

2021-2022 Air Monitoring Network Plan

City of Philadelphia
Department of Public Health
Air Management Services

July 1, 2021

Executive Summary

Philadelphia has an air monitoring network of ten air monitoring stations that house instruments that measure ambient levels of gaseous, solid, and liquid aerosol pollutants. It is operated by the City of Philadelphia's Department of Public Health, Air Management Services (AMS), the local air pollution control agency for the City of Philadelphia. This network is part of a broader network of air monitoring operated by our local states of Pennsylvania, New Jersey, Delaware and Maryland that make up the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD Metropolitan Statistical Area (MSA).

The United States Environmental Protection Agency (US EPA) created regulations on how the air monitoring network is to be set up. These regulations can be found in Title 40 – Protection of Environment in the Code of Federal Regulations (CFR) Part 58 – Ambient Air Quality Surveillance, located online at: <http://www.ecfr.gov/cgi-bin/text-idx?SID=86f79e0c1262e76604e10118aa3cc0ec&mc=true&node=pt40.6.58&rgn=div5>.

Beginning July 1, 2007, and each year thereafter, AMS has submitted to EPA Region III, an Air Monitoring Network Plan (AMNP) which assures that the network stations continue to meet the criteria established by federal regulations.

Air monitoring provides critical information on the quality of air in Philadelphia. The objective for much of our network is to measure pollutants in areas that represent high levels of contaminants and high population exposure. Some monitoring is also done to determine the difference in pollutant levels in various parts of the City, provide long term trends, help bring facilities into compliance, provide real-time monitoring and provide the public with information on air quality.

Air monitoring data is submitted to the EPA on a quarterly basis. EPA's AirData website (<https://www.epa.gov/outdoor-air-quality-data>) provides access to air quality data collected at the monitors. On May 1st of the current year, AMS certifies the prior year's data. The annual data certification process is 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 fourteen sections plus Appendices A – D:

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. **Current Network at a Glance** – This section shows the location of the monitoring sites and the pollutants measured at each site.
4. **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.
5. **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.
6. **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.
7. **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.
8. **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.
9. **NO₂ Monitoring Network** – This section documents the NO₂ monitoring network codified in 40 CFR Part 58.10(a)(5) and 40 CFR Part 58 Appendix D section 4.3.
10. **SO₂ Monitoring Network** – This section documents the SO₂ monitoring network codified in 40 CFR Part 58.10(a)(6) and 40 CFR Part 58 Appendix D section 4.4.
11. **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.
12. **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.
13. **O₃ Monitoring Network** – This section documents the O₃ monitoring network codified in 40 CFR Part 58.10(a)(9) – (12) and 40 CFR part 58 Appendix D section 4.1.
14. **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.

15. Appendix A – PAMS Monitoring Implementation Plan

16. Appendix B – Philadelphia Air Quality Survey & Quality Assurance Project Plan

17. Appendix C – 2020 Community Scale Air Toxics Ambient Monitoring Grant

18. Appendix D – Proof of Publication

AMS has provided a copy of the AMNP for public inspection on the City's website at:
<https://www.phila.gov/departments/air-pollution-control-board/air-management-notice/>.

Comments or questions concerning the air monitoring network or this Plan can be directed to:

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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 to the Environmental Protection Agency (EPA) Regional Administrator an Annual Monitoring Network Plan (AMNP) by July 1, 2021. 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.

The proposed AMNP is available for public inspection on the City's website at <https://www.phila.gov/departments/air-pollution-control-board/air-management-notice/> and at the office of Air Management Services, 321 University Avenue, 2nd Floor, Philadelphia, PA 19104, during normal business hours. For further information, contact Mr. Jason Li, Engineering Supervisor of Program Services at (215) 685-9440.

Written comments on the proposed AMNP should be sent to Mr. Jason Li, Engineering Supervisor of Program Services, Air Management Services, 321 University Avenue, 2nd Floor, Philadelphia, PA 19104 or via email at jiazheng.li@phila.gov. Use "2021 Air Monitoring Network Plan" as the subject line in written communication. Only written comments will be accepted. Comments received by facsimile will not be accepted. Persons wishing to file comments on the proposed AMNP must submit comments by May 17, 2021.

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 intent that they will operate over many years and provide both current and historical information.
- **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}), O₃, SO₂, CO, nitrogen oxides (NO/NO₂/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 NO₂/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 about many things including the peak air pollution levels, typical 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 (O₃)**
 - **Sulfur Dioxide (SO₂)**
 - **Carbon Monoxide (CO)**
 - **Nitrogen Dioxide (NO₂)**
 - NO means nitrogen oxide.
 - NO_x means oxides of nitrogen and is defined as the sum of the concentrations of NO₂ and NO.
 - NO_y means the sum of all total *reactive* nitrogen oxides, including NO, NO₂, 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.
 - PM₁₀ 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)**
- **BaP** – means Benzo(a)Pyrene, a polycyclic aromatic hydrocarbon that is a product of incomplete combustion or burning organic (carbon-containing) items.
- **Black Carbon** – Black Carbon is a major component of "soot", a complex and most strongly absorbing component of particulate matter (PM), that is formed by the incomplete combustion of fossil fuels, biofuels, and biomass.
- **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 44 compounds, carbonyls – 7 compounds, and metals - 7 elements are toxic and are measured to assess the risk of cancer and non-cancer caused by these pollutants. The VOC compounds are analyzed by GC/MS (EPA Compendium Method TO-15); carbonyls are analyzed by HPLC or uHPLC, and metals by ICP-MS(WV).
- **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 PM₁₀ 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.
- **Met One SASS** – Filters used to collect PM measurement of total mass by gravimetry, elements by x-ray fluorescence.
- **Filter-based PM_{2.5}** – Filter-based PM_{2.5} monitors an air sample drawn through a Teflon filter for 24 hours.
- **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 and High Performance Liquid Chromatography (uHPLC and HPLC) measures the carbonyl.

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 PM10 and PM2.5, 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.
- **Inductively Coupled Plasma/Mass Spectrometry (ICP/MS)** – Inductively Coupled Plasma/Mass Spectrometry for the determination of metals including Lead concentration in ambient particulate matter.

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. NO₂ is calculated as NO_x - NO. True NO₂ monitoring technology provides a direct NO₂ 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 (SO₂), in a sample gas drawn through the instrument's sample chamber where it is exposed to ultraviolet light, which causes any SO₂ present to fluoresce. The instrument measures the amount of fluorescence to determine the amount of SO₂ present in the sample gas.
- **Ozone – Ultra Violet** - A light, which supplies energy to a molecule being analyzed. Ozone is analyzed with UV.

Toxic and volatile organic pollutants

- **Cryogenic Preconcentration GC-FID** – Cryogenic Preconcentration Gas Chromatograph/Flame Ionization Detector - air injection volume for capillary GC combined with low concentrations of analyte require that samples be preconcentrated prior to GC analysis. Sample preconcentration is accomplished by passing a known volume of the air sample through a trap filled with fine glass beads that is cooled to

-180°C. With this technique, the volatile hydrocarbons of interest are quantitatively retained in the trap, whereas the bulk constituents of air (nitrogen, oxygen, etc.) are not. The air sample is collected in a vessel of known volume. A portion of this volume is analyzed and used to calculate concentration of each compound in the original air sample after Gas Chromatographic (Flame Ionization Detector, GC-FID) analysis. The sample trapped cryogenically on the glass beads is thermally desorbed into a stream of ultra-pure helium and re-trapped on the surface of a fine stainless steel capillary cooled to -180° C. This second cryogenic trapping stage "focuses" the sample into a small linear section of tubing. The cold stainless steel capillary is ballistically heated (by electrical resistance) and the focused sample quickly desorbs into the helium stream and is transferred to the chromatographic column. Cryogen (liquid nitrogen, LN₂) is used to obtain sub ambient temperatures in the VOC concentration and GC. This analysis is used to determine the concentration of Benzene and other organic compounds and VOC in the atmosphere.

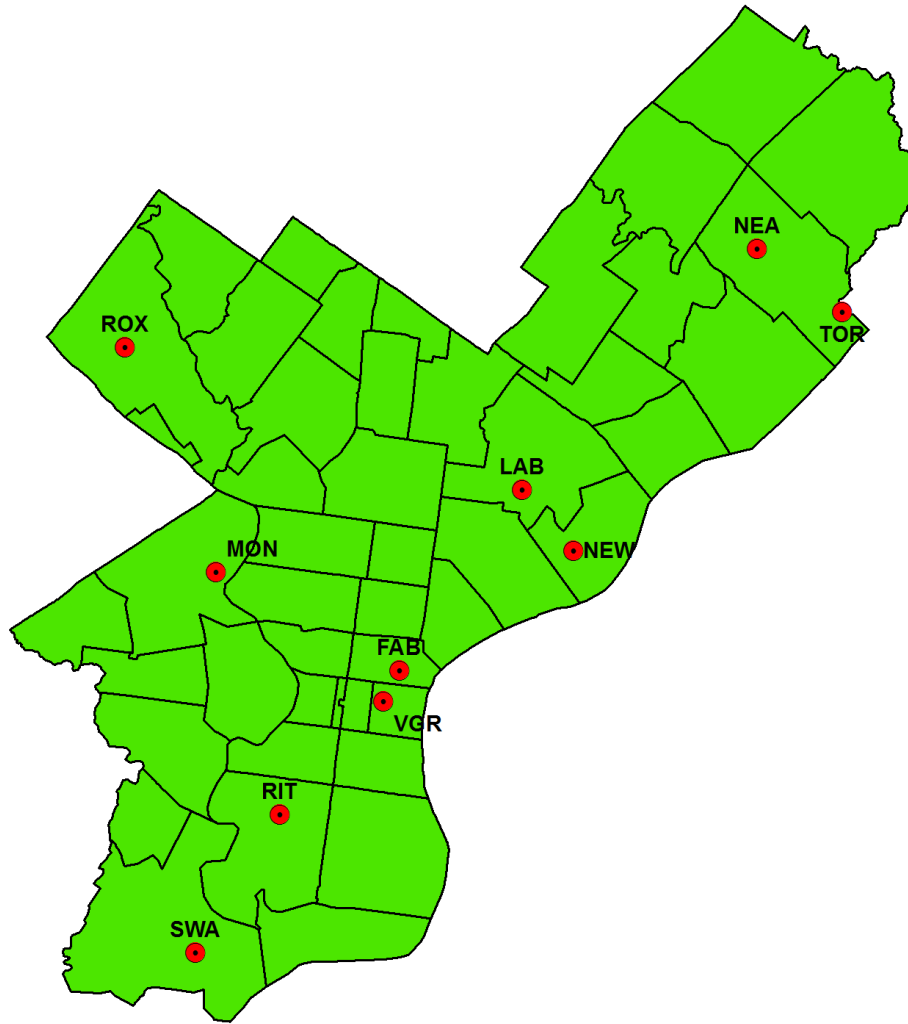
- **GC-MS** – Gas Chromatograph/Mass Spectrometer. Analysis of organic or VOC are conducted using a gas chromatograph (GC) with a mass spectrometer (MS) attached as the detector. Cryogenic preconcentration with liquid nitrogen (LN₂) is also used to trap and concentrate sample components.
- **Auto GC-FID** – 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.
- **High Pressure Liquid Chromatography (HPLC)** – The analytical method used to analyze carbonyl compounds such as acetaldehyde and formaldehyde. Carbonyl compounds are collected on the sampling media as their 2,4-dinitrohydrazine derivatives. The derivatives are separated by liquid chromatography (LC) on a packed column by means of a solvent mixture under high pressure (HPLC) followed by UV detection of each carbonyl derivative. Ultra-High Performance Liquid Chromatography (uHPLC) allows for faster analysis time as well as chromatograms with greater resolution.

Current Network at a Glance

The City of Philadelphia is served by a network of ten air monitoring sites located throughout the City that measure the criteria pollutants (except lead¹): ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and particulate matter (PM₁₀ and PM_{2.5}). Four of the sites also measure toxics, such as benzene, acetaldehyde, and formaldehyde. The map below shows the location of air monitors and the pollutants measured at each monitor location.

¹ EPA waved monitoring lead since 2017 because the 2014-2016 design value was 0.04 ug/m³.

Figure 1 - 2021 Philadelphia Air Monitoring Network as of July 1, 2021



AQS Site Code	AMS Site	Address	Parameter																AMS Site
			CO	SO ₂	Ozone	NO ₂	NOy/NO	PM ₁₀	PM _{2.5}	Speciated PM _{2.5}	PM Coarse	Black Carbon / Ultrafine PM	Carbonyls	PAMS VOC	BaP	TSP Metals (Be, Cr, Mn, Ni, As, Cd, Pb)	Toxics TO15	MET	
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			X	X		X	MON
	VGR	6th & Arch Sts			X				X									X	VGR

Summary of Current Sites

All of our ten monitoring sites are located in Philadelphia, PA:

State: Pennsylvania

City: Philadelphia

County: Philadelphia

Metropolitan Statistical Area (MSA): Philadelphia – Camden - Wilmington, PA-NJ-DE-MD

MSA number: 37980

Population: 6,102,434 (2019 annual estimate)²

EPA Region: III, Philadelphia

Class I area: Brigantine Natural Wildlife Preserve near Atlantic City, NJ

City population: 1,584,064 (2019 annual estimate)³

Time zone: EST

UTM zone: 18

² MSA population estimates from:

<https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-metro-and-micro-statistical-areas.html>

³ Philadelphia County population estimates from:

<https://www.census.gov/data/tables/time-series/demo/popest/2010s-counties-total.html>

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 Sts.	Periphery site.
421010024	NEA	Grant Ave & Ashton Rd.	Periphery site. High Ozone.
421010048	NEW	2861 Lewis St.	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	24 th & Ritner Sts.	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	3 rd & Spring Garden Sts.	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 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 1 st 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.
	VGR	6 th & Arch Sts.	EPA's Village Green Air Monitoring Station. Utilizes solar and wind turbine power as energy sources. Sited to increase community awareness of environmental conditions.

Direction of Future Air Monitoring

The agency will study and assess the overall monitoring program within the City to determine the course of future changes to the air monitoring network.

The agency will focus on the following:

- The agency will re-evaluate the number and monitoring locations for toxics due to decreased EPA funding and health risks in key locations.
- The agency will consider monitoring data from the Philadelphia Air Quality Survey (PAQS) project, the Community Scale Air Toxics Ambient Monitoring grant, the mobile monitoring project, and other monitoring projects to evaluate concentrations of air pollutants throughout the city. Based on these results, the agency plans to propose updates to FRM/FEM and air toxics monitoring locations.
- Improve the understanding of particulate and air toxic pollutants in Philadelphia.
 - The agency plans to pursue negotiations with the port entities in order to implement monitoring and emission inventory efforts in this location.
- The agency would like to consider Environmental Justice during the development of the Air Monitoring Network Plan and look to investigate concentrations in these communities.
- The agency would like to consider the establishment of an asset management framework for the monitoring system and develop an air quality monitoring modernization plan as opportunities for sustainability.
- The agency would like to understand the performance and remedy the challenges on the use of low-cost sensors to provide real-time, local-scale air quality information.

Proposed Changes to the Network

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

- March 2021 – December 2022
 - PAMS Monitoring set to begin by June 1, 2021.
 - See Appendix A for latest PAMS Monitoring Implementation Plan.
 - Establish a PM_{2.5} monitor at LAB – starting date to be determined.
 - Real-time data is planned to be available in the Summer of 2021 at <https://www.pandonia-global-network.org> for the PANDORA spectrometer installed in March of 2021 at the NEW site. The PANDORA spectrometer is an operational research instrument from National Aeronautics and Space Administration (NASA) in partnership with EPA that takes column measurements of O₃, SO₂, formaldehyde, BrO, NO₂, and H₂O available at PAMS sites.
 - Philadelphia Air Quality Survey.
 - AMS will continue to maintain sites and sample ambient air as shown in Appendix B.
 - AMS awarded EPA's Community-Scale Air Toxics Ambient Monitoring grant for 2020.
 - See Appendix C for more information.
 - A mobile monitoring station is planned to be added in the Fall of 2021 that will measure BTEX (Benzene, Toluene, Ethylbenzene, m-, o-, and p- Xylene), NO, NO₂, SO₂, O₃, PM_{2.5}, meteorological data, CO, CO₂, CH₄, H₂O, and Total VOCs measurement calibrated to Isobutylene. A modified Ford Transit 250 will include GPS to track speed and direction and can be used while the vehicle is in motion or stationary.
 - AMS plans to assist EPA on a port monitoring project.

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.

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.

The PAMS Monitoring Implementation Network Plan is included in Appendix A.

Pb 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 has no source oriented Pb sources that emit 0.50 or more tons per year.

NO₂ Monitoring Network

The requirements for the NO₂ 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 NO₂ monitor that meets the area-wide monitoring requirements. The first near-road NO₂ monitor was established at TOR and started operation on January 1, 2014. The second near-road NO₂ monitor is located at MON and started operation on July 20, 2015.

SO₂ Monitoring Network

The requirements for the SO₂ air monitoring network are codified in 40 CFR Part 58.10(a)(6) and 40 CFR Part 58 Appendix D section 4.4.

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 NO₂ monitor at TOR and has been operational since January 1, 2014.

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 NO₂ station for CBSAs with a population of 1,000,000 or more persons is met at the TOR monitoring site.

O₃ Monitoring Network

The requirements for the O₃ 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 O₃ monitors.

Enhanced Monitoring Plan

40 CFR Part 58 Appendix D. 5(h) requires: “*States with Moderate and above 8-hour O₃ 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 O₃ and O₃ 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 O₃ 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 O₃ problems in the state. Such activities may include, but are not limited to, the following:*

- (1) Additional O₃ 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 will work with PADEP for enhanced O₃ and O₃ precursor monitoring.

Currently, AMS monitors the following beyond the minimal requirements:

- (1) Year round ozone monitoring at all sites.

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

PAMS Monitoring Implementation Network Plan is included in Appendix A.

Detailed Information on Each Site

The tables that follow provide detailed information for each of the 10 monitoring stations in Philadelphia County. As per 40 CFR Part 58.10(a)(1), the siting and operation of each monitor in the 2021-2022 AMNP meets the requirements of 40 CFR Part 58 and Appendices A, B, C, D, and E of this part where applicable.

Table 2 – Detailed LAB Information with Monitoring Station Picture

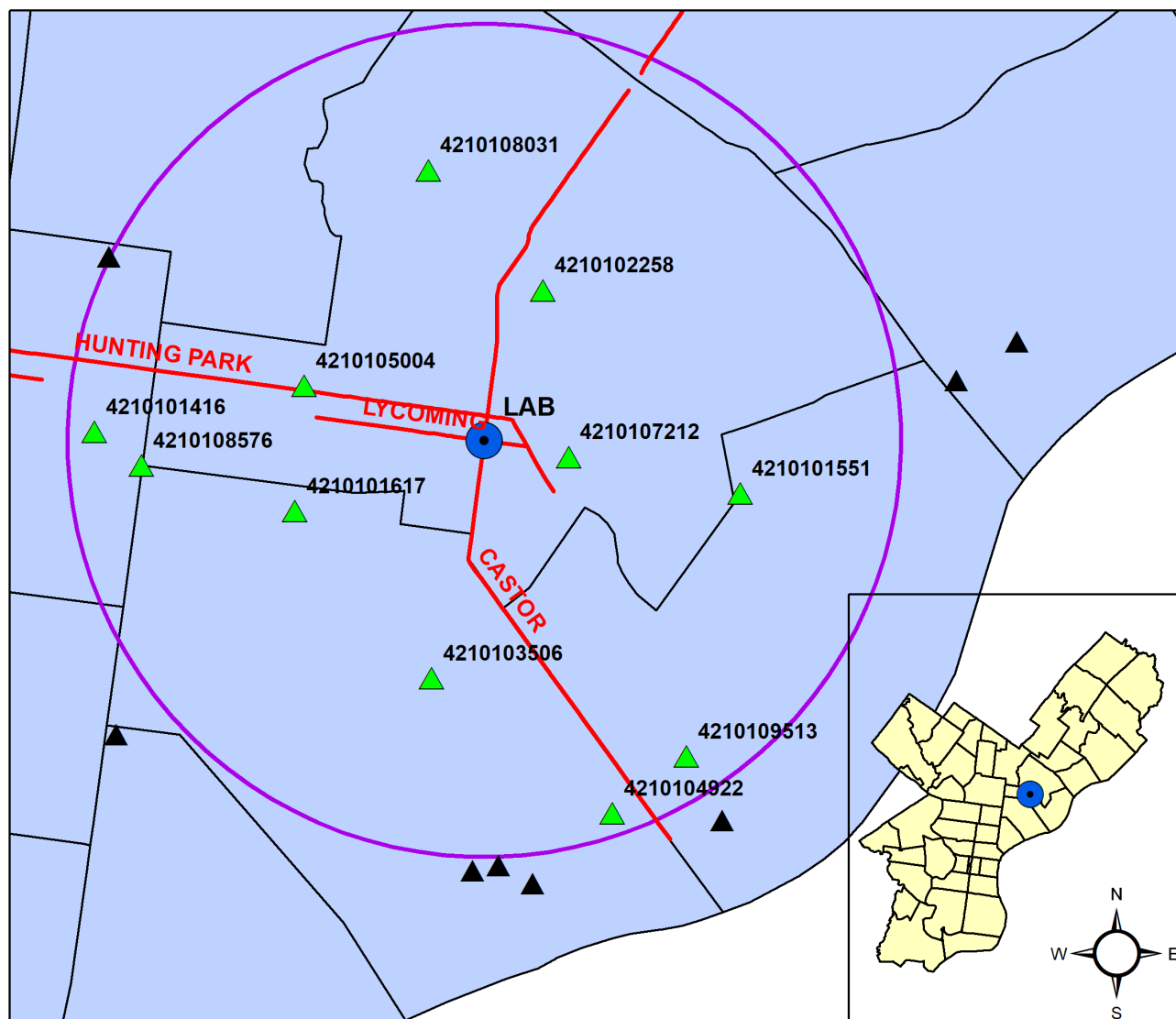
AMS SITE ID: LAB
AQS Site ID: 421010004
Street Address: 1501 E. Lycoming Street, 19124
Geographical Coordinates
Latitude: 40.008889
Longitude: -75.09778



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	Neighborhood	Population Exposure	7	1/1/2018
PM2.5 Continuous	SLAMS		Continuous	Teledyne T640 at 5.0 LPM	Broadband Spectroscopy		88101	4	236	Neighborhood	Population Exposure	2	TBD

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

AMS LABORATORY - 1501 E. LYCOMING ST. EPA AIRS CODE: 421010004



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
4210104922	PHILA GAS WORKS/RICHMOND PLT	3100 E VENANGO ST	0.000	2.820	4.756	0.293	0.254	0.032	0.231
4210109513	NORTHEAST WPCP/PHILA	3899 RICHMOND ST	0.000	5.313	4.920	3.951	3.951	0.469	5.633
4210103506	PTR BALER AND COMPACTOR/PHILA	2207 E ONTARIO ST	0.000	0.388	0.484	0.038	0.038	0.048	21.685
4210101617	PUROLITE INC/MFG CHEM	3620 G ST	0.000	2.524	3.005	0.228	0.228	0.018	2.683
4210101551	ADVANSIX INC	4700 BERMUDA ST	0.000	84.476	270.547	68.671	55.319	60.663	104.475
4210108576	ST CHRISTOPHERS HOSP FOR CHILDREN/PHILA	ERIE AVE & FRONT ST	0.000	3.424	6.161	0.453	0.452	0.204	0.413
4210107212	DOMESTIC LINEN SUPPLY CO INC/PHILADELPHIA	4100 FRANKFORD AVE	0.000	0.893	1.066	1.009	1.009	0.007	19.050
4210101416	TDPS MATERIALS INC/ASPHALT PLT	3870 N 2ND ST	0.000	9.080	1.820	1.610	0.200	0.240	2.240
4210105004	MIPC LLC/ PHILA	4210 G ST	0.000	0.000	0.000	0.000	0.000	0.000	24.790
4210102258	FRONTIDA BIOPHARM INC	1100 ORTHODOX ST	0.000	1.182	1.448	0.110	0.039	0.012	2.431
4210108031	FRIENDS HOSP/PHILA	4641 ROOSEVELT BLVD	0.000	1.694	2.077	0.065	0.043	0.017	0.114

Figure 3 – LAB North Aerial View



Table 3 – Detailed ROX Information with Monitoring Station Picture

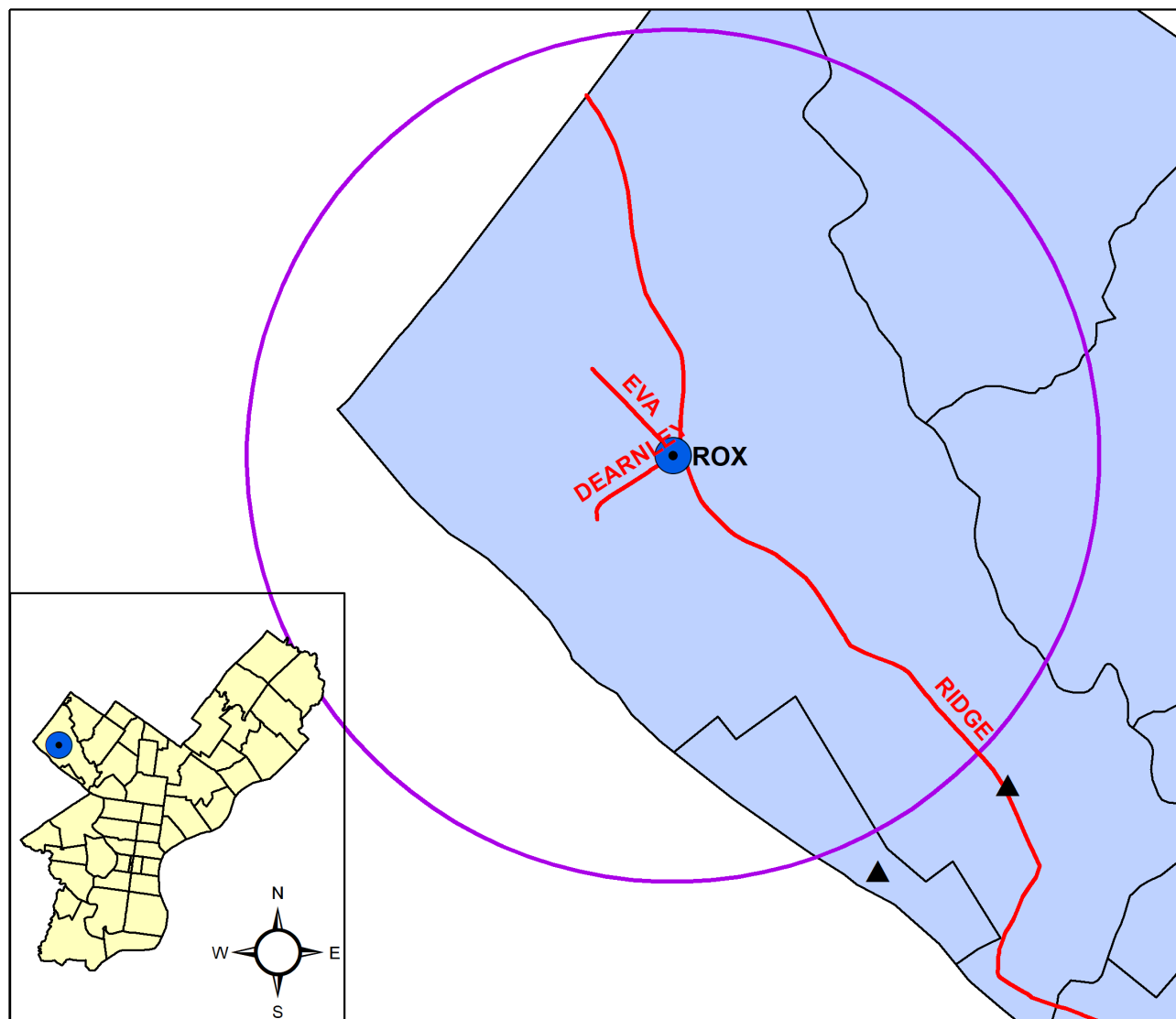
AMS SITE ID: ROX
AQS Site ID: 421010014
Street Address: Eva & Dearnley Streets
Geographical Coordinates
Latitude: 40.049604
Longitude: -75.241209



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	HPLC		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

ROXBOROUGH - EVA & DEARNLEY STS. EPA AIRS CODE: 421010014



			2018 Emissions (tons)						
SiteID	Facility Name	Address	Pb	CO	NOX	PM10	PM2.5	SO2	VOC

Figure 5 – ROX North Aerial View



Table 4 – Detailed NEA Information with Monitoring Station Picture

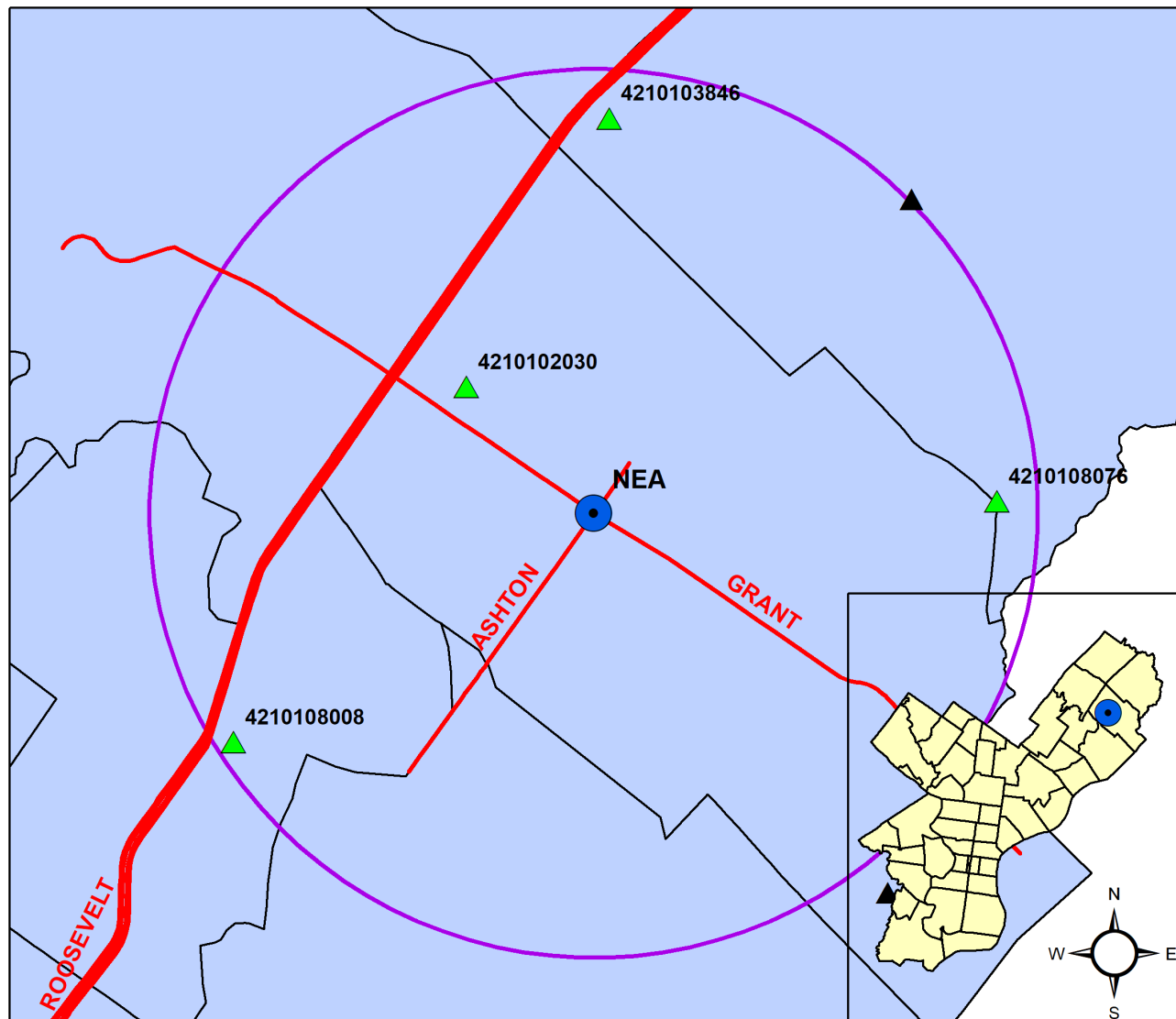
AMS SITE ID: NEA
AQS Site ID: 421010024
Street Address: Grant Ave & Ashton Rd
Geographical Coordinates
Latitude: 40.076389
Longitude: -75.011944



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	Neighborhood	Highest concentration	6	1/1/1974

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

NORTHEAST AIRPORT - GRANT AVE & ASHTON RD. **EPA AIRS CODE: 421010024**



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
4210108008	NAZARETH HOSP/PHILA	2601 HOLME AVE	0.000	1.724	2.380	0.088	0.064	0.037	0.130
4210108076	JEFFERSON TORRESDALE HOSPITAL	RED LION & KNIGHTS RD	0.000	7.301	10.344	0.521	0.000	0.122	0.807
4210102030	RYDER TRUCK RENTAL INC/BUEGRASS RD	9751 BLUE GRASS RD	0.000	0.020	0.100	0.003	0.000	0.001	0.241
4210103846	NATL PUB CO/ROOSEVELT BLVD	11311 ROOSEVELT BLVD	0.000	0.522	0.623	0.046	0.046	0.003	2.955

Figure 7 – NEA North Aerial View



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

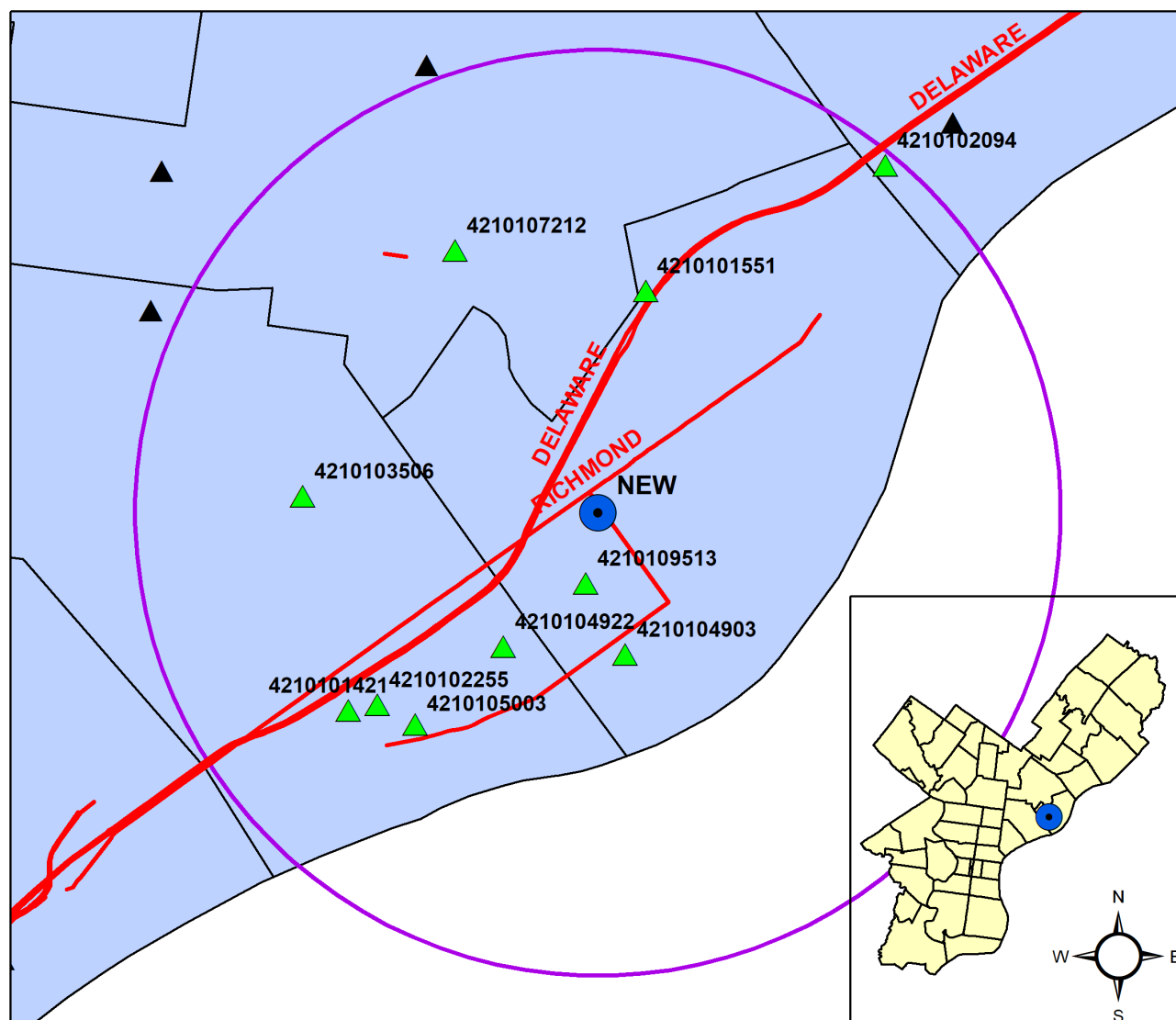


Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO (trace)	SLAMS	NCORE	Continuous	Instrumental	Gas Filter Correlation CO Analyzer	High sensitivity	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	Neighborhood	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	239	Neighborhood	Population Exposure	2	1/1/2019
PM2.5 Continuous	SLAMS	NCORE	Continuous	Teledyne API T640 at 5.00 LPM	Broadband Spectroscopy		88101	5	236	Neighborhood	Population Exposure	2	8/19/2020
PM2.5 Continuous	SLAMS	NCORE	Continuous	Teledyne API T640X at 16.67 LPM	Broadband Spectroscopy		88101	4	238	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	240	Neighborhood	Population Exposure	2	1/1/2019
Meteorological	SLAMS	NCORE	Continuous		Air quality measurements approved instrumentation for wind speed, wind direction, humidity,		Vary	1	Vary	Neighborhood	Population Exposure	10	6/1/1993

					barometric pressure, rainfall, and solar radiation								
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH- Coated Cartridges	HPLC	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	1,3	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
Ceilmeter	SLAMS	PAMS	Continuous	Vaisala									1/1/2018
Solar radiation	SLAMS	PAMS	Continuous	MetOne									
UV radiation	SLAMS	PAMS	Continuous	Eppey									
Precipitation	SLAMS	PAMS	Continuous	MetOne									
True NO2	SLAMS	PAMS	Continuous	Teledyne Model T500U	Cavity Attenuated Phase Shift Spectroscopy		42602	1	212	Neighborhood	Population Exposure		4/1/2019

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

NORTHEAST WASTE - 2861 LEWIS ST. EPA AIRS CODE: 421010048



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
4210105003	KINDER MORGAN LIQUIDS TERM/PHILA	3300 N DELAWARE AVE	0.000	4.765	5.172	0.369	0.285	0.080	17.535
4210101421	RIVERSIDE MATERIALS INC/ASPHALT PLT	2870 E ALLEGHENY AVE	0.000	22.080	4.610	2.240	0.890	0.560	7.970
4210102255	SMITH EDWARDS DUNLAP CO/ALLEGHENY AVE	2867 E ALLEGHENY AVE	0.000	0.142	0.172	0.013	0.000	0.033	3.194
4210104903	EXELON GENERATING CO/RICHMOND	3901 N DELAWARE AVE	0.000	0.019	3.230	0.110	0.022	0.239	0.002
4210104922	PHILA GAS WORKS/RICHMOND PLT	3100 E VENANGO ST	0.000	2.820	4.756	0.293	0.254	0.032	0.231
4210109513	NORTHEAST WPCP/PHILA	3899 RICHMOND ST	0.000	5.313	4.920	3.951	3.951	0.469	5.633
4210103506	PTR BALER AND COMPACTOR/PHILA	2207 E ONTARIO ST	0.000	0.388	0.484	0.038	0.038	0.048	21.685
4210101551	ADVANSIX INC	4700 BERMUDA ST	0.000	84.476	270.547	68.671	55.319	60.663	104.475
4210107212	DOMESTIC LINEN SUPPLY CO INC/PHILADELPHIA	4100 FRANKFORD AVE	0.000	0.893	1.066	1.009	1.009	0.007	19.050
4210102094	DIETZ & WATSON INC/PHILA	5701 TACONY ST	0.000	5.937	3.692	0.554	0.543	0.168	0.398

Figure 9 – NEW North Aerial View



Table 6 – Detailed RIT Information with Monitoring Station Picture

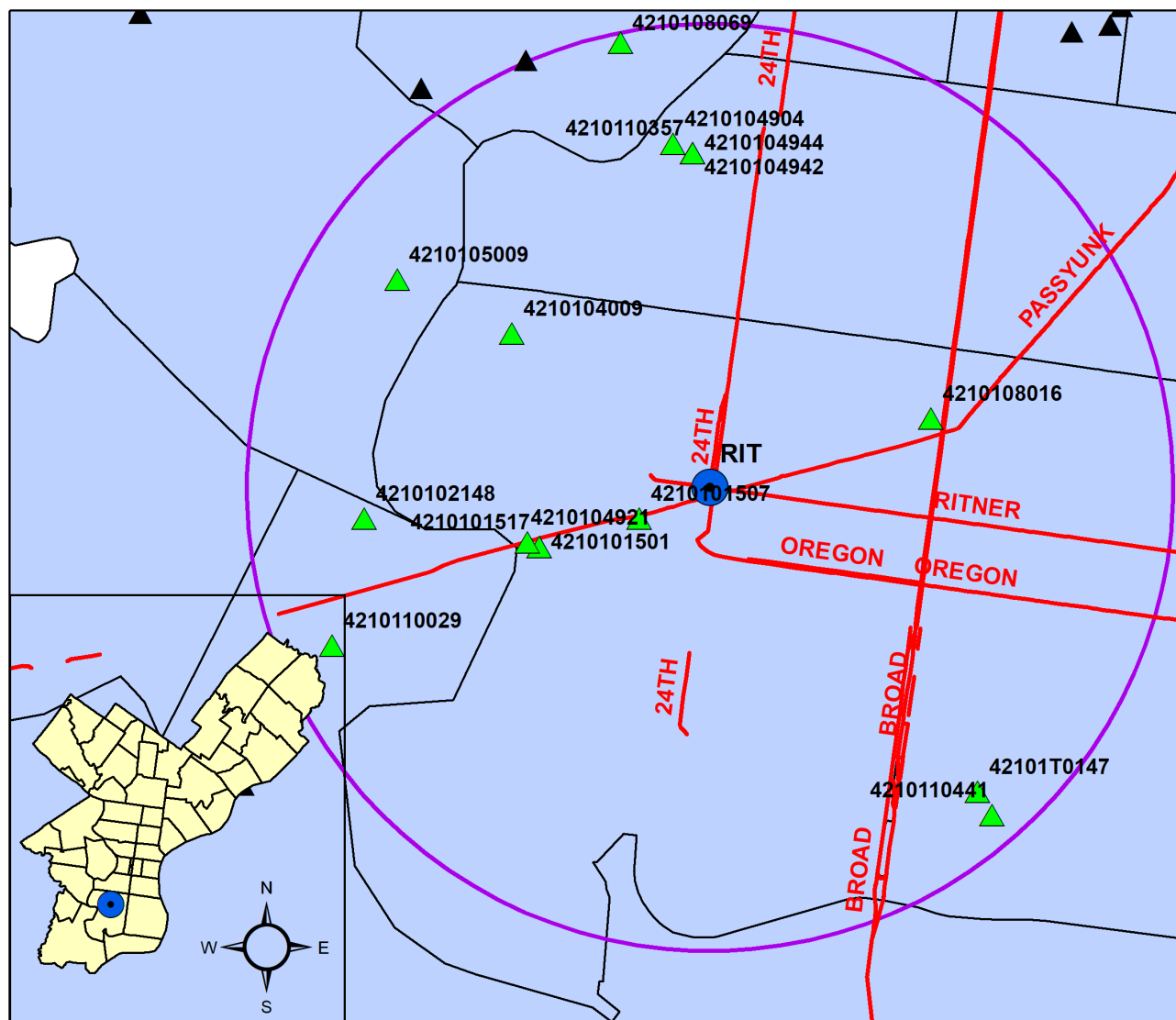
AMS SITE ID: RIT
AQS Site ID: 421010055
Street Address: 24th & Ritner Streets
Geographical Coordinates
Latitude: 39.922867
Longitude: -75.186921



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 WV (TSP sampler with quartz)	Vary	1	089	Neighborhood	Population Exposure	4	8/31/2004
Carbonyls	Other	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	HPLC		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	236	Neighborhood	Population Exposure	4	4/1/2020

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

RITNER - 24TH & RITNER STS. EPA AIRS CODE: 421010055



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
4210110441	LINCOLN FINANCIAL FIELD	1 LINCOLN FINANCIAL FIELD WA	0.000	1.274	2.686	0.120	0.120	0.011	0.147
42101T0147	CITIZENS BANK PARK/PHILA	1001 PATTISON AVE	0.000	2.470	2.840	0.210	0.210	0.021	0.170
4210110029	KINDER MORGAN POINT BREEZE TERM/ PHILA	6310 PASSYUNK AVE	0.000	0.127	0.151	0.012	0.012	0.001	16.858
4210101501	PHILA ENERGY SOL REF/ PES	3144 W PASSYUNK AVE	0.008	373.252	581.274	63.383	63.383	65.846	575.338
4210101517	PES/SCHUYLKILL TANK FARM	3144 W PASSYUNK AVE	0.000	1.163	0.435	0.019	0.019	0.019	81.482
4210104921	PHILA GAS WORKS/PASSYUNK PLT	3100 W PASSYUNK AVE	0.000	2.228	3.117	0.262	0.206	0.092	0.358
4210101507	SUNOCO LOGISTICS/BELMONT TERM	2700 W PASSYUNK AVE	0.000	8.830	3.540	0.000	0.000	0.036	13.190
4210102148	CLEAN EARTH OF PHILA LLC/PHILA	3201 S 61ST ST	0.000	0.000	0.000	0.150	0.020	0.000	1.950
4210108016	CONSTITUTION HEALTH PLAZA / PHILA	1930 S BROAD ST	0.000	0.360	0.554	0.023	0.019	0.014	0.030
4210104009	TRANSFLO TERMINAL SERVICES INC/PHIL	3600 MOORE ST	0.000	0.022	0.089	0.404	0.007	0.001	0.042
4210105009	PBF LOGISTICS TERM 51ST/PHILA	1630 S 51ST ST	0.000	0.000	0.000	0.000	0.000	0.000	1.407
4210104942	VICINITY ENERGY SCHUYLKILL STATION	2600 CHRISTIAN ST	0.000	3.250	58.100	0.790	0.790	1.550	0.450
4210104944	GRAYS FERRY COGEN PARTNERSHIP/PHILA	2600 CHRISTIAN ST	0.001	18.410	223.400	15.080	15.080	3.700	0.600
4210110357	VICINITY ENERGY EFFICIENCY	2600 CHRISTIAN ST	0.000	0.040	2.900	0.300	0.300	0.150	1.380
4210104904	EXELON GENERATION CO/SCHUYLKILL STA	2800 CHRISTIAN ST	0.000	0.427	3.281	0.170	0.019	0.006	0.014
4210108069	CHILDRENS HOSP OF PHILA/ PHILA	34TH & CIVIC CENTER BLVD	0.000	14.119	27.485	2.963	2.963	0.929	2.738

Figure 11 – RIT North Aerial View

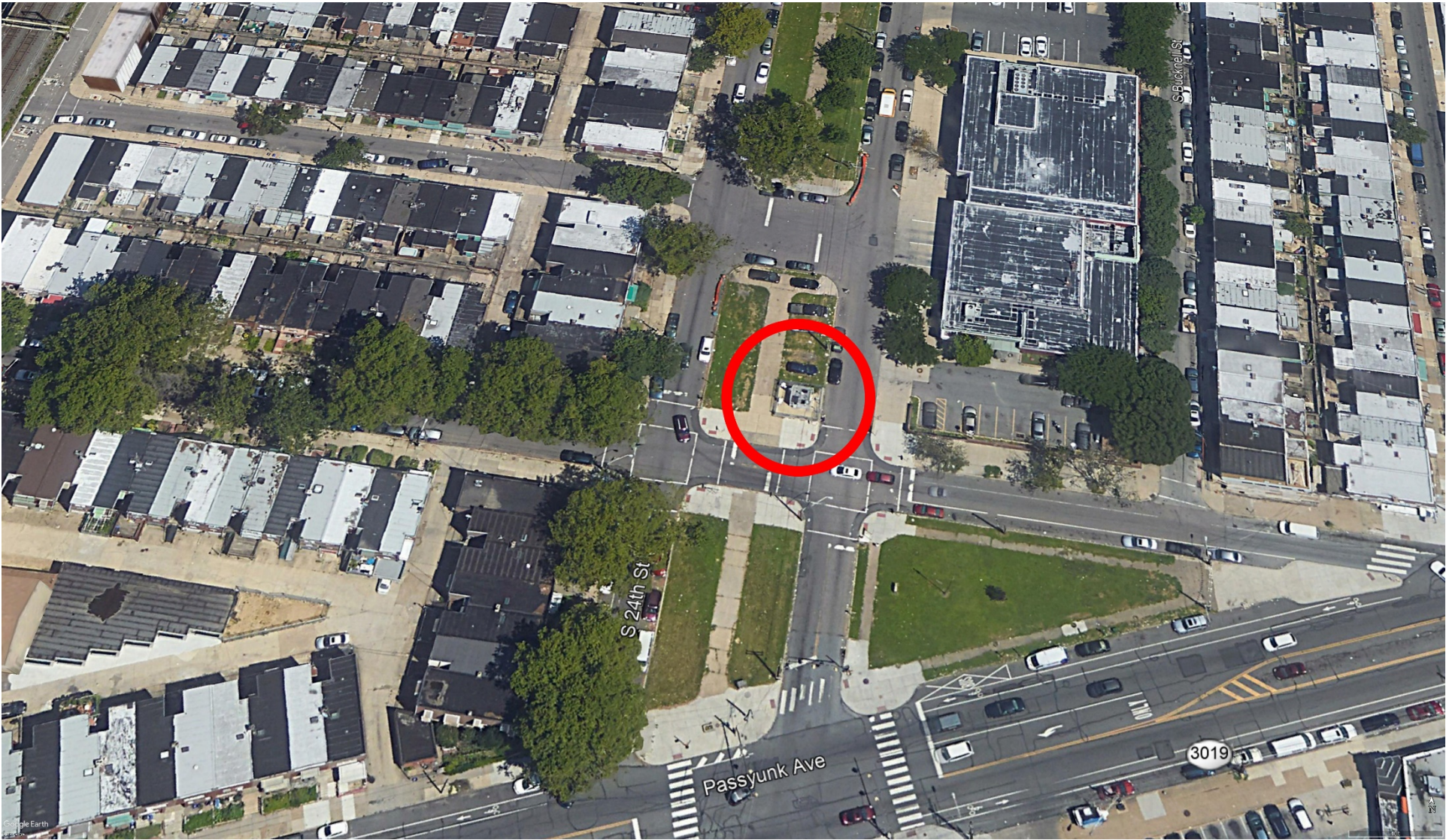


Table 7 – Detailed FAB Information with Monitoring Station Picture

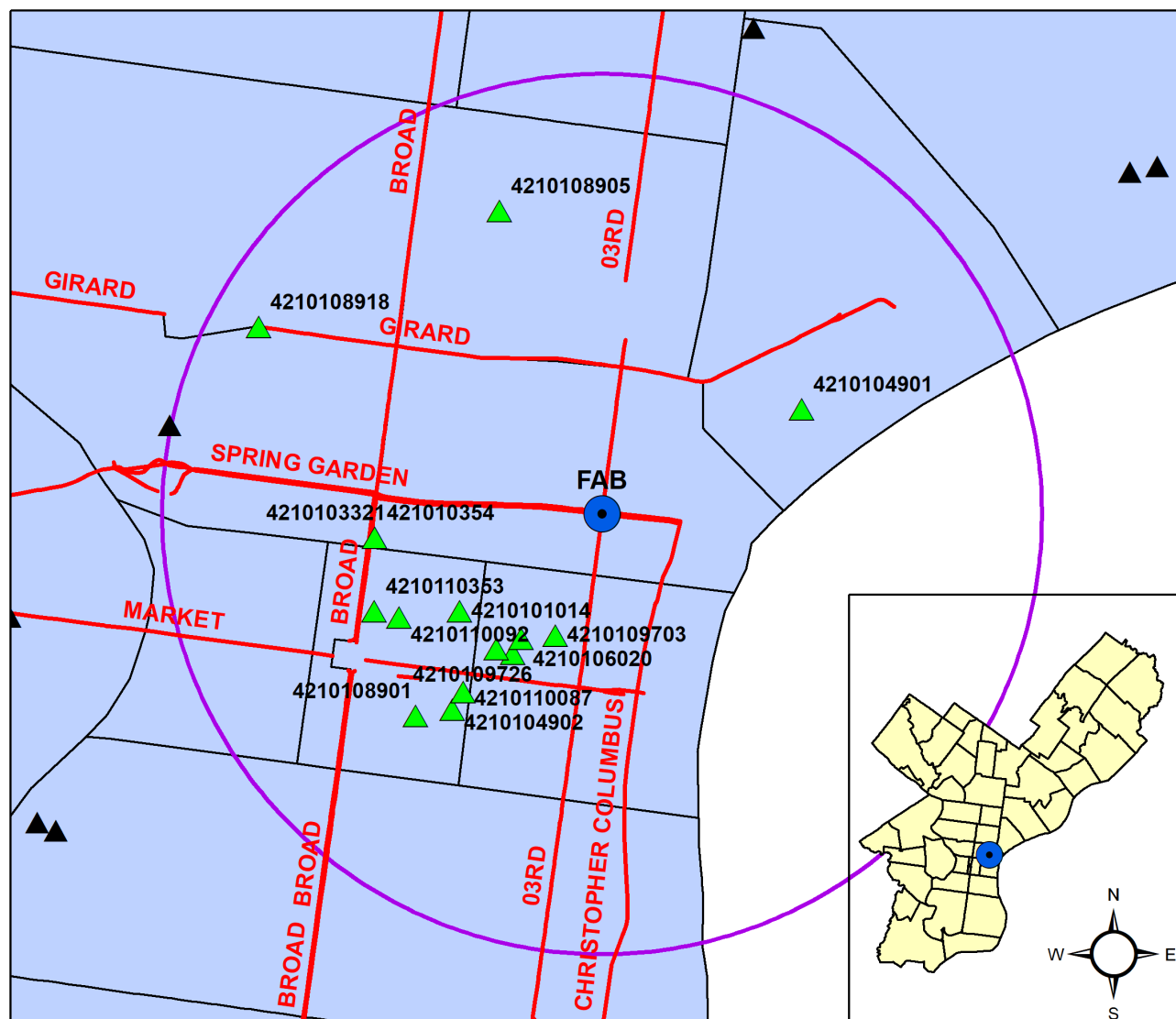
AMS SITE ID: FAB
AQS Site ID: 421010057
Street Address: 3rd and Spring Garden Sts.
Geographical Coordinates
Latitude: 39.960048
Longitude: -75.142614



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	236	Neighborhood	Highest Concentration	2	1/1/2020

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

FIRE ADMINISTRATION BUILDING - 3RD & SPRING GARDEN STS. EPA AIRS CODE: 421010057



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
4210108901	THOMAS JEFFERSON UNIV/PHILA	11 & WALNUT ST	0.000	0.516	2.501	0.169	0.169	0.156	0.127
4210104902	VICINITY ENERGY EDISON STATION	908 SANSOM ST	0.000	1.732	17.209	2.911	1.535	26.590	0.099
4210110087	HCP INC/PHIL	833 CHESTNUT ST	0.000	0.733	0.969	0.025	0.025	0.014	0.045
4210109723	WILLIAM J GREEN JR FED BLDG/GSA	600 ARCH ST	0.000	2.650	3.990	0.240	0.240	0.050	0.190
4210109726	FEDERAL BUR OF PRISONS/ PHILA COURT	700 ARCH ST	0.000	1.115	1.394	0.527	0.000	0.014	0.077
4210106020	FEDERAL RESERVE BANK/PHILA	100 N 6TH ST	0.000	1.893	2.524	0.190	0.190	0.043	0.138
4210109703	US MINT/PHILA	151 N INDEPENDENCE MALL E	0.000	4.192	2.892	0.088	0.000	0.019	1.393
4210110092	PA CONV CTR/ARCH ST	1101 ARCH ST	0.000	1.905	2.659	0.100	0.093	0.040	0.138
4210101014	VERIZON MKT CTRL OFC/RACE ST	900 RACE ST	0.000	0.172	1.470	0.133	0.022	0.124	0.100
4210110353	PA CONVENTION CTR ANNEX/BROAD ST	111 N BROAD ST	0.002	0.813	1.566	0.080	0.080	0.056	0.083
4210103321	SUNGARD RECOVERY SVC INC/BROAD ST PHILA	401 N BROAD ST STE 600	0.000	0.015	0.039	0.002	0.000	0.000	0.002
421010354	CROSS CONNECT/PHILADELPHIA	401 N BROAD ST	0.000	0.015	0.076	0.004	0.000	0.000	0.004
4210104901	EXELON GENERATION CO/DELAWARE STA	1325 N BEACH ST	0.000	0.377	2.689	0.171	0.016	0.045	0.013
4210108918	GIRARD COLL/BOARDING SCH	GIRARD & CORINTHIAN AVE	0.000	2.355	2.808	0.213	0.213	0.017	0.154
4210108905	TEMPLE UNIV/ MAIN CAMPUS	1009 W MONTGOMERY AVE	0.000	16.340	24.190	2.700	2.699	0.330	3.663

Figure 13 – FAB North Aerial View



Table 8 – Detailed SWA Information with Monitoring Station Picture

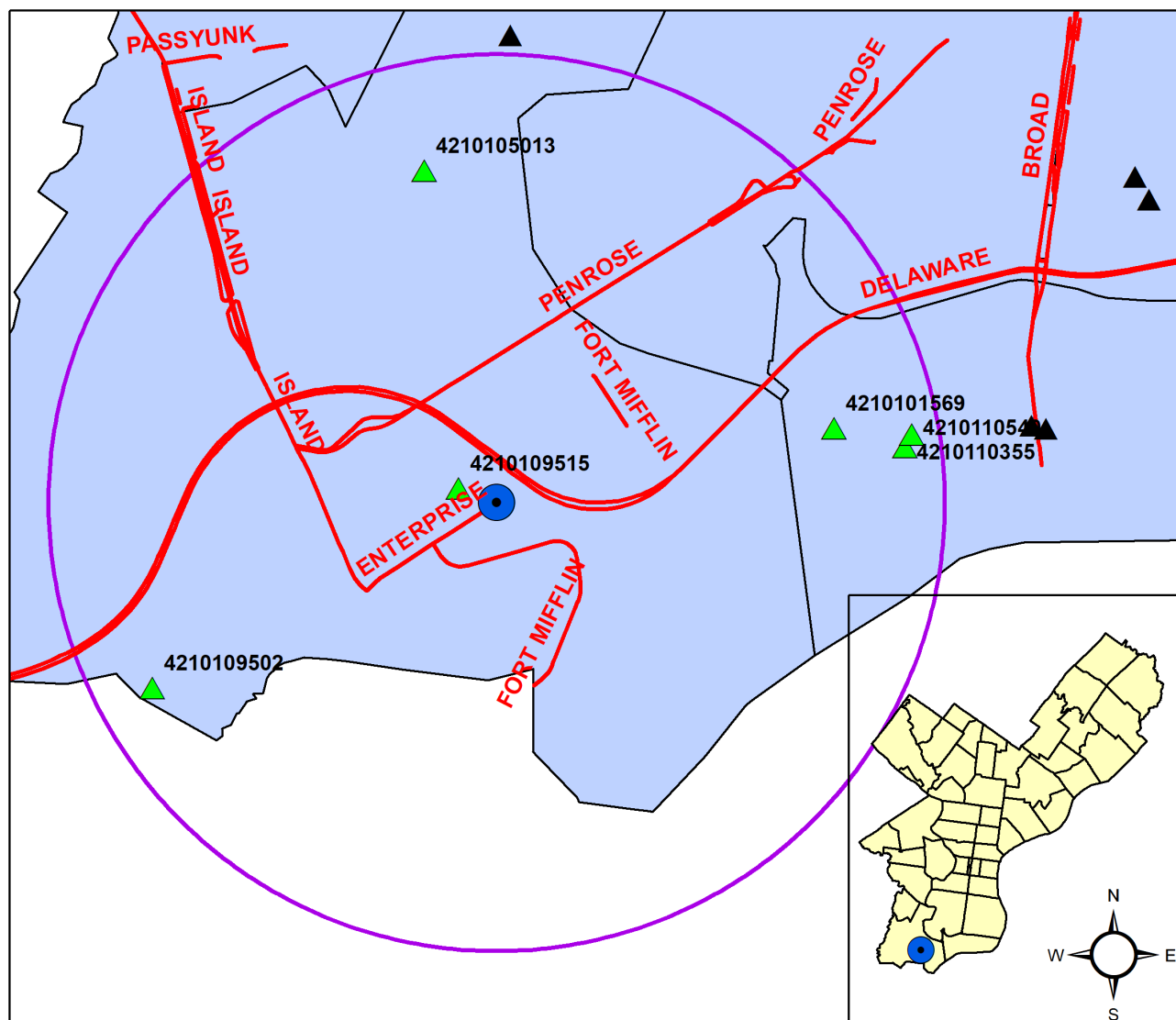
AMS SITE ID: SWA
AQS Site ID: 421010063
Street Address: 8200 Enterprise Avenue, 19153
Geographical Coordinates
Latitude: 39.88294
Longitude: -75.21965



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	HPLC		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

PHILADELPHIA AIRPORT - 8200 ENTERPRISE AVE. EPA AIRS CODE: 421010063



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
4210109502	PHILA INTL AIRPORT/PHILA	INDUSTRIAL HWY	0.000	6.791	14.255	1.387	1.387	0.102	0.879
4210109515	PHILA WATER DEPT/STP SW	8200 ENTERPRISE AVE	0.000	9.285	4.192	0.978	0.978	0.771	3.090
4210110355	PHILA SHIP REPAIR/PHILA	5195 S 19TH ST	0.000	4.094	18.918	2.308	0.000	0.007	8.714
4210110540	NAVY YARD PEAKER STATION	1901 KITTY HAWK AVE	0.000	6.140	3.200	0.001	0.001	0.009	2.540
4210101569	PHILLY SHIPYARD INC / PHILA	PHILA NAVAL BUS CTR	0.000	0.024	0.014	7.295	6.707	0.000	11.547
4210105013	PBF LOGISTICS TERM 67TH ST/PHILA	6850 ESSINGTON AVE	0.000	1.293	1.539	0.113	0.113	0.010	52.915

Figure 15 – SWA North Aerial View



Table 9 – Detailed TOR Information with Station Monitoring Picture

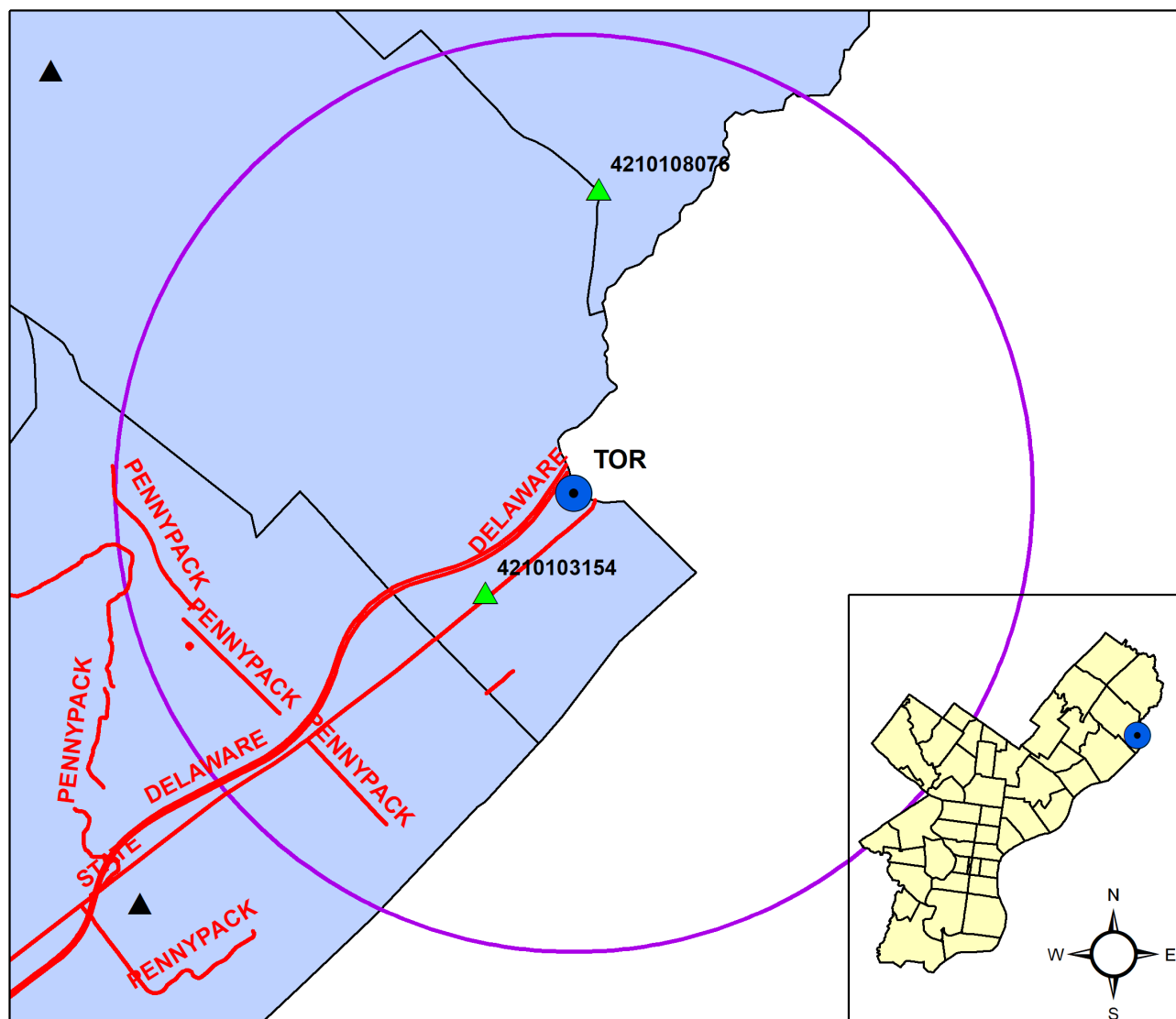
AMS SITE ID: TOR
AQS Site ID: 421010075
Street Address: 4901 Grant Ave. & James St., 19114
Geographical Coordinates
Latitude: 40.054171
Longitude: -74.985166



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	236	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

TORRESDALE - 4901 GRANT AVE. & JAMES ST. **EPA AIRS CODE: 421010075**



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
4210103154	JOWITT AND RODGERS CO/STATE RD FAC	9400 STATE RD	0.000	0.036	0.180	0.020	0.014	0.001	8.949
4210108076	JEFFERSON TORRESDALE HOSPITAL	RED LION & KNIGHTS RD	0.000	7.301	10.344	0.521	0.000	0.122	0.807

Figure 17 – TOR North Aerial View

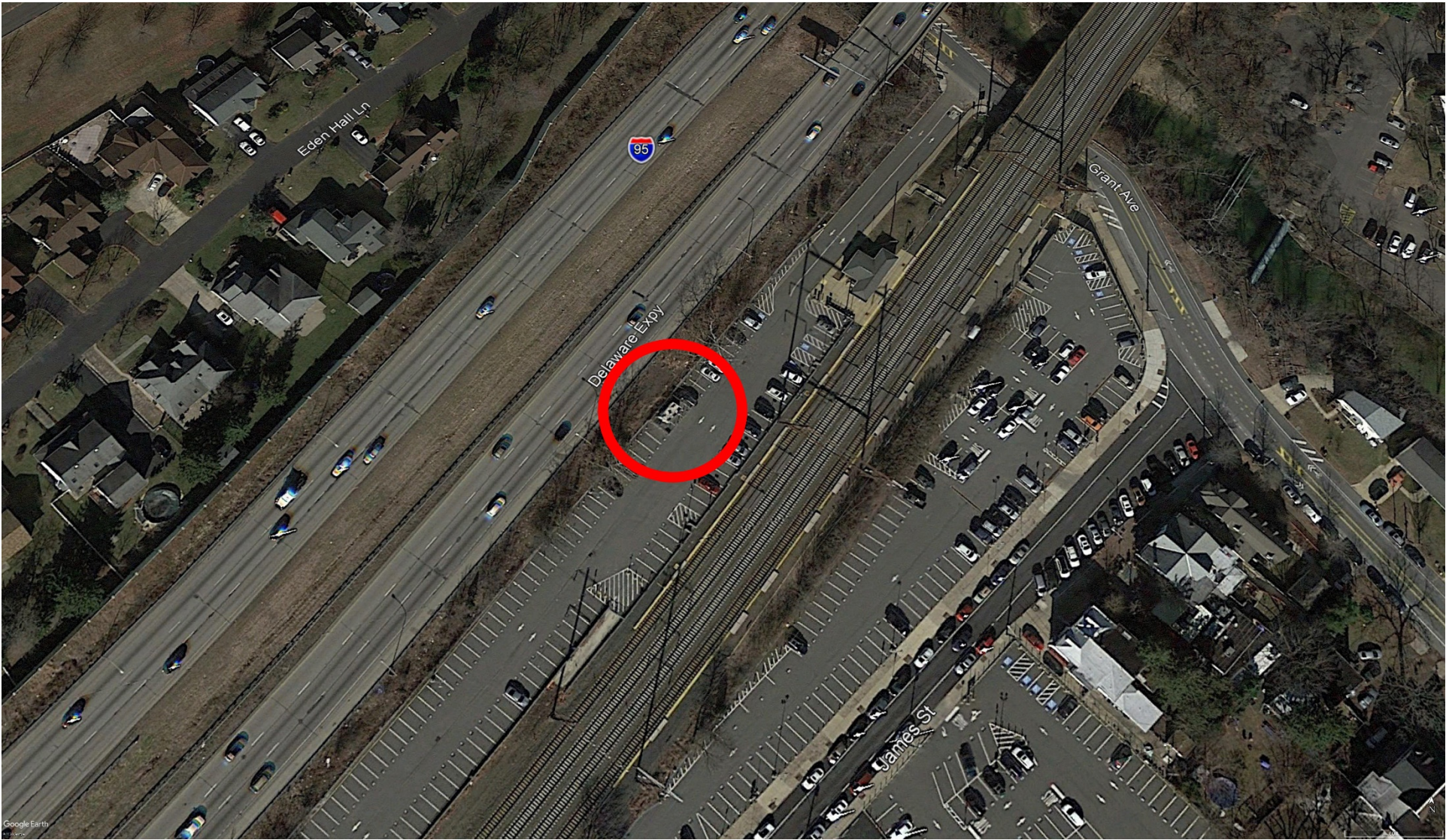


Table 10 Detailed MON Information with Monitoring Station Picture

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

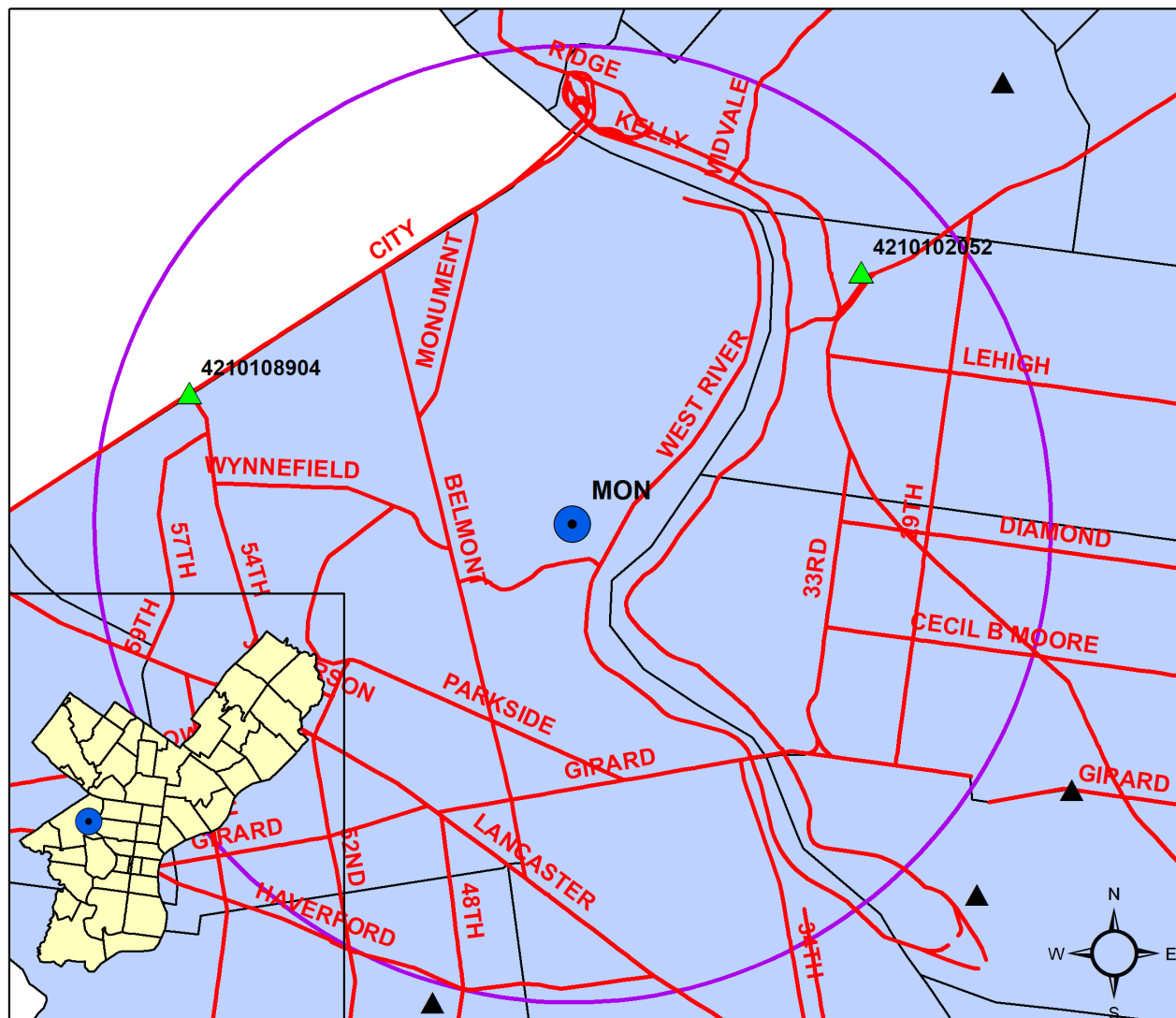


Parameter	Monitoring Type	Monitor Network Affiliation	Operating Schedule	Collection Method	Analysis Method	Comments	Parameter Code	POC	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO	SLAMS	Near Road	Continuous	Instrumental	Gas Filter Correlation CO Analyzer		42101	1	093	Microscale	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	236	Neighborhood	Highest Concentration, Source Oriented	4	6/1/2020
Black Carbon	SLAMS	Near Road	Continuous	Instrumental	Teledyne Model 633		88317	1	894	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
Ultrafine Particulate	SLAMS	Near Road	Continuous	Instrumental	Teledyne Model 651		87101	1	173	Microscale	Highest Concentration, Source Oriented	4	7/1/2015

BaP	SLAMS	Near Road	1/6 days	Hi-Vol- SA/GMW- 321-B	Gravimetric	Integrated samplers. Weighed by AMS. Analysis by Allegheny County, PA	17242	1	091	Microscale	Highest Concentration, Source Oriented	4	7/1/2015
Metals	Other	Near Road	1/6 days	Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz)	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

MONTGOMERY - INTERSTATE 76 & MONTGOMERY DR EPA AIRS CODE: 421010076



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
4210108904	SAINT JOSEPHS UNIV/PHILA	54TH & CITY AVE	0.000	5.530	7.010	0.530	0.530	0.140	0.400
4210102052	SUN CHEM CORP/HUNTING PARK PLT	3301 W HUNTING PARK AVE	0.000	0.304	0.362	0.086	0.086	0.002	10.061

Figure 19 – MON North Aerial View

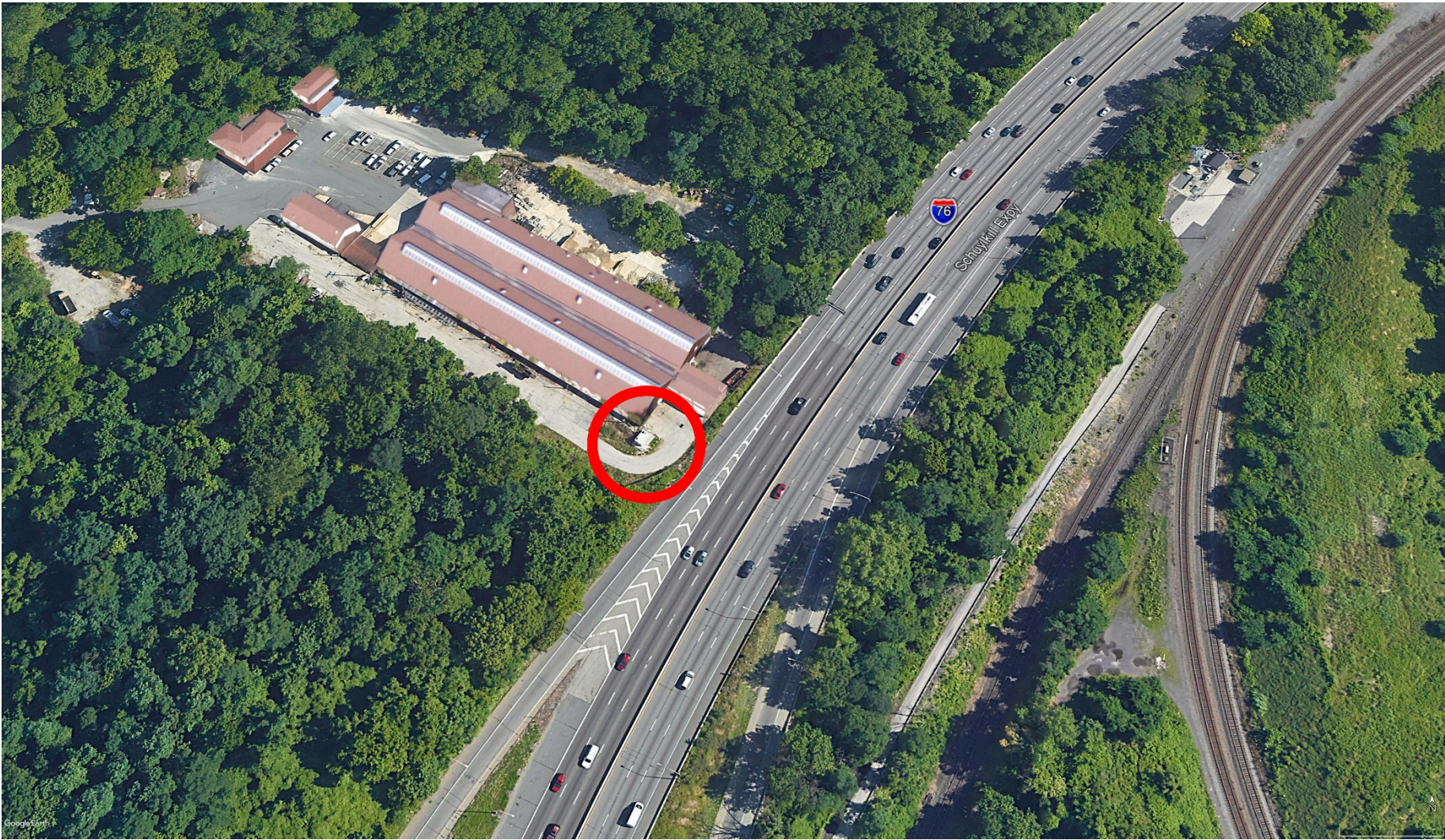


Table 11 – Detailed VGR Information with Monitoring Station Picture

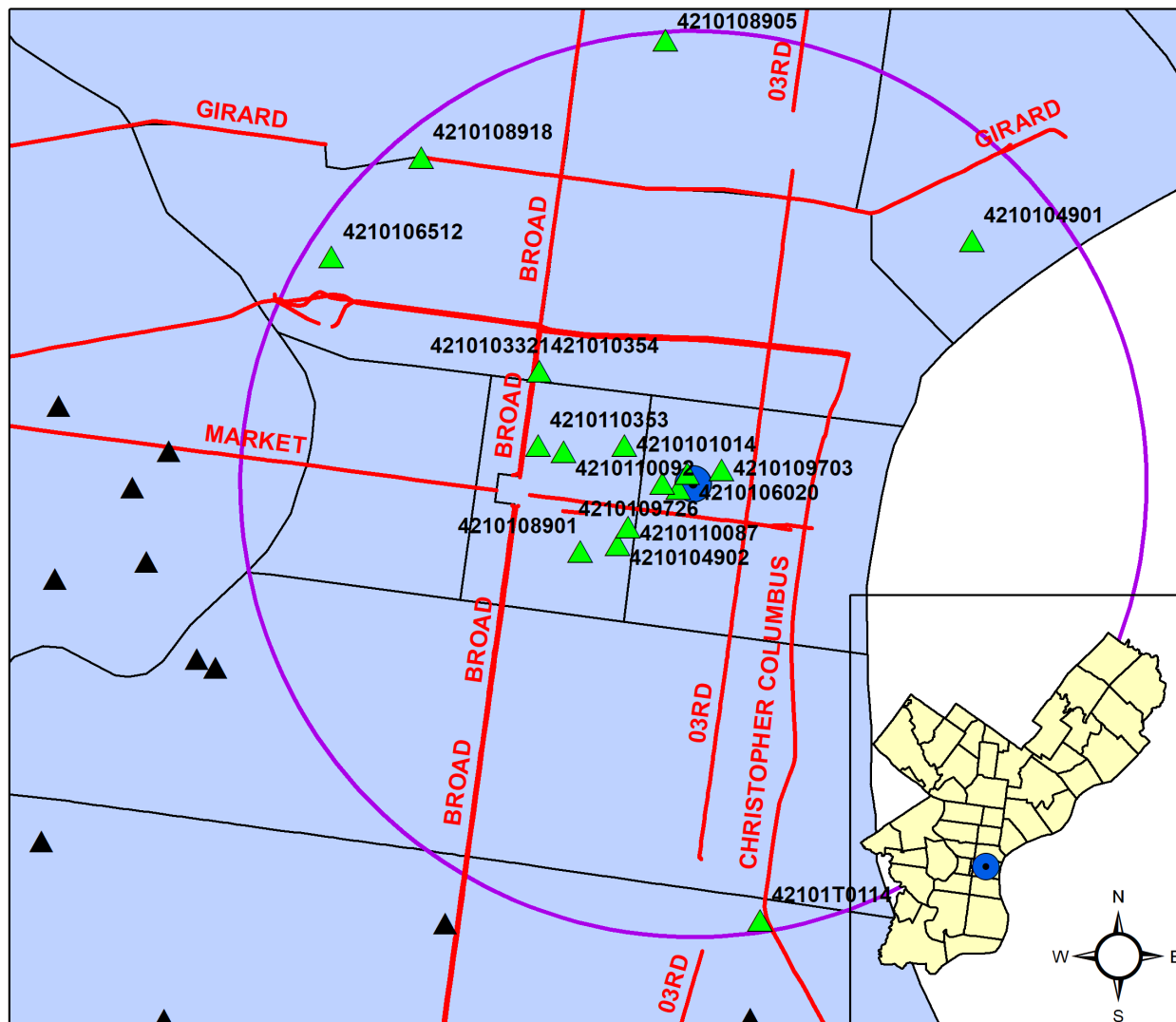
AMS SITE ID: VGR
AQS Site ID:
Street Address: 6th & Arch Streets
Geographical Coordinates
Latitude: 39.952608
Longitude: -75.149704



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							3/15/2015
PM2.5 Continuous			Continuous	Thermo		Not in AQS							3/15/2015
Meteorological			Continuous		Wind speed, wind direction, humidity, temperature	Not in AQS							3/15/2015

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

VILLAGE GREEN 6TH & ARCH STS.



SiteID	Facility Name	Address	2019 Emissions (tons)						
			Pb	CO	NOX	PM10	PM2.5	SO2	VOC
42101T0114	COATING & CONVERTING TECH CORP/ADHESIVE COATING	80 E MORRIS ST	0.000	0.371	0.442	0.034	0.034	0.003	4.395
4210108901	THOMAS JEFFERSON UNIV/PHILA	11 & WALNUT ST	0.000	0.516	2.501	0.169	0.169	0.156	0.127
4210104902	VICINITY ENERGY EDISON STATION	908 SANSOM ST	0.000	1.732	17.209	2.911	1.535	26.590	0.099
4210110087	HCP INC/PHIL	833 CHESTNUT ST	0.000	0.733	0.969	0.025	0.025	0.014	0.045
4210109723	WILLIAM J GREEN JR FED BLDG/GSA	600 ARCH ST	0.000	2.650	3.990	0.240	0.240	0.050	0.190
4210109726	FEDERAL BUR OF PRISONS/ PHILA COURT	700 ARCH ST	0.000	1.115	1.394	0.527	0.000	0.014	0.077
4210106020	FEDERAL RESERVE BANK/PHILA	100 N 6TH ST	0.000	1.893	2.524	0.190	0.190	0.043	0.138
4210109703	US MINT/PHILA	151 N INDEPENDENCE MALL E	0.000	4.192	2.892	0.088	0.000	0.019	1.393
4210110092	PA CONV CTR/ARCH ST	1101 ARCH ST	0.000	1.905	2.659	0.100	0.093	0.040	0.138
4210101014	VERIZON MKT CTRL OFC/RACE ST	900 RACE ST	0.000	0.172	1.470	0.133	0.022	0.124	0.100
4210110353	PA CONVENTION CTR ANNEX/BROAD ST	111 N BROAD ST	0.002	0.813	1.566	0.080	0.080	0.056	0.083
4210103321	SUNGARD RECOVERY SVC INC/BROAD ST PHILA	401 N BROAD ST STE 600	0.000	0.015	0.039	0.002	0.000	0.000	0.002
421010354	CROSS CONNECT/PHILADELPHIA	401 N BROAD ST	0.000	0.015	0.076	0.004	0.000	0.000	0.004
4210104901	EXELON GENERATION CO/DELAWARE STA	1325 N BEACH ST	0.000	0.377	2.689	0.171	0.016	0.045	0.013
4210106512	PHILADELPHIAN CONDOMINIUMS/PHILA	2401 PENNSYLVANIA AVE	0.000	1.577	1.987	0.151	0.151	0.011	0.089
4210108918	GIRARD COLL/BOARDING SCH	GIRARD & CORINTHIAN AVE	0.000	2.355	2.808	0.213	0.213	0.017	0.154
4210108905	TEMPLE UNIV/ MAIN CAMPUS	1009 W MONTGOMERY AVE	0.000	16.340	24.190	2.700	2.699	0.330	3.663

Figure 21 – VGR North Aerial View



Appendix A

PAMS Implementation Network Plan

PAMS Monitoring Implementation Network Plan

Monitoring Organizations Required To Operate At NCore Sites

Philadelphia Air Management Services operates one Photochemical Assessment Monitoring Station (PAMS) site in the air monitoring network, at the NEW site, per the monitoring rule (80 FR 65292; October 26, 2015) which requires PAMS measurements June 1 through August 31 at NCore sites that are located in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more.

The main objective of the PAMS program is to develop a database of ozone precursors and meteorological measurements to support ozone model development and track the trends of important ozone precursor concentrations. The EPA and other scientists use the data collected from the PAMS network to develop, evaluate, and improve ozone models.

Per 85 FR 834; February 7, 2020, the EPA finalized a revision to the start date for the updated PAMS monitoring site network established in 40 CFR part 58, Appendix D. This final action extended the start date from June 1, 2019, to June 1, 2021, giving state and local air monitoring agencies two additional years to acquire the necessary equipment and expertise needed to successfully make the required PAMS measurements by the start of the 2021 PAMS season.

Network Decision

The NCore site located at NEW serves as the location of the required PAMS site and measures the following parameters described below. An Inventory of equipment used at the site(s) is provided in Attachment 2.

Auto GC Decision

Volatile organic compounds (VOCs) – A complete list of the targeted compounds are found in Table 1.

We will measure hourly speciated VOC concentrations with an auto-gas chromatograph (GC) using the Consolidated Analytical Systems (CAS).

Meteorology Measurements Decision

We will measure mixing height using the Vaisala CL51 Ceilometer.

Other Required Measurements

- **Carbonyls** - Carbonyl sampling at a frequency of three 8-hour samples on a one-in-three day basis (~90 samples per PAMS sampling season) using ATEC Sampler and Waters HPLC equipment for analysis. A complete list of the target carbonyl compounds may be found in Table 1. The TO-11A test method, as used in the National Air Toxics Trends (NATTS) program⁴ will be used.

⁴ See NATTS Technical Assistance Document for TO-11A method.

- **Nitrogen Oxides** - Will monitor for NO and NO_y (total oxides of nitrogen) in addition to true NO₂. The true NO₂ is required to be measured with a direct reading NO₂ analyzer, cavity attenuated phase shift (CAPS) spectroscopy or photolytic-converter NO_x analyzer. We will measure true NO₂ using the Teledyne T500U. NO and NO_y will be measured using Teledyne instrumentation as well.

Table 1 PAMS Target Compound List

Priority Compounds				Optional Compounds			
1	1,2,3-trimethylbenzene ^a	19	n-hexane ^b	1	1,3,5-trimethylbenzene	19	m-diethylbenzene
2	1,2,4-trimethylbenzene ^a	20	n-pentane	2	1-pentene	20	methyleyclohexane
3	1-butene	21	o-ethyltoluene ^a	3	2,2-dimethylbutane	21	methyleyclopentane
4	2,2,4-trimethylpentane ^b	22	o-xylene ^{a,b}	4	2,3,4-trimethylpentane	22	n-decane
5	acetaldehyde ^{b,c}	23	p-ethyltoluene ^a	5	2,3-dimethylbutane	23	n-heptane
6	acetone ^{c,d}	24	Propane	6	2,3-dimethylpentane	24	n-nonane
7	benzene ^{a,b}	25	propylene	7	2,4-dimethylpentane	25	n-octane
8	c-2-butene	26	styrene ^{a,b}	8	2-methylheptane	26	n-propylbenzene ^a
9	ethane ^d	27	toluene ^{a,b}	9	2-methylhexane	27	n-undecane
10	ethylbenzene ^{a,b}	28	t-2-butene	10	2-methylpentane	28	p-diethylbenzene
11	Ethylene			11	3-methylheptane	29	t-2-pentene
12	formaldehyde ^{b,c}			12	3-methylhexane	30	α/β-pinene
13	Isobutane			13	3-methylpentane	31	1,3 butadiene ^b
14	Isopentane			14	Acetylene	32	benzaldehyde ^c
15	Isoprene			15	c-2-pentene	33	carbon tetrachloride ^b
16	m&p-xylenes ^{a,b}			16	cyclohexane	34	Ethanol
17	m-ethyltoluene ^a			17	cyclopentane	35	Tetrachloroethylene ^b
18	n-butane			18	isopropylbenzene ^b		

Source: Revisions to the Photochemical Assessment Monitoring Stations Compound Target List.
U.S. EPA, November 20, 2013

^a Important SOAP (Secondary Organic Aerosols Precursor) Compounds

^b HAP (Hazardous Air Pollutant) Compounds

^c Carbonyl compounds

^d Non-reactive compounds, not considered to be VOC for regulatory purposes

Attachment 2 Equipment Inventory

Region	3
State	PA
Local	Philadelphia
AQS ID	42-101-0048
MSA	Philadelphia- Camden- Wilmington, PA-NJ-DE-MD

Parameter	Category	Detail
Agency	What is the monitoring agency name responsible for the PAMS Required Site?	Philadelphia Air Management Services
Site	PAMS Pollutant Site AQS ID (where auto-GC, carbonyls, NO2 are measured)	42-101-0048
	PAMS Meteorology Site AQS ID (for ceilometer, UV, solar measurements if not at pollutant site)	
	Are you operating a PAMS EMP site or sites? If so, please list	
Mixing Layer Height (MLH)	Is a ceilometer installed at the site or alternate meteorology site?	Yes
	Is an instrument type other than a ceilometer to be used for MLH?	No
	instrument type (ceilometer, radar profiler, etc)	Ceilometer
	manufacturer (e.g., Vaisala, Lufft)	Vaisala
	model (e.g., CL-51, CHM15k, CL-31)	CL-51
	date installed at site	1/1/2018
	MLH software (e.g., BL-View)	BL-View
	MLH software version	2.1.1.0
	Are ceilometer data sent to the UMBC ceilometer database?	Yes
	If ceilometer data are not sent to UMBC, why not? (e.g., IT will not allow, no ethernet at site)	
	comments (include problems, delays, difficulty, etc)	
Auto-GC	Is the auto-GC installed and operating (generating data)? If not, when is this anticipated?	19-Apr
	Auto-GC manufacturer/model	CAS-Chromatotec (FID)
	Is there a service contract for the auto-GC?	Yes
	Do you have a dynamic dilution system? If so, please list manufacturer and model	Yes, Entech 4700
	Zero air generator manufacturer/model - 1	CAS/AirmoCAL
	Zero air generator manufacturer/model - 2 (e.g., TOC generator)	
	Hydrogen generator manufacturer/model	CAS/Hydroxychrom
	Compressor manufacturer/model	
	Is the site reporting all priority compounds to AQS?	Yes
	Is the site reporting all optional compounds to AQS? If not, which are not reported and why?	It is our plan to report all optional compounds
	Do you have an operator chosen for the instrument? If yes, who?	Yes, Morgan K Robinson
	Please indicate your intended monitoring schedule: a. June 1 to August 31, b. year round, c. other (please indicate)	June 1 to August 31
	Have you determined the residence time to be less than or equal to 20 s?	yes

	Please indicate the method used to determine residence time (e.g. PAMS workgroup spreadsheet template or in-house spreadsheet)	PAMS workgroup spreadsheet template
	comments (include problems, delays, difficulty, etc)	
Data Acquisition System (DAS)	Will a DAS be used for PAMS pollutant and/or meteorology instruments?	Yes
	Pollutant DAS (manufacturer and model)	Agilaire 8872 AirVision
	Meteorology DAS (manufacturer and model)	Agilaire 8872 AirVision
	comments	
True NO ₂ Measurement	Is a true NO ₂ instrument installed and operating?	Yes
	Instrument manufacturer and model	Teledyne T500U
	Gas calibrator manufacturer and model	Teledyne T700U
	What is the diluent mass flow controller range (e.g. 500 to 5000 cc/min)	0 to 20 LPM
	What is the standard gas mass flow controller range (e.g. 10 to 100 cc/min)?	CAL1: 0 to 200 cc/min CAL2: 0 to 20 cc/min
	What zero air generator (make/model) will support the instrument?	Teledyne T701H
	Method of NO ₂ calibration (GPT or NO ₂ standard gas dilution)	GPT
	What is the name/location of the gas supplier (e.g. Airgas, Cincinnati, OH)?	Praxair, Morrisville, PA
	comments (include problems, delays, difficulty, etc)	
NO _y (total reactive nitrogen compounds) Measurement	Is an NO _y instrument installed and operating?	Yes
	Instrument manufacturer and model	Teledyne 200U
	Gas calibrator manufacturer and model	Teledyne T700U
	What is the diluent mass flow controller range (e.g. 500 to 5000 cc/min)	0 to 20 LPM
	What is the standard gas mass flow controller range (e.g. 10 to 100 cc/min)?	CAL1: 0 to 200 cc/min CAL2: 0 to 20 cc/min
	What zero air generator (make/model) will support the instrument?	Teledyne T701H
	Method of NO/NO ₂ calibration (GPT or NO ₂ standard gas dilution)	GPT
	What is the name/location of the gas supplier (e.g. Airgas, Cincinnati, OH)?	Praxair, Morrisville, PA
	comments (include problems, delays, difficulty, etc)	
Carbonyls Sampling	Is an carbonyls sampler (capable of 3 consecutive 8-hour samples) installed and operating?	Yes
	Has the carbonyls sampler undergone zero certification and MFC calibration?	No
	Carbonyls sampler manufacturer and model	ATEC
	Flow transfer standard manufacturer and model	BIOS Definer 220-M
	Flow transfer standard calibration date	9/1/2021; 12/29/2021
	Do you intend to collect precision (duplicate and/or collocated samples - please indicate which)?	
	Do you have a continuous formaldehyde monitor installed or plan to purchase one?	No
	comments (include problems, delays, difficulty, etc)	
Carbonyls Analysis	Please identify the carbonyls analytical support laboratory	Philadelphia Air Management Services
	comments	
Temperature	Is a temperature probe installed and operating?	Yes
	Temperature probe manufacturer and model	Vaisala WXT 520
	comments	10 meter high

Relative Humidity	Is a relative humidity probe installed and operating?	Yes
	Relative humidity instrument manufacturer and model	Vaisala WXT 520
	comments	10 meter high
Barometric Pressure	Is a barometer (or equivalent barometric pressure instrument) installed and operating?	Yes
	Barometric pressure instrument manufacturer and model	Vaisala WXT520
	comments	
UV Radiation	Is a UV radiometer installed and operating?	Yes
	UV instrument manufacturer and model	Eppley TUVR
	comments	
Solar Radiation	Is a solar pyranometer/radiometer installed and operating?	Yes
	Solar instrument manufacturer and model	MetOne 094
	comments	
Precipitation	Is a precipitation gauge installed and operating?	Yes
	Precipitation gauge manufacturer and model	MetOne 375C
	comments	
Wind Speed/ Wind Direction	Is a wind speed/wind direction instrument array installed and operating?	Yes
	manufacturer(s)	Vaisala
	model(s)	WXT520
	comments	10 meter high

Appendix B
Philadelphia Air Quality Survey

Philadelphia Air Quality Survey Project Overview

Objectives

Although the City of Philadelphia has operated a network of EPA sponsored regulatory air monitoring stations for many years, the number of these stations is usually small, and the locations of the stations cannot reflect neighborhood level variances of air quality across the city. This project aims to fill the gap 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}, NO₂, ozone, SO₂, 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 winter time 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 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 is mounted on an utility pole about 10 – 11 feet above the ground.

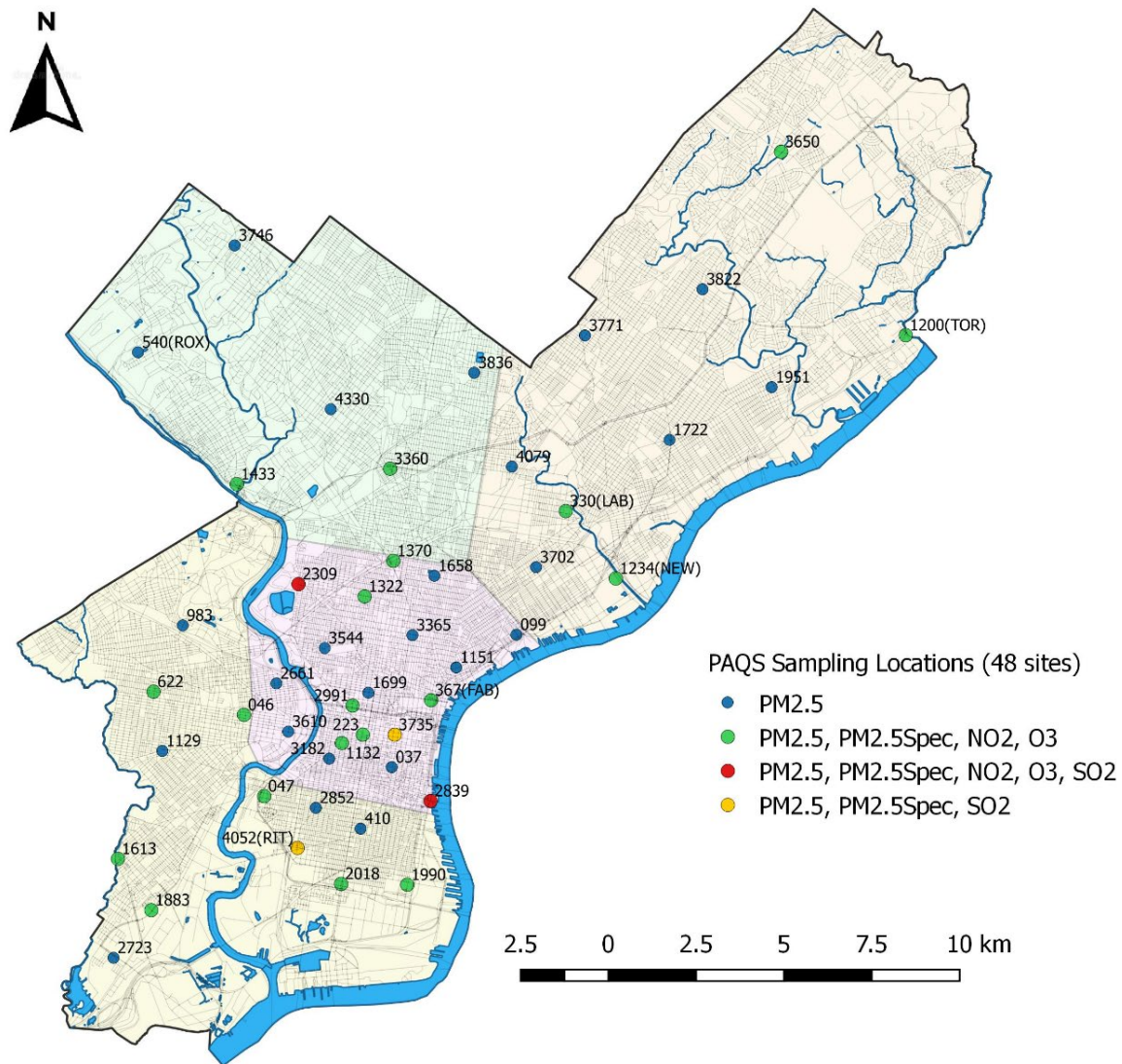
Sampling Unit: The sampling unit contains a filter based PM_{2.5} sample collector. At some of the sites, the sampling unit also includes NO₂, SO₂, and/or O₃ passive samplers. The unit contains meteorological sensors as well and is powered by two batteries.

Sampling Operation: The sampling unit operates on 2-week sampling cycles. Four sites, known as "reference sites", are monitored with consecutive sampling periods throughout the year to provide a time series of pollutant concentrations. For the rest of the sites, sampling units are 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 to 13 other sites are monitored. These 11 – 13 sites in each session are 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 is ongoing. 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 report⁵ based on the first two years' data has been produced. During the period from September 2018 through August 2019, the site with the highest 12-month average PM_{2.5} concentration had a value of 10.1 µg/m³ (in Center City); the lowest was 6.4 µg/m³ (in Northwest Philadelphia); and the citywide all-sites 12-month average PM_{2.5} concentration was 7.9 µg/m³. Based on data analysis of the first two years' measurements, minor adjustments have been made in the monitoring site network in order to: 1) add sampling sites where local communities had significant air quality concerns but monitoring data were unavailable, and 2) discontinue sites where both the air pollution levels and the population density were relatively low. After these adjustments, the PAQS project maintains 48 sampling sites starting September 2020, as shown in the map below.



⁵ https://www.phila.gov/media/20210316150355/PAQS_Report_Sept4-2020_final.pdf

Appendix C
2020 Community-Scale Air Toxics Ambient Monitoring Grant

2020 Community-Scale Air Toxics Ambient Monitoring Grant Project

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 will focus on monitoring the top seven air toxics in Philadelphia: formaldehyde, benzene, carbon tetrachloride, naphthalene, acetaldehyde, 1,3-butadiene, and ethylene oxide.

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

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

Rational

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

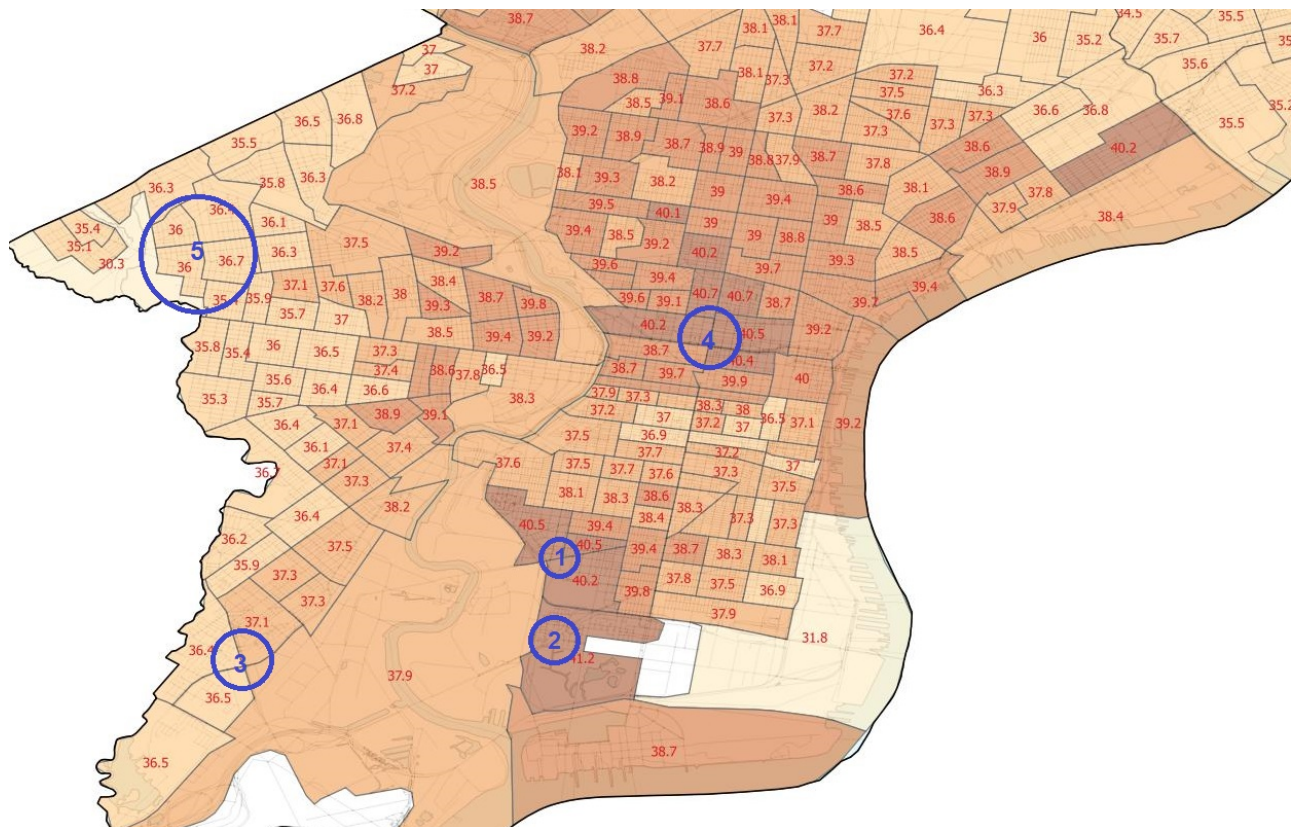
Passive samplers will be used to continuously measure the air toxics. The sampling period will last at least 12 months. A weather-proof sampler housing will be installed at a height about 3 meters above the ground at each site (as illustrated below). EPA designated analytical methods (GC/MS and uHPLC) will be used in sample analysis.



Project Timeline (2 years in total, 1 year of air sampling operation)

Activity	Nov – Dec 2020	Jan – Mar 2021	Apr – Jun 2021	Jul – Sep 2021	Oct – Dec 2021	Jan – Mar 2022	Apr – Jun 2022	Jul – Oct 2022
Equipment purchase and testing, training	X	X	X					
Preparation for sites and field sampling		X	X					
Sampling intensives			(may start in 2021Q2 pending equipment purchase)	X	X	X	X	
Data analysis / assessment					X	X	X	X
Preliminary assessment reports						X		
Final Report								X

Proposed Monitoring Locations:



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

Appendix D

Proof of Publication