



District of Columbia 2013 Annual Ambient Air Monitoring Network Plan

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Acronyms and Definitions

AQI	Air Quality Index
AQS	Air Quality Subsystem
AQD	Air Quality Division
BAM/BAMM	Beta Attenuation (Mass) Monitor - used for continuous measurements of particulate matter
CAA	Clean Air Act
C.F.R.	Code of Federal Regulations
CSN	PM _{2.5} Chemical Speciation Network
CO	Carbon Monoxide
DDOE	District Department of the Environment
EPA	U.S. Environmental Protection Agency
FEM	Federal Equivalent Method
FID	Flame Ionization Detector
FRM	Federal Reference Method
GC	Gas Chromatograph
HAPS	Hazardous Air Pollutants
IMPROVE	Interagency Monitoring of Protected Visual Environments
IR	Infrared (radiation)
MAB	Monitoring and Assessment Branch, Air Quality Division
MSA	Metropolitan Statistical Area
NAA	Non-attainment Area
NAAQS	National Ambient Air Quality Standard
NATTS	National Air Toxic Trends Stations
NAMS	National Air Monitoring Station
NCore	National Core Monitoring Network
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
PAHs	Polycyclic Aromatic Hydrocarbons
PAMS	Photochemical Assessment Monitoring network Stations
Pb	Lead
PM _{2.5}	Particulate matter with an equivalent diameter less than or equal to 2.5 µm
PM ₁₀	Particulate matter with an equivalent diameter less than or equal to 10 µm
QA	Quality Assurance
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Stations
SO ₂	Sulfur Dioxide
TSP	Total Suspended Particles
TEOM	Tapered Element Oscillating Microbalance - used for continuous measurements of PM ₁₀ or PM _{2.5}
UV	Ultraviolet (radiation)
VOCs	Volatile Organic Compounds

Executive Summary

In October 2006, the U.S. Environmental Protection Agency (EPA) amended the ambient air monitoring regulations codified in 40 Code of Federal Regulations (C.F.R.) Part 58. The amendments require state and local monitoring agencies to conduct periodic assessment of the ambient air monitoring networks and propose any changes in an annual air monitoring network plan. The annual network plans are due to the Regional Administrator by July 1st. The District Department of the Environment (DDOE) conducted a review of the District of Columbia's (District) air monitoring network and the annual assessment is presented in this 2013 Annual Ambient Air Monitoring Network Plan ("Network Plan").

The revised 2010 NO₂ standards require establishment of a new network of near-roadway monitors. DDOE recently received federal grant funds for establishing a near-roadway NO₂ ambient monitoring station in the District by January 1, 2015. Additional details about the District's new near-roadway NO₂ ambient monitoring station will be presented in the next year's annual network plan.

DDOE is proposing additions and changes to the District's ambient air monitoring network as below and seeks the EPA Regional Administrator's approval.

PM₁₀ FRM/FEM Monitors:

DDOE currently operates two PM₁₀ FRM (filter-based manual) Low-Volume Andersen samplers- a primary and a secondary monitor. DDOE also operates a continuous PM₁₀ FEM at the same location.

DDOE is proposing to discontinue both the primary and secondary manual filter-based samplers currently in operation. Expected date of shut down for these aging monitors is January 31, 2014.

DDOE is proposing to co-designate the McMillan NCore station's BAMM PM₁₀ FEM automated sampler for PM₁₀ network to fulfill the monitoring requirements in the District.

Air Toxics - Hexavalent Chromium Monitor:

DDOE has been operating a Hexavalent Chromium sampler at its air toxics monitoring station. EPA evaluated the ambient concentrations of hexavalent chromium in the District and found that the levels were below the method detection limit. Based on EPA's advice and earlier communications with EPA Region 3 offices, DDOE will discontinue hexavalent chromium sampling beginning in July 2013.

As required by 40 C.F.R. § 58.10, the District's draft 2013 Network Plan is being made available to the public on the DDOE website for a 30-day public examination. This plan will be submitted to EPA by July 1, 2013.

1.0 Introduction

In 1970, Congress passed the Clean Air Act (CAA) and authorized the U.S. 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 the elderly. Secondary standards were set to protect public welfare (decreased visibility, damage to crops, vegetation, and buildings, etc). CAA requires that the state and local air agencies operate and maintain ambient air surveillance networks. Six pollutants currently have NAAQS: ozone (O₃), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), particulate matter (less than 10 microns, PM₁₀, and less than 2.5 microns aerodynamic diameter, PM_{2.5}) and lead (Pb). These are commonly known as "criteria" air pollutants. When air quality does not meet the NAAQS for one of the criteria pollutants, the area is said to be in "nonattainment" for that pollutant.

Air pollution comes from many sources. On-road vehicles (cars, trucks, buses and motorcycles), off-road equipment (locomotives, boats, construction equipment, lawn mowers etc), area sources (gas stations, auto maintenance facilities, painting operations, and consumer products usage, etc.) factories, power plants and even fires can create pollution that harms our environment. Determining the ambient air quality through monitoring is essential to effective control of air pollution. Control measures implemented by federal, state and local governments, subsequent to the 1970 CAA and the 1990 CAA Amendments, resulted in significant improvements to ambient air quality.

DDOE regulates air pollution sources in the District to protect public health and the environment. DDOE uses its ambient monitoring network to track changes in the District's air quality and to evaluate compliance with the NAAQS. Ambient air quality monitoring in the District began in the late 1950s, prior to the establishment of EPA. The first monitors were simple mechanisms or passive collectors such as dust-fall buckets and tape samplers. These were followed in the 1960s by wet-chemistry instruments, which were soon replaced by more advanced electronic automated instruments. The addition of computer technology in operating monitoring systems and air pollution data collection in the late 1970s and early 1980s was critical to the development of the core monitoring network that exists today.

Over the years, monitoring goals have shifted to include measuring high pollution concentrations in population centers, detecting trends, and determining compliance with updated national and state air quality standards, as well as establishing background levels and measuring pollution transported from areas outside. As required by the federal air monitoring regulation, the District follows the guidance for air monitoring in areas of 1) expected high concentrations, 2) high population density, 3) significant sources, 4) general background concentrations, and 5) regional transport.

In October 2006, EPA issued final regulations concerning state and local agency ambient air monitoring networks. These regulations require periodic assessment of monitoring networks. The Network Plan and periodic network assessment as described in § 58.10 must contain the following information for existing and proposed site(s):

1. Air Quality System (AQS) site identification number;
2. Location, including street address and geographical coordinates;
3. Sampling and analysis method(s) for each measured parameter;
4. Operating schedules for each monitor;
5. Any proposals to remove or move a monitoring station within a period of 18 months following plan submittal;
6. Monitoring objective and spatial scale of representativeness for each monitor;
7. The identification of any sites that are suitable and sites that are not suitable for comparison against the annual PM_{2.5} NAAQS or 24-hour PM_{10-2.5} NAAQS as described in § 58.30;
8. Metropolitan Statistical Area (MSA), Core Based Statistical Area (CBSA), Combined Statistical Area (CSA) or other area represented by the monitor;
9. The designation of any Pb monitors as either source-oriented or non-source-oriented according to Appendix D to 40 C.F.R. Part 58;
10. Any source-oriented monitors for which a waiver has been requested or granted by the EPA Regional Administrator as allowed for under § 4.5(a)(ii) of Appendix D to 40 C.F.R. Part 58;
11. Any source-oriented or non-source-oriented site for which a waiver has been requested or granted by the EPA Regional Administrator for the use of Pb-PM₁₀ monitoring in lieu of Pb-TSP monitoring as allowed in § 2.10 of Appendix C to 40 C.F.R. Part 58; and
12. The identification of required NO₂ monitors as either near-road or area-wide sites in accordance with Appendix D, Section 4.3 of 40 C.F.R. Part 58.

This document is an annual revision of the District's Ambient Air Monitoring Network Plan and it contains a description of the District's monitoring network, various parameters within the network, monitoring station information, and data. This annual review document also confirms that the District's air monitoring program continues to meet federally established monitoring and data assessment criteria.

1.1 District's Ambient Air Monitoring Strategy

Ambient air monitoring systems are a critical part of the District's air quality management program. Air quality management involves a cycle of air quality monitoring, setting standards and objectives, identifying and implementing control strategies, assessing the results of the control strategies, and measuring progress. Air monitoring data provide accountability for emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors. The data also form the basis for air quality forecasts and other public outreach air quality reports. Ambient monitoring data have many uses throughout this process, such as:

- Determining compliance with the NAAQS;
- Characterizing air quality and trends;
- Estimating health risks and ecosystem impacts;
- Developing and evaluating emission control strategies;
- Evaluating source-receptor relationships;
- Providing input data for models and evaluating models; and
- Measuring overall progress of air pollution control programs.

Over the last 20 years, ambient levels of criteria pollutants have decreased significantly in the District due to the implementation of various control measures. The decade of the 1980s was a transition for air quality with the introduction of automobiles equipped with catalytic converters and the accompanying air pollution reductions for NO₂, CO and volatile organic compounds (VOCs). Ozone, PM_{2.5} and PM₁₀ air pollution levels have been greatly reduced, although the District still remains in nonattainment for ozone. Pollution reduction strategies for stationary sources, on-road and off-road vehicles, and non-point area sources have reduced SO₂, nitrogen oxides (NO_x) and VOCs. The phasing out of leaded gasoline in the 1980s led to a significant drop in ambient Pb levels.

2.0 District's Ambient Air Network

The Monitoring and Assessment Branch in DDOE's Air Quality Division operates, maintains, and performs all functions of the ambient air monitoring program required by the CAA. The District's network currently consists of five (5) monitoring sites. Sampling covers criteria air pollutants, air toxics, PM_{2.5} mass and chemical speciation, and enhanced monitoring for ozone and its precursor pollutants with a photochemical assessment monitoring station (PAMS) for measuring speciated VOCs, NO_x, carbonyls, and meteorological parameters.

One of the significant elements of the October 2006 monitoring regulations was the establishment of a multi-pollutant National Core (NCore) monitoring network to provide trace-level air quality measurements. The District launched an NCore station at its McMillan site (11-001-0043) in January 2011. DDOE established an ambient Pb monitor at the NCore site on January 1, 2012, to fulfill the monitoring requirements of 2008 Pb NAAQS.

Figure 2-1 and Tables 2-1 through Table 2-5 below include information about the District's air monitoring sites and the measured pollutant parameters.

Table 2-1: 2013 Ambient Air Monitoring Network and Monitor Details

Site Name, AQS ID	Street Address	City, County, ZIP	Latitude, Longitude	Location Setting	Nearest Road	Traffic Count	Traffic Count Year	Distance From nearest road (m)	Metro Statistical Area (MSA)
McMillan 11-001-0043	2500 1st St., N.W.	Washington DC, 20001	38°55'18.81"N 77° 0'47.58"W	Urban	First Street NW	7,400	2010	50	DC-Arlington-Alexandria
River Terrace 11-001-0041	420 34th Street N.E.	Washington, DC, 20019	38°53'44.06"N 76°57'29.06"W	Urban	Benning Rd.	43,100	2010	100	DC-Arlington-Alexandria
Verizon 11-001-0023	2055 L St., N.W.	Washington, DC, 20036	38°54'13.94"N 77° 2'45.03"W	City Center	L St.	14,100	2010	5	DC-Arlington-Alexandria
Hains Point 11-001-0042	1100 Ohio Drive, S.W.	Washington, DC, 20242	38°52'34.40"N 77° 2'3.78"W	Urban	I-395	175,400	2010	250	DC-Arlington-Alexandria
Takoma Recreation Center 11-001-0050	301 Van Buren St., N.W.	Washington, DC, 20012	38°.970092"N 77° .016715W	Urban	Blair Rd., N.W.	15,200	2010	200	DC-Arlington-Alexandria

Table 2-2: Monitoring sites and parameters information

Site Name, AQS ID	Parameter	Start Date	Method Code	Probe Height (m)	Scale of Representative	Monitoring Objective	Type	Sample Schedule
McMillan 11-001-0043	Nitrogen Dioxide, Nitric Oxide	06/01/1994	074	3	Urban	Population Exposure/Max Precursor	PAMS/SLAMS	Hourly
	NOy (Total reactive nitrogen oxides)	1/1/2011	090	3	Urban	General/Background	NCORE	Hourly
	SO2 (trace)	1/1/2011	592	3	Urban	General/Background	NCORE	Hourly
	CO (trace)	1/1/2011	588	3	Urban	General/Background	NCORE	Hourly
	PM10-2.5 coarse	1/1/2011	185	3	Urban	General/Background	NCORE	Hourly
	Type 2 PAMS	06/01/1994	128	3	Urban	General/Background	PAMS	Hourly
	Ozone	06/01/1994	047	3	Urban	Population Exposure/Max Precursor	PAMS/SLAMS/NCORE	Hourly
	PM2.5 Continuous	01/01/2003	170	4	Urban	Population Exposure/Max Precursor	SLAMS	Hourly
	PM10 Continuous	1/1/2011	170	4	Urban	Population Exposure/Max Precursor	SLAMS	Hourly
	PM10 Low-Vol	01/04/2012		4	Urban	Population Exposure/Max Precursor	SLAMS	Daily
	PM2.5	01/01/1999	118	4	Urban	Population Exposure/Max Precursor	NCORE/SLAMS	Daily
	PM2.5 Chemical Speciation	01/01/2002	810	4	Urban	Population Exposure/Trends	CSN	Every 3 days
	Air Toxics	1/1/2001	150	4	Urban	Population Exposure/Trends	NATTS	Every 6 Days
	PM10 High-Vol	1/1/2001	065	4	Urban	Population Exposure/Trends	NATTS	Every 6 Days
	Pb	01/01/2012	189	4	Neighborhood	Population Exposure/Trends	NCORE/SLAMS	Every 6 Days
	Black Carbon	1/1/2001	862	4	Urban	Population Exposure/Trends	SLAMS	Hourly
Organic/Elemental Carbon	02/02/2012	N/A	4	Urban	Population Exposure/Trends	Special Study	Hourly	
River Terrace 11-001-0041	Carbon Monoxide	5/1/1993	054	10	Neighborhood	Population Exposure	SLAMS	Hourly
	Nitric Oxide	5/1/1993	074	10	Neighborhood	Population Exposure	SLAMS	Hourly
	Nitrogen Dioxide	5/1/1993	074	10	Neighborhood	Population Exposure	SLAMS	Hourly
	Oxides of Nitrogen	5/1/1993	074	10	Neighborhood	Population Exposure	SLAMS	Hourly
	Ozone	5/1/1993	047	10	Neighborhood	Population Exposure	SLAMS	Hourly
	PM2.5	01/01/1999	118	10	Neighborhood	Population Exposure	SLAMS	Daily
	Sulfur Dioxide	5/1/1993	060	10	Neighborhood	Population Exposure	SLAMS	Hourly
Verizon 11-001-0023	Carbon Monoxide	10/1/1980	054	3	Urban	Population Exposure	SLAMS/NAMS	Hourly
Hains Point 11-001-0042	PM2.5	03/01/1999	118	10	Urban	Population Exposure	SLAMS	Every 3 Days
Takoma Recreation Center 11-001-0050	Nitric Oxide	1/1/2013	074	10	Neighborhood	Population Exposure	SLAMS	Hourly
	Nitrogen Dioxide	1/1/2013	074	10	Neighborhood	Population Exposure	SLAMS	Hourly
	Oxides of Nitrogen	1/1/2013	074	10	Neighborhood	Population Exposure	SLAMS	Hourly
	Ozone	1/1/2013	047	10	Neighborhood	Population Exposure	SLAMS	Hourly

Table 2-3: Monitor count for the District's network

Site Name	Pollutant Parameter / Pollutant Group																										
	Pb TSP	Air Toxics	Black Carbon, OC,EC	Chromium-6 (Air Toxics)	PAH Compounds (Air Toxics)	CO	NO	NO2	NOx	NOy	O3	PAMS VOCs	PAMS VOCs Continuous (Auto-GC)	PM2.5	PM2.5 Elemental/Organic Carbon	PM2.5 (Continuous)	Air Toxics Metals (PM10)	PM10	PM10 -2.5 (Continuous) PMcoarse	Speciated PM2.5	SO2	Trace CO	Trace SO2	NCORE – Surface Meteorology	PAMS – Surface Meteorology	TOTALS*	
McMillan	1	1	2	1	1		1	1	1	1	1	1	1	2	1	1	1	2	1	1		1	1	1	1	1	26
River Terrace School						1	1	1	1		1			1							1						7
Verizon Building						1																					1
Takoma Recreation Center							1	1	1		1																4
Hains Point													1														1
																											39

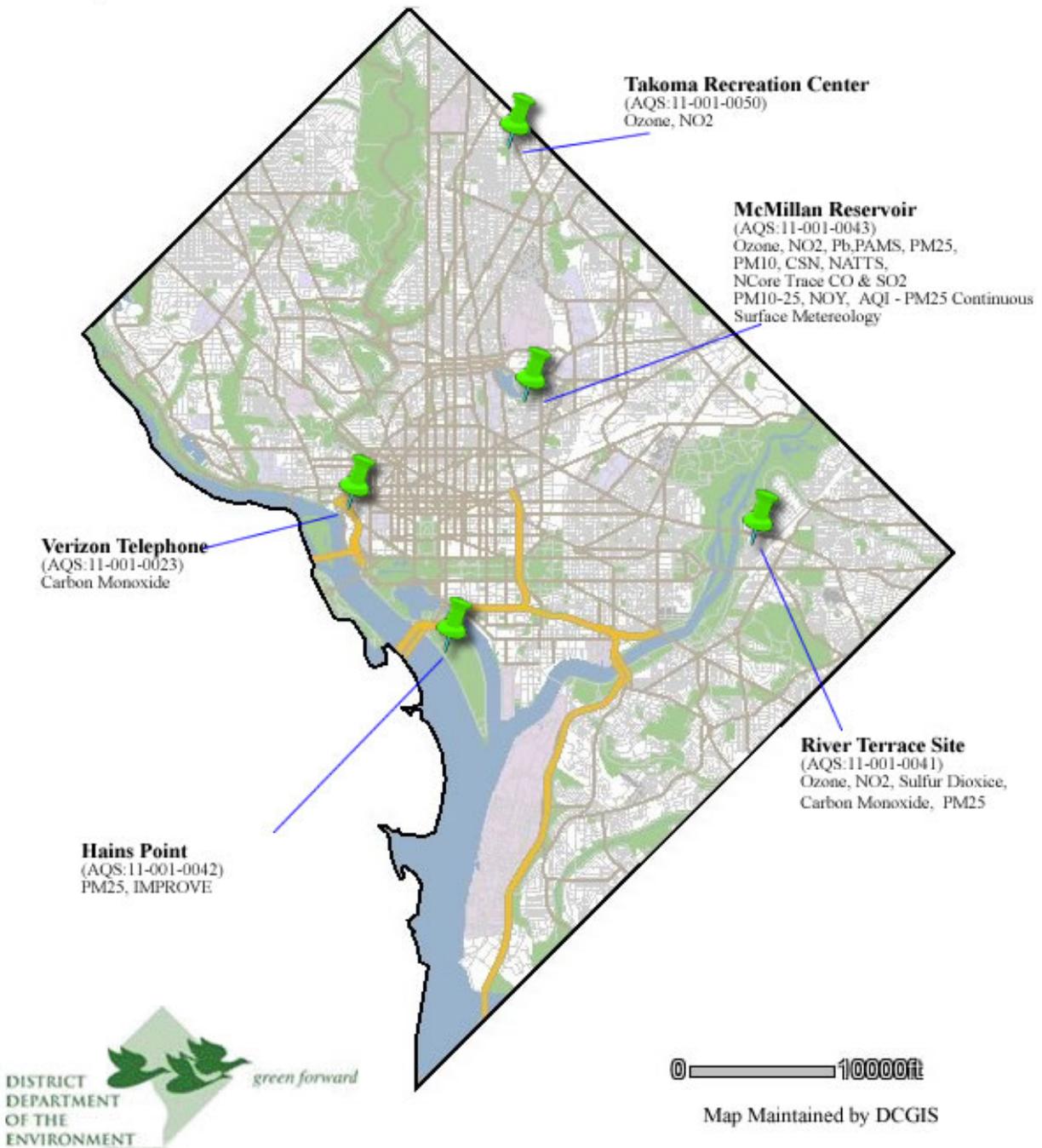
Table 2-4: Monitoring Methods and AQS Codes

Parameter	Method Code	Sample Analysis Description
Air Toxics	150	Capillary GC ITD Mass Spectrometer
Carbon Monoxide	054	Nondispersive Infrared Photometry
Carbon Monoxide, Trace	588	Nondispersive Infrared Photometry
Nitric Oxide and Nitrogen Dioxide	074	Chemiluminescence
Total Reactive Nitrogen Oxides	090	Chemiluminescence
PAMS VOCs	128	Gas Chromatograph with FID
PAMS VOCs	126	Cryogenic Pre-concentration Trap GC/FID
Ozone	047	Ultra Violet Photometry
PM10 Continuous	170	Beta Attenuation Mass Monitor – PM10 FEM with glass fiber filter tape
PM10 Low-Vol		Gravimetric
PM10 High-Vol	065	Gravimetric
PM2.5	118	Gravimetric
PM2.5 Speciation: Trace Elements	821	Energy Dispersive XRF using Teflon Filter
PM2.5 Species Constituents: Ions	812	Ion Chromatography using Nylon Filter
PM2.5 Species Constituents: Organics	813	Using quartz filter – Thermo-Optical Transmittance
PM10-2.5 Coarse	185	Dual BAM-1020 monitors
PM2.5 Continuous	170	Beta Attenuation Mass Monitor - PM2.5 FEM with glass fiber filter tape
PM2.5 - Elemental and Organic Carbon	862	BC/EC, Self-contained Non-dispersive Infrared (NDIR) Detector System
Sulfur Dioxide	060	Pulsed Fluorescence
Sulfur Dioxide, trace	592	Pulsed Fluorescence
Pb (Lead) TSP	189	ICP-MS Extracted on a hot plate with 3M HNO3 according to SW-846 Meth 6020A

Table 2-5: Constituent Compounds and Species Measured in the District

Constituent Group	Compounds in the Constituent Group
Air Toxics	Dichlorodifluoromethane, Chloromethane, 1,2-Dichloro-1,1,2,2,tetrafluoroeth, Chloroethene, 1,3-Butadiene, Bromomethane, Chloroethane, Trichlorofluoromethane, Acrolein, Acetone, 1,1-Dichloroethene, Methylene Chloride, Carbon disulfide, Isopropyl Alcohol, 1,1,2-Trichloro-1,2,2-trifluoroethane, Trans-1,2-Dichloroethene, 1,1-Dichloroethane, 2-methoxy-2-methyl-Propane, Methyl ethyl Ketone (2-butanone), Cis-1,2-Dichloroethene, Hexane, Chloroform, Ethyl Acetate, Tetrahydrofuran, 1,2-Dichloroethane, 1,1,1-Trichloroethane, Benzene, Carbon tetrachloride, Cyclohexane, 1,2-Dichloropropane, Bromodichloromethane, Trichloroethylene, Heptane, Cis-1,3-Dichloro-1-Propene, Methyl Isobutyl Ketone, Trans-1,3-Dichloro-1-Propene, 1,1,2-Trichloroethane, Toluene, Dibromochloromethane, Methyl butyl Ketone, (2-Hexanone), 1,2-Dibromoethane, Tetrachloroethylene, Chlorobenzene, Ethyl benzene, m & p- Xylene, Bromoform (Tribromomethane), Styrene, 1,1,2,2-Tetrachloroethane, o-Xylene, 1-Ethyl-4-Methylbenzene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, Benzyl Chloride, 1,3-dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, 1,2,4-Trichlorobenzene, and Hexachloro-1,3-Butadiene
PAMS VOCs	Acetone, Ethane, Acetylene, Propane, 2,2-dimethylbutane, Benzene, i-Butane, n-Butane, i-Pentane, n-Pentane, 2,2,4-trimethylpentane, i-Propylbenzene, n-hexane, 2-methylpentane, 2,3-dimethylbutane, Cyclopentane, Ethylbenzene, n-Propylbenzene, 3-methylpentane, Toluene, Styrene, n-Heptane, 2-methylhexane, 2,4-dimethylpentane, 2,3,4-trimethylpentane, o-Xylene, 3-methylhexane, 2,3-dimethylpentane, Formaldehyde, n-Octane, 2-methylheptane, Cyclohexane, 3-methylheptane, n-Nonane, m&p-Xylenes, Methylcyclohexane, Methylcyclopentane, n-Decane, n-Undecane, Acetaldehyde, 1,2,3-Trimethylbenzene, 1,2,4-Trimethylbenzene, 3-methyl-1-butene, 1-Butene, Propene, 1-Pentene, 1,3,5-Trimethylbenzene, 2-methyl-1-pentene, 2-methyl-2-butene, c-2-hexene, c-2-pentene, c-2-Butene, Cyclopentene, 4-methyl-1-pentene, t-2-hexene, t-2-Butene, t-2-pentene, Isoprene
Speciated PM2.5 Mass	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, PyroIC, Rubidium, Samarium, Scandium, Selenium, Silicon, Silver, Sodium, Strontium, Sulfate, Sulfur, Tantalum, Terbium, Tin, Titanium, Total carbon, Vanadium, Wolfram, Yttrium, Zinc, and Zirconium

Figure 2-1: District's Ambient Air Monitoring Network



2.1 Air Monitoring Networks

The District's monitoring stations individually are part of one or more of the national ambient air monitoring networks. The following sections describe each monitoring network type.

State and Local Air Monitoring Station:

The state and local ambient monitoring stations (SLAMS) measure ambient levels of gaseous and particulate air pollutants. SLAMS represent the majority of all criteria pollutant (SO₂, NO₂, CO, O₃, Pb, PM_{2.5}, PM₁₀) monitoring across the nation. These stations use federal reference or federal equivalent methods (FRM/FEM) for direct comparison to the NAAQS to determine whether areas are in attainment or nonattainment for the air quality standards. There are approximately 4,000 SLAMS monitoring stations nationwide. The distribution of stations in the SLAMS Network is determined in large part by the needs of state and local air pollution control agencies to meet State Implementation Plan (SIP) requirements. The District's network consists of five SLAMS.

National Air Monitoring Station Network:

The NAMS network is a subset of the SLAMS network and was developed in the 1970s. NAMS stations use federal reference or equivalent methods (FRM/FEM) for direct comparison to the NAAQS. In the early 1980s, the networks began to add PM₁₀ monitors, and then expanded to include PM_{2.5} monitors, beginning in 1999, to assess attainment with the 1997 PM_{2.5} NAAQS. The PM_{2.5} network consists of ambient monitoring sites that measure PM_{2.5} mass. The NAMS are designated as national trends sites and, in some cases, also serve as design value sites for Metropolitan Statistical Areas (MSAs).

Near-Roadway Monitoring Network

The 2010 NO₂ NAAQS minimum monitoring requires establishment of a network with at least two near-roadway NO₂ monitors in the Washington DC-MD-VA CBSA. DDOE recently received federal grant funds for establishing a near-roadway NO₂ ambient monitoring station in the District by January 1, 2015. Details about the District's new near-roadway NO₂ monitoring station will be presented in the next year's annual network plan.

NCore Monitoring Network:

In October 2006, EPA revised the national air quality monitoring regulations (40 C.F.R. Part 58). The most significant element of the revised regulations was to establish an NCore multi-pollutant monitoring network by January 1, 2011. Measurements for pollutants such as ozone, trace SO₂, trace CO, total reactive nitrogen oxides (NO_y) and PM_{coarse} (PM_{10-2.5}; PM between 10 microns and 2.5 microns in diameter), and surface meteorological measurements for wind speed, wind direction, relative humidity, and ambient temperature are required at NCore sites. Ambient Pb monitoring is also required at NCore sites by January 1, 2012.

The District established an NCore station at the McMillan site (11-001-0043) January 2011. The NCore station consists of SO₂ and CO trace gas analyzers, NO_y analyzer and BAMM FEM

monitors to measure PM_{10-2.5}. A TSP-Pb FRM monitor was added at the McMillan NCore station in January 2012.

Photochemical Assessment Monitoring Stations Network:

The Photochemical Assessment Monitoring Stations (PAMS) network was developed in the 1990s to provide an air quality database that will assist in evaluating and modifying control strategies for attaining the ozone NAAQS. The measured parameters include ozone, VOCs, and NO_x. The national PAMS network consists of 75 sites in 25 metropolitan areas. PAMS was a major addition to state and local networks, with near research grade measurements for over 56 VOC compounds during core part of the ozone season (June to August). The District operates one PAMS Type 2 station at the McMillan site. Recently in 2011, DDOE deployed Viasala WXT 520 meteorological monitoring sensors on a new 10-meter tower at the McMillan PAMS/NCore site.

Special Purpose Monitoring Networks:

Special Purpose Monitoring (SPM) networks include National Air Toxic Trends Stations (NATTS), PM_{2.5} Chemical Speciation Network (CSN), and Air Quality Index (AQI) and other special purpose monitors. Currently, the District's SPM network consists of: one NATTS, one CSN station, one continuous PM_{2.5} AQI station, and one OC/EC Sunset semi-continuous carbon analyzer at the McMillan site.

Interagency Monitoring of Protected Visual Environments Network:

The Interagency Monitoring of Protected Visual Environments (IMPROVE) program was established in 1985 to help implement plans to reduce visibility impairment in Class I areas (large federally-protected national parks and wilderness areas) as stipulated in the CAA. There are about 110 IMPROVE sites in Class I visibility protection areas. These sites collect aerosol samples and analyze the filters for trace elements, major ions, and carbon fractions. Most of the IMPROVE sites are operated by federal agencies within the U.S. Department of the Interior.

The U.S. National Park Service (NPS) operates one IMPROVE site along with a nephelometer at the Hains Point station in the District. DDOE operates a PM_{2.5} FRM monitor at the District's IMPROVE site. This site may be one of the very few IMPROVE sites in an urban area.

2.2 Pollutant Parameters

DDOE operates a comprehensive air monitoring network covering a range of pollutants. This section presents descriptions segregated by pollutant parameter.

Fine Particulate Matter (PM_{2.5})

PM_{2.5} FRM Monitors: DDOE operates four Partisol 2025 PM_{2.5} FRM monitors in its air monitoring network – one each at the River Terrace and Hains Point stations, and two PM_{2.5} FRMs collocated at the McMillan site. The McMillan and River Terrace primary monitors are

daily sampling sites while the Hains Point monitor is on a 1-in-3 day sampling schedule. The collocated secondary PM_{2.5} monitor at McMillan is operated on a 1-in-6 day sampling schedule.

PM_{2.5} Chemical Speciation Network: DDOE currently operates one PM_{2.5} CSN (MetOne SASS) monitor at the McMillan site. The District implemented the carbon channel upgrade (URG 3000N) for the CSN monitor during 2007. The CSN monitor at the McMillan site operates on a 1-in-3 day sampling schedule to measure PM_{2.5} chemical species. NPS operates an IMPROVE PM_{2.5} speciation monitor and a nephelometer at the Hains Point site.

Continuous PM_{2.5} Monitoring: DDOE designated the BAM PM_{2.5} continuous FEM monitor at the McMillan (11-001-0043) site as the PM_{2.5} AQI monitor. DDOE shut down the old TEOM non-FEM PM_{2.5} AQI monitor in June 2012. The old TEOM PM_{2.5} monitor is being converted as a PM₁₀ continuous FEM for future use.

Particulate Matter (PM₁₀)

In January 2012, DDOE implemented a network change and relocated the PM₁₀ sampling from the River Terrace (11-001-0041) site to the McMillan (11-001-0043) site. As approved by EPA, DDOE discontinued the Hi-Vol PM₁₀ monitors at the River Terrace station and established two Low-Vol PM₁₀ monitors at the McMillan Reservoir station by converting the old Andersen FRM monitors. DDOE also operates a continuous BMM PM₁₀ FEM sampler at the McMillan site.

Ozone (O₃)

Ozone is not emitted directly from a pollution source but is formed in the lower atmosphere by the reaction of NO_x and VOCs in the presence of sunlight and warm temperatures. Sources of NO_x include automobiles, power plants, and other fuel combustion equipment. VOCs 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. These compounds or “precursors of ozone” can travel for many miles before chemical reactions in the atmosphere form ozone.

DDOE currently operates Thermo-49i series ozone analyzers at three sites in the District: River Terrace, McMillan Reservoir, and Takoma Recreation Center.

Ozone is measured by ultraviolet absorption photometry. Air is drawn continuously through a sample cell where ultraviolet light passes through it. Ozone 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 electric signal related to the concentration of ozone in the sample cell. Even though 40 C.F.R. Part 58 Appendix D requires ozone monitoring primarily during the ozone season (April 1 to September 30), DDOE is committed to year-round measurements and collects ozone data on an hourly basis.

Carbon Monoxide/Trace-CO

CO is measured by infrared absorption photometry. Air is drawn continuously through a sample cell where infrared light passes through it. CO 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 electric signal related to the CO concentration in the sample cell. The CO trace analyzer is designed to measure background concentrations of CO with a lower detection limit less than 4 ppb and uses a high performance modified vacuum pump. CO concentrations are highest along heavily traveled roadways and decreases significantly with distance from traffic. Therefore, CO monitors are usually located close to roadways or in urban areas.

DDOE operates two Thermo-48i series CO analyzers year-round one each at the River Terrace and Verizon sites. In January 2011, DDOE deployed an Ecotech EC9830T trace-CO analyzer at the McMillan site to meet NCore monitoring requirements.

Nitrogen Dioxide (NO₂)

NO₂ is measured indirectly. First, nitrogen oxide (NO) is measured using the chemiluminescence reaction of NO with O₃. 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 NO₂. Light emitted from this reaction is detected with a photomultiplier tube and converted to an electrical signal proportional to the NO concentration. Next, NO_x is measured by passing the air through a converter where any NO₂ 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 NO₂ concentration is equal to the difference between NO_x and NO.

NO_x 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.

DDOE currently operates NO₂ monitors at three sites collocated with ozone measurement sensors. The NO-NO₂-NO_x Thermo-42i analyzers are operated year-round and are located at the River Terrace, McMillan, and Takoma Recreation Center sites.

Total Reactive Nitrogen Oxides (NO_y): In January 2011, DDOE installed an Ecotech EC9841A model NO_y analyzer at the McMillan NCore station. This is a chemiluminescence-based analyzer that uses a high performance NO_y converter to measure trace levels of NO_y and NO.

Near-road NO₂ network: The 2010 NO₂ NAAQS requires establishment of a new network of near-roadway NO₂ monitors. In February 2013, DDOE received a federal grant for establishing a near-roadway monitoring station in the District by January 1, 2015. Details about the District's new near-roadway NO₂ monitoring will be presented in the next year's annual network plan.

Sulfur Dioxide/Trace-SO₂

SO₂ 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 SO₂ 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 SO₂ concentration. The SO₂ trace analyzer is a high performance UV fluorescence analyzer designed to measure background concentration of SO₂

with a lower detection limit less than 200 parts per trillion. The main sources of SO₂ are combustion of coal and oil (mostly from electrical generating units, refineries, smelters, and industrial boilers).

DDOE operates one Thermo 43i continuous SO₂ monitor at the River Terrace station and collects hourly data year-round. In January 2011, DDOE deployed an Ecotech EC9850T trace-SO₂ analyzer at the McMillan NCore station.

Air Toxics

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. Toxics are released from automobiles, gasoline vapors, and a large variety of large and small commercial and industrial sources that use chemical solvents, paint thinner, and other chemical compounds.

DDOE operates one NATTS station at the McMillan site. Air toxics samples are collected for 24 hours with a model 910A Environmental Systems Inc. canister sampler on a 1-in-6 day schedule.

NATTS monitors at the McMillan site include: hexavalent chromium (ERG Cr+6 analyzer), PAH (Tisch Puf+ analyzer), heavy metals (PM₁₀ High-Vol), and VOCs and carbonyls (Model 910A, Environmental Systems Inc). The sampled canisters and carbonyls sep-paks are returned to the laboratory for analysis on an Entech/Agilent gas chromatograph (GC) mass spectrometer system. The District's NATTS site also includes an Aethalometer (Magee Scientific) for continuous sampling of black carbon (OC/EC).

EPA evaluated the ambient concentrations of hexavalent chromium in the District and found that the levels were generally below the method detection limit. Hence, based on EPA's advice, DDOE will discontinue sampling for hexavalent chromium beginning in July 2013.

PAMS Ozone Precursors

VOCs and nitrogen oxides are precursor pollutants for ground-level O₃ formation. VOCs are released 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.

DDOE operates one PAMS Type 2 station at the McMillan site. The parameters measured are O₃, NO, NO_x, NO₂, speciated VOCs, and surface meteorology.

During the core ozone season (June-August), three-hour canister air samples are collected on a 1-in-3 day schedule by using a XonTech Model 910A sampler. Additionally, 24-hour canister air samples are collected on a 1-in-6 day sampling schedule with a XonTech Model 910A sampler. The canisters are returned to the laboratory for analysis on an EnTech/Agilent GC/FID system for speciated VOCs. During core ozone season, hourly measurements for a set of 56 target hydrocarbons are made on-site using a Perkin Elmer VOC Air Analyzer with dual flame ionization detectors (Perkin-Elmer 350ATD ozone precursor sampler and Clarus 500 PAMS Gas Chromatograph sampling system).

DDOE also operates continuous O₃ and NO_x analyzers complemented with surface meteorological measurements at the McMillan PAMS site. In 2011, DDOE deployed Viasala WXT 520 meteorological monitoring sensors on a new 10-meter tower at the McMillan PAMS/NCORE site.

Lead (Pb)

Beginning in January 2012, DDOE has been operating a TSP-Pb monitor at its McMillan NCORE site on a 1-in-6 day sampling schedule. Samples are sent to the West Virginia Department of Environmental Protection's Air Monitoring Laboratory for chemical analysis.

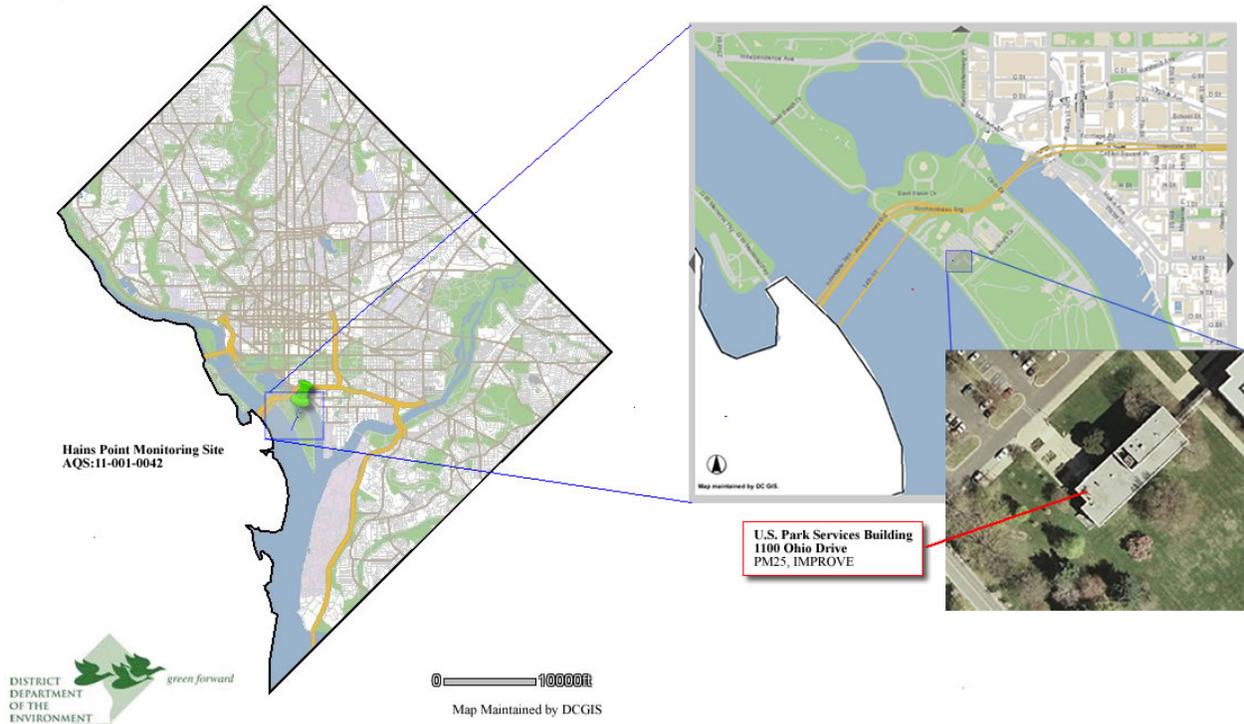
3.0 District of Columbia's Air Monitoring Stations

DDOE currently maintains a network of five ambient air monitoring stations. Hains Point, McMillan, River Terrace, Takoma Recreation Center, and Verizon are the descriptive names of these stations. The following sections provide additional information. Maps for the individual sites are shown in Figures 3-1 to 3-5.

3.1 Hains Point Station

The Hains Point monitoring station has been operational since January 1988, and the measurement sensors are perched on the rooftop of a NPS Park Police building. NPS operates IMPROVE PM_{2.5} mass and speciation and PM₁₀ monitors at this site. DDOE operates a PM_{2.5} FRM monitor at this location. This is also one of the very few urban IMPROVE sites in the nation.

Figure 3-1: Hains Point Monitoring Station Locator Maps

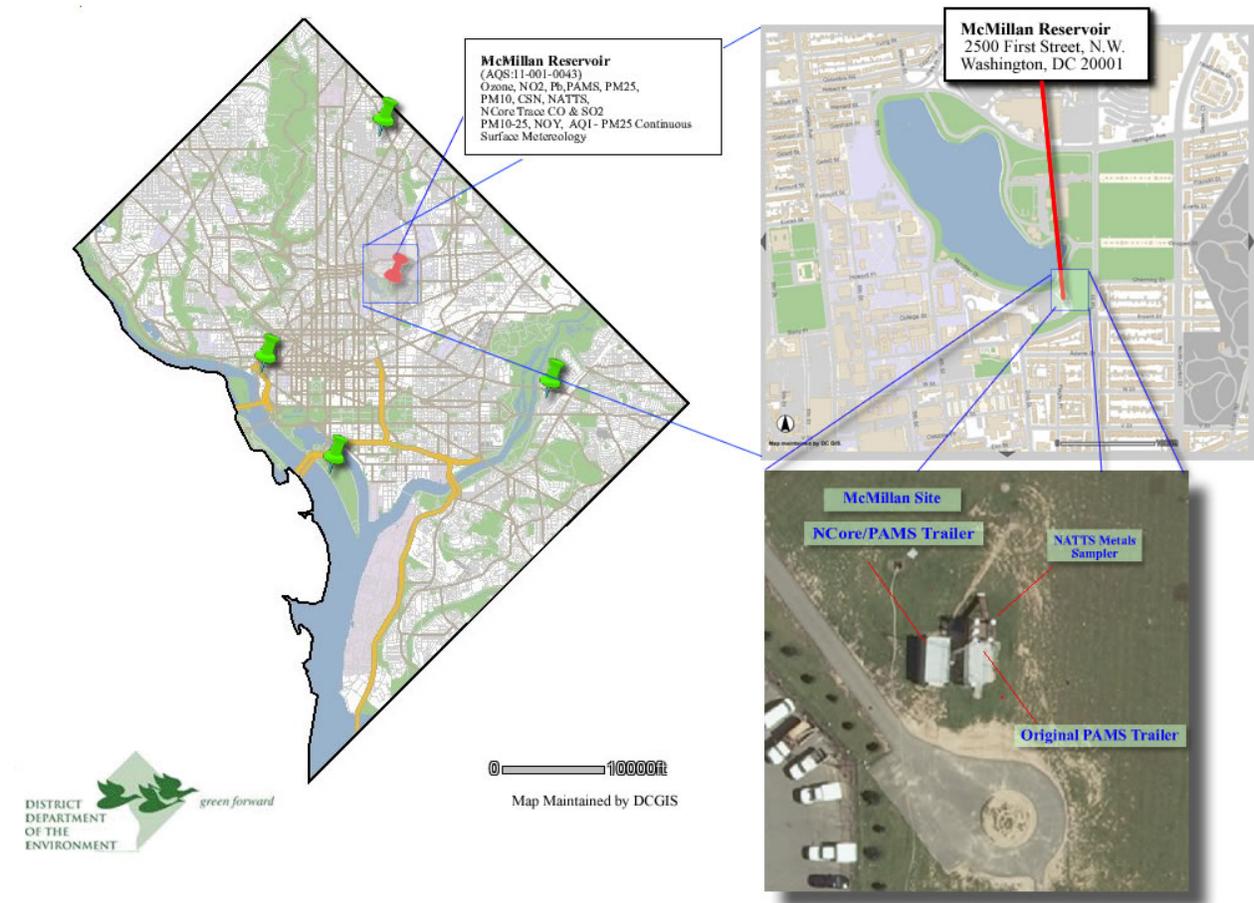


3.2 McMillan Station

The McMillan monitoring station is the most comprehensive ambient air station in the District. It was launched in 1994 as a PAMS Type 2 station. Measurements for 56 target hydrocarbons are conducted with a PAMS automatic GC ambient air sampling system. The station was expanded in 2000 and 2001 with the addition of PM_{2.5} FRM, PM_{2.5} CSN monitoring, PM_{2.5} continuous, NATTS and BC/EC sensors. Surface meteorological measurements are carried out at the McMillan Reservoir site as part of PAMS monitoring.

Also, the McMillan was the first NATTS site in EPA Region 3. In January 2011, the McMillan site has expanded into an NCore network monitoring station. TSP Pb monitor was added in January 2012. Additionally, as part of the national pilot study, a Sunset Model 4 Semi-Continuous OC/EC monitor was deployed at McMillan station under EPA Office of Air Quality Planning and Standards (OAQPS) guidance.

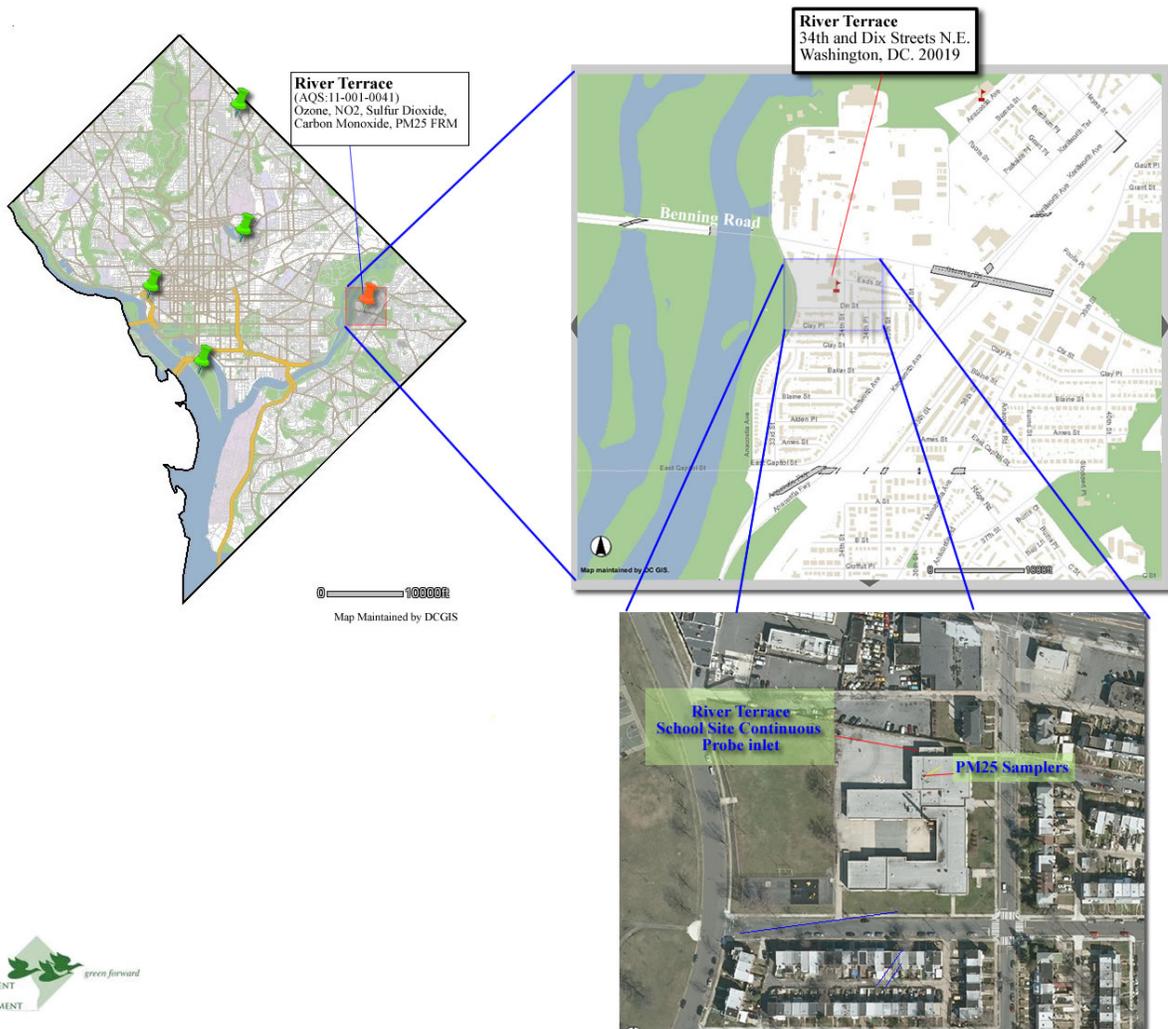
Figure 3-2: McMillan Reservoir Site Locator Maps



3.3 River Terrace Station

The River Terrace monitoring station has been in operation since 1993. The site consists of measurement analyzers for O₃, SO₂, CO, NO_x, and PM_{2.5}.

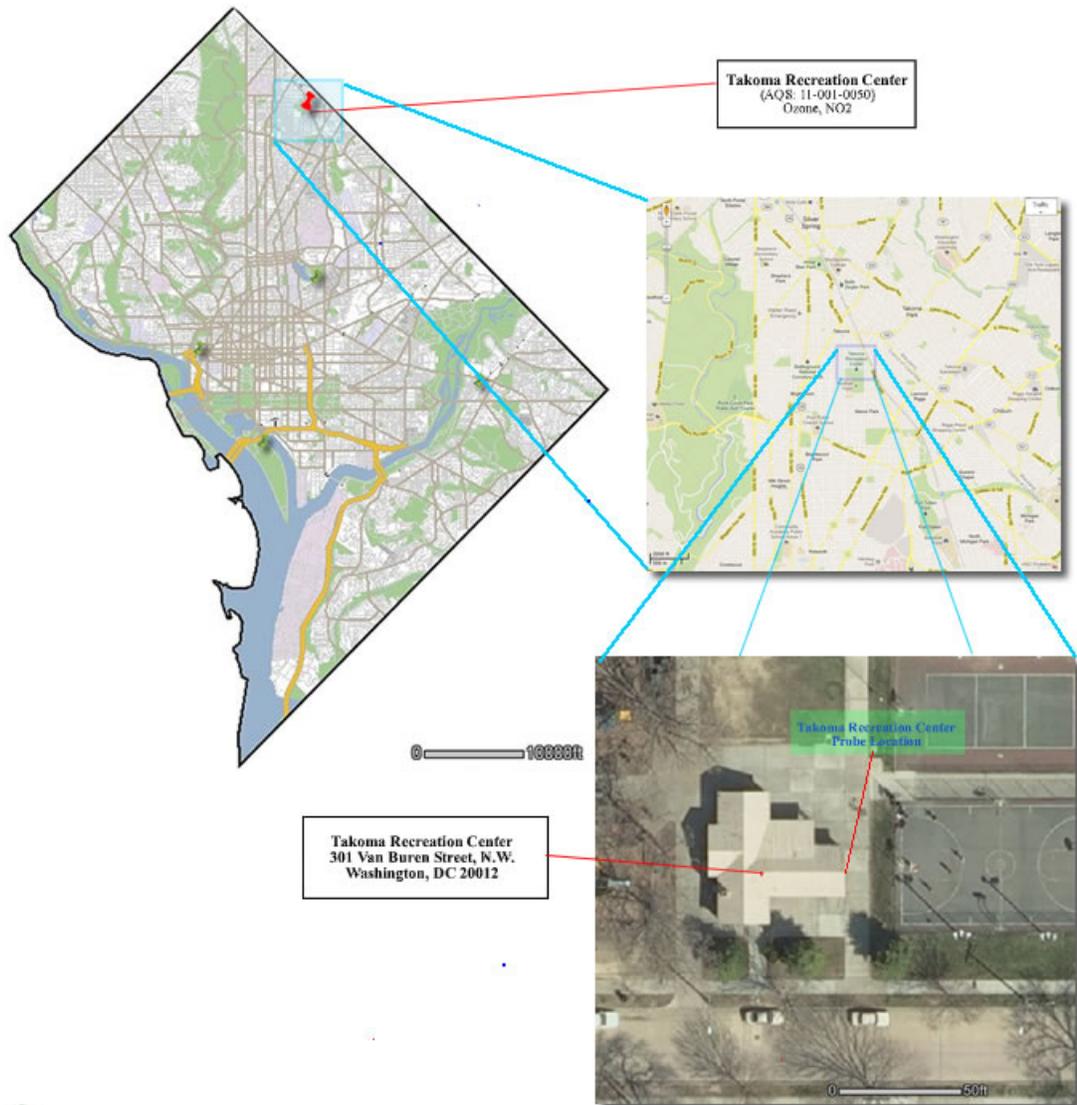
Figure 3-3: River Terrace Site Locator Maps



3.4 Takoma Recreation Center Station

The Takoma Recreation Center monitoring station has been in operation since January 2013. The station consists of measurement analyzers for O₃ and NO_x. This station was established as a replacement site for Takoma School station (11-001-0025) which had ceased operations in 2011 because of a fire incident.

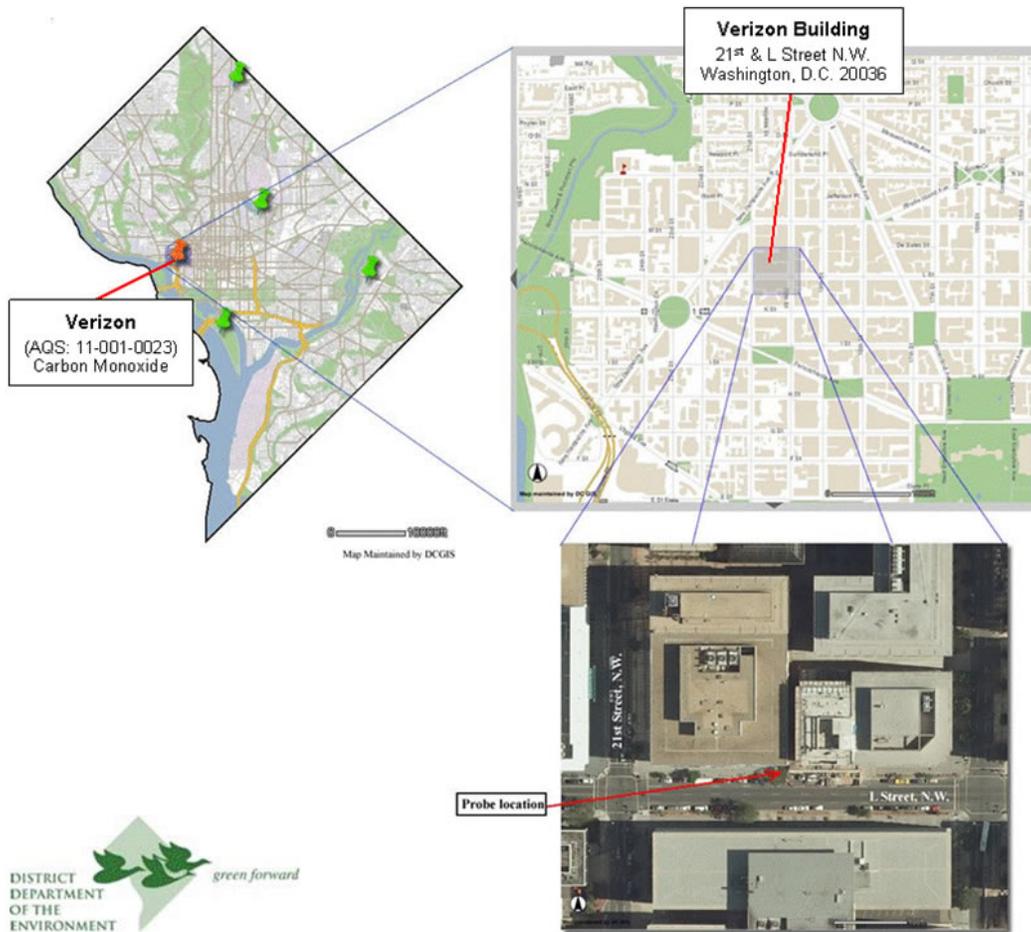
Figure 3-4: Takoma Recreation Center Site Locator Maps



3.5 Verizon Station

The Verizon station was launched in 1980 and it houses a CO measurement sensor. This measuring component is important for the District because it is located in the core business district where there is a significant component of pedestrian traffic as well as traffic congestion. Classified as a “micro-scale” site, the Verizon station is in a “city canyon” type of environment.

Figure 3-5: Verizon Monitoring Site Locator Maps



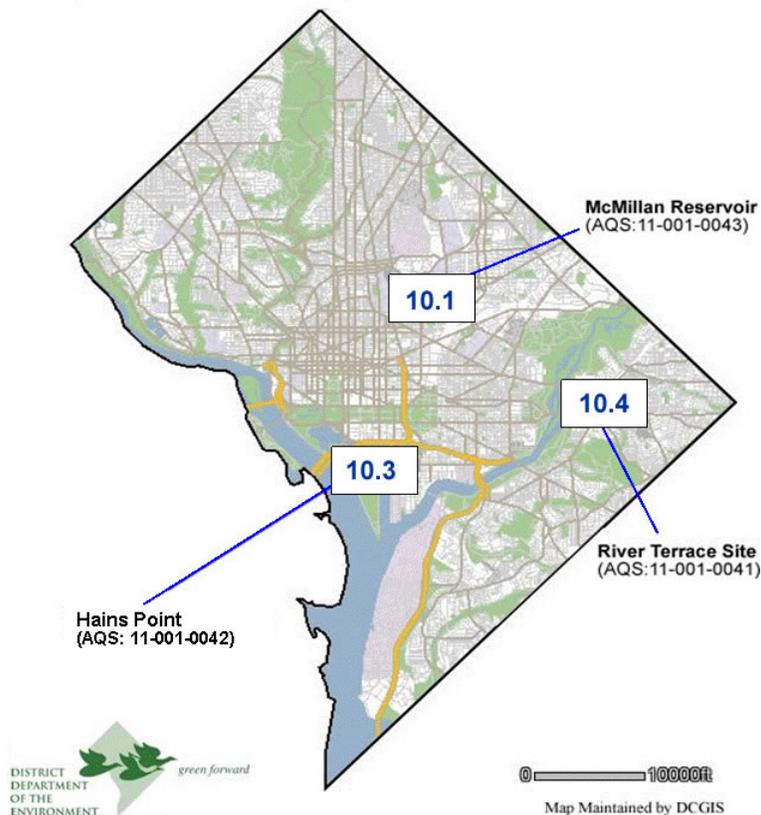
4.0 Ozone and PM_{2.5} Air Quality

Ambient air quality for criteria pollutants as given by design value concentrations a to determine if the monitored air quality in the District is in compliance with the NAAQS. Design values are defined in CAA guidance and are often based on multiple years of data to ensure a stable indicator. Design values are typically used to classify nonattainment areas, assess progress towards meeting the NAAQS, and develop control strategies. Design values are computed and published annually by EPA's OAQPS and reviewed in conjunction with the EPA regional offices.

4.1 Annual PM_{2.5} Design Concentrations

The figure and table below give the design concentrations for PM_{2.5} at the District's sites for the recent period. The annual PM_{2.5} design values were calculated using the average of the annual arithmetic mean for a consecutive three-year period. Design values based on 2009 to 2012 ambient data indicate that the District is in attainment for the annual PM_{2.5} NAAQS of 15 µg/m³.

Figure 3-6: Annual PM_{2.5} Design Values

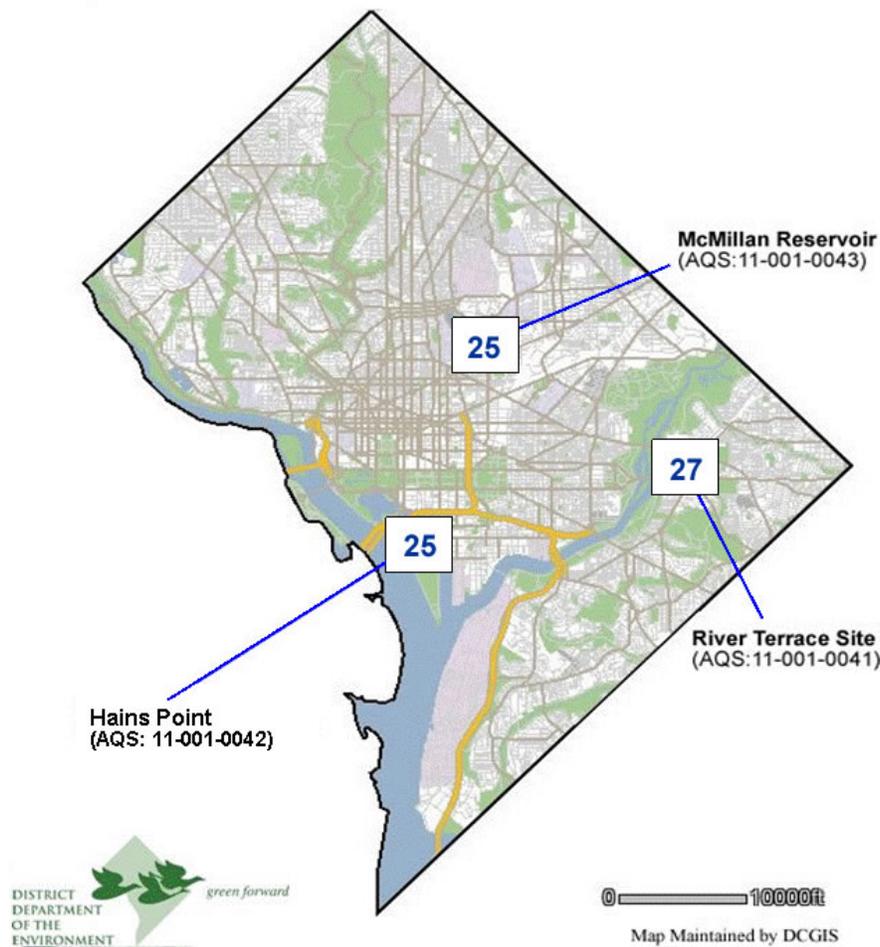


Annual PM _{2.5} Design Values (µg/m ³)					
Site	AIRS ID	2009	2010	2011	2012
Hains Point	110010042	12.0	11.2	10.5	10.3
McMillan	110010043	11.6	10.8	10.3	10.1
River Terrace	110010041	12.1	11.2	10.6	10.4

4.2 Daily PM_{2.5} Design Concentrations

Daily PM_{2.5} design concentrations are calculated using the 98th percentile ambient concentration value from each year for a given consecutive three-year period. The design value is the average of the three 98th percentile data. The table below gives the design values for daily PM_{2.5} using data from 2008 to 2012. Design values based on the recent data indicate that the District is in attainment for the 2006 daily PM_{2.5} NAAQS of 35 µg/m³.

Figure 3-7: Daily PM_{2.5} Design Values

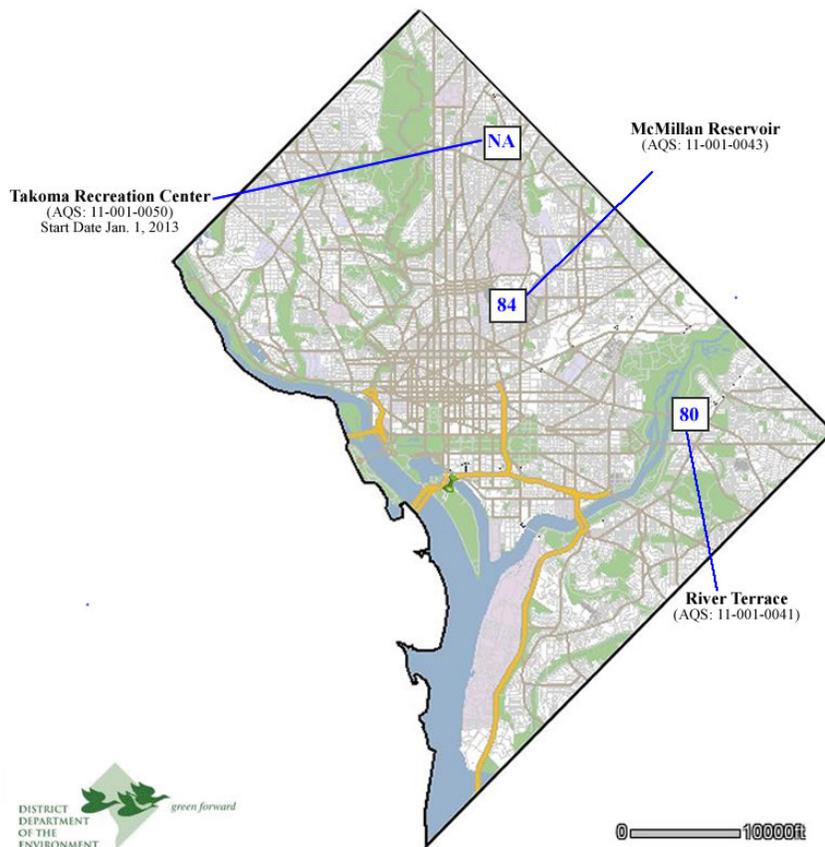


Daily PM _{2.5} Design Values (µg/m ³)					
Site	AIRS ID	2009	2010	2011	2012
Hains Point	110010042	28	26	24	25
McMillan	110010043	29	26	25	25
River Terrace	110010041	29	27	26	27

4.3 Ozone Design Concentrations

The table below includes current design values for ground-level ozone using data from 2007 to 2012. The ozone design values are calculated by taking the three-year average of the annual 4th highest daily maximum 8-hr average concentrations. The 2008 8-hr ozone NAAQS is 0.075 ppm, or 75 ppb. Monitored data indicate that the ambient air quality is in violation of the NAAQS at O₃ monitoring sites in the District. Monitoring at the Takoma School (11-001-0025) station was discontinued in 2011 because of a fire incident, so the design value for Takoma School is based on two years of data. The new Takoma Recreation Center O₃ monitoring site (11-001-0050) was deployed in January 2013 and there is inadequate data for this monitor.

Figure 3-8: Ozone Design Values



Design Values (ppb)						
Site	AIRS ID	2008	2009	2010	2011	2012
McMillan	11-001-0043	87	80	79	79	84
River Terrace	11-001-0041	86	78	77	76	80
Takoma	11-001-0025	80	77	75	75*	N/A
Takoma Recreation Center	11-001-0050	N/A	N/A	N/A	N/A	N/A

*Takoma School monitor shut down in 2011 because of a fire incident. The 2011 design value for Takoma School monitor was based on two years (2009 and 2010) data.

**Takoma Recreation Center station started in January 2013

5.0 Network Changes and Upgrades

The District supports EPA's efforts to protect public health and natural resources under the CAA. DDOE is working with EPA Region 3 and EPA's OAQPS to evaluate potential modifications to the District's network, including changes to the monitoring sites, sampling schedules, sampling equipment, and technologies, to ensure that the District's ambient air monitoring program meets all regulatory requirements.

The 2010 NO₂ NAAQS revisions require the establishment of at least two near-roadway NO₂ monitors in the Washington DC-MD-VA metropolitan area. The District received federal funding for the establishment of a new near-road NO₂ monitoring station. DDOE is working with the District's Department of Transportation (DDOT) and NPS to identify a suitable location for a near-roadway NO₂ monitoring site in the District. DDOE is expected to establish a near-roadway NO₂ station for operation by January 1, 2015. Details about the new near-roadway NO₂ monitoring station will be presented in the next year's annual network plan.

The sections below describe recently implemented changes and proposed changes to the District's monitoring network.

5.1 McMillan (Site ID 11-001-0043)

- PAMS monitors: No changes planned.
- NCore monitors: No changes planned.
- Pb monitors: No changes planned
- PM_{2.5} FRM monitors: No changes planned.
- PM_{2.5} CSN: No changes planned.
- PM₁₀ FRM/FEM Monitors:
DDOE currently operates two PM₁₀ FRM (filter-based manual) Low-Volume Anderson samplers- a primary and a secondary monitor. DDOE also operates a BAMM PM₁₀ FEM for the NCore station at this location.

DDOE is proposing to discontinue both the primary and secondary manual filter-based samplers currently in operation at the McMillan station. Expected date of shut down for these aging monitors is January 31, 2014.

DDOE is proposing to co-designate the McMillan NCore station's BAMM PM₁₀ FEM automated sampler for PM₁₀ network to fulfill the monitoring requirements in the District.

- NATTS monitors:
DDOE has been operating a hexavalent chromium sampler at its air toxics monitoring station. EPA evaluated the ambient concentrations of hexavalent chromium in the District and found that the levels were below the method detection limit. Based on EPA's advice and earlier communications with EPA Region 3 offices, DDOE will discontinue hexavalent chromium sampling beginning in July 2013.

5.2 River Terrace School (ite ID 11-001-0041)

- No changes are planned.

5.3 Takoma Recreation Center (Site ID 11-001-0050)

- No changes are planned.

5.4 Hains Point (Site ID 11-001-0042)

- No changes are planned.

5.5 Verizon (Site ID 11-001-0023)

- No changes are planned.

6.0 Air Monitoring Program and Data Contacts

The Monitoring and Assessment Branch in DDOE's Air Quality Division maintains the District's ambient air monitoring network and quality assures and quality controls the ambient air quality data. Data is stored locally for use by staff and for preparation of special reports, data charts, special requests and Freedom of Information Act requests.

Data is delivered to EPA's AQS database and reported on a schedule set forth in 40 C.F.R. Part 58 of the CAA. EPA controls access to the raw ambient air quality data that DDOE transmits to the national database. Annual data reports are generated from AQS and data certifications are prepared by DDOE, according to the reporting requirements in 40 C.F.R. Part 58. Data requests can be directed via email to: robert.day@dc.gov.

The main contact for the District's air monitoring program is:

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