Air Monitoring: History and Rationale

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Who will you hear from?

- Craig Fitzner
  Air Monitoring
  Unit Chief

- Jenifer Dixon
  OEA Air Specialist

Webinar Set Up

- All lines will be muted
- Questions can be sent to us via the question/chat box
- We will record and post the webinar online

Overview

- Monitoring requirements: where and why we monitor
- What happens to the data?
- What does the data show?
  - Recent trends
- What's on the horizon?
  - Ozone
  - Sulfur dioxide
  - Refineries
  - Near-Road Air Toxics

Clean Air Act [Section 110(a)(2)(B)]

- Each [State implementation] plan shall
  - Provide for the establishment and operation of appropriate devices, methods, systems, and procedures necessary to-
    - » (i) monitor, compile, and analyze data on ambient air quality, and
    - » (ii) upon request, make such data available to the Administrator;

Section 110(a)(2)(B) is for Criteria Pollutants

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO_2)
- Sulfur Dioxide (SO_2)
- Ozone (O_3)
- Lead (Pb)
- Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate Monitoring

- Total Suspended Particulate (metals)
- PM_{10} (Manganese and NAAQS)
- $PM_{10-2.5}$ (PM Coarse)
- $PM_{2.5}$ (NAAQS)
  - Filter-based FRM
  - Tapered Element Oscillating Microbalances (TEOMs) and Beta Attenuation Monitors (BAMs)
    - Continuous
  - Speciation Air Sampling System (SASS)
  - Carbon Black
    - Aethalometers
    - EC/OCs

40 CFR Part 58
Appendix D

- Network Design Criteria for Ambient Air Quality Monitoring
  - Population based
    - » Table D2 (O_3)
    - » Table D4 (PM_{10})
    - » Table D5 ($PM_{2.5}$)
  - Non-population based
    - » Section 4.2 (CO)
    - » Section 4.3 (NO_2)
    - » Section 4.4 (SO_2)
    - » Section 4.5 (Pb)

40 CFR Part 58

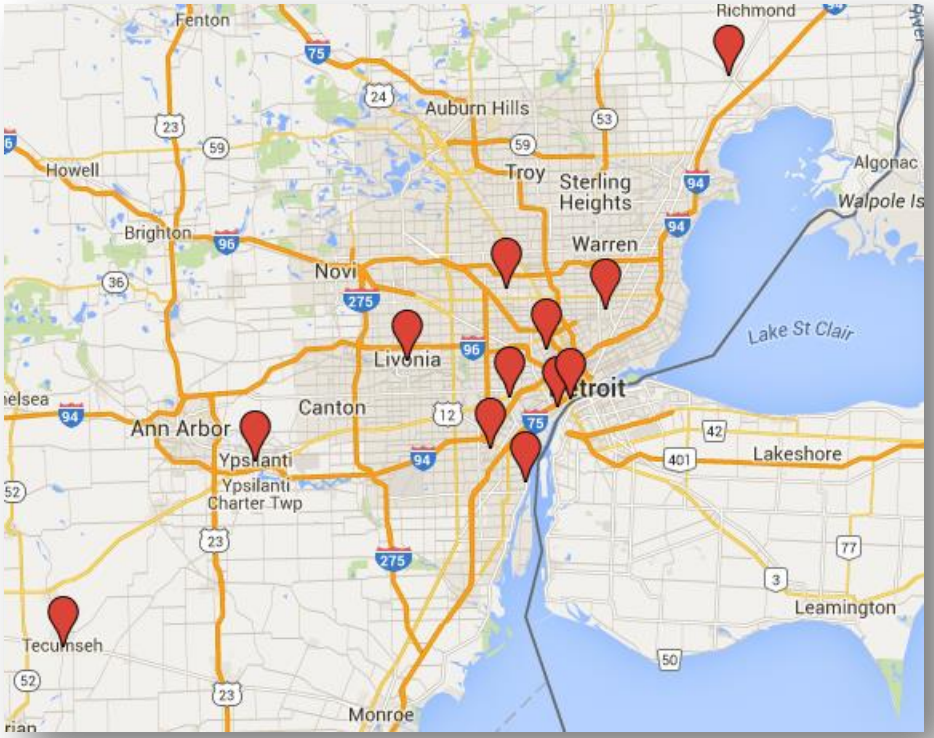
Appendix D Table D5 ($PM_{2.5}$)

MSA population	Most recent 3-year design value ≥85% of any $PM_{2.5}$ NAAQS	Most recent 3-year design value <85% of any $PM_{2.5}$ NAAQS
>1,000,000	3	2
500,000-1,000,000	2	1
50,000-<500,000	1	0

Network Design Criteria

- So…a Detroit-sized metropolitan area [population of 4.3 million] would have three $PM_{2.5}$ monitors?

- Twelve $PM_{2.5}$ FRMs
  - New Haven
  - East 7 Mile
  - Allen Park
  - Oak Park
  - Ypsilanti
  - Tecumseh
  - Linwood
  - SWHS
  - West Lafayette
  - Wyandotte
  - Dearborn
  - Livonia



Sites are located to..

- ✓ determine the highest concentrations expected to occur in the area.
- ✓ measure typical concentrations in areas of high population density.
- ✓ determine the impact of significant sources on air quality.
- ✓ determine general background concentration levels.
- ✓ determine the extent of regional pollutant transport among populated areas; and in support of secondary standards.
- ✓ measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts.

U.S. EPA Requirements
(non-population based)

- Sulfur Dioxide (SO_2)
  - Population Weighted Emission Impact (PWEI)
    - Lansing (2012)
    - Monroe (2013)
    - West Olive (2015)
  - Existing Network
    - Detroit Fort Street (1971)
    - Port Huron (2012)

U.S. EPA Requirements
(non-population based)

- Lead (Pb)
  - Sources emitting more than ½ ton per year and where modeling shows potential impacts greater than one-half of the NAAQS
    - Belding (2010)
    - Port Huron (2012)
    - Vassar (2011)
    - East Jordan (2011)
  - Oakland County Airport (2011)
  - Existing Network
    - Dearborn (1990)
    - Allen Park (2010)
    - Grand Rapids (2010)

U.S. EPA Requirements
(non-population based)

- NCORE
  - Allen Park and Grand Rapids
    - Trace gas monitoring (NOy, CO, SO_2)
    - Year-round ozone
    - Particulate including $PM_{10-2.5}$

U.S. EPA Requirements
(non-population based)

- Near Road
  - A result of the 2010 revision to the NO_2 NAAQS
  - Nitrogen dioxide (NO_2), carbon monoxide (CO) and particulate ($PM_{2.5}$) in 2015
  - Roadways in large metropolitan areas having the highest populations (greater than 1 million) and highest daily traffic volumes
    - Phase 1: Detroit (Eliza Howell Park at I-96 and Telegraph) (2011)
    - Phase 2: Livonia (Schoolcraft College at I-275 and 7 Mile) (2015)
    - Phase 3: Grand Rapids (2017?)

There are challenges associated with near-road monitoring

National Air Toxics Trend Site (Dearborn)

Summa Can for VOCs (volatile organic compounds)

Metals – collected on TSP/PM10 filters

Semi-Volatile sampling

Site Specific Requirements

- Given our schedule: Continuous gas monitors and 1:3, 1:6 and 1:12 day particulate filters
- 7 day/week access and high visibility for security
  - Schools
  - Municipalities

Flint

Site Specific Requirements

(40 CFR 58 Appendix E)

- No trees or other obstructions

Site Specific Requirements

(40 CFR 58 Appendix E)

- Probe Height

Site Specific Requirements

(40 CFR 58 Appendix E)

- Monitor Spacing

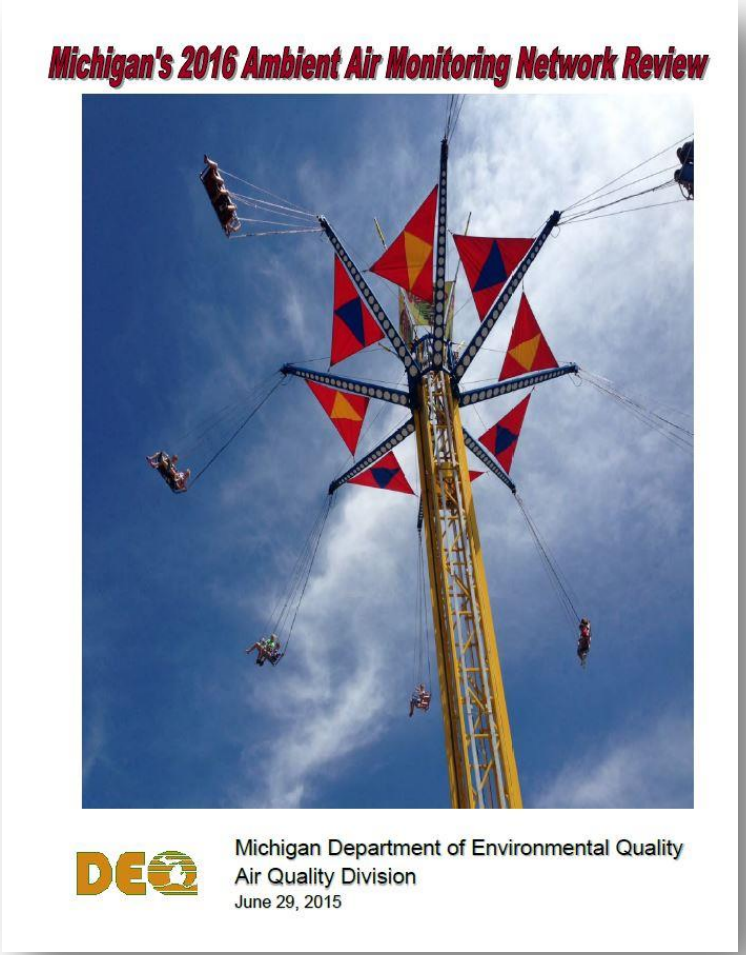
Other Site Requirements

- Electricity!

Annual Network Review

Describes changes proposed to MDEQ's network

- An annual requirement due to U.S. EPA every July 1st
- 30 day public comment period starting on approximately May 15th of each year



Quality Assurance
(40 CFR Part 58, Appendix A)

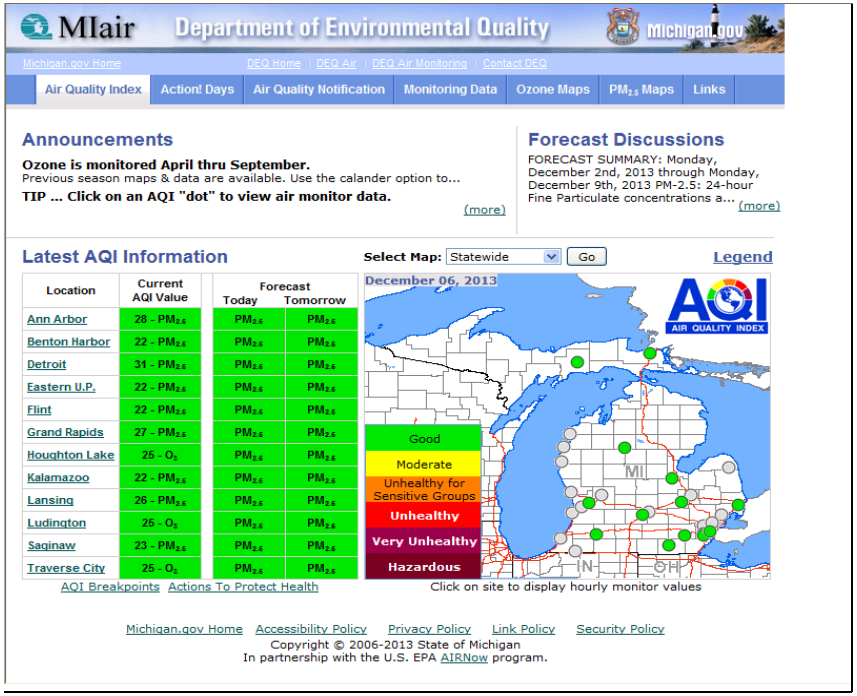
- Mandate: 75% data completeness
- FRM and FEM Methods:
  - Nightly zero subtractions
  - Biweekly gas checks
  - Monthly particulate flow checks
  - Certification of measurement devices
  - Annual or semi-annual MDEQ audits
  - Annual U.S. EPA audits
    - Co-located particulate measurements
    - Gas challenges

…make such data available to the Administrator

- AQS: Air Quality Subsystem
  - U.S. EPA's official data repository (for regulatory use)
    - Upload data and QA info by 90 days after the end of the calendar quarter
      - MDEQ, tribal and select industrial data (long term and permit required)
        - » Marathon
        - » Dow Chemical
        - » DTE Monroe
    - Annual data certification by May 1 each year
      - MDEQ sites
      - Little River Band of Ottawa Indians
      - Inter-Tribal Council of Michigan

Ways to Access Air Monitoring Data

Near Real Time (MIair)



http://deqmiair.org

Hourly Data

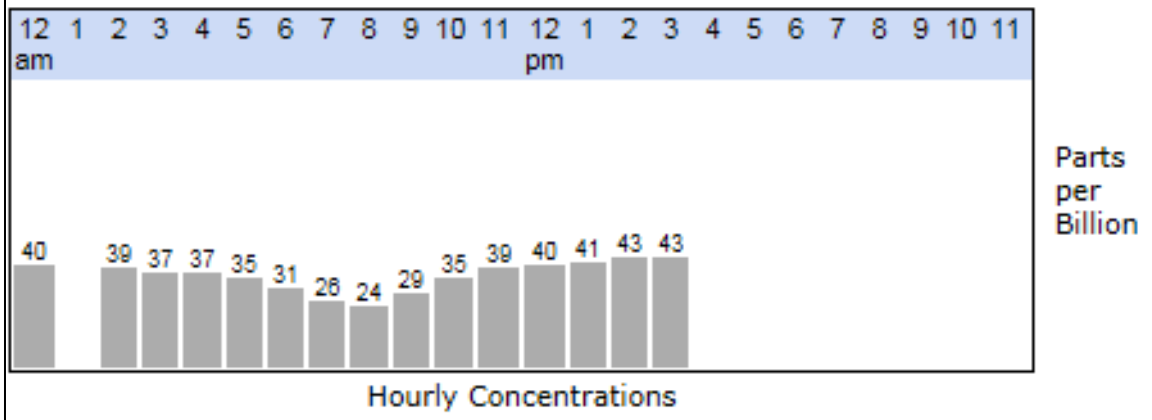
Site: Lansing

Hourly air quality measurements*

*Displayed values are end-hour. All data are preliminary and subject to validation.

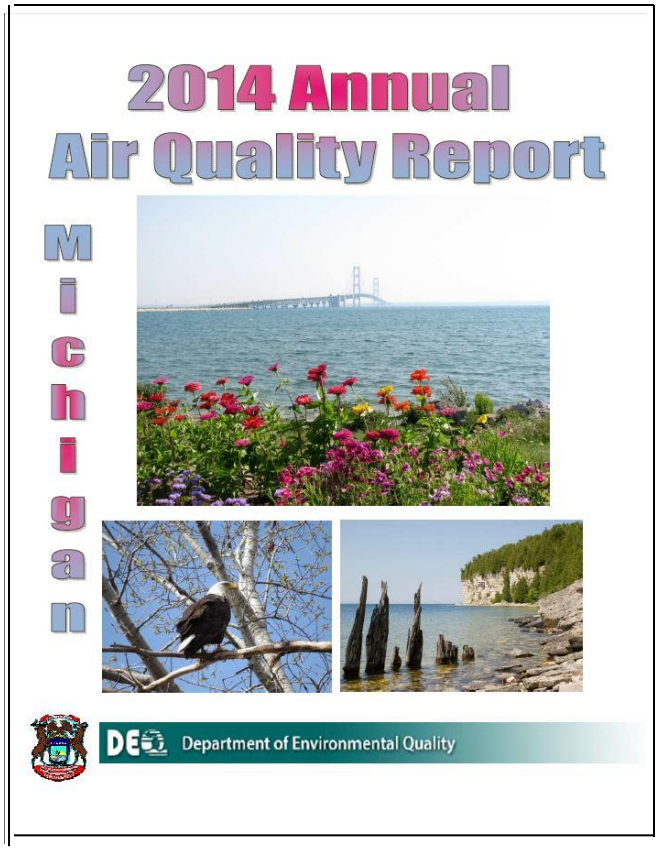
<< < Today > >> 2/26/2016 Go

Ozone



Accessing Air Monitoring Data (continued)

Summary Data



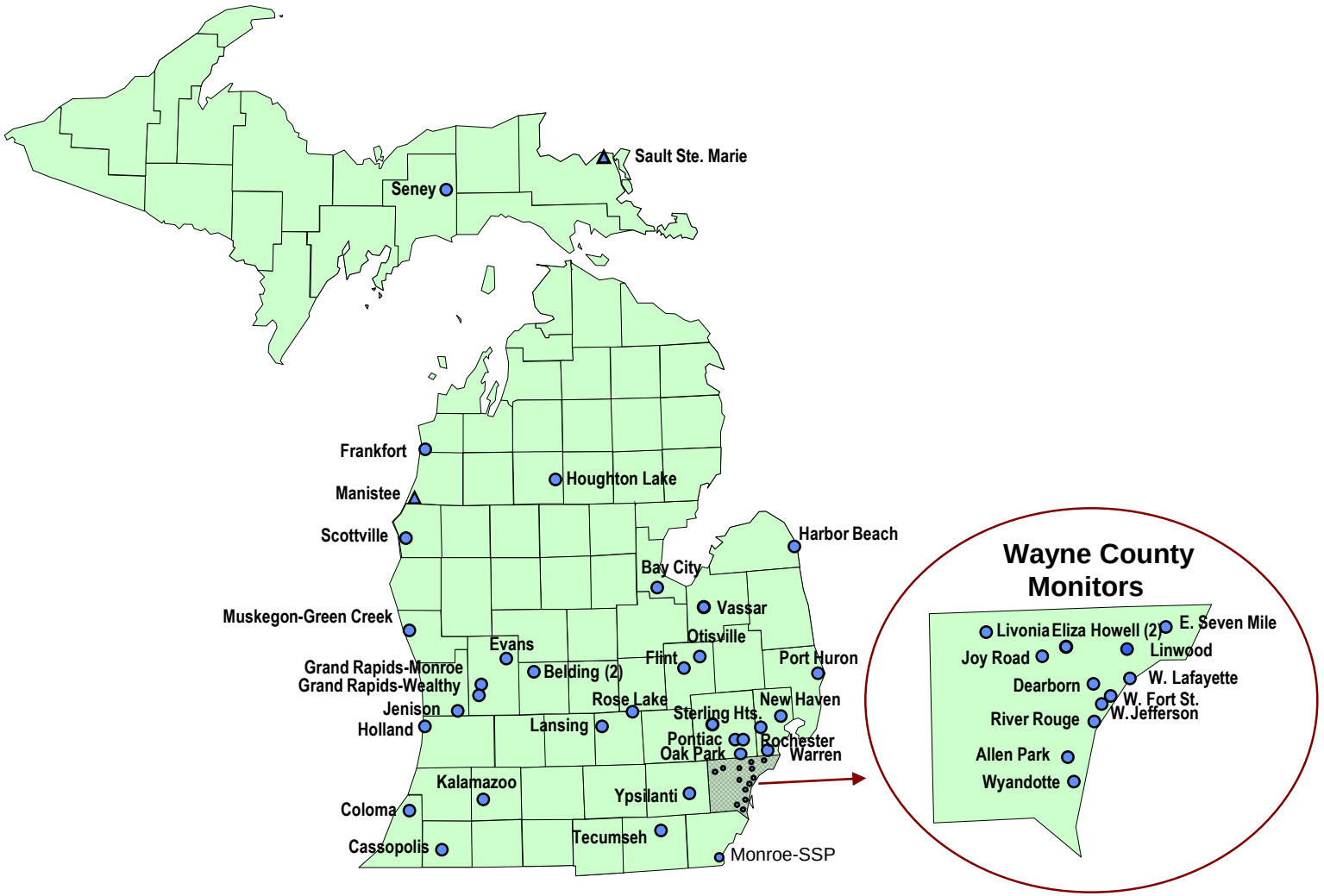
Summary Tables
(Appendix A)

Pb (24-hour) Measured in µg/m^3

City	County	Year	# OBS	Highest rolling 3-month Arith Mean	Highest Value (24 hr)
Belding-Reed St.	Ionia	2014	60	0.04	0.270
Belding-Merrick St.	Ionia	2014	60	0.05	0.210
Grand Rapids	Kent	2014	60	0.01	0.012
Port Huron Rural St.	St. Clair	2014	60	0.03	0.130
Vassar	Tuscola	2014	61	0.00	0.014
Allen Park	Wayne	2014	59	0.01	0.027
Dearborn	Wayne	2014	60	0.02	0.060

2014 data

MDEQ Air Monitoring Sites



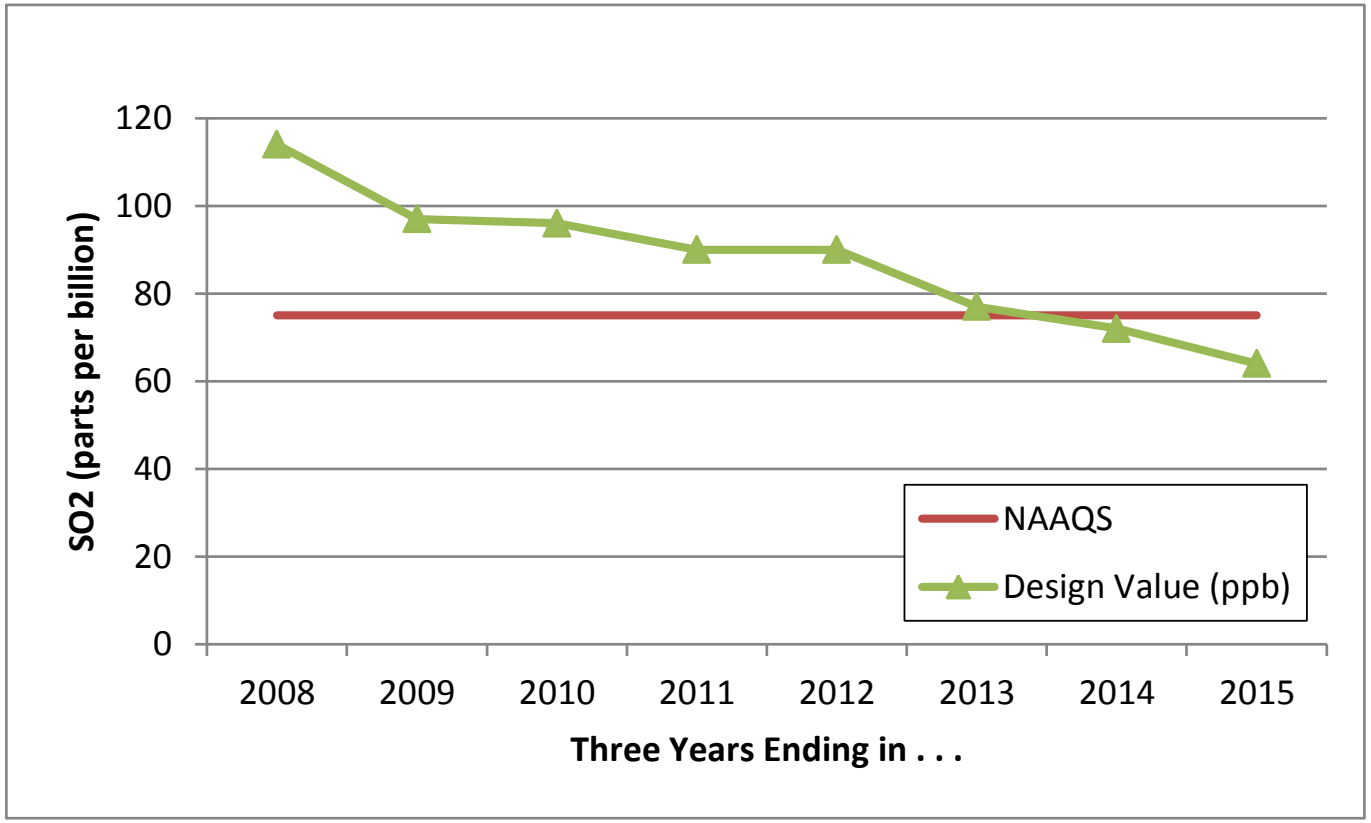
Types of Monitors and Their Location

Area	AIRS ID	Site Name	CO	NO_2	Trace NO_y	O_3	PM_{10}	$PM_{2.5}$	$PM_{2.5}$ TEOM	$PM_{2.5}$ Speciation	SO_2	Trace SO_2	VOC	Carbonyls	Trace Metals
Detroit-Ann Arbor	260910007	Tecumseh				√		√	√	√+E					
	260990009	New Haven				√		√							
	260991003	Warren				√									
	261250001	Oak Park				√		√							
	261470005	Port Huron				√		√	√	√	√				
	261470031	Port Huron-Rural St.													√@+Pb
	261610008	Ypsilanti				√		√	√						
	261630001	Allen Park	√*		√	√	√	√	√	√+A		√			√@+Pb
	261630005	River Rouge					√							√	√@
	261630015	Detroit-W. Fort St.					√	√		√	√		√	√	√@

Air Monitoring Trends Data

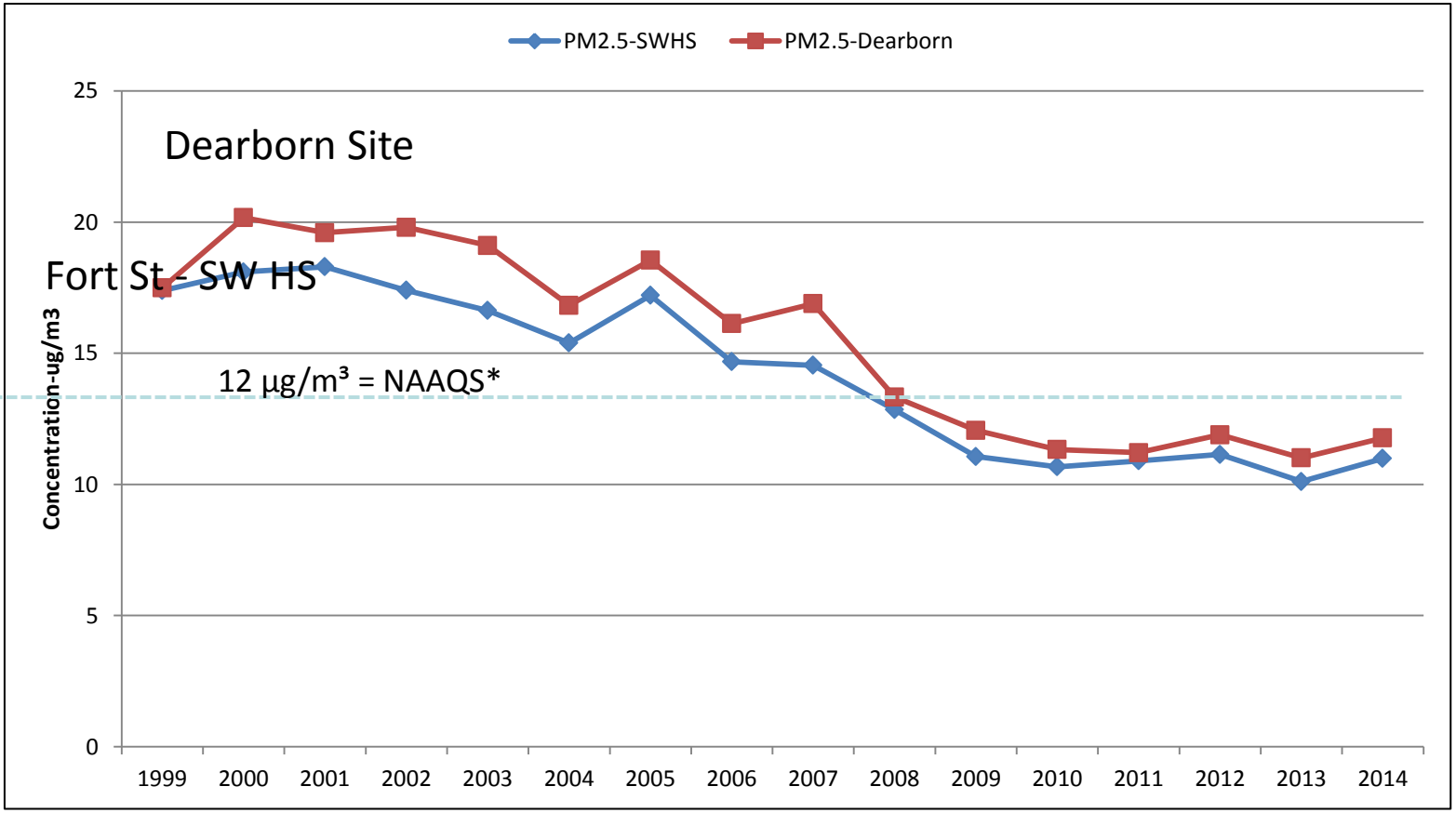
Sulfur Dioxide SO_2

3-Year Average of 99th Percentile Maximum Daily 1 Hour at Detroit – W. Fort Street (SWHS)



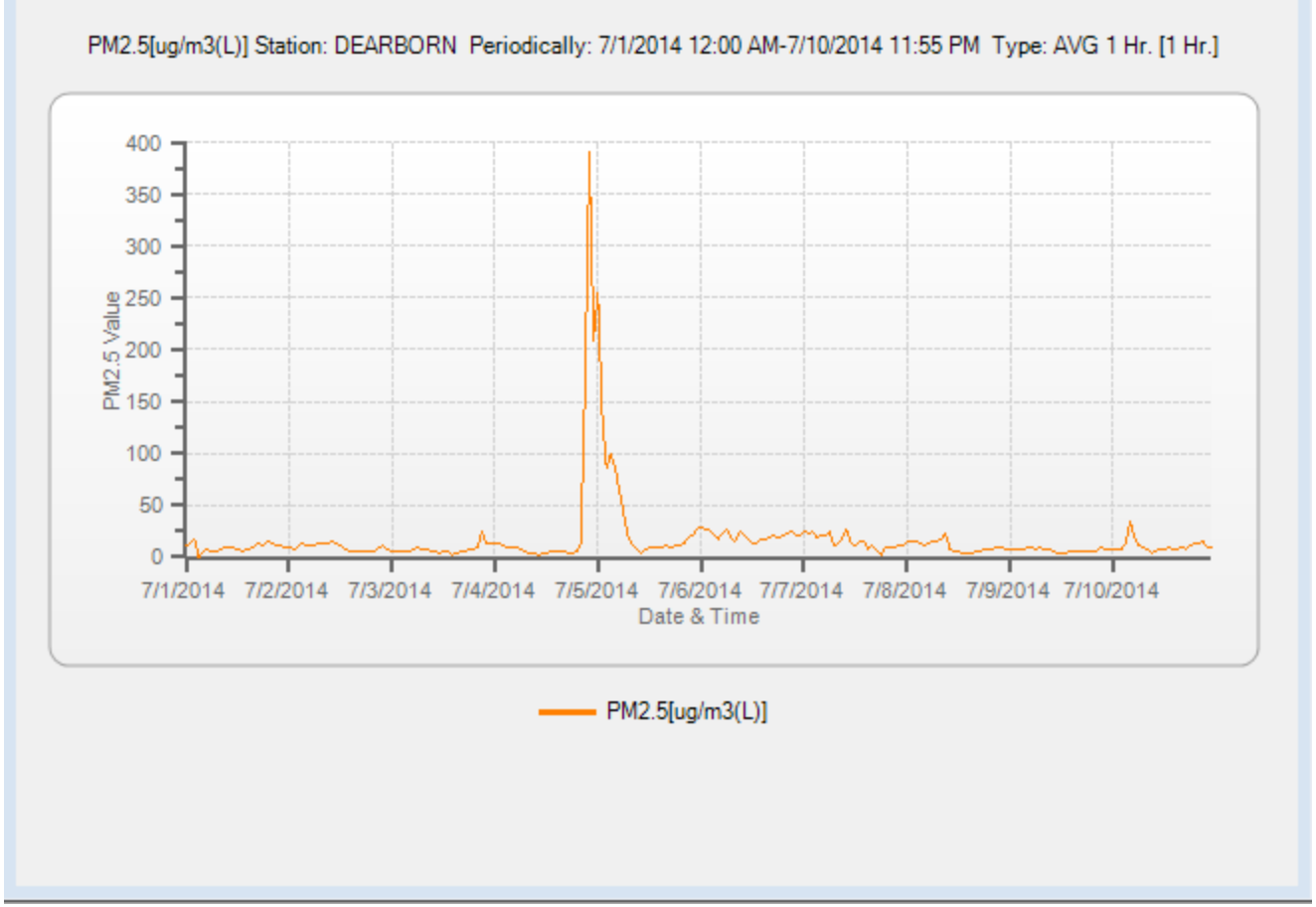
Particulate Matter <2.5 µm in Diameter ($PM_{2.5}$)

Annual Average Concentrations



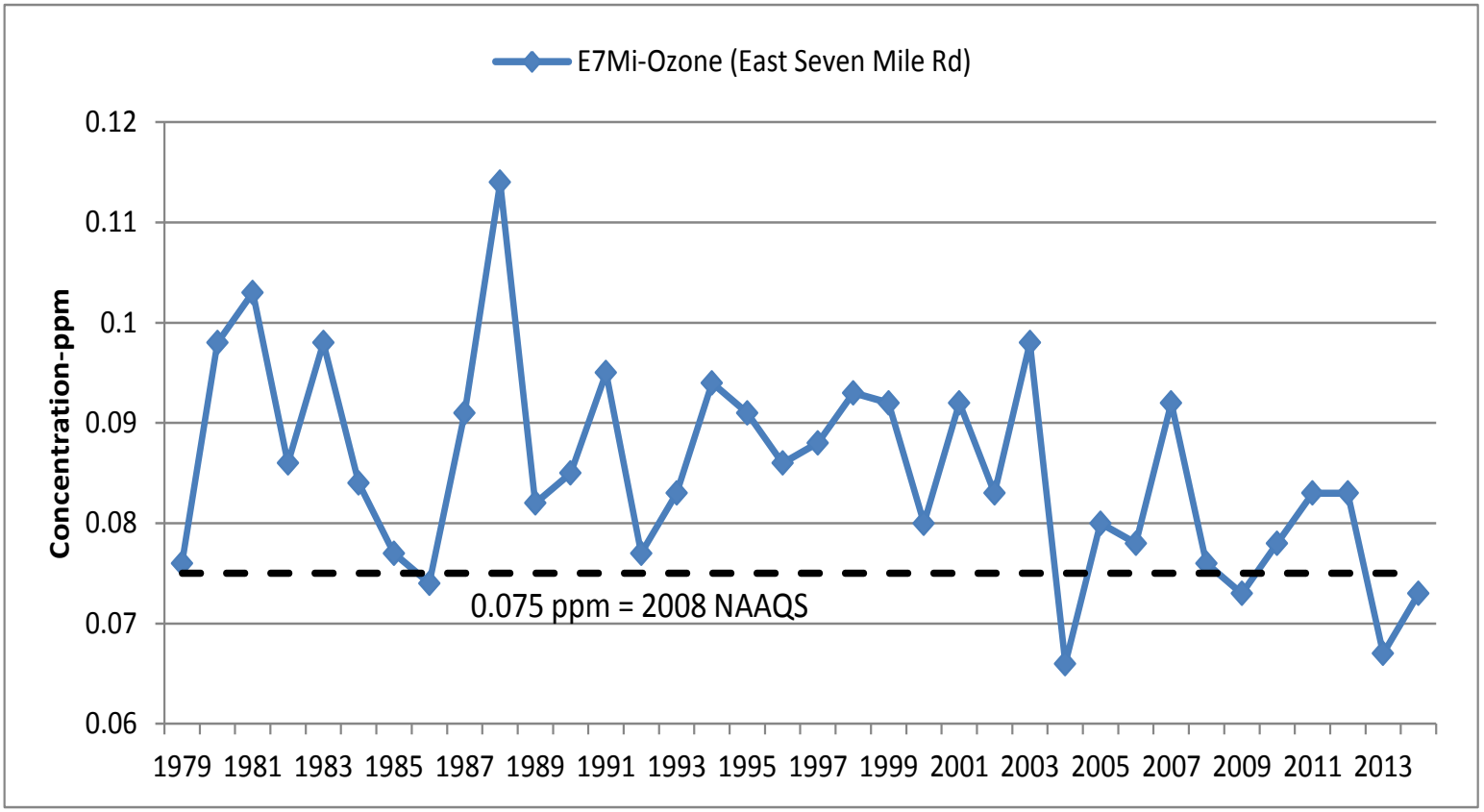
*The annual

Maximum Hourly $PM_{2.5}$



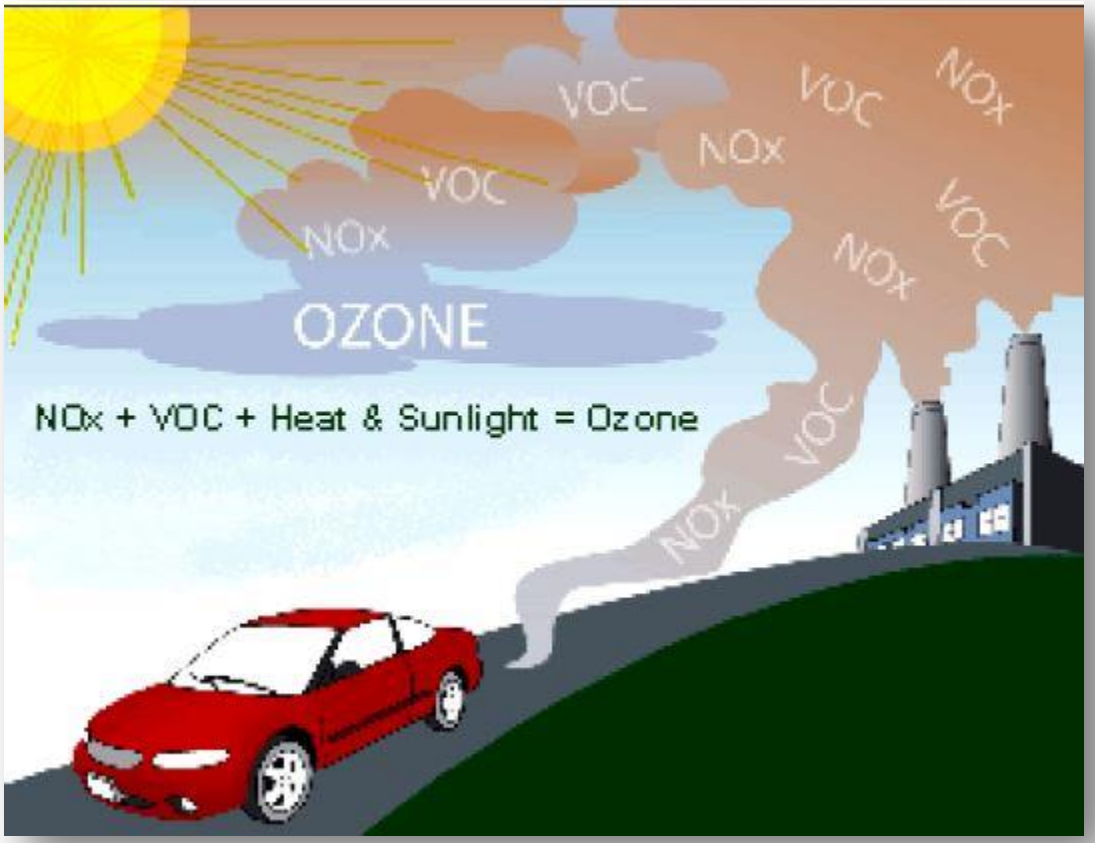
Ozone (O_3)

4th Maximum 8-Hour Concentration

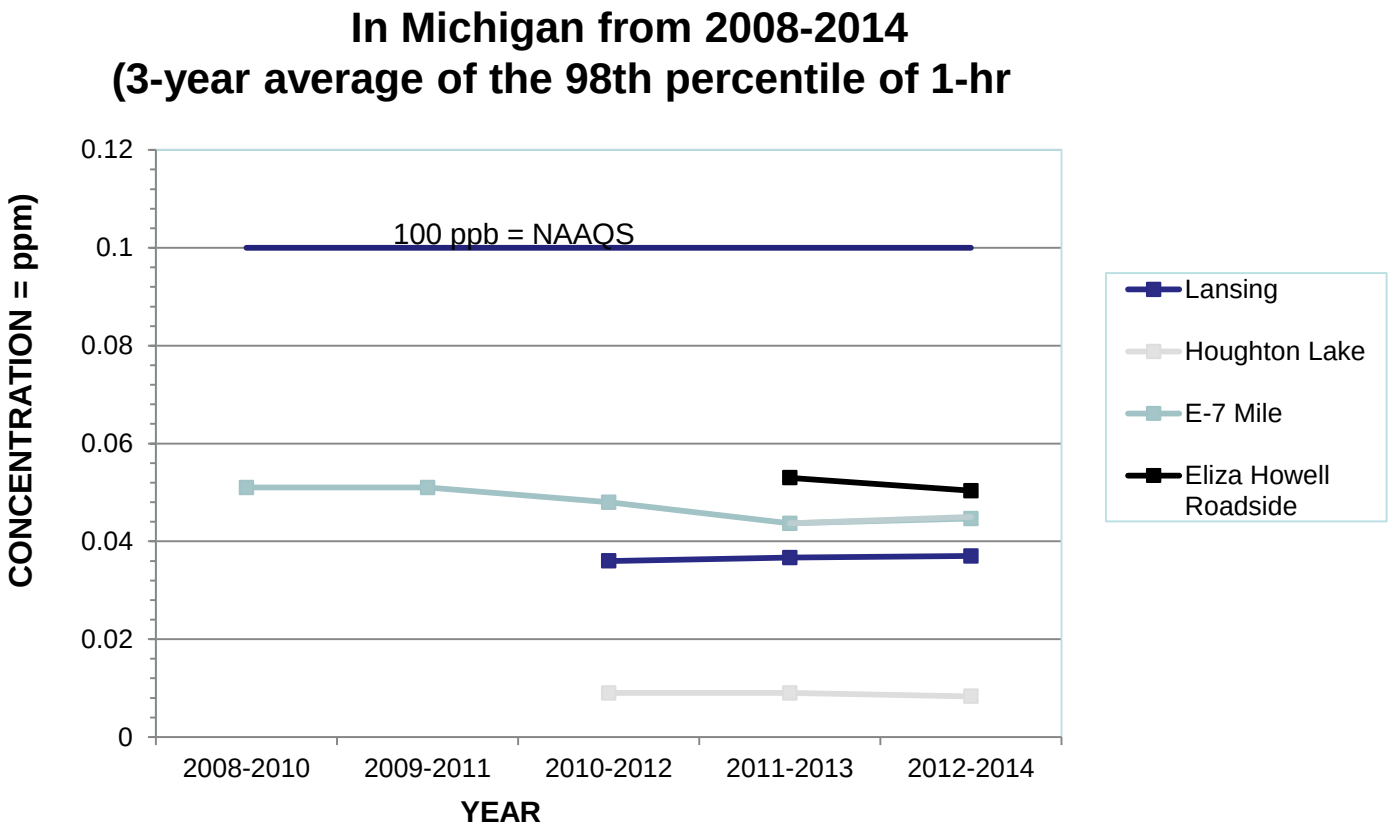


*

Ozone Formation

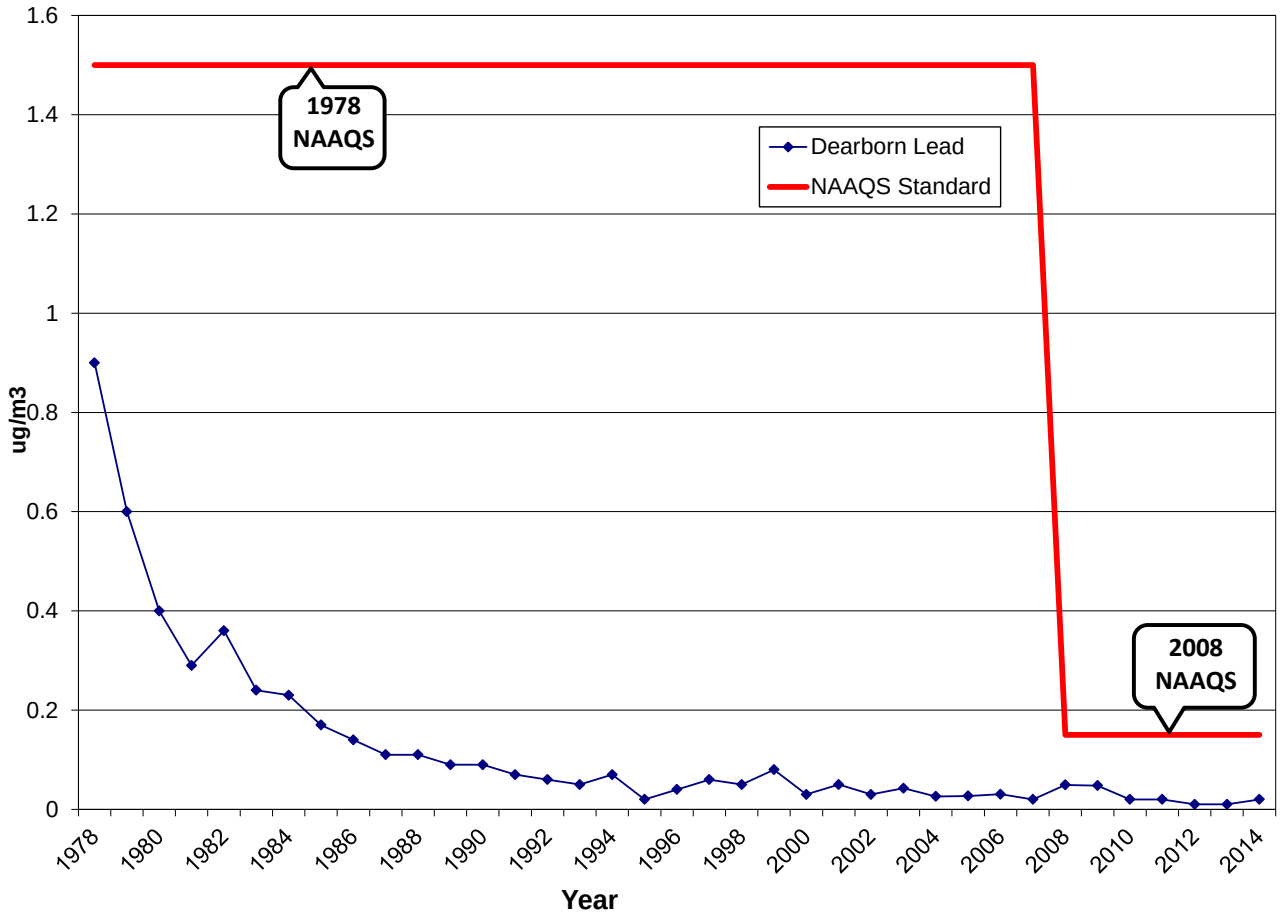


NO_2

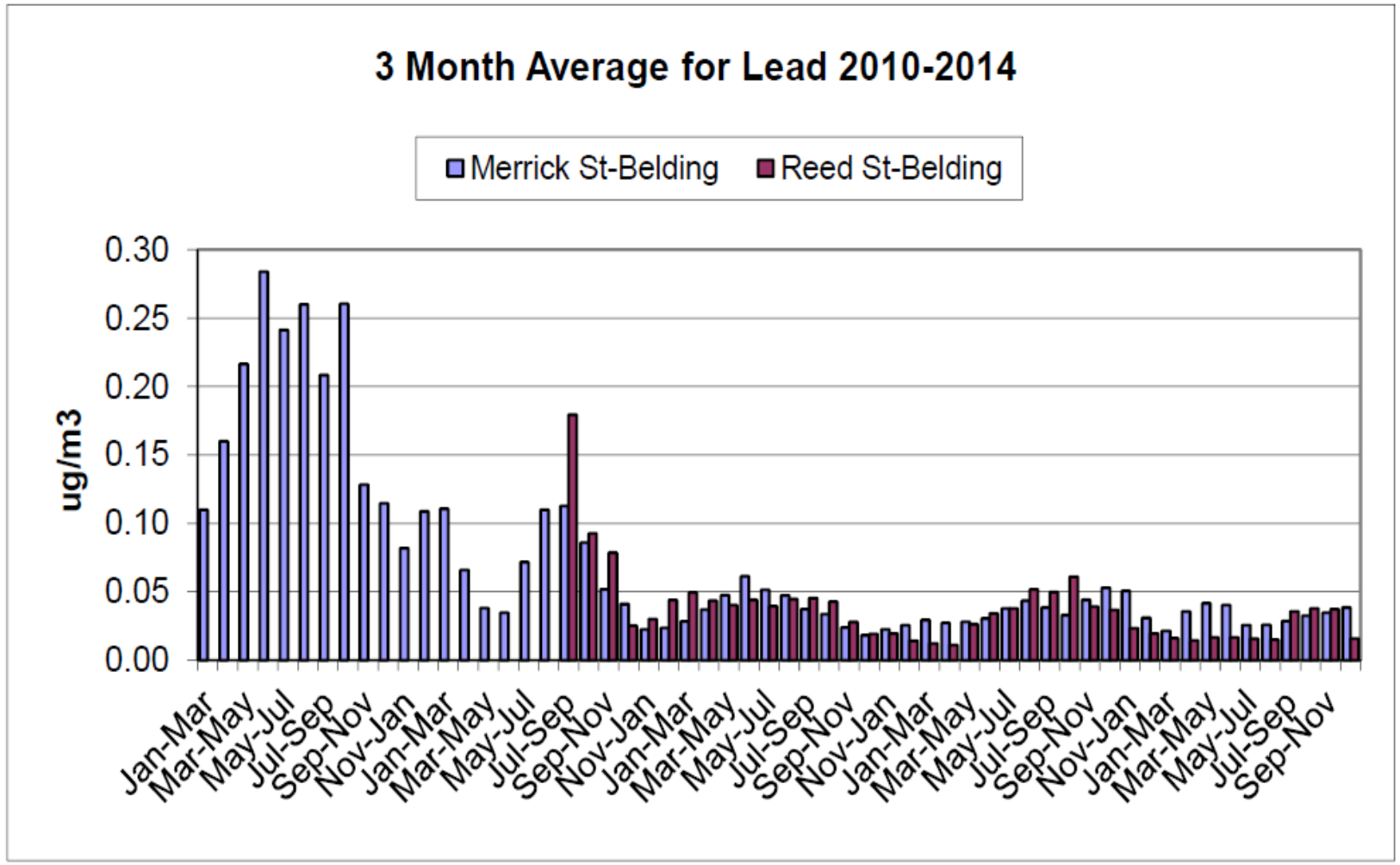

In Michigan from 2008-2014
(3-year average of the 98th percentile of 1-hr
CONCENTRATION = ppm)
0.12
0.1
0.08
0.06
0.04
0.02
0
100 ppb = NAAQS
2008-2010
2009-2011
2010-2012
2011-2013
2012-2014
YEAR
Lansing
Houghton Lake
E-7 Mile
Eliza Howell Roadside

Lead at Dearborn

Historical Quarterly / 3-Month Averages



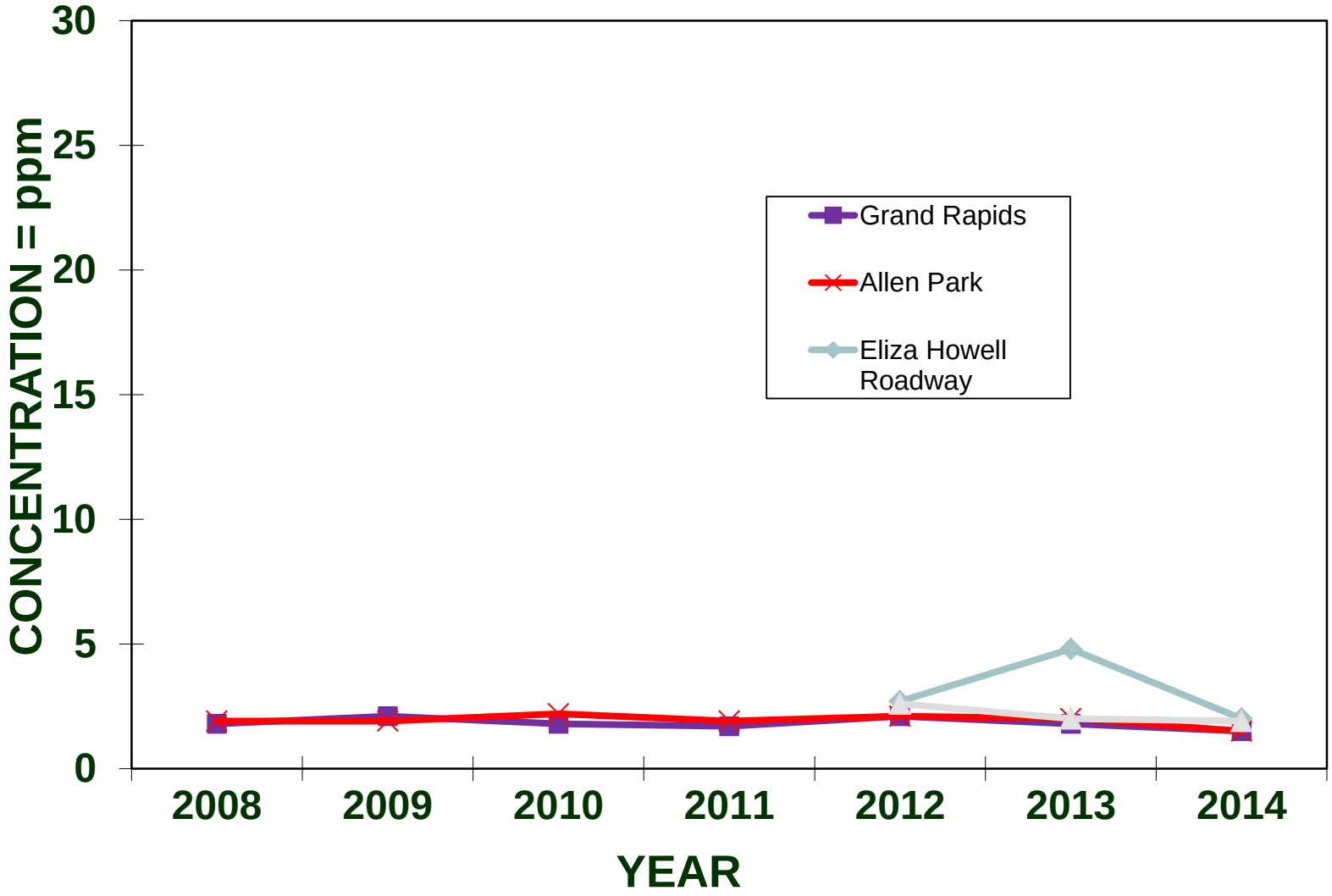
Lead at Belding



CO

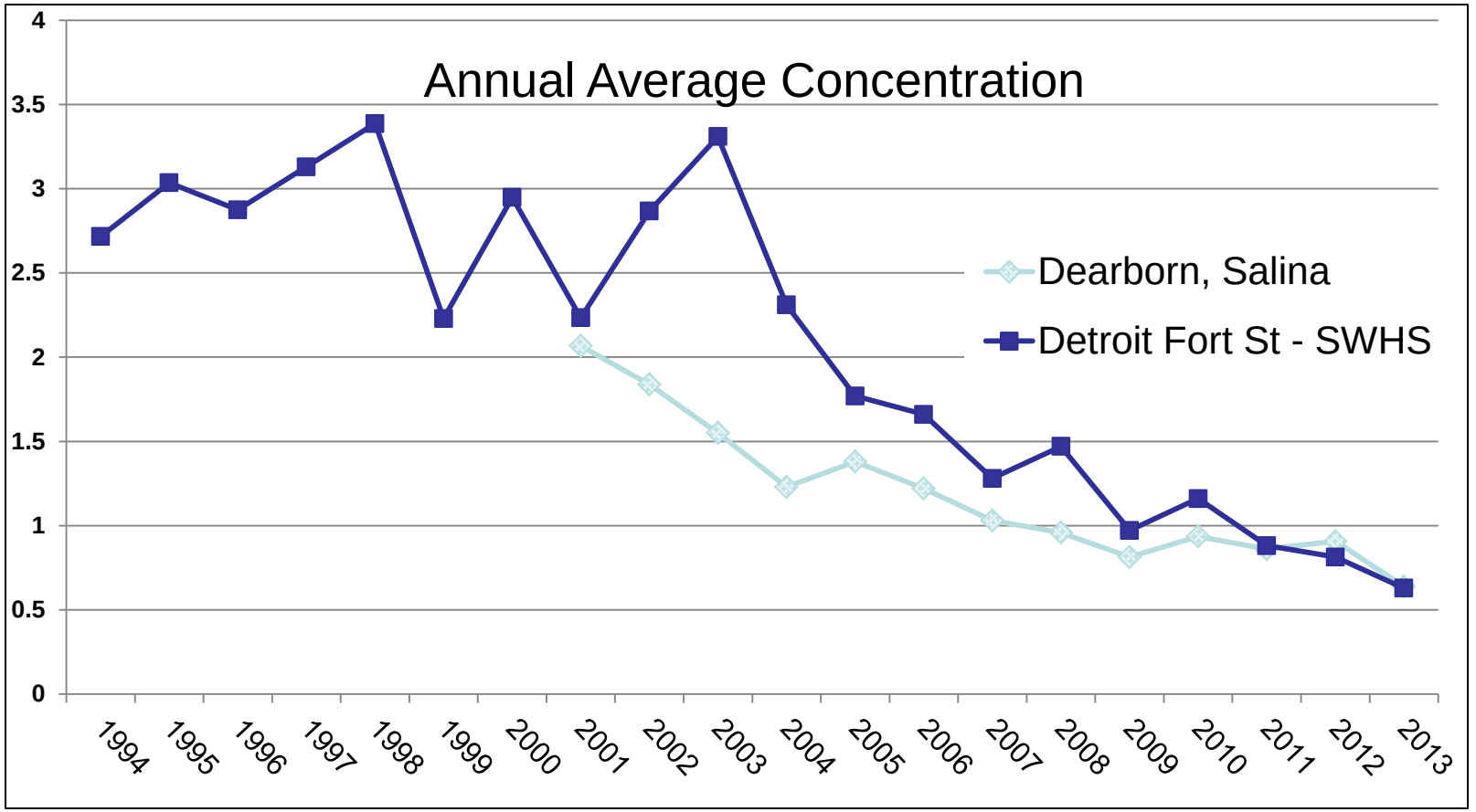
Levels in MI from 2008-2014

(2nd Highest 1-Hr Maximum Values)



Benzene

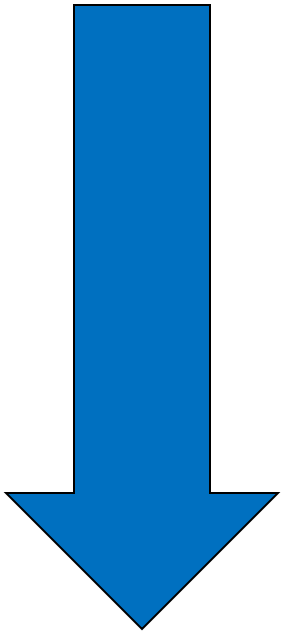
µg/m3)



What's New?

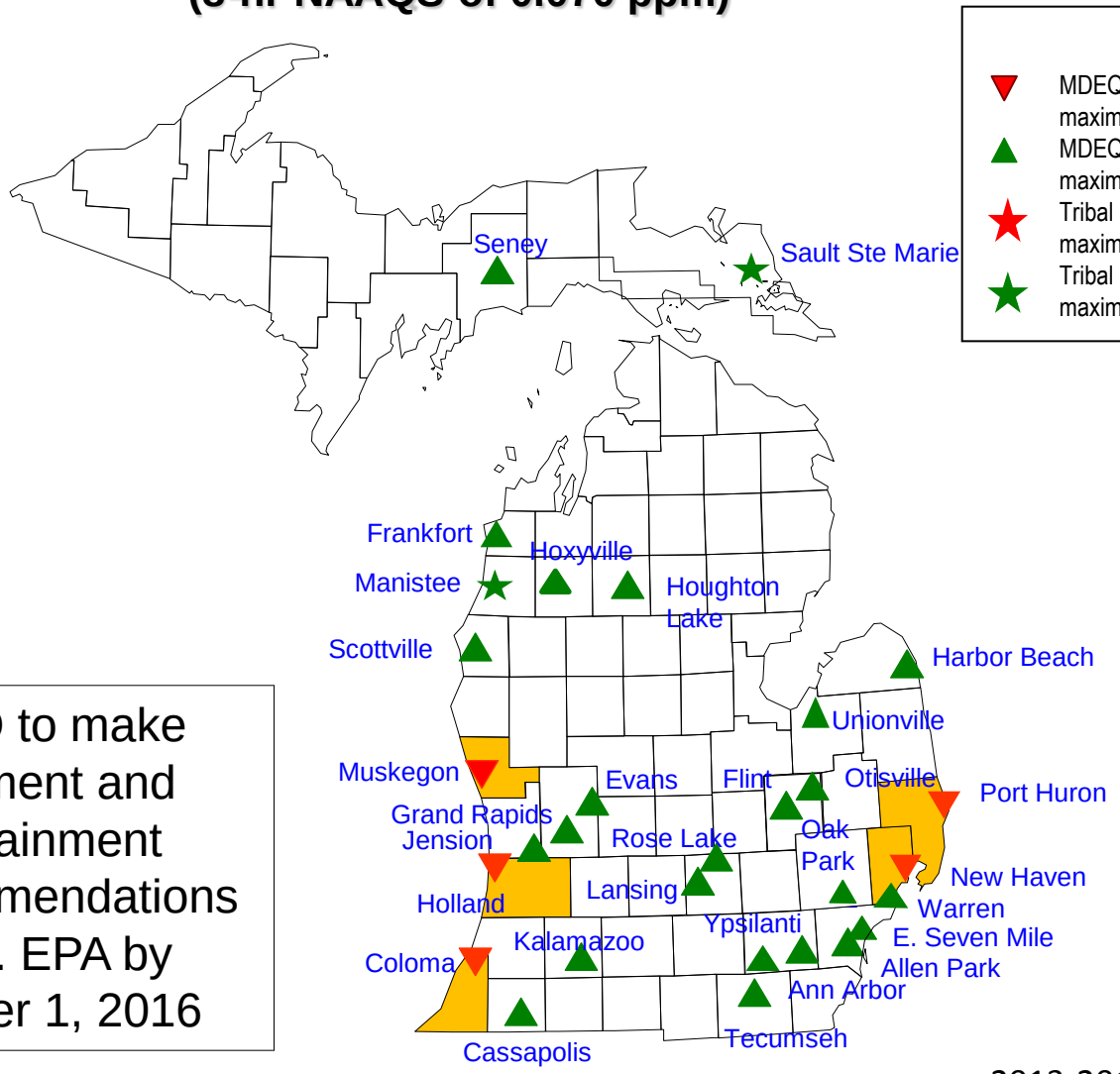
Ozone

- Reduced the NAAQS to 0.070 ppm
  - Rule signed October 1, 2015 and published October 26, 2015
  - Annual fourth-highest daily maximum 8-hour concentration, averaged over three years
    - Five sites above the NAAQS (ppm)
      - Holland (0.075),
      - Muskegon (0.074),
      - Coloma (0.073),
      - New Haven (0.071) and
      - Port Huron (0.072)



Potential Ozone Non-attainment

(8-hr NAAQS of 0.070 ppm)



MDEQ to make attainment and nonattainment recommendations to U.S. EPA by October 1, 2016

2013-2015 data

Ozone

- Also made changes to monitoring requirements
  - Lengthen Michigan's ozone monitoring season
    - Old Season APR 1-SEP 30
    - New Season MAR 1 - OCT 31
  - Requires new Photochemical Assessment Monitoring Station (PAMS) monitoring at NCORE sites;
    - Most notably auto gas chromatographs

Sulfur Dioxide

- Data Requirement Rule, affecting outstate sources of SO_2 emitting more than 2000 tons/year
  - Rule signed on August 10, 2015 and published on August 21, 2015
  - Two sources must characterize their impacts by either modeling or through ambient air monitoring
    - If monitoring, methodology must be proposed by July 1, 2016 and operational by January 1, 2017 (number and location of sites required?)
    - Data must collected for three years, meeting the quality assurance requirements of 40 CFR 58
    - the designation of these areas would be completed in 2020

Monitoring at Refineries

- Rule signed September 29, 2015 and published December 1, 2015
  - Perimeter benzene monitoring
    - Two week passive monitors must encircle the facility
      - » Compare a rolling annual average of 2.8 ppb, facility do a root cause analysis (RCA) and corrective action
    - Provides for alternative monitoring methods allowing real time monitoring in the future

Near Road Air Toxics

- September 2015: MDEQ received grant to collect air toxics data at two metro Detroit near road sites
  - Carbonyls
  - Continuous BTEX
  - Carbon black
  - Ultra-fine Particulate
  - Metals (continuous and filter-based)

- Sampling to run for two years, beginning Spring 2016

Take Aways

- MDEQ is required by the Clean Air Act to monitor air quality
- 40 CFR Part 58 Appendices D and E determine where monitors are sited
- Air quality data is available via MIair, the AQD Annual Air Quality Report or by calling the Air Monitoring Unit.

Questions or Comments?

What's Coming Up?

Dust: Fugitive Dust Regulations and Fugitive Dust Plans

April 13, 2016 at 10:00AM

Enforcement – I received a Violation Notice. Now what?

Wednesday, May 18, 2016 at 10:00

Please join us!

Wrap Up

- Recording
- Materials
- Continuing Education
- Evaluation

Michigan Department of Environmental Quality

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