REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR THE OHIO PORTION OF THE CINCINNATI, OH-KY-IN 8- HOUR OZONE NONATTAINMENT AREA

Butler, Clermont, Clinton, Hamilton, and Warren Counties, Ohio

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

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CHAPTER ONE

Introduction

The Clean Air Act (CAA) requires areas failing to meet the National Ambient Air Quality Standard (NAAQS) for ozone to develop State Implementation Plans (SIP's) to expeditiously attain and maintain the standard. On March 12, 2008, the United States Environmental Protection Agency (U.S. EPA) revised the air quality standard for ozone replacing the 1997 eight-hour standard of 0.08 parts per million (ppm) with a more stringent standard of 0.075 ppm.

On March 21, 2012 (77 FR 30088), U.S. EPA designated nonattainment areas for the 2008 eight-hour ozone standard. Section 107(d)(3)(E) of the CAA allows states to request nonattainment areas to be redesignated to attainment provided certain criteria are met. The following are the criteria that must be met in order for an area to be redesignated from nonattainment to attainment:

i) A determination that the area has attained the eight-hour ozone standard.
ii) An approved State Implementation Plan (SIP) for the area under Section 110(k).
iii) A determination that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the SIP and other federal requirements.
iv) A fully approved maintenance plan under Section 175(A).
v) A determination that all Section 110 and Part D requirements have been met.

Background

The current Cincinnati, OH-KY-IN nonattainment area includes the following Counties: Butler, Clermont, Clinton, Hamilton, and Warren in Ohio; Dearborn (partial nonattainment of Lawrenceburg Township only*)* in Indiana; and Boone, Campbell, and Kenton in Kentucky (partial nonattainment[1]).

[1] Boone County (part) 2000 Census tracts: 702, 703.01, 703.04, 703.05, 703.06, 703.07, 703.08, 703.09, 704.01, 704.02, 705.01, 705.02, 706.01, 706.03, 706.04. Campbell County (part) 2000 Census tracts: 501, 502, 503, 504, 505, 506, 511.01, 511.02, 512, 513, 519.01, 519.03, 519.04, 520.01, 520.02, 521, 522, 523.01, 523.02, 524, 525, 526, 528, 529, 530, 531.

As part of the 1997 eight-hour ozone standard designations, the following Counties within the Cincinnati, OH-KY-IN area were designated as basic nonattainment pursuant to Subpart 1 of the CAA and, therefore, were subject to nonattainment area rulemakings: Butler, Clermont, Clinton, Hamilton, and Warren Counties in Ohio; Boone, Campbell and Kenton Counties in Kentucky; and Dearborn County (partial nonattainment of Lawrenceburg Township only) in Indiana. The Ohio portion of the Cincinnati, OH-KY-IN area was redesignated to attainment on May 11, 2010 (75 FR 26118). A maintenance plan was approved at that time.

As a result of the 2012 ozone designations for the 2008 eight-hour ozone standard, U.S. EPA designated the Cincinnati, OH-KY-IN area marginal nonattainment, pursuant to Subpart 2 of the CAA, and Ohio Environmental Protection Agency (Ohio EPA) was required to submit certain nonattainment plan elements by July 20, 2014. Ohio EPA submitted those elements on July 18, 2014 and is awaiting U.S. EPA action.

This document is intended to support Ohio's request that the Ohio portions of the Cincinnati, OH-KY-IN area be redesignated from nonattainment to attainment for the eight-hour ozone standard. In addition, the States of Kentucky and Indiana also intend to submit requests for their respective portions of the Cincinnati, OH-KY-IN area. The Cincinnati, OH-KY-IN area has recorded three (3) years of complete quality-assured ambient air quality monitoring data for the years 2012 through 2014 demonstrating attainment of the eight-hour ozone standard.

Geographical Description

The Cincinnati, OH-KY-IN eight-hour ozone nonattainment area is located in southwest Ohio and includes the following Counties of: Butler, Clermont, Clinton, Hamilton, and Warren in Ohio; Dearborn (partial nonattainment of Lawrenceburg Township only) in Indiana; and partial areas[2] of Boone, Campbell, and Kenton in Kentucky. This area is shown in Figure 1 under Chapter Three.

Kenton County (part) 2000 Census tracts: 603, 607, 609, 610, 611, 612, 613, 614, 616, 636.03, 636.04, 636.05, 636.06, 638, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655.01, 655.02, 656, 657, 658, 659, 668, 669, 670, 671.

[2] Boone County (part) 2000 Census tracts: 702, 703.01, 703.04, 703.05, 703.06, 703.07, 703.08, 703.09, 704.01, 704.02, 705.01, 705.02, 706.01, 706.03, 706.04. Campbell County (part) 2000 Census tracts: 501, 502, 503, 504, 505, 506, 511.01, 511.02, 512, 513, 519.01, 519.03, 519.04, 520.01, 520.02, 521, 522, 523.01, 523.02, 524, 525, 526, 528, 529, 530, 531. Kenton County (part) 2000 Census tracts: 603, 607, 609, 610, 611, 612, 613, 614, 616, 636.03, 636.04, 636.05, 636.06, 638, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655.01, 655.02, 656, 657, 658, 659, 668, 669, 670, 671.

Status of Air Quality

Ozone monitoring data for the most recent three (3) years, 2012 through 2014, demonstrate that the air quality has met the NAAQS for ozone in this marginal nonattainment area. The NAAQS attainment, accompanied by decreases in emission levels discussed in Chapter Four, supports a redesignation to attainment for the Cincinnati, OH-KY-IN area based on the requirements in Section 107(d)(3)(E) of the CAA.

CHAPTER TWO

Requirements for Redesignation

U.S. EPA has published detailed guidance in a document entitled *Procedures for Processing Requests to Redesignate Areas to Attainment* (Redesignation Guidance), issued September 4, 1992, to Regional Air Directors. The redesignation request and maintenance plan are based on the Redesignation Guidance, supplemented with additional guidance received from staff of U.S. EPA Region V.

Below is a summary of each redesignation criterion as it applies to the Cincinnati, OH-KY-IN area.

i.) Attainment of the standard

There are two components involved in making this demonstration. The first component relies on ambient air quality data. The data that are used to demonstrate attainment should be the product of ambient monitoring that is representative of the area of highest concentration. The data should be collected and quality-assured in accordance with 40 CFR 58 and recorded in the Air Quality System (AQS) in order for it to be available to the public for review.

The second component relies upon supplemental U.S. EPA-approved air quality modeling. The supplemental modeling is not required for ozone nonattainment areas seeking redesignation; however, Ohio EPA has incorporated photochemical modeling information in Chapter Seven to further support our request that Ohio's portion of the nonattainment area be redesignated to attainment.

ii.) SIP approval

The SIP for the area must be fully approved under Section 110(k) and must satisfy all the requirements that apply to the area. Ohio's SIP was approved on May 4, 1994 (59 FR 23799), and March 23, 1995 (60 FR 15235) and includes the Cincinnati, OH-KY-IN area. In addition, on July 18, 2014, Ohio EPA submitted a SIP revision for this area and is awaiting U.S. EPA action. Chapter Five discusses this requirement in more detail.

iii.) Permanent and enforceable improvement in air quality

The state must be able to reasonably attribute the improvement in air quality to emission reductions which are permanent and enforceable. The state should estimate the percent reduction achieved from federal measures as well as control measures that have been adopted and implemented by the state.

The Cincinnati, OH-KY-IN area was designated marginal nonattainment for ozone as part of U. S. EPA "Air Quality Designations for the 2008 Ozone NAAQS." (77 FR 30088) On March 6, 2015, U.S. EPA finalized the "Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; Final Rule" (herein referred to as "Implementation Rule"). (80 FR 12264)

In the Implementation Rule, U.S. EPA states "Under CAA section 182(a), Marginal areas have up to 3 years from the effective date of designation to attain the NAAQS, and are not required to submit an attainment demonstration SIP." (80 FR 12268) Further, U.S. EPA identifies "An attainment demonstration consists of: (1) Technical analyses, such as base year and future year modeling of emissions which identifies sources and quantifies emissions from those sources that are contributing to nonattainment; (2) analyses of future year emissions reductions and air quality improvement resulting from existing (*i.e.,* already adopted or ''on the books'') national, regional and local programs, and potential new local measures needed for attainment, including RACM and RACT for the area; (3) a list of adopted measures (including RACT) with schedules for implementation and other means and techniques necessary and appropriate for demonstrating attainment as expeditiously as practicable but no later than the outside attainment date for the area's classification; and (4) a RACM analysis to determine whether any additional RACM measures could advance attainment by 1 year." (80 FR 12268) Therefore, these requirements, and specifically, the requirement to adopt specific state measures beyond federal measures, are not applicable to marginal areas, such as the Cincinnati, OH-KY-IN nonattainment area.

Regardless, Ohio has adopted and implemented control measures for these counties in the area beyond the federal measures in order to comply with the 1997 eight-hour ozone standard and Ohio also adopted the initial 1979/1981 statewide rules. These measures and rules remain in effect and have assisted the Cincinnati, OH-KY-IN area in reaching attainment for the 2008 eight-hour ozone standard. Below is a list of several previously adopted Ohio rules that have contributed to reducing ozone in this area:

- Portable Fuel Containers requirements

- Architectural and Industrial Maintenance (AIM) Coatings rules
- Consumer Products rules
- Clean Air Interstate Rule (CAIR)
- NO_x Sip Call rules

Chapters Four and Five discuss this requirement in more detail.

iv.) Section 110 and Part D requirements

For purposes of redesignation, a state must meet all requirements of Section 110 and Part D that were applicable prior to submittal of the complete redesignation request.

Subpart 1 of Part D consists of general requirements applicable to all areas which are designated nonattainment based on a violation of the NAAQS. Subpart 2 of Part D consists of more specific requirements applicable to lead.

i.) Section 110(a) requirements

Section 110(a) of Title I of the CAA contains the general requirements for a SIP. Section 110(a)(1) generally directs states to submit a SIP that provides for implementation, maintenance, and enforcement of the air quality standards to the U.S. EPA after reasonable notice and public hearing. Section 110(a)(2) provides that the infrastructure SIP submitted by a state must have been adopted by the state after reasonable public notice and hearing, and that, among other things, it must include enforceable emission limitations and other control measures[3], means or techniques necessary to meet the requirements of the CAA; provide for establishment and operation of appropriate devices, methods, systems and procedures necessary to monitor ambient air quality; provide for implementation of a source permit program to regulate the modification and construction of any stationary source within the areas covered by the plan; include provisions for the implementation of Part C, prevention of significant deterioration (PSD) and Part D, NSR permit programs; include criteria for stationary source emission control measures, monitoring, and reporting; include provisions for air quality modeling; and provides for public and local agency participation in

[3] Other than nonattainment emission limitations and measures which are a part of nonattainment area plans and subject to the timing requirements of Section 172 of the CAA.

planning and emission control rule development. In Ohio's December 27, 2012 infrastructure SIP submission, Ohio verified that the State fulfills the requirements of Section 110(a)(2) of the Act.

ii.) Section 172(c) requirements

This Section contains general requirements for nonattainment plans. The requirements for reasonable further progress, identification of certain emissions increases, and other measures needed for attainment will not apply for redesignations because they only have meaning for areas not attaining the standard. The requirements for an emission inventory will be satisfied by the inventory requirements of the maintenance plan. Chapters Four and Five discuss this requirement in more detail.

iii.) Conformity

The state must work with U.S. EPA to show that its SIP provisions are consistent with the Section 176(c)(4) conformity requirements. The redesignation request should include conformity procedures, if the state already has these procedures in place. If a state does not have conformity procedures in place at the time that it submits a redesignation request, the state must commit to follow U.S. EPA's conformity regulation upon issuance, as applicable.

v.) Maintenance plans

Section 107(d)(3)(E) stipulates that for an area to be redesignated, U.S. EPA must fully approve a maintenance plan that meets the requirements of Section 175(A). The maintenance plan must constitute a SIP revision and must provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation. Section 175 (A) further states that the plan shall contain such additional measures, if any, as may be necessary to ensure such maintenance.

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

States seeking redesignation of a nonattainment area should consider the following provisions:

a.) attainment inventory;
b.) maintenance demonstration;
c.) monitoring network;
d.) verification of continued attainment; and
e.) contingency plan.

Chapter Six discusses this requirement in more detail.

CHAPTER THREE

OZONE MONITORING

CAA Section107 (d)(3)(E)(i)

Requirement 1 of 4

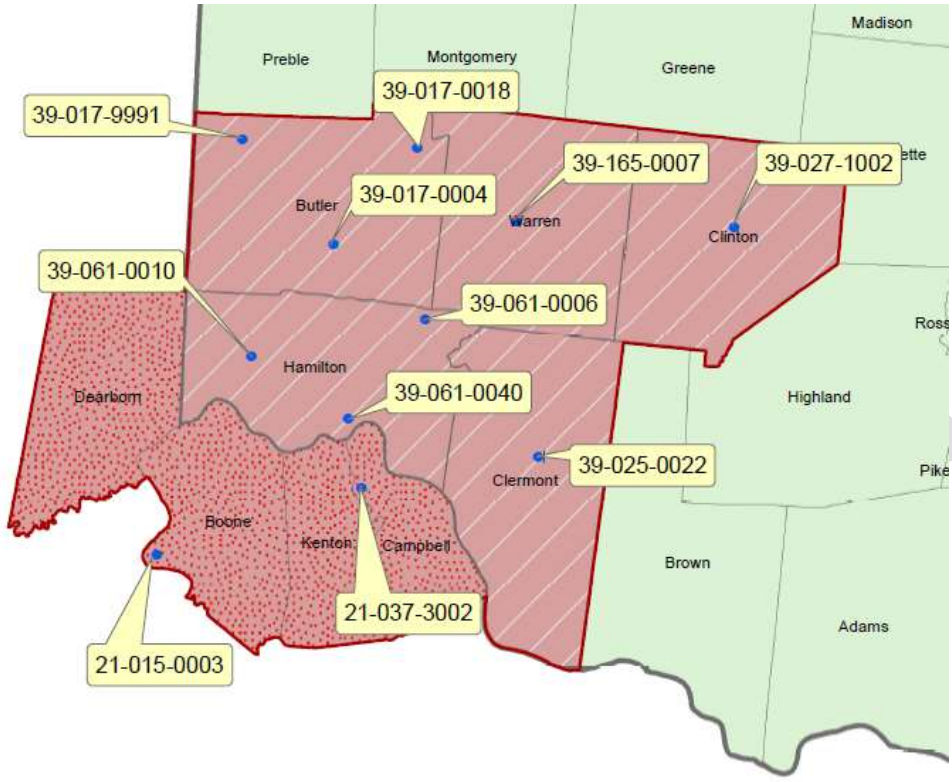
A demonstration that the NAAQS for ozone, as published in 40 CFR 50.15, has been attained.

Background

There are eleven monitors measuring ozone concentrations in this nonattainment area. Nine of the eleven monitors, located in Ohio, are operated by Ohio EPA Division of Air Pollution Control, Southwest District Office and the Hamilton County Division of Environmental Services. A listing of the design values based on the three-year average of the annual fourth highest daily maximum eight-hour average ozone concentrations from 2012 through 2014 is shown in Table 1. The locations of the monitoring sites for this nonattainment area are shown on Figure 1.

Demonstration

Figure 1 - Map of the Cincinnati, OH-KY-IN nonattainment area and monitor locations



Requirement 2 of 4

Ambient monitoring data quality assured in accordance with 40 CFR 58.10, recorded in the U.S. EPA air quality system (AQS) database, and available for public view.

Demonstration

The Ohio EPA has quality assured all data shown in Appendix A in accordance with 40 CFR 58.10 and the Ohio Quality Assurance Manual. Ohio EPA has recorded the data in the AQS database and, therefore, the data are available to the public.

Requirement 3 of 4

A showing that the three-year average of the fourth highest values, based on data from all monitoring sites in the area or its affected downwind environs, are below 75 parts per billion (ppb). (This showing must rely on three complete, consecutive calendar years of quality assured data.)

Background

The following information is taken from Appendix P, "Interpretation of the Primary and Secondary NAAQS for O3" of 40 CFR Part 58.

Three complete years of ozone monitoring data are required to demonstrate attainment at a monitoring site. The eight-hour primary and secondary ozone ambient air quality standards 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 0.075 ppm. When this occurs, the site is said to be in attainment. Three significant digits must be carried in the computations. Because the third decimal digit, in ppm, is truncated, 0.075666* ppm is the largest concentration that is less than or equal to 0.075 ppm. Therefore, for the purposes of this request, values below 0.0757 ppm meet the standard. 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 design value.

Table 1 shows the monitoring data for 2012 – 2014 that were retrieved from the U.S. EPA AQS. The air quality design value for the area is the highest design value among all sites in the area. *Please note that the standard is measured in ppm while the commonly used unit is ppb. For the remainder of this document, ppb will be used.*

Demonstration

Table 1 - Monitoring Data for the Cincinnati, OH-KY-IN, OH area for 2012 – 2014

Data source: **U.S. EPA Air Quality System (AQS)**
http://www.epa.gov/aqs

					1st	2nd	3rd	4th	2012-2014
SITE ID	**COUNTY**	**ADDRESS**	**YEAR**	**%OBS**	**8-HR**	**8-HR**	**8-HR**	**8-HR**	**AVERAGE**
39-017-0004	Butler	Hamilton	2012	100	95	90	89	83	73
39-017-0004	Butler	Hamilton	2013	98	70	70	69	68	
39-017-0004	Butler	Hamilton	2014	99	80	72	71	70	
39-017-0018	Butler	Middletown	2012	95	88	87	85	84	73
39-017-0018	Butler	Middletown	2013	100	76	70	68	68	
39-017-0018	Butler	Middletown	2014	99	75	73	71	69	
39-017-9991	Butler	Not in City	2012	93	97	88	87	85	74
39-017-9991	Butler	Not in City	2013	94	75	73	69	69	
39-017-9991	Butler	Not in City	2014	94	74	72	71	69	
39-025-0022	Clermont	Batavia	2012	100	107	97	94	91	75
39-025-0022	Clermont	Batavia	2013	100	78	69	66	66	
39-025-0022	Clermont	Batavia	2014	98	70	69	68	68	
39-027-1002	Clinton	Not in City	2012	100	100	91	87	86	73
39-027-1002	Clinton	Not in City	2013	99	77	69	65	64	
39-027-1002	Clinton	Not in City	2014	99	77	71	70	70	
39-061-0006	Hamilton	Blue Ash	2012	96	98	96	92	87	75
39-061-0006	Hamilton	Blue Ash	2013	95	74	70	69	69	
39-061-0006	Hamilton	Blue Ash	2014	96	83	72	71	70	
39-061-0010	Hamilton	Cleves	2012	87	90	85	85	83	73
39-061-0010	Hamilton	Cleves	2013	97	73	71	69	64	

SITE ID	COUNTY	ADDRESS	YEAR	%OBS	1st 8-HR	2nd 8-HR	3rd 8-HR	4th 8-HR	2012-2014 AVERAGE
39-061-0010	Hamilton	Cleves	2014	100	76	75	74	73	
39-061-0040	Hamilton	Cincinnati	2012	100	96	83	82	82	73
39-061-0040	Hamilton	Cincinnati	2013	99	74	73	72	69	
39-061-0040	Hamilton	Cincinnati	2014	100	78	74	69	69	
39-165-0007	Warren	Lebanon	2012	100	92	89	84	80	72
39-165-0007	Warren	Lebanon	2013	99	74	72	71	67	
39-165-0007	Warren	Lebanon	2014	100	74	73	71	71	
21-015-0003	Boone	Not in City	2012	100	85	83	78	74	65
21-015-0003	Boone	Not in City	2013	100	71	62	60	59	
21-015-0003	Boone	Not in City	2014	100	64	64	62	62	
21-037-3002	Campbell	Highland Heights	2012	99	106	89	84	84	75
21-037-3002	Campbell	Highland Heights	2013	100	79	76	72	72	
21-037-3002	Campbell	Highland Heights	2014	99	74	74	72	71	
Highest Average									**75 ppb**

The area's design values have trended downward as emissions have declined due to such factors as cleaner automobiles and fuels, along with controls for EGUs, both regionally and locally.

Requirement 4 of 4

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

Demonstration

Ohio EPA commits to continue monitoring ozone levels at the Ohio sites indicated in Figure 1. Ohio EPA will consult with U.S. EPA Region V prior to making changes to the existing monitoring network, should changes become necessary in the future. Ohio EPA will continue to quality assure the monitoring data to meet the requirements of 40 CFR 58 and all other federal requirements. Connection to a central station and updates to the Ohio EPA web site[4] will provide real time

availability of the data and knowledge of any exceedances. Ohio EPA will enter all data into AQS on a timely basis in accordance with federal guidelines.

CHAPTER FOUR

EMISSION INVENTORY

CAA Section107 (d)(3)(E)(iii)

U.S. EPA's Redesignation Guidance requires the submittal of a comprehensive inventory of ozone precursor emissions (VOC and NO_x) representative of the year when the area achieves attainment of the ozone air quality standard. Ohio also must demonstrate that the improvement in air quality between the year that violations occurred and the year that attainment was achieved is based on permanent and enforceable emission reductions. Other emission inventory related requirements include a projection of the emission inventory to a year at least 10 years following redesignation; a demonstration that the projected level of emissions is sufficient to maintain the ozone standard; and a commitment to provide future updates of the inventory to enable tracking of emission levels during the 10-year maintenance period.

The emissions inventory development and emissions projection discussion below, with the exception of the mobile (on-road) emissions inventory and projections, identifies procedures used by Indiana Department of Environmental Management (IDEM), in consultation with Ohio EPA and Kentucky Division of Environmental Quality (KDEQ),) regarding emissions from Ohio's portion of the counties in the Cincinnati, OH-KY-IN area. Specific emissions data are provided for all counties, including those in Ohio, Kentucky and Indiana.

Area, non-road, and point source emissions were compiled from the data available on U.S. EPA's Emissions Modeling Clearinghouse website .[4] Using Ozone NAAQS Emissions Modeling platform (2011v6.1) data were collected together for the 2011 National Emissions Inventory (NEI) year and the 2018 and 2025 U.S. EPA-projected inventories. Using those datasets the intervening years were interpolated between 2011 and 2018 and then between 2018 and 2025. The years beyond 2025 were estimated using the TREND function in Microsoft Excel. If the TREND function resulted in a negative value, the emissions were assumed to not change. Mobile source emissions were developed in conjunction with the Ohio, Kentucky, Indiana, and the Council of Governments (OKI) and were calculated from emission factors produced by U.S. EPA's 2014 Motor Vehicle Emission Simulator (MOVES) software program and data extracted from the region's travel-demand model. Biogenic emissions are not included in these summaries. Appendix B contains data tables and graphs of estimated emissions for all sources (except mobile) for all years. Appendix C contains detailed methodology and data for mobile source emissions for all years.

4http://www.epa.gov/ttn/chief/emch/index.html

Ohio recognizes that revisions to the emissions data below may be necessary once Kentucky and Indiana prepare a redesignation request and maintenance plan for their portion of the nonattainment area.

Requirement 1 of 5

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

Background

The point source data are taken from Ohio's annual emissions reporting program.

Periodic inventories, which include emissions from all sectors - mobile, area, non-road, and point sources - are prepared every three years.

Demonstration

The 2011 inventory is used as the nonattainment base year for the purpose of thissubmittal[5]. The 2014 inventory is used as the attainment year inventory for the purposes of comparison. These inventories represent a comprehensive, accurate, and current inventory of actual emissions from all sources of the relevant pollutants in the Cincinnati, OH-KY-IN area. The detailed emission inventory information of the Cincinnati, OH-KY-IN area is provided in Appendix B and C. Emissions of VOC and NOx for 2011 and 2014 are identified under Requirement Three of this Chapter.

Requirement 2 of 5

A projection of the emission inventory to a year at least 10 years following redesignation.

Background

As discussed above, IDEM and Ohio EPA prepared a projected emissions inventory for the Cincinnati, OH-KY-IN area including area, non-road, mobile, and point sources for precursors of ozone (VOCs and NO_x) for the nonattainment area.

[5] On July 18, 2014, Ohio EPA submitted its 2008 base year inventory as required under CAA Section 182(a)(1). Ohio EPA is not requesting that inventory be replaced with the 2011 inventory in this submittal in Ohio's SIP.

Demonstration

In consultation with U.S. EPA and other stakeholders, Ohio EPA selected the year 2030 as the maintenance year for this redesignation request. The request also contains projected emission inventories for 2020. The detailed emission inventory information of the Cincinnati, OH-KY-IN area is provided in Appendix B and C.

On-Road Mobile Emission Estimations

Tables 2 through 13 contain the results of the emissions analysis for the appropriate years. All emissions estimations are expressed in tons per summer day (TSD).

Table 2 - Butler County, Ohio Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	10.21	7.59	4.79	2.88
NOx (TSD)	12.24	8.85	4.74	2.44
VMT (miles/day)	8,310,016	8,410,655	8,605,779	8,996,125

Table 3 - Clermont County, Ohio Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	6.27	4.66	2.94	1.77
NOx (TSD)	7.52	5.44	2.91	1.50
VMT (miles/day)	5,104,068	5,165,881	5,285,728	5,525,481

Table 4 - Clinton County, Ohio Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	2.27	1.53	0.93	0.71
NOx (TSD)	4.53	3.51	1.86	1.28
VMT (miles/day)	1,867,870	2,004,092	2,172,898	2,531,300

Table 5 - Hamilton County, Ohio Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	28.09	20.88	13.18	7.92
NOx (TSD)	33.69	24.37	13.05	6.71
VMT (miles/day)	22,870,707	23,147,685	23,684,703	24,759,009

Table 6 - Warren County, Ohio Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	8.21	6.10	3.85	2.32
NOx (TSD)	9.84	7.12	3.81	1.96
VMT (miles/day)	6,683,481	6,764,422	6,921,354	7,235,297

Table 7 – Dearborn County, Indiana Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	1.33	0.99	0.62	0.38
NOx (TSD)	1.89	1.37	0.74	0.39
VMT (miles/day)	698,492	706,951	723,352	756,163

Table 8 – Summary of Ohio and Indiana Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	56.38	41.75	26.31	15.98
NOx (TSD)	69.71	50.66	27.11	14.28
VMT (miles/day)	45,534,634	46,199,686	47,393,814	49,803,375

Table 9 - Boone County, Kentucky Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	3.68	2.82	1.54	0.86
NOx (TSD)	7.75	6.14	2.71	1.18
VMT (miles/day)	4,156,815	4,312,570	4,610,421	5,188,521

Table 10 - Campbell County, Kentucky Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	2.29	1.76	0.96	0.54
NOx (TSD)	4.83	3.83	1.69	0.74
VMT (miles/day)	2,591,180	2,688,271	2,873,939	3,234,301

Table 11 - Kenton County, Kentucky Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	3.48	2.67	1.46	0.82
NOx (TSD)	7.34	5.81	2.57	1.12
VMT (miles/day)	3,934,084	4,081,493	4,363,385	4,910,509

Table 12 – Summary of Kentucky Emission Estimations for On-Road Mobile Sources

	2011	2014	2020	2030
VOC (TSD)	9.45	7.25	3.96	2.22
NOx (TSD)	19.92	15.78	6.97	3.04
VMT (miles/day)	10,682,079	11,082,334	11,847,745	13,333,331

Table 13 - Emission Estimation Totals for On-Road Mobile Sources for the Cincinnati-OH-KY-IN Area

	2011	2014	2020	2030
VOC (TSD)	65.83	49.00	30.27	18.20
NOx (TSD)	89.63	66.44	34.08	17.32
VMT (miles/day)	55,991,838	57,278,667	61,836,697	66,075,987

Motor Vehicle Emission Budget

Table 14 and Table 15 contain the motor vehicle emissions budgets for the Cincinnati, OH-KY-IN area. For planning purposes, budgets are established for the combined Ohio and Indiana portions and for the separate Kentucky portion.

Table 14 - Mobile Vehicle Emissions Budget for Ohio and Indiana

	2020 Estimated Emissions	2020 Mobile Safety Margin Allocation*	2020 Total Mobile Budget	2030 Estimated Emissions	2030 Mobile Safety Margin Allocation*	2030 Total Mobile Budget
VOC (TSD)	26.31	3.95	30.26	15.98	2.40	18.38
NOx (TSD)	27.11	4.07	31.18	14.28	2.14	16.42
VMT (miles/day)	47,393,814	-	-	49,803,375	-	-

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

The above budgets for the Ohio and Indiana portion of the area, agreed upon as part of the interagency consultation process, include the emission estimates calculated for 2020 and 2030 (from Table 8) with an additional 15 percent margin of safety allocated to those estimates.

In an effort to accommodate future variations in travel demand models and VMT forecast when no change to the network is

planned, Ohio EPA consulted with U.S. EPA to determine a reasonable approach to address this variation. Based on this discussion, a 15 percent margin of safety allocation was agreed upon and has been added to the emissions estimates for the Ohio and Indiana portions of this nonattainment area.

Table 15 - Mobile Vehicle Emissions Budget for Kentucky

	2020 Estimated Emissions	2020 Mobile Safety Margin Allocation	2020 Total Mobile Budget	2030 Estimated Emissions	2030 Mobile Safety Margin Allocation	2030 Total Mobile Budget
VOC (TSD)	3.96	0.59	4.55	2.22	0.33	2.55
NOx (TSD)	6.97	1.05	8.02	3.04	0.46	3.50
VMT (miles/day)	12,232,034	-	-	13,333,331	-	-

The above budget for the Kentucky portion of the area was provided directly by Kentucky as part of the consultation process and also includes a margin of safety allocated to the emission estimates calculated for 2020 and 2030 (from Table 12).

The emission estimates are derived from the travel demand model and MOVES2014 as described above. All methodologies, the latest planning assumptions, and the safety margins allocations were determined through the interagency consultation process described in the Transportation Conformity Memorandum of Understanding (MOU) among OKI, Ohio DOT, and Ohio EPA.

A 15 percent margin of safety is appropriate because: 1) there is an acknowledged potential variation in VMT forecast and potential estimated mobile source emissions due to expected modifications to TDM and mobile emissions models; and 2) the total decrease in emissions from all sources is sufficient to accommodate this 15 percent allocation of safety margin to mobile sources while still continuing to maintain the total emissions in the Cincinnati, OH-KY-IN area well below the 2014 attainment level of emissions.

The 15 percent margin of safety was calculated by taking 15 percent of the mobile source emission estimates. Safety margin, as defined by the conformity rule, looks at the total emissions from all sources in the nonattainment area. The actual allocation is less than 15 percent of the total emission

reduction from all sources as can be seen from Table 36.

In summary, for all three states combined, the mobile budget safety margin allocation translates into:

--An allocation of 4.54 TSD for VOC and 5.12 TSD for NOx for 2020; and
-An allocation of 2.73 TSD for VOC and 2.60 TSD for NOx for 2030.

When compared to the overall safety margin, as defined in 40 CFR 93.101[6], discussed under "Requirement 3 of 5" below, it is evident this allocation is significantly below the total safety margin for this area (see Table 36).

The current eight-hour budgets will no longer be applicable either after the effective date of the approved redesignation or after the effective date of any U.S. EPA action approving a finding that the new eight-hour conformity budget included in this submittal is adequate for transportation conformity purposes, whichever date comes first.

Requirement 3 of 5

A demonstration that the projected level of emissions is sufficient to maintain the ozone standard.

Background

Maintenance is demonstrated when the future-year (2030) projected emission totals are below the 2014 attainment year totals.

Sectors included in the following tables are: Electrical Generating Unit (EGU); Non-Electrical Generating Unit (Non-EGU); Non-road Mobile (Non-road); Other-Area (Area); and On-road Mobile (On-road).

Demonstration

NO_x

[6] "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.

Table 16 - Butler County, Ohio NO_x Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	1.12	0.73	0.22	0.26	
Non-EGU	9.57	9.58	9.57	9.57	
Non-road	4.27	3.39	2.03	1.16	
Area	4.78	4.78	4.78	4.79	
On-road	12.24	8.85	4.74	2.44	
TOTAL	**31.98**	**27.33**	**21.34**	**18.22**	**9.11**

Table 17 - Clermont County, Ohio NO_x Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	43.41	38.17	31.18	31.18	
Non-EGU	0.14	0.14	0.14	0.14	
Non-road	2.27	1.81	1.11	0.63	
Area	1.14	1.14	1.14	1.15	
On-road	7.52	5.44	2.91	1.50	
TOTAL	**54.48**	**46.70**	**36.48**	**34.60**	**12.10**

Table 18 - Clinton County, Ohio NOx Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	
Non-EGU	0.00	0.00	0.00	0.00	
Non-road	1.15	0.96	0.64	0.29	
Area	0.52	0.52	0.52	0.53	
On-road	4.53	3.51	1.86	1.28	
TOTAL	**6.20**	**4.99**	**3.02**	**2.10**	**2.89**

Table 19 - Hamilton County, Ohio $\underline{NO_x}$ Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	17.72	14.47	10.15	10.15	
Non-EGU	8.59	8.59	8.60	8.60	
Non-road	8.56	6.76	4.06	2.59	
Area	10.09	10.08	10.08	10.10	
On-road	33.69	24.37	13.05	6.71	
TOTAL	**78.65**	**64.27**	**45.94**	**38.15**	**26.12**

Table 20 - Warren County, Ohio $\underline{NO_x}$ Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	
Non-EGU	1.55	1.55	1.54	1.54	
Non-road	3.24	2.55	1.50	0.78	
Area	1.66	1.66	1.66	1.67	
On-road	9.84	7.12	3.81	1.96	
TOTAL	**16.29**	**12.88**	**8.51**	**5.95**	**6.93**

Table 21 - Dearborn County, Indiana $\underline{NO_x}$ Emission Inventory (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	15.08	8.73	0.26	0.26	
Non-EGU	2.71	2.71	2.70	2.70	
Non-road	0.53	0.44	0.30	0.18	
Area	0.47	0.47	0.48	0.48	
On-road	1.89	1.37	0.74	0.39	
TOTAL	**20.68**	**13.72**	**4.48**	**4.01**	**9.71**

Table 22 - Boone County, Kentucky $\underline{NO_x}$ Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	7.48	7.73	8.07	8.07	
Non-EGU	2.23	2.26	2.47	3.34	
Non-road	1.85	1.54	1.05	0.67	
Area	0.76	0.76	0.76	0.77	
On-road	7.75	6.14	2.71	1.18	
TOTAL	**20.07**	**18.43**	**15.06**	**14.03**	**4.40**

Table 23 - Campbell County, Kentucky NO_x Emission Inventory Total (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	
Non-EGU	0.23	0.23	0.23	0.23	
Non-road	0.67	0.57	0.40	0.26	
Area	0.87	0.87	0.87	0.87	
On-road	4.83	3.83	1.69	0.74	
TOTAL	**6.60**	**5.50**	**3.19**	**2.10**	**3.40**

Table 24 - Kenton County, Kentucky NO_x Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	
Non-EGU	0.40	0.40	0.40	0.40	
Non-road	1.42	1.18	0.80	0.50	
Area	1.88	1.88	1.88	1.88	
On-road	7.34	5.81	2.57	1.12	
TOTAL	**11.04**	**9.27**	**5.65**	**3.90**	**5.37**

Table 25 - Cincinnati-OH-KY-IN Area NO_x Emission Inventory Totals (TSD)

NOx	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
Butler	31.98	27.33	21.34	18.22	
Clermont	54.48	46.70	36.48	34.60	
Clinton	6.20	4.99	3.02	2.10	
Hamilton	78.65	64.27	45.94	38.15	
Warren	16.29	12.88	8.51	5.95	
Dearborn	20.68	13.72	4.48	4.01	
Boone	20.07	18.43	15.06	14.03	
Campbell	6.60	5.50	3.19	2.10	
Kenton	11.04	9.27	5.65	3.90	
COMBINED NOx TOTAL	**245.99**	**203.09**	**143.67**	**123.06**	**80.03**

VOC

Table 26 - Butler County, Ohio VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.03	0.02	0.02	0.02	
Non-EGU	3.09	3.05	2.99	2.99	
Non-road	2.93	2.61	2.23	2.43	
Area	9.59	9.51	9.38	9.31	
On-road	10.21	7.59	4.79	2.88	
TOTAL	**25.85**	**22.78**	**19.41**	**17.63**	**5.15**

Table 27 - Clermont County, Ohio VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.28	0.28	0.31	0.43	
Non-EGU	0.22	0.22	0.21	0.21	
Non-road	1.95	1.73	1.43	1.46	
Area	5.41	5.36	5.28	5.20	
On-road	6.27	4.66	2.94	1.77	
TOTAL	**14.13**	**12.25**	**10.17**	**9.07**	**3.18**

Table 28 - Clinton County, Ohio VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	
Non-EGU	0.01	0.01	0.01	0.01	
Non-road	0.84	0.71	0.51	0.42	
Area	2.49	2.51	2.54	2.61	
On-road	2.27	1.53	0.93	0.71	
TOTAL	**5.61**	**4.76**	**3.99**	**3.75**	**1.01**

Table 29 - Hamilton County, Ohio VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.26	0.23	0.19	0.24	
Non-EGU	2.40	2.39	2.39	2.38	
Non-road	7.44	6.54	5.42	5.87	
Area	21.88	21.66	21.30	21.01	
On-road	28.09	20.88	13.18	7.92	
TOTAL	**60.07**	**51.70**	**42.48**	**37.42**	**14.28**

Table 30 - Warren County, Ohio VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	
Non-EGU	0.63	0.63	0.61	0.58	
Non-road	2.12	1.93	1.54	1.51	
Area	5.71	5.66	5.59	5.52	
On-road	8.21	6.10	3.85	2.32	
TOTAL	**16.67**	**14.32**	**11.59**	**9.93**	**4.39**

Table 31 - Dearborn County, Indiana VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.27	0.18	0.05	0.05	
Non-EGU	4.01	4.01	4.01	4.01	
Non-road	0.42	0.36	0.29	0.27	
Area	1.75	1.75	1.77	1.85	
On-road	1.33	0.99	0.62	0.38	
TOTAL	**7.78**	**7.29**	**6.74**	**6.56**	**0.73**

Table 32 - Boone County, Kentucky VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.29	0.28	0.28	0.28	
Non-EGU	2.48	2.45	2.43	2.53	
Non-road	2.61	2.28	1.80	1.60	
Area	4.66	4.48	4.22	4.13	
On-road	3.68	2.82	1.54	0.86	
TOTAL	**13.72**	**12.31**	**10.27**	**9.40**	**2.91**

Table 33 - Campbell County, Kentucky VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	
Non-EGU	0.44	0.44	0.43	0.41	
Non-road	0.70	0.60	0.45	0.40	
Area	2.31	2.25	2.17	2.13	
On-road	2.29	1.76	0.96	0.54	
TOTAL	**5.74**	**5.05**	**4.01**	**3.48**	**1.57**

Table 34 - Kenton County, Kentucky VOC Emission Inventory Totals (TSD)

Sector	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
EGU	0.00	0.00	0.00	0.00	
Non-EGU	0.63	0.63	0.61	0.57	
Non-road	1.14	1.01	0.87	0.92	
Area	4.64	4.50	4.28	4.16	
On-road	3.48	2.67	1.46	0.82	
TOTAL	**9.89**	**8.81**	**7.22**	**6.47**	**2.34**

Table 35 - Cincinnati-OH-KY-IN Area VOC Emission Inventory Totals (TSD)

VOC	2011 Base	2014 Attainment	2020 Interim	2030 Maintenance	Safety Margin
Butler	25.85	22.78	19.41	17.63	
Clermont	14.13	12.25	10.17	9.07	
Clinton	5.61	4.76	3.99	3.75	
Hamilton	60.07	51.70	42.48	37.42	
Warren	16.67	14.32	11.59	9.93	
Dearborn	7.78	7.29	6.74	6.56	
Boone	13.72	12.31	10.27	9.40	
Campbell	5.74	5.05	4.01	3.48	
Kenton	9.89	8.81	7.22	6.47	
COMBINED VOC TOTAL	**159.46**	**139.27**	**115.88**	**103.71**	**35.56**

VOC and NOx

Table 36 - Cincinnati-OH-KY-IN Area Comparison of 2008 attainment year and projected emission estimates (TSD)

	2014	2020	2020 Projected Decrease	2030	2030 Projected Decrease
VOC	139.27	115.88	23.39	103.71	35.56
NO_x	203.09	143.67	59.42	123.06	80.03

As shown in the table above, VOC emissions in the nonattainment area are projected to decrease by 23.39 TSD in 2020 and 35.56 TSD in 2030. In general, emissions for all sectors are projected to decline or remain stable. EGU sources in Clermont County (OH) and Hamilton County (OH) show a very slight increase, but this is fractional compared to the overall reductions expected. Furthermore, Butler County (OH) shows a minor increase in regards to non-road emissions; Clinton County (OH) a slight increase in area emissions; and Boone County (KY) is estimated to have an increase in non-EGU emissions. Again this increase does not affect the overall reduction in VOC emissions for the area and are likely contributed to slight changes in population projections. Cleaner vehicles and fuels are expected to be in place in 2018 and will cause an overall drop in VOC emissions.

NO_x emissions in the nonattainment area are projected to decrease by 59.42 TSD in 2020 and 80.03 TSD in 2030. EGU, non-road and on-road emissions are all projected to decline while non-EGU and area emissions are projected to remain steady overall. Again, Boone County (KY) is estimated to have an increase in EGU and non-EGU emissions which is likely contributed to slight changes in population projections. Decreases from U.S. EPA rules covering EGUs (NOx SIP Call, CAIR and CSAPR), Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements[7], Highway Heavy-Duty Engine Rule[8], and the Non-Road Diesel Engine Rule[9] are factored into the changes.

As identified in Table 14 and Table 15 above, an additional

[7] http://www.epa.gov/fedrgstr/EPA-AIR/2000/February/Day-10/a19a.htm

[8] http://www.epa.gov/fedrgstr/EPA-AIR/1997/October/Day-21/a27494.htm

[9] http://www.epa.gov/fedrgstr/EPA-AIR/1998/October/Day-23/a24836.htm

mobile budget margin of safety allocation is being requested for mobile emissions. The mobile budget margin of safety allocation translates into an additional 4.54 TSD for VOC and 5.12 TSD for NOx in the year 2020 and 2.73 TSD for VOC and 2.60 TSD for NOx in the year 2030. U.S. EPA's conformity regulations allow for allocation, through a revision to the SIP, of all or some portion of the overall area's safety margin (emission reductions from 2014 to 2030) to the mobile emissions budgets for future conformity. As identified in Table 14 and Table 15 above, the mobile budget margin of safety allocation and the total budget is distributed separately between Kentucky (alone) and Ohio/Indiana (combined). For the entire area, Ohio, Indiana and Kentucky chose to allocate:

- In 2020: 4.54 TSD of the 23.39 TSD safety margin for VOC and 5.12 TSD of the 59.42 TSD safety margin for NOx as a mobile emissions budget safety margin.

- In 2030: 2.73 TSD of the 35.36 TSD safety margin for VOC and 2.60 TSD of the 80.03 TSD safety margin for NOx as a mobile emissions budget safety margin.

Requirement 4 of 5

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

Background

Ambient air quality data from all monitoring sites indicate that air quality met the NAAQS for ozone in 2012 through 2014. U.S. EPA's Redesignation Guidance (p 9) states: "A state may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory, or by modeling to show that the future mix of sources and emissions rates will not cause a violation of the NAAQS."

Demonstration

Permanent and enforceable reductions of VOC and NOx emissions have contributed to the attainment of the eight-hour ozone standard. Some of these reductions were due to the application of tighter federal standards on new vehicles and non-road diesel engines while reductions in EGU emissions were due to implementation of CAIR/CSAPR.

With respect to EGUs, changes at several facilities have resulted in reductions in NOx emissions. Tanner's Creek Generating Station in Dearborn County (IN) permanently shutdown in May of 2015. Prior to the shutdown, NOx emissions had dropped from 15.08 TSD to 8.73 TSD (2011 to 2014). The Walter C. Beckjord facility in Clermont County (OH) permanently shutdown in October of 2014. Prior to the shutdown, NOx emissions had dropped in Clermont County from 43.41 TSD to 38.17 TSD (2011 to 2014), partly attributable to the Walter C. Beckjord facility. And lastly, unit 3 (163 megawatts) of the Miami Fort facility in Hamilton County (OH) permanently shutdown in June of 2015. Prior to the shutdown, NOx emissions had dropped in Hamilton County from 17.72 TSD to 14.27 TSD (2011 to 2014), partly attributable to unit 3 at Miami Fort.

Reductions achieved are discussed in greater detail under Chapter Five.

Table 37 - Cincinnati, OH-KY-IN Area Combined Comparison of 2011 base year and 2014 attainment year EGU, non-road, and on-road reductions

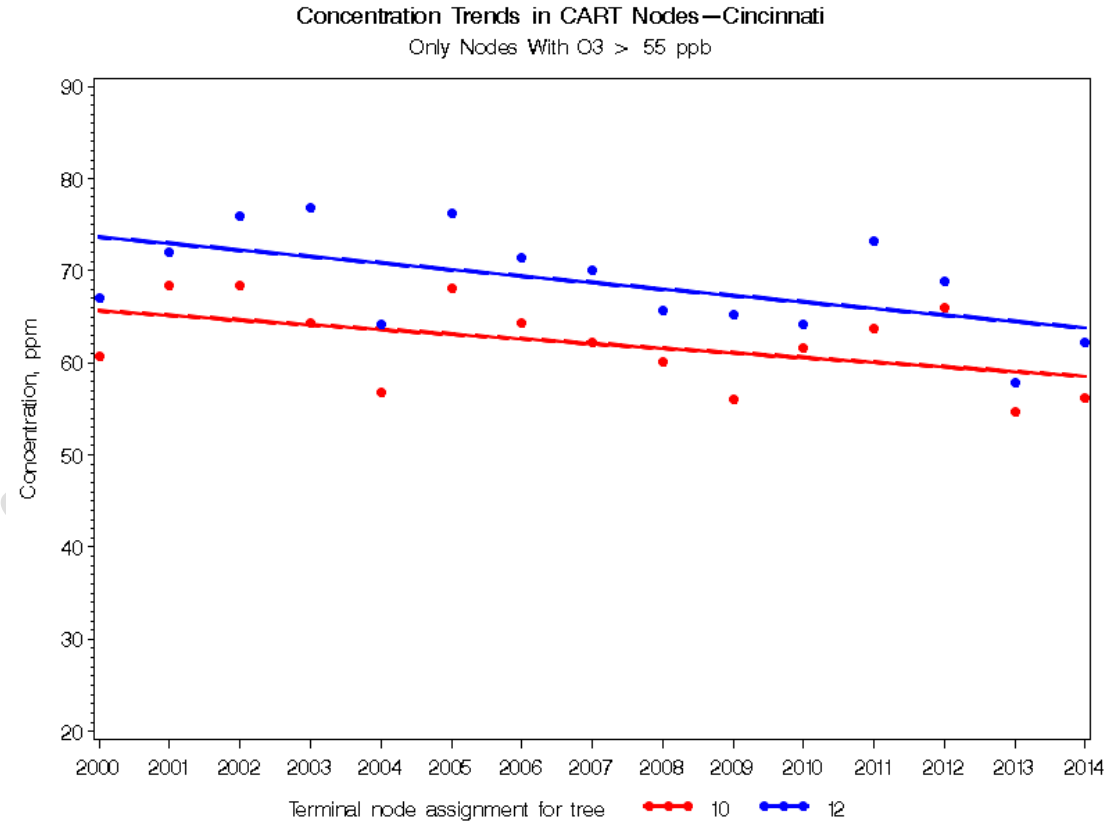
	2011	2014
EGU NOx	84.81	69.83
Non-road NOx	23.96	19.20
Non-road VOC	20.15	17.77
On-road VOC	65.83	49.00
On-road NO_x	89.63	66.44

To further support Ohio's demonstration that the improvement in air quality between the year violations occurred and the year attainment was achieved is based on permanent and enforceable emission reductions and not on temporary adverse economic conditions or unusually favorable meteorology, an analysis was performed by the Lake Michigan Air Directors Consortium (LADCO) in order to demonstrate the improvement in air quality is not based on unusually favorable meteorology. Appendix D includes additional details and methodology regarding this analysis.

A classification and regression tree analysis was conducted with the 2000 through 2014 data from three Cincinnati area ozone

sites: Colerain (EPA site number 3906100101), Sycamore (3906100061), and Taft (390610040). The goal of the analysis was to determine the meteorological and air quality conditions associated with ozone episodes, and construct trends for the days identified as sharing similar meteorological characteristics. Regression trees were developed for the three Cincinnati monitors to classify each summer day (May-September) by its ozone concentration and associated meteorological conditions. Similar days are assigned to nodes, which are equivalent to branches of the regression tree. Ozone trends in these nodes are then plotted (see Figure 2).

Figure 2 - Trends in High-Ozone Nodes for Cincinnati Monitors



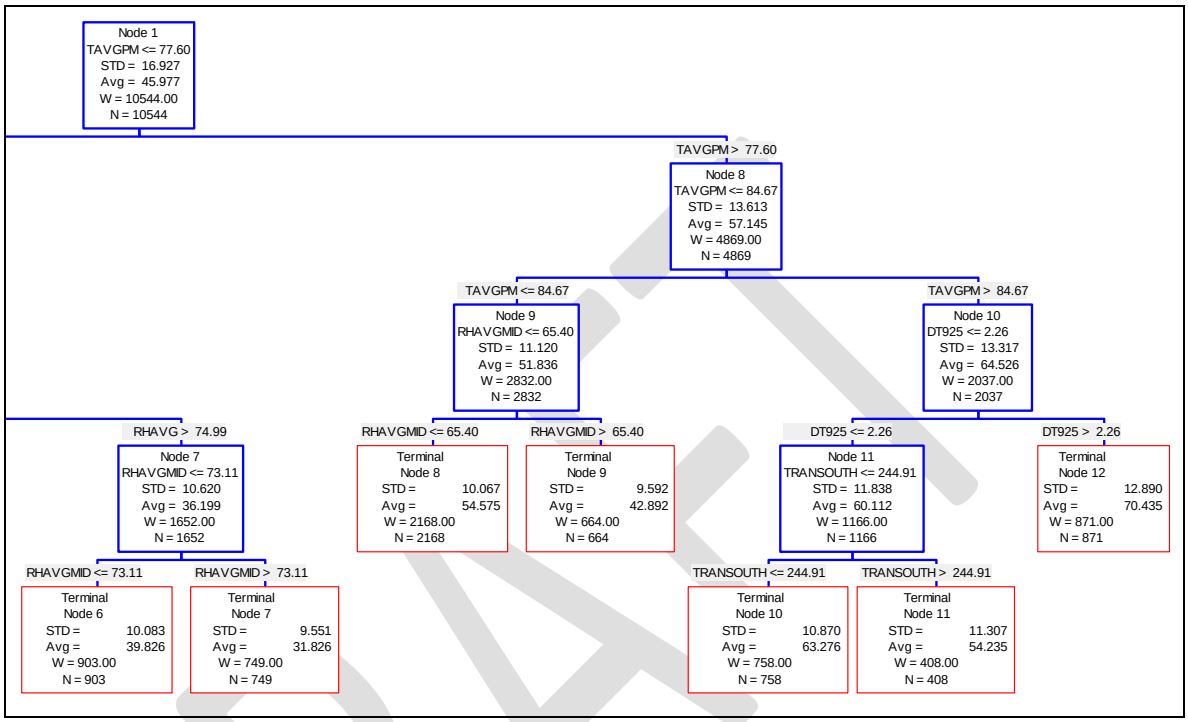
By grouping days with similar meteorology, the influence of meteorological variability on the underlying trend in ozone concentrations is partially removed; the remaining trend is presumed to be due to trends in precursor emissions or other non-meteorological influences. Trends in Cincinnati are declining over the period examined. No a priori selection of important meteorological variables is used to develop the trees;

instead, the CART model searches exhaustively through the 60 meteorological variables supplied to determine which are most efficient in predicting ozone. Although the exact selection of predictive variables changes from site to site, the universally common predictors are temperature, wind direction, and relative humidity. These are included in the dataset as daily averages and maximums as well as averages at specific times throughout the day (morning 7-10 am, afternoon 1-4 pm, etc.).

Meteorological data are from National Weather Service monitoring stations, usually airports. Upper air data are included as well. Because the upper air sites are far fewer in number than surface observation sites, data from the nearest upper air site is matched to each surface site. Hourly meteorological parameters used in the models included temperature, wind speed, wind direction, solar radiation, relative humidity, dew point, precipitation, fog, cloud attenuation, and station pressure. Daily meteorological parameters included the morning mixing height, winds and temperature at 925, 850, and 700 mb, transport distance (24-hr trajectory length), and transport direction.

Both classification trees and regression trees were examined, and performed quite similarly. Regression trees were preferred in this analysis because the trees yield quantitative values for predicted ozone rather than a simple episode/nonepisode indicator. Ranks of predictor variables were similar for both types of models. Models were tested with 10-fold cross validation. Figure 3 shows a portion of the regression tree for Cincinnati.

Figure 3 - Partial Regression tree for Cincinnati (highlighted boxes are high-concentration nodes 10 and 12 used for trends)



The analysis above further supports Ohio's demonstration that the improvement in air quality between the year violations occurred and the year attainment was achieved is based on permanent and enforceable emission reductions and not on unusually favorable meteorology.

Requirement 5 of 5

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

Demonstration

In Ohio, major point sources in all counties are required to submit air emissions information annually, in accordance with U.S. EPA's Consolidated Emissions Reporting Rule (CERR). Ohio EPA prepares a new periodic inventory for all ozone precursor emission sectors every three years. These ozone precursor inventories will be prepared for future years as necessary to comply with the inventory reporting requirements established in the CFR. Emissions information will be compared to the 2011 base year and the 2030 projected maintenance year

inventories to assess emission trends, as necessary, and to assure continued compliance with the ozone standard.

CHAPTER FIVE

CONTROL MEASURES AND REGULATIONS

CAA Section107 (d)(3)(E)(ii), 107(d)(3)(iv) & 107(d)(3)(E)(v)

Requirement 1 of 5

Section 182(a) of the 1990 Clean Air Act Amendments requires states with marginal nonattainment areas to implement RACT under Section 172(b).

Background

Section 182(b) of the 1990 Clean Air Act Amendments requires states with moderate nonattainment areas to submit a SIP to correct, or add, RACT requirements under Section 172(b) (as in effect immediately before the enactment of the Clean Air Act Amendments of 1990).

Demonstration

As required under the 1-hour ozone standard, Ohio EPA submitted VOC RACT rules which U.S. EPA approved on April 25, 1996 (61 FR 18255) and September 7, 1994 (59 FR 46182).

Statewide RACT rules have been applied to all new sources locating in Ohio since that time. RACT requirements are incorporated into permits along with monitoring, recordkeeping, and reporting necessary to ensure ongoing compliance. Ohio EPA also has an active enforcement program to address violations discovered by field office staff. The Ohio RACT rules are found in OAC Chapter 3745-21[10].

Requirement 2 of 5

Section 182(a)(3)(B) requires states to submit emissions statements.

Background

Section 182(a)(3)(B) requires states to submit emissions statements within two years of the enactment of the Clean Air Act Amendments and then every three years thereafter.

Demonstration

Ohio EPA submitted its emissions statement SIP on March 18, 1994 which was approved by U.S. EPA on October 13, 1995 (59 FR 51863). In addition, on July 18, 2014, Ohio EPA submitted a SIP revision for this area and is awaiting U.S. EPA action. As discussed in Chapter 4 (Requirement 4), Ohio EPA submits, and

[10] http://www.epa.state.oh.us/dapc/regs/3745-21/3745_21.html

commits to submit, emission inventories (statements) every three years.

Requirement 3 of 5

Evidence that control measures required in past ozone SIP revisions have been fully implemented.

Background

In addition to the historic RACT requirements and those mentioned above, on October 27, 1998, U.S. EPA promulgated the NO_x SIP Call requiring 22 states to pass rules that would result in significant emission reductions from large EGUs, industrial boilers, and cement kilns in the eastern United States. Ohio promulgated this rule in 2001. NOx SIP Call requirements are incorporated into permits along with monitoring, recordkeeping, and reporting necessary to ensure ongoing compliance. Ohio EPA also has an active enforcement program to address violations discovered by field office staff. Compliance is tracked through the Clean Air Markets data monitoring program. Beginning in 2004, this rule accounts for a reduction of approximately 31 percent of all NO_x emissions statewide compared to previous uncontrolled years. The other 21 states also have adopted these rules.

As discussed in detail below, U.S. EPA subsequently replaced the NOx SIP Call with CAIR and CSAPR. CSAPR continues to be implemented and amounts to even further reductions than that realized under the NOx SIP Call.

Section 182(b) contains additional provisions applicable to moderate nonattainment areas, for which the Cincinnati, OH-KY-IN area was under the one-hour standard. Section 182(b)(3) requires gasoline vapor recovery systems for gasoline dispensing stations in the area and section 182(b)(4) requires motor vehicle inspection and maintenance programs.

Demonstration

NOx SIP Call

Controls for EGUs under the NOx 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 web site, 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[11] in response to the SIP Call. OAC Chapter 3745-14 regulates EGUs and certain non-EGUs under a cap and trade program based on an 85 percent reduction of NOx 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 CAIR program superseded it as discussed above.

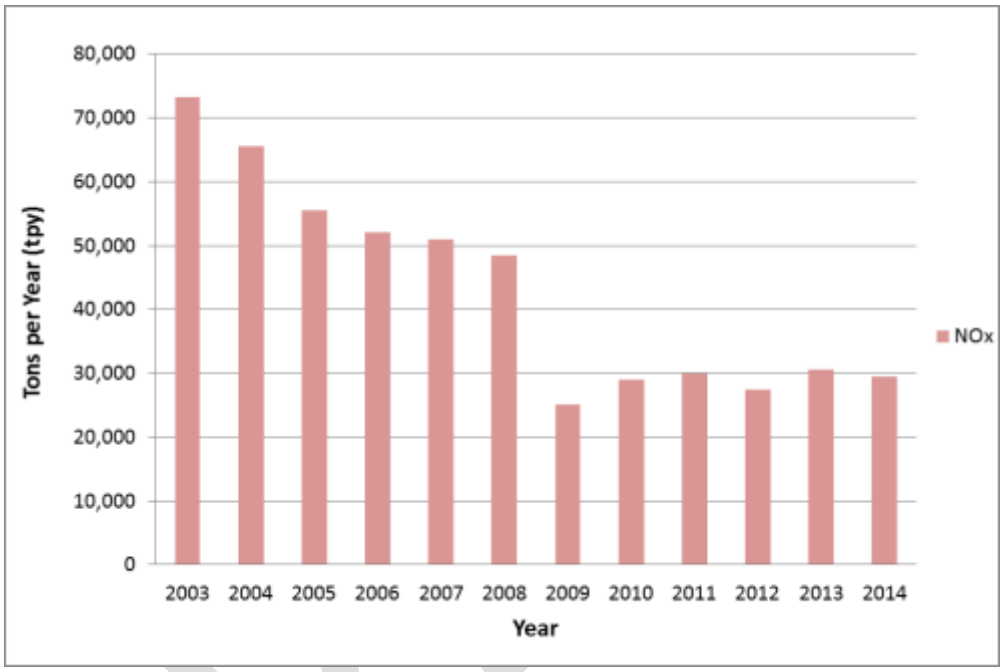
On April 21, 2004, U.S. EPA published Phase II of the NO_x SIP Call that establishes a budget for large (greater than 1 ton per day emissions) stationary internal combustion engines. Ohio EPA's OAC rule 3745-14-12 addresses stationary internal combustion engines, all used in natural gas pipeline transmissions. U.S. EPA approved this revision to the SIP on April 4, 2008. An 82 percent NO_x reduction from 1995 levels is 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. Data taken from the U.S. EPA Clean Air Markets web site, quantify the gradual NO_x reductions that have occurred in Ohio as a result of implementation of CAIR. CAIR's cap and trade program stayed in place through 2014, at which time the CSAPR program superseded it.

The following graph depicts the trend in NOx emissions from EGUs for the entire nonattainment area:

[11] http://www.epa.state.oh.us/dapc/regs/3745-14/3745_14.html

Figure 4 - NO_x Emissions from EGUs – Entire Nonattainment Area
Electric Generating Units,
2003-2014



Gasoline Vapor Recovery Systems

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.

Motor Vehicle Inspection and Maintenance Program

The U.S. EPA's final I/M regulations in 40 CFR Part 85 require the states to submit a fully adopted I/M program by November 15, 1993. U.S. EPA approved Ohio's enhanced I/M program (E-Check), on April 4, 1995 (60 FR 16989) and January 6, 1997 (62 FR 646). The E-check program is no longer being implemented in this area. On November 3, 2005, Ohio EPA submitted a request for replacement of the E-Check program in this area. In order to transfer the E-Check program from the active maintenance plan to a contingency plan, alternative emission reduction programs were adopted to replace the benefits associated with the E-Check program in the one-hour maintenance plan approved at that time. The following programs were implemented in place of the E-Check program and are still being implemented today in the original one-hour attainment area (excludes Clinton County):

- OAC rule 3745-21-09(O)(2)(e) - Vapor pressure limit for cold cleaning degreasing operations. Approved July 28, 2009 (74 FR 37171)
- OAC rule 3745-21-18 - Mobile equipment refinishing emission reduction via high transfer efficiency spray guns. Approved July 28, 2009 (74 FR 37171)
- OAC Chapter 3745-72 - Low Reid Vapor Pressure Fuels. Approved May 25, 2007 (72 FR 29269)
- OAC rule 3745-21-17 - Portable Fuel Containers. Approved October 14, 2009 (74 FR 52691)

In addition to the above, there are several measures beyond the CAA requirements that have been implemented in this area.

Tier II Emission Standards for Vehicles and Gasoline Sulfur Standards

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 proposal, automakers will be required to sell cleaner cars, and refineries will be required to make cleaner, lower sulfur gasoline. This rule will apply nationwide. The federal rules were phased in between 2004 and 2009. U.S. EPA has estimated that NO_x emission reductions were 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. VOC emission reductions were 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.

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 will be phased in between 2017 and 2025. Tier III requires all passenger vehicles to meet an average standard of 0.03 gram/mile of NOx. Compared to Tier II, the Tier III tailpipe standards for light-duty vehicles are expected to reduce NOx 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 reduces the sulfur content of gasoline to 10 ppm, beginning in January 2017.

Heavy-Duty Diesel Engines

In July 2000, U.S. EPA issued a final rule for Highway Heavy Duty Engines, a program which includes low-sulfur diesel fuel standards, which was phased in from 2004 through 2007. This rule applies to heavy-duty gasoline and diesel trucks and buses. This rule resulted in a 40 percent reduction in NO_x from diesel trucks and buses, a large sector of the mobile sources NO_x inventory.

Clean Air Non-road Diesel Rule

In May 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 also contains a cleaner fuel standard similar to the highway diesel program. The new standards cut emissions from non-road diesel engines by more than 90 percent. Non-road diesel equipment, as described in this rule, accounted for 47 percent of diesel particulate matter (PM) and 25 percent of NO_x from mobile sources nationwide. Sulfur levels were reduced in non-road diesel fuel by 99 percent from previous levels, from approximately 3,000 parts per million (ppm) to 15 ppm in 2009. New engine standards took effect, based on engine horsepower, starting in 2008.

Non-road Spark-Ignition Engines and Recreational Engine Standards

Effective in January 2003, this standard regulates NOx, VOCs, and carbon monoxide (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 spark-ignition engines (forklifts and airport ground service equipment), recreational vehicles (off-highway motorcycles and all-terrain vehicles), and recreational marine diesel engines. When all of the non-road spark-ignition engines and recreational engine standards are fully implemented, an overall 80% reduction in NOx, 72% reduction in VOC, and 56% reduction in CO emissions are expected by 2020.

Reciprocating Internal Combustion Engine Standards

This new standard, effective in May 2010, regulates emissions of air toxics from existing diesel powered stationary reciprocating internal combustion engines 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 reciprocating internal combustion engines of approximately 1,000, 2,800, and 27,000 tpy of air toxics, fine particles (PM2.5), and CO, respectively.

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 (MARPOL 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 NOx emissions that will begin 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 MARPOL Annex VI. When this strategy is fully implemented in 2030, U.S. EPA estimates that NOx and PM2.5 emissions in the U.S. will be reduced by approximately 1.2 million tpy and 143,000 tpy, respectively.

Clean Air Interstate Rule (CAIR)/Cross State Air Pollution Rule (CSAPR)

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 NOx SIP Call; Final Rule." This rule established the requirement for states to adopt rules limiting the emissions of NOx and SO2 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 PM2.5, SO2, and ozone precursors (NOx).

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 NOx and SO2 in two phases, with Phase I caps for NOx and SO2 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. SO2 emissions from power plants in the 28 eastern states, as well as Washington 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. NOx 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 NOx trading programs, and an annual SO2 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 SO2 and annual NOx, and May 1, 2015 for ozone season NOx. Combined with other final state and U.S. EPA actions, CSAPR will reduce power plant SO2 emissions by 73% and NOx emissions by 54% from 2005 levels in the CSAPR region, which includes the states of Indiana, Kentucky, and Ohio.

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 also 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. When these standards are fully implemented in 2015, U.S. EPA estimates that VOC and air toxic emissions in the U.S. will be reduced by approximately 190,000 to 290,000 tpy and 12,000 to 20,000 tpy, respectively.

Mercury and Air Toxic Standards

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 estimates that this rule will apply to approximately 1,100 coal-fired and 300 oil-fired EGUs at 600 power plants in the U.S. According to U.S. EPA, most facilities will 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 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 also 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.

Controls Specific to Ohio Counties

As discussed above, several federally enforceable changes at EGUs have resulted in reductions in NOx emissions. Tanner's Creek Generating Station in Dearborn County (IN) permanently shutdown in May of 2015. The Walter C. Beckjord facility in Clermont County (OH) permanently shutdown in October of 2014. And lastly, unit 3 (163 megawatts) of the Miami Fort facility in Hamilton County (OH) permanently shutdown in June of 2015.

Together, these rules will substantially reduce local and regional sources of ozone precursors.

Requirement 4 of 5

Acceptable provisions to provide for new source review.

Background

Ohio has a longstanding and fully implemented New Source Review (NSR) program. This is addressed in OAC Chapter 3745-31[12]. The Chapter includes provisions for the Prevention of Significant Deterioration (PSD) permitting program in OAC rules 3745-31-01 to 3745-31-20. Ohio's PSD program was conditionally approved on October 10, 2001 (66 FR 51570) and received final approval on January 22, 2003 (68FR 2909) by U.S. EPA as part of the SIP.

Demonstration

Any facility that is not listed in the 2008[13] emission inventory, or for the closing of which credit was taken in demonstrating attainment, will not be allowed to construct, reopen, modify, or reconstruct without meeting all applicable NSR requirements. Once the area is redesignated, Ohio EPA will implement NSR through the PSD program.

[12] http://www.epa.state.oh.us/dapc/regs/3745-31/3745_31.html

[13] On July 18, 2014, Ohio EPA submitted its 2008 base year inventory as required under CAA Section 182(a)(1).

Requirement 5 of 5

Assure that all existing control measures will remain in effect after redesignation unless the State demonstrates through photochemical modeling that the standard can be maintained without one (1) or more control measures.

Demonstration

Ohio commits to maintaining the aforementioned control measures after redesignation. Ohio hereby commits that any changes to its rules or emission limits applicable to VOC and/or NO_x sources, as required for maintenance of the ozone standard in the Cincinnati area, will be submitted to U.S. EPA for approval as a SIP revision.

Ohio, through Ohio EPA's Legal section, has the legal authority and necessary resources to actively enforce any violations of its rules or permit provisions. After redesignation, it intends to continue enforcing all rules that relate to the emission of ozone precursors in the Cincinnati area.

CHAPTER SIX

CONTINGENCY MEASURES

CAA Section 107(d)(3)(E)(v)

Requirement 1 of 4

A commitment to submit a revised plan eight (8) years after redesignation.

Demonstration

Ohio hereby commits to review its maintenance plan eight (8) years after redesignation, as required by Section 175(A) of the CAA.

Requirement 2 of 4

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

Demonstration

Ohio hereby commits to adopt and expeditiously implement necessary corrective actions in the following circumstances:

Warning Level Response:

A warning level response shall be prompted whenever an annual (1-year) fourth high monitored value of 79 ppb occurs in a single ozone season within the maintenance area. A warning level response will consist of a study to determine whether the ozone value indicates a trend toward higher ozone values or whether emissions appear to be increasing. The study will evaluate whether the trend, if any, is likely to continue and, if so, the control measures necessary to reverse the trend taking into consideration ease and timing for implementation as well as economic and social considerations. Implementation of necessary controls in response to a warning level response trigger will take place as expeditiously as possible, but in no event later than 12 months from the conclusion of the most recent ozone season (October 31).

Should it be determined through the warning level study that action is necessary to reverse the noted trend, the procedures for control selection and implementation outlined under “action level response” shall be followed.

Action Level Response:

An action level response shall be prompted whenever a two-year average fourth high monitored value of 76 ppb or greater occurs within the maintenance area. A violation of the standard (three-year average fourth high value of 85 ppb or greater) shall also prompt an action level response. In the event that the action level is triggered and is not found to be due to an exceptional event, malfunction, or noncompliance with a permit condition or rule requirement, Ohio EPA in conjunction with the metropolitan planning organization or regional council of governments, will determine additional control measures needed to assure future attainment of the NAAQS for ozone. In this case, measures that can be implemented in a short time will be selected in order to be in place within 18 months from the close of the ozone season that prompted the action level. Ohio EPA will also consider the timing of an action level trigger and determine if additional, significant new regulations not currently included as part of the maintenance provisions will be implemented in a timely manner and will constitute our response.

Control Measure Selection and Implementation

Adoption of any additional control measures is subject to the necessary administrative and legal process. This process will include publication of notices, an opportunity for public hearing, and other measures required by Ohio law for rulemaking.

If a new measure/control is already promulgated and scheduled to be implemented at the federal or State level, and that measure/control is determined to be sufficient to address the upward trend in air quality, additional local measures may be unnecessary. Furthermore, Ohio will submit to U.S. EPA an analysis to demonstrate the proposed measures are adequate to return the area to attainment.

Requirement 3 of 4

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

Demonstration

Contingency measures to be considered will be selected from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. The selection of measures will be based on cost-effectiveness, emission

reduction potential, economic and social considerations or other factors that Ohio EPA deems appropriate. Ohio EPA will solicit input from all interested and affected persons in the maintenance 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 exhaustive.

1) Implementation of an enhanced I/M program (E-Check) in Butler, Clermont, Hamilton and Warren Counties.

2) Tighten or adopt VOC RACT on existing sources covered by U.S. EPA Control Technique Guidelines issued after the 1990 CAA.

3) Apply VOC RACT to smaller existing sources.

4) 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.

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

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

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

8) Require VOC or NO_x controls on new minor sources (less than 100 tons).

9) Adopt NOx RACT for existing combustion sources.

No contingency measure shall be implemented without providing the opportunity for full public participation during which the relative costs and benefits of individual measures, at the time they are under consideration, can be fully evaluated.

Requirement 4 of 4

A list of VOC and NO_x sources potentially subject to future additional control requirements.

Demonstration

The following is a list of VOC and NO_x sources potentially subject to future controls.

NO_x RACT

- EGUs
- asphalt batching plants
- industrial/commercial and institutional boilers
- process heaters
- internal combustion engines
- combustion turbines
- other sources greater than 100 tons per year

VOC RACT

- synthetic organic compound manufacturing
- organic compound batch processes
- wood manufacturing
- industrial wastewater
- aerospace industry
- bakeries
- plastic parts coating
- volatile organic liquid storage
- industrial solvent cleaning
- offset lithography
- industrial surface coating
- other sources greater than 50 tons per year

CHAPTER SEVEN

MODELING ANALYSIS

Summary of Modeling Results for National Emission Control Strategies in Final Rulemakings

Although U.S. EPA's Redesignation Guidance does not require modeling for ozone nonattainment areas seeking redesignation, extensive modeling has been performed covering the Cincinnati, OH-KY-IN, area to determine the effect of national emission control strategies on ozone levels. This area includes Butler, Clermont, Clinton, Hamilton, and Warren Counties in Ohio. These modeling analyses determined that this area was significantly impacted by ozone and ozone precursor transport and regional NOx reductions will help the area attain the 2008 eight-hour ozone standard of 75 ppb in this area.

U.S. EPA Modeling Analysis for Interstate Transport "Good Neighbor" Provision

U.S. EPA conducted modeling for the Interstate Transport "Good Neighbor" Provision. This analysis was performed in 2014 and included in the "Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Transport Assessment" to assist states in developing "Good Neighbor SIPs," as required by the CAA to address interstate transport of air pollution that affects downwind states' ability to attain and maintain the 2008 eight-hour ozone standard. Some of the major federal emission strategies included in the modeling are: National Emission Standards for Hazardous Air Pollutants (NESHAPs) for Reciprocating Internal Combustion Engines (RICE) and cement manufacturing plants, the Boiler Maximum Achievable Control Technology (MACT) rule, the Energy Independence and Security Act (EISA) renewable fuel standard mandate, New Source Performance Standards (NSPS) for VOC controls, the Mobile Source Air Toxics rule, Tier III Emission Standards for Vehicles and Gasoline Sulfur Standards, Emission Standards for Locomotives and Marine Compression-Ignition Engines, and the Nonroad Spark-Ignition Engines and Recreational Engine Standards.

This modeling was conducted to identify monitoring sites that may have difficulty attaining the 2008 eight-hour ozone standard in 2018 and identify states that were contributing to attainment issues at a given monitoring site. The air quality model used for this rulemaking was the Comprehensive Air Quality Model with Extensions (CAMx) version 6.10. The modeling domain consisted of a 12 kilometer (km) x 12 km coarse grid covering the continental United States and portions of Canada and Mexico and 25 vertical layers from the surface up through the troposphere to a height of 50 millibars of pressure. Base year 2011 emissions were modeled. Meteorology from 2011 was created

using the Weather Research Forecasting (WRF) Model version 3.4 and was used for the base case and projected year modeling runs. More detailed information on the CAMx input file and additional data used for the photochemical modeling can be found in U.S. EPA's "Air Quality Modeling Technical Support Document for the 2008 Ozone NAAQS Transport Assessment," dated January 2015.

Table 38 shows the results of U.S. EPA's "Good Neighbor" Provision modeling for ozone impacts at the ozone monitors in the Cincinnati area. The monitor identification number, county, and state locations are listed, as well as the 2009 – 2013 eight-hour ozone base period average design values that were used to calculate 2018 projected average design values. Note that the 2009 – 2013 average design values were calculated by averaging the three 3-year design values from 2009 – 2011, 2010 –2012, and 2011 – 2013.

Model results are used in a relative rather than absolute sense. Relative use of the model results calculates the fractional change in maximum concentrations based on two different emission scenarios, 2011 NEI emissions and 2018 projected emissions for this exercise. This fractional change, also known as a relative response factor (RRF), can be applied to each monitor's average base period design value to determine ozone impacts. This approach differs from using the absolute or actual modeled result, which may show under- or over-predictions with the actual monitored values. The 2009 – 2013 average design values were multiplied by the corresponding RRF to determine all 2018 projected average design values.

Table 38- Comparison of Cincinnati Area Average Design Values with U.S. EPA "Good Neighbor" Provision Modeling Results (ppm)

Monitor ID	County	State	Monitored Average Design Value 2009 – 2013 Base Period	U.S. EPA Projected Average Design Value 2018 Base Case
39-017-0004	Butler	OH	0.0770	0.0700
39-017-0018	Butler	OH	0.0797*	0.0709
39-017-9991	Butler	OH	0.0770**	0.0676
39-025-0022	Clermont	OH	0.0787	0.0679
39-027-1002	Clinton	OH	0.0787	0.0671
39-061-0006	Hamilton	OH	0.0820	0.0732
39-061-0010	Hamilton	OH	0.0763	0.0678
39-061-0040	Hamilton	OH	0.0787	0.0708
39-165-0007	Warren	OH	0.0777	0.0676
21-015-0003	Boone	KY	0.0680	0.0598
21-037-3002	Campbell	KY	0.0767	0.0685

* Represents an average of two design values (2010 – 2012 and 2011 – 2013)
** Represents one design value (2011 – 2013)

Due to the differences in the base period 2009 – 2013 average design values and the most current average design values for all of the Cincinnati area ozone monitors, a comparison of these two values, as well as the 2018 projected average design values taken from the "Good Neighbor" Provision was made, and are presented in Table 39. The current average design values were calculated by averaging the three 3-year design values from 2010 – 2012, 2011 – 2013, and 2012 – 2014.

Comparison of the 2009 – 2013 average design values with the most current 3-year average design value for all ozone monitors in the Cincinnati area show the most current average design values are below the average eight-hour ozone design values for 2009 – 2013, with the exception of the Campbell County, Kentucky, monitor that had an increase of 0.0003 ppm.

Based on the 2009 – 2013 average design values, the 2018 projected average design values modeled well below the 2008 eight-hour ozone standard of 75 ppb. With the exception of the Campbell County, Kentucky monitor, if the modeling was conducted with the 2010 – 2014 average design values, the 2018 projected average design values would be lower than the current results, further re-enforcing maintenance of the standard. For the highest monitor in the area (Hamilton County), the 2018 projected average design value is 0.0732 ppm, well below the level of the 2008 eight-hour ozone standard that demonstrates attainment (0.0757 ppm). Even if the modeling was performed using the slightly higher 2010 – 2014 average design value, it is expected that the 2018 projected average design value would still be well below the standard for the Hamilton County monitor.

Table 39- Comparison of Cincinnati Area Current Design Values with U.S. EPA "Good Neighbor" Design Values (ppm)

Monitor ID	County	State	Monitored Average Design Value 2009 – 2013 Base Period	Current Monitored Average Design Value 2010 – 2014	U.S. EPA-Projected Average Design Value 2018 Base Case
39-017-0004	Butler	OH	0.0770	0.0760	0.0700
39-017-0018	Butler	OH	0.0797*	0.0770	0.0709
39-017-9991	Butler	OH	0.0770**	0.0770	0.0676
39-025-0022	Clermont	OH	0.0787	0.0780	0.0679
39-027-1002	Clinton	OH	0.0787	0.0770	0.0671
39-061-0006	Hamilton	OH	0.0820	0.0800	0.0732
39-061-0010	Hamilton	OH	0.0763	0.0760	0.0678
39-061-0040	Hamilton	OH	0.0787	0.0770	0.0708
39-165-0007	Warren	OH	0.0777	0.0750	0.0676
21-015-0003	Boone	KY	0.0680	0.0670	0.0598
21-037-3002	Campbell	KY	0.0767	0.0770	0.0685

* Represents an average of two design values (2010-2012 and 2011-2013)
** Represents one design value (2011-2013)

LADCO Modeling for Eight-Hour Ozone Standard

The LADCO performed photochemical modeling for ozone, which used the most recent emissions inventories and model updates. This modeling was performed to support attainment demonstrations for the five-state LADCO region. The photochemical model used by LADCO and Indiana for the eight-hour ozone standard analysis is CAMx version 6.11, developed by Environ. This model has been accepted by U.S. EPA as an approved air quality model for regulatory analysis and attainment demonstrations. Requirements of 40 CFR 51.112, as well as the "Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-hour Ozone NAAQS" (EPA-454/R-05-002, Oct. 2005), are satisfied with the use of CAMx for attainment demonstrations. Meteorology from 2011, as well as 2011 base year emissions (based on legally enforceable emission controls required by consent decrees, state rules, or permit), was used to conduct this modeling. The base period average design values for attainment purposes were calculated from the periods 2009 – 2011, 2010 – 2012, and 2011 – 2013. The projected year modeled was 2018.

Table 40 shows that modeled ozone concentrations in the Cincinnati area for 2018 will be below the eight-hour ozone standard of 75 ppb. As shown in Table 39 above, the current 2010 – 2014 average design values decreased from the 2009 – 2013 average design values, with the exception of the Campbell County, Kentucky monitor, which increased by 0.0003 ppm. At the other monitors, where the design values have decreased, the projected average design values would be lower than the LADCO modeling results using the latest average design values. For the Campbell County, Kentucky monitor, the projected average design value was well below the 2008 eight-hour ozone standard at 0.0719 ppm. As with U.S. EPA's modeling, even if the LADCO modeling was performed using the slightly higher 2010 – 2014 average design value, it is expected that the 2018 projected average design value would still be well below the standard for the Campbell County monitor.

Table 40- LADCO's Modeling Results for the Cincinnati Area (ppm)

Monitor ID	County	State	Monitored Average Design Value 2009 – 2013 Base Period	LADCO-Projected Average Design Value 2018 Base Case
39-017-0004	Butler	OH	0.0770	0.0717
39-017-0018	Butler	OH	0.0800*	0.0729
39-017-9991	Butler	OH	0.0770**	0.0704
39-025-0022	Clermont	OH	0.0787	0.0713
39-027-1002	Clinton	OH	0.0787	0.0707
39-061-0006	Hamilton	OH	0.0820	0.0736
39-061-0010	Hamilton	OH	0.0763	0.0718
39-061-0040	Hamilton	OH	0.0787	0.0738
39-165-0007	Warren	OH	0.0777	0.0692
21-015-0003	Boone	KY	0.0680	0.0640
21-037-3002	Campbell	KY	0.0767	0.0719

*Represents an average of two design values (2010 – 2012 and 2011 – 2013)
**Represents one design value (2011 – 2013)

Summary of Existing Modeling Results

U.S. EPA and LADCO modeling shows that national emission control measures will bring the Cincinnati area into attainment of the 2008 eight-hour ozone NAAQS by 2018, if not earlier. Rulemakings to be implemented in the next several years will provide assurance that air quality will continue to meet the standard into the future. U.S. EPA's modeling support for the Interstate Transport "Good Neighbor" Provision show future year design values for the Cincinnati area will attain the ozone standard with 2018 projected average design values below the 2008 eight-hour ozone standard of 75 ppb. In addition, LADCO's modeling results continue to show 2018 projected average design values below the eight-hour ozone standard. U.S. EPA and LADCO modeling demonstrates that the Cincinnati, OH-KY-IN, ozone nonattainment area will attain the 2008 eight-hour ozone standard. Future national and local emission control strategies will ensure that the area's attainment will be maintained with an increasing margin of safety over time.

CHAPTER EIGHT

PUBLIC PARTICIPATION

Ohio published notification for a public hearing and solicitation for public comment concerning the draft redesignation petition and maintenance plan in the widely distributed county publications.

The public hearing to receive comments on the redesignation request was held on March 3, 2016 at. The public comment period closed on March 3, 2016. _____ testimony was provided at the public hearing and _____ comments were received during the public comment period. Appendix E includes a copy of the public notice and transcript from the public hearing and comment period.

CHAPTER NINE

CONCLUSIONS

The Cincinnati, OH-KY-IN ozone nonattainment area has attained the 2008 NAAQS for ozone and complied with the applicable provisions of the 1990 Amendments to the CAA regarding redesignations of ozone nonattainment areas. Documentation to that effect is contained herein. Ohio EPA has prepared a redesignation request and maintenance plan that meet the requirements of Section 110 (a)(1) of the 1990 CAA.

Based on this presentation, the Cincinnati, OH-KY-IN ozone nonattainment area meets the requirements for redesignation under the CAA and U.S. EPA guidance. Ohio has performed an analysis that shows the air quality improvements are due to permanent and enforceable measures. Furthermore, because this area is subject to significant transport of pollutants, significant regional NO_x reductions will ensure continued compliance (maintenance) with the standard with an increasing margin of safety.

The State of Ohio hereby requests that the Cincinnati, OH-KY-IN ozone nonattainment area be redesignated to attainment simultaneously with U.S. EPA approval of the maintenance plan provisions contained herein. In addition, the State of Ohio requests that this maintenance plan satisfy the requirements of CAA Section 175A (b), for subsequent plan revisions required for areas redesignated for the eight-hour ozone standard.

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