Annual Ambient Air Monitoring Network Review

Department of Environment, Great Lakes, and Energy
Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909-7760

July 1, 2021

www.michigan.gov/air

Printed by authority of the Michigan Department of Environment, Great Lakes, and Energy
Current print costs are: $0.46 per page

EGLE **Michigan Department of Environment, Great Lakes, and Energy**

TABLE OF CONTENTS

Page

Introduction 1
- Federal Changes 1
- Historical Changes 1
- Recent Changes 2
- Changes and Recommendations for Michigan's Air Monitoring Network in 2022 2
- Network Review Goals 2
- Public Comment Process 3

Ambient Air Monitoring Network Requirements 4
- Other Monitoring Network Requirements 7
- Network Review Requirements 8
- Monitor Deployment by Location 9
- Quality Assurance (QA) 11

Lead Monitoring Network 12
- Background 12
- The 2008 Lead NAAQS 12
- Point Source-oriented Monitoring 13
- Non-source-oriented/NCore Monitoring Network Design 13
- Lead Co-location Requirements 13
- Waiver(s) From Lead Monitoring 18
- Lead Quality Assurance 18
- Plans for the 2022 Lead Monitoring Network 18

NCore Monitoring Network 19
- Network Design 19
- Michigan NCore Sites 20
- NCore Quality Assurance 21
- Plans for 2022 NCore Monitoring Network 21

Ozone Monitoring Network 25
- Ozone Season and Modeling 32
- Ozone Quality Assurance 32
- Ozone Area Designations 32
- Plans for the 2022 Ozone Monitoring Network 34

$PM_{2.5}$ FRM Monitoring Network 35
- $PM_{2.5}$ Quality Assurance 42
- Plans for the 2022 $PM_{2.5}$ FRM Monitoring Network 42

Continuous $PM_{2.5}$ Monitoring Network 43
- $PM_{2.5}$ Continuous Quality Assurance 45
- Plans for the 2022 $PM_{2.5}$ TEOM and $PM_{2.5}$ BAM Network 46

Speciated $PM_{2.5}$ Monitoring Network 47
- Continuous Speciation Measurements 47
- Speciation Quality Assurance 47
- Plans for the 2022 $PM_{2.5}$ Speciation Monitoring Network 49
- MetOne SASS and URG 3000N 49
- Black Carbon – Aethalometer 49

PM_{10} Monitoring Network 50
- PM_{10} Quality Assurance 54
- Plans for the 2022 PM_{10} Monitoring Network 55

TABLE OF CONTENTS, Continued

Page

Carbon Monoxide (CO) Monitoring Network....56
CO Quality Assurance....56
Plans for the 2022 CO Monitoring Network....57
Nitrogen Dioxide (NO_2) and NO_Y Monitoring Network....60
Tier 1: Near-roadway NO_2 Monitors – Phase 2....62
Tier 2: Area-wide NO_2 Monitors....62
NO_2 Monitoring for GHIB Study....63
NO_2 Monitoring for NSR....64
NO_Y Monitoring....64
NO_2 and NO_Y Quality Assurance....64
Plans for the 2022 NO_2 and NO_Y Monitoring Network....65
Sulfur Dioxide (SO_2) Monitoring Network....67
SO_2 Monitoring and Modeling Requirements....69
SO_2 Quality Assurance....70
Plans for the 2022 SO_2 Monitoring Network....71
Trace Metal Monitoring Network....74
Trace Metal Quality Assurance....77
Volatile Organic Compound (VOC) Monitoring Network....78
VOC Quality Assurance....78
Plans for the 2022 VOC Monitoring Network....78
Carbonyl Monitoring Network....81
Carbonyl Quality Assurance....81
Plans for the 2022 Carbonyl Monitoring Network....82
Polycyclic Aromatic Hydrocarbons (PAHs) Monitoring Network....84
PAH Quality Assurance....84
Plans for the 2022 PAH Monitoring Network....84
PAMS Network....86
Network Decision....87
Meteorological Measurements....89
Meteorological Equipment Quality Assurance....89
Plans for the 2022 Meteorological Monitoring Network....89
Near-roadway Special Purpose Monitors....92
GHIB Study....92
Adequacy of Michigan's Monitoring Sites....94

Appendix A: Acronyms and Their Definitions
Appendix B: Summary of Comments Received and Replies

TABLE OF CONTENTS, Continued

List of Tables

Page

1 Composition of Core-based Statistical Areas in Michigan 6
2 Composition of Micropolitan Statistical Areas in Michigan 7
3 Monitor Distribution of the 2021-2022 Network in Michigan 10
4 Deployment Schedule of Lead Sites and Calculation of the Total Number of Co-located Lead Sites 15
5 Michigan's Lead Monitoring Network 16
6 Measurements Collected at the Grand Rapids–Monroe St. (260810020) NCore Site 22
7 Measurements Collected at the Allen Park (261630001) NCore Site 23
8 Michigan's NCore Monitoring Network 24
9 SLAMS Minimum Ozone Monitoring Requirements 25
10 Application of Minimum Ozone Requirements in the October 17, 2006 – Final Revision to the Monitoring Regulation to Michigan's Ozone Network 26
11 Michigan's Ozone Monitoring Network 2022 30
12 $PM_{2.5}$ Minimum Monitoring Requirements 35
13 Application of the Minimum $PM_{2.5}$ Monitoring Requirements in the October 17, 2006, Final Revision to the Monitoring Regulation to Michigan's $PM_{2.5}$ FRM Network 36
14 Michigan's $PM_{2.5}$ FRM Network 40
15 Michigan's Continuous $PM_{2.5}$ Monitoring Network 44
16 Michigan's $PM_{2.5}$ Speciation Network 48
17 PM_{10} Minimum Monitoring Requirements (Number of Stations per MSA) 50
18 Application of the Minimum PM_{10} Monitoring Regulations in the April 30, 2007, Correction to the October 17, 2006, Final Revision to the Monitoring Regulation to Michigan's PM_{10} Network 52
19 Michigan's PM_{10} Monitoring Network 53
20 Michigan's CO Monitoring Network 59
21 NO_2 Network Design 61
22 Michigan's NO_2 and NO_Y Monitoring Network 66
23 Population Weighted Emission Index Based Monitoring Requirements 68
24 Population Weighted Emissions Index Totals for CBSAs in Michigan 68
25 Michigan's SO_2 Monitoring Network 72
26 Michigan's Trace Metal Monitoring Network 75
27 Michigan's VOC Monitoring Network 80
28 Michigan's Carbonyl Monitoring Network 83
29 Michigan's PAH Monitoring Network 85
30 PAMS Target Compound List 88
31 Meteorological Measurements in Michigan 91
32 Instruments and Sites Added for the Gordie Howe International Bridge Study 93
33 Summary of Waivers for Michigan's Monitoring Network 94

TABLE OF CONTENTS, Continued

List of Figures

Page

1 MSAs in Michigan's Lower Peninsula 4
2 Michigan's Lead Monitoring Network 17
3 Michigan's NCore Monitoring Network 24
4 Comparison of 4th Highest 8-Hour Ozone Values Averaged Over Three Years: 2016-2018, 2017-2019 and 2018-2020 27
5 Ozone Design Values 2014–2016 29
6 Michigan's Ozone Network in 2021-2022 31
7 Michigan's $PM_{2.5}$ FRM Monitoring Network 41
8 Michigan's Continuous $PM_{2.5}$ Network 45
9 Michigan's $PM_{2.5}$ Speciation (SASS) Network 49
10 Michigan's PM_{10} Monitoring Network 54
11 Michigan's CO Monitoring Network 58
12 Comparison of Eliza Howell Park Location with other Air Monitoring Stations and Roadway Segments with High Traffic Counts 62
13 NO_2 Emissions in Kent and Ottawa Counties 63
14 Michigan's NO_2 and NO_Y Monitoring Network 67
15 Michigan's SO_2 Monitoring Network 73
16 Michigan's Trace Metal Monitoring Network 76
17 Michigan's VOC Monitoring Network 79
18 Michigan's Carbonyl Monitoring Network 82
19 Michigan's PAH Monitoring Network 86

INTRODUCTION

The purpose of this document is to examine Michigan's ambient air monitoring network and recommend changes based on monitor history, population distribution, and modifications to federal monitoring requirements under the Clean Air Act (CAA), Title 40 of the Code of Federal Regulations (CFR) Part 58. Recommended changes to this network will be implemented during the 2022 calendar year, contingent upon adequate levels of funding.

Federal Changes

Historically there have been a number of changes at the federal level that have impacted the design of Michigan's monitoring network. These changes include revisions to the National Ambient Air Quality Standards (NAAQS) for Lead (Pb), Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), secondary NAAQS for NO_2 and SO_2, Particulate Matter (PM), and Ozone. Changes or revisions in the ambient air monitoring rules, made by the United States Environmental Protection Agency (USEPA) can be found in 40 CFR Part 58, which contains the ambient air monitoring requirements for all criteria pollutants. [1]

Historical Changes

Lead: On November 12, 2008, the USEPA modified, strengthened, and reduced the primary health-based lead NAAQS from a maximum quarterly average of 1.5 µg/m^3 to a 3-month rolling average of 0.15 µg/m^3.

Sulfur Dioxide: On November 16, 2009, the USEPA proposed to modify the SO_2 NAAQS and proposed the creation of a two-tier monitoring network based on SO_2 emissions, requiring a total of 12 SO_2 stations in Michigan. The SO_2 NAAQS became final on August 23, 2010. The network design was modified to a single tier requiring a total of five SO_2 monitors in Michigan. Changes to the SO_2 monitoring network are discussed in this network review and were required to be implemented before January 1, 2013.

On February 12, 2010, a secondary NAAQS for SO_2 was proposed and the final rule was effective June 4, 2012. The USEPA chose to retain the standards while adding additional monitoring requirements

Nitrogen Dioxide: On February 9, 2010, the USEPA changed the NO_2 NAAQS and required the deployment of a two-tiered NO_2 monitoring network consisting of near-roadway and community monitors. Design of the new NO_2 monitoring network is discussed in this network review. These NO_2 monitors had a deployment deadline of January 1, 2013.

[1] https://www.federalregister.gov/documents/2020/01/08/2019-28219/extension-of-start-date-for-revised-photochemical-assessment-monitoring-stations

On February 12, 2010, a secondary NAAQS for NO_2 was proposed, and the final rule was effective June 4, 2012. The USEPA chose to retain the standards while adding additional monitoring requirements.

On December 22, 2016, the USEPA finalized the rule to remove the requirement of tier III near-road NO_2 monitors.

Carbon Monoxide: On August 13, 2011, the USEPA proposed to retain the CO NAAQS level while adding additional monitoring requirements. The USEPA proposed that CO monitors be added to the near-roadway sites. These CO monitors had a deployment deadline of January 1, 2014.

Particulate Matter: The USEPA revised and lowered the $PM_{2.5}$ annual average NAAQS to 12.0 $\mu g/m^3$, which was effective March 18, 2013.

Ozone: Effective October 26, 2015, the USEPA revised and strengthened the 8-hour ozone NAAQS to 0.070 parts per million (ppm).

Recent Changes

Ozone: Effective December 20, 2019, the USEPA extended the start date for the required Photochemical Assessment Monitoring Stations (PAMS) from June 1, 2019, to June 1, 2021. This extension was made to give states more time to acquire the necessary equipment and expertise needed to successfully make the required PAMS measurements. The PAMS network is designed to evaluate the precursor compounds that contribute to the formation of ozone.

Changes and Recommendations for Michigan's Air Monitoring Network in 2022

No new changes are being made to Michigan's ambient air monitoring network during 2022. If funding cuts occur, additional changes to the network may need to be implemented.

Lead and Metals: EGLE lost site access to S. Delray (261630027) and had to shut it down on April 6, 2020. However, due to the construction of the Gordie Howe International Bridge (GHIB), three new sites were added in 2018 to the S. Delray area, which measure metals along with several other parameters.

Network Review Goals

The Michigan Ambient Air Monitoring Network Review will describe the ambient air monitoring network, show how the network meets the USEPA's monitoring regulations, discuss the public comment procedure, summarize recent changes to the network, and address potential impacts of other actions in greater detail. All discussions of air monitors reference a unique nine-digit site identification code to remove all ambiguity regarding the monitor location.

Public Comment Process

The USEPA requires that EGLE document the process for obtaining public comments and include any comments received through the public notification process. As such, on May 18, 2021, it was announced through the AQD list serve that this network review document was placed on the Air Quality Division (AQD) section of EGLE's Internet home page to solicit comments from the general public and stakeholders. In addition, the public comment period will be announced in a press release. Reviewers are given 30 calendar days from the date the draft network review report is posted to provide written comments. Written comments are accepted until close of business June 18, 2021, either by e-mail or by postal service (verbal comments are not accepted) and should be sent to:

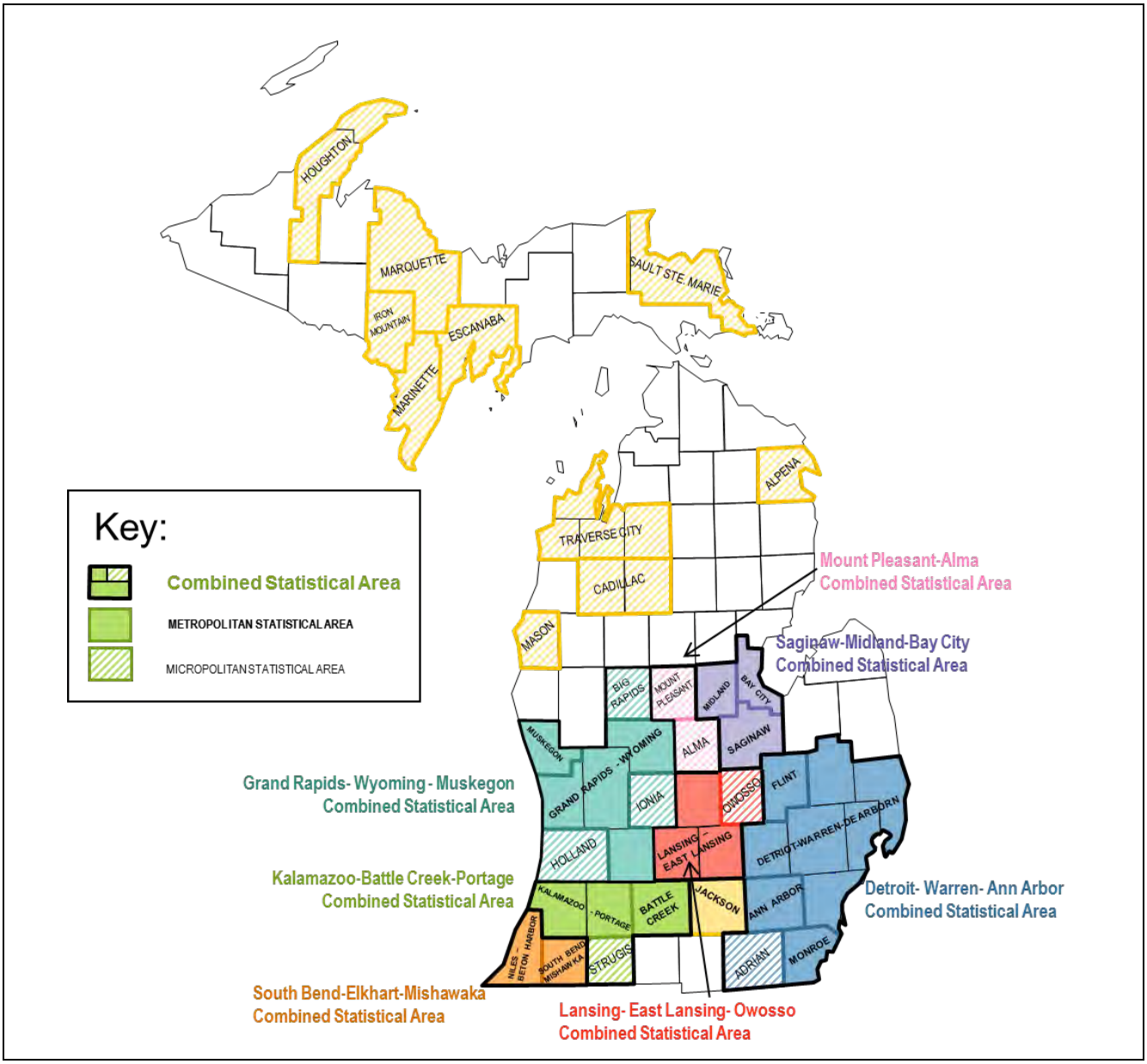
Navnit K. Ghuman
EGLE – Air Quality Division
3058 West Grand Blvd., Suite 2-300
Detroit, MI 48202
GhumanN@Michigan.gov

All written comments that are received will be organized by topic, summarized, and addressed in the final version of the Michigan Ambient Air Monitoring Network Review. The final document will be placed on the AQD section of EGLE's Internet home page and sent to the USEPA Region 5 office for approval. Hardcopies of the final version will be available for inspection, by appointment only, free of charge, at the AQD offices located in Lansing (525 West Allegan Street) or Detroit (3058 West Grand Boulevard, Suite 2-300). Requests for hard copies of the plan may incur a nominal fee to cover copying and/or mailing costs. These requests should be directed to Ms. Navnit K. Ghuman, AQD, 313-456-4695, GhumanN@Michigan.gov.

AMBIENT AIR MONITORING NETWORK REQUIREMENTS

The minimum network design criteria for ozone, $PM_{2.5}$ (particulate matter with an aerodynamic diameter less than or equal to [≤] 2.5 micrometers) and PM_{10} (≤ 10 micrometers) are based on the 2010 Metropolitan Statistical Area (MSA) geographical borders, population totals, and historical concentrations. The MSA outlines for Michigan are shown in **Figure 1** [2]

Figure 1: MSAs in Michigan's Lower Peninsula



[2] https://www2.census.gov/geo/maps/metroarea/stcbsa_pg/Feb2013/cbsa2013_MI.pdf

To be classified as an MSA, an area must have an urban core population totaling at least 50,000 people in the most recent decennial census. Micropolitan statistical areas contain an urban core of at least 10,000 (but less than 50,000). MSAs that consist of one or more counties, have a sizeable urban cluster or a high level of commuting to or from an urban cluster. MSAs and/or micropolitan areas are grouped to form consolidated statistical areas (CSAs), also shown in **Figure 1**. A CBSA is defined as an entity consisting of the county or counties associated with at least one urbanized area/urban cluster of at least 10,000 in population, plus adjacent counties having a high degree of social and economic integration. Changes to the metropolitan and micropolitan areas as a result of the 2010 Census were released in 2013. The areas affected include Midland, Hillsdale, Three Rivers, Ludington, and Whitehall. However, the remainder of MSAs in the state were unaffected by the 2010 Census.

The specific counties that make up each MSA or micropolitan area in Michigan are listed in **Table 1 and Table 2**.[3] These geographical areas, coupled with their population totals and historical ambient monitoring data, were used to develop the minimum monitoring network design for ozone, $PM_{2.5}$, and PM_{10}. **Table 1** shows the adjusted 2019 population totals. Due to COVID-related delays, the 2020 census data is not available and 2019 adjusted totals have been used in this review.

Some proposed monitoring requirements are based on micropolitan statistical areas with an urban cluster of at least 10,000 but less than 50,000 people. **Table 2** shows 2019 population estimates for micropolitan areas in Michigan.

[3] Metropolitan and Micropolitan Statistical Areas: April 1, 2010 to July 1, 2019 (CBSA-EST2009-1). Source: U.S. Census Bureau, Population Release Date March 2019. https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-metro-and-micro-statistical-areas.html

Table 1: Composition of Core-based Statistical Areas in Michigan

Combined Statistical Areas	Population Estimates 2019	Core-based Statistical Areas	Population Estimates 2019	County
Detroit-Warren-Ann Arbor CSA	5,341,994	Detroit-Warren-Dearborn MSA	4,319,629	Wayne
				Oakland
				Macomb
				Livingston
				St. Clair
				Lapeer
		Flint MSA	405,813	Genessee
		Ann Arbor MSA	367,601	Washtenaw
		Monroe MSA	150,500	Monroe
		Adrian Micropolitan	98,451	Lenawee
Grand Rapids-Wyoming-Muskegon CSA	1,476,680	Grand Rapids-Wyoming MSA	1,077,370	Kent
				Ottawa
				Montcalm
				Barry
		Muskegon MSA	173,566	Muskegon
		Holland Micropolitan	118,081	Allegan
		Ionia Micropolitan	64,210	Ionia
		Big Rapids Micropolitan	43,453	Mecosta
Lansing-East Lansing-Owosso CSA	618,583	Lansing-East Lansing MSA	550,391	Ingham
				Eaton
				Clinton
		Owosso Micropolitan	68,192	Shiawassee
Kalamazoo-Battle Creek-Portage CSA	460,189	Kalamazoo-Portage MSA	265,066	Kalamazoo
				Van Buren
		Battle Creek MSA	134,159	Calhoun
		Sturgis Micropolitan	60,964	St. Joseph
Saginaw-Midland-Bay City CSA	376,821	Saginaw MSA	190,539	Saginaw
		Bay City MSA	103,126	Bay
		Midland MSA	83,156	Midland
South Bend-Elkhart-Mishawaka, IN-MI CSA	729,613	South Bend-Mishawaka, IN-MI MSA	323,613	St. Joseph, IN
				Cass
		Elkhart-Goshen, IN MSA	206,341	Elkhart, IN
		Niles-Benton Harbor MSA	153,401	Berrien
		Plymouth, IN Micropolitan	46,258	Marshall, IN
Mount Pleasant-Alma CSA	110,583	Mount Pleasant Micropolitan	69,872	Isabella
		Alma Micropolitan	40,711	Gratiot
none		Jackson MSA	158,510	Jackson

Table 2: Composition of Micropolitan Statistical Areas in Michigan

Micropolitan Area	Principal Cities	Counties	Population Estimates 2019
Adrian	Adrian	Lenawee	98,451
Alma	Alma	Gratiot	40,711
Alpena	Alpena	Alpena	28,405
Big Rapids	Big Rapids	Mecosta	43,453
Cadillac	Cadillac	Missaukee,Wexford	48,749
Coldwater	Coldwater	Branch	43,517
Escanaba	Escanaba	Delta	35,784
Hilsdale	Hillsdale	Hillsdale	45,605
Holland	Holland(pt.)	Allegan	118,081
Houghton	Houghton	Houghton,Keweenaw	37,800
Ionia	Ionia	Ionia	64,210
Iron Mountain	Iron Mountain,MI	Dickinson,MI:Florence,WI	29,534
Ludington	Ludington	Mason	29,144
Marinette	Marinette,WI	Menominee,MI:Marinette,WI	63,130
Marquette	Marquette	Marquette	66,699
Mount Pleasant	Mount Pleasant	Isabelle	69,872
Owosso	Owosso	Shiawassee	68192 *
Sault Ste.Marie	Sault St. Marie	Chippewa	37,349
Sturgis	Sturgis	St.Joseph	60,964
Traverse City	Traverse City	Benzie, Grand Traverse, Kalkaska, Leelanau	150,653

Other Monitoring Network Requirements

NCore sites provide a full suite of measurements at one location. NCore stations collect the following measurements: year-round ozone, SO_2 (trace), CO (trace), NO_Y (reactive oxides of nitrogen), $PM_{2.5}$ FRM, continuous $PM_{2.5}$, speciated $PM_{2.5}$, PM coarse ($PM_{10-2.5}$), wind speed, wind direction, relative humidity, and ambient temperature. Previously, a minimum of 10 NCore sites nationwide measure lead; however, this requirement was removed in 2016. The NCore stations in Michigan, located at Grand Rapids–Monroe St. (260810020) and Allen Park (261630001), became operational January 1, 2010; one full year ahead of schedule.

The 2015 Ozone Standard added an additional requirement to the NCore sites by requiring PAMS monitors to be located at certain NCore sites. The two NCore sites in Michigan were initially required to implement PAMS monitoring on June 1, 2019, but due to a delay in federal funding, this deadline was extended to June 1, 2021. The AQD received USEPA approval for the Detroit E 7 Mile site to host the PAMS monitoring rather than the Allen Park NCore site. Both sites will conduct the PAMS suite of measurements.

State and Local Air Monitoring Stations (SLAMS) monitors will supplement the network and improve spatial coverage. Specific network design criteria are contained in the monitoring regulations that describe the SLAMS monitoring networks for criteria pollutants. These requirements are discussed in detail in the remainder of this review.

Network Review Requirements

According to 40 CFR Part 58.10, an Air Monitoring Network Review should:

- Be conducted at least once a year;
- Determine if the system meets the monitoring objectives stated in Appendix D of 40 CFR Part 58 "Network Design Criteria for Ambient Air Quality Monitoring"[4];
- Determine if the system meets the appropriate spatial scales and monitoring objectives, population-driven requirements, and the minimum number of stations that are required based on the likelihood of exceeding the NAAQS;
- Identify needed modifications to the network including termination and relocation of unnecessary stations;
- Identify any new stations that are necessary;
- Correct any inadequacies previously identified; and
- Be used as a starting point for five-year regional assessments.

Elements that must be included in the Network Review are:

- The USEPA's Air Quality System (AQS) site identification number;
- Site locations including coordinates and street address;
- Sampling and analysis methods, including parameter codes;
- Operating schedule;
- Monitoring objective and spatial scales;
- Identification of those sites that are suitable and not suitable for comparison to the NAAQS (for $PM_{2.5}$ only);
- The MSA, CBSA, or CSA represented by each monitor; and
- Evidence that the siting and operation of the monitor meets 40 CFR Part 58, Appendices A (quality assurance requirements), C (ambient air quality monitoring), D (network design criteria), and E (probe and monitoring path siting criteria).

For Michigan, the site-specific data is summarized in various tables throughout the review.

The modifications to the network should address:

- New census data;
- Changes in air quality levels; and
- Changes in emission patterns.

[4] "Environmental Protection Agency Ambient Air Quality Surveillance Regulations." 40 CFR Part 58, Appendix D; April 27, 2016.

The time frame for implementation of modifications is one year from the time of the previous network review. Changes will be made on a calendar year basis whenever possible.

Monitor Deployment by Location

Table 3 summarizes the distribution of ambient air monitors by pollutant in operation in Michigan during 2021-2022. The distinction is made between building and trailer to indicate differences in floor space and temperature control, information useful in planning deployment of new monitors.

Table 3: Monitor Distribution of the 2021-2022 Network in Michigan

Site Name	AQS ID	O_3	$PM_{2.5}$ FRM	Continuous FEM $PM_{2.5}$	Speciation	PM_{10}	PM Coarse	CO	NO_2	NOy	SO_2	Metals (TSP)	Black Carbon	VOCs	Carbonyls	PAHs	Meteorological	Building/Trailer
Holland	260050003	x		MB													x	T
Bay City	260170014			MB													x	T
Benzonia (Frankfort)	260190003	x																T
Coloma	260210014	x															x	T
Cassopolis	260270003	x															x	B
Rose Lake 2	260370002	x																B
Flint	260490021	x	6d	MB													x	T
Otisville	260492001	x															x	T
Harbor Beach	260630007	x															x	T
Belding - Merrick St.	260670003											Pb & 4						
Lansing Filley	260650018	x	3d	T					x		x						x	T
Kalamazoo	260770008	x		T													x	T
Gr.Rapids-Monroe St	260810020	x	3d	TX	x	TX	TX	Tr	P	Tr	Tr			P	P		x	T
Gr.Rapids-Near-road	260810023			MB				x	x								x	
Evans	260810022	x															x	T
Tecumseh	260910007	x		TB													x	T
New Haven	260990009	x		T													x	T
Sterling Hts/Freedom	260990021																x	
Warren	260991003	x																T
Manistee (Tribal)	261010922	x	3d														x	B
Scottville	261050007	x															x	T
Houghton Lake	261130001	x		MB					x								x	T
Muskegon-Green Crk	261210039	x															x	T
Oak Park	261250001	x	3d														x	T
Pontiac	261250011																x	
Rochester	261250012																x	
Jenison	261390005	x		TX		TX											x	T
Port Huron	261470005	x		T							x						x	T
Port Huron-Rural St.	261470031											Pb & 4						
Seney	261530001	x		MB													x	T
Ypsilanti	261610008	x	6d	TB													x	T
Allen Park	261630001	x	3d	TX	x	TX	TX	Tr		Tr	Tr		x				x	T
River Rouge	261630005											Pb & 4			x		x	T
Detroit -SW HS	261630015		3d	T	x	x			x		x	Pb & 4	x	x	x		x	B
E. 7 Mile - Detroit	261630019	x	3d						P	Tr				P	P		x	B
Joy Rd. - Detroit	261630026																x	
Dearborn	261630033		3d&6d	Te	x	x&Te						x	x	x	x	x	x	B
Eliza Howell	261630093			MB				x	x								x	T
Livonia Near-road 2	261630101							x	x								x	T
NMH48217	261630097			Te							x	Pb & 4						T
DP4th	261630098			T				x	x		x	Pb & 4	x					T
Trinity	261630099			T				x	x		x	Pb & 4	x				x	T
Military	261630100			T					x		x	Pb & 4	x					T
	Total	26	10	22	4	5	2	7	11	3	9	9	6	4	5	1	35	36

3d a run every three days
6d a run every six days

Te TEOM
T T640
TX T640X
MB MetOne BAM
TB ThermoBAM

P PAMS
Tr Trace

psd pending shut down
B/T/S Building/Trailer/Shelter
Pb & 4 Lead &Metals suite: Mn, As, Cd, Ni,

Quality Assurance (QA)

EGLE has an approved Quality Management Plan (QMP). In turn, the Air Monitoring Unit (AMU) has a Quality Assurance Project Plan (QAPP), which covers operation of the ambient air network. The QAPP addresses criteria pollutants, air toxics, metals, and particulates including the USEPA $PM_{2.5}$ Speciation Trends Network (STN). Separate QAPPs exist for the National Air Toxics Trend Site (NATTS), PAMS, and NCore. Special purpose monitoring projects also have dedicated QAPPs. The AMU has approved standard operating procedures, standardized forms and documentation policies, and a robust audit and assessment program to ensure high data quality.

As part of the network review process, it is important to ensure that each monitor meets the specific requirements in 40 CFR Part 58, Appendix A, governing proper calibration and operation, proper probe height, and monitor path length. In addition, the site itself must meet specific criteria governing distances from large trees and buildings, exhaust vents, highways, etc. To address the adequacy of these operational parameters, various types of audits are performed.

The USEPA finalized revisions to the ambient air monitoring requirements for criteria pollutants, which were published in the *Federal Register* on March 27, 2016, and became effective on April 27, 2016. EGLE has implemented most of these changes and has procured the equipment to fully implement the requirement for conducting lower level annual audit points for the gaseous monitors.

Audits are conducted by the AMU's Quality Assurance (QA) Team, which has a separate reporting line of supervision. The audits are conducted on the particulate-based monitors every six months ($PM_{2.5}$ FRM, continuous $PM_{2.5}$ and PM_{10}, $PM_{2.5}$ Speciation, High Volume TSP [total suspended particulate], and PM_{10}) and the gaseous monitors (CO, SO_2, ozone, NO_Y, NOx, and NO_2) at least once a year. All audit results are reported to AQS quarterly. The toxics monitors (volatile organic compounds [VOCs], carbonyl compounds, and poly-aromatic hydrocarbons [PAH]) are also audited once a year and the aethalometers are audited every six months by the QA Team. These audits are conducted with independent equipment and gases, which are only used for quality assurance. The AMU's QA Coordinator reviews the results from all audits.

External audits are conducted annually by the USEPA. The USEPA conducts Performance Evaluation Program (PEP) audits for $PM_{2.5}$ samplers, eight sites per year, and National Performance Audit Program (NPAP) for the gaseous monitors, 20 percent of the sites, per year using a Thru-The-Probe (TTP) audit system. The USEPA also conducts program-wide Technical Systems Audits (TSA) every three years to evaluate overall program operations and assess adequacy of documentation and records retention. External audits are also conducted on the laboratory operations for air toxics (VOCs and carbonyls) and metals through the use of performance evaluation samples. The concentrations of audit samples are unknown to both the AQD staff and EGLE Environmental Laboratory staff.

LEAD MONITORING NETWORK

Background

On December 14, 2010, the USEPA revised the ambient monitoring requirements to better address possible exposures to lead.[5] On January 5, 2015, the USEPA proposed to retain the current standard. Monitoring is required for point sources that emit 0.5 tons of lead per year or more, if modeling indicates that the maximum concentration is more than half of the level of the air quality standard. If modeling indicates that there is little likelihood of violating the NAAQS, a waiver from monitoring may be obtained from the regional administrator.

The final component of the 2010 revisions to the monitoring regulations includes the addition of population-oriented lead monitors at NCore stations that are located in CBSAs with populations greater than 500,000. In the final monitoring regulations of 2016, the USEPA has removed lead monitoring requirement at NCore sites, provided the sites are attaining the standard.

To place these new monitoring requirements into context, the 2008 lead NAAQS is reviewed below, as are changes already implemented in the lead network.

The 2008 Lead NAAQS

The 2008 lead NAAQS reduced the level of the standard from a maximum quarterly average of 1.5 µg/m^3 to 0.15 µg/m^3 as a rolling three-month average. To determine if the primary NAAQS is met, the maximum three-month average within a three-year period is compared to the level of 0.15 µg/m^3.

In addition to changing the level and form of the standard, the 2008 NAAQS also changed monitoring requirements. The USEPA required that ambient monitoring be performed downwind of point sources emitting one ton or more per year of lead, unless modeling proved that the sources didn't pose a health risk. In 2010, the new per-ton threshold was reduced to 0.5 ton/year.

The NAAQS retained the Total Suspended Particle (TSP) size fraction of lead, but acknowledged that agencies may, under certain conditions, measure lead as PM_{10} if low volume sampling devices are used. EGLE is currently using high volume TSP samplers to measure lead and will continue to do so for compliance with the NAAQS and consistency with historical data. The NAAQS requires that lead sampling be conducted on a once every six-day schedule. The filters are analyzed by EGLE laboratory using ICP/MS. EGLE follows the USEPA sampling schedule published yearly on the USEPA web site at:
http://www.epa.gov/sites/production/files/2020-11/documents/2021_sampling_schedule.pdf

[5] "Environmental Protection Agency National Ambient Air Quality Standards for Lead; Final Rule." 40 CFR Parts 50, 51, 53 and 58, November 12, 2008.

Point Source-oriented Monitoring

In 2018, EGLE added three new lead monitoring sites near the GHIB. Additional site details are in the Special Purpose Monitoring section.

For 2022, there are no new facilities that need to be investigated with regard to the lead NAAQS requirements. The Merrick St. site (260670003) and the Port Huron Rural St. site (261470031) are still operating.

Non-source-oriented/NCore Monitoring Network Design

According to the November 12, 2008, lead NAAQS, each CBSA with a population equaling or exceeding 500,000 people shall have a lead monitoring station to measure neighborhood scale lead in the urban area. Part of the revised 2016 USEPA regulations stated removal of lead monitoring requirement at NCore sites, provided they are attaining the standard. As a result, EGLE discontinued lead sampling at the two NCore sites at Grand Rapids (260810020) and Allen Park (261630001) in 2020.

Lead Co-location Requirements

If a primary quality assurance organization (PQAO) has a mixture of source and non-source-oriented lead sites, the number of co-located lead sites is equal to 15 percent of the total number of these lead sites. According to the *Federal Register,* the co-located site should be at the location with the highest lead concentrations. **Table 4** describes the deployment schedule for various components of the EGLE lead network and total number of co-located lead sites that are required.

EGLE prefers to retain one co-located lead site at the NATTS site at Dearborn (261630033), which is located close to many industrial sources including a steel mill, automotive manufacturing plant, and a rail yard. The station is sited at Salina Elementary School. Typically, NATTS sites determine lead as PM_{10} using a high volume sampler and thus do not meet the monitoring requirements, which specify the use of a high volume TSP sampler or a low volume PM_{10} sampler under certain instances. However, EGLE opted to collect co-located lead measurements as both TSP and PM_{10} at the Dearborn site to continue generating trend data, promote comparability with other NATTS sites in the nation, and to determine precision for both size fractions. In addition, a Met One SASS monitor supports the measurement of lead as $PM_{2.5}$, rounding out the suite of various particle sizes.

As shown in **Table 4,** the total number of lead sites in Michigan was expanded in 2018 when the new GHIB sites were installed. A second co-located site for lead was established to meet the 15 percent requirement. A second co-located monitor was added to the Port Huron-Rural St. site (261470031) in August 2018.

EGLE lost site access to S. Delray (261630027) on W. Jefferson Ave. due to a change in property ownership, and on April 6, 2021, the site was shut down, resulting in the loss of a historical lead site. The loss of this site reduces the state network to nine sites, which requires only one co-located site; however, EGLE plans to operate co-located samplers at both Dearborn and Port Huron.

Table 5 summarizes the lead monitoring site information for the Michigan lead network in 2022. **Figure 2** shows monitoring site locations in the 2022 network.

Table 4: Deployment Schedule of Lead Sites and Calculation of the Total Number of Co-located Lead Sites

Site Name and ID	Site Purpose	2014	2015	2016	2017	2018	2019	2020	2021	2022
Belding-Reed St (260670002)	Source -oriented	x	x	x	x	x				
Belding (260670003)	Source -oriented	x	x	x	x	x	x	x	x	x
Grand Rapids-Monroe St. (260810020)	NCore Non-Source -oriented	x	x	x	x	x	x			
Port Huron-Rural St. (261470031)	Source -oriented *co-located site*	x	x	x	x	x	x	x	x	x
Allen Park (261630001)	NCore Non-Source -oriented	x	x	x	x	x	x			
River Rouge (261630005)	Non-Source -oriented					x	x	x	x	x
Detroit -SW HS (261630015)	Non-Source -oriented					x	x	x	x	x
S.Delray (261630027)	Non-Source -oriented					x	x	x	x	
Dearborn (261630033)	NATTS *co-located site*	x	x	x	x	x	x	x	x	x
NMH48217 (261630097)	SLAMS			x	x	x	x	x	x	x
Trinity (261630098)	Source -oriented					x	x	x	x	x
DP4TH (261630099)	Source -oriented					x	x	x	x	x
Military (261630100)	Source -oriented					x	x	x	x	x
	Total No of sites	6	6	7	7	13	12	10	10	9
	No. Co-located sites Required	1	1	1	1	2	2	2	2	2

Operational x

Table 5: Michigan's Lead Monitoring Network

Operating Schedule: 1:6 days

Method: High Volume Sampler & ICAP Spectra, Method Code 189

Point Source Oriented Sites

Monitoring Sites														
Site Name	AQS Site ID	Address	Part. Size	Latitude	Longitude	Sampling Frequency	Purpose/ Type	Parameter Code	POC	Scale	County	Date Estab.	Facility Name	Est Emissions Tons/yr
Belding - Merrick St.	260670003	509 Merrick St.	TSP	43.09984	-85.22163	1:6	max conc	14129	1	Micro	Ionia	1/1/10	Mueller Industries	0.9 - 1.0
Port Huron	261470031	324 Rural St.	TSP	42.98209	-82.449233	1:6	max conc	14129	1	Micro	St. Clair	1/1/13	Mueller Industries	0.75
Port Huron	261470031	324 Rural St.	TSP	42.98209	-82.449233	1:12,co-loc	max conc	14129	2	Micro	St. Clair	8/1/08	Mueller Industries	0.75

Non Source Oriented Sites

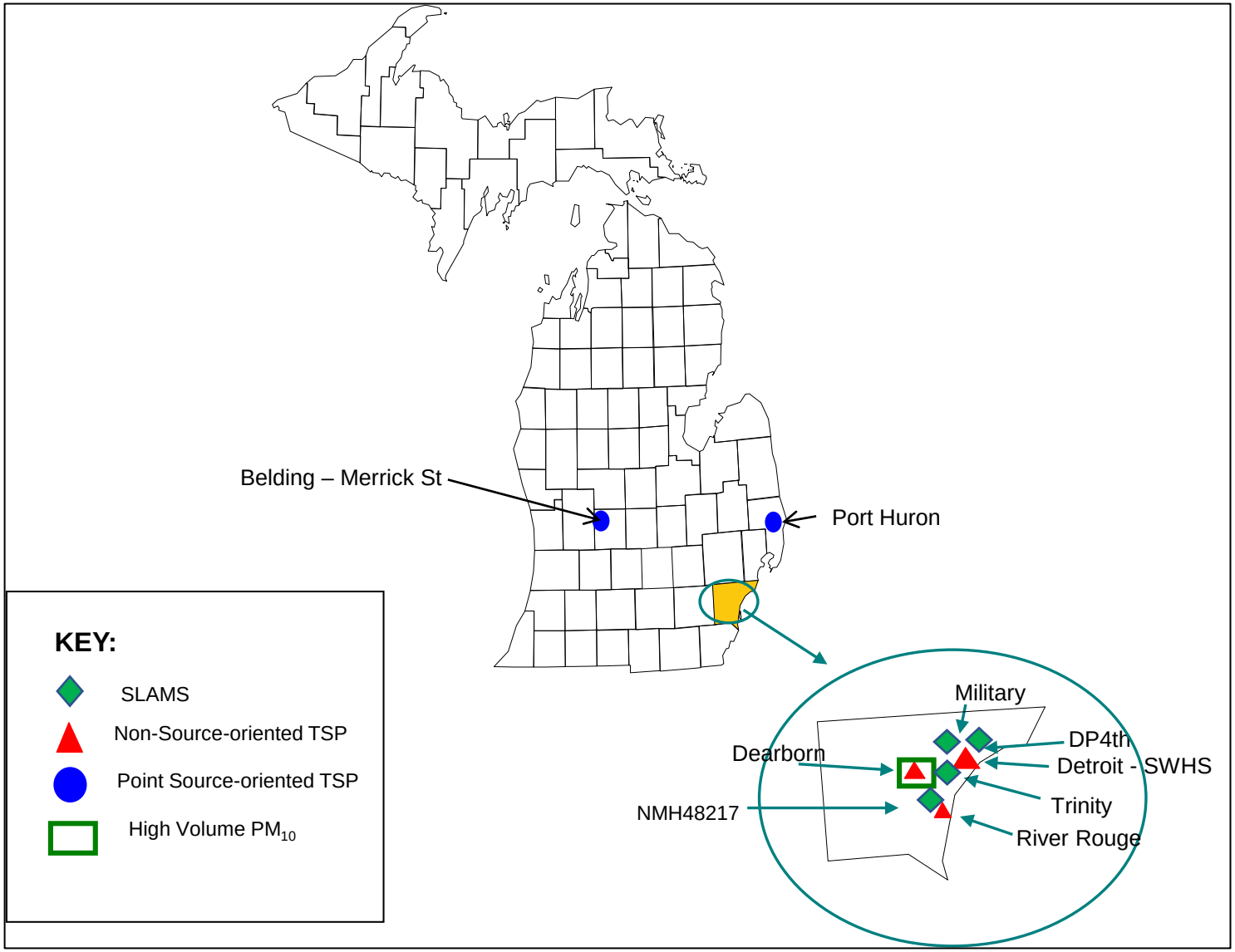
Monitoring Sites														
Site Name	AQS Site ID	Address	Part. Size	Latitude	Longitude	Sampling Frequency	Purpose/ Type	Parameter Code	POC	Scale	County	Date Estab.	CBSA [1]	Pop (2019 Estimate)
River Rouge	261630005	315 Genesee	TSP	42.267222	-83.13222	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/1/18	DWL	4,319,629
Detroit -SW HS	261630015	150 Waterman	TSP	42.302778	-83.106667	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/1/18	DWL	4,319,629
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.148889	1:6	max conc	14129	1	Neighborhood	Wayne	6/1/90	DWL	4,319,629
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.148889	1:12, co-loc	max conc	14129	2	Neighborhood	Wayne	6/1/90	DWL	4,319,629
Dearborn	261630033	2842 Wyoming	PM_{10}	42.306666	-83.148889	1:6	max conc	14129	1	Neighborhood	Wayne	6/1/90	DWL	4,319,629
Dearborn	261630033	2842 Wyoming	PM_{10}	42.306666	-83.148889	1:12, co-loc	max conc	14129	2	Neighborhood	Wayne	6/1/90	DWL	4,319,629
NMH 48217	261630097	3225 Deacon St	TSP	42.2616692	-85.157893	1:6	pop.exp	14129	1	Neighborhood	Wayne	9/1/18	DWL	4,319,629
DP4th	261630098	4700 W Fort St	TSP	42.312158	-83.091943	1:6	max conc	14129	1	Neighborhood	Wayne	7/17/18	DWL	4,319,629
Trinity	261630099	9191W Fort St	TSP	42.295824	-83.129431	1:6	max conc	14129	1	Neighborhood	Wayne	10/17/18	DWL	4,319,629
Military	261630100	1238 Military Park	TSP	42.30934	-83.115722	1:6	max conc	14129	1	Neighborhood	Wayne	11/1/18	DWL	4,319,629

[1] **CBSA Key:**

DWL = Detroit-Warren-Livonia Core Based Statistical Area

GW = Grand Rapids-Wyoming Core Based Statistical Area

Figure 2: Michigan's Lead Monitoring Network



Waiver(s) From Lead Monitoring

In the 2010 Network Review, waivers from monitoring were sought for point sources where modeling indicated there was little likelihood to violate the NAAQS. These waivers were renewed again in July 2014. According to the waiver process, new waivers from monitoring for these sources need to be applied for five years after the first waiver was obtained. The current emission inventory data indicates that the previous sources are below the threshold that previously required a waiver. Likewise, there are no new sources of lead over this threshold value.

Lead Quality Assurance

The site operator conducts a flow rate verification each month. The flow check values are sent to the QA Coordinator each quarter. An independent audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent, dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results and hard copies are retained in the QA files. The audit results are uploaded to the USEPA's AQS database each quarter. External lead PEP audits are conducted annually by the USEPA. The USEPA uses a separate sampler at the monitoring station to collect a filter on the same day as an EGLE sample. The USEPA's PEP filter is analyzed by a USEPA laboratory. Once EGLE enters the filter results in the AQS database, the USEPA enters the result from the co-located PEP filter for comparison.

EGLE's Laboratory participates in an external performance testing program that is administered by the USEPA. The laboratory analyzes spiked filter strips each month which are reported to the USEPA AQS database. Once a quarter, EGLE sends a co-located lead filter to the USEPA Region 9 laboratory. The results from the primary filter, analyzed by EGLE laboratory, are compared to the co-located filter that was analyzed by the USEPA Region 9 laboratory.

Plans for the 2022 Lead Monitoring Network

In 2022, EGLE will continue to collect high volume TSP and PM_{10} lead measurements at the NATTS site:

- Dearborn NATTS site (261630033); and
- Co-located Dearborn NATTS (261630033).

In 2022, EGLE will continue TSP lead source-oriented measurements at:

- Port Huron (261470031);
- Co-located Port Huron (261470031); and
- Belding–Merrick St. (260670003).

In 2022, EGLE will continue TSP lead measurements at the three new sites set up in 2018 around the GHIB area.

- DP4th (261630098);
- Trinity (261630099); and
- Military (261630100).

In 2018, EGLE added high volume TSP lead non-source-oriented measurements at following sites, EGLE lost site access to S. Delray (261630027) and shut down the site on April 6, 2021:

- River Rouge (261630005);
- Detroit – SWHS (261630015);
- NMH48217 (261630097); and
- S. Delray (261630027) shut down 2021.

Lead sampling at NCore sites is no longer required, thus in 2020, EGLE discontinued collecting lead measurements using high volume TSP samplers at the NCore sites at:

- Grand Rapids–Monroe St. (260810020); and
- Allen Park (261630001).

NCORE MONITORING NETWORK

The purpose of the NCore stations is to collect a variety of air quality measurements that can be used to provide an integrated approach to air quality management. Collection of a suite of measurements at a single site improves our understanding of how concentrations of various pollutants are inter-related and can evaluate the effectiveness of control programs. Data from NCore sites is also used for the determination of air quality trends, for model evaluation, and for attainment purposes. Reference or equivalent methods must be used.

Network Design

Neighborhood and urban scale measurements are to be made at one NCore site per state. Some states, including Michigan, have more than one major population center or multiple airsheds with unique characteristics. Sampling at NCore sites should use a spatial scale of neighborhood (up to 4 km) or urban (4 km to 50 km).

There are a limited number of rural NCore stations. These NCore sites are located away from the influences of major sources, are sited in areas of relatively homogeneous geography, and should sample on a regional scale or larger. There are no rural NCore sites in Michigan.

Whether urban or rural, the *Federal Register*[6] specifies the minimum parameters that each NCore site must measure:

- Continuous $PM_{2.5}$
- 24-hour $PM_{2.5}$
- Speciated $PM_{2.5}$
- $PM_{10–2.5}$
- Ozone
- Trace SO_2
- Trace CO
- NO/NO_Y
- Wind speed
- Wind direction
- Relative humidity
- Outdoor temperature
- Lead (not required in 2016 ruling, discontinued sampling 2020)

Michigan NCore Sites

EGLE's NCore sites are located at Grand Rapids-Monroe St. (260810020) in the Grand Rapids-Wyoming CBSA and at Allen Park (261630001) in the Detroit-Warren-Livonia CBSA. Details were provided in the 2010 Network Review. The 2015 ozone NAAQS has a requirement for PAMS measurements of specific ozone precursor compounds at some NCore sites across the nation. These requirements for EGLE are discussed in the PAMS chapter later in this review.

Tables 6 and **7** list the parameters currently measured at Grand Rapids-Monroe St. (260810020) and Allen Park (261630001), respectively. Start dates are also shown.

Speciation samplers at EGLE NCore stations sample on a once every three-day sampling schedule (USEPA schedule) to meet the NCore monitoring requirements.

Lead was added to both sites in January 2010 and discontinued in 2020 since the measured levels were low and no longer mandated. Relative Humidity was added to the Grand Rapids–Monroe St. (260810020) NCore station on March 3, 2010.

In October 2020, the low volume PM_{10}, $PM_{2.5}$ TEOM, and high volume PM_{10} instrumentation at both NCore sites was replaced by a continuous FEM T640X instrument. The T640X is designed to continuously measure for 2.5 micron,10 micron and coarse particulate matter ($PM_{10-2.5}$).

Site specific data for Michigan's NCore network is summarized in **Table 8**. A map showing the locations of NCore sites is displayed in **Figure 3**.

[6] "Environmental Protection Agency National Ambient Air Quality Standards for Lead; Final Rule." 40 CFR Parts 50, 51, 53 and 58, November 12, 2008.

NCore Quality Assurance

EGLE's NCore stations contain a variety of monitors that are required to meet the federal requirements for NCore stations. Quality assurance is discussed for each type of monitor in the appropriate section of the network review.

Plans for 2022 NCore Monitoring Network

In 2022, EGLE is planning to continue to collect the measurements required for the NCore program at the following sites:

- Grand Rapids–Monroe St. (260810020); and
- Allen Park (261630001).

In 2022, seasonal PAMS measurements will also be collected at the Grand Rapids NCore site and the Detroit-E 7 Mile site as an alternative to the Allen Park site, as approved by USEPA Region 5.

Table 6: Measurements Collected at the Grand Rapids-Monroe St. (260810020) NCore Site

Parameter	Designation	Spatial Scale	Sampling Frequency	Instrument Type	Method	Existing Monitor Start-Up Date	Comments
$PM_{2.5}$ continuous	NCore/AQI	Neighborhood	Continuous	***R & P TEOM 1400a replaced with a*** Teledyne API Model T640X	***Tapered element oscillating microbalance*** ..... FEM	***11/4/1999*** 10/22/2020	The T640X replaced the PM2.5 TEOM ,low vol PM10 and high vol PM10 (used to calculate PMc)
$PM_{2.5}$ FRM mass	NCore	Neighborhood	1:3 days	**R & P Partisol plus 2025 replaced with a** Teledyne API Model T640X	Manual collection, gravimetric analysis ..... FEM	10/23/1998 ..... 10/22/2020	The T640X replaced the PM2.5 TEOM ,low vol PM10 and high vol PM10 (used to calculate PMc)
$PM_{2.5}$ Speciation	NCore	Neighborhood	1:3 days	Met One Super SASS + URG 3000N	Manual collection, laboratory analysis*	6/1/02 at 1:6 sampling frequency	Freq. changed to 1:3 on 1/1/2011
Trace CO	NCore/AQI	Neighborhood	Continuous	48i-TLE	Non-dispersive infrared	4/25/2007	probe height 5 m
Trace SO_2	NCore/AQI	Neighborhood	Continuous	43i-TLE	UV fluorescence	4/1/2008	probe height 5 m
NO_Y	NCore/AQI	Neighborhood	Continuous	42iy	Chemiluminescence	4/1/2008	external converter installed at 10 m
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 A1E	UV absorption	4/24/1980	Year round
Lead	***Non-source***	***Neighborhood***	***1:6 days***	***General Metal Works Hi-Vol filter based***	***Manual collection, ICP/MS analysis***	***1/8/2010***	***Shut down 2020***
$PM_{10-2.5}$ mass	NCore	Neighborhood	1:3 days	**R & P Partisol plus 2025 replaced with a** Teledyne API ModelT640X	Manual collection, gravimetric analysis ..... FEM	7/16/2010 ..... 10/22/2020	The T640X replaced the PM2.5 TEOM ,low vol PM10 and high vol PM10 (used to calculate PMc)
WS	NCore	Neighborhood	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	1/1/1988	At 10 m
WD	NCore	Neighborhood	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	1/1/1988	At 10 m
Relative Humidity	NCore	Neighborhood	Continuous	R. M. Young	Resistance hygrometer	3/3/2010	> 4 m
Outdoor Temperature	NCore	Neighborhood	Continuous	R. M. Young	Thermometer	7/15/1993	> 4 m
Sigma Theta	SLAMS	Neighborhood	Continuous	R. M. Young Prop. Anemom. & vane	Calculation	1/16/2001	Optional
Barometric Pressure	SLAMS	Neighborhood	Continuous	R. M. Young	Electronic pressure sensor	7/15/1993	Optional
PM_{10} Hi-Vol	***SLAMS***	***Neighborhood***	***1:6 days***	***Hi-Vol***	***Manual collection, gravimetric analysis***	***1/1/1985***	***Shutdown in 2020 replaced with the T640X***

* Laboratory analysis consists of ion chromatography, X-Ray Fluorescence (XRF) and thermal optical analysis for ions, trace metals and forms of carbon, respectively.

Table 7: Measurements Collected at the Allen Park (261630001) NCore Site

Parameter	Designation	Spatial Scale	Sampling Frequency	Instrument Type	Method	Existing Monitor Start-Up Date	Comments
$PM_{2.5}$ continuous	***NCore/AQI***	***Neighborhood***	***Continuous***	***R & P TEOM 1400a replaced with a*** Teledyne API Model T640X	***Tapered element oscillating microbalance (TEOM)*** ..... FEM	***2/1/2001*** 10/06/20	The T640X replaced the PM2.5 TEOM ,low vol PM10 and high vol PM10 (used to calculate PMc***)***
$PM_{2.5}$ FRM mass	***NCore***	***Neighborhood***	***1:1 day***	***R & P Partisol plus 2025 repalced with a*** Teledyne API Model T640X	Manual collection,gravimetric analysis ..... FEM	***5/12/1999*** 10/06/2020	The T640X replaced the PM2.5 TEOM ,low vol PM10 and high vol PM10 (used to calculate PMc)
$PM_{2.5}$ Speciation	NCore	Neighborhood	1:3 day	Met One Super SASS + URG 3000N + IMPROVE carbon channel	Manual collection, laboratory analysis*	12/1/2000	———
Trace CO	NCore/AQI	Neighborhood	Continuous	48i-TLE	Non-dispersive infrared	6/1/2007	probe height 4m
Trace SO_2	NCore/AQI	Neighborhood	Continuous	43i-TLE	UV fluorescence	4/1/2008	probe height 4 m
NO_Y	NCore/AQI	Neighborhood	Continuous	42iy	Chemiluminescence	4/1/2008	external converter installed at 10 m
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 E	UV absorption	1/1/1980	Year round probe height 4 m
Lead	***Non-source***	***Neighborhood***	***1:6 days***	***General Metal Works Hi-Vol filter-based***	***Manual collection, ICP/MS analysis***	***3/2/01 to 3/31/07; 1/2/10***	***Shutdown in 2020***
$PM_{10-2.5}$ mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025 replaced with a Teledyne API Model T640X	Manual collection,gravimetric analysis ..... FEM	7/16/2010 ..... 10/06/2020	The T640X replaced the PM2.5 TEOM ,low vol PM10 and high vol PM10 (used to calculate PMc)
WS	NCore	Neighborhood	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	10/18/1981	At 10 m
WD	NCore	Neighborhood	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	10/18/1981	At 10 m
Relative Humidity	NCore	Neighborhood	Continuous	R. M. Young	Resistance hygrometer	1/1/2000	> 4 m
Outdoor Temperature	NCore	Neighborhood	Continuous	R. M. Young	Thermometer	1/1/2000	> 4 m
Sigma Theta	SLAMS	Neighborhood	Continuous	R. M. Young Prop. Anemom. & vane	Calculation	9/1/2001	Optional
Barometric Pressure	SLAMS	Neighborhood	Continuous	R. M. Young	Electronic pressure sensor	1/5/1971	Optional
Black Carbon	SLAMS	Neighborhood	Continuous	Magee large spot AE21	Optical absorption	12/19/2003	Not Req NCore
PM_{10} Hi-Vol	***Was NAMS***	***Neighborhood***	***1:6 days***	***Hi-Vol***	***Manual collection, gravimetric analysis***	***9/12/1987***	***Shutdown in 2020 replaced with the T640***

* Laboratory analysis consists of ion chromatography, X-Ray Fluorescence (XRF) and thermal optical analysis for ions, trace metals and forms of carbon, respectively.

Table 8: Michigan's NCore Monitoring Network

Monitoring Sites										
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose/ Type	Scale	County	Date Estab.	CBSA[1]	2019 Population Estimate
Grand Rapid	260810020	1179 Monroe St., NW,	42.98417	-85.6714	Pop. Exp.	Neighborhoo	Kent	1/1/10	GW	1,077,370
Allen Park	261630001	14700 Goddard	42.22861	-83.2083	Pop. Exp.	Neighborhoo	Wayne	1/1/10	DWL	4,319,629

[1] **CBSA Key:**

DWL = Detroit-Warren-Livonia Core Based Statistical Area

GW = Grand Rapids-Wyoming Core Based Statistical Area

Figure 3: Michigan's NCore Monitoring Network

OZONE MONITORING NETWORK

On October 26, 2015, the USEPA revised the ozone NAAQS, lowering the standard to 0.070 ppm and extending the ozone season in many areas, including Michigan, from March 1 through October 31. EGLE began the expanded season in 2017.

As a result of the October 17, 2006, monitoring regulations, the minimum number of required ozone sites in an MSA were changed. In addition, due to the 2010 census, MSA boundaries were modified, and population totals tied to measurements of ambient air quality were increased. A monitor with a design value (using the most recent three years of data) that is ≥ 85 percent of the ozone NAAQS has a higher probability of violating the standard. Therefore, the USEPA requires more monitors in these MSAs. In other instances, the number of monitors may be reduced if the design value is greater than 115 percent of the NAAQS.[7] *Note:* Background and transport ozone monitors are still required but are not shown in **Table 9**.

Table 9: SLAMS Minimum Ozone Monitoring Requirements

MSA Population[1,2]	Most Recent 3-year Design Value Concentrations ≥ 85% of any Ozone NAAQS[3]	Most Recent 3-year Design Value Concentrations < 85% of any Ozone NAAQS[3,4]
> 10 million	4	2
4 - 10 million	3	1
350,000 - < 4 million	2	1
50,000 - < 350,000[5]	1	0

[1] Minimum monitoring requirements apply to the MSA.
[2] Population based on the latest available census figures.
[3] The ozone NAAQS levels and forms are defined in 40 CFR Part 50.
[4] These minimum monitoring requirements apply in the absence of a design value.
[5] MSA must contain an urbanized area of 50,000 or more population.

Applying the requirements described in **Table 9** to Michigan's MSAs, population totals and the most recent 3-year design values results in a minimum ozone network design summarized in **Table 10**. All monitors in Michigan are on or above 85 percent of the ozone NAAQS of 0.070 ppm.

Figure 4 illustrates changes in the 3-year averages of the fourth highest ozone values, called design values, from 2016 to 2020. When contemplating changes to the ozone network, it is important to consider changes in design values in nonattainment areas. In 2015 the USEPA lowered the ozone NAAQS to 0.070 ppm. The USEPA's nonattainment designations were based on the ozone design values for 2014-2016.

[7] Table D-2 of Appendix D to Part 58.

Table 10: Application of Minimum Ozone Requirements in the October 17, 2006 - Final Revision to the Monitoring Regulation to Michigan's Ozone Network

NAAQS: 0.070 ppm

85% NAAQS: 0.059 ppm

Decimals to the right of the third decimal place are truncated.

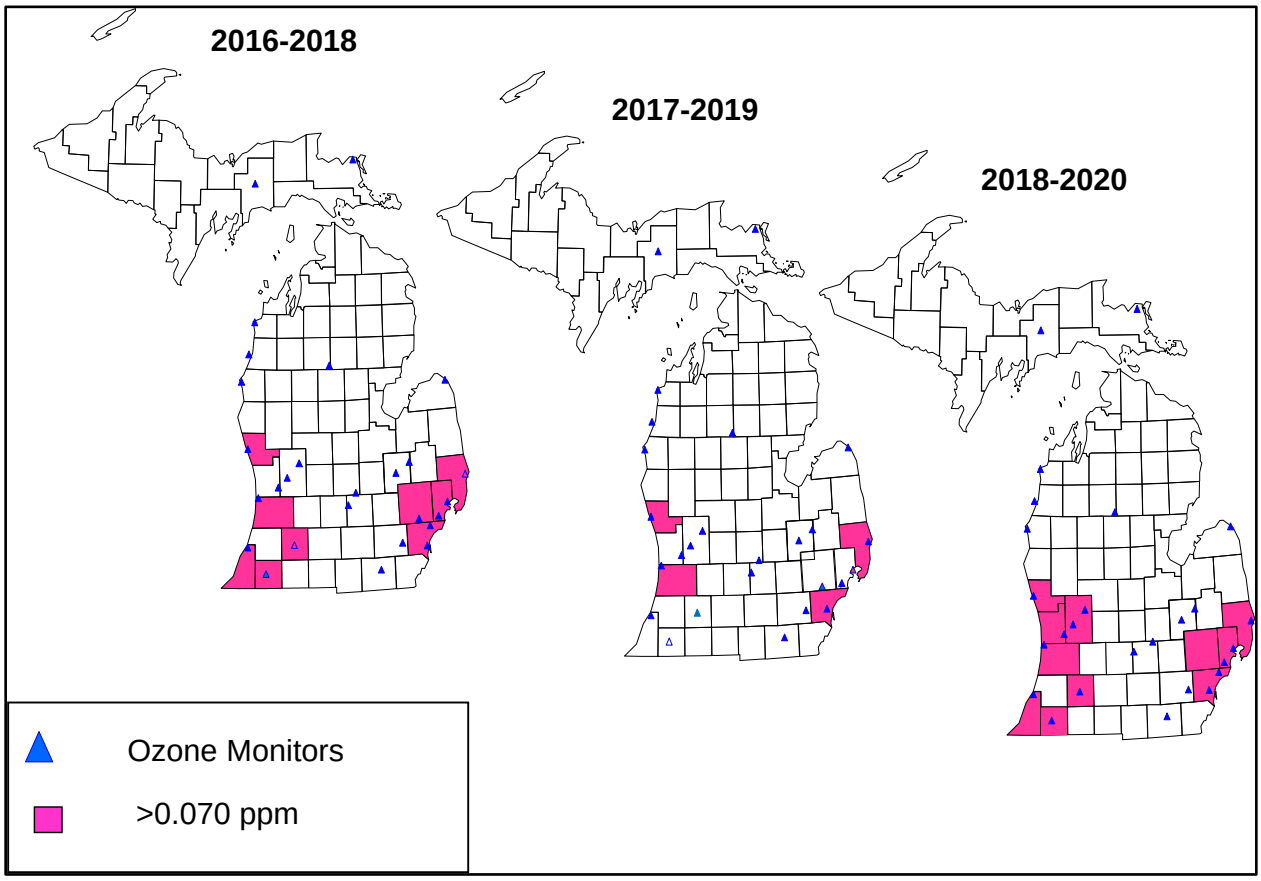
The 3-year O3 average at the MSA Design Value site is shown in bold.

Values for sites ≥ 85% NAAQS are in red.

MSA	2019 Population Estimate	Counties	Existing Monitors	2018-2020 3-year O_3 design value	Min. No. Monitors Required
Detroit-Warren-Livonia MSA	4,319,629	Macomb	New Haven	0.071	3
			Warren	0.068	
		Oakland	Oak Park	0.072	
		Wayne	Allen Park	0.067	
			Detroit - E 7 Mile	**0.071**	
		Lapeer	---		
		St. Clair	Port Huron	0.071	
		Livingston	---		
Flint MSA	405,813	Genesee	Flint	**0.065**	2
			Otisville	0.065	
Monroe MSA	150,500	Monroe	---		
Ann Arbor MSA	367,601	Washtenaw	Ypsilanti	**0.067**	2
Grand Rapids-Wyoming MSA	1,077,370	Kent	Grand Rapids	0.071	2
			Evans	0.065	
		Barry	---		
		Ottawa	Jenison	**0.071**	1
		Montcalm	---		
Muskegon-Norton Shores MSA	173,566	Muskegon	Muskegon	**0.076**	1
Lansing-East Lansing MSA	550,391	Clinton	Rose Lake	0.063	2
		Ingham	Lansing	**0.062**	
		Eaton	---		
Bay City MSA	103,126	Bay	---		
Saginaw MSA	190,539	Saginaw	---		
Kalamazoo-Portage MSA	265,066	Kalamazoo	Kalamazoo	**0.068**	1
		Van Buren	---		
Niles-Benton Harbor MSA	153,401	Berrien	Coloma	**0.072**	1
Jackson MSA	158,510	Jackson	---		
Battle Creek MSA	134,159	Calhoun	---		
South Bend Mishawaka MSA	323,613	Cass	Cassopolis	**0.071**	1

Other areas:	Comments			
	transport site	Lenawee	Tecumseh	0.065
		Benzie	Frankfort	0.064
		Huron	Harbor Beach	0.068
		Allegan	Holland	0.073
	background site	Missaukee	Houghton Lake	0.064
		Mason	Scottville	0.064
		Schoolcraft	Seney	0.063
	tribal site	Manistee	Manistee	0.059

Figure 4: Comparison of 4th Highest 8-Hour Ozone Values Averaged Over Three Years 2016-2018, 2017-2019 and 2018-2020



In southeast Michigan, New Haven (260990009) has been the design value site for many years, measuring maximum ozone concentrations downwind from Detroit. However, in 2015, the Port Huron (2611470005) monitoring site became the new design value site for the Detroit-Warren-Livonia MSA. Since then, the design value site has fluctuated between the Port Huron and E 7 Mile sites. The location of the maximum ozone concentration has moved in recent years, possibly due to changes in the amount, type, and location of ozone precursor emissions. The E 7 Mile (261630019) site and the Port Huron (2611470005) both have a 3-year average of 0.071 ppm, and Oak Park (261250001) has an average of 0.072 ppm and could be considered the design value site for 2021 over E 7 Mile. Allen Park (261630001) is upwind of the central business district and is an NCore site for the Detroit-Warren-Livonia MSA. Both NCore sites are required by EGLE to measure ozone over the entire year.

Although three ozone sites are required for the Detroit-Warren-Livonia MSA, USEPA Region 5 staff have indicated that E 7 Mile (2601630019) will be the new design value site for that area. The Oak Park (261250001) and Port Huron (261470005) monitors are the only ozone sites in Oakland and St. Clair Counties, respectively. Based on 2018-2020 data, Allen Park (261630001) and Warren (261631003) are below the 0.070 ppm design values, whereas New Haven (2610990009),Oak Park (261250001), E 7 Mile (261630019), and Port Huron (261470005) are over the 0.070 ppm design value.

Two monitors are required in the Ann Arbor MSA, they are the Ypsilanti monitor (261610008) and the downwind monitor in Oak Park (261250001). The urban center city location coupled with a downwind maximum concentration site is a carry-over from the defunct NAMS network. Oakland County houses the downwind site, although it is outside of the boundary of the Ann Arbor MSA. The upwind/downwind configuration will be retained wherever possible to preserve historical trend data.

Two monitors are required in the Flint MSA. They consist of the urban center city site in Flint (260490021) and the downwind site at Otisville (260492001).

Three ozone monitors are also required in the Grand Rapids-Wyoming MSA. They consist of the urban center city site in Grand Rapids on Monroe St. (260810020), the downwind site at Evans (260810022), and the Jenison (26139005) site.

Two monitors are required in the Lansing-East Lansing MSA, consisting of the urban center city site in Lansing (260650018) and the downwind Rose Lake (260370002) location.

A single ozone monitor is required in each of the MSAs of Holland-Grand Haven, Muskegon-Norton Shores, Kalamazoo-Portage, Niles-Benton Harbor, and South Bend-Mishawaka. The Holland (260050003), Muskegon–Green Creek Rd. (261210039), Kalamazoo (260770008), Coloma (260210014), and Cassopolis (260270003) monitors fulfill these requirements, respectively. Nonattainment designations on the west side of the state were based on the 2014-2016 design values at the Holland, Muskegon, and Coloma sites.

Tecumseh (260910007) measures ozone transport into southeast Michigan and is required by Michigan's maintenance plan. Harbor Beach (260630007) measures transport out of southeast Michigan under southwesterly winds. Scottville (261050007) and Frankfort(260190003) are sited to measure transport of ozone along Lake Michigan and have been in operation for 20 and 26 years, respectively. These two sites are also an important part of Michigan's maintenance plan. Houghton Lake (261130001) and Seney (261530001) measure background ozone levels in the upper region of the Lower Peninsula and Upper Peninsula, respectively.

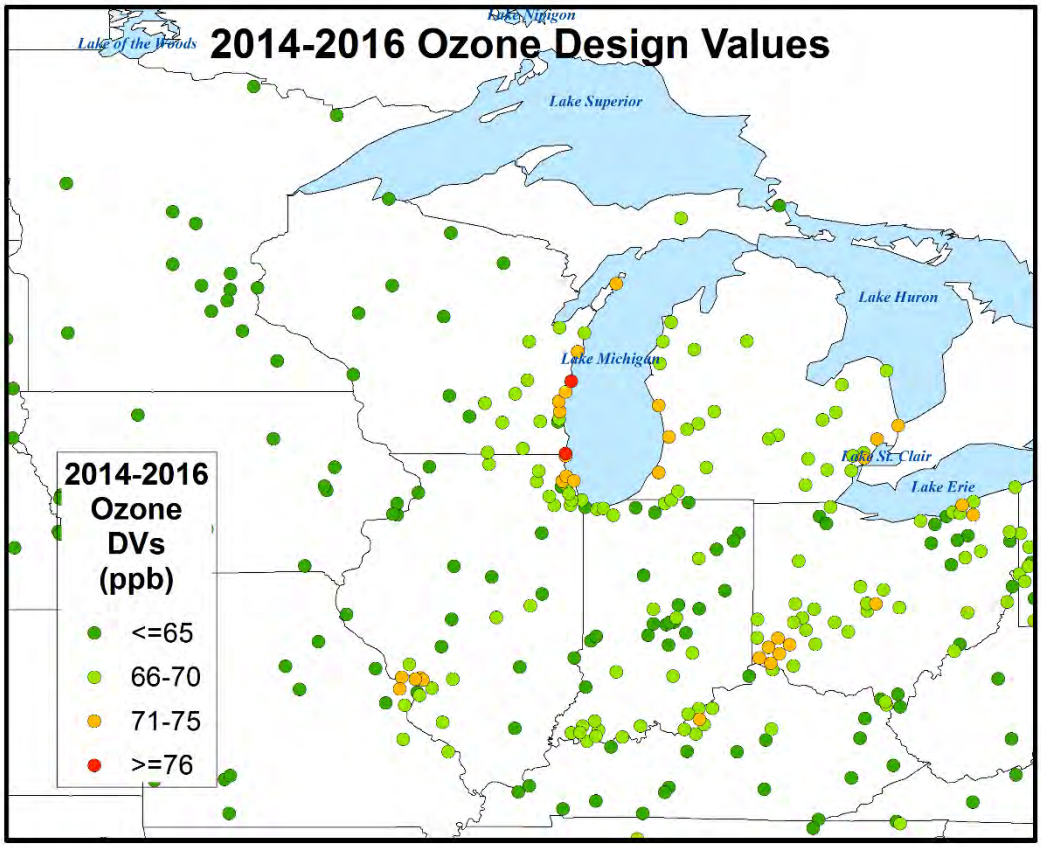
The tribal ozone site in Manistee (261010922) is operated by the Little River Band of Ottawa Indians. Continued operation in 2022 is anticipated contingent on funding.

Created by the Lake Michigan Air Directors Consortium (LADCO), **Figure 5** (map) compares ozone concentrations across the region.

Ozone nonattainment areas are classified based upon the severity of their ozone concentrations. Eight-hour Ozone (2015 Standard) classifications are listed below.

Extreme:	Area has a design value of 0.163 ppm and above
Severe-17:	Area has a design value of 0.111 up to but not including 0.163 ppm
Severe-15:	Area has a design value of 0.105 up to but not including 0.111 ppm
Serious:	Area has a design value of 0.093 up to but not including 0.105 ppm
Moderate:	Area has a design value of 0.081 up to but not including 0.093 ppm
Marginal:	Area has a design value of 0.071 up to but not including 0.081 ppm

Figure 5: Ozone Design Values 2014 – 2016[8]



[8] Map provided by D. Kenski, Lake Michigan Air Directors Consortium (LADCO).

Table 11 summarizes the ozone monitoring site information for sites that were operational in 2021 and are planned to be operational in 2022. **Figure 6** illustrates the geographical distribution of this network.

Table 11: Michigan's Ozone Monitoring Network 2022

Method: Ultra Violet Absorption Continuous Monitor, Method Code 087

SLAMS Stations

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA[1]	2019 Population Estimate
Holland	260050003	966 W 32nd St	42.7678	-86.14861	max conc	44201	1	urban	Allegan	8/25/92	A	118,081
Frankfort	260190003	West St., Benzonia Twp.	44.6169	-86.10944	max conc	44201	1	regional	Benzie	7/28/92	Not in MSA	N/A
Coloma	260210014	Paw Paw WWTP, 4689 Defield Rd.,Coloma	42.1978	-86.30972	max conc	44201	1	regional	Berrien	8/3/92	NBH	153,401
Cassopolis	260270003	Ross Beatty High School, 22721 Diamond	41.8956	-86.00167	pop exp	44201	2	urban	Cass	5/16/91	SBM	323,613
Rose Lake	260370002	9870 Stoll Rd,Lansing	42.7983	-84.39389	max conc	44201	1	urban	Clinton	9/30/16	LEL	550,391
Flint	**260490021**	**Whaley Park, 3610 Iowa**	**43.0472**	**-83.67028**	**pop exp**	**44201**	**1**	**nghbrhd**	**Genesee**	**6/16/92**	**F**	**405,813**
Otisville	**260492001**	**G11107 Washburn Rd**	**43.1683**	**-83.46167**	**max conc**	**44201**	**1**	**urban**	**Genesee**	**5/13/80**	**F**	**405,813**
Harbor Beach	260630007	1172 S. M 25, Sand Beach Twp.	43.8364	-82.64306	backgrd	44201	1	regional	Huron	4/1/94	Not in MSA	N/A
Lansing Filley	260650018	815 Filley St., Lansing	42.7614	-84.56287	pop exp	44201	2	nghbrhd	Ingham	4/1/18	LEL	550,391
Kalamazoo	260770008	Fairgrounds, 2500 Lake St	42.2781	-85.54194	pop exp	44201	1	nghbrhd	Kalamazoo	6/1/92	KP	265,066
Grand Rapids	***260810020***	***1179 Monroe NW***	***42.9842***	***-85.6714***	***pop exp***	***44201***	***1***	***nghbrhd***	***Kent***	***4/24/80***	***GW***	***1,077,370***
Evans	260810022	10300 14 Mile Road, NE	43.1767	-85.41667	max conc	44201	1	urban	Kent	4/1/99	GW	1,077,370
Tecumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	backgrd	44201	1	regional	Lenawee	7/6/93	AL	98,451
New Haven	260990009	57700 Gratiott	42.7314	-82.79361	max conc	44201	1	urban	Macomb	7/14/80	DWL	4,319,629
Warren	**260991003**	**29900 Hoover**	**42.5133**	**-83.00611**	**max conc**	**44201**	**1**	**urban**	**Macomb**	**1/1/77**	**DWL**	**4,319,629**
Scottville	261050007	525 W US 10	43.9533	-86.29444	max conc	44201	1	regional	Mason	4/1/98	Not in MSA	N/A
Houghton Lake	261130001	1769 S Jeffs Road	44.3106	-84.89194	background	44201	1	regional	Missaukee	4/1/98	Not in MSA	N/A
Muskegon	261210039	1340 Green Creek Road	43.2781	-86.31111	pop exp	44201	1	regional	Muskegon	5/1/91	MNS	173,586
Oak Park	261250001	13701 Oak Park Blvd.	42.4631	-83.18333	pop exp	44201	2	urban	Oakland	1/9/81	DWL	4,319,629
Jenison	261390005	6981 28Th Ave. Georgetown Twp.	42.8944	-85.85278	pop exp	44201	1	urban	Ottawa	4/1/89	GW	1,077,370
Port Huron	261470005	2525 Dove Rd	42.9533	-82.45639	pop exp	44201	1	urban	Saint Clair	2/28/81	DWL	4,319,629
Seney	261530001	Seney Wildlife Refuge, HCR 2 Box 1	46.2889	-85.95027	bkgrd	44201	1	regional	Schoolcraft	1/15/02	Not in MSA	N/A
Ypsilanti	261610008	555 Towner Ave	42.2406	-83.59972	pop exp	44201	1	nghbrhd	Washtenaw	4/1/00	AA	367,601
Allen Park	***261630001***	***14700 Goddard***	***42.2286***	***-83.2083***	***pop exp***	***44201***	***2***	***nghbrhd***	***Wayne***	***1/1/80***	***DWL***	***4,319,629***
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.4308	-83.00028	max conc	44201	2	urban	Wayne	4/11/77	DWL	4,319,629

Tribal Stations

Monitoring Sites												
Site Name	AIRS Site ID	Address	Latitude	Longitude	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA [1]	2019 Population Estimate
Manistee	261010922	3031 Domres Rd	44.307	-86.24268	transport	44,201	1	regional	Manistee	4/1/06	Not in MSA	N/A

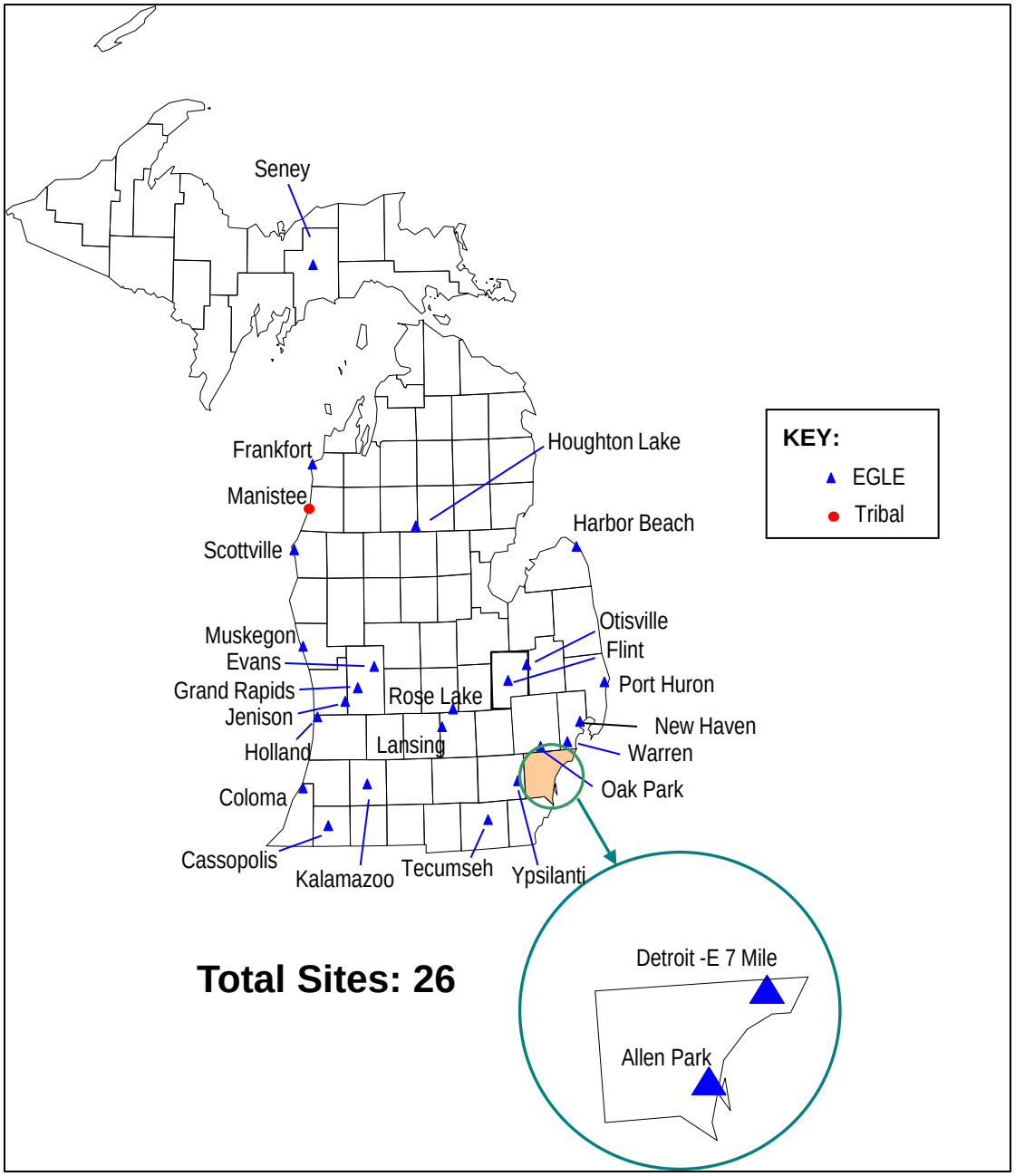
[1] **MSA Key:**

A = Allegan Micropolitan Area
AA = Ann Arbor MSA
AL = Adrian Micropolitan Area
DWL = Detroit-Warren-Livonia MSA
F = Flint MSA
GW = Grand Rapids-Wyoming MSA
HGH = Holland-Grand Haven MSA
KP = Kalamazoo-Portage MSA
LEL= Lansing-E. Lansing MSA
MNS = Muskegon-Norton Shores MSA
NBH = Niles-Benton Harbor MSA
SBM = South Bend-Mishawaka MSA (IN/MI)

[2] **Former NAMS sites** are shown in **bold**.Old Lansing and Roselake have been moved

[3] **NCore sites** are shown in *italics*.

Figure 6: Michigan's Ozone Network in 2021-2022



Ozone Season and Modeling

The length of the ozone season was modified with the enactment of the 0.070 ppm 8-hour primary NAAQS. The new ozone NAAQS final rule extends the ozone season in Michigan from March 1 through October 31. This new season started with the 2017 ozone season.

With the new 1-hour NO_2 NAAQS, modeling conducted as part of the permitting process for new source review (NSR) has indicated that many facilities in Michigan could violate the standard. More refined modeling is an option using the Ozone Limiting Method or Plume Volume Molar Ratio Method (PVMRM), but more site-specific 1-hour NO_2 background levels, as well as year-round ozone values, are necessary. Specifically, modeling staff need five years of ozone and NO_2 data collected in small cities, urban, and rural areas. While Allen Park (261630001) and Grand Rapids–Monroe St. (260810020) measure ozone values in urban areas throughout the year, levels in smaller cities and rural areas were not available. Therefore, beginning October 1, 2010, EGLE began to monitor for ozone throughout the year at the Lansing (260650012) and Houghton Lake (261130001) stations. The new Lansing site (260650018) operates the same parameters as the previous Lansing site. The collection of additional NO_2 data to support NSR modeling is discussed in the NO_2 section.

Ozone Quality Assurance

Site operators conduct 1-point quality assurance checks on the monitors every two weeks. Results are sent to the QA Coordinator for review each quarter. Each ozone monitor is also audited annually by the AMU's QA Team. The audit utilizes a dedicated ozone photometer to assess the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and the inlet probe), siting, and documentation of precision checks. The results of the ozone audits and quality assurance checks indicate whether the monitor is meeting measurement quality objectives. The AMU uploads the results of the precision checks and audits to the USEPA's AQS database each quarter. The QA Coordinator reviews all audits. Hard copies are retained in the QA files.

The USEPA conducts thru-the-probe audits of 20 percent of EGLE's ozone monitors each year. The audit consists of delivering four levels of ozone to the station monitor through the probe. The percent difference that is measured by the auditor's monitor is compared to the station monitor. The auditor also assesses station and monitoring siting criteria. The USEPA auditor provides the AMU with a copy of the audit results and uploads the audit data to AQS.

Ozone Area Designations

On April 30, 2018, the USEPA made their final ozone nonattainment designations. On the west side of the state, part of Allegan County, all of Berrien County, and part of Muskegon County were reclassified for nonattainment for ozone. On the east side of the state, a 7-county area was reclassified as nonattainment for ozone, which includes

Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Counties. The remaining counties were designated in attainment or unclassifiable.

In accordance with the CAA section 107(d), the USEPA must designate as nonattainment any area that violates the NAAQS and any nearby areas that contribute to the violation in the violating area. Based on the five factors below, the USEPA has determined that Livingston, Monroe, Oakland, and Washtenaw Counties contribute to the violating area.

1. Air Quality Data (including the design value calculated for each FRM or FEM monitor;
2. Emissions and Emissions-related Data (including locations of sources, population, amount of emissions, and urban growth patterns);
3. Meteorology (weather / transport patterns);
4. Geography/Topography (including mountain ranges or other physical features that may influence the fate and transport of emissions and ozone concentrations); and
5. Jurisdictional Boundaries (e.g., counties, air districts, existing nonattainment areas, areas of Indian country, Metropolitan Planning Organizations [MPOs]).

The nonattainment areas in western Michigan, with violating ozone monitors, are areas impacted by the unique air flow and meteorology of Lake Michigan and the resulting subregional transport of ozone and ozone-forming emissions from major urban areas in the Lake Michigan area (e.g., Chicago, Gary, and Milwaukee). At shoreline locations, the contribution of ozone-forming emissions from sources in Michigan is negligible.

Area	Michigan's Recommended Nonattainment Counties	EPA's Designated Nonattainment Counties
Detroit, MI	Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne Counties	Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne Counties
Muskegon, MI	Muskegon Partial County	Muskegon Partial County
Allegan, MI	Allegan Partial County	Allegan Partial County
Berrien, MI	Berrien County	Berrien County

Plans for the 2022 Ozone Monitoring Network

Beginning October 1, 2009, EGLE began collecting ozone measurements all year at the NCore sites and plans to continue through 2022:

- Grand Rapids (260810020); and
- Allen Park (261630001).

To support NSR modeling projects, EGLE will continue to collect ozone measurements all year in 2022 at the following sites:

- Lansing (260650018); and
- Houghton Lake (261130001).

The current ozone network exceeds the minimum design specifications in 40 CFR Part 58. No ozone site reductions are planned at this time. The following monitors are planned to be retained as part of the 2022 ozone network; operating March 1 through October 31:

- Holland (260050003)
- Frankfort/Benzonia (260190003)
- Coloma (260210014)
- Cassopolis (260270003)
- Rose Lake 2 (260370002)
- Flint (260490021)
- Otisville (260492001)
- Harbor Beach (260630007) downwind monitor
- Kalamazoo (260770008)
- Evans (260810022)
- Tecumseh (260910007) background monitor
- New Haven (260990009)
- Warren (260991003)
- Scottville (261050007)
- Muskegon (261210039)
- Oak Park (261250001)
- Jenison (261390005)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)
- Detroit-E 7 Mile (261630019)

The Manistee (261050922) tribal monitor will continue to operate in 2022.

$PM_{2.5}$ FRM MONITORING NETWORK

The January 15, 2013, revision to the PM NAAQS lowered the $PM_{2.5}$ annual average from 15.0 µg/m^3 to 12.0 µg/m^3. All counties in Michigan are currently meeting this standard.

The October 17, 2006, changes to the monitoring regulations impacted the minimum number of $PM_{2.5}$ sites in an MSA, as shown in **Table 12**.[9] Background and transport monitors are required, in addition to these minimum requirements.

Although speciation monitoring is required, details specifying the exact number of sites and their sampling frequency were not stated in the October 17, 2006, regulations. However, the continued operation of the speciation trends site Allen Park (261630001) on a once every three-day sampling schedule is required.

Michigan does not spatially average $PM_{2.5}$ values from multiple sites to determine attainment with the annual $PM_{2.5}$ NAAQS. Therefore, if a $PM_{2.5}$ monitor that is violating the NAAQS must be removed due to loss of access or funding, a replacement site need not be found, if the annual and/or 24-hour design value site(s) in that MSA are still operational. The attainment status of the area is dependent upon the design value sites.

Table 12: $PM_{2.5}$ Minimum Monitoring Requirements

MSA Population[1,2]	Most Recent 3-year Design Value Concentrations ≥ 85% of any $PM_{2.5}$ NAAQS[3]	Most Recent 3-year Design Value Concentrations < 85% of any $PM_{2.5}$ NAAQS[3,4]
> 1,000,000	3	2
500,000 – < 1,000,000	2	1
50,000 - ≤ 500,000[5]	1	0

[1] Minimum monitoring requirements apply to the MSA.
[2] Population based on the latest available census figures.
[3] The $PM_{2.5}$ NAAQS levels and forms are defined in 40 CFR Part 50.
[4] These minimum monitoring requirements apply in the absence of a design value.
[5] MSA must contain an urbanized area of 50,000 or more.

The regulations also state that any FRM monitors that are within ± 5 percent of the level of the 24-hour NAAQS must sample on a daily sampling frequency. The monitoring regulations also state that organizations co-locate 15 percent of sites for each primary method with a secondary $PM_{2.5}$ measurement to estimate precision at a reporting organization level.

[9] Table D-5 of Appendix D to Part 58.

In 2016, EGLE changed all FRM monitors to very sharp cut cyclones. The changes were made in April and May 2016. This changed the method code from 118 to 145. The dates of each instrument conversion can be determined by the data in the USEPA's AQS database.

Applying **Table 12** to Michigan's MSAs, population totals and most recent three-year design values results in **Table 13**. Design values shown in bold print represent the controlling site in each MSA, which is also called the design value site.

Table 13: Application of the Minimum $PM_{2.5}$ Monitoring Requirements in the October 17, 2006, Final Revision to the Monitoring Regulation to Michigan's $PM_{2.5}$ FRM Network

The annual avg & 24-hr avg are rounded to 1 and 0 decimal points respectively.

annual	24-hr	**5% of the 24-Hr NAAQS**
85% of 12 ug/m3	85% of 35 ug /m3	33-37 = 5% NAAQS
10.2	30	

The 3-year PM2.5 average at MSA Design Value site is shown in bold.

MSA	2019 Population Est.	Counties	Existing Monitors	2017-2020 3-year PM2.5 design value (annual)	2017-2020 3-year PM2.5 design value (24-Hr)	Min. No. monitors Required	Comments
		Macomb	New Haven	7.5	18	3	
		Oakland	Oak Park	8.0	19		
		Wayne	Allen Park	8.8	22		daily
			Detroit-SW HS	**11.6**	**30**		
			Detroit - Linwood (closed)	---	---		
			Detroit - E 7 Mile	8.0	19		
			DP4th	**10.8**	27		
			Trinity	**11.6**	28		
			Military	**11.6**	29		
Detroit-Warren-Livonia MSA	4,319,629		Livonia (closed)	---	---		
			Dearborn	**10.4**	25		
			Wyandotte (closed)	---	---		
			Livonia Near Road (relocated)	8.6	24.0		
		Lapeer	---				
		St Clair	Port Huron	7.9	20		
		Livingston	---				
Flint MSA	405,813	Genesee	Flint	***7.3***	19	0	
Monroe MSA	150,500	Monroe	Sterling State Park (closed)	---	---	0	
Ann Arbor MSA	367,601	Washtenaw	Ypsilanti	8.3	21	0	
		Kent	GR - Monroe St.	8.2	22	2	
			GR - Wealthy St.	---	--		
Grand Rapids-Wyoming MSA	1,077,370	Barry	---				
		Ottawa	Jenison	8.3	23		
		Montcalm	---				
Muskegon-Norton Shores MSA	173,566	Muskegon	Muskegon - Apple St. (closed)			0	
		Clinton	---				
Lansing-East Lansing MSA	550,391	Ingham	Lansing Filley	**7.5**	26	0	
		Eaton	---				
Bay City MSA	103,126	Bay	Bay City	6.9	19	0	
Kalamazoo-Portage MSA	265,066	Kalamazoo	Kalamazoo	7.9	20	0	
		Van Buren	---				
Niles-Benton Harbor MSA	153,401	Berrien	Coloma (closed)	---	---	0	
Jackson MSA	158,510	Jackson	---				
Battle Creek MSA	134,159	Calhoun	---				
South Bend-Mishaw aka MSA	323,613	Cass	---				
		St. Joseph, IN				0	
Other areas							
		Allegan	Holland	7.4	21		*micropolitan area*
		Missaukee	Houghton Lake	5.4	15		
		Manistee	Manistee	5.6	17		
		Lenawee	Tecumseh	8.1	21		
		Schoolcraft	Seney	4.2	17		

The reduced concentrations of $PM_{2.5}$ measured since 2010 have caused the 2017-2020 design values to drop markedly in many MSAs. The minimum number of monitoring sites in Monroe, Ann Arbor, Holland-Grand Haven, Muskegon-Norton Shores, Lansing-East Lansing, Bay City, Kalamazoo-Portage, Flint, and Niles-Benton Harbor has fallen from one site to zero. Due to an increase in population, two monitors sites are again required in the Grand Rapids-Wyoming MSA.

The $PM_{2.5}$ monitor in Holland (260050003) in Allegan County is a micropolitan area. The monitor's design values were no longer within 85 percent of the NAAQS. As the agency works to transition to real-time monitoring, EGLE replaced the filter-based FRM sampler with a continuous FEM, Met One BAM on January 6, 2020.

The Saginaw MSA is required to have a $PM_{2.5}$ FRM site. The USEPA Regional Administrator granted a waiver allowing for the Bay City site (260170014) to fulfill this requirement. The 24-hour $PM_{2.5}$ design value of the monitor in Bay City was less than 85 percent of the NAAQS, indicating that monitoring was no longer required. EGLE will continue to measure $PM_{2.5}$ and has replaced the filter-based FRM and TEOM with a continuous FEM, Met One BAM October 24, 2019.

As shown in **Table 13**, using the most recent three years of data, the Flint (260490021) monitor had an annual and a 24-hour design value equaling 7.3 and 19 $\mu g/m^3$, respectively, which are less than 85 percent of their respective NAAQS. EGLE will still continue to operate a filter-based FRM $PM_{2.5}$ monitor as a secondary sampler to the Met One BAM in the Flint MSA in 2022. The continuous Met One BAM replaced the TEOM on September 6, 2018.

The annual and 24-hour $PM_{2.5}$ design values at the Lansing monitor (260650018) are no longer greater than 85 percent of the NAAQS, indicating that monitoring is no longer required. However, EGLE will continue to measure $PM_{2.5}$, and made the transition to a continuous FEM T640 in 2021 while continuing to run a co-located FRM filter-based sampler.

The Kalamazoo (260770008) monitor fulfilled the requirement that the Kalamazoo-Portage MSA have one FRM sampler. Both the 24-hour and annual design values are now less than 85 percent of the respective NAAQS, indicating that a site is no longer necessary in this MSA. On January 1, 2021, EGLE discontinued operation of both the primary and secondary, filter-based FRM $PM_{2.5}$ samplers and the $PM_{2.5}$ TEOM. A continuous $PM_{2.5}$ FEM (T640) monitor installed October 20, 2020, will continue to operate at this site in 2022.

In the past, two monitors were required in the Grand Rapids-Wyoming MSA; the site at Monroe St. (260810020) and at Wealthy St. in Wyoming (260810007). The Grand Rapids-Monroe St. (260810020) is an NCore site and is therefore required to retain the $PM_{2.5}$ FRM monitor. Due to difficulties with accessing the Wealthy St. (260810007) site, EGLE had to relocate the $PM_{2.5}$ monitor to the Jenison (261390005) site January 14, 2018. The 24-hour and annual design values at both sites are now less than 85 percent of the respective NAAQS. EGLE replaced the FRM monitors at both sites with new

continuous $PM_{2.5}$ FEM (T640X) monitors in October and December of 2020.The T640X has FEM status for $PM_{2.5}$, PM_{10}, and $PM_{10-2.5}$.

The Tecumseh site (260910007) is the upwind background site near the Detroit-Warren-Livonia MSA, EGLE added a continuous FEM Thermo BAM on January 1, 2019, replacing the continuous $PM_{2.5}$ TEOM and filter-based FRM sampler.

The sites at New Haven (260990009) and Oak Park (261250001) are the only sites in Macomb and Oakland Counties, respectively. EGLE will continue to operate the Oak Park FRM monitor. The New Haven monitor was replaced November 4, 2020, with a continuous $PM_{2.5}$ FEM (T640X) monitor at this site.

Houghton Lake (261130001) is the background $PM_{2.5}$ FRM site in Michigan. EGLE replaced the filter-based sampler with a continuous $PM_{2.5}$ BAM on January 1, 2019.

The Port Huron (261470005) site design value has also dropped, EGLE replaced the FRM $PM_{2.5}$ monitor with a new continuous $PM_{2.5}$ FEM (T640) monitor on November 6, 2020.

Fine particulate concentrations have dropped below 85 percent of the level of the NAAQS in the Ann Arbor MSA, so a monitor is no longer required. However, EGLE will continue to operate a $PM_{2.5}$ FRM as a secondary monitor to the continuous $PM_{2.5}$ Thermo BAM at the Ypsilanti site (261610008) in 2022.

Total of three $PM_{2.5}$ FRM monitors are required in the Detroit-Warren-Livonia MSA. Dearborn (261630033) has historically been the highest annual design value site with a primary and a secondary monitor. EGLE will continue the operation of both FRM monitors at Dearborn. Allen Park (261630001) is the population-oriented trend site, an NCore site, and as such, is also required to collect speciated $PM_{2.5}$ samples on a once every three-day schedule. EGLE will continue to operate the FRM at the Allen Park site. Detroit-SWHS site (261630015) is the second highest site in the MSA. With construction of the GHIB near this site, EGLE will continue operating the primary $PM_{2.5}$ along with a continuous FEM sampler. EGLE replaced the Thermo BAM with a T640X on September 29, 2020. The E 7 Mile (261630019) site $PM_{2.5}$ FRM will continue operation in 2022.

The Livonia site (261630025) in western Wayne County was shut down on January 1, 2019. The Livonia Near-road site (261630095) fulfilled the requirement for $PM_{2.5}$ monitoring at the near-road site. However, the near-roadway site was shut down due to accessibility issues in July 2019. As a result, the MetOne BAM was moved to the Eliza Howell Near-roadway site (261630093) to satisfy the near-roadway requirement in the Detroit MSA for $PM_{2.5}$ monitoring. A replacement site in Livonia along I-275 is slated for sampling carbon monoxide and nitrogen dioxide in 2022.

A tribal $PM_{2.5}$ FRM monitoring site located in Manistee (261010922) is operated by the Little River Band of Ottawa Indians and will continue to operate in 2022.

The above changes in the network will reduce the required number of FRM co-located sites. This reduction to 10 sites equates to a 15 percent co-location requirement of one site. EGLE proposes to keep Dearborn (261630033) as the co-located site.

Table 14 summarizes the $PM_{2.5}$ FRM monitoring site information for sites that were operational in 2021 and are planned to be operational in 2022. **Figure 7** illustrates the geographical distribution of $PM_{2.5}$ FRM monitors for 2022.

Table 14: Michigan's $PM_{2.5}$ FRM Network

Operating Schedule: Once every 6 days, once every 3 days or daily see below.

SLAMS Network

Method: Partisol 2025 Rupprecht & Patashnick Samplers, Method Code 142

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA [1]	2019 Population Estimate
Flint	260490021	Whaley Park, 3610 Iowa St., Flint	43.04722	-83.670278	1:3	Pop. Exp.	88101	1	Neighborhood	Genesee	12/16/98	F	405,813
Lansing Filley	260650018	815 Filley St Lansing	42.76138	-84.562867	1:3	Pop. Exp.	88101	1	Neighborhood	Ingham	05/16//2018	LEL	550,391
Grand Rapids	260810020	1179 Monroe St., NW,	42.984167	-85.671389	1:3	Pop. Exp.	88101	1	Neighborhood	Kent	10/23/98	GW	1,077,370
Oak Park	261250001	13701 Oak Park Blvd.	42.463056	-83.183333	1:3	Pop. Exp.	88101	1	Neighborhood	Oakland	12/25/98	DWL	4,319,629
Ypsilanti	261610008	555 Towner Ave.	42.240556	-83.599722	1:3	Pop. Exp.	88101	1	Neighborhood	Washtenaw	8/4/99	AA	367,601
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:3	Pop. Exp.	88101	1	Neighborhood	Wayne	5/12/99	DWL	4,319,629
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:3	Pop. Exp. Max. Conc.	88101	1	Neighborhood	Wayne	2/26/99	DWL	4,319,629
Detroit - E 7 Mile	261630019	11600 E. 7 Mile, Osborne School	42.430833	-83.000278	1:3	Pop. Exp.	88101	1	Neighborhood	Wayne	4/30/00	DWL	4,319,629
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	1:3	Pop. Exp. Max. Conc.	88101	1	Neighborhood	Wayne	2/5/99	DWL	4,319,629
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	1:6, co-loc	Pop. Exp. Max. Conc.	88101	2	Neighborhood	Wayne	2/5/99	DWL	4,319,629

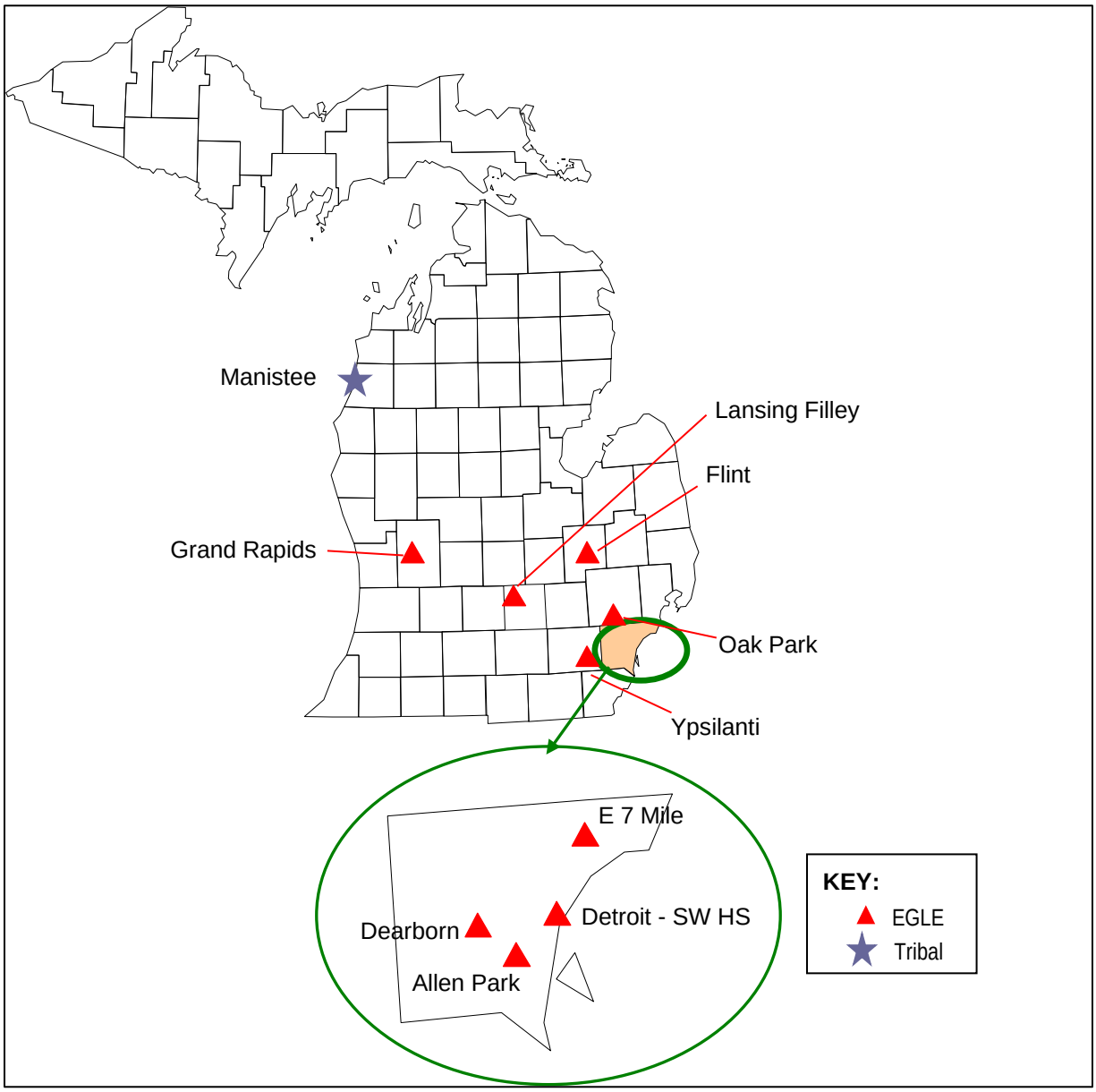
Special Purpose and Tribal $PM_{2.5}$ Monitors in Michigan

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA [1]	2019 Population Estimate
Manistee	261010922	3031 Domres Rd.	44.307	-86.24268	1:3	Tribal	88101	1	Regional	Manistee	4/2/06	Not in CBSA	N/A

[1] MSA Key:

AA = Ann Arbor MSA
DWL = Detroit-Warren-Livonia MSA
F = Flint MSA
GW = Grand Rapids-Wyoming MSA
LEL = Lansing-E. Lansing MSA

Figure 7: Michigan's $PM_{2.5}$ FRM Monitoring Network



$PM_{2.5}$ Quality Assurance

The $PM_{2.5}$ sampling is addressed in the Air Monitoring Unit program QAPP. EGLE plans to operate one co-located $PM_{2.5}$ FRM samplers, meeting the precision monitoring requirement of 15 percent. The sampling frequency of the co-located precision sampler at Dearborn (261630033) is once every six days. Each continuous method must have a co-located FRM sampler. An FRM sampler will operate at Flint (260490021) to co-locate with the MetOne BAM, Ypsilanti (261610008) to co-locate with the Thermo BAM, Lansing (260650018) to co-locate with the T640, and both Grand Rapids (260810020) and Allen Park (261630001) NCore sites will operate FRM samplers with the T640X samplers.

EGLE's station operators conduct flow rate verifications every four weeks to ensure the flow rate is meeting the measurement quality objectives. Results from these flow checks are submitted to the Quality Assurance Team each month for review and are uploaded to the USEPA's AQS database each quarter. Every six months, each $PM_{2.5}$ sampler is audited by a member of the AMU's QA Team. The auditor has a separate line of supervision from the site operator and uses dedicated equipment for audits. The audit assesses the accuracy of the flow as well as the monitor sampling and siting criteria. Every flow audit is reviewed by the QA Coordinator, copies are retained in the QA files, and the audits are uploaded to the USEPA's AQS database. The AMU's auditor also performs a systems audit for each sampler. The systems audit evaluates the siting criteria, condition of the sampling site/station, and other parameters. Copies of the systems audit forms are reviewed by the QA Coordinator and are retained in the QA central files.

EGLE participates in the USEPA's PEP audits at eight sites each year. The USEPA auditor sets up a $PM_{2.5}$ monitor to run side-by-side with the station $PM_{2.5}$ sampler on a run day. The filter from the PEP audit is sent to a USEPA laboratory for analysis. Once the EGLE filter weight is entered into the USEPA's AQS database, the audit filter weight is entered by the USEPA whereby the concentrations are compared between the PEP audit filter and the station filter. The USEPA auditor also assesses the station and monitor siting criteria to evaluate adequacy of the location, including distances from trees, exhaust vents, and large buildings. Probe heights and separation distances are also assessed.

Plans for the 2022 $PM_{2.5}$ FRM Monitoring Network

The following filter-based $PM_{2.5}$ FRM monitors, and sampling frequencies will be retained as part of the 2022 network:

- Flint (260490021) one in three day
- Lansing (260650018) one in three day
- Grand Rapids (260810020) one in three day
- Manistee (261010922) tribal site, one in three day
- Oak Park (261250001) one in three day
- Ypsilanti (261610008) one in three day
- Allen Park (261630001) one in three day
- Detroit-SWHS (261630015) one in three day

- E 7 Mile (261630019) one in three day
- Dearborn (261630033) one in three day
- Dearborn (261630033) one in six day

CONTINUOUS $PM_{2.5}$ MONITORING NETWORK

According to the October 17, 2006, changes to the monitoring regulations, 50 percent of the minimum number of required FRM sites must be co-located with a continuous $PM_{2.5}$ monitor. The current number of continuous monitors operational in the state exceed the minimum number that are required. State agencies are encouraged by the USEPA to convert the existing filter-based FRM $PM_{2.5}$ samplers to FEM continuous instruments. This change in technology allows for real-time measurements for both public notification and regulatory comparison to the National Ambient Air Quality Standards. The change in technology also reduces filter costs, laboratory analysis costs, and staff time to conduct filter installation and recovery. Both filter-based and continuous instruments still require the monthly flow rate verifications and semi-annual audits.

The Dearborn (261630033) monitor measures the highest concentrations of $PM_{2.5}$ in Michigan and is needed for the development of attainment strategies, AIRNOW reporting, diurnal profiling, and estimation of risk. The Allen Park (261630001) monitor is needed to provide a counterpoint to the measurements taken at Dearborn. Allen Park is a population-oriented site designated as the trend site for Michigan. Dearborn is the maximum concentration site, so comparisons between these sites are important to characterize point source impacts on ambient air quality. The $PM_{2.5}$ TEOMs at Grand Rapids-Monroe St. (260810020) and Allen Park (261630001) were both replaced with continuous FEM T640X on October 20, and October 6, 2020, respectively, to meet the NCore requirement for continuous fine particulate measurements.

In 2022, EGLE will operate two Rupprecht & Patashnick TEOM, non-FEM samplers for public notification purposes, seven FEM MetOne BAM monitors, two Thermo BAMs, eight FEM Teledyne T640 monitors, and three Teledyne T640X to supply continuous fine particulate data at 22 monitoring sites, as shown in **Table 15**. **Figure 8** illustrates the geographical distribution of the continuous monitoring network.

With the ongoing construction of the GHIB, EGLE in 2022 will continue to run $PM_{2.5}$ FEM T640 samplers at Detroit – SWHS (261630015), DP4th (261630098), Trinity (261630099) and Military Park (2616300100), which replaced the Thermo BAMs operational since the summer and fall of 2018.

EGLE operates the TEOMs from March through October with an inlet temperature of 50°C. Once the ozone season is over, starting November 1, EGLE reduces the inlet temperature to 30°C in the winter months to minimize loss of nitrates. Operating the TEOMs in this way maximizes comparability with the FRMs. The $PM_{2.5}$ TEOM, T640, T640X, and BAM sites operate to support AIRNOW real time data reporting and to provide adequate spatial coverage.

Table 15: Michigan's Continuous $PM_{2.5}$ Monitoring Network

Operating Schedule: continuous

Method:	Rupprecht & Patashnick Tapered Element Oscilating Microbalance (TEOMS) Samplers Method Codes 701/703										
	Monitoring Sites										Estimated
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Population 2019
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	4,319,629
NMH48217	261630097	3225 S Deacon St.	42.261669	-83.157893	Pop. Exp.	Neighborhood	Wayne	8/18/16	DWL	4,319,629

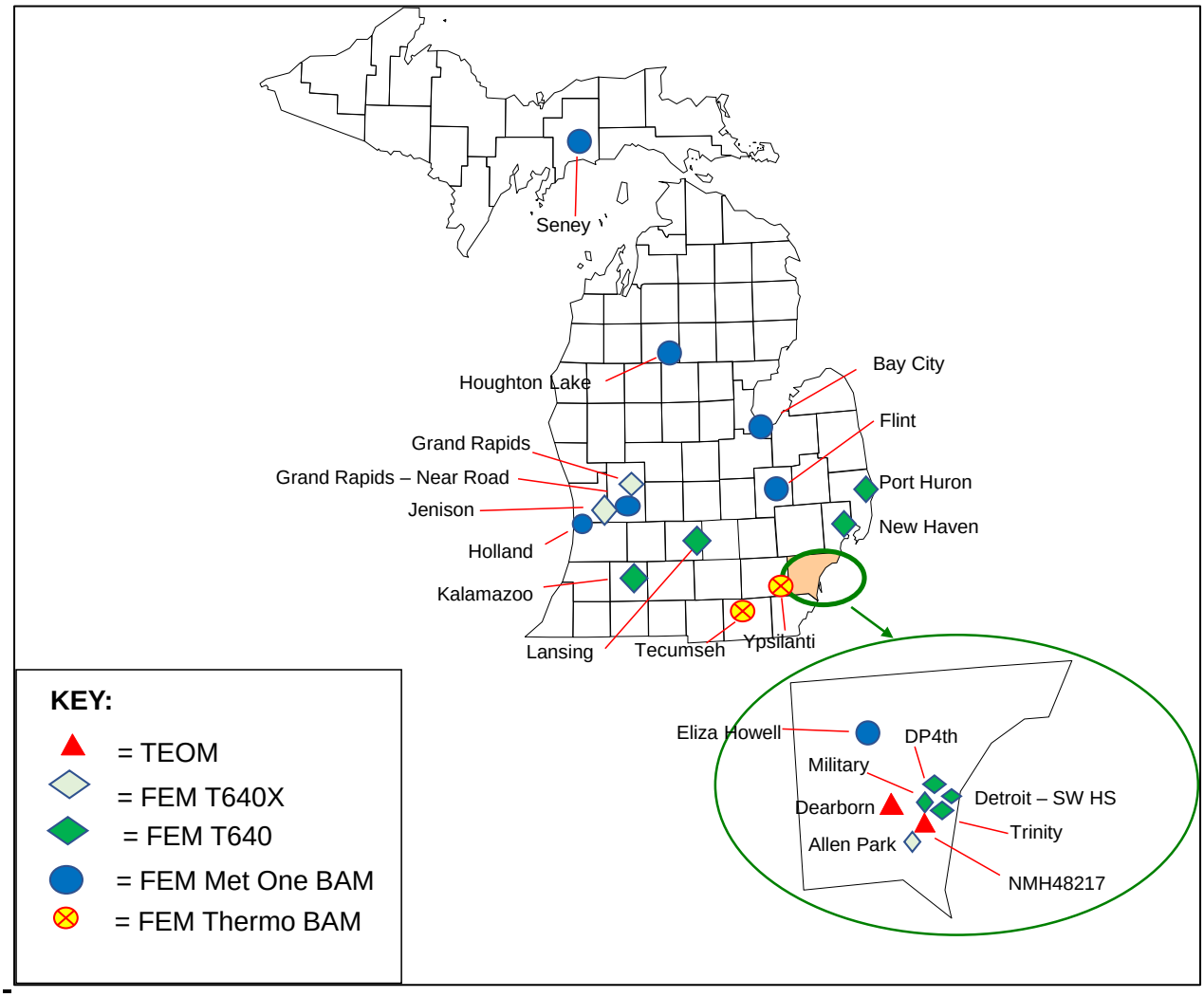
Method:	MetOne Beta Attenuation Monitor (BAM) Method Code 170									
	Monitoring Sites									Estimated
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Population 2019
Holland	260050003	966 W 32nd	42.767778	-86.148611	Pop. Exp.	urban	Allegan	8/1/19	A	118,081
Bay City	260170014	1001 Jennison St.	43.571389	-83.890833	Pop. Exp.	Neighborhood	Bay	8/1/19	BC	103,126
Flint	260490021	Whaley Park , 3610 low a St., Flint	43.047220	-83.670278	Pop. Exp.	Neighborhood	Genesee	9/11/18	F	405,813
Grand Rapids Near-Road	260810023	4365 Louisiana Ave. SW	42.885368	-85.679765	Pop. Exp.	Neighborhood	Kent	12/1/21	GW	1,077,370
Houghton Lake	261130001	1769 S Jeffs Rd.	44.310556	-84.891944	Background	Regional	Missaukee	11/28/18	Not in CBSA	N/A
Seney	261530001	Seney Wildlife Refuge, HCR 2 Box 1	46.288880	-85.950270	Background	Regional	Schoolcraft	1/1/21	Not in CBSA	N/A
Eliza How ell Near- Road	2601630094	23751 Fenkell St,	42.984167	-85.671389	Pop. Exp.	Neighborhood	Wayne	11/1/19	DWL	4,319,629

Method:	Thermo Beta Attenuation Monitor (BAM) Method Code 183									
	Monitoring Sites									Estimated
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Population 2019
Tecumseh	260910007	6792 Raisin Center Highw ay	41.995556	-83.946667	up w ind backgrd	regional	Lenaw ee	11/27/18	AL	98,451
Ypsilanti	261610008	555 Tow ner Ave.	42.240556	-83.599722	Pop. Exp.	Neighborhood	Washtenaw	2/24/00	AA	367,601

Method:	Teledyne API T640 / T640X	Method Code 236 / 238								
	Monitoring Sites									Estimated
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Population 2019
Lansing	260650012	220 N. Pennsylvania	42.738611	-84.534722	Pop. Exp.	Neighborhood	Ingham	9/21/20	LEL	550,391
Kalamazoo	260770008	Fairgrounds,1400 Olmstead Rd.	42.278056	-85.541944	Pop. Exp.	Neighborhood	Kalamazoo	10/20/22	KP	265,066
Grand Rapids (T640X)	260810020	1179 Monroe St., NW,	42.984167	-85.671389	Pop. Exp.	Neighborhood	Kent	10/22/20	GW	1,059,113
New Haven	260990009	57700 Gratiot	42.731389	-82.793611	Pop. Exp.	Neighborhood	Macomb	11/4/20	DWL	4,319,629
Jenison	261390005	6981 29th Ave	42.894444	-85.852778	Background	Neighborhood	Ottaw a	10/19/20	GW	1,077,370
Port Huron	261470005	2525 Dove Rd.	42.953333	-82.456389	Pop. Exp.	Urban	St. Clair	11/6/20	DWL	4,319,629
Allen Park (T640X)	261630001	14700 Goddard	42.228611	-83.208333	Pop. Exp.	Neighborhood	Wayne	10/6/20	DWL	4,319,629
Detroit-SW HS	261630015	150 Waterman	42.302778	-83.106667	Background	Neighborhood	Wayne	9/29/20	DWL	4,319,629
DP4th	161630098	4700 W Fort St	42.312158	-83.091943	Background	Neighborhood	Wayne	10/13/20	DWL	4,319,629
Trinity	261630099	9191 W Fort St	42.295824	-83.129431	Background	Neighborhood	Wayne	10/2/20	DWL	4,319,629
Military	261630100	1238 Military St	42.312078	-83.103469	Background	Neighborhood	Wayne	9/25/20	DWL	4,319,629

AL = Adrian Micropolitan Area
AA = Ann Arbor Metro. Area
BC = Bay City Metro. Area
DWL = Detroit-Warren-Livonia MSA
F = Flint Metro Area
GW = Grand Rapids-Wyoming MSA
KP = Kalamazoo-Portage Metro. Area
LEL = Lansing-E. Lansing Metro. Area

Figure 8: Michigan's Continuous $PM_{2.5}$ Network



$PM_{2.5}$ Continuous Quality Assurance

The AMU site operator conducts flow rate verifications once a month. Results from the flow checks are sent to the QA Team for review each month and reported to the USEPA's AQS database each quarter. An independent flow rate audit is conducted by a member of the AMU's QA Team every six months. During the flow rate audit, the auditor assesses the condition of the station, sample probe, and siting criteria. The QA Coordinator reviews all audit results and hard copies of the results are retained in the QA files. Each quarter the flow audits are uploaded to the USEPA's AQS database.

Plans for the 2022 $PM_{2.5}$ TEOM and $PM_{2.5}$ BAM Network

During 2022, Michigan will continue to operate $PM_{2.5}$ TEOM (non-FEM) monitors at:

- Dearborn (261630033)
- NMH 48217 (261630095)

During 2022, EGLE plans to continue to operate $PM_{2.5}$ Met One BAM monitors at:

- Holland (260050003) Method 170
- Bay City (260170014) Method 170
- Flint (260490021) Method 170
- Grand Rapids-Near-road (260810023) Method 170
- Houghton Lake (261130001) Method 170
- Seney (261530001) Method 170
- Eliza Howell-Near-road (261600101) Method 170

During 2022, EGLE plans to continue to operate $PM_{2.5}$ Thermo BAM monitors at:

- Tecumseh (260910007) Method 183
- Ypsilanti (261610008) Method 183

During 2022, EGLE plans to continue to operate $PM_{2.5}$ Teledyne T640/T640X monitors at:

- Lansing (260650018) Method 236
- Kalamazoo (260770008) Method 236
- Grand Rapids (260810020) Method 238
- New Haven (260990009) Method 236
- Jenison (261390005) Method 238
- Port Huron (261470005) Method 236
- Allen Park (261630001) Method 238
- Detroit–SWHS (261630015) Method 236
- DP4th (261630098) Method 236
- Trinity (261630099) Method 236
- Military (261630100) Method 236

SPECIATED $PM_{2.5}$ MONITORING NETWORK

Continued operation of the speciation trend site network is required on a national level and these sites sample on frequency of once every three days, following the USEPA sampling schedule. The speciated trend site in Michigan is located at Allen Park (261630001). All remaining supplemental speciation sites operate on a once every six-day schedule, except for the NCore site at Grand Rapids–Monroe St. (260810020), which also has a sampling frequency of once every three days. The speciation network is described in **Table 16**. **Figure 9** illustrates the current coverage across Michigan.

Note that Allen Park (261630001) contains a suite of carbon channel samplers: an IMPROVE, a Met One SUPER SASS, and an URG 3000 N. EGLE will continue to operate the three different carbon samplers to support USEPA OAQPS inter-sampler comparability studies.

Continuous Speciation Measurements

In addition to the speciated measurements integrated over a 24-hour time period described above, EGLE operates continuous monitors for black carbon using aethalometers. Large spot aethalometers from Magee Scientific operate at Dearborn (261630033) and Allen Park (261630001). These units measure carbon black, which is very similar to and correlates well with elemental carbon. As part of the Community Scale Air Toxics monitoring grant in 2015, three new aethalometers were purchased from Magee Scientific. These were installed in 2016 as Special Purpose Monitors at Eliza Howell Near-road (261630093), Eliza Howell Downwind (261630094), and Livonia Near-road (261630095) for the Air Toxics Near-roadway study. When that study ended in 2017, these instruments were relocated to the three new GHIB monitoring locations and another at Detroit-SWHS (261630015) in 2018.

Speciation Quality Assurance

The site operator conducts flow rate verifications every four weeks. Results from the flow checks are sent to the QA Team for review each month and uploaded to the USEPA's AQS database each quarter. The QA team conducts semi-annual flow rate audits on the $PM_{2.5}$ speciation monitors. The auditor also assesses the monitoring station and siting criteria to ensure it continues to meet the measurement quality objectives. Audit results are reviewed by the AMU's QA Coordinator. Only the audit data for SASS/URG is uploaded to the USEPA's AQS database each quarter. The USEPA periodically conducts technical systems audits and instrument audits for the speciation network. The USEPA also conducts audits of the national contract laboratory, which supplies speciation analysis services for the entire nation.

Table 16: Michigan's $PM_{2.5}$ Speciation Network

Current Speciation Sites

Operating Schedule: Once Every 3 days (Allen Park and Grand Rapids), once every 6 days all others. Follows USEPA sampling schedule.

Method: Met One SASS and URG 3000 N units to collect organic & elemental carbon, Method Code 811 (SASS) Method Code 839/840 (URG)

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Start Date	MSA [1]	2019 Population Estimate
Grand Rapids	260810020	1179 Monroe St., NW,	42.984	-85.67139	1:3	Pop. Exp.	5	Neighborhood	Kent	11/4/99	GW	1,077,370
Allen Park	261630001	14700 Goddard	42.229	-83.20833	1:3	Pop. Exp.	5	Neighborhood	Wayne	12/1/00	DWL	4,319,629
Detroit- SWHS	261630015	150 Waterman St	42.303	-83.10667	1:6	Pop. Exp. Max. Conc.	5	Neighborhood	Wayne	11/2/08	DWL	4,319,629
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	1:6	Pop. Exp. Max. Conc.	5	Neighborhood	Wayne	9/26/03	DWL	4,319,629

Continuous Speciation Measurements

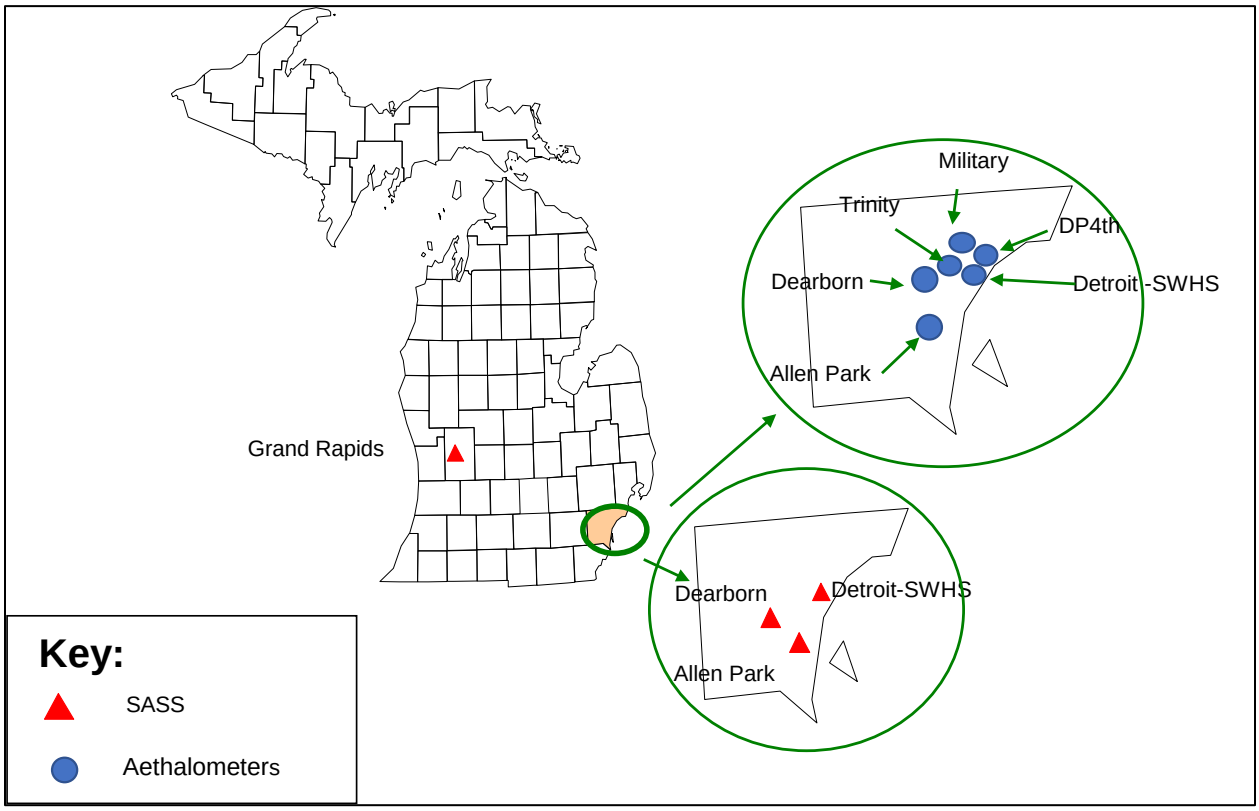
Method: Magee Aethalometer: Method Code 861

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Method	Purpose	POC	Scale	County	Start Date	MSA [1]	2019 Population Estimate
Allen Park	261630001	14700 Goddard	42.229	-83.20833	McGee large spot Aethalometer (carbon black)	Pop. Exp.	1	Neighborhood	Wayne	1/1/04	DWL	4,319,629
Detroit- SWHS	261630015	150 Waterman St	42.303	-83.10667	McGee large spot Aethalometer (carbon black)	SPM		Neighborhood	Wayne	8/20/18	DWL	4,319,629
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	McGee large spot Aethalometer (carbon black)	Pop. Exp. Max. Conc.	1	Neighborhood	Wayne	12/19/03	DWL	4,319,629
DP4th	161630098	4700 W Fort St	42.312	-83.09194	McGee large spot Aethalometer (carbon black)	Max. Conc.	1	Neighborhood	Wayne	7/30/18	DWL	4,319,629
Trinity	261630099	9191 W Fort St	42.296	-83.12943	McGee large spot Aethalometer (carbon black)	Pop. Exp.	1	Neighborhood	Lenaw ee	10/23/18	DWL	4,319,629
Military	261630100	1238 Military St	42.309	-83.10347	McGee large spot Aethalometer (carbon black)	Pop. Exp.	1	Neighborhood	Wayne	11/17/18	DWL	4,319,629

[1] MSA Key:

AL = Adrian Micropolitan Area
DWL = Detroit-Warren-Livonia MSA
GW = Grand Rapids-Wyoming MSA
SPM = Special Purpose Monitor

Figure 9: Michigan's $PM_{2.5}$ Speciation (SASS) Network



Plans for the 2022 $PM_{2.5}$ Speciation Monitoring Network

Met One SASS and URG 3000N:

During 2022, contingent upon adequate levels of funding, EGLE will continue to operate 24-hour $PM_{2.5}$ speciation monitors at:

- Grand Rapids (260810020) operating once every three days;
- Allen Park (261630001) operating once every three days;
- Dearborn (261630033) operating once every six days; and
- Detroit-SWHS (261630015) operating once every six days.

Black Carbon - Aethalometer:

During 2022, EGLE will continue to operate hourly Magee aethalometer monitors at:

- Dearborn (261630033);
- Allen Park (261630001);
- Detroit -SWHS (261630015);
- DP4th 261630098);
- Trinity (261630099); and
- Military Park (261630100).

PM_{10} MONITORING NETWORK

The October 17, 2006, monitoring regulations modified the minimum number of PM_{10} samplers required in MSAs. Since then, further revisions have occurred, relaxing the numbers of sites required in high population areas with low concentrations of PM_{10}, as shown in **Table 17**.[10]

Table 17: PM_{10} Minimum Monitoring Requirements (Number of Stations per MSA)[1]

Population Category	High Concentration[2]	Medium Concentration[3]	Low Concentration[4, 5]
> 1,000,000	6-10	4-8	2-4
500,000 – 1,000,000	4-8	2-4	1-2
250,000 – 500,000	3-4	1-2	0-1
100,000 – 250,000	1-2	0-1	0

[1] Selection of urban areas and actual numbers of stations per area within the ranges shown in this table will be jointly determined by USEPA and the state agency.
[2] High concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding the PM_{10} NAAQS by 20% or more.
[3] Medium concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding 80% of the PM_{10} NAAQS.
[4] Low concentration areas are those for which ambient PM_{10} data show ambient concentrations < 80% of the PM_{10} NAAQS.
[5] These minimum monitoring requirements apply in the absence of a design value.

Applying **Table 17** to Michigan's urban areas, population totals, and historical PM_{10} data results in the design requirements that are shown in **Table 18**.

According to the tables, two to four PM_{10} sites are required in the Detroit-Warren-Livonia Metropolitan Area. Currently, there are three sites in operation; one at Allen Park (261630001), one at Detroit-SWHS (261630015), and a co-located pair at the design value site at Dearborn (261630033). The one at Allen Park (261630001) was shut down January 7, 2021, and replaced with the FEM, continuous T640X, which has been sampling since October 6, 2020.

The PM_{10} monitoring requirements specify that two to four PM_{10} sites are required in the Grand Rapids-Wyoming MSA. There are two sites in operation, one at Grand Rapids (260810020) and the second at Jenison (261390005). In January 2021, EGLE shut down both high volume filter-based monitors at each site and replaced with the FEM, continuous T640X monitors that were sampling since October and December 2020.

According to the requirements, either zero or one PM_{10} monitor is required in the Flint MSA. In 2006, EGLE operated a PM_{10} sampler in Flint (260490021) but as a result of budget cuts and low concentrations, PM_{10} sampling was discontinued on April 1, 2007.

[10] Table D-4 of Appendix D to Part 58.

As part of a special study investigating the concentrations of manganese (Mn) in the Detroit urban area, PM_{10} filters at Allen Park (261630001), Detroit-SWHS (261630015) and Dearborn (261630033) are analyzed for Mn and compared with the concentrations of Mn on the TSP filters. The manganese data was reviewed and determined to be equivalent to the TSP values. Therefore, the PM_{10} manganese analysis was discontinued in March 2009.

$PM_{10-2.5}$ (coarse) measurements are required at NCore sites in Grand Rapids–Monroe St. (260810020) and Allen Park (261630001). It is determined by subtracting the fine particulate from the PM_{10} size fraction. This is measured by the FEM, continuous T640X began on October 22, 2020.

Table 18: Application of the Minimum PM_{10} Monitoring Regulations in the April 30, 2007, Correction to the October 17, 2006, Final Revision to the Monitoring Regulation to Michigan's PM_{10} Network

Design value sites are in bold

MSA	2019 Estimated Population	Counties	Existing Monitors	2019-2020 most recent 3-year PM10 design value (24-Hr)	Conc. Class.	Min No monitors Required
Detroit-Warren-Livonia MSA	4,319,629	Macomb	---	**---**		2-4
		Oakland	---	**---**		
		Wayne	Allen Park	32	low	
			Detroit -SW HS	65	low	
			Dearborn	**48**	low	
		Lapeer	---	**---**		
		St Clair	---	**---**		
		Livingston	---	---		
Flint MSA	405,813	Genesee	---	---		
Monroe MSA	150,500	Monroe	---	**---**		
Ann Arbor MSA	367,601	Washtenaw	---	**---**		0-1
Grand Rapids-Wyoming MSA	1,077,370	Kent	Gand Rapids	35		2
		Barry	---	---		
		Ottawa	Jenison started 2018	32		
		Montcalm	---	----		
Muskegon-Norton Shores MSA	173,566	Muskegon	---	---		
Lansing-East Lansing MSA	550,391	Clinton	---	---		0-1
		Ingham	---	---		
		Eaton	---	---		
Bay City MSA	103,126	Bay	---	---		
Saginaw-Saginaw Twp N MSA	190,539	Saginaw	---	---		
Kalamazoo-Portage MSA	265,066	Kalamazoo	---	---		0-1
		Van Buren	---	---		
Niles-Benton Harbor MSA	153,401	Berrien	---	---		
Jackson MSA	158,510	Jackson	---	---		
Battle Creek MSA	134,159	Calhoun	---	---		
South Bend-Mishawaka MSA	323,613	Cass	---	---		0-1
		St. Joseph, IN	---	---		

MSAs with populations greater than 500,000 require at least 1 PM 10 monitor.

Table 19 summarizes the PM_{10} monitoring site information for sites in operation in 2021-2022. **Figure 10** shows the PM_{10} monitoring locations for 2021-2022.

Table 19: Michigan's PM_{10} Monitoring Network

Manual High Volume PM_{10} Sites

Method: Manual High Volume Sampler Tisch Environmental, Inc.Model TE-6070D-B

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	2019 Population Estimate
Detroit - SWHS	261630015	150 Waterman	42.30278	-83.106667	1:6	High Vol	max conc	81102	1	nghbrhd	Wayne	3/27/87	DWL	4,319,629
Dearborn	261630033	2842 Wyoming	42.30667	-83.148889	1:6	High Vol	max conc	81102	1	nghbrhd	Wayne	6/12/90	DWL	4,319,629
Dearborn	261630033	2842 Wyoming	42.30667	-83.148889	1:12	High Vol for precision	max conc	81102	9	nghbrhd	Wayne	6/12/90	DWL	4,319,629

Continous PM_{10} Sites

Method: Continous Particulate Mass Monitor Ruppecht and Patashnick TEOM® 1400 series

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	2019 Population Estimate
Dearborn	261630033	2842 Wyoming	42.30667	-83.148889	continuous	R&P PM10 TEOM	max conc	81102	3	nghbrhd	Wayne	4/1/00	DWL	4,319,629

Continous Low Volume PM_{10} Sites

Method: Continous Particulate Mass Monitor Teledyne T640x PM_{10}

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	2019 Population Estimate
Grand Rapids	260810020	1179 Monroe NW	42.98417	-85.671389	continuous	T640x	pop exp	81102	1	nghbrhd	Kent	10/22/20	GW	1,077,370
Jenison	261390005	6981 28Th Ave. Georgetow n Tw p.	42.89444	-85.852778	continuous	T640x	pop exp	81102	1	nghbrhd	Ottaw a	10/19/20	GW	1,077,370
Allen Park	261630001	14700 Goddard	42.22861	-83.208333	continuous	T640x	pop exp	81102	1	nghbrhd	Wayne	10/6/20	DWL	4,319,629

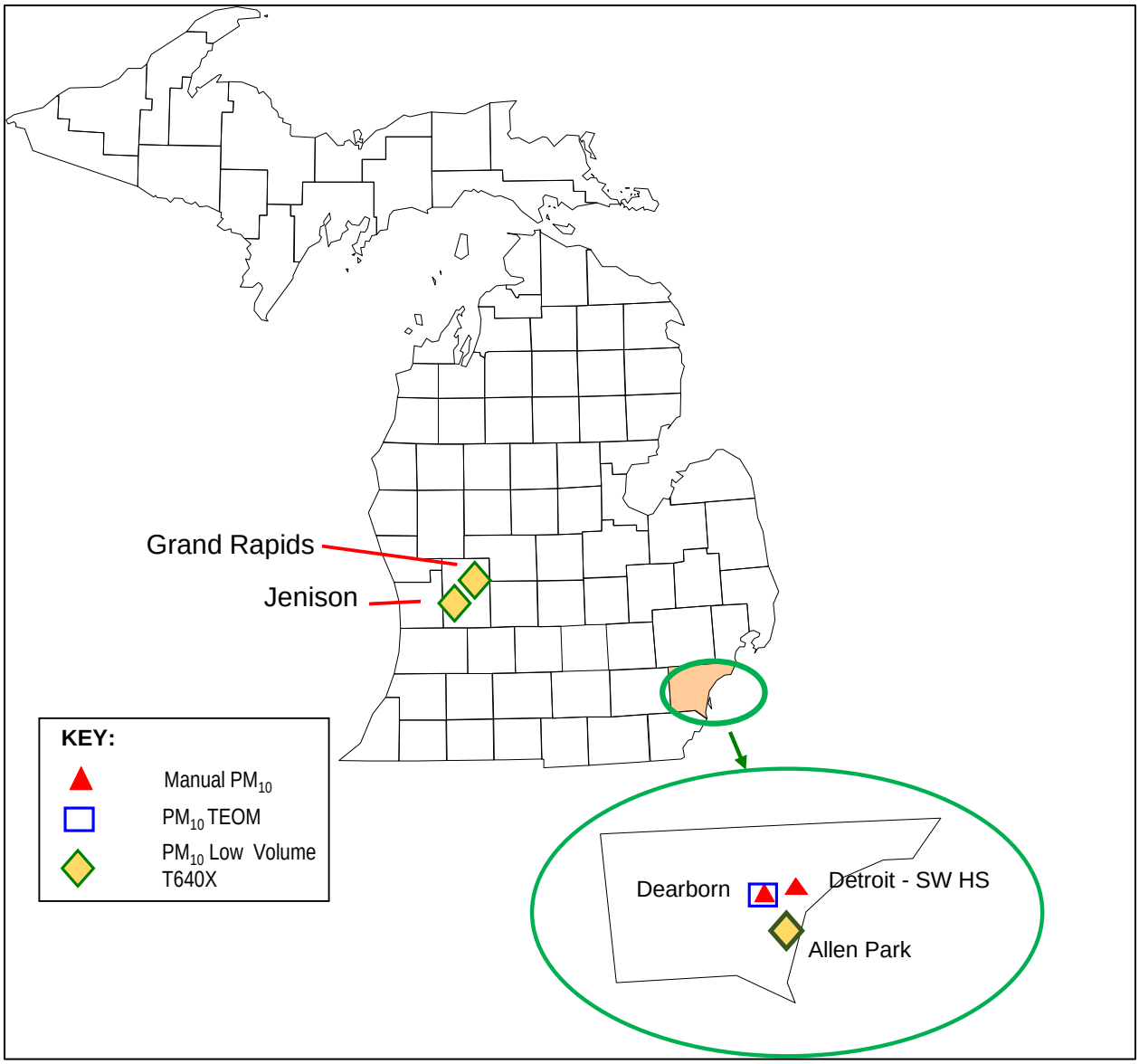
NCore Continous Low Volume PM Coarse Sites

Method: Continous Particulate Mass Monitor Teledyne T640x $PM_{10-2.5}$

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	2019 Population Estimate
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.98417	-85.671389	continuous	T640X	pop exp	81102	1	nghbrhd	Kent	10/22/20	GW	1,077,370
Allen Park	261630001	14700 Goddard	42.22861	-83.208333	continuous	T640X	pop exp	81102	1	nghbrhd	Wayne	10/6/20	DWL	4,319,629

[1] **CBSA Key:** DWL= Detroit-Warren-Livonia Metro. Area
GW=Grand Rapids-Wyoming Metro. Area

Figure 10: Michigan's PM_{10} Monitoring Network



PM_{10} Quality Assurance

The AMU site operator conducts a flow rate verification once a month. Flow check values are sent to the QA Team for review and are reported to the USEPA's AQS database each quarter. An independent flow rate audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files. Audit results are uploaded to the USEPA's AQS database each quarter.

Plans for the 2022 PM_{10} Monitoring Network

During 2022, contingent upon adequate levels of funding, EGLE is planning to operate:

1. **High volume PM_{10} monitors sampling over 24-hours at:**

    - Detroit–SWHS (261630015) - once every six day
    - Dearborn (261630033) - once every six day
    - Dearborn (261630033) - once every 12 day

2. **Low volume PM_{10} continuous T640X monitors** measure both PM_{10} and $PM_{10-2.5}$ (PM_{c}) at the following NCore sites:

    - Grand Rapids (260810020) PM_{10} and PM_{c}
    - Jenison (261390005) PM_{10}
    - Allen Park (261630001) PM_{10} and PM_{c}

3. **Continuous PM_{10} TEOM** at Dearborn (261630033) - hourly schedule.

CARBON MONOXIDE (CO) MONITORING NETWORK

Prior to the latest CO NAAQS review, EGLE operated trace CO monitors at Grand Rapids–Monroe St. (260810020) and Allen Park (261630001) as part of NCore.

On August 31, 2011[11], the USEPA finalized the new CO NAAQS and retained the level and form of the CO NAAQS but revised the design of the ambient monitoring network for CO to be more focused on heavily traveled urban roads. In the rule, CBSAs with population totals equal to or greater than one million people would be required to add CO monitors to near-road monitoring stations that are required in the NO_2 network design. EGLE had CO monitor at two sites; Eliza Howell Near-road (261630093) and the Livonia Near-road (261630095) site. Due to site access issues the Livonia Near-road site had to be shut down and relocated to the Livonia Near-road 2 (261630101) site in the summer of 2021. Due to an increase in population, the Grand Rapids MSA is required to have a near-roadway monitoring station. EGLE established a near-roadway monitoring site in Grand Rapids in 2021.

Table 20 summarizes the CO monitoring site information for sites that will operate in 2022. **Figure 11** shows the distribution of CO monitors across the state of Michigan.

CO Quality Assurance

The AMU site operator performs a 1-point quality assurance check of the analyzer every two weeks. Results of checks are sent to the QA Coordinator each quarter. Each monitor is audited annually by the AMU's QA Team. The auditor has a separate reporting line of authority from the site operator. The auditor utilizes a dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor at several concentrations using a certified gas standard. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of the 1-point checks. Results of the 1-point checks and annual audits indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the results of the checks and audits to the USEPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

External audits are conducted by the USEPA's thru-the-probe audit procedure for regular and trace level CO monitors. The USEPA reports the results to AQS.

[11] Environmental Protection Agency, "National Ambient Air Quality Standards for Carbon Monoxide," 40 CFR Parts 50, 53 and 58, proposed rule, January 28, 2011.

Plans for the 2022 CO Monitoring Network

Contingent upon adequate levels of funding, EGLE plans to continue to operate trace level CO monitors to support NCore operations at:

- Grand Rapids (26810020); and
- Allen Park (261630001).

Contingent upon adequate levels of funding, EGLE plans to operate CO monitors at the near-roadway monitoring sites:

- Grand Rapids Near-road (26810023);
- Eliza Howell (roadway) (261630093); and
- Livonia Near-road 2 (261630101).

Contingent on adequate funding, EGLE will operate the CO monitors around the GHIB project at:

- DP4th (261630098); and
- Trinity (261630099).

Figure 11: Michigan's CO Monitoring Network

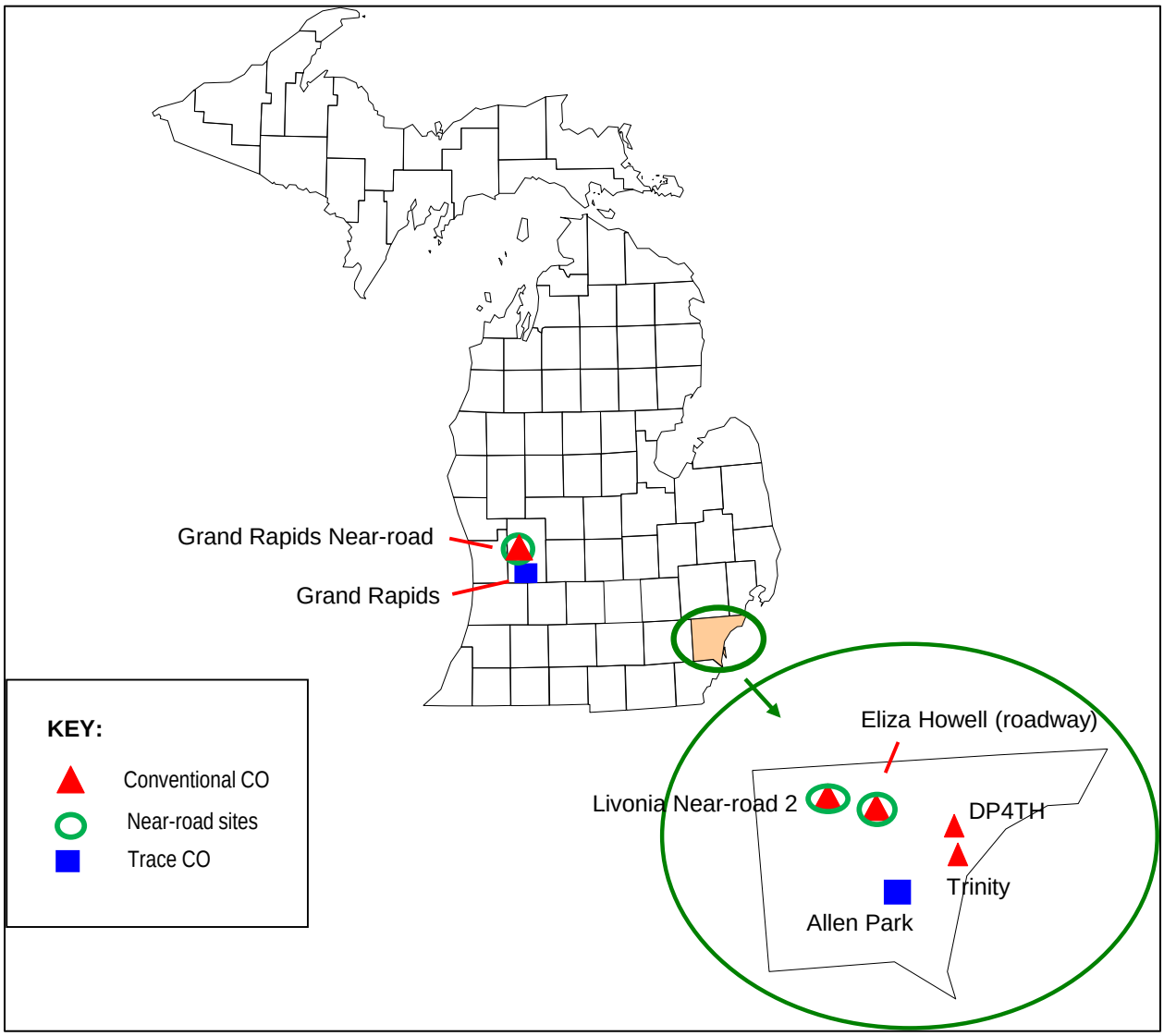


Table 20: Michigan's CO Monitoring Network

Ncore Sites (Trace)

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA [1]	2019 Population Estimate
Grand Rapids	260810020	1179 Monroe NW	42.98417	-85.671389	trace CO	pop exp	42101	1	nghbrhd	Kent	1/1/08	GW	1,077,370
Allen Park	261630001	14700 Goddard	42.22861	-83.208333	trace CO	pop exp	42101	1	nghbrhd	Wayne	1/1/08	DWL	4,319,629

Near Roadway Sites

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA [1]	2019 Population Estimate
Grand Rapids Near - road	260810023	4365 Louisiana Ave. SW	42.88537	-85.679765	CO	Near Road	42101	1	micro	Kent	8/1/21	GW	1,077,370
Eliza Howell (Roadway)	261630093	Service Road I-96 & Telegraph	42.38599	-83.26632	CO	Near Road	42101	1	micro	Wayne	9/1/11	DWL	4,319,629
Livonia Near Road 2	261630101	14975 Eckels Rd	42.39357	-83.431948	CO	Near Road	42101	1	micro	Wayne	8/1/21	DWL	4,319,629

Special Purpose Monitors

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA [1]	2019 Population Estimate
DP4th	261630098	4700 W Fort St	42.31216	-83.091943	CO	Max. Conc.	42101	1	nghbrhd	Wayne	7/27/18	DWL	4,319,629
Trinity	261630099	9191 W Fort St	42.29582	-83.129431	CO	Pop. Exp.	42101	1	nghbrhd	Wayne	10/25/18	DWL	4,319,629

[1] MSA Key:

DWL = Detroit-Warren-Livonia MSA GW = Grand Rapids-Wyoming MSA

NITROGEN DIOXIDE (NO_2) and NO_Y MONITORING NETWORK

On February 9, 2010, the USEPA modified the NO_2 NAAQS from an ***annual*** average concentration of 53 ppb to an ***hourly*** average of 100 ppb.

Along with modifications to the standard, changes to the design of the ambient monitoring network also occurred. A three-tiered monitoring network for NO_2 focuses on near-roadway monitoring as well as monitoring at urban locations. The minimally required components of the network are:

Tier 1: Near-road Monitors

1. Every CBSA with a population greater than or equal to 1,000,000 people must have a microscale NO_2 monitor located within 50 meters of a major roadway.
2. An additional near-roadway site is required in CBSAs with populations of 2,500,000 or more.
3. An additional near-roadway site is required for any roadway segment with 250,000 or more annual average daily traffic (AADT) totals.

Tier 2: Area-wide Monitors

One NO_2 monitor in every CBSA with a population equal to or greater than 1,000,000 people. This monitor should be located in an area with an expected high concentration of NO_2 and should use a neighborhood or larger scale. Emission inventory data should be used to make this selection.

Tier 3: Regional Administrator Required Monitors

The USEPA Administrator must require a minimum of 40 NO_2 monitors nationwide in locations with "susceptible and vulnerable" populations.

The network design described above uses the latest available Census figures. The new monitoring stations were to be deployed and operational by January 1, 2013.[12] Due to budgetary constraints, the USEPA developed a build-and-hold system for implementing the new monitoring locations. Two Detroit near-road monitoring sites have been deployed. In addition, EGLE operated the community scale NO_2 monitor at its Detroit-E 7 Mile (261630019) site.

The USEPA has finalized a new rule, which eliminates Tier 3 of the near-road sites. This would have removed the requirement for a near-road site in Grand Rapids; however, the Grand Rapids CBSA exceeded the one million population threshold, which is now subject to the Tier 1 requirements. Funding for a near-road site in the Grand Rapids CBSA per CFR requirements was approved. EGLE started operation of the

[12] "Primary National Ambient Air Quality Standards for Nitrogen Dioxide," USEPA, 40 CFR Parts 50 and 58. February 9, 2010.

Grand Rapids near-road monitoring station in summer 2021. The existing NO_Y monitor at the NCore site did not meet the CFR requirements for the near-roadway site.

The one million population in Grand Rapids requires both a near-road site (Tier 1) and a population-based area monitor (Tier 2). EGLE installed a 'true NO_2' for PAMS, which would meet both the population requirement and the PAMS requirement. Previously when the USEPA funding for the PAMS direct NO_2 was initially delayed, EGLE installed in 2019 a traditional NO_X analyzer at Jenison (261390005). Once the PAMS funding was received for the direct NO_2 sampler at Grand Rapids, EGLE shut down the NO_X analyzer at Jenison on January 6, 2021.

Table 21 summarizes the monitoring requirements for NO_2 according to the various tiers for all CBSAs in Michigan. As shown by this table, one monitor is required in Grand Rapids-Wyoming MSA and three monitors are required in the Detroit-Warren-Livonia MSA.

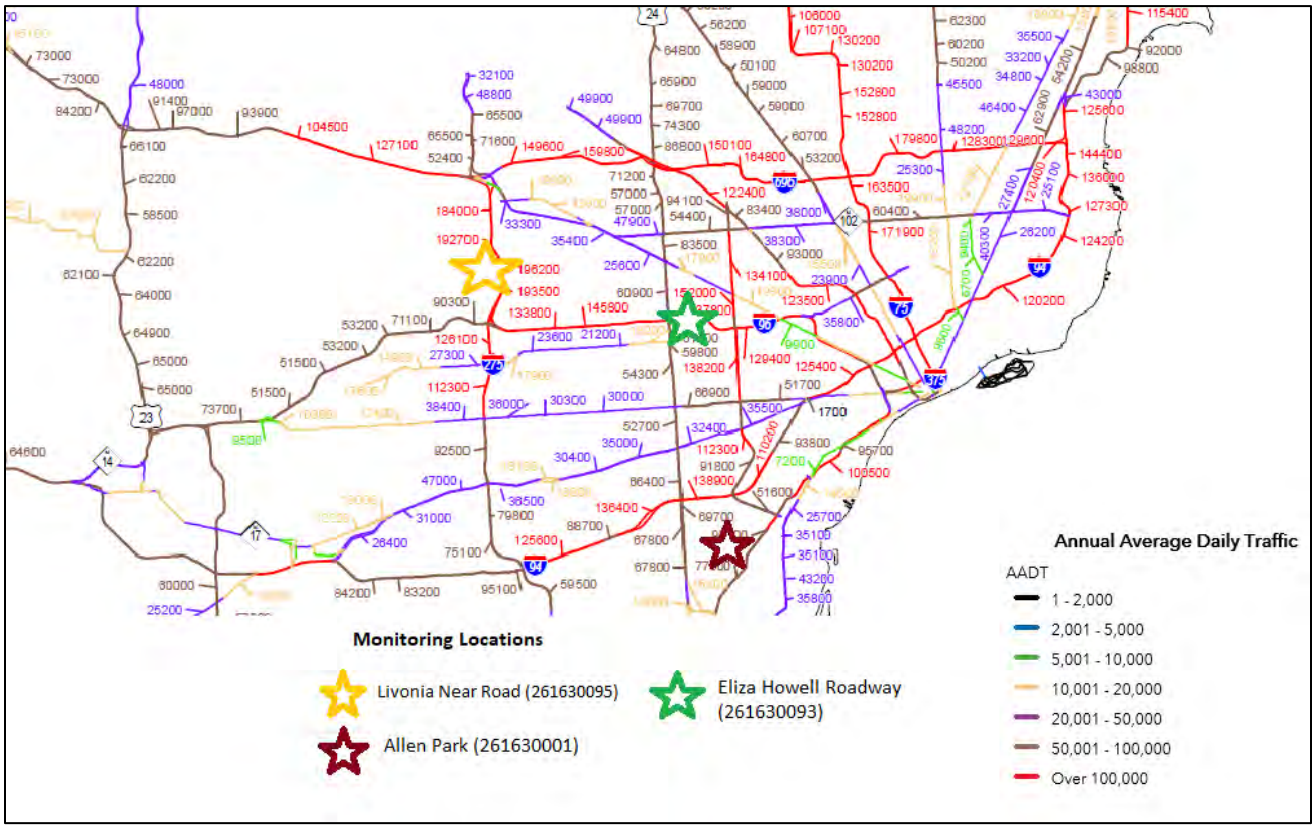
Table 21: NO_2 Network Design

MSA	Counties	2019 Estimated Population	Near Roadway Monitors Req'd	Additional Near Roadway Site	250,000 AADT	Community Wide Monitor	EJ Monitor
Detroit-Warren-Livonia MSA	Macomb Oakland Wayne Lapeer St Clair Livingston	4,319,629	1	1		1	
Flint MSA	Genesee	405,813					
Monroe MSA	Monroe	150,500					
Ann Arbor MSA	Washtenaw	367,601					
Grand Rapids-Wyoming MSA	Kent Barry Ottawa Montcalm	1,077,370	1			1	
Muskegon-Norton Shores MSA	Muskegon	173,566					
Lansing-East Lansing MSA	Clinton Ingham Eaton	550,391					
Bay City MSA	Bay	103,126					
Saginaw MSA	Saginaw	190,539					
Kalamazoo-Portage MSA	Kalamazoo Van Buren	265,066					
Niles-Benton Harbor MSA	Berrien	153,401					
Jackson MSA	Jackson	158,510					
Battle Creek MSA	Calhoun	134,159					
South Bend Mishawaka MSA IN/MI	Cass St. Joseph, IN	323,613					

Tier 1: Near-roadway NO_2 Monitors – Phase 2

The second near-road site for the Detroit-Warren-Livonia MSA was due by January 1, 2015. The Livonia Near-road site (261630095) was established in December 2014 and was operational by January 1, 2015. This is the heaviest traveled traffic segment in the Detroit-Warren-Livonia MSA, see yellow star on **Figure 12 showing Annual Average Daily Traffic (AADT)**. Due to site access issues the site had to be shut down. It has been relocated in the same traffic area segment and started operation in summer of 2021.
(https://www.michigan.gov/mdot/0,4616,7-151-11151-22141--,00.html)

Figure 12: Comparison of Eliza Howell Park Location with other Air Monitoring Stations and Roadway Segments with High Traffic Counts



Tier 2: Area-wide NO_2 Monitors

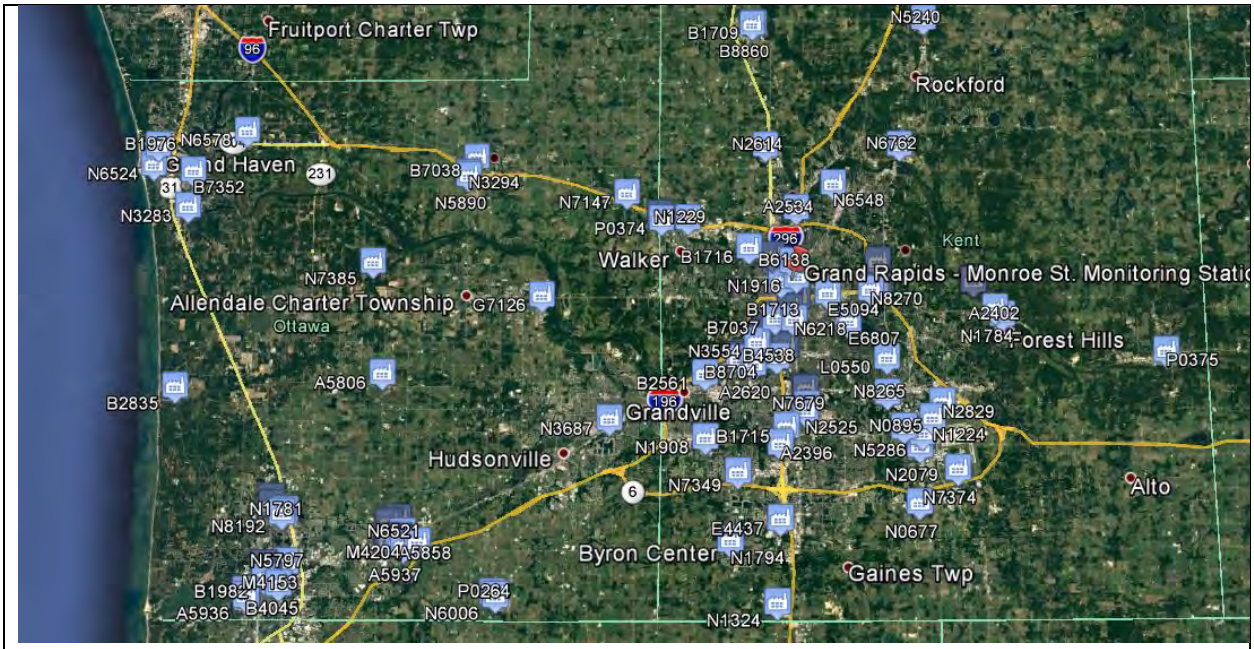
Area-wide monitoring is required in every CBSA with 1,000,000 or more people. The Detroit-Warren-Livonia MSA and the Grand Rapids-Wyoming MSA both meet this requirement in Michigan. In Detroit, EGLE is currently operating NO_2 monitors at the sites identified as Detroit-SWHS (261630015), DP4th (261630098), Trinity (261630099), and Military Park (261630100).

The NO_X monitor at the Detroit-E 7 Mile site (261630019) in northeast Detroit was shut down August 15, 2018, to prepare the site for the PAMS network, which includes the operation of direct NO_2 and NO_Y monitors. The NO_Y monitor has been operational since May 15, 2019, and the direct NO_2 has been operating since January 28, 2021.

The Grand Rapids MSA area is required to have an area wide NO_2 monitor as the population requirement. The NO_Y monitor at the NCore site does not satisfy this requirement. EGLE installed a 'true NO_2' for PAMS, which meets both the population requirement and the PAMS requirement. When the USEPA funding for the PAMS direct NO_2 was delayed, EGLE installed January 10, 2019, a traditional NO_X analyzer at Jenison (261390005). This was shut down on January 6, 2021, once PAMS funding allowed for the direct NO_2 sampler at Grand Rapids to be operational on January 14, 2021. This will meet both the NCore and PAMS requirements.

Figure 13 shows the NO_2 emission points for Kent and Ottawa Counties, as well as the location of the Grand Rapids site.

Figure 13: NO_2 Emission in Kent and Ottawa Counties



NO_2 Monitoring for GHIB Study

In 2018, to monitor NO_2 before, during, and after construction of the GHIB, EGLE added three new sites; DP4th (261630098), Trinity (261630099) and Military Park (261630100), in addition to the existing Detroit-SWHS site (2616300015).

NO_2 Monitoring for NSR

Recent modeling projects for NSR (New Source Review) have shown that there is a possibility that the new 1-hour NO_2 NAAQS could be violated using current modeling techniques. More refined modeling that would provide a more accurate picture of the impact from new sources could be performed; however, EGLE lacked ambient data required for use in the models. At least five years of NO_2 data are required in both urban and rural locations. Therefore, on July 1, 2010, EGLE began collecting NO_2 measurements at Houghton Lake (261130001) and at Lansing (260650012).

NO_Y Monitoring

Trace NO_Y monitors for the NCore sites at Grand Rapids–Monroe St. (260810020) and Allen Park (261630001) have been operational since December 2007. The Detroit-E 7 Mile site is operating an NO_Y monitor for PAMS.

Table 22 summarizes the NO_2 and NO_Y monitoring site information for sites that were running in 2021 and will continue to operate in 2022. **Figure 14** shows the NO_2 and NO_Y monitoring network operated by EGLE in 2021 and 2022.

NO_2 and NO_Y Quality Assurance

The AMU site operator performs a 1-point quality assurance check of the analyzer every two weeks. The checks are sent to the QA Coordinator each month. Each monitor is audited annually by the AMU's QA Team, which has a separate reporting line of authority from the site operator. The auditor utilizes dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor at several concentrations using a certified gas standard. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. The results of the audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the precision check results and audit results to the USEPA's AQS database each quarter. The QA Coordinator reviews all audit results and hard copies are retained in the QA files.

For conventional (non-trace level) NO_2 monitors, the USEPA conducts thru-the-probe audits at 20 percent of the monitors each year. The audit consists of delivering four levels of calibration gas to the station monitor through the probe. At this time, the USEPA is not conducting thru-the-probe audits for the NO_Y monitors.

Plans for the 2022 NO_2 and NO_Y Monitoring Network

During 2022, contingent upon adequate levels of funding, EGLE is planning to operate NO_2, NO_x at the following sites:

- Grand Rapids Near-road (260810023) Tier 1
- Eliza Howell Near-road site (261630093) Tier 1
- Livonia Near-road (261630095) Tier 1
- Lansing (260650018) Tier 2
- Houghton Lake (261130001) Tier 2
- Detroit SWHS (261630015) Tier 2
- DP4 (261630098) Tier 2
- Trinity (261630099) Tier 2
- Military (261630100) Tier 2

Also contingent upon adequate funding, EGLE will continue to operate trace level NO_Y monitors at the NCore and PAMS sites:

- Grand Rapids–Monroe St. (26810020) - NCore and PAMS
- Allen Park (261630001) - NCore
- Detroit E 7 Mile (261630019) - PAMS

Also contingent upon adequate funding, EGLE will in 2022 operate direct NO_2 monitors during the PAMS season at the following sites:

- Grand Rapids (260810020)
- Detroit-E 7 Mile (261630019)

Table 22: Michigan's NO_2 and NO_Y Monitoring Network

Operating Schedule: Continuous

Method: Chemiluminescense, Method Code 074 (NOx) and Method Code 075 (NO_y)

NCore Sites

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	2019 Population Estimate
Grand Rapids	***260810020***	***1179 Monroe NW***	***42.984***	***-85.67***	***NOy****	***pop exp***	***42612***	***1***	***nghbrhd***	***Kent***	***1/1/08***	***GW***	***1,077,370***
Allen Park	261630001	14700 Goddard	42.229	-83.208	NOy	pop exp	42612	1	nghbrhd	Wayne	1/1/08	DWL	4,319,629

Tier 1: Near Roadway Sites

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	2019 Population Estimate
Grand Rapids Near-Road	260810023	4365 Louisiana Ave. SW	42.885	-85.68	NO_2	pop exp	42602	1	nghbrhd	Kent	1/1/20	GW	1,077,370
Eliza Howell	261630093	Service Road I-96 & Telegraph	42.386	-83.266	NO_2	Near Road	42602	1	micro	Wayne	9/1/11	DWL	4,319,629
Livonia Near Road 2	261630101	14975 Eckels Rd.	42.394	-83.432	NO2	Near Road	42602	1	micro	Wayne	1/1/15	DWL	4,319,629

Tier 2: Community Sites

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	2019 Population Estimate
Lansing	260650012	220 N Pennsylvania	42.739	-84.535	NO2	pop exp	42602	1	nghbrhd	Ingham	9/5/80	LEL	550,391
Houghton Lake	261130001	1769 S Jeffs Road	44.311	-84.892	NO2	background	42602	1	regional	Missaukee	4/1/98	Not in CBSA	N/A
Detroit-SWHS	261630015	150 Waterman	42.303	-83.107	NO2	pop exp	42602	1	nghbrhd	Wayne	6/11/18	DWL	4,319,629
Detroit - E 7 Mile	***261630019***	***11600 East Seven Mile Road***	***42.431***	***-83***	***NOy****	***pop exp***	***42602***	***1***	***urban***	***Wayne***	***5/15/19***	***DWL***	***4,319,629***
DP4th	261630098	4700 W Fort St	42.312	-83.092	NO2	Max.Conc.	42602	1	nghbrhd	Wayne	7/17/18	DWL	4,319,629
Trinity	261630099	9191 W Fort St	42.296	-83.129	NO2	pop exp	42602	1	nghbrhd	Wayne	10/17/18	DWL	4,319,629
Military	261630100	1238 Military St	42.312	-83.103	NO2	pop exp	42602	1	nghbrhd	Wayne	11/1/18	DWL	4,319,629

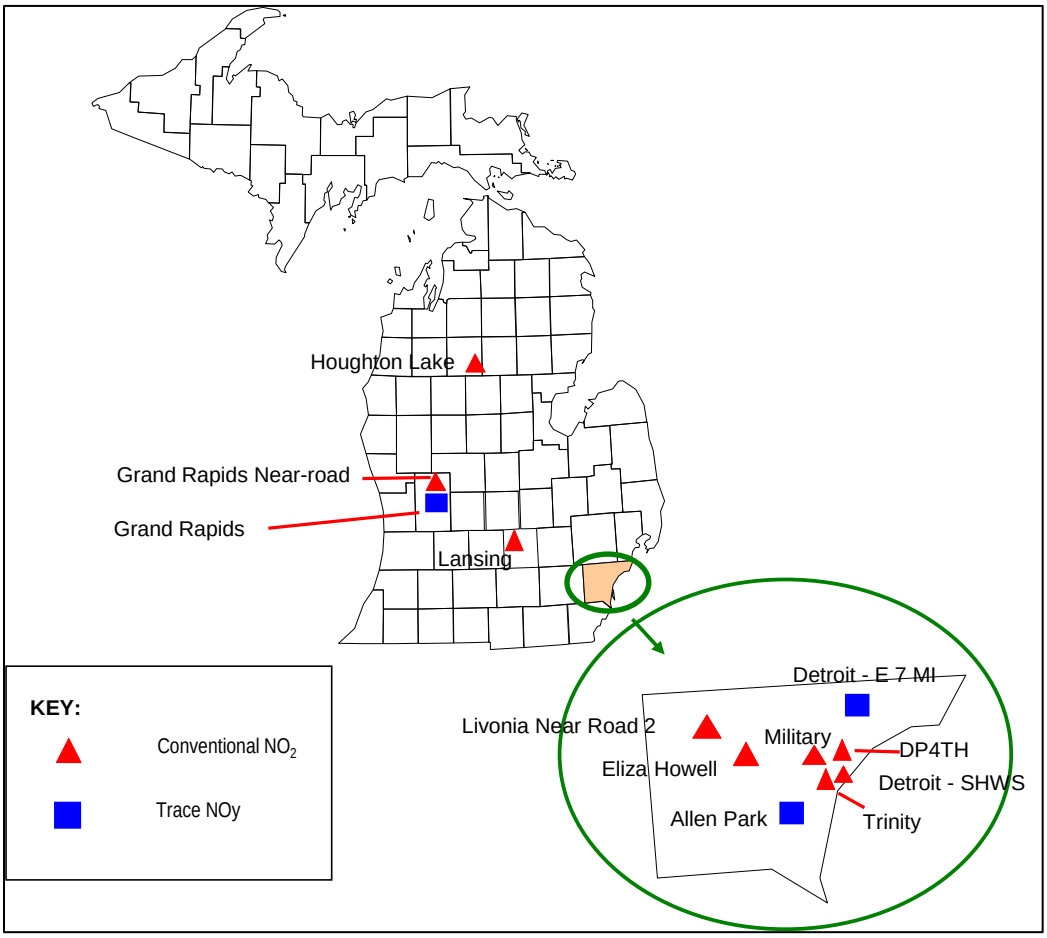
PAMS

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	2019 Population Estimate
Grand Rapids	***260810020***	***1179 Monroe NW***	***42.984***	***-85.67***	***NO2 ****	***pop exp***	***42602***	***1***	***nghbrhd***	***Kent***	***1/14/21***	***GW***	***1,077,370***
Detroit - E 7 Mile	***261630019***	***11600 East Seven Mile Road***	***42.431***	***-83***	***NO2****	***pop exp***	***42602***	***1***	***urban***	***Wayne***	***1/28/21***	***DWL***	***4,319,629***

[1] CBSA Key: DWL= Detroit-Warren-Livonia MSA
GW = Grand Rapids-Wyoming MSA
LEL= Lansing-East Lansing MSA

* PAMS direct-NO_2, NO_y

Figure 14: Michigan's NO_2 and NO_Y Monitoring Network



SULFUR DIOXIDE (SO_2) MONITORING NETWORK

On June 2, 2010, the USEPA made the SO_2 NAAQS more stringent by revoking the 24-hour and annual average standards and creating an hourly standard that cannot exceed 75 ppb. The form of the standard is the 99th percentile averaged over three years. The secondary standard has not been changed.[13]

To design a monitoring network, the USEPA created the Population Weighted Emissions Index (PWEI) that is calculated by:

(CBSA population)[14] (total SO_2 emissions in that CBSA in tpy) / 1,0000,000 = PWEI

[13] Primary National Ambient Air Quality Standards for Sulfur Dioxide; Final Rule, 75 *Federal Register* 35520 (June 22, 2010).

[14] According to the latest Census Bureau estimates.

The PWEI value for each CBSA is compared to the threshold values shown in **Table 23** to determine the number of monitoring sites that are required:

Table 23: Population Weighted Emission Index Based Monitoring Requirements

Population Weighted Emissions Index Value	Number of Sites
Greater than or equal to 1,000,000	3
Greater than 100,000 but less than 1,000,000	2
Greater than 5,000	1

The PWEI monitors serve a variety of purposes including assessing population exposure, determining trends and transport as well as ascertaining background levels.

The USEPA allows agencies to count the NCore SO_2 monitors as part of these new requirements. Also, because the new SO_2 monitors are not single source-oriented, existing infrastructure can be used to select locations for expansion of the SO_2 network.

If **Table 23** is applied to the PWEI calculations for the CBSAs in Michigan, the number of monitors that are required is shown in **Table 24**. The data in the table uses the 2010 Census data and the 2014 version of the National Emissions Inventory data.

Table 24: Population Weighted Emissions Index Totals for CBSAs in Michigan

MSA	Counties	2014 NEI Download: Total County SO_2 Emissions, tpy	2014 NEI SO_2 Total Emissions, tpy	2010 Population	2014/2010 NEI PWEI	Monitors Required 2008 EI & 2010 Census
Detroit-Warren-Livonia Metro Area	Macomb	1,640.40	148,810	4,296,250	639,325	2
	Oakland	1,785.67				
	Wayne	53,783.79				
	Lapeer	339.64				
	St Clair	91,003.09				
	Livingston	257.45				
Flint Metro Area	Genesee	736.16	736	425,790	313	0
Monroe Metro Area	Monroe	17,728.75	17,729	152,021	2,695	0
Ann Arbor Metro Area	Washtenaw	596.75	597	344,791	206	0
Grand Rapids-Wyoming Metro Area	Kent	1,650.61	1,991	774,160	1,542	0
	Barry	152.05				
	Newaygo	79.70				
	Ionia	108.91				
Holland-Grand Haven Metro Area	Ottawa	40,353.25	40,353	263,801	10,645	1
Muskegon-Norton Shores Metro Area	Muskegon	12,313.94	12,314	172,188	2,120	0
Lansing-East Lansing Metro Area	Clinton	238.56	11,729	464,036	5,442	1
	Ingham	5,069.91				
	Eaton	6,420.12				
Bay City Metro Area	Bay	15,356.59	15,357	107,771	1,655	0
Saginaw-Saginaw Twp N Metro Area	Saginaw	500.99	501	200,169	100	0
Kalamazoo-Portage Metro Area	Kalamazoo	1,397.61	1,533	326,589	500	0
	Van Buren	134.89				
Niles-Benton Harbor Metro Area	Berrien	349.72	350	156,813	55	0
Jackson Metro Area	Jackson	444.89	445	160,248	71	0
Battle Creek Metro Area	Calhoun	388.72	389	136,146	53	0
South Bend Mishawaka Metro Area IN/MI	Cass	76.76	77	52,293	4	0

Based on the 2014 emissions data and 2010 population estimates, the Detroit-Warren-Livonia CBSA needs two SO_2 monitoring sites, while the Holland-Grand Haven Metropolitan Area and Lansing-East Lansing Metropolitan Area each need a single SO_2 monitoring site.

The NCore trace level SO_2 monitor at Allen Park (261630001) fulfills the requirement for one of the SO_2 monitors required in the Detroit-Warren-Livonia CBSA. EGLE also monitors at Detroit–SWHS (261630015) and Port Huron (261470005).

EGLE deployed SO_2 monitors in the Holland-Grand Haven Metropolitan Area at the West Olive site (261390011) in Ottawa County on January 1, 2015, and in the Lansing-East Lansing Metropolitan Area at the Lansing site (260650012) in Ingham County on January 1, 2012. The USEPA approved the discontinuation of the West Olive site, which shut down on January 1, 2021. The USEPA also approved the discontinuation of the Sterling State Park site (261150006) in Monroe County, which shut down on January 1, 2021.

In 2018, SO_2 monitors were added to the three new GHIB sites: DP4th (261630098), Trinity (261630099), and Military Park (261630100).

Table 25 summarizes the SO_2 monitoring site information for sites that were operational in 2021 and are planned to be operational in 2022. **Figure 15** shows the geographical distribution of SO_2 sites across Michigan.

SO_2 Monitoring and Modeling Requirements

With the revision to the SO_2 NAAQS in 2010, federal regulations also changed for monitoring and modeling SO_2 emissions. The USEPA established a three-tiered process for assessing the attainment status of the ambient air near large sources emitting SO_2.

States were required in Tier 1 to establish monitoring stations in areas with high population levels and high emission levels. Existing monitors in Detroit and Lansing, and new monitors in West Olive and Monroe met this obligation for assessment. Of these four areas, a portion of Wayne County was found to have levels of SO_2 exceeding the health-based standard. This area was designated by the USEPA as nonattainment. EGLE completed an attainment plan that included rulemaking, which would bring the area into compliance with the NAAQS. EGLE was sued by an affected company, lost the lawsuit, and now the USEPA has developed a Federal Implementation Plan for the nonattainment area.

The second tier requires states to conduct either monitoring or modeling for sources emitting over 16,000 tons per year. EGLE identified six areas meeting this criterion. Modeling has been completed for sources in St. Clair, Eaton, Ingham, Marquette, Ottawa, Bay, and Monroe Counties. The USEPA reviewed the modeling and designated a small portion of St. Clair County as nonattainment, and the other areas were designated attainment/unclassifiable in September 2016. Control strategies will be developed for the sources in St. Clair County and the attainment plan will be

incorporated into the Michigan State Implementation Plan (SIP). DTE Energy installed two SO_2 special purpose monitoring stations in St. Clair County to provide additional SO_2 and meteorological data to aid future SIP development. These monitors are not part of a Data Requirements Rule network.

The third tier involves modeling of SO_2 source emissions greater than 2,000 tons per year. This modeling project involved two sources in Delta County and Alpena County, and was submitted to the USEPA on January 11, 2017. The modeling demonstrated that the two sources did not have an impact on the NAAQS. The USEPA designated the two counties as attainment/unclassifiable on April 9, 2018.

The necessity of taking a combination monitoring/modeling approach to assessment for SO_2 was borne out of the fact that monitoring could not cover every wind scenario at each large emission source nationwide. States could not bear the large associated expenses of establishing enough new monitoring sites to adequately characterize the SO_2 pollutant levels in ambient air. Assessment is enhanced with additional modeling, a less expensive methodology, which helps to inform planners about the degree of the problem and the effectiveness of different proposed control measures. EGLE continues to identify strategies to reduce SO_2 pollutant levels through collaboration with Michigan industry, as well as local and federal partners.

SO_2 Quality Assurance

The AMU site operator performs a 1-point quality assurance check of the analyzer every two weeks. The checks are sent to the QA Coordinator each quarter. Each monitor is audited annually by the AMU's QA Team, which has a separate reporting line of authority from the site operator. The auditor utilizes a dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor at several concentrations using a certified gas standard. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. Results of the checks and audits indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads 1-point checks and audit results to the USEPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

The USEPA conducts thru-the-probe audits on 20 percent of the SO_2 monitors each year. The audit consists of delivering four levels of calibration gas to the station monitor through the probe. The USEPA reports the audit results to AQS.

Plans for the 2022 SO_2 Monitoring Network

During 2022, contingent upon adequate levels of funding, EGLE is planning to continue to operate SO_2 monitors at:

- Lansing (260650018)
- Grand Rapids (260810020) NCore trace SO_2
- Port Huron (261470005)
- Allen Park (261630001) NCore trace SO_2
- Detroit-SWHS (261630015)
- NMH 48217 (261630097)
- DP4 (261630098)
- Trinity (261630099)
- Military Park (2161630100)

Table 25: Michigan's SO_2 Monitoring Network

Operating Schedule: Continuous

Method: Ultra Violet Stimulated Fluorescence; Method Code 060 (SO_2) and Method Code 600 (Trace SO_2)

NCore Sites, Trace

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parmeter Code	POC	Scale	County	Start Date	MSA [1]	2019 population Estimate
Grand Rapids	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	42401	2	nghbrhd	Kent	1/1/08	GW	1,077,370
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	42401	1	nghbrhd	Wayne	1/1/08	DWL	4,319,629

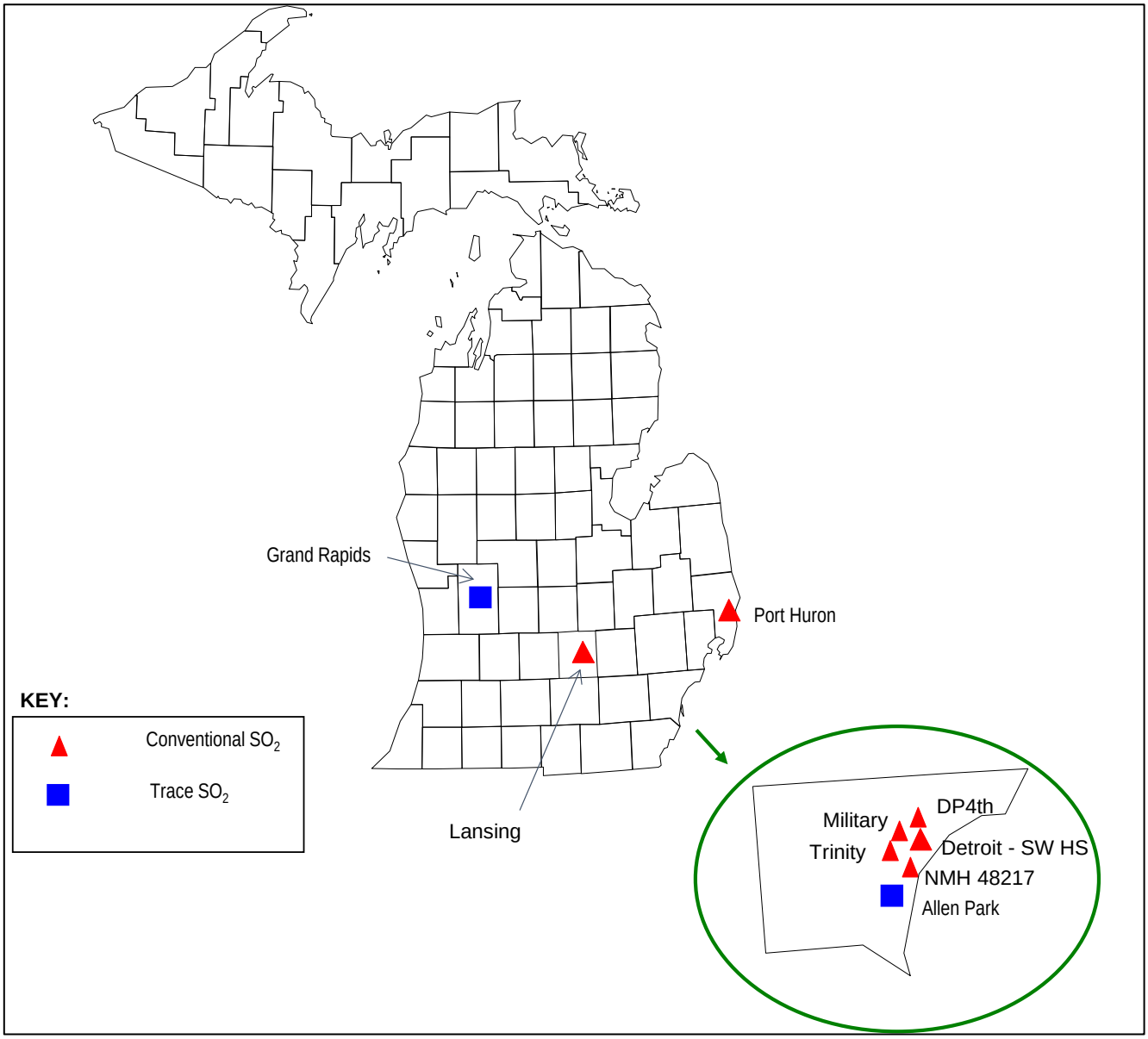
Source-Oriented and Community Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parmeter Code	POC	Scale	County	Start Date	MSA [1]	2019 population Estimate
Lansing	260650012	220 N Pennsylvania	42.7386	-84.534722	SO2	Max Conc	42401	1	nghbrhd	Ingham	1/1/12	LEL	550,391
Port Huron	261470005	2525 Dove Rd	42.9533	-82.456389	SO2	Max Conc	42401	1	urban	St. Clair	2/28/81*	DWL	4,319,629
Detroit - SW HS	261630015	150 Waterman	42.3028	-83.106667	SO2	Max Conc	42401	1	nghbrhd	Wayne	1/1/71	DWL	4,319,629
NMH 48217	261630097	3225 S. Deacon St.	42.2617	-83.157893	SO2	pop exp	42401	1	nghbrhd	Wayne	8/24/2016	DWL	4,319,629
DP4th	261630098	4700 W Fort St	42.3122	-83.091943	SO2	Max Conc	42401	1	nghbrhd	Wayne	8/3/18	DWL	4,319,629
Trinity	261630099	9191 W Fort St	42.2958	-83.129431	SO2	Max Conc	42401	1	nghbrhd	Wayne	10/23/18	DWL	4,319,629
Military	261630100	1238 Military	42.3121	-83.103469	SO2	Max Conc	42401	1	nghbrhd	Wayne	11/2/18	DWL	4,319,629

[1] **MSA Key:** DWL = Detroit-Warren-Livonia MSA
GW = Grand Rapids-Wyoming MSA
LEL = Lansing-East Lansing MSA
Monroe = Monroe MSA

* Monitor shutdown in 2007 restarted in January 2012

Figure 15: Michigan's SO_2 Monitoring Network



TRACE METAL MONITORING NETWORK

Since 1981, monitoring for trace metals as TSP (Total Suspended Particles) has been conducted as part of the Michigan Toxics Air Monitoring Program (MITAMP). Over the years, the program gradually expanded to ten sites that collect TSP samples on a once every six or 12-day schedule. Due to site access issues the S. Delray-Jefferson site had to be shut down in 2021,and there are now only 9 sites. Sample collection follows the schedule developed by the USEPA. The TSP filters are analyzed by the EGLE laboratory for lead, manganese, arsenic, cadmium, and nickel. Further discussion of lead is detailed in another chapter.

The Dearborn (261630033) NATTS site measures a suite of 14 metals in both the TSP and PM10 size fractions. The list of metals includes lead, beryllium, vanadium, chromium, manganese, nickel, cobalt, copper, zinc, arsenic, molybdenum, cadmium, barium, and iron.

In 2022, the following sites will measure TSP metals and PM_{10} as indicated below:

- Belding-Merrick St. (260670003)
- Port Huron (261470031); co-located
- River Rouge (261630005)
- SW Detroit-SWHS (261630015)
- Dearborn (261630033) TSP; NATTS -14 metals list and co-located
- Dearborn (261630033) $PM_{10;}$ NATTS -14 metals list and co-located
- NMH 48217 (261630097)
- DP4 (261630098)
- Trinity (261630099)
- Military Park (261630100)

Table 26 summarizes the trace metals monitoring site information for 2022. **Figure 16** shows the geographical distribution of trace metal sites across Michigan.

Table 26: Michigan's Trace Metal Monitoring Network

Operating Schedule: 1:6, follows EPA published calendar

Method: TSP: High Volume sampler using glass fiber filter ; Emission Spectra ICAP for lead; ICP MS for remaining metals

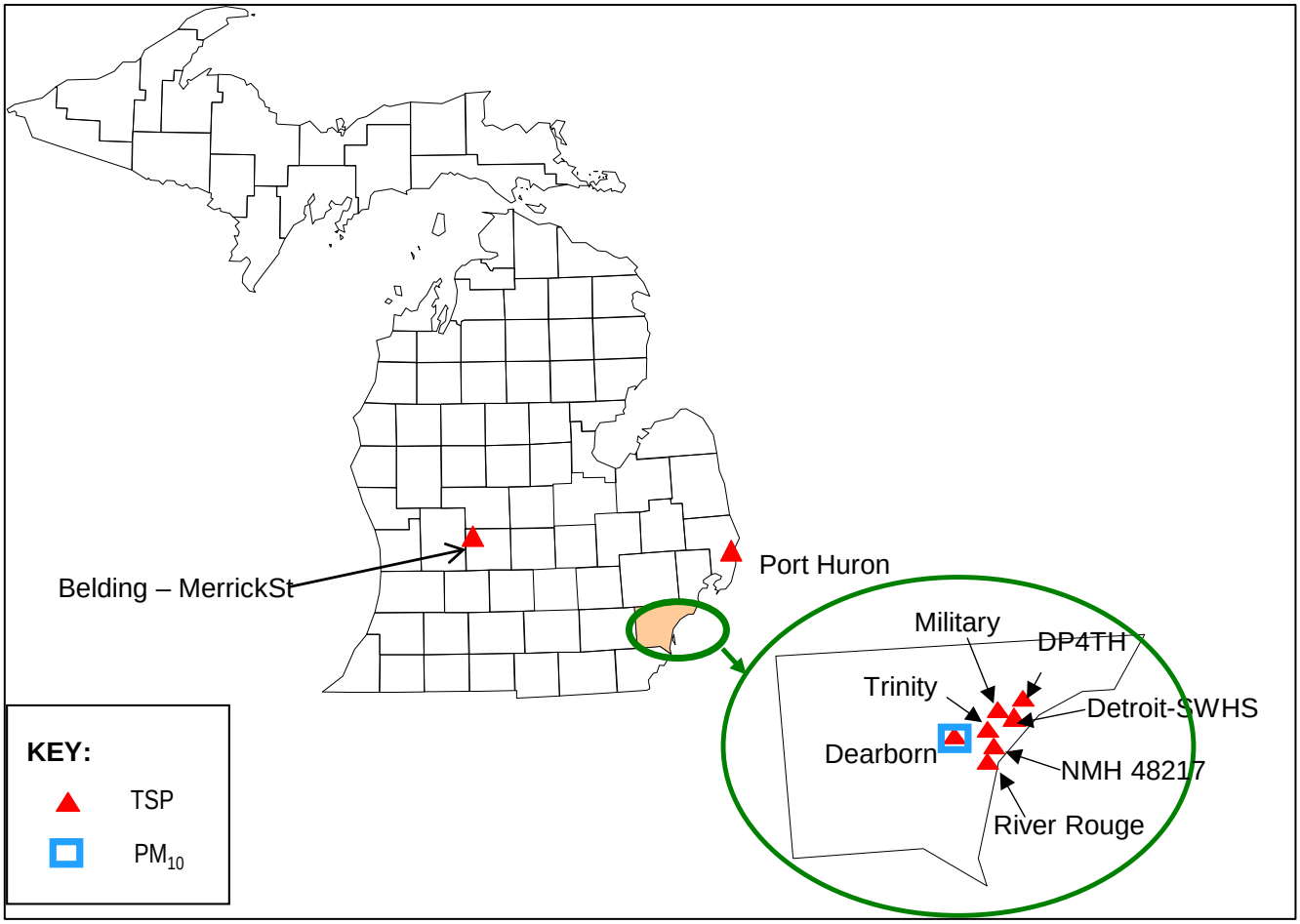
PM10: High Volume sampler using quartz filter; Emission Spectra ICAP for lead; ICP MS for remaining metals

Monitoring Sites														
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose/ Type	POC	Scale	County	Date Estab.	MSA [1]	2019 Population Estimated
Belding - Merrick St	260670003	509 Merrick	43.09984	-85.22163	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	micro	Ionia	1/1/10	I	* 64210
Port Huron	261470031	324 Rural St	42.98209	-82.449233	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	micro	Saint Clair	1/1/13	DWL	4,319,629
Port Huron (colocated)	261470031	324 Rural St	42.98209	-82.449233	1:12	Pb, Mn, As, Cd, Ni	TSP	max conc	1	micro	Saint Clair	1/1/13	DWL	4,319,629
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	nghbrhd	Wayne	1/1/94	DWL	4,319,629
Detroit - (SWHS)	261630015	150 Waterman	42.302778	-83.106667	1:6	Pb, Mn, As, Cd, Ni	TSP	pop exp	1	nghbrhd	Wayne	2/26/99	DWL	4,319,629
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,319,629
Dearborn (colocated)	261630033	2842 Wyoming	42.306666	-83.148889	1:12	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	9	nghbrhd	Wayne	6/1/90	DWL	4,319,629
NMH 48217 [2]	261630097)				1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	nghbrhd	Wayne		DWL	4,319,629
DP4th [2]	261630098	4700 W Fort St	42.312158	-83.091943	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	nghbrhd	Wayne	1/25/09	DWL	4,319,629
Trinity [2]	261630099	9191 W Fort St	42.295824	-83.129431	1:6	Pb, Mn, As, Cd, Ni	TSP	pop exp	1	nghbrhd	Wayne	1/25/09	DWL	4,319,629
Military [2]	261630100	1238 Military St	42.312078	-83.103469	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,319,629
Dearborn	***261630033***	***2842 Wyoming***	***42.306666***	***-83.148889***	***1:6***	***Zn, As, Mo, Cd, Ba, Pb, Fe***	***PM 10***	***max conc***	***1***	***nghbrhd***	***Wayne***	***6/1/90***	***DWL***	***4,319,629***
Dearborn (colocated)	***261630033***	***2842 Wyoming***	***42.306666***	***-83.148889***	***1:12***	***Zn, As, Mo, Cd, Ba, Pb, Fe***	***PM 10***	***max conc***	***3***	***nghbrhd***	***Wayne***	***6/1/90***	***DWL***	***4,319,629***

[1] **MSA Key:** DWL Detroit-Warren-Livonia MSA
I Ionia Micropolitan * population estimate from 2018,2019 not available
GW Grand Rapids- Wyoming MSA

[2] SPM Special Purpose Monitor

Figure 16: Michigan's Trace Metal Monitoring Network



Trace Metal Quality Assurance

The site operator conducts a flow rate verification once a month. Flow check values are sent to the QA Coordinator each quarter. An independent audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent, dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

EGLE Laboratory participates in two types of external performance testing programs. A nationally-based audit program sends a sample that has a known concentration of metals spiked onto a filter. The lab analyzes the filter in the same fashion as the routine samples. Results are compared to a "true" value and tabulated for all participants in the program. EGLE Laboratory also receives regional round robin audits. The regional audit sample is collected by running an ambient air monitor for 24 hours. The filter is cut into strips and sent to several laboratories. Results for the participating laboratories are compared to each other since a "true" value is not known.

Co-located samples for precision are collected for both PM_{10} and TSP-sized trace metals at Dearborn (261630033) and at Port Huron (261470031) TSP-size on a once every 12-day frequency.

VOLATILE ORGANIC COMPOUND (VOC) MONITORING NETWORK

The collection and analysis of more than 50 VOC compounds per sample began at various sites in 1990 as part of the MITAMP (Michigan Toxics Air Monitoring Program). Either a once every six-day or once every 12-day sampling frequency has been used depending on the site and budget status. The VOC network follows the sampling calendar published by the USEPA. The SW Detroit-SWHS (261630015) site in Detroit has been the trend site and has collected VOC samples every year since 1993. The determination of VOC samples on a once every six-day sampling frequency using Method TO-15 is required for the NATTS site at Dearborn (261630033). A minimum of six precision (duplicate) samples per year are also collected at Dearborn (261630033) as part of the NATTS program. NATTS samples go to a national contract lab and the trend site samples are analyzed by the EGLE lab.

Continuous VOC sampling with an Auto-GC is also a requirement of the PAMS (photochemical assessment monitoring station) network, operational in 2021. The PAMS section of this document provides more details.

Table 27 summarizes the VOC monitoring site information. **Figure 17** illustrates the geographical distribution of VOC monitors in Michigan.

VOC Quality Assurance

Once a year, the QA Team conducts a thru-the-probe audit using a known concentration of specialized calibration gas. The gas is sent through the station sample probe and collected into a clean, evacuated 6-liter Summa canister over a 24-hour period, and analyzed using USEPA Method TO-15. The results are compared to the auditor's target concentration. The EGLE QA Team also annually conducts a zero-air check on the sampler by running VOC-free air through the probe and into an air canister for 24 hours. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The EGLE laboratory also participates in regional performance test programs. The regional performance test audit is produced by a multi-sampling unit that collects actual ambient air. The results from the participating laboratories are compared to each other since a "true" value is not known. The QA Coordinator receives, reviews, and retains copies of all performance test audit samples. The EGLE laboratory also participates in regional round robin samples.

Plans for the 2022 VOC Monitoring Network

During 2022, contingent upon adequate levels of funding, EGLE plans to continue collecting VOCs using Summa cans at:

- SW Detroit-SWHS (261630015) Air Toxics Trend site; once every 12 days.
- Dearborn (261630033) NATTS site; once every six days and precision samples once every two months.

In June 2021, EGLE started operating the continuous Auto-GC for VOC analysis at the following PAMS sites:

- Detroit E 7 Mile (261630019)
- Grand Rapids (260810020)

Figure 17: Michigan's VOC Monitoring Network

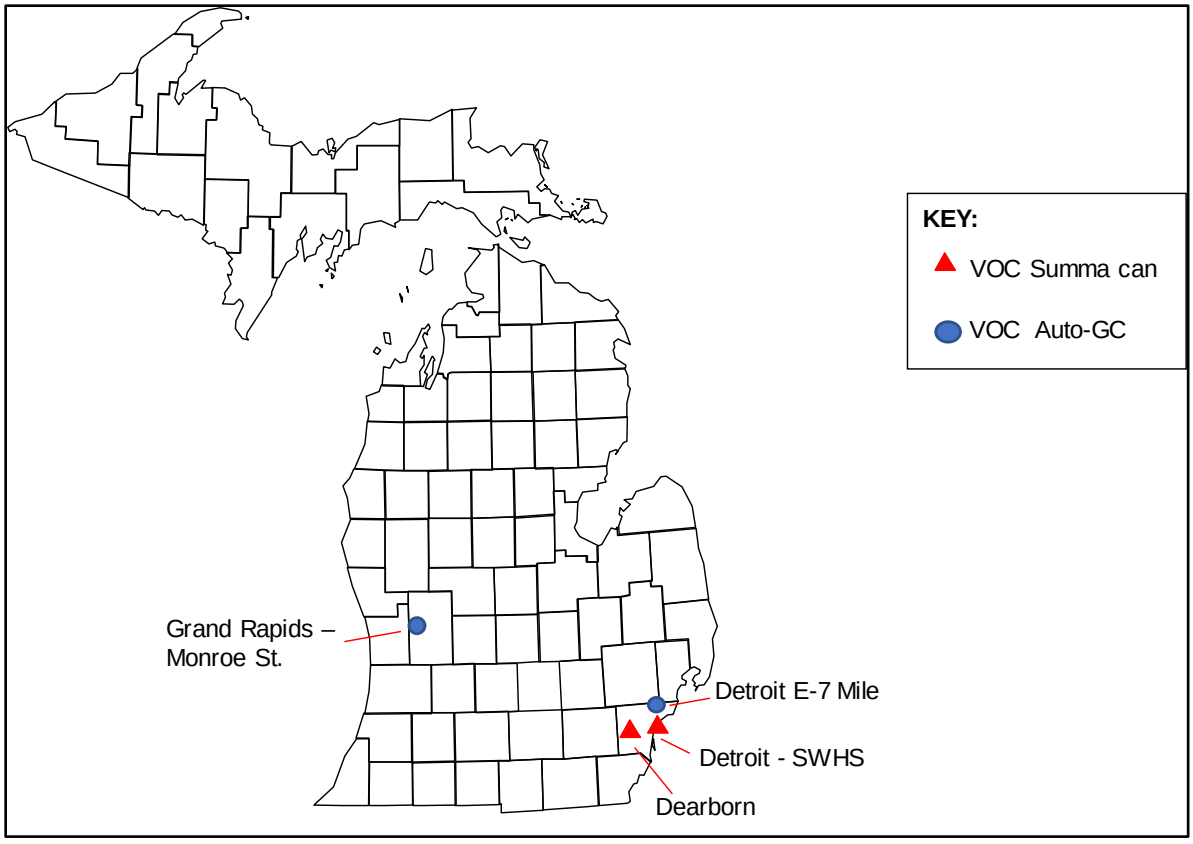


Table 27: Michigan's VOC Monitoring Network

Operating Schedule: 1:6 and 1:12, Follows EPA Published Schedule
Method: Stainless Steel Pressurized Canister Sampler; Gas Chromatograph/ Mass Spectrometer (24-hr samples); Method Code 110

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Date Estab.	MSA [1]	2019 Population Estimate
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	1	nghbrhd	Wayne	2/26/99	DWL	4,319,629
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,319,629

Operating Schedule: Semi continous ; 1 hour composite
Method: CAS Auto-GC

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Date Estab.	MSA [1]	2019 Population Estimate
Grand Rapids	260810020	1179 Monroe NW	42.984167	-85.671389	1-hr composite	pop exp	1	nghbrhd	Kent	6/1/21	GW	1,077,370
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	1-hr composite	pop exp	1	nghbrhd	Wayne	6/1/21	DWL	4,319,629

[1] **MSA Key:** DWL= Detroit-Warren-Livonia
GW=Grand Rapids-Wyoming Metro

CARBONYL MONITORING NETWORK

The collection of carbonyl compounds, including formaldehyde and acetaldehyde as part of MITAMP, began at various sites in 1995. Either a once every six-day or once every 12-day sampling frequency has been used depending on the site and budget status. The carbonyl network follows the sampling calendar published by the USEPA. The SW Detroit-SWHS (261630015) site in Detroit has been the trend site and has collected carbonyl samples every year since 1995.

Levels of formaldehyde in southeast Michigan are very heterogeneous, unlike other areas of the United States. Historical concentrations at River Rouge (261630005) are elevated, so the continuation of this monitor is important for the characterization of risk and for the determination of trends, this runs on a once every 12-day schedule. SW Detroit-SWHS site (261630015) is EGLE's air toxic trend site, so monitoring has continued on a once every 12-day schedule. Monitoring for carbonyl compounds on a one in six-day frequency using Method TO-11A is required at the Dearborn NATTS site (261630033). Also, as a part of NATTS, six precision samples for carbonyls are collected every year.

Carbonyl sampling is also a requirement of the PAMS (photochemical assessment monitoring station) network which became operational in 2021. The PAMS section of this document provides more details.

Table 28 summarizes the carbonyl monitoring site information for sites that were in existence in 2021 and will be added in 2022. **Figure 18** shows the distribution of carbonyl samplers across Michigan.

Carbonyl Quality Assurance

Once a year, the QA Team conducts a thru-the-probe audit using a known concentration of specialized calibration gas. The gas is sent through the station sample probe and collected on a dinitrophenyl hydrazine (DNPH) cartridge over a 24-hour period and analyzed using USEPA Method TO-11A. The laboratory result is compared to the auditor's target concentration. The QA Team also conducts a zero-air check of the sampler once a year by sending carbonyl-free air through the probe and into the sampler for 24 hours. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The carbonyl samples are sent to two different labs. NATTS samples go to a national contract lab. The national lab participates in a national performance test program. The Detroit-SWHS and River Rouge samples go to a lab that is also required to participate in the NATTS performance test program. The national contractor sends a spiked sample of known compounds and concentrations to the laboratory. The results are compared to the "true" value. The regional performance test audit is produced by a multi-sampling unit that collects actual ambient air. The results from the participating laboratories are compared to each other since a "true" value is not known. The QA Coordinator receives, reviews, and retains copies of all performance test audit samples.

Plans for the 2022 Carbonyl Monitoring Network

During 2022, contingent upon adequate levels of funding, Michigan plans to continue collecting carbonyls year-round at:

- River Rouge (261630005) - once every 12 days
- SW Detroit-SWHS (261630015) – Air Toxics Trend site; once every 12 days.
- Dearborn (261630033) – NATTS site -once every six days and precision sample once every two months

In June 2021, EGLE started collecting *three 8-hour carbonyl samples on a one-in-three day basis* during June, July, and August at the following PAMS sites:

- Detroit E-7 Mile (261630019)
- Grand Rapids (260810020)

Figure 18: Michigan's Carbonyl Monitoring Network

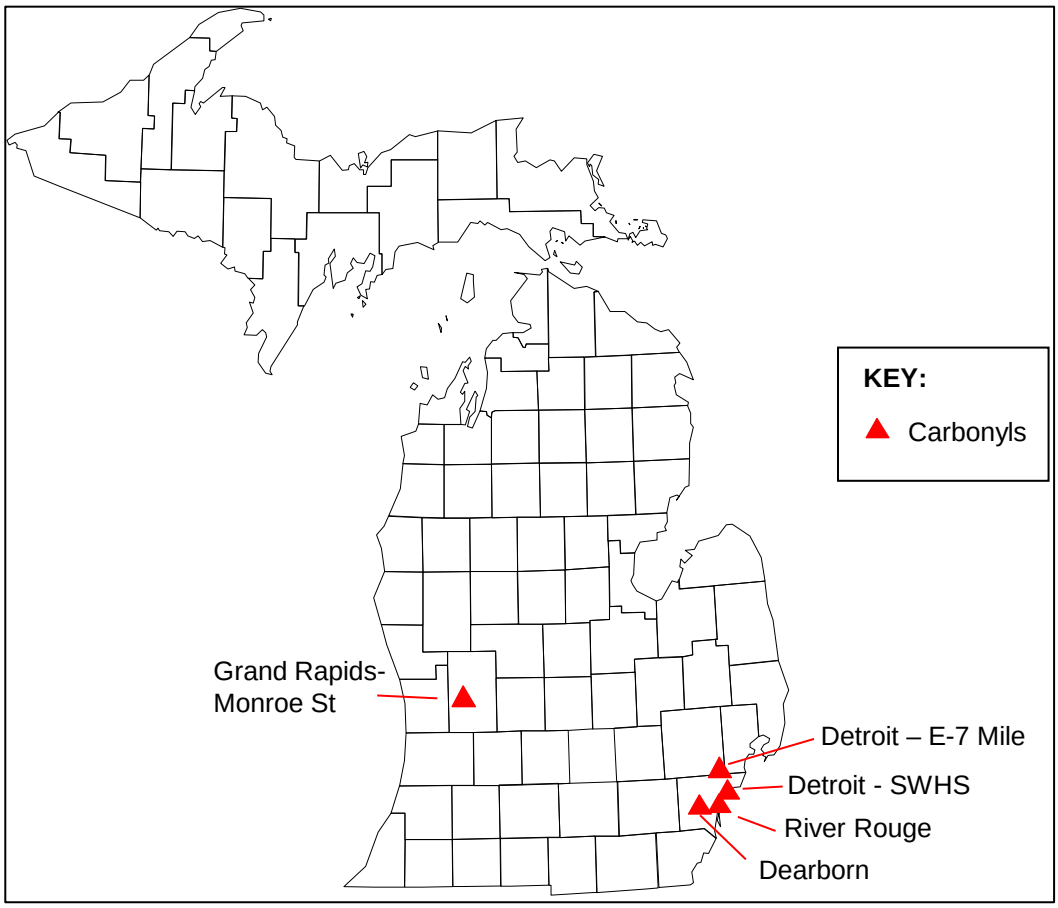


Table 28: Michigan's Carbonyl Monitoring Network

Operating Schedule: 1:6 and 1:12, Follows EPA published schedule

Method: TO-11A ; 2,4 dinitrophenyl hydrazine treated silica gel cartridges; HPLC with ultraviolet absorption; Method Code 202

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Date Estab.	MSA [1]	2019 Population Estimate
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,319,629
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:12	max conc	1	nghbrhd	Wayne	1/1/94	DWL	4,319,629
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	2	nghbrhd	Wayne	2/26/99	DWL	4,319,629
Grand Rapids	260810020	1179 Monroe NW	42.984167	-85.671389	3 8-hr samples 1:3 day	pop exp	1	nghbrhd	Kent	6/1/21	GW	1,077,370
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	3 8-hr samples 1:3 day	pop exp	1	nghbrhd	Wayne	6/1/21	DWL	4,319,629

[1] **MSA Key:** DWL= Detroit-Warren-Livonia
GW=Grand Rapids-Wyoming Metro

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) MONITORING NETWORK

As part of the USEPA's desire to augment the NATTS, PAHs were added to the Dearborn site on April 6, 2008. Samples are collected on a once every six-day sampling schedule using an Anderson PS-1 sampler. The PAH network follows the sampling calendar published by the USEPA. The sampler contains a glass thimble filled with prepared polyurethane foam plugs that surround XAD-2 resin. Volatile PAHs are absorbed into the foam and XAD-2 resin. Particle bound PAHs are trapped on a filter that precedes the thimble. A second sampler was deployed to the Dearborn site so that six precision samples can be collected each year, conforming to the USEPA's co-location criteria.

The sample media is sent to the national contract laboratory, Eastern Research Group (ERG), where it is extracted and analyzed according to ASTM test method D 6209, which is equivalent to USEPA method TO-13A.

Table 29 shows the site information for PAH sites that will be in operation in 2022 **Figure 19** shows the locations of the PAH monitoring sites.

PAH Quality Assurance

The site operator conducts a flow rate verification once a month. The flow check values are sent to the QA Coordinator each quarter. An independent audit is conducted by a member of the AMU's QA Team once a year. The auditor is in a separate line of reporting authority from the site operator and uses independent, dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

Plans for the 2022 PAH Monitoring Network

During 2022, contingent upon adequate levels of funding, Michigan plans to continue collecting PAHs at:

- Dearborn (261630033) – once every six days and precision once every two months.

Table 29: Michigan's PAHs Monitoring Network

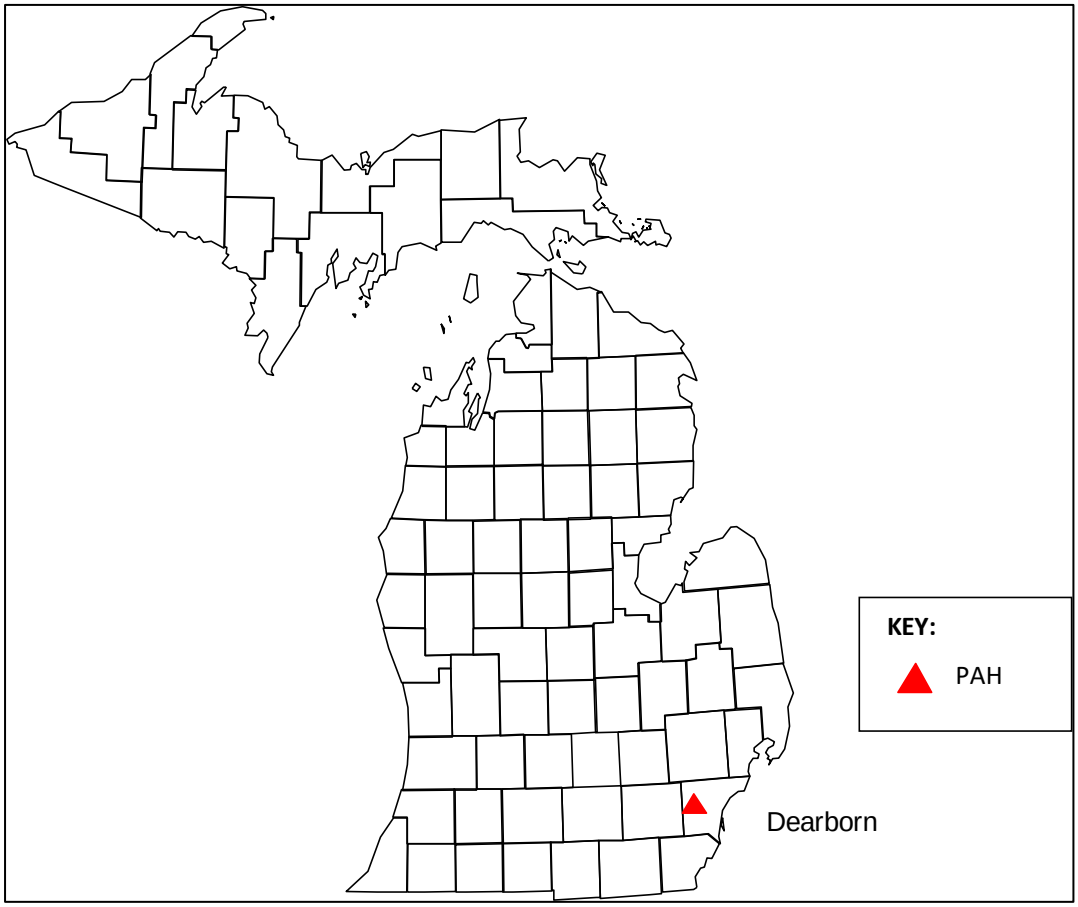
Operating Schedule: 1:6 , Follows EPA published schedule

Method: Polyurethane foam plugs and XAD-2 resin with gas chromatography mass spectrometry; Method Code 202

Monitoring Sites														
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Parameter Code	POC	Purpose/ Type	POC	Scale	County	Date Estab.	MSA [1]	Pop (2019 Estimated)
Dearborn	261630033	2842 Wyoming	42.30667	-83.1489	1:6	various	1	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,319,629

[1] **MSA Key:** DWL= Detroit-Warren-Livonia MSA

Figure 19: Michigan's PAHs Monitoring Network



PAMS NETWORK

The PAMS network is an ozone precursor monitoring network operated by state and local agencies. EGLE has not operated a Photochemical Assessment Monitoring Station (PAMS) site since before 2001. However, the revised monitoring rule (80 FR 65292; October 26, 2015)[15] requires PAMS measurements June 1 through August 31 at NCore sites that are located in CBSAs with populations of one million or more. Federal funding was provided for Michigan to establish two PAMS sites which began operation in 2021. EGLE will continue to operate the PAMS stations in 2022.

[15] 2015-26594.pdf (thefederalregister.org)

Network Decision

EGLE has two NCore sites located at Allen Park (261630001) and Grand Rapids-Monroe St. (260810020). The Grand Rapids-Monroe St. (260810020) will serve as one of the locations and the second Detroit PAMS site will be operated at E 7 Mile (261630019) due to its higher ozone design values. This alternate site for the Detroit area PAMS station was approved by the USEPA in October 2018.EGLE has used the national purchasing contract to obtain the auto-gas chromatographs (CAS), ceilometers (Vaisala), and true NO2 (Teledyne) analyzers.

PAMS Parameters:

- Hourly averaged *ozone*
- Auto-GCs for hourly averaged *speciated VOCs*, list of the targeted compounds is presented in **Table 30**.
- Hourly averaged *NO, reactive oxides of nitrogen (NO_y)* in addition to *true NO_2* sampling with the true NO_2 analyzers.
- *Carbonyl* sampling at a frequency of three 8-hour samples on a one-in-three-day basis (90 samples per PAMS sampling season) is required. EGLE intends to use the national contract laboratory for the analysis of the PAMS carbonyl samples. A complete list of the target carbonyl compounds may be found in **Table 30**. The TO-11A test method, as used in the National Air Toxics Trends (NATTS) program will be used.
- Meteorological Measurements:
    - Ceilometers for determining hourly averaged mixing height,
    - Hourly averaged ambient temperature,
    - Hourly vector-averaged wind direction,
    - Hourly vector-averaged wind speed,
    - Hourly averaged atmospheric pressure,
    - Hourly averaged relative humidity or
    - Hourly precipitation,
    - Hourly averaged solar radiation with a continuous pyranometer, and
    - Hourly averaged ultraviolet radiation with a continuous UV radiometer

Table 30: PAMS Target Compound List

Priority Compounds				Optional Compounds			
1	1,2,3-trimethylbenzene [a]	19	n-hexane [b]	1	1,3,5-trimethylbenzene	19	m-diethlybenzene
2	1,2,4-trimethylbenzene [a]	20	n-pentane	2	1-pentene	20	methylcyclohexane
3	1-butene	21	o-ethyltoluene [a]	3	2,2-dimethylbutane	21	methylcyclopentane
4	2,2,4-trimethylpentane [b]	22	o-xylene [a,b]	4	2,3,4-trimethylpentane	22	n-decane
5	acetaldehyde [b,c]	23	p-ethyltoluene [a]	5	2,3-dimethylbutane	23	n-heptane
6	acetone [c,d]	24	Propane	6	2,3-dimethylpentane	24	n-nonane
7	benzene [a,b]	25	propylene	7	2,4-dimethylpentane	25	n-octane
8	c-2-butene	26	styrene [a,b]	8	2-methylheptane	26	n-propylbenzene [a]
9	ethane [d]	27	toluene [a,b]	9	2-methylhexane	27	n-undecane
10	ethylbenzene [a,b]	28	t-2-butene	10	2-methylpentane	28	p-diethylbenzene
11	Ethylene			11	3-methylheptane	29	t-2-pentene
12	formaldehyde [b,c]			12	3-methylhexane	30	α/β-pinene
13	Isobutane			13	3-methylpentane	31	1,3 butadiene [b]
14	Isopentane			14	Acetylene	32	benzaldehyde [c]
15	Isoprene			15	c-2-pentene	33	carbon tetrachloride [b]
16	m&p-xylenes [a,b]			16	cyclohexane	34	Ethanol
17	m-ethyltoluene [a]			17	cyclopentane	35	Tetrachloroethylene [b]
18	n-butane			18	isopropylbenzene [b]		

Source: Revisions to the Photochemical Assessment Monitoring Stations Compound Target List. USEPA, November 20, 2013

[a] Important SOAP (Secondary Organic Aerosols Precursor) Compounds

[b] HAP (Hazardous Air Pollutant) Compounds

[c] Carbonyl compounds

[d] Non-reactive compounds, not considered to be VOC for regulatory purposes

METEOROLOGICAL MEASUREMENTS

Various meteorological measurements have been added to supplement the ambient monitoring network and enhance data analysis activities. A description of the types of meteorological measurements that are made at each site is provided in **Table 31**. EGLE is not planning any changes to the meteorological measurements, except as required for PAMS.

Meteorological Equipment Quality Assurance

On an annual basis, an Equipment Technician conducts a multi-speed and directional certification of the propeller anemometer and vane systems. The QA Team staff or Senior Environmental Technician performs a "sun shot" to check the true north orientation of the anemometer and vane system at the station.

An independent audit is conducted by the QA Team to assess the accuracy of the indoor and outdoor temperature, barometric pressure, and relative humidity measurements at the site. The comparison is done between the station's measurements and the auditor's certified thermometer, barometer, and hygrometer to ensure quality objectives are being met. The QA Coordinator reviews the results of both the wind speed and wind direction certifications, as well as the independent audits. Hard copies of all assessments are retained in the QA file system.

Plans for the 2022 Meteorological Monitoring Network

During 2022, contingent upon adequate levels of funding, Michigan plans to continue collecting hourly meteorological measurements at:

- Holland (26005003)
- Bay City (260170014)
- Coloma (260210014)
- Cassopolis (260270003)
- Flint (260490021)
- Otisville (260492001)
- Harbor Beach (260630007)
- Lansing (260650018)
- Kalamazoo (260770008)
- Grand Rapids (260810020)
- Grand Rapids Near-road (260810023); *new site*
- Evans (280810022)
- Tecumseh (260910007)
- New Haven (260990009)
- Sterling Heights/Freedom Hill (260990021)
- Manistee (261010922) Tribal
- Scottville (261050007)
- Houghton Lake (261130001)
- Muskegon (261210039)

- Oak Park (261250001)
- Pontiac (261250011)
- Rochester (261250012)
- Jenison (261390005)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- River Rouge (261630005)
- Detroit–SWHS (261630015)
- Detroit–E 7 Mile (261630019)
- Detroit–Joy Rd. (261630026)
- Dearborn (261630033)
- Eliza Howell (261630093)
- Trinity (261630099)
- Livonia Near-road 2 (261630101); *relocated site*

Table 31: Meteorological Measurements in Michigan

Site Name	AQS ID	Wind Speed 61103	Wind Direction 61104	Temperature 62101	Relative Humidity 62201	Precipitation65102	Barometric Pressure 64101	UV Radiation 63302	Solar Radiation 63301	Mixing height 61301	Sigma Theta 61106
Holland	260050003	x	x	x	x		x		x		x
Bay City	260170014	x	x	x							x
Coloma	260210014	x	x	x							x
Cassopolis	260270003	x	x	x							x
Flint	260490021	x	x	x			x				x
Otisville	260492001	x	x	x			x				x
Harbor Beach	260630007	x	x	x							x
Belding- Reed St	260670002	x	x	x			x				x
Lansing	260650012	x	x	x			x				x
Kalamazoo	260770008	x	x	x							x
Grand Rapids	260810020	x	x	x	x	x *(pams)*	x	x *(pams)*	x *(pams)*	x *(pams)*	x
Grand Rapids Near-road	260810023	x	x	x							x
Evans	260810022	x	x	x							x
Tecumseh	260910007	x	x	x			x				x
New Haven	260990009	x	x	x	x				x		x
Sterling Hts/ Freedom Hill	260990021	x	x	x							x
Manistee	261010922	x	x	x			x				x
Scottville	261050007	x	x	x							x
Houghton Lake	261130001	x	x	x			x				x
Muskegon,	261210039	x	x	x							x
Oak Park	261250001	x	x	x			x				x
Pontiac	261250011	x	x	x							x
Rochester	261250012	x	x	x							x
Jenison	261390005	x	x	x							x
Port Huron	261470005	x	x	x			x				x
Seney	261530001	x	x	x	x		x				x
Ypsilanti	261610008	x	x	x			x				x
Allen Park	261630001	x	x	x	x		x				x
River Rouge	261630005	x	x	x							x
Detroit - SW HS	261630015	x	x	x	x		x				x
Detroit - E 7 Mile	261630019	x	x	x	x	x *(pams)*	x	x *(pams)*	x *(pams)*	x *(pams)*	x
Livonia Near Road 2	261630101	x	x	x							x
Detroit - Joy Rd	261630026	x	x	x							x
Dearborn	261630033	x	x	x	x		x				x
Eliza Howell	261630093	x	x	x							x
	Total	35	35	35	8	2	17	2	4	2	35

All Parameters at all sites use POC 1, expect River Rouge WS and WD which is POC 2

Near-roadway and Special Purpose Monitors

EGLE is currently working on one special project

The USEPA has approved funding for the required near-road monitoring station in the Grand Rapids area. This site is required since Grand Rapids CBSA hit the one-million population threshold. EGLE started monitoring in summer 2021.

In 2022, contingent upon funding, EGLE will monitor at the following near-roadway sites:

- Grand Rapids Near-road (260810023); CO, NO_x, $PM_{2.5}$ BAM and meteorological parameters.
- Eliza Howell Near-road (261630093); CO, NO_x, $PM_{2.5}$ BAM and meteorological parameters.
- Livonia Near-road 2 (261630101); CO, NOx, and meteorological parameters.

GHIB Study:

In a joint Canadian-American venture, the GHIB will be built linking Windsor, Ontario and Detroit, Michigan. Demolition, construction, and vehicular traffic using the bridge all have the potential to cause an increase in the level of air pollution in nearby communities. In 2018, EGLE established three new air monitoring sites in SW Detroit and placed additional monitors in the existing SW Detroit (SWHS) (261630015) site. The new sites are Detroit Police 4th Precinct or DP4th (261630098), Trinity (261630099), and Military Park (261630100). The three new sites are measuring NOx, SO_2, CO, continuous $PM_{2.5}$, black carbon, and 5 trace metals including lead. There is no CO monitor at the Military Park (26163100) site. A NOx, continuous $PM_{2.5}$, and black carbon were added to the SW Detroit (SWHS) (261630015) site. The new sites and additional parameters at the SWHS site became operational in the summer and fall of 2018. In 2021, EGLE replaced the existing Thermo BAMs at all four sites with newer continuous $PM_{2.5}$ Teledyne T640 instruments. **Table 32** identifies the instruments that were deployed for the project.

Table 32: Instruments and Sites Added for the Gordie Howe International Bridge (GHIB) Study

Site	Instrument	Sampling Frequency
SWHS (261630015)	MET	Hourly
	SO_2	Hourly
	NOx	Hourly
	TSP-Pb	24-hr every 6 day
	Continuous $PM_{2.5}$T640	Hourly
	Black Carbon-Aethalometer	Hourly
DP4th (261630098)	SO_2	Hourly
	CO	Hourly
	NOx	Hourly
	TSP-Pb	24-hr every 6 day
	Continuous $PM_{2.5}$T640	Hourly
	Black Carbon-Aethalometer	Hourly
Trinity (261630099)	MET	Hourly
	SO_2	Hourly
	CO	Hourly
	NOx	Hourly
	TSP-Pb	24-hr every 6 day
	Continuous $PM_{2.5}$T640	Hourly
	Black Carbon-Aethalometer	Hourly
Military (261630100)	SO_2	Hourly
	NOx	Hourly
	TSP-Pb	24-hr every 6 day
	Continuous $PM_{2.5}$T640	Hourly
	Black Carbon-Aethalometer	Hourly

ADEQUACY OF MICHIGAN'S MONITORING SITES

The suitability of monitoring site locations is frequently assessed by the AMU's QA Team and the USEPA. The USEPA assesses the adequacy of the stations during $PM_{2.5}$ PEP audits, gaseous NPAP audits, and technical systems audits. The results indicate that the stations are properly sited, which includes distances away from obstructions, large trees, and set-backs from roadways. Suitability of probe heights and separation distances are assessed both by EGLE and USEPA auditors. If any issues are found during the audits, EGLE works with USEPA Region 5 to correct them during the audit follow-up process.

In 2021, EGLE lost site access to the historical S. Delray/Jefferson (261630027) site, which monitored for TSP (metals) and MET data. Sampling for metals is currently being performed at six other nearby sites in the south west Detroit area

Table 33 summarizes the various monitoring waivers EGLE has requested.

Table 33: Summary of Waivers for Michigan's Monitoring Network

Type of Wavier	Explanation
Ozone Monitor	The Ann Arbor MSA is represented by a monitor in Oakland County.
Lead Co-location	There is not a large enough footprint at the Belding monitoring sites to co-locate a lead monitor. Therefore, EGLE requested to leave the lead co-location at Dearborn. Originally requested in 2010. A second co-located monitor is located in Port Huron.
Lead Monitoring	Request to waive lead monitoring at Consumer's JH Campbell plant. Modeling shows low impact. Originally requested in 2009 and resubmitted in 2014. Current emission data is below the required monitoring threshold.
Lead Monitoring	Request to waive lead monitoring at St. Mary's Cement plant. Modeling shows low impact. Originally requested in 2009 and resubmitted in 2014. Current emission data is below the required monitoring threshold.
Lead Monitoring	Request to waive lead monitoring at Consumer's Karn-Weadock plant. Modeling shows low impact. Originally requested in 2011 and resubmitted in 2016. Current emission data is below the required monitoring threshold.
PAMS Monitoring	The USEPA approved the request to locate the Detroit area PAMS station at the E 7 Mile site (261630019) in lieu of the NCore site in Allen Park (261630001).

Appendix A: Acronyms and Their Definitions

Acronym	Definition
>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
%	Percent
µg/m^3	Micrograms per cubic meter
AERMOD	AMS/USEPA Regulatory Model
AMU	Air Monitoring Unit
AQD	Air Quality Division
AQS	Air Quality System (USEPA air monitoring data archive)
ARM	Approved regional method
BAM	Beta Attenuation Monitor (hourly $PM_{2.5}$ measurement monitor)
CAA	Clean Air Act
CASTNET	Clean Air Status and Trends Network
CBSA	Core-Based Statistical Area
CFR	Code of Federal Regulations
CO	Carbon monoxide
CSA	Consolidated Statistical Area
DNPH	2,4 -di nitrophenyl hydrazine – this is the derivatizing agent on the cartridges used to collect carbonyl samples
DPW	Department of Public Works
EC	Elemental carbon
USEPA	United States Environmental Protection Agency
FDMS	Filter Dynamic Measurement System
FEM	Federal Equivalent Method
FIA	Family Independence Agency
FRM	Federal Reference Method
GC	Gas chromatograph (instrument providing VOC measurements)
GFIs	Ground fault circuit interrupters

Acronym	Definition
GHIB	Gordie Howe International Bridge
hr	Hour
IN-MI	Indiana-Michigan
LADCO	Lake Michigan Air Directors Consortium
EGLE	*Michigan Department of* Environment, Great Lakes, and Energy
MITAMP	Michigan Toxics Air Monitoring Program
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standard
NAMS	National Air Monitoring Station
NATTS	National Air Toxics Trend Sites
NCore	National Core Monitoring Sites
NEI	National Emission Inventory
NO_2	Nitrogen dioxide
NO_X	Oxides of Nitrogen
NO_Y	Oxides of nitrogen + nitric acid + organic and inorganic nitrates
NPAP	National Performance Audit Program
NSR	New Source Review
OAQPS	Office of Air Quality and Planning and Standards (USEPA)
OC	Organic carbon
OTAQ	Office of Transportation and Air Quality (USEPA)
PAH	Polynuclear Aromatic Hydrocarbon
PAMS	Photochemical Assessment Monitoring Station
PEP	Performance Evaluation Program
PM	Particulate matter
PMc	Particulate Matter coarse
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	Particulate matter with a diameter of 10 microns or less
$PM_{10-2.5}$	Coarse PM equal to the concentration difference between PM10 and PM2.5
ppb	parts per billion
ppm	parts per million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)

Acronym	Definition
PQAO	Primary Quality Assurance Organization
PWEI	Population Weighted Emissions Index
QA	Quality assurance
QAPP	Quality Assurance Project Plan
RTI	Research Triangle Institute (national contract laboratory for speciated PM2.5)
SASS	Source Assessment Sampling System
SLAMS	State and Local Air Monitoring Station
SO2	Sulfur dioxide
STAG	State Air Grant (federal)
STN	Speciation Trend Network (PM2.5)
TEOM	Tapered element oscillating microbalance (hourly PM2.5 measurement monitor)
tpy	ton per year
TRI	Toxic Release Inventory
TSA	Technical Systems Audits
TSP	Total Suspended Particulate
TTP	Through the probe audit
U of M	University of Michigan
U.S.	United States
VOC	Volatile organic compounds

Appendix B: Summary of Comments Received and Replies

As part of the network review process, the USEPA requires that EGLE solicit public comments. EGLE made the draft 2022 Network Review available for public comment by posting the document on its Air Quality Web page. To ensure that the public was aware the document was open for comment, the 30-day public comment period was announced through the Air Quality Listserv and via a press release on May 18, 2020. EGLE received three comments to the Network Review.

I realize that you are taking comments with regard to Michigan's Air Monitoring Network; however, I have a suggestion on how to improve the air quality in Michigan.

The sharp increase in lung cancer among non-smokers could, in part, be attributable to the air we breathe. I represent Green Fuel Tabs, a product that will greatly reduce carbon emissions when added to gasoline or diesel. One of our maritime clients saw an 87% reduction in PM (particulate matter) emitting from the stack. Another was going to be fined by the Coast Guard for wet exhaust until they used our product. In trucks, diesel particulate filters are supposed to trap PM to lower emissions. Even with these filters, our trucking clients have experienced an additional 64% reduction in PM emissions. NOx, CO2 and other hazardous emissions are also substantially decreased.

It ***is*** possible to improve the air quality by using Green Fuel Tabs in fuel. Widespread use of electric vehicles, especially semi-trucks, is not likely to happen any time soon. In the meantime, we can improve air quality ***now***.

I can provide more product information and data, but wanted to introduce myself first.
Please contact me at 248-212-4899 to schedule a time to talk about this important issue.

Thank you,

Laurie Mueller
A&A Catalystics, LLC
Rochester Hills, MI
248-212-4899

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 28, 2021

Ms. Laurie Mueller
A&A Catalystics, LLC
Rochester Hills, Michigan
transportationsavings@gmail.com **via Email**

Dear Ms. Mueller:

Subject: EGLE's response to A&A Catalystics' comments regarding Michigan's draft 2022 Ambient Air Quality Monitoring Network Review

The Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD) appreciates your comments regarding the draft 2022 Air Monitoring Network Review plan. Each year, the Air Monitoring Unit within the AQD meticulously evaluates all federal requirements to ensure all standards are met by our statewide monitoring network. We conduct measurements of air pollution all around the state of Michigan. Our goal is to provide accurate data concerning air quality to protect human health and the environment. However, our program does not have the ability to promote the use of fuel additive products or other pollution reduction technologies. The Michigan Department of Transportation may be in a much better position to evaluate the use or implementation of such products.

Thank you again for your comments and feedback. If you have further questions or concerns, please contact me at 313-720-1542; GhumanN@Michigan.gov; or EGLE AQD, 3058 West Grand Boulevard, Suite 2-300, Detroit, Michigan 48202.

Sincerely,

Navnit K. Ghuman

Navnit K. Ghuman
Environmental Quality Analyst
Air Quality Analyst
EGLE, AQD

cc: Ms. Susan Kilmer, EGLE

June 18, 2021

Submitted by email to: GhumanN@Michigan.gov

Navnit K. Ghuman
EGLE – Air Quality Division
3058 West Grand Blvd., Suite 2-300
Detroit, MI 48202
GhumanN@Michigan.gov

RE: Comment on Michigan's 2022 Annual Ambient Air Monitoring Network Review

The Michigan Department of Environment, Great Lakes, and Energy ("EGLE") is accepting comments on the 2022 Annual Ambient Air Monitoring Network Review through June 18, 2021. The Great Lakes Environmental Law Center is submitting this Comment for consideration on behalf of the following persons and organizations:

- Detroit People's Platform
- Georgia Street Community Collective
- Principia, LLC
- The Original United Citizens of Southwest Detroit
- Lorraine Covington, Eastside Detroit Resident
- Michael Covington, Eastside Detroit Resident
- Mark Covington, Eastside Detroit Resident
- Daniel L. and Sharon A. Buttry, Hamtramck Residents
- Theresa Landrum, Southwest Detroit Resident and Member of the Michigan Advisory Council on Environmental Justice
- Frank Houston, Member of the Michigan Advisory Council on Environmental Justice
- Mona Munroe-Younis, Environmental Transformation Movement of Flint and Member of the Michigan Advisory Council on Environmental Justice
- Paul Mohai, Member of the Michigan Advisory Council on Environmental Justice

Sincerely,

/s/Nick Leonard

Nick Leonard
Executive Director
Great Lakes Environmental Law Center

nicholas.leonard@glelc.org | 313-782-3372

I. Introduction

The Great Lakes Environmental Law Center ("GLELC") calls on EGLE to establish a more robust network of monitoring stations on the eastside of Detroit. This will provide regulators with a more detailed dataset, allowing them to ensure that all Michiganders are able to enjoy air quality that is compliant with National Ambient Air Quality Standards. GLELC is concerned that the current system of air monitoring in the region is insufficient and does not precisely measure the vast array of pollutants emitted, primarily by large industrial facilities. Further, a particularly worrying trend is that the population living nearest to these large facilities is predominantly people of color, low income, and/or does not have a high school education. Further, this same population is at an above average risk of exposure to several air pollutants and toxics, which increases the chances of developing health issues like certain cancers, respiratory illnesses, and other diseases.

Ambient air monitoring is a system of tracking pollutant levels by measuring the quantity and types of certain pollutants, including criteria pollutants in the outdoor air.[1] This practice allows federal and state regulators to effectively assess the extent of pollution and manage air quality for public health and welfare.[2] Data collecting also provides important information about pollution levels in the area to the general public, develop new emissions control strategies, discover air quality trends, and support further research.[3]

There are multiple methods to measure air quality, normally determined by the pollutant in question.[4] According to the EPA, developing a monitoring strategy requires full examination of the options to determine which methods are most effective, accounting for investment costs, operating costs, system reliability, and ease of operation.[5] Station locations depend on the purpose of the monitoring but always are established in population centers.[6] For example, they are installed in city centers, near busy roads, or near facilities of concern like major stationary sources.[7] Most stations serve the purpose of promoting human health objectives.[8]

---

[1] EPA, *Managing Air Quality - Ambient Air Monitoring*, *available at* https://www.epa.gov/air-quality-management-process/managing-air-quality-ambient-air-monitoring.
[2] *Id.*
[3] *Id.*
[4] *Id.*
[5] *Id.*
[6] *Id.*
[7] *Id.*
[8] *Id.*

Most ambient air monitoring networks supporting air quality management are designed and operated by state or local governments.[9] The EPA develops requirements for these networks, published in the Code of Federal Regulations ("CFR") under Title 40.[10] Changes to ambient air monitoring rules under 40 CFR Part 58 are allowed. Historically, there have been several revisions, often to allow for more precise measurements of criteria pollutants in ambient air.[11]

There are several different networks, including ones for air toxics and lead. There is also the National Core Network (NCore), Near-Road NO2 Monitoring, Ozone Photochemical Assessment Monitoring Stations (PAMS), Particulate Matter (PM) Networks, and so on.[12] Monitoring stations in Michigan are laid out according to the 2010 Metropolitan Statistical Area ("MSA") geographical borders, population totals, and historical concentrations.[13] NCore stations collect measurements including, inter alia, ozone, PM2.5, SO2, CO, and PM coarse (PM10-2.5).[14] The NCore stations in Michigan are in Allen Park and Grand Rapids, and began operation in 2010.[15] These NCore stations were required to implement PAMS monitoring in 2019. Due to lack of funding, though, the Detroit East Seven Mile station (the only station on the eastside of Detroit) started hosting the PAMS monitoring instead.[16]

According to the 2022 Review, no changes are being made to Michigan's ambient air monitoring network during 2022.[17] However, it is GLELC's view that this inaction is erroneous. It believes that the benefits of installing more stations on Detroit's eastside is highly warranted, and greatly outweighs the cost. Further, the stations should track all pollutants that are technologically feasible to track. In order to best achieve the goals of data collecting, and adhere to the tenets of environmental justice on the eastside of Detroit, more monitoring stations must be installed. Specifically, there is a need for additional monitoring of volatile organic compounds ("VOCs") and PM10 on the eastside of Detroit due to the high amount of industrial facilities in operation, including U.S. Ecology North and FCA Jefferson North.

---

[9] *Id.*
[10] *Id.* ("Requirements related to network monitoring methods are in the appendices to CFR Part 50 and in CFR Part 53. Network requirements are in CFR Part 58 – Ambient Air Quality Surveillance.").
[11] EGLE Air Quality Division, *Michigan's 2022 Annual Ambient Air Monitoring Network Review* (Jul. 1, 2021), *available at* https://www.michigan.gov/documents/egle/egle-aqd-amu-draft-2022-air-monitoring-network-review_725292_7.pdf.
[12] EPA, *Ambient Monitoring Technology Information Center (AMTIC)*, *available at* https://www.epa.gov/amtic/amtic-ambient-air-monitoring-networks.
[13] EGLE, *supra* note 11.
[14] *Id.*
[15] *Id.*
[16] *Id.*
[17] *Id.*

As seen in the following maps, only three stations in the Detroit-Warren-Ann Arbor Combined Statistical Area currently monitor PM10. They are Allen Park, Dearborn - Salina Elementary School, and SW Detroit (SWHS). The one and only station on the eastside of Detroit, East 7 Mile, does not monitor for PM10. Before June 2021, only the stations at Dearborn - Salina Elementary School and SW Detroit (SWHS) monitored for VOCs, as seen in the map below.

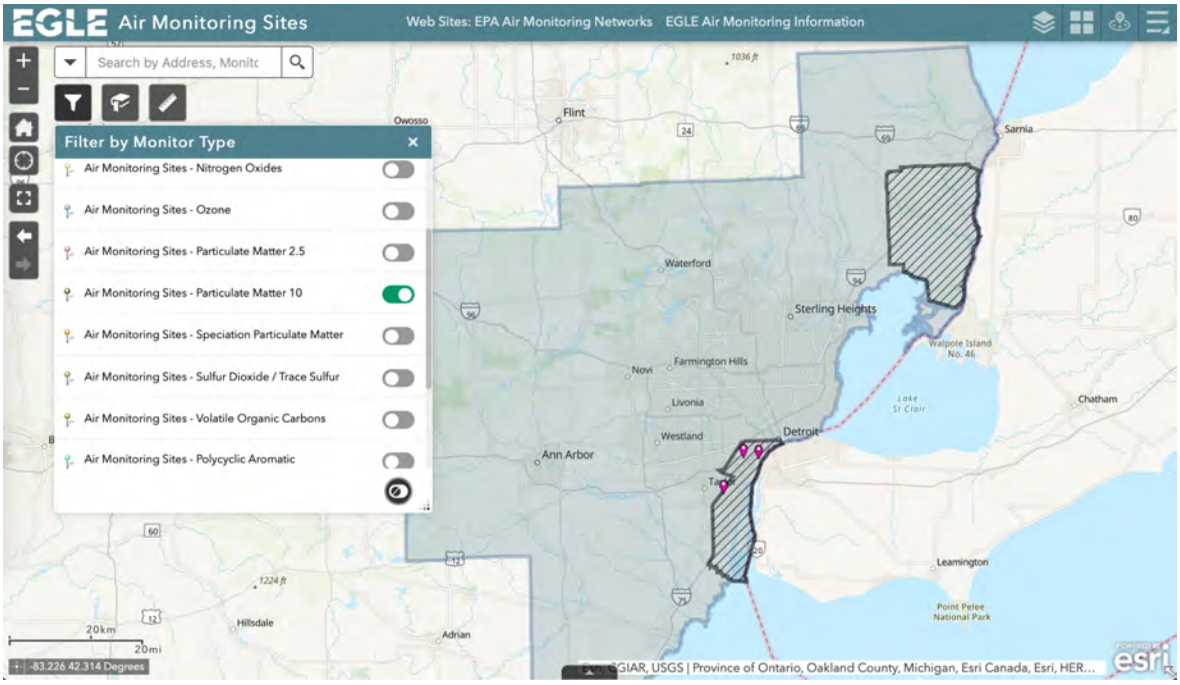


Figure 1 - PM10 Monitoring Sites in Metro-Detroit Area

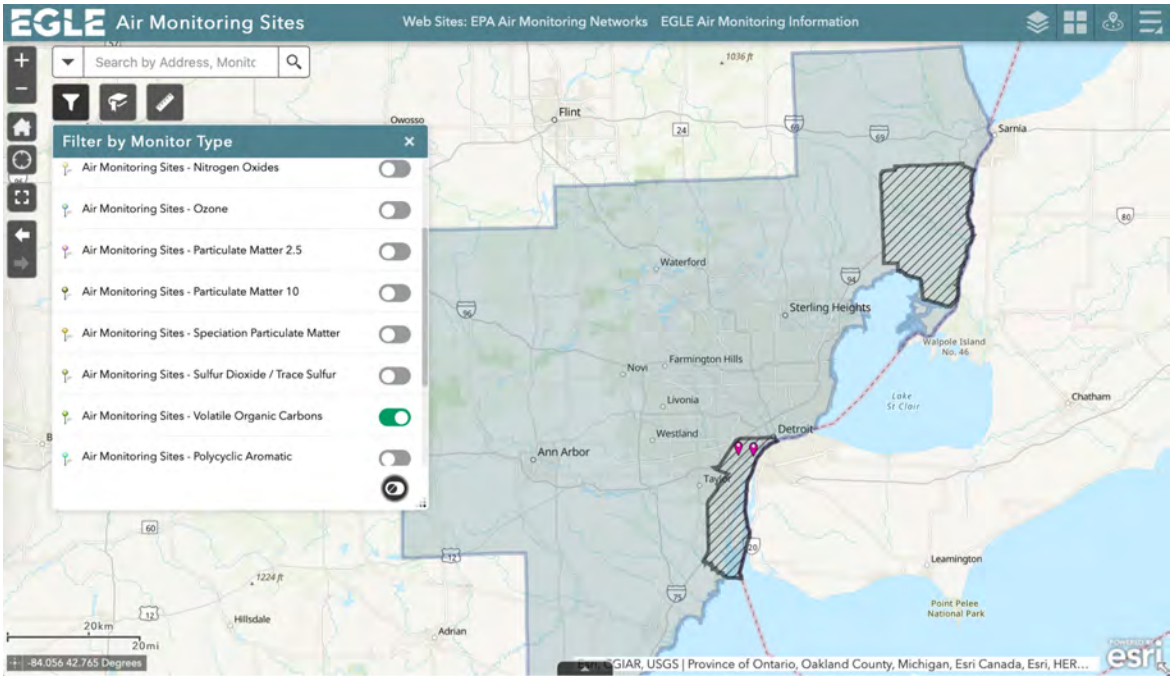


Figure 2 - VOC Monitoring Sites in Metr0-Detroit Area (Pre-June 2022)

Although it is not yet seen in the above map, as of June 2021, EGLE also started operating continuous Auto-GC for VOC analysis at two photochemical assessment monitoring stations ("PAMS"), including Grand Rapids and East 7 Mile.[18]

Based on the legal requirements of ambient air monitoring networks in the Clean Air Act, as well as environmental justice concerns, more monitors should be installed throughout the eastside of Detroit to establish more comprehensive measurements of certain pollutants. In short, there is not enough monitoring of VOCs and PM10 on the eastside of Detroit set out in EGLE's 2022 Network Review. There should be stricter monitoring of these pollutants given the risk they pose to individuals. This includes the addition of monitoring stations throughout the eastside of Detroit. The volume of facilities is high on the eastside and includes U.S. Ecology North and FCA Jefferson North. The sections below explain in more detail why GLELC holds this stance.

II. Comments

GLELC believes that Michigan's 2022 Annual Ambient Air Monitoring Network Review does not adequately provide for the monitoring needs of communities on Detroit's eastside. Because residents on the eastside are exposed to greater levels of emissions and toxins by virtue of their proximity to TRI source emissions, and because they are predominantly members of historically disadvantaged demographics, environmental justice demands a more robust monitoring system be installed to address the health and welfare concerns of these communities. The status quo network that Michigan plans to maintain is not enough. Specifically, GLELC requests that EGLE install an additional PM10 monitor and an additional VOC monitor in Detroit's eastside so that more robust emissions data is available for monitoring, research, and public use.

a. *Additional PM10 and VOC regulatory monitors are the most effective monitors for ensuring air quality for eastside residents.*

The Clean Air Act and ambient air monitoring requirements were created to protect public health and welfare. To that end, monitoring networks serve three equally important objectives: to provide timely information to the general public, to ensure emission compliance, and to provide data for scientific research. Each of these purposes would be served by additional PM10 and VOC regulatory monitors in Detroit's eastside.

Detroit's east side is subject to many major sources of air pollution, including major TRI facilities, like U.S. Ecology and FCA Jefferson. However, data specific to the emissions affecting eastside residents is unavailable through Michigan's current and proposed monitoring network. As proposed, the 2022 Ambient Air Monitoring Network does not

[18] *Id.*

provide for any PM10 monitors on the eastside. Additionally, the nearest VOC monitor is inadequate to provide critical, location-specific information about toxins and source emission in the eastside.

The three PM10 monitoring locations in the Detroit-Warren-Livonia MSA are designed to provide data on a neighborhood scale. That is, they are specific to only a few kilometers. These monitors are also designed to determine max concentration and monitor typical concentrations within the neighborhoods where they are located. Detroit does not currently have PM10 monitors designed for a larger scale understanding of pollution (urban scale), and it lacks source-oriented PM10 monitoring sites. Therefore, the current network cannot provide any accurate information about PM10 levels in Detroit's eastside. Though CFR Part 58 only requires two to four PM10 monitors considering the Detroit-Warren-Livonia MSA's population and PM concentration levels, federal guidance advises a more robust PM monitoring network.[19]

A PM10 monitor on the eastside would provide important health and environmental data where there currently is none, but would also promote emission compliance from facilities in the area and provide information that can be used to better understand the harmful effects of coarse size PM. Currently, the EPA recognizes that PM10 and PM10-2.5 are linked to health effects like mortality, cancer, respiratory health, and cardiovascular health, but the lack of monitoring sites for coarse size PM creates uncertainty as to the extent of these effects. Therefore, CASAC recommends that states implement "improvements to PM10-2.5 exposure assessment, including a more extensive network for direct monitoring of the PM10-2.5 fraction" to reduce these uncertainties for our communities in the future.[20] An additional PM10 monitor should also include speciation monitors to determine if there are elevated levels of metals.

Similar concerns warrant an additional regulatory VOC monitor on the eastside. Though a new VOC monitor was recently installed, it is not close enough to source pollution to provide the best data for eastside communities. Like PM10 monitors in the Detroit-Warren-Livonia MSA, the three VOC monitors in the MSA are neither oriented nor scaled to provide source-oriented, neighborhood-specific information about VOCs on the eastside. Because there is a disproportionally high number of stationary sources and emitters in eastside communities, more accurate VOC information is critical to ensuring emissions compliance, providing the public with critical emission information, and contributing data to scientific research.

b. If regulatory monitors cannot be added to the monitoring network, Special Purpose Monitor sites at a minimum must be installed to progress environmental justice efforts for eastside residents.

[19] EPA'S REVIEW OF THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER, 85 FR 24094-01, 24122-23 (2020).
[20] *Id*. at 14125.

Environmental law and regulations must protect public health and the environment, and they must do so fairly for all persons, regardless of demographics, income, education level, or geographic location.[21] "Where the . . . Government has failed to meet that commitment in the past, it must advance environmental justice."[22] Detroit's eastside is home to many people of color and people with low income. Because these communities face disproportionate health and environmental challenges, environmental justice requires that Michigan law provide the same degree of protection from environmental and health hazards and promote equal access to the decision-making process for having a healthy environment in which to live, learn, and work.[23] To achieve this level of equality, community members, public advocacy groups, regulators, health scientists, and others must have access to complete and accurate data about the challenges on the eastside.

The current monitoring network and the proposed 2022 monitoring network does not provide the equipment necessary to provide a complete database. A single station exists on the eastside, the East Seven Mile Station. However, this station does not monitor for PM10 and only recently started monitoring VOCs in the region. Additionally, a monitoring station closer to major TRI facilities, like U.S. Ecology and FCA Jefferson, would more accurately depict the emission impacts for the area.

Therefore, if regulator monitors cannot be installed, GLELC requests that EGLE install Special Purpose Monitor (SPM) sites on the eastside. SPM sites do not contribute to NAAQS compliance determinations, but they gather data for public access and scientific research.[24] These monitoring sites would provide much-needed data about PM10 and VOC emissions. Installing them in the eastside would provide timely information to the public and to health and atmospheric researchers so that at-risk communities on the eastside would better understand the impacts of nearby TRI facilities. This data would provide information not currently available and help regulators, community members, and health professionals better understand and address the disproportionate health and welfare effects in the eastside.

III. Environmental Justice Concerns

Environmental laws and regulations must treat all persons fairly, regardless of one's race, color, national origin, or income.[25] Environmental justice ("EJ") means (1) ensuring the same degree of protection from environmental and health hazards and (2)

---

[21] *See* EPA, *supra* note 19.
[22] 86 FR 7037, 7037 (Executive Order 13990 on "Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis." (Biden, Jan. 2021).
[23] *See* EPA, *supra* note 19.
[24] 40 C.F.R. § 58.1
[25] EPA, *Environmental Justice*, *available at* https://www.epa.gov/environmentaljustice.

having equal access to the decision-making process to have a healthy environment in which to live, learn, and work.[26]

The Environmental Protection Agency ("EPA") has an office dedicated to addressing EJ concerns, which includes making necessary changes to agency action.[27] Policies must alleviate the environmental and public health challenges facing minority, low-income, and indigenous populations.[28] One important way that the EPA achieves this goal is through EJSCREEN, which is the Agency's screening and mapping tool that allows one to understand environmental and health burdens in his or her community. EJSCREEN provides users with a national database to foster transparency in the EPA's decision-making process.[29]

a. The Amount of TRI Facilities Disproportionately Impacts Minorities

The ambient air monitoring system is not robust enough to protect all residents on the eastside of Detroit, which could harm those living near large TRI facilities. Residents in the area thus receive an incomplete record of all the pollutants, and their possible emissions totals, present in the region. Additionally, according to the U.S. Census Bureau, Detroit's population was estimated to be 670,031 in 2019. 78.3 percent of Detroit's residents are Black, and 14.7 percent are White.

There are approximately twelve sources of pollution throughout the eastside of Detroit, all within a four-mile radius, according to EJSCREEN's database. These facilities are known to contribute to environmental risk, according to the EPA's Toxics Release Inventory ("TRI"). TRI calculations contain data on the amounts of chemicals released from industrial facilities into the environment, managed as waste, and transferred from one facility to another for release or further management.[30]

Next, the Risk-Screening Environmental Indicators ("RSEI") help community members and policy makers explore data on releases of toxic substances from industrial facilities.[31] RSEI incorporates information from the TRI on the amount of toxic chemicals released, together with factors such as the chemical's fate and transport

---

[26] *Id.*
[27] EPA, *Factsheet on the EPA's Office of Environmental Justice*, *available at* https://www.epa.gov/environmentaljustice/factsheet-epas-office-environmental-justice.
[28] *Id.*
[29] EPA, *EJSCREEN*, *available at* https://www.epa.gov/ejscreen.
[30] EPA, *Toxics Release Inventory (TRI) Program*, *available at* https://www.epa.gov/toxics-release-inventory-tri-program.
[31] EPA, *Risk-Screening Environmental Indicators (RSEI) Model*, *available at* https://www.epa.gov/rsei.

through the environment, each chemical's relative toxicity, and potential human exposure.[32] RSEI's often indicate where policymakers must focus their attention.

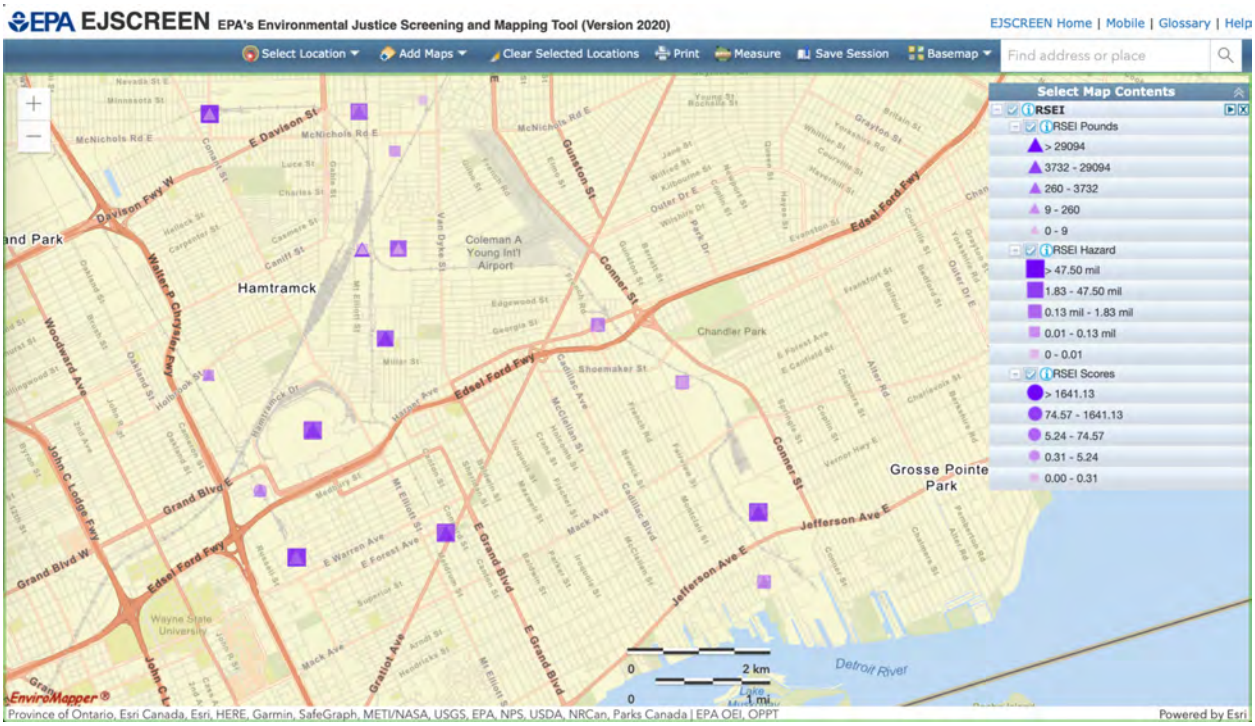


Figure 3 - Major TRI Facilities on the eastside of Detroit, showing RSEI Scores, Hazards, and Pounds

As seen above, the RSEI pounds and hazards vary, but are generally high across the eastside. First, RSEI scores are risk related results and not independently meaningful. RSEI pounds (or releases) are the amount of pounds reported by TRI facilities as released or transferred. And RSEI hazard results are calculated by multiplying the pounds released by the chemical specific toxicity weight for the exposure route associated with the release. Several TRI facilities threaten communities on the eastside of Detroit. Two facilities of particular concern are U.S. Ecology and FCA Jefferson. The facilities at issue each contribute to environmental risk, according to the TRI and RSEI models.

FCA's assembly plant on Jefferson posts an RSEI score of 45,137. It's current sum for TRI pounds is 13,184,116.[33] For air releases alone, the TRI Pounds total for the plant is 2,813,296 (most of the rest of the TRI Pounds amount is from other off-site transfers, accounting for 9,559,237 TRI Pounds).[34] The plant emits a wide array of chemicals into

[32] *Id.*
[33] EPA, *EasyRSEI Dashboard, available at* https://edap.epa.gov/public/extensions/EasyRSEI/EasyRSEI.html (specific facility data found by searching for the facility and gathering reports for the geographic location).
[34] *Id.*

the air, including but not limited to Naphthalene, Glycol Ethers, Xylene, and Ethylbenzene.[35] U.S. Ecology South has a RSEI score of 292,414, and a total TRI pounds amount of 12,349,649. It is a significant emitter of formaldehyde. For the entire area of the eastside, the RSEI score for formaldehyde is 172,524, constituting just over a quarter of the share of air and water releases. The Department of Health and Human Services has determined that formaldehyde, which is a VOC, may reasonably be anticipated to be a human carcinogen.[36]

The following charts from EJSCREEN highlight the environmental indicators, demographic indicators, and EJ Indexes within a mile radius of the FCA Jefferson facility. The population percentile exposed to risks, including PM2.5, ozone, and hazardous waste is around 75 percent. Meanwhile 25 percent of this population is more at risk of developing cancer and respiratory issues. It is also important to note that this same population, as seen on the demographic indicators chart, is mostly people of color, low income, under age 5, and has less than a high school education.

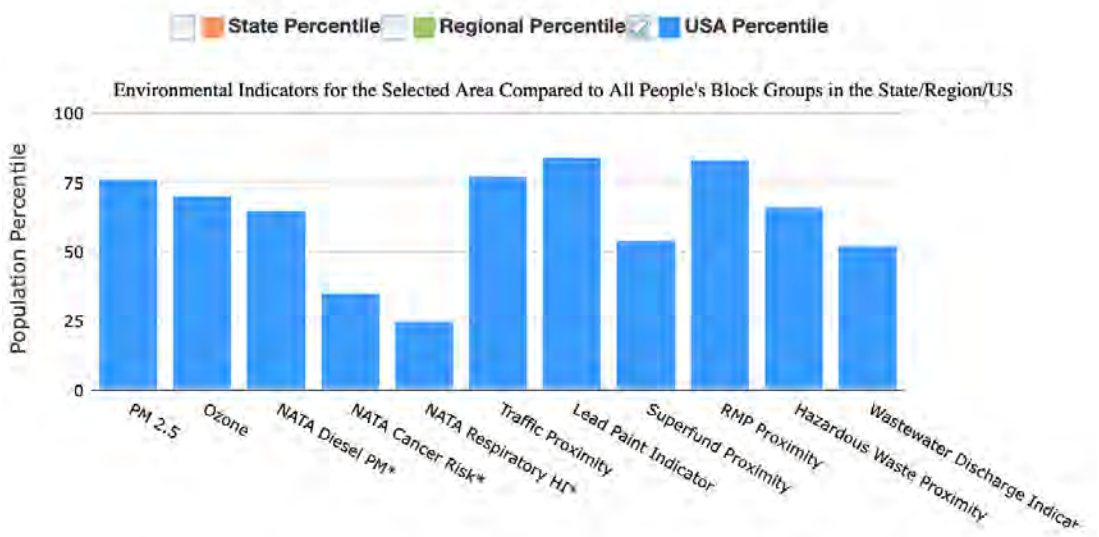


Figure 4 - Population percentiles of risk/exposure to pollutants, diseases, etc. near the FCA Jefferson North Assembly Plant

[35] *Id.*
[36] https://www.atsdr.cdc.gov/ToxProfiles/tp111.pdf

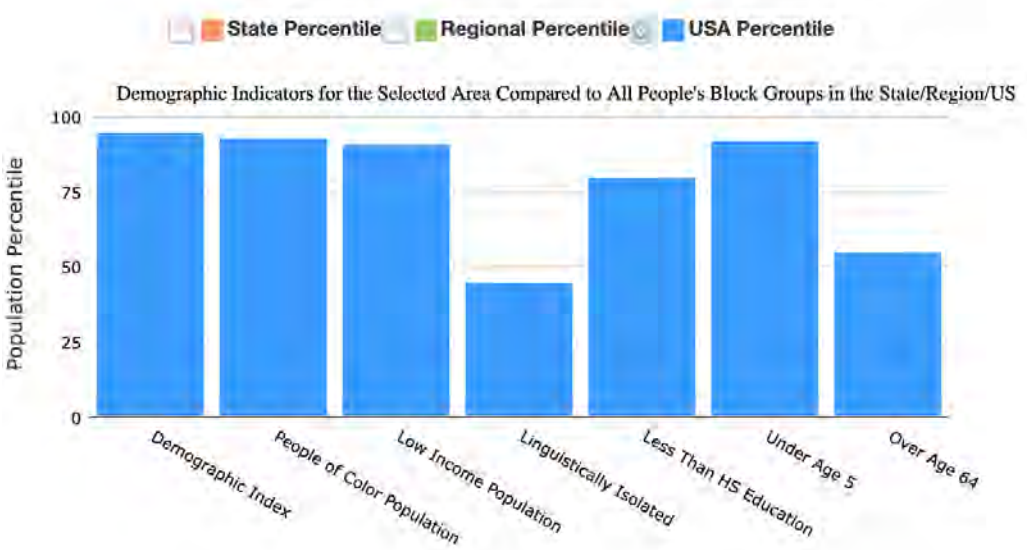


Figure 5 - Chart showing the demographic indicators near the FCA Jefferson facility

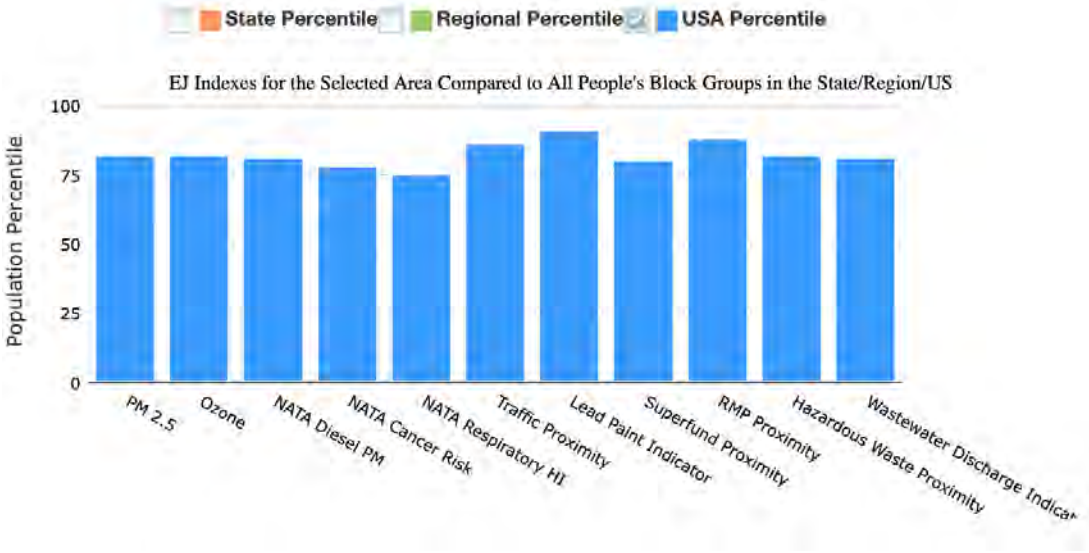


Figure 6 - Chart showing the EJ Indexes near the FCA Jefferson facility

The next set of charts from EJSCREEN show the environmental indicators, demographic indicators, and EJ Indexes within a mile radius of the U.S. Ecology facility. The numbers are similar to the FCA Jefferson population, with a higher risk of cancer and other illnesses due to the high presence of pollutants in the area. The demographic index is also much higher for this region, indicating an alarming environmental justice issue.

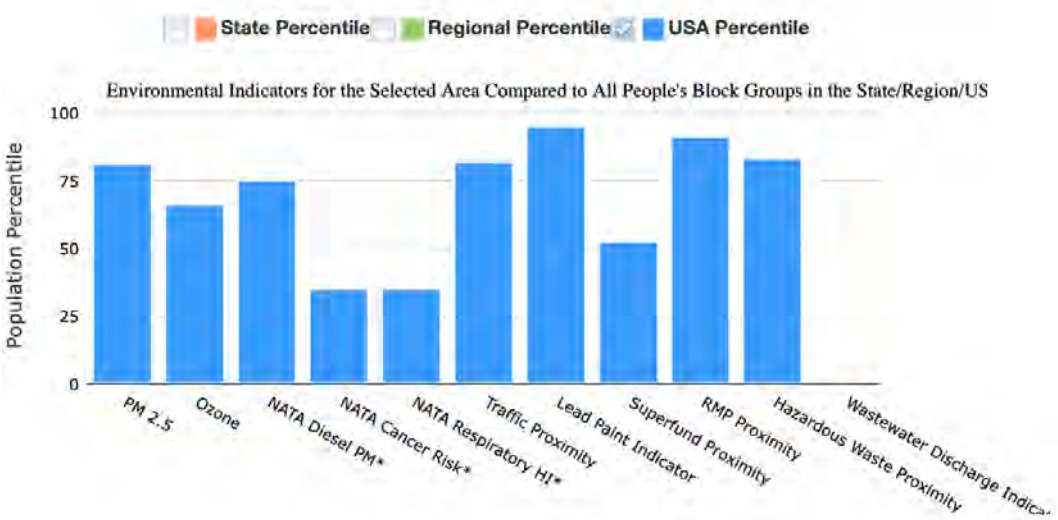


Figure 7 - Chart showing population percentiles of risk/exposure to pollutants, diseases, etc. near the U.S. Ecology facility

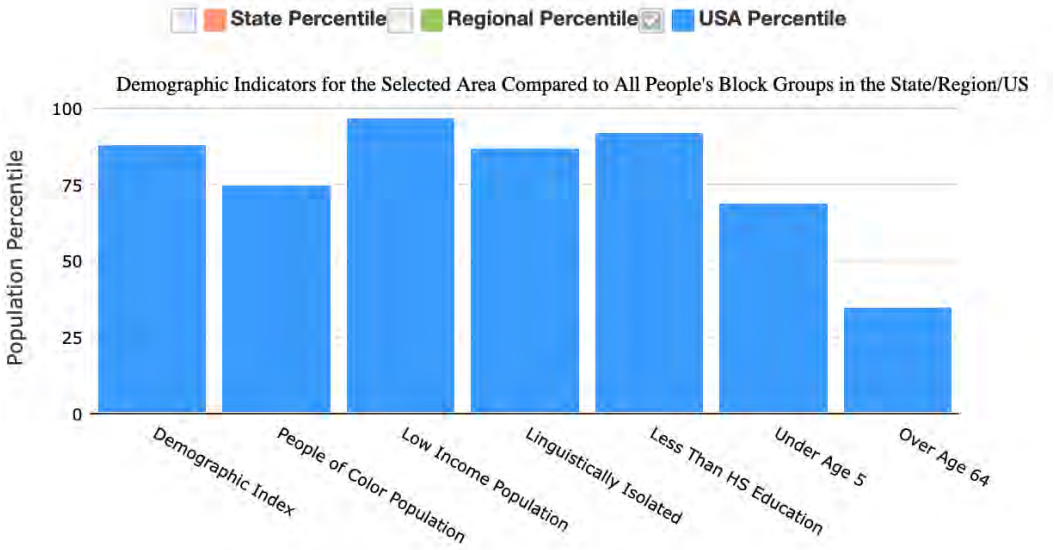


Figure 8 - Chart showing the demographic indicators near the U.S. Ecology facility

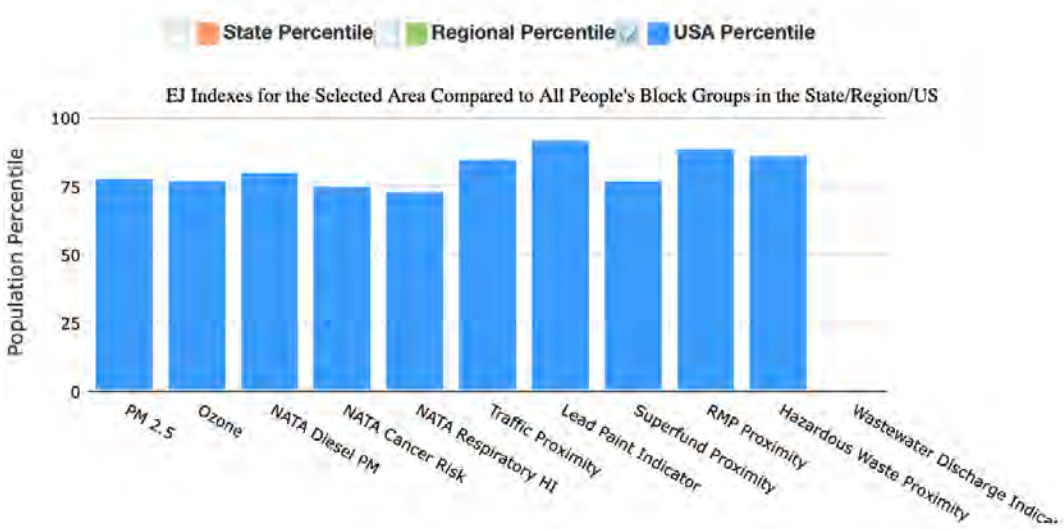


Figure 9 - Chart showing the EJ Indexes near the U.S. Ecology facility

To further illuminate these trends, the next two maps indicate the percentage of the population with a higher risk of respiratory illness and cancer. Several blocks on the eastside of Detroit are above average risks of developing these illnesses. These are also the blocks nearby to the TRI facilities. To emphasize, just a few blocks east in the predominantly white Grosse Pointe Communities, there is a very low percentage chance of developing these illnesses. There are no TRI facilities in those communities as well.

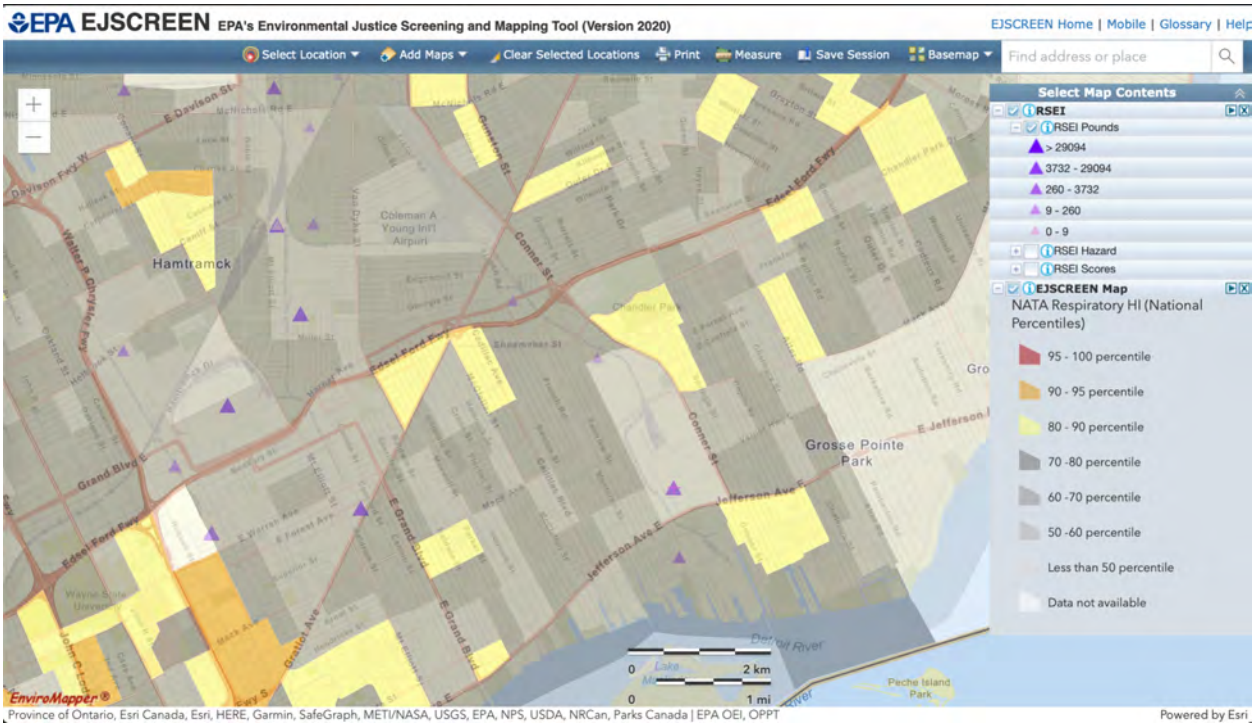


Figure 10 - Chart showing EJSCREEN map shows RSEI pounds for eastside TRI facilities overlaid on NATA Respiratory HI percentiles

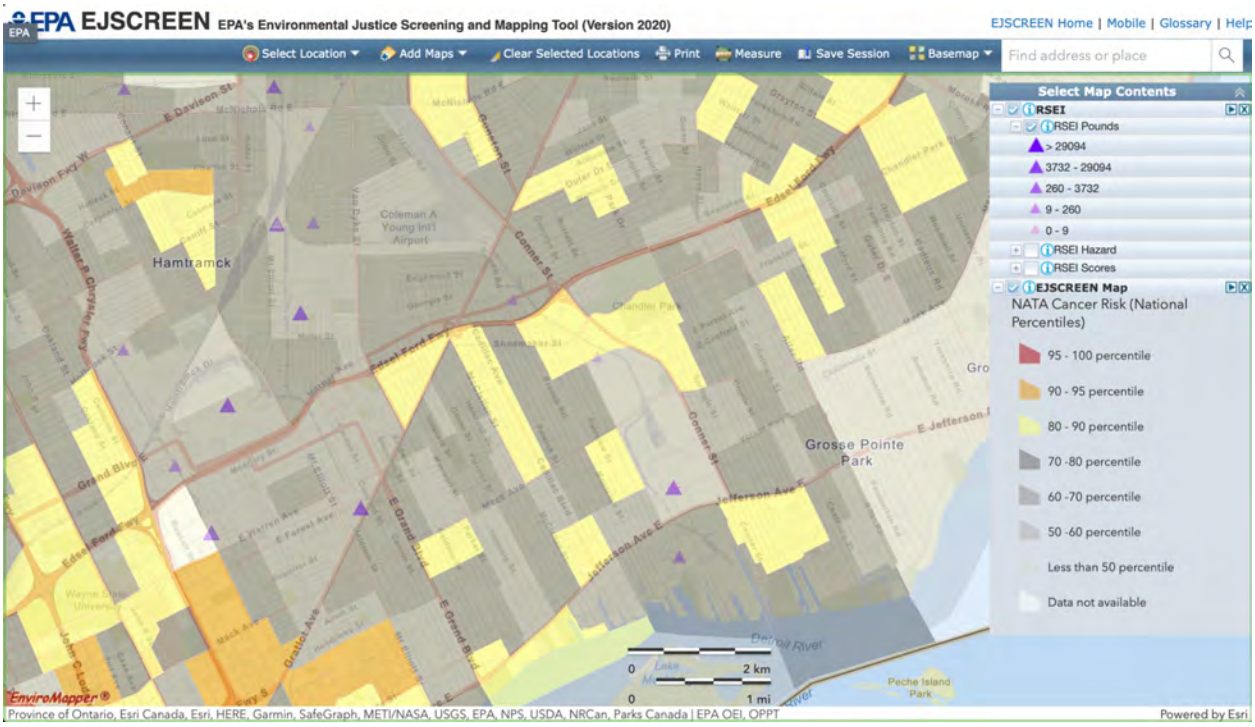


Figure 11 - EJSCREEN map shows RSEI pounds for eastside TRI facilities overlaid on NATA Cancer Risk percentiles. Cancer risks are higher in communities that are in close proximity to TRI facilities

As mentioned, the population living near these facilities include a higher percentage of people of color. Using EJSCREEN's Demographic Index, one can find that there is a higher likelihood of a minority (or low income individual) living near a facility with a high scoring RSEI. The Demographic Index in EJSCREEN is a combination of percent low-income and percent minority. The following side by side map comparisons reveal the TRI facilities, RSEI scores, and the amount of people of color living near those facilities. As mentioned, individuals living closer to large industrial facilities may be exposed to higher risks of cancer, respiratory illnesses, or other diseases or environmental risks.

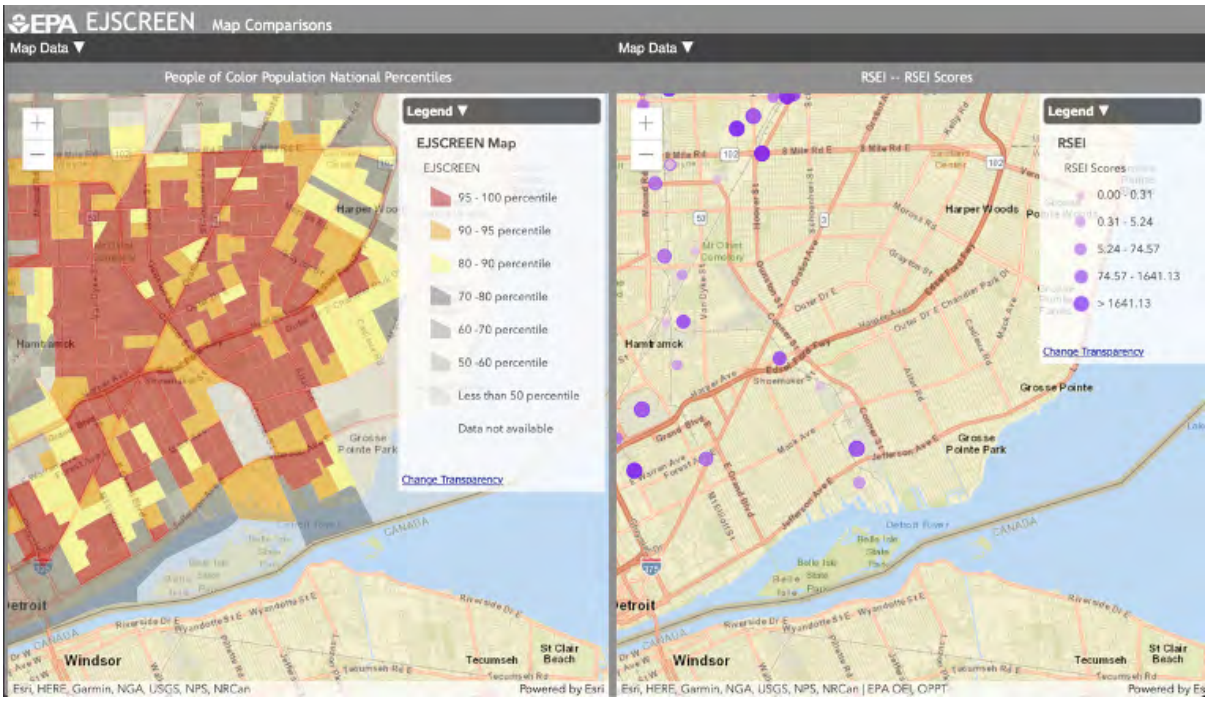


Figure 12 - EJSCREEN side-by-side map comparison showing the percentiles of people of color on the left, and RSEI Scores on the right for the eastside of Detroit

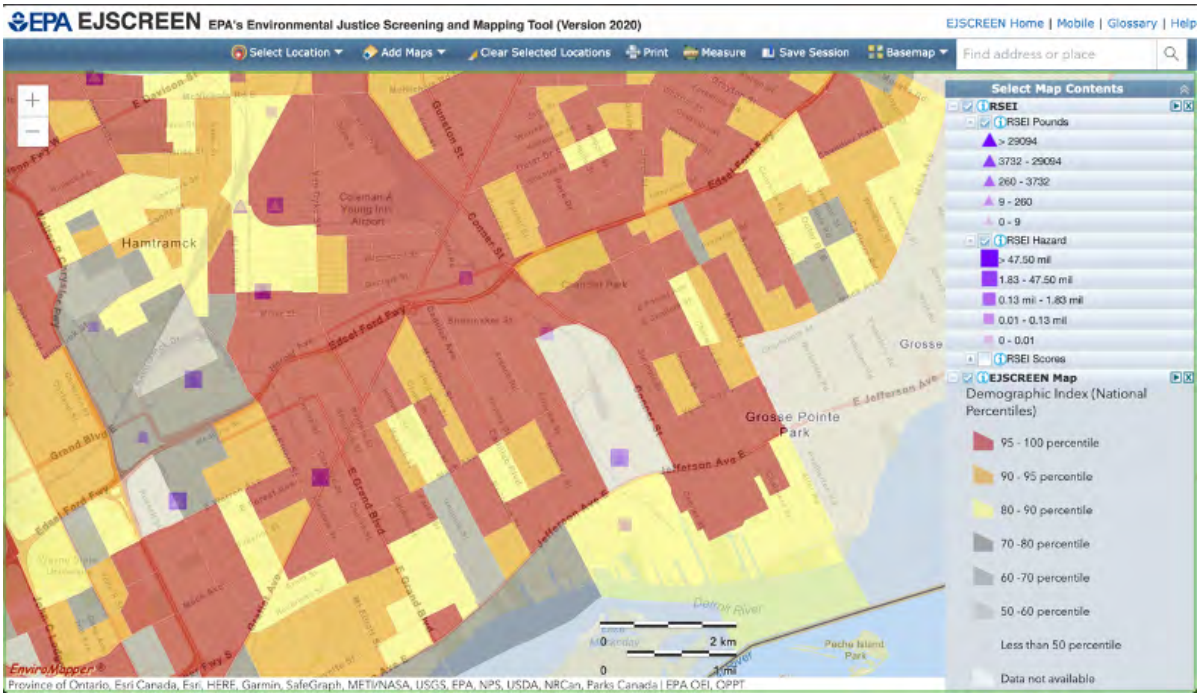


Figure 13 - EJSCREEN map showing Demographic Index percentiles overlaid on RSEI Pounds and Hazards on the eastside

Those living closer to the major polluting facilities are also more likely to be low income. The map below shows this measurement and includes the major industrial facilities on the eastside of Detroit, including FCA and U.S. Ecology.

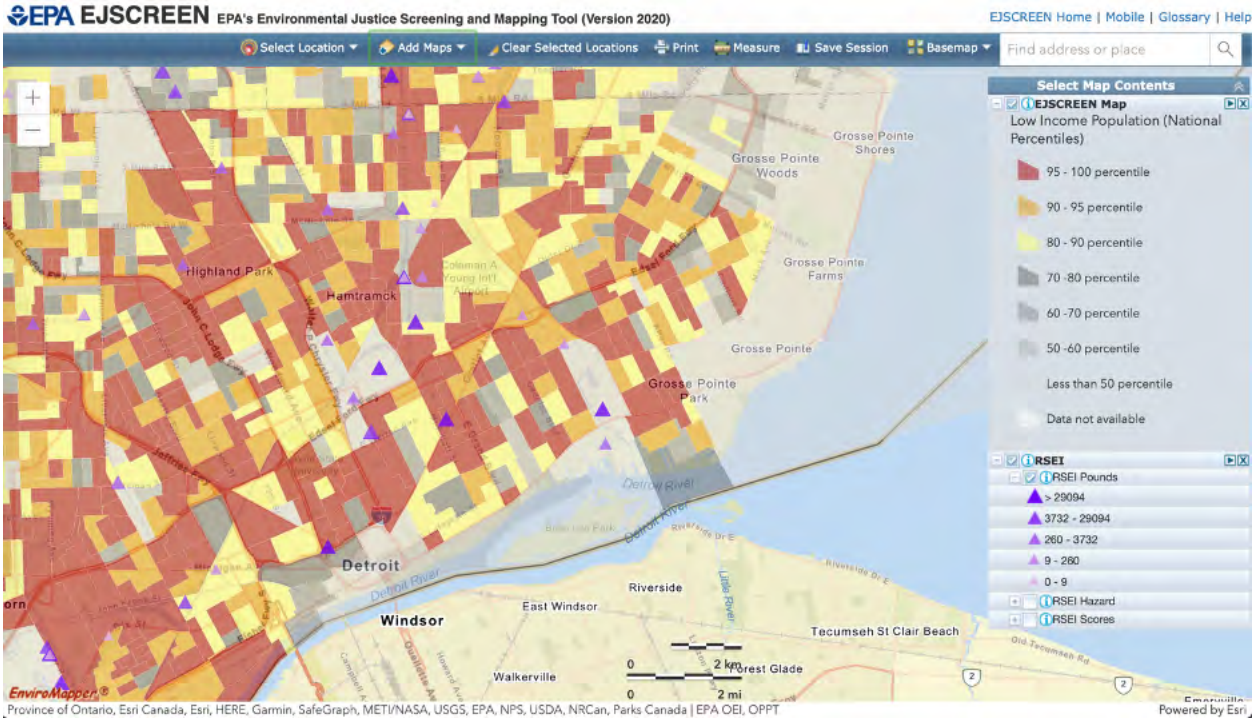


Figure 14 - EJSCREEN map showing RSEI Pounds overlaid on the low income population percentiles on the eastside

Those plants are also in areas ranking at the 80-90th percentile risk for hazardous waste proximity. The next map shows this risk on the eastside of Detroit, further exacerbating the environmental justice issue at stake.

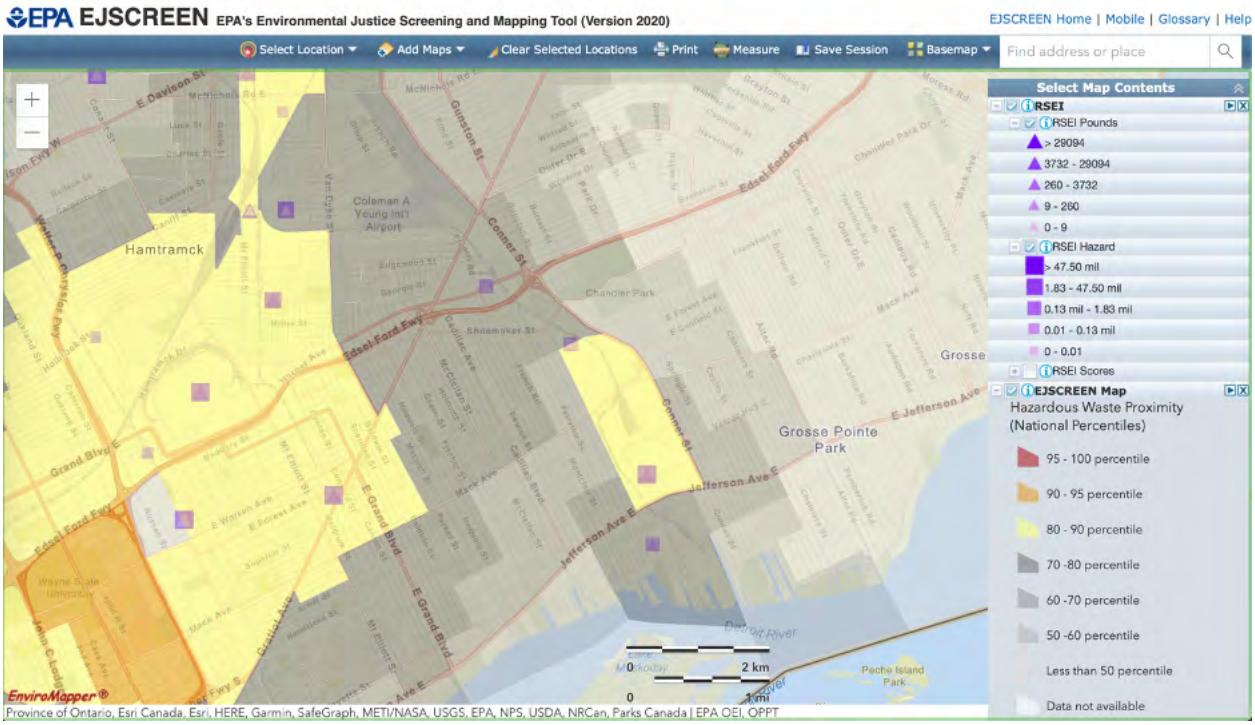


Figure 15 - EJSCREEN map showing hazardous waste proximity percentiles with RSEI Pounds and Hazards on the eastside

b. The Lack of Monitoring Stations Creates an Incomplete Database

The above-mentioned risks on the eastside of Detroit justifies greater monitoring. Yet, there is only one ambient air monitoring station on Detroit's eastside. It is located at 11500 East Seven Mile. This location is not as close as it could be to any of the major TRI facilities in that area, let alone U.S. Ecology and FCA Jefferson. FCA Jefferson North, for example, is located on 2101 Connor Avenue in Detroit. This is roughly 5-6 miles away from the monitoring station. U.S. Ecology North's facility is located at 6520 Georgia Street in Detroit, which is roughly 4-5 miles away from the station. The following map highlights the distance between these two TRI facilities and the air monitoring station.

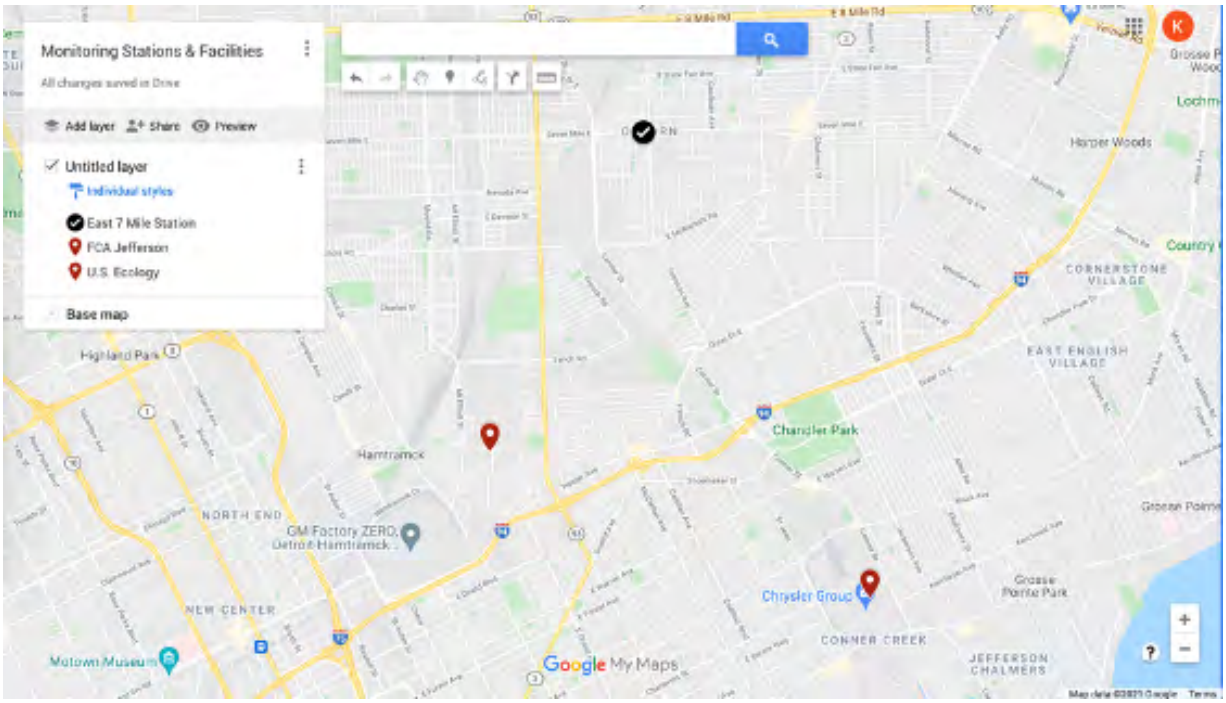


Figure 16 - Custom Google Maps with pins highlighting the distance between the East Seven Mile Monitoring Station and the FCA and U.S. Ecology Facilities

The amount of information gathered from just this one station, that does not even track all chemicals, may not be as comprehensive as it can and should be. The East Seven Mile Station does not monitor PM10, and, as mentioned in the Introduction, only just started monitoring VOCs in the ambient air in the region as of June 2021.

Given the concerning environmental justice issues at play, more monitoring stations are required to track the amount of toxics and pollutants in the ambient air in all areas of the eastside of Detroit. The status quo is not enough, and does not inform the State and EPA of all the potential risks. Not only could there be more environmental risks and health impacts, but the population experiencing these harms is predominantly people of color, low income, and has less than high school education.

III. Legal Requirements and Guidance for Ambient Air Monitoring Networks

Legal support for additional PM10 and VOC monitors on Detroit's eastside comes from the Clean Air Act and Title 40 of the Code of Federal Regulations (CFR) Part 58. Based on these regulations, Federal executive and agency officials have issued monitoring network requirements and guidelines to support State governments' Ambient Air Monitoring Network plans. Even where State governments satisfy the basic requirements of federal law, they may choose to embrace environmental justice

initiatives and address specific issues affecting their citizens' health and wellbeing by establishing more robust monitoring networks targeting specific local concerns.

a. Monitoring and Network Design Objectives

Congress passed the Clean Air Act (CAA) in 1970 in response to increased pollution from urbanization, industrial development, and automobiles.[37] The goal of the CAA is to promote public health and welfare and to promote national research for the prevention and control of air pollution.[38] To achieve its goal, the CAA called for collaboration between federal, state, and local governments.[39] To that end, the EPA issues primary (health-based) and secondary (welfare-based) NAAQS and issues guidance for states to follow.[40] The states use these standards to devise State Implementation Plans (SIPs) to research, monitor, and enforce CAA air quality standards.[41] Title 40 of the Code of Federal Regulations (CFR) Part 58 also imposes requirements for State or Local Air Monitoring Stations (SLAMS), comprised of ambient air quality monitoring sites and equipment used to monitor compliance with NAAQS. SLAMS also include monitors that serve other data purposes, such as Special Purpose Monitor (SPM) stations.[42]

Monitoring networks serve three basic objectives: (1) to "provide air pollution data to the general public in a timely manner," (2) to "support compliance with ambient air quality standards and emissions strategy development," which includes monitoring locations near major air pollution sources to gain "insight into how well industrial sources are controlling their pollutant emissions," and (3) to support pollution research on the health effects and atmospheric processes of emissions.[43] Each of these objectives is equally and independently important.[44]

To fulfill network objectives, monitoring networks must be designed using a variety of types of monitoring sites. CFR Part 58 recognizes six types of monitoring sites. These include sites located to determine the highest concentrations expected to occur in the area covered by the network ("max concentration"), to measure typical concentrations in areas of high population density ("population oriented"), to determine the impact of significant sources or source categories on air quality ("source oriented"), and to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts ("welfare related impacts").[45] Monitoring networks must incorporate these varied types of sites to be "capable of producing information about peak air pollution levels, typical levels in populated areas, . . . and air pollution levels near specific

[37] 42 U.S.C.A. § 7401(a)(2).
[38] *Id*. at § 7401(b)(1)-(2).
[39] *Id*. at § 7401(c).
[40] *Id*. at § 7409(b)(1)-(2).
[41] *Id*. at § 7403(a), (c)(3).
[42] 40 C.F.R. § 58.1.
[43] 40 C.F.R. § Pt. 58, App. D, 1.1(a)-(c).
[44] *Id*. at 1.1.
[45] *Id*. at 1.1.1(a)-(f).

sources."[46] Though network designs involve trade-offs between data needs and available resources, CFR Part 58 expressly states that "[t]he total number of monitoring sites that will serve the variety of data needs will be substantially higher than [CFR's] minimum requirements provide."[47]

When selecting monitoring locations, State governments should consider the air pollutant to be measured, monitoring objectives, and the site type.[48] These factors should match with the spatial scale to be represented.[49] Two spatial scales are especially relevant to our request for PM10 and VOC monitoring on Detroit's eastside. First, a neighborhood scale "[d]efines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range."[50] Second, an urban scale "[d]efines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale."[51]

States may consider spatial scale as a determinative criterion in their site selection processes, but the location may also be a product of other predominant criteria.[52] CFR Part 58, Appendix D, offers an example. In the example, the objective is to determine ozone concentrations in an area, so the best location for monitoring was downwind of a metropolitan area in a neighborhood where children and other susceptible individuals live and spend time outdoors. In this scenario, the physical location was a product of other considerations, like emission patterns, public activity, and meteorological characteristics affecting ozone concentrations. The spatial scale was then determined by matching the correct scale to the requisite site type.[53] "In some cases, the physical location of a site is determined from joint consideration of both the basic monitoring objective and the type of monitoring site desired."[54] CFR Part 58, Appendix D, provides a reference table that matches site types with the appropriate siting scales:

---

[46] *Id*. at 1.1.1.
[47] § Pt. 58, App. D, 1.1.2.
[48] *Id*. at 1.2(a).
[49] *Id*.
[50] *Id*. at 1.2(b)(3).
[51] *Id*. at 1.2(b)(4).
[52] *Id*.
[53] *Id*. at 1.2(c).
[54] *Id*. at 1.2(d).

TABLE D-1 OF APPENDIX D TO PART 58—RELATIONSHIP BETWEEN SITE TYPES AND SCALES OF REPRESENTATIVENESS

Site type	Appropriate siting scales
1. Highest concentration	Micro, middle, neighborhood (sometimes urban or regional for secondarily formed pollutants).
2. Population oriented	Neighborhood, urban.
3. Source impact	Micro, middle, neighborhood.
4. General/background & regional transport	Urban, regional.
5. Welfare-related impacts	Urban, regional.

Table D-1 from § Pt. 58, App. D, 1.2(f) pairing Site Type to Siting Scale for monitoring location selection

b. Monitoring and Network Design Requirements

CFR Part 58, Appendix D, details monitoring requirements generally and specifically by pollutant. Generally, NCore site measurements include PM10-2.5 and, in CBSA's with populations greater than 1,000,000, NCore sites are required to report PAMS measurements, including VOCs.[55] NCore sites include both neighborhood and urban scale measurements in metropolitan areas like Detroit.[56] However, appendix D recommends that NCore sites be located away from direct emission sources to avoid a substantial impact on area-wide measurements.[57] To address specific air quality concerns, states can establish single-pollutant measurement sites as SLAMS sites, but not NCore sites.[58] States must adhere to the CFR Part 58 design criteria for PM10 and PAMS/VOCs and are encouraged to establish single-pollutant measurement sites where the concentration of these pollutants creates special concerns.

PM10 design criteria emphasize that "the most important spatial scales to effectively characterize the emissions of PM10 from both mobile and stationary sources are the middle scales and neighborhood scales."[59] "Middle scale" is characterized by areas of short-term public exposure due to major roadways or stationary sources of particulate pollution.[60] The PM10 "neighborhood scale" represents conditions in homogeneous (in terms of PM concentration) urban sub-regions with dimensions of a few kilometers and a generally more regular shape than the middle scale.[61] Additionally, in MSAs like Detroit-Warren-Livonia with low PM10 concentrations and populations greater than 1,000,000, states must establish a minimum of two to four PM10 monitors.[62] The

[55] § Pt. 58, App. D, 2(c), 5(a).
[56] *Id*. at 2(c).
[57] *Id*.
[58] *Id*. at 2(d).
[59] *Id*. at 4.6(d).
[60] *Id*. at 4.6(d)(2).
[61] *Id*. at 4.6(d)(3).
[62] *Id*. at 4.6(a).

PM10-2.5 design criteria also recommend middle and neighborhood scale measurements, especially in populated areas near significant emissions sources.[63]

c. Analysis of Michigan's 2022 Annual Ambient Air Monitoring Network Design for PM10 and VOC in the Detroit-Warren-Livonia MSA.

GLELC is especially interested in Michigan's PM10 and VOC monitoring networks, described in detail in Michigan's 2022 Annual Ambient Air Monitoring Network Review ("the 2022 Review").

Regarding PM10, the 2022 Review concludes that the Detroit-Warren-Livonia MSA, being a low PM10 concentration area with a population of 4,319,629, must have a minimum number of two to four PM10 monitors.[64] Currently, there are three sites in operation: one at Allen Park (261630001), one at Detroit-SWHS (261630015), and a co-located pair of monitors at Dearborn (261630033).[65] However, these locations are not sufficient to understand the impact of PM10 on Detroit's eastside, so Michigan should establish a fourth site on the eastside.

First, none of these sites have a source oriented or welfare related purpose. According to the 2022 Review, Dearborn and Detroit-SWHS serve a max concentration purpose while the Allen location is population oriented. Consequently, the monitors are designed to determine the highest concentrations of PM10 expected to occur and to measure typical concentrations in their designated area. They are not positioned to understand the extent of specific, significant sources like U.S. Ecology North and FCA Jefferson North.

Additionally, all three use a neighborhood scale meant to represent urban sub-regions spanning only a few kilometers. CFR Part 58 recommends neighborhood scales, along with urban scales, for monitoring PM10. However, the neighborhood scale limits the breadth of monitoring of PM10 in Detroit. The Detroit-Warren-Livonia MSA does not have a monitor with an urban scope designed for larger geographic monitoring, and none of the three existing monitor sites are located on Detroit's eastside.[66] Because the eastside is proximally located near significant sources of PM emissions, distant monitors with only a neighborhood scope may not present an accurate representation of PM10 exposure on the eastside.

Regarding VOC, the 2022 Review explains that Michigan has three VOC monitors in the Detroit-Warren-Livonia MSA. Like MSA's PM10 monitors, these monitors are population and max concentration oriented with a neighborhood scale.[67] Because their locations, purpose, and scale are not representative of the stationary sources and emission levels specific to the eastside, an additional VOC monitor on the eastside

---

[63] *Id*. at 4.8(b).
[64] *See* EGLE, *supra* note 11.
[65] *Id*.
[66] *Id*.
[67] *Id*.

would provide much-needed information for public use, emission compliance monitoring, and scientific research.

Federal standards and guidance further support GLELC's requests for PM10 and VOC monitors for Detroit's eastside communities.

d. Federal Standards: Guidance, Trends, and Environmental Justice

In January 2021, President Biden issued Executive Order 13990 on "Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis." He ordered a national policy commitment to "empower our workers and communities; [and] promote and protect our public health and the environment . . .. Where the Federal Government has failed to meet that commitment in the past, it must advance environmental justice."[68] This order echoes President Clinton's 1994 E.O. 12898 "focus[ing] federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities,"[69] and President Obama's 2011 Memorandum of Understanding on Environmental Justice and Executive Order 12898, requiring federal agencies like the EPA to develop an Environmental Justice Strategy.

Following the emphasis that the federal executive branch has placed on environmental issues and environmental justice, the EPA's NAAQS have become gradually more stringent to further its public health goals. Additionally, the EPA eliminated its use of spatial averaging in PM calculations so that neighborhoods with high PM concentrations would not be easily overlooked when data from monitors in their neighborhoods were averaged with data from neighborhoods with low PM concentrations. The D.C. Circuit Court upheld the EPA's elimination of spatial averaging as reasonable, pointing to the EPA's evidence that averaging inaccurately portrays PM levels, especially in neighborhoods where "sensitive individuals" are likely to live.[70]

However, despite more stringent NAAQS and more localized monitoring requirements, PM concentrations in much of the Midwest have remained unchanged or have increased since 2000.[71] Many communities are concerned about the effects of PMs on their health and welfare. The EPA's Integrated Science Assessments (ISAs) demonstrated a causal link between long-term exposure of PM10 and mortality, cardiovascular effects, metabolic effects, nervous system effects, and cancer.[72] Additionally, ISA concluded that PM has a causal relationship with effects on climate, including visible effects on materials like buildings, metals, and paints.[73] Finally, ISA found a causal relationship

---

[68] 86 FR 7037, 7037.
[69] EPA, SUMMARY OF EXECUTIVE ORDER 12898 (1994), https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice
[70] *Natl. Ass'n of Mfrs. v. E.P.A.*, 750 F.3d 921, 925 (D.C. Cir. 2014).
[71] EPA'S REVIEW OF THE NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER, 85 FR 24094-01, 24102 (2020).
[72] *Id*. at 24126.
[73] *Id*. at 24127.

between PM and visibility impairment, which can impact people's enjoyment of daily activities and their overall sense of well-being.[74] While PM2.5 has been extensively studied, the effects of PM10-2.5 are less certain because of a lack of data and robust studies.[75] "Given the greater spatial and temporal variability of PM10-2.5 and fewer PM10-2.5 monitoring sites, compared to PM2.5, this uncertainty is particularly important for the coarse size fraction."[76]

GLELC implores Michigan to follow CASAC's recommendation to implement "improvements to PM10-2.5 exposure assessment, including a more extensive network for direct monitoring of the PM10-2.5 fraction" to reduce these uncertainties for our communities in the future.[77] Michigan courts have recognized that "[t]he Clean Air Act does 'not preclude a State from submitting a plan more stringent than federal law demands . . .'" In accordance with federal trends and guidance, Michigan should continue pushing its state monitoring network towards environmental justice.

V. Conclusion

GLELC requests that Michigan's 2022 Annual Ambient Air Monitoring Network Review be amended to provide for an additional PM10 monitor and an additional VOC monitor on the eastside of Detroit. These monitors would support environmental justice in Michigan and comport with the policies underlying legal monitoring network requirements.

First, GLELC is concerned about a worrying trend where populations living nearest to large TRI facilities are predominantly people of color, low income, and low education levels. These populations are at an above-average risk of exposure to several air pollutants and toxins, which carry severe health and wellness risks. Residents on the eastside of Detroit are subject to approximately twelve sources of pollution, emitting considerable amounts of dangerous toxins and creating elevated health risks for the area's residents. The populations living nearest to these facilities include a higher percentage of people of color and people with low income. However, a lack of monitoring stations in the area creates an incomplete database. Without a complete database, the environmental and health risks facing these communities cannot be fully understood or adequately addressed. Additional monitors will provide the public, regulators, and scientists with more detailed and accurate data concerning emissions and will allow these groups to provide better air quality to burdened communities.

Michigan's 2022 Ambient Air Monitoring Network meets compliance with the legal requirements enumerated in the Clean Air Act and 40 CFR Part 58. However, state governments are permitted to create networks and regulations that surpass the

[74] *Id*. at 24128.
[75] *Id*. at 24122.
[76] *Id*. at 24122-23.
[77] *Id*. at 14125.

minimum requirements and are encouraged to create systems that consider their citizens' unique health and welfare concerns. Currently, because the purpose and scale of the PM10 and VOC monitors in the Detroit-Warren-Livonia MSA do not align with the source-oriented concerns facing Detroit's eastside, Michigan should improve its monitoring network with additional monitors. Federal guidance explicitly suggests that states establish additional monitors for coarse size PM, like PM10-2.5. The Office of the President, the EPA, and Michigan regulators have recently embraced environmental justice principles, and those principles should be reflected in Michigan's monitoring network.

In conclusion and for the reasons expressed above, GLELC calls on EGLE to expand its network of monitoring stations on the eastside of Detroit. Specifically, it requests that one additional PM10 monitor and one additional VOC monitor be installed on the eastside. GLELC requests that data from these monitors be used for regulatory compliance. However, in the alternative, GLELC requests these monitors be installed as Special Purpose Monitors to support public health, community welfare, and related research for Detroit's eastside.

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 28, 2021

Mr. Nick Leonard, Executive Director
Great Lakes Environmental Law Center
nicholas.leonard@glelc.org **via Email**

Dear Mr. Leonard:

Subject: EGLE's response to Great Lakes Environmental Law Center's comments regarding Michigan's draft 2022 Ambient Air Quality Monitoring Network Review

The Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD) appreciates and thanks you for taking the time to provide thoughtful and specific comments regarding the Annual Air Monitoring Network Review document. Each year the AQD meticulously evaluates all federal requirements to ensure all standards are met by our statewide monitoring network. We appreciate the feedback and will endeavor to address your comments.

Throughout the document, there are requests for additional ambient air monitoring on Detroit's east side for PM_{10} and volatile organic compounds (VOCs). Areas of interest were identified near the US Ecology and FCA facilities. FCA began operating an ambient air monitoring station at their Mack Avenue plant in November 2020. This site continuously measures nitrogen oxides and fine particulate matter ($PM_{2.5}$). Once a month during ozone season, which is March through October, a VOC sample is collected. The data collected at the FCA facility is submitted to EGLE for review.

EGLE is aware of community concerns in this area of Detroit east side. Several Purple Air particulate matter sensors were recently purchased. EGLE anticipates using some of these sensors in the area near US Ecology and other areas of the state this summer. EGLE will also evaluate and explore opportunities to enhance regulatory monitoring in the area near US Ecology in the future. When it is feasible, the agency will consider resources such as EJ SCREEN, emission inventories, pollution modeling, and research data, and will consult with community leaders to evaluate potential locations for additional monitoring in eastside Detroit.

Thank you again for your comments and feedback. If you have further questions or concerns, please contact me at 313-720-1542; GhumanN@Michigan.gov; or EGLE AQD, 3058 West Grand Boulevard, Suite 2-300, Detroit, Michigan 48202.

Sincerely,

Navnit K. Ghuman

Navnit K. Ghuman
Environmental Quality Analyst
Air Quality Analyst
EGLE AQD

cc: Ms. Susan Kilmer, EGLE

Date: June 18,2021

To: Navnit K. Ghuman
EGLE, Air Quality Division,
3058 West Grand Boulevard, Suite 2-300
Detroit, Michigan 48202.
GhumanN@michigan.gov

From: Stuart Batterman
University of Michigan
Ann Arbor, MI 48109-2029

Re: Comments regarding the 2022 Michigan Ambient Air Monitoring Network Review

Thank you for the opportunity to provide some comments on this important document.

As in past years, the Michigan Ambient Air Monitoring Network Review (Review) follows its predecessors, is clear, addresses EPA regulations adequately, and provides some historical background. The Division is known for its high quality data collection activities, and the Review provides helpful data. I have a limited number of comments for this Review. (Some of these comments were also provided in our critique of the 2020 Network Review.)

1. Site access was lost to S. Delray. This site was just NE of Zug Island and the coke battery and steel facilities there. This site measured metals, and provided one of the few locations where fugitive dust and toxics were monitored. While other sites measure metals in the area, specifically, the SWHS and Trinity sites, these sites are more distant and much less likely to capture emissions from Zug Island and other industrial facilities. There is a need to site special purpose monitoring sites near industry in SW Detroit for trace metals and other compounds.

2. There is a need to better characterize metal levels and understand sources on Zug Island and environs, and, as stated above, to replace the metals monitoring that had occurred at the S. Delray site. Justification for this comes, in part, from EGLE's latest report on monitoring data. I used the data provided in Appendix B of the *2019 Air Quality Annual Report* (https://www.michigan.gov/documents/egle/egle-tou-AQD2019-Report_708534_7.pdf), specifically, the reported mean with <MDL=0 to avoid false positives, and the maximum level. I compared levels to reference levels in the current *US EPA Regional Screening Levels*, a risk based compilation (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables), specifically using concentrations that correspond to cancer risk of 10^{-6} and a Hazard Quotient of 1.0. These numbers are similar to EGLE's IRSLs and ITSLs, and were used as EGLE did not provide reference levels for certain metals. Note that this comparison is not a risk assessment, rather, it helps to prioritize specific compounds by providing reference or comparison levels that are health relevant. This comparison indicates the following:

    a. Arsenic: Delray has the highest level of EGLE sites for arsenic, 0.0017 µg/m3, and exceeds the cancer guideline by 2.6 times using the mean, and 18 times using the maximum

    b. Cadmium: Belding is higher, but peak levels of cadmium at Delray, 0.003 µg/m3, exceed the cancer guideline by 2 times.

c. Manganese: High levels of this metal at Delray have been noted previously; the average at this site exceeds the non-cancer guideline by 3 times and the peak level exceeds the guideline by 12 times.

d. Nickel: Delray has the highest levels monitored among the EGLE sites of this metal. Levels do not exceed guidelines but are among the highest in SW Detroit (NMH is higher).

As stated, this analysis is not a risk assessment. Importantly, it does not account for exposure to multiple metals, which would increase the risk. Overall, metals monitoring is limited given the number of large industrial sources, and enhancements to the monitoring network that identify sources and exposure potential is warranted.

2. Black carbon and diesel exhaust emissions. I have previously shared with EGLE summaries of black carbon levels at the SW Detroit monitors using data from the past several years at the five monitoring sites in SW Detroit and comparisons to Allen Park. This analysis shows that BC levels are high in SW Detroit, nearly twice that at Allen Park. These high levels are likely associated with diesel exhaust, which is considered carcinogenic by many authorities, e.g., California. The BC itself appears to constitute a significant fraction of PM2.5 in SW Detroit. Most of the SW Detroit monitors are designed as "special purpose", not as population exposure. While we intend to utilize source apportionment methods to explore this further, there may be benefit in maintaining additional BC monitors that can separate out sources of BC and better represent population exposure. Potential sites might include:

    a. A near-road site, e.g., Eliza Howell, given that the main influences on this site is I-94 and not industry, wood burning, etc., and documentation of the time of day patterns and relationship to other traffic related pollutants could be beneficial. The Allen Park site does show time of day influences and somewhat similar information since it is relatively close to I-75, which also has a considerable amount of truck traffic, however, this site was not designed as a near-road site.

    b. A site near the bridge or "downwind" of the bridge terminal, trying to get at the impact of bridge traffic, which includes about 9000 heavy duty vehicles per day.

    c. A population-oriented site in SW Detroit. Note that the five existing monitors in SW Detroit are located along Fort or other main truck routes or very near industry. What is missing is a monitoring site that is more representative of population exposure in the area.

    d. A comparison population-oriented site elsewhere in Detroit. The E-7mile site might be ok for this purpose.

    e. A combined traffic- and industry-oriented site near the I-75 and I-94 intersection. There is industry to the east and traffic sources to the west.

3. VOCs and carbonyls in Detroit. In addition to EGLE monitoring, some VOCs are monitored at four sites operated by Marathon, Dearborn, SWHS, and now E-7 mile. Again, I used the 2019 EGLE Report to review VOC levels and compared them to the EPA Regional Screening Levels. This report included only two sites, Delray and This analysis flags several compounds:

    a. Benzene: Delray has higher average levels than Dearborn (0.636 μg/m3), a level which exceeds the cancer guideline level by 1.8 times. Peak levels exceed guidelines by 7.5 times.

b. Carbon tetrachloride at Dearborn is high; average levels there slightly exceed the cancer guideline; peak levels are 2.2 times higher.

c. Chloroform at Dearborn is high; average levels (0.625 µg/m3) exceed the cancer guideline by 7 times; peak levels are 12 times higher.

d. Formaldehyde is high at both Dearborn and Delray; Delray is slightly higher, averaging 3.3 µg/m3 exceeding the cancer guideline by 15 times; peak levels at these sites exceed the guideline by 32 times.

    i. Pages 80-81 of the Review discuss the heterogeneity of formaldehyde levels, and indicate that 8-hr samples will also be collected at E-7 mile in a one-in-three day schedule at E-7 mile and Grand Rapids. There is no justification in this part of the Review, but later this is suggested in the PAMS discussion, as a site designed investigate O3 precursors. However, formaldehyde levels at Dearborn and Delray pose health risks directly, and the current 1 in 12 day schedule is minimally adequate, plus the Delray site will be lost. More frequent monitoring of carbonyls at Dearborn or other SW Detroit site is suggested.

e. Tetrachloroethylene at Delray is high, 3.2 µg/m3; the peak level at this site is 26 µg/m3, which exceeds the cancer guideline by 2.3 times.

f. Vinyl chloride at Delray averages 0.027/m3, well below the cancer guideline, but peak levels exceed the guideline by 4.6 times.

g. Similar evaluations should be completed for aldehydes, PAHs, and other organics.

Again as stated above, this analysis is not a risk assessment, nor does it account for exposure to multiple organic substances, which would increase the risk. Again, VOC monitoring is limited given the number of industrial sources, and enhancement should be considered.

4. As noted in previous years, I believe that the Review should acknowledge and ideally include data from additional monitoring sites in Michigan that are required by EGLE as a permit condition or that report to EGLE. The Review excludes non-EGLE operated monitoring sites. The Review should list, map and detail industry-owned and/or operated monitoring sites that report to EGLE and/or EPA or that were required as part of a permit condition to include monitoring, e.g., the 4 Marathon, 2 DTE, and FCA sites in the Detroit region. These are also a number of other TSP and PM10 monitors installed at various industrial sites.

    a. Monitoring parameters at these sites, e.g., QA, data reporting and other details, should be included, along with the rationale for these sites.

    b. Access to data generated by these sites should be made available (see below).

5. The Port Huron area contains a number of SO2 sources, including power plants and refineries on both the US and Canadian side. The US side has a single SO2 monitor, located inland by about 0.8 mile, and likely not in the location likely to obtain higher SO2 levels. The Canadian side also has a single monitor, that has measured 1-hr levels of 65 ppb (2018, most recent data, https://www.ontario.ca/document/air-quality-ontario-2018-report/appendix#annual-so2) and possibly higher in recent years. The Port Huron monitor has measured 1-hr levels of 73 ppb (2019 Report). An demonstration of SO2 compliance may not be needed given the model-based designations in the various rounds, but exploratory monitoring is suggested.

6. The ongoing MOOSE field study (led by EGLE), modeling, and analysis of prior O3 data suggests that the highest O3 levels may be closer to Lake St Clair than represented by the existing monitors at New Haven and Warren. However, sometimes we have found the highest levels a bit further to the north, near Richmond. Now or after the conclusion of this study, EGLE should assess:

    a. The adequacy of the existing O3 monitors to represent maximum concentrations.

    b. Add a description to the Review similar to that provided on p.33 for western Michigan pertaining to non-attainment that discusses "the unique air flow and meteorology of Lake Michigan and the resulting subregional transport of ozone and ozone-forming emissions …." As MOOSE is suggesting that Lake St. Clair is having a significant influence with recirculation and O3 formation.

7. Enhance the data interpretation and data utilization in the Review. While stated in prior years, I believe my suggestions remain relevant that the Review would benefit from a more detailed interpretation of data collected at each monitoring site. (Alternatively, this could be performed in the Annual Monitoring Report.) This could be phased in, e.g., each year a different county could be examined. This would provide a strong rationale for continuation/additions/deletions to the network. Elements of site-specific assessment might include:

    a. Detailed maps and a microinventory describing nearby emission sources at each monitor

    b. Description of local meteorology, seasonal wind roses and pollution roses

    c. Photos and other documentation (previous Reviews have shown this.

    d. Assessment of the data collected, trends, relationship to NAAQS and other guidelines, and overall value of the data at that site. The most recent (2019) report does provide this analysis for the NAAQS and the AQI, but does not tackle toxics, which I have attempted in comments above.

8. Discuss data utilization. Again, I will repeat a comment from a prior review. The Review should discuss the present, future and potential utilization of the data collected by the monitoring network, and develop a plan promote utilization and interpretation. Relevant topics that should be discussed include:

    a. Improving public access to site-specific current, historical and anticipated air quality levels

    b. Source apportionment analyses that identify specific emission sources, source types, or source areas (in the case of regional and secondary pollutants) affecting air quality. Some of this can use simple wind rose and trends plots.

    c. Application in risk assessment and health impact assessments.

    d. Potential role in epidemiological investigations.

9. Include a section of the Review that addresses climate change and preparedness, and the Division's potential contributions. (Again, this comment repeats one submitted earlier.) Dozens of the EQLE monitoring sites collect high quality surface meteorological data, and these data are underutilized. These may provide an excellent opportunity to examine precipitation, temperature and other factors affecting both pollutants (e.g., O3) and heat and cold stress and

potentially precipitation. This information is important for sustainability and many other efforts at city and regional levels, particularly as stresses and climate adaptation efforts increase.

10. Discuss data and resource sharing for sensors. EGLE has been very cooperative with various organizations, including Univ. Michigan, CAPHE, Wayne State, the Ecology Center, etc., with respect to co-locating sensors, sharing data, and calibration services, and should be commended. As noted in prior years, the advent of low-to-moderate cost sensors has presented both EGLE, cities and community organizations with opportunities to monitor air quality. This field is still evolving but EGLE could lay out a strategic framework to encourage and integrate these non-regulatory-type data.
11. On p. 62, there is discussion of the change pertaining to the near-road monitor in Livonia. The information in the Review is not adequate to assess this change, e.g.,
    a. The interactive map EGLE provides (https://egle.maps.arcgis.com/apps/webappviewer/index.html?id=9a4c80a5c7fa4088971757504a3c0ba1) does not show the Livonia monitoring site.
    b. The report should provide more detail on the implications of this move. Detailed maps are suggested.
    c. (Editorial point): The link to the traffic map should be placed in the caption of the figure (https://www.michigan.gov/mdot/0,4616,7-151-11151-22141--,00.html)

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 28, 2021

Stuart Batterman, Ph.D.
Prof., Dept. of Environmental Health Sciences
School of Public Health
Prof., Department of Civil & Environmental Engineering,
College of Engineering
University of Michigan
Room 6507 SPH2
1420 Washington Heights
Ann Arbor, Michigan 48109-2029
stuartb@umich.edu **via Email**

Dear Dr. Batterman:

Subject: EGLE's response to Dr. Stuart Batterman, University of Michigan, and on behalf of CAPHE comments regarding Michigan's draft 2022 Ambient Air Quality Monitoring Network Review

Thank you for taking the time to provide a thoughtful and detailed set of comments for the Air Monitoring draft 2022 Network Review. The Michigan Department of Environment, Great Lakes, and Energy, Air Quality Division, appreciates not only your commending of our work and service towards the goal of cleaner air for the citizens of Michigan; but also, the ongoing discussions and opportunities for partnerships to protect public health.

Each year, the AQD meticulously evaluates all federal requirements to ensure all standards are met by our statewide monitoring network. The annual review evaluates the state's existing ambient air monitoring network to determine adequacy in meeting monitoring objectives; optimizes the network by closing, moving, or adding stations; and ensures that air quality issues important to the state are being addressed. We will address the items you identified in your comments below.

1. Regarding the shutdown of the West Jefferson site in South Delray; the Wayne County Air Pollution Agency operated a trace metals monitor at this location from 1982 until 2001, when the State of Michigan took over operations. In April 2021, EGLE was notified of transfer of property ownership and we were requested to vacate the site. We were disappointed to lose this site with the wealth of historical data. The surrounding area is currently undergoing extensive changes to accommodate the new Gordie Howe International Bridge. Most properties in the vicinity have been sold due to redevelopment and finding suitable locations for air monitoring sites is extremely challenging. However, EGLE currently operates six monitors that sample for trace metals within a 3-mile radius of the former West

Jefferson site. The sites where metals are measured are the SW Detroit (SWHS) site, Detroit 4th Precinct, Trinity St. Marks, Military Park, New Mt. Hermon Baptist Church, and Dearborn. The SW Detroit site and Trinity St. Marks are less than a mile from the former West Jefferson site. The Detroit 4th Precinct and Military Park sites are less than 1.5 miles away. The Dearborn site is 2 miles away and the New Mt. Hermon Baptist Church site is 3 miles from the former West Jefferson site. Due to the extensive monitoring in the area, EGLE does not plan to establish a new site in this vicinity of Detroit.

2. Regarding additional measurements of black carbon; EGLE currently operates six instruments that measure this parameter at the SW Detroit (SWHS) site, Detroit 4th Precinct, Trinity St. Marks, Military Park, Dearborn, and Allen Park. A suggestion was made to conduct black carbon measurements at a near-roadway site. EGLE conducted an air toxics near-roadway study from 2016-2018. Continuous measurements of black carbon were conducted at the Livonia Near-road site (I-275), Eliza Howell Near-road site (I-96), and the Eliza Howell downwind site (I-96). This data is available and was included in a final published report. A suggestion was made to conduct black carbon measurements at a 'downwind' site from the bridge terminal. The Detroit 4th Precinct site was established as a downwind site to the Gordie Howe International Bridge. This site began operation in 2018 and conducts continuous measurements of black carbon. A suggestion was made to conduct black carbon measurements in a population-oriented site in SW Detroit. The Military Park site is located on Military and Regular Streets in SW Detroit, which is a residential area. The Dearborn site is located at Salina Elementary School, also a residential area. EGLE does not plan to purchase additional instruments for this parameter in 2022.

3. Regarding the measurement of volatile organic compounds (VOCs) and carbonyls in Detroit, EGLE measures VOCs using the canister method at the SW Detroit (SWHS) site every 12 days and at the Dearborn site every 6 days. As noted in the comment, VOCs are also being measured at the four sites operated by Marathon every 6 days. FCA is also measuring VOCs once a month during ozone season at their new air monitoring site at the Mack Avenue plant in NE Detroit. EGLE is conducting continuous VOC measurements as part of the Photochemical Assessment Monitoring Stations (PAMS) at the Detroit E. 7 Mile and Grand Rapids sites. Carbonyl compounds are measured at SW Detroit (SWHS) every 12 days, Dearborn every 6 days, and River Rouge every 6 days.

   As required for PAMS, carbonyls are also being measured at Detroit E. 7 Mile and Grand Rapids every 3 days collecting 8-hour samples. Sampling for VOCs and carbonyls is expensive and labor intensive. Additional requirements of the PAMS program did not include staff funding or funding for laboratory analysis of the carbonyl samples. EGLE was required to conduct PAMS sampling in Detroit and Grand Rapids. Due to staffing and budgetary limitations, EGLE is not planning to

expand routine VOC or carbonyl sampling in 2022. EGLE has conducted some targeted short-term sampling events in areas of concern for VOC compounds and this is expected to continue as the needs are identified.

4. Regarding the suggestion to include non-EGLE air monitoring projects in the Network Review; EGLE is required to describe how the network meets the USEPA's monitoring regulations. Monitoring that is conducted by industrial sources, universities, community groups, and other organizations are not part of our EGLE's regulatory network. For more information, see 40 CFR Part 58.10 at 40 CFR § 58.10 - Annual monitoring network plan and periodic network assessment. | CFR | US Law | LII / Legal Information Institute (cornell.edu), which shows there is no requirement to create and post this additional information in the Network Review.

5. Regarding the suggestion to conduct additional SO_2 monitoring in Port Huron; this site currently has the highest annual average for the state. EGLE believes the Port Huron site on Dove Road is representative of the community. EGLE will evaluate the results of the Michigan Ontario Ozone Source Experiment (MOOSE) study and consider if additional monitoring is needed in the future.

6. Regarding the suggestion to re-evaluate the ozone network after the MOOSE study is concluded; this is a recommendation that EGLE will implement. The results of this study will be evaluated when considering future changes to the network for ozone and other pollutants.

7. Regarding the suggestion for enhanced data interpretation and data utilization for future network reviews; this suggestion is something EGLE will consider for future documents as staffing resources allow.

8. Regarding the suggestion to include discussions of climate change and preparedness; EGLE recently created an office within the Department to address climate change. The Air Monitoring Unit, AQD, conducts extensive meteorological measurements which are available for air quality modelers and other policy experts to use in making their assessments. Policy decisions on climate change are beyond the scope of the AMU.

9. Regarding data and resource sharing; EGLE is open to continuing collaborative relationships with researchers, organizations, and other community groups. With the recent purchase of some non-regulatory low-cost sensors, these tools will be available for community scale projects. Collaborative projects are outside of the regulatory framework and therefore are not detailed in the Annual Network Review.

10. Regarding the Livonia Near-roadway monitor; this site is not on the current GIS map because it is still being established and is not in place or collecting data at this time. EGLE anticipates that site being operational in late 2021.

Thank you for your comments and feedback. If you have further questions or concerns, please contact me at 313-720-1542; GhumanN@Michigan.gov; or EGLE AQD, 3058 West Grand Boulevard, Suite 2-300, Detroit, Michigan 48202.

Sincerely,

Navnit K.Ghuman

Navnit K. Ghuman
Environmental Quality Analyst
Air Quality Analyst
EGLE AQD

cc: Ms. Susan Kilmer, EGLE