2025-2026
Air Monitoring Network Plan

City of Philadelphia
Department of Public Health
Air Management Services

Draft Date: 4/3/2025

CERTIFICATION

To the best of my knowledge, this plan has been checked for completeness and the details presented herein are accurate, error-free, legible, and representative of the methods employed by Department of Public Health, Air Management Services.

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Administrative Engineer, Program Service

Table of Contents

Contents

Tables

Figures

Appendices

Executive Summary

The Philadelphia Department of Public Health – Air Management Services (AMS) operates an ambient air monitoring network. Federal Regulations (40CFR58.10) require AMS to submit an annual Air Monitoring Network Plan (AMNP) to EPA Region III to ensure that the network stations continue to meet the criteria established by federal regulations. AMS must document the process for obtaining public comment and include any comments received through the public notification process within the submitted plan. Public comments received on the air monitoring plan must be included in the version submitted to the EPA. All proposed additions, modifications, and discontinuations of State or Local Air Monitoring Station (SLAMS) monitors in AMS's air monitoring network plan are subject to EPA approval.

AMS operates an ambient air monitoring network of ten air monitoring stations that house instruments measuring ambient levels of gaseous, solid, and liquid aerosol pollutants. This air monitoring network is part of a broader network operated by the states of Pennsylvania, New Jersey, Delaware, and Maryland that monitor the ambient air in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area (MSA).

Summary of air monitoring network changes since the last Plan:

- In 2024, AMS proposed an additional air monitor to begin operating in January 2025 to improve the current network. AMS has constructed the monitor with all necessary equipment, but the monitoring start date has been delayed because of siting issues. AMS changed the proposed monitor location and anticipates siting issues to be resolved and monitoring to start in July 2025.
- In 2024, AMS ceased using Black Carbon and Ultrafine PM data at the MON monitor due to sensor technical issues.
- AMS concluded the PAQS project and will create a final report in 2025. PAQS monitors will be replaced by Clarity real-time sensors.
- AMS Completed the Community scale Air Toxics Monitoring program and will be extending and expanding it.
- AMS completed a pilot study to determine the accuracy and reliability of real-time Clarity $PM_{2.5}$ and NO_2 sensors.

Summary of proposed air monitoring network changes:

- Begin monitoring $PM_{2.5}$, NO_2, VOCs and air toxics at the HUN site.
- Begin measurements of continuous $PM_{2.5}$ and VOCs at ARP grant project sites.
- Begin operating real time Clarity $PM_{2.5}$ and NO_2 sensors to replace PAQS.
- Expand the Community Scale Air Toxics Monitoring network with 4 additional monitoring sites.

Air monitoring provides essential information about air quality in Philadelphia. The objective for much of the network is to measure pollutants levels in areas with high contamination and significant population exposure. Additionally, monitoring helps identify differences in pollutant levels in various parts of the City, track long term trends, support facility compliance, enable real-time monitoring, and provide the public with air quality information.

Air monitoring data is submitted to the EPA on a quarterly basis. EPA's Air Data website (https://www.epa.gov/outdoor-air-quality-data) provides access to air quality data collected at the monitors. On May 1st of each year, AMS certifies the previous year's data in accordance with the annual data certification process outlined in 40 CFR Part 58.15.

The proper siting of a monitor requires the specification of the monitoring objective, the types of sites necessary to meet the objective, and the desired spatial scale of representativeness. These are discussed in the section entitled "Definitions".

This Plan is composed of the following sections and appendices:

1. **Public Participation** – This section provides information on how the public is made aware of the AMNP and where it is available for review.

2. **Definitions** – This section describes the terms used for air monitoring programs, measurement methods, monitoring objectives, spatial scales, air monitoring areas, pollutants, collection methods, and analysis methods.

3. **Changes since Last Air Monitoring Network Plan** – This section gives an overview of changes to the monitoring network that occurred from April 2024 – March 2025.

4. **Direction of Future Air Monitoring** – This section gives a perspective of the major areas and initiatives AMS will be considering during the next few years.

5. **Proposed Changes to the Network** – This section describes changes that may occur within the next 18 months that would modify the network from how it is currently described in the AMNP.

6. **Current Network at a Glance** – This section shows the location of the monitoring sites and the pollutants measured at each site.

7. **Current Sites Summary** – This section provides information applicable to our overall network such as population. It also provides a brief overall purpose for each monitoring site.

8. **NCore Monitoring Network** – This section documents the NCore monitoring network codified in 40 CFR Part 58.10(a)(3) and 40 CFR Part 58 Appendix D section 3.

9. **Pb Monitoring Network** – This section documents the Pb monitoring network codified in 40 CFR Part 58.10(a)(4) and 40 CFR Part 58 Appendix D section 4.5.

10. **NO_2 Monitoring Network** – This section documents the NO_2 monitoring network codified in 40 CFR Part 58.10(a)(5) and 40 CFR Part 58 Appendix D section 4.3.

11. **SO_2 Monitoring Network** – This section documents the SO_2 monitoring network codified in 40 CFR Part 58.10(a)(6) and 40 CFR Part 58 Appendix D section 4.4.

12. **CO Monitoring Network** – This section documents the CO monitoring network codified in 40 CFR Part 58.10(a)(7) and 40 CFR Part 58 Appendix D section 4.2.

13. **$PM_{2.5}$ Monitoring Network** – This section documents the $PM_{2.5}$ monitoring network codified in 40 CFR Part 58.10(a)(8) and 40 CFR Part 58 Appendix D section 4.7.

14. **O_3 Monitoring Network** – This section documents the O_3 monitoring network codified in 40 CFR Part 58.10(a)(9) – (12) and 40 CFR part 58 Appendix D section 4.1.

15. **Detailed Information on Each Site** – This is the largest section of the AMNP. Each monitoring site is separately described in a table, complete with pictures and maps. The material is presented as:
    - A table providing information on the pollutants measured, sampling type, operating schedule, collection method, analysis method, spatial scale, monitoring objective, probe height, and begin date of each monitor;
    - Pictures taken at ground level of the monitoring station;
    - A map of the monitoring site complete with major cross streets and major air emission sources within 3000 meters (almost 2 miles); and
    - An aerial picture providing a north view of the site.

16. **Appendix A** – **Philadelphia Air Quality Survey**

17. **Appendix B** – **2020 Community-Scale Air Toxics Ambient Monitoring Grant**

18. **Appendix C – 2022 American Rescue Plan Grant Project**

19. **Appendix D – Proof of Public Notice Publication**

20. **Appendix E – Comment and response Document**

21. **Disclaimer of Endorsement**

Public Participation

The Code of Federal Regulations (CFR) Title 40: Protection of Environment, Part 58: Ambient Air Quality Surveillance requires state and local air pollution control agencies to adopt and submit an annual Air Monitoring Network Plan (AMNP, or the Plan) to the Environmental Protection Agency (EPA) Regional Administrator by July 1, of each year. The AMNP provides for the establishment and maintenance of an air quality surveillance system that consists of a network of monitoring stations. A proposed AMNP must be made available for public inspection and comment for at least 30 days prior to submission to EPA.

Air Management Services (AMS) is the local air pollution control agency for the City of Philadelphia under the Department of Public Health. Philadelphia has an air monitoring network of 10 air monitoring stations that house instruments that measure ambient levels of air pollutants under the EPA regulatory monitoring requirements. In 2024 AMS proposed to establish an additional monitoring station in North Philadelphia. The start of monitoring has been delayed, but AMS anticipate monitoring will begin in 2025. AMS also operates other air monitoring sites and equipment based on available funding, public input and other factors, as described in this Plan. AMS is committed to continuously improving air monitoring in Philadelphia neighborhoods, especially those that face an undue burden from air pollution.

- The public can find copies of the draft AMNP at https://www.phila.gov/departments/air-pollution-control-board/air-management- notices/ and at the office of Air Management Services, 7801 Essington Ave, Philadelphia, PA 19153, during normal business hours. Please contact AMS at 215-685-9429 to schedule an appointment. For further information, contact Rahel Gebrekidan, Program Services Unit, AMS at dphams_ps@phila.gov.

Written comments on the proposed AMNP should be sent by mail to Rahel Gebrekidan, Program Services Manager / 2025 AMNP, Air Management Services, 7801 Essington Ave, Philadelphia, PA 19153; or via E-mail at dphams_ps@phila.gov , with “2025 Air Monitoring Network Plan” included in the subject line.

Only written comments by mail/email will be accepted. Comments received by facsimile or voice messages will not be accepted. Persons wishing to file comments on the proposed AMNP must submit comments by May 5, 2025 (within 30 days of the publication of the public notice in the local newspaper, Daily News)

Definitions

Air Monitoring Programs

EPA has established various air monitoring programs for the measurement of pollutants. Some of these are briefly described below. Later in this AMNP, air monitoring sites and monitoring equipment are specifically identified relative to these air monitoring programs:

- **CSN** – Chemical Speciation Network. It is a $PM_{2.5}$ sampling network with sites located principally in urban areas.
- **NATTS** – National Air Toxics Trends Stations. This network provides ambient levels of hazardous air pollutants. These sites are established with the goal of operating over extended periods, providing both current and historical data on air quality trends related to toxic air pollutants
- **NCore** – National Core multi-pollutant monitoring stations. Monitors at these sites are required to measure particles ($PM_{2.5}$, speciated $PM_{2.5}$, $PM_{10-2.5}$), O_3, SO_2, CO, nitrogen oxides ($NO/NO_2/NO_y$), and basic meteorology. They principally support research in air pollution control.
- **SLAMS** – State or Local Air Monitoring Stations. The SLAMS make up the ambient air quality monitoring sites that are primarily needed for NAAQS comparisons, but may serve other data purposes. SLAMS exclude special purpose monitor (SPM) stations and include NCore, PAMS, Near-road NO_2/CO and all other State or locally operated stations that have not been designated as SPM stations.
- **PAMS** – Photochemical Assessment Monitoring Station for the enhanced monitoring of ozone, oxides of nitrogen (NO_x), and volatile organic compounds (VOC) to obtain more comprehensive and representative data on ozone air pollution.
- **SPM** – Special Purpose Monitor. As the name implies these monitors are placed for purposes of interest to the city of Philadelphia. Often this monitoring is performed over a limited amount of time. Data is reported to the federal Air Quality System (AQS) and is not counted when showing compliance with the minimum requirements of the air monitoring regulations for the number and siting of monitors of various types.
- **Urban Air Toxics** – Urban Air Toxics (UAT) monitoring addresses toxic air pollutant emissions in urban areas. UAT air monitoring is regularly conducted for volatile organic compounds (VOCs).

Measurement Methods

- **Federal Equivalent Method (FEM)** – A method for measuring the concentration of an air pollutant in the ambient air that has been designated as an equivalent method in accordance with 40 CFR Part 53; it does not include a method for which an equivalent method designation has been canceled in accordance with 40 CFR Part 53.11 or 40 CFR Part 53.16.
- **Federal Reference Method (FRM)** – A method of sampling and analyzing the ambient air for an air pollutant that is specified as a reference method in an appendix to 40 CFR Part 50, or a method that has been designated as a reference method in accordance with this part; it does not include a method for which a reference method designation has been canceled in accordance with 40 CFR Part 53.11 or 40 CFR Part 53.16.

Monitoring Objectives

The ambient air monitoring networks must be designed to meet three basic monitoring objectives:

- Provide air pollution data to the general public in a timely manner.
- Support compliance with ambient air quality standards and emissions strategy development.
- Assist in the evaluation of regional air quality models used in developing emission strategies, and to track trends in air pollution abatement control measures' impact on improving air quality.

In order to support the air quality management work indicated in the three basic air monitoring objectives, a network must be designed with a variety of different monitoring sites. Monitoring sites must be capable of informing managers of many parameters including the peak air pollution levels, typical pollution levels in populated areas, air pollution transported into and outside of a city or region, and air pollution levels near specific sources.

Spatial Scales

The physical siting of the air monitoring station must be consistent with the objectives, site type and the physical location of a particular monitor.

The goal in locating monitors is to correctly match the spatial scale represented by the sample of monitored air with the spatial scale most appropriate for the monitoring site type, air pollutant to be measured, and the monitoring objective.

The spatial scale results from the physical location of the site with respect to the pollutant sources and categories. It estimates the size of the area surrounding the monitoring site that experiences uniform pollutant concentrations. The categories of spatial scale are:

- **Microscale** – Defines concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.
- **Middle scale** – Defines concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.
- **Neighborhood scale** – Defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range. The neighborhood and urban scales listed below have the potential to overlap in applications that concern secondarily formed or homogeneously distributed air pollutants.
- **Urban scale** – Defines concentrations within an area of city-like dimensions, on the order of 4 to 50 kilometers. Within a city, the geographic placement of sources may result in there being no single site that can be said to represent air quality on an urban scale.
- **Regional scale** – Defines usually a rural area of reasonably homogeneous geography without large sources, and extends from tens to hundreds of kilometers.
- **National and global scales** – These measurement scales represent concentrations characterizing the nation and the globe as a whole.

Air Monitoring Area

- **Core-Based Statistical Area (CBSA)** – Defined by the U.S. Office of Management and Budget, as a statistical geographic entity consisting of the county or counties associated with at least one urbanized area/urban cluster of at least a population of 10,000 people, plus adjacent counties having a high degree of social and economic integration.
- **Metropolitan Statistical Area (MSA)** – A Core-Based Statistical Area (CBSA) associated with at least one urbanized area of a population of 50,000 people or more. The central county plus adjacent counties with a high degree of integration comprise the area.

Pollutants and Parameters

Air Management Services monitors for a wide range of air pollutants and parameters:

- **Criteria Pollutants** are measured to assess if and how well we are meeting the National Ambient Air Quality Standards (NAAQS) that have been set for each of these pollutants. These standards are set to protect the public's health and welfare.
  - **Ozone (O_3)**
  - **Sulfur Dioxide (SO_2)**
  - **Carbon Monoxide (CO)**
  - **Nitrogen Dioxide (NO_2)**
    - NO means nitrogen oxide.
    - NO_x means oxides of nitrogen and is defined as the sum of the concentrations of NO_2 and NO.
    - NO_y means the sum of all total *reactive* nitrogen oxides, including NO, NO_2, and other nitrogen oxides referred to as NO_Z.
  - **Particulate**
    - $PM_{2.5}$ means particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
    - PM_{10} means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
    - PM Coarse means particulate matter with an aerodynamic diameter greater than 2.5 micrometers and less than 10 micrometers.
    - Ultrafine Particulate Matter means particulate matter with an aerodynamic diameter less than 0.1 micrometers.
  - **Lead (Pb)**
    - EPA has waived monitoring lead since 2017 because the 2014-2016 design value in Philadelphia was 0.04 $\mu g/m^3$, well below the National Ambient Air Quality Standards for lead of 0.15 $\mu g/m^3$.
- **MET** – Meteorology parameters that may include temperature, relative humidity, barometric pressure, wind speed, wind direction, mixing height, precipitation, solar and UV radiation.
- **Speciated $PM_{2.5}$** – $PM_{2.5}$ particles are analyzed to identify their makeup (60 components including elements, radicals, elemental carbon, and organic carbon) and help assess the level of health risk and identify sources that are contributing to the levels of $PM_{2.5}$ being measured.
- **Toxics** – Approximately 50 VOC compounds, 7 carbonyls, and 7 metal elements are measured as air toxics to assess the risk of cancer and non-cancer hazard caused by these

pollutants. The VOC compounds are analyzed by GC/MS (EPA Compendium Method TO-15); carbonyls are analyzed by uHPLC (ultra-High-Performance Liquid Chromatography), and metals by ICP-MS(URG) (to be analyzed by an outside lab).

- **PAMS Volatile Organic Compounds (VOC)** – Approximately 57 of these compounds are monitored to assist in understanding the formation of ozone and how to control this pollutant. These compounds are analyzed by Auto GC-FID.

Collection Methods

Particulate samples

- **Broadband Spectroscopy PM Mass Monitor** – This instrument provides continuous $PM_{2.5}$ real-time mass measurements using broadband spectroscopy which combines advanced LED technology with light scattering theory. Certain PM Mass Monitor Models provide simultaneous, continuous PM_{10} and $PM_{2.5}$, real-time PM mass measurements.

The following instruments provide concentration values of particulate over a 24-hour period. Laboratory analysis is required before the concentration of particulate can be determined.

- **Hi-Vol** – High-Volume Air Samplers (HVAS) are used to determine the concentration of particulate matter in the air. All collected material is defined as total suspended (in the air) particulates (TSP), including lead (Pb) and other metals. A Hi-Volume sampler consists of two basic components: a motor similar to those used in vacuum cleaners and an air flow control system.
- **Filter-based $PM_{2.5}$** – Filter-based $PM_{2.5}$ monitors with air samples drawn through a Teflon filter for 24 hours.
- **Met One SASS** – Filters used to collect PM measurement of total mass by gravimetry, elements by x-ray fluorescence.
- **URG** – Filters used to collect PM measurement of organic and elemental carbon.

Gaseous / criteria pollutants

- **Instrumental - Data from these instruments is telemetered to a central computer system and values are available in near "real time".** An analyzer used to measure pollutants such as: carbon monoxide, sulfur dioxide, nitrogen oxides and ozone.

Toxic and organic (VOC) pollutants

- **SS Canister Pressurized** – Ambient air is collected in stainless-steel canisters, cryogenically concentrated using liquid nitrogen and analyzed for target VOCs and other organic components by GC-FID and GC-MS.
- **Canister Sub Ambient Pressure** – Collection of ambient air into an evacuated canister with a final canister pressure below atmospheric pressure.
- **DNPH-Coated Cartridges** – Cartridges are coated with 2,4-dinitrophenylhydrazine (DNPH). This is used for carbonyl determination in ambient air. Ultra-High Performance Liquid Chromatography (uHPLC) is used to measure carbonyls.

Analysis Methods

Particulate concentration

- **Gravimetric** – The determination of the quantities of the constituents of a compound, describes a set of methods for the quantitative determination of an analyte based on the weight of a solid. Laboratory analysis is needed.
- **Broadband Spectroscopy** – Broadband spectroscopy combines advanced LED technology with light scattering theory. Certain PM Mass Monitor Models provide simultaneous, continuous PM_{10} and $PM_{2.5}$, real-time PM mass measurements.

Composition/make-up of particulates

- **Energy Dispersive XRF** – Energy dispersive x-Ray Fluorescence Spectrometer for the determination of species in ambient particulate matter.
- **Ion Chromatography –** Ion-exchange chromatography (or ion chromatography) is a chromatography process that separates ions and polar molecules based on their affinity to the ion exchanger for the determination of species in ambient particulate matter.
- **IMPROVE –** Thermal Optical Reflectance (TOR) analysis using the Interagency Monitoring of Protected Visual Environments (IMPROVE)_A protocol.

Gaseous / criteria pollutants

- **Nitrogen Oxides – Chemiluminescence** – Emission of light as a result of a chemical reaction at environmental temperatures. This analysis is used for NO, NO_x, and NO_y. NO_2 is calculated as NO_x- NO. True NO_2 monitoring technology provides a direct NO_2 measurement. The instrument utilizes a Cavity Attenuated Phase Shift (CAPS) technique.
- **Carbon Monoxide – Gas Filter Correlation** – Measures low ranges of carbon monoxide by comparing infrared energy absorbed by a sample to that absorbed by a reference gas according to the Beer-Lambert law. Using a Gas Filter Correlation Wheel, a high energy IR light source is alternately passed through a CO filled chamber and a chamber with no CO present. The light path then travels through the sample cell, which has a folded path of 14 meters. The energy loss through the sample cell is compared with the span reference signal provided by the filter wheel to produce a signal proportional to concentration.
- **Sulfur Dioxide** – **UV Fluorescent** – UV Fluorescence Sulfur Dioxide Analyzer is a microprocessor-controlled analyzer that determines the concentration of sulfur dioxide (SO_2), in a sample gas drawn through the instrument's sample chamber where it is exposed to ultraviolet light, which causes any SO_2 present to fluoresce. The instrument measures the amount of fluorescence to determine the amount of SO_2 present in the sample gas.
- **Ozone** – **Ultraviolet -** A light, which supplies energy to a molecule being analyzed. Ozone is analyzed with UV.

Toxic and volatile organic pollutants

- **GC-MS** – Gas Chromatograph/Mass Spectrometer**.** Analysis of organic or VOC are conducted using a gas chromatograph (GC) with a mass spectrometer (MS) attached as the detector. Cryogenic preconcentration with liquid nitrogen (LN_2) is also used to trap and concentrate sample components.
- **Auto GC-FID** – Automated Gas Chromatograph. Continuous hourly analysis of VOC using airmoVOC C2-C6 (light volatile hydrocarbons) and airmoVOC C6-C12 (heavy volatile hydrocarbons) analyzers with Flame Ionization Detection.

- **Ultra-High Performance Liquid Chromatography (uHPLC)** – The analytical method used to analyze carbonyl compounds such as acetaldehyde and formaldehyde. Compared with traditional HPLC, uHPLC allows for faster analysis as well as chromatograms with greater resolution.

Changes since Last Air Monitoring Network Plan

Several changes in the monitoring network have occurred after the 2024 – 2025 AMNP was submitted. These changes include:

- Discontinuation of Black Carbon and Ultrafine Particulate Matter Monitoring – the MON Monitor operated a Teledyne black carbon monitor and Ultrafine PM monitor as part of the near road monitoring network from 2015 – 2024. Both monitors have experienced many technical and reliability issues during their operation. In 2024 AMS was only able to recover a small number of samples from each device. As a result of these issues, the measurements of the black carbon and ultrafine PM at MON are not being used by AMS. Black carbon and ultrafine PM are not Criteria Pollutants and are not a monitoring requirement for any AMS programs.

- Location change of the proposed HUN monitor – AMS had originally agreed to locate the HUN monitor at 2201 W. Hunting Park Ave, but the agreement for the location was unable to be finalized. AMS decided to locate the site at an alternate location in North Philadelphia, 5200 Wissahickon Ave. The new location for the HUN monitor is less than a mile (0.95 miles) to the northwest of the originally proposed location. The new location still provides monitoring to communities in the area that are affected by industrial sources and highways.

- Completion of PAQS project – The Philadelphia Air Quality Survey (PAQS) was a community scale project that ran from 2018 – 2024. The project utilized 48 – 50 monitors to measure street level pollutant concentrations throughout the city. The PAQS project provided air quality readings at the highest resolution to date. After the success of the PAQS project, AMS is improving it by replacing PAQS sensors with real-time sensors. The final PAQS report will be submitted to EPA in 2025. More details on the PAQS project are shown in Appendix A.

- Completion of and decision to expand the Community Scale Toxics Monitoring project – The Community Scale Air Toxics Monitoring project was the result of an EPA grant awarded to AMS in 2020 to study the air toxics concentrations in communities near many emission sources. The project monitored air toxics at 4 locations that were likely to have elevated air toxics emissions and 1 reference site. The project monitored these pollutants from 2023 – 2024 and provided valuable insight into air toxics concentrations in these areas. A final project report is ready to be submitted to the EPA. The EPA grant funded the project for two years, but AMS determined the value of the project was worth extending and expanding. AMS will add 4 additional monitoring locations and will be self-funding the extension of the project. The project is discussed in more detail in Appendix B.

- Confirmed reliability of Clarity Node-S $PM_{2.5}$ and NO_2 sensors – As previously discussed, AMS has ended the PAQS project but plans to replace it with better resources. This improvement involves using real-time air monitors rather than filter-based monitors which do not give real-time data. Unfortunately, medium-cost real-time monitors can prove unreliable. In 2024, AMS conducted a pilot study with Clarity Node-S real-time $PM_{2.5}$ and NO_2 sensors to determine their reliability. This pilot study involved a partnership between AMS and Clarity to

collocate Clarity sensors with AMS FRM/FEM monitors. The FRM/FEM monitors were used to calibrate and measure the accuracy of the Clarity sensors. The pilot program showed that Clarity sensors provided real-time data with enough accuracy to be used for public awareness purposes. The replacement of PAQS with Clarity sensors is discussed in more detail later in this Plan.

Proposed Changes to the Network

Below are changes that are anticipated or possible to occur over the next 18 ~ 22 months to the existing air monitoring network:

April 2025 – December 2026

- AMS was awarded EPA's Community-Scale Air Toxics (CSAT) Ambient Monitoring grant for 2020 and successfully implemented the project from 2023 - 2024. The final report for the project will be submitted to EPA on May 2, 2025 AMS will also extend the program to further monitor air toxics in additional areas. The project involved monitoring air toxics at 5 locations. AMS will be adding 4 more locations in overburdened communities and will continue monitoring for the next 10 years. AMS will self-fund the extension and expansion of the project.
  - See Appendix B for more information (this is not a part of the monitoring network shown in Figure 1).

- AMS was awarded an American Rescue Plan (ARP) grant, Enhanced Air Monitoring in Communities, from EPA in 2022. Procurement of the proposed equipment such as the Dust track $PM_{2.5}$ continuous measuring device and PID112 VOC measurement devices is finalized. AMS is waiting for the final part of the grant from EPA to start sample collection and analysis. Passive measurement of NO_2 and Ozone will be performed according to the project proposal. AMS will also be regularly taking passive sampling of air toxics as a reference for the PID112 VOC measurements.
  - See Appendix C for more information (this is not a part of the monitoring network shown in Figure 1).

- AMS was awarded an Inflation Reduction Act (IRA) grant for a neighborhood multipollutant monitoring site. AMS used this grant to establish a new monitoring site. The HUN site is proposed as an addition to the Air Monitoring Network shown in Figure 1. This site will be located in North Philadelphia where a large portion of the residents live in overburdened communities. HUN will monitor $PM_{2.5}$, PM_{10}, NO_2, and air toxics. With the recent EPA final rule of changing the $PM_{2.5}$ annual standard to 9 $\mu g/m^3$, this will be an important new monitoring station using FEM instruments. The HUN monitor is discussed in additional details in this report. AMS has completed equipment procurement for this project and anticipates monitoring with the equipment to begin in the summer of 2025.

- As discussed in the Changes Since Last AMNP section, AMS has ended the PAQS project. However, the value of the PAQS project was well understood. AMS has decided to replace the PAQS air monitors with medium-cost real-time Clarity Node-S $PM_{2.5}$ and NO_2 monitors. AMS plans to purchase between 48 – 75 of these monitors to provide air quality data to all neighborhood throughout Philadelphia. The data from the real-time sensors will be available online to the public and will provide Philadelphia residents and communities with current air quality data. This action represents an improvement upon a successful program that will make air quality data more accessible to the public.

Direction of Future Air Monitoring

AMS is studying and assessing the overall monitoring program within the County to determine the course of future changes to the air monitoring network.

The agency will focus on the following:

- The agency will continue to analyze monitoring data collected from the existing Philadelphia Air Monitoring Network and other monitoring projects to evaluate concentrations of air pollutants throughout the city. Based on these results and funding, the agency plans to propose updates to FRM/FEM and air toxics monitoring locations if needed.

- The agency will continue to work on community issues and enhanced public participation during the development of the Air Monitoring Network Plan and investigate pollutant concentrations in overburdened communities. A new air monitoring station will be set up at 5200 Wissahickon Ave in North Philadelphia (HUN site). The AMS mobile platform (monitoring van) will also be deployed to these neighborhoods for enhanced air monitoring.

- The agency is working to make air quality data more accessible and useful to the general public. The implementation of real-time $PM_{2.5}$ and NO_2 sensors, as well as online data visualization and communication tools helps accomplish this goal. AMS will continue looking for more opportunities to improve data accessibility through mapping programs, online tools, and outreach programs.

- The agency will continue to allocate more resources to understanding air toxics concentrations in Philadelphia. This will help in implementing the recently amended Air Management Regulation VI, which has been strengthened to reduce air toxics concentrations and health risks. Understanding air toxics concentrations in Philadelphia will also help support future regulation and programs to reduce human risks.

- The agency is developing an asset management framework for the monitoring system and an air quality monitoring modernization plan as opportunities for sustainability. This may include an asset inventory in the AirVision database system.

- The agency will seek other funding opportunities (e.g. grants issued by EPA and other funding sources) to further invest in air monitoring in overburdened communities.

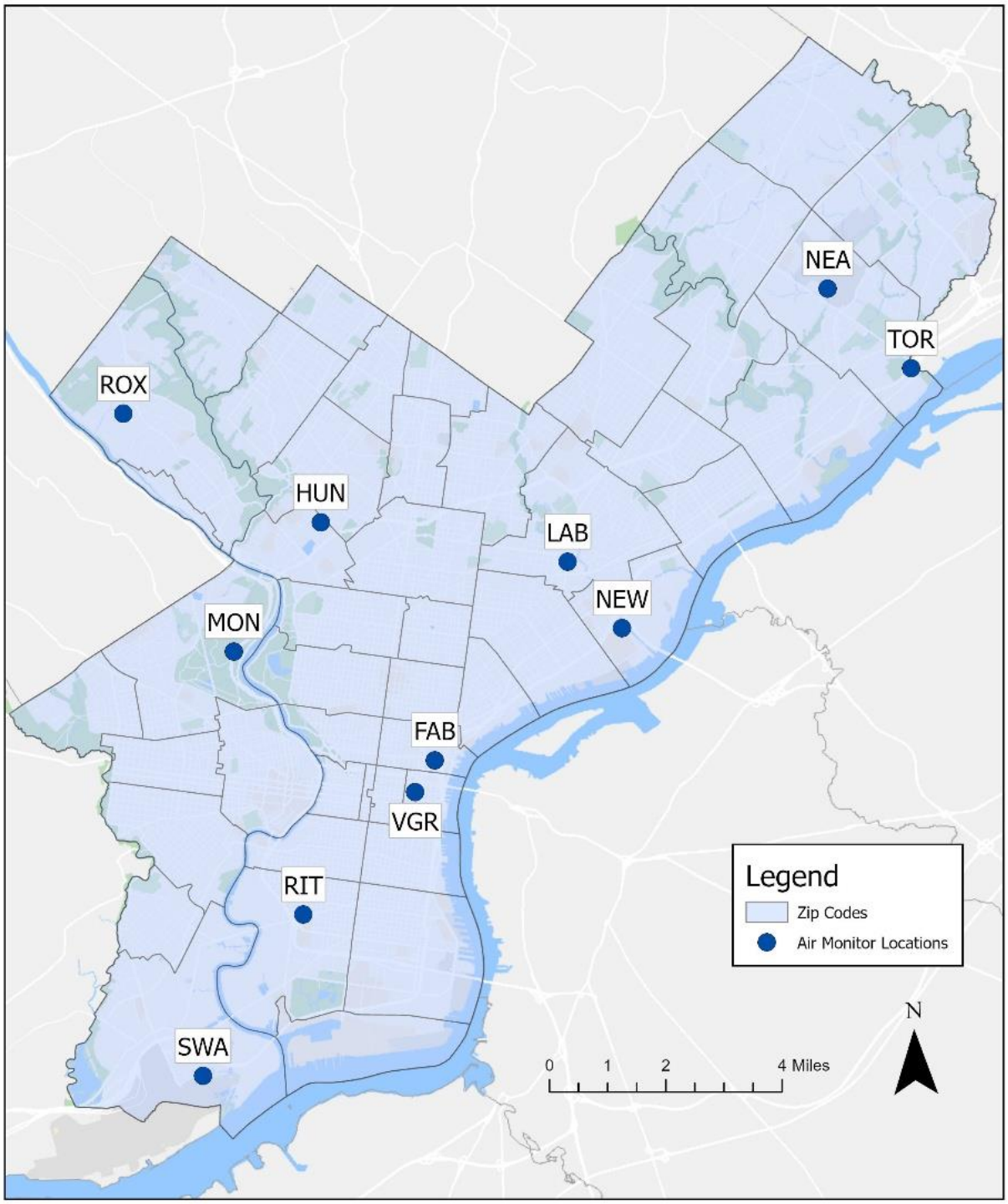
Current Network at a Glance

The City of Philadelphia is currently served by a network of ten air monitoring sites located throughout the city that measure the criteria pollutants (except lead): ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM_{10} and $PM_{2.5}$).

Four of the sites also measure air toxics, such as benzene, acetaldehyde, and formaldehyde. Figure 1 below shows the location of air monitors, and the pollutants measured at each monitor location.

In 2024, AMS proposed an additional monitoring station, the HUN site, in North Philadelphia. The site was scheduled to begin operation in January 2025 but has been delayed by siting issues. A new location for the HUN site has been proposed and AMS anticipates monitoring will commence in 2025.

Figure 1 - 2025 Philadelphia Air Monitoring Network as of July 1, 2025



			Parameter														
AQS Site Code	**AMS Site**	**Address**	**CO**	**SO_2**	**Ozone**	**NO_2**	**NOy/NO**	**PM_{10}**	**$PM_{2.5}$**	**Speciated $PM_{2.5}$**	**PM Coarse**	**Carbonyls**	**PAMS VOC**	**TSP Metals** (Be, Cr, Mn, Ni, As, Cd, Pb)	**Toxics TO15**	**MET**	**AMS Site**
421010004	**LAB**	1501 E. Lycoming St			X				X								**LAB**
421010014	**ROX**	Eva & Dearnley Sts										X			X		**ROX**
421010024	**NEA**	Grant Ave & Ashton Rd			X												**NEA**
421010048	**NEW**	2861 Lewis St	X	X	X	X	X	X	X	X	X	X	X		X	X	**NEW**
421010055	**RIT**	24th & Ritner Sts		X					X	X		X		X	X		**RIT**
421010057	**FAB**	3rd & Spring Garden Sts							X								**FAB**
421010063	**SWA**	8200 Enterprise Ave										X			X		**SWA**
421010075	**TOR**	4901 Grant Ave & James St	X			X			X							X	**TOR**
421010076	**MON**	I-76 & Montgomery Drive	X			X			X					X			**MON**
(not in AQS)	**VGR**	6th & Arch Sts			X				X							X	**VGR**
421010068	**HUN**	5200 Wissahickon Ave *				X			X			X			X		**HUN**

*HUN is a new site proposed for 2025

Summary of Current Sites

All of the 10 monitoring sites are located in Philadelphia, PA:

State: Pennsylvania
City: Philadelphia
County: Philadelphia
Metropolitan Statistical Area (MSA): Philadelphia-Camden-Wilmington, PA-NJ-DE-MD, consisting of 11 counties in the four states.
MSA number: 37980
MSA population: 6,245,051 (2020 census data)[1]
EPA Region: III (regional office located in Philadelphia)
Class I Area: Brigantine Natural Wildlife Preserve near Atlantic City, NJ
Philadelphia County population: 1,550,542 (July 1, 2023 estimate)[2]
Time zone: EST
UTM zone: 18

The air monitoring requirements and protocols set forth in 40 CFR Part 58 are mostly based on MSA and/or CBSA, rather than an individual county or city.

Air monitors in this Plan are designed and located to fulfill the air monitoring requirements for the Philadelphia MSA, along with other air monitoring sites in the MSA operated by the states of Pennsylvania, New Jersey, Delaware, and Maryland.

Table 1 is a summary of the monitoring sites.

[1] Census data from https://www.census.gov/library/visualizations/interactive/2020-population-and-housing-state-data.html

[2] 2023 Census Bureau estimates from https://www.census.gov/quickfacts/fact/table/philadelphiacountypennsylvania,philadelphiacitypennsylvania,PA/PST045223#PST045223

Table 1 – Site Summary Table

AQS Site Code	AMS Site	Address	Statement of Purpose
421010004	**LAB**	1501 E. Lycoming St.	Built in 1964, is a good site to test new or complex monitoring methods as laboratory staff are readily available.
421010014	**ROX**	Eva & Dearnley St.	Periphery site.
421010024	**NEA**	Grant Ave & Ashton Rd.	Periphery site. High Ozone.
421010048	**NEW**	2861 Lewis St.	NEW (Northeast Waste) originally sited to measure the impact of Franklin Smelting and Refining (now closed), MDC (now closed), and the waste water treatment plant. In 2013, the NCore site was re-located here and in 2017 is a designated PAMS site.
421010055	**RIT**	24th & Ritner St.	This site was selected to help assess the impact of the petroleum refinery on the local community. The area was identified by air quality modeling.
421010057	**FAB**	3rd & Spring Garden St.	This site was established to represent the highest levels of $PM_{2.5}$ in the City based on EPA Region III's air quality modeling of air toxics in Philadelphia. It shows high levels of $PM_{2.5}$ created by vehicle traffic.
421010063	**SWA**	8200 Enterprise Ave.	This site was established to measure air toxics, carbonyls, and metals. EPA Region III modeling analysis showed areas near the airport to have high levels of aldehydes.
421010075	**TOR**	4901 Grant Ave & James St.	This site was established as the 1st near-road NO_2 monitor in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area.
421010076	**MON**	I-76 & Montgomery Drive	This site was established as the 2nd near-road NO_2 monitor in the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area.
N/A	**VGR**	6th & Arch St.	Village Green Air Monitoring Station. Utilizes solar and wind turbine power as energy sources. Sited to increase community awareness of environmental conditions.
421010068	**HUN**	5200 Wissahickon Ave	This site was selected in 2024 to enhance neighborhood-scale air monitoring since no monitor was present near this neighborhood.

NCore Monitoring Network

The requirements for the NCore air monitoring network are codified in 40 CFR Part 58.10(a)(3) and 40 CFR Part 58 Appendix D section 3.

The NCore station is located at NEW (Northeast Waste).

As codified in 40 CFR Part 58 Appendix D section 5(a), PAMS measurements are required at NCore sites that are in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more. 40 CFR Part 58.13(h) requires the PAMS sites to be established and operating no later than June 1, 2021. AMS started the PAMS monitoring on schedule.

The PAMS Monitoring Implementation at this site started in June 2021.

Pb (Lead) Monitoring Network

The requirements for the Pb air monitoring network are codified in 40 CFR Part 58.10(a)(4) and 40 CFR Part 58 Appendix D section 4.5.

Philadelphia County does not currently have any source oriented Pb monitoring because there are no sources emitting 0.50 tons or more per year. Additionally, EPA has waived monitoring lead since 2017 because the 2014-2016 design value in Philadelphia was 0.04 µg/m3, which is well below the National Ambient Air Quality Standards (NAAQS) for lead of 0.15 µg/m3. However, Pb is still monitored as a part of the heavy metals in the air toxics monitoring program.

NO_2 Monitoring Network

The requirements for the NO_2 air monitoring network are codified in 40 CFR Part 58.10(a)(5) and 40 CFR Part 58 Appendix D section 4.3.

AMS currently operates an NO_2 monitor that meets the area-wide monitoring requirements at the NEW site. The first near-road NO_2 monitor was established at TOR and started operation on January 1, 2014. The second near-road NO_2 monitor is located at MON and started operation on July 20, 2015. The proposed HUN site will also monitor NO_2.

SO_2 Monitoring Network

The requirements for the SO_2 air monitoring network are codified in 40 CFR Part 58.10(a)(6) and 40 CFR Part 58 Appendix D section 4.4.

AMS currently monitors SO_2 at NEW and RIT in this Plan.

CO Monitoring Network

The requirements for the CO air monitoring network are codified in 40 CFR Part 58.10(a)(7) and 40 CFR Part 58 Appendix D section 4.2.

The Philadelphia-Camden-Wilmington, PA-NJ-DE-MD CBSA has a CO monitor collocated with the near-road NO_2 monitor at TOR and has been operational since January 1, 2014. AMS also monitors CO at the NEW and the MON (near-road) sites.

$PM_{2.5}$ Monitoring Network

The requirements for the $PM_{2.5}$ air monitoring network are codified in 40 CFR Part 58.10(a)(8) and 40 CFR Part 58 Appendix D section 4.7.

The requirement for at least one $PM_{2.5}$ monitor to be collocated at a near-road NO_2 station for CBSAs with a population of 1,000,000 or more persons is met at the TOR monitoring site.

AMS also monitors $PM_{2.5}$ at LAB, NEW, RIT, FAB, MON, and VGR (non-regulatory). AMS currently operates $PM_{2.5}$ monitors beyond the minimum requirements. The proposed HUN site will also monitor $PM_{2.5}$.

O_3 Monitoring Network

The requirements for the O_3 air monitoring network are codified in 40 CFR Part 58.10(a)(9) – (12) and 40 CFR Part 58 Appendix D section 4.1.

AMS currently operates three regulatory O_3 monitors in this Plan.

Enhanced Monitoring Plan

40 CFR Part 58 Appendix D. 5(h) requires: "*States with Moderate and above 8-hour O_3 nonattainment areas and states in the Ozone Transport Region as defined in 40 CFR 51.900 shall develop and implement an Enhanced Monitoring Plan (EMP) detailing enhanced O_3 and O_3 precursor monitoring activities to be performed. The EMP shall be submitted to the EPA Regional Administrator no later than October 1, 2019 or two years following the effective date of a designation to a classification of Moderate or above O_3 nonattainment, whichever is later. At a minimum, the EMP shall be reassessed and approved as part of the 5-year network assessments required under 40 CFR 58.10(d). The EMP will include monitoring activities deemed important to understanding the O_3 problems in the state. Such activities may include, but are not limited to, the following:*

(1) Additional O_3 monitors beyond the minimally required under paragraph 4.1 of this appendix,

(2) Additional NO_x or NO_y monitors beyond those required under 4.3 of this appendix,

(3) Additional speciated VOC measurements including data gathered during different periods other than required under paragraph 5(g) of this appendix, or locations other than those required under paragraph 5(a) of this appendix, and

(4) *Enhanced upper air measurements of meteorology or pollution concentrations.*"

Please note only States, not local counties, are required to submit an EMP to the EPA. AMS works with the Pennsylvania Department of Environmental Protection (PA DEP) for enhanced O_3 and O_3 precursor monitoring.

Currently, AMS monitors the following beyond the minimum requirements:

(1) Year-round ozone monitoring at four sites: NEA, LAB, NEW, and VGR (non-regulatory).

Pending funding for EMPs, AMS cannot guarantee that year-round monitoring will continue

Detailed Information on Each Site

The tables that follow provide detailed information for each of the 10 current and 1 proposed monitoring stations in Philadelphia County. As per 40 CFR Part 58.10(a)(1), the siting and operation of each monitor in the 2025-2026 AMNP meet the requirements of 40 CFR Part 58 and Appendices A, B, C, D, and E of this part where applicable.

The Major Emission Sources shown in Figures 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 and 22 are those within 3000 meters from a monitoring site. These are facilities included in the EPA 2023 stationary point source emission inventories.

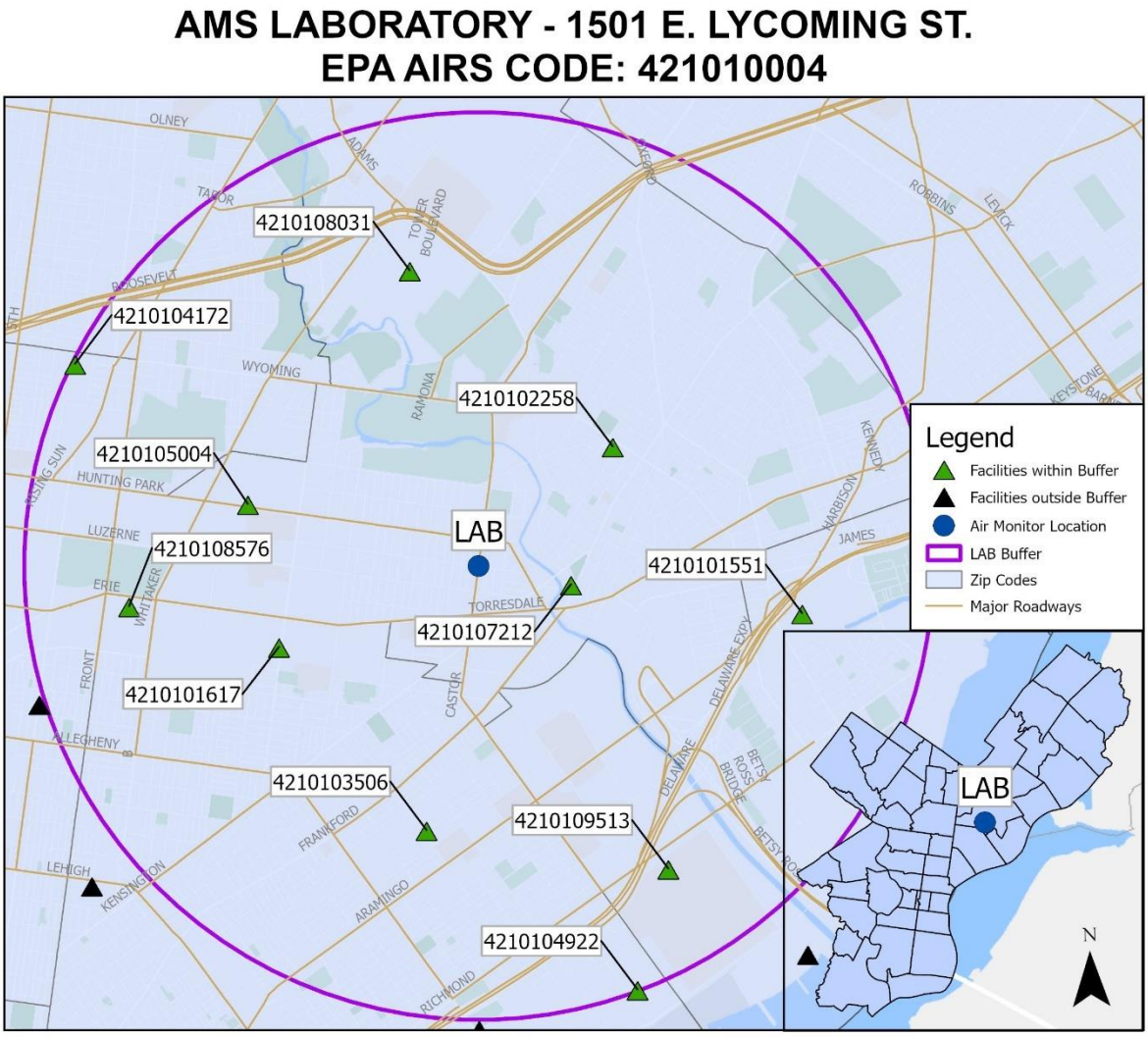
LAB Monitor

Table 2 – Detailed LAB Information with Monitoring Station Picture

AMS SITE ID: LAB
AQS Site ID: 421010004
Street Address: 1501 E. Lycoming Street, 19124
Geographical Coordinates
Latitude: 40.008889
Longitude: -75.09778

Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Ozone	SLAMS		Continuous	Instrumental	Ultraviolet Absorption	Year-round operation	44201	2	087	Urban Scale	Population Exposure	7	1/1/2018
PM2.5 Continuous	SLAMS		Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	4	636	Neighborhood	Highest Concentration	8	10/1/2021

Figure 2 – LAB Monitoring Site Map with Major Streets and Major Emission Sources



LAB - Number of facilities within 3000 m radius: 11			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
4210101551	ADVANSIX INC	4700 BERMUDA ST	61.220		271.880	44.380	34.840	52.900	102.940
4210101617	PUROLITE INC/MFG CHEM	3620 G St	2.190		2.600	10.300	10.300	0.010	2.490
4210102258	MUTUAL PPHARM CO INC/FRONTIDA BIOPHARM	1100 ORTHODOX ST	1.190		1.430	0.100	0.100	0.000	1.330
4210103506	PTR BALER AND COMPACTOR/PHILA	2207 E ONTARIO ST	0.330		0.400	0.030	0.030	0.000	8.130
4210104172	SEPTA BERRIDGE/COURTLAND MAINT SHOP	200 W WYOMING AVE	1.090		3.190	1.020	1.020	0.000	3.610
4210104922	PHILA GAS WORKS/RICHMOND PLT	3100 E VENANGO ST	2.040		3.900	0.170	0.170	0.010	0.170
4210105004	MIPC LLC/ PHILA	4210 G ST							22.140
4210107212	DOMESTIC LINEN SUPPLY CO INC/PHILADELPHI	4100 FRANKFORD AVE	0.600		0.650	0.530	0.530	0.010	1.930
4210108031	FRIENDS HOSP/PHILA	4641 ROOSEVELT BLVD	1.140		1.480	0.040	0.040	0.020	0.060
4210108576	ST CHRISTOPHERS HOSP FOR CHILDREN/PHILA	ERIE AVE & FRONT ST	3.810		7.230	0.510	0.510	0.250	0.490
4210109513	NORTHEAST WPCP/PHILA	3899 RICHMOND ST	7.910		8.260	3.710	3.640	0.610	11.710

Figure 3 – LAB North Aerial View

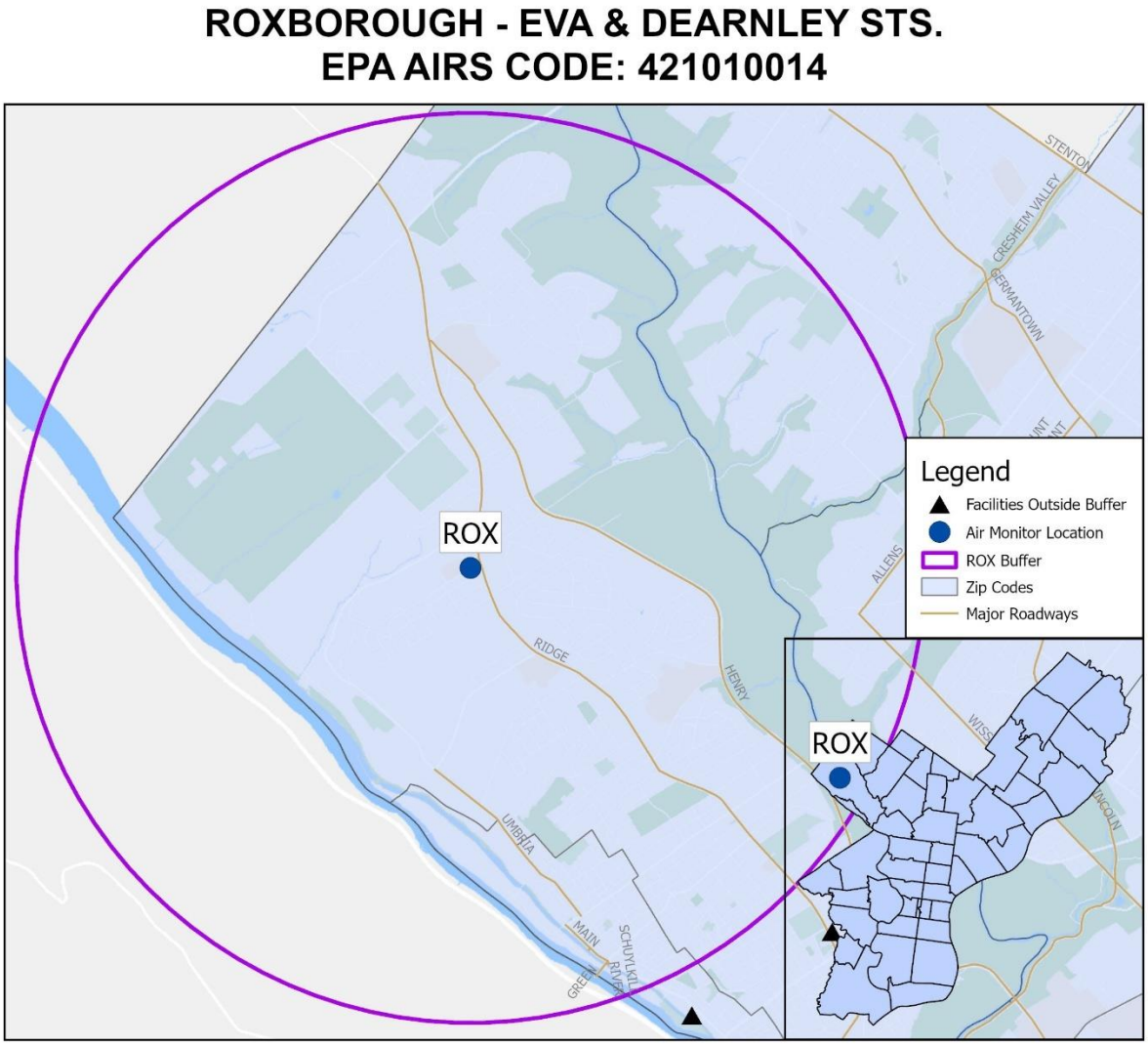
ROX Monitor

Table 3 – Detailed ROX Information with Monitoring Station Picture

AMS SITE ID: ROX
AQS Site ID: 421010014
Street Address: Eva & Dearnley Streets
Geographical Coordinates
Latitude: 40.049604
Longitude: -75.241209

Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	uHPLC		Vary	2	102	Neighborhood	Population Exposure	4	5/7/2003
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	4,5	150	Neighborhood	Population Exposure	4	1/1/2004

Figure 4 – ROX Monitoring Site Map with Major Streets and Major Emission Sources



ROX - Number of facilities within 3000 m radius: 0			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC

Figure 5 – ROX North Aerial View

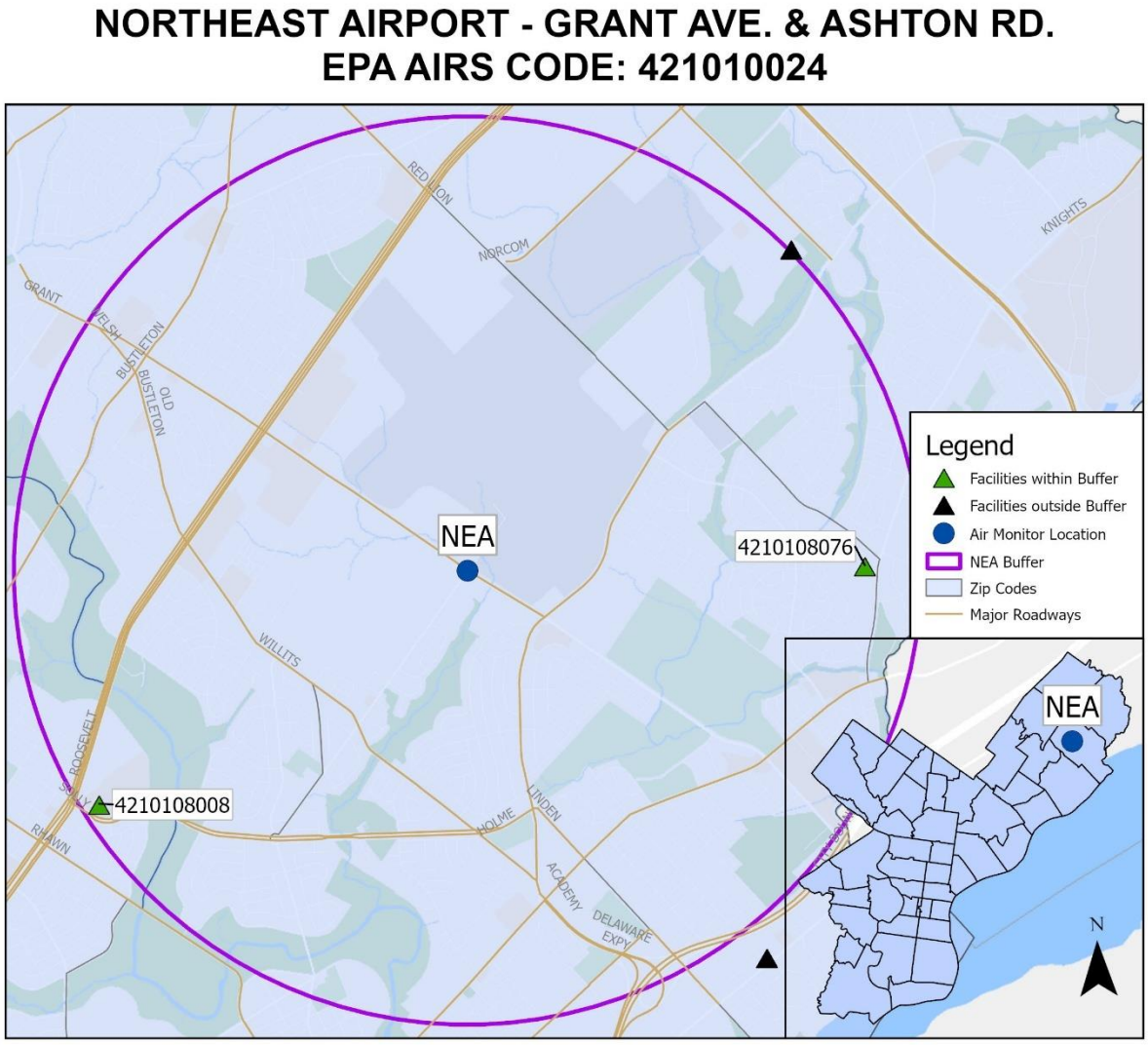
NEA Monitor

Table 4 – Detailed NEA Information with Monitoring Station Picture

AMS SITE ID: NEA
AQS Site ID: 421010024
Street Address: Grant Ave & Ashton Rd
Geographical Coordinates
Latitude: 40.076389
Longitude: -75.011944

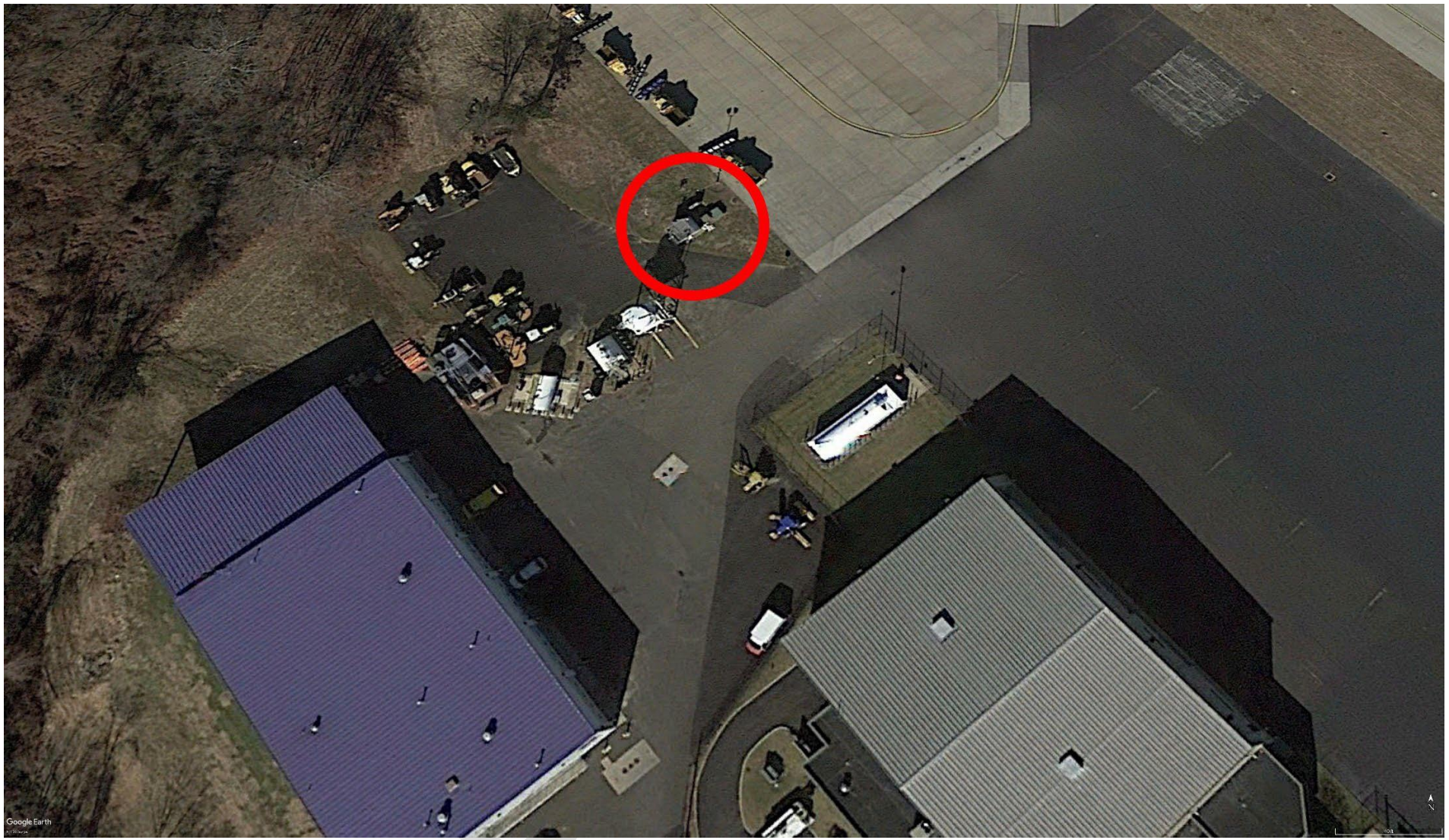
Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Ozone	SLAMS		Continuous	Instrumental	Ultraviolet Absorption	Year-round operation	44201	1	087	Urban	Highest concentration	6	1/1/1974

Figure 6 – NEA Monitoring Site Map with Major Streets and Major Emission Sources



NEA - Number of facilities within 3000 m radius: 2			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
4210108008	NAZARETH HOSP/PHILA	2601 HOLME AVE	1.750		2.480	0.100	0.090	0.060	0.150
4210108076	JEFFERSON HEALTH NORTHEAST/TORRESDALE HOSPITAL	RED LION & KNIGHTS RD	3.280		4.660	0.230		0.020	0.300

Figure 7 – NEA North Aerial View



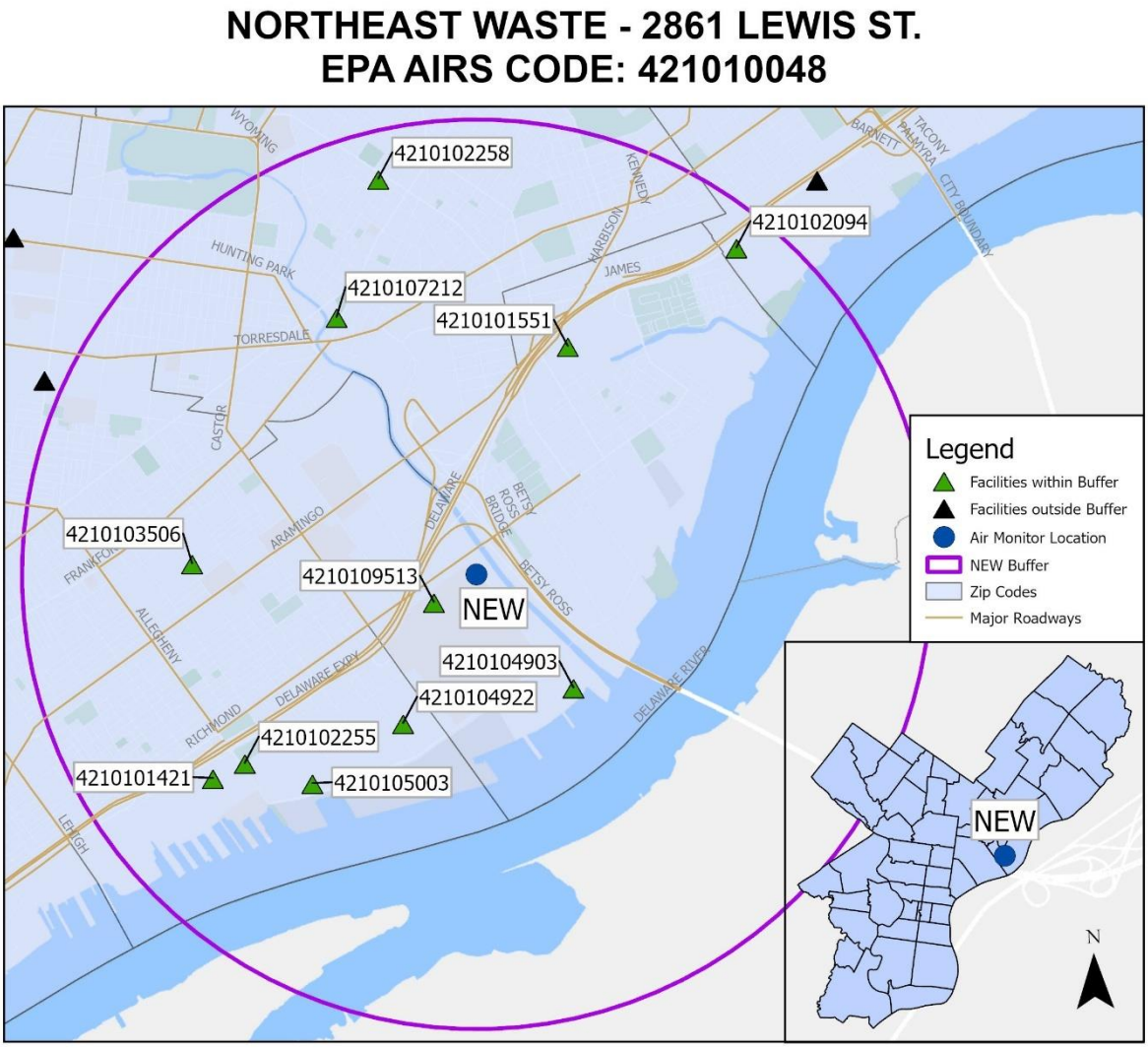
NEW Monitor

Table 5 – Detailed NEW information with Monitoring Station Picture

AMS SITE ID: NEW
AQS Site ID: 421010048
Street Address: 2861 Lewis Street
Geographical Coordinates
Latitude: 39.991389
Longitude: -75.080833

Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO (trace)	SLAMS	NCORE	Continuous	Instrumental	Gas Filter Correlation CO Analyzer	High sensitivity	42101	1	093	Neighborhood	Population Exposure	2	10/2/2013
SO2 (trace)	SLAMS	NCORE	Continuous	Instrumental	Ultraviolet Fluorescence	High sensitivity	42401	2	100	Neighborhood	Population Exposure	2	10/2/2013
Ozone	SLAMS	NCORE	Continuous	Instrumental	Ultraviolet Absorption	Year-round operation	44201	1	087	Urban Scales	Population Exposure	2	10/2/2013
NO	SLAMS	NCORE	Continuous	Instrumental	Chemiluminescence Teledyne	High sensitivity external converter mounted at 10m	42601	1	099	Neighborhood	Population Exposure	10	10/2/2013
NOy	SLAMS	NCORE	Continuous	Instrumental	Chemiluminescence Teledyne	High sensitivity external converter mounted at 10m	42600	1	699	Neighborhood	Population Exposure	10	10/2/2013
PM10 Continuous	SLAMS	NCORE	Continuous	Teledyne API T640X at 16.67 LPM	Broadband Spectroscopy		81102	2	639	Neighborhood	Population Exposure	2	1/1/2019
PM2.5 Continuous	SLAMS	NCORE	Continuous	Teledyne API T640 at 5.00 LPM	Broadband Spectroscopy		88101	5	636	Neighborhood	Population Exposure	2	8/19/2020
PM2.5 Continuous	SLAMS	NCORE	Continuous	Teledyne API T640X at 16.67 LPM	Broadband Spectroscopy		88101	4	638	Neighborhood	Population Exposure	2	1/1/2020
PM2.5 Speciated	SLAMS	NCORE, CSN	1/3 days	Met One SASS (Nylon and Teflon) and URG	Energy Dispersive XRF, Ion Chromatography and IMPROVE	Analysis by EPA	Vary	5	Vary	Neighborhood	Population Exposure	2	10/2/2013
PM2.5 FRM	SLAMS	NCORE	1/3 days	R&P PM2.5	Gravimetric	NEW-D	88101	1	145	Neighborhood	Population Exposure	2	10/2/2013
PM10-2.5 (PM Coarse)	SLAMS	NCORE	Continuous	Teledyne API T640X at 16.67 LPM	Broadband Spectroscopy		86101	4	640	Neighborhood	Population Exposure	2	1/1/2019
Meteorological	SLAMS	NCORE	Continuous		Air quality measurements approved instrumentation for wind speed, wind direction, humidity, barometric pressure,rainfall and solar radiation		Vary	1	Vary	Neighborhood	Population Exposure	10	6/1/1993
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	uHPLC	In addition to the 1-in-6 days UAT sampling, also sampling for three of 8-hour periods every 3rd day during PAMS season (June 1 - Aug 31)	Vary	1,4	102	Neighborhood	Population Exposure	7	10/14/2016
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	1,2	150	Neighborhood	Population Exposure	7	10/14/2016
PAMS VOC	SLAMS	PAMS	Continuous	CAS Auto GC		Year-round operation	Vary			Neighborhood	Population Exposure	5	6/1/2021
Ceilometer	SLAMS	PAMS	Continuous	Vaisala									1/1/2018
Solar radiation	SLAMS	PAMS	Continuous	MetOne									1/7/2022
UV radiation	SLAMS	PAMS	Continuous	Eppley									1/7/2022
Precipitation	SLAMS	PAMS	Continuous	MetOne									
True NO2	SLAMS	PAMS	Continuous	Teledyne Model T500U	Cavity Attenuated Phase Shift Spectroscopy		42602	1	212	Neighborhood	Population Exposure	4	4/1/2019

Figure 8 – NEW Monitoring Site Map with Major Streets and Major Emission Sources



NEW - Number of facilities within 3000 m radius: 11			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
4210101421	RIVERSIDE MATERIALS INC/ASPHALT PLT	2870 E ALLEGHENY AVE	3.340	0.0001	3.840	0.620	0.380	0.700	1.190
4210101551	ADVANSIX INC	4700 BERMUDA ST	61.220		271.880	44.380	34.840	52.900	102.940
4210102094	DIETZ & WATSON INC/PHILA	5701 TACONY ST	5.650		4.880	0.540	0.510	0.180	0.390
4210102255	SMITH EDWARDS DUNLAP CO/ALLEGHENY AVE	2867 E ALLEGHENY AVE	0.080		0.100	0.010	0.010	0.050	1.090
4210102258	MUTUAL PPHARM CO INC/FRONTIDA BIOPHARM	1100 ORTHODOX ST	1.190		1.430	0.100	0.100	0.000	1.330
4210103506	PTR BALER AND COMPACTOR/PHILA	2207 E ONTARIO ST	0.330		0.400	0.030	0.030	0.000	8.130
4210104903	EXELON GENERATING CO/RICHMOND	3901 N DELAWARE AVE	0.020		3.050	0.050	0.020	0.030	0.000
4210104922	PHILA GAS WORKS/RICHMOND PLT	3100 E VENANGO ST	2.040		3.900	0.170	0.170	0.010	0.170
4210105003	KINDER MORGAN LIQUIDS TERM/PHILA	3300 N DELAWARE AVE	4.800		5.290	0.380	0.300	0.040	27.400
4210107212	DOMESTIC LINEN SUPPLY CO INC/PHILADELPH	4100 FRANKFORD AVE	0.600		0.650	0.530	0.530	0.010	1.930
4210109513	NORTHEAST WPCP/PHILA	3899 RICHMOND ST	7.910		8.260	3.710	3.640	0.610	11.710

Figure 9 – NEW North Aerial View

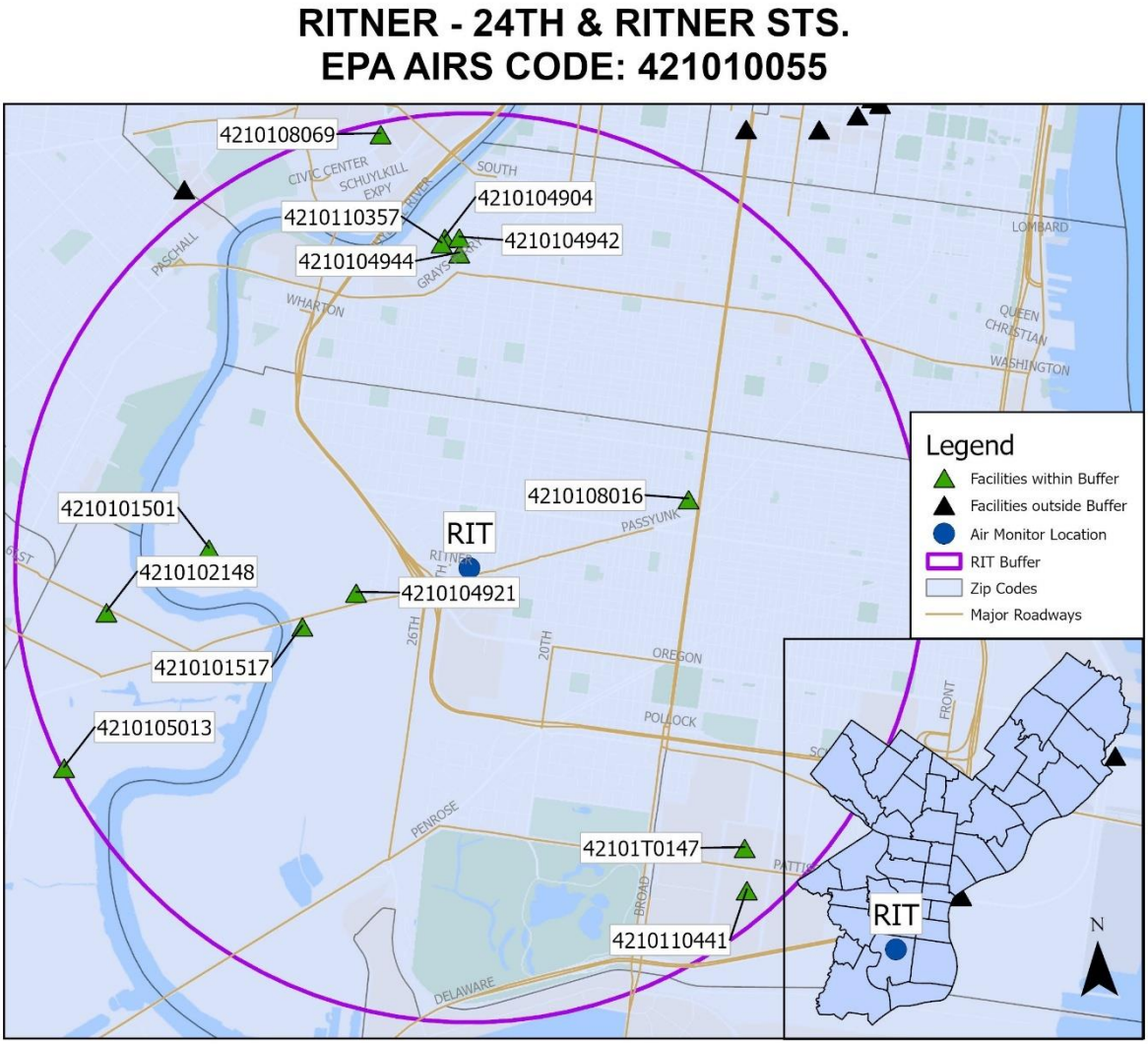
RIT Monitor

Table 6 – Detailed RIT Information with Monitoring Station Picture

AMS SITE ID: RIT
AQS Site ID: 421010055
Street Address: 24th & Ritner Streets
Geographical Coordinates
Latitude: 39.922867
Longitude: -75.186921

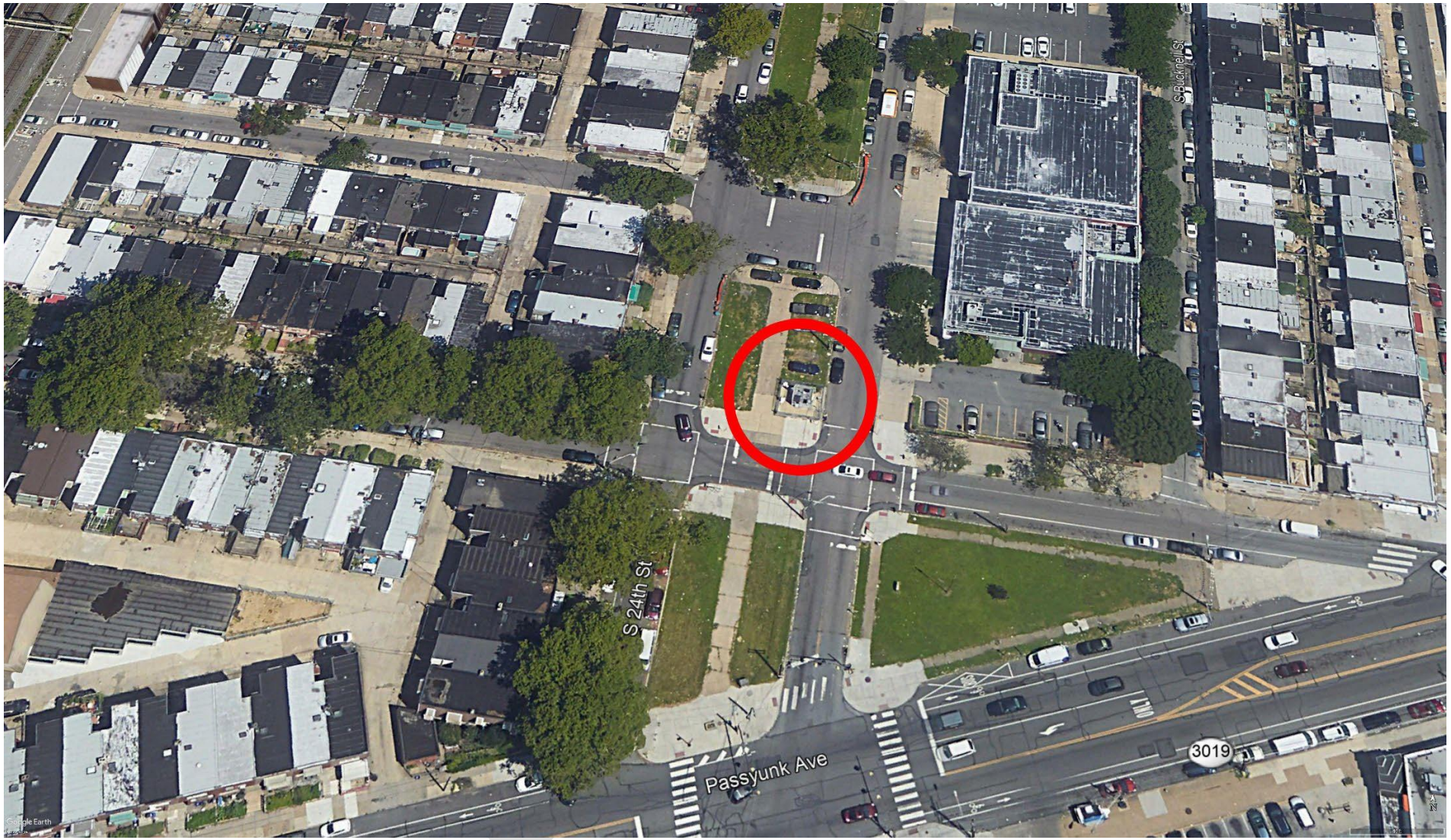
Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
SO2	SLAMS		Continuous	Instrumental	Ultraviolet Fluorescence		42401	1	100	Neighborhood	Population Exposure	4	11/9/2004
PM2.5 Speciated	SLAMS	CSN	1/3 days	Met One SASS (Nylon and Teflon) and URG	Energy Dispersive XRF, Ion Chromatography and IMPROVE	Analysis by EPA	Vary	5	Vary	Neighborhood	Population Exposure	2	9/1/2005
Metals	Other		1/6 days	Hi-Vol	ICP-MS	Analysis by ERG	Vary	1	089	Neighborhood	Population Exposure	4	8/31/2004
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	uHPLC		Vary	2	102	Neighborhood	Population Exposure	4	Vary
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	4,5	150	Neighborhood	Population Exposure	4	11/1/2004
PM2.5 Continuous	SLAMS		Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	2	636	Neighborhood	Population Exposure	4	4/1/2020

Figure 10 – RIT Monitoring Site Map with Major Streets and Major Emission Sources



RIT - Number of facilities within 3000 m radius: 13			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
4210101501	PHILA ENERGY SOL REF/ PES	3144 W PASSYUNK AVE	4.610		7.090	0.190	0.190	0.000	10.820
4210102148	CLEAN EARTH OF PHILA LLC/PHILA	3201 S 61ST ST				0.010	0.000		2.520
4210104904	EXELON GENERATION CO/SCHUYLKILL STA	2800 CHRISTIAN ST	0.040		0.230	0.000	0.000	0.000	0.000
4210104921	PHILA GAS WORKS/PASSYUNK PLT	3100 W PASSYUNK AVE	2.570		2.940	0.200	0.200	0.010	0.310
4210104942	VICINITY ENERGY PHILA INC/SCHUYLKILL STATIOI	2600 CHRISTIAN ST	131.200	0.0003	42.700	0.850	0.850	0.280	0.810
4210104944	GRAYS FERRY COGEN PARTNERSHIP/PHILA	2600 CHRISTIAN ST	33.960	0.0008	######	7.490	7.490	3.900	7.220
4210105013	PLAINS PROD TERM LLC/PBF LOGISTICS TERM 67	6850 ESSINGTON AVE	0.610		1.830	0.140	0.140	0.010	59.440
4210108069	CHILDRENS HOSP OF PHILA/ PHILA	34TH & CIVIC CENTER BLVD	7.600	0.0001	7.440	0.900	0.900	0.540	1.050
4210110357	VICINITY ENERGY PHILA INC/EFFICIENCY	2600 CHRISTIAN ST	0.020		1.300	0.060	0.060	0.030	0.390
4210110441	PHILA EAGLES/LINCOLN FINANCIAL FIELD	1 LINCOLN FINANCIAL FIELD W	1.060		1.810	0.090	0.090	0.000	0.080
42101T0147	CITIZENS BANK PARK/PHILA	1001 PATTISON AVE	2.260		2.550	0.190	0.190	0.040	0.210
4210108016	CONSTITUTION HEALTH PLAZA / PHILA - 749378	1930 S BROAD ST	0.280		0.520	0.010	0.010	0.000	0.020
4210101517	PES/SCHUYLKILL TANK FARM - 749289	3144 PASSYUNK AVE							0.730

Figure 11 – RIT North Aerial View



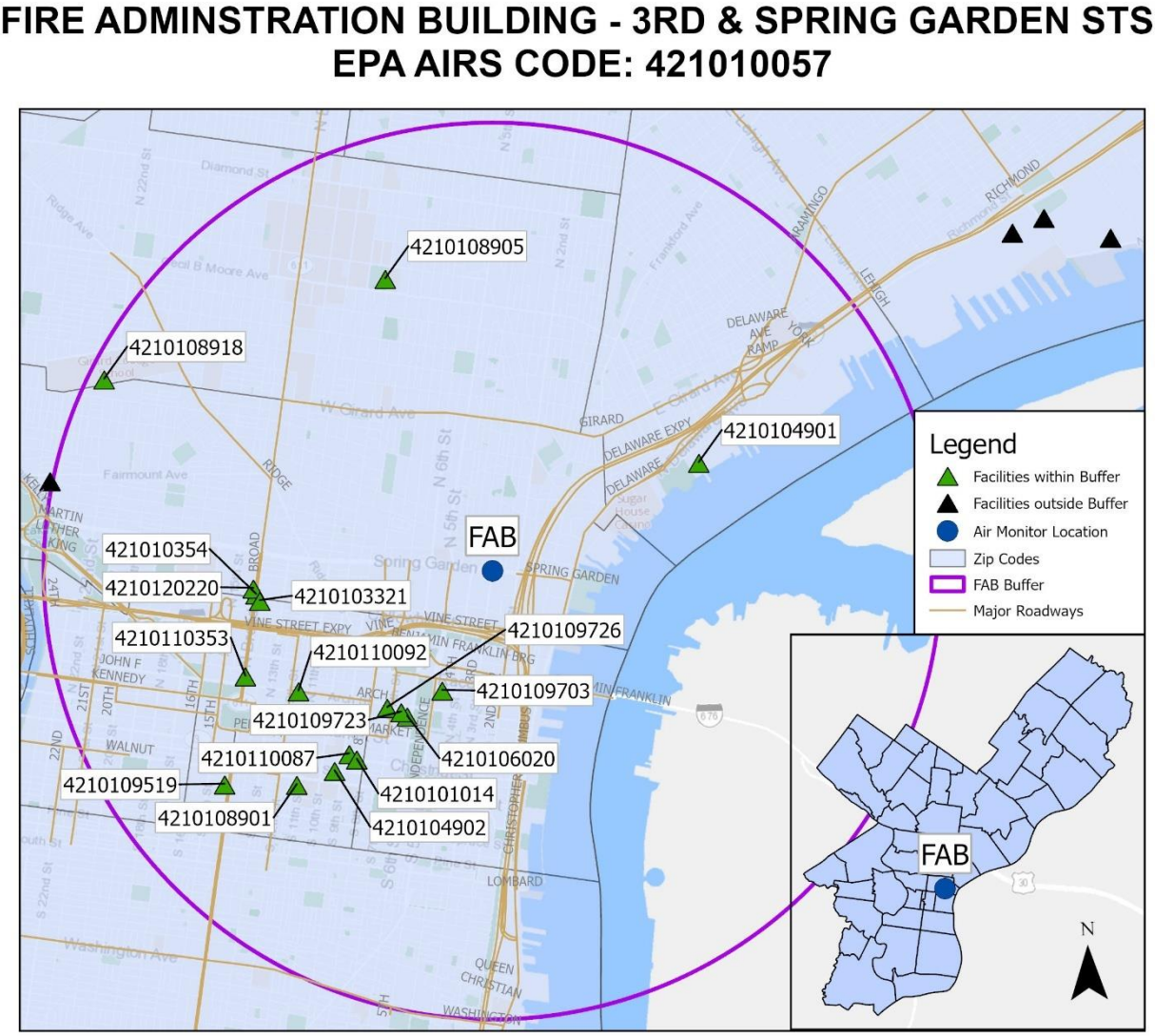
FAB Monitor

Table 7 – Detailed FAB Information with Monitoring Station Picture

AMS SITE ID: FAB
AQS Site ID: 421010057
Street Address: 3rd and Spring Garden Sts.
Geographical Coordinates
Latitude: 39.960048
Longitude: -75.142614

Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
PM2.5 Continuous	SLAMS		Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	2	636	Neighborhood	Highest Concentration	2	1/1/2020

Figure 12 – FAB Monitoring Site Map with Major Streets and Major Emission Sources



FAB - Number of facilities within 3000 m radius: 17			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
421010354	CROSS CONNECT/PHILADELPHIA	401 N BROAD ST	0.120		0.310	0.010	0.010	0.000	0.010
4210101014	VERIZON MKT CTRL OFC/RACE ST	900 RACE ST	0.210		1.890	0.160	0.040	0.160	0.120
4210103321	SUNGARD RECOVERY SVC INC/BROAD ST PHILA	401 N BROAD ST STE 600	0.240		0.480	0.000	0.000	0.000	0.000
4210104901	EXELON GENERATION CO/DELAWARE STA	1325 N BEACH ST	0.080		0.470	0.000	0.000	0.000	0.000
4210104902	VICINITY ENERGY PHILA INC/EDISON STATION	908 SANSOM ST	0.190		11.000	0.650	0.150	0.210	0.210
4210106020	FEDERAL RESERVE BANK/PHILA	100 N 6TH ST	2.040		2.560	0.190	0.190	0.110	0.140
4210108901	THOMAS JEFFERSON UNIV/PHILA	11th & WALNUT ST	0.680		2.630	0.040	0.040	0.020	0.100
4210108905	TEMPLE UNIV/ MAIN CAMPUS	1009 W MONTGOMERY AVE	14.260		22.230	2.410	2.410	0.240	1.920
4210108918	GIRARD COLL/BOARDING SCH	GIRARD & CORINTHIAN AVE	2.080		2.460	0.190	0.190	0.010	0.130
4210109703	US MINT/PHILA	151 N INDEPENDENCE MALL E	5.030		3.370	0.070	0.070	0.020	1.000
4210109723	WILLIAM J GREEN JR FED BLDG/GSA	600 ARCH ST	1.780		2.420	0.160	0.160	0.060	0.120
4210109726	FEDERAL BUR OF PRISONS/ PHILA COURT	700 ARCH ST	1.510	0.0408	0.590	0.130	0.120	0.020	0.110
4210110092	PA CONV CTR/ARCH ST	1101 ARCH ST	1.530		2.150	0.170	0.170	0.050	0.130
4210110353	PA CONV CTR ANNEX/BROAD ST	111 N BROAD ST	0.760		1.330	0.100	0.100	0.080	0.090
4210120220	PHILADELPHIA PUBLIC SERVICE BUILDING - 85132	400 N Broad ST	0.490		0.780	0.050	0.040	0.030	0.050
4210110087	HCP INC/PHIL - 829391	833 CHESTNUT ST	0.49		0.56	0.04	0.04		0.02
4210109519	PHILA PRISON SYS/CORR FAC - 749410	230 S BROAD ST	3.56		4.6	0.35	0.34	0.25	0.63

Figure 13 – FAB North Aerial View

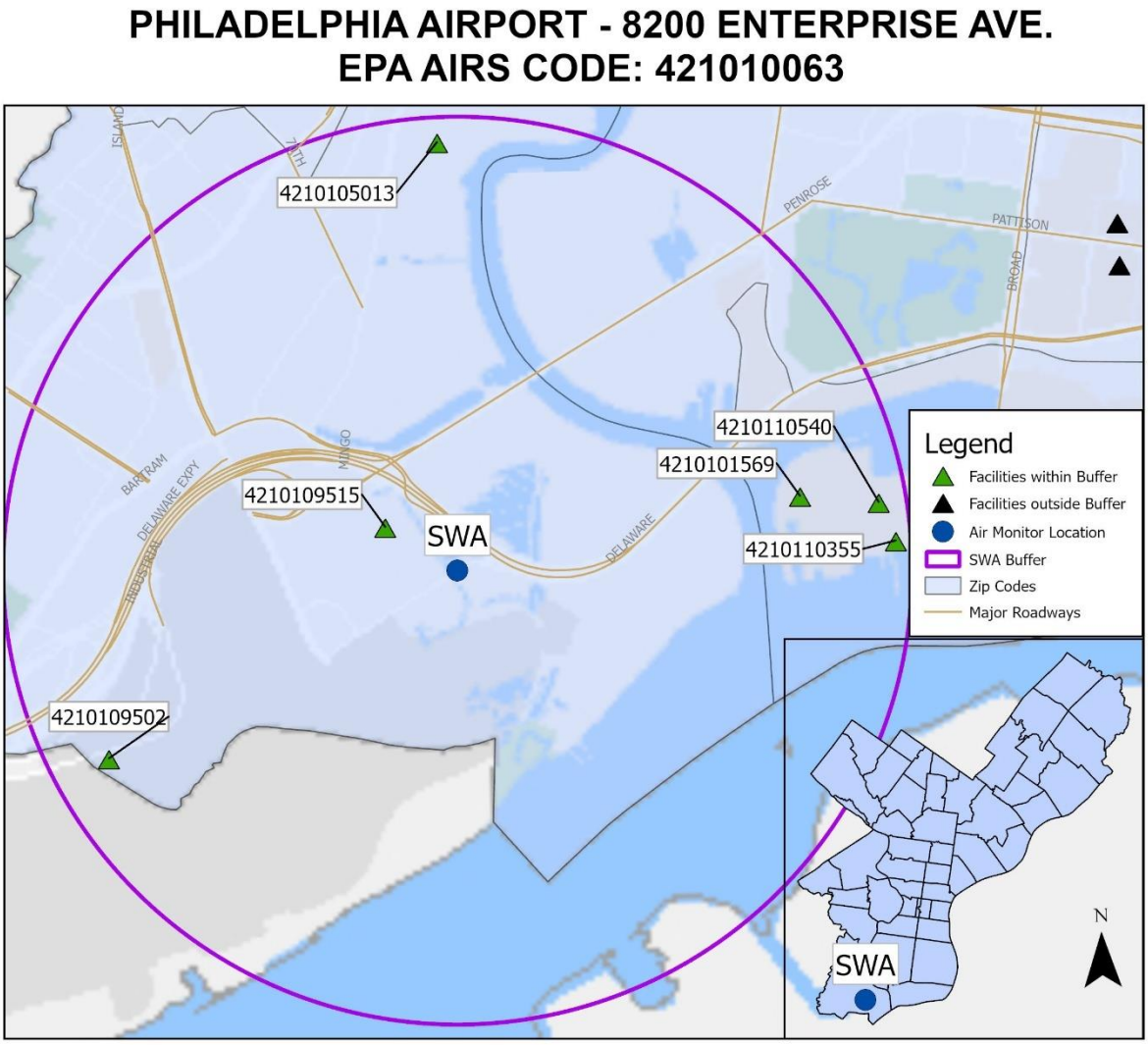
SWA Monitor

Table 8 – Detailed SWA Information with Monitoring Station Picture

AMS SITE ID: SWA
AQS Site ID: 421010063
Street Address: 8200 Enterprise Avenue, 19153
Geographical Coordinates
Latitude: 39.88294
Longitude: -75.21965

Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	uHPLC		Vary	2	102	Neighborhood	Source-Oriented	4	9/10/2009
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	3,5	150	Neighborhood	Source-Oriented	4	9/10/2009

Figure 14 – SWA Monitoring Site Map with Major Streets and Major Emission Sources



SWA - Number of facilities within 3000 m radius: 6			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
4210101569	PHILLY SHIPYARD INC / PHILA	PHILA NAVAL BUS CTF	1.970		1.720	8.890	3.450	0.010	17.810
4210105013	PLAINS PROD TERM LLC/PBF LOGISTICS TERM 671	6850 ESSINGTON AVE	0.610		1.830	0.140	0.140	0.010	59.440
4210109502	PHILA INTL AIRPORT/PHILA	INDUSTRIAL HWY	5.580	0.0001	12.160	1.120	1.120	0.090	0.780
4210109515	PHILA WATER DEPT/STP SW	8200 ENTERPRISE AVI	7.520		3.900	0.810	0.810	0.620	6.780
4210110355	PHILA SHIP REPAIR/PHILA	5195 S 19TH ST	3.790		15.140	1.770	1.010	0.000	10.220
4210110540	PHILA CITY IND DEC AUTH/NAVY YARD PEAKER ST	1901 KITTY HAWK AVE	2.340		1.290	0.160	0.160	0.000	0.930

Figure 15 – SWA North Aerial View

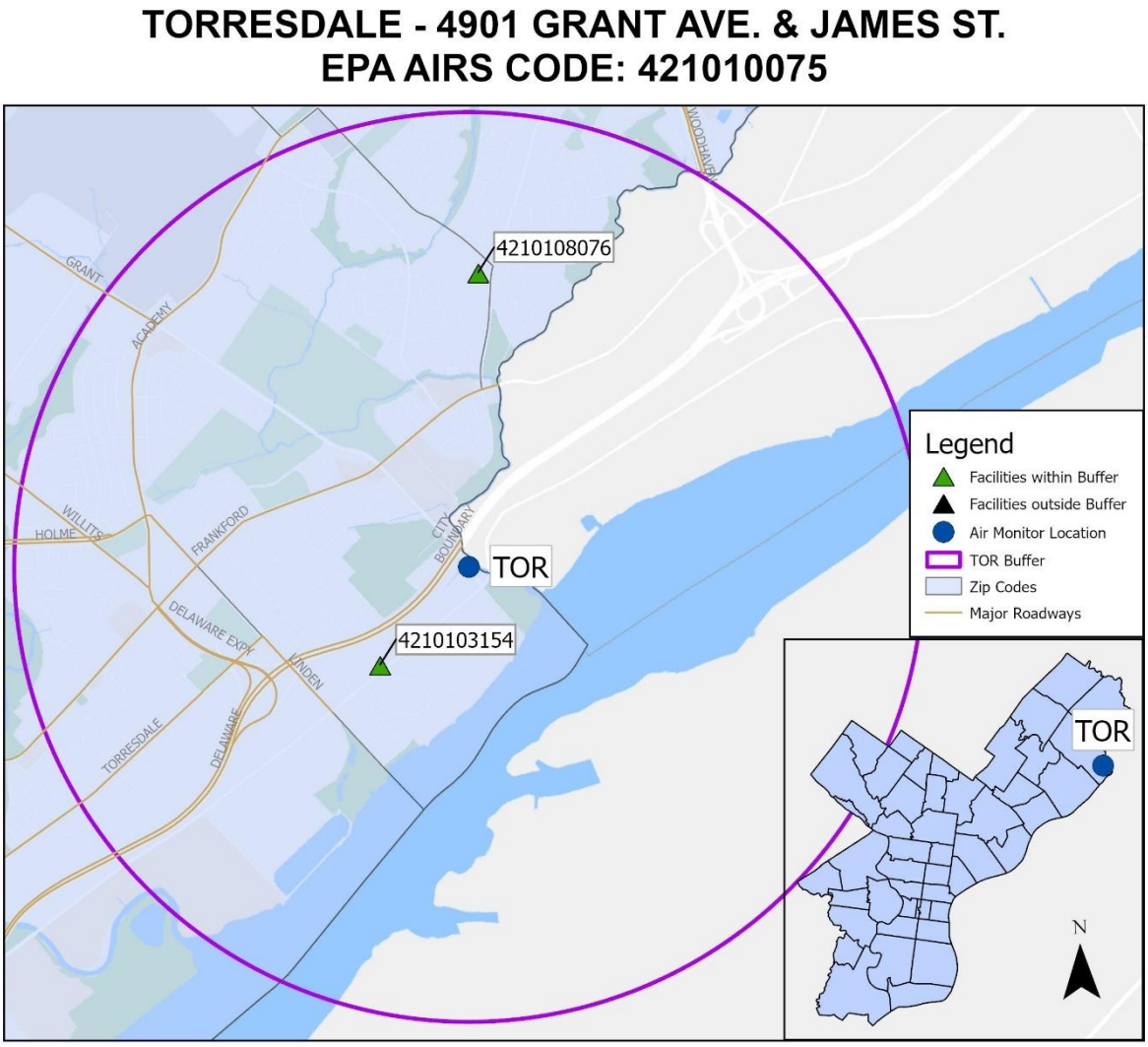
TOR Monitor

Table 9 – Detailed TOR Information with Monitoring Station Picture

AMS SITE ID: TOR
AQS Site ID: 421010075
Street Address: 4901 Grant Ave. & James St., 19114
Geographical Coordinates
Latitude: 40.054171
Longitude: -74.985166

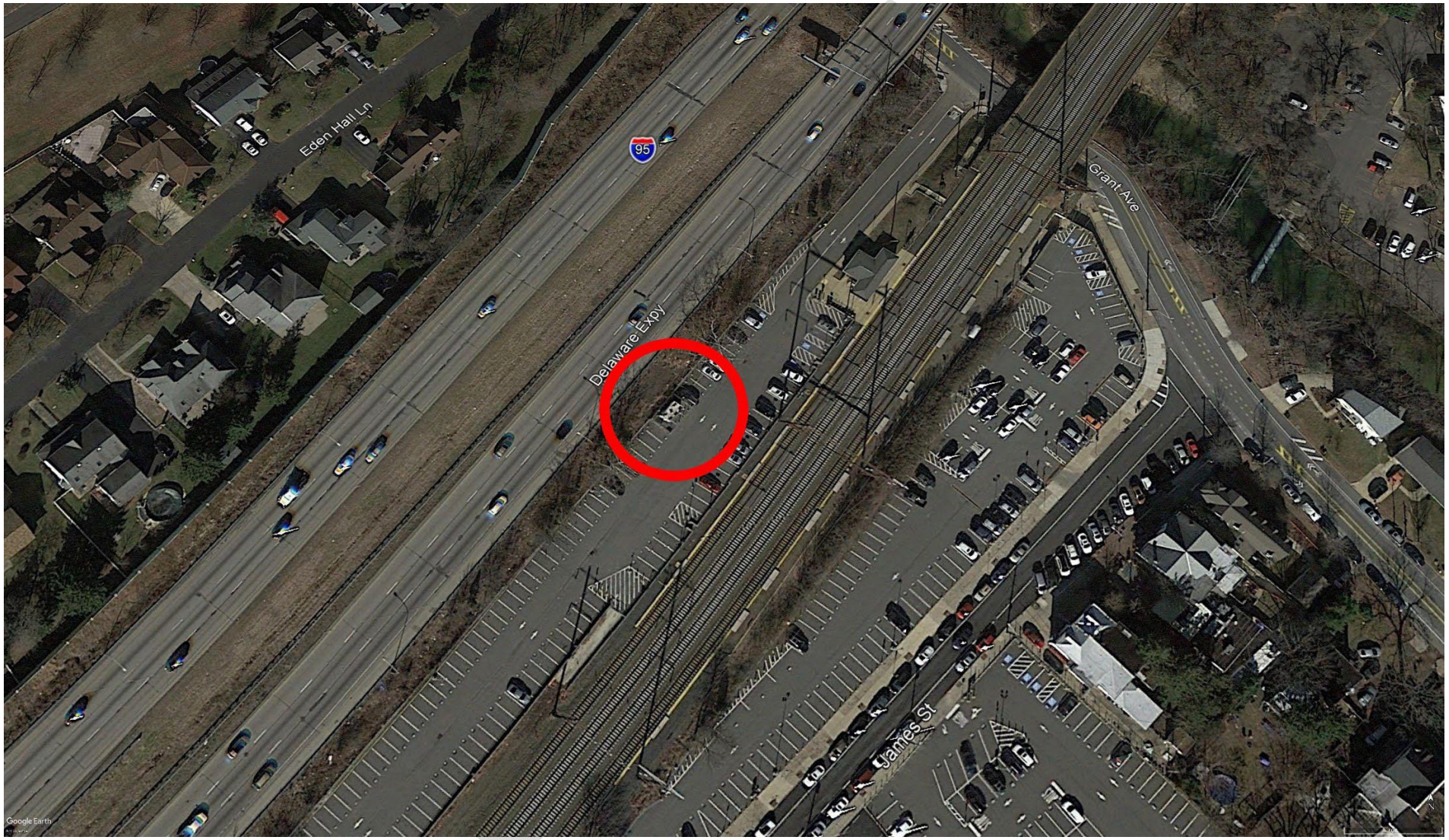
Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO	SLAMS	Near Road	Continuous	Instrumental	Gas Filter Correlation CO Analyzer		42101	1	093	Microscale	Highest Concentration, Source Oriented	5	1/1/2014
NO2	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42602	1	099	Microscale	Highest Concentration, Source Oriented	5	1/1/2014
NO	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42601	1	099	Microscale	Highest Concentration, Source Oriented	5	1/1/2014
NOx	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42603	1	099	Microscale	Highest Concentration, Source Oriented	5	1/1/2014
PM2.5 Continuous	SLAMS	Near Road	Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	2	636	Microscale	Highest Concentration, Source Oriented	5	4/1/2020
Meteorological	SLAMS	Near Road	Continuous		Vaisala 435C RH/AT Sensor		Vary	1	Vary	Microscale	Highest Concentration, Source Oriented	5	1/1/2014

Figure 16 – TOR Monitoring Site Map with Major Streets and Major Emission Sources



TOR - Number of facilities within 3000 m radius: 2			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
4210103154	JOWITT AND RODGERS CO/STATE RD FAC	9400 STATE RD	0.040		0.160	0.020	0.010	0.000	8.100
4210108076	JEFFERSON HEALTH NORTHEAST/TORRESDALE HOSF	RED LION & KNIGHTS RD	3.280		4.660	0.230		0.020	0.300

Figure 17 – TOR North Aerial View



MON Monitor

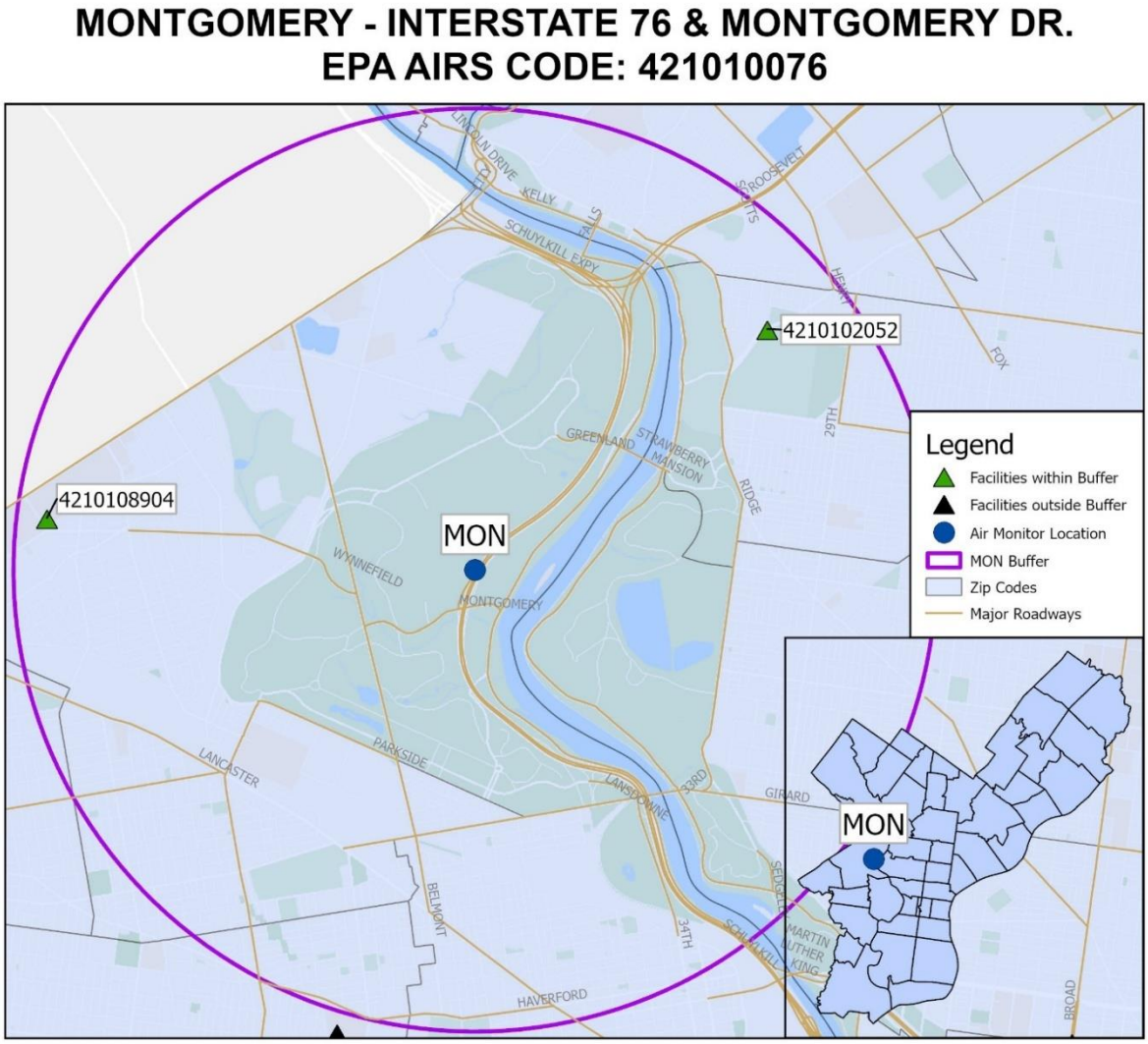
Table 10 Detailed MON Information with Monitoring Station Picture

AMS SITE ID: MON
AQS Site ID: 421010076
Street Address: I-76 & Montgomery Drive, Car Barn OFM Shop 282
Geographical Coordinates
Latitude: 39.988842
Longitude: -75.207205

Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO	SLAMS	Near Road	Continuous	Instrumental	Gas Filter Correlation CO Analyzer		42101	1	093	Microscale	Highest Concentration, Source Oriented	4	1/10/2017
NO2	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42602	1	099	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
NO	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42601	1	099	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
NOx	SLAMS	Near Road	Continuous	Instrumental	Gas Phase Chemiluminescence		42603	1	099	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
PM2.5 Continuous	SLAMS	Near Road	Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	2	636	Neighborhood	Highest Concentration, Source Oriented	4	6/1/2020

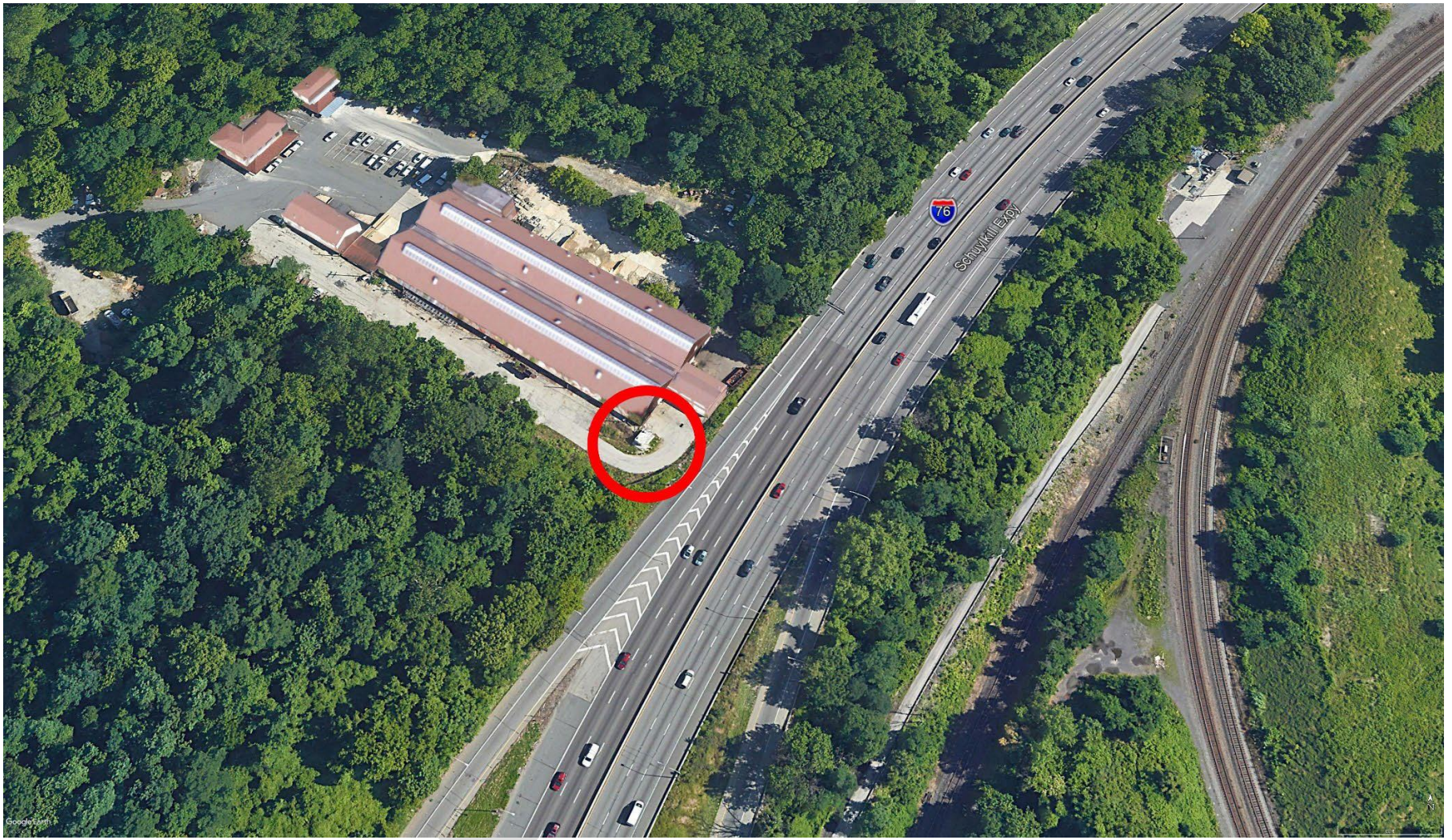
Metals	Other	Near Road	1/6 days	Hi-Vol	ICP-MS	Analysis by ERG	Vary	1	089	Neighborhood	Population Exposure	4	7/1/2015
Meteorological	SLAMS	Near Road	Continuous		Air quality measurements approved instrumentation for wind speed, wind direction, humidity, barometric pressure, rainfall and solar radiation		Vary	1	Vary	Microscale	Highest Concentration, Source Oriented	4	7/1/2015

Figure 18 – MON Monitoring Site Map with Major Streets and Major Emission Sources



MON - Number of facilities within 3000 m radius: 2			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
4210102052	SUN CHEM CORP/HUNTING PARK PLT	3301 W HUNTING PARK AVE	0.260		0.310	0.080	0.080	0.000	9.930
4210108904	SAINT JOSEPHS UNIV/PHILA	54TH & CITY AVE	5.820		7.360	0.560	0.560	0.180	0.410

Figure 19 – MON North Aerial View



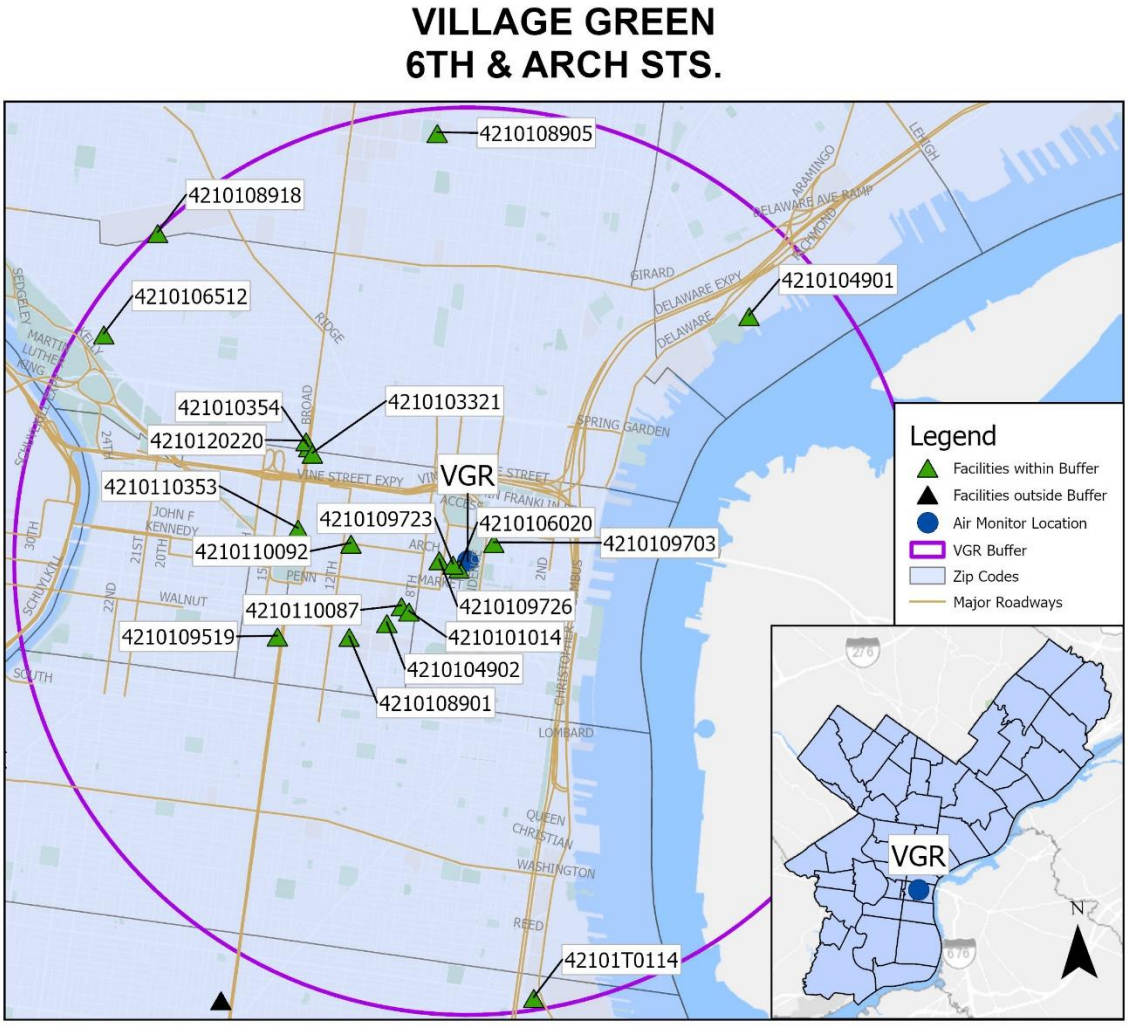
VGR Monitor

Table 11 – Detailed VGR Information with Monitoring Station Picture

AMS SITE ID: VGR
AQS Site ID: N/A
Street Address: 6th & Arch Streets
Geographical Coordinates
Latitude: 39.952608
Longitude: -75.149704

Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Ozone			Continuous	2B Technologies		Not in AQS, for study purposes only							3/15/2015
PM2.5 Continuous			Continuous	Thermo		Not in AQS, for study purposes only							3/15/2015
Meteorological			Continuous		Wind speed, wind direction, humidity, temperature	Not in AQS, for study purposes only							3/15/2015

Figure 20 – VGR Monitoring Site Map with Major Streets and Major Emission Sources



VGR - Number of facilities within 3000 m radius: 19			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
421010354	CROSS CONNECT/PHILADELPHIA	401 N BROAD ST	0.120		0.310	0.010	0.010	0.000	0.010
4210101014	VERIZON MKT CTRL OFC/RACE ST	900 RACE ST	0.210		1.890	0.160	0.040	0.160	0.120
4210103321	SUNGARD RECOVERY SVC INC/BROAD ST PHILA	401 N BROAD ST STE 600	0.240		0.480	0.000	0.000	0.000	0.000
4210104901	EXELON GENERATION CO/DELAWARE STA	1325 N BEACH ST	0.080		0.470	0.000	0.000	0.000	0.000
4210104902	VICINITY ENERGY PHILA INC/EDISON STATION	908 SANSOM ST	0.190		11.000	0.650	0.150	0.210	0.210
4210106020	FEDERAL RESERVE BANK/PHILA	100 N 6TH ST	2.040		2.560	0.190	0.190	0.110	0.140
4210106512	PHILADELPHIAN CONDOMINIUMS/PHILA	2401 PENNSYLVANIA AVE	1.430		1.750	0.140	0.140	0.000	0.090
4210108901	THOMAS JEFFERSON UNIV/PHILA	11th & WALNUT ST	0.680		2.630	0.040	0.040	0.020	0.100
4210108905	TEMPLE UNIV/ MAIN CAMPUS	1009 W MONTGOMERY AVE	14.260		22.230	2.410	2.410	0.240	1.920
4210108918	GIRARD COLL/BOARDING SCH	GIRARD & CORINTHIAN AVE	2.080		2.460	0.190	0.190	0.010	0.130
4210109703	US MINT/PHILA	151 N INDEPENDENCE MALL E	5.030		3.370	0.070	0.070	0.020	1.000
4210109723	WILLIAM J GREEN JR FED BLDG/GSA	600 ARCH ST	1.780		2.420	0.160	0.160	0.060	0.120
4210109726	FEDERAL BUR OF PRISONS/ PHILA COURT	700 ARCH ST	1.510	0.0408	0.590	0.130	0.120	0.020	0.110
4210110092	PA CONV CTR/ARCH ST	1101 ARCH ST	1.530		2.150	0.170	0.170	0.050	0.130
4210110353	PA CONV CTR ANNEX/BROAD ST	111 N BROAD ST	0.760		1.330	0.100	0.100	0.080	0.090
42101T0114	COATING & CONVERTING TECH CORP/ADHESIVE COAT	80 E MORRIS ST	0.550		0.660	0.060	0.060	0.000	3.820
4210110087	HCP INC/PHIL - 829391	833 CHESTNUT ST	0.490		0.560	0.040	0.040	0.000	0.020
4210109519	PHILA PRISON SYS/CORR FAC - 749410	230 S BROAD ST	3.560		4.600	0.350	0.340	0.250	0.630
4210120220	PHILADELPHIA PUBLIC SERVICE BUILDING - 851324	400 N Broad ST	0.490		0.780	0.050	0.040	0.030	0.050

Figure 21 – VGR North Aerial View

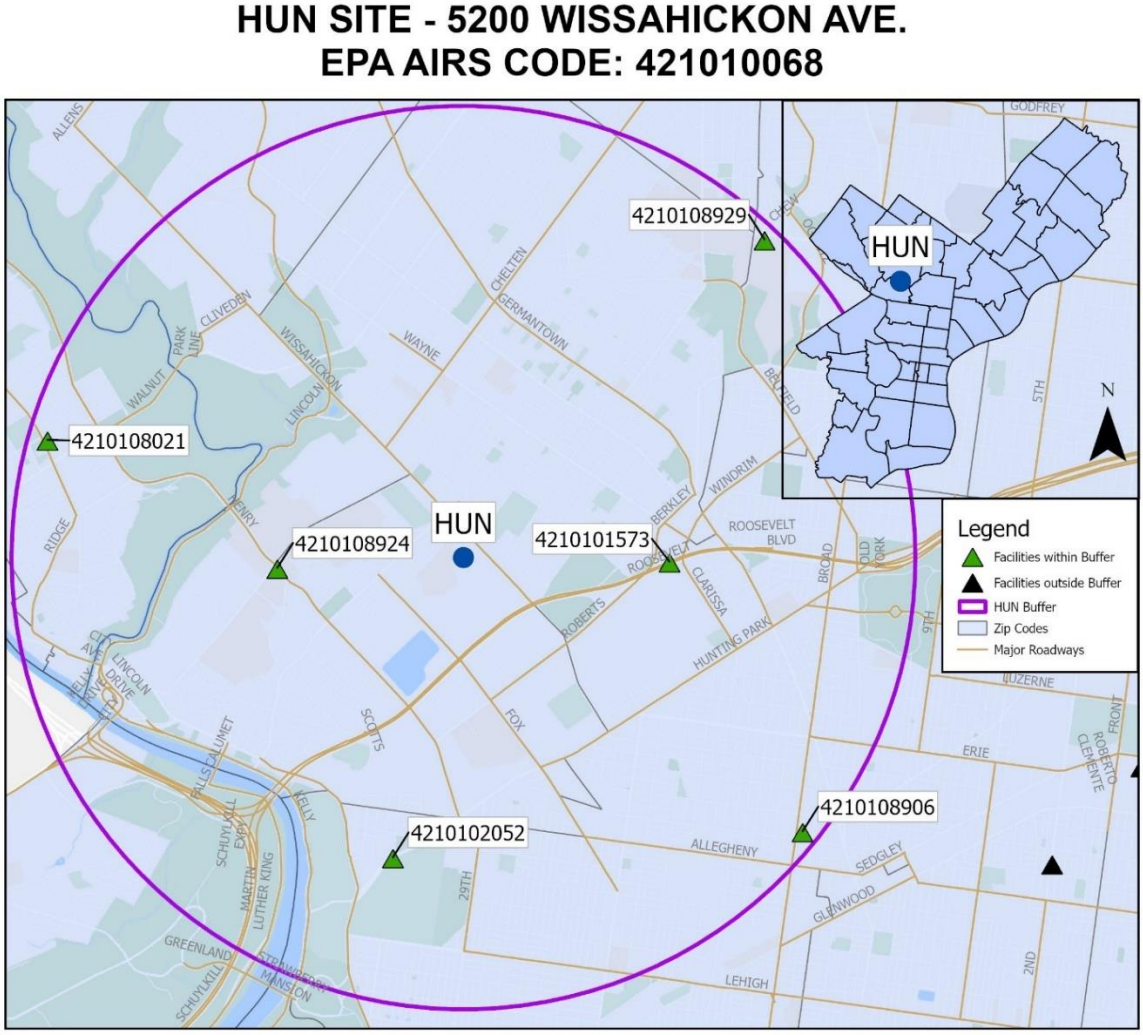
HUN Monitor

Table 12 – Detailed HUN Site Information

AMS SITE ID: HUN
AQS Site ID: 421010068
Street Address: 5200 Wissahickon Ave, Philadelphia, PA 19144
Geographical Coordinates
Latitude: 40.020568
Longitude: -75.177729

Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
NO2	SLAMS		Continuous	Instrumental	Gas Phase Chemiluminescence		42602	1	099	Neighborhood	Population Exposure	4	
NO	SLAMS		Continuous	Instrumental	Gas Phase Chemiluminescence		42601	1	099	Neighborhood	Population Exposure	4	
NOX	SLAMS		Continuous	Instrumental	Gas Phase Chemiluminescence		42603	1	099	Neighborhood	Population Exposure	4	
PM2.5 Continuous	SLAMS		Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	1	636	Neighborhood	Population Exposure	4	
Carbonyl	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	uHPLC		Vary	1	102	Neighborhood	Population Exposure	4	
Toxics	Other	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		Vary	2	150	Neighborhood	Population Exposure	4	

Figure 22 – HUN Monitoring Site Map with Major Streets and Major Emission Sources



HUN - Number of facilities within 3000 m radius: 6			2023 Emissions (tons)						
Facility ID	Name	Address	CO	Pb	NOx	PM10	PM2.5	SOx	VOC
4210101573	SEPTA ROBERTS C	341-342 ROBERTS AVE	0.670		7.570	0.110	0.070	0.150	1.260
4210102052	SUN CHEM CORP/HUNTING PARK PLT	3301 W HUNTING PARK AV	0.260		0.310	0.080	0.080	0.000	9.930
4210108906	TEMPLE UNIV HEALTH SCIENCES CAMPUS/STE/	3401 N BROAD ST	21.880		11.360	2.090	2.090	0.210	1.460
4210108924	PHILA UNIV/COLL OF TEXTILE	HENRY AVE & SCHOOL LN	2.100		2.860	0.220	0.220	0.020	0.150
4210108021	ROXBOROUGH MEM HOSP/PHILA	5800 RIDGE AVE	1.540		1.510	0.060	0.060	0.020	0.110
4210108929	LASALLE UNIV/W OLNEY AVE	1900 W OLNEY AVE	0.880		1.190	0.050	0.050	0.160	0.030

Figure 23 – HUN Site North Aerial View

Appendix A
Philadelphia Air Quality Survey

Philadelphia Air Quality Survey (PAQS) Project Overview

Objectives

This project was designed to fill gaps in air quality monitoring and achieve the following objectives:

1. Set up street-level, neighborhood-oriented air sampling sites throughout the city to sample the air for two years or more and capture seasonal changes and neighborhood-to-neighborhood spatial variances in air quality.
2. Measure air pollutants with significant health concerns, including $PM_{2.5}$, NO_2, ozone, SO_2, and black carbon.
3. Obtain quality assured data results that can serve as the basis for future work, including: provide policy recommendations to reduce pollution from congested city traffic, diesel vehicles and wintertime fuel burning; analyze the relations between air quality and land use characters at neighborhood level; provide data for studying public health impact of air pollution in the city.

Project Design

Monitoring Sites: A grid of 300m x 300m cells was created over the city map using GIS tools for the purposes of site selection, data processing, and possible air quality modeling in the future. A sampling site falls in one of these cells. The entire city was divided into four quadrants (areas): Central, Northeast, Northwest, and South/Southwest. The Central quadrant was given larger number of sites and higher site density, considering the high density of population, traffic and buildings, and potentially larger gradients of pollutant concentration variances. Originally 50 monitoring sites were selected. About 65% of the sites were randomly selected using GIS mapping techniques to make the air sampling statistically representative. About 35% of the sites were determined as "purposeful" sites. Their locations were selected to serve one or more particular purposes. At each monitoring site, a portable sampling unit was mounted on a utility pole about 10 – 11 feet above the ground.

Sampling Unit: The sampling unit contained a filter based $PM_{2.5}$ sample collector. At some of the sites, the sampling unit also included NO_2, SO_2, and/or O_3 passive samplers. The unit contained meteorological sensors as well.

Sampling Operation: The sampling units operated on 2-week sampling cycles. Four sites, known as "reference sites", were monitored with consecutive sampling periods throughout the year to provide a time series of pollutant concentrations. For the rest of the sites, sampling units were rotated to cover them in four operational sessions (2-week periods) during a season (a three-month period). In each session, the four reference sites plus 11 - 13 other sites were monitored. These 11 – 13 sites in each session were randomly selected across the city to avoid spatio-temporal confounding associated with different sites being monitored during different time windows.

Outputs

The air sampling operation started in May 2018 and ended in December 2024. The project outputs include measurements from the first ever citywide large scale street level air monitoring, demonstrating spatial variance of pollutant concentrations across the city. A project report[3] based on the first two years' data has been produced, and AMS is currently producing the final project report.

During this 12-month period from December 1, 2022, through November 30, 2023, the citywide all-sites $PM_{2.5}$ average concentration was 10.3 μg/m^3. This included data from June 2023 when multiple large-scale wildfires in North America caused widespread air quality deterioration over the course of several weeks. In regulatory processes, air quality data under this type of circumstance can be excluded under EPA's Exceptional Events Rule[4]. If the PAQS data in June 2023 were excluded, the 12-month (12/1/2022 - 11/30/2023) citywide average $PM_{2.5}$ concentration would be 8.2 μg/m^3. EPA has decided that, although there are spikes on $PM_{2.5}$ and Ozone concentration due to the wildfires, exceptional events may not be considered when evaluating the concentration of pollutants for regulatory purposes. The reason for this decision was that consideration of such events would not likely have an effect on the attainment status of the city and the state due to the voluntary bump up for Ozone attainment and the new lower $PM_{2.5}$ NAAQS.

During the 2024 sampling period, AMS collected $PM_{2.5}$ and NO_2 samples. $PM_{2.5}$ Samples are currently in the quality control process. In the same sampling period, the citywide all-site NO_2 average concentration was 15.9 ppb, well below the annual NAAQS of 53 ppb. Although PAQS does not use regulatory monitors, the NAAQS comparison is useful to show low NO_2 concentrations. The NO_2 map below shows the annual average concentration at each monitor.

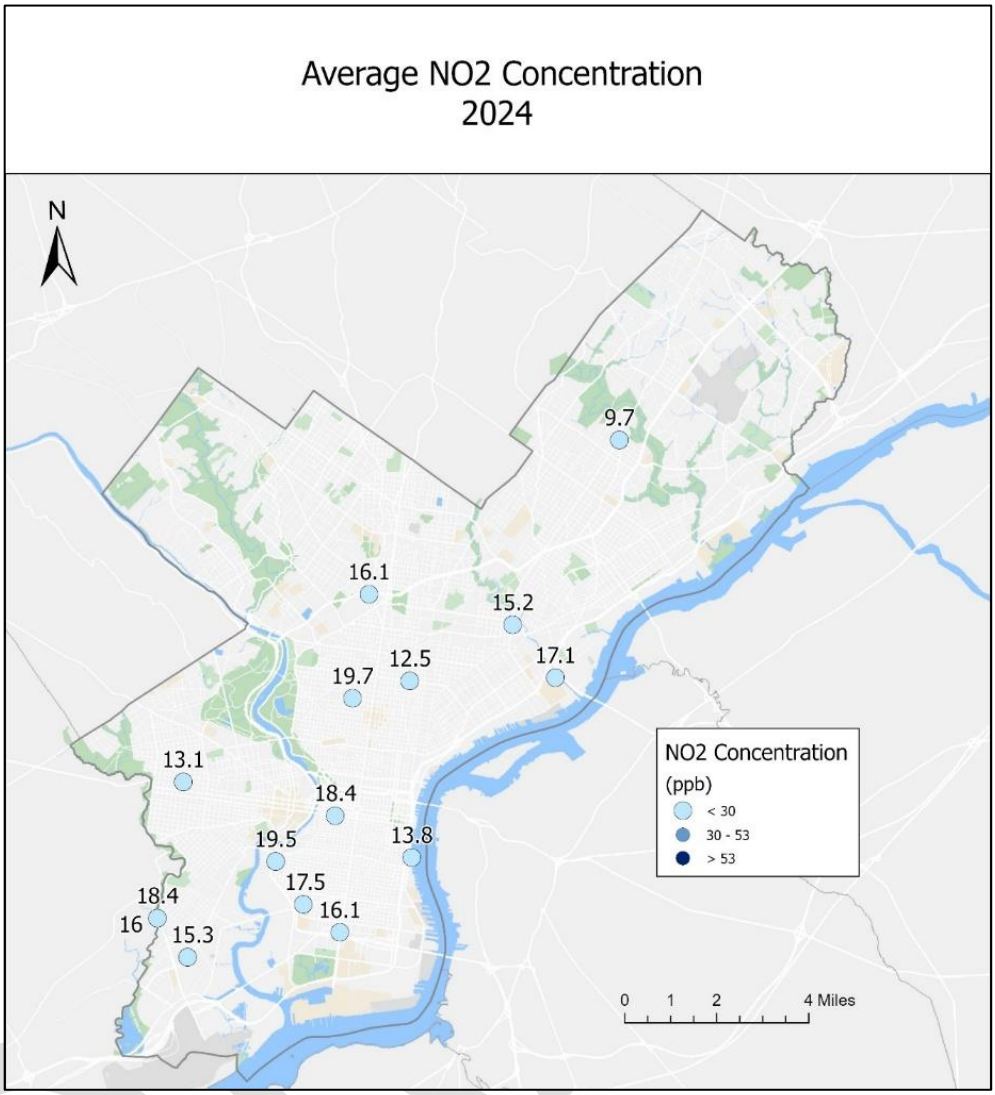
As of December 2024, a total of 102 sampling sessions have been performed. Large amounts of data have been collected that allow AMS to meet the initial objectives of the project.

AMS collected samples at 48 – 50 sites from 2018 to2023. In 2024, however, the number of sampling sites was downsized to just 10 due to interruption of a maintenance contract with a consultant and the need to replace the PAQS monitors with alternative air sensors. The new sensors will provide real time data for the public. AMS is currently running a project to install Clarity Node-S real-time $PM_{2.5}$ and NO_2 measurement devices in line with the public expectation of the accessible real-time air quality data.

Considering the increased efforts to fill monitoring gaps in the city with the new HUN site, Clarity Sensors, and other projects (including the Community-Scale Air Toxics monitoring, the ARP grant project, the IRA grant project, the mobile monitoring platform, etc.), the agency decided to conclude the PAQS project and sampling ended in December 2024. The final report for the PAQS project from 2018 - 2024 will be prepared and released to the public. Feedback from the report will be used for future policy recommendations and for updating the city air monitoring operation (PAQS is not a part of the monitoring network shown in Figure 1).

[3] https://www.phila.gov/media/20210316150355/PAQS_Report_Sept4-2020_final.pdf

[4] https://www.epa.gov/air-quality-analysis/treatment-air-quality-monitoring-data-influenced-exceptional-events


Average NO2 Concentration
2024
N
9.7
16.1
15.2
17.1
12.5
19.7
13.1
18.4
19.5
13.8
17.5
18.4
16
16.1
15.3
NO2 Concentration
(ppb)
< 30
30 - 53
> 53
0
1
2
4 Miles

Appendix B
2020 Community-Scale Air Toxics Ambient Monitoring Grant

Summary

In October 2020, AMS received an EPA grant award for Community-Scale Air Toxics Ambient Monitoring (RFP Number: EPA-OAR-OAQPS-20-05). This project focused on monitoring the top six air toxics in Philadelphia: formaldehyde, benzene, carbon tetrachloride, naphthalene, acetaldehyde, and 1,3-butadiene.

Monitoring was conducted in 4 areas and 5 sampling sites. See attached map for site locations. All monitoring areas are Environmental Justice areas.

1. South Philadelphia (at existing AMS RIT monitoring station)
2. South Philadelphia (south of RIT, east of the former PES Refinery)
3. Eastwick neighborhood
4. Center City
5. Reference site, West Philadelphia

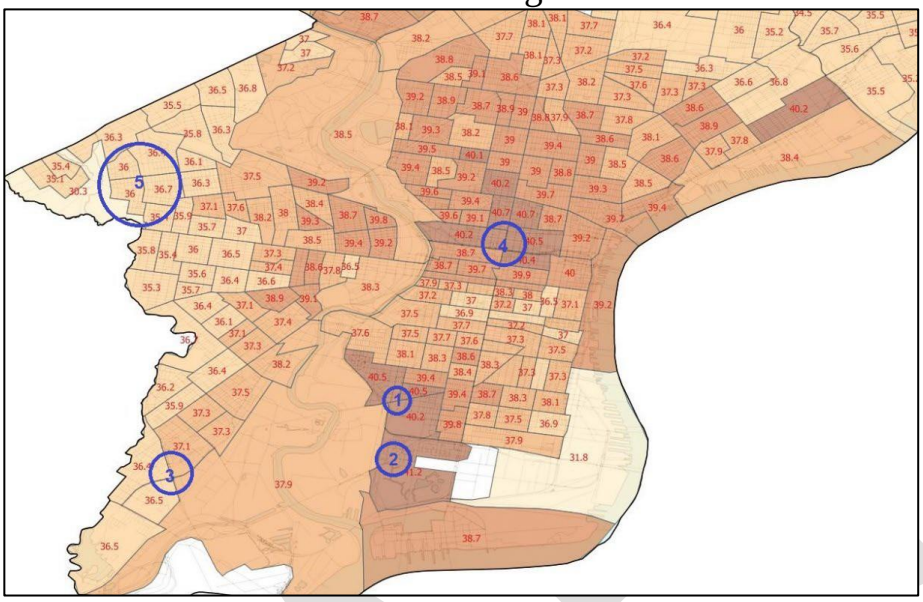
Rationale

EPA's 2014 National Air Toxics Assessment (NATA) shows the above seven compounds contributed the most air toxics cancer risks in Philadelphia. The community surrounding the oil refinery complex in South Philadelphia has long been concerned about the impact of exposure to air toxics. This neighborhood has high poverty rates, lower-than-average education levels, and a large at-risk population. The Eastwick neighborhood is about 1.5 miles north of the Philadelphia International Airport and close to a Superfund site. According to a University of Pennsylvania study, a large percentage of residents in this neighborhood have complained about asthma and breathing problems. Also, parts of Center City are among the areas with the highest lifetime air toxics total cancer risks in Philadelphia.

Methods

Passive samplers were used to continuously measure the air toxics. The sampling period started in July 2023 and will extend past the end date of the project. A weather-proof sampler housing was installed at a height about 3 meters above the ground at each site. EPA designated analytical methods (GC/MS and uHPLC) were used for the sample analysis. Monitoring results at each location from July 2023 – April 2024 are shown in the tables below.

Monitoring Locations



(Numbers in red indicate estimated air toxics cancer risk (per million population) by census tract according to EPA 2014 NATA study)

Average concentrations from monitoring between July 2023 and April 2024 are shown in the tables below.

Benzene

Location	Concentration (ppb)
RIT (1)	3.39
PEN (2)	3.27
EAST (3)	2.81
CEN (4)	2.85
WEST (5)	2.81

1,3-Butadiene

Location	Concentration (ppb)
RIT (1)	0.761
PEN (2)	0.758
EAST (3)	0.696
CEN (4)	0.700
WEST (5)	0.747

Carbon Tetrachloride

Location	Concentration (ppb)
RIT (1)	2.16
PEN (2)	2.29
EAST (3)	2.07
CEN (4)	2.31

WEST (5)	2.27

Naphthalene

Location	Concentration (ppb)
RIT (1)	2.72
PEN (2)	2.31
EAST (3)	2.05
CEN (4)	2.01
WEST (5)	2.19

Progress Update

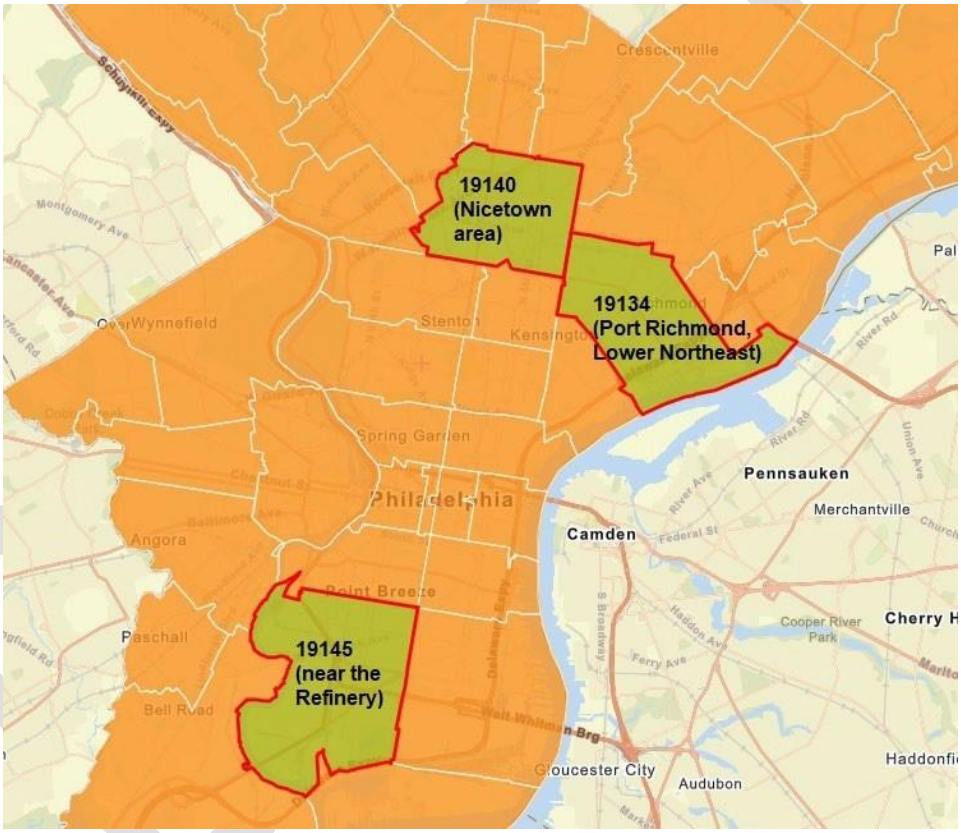
AMS will submit the final report to EPA on May 2, 2025. AMS is extending the sampling operation of this project to additional areas in the city that are disproportionately impacted by air pollution. AMS is adding 4 new monitoring locations in University City (19104), South Philadelphia (19103), Northeast Philadelphia (19134), and at the NEW Monitor (19137). AMS will be self-financing the continuation and expansion of the project for the next 10 years. AMS will determine the precise locations of the new monitors in the summer of 2025.

Appendix C
2022 American Rescue Plan Grant Project

Summary

In November 2022 AMS received an EPA grant award for Enhanced Air Monitoring for Communities (EPA-OAR-OAQPS-22-01) under the American Rescue Plan (ARP).

This project deploys continuous air monitors at three sites in Philadelphia, which are located in areas near major emission sources including the former Philadelphia refinery complex, the Philadelphia International Airport, Kinder Morgan storage tanks, a US Postal processing center, and major highways (I-95, I-76, Roosevelt Blvd.). The project will produce results to fill air monitoring gaps in these areas and helps strategize pollution reduction strategies. The three sites will monitor criteria pollutants and VOCs/air toxics around three Zip Code areas: 19140, 19134 and 19145 (shown in the map below).



Technical Approach

The overall approach to this project focused on providing continuous monitoring in communities near major emission sources. Medium-cost continuous monitors (such as the DustTrak™ 8540 Environmental Monitors) will be used for $PM_{2.5}$ measurement. VOCs will be monitored continuously using instruments such as the PID 112 Model VOC monitors. Canister samples of VOCs/air toxics (with EPA designated methods) will be used for quality assurance. Passive samplers will be used to collect O_3 and NO_2 samples at each site.

Timeframe

Initially, the sampling operation was planned to start in mid-2023 and run for 12 months. The entire project, including equipment acquisition, site preparation, training, air sampling, and data processing & reporting, will last 2 years in total. Delays during the equipment procurement process have pushed the timeline back.

As of March 2025, AMS has procured all the monitoring equipment for the project. AMS prepared the project QAPP, submitted it to the EPA, and has received feedback and comments. Data collection will begin as soon as EPA releases the remaining working capital of the budget required to run the air monitors. The remaining budget is pending, and the project will be completed one year from the start of the final funding release.

Appendix D
Proof of Public Notice Publication

Appendix E
Comment Response Document

DISCLAIMER OF ENDORSEMENT

Reference to any specific product, service, trade name, trademark, brand, provider, or manufacturer in this Plan document does not constitute recommendation or endorsement by Air Management Services, Department of Public Health, City of Philadelphia.