Indiana
2018
Ambient Air Monitoring
Network Plan

Indiana Department of Environmental Management
Office of Air Quality
July 1, 2017

Table of Contents

Acronyms 7
Introduction 8
Public Review and Comment 9
Indiana's Air Monitoring Network 9
Air Quality Data 9
Overview of Monitored Parameters 9
Criteria Pollutants 9
Carbon Monoxide (CO) 9
Lead (Pb) 9
Nitrogen Dioxide (NO_2) 9
Ozone (O_3) 10
Particulate Matter (PM_{10}) 10
Fine Particulate Matter ($PM_{2.5}$) 10
Sulfur Dioxide (SO_2) 10
Non Criteria Parameters 10
$PM_{2.5}$ Speciation 10
Photochemical Assessment Monitoring Station, PAMS (Ozone Precursors) 10
Carbon Dioxide (CO_2) 11
Toxics / Carbonyls / Metals 11
Meteorological Monitoring 11
NCore Monitoring 11
Near-Road Monitoring 12
National Ambient Air Quality Standards (NAAQS) 12
5-Year Network Assessment 12
New U.S. EPA Monitoring Requirements 13
Network Overview 13
Review Summary 18
Network Description 18
Network Review Description 19
Monitoring Requirements 21
Quality Assurance 22
Parameter Networks 26
Carbon Oxides (CO, CO_2) 26
Monitoring Requirements 26
Monitoring Methodology 26
Monitoring Network 26
Network Modifications 26
Lead (Pb) 29
Monitoring Requirements 29
Monitoring Scale 29
Monitoring Methodology 29
Monitoring Network 29
Network Modifications 29
Oxides of Nitrogen (NO, NO_2, NO_x, NO_y) 32
Monitoring Requirements 32
Monitoring Methodology 32
Monitoring Network 32
Network Modifications 32
Ozone (O_3) 35
Monitoring Requirements 35
Monitoring Season 35

Data 35
Monitoring Methodology 35
Monitoring Network 35
Network Modifications 35
Particulate Matter (PM_{10}) 43
Monitoring Requirements 43
Monitoring Methodology 43
Monitoring Network 43
Network Modifications 43
Fine Particulate Matter ($PM_{2.5}$) 47
Monitoring Requirements 47
Monitoring Methodology 47
Monitoring Network 48
Data / Design Value 49
Network Modifications 51
Unanticipated Network Changes 51
Sulfur Dioxide (SO_2) 56
Monitoring Requirements 56
Monitoring Methodology 57
Monitoring Network 57
Network Modifications 57
$PM_{2.5}$ Speciation 60
Monitoring Requirements 60
Monitoring Methodology 60
Monitoring Network 60
Network Modifications 60
PAMS Ozone Precursors (VOCs) 63
Monitoring Requirements 63
Monitoring Methodology 63
Monitoring Network 64
Network Modifications 64
Toxics (VOCs) 67
Monitoring Requirements 67
Monitoring Methodology 67
Monitoring Network 68
Network Modifications 68
Carbonyls 71
Monitoring Requirements 71
Monitoring Methodology 71
Monitoring Network 71
Network Modifications 71
Metals 74
Monitoring Requirements 74
Monitoring Methodology 74
Monitoring Network 74
Network Modifications 74
Meteorological Monitoring 77
Monitoring Requirements 77
Monitoring Methodology 77
Monitoring Network 77
Network Modifications 78
NCore 81
Monitoring Requirements 81
Monitoring Network 81
Network Modifications 81
Near-Road 85

Monitoring Requirements 85
Monitoring Network 85
Network Modifications 85

Appendices

Appendix A - Comment Submittal Information & Comments……..……..87

Appendix B - Lead Monitoring Waivers……...……90

Appendix C - PAMS Monitoring Implementation Network Plan..……..98

Cover photo of new Michigan City – W. Michigan Blvd. shelter.

List of Tables

Table 1 – State Air Monitoring Network 14
Table 2 – Carbon Oxides Monitoring Network 28
Table 3 – Lead Monitoring Network 31
Table 4 – Oxides of Nitrogen (NO, NO_2, NO_x, NO_y) Monitoring Network 34
Table 5 – SLAMS Minimum O_3 Monitoring Requirement 37
Table 6 – SLAMS O_3 Sites Required for Indiana 38
Table 7 – Ozone Monitoring Network 41
Table 8 – PM_{10} Site Requirements 44
Table 9 – PM_{10} Monitoring Network 46
Table 10 – SLAMS Minimum $PM_{2.5}$ Monitoring Site Requirements 47
Table 11 – Number of SLAMS $PM_{2.5}$ Monitoring Sites Required for Indiana 48
Table 12 – $PM_{2.5}$ Monitoring Network 53
Table 13 – Number of SO_2 Sites Required by CFR 57
Table 14 – SO_2 Monitoring Network 59
Table 15 – $PM_{2.5}$ Speciation Monitoring Network 62
Table 16 – PAMS Target Compounds 63
Table 17 – Ozone Precursor Monitoring Network 66
Table 18 – VOCs 67
Table 19 – Toxics Monitoring Network 70
Table 20 – Carbonyl Monitoring Network 73
Table 21 – Metals Monitoring Network 76
Table 22 – Meteorological Monitoring Network 80
Table 23 – NCore Required Parameters 83
Table 24 – Additional Parameters Collected at NCore Site 84

List of Figures

Figure 1 – State Air Monitoring Network 2018 17
Figure 2 – Indiana CBSAs 25
Figure 3 – Carbon Oxides Monitoring Network 27
Figure 4 – Lead Monitoring Network 30
Figure 5 – Oxides of Nitrogen Monitoring Network 33
Figure 6 – O_3 Design Values (2014 – 2016) 39
Figure 7 – O_3 Monitoring Network 40
Figure 8 – PM_{10} Monitoring Network 45
Figure 9 – $PM_{2.5}$ Site Design Values 50
Figure 10 – $PM_{2.5}$ Monitoring Network 52
Figure 11 – SO_2 Monitoring Network 58
Figure 12 – Speciation Monitoring Network 61
Figure 13 – Ozone Precursors Network 65
Figure 14 – Toxics Monitoring Network 69
Figure 15 – Carbonyl Monitoring Network 72
Figure 16 – Metals Monitoring Network 75
Figure 17 – Meteorological Monitoring Network 79
Figure 18 – NCore Monitoring Network 82
Figure 19 – Near-Road Monitoring Network 86

Acronyms

AADT	Annual Average Daily Traffic
AERMET	American Meteorological Society / Environmental Protection Agency Regulatory Meteorology
AERMOD	American Meteorological Society / Environmental Protection Agency Regulatory Model
ANP	Annual Network Plan (this document)
APCD	Louisville Metropolitan Air Pollution Control District
AQI	Air Quality Index
AQS	Air Quality System
BAM	Beta Attenuation Monitor
BOF	Basic Oxygen Furnace
CAPS	Cavity Attenuated Phase Shift
CBSA	Core Based Statistical Area
CFR	Code of Federal Regulations
CSA	Combined Statistical Area
CSN	Chemical Speciation Network
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DNPH	2,4-Dinitrophenylhydrazine
DRR	Data Requirement Rule
DV	Design Value
EMITS	Emission Inventory Tracking System
ESAT	Environmental Services Assistance Team
FEM	Federal Equivalent Method
FID	Flame Ionization Detector
FRM	Federal Reference Method
GC	Gas Chromatograph
GC/MS	Gas Chromatograph / Mass Spectrometry
HPLC	High Pressure Liquid Chromatography
HVAC	Heating Ventilation Air Conditioning
ICP/MS	Inductive Coupled Plasma / Mass Spectrometry
IDEM	Indiana Department of Environmental Management
INDOT	Indiana Department of Transportation
KDEP	Kentucky Department for Environmental Protection
LADCO	Lake Michigan Air Directors Consortium
mm	Millimeter
mmBTU	One million British Thermal Units
LEADS	Leading Environmental Analysis and Display System
mb	millibar
MOA	Memorandum of Agreement
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standard
NATTS	National Air Toxics Trends Station
NCore	National Core multi-pollutant monitoring stations
NEI	National Emissions Inventory
NIPSCO	Northern Indiana Public Services Company
NIST	National Institute of Standards and Technology
nm	Nanometer
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen

NO_y	Total Reactive Nitrogen Oxides
NPAP	National Performance Audit Program
NWS	National Weather Service
O_3	Ozone
OAQPS	Office of Air Quality Planning and Standards
PAMS	Photochemical Assessment Monitoring Station
Pb	Lead
PEP	Performance Evaluation Program
PM	Particulate matter
$PM_{2.5}$	Particulate matter with a diameter less than or equal to 2.5 micrometers
PM_{10}	Particulate matter with a diameter less than or equal to 10 micrometers
$PM_{10-2.5}$	Particulate matter with a diameter less than or equal to 10 micrometers, and greater than or equal to 2.5 micrometers
ppb	parts per billion
ppm	parts per million
PQAO	Primary Quality Assurance Organization
PSD	Prevention of Significant Deterioration
PWEI	Population Weighted Emissions Index
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RTD	Resistance Temperature Detector
SWOAQA	Southwest Ohio Air Quality Agency
SASS	Speciation Air Sampling System
SHARP	Synchronized Hybrid Ambient Real-time Particulate
SIP	State Implementation Plan
SLAMS	State or Local Air Monitoring Stations
SO_2	Sulfur Dioxide
SPM	Special Purpose Monitor
STN $PM_{2.5}$	Speciation Trends Network
S/V	Susceptible and Vulnerable Populations
TAD	Technical Assistance Document
TPY	Tons Per Year
TRI	Toxics Release Inventory
TSA	Technical Systems Audit
TSP	Total Suspended Particulate
TEOM	Tapered Element Oscillating Microbalance
$\mu g/m^3$	micrograms per cubic meter
U.S. EPA	United States Environmental Protection Agency
UV	Ultraviolet
VOC	Volatile Organic Compounds
VSCC	Very Sharp Cut Cyclone
XRF	X-Ray Fluorescence

Introduction

In October 2006, United States Environmental Protection Agency (U.S. EPA) issued final regulations concerning state and local agency ambient air monitoring networks. These regulations in 40 CFR Part 58.10 require states to submit an annual monitoring network review to U.S. EPA. This network plan is required to provide the framework for establishment and maintenance of an air quality surveillance system and to list any changes that are proposed to take place to the current network during the 2018 season.

Public Review and Comment

The annual monitoring network plan must be made available for public inspection for 30 days prior to submission to U.S. EPA. Information on how to comment on the plan and any comments received are listed in Appendix A (page 87).

Indiana's Air Monitoring Network

The Indiana Department of Environmental Management (IDEM) regulates air quality to protect public health and the environment in the State of Indiana. Air monitoring data are required by regulation and are used to determine compliance with U.S. EPA's National Ambient Air Quality Standards (NAAQS). Other important uses of the air monitoring data include, the production of a daily AQI report, daily air quality forecast report, support of short and long-term health risk assessments, identification of a localized health concern, and tracking long-term trends in air quality. Indiana monitors the six criteria pollutants which have NAAQS identified for them; CO, lead, NO_2, O_3, particulate matter (PM_{10} and $PM_{2.5}$), and SO_2. Other pollutants which do not have ambient standards established for them are also monitored: toxics (volatile organic compounds, VOCs), metals, carbonyls, $PM_{2.5}$ speciated compounds, ozone precursors, and CO_2. In addition, meteorological data are also collected to support the monitoring and aid in analysis of the data.

Air Quality Data

IDEM presents two different types of air quality data, intermittent and continuous, on IDEM's Internet website http://www.in.gov/idem/airquality/2346.htm. Monthly and annual summary reports of pollutants collected by manual methods are available as well as hourly values from continuous monitors. The Leading Environmental Analysis and Display System (LEADS) provides on-line access to Indiana's continuous air quality monitoring network. It has been available to the public since July, 2007. LEADS offers access to near real-time data from 61 continuous air monitoring sites across Indiana. This allows anyone to track pollutant and meteorological values throughout the day. In addition, past data back to 1998 are available as raw data and canned summary reports or user specified retrievals. Intermittent data from 41 sites are available on LEADS.

Overview of Monitored Parameters

Criteria Pollutants

Carbon Monoxide (CO)

Carbon monoxide (CO) is a poisonous gas that, when introduced into the bloodstream, inhibits the delivery of oxygen to body tissue. The health risk is greatest for individuals with cardiovascular disease.

Lead (Pb)

Lead (Pb) is a metal that is highly toxic when ingested or inhaled. It is a suspected carcinogen of the lungs and kidneys and has adverse effects on cardiovascular, nervous, and renal systems.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide (NO_2) is a highly toxic, reddish-brown gas that is created primarily from fuel combustion in industrial sources and vehicles. It creates an odorous haze that causes eye and sinus irritation, blocks natural sunlight, and reduces visibility.

Ozone (O_3)

Ground-level ozone (O_3), or photochemical smog, is not emitted into the atmosphere as ozone, but rather is formed by the reactions of other pollutants. The primary pollutants entering into this reaction, VOCs and oxides of nitrogen, create ozone in the presence of sunlight. Ozone is a strong irritant of the upper respiratory system and also causes damage to crops.

Particulate Matter (PM_{10})

Particulate matter with a mean diameter of 10 microns or less (PM_{10}) is emitted from transportation and industrial sources. Exposure to particle pollution is linked to a variety of significant health problems ranging from aggravated asthma to premature death in people with heart and lung disease.

Fine Particulate Matter ($PM_{2.5}$)

Fine particulate matter with a diameter of 2.5 microns or less ($PM_{2.5}$) is created primarily from industrial processes and fuel combustion. These particles are breathed deeply into the lungs. Exposure to particle pollution is linked to a variety of significant health problems ranging from aggravated asthma to premature death in people with heart and lung disease.

Sulfur Dioxide (SO_2)

Sulfur dioxide (SO_2) is a gaseous pollutant that is emitted primarily by industrial furnaces or power plants burning coal or oil containing sulfur. At high concentrations, breathing can be impaired. Damage to vegetation can also result.

Non Criteria Parameters

$PM_{2.5}$ Speciation

U.S. EPA implemented the $PM_{2.5}$ chemical speciation monitoring program. Knowing the chemical composition of the $PM_{2.5}$ mix is important for determining sources of pollution and links between observed health effects. The basic objective of speciation analysis is to develop seasonal and annual chemical characterizations of ambient particulates across the nation. This speciation data will be used to perform source attribution analyses, evaluate emission inventories and air quality models, and support health related research studies and regional haze assessments.

The speciation samplers use different inlet tubes and filters to collect the components of the $PM_{2.5}$ mixture. The process consists of using three different types of filters to separate out such specific compounds as: sulfate, nitrate, organic and elemental carbon, ammonium, metals, and certain ions.

Photochemical Assessment Monitoring Station, PAMS (Ozone Precursors)

Of the six criteria pollutants, O_3 is the most encompassing. The most prevalent photochemical oxidant and an important contributor to “smog”, O_3 is unique among the criteria pollutants because it is not emitted directly into the air. Instead, it results from complex chemical reactions in the atmosphere between VOCs and NO_x in the presence of sunlight. There are thousands of sources of VOCs and NO_x located across the country. To track and control O_3, U.S. EPA is trying to create an understanding of not only the pollutant itself, but the chemicals, reactions, and conditions that contribute to its formation as well. Because of this, U.S. EPA called for improved monitoring of O_3 and its precursors, VOC and NO_x, to obtain more comprehensive and representative data on O_3 air pollution. U.S. EPA initiated the PAMS program in February 1993. The PAMS program requires the establishment of an enhanced monitoring network in all O_3 nonattainment areas classified as serious, severe, or extreme. Details of what compounds are sampled are found in the Parameter Networks section.

Carbon Dioxide (CO_2)

In 2009 the U.S. EPA declared CO_2 a pollutant. Carbon dioxide (CO_2) is the primary greenhouse gas emitted through human activities. Gases that trap heat in the atmosphere are called greenhouse gases. CO_2 is naturally present in the atmosphere as part of the earth's carbon cycle. The carbon cycle is the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals. CO_2 emissions come from a variety of natural sources. Human activities can influence the carbon cycle by adding more CO_2 to the atmosphere and by influencing the ability of natural sinks, like forests, to remove CO_2 from the atmosphere. The main human activity that emits CO_2 is the combustion of fossil fuels like coal, natural gas, and oil used for energy and transportation.

Toxics / Carbonyls / Metals

Toxic air pollutants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer, other serious health effects, or adverse environmental conditions. Air toxics include semi-volatile and volatile organic compounds (VOC), metals, and carbonyls.

Air toxic compounds are released from many different sources, including mobile sources (vehicles), stationary industrial sources, small area sources, indoor sources (cleaning materials, etc.), and other environmental sources (wildfires, etc.). The lifetime, transportation, and make-up of these pollutants are affected by weather and landscape. They can be transported far away from the original source, or be caught in rain and deposited to waterways or land.

The air toxics, carbonyls, and metals are divided into separate categories due to different sampling and analytical methodologies used for each. With all three categories combined, more than eighty different pollutants are analyzed.

Meteorological Monitoring

Any study of air pollution should include an analysis of the weather patterns (meteorology) of the local area because the fate of air pollutants is influenced by the movement and characteristics of the air mass into which they are emitted.

If the air is calm and pollutants cannot disperse, then the concentration of these pollutants will build up. Conversely, if a strong and turbulent wind is blowing, the pollutant will rapidly disperse into the atmosphere and will result in lower concentrations near the pollution source.

The measurements of wind speed and direction, temperature, humidity, rainfall, barometric pressure, ultraviolet radiation and solar radiation are important parameters used in the study of air quality monitoring results and to further understand the chemical reactions that occur in the atmosphere. Meteorological monitoring is used to predict air pollution events, high pollutant concentration days, and to simulate and predict air quality using computer models.

NCore Monitoring

NCore is a multi-pollutant approach to monitoring. NCore sites are intended to support multiple objectives with a greater emphasis on assessment, research support, and accountability than the traditional SLAMS networks. NCore provides an opportunity to address new directions in monitoring and begin to fill measurement and technological gaps that have accumulated in the networks. Indiana is required to establish and operate one urban NCore site. These sites are required to measure $PM_{2.5}$, speciated $PM_{2.5}$, $PM_{10-2.5}$, O_3, SO_2, CO, Nitrogen Oxides (NO/NO_2), Total Reactive Nitrogen Oxides (NO_y), and meteorology. By June 2019 PAMS are to be included at NCore sites located in a CBSA with a population of 1,000,000 or more.

Near-Road Monitoring

On February 9, 2010, the U.S. EPA promulgated monitoring regulations for the NO_2 monitoring network. In the new monitoring requirements, state and local air monitoring agencies are required to install near-road NO_2 monitoring stations at locations where peak hourly NO_2 concentrations are expected to occur within the near-road environment in larger urban areas. Site selection is required to consider traffic volumes, fleet mix, roadway design, traffic congestion patterns, local terrain, and meteorology in determining where a required near-road NO_2 monitor should be placed. Indiana must establish and operate one near-road monitoring site. IDEM worked with the INDOT to obtain a location for the site. The near-road site is required to measure Nitrogen Oxides (NO/NO_2), CO, O_3, and meteorology.

National Ambient Air Quality Standards (NAAQS)

NAAQS are identified for the criteria pollutants; CO, Pb, NO_2, O_3, particulate matter (PM_{10} and $PM_{2.5}$), and SO_2. Measuring pollutant concentrations in outdoor air and comparing the measured concentrations to corresponding standards determines the ambient air quality status of an area as attaining or not attaining the standards.

The NAAQS are separated into primary and secondary standards. Primary standards are those established to protect public health. Secondary standards are those established to protect the public welfare from adverse pollution effects on soils, water, vegetation, manmade materials, animals, weather, visibility, property, and economy.

The scientific criteria upon which the standards are based are reviewed periodically by U.S. EPA, which may retain or change the standards according to its findings. Note that there are hundreds of compounds that are generally considered pollutants when found in ambient air but whose health and welfare effects are not well enough understood for ambient standards to be defined.

A pollutant measurement that is greater than the ambient air quality standard for its specific averaging time is called an exceedance. An exceedance is not necessarily a synonym for a violation. For each pollutant there are specific rules about how many exceedances are allowed in a given time period before a pattern of exceedances is considered a violation of the NAAQS that may result in regulatory actions to further clean up the area's air. This distinction is made to allow for certain limited exceedances of the standard that may occur during an unusual weather pattern, for example, reserving regulatory action for instances where the exceedances are too frequent.

The design value for a site is the level of pollutant concentration when the rules of the NAAQS calculations are applied to that specific pollutant. For example, the O_3 design value is calculated by taking the three year average of the annual fourth highest daily 8-hour maximums. If this number is above the NAAQS for O_3, then it is a violation or 'nonattainment' of the NAAQS. If the design value is below the NAAQS then the area is in 'attainment' of the standard. Generally, nonattainment is based on the highest design value reported for a specific geographic area (usually a CBSA), and the entire area would be defined by that monitor, and classified accordingly. This number basically tells you how polluted an area would be in relation to a NAAQS. A listing of the NAAQS can be found at:
https://www.epa.gov/criteria-air-pollutants/naaqs-table

5-Year Network Assessment

U.S. EPA requires a Network Assessment be performed every five (5) years, as per 40 CFR Part 58.10(d). The second Regional Network Assessment, published in 2015 by the Lake Michigan Air Directors Consortium (LADCO) for the states of Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin is available at:
http://www.ladco.org/reports/general/Regional_Network_Assessment/RNA15.html

The first Regional Network Assessment, published July 1, 2010 is available at:
http://www.ladco.org/reports/general/Regional_Network_Assessment/index.php
Indiana uses the recommendations from the Regional Assessment as input into the Annual Network Review.

New U.S. EPA Monitoring Requirements

Several of the NAAQS and monitoring requirements for the various pollutants have either been revised recently, are in the final review stages prior to promulgation, or are planning to have proposals within the next year. Even though IDEM is aware of these proposals and how they could possibly affect Indiana's monitoring network, only those requirements which have been approved and are in effect at this time are considered when modifying Indiana's current network.

Network Overview

Indiana has reviewed its current ambient air quality network and has developed a proposed network to be implemented during 2018. Current NAAQS, data trends, site redundancy, siting problems, site access concerns and other identified monitoring issues all contribute to any proposed network revisions.

The number of sites listed in the current monitoring network include sites where changes were planned to have occurred during 2016 and were not, but are planned, or have been completed during 2017. These include the relocation of the Hammond-Purdue site for $PM_{2.5}$.

Indiana's air monitoring network for 2018 consists of the sites and monitors listed in Table 1. All site changes which have occurred or plan to take place in 2017 are included along with the planned network modifications for 2018. Figure 1 is an overview of Indiana's current monitoring network with population density showing the locations where monitoring takes place in 2018.

The number of monitoring locations operated by the State is planned to decrease from 83 sites to 79. The number of monitored parameters or monitoring systems will decrease from 181 to 177.

Table 1 – State Air Monitoring Network

Indiana Ambient Air Quality Monitoring Network 2017

AQS#	COUNTY	CITY	SITE NAME	SITE ADDRESS	O_3	SO_2	CO / CO_2	NO_X	PM_{10}	$PM_{10-2.5}$	$PM_{2.5}$ (FRM)	$PM_{2.5}$ (Cont)	$PM_{2.5}$ (Spec)	$PM_{2.5}$ (Spec Cont)	LEAD	TOXICS (VOCs)	O_3 PREC	CAR-BONYLS	METALS	MET
170230001	Clark, IL	West Union, IL	West Union	416 S. Hwy 1	X															X
180030002	Allen	Leo	Leo	Leo HS, 14600 Amstutz Rd.	X															
180030004	Allen	Fort Wayne	Fort Wayne - Beacon St.	2022 N. Beacon St	X						X	X								X
180050007	Bartholomew		Hope	Hauser Jr-Sr HS, 9404 N775 E.	X		X													
180050008	Bartholomew	Columbus	Columbus - Rocky Ford Rd.	3475 Trestle Dr.							X	X								
180110001	Boone		Whitestown	Perry-Worth Elem Sch., 3900 E. 300 S, Lebanon	X															
180130001	Brown		Helmsburg	Jackson Twp Fire Dept., 4831 Helmsburg Road, Nashville	X															
180150002	Carroll		Flora	Flora Airport, 481 S. 150 W, Flora	X															X
180190006	Clark	Jeffersonville	Jeffersonville - Walnut St	PFAU, 719 Walnut St.					Relocate		Relocate		Relocate							
18019____	Clark	Jeffersonville							Relocation		Relocation	Add	Relocation	Add B. Carbon						
180190008	Clark		Charlestown St. Park	Charlestown State Park, 12500 Highway 62, Charlestown	X						X									X
180190009	Clark	Clarksville	Clarksville	Falls of the Ohio State Park, 201 W. Riverside Dr.												X				
180350006	Delaware	Muncie	Muncie - Central HS	801 N. Walnut St.							X									
180350009	Delaware	Muncie	Muncie - Mt. Pleasant Blvd.	2601 W. Mt. Pleasant Blvd.											Add Collocate					
180350010	Delaware	Albany	Albany	Albany Elem. Sch., 700 W. State St.	X															
180372001	Dubois	Jasper	Jasper - Post Office	Post Office, 206 E. 6th St.					X		X		X							
180390007	Elkhart	Bristol	Bristol	Bristol Elem. Sch. 705 Indiana Ave.	X															
180390008	Elkhart	Elkhart	Elkhart - Prairie St.	2745 Prairie St.							X	X		B. Carbon						
180431004	Floyd	New Albany	New Albany	Green Valley Elem. Sch., 2230 Green Valley Rd.	Relocation	Relocation					Relocation	Relocation								
180550001	Greene		Plummer	2500 S. 275 W	X						X									X
180570006	Hamilton	Noblesville	Noblesville - 191st St.	Our Lady of Grace Catholic Church, 9900 E. 191st St.	X															
180570007	Hamilton	Fishers	Fishers	11775 Brooks School Road							X	X								
180630004	Hendricks	Avon	Avon	7203 E. US Highway 36	X															
180650003	Henry		Mechanicsburg	Shenandoah HS, 7354 W. Hwy. 36, Middletown							X		X							X
180670004	Howard	Kokomo	Kokomo - E. Vaile Ave.	1802 E. Vaile Ave.	Add						X	X								
180670005	Howard	Kokomo	Kokomo - KOG	Kokomo Opalscent Glass, 1310 S. Market St.															Discontinue	
180690002	Huntington	Roanoke	Roanoke	Roanoke Elem. Sch., 423 W. Vine St.	X															

AQS#	COUNTY	CITY	SITE NAME	SITE ADDRESS	O_3	SO_2	CO / CO_2	NO_X	PM_{10}	$PM_{10-2.5}$	$PM_{2.5}$ (FRM)	$PM_{2.5}$ (Cont)	$PM_{2.5}$ (Spec)	$PM_{2.5}$ (Spec Cont)	LEAD	TOXICS (VOCs)	O_3 PREC	CAR-BONYLS	METALS	MET
180710001	Jackson		Brownstown	225 W & 300 N, Brownstown	X															X
180810002	Johnson	Trafalgar	Trafalgar	200 W. Pearl St.	Discontinue															
180890006	Lake	East Chicago	East Chicago - Franklin Sch.	Washington (formerly Franklin) Elem. Sch, 2400 Cardinal Dr.					X		X									
180890015	Lake	East Chicago	East Chicago - Post Office.	East Chicago Post Office, 901 E. Chicago Ave.			X													
180890022	Lake	Gary	Gary - IITRI	IITRI Bunker, 201 Mississippi St.	X	X		X	X		X	X	X	B. Carbon		X				X
180890026	Lake	Gary	Gary - Burr St.	25th Ave. and Burr St.							X									
180890031	Lake	Gary	Gary - Madison St.	Indiana American Water Co. 650 Madison St.					X		X									
180890032	Lake	Gary	Gary - 4th Ave.	Gary SouthShore RailCats, One Stadium Plaza											X				X	
180890033	Lake	East Chicago	East Chicago - E. 135th St.	Abraham Lincoln Elem. Sch., E. 135th St.											X				X	
180890034	Lake	East Chicago	East Chicago - Marina	East Chicago Marina, 3301 Aldis St.					X						X	X			X	
180890035	Lake	Whiting	Whiting - Center St.	1500 Center St. (H.S. Admin. Bldg.)												X				
180892004	Lake	Hammond	Hammond - Purdue	Powers Bldg. Purdue Univ. Calumet, 2200 169th St.							Relocate	Relocate								
18089___	Lake	Hammond									Relocation	Relocation								
180892008	Lake	Hammond	Hammond - 141st St.	1300 E. 141st St.	X	X									Discontinue	X			Discontinue	X
180910005	LaPorte	Michigan City	Michigan City - W. Michigan Blvd.	NIPSCO Gas Station, 490 W. Michigan Blvd.	X															
180910010	LaPorte	LaPorte	LaPorte - E. Lincolnway	2011 E. Lincolnway	X															
180910011	LaPorte	Michigan City	Michigan City - Marsh Elem. Sch.	400 E. Homer St.							X									
180950010	Madison		Emporia	East Elem. Sch., 893 E. US 36, Pendleton	X															
180950011	Madison	Anderson	Anderson - Eastside Elem.	Eastside Elem. Sch., 844 N. Scatterfield Rd.							X	X								
180970043	Marion	Indianapolis	Indpls - West St.	1735 S. West St.					X		X									
180970050	Marion	Indianapolis	Indpls - Ft. Harrison	Ft. Harrison St. Park, 5753 Glenn Rd.	X															
180970057	Marion	Indianapolis	Indpls - Harding St.	1321 S. Harding St.	X	X														
180970063	Marion	Indianapolis	Indpls - Rockville Rd.	7601 Rockville Rd											Discontinue					
180970072	Marion	Indianapolis	Indpls - N. Ilinois St	50 N. Illinois St.			X													
180970073	Marion	Indianapolis	Indpls - E. 16th St	6125 E. 16th St.	Discontinue															X
180970078	Marion	Indianapolis	Indpls - Washington Park	Washington Park, 3120 E. 30th St,	X	X	X	X	X	X	X	X	X	B. Carbon		X	X	X		Add Ceilometer
180970081	Marion	Indianapolis	Indpls - W. 18th St	School 90, 3351 W. 18th St.							X	X								
180970083	Marion	Indianapolis	Indpls - E. Michigan St	School 15, 2302 E. Michigan St.							X									
180970084	Marion	Indianapolis	Indpls - School 21	School 21, 2815 English Ave.							Relocation									
180970086	Marion	Indianapolis	Indpls - Southport	Southport Advanced Wastewater Treatment Plant, 3800 W. Southport Rd																X
180970087	Marion	Indianapolis	Indpls - I-70 E	1650 Ludlow Ave.	X		X	X			X	X		B. Carbon		X				X

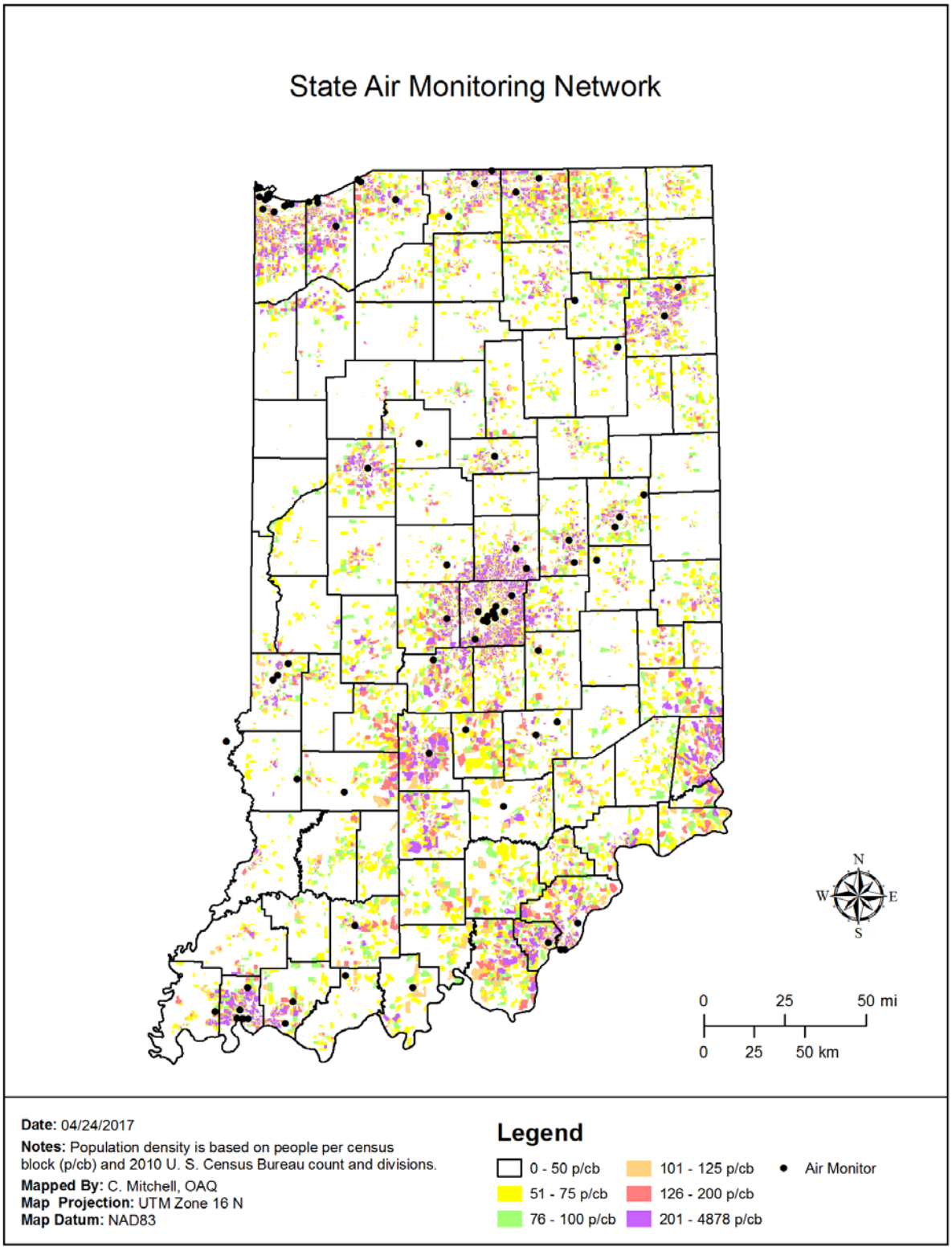
AQS#	COUNTY	CITY	SITE NAME	SITE ADDRESS	O_3	SO_2	CO / CO_2	NO_X	PM_{10}	$PM_{10-2.5}$	$PM_{2.5}$ (FRM)	$PM_{2.5}$ (Cont)	$PM_{2.5}$ (Spec)	$PM_{2.5}$ (Spec Cont)	LEAD	TOXICS (VOCs)	O_3 PREC	CAR-BONYLS	METALS	MET
181050003	Monroe	Bloomington	Bloomington - Binford	Binford Elem. Sch., 2300 E. 2nd St.							X	X								
181090005	Morgan	Monrovia	Monrovia	Monrovia HS, 135 S Chestnut St	X															
181230009	Perry		Leopold	Perry Central HS, 18797 Old St. Rd 37, Leopold	X															
181270023	Porter	Portage	Portage - Hwy 12	Bethlehem Steel Waste Lagoon, Hwy. 12					X											
181270024	Porter	Ogden Dunes	Ogden Dunes	Water Treatment Plant, 84 Diana Rd.	X						X	X				X				
181270026	Porter	Valparaiso	Valparaiso	Valparaiso Water Dept., 1000 Wesly St.	X															
181270027	Porter		Burns Harbor - Port of Indiana	E. Boundary Rd											X				X	
181290003	Posey		St. Philips	2027 St. Phillips Rd., Evansville	X															X
181410010	St. Joseph		Potato Creek St. Park	Potato Creek St. Park, 25601 St. Rd. 4, N. Liberty	X															
181410015	St. Joseph	South Bend	S. Bend - Shields Dr.	2335 Shields Dr.	X			X			X	X								X
181410016	St. Joseph	Granger	Granger - Beckley St.	12441 Beckley St., Granger	X															
181450001	Shelby		Fairland	Triton Central MS, 4740 W. 600N, Fairland	X															
181470009	Spencer	Dale	Dale	David Turnham School, 105 Dunn St.							X									
181530007	Sullivan		Dugger	Greene Sullivan State Forest, 2551 IN-159							X									
181570008	Tippecanoe	Lafayette	Lafayette - Greenbush St.	Cinergy Substation, 3401 Greenbush St.							X	X								
181630013	Vanderburgh		Inglefield	Scott Elem. School, 14940 Old State Rd.	X															
181630016	Vanderburgh	Evansville	Evansville - U. of E.	University of Evansville - Carson Center							X					X				
181630021	Vanderburgh	Evansville	Evansville - Buena Vista	1110 W. Buena Vista Rd.	X	X		X	X		X	X	X	B. Carbon						
181630022	Vanderburgh	Evansville	Evansville - Lloyd	10 S. 11th Ave.			X													
181630023	Vanderburgh	Evansville	Evansville - E. Walnut	Rescue Mission, 500 E. Walnut St.							X									
181670018	Vigo	Terre Haute	Terre Haute - Lafayette Ave.	961 N. Lafayette Ave.	X	X			X		X	X								
181670025	Vigo	Terre Haute	Terre Haute - Fort Harrison Rd.	INDOT Maintenance, 2400 Fort Harrison Rd.												X				
181670024	Vigo		Sandcut	7597 Stevenson Rd., Terre Haute	X															
181730008	Warrick	Boonville	Boonville	Boonville HS, 300 N. 1st St.	X															
181730009	Warrick		Lynnville	Tecumseh HS, 5244 State Road 68, Lynnville	Discontinue															
181730011	Warrick		Dayville	3488 Eble Rd., Newburgh	X															X
181830003	Whitley		Larwill	Whitko Middle School, 710 N. State Rd. 5							X	X								X

Number of Parameters

	Number of Monitoring Sites	Number of Monitored Parameters	O_3	SO_2	CO	NO_X	PM_{10}	$PM_{10-2.5}$	$PM_{2.5}$(FRM)	$PM_{2.5}$(Cont)	$PM_{2.5}$(Spec)	$PM_{2.5}$(Spec Cont)	LEAD	TOXICS (VOCs)	O_3 PREC	CARBONYLS	METALS	MET
Current Monitoring Network (2017)	83	181	43	7	6	5	11	1	36	19	6	5	7	10	1	1	6	17
Proposed Monitoring Network (2018)	79	177	41	7	6	5	11	1	36	20	6	6	5	10	1	1	4	17

Indicates a site where a change is to occur or occurred in 2017
Indicates a site where a change is planned for 2018

Figure 1 – State Air Monitoring Network 2018



Review Summary

The changes proposed for the 2018 Monitoring Network are:

- Discontinue Lynnville O_3.
- Discontinue Trafalgar O_3.
- Discontinue Indpls – E. 16th St. O_3.
- Discontinue Indpls – Rockville Rd. Pb.
- Discontinue Hammond 141st St. Pb and manganese, and relocate the collocated QA Pb to Muncie – Mt. Pleasant Blvd.
- Add O_3 at Kokomo – E. Vaile Ave.
- Monitor O_3 all year at all sites.
- Early adopters of PAMS at Indpls – Washington Park; add ceilometer.

Updates on the changes proposed for the 2017 Monitoring Network:

- Relocate Jeffersonville $PM_{2.5}$, PM_{10}, and speciation. Add continuous $PM_{2.5}$, and Black Carbon.
- The source oriented Pb site in Indianapolis was not installed after new emissions information was submitted and the modeling was redone. A waiver is being requested.
- Relocate Hammond-Purdue $PM_{2.5}$. Ongoing from 2014 Network Plan.
- Relocation of Michigan City – 4th St. to Michigan City – W. Michigan Blvd. No valid O_3 data collected during the 2016 O_3 season.
- Discontinue Kokomo – KOG metals. Site lease expired.
- A Pb waiver for Crane Division Naval Surface Warfare Center is being requested.
- Exclusion for comparison to the NAAQS of the $PM_{2.5}$ FEM data at South Bend – Shields Dr. and Evansville – Buena Vista was not approved.

Unplanned changes to the 2017 Monitoring Network:

- Discontinue Gary – IITRI PAMS, carbonyls.
- Relocation of Indpls – School 21 $PM_{2.5}$.
- Relocation of New Albany SO_2, O_3, and $PM_{2.5}$.
- Addition of $PM_{2.5}$ at Dugger.
- Addition of barometric pressure and calculation of dew point at Fort Wayne – Beacon St. and South Bend – Shields Dr.

Network Description

As per 40 CFR Part 58.10, an annual monitoring network plan which provides for the establishment and maintenance of an air quality surveillance system consisting of the air quality monitors in the state, is required to be submitted by all states to U.S. EPA.

Specifically §58.10 (a) requires for each existing and proposed monitoring site:

1. A statement of whether operation of each monitor meets the requirements of appendices A, B, C, D, and E of 40 CFR Part 58, where applicable.
2. Proposals for any State and Local Air Monitoring Station (SLAMS) network modifications.
3. A detailed description of the PAMS network being operated in accordance with the requirements of appendix D to 40 CFR Part 58.

§58.10 (b) requires the plan must contain the following information for each existing and proposed site:

1. The Air Quality System (AQS) site identification number.
2. The location, including street address and geographical coordinates.
3. The sampling and analysis method(s) for each measured parameter.

4. The operating schedules for each monitor.
5. Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal.
6. The monitoring objective and spatial scale of representativeness for each monitor.
7. The identification of any sites that are suitable and sites that are not suitable for comparison against the annual $PM_{2.5}$ NAAQS as described in §58.30.
8. The Metropolitan Statistical Area (MSA), Core Based Statistical Area (CBSA), Combined Statistical Area (CSA) or other area represented by the monitor.
9. The designation of any Pb monitors as either source-oriented or non-source-oriented according to Appendix D to 40 CFR part 58.
10. Any source-oriented monitors for which a waiver has been requested or granted by the U.S. EPA Regional Administrator as allowed for under paragraph 4.5(a)(ii) of Appendix D to 40 CFR part 58.
11. Any source-oriented or non-source-oriented site for which a waiver has been requested or granted by the U.S. EPA Regional Administrator for the use of Pb-PM_{10} monitoring in lieu of Pb-TSP monitoring as allowed for under paragraph 2.10 of Appendix C to 40 CFR part 58.
12. The identification of required NO_2 monitors as near-road, area-wide, or vulnerable and susceptible population monitors in accordance with Appendix D, section 4.3 of this part.
13. The identification of any $PM_{2.5}$ FEMs and/or ARMs used in the monitoring agency's network where the data are not of sufficient quality such that data are not to be compared to the NAAQS. For required SLAMS where the agency identifies that the $PM_{2.5}$ Class III FEM or ARM does not produce data of sufficient quality for comparison to the NAAQS, the monitoring agency must ensure that an operating FRM or filter-based FEM meeting the sample frequency requirements described in §58.12 or other Class III $PM_{2.5}$ FEM or ARM with data of sufficient quality is operating and reporting data to meet the network design criteria described in appendix D to this part.

Network Review Description

The following definitions represent the categories found in the Network Review. Over the years, the list of Monitor Type designations has changed. This is the current list.

Monitor Type – Indicates the "Administrative classification of a monitor." Each monitor can only have one monitor type at a time. The complete list allowed is listed below with those used in Indiana's network **underlined and in bold**:

- **SLAMS** – State or Local air monitoring station for parameters (pollutants and/or meteorological data) addressed by 40 CFR Part 58. The SLAMS make up the ambient air quality sites that are primarily needed for NAAQS comparison, but may serve other data purposes. U.S. EPA must approve all SLAMS sites.
- TRIBAL – Air monitoring stations operating under the authority of a Federally recognized tribal agency for parameters addressed by 40 CFR Part 58.
- **SPECIAL PURPOSE (SPM)** – A monitor that an agency has designated as "Special Purpose" in its annual monitoring network plan for parameters addressed by 40 CFR Part 58. SPMs are not counted by the agency when showing compliance with the minimum network requirements for the number and siting of monitors. SPMs generally indicated a shorter term monitoring project. Or monitors are designated SPM for the first 24-months of monitoring to allow for ease of site movement due to unforeseen circumstances.
- INDUSTRIAL – A monitor that is operated by a private industry entity rather than under control of a State, Local, or Tribal government.
- EPA – A monitor that is operated by EPA or an EPA contractor for parameters addressed by 40 CFR Part 58.
- NON-EPA FEDERAL – A monitor operated by another Federal agency for parameters addressed by 40 CFR Part 58.

- **OTHER** – A monitor for a parameter not addressed by 40 CFR Part 58. It is not allowed for criteria pollutants or other parameters associated with a monitoring network such as NCORE, PAMS, NATTS, etc.

Network – The Monitor Network or Program affiliation of the monitor. A monitor may have more than one at a time or no value. Those networks in Indiana's plan are listed:

- NCore – *National Core (NCore) Multi-pollutant Monitoring Station*: Sites that measure multiple pollutants at trace levels in order to provide support to integrated air quality management data needs. There is currently one NCore site for Indiana located in Indianapolis.
- Near-Road – Monitors at sites meeting the near road design as per 40 CFR Part 58. Typically measure near road peak hourly NO_2 or CO concentrations in larger urban areas. There is currently one Near-Road site for Indiana located in Indianapolis.
- CSN Supplemental – *Supplemental Speciation Station*: Any $PM_{2.5}$ speciation station that is used to gain supplemental data and is not dedicated as part of the speciation trends network.
- CSN STN – *Trends Speciation Station*: A $PM_{2.5}$ speciation station designated to be part of the speciation trends network. This network provides chemical species data of fine particulates.
- Unofficial PAMS – *Unofficial Photochemical Assessment Monitoring Station*: Sites established in serious and severe O_3 nonattainment areas in the 1990s to obtain more comprehensive data of areas with ozone pollution by also monitoring NO_x and VOCs.

NO_2 Design Criteria – operation of a minimum number of required NO2 monitoring sites.

- Near-Road - Within the NO_2 network, there must be one microscale near-road NO_2 monitoring station in each CBSA with a population of 500,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT counts.
- Area-Wide - Within the NO_2 network, there must be one monitoring station in each CBSA with a population of 1,000,000 or more persons to monitor a location of expected highest NO_2 concentrations representing the neighborhood or larger spatial scales.
- Regional Administrator Required Monitoring – *Susceptible and vulnerable populations (S/V).* The U.S. EPA Regional Administrators, in collaboration with States, must require additional NO_2 monitoring stations nationwide in any area, inside or outside of CBSAs, above the minimum monitoring requirements, with a primary focus on siting these monitors in locations to protect susceptible and vulnerable populations.

Operating Schedule - specifies how often a sample is taken.

- Continuous - operates 24 hours per day, 7 days per week; applies mainly to gaseous analyzers, although some particulate samplers (TEOM, SHARP, and BAMs) operate continuously.
- Daily – a sample is taken every day; applies to manual method particulate samplers.
- 3 - Day - Manual method particulate samplers that run every third day.
- 6 - Day - Manual method particulate samplers that run every sixth day.

Sampling Method – Each ambient air monitor is classified by a specific method number. This method combines both the collection procedure along with the analysis performed on the sample. These numbers can be found in the U.S. EPA "List of Designated Reference and Equivalent Methods" (see U.S. EPA Ambient Monitoring Technology Information Center web page at:
https://www3.epa.gov/ttn/amtic/criteria.html

Scale – The specific "spatial scales of representation" describes the physical dimensions of the air parcel around the monitoring station throughout which actual pollutant concentrations are reasonably similar.

- Microscale - Areas ranging from several meters to about 100 meters,
- Middle scale - Areas ranging from 100 meters to 0.5 kilometers,
- Neighborhood - 0.5 to 4.0 kilometers, and uniform land use,
- Urban scale - 4 to 50 kilometers,
- Regional - 50 to hundreds of kilometers.

Monitoring Objective – Describes the purpose/objective for monitoring at a site.

- General/Background concentration – sites located to determine general background concentration levels.
- Highest concentration – sites located to determine the highest concentrations expected to occur in the area covered by the network.
- Maximum Precursor Emissions Impact – sites where the magnitude and type of precursor emissions in the area are expected to impact. These sites are suited for the monitoring of urban air toxic pollutants.
- Population exposure – sites located to measure typical concentrations in areas of high population density.
- Quality assurance – sites where two monitors of the same type are located; one used to report air quality for the site, and the other dedicated as an audit monitor.
- Regional transport – sites located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards.
- Source-oriented – sites located to determine the impact of significant sources or source categories on air quality.
- Upwind background – sites established to characterize upwind background and transported ozone and its precursor concentrations into an area.

Waiver Required – 40 CFR Part 58 Appendix E Section 10 allows for waiver provisions. Most sampling probes or monitors can be located so they meet the requirements of Appendix E. There may be existing sites that may not meet these requirements. The U.S. EPA will consider a written request from the State agency to waive one or more siting criteria for some monitoring sites providing that the State can adequately demonstrate the need (purpose) for monitoring or establishing a monitoring site at that location.

NAAQS Comparable – 40 CFR Part 58 Subpart B requires the identification of any sites that are suitable or not suitable for comparison against the $PM_{2.5}$ NAAQS as described in § 58.11 and §58.30. If a 'No' is present in this category the data should not be used in comparison to the NAAQS.

CBSA - Core-Based Statistical Area is defined by the U.S. Office of Management and Budget as a statistical geographic entity consisting of the county or counties associated with at least one urbanized area/urban cluster of at least 10,000 population, plus adjacent counties having a high degree of social and economic integration. CBSA replaces the term Metropolitan Statistical Area, MSA. The term MSA continues to be used in the CFR. Figure 2 is a map of the CBSAs in Indiana. Several border areas are included with other counties in bordering states.

CSA - Combined Statistical Area (CSA) is defined by the U.S. Office of Management and Budget as a geographical area consisting of two or more adjacent Core Based Statistical Areas (CBSA) with employment interchange of at least 15 percent.

Site Change Proposed – Designates whether this particular site is being considered for some type of modification during 2018: relocation, discontinuation, or addition.

Monitoring Requirements

Appendix A of 40 CFR Part 58 outlines the Quality Assurance Requirements for SLAMS, and other monitor types whose data are intended to be used to determine compliance with the NAAQS. It details the calibration and auditing procedures used to collect valid air quality data, the minimum number of collocated monitoring sites, the calculation used for data quality assessments and the reporting requirements. All sites in Indiana operate following the requirements set forth in this appendix.

Appendix B of 40 CFR Part 58 specifies the Quality Assurance Requirements for the control and assessment of the quality of the ambient air monitoring data submitted to a PSD reviewing authority or

the EPA by an organization operating an air monitoring station, or network of stations, operated in order to comply with Part 51 New Source Review—Prevention of Significant Deterioration (PSD).

Appendix C of 40 CFR Part 58 specifies the criteria pollutant monitoring methods which must be used in SLAMS and NCore stations. All criteria pollutant monitoring in Indiana follows the methods specified in this appendix.

Appendix D of 40 CFR Part 58 deals with the network design criteria for ambient air quality monitoring. The overall design criteria, the minimum number of sites for each parameter, the type of sites, the spatial scale of the sites, and the monitoring objectives of the sites are detailed in this appendix. In designing the air monitoring network for Indiana, the requirements of this appendix were followed. The specifics for each pollutant network are in the individual parameter chapters.

O_3, PM_{10}, and $PM_{2.5}$ have minimum monitoring requirements based upon the population of an MSA. Population data from the 2010 Census are used in this report unless otherwise specified.

According to §2(e) of Appendix D, "The EPA recognizes that State and local agencies must consider MSA/CSA boundaries and their own political boundaries and geographical characteristics in designing their air monitoring networks. The EPA recognizes that there may be situations where the EPA Regional Administrator and the affected State or local agencies may need to augment or to divide the overall MSA/CSA monitoring responsibilities and requirements among these various agencies to achieve an effective network design. Full monitoring requirements apply separately to each affected State or local agency in the absence of an agreement between the affected agencies and the EPA Regional Administrator." The individual tables list the data, the requirements, and the current sites for the full multi-agency MSAs or CBSAs. In instances where it is more logical or desirable to divide the monitoring requirements, Indiana has entered into agreements with some of the neighboring agencies to ensure that the minimum requirements for the MSA continue to be met and the resulting network provides adequate coverage. Agreements have been signed with the Southwest Ohio Air Quality Agency (SWOAQA), the Louisville Metropolitan Air Pollution Control District (APCD), and the Illinois EPA.

Appendix E of 40 CFR Part 58, which deals with the placement of the monitoring probe, it's spacing from obstructions and what materials the probe can be made of. All monitors operated in Indiana meet Appendix E criteria.

Quality Assurance

Quality assurance of environmental data operations (data and equipment) is provided by the Quality Assurance Section, an independent unit within the Air Monitoring Branch of the IDEM Office of Air Quality. The foundation for the quality assurance program is set forth in 40 CFR Part 58 Appendix A and realized through the guidance found within its Quality Assurance Project Plan (QAPP), the IDEM Quality Assurance Manual. This document provides monitoring equipment operating procedures, quality assurance procedures, and data management tools to fulfill the requirements of Appendix A. The document's regulatory framework is based on those requirements outlined in 40 CFR Part 58 Appendices A, D, and E, as well as information in a variety of vendor and U.S EPA guidance documents, primarily the *QA Handbook for Air Pollution Measurement Systems: Volume II: Ambient Air Quality Monitoring Program* and *QA Handbook for Air Pollution Measurement Systems: Volume IV: Meteorological Measurements*. To further elaborate and define the information in the IDEM Quality Assurance Manual, standard operating procedures (SOPs) have been developed as guidance in achieving consistent and accurate quality assurance of environmental data operations.

An integral part of the monitoring network design are the siting requirements for ambient air-monitoring sites. The siting requirements are outlined in 40 CFR Part 58 Appendix E with additional guidance in the U.S. EPA QA Handbooks and the IDEM Quality Assurance Manual. The Appendix E site requirement include the following:

- Vertical distance of probe inlet above ground

- Horizontal distance of probe inlet from supporting structures, walls, parapets
- Location of probe inlet relative to prevailing wind conditions
- Probe inlet distance from minor sources
- Probe inlet distance from buildings and other potential obstruction
- Probe inlet distance from the drip-line of trees
- Probe inlet distance from roadways
- Probe material type
- Determination of pollutant sample residence time.

Over time, monitoring sites that initially met siting requirements may no longer conform to those requirements due to changes in the surrounding physical environment, the shelter conditions, and/or property land-use. On a triennial schedule, the Quality Assurance Section evaluates the site condition through physical measurements, site photographs and other observations to verify that each monitoring site continues to meet the criteria outlined in 40 CFR 58 Appendix E, Appendix A (vertical and horizontal distances between collocated particulate monitors), and the IDEM Quality Assurance Manual.

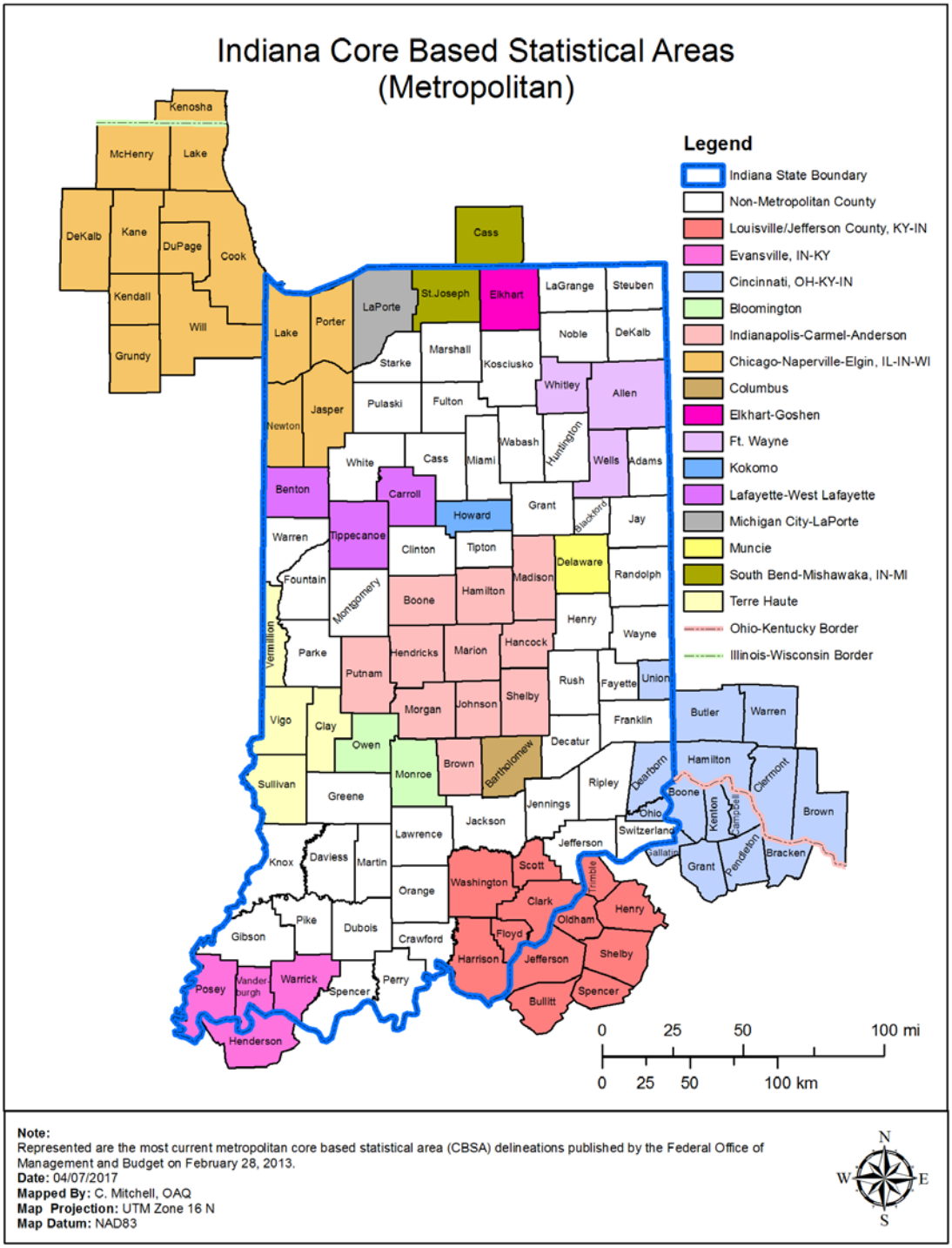
To confirm that the quality and usefulness of the collected air-monitoring data, Appendix A specifies acceptable limits on measurement uncertainty. To ensure that the data collection instruments meet those limits, the Air Monitoring Branch utilizes an automated calibration system for gas analyzers and manual verifications of filter-based and automated particulate matter (PM) instruments for quality control (QC) purposes. Daily span/zero control checks and weekly span/one-point QC checks/zero checks are scheduled to evaluate the operation of the gas analyzers. These results are reviewed by the LEADS system administrator and the Ambient Monitoring Section parameter specialist to identify issues that may affect data validity. In the event a weekly scheduled QC check cannot be performed due to issues with the on-site calibrator, a manual span/1-point QC check may be performed on the gas analyzer by the Ambient Section parameter specialist (or a QA staff member) to ensure that the monitoring system has at least one check per bi-weekly period. For particulate matter instruments, staff from the Ambient Monitoring Sections perform a monthly flow rate verification, along with other checks (ambient temperature, filter temperature, barometric pressure, system leak checks), on each filter-based and continuous PM monitor in the network and the units of the Chemical Speciation Network (CSN) $PM_{2.5}$ monitoring program. Corrective action is undertaken when the one-point QC checks and the PM flow rate verifications exceed the limits prescribed in Appendix D of the U.S. EPA *Quality Assurance Handbook for Air Pollution Measurement System; Volume II* and the IDEM Quality Assurance Manual.

Appendix A of 40 CFR Part 58 requires an independent assessment of the ambient data collection activities. The Quality Assurance Section fulfills this role by performing quarterly audits of gas analyzers, filter-based and continuous PM instruments, CSN samplers, and annual audits of the meteorological sensors. Audit equipment used by the Quality Assurance Section staff is independent of that equipment used in calibrations, QC checks, and verifications. Quarterly performance evaluation audits of gas analyzers utilize the audit concentration levels outlined in Appendix A. For filter-based and automated PM samplers and the CSN $PM_{2.5}$ monitoring network, the QA Section performs quarterly audits of the flow rate, temperature, barometric pressure, and leak checks of those units. Recently, the Quality Assurance Section has initiated a program to verify the capability of zero air generators and field zero air checks of the Summa canister collection systems used in the Air Toxics program. In addition, the Quality Assurance Section maintains and operates the Air Monitoring Branch Certification Facility. This facility certifies that the operation of calibration and test equipment and the concentration of test gas cylinders are comparable to equipment or test gas cylinders certified to National Institute of Standards and Technology (NIST) standards.

Data review is an examination of the collected data to ensure that it has been recorded and processed correctly. The collected environmental monitoring data and all audit results (weekly 1-point QC checks, monthly flow rate verifications and quarterly flow rate audits, and performance evaluation audits) are verified by Ambient Monitoring Section staff and validated by the Quality Assurance Section. The environmental data and the audit results are submitted to the U.S. EPA's Air Quality System (AQS) within 90 days after the end of the quarter.

In addition to the monitoring review activities performed by the Quality Assurance Section, U.S. EPA Region V staff and its Environmental Services Assistance Team (ESAT) contractor, TechLaw, Inc., provide an additional review of the IDEM monitoring operations and procedures. Each year the ESAT contractor conducts Performance Evaluation Program (PEP) audits on eight $PM_{2.5}$ samplers and National Performance Audit Program (NPAP) audits on approximately 20% of the gas parameter monitoring sites. Every three years U.S. EPA Region V staff conducts a Technical Systems Audit (TSA) to review and evaluate the monitoring program, QA procedures, laboratory operations and project documentation. These reviews ensure that the collected data meets its intended purpose of being representative of the air over Indiana and that the data can be compared to the National Ambient Air Quality Standards (NAAQS).

Figure 2 – Indiana CBSAs



Note:
Represented are the most current metropolitan core based statistical area (CBSA) delineations published by the Federal Office of Management and Budget on February 28, 2013.
Date: 04/07/2017
Mapped By: C. Mitchell, OAQ
Map Projection: UTM Zone 16 N
Map Datum: NAD83

Parameter Networks

Carbon Oxides (CO, CO_2)

Monitoring Requirements

40 CFR Part 58 Appendix D §4.2 details the requirements for CO monitoring. One CO monitor is required to operate collocated with one required near-road NO_2 monitor in CBSAs having a population of 1,000,000 or more persons. Other CO monitors may be required if deemed necessary by the Regional Administrator. As per 58.13(e)(2), Indiana's CO site must be operational by January 1, 2017.

In addition 40 CFR Part 58 Appendix D §3(b) states that CO measurements will be included at the NCore multi-pollutant monitoring sites. CO is monitored at the Indpls - Washington Park (180970078) NCore site.

Microscale and middle scale measurements are useful classifications for SLAMS CO sites since most people have the potential for exposure on these scales. Maximum CO concentrations primarily occur in areas near major roadways and intersections with high traffic density and often poor atmospheric ventilation.

Middle scale CO monitoring is intended to represent areas with dimensions from 100 meters to 0.5 kilometers. In some cases middle scale measurements may apply to areas that have a total length of several kilometers such as "Line Emission Sources." This type of emission source area would include air quality along a commercially developed street, a shopping plaza, a freeway corridor, parking lots and feeder streets.

Microscale CO monitoring applies when air quality measurements are to be used to represent distributions within street canyons, over sidewalks and near major roadways. Microscale measurements in one location can often be considered as representative of similar locations throughout a city.

There are no requirements to monitor the greenhouse gas CO_2. A regional scale site, Hope (180050007) measures background CO_2 concentrations in Indiana.

Monitoring Methodology

Indiana's carbon oxides monitoring network collects data with Teledyne Advanced Pollution Instrumentation (API) T300 and T360 (CO_2) analyzers along with Thermo Scientific Model 48i using nondispersive infrared monitoring methodology. The API Model 300EU and T300EU Trace level/Ultra-sensitive analyzers are used to collect trace level CO data at both the NCore Indpls – Washington Park site, and the Near-Road Indpls – I-70 E site (180970087).

Monitoring Network

Indiana operates five CO and one CO_2 monitors located throughout the state, as displayed in Figure 3. The details of the current network are listed in Table 2.

Network Modifications

There are no changes or modifications planned for the Carbon Oxides Monitoring Network in 2018.

Figure 3 – Carbon Oxides Monitoring Network

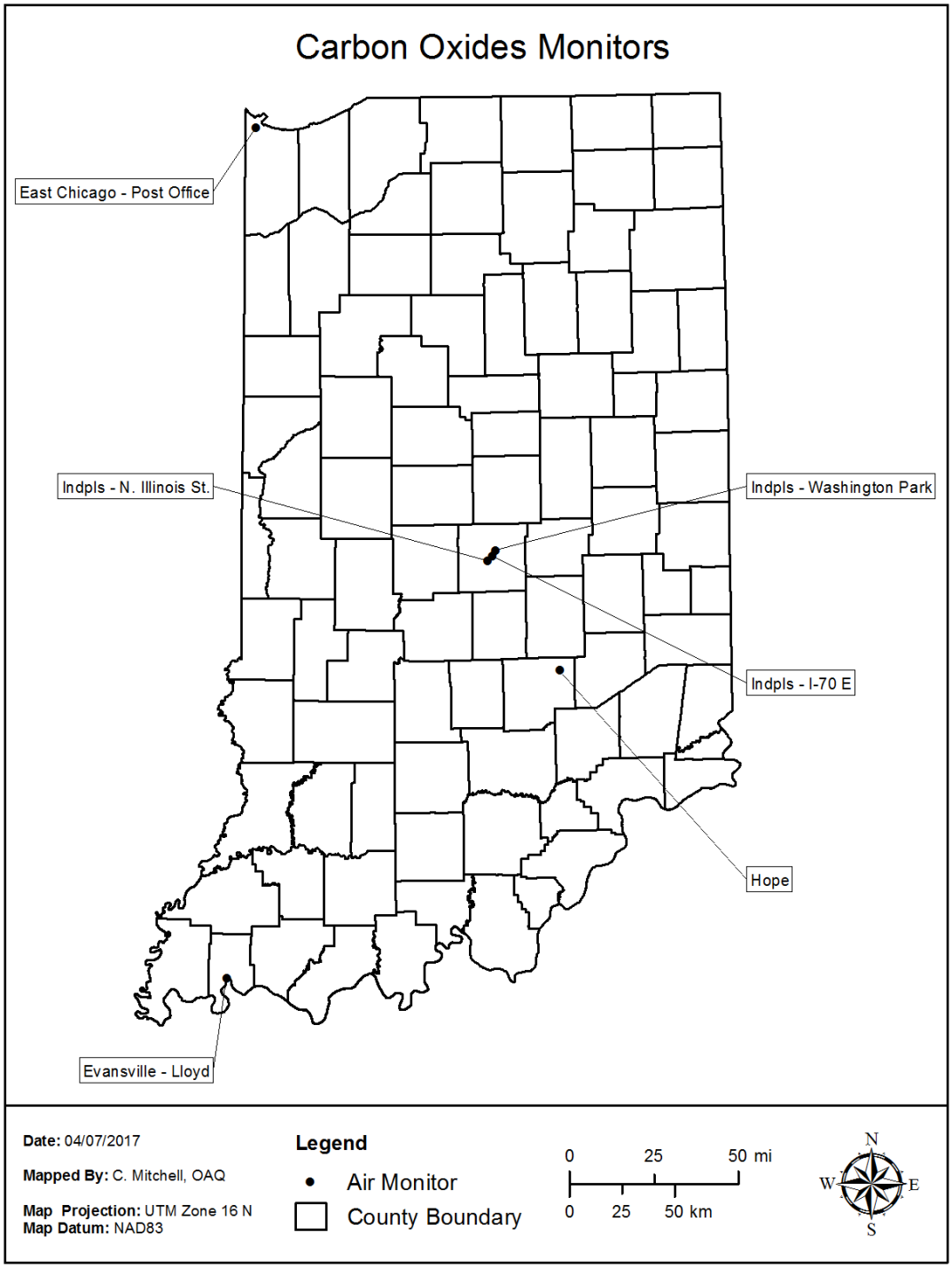


Table 2 – Carbon Oxides Monitoring Network

Parameter Code: 42101, 42102 **CO, CO_2 - Carbon Oxides**

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180050007	Hope	Bartholomew		Hauser Jr-Sr HS, 9404 N775 E.	SPM	09/28/16	Continuous	012	Regional	Background	39.294322	-85.766846	Columbus	No
180890015	East Chicago - Post Office	Lake	East Chicago	Post Office, 901 East Chicago Ave.	SLAMS	03/01/84	Continuous	054	Micro	Highest Conc	41.629073	-87.461554	Chicago-Naperville-Elgin, IL-IN-WI	No
180970072	Indpls - Illinois St.	Marion	Indianapolis	50 N. Illinois St.	SLAMS	02/01/90	Continuous	093	Micro	Highest Conc	39.768056	-86.160000	Indianapolis-Carmel-Andersor	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (NCORE)	01/01/10	Continuous	593	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Andersor	No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	SLAMS (NEAR ROAD)	05/02/14	Continuous	593	Micro	Highest Conc	39.787933	-86.130880	Indianapolis-Carmel-Andersor	No
181630022	Evansville - Lloyd	Vanderburgh	Evansville	10 S. 11th Ave	SLAMS	09/10/09	Continuous	093	Micro	Highest Conc	37.977222	-87.596389	Evansville, IN-KY	No

CO MONITORING METHOD:
054 - THERMO ELECTRON 48C, 48i
093 - TELEDYNE API T300
593 - TELEDYNE API 300EU, T300EU TRACE-LEVEL
012 - TELEDYNE API T360 - CO2

Lead (Pb)

Monitoring Requirements

The lead NAAQS final rule of November 12, 2008, states that the primary and secondary standards for lead are not to exceed 0.15 µg/m^3 averaged over a rolling 3-month time period. 40 CFR Part 58 Appendix D §4.5 specifies that Pb monitoring must be conducted taking into account Pb sources which are expected to or have been shown to contribute to a maximum Pb concentration in ambient air in excess of the NAAQS, taking into account the logistics and potential for population exposure. At a minimum there must be one source-oriented SLAMS site located to measure the maximum Pb concentration in ambient air resulting from each Pb source which emits 0.5 or more tons per year (TPY). Annually IDEM works with U.S. EPA in reviewing the latest emissions inventories to determine if additional sources warrant monitoring. These emissions inventories include the most recent versions of the National Emissions Inventory (NEI), Toxics Release Inventory (TRI), and Indiana's Emission Inventory Tracking System (EMITS). IDEM reviewed the current emissions inventories and determined no new sources exceed the 0.5 TPY threshold, so no new Pb monitoring is required.

Waivers may be granted if the state can demonstrate the Pb source will not contribute to a maximum Pb concentration in ambient air in excess of 50% of the NAAQS. The waivers must be renewed once every 5 years as part of this ANP (see Appendix B, page 88).

Collocated samplers are required at 15% of the sites operated by a Primary Quality Assurance Organization (PQAO) or a minimum of one per network. Indiana is required to operate one collocated site.

Monitoring Scale

The appropriate scales for the source-oriented sites are either microscale (up to 100 meters) or middle scale (100 to 500 meters). The neighborhood scale (0.5 – 4.0 kilometers) is the appropriate scale for population-oriented monitoring.

Monitoring Methodology

Indiana utilizes TSP filter sampling with atomic absorption analysis to generate ambient Pb concentrations from the monitoring sites.

Monitoring Network

A source oriented Pb monitor was to be added near the Indianapolis Wastewater Treatment facility in 2017. After receiving updated emissions information and rerunning the modeling it has been determined monitoring is no longer required and a waiver has been requested. A waiver is also being requested for Crane Army Ammunition Activity in Martin County. See Appendix B, page 88.

Waivers were granted in 2017 for ALCOA Power Plant, Warrick County and Ardagh Glass, Randolph County.

The Pb monitoring network in Indiana in 2018 consists of five sites. These sites are displayed in Figure 4 and detailed in Table 3.

Network Modifications

Pb monitoring at Hammond – 141st St. (180892008) will be discontinued. The design value of this site, 0.03 µg/m^3, is well below the standard of 0.15 µg/m^3. The collocated sampler will be moved to the site with the highest lead concentration as recommended by the U.S. EPA. This site is Muncie Exide – Mt. Pleasant Blvd. (180350009).

Pb monitoring at Indpls – Rockville Rd. (180970063) will be discontinued. The site property owner, Rexnord Corporation, will be shutting down operations in mid-2017. IDEM plans to monitor Pb at the site through the end of 2017 to obtain a complete data set as long as power is still available. The design value of this site, 0.02 µg/m^3, is well below the standard of 0.15 µg/m^3.

Figure 4 – Lead Monitoring Network

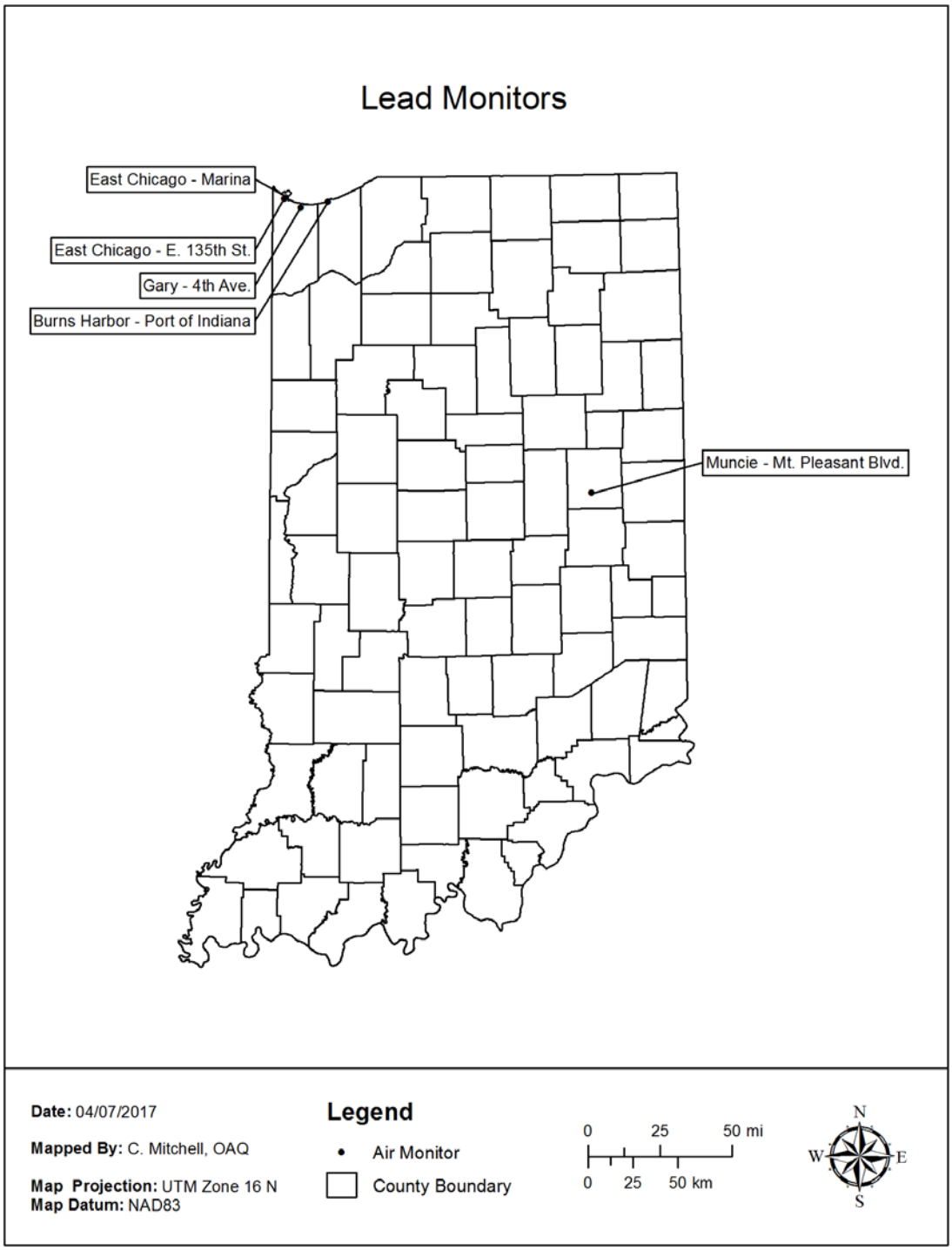


Table 3 – Lead Monitoring Network

Parameter Code: 14129 **Pb - Lead**

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Source Oriented?	Site Change Proposed?
180350009	Muncie - Mt. Pleasant Blvd.	Delaware	Muncie	2601 W. Mt. Pleasant Blvd.	SLAMS	01/02/10	6-Day	107	Middle	Source Oriented	40.158417	-85.415021	Muncie	Yes Exide	No
180350009	Muncie - Mt. Pleasant Blvd.	Delaware	Muncie	2601 W. Mt. Pleasant Blvd.	SLAMS	01/01/18	6-Day	107	Middle	Quality Assurance	40.158417	-85.415021	Muncie	Yes Exide	Relocation
180890032	Gary - 4th. Ave	Lake	Gary	Gary SouthShore RailCats, One Stadium Plaza	SLAMS	01/02/10	6-Day	107	Middle	Source Oriented	41.603582	-87.332658	Chicago-Naperville-Elgin, IL-IN-WI	Yes US Steel	No
180890033	East Chicago - E. 135th St.	Lake	East Chicago	Abraham Lincoln Elem. Sch., E. 135th St.	SLAMS	01/02/10	6-Day	107	Middle	Source Oriented	41.649064	-87.447256	Chicago-Naperville-Elgin, IL-IN-WI	Yes Mittal West	No
180890034	East Chicago-Marina	Lake	East Chicago	East Chicago Marina, 3301 Aldis St.	SLAMS	10/30/12	6-Day	107	Middle	Source Oriented	41.653501	-87.435561	Chicago-Naperville-Elgin, IL-IN-WI	Yes Mittal East	No
180892008	Hammond - 141st St.	Lake	Hammond	1300 E. 141st St.	SLAMS	01/01/77	6-Day	107	Neigh	Pop Exp	41.639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No	Discontinue
180892008	Hammond - 141st St.	Lake	Hammond	1300 E. 141st St.	SLAMS	01/01/07	6-Day	107	Neigh	Quality Assurance	41.639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No	Relocate
180970063	Indpls - Rockville Rd.	Marion	Indianapolis	7601 Rockville Road	SLAMS	01/01/84	6-Day	107	Middle	Src Oriented Highest Conc	39.760889	-86.296863	Indianapolis-Carmel-Anderso	Yes Quemetco	Discontinue
180970063	Indpls - Rockville Rd.	Marion	Indianapolis	7601 Rockville Road	SLAMS	10/01/00	6-Day	107	Middle	Quality Assurance	39.760889	-86.296863	Indianapolis-Carmel-Anderso	Yes Quemetco	Discontinue
181270027	Burns Harbor-Port of Indiana	Porter		E. Boundary Rd	SLAMS	08/18/11	6-Day	107	Middle	Source Oriented	41.635161	-87.150376	Chicago-Naperville-Elgin, IL-IN-WI	Yes Arcelor Mittal	No

MONITORING METHOD: 107 - HI-VOL SAMPLER/FLAMELESS ATOMIC ABSORPTION (GFAA)

Oxides of Nitrogen (NO, NO_2, NO_x, NO_y)

Monitoring Requirements

On February 9, 2010, the Federal Register amended 40 CFR Parts 50 and 58 establishing a new NO_2 NAAQS for 1-hour concentrations and new monitoring requirements to be implemented by January 1, 2014.

One microscale near-road NO_2 monitoring station must be located within each CBSA with a population of 500,000 people, or more to be installed by January 1, 2014. An additional near-road NO_2 monitoring station is required for any CBSA with a population of 2,500,000 persons or more. For Indiana, one near-road site is required for the Indianapolis-Carmel-Anderson CBSA. Additionally, sites are required for the Cincinnati, OH-KY-IN CBSA, the Louisville/Jefferson County, KY-IN CBSA, and the Chicago-Naperville-Elgin, IN-IL-WI CBSA. These cross-state requirements are addressed in agreements signed with the appropriate neighboring agencies.

One area-wide NO_2 monitoring station must also be located in each CBSA with a population greater than 1,000,000 people and was required to be installed by January 1, 2013. Each area listed above also requires an area-wide monitor.

Gary – IITRI (180890022) has been designated a Regional Administrator Required Monitor by the U.S. EPA. 40 CFR Part 58 Appendix D §4.3.4(a) states: “The Regional Administrators, in collaboration with States, must require a minimum of forty additional NO_2 monitoring stations nationwide in any area, inside or outside of CBSAs, above the minimum monitoring requirements, with a primary focus on siting these monitors in locations to protect susceptible and vulnerable populations.” Susceptible and vulnerable populations include asthmatics and disproportionately exposed groups at particular risk of NO_2-related health effects, both because of increased exposure and because these groups have a higher prevalence of asthma and higher hospitalization rates for asthma. These monitors were to be designated by January 1, 2013.

40 CFR Part 58 Appendix D §3(b) and 40 CFR Part 58 Appendix D §4.3 state that NO/NO_y measurements should be included at the NCore multi-pollutant monitoring sites and in the PAMS program. NO/NO_y monitors are used at these sites because it is important to collect data on total reactive nitrogen species in order to better understand O_3 photochemistry.

Monitoring Methodology

The NO, NO_2 and NO_x network uses Thermo Scientific Model 42i chemiluminescence monitors to collect data. The API Model T200U NO_y Trace level/Ultra-sensitive analyzer is used to collect NO and NO_y data at the Indpls – Washington Park NCore site (180970078). The Teledyne Model T500U Cavity Attenuated Phase Shift (CAPS) NO_2 Analyzer measures NO_2 directly unlike the traditional chemiluminescence monitors that measure NO_2 by subtracting NO from NO_x. Data is being collected at Indpls – I-70 E near-road site (180970087) for comparison.

Monitoring Network

Indiana operates five NO_2 monitors and one trace level monitor as displayed in Figure 5. The current network, along with any changes planned in 2018, is listed in Table 4.

Network Modifications

A Teledyne direct-read NO_2 CAPS monitor will be installed at the Indpls – Washington Park NCORE site in accordance with 40 CFR Part 58 Appendix D §5(b)(4) to support PAMS.

Figure 5 – Oxides of Nitrogen Monitoring Network

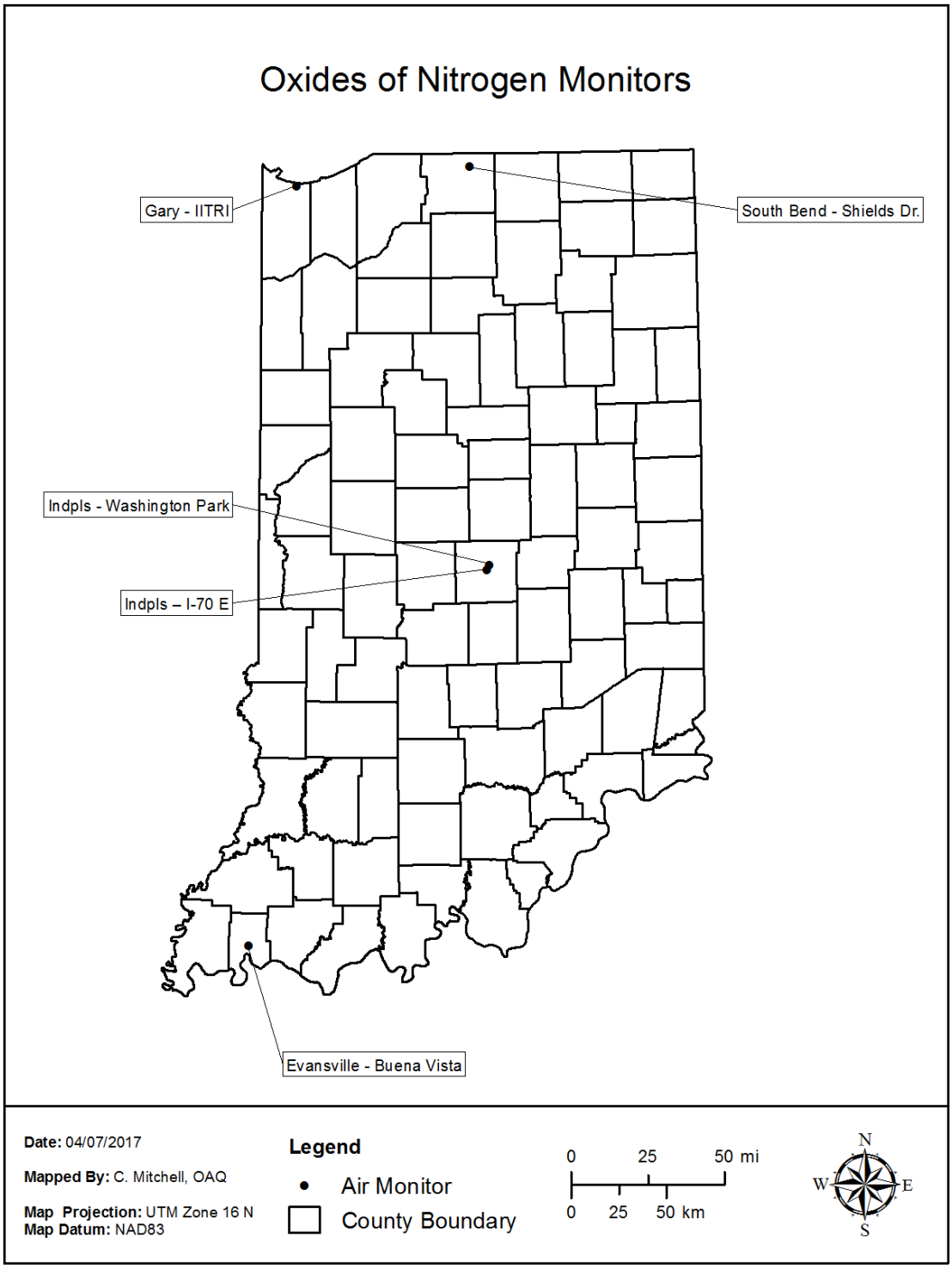


Table 4 – Oxides of Nitrogen (NO, NO_2, NO_x, NO_y) Monitoring Network

Parameter Code: 42601, 42602, 42603, 42600 **NO, NO_2, NO_X, NO_y - Oxides of Nitrogen**

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	NO_2 Design Criteria	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS (UNOFFICAL PAI	S/V	06/27/95	Continuous	074	Neigh	Highest Conc	41.606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (NCORE)	Area-Wide	01/01/13	Continuous	074	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Anderso	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (NCORE)		01/01/11	Continuous	699	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Anderso	No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	SLAMS (NEAR ROAD)	Near-Road	02/07/14	Continuous	074	Micro	Pop Exp	39.787933	-86.130880	Indianapolis-Carmel-Anderso	No
181410015	South Bend - Shields Dr.	St Joseph	South Bend	2335 Shields Dr.	SLAMS		06/06/06	Continuous	074	Neigh	Pop Exp	41.696667	-86.214722	South Bend-Mishawaka, IN-MI	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS		07/08/09	Continuous	074	Neigh	Pop Exp	38.013333	-87.577222	Evansville, IN-KY	No

NOx MONITORING METHOD: 074-THERMO ELECTRON 42i
NOy MONITORING METHOD: 699-TELEDYNE API 200EU NOy TRACE-LEVEL
NO2 MONITORING METHOD: 212-TELEDYNE API T500U CAPS

Ozone (O_3)

Monitoring Requirements

Table D-2 in 40 CFR Part 58 Appendix D details the number of O_3 sites required in each CBSA. The number of sites is based on the population of a CBSA and if the design value exceeds 85% of the standard, or 0.060 ppm, for that area. Table 5 lists the requirements stated in Part 58. Table 6 lists the requirements as they relate to Indiana. There are five CBSAs which cross state lines. Except for the Cincinnati, OH-KY-IN CBSA, Indiana meets the requirement for all CBSAs, including multi-agency CBSAs. A multi-agency agreement between the Southwest Ohio Air Quality Agency (Cincinnati, OH) and IDEM specifies that the Southwest Ohio Air Quality Agency will fulfill all the O_3 monitoring requirements in this CBSA. In the absence of an agreement, Indiana would be required to operate two sites in the Cincinnati, OH-KY-IN CBSA.

Monitoring Season

Table D-3 of Appendix D of Part 58 defines the O_3 monitoring season for all of the states. Indiana's monitoring season is from March 1 to October 31 which is the same as all surrounding states. All Indiana sites will be operated year-round starting on January 1, 2018.

Indpls – Washington Park (180970078) is Indiana's NCore site and Indpls – I-70 E (180970087) is Indiana's near-road site. They are both required to collect data all year. Indiana has elected to conduct year-round O_3 monitoring at all sites starting on January 1, 2018 due to the extension of the O_3 season by two months in 2017. The previous benefits of being able to turn equipment off for six months to save wear and expendables has been lessened with the longer season.

Data

The design value for an area, usually a county or a CBSA, is determined by the 3-year average of the 4th highest daily 8-hour maximum from the highest site in the area. If this value is greater than 0.070 ppm, the area is considered to be in violation of the NAAQS and could potentially be designated as a nonattainment area. If the air quality improves and the design value is 0.070 ppm or less, the area may be reclassified as a maintenance area.

The design values for all sites for the most recent sampling period (2014 – 2016) along with the 2008 8-hour nonattainment areas are illustrated in Figure 6. All sites had design values for the most recent sampling period (2014 – 2016) that meet the current 2015 NAAQS of 0.070 ppm. Michigan City – W. Michigan Blvd. (180910005) monitor does not have a design value for the sample period (2014 – 2016) because there was less than 75% data recovery in 2016 due to the replacement of the shelter, land lease delays, and equipment problems.

Monitoring Methodology

Monitoring sites in Indiana use Federal Equivalent Method O_3 analyzers from Thermo Scientific; Models 49c, or 49i (Method Code 047), or API Model T400 (Method Code 087). These monitors use ultraviolet absorption photometry. Air is drawn through a sample cell through which ultraviolet light (254 nm wavelength) passes. Any light that is not absorbed by the O_3 is then converted into an electrical signal proportional to the O_3 concentration.

Monitoring Network

In 2018 there will be 41 monitoring sites in Indiana's O_3 monitoring network as displayed in Figure 7. The O_3 monitoring network with proposed changes for 2018 is in Table 7.

Network Modifications

There are four network modifications planned for 2018. O_3 monitoring will be added to the Kokomo – E. Vaile Ave. (180670004) site. The O_3 monitoring at Lynnville (181730009), Trafalgar (180810002), and Indpls – E. 16th St. (180970073) will be discontinued.

The three O_3 monitoring sites discontinuation justifications will use the following criteria in §58.14 System modification (c) "Other requests for discontinuation may also be approved on a case-by-case basis if discontinuance does not compromise data collection needed for implementation of a NAAQS and if the requirements of appendix D to this part, if any, continue to be met."

The first network modification will be the addition of O_3 monitoring at Kokomo – E. Vaile Ave. site. The City of Kokomo has been growing and may require O_3 monitoring for population exposure after the 2020 Census. This will be the first O_3 monitor in the Kokomo CBSA.

The second network modification will be the discontinuation of the Lynnville site. There are seven O_3 monitoring sites in the Evansville, IN-KY CBSA, the CFR requires only one. The design value for this site is the lowest of three O_3 monitoring sites in Warrick County. This site has more invalid data on hot summer days due to problems with temperature control. The school no longer operates air conditioning during the summer break due to budget restraints. This site's O_3 data is comparable with the Boonville (181730008) site located 16.6 kilometers south-southeast.

Design Values in PPM

3 Year Period	Lynnville	Boonville	Dayville
2005-2007	0.075	0.080	0.077
2006-2008	0.071	0.077	0.071
2007-2009	0.069	0.072	0.064
2008-2010	0.066	0.068	0.062
2009-2011	0.068	0.070	0.066
2010-2012	0.072	0.073	0.074
2011-2013	0.069	0.070	0.073
2012-2014	0.066	0.067	0.071
2013-2015	0.062	0.065	0.065
2014-2016	0.066	0.068	0.067

The third network modification will be the discontinuation of the Trafalgar site. This O_3 monitor site has become redundant since IDEM installed a Bloomington downwind O_3 monitoring site in Helmsburg (180130001) in 2014. Trafalgar was established by the former Indianapolis local agency as a population exposure monitor to determine the O_3 entering the Indianapolis region. Helmsburg O_3 data can also be used for O_3 transport into the Indianapolis region. The Trafalgar site is located in an elementary school that closed in June 2016 and the building is for sale. This site's O_3 data is comparable with Helmsburg located 20.9 kilometers southwest.

Design Values in PPM

3 Year Period	Trafalgar	Helmsburg
2012-2014	0.056	0.058
2013-2015	0.063	0.060
2014-2016	0.062	0.063

The fourth network modification will be the discontinuation of the Indpls – E. 16th St. site. This site is no longer needed. There are twelve O_3 monitoring sites in the Indianapolis-Carmel-Anderson CBSA with five in Marion County. A data comparison of this site and Indpls – Washington Park (180970078) and Indpls – Ft. Harrison (180970050) indicates that this site's O_3 monitoring is redundant. Indpls – E. 16th St. O_3 data is comparable with Indpls - Washington Park located 5.3 kilometers north-northwest.

Design Values in PPM

3 Year Period	Indpls - E. 16th St.	Indpls - Washington Park	Indpls - Ft. Harrison
2005-2007	0.077	NA	0.079
2006-2008	0.072	NA	0.078
2007-2009	0.070	NA	0.077
2008-2010	0.065	NA	0.073
2009-2011	0.068	0.067	0.074
2010-2012	0.074	0.070	0.074
2011-2013	0.074	0.072	0.070
2012-2014	0.071	0.068	0.066
2013-2015	0.064	0.065	0.064
2014-2016	0.065	0.066	0.069

Table 5 – SLAMS Minimum O_3 Monitoring Requirement

# of Sites Required per Population and Design Value		
MSA Population	**3yr Design Value>=85% of NAAQS (0.060 ppm)**	**3 yr Design Value < 85% of NAAQS (0.060 ppm)**
>10 million	4	2
4-10 million	3	1
350,000 - 4 million	2	1
50,000 - 350,000	1	0

Table 6 – SLAMS O_3 Sites Required for Indiana

Indiana MSAs	MSA Population [1] (2010)	Design Value (ppm) (2014-2016)	# of Sites Required per CFR	2017 No. of Sites	2018 No. of Sites
Bloomington	159,549	0.061	1	1 [4]	1
Chicago-Naperville-Elgin, IL-IN-WI (total MSA)	9,461,105	0.077 [2]	3	21 [2]	-
Chicago-Naperville-Elgin, IL-IN-WI (IN only)	9,461,105	0.069 [3]	3	4 [3]	4
Cincinnati, OH-KY-IN (total MSA)	2,114,580	0.072 [2]	2	10 [2]	
Cincinnati, OH-KY-IN (IN only)	2,114,580	No Data [3]	2	0 [3]	0
Columbus	76,794	0.068	1	1	1
Elkhart-Goshen	197,559	0.061	0	1	1
Evansville, IN-KY (total MSA)	311,552	0.070 [2]	1	7 [2]	-
Evansville, IN-KY (IN only)	311,552	0.070 [3]	1	6 [3]	5
Fort Wayne	416,257	0.063	2	2	2
Indianapolis-Carmel-Anderson	1,887,862	0.069	2	13 [4]	11
Kokomo	82,752	No Data	0	0	1
Lafayette-West Lafayette	201,789	0.064	1	1	1
Louisville/Jefferson County, KY-IN (total MSA)	1,235,708	0.074 [2]	2	7 [2]	-
Louisville/Jefferson County, KY-IN (IN only)	1,235,708	0.070 [3]	2	2 [3]	2
Michigan City-LaPorte	111,467	0.068	1	2	2
Muncie	117,671	0.059	0	1	1
South Bend-Mishawaka, IN-MI (total MSA)	319,224	0.070 [2]	1	4 [2]	-
South Bend-Mishawaka, IN-MI (IN only)	319,224	0.068 [3]	1	3 [3]	3
Terre Haute	172,425	0.065	1	2	2
Non MSA					
West Union - Clark Co., IL		0.064		1	1
Plummer - Greene Co. [3]		0.066		1	1
Huntington - Huntington Co.		0.058		1	1
Brownstown - Jackson Co.		0.066		1	1
Leopold - Perry Co.		0.067		1	1
	DV exceeds NAAQS				
	DV ≥ 85% of NAAQS				
# of sites needed if Indiana meets all multi-state MSA requirements			18		
		Sites in Indiana Network		**43**	**41**

[1] MSA populations adjusted according to MSA changes in February 2013.

[2] Information for full MSA.

[3] Information for Indiana's portion of MSA.

[4] Bloomington MSA impact site is located in Brown County, part of Indianapolis-Carmel-Anderson MSA

Figure 6 – O_3 Design Values (2014 – 2016)

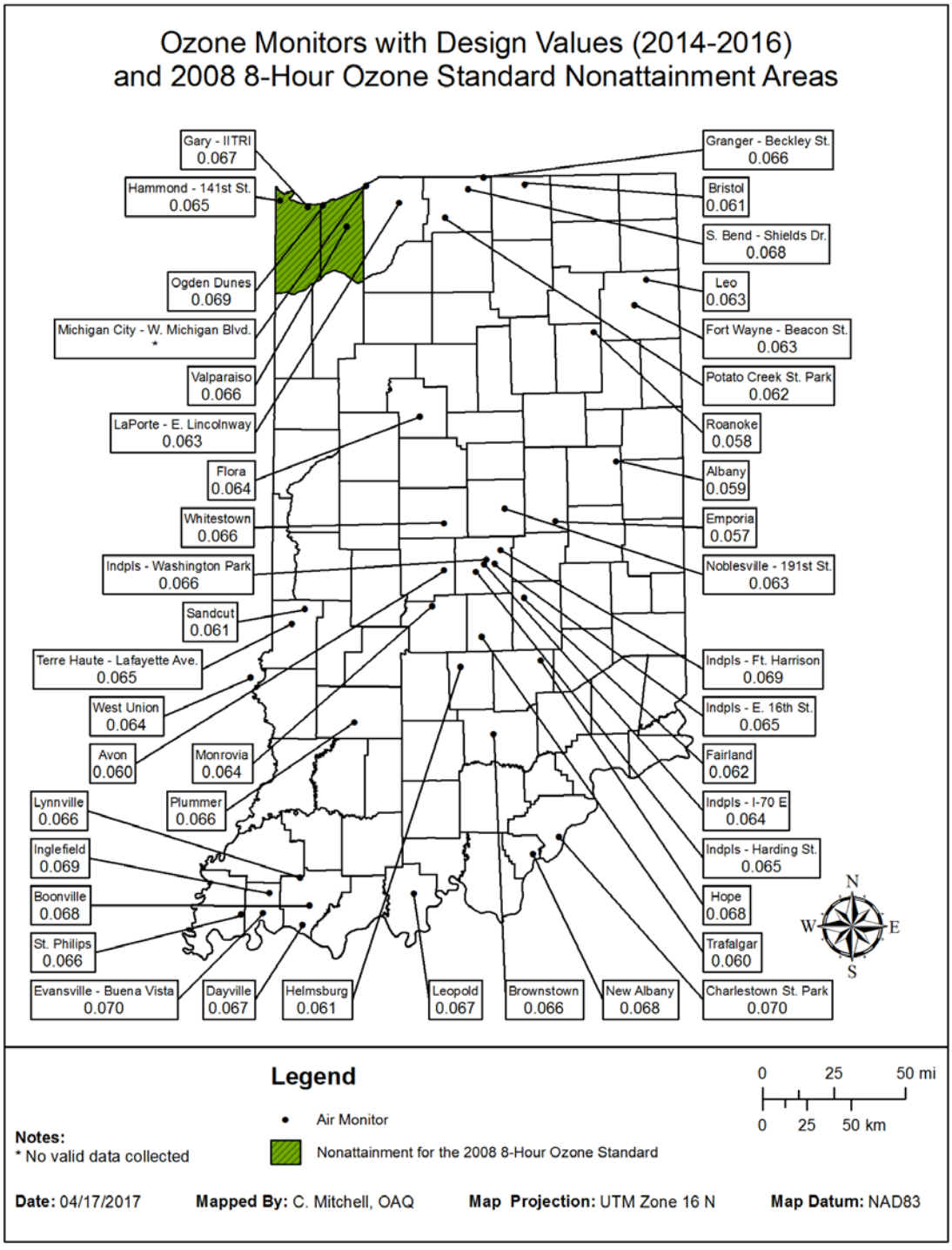


Figure 7 – O_3 Monitoring Network

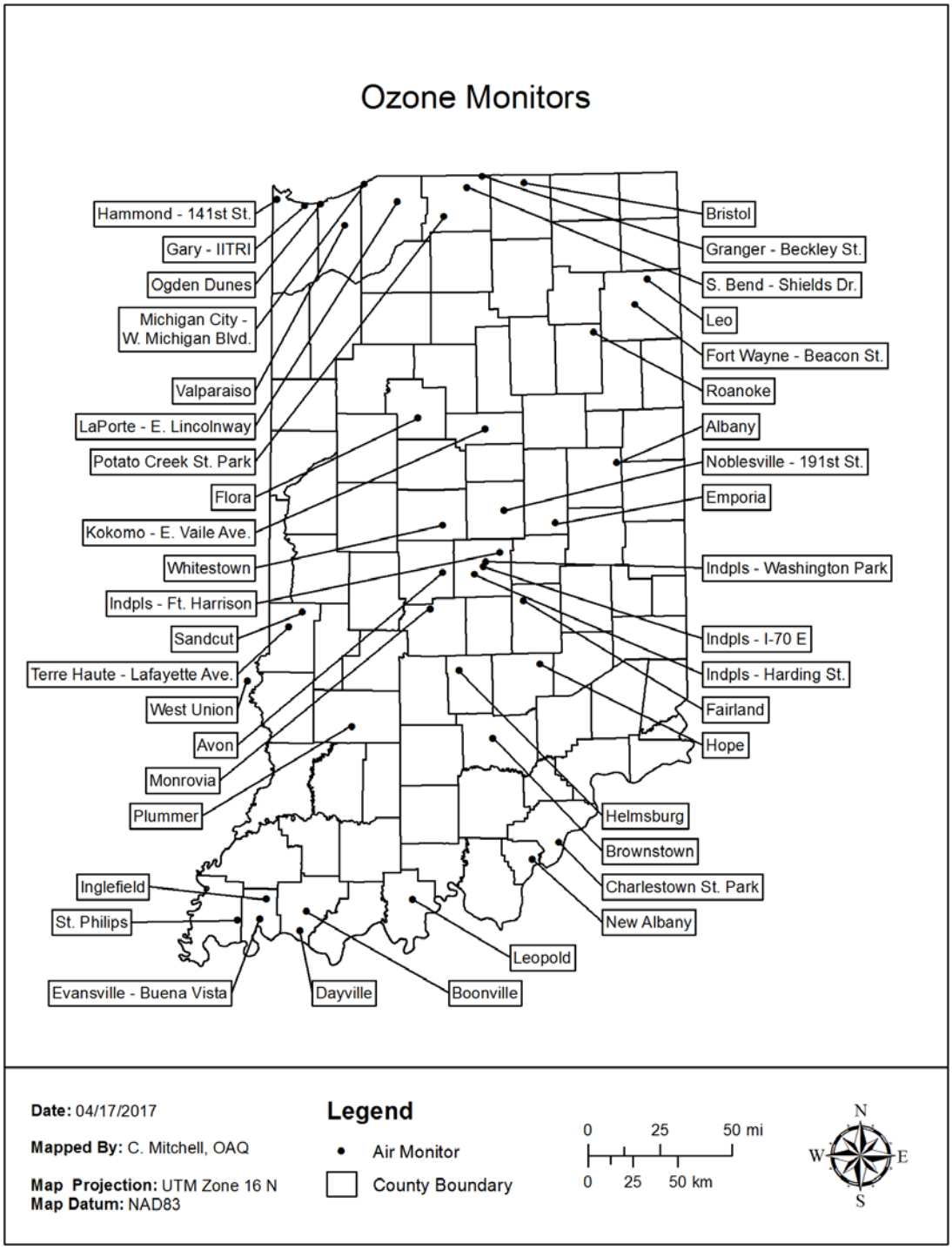


Table 7 – Ozone Monitoring Network

Parameter Code: 44201 **O_3 - Ozone**

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
170230001	West Union	Clark, IL		416 S. Hwy 1, West Union, IL	SLAMS	04/01/01	Continuous	047	Urban	General Bkgrd	39.210857	-87.668297	Non-MSA County	No
180030002	Leo HS	Allen	Leo	Leo HS, 14600 Amstutz Rd.	SLAMS	04/01/86	Continuous	047	Urban	Highest Conc	41.221418	-85.016821	Ft. Wayne	No
180030004	Ft Wayne - Beacon St.	Allen	Fort Wayne	2022 N. Beacon St.	SLAMS	07/01/79	Continuous	047	Neigh	Pop Exp	41.094965	-85.101816	Ft. Wayne	No
180050007	Hope	Bartholomew		Hauser Jr-Sr HS, 9404 N775 E.	SLAMS	05/28/13	Continuous	087	Urban	Pop Exp	39.294322	-85.766846	Columbus	No
180110001	Whitestown	Boone		Perry - Worth Elem Sch., 3900 E. 300 S, Lebanon	SLAMS	04/01/01	Continuous	047	Urban	Highest Conc	39.997773	-86.395394	Indianapolis-Carmel-Anderson	No
180130001	Helmsburg	Brown		Jackson Twp Fire Dept. 4831 Helmsburg Road, Nashville	SLAMS	05/16/14	Continuous	047	Urban	Highest Conc	39.263914	-86.292261	Indianapolis-Carmel-Anderson	No
180150002	Flora	Carroll		Flora Airport, 481 S. 150 W., Flora	SLAMS	04/01/01	Continuous	047	Urban	Pop Exp	40.540455	-86.553035	Lafayette-West Lafayette	No
180190008	Charlestown State Park	Clark		Charlestown State Park, 12500 Hwy 62, Charlestown	SLAMS	05/04/07	Continuous	047	Urban	Highest Conc	38.393823	-85.664118	Louisville/Jefferson County, KY-IN	No
180350010	Albany	Delaware	Albany	Albany Elem. Sch., 706 W. State St.	SLAMS	04/01/01	Continuous	047	Urban	Pop Exp	40.300385	-85.245862	Muncie	No
180390007	Bristol	Elkhart	Bristol	Bristol Elem Sch., 705 Indiana Ave.	SLAMS	04/01/02	Continuous	047	Urban	Pop Exp	41.717778	-85.830278	Elkhart-Goshen	No
180431004	New Albany	Floyd	New Albany	Green Valley Elem. Sch., 2230 Green Valley Road	SLAMS	01/01/77	Continuous	047	Neigh	Highest Conc	38.307913	-85.834313	Louisville/Jefferson County, KY-IN	No
180550001	Plummer	Greene		2500 S. 275 W	SLAMS	04/03/00	Continuous	047	Regional	Upwind Bkgrd	38.985556	-86.990000	Non-MSA County	No
180570006	Noblesville - 191st St.	Hamilton	Noblesville	Our Lady of Grace Catholic Church, 9900 E. 191st St.	SLAMS	05/13/10	Continuous	047	Urban	Highest Conc	40.068297	-85.992451	Indianapolis-Carmel-Anderson	No
180630004	Avon	Hendricks	Avon	7203 E. US 36, Avon	SLAMS	04/01/00	Continuous	047	Urban	Pop Exp	39.758889	-86.398611	Indianapolis-Carmel-Anderson	No
180670004	Kokomo - E. Vaile Ave.	Howard	Kokomo	1802 E. Vaile Ave.	SPM	01/01/18	Continuous	47	Urban	Pop Exp	40.481347	-86.109688	Kokomo	Add
180690002	Roanoke Elem School	Huntington	Roanoke	Roanoke Elem. Sch., 423 W. Vine St.	SLAMS	04/14/00	Continuous	047	Urban	Upwind Bkgrd	40.959671	-85.379647	Non-MSA County	No
180710001	Brownstown	Jackson		225 W & 300 N, Brownstown	SLAMS	04/04/00	Continuous	047	Regional	Upwind Bkgrd	38.920835	-86.080523	Non-MSA County	No
180810002	Trafalgar	Johnson	Trafalgar	200 W. Pearl St.	SLAMS	04/01/97	Continuous	047	Urban	Pop Exp	39.417155	-86.152406	Indianapolis-Carmel-Anderson	Discontinue
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS (UNOFFICAL PAI	07/01/95	Continuous	047	Neigh	Pop Exp	41.606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180892008	Hammond - 141st St.	Lake	Hammond	1300 E. 141st St.	SLAMS	01/01/76	Continuous	047	Neigh	Pop Exp	41.639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No
180910005	Michigan City - W. Michigan Blvd.	La Porte	Michigan City	NIPSCO Gas Station, 490 W. Michigan Blvd.	SLAMS	05/24/90	Continuous	047	Urban	Pop Exp	41.717664	-86.907763	Michigan City-LaPorte	No
180910010	LaPorte - E. Lincolnway	La Porte	La Porte	2011 E. Lincolnway	SLAMS	05/07/97	Continuous	047	Urban	Pop Exp	41.629167	-86.684444	Michigan City-LaPorte	No

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180950010	Emporia	Madison		East Elem. Sch., 893 E. US 36, Pendleton	SLAMS	04/05/93	Continuous	047	Urban	Pop Exp	40.002511	-85.656391	Indianapolis-Carmel-Andersor	No
180970050	Indpls - Ft Harrison	Marion	Indianapolis	5753 Glenn Rd	SLAMS	12/01/79	Continuous	047	Urban	Highest Conc	39.858889	-86.021389	Indianapolis-Carmel-Andersor	No
180970057	Indpls - Harding St.	Marion	Indianapolis	1321 S. Harding St.	SLAMS	03/01/82	Continuous	087	Neigh	Pop Exp	39.749027	-86.186269	Indianapolis-Carmel-Andersor	No
180970073	Indpls - E. 16th St.	Marion	Indianapolis	6125 E. 16th St.	SLAMS	04/02/90	Continuous	047	Neigh	Pop Exp	39.789167	-86.060833	Indianapolis-Carmel-Andersor	Discontinue
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (NCORE)	04/01/09	Continuous	047	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Andersor	No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	SLAMS (NEAR ROAD)	05/14/14	Continuous	047	Neigh	Pop Exp	39.787933	-86.130880	Indianapolis-Carmel-Andersor	No
181090005	Monrovia	Morgan	Monrovia	Monrovia HS., 135 S. Chestnut St,	SLAMS	04/01/97	Continuous	047	Urban	Pop Exp	39.575409	-86.477852	Indianapolis-Carmel-Andersor	No
181230009	Leopold	Perry		Perry Central HS, 18797 Old St Rd 37, Leopold	SLAMS	04/01/04	Continuous	047	Urban	Highest Conc	38.115153	-86.603242	Non-MSA County	No
181270024	Ogden Dunes	Porter	Ogden Dunes	Water Treatment Plant, 84 Diana Rd	SLAMS	11/01/83	Continuous	047	Urban	Highest Conc	41.617500	-87.199167	Chicago-Naperville-Elgin, IL-IN-WI	No
181270026	Valparaiso	Porter	Valparaiso	Valpo Water Department, 1000 Wesley St.	SLAMS	04/01/98	Continuous	047	Urban	Pop Exp	41.512118	-87.036236	Chicago-Naperville-Elgin, IL-IN-WI	No
181290003	St Philips	Posey		2027 South St. Phillips Rd., Evansville	SLAMS	07/01/96	Continuous	047	Urban	Upwind Bkgrd	38.005278	-87.718056	Evansville, IN-KY	No
181410010	Potato Creek State Park	St Joseph		Potato Creek St. Park, 25601 St. Rd 4, North Liberty	SLAMS	04/24/91	Continuous	047	Urban	Upwind Bkgrd	41.551667	-86.370556	South Bend-Mishawaka, IN-MI	No
181410015	South Bend-Shields Dr.	St Joseph	South Bend	2335 Shields Dr.	SLAMS	06/06/06	Continuous	047	Neigh	Pop Exp	41.696667	-86.214722	South Bend-Mishawaka, IN-MI	No
181410016	Granger-Beckley St.	St Joseph	Granger	12441 Beckley St., Granger	SLAMS	04/01/12	Continuous	047	Urban	Highest Conc	41.754722	-86.110000	South Bend-Mishawaka, IN-MI	No
181450001	Fairland	Shelby		Triton Central MS, 4740 W. 600N , Fairland	SLAMS	04/01/00	Continuous	047	Urban	General Bkgrd	39.613367	-85.870669	Indianapolis-Carmel-Andersor	No
181630013	Inglefield	Vanderburgh		Scott School, 14940 Old State Road	SLAMS	05/01/80	Continuous	047	Urban	Highest Conc	38.113889	-87.536667	Evansville, IN-KY	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS	07/08/09	Continuous	087	Neigh	Pop Exp	38.013333	-87.577222	Evansville, IN-KY	No
181670018	Terre Haute - Lafayette Ave.	Vigo	Terre Haute	961 N. Lafayette Ave.	SLAMS	07/01/83	Continuous	047	Neigh	Pop Exp	39.485987	-87.401312	Terre Haute	No
181670024	Sandcut	Vigo		7597 N. Stevenson Rd., Terre Haute	SLAMS	04/01/01	Continuous	047	Urban	Pop Exp	39.560556	-87.313056	Terre Haute	No
181730008	Boonville	Warrick	Boonville	Boonville HS, 300 N. 1st St.	SLAMS	04/16/91	Continuous	047	Urban	Highest Conc	38.051667	-87.278056	Evansville, IN-KY	No
181730009	Lynnville	Warrick		Tecumseh HS, 5244 State Rd 68, Lynnville	SLAMS	05/02/91	Continuous	047	Urban	Highest Conc	38.194167	-87.341389	Evansville, IN-KY	Discontinue
181730011	Dayville	Warrick		3488 Eble Rd., Newburgh	SLAMS	04/01/07	Continuous	047	Urban	Highest Conc	37.954444	-87.321667	Evansville, IN-KY	No

O3 MONITORING METHOD: 047 - THERMO ELECTRON 49C, 49i
087 - TELEDYNE API T400

Particulate Matter (PM_{10})

Monitoring Requirements

The requirements for the design of the PM_{10} monitoring network are listed in 40 CFR Part 58 Appendix D §4.6. Indiana must operate the minimum number of sites as defined by the CBSA population and the ambient PM_{10} data of the area. Table 8 lists the sites required per CBSA along with the highest monitored PM_{10} value in the proper category for each CBSA. The current and proposed networks are also listed. There are five CBSAs which cross state lines. Indiana meets the requirement for the number of sites for the full CBSA, in the multi-agency CBSAs, except for the Cincinnati, OH-KY-IN and Louisville/Jefferson County, KY-IN CBSAs. IDEM has multi-agency agreements with the Southwest Ohio Air Quality Agency (Cincinnati, OH) and the Louisville Metropolitan Air Pollution Control District (APCD) specifying the sites which will operate in each district to fulfill the PM_{10} monitoring requirements in the Cincinnati, OH-KY-IN and Louisville/Jefferson County, KY-IN CBSAs.

Collocated samplers are required at 15% of the sites in the network to determine monitoring precision. IDEM is required to operate two collocated samplers.

Monitoring Methodology

Intermittent PM_{10} samples are collected on a pre-weighed 46.2 mm diameter Teflon™ filter. Air is drawn through an inlet designed to pass only particles smaller than 10 microns in diameter and across the filter for 24 hours. The filter is then removed and weighed again. Concentrations are calculated by dividing the weight gain by the volume of air that passed through the filter.

Continuous PM_{10} concentrations are obtained by using a Thermo Scientific Model 1405 which collects the particulate on a filter attached to an oscillating glass rod. The concentration of the particulate is proportional to the change in oscillating frequency. A Met One BAM 1020 is used to collect continuous PM_{10}. Particulate is collected through a sampling inlet onto a filter tape. The amount of particulate concentration is determined by measuring beta ray transmissions through the tape. The Teledyne API 602 Beta^{PLUS} is also used to collect continuous PM_{10} on 47 mm diameter filters using direct beta attenuation to determine the mass measurement.

Monitoring Network

Indiana currently operates 11 monitoring sites in the State. The 2018 network is displayed in Figure 8. Concentrations at all sites except for two source-oriented sites in Northwest Indiana, Gary – IITRI (180890022) and Portage – Hwy 12 (181270023), are well under 50% of the 24-hour NAAQS of 150 µg/m^3. Table 9 details the current PM_{10} network.

Network Modifications

There are no network modifications planned for 2018.

Table 8 – PM_{10} Site Requirements

CFR Requirement	MSA Population		High Conc.[1]	Medium Conc.[2]	Low Conc.[3]		
	> 1,000,000	# of Required Sites =>	6-10	4-8	2-4		
	MSA	**Population**	**MSA Highest Value**			**# of Sites 2017**	**# of Sites 2018**
	Chicago-Naperville-Elgin, IL-IN-WI	9,461,105			124 [4,6] / 66 [5,6]	9	-
	Chicago-Naperville-Elgin, IL-IN-WI	9,461,105			124 [4,7] / 66 [5,7]	5	5
	Cincinnati, OH-KY-IN	2,114,580			82 [4,6] / 42 [5,6]	7	-
	Cincinnati, OH-KY-IN	2,114,580			No Data [7]	0	0
	Indianapolis-Carmel-Anderson	1,887,862			73	2	2
	Louisville-Jefferson County, KY-IN	1,235,708			51 [6]	3	-
	Louisville-Jefferson County, KY-IN	1,235,708			38 [7]	1	1

CFR Requirement	MSA Population		High Conc.[1]	Medium Conc.[2]	Low Conc.[3]		
	500,000 - 1,000,000	# of Required Sites =>	4-8	2-4	1-2		
	MSA	**Population**	**MSA Highest Value**			**# of Sites 2017**	**# of Sites 2018**
	No MSAs in this category						

CFR Requirement	MSA Population		High Conc.[1]	Medium Conc.[2]	Low Conc.[3]		
	250,000 - 500,000	# of Required Sites =>	3-4	1-2	0-1		
	MSA	**Population**	**MSA Highest Value**			**# of Sites 2017**	**# of Sites 2018**
	Evansville, IN-KY	311,552			34 [6]	2	-
	Evansville, IN-KY	311,552			33 [7]	1	1
	Fort Wayne	416,257			No Data	0	0
	South Bend-Mishawaka, IN-MI	319,224			No Data	0	0
	South Bend-Mishawaka, IN-MI	319,224			No Data	0	0

CFR Requirement	MSA Population		High Conc.[1]	Medium Conc.[2]	Low Conc.[3]		
	100,000 - 250,000	# of Required Sites =>	1-2	0-1	0		
	MSA	**Population**	**MSA Highest Value**			**# of Sites 2017**	**# of Sites 2018**
	Bloomington	159,549			No Data	0	0
	Elkhart-Goshen	197,559			No Data	0	0
	Kokomo	82,752			No Data	0	0
	Lafayette-West Lafayette	201,789			No Data	0	0
	Michigan City-LaPorte	111,467			No Data	0	0
	Muncie	117,671			No Data	0	0
	Terre Haute	172,425			35	1	1

Non MSA		**Highest Value**			**# of Sites 2017**	**# of Sites 2018**
Jasper - Dubois Co.	54,734			35	1	1
				Sites in Indiana Network	**11**	**11**

[1] Exceeds NAAQS by 20% (180ug/m3).

[2] Exceeds 80% of NAAQS (120 ug/m3).

[3] <80% of NAAQS (120 ug/m3).

[4] Highest value from source oriented site (not indicative of entire MSA).

[5] Highest value from population oriented sites.

[6] Information for full MSA.

[7] Information for Indiana's portion of MSA

Figure 8 – PM_{10} Monitoring Network

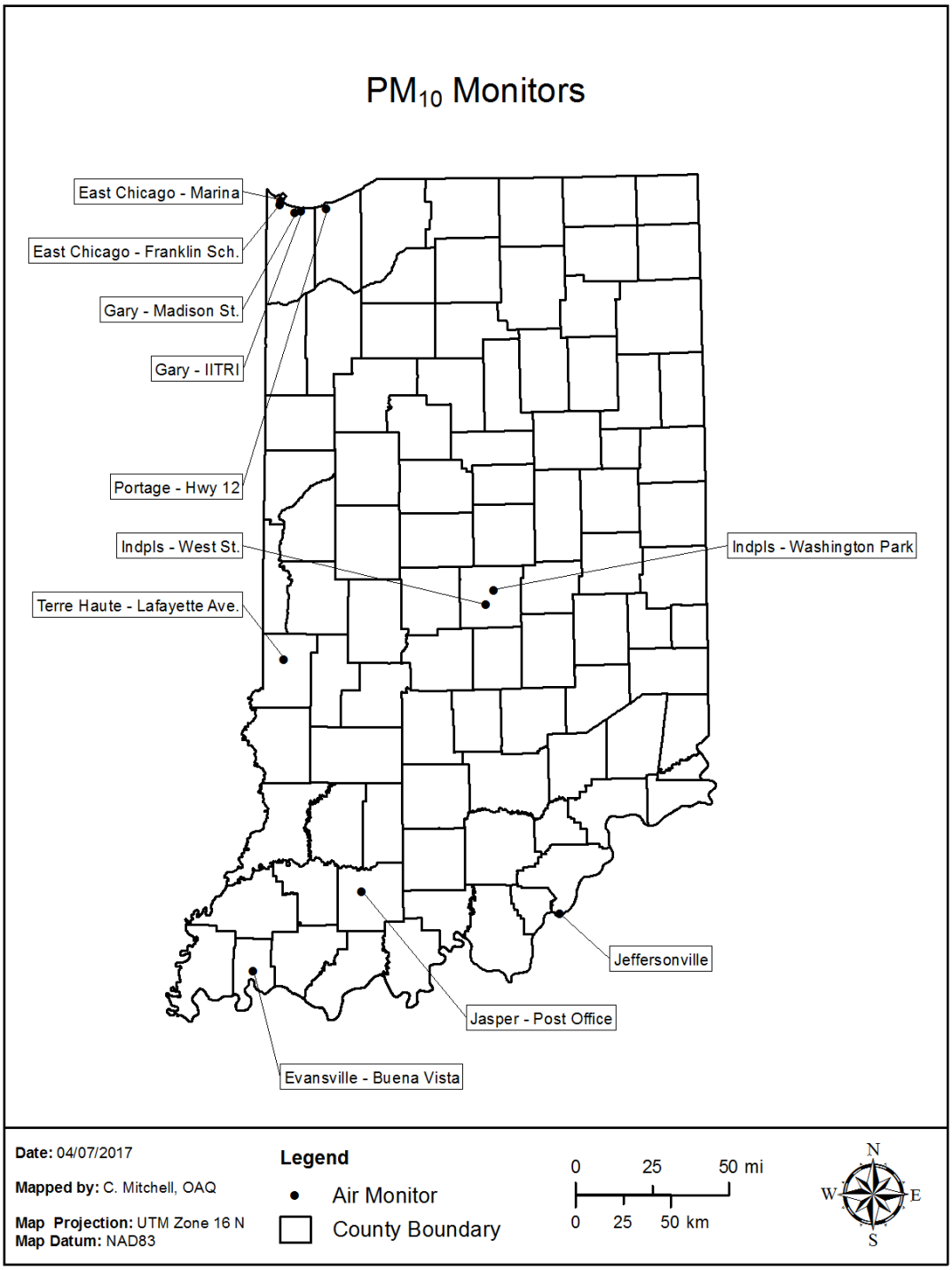


Table 9 – PM_{10} Monitoring Network

Parameter Code: 81102 **PM_{10} - Particulate Matter**

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180190006	Jeffersonville - Walnut St.	Clark	Jeffersonville	Jeffersonville PFAU, 719 Walnut St.	SLAMS	06/26/03	6-Day	127	Neigh	Pop Exp	38.277719	-85.740111	Louisville/Jefferson County, KY-IN	Relocate
18019	Jeffersonville -	Clark	Jeffersonville		SPM	01/01/18	6-Day	127	Neigh	Pop Exp	38.289762	-85.722334	Louisville/Jefferson County, KY-IN	Relocation
180372001	Jasper - Post Office	Dubois	Jasper	Jasper Post Office, 206 E. 6th St.	SLAMS	07/01/87	6-Day	127	Neigh	Highest Conc	38.391389	-86.929167	Non-MSA County	No
180890006	East Chicago - Franklin Sch.	Lake	East Chicago	Washington (formerly Franklin) School, Alder & 142nd St.	SLAMS	10/01/87	6-Day	127	Middle	Highest Conc	41.636111	-87.440833	Chicago-Naperville-Elgin, IL-IN-WI	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS	03/01/97	Continuous	079	Middle	Source Oriented	41.606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180890031	Gary - Madison St.	Lake	Gary	Indiana American Water Co., 650 Madison St.	SLAMS	07/01/05	6-Day	127	Neigh	Pop Exp	41.598505	-87.342991	Chicago-Naperville-Elgin, IL-IN-WI	No
180890031	Gary - Madison St.	Lake	Gary	Indiana American Water Co., 650 Madison St.	SLAMS	07/01/05	6-Day	127	Neigh	Quality Assurance	41.598505	-87.342991	Chicago-Naperville-Elgin, IL-IN-WI	No
180890034	East Chicago-Marina	Lake	East Chicago	East Chicago Marina, 3301 Aldis St.	SLAMS	10/30/12	6-Day	127	Middle	Source Oriented	41.653501	-87.435561	Chicago-Naperville-Elgin, IL-IN-WI	No
180970043	Indpls - West St.	Marion	Indianapolis	1735 S. West St.	SLAMS	10/29/86	6-Day	127	Middle	Highest Conc	39.744957	-86.166496	Indianapolis-Carmel-Anderso	No
180970043	Indpls - West St.	Marion	Indianapolis	1735 S. West St.	SLAMS	01/01/13	6-Day	127	Middle	Quality Assurance	39.744957	-86.166496	Indianapolis-Carmel-Anderso	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St.	SLAMS	07/01/10	1-Day	127	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Anderso	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St.	SLAMS	08/02/11	Continuous	122	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Anderso	No
181270023	Portage - Hwy 12	Porter	Portage	Bethlehem Steel Waste Lagoon, Hwy 12	SLAMS	10/01/95	Continuous	079	Neigh	Highest Conc	41.616561	-87.146921	Chicago-Naperville-Elgin, IL-IN-WI	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS	07/10/09	6-Day	127	Neigh	Pop Exp	38.013333	-87.577222	Evansville, IN-KY	No
181670018	Terre Haute - Lafayette Ave.	Vigo	Terre Haute	961 N. Lafayette Ave.	SLAMS	07/01/88	6-Day	127	Neigh	Pop Exp	39.485987	-87.401312	Terre Haute	No

PM10 MONITORING METHODS:
079 - Thermo Scientific 1405
122- Met One - Beta Attenuation
127 - R&P 2025A or 2025B Sequential
205 - Teledyne 602 Beta PLUS

Fine Particulate Matter ($PM_{2.5}$)

Monitoring Requirements

40 CFR Part 58, Appendix D §4.7 details the number of $PM_{2.5}$ sites required in each CBSA. The number of sites is based on the population of a CBSA and if the design value for that area is greater or less than 85% of either NAAQS. Table 10 (Table D-5 of Appendix D) lists the minimum requirements as stated in Part 58. Table 11 lists the requirements as they relate to Indiana. Indiana meets the minimum number of sites for each CBSA within Indiana's boundaries. There are five CBSAs which cross state lines. Except for the Cincinnati, OH-KY-IN CBSA, Indiana meets the requirement for the number of sites for the full CBSA in the multi-agency CBSAs. An agreement between the SWOAQA and IDEM specifies that the SWOAQA will fulfill the $PM_{2.5}$ monitoring requirements in the Cincinnati, OH-KY-IN CBSA. In the absence of an agreement, Indiana would be required to operate three sites in the Cincinnati, OH-KY-IN CBSA, and 15 additional monitoring sites.

In addition, 40 CFR, Appendix D §4.7.2 states that "State, or where appropriate, local agencies must operate continuous fine particulate analyzers equal to at least one-half (round up) the minimum required sites listed in Table D-5 of Appendix D. At least one required FRM/FEM monitor in each MSA must be collocated." As these requirements are applied to Indiana, 10 would be required. Indiana meets this requirement in all CBSAs, except in the Cincinnati, OH-KY-IN and Louisville/Jefferson County, KY-IN CBSAs. IDEM has multi-agency agreements with SWOAQA (Cincinnati, OH) and APCD of Louisville specifying the sites which will operate in each district to fulfill the $PM_{2.5}$ monitoring requirements in the Cincinnati, OH-KY-IN and Louisville/Jefferson County, KY-IN CBSAs.

Collocated samplers are required at 15% of the FRM/FEM sites operated by each PQAO. IDEM is the sole PQAO for Indiana and plans to operate 36 sites. Indiana is required to have five collocated samplers.

Table 10 – SLAMS Minimum $PM_{2.5}$ Monitoring Site Requirements

Number of Sites per MSA and Design Value		
MSA Population	3 yr DV >= 85% of either NAAQS	3 yr DV < 85% of either NAAQS
> 1,000,000	3	2
500,000 - 1,000,000	2	1
50,000 - 500,000	1	0
	also	
	Statewide Background Site	1
	Statewide Transport Site	1
85% of 24-hour NAAQS (35) = 29.75 μg/m3		
85% of Annual NAAQS (12) = 10.2 μg/m3		

Monitoring Methodology

Intermittent $PM_{2.5}$ is sampled by drawing air through a specially designed inlet that excludes particles larger than 2.5 microns in diameter. The remaining particles are collected on a 46.2 mm diameter Teflon™ Microfiber filter that is weighed before and after the sampling period to determine the particulate mass. Indiana uses the R&P or Thermo Scientific Model 2025 Sequential Samplers (FEM) (EQPM-0202-145) to collect intermittent data. The normal sampling schedule varies, as determined by the regulations. Reporting monitors sample every third day. Collocated monitors used for assessing data precision operate on a one-in-six day schedule.

Continuous data are collected using one of the following monitors: Met One BAM 1020 $PM_{2.5}$ (FEM) (EQPM-0308-170), Thermo Scientific Model 5030 SHARP (EQPM-0609-184), or Teledyne Model 602 Beta ^{PLUS} Particle Measurement System (EQPM-0912-204). The BAM 1020 collects fine particulate through a sampling inlet onto a filter tape, using a beta ray transmission to measure the amount of particulate concentration collected during a specific sampling period. The SHARP 5030 collects the particulate onto a filter tape and uses a beta ray transmission to measure the amount of particulate concentration, similar to the BAM 1020 FEM. In addition, the SHARP 5030 also has an optical assembly that senses light scattered by the aerosol and is constantly referenced to the measurement of the mass sensor. The TAPI 602 collects the particulate on a filter and uses beta ray transmission combined with dual-channel, sequential sampling technology to determine concentration.

Table 11 – Number of SLAMS $PM_{2.5}$ Monitoring Sites Required for Indiana

MSA	MSA Population [1] (2010)	Annual Design Value (µg/m3) (2014-2016)	Daily Design Value (µg/m3) (2014-2016)	# of Sites Required per CFR	2017 # of Sites	2018 # of Sites (IN)	2017 # of Cont. Mont.	2018 # of Cont. Mont. (IN)
Bloomington	159,549	8.8	19	0	1	1	1	1
Chicago-Naperville-Elgin, IL-IN-WI (total MSA)	9,461,105	11 [2]	27 [2]	3	24 [2]	-	12 [2]	-
Chicago-Naperville-Elgin, IL-IN-WI (IN only)	9,461,105	10.1 [3]	25 [3]	3	6 [3]	6	2 [3]	3
Cincinnati, OH-KY-IN (total MSA)	2,114,580	11.5 [2]	24 [2]	3	12 [2]	-	8 [2]	-
Cincinnati, OH-KY-IN (IN only)	2,114,580	No Data [3]	No Data [3]	3	0 [3]	0	0 [3]	0
Columbus	76,794	10.6 [4]	24 [4]	1	1	1	1	1
Elkhart-Goshen	197,559	10.0	28	0	1	1	1	1
Evansville, IN-KY (total MSA)	311,552	10.1 [2]	22 [2]	0	4 [2]	-	2 [2]	-
Evansville, IN-KY (IN only)	311,552	10.1 [3]	22 [3]	0	3 [3]	3	1 [3]	1
Fort Wayne	416,257	9.8	25	0	2	2	2	2
Indianapolis-Carmel-Anderson	1,887,862	11.4	26	3	8	8	5	5
Kokomo	82,752	10.2 [5]	22 [5]	0	1	1	1	1
Lafayette-West Lafayette	201,789	9.1	23	0	1	1	1	1
Louisville-Jefferson County, KY-IN (total MSA)	1,235,708	10.6	24	3	7 [2]	-	5 [2]	-
Louisville-Jefferson County, KY-IN (IN only)	1,235,708	10.6 [3]	24 [3]	3	3 [3]	3	1 [3]	2
Michigan City-LaPorte	111,467	8.9	21	0	1	1	0	0
Muncie	117,671	9	22	0	1	1	0	0
South Bend-Mishawaka, IN-MI (total MSA)	319,224	9.3 [2]	23 [2]	0	1 [2]	-	1 [2]	-
South Bend-Mishawaka, IN-MI (IN only)	319,224	9.3 [3]	23 [3]	0	1 [3]	1	1 [3]	1
Terre Haute	172,425	9.7	23	0	1	1	1	1
Other Requirements								
State Background Site - Green Co.		8.8	22	1	1	1		
State Transport Site - Henry Co.		8.4	20	1	1	1		
Non MSAs								
Jasper - Dubois Co.		9.8	24		1	1		
Dale - Spencer Co.		9.5	22		1	1		
Dugger - Sullivan Co.		No Data [6]	No Data [6]		1	1		
		Values above NAAQS						
		DV ≥ 85% of NAAQS						
# of sites needed if Indiana meets all multi-state MSA requirements				15				
# of continuous monitors required (1/2 of the required sites)(rounded up)				8				
			Sites in Indiana Network		**36**	**36**	**18**	**20**

[1] MSA populations adjusted according to MSA changes in February 2013.
[2] Information for full MSA.
[3] Information for Indiana's portion of MSA.
[4] Site began operation in July 2014
[5] Site began operation in April 2014
[6] Site began operation in April 2017

Monitoring Network

An intermittent $PM_{2.5}$ FRM site located in Dugger, IN (181530007) was installed and began sampling with a 1/1 frequency on April 1, 2017. The site was setup after concerns were raised by the community regarding a nearby coal mine. Monitoring will continue for approximately 3 years. Sampling frequency may be reduced to 1/3 beginning in 2018 based on the concentrations collected during 2017.

Notification was received during first quarter 2017 of plans for the school located at the New Albany (180431004) monitoring site to begin major construction on the land currently occupied by

the monitoring shelter. Monitoring is expected to continue uninterrupted thru November 2017. IDEM is currently working with the school district to secure a new location for the shelter and instruments. After the move the Met One BAM 1020 FEM will be replaced with a real-time FEM in an effort to obtain better correlation with the FRM monitors. A Thermo Fisher SHARP or a Teledyne API T640 will be installed.

Monitoring at Indpls – School 21 (180970084) was suspended on September 1, 2016 due to major building renovations on the property. The land currently occupied by the intermittent $PM_{2.5}$ FRM was needed for the expansion. When the construction concludes, monitoring is planned to resume nearby on the same property grounds. IDEM worked with the contractors to locate a suitable location.

Relocation of the Jeffersonville (180190006) site continues. When the new site is setup, continuous $PM_{2.5}$ and black carbon will be installed. A real-time FEM will be installed, either a Thermo Fisher SHARP or a Teledyne API T640.

Lease negotiations continue between IDEM and property owners to find a replacement site for Hammond – Purdue (180892004) $PM_{2.5}$ and to resume continuous $PM_{2.5}$ FEM monitoring.

As per 40 CFR Part 58.12, if the 24-hour design value of an area is within plus or minus 5% of the NAAQS, then sampling must be daily. Each year the data are evaluated to determine which sites must collect daily data. The design values from 2014 through 2016 will determine which sites will collect daily samples in 2018. No sites are currently required to collect daily samples.

In 2018 the Indiana $PM_{2.5}$ monitoring network consists of 36 monitoring sites. Continuous monitors will be collecting data at 20 site locations.

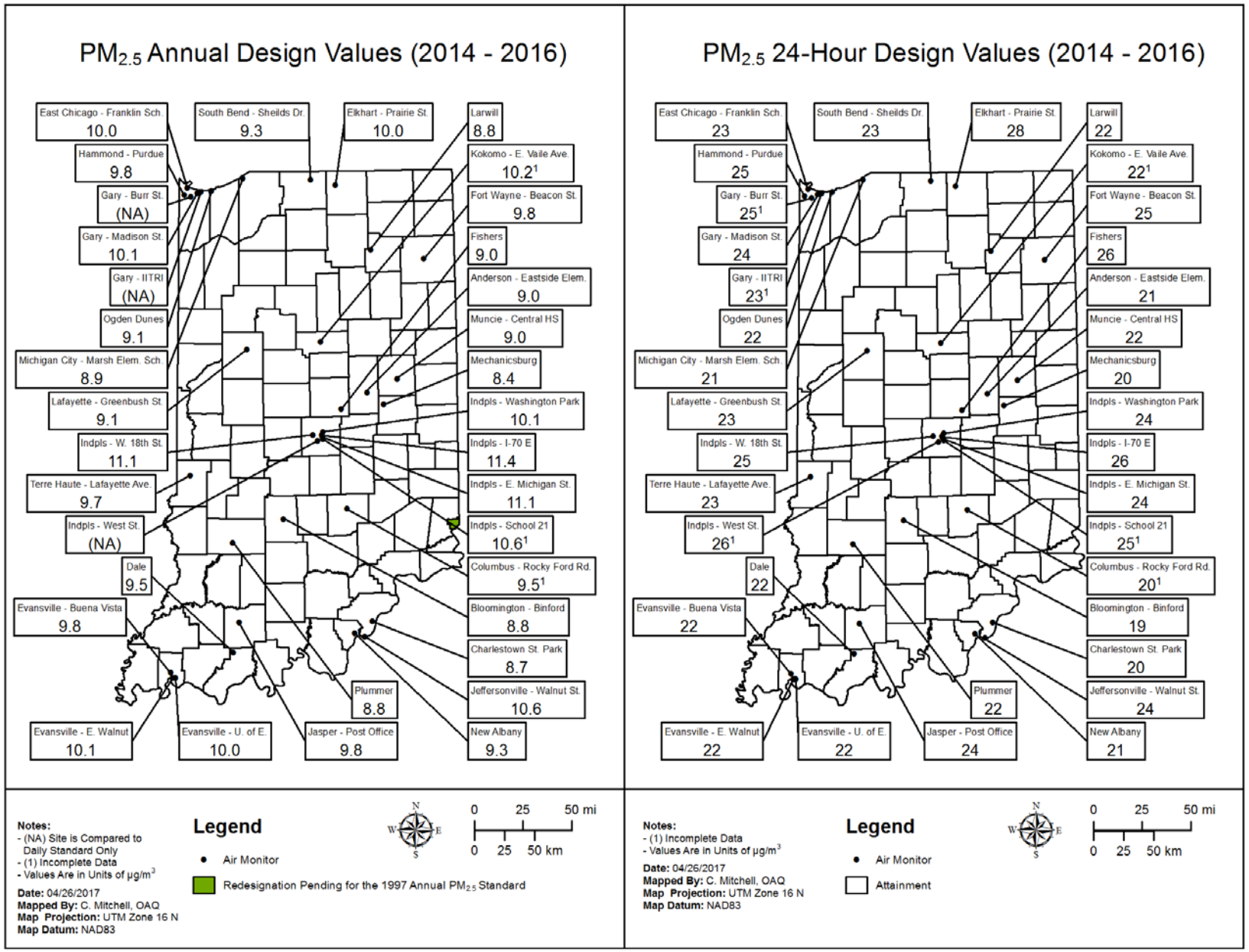
Data / Design Value

The data collected from the intermittent FEM samplers are considered eligible for comparison to the NAAQS and used for calculation of the design value for a site. The continuous data is also eligible for comparison to the NAAQS, with the exception of Indpls – I-70 E (180970087) and Evansville – Buena Vista (181630021) due to having less than 24 months of collected data using the current monitoring method.

A site's annual design value is determined by first calculating the quarterly average concentrations, then calculating the weighted annual concentration by averaging the quarterly values, and then averaging the three consecutive annual averages. The highest site design value in a CBSA is generally determined to be the design value for the area. It is compared to the annual NAAQS of 12 $\mu g/m^3$ to determine attainment/nonattainment for the area. Similarly, a site's 24-hour design value is obtained by averaging the 98^{th} percentile value from three consecutive years. This value is then compared to the 24-hour NAAQS, 35 $\mu g/m^3$, to determine attainment/nonattainment of the 24-hour standard.

The design values for all sites for the most recent sampling period (2014 - 2016), along with the designation status of areas for $PM_{2.5}$ are shown in Figure 9. Currently all counties in Indiana meet the 24-hour, and 2012 annual NAAQS for $PM_{2.5}$.

Figure 9 – $PM_{2.5}$ Site Design Values



Network Modifications

Continuous FEM monitoring methods at multiple sites will be changed in an effort to obtain better correlation with the intermittent $PM_{2.5}$ FRMs. The MetOne BAM 1020 installed at South Bend Shields Dr. (181410015) will be replaced with a Thermo Fisher SHARP 5030. The Thermo Fisher SHARP 5030 installed at Bloomington – Binford (181050003) will be replaced with a MetOne BAM 1020.

The $PM_{2.5}$ monitoring network with the changes proposed for 2018 is shown in Table 12. A map of the 2018 network is shown in Figure 10.

Unanticipated Network Changes

Indiana has not opted to spatially average $PM_{2.5}$ values from multiple sites in an MSA. If access to a site is lost or the site must be discontinued, and that site is violating the NAAQS for $PM_{2.5}$, a new site need not be found, if the 'design value site' for the CBSA is still operational. The attainment of the area would still be determined by the 'design value site'. However, if the violating 'design value site' were to be lost, every effort would be made to obtain a new site close to the old site and having the same scale of representativeness and monitoring objectives as the original site.

Figure 10 – $PM_{2.5}$ Monitoring Network

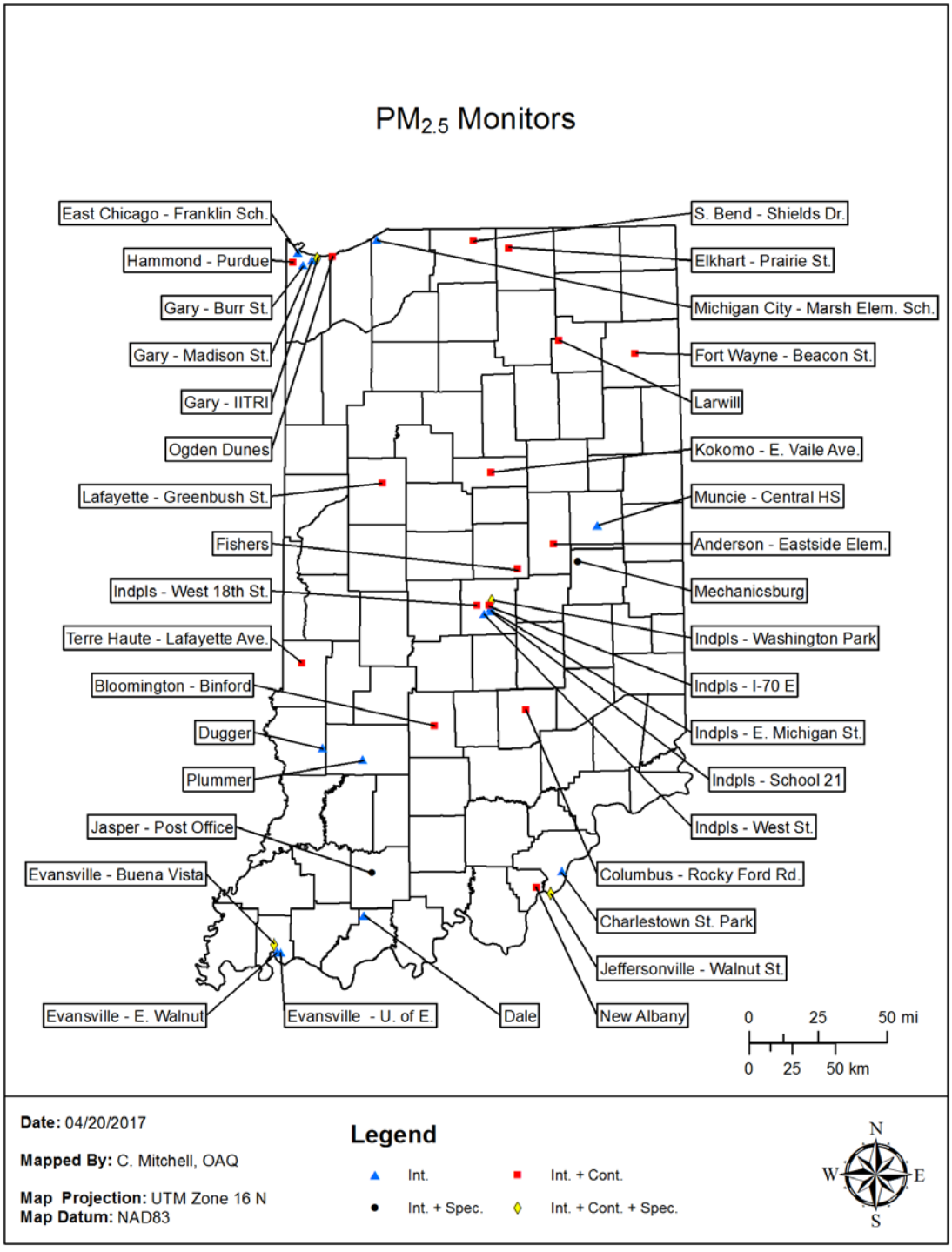


Table 12 – $PM_{2.5}$ Monitoring Network

$PM_{2.5}$ Monitoring Network

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	Waiver Required?	NAAQS Comparable	CBSA	Site Change Proposed?
180030004	Ft Wayne - Beacon St.	Allen	Fort Wayne	2022 North Beacon St.	SLAMS	01/01/99	3-Day	145	Neigh	Pop Exp	41.094965	-85.101816	No	Yes	Ft. Wayne	No
180030004	Ft Wayne - Beacon St.	Allen	Fort Wayne	2022 North Beacon St.	SLAMS	01/01/02	Continuous	170	Neigh	Pop Exp	41.094965	-85.101816	No	Yes	Ft. Wayne	No
180050008	Columbus - Rocky Ford Rd.	Bartholomew	Columbus	3475 Trestle Dr.	SLAMS	07/16/14	3-Day	145	Neigh	Pop Exp	39.237457	-85.891332	No	Yes	Columbus	No
180050008	Columbus - Rocky Ford Rd.	Bartholomew	Columbus	3475 Trestle Dr.	SLAMS	07/25/14	Continuous	170	Neigh	Pop Exp	39.237457	-85.891332	No	Yes	Columbus	No
180190006	Jeffersonville - Walnut St.	Clark	Jeffersonville	Jeffersonville PFAU, 719 Walnut St.	SLAMS	06/26/03	1-Day	145	Neigh	Pop Exp	38.277719	-85.740111	No	Yes	Louisville/Jefferson County, KY-IN	Relocate
18019	Jeffersonville	Clark	Jeffersonville		SPM	01/01/18	3-Day	145	Neigh	Pop Exp	38.289762	-85.722334			Louisville/Jefferson County, KY-IN	Relocation
18019	Jeffersonville	Clark	Jeffersonville		SPM	01/01/18	Continuous	184	Neigh	Pop Exp	38.289762	-85.722334			Louisville/Jefferson County, KY-IN	Add
180190008	Charlestown State Park	Clark		Charlestown State Park, 12500 Hwy 62, Charlestown	SLAMS	07/01/08	3-Day	145	Urban	Pop Exp	38.393823	-85.664118	No	Yes	Louisville/Jefferson County, KY-IN	No
180350006	Muncie - Central HS	Delaware	Muncie	Muncie Central HS, 801 N. Walnut St.	SLAMS	10/15/99	3-Day	145	Neigh	Pop Exp	40.199502	-85.387908	No	Yes	Muncie	No
180372001	Jasper - Post Office	Dubois	Jasper	Post Office, 206 E. 6th St.	SLAMS	01/01/00	3-Day	145	Neigh	Pop Exp	38.391389	-86.929167	No	Yes	Non-MSA County	No
180390008	Elkhart - Prairie St.	Elkhart	Elkhart	2745 Prairie St.	SLAMS	01/01/08	3-Day	145	Neigh	Pop Exp	41.657155	-85.968446	No	Yes	Elkhart-Goshen	No
180390008	Elkhart - Prairie St.	Elkhart	Elkhart	2745 Prairie St.	SLAMS	11/23/10	Continuous	170	Neigh	Pop Exp	41.657155	-85.968446	No	Yes	Elkhart-Goshen	No
180431004	New Albany	Floyd	New Albany	Green Valley Elem. Sch., 2230 Green Valley Rd.	SLAMS	01/18/99	3-Day	145	Neigh	Pop Exp	38.307913	-85.834313	No	Yes	Louisville/Jefferson County, KY-IN	No
180431004	New Albany	Floyd	New Albany	Green Valley Elem. Sch., 2230 Green Valley Rd.	SLAMS	01/18/99	6-Day	145	Neigh	Quality Assurance	38.307913	-85.834313	No	No	Louisville/Jefferson County, KY-IN	No
180431004	New Albany	Floyd	New Albany	Green Valley Elem. Sch., 2230 Green Valley Rd.	SLAMS	11/01/03	Continuous	170	Neigh	Pop Exp	38.307913	-85.834313	No	No	Louisville/Jefferson County, KY-IN	No
180550001	Plummer	Greene		2500 S. 275 W	SLAMS	01/12/12	3-Day	145	Regional	Upwind Bkgrd	38.985556	-86.990000	No	Yes	Non-MSA County	No
180570007	Fishers	Hamilton	Fishers	11775 Brooks School Rd.	SLAMS	01/02/14	3-Day	145	Urban	Pop Exp	39.960884	-85.939546	No	Yes	Indianapolis-Carmel-Anderson	No
180570007	Fishers	Hamilton	Fishers	11775 Brooks School Rd.	SLAMS	12/06/13	Continuous	170	Urban	Pop Exp	39.960884	-85.939546	No	Yes	Indianapolis-Carmel-Anderson	No
180650003	Mechanicsburg	Henry		Shenandoah HS, 7354 W. Hwy. 36, Pendleton	SLAMS	09/06/00	3-Day	145	Regional	Regional Transport	40.009544	-85.523470	No	Yes	Non-MSA County	No
180670004	Kokomo - E. Vaile Ave.	Howard	Kokomo	1802 E. Vaile Ave.	SLAMS	04/03/14	3-Day	145	Urban	Pop Exp	40.481347	-86.109688	No	Yes	Kokomo	No
180670004	Kokomo - E. Vaile Ave.	Howard	Kokomo	1802 E. Vaile Ave.	SLAMS	04/03/14	Continuous	170	Urban	Pop Exp	40.481347	-86.109688	No	Yes	Kokomo	No

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	Waiver Required?	NAAQS Comparable	CBSA	Site Change Proposed?
180890006	East Chicago - Franklin Sch.	Lake	East Chicago	Washington (formerly Franklin) School, Alder & 142nd St.	SLAMS	01/27/99	3-Day	145	Neigh	Pop Exp	41.636111	-87.440833	No	Yes	Chicago-Naperville-Elgin, IL-IN-WI	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS	03/04/99	3-Day	145	Middle	Source & Pop Exp	41.606667	-87.304722	Requested	Yes**	Chicago-Naperville-Elgin, IL-IN-WI	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS	01/01/03	Continuous	170	Middle	Source & Pop Exp	41.606667	-87.304722	Requested	Yes	Chicago-Naperville-Elgin, IL-IN-WI	No
180890026	Gary - Burr St	Lake	Gary	Truck Stop, 25th Ave & Burr St.	SLAMS	02/12/00	3-Day	145	Middle	Source & Pop Exp	41.573056	-87.405833	No	Yes**	Chicago-Naperville-Elgin, IL-IN-WI	No
180890031	Gary - Madison St.	Lake	Gary	Indiana American Water Co., 650 Madison St.	SLAMS	07/01/05	3-Day	145	Neigh	Pop Exp	41.598505	-87.342991	No	Yes	Chicago-Naperville-Elgin, IL-IN-WI	No
180890031	Gary - Madison St.	Lake	Gary	Indiana American Water Co., 650 Madison St.	SLAMS	07/01/05	6-Day	145	Neigh	Quality Assurance	41.598505	-87.342991	No	No	Chicago-Naperville-Elgin, IL-IN-WI	No
180892004	Hammond - Purdue	Lake	Hammond	Powers Bldg. Purdue Univ. Calumet, 2200 169th St.	SLAMS	02/01/99	3-Day	145	Neigh	Pop Exp	41.585278	-87.474444	No	Yes	Chicago-Naperville-Elgin, IL-IN-WI	Relocate
180892004	Hammond - Purdue	Lake	Hammond	Powers Bldg. Purdue Univ. Calumet, 2200 169th St.	SLAMS	12/01/03	Continuous	184	Neigh	Pop Exp	41.585278	-87.474444	No	No	Chicago-Naperville-Elgin, IL-IN-WI	Relocate
18089	Hammond	Lake	Hammond		SPM	2016	3-Day	145	Neigh	Pop Exp	41.594408	-87.495041	No		Chicago-Naperville-Elgin, IL-IN-WI	Relocation
18089	Hammond	Lake	Hammond		SPM	2016	Continuous	184	Neigh	Pop Exp	41.594408	-87.495041	No		Chicago-Naperville-Elgin, IL-IN-WI	Relocation
180910011	Michigan City - Marsh Elem. Sch.	La Porte	Michigan City	Marsh Elem. Sch., 400 E. Homer St.	SLAMS	12/17/99	3-Day	145	Neigh	Pop Exp	41.706944	-86.891111	No	Yes	Michigan City-LaPorte	No
180950011	Anderson - Eastside Elem.	Madison	Anderson	Eastside Elementary Sch., 844 N. Scatterfield Rd.	SLAMS	07/22/10	3-Day	145	Middle	Pop Exp	40.125690	-85.652127	No	Yes	Indianapolis-Carmel-Anderson	No
180950011	Anderson - Eastside Elem.	Madison	Anderson	Eastside Elementary Sch., 844 N. Scatterfield Rd.	SLAMS	07/08/10	Continuous	184	Middle	Pop Exp	40.125690	-85.652127	No	Yes	Indianapolis-Carmel-Anderson	No
180970043	Indpls - West St.	Marion	Indianapolis	1735 South West Street	SLAMS	01/24/99	3-Day	145	Middle	Pop Exp	39.744957	-86.166496	No	Yes**	Indianapolis-Carmel-Anderson	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (NCORE)	03/07/99	3-Day	145	Neigh	Pop Exp	39.810833	-86.114444	No	Yes	Indianapolis-Carmel-Anderson	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (NCORE)	01/01/04	Continuous	170	Neigh	Pop Exp	39.810833	-86.114444	No	Yes	Indianapolis-Carmel-Anderson	No
180970081	Indpls - W. 18th St.	Marion	Indianapolis	Ernie Pyle Sch 90, 3351 W. 18th St.	SLAMS	02/03/99	3-Day	145	Neigh	Pop Exp	39.788889	-86.214722	No	Yes	Indianapolis-Carmel-Anderson	No
180970081	Indpls - W. 18th St.	Marion	Indianapolis	Ernie Pyle Sch 90, 3351 W. 18th St.	SLAMS	02/11/99	6-Day	145	Neigh	Quality Assurance	39.788889	-86.214722	No	No	Indianapolis-Carmel-Anderson	No
180970081	Indpls - W. 18th St.	Marion	Indianapolis	Ernie Pyle Sch 90, 3351 W. 18th St.	SLAMS	11/01/07	Continuous	184	Neigh	Pop Exp	39.788889	-86.214722	No	Yes	Indianapolis-Carmel-Anderson	No
180970083	Indpls - E. Michigan St.	Marion	Indianapolis	Thomas Gregg Sch 15, 2302 E. Michigan St.	SLAMS	01/22/99	3-Day	145	Neigh	Pop Exp	39.774896	-86.122000	No	Yes	Indianapolis-Carmel-Anderson	No
180970084	Indpls - School 21	Marion	Indianapolis	IPS Sch 21, 2815 English Ave.	SLAMS	02/16/09	3-Day	145	Neigh	Pop Exp	39.759167	-86.114722	No	No	Indianapolis-Carmel-Anderson	No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	SLAMS (NEAR ROAD)	02/01/14	3-Day	145	Middle	Highest Conc	39.787933	-86.130880	No	Yes	Indianapolis-Carmel-Anderson	No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	SLAMS (NEAR ROAD)	11/05/15	Continuous	184	Middle	Highest Conc	39.787933	-86.130880	No	No	Indianapolis-Carmel-Anderson	No
181050003	Bloomington - Binford	Monroe	Bloomington	Binford Elementary Sch, 2300 E. 2nd St.	SLAMS	04/01/09	3-Day	145	Neigh	Pop Exp	39.159372	-86.504747	No	Yes	Bloomington	No
181050003	Bloomington - Binford	Monroe	Bloomington	Binford Elementary Sch, 2300 E. 2nd St.	SLAMS	04/01/09	Continuous	184	Neigh	Pop Exp	39.159372	-86.504747	No	No	Bloomington	No

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	Waiver Required?	NAAQS Comparable	CBSA	Site Change Proposed?
181270024	Ogden Dunes	Porter	Ogden Dunes	Water Treatment Plant, 84 Diana Rd	SLAMS	01/27/99	3-Day	145	Neigh	Pop Exp	41.617500	-87.199167	No	Yes	Chicago-Naperville-Elgin, IL-IN-WI	No
181270024	Ogden Dunes	Porter	Ogden Dunes	Water Treatment Plant, 84 Diana Rd	SLAMS	12/03/03	Continuous	170	Neigh	Pop Exp	41.617500	-87.199167	No	Yes	Chicago-Naperville-Elgin, IL-IN-WI	No
181410015	South Bend - Shields Dr.	St Joseph	South Bend	2335 Shields Dr.	SLAMS	06/01/06	3-Day	145	Neigh	Pop Exp	41.696667	-86.214722	No	Yes	South Bend-Mishawaka, IN-MI	No
181410015	South Bend - Shields Dr.	St Joseph	South Bend	2335 Shields Dr.	SLAMS	06/01/06	6-Day	145	Neigh	Quality Assurance	41.696667	-86.214722	No	No	South Bend-Mishawaka, IN-MI	No
181410015	South Bend - Shields Dr.	St Joseph	South Bend	2335 Shields Dr.	SLAMS	06/01/06	Continuous	170	Neigh	Pop Exp	41.696667	-86.214722	No	No	South Bend-Mishawaka, IN-MI	No
181470009	Dale	Spencer	Dale	David Turnham School, Dunn & Locust	SLAMS	02/01/00	3-Day	145	Urban	Regional Trans	38.167500	-86.983333	No	Yes	Non-MSA County	No
181530007	Dugger	Sullivan		Greene Sullivan State Forest, : IN-159	SPM	04/01/17	1-Day	145	Neigh	Source & Pop Exp	39.044992	-87.258969	No	No	Terre Haute	No
181570008	Lafayette - Greenbush St.	Tippecanoe	Lafayette	Cinergy Substation, 3401 Greenbush St	SLAMS	10/01/02	3-Day	145	Neigh	Pop Exp	40.431667	-86.852500	No	Yes	Lafayette-West Lafayette	No
181570008	Lafayette - Greenbush St.	Tippecanoe	Lafayette	Cinergy Substation, 3401 Greenbush St	SLAMS	10/01/02	6-Day	145	Neigh	Quality Assurance	40.431667	-86.852500	No	No	Lafayette-West Lafayette	No
181570008	Lafayette - Greenbush St.	Tippecanoe	Lafayette	Cinergy Substation, 3401 Greenbush St	SLAMS	04/01/05	Continuous	170	Neigh	Pop Exp	40.431667	-86.852500	No	Yes	Lafayette-West Lafayette	No
181630016	Evansville - U of E	Vanderburgh	Evansville	Carson Center, Walnut St.	SLAMS	06/05/99	3-Day	145	Neigh	Pop Exp	37.974444	-87.532222	No	Yes	Evansville, IN-KY	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS	07/10/09	3-Day	145	Neigh	Pop Exp	38.013333	-87.577222	No	Yes	Evansville, IN-KY	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS	07/14/09	Continuous	204	Neigh	Pop Exp	38.013333	-87.577222	No	No	Evansville, IN-KY	No
181630023	Evansville - E. Walnut	Vanderburgh	Evansville	500 E. Walnut St.	SLAMS	01/01/13	3-Day	145	Neigh	Pop Exp	37.974460	-87.558018	No	Yes	Evansville, IN-KY	No
181670018	Terre Haute - Lafayette Ave.	Vigo	Terre Haute	961 N. Lafayette Ave.	SLAMS	03/19/99	3-Day	145	Neigh	Pop Exp	39.485987	-87.401312	No	Yes	Terre Haute	No
181670018	Terre Haute - Lafayette Ave.	Vigo	Terre Haute	961 N. Lafayette Ave.	SLAMS	07/02/03	Continuous	170	Neigh	Pop Exp	39.485987	-87.401312	No	Yes	Terre Haute	No
181670018	Terre Haute - Lafayette Ave.	Vigo	Terre Haute	961 N. Lafayette Ave.	SLAMS	01/01/13	Continuous	170	Neigh	Quality Assurance	39.485987	-87.401312	No	Yes	Terre Haute	No
181830003	Larwill	Whitley	Larwill	Whitko Middle School, 710 N. State Rd. 5	SLAMS	04/08/10	3-Day	145	Regional	Regional Transport	41.169722	-85.629444	No	Yes	Ft. Wayne	No
181830003	Larwill	Whitley	Larwill	Whitko Middle School, 710 N. State Rd. 5	SLAMS	04/08/10	Continuous	170	Regional	Regional Transport	41.169722	-85.629444	No	Yes	Ft. Wayne	No

** According to 40 CFR Part 58 Subpart D, PM2.5 data that is representative of a unique population-oriented scale or localized hot spot are only eligible for comparison to the 24-hour PM2.5 NAAQS. The annual standard does not apply.

MONITORING METHODS:
145 - R&P 2025A or B or Thermo 2025i
170 - MET ONE BAM - FEM
184 - Thermo SHARP
204 - Teledyne 602 Beta PLUS

Sulfur Dioxide (SO_2)

Monitoring Requirements

The monitoring requirements for SO_2 are detailed in 40 CFR Part 58 Appendix D §4.4. Section 4.4.2 of the Appendix lists the number of monitors to be located in a CBSA based on the Population Weighted Emissions Index, PWEI. The PWEI combines the population of the area and the SO_2 emissions from the 2014 National Emissions Inventory for each county. The 2016 population estimates from the U.S. Census Bureau is multiplied by the emissions and divided by one million. The PWEI dictates the number of sites required:

PWEI	# of Sites
>1,000,000	3
100,000 to 1,000,000	2
5,000 to 100,000	1
<5,000	0

As depicted in Table 13, the CBSAs in Indiana which require monitoring sites are the Chicago-Naperville-Elgin, IL-IN-WI CBSA, the Cincinnati, OH-KY-IN CBSA, the Indianapolis-Carmel-Anderson, IN CBSA, the Evansville, IN-KY CBSA, the Louisville/Jefferson County, KY-IN CBSA, and the Terre Haute, IN CBSA. Indiana meets the minimum monitoring requirements in four of the six areas which require monitors. For the Chicago-Naperville-Elgin, IL-IN-WI CBSA Indiana has a Memorandum of Agreement, MOA with Illinois EPA for the remaining required site to be operated by them. For the Cincinnati, OH-KY-IN CBSA, SWOAQA meets the monitoring requirements in that area as per an agreement between Indiana and SWOAQA.

In addition to the SO_2 monitoring requirements above (PWEI), on August 21, 2015, U.S. EPA published its final Data Requirements Rule (DRR) for the 2010 1-hour SO_2 NAAQS (https://www.gpo.gov/fdsys/pkg/FR-2015-08-21/pdf/2015-20367.pdf). This rule directed states to provide data to U.S. EPA to characterize current air quality in areas with large sources of SO_2 emissions to identify maximum 1-hour SO_2 concentrations in ambient air. The DRR required states to indicate the approach they will use for each listed source to characterize air quality in the respective area: air quality characterization through air quality modeling or ambient monitoring, or establishment of a federally enforceable emission limit (or facility shut down). As required by the DRR, IDEM identified to U.S. EPA the approach it intended to use to characterize the air quality in each of the areas identified under the DRR. Throughout the state of Indiana, one source characterize the air quality around their facilities using ambient monitoring. Based on modeling conducted in accordance with U.S. EPA's SO_2 NAAQS Monitoring Technical Assistance Document, and in consultation with U.S. EPA, a monitoring site location was selected to meet this requirement. As required by the DRR, this monitor was installed and operating by January 1, 2017. Facilities monitoring for SO_2 under the 2015 Data Requirements Rule operate similar to the monitoring at other SO_2 sites operated by IDEM.

Monitoring of SO_2 is also required at the NCore sites as per 40 CFR Part 58 Appendix D, 4.4.5.

Table 13 – Number of SO_2 Sites Required by CFR

CBSA Name - Required Areas	2014 NEI Data (tons/year)[1]	2016 Pop. Estimate [2]	PWEI Values	PWEI Required Sites	Current No. of Sites	2018 No. of Sites
Chicago-Naperville-Elgin, IL-IN-WI (total CBSA)	80,738	9,512,999	768,061	2	6	-
Chicago-Naperville-Elgin, IL-IN-WI (IN only)					2	2
Cincinnati, OH-KY-IN (total CBSA) [3]	101,915	2,165,139	220,660	2	6	-
Cincinnati, OH-KY-IN (IN only)					0	0
Indianapolis-Carmel-Anderson, IN [3]	40,249	2,004,230	80,668	1	2	2
Evansville, IN-KY (total CBSA) [3]	27,965	315,948	8,835	1	2	-
Evansville, IN-KY (IN only)					1	1
Louisville-Jefferson County, KY-IN (total CBSA) [3]	45,952	1,283,430	58,976	1	4	-
Louisville-Jefferson County, KY-IN (IN only)					1	1
Terre Haute, IN	36,208	170,687	6,180	1	1	1
# of sites needed to meet full CBSA requirements				8		
Sites in Indiana Network					**7**	**7**

[1] Emissions data from USEPA Table

[2] Population estimates from US Census Bureau

[3] Population from revised CBSAs (Feb 2013)

Monitoring Methodology

Indiana's SO_2 monitoring network collects data with Thermo Scientific Models 43c and 43i using pulsed ultra-violet fluorescence monitoring methodology. A Thermo Scientific Model 43i Trace Level-Enhanced is used to collect trace level SO_2 data at the NCore, Indpls – Washington Park site (180970078).

Monitoring Network

In November, 2017 the shelter at New Albany (180431004) will be relocated on school property to allow construction of a new building. The shelter will be moved approximately 150 meters east-southeast of its current location.

Indiana operates seven SO_2 monitors located throughout the state, as displayed in Figure 11. This Figure includes nine townships designated nonattainment for SO_2. The current network is listed in Table 14.

Network Modifications

No changes are planned for the network in 2018.

Figure 11 – SO_2 Monitoring Network

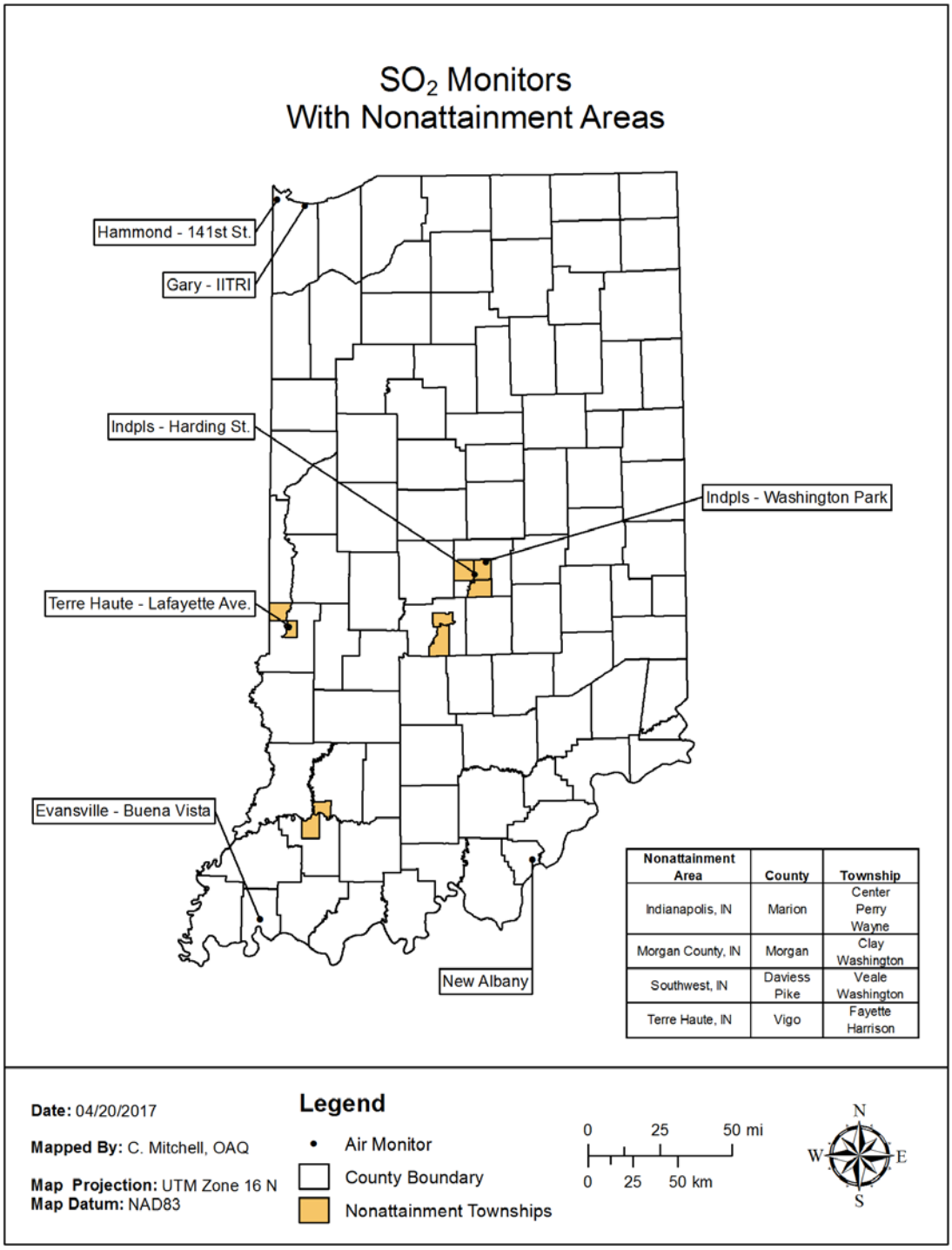


Table 14 – SO_2 Monitoring Network

Parameter Code: 42401 **SO_2 - Sulfur Dioxide**

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180431004	New Albany	Floyd	New Albany	Green Valley Elem. Sch., 2230 Green Valley Rd.	SLAMS	11/01/76	Continuous	060	Neigh	Pop Exp	38.307913	-85.834313	Louisville/Jefferson County, KY-IN	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS	06/12/97	Continuous	060	Neigh	Pop Exp	41.606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180892008	Hammond - 141st St.	Lake	Hammond	1300 E. 141st St.	SLAMS	08/01/75	Continuous	060	Neigh	Highest Conc	41.639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No
180970057	Indpls - Harding St.	Marion	Indianapolis	1321 S. Harding St.	SLAMS	03/04/82	Continuous	060	Neigh	Highest Conc	39.749027	-86.186269	Indianapolis-Carmel-Andersor	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (NCORE)	01/01/10	Continuous	560	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Andersor	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS	07/08/09	Continuous	060	Neigh	Pop Exp	38.013333	-87.577222	Evansville, IN-KY	No
181670018	Terre Haute - Lafayette Ave.	Vigo	Terre Haute	961 N. Lafayette Ave.	SLAMS	07/01/83	Continuous	060	Neigh	Pop Exp	39.485987	-87.401312	Terre Haute	No

SO2 MONITORING METHOD: 060 - THERMO ELECTRON 43C, 43i
560 - THERMO ELECTRON 43i TRACE LEVEL

$PM_{2.5}$ Speciation

Monitoring Requirements

Monitoring requirements in 40 CFR Part 58 Appendix D §4.7.4 states that "each state shall continue to conduct chemical speciation monitoring and analyses at sites designated to be part of the STN $PM_{2.5}$." The STN $PM_{2.5}$ is part of the CSN.

Monitoring Methodology

Intermittent speciation samples are collected on three different filter mediums, each for a specific analysis and list of compounds. A Teflon™ filter, using the Energy Dispersive X-ray Fluorescence analysis methodology, is used to target 33 trace metals. A nylon filter, using Ion Chromatography for an analytical method, is used to target sulfates, nitrates, and three cations (ammonium, potassium, and sodium). A quartz fiber filter, using Thermal Optical Analysis, is used to target organic, elemental, and total carbon.

The Met One SASS and SuperSASS is used to collect $PM_{2.5}$, trace elements, Cations-$PM_{2.5}$, Nitrate-$PM_{2.5}$, and Sulfate-$PM_{2.5}$ data. The URG-3000N sampler is used to collect organic and elemental carbon data. Samples are collected on a 1/6 day sampling frequency at all sites except the Indpls – Washington Park (180970078) site, which samples every third day.

Indiana also operates continuous speciation monitors at five different locations. A Magee Aethalometer, using optical absorption analysis methodology, is used for sampling black carbon at the Indpls – Washington Park, Gary – IITRI (180890022), Evansville – Buena Vista (181630021), and Elkhart – Prairie St. (180390008) sites. A Teledyne API Aethalometer, using optical adsorption analysis methodology, is used for sampling black carbon at the Indpls – I-70 E. (180970087) site.

Monitoring Network

Currently the Indiana speciation network consists of six STN $PM_{2.5}$ and five continuous monitors across the state. The current network, along with any changes planned for 2018, is listed in Table 15 and displayed in Figure 12.

Network Modifications

The State of Indiana proposes adding Aethalometer Black Carbon to the new Jeffersonville site starting January 1, 2018. A Teledyne API Aethalometer will be deployed at this site.

Figure 12 – Speciation Monitoring Network

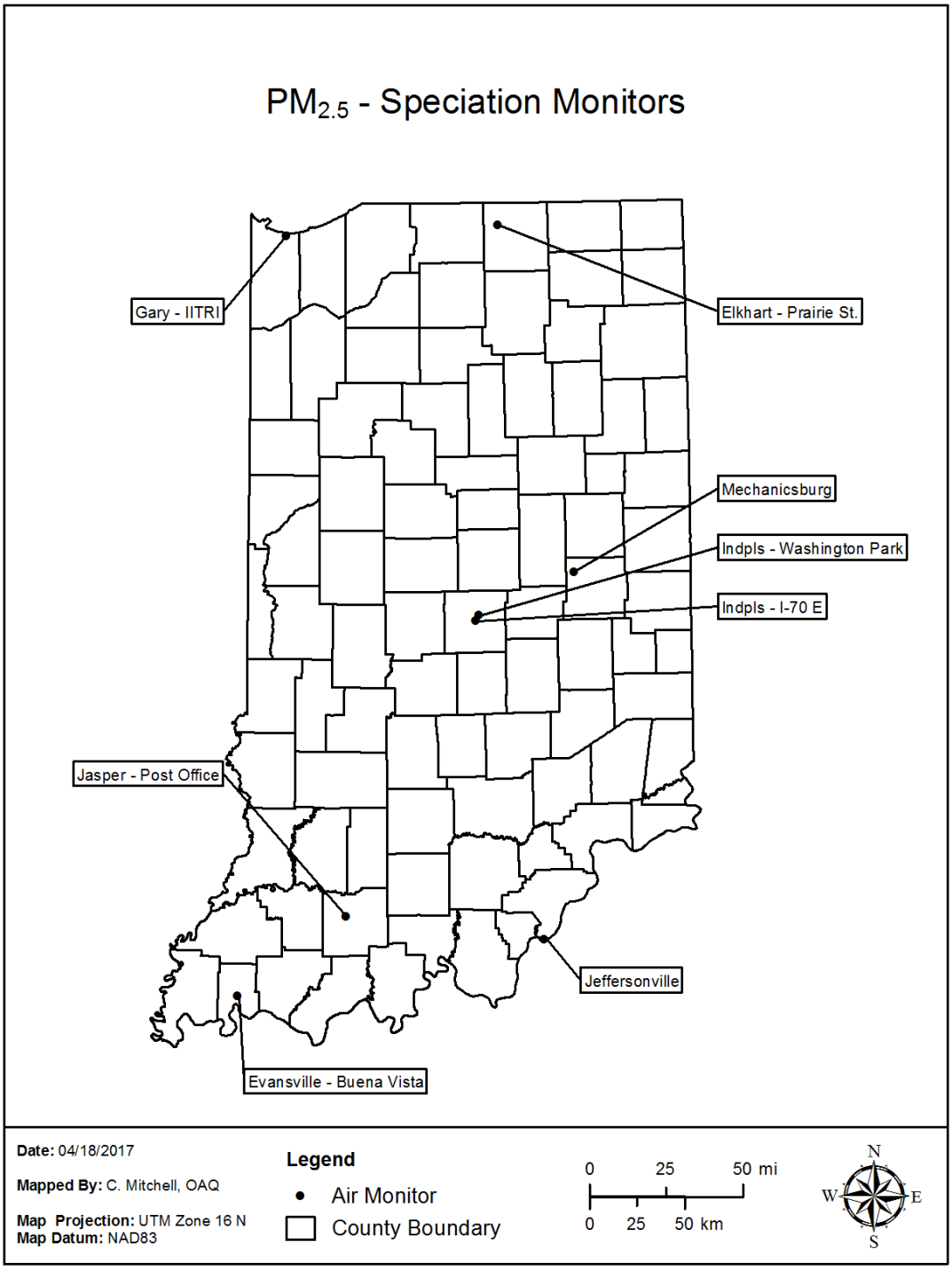


Table 15 – $PM_{2.5}$ Speciation Monitoring Network

PM2.5 Speciation (Sulfate, Nitrate, Carbon, etc.)

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180190006	Jeffersonville-Walnut St.	Clark	Jeffersonville	Jeffersonville PFAU, 719 Walnut St.	SLAMS (CSN SUPPLEMENTAL	07/01/08	6-Day	810,811,812,826,831,838,839,840,841,842	Neigh	Pop Exp	38.277719	-85.740111	Louisville/Jefferson County, KY-IN	Relocate
18019	Jefersonville	Clark	Jeffersonville		SLAMS (CSN SUPPLEMENTAL	01/01/18	6-Day	810,811,812,826,831,838,839,840,841,842	Neigh	Pop Exp	38.289762	-85.722334	Louisville/Jefferson County, KY-IN	Relocation
18019	Jefersonville	Clark	Jeffersonville		SLAMS (CSN SUPPLEMENTAL	01/01/18	Continuous Black Carbon	894	Neigh	Pop Exp	38.289762	-85.722334	Louisville/Jefferson County, KY-IN	Add
180372001	Jasper - Post Office	Dubois	Jasper	Post Office, 206 E. 6th St	SLAMS (CSN SUPPLEMENTAL	01/04/05	6-Day	810,811,812,826,831,838,839,840,841,842	Neigh	Pop Exp	38.391389	-86.929167	Non-MSA County	No
180390008	Elkhart - Prairie St.	Elkhart	Elkhart	2745 Prairie St.	SLAMS	02/01/12	Continuous Black Carbon	876	Neigh	Pop Exp	41.657155	-85.968446	Elkhart-Goshen	No
180650003	Mechanicsburg	Henry		Shenandoah HS, 7354 W. Hwy. 36	SLAMS (CSN SUPPLEMENTAL	02/01/02	6-Day	810,811,812,826,831,838,839,840,841,842	Regional	Regional Trans	40.009544	-85.523470	Non-MSA County	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS (CSN SUPPLEMENTAL	04/03/03	6-Day	810,811,812,826,831,838,839,840,841,842	Middle	Pop Exp	41.606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS	04/01/05	Continuous Black Carbon	866	Middle	Pop Exp	41.606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (CSN STN) (NCORE)	12/13/00	3-Day	810,811,812,826,831,838,839,840,841,842	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Andersc	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS	10/01/03	Continuous Black Carbon	866	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Andersc	No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	SLAMS (NEAR ROAD)	05/06/15	Continuous Black Carbon	894	Middle	Source Oriented	39.787933	-86.130880	Indianapolis-Carmel-Andersc	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS (CSN SUPPLEMENTAL	07/12/09	6-Day	810,811,812,826,831,838,839,840,841,842	Neigh	Pop Exp	38.013333	-87.577222	Evansville, IN-KY	No
181630021	Evansville - Buena Vista	Vanderburgh	Evansville	1110 W. Buena Vista Rd	SLAMS	07/08/09	Continuous Black Carbon	876	Neigh	Pop Exp	38.013333	-87.577222	Evansville, IN-KY	No

MONITORING METHOD:
810 - MET ONE SASS NYLON / GRAVIMETRIC
811 - MET ONE SASS TEFLON / ANALYSIS METHOD: ENERGY DISPERSIVE XRF
812 - MET ONE SASS NYLON / ANALYSIS METHOD: ION CHROMATOGRAPHY
826 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET / IMPROVE_A TOT
831 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET / EC1+EC2+EC3-(OP(TOR))
838 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET / IMPROVE TOT
839 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET/OC1+OC2+OC3+OC4+(OP(TOT))
840 - URG 3000 w. PALL QUARTZ FILTER AND CYCLONE INLET / EC1+EC2+EC3-(OP(TOT))
841 - URG 3000N w. PALL QUARTZ FILTER AND CYCLONE INLET / IMPROVE_A
842 - URG 3000N w. PALL QUARTZ FILTER AND CYCLONE INLET / IMPROVE_A TOR
866 - MAGEE AETHALOMETER AE21 / ANALYSIS METHOD: OPTICAL ABSORPTION
876 - MAGEE AETHALOMETER AE22 / ANALYSIS METHOD: OPTICAL ABSORPTION
894 - TELEDYNE API MODEL 633 AETHALOMETER / ANALYSIS METHOD: OPTICAL ABSORPTION

PAMS Ozone Precursors (VOCs)

Monitoring Requirements

Ozone precursor monitoring is required as part of the PAMS program. PAMS measurements are required at each NCore site located in a CBSA with a population of 1,000,000 or more, based on the latest available census figures. Monitoring must start by June 1, 2019. Indpls – Washington Park (180970078) is Indiana's NCore site. The specific requirements are addressed in 40 CFR Part 58 Appendix D §5. PAMS measurements include: (1) hourly averaged speciated VOCs; (2) carbonyl sampling; (3) hourly averaged O_3; (4) hourly averaged NO, true NO_2, and NO_y; (5) hourly averaged ambient temperature; (6) hourly vector-averaged wind direction; (7) hourly vector-averaged wind speed; (8) hourly averaged barometric pressure; (9) hourly averaged relative humidity; (10) hourly precipitation; (11) hourly averaged mixing-height; (12) hourly averaged solar radiation; and (13) hourly averaged ultraviolet radiation. All but one of these parameters are collected at Indiana's PAMS. Instrumentation to measure hourly average mixing height will be added.

This section deals with hourly averaged speciated VOCs. The other parameters are addressed in their own area. According to the plan, 59 speciated VOCs are to be collected at Indiana's PAMS.

Monitoring Methodology

Ozone precursor VOCs are collected continuously using a Perkin Elmer Clarus 500 GC, with dual Flame Ionization Detectors (FID)s and a TurboMatrix thermal desorber. In addition, canister samples are collected on a one-in-six day sampling schedule. These canisters are analyzed using U.S. EPA Method TO-15. The 59 PAMS target compounds are shown in Table 16.

Table 16 – PAMS Target Compounds

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

[a] Important SOAP (Secondary Organic Aerosols Precursor) Compounds
[b] HAP (Hazardous Air Pollutant) Compounds
[c] Carbonyl compounds
[d] Non-reactive compounds, not considered to be VOC for regulatory purposes
[e] Compounds measured and reported, not required for regulatory purposes

Monitoring Network

Indiana operates a PAMS monitoring site collecting ozone precursor VOCs at Indpls – Washington Park NCore for the Indianapolis-Carmel-Anderson CBSA. The normal PAMS monitoring season is June, July, and August, but Indiana began collecting data year-round in 2011 to observe values outside the season as well. Since Indiana's PAMS is already operational IDEM has elected to be an early adopter, meaning PAMS data will be collected and submitted one year prior to the mandatory start date of June 1, 2019. See Appendix C, page 96 for additional information on the PAMS network. The monitors are shown in Figure 13 and site details are in Table 17.

Network Modifications

As an early adopter, Indiana will begin officially monitoring PAMS and submitting data according to the requirements in 40 CFR 58, Subpart G, Appendix D starting June 1, 2018.

Figure 13 – Ozone Precursors Network

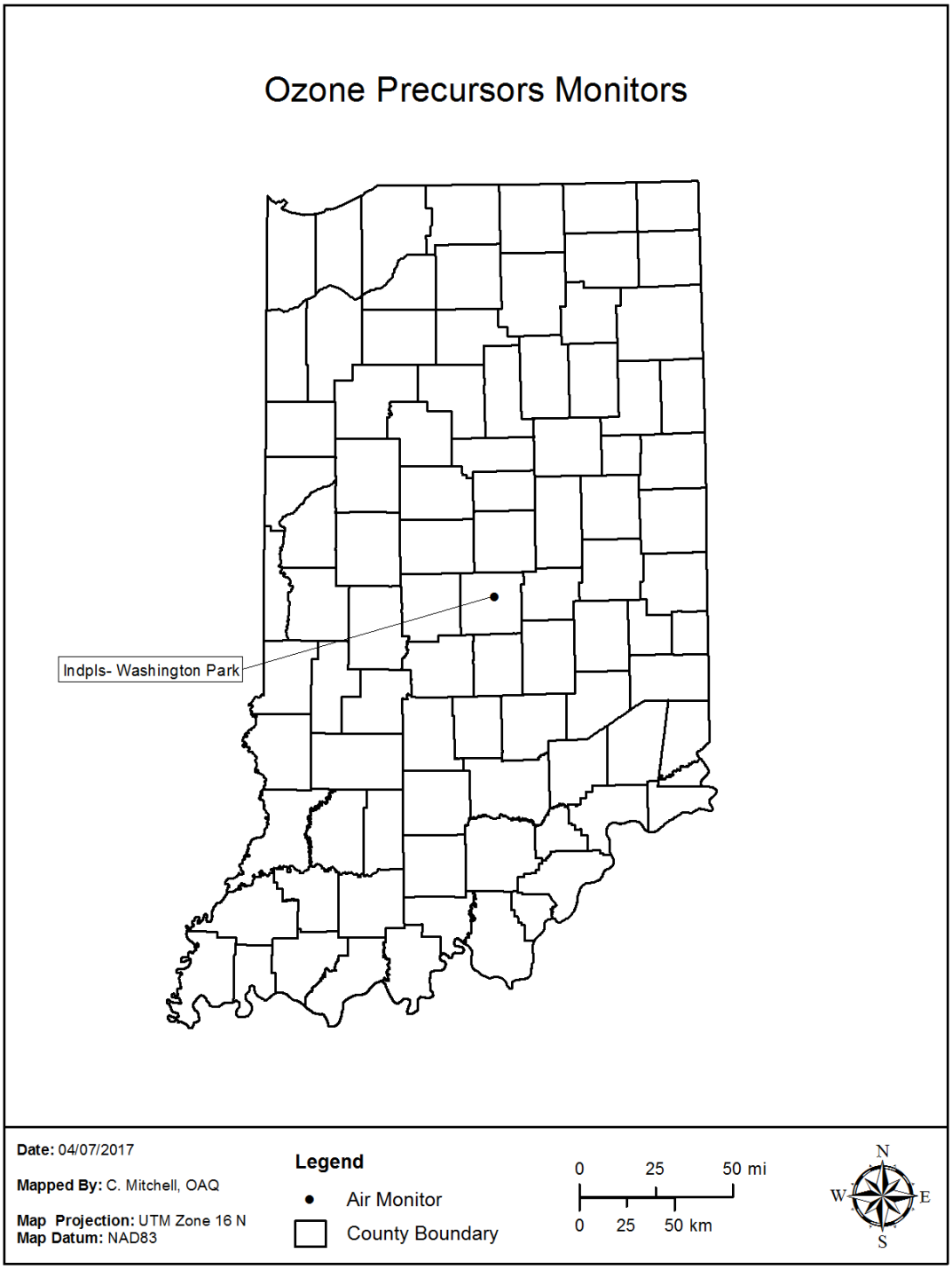


Table 17 – Ozone Precursor Monitoring Network

Ozone Precursors

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS	07/01/11	Continuous	128	Middle	Max Prec. Em. Impact	39.810833	-86.114444	Indianapolis-Carmel-Anderso	No

MONITORING METHOD: 128 - AUTO GC; SUBAMBIENT - DUAL FID
146 - AUTO GC; SUBAMBIENT - DUAL FID

Toxics (VOCs)

Monitoring Requirements

There are no requirements for toxics monitoring listed in 40 CFR Part 58.

Monitoring Methodology

Indiana uses a modification of the TO-15 method to collect toxics VOC data. TO-15 is part of U.S. EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air and consists of guidance for the sampling and analysis of volatile organic compounds in air. Ambient air is collected in a stainless steel canister in the field using either the Meriter MCS-1-R or the ATEC 2200 Air Toxic Samplers and analyzed using a GC/MS to determine the concentration of the compounds found in the sample obtained. Samples are collected for 24 hours on a one-in-six day sampling schedule. Table 18 lists the 62 different VOCs, and an aggregate currently being analyzed and reported.

Table 18 – VOCs

Propene	Freon-12	Chloromethane	Freon-114
Vinyl Chloride	1,3-Butadiene	Bromomethane	Chloroethane
Ethanol	Acrolein	Acetone	Freon-11
Isopropanol	Vinylidene Chloride	Dichloromethane	Carbon Disulfide
Freon-113	t-1,2-Dichloroethene	1,1-Dichloroethane	Methyl Tert-Butyl Ether
Vinyl acetate	Methyl Ethyl Ketone	c-1,2-Dichloroethene	Hexane
Ethyl Acetate	Chloroform	Tetrahydro-Furan	1,2-Dichloroethane
1,1,1-Trichloroethane	Benzene	Carbon Tetrachloride	Cyclohexane
1,2-Dichloropropane	Bromodichloromethane	Trichloroethene	1,4-dioxane
Heptane	c-1,3-Dichloropropene	Methyl Isobutyl Ketone	t-1,3-Dichloropropene
1,1,2-Trichloroethane	Toluene	Methyl Butyl Ketone	Dibromochloromethane
1,2-Dibromoethane	Tetrachloroethene	Chlorobenzene	Ethylbenzene
m+p-Xylenes	Bromoform	Styrene	1,1,2,2-Tetrachloroethane
o-Xylene	p-Ethyltoluene	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene
Benzyl Chloride	m-Dichlorobenzene	p-Dichlorobenzene	o-Dichlorobenzene
1,2,4-Trichlorobenzene	Hexachloro-1,3-butadiene	Total NMOC	

Monitoring Network

Indiana will operate 10 toxics sites. The current network, along with any changes planned in 2018, is listed in Table 19 and shown in Figure 14.

Network Modifications

No changes are planned for the Toxics Monitoring Network in 2018.

Figure 14 – Toxics Monitoring Network

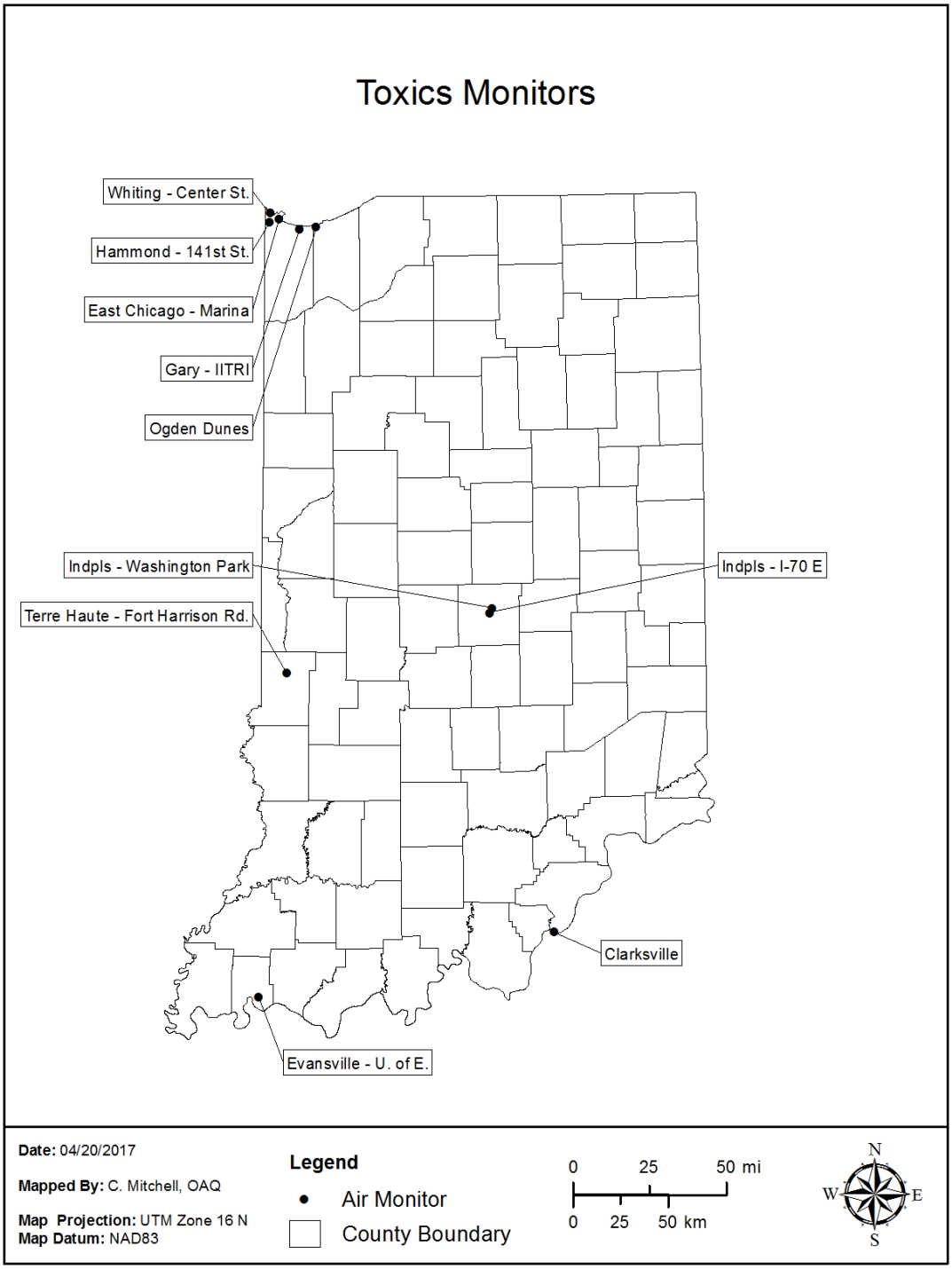


Table 19 – Toxics Monitoring Network

Toxics - VOC

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180190009	Clarksville	Clark	Clarksville	Falls of the Ohio SP, 201 W. Riverside Dr.	OTHER	03/07/08	6-Day	126,150	Neigh	Pop Exp	38.276557	-85.763791	Louisville/Jefferson County, KY-IN	No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	OTHER	07/06/95	6-Day	126,150	Middle	Pop Exp	41.606667	-87.304722	Chicago-Naperville-Elgin, IL-IN-WI	No
180890034	East Chicago-Marina	Lake	East Chicago	East Chicago Marina, 3301 Aldis St.	OTHER	10/30/12	6-Day	126,150	Neigh	Pop Exp	41.653501	-87.435561	Chicago-Naperville-Elgin, IL-IN-WI	No
180890035	Whiting - Center St.	Lake	Whiting	1500 Center St. (H.S. Admin. Bldg.)	OTHER	12/26/15	6-Day	126,150	Neigh	Pop Exp	41.681393	-87.490233	Chicago-Naperville-Elgin, IL-IN-WI	No
180892008	Hammond - 141st St.	Lake	Hammond	1300 E. 141st St.	OTHER	02/01/89	6-Day	126,150	Neigh	Pop Exp	41.639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St.	OTHER	04/18/99	6-Day	126,150	Neigh	Pop Exp	39.810833	-86.114444	Indianapolis-Carmel-Anderso	No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	SLAMS (NEAR ROAD	01/01/16	6-Day	126,150	Middle	Source Oriented	39.787933	-86.130880	Indianapolis-Carmel-Anderso	No
181270024	Ogden Dunes	Porter	Ogden Dunes	Water Treatment Plant, 84 Diana Rd.	OTHER	08/05/98	6-Day	126,150	Neigh	Pop Exp	41.617500	-87.199167	Chicago-Naperville-Elgin, IL-IN-WI	No
181630016	Evansville - U of E	Vanderburgh	Evansville	Carson Center, Walnut St.	OTHER	06/23/99	6-Day	126,150	Neigh	Pop Exp	37.974444	-87.532222	Evansville, IN-KY	No
181670025	Terre Haute - Fort Harrison Rd.	Vigo	Terre Haute	INDOT Maintenance, 2400 Fort Harrison Rd.	OTHER	10/13/13	6-Day	126,150	Neigh	Pop Exp	39.507688	-87.374440	Terre Haute	No

MONITORING METHOD: 126 - CRYOGENIC PRECONCENTRATION GC/FID DETECTION
150 - Cryogenic Preconcentration GC/MS

Carbonyls

Monitoring Requirements

Carbonyl monitoring is required as one of the components of the PAMS monitoring program. The overall requirements are addressed in 40 CFR Part 58 Appendix D.

Monitoring Methodology

Carbonyl data are collected using Method TO-11A of the U.S. EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Compendium of Method. Currently Indiana uses the ATEC 2200 2C for one-in-six day sampling at the Indpls – Washington Park (180970078) site. Samples are collected by drawing a known volume of air through a cartridge filled with silica gel coated with activated DNPH. These samples are analyzed using HPLC with a UV absorption detector.

Monitoring Network

Indiana currently operates one carbonyl monitoring site. Sampling at the Indpls – Washington Park site is conducted as part of Indiana's PAMS and toxics networks. The details of the network are provided in Table 20 and locations are shown in Figure 15.

Network Modifications

On June 1, 2018 Indiana will increase the monitoring frequency to three 8-hour samples on a one-in-three day basis as part of the early adoption of the PAMS program.

Figure 15 – Carbonyl Monitoring Network

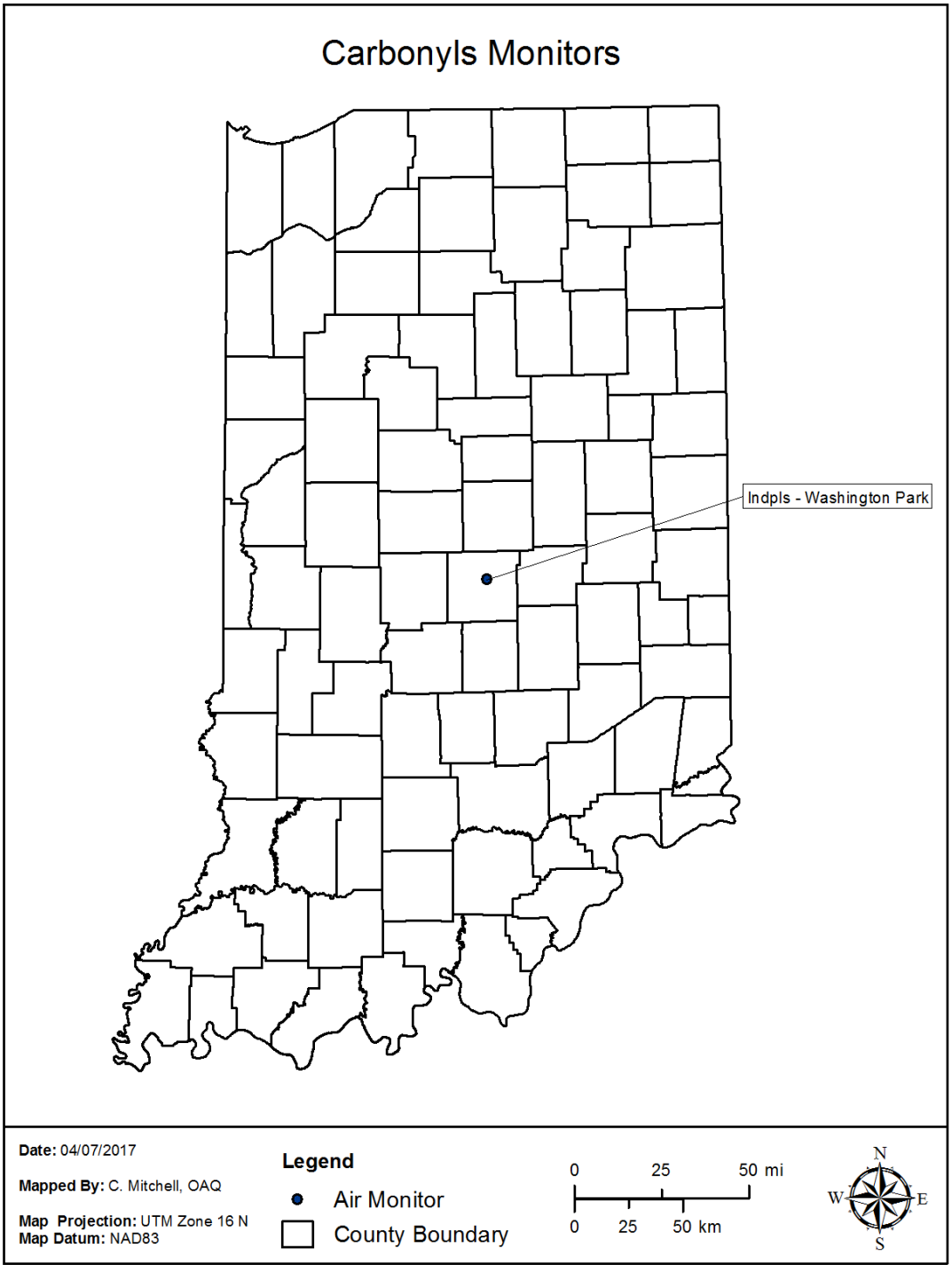


Table 20 – Carbonyl Monitoring Network

Carbonyls

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS	04/18/99	6-Day 3-Day Jun-Aug	202	Neigh	Max Prec. Em. Impact	39.810833	-86.114444	Indianapolis-Carmel-Anders	No

MONITORING METHOD: 202 - HPLC (TO-11A) DNPH-COATED CARTRIDGES

Metals

Monitoring Requirements

There are no requirements for metals monitoring listed in 40 CFR Part 58.

Monitoring Methodology

Metals data are collected using a TSP sampler. The sample is collected on high purity glass microfiber filters for a 24-hour period according to an every sixth day sampling schedule. Filters are analyzed using the flameless atomic absorption method.

Monitoring Network

Kokomo – KOG (Kokomo Opalescent Glass) (180670005) will be discontinued due to expiration of the site lease mid-2017 with no significant concentrations found. The U.S. EPA launched a nationwide review of small art glass-making factories after the discovery of heavy metals in air samples taken near two makers of colored glass in the city of Portland, Oregon. Metals monitoring was conducted in Kokomo for one year.

There are four sites that monitor TSP metals in Indiana. Manganese is the only metal (other than Pb) monitored in Lake and Porter counties. Due to concern over possible elevated manganese values reported in the School Air Toxics monitoring program in 2009, it was decided to analyze all the Pb samples collected in Lake and Porter Counties for manganese. These sites began reporting the additional metals data on January 2, 2010. These sites are detailed in Table 21 and shown in Figure 16.

Network Modifications

Metals monitoring at Hammond – 141st St. (180892008) will be discontinued at the end of 2017 due to Pb TSP sampling ending. There will not be a filter to analyze for metals. In the previous 5 years (2012 – 2016) the highest manganese levels at the site are as follows; highest annual arithmetic mean 0.078 $\mu g/m^3$ in 2014, highest 24-hour value 0.88 $\mu g/m^3$ in 2016.

Figure 16 – Metals Monitoring Network

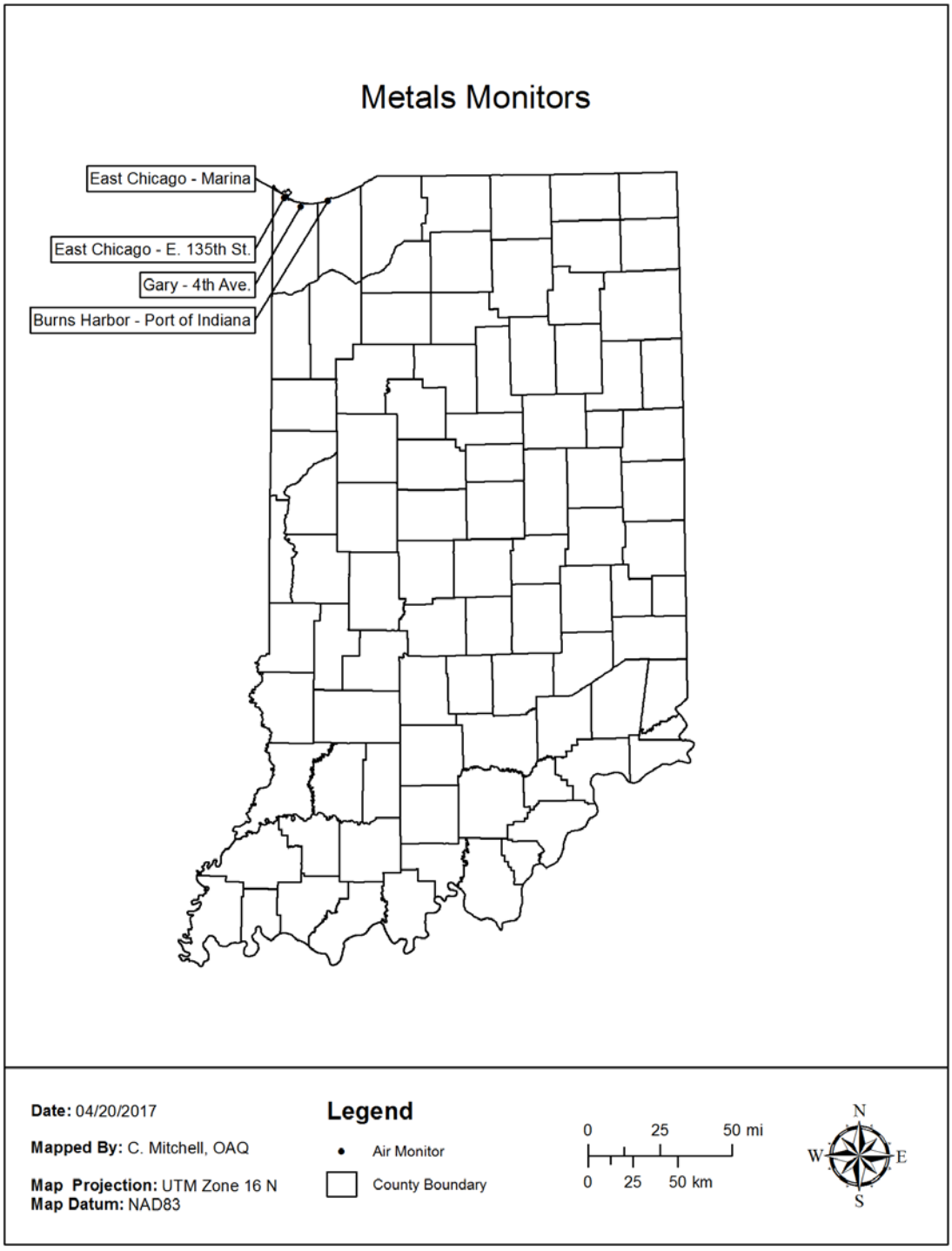


Table 21 – Metals Monitoring Network

Metals

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Start Date	Operating Schedule	Monitoring Method	Scale	Monitoring Objective	Latitude	Longitude	CBSA	Site Change Proposed?
180670005	Kokomo - KOG	Howard	Kokomo	Kokomo Opalscent Glass, S. Market St.	OTHER	06/10/16	1-Day		Middle	Source Oriented	40.471414	-86.128741	Kokomo	Discontinue
180890032	Gary - 4th. Ave *	Lake	Gary	Gary SouthShore RailCats, One Stadium Plaza	OTHER	01/02/10	6-Day	107	Middle	Source Oriented	41.603582	-87.332658	Chicago-Naperville-Elgin, IL-IN-WI	No
180890033	East Chicago - E. 135th St. *	Lake	East Chicago	Abraham Lincoln Elem. Sch., E. 135th St.	OTHER	01/02/10	6-Day	107	Middle	Source Oriented	41.649064	-87.447256	Chicago-Naperville-Elgin, IL-IN-WI	No
180890034	East Chicago-Marina*	Lake	East Chicago	East Chicago Marina, 3301 Aldis St.	OTHER	10/30/12	6-Day	107	Middle	Source Oriented	41.653501	-87.435561	Chicago-Naperville-Elgin, IL-IN-WI	No
180892008	Hammond - 141st St. *	Lake	Hammond	1300 E. 141st St.	OTHER	01/02/10	6-Day	107	Middle	Pop Exp	41.639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	Discontinue
180892008	Hammond - 141st St. *	Lake	Hammond	1300 E. 141st Street	OTHER	01/02/10	6-Day	107	Middle	Quality Assurance	41.639444	-87.493611	Chicago-Naperville-Elgin, IL-IN-WI	Discontinue
181270027	Burns Harbor-Port of Indiana*	Porter		E. Boundary Rd	OTHER	08/18/11	6-Day	107	Middle	Source Oriented	41.635161	-87.150376	Chicago-Naperville-Elgin, IL-IN-WI	No

Metals Monitored

Manganese
Nickel
Arsenic
Beryllium
Cadmium
Chromium

* Manganese Only

MONITORING METHOD: 107 - HI-VOL SAMPLER / ANALYSIS METHOD: FLAMELESS ATOMIC ABSORPTION
___ - LO-VOL TSP SAMPLER / ANALYSIS METHOD: XRF

Meteorological Monitoring

Monitoring Requirements

Meteorological monitoring is generally not required for SLAMS, however meteorological monitoring data support the suitability of the site along with other data sets. Many factors determine the amount and types of meteorological data that are collected in Indiana. Some of the factors include the intended use of the data and the availability of representative meteorological data that is already being collected by the National Weather Service in any given area of interest. Meteorological monitoring is required at two types of sites: NCore and PAMS. 40 CFR Part 58 Appendix D §3(b) specifies that at a minimum wind speed, wind direction, relative humidity, and ambient temperature be measured at NCore sites. Meteorology measurements are required at PAMS according to 40 CFR Appendix D §5. The required meteorological measurements are as follows; hourly averaged ambient temperature, hourly vector-averaged wind direction, hourly vector-averaged wind speed, hourly average atmospheric pressure, hourly averaged relative humidity, hourly precipitation, hourly averaged mixing height, hourly averaged solar radiation and hourly averaged ultraviolet radiation. Hourly average mixing height will be added at Indpls – Washington Park (180970078) PAMS by June 1, 2018.

The near-road NO_2 monitoring sites do not require meteorological monitoring according to 40 CFR Part 58. However, meteorological monitoring is listed as a recommended Primary Priority in the Near-Road NO_2 Monitoring TAD. U.S. EPA suggests (at a minimum) to monitor wind speed, wind direction, temperature and relative humidity. If possible, other measurements such as precipitation, solar radiation and barometric pressure (among others) should be considered as well.

Monitoring Methodology

Monitoring sites in Indiana use a number of different sensors to record meteorological conditions. For wind data collection there are four sites with RM Young 3D Ultrasonic wind units. These sites are Gary – IITRI (180890022), Mechanicsburg (180650003), Indpls – I-70 E (180970087) and St. Philips (181290003). The remainder of sites collect wind data with RM Young propeller based wind units.

One instrument collects both Outdoor Temperature and Relative Humidity data at each site where these parameters are collected. The RM Young model 41372VF and 41382VF are both currently in use. They both use platinum RTD for temperature and a Rotronic Hygromer for humidity detection.

There are several different types of Barometric Pressure sensors deployed throughout the network. The manufacturers are Novalynx, Met One and RM Young but the technology used in each is a similar electronic barometer with a lower level of 500 millibars and an upper level of 1100 millibars.

Solar Radiation data are collected at three sites in Indiana with one type of precision spectral pyranometer, model PSP, manufactured by The Eppley Laboratory, Inc. Ultraviolet Radiation data are also collected at the same three sites with one type of Total Ultraviolet Radiometer, model TUVR, also manufactured by The Eppley Laboratory, Inc.

Precipitation data are collected at two sites in Indiana with one type of tipping bucket rain gauge, model 52202-E, manufactured by RM Young.

Monitoring Network

As of March 1, 2017 barometric pressure and dew point temperature monitoring were added to Fort Wayne – Beacon St. (180030004) and South Bend – Shields Dr. (181410015). The

additional monitoring was added to provide coverage for these areas of the state and have more consistency throughout the meteorological monitoring network.

Figure 17 shows meteorological data are to be collected at 17 sites across Indiana in 2018. Sites are established to provide coverage in all areas of the state where pollutant monitoring is conducted. Table 22 details the meteorological sites and the parameters collected.

Network Modifications

A ceilometer will be added at Indpls – Washington Park PAMS by June 1, 2018.

Figure 17 – Meteorological Monitoring Network

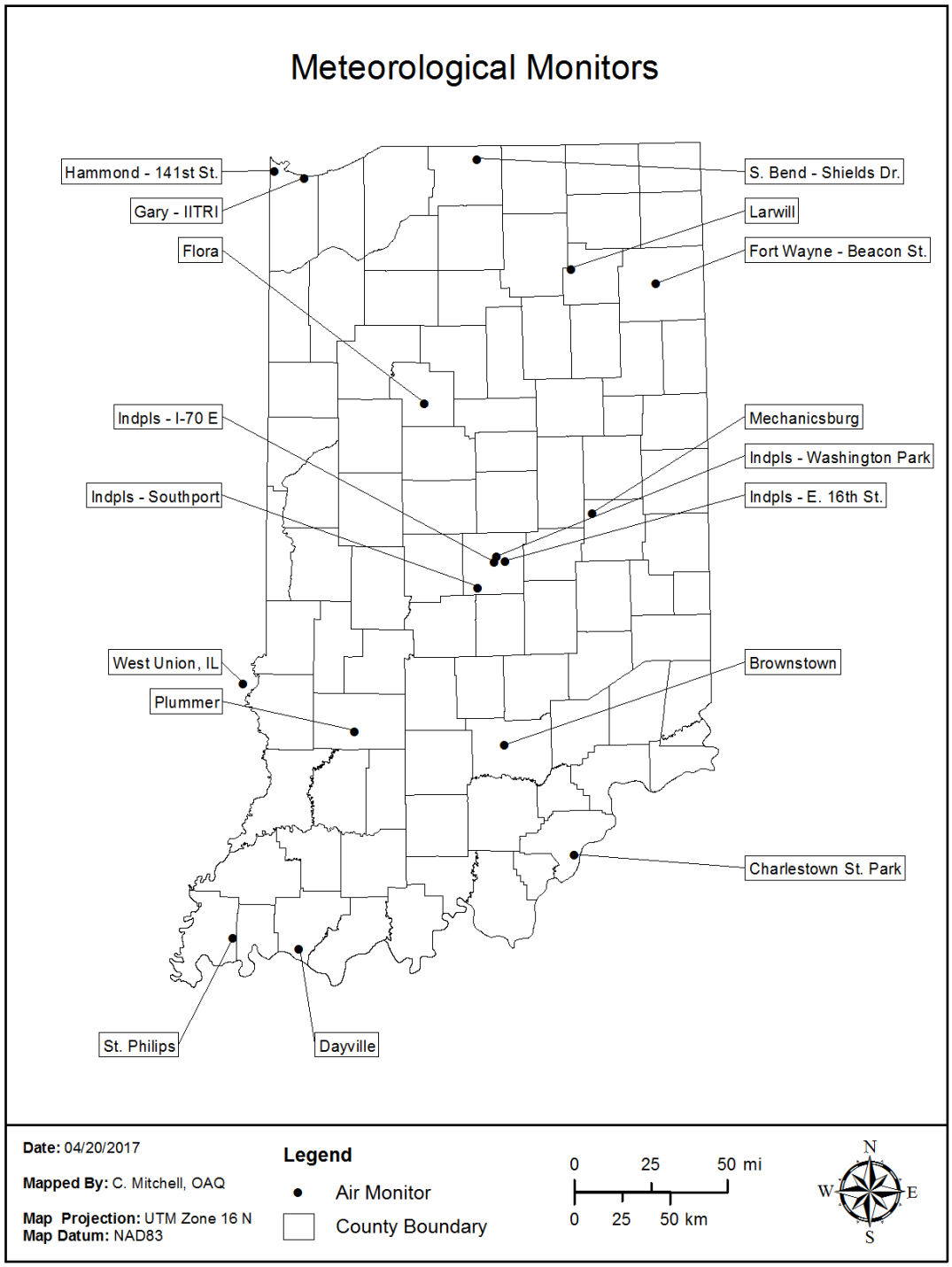


Table 22 – Meteorological Monitoring Network

Meteorological Parameters by Site

RO: 0520 OPERATING AGENCY: Indiana Department of Environmental Management

Site ID	Site Name	County	City	Address	Monitor Type (Network)	Latitude	Longitude	61103/ 61104 WS / WD	62201 RH	64101 Baro Press	62101 Outside Temp	63302 UV Rad	63301 Solar Rad	61112 Vertical WD	65102 Precip	Site Change Proposed?
170230001	West Union	Clark Co., IL	West Union	416 S. St. Hwy 1	OTHER	39.210857	-87.668297	■	■	■	■					No
180030004	Ft Wayne - Beacon St.	Allen	Fort Wayne	2022 North Beacon	OTHER	41.094965	-85.101816	■	■	■	■					No
180150002	Flora	Carroll		Flora Airport, 481 S. 150 W	OTHER	40.540455	-86.553035	■	■		■					No
180190008	Charlestown State Park	Clark		Charlestown State Park, 12500 Hwy 62, Charlestown	OTHER	38.393823	-85.664118	■	■	■	■					No
180550001	Plummer	Greene		2500 S. 275 W	OTHER	38.985556	-86.990000	■	■		■					No
180650003	Mechanicsburg	Henry		Shenandoah HS, 7354 W. Hwy. 36	OTHER	40.009544	-85.523470	■	■	■	■			■		No
180710001	Brownstown	Jackson		225 W & 300 N	OTHER	38.920835	-86.080523	■	■		■					No
180890022	Gary - IITRI	Lake	Gary	IITRI Bunker, 201 Mississippi St.	SLAMS (UNOFFICAL PAMS)	41.606667	-87.304722	■	■	■	■	■	■	■	■	No
180892008	Hammond - 141st St.	Lake	Hammond	1300 E. 141st St.	OTHER	41.639444	-87.493611	■	■		■					No
180970073	Indpls - E. 16th St.	Marion	Indianapolis	6125 E. 16th St.	OTHER	39.789167	-86.060833	■								No
180970078	Indpls - Washington Park	Marion	Indianapolis	Washington Park, 3120 E. 30th St	SLAMS (NCORE)	39.810833	-86.114444	■	■	■	■	■	■		■	No
180970086	Indpls - Southport	Marion	Indianapolis	Southport Advanced Wastewater Treatment 3800 W. Southport Rd	OTHER	39.664498	-86.234898	■								No
180970087	Indpls - I-70 E	Marion	Indianapolis	1650 Ludlow Ave.	SLAMS (NEAR ROAD	39.787933	-86.130880	■	■		■					No
181290003	St Philips	Posey		2027 S. St. Phillips Rd., Evansville	OTHER	38.005278	-87.718056	■	■	■	■	■	■			No
181410015	South Bend - Shields Dr.	St Joseph	South Bend	2335 Shields Dr.	OTHER	41.696667	-86.214722	■	■	■	■			■		No
181730011	Dayville	Warrick		3488 Eble Rd., Newburgh	OTHER	37.954444	-87.321667	■	■	■	■					No
181830003	Larwill	Whitley		Whitko Middle School, 710 N. State Rd. 5	OTHER	41.169722	-85.629444	■	■		■					No

NCore

Monitoring Requirements

40 CFR Part 58 Appendix D §3 requires each state to operate at least one NCore site and lists the minimum parameters which must be measured at that site. Currently the required parameters are continuous and intermittent $PM_{2.5}$, $PM_{2.5}$ speciation, $PM_{10-2.5}$ particle mass, CO, O_3, SO_2, NO/NO_y, wind speed, wind direction, relative humidity, and ambient temperature.

Monitoring Network

As shown in Figure 18, Indiana's NCore site is Indpls – Washington Park (180970078). The details for all the NCore parameters are listed in Table 23. Except for $PM_{10-2.5}$, parameters are also listed in the individual parameter sections.

Other parameters have also been collected at the Indpls – Washington Park site. These are listed in Table 24 as well as in the individual parameter sections.

Network Modifications

No changes are planned for the NCore Monitoring Network in 2018.

Figure 18 – NCore Monitoring Network

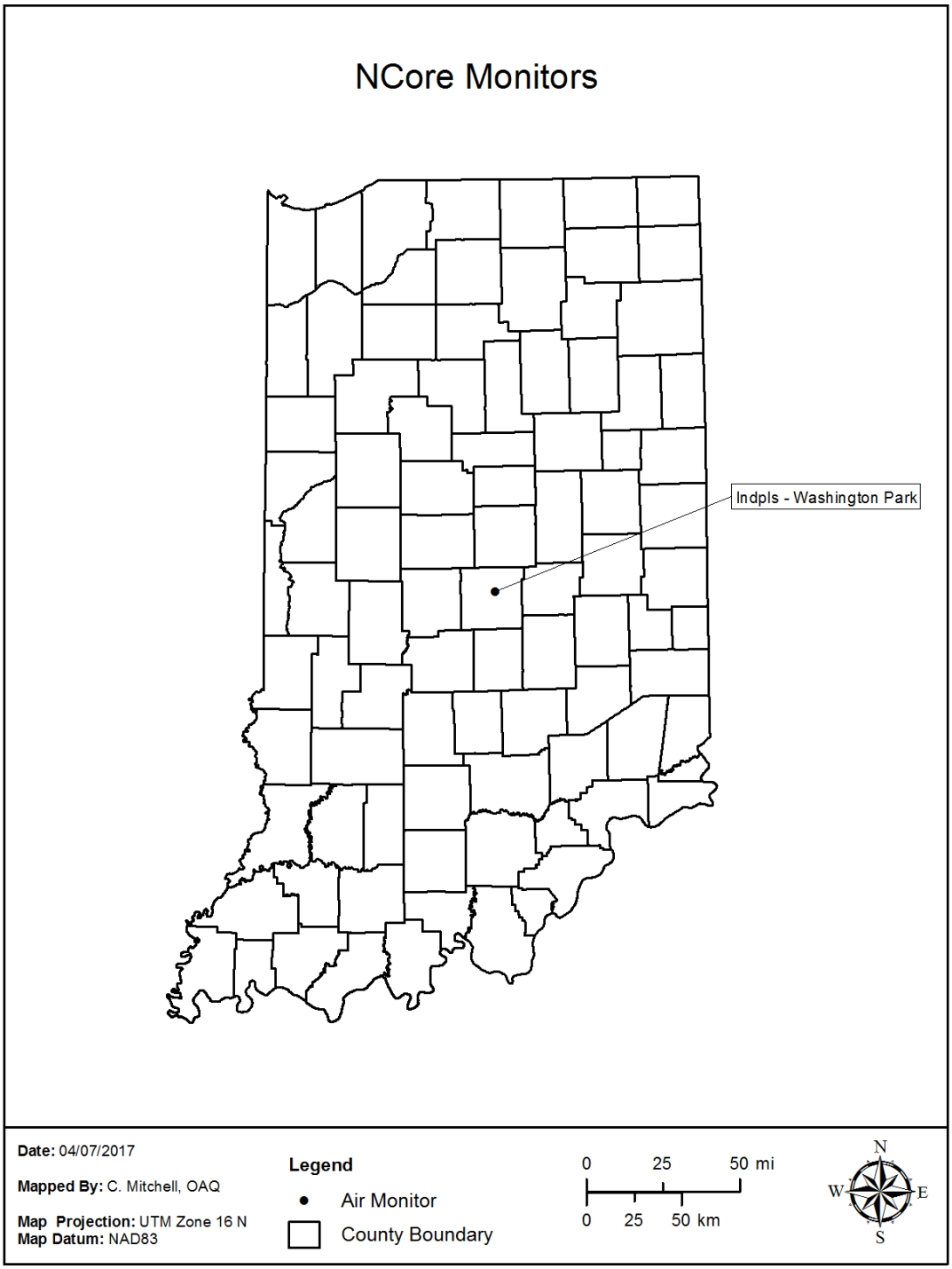


Table 23 – NCore Required Parameters

Parameter	Monitor Type	Start Date	Sampler or Monitor	Method Code	Analysis Method	Sample Frequency
CO – trace level	SLAMS	1/1/2010	Teledyne API 300EU	593	Automated reference method utilizing trace level non-dispersive infrared analysis.	Continuous
NO	SLAMS	3/10/2010	Teledyne API 200EU	699	Automated reference method utilizing chemiluminescence analysis.	Continuous
NO_y	SLAMS	3/10/2010	Teledyne API 200EU	699	Automated reference method utilizing chemiluminescence analysis.	Continuous
O_3	SLAMS	4/1/2009	Thermo Scientific 49i	047	Automated equivalent method utilizing uv photometry analysis.	Continuous
SO_2 – trace level	SLAMS	1/1/2010	Thermo Scientific 43i TLE	560	Automated equivalent method utilizing Trace Level UV Fluorescence Analysis	Continuous
Intermittent $PM_{2.5}$	SLAMS	3/7/1999	Thermo Scientific 2025	145	Manual reference method utilizing gravimetric analysis.	1/3 day
Continuous $PM_{2.5}$	SLAMS	1/1/2004	Met One Instruments BAM-1020 System	170	Automated equivalent method utilizing beta ray transmission	Continuous
Intermittent $PM_{10-2.5}$	SLAMS	7/1/2010	Thermo Scientific Partisol-Plus Model 2025 Sequential sampler pair	176	Manual reference method utilizing gravimetric analysis.	1/3 day
Continuous $PM_{10-2.5}$	SLAMS	7/22/2011	Met One Instruments BAM-1020 System	185	Automated equivalent method utilizing beta ray transmission	Continuous
$PM_{2.5}$ Speciation	SLAMS	12/13/2000	Met One SASS & URG 3000N	811 / 812 / 833	Multi-species manual collection method utilizing thermal optical, ion chromatography, gravimetric, and x-ray fluorescence analyses.	1/3 day
WS/WD	SLAMS	10/11/2009	RM Young 05305-AQ	020	Air quality measurements approved instrumentation for wind speed and wind direction	Continuous
OT/RH	SLAMS	10/11/2009	RM Young 41372VF	040 / 020	Air quality measurements approved instrumentation for humidity and temperature	Continuous

Table 24 – Additional Parameters Collected at NCore Site

Parameter	Designation	Start Date	Sampler or Monitor	Method Code	Analysis Method	Sample Frequency
Intermittent PM_{10}	SLAMS	7/1/2010	Thermo Scientific 2025	127	Manual reference method utilizing gravimetric analysis.	1/3 day
Continuous PM_{10}	SLAMS	8/2/2011	Met One Instruments BAM-1020 System	122	Automated equivalent method utilizing beta ray transmission	Continuous
NO_2	SLAMS	1/1/2013	Teledyne API T500U	212	Direct-read Cavity Attenuated Phase Shift (CAPS)	Continuous
Continuous Black Carbon	SLAMS	10/1/2003	Magee AE21	866	Optical Absorption	Continuous
Toxics	OTHER	4/18/1999	Meriter MCS-1-R	126 / 150	SS 6l canister with cryogenic GC/MS	1/6 day
Carboynls	SLAMS	4/18/1999	ATEC 2200 2C	102	Silica DNPH cartridge w/KI O3 scrubber with HPLC (TO-11A)	1/6 day 1/3 day Jun-Aug
Precipitation	OTHER	10/11/2009	RM Young 52202E	014	Air quality measurements approved instrumentation for rainfall	Continuous
BP	OTHER	10/11/2009	Met One 594	011	Air quality measurements approved instrumentation for barometric pressure	Continuous
Solar Radiation	OTHER	1/1/2013	Eppley Precision Spectral Pyranometer	011	First Class Radiometer	Continuous
Ultraviolet Radiation	OTHER	1/1/2013	Eppley Total Ultraviolet Radiometer	011	Hermetically sealed selenium barrier-layer cell	Continuous
PAMS	SLAMS	7/1/2011	Perkin Elmer Clarus 500 Gas Chromatograph	128	Cryogenic Preconcentration GC/FID Detection	Continuous
Mixing Height	SLAMS	6/1/2018	Vaisala CL51 Ceilometer	128	Optical scattering pulsed diode laser LIDAR (Light Detection And Ranging)	Continuous

Near-Road

Monitoring Requirements

40 CFR Part 58 Appendix D § 4.3.2 promulgated new NO_2 monitoring requirements. These included the requirement for establishing near-road NO_2 monitoring stations to be operational by January 1, 2014. The requirements for the near-road site as they apply to Indiana are as follows:

(a) Within the NO_2 network, there must be one microscale near-road NO_2 monitoring station in each CBSA with a population of 500,000 or more persons to monitor a location of expected maximum hourly concentrations sited near a major road with high AADT counts as specified in paragraph 4.3.2(a)(1) of this appendix. CBSA populations shall be based on the latest available census figures.

(1) The near-road NO_2 monitoring stations shall be selected by ranking all road segments within a CBSA by AADT and then identifying a location or locations adjacent to those highest ranked road segments, considering fleet mix, roadway design, congestion patterns, terrain, and meteorology, where maximum hourly NO_2 concentrations are expected to occur and siting criteria can be met in accordance with Appendix E of this part. Where a State or local air monitoring agency identifies multiple acceptable candidate sites where maximum hourly NO_2 concentrations are expected to occur, the monitoring agency shall consider the potential for population exposure in the criteria utilized to select the final site location.

From the most recent census data from 2010 for Indiana's CBSAs there are four CBSAs which have more than 1,000,000 persons:

CBSA	Population
Chicago-Naperville-Elgin, IL-IN-WI	9,461,405
Cincinnati, OH-KY-IN	2,114,580
Indianapolis-Carmel-Anderson, IN	1,887,862
Louisville-Jefferson County, KY-IN	1,235,708

Indiana has agreements in place with Ohio, Kentucky, and Illinois with regard to how the monitoring requirements are shared in these multi-state CBSAs. The near-road monitoring in these areas will be the responsibility of the adjoining states. Indiana will be responsible for and deploy the near-road site in the Indianapolis-Carmel-Anderson CBSA.

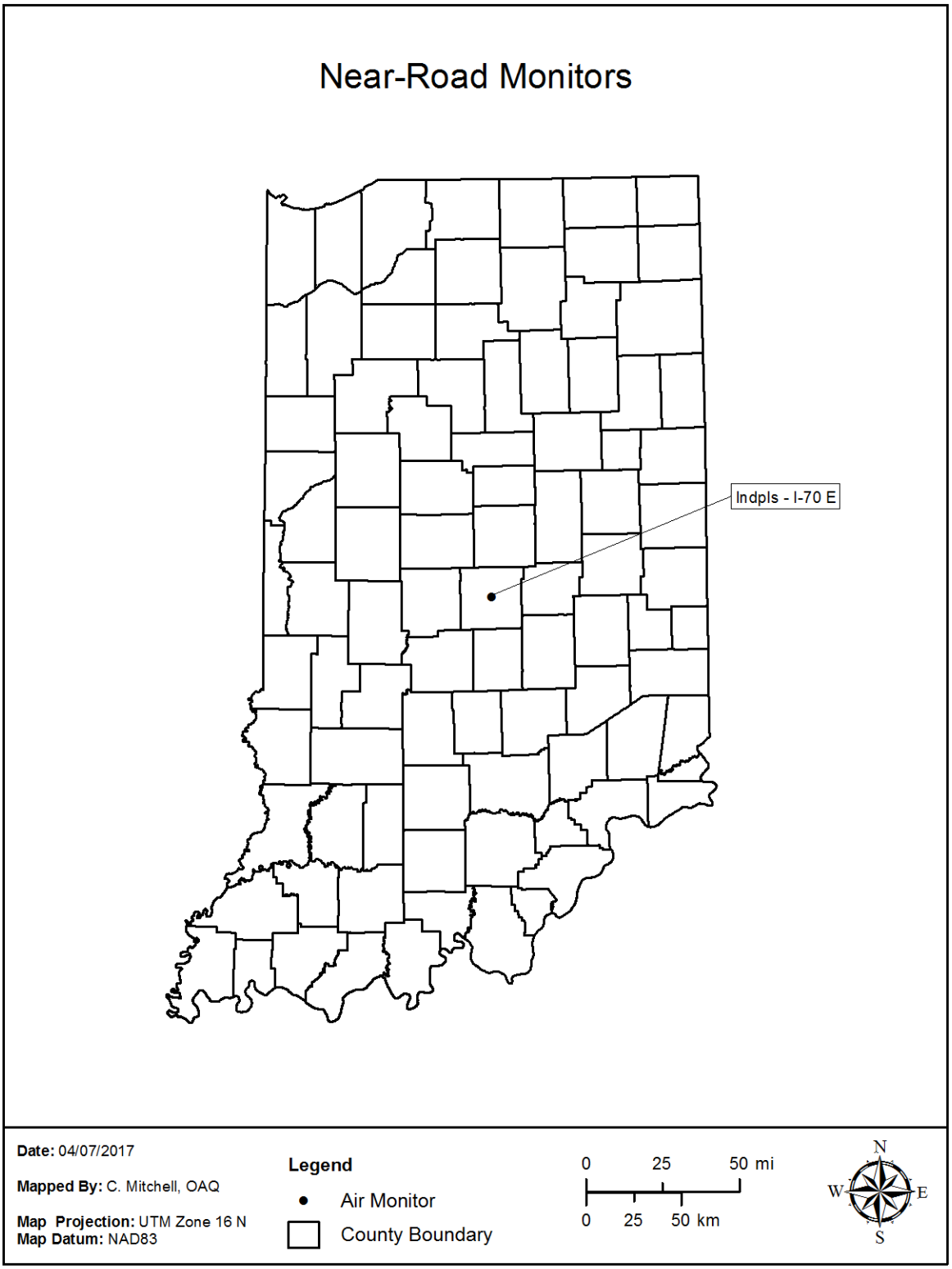
Monitoring Network

IDEM worked with the INDOT to obtain a location for this site along Interstate 70, between the northeast interchange of I-70 and I-65 and the Keystone Ave. exit. As shown in Figure 19, Indiana's near-road site is Indpls – I-70 E. (180970087). Monitors at the site include NO_2, CO, O_3, wind speed, wind direction, ambient temperature, relative humidity, black carbon, air toxics, and $PM_{2.5}$. These parameters are also listed in the individual parameter sections.

Network Modifications

No changes are planned for the near-road monitoring network in 2018.

Figure 19 – Near-Road Monitoring Network



Appendix A - Comment Submittal Information

The proposed 2018 Ambient Air Monitoring Network Plan is posted on the IDEM website at http://www.in.gov/idem/airquality/2389.htm for review and comment for thirty (30) days.

Comments should be emailed to:

Steve Lengerich (slengeri@idem.IN.gov)

or mailed to:

Steve Lengerich
IDEM/OAQ/AMB
100 North Senate Avenue
Shadeland
Indianapolis, IN 46204-2251

or faxed to:

317-308-3239

Network Comments

Response to Comments
Comment #1

Received from Matt Mosier, Office of Sustainability – City of Indianapolis
E-mail submission on 6/5/2017.

Mr. Mosier submitted comments addressing the following areas:

1. Ozone

   Mr. Mosier opposes the discontinuation of the Indpls – E. 16th St. site for ozone. He states that in the past the E. 16th St. site was above the new lower ozone standard. He feels that keeping this site provides the region more accurate representation of ozone levels. It serves to alert the public of the extent and degree of elevated ozone levels.

2. $PM_{2.5}$

   The Indpls – School 21 $PM_{2.5}$ monitoring site was suspended on September 1, 2016 due to major building renovation at the site. Mr. Mosier asked if there was an estimated date when the site would be operational.

3. Lead

   Even though the lead monitoring site at Indpls – Rockville Rd. is not required, the data have been well below the standard, and the emissions below the 0.5 TPY threshold, Mr. Mosier would like to see the monitoring continue to address future concerns or as a service to the public.

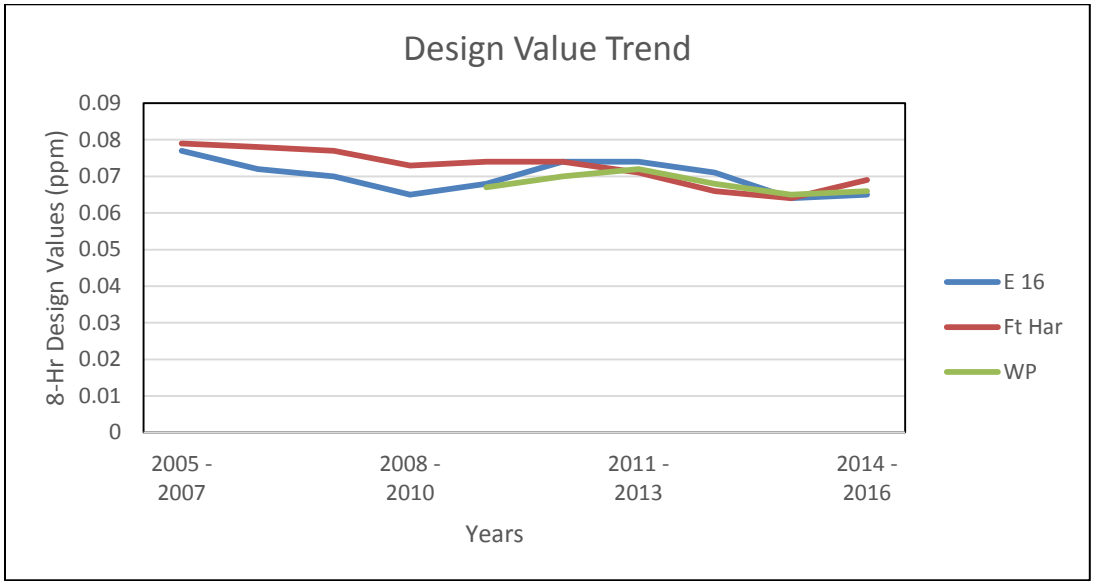
Response

1. Ozone

   The design values for the Indpls – E. 16th St., Indpls – Ft. Harrison, and Indpls – Washington Park monitoring sites have been trending downward over the past ten years

as the air quality has continued to improve (see Table). All three sites are currently meeting the new NAAQS of 0.070 ppm. When wind patterns across the Indianapolis area are in a general southwest to northeast direction, Ft. Harrison is in line to be the highest site within Marion County, due to its distance and direction from the Central Business District. Indpls – E. 16th St. would be the next highest with Indpls – Washington Park being third highest of the three sites. When comparing the daily 8-hour values from Ft. Harrison and E. 16th St. since 2007, they compare very well with a correlation coefficient of 0.910. Discontinuing E. 16th St. would not change the overall data values collected. As Ft. Harrison is generally the highest site in the immediate Indianapolis Urban Area, the AQI calculated using data from this site would be higher and be more adequately appropriate to inform and protect the public than other sites in Marion County. All other sites in the surrounding counties would be collecting data as well, and when they are the higher site, their data would dictate the overall AQI for Central Indiana.

IDEM will discontinue ozone monitoring at Indpls – E. 16th St. effective after the 2017 monitoring season, pending approval of the plan by U.S. EPA.



2. $PM_{2.5}$

After delays in construction startup of the project by the contractor, providing the exact location for the new site, and vendor issues with work at the site, monitoring began at the new location on May 19, 2017.

3. Lead

The current design value for Indpls – Rockville Rd. is 0.03 µg/m^3 with the majority of the 3-month averages being either 0.01 µg/m^3 or 0.02 µg/m^3 over the past five years, well below the NAAQS of 0.15 µg/m^3. The emissions reported for Quemetco since 2010 have been below 0.5 tons per year, the value used as the trigger value for modeling of the facility to determine if monitoring is necessary. With the data collected and the emissions being below the values required to continue monitoring, IDEM believes the monitoring can be discontinued. In addition, with the closing of Rexnord Corp., the property on which the monitor is located, continued access and power to the site are not guaranteed. IDEM will discontinue lead monitoring at Indpls – Rockville Rd. at the end of 2017, pending approval by USEPA.

The lead emissions from all facilities across the state are reviewed annually during the network review process to determine if sites are needed. If the emissions were to

increase or if modeling were to show that a site is necessary, IDEM would pursue a new site at that time.

Comment #2
Received from Dr. Tony GiaQuinta, MD Fellow of the American Academy of Pediatrics (FAAP), on behalf of the Infant Mortality Committee.
E-mail submission on 6/8/2017.

> Dr. GiaQuinta states that in light of the high infant mortality rate in Daviess County, IN, and the power plants located in surrounding counties, the monitoring in the area is inadequate. He states that increased monitoring in Daviess County is needed to establish a possible environmental link to its staggering infant mortality rate.

Response
IDEM is considering the establishment of a monitoring site in Daviess County. There is additional data needed to help determine the appropriate location of a site before a commitment to this project can be made. At this point the site will not be able to be addressed in the 2018 Monitoring Plan submittal.

Appendix B

Addendum to the Belmont Lead Monitor Waiver Request

Overview

CWA Authority, Inc. – Belmont Advanced Wastewater Treatment Plant (Belmont), located at 2700 South Belmont Avenue, Indianapolis, Indiana has been evaluated to determine whether lead (Pb) monitoring would be required. Historically, Belmont Pb emissions were above 0.5 tons per year and air dispersion modeling was conducted to determine Pb impacts in the area. At the time of the most recent modeling evaluation to compare Belmont's maximum modeled Pb impacts to the 2008 annual Pb National Ambient Air Quality Standard (NAAQS) of 0.15 µg/m^3 (micrograms per cubic meter), based on a 3-month average; current emission controls had just been installed on the four multiple hearth wastewater treatment sludge incinerators and the reported emissions did not reflect the reductions due to the controls. Therefore, modeled Pb emissions were grossly overestimated in comparison to Belmont's actual Pb emissions. The Indiana Department of Environmental Management's (IDEM's) modeling evaluation conducted on April of 2016, based on Belmont's 2014 Pb emissions, determined maximum modeled impacts in the area surrounding the facility approached the Pb NAAQS. As such, IDEM recommended a Pb ambient air monitor be installed near Belmont to characterize air quality in the area.

However, 40 Code of Federal Regulations (CFR) 60 Subpart LLLL (Standards of Performance for New Sewage Sludge Incineration Units) became effective for modifications made after September 2011. Belmont was considered an affected source under this standard and revised their Part 70 operating permit, issued October 14, 2014 to demonstrate compliance with Subpart LLLL. Belmont installed wet electrostatic precipitators, venturi scrubbers, regenerative thermal oxidizers and activated carbon adsorbers in series with the existing venturi and tray impingement scrubbers. The installation of the control equipment occurred on each of the four incinerators from June 2014 to December 2015.

Upon further review of Belmont's 2015 and 2016 Pb emissions in February of 2017, IDEM found the installation of the series of emission controls pursuant to Subpart LLLL had been completed and was reflected in the 2015 emissions reporting. Following installation of the controls, subsequent stack testing showed greater reductions of Pb emissions from each incinerator. Belmont had previously used more conservative AP-42 emission factors to determine Pb emissions from their facility prior to 2015. With the development of emission factors based on Belmont's recent stack test results, more representative emissions have been calculated for the four incinerators. Belmont's current emission control configuration demonstrates compliance with the New Source Performance Standard (NSPS) for the New Sewage Sludge Incineration Units and yield much lower Pb emissions from the facility as a whole. The resulting modeled Pb impacts are extremely low and do not approach the Pb NAAQS and therefore, no Pb ambient air monitoring is required. As such, IDEM is requesting that the United States Environmental Protection Agency (U.S. EPA) grant its waiver request from installing a Pb ambient air monitor near Belmont to characterize air quality in the surrounding area.

U.S. EPA – Region 5 Comments and IDEM's Response to Comments

U.S. EPA reviewed IDEM's Pb monitoring waiver request for Belmont and requested additional information concerning the Pb emissions and dry sludge throughputs from the facility. A summary of U.S. EPA comments was submitted by Jesse McGrath of U.S. EPA – Region 5 to IDEM on April 5, 2017. IDEM's responses to U.S. EPA's comments are listed below and show that Belmont's Pb emissions are no threat to violate the Pb NAAQS.

1) Use the emissions factor that is most representative of the facility's current operations to estimate 2014-2016 total yearly emissions.

- IDEM calculated a representative emission factor based on several parameters: the 40 CFR 60, Subpart LLLL Pb emission limit of 0.0035 milligrams per dry standard cubic meter (mg/dscm), the average dry standard cubic feet flow rate measured at recent stack tests for each of the four incinerators, as well as the maximum throughput capacity at each incinerator, rated at 2.6 tons of dry sludge/hour. The resulting emission factor was calculated to be **0.0004852 lb of Pb/ton of dry sludge processed**. This emission factor was used to calculate the Pb emissions based on the annual dry sludge throughput of all four incinerators from 2008 - 2016. Table 1 below shows the annual dry sludge throughput for the latest three years and the resulting Pb emissions using the emission factor based on the Subpart LLLL limit. It should be noted that stack test results for each of the incinerators achieve the Subpart LLLL limit; therefore these emissions estimates represent a conservative approach to the actual emissions.

Table 1. Belmont Annual Dry Sludge Throughput and Calculated Pb Emissions

Year	2014	2015	2016
Throughput (tons)	47,191	37,097	41,976
Pb emissions (t/yr)	1.15E-03	9.00E-04	1.02E-03

2) Use the throughput for each year to estimate total yearly emissions.

- IDEM calculated the total annual Pb emissions from Belmont, based on the reported dry sludge throughput from 2008 – 2016 as well as the 3-year average of the dry sludge throughputs over the same time period, as shown in Table 2 below. These throughputs were multiplied by the emission factor calculated from the current emission controls and the Subpart LLLL limit to determine the emissions.

Table 2. Belmont Annual Dry Sludge Throughput and Estimated Pb Emissions

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Throughput (tons)	13,342	19,942	21,188	24,270	43,845	48,458	47,191	37,097	41,976
Emissions (t/yr)	3.24E-04	4.84E-04	5.14E-04	5.89E-04	1.06E-03	1.18E-03	1.15E-03	9.00E-04	1.02E-03
3-Year Period			**2008-2010**	**2009-2011**	**2010-2012**	**2011-2013**	**2012-2014**	**2013-2015**	**2014 - 2016**
3-year Average Throughput (tons)			18,157	21,800	29,768	38,858	46,498	44,249	42,088
3-year Average Emissions (t/yr)			4.41E-04	5.29E-04	7.22E-04	9.43E-04	1.13E-03	1.07E-03	1.02E-03

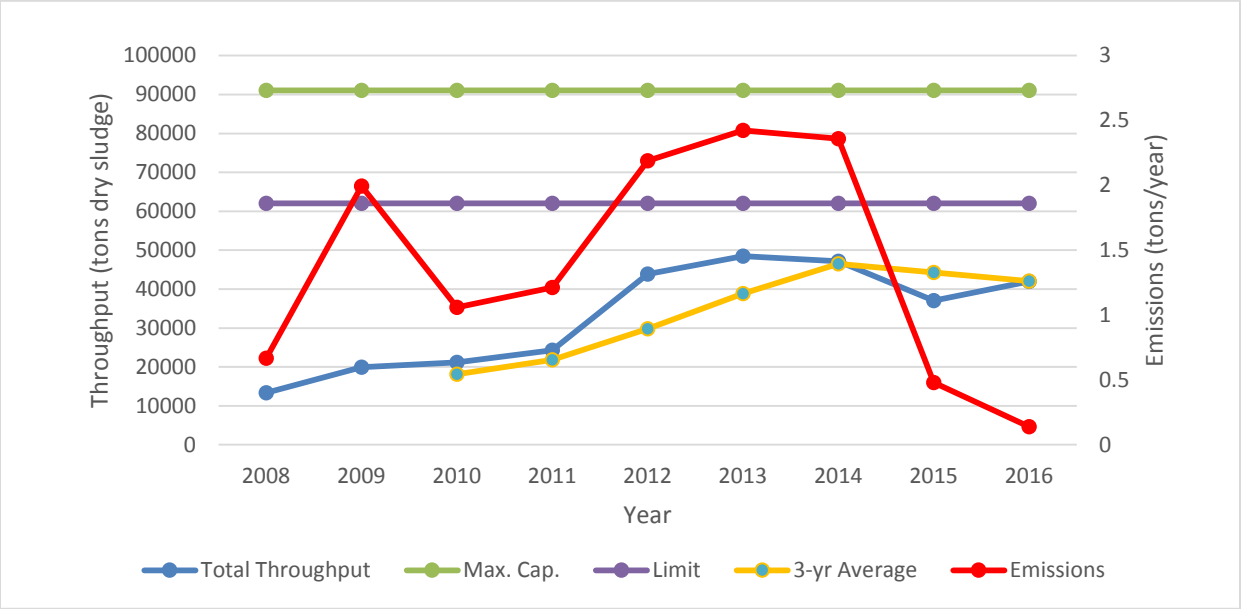
3) Base modelling on the highest yearly emissions from the 3 year period.

- Modeling was conducted using the emissions calculated from the maximum dry sludge throughput in 2013. This is the maximum throughput reported throughout the nine-year period (2008 – 2016) and was used as a conservative emission estimate for modeling purposes. Based on the Pb emission calculation of 1.18E-03 t/yr, the maximum modeled Pb impact was 0.00007 µg/m^3, well below the quarterly Pb NAAQS of 0.15 µg/m^3.

4) Provide a comparison of the 2014-2016 throughput to past levels.

- IDEM has summarized Belmont's sludge throughput information below in Chart 1. Included in the chart are the actual annual throughput values and the 3-year average of the annual dry sludge throughput from the four incinerators for 2008 – 2016, the maximum capacity of dry sludge throughput for all four incinerators combined and the Minor Source Limit of 62,050 tons dry sludge for all four incinerators (Emission Offset and Hazardous Air Pollutants Minor Limit condition in the City of Indianapolis operating permit issued on 8/21/1990 and incorporated as Condition D.2.2(a)(2) in Belmont's Title V permit (097-33066-00032). The reported Pb emissions (without taking into account the Subpart LLLL emission controls until 2015) are also included for comparison purposes.

Chart 1. Dry Sludge Throughput and Reported Pb Emissions for Belmont

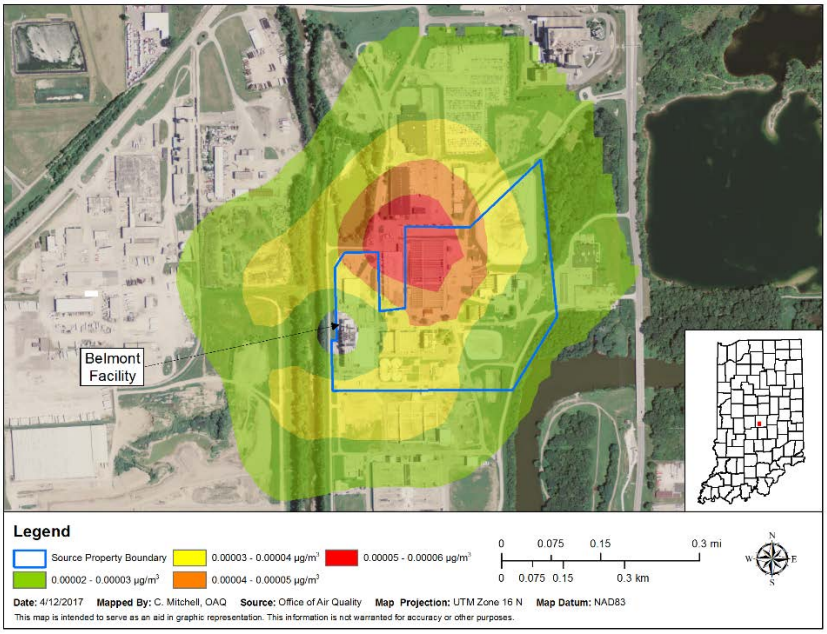


- Maximum capacity for each incinerator: 2.6 tons dry sludge/hour = 22,776 tons dry sludge/yr * 4 incinerators = 91,104 tons dry sludge
- Throughput limit: 62,050 tons dry sludge/12 consecutive months for all 4 incinerators (Limit of 17,712 tons dry sludge/12 consecutive months for Incinerator 2)

5) *Compile the modelling inputs, such as meteorology, and send them to Carolyn Persoon.*

- Modeling was conducted using the emission factor calculated from the 0.0035 mg/dscm Subpart LLLL emission limit and the maximum annual dry sludge throughput from the previous nine years. Figure 1 below shows the modeled Pb concentrations from Belmont. As can be seen, the maximum impacts occur to the northeast of Belmont with the maximum impacts falling well below the Pb NAAQS. All modeling input and output files as well as the meteorological files have been submitted to Carolyn Persoon and Justin Coughlin of U.S. EPA – Region 5 via email.

Figure 1: Concentration Map of Modeled Pb Impacts: Belmont



6) For informational purposes, outside of the waiver request, we also want to know if there is a limit to the amount of Pb that can be in the sludge, rather than only a limit on the tonnage of sludge that can be incinerated.

- The Pb emission limit of 0.0035 milligrams per dry standard cubic meter according to 40 CFR 60, Subpart LLLL - Table 2 applies to the source and compliance with this NSPS requires stack testing every 3 years. IDEM is not aware of any requirements for sampling of the processed sludge for Pb.

Summary

IDEM has reviewed annual dry sludge throughputs, New Source Performance Standards, permit conditions and stack testing information to characterize current operating conditions and Pb emissions under the current emission control configuration at Belmont. Belmont is in compliance with 40 CFR 60, Subpart LLLL and resulting Pb emissions have been greatly reduced over the past two years and will continue to be controlled in the future. Air dispersion modeling conducted with this current emission scenario is more than 99% below the Pb NAAQS of 0.15 µg/m^3 and no further evaluation is necessary. As such, IDEM is requesting that United States Environmental Protection Agency (U.S. EPA) grant its waiver request from installing a Pb ambient air monitor near Belmont to characterize air quality in the surrounding area.

Lead Monitoring Waiver Request for Crane

Executive Summary

Crane Division, Naval Surface Warfare Center (Crane) is a stationary military base where military ordnances are manufactured, stored and disposed. Crane is located at 300 Highway 361 near Crane, Martin County, Indiana and has been evaluated to determine whether lead (Pb) monitoring would be required. Historically, Crane Pb emissions were above 0.5 tons per year (TPY) and air dispersion modeling was conducted to determine Pb impacts in the area. Those previous modeling results indicated modeled impacts were below the Pb National Ambient Air Quality Standard (NAAQS) and no monitoring was required.

At the time of the most recent modeling evaluation to compare Crane's maximum modeled Pb impacts to the 2008 annual Pb NAAQS of 0.15 $\mu g/m^3$ (micrograms per cubic meter), based on a 3-month average; a significant permit modification (101-37213-00005) was issued on April 17, 2017. This permit resulted in lower potential controlled Pb emissions by a factor of 20. Therefore, the permitted controlled potential emissions of Pb were used for this modeling evaluation to represent current and future emissions to determine impacts on air quality in the area.

Crane's Lead Emissions

Table 1 below shows Crane's controlled potential Pb emissions as a result of compliance with 40 CFR 63, Subpart EEE: National Emission Standards for Hazardous Air Pollutants for Hazardous Waste Combustors for the Rotary Kiln Incinerator.

Table 1 - Sources of Crane's Pb Emissions

Source	Emission (TPY)
Rotary Kiln Incinerator (P03)	0.04000
Detonation Chamber (P01)	0.00834
Bldg. 2674 Replacement Boilers	0.00099
NG Combustion	0.00134
Total	**0.05067**

The Rotary Kiln Incinerator (P03) Pb emissions were calculated by multiplying the annual throughput limit of 347 TPY of Net Explosive Weight (NEW) by the Pb fraction of NEW of 1.15E-04 pound of Pb per pound of NEW. This emission factor was based on "Health Risk Assessment for Military Munitions Treatment Facilities at Sierra Army Depot", Table 2-19- Deactivation Furnaces, 1996 and was calculated downstream after the cyclone, baghouse and afterburner emission controls.

The Detonation Chamber (P01) Pb emissions were calculated by multiplying the hourly throughput limit of NEW of 750 pounds/hour by the Pb emission factor of 2.54E-03 lb/lb of NEW and by the control efficiency of the Detonation Chamber baghouse at 99.9%.

Table 2 shows the trend in actual reported emissions and annual throughput of the NEW treated and testing/demolition operations.

Table 2 - Crane Actual and Projected Pb Emissions and Annual NEW Throughputs

Year	2012	2013	2014	2015	2016	2017
Actual Pb emissions (TPY)	0.9750	0.2964	2.365	1.1095	N/A	0.0506*
Throughput (Tons)	2104.3	1071.3	1548.5	1548.5	N/A	N/A

* Potential emissions after controls according to most recent permit

Air Quality Dispersion Modeling Analysis

The purpose of this modeling analysis was to demonstrate whether there is a need to conduct Pb monitoring near Crane in Martin County, Indiana, based on potential Pb emissions. Modeled results approaching the Pb NAAQS would determine if ambient monitoring for Pb is necessary to assess the air quality in the area.

The American Meteorological Society / Environmental Protection Agency Regulatory Model (AERMOD) version 16216r was used for this analysis, using all regulatory defaults and the adjusted surface friction velocity (ADJ_U*) as a regulatory option. Terrain and discrete receptor information for Crane were taken from the Pb modeling files used for the previous modeling evaluation of Crane.

Crane was modeled using Evansville National Weather Service (NWS) surface data and Lincoln, IL upper air data for five years of meteorology (2012-2016). Meteorological data was processed using American Meteorological Society / Environmental Protection Agency Regulatory Meteorology (AERMET) version 16216.

Table 3 shows the maximum modeled monthly Pb concentrations for Crane based on the potential Pb emissions of 0.0506 tons per year and the percentage of the maximum concentration compared to the rolling 3-month average Pb NAAQS of 0.15 µg/m^3.

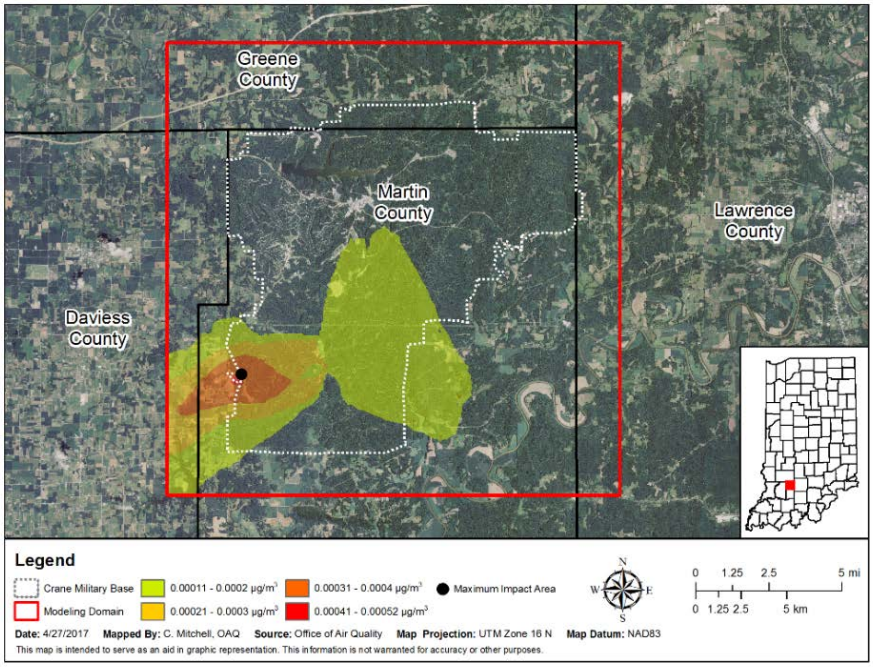
Table 3 – Modeling Results for Crane

SOURCE NAME	**POTENTIAL EMISSION RATE**	***HIGHEST MONTHLY LEAD IMPACT****	***LEAD NAAQS ROLLING 3-MONTH AVERAGE***	***PERCENTAGE BELOW LEAD STANDARD***
	(tons/year)	(µg/m^3)	*(µg/m^3)*	%
Crane Naval Surface Warfare Center	0.050	5.0E-04	0.15	99+%

* Highest monthly average was used as a conservative estimate of rolling 3 month values

Crane had maximum monthly modeled concentrations well below the Pb standard, which is based on a rolling 3-month average. These conservative modeling results, as shown below in Figure 1, clearly demonstrate there is no need for Pb monitoring near the Crane facility with maximum modeled impacts falling well below the Pb NAAQS. Crane's permitted throughput limits will yield much lower Pb emissions from the facility as a whole. The resulting modeled Pb impacts are extremely low and do not approach the Pb NAAQS and therefore, no Pb ambient air monitoring is required. As such, IDEM is requesting that the United States Environmental Protection Agency (U.S. EPA) grant its waiver from the requirement to monitor Pb near Crane to characterize air quality in the surrounding area.

Figure 1 - Concentration Map of Modeled Pb Impacts: Crane



Summary

Crane Division, Naval Surface Warfare Center (Crane) is a stationary military base where ammunition, rockets and other military ordnance are manufactured, stored and disposed. Crane is located at 300 Highway 361 near Crane, Martin County, Indiana. IDEM has reviewed the Net Explosive Weight (NEW) limited throughputs, New Source Performance Standards, permit conditions and stack testing information to characterize current operating conditions and Pb emissions at Crane. Crane complies with 40 CFR 63, Subpart EEE and resulting Pb emissions are being greatly reduced and will continue to be well controlled in the future. Air dispersion modeling conducted with this current emission scenario is 99.6% below the Pb NAAQS of 0.15 µg/m^3 and no further evaluation is necessary. As such, IDEM is requesting that United States Environmental Protection Agency (U.S. EPA) grant its waiver from the requirement to monitor Pb near Crane to characterize air quality in the surrounding area.

Appendix C

PAMS Monitoring Implementation Network Plan

The Indiana Department of Environmental Management (IDEM) has operated a SLAMS Photochemical Assessment Monitoring Stations (PAMS) at the Indpls – Washington Park NCore site (180970078) since July 1, 2011. The recently revised monitoring rule (80 FR 65292; October 26, 2015) requires PAMS measurements June 1 through August 31 at NCore sites that are located in Core Based Statistical Areas (CBSAs) with populations of 1,000,000 or more starting June 1, 2019. The NCore site at Indpls – Washington Park will serve as the location of the required PAMS site and will measure the following parameters described below. Indiana has chosen to be an early adopter and will begin the revised PAMS monitoring on June 1, 2018. An Inventory of equipment used at and purchased for the site is provided in Attachment 1.

Volatile Organic Compounds (VOCs)

Hourly speciated VOC measurements will be obtained with an auto-gas chromatograph (GC) using a Perkin Elmer Clarus 500 GC, with dual Flame Ionization Detectors (FID)s and a TurboMatrix thermal desorber. A complete list of the targeted compounds are found in Table 1.

Meteorology Measurements

Instrumentation to measure wind direction, wind speed, temperature, humidity, atmospheric pressure, precipitation, solar radiation, ultraviolet radiation, and mixing height will be used. The following instrumentation to measure the parameters described above have been installed or will be purchased:

- RM Young wind direction, wind speed, model 05305-AQ.
- RM Young temperature and relative humidity, model 41372VF.
- Met One atmospheric pressure transducer, model 092.
- RM Young precipitation tipping bucket, model 52202-E.
- Eppley Laboratory solar radiation spectral pyranometer, model PSP.
- Eppley Laboratory total ultraviolet radiometer, model TUVR.
- Vaisala Ceilometer, to determine mixing height, model CL51. To be purchased.

Other Required Measurements

- **Carbonyls –** Carbonyl sampling at a frequency of three 8-hour samples on a one-in-three day basis (~90 samples per PAMS sampling season) using an ATEC 2200 2C. A complete list of the target carbonyl compounds may be found in Table 1. The TO-11A test method, as used in the National Air Toxics Trends (NATTS) program[1] will be used.
- **Nitrogen Oxides –** Monitors for NO and NO_y (total oxides of nitrogen) in addition to true NO_2 will be operated. The true NO_2 is required to be measured with a direct reading NO_2 analyzer, cavity attenuated phase shift (CAPS) spectroscopy or photolytic-converter NO_x analyzer. The Teledyne API Model T500U CAPS NO_2 Analyzer has been purchased. NO and NOy will be measured using a Teledyne API Model 200EU Trace level analyzer.

[1] See NATTS Technical Assistance Document for TO-11A method. https://www3.epa.gov/ttnamti1/airtox.html

Table 1: PAMS Target Compound List

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

[a] Important SOAP (Secondary Organic Aerosols Precursor) Compounds
[b] HAP (Hazardous Air Pollutant) Compounds
[c] Carbonyl compounds
[d] Non-reactive compounds, not considered to be VOC for regulatory purposes
[e] Compounds measured and reported, not required for regulatory purposes

Attachment 1: Equipment Inventory

Region	5
State	Indiana
AQS ID	18-097-0078
CBSA	Indianapolis-Carmel-Anderson, IN

Parameter	Category	Detail
Site	Is the AQS site ID listed above the expected PAMS Core site location?	**Yes**
	What is the status of the decision for the expected PAMS Core site location (not started, draft, or final)?	**We are currently operating an unofficial PAMS at that site**
	Is there an alternate PAMS Core site location selected?	**No**
Mixing Height	Is there an existing functional ceilometer or other similar instrument available for use?	No- will be purchasing one
	current location (at future PAMS Core site, at other site, not applicable)	AQS #18-097-0078
	instrument type (ceilometer, radar profiler, etc)	ceilometer
	manufacturer	
	model	
	date purchased	
	comments	
Auto GC	Is there an existing Auto GC available for use?	Yes
	current location (at future PAMS Core site, at other site, not applicable)	AQS #18-097-0078
	manufacturer	Perkin Elmer
	model	Clarus 500 GC
	date purchased	May, 2006
	Does it have a service contract?	Yes
	Do you currently have auto GC components (such a preconcentrator) that you plan to use at the Required PAMS site?	Thermal Desrober
	manufacturer	Perkin Elmer
	model	Turbo Matrix
	date purchased	May, 2006
True NO2	Is there an existing true NO2 instrument available for use?	No- will be purchasing one
	current location (at future PAMS Core site, at other site, not applicable)	AQS #18-097-0078
	instrument type (photolytic conversion, cavity ringdown, CAPS, etc)	
	manufacturer	
	model	
	date purchased	
	comments	
Carbonyls Sampling	Is there an existing sequential carbonyls sampling unit or similar instrument available for use?	Yes
	current location (at future PAMS Core site, at other site, not applicable)	AQS #18-097-0078
	manufacturer	ATEC
	model	2200 2C
	date purchased	June 31, 2006
	comments	
Carbonyls Analysis	Does the site currently have a support laboratory for carbonyls or plans to use a support laboratory?	Support lab
	laboratory name	ERG
	comments	
Barometric Pressure	instrument type (aneroid barometer, etc)	pressure transducer
	manufacturer	Met One
	model	092
	date purchased	Jan. 2007
	comments	
UV Radiation	instrument type (UV radiometer, etc)	Total UV Radiometer
	manufacturer	The Eppley Laboratory, Inc
	model	TUVR
	date purchased	Jan. 2000
	comments	
Solar Radiation	instrument type (pyranometer, etc)	spectral pyranometer
	manufacturer	The Eppley Laboratory, Inc
	model	PSP
	date purchased	Jan. 2000
	comments	
Precipitation	instrument type (tipping bucket, weighing, etc)	tipping bucket
	manufacturer	R M Young
	model	52202-E
	date purchased	Jan. 2004
	comments	