



District of Columbia  
Calendar Year 2025 Annual Ambient Air  
Monitoring Network Plan

DRAFT

March 2024



Air Monitoring Branch  
Air Quality Division  
Department of Energy & Environment  
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## Acronyms and Definitions

|                   |  |
|-------------------|--|
| AQI               | Air Quality Index  |
| AQS               | Air Quality System   |
| BAM               | Beta Attenuation (Mass) Monitor – used for continuous measurements of particulate matter                             |
| CAA               | Clean Air Act  |
| CAPS              | Cavity Attenuated Phase Shift  |
| C.F.R.            | Code of Federal Regulations  |
| CSN               | PM <sub>2.5</sub> Chemical Speciation Network  |
| CO                | Carbon Monoxide  |
| DOEE              | Department of Energy and Environment   |
| EMP               | Enhanced Monitoring Plan   |
| 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   |
| IR                | Infrared (radiation)   |
| 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 <sub>2</sub>   | Nitrogen Dioxide   |
| NO <sub>x</sub>   | Oxides of Nitrogen (ozone precursor)   |
| NO <sub>y</sub>   | Total Reactive Nitrogen Species (ozone precursor)  |
| O <sub>3</sub>    | Ozone  |
| OC/EC             | Organic Carbon/Elemental Carbon  |
| PAHs              | Polycyclic Aromatic Hydrocarbons   |
| PAMS              | Photochemical Assessment Monitoring network Stations   |
| Pb                | Lead   |
| PM <sub>2.5</sub> | Particulate matter with an equivalent diameter less than or equal to 2.5 μm  |
| PM <sub>10</sub>  | 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 <sub>2</sub>   | Sulfur Dioxide   |
| TSP               | Total Suspended Particles  |
| TEOM              | Tapered Element Oscillating Microbalance – used for continuous measurements of PM <sub>10</sub> or PM <sub>2.5</sub> |
| UV                | Ultraviolet (radiation)  |
| VOCs              | Volatile Organic Compounds   |

## **Executive Summary**

The Clean Air Act mandates an ambient air quality surveillance system in state and local jurisdictions including the District of Columbia (District). The U.S. Environmental Protection Agency (EPA) codified the national ambient air monitoring regulations in Title 40 Code of Federal Regulations (C.F.R.) Part 58. The regulations require state and local monitoring agencies to conduct a periodic assessment of ambient air monitoring networks and propose any changes in an annual ambient air monitoring network plan. Annual network plans need to be submitted to EPA by July 1<sup>st</sup> of every year. This is the District's Annual Ambient Air Network Plan (Network Plan) for the calendar year 2025.

In March 2024, District of Columbia Department of Energy and Environment (DOEE) established a new ambient monitoring station in an overburdened community in Ward 8. The new station has been funded by the American Rescue Plan Act of 2021 (ARP) Direct Award Air Monitoring federal grant.

DOEE is proposing no changes to the District's current six-station ambient air monitoring network in the calendar year 2025. The District's ambient monitoring network will be maintained as described in the subsequent sections of this Network Plan.

## 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 that threaten human health and welfare. Primary standards are set according to criteria designed to protect public health, including sensitive populations such as children and the elderly. Secondary standards are set to minimize harm to public welfare and the environment (*e.g.*, decreased visibility, damage to crops, vegetation, and buildings).

Six pollutants currently have NAAQS: ozone (O<sub>3</sub>), carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), particulate matter (less than 10 microns, PM<sub>10</sub>; and less than 2.5 microns aerodynamic diameter, PM<sub>2.5</sub>), 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” of the standard for that pollutant.

Air pollution comes from many sources including on-road vehicles (cars, trucks, buses, and motorcycles), off-road equipment (locomotives, boats, construction equipment, lawn mowers), area sources (small stationary sources that cumulatively impact air quality such as gas stations, auto maintenance facilities, painting operations, consumer products usage), large stationary sources (factories, power plants), and even fires. The CAA requires that state and local air agencies operate and maintain ambient air surveillance networks to measure pollutant concentrations. DOEE uses its ambient monitoring network to track changes in the District’s ambient air and to evaluate the District’s 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 the late 1970s and early 1980s to operate monitoring systems and collect air data was critical to the development of the core monitoring network that exists today.

Over the years, monitoring goals have shifted based on changes in the NAAQS. On October 1, 2015, EPA strengthened the 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. EPA designated the District as a marginal nonattainment area for the 2015 ozone NAAQS, based on 2014-2016 air quality data. Formal attainment plans for the 2015 standards are due beginning in August 2020. Note that the District attained the old 2008 ozone NAAQS and submitted a redesignation request and maintenance plan for the old NAAQS to EPA, which have both been approved as of July 16, 2019.

In 2014, EPA redesignated the District from nonattainment to attainment of the 1997 annual NAAQS for PM<sub>2.5</sub> (15 µg/m<sup>3</sup>), and also designated the District as an attainment area for the more stringent 2012 annual NAAQS (12 µg/m<sup>3</sup>). 79 Fed. Reg. 60081 (October 6, 2014). The District is in compliance with the 2012 PM<sub>2.5</sub> NAAQS and continues to maintain the standards. More recently on February 7, 2024, EPA further strengthened the PM<sub>2.5</sub> primary annual NAAQS and

set it at 9.0  $\mu\text{g}/\text{m}^3$ . Based on 2023 preliminary data, District is in compliance with the more stringent new 2024  $\text{PM}_{2.5}$  annual standard.

The Air Monitoring Branch (AMB) in DOEE's Air Quality Division (AQD) operates, maintains, and performs all functions of the ambient air monitoring program required by the CAA. As required by federal air monitoring regulations, the District's monitoring network is designed to study expected high pollutant concentrations, high population density, significant sources, general background concentrations, and regional transport.

In October 2006, EPA issued final regulations that require periodic assessment of monitoring networks. As described in 40 C.F.R. § 58.10, the following information for existing and proposed site(s) must be included in a Network Plan:

1. Air Quality System (AQS) site identification number;
2. Site 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  $\text{PM}_{2.5}$  NAAQS or 24-hour  $\text{PM}_{10-2.5}$  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- $\text{PM}_{10}$  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  $\text{NO}_2$  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 Annual Ambient Air Monitoring Network Plan for the District for calendar year 2025 contains a description of the District's monitoring program, various parameters within the network, and additional monitoring station information. It also confirms that the District's air monitoring program continues to meet federally established monitoring and data assessment criteria.

### 1.1 The 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 monitoring the quality of the ambient air,



setting air quality standards and objectives, identifying and implementing control strategies, and measuring progress. Air monitoring data is used throughout this process to help:

- Determine compliance with the NAAQS;
- Characterize air quality and pollutant trends;
- Estimate health risks and ecosystem impacts;
- Develop and evaluate emission control strategies;
- Evaluate source-receptor relationships;
- Provide input data for models and evaluating models;
- Measure overall progress of air pollution control programs; and
- Inform air quality forecasts and other public outreach air quality reports.

Over the last 25 years, ambient levels of criteria pollutants have decreased significantly in the District due to the implementation of various control measures. In the 1980s, the introduction of automobiles equipped with catalytic converters resulted in significant reductions in NO<sub>2</sub>, carbon monoxide (CO), and volatile organic compounds (VOCs). The phasing out of lead in gasoline led to a significant drop in ambient lead (Pb) levels. Since then, various control strategies for stationary sources, on-road and off-road vehicles, and non-point area sources have reduced sulfur dioxide (SO<sub>2</sub>), nitrogen oxide (NO<sub>x</sub>), PM<sub>2.5</sub>, and PM<sub>10</sub> levels in the ambient air. There is also less formation of problematic ozone, although the District remains in nonattainment of 8-hour ground-level ozone standards.

## 2.0 District's Ambient Air Network

The District's network currently consists of six (6) monitoring sites. Sampling covers criteria air pollutants, PM<sub>2.5</sub> 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<sub>x</sub>, carbonyls, air toxics, and surface and boundary-layer 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. Then, to fulfill the monitoring requirements of the 2008 Pb NAAQS, DOEE established an ambient Pb monitor at the NCore site in January 2012, which was later terminated at the end of 2016 after monitoring requirements were revised.

In early 2015, an experimental Village Green park-bench air monitoring station with low-cost emerging air sensor technology was established in the District. The park-bench air monitoring station is primarily for technology demonstration and public education purposes, and it is not part of the District's regulatory network of air monitoring stations.

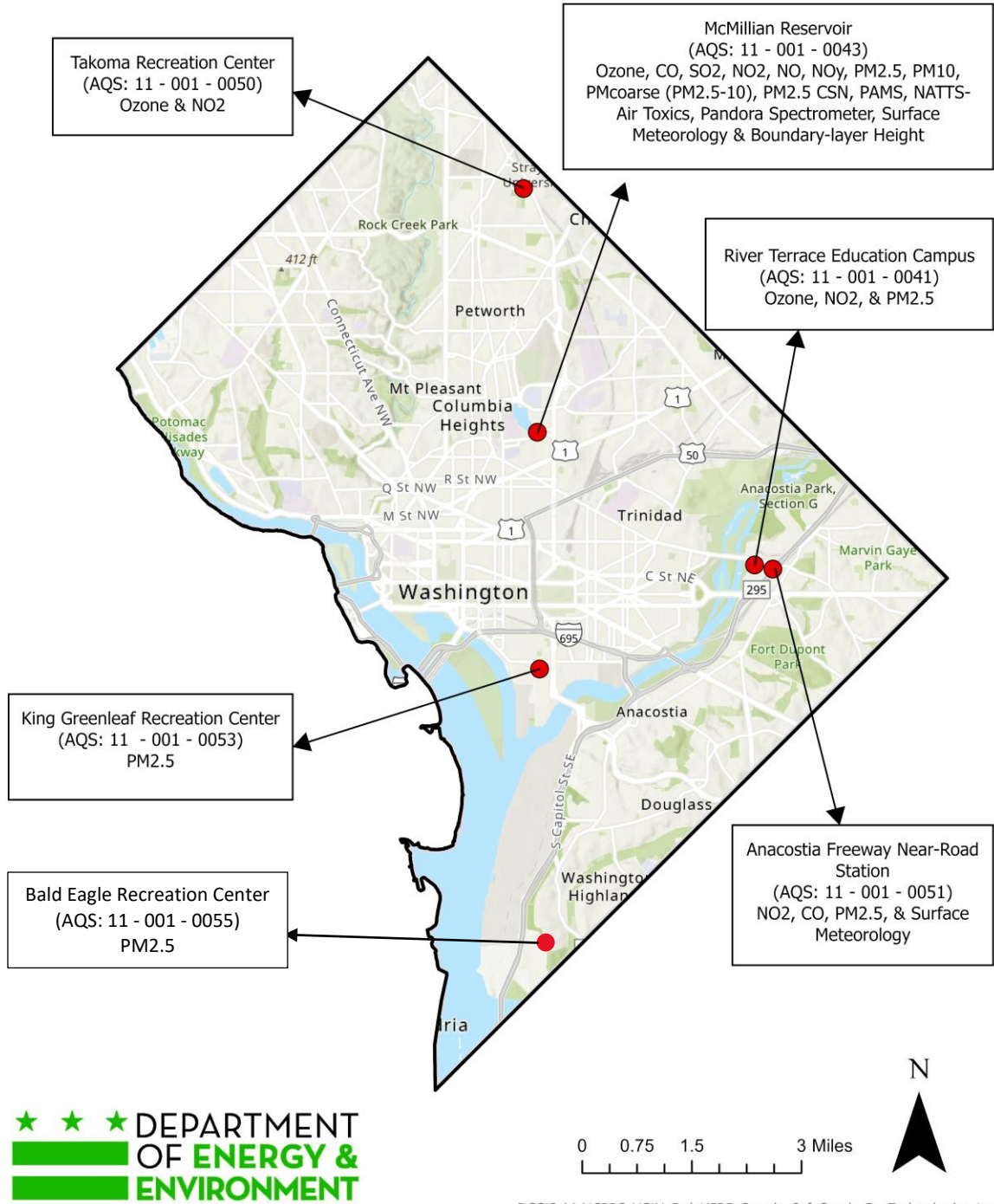
During the calendar year 2015, the District's network expanded with the addition of a new Anacostia Freeway Near-Road air monitoring station. In August 2017, a special purpose monitor was installed to determine PM<sub>2.5</sub> pollution at the King Greenleaf Recreation Center in the Buzzard Point community. The King Greenleaf Recreation Center site (11-001-0053) officially became part of the SLAMS network in January 2018.

In March 2024, DOEE added the sixth station to its ambient network at the Bald Eagle Recreation Center (11-001-0055) in an overburdened environmental justice (EJ) community in District's Ward 8. This EJ station has been funded by the federal ARP Direct Award Air Monitoring grant.

Figure 2-1 and Tables 2-1 through Table 2-5 below give information about the District's six (6) regulatory air monitoring stations and the measured pollutant parameters.

**Figure 2-1: The District’s Ambient Air Monitoring Network**

## Washington DC's Ambient Air Monitoring Network



DCGIS, M-NCPPC, VGIN, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, Esri, NASA, NGA, USGS

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

| Site Name, AQS ID                                  | Street Address                             | City, County, ZIP    | Latitude, Longitude (UTM)   | Location Setting | Nearest Road            | Traffic Count | Traffic Count Year | Distance From nearest road (m) | Metro Statistical Area (MSA) |
|--|--|----------------------|-----------------------------|------------------|-------------------------|---------------|--------------------|--------------------------------|------------------------------|
| McMillan<br>11-001-0043                            | 2500 First Street, N.W.                    | Washington DC 20001  | +38.921847<br>-77.013178    | Urban            | Michigan Ave. NW        | 22,054        | 2019               | 100                            | DC-Arlington-Alexandria      |
| River Terrace<br>11-001-0041                       | 420 34th Street, N.E.                      | Washington, DC 20019 | +38.895572<br>-76.958072    | Urban            | Benning Rd.             | 39,433        | 2019               | 100                            | DC-Arlington-Alexandria      |
| Takoma Recreation Center<br>11-001-0050            | 301 Van Buren Street, N.W.                 | Washington, DC 20012 | +38.970092<br>-77.016715    | Urban            | Blair Rd., N.W.         | 19,260        | 2019               | 200                            | DC-Arlington-Alexandria      |
| Anacostia Freeway Near-Road Station<br>11-001-0051 | 3600 Benning Road N.E. @ Anacostia Freeway | Washington, DC 20019 | +38.894770<br>-76.953426    | Urban            | Anacostia Freeway I-295 | 140,630       | 2019               | 10                             | DC-Arlington-Alexandria      |
| King Greenleaf Recreation Center<br>11-001-0053    | 201 N Street, S.W.                         | Washington, DC 20024 | +38.875161<br>-77.012816    | Urban            | South Capitol SW        | 96,819        | 2019               | 320                            | DC-Arlington-Alexandria      |
| Bald Eagle Recreation Center<br>11-001-0055        | 100 Joliet Street, S.W.                    | Washington, DC 20032 | +38.8187243,<br>-77.0102537 | Urban            | MLK Jr Avenue SW        | 6,099         | 2019               | 100                            | DC-Arlington-Alexandria      |

**Table 2-2: Monitoring Sites and Parameters of Each Monitor**

| Site Name, AQS ID       | Parameter                            | Start Date | Method Code | Probe Height (m) | Measurement Scale   | Monitoring Objective                      | Network Type     | Sample Schedule      |
|-------------------------|--------------------------------------|------------|-------------|------------------|---------------------|---|------------------|----------------------|
| McMillan<br>11-001-0043 | Nitric Oxide                         | 6/1/1994   | 074/599     | 3                | Urban               | Population Exposure/Max Precursor         | SLAMS/PAMS       | Hourly               |
|                         | Nitrogen Dioxide                     | 6/1/1994   | 074/599     | 3                | Urban               | Population Exposure/Max Precursor         | SLAMS/PAMS       | Hourly               |
|                         | Oxides of Nitrogen                   | 6/1/1994   | 074/599     | 3                | Urban               | Population Exposure/Max Precursor         | SLAMS/PAMS       | Hourly               |
|                         | NOy (Total reactive nitrogen oxides) | 1/1/2011   | 699         | 3                | Urban               | Population Exposure General/Background    | SLAMS/NCore      | Hourly               |
|                         | True Nitrogen Dioxide                | 1/1/2020   | 212         | 3                | Urban               | General/Background Max Precursor          | PAMS             | Hourly               |
|                         | SO2 (trace)                          | 1/1/2011   | 100         | 3                | Urban               | Population Exposure General/Background    | SLAMS/NCore      | Hourly               |
|                         | CO (trace)                           | 1/1/2011   | 593         | 3                | Urban               | Population Exposure General/Background    | SLAMS/NCore      | Hourly               |
|                         | Type 2 PAMS                          | 6/1/1994   | 102/228     | 3                | Neighborhood/Urban  | General/Background, Max Precursor         | PAMS             | Hourly/ Every 3 Days |
|                         | Ozone                                | 6/1/1994   | 047/087     | 3                | Neighborhood/Urban  | Population Exposure/Highest Concentration | SLAMS/PAMS NCore | Hourly               |
|                         | PM <sub>2.5</sub> Continuous         | 1/1/2003   | 209         | 4                | Urban               | Population Exposure                       | SLAMS            | Hourly               |
|                         | PM <sub>10</sub> Continuous          | 1/1/2003   | 639         | 4                | Urban               | Population Exposure                       | SLAMS            | Hourly               |
|                         | PM <sub>10-2.5</sub> Continuous      | 1/1/2003   | 639/640     | 4                | Urban               | Population Exposure                       | SLAMS/NCore      | Hourly               |
| PM <sub>2.5</sub>       | 1/1/1999                             | 145        | 4           | Urban            | Population Exposure | SLAMS/NCore                               | Every 3 Days     |                      |

| Site Name, AQS ID  | Parameter                             | Start Date | Method Code | Probe Height (m) | Measurement Scale | Monitoring Objective                        | Network Type    | Sample Schedule |
|--|---------------------------------------|------------|-------------|------------------|-------------------|---|-----------------|-----------------|
|  | PM <sub>2.5</sub> Chemical Speciation | 1/1/2002   | 000         | 4                | Urban             | Population Exposure/Trends                  | CSN             | Every 3 days    |
|  | Air Toxics                            | 1/1/2001   | 150         | 4                | Urban             | Population Exposure/Trends                  | NATTS           | Every 6 Days    |
|  | PM <sub>10</sub> High-Vol             | 1/1/2001   | 162         | 4                | Urban             | Population Exposure/Trends                  | NATTS           | Every 6 Days    |
|  | Black Carbon                          | 1/1/2001   | 894         | 4                | Urban             | Population Exposure/Trends                  | NATTS           | Hourly          |
| River Terrace<br>11-001-0041                             | Nitric Oxide                          | 5/1/1993   | 599         | 4                | Neighborhood      | Population Exposure                         | SLAMS           | Hourly          |
|  | Nitrogen Dioxide                      | 5/1/1993   | 599         | 4                | Neighborhood      | Population Exposure                         | SLAMS           | Hourly          |
|  | Oxides of Nitrogen                    | 5/1/1993   | 599         | 4                | Neighborhood      | Population Exposure                         | SLAMS           | Hourly          |
|  | Ozone                                 | 5/1/1993   | 047         | 4                | Neighborhood      | Population Exposure/Highest Concentration   | SLAMS           | Hourly          |
|  | PM <sub>2.5</sub>                     | 1/1/1999   | 209         | 4                | Neighborhood      | Population Exposure                         | SLAMS           | Hourly          |
| Takoma Recreation<br>Center<br>11-001-0050               | Nitric Oxide                          | 1/1/2013   | 599         | 4                | Neighborhood      | Population Exposure                         | SLAMS           | Hourly          |
|  | Nitrogen Dioxide                      | 1/1/2013   | 599         | 4                | Neighborhood      | Population Exposure                         | SLAMS           | Hourly          |
|  | Oxides of Nitrogen                    | 1/1/2013   | 599         | 4                | Neighborhood      | Population Exposure                         | SLAMS           | Hourly          |
|  | Ozone                                 | 1/1/2013   | 087         | 4                | Neighborhood      | Population Exposure/Max Ozone Concentration | SLAMS           | Hourly          |
| Anacostia Freeway Near-Road Station<br>11-001-0051       | Nitric Oxide                          | 1/1/2015   | 599         | 4                | Microscale        | Source Oriented/Highest Concentration       | Near-Road SLAMS | Hourly          |
|  | Nitrogen Dioxide                      | 1/1/2015   | 599         | 4                | Microscale        | Source Oriented/Highest Concentration       | Near-Road SLAMS | Hourly          |
|  | Oxides of Nitrogen                    | 1/1/2015   | 599         | 4                | Microscale        | Source Oriented/Highest Concentration       | Near-Road SLAMS | Hourly          |
|  | Carbon Monoxide                       | 1/1/2015   | 593         | 4                | Middlescale       | Source Oriented/Highest Concentration       | Near-Road SLAMS | Hourly          |
|  | PM <sub>2.5</sub>                     | 1/1/2015   | 209         | 4                | Microscale        | Source Oriented/Highest Concentration       | Near-Road SLAMS | Hourly          |
| King<br>Greenleaf<br>Recreation<br>Center<br>11-001-0053 | PM <sub>2.5</sub>                     | 1/1/2018   | 209         | 4                | Urban             | Population Exposure                         | SLAMS           | Hourly          |
| Bald Eagle<br>Recreation<br>Center<br>11-001-0055        | PM <sub>2.5</sub>                     | 4/1/2024   | 209         | 4                | Urban             | Population Exposure                         | SLAMS           | Hourly          |

**Table 2-3: Monitor Count for the District’s Network**

| Pollutant Parameter/ Pollutant Group                   | Site               |                      |                          |                                  |                              |                             | Monitor Count Totals |
|--|--------------------|----------------------|--------------------------|----------------------------------|------------------------------|-----------------------------|----------------------|
|  | McMillan Reservoir | River Terrace School | Takoma Recreation Center | King Greenleaf Recreation Center | Bald Eagle Recreation Center | Anacostia Freeway Near-Road |                      |
| CO   |                    |                      |                          |                                  |                              | 1                           | 1                    |
| O3   | 1                  | 1                    | 1                        |                                  |                              |                             | 3                    |
| PM <sub>2.5</sub> (FRM)                                | 1                  |                      |                          |                                  |                              |                             | 1                    |
| NO   | 1                  | 1                    | 1                        |                                  |                              | 1                           | 4                    |
| NO <sub>2</sub>  | 1                  | 1                    | 1                        |                                  |                              | 1                           | 4                    |
| NO <sub>x</sub>  | 1                  | 1                    | 1                        |                                  |                              | 1                           | 4                    |
| NO <sub>y</sub>  | 1                  |                      |                          |                                  |                              |                             | 1                    |
| True NO <sub>2</sub>                                   | 1                  |                      |                          |                                  |                              |                             | 1                    |
| Trace CO   | 1                  |                      |                          |                                  |                              |                             | 1                    |
| Trace SO <sub>2</sub>                                  | 1                  |                      |                          |                                  |                              |                             | 1                    |
| PM <sub>2.5</sub> (Continuous)                         | 1                  | 1                    |                          | 1                                | 1                            | 1                           | 5                    |
| PM <sub>10</sub> (Continuous)                          | 1                  |                      |                          |                                  |                              |                             | 1                    |
| PM <sub>10-2.5</sub> (Continuous) PM <sub>coarse</sub> | 1                  |                      |                          |                                  |                              |                             | 1                    |
| Speciated PM <sub>2.5</sub>                            | 1                  |                      |                          |                                  |                              |                             | 1                    |
| PM <sub>2.5</sub> Black Carbon (OC/EC)-URG             | 1                  |                      |                          |                                  |                              |                             | 1                    |
| Air Toxics   | 1                  |                      |                          |                                  |                              |                             | 1                    |
| PAH Compounds (Air Toxics)                             | 1                  |                      |                          |                                  |                              |                             | 1                    |
| Air Toxics Metals (PM <sub>10</sub> )                  | 1                  |                      |                          |                                  |                              |                             | 1                    |
| OC/EC - Aethalometer                                   | 1                  |                      |                          |                                  |                              |                             | 1                    |
| PAMS VOCs /Carbonyls                                   | 1                  |                      |                          |                                  |                              |                             | 1                    |
| PAMS VOCs Continuous (Auto-GC)                         | 1                  |                      |                          |                                  |                              |                             | 1                    |
| Surface Meteorology                                    | 1                  |                      |                          |                                  |                              | 1                           | 2                    |
| Ceilometer   | 1                  |                      |                          |                                  |                              |                             | 1                    |
| Total  | 22                 | 5                    | 4                        | 1                                | 1                            | 6                           | 39                   |

**Table 2-4: Monitoring Methods and AQS Codes**

| Parameter  | Method Code | Sample Analysis Description  |
|--|-------------|--|
| Air Toxics                                       | 150         | Cryogenic Pre-concentration: GC/MS Solid Phase Micro Extraction: GC/MS |
| Carbon Monoxide, Trace                           | 593         | Gas Filter correlation API T300U                                       |
| Nitric Oxide and Nitrogen Dioxide                | 074         | Chemiluminescence Thermo 42i   |
| Nitric Oxide and Nitrogen Dioxide                | 599         | Chemiluminescence API T200U  |
| Total Reactive Nitrogen Oxides                   | 691/699     | Chemiluminescence EcoTech EC9843<br>Chemiluminescence API T200U        |
| True-Nitrogen Dioxide                            | 212         | API T500U - CAPS (Cavity Attenuated Phase Shift)                       |
| PAH  | 118         | Tisch PUF  |
| PAMS Carbonyls                                   | 102         | High Performance Liquid Chromatography                                 |
| PAMS VOCs  | 228         | Cryogenic Pre-concentration Trap GC/FID<br>Markes-Agilent Auto-GC      |
| Ozone  | 047         | UV Photometry Thermo 49i   |
| Ozone  | 087         | UV Photometry API T400   |
| PM <sub>10</sub> Continuous                      | 639         | Scattered Light Spectrometry API T640x                                 |
| PM <sub>10</sub> High-Vol                        | 162         | Gravimetric Hi Vol SSI EcoTech 3000                                    |
| PM <sub>2.5</sub>                                | 145         | Gravimetric R&P Model 2025   |
| PM <sub>2.5</sub> Speciation: Trace Elements     | 811         | Energy Dispersive XRF using Teflon Filter                              |
| PM <sub>2.5</sub> Species Constituents: Ions     | 812         | Ion Chromatography using Nylon Filter                                  |
| PM <sub>2.5</sub> Species Constituents: Organics | 838         | Thermo-Optical Transmittance using Quartz Filter                       |
| PM <sub>10-2.5</sub> Coarse                      | 639/640     | Scattered Light Spectrometry API T640x                                 |
| PM <sub>2.5</sub> Continuous                     | 209         | Met One BAM-1022 Monitor – PM <sub>2.5</sub> FEM                       |
| PM <sub>2.5</sub> – Black Carbon                 | 894         | McGee Scientific Model AE33-7 Dual Spot                                |
| Sulfur Dioxide, Trace                            | 592         | Ultraviolet Pulsed Fluorescence EC9850T                                |
| Sulfur Dioxide, Trace                            | 100         | Ultraviolet Fluorescence API 100 EU                                    |

**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,tetrafluoroethane, 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, Hexachloro-1,3-Butadiene, and Ethylene Oxide |
| PAMS VOCs                        | Acetone, Ethane, Ethylene, 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, P-Ethyltoluene, M-Ethyltoluene, O-Ethyltoluene, 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, 1,3 Butadiene, Alpha Pinene, Beta Pinene   |
| PAMS Carbonyls                   | Acetaldehyde, Formaldehyde, Acetone, Methyl Isobutyl Ketone, Methyl Ethyl Ketone, Propionaldehyde, Benzaldehyde  |
| Speciated PM <sub>2.5</sub> 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, PyroC, Rubidium, Samarium, Scandium, Selenium, Silicon, Silver, Sodium, Strontium, Sulfate, Sulfur, Tantalum, Terbium, Tin, Titanium, Total carbon, Vanadium, Wolfram, Yttrium, Zinc, and Zirconium   |



## 2.1 Ambient Air Monitoring Networks

Each of the District's monitoring stations is individually 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 (SLAMS):*

SLAMS measure ambient levels of gaseous and particulate air pollutants. SLAMS represent the majority of all criteria pollutant (SO<sub>2</sub>, NO<sub>2</sub>, CO, O<sub>3</sub>, Pb, PM<sub>2.5</sub>, PM<sub>10</sub>) 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 of 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 currently consists of six (6) SLAMS.

### *National Air Monitoring Station (NAMS) Network:*

The NAMS network, developed in the 1970s, is a subset of the SLAMS network. NAMS stations use FRM/FEM for direct comparison to the NAAQS. In the early 1980s, the networks began to add PM<sub>10</sub> monitors, and then expanded to include PM<sub>2.5</sub> monitors, beginning in 1999, to assess attainment with the 1997 PM<sub>2.5</sub> NAAQS. The network consists of ambient monitoring sites that measure PM<sub>2.5</sub> 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 NO<sub>2</sub> NAAQS required establishment of a network with at least two (2) near-roadway NO<sub>2</sub> monitors in the Washington DC-MD-VA-WV MSA. Measurements for pollutants such as NO<sub>2</sub>, CO, PM<sub>2.5</sub> and surface meteorological measurements for wind direction and wind speed are required at primary near-road sites.

The District established a near-road station along the Anacostia Freeway in River Terrace community (site ID: 11-001-0051) in April 2015. The near-road station consists of NO<sub>2</sub> and CO trace gas analyzers, BAM FEM continuous monitor to measure PM<sub>2.5</sub>, and surface meteorological measurements for wind speed, wind direction, relative humidity, barometric pressure and ambient temperature.

### *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 SO<sub>2</sub>, trace CO, total reactive nitrogen oxides (NO<sub>y</sub>) and PM<sub>coarse</sub> (PM<sub>10-2.5</sub>; 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 was also required at NCore sites beginning in January 2012. In April 2016, EPA revised the national air quality monitoring regulations (40 C.F.R. Part 58 Appendix D) section 3(b) and section 4.5(b)(c) to remove the requirements for NCore sites to measure Lead (Pb) as well as the speciated components of PM<sub>coarse</sub> (PM<sub>10-2.5</sub>).

The District established an NCore station at the McMillan site (11-001-0043) in January 2011. The NCore station consists of SO<sub>2</sub> and CO trace gas analyzers, a NO<sub>y</sub> analyzer, and a BAM FEM monitor to measure PM<sub>10-2.5</sub>. A TSP-Pb FRM monitor was added at the McMillan NCore station in January 2012. DOEE shut down the Pb monitor under the provisions of the revised 40 C.F.R. Part 58, at the end of 2016 monitoring period.

#### *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, carbonyls, and NO<sub>x</sub>. The national PAMS network consists of forty-three (43) sites in twenty-five (25) metropolitan areas. PAMS was a major addition to state and local networks, with near-research grade measurements for over 56 VOC compounds during the core part of the ozone season (June to August).

The District operates one (1) PAMS Type 2 station at the McMillan site. In 2011, DOEE deployed Vaisala WXT 520 meteorological monitoring sensors on a new 10-meter tower at the McMillan PAMS/NCore site. The District has since updated its suite of meteorological instruments to satisfy the 2015 PAMS monitoring requirements.

The 2015 amendments to the national ambient monitoring regulations (40 C.F.R. Part 58, Appendix D, Section 5) revised the PAMS monitoring requirements in conjunction with the promulgation of the 2015 8-hour ozone NAAQS of 70 ppb. These amendments require changes to PAMS monitoring and implementation of an enhanced monitoring plan (EMP) by 2021 in certain areas of the nation, including the District. The new requirements are as follows:

- Hourly averaged speciated volatile organic compounds (VOCs);
- Three 8-hour averaged carbonyl samples per day on a 1 in 3-day schedule;
- Hourly averaged Ozone (O<sub>3</sub>), nitrogen oxide (NO), true nitrogen dioxide (NO<sub>2</sub>), and total reactive nitrogen (NO<sub>y</sub>);
- Hourly averaged of ambient temperature, vector-averaged wind direction and wind speed, atmospheric pressure, relative humidity, precipitation, solar radiation, and ultraviolet radiation; and
- Hourly averaged of mixing-height.

For the District, this requirement has been met by collecting PAMS measurements at the McMillan NCore station. This site is already designated as a PAMS site under the existing PAMS regulatory requirements. The District adopted the national PAMS QAPP and SOPs and will follow the guidance presented in the PAMS TAD. These required DC-specific documents have been approved by EPA in July 2020.

Based on 40 C.F.R. part 58, Appendix D, state air monitoring agencies were initially required to begin making PAMS measurements at their NCore location(s) by June 1, 2019. The equipment needed to measure PAMS parameters were to be purchased by USEPA using a nationally negotiated contract and delivered to the monitoring agencies. USEPA has announced that due to contract delays, the necessary equipment would not be delivered in time to begin making PAMS measurements by June 1, 2019. USEPA finalized a rule on January 8, 2020 to extend the start date of PAMS measurements to June 1, 2021. The District was able to deploy the entire suite and make all PAMS measurements at the McMillan NCore site by January 2020. As part of the new requirements, DOEE also updated PAMS suite of meteorological instruments.

DOEE has started measurements at the District's PAMS site for the following PAMS compounds/parameters:

#### Ozone

Hourly averaged ozone is measured year-round using either a Thermo 49i or Teledyne API T400.

#### Nitrogen Oxides

Hourly averaged NO, NO<sub>y</sub> and true NO<sub>2</sub> will be measured at a minimum, from June through August. True NO<sub>2</sub> will be measured using Teledyne API Model 500U CAPS NO<sub>2</sub> analyzer. NO and NO<sub>y</sub> will be measured using a Teledyne API Model T200U.

#### Hourly Speciated VOCs

Hourly averaged speciated VOCs will be measured during the core ozone season June-August with Markes-Agilent Auto GC system.

#### Carbonyls

Carbonyls will be sampled at a frequency of three 8-hour samples on a 1-in-3-day basis during the core ozone season (i.e., June, July, August) using an ATEC Model 8000-2 Eight Channel Automated Carbonyl sampler with co-located independent channel. Samples will be analyzed by EPA Method TO-11A.

#### Meteorological Parameters

Hourly averages of ambient temperature and relative humidity are measured using the Vaisala HMP155; vector-averaged wind direction and wind speed are measured by the Vaisala WMT702; atmospheric pressure is recorded using the Vaisala PTB110; precipitation is measured using the Met One 385; solar radiation is measured by the Kipp and Zonen CMP6; ultraviolet A and B radiation is measured by the Kipp and Zonen SUV5; and the hourly averaged mixing layer height is measured using the Vaisala Model CL51 ceilometer.

As a jurisdiction in the Ozone Transport Region (OTR), the District is required to adopt an EMP no later than October 1, 2019. The District's EMP was approved by EPA on October 28, 2019. A Pandora spectrometer was deployed at McMillan PAMS site in August 2020. The Pandora instruments study the atmosphere by using spectroscopy, delivering total column profiles of the atmosphere, including ozone, nitrogen dioxide and formaldehyde. Pandora spectrometer tracks either the sun or moon to collect light through the total atmospheric column at wavelengths

between 291 nm to 523 nm; collected data gives information on the trace gases, specifically ozone, NO<sub>2</sub> and formaldehyde.

*Special Purpose Monitoring Networks:*

Special Purpose Monitoring (SPM) networks include National Air Toxic Trends Stations (NATTS), PM<sub>2.5</sub> Chemical Speciation Network (CSN), and other special purpose monitors.

Currently, the District’s SPM network consists of one (1) NATTS, and one (1) CSN station at the McMillan site.

Through a partnership with DOEE, EPA installed a Village Green station at the Smithsonian National Zoological Park (National Zoo) in the District in 2015. The Village Green park bench community air monitoring station is intended for research and education on air quality and it is not meant for use as a regulatory monitor.

2.2 Pollutant Parameters

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

*Fine Particulate Matter (PM<sub>2.5</sub>)*

*PM<sub>2.5</sub> FEM Monitors:* DOEE operates five (5) automated BAM 1022 PM<sub>2.5</sub> monitors in its air monitoring network – one (1) each at the Anacostia Freeway Near Road, River Terrace, McMillan, King Greenleaf Recreation Center and Bald Eagle Recreation Center site. The McMillan, Anacostia Freeway Near-Road, River Terrace, King Greenleaf Recreation Center, and Bald Eagle Recreation Center primary monitors are continuous hourly sampling schedule. The required collocated secondary PM<sub>2.5</sub> FRM monitor at McMillan is operated on a 1-in-3-day sampling schedule.

DOEE replaced the PM<sub>2.5</sub> network FRM monitors with continuous FEM monitors at the beginning of the calendar year 2017.

**Table 2-6: Number of PM<sub>2.5</sub> SLAMS Sites** (based on Table D–5, Appendix D, 4.7.1(a) to 40 C.F.R. Part 58, PM<sub>2.5</sub> Minimum Monitoring Requirements)

| MSA Name                                     | Population | Annual Design Value 2016-2018 | Daily Design Value 2016-2018 | Required SLAMS Monitors | Monitors Active in DC/Total <sup>A,B</sup> | Required 85% NAAQS <sup>Δ</sup> |
|--|------------|-------------------------------|------------------------------|-------------------------|--|---------------------------------|
| Washington-Arlington-Alexandria, DC-VA-MD-WV | 6,251,240  | 9.0                           | 20                           | 2                       | 5/10                                       | 3                               |

A - Based on tables available at <https://www.epa.gov/air-trends/air-quality-design-values>.

B- Total number of monitors includes those located in other jurisdictions within the MSA.

*PM<sub>2.5</sub> Chemical Speciation Network (CSN)*: DOEE currently operates one (1) PM<sub>2.5</sub> CSN (Met One SuperSASS) monitor at the McMillan site. The District implemented the carbon channel upgrade (URG 3000N) for the CSN monitor in 2007. The CSN monitor at the McMillan site operates on a 1-in-3-day sampling schedule to measure PM<sub>2.5</sub> chemical species.

*Particulate Matter (PM<sub>10</sub>)*

DOEE operates one (1) continuous Teledyne 640x PM<sub>10</sub> FEM sampler at the McMillan site for reporting PM<sub>10</sub> mass measurements. In 2013, EPA approved co-designation of the McMillan NCore station’s PM<sub>10</sub> FEM BAM1020 automated sampler for PM<sub>10</sub> network to fulfill the PM<sub>10</sub> NAAQS monitoring requirements in the District. Subsequent to receiving EPA’s approval, DOEE decommissioned the two (2) very old and aging filter based manual PM<sub>10</sub> FRM samplers (primary and secondary monitors) in January 2014.

Additionally, DOEE operates a High-Volume PM<sub>10</sub> sampler for NATTS toxic metals analysis.

*Ozone (O<sub>3</sub>)*

DOEE currently operates either a Teledyne API T400 or Thermo-49i series ozone analyzer at three (3) 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.

Ozone season begins on March 1 and continues through October 31. DOEE already conducts year-round ozone measurements and collects ozone data on an hourly basis, so no additional changes are necessary.

Ozone monitoring requirements are determined by the MSA population and design value, as specified in Table D-2 of 40 C.F.R. Part 58 Appendix D. Table 2-1 shows that the DOEE monitoring network meets or exceeds the minimum requirements.

**Table 2-7: Number of Ozone SLAMS Sites** (based on Table D–2, Appendix D,4.1(a) to 40 C.F.R. Part 58, Ozone Minimum Monitoring Requirements)

| MSA Name  | Population | Monitors Deployed by State <sup>A</sup> |    |    |    |  |  | Total Monitors | Required<br>≥ 85% NAAQS |
|---|------------|---|----|----|----|--|--|----------------|-------------------------|
|   |            | DC                                      | MD | VA | WV |  |  |                |                         |
| Washington-Arlington-Alexandria,<br>DC-VA-MD-WV | 6,251,240  | 3                                       | 7  | 7  | 0  |  |  | 17             | 3                       |

|       |  |  |   |   |   |   |  |    |   |
|-------|--|--|---|---|---|---|--|----|---|
| Total |  |  | 3 | 7 | 7 | 0 |  | 17 | 3 |
|-------|--|--|---|---|---|---|--|----|---|

A - Based on tables available at <https://www.epa.gov/air-trends/air-quality-design-values>.

All areas had their maximum site  $\geq$  85% Ozone NAAQS.

Within an O<sub>3</sub> network, at least one O<sub>3</sub> 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<sub>3</sub> 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<sub>3</sub> 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<sub>3</sub> concentrations, more specifically, downwind during periods of photochemical activity. For the Washington-Arlington-Alexandria, DC-MD-VA-WV MSA, the ozone monitor at the Takoma Recreation Center site is assigned this designation for the District portion of the MSA.

### *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 of less than 4 ppb and uses a high-performance modified vacuum pump. CO concentrations are highest along heavily traveled roadways and decrease significantly with distance from traffic. Therefore, CO monitors are usually located close to roadways or in urban areas.

One CO monitor is required to be collocated with a near-road NO<sub>2</sub> monitor. EPA revised the minimum monitoring requirements for CO on August 12, 2011. Since 2 CO monitor is collocated with a near-road NO<sub>2</sub> monitor as required, DOEE proposed to discontinue two CO monitors (one at the River Terrace station and one at the Verizon station) at the end of 2016 in our 2017 network plan. DOEE's 2017 Annual Network Plan was approved by EPA on November 10, 2016. Currently, DOEE operates an API T300U trace CO analyzer at the Anacostia Freeway Near-Road station and an API T300 CO analyzer at the McMillan Reservoir station.

DOEE will continue maintaining the two remaining CO monitors: one at the NCore station and one at the Anacostia Freeway Near-Road station.

### *Nitrogen Dioxide (NO<sub>2</sub>)*

NO<sub>x</sub> emissions are produced during high temperature burning of fuels. Sources of NO<sub>x</sub> include motor vehicles and stationary sources such as power plants and industrial boilers.

NO<sub>2</sub> is measured indirectly. First, nitrogen oxide (NO) is measured using the chemiluminescence reaction of NO with O<sub>3</sub>. 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 ozone to produce NO<sub>2</sub>. Light emitted from this reaction is detected with a photomultiplier tube and converted to an electrical signal proportional to the NO concentration. Next, NO<sub>x</sub> is measured by passing the air through a converter where any NO<sub>2</sub> 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<sub>x</sub>. The NO<sub>2</sub> concentration is equal to the difference between NO<sub>x</sub> and NO.

True NO<sub>2</sub> is a direct measurement of NO<sub>2</sub>, which uses cavity-attenuated phase shift (CAPS) NO<sub>2</sub> monitors to provide a direct absorption measurement of nitrogen dioxide. Unlike standard chemiluminescence-based monitors, these instruments require no conversion of NO<sub>2</sub> to another species and thus are not sensitive to other nitrogen-containing species. The CAPS NO<sub>2</sub> monitor operates as an optical absorption spectrometer that yields both reliable and accurate measurements of ambient nitrogen dioxide down to sub ppb concentrations, with lower noise levels than chemiluminescence-based monitors.

DOEE currently operates NO<sub>2</sub> monitors at four (4) sites and three of those sites are collocated with ozone measurement sensors. A NO-NO<sub>2</sub>-NO<sub>x</sub> Thermo-42i analyzer is operated year-round at the McMillan Reservoir station. The API T200u NO-NO<sub>2</sub>-NO<sub>x</sub> analyzers are operated year-round at the River Terrace, Anacostia Freeway, and Takoma Recreation Center stations. The true-NO<sub>2</sub> API model T500U-CAPS sampler has been deployed since January 2020 at McMillan.

*RA-40:* The monitoring regulations for the 2010 NO<sub>2</sub> NAAQS say that the EPA Regional Administrator can require a minimum of forty (40) monitors to be sited inside or outside of CBSAs nationwide in locations with “susceptible and vulnerable” populations. The community-level NO<sub>2</sub> network monitors are called “RA-40” designated monitors. DOEE and EPA assigned a RA-40 designation to the NO<sub>2</sub> monitor at the River Terrace station.

*Total Reactive Nitrogen Oxides (NO<sub>y</sub>):* Since July 2017, DOEE has operated a Teledyne API T200u configured for NO-NO<sub>2</sub>-NO<sub>y</sub> measurements at the McMillan Reservoir station. These samplers are a chemiluminescence-based analyzer that uses a high-performance NO<sub>y</sub> converter to measure trace levels of NO<sub>y</sub> and NO.

*Near-Road NO<sub>2</sub> Network:* In January 2015, DOEE established one (1) NO<sub>2</sub> near-road monitoring station collocated with trace CO measurements along the Anacostia Freeway (Site: 11-001-0051). Valid data collection began in June 2015.

### *Sulfur Dioxide/Trace-SO<sub>2</sub>*

SO<sub>2</sub> 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 SO<sub>2</sub> 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<sub>2</sub> concentration. The SO<sub>2</sub> trace analyzer is a high-performance UV fluorescence analyzer designed to measure background concentration of SO<sub>2</sub> with a lower detection limit less than 200 parts per trillion.

DOEE operates one (1) Teledyne T100U trace-SO<sub>2</sub> analyzer at the McMillan NCore station.

The District proposed to decommission the Thermo 43i continuous SO<sub>2</sub> monitor at the River Terrace station in the 2020 Network Plan. The monitor was redundant since the network already had the required number of SO<sub>2</sub> monitors. Once EPA approved the 2020 Network Plan on October 28, 2019, DOEE decommissioned the SO<sub>2</sub> monitor at River Terrace.

#### *Air Toxics*

DOEE operates one (1) NATTS station at the McMillan site. Air toxics samples are collected for 24 hours on a 1-in-6-day schedule.

NATTS monitors at the McMillan site capture PAH (Tisch PUF+ analyzer), toxic heavy metals (EcoTech 3000 PM<sub>10</sub> High-Vol), and VOCs (Model 2200-22 Atmospheric Technology Inc., ATEC) and carbonyls (Model 8000 Atmospheric Technology Inc., ATEC). The sampled canisters 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 (Aerosol Magee Scientific AE33) for continuous sampling of black carbon (OC/EC).

#### *PAMS Ozone Precursors*

DOEE operates one (1) PAMS Type 2 station at the McMillan site. The parameters measured are O<sub>3</sub>, NO, NO<sub>x</sub>, NO<sub>2</sub>, Tru NO<sub>2</sub>, speciated VOCs, carbonyls, and surface meteorology.

During the peak ozone season (June to August), hourly measurements for a set of 56 target hydrocarbons are made on-site using a Markes/Agilent VOC Air Analyzer with dual flame ionization detector (Markes Unity-xr with CIA Advantage ozone precursor sampler and Agilent 7890B PAMS Gas Chromatograph sampling system). The measurement method for carbonyls is based on EPA's Compendium Method TO-11A, which incorporates the use of sorbent cartridges coated with 2,4-dinitrophenylhydrazine and ATEC Model 8000-3 sampler for sample collection on a 1-in-3-day schedule during the core ozone season. The sample analysis is performed with high performance liquid chromatography.

DOEE also operates continuous O<sub>3</sub> and NO<sub>x</sub> analyzers complemented with surface meteorological measurements at the McMillan PAMS site. In 2011, DOEE deployed Vaisala WXT 520 meteorological monitoring sensors on a new 10-meter tower at the McMillan PAMS/NCore site. DOEE has replaced the meteorological sensor with the Vaisala HMP155 temperature and humidity probe, the Vaisala WMT702 wind speed and direction sonic anemometer, the Vaisala PTB110 pressure sensor, the Met One 385 tipping bucket rain gauge, the Kipp and Zonen CMP6 solar radiation pyranometer, the Kipp and Zonen SUV5 ultraviolet radiation radiometer, and the Vaisala CL51 mixing layer height ceilometer.

#### *Lead (Pb)*

DOEE discontinued Pb sampling at the end of 2016, under the provisions of 40 C.F.R.



In January 2012, DOEE began operating a TSP-Pb monitor at its McMillan NCore site on a 1-in-6-day sampling schedule. Data collected for four years were measuring concentrations at about 4% of the NAAQS.

### 3.0 District of Columbia’s Air Monitoring Stations

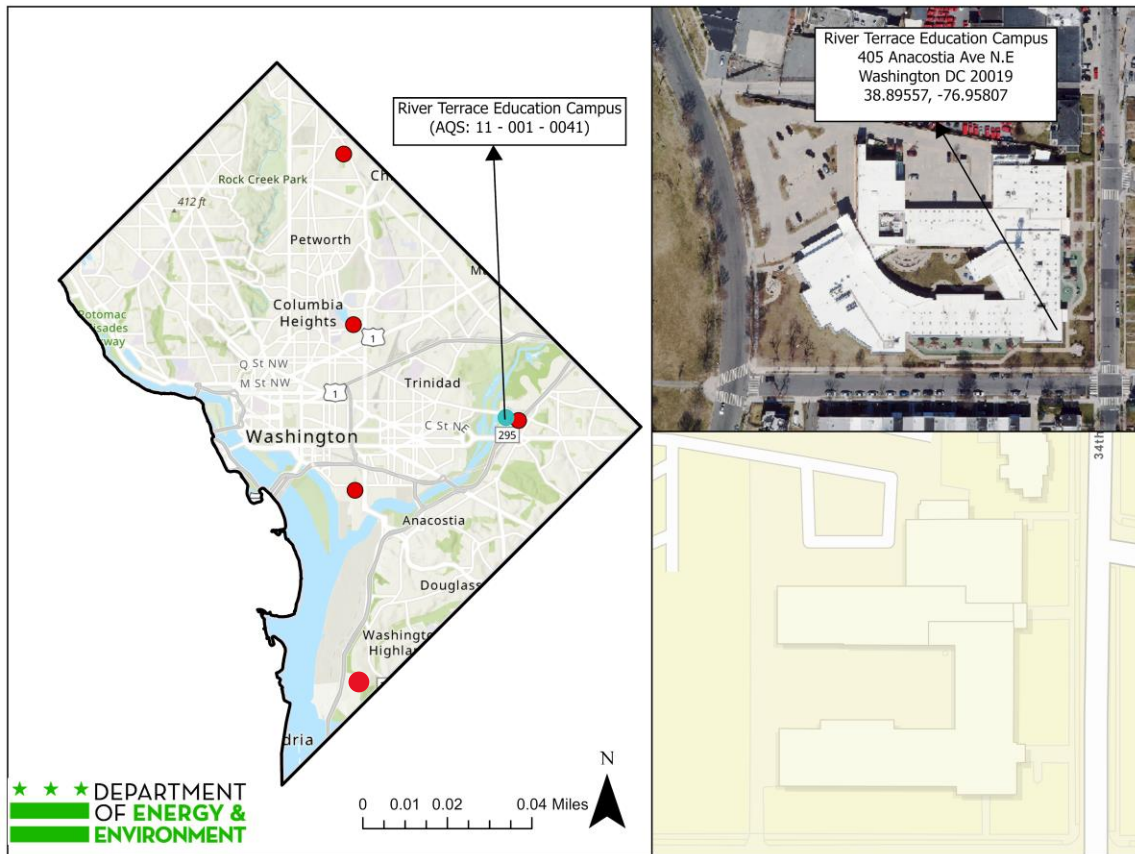
DOEE currently maintains a network of six (6) ambient air monitoring stations: River Terrace, McMillan, Takoma Recreation Center, Anacostia Freeway near-road, King Greenleaf Recreation Center, and Bald Eagle Recreation Center station. The following sections provide additional information. Maps for the individual sites are shown in Figures 3-1 to 3-6.

#### 3.1 River Terrace Station (11-001-0041)

The River Terrace monitoring station has been in operation since 1993. The site consists of measurement analyzers for O<sub>3</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub>.

Starting calendar year 2017, the PM<sub>2.5</sub> FRM monitor was replaced with a FEM monitor and the CO monitor was discontinued. DOEE discontinued the SO<sub>2</sub> monitor in 2019 due to redundancy with the trace SO<sub>2</sub> monitor for NCore at the McMillan Reservoir monitoring site (11-001-0043).

**Figure 3-1: River Terrace Site Locator Maps**



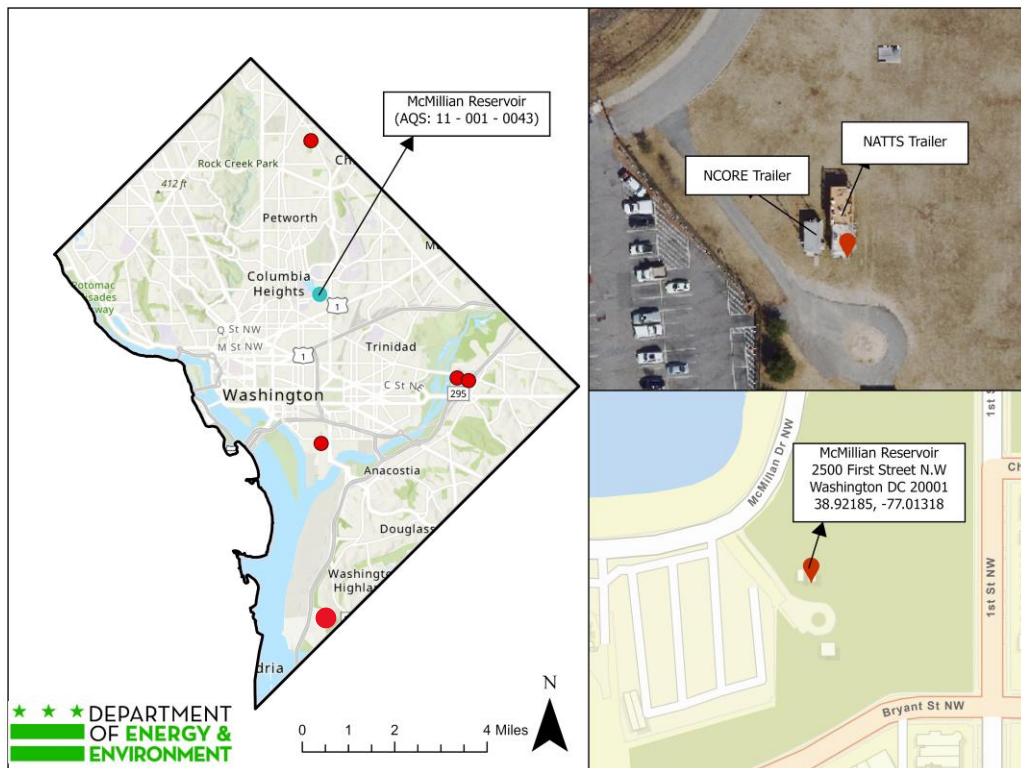
### 3.2 McMillan Station (11-001-0043)

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<sub>2.5</sub> FRM, PM<sub>2.5</sub> CSN monitoring, PM<sub>2.5</sub> 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 site was the first NATTS site in EPA Region III. In January 2011, the McMillan site expanded into an NCore network monitoring station. A TSP-Pb monitor was added in January 2012 and terminated at the end of 2016 after monitoring requirements were revised. Additionally, as part of the EPA Office of Air Quality Planning and Standards (OAQPS) national pilot study, a Sunset Model 4 Semi-Continuous OC/EC monitor was deployed at McMillan station from January 2012 to August 2016. A Vaisala CL51 ceilometer was deployed in January 2020 and a Pandora spectrometer was deployed in August 2020.

Starting calendar year 2017, the PM<sub>2.5</sub> FRM monitor was replaced with a FEM monitor.

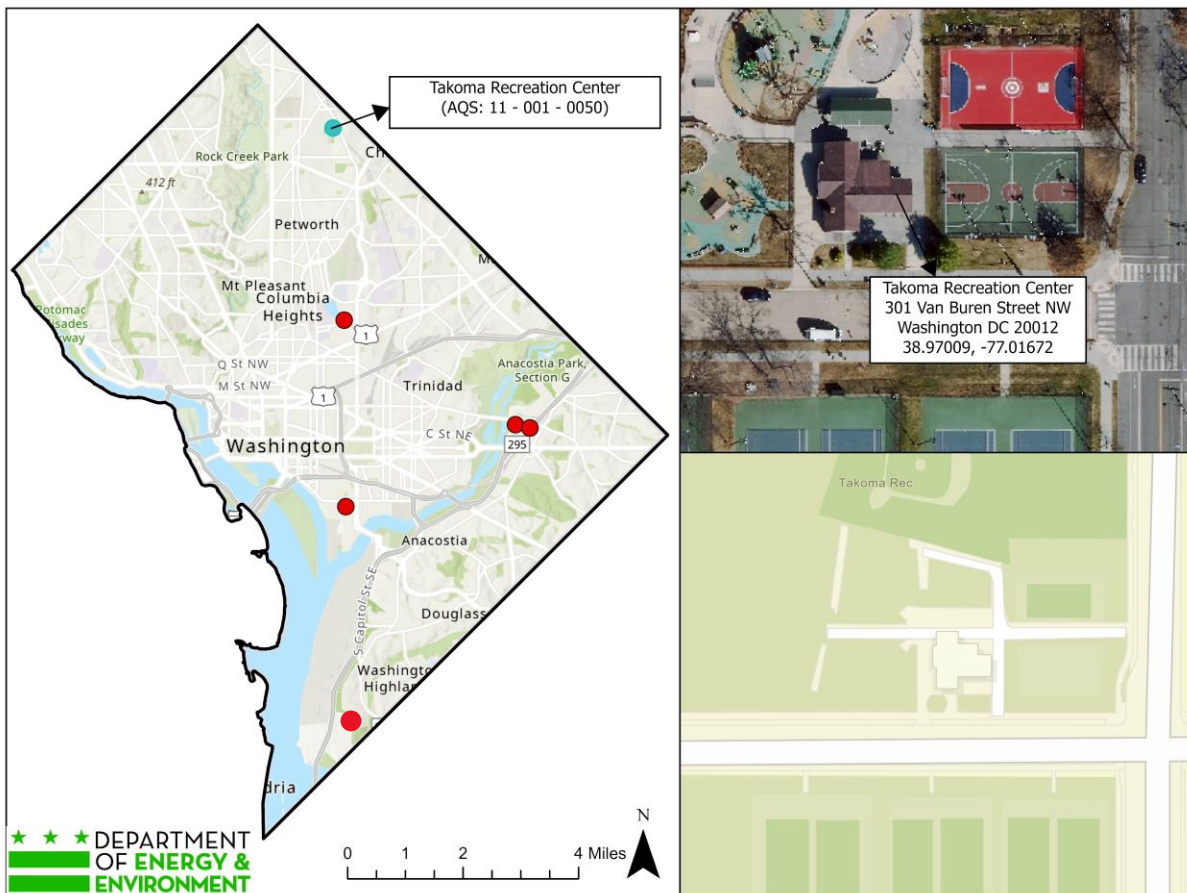
**Figure 3-2: McMillan Reservoir Site Locator Maps**



### 3.3 Takoma Recreation Center Station (11-001-0050)

The Takoma Recreation Center monitoring station has been in operation since January 2013<sup>1</sup>. The station consists of measurement analyzers for O<sub>3</sub> and NO<sub>x</sub>. This station was established as a replacement site for Takoma School station (11-001-0025), where operations ended in 2011 because of a building fire incident.

**Figure 3-3: Takoma Recreation Center Site Locator Maps**

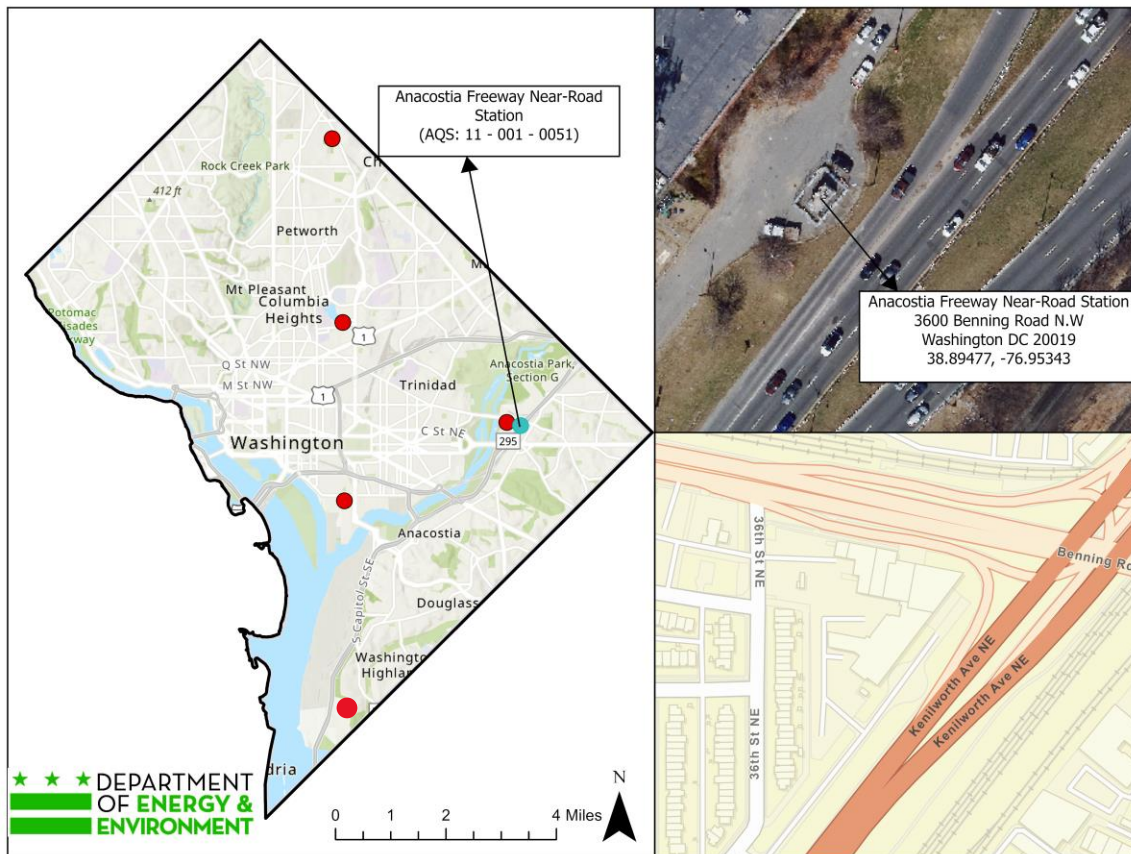


<sup>1</sup> Takoma Recreation Center monitoring station operations were temporarily halted in 2022 from 04/28/2022 to 10/07/2022 due to building repairs. Similarly, monitoring station operations were temporarily halted again in 2023 from 04/05/2023 to 09/14/2023 due to a burglary incident. Building security has been enhanced since and station operations and data collection resumed.

### 3.4 Anacostia Freeway Near-Road Station (11-001-0051)

The Anacostia Freeway Near-Road Station was launched in January 2015, and it houses NO<sub>2</sub>, CO, and PM<sub>2.5</sub> continuous measurement sensors. This station serves as an important and critical station in the metropolitan area and the District because of its location for capturing peak 1-hour NO<sub>2</sub> and CO concentrations expected in the near-road environment.

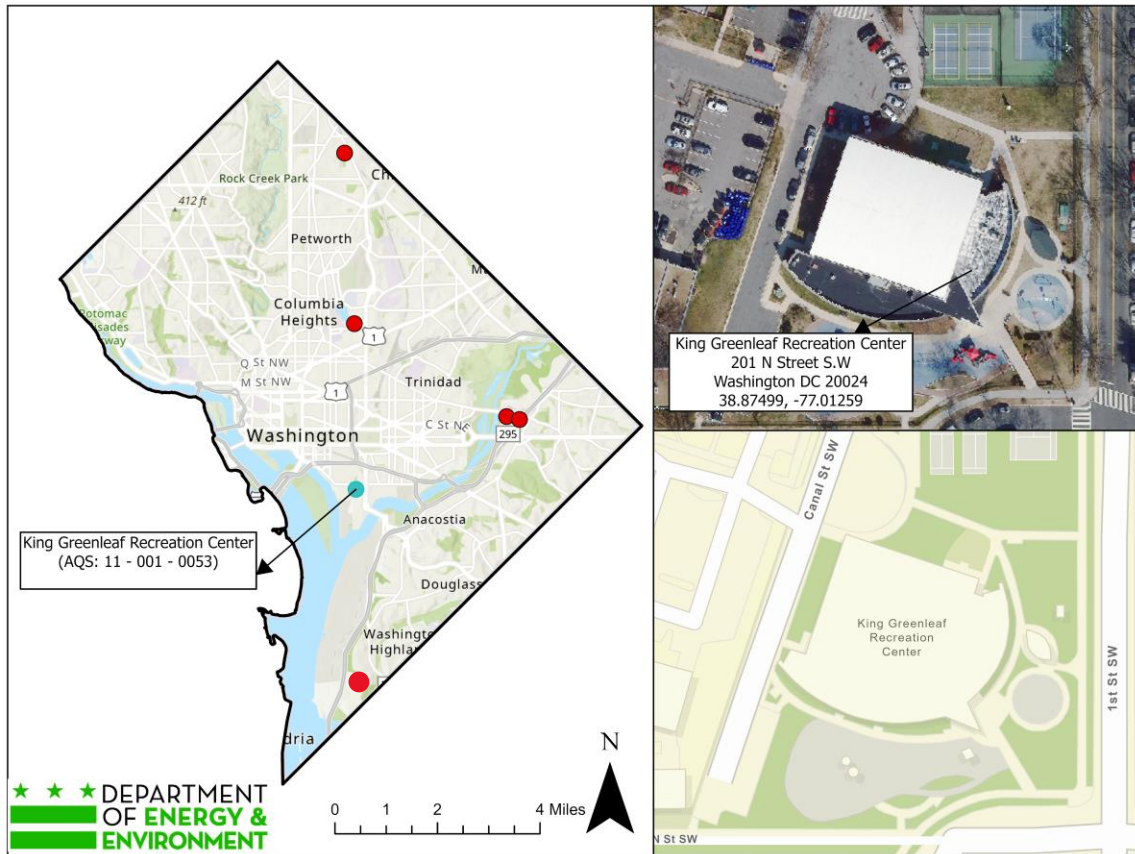
**Figure 3-4: Anacostia Freeway Near-Road Site Locator Maps**



### 3.5 King Greenleaf Recreation Center Station (11-001-0053)

The King Greenleaf monitoring station has been operational since August 2017, but was not added to the AQS until January 1, 2018. DOEE operates a PM<sub>2.5</sub> FEM monitor at this location on the rooftop of the recreation center. This station was first deployed as a special purpose monitor but was added on to the District's network in 2018.

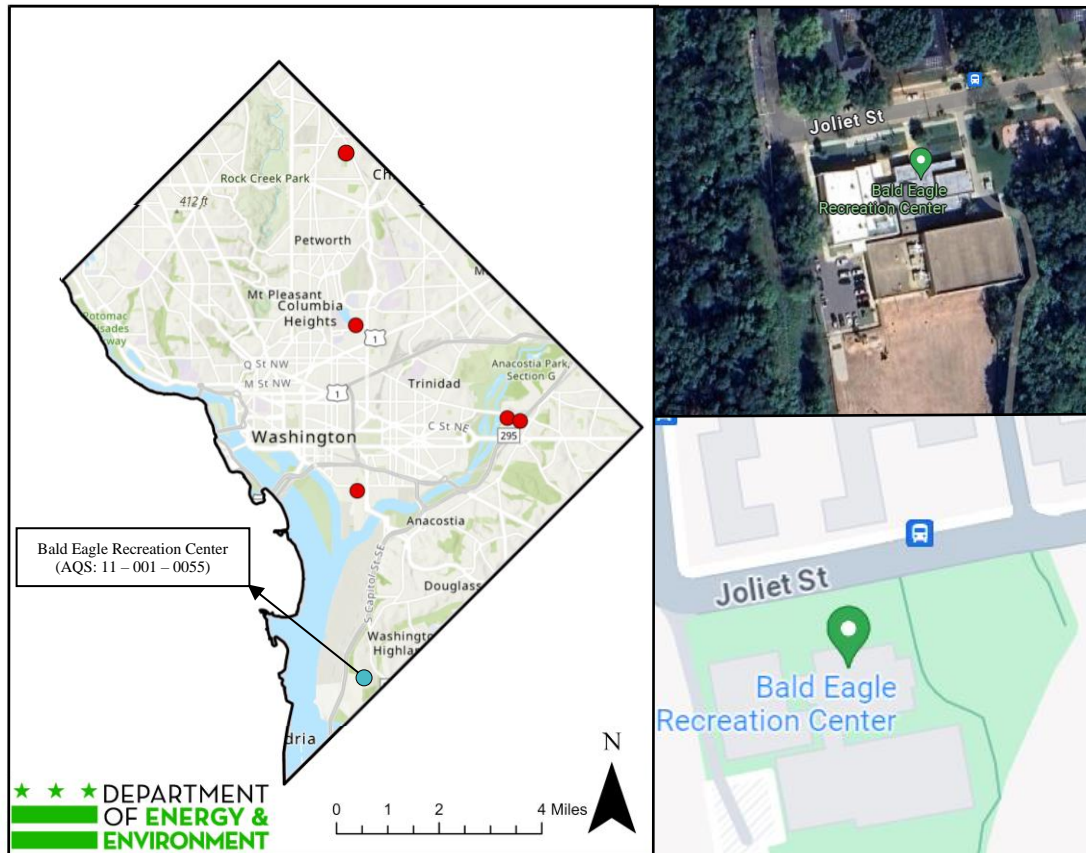
**Figure 3-5: King Greenleaf Recreation Center Site Locator Maps**



### 3.6 Bald Eagle Recreation Center Station (11-001-0055)

The Bald Eagle Recreational Center ambient air monitoring station has been operational since March 2024. DOEE operates a PM<sub>2.5</sub> FEM monitor at this location. This station was deployed as an EJ, community-centric air monitoring site with ARP direct award federal grant funding.

**Figure 3-6: Bald Eagle Recreation Center Site Locator Maps**



## 4.0 Ozone and PM<sub>2.5</sub> Air Quality

Ambient data for criteria pollutants as given by design value concentrations are used to determine if the monitored air quality in the District is in compliance with the NAAQS. Design values (DV) are defined in CAA guidance and are often based on multiple years of data to ensure a stable indicator. Design value data is 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 regional offices.

### 4.1 Annual PM<sub>2.5</sub> Design Concentrations

Figure 4-1 below gives the design concentrations for PM<sub>2.5</sub> at the District's sites for the recent period. The annual PM<sub>2.5</sub> design values were calculated using the average of the annual arithmetic mean for a consecutive three-year period. Design values based on 2016 to 2023 data indicate that the District is in attainment for the 2012 annual PM<sub>2.5</sub> NAAQS of 12 µg/m<sup>3</sup>.

### 4.2 Daily PM<sub>2.5</sub> Design Concentrations

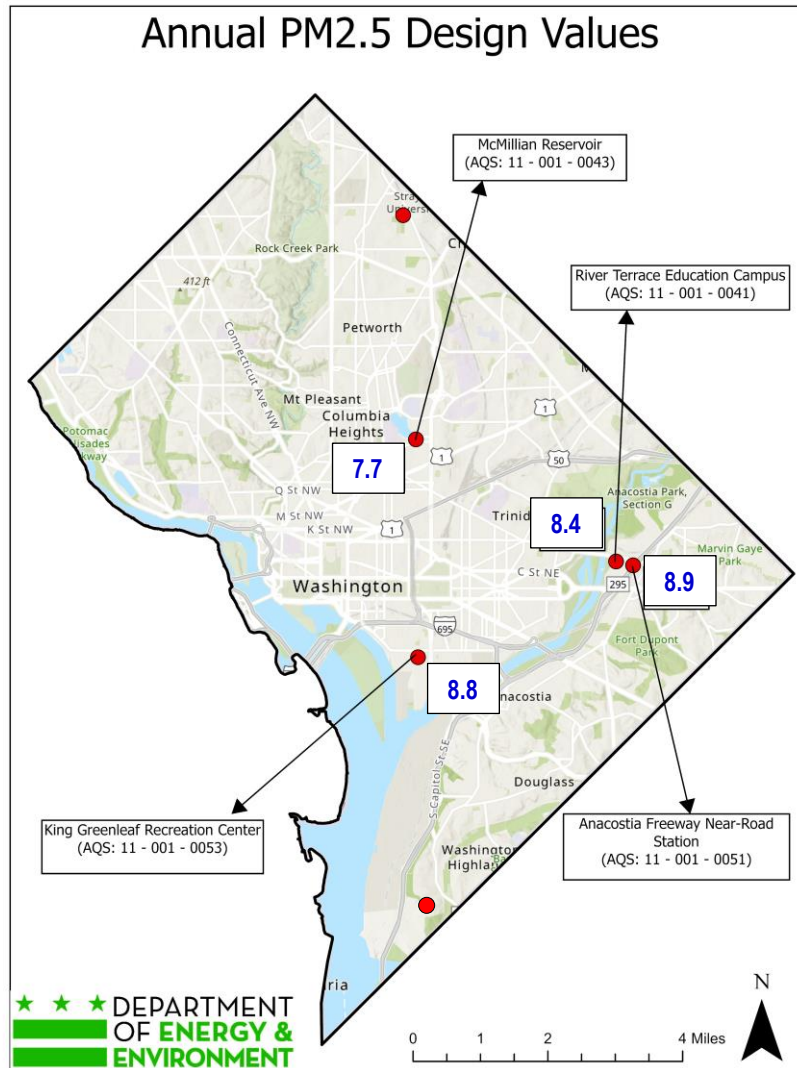
Daily PM<sub>2.5</sub> design concentrations are calculated using the 98<sup>th</sup> percentile ambient concentration value from each year for a given consecutive three-year period. The design value is the average of the three 98<sup>th</sup> percentile data. Figure 4-2 gives the design values for daily PM<sub>2.5</sub> using data from 2016 to 2023. Design values based on the recent data indicate that the District is in attainment for the 2006 daily PM<sub>2.5</sub> NAAQS of 35 µg/m<sup>3</sup>.

### 4.3 Ozone Design Concentrations

Figure 4-3 includes current design values for ground-level ozone using data from 2016 to 2023. The ozone design values are calculated by taking the three-year average of the annual 4<sup>th</sup> highest daily maximum 8-hr average concentrations. The 2015 8-hr ozone NAAQS is 0.070 ppm, or 70 ppb. Monitored data indicate that the ambient air quality is in violation of the NAAQS at O<sub>3</sub> monitoring sites in the District.



**Figure 4-1: Annual PM<sub>2.5</sub> Design Values**



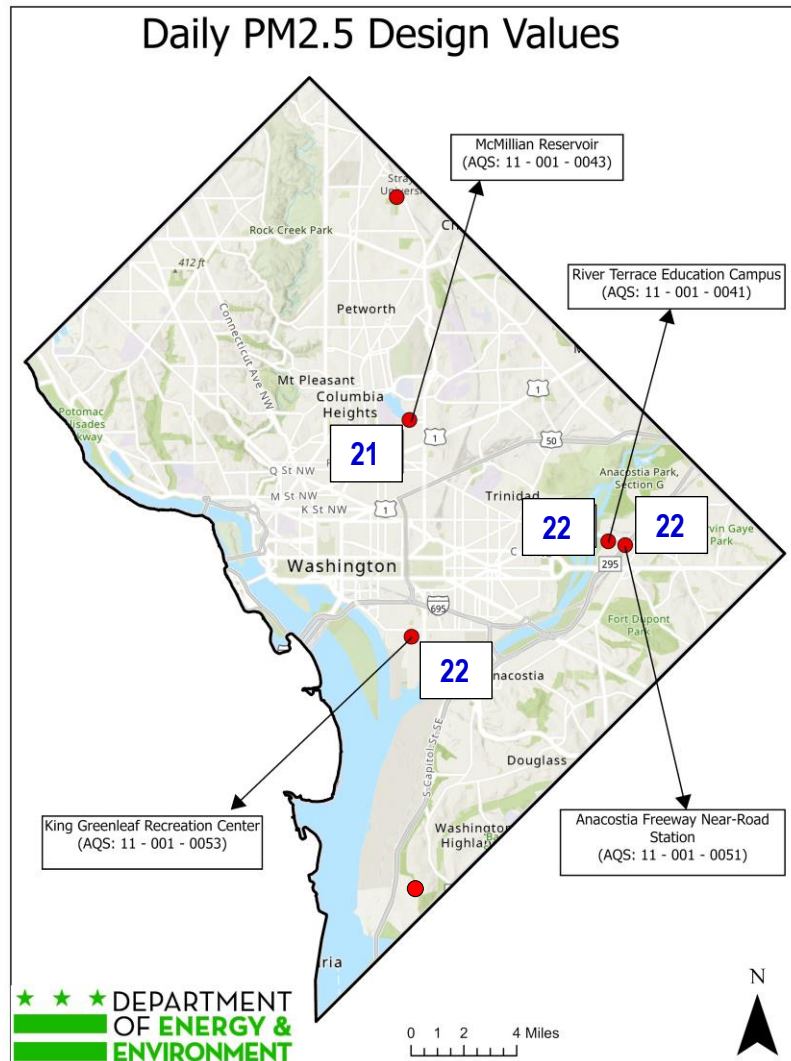
| Annual PM <sub>2.5</sub> Design Values (µg/m <sup>3</sup> ) |             |                   |      |                  |                  |      |      |      |                   |
|---|-------------|-------------------|------|------------------|------------------|------|------|------|-------------------|
| Site  | AQS ID      | 2016              | 2017 | 2018             | 2019             | 2020 | 2021 | 2022 | 2023 <sup>C</sup> |
| McMillan  | 11-001-0043 | 9.0               | 9.2  | 9.0              | 8.9              | 7.6  | 7.2  | 6.9  | 7.7               |
| River Terrace   | 11-001-0041 | N/A <sup>A</sup>  | 8.5  | 8.5 <sup>B</sup> | 8.6              | 8.0  | 7.8  | 7.5  | 8.4               |
| Anacostia Freeway Near-Road                                 | 11-001-0051 | 10.1 <sup>B</sup> | 10.2 | 9.8              | 9.5              | 8.7  | 8.8  | 8.6  | 8.9               |
| King Greenleaf  | 11-001-0053 | -                 | -    | 8.2 <sup>B</sup> | 8.1 <sup>B</sup> | 7.6  | 7.9  | 7.9  | 8.8               |

<sup>A</sup>River Terrace temporarily shut down from March 2014 to April 2016 for school renovation. 2016 Design Values not available.

<sup>B</sup>The Design Value is based on incomplete data.

<sup>C</sup>The Design Value is based preliminary data for calendar year 2023.

**Figure 4-2: Daily PM<sub>2.5</sub> Design Values**



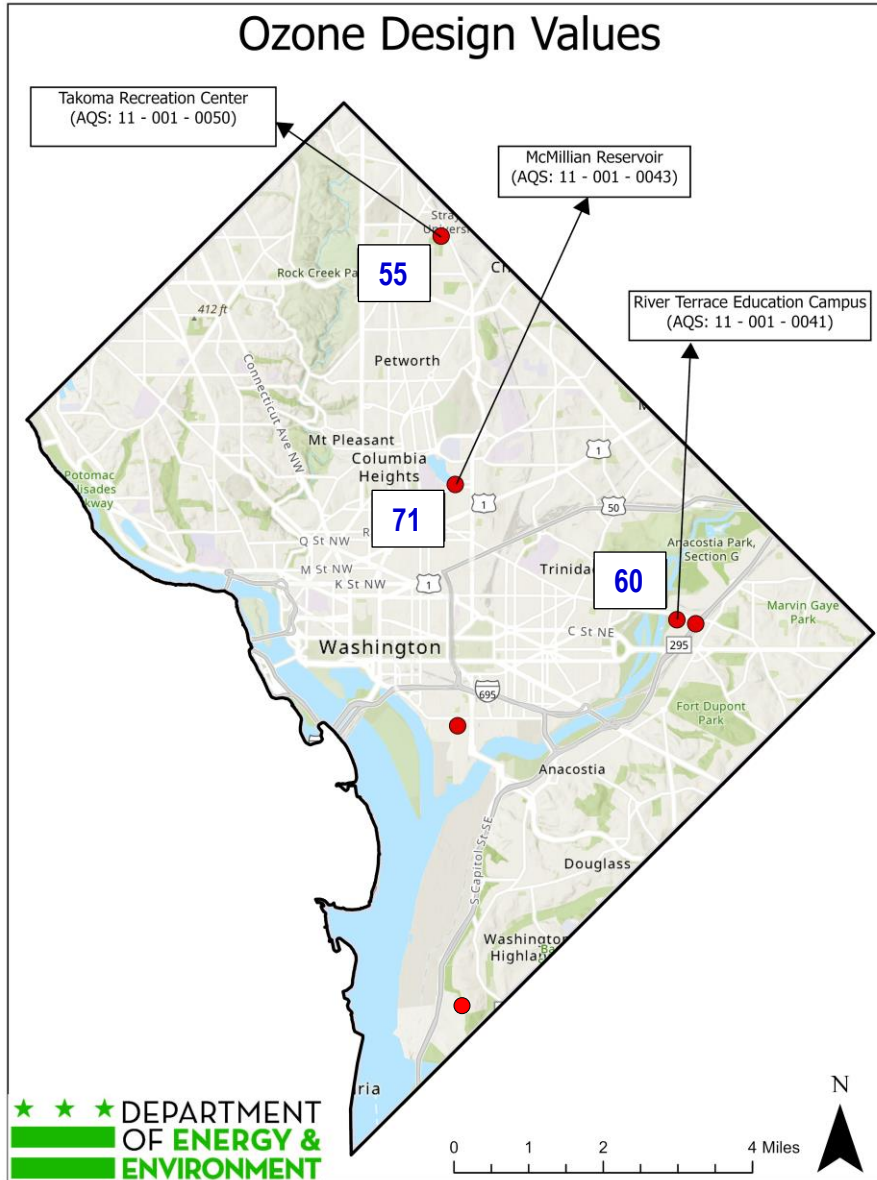
| Daily PM <sub>2.5</sub> Design Values (µg/m <sup>3</sup> ) |             |                  |      |                 |                 |      |      |      |                   |
|--|-------------|------------------|------|-----------------|-----------------|------|------|------|-------------------|
| Site   | AQS ID      | 2016             | 2017 | 2018            | 2019            | 2020 | 2021 | 2022 | 2023 <sup>C</sup> |
| McMillan   | 11-001-0043 | 21               | 21   | 20              | 20              | 19   | 18   | 17   | 21                |
| River Terrace  | 11-001-0041 | N/A <sup>A</sup> | 17   | 18 <sup>B</sup> | 21              | 21   | 20   | 18   | 22                |
| Anacostia Freeway Near-Road                                | 11-001-0051 | 25 <sup>B</sup>  | 23   | 21              | 21              | 22   | 22   | 20   | 22                |
| King Greenleaf Recreation Center                           | 11-001-0053 | -                | -    | 19 <sup>B</sup> | 18 <sup>B</sup> | 19   | 19   | 18   | 22                |

<sup>A</sup>River Terrace temporarily shut down from March 2014 to April 2016 for school renovation. 2016 Design Values not available.

<sup>B</sup>The Design Value is based on incomplete data.

<sup>C</sup>The Design Value is based preliminary data for calendar year 2023.

**Figure 4-3: Ozone Design Values**



| Ground-level Ozone Design Values (ppb) |             |                  |                 |      |      |      |      |      |                   |
|--|-------------|------------------|-----------------|------|------|------|------|------|-------------------|
| Site                                   | AQS ID      | 2016             | 2017            | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 <sup>C</sup> |
| McMillan                               | 11-001-0043 | 70               | 71              | 72   | 71   | 69   | 68   | 67   | 71                |
| River Terrace                          | 11-001-0041 | N/A <sup>A</sup> | 60 <sup>B</sup> | 57   | 56   | 55   | 60   | 59   | 60                |
| Takoma Recreation Center               | 11-001-0050 | 70               | 70              | 70   | 69   | 67   | 66   | 61   | 55 <sup>B</sup>   |

<sup>A</sup>River Terrace temporarily shut down from March 2014 to April 2016 for building renovation. 2016 Design Values were not available due to station temporarily shut down for renovation.

<sup>B</sup>The Design Value was based on incomplete data.

<sup>C</sup>The Design Value is based preliminary data for calendar year 2023.

## 5.0 Network Changes and Upgrades

The District supports EPA's efforts to protect public health and natural resources under the CAA. DOEE is working with EPA Region III 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.

- DOEE is proposing **no changes** at the District's **existing** ambient air monitoring network in calendar year 2025.

The sections below give additional information for the District's monitoring network in calendar year 2024. DOEE seeks EPA's concurrence and Region III Regional Administrator's approval for these proposed changes, if any.

### 5.1 River Terrace School (Site ID 11-001-0041)

- SLAMS O<sub>3</sub> and NO<sub>2</sub> monitors: No changes planned
- PM<sub>2.5</sub> FEM monitor: No changes planned
- SLAMS monitors: SO<sub>2</sub> monitor was shut down in October 2019 and CO monitor shutdown end of December 2016, as approved by EPA

### 5.2 McMillan (Site ID 11-001-0043)

- PAMS monitors: No changes planned
- NATTS monitors: No changes planned
- NCore monitors: No changes planned
- PM<sub>2.5</sub> monitors: No changes planned
- PM<sub>2.5</sub> CSN: No changes planned
- PM<sub>10</sub> FEM Monitors: No changes planned

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

- SLAMS O<sub>3</sub> and NO<sub>2</sub> monitors: No changes planned

### 5.4 Anacostia Freeway Near-Road station (Site ID 11-001-0051)

- NO<sub>2</sub> and CO monitors: No changes planned
- PM<sub>2.5</sub> FEM monitor: No changes planned

### 5.5 King Greenleaf Recreation Center (Site ID 11-001-0053)

- PM<sub>2.5</sub> FEM monitor: No changes planned
- 

### 5.6 Bald Eagle Recreation Center (Site ID 11-001-0055)

- PM<sub>2.5</sub> FEM monitor: No changes planned

## 6.0 Air Monitoring Program and Data Contacts

The Air Monitoring Branch in DOEE'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, and special requests such as 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. EPA controls access to the raw ambient air quality data that DOEE transmits to the national database. Ambient air quality monitoring data must be certified on an annual basis as accurate and complete. The certification process begins with the complete submittal of all SLAMS data to the federal AQS for the calendar year. State and local air monitoring agencies are required to transmit and certify the collected data for the previous calendar year by May 1.

DOEE has developed ambient monitoring guidelines in order to ensure that ambient air quality data collected at the state's ambient monitors are of the highest quality and conform to federal requirements for quality assurance under 40 C.F.R. 58.3.

DOEE uploaded fully quality assured calendar year 2023 data for the District's network to EPA's AQS national database. Submittal of precise and accurate data into AQS was accomplished and a formal certification of calendar year 2023 data will be transmitted to EPA in April 2024.

Annual data reports are generated from AQS, and data certifications are prepared by DOEE, according to the reporting requirements in 40 C.F.R. Part 58. Data requests can be directed via email to: [berhan.teklu@dc.gov](mailto:berhan.teklu@dc.gov).

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

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Phone: (202) 535-2989  
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