MARYLAND

DEPARTMENT OF THE ENVIRONMENT

AMBIENT AIR MONITORING NETWORK PLAN for CALENDAR YEAR 2017

Prepared for:

U.S. Environmental Protection Agency

Prepared by:

Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

April 15, 2016

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TABLE OF CONTENTS

Section **Page**

TABLE OF FIGURES

Title **Page**

TABLE OF TABLES

Title **Page**

ACRONYMS AND DEFINITIONS

AADT	Annual Average Daily Traffic
AQS	Air Quality System
AQS ID	9-digit site identification number in AQS database
ARMA	MDE's Air and Radiation Management Administration
BAM	Beta Attenuation [Mass] Monitor-for measuring continuous particulate matter
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CASTNET	Clean Air Status and Trends Network
CBSA	Core Based Statistical Area
CFR	Code of Federal Regulations
CSA	Combined Statistical Area
CSN	Chemical Speciation Network
CO	Carbon Monoxide
EGU	Electrical Generating Unit
FE-AADT	Fleet Equivalent Annual Average Daily Traffic
FEM	Federal Equivalent Method-EPA approved method designated as equivalent to the Federal Reference Method (FRM) for a specific pollutant to compared to the applicable NAAQS
FID	Flame Ionization Detector
FRM	Federal Reference Method-EPA approved reference method necessary for a specific pollutant to be compared to the applicable NAAQS
GC	Gas Chromatograph
HAPS	Hazardous Air Pollutants
IMPROVE	Interagency Monitoring of Protected Visual Environments
IR	Infrared (radiation)
MDE	Maryland Department of the Environment
MSA	Metropolitan Statistical Area
NAA	Non-attainment Area
NAAQS	National Ambient Air Quality Standards-used for determining attainment status
NCore	National Core multi-pollutant monitoring stations
NEI	National Emissions Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
Nm	Nanometer, an SI unit for measuring length; 1 nm equals 10^{-9} meter.
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen (ozone precursor)
NO_y	Total Reactive Nitrogen Species (ozone precursor)
O_3	Ozone
OC/EC	Organic Carbon/Elemental Carbon
PAMS	Photochemical Assessment Monitoring Station
Pb	Lead
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 μm
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 μm

$PM_{10-2.5}$	Pronounced “PM coarse” - Particulate matter with an aerodynamic diameter less than or equal to 10 μm minus particulate matter with an aerodynamic diameter less than or equal to 2.5 μm
QA	Quality Assurance
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
TEOM	Tapered Element Oscillating Microbalance
TSP	Total suspended particulate
μm	Micrometer (10^{-6} meter)
US EPA	United States Environmental Protection Agency
UV	Ultraviolet
VOCs	Volatile Organic Compounds

1. INTRODUCTION

In 1970, Congress passed the Clean Air Act (CAA) that authorized the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for pollutants shown to threaten human health and welfare. Primary standards were set according to criteria designed to protect public health, including an adequate margin of safety to protect sensitive populations such as children and asthmatics. Secondary standards were set according to criteria designed to protect public welfare (decreased visibility, damage to crops, vegetation, buildings, etc.). As part of the CAA, both local and state air quality agencies are required to maintain and operate ambient air quality monitoring networks.

The six pollutants that currently have NAAQS are: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$ and PM_{10}), and lead (Pb). They are commonly called the "criteria" pollutants. When air quality does not meet the NAAQS for one of the criteria pollutants, the area is said to be in “non-attainment” with the NAAQS for that pollutant.

On June 1, 2015, EPA determined that the Baltimore, Maryland Moderate Nonattainment Area (Baltimore NAA) has attained the 2008 8-hour ozone NAAQS for ground-level ozone. On October 1, 2015, EPA strengthened the National Ambient Air Quality Standards (NAAQS) for ground-level ozone to 70 parts per billion (ppb), based on extensive scientific evidence about ozone’s effects on public health and welfare. The updated standards will improve public health protection, particularly for at-risk groups including children, older adults, people of all ages who have lung diseases such as asthma, and people who are active outdoors, especially outdoor workers. They also will improve the health of trees, plants and ecosystems. EPA anticipates making attainment/non-attainment designations for the 2015 ozone NAAQS, based on 2014-2016 air quality data, by late 2017. Formal attainment plans for the 2015 standards, if needed, are not anticipated to be due until 2020 or 2021.

On December 16, 2014, EPA approved Maryland's request to redesignate the Baltimore NAA to “Attainment” for the 1997 annual $PM_{2.5}$ NAAQS. The Baltimore NAA also attains the 2008 $PM_{2.5}$ annual standard and continues to attain that standard. The Baltimore NAA includes the following: Anne Arundel, Baltimore, Carroll, Harford, and Howard Counties, and Baltimore City.

A Core Based Statistical Area (CBSA) is a U.S. geographic area defined by the Office of Management and Budget (OMB) that centers on an urban center of at least 10,000 people and adjacent areas that are socioeconomically tied to the urban center by commuting. The term "CBSA" refers collectively to both metropolitan statistical areas (MSA’s) and micropolitan statistical areas. The OMB released new standards based on the 2010 Census on February 28, 2013. For the purposes of the Maryland Air Monitoring Network, the terms CBSA and MSA are interchangeable. The names and boundaries of the MSA’s in Maryland are shown in Table 1-1 and Figure 1-1. Counties outside of Maryland are included in the map because they are part of the MSA; however, this document will address only monitors in Maryland.

Table 1-1 Maryland's MSA's. Source: Maryland Dept. of Planning, 2012 estimates (http://www.mdp.state.md.us/msdc/census/cen2010/MetroAreaMap/table2.pdf)

MSA Name	Population	Maryland Counties in the MSA
Baltimore-Towson, MD	2,753,149	Carroll, Baltimore County, Baltimore City, Harford, Howard, Anne Arundel, Queen Anne's
Hagerstown-Martinsburg, MD-WV	256,278	Washington
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	Frederick, Montgomery, Prince George's, Charles, Calvert
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	Cecil
Salisbury, MD-DE	381,868	Somerset, Wicomico, Worchester

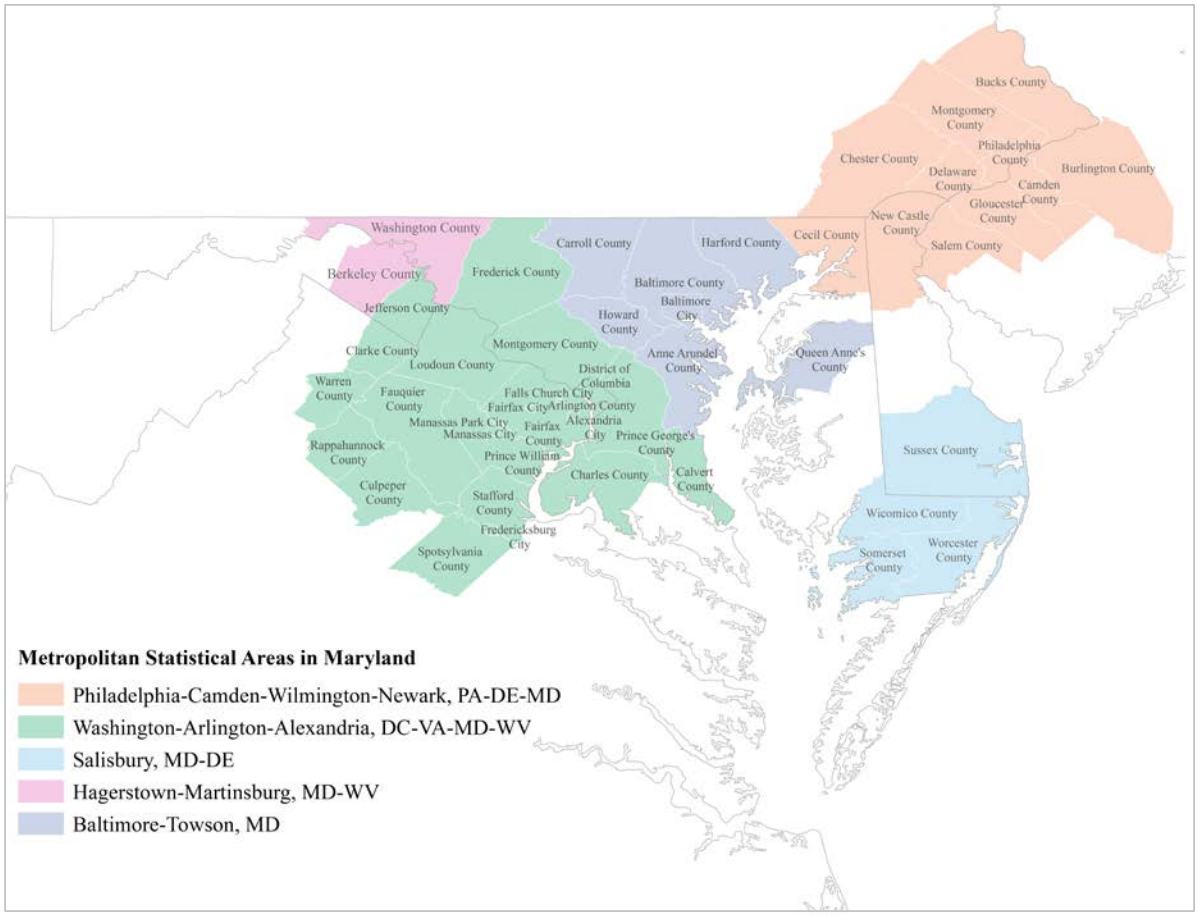

Figure 1-1 Map Depicting MSA's in Maryland.

The original EPA ozone precursor revisions to the air monitoring regulations (40 CFR Part 58) required by Title 1, Section 182 of the 1990 Clean Air Act Amendments (CAAA) were promulgated on February 12, 1993. The CAAA requires that the States incorporate enhanced monitoring for ozone, speciated volatile organic compounds (VOC's), oxides of nitrogen (NO_x), carbonyls, and meteorological parameters (MET) into their State Implementation Plan (SIP). The Part 58 regulations refer to these enhanced monitoring stations as photochemical assessment monitoring stations (PAMS). States are not required to comply with the enhanced monitoring regulations under the new 2015 ozone NAAQS until 2019 and these requirements will be addressed in the 2018 Network Plan. The final rule streamlines and modernizes the PAMS network to use monitoring resources most efficiently. There are no ambient standards for any of the VOC's.

Section 112 of the CAA currently identifies 187 hazardous air pollutants (HAPS), also referred to as air toxics, and requires EPA to regulate facilities that emit one or more of these air toxics. EPA Region III has developed a Cooperative Air Toxics Monitoring Program, and MDE operates several air toxics sites as part of the program. MDE also provides analytical support for other sampling sites in EPA Region III.

As part of the CAA, states are required to submit an annual network plan to the U.S. EPA for review and approval. Since 2007, EPA has required State and Local Air Pollution Control Agencies to make this plan available for public inspection at least thirty days prior to formal submission to EPA. This document will be available for public comment on the MDE website.

MDE is also required to certify the air quality monitoring data every May 1st for the previous calendar year's data. MDE's air quality monitoring data for 2014 were certified on May 1, 2015.

2. REQUIREMENTS FOR MONITORING NETWORK DESCRIPTIONS

In October 2006, the U.S. EPA issued final regulations concerning state and local agency ambient air monitoring networks. These regulations require an annual monitoring network plan including the information described below. The annual monitoring network plan as described in §58.10 must contain the following information for existing and proposed sites:

- The Air Quality System (AQS) site identification number
- The location, including street address and geographical coordinates
- The sampling and analysis method(s) for each measured parameter
- The operating schedules for each monitor
- Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal
- The identification of sites that are suitable and sites that are non-suitable for comparison against the annual $PM_{2.5}$ NAAQS as described in §58.30
- The monitoring objective and spatial representative scale for each monitor
- The Metropolitan Statistical Area (MSA), Core Based Statistical Area (CBSA), Combined Statistical Area (CSA) or other area represented by the monitor

3. MARYLAND AIR MONITORING NETWORK

Maryland currently operates 26 air monitoring sites around the state that measure ground-level concentrations of criteria pollutants, air toxics, meteorological parameters, and research-oriented parameters (Tables 3-1 through 3-6). Two of the sites are 'Haze Cams', cameras exclusively used to monitor visibility. Although monitoring takes place statewide, most of the stations are concentrated in the urban/industrial areas that have the highest population and number of pollutant sources. This network is maintained and operated by the Ambient Air Monitoring Program, Air and Radiation Management Administration, Maryland Department of the Environment. A comprehensive air monitoring network map is shown in Fig 3-1. Additional topographic and aerial maps and site descriptions are provided in Appendix A.

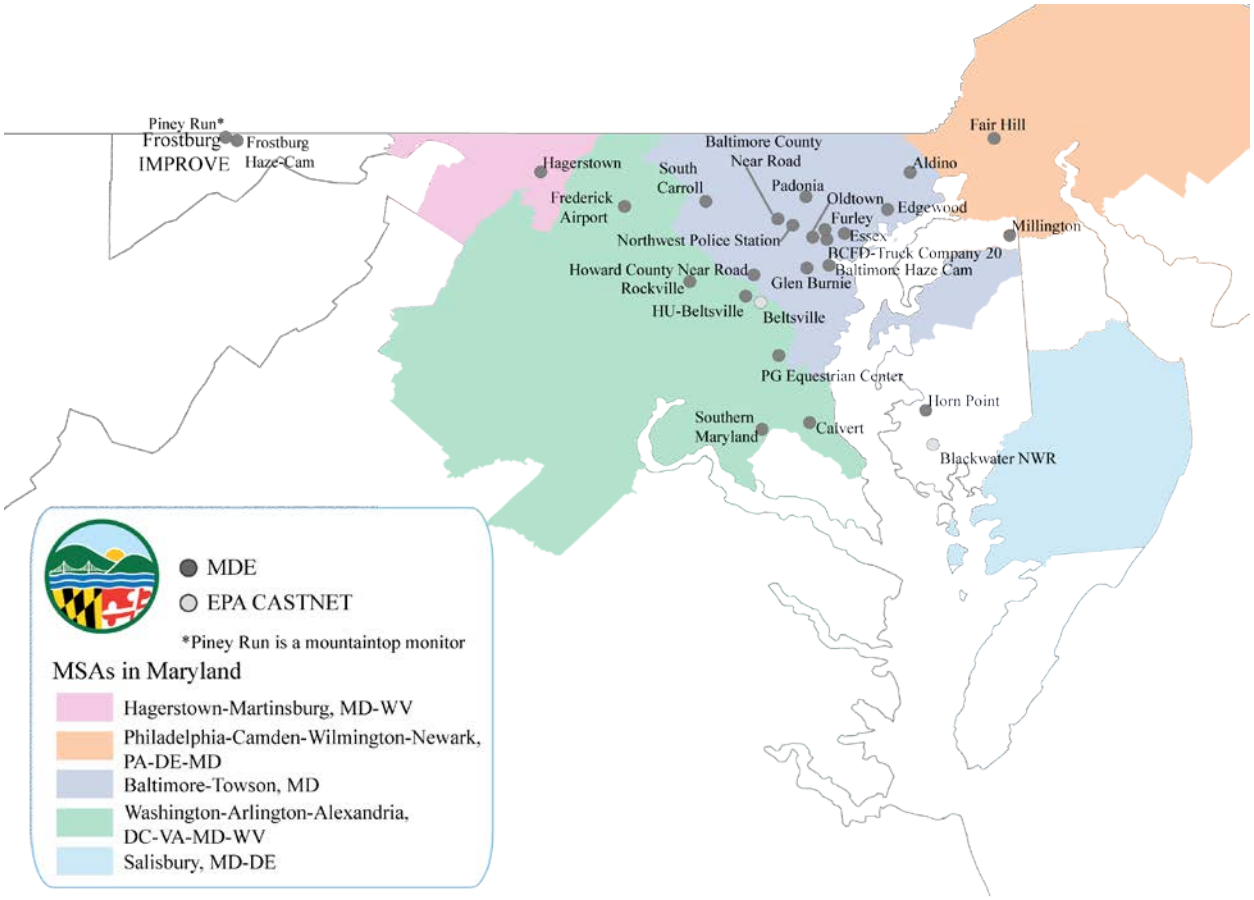

Figure 3-1 Maryland's Current Air Monitoring Network Map.

In addition to the 26 monitoring stations operated by MDE, two CASTNET sites are located in Maryland: Blackwater National Wildlife Refuge and Beltsville (Figure 3-1). CASTNET, the Clean Air Status and Trends Network, is a long-term environmental monitoring network with 90 sites located throughout the US and Canada. CASTNET sites are managed and operated by EPA's Clean Air Markets Division (CAMD) in cooperation with the National Parks Service (NPS) and other federal, state, and local partners. The network was established under the 1991 Clean Air Act Amendments to assess the trends in acidic deposition due to emission reduction programs, such as the Acid Rain Program, NO_x Budget Trading Program, and the Clean Air Interstate Rule (CAIR). CASTNET measures ambient concentrations of sulfur and nitrogen species as well as rural ozone concentrations. Results from CASTNET are used to report on geographic patterns and temporal trends in acidic pollutants, deposition, and regional ozone concentrations, so the sites located in Maryland are included in this network plan.

Maryland's 2016 Annual Network Plan was approved by EPA on November 12, 2015 (Appendix B), and included the following changes:

- The CO monitor at Oldtown was terminated at the end of 2015
- The scale of the CO monitor at Howard County Near Road was changed from microscale to middle scale
- The O_3 monitor at Davidsonville was terminated at the end of the 2015 ozone season and was moved to the Glen Burnie site
- To fulfill $PM_{2.5}$ collocation requirements, a new FEM continuous monitor was installed at Padonia and designated as the primary monitor, while one of the FRM filter-based monitors at that location was removed
- The measurement scale for the $PM_{2.5}$ monitor at Fair Hill was changed to neighborhood and the monitor objective was changed to population exposure
- The monitor objective for the $PM_{2.5}$ monitor at PG Equestrian center was changed to general/background

This year's plan continues some of the changes begun in last year's plan. This is a reflection of a shift in monitoring emphasis, with some pollutants becoming less of a concern and others becoming a higher priority. This year's network plan continues that shift in monitoring emphasis. In it, MDE proposes discontinuing one NO_Y monitor and one PM_{10} monitor, and relocating those instruments to new locations to replace aging monitors; and discontinuing one lead monitor and four $PM_{2.5}$ monitors, while shutting down one monitoring station altogether. During this period of realignment of the monitoring network we continue to plan for a focus on near road and SO_2 (source) monitoring during the next three years. We believe the attached network plan offers the best balance of monitoring the highest priority air pollutants within our available resources. Although not noted in the network plan, we are also directing resources towards upgrading the infrastructure at existing sites and modernizing our remaining fleet of fine particle and ozone monitors.

3.1 General Information

The following tables include information required as part of the monitoring network description. General information (e.g. site name, AQS identification number, latitude, longitude, etc.) can be found in Table 3-1. Specific information related to each parameter measured at air monitoring sites is given in Tables 3-2 and 3-3. Meteorological parameters measured are included in Table 3-4. Monitoring method descriptions can be found in Table 3-5. Parameters measured as part of the air toxics, PAMS, IMPROVE, and speciated $PM_{2.5}$ mass are listed in Table 3-6.

Table 3-1 General Information for Current Maryland Ambient Air Monitoring Sites

Site Name, AQS ID	Street Address	City, County	Zip Code	Latitude, Longitude (NAD83)	Location Setting	Nearest Road	Traffic Count (2013)	Distance from Nearest Road (m)	CBSA/MSA
Aldino, 240259001	3560 Aldino Rd.	Aldino, Harford	21028	39.563333, -76.203889	Suburban	Aldino Rd.	1553	14	Baltimore-Towson
Baltimore County Near Road 240050009	4380 Old Court Rd.	Pikesville, Baltimore County	21208	39.371679, -76.746814	Suburban	I-695/I-795	189380	20	Baltimore-Towson
Baltimore Haze Cam	Raven Power, 1000 Brandon Shores Dr.	Pasadena, Anne Arundel	21226	39.181513 , -76.537625	Urban	NA	NA	NA	NA
BCFD-Truck Company 20, 245100008	5714 Eastern Ave.	Baltimore, City	21224	39.287770, -76.546861	Urban	Eastern Ave.	24421	45	Baltimore-Towson
Beltsville CASTNET, 240339991	Powder Mill Rd.	Laurel, Prince George's	20708	39.0284, -76.8171					
Blackwater NWR CASTNET, 240199991	Blackwater National Wildlife Refuge	Cambridge, Dorchester	21613	38.445, -76.1114					
Calvert, 240090011	350 Stafford Rd.	Barstow, Calvert	20678	38.536722, -76.617194	Rural	Stafford Rd.	3265	53	Washington-Arlington-Alexandria
Edgewood, 240251001	Edgewood Chemical Biological Center (APG), Waehli Rd.	Edgewood, Harford	21010	39.410191, -76.296946	Rural	Waehli Rd.	4240	16	Baltimore-Towson
Essex, 240053001	600 Dorsey Ave.	Essex, Baltimore County	21221	39.310833, -76.474444	Suburban	Woodward Dr.	9521	5	Baltimore-Towson
Fair Hill, 240150003	Fair Hill Natural Resource Mgmt. Area 4600 Telegraph Rd.	Fair Hill, Cecil	21921	39.701444, -75.860051	Rural	Telegraph Rd. (RT 273)	7123	26	Philadelphia-Camden-Wilmington
Frederick Airport, 240210037	180 E. Airport Dr.	Frederick, Frederick	21701	39.422760, -77.375190	Suburban	Disposal Plant Rd.	2254	9	Washington-Arlington-Alexandria
Frostburg Haze-Cam	E. Garrett Co. Vol. Fire Dept. 401 Finzel Rd.	Finzel, Garrett	21532	39.686467, -78.966917	Rural	NA	NA	NA	NA
Frostburg IMPROVE	Frostburg Reservoir	Finzel, Garrett	21532	39.705896, -79.012117	Rural	Grantsville Rd.	1990	1441	NA
Furley, 245100054	Furley E.S. Rec. Ctr., 4633 Furley Ave.	Baltimore, City	21206	39.328807, -76.553075	Urban and Center City	Furley Ave.	2271	29	Baltimore-Towson

Site Name, AQS ID	Street Address	City, County	Zip Code	Latitude, Longitude (NAD83)	Location Setting	Nearest Road	Traffic Count (2013)	Distance from Nearest Road (m)	CBSA/MSA
Glen Burnie, 240031003	AA Co. Public Works 7409 Balt-Annap. Blvd.	Glen Burnie, Anne Arundel	21061	39.169533, -76.627933	Suburban	Baltimore-Annapolis Blvd.	16591	42	Baltimore-Towson
Hagerstown, 240430009	18530 Roxbury Rd.	Hagerstown, Washington	21740	39.564178, -77.720244	Rural	Roxbury Rd.	8870	49	Hagerstown-Martinsburg
Horn Point, 240190004	University of Md - CES Horn Point Laboratory 2020 Horns Point Rd	Cambridge, Dorchester	21613	38.587525, -76.141006	Rural	Horns Point Rd.	4352	64	Cambridge (Micro)
Howard County Near Road, 240270006	I-95 S Welcome Center	Laurel, Howard	20723	39.143130 -76.846110	Suburban	I-95	192401	16	Baltimore-Towson
HU-Beltsville, 240330030	Howard University Beltsville Lab., 12003 Old Baltimore Pike	Beltsville, Prince George's	20705	39.055277, -76.878333	Suburban	Old Baltimore Pike	15692	385	Washington-Arlington-Alexandria
Millington, 240290002	Millington WMA-Massey-MD Line Rd.	Millington, Kent	21650	39.305021, -75.797317	Rural	RT 330, Massey-DE Line Rd.	971	121	NA
Northwest Police Station, 245100007	NW District Police Sta., 5271 Reisterstown Rd.	Baltimore, City	21215	39.344650, -76.685380	Urban	Reisterstown Rd.	14741	25	Baltimore-Towson
Oldtown, 245100040	Oldtown Fire Station, 1100 Hillen St.	Baltimore, City	21202	39.297733, -76.604603	Urban and Center City	Hillen St.	12392	7	Baltimore-Towson
Padonia, 240051007	Padonia E.S., 9834 Greenside Dr.	Cockeysville, Baltimore County	21030	39.462029, -76.631673	Suburban	Greenside Dr.	1841	46	Baltimore-Towson
PG Equestrian Center, 240338003	14900 Pennsylvania Ave.	Greater Upper Marlboro, Prince George's	20772	38.811940, -76.744170	Rural	Pennsylvania Ave.	52980	191	Washington-Arlington-Alexandria
Piney Run, 240230002	Frostburg Reservoir, Finzel	Frostburg, Garrett	21532	39.705950, -79.012000	Rural	Piney Run Rd.	1900	1141	NA
Rockville, 240313001	L.E. Smith Env. Educ. Ctr, 5110 Meadowside Ln.	Rockville, Montgomery	20855	39.114313, -77.106876	Rural	Meadowside Ln.	16981	77	Washington-Arlington-Alexandria
South Carroll, 240130001	South Carroll H.S. 1300 W Old Liberty Rd.	Sykesville, Carroll	21784	39.444294, -77.042252	Rural	Old Liberty Rd.	9473	248	Baltimore-Towson
Southern Maryland, 240170010	14320 Oaks Rd.	Charlotte Hall, Charles	20622	38.508547, -76.811864	Rural	Access Rd.	5100	16	Washington-Arlington-Alexandria

Note: Blank cells indicate no data available. NA means not applicable. Traffic count data are AADT 2013, MD State Hwy Administration. CASTNET sites are operated by EPA's Clean Air Markets Division in cooperation with the National Parks Service and other federal, state, and local partners.

Table 3-2 Monitor Information for Current Maryland Ambient Air Monitoring Sites

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
Aldino, 240259001	Ozone (O_3)	04/20/1990	047	10	Urban	Highest Concentration	SLAMS	H, S
Baltimore County Near Road 240050009	Nitric Oxide (NO)	01/01/2016	599	4.4	Microscale	Source Oriented/ Highest Concentration	SLAMS	H
	Nitrogen Dioxide (NO_2)	01/01/2016	599	4.4	Microscale	Source Oriented/ Highest Concentration	SLAMS	H
	Oxides of Nitrogen (NO_X)	01/01/2016	599	4.4	Microscale	Source Oriented/ Highest Concentration	SLAMS	H
Baltimore Haze Cam @ Brandon Shores	Visibility	04/01/2007	NA	NA	NA	Public Notification	NA	NA
BCFD-Truck Co. 20, 245100008	PM_{10} - STP	03/10/2004	127	7.6	Neighborhood	Population Exposure	SLAMS	6
	$PM_{2.5}$ - Local Conditions	06/20/2001	145	7.9	Neighborhood	Population Exposure	SLAMS	3
Beltsville CASTNET, 240339991	Ozone (O_3)	04/01/2011	047	10	Regional	Highest Concentration	CASTNET	H
	Sulfur Dioxide (SO_2)	04/01/2011	560	10	Regional	Highest Concentration	CASTNET	F
Blackwater NWR CASTNET, 240199991	Ozone (O_3)	01/01/2011	047	10	Regional	Highest Concentration	CASTNET	H
Calvert, 240090011	Ozone (O_3)	04/01/2005	047	4.6	Urban	Population Exposure	SLAMS	H, S
Edgewood, 240251001	Ozone (O_3)	03/10/1980	047	4.5	Urban	Highest Concentration	SLAMS	H, S
	$PM_{2.5}$ - Hourly	09/01/2011	170	5.1	Neighborhood	Population Exposure	SLAMS	H
Essex, 240053001	Air Toxics	01/01/1990	150	4	Neighborhood	Population Exposure	Other	6
	Carbon Monoxide (CO)	02/15/2006	593	4.4	Middle	Highest Concentration	SLAMS	H
	Nitric Oxide (NO)	01/01/1993	599	4.4	Neighborhood	Population Exposure, Max Precursor	SLAMS	H
	Oxides of Nitrogen (NO_X)	01/01/1980	599	4.4	Neighborhood	Max Precursor	SLAMS	H
	Nitrogen Dioxide (NO_2)	01/01/1972	599	4.4	Neighborhood	Population Exposure	SLAMS	H
	Ozone (O_3)	01/01/1972	047	4.4	Neighborhood	Highest Concentration, Population Exposure	SLAMS	H
	$PM_{2.5}$ - Local Conditions	01/01/1999	145	5.1	Neighborhood	Population Exposure	SLAMS	3
	$PM_{2.5}$ - Speciation	07/08/2004	812	5.0	Neighborhood	Population Exposure	Trends Speciation	6
	Sulfur Dioxide (SO_2)	07/01/2003	600	4.4	Neighborhood	Highest Concentration	SLAMS	R
	Type 2 PAMS VOCS	01/01/1992	126, 142	4	Neighborhood	Max Precursor, Highest Concentration	SLAMS/Unofficial PAMS	H, 6, 12

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
Fair Hill, 240150003	Ozone (O_3)	01/01/1992	087	4.5	Urban	Regional Transport	SLAMS	H, S
	$PM_{2.5}$ - Hourly	07/01/2010	170	4.7	Neighborhood	Population Exposure	SLAMS	H
Frederick Airport, 240210037	Ozone (O_3)	07/09/1998	087	4.6	Urban	Population Exposure	SLAMS	H, S
Frostburg IMPROVE, 240239000	IMPROVE Parameters	03/01/2004	NA	4.0	Regional	Public Notification	NA	6
Frostburg Haze Cam	Visibility	10/01/2005	NA	NA	NA	Public Notification	NA	NA
Furley, 245100054	Ozone (O_3)	08/20/2006	047	7.5	Neighborhood	Population Exposure	SLAMS	H, S
Glen Burnie, 240031003	Ozone (O_3)	04/01/2016	047	5	Neighborhood	Population Exposure	SLAMS	H
	PM_{10} - STP	08/22/2008	127	4.7	Neighborhood	Population Exposure	SLAMS	6
	PM_{10} - STP	08/22/2008	127	4.7	Neighborhood	Population Exposure	QA-Collocated	6
	$PM_{2.5}$ - Local Conditions	01/01/1999	145	5	Neighborhood	Population Exposure	SLAMS	3
Hagerstown, 240430009	Ozone (O_3)	04/01/1999	047	4.6	Urban	Highest Conc/ Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Hourly	07/01/2010	170	5.09	Urban	Highest Conc	SLAMS	H
Horn Point, 240190004	Carbon Monoxide (CO)	04/01/2012	593	4	Regional	General/Background	SLAMS	H
	Nitric Oxide (NO)	04/01/2012	699	4	Regional	General/Background	SLAMS	H
	NO_Y - NO	04/01/2012	699	4	Regional	General/Background	SLAMS	H
	Ozone (O_3)	04/01/2012	087	4	Regional	General/Background	SLAMS	H
	$PM_{2.5}$ - Hourly	04/01/2012	170	4	Regional	General/Background	SLAMS	H
	Reactive Oxides of Nitrogen (NO_Y)	04/01/2012	699	4	Regional	General/ Background	SLAMS	H
	Sulfur Dioxide (SO_2)	04/01/2012	600	4	Regional	General/ Background	SLAMS	R
Howard County Near Road, 240270006	Air Toxics	04/01/2014	150	4	Microscale	Source Oriented/Highest Conc	SLAMS	6
	Black Carbon	08/01/2015	NA	4	Microscale	Source Oriented/Highest Conc	SPM	H
	Carbon Monoxide (CO)	04/01/2014	593	4	Middle Scale	Source Oriented/Highest Conc	SLAMS	H
	Nitric Oxide (NO)	04/01/2014	599	4	Microscale	Source Oriented/Highest Conc	SLAMS	H
	Nitrogen Dioxide (NO_2)	04/01/2014	599	4	Microscale	Source Oriented/Highest Conc	SLAMS	H
	Oxides of Nitrogen (NO_X)	04/01/2014	599	4	Microscale	Source Oriented/Highest Conc	SLAMS	H
	$PM_{2.5}$ - Hourly	04/01/2014	170	4.5	Microscale	Source Oriented/Highest Conc	SLAMS	H

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
HU-Beltsville, 240330030	Carbon Monoxide (CO)	01/01/2007	554	4.6	Urban	General/Background	SLAMS/NCore	H
	Air Toxics	05/05/2005	150	4	Neighborhood	Population Exposure	Other	6
	Lead (Pb)	12/12/2011	811	2.3	Neighborhood	Population Exposure	SLAMS/NCore	3
	Nitric Oxide (NO)	05/28/2005	674	10	Urban	General/Background	SLAMS/NCore	H
	Nitric Oxide (NO)	01/01/2012	599	4.6	Urban	General/Background	SLAMS/NCore	H
	Nitrogen Dioxide (NO_2)	01/01/2012	599	4.6	Urban	General/Background	SLAMS/NCore	H
	NO_Y - NO	05/28/2005	674	10	Urban	General/Background	SLAMS/NCore	H
	Oxides of Nitrogen (NO_X)	01/01/2012	599	4.6	Urban	General/Background	SLAMS/NCore	H
	Ozone (O_3)	05/01/2005	047	4.6	Urban	Highest Conc./ Population Exposure	SLAMS/NCore	H
	$PM_{2.5}$ Speciation	12/05/2004	812	2.3	Urban	Population Exposure General/Background	SLAMS/NCore	3
	PM_{10} - STP	07/25/2010	127	2.3	Neighborhood	Population Exposure	SLAMS/NCore	3
	PM_{10} - STP	07/31/2010	127	2.3	Neighborhood	Population Exposure	QA-Collocated	12
	$PM_{10-2.5}$ - Local Conditions	07/25/2010	176	2.3	Neighborhood	Population Exposure	SLAMS/NCore	3
	$PM_{10-2.5}$ - Local Conditions	07/31/2010	176	2.3	Neighborhood	Population Exposure	QA-Collocated	12
	$PM_{2.5}$ - Local Conditions	07/10/2004	145	2.3	Urban	Population Exposure	SLAMS/NCore	3
	$PM_{2.5}$ - Local Conditions	07/31/2010	145	2.3	Urban	Population Exposure	QA-Collocated	12
	$PM_{2.5}$ - Hourly	07/01/2010	170	4.5	Urban	Population Exposure	SLAMS/NCore	H
	EC/OC	01/01/2005	NA	4	NA	NA	SPM	2
	Black Carbon	12/01/2007	NA	4	NA	NA	SPM	H
	Reactive Oxides of Nitrogen (NO_Y)	05/23/2008	674	10	Urban	General/Background	NCore	H
	Sulfur Dioxide (SO_2)	09/29/2006	560	4.6	Urban	General/Background	SLAMS/NCore	R
	TYPE 1/3 PAMS VOCS	05/05/2005	126	4	Urban	Upwind/Background	Unofficial PAMS/NCore	6, S: 3
Millington, 240290002	Ozone (O_3)	06/19/1989	087	4.5	Urban	Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Hourly	07/01/2010	170	5	Neighborhood	Population Exposure	SLAMS	H
Northwest Police Station, 245100007	$PM_{2.5}$ - Local Conditions	01/01/1999	145	8.2	Neighborhood	Population Exposure	SLAMS	3

Site Name & AQS ID	Parameter	Start Date	Method Code	Probe Height	Measurement Scale	Monitor Objective	Monitor Network/Type	Schedule
Oldtown, 245100040	Air Toxics	01/01/1990	150	9	Neighborhood	Population Exposure	Other	6
	Nitric Oxide (NO)	01/01/1994	599	4.2	Middle	Highest Concentration	SLAMS	H
	Nitrogen Dioxide (NO_2)	11/05/1981	599	4.4	Middle	Highest Concentration	SLAMS	H
	Oxides of Nitrogen (NO_X)	01/01/1982	599	4.4	Middle	Highest Concentration	SLAMS	H
	$PM_{2.5}$ - Local Conditions	01/01/1999	145	4.9	Middle	Highest Concentration	SLAMS	1
	$PM_{2.5}$ - Hourly	07/01/2010	170	5.1	Middle	Highest Concentration	SLAMS	H
Padonia, 240051007	Ozone (O_3)	01/01/1979	087	4.2	Neighborhood	Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Hourly	01/01/2016	170	4.8	Neighborhood	Population Exposure	SLAMS	H
	$PM_{2.5}$ - Local Conditions	01/01/1999	145	4.8	Neighborhood	Population Exposure	SLAMS	3
PG Equestrian Center, 240338003	Ozone (O_3)	04/01/2002	087	4.4	Urban	Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Local Conditions	05/01/2002	145	5.1	Neighborhood	General/Background	SLAMS	3
Piney Run, 240230002	Carbon Monoxide (CO)	09/01/2007	554	4.4	Regional	Regional Transport	SLAMS/NCore	H
	EC/OC	07/01/2004	NA	4.6	Regional	Regional Transport	SLAMS/NCore	2
	Nitric Oxide (NO)	05/01/2004	691	10	Regional	Regional Transport	SLAMS/NCore	H
	Nitric Oxide (NO)	01/01/2014	599	4.6	Regional	Regional Transport	SLAMS/NCore	H
	Nitrogen Dioxide (NO_2)	01/01/2014	599	4.6	Regional	Regional Transport	SLAMS/NCore	H
	Oxides of Nitrogen (NO_X)	01/01/2014	599	4.6	Regional	Regional Transport	SLAMS/NCore	H
	NO_Y - NO	05/01/2004	691	10	Regional	Regional Transport	SLAMS/NCore	H
	Ozone (O_3)	04/01/2004	087	4.4	Regional	Regional Transport	SLAMS/NCore	H
	$PM_{10-2.5}$ - Local Cond	01/01/2011	185	4.9	Regional	Regional Transport	SLAMS/NCore	H
	$PM_{2.5}$ - Hourly	07/01/2010	170	4.9	Regional	Regional Transport	SLAMS/NCore	H
	Reactive Oxides of Nitrogen (NO_Y)	05/01/2004	691	10	Regional	Regional Transport	SLAMS/NCore	H
	Sulfur Dioxide (SO_2)	04/01/2004	560	4.4	Regional	Population Exposure	SLAMS/NCore	R
Rockville, 240313001	Ozone (O_3)	01/01/1980	047	4.6	Urban	Population Exposure	SLAMS	H, S
	$PM_{2.5}$ - Hourly	07/01/2010	170	5.3	Neighborhood	Population Exposure	SLAMS	H
South Carroll, 240130001	Ozone (O_3)	07/14/1983	047	4.5	Urban	Population Exposure	SLAMS	H, S
Southern Maryland, 240170010	Ozone (O_3)	10/02/1984	087	4.6	Regional	General Background	SLAMS	H, S

* Sampling Schedule is coded as follows: 1 – every day, 2 – every 2 hours, 3 – every 3rd day, 6 - every 6th day, 12 – every 12th day, H – every hour, every day, R – both every hour and every five minutes every day, S – seasonally measured only. F means passive filter collected every 2 weeks. NA means not applicable for the cell.

Table 3-3 Monitor Counts by Site (Cross-reference to Table 3-2)

Site Name	Air Toxics	Carbon Monoxide	Elemental & Organic Carbon	IMPROVE Parameters	Lead (Pb)	Ultrafine Particle Counter	Nitric Oxide (NO)	Nitrogen Dioxide (NO2)	NOy - NO	Oxides of Nitrogen (NOX)	Ozone	PM2.5 - Hourly	PM10 - Hourly	PM10 STP	PM10-2.5 - Local Conditions	PM2.5 - Local Conditions	PM2.5 Speciation	Reactive Oxides of N (NOy)	Sulfur Dioxide	Type 2 PAMS VOCS	TYPE 1 & 3 PAMS VOCS	Aethalometer	Camera	Total
Aldino											1													1
Baltimore Co. Near Rd							1	1		1														3
Baltimore Haze Cam																							1	1
BCFD-Truck Co. 20														1		1								2
Beltsville CASTNET											1								1					2
Blackwater NWR CASTNET											1													1
Calvert											1													1
Edgewood											1	1												2
Essex	1	1					1	1		1	1					1	1		1	1	1			11
Fair Hill											1	1												2
Frederick Airport											1													1
Frostburg Hazecam																							1	1
Frostburg Improve				1																				1
Furley											1													1
Glen Burnie											1			2		1								4
Hagerstown											1	1												2
Horn Point		1					1		1		1	1						1	1					7
Howard County Near Rd	1	1				1	1	1		1		1										1		8
Howard U. Beltsville	1	1	1		1	1	1	1	1	1	1	1		2	2	2	1	1	1		1	1		22
Millington											1	1												2
Northwest Police Station																1								1
Oldtown	1							1		1		1				1								5
Padonia											1	1				1								3
PG Equestrian Center											1					2								3
Piney Run		1	1				1	1	1	1	1	1	1		1			1	1					12
Rockville											1	1												2
South Carroll											1													1
Southern Maryland											1													1
Total	4	5	2	1	1	2	6	6	3	6	20	11	1	5	3	10	2	3	5	1	2	2	2	**103**

Table 3-4 Count of Meteorological Parameters Measured in the Maryland Network

AQS State County Site	Local Site Name	Barometric Pressure-64101	Temperature -62101	Rain - 65102	Relative Humidity - 62201	Solar Radiation-63301	Ultraviolet Radiation-63302	Wind Direction - 61104	Wind Speed - 61103	
240259001	Aldino	1	1	1	1			1	1	6
240050009	Baltimore County Near Rd	1	1	1	1			1	1	6
240251001	Edgewood	1	1	1	1			1	1	6
240053001	Essex	1	1	1	1	1	1	1	1	8
240150003	Fair Hill	1	1	1	1			1	1	6
240031003	Glen Burnie	1	1	1	1			1	1	6
240430009	Hagerstown	1	1	1	1			1	1	6
240190004	Horn Point	1	1	1	1			1	1	6
240270006	Howard County Near Rd	1	1	1	1			1	1	6
240330030	HU-Beltsville	1	1	1	1	1		1	1	7
240290002	Millington	1	1	1	1			1	1	6
240051007	Padonia	1	1	1	1			1	1	6
240338003	PG Equestrian Center	1	1	1	1			1	1	6
240230002	Piney Run	1	1	1	1			1	1	6
240313001	Rockville	1	1	1	1			1	1	6
240130001	South Carroll	1	1	1	1			1	1	6
Total		16	16	16	16	2	1	16	16	**99**

Table 3-5 Monitoring Methods and Associated AQS Codes used in the Maryland Ambient Air Monitoring Network

Parameter	Parameter Code	Method Code	Sample Analysis Description
Air Toxics*	NA	150	Cryogenic Pre-concentration: GC/MS
Black Carbon	NA	NA	API Teledyne 633 Aethelometer
Carbon Monoxide, trace	42101	554,	Gas Filter Correlation Thermo Electron 48I-TLE
	42101	593	Gas Filter Correlation Teledyne API 300 EU
Lead	85129	811	X-RAY Fluorescence (EDXRF) FRM
Nitric Oxide and Nitrogen Dioxide	42601-2,42602, 42603	074	Chemiluminescence
Nitric Oxide and Reactive Oxides of Nitrogen (NOy – NO)	42601, 42612, 42600	674	Thermo 42i-Y Chemiluminescence for low level measurements
	42601, 42612, 42600	691	Chemiluminescence, Ecotech EC9843
	42601, 42612, 42600	699	Chemiluminescence, Teledyne API T200U-Y
	42601-2,42602, 42603	599	Gas Phase Chemiluminescence, Teledyne API T200U
PAMS VOCS*	NA	128	Gas Chromatograph with flame; GC FID
	NA	126	Cryogenic Pre-concentration Trap GC/FID
	NA	142	Pre-concentration Trap/Thermal, Auto GC (PE Clarus 500 Dual COL)
	NA	150	SS 6L- Pressurized, Cryogenic Pre-concentration: GC/MS
Ozone	44201	047	Ultraviolet Photometry
	44201	087	Ultraviolet Radiation Absorption
PM_{10}	81102	127	Gravimetric, R - P CO Partisol Model 2025
PM_{10}	85101	122	FEM, Beta Attenuation
$PM_{2.5}$	88101	145	Gravimetric, Partisol Plus 2025
$PM_{2.5}$ continuous	88101-3	170	FEM, Beta Attenuation
$PM_{10-2.5}$(PM Coarse)	86101	176	PAIRED Gravimetric Difference, Partisol Plus 2025
	86101	185	PAIRED Gravimetric Difference, Met One BAM-1020 System
$PM_{2.5}$ Species* Constituents: Trace elements	NA	811	Energy Dispersive XRF using Teflon filter
$PM_{2.5}$ Species* Constituents: Ions	NA	812	Ion Chromatography using Nylon filter
$PM_{2.5}$ Species* Constituents: Organics	NA	813	Thermo-Optical Transmittance using Quartz filter
$PM_{2.5}$ Speciation mass	88502-5	810	Gravimetric, Met One SASS using Teflon
$PM_{2.5}$- Elemental and Organic Carbon	NA	NA	OCEC, Self-contained, non-dispersive Infrared (NDIR) detector system, Sunset OCEC model 3F
IMPROVE Parameters*	NA	NA	Four module, Improve Protocol analysis
Sulfur Dioxide	42401	060	Pulsed Fluorescence
Sulfur Dioxide, trace	42401	560	Pulsed Fluorescence, 43C-TLE/43I-TLE
	42401	600	Ultraviolet Fluorescence API 100 EU
Visibility	NA	NA	Camera (Haze Cam)

*See Table 3-4 for constituents belonging to these groups. NA means not applicable for the cell. Parameter occurrence code (POC) 1 unless otherwise noted.

Table 3-6 Constituent Compounds and Species Measured in Maryland

CONSTITUENT GROUP	COMPOUNDS IN THE CONSTITUENT GROUP
Air Toxics	Dichlorodifluoromethane, Chloromethane, 1,2-Dichloro-1,1,2,2,tetrafluorolethane, Chloroethene, 1,3-Butadiene, Trichlorofluoromethane, Acrolein, Acetone, Methylene Chloride, 1,1,2-Trichloro-1,2,2-trifluoroethane, 2-methoxy-2-methyl-Propane, Hexane, Chloroform, Tetrahydrofuran, 1,2-Dichloroethane, 1,1,1-Trichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, 1,2-Dichloropropane, Trichloroethene, Heptane, Cis-1,3-Dichloro-1-Propene, Trans-1,3-Dichloro-1-Propene, Toluene, 1,2-Dibromoethane, Tetrachloroethylene, Chlorobenzene, Ethylbenzene, m & p- Xylene, Styrene, 1,1,2,2-Tetrachloroethane, o-Xylene, 1-Ethyl-4-Methylbenzene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, 1,4-Dichlorobenzene
IMPROVE Parameters	Air temperature, Aluminum, Ammonium ion, Ammonium Nitrate, Ammonium sulfate, Arsenic, Bromine, Calcium, Chloride, Chlorine, Chromium, Copper, Elemental carbon, Humidity, Hydrogen, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Nitrate, Nitrite, Organic carbon, Phosphorus, PM_{10}, $PM_{2.5}$, Potassium, Relative Humidity, Rubidium, Selenium, Silicon, Sodium, Strontium, Sulfate, Sulfur Dioxide, Sulfur, Titanium, Vanadium, Zinc, and Zirconium
PAMS VOCs	Acetaldehyde, Acetone, Acrolein, Formaldehyde, Methyl Ethyl Ketone, Methyl Isobutyle Ketone, Propionaldehyde, Ethene, Ethyne, Ethane, Propene, Propane, Isobutane, 1-Butene, Butane, T-2-Butene, C-2-Butene, Isopentane, 1-Pentene, Pentane, Isoprene, T-2-Pentene, C-2-Pentene, 2,2-Dimethylbutane, Cyclopentane, 2,3-Dimethylbutane, 2-Methylpentane, 3-Methylpentane, 1-Hexene, Hexane, Methylcyclopentane, 2,4dimethylpentane, Benzene, Cyclohexane, 2-Methylhexane, 2,3dimethylpentane, 3-Methylhexane, 2,2,4tmpentane, Heptane, Methylcyclohexane, 2,3,4-Tmpentane, Toluene, 2-Methylheptane, 3-Methylheptane, Octane, Ethylbenzene, M&P-Xylene, Styrene, O-Xylene, Nonane, Isopropylbenzene, Propylbenzene, 1-Ethyl-3-Mbenzene, 1-Ethyl-4-Mbenzene, 135tmbenzene, 1-Ethyl-2-Mbenzene, 124tmbenzene, Decane, 1,2,3-Trimbenzene, M-Diethylbenzene, P-Diethylbenzene, Undecane, Dodecane, Total HC, PAMSHC
$PM_{2.5}$ Chemical Species	Aluminum, Ammonium, antimony, Arsenic, Barium, Bromine, Cadmium, Calcium, Carbonate carbon, Cerium, Cesium, Chlorine, Chromium, Cobalt, Copper, Elemental carbon, Europium, Gallium, Gold, Hafnium, Indium, Iridium, Iron, Lanthanum, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Niobium, Nitrate, OCX, OCX2, Organic carbon, Phosphorus, Pk1_OC, Pk2_OC, Pk3_OC, Pk4_OC, Potassium, PyrolC, Rubidium, Samarium, Scandium, Selenium, Silicon, Silver, Sodium, Strontium, Sulfate, Sulfur, Tantalum, Terbium, Tin, Titanium, Total carbon, Vanadium, Wolfram, Yttrium, Zinc, and Zirconium

4. SPECIFIC POLLUTANT NETWORK DESCRIPTIONS AND REQUIREMENTS

4.1 Carbon Monoxide (CO) – General Description and Sampling Method

Carbon monoxide is measured by infrared absorption photometry. Air is drawn continuously through a sample cell where infrared light passes through it. Carbon monoxide molecules in the air absorb part of the infrared light, reducing the intensity of the light reaching a light sensor. The light is converted into an electrical signal related to the concentration of carbon monoxide in the sample cell.

4.1.1 Monitoring Requirements

EPA revised the minimum monitoring requirements for CO on August, 12, 2011. One CO monitor is required to be collocated with a near-road NO_2 in urban areas having a population of 1 million or more. MDE added a CO monitor to the near road NO_2 monitoring site at the Interstate 95 South (I-95S) rest area between MD-32 and MD-216. This monitor began collecting data April 1, 2014. Operation of the existing CO sites in Maryland is required until MDE requests discontinuation of a site in the Annual Network Plan and the EPA Regional Administrator approves the request.

Table 4-1 CO Monitoring Requirements

Requirement	Appendix D 40 CFR Part 58	Required in Maryland	Number of monitors active in Maryland
One CO monitor collocated with a Near Road NO_2 in urban area with a population >= 1 million	4.2.1	1	1
One CO monitor at each Type 2 PAMS site	5.3, Table D-6	1	1
One CO monitor at each NCore site	3(b)	2	2

In addition to the monitors required above, MDE operates a CO monitor at the Horn Point site (Tables 3-2 and 3-3).

4.1.2 Sources

CO is formed when carbon in fuel is not completely burned. The EPA estimates that approximately 60% of all CO emissions are from motor vehicle exhaust. Other sources include waste incinerators, wood stoves, furnaces, and some industrial processes. Concentrations are highest along heavily traveled highways, and decrease significantly the further away the monitor is from traffic. Therefore, CO monitors are usually located close to roadways or in urban areas.

4.1.3 Changes Planned for 2016-2017

No changes planned.

4.2 Lead (Pb) – General Description and Sampling Method

MDE collects lead by gravimetric PM_{10} samplers as described in Section 4.5; then the filters are sent to a lab to be analyzed for lead by the x-ray fluorescence method. If a lead-PM_{10} monitor measures three-month average levels greater than or equal to 0.10 μg/m3, then MDE must install and operate a lead-TSP monitor within six months.

4.2.1 Monitoring Requirements

The latest revision to the lead (Pb) NAAQS was finalized on October 15, 2008, lowering the primary and secondary standards from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$. Revisions to the lead monitoring regulations were finalized on December 27, 2010 as follows:

Table 4-2 Lead Monitoring Requirements

Requirement	Appendix D 40 CFR Part 58	Required in MD	Number in MD
One source-oriented SLAMS site located to measure the maximum Pb concentration resulting from each non-airport Pb source which emits 0.50 or more tons per year	4.5(a)	0	0
One source-oriented SLAMS site located to measure the maximum Pb concentration resulting from airport which emits 1.0 or more tons per year	4.5(a)	0	0
Non-source oriented Pb monitoring at each required NCore site in a CBSA having a population of 500,000 or more	4.5(b)	1	1

4.2.2 Sources

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been motor vehicles and industrial sources. As a result of EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector dramatically declined by 95 percent between 1980 and 1999, and levels of lead in the air decreased by 94 percent between 1980 and 1999. Today, the highest levels of lead in air are usually found near lead smelters. Other stationary sources are waste incinerators, utilities, lead-acid battery manufacturers and general aviation airports. Soil can pick up lead from exterior paint, or other sources such as past use of leaded gas in cars.

There are no sources in Maryland that emit more than ½ ton (1,000 pounds) of lead per year. Table 4-3 shows Maryland 2014 lead emissions developed from data recently corrected to reflect new stack test data from the NRG Morgantown and Raven Power Fort Smallwood Road complex generation facilities. This table includes the basis of the emissions factors used in the companies' certification reports.

Table 4-3 2014 Maryland Lead Emissions

Premises ID	Company Name	Annual Emissions (TPY)	Annual Emissions (lbs/YR)	Source of Emission Factor Used for 2014
033-0014	NRG Chalk Point Generating Station	0.224	448.51	AP-42 Factor
510-1886	Wheelabrator Baltimore, LP	0.147	293.93	2014 Stack Test
017-0014	NRG Morgantown Generating Station	0.129	257.40	2015 Stack Test
031-0019	NRG Dickerson Generating Station	0.109	218.18	AP-42 Factor
005-0079	C. P. Crane LLC	0.065	130.00	AP-42 Factor
031-1718	Montgomery County Resource Recovery Facility (MCRRF)	0.029	57.78	2014 Stack Test
001-0011	Verso Luke Paper Company	0.026	52.00	Sara Handbook
043-0008	Holcim (US), Inc	0.020	40.00	2014 Stack Test
510-2260	Clean Harbors of Baltimore	0.017	34.30	AP-42 Factor
013-0012	Lehigh Cement Company LLC	0.015	30.70	2011 Stack Test
003-0468	Fort Smallwood Road Complex	0.014	28.00	2010 Stack Test
033-0667	USDA Beltsville Agriculture Research Center	0.010	20.04	AP-42 Factor
017-0040	Naval Support Facility Indian Head	0.008	15.71	Nat Gas in 2015
003-0317	National Security Agency	0.006	11.90	AP-42 Factor
510-2975	Curtis Bay Energy, LP	0.006	11.83	2014 Stack Test
005-0302	Galvco of Maryland, LLC, dba Baltimore Galvanizing	0.006	11.68	AP-42 Factor
005-2406	Maryland Recycle Company, Inc.	0.005	10.79	Industry Factor
025-0024	Constellation Power - Perryman Generating Station	0.005	10.32	AP-42 Factor
025-0212	Harford County Resource Recovery Facility	0.004	7.26	2014 Stack Test
043-0003	Redland Brick, Inc. - Cushwa Plant	0.003	6.66	
023-0042	Mettiki Coal, LLC	0.003	5.60	AP-42 Factor
001-0203	AES Warrior Run Inc	0.003	5.28	Stack Test
510-1653	Baltimore Scrap	0.002	4.35	Stack Test
031-0324	National Institutes of Health	0.002	3.76	
021-0027	Redland Brick, Inc. - Rocky Ridge	0.002	3.62	
045-0309	ICM of MD, Inc.-Delmar Plant	0.002	3.59	
021-0131	Fort Detrick - Area B & Main Post	0.001	1.98	2014 Stack Test
043-0269	C. William Hetzer, Inc	0.001	1.85	
510-3032	University of Maryland at Baltimore	0.001	1.65	AP-42 Factor
009-0021	Dominion Cove Point LNG, LP	0.001	1.20	
041-0069	Easton Utilities - Airport Park	0.001	1.16	
035-0033	David A. Bramble - Wye Mills Asphalt Plant	0.001	1.01	
041-0029	Easton Utilities - N. Washington Street	0.000	0.89	
003-0826	Aggregate Industries - Severn Asphalt	0.000	0.78	
017-0150	Aggregate Industries - Waldorf	0.000	0.59	
003-0056	Erachem Comilog, Inc	0.000	0.48	
033-0675	NASA Goddard Space Flight Center	0.000	0.47	
510-0651	Veolia Energy Baltimore Heating, LLP-Central Ave	0.000	0.40	
031-0323	National Institute of Standards & Technology	0.000	0.36	AP-42 Factor
510-0171	P. Flanigan and Sons, Inc	0.000	0.23	
510-3078	Veolia Energy Baltimore Heating, LLP-Saratoga Plant	0.000	0.22	
510-2796	Veolia Energy Baltimore Heating, LLP-Spring Gardens Plant	0.000	0.22	
021-0444	Frederick National Laboratory for Cancer Research	0.000	0.20	

033-0002	Aggregate Industries - Kirby Road Asphalt Plant	0.000	0.18	
031-1361	F. O. Day Bituminous Company	0.000	0.18	
025-0056	American Infrastructure-MD, Inc.-Aberdeen Asphalt	0.000	0.18	
021-0409	Miller Asphalt - Legore	0.000	0.17	
510-0069	P. Flanigan & Sons, Inc	0.000	0.16	
033-1068	Forestville Asphalt Company	0.000	0.16	
025-0031	Maryland Paving, Inc. - Aberdeen	0.000	0.15	
013-0046	C.J. Miller, LLC	0.000	0.14	
005-2436	Maryland Paving - Texas Quarry	0.000	0.14	
003-0250	Northrop Grumman Systems Corporation	0.000	0.14	
021-0459	MedImmune, LLC	0.000	0.11	
003-0234	Bitumar USA, Inc.	0.000	0.11	
043-0114	Craig Paving, Inc	0.000	0.11	
021-0408	Frederick Asphalt Co., L.C. At Essroc	0.000	0.10	
017-0119	Charles County Asphalt	0.000	0.09	
027-0052	MD & VA Milk Producers Coop	0.000	0.09	
510-0106	United States Gypsum Company	0.000	0.06	
031-1129	GSA Federal Research Center at White Oak - Cup #1	0.000	0.04	
031-2552	Federal Research Center at White Oak	0.000	0.04	
013-0102	C.J. Miller, LLC	0.000	0.04	
005-0184	Noxell Corporation	0.000	0.04	
027-0080	Precoat Metals	0.000	0.03	
510-0918	Buckeye Terminals, LLC - Baltimore Terminal	0.000	0.01	
031-2164	MedImmune, Inc.- Gaithersburg	0.000	0.01	
	Total Lead Emissions	**0.870**	**1,739.37**	

4.2.3 Changes Planned for 2016-2017

No changes planned.

4.3 Nitrogen Dioxide (NO_2) – General Description and Sampling Method

Nitrogen dioxide is produced during high-temperature burning of fuels. Sources include motor vehicles and stationary sources that burn fossil fuels such as power plants and industrial boilers. It is measured indirectly. First, nitrogen oxide (NO) is measured using the chemiluminescence reaction of nitric oxide (NO) with ozone (O_3). Air is drawn into a reaction chamber where it is mixed with a high concentration of ozone from an internal ozone generator. Any NO in the air reacts with the ozone to produce NO_2. Light emitted from this reaction is detected with a photomultiplier tube and converted to an electrical signal proportional to the NO concentration. Next, total nitrogen oxides (NO_x) are measured by passing the air through a converter where any NO_2 in the air is reduced to NO before the air is passed to the reaction chamber. By alternately passing the air directly to the reaction chamber, and through the converter before the reaction chamber, the analyzer alternately measures NO and NO_x. The NO_2 concentration is equal to the difference between NO_x and NO.

4.3.1 Monitoring Requirements

On January 22, 2010, EPA strengthened the health-based National Ambient Air Quality Standard (NAAQS) for nitrogen dioxide (NO_2) by setting a new 1-hour NAAQS at 100 ppb. The existing annual average NAAQS of 53 ppb has been retained as well. In addition to establishing a new 1-hour NO_2 NAAQS, EPA revised the NO_2 monitoring requirements in urban areas.

Table 4-4 NO_2 Monitoring Requirements

Requirement	Appendix D 40 CFR Part 58	Required in Maryland	Number of monitors active in Maryland
Near Road NO_2 monitoring in CBSA with a population >= 500,000	4.3.2(a)	1	0
Near Road NO_2 monitoring in CBSA with a population >= 2,500,000	4.3.2(a)	2	3 qualifying CBSA's
Area-wide monitoring in CBSA with population > 1 million	4.3.3	1	3 qualifying CBSA's
Regional Administrator required monitoring	4.3.4	Variable	0

Near Road Monitoring

There are three MSA's with populations greater than 2,500,000 that are either wholly in Maryland, or that Maryland is a part of, that each qualify for two near road NO_2 monitors (Table 1-1). For the Baltimore-Towson, MD MSA, MDE is currently operating two near road NO_2 monitoring stations: the Howard County Near Road site, located on I-95 S between Routes 32 and 216, and the Baltimore County Near Road site, located at the Maryland Transit Administration maintenance facility at the interchange of I-695 and I-795.

For the Washington-Arlington-Alexandria, DC-VA-MD-WV MSA, the requirements will be met by monitors installed in Washington, DC by the District of Columbia Department of the Environment (DDOE) and in Virginia by the Virginia Department of Environmental Quality (VaDEQ). For the Philadelphia-Camden-Wilmington-Newark, PA-DE-MD MSA, the requirements will be met by monitors installed by the Pennsylvania Department of Environmental Protection (PADEP).

Community Wide Monitoring

There are three MSA's with populations greater than 1,000,000 that are either wholly in Maryland, or that Maryland is a part of, that each qualify for one community wide NO_2 monitor (Table 1-1). MDE's NO_2 monitors at the Essex and Oldtown sites fulfill this requirement for the Baltimore-Towson, MD MSA.

For the Washington-Arlington-Alexandria, DC-VA-MD-WV MSA, the requirements will be met by monitors installed in Washington, DC by the District of Columbia Department of the Environment (DDOE) and in Virginia by the Virginia Department of Environmental Quality (VaDEQ). For the Philadelphia-Camden-Wilmington-Newark, PA-DE-MD MSA, the requirements will be met by monitors installed by the Pennsylvania Department of Environmental Protection (PADEP).

Sensitive and Vulnerable Populations

EPA Region III has not required MDE to install any additional monitors to meet this requirement.

4.3.2 Sources

Oxides of nitrogen are produced during high-temperature burning of fuels. Sources of NO_x include motor vehicles and stationary sources that burn fossil fuels such as power plants and industrial boilers.

4.3.3 Changes Planned for 2016-2017

MDE is not proposing any changes to the NO_2 monitoring network but is proposing to terminate the NO_Y monitoring at Horn Point and to move the Teledyne API T200U instrument from Horn Point to Piney Run. Reactive oxides of nitrogen (NO_Y) are composed of NO_2, NO, and other nitrogen oxide compounds. The NO_Y monitor at Piney Run, an Ecotech 9843, is aging and needs to be replaced. There is no network requirement for monitoring NO_Y at Horn Point, while Piney Run is an NCore site and does require NO_Y monitoring. This change will allow scarce monitoring resources to be utilized most efficiently.

4.4 Ozone (O_3) – General Description and Sampling Method

Ozone is measured by ultraviolet absorption photometry. Air is drawn continuously through a sample cell where ultraviolet light passes through it. O_3 molecules in the air absorb part of the ultraviolet light, reducing the intensity of the light reaching a light sensor. The light is converted into an electrical signal related to the concentration of O_3 in the sample cell.

On October 1, 2015, EPA strengthened the National Ambient Air Quality Standards (NAAQS) for ground-level ozone to 70 parts per billion (ppb), based on extensive scientific evidence about ozone's effects on public health and welfare. The updated standard will improve public health protection, particularly for at-risk groups including children, older adults, people of all ages who have lung diseases such as asthma, and people who are active outdoors, especially outdoor workers. They also will improve the health of trees, plants and ecosystems.

4.4.1 Monitoring Requirements

Ozone monitoring requirements are determined by the MSA population and design value, as specified in Table D-2 of 40 CFR Part 58 Appendix D. Table 4-5 shows that the MDE monitoring network meets or exceeds the minimum requirements. Since ozone levels decrease significantly in the colder periods of the year in many areas, ozone is only required to be monitored during the designated "ozone season". The implementation of the 2015 Ozone NAAQS includes expanding the ozone season in Maryland from March 1 through October 31 starting in 2017.

Table 4-5 Number of Ozone SLAMS Sites Required (based on Table D–2 , Appendix D to 40 CFR Part 58, Ozone Minimum Monitoring Requirements)

MSA Name	Population	Monitors Deployed by State[A]						Total Monitors	Required >= 85% NAAQS
		DE	DC	MD	VA	WV	PA		
Baltimore-Towson, MD	2,753,149	0	0	7	0	0	0	7	4
Hagerstown-Martinsburg, MD-WV	256,278	0	0	1	0	1	0	2	1
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	0	3	7	8	0	0	18	3
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	4	0	1	0	0	8	13	3
Salisbury, MD-DE	381,868	0	0	0	0	0	0	0	1
Total		4	3	16	8	1	8	40	12

A - Based on tables available at http://www.epa.gov/airtrends/values.html. All areas had their maximum site >= 85% Ozone NAAQS.

Within an O_3 network, at least one O_3 site for each MSA must be designed to record the maximum concentration for that particular metropolitan area. More than one maximum concentration site may be necessary in some areas. Since O_3 requires appreciable formation time, the mixing of reactants and products occurs over large volumes of air, and this reduces the importance of monitoring small-scale spatial variability. The appropriate spatial scales for O_3 sites are neighborhood, urban, and regional.

The prospective maximum concentration monitor site should be selected in a direction from the city that is most likely to observe the highest O_3 concentrations, more specifically, downwind during periods of photochemical activity. For the Baltimore-Towson, MD MSA, Essex, Edgewood, and Aldino are assigned this designation. For the Washington-Arlington-Alexandria, DC-MD-VA-WV MSA, HU-Beltsville, Beltsville-CASTNET and PG Equestrian Center are assigned this designation for the Maryland portion of the MSA. For the Martinsburg-Hagerstown, MD-WV MSA, Hagerstown is assigned this designation.

4.4.2 Sources

Ozone is not emitted directly from a pollution source but is formed in the lower atmosphere by the reaction of nitrogen oxides (NO_x) and volatile organic compounds (VOC's) in the presence of sunlight and warm temperatures. Sources of nitrogen oxides include automobiles, power plants and other combustion activities. VOC's can come from automobiles, gasoline vapors, and a variety of large and small commercial and industrial sources that use chemical solvents, paint thinners, and other chemical compounds. NO_x and VOC's or "precursors of ozone" can travel for many miles before chemical reactions in the atmosphere form O_3.

4.4.3 Changes Planned for 2016-2017

The implementation of the 2015 Ozone NAAQS includes expanding the ozone season in Maryland from March 1 through October 31, beginning March 1, 2017.

4.5 Particulate Matter (PM_{10}) – General Description and Sampling Method

MDE uses both manual gravimetric and automated monitors to measure PM_{10} mass concentrations. The PM_{10} Beta Attenuation Monitor (BAM) automatically measures and records dust concentrations with built-in data logging. The principal of beta ray attenuation is used to provide a simple determination of mass concentration. An external pump pulls a measured amount of air through a filter tape for a one-hour period. The filter tape, impregnated with ambient dust, is placed between the source and the detector thereby causing the attenuation of the measured beta-particle signal. The degree of attenuation of the beta-particle signal is used to determine the mass concentration of particulate matter on the filter tape and hence the hourly volumetric concentration of particulate matter in the ambient air.

Gravimetric samplers draw air through a specially designed inlet that excludes particles larger than 10 microns in diameter for a period of 24 hours. The particles are collected on a Teflon filter that is weighed to determine the particulate mass. These samplers report the air volume measured during the sampling period allowing the concentration (mass/volume) to be calculated.

4.5.1 Monitoring Requirements

The number of required PM_{10} monitors in each CBSA is determined by the CBSA population and design value, as specified in Table D-5 of Appendix D to 40 CFR Part 58. Table 4-6 shows that the MDE monitoring network meets or exceeds the minimum requirements.

Table 4-6 Number of PM_{10} SLAMS Sites Required (based on Table D–4, Appendix D to 40 CFR Part 58, PM_{10} Minimum Monitoring Requirements)

MSA Name	Population	Monitors Required[A]	Active Monitors in MD/Total[B]
Baltimore-Towson, MD	2,753,149	2-4	3/3
Hagerstown-Martinsburg, MD-WV	256,278	0-1	0/0
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	2-4	1/7
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	2-4	0/4
Salisbury, MD-DE	381,868	0-1	0/0

A – All of the listed MSA's have PM_{10} ambient concentrations well below 80% of the PM_{10} NAAQS.
B –Based on tables available at http://www.epa.gov/airtrends/values.html.

Minimum Requirements for Collocated PM_{10}

A minimum of 15% (round up), or at least one, of the PM_{10} monitors must be collocated as specified in 40 CFR Part 58 Appendix A 3.3.1. MDE has 3 PM_{10} monitors and two are collocated, thereby meeting this requirement.

4.5.2 Sources

Major sources of PM_{10} include steel mills, power plants, motor vehicles, industrial plants, unpaved roads, and agricultural tilling. The wide variety of PM_{10} sources means that the chemical and physical composition of coarse particles is highly variable.

4.5.3 Changes Planned for 2016-2017

MDE is proposing to terminate the PM_{10} monitoring at BCFD and to move the Partisol 2025 instrument from there to Oldtown in an effort to streamline resources in the monitoring network. Oldtown in only four miles northwest of BCFD and characterizes similar air quality. The PM monitors at BCFD are located on the roof of a fire department and can be difficult to access. This move would preserve the same number of PM_{10} monitors in the Baltimore-Towson MSA.

MDE is proposing to terminate the PM_{10} monitoring at Piney Run. Although this monitor is part of the $PM_{10-2.5}$ (PM Coarse) monitoring requirements for NCore sites, MDE is requesting a waiver because the values are low and because the monitor can be used as a spare or to replace the FRM monitor at Essex. The IMPROVE PM_{10} monitor is not an FEM and therefore cannot be used to determine compliance with the NAAQS, however the instrument is similar to the FEM. The highest 24-hour (daily) average value, based on IMPROVE data, did not exceed 40 $\mu g/m^3$ over last 5 years (figure 4-1) and this is well below the 24-hour NAAQS of 150 $\mu g/m^3$.

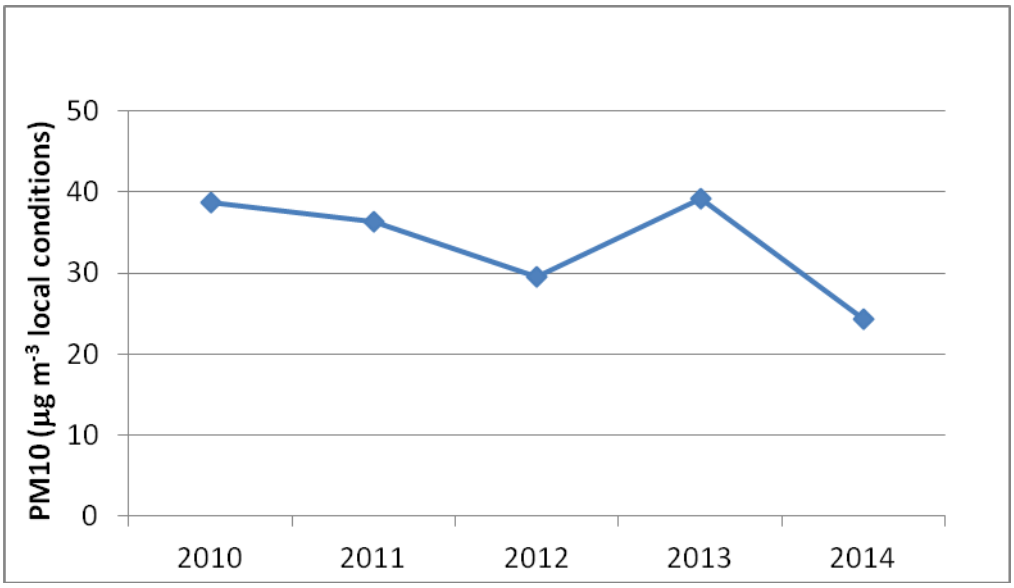

Figure 4-1 Maximum 24-hour (daily) Average PM_{10} values at Piney Run, 2010-2014. Source: IMPROVE data

4.6 Fine Particulate Matter ($PM_{2.5}$) – General Description and Sampling Method

MDE also uses both manual gravimetric and automated monitors (BAM's) to measure $PM_{2.5}$ mass concentrations. A filter attached to the inlets of these monitors excludes particles having diameters greater than 2.5 microns. Otherwise, the monitors work as described for PM_{10} gravimetric and automated monitoring. Some of the gravimetric monitors are specially equipped to collect $PM_{2.5}$ samples, which are later analyzed into concentrations of the samples' chemical constituents or species. See Table 3-4 for list of speciated $PM_{2.5}$ mass. MetOne Super SAAS samplers, URG 3000N, and IMPROVE samplers are used for the collection of samples for the chemical speciation of $PM_{2.5}$. The samplers collect 3 to 4 filter samples simultaneously every third or sixth day for a period of 24 hours. These samples are then sent to an EPA contract laboratory for chemical analyses. There are over 50 species consisting of ions, metals, and carbon species quantified by the analyses (Table 3-6).

4.6.1 Monitoring Requirements

The number of required $PM_{2.5}$ monitors in each MSA is determined by the MSA population and design value, as specified in Table D-5 of Appendix D to 40 CFR Part 58. Table 4-7 shows that the MDE monitoring network meets or exceeds the minimum requirements.

Table 4-7 Number of $PM_{2.5}$ SLAMS Sites Required (based on Table D–5, Appendix D to 40 CFR Part 58, $PM_{2.5}$ Minimum Monitoring Requirements)

MSA Name	Population	Annual Design Value	Daily Design Value	Required SLAMS Monitors	Monitors Active in MD/Total[A,B]	Required ≥ 85% NAAQS
Baltimore-Towson, MD	2,753,149	10.5	26	3	8/8	3
Hagerstown-Martinsburg, MD-WV	256,278	10.7	27	1	1/2	1
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	10.1	23	2	3/10	3
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	12.4	31	3	1/6	2
Salisbury, MD-DE	381,868	8.5	23	0	0/1	0

A - Based on tables available at http://www.epa.gov/airtrends/values.html.
B- Total number of monitors includes those located in other States.

Minimum Requirements for Collocated $PM_{2.5}$

Collocation requirements for $PM_{2.5}$ are based on the number of $PM_{2.5}$ monitors within a Primary Quality Assurance Organization (PQAO) and by measurement method (FRM or FEM) as specified in 40 CFR Part 58 Appendix A 3.2.5 and Appendix D 4.7.2. MDE is its own PQAO so all monitors in Maryland are counted in the collocation requirements. A minimum of 15% (round up) of the monitors must be collocated. MDE has 16 $PM_{2.5}$ monitoring stations; therefore at least 2 must be collocated. MDE currently operates three collocated $PM_{2.5}$ monitors, one FRM-FRM (Howard U), one FRM-FEM (Oldtown), and one FEM-FRM (Padonia). The additional FRM-FRM collocation at PG Equestrian Center is redundant and we are proposing to discontinue operation there (see section 4.6.4.)

Requirements for Continuous $PM_{2.5}$ Monitoring

At least one-half (round up) of the minimum number of sites per MSA must operate continuous $PM_{2.5}$ monitors. MDE operates 11 continuous $PM_{2.5}$ monitors, four in the Baltimore-Towson, MD MSA; two in the Washington-Arlington-Alexandria, DC-VA-MD-WV MSA; one in the Philadelphia-Camden-Wilmington-Newark, PA-DE-MD MSA; and one in the Hagerstown-Martinsburg, MD-WV MSA. The other three are in areas not designated as MSA's (Tables 3.2a and 3.2b).

Requirements for Near Road $PM_{2.5}$ Monitoring

For MSA's with a population of one million or greater, at least one $PM_{2.5}$ monitor is to be located at a near road NO_2 station. The Howard County near road site fulfills this requirement for the Baltimore-Towson, MD MSA. MDE does not operate near road NO_2 stations in any other MSA (Section 4.3.1).

Requirements for $PM_{2.5}$ Chemical Speciation

Each state shall continue to conduct chemical speciation monitoring and analyses at sites designated to be part of the $PM_{2.5}$ Speciation Trends Network (STN). MDE conducts chemical speciation monitoring at Essex and Howard U-Beltsville, and Howard U-Beltsville is designated as part of the STN.

Other Requirements for $PM_{2.5}$ Monitoring

The required monitoring sites must be located to represent area-wide air quality. These will typically be either neighborhood or urban scale, although micro or middle scale may be appropriate in some urban areas. At least one monitoring site must be neighborhood scale or greater in an area expected maximum concentration and one site must be sited in an area of poor air quality. Each State shall have at least one $PM_{2.5}$ site to monitor for regional background and at least one $PM_{2.5}$ site to monitor for regional transport. Each NCORE station must operate a $PM_{2.5}$ monitor. Table 4-7 shows that MDE meets all of these additional requirements.

4.6.2 Sources

$PM_{2.5}$ pollution is emitted from combustion activities, such as industrial and residential fuel burning and motor vehicles. $PM_{2.5}$ can also form in the atmosphere from precursor compounds through various physical and chemical processes.

Table 4-8 Monitor Objective Types and Scales Assigned to Monitors in the Maryland $PM_{2.5}$

Site Name	Measurement Scale	Monitor Objective	MSA
Oldtown	Middle Scale	Highest Concentration	Baltimore-Towson, MD
Howard Co. Near Rd	Microscale	Highest Concentration/ Source Oriented	Baltimore-Towson, MD
Glen Burnie	Neighborhood	Population Exposure	Baltimore-Towson, MD
Padonia	Neighborhood	Population Exposure	Baltimore-Towson, MD
Essex	Neighborhood	Population Exposure	Baltimore-Towson, MD
Edgewood	Neighborhood	Population Exposure	Baltimore-Towson, MD
NW Police Station	Neighborhood	Population Exposure	Baltimore-Towson, MD
BCFD-20	Neighborhood	Population Exposure	Baltimore-Towson, MD
Hagerstown	Urban Scale	Population Exposure/ Highest Concentration	Hagerstown-Martinsburg, MD-WV
Fair Hill	Regional Scale	Population Exposure	Philadelphia-Camden-Wilmington, PA-DE-MD
Rockville	Neighborhood	Population Exposure	Washington-Arlington-Alexandria, DC-VA-MD-WV
Howard U.	Urban Scale	Population Exposure	Washington-Arlington-Alexandria, DC-VA-MD-WV
PG Equestrian Center	Neighborhood	General/Background	Washington-Arlington-Alexandria, DC-VA-MD-WV
Horn Point	Regional Scale	Population Exposure	NA
Millington	Neighborhood	Population Exposure	NA
Piney Run	Regional Scale	Regional Transport	NA

4.6.3 Applicability of FEM Data for Comparison to the NAAQS and Reporting the AQI

MDE operates both FRM and FEM $PM_{2.5}$ monitors (Tables 3.2a, 3.2b, and 3.3). Pursuant to the January, 15 2013 revisions to $PM_{2.5}$ monitoring requirements, MDE recommends that all of the FEM monitors currently operating in the MDE monitoring network remain eligible for comparison to the $PM_{2.5}$ NAAQS and for reporting the AQI. This recommendation applies retrospectively to FEM data collected since the first quarter of 2012, and prospectively for data collected in 2016 and 2017. MDE will re-evaluate this recommendation for FEM data collected in the 36 months prior to January 1, 2015 and 2016 in next year's Annual Network Plan.

4.6.4 Changes Planned for 2016-2017

FRM monitors require more work-hours for pick-up and drop-off of samples, quality assurance is more time-consuming than for FEM monitors, and there are also costs associated with analyzing the filters. In an effort to increase efficiency of operations and reduce costs, MDE is proposing to discontinue some of the FRM $PM_{2.5}$ monitors. Because MDE is operating more monitors than required by 40 CFR Part 58, Appendix D, there is an opportunity to promote efficiency by reducing the network size while still meeting EPA requirements.

MDE is proposing discontinuing three FRM $PM_{2.5}$ monitors in the Washington-Arlington-Alexandria MSA: one monitor at the Glen Burnie site and the two collocated monitors at the PG Equestrian Center. The PG Equestrian Center monitor has the lowest $PM_{2.5}$ design value in the state. The Glen Burnie monitor has the same design value as the HU-Beltsville monitor (9.5 $\mu g/m^3$). These monitors are not required by 40 CFR Part 58, Appendix D. Additionally, because of the lower fine particle concentrations throughout the state, the monitors are no longer needed to ensure an adequate fine particle network. Finally, the requirement for FRM-FRM collocation is being met at HU-Beltsville, making the two collocated monitors at the PG Equestrian Center redundant and unnecessary.

MDE is proposing discontinuing the FRM $PM_{2.5}$ monitor at BCFD and moving the PM_{10} monitor from BCFD to Oldtown (section 4.5), both located in the Baltimore-Towson MSA. Oldtown currently measures the largest $PM_{2.5}$ design value in the state (though it is below the NAAQS). Oldtown is only four miles northwest of BCFD and characterizes similar air quality. The PM monitors at BCFD are located on the roof of a fire department and can be difficult to access.

4.7 Sulfur Dioxide (SO_2) – General Description and Sampling Method

Sulfur dioxide (SO_2) is measured with a fluorescence analyzer. Air is drawn through a sample cell where it is subjected to high intensity ultraviolet light. This causes the sulfur dioxide molecules in the air to fluoresce and release light. The fluorescence is detected with a photo multiplier tube and converted to an electrical signal proportional to the SO_2 concentration.

On August 10, 2015, the U.S. Environmental Protection Agency finalized requirements for air agencies to monitor or model ambient SO_2 levels in areas with large sources of SO_2 emissions to help implement the 1-hour SO_2 National Air Ambient Quality Standard (NAAQS). This final rule establishes that, at a minimum, air agencies must characterize air quality around sources that emit 2,000 tons per year (tpy) or more of SO_2. On January 5, 2016, MDE notified EPA Region III of six SO_2 emissions sources located in Maryland for which the state will be required to submit further air quality characterization. These sources are listed in Table 4-9, along with 2014 emissions data.

Table 4-9 Maryland's Draft List of Sources Subject to the Final, 1-hour SO_2 Data Requirements Rule.*

Facility Name	CAMD SO_2 (tons)	MDE Data System (TEMPO) SO_2 (tons)
Brandon Shores	3,145.09	12,757.31**
CP Crane	1,887.16	1,890.04
Chalk Point	3,928.48	3,933.20
Herbert A Wagner	9,610.26	12,757.31**
Verso Luke Mill	N/A	16,999.39
Morgantown	2,961.76	3,134.47

*Note that every other source in Maryland emits less than 1,000 tpy of SO_2, per TEMPO 2014 data.
** This is the total for Ft. Smallwood, including both Brandon Shores and HA Wagner
CAMD: Clean Air Markets Division

An air agency may avoid the requirement for air quality characterization near a source by adopting enforceable emission limits that ensure that the source will not emit more than 2,000 tpy of SO2. This final rule gives air agencies the flexibility to characterize air quality using either modeling of actual source emissions or using appropriately sited ambient air quality monitors. At the time of this publication, all sources except Verso Luke Mill are expected to model their emissions. Verso Luke Mill submitted a draft monitoring plan to MDE in March 2016. When Verso Luke Mill has submitted a complete package of material describing their proposed monitoring plan, an addendum to this Network Plan will be published and made available for a separate 30-day public comment period. The same July 2016 submission deadline to EPA will apply to this addendum.

4.7.1 Monitoring Requirements

The minimum number of required SO_2 monitors in each MSA is proportional to the product of the total amount of SO_2 emissions in the MSA and its population, as specified in 40 CFR Part 58, Appendix D, Section 4.4. The resulting value is defined as the Population Weighted Emissions Index (PWEI). SO_2 emissions shown in Table 4-10 are from the 2011 National Emissions Inventory (NEI).

Table 4-10 Minimum SO_2 Monitoring Requirements

MSA Name	Population	2011 NEI SO_2 (tons/year)	PWEI (millions of people-tons per year)	Monitors Required	Monitors Active in MD/Total[A]
Baltimore-Towson, MD	2,753,149	25,933	71,398	1	1/1
Hagerstown-Martinsburg, MD-WV	256,278	3,306	847	0	0/0
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,860,342	21,513	126,074	2	1/5
Salisbury, MD-DE	381,868	10,772	4,114	0	0/0
Philadelphia-Camden-Wilmington-Newark, PA-DE-MD	6,018,800	22,647	136,310	2	0/11

A - Based on tables available at http://www.epa.gov/airtrends/values.html.

Other SO_2 Monitoring Requirements

The Regional Administrator may require additional SO_2 monitoring stations above the minimum in areas where the minimum requirements are not deemed sufficient to meet monitoring objectives. There are no additional monitors required in Maryland by the Regional Administrator.

Each NCore station must operate a SO_2 monitor. This requirement is met at both the HU-Beltsville and Piney Run monitoring stations.

4.7.2 Sources

The main sources of SO_2 are combustion of coal and oil (mostly from electrical generating units (EGUs), refineries, smelters, and industrial boilers). Nationally, two-thirds of all sulfur dioxide emissions are from EGUs. Coal operated EGUs account for 95% of these emissions.

4.7.3 Changes Planned for 2016-2017

No changes planned.

4.8 Photochemical Assessment Monitoring Stations (PAMS) – General Description and Sampling Method

The purpose of the PAMS program is to provide an air quality database that will assist in evaluating and modifying control strategies for attaining the ozone NAAQS. The selection of parameters to be measured at a PAMS site varies with the site's ozone nonattainment designation (moderate, serious, severe or extreme) and whether the site is upwind or downwind of ozone precursor source areas. The parameters are O_3, NO, NO_x, NO_2, NO_y and speciated volatile organic compounds (VOC's).

On October 1, 2015, the new ozone NAAQS was finalized, which included updated PAMS requirements. However, states have until 2019 to meet these new PAMS requirements, and MDE will address those in the 2019 Monitoring Network Plan, which will be due July 1, 2018.

Methods used to sample and analyze VOC's and NO_y follows (NO/NO_x and O_3 have already been described in Sections 4.3 and 4.4, respectively):

- Ambient air is collected in eight 3-hour canister samples every 3rd day(June – August) using a XonTech Model 910A Canister Sampler with a Model 912 multi-canister sampling adapter. The canisters are returned to the laboratory for analysis on an EnTech/Agilent GC/FID system.
- Ambient air is collected in 24-hour canister samples every sixth day using a XonTech Model 910A/Atec Model 2200 Canister Sampler. The canisters are returned to the laboratory for analysis on an EnTech/Agilent GC/FID system. These are the same canister samples listed in section 4.9 below but analyzed for the PAMS list of compounds.
- Ambient air is collected and analyzed on-site every hour (June – August) using a Perkin Elmer VOC Air Analyzer with dual flame ionization detectors.
- Ambient air is sampled hourly for NO_y using a TECO, Model 42C low level oxides of nitrogen analyzer.

4.8.1 Monitoring Requirements and Locations

Design criteria for the PAMS network are based on locations relative to ozone precursor source areas and predominant wind directions associated with high ozone events (40 CFR 58 Appendix D, 5.1). There are specific monitoring objectives associated with each location. The overall design should enable characterization of precursor emissions sources within ozone Non-Attainment Areas (NAA), transport of ozone and its precursors, and the photochemical processes related to ozone nonattainment. Specific monitoring objectives associated with each of these sites may result in four distinct site types:

- Type 1 sites are intended to characterize upwind background and transported ozone and its precursor concentrations entering the area and will identify those areas which are subjected to transport.

- Type 2 sites are intended to monitor the magnitude and type of precursor emissions in the area where maximum precursor emissions are expected to impact and are suited for the monitoring of urban air toxic pollutants.
- Type 3 sites are intended to monitor maximum ozone concentrations occurring downwind from the area of maximum precursor emissions.
- Type 4 sites are intended to characterize the downwind transported ozone and its precursor concentrations exiting the area and will identify those areas which are potentially contributing to overwhelming transport in other areas.

A Type 2 site is required for each PAMS area. Only two sites are required for each area, providing all chemical measurements are made. The PAMS network for the Baltimore NAA is described in Table 4-11. There are two PAMS monitoring stations in the Baltimore, MD NAA: the HU-Beltsville Type 1 site and Essex Type 2 site. The HU-Beltsville station also doubles as a Type 3 site for the Washington, DC NAA PAMS network. Note that the HU-Beltsville PAMS station serves different objectives for the Baltimore and Washington NAA's. The required PAMS monitoring locations and frequencies from the PAMS monitoring rule (40 CFR 58, Appendix D, Table D-6) are provided in Table 4-12. The requirements are all being met.

Table 4-11 Monitoring Details for PAMS Network

Site Name	PAMS Type	Parameters observed	Monitoring objective
Essex	Type 2	O_3	Population exposure
		VOCs	Maximum precursor emissions impact Population exposure
		NO_x	Maximum precursor emissions impact Population exposure
		CO	Maximum precursor emissions impact Highest concentration Population exposure
HU-Beltsville	Type 1/3	O_3	Highest concentration
		VOCs	Upwind background / Population exposure
		NO_y, NOx	General/Background
		CO	General/Background

Table 4-12 Summary of Required PAMS Monitoring Locations and Frequencies

Measurement	Where required	Sampling frequency (all daily except for upper air meteorology)	Status
Speciated VOC	Two sites per area, one of which must be a Type 2 site	During the PAMS monitoring period: (1) Hourly auto GC, or (2) Eight 3-hour canisters, or (3) 1 morning and 1 afternoon canister with a 3-hour or less averaging time plus Continuous Total Non-methane Hydrocarbon measurement.	Met at Essex (Type 2, auto GC)) and HU-Beltsville (Type 1/ 3, canisters)
Carbonyl sampling	Type 2 site in areas classified as serious or above for the 8-hour ozone standard	3-hour samples every day during the PAMS monitoring period.	Met at Essex (Type 2)
NO_X	All Type 2 sites	Hourly during the ozone monitoring season.	Met at Essex (Type 2) and HU-Beltsville (Type 1/3)
NO_y	One site per area at the Type 3 or Type 1 site	Hourly during the ozone monitoring season.	Met at HU-Beltsville (Type 1/3)
CO (ppb level)	One site per area at a Type 2 site	Hourly during the ozone monitoring season.	Met at Essex (Type 2) and HU-Beltsville (Type 1/3)
Ozone	All sites	Hourly during the ozone monitoring season.	Met at Essex and HU-Beltsville
Surface met	All sites	Hourly during the ozone monitoring season.	Met at Essex and HU-Beltsville
Upper air meteorology	One representative location within PAMS area	Sampling frequency must be approved as part of the annual monitoring network plan required in 40 CFR 58.10.	Met at HU-Beltsville.

4.8.2 Sources

PAMS VOC's can come from automobiles, gasoline vapors, and a vast variety of large and small commercial, and industrial sources that use chemical solvents, paint thinners and other chemical compounds.

4.8.3 Changes Planned for 2016-2017

No changes planned.

4.9 Air Toxics – General Description and Sampling Method

Air toxics, or hazardous air pollutants (HAPS), are those pollutants which are known or suspected to cause cancer or other serious health effects, such as reproductive or birth defects, or adverse environmental effects. MDE's air toxics network measures the toxic VOCs listed in Table 3-6. Air toxics samples are collected for 24 hours in canisters with a XonTech 910A or Atec 2200 canister sampler on an every sixth day schedule. The canisters are returned to the laboratory for analysis on an Entech/Agilent gas chromatograph mass spectrometer system.

4.9.1 Monitoring Requirements

As part of the EPA Region III Cooperative Toxic Monitoring Program, MDE operates four air toxic monitoring stations to assess general urban levels. Toxics are sampled every sixth day year-round.

4.9.2 Monitoring Locations

There are four monitors measuring air toxics in Maryland: Essex, Baltimore County; Oldtown, Baltimore City; Howard County Near Road, Howard County; and HU-Beltsville, Prince George's County. Refer back to Table 3-2 Monitor Information for Current Maryland Ambient Air Monitoring Sites, for parameter information and monitoring objective at each monitoring site. For a map of monitoring locations in Maryland refer to Figure 3-1.

4.9.3 Sources

Toxics can come from automobiles, gasoline vapors, and a large variety of large and small commercial and industrial sources that use chemical solvents, paint thinners and other chemical compounds.

4.9.4 Changes Planned for 2016-2017

No changes planned.

4.10 NCore – General Description and Sampling Method

NCore, or National Core multi-pollutant monitoring stations, is the National monitoring network required in the October 17, 2006 revisions to the air monitoring regulations (40CFR, Part 58). NCore sites are required to measure, at a minimum, $PM_{2.5}$ particle mass using continuous and integrated/filter-based samplers, speciated $PM_{2.5}$, $PM_{10-2.5}$ particle mass, speciated $PM_{10-2.5}$, O_3, SO_2, CO, NO/NO_y, wind speed, wind direction, barometric pressure, rain, relative humidity, and ambient temperature.

Sampling methods for $PM_{2.5}$, speciated $PM_{2.5}$, O_3, SO_2, NO/ NO_y are described under the individual pollutant sections throughout this document. Trace level measurement of CO and SO_2 is performed at NCore sites. $PM_{10-2.5}$ or PMCoarse is determined by the difference between collocated PM_{10} and $PM_{2.5}$ FRM samplers. There is no generally accepted method to perform $PM_{10-2.5}$ chemical speciation at this time.

The meteorological parameters (Table 3-4) are measured as follows:

- The Vaisala WXT520 PTU module contains separate sensors for pressure, temperature and humidity measurement. The measurement principle of the pressure, temperature and humidity sensors is based on an advanced RC oscillator and two reference capacitors against which the capacitance of the sensors is continuously measured. The microprocessor of the transmitter performs compensation for the temperature dependency of the pressure and humidity sensors.
- The Vaisala WXT520 uses RAINCAP Sensor 2- technology in precipitation measurement. The precipitation sensor comprises of a steel cover and a piezoelectrical sensor mounted on the bottom surface of the cover. The precipitation sensor detects the impact of individual raindrops. Hence, the signal of each drop can be converted directly to accumulated rainfall. An advanced noise filtering technique is used to filter out signals originating from other sources and not raindrops.
- The Vaisala WXT520 uses WINDCAP sensor technology in wind measurement. The wind sensor has an array of three equally spaced ultrasonic transducers on a horizontal plane. Wind speed and wind directions are determined by measuring the time it takes the ultrasound to travel from each transducer to the other two. The wind sensor measures the transit time (in both directions) along the three paths established by the array of transducers. This transit time depends on the wind speed along the ultrasonic path. For zero wind speed, both the forward and reverse transit times are the same. With wind along the sound path, the up-wind direction transit time increases and the down-wind transit time decreases.

MDE operates other meteorological parameters not required by the NCore network, and they are measured as follows:

- MetOne's Model 092 instrument is used to measure barometric pressure. The instrument directly senses the weight of the air column or the atmospheric pressure.
- The Climatronics's P/N 102342 Pyranometer is used to measure solar radiation. The detector element is a circular wire bound multi-junction thermopile. This thermopile sensor absorbs solar radiation and converts it to heat. The heat flows through the sensor to the pyranometer housing and generates a voltages output signal that is proportional to the solar radiation.

4.10.1 Monitoring Requirements

Each State is required to operate one NCore site. Urban NCore stations are to be located at the urban or neighborhood scale to provide representative concentrations of exposure expected throughout the metropolitan area. Rural NCore stations are to be located to the maximum extent practicable at a regional or larger scale away from any large local emission source so that they represent ambient concentrations over an extensive area.

4.10.2 Monitoring Locations

MDE operates two NCore stations, at HU-Beltsville and Piney Run. The Beltsville site is considered an Urban NCore site and Piney Run, a Rural NCore site. Refer to Table 3-2 for parameter information and monitoring objective at each site. For a map of monitoring locations in Maryland, refer to Figure 3-1.

4.10.3 Sources

Sources have already been addressed under the individual pollutant sections throughout this document.

4.10.4 Changes Planned for 2016-2017

No changes planned.

MARYLAND

DEPARTMENT OF THE ENVIRONMENT

APPENDIX A

TOPOGRAPHIC AND AREAL MAPS and SITE DESCRIPTIONS of AIR MONITORING STATIONS IN MARYLAND

Prepared for:

U.S. Environmental Protection Agency

Prepared by:

Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

April 15, 2016

MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard | Baltimore, MD 21230 | www.mde.maryland.gov
410-537-3000 | 800-633-6101 | TTY Users: 800-735-2258
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Ben Grumbles, *Secretary*

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TABLE of FIGURES

Title **Page**

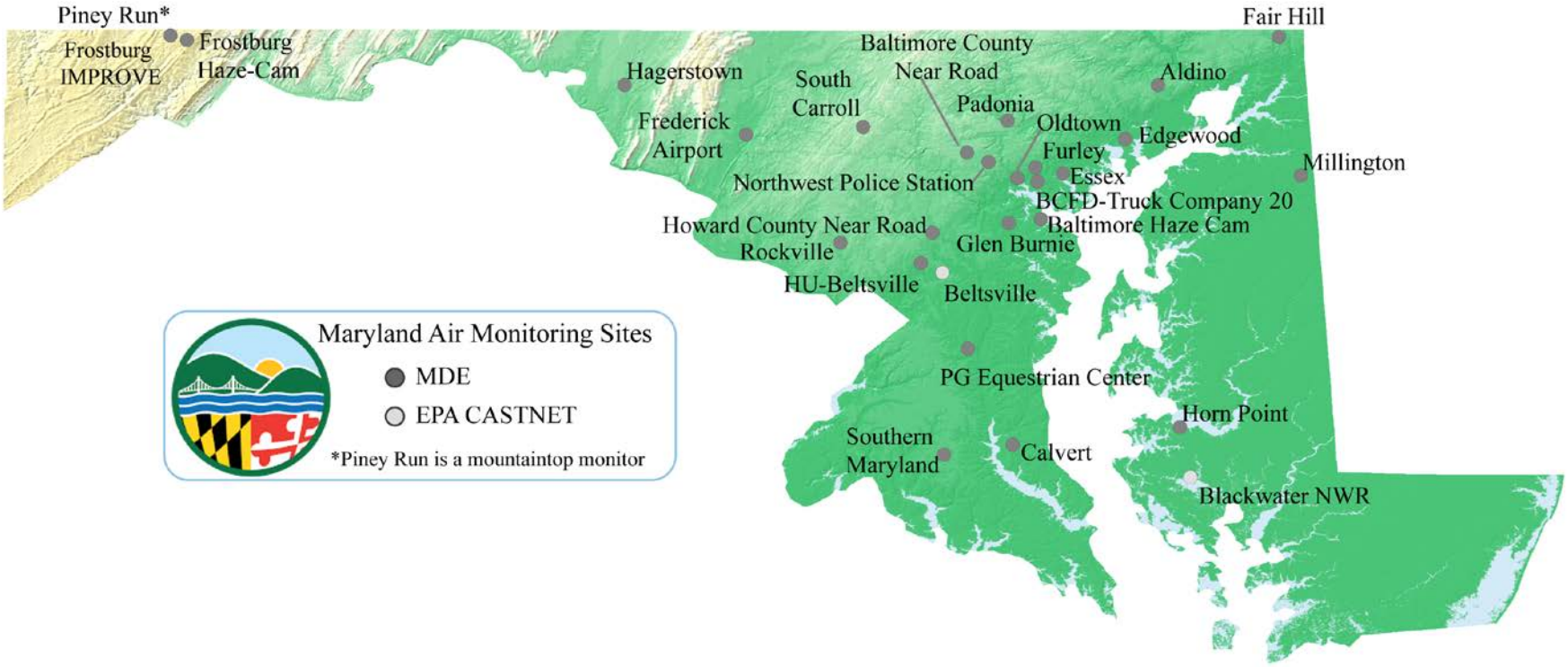

Figure A- 1. Topographic map of air monitoring sites in Maryland.

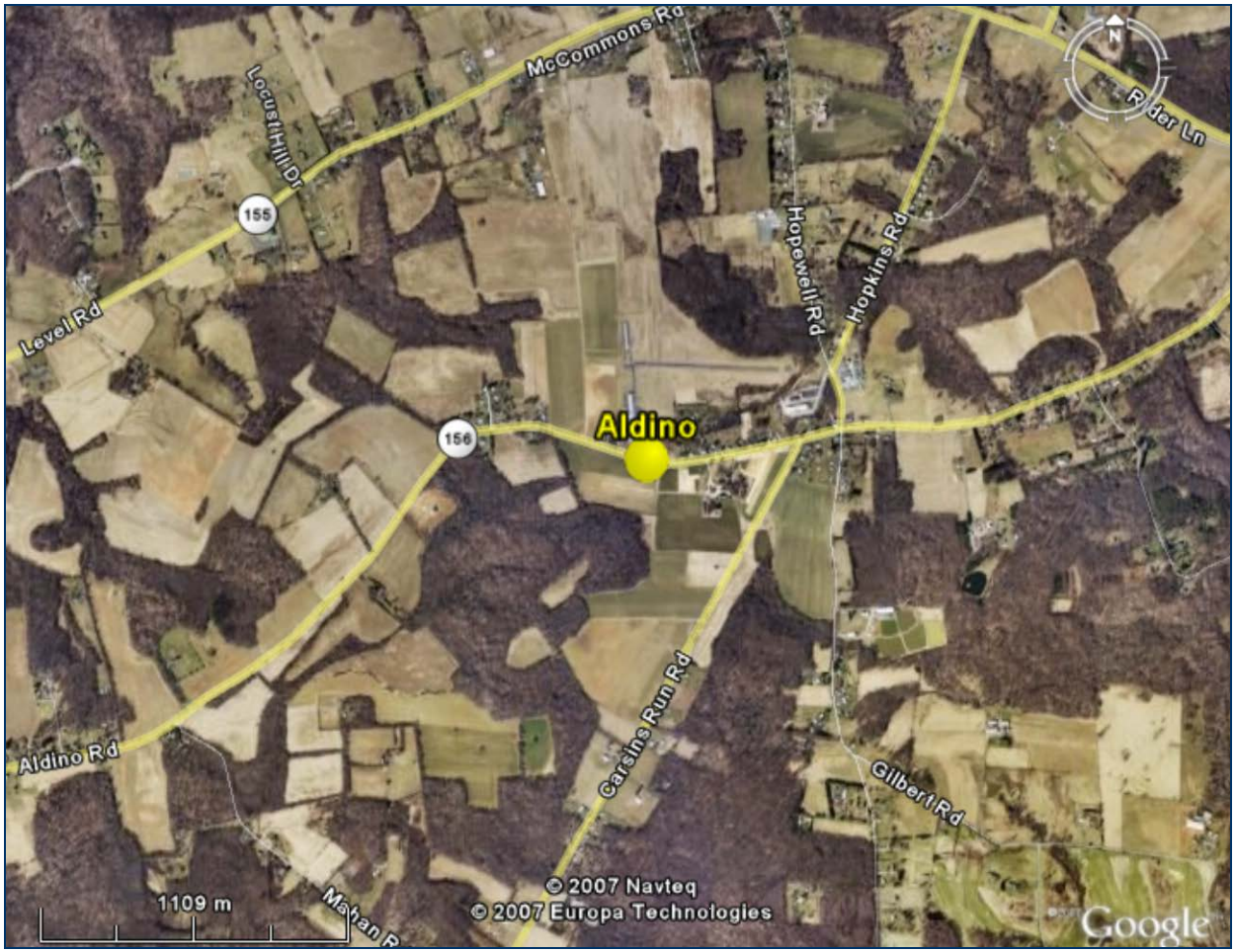

Figure A- 2. Areal map of Aldino air monitoring site in Harford County, MD. Aldino was chosen as a seasonal ozone monitoring site because of the potential to measure the highest concentration of ozone at an urban measurement scale in a suburban setting. To the north of the Aldino monitoring site lies a two lane road, Aldino Road, about 20 feet from the side of the shelter, with a couple of telephone poles and a sod field on the far side of the road. To the east and directly next to the shelter is a parking lot to hold a single row of about 20 cars. At the far end of the parking lot is a one-story office building belonging to Harford Air Services. There are several small airplanes and several hangars behind the office building. To the south is a large flat grassy field containing a grass/dirt runway and another small hangar. To the west is the end of the runway, a house just past the runway, and the continuation of Aldino Road and the sod farm.

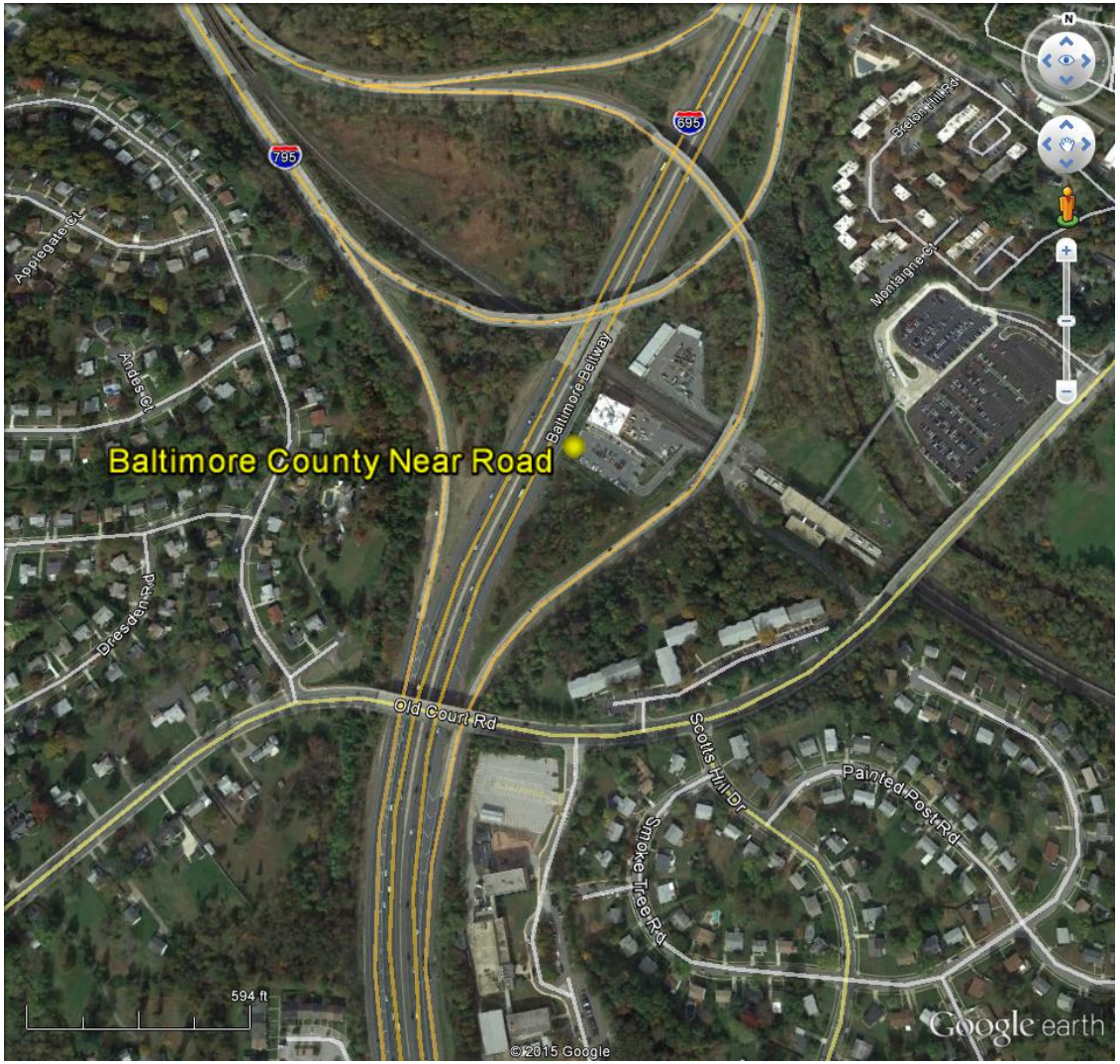

Figure A- 3. Areal map of the Baltimore County Near Road air monitoring site in Baltimore County, MD. BCNR, located in a suburban setting, was chosen as a site for monitoring air quality near roads, including NO, NO_2, and NO_x, source-oriented/highest concentration at the microscale. The BCNR site is in the back left corner of a Metro Station parking lot next to a gazebo that is to the left of the site.

Figure A- 4. Areal map of Baltimore Haze Cam site at Brandon Shores in Anne Arundel County, MD. Brandon Shores was chosen as a Haze Cam site for the purpose of providing public notification of visibility in an urban setting. The location provides an excellent vista of downtown Baltimore City.

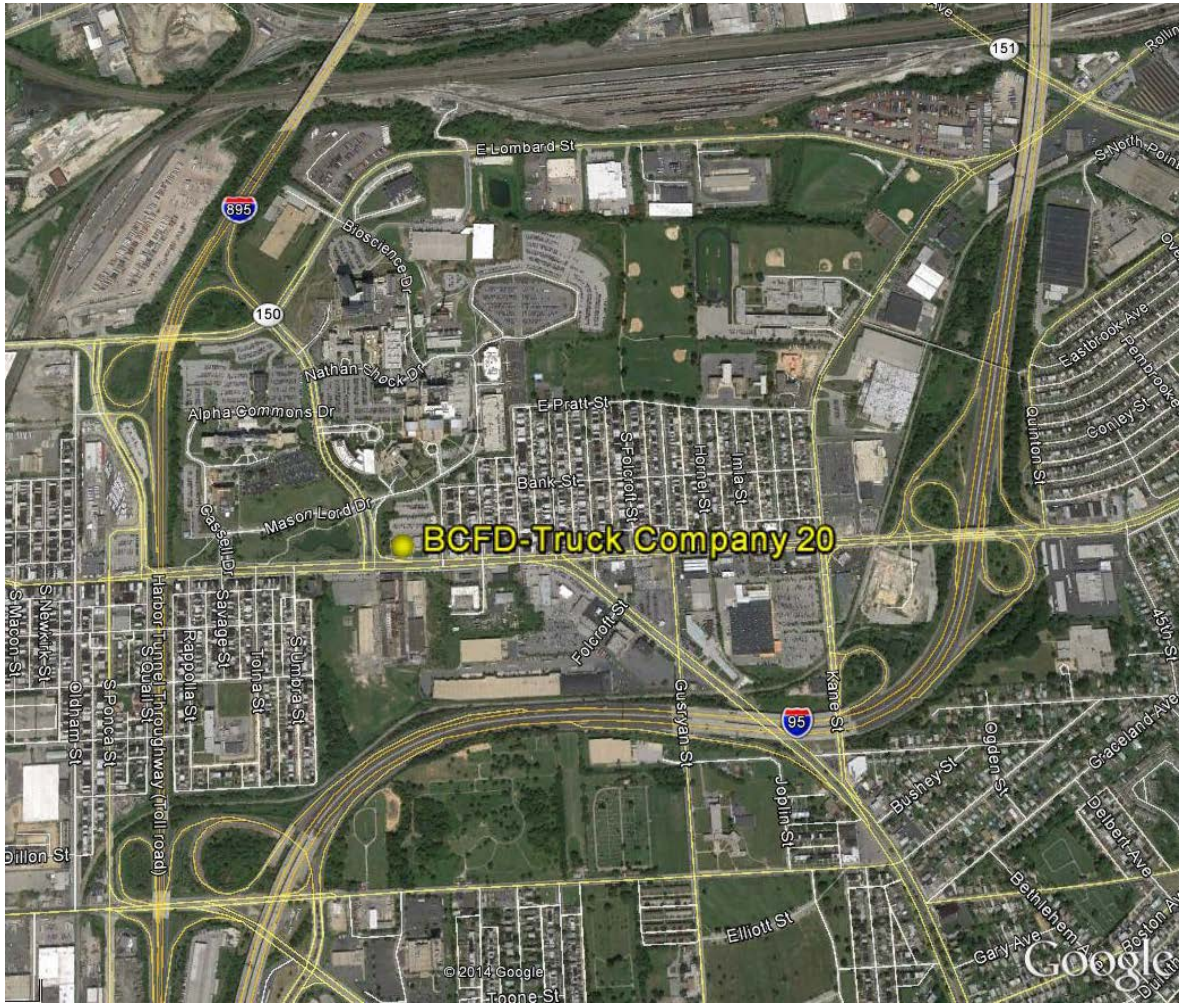

Figure A- 5. Areal map of BCFD-Truck Company 20 air monitoring site in Baltimore City, MD. BCFD-20 was chosen as a PM monitoring site because of the potential to measure the population exposure of PM at the neighborhood scale in an urban setting. The monitors are located on the south-easternmost corner of the roof top of the fire department. The building is about two stories tall with a flat roof. To the east is a side street with row houses, cars, and a small convenience store. To the south is Eastern Ave., which is 5 lanes wide. Past Eastern Ave. are a few warehouses and a grassy flat area with a few trees to hide interstate 95 in the far distance. To the west is the police station and the entrance to Johns Hopkins Bayview Hospital, and the city continuing behind it. To the north past the end of the roof top is a parking lot for the fire department.

Figure A- 6. Areal map of Beltsville CASTNET air monitoring site in Prince George's County, MD. Beltsville was chosen as an ozone monitoring site in the CASTNET network because of the potential to measure the highest concentration of ozone at a regional measurement scale.

Figure A- 7. Areal map of Blackwater NWR CASTNET air monitoring site in Dorchester County, MD. Blackwater was chosen as an ozone monitoring site in the CASTNET network because of the potential to measure the highest concentration of ozone at a regional measurement scale.

Figure A- 8. Areal map of Calvert air monitoring site in Calvert County, MD. Calvert was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban measurement scale in a rural setting. The site is located at a recycling facility on a paved parking lot adjacent to a large radio tower that is several hundred feet high.

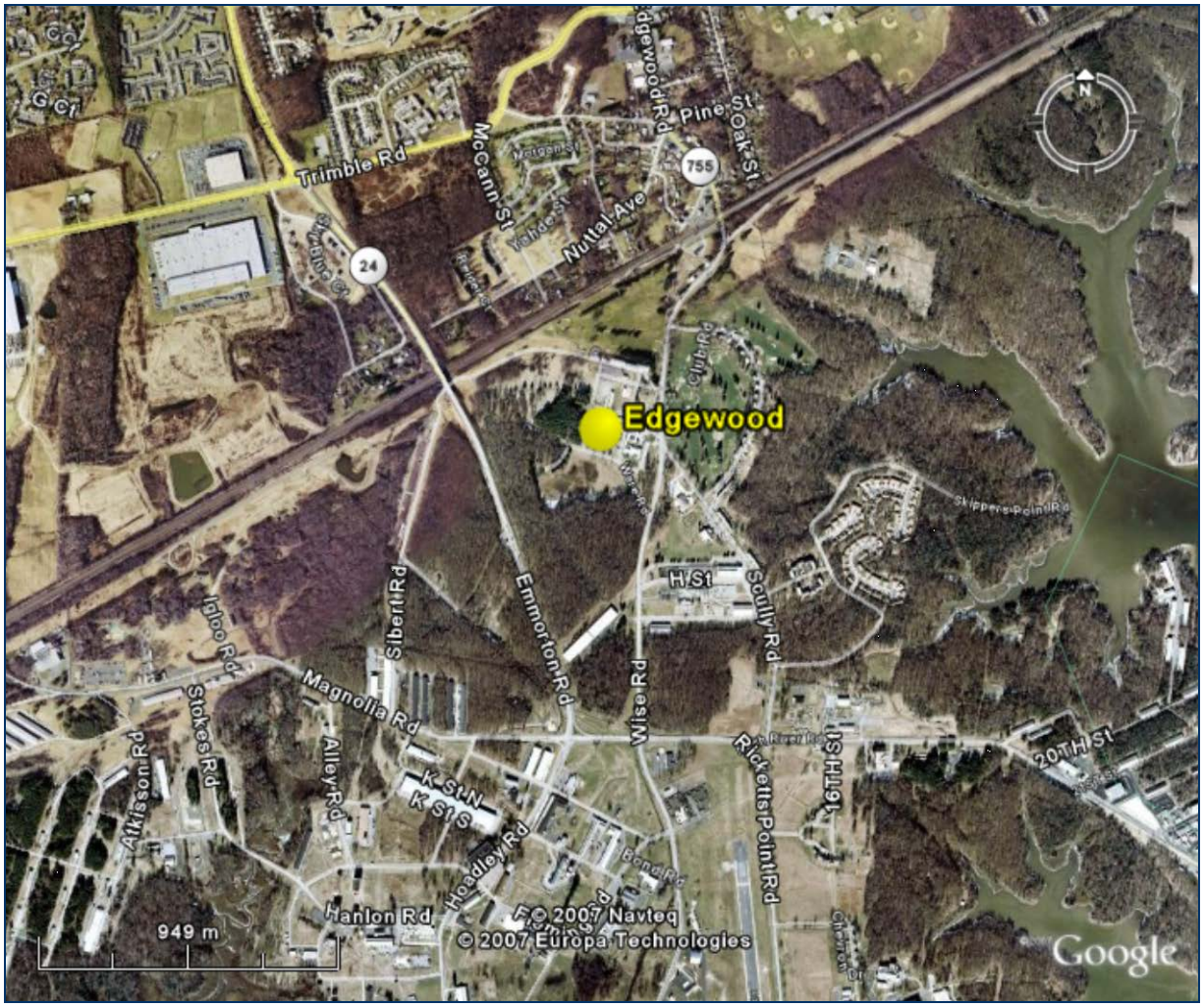

Figure A- 9. Areal map of Edgewood air monitoring site in Harford County, MD. Edgewood was chosen as a seasonal ozone monitoring site because of the potential to measure the highest concentration of ozone at the urban measurement scale. It was chosen as a $PM_{2.5}$ monitoring site because it has the potential to measure population exposure to PM at the neighborhood scale. It is located in a rural setting. The site is located within the Aberdeen Proving Grounds. Adjacent to the site are woods, a few small buildings, and mobile units that the Army uses as storage for their own ambient air monitoring equipment. The site is several miles west of the Chesapeake Bay.

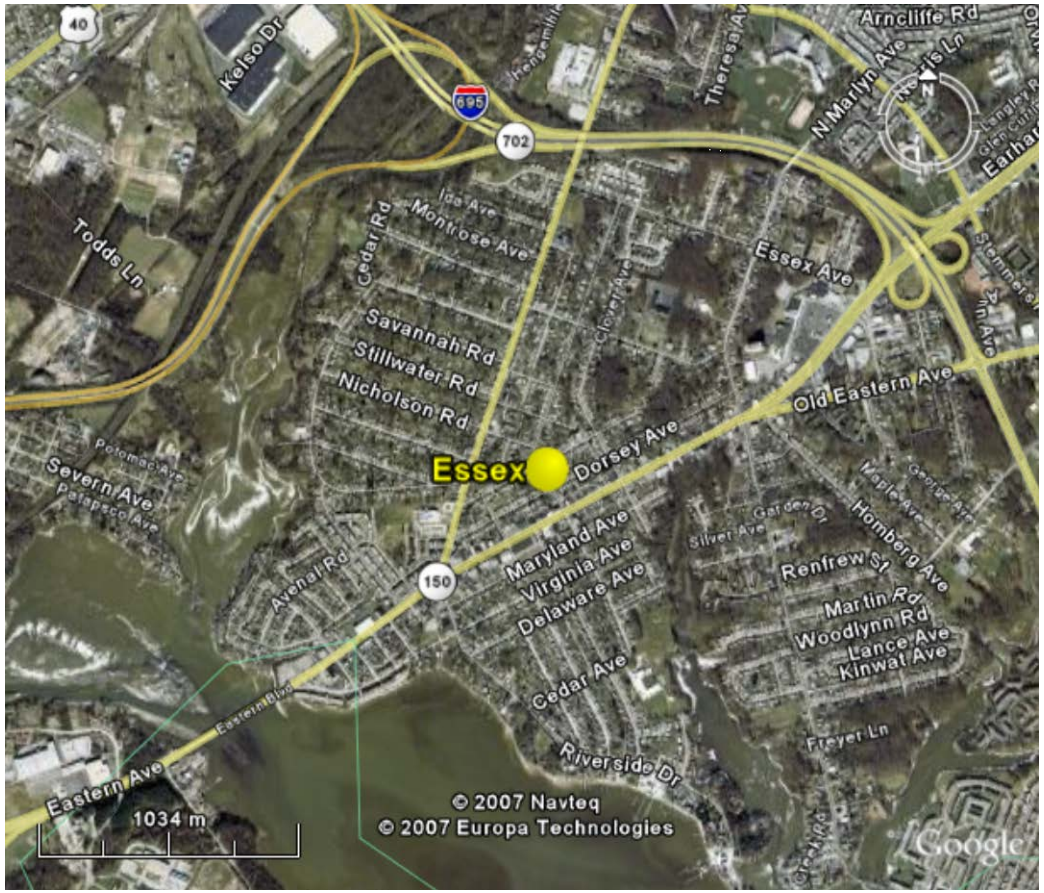

Figure A- 10. Areal Map of the Essex air monitoring site in Baltimore County, MD. Essex, an NCore station located in a suburban setting, was chosen as a site for monitoring air toxics population exposure at the neighborhood scale; CO highest concentration at the middle scale; NO population exposure and maximum precursor at the neighborhood scale; NO_x and NO_2 maximum precursor at the neighborhood scale; year-round ozone highest concentration and population exposure at the neighborhood scale; $PM_{2.5}$ (local conditions and hourly) population exposure at the neighborhood scale; SO_2 highest concentration at the neighborhood scale; and Type 2 PAMS VOC's maximum precursor and highest concentration at the neighborhood scale. Essex is located in the parking lot of the Essex Senior Center, two blocks from a four-lane road going through the town. To the north of the monitoring station is a small patch of grass, a sidewalk, and Woodward Road, a two-lane road. To the south and west of the monitoring shelter is parking lot for the senior center, which can hold about 50 cars. The senior center is located just beyond the parking lot. The surrounding area is a neighborhood with one or two-story houses on less than quarter acre lots, power lines, and sparse trees.

Figure A- 11. Areal map of Fair Hill air monitoring site in Cecil County, MD. Fair Hill was chosen as a seasonal ozone monitoring site because of the potential to measure the regional transport of ozone at the urban measurement scale. It was chosen as a PM2.5 monitoring site because of the potential to measure general/background PM at the regional scale. It is located in a rural setting. To the north of the Fair Hill monitoring site lies a flat grass field, a single paved lane, and a steeplechase and turf track beyond the lane. In the far distance are a few single story office buildings, and a riding ring with bleachers. To the east continues the grass field and single paved lane. The steeplechase and turf track also continue this direction until meeting with several mature trees and a barn in the distance. To the south passes Rt. 273, a two lane road, just behind the shelter. Past the road is a grass field leading to several racing barns and a couple of mature trees with a training track in the background. To the west continues Rt. 273. Just beyond the road is a gravel parking lot for day horse trailer parking. On the near side of the road in the distance are several one story office and land management buildings.

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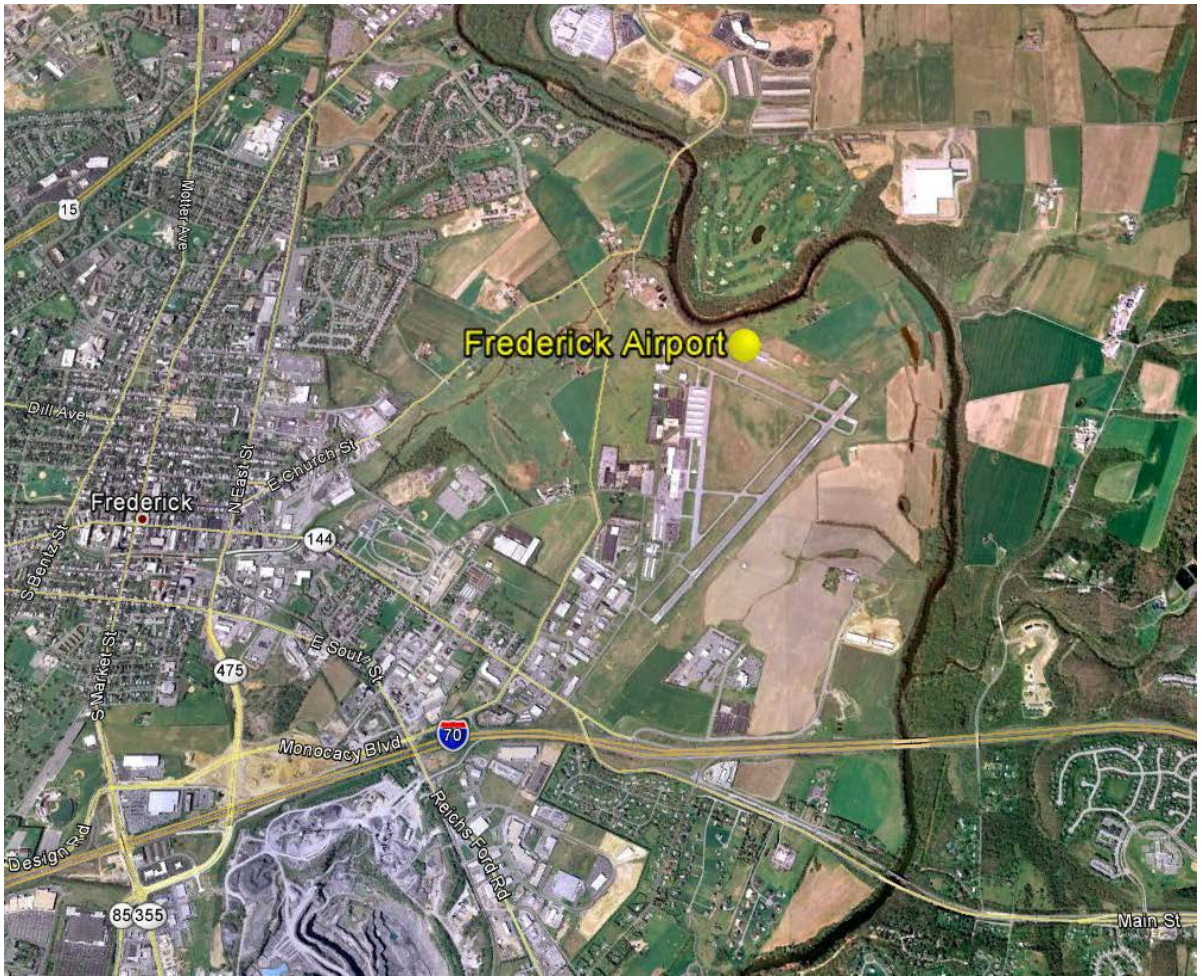

Figure A- 12. Areal map of Frederick Airport air monitoring site in Frederick County, MD. Frederick was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at an urban measurement scale in a suburban setting. The Frederick trailer sits off to the side of a road that passes through a Wastewater Treatment Facility. The trailer sits a few feet from a building and airplanes can frequently be observed taking off from the airport in the distance.

Figure A- 13. Areal map of Frostburg Haze Cam site in Garrett County, MD. Frostburg was chosen as a Haze Cam site for the purpose of providing public notification of visibility in a rural setting. The location provides a view of the Piney Run air monitoring station.

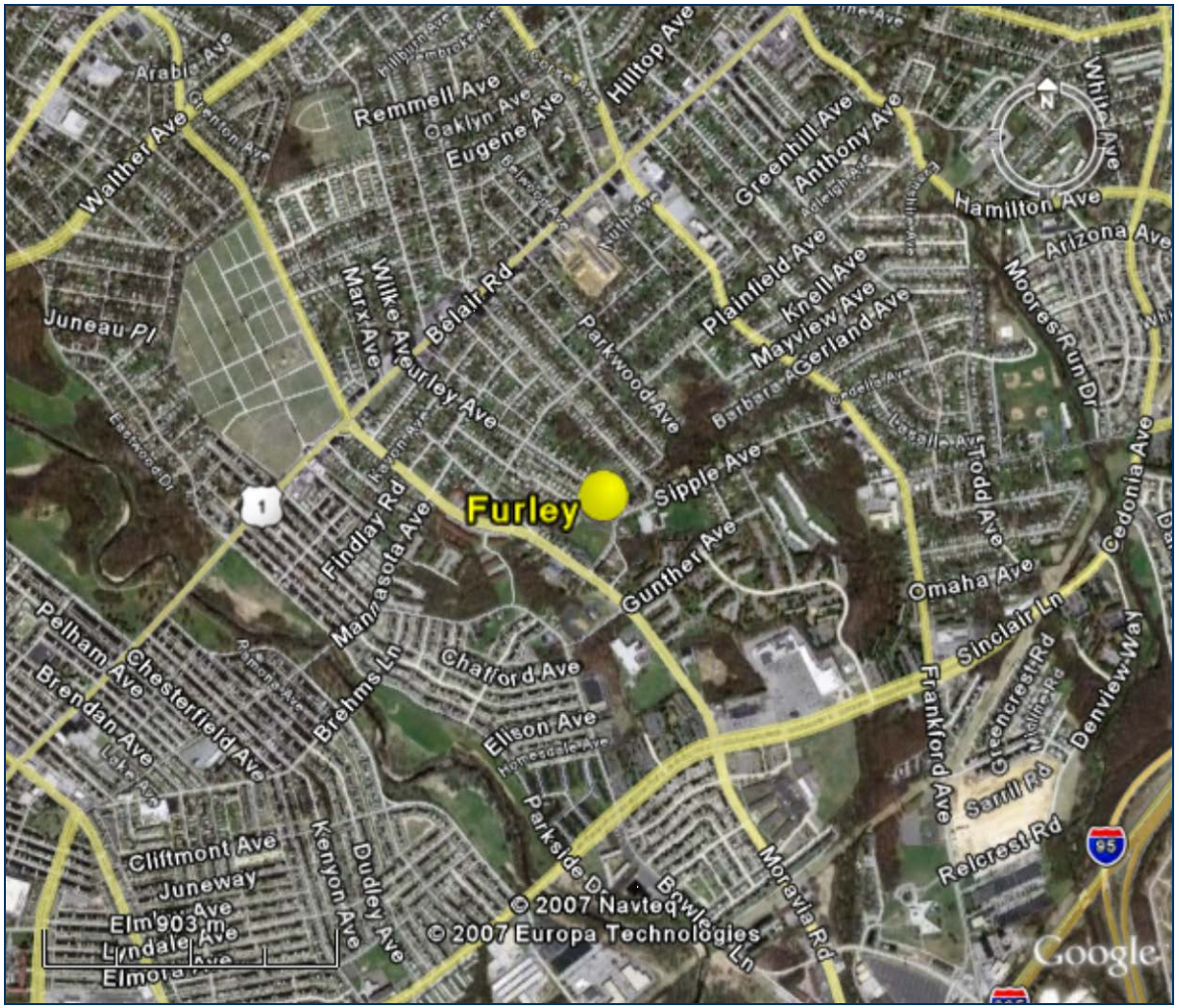

Figure A- 14. Areal map of Furley air monitoring site in Baltimore City, MD. Furley was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the neighborhood measurement scale in an urban, city center setting. The Furley site is located within one of the cafeterias of Furley Elementary school (which is a pretty big school if you ever get lost in the hallways). The instruments are located in a cabinet (kind of like a rack) in the back left corner of the cafeteria.

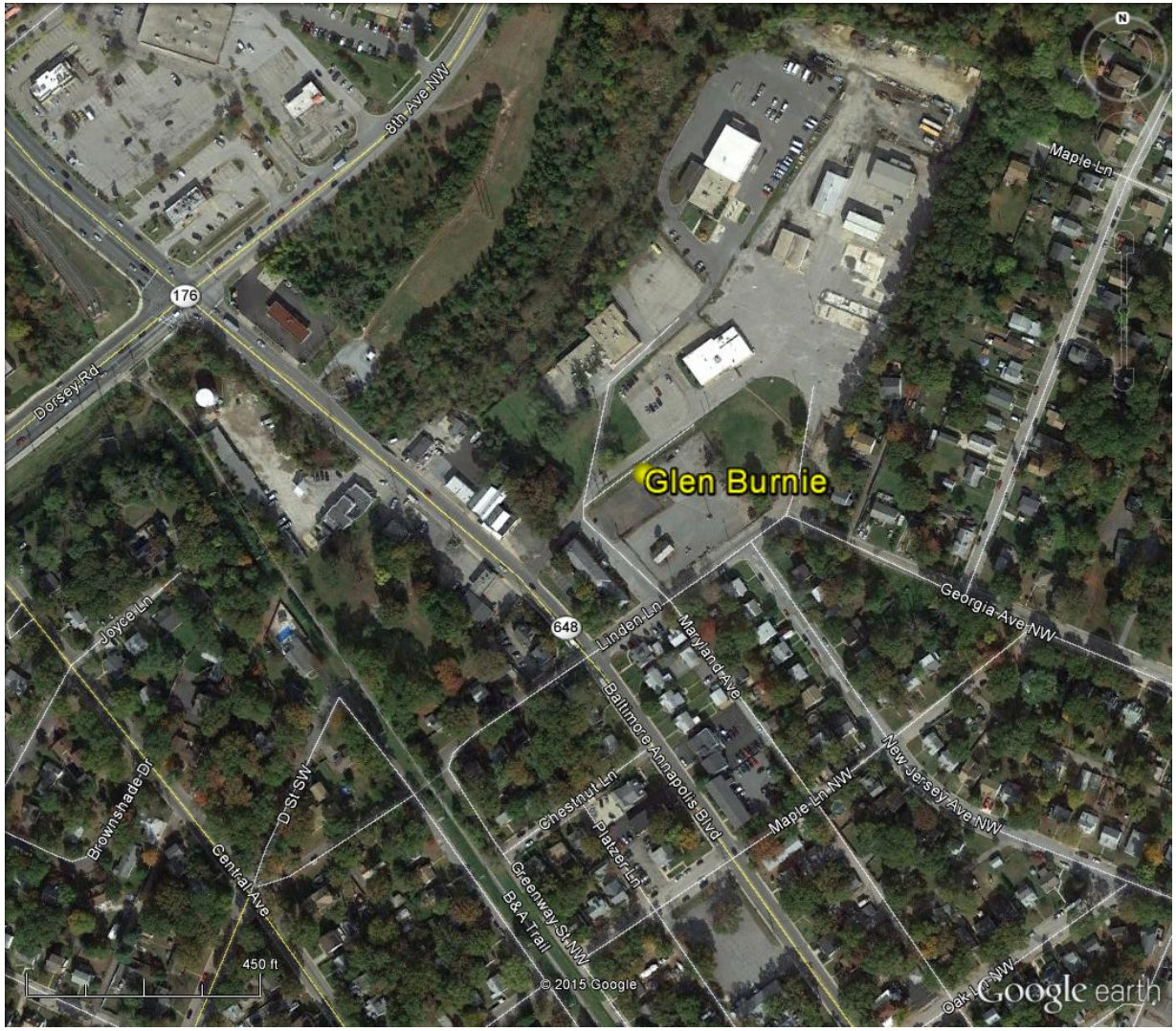

Figure A- 15. Areal map of Glen Burnie air monitoring site in Anne Arundel County, MD. Glen Burnie was chosen as a PM monitoring site because of the potential to measure the population exposure of PM at the neighborhood scale in a suburban setting.

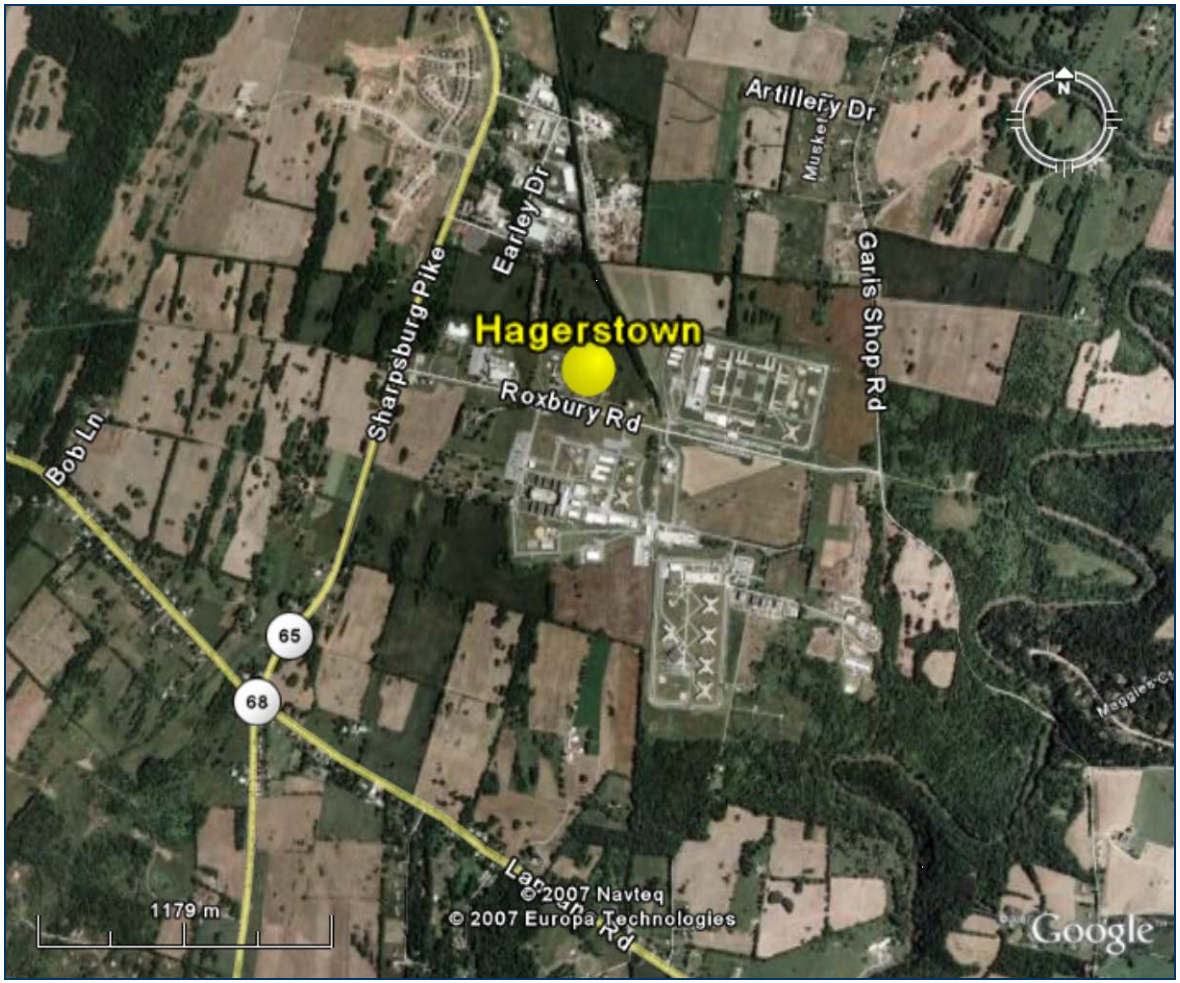

Figure A- 16. Areal map of Hagerstown air monitoring site in Washington County, MD. Hagerstown was chosen as a seasonal ozone monitoring site because of the potential to measure the highest concentration and population exposure of ozone at the urban scale. It was chosen as a PM2.5 monitoring site because of the potential to measure population exposure to PM at the urban scale. It is located in a rural setting. The Hagerstown trailer sits right by a blue water tower on rolling hills a few hundred feet from a correctional facility. You can see two parking lots - one lot that is passed to get to the trailer and one lot that is across the road from the trailer.

Figure A- 17. Areal map of the Horn Point air monitoring site in Dorchester County, MD. Horn Point, located in a rural setting, was chosen as a site for monitoring CO population exposure at the regional scale; NO population exposure at the regional scale; NO_y-NO population exposure at the regional scale; year-round ozone population exposure at the regional scale; $PM_{2.5}$ (hourly) population exposure at the regional scale; Reactive oxides of Nitrogen (NO_y) population exposure at the regional scale; and SO_2 population exposure at the regional scale. The site is located on the lower eastern shore and sits in an open field with pine trees in the distance surrounding the site. The University of Maryland Center for Environmental and Estuarine Studies is next door to the site.

Figure A- 18. Areal map of the Howard County Near Road air monitoring site in Howard County, MD. HCNR, located in a suburban setting, was chosen as a site for monitoring air quality near roads, including air toxics, CO, NO, NO2, NOx, and PM2.5 source-oriented/highest concentration at the microscale. To the north of the Howard County Near Road monitoring site is a small grassy area with a few trees along with our gravel access road and the Rest Stop just beyond. The Rest Stop accommodates many tractor trailers and cars. To the east the grassy patch continues and acts as storm water management for the parking area and just beyond is the on-ramp to access the parking area. To the south just behind the trailer is interstate 95 spanning 8 lanes with a good size grass median. On the far side of the road is the rest stop for north bound traffic. To the west the interstate continues and is joined by the exit ramp from the rest area. There are trees and woods on the far side of the exit ramp.

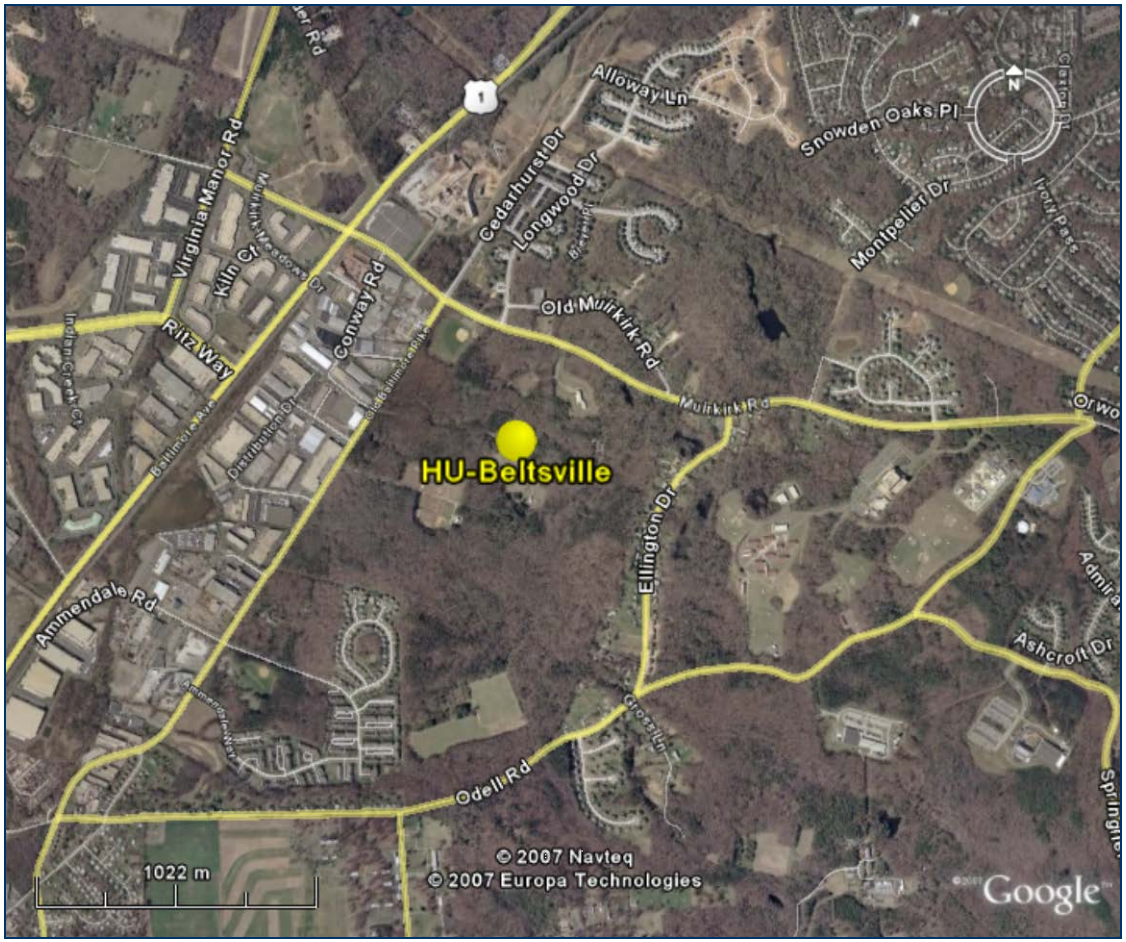

Figure A- 19. Areal map of HU-Beltsville air monitoring site in Prince George's County, MD. HU-Beltsville, an NCore station located in a suburban setting, was chosen as a site for monitoring air toxics population exposure at the neighborhood scale; CO, NO, NO_2, NO_y-NO, NO_x, and NO_y general/background at the urban scale; year-round ozone highest concentration and population exposure at the urban scale; PM population exposure at the urban scale for $PM_{2.5}$ and neighborhood scale for PM_{10}; SO_2 general/background at the urban scale; and Type 3 PAMS VOC's upwind/background at the urban scale. The site is in an open yard surrounded by trees.

Figure A- 20. Areal map of Millington air monitoring site in Kent County, MD. Millington was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban scale. It was chosen as a $PM_{2.5}$ monitoring site because it has the potential to measure population exposure to PM at the neighborhood scale. It is located in a rural setting. The site is located on the upper eastern shore in a wildlife management area and is adjacent to fields and woods. A few hundred yards away is a small use airport.

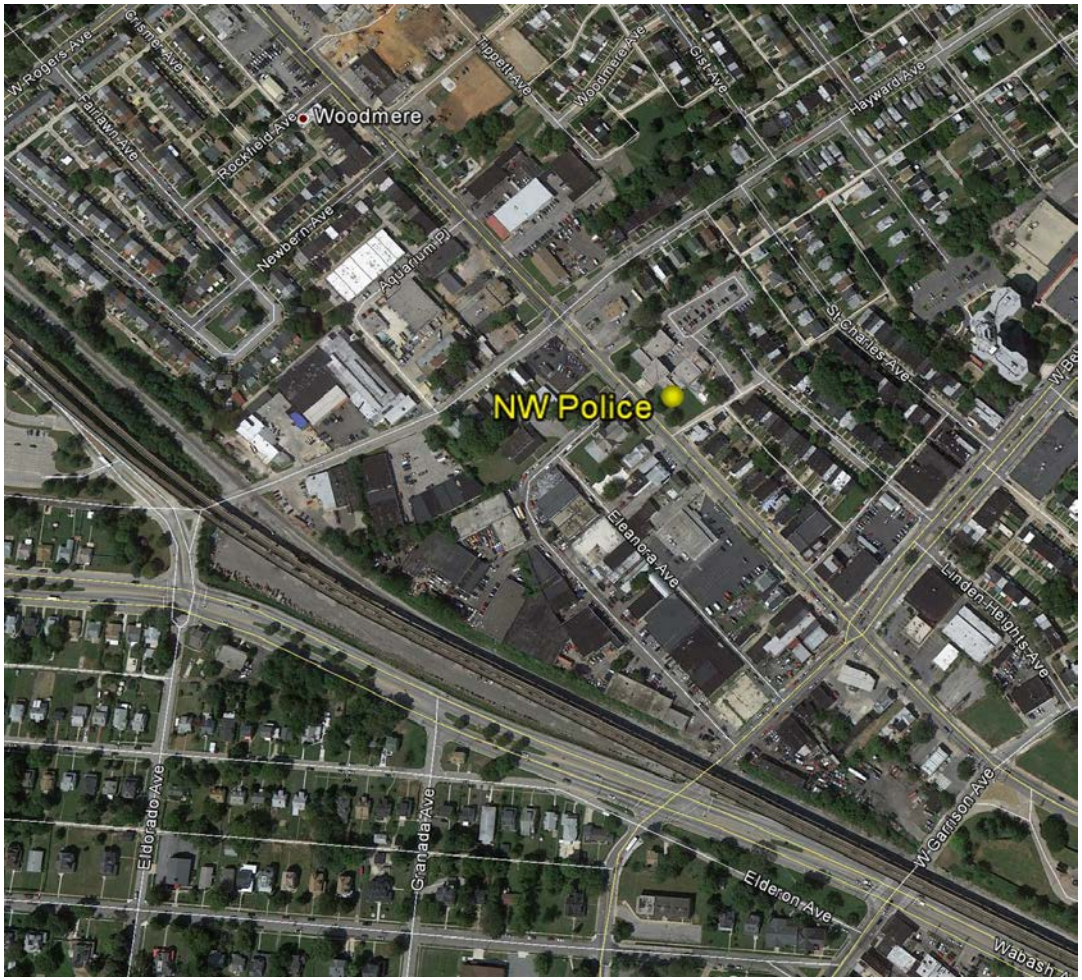

Figure A- 21. Areal map of Northwest Police Station air monitoring site in Baltimore City, MD. NWPS was chosen as a PM monitoring site because of the potential to measure the population exposure of PM at the neighborhood scale in an urban setting.

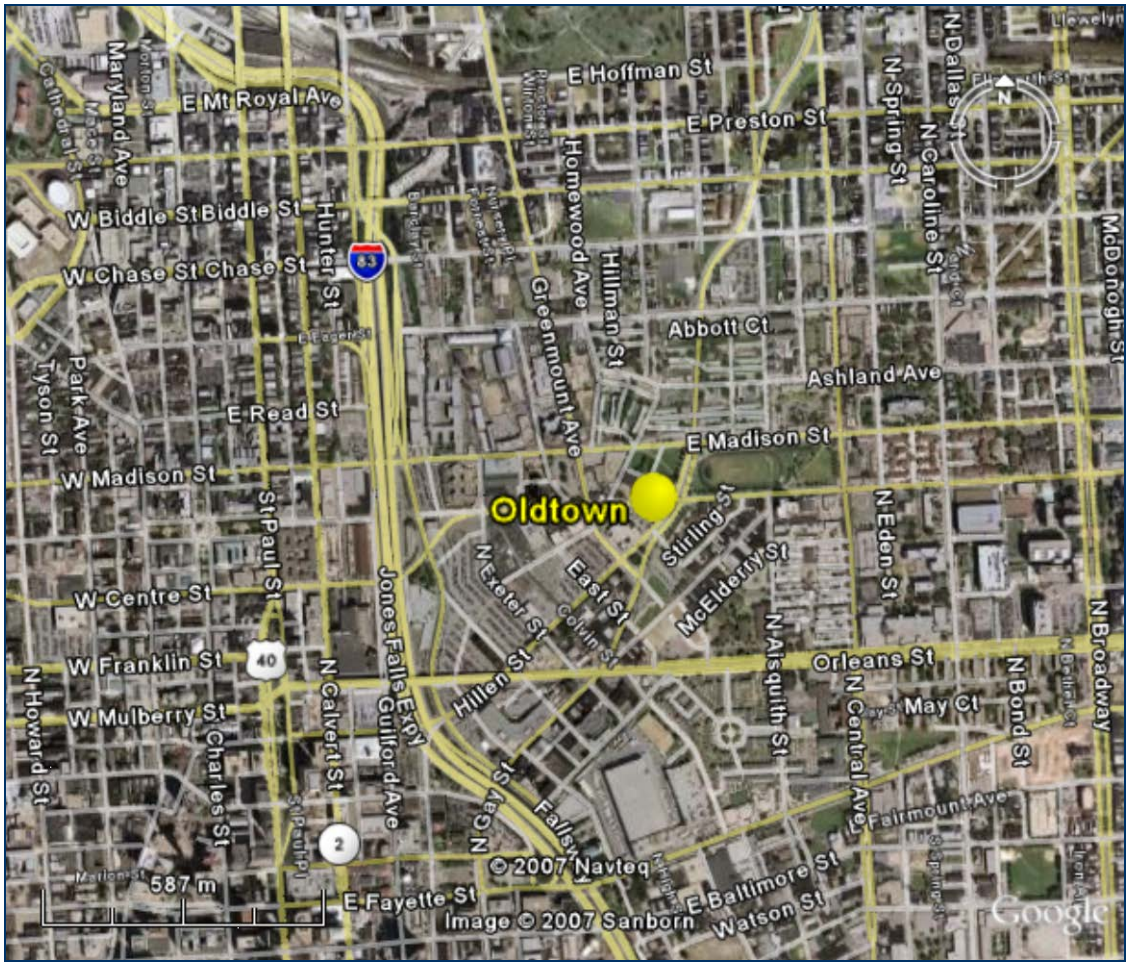

Figure A- 22. Areal map of Oldtown air monitoring site in Baltimore City, MD. Oldtown, located in an urban and center city setting, was chosen as a site for monitoring air toxics, CO, NO, NO2, NOx, and PM2.5 highest concentration at the middle scale, and air toxics population exposure at the neighborhood scale. The Oldtown trailer sits in a parking lot off to the side of a very busy four-way intersection right by a bus stop where buses stop often. There is also a fire station within a couple hundred feet of the trailer and nearby sidewalks by the bus stop and along the street next to the trailer.

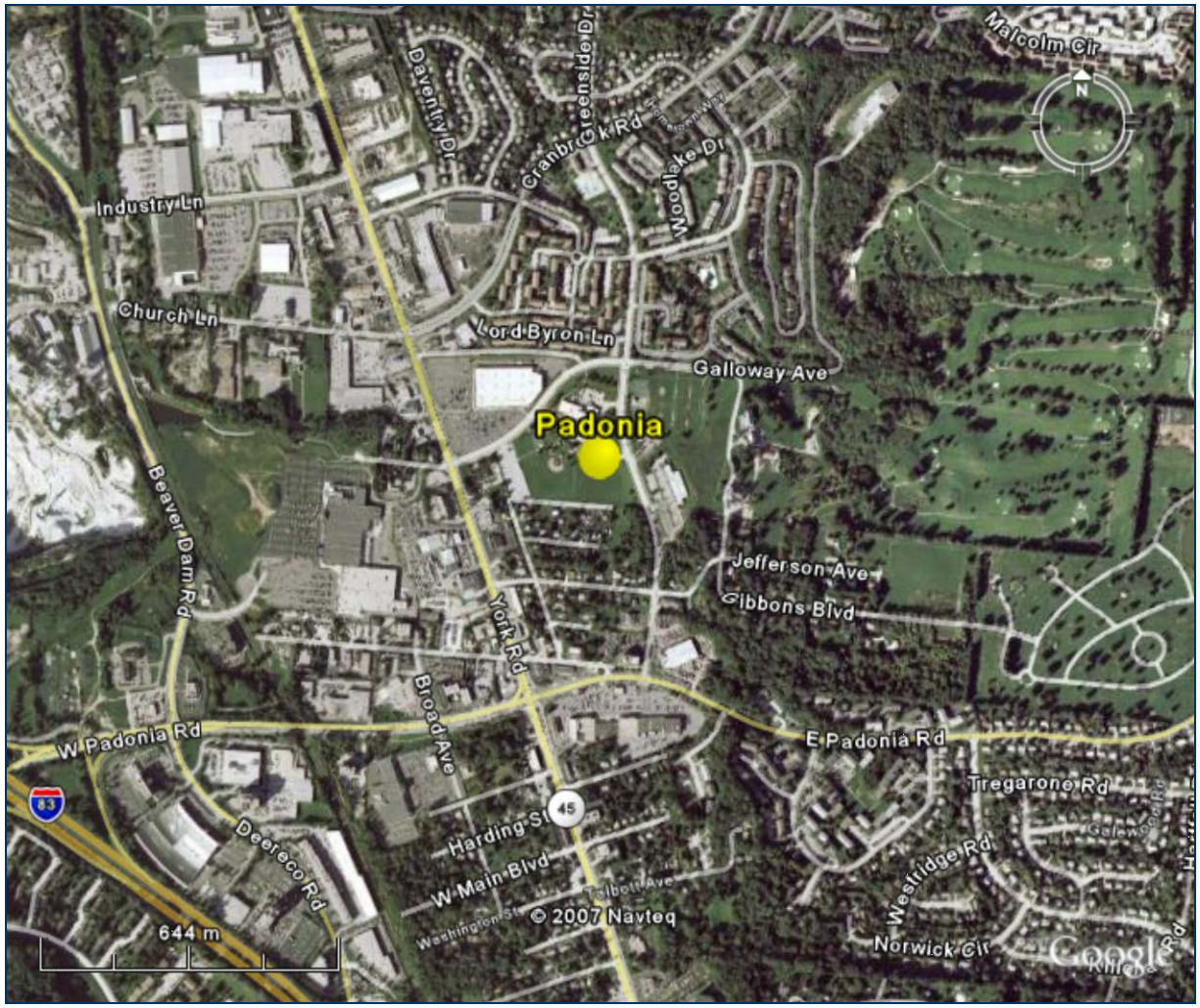

Figure A- 23. Areal map of Padonia air monitoring site in Baltimore County, MD. Padonia was chosen as a seasonal ozone and $PM_{2.5}$ monitoring site because of the potential to measure the population exposure of ozone and $PM_{2.5}$ at the neighborhood scale. It is located in a suburban setting. The Padonia trailer sits on an elementary school ground right near a parking lot. There are a few other longer trailers (for school purposes) next to the site trailer. There is a gravel pit, a landfill, and a spice company all off Beaver Dam Road, to the west and slightly north of the site.

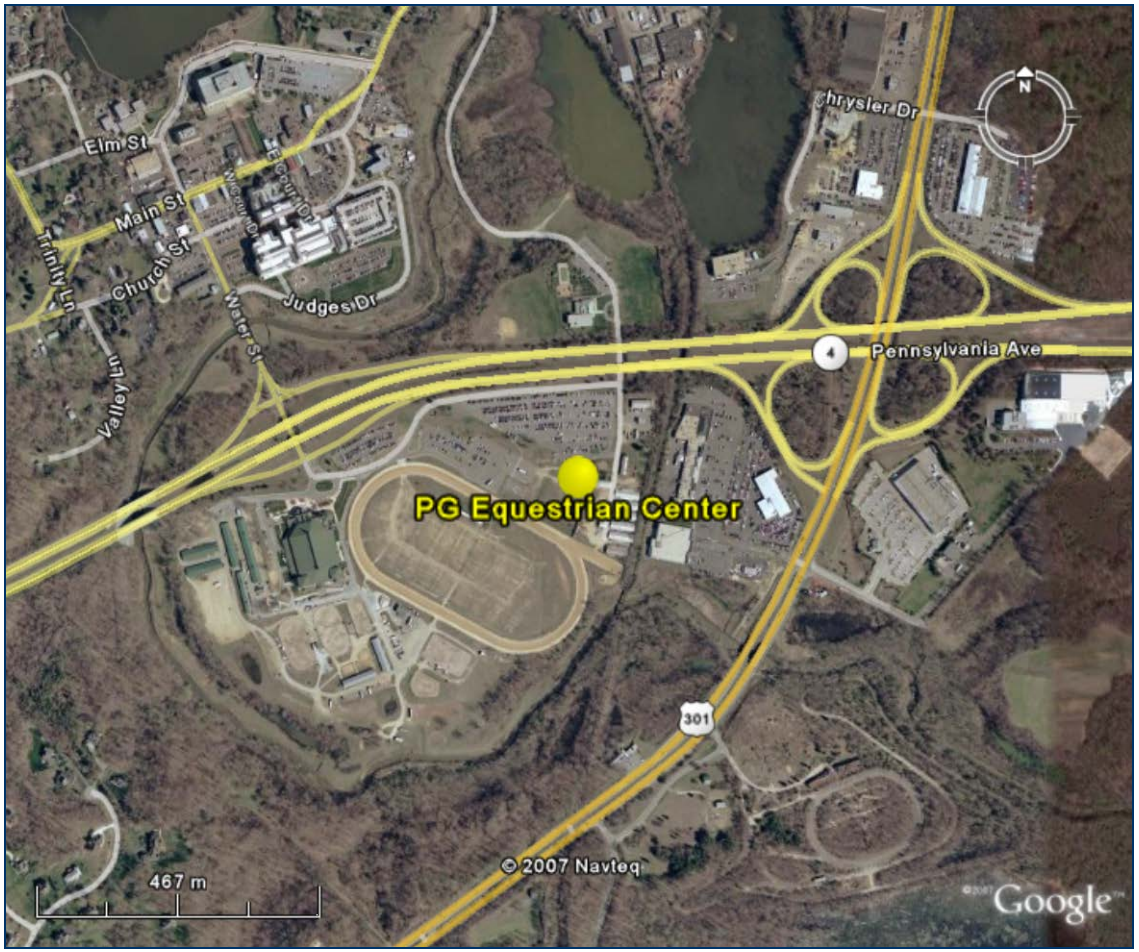

Figure A- 24. Areal map of PG Equestrian Center air monitoring site in Prince George's County, MD. PG Equestrian Center was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban scale. It was chosen as a PM2.5 monitoring site because it has the potential to measure population exposure to PM2.5 at the neighborhood scale. It is located in a rural setting. The site sits in the parking lot of the Ranger office. Surrounding the site are parking lots and a horse track.

Figure A- 25. Areal map of Piney Run air monitoring site in Garrett County, MD. Piney Run, an NCore station located in a rural setting, was chosen as a site for monitoring year-round ozone, CO, NO, NO_2, NO_y-NO, NO_x, NO_y, SO_2, and PM regional transport at the regional scale.

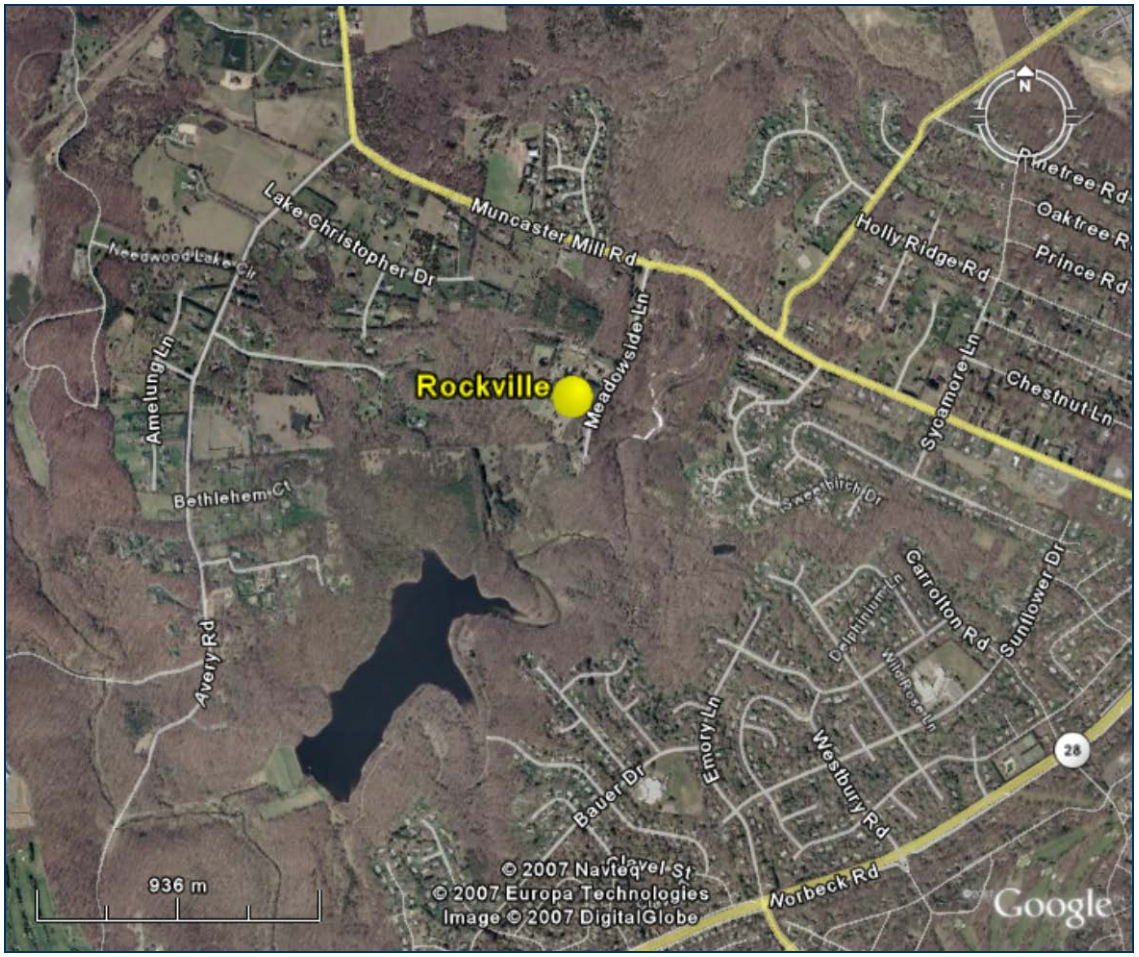

Figure A- 26. Areal map of Rockville air monitoring site in Montgomery County, MD. Rockville was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban measurement scale. It was chosen as a $PM_{2.5}$ monitoring site because it has the potential to measure population exposure to PM at the neighborhood scale. It is located in a rural setting.

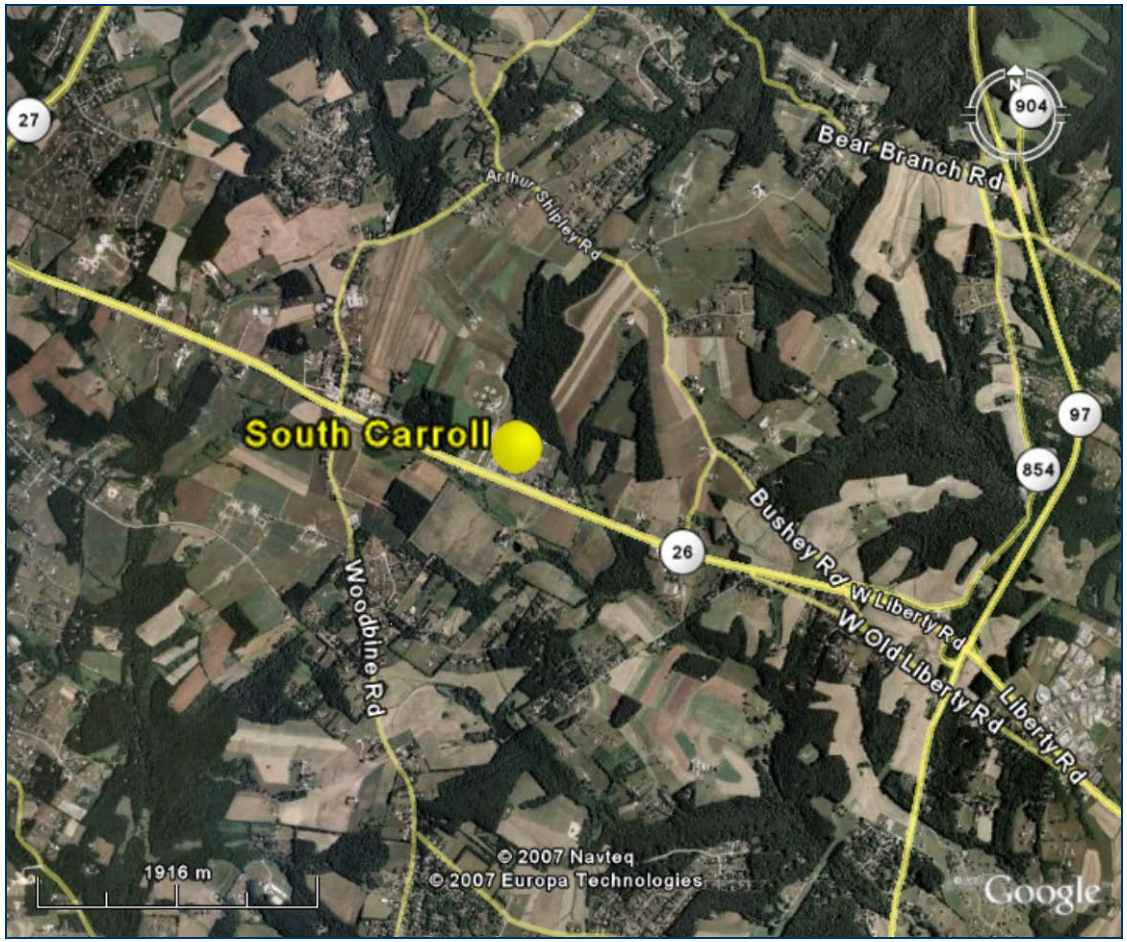

Figure A- 27. Areal map of South Carroll air monitoring site in Carroll County, MD. South Carroll was chosen as a seasonal ozone monitoring site because of the potential to measure the population exposure of ozone at the urban measurement scale. It is located in a rural setting. The South Carroll trailer sits a few yards from South Carroll High School on the grounds of the school. There is a fence right alongside the trailer as well as ball playing fields within sight of the trailer.

Figure A- 28. Areal map of Southern Maryland air monitoring site in Charles County, MD. Southern Maryland was chosen as a seasonal ozone monitoring site because of the potential to measure the general background ozone at the regional measurement scale. It is located in a rural setting. This site is our most southern site and is located in the yard of a pre-release prison surrounded by fields and woods.

MARYLAND
DEPARTMENT OF THE ENVIRONMENT

APPENDIX B
EPA Approval Letter (Nov. 12, 2015) for the 2016 Air Monitoring Annual Network Plan

Prepared for:
U.S. Environmental Protection Agency

Prepared by:
Ambient Air Monitoring Program
Air and Radiation Management Administration
Maryland Department of the Environment

April 15, 2016

MARYLAND DEPARTMENT OF THE ENVIRONMENT
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Lawrence J. Hogan, Jr., *Governor* | Boyd K. Rutherford, *Lt. Governor*
Ben Grumbles, *Secretary*

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

NOV 12 2015

The Honorable Benjamin H. Grumbles, Secretary
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, Maryland 21230

Dear Secretary ~~Grumbles~~ Ben:

By letter and enclosures dated July 1, 2015, the Maryland Department of Environmental (MDE) submitted to the U. S. Environmental Protection Agency (EPA) an annual ambient air monitoring network plan in accordance with the regulatory requirements of 40 CFR Part 58 - Ambient Air Quality Surveillance. Based on our review, EPA hereby approves MDE's July 1, 2015 annual ambient air monitoring network plan on the basis that the plan meets the requirements of 40 CFR Part 58.10.

Additionally, 40 CFR Section 58.11(c) requires any changes to the air monitoring network or design of the following air monitoring systems be approved by the EPA Administrator:

a) Photochemical Assessment Monitoring Systems (PAMS)
b) Particulate Matter Speciation Trends Network (STN)
c) The National Core Monitoring Network (NCore)

EPA determined that MDE's July 1, 2015 annual ambient air monitoring network plan does not require approval from the EPA Administrator because there were no changes to any of the air monitoring systems listed above.

If you have any questions please do not hesitate to contact me or have your staff contact Mr. Matthew Colip, EPA's Maryland Liaison, at (215) 814-5439. For questions regarding this approval action, your staff may contact Mr. David L. Arnold, Acting Director, Air Protection Division, at (215) 814-2172.

Sincerely,

Shawn M. Garvin
Regional Administrator

cc: Mr. George S. Aburn, Jr., MDE