Ohio Air Quality 2023

39-155-0015, Trumbull County

Ohio EPA
Division of Air Pollution Control
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STATE OF OHIO
AIR QUALITY
CALENDAR YEAR 2023

PREPARED BY
DIVISION OF AIR POLLUTION CONTROL
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Table of Contents

List of Tables

List of Tables

List of Figures

Acronyms and Abbreviations

AMNP	Annual Monitoring Network Plan
AQI	Air Quality Index (replaced Pollutant Standard Index, PSI)
AQS	Air Quality System
ATMP	Air Toxics Monitoring Program
CAA	Clean Air Act
CASTNET	Clean Air Status and Trends Network
CBSA	Core-Based Statistical Area
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DES	Division of Environmental Services
DNS	Did Not Sample
FEM	Federal Equivalent Method
FRM	Federal Reference Method
FR	Federal Register
GC	Gas Chromatograph or Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
ICP/MS	Inductively Coupled Plasma/ Mass Spectrometry
ICP/OES	Inductively Coupled Plasma/Optical Emissions Spectroscopy
MDL	Method Detection Limit
$\mu g/m^3$	micrograms per cubic meter
mg/m^3	milligrams per cubic meter
MSA	Metropolitan Statistical Area
ng/m^3	nanograms per cubic meter
NAAQS	National Ambient Air Quality Standards
NAMS	National Ambient Monitoring Stations
NCore	National Core Monitoring Network
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_3	Ozone
OASN	Ohio Air Sampling Network
Obs	Observations
Ohio EPA	Ohio Environmental Protection Agency
Pb	Lead
PAMS	Photochemical Assessment Monitoring Stations
POC	Parameter Occurrence Code
ppb	parts per billion
ppm	parts per million
ppbv	parts per billion by volume
PQAO	Primary Quality Assurance Organization
PM_{10}	Particulate matter having an aerodynamic diameter ≤10 microns
$PM_{2.5}$	Particulate matter having an aerodynamic diameter ≤2.5 microns
PSI	Pollutant Standard Index (replaced by Air Quality Index, AQI)
RADS	Remote Ambient-Air Data System
RL	Reporting Limit
SLAMS	State/Local Ambient Monitoring Stations
SO_2	Sulfur Dioxide
TO-15	Toxics analysis methods descriptions

Acronyms and Abbreviations

TSP	Total Suspended Particulate
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

Executive Summary

A. General Review

Air quality data for calendar year 2023 are summarized for seven criteria pollutants: particulate matter with aerodynamic diameter less than 10 microns (PM_{10}), particulate matter with aerodynamic diameter less than 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone, and lead. Data are also summarized for total suspended particulates (TSP). Also included is a section discussing toxics monitoring projects conducted and trend analysis results for the criteria pollutants: PM_{10}, $PM_{2.5}$, ozone, NO_2, SO_2, CO, and lead.

B. Discussion of National Ambient Air Quality Standards, Exceedances and Violations

The United States Environmental Protection Agency (U.S. EPA) sets National Ambient Air Quality Standards (NAAQS) for each of the criteria pollutants. In setting the NAAQS, U.S. EPA indicated a level (e.g., 0.070 ppm), an averaging time (e.g., eight-hours) and a form (e.g., annual fourth-highest daily maximum eight-hour concentration, averaged over three years) (see Table 1). A monitor is in violation of the NAAQS when it exceeds the level, over the averaging time, for a given form.

Table 1. U.S. EPA and Ohio EPA Ambient Air Quality Standards

			Level	
Pollutant	**Averaging time**	**Form**	**Primary***	**Secondary***
PM_{10}	24-hour	Not to be exceeded more than once per year on average over 3 years	150 μg/m^3	150 μg/m^3
$PM_{2.5}$	1-year	Annual mean, averaged over 3 years	12.0 μg/m^3^	15.0 μg/m^3
	24-hour	98th percentile, averaged over 3 years	35 μg/m^3	35 μg/m^3
Ozone	8-hour	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	0.070 ppm	0.070 ppm
NO_2	1-hour	98th percentile of 1-hour daily maximum concentrations, average over 3 years	100 ppb	none
	1-year	Annual mean	53 ppb	53 ppb
SO_2	1-hour	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years	75 ppb	none
	3-hour	Not to be exceeded more than once per year	none	0.5 ppm
CO	8-hour	Not to be exceeded more than once per year	9 ppm	none
	1-hour	Not to be exceeded more than once per year	35 ppm	none
Lead	Rolling 3-month average	Not to be exceeded	0.15 μg/m^3	0.15 μg/m^3

*Primary NAAQS are established for protection of public health; secondary NAAQS are established for protection of public welfare.

^ Primary NAAQS was revised in March 2024 to 9.0 μg/m^3. Since this report concerns data from 2023 the 12.0 μg/m^3 NAAQS is referenced in this report and all data within is compared to this standard.

In some cases, NAAQS are separated into two parts: primary and secondary. A primary standard sets the level of air pollution where human health is protected. A secondary standard sets the level where the welfare of citizens is protected due to air pollution damage to crops, animals, vegetation and materials.

A monitor could show an exceedance of the level for a given averaging time, without triggering a violation of the NAAQS. For example, in 2023, an ozone monitor could have an annual fourth-highest daily maximum eight-hour concentration exceed the 0.070 ppm level but be below the NAAQS when averaged over three years. In that case we would denote that an exceedance occurred on an annual basis in 2023 but not a violation. Exceedances and violations are discussed in more detail in the observation and conclusions section.

Table 2 provides a summary of violations by county that occurred in 2023. There were no violations of the 24-hour $PM_{2.5}$, NO_2, SO_2, lead or CO NAAQS during 2023.

Table 2. Violation of National Ambient Air Quality Standards (NAAQS) by County 2021-2023

Pollutant	Standard	Counties
PM_{10}	24-hour (150 µg/m^3)	Bulter
$PM_{2.5}$	Annual (12.0 µg/m^3)	Cuyahoga
Ozone	8-hour (0.070 ppm)	Cuyahoga, Lake and Lucas

C. Observations and Conclusions

Particulate matter having an aerodynamic diameter ≤10 microns (PM_{10})

There were 33 PM_{10} monitoring sites with a total of 35 monitors to collect ambient and quality assurance data.

There was at least one monitor in nine counties with a 24-hour concentration exceeding the PM_{10} NAAQS in 2023. However, only Bulter County had a monitor in violation of the PM_{10} NAAQS. Due to the form of the standard being averaged over three years, one year with exceedances does not constitute a violation of the 24-hour NAAQS. The monitoring site in Bulter County experienced concentrations over the PM_{10} NAAQS three times in 2021 and one time in 2023. The 2021 violations were the result of a nearby facility and were corrected in 2022. It is likely that wildfire smoke contributed to the 2023 concentration.

Particulate matter having an aerodynamic diameter ≤2.5 microns ($PM_{2.5}$)

There were 45 $PM_{2.5}$ monitoring sites with 97 monitors to collect both ambient and quality assurance data. Most are filter-based instruments collecting individual 24-hour average concentrations on a schedule of either every three-days or every six-days, and the remaining are continuous instruments collecting hourly concentrations each day in addition to 10 chemical speciation monitors that operate on an every three- or six-day schedule with filters analyzed for chemical composition of $PM_{2.5}$ matter.

There is both an annual and 24-hour $PM_{2.5}$ NAAQS. In 2023, there were three counties with an exceedance of the 24-hour $PM_{2.5}$ NAAQS: Butler, Cuyahoga, and Summit Counties. Two of those counites, Butler and Cuyahoga also had an exceedance of the annual $PM_{2.5}$ NAAQS. Due to the form of both standards being averaged over three years, one year with exceedances does not constitute a violation of the annual or 24-hour NAAQS. There were no violations of the 24-hour NAAQS in 2023. Cuyahoga County had one site violating the annual NAAQS in 2023.

Ozone (O_3)

There were 50 ozone continuous monitoring sites collecting ambient hourly data, two of which were operated by U.S. EPA as part of their CASTNET monitoring network.

There was at least one monitor in each of thirty counties with exceedances of the eight-hour NAAQS during at least one eight-hour period in 2023. However, thirteen counties exceeded the eight-hour NAAQS during the fourth highest eight-hour period: Allen, Butler, Clinton, Cuyahoga, Greene, Hamilton, Lake, Lucas, Medina, Montgomery, Summit, Warren and Wood Counties. The three-year, eight-hour ozone NAAQS was in violation in Cuyahoga, Lake and Lucas Counties for the most recent three-year period.

Nitrogen Dioxide (NO_2)

There were seven NO_2 continuous monitoring sites collecting ambient hourly data.

There is both a one-hour and annual NO_2 NAAQS. There were no exceedances or violations of either of the NO_2 NAAQS in 2023. There have been no violations of the three-year, one-hour or annual NO_2 NAAQS since 1997.

Sulfur Dioxide (SO_2)

There were 29[1] SO_2 continuous monitoring sites with a total of 30 monitors collecting ambient hourly data.

There is both a one-hour and three-hour SO_2 NAAQS. The three-hour SO_2 NAAQS is only a secondary NAAQS. There was one monitor with an exceedance of the one-hour NAAQS during at least one one-hour period in 2023. This exceedance occurred in Gallia County. There were no violations of the most recent three-year period for the one-hour SO_2 NAAQS.

There were no exceedances of the three-hour NAAQS statewide in 2023; the last occurrence of an exceedance of the three-hour SO_2 NAAQS was in 1991.

Carbon Monoxide (CO)

There were seven CO continuous monitoring sites collecting ambient hourly data.

There is both a one-hour and eight-hour CO NAAQS. There were no exceedances or violations of either of the CO NAAQS in 2023. There have been no violations of the one-hour or eight-hour CO NAAQS since 1990 and 1993, respectively.

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[1] One monitor is located in West Virginia to monitor a SO_2 source located in Ohio.

Lead (Pb)

There were 12 lead monitoring sites with a total of 18 monitors collecting ambient and quality assurance data.

In 2023, there were no exceedances or violations of the lead NAAQS. The last violation of the three-month rolling average lead NAAQS occurred in 2021.

D. Monitoring Network

There were 119 monitoring sites reporting data from 47 counties; a list of every Ohio monitoring site in operation during 2023 along with the pollutants monitored at each site can be found in Table 36[2] of this report. Each year, Ohio EPA is required to submit an annual Air Monitoring Network Plan to U.S. EPA which describes the state's ambient monitoring network in detail. The most recent Ohio Air Monitoring Network Plan is available for viewing on our agency website at:

https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/air-monitoring

Site location information is included in the Monitoring Site Description appendix of Ohio's Air Monitoring Network Plan. This information includes a map depicting the general location within the state boundaries along with an aerial and ground level view of each site.

[2] Table 36, as well as the site and county counts include one monitoring site located in West Virginia which is operated by Ohio EPA.

I. INTRODUCTION

A. General

A variety of substances are generated and released into the atmosphere by a multitude of man-made and natural sources. Those substances that may affect public health and welfare are regarded as "air pollutants." U.S. EPA has established NAAQS to safeguard public health and welfare from these air pollutants. Ambient air is defined as air that is accessible to the general public. The air within fenced-in, guarded or limited access areas of facility property is not considered ambient air.

Pollutants for which NAAQS have been promulgated are particulate matter having an aerodynamic diameter ≤10 microns (PM_{10}), particulate matter having an aerodynamic diameter ≤2.5 microns ($PM_{2.5}$), ozone, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO) and lead. The NAAQS are concentrations expressed in micrograms per cubic meter ($\mu g/m^3$), parts per million (ppm) or parts per billion (ppb) per sampling averaging times. The concentrations, averaging times and the form for each standard in effect as of 2023 are provided in Table 1 above.

This report presents summaries of Ohio EPA's measurements of the NAAQS criteria and toxic air pollutants during calendar year 2023. Also presented are selected statistics and trend analyses for Ohio. Each pollutant section provides a brief description of the pollutant, sources from which it originates, potential adverse health effects, and monitoring methods used.

Throughout this report data may be flagged with a footnote as "does not meet the data completeness criteria" or "insufficient data for valid statistical averages." A monitor must operate a minimum amount of time based on operating schedules and monitoring frequency set by U.S. EPA. In order to have a valid statistical average for comparison to the NAAQS with three-year averaging times, a monitor must have all three years of data meeting U.S. EPA's completeness criteria.

In the majority of cases, data sets are incomplete/insufficient due to the startup, shut down, or relocation of a site or monitor. When monitors start, stop, or are relocated, they often cannot meet the minimum operating requirements for that year simply because of the timing of the start up or shut down. Therefore, it can take up to three years for a newly established monitor to have a valid statistical average. Monitors that have shut down but were still active within three years of 2023 are included in tables presenting three-year averages but also do not represent valid statistical averages since the monitor ceased collecting data within that three-year period. More information about the operation of Ohio EPA's air monitoring network, including approvals to start or shut down a site or monitor can be found as part of Ohio EPA's Air Monitoring Network Plan referenced in the Monitoring Network section above.

In other, more rare cases, data sets may be incomplete/insufficient due to other circumstances, such as a prolonged malfunction. Over the course of 2020 and early 2021, Ohio EPA experienced many difficulties in the operation of its monitoring network due to the COVID-19 pandemic. Many sites' operations were suspended or inaccessible for periods of time due to stay-at-home orders related to the pandemic and Ohio EPA's resulting COVID protocols. During this time, Ohio EPA made every effort to minimize data loss and worked quickly to reinstate Ohio EPA's monitoring network to full capacity as soon as possible. By May 2020 the majority of sites were fully operational with a few isolated COVID interruptions at sites occasionally until around March of 2021. This resulted in many more monitors than usual failing to meet ambient data completeness requirements, quality control requirements, flow rate audit requirements, or annual performance evaluation requirements.

From approximately June through August 2023 Ohio observed impacts from wildfire smoke that can be observed across different pollutants. More information regarding the influence of wildfire smoke on 2023 air quality data is discussed in relevant sections below.

B. Development of the Ohio Air Monitoring System

Society's concern about air pollution resulted in the Clean Air Act (CAA) of 1955. The CAA and its subsequent amendments first encouraged, then authorized, grants to help finance the establishment of state and local air pollution control programs. In 1963, Ohio established the Ohio Air Sampling Network (OASN) with 21 monitoring sites, measuring total suspended particulates (TSP) throughout the state. The CAA Amendments of 1970 mandated the promulgation of NAAQS. The U.S. EPA was formed in 1970 and began developing air monitoring regulations requiring states to establish a network of monitors to measure air quality in all major urban areas.

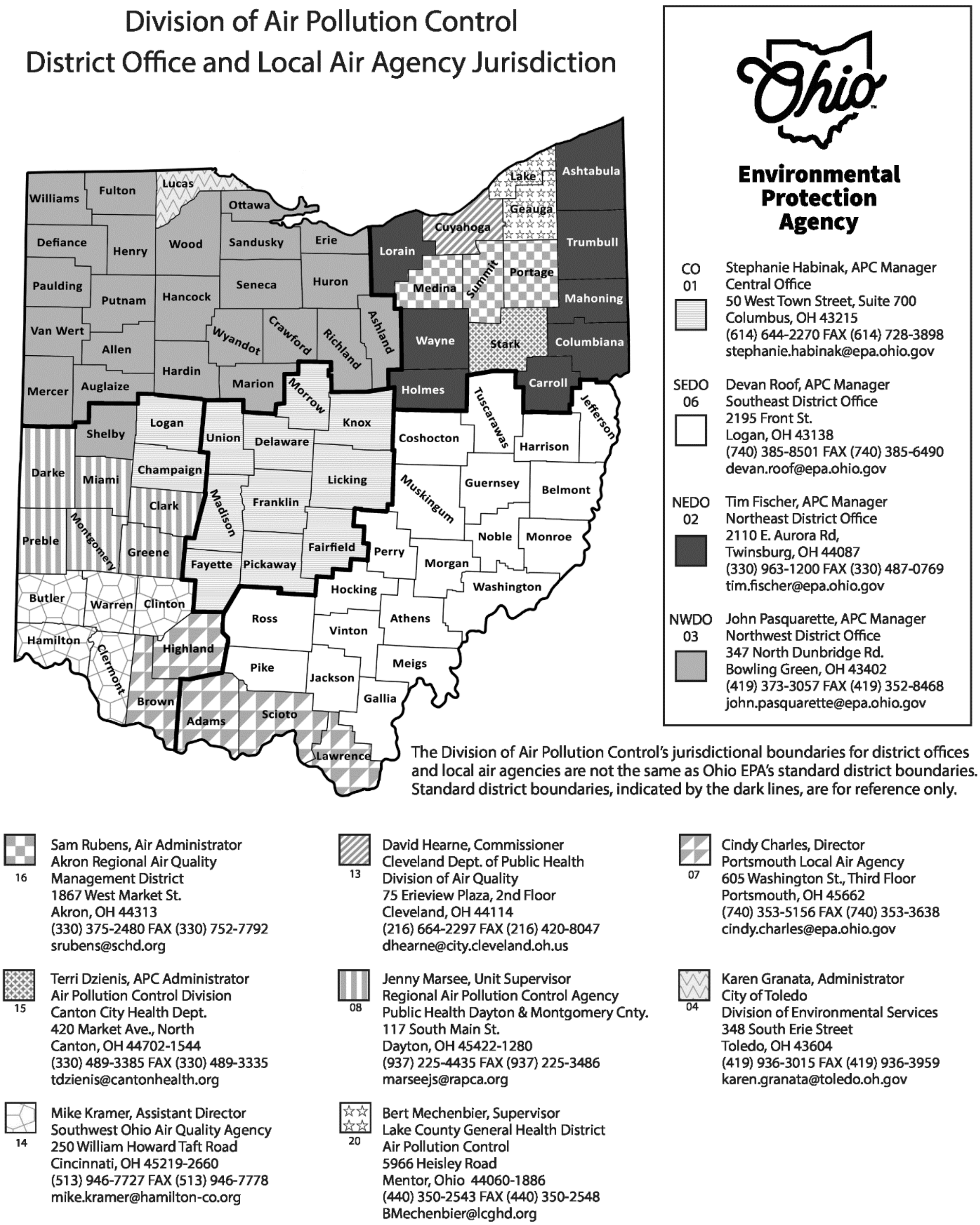
39-035-0060, Cuyahoga County

The air monitoring program began under the Ohio Department of Health and started with regulations for TSP, SO_2, NO_2, CO, and photochemical oxidants. In October of 1972, Ohio EPA was formed and became responsible for CAA compliance. In 1978, U.S. EPA promulgated the NAAQS for lead. In 1979, the NAAQS for ozone replaced photochemical oxidants. Over time, U.S. EPA progressed to monitoring smaller particulate matter. In July of 1987, a NAAQS for PM_{10} was established followed by a NAAQS for $PM_{2.5}$ in July of 1997. These NAAQS replaced TSP. Throughout that time, Ohio's air quality monitoring network significantly expanded.

Ohio has four District Offices and eight Local Air Agencies supporting Ohio's air monitoring program. Figure 1 provides details regarding geographic coverage and contact information for all District Offices and Local Air Agencies.

The goals of the ambient monitoring program are to determine compliance with the NAAQS; to provide real-time monitoring of air pollution episodes; to provide data for trend analyses, regulation evaluation and planning; and to provide daily information to the public concerning air quality in high population areas, near major emission sources and in rural areas.

Figure 1. Ohio EPA District Offices & Local Air Agencies Jurisdictional Boundaries



In 1980, U.S. EPA and Ohio EPA established and designated certain portions of Ohio's ambient air monitoring network to be a part of the National Air Monitoring Station (NAMS) network, created for tracking national trends. This required that all sites produce data of adequate quality and quantity to meet monitoring objectives and statistical analysis.

The first annual PM_{10} NAAQS was set at 50 µg/m^3 and became effective July 1987. In 1997 the first $PM_{2.5}$ NAAQS became effective and included both an annual (15.0 µg/m^3) and 24-hour (65 µg/m^3) NAAQS. Filter-based $PM_{2.5}$ monitors began collecting data in 1999. Monitors to determine chemical makeup of the particulate matter were added in 2000. In 2001, monitors that could continuously measure $PM_{2.5}$ became a programmatic requirement. The 24-hour $PM_{2.5}$ NAAQS was revised in 2006 to 35 µg/m^3, and the annual $PM_{2.5}$ NAAQS was revised in 2012 to 12.0 µg/m^3.

The one-hour ozone NAAQS of 0.12 ppm established in 1979 was supplanted with an eight-hour standard in 1997. The eight-hour NAAQS is the three-year average of each site's annual 4th high eight-hour average, which was set at 0.08 ppm. The one-hour ozone NAAQS was revoked in 2006. In 2008, the eight-hour NAAQS was revised to 0.075 ppm before it was lowered again in 2015 to 0.070 ppm.

In 2008, the NAAQS for lead was revised to 0.15 µg/m^3 as a three-month rolling average, replacing the 1.5 µg/m^3 calendar quarter average NAAQS established in 1978. New monitors near known or presumed sources were required to be operational on the first sampling day of 2010.

On January 1, 2011, U.S. EPA made changes to the designations of NAMS sites. The NAMS designation, used for national trends in concentrations was eliminated in favor of National Core Monitoring Network (NCore) sites, a much smaller network of sites with many more parameters per site monitored. There are three NCore sites in Ohio, which are located in Cincinnati, Cleveland, and Preble County.

In October 2015, U.S. EPA promulgated a more stringent air quality standard for ozone. As a result, Photochemical Assessment Monitoring Stations (PAMS) stations were to be established at all NCore sites located in CBSAs whose population is greater than or equal to one million people. In Ohio there are three NCore sites: Cleveland (MSA population greater than one million), Cincinnati (MSA population greater than one million), and Preble County (not in a CBSA). Therefore, the new rule required Cleveland and Cincinnati NCore sites to have a PAMS operational by the monitoring deadline of June 1, 2019. On January 8, 2020, U.S. EPA issued final rulemaking to delay the start date for PAMS monitoring until June 1, 2021 (85 FR 834). Ohio EPA fully implemented PAMS monitoring by June 1, 2021 in accordance with U.S. EPA's rulemaking extension. The PAMS monitoring season occurs each year from June 1st through August 31st.

Currently, air monitoring sites for criteria pollutants are established using criteria set by U.S. EPA for their location and operation. The monitoring stations in this network are called the State and Local Air Monitoring Stations (SLAMS). There are other types of monitors besides SLAMS monitors, which are established with different criteria set by U.S. EPA. For example, some monitors may be categorized as Special Purpose or Industrial. Regardless of whether a monitor is designated as SLAMS, Special Purpose or Industrial, all ambient air monitoring data from all sites is included in this report.

Details on Ohio's ambient air monitoring network, and how it meets the criteria established by U.S. EPA, are provided annually in the Annual Monitoring Network Plan (AMNP). The AMNP is a CAA requirement, annually addressing the state's network as it existed on July 1 of the reporting year and as it was expected or anticipated to be modified in the year ahead. Appendix A of the AMNP is the Complete Network Plan Description, listing each monitoring site within the Local Air Agencies and District Offices in Ohio. The AMNP is available at https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/air-monitoring.

C. Data Acquisition

Beginning in 1986, the Remote Ambient-Air Data System (RADS) provided for the automatic acquisition of data from Ohio EPA's remote monitors to a central computer. Data is retrieved from each District Office and Local Air Agency's continuous monitoring sites on an hourly basis. RADS has since been upgraded for improved remote access to data by digital cellular wireless technology. Beginning in 2015, RADS began using Agilaire's AirVision software to poll, process and assemble all hourly data collected in Ohio.

D. Data Availability on the Internet

Air monitoring data is available on Ohio EPA's AirOhio website at https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/airohio-air-monitoring-data.

Ohio EPA also provides ozone and $PM_{2.5}$ data updates hourly to U.S. EPA's AirNow website. Current data and data forecasts are presented in the form of tables and maps and can be viewed at http://www.airnow.gov.

Historical ambient air quality data can also be found at https://www.epa.gov/outdoor-air-quality-data. This site is a gateway to maps, reports and user-selected data residing in U.S. EPA's Air Quality System (AQS) database.

II. PARTICULATE MATTER ≤10µM (PM_{10})

A. Overview

In 1987, U.S. EPA promulgated a primary NAAQS for particulate matter that included only those particles with an aerodynamic diameter smaller than or equal to 10 micrometers ($PM_{10,}$ particulate matter ≤10 micrometers). From 1987 to 2006, the annual NAAQS was 50 µg/m^3 annual arithmetic mean (averaged over three years) and the 24-hour NAAQS was 150 µg/m^3 (not to be exceeded more than once per year, averaged over three years).

In 2006, the 24-hour PM_{10} NAAQS of 150 µg/m^3 was retained, but the annual PM_{10} NAAQS was revoked.

39-155-0006, Trumbull County

Ohio's air monitoring network was expanded to include 21 PM_{10} sites in 1986, 45 in 1988, and a high of 91 sites in 1997. Since 1997, the PM_{10} network has been substantially reduced, as monitoring of particulates has been focused to sampling of $PM_{2.5}$ fine particulates. In 2023, there were 33 PM_{10} sites with 35 total monitors. Most monitors are filter-based Federal Reference Method (FRM) instruments collecting 24-hour average concentrations either every three-days or every six-days. Some monitors collect hourly concentrations throughout the year (continuous). Continuous instruments are referred to as Federal Equivalent Method (FEM) PM_{10} monitors. All of Ohio's continuous PM_{10} monitors are used for comparison to the NAAQS or for supplementing data for FRM monitors. Continuous monitoring data from FEM monitors are comparable to the PM_{10} NAAQS when it is located at a site without an FRM monitor or when it is collocated at a site with an FRM and is used to fill data gaps when the intermittent FRM monitor is not operational.

B. Sampling Method

PM_{10} is measured by the filtered air sampler method for non-continuous instruments. These instruments are refined beyond the traditional TSP sampler to limit the size of particle collected on the filter. Measured volumes of air are similarly drawn through a filter for 24 hours. PM_{10} matter trapped on the filter is weighed to determine the mass collected per volume of air. Continuous instruments collect real-time PM_{10} concentrations by various other measurement techniques.

C. Air Quality Data

Table 3 presents PM_{10} data Ohio EPA uses to evaluate air quality for the state. Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met per instrument type (FRM filter based vs FEM continuous). Data reported below will also refer to a POC (parameter occurrence code) followed by a number. For PM_{10}, instruments are a combination of filterable FRM instruments and continuous FEM instruments either dedicated for comparison to the NAAQS (where applicable) or designated for quality assurance purposes. Sites utilizing continuous FEM instruments are marked with a caret (^) in the table below. During 2023, Ohio EPA transitioned several PM_{10} instruments from filterable to continuous resulting in the appearance of more sites than usual not meeting data completeness criteria. However, this is not an indication of whether Ohio EPA PM_{10} data meets the true completeness requirement, which is by site, and considers combining the FRM and FEM data. Unfortunately, U.S. EPA's AQS reports for PM_{10} data do not provide combined site completeness information. This is exacerbated for 2023 because during 2023 alone, Ohio EPA replaced ten FRM monitors with FEM monitors during the year. While PM_{10} monitoring continued at these sites throughout the entire year, the individual instruments appear to have not met completeness requirements. In addition, during 2023, several PM_{10} sites were discontinued as they were no longer necessary. The FEM replacements and FRM shutdowns are evident in Table 4 where you see multiple years of data represented. Years without any data collection by instrument type (FRM versus FEM) indicate the machine was not operating during that period.

The 24-hour PM_{10} NAAQS is 150 $\mu g/m^3$ and should be compared against the column labeled "2nd Max" because the form of the NAAQS is not to be exceeded more than once per year. Because the form of the NAAQS is to be averaged over three years, this is not a direct comparison to the NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2023. However, because the data sets for FRM and FEM instruments are not combined, it's a less meaningful metric this year due to the fact that so many new FEM instruments replaced FRM instruments. In the case where there are both FRM and FEM instruments included in Table 3, the higher of the labeled "2nd Max" would be most representative. Results are reported as $\mu g/m^3$.

Over the course of the summer months, approximately June through August, Ohio's air quality data shows effects from smoke caused by wildfires that occurred outside the state.

Where applicable, Ohio EPA documented and is working to submit exceptional event demonstrations to U.S. EPA to exclude these values for regulatory purposes. Not all days influenced by wildfire smoke will qualify for an exceptional event demonstration. However, as part of the yearly data certification process Ohio EPA has "flagged" PM values influenced by wildfire smoke to provide a more complete understanding of PM concentrations in Ohio for 2023. These qualifier flags do not appear in the tables below but are part of the yearly data certification sent to U.S. EPA.

Because the PM monitoring network is comprised of filterable and continuous instruments wildfire smoke concentrations were more often captured via continuous instruments. As can been seen in the tables below, these wildfires contributed to higher concentrations of PM across the state, which would be evident if compared to data from recent prior years in Ohio Air Quality Reports.

Table 3. PM_{10} 24-Hour Air Monitoring Statistics from Intermittent FRM and Continuous FEM Instruments (µg/m³)

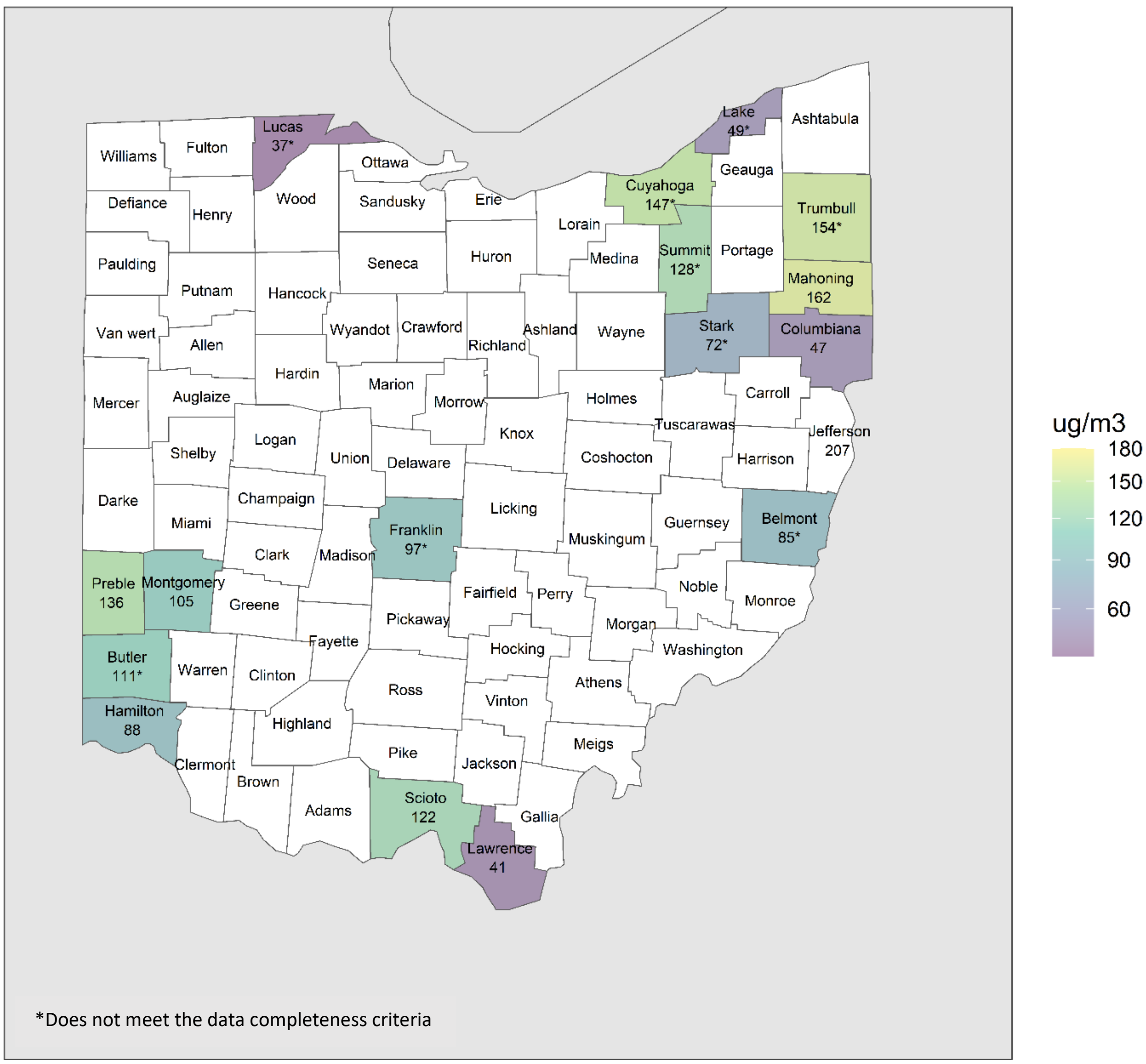
County	Site ID	POC	City	Valid Days	Obs	% Obs	Obs Req	1st Max	2nd Max	3rd Max	4th Max	Days > NAAQS	Max > NAAQS	Mean	
Belmont	39-013-0006	1	Shadyside	31	31	52	60	101	85	72	66	0	0	25.7	*
Belmont	39-013-0006^	3	Shadyside	184	184	50	365	48	45	44	43	0	0	17.5	*
Butler	39-017-0015	2	Middletown	14	14	23	60	34	24	21	20	0	0	13.4	*
Butler	39-017-0015^	3	Middletown	14	14	23	60	32	24	20	19	0	0	13.1	*
Butler	39-017-0015	9	Middletown	259	259	71	365	173	101	98	73	1	1	23.6	*
Butler	39-017-0019^	3	Middletown	359	359	98	365	170	98	85	69	1	1	19.3	
Butler	39-017-0020^	3	Middletown	355	355	97	365	197	111	108	107	1	1	31.5	
Columbiana	39-029-0020	1	East Liverpool	59	59	98	60	50	47	28	28	0	0	12.5	
Columbiana	39-029-0023	1	East Liverpool	60	60	100	60	97	46	36	31	0	0	14.7	
Columbiana	39-029-0023	2	East Liverpool	60	60	100	60	102	47	34	29	0	0	15.0	
Cuyahoga	39-035-0038	1	Cleveland	6	6	10	60	26	23	18	17	0	0	18.0	*
Cuyahoga	39-035-0038^	3	Cleveland	363	363	99	365	227	141	79	77	1	1	25.0	
Cuyahoga	39-035-0045	1	Cleveland	19	19	32	60	52	27	27	25	0	0	21.9	*
Cuyahoga	39-035-0045	2	Cleveland	19	19	32	60	48	27	24	21	0	0	20.9	*
Cuyahoga	39-035-0045^	3	Cleveland	143	143	39	365	42	39	37	37	0	0	18.4	*
Cuyahoga	39-035-0060^	3	Cleveland	358	358	98	365	219	147	113	111	1	1	31.5	
Cuyahoga	39-035-0065	1	Newburgh Heights	35	35	58	60	104	65	64	59	0	0	34.0	*
Cuyahoga	39-035-0065^	3	Newburgh Heights	141	141	39	365	92	71	69	68	0	0	28.6	*
Franklin	39-049-0034	1	Columbus	48	48	80	60	104	88	36	33	0	0	16.5	*
Franklin	39-049-0034	2	Columbus	48	48	80	60	94	93	37	34	0	0	16.7	*
Franklin	39-049-0034^	3	Columbus	59	59	16	365	48	48	46	45	0	0	20.8	*
Franklin	39-049-0040^	3	Columbus	122	122	33	365	98	97	96	94	0	0	33.0	*
Franklin	39-049-0081^	3	Columbus	176	176	48	365	85	58	57	56	0	0	23.3	*
Hamilton	39-061-0040^	9	Cincinnati	356	356	98	365	170	88	79	71	1	1	19.0	
Jefferson	39-081-0017^	3	Steubenville	359	359	98	365	217	207	59	59	2	2.1	20.9	
Lake	39-085-0008	1	Fairport Harbor	50	50	83	60	54	49	48	48	0	0	17.6	*
Lawrence	39-087-0012	1	Ironton	60	60	100	60	62	41	41	33	0	0	16.6	
Lawrence	39-087-0012	2	Ironton	48	48	80	60	59	40	36	30	0	0	14.9	*

County	Site ID	POC	City	Valid Days	Obs	% Obs	Obs Req	1st Max	2nd Max	3rd Max	4th Max	Days > NAAQS	Max > NAAQS	Mean	
Lucas	39-095-0024^	3	Toledo	44	44	12	365	39	37	32	32	0	0	16.8	*
Mahoning	39-099-0015^	3	Youngstown	359	359	98	365	216	162	76	75	2	2.1	20.4	
Montgomery	39-113-0038^	9	Dayton	359	359	98	365	174	105	87	70	1	1	18.5	
Preble	39-135-1001^	3	New Paris	346	346	95	365	191	136	86	71	1	1	17.1	
Scioto	39-145-0013	1	Portsmouth	11	11	18	60	21	16	13	13	0	0	10.5	*
Scioto	39-145-0013^	3	Portsmouth	299	299	82	365	123	122	97	59	0	0	17.0	*
Scioto	39-145-0015^	3	Portsmouth	275	275	75	365	116	112	87	58	0	0	20.0	*
Scioto	39-145-0019	1	Portsmouth	59	59	98	60	54	39	30	27	0	0	13.7	
Scioto	39-145-0020^	1	Franklin Furnace	365	365	100	365	66	59	44	39	0	0	13.3	
Scioto	39-145-0021^	1	Franklin Furnace	350	350	96	365	71	63	47	45	0	0	17.7	
Scioto	39-145-0022^	1	Franklin Furnace	351	351	96	365	78	64	43	42	0	0	15.7	
Stark	39-151-0017^	3	Canton	206	206	56	365	85	72	68	54	0	0	22.8	*
Summit	39-153-0017^	3	Akron	176	176	48	365	214	128	66	49	1	5.4	25.4	*
Trumbull	39-155-0006	1	Warren	60	60	100	60	82	56	29	28	0	0	12.9	
Trumbull	39-155-0014	1	Warren	9	9	15	60	11	10	9	7	0	0	5.9	*
Trumbull	39-155-0014^	3	Warren	304	304	83	365	208	154	96	75	1	1	20.0	*
Trumbull	39-155-0015	1	Girard	35	35	58	60	94	60	37	30	0	0	21.2	*

* Does not meet the data completeness criteria. ^Continuous FEM instruments.

Figure 2 presents the 2nd highest 24-hour maximum concentrations for every county with a PM_{10} monitor in 2023. For counties with more than one PM_{10} monitor, the highest concentration for the county was used. The values in the figures below in some cases will not match the "2nd Max" column in Table 3. For some sites, with multiple POC numbers, the 2nd max is calculated from a combination of primary monitors, collocated monitors, and in some cases continuous monitors that make up a single official data stream for the site. For some counties, the 2nd highest value presented in Figure 2 and Figure 3 are calculated from the combinations of monitors. The information presented in Table 3 above offers individual data for all PM_{10} monitors to provide a complete picture of data collection and air quality in the state.

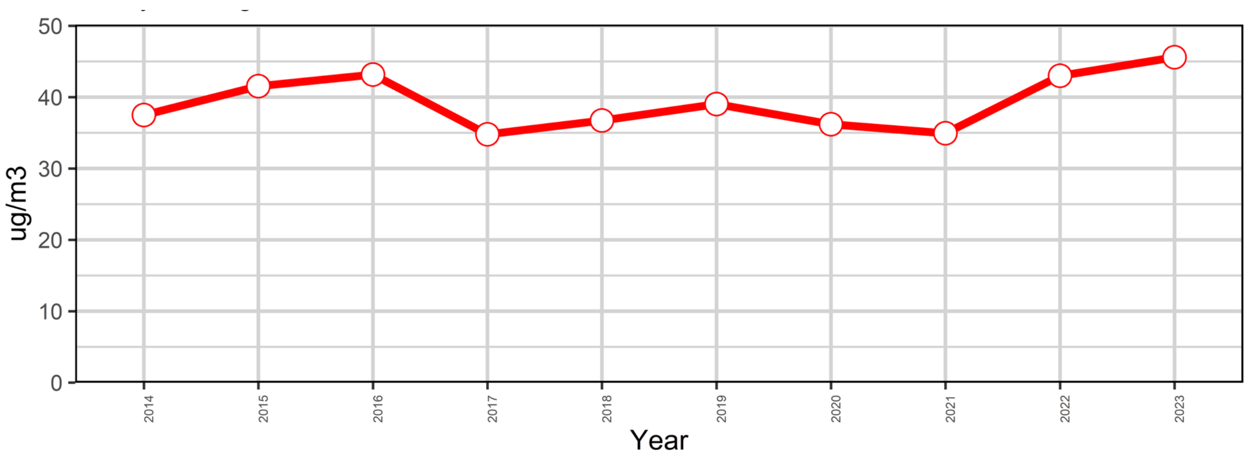
Figure 2. 2023 PM_{10} 2nd High 24-Hour Concentrations



D. Ten Year Air Quality Trends

Figure 3 presents the average of each year's 2nd highest yearly maximum concentration for all monitoring sites for years 2014 through 2023. Overall PM_{10} concentrations in the state are consistently low and well below the NAAQS. You can clearly see an upward movement in 2023, likely due to wildfire events.

Figure 3. PM_{10} Trend: Average 2nd High Concentrations for all Sites



E. Attainment Status

All of Ohio has been designated as in attainment for the 24-hour PM_{10} NAAQS since 2001[3]. As noted earlier in this report, only one monitoring site in Ohio violated the 24-hour PM_{10} NAAQS which is a 24-hour average of 150 µg/m^{3}and not to be exceeded more than once per year on average over three years. This monitoring site exceeded that level three times in 2021 and one time in 2023. The maps and data tables below present the design value[4] for the NAAQS for years 2021 through 2023 and only include data from monitoring sites used for comparison to the NAAQS. Counties that do not show data do not contain monitors and the value shown is the highest concentration for each county where multiple monitors are operated in the same county. Monitors without three years' worth of complete data are not considered to have valid design values and are highlighted in green in Table 4. As noted above, because FRM and FEM data are not combined, the completeness metric presented in these tables are not considered a true representation of the completeness for the entire site.

Often, design value is a term used to identify the value that is compared to the NAAQS. However, for the 24-hour PM_{10} NAAQS this is not the case due to the form of the standard. Nonetheless, it is a useful metric for comparing values across the state and is presented in the figures and tables below. Figure 4 presents the 2nd highest 24-hour maximum concentrations averaged over three years (design value). Table 4 presents the 2nd daily maximum concentration for each year and the three-year averages used to determine the design value for each county.

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[3] Violations do not always lead to an area being officially designated as nonattainment by U.S. EPA. This section of this report identifies information related to official designations and historic and/or current attainment status.

[4] A "design value" represents the highest reading monitor in a county for that NAAQS when more than one monitor resides in a county. In most cases, that value is a three-year average. However, for some pollutants the value is an annual metric. Each section will specify if the design value presented is a three-year average or an annual metric.

Figure 4.2021-2023 PM_{10} 24-Hour Design Values

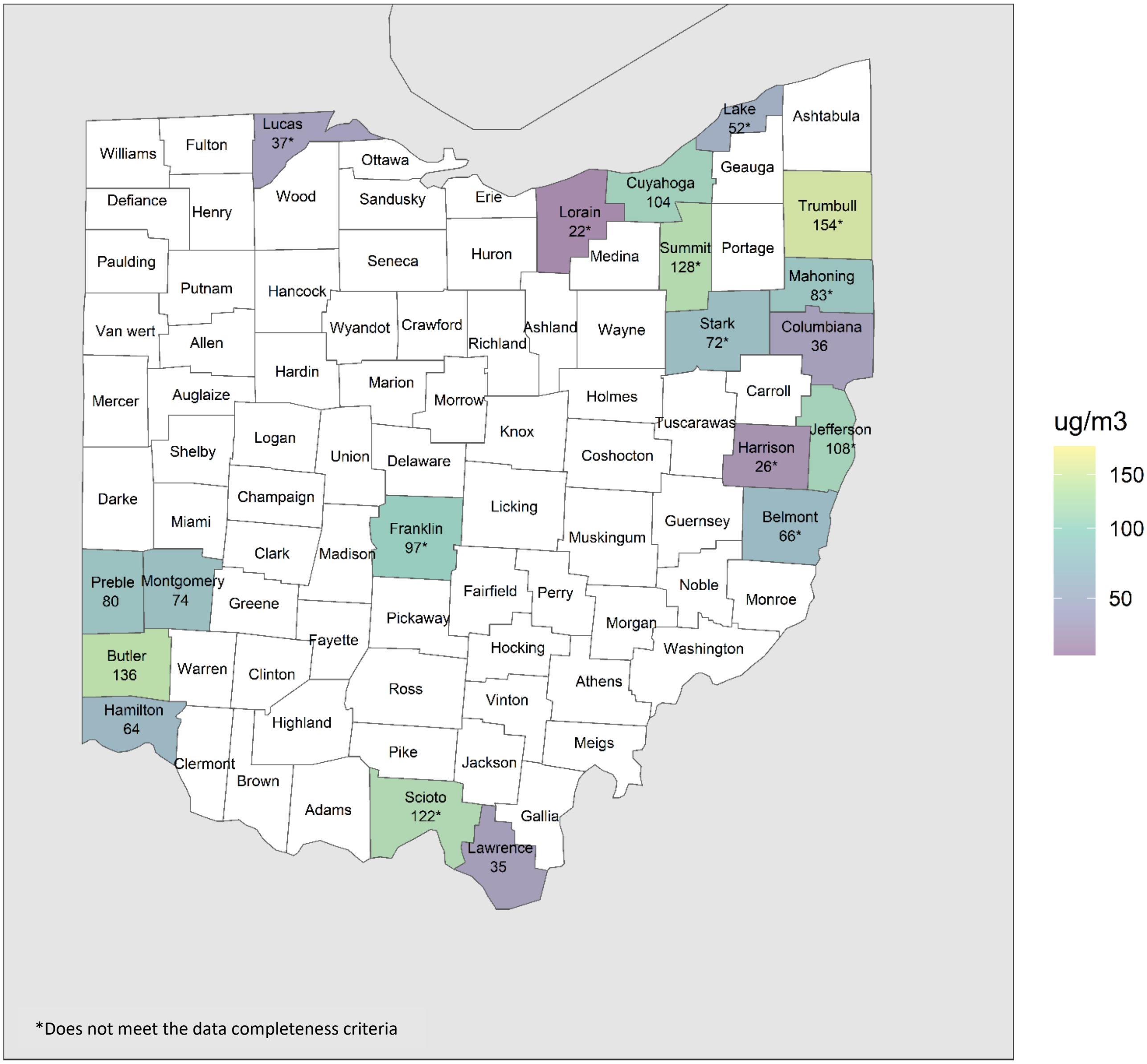


Table 4. PM_{10} 2nd High 24-Hour Concentrations and Three-Year Averages (µg/m³)

Site ID	County	City	Year 2021	2022	2023	Design Value 2021-2023
39-013-0006	Belmont	Shadyside	65	49	85*	66*
39-013-0006^		Shadyside	---*	---*	45*	45*
39-017-0015	Butler	Middletown	49	86	32*	56*
39-017-0015^		Middletown	---*	---*	101*	101*
39-017-0019		Middletown	37	45*	---*	41*
39-017-0019^		Middletown	---*	54*	98	76*
39-017-0020^		Middletown	178	119	111	136
39-029-0020	Columbiana	East Liverpool	27	33	47	36
39-029-0023		East Liverpool	32	30	46	36
39-035-0038	Cuyahoga	Cleveland	87	59	23*	56*
39-035-0038^		Cleveland	63*	71	141	92*
39-035-0045		Cleveland	49	46	27*	41*
39-035-0045^		Cleveland	---*	---*	39*	39*
39-035-0060		Cleveland	21*	---*	---*	21*
39-035-0060^		Cleveland	89	77	147	104
39-035-0065		Newburgh Heights	57	72	65*	65*
39-035-0065^		Newburgh Heights	---*	---*	71*	71*
39-035-1002		Brook Park	25*	27	---*	26*
39-049-0034	Franklin	Columbus	32*	54	88*	58*
39-049-0034^		Columbus	---*	---*	48*	48*
39-049-0040^		Columbus	---*	---*	97*	97*
39-049-0081^		Columbus	---*	---*	58*	58*
39-061-0014	Hamilton	Cincinnati	33*	32	---*	33*
39-061-0040^		Cincinnati	45	58	88	64
39-067-0005	Harrison	Hopedale	28	23*	---*	26*
39-081-0001	Jefferson	Brilliant	29	29	---*	29*
39-081-0017		Steubenville	9*	---*	---*	9*
39-081-0017^		Steubenville	63*	54	207	108*
39-085-0008	Lake	Fairport Harbor	39	68	49*	52*
39-087-0012	Lawrence	Ironton	27	38	41	35
39-093-3002	Lorain	Sheffield	22*	---*	---*	22*
39-095-0024	Lucas	Toledo	---*	---*	37*	37*
39-099-0015^	Mahoning	Youngstown	36*	51*	162	83*
39-113-0038^	Montgomery	Dayton	51	66	105	74
39-135-1001^	Preble	New Paris	50	54	136	80
39-145-0013	Scioto	Portsmouth	23	27	16*	22*
39-145-0013^		Portsmouth	---*	---*	122*	122*
39-145-0015		Haverhill	---*	---*	112*	122*
39-145-0019		Portsmouth	22	25	39	29
39-145-0020^		Franklin Furnace	32	42	59	44
39-145-0021^		Franklin Furnace	36	41	63	47
39-145-0022^		Franklin Furnace	33	43	64	47
39-151-0017	Stark	Canton	---*	---*	72*	72*
39-153-0017	Summit	Akron	---*	---*	128*	128*
39-155-0006	Trumbull	Warren	24*	39	56	40*
39-155-0014		Warren	32	35	10*	26*
39-155-0014^		Warren	---*	---*	154*	154*
39-155-0015		Girard	---*	---*	60*	60*

(Shaded) Insufficient data for valid statistical average.

^Continuous instruments. * Does not meet the data completeness criteria.

III. PARTICULATE MATTER ≤2.5µM ($PM_{2.5}$)

A. Overview

In 1997, U.S. EPA promulgated revisions to the NAAQS for particulate matter to focus on those particles with an aerodynamic diameter smaller than or equal to 2.5 micrometers ($PM_{2.5}$).

In 1997, the annual $PM_{2.5}$ NAAQS was set at 15.0 µg/m^3 as an annual mean, averaged over three years. In 2013, the annual NAAQS was revised from 15.0 µg/m^3 to 12.0 µg/m^3, remaining as an annual mean, averaged over three years.

In 1997, the 24-hour $PM_{2.5}$ NAAQS was set at 65 µg/m^3 and then revised to 35 µg/m^3 in 2006. The 24-hour NAAQS is met when the 98th percentile concentration, averaged over three years, is less than or equal to 35 µg/m^3.

Ohio had a peak of 66 $PM_{2.5}$ monitoring sites in 2008. In 2023, there were 46 $PM_{2.5}$ sites with 87 total monitors. Most are filter-based Federal Reference Method (FRM) instruments collecting 24-hour average concentrations either every three-days or every six-days. Additionally, there are 10 chemical speciation monitors operating on an every three- or six-day schedule with filters analyzed for chemical composition of $PM_{2.5}$ matter. Additional $PM_{2.5}$ monitors collect hourly concentrations throughout the year (continuous). Continuous instruments are referred to as Federal Equivalent Method (FEM) $PM_{2.5}$ monitors or may be designated for the purpose of air quality index (AQI) reporting only. Ohio's continuous $PM_{2.5}$ monitors are used for three proposes: AQI reporting only, comparison to the NAAQS, and for supplementing data for FRM monitors. Except in rare circumstances, all continuous $PM_{2.5}$ monitors serve the purpose of AQI reporting and some may be designated as AQI reporting only monitors and are therefore, not comparable to the NAAQS. AQI only monitors are not considered FEM monitors. Continuous monitoring data from an FEM monitor is comparable to the $PM_{2.5}$ NAAQS when it is located at a site without an FRM monitor or when it is collocated at a site with an FRM and used to fill data gaps when the intermittent FRM monitor is not operational. Speciation monitors are used to determine the composition of the particulates.

39-017-0022, Butler County

B. Sampling Method

$PM_{2.5}$ is measured by the filtered air sampler method for non-continuous instruments. These instruments are refined beyond the TSP and PM_{10} sampler to further limit the size of particle collected on the filter. Measured volumes of air are similarly drawn through a filter for 24 hours. $PM_{2.5}$ matter trapped on the filter is weighed to determine the mass collected per volume of air. Continuous instruments collect real-time $PM_{2.5}$ concentrations by various other measurement techniques. Ohio EPA's continuous network include instruments that use beta attenuation, broadband spectroscopy, and gravimetric methods to measure $PM_{2.5}$ concentrations continuously. Beta attenuation uses beta rays to analysis particles absorbed on a filter over a given time period. Broadband spectroscopy is an innovative technology that combines advanced LED technology with well-understood light scattering theory. Gravimetric units pull in a constant rate of air over a glass tube with a filter that is then continuously weighted to determine the particulate matter concentration.

C. Air Quality Data

Table 5 presents 24-hour 98th percentile $PM_{2.5}$ data from intermittent FRM and all continuous instruments[5] Ohio EPA uses to evaluate air quality for the state. Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met. The 24-hour NAAQS is 35 µg/m^3 and compared against the column labeled "98th Percentile" while the annual NAAQS is 12.0 µg/m^3 and compared against the column labeled "24-Hr Mean". Because the form of both NAAQS is to be averaged over three years, this is not a direct comparison to each NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2023.

Results are reported as µg/m^3. Data reported below will also refer to a POC followed by a number. For $PM_{2.5}$, POC1, POC2 and POC4 instruments are filterable FRM instruments either dedicated to comparing to the NAAQS (where applicable) or designated for quality assurance purposes. For $PM_{2.5}$, POC3 and POC7 are continuous instruments. Due to a necessary firmware update that occurred in 2023 that impacted the majority of continuous instruments operated by Ohio EPA, there are additional POCs in Table 5 below. POC23 and POC27 display "aligned data" from January through June of 2023. While POC3 and POC7 display data for all of 2023 with data alignment from July onward. No single POC can give a true representation of $PM_{2.5}$ air quality at a site due to the form of the NAAQS. However, looking at individual POCs can be insightful information which is why individual POCs are displayed in Tables 5 and 6. For a NAAQS comparable value for each site please see Tables 7 and 8.

As discussed above, AQI-only continuous instruments are not comparable to the NAAQS. These instruments are identified in the table below with a caret (^). FEM continuous instruments are comparable to the NAAQS as described above.

Over the course of the summer months, approximately June through August, Ohio's air quality data shows effects from smoke caused by wildfires that occurred outside the state.

Where applicable, Ohio EPA documented and is working to submit exceptional event demonstrations to U.S. EPA to exclude these values for regulatory purposes. Not all days influenced by wildfire smoke will qualify for an exceptional event demonstration. However, as part of the yearly data certification process Ohio EPA has "flagged" PM values influenced by

[5] The statistical database from which data for this report is generated does not include 98th percentile concentrations for AQI-only continuous instruments; therefore N/A will be found in Table 5 for this statistic and Figure 5 will not display this data.

wildfire smoke to provide a more complete understanding of PM concentrations in Ohio for 2023. These qualifier flags do not appear in the tables below but are part of the yearly data certification.

Because the PM monitoring network is comprised of filterable and continuous instruments wildfire smoke concentrations were more often captured via continuous instruments. As can been seen in the tables below, these wildfires contributed to higher concentrations of PM across the state, which would be evident if compared to data from recent prior years in Ohio Air Quality Reports.

Table 5. $PM_{2.5}$ 24-Hour Air Monitoring Statistics from Intermittent FRM and Continuous Instruments (μg/m³)

County	Site ID	POC	City	Valid Days	1st Max	2nd Max	3rd Max	4th Max	98th Percentile	24-Hr Mean	
Allen	39-003-0009	1	Lima	57	78.2	49.7	45.8	28.5	49.7	10.7	
Allen	39-003-0009	3	Lima	355	117.4	90.2	79.6	47.8	31.3	8.3	
Athens	39-009-0003	1	Sharpsburg	111	64.2	29.6	23.4	20.5	23.4	6.9	
Athens	39-009-0003	3	Sharpsburg	184	35.0	18.2	17.4	16.5	16.5	6.6	*
Athens	39-009-0003	23	Sharpsburg	1	7.9	---	---	---	7.9	7.9	*
Belmont	39-013-0006	1	Shadyside	115	97.9	32.0	24.2	21.6	24.2	8.7	
Belmont	39-013-0006	3	Shadyside	184	34.5	19.5	19.1	15.8	15.8	7.4	*
Butler	39-017-0015	1	Middletown	59	47.6	26.4	24.2	21.6	26.4	9.8	
Butler	39-017-0015	3	Middletown	259	38.6	36.4	26.1	25.0	23.7	10.1	*
Butler	39-017-0015	4	Middletown	61	22.3	20.6	19.4	17.1	20.6	9.3	
Butler	39-017-0015	23	Middletown	78	117.2	70.7	54.6	48.5	70.7	14.6	*
Butler	39-017-0019	1	Middletown	60	48.0	31.4	28.0	26.2	31.4	10.6	
Butler	39-017-0019	3	Middletown	359	36.0	35.1	25.6	25.5	21.3	9.5	*
Butler	39-017-0019	4	Middletown	60	24.4	22.5	20.1	19.0	22.5	9.2	
Butler	39-017-0019	23	Middletown	180	114.2	69.4	53.1	49.6	49.6	10.8	*
Butler	39-017-0020	1	Middletown	59	50.3	34.4	30.0	27.8	34.4	12.2	
Butler	39-017-0020^	3	Middletown	355	121.1	73.7	57.2	56.5	36.9	12.4	
Butler	39-017-0020	4	Middletown	60	29.3	24.5	20.6	19.1	24.5	10.8	
Butler	39-017-0020	23	Middletown	176	119.8	72.4	56.0	55.1	55.1	12.5	*
Butler	39-017-0022	1	Middletown	59	45.8	30.3	30.2	30.0	30.3	12.0	
Butler	39-017-0022	3	Middletown	269	51.5	38.3	37.6	32.0	29.1	11.7	*
Butler	39-017-0022	4	Middletown	60	32.2	24.6	21.4	21.1	24.6	10.6	
Butler	39-017-0022	23	Middletown	85	113.6	67.9	56.2	52.7	67.9	17.0	*
Clark	39-023-0005	1	Springfield	115	51.5	41.6	27.2	23.3	27.2	8.8	
Clark	39-023-0005	3	Springfield	361	52.1	38.4	26.2	24.6	23.0	10.0	*
Clark	39-023-0005	23	Springfield	181	118.2	75.6	60.4	41.7	41.7	10.4	*
Clermont	39-025-0022^	3	Batavia	352	90.2	48.5	45.1	32.6	N/A	6.4	
Cuyahoga	39-035-0034	1	Cleveland	117	31.8	29.5	28.9	19.4	28.9	8.5	
Cuyahoga	39-035-0034	3	Cleveland	98	19.9	17.4	15.1	13.2	17.4	6.3	*
Cuyahoga	39-035-0038	1	Cleveland	108	73.5	31.1	27.0	24.0	27.0	10.3	*
Cuyahoga	39-035-0038	2	Cleveland	116	73.2	31.3	27.4	24.2	27.4	10.4	
Cuyahoga	39-035-0038	3	Cleveland	363	59.9	37.3	28.9	25.9	21.8	10.4	*

County	Site ID	POC	City	Valid Days	1st Max	2nd Max	3rd Max	4th Max	98th Percentile	24-Hr Mean	
Cuyahoga	39-035-0038	23	Cleveland	179	157.1	85.0	54.8	52.8	52.8	12.6	*
Cuyahoga	39-035-0045	1	Cleveland	82	21.2	17.5	16.7	16.0	17.5	8.8	*
Cuyahoga	39-035-0045	3	Cleveland	143	24.9	22.9	20.7	18.4	20.7	8.7	*
Cuyahoga	39-035-0060	1	Cleveland	116	76.7	35.0	31.7	29.7	31.7	10.6	
Cuyahoga	39-035-0060	3	Cleveland	358	63.5	39.7	32.3	30.9	24.6	12.3	*
Cuyahoga	39-035-0060	23	Cleveland	179	151.6	82.0	56.7	51.8	51.8	12.5	*
Cuyahoga	39-035-0065	1	Newburgh	118	74.9	42.4	35.0	33.7	35.0	13.5	
Cuyahoga	39-035-0065	3	Newburgh	177	60.4	36.7	30.1	24.6	24.6	10.7	*
Cuyahoga	39-035-0073	1	Warrensville	118	65.9	26.1	20.6	19.5	20.6	8.2	
Cuyahoga	39-035-0073	3	Warrensville	365	58.2	35.8	25.8	22.6	17.9	8.2	*
Cuyahoga	39-035-0073	23	Warrensville	181	138.1	75.0	49.7	47.8	47.8	10.7	*
Franklin	39-049-0029^	3	New Albany	351	110.1	94.8	53.1	44.7	N/A	7.2	
Franklin	39-049-0034	1	Columbus	121	82.6	47.2	31.2	29.1	31.2	10.0	
Franklin	39-049-0034	2	Columbus	60	83.3	48.4	31.2	25.9	48.4	10.4	
Franklin	39-049-0034	3	Columbus	59	27.9	22.5	21.9	21.6	22.5	10.9	*
Franklin	39-049-0038	1	Columbus	110	83.2	46.4	31.5	27.8	31.5	10.0	*
Franklin	39-049-0038	3	Columbus	300	40.4	33.9	26.9	24.0	21.5	9.7	*
Franklin	39-049-0038	23	Columbus	178	133.5	99.3	68.8	49.9	49.9	11.4	*
Franklin	39-049-0040	1	Columbus	117	53.1	29.8	28.7	23.3	28.7	10.0	
Franklin	39-049-0040	3	Columbus	122	26.7	24.6	24.5	23.6	24.5	9.9	*
Franklin	39-049-0081	1	Columbus	120	85.3	46.1	31.5	29.1	31.5	9.6	
Franklin	39-049-0081	3	Columbus	176	58.7	31.5	26.5	26.4	26.4	10.1	*
Hamilton	39-061-0010^	3	Cleves	353	91.4	48.8	42.0	32.1	N/A	7.6	
Hamilton	39-061-0006	3	Blue Ash	345	102.2	60.2	51.7	38.0	28.6	8.9	
Hamilton	39-061-0014	1	Cincinnati	59	47.0	42.1	27.0	26.7	42.1	11.1	
Hamilton	39-061-0014	2	Cincinnati	60	46.7	41.9	26.7	26.3	41.9	10.8	
Hamilton	39-061-0014	3	Cincinnati	364	39.8	38.9	32.6	25.7	22.7	10.6	*
Hamilton	39-061-0014	4	Cincinnati	61	24.2	18.4	18.4	16.6	18.4	9.5	
Hamilton	39-061-0014	23	Cincinnati	180	108.1	62.8	53.7	49.6	49.6	11.6	*
Hamilton	39-061-0040	1	Cincinnati	59	46.1	26.0	25.3	24.1	26.0	9.4	
Hamilton	39-061-0040	3	Cincinnati	356	39.6	32.2	25.6	23.2	21.4	10.3	*
Hamilton	39-061-0040	4	Cincinnati	61	25.1	21.6	17.7	16.7	21.6	8.4	
Hamilton	39-061-0040	23	Cincinnati	174	113.9	62.4	52.8	48.2	48.2	10.5	*

County	Site ID	POC	City	Valid Days	1st Max	2nd Max	3rd Max	4th Max	98th Percentile	24-Hr Mean	
Hamilton	39-061-0042	1	Cincinnati	58	45.7	30.8	25.2	24.8	30.8	9.8	
Hamilton	39-061-0042	3	Cincinnati	357	37.5	29.7	29.2	24.7	20.7	9.4	*
Hamilton	39-061-0042	4	Cincinnati	61	24.9	20.3	18.0	17.3	20.3	9.0	
Hamilton	39-061-0042	4	Cincinnati	173	111.7	61.5	52.6	45.8	45.8	11.1	*
Hamilton	39-061-0048	2	Cincinnati	57	47.8	43.0	26.3	25.1	43.0	11.2	
Hamilton	39-061-0048	3	Cincinnati	355	98.3	53.5	47.6	45.6	30.6	9.8	
Jefferson	39-081-0017	1	Steubenville	114	112.4	39.7	24.2	21.5	24.2	9.7	
Jefferson	39-081-0017	2	Steubenville	56	112.5	39.8	24.3	21.8	39.8	10.6	
Jefferson	39-081-0017	3	Steubenville	361	43.8	25.3	22.7	21.3	17.6	8.6	*
Jefferson	39-081-0017	23	Steubenville	177	152.5	140.1	33.7	32.9	32.9	11.9	*
Lake	39-085-0007	1	Painesville	115	57.3	55.8	36.1	33.1	36.1	8.5	
Lake	39-085-0007^	3	Painesville	364	82.7	52.3	47.3	47.3	N/A	7.6	
Lawrence	39-087-0012	1	Ironton	117	50.5	31.2	25.2	23.2	25.2	8.5	
Lawrence	39-087-0012	3	Ironton	365	38.4	24.3	21.7	21.2	17.8	8.3	*
Lawrence	39-087-0012	23	Ironton	181	66.4	61.4	38.3	35.1	35.1	9.5	*
Lucas	39-095-0024	1	Toledo	116	98.1	32.7	31.6	27.4	31.6	9.3	
Lucas	39-095-0024^	3	Toledo	44	27.7	21.8	19.2	17.4	27.7	11.0	*
Lucas	39-095-0026	1	Toledo	120	94.8	32.8	31.0	26.5	31.0	9.1	
Lucas	39-095-1003	1	Toledo	118	99.2	40.6	32.9	28.1	32.9	10.5	
Mahoning	39-099-0015	1	Youngstown	60	82.7	46.9	23.6	21.5	46.9	10.5	
Mahoning	39-099-0015	3	Youngstown	359	57.2	27.7	26.0	24.7	20.5	9.0	*
Mahoning	39-099-0015	4	Youngstown	60	25.5	20.3	18.2	17.1	20.3	8.8	
Mahoning	39-099-0015	23	Youngstown	175	149.6	103.8	45.8	37.2	37.2	11.3	*
Medina	39-103-0004	1	Westfield	118	78.8	46.6	28.4	25.7	28.4	8.4	
Medina	39-103-0004	3	Westfield	362	59.4	34.4	24.4	23.6	20.5	7.5	
Medina	39-103-0004	23	Westfield	69	208.5	98.6	46.6	46.2	98.6	16.0	*
Montgomery	39-113-0038	1	Dayton	120	48.4	39.2	25.9	22.9	25.9	8.9	
Montgomery	39-113-0038	2	Dayton	59	48.2	39.7	26.0	21.0	39.7	9.5	
Montgomery	39-113-0038	7	Dayton	359	48.2	39.3	26.4	23.5	21.0	9.7	*
Montgomery	39-113-0038	27	Dayton	175	118.5	75.6	57.3	47.8	47.8	10.7	*
Preble	39-135-1001	1	New Paris	114	46.5	38.3	27.8	24.5	27.8	7.9	
Preble	39-135-1001	3	New Paris	346	46.4	39.6	31.5	22.0	19.0	8.5	*
Preble	39-135-1001	23	New Paris	181	127.3	94.8	56.7	52.9	52.9	10.3	*

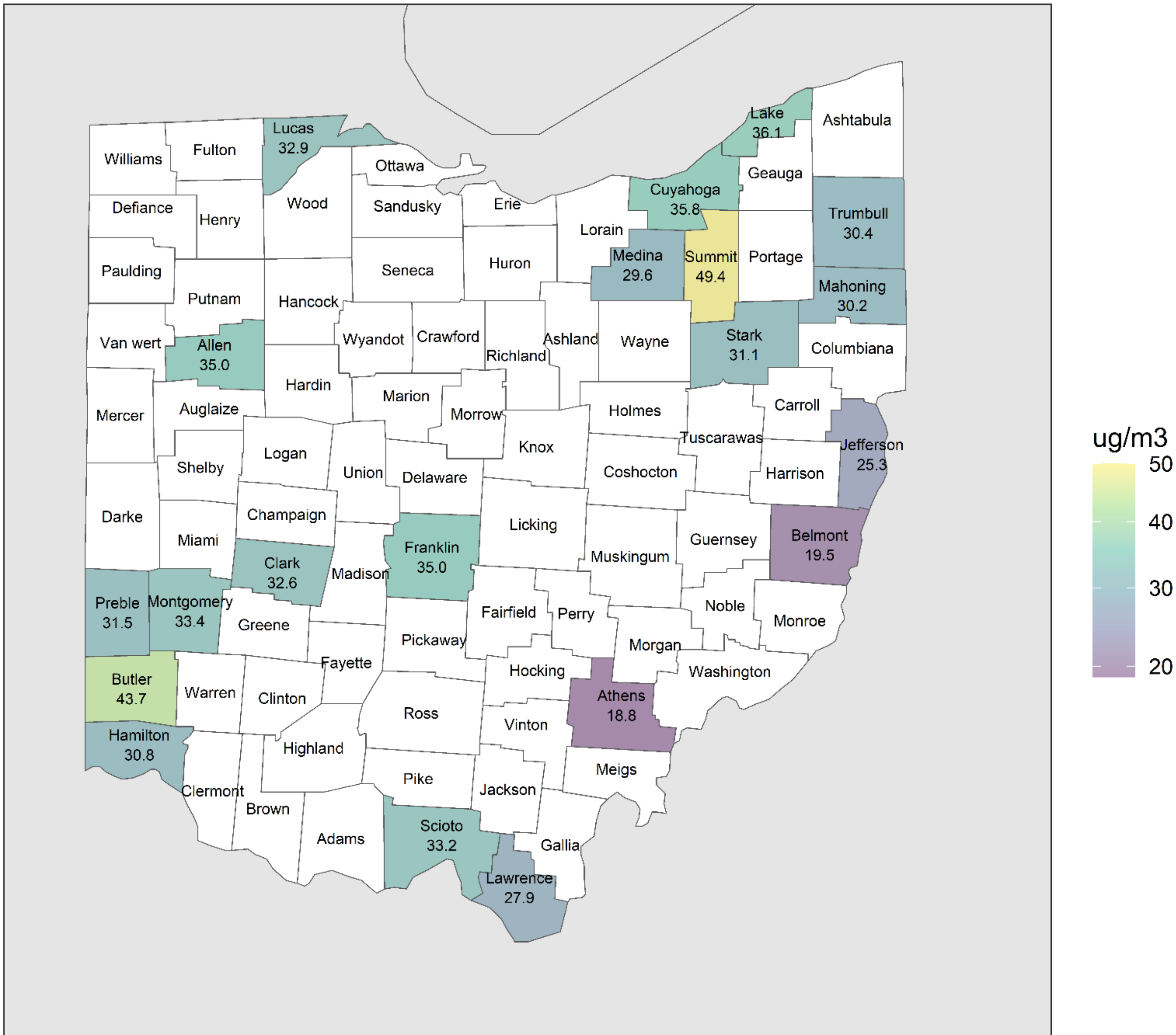
County	Site ID	POC	City	Valid Days	1st Max	2nd Max	3rd Max	4th Max	98th Percentile	24-Hr Mean	
Scioto	39-145-0013	1	Portsmouth	119	53.2	49.9	33.9	25.6	33.9	8.5	
Scioto	39-145-0013	3	Portsmouth	299	43.4	29.5	23.5	21.9	21.0	8.9	*
Scioto	39-145-0013	23	Portsmouth	117	84.6	67.0	40.3	40.0	40.3	9.5	*
Scioto	39-145-0015	1	Portsmouth	60	51.2	33.1	24.4	16.5	33.1	8.7	
Scioto	39-145-0015	3	Portsmouth	275	41.9	24.7	23.4	21.5	20.2	8.7	*
Scioto	39-145-0015	23	Portsmouth	91	76.2	66.1	40.3	38.5	66.1	13.1	*
Stark	39-151-0017	1	Canton	117	110.5	48.0	30.1	28.3	30.1	10.6	
Stark	39-151-0017	2	Canton	58	108.2	47.3	27.9	22.4	47.3	11.4	
Stark	39-151-0017	3	Canton	206	61.7	33.2	29.5	29.0	28.6	10.8	*
Stark	39-151-0017	23	Canton	36	30.3	28.6	22.4	19.8	30.3	11.2	*
Stark	39-151-0020	1	Canton	120	105.4	46.8	29.6	27.2	29.6	9.6	
Stark	39-151-0020	3	Canton	352	58.4	31.1	28.6	25.9	22.3	9.5	*
Stark	39-151-0020	23	Canton	180	206.4	137.8	44.4	43.1	43.1	12.2	*
Summit	39-153-0017	1	Akron	121	81.9	49.6	32.0	28.4	32.0	9.5	
Summit	39-153-0017	2	Akron	52	81.1	49.5	31.7	28.4	49.5	10.6	*
Summit	39-153-0017	3	Akron	314	52.5	28.0	27.4	23.2	20.2	8.0	*
Summit	39-153-0017	23	Akron	17	152.9	86.4	36.5	34.3	152.9	28.7	*
Summit	39-153-0023	1	Akron	69	80.1	49.4	27.1	26.9	49.4	11.7	*
Summit	39-153-0023	3	Akron	19	58.6	32.2	22.0	19.1	58.6	16.0	*
Summit	39-153-0023	23	Akron	5	14.6	14.4	10.4	7.5	14.6	10.5	*
Trumbull	39-155-0014	1	Warren	59	78.7	50.4	24.9	24.1	50.4	10.5	
Trumbull	39-155-0014	3	Warren	364	63.0	30.0	29.8	26.4	22.9	8.6	*
Trumbull	39-155-0014	4	Warren	61	24.0	22.7	19.5	19.2	22.7	9.1	
Trumbull	39-155-0014	23	Warren	127	143.6	98.8	45.7	40.2	45.7	11.4	*
Warren	39-165-0007^	3	Lebanon	354	100.8	59.9	49.0	35.4	N/A	8.7	

* Does not meet the data completeness criteria. ^ Monitor used for AQI purposes only.

Figure 5 presents the 98th percentile 24-hour concentrations and Figure 6 presents the annual average concentrations for every county with a $PM_{2.5}$ monitor[6] in 2023. The values in the figures below in some cases will not match the "98th Percentile" or "24-Hr Mean" column in Table 5. For some sites, with multiple POC numbers, the 98th percentile and mean are calculated from a combination of primary monitors, collocated monitors, and in some cases continuous monitors that make up a single official data stream for the site. For some counties, the highest value presented in Figure 5 and Figure 6 are calculated from the combinations of monitors. These calculated values will match the "2023" column in Table 7, for 24-hour concentrations and Table 8, for annual average concentrations. The information presented in Table 5 above offers individual data for all $PM_{2.5}$ monitors to provide a complete picture of data collection and air quality in the state. For counties with more than one $PM_{2.5}$ monitor, the highest concentration for the county was used. All concentrations are reported as $\mu g/m^3$.

[6]Figure 6 includes data from the AQI-only continuous monitors located in Clermont and Warren Counties. These values are not official values because 98th percentile values and design values are not calculated for AQI-only monitors. However, in Figure 6 the annual average values have been included for the two counties to provide a more complete picture of $PM_{2.5}$ data in the state for 2023. Since official design values are not calculated for AQI-only monitors, the two counties therefore do not appear on the maps or tables in the Attainment Status section.

Figure 5. 2023 $PM_{2.5}$ 24-Hour 98th Percentile Concentrations



*Does not meet the data completeness criteria

Figure 6. 2023 $PM_{2.5}$ Annual Average Concentrations

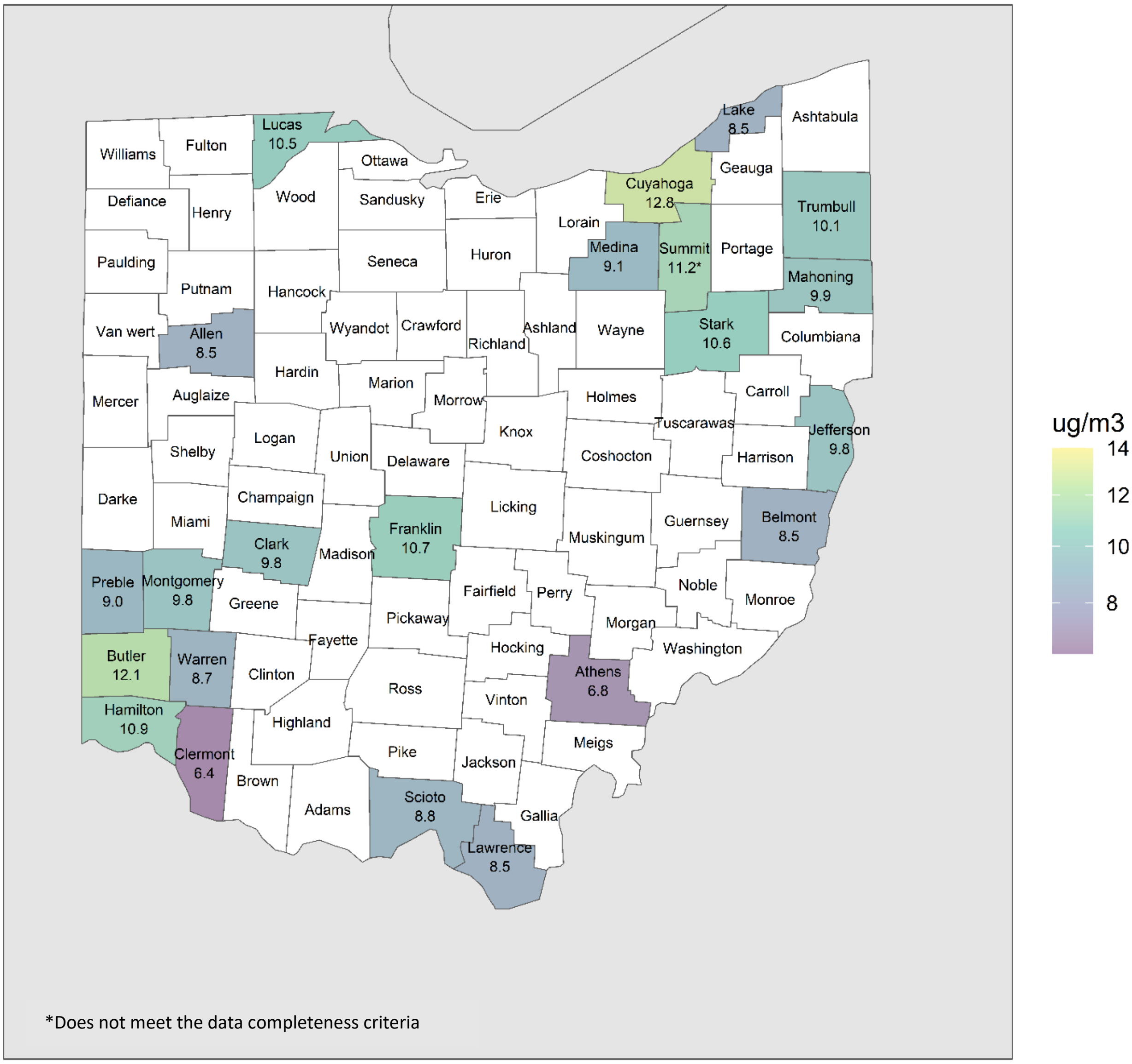


Table 6 presents one-hour $PM_{2.5}$ data from continuous instruments. It is important to note that many of these monitors have a single maximum hour reading above the 24-hour $PM_{2.5}$ NAAQS of 35 µg/m^3. $PM_{2.5}$ concentrations can change quickly due to factors such as meteorological conditions and activity at nearby sources of $PM_{2.5}$ and high hourly values are not uncommon. Continuous monitors provide valuable, detailed information about the variations in concentrations and can record short-term events of high concentrations. That is why these monitors are well-suited for reporting to the AQI. It is because of these variables that the data presented in Table 6 is not used in comparison with the NAAQS.

Table 6. $PM_{2.5}$ One-Hour Air Monitoring Statistics from Continuous Instruments ($\mu g/m^3$)

County	Site ID	POC	City	Obs	1st Max	2nd Max	3rd Max	4th Max	1-Hr Mean
Allen	39-003-0009	3	Lima	8541	167.2	165.7	164.2	157.5	8.26
Athens	39-009-0003	3	Sharpsburg	4424	66.9	57.1	55.4	54.4	6.67*
	39-009-0003	23	Sharpsburg	33	11.6	11.6	11.4	11.1	6.89*
Belmont	39-013-0006	3	Shadyside	4404	52.6	52.4	49.7	48.2	7.46*
Butler	39-017-0015	3	Middletown	6246	153.9	153.5	150.1	148.5	11.86*
	39-017-0015	23	Middletown	1878	152.6	152.6	148.2	146.6	14.54*
	39-017-0019	3	Middletown	8631	151.4	149.5	149.5	141.3	10.88
	39-017-0019	23	Middletown	4318	150.5	148.6	144.0	140.4	10.83*
	39-017-0020	3	Middletown	8564	171.5	165.3	163.5	158.1	12.49
	39-017-0020	23	Middletown	4252	169.6	163.4	161.6	157.2	12.59*
	39-017-0022	3	Middletown	6481	742.0	160.6	145.6	145.5	13.80*
	39-017-0022	23	Middletown	2070	144.7	143.6	142.8	138.0	16.85*
Clark	39-023-0005	3	Springfield	8695	150.1	149.3	148.8	144.8	10.93
	39-023-0005	23	Springfield	4340	147.4	146.9	142.9	142.4	10.50*
Clermont	39-025-0022	3	Batavia	8451	125.6	122.5	120.3	117.6	6.48
Cuyahoga	39-035-0034	3	Cleveland	2389	31.3	30.4	29.7	28.1	6.58*
	39-035-0038	3	Cleveland	8717	251.4	241.1	231.4	227.1	12.26
	39-035-0038	3	Cleveland	4311	249.5	239.2	229.5	225.2	12.67*
	39-035-0045	3	Cleveland	3453	48.3	45.3	41.9	39.3	8.65*
	39-035-0060	3	Cleveland	8602	244.6	237.3	226.7	220.5	13.11
	39-035-0060	23	Cleveland	4281	242.7	235.4	224.8	218.6	12.50*
	39-035-0065	3	Newburgh Heights	4228	87.4	86.8	84.9	82.3	10.66*
	39-035-0073	3	Warrensville Heights	8732	226.4	220.5	219.7	218.6	10.13
	39-035-0073	23	Warrensville Heights	4332	224.5	218.6	217.8	216.7	10.74*
Franklin	39-049-0029	3	New Albany	8528	506.3	236.9	203.9	188.3	7.22

County	Site ID	POC	City	Obs	1st Max	2nd Max	3rd Max	4th Max	1-Hr Mean
	39-049-0034	3	Columbus	1420	55.0	54.2	39.1	38.3	10.95*
	39-049-0038	3	Columbus	7221	208.0	188.2	185.2	180.8	11.88
	39-049-0038	23	Columbus	4284	206.1	186.3	183.3	178.9	11.44*
	39-049-0040	3	Columbus	2917	60.6	58.8	51.8	51.5	10.09*
	39-049-0081	3	Columbus	4218	98.8	75.1	74.5	74.2	10.06*
Hamilton	39-061-0006	3	Blue Ash	8345	149.1	146.7	146.4	132.7	8.90
	39-061-0010	3	Cleves	8497	127.1	126.6	106.0	100.9	7.58
	39-061-0014	3	Cincinnati	8732	163.2	155.5	152.1	145.1	11.77
	39-061-0014	23	Cincinnati	4320	162.3	154.6	151.2	143.2	11.68*
	39-061-0040	3	Cincinnati	8604	156.8	152.2	151.7	150.1	11.12
	39-061-0040	23	Cincinnati	4228	155.9	150.3	149.8	148.2	10.63*
	39-061-0042	3	Cincinnati	8655	155.3	154.9	146.9	143.2	10.90
	39-061-0042	23	Cincinnati	4248	154.4	154.0	146.0	141.3	11.16*
	39-061-0048	3	Cincinnati	8515	203.3	193.0	141.7	140.6	9.80
Jefferson	39-081-0017	3	Steubenville	8651	222.5	220.0	219.9	219.6	10.76
	39-081-0017	23	Steubenville	4247	221.6	219.1	218.0	217.7	11.91*
Lake	39-085-0007	3	Painesville	8679	173.4	166.3	157.8	151.4	7.62
Lawrence	39-087-0012	3	Ironton	8739	170.8	108.1	105.6	91.8	9.48
	39-087-0012	23	Ironton	4330	169.9	107.2	104.7	90.9	9.57*
Lucas	39-095-0024	3	Toledo	1055	62.0	35.1	33.7	33.6	10.93*
	39-095-0024	23	Toledo	7509	171.7	164.8	159.8	146.4	8.40
Mahoning	39-099-0015	3	Youngstown	8609	227.0	217.5	217.3	214.6	10.53
	39-099-0015	23	Youngstown	4203	226.1	216.4	215.6	213.7	11.19*
Medina	39-103-0004	3	Westfield	8662	275.7	273.8	272.9	267.0	9.63
	39-103-0004	23	Westfield	1668	274.8	272.0	271.9	266.1	15.97*
Montgomery	39-113-0038	7	Dayton	8645	152.4	151.5	150.4	148.4	10.90
	39-113-0038	7	Dayton	4232	150.5	149.6	148.5	147.5	10.72*

County	Site ID	POC	City	Obs	1st Max	2nd Max	3rd Max	4th Max	1-Hr Mean
Preble	39-135-1001	3	New Paris	8317	185.6	183.7	177.7	173.9	10.18
	39-135-1001	23	New Paris	4336	183.7	181.8	175.8	172.0	10.35*
Scioto	39-145-0013	3	Portsmouth	7184	256.5	125.4	123.9	115.1	10.08
	39-145-0013	23	Portsmouth	2802	124.5	123.0	114.2	96.2	11.08*
	39-145-0015	3	Portsmouth	6587	104.1	98.7	96.2	95.0	10.58
	39-145-0015	23	Portsmouth	2178	103.2	97.8	95.3	94.1	13.10*
Stark	39-151-0017	3	Canton	4949	103.5	98.2	81.7	81.1	10.91*
	39-151-0017	23	Canton	871	102.6	97.3	80.8	80.2	11.25*
	39-151-0020	3	Canton	8457	281.3	281.2	278.6	274.7	11.58
	39-151-0020	23	Canton	4330	280.4	280.3	277.7	273.8	12.25*
Summit	39-153-0017	3	Akron	7527	219.0	218.8	216.7	210.0	9.33
	39-153-0017	23	Akron	418	218.1	217.9	215.8	209.1	28.06*
	39-153-0023	3	Akron	497	78.2	72.3	70.6	70.4	14.60*
	39-153-0023	23	Akron	145	21.1	20.8	19.4	19.0	10.31*
Trumbull	39-155-0014	3	Warren	8721	241.4	227.2	216.7	214.7	10.68
	39-155-0014	23	Warren	3037	240.5	226.3	214.8	213.8	12.58*
Warren	39-165-0007	3	Lebanon	8508	137.5	133.9	133.6	133.6	8.76
Summit	39-153-0017	3	Akron	8540	93.1	69.2	61.6	58.9	8.06
Trumbull	39-155-0014	3	Warren	8422	138.8	136.3	116.4	83.5	7.03
Warren	39-165-0007	3	Lebanon	8476	94.5	39.9	38.2	37.0	7.74

* Does not meet the data completeness criteria.

D. Ten Year Air Quality Trends

Figure 7 presents the average of each year's 24-hour 98th percentile concentration for all monitoring sites for years 2014 through 2023. Overall, 24-hour 98th percentile $PM_{2.5}$ concentrations have remained fairly consistent over the last seven years with a slight increase (wildfire smoke influenced) in 2023 while still remaining approximately 5 µg/m^3 or more below the NAAQS throughout the last decade.

Figure 7. $PM_{2.5}$ Trend: Average 24-Hour 98th Percentile Concentrations for all Sites

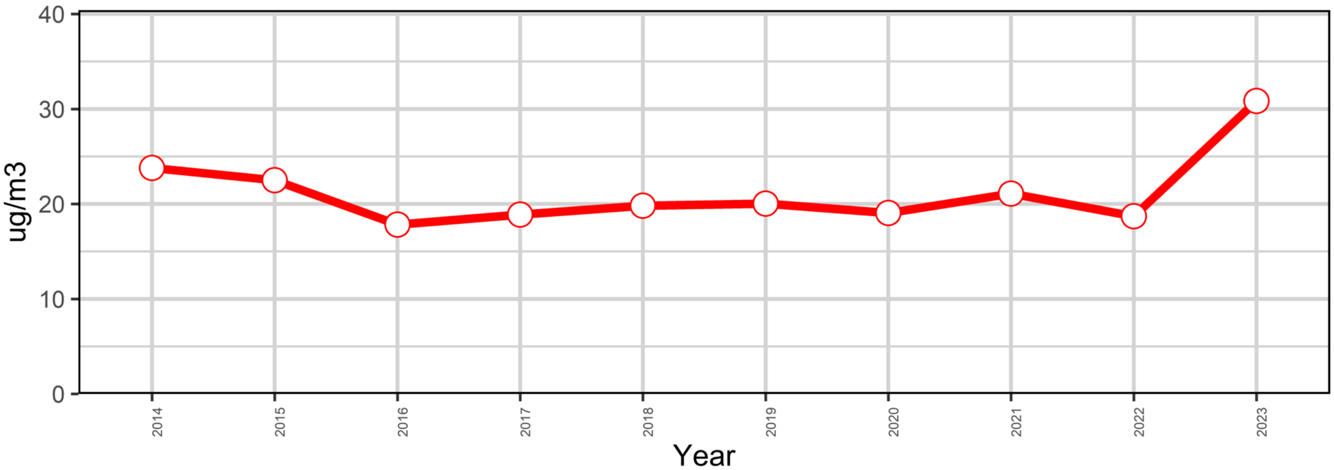


Figure 8 presents the average of each year's annual averages for all monitoring sites for years 2014 through 2023. Overall, annual average $PM_{2.5}$ concentrations in the state have remain below the NAAQS throughout the last decade, primarily being consistent or trended downwards except in 2023. The 2023 increase was influenced by wildfire smoke.

Figure 8. $PM_{2.5}$ Trend: Average Annual Average Concentrations for all Sites

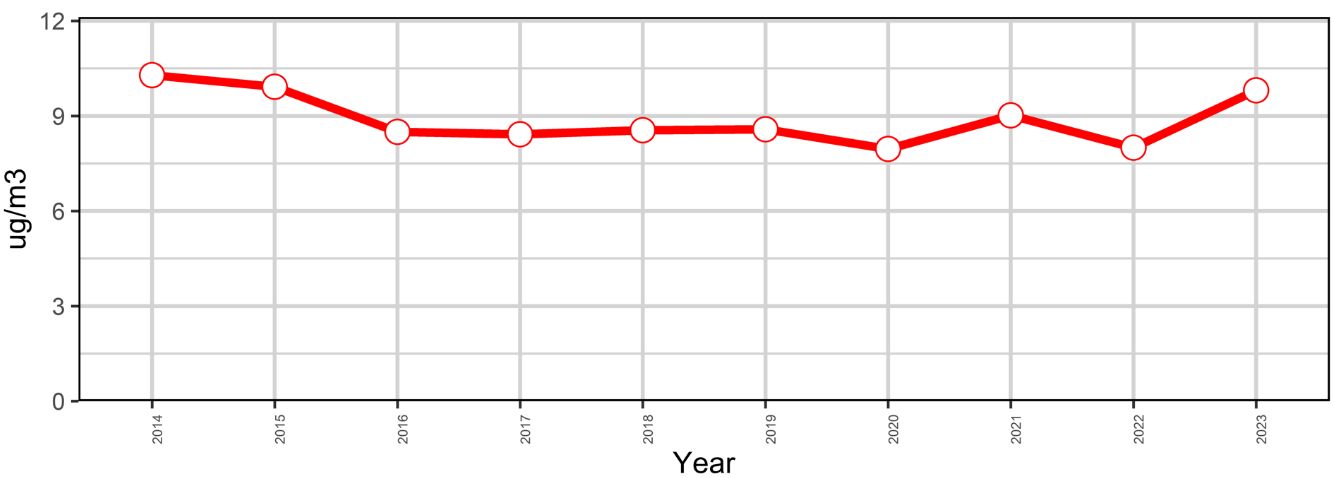
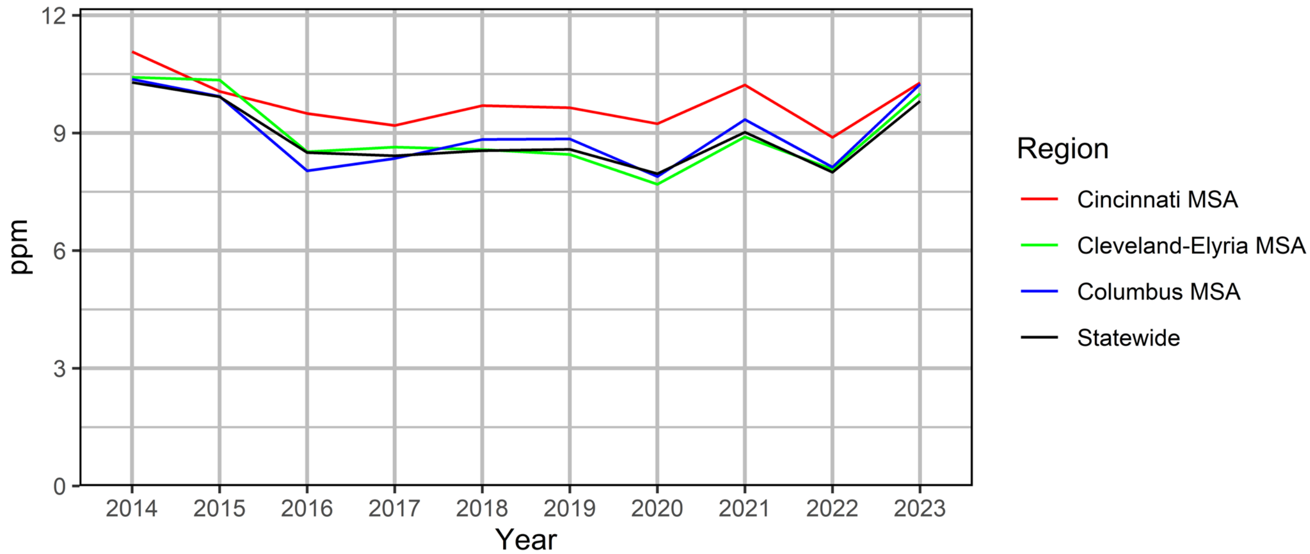


Figure 9 presents the statewide average of each year's annual averages from Figure 8 in comparison to the average of each year's annual averages for the three largest metropolitan-statistical areas (MSA) in Ohio. Particulate pollution has been on a fairly consistent trend in the state for most of the past decade. The increase in 2023 concentrations is mainly attributed to wildfire smoke.

Figure 9. $PM_{2.5}$ Trend: Average Annual Average Concentrations for all Sites Statewide and Within MSAs



E. Attainment Status

The entire state has been designated as in attainment for both the 24-hour (35 µg/m^3) and annual (12.0 µg/m^3) $PM_{2.5}$ NAAQS since 2013 and 2019, respectively. As discussed above, one monitoring site in the state violated the annual $PM_{2.5}$ NAAQS in 2023. The maps and data tables below present the design values for both NAAQS for years 2021 through 2023 and only include data from monitoring sites used for comparison to the NAAQS. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Monitors without three years' worth of complete data are not considered to have valid design values for comparison to the NAAQS and are highlighted in green in Table 7 and Table 8.

Figure 10 presents the 24-hour design value calculated by the three-year average of 98th percentile concentrations and Table 7 shows each year's individual 98th percentile concentration and the three-year averages used to determine the 24-hour design value for each county.

Figure 10. 2021-2023 24-Hour PM2.5 Design Values

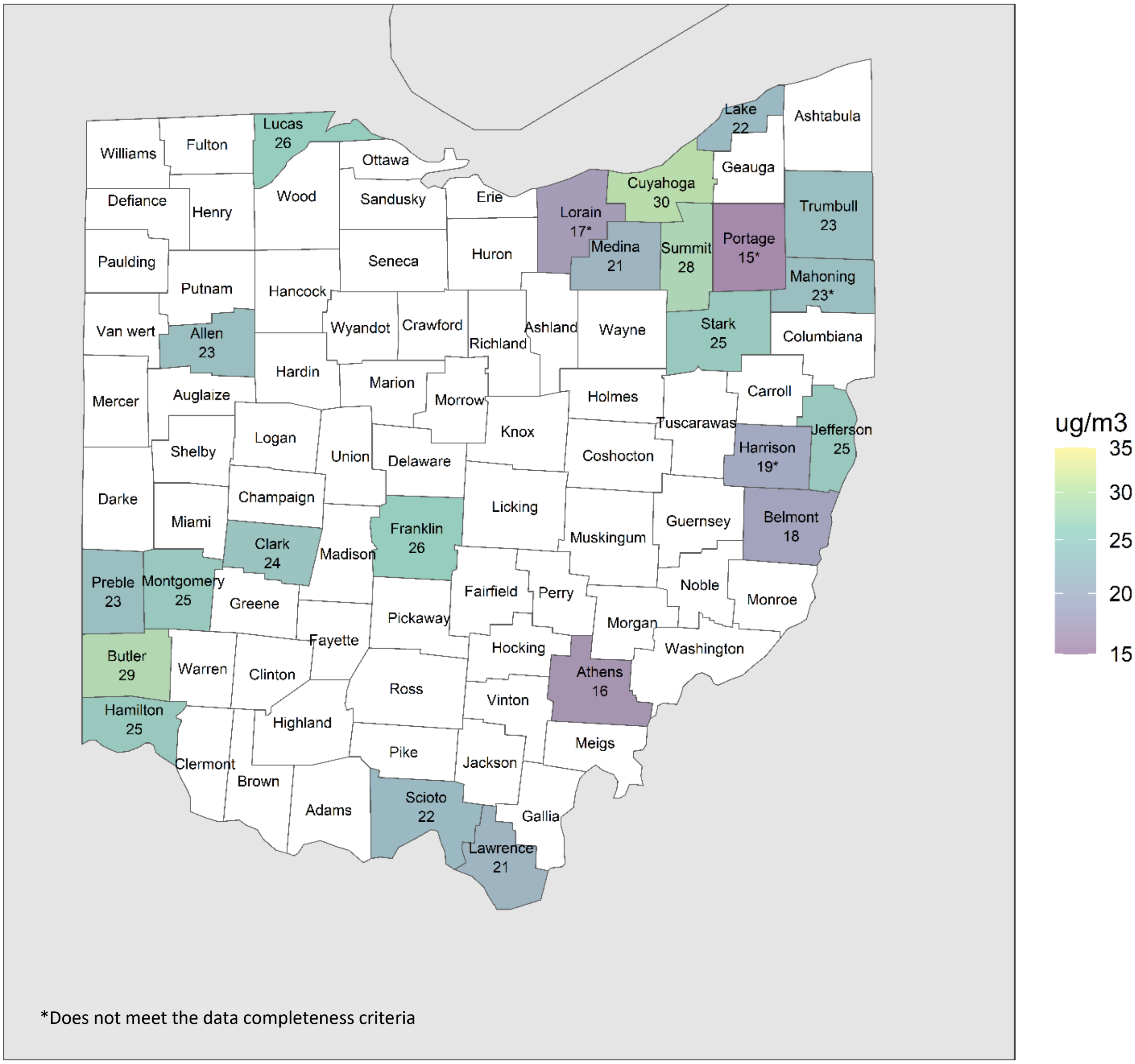


Table 7. $PM_{2.5}$ 24-hour 98th Percentile Concentrations and 24-Hour Design Values (µg/m³)

Site	County	City	Year 2021	Year 2022	Year 2023	Design Value 2021-2023
39-003-0009	Allen	Lima	16.8	16.5	35.0	23
39-009-0003	Athens	Sharpsburg	17.3	12.5	18.8	16
39-013-0006	Belmont	Shadyside	21.1	14.6	19.5	18
39-017-0015	Butler	Middletown	22.7	19.0	38.6	27
39-017-0016	Butler	Fairfield	20.9	19.9	-----*	20
39-017-0019	Butler	Middletown	20.8	20.0	30.5	23
39-017-0020	Butler	Middletown	26.7	22.2	34.4	27
39-017-0022	Butler	Middletown	23.1	20.5	43.7	29
39-023-0005	Clark	Springfield	22.3	18.1	32.6	24
39-035-0034	Cuyahoga	Cleveland	19.7	15.2	19.9	18
39-035-0038	Cuyahoga	Cleveland	22.5	23.9	34.0	26
39-035-0045	Cuyahoga	Cleveland	20.9	17.6	17.7*	19
39-035-0060	Cuyahoga	Cleveland	23.7	24.7	35.0	27
39-035-0065	Cuyahoga	Newburgh Heights	28.7	27.4	35.0	30
39-035-0073	Cuyahoga	Warrensville Heights	21.8	20.5	35.8	25
39-035-1002	Cuyahoga	Brook Park	15.1*	15.5	-----*	15
39-049-0034	Franklin	Columbus	19.4	17.3	29.1	22
39-049-0038	Franklin	Columbus	23.8	20.8	35.0	26
39-049-0040	Franklin	Columbus		18.6*	24.6	22
39-049-0081	Franklin	Columbus	20.1	17.4	29.1	22
39-061-0006	Hamilton	Blue Ash	22.7	18.2	28.6	23
39-061-0014	Hamilton	Cincinnati	24.6	20.2	30.8	24
39-061-0040	Hamilton	Cincinnati	24.2	18.7	27.3	23
39-061-0042	Hamilton	Cincinnati	23.4	20.0	30.4	24
39-061-0048	Hamilton	Cincinnati	25.1	19.8	30.6	25
39-067-0005	Harrison	Hopedale	17.4	19.9*	-----*	19
39-081-0017	Jefferson	Steubenville	29.7	21.6	25.3	25
39-085-0007	Lake	Painesville	15.7	15.1	36.1	22
39-087-0012	Lawrence	Ironton	21.9	15.1	27.9	21
39-093-3002	Lorain	Sheffield	17.2*	-----*	-----*	17
39-095-0024	Lucas	Toledo	20.8	16.5*	31.6	23
39-095-0026	Lucas	Toledo	19.9	18.3	31.0	23
39-095-1003	Lucas	Toledo	21.5	23.5	32.9	26
39-099-0015	Mahoning	Youngstown	18.6*	17.7	30.2	22
39-103-0004	Medina	Westfield	16.9	17.7	29.6	21
39-113-0038	Montgomery	Dayton	22.5	20.0	33.4	25
39-133-0002	Portage	Ravenna	13.9*	16.6	-----*	15
39-135-1001	Preble	New Paris	21.4	16.9	31.5	23
39-145-0013	Scioto	Portsmouth	15.0	16.7	31.7	21
39-145-0015	Scioto	Portsmouth	16.3	15.3	33.2	22
39-151-0017	Stark	Canton	20.9*	19.5	28.6	23
39-151-0020	Stark	Canton	24.1	23.0	31.1	25
39-153-0017	Summit	Akron	22.8	18.8	27.4	23
39-153-0023	Summit	Akron	20.2	15.5	49.4*	28
39-155-0014	Trumbull	Warren	22.5	16.6	30.4	23

(Green shading) Insufficient data for valid statistical average. * Does not meet the data completeness criteria.

Figure 11 presents the annual design value calculated by the three-year average of the mean concentrations and Table 8 shows each year's annual averages and the three-year averages used to determine the annual design value for each county.

Figure 11. 2021-2023 Annual $PM_{2.5}$ Design Values

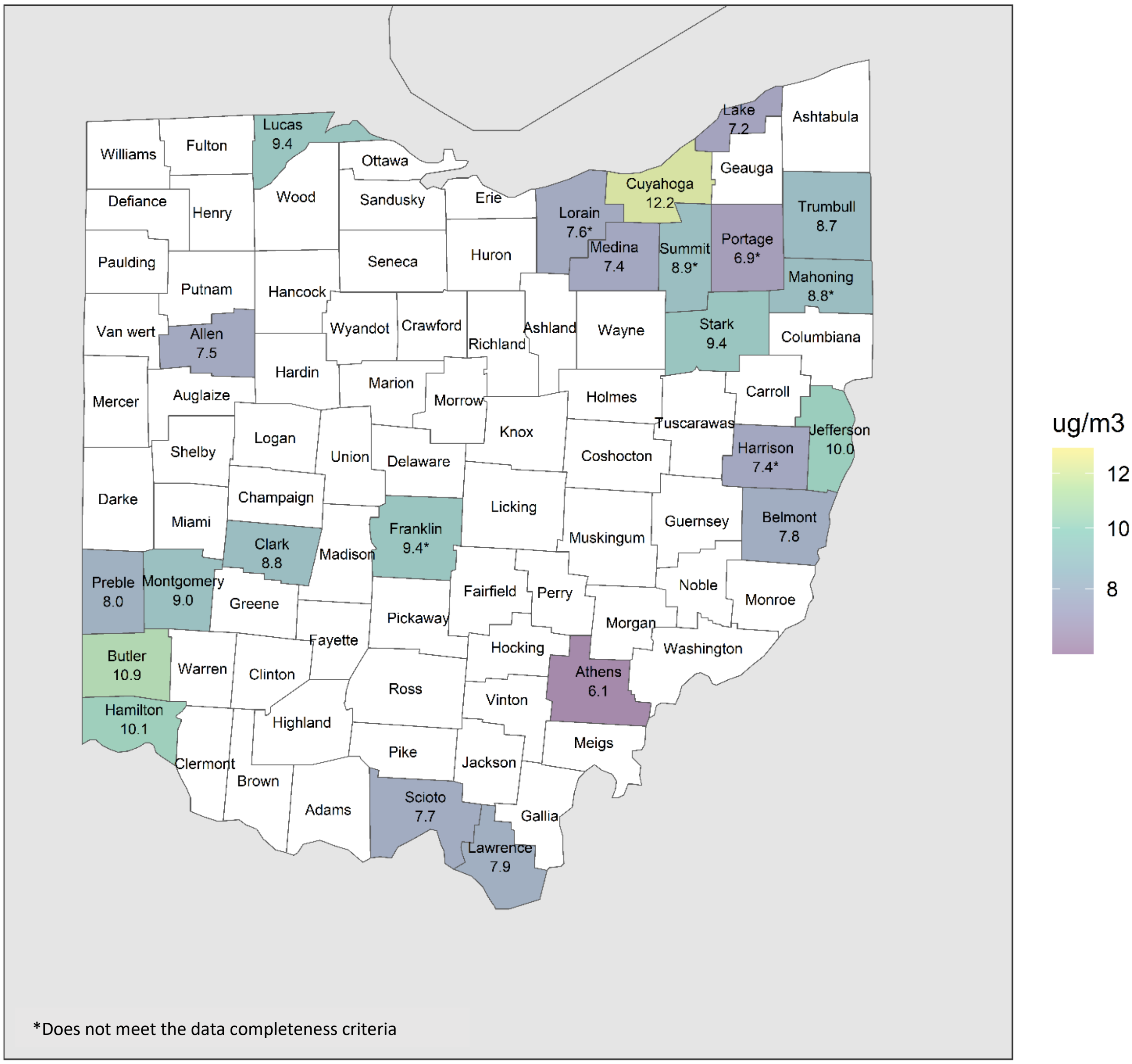


Table 8. $PM_{2.5}$ Annual Averages and Annual Design Values (µg/m^3)

Site	County	City	Year 2021	Year 2022	Year 2023	Design Value 2021-2023
39-003-0009	Allen	Lima	6.9	7.1	8.5	7.5
39-009-0003	Athens	Sharpsburg	6.2	5.5	6.8	6.1
39-013-0006	Belmont	Shadyside	8.1	6.7	8.5	7.8
39-017-0015	Butler	Middletown	9.8	8.4	10.5	9.6
39-017-0016		Fairfield	8.8	7.8	-----*	8.3
39-017-0019		Middletown	9.4	8.6	10.1	9.1
39-017-0022		Middletown	11	9.5	12.1	10.9
39-023-0005	Clark	Springfield	9.6	8.3	9.8	8.8
39-035-0034	Cuyahoga	Cleveland	7.5	6.7	8.4	7.5
39-035-0038		Cleveland	10.3	9.7	11.2	10.0
39-035-0045		Cleveland	9.9	8.2	8.9*	9.0
39-035-0060		Cleveland	10.4	9.7	11.9	10.2
39-035-0065		Newburgh Heights	12.7	11	12.8	12.2
39-035-0073		Warrensville Heights	9.4	8.4	9.1	8.5
39-035-1002		Brook Park	7.45*	6.5	-----*	7.0
39-049-0034	Franklin	Columbus	9.1	7.7	10.3	9.0
39-049-0038		Columbus	9.9	8.7	10.7	9.3
39-049-0040		Columbus	---*	8.7*	10.2	9.4
39-049-0081		Columbus	9	7.3	9.9	8.7
39-061-0006	Hamilton	Blue Ash	10.2	8.6	8.9	9.2
39-061-0014		Cincinnati	11.1	9.7	10.9	9.9
39-061-0040		Cincinnati	10	8.6	10.0	8.9
39-061-0042		Cincinnati	10.8	9.1	10.1	9.3
39-061-0048		Cincinnati	10.8	9.7	9.8	10.1
39-067-0005	Harrison	Hopedale	7.9	7.0*	-----*	7.4
39-081-0017	Jefferson	Steubenville	11.7	9.8	9.8	10.0
39-085-0007	Lake	Painesville	6.9	6.2	8.5	7.2
39-087-0012	Lawrence	Ironton	8.7	7.8	8.5	7.9
39-093-3002	Lorain	Sheffield	7.62*	---*	-----*	7.6
39-095-0024	Lucas	Toledo	8.6	6.6*	9.8	8.3
39-095-0026		Toledo	8.4	6.9	9.1	8.1
39-095-1003		Toledo	8.9	8.7	10.5	9.4
39-099-0014	Mahoning	Youngstown	8.8*	---*	-----*	8.8
39-099-0015		Youngstown	8.3*	8.4	9.9	8.5
39-103-0004	Medina	Westfield	6.9	6.3	9.1	7.4
39-113-0038	Montgomery	Dayton	9.9	8.7	9.8	9.0
39-133-0002	Portage	Ravenna	7.3*	6.4	-----*	6.9
39-135-1001	Preble	New Paris	8.8	8	9.0	8.0
39-145-0013	Scioto	Portsmouth	7.1	6.8	8.7	7.6
39-145-0015		Portsmouth	7.1	7.1	8.8	7.7
39-151-0017	Stark	Canton	9.4*	8.2	10.7	9.4
39-151-0020		Canton	10.2	8.7	10.3	9.2

Site	County	City	Year 2021	2022	2023	Design Value 2021-2023
39-153-0017	Summit	Akron	8.6	7.9	9.3	8.6
39-153-0023		Akron	8.7	6.8	11.2*	8.9
39-155-0014	Trumbull	Warren	8.7	7.3	10.1	8.7

(green shading) Insufficient data for valid statistical average. * Does not meet the data completeness criteria.

IV.OZONE (O3)

A. Overview

Ozone differs from other pollutants in that it is not directly emitted into the atmosphere from sources. Rather, it is created photochemically in the lower atmosphere by the reaction of volatile organic compounds (VOC) and oxides of nitrogen (NO_x) in the presence of sunlight. For this reason, it is referred to as a secondary pollutant. Ozone is the predominant oxidant component of photochemical smog.


39-151-4005, Stark County

In urban areas, NO_x is emitted primarily from combustion sources such as the internal combustion engine, electric power generation units, and gas and oil-fired boilers. VOCs, important in sustaining the reactions, are emitted in the exhausts of gasoline, diesel and jet engines, through the evaporation of gasoline and solvents such as dry-cleaning fluids, from industrial and non-industrial surface coating operations such as paint booths, from open burning, and from other combustion sources.

The ozone NAAQS has been revised frequently. Prior to 1997, the one-hour NAAQS was 0.12 ppm, with a violation occurring when there were more than three exceedances annually. In 1997, the NAAQS was supplanted with an 8-hour average of 0.08 ppm where a violation occurred when the annual 4th highest daily maximum eight-hour concentration averaged over three years exceeded the level of the NAAQS. In 2006, the one-hour NAAQS was revoked. Then, in 2008, the eight-hour NAAQS was lowered to 0.075 ppm. In 2015, the NAAQS was revised to 0.070 ppm, where a violation occurs when the annual 4th highest daily maximum eight-hour average concentration averaged over three years exceeds the level of the NAAQS.

In 2023, there were 50 ozone sites.

B. Sampling Method

Ozone is monitored continuously during the ozone season and year-round at a select few site in Ohio. Beginning in 2017, the ozone season was extended to March 1 through October 31. Prior to 2017, the ozone season was from April 1 through October 31.

An ozone analyzer operates using ultraviolet absorption. The air sample is drawn into the analyzer and irradiated with an ultraviolet light of 253.7 nanometers wavelength. The amount of light absorbed is related to the amount of ozone present.

C. Air Quality Data

Table 9 presents daily maximum eight-hour ozone data from continuous instruments Ohio EPA uses to evaluate air quality for the state. Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met. The eight-hour NAAQS is 0.070 ppm and should be compared against the column labeled "4th Max." The column marked "Exceedance" indicates the number of days that monitor had an eight-hour period above the NAAQS. Because the form of the NAAQS is to be averaged over three years, this is not a direct comparison to the NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2023. All concentrations are reported in ppm.

Table 9. Ozone Eight-Hour Air Monitoring Statistics (ppm)

County	Site ID	POC	City	% Obs	Valid Days Measured	Number of Days in Season	1st Max	2nd Max	3rd Max	4th Max	Exceedances
Allen	39-003-0009	1	Lima	99	242	245	0.075	0.073	0.073	0.072	4
Ashtabula	39-007-1001	1	Conneaut	100	244	245	0.084	0.078	0.069	0.069	2
Butler	39-017-0018	1	Middletown	99	242	245	0.078	0.073	0.071	0.071	4
Butler	39-017-0023	1	Hamilton	99	242	245	0.082	0.081	0.077	0.068	3
Butler	39-017-9991^	1	Oxford Township	98	241	245	0.077	0.070	0.070	0.069	1
Clark	39-023-0001	1	Springfield	98	241	245	0.074	0.070	0.070	0.069	1
Clark	39-023-0003	1	Enon	98	239	245	0.074	0.072	0.069	0.068	2
Clermont	39-025-0022	1	Batavia	100	244	245	0.077	0.075	0.069	0.068	2
Clinton	39-027-1002	1	Wilmington	98	241	245	0.079	0.075	0.075	0.074	4
Cuyahoga	39-035-0034	1	Cleveland	98	240	245	0.087	0.079	0.075	0.071	5
Cuyahoga	39-035-0060	1	Cleveland	97	355	365	0.078	0.076	0.071	0.065	3
Cuyahoga	39-035-0064	1	Berea	98	240	245	0.080	0.079	0.076	0.075	5
Cuyahoga	39-035-5002	1	Mayfield	88	216	245	0.090	0.076	0.075	0.073	5
Delaware	39-041-0002	1	Delaware	100	244	245	0.073	0.069	0.066	0.066	1
Franklin	39-049-0029	1	New Albany	100	244	245	0.070	0.070	0.070	0.069	0
Franklin	39-049-0081	1	Columbus	99	242	245	0.071	0.068	0.067	0.067	1
Geauga	39-055-0004	1	Chardon	100	244	245	0.079	0.070	0.066	0.066	1
Greene	39-057-0006	1	Xenia	99	243	245	0.078	0.077	0.075	0.073	4
Hamilton	39-061-0006	1	Blue Ash	99	242	245	0.079	0.077	0.077	0.073	6
Hamilton	39-061-0010	1	Cleves	98	241	245	0.084	0.083	0.079	0.073	5
Hamilton	39-061-0040	1	Cincinnati	99	360	365	0.088	0.078	0.075	0.075	8
Jefferson	39-081-0017	1	Steubenville	100	244	245	0.078	0.073	0.069	0.069	2
Knox	39-083-0003	1	Centerburg	100	244	245	0.072	0.070	0.070	0.069	1
Lake	39-085-0003	1	Eastlake	98	241	245	0.084	0.082	0.073	0.072	4
Lake	39-085-0007	1	Painesville	99	243	245	0.081	0.078	0.073	0.073	5
Lawrence	39-087-0011	1	Willow Wood	99	242	245	0.061	0.061	0.060	0.060	0
Lawrence	39-087-0012	1	Ironton	99	243	245	0.065	0.064	0.063	0.063	0
Licking	39-089-0005	1	Heath (Fourmile Lock)	98	240	245	0.068	0.067	0.066	0.065	0
Licking	39-089-0008	1	Reynoldsburg	100	244	245	0.069	0.066	0.062	0.062	0
Lorain	39-093-0018	1	Sheffield	99	242	245	0.067	0.067	0.066	0.064	0

County	Site ID	POC	City	% Obs	Valid Days Measured	Number of Days in Season	1st Max	2nd Max	3rd Max	4th Max	Exceedances
Lucas	39-095-0024	1	Toledo	100	244	245	0.078	0.075	0.072	0.072	5
Lucas	39-095-0027	1	Waterville	100	244	245	0.081	0.075	0.074	0.074	6
Lucas	39-095-0035	1	Curtice	100	244	245	0.083	0.081	0.079	0.073	11
Madison	39-097-0007	1	Paint Township	99	242	245	0.072	0.072	0.070	0.067	2
Mahoning	39-099-0015	1	Youngstown	100	244	245	0.084	0.069	0.068	0.068	1
Medina	39-103-0004	1	Westfield Township	98	241	245	0.074	0.073	0.072	0.072	4
Miami	39-109-0005	1	Casstown	99	243	245	0.074	0.072	0.071	0.069	3
Montgomery	39-113-0037	1	Dayton	99	242	245	0.078	0.077	0.072	0.071	5
Noble	39-121-9991^	1	Wayne Township	94	231	245	0.074	0.070	0.070	0.066	1
Portage	39-133-1001	1	Kent	98	240	245	0.089	0.072	0.072	0.070	3
Preble	39-135-1001	1	New Paris	96	350	365	0.076	0.073	0.070	0.068	2
Stark	39-151-0016	1	Canton	98	240	245	0.083	0.076	0.073	0.070	3
Stark	39-151-0022	1	Brewster	99	243	245	0.072	0.070	0.068	0.066	1
Stark	39-151-4005	1	Alliance	99	243	245	0.082	0.073	0.071	0.068	3
Summit	39-153-0026	1	Akron	99	243	245	0.085	0.076	0.071	0.071	4
Trumbull	39-155-0011	1	Vienna	100	244	245	0.086	0.075	0.070	0.068	2
Trumbull	39-155-0013	1	Kinsman	99	243	245	0.078	0.072	0.066	0.065	2
Warren	39-165-0007	1	Lebanon	99	243	245	0.076	0.076	0.076	0.074	5
Washington	39-167-0004	1	Marietta	97	237	245	0.070	0.065	0.064	0.064	0
Wood	39-173-0003	1	Bowling Green	98	240	245	0.078	0.077	0.071	0.071	4

^ Indicates monitor is operated by U.S. EPA.

Table 10 presents daily maximum one-hour ozone data from continuous instruments. Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met. There no longer is a one-hour NAAQS for ozone. It is important to note that many of these monitors have a single maximum hour reading above the eight-hour ozone NAAQS of 0.070 ppm. Ozone concentrations can change quickly due to factors such as meteorological conditions and activity at nearby sources (e.g, rush hour traffic). These values are not comparable to the NAAQS. All concentrations are reported in ppm.

Table 10. Ozone One-Hour Air Monitoring Statistics (ppm)

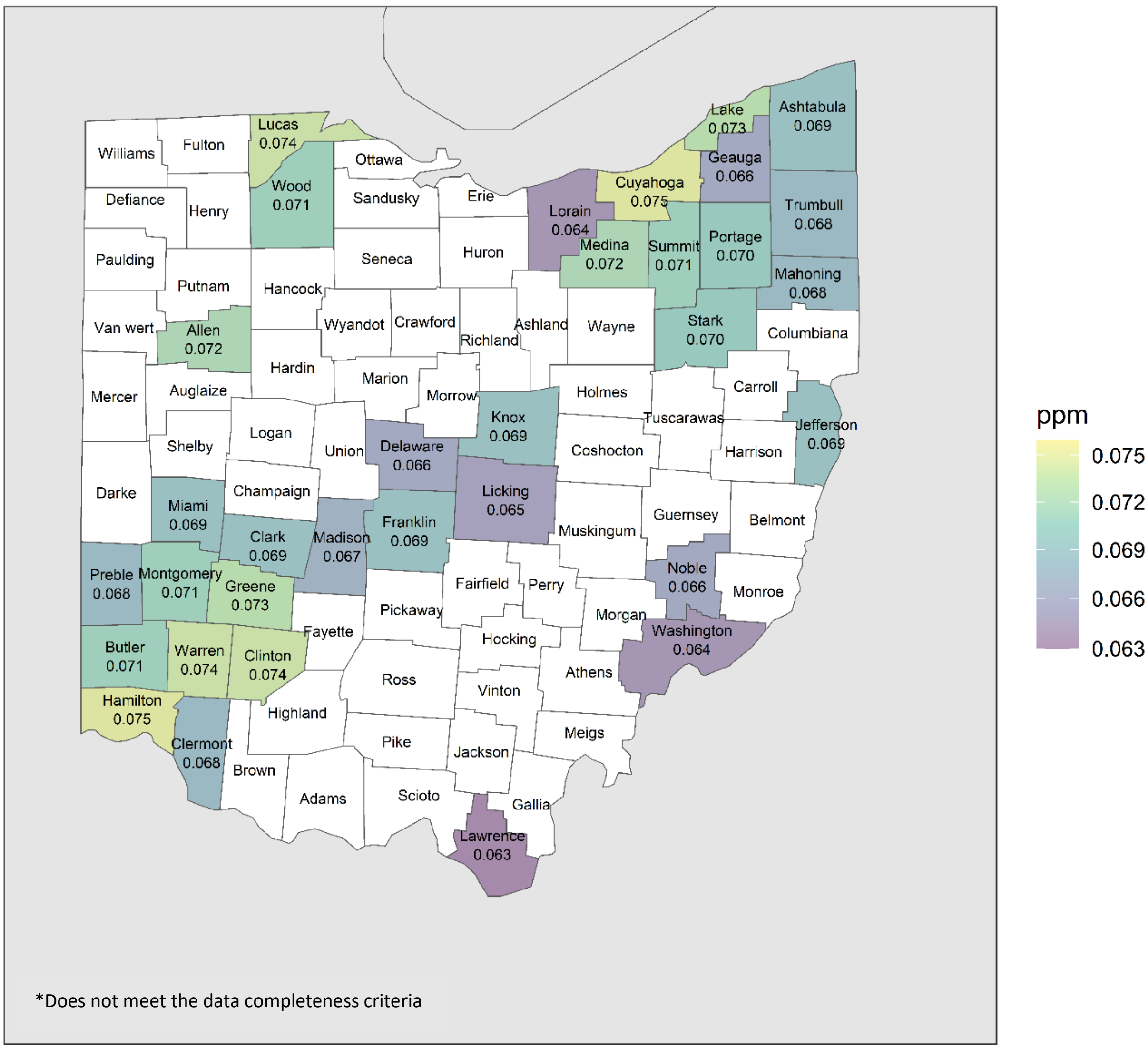
County	Site ID	POC	City	Valid Days Measured	Number of Days in Season	1st Max	2nd Max	3rd Max	4th Max
Allen	39-003-0009	1	Lima	245	245	0.084	0.080	0.078	0.076
Ashtabula	39-007-1001	1	Conneaut	245	245	0.092	0.084	0.078	0.075
Butler	39-017-0018	1	Middletown	243	245	0.082	0.082	0.081	0.080
Butler	39-017-0023	1	Hamilton	243	245	0.098	0.092	0.082	0.081
Butler	39-017-9991^	1	Oxford Township	243	245	0.082	0.077	0.077	0.074
Clark	39-023-0001	1	Springfield	243	245	0.079	0.078	0.077	0.076
Clark	39-023-0003	1	Enon	240	245	0.082	0.078	0.077	0.076
Clermont	39-025-0022	1	Batavia	245	245	0.086	0.081	0.080	0.079
Clinton	39-027-1002	1	Wilmington	242	245	0.086	0.086	0.084	0.083
Cuyahoga	39-035-0034	1	Cleveland	243	245	0.093	0.088	0.086	0.078
Cuyahoga	39-035-0060	1	Cleveland	360	365	0.083	0.082	0.078	0.072
Cuyahoga	39-035-0064	1	Berea	241	245	0.088	0.083	0.081	0.080
Cuyahoga	39-035-5002	1	Mayfield	218	245	0.099	0.084	0.081	0.077
Delaware	39-041-0002	1	Delaware	243	245	0.083	0.075	0.072	0.071
Franklin	39-049-0029	1	New Albany	245	245	0.080	0.075	0.074	0.073
Franklin	39-049-0081	1	Columbus	244	245	0.074	0.074	0.072	0.072
Geauga	39-055-0004	1	Chardon	245	245	0.087	0.073	0.073	0.072
Greene	39-057-0006	1	Xenia	244	245	0.083	0.082	0.079	0.079
Hamilton	39-061-0006	1	Blue Ash	242	245	0.089	0.086	0.079	0.079
Hamilton	39-061-0010	1	Cleves	244	245	0.101	0.089	0.087	0.079
Hamilton	39-061-0040	1	Cincinnati	360	365	0.106	0.088	0.086	0.085
Jefferson	39-081-0017	1	Steubenville	245	245	0.083	0.079	0.077	0.076
Knox	39-083-0003	1	Centerburg	245	245	0.077	0.076	0.075	0.074

County	Site ID	POC	City	Valid Days Measured	Number of Days in Season	1st Max	2nd Max	3rd Max	4th Max
Lake	39-085-0003	1	Eastlake	244	245	0.094	0.094	0.078	0.077
Lake	39-085-0007	1	Painesville	244	245	0.091	0.087	0.085	0.077
Lawrence	39-087-0011	1	Willow Wood	242	245	0.071	0.069	0.067	0.066
Lawrence	39-087-0012	1	Ironton	244	245	0.073	0.072	0.070	0.069
Licking	39-089-0005	1	Heath (Fourmile Lock)	241	245	0.078	0.073	0.073	0.071
Licking	39-089-0008	1	Reynoldsburg	245	245	0.080	0.072	0.072	0.070
Lorain	39-093-0018	1	Sheffield	243	245	0.072	0.072	0.071	0.070
Lucas	39-095-0024	1	Toledo	245	245	0.088	0.080	0.078	0.078
Lucas	39-095-0027	1	Waterville	245	245	0.093	0.090	0.081	0.079
Lucas	39-095-0035	1	Curtice	245	245	0.107	0.092	0.089	0.087
Madison	39-097-0007	1	Paint Township	244	245	0.077	0.076	0.075	0.073
Mahoning	39-099-0015	1	Youngstown	245	245	0.088	0.077	0.076	0.074
Medina	39-103-0004	1	Westfield Township	242	245	0.080	0.079	0.077	0.076
Miami	39-109-0005	1	Casstown	244	245	0.078	0.078	0.077	0.075
Montgomery	39-113-0037	1	Dayton	244	245	0.087	0.080	0.079	0.078
Noble	39-121-9991^	1	Wayne Township	232	245	0.079	0.077	0.077	0.075
Portage	39-133-1001	1	Kent	241	245	0.100	0.077	0.077	0.077
Preble	39-135-1001	1	New Paris	351	365	0.082	0.079	0.078	0.077
Stark	39-151-0016	1	Canton	242	245	0.090	0.082	0.079	0.075
Stark	39-151-0022	1	Brewster	244	245	0.079	0.078	0.075	0.075
Stark	39-151-4005	1	Alliance	244	245	0.089	0.081	0.077	0.076
Summit	39-153-0026	1	Akron	243	245	0.093	0.082	0.079	0.077
Trumbull	39-155-0011	1	Vienna	245	245	0.096	0.080	0.075	0.074
Trumbull	39-155-0013	1	Kinsman	242	245	0.091	0.079	0.074	0.074
Warren	39-165-0007	1	Lebanon	244	245	0.087	0.086	0.084	0.082
Washington	39-167-0004	1	Marietta	237	245	0.072	0.072	0.068	0.068
Wood	39-173-0003	1	Bowling Green	241	245	0.094	0.086	0.077	0.076

^ indicates monitor is operated by U.S. EPA.

Figure 12 presents the 4th highest eight-hour ozone concentrations for every county with an ozone monitor in 2023. For counties with more than one ozone monitor, the highest concentration for the county was used. All concentrations are reported as ppm. Note, in nearly all cases these values will match the 4th Max column of table 9. However, the data in the map is taken from a U.S. EPA Design Value Report, which includes the official 4th Max value to be compared against the NAAQS after factoring in any potential data exclusions. Table 9 shows data from a U.S. EPA Quick Look Report, which may not include data exclusions.

Figure 12. 2023 Ozone 4th Highest Eight-Hour Concentrations



D. Ten Year Air Quality Trends

Assessing progress towards attainment of the ozone NAAQS is complicated because of the influence of meteorology on ozone levels. Differences in weather conditions can cause variations from year to year in ozone NAAQS exceedances.

Figure 13 presents the average of each year's eight-hour 4th high daily maximum concentration for all monitoring sites for the years 2014 through 2023. Ozone pollution has maintained fairly consistent concentrations in the state throughout the past decade.

Figure 13. Ozone Trend: Average Eight-Hour 4th High Daily Max Concentrations for all Sites

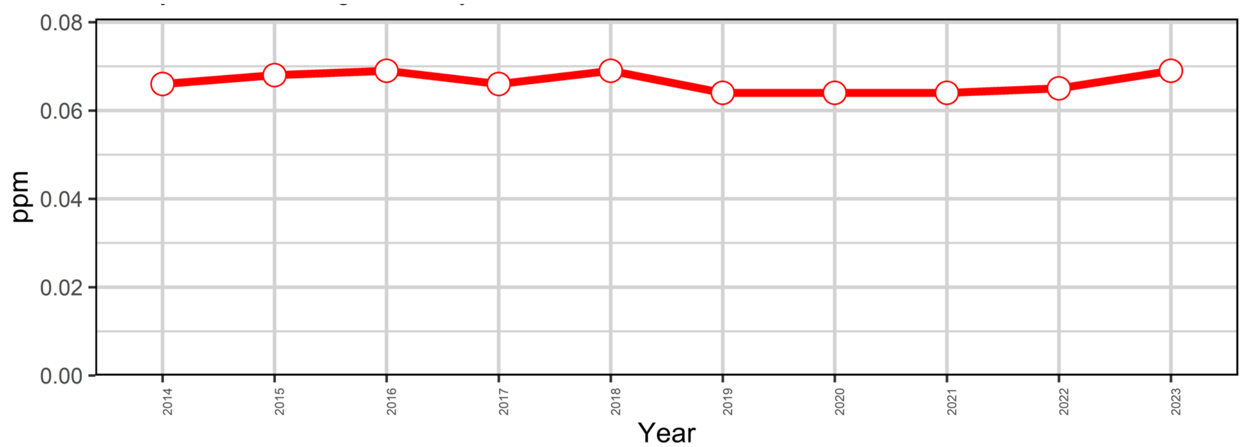


Figure 14 presents the statewide average of each year's eight-hour 4th high daily maximum concentration from Figure 13 in comparison to the average of each year's eight-hour 4th high daily maximum concentration for the three largest MSAs in Ohio. Ozone pollution has maintained fairly consistent concentrations in the state throughout the past decade.

Figure 14. Ozone Trend: Average Eight-Hour 4th High Daily Max Concentrations for all Sites Statewide and Within MSAs

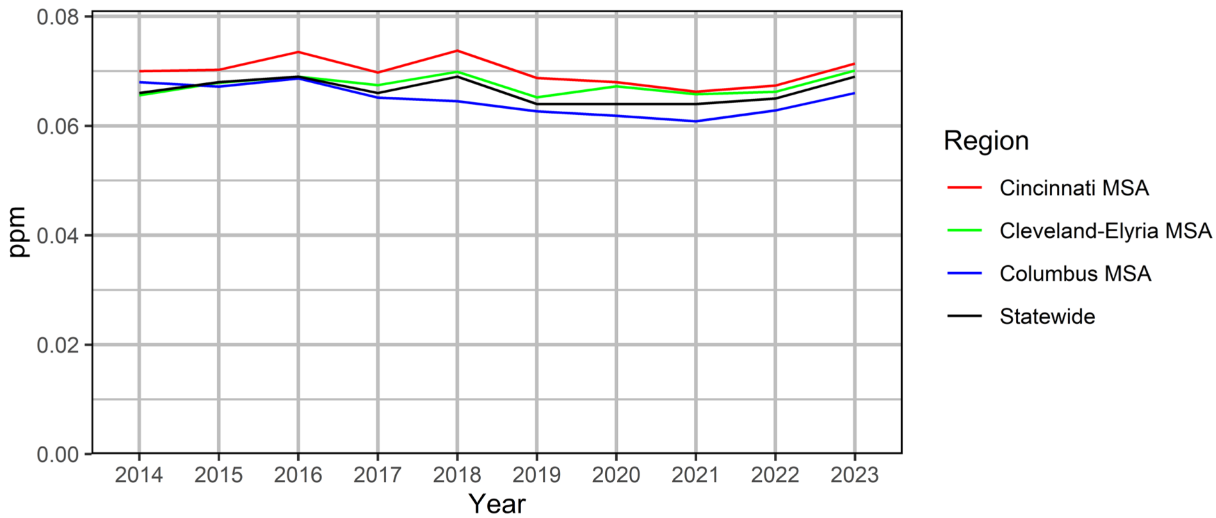


Table 11 presents the following statistics for 2014 to 2023: the date the first ozone exceedance occurred for each ozone season along with the number of sites with one or more exceedance during the ozone season compared to the number of sites in operation that season; and the date of the last ozone exceedance for each ozone season along with the number of sites with an exceedance that day, and the highest eight-hour reading that day in ppb.

Table 11. Date of First Seasonal Exceedance with Number of Exceeding Sites Compared to Total Sites, and Date of Last Seasonal Exceedance with Number of Sites with Exceedance on Last Exceedance Day and the Highest Concentration from those Sites (2014-2023)

Year	Date of First Exceedance	Number of Total Exceedances During the Season /Total Sites		Date of Last Exceedance	Number of Exceeding Sites on Last Day^	Statewide Max on Day of Last Exceedance	
		2008 NAAQS 75 ppb	2015 NAAQS 70 ppb			2008 NAAQS 75 ppb	2015 NAAQS 70 ppb
2014	21 April	10 / 51		12 July	1	77	
2015	5 May		36/51	17 September	3		74
2016	17 April		43/52	23 September	10		76
2017	15 May		30/51	26 September	2		74
2018	17 May		38/52	4 August	1		80
2019	28 June		17/51	14 July	3		80
2020	9 June		29/51	10 August	1		80
2021	18 May		33/52	24 August	5		80
2022	12 May		83/51	4 July	1		73
2023	14 April		146/50	21 August	1		73

^2008 NAAQS of 75 ppb applied for year 2014; 2015 NAAQS of 70 ppb applied for years 2015-2023.

E. Attainment Status

At the time of this report, Ohio has one area that remains designated as moderate nonattainment for the ozone NAAQS of 0.070 ppm: the Cleveland area (Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit Counties). The Columbus area (Delaware, Fairfield, Franklin, and Licking Counties) was formerly in nonattainment, however, in April of 2019 the counties were eligible to be reclassified to attainment for the NAAQS based on 2016 through 2018 air quality data. U.S. EPA approved Ohio EPA's redesignation and maintenance plan request for the Columbus area effective August 21, 2019. Furthermore, the Cincinnati area (Butler, Clermont, Hamilton, and Warren Counties) was formerly in nonattainment. The area was reclassified to attainment for the NAAQS based on 2019 through 2021 air quality data. U.S. EPA approved Ohio EPA's redesignation and maintenance plan request for the Cincinnati area effective June 9, 2022.

Moderate nonattainment areas have up to six years from initial nonattainment designation to attain the NAAQS. For the 2015 ozone NAAQS, attainment was required by August 3, 2024, which means areas must show attainment using air quality data for the full three-year period of 2021 through 2023. Based on the valid ozone data for this period that have been certified by Ohio EPA, the Cleveland nonattainment area did not meet the ozone standard by the moderate attainment date. As such, it is expected that U.S. EPA will promulgate a reclassification (commonly referred to as a "bump-up") of the Cleveland area to serious nonattainment. A bump-up from moderate to serious nonattainment would trigger additional requirements under the CAA, including, but not limited to, a reduction of the major source threshold from 100 tons per year to 50 tons per year for NO_x and VOCs, which are precursors to ozone formation. Ohio EPA is focused on continuing to address the ozone emissions in the Cleveland nonattainment area and is working on strategies to bring the above-mentioned counties into attainment. More information regarding this process can be found on our State Implementation Plans (SIP) website (https://epa.ohio.gov/divisions-and-offices/air-pollution-control/state-implementation-plans).

The map and data table below present the design value for the NAAQS for years 2021 through 2023. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Monitors without three years' worth of complete data are not considered to have valid design values for comparison to the NAAQS and are highlighted in green in Table 12.

Figure 15 presents the highest eight-hour 4^{th} high daily maximum concentration averaged over three-years (2021 through 2023). This is the counties design value. Table 12 presents each year's individual eight-hour 4^{th} high daily maximum concentration and the three-year averages used to determine the eight-hour design value for each county.

Figure 15. 2021-2023 Eight-Hour Ozone Design Values

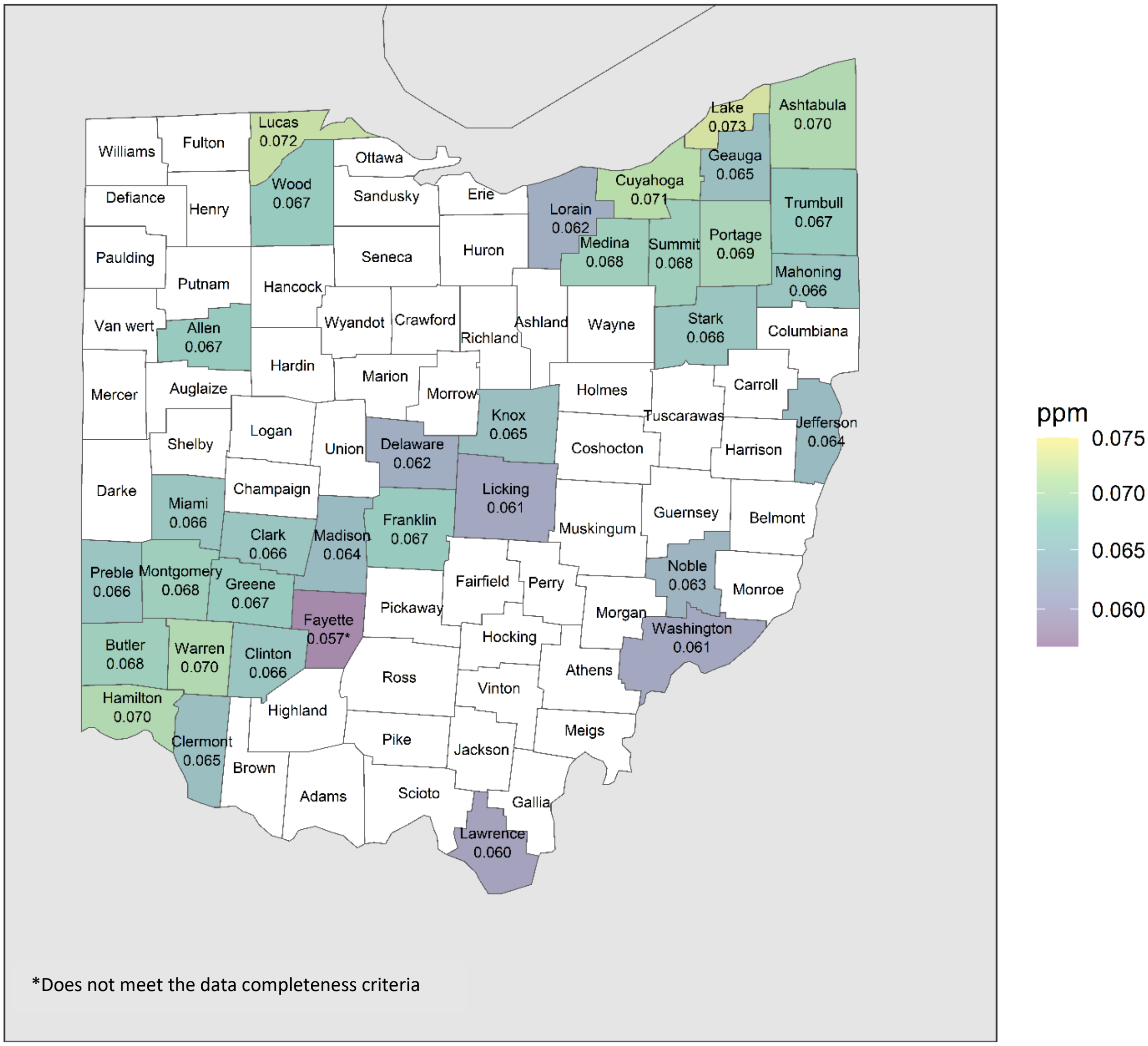


Table 12. Eight-Hour Ozone 4th High Daily Maximum Concentrations and Eight-Hour Design Values (ppm)

Site ID	County	City	4th High in Year 2021	2022	2023	Design Value 2021-2023
39-003-0009	Allen	Lima	0.063	0.067	0.072	0.067
39-007-1001	Ashtabula	Conneaut	0.068	0.073	0.069	0.070
39-017-0018	Butler	Middletown	0.064	0.067	0.071	0.067
39-017-0023		Hamilton	0.066	0.070	0.068	0.068
39-017-9991^		Oxford Township	0.063	0.066	0.069	0.066
39-023-0001	Clark	Springfield	0.062	0.068	0.069	0.066
39-023-0003		Enon	0.065	0.064	0.068	0.065
39-025-0022	Clermont	Batavia	0.065	0.063	0.068	0.065
39-027-1002	Clinton	Wilmington	0.062	0.064	0.074	0.066
39-035-0034	Cuyahoga	Cleveland	0.070	0.073	0.071	0.071
39-035-0060		Cleveland	0.059	0.061	0.065	0.061
39-035-0064		Berea	0.069	0.065	0.075	0.069
39-035-5002		Mayfield	0.068	0.065	0.073	0.068
39-041-0002	Delaware	Delaware	0.061	0.060	0.066	0.062
39-047-9991^	Fayette	Mt. Sterling	0.061	0.051*	---	0.057
39-049-0029	Franklin	New Albany	0.064	0.069	0.069	0.067
39-049-0081		Columbus	0.061	0.062	0.067	0.063
39-055-0004	Geauga	Chardon	0.067	0.064	0.066	0.065
39-057-0006	Greene	Xenia	0.063	0.065	0.073	0.067
39-061-0006	Hamilton	Blue Ash	0.070	0.069	0.073	0.070
39-061-0010		Cleves	0.064	0.068	0.073	0.068
39-061-0040		Cincinnati	0.069	0.067	0.075	0.070
39-081-0017	Jefferson	Steubenville	0.063	0.061	0.069	0.064
39-083-0003	Knox	Centerburg	0.063	0.064	0.069	0.065
39-085-0003	Lake	Eastlake	0.072	0.076	0.072	0.073
39-085-0007		Painesville	0.063	0.062	0.073	0.066
39-087-0011	Lawrence	Willow Wood	0.057	0.059	0.060	0.058
39-087-0012		Ironton	0.058	0.060	0.063	0.060
39-089-0005	Licking	Heath (Fourmile Lock)	0.060	0.060	0.065	0.061
39-089-0008		Reynoldsburg	0.057	0.063	0.062	0.060
39-093-0018	Lorain	Sheffield	0.059	0.063	0.064	0.062
39-095-0024	Lucas	Toledo	0.063	0.069	0.072	0.068
39-095-0027		Waterville	0.064	0.065	0.074	0.067
39-095-0035		Curtice	0.075	0.070	0.073	0.072
39-097-0007	Madison	Paint Township	0.062	0.063	0.067	0.064
39-099-0015	Mahoning	Youngstown	0.065	0.067	0.068	0.066
39-103-0004	Medina	Westfield Township	0.065	0.067	0.072	0.068
39-109-0005	Miami	Casstown	0.063	0.066	0.069	0.066
39-113-0037	Montgomery	Dayton	0.068	0.066	0.071	0.068
39-121-9991^	Noble	Wayne Township	0.062	0.063	0.066	0.063
39-133-1001	Portage	Kent	0.067	0.071	0.070	0.069
39-135-1001	Preble	New Paris	0.063	0.069	0.068	0.066
39-151-0016	Stark	Canton	0.064	0.066	0.070	0.066
39-151-0022		Brewster	0.060	0.063	0.066	0.063
39-151-4005		Alliance	0.066	0.066	0.068	0.066
39-153-0026	Summit	Akron	0.066	0.069	0.071	0.068
39-155-0011	Trumbull	Vienna	0.067	0.068	0.068	0.067
39-155-0013		Kinsman	0.067	0.066	0.065	0.066
39-165-0007	Warren	Lebanon	0.069	0.069	0.074	0.070

Site ID	County	City	4th High in Year 2021	2022	2023	Design Value 2021-2023
39-167-0004	Washington	Marietta	0.061	0.060	0.064	0.061
39-173-0003	Wood	Bowling Green	0.065	0.066	0.071	0.067

^ Indicates monitor is operated by U.S. EPA.

* Does not meet the data completeness criteria.

V. NITROGEN DIOXIDE (NO_2)

A. Overview

NO_2 is formed in high temperature combustion processes, when nitrogen in the air is oxidized to nitric oxide (NO) or nitrogen dioxide (NO_2). The major sources of NO_2 are high temperature fuel combustion, motor vehicles, and certain chemical processes. NO_2 is also a significant pollutant because the combination of NO_2 and ground level hydrocarbon compounds causes the production of photochemical oxidants, primarily ozone.

39-061-0048, Hamilton County

In 1971, U.S. EPA established the annual NAAQS for NO_2 at 53 ppb (annual mean). In 2010, U.S. EPA revised the NAAQS for NO_2 by establishing a one-hour NAAQS of 100 ppb which is the three-year average of the 98th percentile of one-hour daily maximum values. The annual NAAQS of 53 ppb was retained.

In 2023, there were seven NO_2 sites.

B. Sampling Method

Continuous monitoring of NO_2 is based on a chemiluminescent reaction between NO and ozone. When these two gases react, ultraviolet light at a specific wavelength is produced. In the monitor, ambient air is drawn along two paths. In the first path, the air is reacted directly with ozone, and the light energy produced is proportional to the amount of nitric oxide in the air. In the second path, the air is reacted with ozone after it passes through a catalytic reduction surface. The reduction surface converts NO_2 to NO and the light energy produced is a measure of the total oxides of nitrogen in the air sample. The electronic difference of these two signals yields the concentration of NO_2.

C. Air Quality Data

Table 13 presents NO_2 data Ohio EPA uses to evaluate air quality for the state. The annual NAAQS is 53 ppb and is compared against the column labeled “Mean” while the one-hour NAAQS is 100 ppb and compared against the column labeled “98th Percentile”. Because the form of the one-hour NAAQS is to be averaged over three years, this is not a direct comparison to the NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2023. Compliance with the annual NAAQS is a directly compared to this data. All concentrations are reported as ppb.

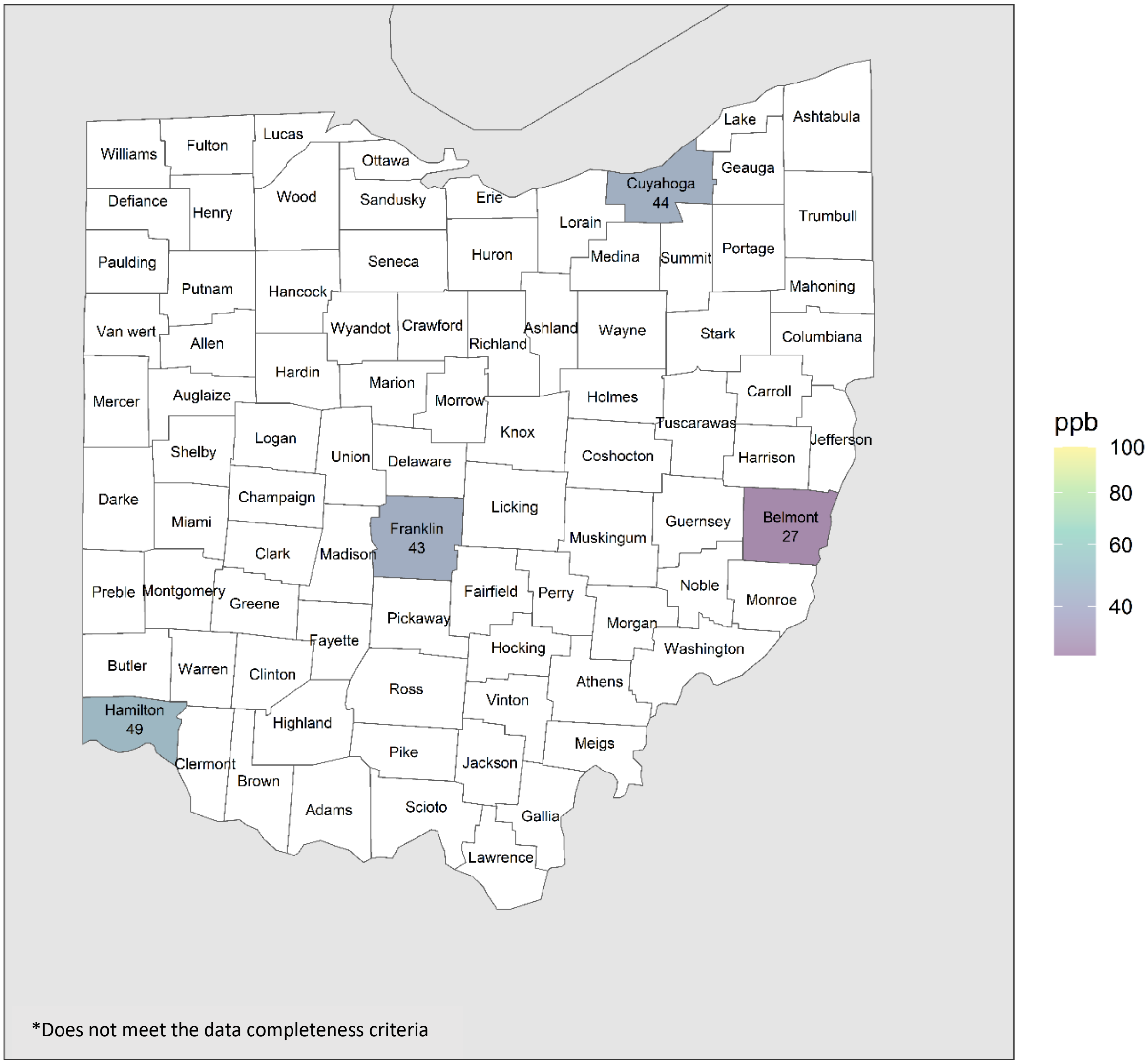
Table 13. NO_2 Air Monitoring Statistics (ppb)

County	Site ID	POC	City	Complete Quarters	Obs	% Complete	1^{st} Max 1-Hr	2^{nd} Max 1-Hr	98^{th} Percentile	Mean
Belmont	39-013-0006	1	Shadyside	4	7734	88	42	32	27	4
Cuyahoga	39-035-0060	1	Cleveland	4	8099	92	55	54	44	9
Cuyahoga	39-035-0073	1	Warrensville	4	8409	96	40	39	34	7
Franklin	39-049-0034	1	Columbus	4	7924	90	50	44	43	9
Franklin	39-049-0038	1	Columbus	4	8683	99	40	40	35	7
Hamilton	39-061-0040	2	Cincinnati	4	7996	91	47	46	42	9
Hamilton	39-061-0048	1	Cincinnati	4	8457	97	61	54	49	18

Figure 16 presents the 98^{th} percentile one-hour maximum concentration for every county with an NO_2 monitor in 2023. For counties with more than one NO_2 monitor, the highest concentration for the county was used. All concentrations are reported as ppb.

Figures presenting the annual concentrations for monitors in 2023 are included in the Attainment Status section below since these values are directly comparable to the NAAQS and therefore indicate monitored attainment status.

Figure 16. 2023 NO_2 98th Percentile One-Hour Concentrations



D. Ten Year Air Quality Trends

Figure 17 presents the 98th percentile one-hour maximum concentrations for all monitoring sites for years 2014 through 2023.

Figure 17. NO_2 Trend: Average 98th Percentile One-Hour Maximum Concentrations for all Sites

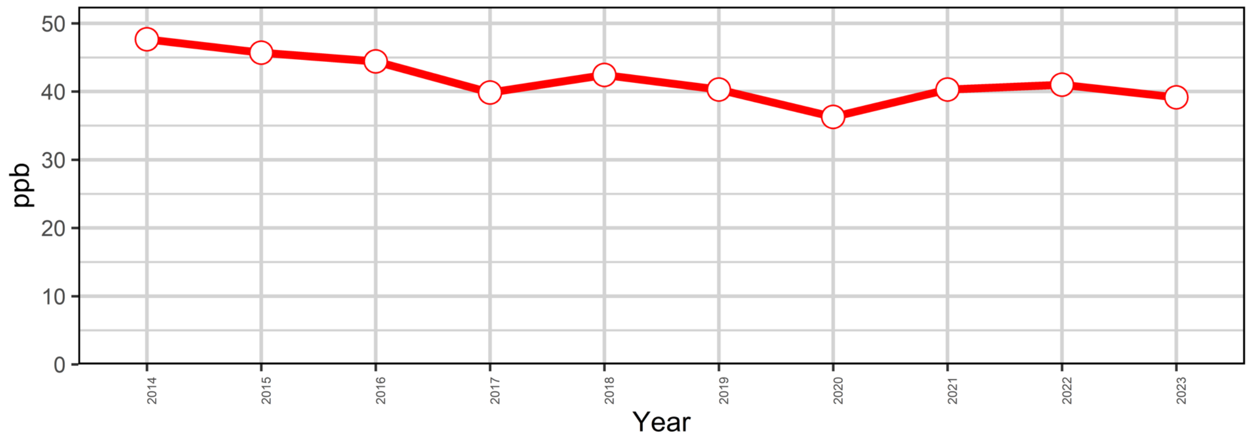
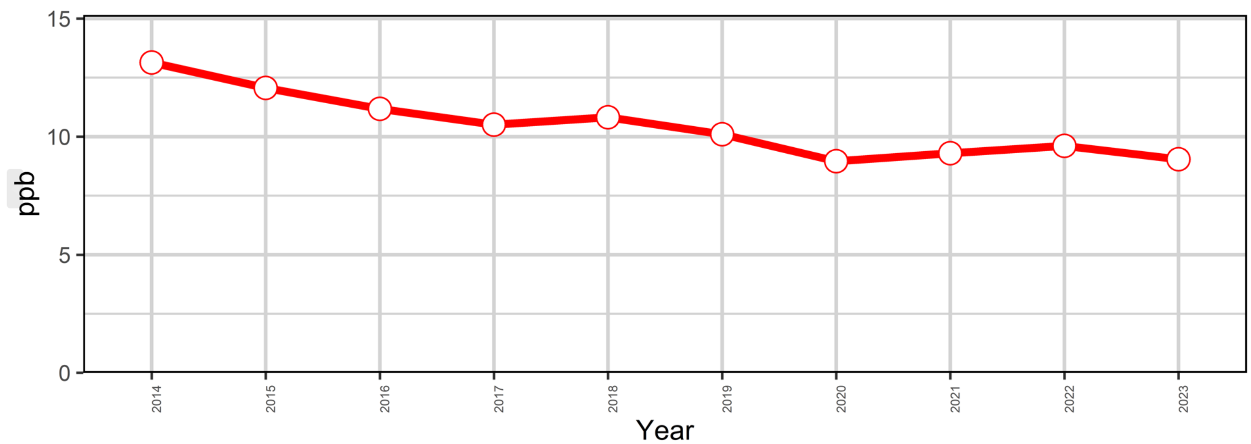


Figure 18 presents the average annual mean concentrations for all monitoring sites for years 2014 through 2023. NO_2 concentrations have been well under the NAAQS and fairly consistent downward trend over the last ten years.

Figure 18. NO_2 Trend: Average Annual Mean Concentrations for all Sites



E. Attainment Status

The entire state has always been designated as in attainment for both of the one-hour (100 ppb) and annual (53 ppb) NO_2 NAAQS. Table 14 and Figure 19 below present the design values for the one-hour NAAQS for years 2021 through 2023. Refer to Table 13 for the annual mean concentration for each county for 2023 which is presented in Figure 20 below, and is the design value for the annual NAAQS. Counties that do not show data do not contain monitors and the value shown in the map is the highest concentration for each county where multiple monitors are operated in the same county. For the one-hour NAAQS, monitors without three years' worth of complete data are not considered to have valid design values for comparison to the one-hour NAAQS and are highlighted in green in Table 14.

Figure 19 presents the one-hour design value calculated by the three-year average of the 98th percentile concentrations and the three-year averages used to determine the one-hour design value for each county.

Figure 19. 2021-2023 One-Hour 98th Percentile NO_2 Design Values

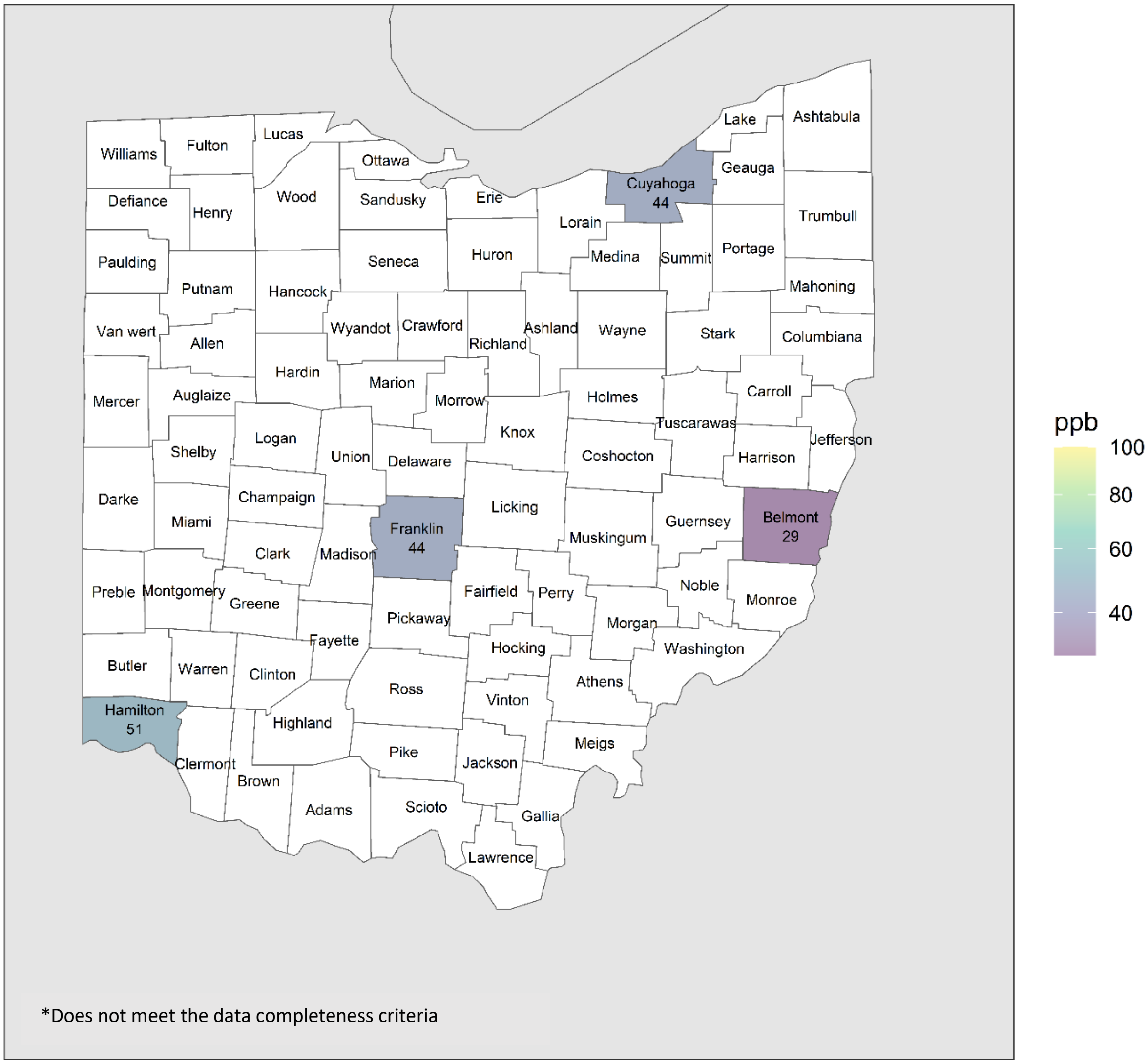


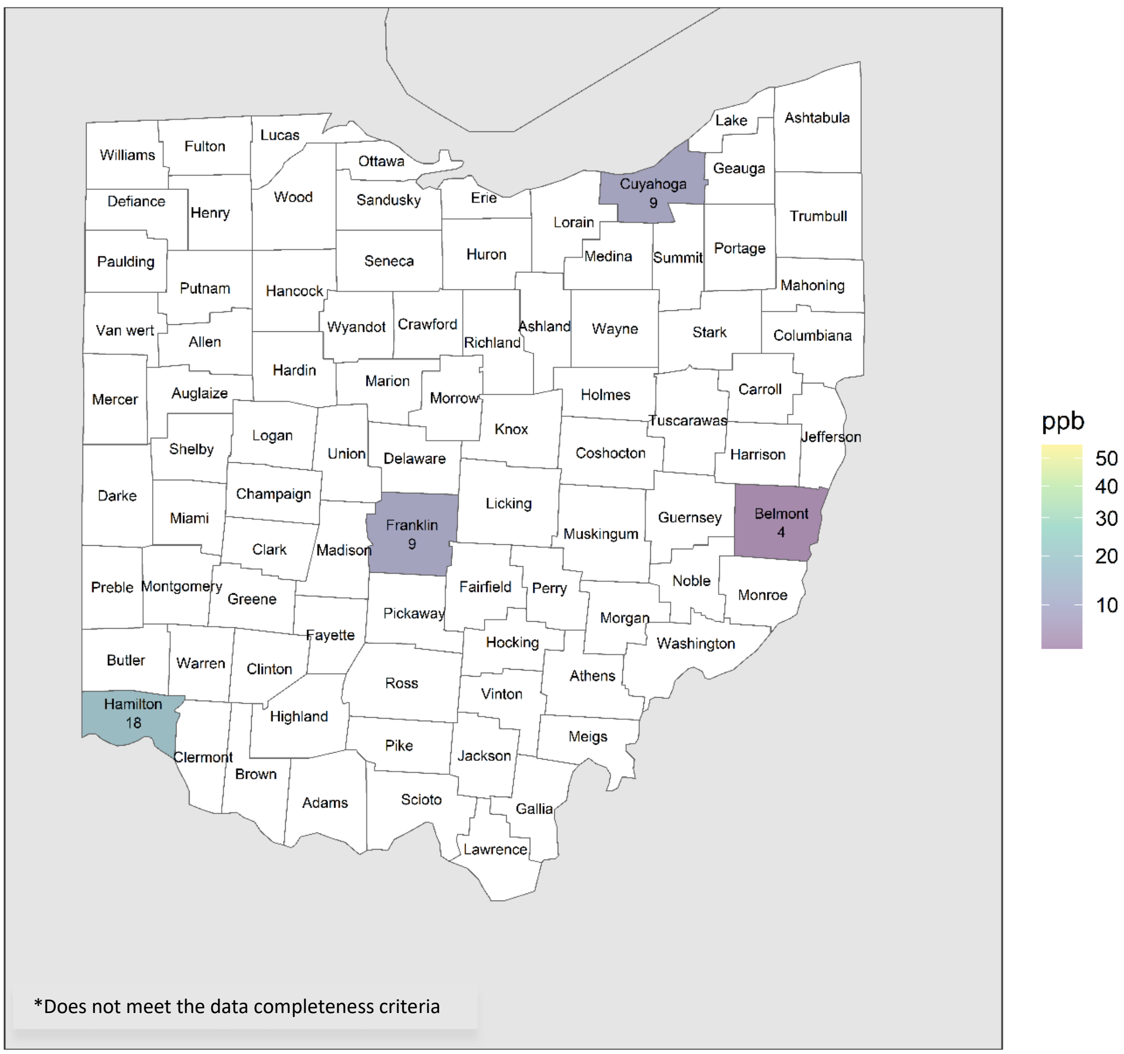
Table 14. NO_2 One-Hour 98th Percentile Concentrations and One-Hour Design Values (ppb)

Site ID	County	City	98th Percentile in Year 2021	2022	2023	Design Value 2021-2023
39-013-0006	Belmont	Shadyside	30	31	27	29
39-035-0060	Cuyahoga	Cleveland	38	49	44	44
39-035-0073		Warrensville Heights	38	34	34	35
39-049-0034	Franklin	Columbus	47	42	43	44
39-049-0038		Columbus	42	38	35	38
39-061-0040	Hamilton	Cincinnati	38	38	42	39
39-061-0048		Cincinnati	49	55	49	51

Insufficient data for valid statistical average. * Does not meet the data completeness criteria.

Figure 20 presents the annual design value which is the annual mean concentrations from Table 13 and is the annual design value for each county.

Figure 20. 2022 NO_2 Annual Concentrations



VI. SULFUR DIOXIDE (SO_2)

A. Overview

SO_2 is a colorless gas formed through the combination of sulfur and oxygen during combustion. The major sources of SO_2 are the burning of sulfur-containing fossil fuels (mainly coal), with lesser amounts caused by industrial processes such as smelting. The control of SO_2 emissions can be accomplished by burning coal or oil with a relatively low sulfur content. Newer boilers may be equipped with flue gas desulfurization systems that use a caustic solution to scrub SO_2 from the exhaust gas stream.

39-053-0006, Gallia County

In 2010, U.S. EPA revised the NAAQS for SO_2 by establishing a one-hour NAAQS at a level of 75 ppb based on the three-year average of the annual 99th percentile of one-hour daily maximum concentrations. In the same action, the primary annual and 24-hour NAAQS in effect were revoked. The three-hour 500 ppb secondary NAAQS (not to be exceeded more than once per year) was retained.

In 2023, there were 29 SO_2 sites.

B. Sampling Method

SO_2 is measured continuously by instruments using ultraviolet fluorescent techniques. The analyzers irradiate and air sample with ultraviolet light. SO_2 gas molecules absorb a portion of this energy, and then re-emit the energy at a characteristic wavelength of light. This light energy emitted by SO_2 molecules is sensed by a photomultiplier tube and converted to an electronic signal proportional to the concentration of SO_2 present.

C. Air Quality Data

Table 15 below present one-hour 99th percentile SO_2 data from continuous instruments Ohio EPA uses to evaluate air quality for the state (including one monitor located in West Virginia). Data presented with an asterisk (*) indicates the data completeness requirements established by U.S. EPA were not met. The one-hour[7] NAAQS is 75 ppb and compared against the column labeled "99th Percentile." Because the form of the one-hour primary NAAQS is to be averaged over three years, this is not a direct comparison to the NAAQS but remains a useful and conservative metric to compare to the NAAQS when evaluating air quality for 2023. Results are reported as ppb. Data reported below will also refer to a POC followed by a number. For SO_2, POC1 and POC2 instruments are dedicated for comparison with the NAAQS (or designated for quality assurance purposes).

[7] The three-hour NAAQS for SO_2 is the only NAAQS that is a secondary only NAAQS and is not directly analyzed as a part of this report's statistics.

Table 15. SO_2 Air Monitoring Statistics (ppb)

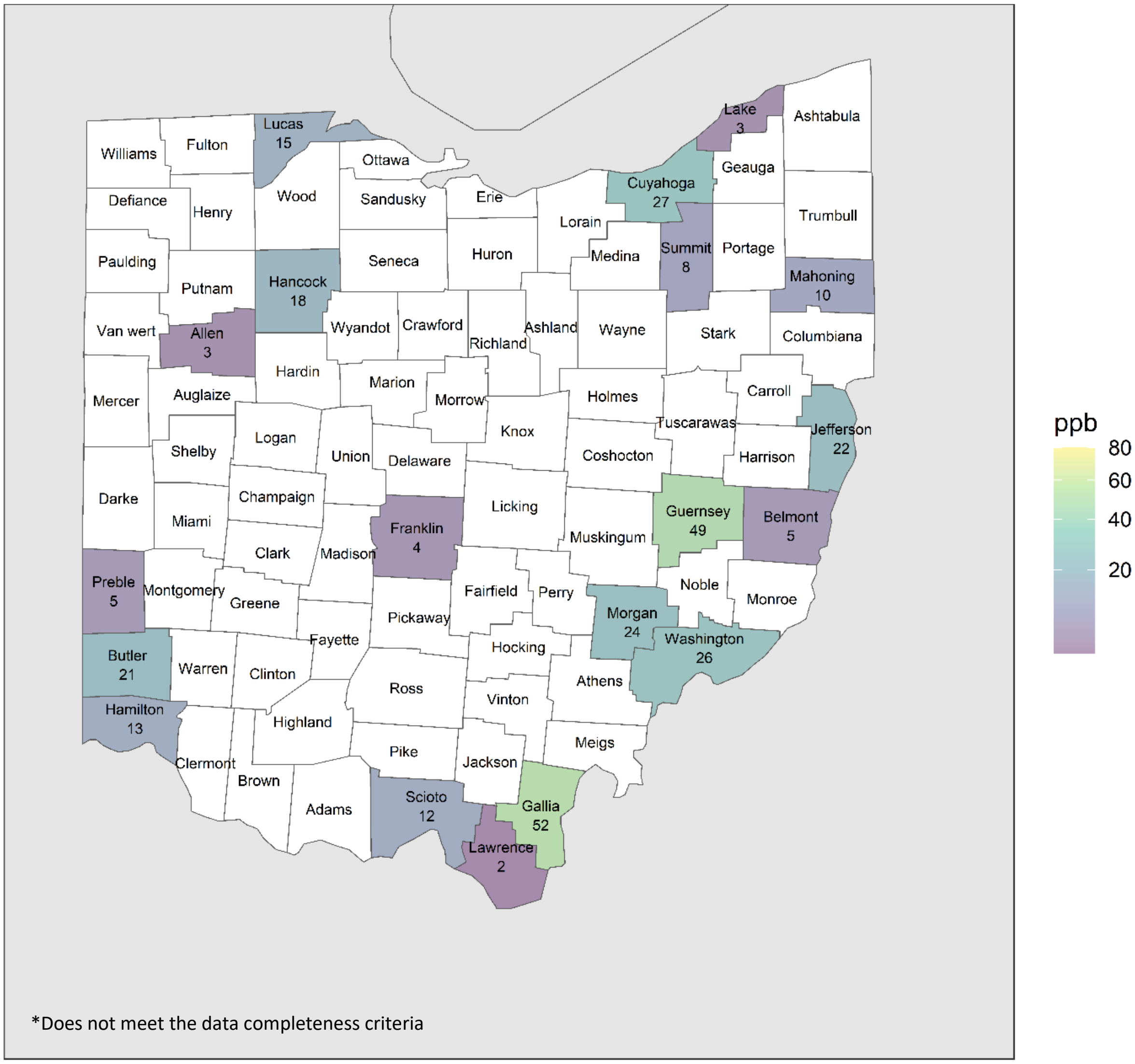
County	Site ID	POC	City	Complete Quarters	Obs	1st Max 1-Hr	2nd Max 1-Hr	99th Percentile	Mean
Allen	39-003-0009	1	Lima	4	8352	7	5	3	0.29
Belmont	39-013-0006	1	Shadyside	4	8301	7	5	5	0.46
Butler	39-017-0019	1	Middletown	4	8631	41	19	14	0.13
Butler	39-017-0020	1	Middletown	4	8582	40	22	21	0.47
Butler	39-017-0021	1	Middletown	4	8633	40	29	20	0.57
Cuyahoga	39-035-0038	2	Cleveland	4	8354	32	31	27	0.83
Cuyahoga	39-035-0060	2	Cleveland	4	8178	22	21	19	0.42
Cuyahoga	39-035-0065	1	Newburgh Heights	4	8609	56	11	8	0.34
Franklin	39-049-0034	1	Columbus	4	8280	9	6	4	0.42
Gallia	39-053-0004	1	Cheshire	4	8316	69	60	47	0.71
Gallia	39-053-0005	1	Cheshire	4	8009	191	127	52	1.17
Gallia	39-053-0006	1	Cheshire	4	8259	69	59	52	1.19
Guernsey	39-059-0003	1	Byesville	4	8561	62	53	49	1.25
Guernsey	39-059-0004	1	Byesville	4	8732	56	40	37	1.09
Hamilton	39-061-0010	2	Cleves	4	8514	29	23	13	0.11
Hamilton	39-061-0040	1	Cincinnati	4	8574	7	7	7	1.02
Hancock	39-063-0005	1	Fostoria	4	8181	27	26	18	1.93
Jefferson	39-081-0017	1	Steubenville	4	8327	28	25	22	0.97
Lake	39-085-0007	1	Painesville	4	8662	13	7	3	0.64
Lawrence	39-087-0012	1	Ironton	4	8311	4	3	2	0.01
Lucas	39-095-0008	2	Toledo	4	7836	31	23	15	0.21
Mahoning	39-099-0015	1	Youngstown	4	8030	56	56	10	0.51
Mason	54-053-0001^	1	Lakin	4	8316	41	39	36	0.67
Morgan	39-115-0004	1	Center Township	4	8317	61	28	24	1.33
Preble	39-135-1001	1	New Paris	4	7655	9	5	5	0.35*
Scioto	39-145-0020	1	Franklin Furnace	4	8638	20	18	12	0.47
Scioto	39-145-0022	1	Franklin Furnace	4	8667	40	17	11	0.57

County	Site ID	POC	City	Complete Quarters	Obs	1st Max 1-Hr	2nd Max 1-Hr	99th Percentile	Mean
Summit	39-153-0017	1	Akron	4	8555	12	9	8	0.33
Washington	39-167-0011	1	Beverly	4	8331	34	31	26	1.39

*Does not meet the data completeness criteria. ^Indicates monitor is located in West Virginia.

Figure 21 presents the 99th percentile one-hour concentrations for 2023. For counties with more than one SO_2 monitor the highest value was used. Only monitors in Ohio counties are represented in this map. All concentrations for SO_2 are reported in ppb.

Figure 21. 2023 SO_2 99th Percentile One-Hour Concentrations



D. Ten Year Air Quality Trends

Figure 22 presents the average of each year's 99th percentile values for all monitoring sites for 2014 through 2023.

Figure 22. SO_2 Trend: Average One-Hour 99th Percentile Concentrations for all Sites

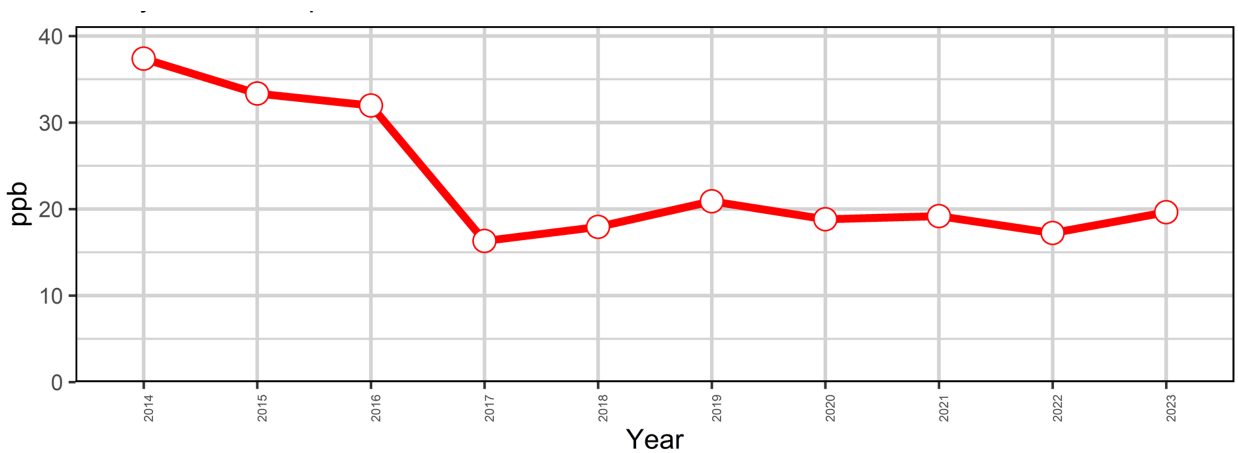
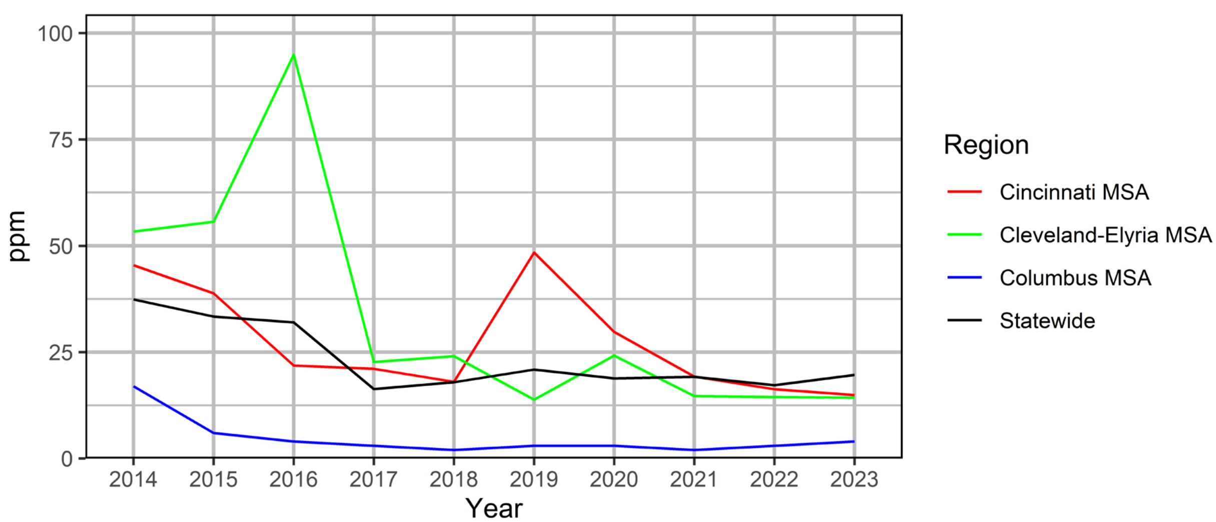


Figure 23 presents the statewide average of each year's annual averages from Figure 22 in comparison to the average of each year's annual averages for three largest MSAs in Ohio. There has historically been significant SO_2 reductions over the years since the promulgation of the first SO_2 NAAQS in 1971. While the graph in Figure 23 indicates a few occasions with increases in SO_2 concentrations, these instances have occurred with industry specific increases in emissions. Ohio EPA has addressed these instances as they have occurred. Even with the few industry-specific increases in SO_2 emissions over the years, Ohio continues to see a steady decline in concentrations as seen in Figure 22.

Figure 23. SO_2 One-Hour 99th Percentile Trend by MSA



E. Attainment Status

In 2023, there was one nonattainment area for the one-hour (75 ppb) primary SO_2 NAAQS. This nonattainment area is located in southeastern Ohio and includes Center Township in Morgan County and Waterford Township in Washington County and is known as the Muskingum River nonattainment area. The area has been monitoring attainment with a three-year design value since 2017. Ohio EPA submitted revisions to the attainment strategy for the area on May 24, 2023. On September 8, 2023, U.S. EPA approved (88 FR 61969) Ohio EPA's attainment plan for the Muskingum River nonattainment area.

The maps and data tables below present the design values for the primary one-hour NAAQS for years 2021 through 2023. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Monitors without three years' worth of complete data are not considered to have valid design values for comparison to the NAAQS and are highlighted in green in Table 16.

Figure 24 presents the one-hour design value calculated by the three-year average of the 99th percentile of one-hour maximum concentrations and Table 16 presents each year's individual 99th percentile of one-hour maximum concentration and the three-year averages used to determine the one-hour design value for each county.

Figure 24. 2021-2023 One-Hour SO_2 Design Values

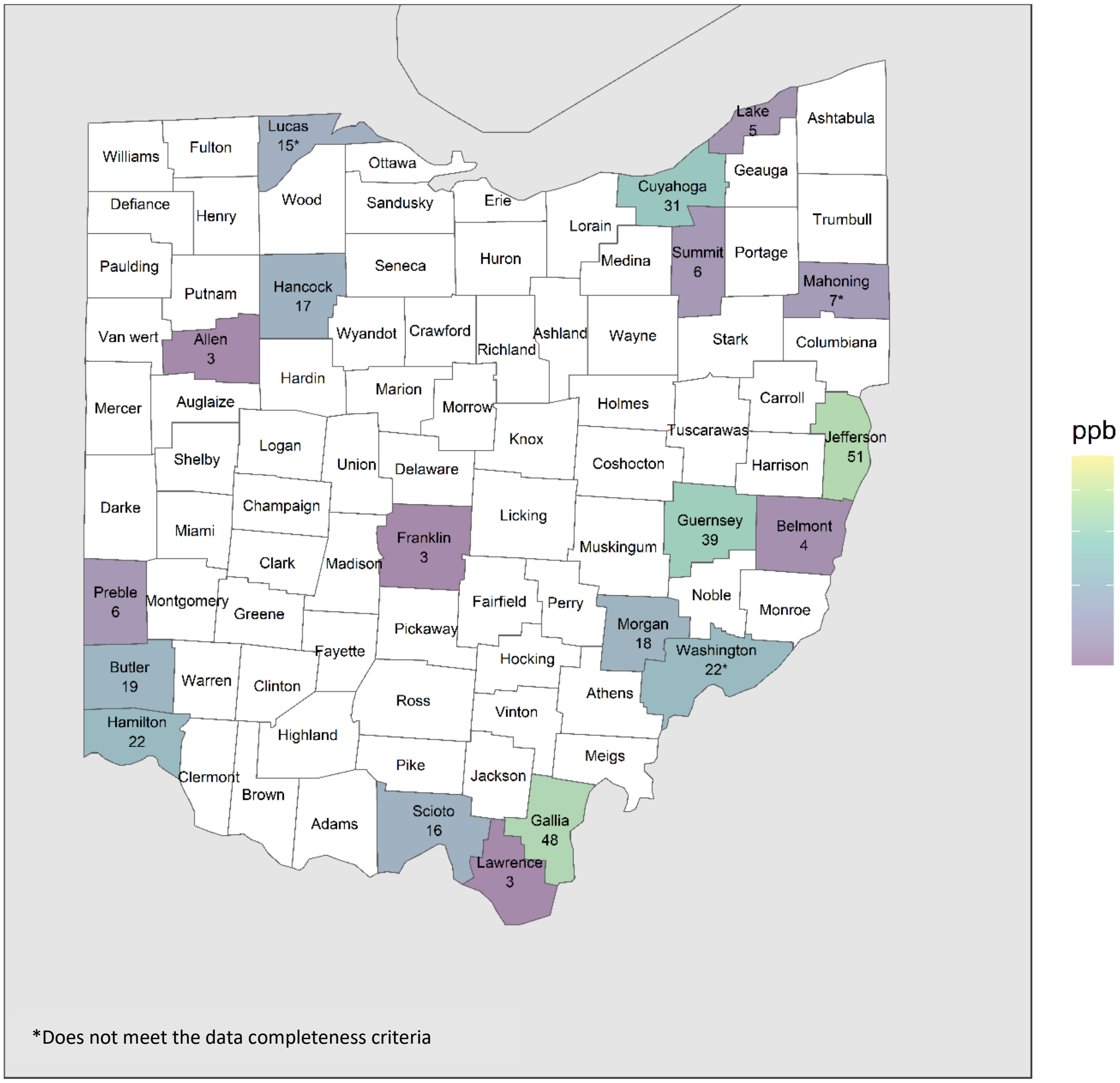


Table 16. SO_2 99th Percentile Concentrations and One-Hour Design Values (ppb)

Site ID	County	City	99th Percentile in Year			Design Value
			2021	2022	2023	2021-2023
39-003-0009	Allen	Lima	3.0	4.0	3.0	3
39-013-0006	Belmont	Shadyside	3.0	4.0	5.0	4
39-017-0019	Butler	Middletown	13.0	18.0	14.0	15
39-017-0020	Butler	Middletown	22.0	13.0	21.0	19
39-017-0021	Butler	Middletown	17.0	13.0	20.0	17
39-035-0038	Cuyahoga	Cleveland	39.0	28.0	27.0	31
39-035-0060	Cuyahoga	Cleveland	19.0	12.8	19.2	17
39-035-0065	Cuyahoga	Newburgh Heights	11.0	13.0	8.0	11
39-049-0034	Franklin	Columbus	2.0	3.0	4.0	3
39-053-0004	Gallia	Cheshire	57.0	30.0	47.0	45
39-053-0005	Gallia	Cheshire	52.0	40.0	52.0	48
39-053-0006	Gallia	Cheshire	39.0	32.0	52.0	41
39-059-0003	Guernsey	Byesville	35.2	33.1	49.2	39
39-059-0004	Guernsey	Byesville	23.5	19.2	37.0	27
39-061-0010	Hamilton	Cleves	28.0	24.0	13.0	22
39-061-0040	Hamilton	Cincinnati	16.3	13.4	6.6	12
39-063-0005	Hancock	Fostoria	21.0	13.0	18.0	17
39-081-0017	Jefferson	Steubenville	94.0	36.0	22.0	51
39-085-0007	Lake	Painesville	9.0	4.0	3.0	5
39-087-0012	Lawrence	Ironton	3.0	4.0	2.0	3
39-095-0008	Lucas	Toledo	14.0*	17.0	15.0	15
39-099-0015	Mahoning	Youngstown	6.0*	6.0	10.0	7
54-053-0001^	Mason	Lakin	43.0	32.0	36.0	37
39-115-0004	Morgan	Center Township	18.0*	13.0	24.0	18
39-135-1001	Preble	New Paris	7.0	6.5	4.6	6
39-145-0020	Scioto	Franklin Furnace	15.0	21.0	12.0	16
39-145-0022	Scioto	Franklin Furnace	9.0	17.0	11.0	12
39-153-0017	Summit	Akron	5.0	6.0	8.0	6
39-167-0011	Washington	Beverly	17.0*	24.0	26.0	22

(green shading) Insufficient data for valid statistical average; * Does not meet the data completeness criteria.

^Indicates monitor is located in West Virginia.

VII. CARBON MONOXIDE (CO)

A. Overview

CO is a colorless and odorless gas and the most abundant and widely distributed NAAQS pollutant found in the lower atmosphere. It is produced by the incomplete combustion of carbon containing fuels, primarily in the internal combustion engine.

39-035-0051, Cuyahoga County

There are two NAAQS for CO, the one-hour is set at 35 ppm and the eight-hour is set at 9 ppm, neither to be exceeded more than once per year.

In 2023, there were seven CO sites.

B. Sampling Method

CO is monitored continuously by analyzers that operate on the infrared absorption principle. Air is drawn into a sample chamber and a beam of infrared light is passed through it. CO absorbs infrared radiation, and any decrease in the intensity of the beam is due to the presence of CO molecules. This decrease is directly related to the concentration of CO in the air. A special detector measures the difference in the radiation between this beam and a duplicate beam passing through a reference chamber with no CO present. This difference in intensity is electronically translated into a reading of the CO.

C. Air Quality Data

Table 17 presents one-hour and eight-hour CO data from continuous instruments Ohio EPA uses to evaluate air quality for the state. The one-hour NAAQS is 35 ppm and compared against the column labeled "1st Max 1-Hr" while the eight-hour NAAQS is 9 ppm and compared against the column labeled "1st Max 8-Hr". Results are reported as ppm.

Table 17. CO One-Hour and Eight-Hour Air Monitoring Statistics (ppm)

County	Site ID	POC	City	Obs	1st Max 1-Hr	2nd Max 1-Hr	Obs >1-Hr NAAQS	1st Max 8-Hr	2nd Max 8-Hr	Obs >8-Hr NAAQS
Cuyahoga	39-035-0051	1	Cleveland	8219	22.5	19.8	0	6.7	5.1	0
Cuyahoga	39-035-0060	1	Cleveland	7580	3.3	2.0	0	1.3	1.2	0
Cuyahoga	39-035-0073	1	Warrensville Heights	8226	1.7	1.4	0	1.1	1.1	0
Franklin	39-049-0038	1	Columbus	8244	1.3	1.3	0	1.1	1.1	0
Hamilton	39-061-0040	1	Cincinnati	8161	1.8	1.5	0	1.1	1.0	0
Hamilton	39-061-0048	1	Cincinnati	8481	1.8	1.7	0	1.4	1.4	0
Preble	39-135-1001	1	New Paris	7658	1.2	1.2	0	1.1	1.0	0

Figures presenting the one-hour 1st highest maximum concentrations and eight-hour 1st highest maximum concentration for monitors in 2023 are included in the Attainment Status section below since these values are directly comparable to the NAAQS and therefore indicate monitored attainment status.

D. Ten Year Air Quality Trends

Figure 25 presents the average of each year's one-hour 1st highest maximum concentration for all monitoring sites for years 2014 through 2023. Figure 26 presents the average of each year's eight-hour 1st highest maximum concentration for all monitoring sites for years 2014 through 2023. CO concentration have remained well below the NAAQS for the last few decades despite a slight increase in 2023. This increase is attributed to one monitoring site on a day when smoke from wildfires was documented in the area of the monitoring location. This smoke likely contributed to the higher CO concentration, without causing an exceedance of the CO NAAQS standard.

Figure 25. CO Trend: Average 1st Highest Maximum One-Hour Concentrations for all Sites

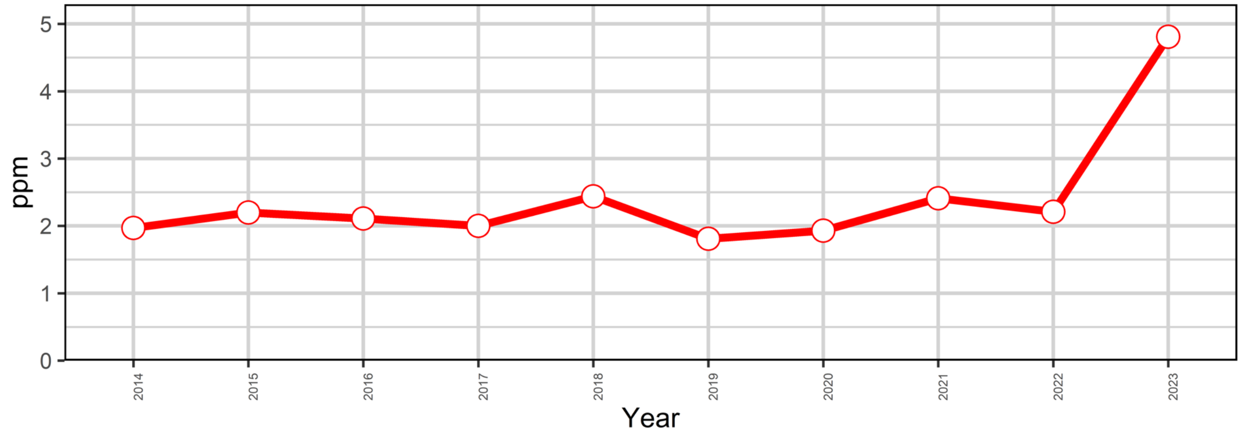
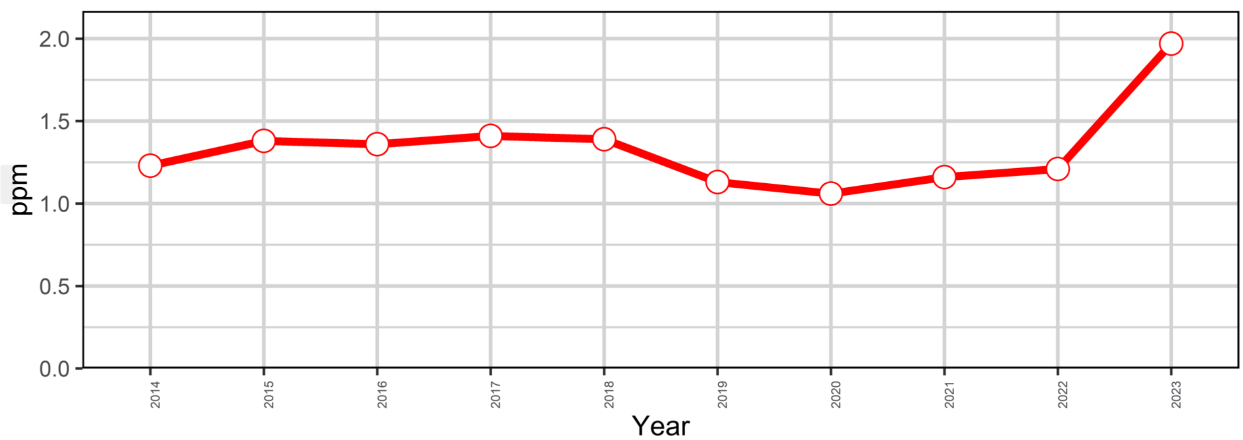


Figure 26. CO Trend: Average 1st Highest Maximum Eight-Hour Concentrations for all Sites



E. Attainment Status

The entire state has been designated as attainment for both the one-hour and eight-hour NAAQS since 1994. The last violation of the one-hour CO NAAQS occurred in 1990 in Jefferson County. The last violation of the eight-hour NAAQS occurred in 1993 in Cuyahoga County. The maps below present the design values for both NAAQS for 2023. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Refer to Table 17 above for the one-hour and eight-hour highest maximum concentrations that are considered the design values for 2023. These concentrations are displayed in the figures below.

Figure 27 presents the one-hour design value calculated by the 2023 1st highest maximum one-hour concentration.

Figure 27. 2023 One-Hour CO Design Values

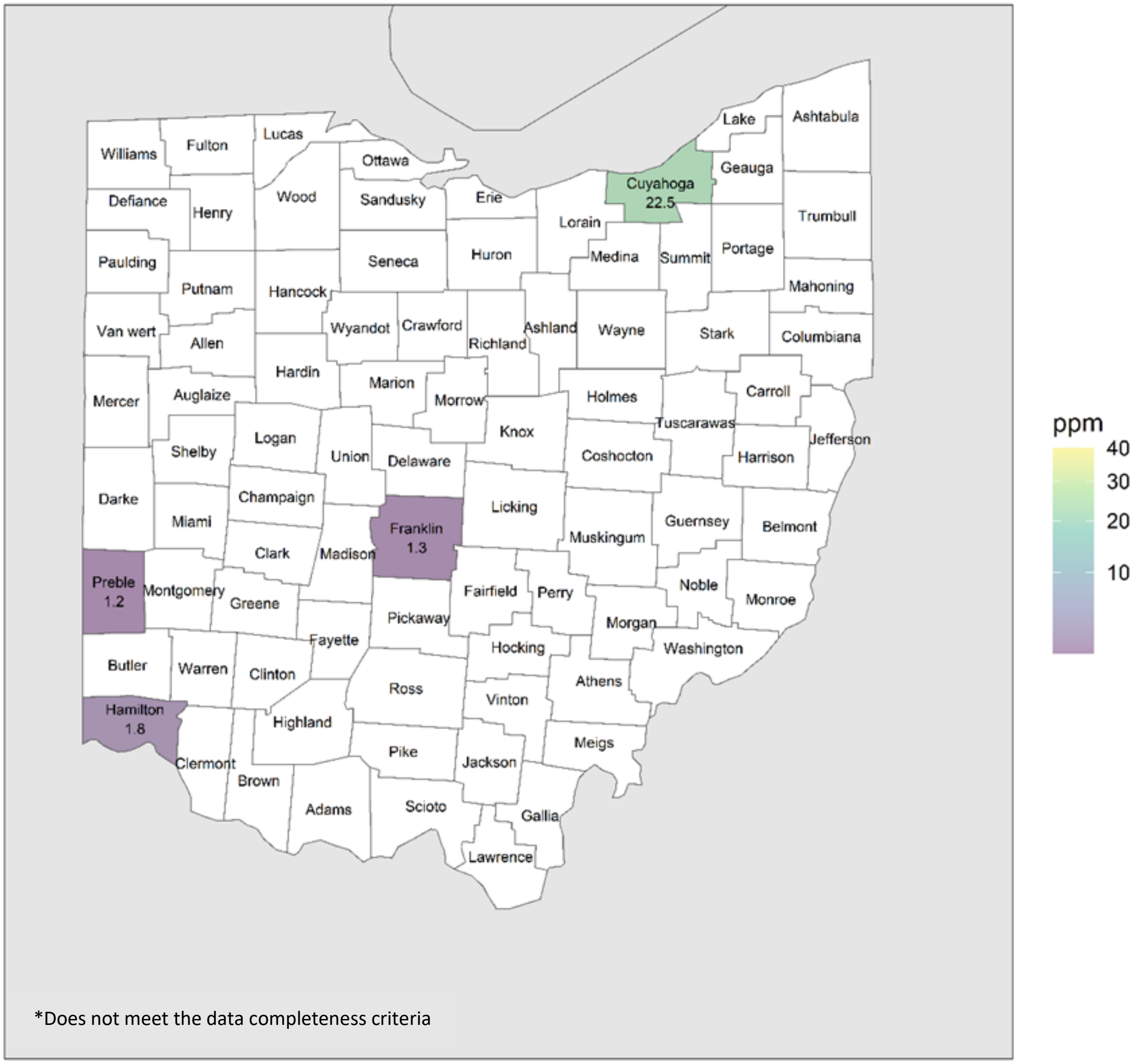
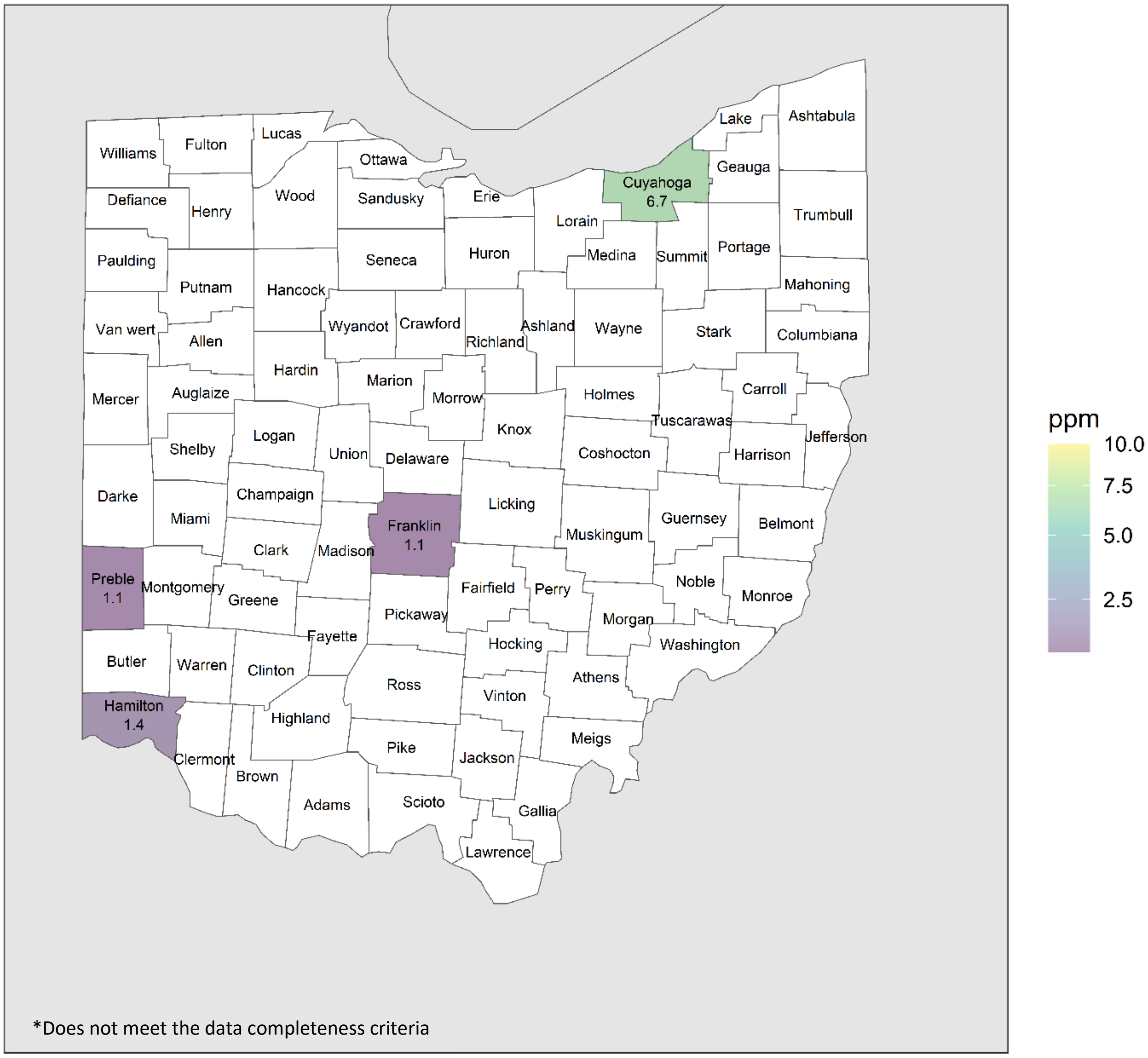


Figure 28 presents the eight-hour design value calculated by the 2023 1st highest maximum eight-hour concentration.

Figure 28. 2023 Eight-Hour CO Design Values



VIII. LEAD (PB)

A. Overview

Airborne lead was historically caused by vehicles using leaded fuels. Now the primary sources of airborne lead include lead smelting facilities, lead-acid storage battery manufacturing plants and other manufacturing operations.

In the period from 1978 to 1991, lead concentrations at traffic-oriented sites dropped by over 90%, reflecting the removal of lead from gasoline. In 1999, the U.S. EPA eliminated the requirement for traffic-oriented sites and shifted focus to monitoring at industrial sources. Ohio EPA discontinued monitoring at traffic-oriented sites in 1999.

39-029-0019, Columbiana County

In 2008, U.S. EPA promulgated revisions to the NAAQS for lead by strengthening it from 1.5 µg/m^3 as a calendar quarter average to 0.15 µg/m^3 as a rolling three-month average. The revised lead NAAQS requires monitoring at lead sources that report actual emissions of greater than 0.5 tons per year.

In 2023, there were 12 lead sites with 18 total monitors.

B. Sampling Method

Lead samples are collected as TSP on glass fiber filters according to 40 CFR Part 50, Appendix B, Reference method for the Determination of Suspended Particulate Matter in the Atmosphere. These filters are then analyzed by the manual Equivalent method: EQL-0710-192, *Heated Nitric Acid Hot Block Digestion and ICP/MS Analysis for Lead (Pb) on TSP High-Volume Filters*. In this method, one ¾"x 8" portion or strip, of the TSP filter is dissolved in a solution of nitric acid, heated on a hot block, on which the solution is reduced to final volume for analysis. The extracted solution is then analyzed by inductively coupled plasma-mass spectrometry, (ICP/MS) to determine the amount of lead collected on the original filter.

C. Air Quality Data

Table 18 displays maximum one-month average and maximum three-month rolling averages for lead data from intermittent instruments Ohio EPA uses to evaluate air quality for the state. The lead NAAQS is 0.15 µg/m^3 as a three-month rolling average not to be exceeded and is compared against the column labeled "Max 3-Month Average." The maximum one-month average and the month it occurred are also included in the table below but are not comparable to the NAAQS. All concentrations for lead are reported as µg/m^3.

Table 18. Lead Air Monitoring Statistics (µg/m³)

County	Site ID	City	Max 1-Month Average	Month of 1-Month Max^	Max 3-Month Average	Month of 3-Month Max	Valid Months
Columbiana	39-029-0019	East Liverpool	.01	December	.01	June	12
Columbiana	39-029-0020	East Liverpool	.02	July	.01	July	12
Columbiana	39-029-0023	East Liverpool	.03	July	.02	September	12
Cuyahoga	39-035-0038	Cleveland	.05	June	.03	June	12
Cuyahoga	39-035-0049	Cleveland	.10	May	.04	May	12
Franklin	39-049-0040	Columbus	.01	May	.00	January	12
Fulton	39-051-0001	Delta	.01	October	.01	January	12
Marion	39-101-0003	Marion	.02	July	.02	April	12
Marion	39-101-0004	Marion	.01	December	.01	June	12
Stark	39-151-0024	Canton	.26	June	.15	June	12
Stark	39-151-0025	Canton	.07	May	.06	May	12
Washington	39-167-0008	Marietta	.00	December	.00	January	12

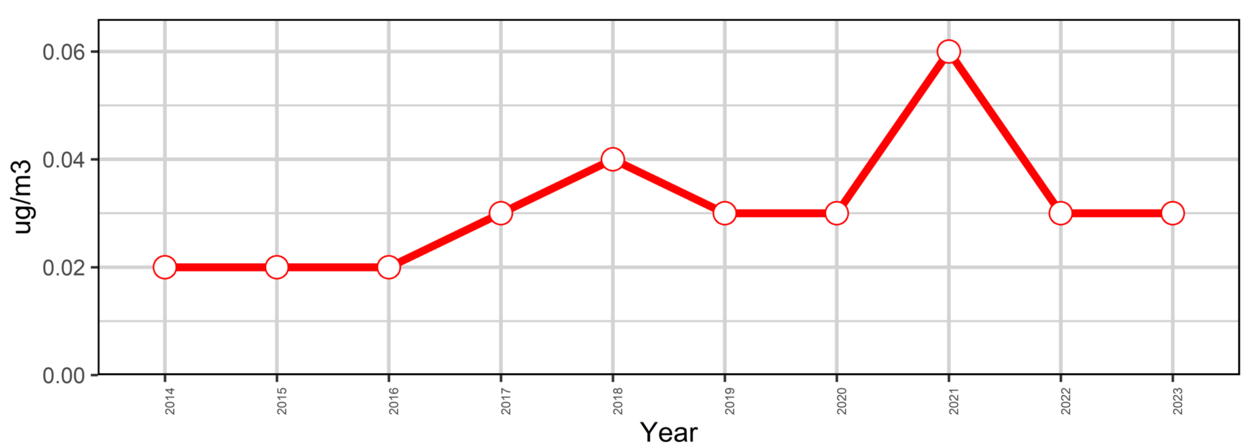
^Where multiple months have the same 1-Month Max, the last month of the year is identified.

A figure displaying the highest three-month rolling average concentrations for monitors in 2023 is included in the Attainment Status section below since these values are directly comparable to the NAAQS and therefore indicate monitored attainment status.

D. Ten Year Air Quality Trends

Figure 29 presents the average of each year's highest three-month rolling average concentration for all monitoring sites for years 2014 through 2023.

Figure 29. Lead Trend: Average Highest Three-Month Rolling Average Concentrations for all Sites



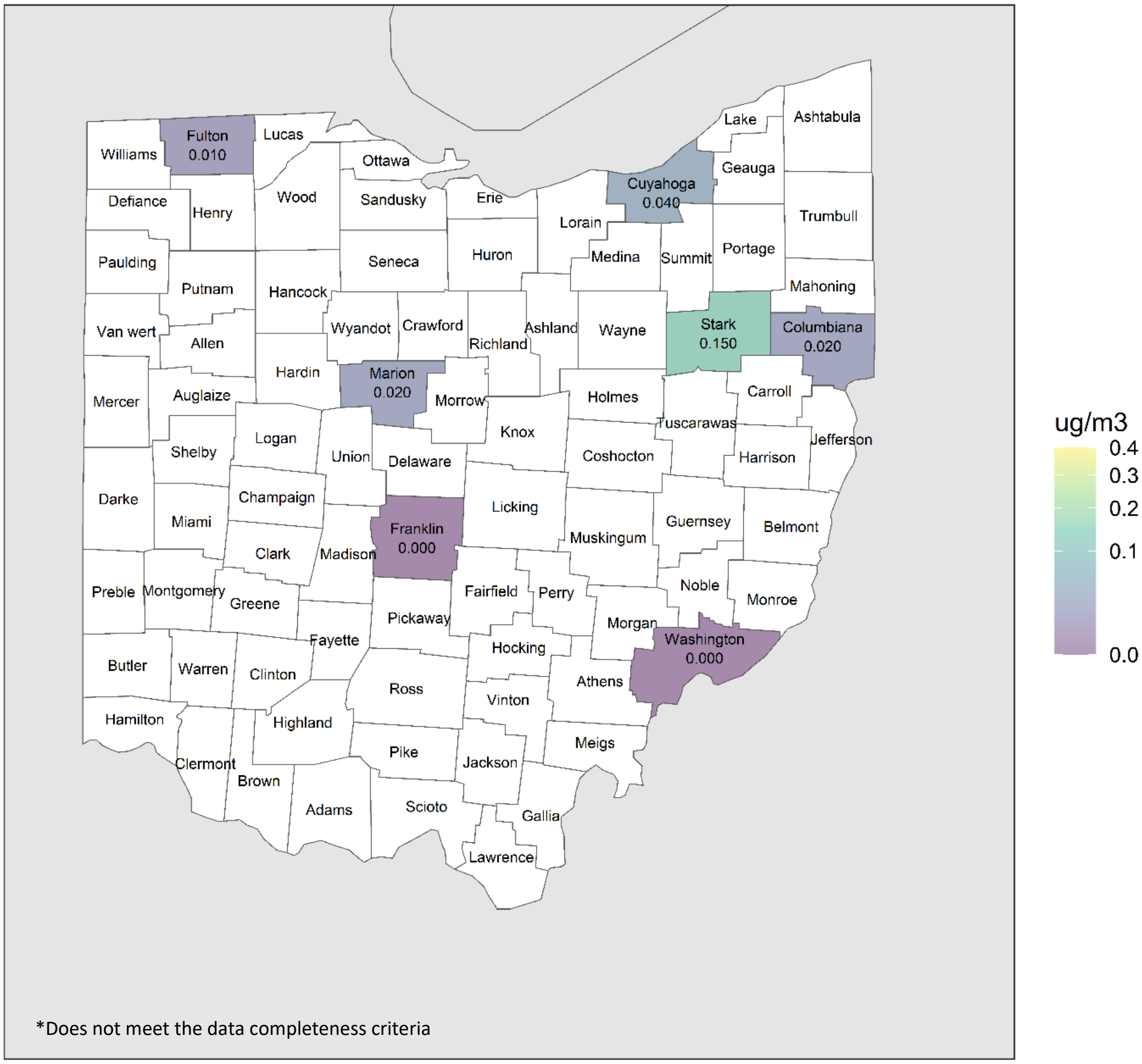
Overall Ohio has made great strides in reducing lead emissions over the last few decades and continues to do so today. The increase in the statewide average concentration, beginning in 2017, is due to a sole source in Stark County (monitor 39-151-0024), which ceased operations in 2023.

E. Attainment Status

Since March 2018, the entire state had been designated as in attainment for the lead NAAQS. However, on May 3, 2022 (87 FR 26147), U.S. EPA provided public notice they intend to redesignate a portion of the Canton Ohio area in northeastern Stark County from attainment to nonattainment for the 2008 lead NAAQS. On March 10, 2023 (88 FR 14920), U.S. EPA issued final determination on this matter to redesignate a portion of Stark County as nonattainment for the lead NAAQS, effective April 10, 2023. Ohio EPA submitted an attainment demonstration to U.S. EPA on September 19, 2024.

The map below presents the design values for the lead NAAQS for 2023. Counties that do not show data do not contain monitors and the value shown in the maps is the highest concentration for each county where multiple monitors are operated in the same county. Refer to Table 18 for the highest three-month rolling average concentrations that are considered the design values for 2023 and included in the figure below. Figure 30 presents the three-month rolling average design value for lead for 2023.

Figure 30. 2023 Lead Design Values



IX. TOTAL SUSPENDED PARTICULATE (TSP)

A. Overview

TSP is defined as any liquid (aerosol) or solid substance found in the atmosphere. Particles larger than approximately 100 microns in diameter settle rapidly due to gravity and are not considered suspended particulates. Fly ash, process dusts, soot and oil aerosols are all common forms of suspended particulate matter. The major sources of particulate pollution are industrial processes, electric power generation, industrial fuel combustion, and dust from roadways and construction sites. Particulate pollution causes a wide range of damage to materials, as well as limiting visibility and reducing the amount of sunlight reaching the earth. Components of particulates may be harmful, such as sulfates, nitrates and metals. The major adverse health effects on humans are related to damage to the respiratory system through interference with the lungs' natural cleansing processes.

39-035-0038, Cuyahoga County

In 1987, TSP sampling was gradually replaced by PM_{10} and then $PM_{2.5}$ sampling. The number of monitors decreased from over 200 in 1987 to two sites with three total monitors in 2023. TSP monitors are now primarily used for the purpose of collecting data for lead and other metals, although in some cases Ohio will still collect TSP data for the purpose of comparing to historical trends. There are no longer any NAAQS for TSP.

B. Sampling Method

TSP is measured by the high-volume air sampler method. This instrument draws measured volumes of air through a glass fiber filter for 24 hours. Particulate matter trapped on the filter is weighed to determine the mass of the particulates collected per volume of air.

C. Air Quality Data

Table 19 displays TSP data Ohio EPA uses to evaluate air quality for the state and evaluate historical trends. Data presented with an asterisk (*) indicates the data completeness criteria established by U.S. EPA were not met. All concentrations for TSP are reported as $\mu g/m^3$.

Table 19. TSP Air Monitoring Statistics (µg/m³)

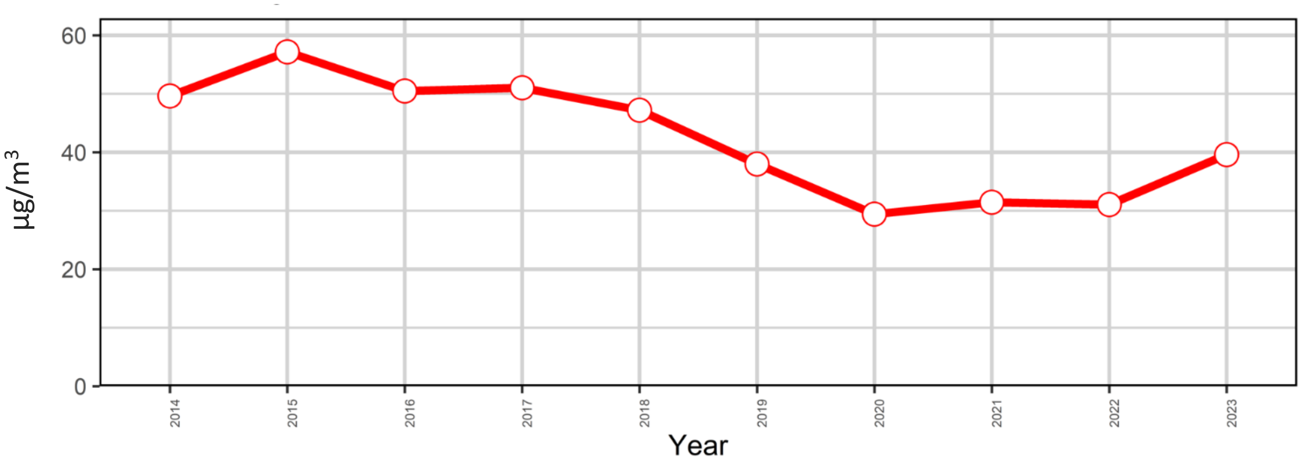
County	Site ID	POC	City	Obs	1st Max	2nd Max	3rd Max	4th Max	Mean
Columbiana	39-029-0023	1	East Liverpool	58	146	126	73	73	30.6
Cuyahoga	39-035-0038	1	Cleveland	60	152	152	112	108	48.6

*Does not meet the data completeness criteria.

D. Ten Year Air Quality Trends

Figure 31 presents the average of each year's mean concentration for all monitoring sites for years 2014 through 2023. TSP concentrations in the state have been fairly consistent over the last ten years and overall trend downwards.

Figure 31. TSP Trend: Average Mean Concentrations for all Sites



X. AIR TOXICS

A. Overview

Ohio EPA operates a network of air toxics monitors as part of a state-wide Air Toxics Monitoring Program (ATMP). This sampling network is modeled after programs and methods recommended by U.S. EPA. The emphasis has been on urban toxics monitoring for VOCs and heavy metals. Following this introduction, there are brief sections describing sampling and analytical procedures for the pollutants monitored.

39-081-0017, Jefferson County

The principle focus of the ATMP is urban monitoring – looking for risks in areas where people live. In support of this effort, air toxics monitoring has concentrated on the following groups of compounds:

- VOCs
- examples: benzene, chloroform, styrene, toluene
- heavy metals
- examples: beryllium, manganese

Intermittent air sampling has been conducted at semi-permanent monitoring sites (where monitoring extends beyond a six-month period) for VOCs and heavy metals.

Past sampling efforts have included:

- Cross Media pollution monitoring
- Urban air toxics
- Great Lakes deposition monitoring
- Source monitoring
- Post-remediation Monitoring
- Complaint investigation
- Emergency Episode Monitoring
- Emissions verification

During 2023, Ohio EPA conducted mostly routine air toxics monitoring although some short projects were also conducted throughout the state. The sampling and analytical methods for VOCs and heavy metals are described below.

B. Volatile Organic Compound (VOC)

Sampling Method

A major component of the ATMP is ambient sampling for VOCs which are compounds that are generally found in the vapor state. Most VOC samples were collected using a whole air sampling system that pumps ambient air into a stainless-steel canister, which allows an air sample to be maintained virtually unchanged until it is analyzed. Samples can also be collected using only the vacuum of the canister to draw in an air sample. These vacuum-filled “grab” samples usually take only a few minutes to collect and are useful for collecting transient odors or potentially high concentration samples. Ohio EPA is now capable of collecting specific samples for one-, three, eight-, and 24-hours using this grab sampling method.

Samples at the semi-permanent sampling sites are collected consistent with the national air toxics monitoring schedule of once every 12th day or every 6th day over a 24-hour sampling period. Specific procedures for this type of sampling can be found in U.S. EPA’s Compendium of Methods for the Determination of Toxic Organic Compound in Ambient Air in the section TO-15.

Analysis

The volatile tendency of VOCs allows them to be vaporized when heated, if not already in a gaseous state, and injected into an analytical instrument called a gas chromatograph mass spectrometer (GC/MS). As a sample passes through a GC column, various compounds separate out of the sample mixture. As the individual compounds exit the column, and pass through the MS, the detector records a response. That response is illustrated on a chromatogram as a peak, the area of which indicates the concentration of the compound. Compound identification is accomplished in part by comparing unknown peak retention times (the measure of time it takes for an individual compound to pass through a chromatography column) with those from a chromatogram of a known mixture of compounds analyzed under the same conditions. In addition, compound identification is confirmed by examination of the fragmentation pattern of ions of the various VOCs when compared to the pattern for each compound stored in the instrument database.

Most canister samples collected in Ohio were analyzed by the Ohio EPA, Division of Environmental Services (DES). Canister samples from counties under the jurisdiction of the Southwest Ohio Air Quality Agency were analyzed by a third-party lab. Laboratory analytical methods for VOC detection must follow procedures outlined in 40 CFR Part 136 for determining the analytical equipment's method detection limit (MDL) for each compound.

Differing from the MDL, a separate reporting limit (RL) is based on the equipment's practical quantitation limits. Any amount detected below the RL is identified as such, and the lab report further identifies if that sample was:

- less than the RL but greater than the MDL. This indicates that the compound may be present, however the concentration is estimated due to the fact it is below the RL. Even as an estimated value, the laboratory has a high confidence in the concentration of the sample and the value is reported. Or,
- less than the RL and less than the MDL. This is considered a non-detection.

Concentrations equal to or above the RL are reported without caveat, unless otherwise qualified. Most VOC target compounds' RL is 0.1 parts per billion by volume (ppbv). The RL can periodically change if the calculated MDL value, for a specific parameter, changes, or there are changes to instrument sensitivity. The qualifiers are included on the raw data from the laboratory and are not displayed in this report but affect which values are reported to the statistical database from which data for this report is generated. The tables below summarize the data for each compound collected in the state.

Table 20 presents target compounds for VOC analysis. Table 21 presents results for 24-hour samples of each target compound. Averages in Table 21 were calculated from concentrations above the reporting limit or those that are less than the RL but greater than the MDL. Non-detections or zero values are not included in the calculated averages reported below. The frequency detected column displays the number of times a compound was at or above the reporting limit or less than the RL but greater than the MDL and the number of times that compound was sampled for at sites throughout the state in 2023. Table 22 has information about VOC sites operating in 2023, and Table 23 provides a summary of all VOC parameters for each site. Sites that did not sample for a given compound will display “DNS”.

Table 20. DES VOC Target Compound List For TO-15 Analysis

	CAS #	Compound Name		CAS #	Compound Name		CAS #	Compound Name
1	000071-55-6	1,1,1-Trichloroethane	**26**	000067-64-1	Acetone	**51**	000067-63-0	Isopropyl alcohol
2	000079-34-5	1,1,2,2-Tetrachloroethane	**27**	000107-02-8	Acrolein	**52**	000080-62-6	Methyl methacrylate
3	000076-13-1	1,1,2-Trichloro-1,2,2-	**28**	000107-13-1	Acrylonitrile	**53**	001634-04-4	Methyl-butyl ether
4	000079-00-5	1,1,2-Trichloroethane	**29**	000071-43-2	Benzene	**54**	000075-09-2	Methylene chloride
5	000075-34-3	1,1-Dichloroethane	**30**	000100-44-7	Benzyl chloride	**55**	000091-20-3	Naphthalene
6	000075-35-4	1,1-Dichloroethene	**31**	000075-27-4	Bromodichloromethane	**56**	000106-97-8	n-Butane
7	000120-82-1	1,2,4-Trichlorobenzene	**32**	000075-25-2	Bromoform	**57**	000142-82-5	n-Heptane
8	000095-63-6	1,2,4-Trimethylbenzene	**33**	000074-83-9	Bromomethane	**58**	000111-84-2	n-Nonane
9	000106-93-4	1,2-Dibromoethane	**34**	000075-15-0	Carbon disulfide	**59**	000109-66-0	n-Pentane
10	000076-14-2	1,2-Dichloro-1,1,2,2-	**35**	000056-23-5	Carbon tetrachloride	**60**	000103-65-1	n-Propylbenzene
11	000095-50-1	1,2-Dichlorobenzene	**36**	000108-90-7	Chlorobenzene	**61**	000095-49-8	o-Chlorotoluene
12	000107-06-2	1,2-Dichloroethane	**37**	000075-00-3	Chloroethane	**62**	000095-47-6	o-Xylene
13	000078-87-5	1,2-Dichloropropane	**38**	000067-66-3	Chloroform	**63**	000115-07-1	Propylene
14	000108-67-8	1,3,5-Trimethylbenzene	**39**	000074-87-3	Chloromethane	**64**	000100-42-5	Styrene
15	000106-99-0	1,3-Butadiene	**40**	000156-59-2	cis-1,2-Dichloroethene	**65**	000127-18-4	Tetrachloroethylene
16	000541-73-1	1,3-Dichlorobenzene	**41**	010061-01-5	cis-1,3-Dichloropropene	**66**	000109-99-9	Tetrahydrofuran
17	000106-46-7	1,4-Dichlorobenzene	**42**	000098-82-8	Cumene	**67**	000108-88-3	Toluene
18	000123-91-1	1,4-Dioxane	**43**	000110-82-7	Cyclohexane	**68**	000108-38-3	Total m&p-xylenes
19	000540-84-1	2,2,4-Trimethylpentane	**44**	000124-48-1	Dibromochloromethane	**69**	000156-60-5	trans-1,2-Dichloroethene
20	000078-93-3	2-Butanone	**45**	000075-71-8	Dichlorodifluoromethane	**70**	010061-02-6	trans-1,3-Dichloropropene
21	000591-78-6	2-Hexanone	**46**	000064-17-5	Ethanol	**71**	000079-01-6	Trichloroethene
22	000075-65-0	2-Methyl-2-propanol	**47**	000141-78-6	Ethyl acetate	**72**	000075-69-4	Trichlorofluoromethane
23	000107-05-1	3-Chloropropene	**48**	000100-41-4	Ethylbenzene	**73**	000108-05-4	Vinyl acetate
24	000622-96-8	4-Ethyltoluene	**49**	000087-68-3	Hexachlorobutadiene	**74**	000593-60-2	Vinyl bromide
25	000108-10-1	4-Methyl-2-pentanone	**50**	000110-54-3	Hexane	**75**	000075-01-4	Vinyl chloride

Table 21. VOC Summary of Statewide Canister Data

Compound	Concentration* (ppbv)			Frequency Detected
	Reporting Limit (RL)	Average	Maximum	
1,1-Dichloroethane	0.1			0/231
1,1-Dichloroethylene	0.1			0/231
1,1,2-Trichloro-1,2,2-trifluoroethane	0.1	0.07	0.627	94/135
1,1,2-Trichloroethane	0.1			0/231
1,1,2,2-Tetrachloroethane	0.1	0.11	0.12	2/231
1,2-Dichlorobenzene	0.1	0.05	0.0904	2/231
1,2-Dichloropropane	0.1			0/231
1,2,4-Trichlorobenzene	0.5	0.32	0.469	42/231
1,2,4-Trimethylbenzene	0.1	0.1	0.33	71/231
1,3-Butadiene	0.1	0.24	1.21	40/231
1,3-Dichlorobenzene	0.1	0.08	0.172	23/231
1,3-Dichloropropene(total)	0.1			0/135
1,3,5-Trimethylbenzene	0.1	0.05	0.0999	64/231
1,4-Dichlorobenzene	0.1	0.08	0.24	68/231
1,4-Dioxane	0.1	0.05	0.056	2/193
2-Propanol	2	1.47	16	142/192
2,2,4-Trimethylpentane	0.2	0.21	1.69	88/193
3-Chloropropene	0.1	0.23	0.23	1/193
Acetone	1.2	4.98	58	224/231
Acrolein - Unverified	0.5	0.37	8.45	124/135
Acrylonitrile	0.2	0.44	1.7	23/163
Benzene	0.1	0.23	0.892	215/231
Benzyl chloride	0.1	0.15	0.313	10/193
Bromodichloromethane	0.1			0/231
Bromoform	0.1	0.09	0.102	6/231
Bromomethane	0.1			0/231
Carbon disulfide	0.2	1.64	4.05	53/231
Carbon tetrachloride	0.1	0.08	0.938	167/231
Chlorobenzene	0.1	0.03	0.041	6/231
Chloroethane	0.1	1.55	1.55	1/231
Chloroform	0.1	0.08	1.5	33/231
Chloromethane	0.1	0.51	1.49	229/230
cis-1,2-Dichloroethene	0.1	0.46	1.1	3/231
cis-1,3-Dichloropropene	0.1			0/96
Cyclohexane	0.1	0.11	0.496	64/231
Dibromochloromethane	0.1	0.08	0.0907	7/231
Dibromomethane	0.5			0/58
Dichlorodifluoromethane	0.1	0.47	0.63	230/231
Dichloromethane	0.2	0.12	0.53	194/231
Ethyl acetate	0.1	0.21	2.1	66/173
Ethyl alcohol	1	9.34	109	190/193
Ethylbenzene	0.1	0.09	0.35	104/231
Ethylene dibromide	0.1	0.08	0.0982	3/231
Ethylene dichloride	0.1	0.02	0.028	5/231

Compound	Concentration* (ppbv)			Frequency Detected
	Reporting Limit (RL)	Average	Maximum	
Freon 113	0.1	0.06	0.0955	79/96
Freon 114	0.1	0.56	0.629	6/231
Furan, tetrahydro-	0.2	0.18	0.374	33/231
Hexachlorobutadiene	0.2	0.11	0.241	40/231
Isopropylbenzene	0.1	0.04	0.0782	27/193
m/p Xylene	0.1	0.21	1.2	137/231
Methyl Butyl Ketone	0.1	0.1	0.223	58/231
Methyl chloroform	0.1			0/231
Methyl ethyl ketone	0.5	0.57	5.5	221/231
Methyl isobutyl ketone	0.1	0.13	1.49	52/231
Methyl methacrylate	0.1	0.38	1.96	12/135
Methyl tert-butyl ether	0.1			0/231
n-Butane	0.1	2.15	16.9	183/193
n-Decane	2	0.14	0.21	4/58
n-Heptane	0.1	0.13	0.772	111/231
n-Hexane	0.1	0.26	4.8	177/231
n-Nonane	0.5	0.14	0.29	4/58
n-Octane	0.5	0.08	0.17	6/58
n-Pentane	0.5	0.38	0.87	41/58
n-Propylbenzene	0.1	0.02	0.028	5/58
n-Undecane	2	0.19	0.36	11/58
Naphthalene	0.2	0.19	0.469	121/231
o-Xylene	0.1	0.09	0.42	120/231
p-Ethyltoluene	0.1	0.07	0.246	74/231
Propylene	0.2	1.51	29.4	154/231
Styrene	0.1	0.12	1.5	93/231
Tetrachloroethylene	0.1	0.7	24.6	39/231
Toluene	0.1	0.55	4	221/231
trans-1,2-Dichloroethylene	0.1	0.23	0.592	3/231
trans-1,3-Dichloropropene	0.1			0/231
Trichloroethylene	0.1	0.24	0.731	10/231
Trichlorofluoromethane	0.1	0.2	0.465	231/231
Vinyl acetate	0.2	0.35	1.78	122/231
Vinyl bromide	0.2			0/135
Vinyl chloride	0.1			0/231

Table 22. VOC Sampling Site Identification

AQS #	City	County*	Address
39-017-0019	Middletown	Butler - 1	1200 Oxford State Rd.
39-017-0020	Middletown	Butler - 2	3350 Yankee Rd.
39-035-0038	Cleveland	Cuyahoga - 1	2547 St. Tikhon Ave.
39-049-0034	Columbus	Franklin	Korbel Ave.
39-061-0014	Cincinnati	Hamilton - 1	Seymour & Vine St.
39-061-0047	Cincinnati	Hamilton - 2	7529 Gracely Dr.
39-067-0005	Jewett	Harrison	46700 Giacobbi Rd.
39-081-0017	Steubenville	Jefferson	618 Logan St.

* Counties with multiple sites are referenced by *county - #* in the following summary table.

Table 23. Summary of VOC results

Compound list	Average; Maximum (ppbv) Number of detections / total samples								
	Butler - 1	Butler - 2	Cuyahoga - 1	Cuyahoga - 2	Franklin	Hamilton - 1	Hamilton - 2	Harrison	Jefferson
Carbon disulfide	1.49/3.8 (20/30)	2.26/4 (23/28)	0.06/0.0578 (1/28)	0.09/0.0852 (1/26)	4.05/4.05 (1/10)	0.13/0.237 (6/28)	--/-- (0/27)	0.05/0.0548 (1/54)	1.49/3.8 (20/30)
Propylene	1.09/2.1 (11/30)	1.62/3.1 (9/28)	1.42/3.96 (28/28)	0.85/2.06 (25/26)	--/-- (0/10)	0.87/1.21 (3/28)	3.36/29.4 (26/27)	1.06/3.2 (52/54)	1.09/2.1 (11/30)
Freon 113	0.06/0.08 (30/30)	0.06/0.074 (27/28)	DNS	DNS	0.06/0.058 (1/10)	0.07/0.0955 (21/28)	DNS	DNS	0.06/0.08 (30/30)
Freon 114	--/-- (0/30)	--/-- (0/28)	0.56/0.56 (2/28)	0.58/0.629 (3/26)	--/-- (0/10)	--/-- (0/28)	0.51/0.51 (1/27)	--/-- (0/54)	--/-- (0/30)
Ethyl acetate	DNS	DNS	0.13/0.356 (16/28)	0.12/0.201 (12/26)	1.38/2.1 (2/10)	0.08/0.083 (2/28)	0.24/0.874 (13/27)	0.2/1.53 (21/54)	DNS
n-Butane	1.05/3.7 (26/30)	1.09/5.1 (22/28)	3.48/12.6 (28/28)	1.57/5.92 (26/26)	DNS	DNS	3.39/16.9 (27/27)	2.08/13.4 (54/54)	1.05/3.7 (26/30)
1,3-Butadiene	0.08/0.15 (3/30)	--/-- (0/28)	0.25/0.885 (9/28)	0.19/0.444 (10/26)	--/-- (0/10)	0.26/0.37 (4/28)	0.29/0.525 (3/27)	0.3/1.21 (11/54)	0.08/0.15 (3/30)
n-Pentane	0.4/0.87 (23/30)	0.36/0.87 (18/28)	DNS	DNS	DNS	DNS	DNS	DNS	0.4/0.87 (23/30)
n-Hexane	0.14/0.35 (21/30)	0.11/0.27 (14/28)	0.31/0.77 (25/28)	0.23/0.56 (21/26)	0.27/0.45 (4/10)	0.15/0.327 (18/28)	0.39/2.9 (24/27)	0.33/4.8 (50/54)	0.14/0.35 (21/30)
n-Heptane	0.09/0.16 (11/30)	0.07/0.14 (5/28)	0.1/0.16 (15/28)	0.12/0.223 (16/26)	0.37/0.74 (4/10)	0.1/0.22 (7/28)	0.17/0.772 (16/27)	0.12/0.752 (37/54)	0.09/0.16 (11/30)
n-Octane	0.06/0.075 (3/30)	0.11/0.17 (3/28)	DNS	DNS	DNS	DNS	DNS	DNS	0.06/0.075 (3/30)
n-Nonane	0.14/0.29 (3/30)	0.11/0.11 (1/28)	DNS	DNS	DNS	DNS	DNS	DNS	0.14/0.29 (3/30)
n-Decane	0.08/0.082 (1/30)	0.16/0.21 (3/28)	DNS	DNS	DNS	DNS	DNS	DNS	0.08/0.082 (1/30)
Cyclohexane	0.04/0.059 (9/30)	0.09/0.25 (4/28)	0.11/0.172 (8/28)	0.11/0.162 (10/26)	--/-- (0/10)	0.08/0.17 (4/28)	0.13/0.308 (11/27)	0.15/0.496 (18/54)	0.04/0.059 (9/30)
2,2,4-Trimethylpentane	0.1/0.18 (14/30)	0.08/0.19 (10/28)	0.51/1.69 (17/28)	0.23/0.52 (12/26)	DNS	DNS	0.1/0.152 (8/27)	0.15/0.514 (27/54)	0.1/0.18 (14/30)
Ethyl alcohol	5.2/15 (30/30)	8.16/21 (25/28)	4.23/25 (28/28)	19.34/109 (26/26)	DNS	DNS	5.67/51.7 (27/27)	11.88/88.4 (54/54)	5.2/15 (30/30)

*DNS- Did not sample for this compound

Compound list	Average; Maximum (ppbv) Number of detections / total samples								
	Butler - 1	Butler - 2	Cuyahoga - 1	Cuyahoga - 2	Franklin	Hamilton - 1	Hamilton - 2	Harrison	Jefferson
2-Propanol	3.18/16 (24/30)	2.94/10 (25/27)	0.55/1.58 (17/28)	0.48/1.27 (19/26)	DNS	DNS	0.76/7.03 (17/27)	0.67/2.82 (40/54)	3.18/16 (24/30)
3-Chloropropene	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	DNS	DNS	0.23/0.23 (1/27)	--/-- (0/54)	--/-- (0/30)
Methyl tert-butyl ether	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
Methyl methacrylate	DNS	DNS	0.11/0.107 (1/28)	0.46/1.96 (8/26)	DNS	DNS	0.29/0.355 (2/27)	0.22/0.216 (1/54)	DNS
Vinyl acetate	--/-- (0/30)	--/-- (0/28)	0.38/0.933 (28/28)	0.37/0.974 (24/26)	--/-- (0/10)	--/-- (0/28)	0.38/1.78 (24/27)	0.3/1.02 (46/54)	--/-- (0/30)
Acrolein - Unverified	DNS	DNS	0.32/0.62 (26/28)	0.33/0.68 (24/26)	DNS	DNS	0.64/8.45 (23/27)	0.29/1.19 (51/54)	DNS
Acetone	5.73/14 (30/30)	9.63/58 (28/28)	5.81/10.7 (28/28)	3.65/6.01 (26/26)	9.99/29.8 (5/10)	3.32/7.9 (28/28)	4.11/13.4 (26/27)	3.16/9.78 (53/54)	5.73/14 (30/30)
Methyl ethyl ketone	0.51/1.7 (29/30)	0.82/5.5 (28/28)	0.53/1.29 (28/28)	1/4.02 (26/26)	0.6/0.6 (1/10)	0.43/0.854 (28/28)	0.43/1.04 (27/27)	0.42/1.95 (54/54)	0.51/1.7 (29/30)
Methyl Butyl Ketone	0.11/0.16 (4/30)	0.18/0.21 (4/28)	0.11/0.132 (8/28)	0.09/0.173 (13/26)	--/-- (0/10)	0.13/0.2 (2/28)	0.07/0.136 (11/27)	0.09/0.223 (16/54)	0.11/0.16 (4/30)
Methyl isobutyl ketone	0.06/0.097 (8/30)	0.11/0.37 (9/28)	0.12/0.19 (8/28)	0.1/0.147 (6/26)	--/-- (0/10)	0.11/0.26 (4/28)	0.4/1.49 (5/27)	0.1/0.126 (12/54)	0.06/0.097 (8/30)
Acrylonitrile	DNS	DNS	0.65/0.725 (2/28)	0.07/0.0745 (2/26)	DNS	0.45/1.7 (12/28)	0.66/1.22 (3/27)	0.36/1.02 (4/54)	DNS
Chloromethane	0.44/0.62 (30/30)	0.43/0.6 (27/28)	0.55/0.9 (28/28)	0.54/1.08 (25/25)	0.62/1.36 (10/10)	0.52/0.766 (28/28)	0.53/1.49 (27/27)	0.52/0.95 (54/54)	0.44/0.62 (30/30)
Dichloromethane	0.15/0.27 (27/30)	0.18/0.3 (26/28)	0.15/0.53 (27/28)	0.09/0.14 (20/26)	0.06/0.062 (1/10)	0.14/0.335 (26/28)	0.08/0.129 (24/27)	0.09/0.13 (43/54)	0.15/0.27 (27/30)
Chloroform	0.03/0.036 (13/30)	0.03/0.038 (7/28)	--/-- (0/28)	--/-- (0/26)	0.64/1.5 (3/10)	0.03/0.045 (10/28)	--/-- (0/27)	--/-- (0/54)	0.03/0.036 (13/30)
Carbon tetrachloride	0.07/0.091 (29/30)	0.07/0.09 (27/28)	0.08/0.108 (20/28)	0.08/0.107 (15/26)	--/-- (0/10)	0.11/0.938 (21/28)	0.08/0.111 (19/27)	0.08/0.107 (36/54)	0.07/0.091 (29/30)
Dibromomethane	--/-- (0/30)	--/-- (0/28)	DNS	DNS	DNS	DNS	DNS	DNS	--/-- (0/30)
Bromoform	--/-- (0/30)	--/-- (0/28)	0.08/0.0915 (2/28)	0.09/0.102 (2/26)	--/-- (0/10)	--/-- (0/28)	0.07/0.0702 (1/27)	0.1/0.102 (1/54)	--/-- (0/30)

*DNS- Did not sample for this compound.

Compound list	Average; Maximum (ppbv) Number of detections / total samples								
	Butler - 1	Butler - 2	Cuyahoga - 1	Cuyahoga - 2	Franklin	Hamilton - 1	Hamilton - 2	Harrison	Jefferson
Trichlorofluoromethane	0.21/0.26 (30/30)	0.21/0.27 (28/28)	0.2/0.266 (28/28)	0.19/0.28 (26/26)	0.28/0.465 (10/10)	0.23/0.305 (28/28)	0.19/0.247 (27/27)	0.18/0.243 (54/54)	0.21/0.26 (30/30)
Chloroethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	1.55/1.55 (1/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
1,1-Dichloroethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
Methyl chloroform	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
Ethylene dichloride	0.02/0.025 (3/30)	0.02/0.023 (1/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	0.03/0.028 (1/28)	--/-- (0/27)	--/-- (0/54)	0.02/0.025 (3/30)
Tetrachloroethylene	0.04/0.053 (2/30)	0.02/0.026 (2/28)	0.09/0.125 (7/28)	0.07/0.0932 (3/26)	0.11/0.11 (1/10)	3.12/24.6 (8/28)	0.08/0.117 (5/27)	0.09/0.163 (11/54)	0.04/0.053 (2/30)
1,1,2,2-Tetrachloroethane	0.1/0.1 (1/30)	0.12/0.12 (1/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	0.1/0.1 (1/30)
Bromomethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
1,1,2-Trichloroethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
1,1,2-Trichloro-1,2,2-trifluoroethane	DNS	DNS	0.07/0.0955 (20/28)	0.07/0.0938 (15/26)	DNS	DNS	0.06/0.0948 (19/27)	0.07/0.627 (40/54)	DNS
Dichlorodifluoromethane	0.48/0. 6(30/30)	0.46/0.58 (28/28)	0.48/0.58 (28/28)	0.45/0.57 (25/26)	0.51/0.58 (10/10)	0.5/0.63 (28/28)	0.44/0.54 (27/27)	0.45/0.587 (54/54)	0.48/0.6 (30/30)
Trichloroethylene	0.02/0.023 (3/30)	--/-- (0/28)	0.16/0.356 (4/28)	--/-- (0/26)	0.73/0.73 (1/10)	0.48/0.731 (2/28)	--/-- (0/27)	--/-- (0/54)	0.02/0.023 (3/30)
1,1-Dichloroethylene	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
Bromodichloromethane	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
1,2-Dichloropropane	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
trans-1,3-Dichloropropene	--/- -(0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
cis-1,3-Dichloropropene	--/-- (0/30)	--/-- (0/28)	DNS	DNS	--/-- (0/10)	--/-- (0/28)	DNS	DNS	--/-- (0/30)

*DNS- Did not sample for this compound

Compound list	Average; Maximum (ppbv) Number of detections / total samples								
	Butler - 1	**Butler - 2**	**Cuyahoga - 1**	**Cuyahoga - 2**	**Franklin**	**Hamilton - 1**	**Hamilton - 2**	**Harrison**	**Jefferson**
Dibromochloromethane	--/-- (0/30)	--/-- (0/28)	0.09/0.0907 (2/28)	0.07/0.0696 (1/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	0.08/0.0904 (4/54)	--/-- (0/30)
trans-1,2-Dichloroethylene	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	0.05/0.0505 (2/26)	--/-- (0/10)	0.59/0.592 (1/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
cis-1,2-Dichloroethene	--/-- (0/30)	--/-- (0/28)	0.06/0.0646 (1/28)	--/-- (0/26)	1.1/1.1 (1/10)	0.21/0.213 (1/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
1,3-Dichloropropene(total)	DNS	DNS	--/-- (0/28)	--/-- (0/26)	DNS	DNS	--/-- (0/27)	--/-- (0/54)	DNS
Ethylene dibromide	--/-- (0/30)	--/-- (0/28)	0.1/0.0982 (1/28)	0.07/0.0862 (2/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
Hexachlorobutadiene	0.04/0.037 (1/30)	0.01/0.014 (1/28)	0.09/0.148 (7/28)	0.13/0.15 (6/26)	--/-- (0/10)	--/-- (0/28)	0.11/0.152 (9/27)	0.12/0.241 (16/54)	0.04/0.037 (1/30)
Vinyl chloride	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
Vinyl bromide	DNS	DNS	--/-- (0/28)	--/-- (0/26)	DNS	DNS	--/-- (0/27)	--/-- (0/54)	DNS
n-Undecane	0.17/0.28 (5/30)	0.21/0.36 (6/28)	DNS	DNS	DNS	DNS	DNS	DNS	0.17/0.28 (5/30)
m/p Xylene	0.17/0.41 (29/30)	0.18/1.2 (27/28)	0.17/0.28 (13/28)	0.32/0.547 (13/26)	0.58/0.871 (4/10)	0.14/0.371 (21/28)	0.23/0.694 (7/27)	0.22/0.493 (23/54)	0.17/0.41 (29/30)
Benzene	0.23/0.59 (30/30)	0.21/0.53 (28/28)	0.22/0.484 (27/28)	0.25/0.674 (23/26)	0.3/0.462 (7/10)	0.2/0.63 (28/28)	0.23/0.836 (21/27)	0.24/0.892 (51/54)	0.23/0.59 (30/30)
Toluene	0.99/3.3 (30/30)	1.27/3.1 (28/28)	0.28/0.595 (28/28)	0.5/1.41 (26/26)	1.18/4 (6/10)	0.28/0.662 (27/28)	0.18/0.834 (23/27)	0.3/1.16 (53/54)	0.99/3.3 (30/30)
Ethylbenzene	0.06/0.14 (24/30)	0.08/0.35 (16/28)	0.1/0.137 (9/28)	0.11/0.198 (14/26)	0.23/0.267 (3/10)	0.06/0.13 (14/28)	0.13/0.206 (6/27)	0.11/0.165 (18/54)	0.06/0.14 (24/30)
o-Xylene	0.07/0.14 (26/30)	0.09/0.42 (21/28)	0.08/0.129 (11/28)	0.13/0.19 (13/26)	0.23/0.26 (2/10)	0.06/0.161 (17/28)	0.1/0.244 (8/27)	0.1/0.197 (22/54)	0.07/0.14 (26/30)
1,3,5-Trimethylbenzene	0.03/0.043 (13/30)	0.02/0.054 (8/28)	0.07/0.0999 (7/28)	0.07/0.0894 (8/26)	--/-- (0/10)	0.01/0.021 (5/28)	0.07/0.0756 (9/27)	0.07/0.0982 (14/54)	0.03/0.043 (13/30)
1,2,4-Trimethylbenzene	0.06/0.12 (23/30)	0.06/0.16 (12/28)	0.17/0.234 (3/28)	0.22/0.33 (8/26)	0.12/0.12 (1/10)	0.05/0.11 (14/28)	0.22/0.251 (2/27)	0.17/0.229 (8/54)	0.06/0.12 (23/30)
n-Propylbenzene	0.02/0.024 (4/30)	0.03/0.028 (1/28)	DNS	DNS	DNS	DNS	DNS	DNS	0.02/0.024 (4/30)

*DNS- Did not sample for this compound

Compound list	Average; Maximum (ppbv) Number of detections / total samples								
	Butler - 1	Butler - 2	Cuyahoga - 1	Cuyahoga - 2	Franklin	Hamilton - 1	Hamilton - 2	Harrison	Jefferson
Isopropylbenzene	0.01/0.022 (7/30)	0.03/0.047 (8/28)	0.07/0.0707 (2/28)	0.06/0.0734 (2/26)	DNS	DNS	0.06/0.067 (3/27)	0.07/0.0782 (5/54)	0.01/0.022 (7/30)
p-Ethyltoluene	0.05/0.091 (17/30)	0.05/0.12 (9/28)	0.08/0.119 (8/28)	0.1/0.246 (10/26)	--/-- (0/10)	0.05/0.104 (7/28)	0.08/0.0886 (7/27)	0.08/0.113 (16/54)	0.05/0.091 (17/30)
Styrene	0.03/0.046 (11/30)	0.03/0.043 (8/28)	0.08/0.111 (11/28)	0.08/0.138 (12/26)	--/-- (0/10)	0.26/1.5 (25/28)	0.08/0.142 (8/27)	0.09/0.149 (18/54)	0.03/0.046 (11/30)
Chlorobenzene	--/-- (0/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	0.03/0.041 (6/28)	--/-- (0/27)	--/-- (0/54)	--/-- (0/30)
1,2-Dichlorobenzene	0.02/0.017 (1/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	--/-- (0/10)	--/-- (0/28)	--/-- (0/27)	0.09/0.0904 (1/54)	0.02/0.017 (1/30)
1,3-Dichlorobenzene	0.01/0.012 (1/30)	--/-- (0/28)	0.07/0.0784 (5/28)	0.06/0.0647 (2/26)	--/-- (0/10)	--/-- (0/28)	0.1/0.172 (6/27)	0.09/0.171 (9/54)	0.01/0.012 (1/30)
1,4-Dichlorobenzene	0.08/0.24 (14/30)	0.06/0.14 (18/28)	0.07/0.0881 (7/28)	0.08/0.135 (5/26)	--/-- (0/10)	0.05/0.14 (3/28)	0.09/0.131 (9/27)	0.09/0.137 (12/54)	0.08/0.24 (14/30)
Benzyl chloride	0.02/0.017 (1/30)	--/-- (0/28)	0.19/0.257 (2/28)	0.1/0.122 (2/26)	DNS	DNS	--/-- (0/27)	0.19/0.313 (5/54)	0.02/0.017 (1/30)
1,2,4-Trichlorobenzene	0.06/0.058 (1/30)	--/-- (0/28)	0.32/0.397 (9/28)	0.34/0.405 (7/26)	--/-- (0/10)	--/-- (0/28)	0.35/0.438 (9/27)	0.32/0.469 (16/54)	0.06/0.058 (1/30)
Naphthalene	0.05/0.18 (21/30)	0.07/0.29 (16/28)	0.28/0.468 (15/28)	0.24/0.462 (15/26)	--/-- (0/10)	0.03/0.0942 (10/28)	0.3/0.464 (15/27)	0.3/0.469 (29/54)	0.05/0.18 (21/30)
1,4-Dioxane	0.05/0.056 (2/30)	--/-- (0/28)	--/-- (0/28)	--/-- (0/26)	DNS	DNS	--/-- (0/27)	--/-- (0/54)	0.05/0.056 (2/30)
Furan, tetrahydro-	--/-- (0/30)	0.22/0.22 (1/28)	0.17/0.311 (9/28)	0.14/0.238 (6/26)	0.23/0.23 (1/10)	0.11/0.11 (1/28)	0.18/0.23 (7/27)	0.2/0.374 (8/54)	--/-- (0/30)

*DNS- Did not sample for this compound.

C. Heavy Metals

Sampling Method

Ambient air toxic monitoring by Ohio EPA for heavy metals other than lead was initiated in 1989. Since that time, all Ohio EPA air filter samples have been analyzed by Ohio EPA, DES. A summary of results can be found in Table 25 through Table 36. Sampling for heavy metals is conducted using a high-volume TSP sampler with a glass fiber filter. Sampling is conducted with 24-hour samples collected once every six days. The operating procedures for lead can be found in the Code of Federal Regulations, 40 CFR, Part 50, Appendix G. These basic procedures are also used for other metals.

Analysis

Data below presents filters collected at each site that were analyzed as a monthly composite. Typically, there are five sampling days per month in which a filter is collected. One strip is cut from the individual filter and combined with strips from all the filters collected that month and analyzed as one sample for the entire month. These composite samples are acid extracted with the resulting solution analyzed by Inductively Coupled Plasma/Optical Emissions Spectroscopy (ICP/OES) and/or Inductively Coupled Plasma/Mass Spectroscopy (ICP/MS) instruments, in a method that is similar to that which is used for the determination of lead from TSP filters. The methods identify and quantitate elements through ionization in plasma and measuring them by either light emission spectroscopy (ICP/OES) or separation by mass/charge ratio and detection via an electron multiplier (ICP/MS).

Parameters

Lead was the first metal Ohio EPA sampled in ambient air as a part of the NAAQS monitoring. Over the years, Ohio EPA added other metals to the analysis program, although lead remains the only metal for which a NAAQS has been established.

For this section, data presented is from the monthly composite samples collected and analyzed for eight metals:

- Arsenic
- Cadmium
- Chromium
- Beryllium
- Lead
- Nickel
- Zinc
- Manganese

From each sample, most parameters are analyzed using a very sensitive ICP/MS analytical system. The following parameters, typically detected in higher concentrations, are still analyzed with the ICP method only:

- Iron
- Potassium
- Zinc
- Manganese

Particulate mercury that can be detected from a glass or quartz fiber filter has been added to the parameter list for few samples collected from sites in communities with specific concerns about potential mercury sources. Mercury analysis for each sample is performed separately from the other metals. Total mercury is determined using a cold vapor method developed by Ohio DES.

Table 24 identifies monitoring sites' locations and references the respective tables that follow summarizing each site’s results.

Table 24. Metals Sampling Site Identification

AQS #	City	County	Address	Table
39-029-0019	E. Liverpool - 1	Columbiana	1250 St. George St.	Table 25
39-029-0020	E. Liverpool - 2	Columbiana	2220 Michigan Ave.	Table 26
39-029-0023	E. Liverpool - 3	Columbiana	500 Maryland Ave.	Table 27
39-035-0038	Cleveland - 1	Cuyahoga	2547 St. Tikhon Ave.	Table 28
39-035-0049	Cleveland - 3	Cuyahoga	4150 East 56th St.	Table 29
39-049-0040	Columbus	Franklin	2104 Jackson Pike	Table 30
39-051-0001	Delta	Fulton	200 Van Buren St.	Table 31
39-101-0003	Marion - 1	Marion	Hawthorne Ave.	Table 32
39-101-0004	Marion - 2	Marion	640 Bellefontaine Ave.	table 33
39-151-0024	Canton- 1	Summit	3159 Georgetown Rd. NE	Table 34
39-151-0025	Canton- 2	Summit	719 Marietta Ave. NE	Table 35
39-167-0008	Marietta	Washington	S.R. 676	Table 36

Table 25. Heavy Metals: E. Liverpool - 1 (39-029-0019)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.597	<0.039500	0.116	1.16	2.37	34.7	0.413	0.0177	22
February	4.14	<0.051500	0.137	1.17	3.29	26	<1.030000	0.0137	19.2
March	0.645	0.0375	0.233	1.33	3.01	38.2	0.607	0.0205	19.4
April	1.24	0.056	0.207	<1.990000	4.66	33.8	<1.990000	0.0119	26.1
May	2.21	0.0437	0.314	1.63	6.18	75.2	0.897	0.0227	33.6
June	1.82	<0.041500	0.381	1.15	5.62	55	<0.830000	0.0115	36.2
July	1.76	<0.042800	0.24	2.14	3.15	17.7	<2.140000	0.018	25.9
August	0.938	<0.041400	0.217	0.931	7.4	23.7	<0.828000	0.0137	45.2
September	3.44	<0.041000	0.326	<0.825000	7.42	37.5	<0.821000	0.00972	31.5
October	1.01	<0.040300	0.212	<2.010000	4.39	32.5	<2.010000	0.0169	20.7
November	1.2	0.0394	0.529	<1.970000	4.4	60.7	<1.970000	0.0144	34.1
December	2.92	<0.041200	0.282	1.9	5.42	59.9	1.65	0.0924	44.5

Table 26. Heavy Metals: E. Liverpool - 2 (39-029-0020)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.603	<0.055100	0.127	3.48	2.15	220	1.42	0.016	21.3
February	0.741	<0.067400	0.114	1.17	2.4	50.4	<0.674000	0.0143	23.3
March	0.954	<0.046200	0.536	3.03	2.56	203	1.59	0.0188	19.7
April	0.985	<0.056100	0.168	<2.810000	4.12	66.2	<2.810000	0.012	20.3
May	1.39	<0.056800	0.256	3.97	4.63	521	2.37	0.0215	29.8
June	1.67	<0.056100	0.29	3.48	3.75	298	<2.800000	0.0181	27.6
July	1.88	<0.056100	0.255	2.75	6.49	129	<1.120000	0.0223	23.5
August	0.957	<0.069400	0.203	2.22	3.12	219	1.2	0.0148	26.8
September	0.983	<0.053700	0.214	3.8	8.34	361	4.76	0.00914	26.1
October	1.03	<0.053700	0.238	1.36	5.84	238	1.07	0.0123	15.4
November	1.09	<0.054400	0.645	6.2	3.71	697	3.49	0.0108	32.4
December	1.21	<0.058800	0.337	4.73	5.96	450	3.37	0.155	37.5

Table 27. Heavy Metals: E. Liverpool - 3 (39-029-0023)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.633	<0.042100	0.123	1.07	2.32	40.7	<0.421000	0.0187	22
February	<0.692000	<0.069200	<0.069200	<0.692000	1.74	12	<0.692000	0.0101	15.3
March	0.632	<0.035000	0.175	1.09	2.83	27.2	0.527	0.0227	17.7
April	1.02	<0.041400	0.193	<2.070000	7.84	20.6	<2.070000	0.0117	23.3
May	1.42	<0.042600	0.29	1.6	7.51	87.7	<0.852000	0.0227	36.6
June	1.67	<0.043100	0.317	<0.861000	5.8	66.8	<0.861000	0.0155	35.1
July	1.65	<0.042700	0.3	<2.140000	3.51	21.1	<2.140000	0.0213	29.8
August	0.876	<0.041500	0.166	0.678	2.94	14.6	<0.415000	0.0142	23.1
September	4.56	<0.040700	0.507	0.916	15.9	41.5	<0.814000	0.00886	28
October	1.19	<0.050300	0.27	<2.510000	5.5	36.3	<2.510000	0.0119	29.1
November	1.54	<0.040400	0.578	<2.020000	14.2	51.5	<2.020000	0.0148	37.6
December	3.84	<0.041300	0.275	1.1	5.38	44.9	<0.827000	0.148	42.9

Table 28. Heavy Metals: Cleveland - 1 (39-035-0038)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	0.594	<0.052200	0.223	1.62	4	24.4	1.45	53.5
February	<0.651000	<0.065100	0.167	1.74	4	26.7	1.14	40.4
March	0.63	<0.043000	0.266	2.53	8	36.4	2.01	57.9
April	0.623	<0.051800	0.107	1.61	4	23.5	2.03	37.5
May	2.1	0.116	0.522	8.83	19	189	2.99	191
June	1.95	0.0831	0.612	5.18	14	118	2.7	178
July	1.49	0.0652	0.306	4.37	8	94.7	1.36	105
August	0.82	<0.050500	0.168	3.42	10	36.3	1.86	49.3
September	1.22	0.0637	0.261	2.99	10	71.2	3.99	76.2
October	0.83	<0.050900	0.2	3.14	10.3	47.7	1.69	61.8
November	1.38	0.0827	1.07	4.26	13	106	1.58	166
December	1.41	0.0831	0.509	6.78	12	140	2.28	159

Table 29. Heavy Metals: Cleveland - 3 (39-035-0049)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	2.9	<0.056800	0.441	10.2	10	134	3.06	303
February	<0.707000	<0.070700	0.224	4.7	4	100	1.7	104
March	0.804	<0.046700	0.144	1.76	63	31.6	0.881	42.7
April	1.1	0.0657	0.372	14.8	8	180	3.63	294
May	3.81	0.0953	0.513	5.63	92	142	3.31	101
June	1.5	<0.055200	0.444	3.6	9	71	2.63	81.2
July	1.6	<0.054800	0.349	4.58	6	111	1.76	157
August	1.95	0.0563	0.419	4.32	9	92.8	2.69	82.4
September	1.18	<0.055000	0.274	2.87	11	65.8	7.88	108
October	0.731	<0.055500	0.22	4.36	5.49	101	2.26	103
November	1.22	<0.056200	0.924	4.39	9	67.7	3.06	63.8
December	0.966	<0.056200	0.242	4.09	6	74.3	2.48	129

Table 30. Heavy Metals: Columbus (39-049-0040)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	0.629	<0.047300	0.189	0.853	2.5	6.98	<0.047300	37
February	<0.604000	<0.060400	0.103	0.709	2.12	9.85	<0.604000	27.2
March	0.584	<0.039300	0.195	0.693	2.11	9.77	0.639	25.7
April	0.676	<0.046300	0.118	0.788	2.69	14.5	0.608	24.9
May	1.93	<0.047300	0.266	1.24	5.32	29	1.12	63.2
June	1.28	<0.047000	0.263	0.849	3.13	14.3	0.554	36.6
July	1.32	<0.046600	0.336	0.958	4.84	17.6	0.698	34.8
August	0.94	<0.046700	0.142	<0.934000	3.43	16.1	<0.934000	38.7
September	1.39	<0.044900	0.174	<0.898000	3.81	19.7	<0.898000	41.7
October	0.784	<0.049300	0.125	0.612	2.73	14.1	0.609	22
November	1.12	<0.043700	0.418	0.896	2.53	18.6	1.39	41.1
December	0.937	<0.046300	0.197	0.68	2.33	12.3	0.549	50.9

Table 31. Heavy Metals: Delta (39-051-0001)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	<0.444000	<0.044400	0.12	0.828	4.14	6.52	<0.444000	41.9
February	<0.792000	<0.079200	0.102	0.977	5.59	6.54	0.81	25.5
March	<0.398000	<0.039800	0.121	0.666	13.2	7.61	0.515	58.2
April	0.483	<0.044500	0.106	1.44	7.05	19.5	0.68	53.3
May	1.34	<0.045400	0.141	1.18	4.33	15.2	0.797	24.4
June	1.04	<0.043800	0.236	1.24	6.19	12.9	1.01	37.2
July	0.612	<0.043600	0.193	0.95	9.52	11.7	0.586	56.7
August	0.771	<0.044100	0.117	1.14	8.74	15.3	0.775	49.1
September	0.801	<0.045400	0.183	0.693	4.54	6.09	0.531	21.8
October	0.882	<0.045100	0.101	0.922	5.22	9.41	<0.451000	35.2
November	0.941	<0.045100	0.486	1.03	3.72	10.7	0.557	33.5
December	0.711	<0.044600	0.0951	0.811	4.94	8.87	<0.446000	37.7

Table 32. Heavy Metals: Marion - 1 (39-101-0003)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	0.735	<0.042600	0.186	3.22	4.52	51.9	1.32	0.0136	40.8
February	0.832	<0.052800	0.279	6.3	7.78	104	1.48	0.0326	96.9
March	0.511	<0.034800	0.175	3.38	5.65	49.6	0.954	0.0139	57.3
April	1.41	<0.042300	0.331	7.92	22.4	142	2.77	0.0354	134
May	1.08	<0.041600	0.159	2.25	5.16	35.3	0.933	<0.004990	32.2
June	1.08	<0.040100	0.224	2.64	5.77	34.8	0.772	0.0137	64.5
July	1.4	<0.039500	0.382	14.7	20.2	191	2.63	0.0283	155
August	0.677	<0.040000	0.148	3.66	4.76	43.2	1.44	0.0151	71.8
September	0.81	<0.039800	0.133	1.6	3.38	22.5	1.34	0.0115	40.5
October	0.48	<0.041400	0.197	5.39	9.18	79.4	1.3	0.0188	66.8
November	0.564	<0.040400	0.446	4.07	6.59	64.7	1.55	0.0207	63.8
December	0.633	<0.040000	0.235	5.35	9.02	98.9	1.63	0.221	66.8

Table 33. Heavy Metals: Marion - 2 (39-101-0004)

	Monthly composite (ng/m³)								
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Mercury	Zinc
January	<0.500000	<0.050000	0.0952	1.03	2.14	8.42	<0.500000	0.0122	26
February	<0.643000	<0.064300	0.0996	1.89	2.89	24.7	0.643	0.0137	29.7
March	0.622	<0.042800	0.104	0.151	2.79	18.3	0.686	0.0121	60.5
April	<0.477000	<0.047700	0.097	1.64	3.45	18.4	0.658	0.0144	18.6
May	1.38	<0.045800	0.216	3.02	7.36	51.5	1.09	<0.005500	45.9
June	1.98	<0.047700	0.304	2.77	6.78	42.5	0.742	0.0194	80.8
July	1.04	<0.046700	0.184	3.39	4.87	40.6	0.858	0.0186	49.3
August	1.15	<0.046800	0.132	1.75	3.07	19.8	0.74	0.0153	69.1
September	0.915	<0.047800	0.13	1.74	3.37	22.4	0.919	0.0138	29
October	0.735	<0.058400	0.152	2.56	4.74	33.2	0.867	0.0184	41
November	0.874	<0.050400	0.506	3.77	5.28	58.4	1.27	0.0253	60.8
December	0.996	<0.051800	0.305	5.36	8.97	95.3	1.19	0.261	116

Table 34. Heavy Metals: Canton-1 (39-151-0024)

	Monthly composite (ng/m³)							
	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
January	0.613	<0.050100	0.268	2.45	45.2	55.9	0.881	148
February	<0.6250	<0.0625	0.145	5.96	30.1	179	1.15	54.5
March	0.816	<0.040900	0.173	3.13	46.5	88.6	0.884	37.8
April	0.866	<0.049200	0.204	5.25	14.5	89.2	1.02	73.9
May	1.16	<0.049600	0.295	5.71	33.5	159	1.38	79.4
June	1.47	<0.0501	0.44	5.72	143	149	1.4	89.3
July	2.02	<0.0472	0.476	3.69	15.4	72.6	0.875	76.3
August	1.33	<0.0473	0.19	1.97	7	40.9	0.777	41.7
September	1.24	<0.0478	0.223	1.2	4.6	14.2	0.579	18.4
October	0.984	<0.0480	0.284	1.34	5.4	15.3	0.658	30.1
November	1.32	<0.0474	0.48	1.04	3.5	13.2	0.597	26.7
December	0.978	<0.0471	0.314	1.17	3	14.4	0.544	53.2

Table 35. Heavy Metals: Canton-2 (39-151-0025)

	Monthly composite (ng/m³)							
	Arsenic	**Beryllium**	**Cadmium**	**Chromium**	**Lead**	**Manganese**	**Nickel**	**Zinc**
January	<0.5220	<0.0522	0.0629	1.17	7.69	12.3	0.632	27.6
February	<0.6580	<0.0658	0.0733	1.83	2.7	22.2	<0.6580	19.9
March	0.634	<0.043400	0.534	7.16	7.76	119	1.97	372
April	0.806	<0.049000	0.142	1.89	4.27	22	0.814	36.7
May	1.19	<0.050000	0.265	4.18	41.1	105	1.18	77.9
June	1.33	<0.0497	0.424	4.34	22.4	96.6	1.09	87.1
July	1.96	<0.0502	0.3	1.8	5.9	28.5	0.656	57.2
August	1.33	<0.0487	0.156	2.16	5	24.4	0.82	39.8
September	1.33	<0.0493	0.16	1.35	5	19.1	0.654	23.1
October	1.11	<0.0500	0.251	1.26	4.9	13.8	0.674	32.4
November	3.49	<0.0525	0.572	1.19	3.9	14.7	0.656	33.6
December	0.97	<0.0525	0.299	1.16	3	13.2	0.546	68.3

Table 36. Heavy Metals: Marietta (39-167-0008)

	Monthly composite (ng/m³)								
	Arsenic	**Beryllium**	**Cadmium**	**Chromium**	**Lead**	**Manganese**	**Nickel**	**Mercury**	**Zinc**
January	0.909	<0.047300	0.111	<0.473000	1.75	29.7	<0.473000	0.00931	19.7
February	<0.707000	<0.070700	<0.070700	<0.707000	1.39	22.8	<0.707000	0.0112	12
March	<0.483000	<0.048300	0.151	0.636	2.25	93	<0.483000	0.0111	15
April	<0.677000	<0.067700	0.12	0.756	2.03	41.5	<0.677000	0.0264	23.4
May	<0.662000	<0.066200	0.169	0.772	2.6	117	<0.662000	0.028	35.9
June	0.538	<0.052600	0.223	0.783	1.86	29.2	<0.526000	0.0336	20.9
July	0.85	<0.058800	0.15	1.37	2.63	157	0.768	0.0119	21
August	0.662	<0.059100	0.111	0.85	1.79	51	<0.591000	0.0137	21.7
September	0.857	<0.059900	0.294	1.98	1.74	50.9	<0.599000	0.014	15.3
October	<0.606000	<0.060600	0.838	0.783	2.37	147	<0.606000	0.0087	21.3
November	<0.620000	<0.062000	0.404	0.693	2.12	123	<0.620000	0.0166	23.8
December	0.728	<0.057400	0.502	1.18	3.67	305	<0.574000	0.0124	32.6

XI. AIR QUALITY INDEX (AQI)

There has been a daily reporting of ambient air quality in Ohio's major metropolitan areas in some form since 1971. A national Pollution Standards Index (PSI) was established in 1977 to report air quality. This index was adopted by Ohio EPA's District Offices and the Local Air Agencies to inform the public of daily air quality.

The AQI is a uniform "scaling" of five pollutants: particulate (PM_{10} and $PM_{2.5}$), CO, SO_2, ozone, and NO_2. The concentration level of each of these is calculated every day to determine the AQI. The pollutant with the highest AQI is reported to the media. A summary of AQI index values per pollutant is found in Table 37 below.

When the AQI exceeds, or is expected to exceed, 100 in a major city, the agency concerned issues a "health advisory". When pollution levels exceed an AQI of 200 and are projected to persist, an "air pollution episode" exists and the Governor declares an "alert." This initiates mandatory cutbacks of emissions from specified facilities to alleviate the situation. If the AQI were to surpass 300, 400 or 500, progressively greater cutbacks would be implemented to reduce pollutants to an acceptable level.

The AQI trend shows that Ohio's air quality has improved significantly. Although alerts were commonplace in the early 1970's, none have happened in over twenty years, and the number of health advisories has been greatly reduced.

Table 37. Comparison of AQI Values

	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	CO (ppm)	SO_2 (ppm)	Ozone (ppm)[1]		NO_2 (ppm)		
Index Value	**24-hr**	**24-hr**	**8-hr**	**24-hr**	**8-hr**	**1-hr**	**1-hr**	**Color**	**Category**
0-50	0-54	0.0-12.0	0.0-4.4	0-0.035	0.000-0.054		0-0.053	Green	Good
51-100	55-154	12.1-35.4	4.5-9.4	0.036-0.075	0.055-0.070		0.054-0.100	Yellow	Moderate
101-150	155-254	35.5-55.4	9.5-12.4	0.076-0.185	0.071-0.085	0.125-0.164	0.101-0.360	Orange	Unhealthy for Sensitive Groups
151-200	255-354	55.5-150.4	12.5-15.4	0.186-0.304	0.086-0.105	0.165-0.204	0.361-0.64	Red	Unhealthy
201-300	355-424	150.5-250.4	15.5-30.4	0.305-0.604	0.106-0.200	0.205-0.404	0.65-1.24	Purple	Very Unhealthy
301[2]+	425+	250.5 +	30.5+	0.605+	(2)	0.405+	1.25+	Maroon	Hazardous

[1] Areas are generally required to report the AQI based on eight-hour ozone values. The maximum of the eight-hour or one-hour is used.

[2] Eight-hour ozone values do not define AQI values >301. AQI values of 301 or higher then become calculated with one-hour ozone concentrations.

XII. MONITORING SITES

39-135-1001, Preble County

The following pages provide details on the 2023 monitoring network, including sites where VOC air toxics air monitoring is conducted. Parameters monitored at these sites are labeled as follows:

- CO Carbon Monoxide
- H2S Hydrogen Sulfide
- Met Meteorological data
- NO2 Nitrogen Dioxide
- O3 Ozone
- PMc Coarse particulate matter, *i.e.*, PM_{10} - $PM_{2.5}$ = PM_{coarse}
- Pb Lead
- PM10c PM_{10} Continuous
- PM10 Particulate matter with aerodynamic diameter < 10 µm (PM_{10})
- PM25c $PM_{2.5}$ Continuous
- PM25 Particulate matter with aerodynamic diameter < 2.5 µm ($PM_{2.5}$)
- PM1c Particulate matter with aerodynamic diameter < 1.0 µm (PM_1) Continuous
- PMsp $PM_{2.5}$ Speciation
- SO2 Sulfur Dioxide
- TSP Total Suspended Particulate
- VOC Volatile Organic Compounds

The first column of the table provides AQS codes[8], which have the following format:

- XX state code (the state code for Ohio is 39)
- XXX county code (odd numbers, alphabetical)
- XXXX site code

[8]Sites operated by U.S. EPA as part of their CASTNET monitoring network are identified with ^.

Table 38. Monitoring Network for 2023

AQS No.	County	Site Location	Parameter(s)
		A	
39-003-0009	Allen	2850 Bible Rd.	PM25, PM25c, O3, SO2
39-007-1001	Ashtabula	770 Lake Rd.	O3
39-009-0003	Athens	SR 377	PM25, PM25c
		B	
39-013-0006	Belmont	2 E. Ball Park St.	PM10c, PM25, PM25c, NO2, SO2
39-017-0015	Butler	3901 Lefferson	PM10c, PM25, PM25c
39-017-0018	Butler	1701 Runway Dr.	O3
39-017-0019	Butler	1200 Oxford State Rd.	PM10c, PM25, PM25c, SO2, VOC
39-017-0020	Butler	3350 Yankee Rd.	PM10c, PM25, PM25c, SO2, VOC
39-017-0021	Butler	1501 Made Industrial Dr.	SO2
39-017-0022	Butler	3214 Yankee Rd.	PM25, PM25c
39-017-0023	Butler	2200 Hensley Ave.	O3
39-017-9991^	Butler	Miami University	O3
		C	
39-023-0001	Clark	5171 Urbana Rd.	O3
39-023-0003	Clark	5400 Spangler Rd.	O3
39-023-0005	Clark	350 N. Fountain Ave.	PM25, PM25c
39-025-0022	Clermont	2400 Clermont Center Dr.	O3, PM25c
39-027-1002	Clinton	62 Laurel Dr.,	O3
39-029-0019	Columbiana	1250 St. George St.	Pb, metals
39-029-0020	Columbiana	2220 Michigan Ave.	PM10, Pb, metals
39-029-0023	Columbiana	500 Maryland Ave.	PM10, TSP, Pb, metals
39-035-0034	Cuyahoga	891 E. 152nd St.	PM25, PM25c, O3
39-035-0038	Cuyahoga	2547 St. Tikhon Ave.	PM10c, PM25, PM25c PMsp, SO2, TSP, Pb, metals, VOC
39-035-0045	Cuyahoga	4950 Broadway Ave.	PM10c, PM25, PM25c
39-035-0049	Cuyahoga	4150 E. 56th St.	Pb, metals
39-035-0051	Cuyahoga	1301 E. 9th	CO
39-035-0060	Cuyahoga	E. 14th & Orange	PM10c, PM25, PM25c, PMc, PM1c PMsp, O3, NO2, SO2, CO, VOC, Met
39-035-0064	Cuyahoga	390 Fair St.	O3
39-035-0065	Cuyahoga	4600 Harvard Ave.	PM10c, PM25, PM25c, PMsp, SO2
39-035-0073	Cuyahoga	25609 Emery Rd.	PM25, PM25c, NO2, CO
39-035-0076	Cuyahoga	6000 Canal Rd.	PMsp
39-035-5002	Cuyahoga	6116 Wilson Mills Rd.	O3
		D	
39-041-0002	Delaware	359 Main Rd.	O3

AQS No.	County	Site Location	Parameter(s)
		F	
39-047-9991^	Fayette	Deer Creek	O3
39-049-0029	Franklin	7600 Fodor Rd.	PM25c, O3
39-049-0034	Franklin	Korbel Ave.	PM10c, PM25, PM25c, NO2, SO2, VOC
39-049-0038	Franklin	7560 Smoky Row Rd.	PM25, PM25c, PM1c, NO2, CO, black carbon
39-049-0040	Franklin	2104 Jackson Pike	PM10c, PM25, PM25c, Pb, metals
39-049-0081	Franklin	5750 Maple Canyon Ave.	PM10c, PM25, PM25c, O3
39-051-0001	Fulton	200 Van Buren St.	Pb, metals
		G	
39-053-0004	Gallia	350 Watson Grove Rd.	SO2
39-053-0005	Gallia	583 Honeysuckle Dr.	SO2, Met
39-053-0006	Gallia	8323 SR 7 North	SO2
39-055-0004	Geauga	13000 Auburn Rd.	O3
39-057-0006	Greene	541 Ledbetter Rd.	O3
39-059-0003	Guernsey	62868-62998 Co Hwy 35	SO2
39-059-0004	Guernsey	60737-60733 OH-209	SO2
		H	
39-061-0006	Hamilton	11590 Grooms Rd.	PM25c, O3
39-061-0010	Hamilton	6950 Ripple Rd.	PM25c, O3, SO2
39-061-0014	Hamilton	Seymour & Vine, Cincinnati	PM25, PM25c VOC
39-061-0040	Hamilton	250 Wm. Howard Taft Rd.	PM10c, PM25, PM25c, PMc, PM1c, PMsp, O3, NO2, SO2, CO, VOC, black carbon, Met
39-061-0042	Hamilton	2101 W. Eighth St.	PM25, PM25c
39-061-0047	Hamilton	7529 Grace, Ave.	VOC
39-061-0048	Hamilton	3428 Colerain Ave.	PM25, PM25c, NO2, CO, black carbon
39-063-0005	Hancock	23921 Twp. Rd. 214	SO2
39-067-0005	Harrison	46700 Jewett Hopedale Rd.	VOC, Met
		J	
39-081-0017	Jefferson	618 Logan St.	PM10c PM25, PM25c, PMsp, O3, SO2, VOC
		K	
39-083-0003	Knox	4625 Lock Rd.	O3
		L	
39-085-0003	Lake	36010 Lakeshore Blvd.	O3
39-085-0007	Lake	177 Main St.	PM25, PM25c, O3, SO2
39-085-0008	Lake	5 High St.	PM10
39-087-0011	Lawrence	SR 141	O3
39-087-0012	Lawrence	450 Commerce Dr.	PM10, PM25, PM25c, O3, SO2
39-089-0005	Licking	310 Licking View Dr.	O3
39-089-0008	Licking	8955 E. Main St.	O3
39-093-0018	Lorain	4706 Detroit Rd.	O3
39-095-0008	Lucas	3040 York St.	SO2

AQS No.	County	Site Location	Parameter(s)
39-095-0024	Lucas	348 S. Erie St.	PM10c, PM25, PM25c, O3
39-095-0026	Lucas	4150 Airport Highway	PM25
39-095-0027	Lucas	200 S. River Rd.	O3
39-095-0035	Lucas	10739 Corduroy Rd.	O3, MET
39-095-1003	Lucas	163 Lee St.	PM25
		M	
39-097-0007	Madison	9940 SR 38 SW	O3
39-099-0015	Mahoning	91 Wick Oval St.	PM10c, PM25, PM25c, O3, SO2
39-101-0003	Marion	Hawthorne Ave.	Pb, metals
39-101-0004	Marion	640 Bellefontaine Ave.	Pb, metals
54-053-0001	Mason, WV	Highway 62	SO2, Met
39-103-0004	Medina	Ballash Rd.	PM25, PM25c, O3
39-109-0005	Miami	3825 N. SR 589	O3
39-113-0037	Montgomery	1401 Harshman Rd.	O3
39-113-0038	Montgomery	444 W. Third St.	PM10c, PM25, PM25c, PMc, PMsp
39-115-0004	Morgan	2535 SR 83	SO2
		N	
39-121-9991^	Noble	Quaker City	O3
		O	
39-123-0006	Ottawa	2517 State Rt. 590	Beryllium
39-123-0007	Ottawa	2124 S Slemmer Portage Rd.	Beryllium
39-123-0008	Ottawa	1338 S Portage River Rd.	Beryllium
39-123-0009	Ottawa	14405 W True Rd.	Beryllium
39-123-0010	Ottawa	15473 W State Rte. 105	Beryllium
39-123-0011	Ottawa	14850 State Rte. 105	Beryllium
39-123-0012	Ottawa	14244 W State Rte. 105	Beryllium
39-123-0013	Ottawa	14028 W State Rte. 105	Beryllium
39-123-0014	Ottawa	14681 W State Rte. 105	Beryllium
		P	
39-133-1001	Portage	1570 Ravenna Rd.	O3
39-135-1001	Preble	6940 Oxford Gettysburg Rd.	PM10c, PM25, PM25c, PMc, PMsp, O3, NO2, SO2, CO, Met
		S	
39-145-0013	Scioto	4862 Gallia St.	PM10c, PM25, PM25c
39-145-0015	Scioto	1526 Haverhill-Furnace Rd.	PM10c, PM25, PM25c
39-145-0019	Scioto	605 Washington St.	PM10
39-145-0020	Scioto	2840 Back Rd.	PM10c, SO2
39-145-0021	Scioto	2446 Gallia Pike	PM10c
39-145-0022	Scioto	1740 Gallia Pike	PM10c, SO2
39-151-0016	Stark	515 25th St.	O3
39-151-0017	Stark	1330 Dueber Ave.	PM10c, PM25, PM25c, PMsp

AQS No.	County	Site Location	Parameter(s)
39-151-0020	Stark	420 Market Ave.	PM25, PM25c
39-151-0022	Stark	45 S. Wabash Ave.	O3
39-151-0024	Stark	3150 Georgetown Rd., NE	Pb, metals
39-151-0025	Stark	719 Marietta Ave., NE	Pb, metals
39-151-4005	Stark	1175 W. Vine St.	O3
39-153-0017	Summit	80 Brittain Rd.	PM10, PM25, PM25c, SO2, black carbon
39-153-0023	Summit	642 W. Exchange St.	PM25, PM25c, PM25sp
39-153-0026	Summit	985 Gorge Blvd.	O3
		T	
39-155-0006	Trumbull	2323 Main Ave.	PM10
39-155-0011	Trumbull	842 Youngstown-Kingsville Rd.	O3
39-155-0013	Trumbull	6380 SR 87	O3
39-155-0014	Trumbull	540 Laird Ave. SE	PM10c, PM25, PM25c
39-155-0015	Trumbull	945 S. State St.	PM10
		W	
39-165-0007	Warren	416 Southeast St.	PM25c, O3
39-167-0004	Washington	2000 Fourth St.	O3
39-167-0008	Washington	SR 676	Pb, metals
39-167-0011	Washington	22275 SR 60	SO2
39-173-0003	Wood	347 N. Dunbridge Rd.	O3