

Michigan's 2011 Ambient Air Monitoring Network Review

June 25, 2010

Michigan Dept. of Natural Resources and
Environment
Air Quality Division



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TABLE OF CONTENTS

	<u>Page</u>
Background	1
Federal Changes	1
Recommendations from the Regional 5-year Network Assessment	2
Recommendations for Michigan’s Air Monitoring Network in 2011	3
Network Review Goals	3
Public Comment Process	4
Ambient Air Monitoring Network Requirements	5
Other Monitoring Network Requirements	7
PM _{2.5} Monitoring Network Changes	8
Network Review Requirements	8
Quality Assurance	9
Monitor Deployment by Location	9
Lead Monitoring Network	12
Source-oriented Monitoring Network Design	13
Non-source-oriented Monitoring Network Design	14
Lead Quality Assurance	18
Plans for 2011 Lead Monitoring Network	18
NCore Monitoring Network	19
Network Design	19
Michigan NCore Sites	20
NCore Quality Assurance	20
Plans for 2011 NCore Monitoring Network	20
Ozone Monitoring Network	24
Impact of the Proposed Changes to the Ozone Monitoring Requirements	31
Impact of the Regional 5-year Network Review on Michigan’s Ozone Monitoring Network	32
Ozone Season & Modeling	33
Ozone Quality Assurance	33
Plans for the 2011 Ozone Monitoring Network	34
PM _{2.5} FRM Monitoring Network	35
Impact of the Regional 5-year Network Review on Michigan’s PM _{2.5} Monitoring Network	39
PM _{2.5} Designations	42
Conversion of PM _{2.5} Grant Dollars	43
PM _{2.5} Quality Assurance	43
Plans for the 2011 PM _{2.5} FRM Monitoring Network	44
Continuous PM _{2.5} Monitoring Network	46
Filter Dynamic Measurement System (FDMS) Inlets	46
PM _{2.5} TEOM Quality Assurance	49
Plans for the 2011 PM _{2.5} TEOM Network	50
Speciated PM _{2.5} Monitoring Network	51
Chemical Composition of PM _{2.5} and Lab Costs	52
Continuous Speciation Measurements	52
Speciation Quality Assurance	54
Plans for the 2011 PM _{2.5} Speciation Monitoring Network	55

TABLE OF CONTENTS, CONT'D.

	<u>Page</u>
PM ₁₀ Monitoring Network	56
History of PM ₁₀ Co-located and Continuous PM ₁₀ Measurements	62
PM ₁₀ Quality Assurance	62
Plans for the 2011 PM ₁₀ Monitoring Network	62
Carbon Monoxide (CO) Monitoring Network	64
Trace CO Quality Assurance	64
Plans for the 2011 CO Monitoring Network	64
Nitrogen Dioxide (NO ₂) and NO _y Monitoring Network	67
NO ₂ and NO _y Quality Assurance	78
Plans for the 2011 NO ₂ and NO _y Monitoring Network	78
Sulfur Dioxide (SO ₂) Monitoring Network	81
SO ₂ Quality Assurance	84
Plans for the 2011 SO ₂ Monitoring Network	84
Trace Metal Monitoring Network	87
Trace Metal Quality Assurance	92
Plans for the 2011 Trace Metal Monitoring Network	92
Volatile Organic Compound (VOC) Monitoring Network	93
VOC Quality Assurance	93
Plans for the 2011 VOC Monitoring Network	93
Carbonyl Monitoring Network	96
Carbonyl Quality Assurance	96
Plans for the 2011 Carbonyl Monitoring Network	97
Polynuclear Aromatic Hydrocarbon (PAH) Monitoring Network	100
PAH Quality Assurance	100
Plans for the 2011 PAH Monitoring Network	100
Meteorological Measurements	102
Meteorological Equipment Quality Assurance	102
Plans for the 2011 Meteorological Monitoring Network	102
Adequacy of Michigan's Monitoring Sites	104
Appendix A: Acronyms and Their Definitions	105
Appendix B: Summary of Comments Received and Replies	107
Appendix C: Written Comments Received	109

List of Tables

1	Composition of Core-based Statistical Areas in Michigan	6
2	Composition of Micropolitan Areas in Michigan	7
3	Monitor Distribution Throughout the 2009 Network in Michigan	11
4	Michigan Lead Point Sources Emitting More Than 0.5 t/yr of Lead	13
5	Updated List of Lead Areas Sources in Michigan That Could Trigger a Monitoring Requirement	14
6	Michigan's 2009 Lead Monitoring Network	16
7	Proposed Lead Monitoring Network	16
8	Measurements Collected at the Grand Rapids – Monroe St. (260810020) NCore Site ..	21
9	Measurements Collected at the Allen Park (261630001) NCore Site	22

TABLE OF CONTENTS, CONT'D.

Page

List of Tables, Continued

10	NCore Network in Michigan	23
11	SLAMS Minimum Ozone Monitoring Requirements	24
12	Application of the Minimum Ozone Requirements in the October 17, 2006 Final Revision to the Monitoring Regulation to Michigan's Ozone Network	25
13	Michigan's Ozone Monitoring Network in 2009 and 2010	29
14	PM _{2.5} Minimum Monitoring Requirements	35
15	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
16	PM _{2.5} FRM Network in Michigan in 2009 and 2010	41
17	Michigan's Continuous PM _{2.5} Monitoring Network in 2009 and 2010	48
18	Michigan's PM _{2.5} Speciation Network in 2009 and 2010	53
19	PM ₁₀ Minimum Monitoring Requirements (Number of Stations per MSA)	56
20	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	58
21	Michigan's 2009 PM ₁₀ Monitoring Network	59
22	2010 PM ₁₀ Monitoring Network in Michigan	60
23	Michigan's CO Monitoring Network in 2009 and 2010	65
24	NO ₂ Network Design	68
25	Michigan's 2009 NO ₂ and NO _y Monitoring Network	79
26	2010 NO ₂ and NO _y Monitoring Network in Michigan	79
27	First Tier SO ₂ Monitoring Requirements in the Proposed NAAQS	81
28	Population Weighted Emission Index Based Monitoring Requirements in the Final SO ₂ NAAQS	82
29	Population Weighted Emissions Index Totals for CBSAs in Michigan	82
30	Michigan's SO ₂ Monitoring Network in 2009 and 2010	85
31	Michigan's 2009 Trace Metal Monitoring Network	89
32	2010 Trace Metal Monitoring Network in Michigan	90
33	Michigan's VOC Monitoring Network in 2009 and 2010	94
34	Michigan's Carbonyl Monitoring Network in 2009 and 2010	98
35	PAH Network in Michigan in 2009 and 2010	101
36	Meteorological Measurements in Michigan	103

TABLE OF CONTENTS, CONT'D.

Page

List of Figures

1	MSAs in Michigan's Lower Peninsula.....	5
2	Comparison of Michigan's 2009 Lead Monitoring Network with the Source and Non-source-oriented Network	17
3	Michigan's 2010 NCore Monitoring Network	23
4	Comparison of 4 th Highest 8-Hour Ozone Values Averaged Over Three Years 2005-2007, 2006-2008, and 2007-2009.....	26
5	Ozone Design Values 2007-2009 Across Region 5	28
6	Michigan's Ozone Network in 2009 and 2010	30
7	Michigan's PM _{2.5} FRM Monitoring Network in 2009 and 2010.....	42
8	PM _{2.5} Nonattainment Areas	43
9	Michigan's 2009 and 2010 Continuous PM _{2.5} Network.....	49
10	Michigan's 2009 and 2010 PM _{2.5} Speciation Network	54
11	Comparison of Michigan's 2009 and 2010 PM ₁₀ Monitoring Network	61
12	Michigan's CO Monitoring Network in 2009 and 2010.....	66
13	Annual Average Daily Traffic Counts in the Grand Rapids-Wyoming MSA.....	69
14	Views around Segment A: 131 and Leonard Street in the Grand Rapids/ Wyoming MSA.....	70
15	Views around Segment B: 131 and Fulton Street in the Grand Rapids- Wyoming MSA.....	70
16	Views around Segment C: 131 and Burton Street in the Grand Rapids- Wyoming MSA.....	71
17	Views at 131 and 28 th Street.....	71
18	Annual Average Daily Traffic Counts in Detroit-Warren-Livonia MSA	72
19	Location of Couzens Avenue and Mound Rd Segments in the Detroit- Warren-Livonia MSA	73
20	Photos of Mound Rd Segment.....	73
21	Photos of Couzens Road Segment	74
22	Environmental Justice Areas in Michigan	76
23	Environmental Justice Areas in Southeast Michigan.....	77
24	Comparison of Michigan's 2009 and 2010 NO ₂ and NO _y Monitoring Network.....	80
25	Michigan's SO ₂ Monitoring Network in 2009 and 2010	86
26	Comparison of Michigan's 2009 and 2010 Trace Metal Monitoring Network	91
27	Michigan's 2009 and 2010 VOC Monitoring Network.....	95
28	Michigan's 2009 and 2010 Carbonyl Monitoring Network	99
29	Michigan's 2009 and 2010 PAH Monitoring Network	101

BACKGROUND:

The purpose of this document is to examine Michigan's ambient air monitoring network in operation during 2009-2010 and recommend changes based on monitor history, population distribution, and modifications to federal monitoring requirements under the Clean Air Act (CAA), 40 Code of Federal Regulations (CFR) Part 58. Recommended changes to this network will be implemented during the 2011 calendar year, contingent upon adequate levels of funding.

The draft 2010 grant guidance recommends¹ that states defer from making major changes to their sulfur dioxide (SO₂), carbon monoxide (CO), and nitrogen dioxide (NO₂) networks until the U.S. Environmental Protection Agency (EPA) can complete the National Ambient Air Quality Standard (NAAQS) reviews for these pollutants, perhaps as early as May 13, 2011. As a result of these reviews, changes to the monitoring networks may have to be implemented. Also, a comprehensive 5-year network analysis is due by July 1, 2010. The modifications suggested by the 5-year analysis are discussed in this review.

In January 2010, the Departments of Natural Resources and Environmental Quality were merged into the Department of Natural Resources and Environment (DNRE). The impact this merger will have on the ambient air monitoring network or the ability to implement any changes suggested by either the 5-year network analysis or this annual network review are unknown. The budget is another unknown factor. Therefore, all recommendations are contingent upon adequate funding and personnel.

In previous years, the network review was named for the year before any changes occurred. For example, a previous review was called the 2006 network review, was published in 2007 and described changes to the 2008 monitoring network. To be consistent with other states in the region, the DNRE is changing the naming convention and will name the review according to the year that the changes will take place. In other words, the network review that was published in 2009 described changes to the 2010 monitoring network and was titled "Michigan's 2010 Network Review." Due to the change in the naming convention, there are no 2007 or 2008 network reviews. The sequence jumps from "Michigan's 2006 Ambient Air Monitoring Review" to "Michigan's 2009 Ambient Air Monitoring Review." The 2011 Ambient Air Monitoring Review continues with this convention.

Federal Changes

There are a number of proposals at the federal level that may impact the design of Michigan's monitoring network. These proposals include changes to the NAAQS for ozone, lead, NO₂, and SO₂. In addition, the NAAQS for CO, urban visibility as well as secondary NAAQS for SO₂ and NO₂ are scheduled for review before 2012.

On March 12, 2008, the EPA changed the NAAQS for ozone, reducing the level of the standard from 0.08 ppm to 0.075 ppm. Then, on January 19, 2010, the EPA proposed a further strengthening of the level of the primary standard to somewhere between 0.060 ppm and 0.070 ppm. A secondary O₃ NAAQS was also proposed to protect vegetation. These two proposed changes also impact the design of the ambient monitoring network. Background monitors may need to be deployed in rural areas to assess the impact of ozone on sensitive vegetation, in micropolitan statistical areas with an urban cluster of 10,000 and less than 50,000 and at maximum concentration areas impacted by transport. Smaller metropolitan areas with population levels between 50,000 and 350,000, currently without ozone monitors, and no

¹ *Draft Fiscal Year 2010 National Program and Grant Guidance*, U.S. EPA Office of Air and Radiation, February 18, 2009.

historical ozone data are required to have one ozone monitor per MSA according to the January 19, 2010 proposal. These changes are to be incorporated into the network review that is due July 1, 2011 and any new sites have to be operational by January 1, 2012 or the first day of the ozone season in that area.

On November 12, 2008, the EPA modified the lead NAAQS by reducing the level of the standard from a maximum quarterly average of 1.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to 0.15 $\mu\text{g}/\text{m}^3$, as a three-month rolling average. The monitoring network design has been modified to consist of both source-oriented monitors as well as population-oriented monitors. An emissions threshold of 1.0 ton per year has been established that triggers a source-oriented monitoring requirement. These source-oriented lead monitoring sites were operational by January 1, 2010. The EPA has proposed to modify the threshold for source-oriented lead monitors, reducing it to 0.5 tpy. These new monitors are discussed in this network review and may become operational by summer 2011 if EPA promulgates the lower threshold triggering monitoring. In addition to source-oriented monitoring, there is also a population-driven requirement. The population-oriented monitoring sites are not required to be operational until January 2011, but because the population-oriented sites are already in existence, the DNRE began collection of lead at the population-oriented sites on January 1, 2010.

On February 9, 2010, the EPA changed the NO_2 NAAQS and required the deployment of a two-tiered NO_2 monitoring network consisting of near-roadway and community monitors. These NO_2 monitors have a deployment deadline of January 1, 2013.

On November 16, 2009, the EPA 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 final version of the SO_2 NAAQS was published on June 22, 2010. The network design was modified to a single tier requiring a total of five SO_2 monitors in Michigan.

The design of the ambient monitoring network may also be impacted by possible pending changes to the NAAQS, which include the secondary SO_2 and NO_2 NAAQS, the CO NAAQS and the PM NAAQS. A secondary NAAQS for NO_2 and SO_2 was proposed on February 12, 2010 and the notice of final rule making is due by October 19, 2010. The CO NAAQS is scheduled to be reviewed this year, with a proposal due by October 28, 2010 and a notice of final rulemaking due by May 13, 2011. Lastly, the particulate NAAQS is undergoing review. Modifications may include an urban visibility component. A proposed rulemaking is anticipated in January 2011, with a final rulemaking expected in October 2011. The impact of any proposed network changes will be presented in the Annual Network Review.

Recommendations from the Regional 5-year Network Assessment

Monitor and site-specific recommendations from the Regional 5-year Network Assessment include:

- Review of redundant O_3 and $\text{PM}_{2.5}$ sites that include:
 - O_3 : Oak Park (261250001) / Warren (260991003) / Detroit - E 7 Mile (261630019)
 - $\text{PM}_{2.5}$: Allen Park (261630001) / Detroit - Linwood (261630016) / Oak Park (261250001)
 - $\text{PM}_{2.5}$: Ypsilanti (261610008) / Livonia (261630025)
 - $\text{PM}_{2.5}$: Oak Park (261250001) / Livonia (261630025)
 - $\text{PM}_{2.5}$: Detroit - SWHS (261630015) / Detroit - Linwood (261630016)

Addition of O₃ precursor monitoring (i.e., continuous THC, NO_x) in Detroit.
Addition of NO_x/NO_y at Holland (260050003) PAMS Type 3 Site.
Review of the cluster of PM_{2.5} sites in western MI and determine whether any shutdowns are appropriate.
Consider removing Luna Pier (261150005) or Toledo PM_{2.5} speciation measurements.

Recommendations for Michigan's Air Monitoring Network in 2011

The following changes will be made to Michigan's ambient air monitoring network, contingent upon adequate funding. If funding cuts occur, additional changes to the network may have to be implemented.

- The sampling frequency of the PM_{2.5} speciation monitor at the Grand Rapids- Monroe St (260810020) NCore station will be increased from once every six days to once every three days beginning January 1, 2011, meeting NCore requirements.
- The sampling frequency of the daily PM_{2.5} site at Detroit – FIA/Lafayette (261630039) site will be reduced from daily to once every three days when the special inter-comparison study with the MetOne BAM is completed:
- The PM_{2.5} TEOM at Tecumseh (260910007) will be moved to Detroit – Newberry School (261630038) on January 1, 2011.
- The DNRE will add NO₂ measurements at the Lansing (260650012) site mid-year (July 1, 2010) and will continue to operate this monitor in 2011.
- The DNRE will add NO₂ measurements at the Houghton Lake (261130001) site mid-year (July 1, 2010) and will continue to operate this monitor in 2011.
- The DNRE will continue to collect ozone measurements throughout the year at the Lansing (260650012) site to support PSD modeling
- The DNRE will continue to collect ozone measurements throughout the year at the Houghton Lake (261130001) site to support PSD modeling
- If EPA promulgates ozone monitoring in micropolitan areas, and DNRE can obtain access to a suitable monitoring location, ozone measurements will be added to the Traverse City area before April 1, 2011.
- The DNRE received comments requesting the addition of a fine particulate monitor to the Traverse City area. Contingent upon establishing an ozone site in the Traverse City area, MDNRE will investigate options for deploying a fine particulate monitor to the area. Regardless, MDNRE will meet with local stakeholders on this issue.
- If EPA promulgates a lower emissions threshold triggering additional source oriented lead monitoring, DNRE will deploy any required lead monitors by one year after the rule becomes final, possibly by summer 2011. These new sites, if required, will be documented and discussed in the network review due July 1, 2011.

Network Review Goals

The Michigan Ambient Air Monitoring Network Review will describe the ambient air monitoring network, show how the network meets the EPA'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 EPA requires that the DNRE document the process for obtaining public comments and include any comments received through the public notification process. As such, this network review document was placed on the Air Quality Division (AQD) section of the DNRE Internet homepage to solicit comments from the general public and stakeholders. Reviewers were given 30 calendar days from the date that the draft network review report was posted to provide written comments. Written comments were accepted either by e-mail or by parcel post (verbal comments were not accepted) and were sent to:

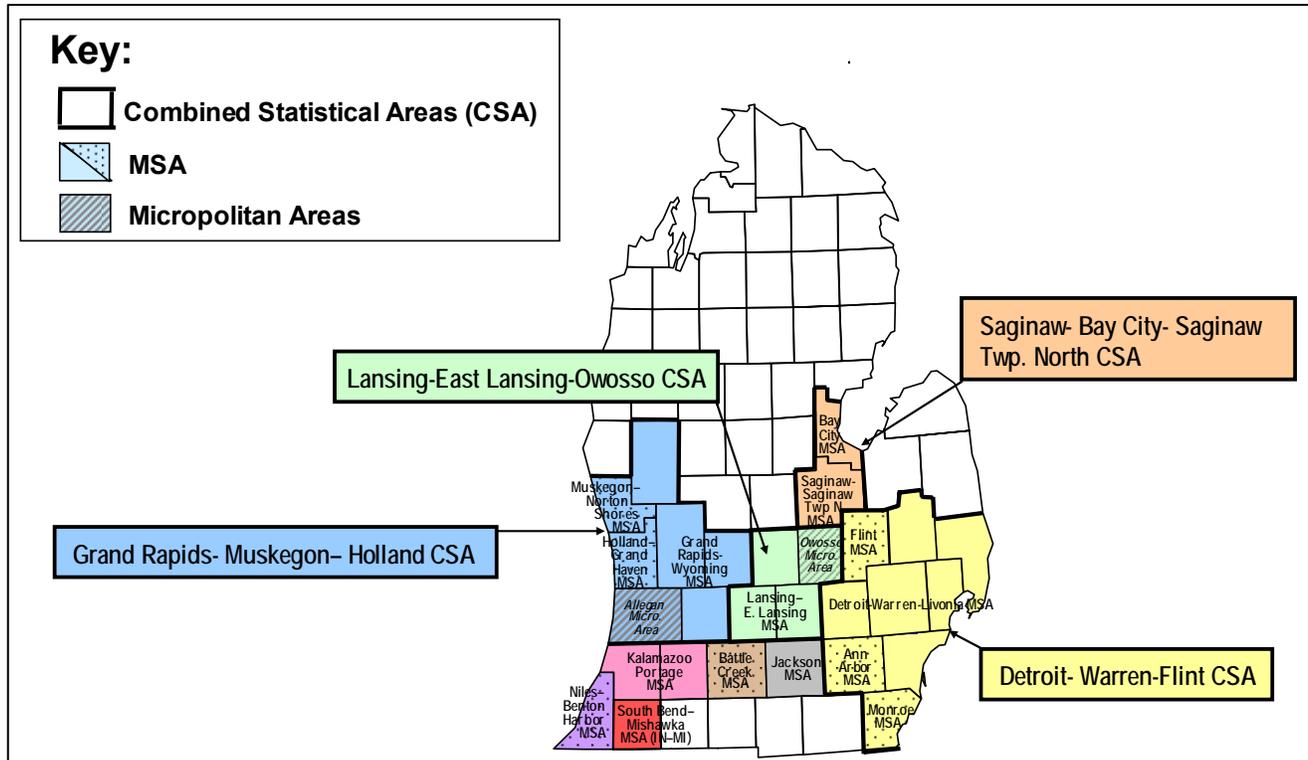
Dr. Mary Ann Heindorf
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All written comments that were received were organized by topic, summarized, and addressed in the final version of the Michigan Ambient Air Monitoring Network Review. The final document will be placed on the AQD section of the DNRE Internet homepage and sent to EPA Region 5 for approval. Hardcopies of the final version are available for inspection free of charge at the DNRE 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 were directed to Mr. Craig Fitzner, AQD, 517-373-7044, Fitzner@Michigan.gov.

AMBIENT AIR MONITORING NETWORK REQUIREMENTS:

On October 17, 2006, the ambient monitoring requirements were changed under the CAA, 40 CFR Part 58. The minimum network design criteria for ozone, PM_{2.5} (PM with an aerodynamic diameter less than or equal to [≤] 2.5 micrometers) and PM₁₀ (≤10 micrometers) are now based on the 2000 Metropolitan Statistical Area (MSA) geographical borders, population totals, and historical concentrations. Minimum network requirements no longer exist for SO₂, NO₂, and CO. Based on the 2000 census, the new MSA outlines for Michigan's Lower Peninsula are shown in **Figure 1**.

FIGURE 1: MSAs IN MICHIGAN'S LOWER PENINSULA



MSAs must have an urban core population totaling at least 50,000 people in the most recent decennial census. The MSAs as so defined are shown in **Figure 1**. MSAs are one or more counties that have a sizeable urban cluster or have a high level of commuting to or from an urban cluster. MSAs and/or micropolitan areas are grouped to form CSAs, also shown in **Figure 1**. Note: Only those micropolitan areas that are part of larger CSA are shown in **Figure 1**. The CSA is defined as a geographical area consisting of two or more adjacent Core-Based Statistical Areas (CBSA) with employment interchange of at least 15%. 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.

The specific counties that make up each MSA or micropolitan area in Michigan are listed in **Table 1**.² These geographical areas, coupled with their population totals and historical ambient monitoring data, were used to develop the minimum monitoring network design for ozone,

² Metropolitan and Micropolitan Statistical Areas: April 1, 2000 to July 1, 2009 (CBSA-EST2009-1) Source U. S. Census Bureau, Population Release Date March 2010.

PM_{2.5}, and PM₁₀. **Table 1** shows the 2009 estimated population totals. These totals were used as the basis of the network design because they are likely to be closer to the totals from the 2010 decennial census.

TABLE 1: COMPOSITION OF CORE-BASED STATISTICAL AREAS IN MICHIGAN

CORE BASED STATISTICAL AREA	2009 EST. POPULATION	URBAN CORE	CENTRAL METROPOLITAN COUNTIES	OUTLYING METROPOLITAN COUNTIES
Ann Arbor	347,563	Ann Arbor Urbanized Area	Washtenaw	
Battle Creek	135,616	Battle Creek Urban Area	Calhoun	
Bay City	107,434	Bay City Urbanized Area	Bay	
Detroit-Warren-Livonia*	4,403,437	Detroit Urbanized Area	Macomb, Oakland, Wayne	
		Port Huron Urbanized Area	St. Clair	
		Lapeer Urban Cluster		Lapeer
		South Lyon- Howell- Brighton Urbanized Area	Livingston	
Flint	424,043	Flint Urbanized Area	Genesee	
Grand Rapids-Wyoming	778,009	Grand Rapids Urbanized Area	Kent	Barry, Newaygo
		Ionia Urban Cluster		Ionia
Holland-Grand Haven	261,957	Holland Urbanized Area	Ottawa	
Jackson	159,828	Jackson Urbanized Area	Jackson	
Kalamazoo-Portage	326,634	Kalamazoo Urbanized Area	Kalamazoo	
		Paw Paw Urban Cluster		Van Buren
Lansing-East Lansing	453,603	Lansing Urbanized Area	Clinton, Eaton, Ingham	
Monroe	152,721	Monroe Urbanized Area	Monroe	
Muskegon-Norton Shores	173,951	Muskegon Urbanized Area	Muskegon	
Niles-Benton Harbor	160,472	Benton Harbor – St Joseph Urbanized Area	Berrien	
Saginaw-Saginaw Twp. North	200,050	Saginaw Urbanized Area	Saginaw	
South Bend-Mishawaka Indiana-Michigan (IN-MI)	317,538	South Bend, IN-MI Urbanized Area (part)	Cass	

* The Detroit-Warren-Livonia MSA is subdivided into the Detroit-Livonia-Dearborn Metropolitan Division (Wayne Co.) and the Warren-Farmington Hills-Troy Metropolitan Division (Lapeer, Livingston, Macomb, Oakland and St. Clair Counties).

The proposed changes to the ozone network require that each state operate three rural ozone sites, one of which must be located in a micropolitan area with an *urban cluster* of at least 10,000 and less than 50,000 people. The total population in micropolitan areas in Michigan is shown in **Table 2**.

TABLE 2: COMPOSITION OF MICROPOLITAN AREAS IN MICHIGAN

MICROPOLITAN AREA	URBAN CORE	MICROPOLITAN AREA POP ³	COUNTIES
Traverse City	Traverse City Urban Cluster	142,350	Grand Traverse, Benzie ⁴ , Kalkaska ⁴ , Leelanau ⁴
Allegan	Plainwell-Otsego Urban Cluster	113,449	Allegan
Adrian	Adrian Urban Cluster	99,837	Lenawee
Midland	Midland Urban Cluster	82,548	Midland
Marquette	Marquette Urban Cluster	65,703	Marquette
Mount Pleasant	Mount Pleasant Urban Cluster	67,176	Isabella
Sturgis	Sturgis Urban Cluster	61,723	St. Joseph
Coldwater	Coldwater Urban Cluster	44,737	Branch
Cadillac	Cadillac Urban Cluster	46,391	Wexford, Missaukee ⁴
Alma	Alma Urban Cluster	41,948	Gratiot
Big Rapids	Big rapids Urban Cluster	41,775	Mecosta
Sault Ste. Marie	Sault Ste. Marie Urban Cluster	38,731	Chippewa
Escanaba	Escanaba Urban Cluster	36,918	Delta
Houghton	Houghton Urban Cluster	37,638	Houghton, Keweenaw ⁴
Alpena	Alpena Urban Cluster	29,289	Alpena
Iron Mountain	Iron Mt-Kingsford WI U. Cluster	31,245	Dickinson
Marinette	Marinette WI Menominee	68,796	Menominee

Other Monitoring Network Requirements

The October 17, 2006 changes to the ambient monitoring regulations eliminated the National Air Monitoring Stations (NAMS) category of monitors that were primarily used for trend purposes. NCore network sites replace the NAMS sites providing a full suite of measurements at one location. The NCore network, when complete, will consist of about 75 sites nationwide, two of which are in Michigan. The NCore stations collect the following measurements: ozone, SO₂ (trace), CO (trace), NO_y, continuous PM_{2.5}, wind speed, wind direction, relative humidity, and ambient temperature. In addition, filter-based measurements are required for PM coarse (PM_{10-2.5}) on a once every three day sampling frequency and PM_{2.5}. Speciated PM coarse will be added at a later date when suitable technology becomes available. A minimum of ten NCore sites nationwide measure lead, but the EPA has proposed that NCore stations house the non-source-oriented lead monitors. The NCore stations in Michigan became operational January 1, 2010, one full year ahead of schedule.

Although the NAMS monitors were replaced with the NCore sites, the State and Local Air Monitoring Stations (SLAMS) monitors will remain to 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.

³ Estimated 2009 census data

⁴ Outlying Micropolitan County

PM_{2.5} Monitoring Network Changes

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. Thus, the loss of the subject site will affect the spatial coverage of the data set, but will have no impact on attainment status.

If access to a design value site is lost, the DNRE will attempt to locate a new site as physically close to the design value site as possible. The new monitor will have the same scale of representativeness and monitoring objectives as the closed site. If subsequent data indicate that the new site is not the design value site, one of the pre-existing sites will become the design value site and the new site will be shut down.

Network Review Requirements

According to 40 CFR, 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."⁵
- 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 identified previously.
- Be used as a starting point for the first five-year assessment due July 1, 2010.

Elements that must be included in the network review are:

- the EPA's Air Quality System (AQS) site identification number,
- site locations including coordinates and street address,
- sampling and analysis methods,
- 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,
- 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.

⁵ "Environmental Protection Agency Ambient Air Quality Surveillance Regulations." 40 CFR Part 58 Appendix D, October 17, 2006.

- changes in air quality levels.
- changes in emission patterns.

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 whenever possible.

Prior to 2007, the particulate network was reviewed in a separate review that was submitted to the EPA each July. Recent changes to the monitoring regulations have incorporated the particulate review into the overall monitoring network review.

Quality Assurance

The DNRE has an approved Quality Management Plan (QMP). In turn, the Air Monitoring Unit (AMU) has a Quality Assurance Project Plan (QAPP), which covers the operation of the ambient air monitoring network. The AMU also has QAPPs for the PM_{2.5} monitoring program, the NATTS, and has adopted the EPA's PM_{2.5} Speciation Trends Network (STN) QAPP. Lastly, 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 of each monitor, 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.

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} TEOM, PM_{2.5} Speciation, High Volume TSP [total suspended particulate], and PM₁₀) and the gaseous monitors (CO, SO₂, ozone, and NO₂) at least once a year. The toxics monitors (volatile organic compounds [VOCs] and carbonyl compounds) are also audited once a year 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 EPA. The EPA conducts Performance Evaluation Program (PEP) audits for PM_{2.5} samplers (eight sites a year) and National Performance Audit Program (NPAP) for the gaseous monitors (20% of the sites per year) using a Thru-the-Probe audit system. The EPA also conducts program-wide Technical Systems Audits every three to five 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 the audit samples are unknown to both the AQD staff and the DNRE Environmental Laboratory staff.

Monitor Deployment By Location

Table 3 summarizes the distribution of ambient air monitors by pollutant in operation in Michigan during 2009. The purpose of including information about the shelter type (building or trailer) is to show the possible availability of space for monitors that require a temperature controlled environment. Although most monitors are located at a building, access to the interior for more monitor deployment may not be possible. In these instances where access is not guaranteed, no shelter is shown. 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. In addition to the parameters mentioned in the table, low volume PM₁₀ was added to both Grand Rapids- Monroe St. (260810020) and Allen Park (261630001) as part of the NCore monitoring requirements. PM_{10-2.5} can be determined by difference. The two NCore sites also began monitoring for ozone for the entire year. In addition, the co-located PM_{2.5} sampler at Allen Park (2671630001) was moved to Dearborn (261630033) to clear space on the deck at Allen Park. Finally, a relative humidity sensor was deployed to Grand Rapids – Monroe St. (260810020). This review summarizes the purpose behind the continued operation of each monitor, by pollutant and discusses plans for network operations.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 3: MONITOR DISTRIBUTION THROUGHOUT THE 2009 NETWORK IN MICHIGAN

Site Name- a box indicates site closure	AQS ID	O ₃	PM _{2.5}	PM _{2.5} TEOM	Speciation	PM ₁₀	CO	trace CO	NO ₂	trace NOy	SO ₂	trace SO ₂	Metals (TSP), Inc. Lead	VOCs	Carbonyls	PAHs	Meteorological parameters	Building or Trailer
Holland	260050003	x	x														x	T
Bay City	260170014		x	x													x	T
Benzonia	260190003	x																T
Coloma	260210014	x	x														x	T
Cassopolis	260270003	x															x	B
Rose Lake	260370001	x																B
Flint	260490021	x	x	x									Mn Only				x	T
Otisville	260492001	x															x	T
Harbor Beach	260630007	x															x	T
Belding - Reed St	260670002																x	B
Belding - Merrick St	260670021												Pb + 4					
Lansing	260650012	x	x	x													x	T
Kalamazoo	260770008	x	x	x													x	T
Grand Rapids - Wealthy St	260810007		x			x												
Grand Rapids - Monroe St	260810020	x	x	x	x	x		x		x		x	Pb + 4				x	T
Evans	260810022	x															x	T
Peshawbestown +	260890001	ozone discontinued															x	B
Tecumseh	260910007	x	x		x												x	T
New Haven	260990009	x	x														x	T
Sterling Hts/Freedom Hill	260990021																x	
Warren	260991003	x																T
Manistee +	261010922	x	x														x	B
Scottville	261050007	x															x	T
Houghton Lake	261130001	x	x	x	x												x	T
Luna Pier	261150005		x		x													
Muskegon - Green Creek Rd	261210039	x															x	T
Muskegon - Apple St	261210040		x															
Oak Park	261250001	x	x														x	T
Pontiac	261250011																x	
Rochester	261250012																x	
Jenison	261390005	x	x														x	T
Port Huron	261470005	x	x	x	x												x	T
Seney	261530001	x		x													x	T
Ypsilanti	261610008	x	x	x													x	T
Allen Park	261630001	x	x	x	x	x		x		x		x	Pb + 4				x	T
River Rouge	261630005												4		x		x	T
Detroit - SW HS	261630015		x		x	x					x		4	x	x		x	B
Detroit - Linwood	261630016		x															B
Detroit - E. 7 Mile	261630019	x	x						x								x	B
Livonia	261630025		x														x	T
Joy Rd	261630026																x	
S Delray/ Jefferson	261630027												4					T
Dearborn	261630033		x	x	x	x							Pb + 11	x	x	x	x	B
Wyandotte	261630036		x															
Detroit -Newberry School	261630038		x	x													x	B
Detroit - FIA/Lafayette	261630039		x	x													x	T
Total		27	27	13	8	5	0	2	1	2	1	2	8	2	3		36	

+ = tribal
 retained, but operating in reduced capacity
'4 = Suite reduced to Mn, As, Cd, Ni

LEAD MONITORING NETWORK:

To address new evidence that exposure to low levels of lead early in life can cause deleterious effects such as IQ and memory loss, the EPA modified the lead NAAQS on November 12, 2008⁶. The level of the primary (health-based) standard was reduced from a maximum quarterly average of 1.5 µg/m³ to 0.15 µg/m³ 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/m³. The secondary standard, which addresses welfare impacts from lead, is identical to the new primary standard. The once every six day sampling frequency has been retained.

Since the CAA was passed, lead levels have dropped dramatically, primarily due to the phase-out of leaded gasoline used to prevent engine knocking. Currently some point sources such as smelters, foundries, boilers, waste incinerators, glass manufacturers and cement producers emit lead, as do piston driven aircraft engines still using leaded fuel. Therefore, the EPA has implemented a source-oriented network design that requires monitoring agencies to conduct ambient air monitoring near facilities emitting more than 1 ton of lead per year. These "first round" sites had to be operational by January 1, 2010. More recently, the EPA proposed to modify the threshold to 0.5 tons of lead emitted per year. The EPA also proposed that non-source-oriented monitoring be conducted at NCore sites instead of at CBSAs with more than 500,000 people. The "second round" of monitoring sites have to be operational one year after the rule is effective, projected by the EPA to be approximately summer 2011⁷. Additional monitoring sites can be required by the Regional Administrator.

It is possible to apply for a waiver from the source-oriented monitoring requirements if a monitoring agency can demonstrate that there is little likelihood of violating the NAAQS. The source-oriented monitoring sites should be sited to measure lead on a microscale to middle scale that corresponds to a range from several meters up to 4.0 kilometers.

At this time, it is not possible to obtain a waiver from the non-source oriented monitoring. Although the non source-oriented monitoring sites are not required to be operational until sometime in 2011, both of the NCore sites in Michigan are located in CBSAs with more than 500,000 people. The DNRE is already conducting lead monitoring at Grand Rapids – Monroe St. (260810020) and Allen Park (261630001) as part of its air toxics program and at the NATTS site at Dearborn (261630033).

The modified NAAQS still retains the TSP size fraction of lead, but acknowledges that agencies may, under certain conditions, measure lead as PM₁₀, if low volume sampling devices are used. Currently, the DNRE is using high volume TSP samplers to measure lead levels at three monitoring stations. As recent as 2007, the DNRE determined TSP lead as part of its air toxics monitoring network at ten sites. However, in the 1990's, the DNRE operated a much more robust TSP trace metals network, reaching as many as 18 sites scattered through 11 counties in Michigan.

To meet the monitoring requirements of the NAAQS, maintain comparability with historical data and make judicious use of existing instrumentation, the DNRE deployed high volume TSP samplers at source-oriented and population-oriented monitoring sites in the lead network. The DNRE has opted to use high volume TSP samplers to collect the lead samples at NCore sites to maintain comparability across the network. The DNRE has also opted to analyze the

⁶ "EPA NAAQS for Lead; Final Rule." 40 CFR Parts 50, 51, 53 and 58, November 12, 2008.

⁷ "Fiscal Year 2011 Draft National Program & Grant Guidance. Appendix C: Ambient Air Monitoring," U.S. EPA Office of Air and Radiation, March 1, 2010

particulate material for Mn, As, Cd and Ni in addition to lead at Belding (260670021) and Grand Rapids-Monroe St. (260810020). The DNRE will continue to analyze high volume TSP filters from Allen Park (261630001) for Pb, Mn, As, Cd and Ni.

Source-oriented Monitoring Network Design

Beginning shortly after the promulgation of the final lead NAAQS on October 15, 2008, the EPA and DNRE began to define and clarify the extent of the ambient monitoring network for lead. Lists of point and area sources were provided by Regional EPA staff. State emission inventory staff reviewed inventory data and provided updated estimates. In this iterative process, the list of point sources in Michigan was consolidated and is shown in **Table 4**.

The DNRE deployed two stations to Belding and both were operational before January 1, 2010. The station at 545 Reed St (260670002) is located at a pump house owned by the Department of Public Works (DPW). This site was used as an air monitoring station in the 1980s and now contains meteorological equipment. The lead monitor is located at 509 Merrick St (260670003) in the right-of-way of the road.

Reducing the threshold to 0.5 tons per year makes the sources shown in **Table 4** candidates for air monitoring. They include: Consumers Energy Karn/Weadock in Bay County, Grede Foundries in Tuscola County, Federal Mogul - St. Johns in Clinton County and Kurdziel Iron of Rothbury in Oceana County.

TABLE 4: MICHIGAN LEAD POINT SOURCES EMITTING MORE THAN 0.5 T/YR OF LEAD

Company	Comments	County	Lead Emissions (tons/yr) 2005	Lead Emissions (tons/yr) 2006	Lead Emissions (tons/yr) 2007	Average 2005 - 2007	Monitoring?
Extruded Metals (Mueller Industries)	modeled conc = 3.2 ug/m3 must monitor	Ionia	0.9	1.0	0.9	0.9	monitor req'd
St. Mary's Cement	Waiver granted	Charlevoix	0.9	1.0	1.0	0.9	
Consumers Energy JH Campbell Generating	Waiver granted	Ottawa	1.0	0.8	0.9	0.9	
Consumers Energy Karn/Weadock		Bay	0.6	0.6	0.6	0.6	
East Jordan Iron Works	Waiver granted	Charlevoix	0.7	0.6	0.5	0.6	
Grede Foundries		Tuscola	0.6	0.5	0.4	0.5	
Federal Mogul - St. Johns		Clinton	0.6	0.5	0.4	0.5	
HOLCIM (US) INC.**	** Closed in 2009.	Monroe	0.3	0.5	0.6	0.4	
Kurdziel Iron of Rothbury		Oceana	0.6	0.1	0.1	0.3	
Eagle Alloy Inc.	* Corrected after error in previous reporting.	Muskegon	0*	0*	0*		
Hayes - Albion Corp.		Calhoun	closed 2002				
Sparta Foundry		Kent	closed 2004				

The EPA also requires source monitoring near airports frequented by piston-driven planes that use leaded aviation fuel. There were no airports in Michigan that exceeded the one ton per year threshold. However, as can be seen in **Table 5**, if the threshold is reduced to 0.5 tons per year, Oakland County Airport, totaling 0.53 tpy⁸, becomes a candidate for monitoring. Detroit Metro Airport (DTW), the largest airport in Michigan, has a low percentage of piston driven aircraft so the estimated lead emissions only total 0.17 tpy.

It is anticipated that after the proposed modifications to the lead rule become final, the EPA will supply state and local agencies with a draft list of possible point sources for review. State and

⁸ Memo dated January 20, 2010 from Marion Hoyer and Meredith Pedde, OTAQ/ASD to Lead NAAQS Docket EPA-HQ-OAR-2006-0735 "Identification of Airports in the 2008 NEI that Have Lead Inventories of 0.50 tons or More."

local agencies will verify the emission estimates and model any sources that could violate the NAAQS. The DNRE will request a waiver from monitoring for any stationary sources where the maximum modeled concentration is less than 50% of the NAAQS. The DNRE will also review area source emission estimated from airports and request a waiver for any airports where a violation of the NAAQS is deemed unlikely. This process will likely occur at the end of 2010 or early in 2011, to ensure deployment the projected deadline of summer 2011.

TABLE 5: UPDATED LIST OF LEAD AREA SOURCES IN MICHIGAN THAT COULD TRIGGER A MONITORING REQUIREMENT (ACCORDING TO EPA)

AIRPORT NAME	ABBREVIATION	COUNTY	LEAD EMISSIONS TONS/YR
Oakland County Int'l	PTK	Oakland	0.53

Non-source-oriented Monitoring Network Design

An historical summary of lead monitoring in Michigan has been discussed in previous versions of the network review. Likewise, summaries of previous versions of lead monitoring requirements were also discussed. Previous versions have proposed population-oriented monitoring stations as part of the lead network. However, the version finalized on November 12, 2008 has renamed the population-oriented monitors to non-source-oriented monitors.

According to the 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. This location should be impacted by re-entrained roadway dust, hazardous waste sites, closed industrial sources that were previously sources of lead, construction and demolition sites and other sources of lead. However, on December 30, 2009⁹, the EPA proposed to replace non-source oriented monitoring with a requirement to add Pb monitoring at NCore sites. It appears that the EPA is proposing low-volume monitoring for lead at NCore sites. However, the source oriented lead network employs high volume samplers. The EPA is soliciting comments about whether all NCore sites or only those NCore sites with populations greater than 500,000 would be subject to lead monitoring. Both Grand Rapids-Wyoming and the Detroit-Warren-Livonia MSA have populations greater than 500,000 so the point is moot. The DNRE is already collecting lead at the NCore sites as is described below.

Prior to April 1, 2007, when budget cuts prompted closure, a trace metals monitor was operational at the Monroe St. site in Grand Rapids (260810020). This location is near major roadways and is in the central Grand Rapids business district. It is also an NCore site. On January 1, 2010 lead monitoring using a high volume TSP sampler was reinstated at this location meeting the proposed requirements for a non-source-oriented lead site at the Grand Rapids NCore site.

The DNRE added another high volume TSP lead site at the population-oriented NCore site at Allen Park (261630001), on January 1, 2010. Although trace metals are currently collected at Allen Park as part of Michigan's air toxics monitoring network, the suite of measurements was reduced to include only Mn, As, Cd and Ni on April 1, 2007 due to budgetary reasons. Re-establishing lead at Allen Park incurred a minimal laboratory cost, had no impact on field

⁹ FR vol 74 no 249 "Revisions to Lead Ambient Air Monitoring Requirements" proposed rule.

operations, supplemented air toxics measurements, enhanced the NCore suite of measurements at Allen Park and improved the spatial coverage of the lead network.

The NATTS at Dearborn (261630033) is located close to a plethora of industrial processes including a steel mill, a rail yard and an incinerator. The station is sited at Salina 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, the DNRE opted to collect co-located lead measurements as both TSP and PM_{10} at the Dearborn site to continue generating trend data (TSP – Pb), promote comparability with other NATTS sites in the nation (PM_{10} – Pb) 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. This location fulfills the non source-oriented monitoring requirement for the Detroit-Warren-Livonia CBSA, leverages the NATTS network PM_{10} lead measurements and supports continued comparison of the distribution of lead between three particle size fractions. As long as the total number of lead sites in Michigan is less than ten, the co-located TSP samplers at Dearborn also fulfill the 15% co-location requirement for the lead network. The sampling frequency for all of the high volume lead measurements at Dearborn is once every six days. If the DNRE encounters budgetary problems, the sampling frequency of the PM_{10} and TSP co-located samplers will be reduced from once every six days to once every 12 days as is allowed by the EPA. The DNRE opts to operate co-located samplers on a once every six day schedule to collect more complete data.

Table 6 summarizes the lead monitoring site information for sites that were in existence in 2009. **Table 7** shows the proposed new lead network broken down by source-oriented and non-source-oriented sites. **Figure 2** compares the lead network in 2010 and 2009 with the proposed design that will be implemented by January 1, 2011.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 6: MICHIGAN'S 2009 LEAD MONITORING NETWORK

Operating Schedule: 1:6
 Method: High Volume Sampler & ICAP Spectra
 Network as of December, 2009

Monitoring Sites			Part. Size	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA ¹	Est. Pop. (2009 Census)
Site Name	AQS Site ID	Address										
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.14889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.14889	1:6, co-loc	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.14889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.14889	1:6, co-loc	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437

¹ CBSA Key:
 DWL = Detroit-Warren-Livonia Core Based Statistical Area

TABLE 7: PROPOSED LEAD MONITORING NETWORK

Operating Schedule: 1:6 days
 Method: High Volume Sampler & ICAP Spectra
 Network as of April 15, 2010

Source Oriented Sites

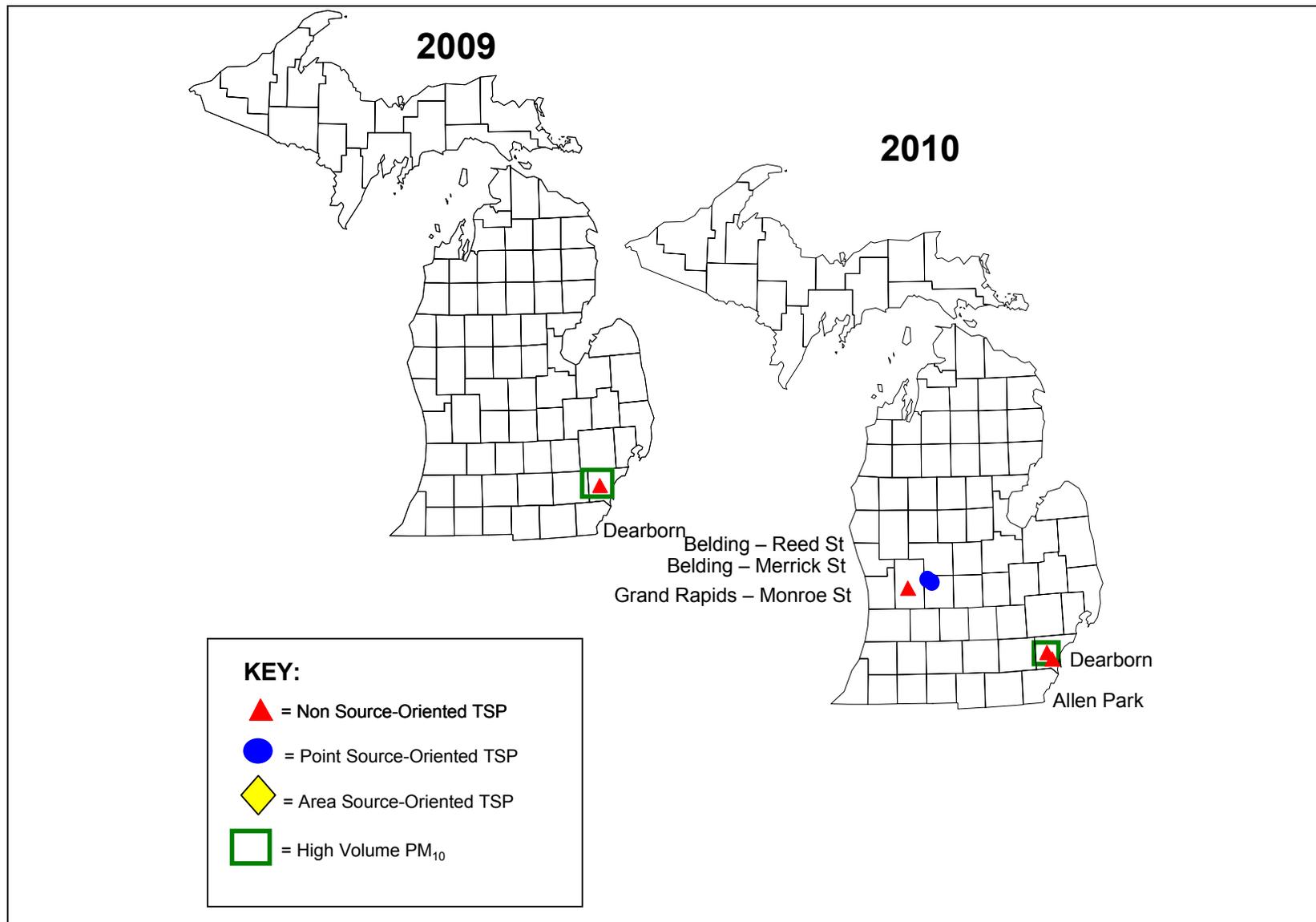
Monitoring Sites			Part. Size	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	Facility Name	Est Emissions Tons/yr
Site Name	AQS Site ID	Address										
Belding - Merrick St	260670003	509 Merrick	TSP	43.09984	-85.22163	1:6	max conc	Neighborhood	Ionia	1/1/10	Extruded Metals	0.9 - 1.0
Belding - Reed St	260670002	(DPW Pump House)	NONE MET ONLY	43.101944	-85.22	continuous	max conc	Neighborhood	Ionia	1/1/10	Extruded Metals	0.9 - 1.0

Non-Source Oriented Sites

Monitoring Sites			Part. Size	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA ¹	Est Pop. (2009 Census)
Site Name	AQS Site ID	Address										
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW.	TSP	42.984167	-85.67139	1:6	Pop. Exp.	Neighborhood	Kent	1/8/10	GW	778,009
Allen Park	261630001	14700 Goddard	TSP	42.228611	-83.20833	1:6	Pop. Exp.	Neighborhood	Wayne	1/2/10	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.14889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.14889	1:6, co-loc	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.14889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.14889	1:6, co-loc	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437

¹ CBSA Key:
 DWL = Detroit-Warren-Livonia Core Based Statistical Area
 GW = Grand Rapids-Wyoming Core Based Statistical Area

FIGURE 2: COMPARISON OF MICHIGAN'S 2009 LEAD MONITORING NETWORK WITH THE SOURCE AND NON-SOURCE-ORIENTED NETWORK



Lead Quality Assurance

The site operator conducts a precision flow check each quarter. The flow check values are sent to the senior auditor 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 EPA's AQS database each quarter.

The DNRE Laboratory participates in an external performance testing programs that is administered by the EPA. The audit program is part of the NPAP and is required by the CFR. The EPA annually sends a filter strip that is spiked with a known concentration of lead. The laboratory reports the result to the EPA and it is compared to the "true" value.

Plans for 2011 Lead Monitoring Network

In 2011, the DNRE is planning to continue to collect lead measurements using high volume TSP samplers at the NCore sites in:

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

High volume TSP lead measurements will continue to be collected at the NATTS site:

- Dearborn NATTS site (261630033)
- Co-located Dearborn NATTS (261630033)

The DNRE is also planning to continue the collection of co-located PM₁₀ lead at the Dearborn (261630033) NATTS site during 2011.

Source-oriented monitoring for lead and collection of meteorological measurements will continue in Belding at:

- Belding – Merrick St (260670003) TSP lead monitoring
- Belding – Reed St (260670002) meteorological measurements

One year after the proposed changes to the lead monitoring requirements become final, the DNRE will establish source oriented high volume TSP monitors at point sources and small airports that are not eligible for a waiver from monitoring.

NCORE MONITORING NETWORK:

Various iterations of the Monitoring Strategy¹⁰ discussed the elimination of NAMS sites and the creation of NCore sites. The purpose behind 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 can improve our understanding of how concentrations of various pollutants are inter related and can evaluate the effectiveness of control programs. Data from NCore sites will be 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, multiple air sheds with unique characteristics, so two to three NCore stations are required to adequately characterize air quality. Sampling at NCore sites should use a spatial scale of neighborhood (up to 4 km) or urban (4 km to 50 km).

Lastly, a limited number of rural NCore stations will be created. The NCore sites should be located away from the influences of major sources, be sited in areas of relatively homogeneous geography and should sample on a regional scale or larger. Regional scale corresponds to distances of tens to hundreds of kilometers. There are no rural NCore sites proposed for Michigan.

Whether urban or rural, the Federal Register¹¹ specifies the minimum parameters that each NCore site must measure:

- Continuous PM_{2.5}
- 24-hr PM_{2.5}
- Speciated PM_{2.5}
- PM_{10-2.5}
- Speciated PM_{10-2.5}
- Ozone
- SO₂
- CO
- NO/NO_y
- Wind speed
- Wind direction
- Relative humidity
- Outdoor temperature
- Lead (at 10 NCore sites nationwide)

Although a waiver from the Regional Administrator may allow the substitution of oxides of nitrogen (NO_x) monitoring for NO_y, the DNRE has already deployed NO_y monitors and is operating them. Although meteorological measurements from other near by sites may be substituted for NCore measurements, the DNRE continues to collect meteorological measurements at its NCore stations. The wind speed (WS) and wind direction (WD) are collected as vector measurements. Sigma theta

¹⁰ "Ambient Air Monitoring Strategy for State, Local, and Tribal Air Agencies," Office of Air Quality Planning and Standards, Research Triangle Park, NC, December 2008

¹¹ "Environmental Protection Agency National Ambient Air Quality Standards for Lead; Final Rule." 40 CFR Parts 50, 51, 53 and 58, November 12, 2008.

will also continue to be collected. The Federal Register also specifies that ten NCore sites nationwide will be required to collect lead at the NCore site or within the same MSA/CSA. The non-source-oriented lead sites previously described in the DNRE's network review happen to coincide with the NCore site locations.

Grant guidance states that agencies are "encouraged to migrate to low-volume PM₁₀ sampling," especially at locations that are co-located with PM_{2.5} FRMs to support measurement of PM_{10-2.5}. The fiscal year 2010 grant guidance does not specifically allocate funds for speciated PM_{10-2.5} or coarse mass measurements. Coarse is encouraged at NCore and at other key sites in 2010. Until technology develops sufficiently, continuous and speciated coarse particulate measurements, ammonia and nitric acid measurements are not required at NCore sites.

Michigan NCore Sites

The DNRE's NCore sites are located at Monroe St. site (260810020) in the Grand Rapids-Wyoming CBSA and Allen Park (261630001) in the Detroit-Warren-Livonia CBSA. Details were provided in the 2010 Network Review.

Tables 8 and 9 list the parameters measured at Monroe St. in Grand Rapids (260810020) and Allen Park (261630001), respectively. Start dates are also shown.

The speciation sampler at the Grand Rapids-Monroe Street station must sample on a once every three day sampling schedule to meet the NCore monitoring requirements. The DNRE will modify the sampling schedule from once every six day to once every three days by January 1, 2011.

Low volume PM₁₀ was added to the Grand Rapids – Monroe St. (260810020) NCore site on January 14, 2010 and was added to the Allen Park (261630001) NCore site on January 8, 2010. Lead added to both sites in January 2010. Humidity was added to the Grand Rapids – Monroe St. (260810020) NCore station on March 3, 2010.

Site specific data summarizing Michigan's NCore network is summarized in **Table 10**. A map showing the locations of NCore sites is displayed in **Figure 3**.

NCore Quality Assurance

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

Plans for 2011 NCore Monitoring Network

In 2011, the DNRE is planning to continue to collect the measurements required for the NCore program at the following sites:

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

The sampling frequency of speciated PM_{2.5} at Grand Rapids – Monroe St. (260810020) will be increased from once every six days to once every three days by January 1, 2011.

When a suitable method is developed and adequate funding is available, the DNRE will add coarse speciation measurements to both Grand Rapids – Monroe St. (260810020) and Allen Park (261630001).

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 8: 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	NEW MONITOR ANTICIPATED START UP DATE	COMMENTS
PM _{2.5} continuous	NCore/AQI	Neighborhood	Continuous	R & P TEOM 1400 a	tapered element oscillating microbalance	11/4/99	---	<i>DOES NOT meet FEM or ARM requirements</i>
PM _{2.5} FRM mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	10/23/98	---	---
PM _{2.5} Speciation	NCore	Neighborhood	1:3 days	Met One SASS + URG 3000N	manual collection, laboratory analysis*	6/1/02 at 1:6 sampling frequency	---	Change freq. to 1:3 by 1/1/2011---
Trace CO	NCore/AQI	Neighborhood	Continuous	API 300 eu/TECO 48 i	non-dispersive infra red	4/25/07	---	probe height 5 m
Trace SO ₂	NCore/AQI	Neighborhood	Continuous	API 100 as/TECO 43i	UV fluorescence	4/1/08	---	probe height 5 m
NO _y	NCore/AQI	Neighborhood	Continuous	TECO 42C	chemiluminescece	4/1/08	---	external converter to be installed at 10 m probe height 5 m
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 A	UV absorption	4/24/80	---	Year round
Lead	Non source	Neighborhood	1:6 days	General Metal Works Hi Vol filter based	manual collection, ICP/MS analysis	1/8/10	---	---
PM _{10-2.5} mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	1/14/10	---	---
PM _{10-2.5} Continuous	---	---	---	---	---	---	---	Not planned
PM _{10-2.5} Speciation	---	---	---	---	---	---	---	EPA to provide details later
WS	NCore	---	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	1/1/88	---	At 10 m
WD	NCore	---	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	1/1/88	---	At 10 m
Relative Humidity	NCore	---	Continuous	R. M. Young	resistance hygrometer	3/3/10	---	> 4 m
Outdoor Temperature	NCore	---	Continuous	R. M. Young	thermometer	7/15/93	---	> 4 m
Sigma Theta	SLAMS	---	Continuous	ESC Data Logger	calculation	1/16/01	---	optional
Barometric Pressure	SLAMS	---	Continuous	R. M. Young	aneroid barometer	7/15/93	---	optional
PM ₁₀	SLAMS	Neighborhood	1:6 days	Hi-vol	manual collection, gravimetric analysis	1/1/85	---	---

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

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 9: MEASUREMENTS COLLECTED AT THE ALLEN PARK (261630001) NCore SITE

PARAMETER	DESIGNATION	SPATIAL SCALE	SAMPLING FREQUENCY	INSTRUMENT TYPE	METHOD	EXISTING MONITOR START UP DATE	NEW MONITOR ANTICIPATED START UP DATE	COMMENTS
PM _{2.5} continuous	NCore/AQI	Neighborhood	Continuous	R & P TEOM 1400 a	tapered element oscillating microbalance	2/1/01	---	<i>DOES NOT meet FEM or ARM requirements</i>
PM _{2.5} FRM mass	NCore	Neighborhood	1:1 day	R & P Partisol plus 2025	manual collection, gravimetric analysis	5/12/99	---	---
PM _{2.5} Speciation	NCore	Neighborhood	1:3 day	Met One Super SASS + URG 3000N + IMPROVE carbon channel	manual collection, laboratory analysis*	12/1/00	---	---
Trace CO	NCore/AQI	Neighborhood	Continuous	API 300 eu/TECO 48 i	non-dispersive infra red	6/1/07	---	4 m probe ht
Trace SO ₂	NCore/AQI	Neighborhood	Continuous	API 100/TECO 43 i as	UV fluorescence	4/1/08	---	4 m probe ht
NO _y	NCore/AQI	Neighborhood	Continuous	TECO 42C	chemiluminescece	4/1/08	---	external converter to be installed at 10 m 4 m probe ht
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 A	UV absorption	1/1/80	---	Year round 4 m probe ht
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	---	---
PM _{10-2.5} mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	1/8/10	---	---
PM _{10-2.5} Continuous	---	---	---	---	---	---	---	Not planned
PM _{10-2.5} Speciation	---	---	---	---	---	---	---	EPA to provide details later
WS	NCore	---	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	10/18/81	---	At 10 m
WD	NCore	---	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	10/18/81	---	At 10 m
Relative Humidity	NCore	---	Continuous	R. M. Young	resistance hygrometer	1/1/00	---	> 4 m
Outdoor Temperature	NCore	---	Continuous	R. M. Young	thermometer	1/1/00	---	> 4 m
Sigma Theta	SLAMS	---	Continuous	ESC Data Logger	calculation	9/1/01	---	optional
Barometric Pressure	SLAMS	---	Continuous	R. M. Young	aneroid barometer	1/5/71	---	optional
Black Carbon	SLAMS	---	Continuous	Magee large spot AE2100	optical absorption	12/19/03	---	Not Req by NCore
PM ₁₀ Hi-vol	Was NAMS	Neighborhood	1:6 days	Hi-vol	manual collection, gravimetric analysis	9/12/87	---	---

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

TABLE 10: N CORE NETWORK IN MICHIGAN

Site Name	Monitoring Sites		Latitude	Longitude	Sampling			Scale	County	Date Estab.	CBSA ¹	Est Pop. (2009 Census)
	AQS Site ID	Address			Frequency	Purpose						
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.98417	-85.67139	1:6	Pop. Exp.	Neighborhood	Kent	1/1/10	GW	778,009	
Allen Park	261630001	14700 Goddard	42.22861	-83.20833	1:6	Pop. Exp.	Neighborhood	Wayne	1/1/10	DWL	4,403,437	

¹ CBSA Key:
 DWL = Detroit-Warren-Livonia Core Based Statistical Area
 GW = Grand Rapids-Wyoming Core Based Statistical Area

FIGURE 3: MICHIGAN'S 2010 N CORE MONITORING NETWORK



OZONE MONITORING NETWORK:

As a result of the October 17, 2006 monitoring regulations, the minimum number of required ozone sites in an MSA has changed. In addition, due to the 2000 census, MSA boundaries have been modified and population totals tied to measurements of ambient air quality have increased. Any monitor with a design value using the most recent three years of data that is $\geq 85\%$ of the ozone NAAQS has a higher probability of violating the standard. Therefore, the EPA requires more monitors in these MSAs. In other instances, the number of monitors may be reduced if the design value is greater than 115% of the NAAQS.¹² Note: background and transport ozone monitors are still required, but are not shown in **Table 11**.

TABLE 11: SLAMS MINIMUM OZONE MONITORING REQUIREMENTS

MSA POPULATION^{1,2}	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS $\geq 85\%$ OF ANY OZONE NAAQS³	MOST RECENT THREE-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 11** to Michigan's MSAs, population totals and the most recent three-year design values results in a minimum ozone network design summarized in **Table 12**¹³. All monitors in Michigan are with in 85% of the ozone NAAQS of 0.075 ppm. On January 19, 2010, EPA proposed to lower the level of the ozone NAAQS from 0.075 ppm to a value between 0.060 and 0.070 ppm, while retaining the same 8-hour form of the standard. No increase in the number of ozone sites will occur as a result of changing the level of the standard to between 0.060 and 0.070 ppm because none of the sites in Michigan are less than 85% of the 0.075 ppm.

Figure 4 illustrates changes in the three year averages of the fourth highest ozone values, called design values, from 2005 to 2009. When contemplating changes to the ozone network, it is important to consider changes design values in non attainment areas. Individual monitors and attainment status is discussed below.

In Southeast Michigan, New Haven (260990009) has been the design value site for many years, measuring maximum ozone concentrations downwind from Detroit. However, updated design values using 2009 data, indicate that the Detroit - E 7 Mile (261630019) site is the new design value site for the Detroit-Warren-Livonia MSA. The location of the maximum ozone concentration has moved about 19 miles closer to the urban center city area, possibly due to changes in the amount, type and location of ozone precursor emissions. Both the New Haven

¹² Table D-2 of Appendix D to Part 58.

¹³ The proposed changes to the ozone NAAQS have changed the data handling procedures. Instead of truncating any numbers to the right of the third decimal place, values are to be rounded. **Table 12** retains the truncation convention because the proposed change hasn't been finalized yet.

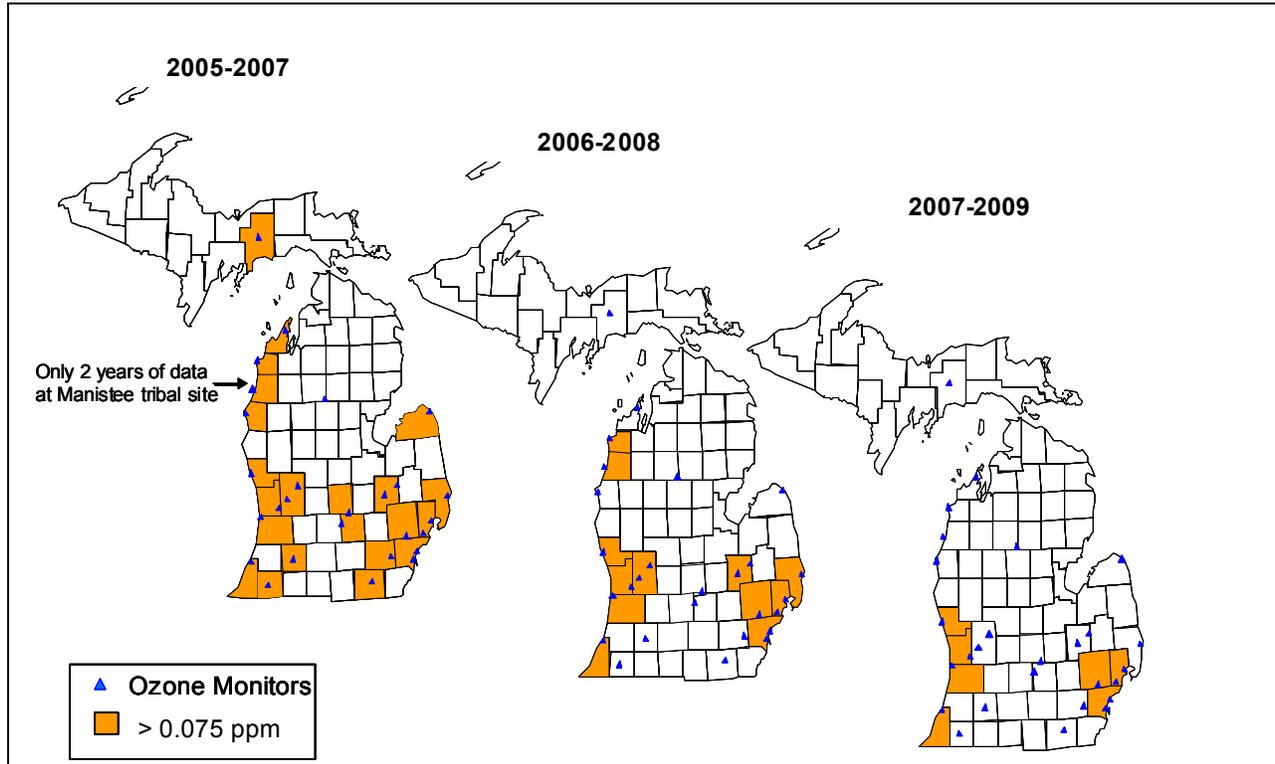
Table 12: Application of Minimum Ozone Requirements in the October 17, 2006 Final Revision to the Monitoring Regulation to Michigan's Ozone Network

NAAQS: 0.075 ppm
 > = 85% 0.063 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.

CBSA	Est. 2009 Population	Counties	Existing Monitors	2007-2009 most recent 3- year O3 design value	Min No monitors Required
Detroit-Warren-Livonia Metro Area	4,403,437	Macomb	New Haven	0.079	3
			Warren	0.078	
		Oakland	Oak Park	0.077	
			Wayne	Allen Park	
		Lapeer	Detroit - E 7 Mile	0.080	
			St Clair	Port Huron	
Livingston	---	---			
	---	---			
Flint Metro Area	424,043	Genesee	Flint	0.072	2
			Otisville	0.074	
Monroe Metro Area	152,721	Monroe	---	---	---
Ann Arbor Metro Area	347,563	Washtenaw	Ypsilanti	0.070	1
Grand Rapids-Wyoming Metro Area	778,009	Kent	Grand Rapids - Monroe St	0.072	2
			Evans	0.075	
		Barry	---	---	
			Newaygo	---	
			Ionia	---	
Holland-Grand Haven Metro Area	261,957	Ottawa	Jenison	0.075	1
Muskegon-Norton Shores Metro Area	173,951	Muskegon	Muskegon - Greek Creek Rd	0.077	1
			Lansing-East Lansing Metro Area	453,603	
Ingham	Lansing	0.073			
	Eaton	---			
Bay City Metro Area	107,434	Bay	---	---	---
Saginaw-Saginaw Twp N Metro Area	200,050	Saginaw	---	---	---
Kalamazoo-Portage Metro Area	326,634	Kalamazoo	Kalamazoo	0.074	1
		Van Buren	---		
Niles-Benton Harbor Metro Area	160,472	Berrien	Coloma	0.076	1
Jackson Metro Area	159,828	Jackson	---	---	---
Battle Creek Metro Area	135,616	Calhoun	---	---	---
South Bend Mishawaka Metro Area IN/MI	317,538	Cass	Cassopolis	0.075	1
Other areas:	<u>Comments</u>				
	<i>transport site</i>	Lenawee	Tecumseh	0.073	
		Benzie	Frankfort	0.072	
		Huron	Harbor Beach	0.072	
	<i>violating monitor</i>	Allegan	Holland	0.081	
	<i>background site</i>	Missaukee	Houghton lake	0.069	
		Mason	Scottville	0.073	
		Schoolcraft	Seney	0.070	
	<i>tribal site</i>	Manistee	Manistee	0.072	

FIGURE 4: COMPARISON OF 4TH HIGHEST 8-HOUR OZONE VALUES AVERAGED OVER THREE-YEARS 2005-2007, 2006-2008 AND 2007-2009



(260990009) and Detroit - E 7 Mile (261630019) sites need to be retained until the location of the design value site stabilizes. Allen Park (261630001) is upwind of the central business district and is a NCore site for the Detroit-Warren-Livonia MSA. As such, the DNRE is required to measure ozone over the entire year at the Allen Park (261630001) site, instead of only during the April through September ozone season in Michigan. Although three ozone sites have been identified for the Detroit-Warren-Livonia MSA, EPA Regional staff have indicated that Warren (260991003) may be becoming the new design value site for that area, so the Warren ozone monitor needs to be retained. The Oak Park (261250001) and Port Huron (261470005) monitors are the only ozone sites in Oakland and St. Clair Counties, respectively.

Two monitors are required in the Ann Arbor MSA and consist of 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. There is not sufficient space in Washtenaw County to site a downwind monitor to measure maximum ozone concentrations, so Oakland County houses the downwind site at Oak Park (261250001), although Oakland County 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 and consist of the urban center city site in Flint (260490021) and the downwind site at Otisville (260492001).

Two ozone monitors are also required in the Grand Rapids-Wyoming MSA and consist of the urban center city site in Grand Rapids on Monroe Street (260810020) and the downwind site at Evans (260810022).

Two monitors are required in the Lansing-East Lansing MSA and consist of the urban center city site in Lansing (260650012) and the downwind Rose Lake (260370001) location.

A single ozone monitor is required in the MSAs of Holland-Grand Haven, Muskegon-Norton Shores, Kalamazoo-Portage, Niles-Benton Harbor, and South Bend-Mishawaka. The Jenison (261390005), Muskegon – Green Creek Rd (261210039), Kalamazoo (260770008), Coloma (260210014) and Cassopolis (260270003) monitors fulfill these requirements, respectively.

The ozone monitor in Holland (260050003 is in Allegan County) is in violation of the 0.075 ppm 8-hour ozone NAAQS. Although Allegan County is classified as a micropolitan area and as such, is not required to have a monitor, the violation status of this monitor requires that it continue operation. This site continually measures the highest ozone values in the state and usually across the region. The Lake Michigan Air Directors Consortium (LADCO) created a map shown in **Figure 5** comparing ozone concentrations across the region. Holland no longer has the largest design value in the region, but is one of four sites with design values greater than 81 parts per billion (ppb).

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 Benzonia (260190003) are sited to measure transport of ozone along Lake Michigan and have been in operation for 8 and 14 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 Lower and Upper Peninsulas, respectively.

The tribal ozone site in Peshawbestown (260890001) in Leelanau County was shut down in 2009. The tribal ozone site in Manistee (261010922) in Manistee County continues to operate. Review of tribal monitors is outside the scope of this review, but the site in Manistee is listed for completeness, to provide a description of spatial coverage of ozone sites across the area and to identify changes to that coverage.

FIGURE 5: OZONE DESIGN VALUES 2007 – 2009 ACROSS REGION 5¹⁴

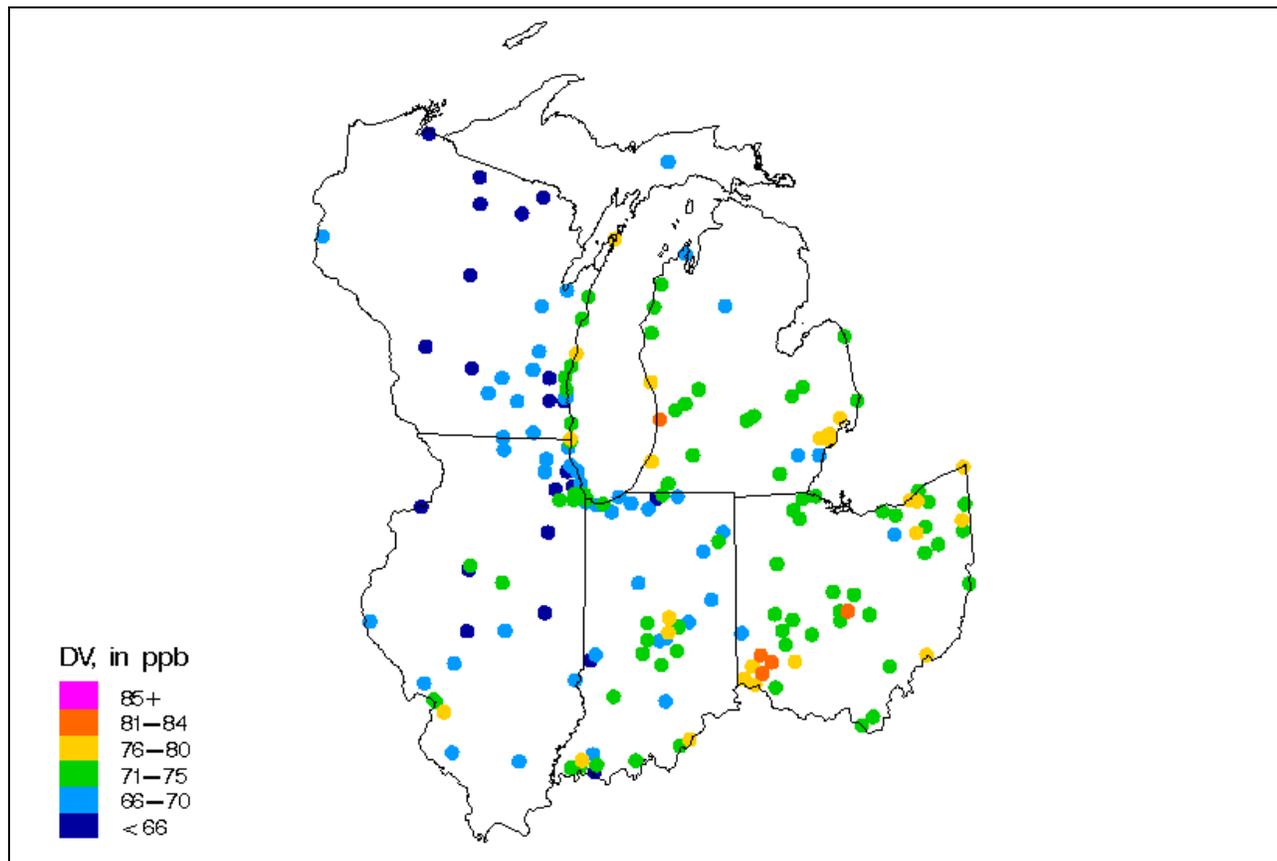


Table 13 summarizes the ozone monitoring site information for sites that were in existence in 2009 and are operational in 2010. **Figure 6** illustrates the geographical distribution of this network.

¹⁴ Map provided by D. Kenski, Lake Michigan Air Directors Consortium

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 13: MICHIGAN'S OZONE MONITORING NETWORK IN 2009 AND 2010

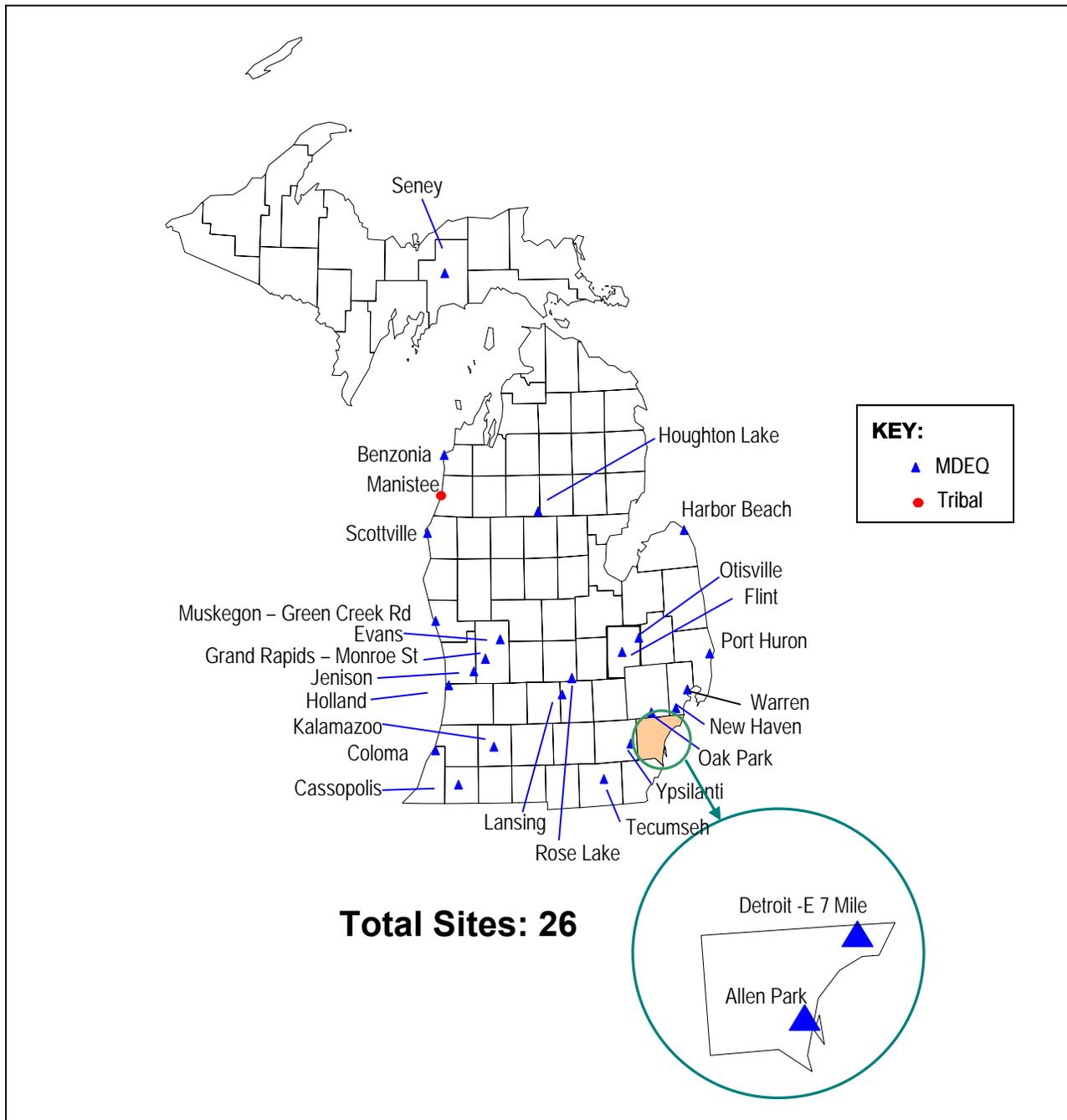
Operating Schedule: Hourly, April 1 to September 30; <i>NCore operate hourly all year</i> SLAMS Stations Network as of October, 2009											
Method: Ultra Violet Absorption Continuous Monitor Former NAMS sites are shown in bold.											
NCore sites are shown in italics											
Monitoring Sites											
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)	
Rose Lake	260370001	8562 E Stoll Rd	42.7983	-84.39389	max conc	urban	Clinton	6/7/79	LEL	453,603	
Flint	260490021	Whaley Park, 3610 Iowa	43.0472	-83.67028	pop exp	nghbrhd	Genesee	6/16/92	F	424,043	
Otisville	260492001	G11107 Washburn Rd	43.1683	-83.46167	max conc	urban	Genesee	5/13/80	F	424,043	
Lansing	260650012	220 N Pennsylvania	42.7386	-84.53472	pop exp	nghbrhd	Ingham	9/5/80	LEL	453,603	
<i>GR - Monroe St</i>	<i>260810020</i>	<i>1179 Monroe NW</i>	<i>42.9842</i>	<i>-85.6714</i>	<i>pop exp</i>	<i>nghbrhd</i>	<i>Kent</i>	<i>4/24/80</i>	<i>GW</i>	<i>778,009</i>	
Warren	260991003	Warren Fire Station Common & Hoover	42.5133	-83.00611	max conc	urban	Macomb	1/1/77	DWL	4,403,437	
Holland	260050003	966 W 32 nd St	42.7678	-86.14861	max conc	regional	Allegan	8/25/92	A	113,449	
Frankfort / Benzonia	260190003	West St., Benzonia Twp.	44.61694	-86.10944	max conc	regional	Benzie	7/28/92	Not in CBSA	N/A	
Coloma	260210014	Paw Paw WWTP, 4689 Defield Rd., Coloma	42.1978	-86.30972	max conc	regional	Berrien	8/3/92	NBH	160,472	
Cassopolis	260270003	Ross Beatty High School	41.8956	-86.00167	pop exp	urban	Cass	5/16/91	SBM	317,538	
Harbor Beach	260630007	1172 S. M 25, Sand Beach Twp.	43.8364	-82.64306	backgrd	regional	Huron	4/1/94	Not in CBSA	N/A	
Kalamazoo	260770008	Fairgrounds, 2500 Lake St	42.2781	-85.54194	pop exp	nghbrhd	Kalamazoo	6/1/92	KP	326,634	
Evans	260810022	10300 14 Mile Road, NE	43.1767	-85.41667	max conc	urban	Kent	4/1/99	GW	778,009	
Tacumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	up wind backgrd	regional	Lenawee	7/6/93	Not in CBSA	N/A	
New Haven	260990009	57700 Gatiott	42.7314	-82.79361	max conc	urban	Macomb	7/14/80	DWL	4,403,437	
Scottville	261050007	525 W US 10	43.9533	-86.29444	max conc	regional	Mason	4/1/98	Not in CBSA	N/A	
Muskegon - Green Ck	261210039	1340 Green Creek Road	43.2781	-86.31111	pop exp	regional	Muskegon	5/1/91	MNS	173,951	
Oak Park	261250001	13701 Oak Park Blvd.	42.4631	-83.18333	pop exp	urban	Oakland	1/9/81	DWL	4,403,437	
Jenison	261390005	6981 28Th Ave, Georgetown Twp.	42.8944	-85.85278	pop exp	regional	Ottawa	4/1/89	HGH	261,957	
Port Huron	261470005	2525 Dove Rd	42.9533	-82.45639	pop exp	regional	Saint Clair	2/28/81	DWL	4,403,437	
Seney	261530001	Seney Wildlife Refuge	46.2889	-85.95027	bkgrd	regional	Schoolcraft	1/15/02	Not in CBSA	N/A	
Ypsilanti	261610008	555 Townner Ave	42.2406	-83.59972	pop exp	nghbrhd	Washtenaw	4/1/00	AA	347,563	
<i>Allen Park</i>	<i>261630001</i>	<i>14700 Goddard</i>	<i>42.2286</i>	<i>-83.2083</i>	<i>pop exp</i>	<i>nghbrhd</i>	<i>Wayne</i>	<i>1/1/80</i>	<i>DWL</i>	<i>4,403,437</i>	
Detroit - E 7 Mile	261830019	11600 East Seven Mile Road	42.4308	-83.00028	max conc	nghbrhd	Wayne	4/11/77	DWL	4,403,437	

Special Purpose and Tribal Stations											
Site Name	AIRS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)	
Houghton Lake	261130001	1769 S Jeffs Road	44.3106	-84.89194	background	regional	Missaukee	4/1/98	Not in CBSA	N/A	
Manistee	261010922	3031 Domres Rd	44.307	-86.24268	transport	regional	Manistee	4/1/06	Not in CBSA	N/A	

¹ CBSA Key:

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

FIGURE 6: MICHIGAN'S OZONE NETWORK IN 2009 AND 2010



Impact of the Proposed Changes to the Ozone Monitoring Requirements

The EPA has proposed¹⁵ to change the monitoring network design by modifying the requirements for ozone monitoring in smaller urban areas and in rural locations. Ozone monitors may be required in MSAs with population levels between 50,000 to 350,000 where there is no monitor or history of monitoring within the previous 5 years. If this portion of the rule remains in the final document, which is expected in August 2010, ozone monitors need to be added to the following metropolitan areas by April 1, 2012:

- Bay City Metro Area
- Saginaw – Saginaw Twp N Metro Area
- Jackson Metro Area
- Monroe Metro Area
- Battle Creek Metro Area

If these network design requirements become finalized, it is the DNRE's intent to add an ozone monitor to the Bay City PM_{2.5} site (260170014) to meet the monitoring requirements for MSAs with population totals between 50,000 and 350,000. Adding a new ozone monitor to this location will also provide better spatial coverage for the network. Due to the close proximity of the Bay City PM_{2.5} site to Saginaw, the DNRE intends to seek a waiver for the Saginaw – Saginaw Twp N Metro area ozone monitor.

The DNRE proposes to create a new site in the Jackson area for an ozone monitor, contingent upon adequate funding. The DNRE proposes to add an ozone monitor to the new SO₂ site that may be required in the Monroe area. The DNRE also proposes to add an ozone monitor in the Battle Creek Metro area. Battle Creek is approximately 25 miles east of Kalamazoo. Ozone concentrations are expected to be lower in Battle Creek, making the Kalamazoo ozone monitor a poor surrogate.

In addition, a secondary ozone standard was proposed that is designed to be protective of vegetation and crops. The secondary standard, called W126 relies on the sum of weighted hourly ozone concentrations. Weighted hourly values between 8 AM and 8 PM are totaled for each day. Monthly sums are totaled and weighted by data completeness. The three sequential months that form the largest total are then selected. This 3-month maximum total may either be compared to the standard or averaged over three years and then compared to the standard, depending on the what is finalized by the EPA. The proposed range of the standard is between 7 and 15 ppm-hours. To better characterize the impact from ozone in areas containing ozone sensitive species, the EPA is proposing to enhance the rural ozone monitoring network by the addition of three types of rural monitoring sites in each state by 2012. Monitors may be required in:

1. remote rural areas that contain ozone sensitive vegetation;
2. non-urban locations where maximum ozone concentrations occur downwind from urban areas, and;
3. smaller communities outside of the larger urban MSAs.

Pending additional guidance from the EPA, the current design of the DNRE's ozone monitoring network appears to fulfill the first two proposed requirements.

¹⁵ Federal Register January 19, 2010 "2010 National Ambient Air Quality Standards for Ozone." Vol 75 No 11.

The ozone monitors at Houghton Lake (261130001) and Seney (261530001) are located in rural areas that contain ozone sensitive vegetation. The Houghton Lake monitor is located at a DNRE deer research facility in an area of the state that is a mix of popular, quaking aspen and red pine. The Seney monitor is located in a Class 1 area that is predominantly marsh with areas of open water.

Regional transport from the Chicago area has been an on going issue so the DNRE has operated a series of rural monitors along the Lake Michigan shoreline since the 1990s. Beginning with the most southern location, the monitors are: Coloma (260210014), Holland (260050003), Muskegon – Green Creek Rd (261210039), Scottville (261050006) and Frankfort (260190003). There is also a tribal ozone monitor at Manistee (1010922) which lies between the DNRE sites at Scottville and Frankfort.

The proposal further describes the siting criterion for smaller communities as those locations in micropolitan areas that are downwind from sources that could experience maximum ozone concentrations. Traverse City is the largest micropolitan area in Michigan with the 2008 estimated population totaling 142,316 people. The next most populous micropolitan area is Adrian in Lenawee County with 100,801 people. There is already an ozone monitor in Lenawee County at Tecumseh (260910007) that is upwind from the Detroit metropolitan area. Selection of Traverse City as the location for the micropolitan ozone monitor is preferred because Traverse City is located downwind from the Chicago area and has a large population. DNRE will either assume operation of the non-attaining tribal monitor at Peshawbestown (260890001) that was been shut down or create a new site in the micropolitan area. The DNRE will remain cognizant of these requirements when developing air monitoring network designs for the newly proposed NAAQS for lead, NO₂ and SO₂.

Before April 1, 2012, contingent upon promulgation of the new ozone network design components, adequate funding and staffing, the DNRE will:

1. Add an O₃ monitor to Bay City
2. Add an O₃ site to Jackson
3. Add an O₃ monitor to Monroe, if leveraging a SO₂ site is possible
4. Seek a waiver from the Regional Administrator for an O₃ site in Saginaw – Saginaw Twp North because the Bay City (260170014) monitor is a good surrogate site
5. Add an O₃ site in Battle Creek
6. Assume operation of the tribal O₃ site at Peshawbestown (260890001) or create a new site in Traverse City Micropolitan area. If this site is created, DNRE will investigate the addition of fine particulate to this location in response to public comments received.

Impact of the Regional 5-Year Network Assessment on Michigan's Ozone Monitoring Network

Ozone and PM_{2.5} were identified in the Region 5 5-Year Network Assessment¹⁶ as priority air pollutants for the region. Using various data analysis tools, possible redundancy was identified in Michigan's ozone network at:

Oak Park (261250001) / Warren (260991003) / Detroit - E 7 Mile (261630019)

¹⁶ "Regional Network Assessment: States of Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin." Draft Report Lake Michigan Air Directors Consortium, April 22, 2010.

The DNRE has considered the suggestion that one or two of these ozone monitors could be shut down and has opted to retain all three monitors for the following reasons.

Oak Park (261250001) is measuring ozone downwind from the Ann Arbor MSA. It is also the only ozone monitor in Oakland County and is important for trend analysis. It has been in operation since 1981.

According to conversations with Region 5 EPA, Warren (260991003) is likely to become the design value site in the Detroit-Warren-Livonia MSA. Data analysis shows that the concentrations of ozone measured at New Haven (260990009) and Warren (260991003) are becoming more similar, with the maximum ozone concentration moving closer to the urban area of Detroit.

According to the 2007-2009 ozone values, the highest concentration in southeast Michigan was measured at the Detroit - E 7 Mile (261630019) site.

Ozone Season & Modeling

With the enactment of the 0.075 ppm 8-hour primary NAAQS, the length of the ozone season was modified in some areas. There are no changes to Michigan's ozone season, which extends from April 1 through September 30. If the EPA promulgates a more stringent ozone standard, the length of Michigan's ozone season may have to be re-evaluated.

With the new 1-hour NO₂ 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 NO₂ background levels as well as year around ozone values are necessary. Specifically, modeling staff need five years of both ozone and NO₂ data collected in small cities, urban and rural areas. While Allen Park (2616309001) and Grand Rapids – Monroe St. (260810020) generate ozone values in urban areas throughout the year, levels in smaller cities and rural areas are not currently available. Therefore, beginning October 1, 2010, the DNRE will monitor for ozone throughout the year at the Lansing (260650012) and Houghton Lake (261130001) stations. The collection of additional NO₂ data to support NSR modeling is discussed in the NO₂ section.

Ozone Quality Assurance

Site operators conduct precision checks on the monitors every two weeks. The results of the precision checks are sent to the senior auditor for review each quarter. Each ozone monitor is also audited annually by the AMU's QA Team. The audit utilizes a dedicated ozone generator 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 precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the results of the precision checks and audits to the EPA's AQS database each quarter. The QA Coordinator reviews all audits and hard copies are retained in the QA files.

The EPA conducts thru-the-probe audits of 20% of the DNRE'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 EPA auditor provides the AMU with a copy of the audit results and uploads the audit data to AQS.

Plans for the 2011 Ozone Monitoring Network

Beginning October 1, 2009, DNRE began collecting ozone measurements all year at the NCore sites at Grand Rapids – Monroe St. (260810020) and Allen Park (261630001). The DNRE plans to continue ozone measurements at these sites throughout 2010 and 2011. To support NSR modeling projects, the DNRE will collect ozone measurements all year at Lansing (260650012) and at Houghton Lake (261130001), beginning October 1, 2010.

The current ozone network meets 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 2011 ozone network:

- Holland (260050003)
- Frankfort/Benzonia (260190003)
- Coloma (260210014)
- Cassopolis (260270003)
- Rose Lake (260370001)
- Flint (260490021)
- Otisville (260492001)
- Harbor Beach (260630007) (downwind monitor)
- Lansing (260650012)
- Kalamazoo (260770008)
- Grand Rapids – Monroe St. (260810020)
- Evans (260810022)
- Tecumseh (260910007) (background monitor)
- New Haven (260990009)
- Warren (260991003)
- Scottville (261050007)
- Houghton Lake (261130001) (special purpose monitor)
- Muskegon – Green Creek Rd (261210039)
- Oak Park (261250001)
- Jenison (261390005)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- Detroit - E 7 Mile (261630019)

To the best of our knowledge, this tribal monitor will continue operation:

- Manistee (261050922) (tribal monitor)

PM_{2.5} FRM MONITORING NETWORK:

The October 17, 2006 changes to the monitoring regulations impacted PM_{2.5} (fine particulate) measurements in a number of ways. The minimum number of PM_{2.5} sites using an FRM in an MSA has been changed and is shown in **Table 14**.¹⁷ In addition to these minimum requirements, background and transport monitors are required.

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.

The regulations also allow states to discontinue FRM monitors if they can operate continuous samplers in a way that qualifies them to be ARM or FEM samplers. Due to the high levels of nitrate and humidity in the Midwest, the continuous monitors used by the DNRE (TEOMs), as well of many of the other monitors operated by the states in the Midwest show a positive bias. Therefore, to avoid an erroneous nonattainment designation caused by monitor bias, the DNRE will avoid deploying any continuous monitors that have ARM or FEM status, because any data will be used by the EPA to determine attainment.

TABLE 14: PM_{2.5} MINIMUM MONITORING REQUIREMENTS

MSA POPULATION^{1,2}	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS ≥ 85% OF ANY PM_{2.5} NAAQS³	MOST RECENT THREE-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% of the level of the 24-hour NAAQS, must sample on a daily sampling frequency. The monitoring regulations also state that 50% of all required FRM sites must co-locate continuous PM_{2.5} measurements.

Applying **Table 14** to Michigan's MSAs, population totals and most recent three-year design values results in **Table 15**. Any design values that are within 85% of a PM_{2.5} NAAQS are shown in blue font. Red font is used for those values that are greater than the NAAQS. Design values that are shown in bold represent the controlling site in each MSA, which is also called the design value site. The monitors with design values that are within 5% of the 24-hour NAAQS are shaded yellow. If these yellow shaded monitors are the design value site in a MSA, daily sampling must be initiated, according to the Federal Register. Changes in the minimum number of required monitoring stations within each MSA are shown in **green bold**.

¹⁷ Table D-5 of Appendix D to Part 58.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 15: 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.

MSA	Est 2009 Population	Counties	Existing Monitors	annual	24-hr	Min No monitors Required	Comments				
				85% of 15 ug/m3 12.8	85% of 35 ug /m3 30						
				most recent 3-year PM2.5 design value (annual)	most recent 3-year PM2.5 design value (24-Hr)						
Detroit-Warren-Livonia Metro Area	4,403,437	Macomb Oakland Wayne	New Haven	10.7	28	3	daily				
			Oak Park	11.4	32						
			Allen Park	11.9	30						
			Detroit-SW HS	12.8	33						
			Detroit - Linwood	12.1	32						
			Detroit - E 7 Mi	11.6	31						
			Livonia	11.2	30						
			Dearborn	14.1	34.7						
			Wyandotte	11.6	27						
			Detroit - Newberry	12.0	30						
			Detroit-FIA/Lafayette	12.3	33						
Lapeer St Clair Livingston	---	Port Huron	11.1	32	---	---					
		Flint Metro Area	424,043	Genesee			Flint	9.9	26	0	
		Monroe Metro Area	152,721	Monroe			Luna Pier	11.6	28	0	
Ann Arbor Metro Area	347,563	Washtenaw	Ypsilanti	11.3	30	1					
Grand Rapids-Wyoming Metro Area	778,009	Kent Barry Newaygo Ionia	GR - Monroe St	10.8	28	1					
			Gr - Wealthy St	10.5	28						
			Holland-Grand Haven Metro Area	261,957	Ottawa			Jenison	10.6	27	0
			Muskegon-Norton Shores Metro Area	173,951	Muskegon			Muskegon - Apple St	9.6	27	0
Lansing-East Lansing Metro Area	453,603	Clinton Ingham Eaton	Lansing	10.1	27	0					
			Bay City Metro Area	107,434	Bay			Bay City	9.1	24	0
			Saginaw-Saginaw Twp N Metro Area	200,050	Saginaw			Saginaw (closed)			0
Kalamazoo-Portage Metro Area	326,634	Kalamazoo Van Buren	Kalamazoo	11.3	28	0					
Niles-Benton Harbor Metro Area	160,472	Berrien	Coloma	10.1	27	0					
Jackson Metro Area	159,828	Jackson	---								
Battle Creek Metro Area	135,616	Calhoun	---								
South Bend-Mishawaka Metro Area IN/MI	317,538	Cass	---								
Other areas											
		Allegan	Holland	10.0	27		<i>micropolitan area</i>				
		Missaukee	Houghton Lake	6.8	21						
		Manistee	Manistee	7.4	23						
	<i>only 2 years of data</i>	Tecumseh	Lenawee	8.5	27						

On February 24, 2009, the United States Court of Appeals ordered the EPA to reconsider the annual NAAQS for PM_{2.5}.¹⁸ At this time, it is unknown what impact this may have on the design of the ambient monitoring network for PM_{2.5}, but if the level of the standard is lowered appreciably, monitoring requirements for MSAs may be altered from the value in the right column to the higher value in the center column of **Table 14**. In addition, the EPA is considering modifying the 24-hr NAAQS to a more stringent level.

¹⁸ American Farm Bureau Federation and National Pork Producers Council Vs. EPA, United States Court of Appeals for the District of Columbia Circuit Court 2/24/09

Annual averages as well as the 98th percentile values averaged over the most recent three years for all PM_{2.5} FRM sites in Michigan are shown in **Table 15**.

The reduced concentrations of PM_{2.5} measured during 2009 have caused the 2007-2009 design values to drop markedly in many MSAs. The minimum number of monitoring sites in Holland-Grand Haven, Muskegon-Norton Shores, Lansing-East Lansing, Bay City, Monroe, Kalamazoo-Portage, Flint and Niles-Benton Harbor has fallen from one site to zero sites. Using the most recent data, only a single site is required in the Grand Rapids-Wyoming MSA, instead of two. Although the DNRE may be able to remove nine PM_{2.5} FRM stations from the fine particulate network, we are reluctant to do so at this time. If the annual PM_{2.5} NAAQS is strengthened in the near future, monitoring may be required again in these MSAs.

Only 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. Allen Park (261630001) is the population-oriented trend site, and as such, is also required to collect speciated PM_{2.5} samples on a once every three day schedule.

The conceptual model¹⁹ of PM_{2.5} created by Dr. Jay Turner, describing the nature of PM_{2.5} across the area discusses an urban excess of fine particulate from local sources that impact Dearborn (261630033), Detroit - SW HS (261630015) and Wyandotte (261630036). Both Detroit - SW HS and Wyandotte need to be retained to continue to evaluate the impacts from these local sources. Also, a new international border crossing called Detroit River International Crossing (DRIC) could be built near Detroit - SW HS and contribute more emissions from motor vehicles, further reiterating the need to retain the Detroit - SW HS monitor. Emissions near the Detroit - E 7 Mile site (261630019) could be increasing. So, although only three monitors are required in the Detroit-Warren-Livonia Metropolitan Area, the conceptual model as well as other data analysis results reinforce the importance of retaining a larger network.

Previously, a co-located sampler was in operation at the Allen Park site (261630001). When Allen Park (261630001) became the NCore site for the Detroit-Warren-Livonia MSA, deck space was at a premium. To make room on the deck, the DNRE moved the co-located sampler from Allen Park (261630001) to Dearborn (261630033), where the deck was recently enlarged. The co-located monitor at Dearborn (261630033) began operation on January 1, 2010.

The sites at Detroit - Newberry School (261630038) and Detroit - FIA/Lafayette (261630039) are special purpose monitors that have been located to measure impacts from diesel powered mobile sources and from the international border crossing at the Ambassador Bridge, respectively.

Through a cooperative grant project with EPA Region 5 and EPA's Office of Research and Development (ORD), the DNRE deployed a special purpose PM_{2.5} FRM sampler to Tecumseh (260910007) in Lenawee County on April 1, 2008. Other special measurements that were added to the Tecumseh site include: PM_{2.5} speciation and continuous EC/OC. The DNRE will collect FRM measurements for one more year at Tecumseh so that three complete years of FRM data can be captured at the upwind site.

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). Now that the design value has been reduced, only a single site is required in the Grand Rapids-Wyoming MSA.

¹⁹ Turner, Jay R. "A Conceptual Model for Ambient Fine particulate Matter Over Southeast Michigan: High Concentration days. Washington University in St. Louis. Revision 0.1 (First Draft) March 4, 2008.

Previously, particulate levels at the Grand Rapids - Monroe St. (260810020) monitor triggered the daily monitoring requirement because they were within +/- 5 % of the 24-hour NAAQS. According to data collected during 2008, levels have declined and daily sampling was no longer required at the Grand Rapids - Monroe St. site. The sampling frequency was reduced to once every three days on April 1, 2009 at the beginning of the quarter following completion of validation of the fourth quarter 2008 data.

During 2009, a co-located PM_{2.5} FRM sampler operated at the Grand Rapids - Monroe site (260810020) on a once every six day sampling frequency to support improved data capture rates.

Due to the reduction in fine particulate values, a monitor is no longer required in the Monroe MSA. The Luna Pier site is the only PM_{2.5} site in Monroe County, located east of I-75, close to the Ohio border. It was selected to help determine transport into the Detroit MSA. The FRM monitor will be retained until possible changes in the NAAQS are made final.

As shown in **Table 15**, using the most recent three years of data, the Flint (260490021) monitor has an annual and a 24-hour average equaling 9.9 and 26 µg/m³ respectively. Both of these averages are less than 85% of their respective NAAQS. Therefore, a PM_{2.5} monitoring site is no longer required in the Flint MSA. No changes are suggested at this time because a more stringent standard for fine particulate could occur

One monitor is still required in the Ann Arbor MSA. The Ypsilanti site (261610008) fulfills this requirement and is located in a zip code with some of the highest incidences of asthma in Michigan. A co-located monitor is also located at this site to determine precision. The sampling frequency of the co-located sampler was increased from once every 12 days to once every six days beginning January 1, 2009 to make it easier to capture 75% complete data per quarter.

PM_{2.5} levels measured at Jenison (261390005) and Muskegon-Apple St (261210040) were within 5% of the level of the 24-hour NAAQS, so the sampling frequency was changed from once every six days to daily for both Jenison (261390005) and Muskegon – Apple Street (261210040) on January 1, 2007. On April 1, 2009 both sites began sampling on a once every three day schedule, because the levels of fine particulate had dropped to less than 5% of the NAAQS. The collection of the December 2009 data, shows that levels have dropped even further. Previously, a single PM_{2.5} FRM monitor was required in the Holland-Grand Haven MSA and Muskegon-Norton Shores MSA. These requirements were fulfilled by the monitor in Jenison (261390005) and by the monitor in Muskegon (261210040), respectively. Recent design values indicate that monitoring is no longer required in these MSAs, but monitoring at these sites will continue in case the NAAQS becomes more stringent.

The annual and 24-hour PM_{2.5} averages from the Lansing monitor (260650012) are no longer greater than 85% of the NAAQS, indicating that monitoring is no longer required. The DNRE will continue to operate the monitor for one more year pending a NAAQS revision.

The Saginaw-Saginaw Township North MSA is required to have a PM_{2.5} FRM site. The DNRE used to operate a PM_{2.5} monitoring site at Saginaw Valley University (261450018) but access was lost due to rapid increases in enrollment at the university. The monitoring trailer was located close to student dormitories and had to be removed for expansion of student housing. The site was shut down January 1, 2006. Annual average PM_{2.5} levels at the Saginaw site were less than those measured at the Bay City site. The 98th percentiles of the 24-hour values that were measured at Saginaw were either within 0.2 µg/m³ of those measured at Bay City or were 2 to 6 µg/m³ less than Bay City, depending upon the year. The EPA Regional Administrator granted a waiver for the PM_{2.5} Saginaw monitor.

The 24-hour PM_{2.5} average from the monitor in Bay City is less than 85% of the NAAQS, indicating that monitoring is no longer required. The DNRE will continue to operate the monitor for at least one more year.

The Kalamazoo monitor (260770008) fulfilled the requirement that the Kalamazoo-Portage MSA have one FRM sampler. Both the most recent 24-hour and annual averages from the Kalamazoo monitor are now less than 85% of the respective NAAQS, indicating that one site is no longer necessary in this MSA. However, the DNRE will continue to operate the monitor for one more year.

During 2008, a co-located PM_{2.5} FRM sampler was operated at Kalamazoo (260770008) on a once every 12 day sampling schedule to determine precision. The sampling frequency was increased to once every six days on January 1, 2009 to improve data capture.

Coloma (260210014) fulfilled the requirement for the Niles-Benton Harbor MSA. The 24-hour PM_{2.5} average from this site is greater than 85% of the NAAQS, indicating that monitoring is still required.

The PM_{2.5} monitor in Holland (260050003) in Allegan County is a micropolitan area. The monitor's design value is no longer within 5% of the NAAQS. Because the site is in a micropolitan area, daily sampling was not required. Now that concentrations have fallen, it may be possible to discontinue monitoring at Holland, but the DNRE will continue to operate the monitor for one more year for the reasons discussed previously.

Houghton Lake (261130001) is the background PM_{2.5} FRM site in Michigan.

A tribal PM_{2.5} monitor is located in Manistee (261010922). Tribal monitors are also operational in the Sault Ste Marie area. However, the DNRE no longer contracts with the Inter-Tribal Council in Sault Ste. Marie, so their monitors are not part of this network review.

Impact of the Regional 5-Year Network Review on Michigan's PM_{2.5} Monitoring Network

Ozone and PM_{2.5} were identified in the Region 5 5-Year Network Assessment²⁰ as priority Air Pollutants for the region. Using a myriad of data analysis tools, possible redundancy was identified in Michigan's PM_{2.5} network at:

- Allen Park (261630001) / Detroit - Linwood (261630016) / Oak Park (261250001)
- Ypsilanti (261610008) / Livonia (261630025)
- Oak Park (2661250001) / Livonia (261630025)
- Detroit - SW HS (261630015) / Detroit - Detroit - Linwood (261630016)

The density of PM_{2.5} monitors in SE Michigan was an asset in the development of a conceptual model for fine particulate²¹. These concepts are proving to be invaluable in the development of an understanding of the nature of fine particulate in SE Michigan and in the development of possible attainment strategies. The DNRE is opting to retain these PM_{2.5} monitors for the following reasons.

²⁰ "Regional Network Assessment: States of Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin." Lake Michigan Air Directors Consortium, April 22, 2010.

²¹ Turner, Jay R. "A Conceptual Model for Ambient Fine particulate Matter Over Southeast Michigan: High Concentration days. Washington University in St. Louis. Revision 0.1 (First Draft) March 4, 2008.

In 2005 to 2005, Detroit - Linwood (261630016) was the 24-hour design value site in southeast Michigan. It may be premature to shut this site down with changes to the PM NAAQS possible in 2011. The DNRE proposes to watch the values of fine particulate at this site and evaluate the possibility of monitor closure in the next network review.

It may be premature to shut down the Livonia (261630025) fine particulate monitor because the EPA and Federal Highway Administration (FHWA) will be conducting a near roadway study in the Detroit metropolitan area beginning in 2010. The Livonia (261630025) site is an upwind traffic oriented site and the fine particulate data may be of use to the near-roadway study. Closure of the Livonia fine particulate FRM monitor will be re evaluated in the next annual review when the near roadway study is drawing to a close.

Table 16 summarizes the PM_{2.5} FRM monitoring site information for sites that existed in 2009 and those that will operate in 2010. **Figure 7** illustrates the geographical distribution of PM_{2.5} FRM monitors.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 16: PM_{2.5} FRM NETWORK IN MICHIGAN IN 2009 AND 2010

Operating Schedule: Once every 6 days, once every 3 days or daily see below.
 Method: Partisol 2025 Rupprecht & Patashnick Samplers

SLAMS Network Network as of October 2009

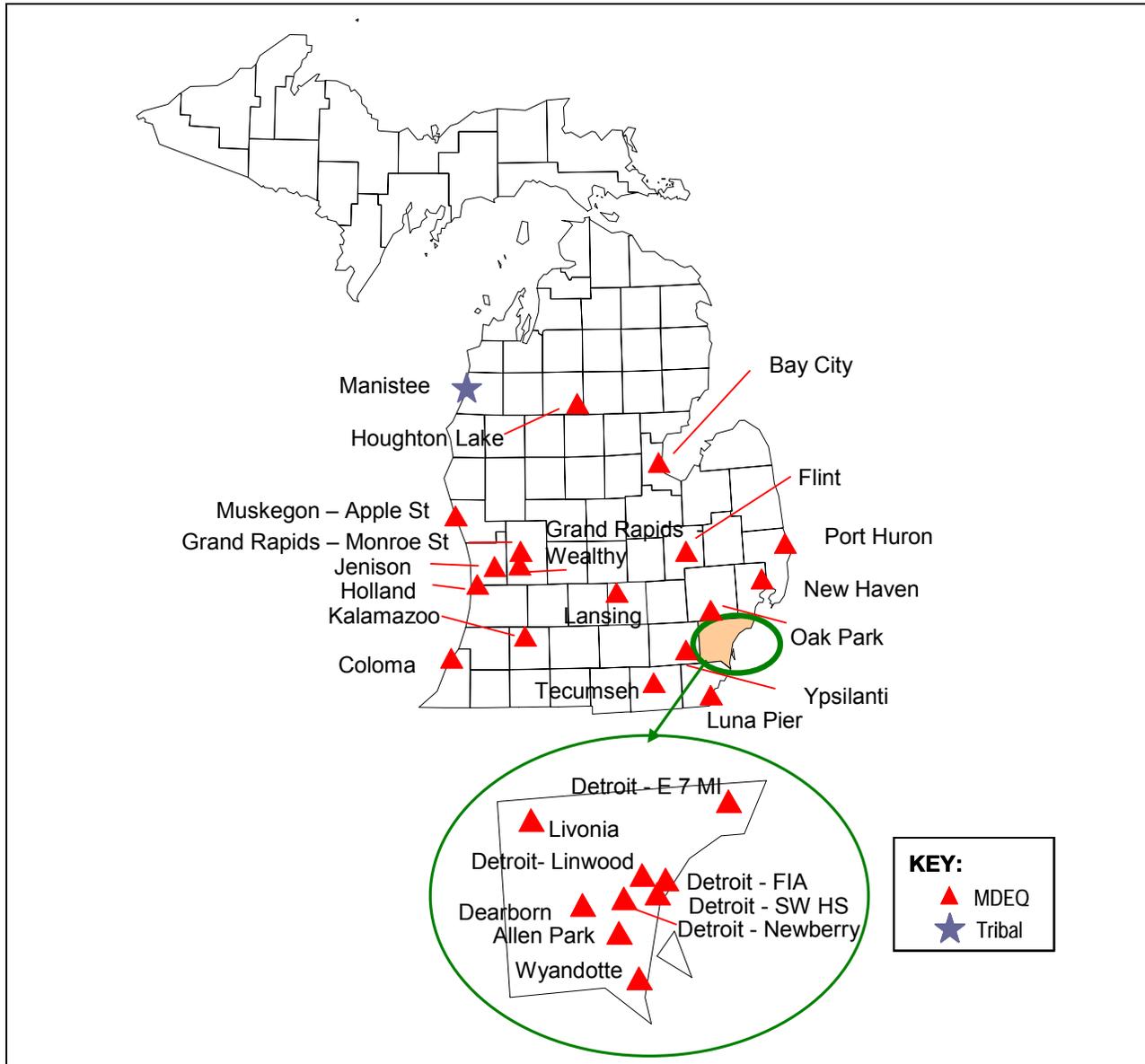
Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
Holland	260050003	966 W. 32 nd , Holland	42.7678	-86.14861	1:3	Pop. Exp.	Neighborhood	Allegan	10/31/98	A	113,449
Bay City	260170014	1001 Jennison St	43.5714	-83.89083	1:3	Pop. Exp.	Neighborhood	Bay	8/24/00	BC	135,616
Coloma	260210014	4689 Defield Rd., Paw Paw WWTP	42.1978	-86.30972	1:3	Transport	Regional	Berrien	11/7/98	NB	160,472
Flint	260490021	Whaley Park, 3610 Iowa St., Flint	43.0472	-83.67028	1:3	Pop. Exp.	Neighborhood	Genesee	12/16/98	F	424,043
Lansing	260650012	220 N. Pennsylvania	42.7386	-84.53472	1:3	Pop. Exp.	Neighborhood	Ingham	11/7/98	LEL	453,603
Kalamazoo	260770008	Fairgrounds, 1400 Olmstead Rd	42.2781	-85.54194	1:3	Pop. Exp.	Neighborhood	Kalamazoo	11/19/98	KP	326,634
Grand Rapids- Wealthy St	260810007	507 Wealthy St	42.9561	-85.67917	1:3	Pop. Exp.	Neighborhood	Kent	11/1/07	GW	778,009
Grand Rapids- Monroe St	260810020	1179 Monroe St., NW,	42.9842	-85.67139	1:3	Pop. Exp.	Neighborhood	Kent	10/23/98	GW	778,009
New Haven	260990009	57700 Gratiott	42.7314	-82.79361	1:3	Pop. Exp.	Neighborhood	Macomb	12/22/98	DWL	4,403,437
Houghton Lake	261130001	1769 S. Jeffs Rd	44.3106	-84.89194	1:3	Background	Regional	Missaukee	2/8/03	Not in CBSA	N/A
Luna Pier	261150005	Erie Shooting Club	41.7639	-83.47194	1:3	Transport	Regional	Monroe	12/17/99	M	152,721
Muskegon - Apple St	261210040	199 E. Apple	43.2331	-86.23861	1:3	Pop. Exp.	Neighborhood	Muskegon	12/18/98	MNS	173,951
Oak Park	261250001	13701 Oak Park Blvd.	42.4631	-83.18333	1:3	Pop. Exp.	Urban	Oakland	12/25/98	DWL	4,403,437
Jenison	261390005	6981 28 th Ave., Georgetown Twp	42.8944	-85.85278	1:3	Pop. Exp.	Neighborhood	Ottawa	11/7/98	HGH	261,957
Port Huron	261470005	2525 Dove Rd.	42.9533	-82.45639	1:3	Pop. Exp.	Regional	Saint Clair	2/11/99	DWL	4,403,437
Ypsilanti	261610008	555 Towner Ave	42.2406	-83.59972	1:3	Pop. Exp.	Neighborhood	Washtena	8/4/99	AA	347,563
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	1:1	Pop. Exp.	Neighborhood	Wayne	5/12/99	DWL	4,403,437
Detroit - SW HS	261630015	SW Highschool, 150 Waterman	42.3028	-83.10667	1:3	Pop. Exp.	Neighborhood	Wayne	2/26/99	DWL	4,403,437
Detroit - Linwood	261630016	2451 Marquette, McMichael School	42.3578	-83.09617	1:3	Pop. Exp.	Neighborhood	Wayne	5/12/99	DWL	4,403,437
Detroit - E 7 Mile	261630019	11600 E. 7 Mile, Osborne School	42.4308	-83.00028	1:3	Pop. Exp.	Neighborhood	Wayne	4/30/00	DWL	4,403,437
Livonia	261630025	38707 Seven Mile Rd	42.4231	-83.42639	1:3	Pop. Exp.	Neighborhood	Wayne	8/21/99	DWL	4,403,437
Dearborn	261630033	2842 Wyoming, Salina School	42.3067	-83.14889	1:3	Pop. Exp.	Neighborhood	Wayne	2/5/99	DWL	4,403,437
Wyandotte	261630036	3625 Biddle, Wyandotte	42.1873	-83.15404	1:3	Pop. Exp.	Neighborhood	Wayne	2/20/99	DWL	4,403,437

2009 Special Purpose and Tribal PM_{2.5} Monitors in Michigan

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
Tecumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	1:3	SPM	up wind backgrd	regional	Lenawee	7/6/93	Not in CBSA	N/A
Manistee	261010922	3031 Domres Rd	44.307	-86.24268	1:3	Tribal	Tribal	Regional	Manistee	4/2/06	Not in CBSA	N/A
Detroit - Newberry School	261630038	4045 29 th St	42.335	-83.1097	1:3	SPM	Source Oriented	Neighborhood	Wayne	12/26/05	DWL	4,403,437
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.3233	-83.06861	1:3 and 1:1	SPM	Source Oriented	Neighborhood	Wayne	8/26/05	DWL	4,403,437

¹ CBSA Key: A = Allegan Micropolitan Area KP= Kalamazoo-Portage Metro. Area
 AA = Ann Arbor Metro. Area LEL= Lansing-E. Lansing Metro. Area
 DWL= Detroit-Warren-Livonia Metro. Area M = Monroe Metro. Area
 F = Flint Metro Area MNS = Muskegon-Norton Shores Metro. Area
 GW=Grand Rapids-Wyoming Metro. Area NBH = Niles-Benton Harbor Metro. Area
 HGH = Holland-Grand Haven Metro. Area SBM= South Bend-Mishawaka Metro. Area (IN/MI)

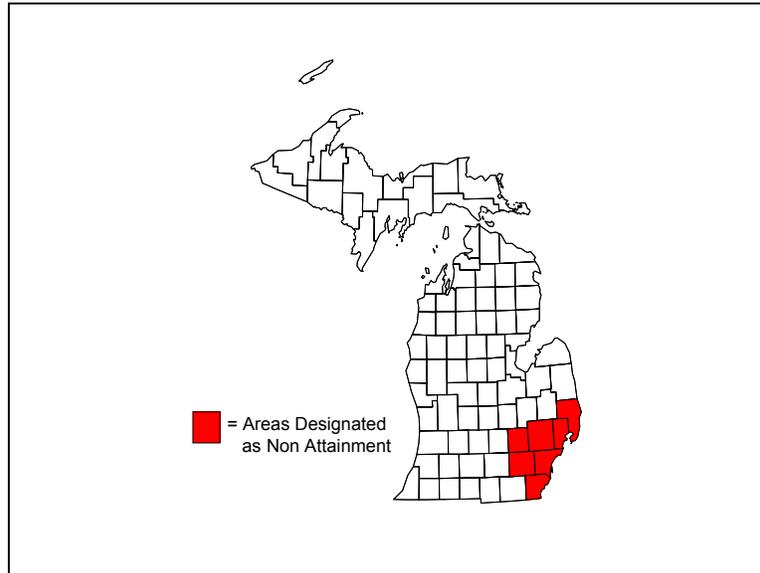
FIGURE 7: MICHIGAN'S PM_{2.5} FRM MONITORING NETWORK IN 2009 AND 2010
 (WHILE THERE WERE NO CHANGES IN SITE LOCATIONS, SAMPLING FREQUENCIES HAVE CHANGED.)



PM_{2.5} Designations

The EPA designated the seven-county area in SE Michigan as nonattainment for both the 24-hour and annual fine particulate NAAQS, as shown in **Figure 8**. The DNRE is currently preparing a request to the EPA to redesignate to attainment. With completion of the 2009 data, all counties in Michigan are meeting the current PM_{2.5} NAAQS.

FIGURE 8: PM_{2.5} NONATTAINMENT AREAS



Conversion of PM_{2.5} Grant Dollars

Currently the PM_{2.5} monitoring networks are funded through a Section 103 Grant. The EPA is considering changing the Section 103 Grant to a conventional Section 105 Grant, which required the receiving agency to supply a 40% match to the federal funds. If all of the funds are converted and a match is required, this would be equivalent to cutting more than \$400,000 from the DNRE's PM_{2.5} monitoring program. If this occurs, a number of PM_{2.5} monitors may need to be shut down due to lack of funding.

PM_{2.5} Quality Assurance

The PM_{2.5} program has separate, fully approved QAPP. The DNRE operates four co-located PM_{2.5} FRM samplers, meeting the precision monitoring requirement of 15%. The sampling frequency of the precision samplers at Grand Rapids – Monroe St. (260810020), Kalamazoo (260770008), Ypsilanti (261610008), and Allen Park (261630001) was reduced from once every six days to once every 12 days, as specified in 40 CFR Part 58 modifications to the regulations. However, the limited number of samples that are collected per quarter has made collection of 75% complete data arduous. On January 1, 2009, the DNRE opted to increase sampling from once every 12 days to once every six days at these co-located sites. The roll out of NCore monitoring on January 1, 2010 has made deck space a premium commodity at Grand Rapids – Monroe St. (260810020) and at Allen Park (261630001). Therefore, the DNRE relocated the co-located sampler at Allen Park (261630001) to Dearborn (261630033) to clear more deck space.

In addition to operating precision monitors, the DNRE's station operators conduct flow checks to ensure the flow rate is meeting the measurement quality objectives. The results from these flow checks are submitted to the PM_{2.5} auditor each month for review. 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 EPA'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.

The EPA conducts Performance Evaluation Program (PEP) audits at eight sites each year. The EPA 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 an independent laboratory for analysis. Once the DNRE filter weight is entered into the EPA's AQS database, the audit filter weight is entered by the EPA whereby the concentrations are compared between the PEP audit filter and the station filter. The EPA auditor also assesses the station and monitor siting criteria to evaluate adequacy of the location, distances from trees, exhaust vents, and large building. Probe heights and separation distances are also assessed.

Plans for the 2011 PM_{2.5} FRM Monitoring Network

The following PM_{2.5} monitors will be retained as part of the 2011 network:

- The one in three day PM_{2.5} FRM monitor in Holland (260050003)
- The one in three day PM_{2.5} FRM monitor in Bay City (260170014)
- The one in three day PM_{2.5} FRM monitor in Coloma (260210014) transport
- The one in three day PM_{2.5} FRM monitor in Flint (260490021)
- The one in three day PM_{2.5} FRM monitor in Lansing (260650012)
- The one in three day PM_{2.5} FRM monitor in Kalamazoo (260770008)
- The one in three day PM_{2.5} FRM monitor at Grand Rapids - Wealthy St (260810007)
- The one in three day PM_{2.5} FRM monitor in Grand Rapids – Monroe St. (260810020)
- The one in three day PM_{2.5} FRM monitor in Tecumseh (260910007)
- The one in three day PM_{2.5} FRM monitor in New Haven (260990009)
- The one in three day PM_{2.5} FRM monitor in Houghton Lake (261130001) background
- The one in three day PM_{2.5} FRM monitor in Luna Pier (261150005) transport
- The one in three day PM_{2.5} FRM monitor in Muskegon – Apple St (261210040)
- The one in three day PM_{2.5} FRM monitor in Oak Park (261250001)
- The one in three day PM_{2.5} FRM monitor in Jenison (261390005)
- The one in three day PM_{2.5} FRM monitor in Port Huron (261470005)
- The one in three day PM_{2.5} FRM monitor in Ypsilanti (261610008)
- The daily PM_{2.5} FRM monitor in Allen Park (261630001)
- The one in three day PM_{2.5} FRM monitor at Detroit - SW HS (261630015)
- The one in three day PM_{2.5} FRM monitor at Detroit - Linwood (261630016)
- The one in three day PM_{2.5} FRM monitor at Detroit - E 7 Mile (261630019)
- The one in three day PM_{2.5} FRM monitor in Livonia (261630025)
- The one in three day PM_{2.5} FRM monitor in Dearborn (261630033)
- The one in three day PM_{2.5} FRM monitor in Wyandotte (261630036)
- The one in three day PM_{2.5} FRM monitor at Detroit - Newberry School (261630038)
- The daily PM_{2.5} FRM monitor at Detroit – FIA/ Lafayette (261630039) will continue the special study comparing continuous fine particulate monitoring data with FRM measurements until one year of data have been collected. At this time the sampling frequency will be reduced to once every three days.

The following precision monitors will continue operation contingent upon adequate funding:

- The one in six day PM_{2.5} FRM monitor in Kalamazoo (260770008).
- The one in six day PM_{2.5} FRM monitor at Grand Rapids – Monroe St. (260810020).
- The one in six day PM_{2.5} FRM monitor in Ypsilanti (261610008).
- The one in six day PM_{2.5} FRM monitor in Dearborn (261630033).

To the best of our knowledge, the following tribal FRM monitor will continue operation:

- A one in three day PM_{2.5} FRM tribal monitoring site in Manistee (261010922), contingent upon the Little River Band of Ottawa Indians' plans for 2010.

CONTINUOUS PM_{2.5} MONITORING NETWORK

According to the October 17, 2006 changes to the monitoring regulations, 50% of the minimum number of required FRM sites must now be collocated with a continuous PM_{2.5} monitor. The 13 continuous monitors operational in the state exceed the minimum number that are required.

In 2009 and 2010, the DNRE operated Rupprecht & Patashnick TEOM samplers to supply continuous fine particulate data at 13 monitoring sites, as shown in **Table 17**. The DNRE currently is meeting the minimum 50% collocation requirement. **Figure 9** illustrates the geographical distribution of the continuous monitors. The newer TEOM unit that was co-located at Detroit - FIA/Lafayette (261630039) remains as a single monitor. The spare TEOM was deployed to Detroit - Newberry School (261630038), retaining the 13 sites. In the event that another TEOM needs repair, the unit at Detroit - FIA/Lafayette site will be deployed to the site lacking a functional TEOM. Therefore, incomplete data may be generated at the Detroit - FIA/Lafayette (261630039) site due to repair issues. The DNRE is currently field testing a MetOne Beta Attenuation Monitor (BAM) at Detroit - FIA/Lafayette (261630039) to assess data comparability between the BAM, the TEOM and the FRM. The FRM is operating on a daily basis.

Researchers from the University of Michigan and Michigan State University are investigating the impact of exposure to fine particulate on physiology. The DNRE is operating a PM_{2.5} TEOM in Tecumseh (260910007) to help generate data necessary for their research.

Michigan has two NCore stations, one in Detroit and one in Grand Rapids. These stations are required to operate a continuous PM_{2.5} sampler. Both Grand Rapids – Monroe St. (260810020) and Allen Park (261630001) currently have PM_{2.5} TEOMs, meeting the requirement for continuous PM^{2.5} measurements.

Filter Dynamic Measurement System (FDMS) Inlets

Initially, the DNRE operated all TEOM units with an inlet temperature of 50°C. Because this high inlet temperature was volatilizing nitrate during the winter months, and due to the EPA's desire to make the continuous data as "FRM-like" as possible, FDMS inlets were installed on the TEOMs during October 2003 and operated until through April 2005, allowing the inlet temperature to be reduced. The data from units with the Filter Dynamic Measurement System (FDMS) inlets showed good correlation with the FRM data during the winter months, but during the summer, the correlation was poor. The FDMS units captured much more nitrate than the FRMs during the summer and thus yielded much higher TEOM readings than recorded by the FRMs. During summer days with high humidity, condensation occurred in the FDMS lines, interfering with data capture and creating maintenance problems. As a possible solution to both the condensation problem and data comparability issue, the DNRE proposed to operate the TEOMs with the FDMS inlets during the winter months and without the FDMS inlets during the summer. The DNRE selected the week of April 1, 2006 to remove the inlets and the week of October 1, 2006 to replace them, corresponding to Michigan's ozone monitoring season. Performance was worse than during the previous year, and was most likely due to a degradation of the nafion driers in the FDMS inlets. In March 2007, the chillers broke on two units and could not be replaced because the instrument manufacturer discontinued the necessary parts in the version of the FDMS units operated by the DNRE. Rather than buying the version C upgrades to the FDMS units, all FDMS units were removed from the TEOMs in February 2007.

Beginning in 2007, the DNRE operates the TEOMs from April through September at an inlet temperature of 50°C. Once the ozone season is over, starting October 1, the DNRE 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 sites operate to support AIRNOW real time data reporting and to provide adequate spatial coverage. This will continue as long as adequate levels of funding are received.

The DNRE is field testing another type of continuous monitor, a Met One Beta Attenuation Monitor (BAM), at the Detroit - FIA/Lafayette (261630039) site to determine comparability with FRM measurements. The sampling frequency of the FRM was increased to daily to support the comparability study.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

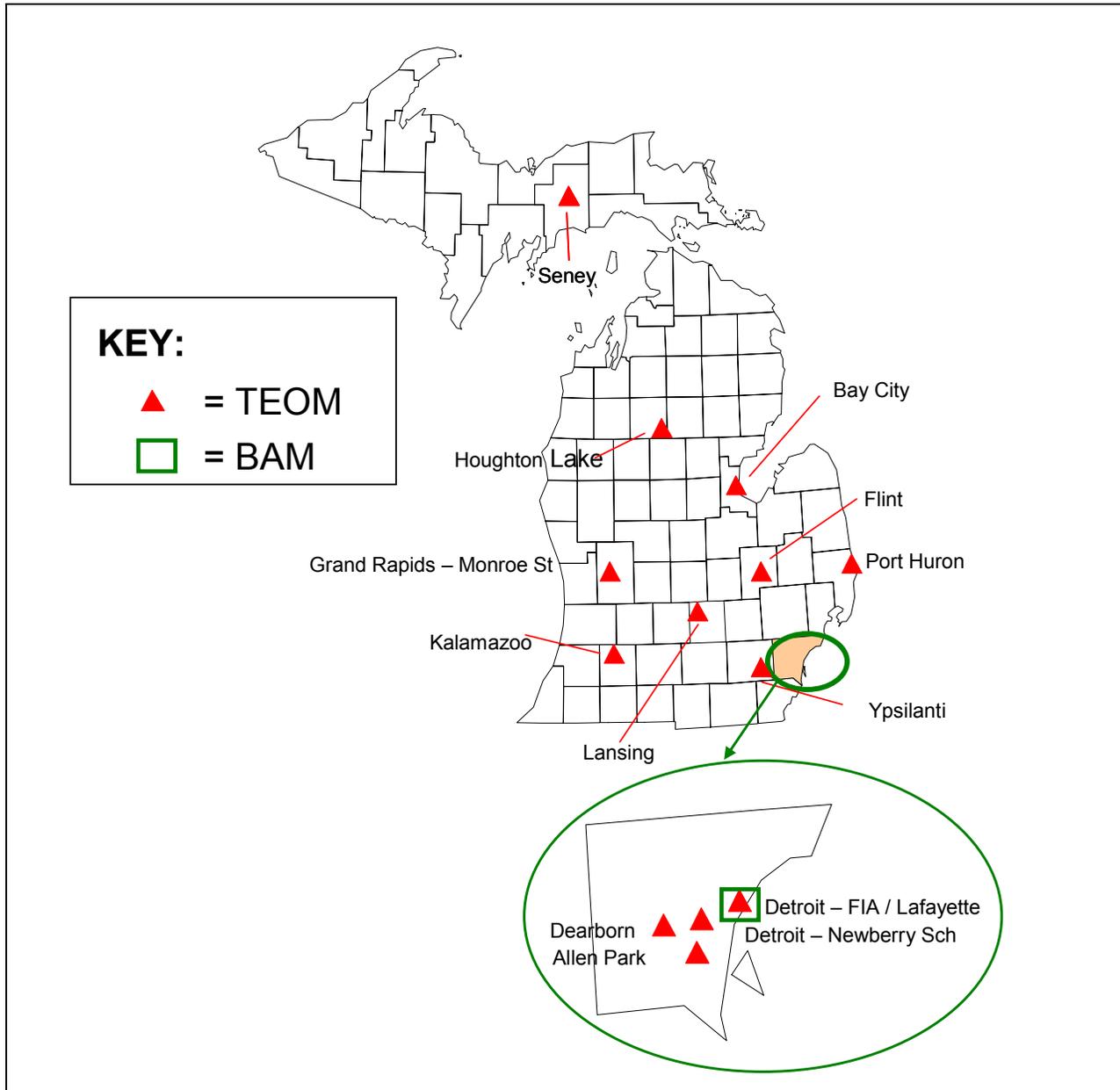
TABLE 17: MICHIGAN'S CONTINUOUS PM_{2.5} MONITORING NETWORK IN 2009 AND 2010

Operating Schedule: continuous										Network as of March 2010
Method: Rupprecht & Patashnick Tapered Element Oscilating Microbalance (TEOMS) Samplers										
Monitoring Sites										
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
Bay City	260170014	1001 Jennison St	43.5714	-83.89083	Pop. Exp.	Neighborhood	Bay	11/19/05	BC	107,434
Flint	260490021	Whaley Park, 3610 Iowa St., Flint	43.0472	-83.67028	Pop. Exp.	Neighborhood	Genesee	5/23/02	F	424,043
Lansing	260650012	220 N. Pennsylvania	42.7386	-84.53472	Pop. Exp.	Neighborhood	Ingham	12/1/99	LEL	453,603
Kalamazoo	260770008	Fairgrounds, 1400 Olmstead Rd	42.2781	-85.54194	Pop. Exp.	Neighborhood	Kalamazoo	8/17/00	KP	326,634
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.9842	-85.67139	Pop. Exp.	Neighborhood	Kent	11/4/99	GW	778,009
Houghton Lake	261130001	1769 S Jeffs Rd	44.3106	-84.89194	Background	Regional	Missaukee	10/9/03	Not in CBSA	N/A
Port Huron	261470005	2525 Dove Rd.	42.9533	-82.45639	Pop. Exp.	Regional	Saint Clair	9/18/03	DWL	4,403,437
Seney	261530001	Seney Wildlife Refuge	46.2889	-85.95027	bkgrd	Regional	Schoolcraft	1/1/02	Not in CBSA	N/A
Ypsilanti	261610008	555 Towner Ave	42.2406	-83.59972	Pop. Exp.	Neighborhood	Washtenaw	2/24/00	Not in CBSA	N/A
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	4,403,437
Dearborn	261630033	2842 Wyoming, Salina School	42.3067	-83.14889	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	4,403,437
Detroit - Newberry School	261630038	4045 29 th St	42.335	-83.1097	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	4,403,437
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.3233	-83.06861	Source Oriented	Neighborhood	Wayne	8/20/05	DWL	4,403,437
Method: MetOne Beta Attenuation Monitor (BAM)										
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.3233	-83.06861	Source Oriented	Neighborhood	Wayne	10/1/09	DWL	4,403,437

¹ CBSA Key:

BC = Bay City Metro. Area	GW=Grand Rapids-Wyoming Metro. Area
DWL= Detroit-Warren-Livonia Metro. Area	KP= Kalamazoo-Portage Metro. Area
F = Flint Metro Area	LEL= Lansing-E. Lansing Metro. Area

FIGURE 9: MICHIGAN'S 2009 AND 2010 CONTINUOUS PM_{2.5} NETWORK



PM_{2.5} TEOM Quality Assurance

The site operator conducts flow checks for precision every four weeks. The results from the precision checks are sent to the auditor for review each month. 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.

Plans for the 2011 PM_{2.5} TEOM Network

Minimal changes to the continuous PM_{2.5} network are anticipated, but if EPA cuts funding, operation of some TEOMs may need to be discontinued in 2011. Continued operation of the PM_{2.5} TEOMs at Dearborn (261630033), Allen Park (261630001), and Grand Rapids – Monroe St. (260610020) will be given the highest priority. 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. Also, the PM_{2.5} TEOMs at Grand Rapids-Monroe St (260810020) and Allen Park (261630001) need to continue operation due to the NCore requirement for continuous fine particulate measurements.

During 2011, contingent upon adequate levels of funding, Michigan is planning to continue to operate PM_{2.5} TEOM monitors at:

- Bay City (260170014)
- Flint (260490021)
- Lansing (260650012)
- Kalamazoo (260770008)
- Grand Rapids – Monroe St. (260810020)
- Houghton Lake (261130001)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- Dearborn (261630033)
- Detroit - Newberry School (261630038) – to become operational January 2011.
- Detroit - FIA/Lafayette (261630039)

In January 2011, the TEOM that is operational at Tecumseh (260910007) will be shut down and returned to Detroit - Newberry School (261630038).

If the DNRE established an O₃ in the Traverse City area, deployment of a continuous fine particulate monitor will be investigated in response to public comments received. The DNRE will also meet with local stakeholders on this issue.

Considering the cost of replacement parts, age of the equipment and the frequency of repairs, if any TEOM monitors would need to be shut down, the highest priority would be given to retaining the NCore and Dearborn PM_{2.5} TEOMs .

SPECIATED PM_{2.5} MONITORING NETWORK:

The October 17, 2006 changes to the monitoring regulations specify that speciation monitoring is required but offer little detail. Continued operation of the speciation trend site network is required on a national level and these sites sample on an increased sampling frequency of once every three days. 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. A new special purpose speciation site was established at Tecumseh (260910007) in April 2008 to assess organic carbon levels upwind from Detroit. Operation of the Tecumseh (260910007) monitor will continue contingent upon adequate funding. The speciation network is described in **Table 18**. **Figure 10** illustrates the coverage across Michigan.

The need for an additional speciation site in southeast Michigan became apparent as a result of the PM_{2.5} conceptual model developed by Jay Turner as well as data analysis and source apportionment work performed by STI and Jay Turner²². There are several days when elevated PM_{2.5} FRM measurements were made at Port Huron (261470005) and nowhere else in the CMA. As such, the DNRE moved the Kalamazoo speciation monitor to Port Huron (261470005) on July 5, 2008 to better understand the composition of elevated PM_{2.5} events downwind from Detroit. Monitoring will continue at this site in 2011 to better understand the nature of fine particulate downwind from the Detroit area.

The conceptual model also identified Detroit - SW HS (261630015) as a site that is influenced by point sources. Speciation data would help better define sources that contribute to elevated PM_{2.5} levels at Detroit - SW HS. Therefore, the speciation sampler at Ypsilanti (261610008), was moved to Detroit - SW HS on November 2, 2008. Monitoring will continue at this site in 2011.

Beginning in 2003 and continuing through 2004, an IMPROVE speciation sampler was operated at Allen Park (261630001) to allow comparisons between the rural IMPROVE network and the urban STN network. Allen Park was one of several urban sites participating in this inter-comparison study. National data analysis indicated that there were differences in the results generated by the various carbon samplers.

To improve the EC/OC data that is collected by the speciation network, the EPA decided to upgrade the carbon channel to URG model 3000 N units, becoming more similar to the IMPROVE network. All upgrades have been accomplished.

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

Lastly, NCore monitoring sites are required to collect speciated fine particulate on a once every three day schedule. As the speciation trend site for Michigan, the NCore site at Allen Park (261630001) is meeting this criterion. However, speciated fine particulate samples are collected at the NCore site at Grand Rapids - Monroe St. (260810020) on a once every six day schedule. The DNRE will increase the sampling frequency at Grand Rapids if the EPA wishes and supplies adequate levels of funding.

²² Wade, K., J Turner, S. Brown, J Garlock, and H. Hafner, "Data Analysis and Source Apportionment of PM_{2.5} in Selected Midwestern Cities," Prepared for LADCO, February 2008.

Chemical Composition of PM_{2.5} and Lab Costs

If the Section 103 funds are converted into Section 105 funds, forcing cuts to the fine particulate network, one option may be to archive some of the speciation filters for later analysis. Changes to the national speciation laboratory contract may support greater options in the selection of tests. Operational costs could be minimized by adopting an alternative approach to sample analysis so that more coverage can be retained in the monitoring network.

Continuous Speciation Measurements

In addition to the speciated measurements integrated over a 24-hour time period described above, Michigan operates continuous monitors for carbon black and EC/OC. Two large spot aethalometers from Magee Scientific began operation at Dearborn (261630033) and Allen Park (261630001) on December 19, 2003 and January 1, 2004, respectively. These units measure carbon black, which is very similar and correlates well with elemental carbon.

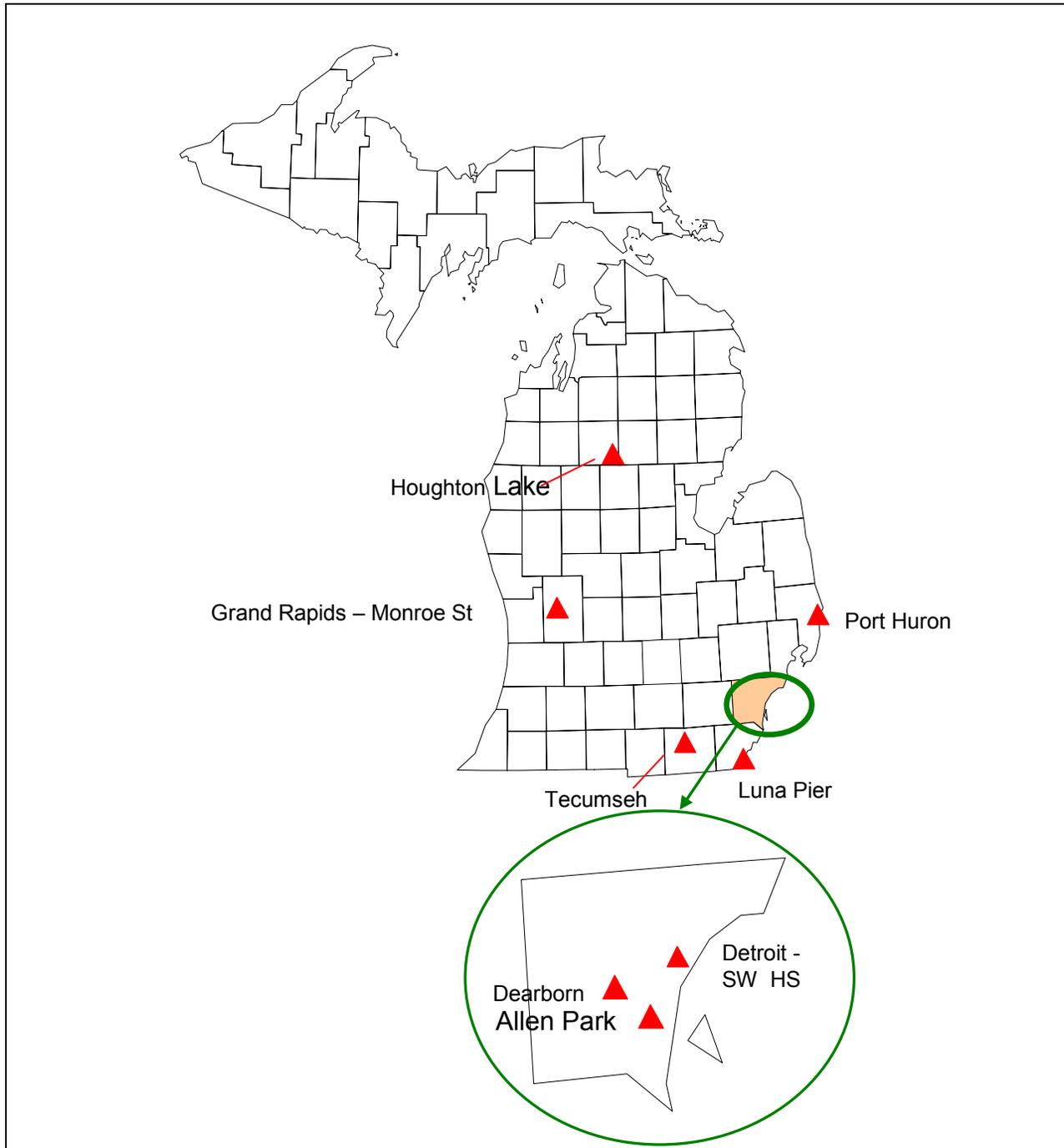
A continuous EC/OC monitor from Sunset Laboratories was deployed to the Newberry School (261630038) site on February 1, 2005 to determine diurnal variation in elemental carbon and organic carbon. To help in the development of attainment strategies, the Southeast Michigan Council of Governments purchased a second Sunset EC/OC unit that was deployed at Dearborn (261630033) on June 11, 2007. Lastly, an additional EC/OC unit was deployed to Tecumseh (260910007) on March 31, 2008 and operated until September 8, 2008 to characterize levels upwind from Detroit. It was removed in September 2008 to aid in a special study characterizing particulate near the Rouge Mere Rail Yard in Dearborn. The EC/OC sampler was returned to Tecumseh (260910007) on January 29, 2009.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 18: MICHIGAN'S PM_{2.5} SPECIATION NETWORK IN 2009 AND 2010

Operating Schedule: Once Every 3 days (Allen Park), once every 6 days all others										Network as of April 15, 2010									
Method: Met One SASS and two URG 3000 N units to collect organic & elemental carbon at Dearborn & Ypsilanti																			
Monitoring Sites			Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)	Comments							
Site Name	AQS Site ID	Address																	
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.9842	-85.67139	1:6	Pop. Exp.	Neighborhood	Kent	11/4/99	GW	778,009								
Tecumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	1:6	up wind backgrd	regional	Lenawee	7/6/93	Not in CBSA	N/A	SPM							
Houghton Lake	261130001	1769 S Jeffs Rd	44.3106	-84.89194	1:6	Background	Regional	Missaukee	10/9/03	Not in CBSA	N/A								
Luna Pier	261150005	Erie Shooting Club	41.7639	-83.47194	1:6	Transport	Regional	Monroe	12/17/99	M	152,721								
Port Huron	261470005	2525 Dove Rd.	42.9533	-82.45639	1:6	Pop. Exp.	Regional	Saint Clair	7/5/08	DWL	4,403,437								
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	1:3	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	4,403,437								
Detroit - SW HS	261630015	SW Highschool, 150 Waterman St	42.3028	-83.10667	1:6	Pop. Exp. Max. Conc.	Neighborhood	Wayne	11/2/08	DWL	4,403,437								
Dearborn	261630033	2842 Wyoming, Salina School	42.3067	-83.14889	1:6	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	4,403,437								
Continuous Speciation Measurements																			
Monitoring Sites			Latitude	Longitude	Sampling Method	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)	Comments							
Site Name	AQS Site ID	Address																	
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	McGee large spot Aethalometer (carbon black)	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	4,403,437								
Dearborn	261630033	2842 Wyoming, Salina School	42.3067	-83.14889	McGee large spot Aethalometer (carbon black)	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	4,403,437								
Tecumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	Sunset EC/OC	up wind backgrd	regional	Lenawee	7/6/93	Not in CBSA	N/A	SPM							
Detroit - Newberry School	261630038	4045 29 th St	42.335	-83.1097	Sunset EC/OC	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	4,403,437								
Dearborn	261630033	2842 Wyoming, Salina School	42.3067	-83.14889	Sunset EC/OC	Pop. Exp. Max. Conc.	Neighborhood	Wayne	6/11/07	DWL	4,403,437								
¹ CBSA Key: <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">DWL= Detroit-Warren-Livonia Metro. Area</td> <td style="width: 50%;">SPM = Special Purpose Monitor</td> </tr> <tr> <td>GW=Grand Rapids-Wyoming Metro. Area</td> <td></td> </tr> <tr> <td>M = Monroe Metro. Area</td> <td></td> </tr> </table>														DWL= Detroit-Warren-Livonia Metro. Area	SPM = Special Purpose Monitor	GW=Grand Rapids-Wyoming Metro. Area		M = Monroe Metro. Area	
DWL= Detroit-Warren-Livonia Metro. Area	SPM = Special Purpose Monitor																		
GW=Grand Rapids-Wyoming Metro. Area																			
M = Monroe Metro. Area																			

FIGURE 10: MICHIGAN'S 2009 AND 2010 PM_{2.5} SPECIATION NETWORK



Speciation Quality Assurance

The DNRE has adopted and follows the EPA's QAPP for the speciation trends network. The site operator conducts flow checks for precision every four weeks. The results from the precision checks are sent to the auditor for review each month. The QA team conducts flow rate audits on the PM_{2.5} speciation monitors every six months. The auditor also assesses the monitoring station and siting criteria to ensure it continues to meet the measurement quality objectives. The audit results are reviewed by the AMU's QA Coordinator, and hard copies are retained in the QA files. The audit data is also uploaded to the EPA's AQS database.

The EPA conducted flow rate and system audits on four of the network's PM_{2.5} speciation monitors in 2006. All four stations that were audited were found to be acceptable and meeting the measurement quality objectives. The EPA also conducts audits of RTI National Laboratory, which supplies speciation analysis services for the entire nation.

Plans for the 2011 PM_{2.5} Speciation Monitoring Network

During 2011, contingent upon adequate levels of funding, Michigan is planning to continue to operate 24-hour PM_{2.5} speciation monitors at:

- The sampling frequency of the Grand Rapids – Monroe St. (260810020) speciation sampler will be increased from once every six days to once every three days by January 1, 2011.
- Tecumseh (260910007) operating once every six days
- Houghton Lake (261130001) operating once every six days
- Luna Pier (261150005) operating once every six days
- Port Huron (261470005) operating once every six days
- Allen Park (261630001) operating once every three days
- Dearborn (261630033) operating once every six days

PM₁₀ MONITORING NETWORK:

The October 17, 2006 monitoring regulations modified the minimum number of PM₁₀ samplers required in MSAs. Since then, further revisions have occurred relaxing the numbers of sites required in high population areas with low concentrations of PM₁₀, as shown in **Table 19**.²³

TABLE 19: PM₁₀ 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 EPA and the State Agency.

² High concentration areas are those for which ambient PM₁₀ data show ambient concentrations exceeding the PM₁₀ NAAQS by 20% or more.

³ Medium concentration areas are those for which ambient PM₁₀ data show ambient concentrations exceeding 80% of the PM₁₀ NAAQS.

⁴ Low concentration areas are those for which ambient PM₁₀ data show ambient concentrations < 80% of the PM₁₀ NAAQS.

⁵ These minimum monitoring requirements apply in the absence of a design value.

Applying **Table 19** to Michigan's urban areas, population totals and historical PM₁₀ data results in the design requirements that are shown in **Table 20**.

According to the tables, two to four PM₁₀ 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- SW HS (261630015) and the design value site at Dearborn (261630033).

The PM₁₀ monitoring requirements specify that one to two PM₁₀ sites are required in the Grand Rapids-Wyoming MSA. There are two sites currently in operation in Grand Rapids, one on Wealthy St (260810007) and one on Monroe St. (260810020). Both of these sites are operational at the request of EPA Region 5.

According to the requirements, either no or one PM₁₀ monitors are required in the Flint MSA. In 2006, the DNRE operated a PM₁₀ sampler in Flint (260490021) but as a result of budget cuts, PM₁₀ sampling was discontinued on April 1, 2007.

As part of a special study investigating the concentrations of manganese (Mn) in the Detroit urban area, a PM₁₀ high volume unit started sampling at River Rouge (261630005) on January 25, 2009. The PM₁₀ filters at River Rouge (261630005), Allen Park (261630001), Detroit - SW HS (261630015) and Dearborn (261630033) were analyzed for Mn and compared with the TSP concentrations of Mn. An added benefit of this study is the collection of levels of PM₁₀ at River Rouge (261630005). The Manganese Work Group will be analyzing the data after one year has been collected. Decisions about future monitoring for Mn in SE Michigan will be made by the work group.

²³ Table D-4 of Appendix D to Part 58.

PM course measurements are required at NCore sites. One acceptable technology is the use of Partisol 2025 units equipped with either a PM_{2.5} head and a WINS impactor or a PM₁₀ head and a down tube. PM course is determined by subtracting the fine particulate from the PM₁₀. Therefore, to meet the NCore requirements, a partisol sampler equipped with a PM₁₀ head and a down tube were deployed to Grand Rapids – Monroe St. (260810020) and Allen Park (261630001) on January 14, 2010 and January 8, 2010, respectively.

Table 21 summarizes the PM₁₀ monitoring site information for sites that were in existence in 2009. **Table 22** shows the PM₁₀ sites that are currently in operation. **Figure 11** compares the PM₁₀ network in 2009 with the current design.

TABLE 20: APPLICATION OF THE MINIMUM PM₁₀ MONITORING REGULATIONS IN THE APRIL 30, 2007 CORRECTION TO THE OCTOBER 17, 2006 FINAL REVISION TO THE MONITORING REGULATION TO MICHIGAN'S PM₁₀ NETWORK

Design value sites are in bold				2007-2009 most recent 3- year PM ₁₀ design value (24-Hr)	Conc. Class.	Min No monitors Required
MSA	Est 2009 Population	Counties	Existing Monitors			
Detroit-Warren-Livonia Metro Area	4,403,437	Macomb	---	---		2-4
		Oakland	---	---		
		Wayne	Allen Park	38	low	
			Detroit -SW HS	52	low	
			Dearborn	69	low	
		Lapeer	---	---		
Livingston	---	---				
Flint Metro Area	424,043	Genesee	Flint	discontinued	low	0 -1
Monroe Metro Area	152,721	Monroe	---	---		
Ann Arbor Metro Area	347,563	Washtenaw	---	---		
Grand Rapids-Wyoming Metro Area	778,009	Kent	GR - Monroe St	34		1-2
			GR- Wealthy	43	low	
		Barry	---	---		
		Newaygo	---	---		
		Ionia	---	---		
Holland-Grand Haven Metro Area	261,957	Ottawa	---	---		
Muskegon-Norton Shores Metro Area	173,951	Muskegon	---	---		
Lansing-East Lansing Metro Area	453,603	Clinton	---	---		
		Ingham	---	---		
		Eaton	---	---		
Bay City Metro Area	107,434	Bay	---	---		
Saginaw-Saginaw Twp N Metro Area	200,050	Saginaw	---	---		
Kalamazoo-Portage Metro Area	326,634	Kalamazoo	---	---		
		Van Buren	---	---		
Niles-Benton Harbor Metro Area	160,472	Berrien	---	---		
Jackson Metro Area	159,828	Jackson	---	---		
Battle Creek Metro Area	135,616	Calhoun	---	---		
South Bend-Mishawaka Metro Area IN/IM	317,538	Cass	---	---		

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

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 21: MICHIGAN'S 2009 PM₁₀ MONITORING NETWORK

Operating Schedule: Once Every 6 days (Continuous measurements are also available at Dearborn)
 Method: Manual High Volume Sampler (Dearborn also uses a R&P TEOM to make continuous measurements) Network as of December 2009

Monitoring Sites			Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
Site Name	AQS Site ID	Address										
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	1:6	High Vol	pop exp	nghbrhd	Wayne	9/12/87	DWL	4,403,437
Detroit - SW HS	261630015	150 Waterman	42.3028	-83.10667	1:6	High Vol	max conc	nghbrhd	Wayne	3/27/87	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.3067	-83.14889	1:6	High Vol	max conc	nghbrhd	Wayne	6/12/90	DWL	4,403,437
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.67139	1:6	High Vol	pop exp	nghbrhd	Kent	3/20/87	GW	778,009
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.67139	1:6	High Vol	pop exp	nghbrhd	Kent	3/20/87	GW	778,009
Grand Rapids - Wealthy St	260810007	509 Wealthy	42.9561	-85.67917	1:6	High Vol	pop exp	nghbrhd	Kent	2/3/89	GW	778,009
River Rouge	261630005	315 Genesee	42.2672	-83.13222	1:6	High Vol	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.3067	-83.14889	1:6	High Vol for precision	max conc	nghbrhd	Wayne	6/12/90	DWL	4,403,437
Dearborn	261630033 continuous	2842 Wyoming	42.3067	-83.14889	continuous	R&P PM10 TEOM	max conc	nghbrhd	Wayne	4/1/00	DWL	4,403,437

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

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 22: 2010 PM₁₀ MONITORING NETWORK IN MICHIGAN

Operating Schedule: Once Every 6 days (Continuous measurements are also available at Dearborn)

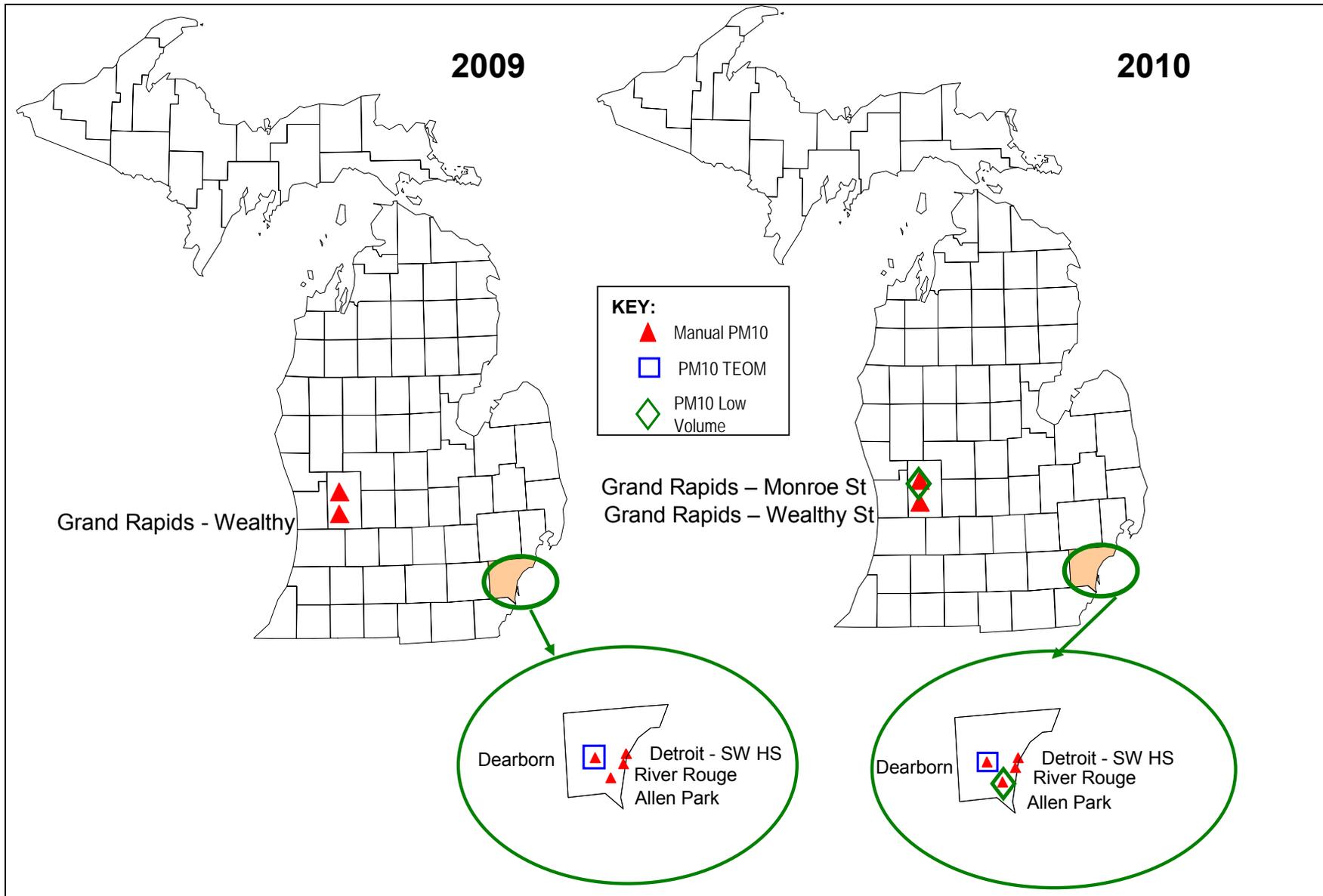
Method: Manual High Volume Sampler (Dearborn also uses a R&P TEOM to make continuous measurements)

Network as of March 15, 2010

Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
	AQS Site ID	Address										
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	1:6	High Vol	pop exp	nghbrhd	Wayne	9/12/87	DWL	4,403,437
Detroit - SW HS	261630015	150 Waterman	42.3028	-83.10667	1:6	High Vol	max conc	nghbrhd	Wayne	3/27/87	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.3067	-83.14889	1:6	High Vol	max conc	nghbrhd	Wayne	6/12/90	DWL	4,403,437
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.67139	1:6	High Vol	pop exp	nghbrhd	Kent	3/20/87	GW	778,009
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.67139	1:6	High Vol	pop exp	nghbrhd	Kent	3/20/87	GW	778,009
Grand Rapids - Wealthy St	260810007	509 Wealthy	42.9561	-85.67917	1:6	High Vol	pop exp	nghbrhd	Kent	2/3/89	GW	778,009
River Rouge	261630005	315 Genesee	42.2672	-83.13222	1:6	High Vol	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.3067	-83.14889	1:6	High Vol for precision	max conc	nghbrhd	Wayne	6/12/90	DWL	4,403,437
Dearborn	261630033 continuous	2842 Wyoming	42.3067	-83.14889	continuous	R&P PM10 TEOM	max conc	nghbrhd	Wayne	4/1/00	DWL	4,403,437

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

FIGURE 11: COMPARISON OF MICHIGAN'S 2009 AND 2010 PM₁₀ MONITORING NETWORK



History of PM₁₀ Co-located and Continuous PM₁₀ Measurements

Prior to 2001, both the DNRE and the Wayne County Department of the Environment, Air Quality Management Division were responsible for operating PM₁₀ networks outside of and within Wayne County, respectively. The monitoring site that measured the highest concentration of PM₁₀ in each of these monitoring networks was subject to special monitoring requirements, as specified in the air monitoring regulations in effect during that time. In Wayne County, the highest PM₁₀ levels were measured at the Dearborn site (261630033) and were sufficiently high to trigger a daily sampling requirement. As time progressed, PM₁₀ levels dropped and the EPA allowed the sampling frequency of the manual sampler at Dearborn to be reduced to a once every six day frequency, if a continuous PM₁₀ sampler was added to the site. A Rupprecht & Patashnick PM₁₀ TEOM became operational on April 1, 2000, and the sampling frequency of the manual monitor was reduced to once every six days.

In the network outside of Wayne County, the Grand Rapids – Wealthy St. (260810007) monitor had the highest PM₁₀ values. Historically, PM₁₀ was sampled on a once every other day schedule, but as PM₁₀ levels dropped, the sampling frequency was reduced to once every six days.

To determine precision for each of the two PM₁₀ networks, a co-located monitor was operated on a once every six day sampling schedule at the two highest sites, Grand Rapids – Wealthy St. (260810007) and Dearborn (261630033). When a PM_{2.5} FRM sampler had to be added to Grand Rapids to meet the modifications in network design, the co-located PM₁₀ sampler was removed on December 31, 2006 due to limited power. In addition, two precision samplers were no longer required because the DNRE had assumed responsibility for the entire air monitoring network in October 2002.

PM₁₀ Quality Assurance

The site operator conducts a flow check once a month. The flow check values are sent to the Senior auditor 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 EPA's AQS database each quarter.

Plans for the 2011 PM₁₀ Monitoring Network

During 2011, contingent upon adequate levels of funding, the DNRE is planning to operate 24-hour PM₁₀ monitors at:

- The PM₁₀ monitor at Wealthy Street in Grand Rapids (260810007) on a once every six day schedule
- The PM₁₀ monitor at Monroe Street in Grand Rapids (260810020) on a once every six day schedule
- The PM₁₀ monitor in Allen Park (261630001) on a once every six day schedule
- The PM₁₀ monitor in Detroit – SW HS (261630015) on a once every six day schedule
- The PM₁₀ monitor in Dearborn (261630033) and the co-located PM₁₀ monitor on a once every six day schedule.

The DNRE is also planning to operate:

- The low volume PM₁₀ monitor at Grand Rapids - Monroe St. (260810020) on a once every six day schedule.
- The low volume PM₁₀ monitor in Allen Park (261630001) on a once every six day schedule.
- Contingent upon advice from the Manganese Work Group, the DNRE will continue to operate the PM₁₀ monitor at River Rouge (261630005) on a once every six day schedule.
- The special purpose monitor PM₁₀ TEOM at Dearborn (261630033) on a hourly schedule.

CARBON MONOXIDE (CO) MONITORING NETWORK:

The new monitoring regulations no longer require CO monitoring. Therefore, when the budget was cut April 2007, the following CO monitors were shut down: Warren (260991003), Oak Park (261250001), Livonia (261630025), and Detroit - Linwood (261630016). In the previous year, the trace level CO monitors at Detroit - Newberry School (261630038) and at Detroit – FIA/Lafayette (261630039) were shut down on March 31st. Since Grand Rapids and Allen Park are NCore sites and trace CO is a required component of the NCore program, the CO monitors at Grand Rapids – Monroe St. (260810020) and Allen Park (261630001) were shut down and replaced with trace gas CO monitors.

However, a new CO NAAQS is scheduled to be proposed in October 2010. If the air quality standard is modified, new monitoring requirements may be created. In light of the possibility of a new CO standard and associated monitoring requirements, the DNRE is not proposing any changes to the CO monitoring network at this time.

Table 23 summarizes the CO monitoring site information for sites that were in existence in 2009 and 2010. **Figure 12** shows the distribution of CO monitors across the state of Michigan.

Trace CO Quality Assurance

The site operator performs a precision check of the analyzer every two weeks. Results of precision checks are sent to the senior auditor 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 dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor. 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 results of the precision checks and audits to the EPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

At this time, the EPA is not conducting thru-the-probe audits for the trace level CO monitors, but intends to implement this program in the future.

Plans for the 2011 CO Monitoring Network

During 2011, contingent upon adequate levels of funding, Michigan is planning to continue to operate trace level CO monitors to support NCore operations, due January 1, 2011:

- Grand Rapids – Monroe St. (26810020)
- Allen Park (261630001)

TABLE 23: MICHIGAN'S CO MONITORING NETWORK IN 2009 AND 2010

Operating Schedule: Continuous Network as of April 15, 2010
 Method: Gas Filter Correlation Analyzer- Trace CO

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
	AQS Site ID	Address									
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	nghbrhd	Kent	4/10/07	GW	778,009
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	nghbrhd	Wayne	5/24/07	DWL	4,403,437

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

FIGURE 12: MICHIGAN'S CO MONITORING NETWORK IN 2009 AND 2010



NITROGEN DIOXIDE (NO₂) AND NO_y MONITORING NETWORK:

On February 9, 2010, the EPA modified the NO₂ NAAQS. Prior to this date, there was a single form of the standard; the annual average concentration of NO₂ could not be greater than 53 parts per billion (ppb). The EPA has added an hourly level of 100 ppb to the NAAQS.

Along with modifications to the standard, changes to the design of the ambient monitoring network also occurred. A three-tiered monitoring network for NO₂ will focus on near roadway monitoring as well as monitoring at ambient locations. The minimally required components of the network are:

Tier 1: Near Roadway Monitors

1. Every CBSA with a population greater than or equal to 500,000 people must have a microscale NO₂ 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

1. One NO₂ 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 NO₂ and should use a neighborhood or larger scale. Emission inventory data should be used to make this selection.

Tier 3: Regional Administrator Required Monitors

1. The EPA Administrator must require a minimum of 40 NO₂ monitors nationwide in locations with "susceptible and vulnerable" populations.

The network design described above shall use the latest available census figures. The new monitoring stations must be deployed and operational by January 1, 2013²⁴.

Table 24 summarizes the monitoring requirements for NO₂ according to the various tiers for all CBSAs in Michigan. As shown by the table, one monitor is required in Grand Rapids-Wyoming MSA and three monitors are required in the Detroit-Warren-Livonia MSA. There are no highway segments with an AADT equal to or greater than 250,000 according to the Michigan Department of Transportation (MDOT) 2008 Sufficiency Report. The roadway segments with AADT closest to 250,000 are located in southeast Michigan along sections of I-696 between I-75 and Couzens Ave. in Madison Heights at 210,000 AADT and between the 11 Mile inter-change at Parkview Blvd. and Mound Rd in Warren at 201,300 AADT. All other sections of roadway in Michigan are under 200,000 AADT.

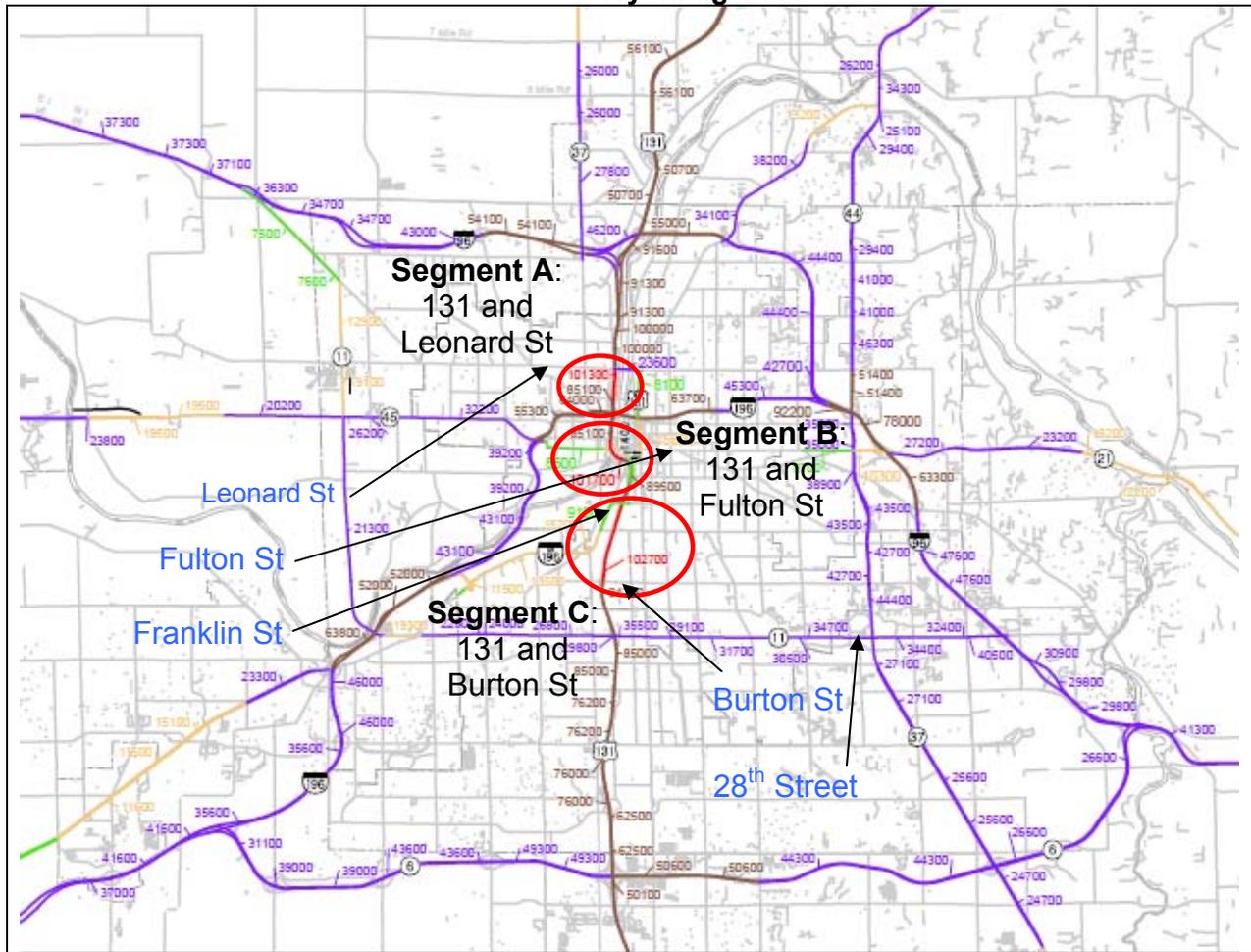
²⁴ "Primary National Ambient Air Quality Standards for Nitrogen Dioxide" EPA 40 CFR Parts 50 and 58. February 9, 2010.

The single near-roadway monitor that is required in the Grand Rapids-Wyoming MSA needs to be sited within 50 m of the roadway segment with the highest ADDT. **Figure 13** illustrates possible locations for the near roadway site, labeled A to C from north to south. At point A, there is an MDOT parking area near the roadway, which is above grade. However, once a trailer is deployed to this location the probe height will be level with the roadway. The location shown in the site photograph labeled A is east of the highway. The highway in this area is at grade. Whatever site is ultimately chosen, the DNRE will work with the MDOT to obtain access to the road right of way and to find the safest possible location for monitoring to be conducted. The ideal location for the Grand Rapids-Wyoming near roadway site appears to be near segment A.

Table 24: NO₂ Network Design

MSA	Counties	Est 2009 Population	Near Roadway Monitors Req'd	Additional Near Roadway Site	250,000 AADT?	Community Wide Monitor	EJ Monitor
Detroit-Warren-Livonia Metro Area	Macomb Oakland Wayne Lapeer St Clair Livingston	4,403,437	1	1		1	
Flint Metro Area	Genesee	424,043					
Monroe Metro Area	Monroe	152,721					
Ann Arbor Metro Area	Washtenaw	347,563					
Grand Rapids-Wyoming Metro Area	Kent Barry Newaygo Ionia	778,009	1				
Holland-Grand Haven Metro Area	Ottawa	261,957					
Muskegon-Norton Shores Metro Area	Muskegon	173,951					
Lansing-East Lansing Metro Area	Clinton Ingham Eaton	453,603					
Bay City Metro Area	Bay	107,434					
Saginaw-Saginaw Twp N Metro Area	Saginaw	200,050					
Kalamazoo-Portage Metro Area	Kalamazoo Van Buren	326,634					
Niles-Benton Harbor Metro Area	Berrien	160,472					
Jackson Metro Area	Jackson	159,828					
Battle Creek Metro Area	Calhoun	135,616					
South Bend Mishawaka Metro Area IN/MI	Cass	317,538					

Figure 13: Annual Average Daily Traffic Counts²⁵ in the Grand Rapids-Wyoming MSA



²⁵ Michigan Department of Transportation web site, 2/26/2010.

Figure 14: Views around Segment A: 131 and Leonard St in the Grand Rapids-Wyoming MSA



Figure 15: Views around Segment B: 131 and Fulton St in the Grand Rapids-Wyoming MSA



Figures 14 to 17 illustrate near roadway views for segments of Highway 131. Issues with other possible locations include roadway elevation, adequate space, access to property and availability of power. All of these preliminary locations will be re-evaluated once the EPA finalizes siting criteria for near-roadway network designs.

Figure 16: Views around Segment C: 131 and Burton St in the Grand Rapids-Wyoming MSA



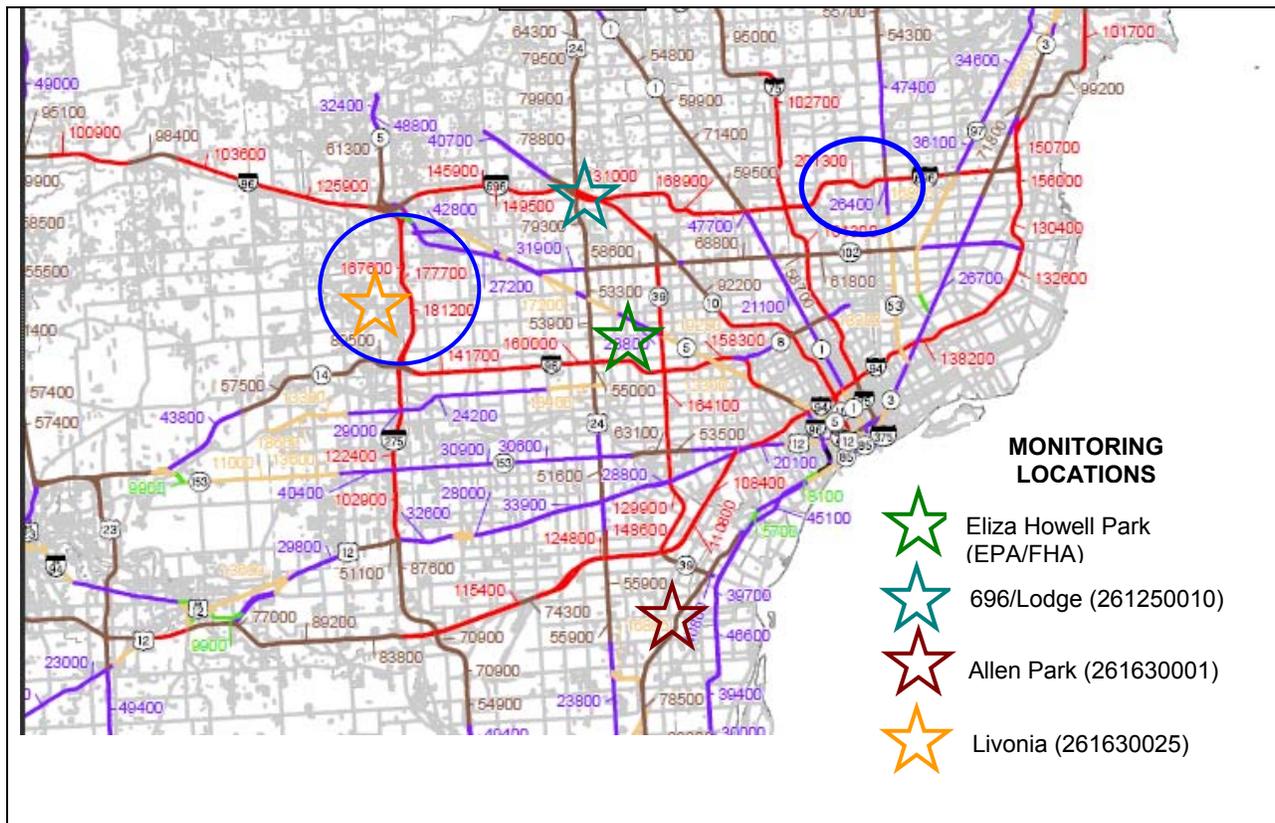
Figure 17: Views at 131 and 28th Street – Note High Volume TSP Samplers



As discussed previously, southeast Michigan contains roadway segments with AADT closest to 250,000. The first segment, labeled "Couzens Ave.," is along sections of I-696 between I-75 and Couzens Ave. in Madison Heights at 210,000 AADT. The second segment, labeled "Mound Rd.," lies between the 11 mile interchange at Parkview Blvd. and Mound Rd in Warren at 201,300 AADT. There are no other segments that exceed a 200,000 AADT in Michigan. Both the Couzens Ave. and Mound Rd segments are almost contiguous and are located within the blue circle in **Figure 18**.

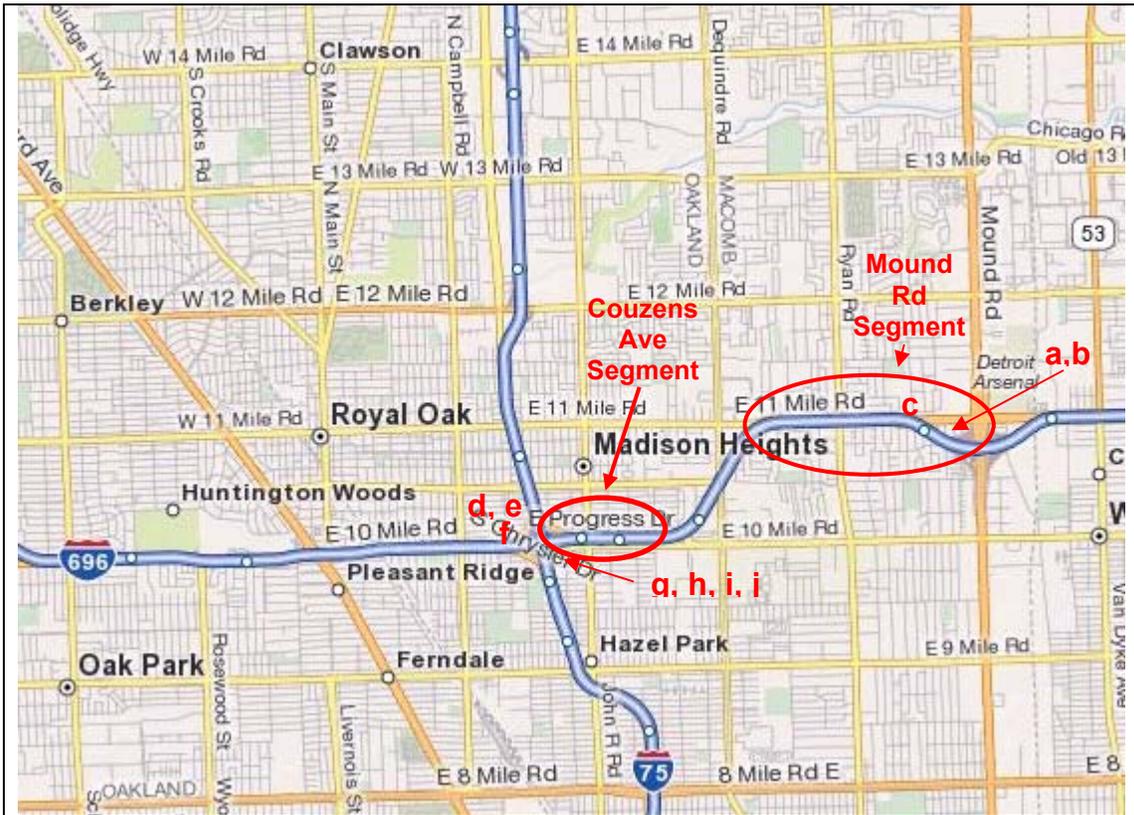
A magnified view of the roadways differentiates the Couzens Ave. and Mound Rd segments in **Figure 19**. Deploying two monitoring stations in southeast Michigan that are near heavily used highways that are at grade may be difficult because many of the segments are below grade.

Figure 18: Annual Average Daily Traffic Counts²⁶ in The Detroit-Warren-Livonia MSA



²⁶ Michigan Department of Transportation web site, 2/26/2010.

Figure 19: Location of the Couzens Ave. and Mound Rd Segments in the Detroit-Warren-Livonia MSA



It can be argued that because the Couzens Ave. and Mound Rd segments are almost contiguous along the same highway, and any near roadway monitoring would be measuring much of the same traffic, with only one or two ramps between potential monitoring sites. Also, the Mound Rd segment is almost entirely below grade, and not suitable for a near roadway site, shown by the photos in **Figure 20**.

Figure 20: Photos of Mound Rd Segment



One of the two near roadway monitoring sites may be located along the Couzens Ave. segment at the southeast corner of the 696 and I-75 intersection. See photos in **Figure 21**, especially points I and j. There is an area near the base of the mobile tower, offering a safe parking location for staff visiting the station. Power is readily available so installation costs will be minimized. There is also sufficient space to house a shelter. However, the DNRE will need to negotiate with the MDOT before any access can be granted.

Figure 21: Photos of Couzens Road Segment

		
Point e – I 75 looking S on 696 Interchange	Point f – knoll above I 75 looking W Stephenson-Dallas	Point g – SE corner 696 & I 75 looking S
		
Point h – I 75-696 Coy-Chrysler	Point i – I 75-696 Coy-Chrysler close up	Point j – I 75-696 Coy-Chrysler close up #2

Other possible monitoring locations for near roadway stations in southeast Michigan include the area along 275 between 96 and 14 with AADTs ranging from 167,600 to 181,200.

Along the 275 corridor, there is a rest station operated by the MDOT, which could provide a location that offers safe parking, available power and sufficient space for a shelter. This area is shown by the circle on the left in **Figure 18**. Other options include rebuilding the near roadway monitoring station at the intersection of 696-Lodge and Telegraph (261250010) that was used in the Detroit pilot project or adding a monitoring station to the Eliza Howell Park where the near-roadway study is being conducted by the EPA/FHA. Selection of either of these two sites would promote continuity with other datasets. The Livonia site (261630025), which is located 500 feet to the west of I-275, would be a good background site assessing levels upwind of a roadway. This would be useful if paired with a station on the other side of the roadway for down wind NO₂ levels. There is already a NO_y monitor operational at the NCore station at Allen Park (261630001), but the shelter is too far (647 feet or 196 meters) from I-75 to meet the siting requirements. However, there is a water treatment plant at the site that meets the separation distance from I-75. There is a possibility that a monitor could be housed in this building.

Area wide monitoring is required in every CBSA with 1,000,000 or more people. The Detroit-Warren-Livonia CBSA is the only CBSA meeting this requirement in Michigan. The DNRE is currently operating a NO₂ monitor at the Detroit -E 7 Mile site (261630019) in northeast Detroit which is downwind from the urban core and located in a residential neighborhood expected to have high NO₂ levels. A NO_y is currently operational at the Allen Park NCore site (261630001) which is sandwiched between a residential neighborhood and I-75. Either of these locations would be a suitable area wide monitoring site.

The final tier of the new NO₂ monitoring network could include an environmental justice component as determined by the EPA Administrator. Forty additional monitoring sites will be deployed through out the nation to meet the environmental justice component of the network design. **Figure 22** shows the locations of environmental justice locations in most of the state. **Figure 23** shows the locations of these areas in southeast Michigan.

Figure 22: Environmental Justice Areas in Michigan

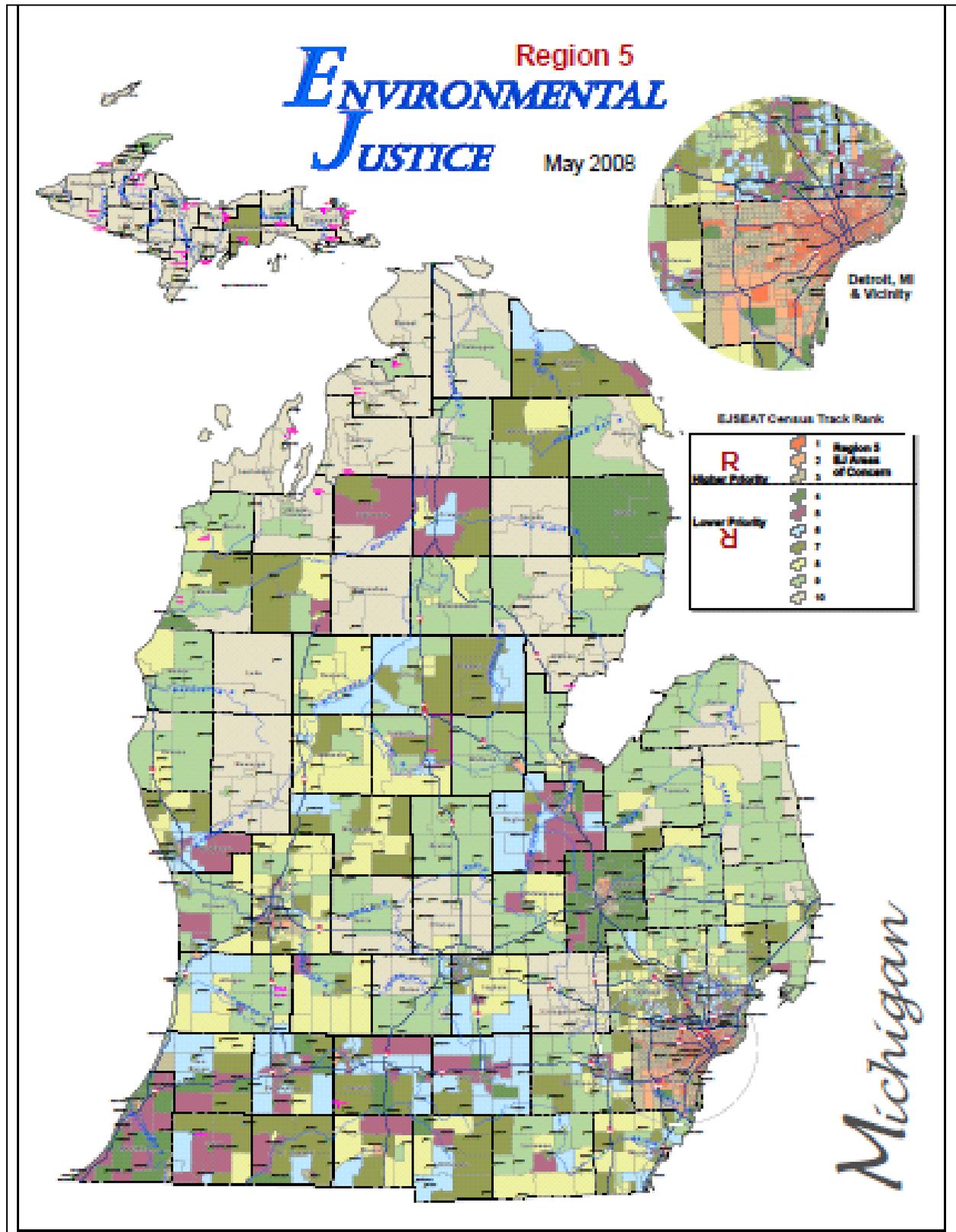
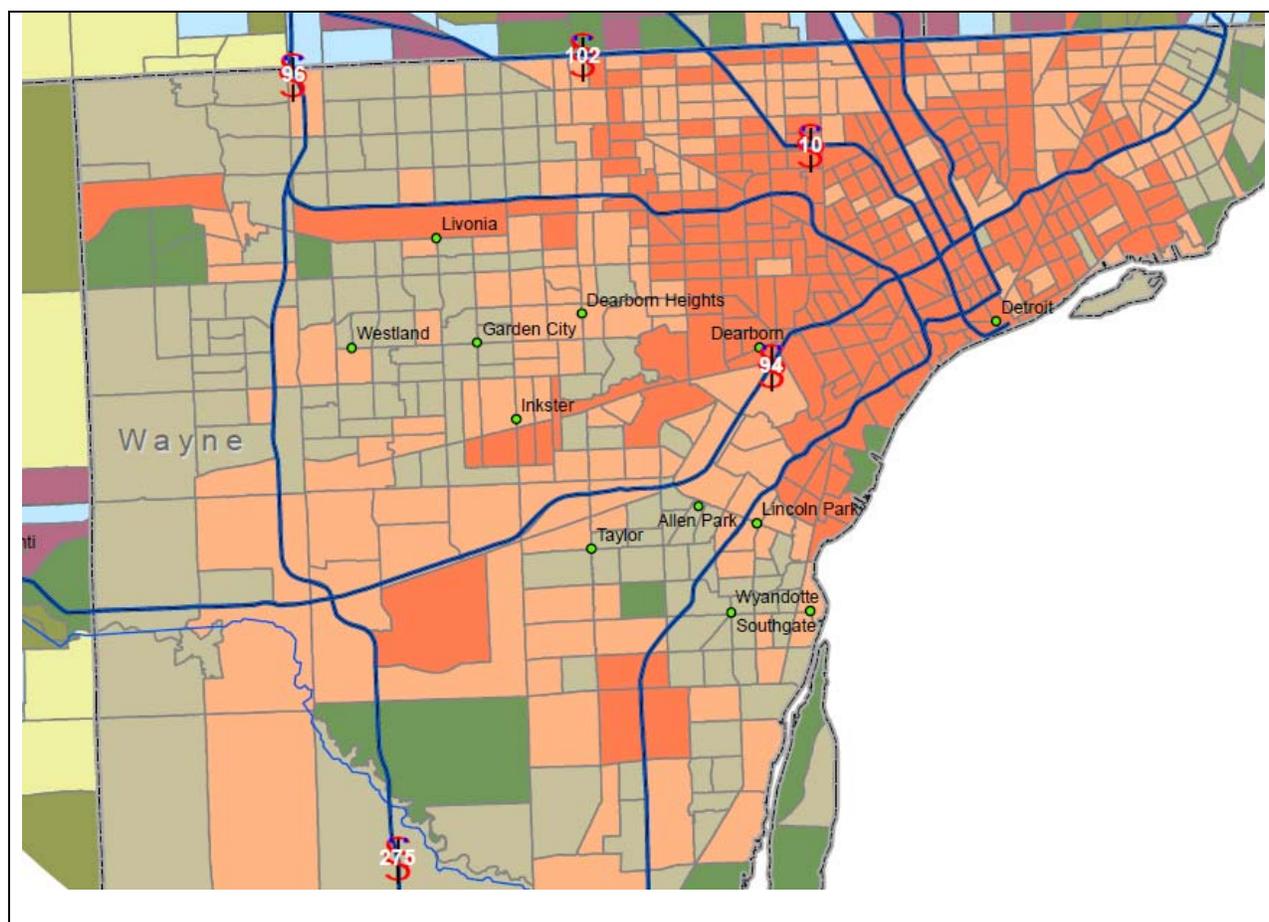


Figure 23: Environmental Justice Areas in Southeast Michigan



The DNRE has minimized the coverage of its NO₂ monitoring network, retaining a single NO₂ monitor at the Detroit PAMS site located at the Detroit - E 7 Mile (261630019) site. It is a downwind NO₂ site in the Detroit area.

Recent modeling projects for new source review have shown that there is a possibility that the new NO₂ NAAQS could be violated using the very conservative estimates in the current techniques. More refined modeling that would provide a more accurate picture of the impact from new sources could be performed; however, the DNRE lacks ambient data required for use in the models. At least five years of NO₂ data are required in both urban and rural locations. Therefore, beginning July 1, 2010, the DNRE will begin collecting NO₂ measurements at Houghton Lake (261130001) and at Lansing (260650012).

Trace NO_y monitors for the NCore sites at Grand Rapids – Monroe St. (260810020) and Allen Park (261630001) were deployed in December 2007. The monitors have been operating intermittently due to instrument malfunctions. The DNRE has purchased a spare unit to ensure the collection of complete data.

Table 25 summarizes the NO₂ and NO_y monitoring site information for sites that were in existence in 2009. **Table 26** shows the NO₂ and NO_y sites that are currently in operation or will become operational during 2010. **Figure 24** compares the NO₂ and NO_y monitoring network in 2009 with the current design.

NO₂ and NO_y Quality Assurance

The site operator performs a precision check of the analyzer every two weeks. The precision checks are sent to the senior auditor 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. 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 EPA'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) NO₂ and NO_y monitors, the EPA conducts thru-the-probe audits to 20% 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 EPA is not conducting thru-the-probe audits for the trace level monitors, but intends to implement this program in the future.

Plans for the 2011 NO₂ and NO_y Monitoring Network

During 2011, contingent upon adequate levels of funding, the DNRE is planning to operate NO₂ at:

- Lansing (260650012)
- Houghton Lake (261130001)
- Detroit - E 7 Mile (261630019)

Also contingent upon adequate funding, the DNRE will continue to operate trace level NO_y monitors at the NCore sites:

- Grand Rapids – Monroe St. site (26810020)
- Allen Park site (261630001)

Beginning January 1, 2013, the DNRE will operate the near roadway and community-oriented NO₂ monitors. As the monitoring network designs become more finalized, they will continue to be documented in the annual network reviews.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

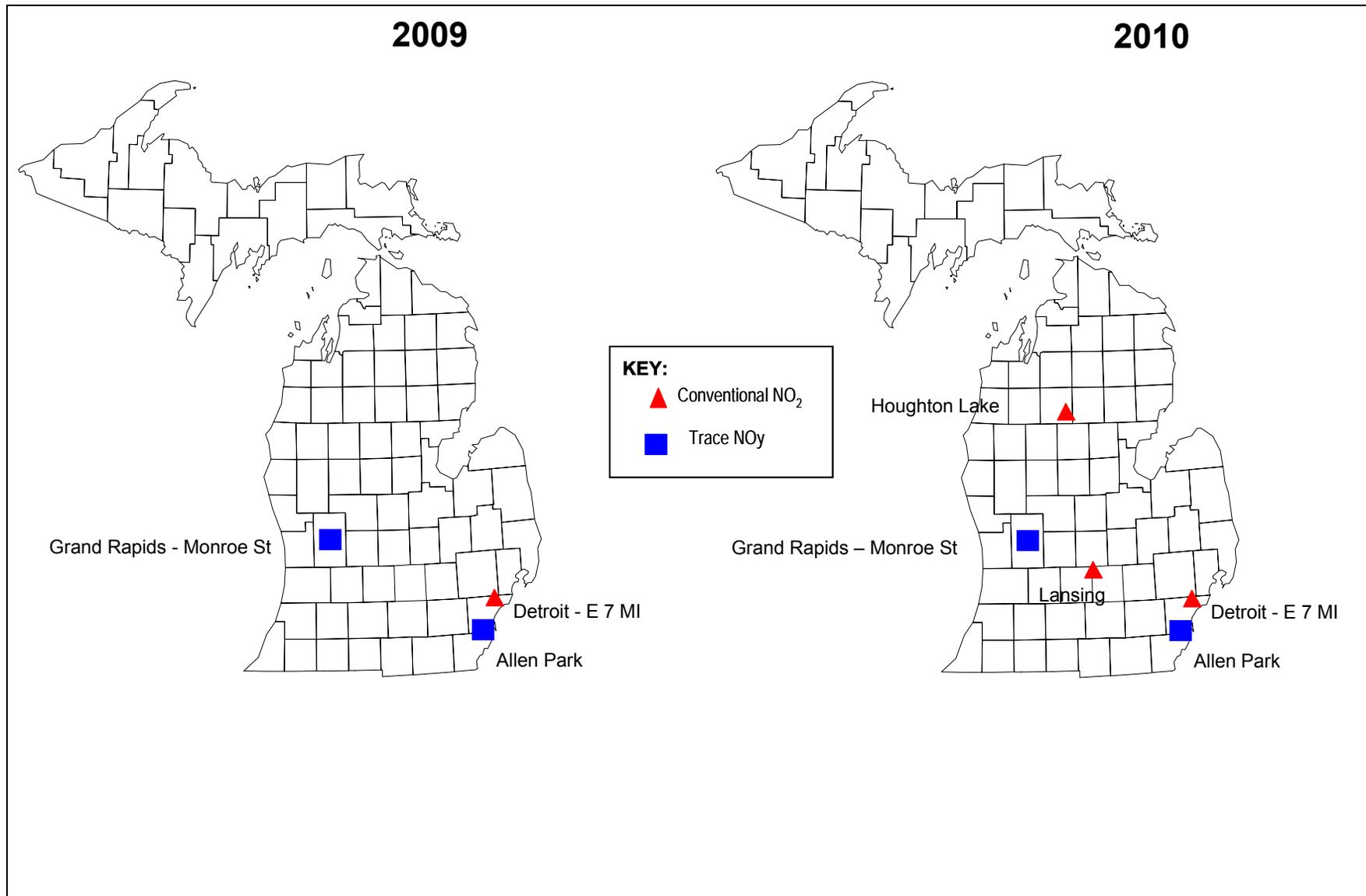
TABLE 25: MICHIGAN'S 2009 NO₂ AND NO_y MONITORING NETWORK

Operating Schedule: Continuous										Network as of October, 2009	
Method: Chemiluminescence										Former NAMS sites are shown in bold.	
Monitoring Sites			Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
Site Name	AQS Site ID	Address									
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.431	-83.00028	NO ₂	pop exp	urban	Wayne	12/1/90	DWL	4,403,437
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984	-85.67139	NO _y	pop exp	nghbrhd	Kent	1/1/08	GW	778,009
Allen Park	261630001	14700 Goddard	42.229	-83.20833	NO _y	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,403,437
¹ CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area GW=Grand Rapids-Wyoming Metro. Area											

TABLE 26: 2010 NO₂ AND NO_y MONITORING NETWORK IN MICHIGAN

Operating Schedule: Continuous										Network as of April 15,2010	
Method: Chemiluminescence										Former NAMS sites are shown in bold.	
Monitoring Sites			Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
Site Name	AQS Site ID	Address									
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.431	-83.00028	NO ₂	pop exp	urban	Wayne	12/1/90	DWL	4,403,437
Houghton Lake	261130001	1769 S Jeffs Road	44.311	-84.89194	NO ₂	background	regional	Missaukee	7/1/10	Not in CBSA	N/A
Lansing	260650012	220 N Pennsylvania	42.739	-84.53472	NO ₂	pop exp	nghbrhd	Ingham	7/1/10	LEL	453,603
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984	-85.67139	NO _y	pop exp	nghbrhd	Kent	1/1/08	GW	778,009
Allen Park	261630001	14700 Goddard	42.229	-83.20833	NO _y	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,403,437
¹ CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area GW=Grand Rapids-Wyoming Metro. Area LEL= Lansing-E. Lansing Metro. Area											

FIGURE 24: COMPARISON OF MICHIGAN'S 2009 AND 2010 NO₂ AND NO_y MONITORING NETWORK



SULFUR DIOXIDE (SO₂) MONITORING NETWORK:

On November 16, 2009, the EPA proposed to strengthen the SO₂ NAAQS by changing the standard from a 24-hour based form not to exceed 140 ppb and an annual average that may not exceed 30 ppb to include an hourly measurement that can't exceed a level between 50 and 100 ppb. The EPA proposed either a 4th highest or 99th percentile form that would be averaged over three years. Changes to the monitoring network were also proposed.

The EPA envisioned a two-tiered approach to creation of a SO₂ monitoring network. The first tier of monitors were to be placed in Core Based Statistical Areas (CBSAs) that have certain population and emission totals. The second tier of monitors were distributed according to a state's contribution to national SO₂ emissions.

To more specifically describe the first tier of monitoring requirements, the EPA created the Population Weighted Emissions Index (PWEI) that is calculated by:

$$(CBSA\ population^{27}) * (total\ SO_2\ emissions\ in\ that\ CBSA\ in\ tpy) / 1,000,000 = PWEI$$

The PWEI value for each CBSA is compared to the following table to determine the number of monitoring sites that are required:

Table 27: First Tier SO₂ Monitoring Requirements in the Proposed NAAQS

Population Weighted Emissions Index Value	Number of Sites
Greater than or equal to 1,000,000	3
Greater than or equal to 10,000 but less than 1,000,000	2
greater than or equal to 5,000 but less than 10,000	1
Less than 5,000	0

On June 22, 2010, EPA finalized the SO₂ NAAQS. The new one-hour standard is set at a level of 75 ppb. The 99th percentile of the daily maximum hourly concentrations are averaged over three years and compared to the level.

EPA also modified the network design by abandoning the two tier approach. The second tier of the monitoring network design that was to be based upon the contribution to national SO₂ emissions was eliminated. A hybrid approach to the PWEI-based network design was created. Instead of conducting source oriented monitoring, the PWEI monitors would serve a variety of purposes including assessing population exposure, determining trends and transport as well as ascertaining background levels.

Contributions from sources would be modeled with the outputs used to determine compliance with the NAAQS. If an area becomes designated as non-attainment as a result of the model output, both monitoring AND modeling would have to show that the area meets the NAAQS in order to achieve attainment.

Due to the reliance on modeling to assess impacts from sources, such a large monitoring network was no longer required, so EPA changed the cut off points shown in **Table 27**, reducing the total number of sites. The new requirements are shown in **Table 28**.

The change in focus of the monitoring network allows agencies to count the NCore SO₂ monitors as part of these new requirements. Also, because the new SO₂ monitors are no longer

²⁷ According to the latest Census Bureau estimates

source oriented, existing infrastructure can be used to select locations for expansion of the SO₂ network.

Table 28: Population Weighted Emission Index Based Monitoring Requirements in the Final SO₂ NAAQS

PWEI Value	Number of Sites
Greater than or equal to 1,000,000	3
Greater than or equal to 100,000 but less than 1,000,000	2
greater than or equal to 5,000 but less than 100,000	1
Less than 5,000	0

If **Table 28** is applied to the PWEI calculations for the CBSAs in Michigan, the number of monitors that are required is shown in **Table 29**. These changes reduced the number of required SO₂ sites from twelve to five.

TABLE 29: POPULATION WEIGHTED EMISSIONS INDEX TOTALS FOR CBSAS IN MICHIGAN

MSA	Counties	2005 NEI		Est 2009 Population	NEI PWEI	Monitors Required
		Download: Total County SO ₂ Emissions, tpy	NEI SO ₂ Total Emissions, tpy			
Detroit-Warren-Livonia Metro Area	Macomb	57	117722	4,403,437	518,381	2
	Oakland	318				
	Wayne	47612				
	Lapeer	20				
	St Clair	69699				
	Livingston	16				
Flint Metro Area	Genesee	221	221	424,043	94	0
Monroe Metro Area	Monroe	128697	128697	152,721	19,655	1
Ann Arbor Metro Area	Washtenaw	24	24	347,563	8	0
Grand Rapids-Wyoming Metro Area	Kent	482	537	778,009	418	0
	Barry	3				
	Newaygo	1				
	Ionia	52				
Holland-Grand Haven Metro Area	Ottawa	42584	42584	261,957	11,155	1
Muskegon-Norton Shores Metro Area	Muskegon	14458	14458	173,951	2,515	0
Lansing-East Lansing Metro Area	Clinton	27	13528	453,603	6,136	1
	Ingham	10305				
	Eaton	3196				
Bay City Metro Area	Bay	30050	30050	107,434	3,228	0
Saginaw-Saginaw Twp N Metro Area	Saginaw	973	973	200,050	195	0
Kalamazoo-Portage Metro Area	Kalamazoo	2149	2160	326,634	706	0
	Van Buren	11				
Niles-Benton Harbor Metro Area	Berrien	31	31	160,472	5	0
Jackson Metro Area	Jackson	170	170	159,828	27	0
Battle Creek Metro Area	Calhoun	321	321	135,616	43	0
South Bend Mishawaka Metro Area IN/MI	Cass	10	10	317,538	3	0

Based on the 2005 emissions data and 2009 population estimates, the Detroit-Warren-Livonia CBSA needs two SO₂ monitoring sites, while the Monroe, Holland-Grand Haven and Lansing-East Lansing Metropolitan Areas each need a single SO₂ monitoring site.

The only non-NCORE SO₂ monitor that is still operational in Michigan is located at Detroit - SWHS (261630015) in the Detroit-Warren Livonia CBSA. This monitor was retained because it has the highest annual average SO₂ levels in Southeast Michigan, is located in an area that was modeled as nonattainment for SO₂ (but never actually violated the standard), was a NAMS site, and is important for trend purposes. This monitor has been in operation for 32 years. This monitor is one of the two SO₂ monitors that are required in the Detroit-Warren-Livonia CBSA. The NCORE trace level SO₂ monitor at Allen Park (261630001) fulfills the requirement for the second monitor.

The DNRE proposes to meet the requirement for a SO₂ monitor in the Holland-Grand Haven metropolitan area by deploying an SO₂ instrument to the Jenison site (261390005) in Ottawa County, by January 1, 2013.

The requirement for a SO₂ monitor in the Lansing – East Lansing metropolitan area will be met by deploying an instrument to the Lansing site (260650012) in Ingham county by January 1, 2013.

Lastly, the new SO₂ NAAQS requires a monitor in the Monroe metropolitan area. Possible changes to the ozone monitoring requirements may require the addition of an ozone monitor to the Monroe metropolitan area. DNRE will identify a suitable location and, if the proposed changes to the ozone NAAQS are finalized both an ozone and SO₂ monitors will be deployed by January 1, 2013. If the proposed ozone changes are not promulgated, only an SO₂ monitor will be deployed.

Trace levels of SO₂ are to be measured at NCORE stations. The DNRE is currently meeting this requirement at Grand Rapids – Monroe St. (260810020) and Allen Park (261630001) .

Table 30 summarizes the SO₂ monitoring site information for sites that were in existence in 2009 and are operating in 2010. **Figure 25** shows the geographical distribution of SO₂ sites across Michigan.

SO₂ Quality Assurance

The site operator performs a precision check of the analyzer every two weeks. The precision checks are sent to the senior auditor 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 dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor. 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 EPA'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) SO₂ monitors, the EPA conducts thru-the-probe audits to 20% 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 EPA is not conducting thru-the-probe audits for the trace level SO₂ monitors, but intends to implement this program in the future.

Plans for the 2011 SO₂ Monitoring Network

During 2011, contingent upon adequate levels of funding, the DNRE is planning to operate SO₂ at:

- Detroit - SW HS site (261630015).

Also contingent upon adequate funding, as part of the NCore operations, the DNRE will continue to operate trace level SO₂ monitors at:

- Grand Rapids – Monroe St. (26810020)
- Allen Park (261630001)

Beginning January 1, 2013, the DNRE will operate additional SO₂ monitors. As the monitoring network designs become more finalized, they will continue to be documented in the annual network reviews.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 30: MICHIGAN'S SO₂ MONITORING NETWORK IN 2009 AND 2010

Operating Schedule: Continuous

Method: Ultra Violet Stimulated Fluorescence

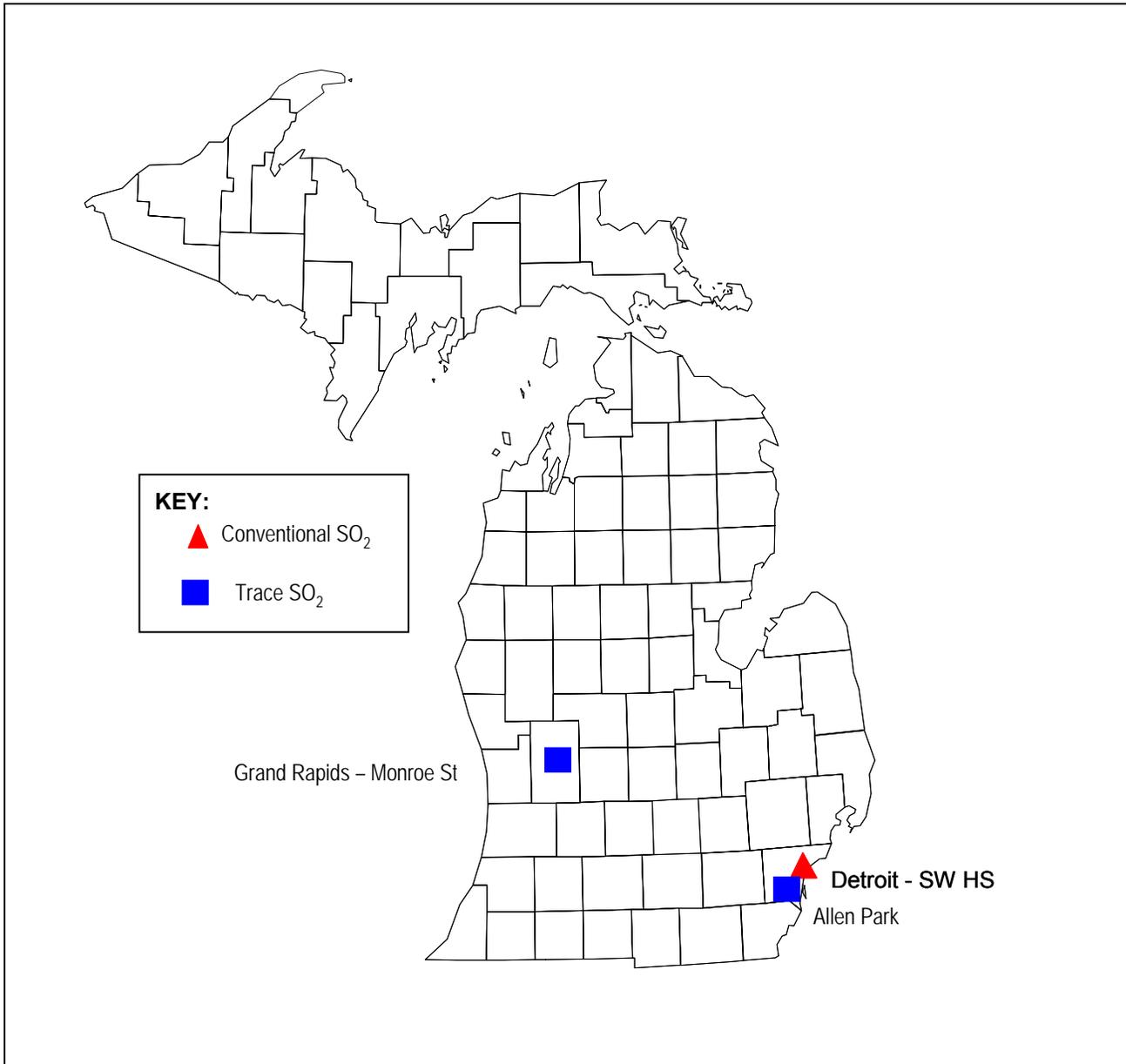
Network as of April 15, 2010

Former NAMS sites are shown in bold.

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA ¹	Est Pop. (2009 Census)
	AQS Site ID	Address									
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	SO2	max conc	nghbrhd	Wayne	1/1/71	DWL	4,403,437
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984167	-85.671389	trace	pop exp	nghbrhd	Kent	1/1/08	GW	778,009
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,403,437

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

FIGURE 25: MICHIGAN'S SO₂ MONITORING NETWORK IN 2009 AND 2010



TRACE METAL MONITORING NETWORK:

Since 1981, monitoring for trace metals as TSP has been conducted as part of the Michigan Toxics Air Monitoring Program (MITAMP). Over the years, the program gradually expanded to nine sites that collected TSP samples on a once every six or once every 12 day schedule. The samples were analyzed for trace levels of metals. The suite of elements has been modified over the years, with the most recent list including beryllium, vanadium, chromium, manganese, nickel, cobalt, copper, zinc, arsenic, molybdenum, cadmium, barium, lead, and iron.

Monitoring for trace metals is not required by the monitoring regulations. Due to budget cuts, reductions had to be made in the monitoring program for trace metals so that other required monitors could be retained. As a result, some trace metal sites were completely shut down, while the number of elements measured at others was reduced. As a result of the April 2007 budget cuts, trace metal monitors at the following sites were shut down:

- Grand Rapids – Monroe St. (260810020)
- Houghton Lake (261130001)
- Ypsilanti (261610008)
- Detroit - E 7 Mile (261630019).

Laboratory analysis for trace metals was limited to only manganese at:

- Flint (260490021).

Laboratory analysis for trace metals was reduced to manganese, arsenic, cadmium, and nickel at:

- Allen Park (261630001)
- Detroit - SW HS (261630015)
- South Delray (261630027)
- River Rouge (261630005).

Trace metals as PM₁₀ are determined as part of the NATTS program at Dearborn (261630033). To promote comparability with the TSP-size trace metals collected at other monitoring stations, and to assess both inter-sampler precision and method precision, co-located PM₁₀ and TSP trace metals are also collected at Dearborn.

To provide data for an internal manganese work group, PM₁₀ metals sampling was initiated at River Rouge (261630005) on January 25, 2009. PM₁₀ filters collected at Allen Park (261630001) and Detroit - SW HS (261630015) were also analyzed for manganese starting January 25, 2009.

Laboratory analysis for manganese as PM₁₀ was initiated at:

- Allen Park (261630001)
- Detroit - SW HS (261630015)
- River Rouge (261630005)

Lead sampling using high volume samplers was initiated in January 2010 at the NCore stations at Allen Park (261630001) and Grand Rapids - Monroe St. (260810020). A source-oriented lead monitoring station also began operation at Belding (260670021). The filters that are being collected as part of the lead program are also being analyzed for manganese, arsenic, cadmium and nickel.

Table 31 summarizes the trace metal monitoring site information for sites that were in existence in 2009. **Table 32** shows the trace metal sites that are currently in operation as well as the elements that are measured at each. **Figure 26** compares the trace metal monitoring network in 2009 with the current design.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 31: MICHIGAN'S 2009 TRACE METAL MONITORING NETWORK

Operating Schedule: 1:6
 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

Former NAMS sites are shown in bold.
 Network as of December 2009

Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose	Scale	County	Date Estab.	CBSA ¹	Est Pop. (2009 Census)
	AQS Site ID	Address											
Flint	260490021	Whaley Park, 3610 Iowa	43.04722	-83.670278	1:6	Mn	TSP	max conc	nghbrhd	Genesee	6/17/92	F	424,043
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	5/1/99	DWL	4,403,437
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	nghbrhd	Wayne	6/1/90	DWL	4,403,437
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	1/1/94	DWL	4,403,437
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	2/26/99	DWL	4,403,437
S Delray	261630027	7701 W Jefferson	42.292222	-83.106944	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	10/6/04	DWL	4,403,437
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	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:6	Mn, As, Cd, Ni	PM 10	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,403,437
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	PM 10	max conc	nghbrhd	Wayne	1/25/09	DWL	4,403,437
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	PM 10	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437

¹ CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area
 F = Flint Metro Area

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

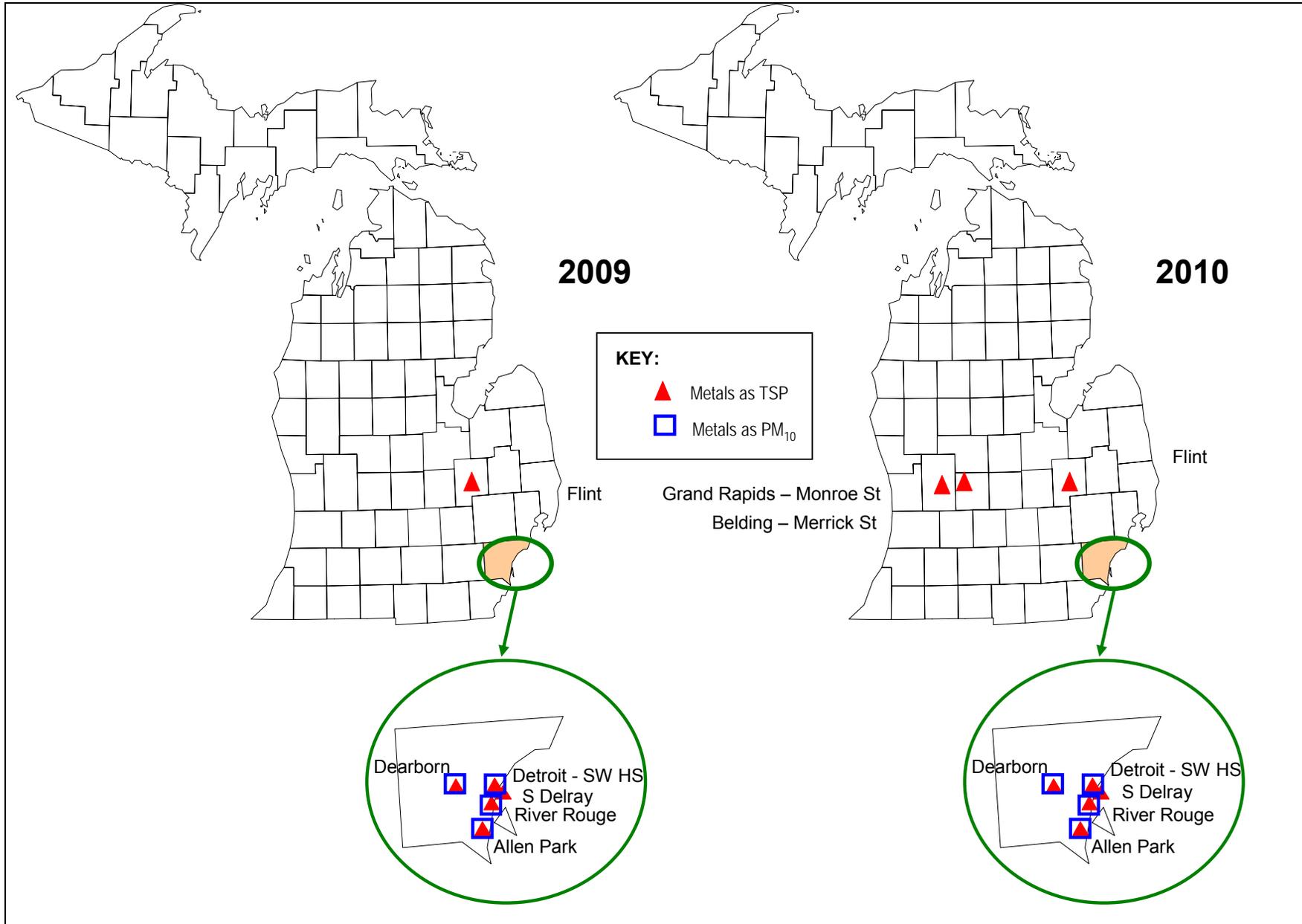
TABLE 32: 2010 TRACE METAL MONITORING NETWORK IN MICHIGAN

Operating Schedule: 1:6
 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
 Former NAMS sites are shown in bold.
 Network as of March, 2010

Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose	Scale	County	Date Estab.	CBSA ¹	Est Pop. (2009 Census)
	AQS Site ID	Address											
Flint	260490021	Whaley Park, 3610 Iowa	43.04722	-83.670278	1:6	Mn	TSP	max conc	nghbrhd	Genesee	6/17/92	F	424,043
Belding - Merrick St	260670003	509 Merrick	43.09984	-85.22163	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	Neighborhood	Ionia	1/1/10	GW	778,009
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.984167	-85.671389	1:6	Pb, Mn, As, Cd, Ni	TSP	Pop. Exp.	Neighborhood	Kent	1/8/10	GW	778,009
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:6	Pb, Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	5/1/99	DWL	4,403,437
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	nghbrhd	Wayne	6/1/90	DWL	4,403,437
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	1/1/94	DWL	4,403,437
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	2/26/99	DWL	4,403,437
S Delray	261630027	7701 W Jefferson	42.292222	-83.106944	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	10/6/04	DWL	4,403,437
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	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:6	Mn, As, Cd, Ni	PM 10	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,403,437
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	PM 10	max conc	nghbrhd	Wayne	1/25/09	DWL	4,403,437
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	PM 10	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437

¹ CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area
 F = Flint Metro Area
 GW=Grand Rapids-Wyoming Metro. Area

FIGURE 26: COMPARISON OF MICHIGAN'S 2009 AND 2010 TRACE METAL MONITORING NETWORK



Trace Metal Quality Assurance

The site operator conducts a precision flow check once a month. The flow check values are sent to the senior auditor 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 EPA's AQS database each quarter.

The DNRE Laboratory participates in two types of external performance testing programs. Each quarter, a nationally based audit sample is sent that has a known concentration of metals spiked onto a filter. The results are compared to a "true" value. Each quarter, the DNRE Laboratory also receives a regional round robin audit. 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. The results for the participating laboratories are compared to each other since a "true" value is not known.

Precision samples for both PM₁₀ and TSP-sized trace metals are collected at Dearborn (261630033) on a once every six day frequency.

Plans for the 2011 Trace Metal Network:

Comments were received that continued measurements of Mn as PM₁₀ are needed to support the investigation of elevated Mn levels by the Manganese Workgroup, so DNRE will continue the collection of these measurements for one more year, contingent upon funding.

During 2011, contingent upon adequate levels of funding, the DNRE is planning to continue to collect trace metal measurements, as described for the above elements at:

- Flint (260490021) – manganese only
- Belding – Merrick St (260670003) - TSP – lead, manganese, nickel, arsenic and cadmium
- Grand Rapids - Monroe St. (260810020) - TSP – lead, manganese, nickel, arsenic and cadmium
- Allen Park (261630001) - TSP – lead, manganese, nickel, arsenic and cadmium; for PM₁₀ manganese, nickel, arsenic and cadmium
- Detroit - SW HS (261630015) - TSP - manganese, nickel, arsenic and cadmium; for PM₁₀ manganese, nickel, arsenic and cadmium
- South Delray (261630027) - TSP – manganese, nickel, arsenic and cadmium only
- River Rouge (261630005) - TSP - manganese, nickel, arsenic and cadmium; for PM₁₀ manganese, nickel, arsenic and cadmium
- Dearborn NATTS site (261630033) for both PM₁₀ and TSP – metals reported include manganese, nickel, arsenic, cadmium, lead, beryllium, vanadium, chromium, cobalt, copper, zinc, molybdenum, barium and iron.

VOLATILE ORGANIC COMPOUND (VOC) MONITORING NETWORK:

The collection of more than 50 VOCs per sample began at various sites in 1990 as part of MITAMP air toxics network. Either a once every six day or once every 12 day sampling frequency has been used depending on the site and budget status. The Detroit - SW HS (261630005) site in Detroit has been the trend site and has collected VOC samples every year since 1993. The determination of VOC samples on a one every six day sampling frequency using Method TO-15 is required for the NATTS site at Dearborn (261630033). A minimum of six precision samples per year are also collected at Dearborn (261630033) as part of the NATTS program.

At most sites, monitoring for VOCs is not required by the monitoring regulations. Due to recent budget cuts, reductions had to be made in the monitoring program so that other required monitors could be retained. To save some of the VOC monitoring sites, other sites were completely shut down.

As a result of the April 2007 budget cuts, the VOC samplers at the following sites were shut down: Grand Rapids (260810020), Houghton Lake (261130001), and Ypsilanti (261610008).

Table 33 summarizes the VOC monitoring site information for sites that were in existence in 2009 and are operating in 2010. **Figure 27** 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 EPA Method TO-15. The results are compared to the auditor's target concentration. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The DNRE Laboratory also participates in both a national and regional performance test program. The national program sends a spiked sample of known compounds and concentrations to the laboratory. The results from state laboratories 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.

Performance evaluation samples containing known levels of various VOCs are analyzed by the DNRE Laboratory on a quarterly basis. The DNRE Laboratory also participates in regional round robin samples.

Plans for the 2011 VOC Monitoring Network

During 2011, contingent upon adequate levels of funding, the DNRE is planning to continue to collect VOCs at:

- Detroit - SW HS (261630015) once every 12 days,
- Dearborn NATTS site (261630033) once every six days and precision samples.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 33: MICHIGAN'S VOC MONITORING NETWORK IN 2009 AND 2010

Operating Schedule: 1:6

Method: Stainless Steel Pressurized Canister Sampler; Gas Chromatograph/ Mass Spectrometer (24-hr samples)

Network as of April 15, 2010

Monitoring Sites											Est Pop.
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA ¹	(2009 Census)
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	nghbrhd	Wayne	2/26/99	DWL	4,403,437
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437

¹ CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area

FIGURE 27 MICHIGAN'S 2009 AND 2010 VOC MONITORING NETWORK



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 Detroit - SW HS (261630005) 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. Sampling for carbonyls is performed at River Rouge (261630005) on a once every six day schedule. Detroit - SW HS (261630015) is the DNRE'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.

At most sites, monitoring for carbonyls is not required by the monitoring regulations. Due to recent budget cuts, reductions had to be made in the monitoring program so that other required monitors could be retained. As a result some of the carbonyl monitoring sites were completely shut down, including:

- Grand Rapids- Monroe St. (260810020)
- Houghton Lake (261130001)
- Ypsilanti (261610008).

Table 34 summarizes the carbonyl monitoring site information for sites that were in existence in 2009 and are continuing to operate in 2010. **Figure 28** 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 EPA Method TO-11A. The laboratory result is compared to the auditor's target concentration. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The DNRE Laboratory also participates in both a national and regional performance test program. The national program 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.

The DNRE Laboratory received bi-annual performance evaluation samples from a contract through the EPA that are analyzed for carbonyl compounds. The DNRE Laboratory also analyzes regional round robin samples.

Plans for the 2011 Carbonyl Monitoring Network

During 2011, contingent upon adequate levels of funding, Michigan is planning to continue to collect carbonyls at:

- Detroit - SW HS (261630015) once every 12 days
- River Rouge (261630005) once every six days
- Dearborn NATTS site (261630033) once every six days and precision samples.

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

TABLE 34: MICHIGAN'S CARBONYL MONITORING NETWORK IN 2009 AND 2010

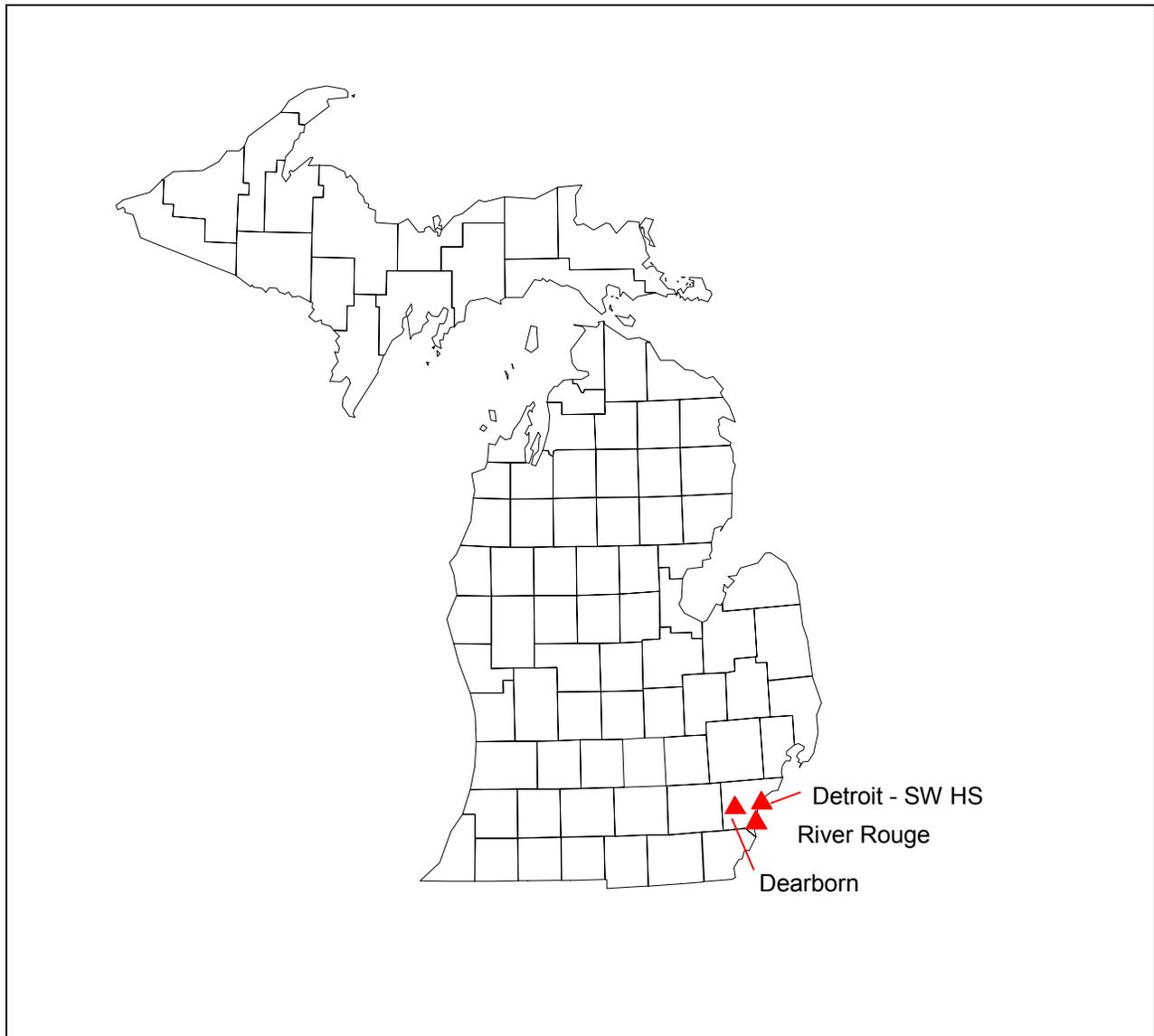
Operating Schedule: 1:6 and 1:12
 Method: 2,4 dinitrophenyl hydrazine treated silica gel cartridges; HPLC with ultraviolet absorption

Network as of April 15, 2010

Monitoring Sites			Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA ¹	Est Pop. (2009 Census)
Site Name	AQS Site ID	Address									
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	max conc	nghbrhd	Wayne	1/1/94	DWL	4,403,437
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	nghbrhd	Wayne	2/26/99	DWL	4,403,437

¹ CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area

FIGURE 28: MICHIGAN'S 2009 AND 2010 CARBONYL MONITORING NETWORK



POLYNUCLEAR AROMATIC HYDROCARBON (PAH) MONITORING NETWORK:

As part of the EPA'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 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 EPA's co-location criteria.

The 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 EPA method TO-13A.

Table 35 shows the site information for PAH sites that were in operation in 2009 and are currently operating. **Figure 29** shows the locations of sites where PAH monitoring occurs.

PAH Quality Assurance

The site operator conducts a precision flow check once a month. The flow check values are sent to the senior auditor 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. The audit results are uploaded to the EPA's AQS database each quarter.

Plans for the 2011 PAH Monitoring Network

During 2011, contingent upon adequate levels of funding, Michigan is planning to continue to collect PAHs on a once every six day sampling frequency at:

- Dearborn (261630033).

TABLE 35: PAH NETWORK IN MICHIGAN IN 2009 AND 2010

Operating Schedule: 1:6
 Method: Polyurethane foam plugs and XAD-2 resin with gas chromatography mass spectrometry
 Network as of April 15, 2010

Monitoring Sites			Latitude	Longitude	Sampling			County	Date Estab.	CBSA ¹	Est Pop. (2009 Census)
Site Name	AQS Site ID	Address			Frequency	Purpose	Scale				
Dearborn	261630033	2842 Wyoming	42.30667	-83.14889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,403,437

¹ CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area

FIGURE 29: MICHIGAN'S 2009 AND 2010 PAH MONITORING NETWORK



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 36**. No changes are planned to the meteorological network.

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 the 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 2011 Meteorological Monitoring Network

During 2011, contingent upon adequate levels of funding, Michigan is planning to continue to collect hourly meteorological measurements at:

- Holland (26005003)
- Bay City (260170014)
- Coloma (260210014)
- Cassopolis (260270003)
- Flint (260490021)
- Otisville (260492001)
- Harbor Beach (260630007)
- Belding - Reed St. (260670002)
- Lansing (260650012)
- Kalamazoo (260770008)
- Grand Rapids – Monroe St. (260810020)
- Evans (280810022)
- Tecumseh (260910007)
- New Haven (260990009)
- Sterling Heights/Freedom Hill (260990021)
- Scottville (261050007)
- Houghton Lake (261130001)
- Muskegon – Green Creek Rd. (261210039)
- Oak Park (261250001)
- Pontiac (261250011)
- Rochester (261250012)
- Jenison (261390005)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)

MICHIGAN'S 2011 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

- Allen Park (261630001)
- River Rouge (261630005)
- Detroit – SW HS (261630015)
- Detroit – Linwood (261630016)
- Livonia (261630025)
- Detroit- Joy Rd. (261630026)
- Dearborn (261630033)
- Detroit – Newberry School (261630038)
- Detroit – FIA/Lafayette (261630039)

To the best of our knowledge, the following tribal meteorological equipment monitor will continue operation:

- Manistee (261010922).

TABLE 36: METEOROLOGICAL MEASUREMENTS IN MICHIGAN

Site Name	AQS ID	WS	WD	Temperature	Rel. Humidity	Barom. Pressure	Solar Radiation	Sigma Theta
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				
Flint	260490021	X	X	X		X		X
Otisville	260492001	X	X	X				X
Harbor Beach	260630007	X	X	X				X
Belding- Reed St	260670002	X	X	X				X
Lansing	260650012	X	X	X		X		X
Kalamazoo	260770008	X	X	X				X
Grgand Rapids - Monroe St	260810020	X	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	X
Sterling Hts/ Freedom Hill	260990021	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, Green Ck Rd	261210039	X	X	X				X
Oak Park	261250001	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
Seney	261530001	X	X	X	X	X	X	X
Ypsilanti	261610008	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 Mi	261630019	X	X	X	X	X		X
Livonia	261630025	X	X	X	X	X		X
Detroit - Joy Rd	261630026	X	X	X				X
Dearborn	261630033	X	X	X	X	X		X
Detroit - Newberry School	261630038	X	X	X				X
Detroit -FIA/Lafayette	261630039	X	X	X				X
Total		35	35	35	8	15	4	31

ADEQUACY OF MICHIGAN'S MONITORING SITES:

The suitability of the monitoring sites locations is frequently assessed by the AMU's QA Team and by the EPA. The EPA assesses the adequacy of the stations during PM_{2.5} PEP audits, gaseous NPAP audits, and 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 DNRE and EPA auditors.

The overall design of the regional air monitoring networks will be assessed by the Regional EPA office with assistance from state, local and tribal agencies once every five years. The next regional review is due by July 1, 2010. This review assesses any redundancies of monitors along border areas will be assessed, identifies monitors that are no longer necessary and determines network deficiencies. Preliminary versions of this assessment were reviewed and suggested changes to Michigan's ambient air monitoring network are addressed in various portions of this review.

APPENDIX A: ACRONYMS AND THEIR DEFINITIONS:

>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
%	Percent
µg/m ³	Micrograms per cubic meter
AERMOD	AMS/EPA Regulatory Model
AMU	Air Monitoring Unit
AQD	Air Quality Division
AQS	Air Quality System (EPA air monitoring data archive)
ARM	Approved regional method
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
EPA	U.S. 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)
GFI	Ground fault circuit interrupters
hr	Hour
IN-MI	Indiana-Michigan
LADCO	Lake Michigan Air Directors Consortium
DNRE	Michigan Department of Natural Resources and Environment
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
OAQPS	Office of Air Quality and Planning and Standards (EPA)
OC	Organic carbon
OTAQ	Office of Transportation and Air Quality (EPA)
PAH	Polynuclear Aromatic Hydrocarbon
PAMS	Photochemical Assessment Monitoring Station

APPENDIX A: ACRONYMS AND THEIR DEFINITIONS, CONTINUED

PEP	Performance Evaluation Program
PM	Particulate matter
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 PM ₁₀ and PM _{2.5}
ppb	parts per billion
ppm	parts per million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)
QA	Quality assurance
QAPP	Quality Assurance Project Plan
RTI	Research Triangle Institute (national contract laboratory for speciated PM _{2.5})
SLAMS	State and Local Air Monitoring Station
SO ₂	Sulfur dioxide
STAG	State Air Grant (federal)
STN	Speciation Trend Network (PM _{2.5})
TEOM	Tapered element oscillating microbalance (hourly PM _{2.5} measurement monitor)
tpy	ton per year
TRI	Toxic Release Inventory
TSP	Total Suspended Particulate
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 2011 Monitoring Network Review was placed on the Internet for public comment. Environmental groups and stake holders were notified by e-mail. A thirty day time frame was provided so the public could provide written comments. This section of the network review responds to those comments.

A total of six letters were received: two from physicians, two from health departments, one from a mayor and one from industry. Copies of the comments received are included in **Appendix C**.

General themes discussed by the respondents included:

- The continued need to characterize manganese levels as PM₁₀ in the Detroit area
- The need for ozone and fine particulate monitoring in the Traverse City area

No respondents discussed the need to eliminate current monitoring activities.

PM₁₀ manganese monitoring in SE Michigan

Most of the filters collected by DNRE are done so to meet particulate monitoring requirements. DNRE collects PM₁₀ samples at Allen Park(261630001) and Detroit - SWHS (261630015) to meet the PM₁₀ network design specifications for the Detroit-Warren-Livonia MSA. The only trace metals monitoring requirement that the DNRE must meet is the requirement under the NATTS program for the collection of PM₁₀ metals at Dearborn (261630033).

To support the Manganese Work Group's investigation into manganese levels in the Detroit area, PM₁₀ filters collected to meet the federal particulate monitoring requirements have been analyzed for Mn. Manganese measurements collected at the Dearborn(2561630033) NATTS site are also available for the workgroup. To provide additional spatial coverage, a PM₁₀ sampler was deployed to River Rouge (261630005) in 2009 and manganese levels were determined.

Since the DNRE must continue to collect PM₁₀ filters from Allen Park (261630001) and Detroit – SW HS (261630015), the analysis of these filters for Mn incurs a minimal cost, so this activity will continue. Collection and analysis of PM₁₀ samples from River Rouge (261630005) incurs a minimal cost and will continue for one more year to better characterize levels of manganese in the area.

Ozone and PM_{2.5} monitoring in Traverse City

EPA proposed modifications to the ozone network by requiring monitors to address ozone transport and background levels, as well as a requirement to monitor ozone in micropolitan areas. It is anticipated that EPA will finalize these requirements in August 2010. **If** these requirements remain in the final version of the ozone NAAQS, DNRE will have to deploy an ozone monitor in an micropolitan area.

A tribal ozone monitor was operational from 2003 to 2008 at Peshawbestown (260890001) in Leelanau County. The fourth highest 8-hour ozone value averaged from 2006 through 2008 equaled 0.071 ppb, meeting the current standard.

From 1998 to 1999, an ozone monitor was operational in Traverse City (260550903) on 2924 Dendros Road. The fourth highest 8-hour values for 1998 and 1999 were 0.081 and 0.083 ppm, respectively, which was in compliance with the NAAQS that was in place at that time.

Thus, DNRE has conducted ozone monitoring periodically in and around the Traverse City area and concentrations have been above background levels, but not greater than whatever NAAQS was in place at that time. However, EPA is reviewing the level of the current ozone standard and may adopt a more stringent level that could range from 0.060 to 0.070 ppm. If this occurs, there is historical evidence that Leelanau or Grand Traverse Counties may not meet a more stringent ozone NAAQS. **If, the new**

monitoring network design requirements and a more stringent level of the standard are promulgated, it is likely the DNRE will need to reinitiate ozone monitoring in the Traverse City area. Because Peshawbestown (260890001) was a tribal site, DNRE may not be able to obtain access to reinitiate monitoring at this location, and in that case, a new location will need to be identified. If a new monitoring location needs to be identified in the Traverse City area, the DNRE will work with and appreciates the help of local stakeholder groups.

Public comments also requested the addition of fine particulate measurements in the Traverse City area.

The DNRE monitored PM_{2.5} in Traverse City (260550003) at 739 Hastings Street, near the airport from 1999 to 2002. The three year annual averages of PM_{2.5} levels at this site were 9.0 and 8.7 ug/m³ for 1999 to 2001 and 2000 to 2002, respectively. The three year averages of the 24-hour 98th percentile value were 24 and 28 ug/m³ for 1999 to 2001 and 2000 to 2002, respectively. Hence, the historical values from Traverse City are far less than the annual and the 24-hour levels of 15.0 ug/m³ and 35 ug/m³, respectively and show little likelihood to violate the NAAQS.

However, EPA is reviewing and is considering setting a more stringent particulate NAAQS. In the March 2010 first external review draft of the Policy Assessment document²⁸, the EPA discussed setting the level of the annual PM_{2.5} NAAQS between 10 and 13 ug/m³ and the level of the 24-hour PM_{2.5} NAAQS between 25 and 35 ug/m³. The policy assessment document is one component of a lengthy rule making process used by EPA to modify the NAAQS. It is anticipated that a notice of public rulemaking will be announced in January 2011 and the new PM NAAQS promulgated around October, 2011.

Although the EPA is reviewing the level of the fine particulate standard, it is unlikely that the level will be stringent enough to cause a monitor in Traverse City to violate the annual standard. Although a 24-hour design value of 28 ug/m³ was measured from 2000 to 2002, fine particulate levels in Michigan have been dropping steadily and depending on the level that EPA selects for the 24-hour standard, a monitor in Traverse City will probably not violate the 24-hour NAAQS. Deploying a monitor using the federal reference method (FRM), which is a manual method, is not required by the current network design specifications for fine particulate material. The manual method samples on a once every three day schedule, (double the sampling frequency for the PM₁₀ sampling discussed above, requires weekly supervision by trained staff and incurs laboratory analysis costs. Therefore, deploying a FRM sampler to the Traverse City ozone site proposed above is not feasible at this time. However, a continuous method may be a better option for deployment into the Traverse City area because it would provide hourly measurements that could be analyzed using meteorological measurements.

If EPA finalizes the requirement for ozone monitoring in micropolitan areas and/or reduces the level of the ozone NAAQS, DNRE will investigate placing an ozone site in or near Traverse City. If a suitable location can be found and the infrastructure necessary to support monitoring activities can be created, the DNRE **may** be able to activate the ozone monitor before EPA's mandated deployment dates. Contingent upon adequate funding and staffing, DNRE will also investigate adding continuous PM_{2.5} and meteorological measurements to the Traverse City ozone site. If the EPA promulgates a more stringent PM NAAQS with different monitoring network design specifications, deploying a PM_{2.5} FRM to Traverse City may be re-evaluated.

²⁸ U.S. EPA Policy Assessment for the Review of the Particulate Matter National Ambient Air Quality Standards" First External Review Draft March 2010, p 2-80 and 2-93.

APPENDIX C: WRITTEN COMMENTS RECEIVED



JENNIFER M. GRANHOLM
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF COMMUNITY HEALTH
LANSING

JANET OLSZEWSKI
DIRECTOR

May 21, 2010

Dr. Mary Ann Heindorf
DNRE Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909

Dear Dr. Heindorf:

I am providing comment on the Michigan Department of Natural Resources and Environment (MDNRE) 2011 Ambient Air Monitoring Network Review dated May 13, 2010. I am a toxicologist with the Michigan Department of Community Health (MDCH) Division of Environmental Health and conduct public health activities at sites of environmental contamination and concern.

I have been involved with the MDNRE Remediation and Redevelopment Division's (RRD's) work at the Downriver Soils site in River Rouge for the past several years. The main exposure concern there is inhalation of manganese-containing particulate matter (PM). (RRD's focus is on resuspension of soils containing elevated levels of manganese.) Previously, air monitoring at the River Rouge station reported PM as Total Suspended Particulate (TSP). *However, data for PM less than or equal to 10 microns (PM10) are necessary to evaluate potential health effects.* MDNRE starting collecting PM10 and analyzing it for manganese, among other constituents, in 2009.

I strongly recommend that MDNRE continue collecting and analyzing for manganese as PM10 at the River Rouge monitoring station, at least through 2011:

1. Steel manufacturers emit manganese from their stacks as well as in fugitive emissions. The 2009-2010 monitoring at River Rouge occurred at a time when U.S. Steel, a nearby industry, significantly reduced production due to the national economic downturn. The Rouge Manufacturing Complex in Dearborn experienced some upsets and changes to their production as well. The PM monitoring data collected for the area over the past year and a half may not reflect "normal" conditions.

2. The soil data collected by and for RRD in its assessment of the Downriver Soils area indicate that manganese is "present in soil above Part 201 Residential/Commercial I Particulate Soil Inhalation Criteria (PSIC) adjusted for various source sizes in the central and northern portions of the" Downriver Soils study area. The PSIC identifies a concentration of hazardous substance in soil that is not expected to yield an ambient air concentration of contaminated particulates that would cause adverse human health effects through inhalation. The Technical Support Document for the PSIC indicates that, under certain conditions, air monitoring may be used to demonstrate compliance with the criteria.

Dr. Mary Ann Heindorf
MDNRE Air Quality Division
May 21, 2010
Page 2

3. Environmental justice is a concern in the metropolitan area around River Rouge, which includes Ecorse, Dearborn, and areas of Detroit, because of historic and on-going pollution sources. The continued collection of PM10 data in the area will "assist in identifying and mitigating disparate impacts", as stated in the December 11, 2009 Draft Michigan Environmental Justice Plan.

Thank you for the opportunity to comment on the 2011 Ambient Air Monitoring Network Review. If you have any questions on these comments, please do not hesitate to contact me.

Sincerely,



Christina Bush, Toxicologist
Toxicology and Response Section
Division of Environmental Health
Bureau of Epidemiology

517-335-9717
bushcr@michigan.gov

References:

Draft Michigan Environmental Justice Plan. December 11, 2009.

MDNRE RRD Operational Memorandum No. 1, Technical Support Document - Attachment 7. Part 201 Generic Soil Inhalation Criteria for Ambient Air, Part 213 Tier I Soil Inhalation Risk-based Screening Levels for Ambient Air. July 2007.

Weston Solutions of Michigan, Inc. Draft Phase III Summary Report: Downriver Soil Assessment Project, Cities of River Rouge and Ecorse, Wayne County, Michigan. Prepared for Michigan Department of Environmental Quality RRD Southeast Michigan District Office. September 2009.

CC: Steven Hoin, MDNRE RRD
Robert Sills, MDNRE AQD



GRAND TRAVERSE COUNTY HEALTH DEPARTMENT

HEALTH ADMINISTRATION
2325 Garfield Road North
Traverse City, MI 49686
Phone: 231-922-2700 fax: 231-922-4629
www.gtchd.org

RECEIVED

June 2, 2010

JUN 07 2010

Dr. Mary Ann Heindorf,
DNRE-Air Quality Division,
P.O. Box 30260,
Lansing, Michigan 48909

AIR QUALITY DIV.

Dear Dr. Heindorf:

This letter is a contribution to Public Comment on the 2011 Ambient Air Monitoring Network Review. I believe that an additional air monitoring station for both particulates and ozone should be located in the Traverse City area because:

1. The regional transport of ozone from the Chicago area has been an on going issue that has impacted the micropolitan area of Traverse City. This ozone issue was cited in the 2010 County Health Rankings by the Robert Wood Johnson Foundation, collaborating with the University of Wisconsin Population Health Institute, which developed rankings for each State's counties. The environmental quality for Grand Traverse County was listed as 67th of the 82 counties, which is partly due to the ozone air quality issue. Presently, the closest air monitoring for ozone is the DNRE Frankfort - Scottville monitoring station. The Peshawbestown monitoring was discontinued some time ago. The data collected from additional monitoring in the Traverse City area could hopefully help set national policy to address the ozone impact on rural areas by large metropolitan areas. It also may give the local public health agencies and healthcare providers timely information to warn vulnerable patients with pulmonary diseases of excessive ozone exposure.
2. There is a proposal for a biomass electrical generation plant by the Traverse City Light and Power Board. It would be very helpful to have ambient measurements of particulates in the atmosphere in the micropolitan area of Traverse City prior to the construction and use of the proposed generating plant. These data would give decision makers a baseline of existing particulates in the area atmosphere *vis a vis* the proposed additional atmospheric particulate loading from the proposed biomass electrical plant. If the proposed plant is built, it will also give regulatory and public health officials some inkling of the efficacy of the pollution abatement equipment of the waste gasses. There is, to the best of my knowledge, no PM_{2.5} monitoring in the micropolitan area of Traverse City, with the nearest monitoring station at Houghton Lake.

This Department would strongly consider providing the support for the regular data collection and maintenance of such a station as it had in the past at a monitoring station at the Traverse City Postal Office. It is my hope that a new monitoring station for the Traverse City area is given careful consideration.

Sincerely,


Frederick L. Keeslar, MSPH
Health Officer

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GRAND TRAVERSE COUNTY HEALTH DEPARTMENT

MICHAEL P. COLLINS, MD, MS

Medical Director

Grand Traverse County & Benzie-Leelanau Health Department

didjdoctor@sbcglobal.net

231-922-2747

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JUN 07 2010

AIR QUALITY DIV.

June 3, 2010

Dr. Mary Ann Heindorf
DNRE – Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909

Dear Dr. Heindorf:

I understand that your Department is considering the possibility of an air monitoring station in Traverse City. I would like to take the opportunity to add my strong support to this idea. As our community wrestles with the options for locally producing electrical power, such a station would provide especially timely information.

One context for this discussion that you may or may not be aware of is that the American Heart Association has recently published a new scientific statement related to particulate matter air pollution and its relationship to cardiovascular disease. The article can be accessed through <http://circ.ahajournals.org/cgi/content/short/121/21/2331>, and in essence states that "This body of evidence has grown and been strengthened substantially since the first American Heart Association scientific statement was published. . .PM_{2.5} exposure is deemed a modifiable factor that contributes to cardiovascular morbidity and mortality". So it is important from the standpoint of public health that our community be as aware as possible of our degree of exposure to this particular risk.

I include an additional letter of support from Laura Shea, M.D. Dr. Shea is a local Family Practitioner who has been concerned about this subject for some time, and who recently hosted an informational session related to the biomass plant proposal at her home. There is considerable interest in this entire subject within the medical community. We would all benefit from the clarity that would result from the local data that an air monitoring station here would provide.

If I can be of any direct assistance in the consideration of this proposition, please call on me.

Sincerely,

A handwritten signature in black ink that reads "M. P. Collins MD".

Michael P. Collins M.D.

6/2/2010

To Whom It May Concern:

I would recommend and support the obtainment of air monitors for PM_{2.5}, NO₂ and Ozone for Grand Traverse County due to concern over denigration of air quality with the increasing number of operating or proposed biomass facilities in our region. (For example: a 38 MW plant operating in Cadillac, a proposed 38 MW plant in Mancelona, a plan for 4 smaller plants in Traverse City and yet another larger plant in Gaylord).

Biomass incinerator facilities in many cases have been found to produce higher amounts of VOCs, NO_x and fine particulate matter emissions than other incinerator methods including coal. Justification for air quality monitoring in Grand Traverse County would include the secondary photochemical reactions due to the high baseline ozone levels (based on adjacent Benzie County readings), the relatively high VOC emissions for Grand Traverse County (based on 2005 reporting data), the number of new biomass plants in close proximity and how these factors may affect air quality over time. Additionally, TCL&P is proposing biomass incinerator plant(s) within the city itself, which is of concern given the relative population density.

The placement of air monitors would provide additional data for the Michigan Air Sampling Network. Additionally, it would allow air quality tracking over time which could be correlated with surveillance data and allow us to better understand the potential adverse health effects of biomass incineration. This is of heightened concern given the recent health care research involving PM_{2.5} and ozone and their effect on cardiopulmonary disease.

Thank you for your consideration of this matter.

Sincerely,

Laura Shea, MD



Investing Our Energy In You

June 9, 2010

Dr. Mary Ann Heindorf
DNRE – Air Quality Division
P.O. Box 30260
Lansing, MI 48909-7760

Dear Dr. Heindorf:

Traverse City Light and Power (TCLP) is a publically-owned utility that provides electric service to approximately 11,000 residential, commercial and industrial customers in the Traverse City area. On behalf of TCLP, I am requesting the Michigan Department of Natural Resources and Environment (MDNRE) consider the installation of an air monitoring station in the Traverse City area. Specifically, we would request that PM 2.5 and ozone monitors be installed in our area. Our concerns regarding these parameters are associated with the following issues: Ozone transport; proposed wood-fueled biomass plant(s) in Traverse City; the impacts of significant population increases in the summer months and general growth; and the establishment of baseline data for future industrial, commercial and residential expansion in the Traverse City area.

We believe that Northern Michigan is under represented in air quality monitoring in the state. The Houghton Lake station is unlikely to be affected by either the impacts of PM 2.5 or regional transport of ozone. Given the significant influx of population in the Traverse City area during the summer and the rapid growth the region is experiencing, we believe PM 2.5 measurements in the area will assist us in future planning to minimize the degradation of air quality in the region. There has been significant concern from some residents of the potential impacts from proposed biomass plants in the region and establishing baseline air monitoring data would be highly useful in allaying concerns surrounding the development of these facilities. The baseline data would be compared to data acquired after the installation of these plants to assure the public that there is no significant health threat from the development of these facilities.

TCLP has set its own goal of 30% renewable energy by 2020, to significantly reduce our carbon dioxide emissions. To accomplish this goal, TCLP has been investigating the potential for one or more combined heat and power wood-fueled biomass plants. We also have power purchase agreements in place for the long term purchase of landfill gas and wind power. Given the abundant wood resources in this part of the state, we believe we can sustainably provide our customers with electric power from sources which are low or no carbon alternatives to the coal electrical generating plants from whom we are currently purchasing 95% of our electricity.

We would be pleased to provide any assistance possible if the MDNRE would be willing to locate a monitoring station in the Traverse City area. Please see the attached letters of support from Christopher M. Bzdok, Mayor of Traverse City, and Frederick L. Keeslar, Health Officer of the Grand Traverse County Health Department.

Thank you for your consideration.

Sincerely,

A handwritten signature in cursive script that reads "Edward E. Rice".

Edward E. Rice, P.E.
Executive Director

1131 Hastings Street
Traverse City, MI 49686

t: 231 922 4940
f: 231 922 4638

tclp.org



The City of Traverse City

Office of the Mayor

GOVERNMENTAL CENTER
400 Boardman Avenue
Traverse City, MI 49684
(231) 922-4440
(231) 922-4476 Fax



June 2, 2010

Dr. Mary Ann Heindorf,
DNRE-Air Quality Division,
P.O. Box 30260,
Lansing, Michigan 48909

Dear Dr. Heindorf:

I am writing to support the request of Traverse City Light & Power for monitoring of fine particulates and ozone in the Traverse City area.

I believe the letters from TCLP and the Grand Traverse County Health Department outline the need for baseline data on the ambient concentrations of these pollutants in this geographic area quite well. I can only add that this is an issue about which the public has become increasingly aware and engaged.

We appreciate your thoughtful consideration of these requests. Please contact me if I may be of any assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "Chris Bzdok".

Christopher M. Bzdok
Mayor

cc: City Manager
City Commission
TCLP
GT County Health Dept.