	3.35	2.24	-33%	4.97	3.35	-33%
Onroad	9.21	4.37	-53%	5.24	3.25	-38%
TOTAL ANTHROPOGENIC	15.36	9.50	-38%	32.37	26.84	-17%
Biogenic	0.72	0.76	5%	21.62	27.60	28%
TOTAL	16.09	10.26	-36%	53.98	54.44	1%

Table 11. Cleveland Ozone Nonattainment Area ozone precursor emissions in TPOSD.

Sector	2017 NO_x	2026 NO_x	2017-2026 NO_x change (%)	2017 VOC	2026 VOC	2017-2026 VOC change (%)
EGU	3.10	0.78	-75%	0.13	0.12	-10%
Non-EGU	11.29	9.44	-16%	7.79	6.72	-14%
Nonpoint	16.48	17.18	4%	116.60	95.77	-18%
Nonroad	25.29	15.45	-39%	33.82	22.36	-34%
Onroad	51.91	21.17	-59%	31.69	17.72	-44%
TOTAL ANTHROPOGENIC	108.07	64.02	-41%	190.03	142.69	-25%
Biogenic	5.32	5.46	3%	131.68	180.33	367%
TOTAL	113.40	69.48	-39%	321.70	323.02	0%

3.2. Point Source Emissions

Emissions from point sources are defined as those whose emissions are usually fairly well characterized, are generally discharged through stacks and which are required to possess an Ohio EPA issued permit. The point source inventory collected from the 2017gb emissions inventory platform was initially developed from Ohio EPA's online reporting database, STARS2, where facilities submit annual emissions reports. Ohio EPA requires annual emission reports for Title V and synthetic minor facilities. After review and approval by Ohio EPA staff, the facility emissions were then formatted, through a U.S. EPA provided Microsoft Access tool, for annual submission to the EIS Gateway to fulfill required reporting for the annual EIS. Initially, the point source inventory was submitted to the EIS Gateway in draft form to begin the quality assurance (QA) process.

The EIS Gateway QA environment performed a variety of checks on the point source inventory, including facility site geographic coordinates, duplicate facilities, release point diameter and others. After the QA checks were performed, the EIS Gateway provided a feedback file with any errors that were encountered. These errors were dealt with on a case-by-case basis, depending on the error. Some errors required collaboration with U.S. EPA such as correcting duplicate facilities. Once all critical errors were corrected, the emissions were submitted to the EIS Gateway in final form.

The final point source inventory is divided into two categories: EGUs and non-EGUs. For EGUs, 2017 emissions were collected from the 2017gb emissions modeling platform[4]. This file provided annual data which was converted to TPOSD using the conversion factors identified above. 2026 projected emissions for EGUs in TPOSD, based on average May to September weekday emissions, were obtained from the 2026hc projected emissions inventory within the 2022v1 emissions modeling platform.

As a conservative approach, no direct adjustments were made to the 2026 projected emissions inventory for EGUs. However, it should be noted that the following EGU point sources within the Cleveland Ozone Nonattainment Area that were included in the 2017 base year emissions inventory have permanently shut down since 2017:

4 "point_16_17_18_19_20_23_26_32_OH_unit_comparison" file provided by U.S. EPA

- Eastlake Substation (Facility ID 0243160009): Emissions unit B006 permanently shut down on February 18, 2020, and the only operating units remaining at the facility are de minimis/exempt or permit-by-rule
- Avon Lake Power Plant (Facility ID 0247030013): Facility and all emissions units permanently shut down on April 1, 2022

Appendix C contains a detailed list of the EGU point sources by facility, with their respective NO_x and VOC emissions for the 2017 base year and 2026 projected year.

For non-EGUs, 2017 emissions were collected from the 2017gb emissions modeling platform[5]. These files provided annual data which was converted to TPOSD using the conversion factors identified above. 2026 projected emissions for non-EGUs in TPOSD, based on average May to September weekday emissions, were obtained from the 2026hc projected emissions inventory within the 2022v1 emissions modeling platform.

As a conservative approach, no direct adjustments were made to the 2026 projected emissions inventory for non-EGUs. However, it should be noted that the following non-EGU point sources within the Cleveland Ozone Nonattainment Area that were included in the 2017 base year emissions inventory have permanently shut down since 2017:

- 3M Elyria (Facility ID 0247040822): Facility and all emissions units permanently shut down on March 16, 2018
- Demag Cranes and Components Corp. (Facility ID 1318535255): Facility and all emissions units permanently shut down on March 31, 2018
- MAR-BAL, INC. (Facility ID 0228000194): Facility and all emissions units permanently shut down on April 5, 2018
- Cansto Coatings LLC (Facility ID 1318008350): Facility and all emissions units permanently shut down on May 14, 2018
- Ritrama Duramark (Facility ID 1318007355): Facility and all emissions units permanently shut down on June 30, 2018

5 "point_16_17_18_19_20_23_26_32_OH_unit_comparison" file provided by U.S. EPA; and "airports_2017NEIpost_POINT_20200618_18jun2020_nf_v1" file available at https://www.epa.gov/air-emissions-modeling/2017-emissions-modeling-platform (select 2017 Data Files and Summaries, 2017 emissions, then the specific file)

- Trelleborg Sealing Profiles NA (Facility ID 1667080043): Facility and all emissions units permanently shut down on December 1, 2018
- DiGeronimo Aggregates LLC (Facility ID 1318270383): Facility and all emissions units permanently shut down on December 31, 2018
- Schwebel Baking Co. (Solon) (Facility ID 1318538152): Facility and all emissions units permanently shut down on May 20, 2019
- M.P.C. Plating, Inc. (Facility ID 1318000838): Facility and all emissions units permanently shut down on May 1, 2020
- ROSBY RESOURCE RECYCLING, INC. (Facility ID 1318118050): Emissions units P001 and P002 both permanently shut down on October 6, 2020, and the only operating emissions units remaining at the facility are de minimis/exempt or permit-by-rule
- The Babcock and Wilcox Research Center (Facility ID 1677020156): Facility and all emissions units permanently shut down on November 4, 2020
- Amcor Flexibles North America, Inc. (Facility ID 1677000105): Facility and all emissions units permanently shut down on March 5, 2021
- Vibrantz Technologies (Facility ID 1318170235): 26 significant emissions units and 39 insignificant emissions units were permanently shut down between 2019 and 2021, resulting in facility-wide emissions falling below major source thresholds
- Angstrom Graphics Midwest, Inc. (Facility ID 1318170170): Facility and all emissions units permanently shut down on September 1, 2023
- Baker Mc Millen Company (Facility ID 1677110035): Emissions unit R002 permanently shut down on August 30, 2023, emissions unit P004 permanently shut down on September 7, 2023, and there are no operating emissions units remaining at the facility
- Lorain County LFG Power Station (Facility ID 0247100968): Facility and all emissions units permanently shut down on August 14, 2024
- NEWKOR, INC. (Facility ID 1318005362): Facility and all emissions units permanently shut down on March 28, 2025

VOC and NO_x RACT have been in place in the Cleveland Ozone Nonattainment Area for many years, and the recent rule revisions detailed further in Section 6 are expected to yield some emissions reductions. Due to the serious reclassification, Ohio lowered the applicability threshold from 100 TPY to 50 TPY and also lowered many exemption levels. There will be new sources subject to NOx and VOC RACT as a result. Under the moderate reclassification, Ohio made changes include lowering the threshold for certain sources such that a few new (but small) sources may be subject, and slightly lowered limits that we expect sources within the Cleveland Ozone Nonattainment Area are able to meet with little to no change to their existing operations. As any changes would be a decrease in emissions, not quantifying them in this inventory results in a conservative estimate of future emissions. Appendix D contains a detailed list of the non-EGU point sources by facility, with their respective NO_x and VOC emissions for the 2017 base year and 2026 projected attainment year.

3.3. Nonpoint Source Emissions

Nonpoint sources (also referred to as area sources) are usually spread over wide areas with no distinct discharge points or are comprised of several small point sources that are difficult to describe separately and whose emissions are not well characterized (e.g., heating furnaces in individual homes, architectural surface coating, automobile refueling, dry cleaning, etc.).

The nonpoint inventory collected from the 2017gb (2017 NEI based) and 2026hc (2020 NEI based) emissions inventory platform was initially developed from a variety of state data supplied to estimate emissions based on procedures and guidance supplied by U.S. EPA, as described further below. State specific data was only used when Ohio was able to provide data that was considered to more accurately describe activity or emissions in Ohio compared to U.S. EPA default data. Where Ohio was unable to provide state specific data, U.S. EPA default data was used. U.S. EPA default data for nonpoint sources was developed by U.S. EPA with the help of the Nonpoint Method Advisory Committee (NOMAD). NOMAD is a group of inventory developers from a variety of state and local agencies that collaborate on the development of methodologies to aid U.S. EPA in the development of default data for the NEI. In order to provide the most accurate and complete nonpoint inventory possible, Ohio implemented quality control and quality assurance measures throughout the development of this inventory. Additionally, Ohio followed inventory preparation procedures in guidance documents provided by U.S. EPA and NOMAD. The quality control and quality assurance of nonpoint data was primarily an ad-hoc process led by U.S. EPA. This process included

comparing 2017 estimates to previous NEI cycles, gap-filling for missing pollutants, and evaluating outliers.

The Oil and Gas nonpoint category was estimated using well counts for conventional and unconventional wells, production data, and well site configuration data obtained from the Ohio Department of Natural Resources Division of Oil and Gas Resource Management. The data was processed through a Microsoft Access tool provided by U.S. EPA to estimate emissions. The tool was used only to estimate emissions from upstream activities since mid and downstream operations are accounted for in Ohio's point inventory. Since operating conditions were different for conventional and unconventional wells, the tool was run twice, once for conventional wells using U.S. EPA default data and then run again with adjustments for well configuration in the tool for unconventional wells. The results were summed for submission to U.S. EPA.

For industrial, commercial, and institutional (ICI) fuel combustion, solvents, gas distribution, and publicly owned treatment works (POTW), point source subtraction was used. This means either nonpoint activity data or emissions were adjusted to account for activity data or emissions that had already been reported in the point source inventory. This process was guided by the Point to Nonpoint Crosswalk which was provided by U.S. EPA. This crosswalk describes the similarities between point Source Classification Codes (SCCs) and nonpoint SCCs to help avoid double counting. Once the nonpoint activity data or emissions were identified, the data was imported into U.S. EPA tools for the specific sectors and a file was generated to be uploaded into the EIS Gateway's QA environment in draft form. The file was quality assured in U.S. EPA's QA environment and corrections were made to satisfy U.S. EPA's QA checks. Once all errors were corrected, final emissions were submitted in final form.

For remaining nonpoint categories other than the Ohio activity submissions (oil and gas, ICI, solvents, POTW, and gas distribution), U.S. EPA default activity data were used except in a few cases where Ohio compiled state-specific activity data. In these cases, state-specific data was collected from a variety of state organizations. Data for POTW, including annual discharge fees to estimate average flows and totals, were provided by the Division of Surface Water in the Ohio EPA.

The state-specific data was used in substitution of U.S. EPA default data. The templates provided by U.S. EPA were imported into Access database, where queries applied all relevant county/SCC combinations from the point source inventory, then overwrote the fields in the

template spreadsheet. This new template was then uploaded directly to the NEI SharePoint page for submission.

Throughout the process of the nonpoint inventory development, Ohio took part in monthly NOMAD calls along with calls for NOMAD sub-committees. Through the regular conference calls, states were able to provide input throughout the development process of the 2017 NEI. Also, the calls provided information and guidance which helped develop a consistent and accurate inventory.

Nonpoint 2017 emissions were collected from the 2017gb emissions modeling platform[6]. These files provided annual data which was converted to TPOSD using the conversion factors identified above.

2026 projected emissions in TPOSD, based on average May to September weekday emissions, were obtained from the 2026hc projected emissions inventory within the 2022v1 emissions modeling platform. This modeling platform used the 2020 NEI as its base year to project from.

Appendix E contains a list of the nonpoint source NO_x and VOC emissions for the 2017 base year and 2026 projected attainment year by SCC and county.

3.4. Mobile Source Emissions

Mobile sources are divided into two major categories, onroad and nonroad. Onroad mobile sources include cars, trucks, buses, and motorcycles used for transportation of goods and passengers on roads and streets. Nonroad mobile sources include other modes of powered transportation such as aircraft, locomotives, ships, and motor vehicles not associated with highway usage. This classification protocol has been utilized throughout this document.

3.4.1. Nonroad Mobile Emissions

The nonroad inventory collected from the 2017gb emissions inventory platform was initially developed in the 2017 NEI and for the 2026hc, from the 2020 NEI. During the development of the 2017 NEI the Motor Vehicle Emissions Simulator (MOVES-2014b) was run by U.S. EPA to generate nonroad emissions. During the development of the 2020 NEI, MOVES3 was run by U.S. EPA to generate projected 2026 nonroad emissions. Ohio EPA did not provide state

6 "2017gb_inventory_nonpoint_29jun2020" and "2017gb_inventory_CMV_12US1_29jun2020" files available at https://www.epa.gov/air-emissions-modeling/2017-emissions-modeling-platform (select 2017 Data Files and Summaries, 2017 emissions, then the specific files)

specific data for the development of nonroad emissions in either case. Since Ohio did not provide state specific data, data from default databases in MOVES was used to generate emissions.

Nonroad 2017 emissions were collected from the 2017gb emissions modeling platform[7]. This file provided monthly data which was converted to TPOSD by dividing July emissions by the number of days in July.

2026 projected emissions in TPOSD, based on average May to September weekday emissions, were obtained from the 2026hc projected emissions inventory within the 2022v1 emissions modeling platform.

Appendix F contains a list of the nonroad NO_x and VOC emissions for the 2017 base year and 2026 projected attainment year by SCC and county.

3.4.2. Onroad Mobile Emissions

Onroad emissions data were developed by NOACA, AMATS, and ODOT, in consultation with Ohio EPA and U.S. EPA Region 5, from emission factors produced by U.S. EPA's MOVES5 modeling system and data extracted from the region's updated travel-demand model. Appendix G contains a list of the onroad NO_x and VOC emissions for the 2017 base year and 2026 projected attainment year by SCC and county. Appendix H contains detailed methodology and data for onroad mobile source emissions.

3.5. Biogenic Emissions

Biogenic emissions come from natural sources, such as vegetation and soil. 2017 biogenic emissions were collected from the 2017gb emissions modeling platform. This file provided monthly data which was converted to TPOSD by dividing July emissions by the number of days in July.

2026 projected biogenic emissions in TPOSD, based on average May to September weekday emissions, were obtained from the 2026hc projected emissions inventory within the 2022v1 emissions modeling platform. However, U.S. EPA's Emissions Inventory Guidance states "biogenic emissions should not be included in the ROP/RFP baseline" (p. 52). Therefore, 2026

7 "2017gb_inventory_nonroad_FIPS_39" file available at https://www.epa.gov/air-emissions-modeling/2017-emissions-modeling-platform (select 2017 Data Files and Summaries, 2017 emissions, nonroad_by_state, then the specific file)

projections for biogenic emissions are not included in this inventory for purposes of ROP/RFP calculations.

3.6. Motor Vehicle Emissions Budgets (MVEBs)

The transportation conformity rule (40 CFR Part 93) requires that attainment plans establish motor vehicle emissions budgets (MVEBs) for the area's attainment year (2026) for ozone precursors (NO_x and VOC). A motor vehicle emissions budget for the purposes of an ozone attainment plan is that portion of the total allowable emissions within the nonattainment area allocated to on-road sources as defined in the submitted attainment plan as being necessary to attain the NAAQS.

Transportation conformity is required by CAA Section 176(c) (42 U.S.C. 7506(c)) to ensure that federal funding and approval are given to highway and transit projects that are consistent with ("conform to") the air quality goals established by a state SIP. Conformity, for the purpose of the SIP, means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment or interfere with maintenance of the NAAQS. The federal requirements apply to areas designated as nonattainment for one or more NAAQS, or which have been redesignated to attainment with federally approved air quality maintenance plans.

The federal transportation conformity rule (40 CFR 93.100-160) provides the process by which the air quality impacts of transportation plans, transportation improvement programs, and transportation projects are analyzed. The agency preparing the plans, programs, or projects must analyze the emissions expected from such proposals in accordance with the transportation conformity rule (40 U.S.C. Section 7506).

As discussed above, NOACA, AMATS, and ODOT, in consultation with Ohio EPA and U.S. EPA Region 5, prepared motor vehicle emissions inventories for 2017 and 2026 for the purpose of setting MVEBs (Table 12). These inventories were developed using appropriate and up-to-date assumptions about vehicle miles traveled (VMT), socioeconomic variables, fuels used, weather inputs, other planning assumptions, and the latest approved motor vehicle emissions model (MOVES5). All methodology is detailed in Appendix H.

Table 12. Total onroad mobile emissions in the Cleveland Ozone Nonattainment Area (TPOSD).

	2017	2026
NO_x (TPOSD)	51.91	21.17
VOC (TPOSD)	31.69	17.72
VMT (miles/day)	26,580,938,120	26,711,202,970

Table 13 identifies Ohio's 2026 MVEBs with a safety margin for the Cleveland Ozone Nonattainment Area. The mobile budgets, agreed upon as part of the interagency consultation process (Appendix H), include the onroad mobile emissions estimates calculated for 2026 with an additional 15% safety margin allocated to those estimates. The 15% safety margin was calculated by taking 15% of the onroad mobile source emissions estimates. To accommodate future variations in travel demand models and VMT forecast when no change to the network is planned, U.S. EPA has historically approved such a reasonable approach to address this variation.

Table 13. MVEBs for the Cleveland Ozone Nonattainment Area (TPOSD).

	2026 Projected Onroad Mobile Emissions	2026 Onroad Mobile Emissions Safety Margin Allocation	2026 Total Onroad Mobile Emissions Budget
NO_x (TPOSD)	17.72	2.66	20.38
VOC (TPOSD)	21.17	3.18	24.34
VMT (miles/day)	26,711,202,970	—	—

A 15% safety margin is appropriate for several reasons. First, there is an acknowledged potential variation in VMT forecast and potential estimated mobile source emissions due to expected modifications to travel demand and mobile emissions models. Second, Ohio is demonstrating that RFP requirements are satisfied even when accounting for the additional emissions from the safety margin (as shown in Section 4). Third, the LADCO modeling (described further in Section 8) projects 2026 ozone values below the standard at all monitors within the Cleveland Ozone Nonattainment Area. Although the total modeled inventory is slightly lower than the SIP inventory when considering the added safety margins, these

inventories are reasonably comparable, and modeling is not considered absolute. Even if modeled emissions were increased slightly to be comparable to the SIP inventory, it would be reasonable to assume that the modeling would continue to show attainment.

The safety margin, as defined by the conformity rule at 40 CFR 93.101, looks at the total emissions from all sources in the area. The definition states "safety margin" means 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. Ohio's actual allocation of a 15% safety margin is at, or well below, the levels required for RFP or attainment.

4. Reasonable Further Progress (RFP)/Rate of Progress (ROP)

The Implementation Rule defines RFP for moderate nonattainment areas with a VOC ROP plan approved under a prior ozone NAAQS as a demonstration that there has been at least a 15% emissions reduction between the base year (2017) and 6 years after the base year (2023) (83 FR 63034). Since U.S. EPA approved the ROP plan for the Cleveland Ozone Nonattainment Area under the 1997 ozone NAAQS (see 74 FR 47414), the moderate RFP requirement is a 15% emissions reduction between 2017 and 2023. For serious nonattainment areas, an additional 9% emissions reduction must also be shown by nine years after the base year (2026). Ultimately, a 24% emissions reduction must be shown between the base year (2017) and the serious attainment year (2026) to fulfill the 15% moderate RFP and 9% serious ROP requirements. These requirements can be satisfied with any combination of anthropogenic NO_x and VOC reductions that are attributable to specific control measures.

As shown in Table 14, Ohio is demonstrating RFP/ROP requirements are satisfied by reductions in NO_x and VOC emissions in the onroad mobile sector attributable to federal onroad control programs, even when accounting for the additional emissions contributed to 2026 emissions in the onroad mobile sector from the safety margin included in the MVEBs as discussed above.

Table 14. Demonstration of RFP/ROP for the Cleveland Ozone Nonattainment Area.

Description	Formula	VOC	NO_X
A. 2017 Base Year Inventory (*adjusted using MOVES5)*		190.03	108.07
15% Moderate Ozone Nonattainment Area RFP			
B. RFP reductions totaling 15% (VOC% +NO_x% = 15%)		3%	12%
C. RFP emissions reductions required to meet 15% RFP	A×B	5.70	12.97
D. RFP target level for 2023	A - C	184.33	95.10
9% Serious Ozone Nonattainment Area ROP			
E. ROP reductions totaling 9% (VOC% +NO_x% = 9%)		1%	8%
F. ROP emissions reductions required to meet 9% ROP	A×E	1.90	8.65
G. ROP target level for 2026	A - C - F	182.43	86.46
H. Reductions between 2017 and 2026			
Federal onroad control programs		13.97	30.74
Total reductions		13.97	30.74
I. Adjustments to reductions			
Allocation to 15% Moderate RFP Reductions		5.70	12.97
Allocation to 2023 Moderate MVEB (15% safety margin from Moderate Plan)		2.95	4.66
Allocation to 2026 Serious MVEB (15% safety margin)		2.66	3.18
Total adjustments to reductions		11.31	20.80
J. Creditable reductions	H - I	2.66	9.94
K. Compare creditable reductions to ROP reduction requirements to determine if at least 9% reduction is achieved	J ≥ F	Yes	Yes
L. 2026 projected emissions		142.69	64.02
M. Compare ROP target with 2026 projected emissions to determine if ROP requirements are met	L ≤ G	Yes	Yes

As described above, onroad emissions were determined using U.S. EPA's MOVES5 model. The MOVES5 model incorporates several federal emissions control programs into its projections. These emissions reduction measures are permanent and enforceable and are implemented in the nonattainment area. The MOVES5 model assumed increases in vehicle or equipment population and usage while projecting decreases in ozone precursor emissions from 2017 to 2026. The estimated emissions reductions are therefore not due to reductions in source

activity, but to the implementation of control measures. Table 15 lists the federal permanent and enforceable onroad emissions control programs modeled by the MOVES5 model.

Table 15. Federal onroad emissions control programs modeled by MOVES5.

Onroad Emissions Control Program	Pollutants	Model Year [a]	Regulation
Passenger vehicles, sport utility vehicles (SUVs), and light duty trucks – emissions and fuel standards	VOC & NO_x	2004-09+ (Tier 2) 2017+ (Tier 3)	40 CFR Parts 85, 86
Light-duty trucks and medium duty passenger vehicle – evaporative standards	VOC	2004-10	40 CFR Part 86
Heavy-duty highway compression engines	VOC & NO_x	2007+	40 CFR Part 86
Heavy-duty spark ignition engines	VOC & NO_x	2005-08+	40 CFR Part 86
Motorcycles	VOC & NO_x	2006-10 (Tiers 1-2)	40 CFR Part 86
Mobile Source Air Toxics – fuel formulation, passenger vehicle emissions, and portable container emissions	Organic Toxics & VOC	2009-15[b]	40 CFR Parts 59, 80, 85, 86
Light-duty vehicle corporate average fuel economy standards	Fuel efficiency (VOC & NO_x)	2012-16 & 2017-25	40 CFR Part 600
The Greenhouse Gas (GHG) Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2	Fuel efficiency (VOC & NO_x)	2018–2027	40 CFR Parts 9, 22, 85, 86, 600, 1033, 1036, 1037, 1039, 1042, 1043, 1065, 1066, 1068
Safer Affordable Fuel Efficient (SAFE) Vehicles Rule	Fuel efficiency (VOC & NO_x)	2021-2026	40 CFR Parts 86, 600
Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards	GHG	2023-2026	40 CFR Parts 19, 86, 523, 600, 1066, 1867
Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards	NO_x	2027+	40 CFR Parts 2, 59, 60, 80, 86, 87, 600, 1030, 1031, 1033, 1036, 1037, 1039, 1042, 1043, 1045, 1048, 1051, 1054, 1060, 1065, 1066, 1068, 1090
Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles	VOC & NO_x	2027+	40 CFR Parts 19, 86, 523, 600, 1066, 1867
Greenhouse Gas Emissions Standard for Heavy-Duty Vehicles – Phase 3	GHG	2027+	40 CFR Parts 86, 1036, 1037, 1039, 1054, 1065

[a] The range in model years affected can reflect phasing of requirements based on engine size or initial years for replacing earlier tier requirements.
[b] The range in model years reflects phased implementation of fuel, passenger vehicle, and portable container emission requirements as well as the phasing by vehicle size and type.

While there are numerous other emissions reductions that Ohio could rely on for the RFP/ROP demonstration, only the emissions reductions in the onroad mobile sector attributable to federal onroad programs are necessary. Additional reductions between 2017 and 2026 that Ohio is not relying on, but provide additional weight of evidence that RFP requirements have been met, include:

- 11.46 TPOSD of VOC and 9.84 TPOSD of NO_x emissions reductions from the nonroad sector. These are not included in the RFP/ROP demonstration as the reductions are not readily linked to specific control measures.
- 0.69 TPOSD of VOC and 3.63 TPOSD of NO_x emissions reductions from the permanent shutdown of various point sources. These source shutdowns are not included in the RFP/ROP demonstration to reserve these emissions reductions for future use as offsets or for other needs. These emissions reductions from permanent source shutdowns are shown in Table 16.

Table 16. Emissions reductions from permanent source shutdowns in the Cleveland Ozone Nonattainment Area between 2017 and 2026.

Facility Name (Facility ID)	**VOC (TPOSD)**	**NO_x (TPOSD)**
3M Elyria (0247040822)	7.73E-2	5.84E-3
Demag Cranes and Components Corp. (1318535255)	3.35E-3	N/A
MAR-BAL, INC. (0228000194)	4.78E-3	N/A
Cansto Coatings LLC (1318008350)	7.17E-3	N/A
Ritrama Duramark (1318007355)	3.05E-2	N/A
Trelleborg Sealing Profiles NA (1667080043)	1.28E-2	4.58E-3
DiGeronimo Aggregates LLC (1318270383)	1.13E-3	2.25E-1
Schwebel Baking Co. (Solon) (1318538152)	N/A	2.43E-4
Eastlake Substation (0243160009)	1.31E-5	3.71E-3
M.P.C. Plating, Inc. (1318000838)	1.27E-2	N/A
ROSBY RESOURCE RECYCLING, INC. (1318118050)	N/A	1.37E-2
The Babcock and Wilcox Research Center (1677020156)	4.94E-7	4.42E-6
Amcor Flexibles North America, Inc. (1677000105)	3.59E-1	4.32E-3
Vibrantz Technologies (1318170235)	N/A	3.90E-1
Avon Lake Power Plant (0247030013)	2.07E-2	2.47E+0
Angstrom Graphics Midwest, Inc. (1318170170)	2.64E-2	2.87E-4
Baker Mc Millen Company (1677110035)	7.06E-3	N/A
Lorain County LFG Power Station (0247100968)	1.11E-1	5.11E-1
NEWKOR, INC. (1318005362)	1.80E-2	N/A
Total Emissions Reductions from Permanent Source Shutdowns	*0.69*	*3.63*

5. Source Emission Statement

Marginal areas are required to submit an emission statement under Section 182(a)(3)(B) of the CAA (78 FR 34202). The emission statement must: ‘‘. . . require that the owner or operator of each stationary source of oxides of nitrogen or volatile organic compounds provide the state with a statement, in such form as the Administrator may prescribe (or an equivalent alternative developed by the state), for classes or categories of sources, showing the actual emissions of oxides of nitrogen and volatile organic compounds from that source. The first such statement shall be submitted within 3 years after the date of the enactment of the CAA Amendments of 1990. Subsequent statements shall be submitted at least every year thereafter. The statement shall contain a certification that the information contained in the statement is accurate to the best knowledge of the individual certifying the statement” (78 FR 34202). U.S. EPA requires that this SIP submittal of the emission statement program be due 2 years after the effective date of designations (83 FR 63000).

In July 1992, U.S. EPA published a guidance memorandum on source emission statements titled, ‘Guidance on the Implementation of an Emission Statement Program.’ Further guidance was provided to clarify the source emission statement requirements were applicable to all areas designated nonattainment for the 1997 ozone NAAQS and classified as Marginal or higher under subpart 2, part D, title I of the CAA Amendments. The Proposed Implementation Rule similarly applies the memorandum ‘‘Emission Statement Requirements Under 8-hour Ozone NAAQS Implementation,’’ dated March 14, 2006, to all areas designated nonattainment for the 2008 ozone NAAQS and classified as Marginal or higher under subpart 2 (78 FR 34202).

All the Ohio 2015 ozone NAAQS nonattainment areas have an emission statement program in place due to historic nonattainment designations for an earlier ozone NAAQS. The Implementation Rule indicates that “a state may have an emissions statement regulation (per CAA Section 182(a)(3)(B)) that has been previously approved by the EPA for a prior ozone NAAQS that covers all the state’s nonattainment areas and relevant classes and categories of sources for the 2015 ozone NAAQS, and that is likely to be sufficient for purposes of meeting the emissions statement requirement for the 2015 ozone NAAQS. Where an air agency determines that an existing regulation is adequate to meet applicable nonattainment area planning requirements of CAA Section 182 (or ozone transport region, OTR, RACT requirements of CAA Section 184) for a revised ozone NAAQS, that air agency’s SIP revision

may provide a written statement certifying that determination in lieu of submitting new revised regulations" (83 FR 63002).

Ohio EPA has the authority under OAC Chapter 3745-24[8] to request NO_x and VOC Emission Statements, which applies to any facility located in a county that is out of attainment for the NAAQS for ozone and emits greater than or equal to 25 TPY of VOC or NO_x during the reporting year. In general, facilities subject to this requirement must submit actual emissions data for NO_x and VOC.

Ohio's current emission statement program was approved by U.S. EPA into Ohio's SIP on September 27, 2007 (72 FR 54844) and confirmed on March 3, 2021 (86 FR 12270).

8 https://epa.ohio.gov/static/Portals/27/regs/3745-24/3745-24_Complete.pdf

6. Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM)

6.1. Reasonably Available Control Technology (RACT)

The Implementation Rule requires states with nonattainment areas classified as moderate or higher to submit a SIP revision that meets the VOC and NO_x RACT requirements in CAA Sections 182(b)(2) and 182(f). The Bump-Up Rule and Reclassified Ozone Areas Rule established the deadline for submission of the RACT SIP revision for serious ozone nonattainment in the Cleveland Ozone Nonattainment Area as January 1, 2026 (90 FR 5651). Ohio submitted the RACT SIP for the 2015 Ozone NAAQS for the Serious Classification to U.S. EPA for approval on March 17, 2025[9], fulfilling this requirement.

As described further in Ohio's RACT SIP, the Cleveland Ozone Nonattainment Area has previously been subject to moderate area planning requirements under prior ozone standards and therefore already satisfied much of the RACT requirements under the 2015 ozone standard. When Ohio was reclassified to moderate under the 2015 ozone standard, Ohio performed an updated assessment of RACT and, for certain source categories, submitted revisions to regulations that establish new or more stringent RACT controls. Revisions to Ohio's NO_x RACT rules in OAC Chapter 3745-110 became effective on March 25, 2022, and revisions to Ohio's VOC RACT rules in OAC Chapter 3745-21 became effective on March 27, 2022. For other source categories, Ohio EPA certified that previously adopted RACT regulations and controls represent RACT for implementing the 2015 ozone NAAQS under the moderate classification. The moderate RACT SIP was submitted on March 20, 2022[10].

When Ohio was reclassified to serious nonattainment for ozone, Ohio submitted regulations that establish new or more stringent RACT requirements for RACT sources. For other source categories, Ohio summarized the current status of implementation of RACT from the moderate classification. Revisions to Ohio's NO_x RACT rules in OAC Chapter 3745-110, revisions to Ohio's VOC RACT rules in OAC Chapter 3745-21, and revisions to permitting requirements in OAC Chapter 3745-31 became effective on April 1, 2025. These rule changes lowered the threshold for NOx and VOC RACT applicability from 100 TPY to 50 TPY. It also

9 https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans/division-of-air-pollution-control-sip-2015

10 https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans/division-of-air-pollution-control-sip-2015

lowered some exemption levels. As a result, more new sources will become subject to RACT. Ohio also lowered the major source permitting thresholds from 100 TPY to 50 TPY.

6.2. Reasonably Available Control Measures (RACM)

CAA Section 172(c)(1) requires that states implement any RACM necessary for attainment of the NAAQS. The Implementation Rule requires a state to demonstrate that it has "adopted all RACM necessary to demonstrate attainment as expeditiously as practicable and to meet any RFP requirements. The SIP revision shall include, as applicable, other control measures on sources of emissions of ozone precursors located outside the nonattainment area, or portion thereof, located within the state if doing so is necessary or appropriate to provide for attainment of the applicable ozone NAAQS in such area by the applicable attainment date" (83 FR 63035). The Bump-Up Rule and Reclassified Ozone Areas Rule require that RACT/RACM be implemented as expeditiously as practicable but no later than the beginning of the applicable attainment year, i.e., January 1, 2026 (87 FR 60907; 90 FR 5651).

Ohio, along with other LADCO states, worked with LADCO on two projects to identify and evaluate candidate emissions controls for reducing NO_x and VOC emissions in the LADCO region, with particular focus on ozone nonattainment areas including the Cleveland Ozone Nonattainment Area. Under contract with LADCO, Ramboll completed two projects: one which investigated potential control measures in all inventory sectors, and one which focused on NO_x control options for industrial point sources (i.e., non-EGU sources). The full reports from these projects are available on LADCO's website at https://www.ladco.org/technical/projects/ramboll-o3-precursors-contract-2020/.

In the first project, Ramboll conducted an analysis of over 300 candidate control measures applicable to point, nonpoint, and mobile emission sources in the LADCO region. First, Ramboll identified existing NO_x and VOC control measures in the LADCO region to provide context for potential emissions reductions from control options. Ramboll then compiled a comprehensive master list of potential control measures, which were then screened based on potential emission reductions, cost effectiveness and other factors to develop a shortlist of candidate control measures for which they conducted a more detailed evaluation. Detailed evaluation was conducted for five source categories: locomotives, harbor craft, gasoline non-road small off-road equipment, heavy duty trucks, and diesel non-road.

In the second project, Ramboll developed a master list of NO_x controls for stationary sources and evaluated potential emissions reductions and costs for ten selected source categories

under various scenarios. The source categories included cement kilns, coal non-EGUs, coke, glass sources, diesel-fired internal combustion engines, natural gas-fired internal combustion engines, iron and steel sources, lime kilns, and process heaters. The scenarios looked at a combination of three levels of control stringency (high, medium and low stringency) and applicability to sources at four different levels based on an assumed potential-to-emit of 100 TPY, 50 TPY, 25 TPY and 10 TPY.

Ohio considers the comprehensive assessment of candidate control options developed under the second task of the first project (Appendix I) to serve as the primary basis for the RACM evaluation, while the detailed evaluation of select control measures in both projects lends additional support to this assessment. The comprehensive master list was developed using U.S. EPA's Menu of Control Measures as a starting point to identify a broad list of control options and was complemented with additional control options identified from various other resources. As shown in Appendix I, Ramboll estimated the available emissions reductions in the Cleveland Ozone Nonattainment Area for each potential control option.

As described in Section 8 of this submittal, Ohio is demonstrating that attainment is achieved in the Cleveland Ozone Nonattainment Area and therefore no additional control measures are required for that purpose. However, additional control measures are required for RACM if they can advance the attainment date by a year or more. This means that any measures advancing the attainment date by a year would have needed to be in place by January 1, 2025. While some of the control measures identified in these studies may provide NO_x or VOC emissions reductions beyond what is currently required, Ohio EPA has concluded there is no possibility of implementing any level of additional control that would advance the attainment date, as it has already passed. Accordingly, no additional controls or emission reductions requirements in the Cleveland Ozone Nonattainment Area are applicable for RACM under the 2015 ozone NAAQS.

7. Enhanced Vehicle Inspection and Maintenance (I/M) Program

The CAA requires moderate nonattainment areas to have a motor vehicle inspection and maintenance (I/M) program that meets the "basic" program requirements of CAA Section 182(b)(4), while serious nonattainment areas are required to have an I/M program that meets the "enhanced" program requirements of CAA Section 182(c)(3). Ohio is certifying that the existing I/M program meets the enhanced vehicle I/M program requirements of CAA Section 182(c)(3) for the Cleveland Ozone Nonattainment Area. The Cleveland Ozone Nonattainment Area began implementing an I/M program in 1996. This program was approved by U.S. EPA on December 17, 1993 (58 FR 65933), April 4, 1995 (60 FR 16989), and January 6, 1997 (62 FR 646).

Consistent with 40 CFR 51.351(d), states with existing I/M programs must submit a performance standard modeling analysis and make any necessary program revisions as part of their serious ozone nonattainment area SIP submissions to ensure that I/M programs are operating at or above the enhanced I/M performance standard level for the 2015 ozone NAAQS.

Ohio has prepared an analysis using MOVES5 in accordance with U.S. EPA's October 2022 "Performance Standard Modeling for New and Existing Vehicle Inspection and Maintenance (I/M) Programs Using the MOVES Mobile Source Emissions Model"[11]. Appendix J provides a description of the analysis and modeling results. In all cases, the emission reductions from Ohio's actual I/M program shows Ohio's program performs better than the performance standard (and is therefore within the 0.02 gram per mile buffer of the emission reductions from the U.S. EPA model program under 40 CFR 51.351(i)). Therefore, Ohio's current I/M program meets the applicable enhanced vehicle I/M program performance requirements in 40 CFR 51.351(i) in all areas in which the program is implemented[12].

11 https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1015S5C.pdf

12 In a few cases, an area might need to demonstrate that their current I/M program satisfies the Basic I/M SIP requirement for one 8-hour NAAQS while also demonstrating that the area meets Enhanced I/M SIP requirement for another ozone NAAQS. In such cases, U.S. EPA allows an area to use only the 8-hour ozone Enhanced performance standard when both the Basic and Enhanced I/M programs under the two ozone standards are involved since it is reasonable to presume that if an I/M program meets the Enhanced performance standard, then it would also meet the Basic performance standard.

8. Attainment Demonstration Strategy

The Implementation Rule requires areas classified as serious to submit an attainment demonstration that provides for emissions reductions necessary to attain the NAAQS by the attainment date. The demonstration must include inventory data, modeling results, and an emissions reduction analysis on which the state has based its projected attainment data. All control measures needed for attainment must be implemented as expeditiously as practicable but no later than the beginning of the attainment year ozone season (83 FR 63033 to 63034).

One important component of a state's control strategy is the suite of control measures that a state is already implementing or will be implementing to comply with national, regional, or state and local regulations already adopted or promulgated that lead to permanent and enforceable reductions in emissions after the area is designated nonattainment. Ohio's attainment demonstration modeling analysis evaluates the potential effects of all these measures and demonstrates they contribute toward timely attainment for the Cleveland Ozone Nonattainment Area.

8.1. Control Strategy

8.1.1. Federal On-the-Books Programs

U.S. EPA has adopted several national rules that require or will require emission reductions from sources of ozone precursors emissions. For Ohio, these rules will provide emissions reductions between the base year of 2017 and the projected attainment year of 2026. The national rules that will help states meet their attainment dates include, but are not limited to:

- NO_x SIP Call

Controls for EGUs under the NO_x SIP Call formally commenced May 31, 2004. Emissions covered by this program have been generally trending downward since 1998 with larger reductions occurring in 2002 and 2003. Data taken from the U.S. EPA Clean Air Markets website quantify the gradual NO_x reductions that have occurred in Ohio as a result of Title IV of the 1990 CAA Amendments and the beginning of the NO_x SIP Call Rule. Ohio developed the NO_x Budget Trading Program rules in OAC Chapter 3745-14[13] in response to the SIP Call. OAC Chapter 3745-14 regulates EGUs and certain non-EGUs under a cap-and-trade program based

13 https://epa.ohio.gov/static/Portals/27/regs/3745-14/3745-14_Complete.pdf

on an 85 percent reduction of NO_x emissions from EGUs and a 60 percent reduction of NO_x emissions from non-EGUs, compared to historical levels. This cap stayed in place through 2008, at which time the Clean Air Interstate Rule (CAIR) program superseded it.

On April 21, 2004, U.S. EPA published Phase II of the NO_x SIP Call that establishes a budget for large (greater than 1 ton per day emissions) stationary internal combustion engines. Ohio EPA's OAC rule 3745-14 addresses stationary internal combustion engines, all used in natural gas pipeline transmissions. U.S. EPA approved this revision to the SIP on April 4, 2008. An 82 percent NO_x reduction from 1995 levels was anticipated. Completion of the compliance plan occurred by May 1, 2006, and the compliance demonstration began May 1, 2007. The 2007 controlled NO_x emissions are 599 tons statewide for the ozone season.

As discussed further below, starting January 1, 2009, CAIR commenced, and emissions covered by this program have continued trending downward. Reductions in NO_x emissions from EGUs both within the nonattainment area and elsewhere in Ohio and in neighboring states contribute to declining ozone levels. CAIR's cap-and-trade program stayed in place through 2014, at which time the Cross-State Air Pollution Rule (CSAPR), CSAPR Update, and Revised CSAPR programs superseded it.

As Ohio non-EGUs are not covered under the CSAPR programs, Ohio modified the NO_x budget program rules in OAC Chapter 3745-14 effective January 29, 2018, to replace trading provisions for the non-EGUs with a demonstration that the statewide ozone season NO_x budget established by the NO_x SIP Call continues to be met.

- Clean Air Interstate Rule (CAIR)/Cross-State Air Pollution Rule (CSAPR)/Good Neighbor Plan (GNP)

On May 12, 2005, U.S. EPA published the following regulation: "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (CAIR); Revisions to Acid Rain Program; Revisions to the NO_x SIP Call; Final Rule." This rule established the requirement for states to adopt rules limiting the emissions of NO_x and sulfur dioxide (SO_2) and provided a model rule for the states to use in developing their rules in order to meet federal requirements. The purpose of CAIR was to reduce interstate transport of particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), SO_2, and ozone precursors such as NO_x.

CAIR applied to any stationary fossil fuel-fired boiler or stationary fossil fuel-fired combustion turbine, or a generator with a nameplate capacity of more than 25 megawatt electrical (MWe)

producing electricity for sale. This rule provided annual state caps for NO_x and SO_2 in two phases, with Phase I caps for NO_x and SO_2 taking effect in 2009 and 2010, respectively. Phase II caps were to become effective in 2015. U.S. EPA allowed limits to be met through a cap-and-trade program if a state chose to participate in the program. SO_2 emissions from power plants in the 28 eastern states, as well as the District of Columbia (D.C.), subject to CAIR were to be cut by 4.3 million tons from 2003 levels by 2010 and 5.4 million tons from 2003 levels by 2015. NO_x emissions were to be cut by 1.7 million tons by 2009 and reduced by an additional 1.3 million tons by 2015. In response to U.S. EPA's rulemaking, Ohio submitted a CAIR SIP which was approved by U.S. EPA on February 1, 2007. Revisions to the CAIR SIP were again submitted on July 15, 2009. The revised CAIR SIP was approved as a direct final action on September 25, 2009 (74 FR 48857). Ohio's rule included annual and seasonal NO_x trading programs, and an annual SO_2 trading program. This rule required compliance effective January 1, 2009.

In July 2008, the D.C. Circuit court vacated CAIR and issued a subsequent remand without vacatur of CAIR in December 2008. The court then directed U.S. EPA to revise or replace CAIR in order to address the deficiencies identified by the court. On July 6, 2011, U.S. EPA finalized CSAPR as a replacement for CAIR. On August 21, 2012, the U.S. Court of Appeals for the D.C. Circuit vacated CSAPR and directed U.S. EPA to continue administering CAIR "pending the promulgation of a valid replacement." In a subsequent decision on the merits, the Court vacated CSAPR based on a subset of petitioners' claims, but on April 29, 2014, the U.S. Supreme Court reversed that decision and remanded the case to the D.C. Circuit court for further proceedings. Throughout the initial round of D.C. Circuit proceedings and the ensuing U.S. Supreme Court proceedings, the stay remained in place and U.S. EPA has continued to implement CAIR. In order to allow CSAPR to replace CAIR in an equitable and orderly manner while further D.C. Circuit Court proceedings were held to resolve petitioner's remaining claims, U.S. EPA filed a motion asking the D.C. Circuit Court to lift the stay. U.S EPA also asked the court to toll all CSAPR compliance deadlines that had not passed as of the date of the stay order by three years. On October 23, 2014, the Court granted the U.S. EPA's motion. CSAPR became effective on January 1, 2015, for SO_2 and annual NO_x, and May 1, 2015, for ozone season NO_x. Combined with other final state and U.S. EPA actions, CSAPR will reduce power plant SO_2 emissions by 73% and NO_x emissions by 54% from 2005 levels in the CSAPR region.

On November 16, 2015, U.S. EPA proposed an update to CSAPR that bring even greater reductions in NO_x emissions (80 FR 75706, December 3, 2015). U.S. EPA estimated the rule

would reduce summertime NO_x emissions from EGUs in the East (including Ohio) by 85,000 tons in 2017 compared to projections without the rule. Due to this rule and other changes already underway in the power sector, U.S. EPA estimated ozone season NO_x emission would be 150,000 tons lower in 2017 than in 2014, a reduction of more than 30%. On September 7, 2016, the CSAPR Update was finalized (81 FR 74504). Implementation began in May 2017 and additional emissions reductions from EGUs continue.

On April 30, 2021, U.S. EPA finalized the Revised CSAPR Update in order to fully address states' outstanding interstate pollution transport obligations for the 2008 ozone standard (86 FR 23054). Starting in 2021, additional reductions were required to Ohio's ozone season NO_x allocations. The Revised CSAPR Update provides for a reduction of almost 10,000 tons of ozone season NO_x in Ohio statewide, a reduction of over 50%.

On June 5, 2023, US EPA finalized a FIP to assure that the states identified in the "Good Neighbor Plan" do not significantly contribute to problems attaining and maintaining the 2015 Ozone NAAQS in downwind states. This rule established an allowance-based ozone season trading program with NO_x emissions budgets for fossil fuel-fired power plants in 25 states, by revising and strengthening the CSAPR "NO_x Ozone Season Group 3 Trading Program". The FIP also established NO_x emissions limitations for certain other industrial stationary sources in 23 states.

This rule would reduce ozone forming NO_x emissions from the 26 significantly contributing upwind states by approximately 94,000 tons during the 2026 ozone season (May 1 – September 30) compared to a business-as-usual scenario. About half of those emissions reductions would come from fossil fuel-fired power plants, reducing their ozone season NO_x emissions by 29% from pre-proposal levels. The additional 47,000 tons of NO_x emissions reductions would come from the other industrial sources covered by the proposal, representing a 15% reduction from pre-proposal levels. These reductions would improve air quality in dozens of areas.

The plan would also reduce other harmful pollutants from power plants. In 2026 alone, U.S. EPA estimates that this proposal would reduce SO_2 emissions by 106,000 tons, $PM_{2.5}$ emissions by 9,000 tons, and carbon dioxide emissions by 40 million metric tons.

On June 27, 2024, the United States Supreme Court stayed the GNP pending judicial review. Then on March 12, 2025, U.S. EPA announced they would be tackling the GNP issue and

working with states regarding their SIPs. The Revised CSAPR Update continues to be implemented at this time.

- Tier III Emission Standards for Vehicles and Gasoline Sulfur Standards

In March 2014, U.S. EPA finalized a federal rule to further strengthen Tier II vehicle emission and fuel standards. This rule will require automakers to produce cleaner vehicles and refineries to make cleaner, lower sulfur gasoline. This rule is being phased in between 2017 and 2025. Tier III requires all passenger vehicles to meet an average standard of 0.03 gram/mile of NO_x. Compared to Tier II, the Tier III tailpipe standards for light-duty vehicles are expected to reduce NO_x and VOC emissions by approximately 80%. Tier III vehicle standards also include evaporative standards using onboard diagnostics that will result in a 50% reduction in VOC emissions compared to Tier II reductions. The rule began reducing the sulfur content of gasoline to 10 ppm, starting in January 2017.

- Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements

In January 2001, U.S. EPA issued a final rule for Highway Heavy Duty Engines, a program which includes low-sulfur diesel fuel standards, which were phased in from 2004 through 2007. This rule applies to heavy-duty gasoline and diesel trucks and buses. Fleet turnover will ensure continued emissions reductions from this category for many years. This rule will result in a 40 percent reduction in NO_x from diesel trucks and buses, a large sector of the mobile sources NO_x inventory. It also estimated the level of sulfur in highway diesel fuel was reduced by 97 percent by mid-2006. U.S. EPA's MOVES emissions model accounts for the continued emissions reductions from this program in future years due to fleet turnover.

- Control of Emissions for Nonroad Spark Ignition (SI) Engines and Equipment

Effective in January 2003, this standard regulates NO_x, VOC, and CO for groups of previously unregulated non-road engines. This standard applies to all new engines sold in the United States and imported after the standards went into effect. The standard applies to large SI engines (forklifts and airport ground service equipment), recreational vehicles (off-highway motorcycles and all-terrain vehicles), and recreational marine diesel engines. When fully implemented, an overall 80% reduction in NO_x, 72% reduction in VOC, and 56% reduction in CO emissions was expected by 2020.

On October 8, 2008, U.S. EPA set emission standards for new nonroad SI engines. The exhaust emission standards applied starting in 2010 for new marine SI engines, including first-time U.S. EPA standards for sterndrive and inboard engines. Exhaust emission standards also applied starting in 2011 and 2012 for different sizes of new land-based SI engines at or below 19 kW. These small engines are used primarily in lawn and garden applications. U.S. EPA also adopted evaporative emission standards for vessels and equipment using any of these engines. U.S. EPA estimates that by 2030, this rule will reduce annual nationwide VOC by 604,000 tons, NO_x by 132,200 tons, and $PM_{2.5}$ by 5,500 tons.

- Reciprocating Internal Combustion Engines (RICEs) National Emissions Standards for Hazardous Air Pollutants (NESHAPs)

U.S. EPA has issued multiple regulations that cover different types of RICEs. U.S. EPA promulgated the National Emissions Standard for Hazardous Air Pollutants (NESHAP) for existing, new, and reconstructed stationary RICEs greater than 500 horsepower (hp) located at major sources on June 15, 2004 (69 FR 33474). U.S. EPA promulgated the NESHAP for new and reconstructed stationary RICE that are located at area sources of hazardous air pollutant (HAP) emissions and for new and reconstructed stationary RICE that have a site rating of less than or equal to 500 hp that are located at major sources of HAP emissions on January 18, 2008 (73 FR 3568). On March 3, 2010, U.S EPA promulgated the NESHAP for existing stationary compression ignition (CI) RICEs with a site rating of less than or equal to 500 hp located at major sources, existing non-emergency CI engines with a site rating greater than 500 hp at major sources, and existing stationary CI RICEs of any site rating located at area sources (75 FR 9674). On August 20, 2010, U.S EPA promulgated the NESHAP for stationary SI RICEs that are located at area sources of HAPs or have a site rating of less than or equal to 500 brake hp and are located at major sources of HAPs (75 FR 51570).

On January 14, 2013, the rule was revised due to legal challenges and petitions for reconsideration. U.S. EPA estimated the revised rule would reduce particulate matter (PM) by 2,800 TPY, NO_x by 9,600 TPY, and VOC by 36,000 TPY starting in 2013.

- Existing Stationary CI RICE NESHAPs

This standard became effective on May 3, 2010, and regulates emissions of air toxics from existing diesel-powered stationary RICEs that meet specific site rating, age, and size criteria. These engines are typically used at industrial facilities (e.g. power, chemical, and

manufacturing plants) to generate electricity for compressors and pumps and to produce electricity to pump water for flood and fire control during emergencies.

The standard applies to stationary diesel engines: (1) that are located at a major source of air toxics emissions and that were installed prior to June 12, 2006; (2) used at major sources of air toxics, having a site rating of less than or equal to 500 horsepower and were constructed or reconstructed before June 12, 2006; and (3) used at major sources of air toxics for nonemergency purposes, having a site rating of greater than 500 horsepower and were constructed or reconstructed before December 19, 2002.

Operators of existing engines were required to: (1) install emission control equipment that would limit air toxics up to 70% for stationary non-emergency engines with a site rating greater than 300 horsepower; (2) perform emission tests to demonstrate engine performance and compliance with rule requirements; and (3) burn ultra-low sulfur fuel in stationary non-emergency engines with a site rating greater than 300 horsepower.

The engine standards took effect in 2013. According to U.S. EPA estimates, this rule has resulted in emission reductions from existing diesel-powered stationary RICEs of approximately 1,000, 2,800, and 27,000 TPY of air toxics, $PM_{2.5}$, and CO, respectively. Although these standards do not directly target ozone precursors, the reduction in air toxics and other pollutants does indirectly influence ozone and helps future improvements in air quality. NO_x and VOC emissions reductions were also likely realized as a co-benefit due to these standards.

- Category 3 Marine Diesel Engine Standards

This new standard, effective in June 2010, promulgated more stringent exhaust emission standards for new large marine diesel engines with per-cylinder displacement at or above 30 liters (commonly referred to as Category 3 compression-ignition marine engines) as part of a coordinated strategy to address emissions from all ships that affect U.S. air quality. These emission standards are equivalent to those adopted in the amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (Annex VI). The emission standards apply in two stages: near-term standards, for newly built engines, which took effect in 2011 and long-term standards requiring an 80% reduction in NO_x emissions that began in 2016.

U.S. EPA is adopting changes to the diesel fuel program to allow for the production and sale of diesel fuel with up to 1,000 ppm sulfur for use in Category 3 marine vessels. The regulations generally forbid production and sale of fuels with more than 1,000 ppm sulfur for use in most U.S. waters unless operators achieve equivalent emission reductions in other ways.

U.S. EPA is also adopting provisions to apply some emission and fuel standards to foreign flagged and in-use vessels that are covered by Annex VI. When this strategy is fully implemented in 2030, U.S. EPA estimates that NO_x and $PM_{2.5}$ emissions in the U.S. will be reduced by approximately 1.2 million TPY and 143,000 TPY, respectively.

- Mercury and Air Toxic Standards (MATS)

This new standard, effective in April 2012, regulates emissions of mercury, acid gases, and non-mercury metallic toxic pollutants from new and existing coal and oil-fired EGUs. U.S. EPA estimated that this rule applied to approximately 1,100 coalfired and 300 oil-fired EGUs at 600 power plants in the United States. According to U.S. EPA, most facilities comply with these standards through a range of strategies, including the use of existing emission controls, upgrades to existing emission controls, installation of new pollution controls, and fuel switching.

Following promulgation of the rule, U.S. EPA received petitions for reconsideration of various provisions of the rule, including requests to reconsider the work practice standards applicable during startup periods and shutdown periods. U.S. EPA granted reconsideration of the startup and shutdown provisions as no opportunity to comment was provided to the public regarding the work practice requirements contained in the final rule.

On November 30, 2012, U.S. EPA published a proposed rule reconsidering certain new source standards and startup and shutdown provisions in Mercury and Air Toxic Standards (MATS). U.S. EPA proposed certain minor changes to the startup and shutdown provisions contained in the 2012 final rule based on information obtained in the petitions for reconsideration. On April 24, 2013, U.S. EPA took final action on the new source standards that were reconsidered and the technical corrections contained in the November 30, 2012, proposed action. U.S. EPA did not take final action on the startup and shutdown provisions and, on June 25, 2013, added new information and analysis to the docket and reopened the public comment period for the proposed revisions. U.S. EPA took final action on the remaining topics open for reconsideration on November 19, 2014. The compliance date for existing sources was April 16, 2015, while the compliance date for new sources was April 16, 2012.

On November 25, 2014, the U.S. Supreme Court accepted several challenges to the rules brought by the utility industry and a coalition of nearly two dozen states. On June 29, 2015, the U.S. Supreme Court ruled that U.S. EPA did not properly account for compliance costs when crafting the MATS rule and remanded the decision to the D.C. Circuit Court for reconsideration. On May 22, 2020, U.S. EPA published in the Federal Register a reconsideration of the appropriate and necessary finding for MATS, correcting flaws in the 2016 supplemental cost finding while ensuring that power plants will emit no more mercury to the air than before. This action did not remove any coal- and oil-fired power plants from the list of affected source categories, so MATS remained in effect.

On May 7, 2024, U.S. EPA promulgated amendments to the MATS rule, including a revised filterable PM emission standard for existing coal-fired EGUs, revised filterable PM emission standard compliance requirements, and a revised mercury emission standard for lignite-fired EGUs (89 FR 38508). However, on June 17, 2025, U.S. EPA published in the Federal Register a proposed rule to repeal these three specific amendments to the MATS rule (90 FR 25535).

- Area Source Boilers, Major Source Boilers, and Commercial/Industrial Solid Waste Incinerators (CISWIs) NESHAPs

On January 31, 2013, February 1, 2013, and February 7, 2013, U.S. EPA finalized revisions to the March 2011 CAA emissions standards for large boilers, small boilers and incinerators, respectively (78 FR 7138, 78 FR 7488, 78 FR 9112). These standards cover more than 200,000 boilers and incinerators that emit harmful air pollution, including mercury, cadmium, and particle pollution.

Boilers at large sources of air toxics emissions are known as major source boilers. They are located at large sources of air pollutants, including refineries, chemical plants, and other industrial facilities. Boilers located at small sources of air toxics emissions are known as area source boilers. These are located at universities, hospitals, hotels and commercial buildings. A CISWI unit is a device that is used to burn solid waste at a commercial or industrial facility. This includes units designed to discard solid waste; energy recovery units designed to recover heat that combust solid waste; and waste burning kilns that combust solid waste in the manufacturing of a product.

In a separate but related action, U.S. EPA revised the Non-Hazardous Secondary Materials (NHSM) rule. This rule defines which materials are, or are not, “solid waste” when burned in combustion units. The NHSM rule helps determine which standards, either boiler or CISWI, a

unit that burns these materials will be required to meet. These combined rules will lead to additional NO_x and VOC reductions. The compliance deadlines for area boilers, major boilers, and CISWI units were 2014, 2016, and 2018, respectively.

- New Source Performance Standards (NSPS) for Residential Wood Heaters

On March 16, 2015, U.S. EPA finalized the residential wood heaters New Source Performance Standards (NSPS) (80 FR 13672). This NSPS rule does not affect existing woodstoves or other wood burning devices; however, it does provide more stringent emissions standards for new woodstoves, outdoor hydronic heaters and indoor wood-burning forced air furnaces. New "Phase 1" less-polluting heater standards begin in 2015, with even more-stringent Phase 2 standards beginning in 2020. However, new units are assumed to replace retired units beginning in 2015. U.S. EPA estimates 9,265 tons of VOC emissions will occur annually.

- Control of Hazardous Air Pollutants from Mobile Sources

This rule, also known as the Mobile Source Air Toxics rule, was published on February 26, 2007 (revised October 16, 2008), requiring refiners and importers to produce gasoline that has an annual average benzene content of 0.62 volume percent or less beginning in 2011 (72 FR 8428, 73 FR 61358). U.S. EPA estimates that in 2030 this rule would reduce total emissions of mobile source air toxics by 330,000 tons and VOC emissions by over 1 million tons.

- SO_2 Data Requirements Rule (DRR)

On August 21, 2015, U.S. EPA finalized the Data Requirements Rule (DRR) for the 2010 1-hour SO_2 Primary NAAQS (80 FR 51052). This rule required characterization of sources with actual SO_2 emissions greater than 2,000 TPY through modeling or monitoring. In response to the DRR, several facilities accepted restrictions such that SO_2 emissions would be sufficiently below 2,000 TPY and further characterization of ambient air quality was unnecessary. NO_x emissions reductions were also realized as a co-benefit due to these restrictions.

- Oil and Natural Gas Industry Standards

This new standard, issued on April 17, 2012, regulates VOC and air toxic emissions from hydraulically fractured natural gas wells and includes requirements for several other sources of pollution in the oil and natural gas industry that were previously unregulated in the United States. U.S. EPA estimates that these standards will apply to approximately 11,400 new natural gas wells hydraulically fractured each year and an additional 1,400 existing natural gas wells refractured annually. Fully implemented in 2015, U.S. EPA estimates that VOC and

air toxic emissions in the U.S. are reduced by approximately 190,000 to 290,000 TPY and 12,000 to 20,000 TPY, respectively.

- Emissions Standards for Locomotives and Marine Compression-Ignition Engines

On June 30, 2008, U.S. EPA published regulations for a comprehensive program to dramatically reduce pollution from locomotives and marine diesel engines. The controls will apply to all types of locomotives, including linehaul, switch, and passenger, and all types of marine diesel engines below 30 liters per cylinder displacement, including commercial and recreational, propulsion, and auxiliary. The near-term emission standards for newly built engines were phased in starting in 2009. The near-term program also included new emission limits for existing locomotives and marine diesel engines that apply when they are remanufactured and take effect as soon as certified remanufacture systems are available, as early as 2008.

The long-term emissions standards for newly built locomotives and marine diesel engines began to take effect in 2015 for locomotives and in 2014 for marine diesel engines. U.S. EPA estimates PM reductions of 90% and NO_x reductions of 80% from engines meeting these standards, compared to engines meeting the current standards. U.S. EPA projects that by 2030, this program will reduce emissions of NO_x and PM by 800,000 TPY and 27,000 TPY, respectively.

- Tier 3 Tailpipe and Evaporative Emission and Vehicle Fuel Standards

In April 2014, U.S. EPA finalized a major program to reduce air pollution from passenger cars and trucks, referred to as "Tier 3" vehicle and fuel standards. Multiple air pollutants are addressed in this rule, including PM, VOC, SO_2, and NO_x, through implementing closely coordinated requirements for both automakers and refiners in the same rulemaking action. NO_x and VOC emissions reductions in 2018 are projected at over 300,000 tons; by 2030, the reduction is nearly 500,000 tons as cleaner vehicles turn over into the fleet. This amounts to a 10% reduction of NO_x and 3% reduction of VOC in 2018 with 25% and 16%, respectively, by 2030. A 56% reduction of SO_2 is projected in 2018 by immediate reductions through reduced fuel sulfur content.

- NO_x Emission Standard for New Commercial Aircraft Engines

On June 18, 2012, U.S. EPA finalized a rule to adopt NO_x emission standards for certain commercial passenger and freighter aircraft engines in common use at airports across the

U.S. The rule contains six major provisions, two of which are new NO_x emission standards for newly certified engine models. The first set of standards, Tier 6, took effect when the rule became effective and represents approximately a 12% reduction from Tier 4 levels. The second set of standards, Tier 8, took effect in 2014 and represents approximately a 15% reduction from Tier 6 levels. Equipment turnover will ensure continued emissions reductions from this category for many years.

- Tier 2 Light-Duty Vehicle Rule

In February 2000, U.S. EPA finalized a federal rule to significantly reduce emissions from cars and light trucks, including sport utility vehicles (SUVs). Under this rule, automakers are required to sell cleaner cars, and refineries are required to make cleaner, lower sulfur gasoline. This rule applies nationwide. The federal rule was phased in between 2004 and 2009, but fleet turnover will ensure continued emissions reductions from this category for many years. U.S. EPA estimated that NO_x emission reductions will be approximately 77 percent for passenger cars, 86 percent for smaller SUVs, light trucks, and minivans, and 65 to 95 percent reductions for larger SUVs, vans, and heavier trucks. The sulfur content of gasoline is estimated to be reduced by up to 90 percent. VOC emission reductions will be approximately 12 percent for passenger cars, 18 percent for smaller SUVs, light trucks, and minivans, and 15 percent for larger SUVs, vans, and heavier trucks. U.S. EPA's MOVES emissions model accounts for the continued emissions reductions from this program in future years due to fleet turnover.

- Clean Air Non-Road Diesel Rule

In June 2004, U.S. EPA issued the Clean Air Non-Road Diesel Rule. This rule applies to diesel engines used in industries such as construction, agriculture, and mining. It contains a cleaner fuel standard, similar to the highway diesel program, which was implemented in 2009, and new engine standards that took effect, based on engine horsepower, starting in 2008 and fully phased in for most engines by 2014. The new standards cut emissions from nonroad diesel engines by more than 90 percent. Nonroad diesel equipment, as described in this rule, currently accounts for 47 percent of diesel PM and 25 percent of NO_x from mobile sources nationwide. Sulfur levels were reduced in nonroad diesel fuel by 99 percent from current levels, from approximately 3,000 ppm now to 15 ppm in 2009. New engine standards took effect, based on engine horsepower, starting in 2008. Equipment turnover will ensure continued emissions reductions from this category for many years.

- Greenhouse Gas (GHG) Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2

In October 2016, U.S. EPA finalized updates to a federal rule to significantly reduce greenhouse gas (GHG) emissions from medium and heavy-duty engines and vehicles (81 FR 73478). This rule sets GHG emissions standards for four regulatory categories of heavy-duty vehicles: Combination tractors; trailers used in combination with those tractors; heavy-duty pickup trucks and vans; and vocational vehicles. The rule also includes separate standards for the engines that power combination tractors and vocational vehicles. Though this rule primarily targets GHG emissions, it does have an added benefit of lowering NO_x and VOC emissions over time due to fleet turnover. The U.S. EPA estimates a reduction in NO_x of between 1.9% and 2.2% in 2025 and 12% and 14% by 2050. Estimates for VOC trends show a reduction of between 2.2% and 3% in 2025 and between 12% and 13% by 2050.

On August 1, 2025, U.S. EPA published in the Federal Register a proposed rule ("Reconsideration of 2009 Endangerment Finding and Greenhouse Gas Vehicle Standards") to repeal all greenhouse gas emission standards for light-duty, medium-duty, and heavy-duty vehicle engines, including this rule (90 FR 36288).

- Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions Standards

In December 2021, the U.S. EPA finalized updates to a federal rule to significantly reduce GHG emissions from cars and light trucks, including SUVs (87 FR 74434). The rule will require manufacturers to manufacture vehicles that emit significantly less GHGs starting with the model years of 2023 and beyond. Though this rule primarily targets GHG emissions it does have an added benefit of lowering NO_x and VOC emissions over time. This rule applies nationwide and will ensure continued emissions reductions as the vehicle fleet turns over. U.S. EPA estimates small changes in emission, 0% NO_x reduction and 2% VOC reduction by 2030, but expects much more significant reduction from 2034 and beyond.

On August 1, 2025, U.S. EPA published in the Federal Register a proposed rule ("Reconsideration of 2009 Endangerment Finding and Greenhouse Gas Vehicle Standards") to repeal all greenhouse gas emission standards for light-duty, medium-duty, and heavy-duty vehicle engines, including this rule (90 FR 36288).

8.1.2. Ohio On-the-Books Programs

Ohio has adopted many state rules, in addition to some of those noted above in response to federal requirements, that require or will require emission reductions from sources of ozone precursors. For Ohio, these rules will provide emissions reductions between the base year of 2017 and the projected attainment year of 2026. The state rules that will help the Cleveland Ozone Nonattainment Area meet the attainment date include, but are not limited to:

- Enhanced Motor Vehicle Inspection and Maintenance (I/M) Program

U.S. EPA's final I/M regulations in 40 CFR Part 85 required states to submit a fully adopted I/M program by November 15, 1993, under Section 182(b)(4). U.S. EPA approved Ohio's enhanced I/M program (E-Check), on April 4, 1995, and January 6, 1997. The E-Check program continues to be implemented in this area. The E-Check program requirements are contained in OAC Chapter 3745-26[14] and the E-Check program is required in Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit counties.

- Consumer Products Rules

On September 15, 2007, Ohio adopted rules in OAC Chapter 3745-112[15], "Consumer products." These rules reduce VOC emissions by regulating the VOC content of consumer products sold, supplied, offered for sale, or manufactured for use in the state of Ohio on or after January 1, 2009. This rule, which was based on a model rule developed by the OTC states, establishes VOC content limitations in such products as sprays, paints, aerosols, waxes, varnishes, and other consumer-oriented products.

On June 20, 2022, Ohio adopted revisions to Ohio's Consumer Products rules. These rules apply statewide and were previously based on the 2006 Phase II OTC model rule for Consumer Products. Ohio EPA updated the rules to adopt more recent versions of the OTC model rule; specifically, up through the 2012 Phase IV OTC model rule (this includes adopting the limits in the 2010 Phase III model rule, as well as the 2013 Technical Update). The implementation date for the revised limits was July 1, 2023.

14 https://epa.ohio.gov/static/Portals/27/regs/3745-26/3745-26_Complete.pdf
15 https://epa.ohio.gov/static/Portals/27/regs/3745-112/3745-112_Complete.pdf

- Architectural and Industrial Maintenance (AIM) Coatings Rules

On September 21, 2007, Ohio adopted rules in OAC Chapter 3745-113[16], "Architectural and Industrial Maintenance (AIM) Coatings." These rules reduce VOC emissions by regulating the VOC content of AIM coatings sold, supplied, offered for sale, or manufactured for use in the state of Ohio on or after September 21, 2007. This rule, which was based on a model rule developed by the OTC states, establishes VOC content limitations in coatings used in architectural or industrial applications such as paints, varnishes, specialty coatings, roof coatings, lacquers, fire retardant coatings, and similar or related coatings.

Effective December 16, 2022, Ohio EPA adopted revisions to the rules to update to the OTC Phase II standards, with an implementation date for the revised limits of January 1, 2024.

- NO_x RACT

NO_x RACT rules in OAC Chapter 3745-110 have been in place in the Cleveland Ozone Nonattainment Area for many years, with the most recent revisions to the rules to update NO_x RACT having been adopted with an effective date of August 1, 2025. As discussed above, these revisions were adopted to address the serious ozone planning requirements that include lowering the threshold for NOx RACT applicability from 100 TPY to 50 TPY.

- VOC RACT

Over the years Ohio has adopted numerous VOC RACT regulations in OAC Chapter 3745-21[17] in response to requirements under the various ozone NAAQS. The majority of these regulations apply in Ohio's urbanized areas, including the Cleveland Ozone Nonattainment Area. The counties affected by these ozone regulations in the Cleveland Ozone Nonattainment Area include Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit counties. The Cleveland Ozone Nonattainment Area counties have the most stringent VOC RACT regulations due to the historic designation as moderate nonattainment for various ozone NAAQS. For the Cleveland Ozone Nonattainment Area counties, Ohio has adopted all the current U.S. EPA Control Technique Guidelines (CTGs) as VOC RACT.

The most recent revisions to the rules to update VOC RACT was adopted with an effective date of August 1, 2025. As discussed above, these revisions were adopted to address the

16 https://epa.ohio.gov/static/Portals/27/regs/3745-113/3745-113_Complete.pdf
17 https://epa.ohio.gov/static/Portals/27/regs/3745-21/3745-21_Complete.pdf

serious ozone planning requirements that include lowering the threshold for VOC RACT applicability from 100 TPY to 50 TPY.

- Gasoline Vapor Recovery System

Section 182(b)(3) requires states to submit Stage II vapor recovery rules no later than November 15, 1992. The U.S. EPA partially approved and partially disapproved Ohio's SIP revision for implementation of Stage II on October 20, 1994 (59 FR 52911). As stated in that rulemaking action, with the exception of paragraph 3745-21-09 (DDD)(5), U.S. EPA considers Ohio's Stage II program to fully satisfy the criteria set forth in the September 17, 1993, U.S. EPA guidance document for such programs entitled "Enforcement Guidance for Stage II Vehicle Refueling Control Programs." Furthermore, the September 17, 1993, guidance memorandum states that once onboard vapor recovery regulations are promulgated, the Stage II regulations are no longer applicable for moderate ozone nonattainment areas. The U.S. EPA promulgated onboard vapor recovery rules in February 1994. Therefore, pursuant to Section 202(a)(6) of the CAA, Stage II would no longer be required. However, some areas, including Ohio, retained Stage II requirements to provide a control method to comply with rate-of-progress emission reduction targets. Congress recognized that onboard refueling vapor recovery and Stage II would eventually become redundant, and actually increase emissions, and provided the U.S. EPA authority to allow states to remove Stage II from their SIPs after U.S. EPA finds that onboard refueling vapor recovery is in widespread use. On May 16, 2012, the U.S. EPA determined that onboard refueling vapor recovery technology is in widespread use throughout the motor vehicle fleet for purposes of controlling motor vehicle refueling emissions. This action (77 FR 28772) also provided notice of an upcoming guidance document for states to use to prepare a SIP revision to remove or phase-out Stage II controls. U.S. EPA published this guidance on August 7, 2012 (EPA-457/B-12-001). The guidance noted that since Section 182(b)(3) requirements no longer applied, the only requirements for Stage II controls are state SIPs (which includes Ohio, as noted above), Section 184(b)(2) for areas in the ozone transport region (does not apply to Ohio), and Section 193 for any area that adopted Stage II controls prior to November 15, 1990 (does not apply to Ohio). In order to remove Stage II control requirements from the SIP, CAA Section 110(l) is required to be addressed. Ohio EPA conducted this demonstration and submitted the SIP revision request to U.S. EPA on July 15, 2015. This demonstration included a new requirement for the use of low permeation hoses which will provide even greater VOC emissions reductions in the future.

- Portable Fuel Containers (PFCs)

On February 10, 2007, Ohio adopted OAC rule 3745-21-17[18], "Portable fuel containers." This rule, which was based on a model rule developed by the OTC states, reduces emissions of VOC from portable fuel canisters (PFCs), which are any container or vessel with a nominal capacity of ten gallons or less intended for reuse that is designed, or used, sold, advertised, or offered for sale primarily for receiving, transporting, storing, and dispensing fuel or kerosene. All PFCs sold in Ohio after July 1, 2007, must meet standards set by the California Air Resources Board (CARB) pursuant to the certification requirements contained in Title 13, Division 3, Chapter 9, Article 6 of the California Code of Regulations, "Portable Containers and Spouts".

- Permanent Shutdown of Sources

Several facilities in the Cleveland Ozone Nonattainment Area have permanently shut down since 2017, most notably the Avon Lake Power Plant (Facility ID 0247030013), which permanently shut down on April 1, 2022. Emissions in 2021 from this EGU were 1,069.1 tons of NO_x and 13.26 of VOC.

- Diesel Emission Reduction Grants (DERG)

Ohio EPA partners with ODOT to administer the Diesel Emissions Reduction Grant (DERG) program to replace older diesel-powered mobile source equipment with newer (less polluting) equipment. The program targets public agency owned diesel engine fleets and privately owned diesel engine fleets with a public sponsor (public-private partnerships) that will undertake vehicle/equipment replacement, repower, retrofit, or installation of anti-idle equipment for the purpose of $PM_{2.5}$ (and precursor) emissions reduction. The DERG program will provide up to 80% cost reimbursement for the purchase of such new equipment. The DERG Program awards approximately $10 million annually in Federal Highway Congestion Mitigation and Air Quality (CMAQ) funding. Since 2017, the funds have been used exclusively for replacement of aging diesel transit buses in 32 priority counties in Ohio. Successful applicants are chosen based on the cost-effectiveness ($/ton of pollutant removed) of the specific project and other factors like location.

18 https://epa.ohio.gov/static/Portals/27/regs/3745-21/3745-21-17_Final.pdf

In the Cleveland Ozone Nonattainment Area, $28,653,004.70 was awarded between 2017 and 2024 to replace 85 diesel transit buses with 85 new transit buses: 57 compressed natural gas (CNG), 11 electric, nine propane, and eight new diesel. Ohio EPA used U.S. EPA's Diesel Emission Quantifier (DEQ)[19] tool to estimate that these projects will result in the following emission reductions: 19.491 TPY of NO_x, 1.196 TPY of $PM_{2.5}$, 2.017 TPY of hydrocarbons (HC), and 7.465 TPY of CO. Of the 85 new transit buses, 44 are in Cuyahoga County, 18 are in Summit County, 15 are in Lake County, and eight are in Portage County.

- Diesel Mitigation Trust Fund (DMTF) Grants (Volkswagen settlement Ohio allocation)

In 2018, Ohio EPA developed a Beneficiary Mitigation Plan to accept and distribute funds allocated to Ohio from the Volkswagen settlement. Ohio's plan allocates $40 million to onroad fleets (school bus replacements, transit bus replacements, and class 4-8 local freight trucks), $19 million to off-road equipment (tugboats, switcher locomotives, airport ground support and port cargo handling equipment), and $11.25 million for infrastructure to support light-duty zero emissions vehicles. Ohio EPA estimates that applying the entire amount of funding allocated to Ohio ($75,302,522.67) to fund the eligible mitigation actions will result in emission reductions of approximately 352 TPY of NO_x. Projects like these will also significantly reduce emissions of other pollutants of concern, such as $PM_{2.5}$, hydrocarbons, CO, and carbon dioxide. Actual emission reductions are dependent on the types of projects that are ultimately selected to receive funding. Benefits will compound over the lifetime of the equipment purchased or repowered.

Beginning in 2018 and continuing through 2024, Ohio EPA awarded 45 DMTF grants totaling $18,698,506.78 for projects located solely within the Cleveland Ozone Nonattainment Area. Ohio EPA used the DEQ to estimate that these projects will result in the following emission reductions within the Cleveland Ozone Nonattainment Area: 44.615 TPY of NO_x, 1.955 TPY of $PM_{2.5}$, 3.604 TPY of HC, and 10.021 TPY of CO.

In late 2021, Ohio EPA awarded DMTF grants for Level 2 (slow) charging stations for electric vehicles at 75 locations in the Cleveland Ozone Nonattainment Area, including 26 in Cuyahoga County, 15 in Summit County, 12 in Lorain County, eight in Lake County, seven in Portage County, four in Medina County, and three in Geauga County. In late 2022, Ohio EPA awarded DMTF grants for DCFC (fast) charging stations to be installed at nine locations in the

19 https://cfpub.epa.gov/quantifier/index.cfm?action=main.home

Cleveland Ozone Nonattainment Area, including three in Cuyahoga County, two in Lorain County, and one each in Lake, Medina, Portage, and Summit counties. Many of these installations have already been completed but some projects are still undergoing modifications. DEQ emission estimates for these charging station projects will be tallied as implementation proceeds.

8.2. Attainment Demonstration Modeling

8.2.1. Attainment Demonstration Modeling Methodology

The Implementation Rule assumes that photochemical grid modeling will be needed to demonstrate attainment (83 FR 63033). LADCO, in consultation with Ohio, has prepared attainment demonstration modeling using the Comprehensive Air Quality Model with Extensions (CAMx) photochemical grid model. CAMx is a three-dimensional, Eulerian air quality model that simulates the chemical transformation and physical transport processes of air pollutants in the troposphere. It includes capabilities to estimate the concentrations of primary and secondary gas and particle phase air pollutants, and dry and wet deposition, from urban to continental spatial scales. CAMx is a "state-of-the-science," open-source air quality model that is computationally efficient, flexible, and publicly available.

All modeling was conducted in accordance with U.S. EPA's November 29, 2018 "Modeling Guidance for Demonstrating Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze" (hereinafter the "2018 Modeling Guidance") as well as U.S. EPA's 2024 "Guideline on Air Quality Models" in 40 CFR Part 51, Appendix W.

LADCO used CAMx version 7.31 to predict ozone concentrations in 2026 to determine if current emissions control programs in the region will lead to attainment of the 2015 ozone NAAQS by the statutory attainment date of August 3, 2027. LADCO collected 2022 and 2026 emissions data for this study primarily from the U.S. EPA 2022v1 ("2022hc") emissions modeling platform. LADCO replaced the 2026 projected EGU emissions from the 2022hc platform with 2026 EGU forecasts estimated with the February 2025 version of the ERTAC EGU Tool version 22.1.

U.S. EPA rigorously quality assures their emission inventories. In addition, LADCO conducts rigorous quality assurance procedures to ensure high data quality. LADCO's emissions modeling quality assurance procedures include reviewing emissions model output files for errors and warnings, comparing emissions between processing steps, checking that

speciation, temporal, and spatial allocation factors are applied correctly, and reviewing the air quality model emissions inputs and stack parameters. LADCO's model performance evaluation demonstrates that the model performance is within conventional and accepted benchmarks and is a valid model for use in regulatory applications. LADCO's full methodology and quality assurance process is discussed in detail in the TSD contained in Appendix K. In addition to discussing how the model was set up, evaluated, and run (including the emissions inventories used), Appendix K presents additional data analyses and weight of evidence support for this attainment plan.

U.S. EPA acknowledges there may be some inconsistencies between the nonattainment area SIP/RFP inventories (presented in Section 3 above) and the inventories used for modeling, because these inventories are developed to meet different objectives and requirements. The LADCO modeling uses 2022 as the base year and 2022-based 2026 projected emissions data from the 2022v1 emissions modeling platform created by the Inventory Collaborative, just as Ohio EPA did for 2026, although LADCO substituted 2026 projected EGU emissions with those from the ERTAC EGU Tool. The 2022v1 platform was the best available data at the time that the modeling began. The Inventory Collaborative selected 2022 as the base year because of meteorology, typical ozone conditions, and average wildfire conditions. These considerations are especially important in selecting a base year for modeling demonstrations. Conversely, the SIP/RFP inventories presented in Section 3 above use a 2017 base year, in accordance with regulatory requirements for the RFP baseline year. Note that the two inventories are not directly comparable due to differences in base year (2017 vs. 2022) and the methodologies used to determine onroad mobile emissions and to derive TPOSD[20].

A comparison of the 2026 projected anthropogenic emissions portions of the SIP/RFP inventories and the LADCO inventories in Table 17 shows that total NO_x emissions in the LADCO modeling inventory were 2.9% higher than the SIP/RFP inventory, while total VOC emissions in the LADCO modeling inventory were 1.6% lower than the SIP/RFP inventory. The overall comparable emissions in the LADCO modeling demonstrate this modeling serves as a good predictor of future year ozone.

After adding the MVEB safety margin allocations to the 2026 projected SIP/RFP inventory, onroad NO_x and VOC emissions become 29.00 and 23.33 TPOSD, respectively, and total NO_x

20 TPOSD in the LADCO modeling inventory was derived by dividing the sum of emissions in the May to September time period by the number of days (153) in that time period. TPOSD in the SIP/RFP inventory is described in Section 3.

and VOC emissions become 71.86 and 148.30 TPOSD, respectively. When comparing this adjusted SIP/RFP inventory to the 2026 projected LADCO modeling inventory, the LADCO inventory has 5.97 TPOSD (8%) lower NO_x emissions and 7.95 TPOSD (5%) lower VOC emissions. Although the total LADCO modeled inventory is slightly lower than the SIP/RFP inventory when considering the added MVEB safety margins, these inventories are still reasonably comparable, and modeling is not considered absolute. Even if modeled emissions were increased slightly to be comparable to the SIP/RFP inventory, it would be reasonable to assume that the modeling would continue to show attainment.

Table 17. Comparison of nonattainment area SIP emissions inventory with LADCO modeling emissions inventory.

Nonattainment Area SIP Emissions Inventory (TPOSD)				
	2017 NO_x	**2026 NO_x**	**2017 VOC**	**2026 VOC**
Point	14.40	10.22	7.93	6.85
Nonpoint	16.48	17.18	116.60	95.77
Nonroad	25.29	15.45	33.82	22.36
Onroad	51.91	21.17	31.69	17.72
Total	108.07	64.02	190.03	142.69
LADCO Modeling Emissions Inventory (TPOSD)				
	2022 NO_x	**2026 NO_x**	**2022 VOC**	**2026 VOC**
Point	9.88	9.93	7.29	7.35
Nonpoint	17.36	17.22	96.56	96.33
Nonroad	17.48	15.44	23.86	22.62
Onroad	33.93	23.30	17.24	14.06
Total	78.66	65.89	144.95	140.35
Difference in Emissions Inventories (LADCO modeling - SIP inventory)				
	Base Year NO_x	**2026 NO_x**	**Base Year VOC**	**2026 VOC**
Point	-31%	-3%	-8%	7%
Nonpoint	5%	0%	-17%	1%
Nonroad	-31%	0%	-29%	1%
Onroad	-35%	10.%	-46%	-201%
Total	-27%	3%	-24%	-2%

8.2.2. Attainment Demonstration Modeling Results

LADCO followed the 2018 Modeling Guidance to calculate future-year design values (DVs) in 2026 (DVF2026) using version 2.1 of the Software for the Modeled Attainment Test – Community Edition (SMAT-CE). SMAT-CE was configured to use the daily max average 8-hr

(MDA8) ozone concentration above 60 ppb in a 3x3 matrix around each monitor across for the 10 highest modeled days. If there are less than 10 days with MDA8 ozone greater than 60 ppb, SMAT-CE uses all days, if there are at least 5 days that meet the minimum threshold criteria.

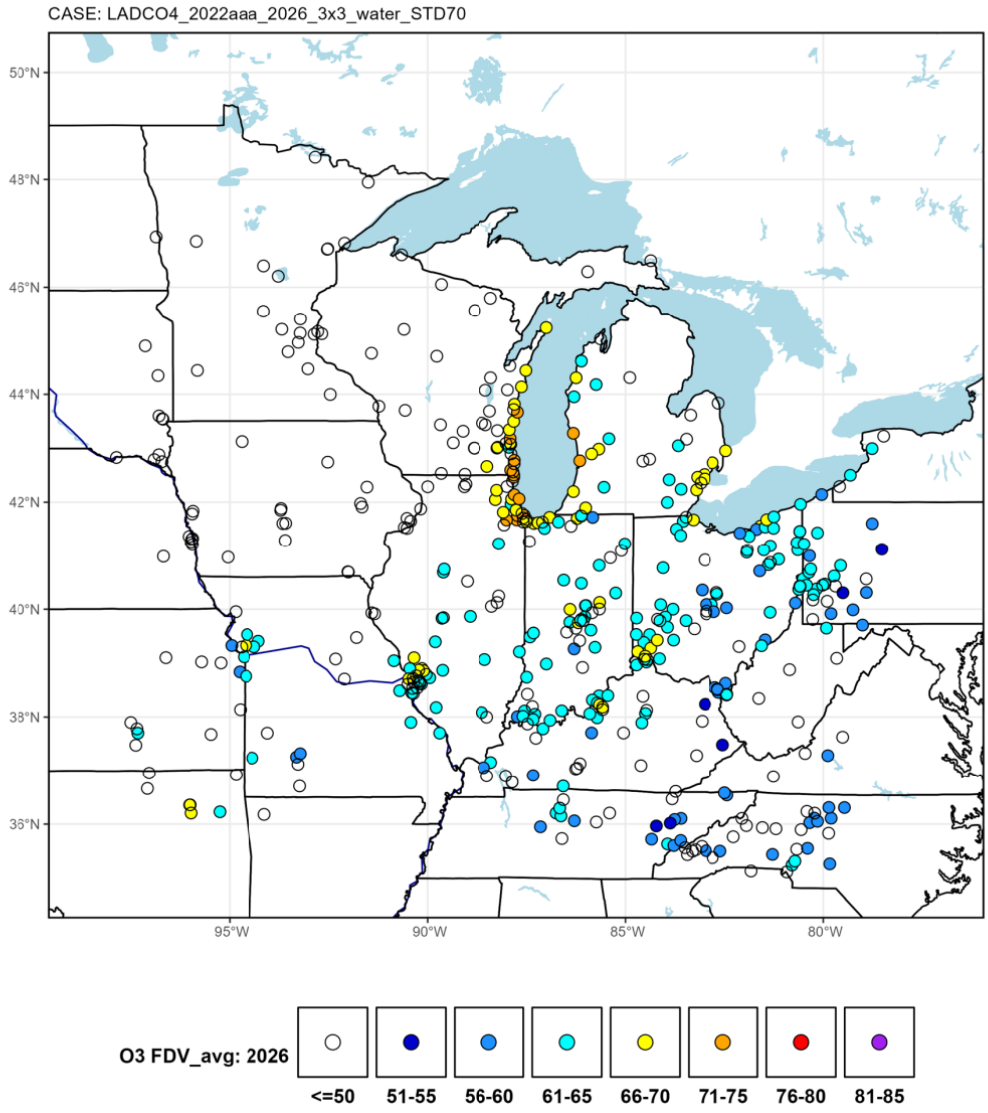
LADCO used the DVF2026 to identify nonattainment sites in 2026 using the 5-year weighted average baseline design values (2020-2024). Under this methodology, sites with an average DVF2026 that exceeds the 2015 ozone NAAQS (71.0 ppb or greater) would be considered nonattainment in 2026.

Table 18 and Figure 4 summarize the results of this modeling analysis. Projected ozone design values for 2026 calculated from the LADCO 4-km CAMx modeling with water cells included in the 3x3 matrix are compared to the corresponding values in the baseline period. As described in the TSD, LADCO also performed alternative modeling with other grid and matrix sizes and excluding water cells, but those modeling runs do not significantly impact the results in the Cleveland Ozone Nonattainment Area. All monitoring locations in the Cleveland Ozone Nonattainment Area are projected to meet the level of the 2015 ozone NAAQS (70 ppb) by 2026. Table 18 also includes a comparison to monitored 2022-2024 design values. Two monitors in the Cleveland Ozone Nonattainment Area were not meeting the standard as of this date: 39-035-0034 with a design value of 72 ppb and 39-085-0003 with a design value of 73 ppb.

Table 18. Projected 2026 ozone design values (ppb) for monitoring sites in the Cleveland Ozone Nonattainment Area.

Site ID	County	2020-2024 Baseline Design Value	2026 Projected Design Value	2022-2024 Monitored Design Value
39-035-0034	Cuyahoga	71.7	68.8	72
39-035-0060		62.0	59.7	63
39-035-0064		67.7	65.0	68
39-035-5002		68.0	65.2	69
39-055-0004	Geauga	65.0	62.4	65
39-085-0003	Lake	73.3	70.3	73
39-085-0007		66.0	63.4	68
39-093-0018	Lorain	61.3	58.8	62
39-103-0004	Medina	67.0	64.6	68
39-133-1001	Portage	68.3	65.5	69
39-153-0026	Summit	67.3	65.0	69

Figure 4. 2026 projected ozone design values calculated with water cells included from the LADCO 2026 4-km CAMx simulation.



8.3. Weight of Evidence Analysis

U.S. EPA recommends that states supplement their modeling with a ‘‘weight of evidence’’ analysis. States may use other information and analyses, in addition to the modeled attainment test, to estimate whether future attainment of the NAAQS in an area is likely. Other analyses may include, but are not limited to, emissions trends, ambient data trends

and analyses, other modeling analyses, and documentation of other non-modeled emissions control strategies, including voluntary programs.

Although Ohio has modeled attainment by the 2026 ozone season (as the last full ozone season before the statutory attainment date of August 3, 2027) with current controls/measures and on-the-books controls, Ohio is including this additional weight of evidence analysis of attainment in the Cleveland Ozone Nonattainment Area.

- ERTAC EGU Projection Tool is conservative.

The ERTAC EGU Projection Tool is conservative, and by design will overestimate future year EGU emissions. As described in the TSD (Appendix K), the ERTAC tool does not use an economics model to forecast future utilization of generating units beyond the forecasts provided by the Energy Information Administration (EIA). Economics models attempt to anticipate responses in this sector to future regulatory mandates or anticipated fuel prices (especially future prices of natural gas). As a result, economics models, including U.S. EPA's Integrated Planning Model (IPM), predict future controls, unit shutdowns and fuel conversions that may or may not occur.

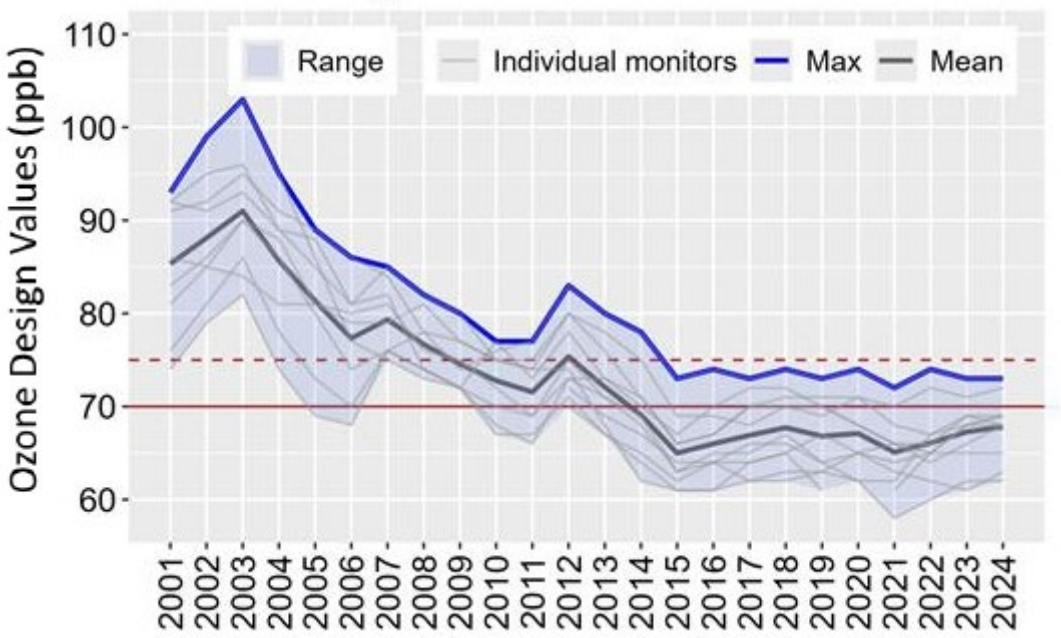
The ERTAC EGU Projection Tool only incorporates new controls, unit shutdowns and fuel conversions that have been identified by the states based on enforceable commitments made by the utilities and is therefore more conservative than economics models that are anticipating the effects of future regulatory requirements and fuel prices. As a result, emissions projections from the ERTAC EGU Projection Tool are consistently higher than those provided by economic-based models, such as IPM. It follows then the air quality modeling using emissions projected by the ERTAC EGU Projection Tool will be more conservative than modeling based on emissions derived from IPM. LADCO's full analysis is discussed in the TSD.

- Ozone concentrations are continuing to decrease, even when adjusted for meteorology.

Figure 5 illustrates the 24-year trend in 3-year ozone design values from 2001 to 2024 at monitors in the Cleveland Ozone Nonattainment Area. Nonattainment mean values and maximum values are shown, along with values for individual monitors. The solid red line shows the level of the 2015 ozone NAAQS, and the dashed line shows the level of the 2008 ozone NAAQS. The design values have decreased significantly over this period from high

values in 2003 to record lows or near-record low values in 2021, with low values persisting through 2024.

Figure 5. Ozone design value trend from 2001 to 2024 in the Cleveland Ozone Nonattainment Area.

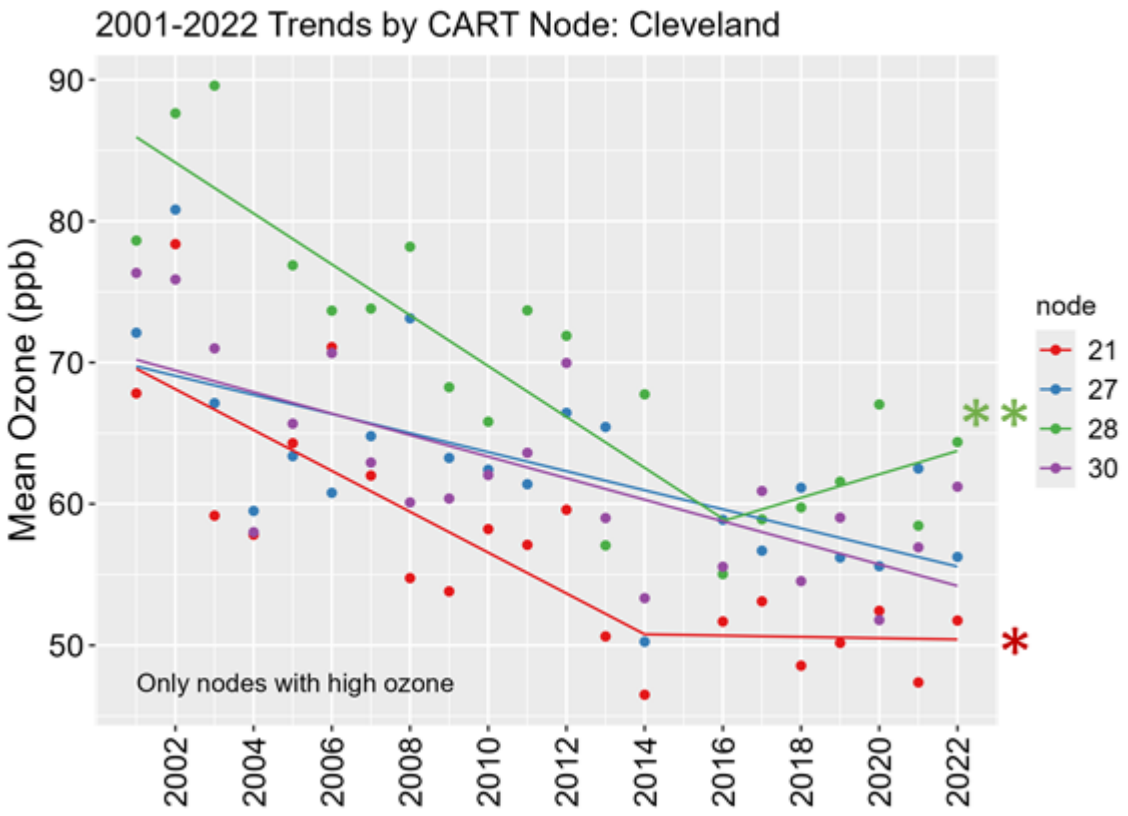


Additionally, LADCO performed a classification and regression tree (CART) analysis to demonstrate that the improvement in air quality is not based on unusually favorable meteorology. Appendix L includes additional details and methodology regarding this analysis. The CART analysis examines 8-hour ozone and meteorological data to determine the meteorological conditions most associated with high ozone days. 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. The analysis included data from 2001 to 2023 to identify the trends in ambient surface ozone concentrations after adjustment for meteorology.

The high-ozone type of days (called “nodes”) from the CART analysis generally exhibits hot temperatures in the afternoon, which was found to be the most important factor in defining the nodes. The highest ozone nodes for the Cleveland region exhibited southerly transport, low 24-hour scalar wind run, low 24-hour transport distance, and low midday relative

humidity, which also appear as important variables. Figure 6 shows that the mean ozone concentrations for all high-concentration nodes in the Cleveland Ozone Nonattainment Area have decreased from 2001 to 2022. A single asterisk denotes that the difference in slopes in a segmented regression fit was significant at the 90th percent confidence level, while a double asterisk denotes significance at the 95th percent confidence level.

Figure 6. CART analysis of trends in high-ozone nodes from 2001 to 2022 for monitors in the Cleveland Ozone Nonattainment Area.



- Emission reductions from Ohio's DERG and DMTF were not included in the modeling.

Section 8.1 describes emissions reductions from the DERG and DMTF grant and funding programs that are not accounted for in the modeling. Under these programs, Ohio can target areas that will benefit the most and the Cleveland Ozone Nonattainment Area is given higher consideration.

9. Nonattainment New Source Review (NNSR)

The establishment of a nonattainment new source review (NNSR) program is required for moderate nonattainment areas under CAA 182(a)(2)(C):

> Within 2 years after November 15, 1990, the State shall submit a revision that includes each of the following:
>
> (i) Provisions to require permits, in accordance with Sections 7502(c)(5) and 7503 of this title, for the construction and operation of each new or modified major stationary source (with respect to ozone) to be located in the area.

This rule addresses the regulation of the larger pollutant-emitting sources (defined as major stationary sources); specific permitting requirements are included in CAA Parts C and D of Title I. These requirements for preconstruction permits are commonly known collectively as the major new source review (NSR) program because they apply specifically to the preconstruction review and permitting of new major stationary sources, and major modifications at existing sources. Part C, the Prevention of Significant Deterioration (PSD) program, applies to areas designated attainment or unclassifiable. Part D, the NNSR program, applies to areas designated nonattainment.

Ohio has a longstanding and fully implemented NSR program. This is addressed in OAC Chapter 3745-31[21]. The chapter includes provisions for the PSD permitting program in OAC rules 3745-31-01 to 3745-31-20 and NNSR program in rules 3745-31-21 to 3745-31-27. Ohio's PSD and NNSR programs were conditionally approved on October 10, 2001, and received final approval on January 22, 2003, by U.S. EPA as part of the SIP[22,23]. The reclassification of an ozone nonattainment area from moderate nonattainment to serious nonattainment requires a decrease in the major source threshold from 100 TPY of NO_x or VOC to 50 TPY of NO_x or VOC, per CAA Section 182(c). On March 17, 2025, Ohio EPA submitted to U.S. EPA for approval a package containing the serious RACT SIP and revisions to SIP-approved rules in OAC Chapters 3745-21, 3745-110, and 3745-31 to implement the serious nonattainment requirements for RACT, NSR, and permitting[24]. This submittal has not yet been acted upon by U.S. EPA to date.

---

21 https://epa.ohio.gov/static/Portals/27/regs/3745-31/3745-31_Complete.pdf
22 https://www.govinfo.gov/content/pkg/FR-2001-10-10/pdf/01-25260.pdf
23 https://www.govinfo.gov/content/pkg/FR-2010-02-25/pdf/2010-3831.pdf
24 https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans/division-of-air-pollution-control-sip-2015

Additionally, the bump-up to serious nonattainment requires an increase in the offset required for sources in the nonattainment area. The emissions offset ratio changes from 1.15 to 1 in a moderate nonattainment area to 1.2 to 1 after the bump-up to serious nonattainment, per CAA 182(c)(10). These ratios are established in OAC rule 3745-31-26.

Ohio is certifying that the existing nonattainment NSR program meets the NNSR requirements of CAA Sections 182(a)(2)(C), 182(b)(5), and 182(c)(10) for the Cleveland Ozone Nonattainment Area under the 2015 ozone NAAQS.

10. Milestones and Contingency Measures

CAA Section 172(c)(9) states: "Such plan shall provide for the implementation of specific measures to be undertaken if the area fails to make reasonable further progress, or to attain the national primary ambient air quality standard by the attainment date applicable under this part. Such measures shall be included in the plan revision as contingency measures to take effect in any such case without further action by the State or the Administrator."

For any serious nonattainment area, contingency measures can include measures that achieve emissions reductions on sources located outside the nonattainment area as well as from sources within the nonattainment area, provided that the measures are factually demonstrated to produce the appropriate air quality impact within the nonattainment area.

Should the Cleveland Ozone Nonattainment Area fail to make RFP or attain by the attainment date, Ohio will implement legally and practically enforceable contingency measures. Emissions reductions from these measures will be in excess of what is needed to meet any other nonattainment plan requirements in the CAA, such as RACT/RACM, and in excess of those relied upon for RFP and attainment modeling.

Ohio will consider contingency measures from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. The Implementation Rule states contingency measures be approximately equivalent to one year's worth of emissions reductions, or approximately 3% of the baseline emissions inventory (83 FR 234); that is, 3.24 TPOSD of NO_x or 5.70 TPOSD of VOC. The selection of measures will be based on cost-effectiveness, emission reduction potential in accordance with one-years' worth of emissions reductions, economic and social considerations, or other factors that Ohio deems appropriate.

Ohio will solicit input from all interested and affected persons in the Cleveland Ozone Nonattainment Area prior to selecting appropriate contingency measures. Because it is not possible at this time to determine what control measures will be appropriate at an unspecified time in the future, the list of contingency measures outlined below is not comprehensive. Some of the contingency measures that were evaluated and would be considered are as follows:

1) Tighten VOC RACT on existing sources covered by U.S. EPA CTGs issued after the 1990 CAA.

2) Apply VOC RACT to smaller existing sources.

3) One or more transportation control measures sufficient to achieve at least half a percent reduction in actual area wide VOC emissions. Transportation measures will be selected from the following, based upon the factors listed above after consultation with affected local governments:

    a. trip reduction programs, including, but not limited to, employer-based transportation management plans, area wide rideshare programs, work schedule changes, and telecommuting;

    b. traffic flow and transit improvements; and

    c. other new or innovative transportation measures not yet in widespread use that affected local governments deem appropriate.

4) Alternative fuel and diesel retrofit programs for fleet vehicle operations.

5) Require VOC or NO_x emission offsets for new and modified major sources.

6) Increase the ratio of emission offsets required for new sources.

7) Require VOC or NO_x controls on new minor sources (less than 50 TPY).

8) Adopt additional NO_x RACT for existing combustion sources.

No contingency measure will be implemented without providing the opportunity for public participation during which the relative costs and benefits of individual measures, at the time they are under consideration, can be evaluated. In general, we expect that Ohio will select the appropriate contingency measures and begin the rule adoption process within 60 days after U.S. EPA official action notifying the state of a finding of failure to attain or meet RFP, with full implementation within one year of the trigger. The rule adoption process will ensure that implementation of the contingency measure does not occur before U.S. EPA's determination of failure to meet RFP or attainment. If the emissions reductions from the selected contingency measure are from sources outside of the nonattainment area, Ohio will provide technical support to prove that the emissions reductions will have the required effect within the designated nonattainment area.

In addition, Ohio EPA has adopted several other rules which serve as contingency measures: Consumer Products rules, AIM Coatings rules, and NO_x and VOC RACT in the Cleveland Ozone Nonattainment Area. These rules take effect around the time a contingency measure would

be triggered: that is, when the area would fail to make RFP or fails to attain the NAAQS by the attainment date.

While contingency measures may be triggered by either failure to make RFP or failure to attain, from a practical standpoint, for a serious nonattainment area it would be a failure to attain that would trigger a contingency measure rather than a failure to make RFP[25]. The Cleveland Ozone Nonattainment Area's serious attainment date is August 3, 2027. A finding of failure to attain would be expected within six months, or by February 3, 2028. However, Ohio should know whether a contingency measure is triggered by the time the 2026 ozone season monitoring data is available, i.e., by January 1, 2027, if not sooner.

25 CAA Section 182(g) discusses milestones, which apply to areas classified as serious or above. The CAA sets the first milestone at 6 years after November 15, 1990, and subsequent milestones every 3 years thereafter. States are required to determine whether each nonattainment area has achieved a reduction in emissions during the preceding interval equivalent to the total emission reductions required by the ROP provisions set forth in Section 182. A demonstration is not required for "an attainment date on which a milestone occurs in cases where the standard has been attained." Section 182(c)(9) then goes on to indicate that a failure to meet a milestone triggers contingency measures. While these sections do not apply to moderate areas, the first reasonable progress milestone was set to occur 6 years from the initial classification, which would have been the same as the moderate attainment date. So, for a moderate area, the relevant year to determine whether actual emissions reductions satisfied the reductions required by the 15% RFP plan is the same year used to determine whether the area has attained the standard based upon monitoring data. Following the logic set forth for areas classified as serious and above, there would be no need to evaluate actual emissions reductions against RFP goals. Either the area attains the NAAQS and no demonstration is needed, or the area fails to attain, and a contingency measure is triggered.

11. Enhanced Monitoring Plan

For areas designated as serious nonattainment or above for ozone, CAA Section 182(c)(1) requires enhanced monitoring of ozone and ozone precursors (NO_x and VOC). However, as part of the final rule revising the ozone NAAQS that was promulgated with an effective date of December 28, 2015, U.S. EPA also revised the Photochemical Assessment Monitoring Stations (PAMS) requirements and expanded their applicability, ultimately requiring states with areas designated as moderate nonattainment or above for ozone to develop and implement Enhanced Monitoring Plans (EMPs) for these areas (80 FR 65292).

To meet these requirements, Ohio EPA submitted an initial EMP for the Cleveland Ozone Nonattainment Area as an appendix to Ohio's 2024-2025 Air Monitoring Network Plan (AMNP)[26]. U.S. EPA approved Ohio's 2024-2025 AMNP, including the EMP for the Cleveland Ozone Nonattainment Area, via a letter dated September 9, 2024[27]. The currently effective EMP for the Cleveland Ozone Nonattainment Area includes additional monitoring of ozone, NO_x, and VOC beyond the minimum requirements of 40 CFR Part 58 Appendix D. The EMP also identifies existing partnerships between Ohio EPA and external entities, including a partnership with LADCO to develop a conceptual model of ozone formation in the Cleveland Ozone Nonattainment Area, and a partnership with the Cleveland Division of Air Quality (CDAQ) to establish a semi-mobile monitoring site to measure concentrations of ozone and ozone precursors within the city of Cleveland as part of a special monitoring project to increase the spatial resolution of concentrations of ozone and ozone precursors in Cleveland. Ohio EPA intends to include updated versions, as necessary, of the EMP for the Cleveland Ozone Nonattainment Area as appendices to future submissions of Ohio's annual AMNP. The currently effective EMP for the Cleveland Ozone Nonattainment Area is included as Appendix M.

26 https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/amnp-2024-2025
27 https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/air-monitoring

12. Clean Fuel Vehicle Program

For areas designated as serious nonattainment or above for ozone, CAA Section 182(c)(4) requires states to submit for approval a SIP revision to develop and implement a clean fuel vehicle program or appropriate substitute, as outlined in 40 CFR 88. On June 29, 2021, U.S. EPA revised these requirements in 40 CFR 88, recognizing that the clean fuel emission standards in the CAA are either less stringent than or equivalent to the standards generally applicable to light-duty vehicles, heavy-duty vehicles, and engines (86 FR 34308). In June 2022, U.S. EPA issued a guidance document titled "Guidance for Fulfilling the Clean Fuel Fleets Requirement of the Clean Air Act" [28] in which it is stated that, "a specific program requiring the purchase of clean-fuel vehicles is no longer necessary in Clean Fuel Fleets SIP submissions." As such, the clean fuel vehicle program requirement of CAA Section 182(c)(4) continues to be satisfied for the Cleveland Ozone Nonattainment Area.

28 https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10155SA.pdf

13. Transportation Control Demonstrations

For areas designated as serious nonattainment or above for ozone, CAA Section 182(c)(5) requires states to submit transportation control demonstrations every three years that assess, "whether current aggregate vehicle mileage, aggregate vehicle emissions, congestion levels, and other relevant parameters are consistent with those used for the area's demonstration of attainment," with a requirement to develop and implement a transportation control measures program to reduce emissions to level consistent with those projected in the attainment demonstration should the actual levels exceed those used in the attainment demonstration for the area.

Ohio EPA is committed to submitting a transportation control demonstration as required in calendar year 2028 to compare the recent actual levels of transportation emission parameters to those used in projections for the attainment demonstration portion of this document. If deemed necessary, Ohio EPA commits to subsequently submitting an additional SIP revision to implement a transportation control measures program within the Cleveland Ozone Nonattainment Area.

14. Public Participation

Ohio published notification for the public comment period and public hearing concerning Ohio's attainment demonstration for the Cleveland, OH 2015 Serious Ozone Nonattainment Area on Ohio EPA's website on **[DATE]. The comment period and public hearing were also noticed in Ohio's Weekly Review and interested parties were notified via electronic mailing lists.

The public comment period closed on **[DATE]. The public hearing was held on **[DATE]. Appendix N includes a copy of the public notice, the transcript from the public hearing, and a response to comments document.