

# 2013-2014 Air Monitoring Network Plan

City of Philadelphia  
Department of Public Health  
Air Management Services

July 1, 2013

## 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-Wilmington-Atlantic City, 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.epa.gov/ttnamti1/40cfr53.html>.

Beginning July 1, 2007, and each year thereafter, AMS has submitted to EPA Region III, an Air Monitoring Network Plan (Plan) 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.

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 - C:

- 1. Announcement of Future Changes to the Network** - This section provides information on how the public is made aware of the Plan 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. Philadelphia's Meteorology and Topography** - This section describes the general meteorology relative to wind and air stagnation and the impact of topography on Philadelphia's meteorology
- 4. Current Network at a Glance** - This section shows the location of the monitoring sites and the pollutants measured at each site.

- 5. 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.
- 6. 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.
- 7. Potential 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 Plan.
- 8. NO<sub>2</sub> Monitoring Network** - Per 40 CFR Part 58.10(a)(5), this section documents how AMS will establish NO<sub>2</sub> monitoring sites in response to the new 1-hour standard.
- 9. CO Monitoring Network** - Per 40 CFR Part 58 Appendix D 4.2.1, this section documents the minimum requirements for CO monitors.
- 10. Changes to a Violating PM<sub>2.5</sub> Monitor** - Per 40 CFR Part 58.10(c), this section documents changes to the PM<sub>2.5</sub> monitoring network that impact the location of a violating PM<sub>2.5</sub> monitor.
- 11. Exclusion of Certain PM<sub>2.5</sub> Continuous FEM Data from Comparison to the NAAQS** - Per 40 CFR Part 58.10 (b) and Part 58.11 (e), this section documents the request to exclude PM<sub>2.5</sub> Continuous FEM Data from the LAB site for NAAQS and AQI purposes.
- 12. NCore Monitoring Site – Relocation from BAX to ROX** - This section describes the current status of and the reasoning behind the involuntary relocation of the current NCore monitoring station (BAX).
- 13. Detailed Information on Each Site** - This is the largest section of the Plan. 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.
- 14. Detailed Information by Pollutant** - The report is completed with detailed information for each the following pollutants: Ozone, Carbon Monoxide, Nitrogen Dioxide, Sulfur Dioxide, Lead, Particulate Matter, and Toxics. The monitoring of each pollutant is described by a map showing where the pollutant is monitored, National Ambient Air Quality Standard (if there is one) and a text description and trend graphs showing the concentration of the pollutant over a number of years.

## **15. Appendices**

- **Siting Criteria** - Appendix A summarizes the probe and monitoring path siting criteria.
- **Request to Exclude PM<sub>2.5</sub> Continuous FEM Data** – Appendix B provides information regarding the request to exclude data from PM<sub>2.5</sub> Continuous FEM from the LAB site.
- **Torresdale Near-road Monitoring Station** – Appendix C provides information regarding the new Torresdale (TOR) near-road NO<sub>2</sub> and CO monitoring station.

AMS has provided a copy of the Plan for public inspection on the City's website at: <http://www.phila.gov/health/airmanagement/index.html>.

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

Mr. Henry Kim  
Chief of Program Services  
Air Management Services  
321 University Avenue, 2nd Floor  
Philadelphia, PA 19104  
Phone: 215-685-9439  
E-mail: [henry.kim@phila.gov](mailto:henry.kim@phila.gov)

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## Announcement of Future Changes to the Network

Beginning July 1, 2007, and each year thereafter, AMS has submitted to EPA Region III, a Plan assuring that the network stations continue to meet the criteria established by federal regulations. At least 30 days prior to July 1 of each year, AMS announces to the public the availability of the Plan through notices published in the *Philadelphia Daily News* and the *Pennsylvania Bulletin*. Copies of the Plan are available for public inspection on the City's website under the Department of Public Health, Air Management Services at:

<http://www.phila.gov/health/airmanagement/index.html>

and at the AMS office:

Air Management Services  
321 University Avenue, 2nd Floor  
Philadelphia, PA 19104  
Phone – 215-685-7586

Provisions will be made to accommodate comments and questions concerning the air monitoring network or the Plan. If comments are received, they will be considered for incorporation into the Plan.

# 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 Plan, air monitoring sites and monitoring equipment are specifically identified relative to these air monitoring programs:

- **NAMS** - National Air Monitoring Stations. This network provides ambient levels of criteria air pollutants (carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate and lead). These sites are established with the intent that they will operate over many years and provide both current and historical information.
- **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<sub>2.5</sub>, speciated PM<sub>2.5</sub>, PM<sub>10-2.5</sub>), O<sub>3</sub>, SO<sub>2</sub>, CO, nitrogen oxides (NO/NO<sub>2</sub>/NO<sub>y</sub>), Pb, 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<sub>2</sub>/CO and all other State or locally operated stations that have not been designated as SPM stations.
- **PAMS** - Photochemical Assessment Monitoring Stations.
- **STN** - A PM<sub>2.5</sub> speciation station designated to be part of the Speciation Trends Network. This network provides chemical species data of fine particulate. These sites are established with the intent that they will operate over many years and provide both current and historical information.
- **State speciation site** - A supplemental PM<sub>2.5</sub> speciation station that is not part of the speciation trends network.
- **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. The agency may designate a monitor as an SPM after January 1, 2007 only if it is a new monitor or for a monitor included in the monitoring plan prior to January 1, 2007, if the Regional Administrator has approved the discontinuation of the monitor as a SLAMS site.

## Measurement Methods

- **Approved Regional Method (ARM)** - A continuous PM<sub>2.5</sub> method that has been approved specifically within a State or Local air monitoring network for purposes of comparison to the NAAQS and to meet other monitoring objectives.
- **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

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

- **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<sub>3</sub>)**
  - **Sulfur Dioxide (SO<sub>2</sub>)**
  - **Carbon Monoxide (CO)**
  - **Nitrogen Dioxide (NO<sub>2</sub>)**
    - NO means nitrogen oxide.
    - NO<sub>x</sub> means oxides of nitrogen and is defined as the sum of the concentrations of NO<sub>2</sub> and NO.
    - NO<sub>y</sub> means the sum of all total *reactive* nitrogen oxides, including NO, NO<sub>2</sub>, and other nitrogen oxides referred to as NO<sub>z</sub>.
  - **Particulate**
    - PM<sub>2.5</sub> means particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
    - PM<sub>10</sub> means particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
  - **Lead (Pb)**
- **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.
- **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.
- **Speciated PM<sub>2.5</sub>** - PM<sub>2.5</sub> 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<sub>2.5</sub> being measured.

## Collection Methods

### Particulate samples

- **BAM-Beta Attenuation Monitor Met One BAM-1020** - This instrument provides concentration values of particulate each hour. The BAM -1020 uses the principle of beta ray attenuation to provide a simple determination of mass concentration. Beta ray

attenuation: A small  $^{14}\text{C}$  element emits a constant source of high-energy electrons, also known as beta particles. These beta particles are efficiently detected by an ultra-sensitive scintillation counter placed nearby. An external pump pulls a measured amount of air through a filter tape. Filter tape, impregnated with ambient dust is placed between the source and the detector thereby causing the attenuation of the measured beta-particle signal. The degree of attenuation of the beta-particle signal may be used to determine the mass concentration of particulate matter on the filter tape and hence the volumetric concentration of particulate matter in ambient air.

**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. Without a size-selective inlet (SSI), all collected material is defined as total suspended (in the air) particulates (TSP), including lead (Pb) and other metals. A size-selective inlet is added for  $\text{PM}_{10}$  measurement. A Hi-Volume sampler consists of two basic components: a motor similar to those used in vacuum cleaners and an air flow control system.
- **Hi-Vol-SA/GMW-321-B** - High Volume Sierra Anderson or General Metal Works (GMW) model 321-B  $\text{PM}_{10}$  is a high volume air sampler system which has a selective inlet 203 cm x 254 cm filter.
- **Met One SASS** - Filters used to collect PM measurement of total mass by gravimetry, elements by x-ray fluorescence.
- **R & P  $\text{PM}_{2.5}$**  - Rupprecht & Potashnick  $\text{PM}_{2.5}$  monitors an air sample drawn through a Teflon filter for 24 hours.

#### **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.
- **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. High Performance Liquid Chromatography (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.
- **BAM-Beta Attenuation** - The principle of beta ray attenuation to provide a simple determination of mass concentration. Instrumental – data is available in near real time.

#### **Composition/make-up of particulates**

- **Atomic Absorption** - This analysis measures the intensity of radiation of a specific wavelength that is absorbed by an atomic vapor.

- **Energy Dispersive XRF** - Energy dispersive x-Ray Fluorescence Spectrometer for the determination of metals including Lead concentration in ambient particulate matter. The method is collected on PM<sub>2.5</sub> filter samples.

#### **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<sub>x</sub>, and NO<sub>y</sub>. NO<sub>2</sub> is calculated as NO<sub>x</sub> - NO.
- **Carbon monoxide - Nondispersive infrared** - A nondispersive infrared (NDIR) gas analyzer is an instrument that measures air samples for CO content.
- **Sulfur dioxide - Pulsed Fluorescent** - Pulsed fluorescence sulfur dioxide monitor where air is drawn from the outside and passes through the analysis cell, and a high intensity burst of UV light is emitted. The sulfur dioxide responds to the specific UV wavelength generated by absorbing the energy. When the flash lamp shuts off (in a fraction of a second) the SO<sub>2</sub> fluoresces giving off an amount of photons directly proportional to the concentration of sulfur dioxide in the air.
- **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, LN<sub>2</sub>) 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 (LN<sub>2</sub>) is also used to trap and concentrate sample components.
- **Thin Layer Chromatography (TLC)** - TLC is a widely used chromatography technique used to separate chemical compounds. It involves a stationary phase consisting of a thin layer of adsorbent material, usually silica gel, aluminum oxide, or cellulose immobilized onto a flat, inert carrier sheet.
- **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.

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## Philadelphia's Meteorology and Topography

Although Philadelphia is located less than 100 miles from the Atlantic Ocean, its climate is predominantly influenced by air masses and prevailing winds from an inland direction. The weather is highly variable, characterized by a succession of alternate high and low pressure systems moving, in general, from west to east with average velocities of 30 to 35 miles per hour (mph) in winter and 20 to 25 mph in summer.

The normal paths of practically all low pressure systems affecting weather in the United States are toward the northeast corner of the nation. About 40 percent of the low centers pass very close to Philadelphia and most of the others approach closely enough to exert some influence on Philadelphia weather, resulting in a regular change in weather patterns without any consistent periods of stagnation. The movement of high pressure centers is slowest in summer and early fall and, because the lower edge of the prevailing westerlies aloft is farthest north at the same time, high pressure centers sometimes become stationary for periods of several days near the Philadelphia area. The result is increasing atmospheric stability at such times. This condition is frequently broken up diurnally in the summer because of the length and intensity of the sun's heating during the day, but strongly stable conditions may persist for a number of successive days in almost any month. Persistent stability, lasting ten days or more, occurs infrequently: on the average, perhaps once in ten years, but it may possibly happen in successive years or more than once in the same year.

Stagnating high pressure systems which result in winds of less than seven mph for a period of seven or more days occurs seldomly. Stagnation lasting four or more days occurred much more frequently and reached a maximum in fall.

During the spring, fall and winter, the weather is dominated by cold air masses of the continental Arctic or continental polar types. These air masses are extremely stable at their source, but are subjected to heating from below as they move across the land, thus generally becoming unstable in the lower few thousand feet by the time they reach Philadelphia. In the summer, the maritime tropical air mass plays as great a part in the weather as the continental air masses. Nocturnal cooling from below produces a high frequency of temperature inversions during the summer, but these are most often broken up or weakened by heating during the day, with ensuing turbulence and mixing at the atmosphere.

Philadelphia is located on the Atlantic Coastal Plain, some 50 miles or more from the nearest mountains (Appalachian) and large bodies of water (Atlantic Ocean and Delaware Bay). The land and sea breeze effect is practically never felt at Philadelphia and the mountain-valley circulation is non-existent.

Within the City itself there are very few marked extremes in topography. Elevations range from sea level at the southern and southwestern extremities of the City to 400 to 450 feet above sea level in the northwestern section (Chestnut Hill), about ten miles away. The Wissahickon Creek and the Schuylkill River flow through the northwestern part of the City, however, and along these two streams there are some rather sharp rises in elevation, as much as 100 to 200 feet in a horizontal distance of 500 feet. Such extremes are quite limited and would not influence the meteorological patterns which affect the City as a whole. They could, of course, contribute to

increased air pollution problems in a small local area within the City under certain circumstances.

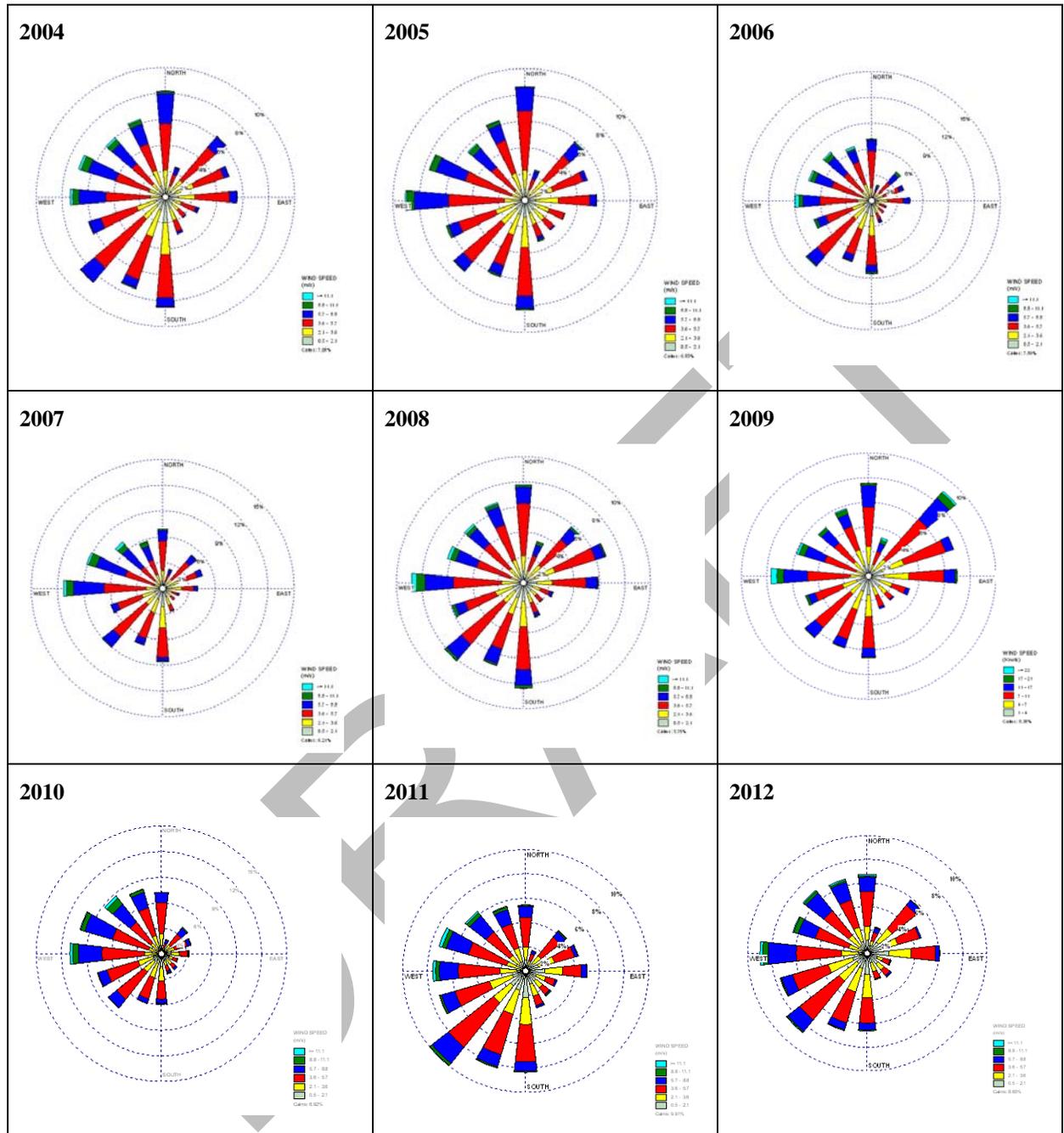
In general, the topography of the City and the immediate surrounding area is such that it would make no significant contribution to increased air stagnation and stability over and above that produced by the meteorological pattern.

(Taken from “The Atmosphere over Philadelphia, Its Behavior and Its Contamination” by Francis K. Davis Jr. Ph.D., Professor of Physics, Drexel Institute of Technology October, 1960)

Figure 1 on the next page - Philadelphia Wind Rose Plots (2004 – 2012) provides information on the frequency and strength of wind in Philadelphia over a nine year period. The “rays” that make up the graph point to the direction the wind comes from. For example, wind blows most often from West to East and least often from the Southeast.

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Figure 1 - Philadelphia Wind Rose Plots (2004-2012)

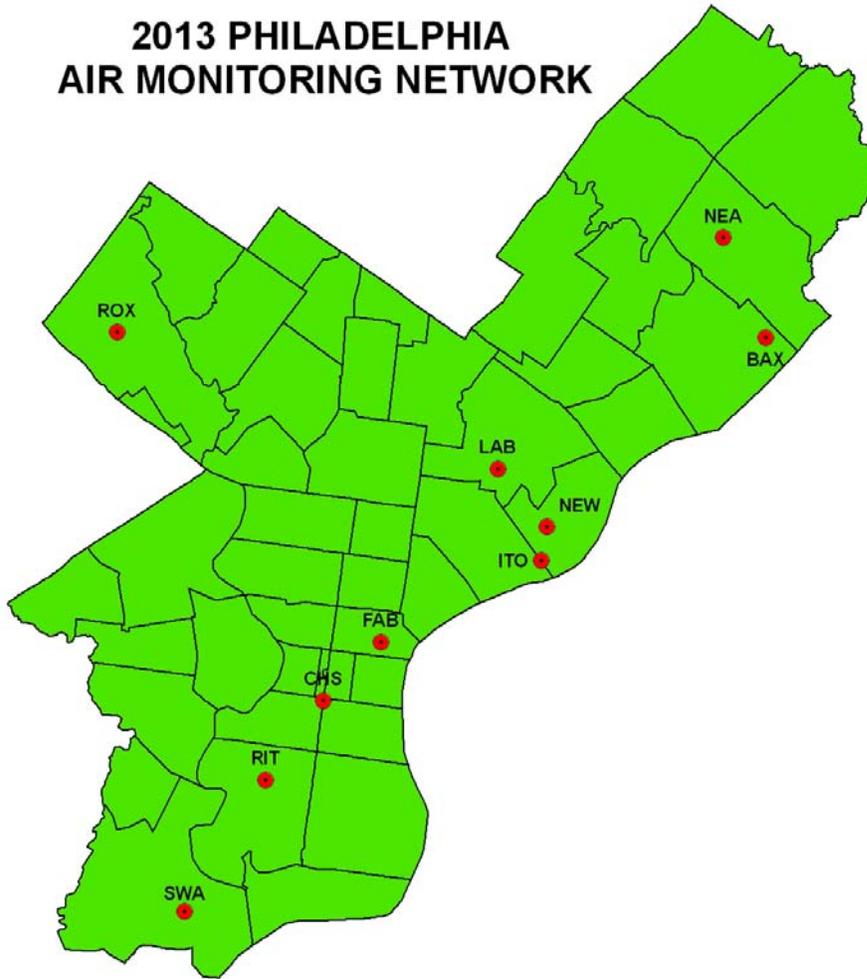


## Current Network at a Glance

The City of Philadelphia is served by a network of ten air monitoring sites located throughout the City that measure the criteria pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), and lead (Pb). Five 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.

Figure 2 - 2013 Philadelphia Air Monitoring Network as of April 5, 2013

### 2013 PHILADELPHIA AIR MONITORING NETWORK



4/5/2013

AMS Site Code	AMS Site Address	Parameter														AMS Site			
		CO	SO <sub>2</sub>	Ozone	NO <sub>2</sub>	NO	PM <sub>10</sub> FEM	PM <sub>2.5</sub> Analysis by EPA	PM <sub>2.5</sub> FRM	PM <sub>10</sub> SS1 (quartz filter)	PM Coarse	TSP Lead	PAMS VOC	Carbonyls	Toxics TO14		BaP analysis by Allegheny County, PA	ME T	
421010004	LAB 1501 E. Locomping	X	X	X	X	X	X	X											LAB
421010014	ROX Eva & Dearline													X	X	X			ROX
421010024	NEA Grant & Aebton			X															NEA
421010047	CHS 500 S. Broad				X	X	X	X					X		X	X			CHS
421010048	NE W 3900 Richmond						X											X	NE W
421010440	ITO Cadnor & Delsware									X								X	ITO
421010066	RIT 24th & Ritner		X				X	X					X		X	X			RIT
421010057	FAB 3rd & Spring Garden								X										FAB
421010053	SWA 8200 Enterprise	X	X	X			X	X					X		X	X			SWA
421011002	BAX 5200 Pennypack	X	X	X			X	X					X		X	X			BAX

## 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-Wilmington-Atlantic City, PA-NJ-DE-MD-

MSA number: 6160

Population: 4,030,926 as of 2011 annual estimate

EPA Region: III, Philadelphia

Class 1 area: Brigantine Natural Wildlife Preserve near Atlantic City, NJ

City population: 1,526,006 as of 2010 census

Time zone: EST

UTM zone: 18

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**Table 1 - Site Summary Table**

<b>AQS Site Code</b>	<b>AMS Site</b>	<b>Address</b>	<b>Statement of Purpose</b>
<b>42101 0004</b>	<b>LAB</b>	1501 E. Lycoming	Built in 1964, a good site for the assessment of the City's impact on precursors to the formation of ozone and is a designated PAMS site. It is a good site to test new or complex monitoring methods as laboratory staff are readily available.
<b>42101 0014</b>	<b>ROX</b>	Fowler & Dearnley	Periphery site
<b>42101 0024</b>	<b>NEA</b>	Grant & Ashton	Periphery site High Ozone
<b>42101 0047</b>	<b>CHS</b>	500 S. Broad	Traffic related, a site that indicates the impact of street traffic and pollutants that are transported into Center City
<b>42101 0048</b>	<b>NEW</b>	3900 Richmond	This site was located to measure the impact of the facilities Franklin Smelting and Refining and MDC, which are now closed and the waste water treatment plant. PM <sub>10</sub> levels are continuously being monitored at this site which is used in reporting the Air Quality Index (AQI).
<b>42101 0449</b>	<b>ITO</b>	Castor & Delaware	This site was located to measure the impact of the facilities Franklin Smelting and Refining and MDC, which are now closed. Monitoring of lead has been discontinued at this site while PM <sub>10</sub> FRM and BaP are still being monitored.
<b>42101 0055</b>	<b>RIT</b>	24 <sup>th</sup> & Ritner	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.
<b>42101 0057</b>	<b>FAB</b>	3 <sup>rd</sup> & Spring Garden	This site was established to represent the highest levels of PM <sub>2.5</sub> in the City based on EPA Region III's air quality modeling of air toxics in Philadelphia. It shows high levels of PM <sub>2.5</sub> created by vehicle traffic.
<b>42101 0063</b>	<b>SWA</b>	8200 Enterprise	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.
<b>42101 1002</b>	<b>BAX</b>	5200 Pennypack	This site was established as the NCore multi-pollutant station, one of 70 in the national network. NCore parameter requirements include measurements of PM <sub>2.5</sub> FRM, speciation, and continuous mass, coarse particles (PM <sub>10-2.5</sub> ), O <sub>3</sub> , trace levels of CO, SO <sub>2</sub> , NO, and NO <sub>y</sub> , and surface meteorology including wind speed and direction, temperature, and relative humidity.

## 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 improving the understanding of particulate and air toxic pollutants in Philadelphia. Model results from the EPA Region III Philadelphia Air Toxics Project were provided to AMS. The Philadelphia river ports and International Airport were identified as potential major contributors to health risk associated with air toxic emissions. The agency plans to pursue negotiations with the port entities in order to implement monitoring and emission inventory efforts in this location.

The agency will utilize funds received from the EPA for its Near-Road NO<sub>2</sub> Monitoring Grant to finalize the installation of the monitoring shelter at the Torresdale train station and begin the data collection/analysis phase. The utilization of this local air monitoring station will ensure compliance with the minimum NO<sub>2</sub> monitoring requirements as outlined by 40 CFR Part 58 Appendix D.

The agency will re-locate the NCore station due to property issues with the current location.

The agency will continue to utilize PM<sub>2.5</sub> FEMs as replacements for FRMs.

The agency will utilize the funds received from the EPA for its Community Scale Air Toxics Monitoring grant to finalize the installation of the monitors. This will enable the agency to continuously monitor air toxic pollutants such as benzene and hydrogen fluoride (HF) in the South Philadelphia community. This 3-year project will help the agency to take appropriate actions in protecting the community and to evaluate the open path monitoring method.

## Proposed Changes to the Network

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

- LAB PM<sub>2.5</sub> FEM data: Request exclusion of 2011, 2012, and 2013 Q1 data from comparison to NAAQS and AQI (see Section “Exclusion of Certain PM<sub>2.5</sub> Continuous FEM Data From Comparison to the NAAQS”)
- Calendar Year 2013 – June 2014
  - The NCore monitoring station at BAX will be re-located to ROX (or another approved location) before the end of 2013.
  - AMS plans to utilize PM<sub>2.5</sub> FEMs as replacements for FRMs.
    - RIT: PM<sub>2.5</sub> FEM monitor installed on June 1, 2011. The FEM was designated the primary monitor on April 1, 2013. There will be no co-located PM<sub>2.5</sub> FRM monitor.
    - CHS: PM<sub>2.5</sub> FEM monitor installed on September 4, 2011. The FEM was designated the primary monitor on April 1, 2013. A co-located PM<sub>2.5</sub> FRM will be operating on a 1 in 3 day schedule.
    - FAB: PM<sub>2.5</sub> FEM monitor installed on September 16, 2012. The projected date for designating the FEM as the primary monitor is July 1, 2013. There will be no co-located PM<sub>2.5</sub> FRM monitor.
  - AMS will establish and operate one Near-road NO<sub>2</sub> monitor (TOR) by January 1, 2014 (See Appendix C).
    - A CO monitor will also be established at the same location by January 1, 2014.
  - AMS plans to establish a monitoring site (PAC) near Washington Ave & S. Columbus Blvd (behind Steel Worker's Union building) or an alternative location (parking lot of Walmart at Pier 70 Blvd).
    - A monitor to measure PM<sub>2.5</sub>, PM<sub>10</sub>, toxics, carbonyls, and metals will be placed to assess the river port.
    - When the PAC site is established:
      - Toxics, carbonyls, and metals will no longer be monitored at ROX and will be moved to PAC.
      - PM<sub>10</sub> and BaP will no longer be monitored at ITO and will be moved to PAC.
        - The ITO site will be shut down.
  - AMS plans to install 2 open path monitors in South Philadelphia to continuously monitor selected air toxics at or near the Sunoco Refinery. See Appendix E of the 2012 – 2013 Air Monitoring Network Plan for additional information.
  - CHS may shut down. Based on EPA Region III modeling results, FAB was established as an alternative site to CHS.
    - If CHS is shut down, NO<sub>2</sub> and NO will be moved to RIT.

## NO<sub>2</sub> Monitoring Network

Per 40 CFR Part 58.10(a)(5), the Plan must document how AMS will establish NO<sub>2</sub> monitoring sites in accordance with the requirements of 40 CFR Part 58 Appendix D by July 1, 2012.

On January 22, 2010, EPA strengthened the health-based National Ambient Air Quality Standard (NAAQS) for nitrogen dioxide (NO<sub>2</sub>) by setting a new 1-hour NO<sub>2</sub> standard at the level of 100 parts per billion (ppb). EPA is also retaining, with no change, the current annual average NO<sub>2</sub> standard of 53 ppb.

EPA also set new requirements for the placement of new NO<sub>2</sub> monitors in urban areas. The requirements are codified in 40 CFR Part 58 Appendix D 4.3.2. The final rule requires:

- 1 microscale near-road NO<sub>2</sub> monitoring station in CBSAs with population of 500,000 persons or more.
- 2 microscale near-road NO<sub>2</sub> monitoring stations in CBSAs with population of 2,500,000 persons or more, or in any CBSA with a population of 500,000 or more persons and one or more road segments with 250,000 or greater AADT counts.
- 1 NO<sub>2</sub> monitoring station in each CBSA with a population of 1,000,000 or more persons to assess community-wide concentrations.
- Monitors must be operational between January 1, 2014 and January 1, 2017.

Based on the final rule, the Philadelphia-Camden-Wilmington, PA-NJ-DE-MD CBSA is required to have 2 near-road NO<sub>2</sub> monitoring stations.

On March 7, 2013, the EPA issued a final rule amending the implementation approach, allowing for additional time to install and operate the near-road NO<sub>2</sub> monitors. One required near-road monitor must be installed and operational by January 1, 2014, for CBSAs with 1,000,000 or more persons. The second required monitor must be installed and operational by January 1, 2015, for a CBSA with 2,500,000 or more persons, or with 500,000 or more persons that has one or more road segments of 250,000 or greater annual average daily traffic counts. This revision replaces the 2010 rule requirement that all NO<sub>2</sub> monitors be operational by January 1, 2013. AMS currently operates an NO<sub>2</sub> monitor that meets the area-wide monitoring requirements.

## CO Monitoring Network

On August 12, 2011, EPA issued a decision to retain the existing National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO). The existing primary standards are 9 parts per million (ppm) measured over 8 hours, and 35 ppm measured over 1 hour.

EPA is revising minimum requirements for CO monitoring by requiring CO monitors to be sited near roads in certain urban areas. The requirements are codified in 40 CFR Part 58 Appendix D 4.2.1. In summary, EPA is requiring one CO monitor to be collocated with a near-road NO<sub>2</sub> monitor in CBSAs having populations of 1 million or more. EPA is specifying that monitors required in CBSAs of 2.5 million or more persons are to be operational by January 1, 2015. Other CO monitors required in CBSAs having 1 million or more persons are required to be operational by January 1, 2017. The Philadelphia-Camden-Wilmington, PA-NJ-DE-MD CBSA will have a CO monitor collocated with the near-road NO<sub>2</sub> monitor and be operational by January 1, 2014.

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## Changes to a Violating PM<sub>2.5</sub> Monitor

Per 40 CFR Part 58.10(c), the Plan must document how AMS will provide for the review of changes to a PM<sub>2.5</sub> monitoring network that impact the location of a violating PM<sub>2.5</sub> monitor or the creation/change to a community monitoring zone, including a description of the proposed use of spatial averaging for purposes of making comparisons to the annual PM<sub>2.5</sub> NAAQS as set forth in appendix N to 40 CFR Part 50. AMS must document the process for obtaining public comment and include any comments received through the public notification process within their submitted Plan.

On May 31, 2008, a network plan was made available for public inspection and was also posted on the City of Philadelphia website. The 2008 plan documented changes to the PM<sub>2.5</sub> monitoring network that impacted the location of a violating PM<sub>2.5</sub> monitor at 500 S. Broad Street (CHS). FAB was established as an alternative to CHS, but CHS was not shutdown.

AMS plans to replace all primary PM<sub>2.5</sub> FRMs with PM<sub>2.5</sub> continuous FEMs, starting with RIT, CHS, and FAB. As of April 1, 2013, RIT and CHS have designated the FEM monitor as the primary monitor. The projected date for designating the FEM as the primary monitor at FAB is July 1, 2013.

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## **Exclusion of Certain PM<sub>2.5</sub> Continuous FEM Data from Comparison to the NAAQS**

40 CFR Part 58.11(e) documents the process for excluding PM<sub>2.5</sub> FEM data from comparison to the NAAQS and/or AQI if the performance criteria described in Table C-4 of Subpart C are not met when assessed with a collocated FRM monitor.

AMS is requesting PM<sub>2.5</sub> FEM data from 2011 through the first quarter of 2013 at the LAB monitoring site (AQS ID 421010004) be excluded from comparison to the NAAQS and AQI. The request to exclude data and the assessment generated to determine FEM incomparability to a collocated FRM is located in Appendix B.

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## **NCore Monitoring Site – Relocation from BAX to ROX**

AMS has been advised that the City of Philadelphia Water Department (PWD) is planning to construct a new underground clean well basin on the property where the current NCore station (BAX) is located. BAX must therefore be relocated prior to November 1, 2013, as construction is projected to commence on or around this date.

Due to the nature of PWD's notification and its proximity to the Air Monitor Network Plan submittal date, AMS is unable to identify a final site for the NCore station relocation. However, AMS is currently working in conjunction with EPA Region III to analyze the possibility of relocating the NCore site to the ROX station, which is already an established monitoring station within the network.

In our 2010 – 2011 Air Monitoring Network Plan, AMS provided information regarding the NCore monitoring station at BAX.

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## Detailed Information on Each Site

### LAB

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



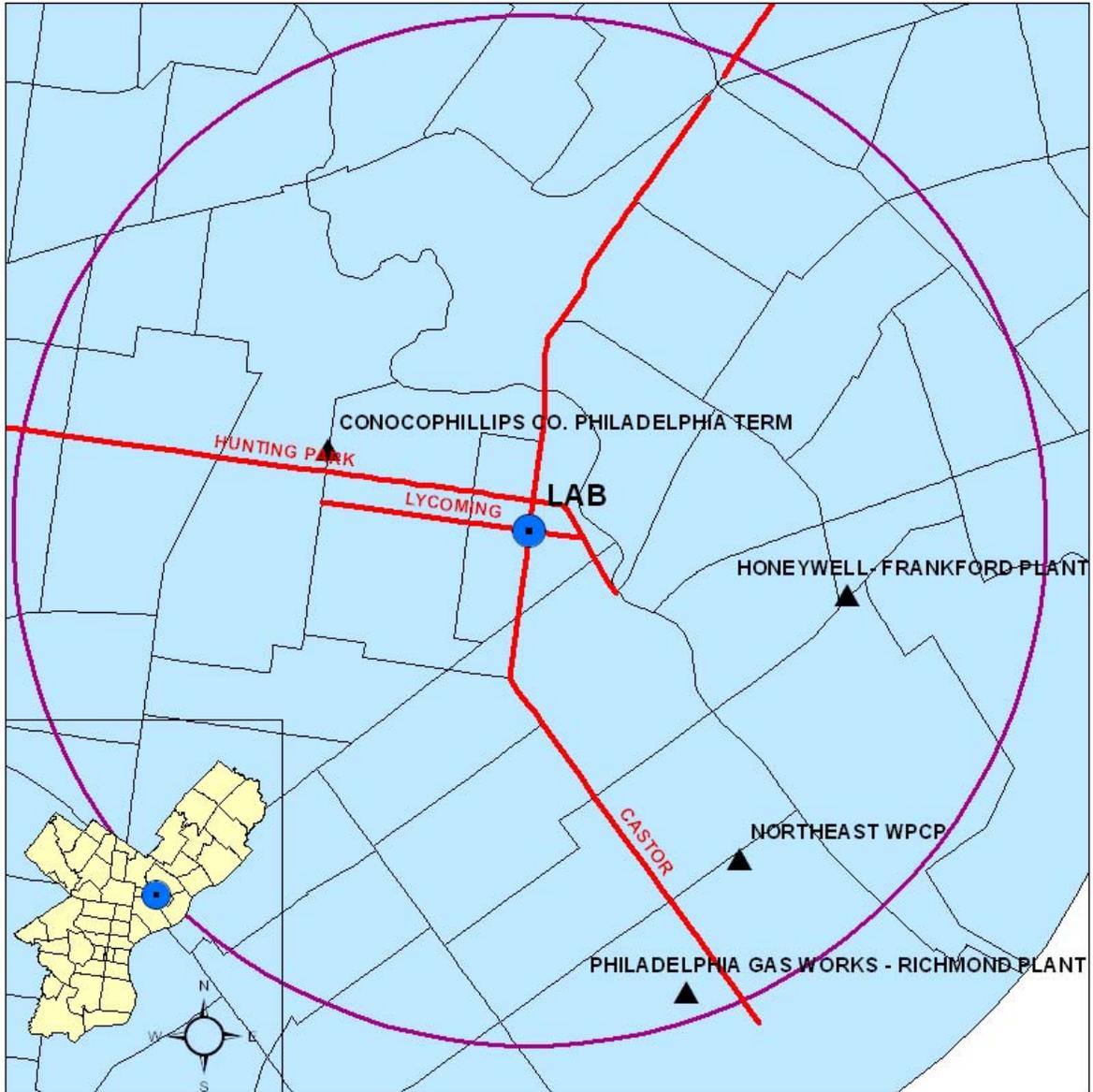
Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO	NAMS	Continuous	Instrumental	Nondispersive infrared		093	Neighborhood	Population Exposure	7	2/1/1966
SO <sub>2</sub>	NAMS	Continuous	Instrumental	Pulsed Fluorescent		100	Neighborhood	Population Exposure	7	2/1/1966
Ozone	PAMS	Continuous	Instrumental	Ultra Violet		87	Neighborhood	Population Exposure	7	1/1/1974
NO <sub>2</sub>	NAMS, PAMS	Continuous	Instrumental	Chemiluminescence		99	Urban	Population Exposure	7	1/1/1977
NO <sub>x</sub>	SLAMS		Instrumental	Chemiluminescence		74	Urban	Population Exposure	7	1/1/1977
NO <sub>y</sub>	SLAMS	Continuous	Low Level Nox Instrumental	TECO 42S Chemiluminescence		599	Neighborhood	Population Exposure		
NO	PAMS									
PM <sub>2.5</sub> Continuous	SLAMS	Continuous		BAM =Beta Attenuation Monitor Met One BAM -1020		170	Neighborhood	Population Exposure		
PM2.5 FRM	SPM	1/3 days	R&P PM <sub>2.5</sub>	Gravimetric		145	Neighborhood	Population Exposure		
PM <sub>10</sub> SSI	NAMS	1/6 days	Hi-Vol-SA/GMW-321-B	Gravimetric	Analysis by EPA	063	Neighborhood	Population Exposure	7	1/1/1999
Metals (TSP Filters)	SPM	1/6 days	Hi-Vol	Atomic Absorption	Analysis by WV (TSP sampler with quartz)	92/89				

PAMS VOC	PAMS, 24 hr Real Time	1/6 days (April, May, Sept, and Oct)	SS Canister Pressurized	Cryogenic Preconcentration GC/FID		101	Middle	Highest Concentration		
	PAMS, 24-hr Colocated	1/6 days (April-Oct)	SS Canister Pressurized	Cryogenic Preconcentration GC/FID		101	Middle	Highest Concentration		
	PAMS, 3-hr RealTime	Daily from June-Aug, with sample every 3 hrs	SS Canister Pressurized	Cryogenic Preconcentration GC/FID	Continuous PAMS 3 hr, samples during summer	101	Middle	Highest Concentration		
	PAMS, 3-hr Colocated	1/6 days (Jun -Aug)	SS Canister Pressurized	Cryogenic Preconcentration GC/FID		101	Middle	Highest Concentration		
Carbonyls	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges	HPLC	Sampled for four 3-hour periods every 3rd day during PAMS season	102	Neighborhood	Population Exposure		
Toxics	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		150	Neighborhood	Population Exposure		
BaP	Urban Air Toxics	1/6 days	Hi-Vol	Thin Layer Chromatography		91				

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Figure 3 - LAB Monitoring Site Map with Major Streets and Major Emission Sources

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



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
01551	HONEYWELL/FRANKFORD PLT	4700 BERMUDA STREET	61.69	183.15	0.00	73.42	57.73	27.85	129.89
04922	PHILA GAS WORKS/RICHMOND PLT	3100 E VENANGO ST	1.93	4.53	0.00	0.17	0.14	0.01	0.16
05004	CONOCOPHILLIPS PHILA TERM	4210 G ST	0.00	0.00	0.00	0.00	0.00	0.00	34.46
09513	NORTHEAST WPCP/PHILA	3899 RICHMOND ST	32.21	9.50	0.00	1.65	1.65	6.17	14.62
<b>TOTAL</b>			<b>95.83</b>	<b>197.18</b>	<b>0.00</b>	<b>75.24</b>	<b>59.53</b>	<b>34.04</b>	<b>179.13</b>

Figure 4- LAB North Aerial View



# ROX

Table 3 –  
Detailed ROX  
Information  
with  
Monitoring  
Station Picture

AMS SITE ID: ROX  
 AQS Site ID: 421010014  
 Street Address: Fowler & Dearnley Streets  
 Geographical Coordinates  
 Latitude: 40.050000  
 Longitude: -75.240556

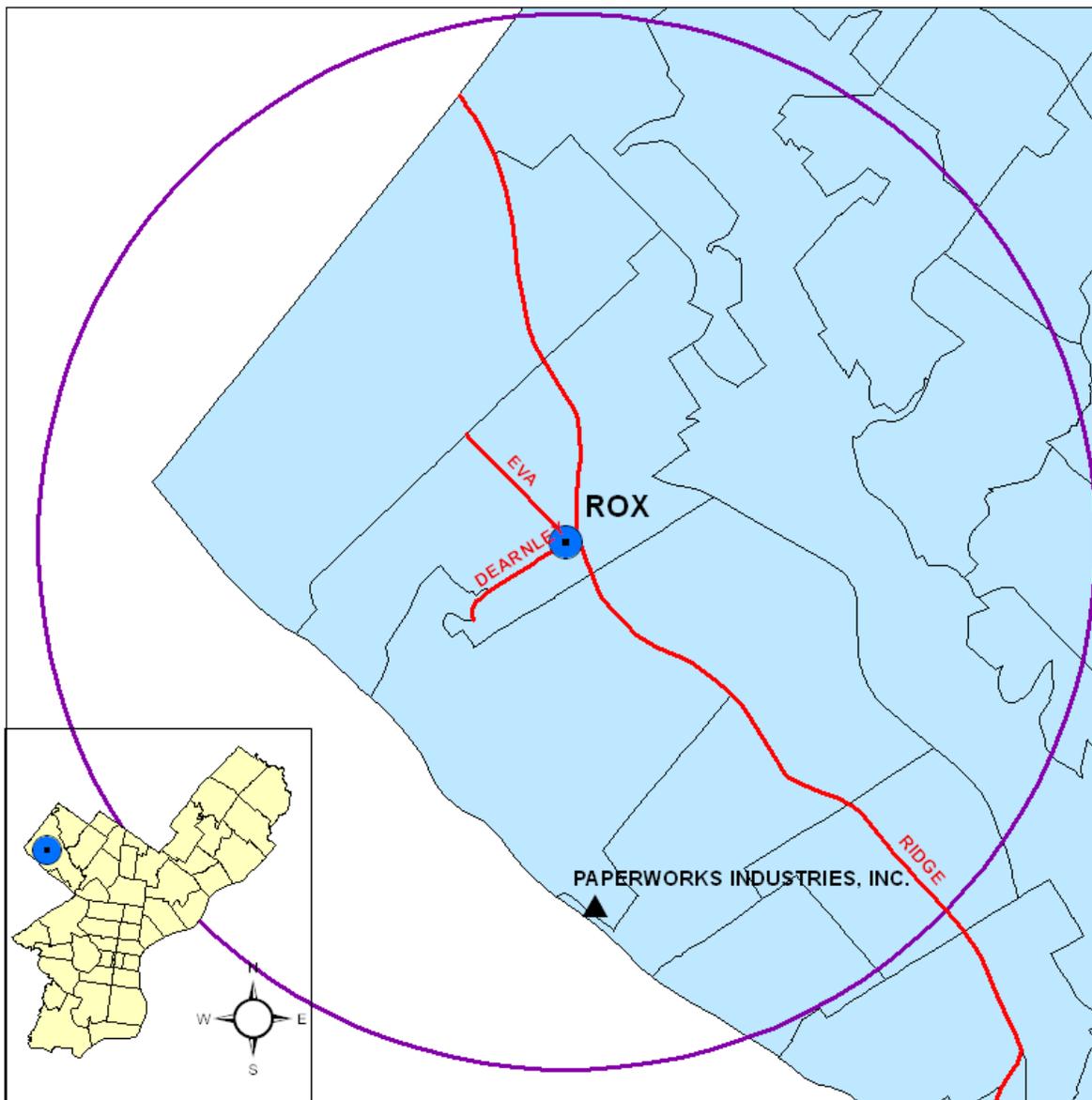


Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Metals	SPM	1/6 days	Hi-Vol	Atomic Absorption	Analysis by WV (TSP sampler with quartz)	92 /89	Neighborhood	Population Exposure		
Carbonyls	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges			102	Neighborhood	Population Exposure		
Toxics	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		150	Neighborhood	Population Exposure		

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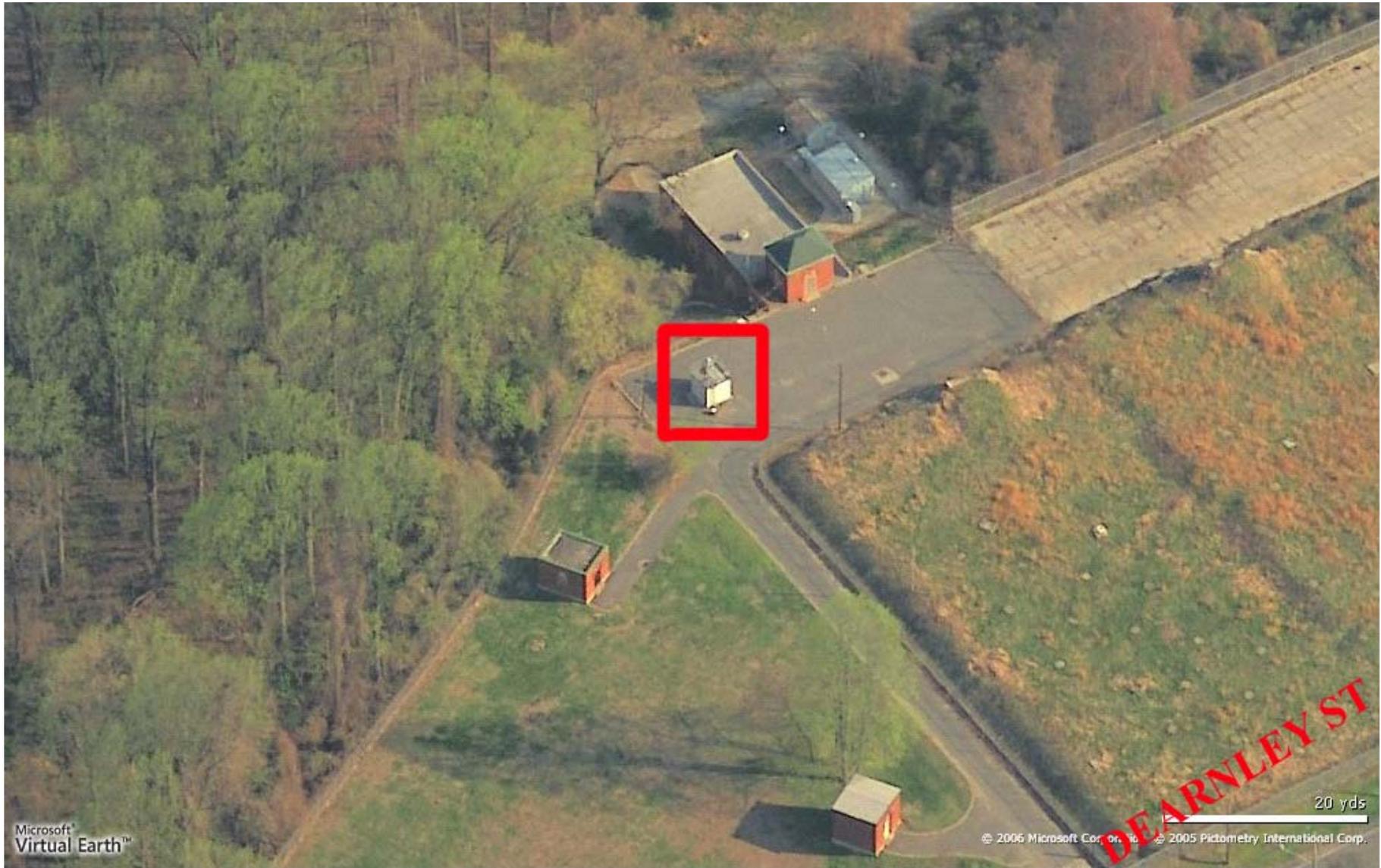
Figure 5 - ROX Monitoring Site Map with Major Streets and Major Emission Sources

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



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
01566	PAPERWORKS IND INC/MILL DIV	5000 FLAT ROCK RD.	40.30	127.50	0.00	0.90	0.90	0.30	19.74

Figure 6 - ROX North Aerial View



**NEA**

**Table 4 –  
Detailed NEA  
Information  
with  
Monitoring  
Station Picture**

**AMS SITE ID: NEA**  
**AQS Site ID: 421010024**  
**Street Address: Grant & Ashton Roads Phila NE Airport**  
**Geographical Coordinates**  
**Latitude: 40.076389**  
**Longitude: -75.011944**

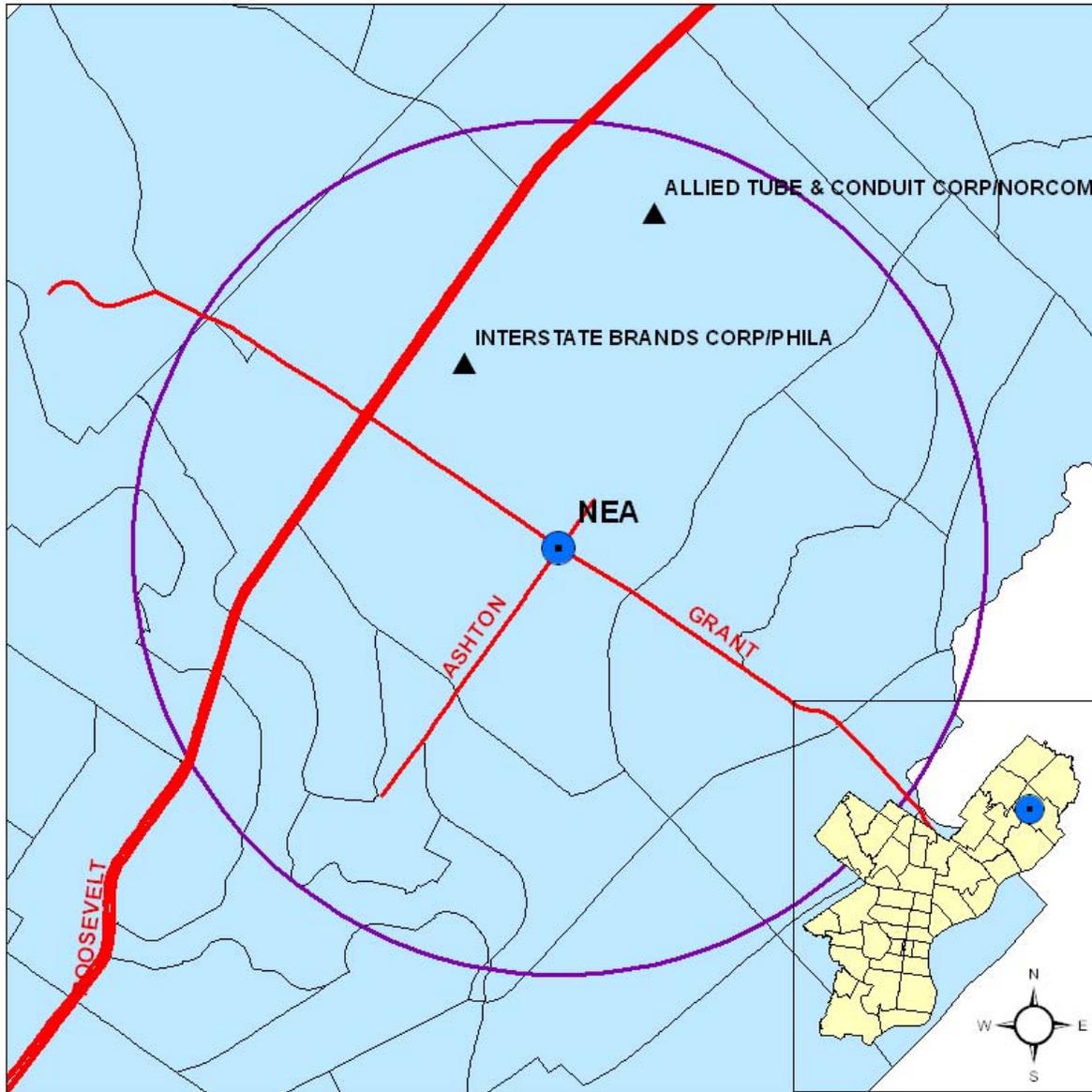


Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Ozone	NAMS	Continuous	Instrumental	Ultra Violet		87	Neighborhood/Middle	Population Exposure/Highest Concentration	6	1/1/1974
Meteorological (MET)	SLAMS	Continuous								

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Figure 7 - NEA Monitoring Site Map with Major Streets and Major Emission Sources

## NORTHEAST AIRPORT - GRANT & ASHTON AVES. EPA AIRS CODE: 421010024



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
03363	ALLIED TUBE & CONDUIT CORP/NORCOM	11350 NORCOM RD	0.11	0.13	0.00	1.88	0.01	0.00	38.42
05811	INTERSTATE BRANDS CORP/PHILA	9801 BLUE GRASS RD	5.30	6.48	0.00	0.19	0.19	0.04	18.56
<b>TOTAL</b>			<b>5.41</b>	<b>6.60</b>	<b>0.00</b>	<b>2.07</b>	<b>0.20</b>	<b>0.04</b>	<b>56.98</b>

Figure 8 - NEA North Aerial View



# CHS

**Table 5 -  
Detailed CHS  
Information  
with  
Monitoring  
Station Picture**

**AMS SITE ID: CHS**  
**AQS Site ID: 421010047**  
**Street Address: 500 S. Broad St**  
**Geographical Coordinates**  
**Latitude: 39.944722**  
**Longitude: -75.166111**



Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
NO <sub>2</sub>	SLAMS	Continuous	Instrumental	Chemiluminescence		99	Neighborhood	Population Exposure	11	1/1/1982
NO	SPM									
PM <sub>2.5</sub> FRM-D	Designated	Daily	R&P PM <sub>2.5</sub>	Gravimetric	NAAQS Compliance Monitoring - Annual and 24 hr	145	Middle	Highest Concentration	4	1/1/1999
PM <sub>2.5</sub> FRM-C	Colocated	Daily				145	Middle	Highest Concentration		
PM <sub>2.5</sub> Continuous	SPM	Continuous		BAM = Beta Attenuation Monitor Met One BAM -1020		731	Middle	Highest Concentration		
Metals	SPM	1/6 days	Hi-Vol	Atomic Absorption	Analysis by WV (TSP sampler with quartz)	92/89	Neighborhood	Population Exposure		
Carbonyls	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges			102	Neighborhood	Population Exposure		
Toxics	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		150	Neighborhood	Population Exposure		

Figure 9 - CHS Monitoring Site Map with Major Streets and Major Emission Sources

## COMMUNITY HEALTH CENTER #1 - 500 S. BROAD ST. EPA AIRS CODE: 421010047



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
04902	VEOLIA ENERGY EDISON/PHILA	908 SANSOM ST	3.00	23.86	0.00	3.98	2.59	47.26	0.35
04904	EXELON GENERATION CO/SCHUYLKILL STA	2800 CHRISTIAN ST	3.42	35.04	0.00	3.38	2.50	42.43	0.47
04942	VEOLIA ENERGY/SCHUYLKILL STA	2600 CHRISTIAN ST	4.90	125.64	0.00	36.10	36.10	239.17	29.86
04944	GRAYS FERRY COGEN PARTNERSHIP PHILA	2600 CHRISTIAN ST	9.89	192.20	0.00	19.92	19.92	11.30	12.36
08069	CHILDRENS HOSP OF PHILA/ PHILA	34TH & CIVIC CENTER BLVD	21.14	23.68	0.00	2.30	2.30	0.70	1.77
08912	UNIV OF PA/PHILA	3451 WALNUT ST	2.13	8.07	0.00	0.54	0.00	0.49	0.43
09703	US MINT/PHILA	151 N INDEPENDENCE MALL EAST	1.30	1.45	0.00	0.01	0.01	0.01	0.46
<b>TOTAL</b>			<b>45.78</b>	<b>409.93</b>	<b>0.01</b>	<b>66.23</b>	<b>63.43</b>	<b>341.37</b>	<b>45.69</b>

Figure 10 - CHS North Aerial View



**NEW**

**Table 6 -  
Detailed NEW  
Information  
with  
Monitoring  
Station Picture**

**AMS SITE ID: NEW**  
**AQS Site ID: 421010048**  
**Street Address: 3900 Richmond Street**  
**Geographical Coordinates**  
**Latitude: 39.991389**  
**Longitude: -75.080833**

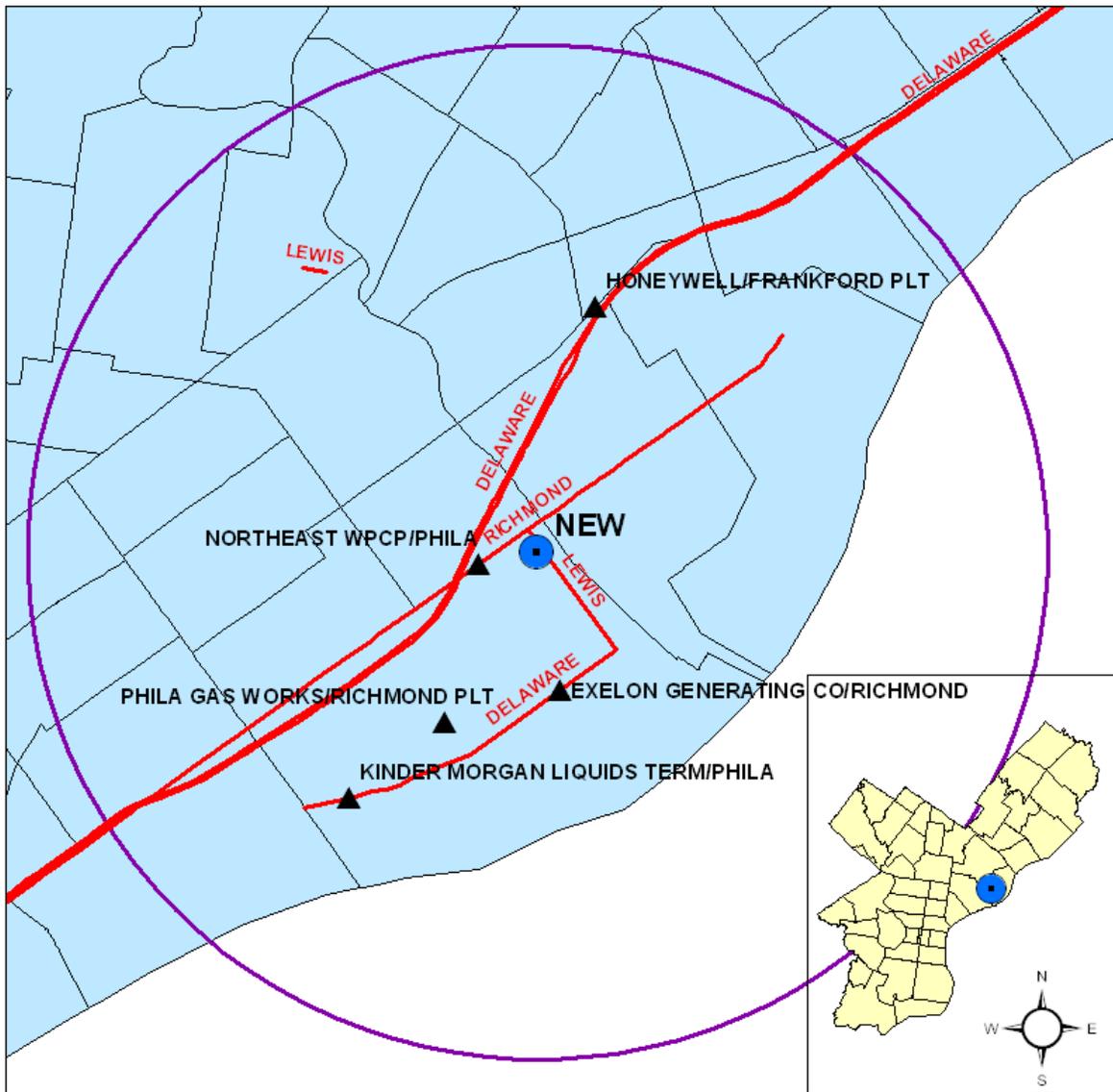


Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
PM <sub>10</sub> Continuous	SPM	Continuous		BAM =Beta Attenuation Monitor Met One BAM -1020	Not reported to AQS	731				2/20/2007
Meteorological (MET)										

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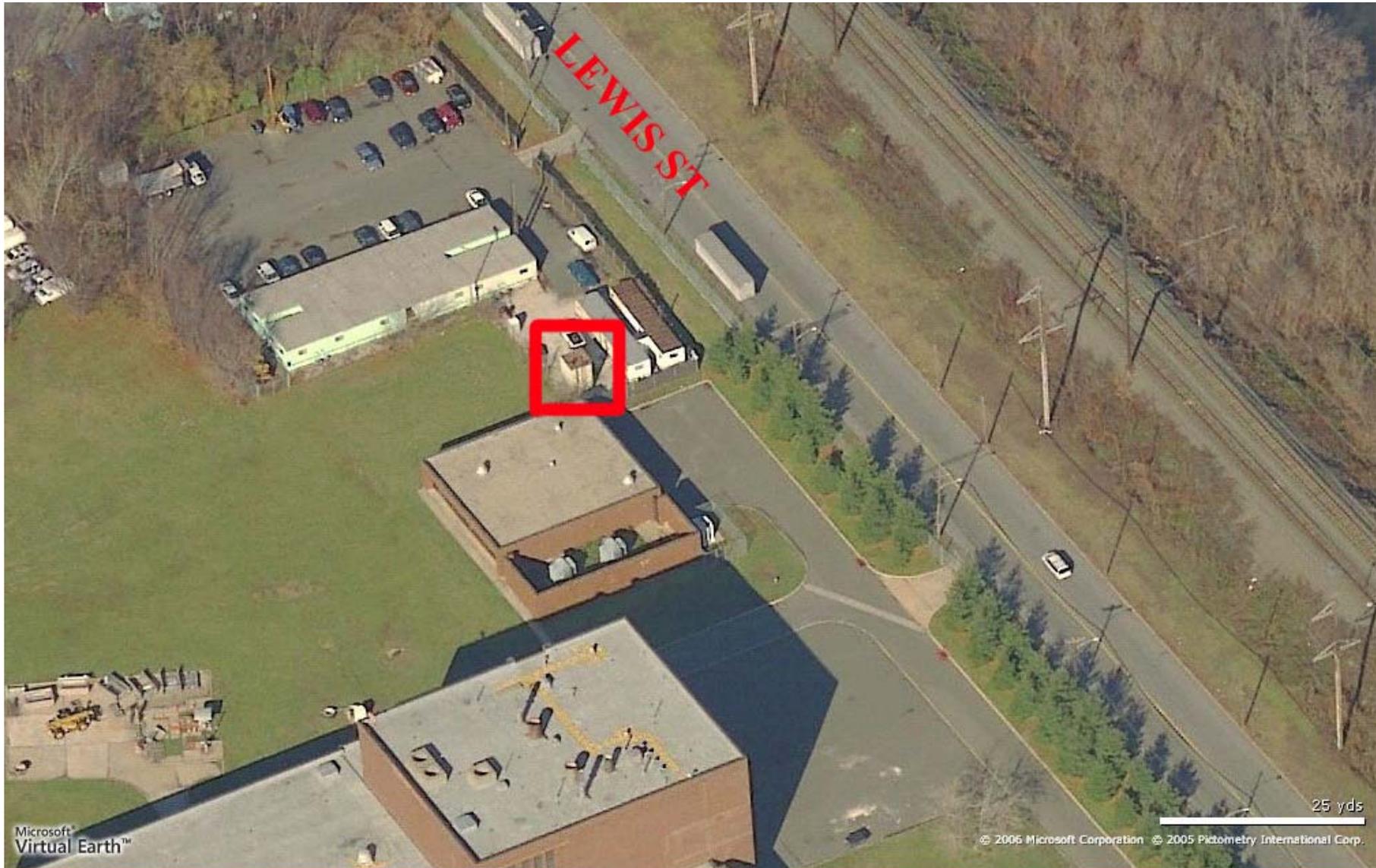
Figure 11 - NEW Monitoring Site Map with Major Streets and Major Emission Sources

## NORTHEAST WASTE - LEWIS & RICHMOND STS. EPA AIRS CODE:421010048



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
01551	HONEYWELL/FRANKFORD PLT	4700 BERMUDA STREET	61.69	183.15	0.00	73.42	57.73	27.85	129.89
04903	EXELON GENERATING CO/RICHMOND	3901 N DELAWARE AVE	0.05	7.07	0.00	0.15	0.15	2.10	0.01
04922	PHILA GAS WORKS/RICHMOND PLT	3100 E VENANGO ST	1.93	4.53	0.00	0.17	0.14	0.01	0.16
05003	KINDER MORGAN LIQUIDS TERM/PHILA	3300 N DELAWARE AVE	2.49	4.56	0.00	0.42	0.37	1.94	41.24
09513	NORTHEAST WPCP/PHILA	3899 RICHMOND ST	32.21	9.50	0.00	1.65	1.65	6.17	14.62
<b>TOTAL</b>			<b>98.36</b>	<b>208.80</b>	<b>0.00</b>	<b>75.81</b>	<b>60.04</b>	<b>38.08</b>	<b>185.91</b>

Figure 12 - NEW North Aerial View



# ITO

Table 7 - Detailed ITO Information with Monitoring Station Picture

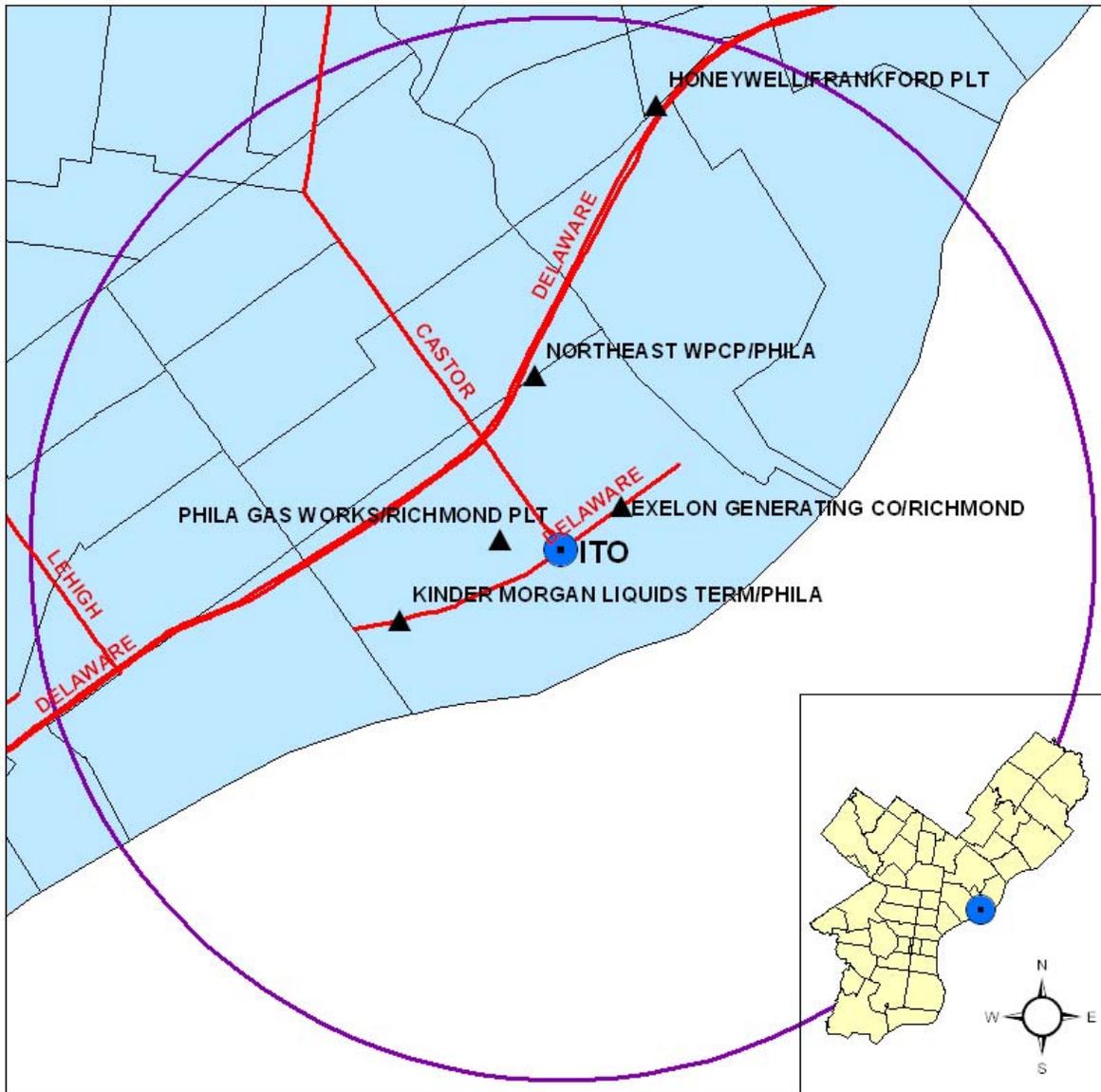
AMS SITE ID: ITO  
 AQS Site ID: 421010449  
 Street Address: Castor & Delaware Avenues  
 Geographical Coordinates  
 Latitude: 39.982500  
 Longitude: -75.083056



Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
ITO-S, SSI	SLAMS	1/6 days	Hi-Vol-SA/GMW-321-B	Gravimetric	Quartz Filter	64	Neighborhood/Middle	Population Exposure /Highest Concentration		
ITO-TC, TSP	SLAMS	1/6 days			Weighed by AMS, Filter afterwards sent to Allegheny County, PA for BaP	91	Neighborhood/Middle	Population Exposure /Highest Concentration		
BaP	Urban Air Toxics	1/6 days	Hi-Vol	Thin Layer Chromatography	Analysis by Allegheny County, PA	91	Neighborhood/Middle	Population Exposure /Highest Concentration		

Figure 13 - ITO Monitoring Site Map with Major Streets and Major Emission Sources

## ITO - CASTOR & DELAWARE AVES. EPA AIRS CODE: 421010449



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
01551	HONEYWELL/FRANKFORD PLT	4700 BERMUDA STREET	61.69	183.15	0.00	73.42	57.73	27.85	129.89
04903	EXELON GENERATING CO/RICHMOND	3901 N DELAWARE AVE	0.05	7.07	0.00	0.15	0.15	2.10	0.01
04922	PHILA GAS WORKS/RICHMOND PLT	3100 E VENANGO ST	1.93	4.53	0.00	0.17	0.14	0.01	0.16
05003	KINDER MORGAN LIQUIDS TERM/PHILA	3300 N DELAWARE AVE	2.49	4.56	0.00	0.42	0.37	1.94	41.24
09513	NORTHEAST WPCP/PHILA	3899 RICHMOND ST	32.21	9.50	0.00	1.65	1.65	6.17	14.62
<b>TOTAL</b>			<b>98.36</b>	<b>208.80</b>	<b>0.00</b>	<b>75.81</b>	<b>60.04</b>	<b>38.08</b>	<b>185.91</b>

Figure 14 - ITO North Aerial View



# RIT

**Table 8 -  
Detailed RIT  
Information  
with  
Monitoring  
Station Picture**

**AMS SITE ID: RIT**  
**AQS Site ID: 421010055**  
**Street Address: 24th & Ritner Streets**  
**Geographical Coordinates**  
**Latitude: 39.922517**  
**Longitude: -75.186783**



Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
SO <sub>2</sub>	NAMS	Continuous	Instrumental	Pulsed Fluorescent	Very high levels momentarily exceeding 0.5 ppm, Expected to begin operation	100	Neighborhood	Population Exposure	4	11/9/2004
PM <sub>2.5</sub> Speciated	NAMS	Continuous	Met One SASS Teflon	Energy Dispersive XRF	Analysis by EPA	811	Neighborhood	Population Exposure		
PM <sub>2.5</sub> FRM	Rover	Daily	R&P PM2.5	Gravimetric		145	Neighborhood	Population Exposure		
PM <sub>2.5</sub> Continuous	SPM	Continuous		BAM =Beta Attenuation Monitor Met One BAM -1020		731	Neighborhood	Population Exposure		
Metals	SPM	1/6 days	Hi-Vol	Atomic Absorption	Analysis by WV (TSP sampler with quartz)	92 /89	Neighborhood	Population Exposure		
Carbonyls	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges			102	Neighborhood	Population Exposure		
Toxics	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		150	Neighborhood	Population Exposure		
Meteorological (MET)		Continuous		Air quality measurements approved instrumentation for wind speed, wind direction, humidity, barometric pressure, rainfall and solar radiation						

Figure 15 - RIT Monitoring Site Map with Major Streets and Major Emission Sources

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



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						VOC
			CO	NOX	PB	PM10	PM2.5	SO2	
01501	SUNOCO INC / PHILA REFINERY R&M	3144 PASSYUNK AVE	1,772.62	1,315.05	0.00	385.73	0.00	297.11	749.36
01507	SUNOCO LOGISTICS / BELMONT TERM	2700 PASSYUNK AVE	21.94	8.80	0.00	0.27	0.00	0.09	35.20
01517	SUN CO / SCHUYLKILL TANK FARM	3144 PASSYUNK AVE	1.03	0.19	0.00	0.00	0.00	0.00	99.43
01569	AKER PHILA SHIPYARD / SHIPBUILDING YARD	PHILA NAVAL BUS CTR	0.92	0.55	0.00	4.66	4.61	0.01	16.31
04904	EXELON GENERATION CO / SCHUYLKILL STA	2800 CHRISTIAN ST	3.42	35.04	0.00	3.38	2.50	42.43	0.47
04942	VEOLIA ENERGY / SCHUYLKILL STA	2600 CHRISTIAN ST	4.90	125.64	0.00	36.10	36.10	239.17	29.86
04944	GRAYS FERRY COGEN PARTNERSHIP / PHILA	2600 CHRISTIAN ST	9.89	192.20	0.00	19.92	19.92	11.30	12.36
05013	PLAINS PROD TERM LLC / 67TH ST	3400 SOUTH 67TH STREET	0.28	0.34	0.00	0.01	0.01	0.00	65.34
08069	CHILDRENS HOSP OF PHILA / PHILA	34TH & CIVIC CENTER BLVD	21.14	23.68	0.00	2.30	2.30	0.70	1.77
<b>TOTAL</b>			<b>1,836.15</b>	<b>1,701.48</b>	<b>0.01</b>	<b>452.37</b>	<b>65.44</b>	<b>590.82</b>	<b>1,010.11</b>

Figure 16 - RIT North Aerial View



# FAB

Table 9 - Detailed FAB Information with Monitoring Station Picture

AMS SITE ID: FAB  
 AQS Site ID: 421010057  
 Street Address: 240 Spring Garden Street, 19123  
 Geographical Coordinates  
 Latitude: 39.960291  
 Longitude: -75.142388



Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
PM <sub>2.5</sub> FRM	SPM	Daily	R&P PM2.5	Gravimetric	NAAQS Compliance Monitoring - 24 hr	145	Neighborhood/Middle	Population Exposure/Highest Conc	2	9/2007 - Rooftop 1/1/2008 - Ground Level
PM2.5 Continuous	SPM	Continuous		BAM = Beta Attenuation Monitor Met One BAM -1020		170	Neighborhood/Middle	Population Exposure/Highest Conc		12-Oct

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Figure 17 - FAB Monitoring Site Map with Major Streets and Major Emission Sources

## FIRESTATION (FAB) - 3RD & SPRING GARDEN STS. EPA AIRS CODE: 421010057



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
04901	EXELON GENERATION CO/DELAWARE STA	1325 N BEACH ST	0.72	4.76	0.00	0.29	0.29	1.36	0.02
04902	VEOLIA ENERGY EDISON/PHILA	908 SANSOM ST	3.00	23.86	0.00	3.98	2.59	47.26	0.35
08905	TEMPLE UNIV/ MAIN CAMPUS	1009 W MONTGOMERY AVE	18.21	26.51	0.00	1.08	1.08	0.35	4.38
09703	US MINT/PHILA	151 N INDEPENDENCE MALL EAST	1.30	1.45	0.00	0.01	0.01	0.01	0.46
<b>TOTAL</b>			<b>23.23</b>	<b>56.57</b>	<b>0.00</b>	<b>5.36</b>	<b>3.97</b>	<b>48.98</b>	<b>5.21</b>

Figure 18 - FAB North Aerial View



# SWA

**Table 10 -  
Detailed SWA  
Information  
with  
Monitoring  
Station Picture**

**AMS SITE ID: SWA**  
**AQS Site ID: 421010063**  
**Street Address: 8200 Enterprise Avenue, 19153**  
**Geographical Coordinates**  
**Latitude: 39.880115**  
**Longitude: -75.222784**

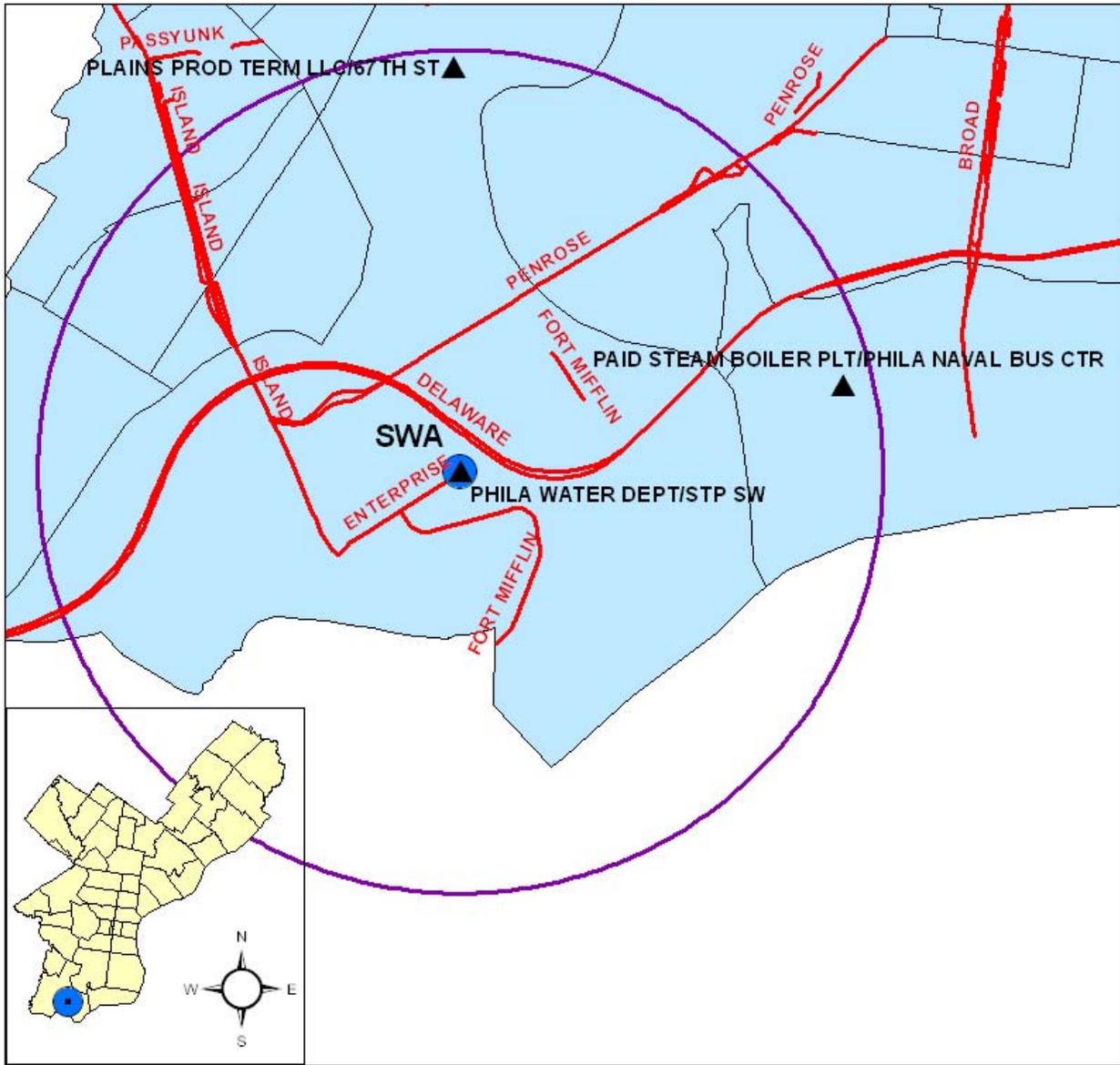


Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
Metals	SPM	1/6 days	Hi-Vol	ICP-MS	Analysis by WV (TSP sampler with quartz)	92 /89	Neighborhood	Population Exposure		9/10/2009
Carbonyls	Urban Air Toxics	1/6 days	DNPH-Coated Cartridges			102	Neighborhood	Population Exposure		9/10/2009
Toxics	Urban Air Toxics	1/6 days	Canister Subambient Pressure	Multi-Detector GC		150	Neighborhood	Population Exposure		9/10/2009

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Figure 19 - SWA Monitoring Site Map with Major Streets and Major Emission Sources

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



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
03013	PLAINS PROD TERM LLC/67TH ST	3400 SOUTH 67TH STREET	0.28	0.34	0.00	0.01	0.01	0.00	65.34
09515	PHILA WATER DEPT/STP SW	8200 ENTERPRISE AVENUE	31.79	16.55	0.00	2.57	2.57	6.30	21.48
09715	PAID STEAM BOILER PLT/PHILA NAVAL BUS CTR	2000 CONSTITUTION AVENUE	6.19	2.36	0.00	0.14	0.14	0.04	0.41
<b>TOTAL</b>			<b>38.26</b>	<b>19.25</b>	<b>0.00</b>	<b>2.72</b>	<b>2.72</b>	<b>6.34</b>	<b>87.23</b>

Figure 20 - SWA Aerial View



# BAX

**Table 11 - Detailed BAX Information with Monitoring Station Picture**

**AMS SITE ID: BAX**  
**AQS Site ID: 421011002**  
**Street Address: 5200 Pennypack Park, 19136**  
**Geographical Coordinates**  
**Latitude: 40.035985**  
**Longitude: -75.002405**



Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO (trace)	Ncore	Continuous	Instrumental	ARM utilizing trace level Non-dispersive infrared	High sensitivity	093	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
SO <sub>2</sub> (trace)	NCore	Continuous	Instrumental	ARM utilizing trace level UV Fluorescence	High sensitivity	100	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
Ozone	Ncore/AQI	Continuous	Instrumental	ARM utilizing Ultra Violet photometry	Year-round operation	087	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
NO (trace)	Ncore									
NO <sub>y</sub> (trace)	Ncore	Continuous	Instrumental	ARM utilizing chemiluminescence	High sensitivity external converter mounted at 10m	599	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
PM <sub>2.5</sub> Continuous	Ncore/AQI	Continuous	BAM =Beta Attenuation Monitor Met One BAM - 1020		FEM	170	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
PM <sub>2.5</sub> Speciated	Ncore	1/3 days	Met One SASS	Energy Dispersive XRF	Analysis by EPA	811	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
PM <sub>2.5</sub> FRM	Ncore	1/3 days	R&P PM <sub>2.5</sub>	Gravimetric	BAX D	145	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
*PM10 - PM2.5 (PM Coarse)	Ncore	1/3 days	Hi-Vol-SA/GMW-321-B	Gravimetric	BAX S (*BAX-S minus BAX D is PM Coarse)	105	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
TSP-HVAS	Ncore	1/6 days	Hi-Vol-SA/GMW-321-B	Gravimetric	Integrated samplers. Weighed by AMS	91	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011

TSP - Lead Only	Ncore	1/6 days	Hi-Vol	Atomic Absorption	TSP-HVAS sample collected and sent to InterMountain Laboratory (IML)	43	Neighborhood/Urban	Population Exposure/Transport/Trend		1/1/2011
Meteorological (MET)	Ncore	Continuous		Air quality measurements approved instrumentation for wind speed, wind direction, humidity, barometric pressure, rainfall and solar radiation						1/1/2011

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Figure 21 - BAX Monitoring Site Map with Major Streets and Major Emission Sources

**BAXTER - 5200 PENNYPACK ST.  
EPA AIRS CODE: 421011002**



PLID	NAME	STREET	2011 EMISSIONS (in TONS/YR)						
			CO	NOX	PB	PM10	PM2.5	SO2	VOC
09519	PHILA PRISON SYS/CORR FAC	8001 STATE RD	8.31	10.54	0.00	0.35	0.21	0.47	0.57

Figure 22 - BAX Aerial View



## Detailed Information by Pollutant

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

#### Principle of Operation

The detection of ozone molecules is based on absorption of 254 nm UV light due to an internal electronic resonance of the O<sub>3</sub> molecule.

NAAQS:

Highest 4<sup>th</sup> daily maximum 8-Hour Concentration = 0.075 ppm

Ground level ozone (the primary constituent of smog) is the pollutant most often responsible for unhealthy air quality in the Philadelphia region. Ozone is not emitted into the atmosphere directly but is formed by reactions of other pollutants. Volatile Organic Compounds (VOCs) and Nitrogen Oxides (NO<sub>x</sub>) react to create ozone in the presence of heat and sunlight.

Unlike the oxygen that we breathe, which has only two atoms of oxygen (O<sub>2</sub>), ozone has an additional oxygen atom, making it very reactive. This is why ozone is said to burn or irritate the lungs. People who are very young or very old, or who have chronic lung problems such as asthma are particularly sensitive to ground level ozone.

In any discussion of ozone, it is important to distinguish between the effects of ozone at the ground and ozone high in the atmosphere, several miles above our heads. An advertisement might use the slogan “good up high, bad nearby,” to describe ozone. Regardless of where it is, no one would want to breathe it. However, up high in what’s called the ozone layer, ozone is essential to the health of nearly every living thing, since it protects the Earth from harmful ultraviolet (UV) light. If not for this natural layer, UV light would sterilize the Earth’s surface, and life as we know it would cease to exist. Near the ground, ozone reacts with buildings, plants, animals, and people, and is one of the most irritating, harmful components of smog. Smog refers to the whole mixture of air pollution in an area, and may include ozone, a whole host of other gases, and fine particles and the hazy conditions they cause. Ozone levels are consistently higher during the summer months.

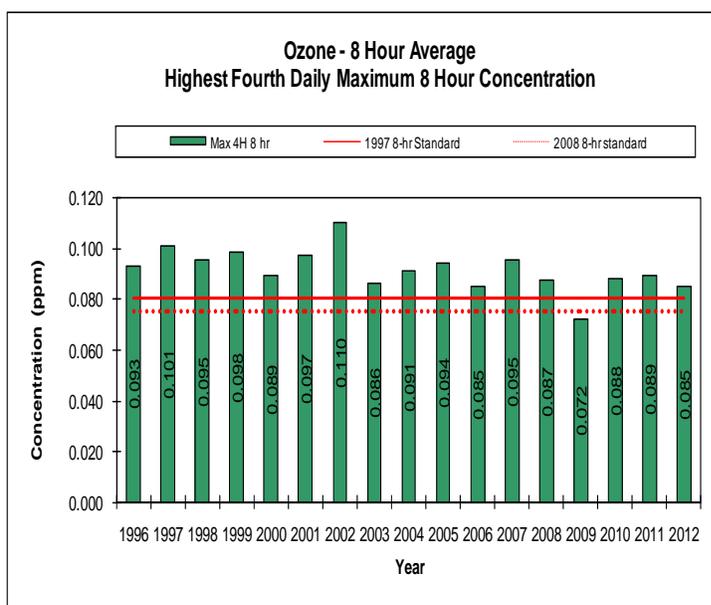
NO<sub>x</sub> are from burning of fuel in industry and motor vehicles. A significant amount of NO<sub>x</sub> that are emitted during fossil fuel combustion is Nitrogen Oxide (NO). NO reacts quickly with ozone to form oxygen (O<sub>2</sub>) and nitrogen dioxide (NO<sub>2</sub>). For this reason ozone levels are depressed in urban areas and increase downwind in more rural areas where there are emissions of NO. NEA was placed to indicate O<sub>3</sub> levels coming into the City and leaving the City.

VOCs are organic compounds that evaporate readily, such as gasoline vapors and paint fumes. VOCs that come from human activities are called anthropogenic VOCs. Some anthropogenic VOCs, such as benzene, are themselves toxic and may increase risks of cancer or lead to other adverse health effects in addition to helping form ozone. Some VOCs are considerably more reactive in the atmosphere than others, and the reactivity of a VOC influences how quickly ozone forms. A compound that reacts quickly to produce ozone will have a much greater impact near its source than one that reacts more slowly.

Philadelphia is in attainment for the 1997 8-hr ozone standard, but is in nonattainment for the 2008 8-hr standard. This means that the standards set by the EPA for ozone are being exceeded. AMS continues efforts with surrounding agencies to get into compliance for ozone. A State Implementation Plan (SIP) is a plan which identifies how a State will attain the standard. Each State is required to have a SIP which contains control measures and strategies which demonstrate how each area will attain and maintain the NAAQS. These plans are developed through a public process, formally adopted by the State, and submitted by the Governor's designee to EPA. The graph below shows ozone trends just for Philadelphia.

On March 12, 2008, EPA revised the level of the primary and secondary 8-hour ozone standards from 0.08 ppm to 0.075 ppm. EPA is reconsidering the level as the NAAQS is not as protective as recommended by EPA's panel of science advisers, the Clean Air Scientific Advisory

**Figure 23 - O<sub>3</sub> Trends**



Committee, CASAC. In the NAAQS final rule, EPA committed to issue a separate rule to address monitoring requirements necessary to implement the new standards. On September 2, 2011, President Obama requested the Administrator Jackson to withdraw the draft Ozone NAAQS and did not support asking state and local governments to begin implementing a new standard that will soon be reconsidered since the work to revise the standard in 2013 has been underway. Presently, states are required to operate a minimum numbers of EPA-approved ozone monitors based on the population of each of their MSA and the most recently measured ozone levels for

each area. States also operate additional ozone monitors to meet objectives including assessment of compliance with the NAAQS, investigation of ozone transport issues, calculations of the Air Quality Index, verification of photochemical modeling efforts, and assessment of ozone-related effects on ecosystems with natural plants sensitive to air pollution damage. EPA is lengthening the required ozone monitoring season in many states to account for the tightened level of the revised NAAQS and require ozone monitors operated as part of a new multi-pollutant network to operate on a year-round schedule when the network is fully operational in 2011. This does not affect Philadelphia because our ozone monitors run all year long.

In 2012, Philadelphia and the surrounding counties were in nonattainment for the 8-hour ozone standard. This means that the standard set by the EPA for ozone was exceeded. This standard was exceeded 19 times in 2012. AMS, along with other local and regional air quality agencies, continues to work towards compliance with ozone standards.

# Carbon Monoxide (CO)

## Principle of Operation

The basic principle by which the analyzer works is called Beer's Law. It defines the concentration of carbon monoxide by the amount of light of a specific wavelength that is absorbed by the carbon monoxide molecules over a fixed distance.

## NAAQS:

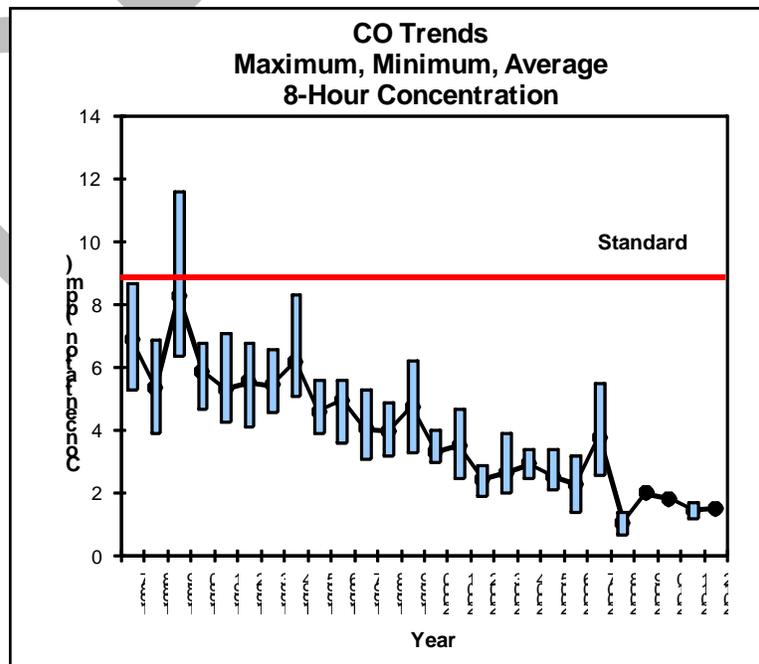
Highest 2<sup>nd</sup> maximum 8-Hour Concentration = 9 ppm

Highest 2<sup>nd</sup> maximum 1-Hour Concentration = 35 ppm

Carbon monoxide (CO) is colorless, odorless, and at high concentrations is a poisonous gas. It is formed when carbon in fuels are not burned completely. By far the largest source of CO is motor vehicle emissions. It is for this reason an area-wide CO monitor is located at the LAB which is near roadways and per EPA promulgation in 75 FR 6474 regarding the near-road monitor requirement for NO<sub>2</sub>, there will be a near-road NO<sub>2</sub> monitor that is operational by January 1, 2014 which is subsequently also used to monitor CO as codified in 40 CFR Part 58 Appendix D in Section 4.2.1. The near-road CO monitor is required to be operational by January 1, 2015 for CBSAs with 2.5 million or more persons or January 1, 2017 for CBSAs with population of 1 million or more persons, but less than 2.5 million persons. Weather greatly affects CO levels, and peak CO concentrations typically occur during the colder months of the year.

Over the last two decades, there has been a continued reduction in carbon monoxide levels. This is mainly the result of federal requirements for cleaner automobiles and fuel and state inspection/maintenance programs.

Figure 24 - CO Trends



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

### Principle of Operation

The concentration of nitric oxide [NO], total oxides of nitrogen [NO<sub>x</sub>] and, by calculation, nitrogen dioxide [NO<sub>2</sub>] is determined in a single instrument. The chemical reaction between nitric oxide [NO] and ozone [O<sub>3</sub>] produces light (chemiluminescence). The concentration of nitric oxide is determined by the intensity of the light.

### NAAQS:

Highest Annual Arithmetic Mean Concentration = 0.053 ppm

Highest 3-year average 98<sup>th</sup> percentile daily 1-Hour Concentration = 100 ppb

Nitrogen dioxide is a light brown gas that is an important component of urban haze. The compound is created primarily from fuel combustion in motor vehicles, utilities, and industrial sources.

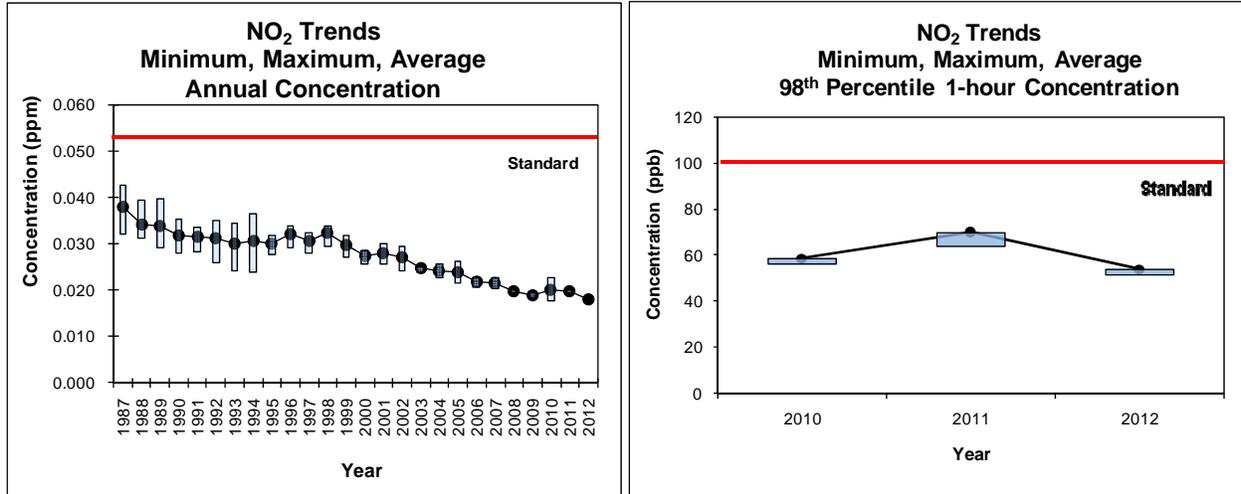
Nitrogen dioxide can irritate the lungs and lower resistance to respiratory infections such as influenza. Nitrogen oxides (NO<sub>x</sub>) are an important precursor to both ozone and acid rain and can affect both land and water ecosystems. They contribute to the formation of fine particulate matter, haze and reductions in visibility.

Ambient levels of nitrogen dioxide in Philadelphia are better than the NAAQS, showing a sustained downward trend over time for the annual standard.

On January 22, 2010, the EPA added the primary 1-hour NO<sub>2</sub> standard of 100 ppb, to protect against short-term exposures, typically near major roads. After careful review of the best available science, on March 20, 2012, the EPA retained the secondary annual NO<sub>2</sub> standard of 0.053 ppm to protect against environmental damage typically effecting plants, soils, lakes, and streams. Trends are shown below for Philadelphia over the last few years.

On March 7, 2013, the EPA issued a final rule establishing deadlines that require any new near-road monitors to be operational between January 1, 2014 and January 1, 2017. This rule replaces the 2010 rule which established deadlines that required new NO<sub>2</sub> monitors to be operational by January 1, 2013. Currently, AMS aims to have the Torresdale near-road monitoring site operational by January 1, 2014.

Figure 25 - NO<sub>2</sub> Trends



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# Sulfur Dioxide (SO<sub>2</sub>)

## Principle of Operation

The concentration of SO<sub>2</sub> is based upon the measurement of fluorescence of SO<sub>2</sub> when it is exposed to Ultra Violet (UV) light (absorption of UV energy).

NAAQS:

Highest 99<sup>th</sup> percentile daily 1-hour Concentration = 75 ppb  
 Highest daily 3-hour Concentration (secondary standard) = 0.5 ppm

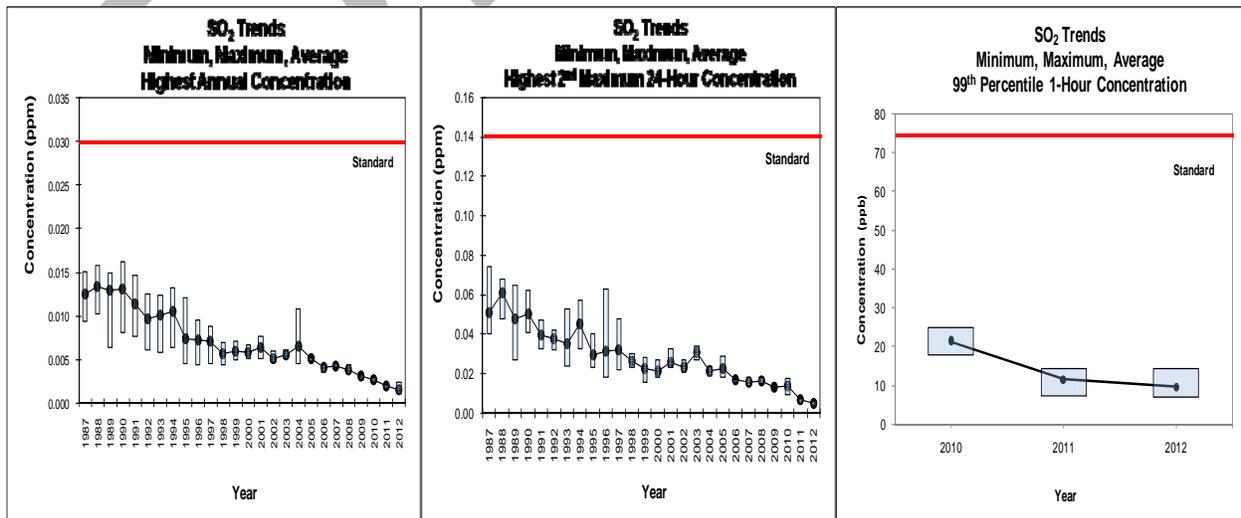
SO<sub>2</sub> is emitted from the burning of fuels that contain sulfur. Industrial grade fuel oils are the primary source in Philadelphia.

The major health concerns associated with exposure to high concentrations of SO<sub>2</sub> include effects on breathing, respiratory illness, alterations in the lungs' defenses, and aggravation of existing respiratory and cardiovascular disease. Together, SO<sub>2</sub> and NO<sub>x</sub> are the major ingredients of acid rain. SO<sub>2</sub> also plays a significant role in the formation of fine particulate matter. Monitors are placed to better understand the impact of the City's major emitters of SO<sub>2</sub>.

SO<sub>2</sub> levels are well within air quality standards and show a slow, continued improvement over time. This is mainly due to industry, businesses, and homes changing to fuels with lower sulfur content such as natural gas. In October 2006, ultra low sulfur diesel (ULSD) came on line for on-road vehicles; producers were required to begin producing ultra ULSD to comply with new requirements that 80% of diesel fuel used for on-road vehicles must be ULSD.

On June 2, 2010, EPA revoked the primary annual and 24-hour SO<sub>2</sub> standards of 30 ppb and 140 ppb, respectively, to a 1-hour standard of 75 ppb. After careful review of the best available science, on March 20, 2012, the EPA retained the secondary 3-hour SO<sub>2</sub> standard of 0.5 ppm to protect against environmental damage, typically effecting plants, soils, lakes, and streams.

Figure 26 - SO<sub>2</sub> Trends



## Lead (Pb)

NAAQS:

Highest 3-Month Rolling Average Concentration =  $0.15 \mu\text{g}/\text{m}^3$

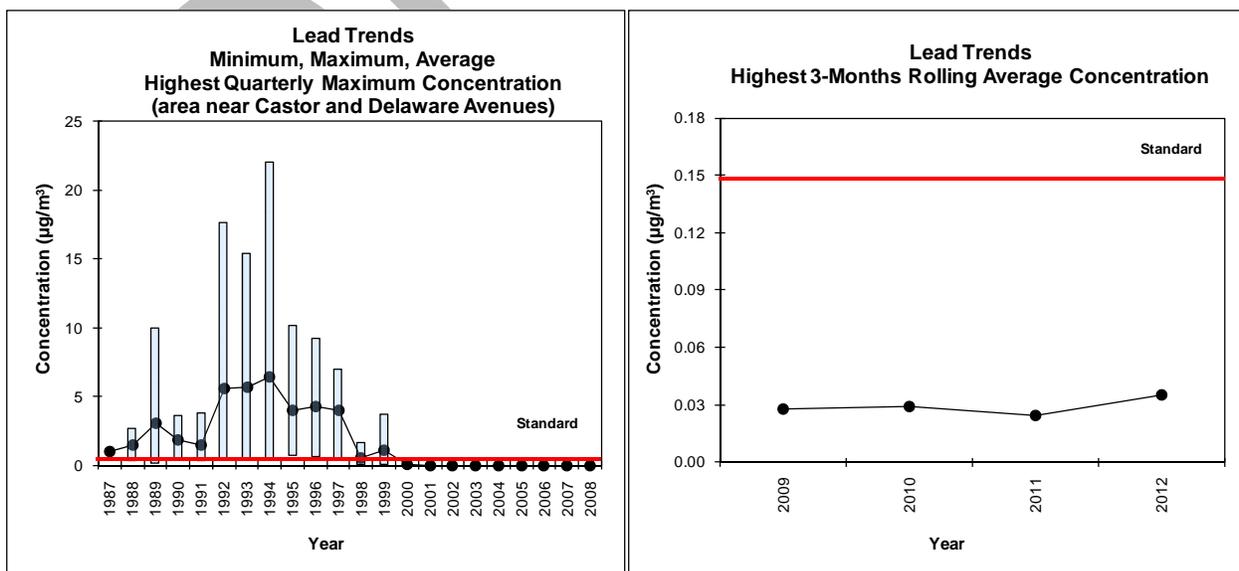
The processing of metals is the major source of lead emissions to the atmosphere. It does not travel over great distances in the air and so concentrations vary, with highest levels near particular industrial sites.

Lead is a metal that is highly toxic when inhaled or ingested. Lead accumulates in the blood, bone, and soft tissue and may affect the kidneys, liver, nervous system and other organs. It also can cause learning difficulties in children.

Ambient lead levels decreased significantly throughout the City due to the use of unleaded gasoline and greater control of emissions from companies that produce or process lead compounds. Lead levels in certain parts of the City were extremely high in the 1980's and 1990's due to the concentration of particular industries in the area. This is reflected in the previously high readings for monitors near Castor and Delaware Avenues. The levels of lead in these areas have drastically improved, and are now comparable to the rest of the City. Currently, AMS measures for ambient lead only at the BAX location.

On November 12, 2008, EPA strengthened the lead NAAQS standard from  $1.5 \mu\text{g}/\text{m}^3$  to  $0.15 \mu\text{g}/\text{m}^3$ , measured as total suspended particles (TSP). AMS meets the new standard. EPA requires monitoring near lead sources with emissions of 0.5 to 1.0 tons per year. Philadelphia has no sources that emit 0.5 or more tons of Pb per year.

Figure 27 - Lead (Pb) Trends



## Particulate Matter

Particulate matter is the general term used for a mixture of solid particles and liquid droplets found in the air. These particles come in a wide range of sizes and originate from stationary, mobile, and natural sources.

PM<sub>10</sub> and PM<sub>2.5</sub> are small particulate matter that measure less than 10 micrometers (0.00001 meters) and 2.5 micrometers (0.0000025 meters) respectively (1/30 thickness of human hair). These small particles penetrate deeply into the respiratory system and can have adverse health effects. In addition to health problems, particulate matter can cause reduced visibility, soiling, and damage to materials.

In 1997, the EPA revised the National Ambient Air Quality Standards to include fine particulate. Fine particles are made up of both primary (combustion) and secondary (formed in the air) sources. Particles remain airborne for long periods of time and disperse in uniform concentrations across wide areas, crossing geographic boundaries.

Fine particles are treated as though they are a single pollutant, but fine particles come from many different sources and are composed of thousands of different compounds. Fortunately, these compounds fall into a few dominant categories: sulfates, nitrates, ammonium compounds, soil, organic carbon compounds, and elemental carbon. Soot, also referred to as black carbon or elemental carbon, is emitted directly by diesel engines and forest fires, among other sources. Most individual particles are likely mixtures of different substances, the products of growing by collisions with other particles and by taking on gases.

### Particulate Matter of less than 10 microns (PM<sub>10</sub>)

#### PM<sub>10</sub>

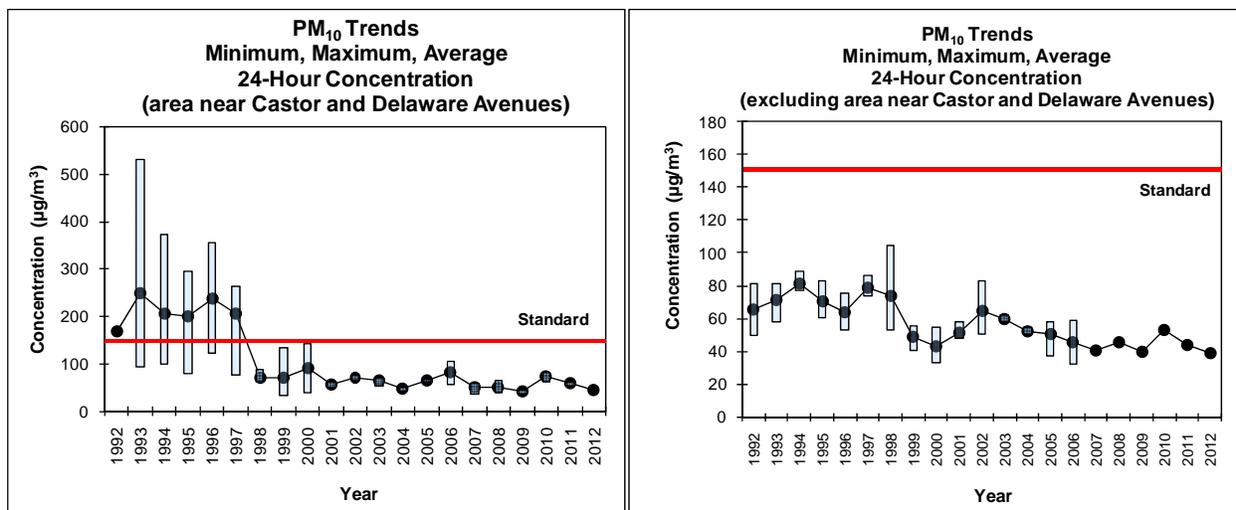
NAAQS:

Highest Second Maximum 24-Hour Concentration = 150 µg/m<sup>3</sup>

Particulate matter levels have been decreasing due to regulations limiting the amount of emissions allowed and the change to cleaner fuels such as natural gas by industry, businesses and homes.

There are two sets of trend charts shown for this pollutant. During the mid 1990s, particulate emissions from several sources in the area of Castor and Delaware Avenues caused extremely high localized measurements. In fact, the levels were many times higher than those measured at other City locations. Because the impact was not widespread, the additional chart is presented to highlight that fact. Specific action to abate these sources have resulted in air quality that now meets the national standards and are now comparable to levels in the rest of the City. Continuous PM<sub>10</sub> data is used in the Air Quality Index. The graphs on the following page show PM<sub>10</sub> trends.

Figure 28 - PM<sub>10</sub> Trends



## Particulate Matter of less than 2.5 microns (PM<sub>2.5</sub>)

### PM<sub>2.5</sub>

#### NAAQS:

1997 Highest Annual Mean Concentration = 15 µg/m<sup>3</sup>

2012 Highest Annual Mean Concentration = 12 µg/m<sup>3</sup>

Highest 98<sup>th</sup> Percentile 24-Hour Concentration = 35 µg/m<sup>3</sup>

PM<sub>2.5</sub> consists of those particles that are less than 2.5 micrometers in diameter. They are also referred to as "fine" particles. Fine particles result from fuel combustion from motor vehicles, power generation, and industrial facilities, as well as from residential fireplaces and wood stoves. A significant amount of fine particles are also formed in the atmosphere by the transformation of gaseous emissions such as SO<sub>2</sub>, NO<sub>x</sub>, VOCs, and ammonia.

Fine particles can accumulate in the respiratory system and are associated with numerous health effects such as premature death, increased respiratory symptoms and disease, and decreased lung functions. Sensitive groups that appear to be at the greatest risk for such effects include the elderly, children, and individuals with cardiopulmonary disease or respiratory ailments such as asthma.

In December 14, 2012, EPA strengthened the annual health standard for PM<sub>2.5</sub>, from 15 µg/m<sup>3</sup> (the annual primary standard that was set in 1997) to 12 µg/m<sup>3</sup>. EPA retains the existing the 24-hour health standard at 35 µg/m<sup>3</sup> that was issued in 2006. The final rule is effective as of March 18, 2013.

Measuring PM<sub>2.5</sub> requires highly sensitive equipment under tight temperature and humidity control. Philadelphia was in nonattainment for the 24-hour PM<sub>2.5</sub> standard, but is now in attainment for both annual and 24-hour PM<sub>2.5</sub> standards.

Monitors are placed to assess public exposure high levels. Continuous PM<sub>2.5</sub> data is used in the

Air Quality Index for some sites. Speciation shows the make-up of PM<sub>2.5</sub> in the City in general and the impact of large sources of emissions.

Figure 31 shows that Philadelphia has met the PM<sub>2.5</sub> 24-hour standard since 2008. The Design Value of the 24-hour standard which is used to demonstrate attainment, is based on a 3-year average of annual 98<sup>th</sup> percentile values. Figure 32 shows Philadelphia based on the site 421010047 (CHS) met the annual PM<sub>2.5</sub> standard for design value period of 2010 - 2012. CHS is one of five PM<sub>2.5</sub> monitoring sites that historically has experienced the highest PM<sub>2.5</sub> concentration. The Design Value is based on a 3-year average of annual averages.

Figure 29 - PM<sub>2.5</sub> Trends

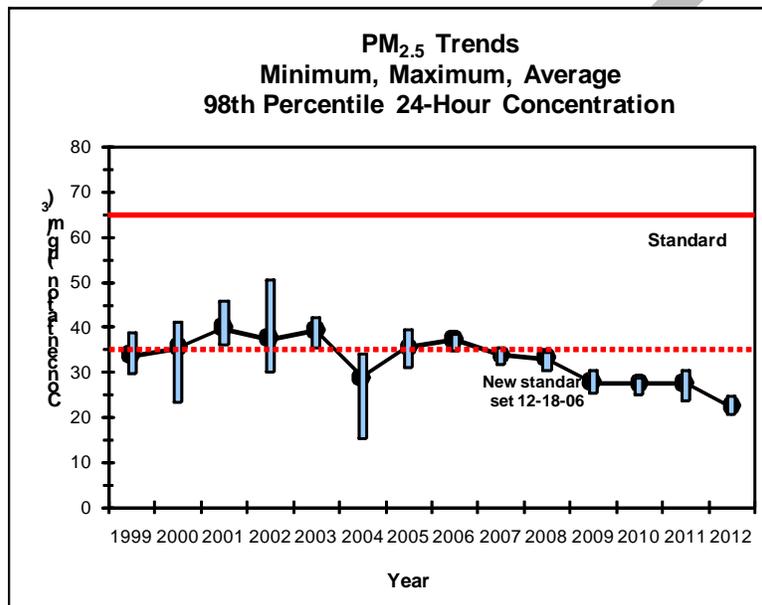
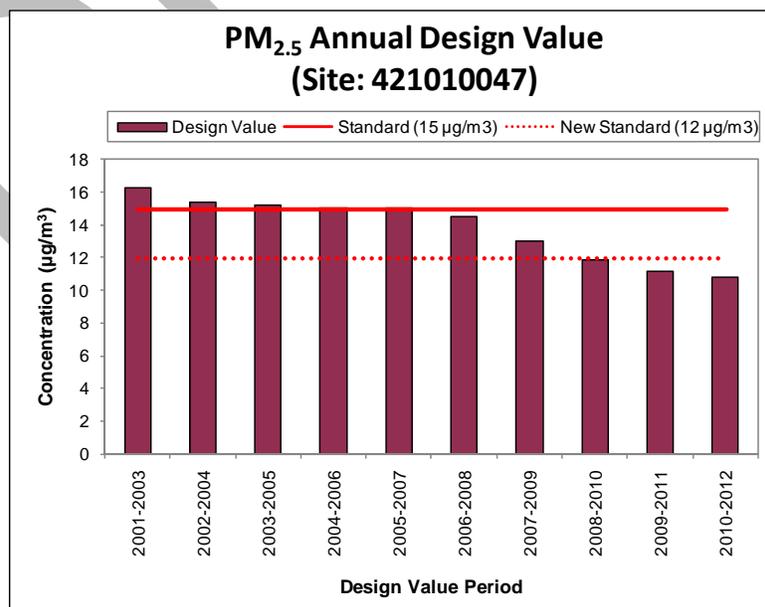


Figure 30 - PM<sub>2.5</sub> Design Values



## Toxics

Air toxics, also referred to as toxic air pollutants or hazardous air pollutants (HAPs), are substances that cause adverse health effects or environmental damage. The Federal Clean Air Act Amendments (CAAA) of 1990 lists 187 pollutants or chemical groups as HAPs. Examples of air toxics include heavy metals (such as beryllium), organic chemicals (such as formaldehyde), polycyclic organic matter (POM, which are formed primarily by combustion), benzene (which is found in gasoline), and pesticides, fine mineral fibers, and asbestos. HAPs are emitted from stationary sources (large industrial facilities), area sources (dry cleaners and household uses), as well as mobile sources (trucks and buses).

The mix of monitor locations provides information on public exposure from major industry, road traffic, and background.

There is less information known about the health impact from the 187 HAPs than there are for criteria pollutants, and no national standards exist for them. However, a number of these pollutants are known or suspected to be carcinogenic, and there is no known “safe concentration.” The danger posed by toxics is often referred to in terms of risk. Risk is defined as the likelihood of a negative outcome from a certain level of a specific chemical, or the measure of a chance that health problems will occur. For example, many toxics cause cancer, while others cause respiratory problems, birth defects, neurological or, immune response problems, and other health concerns. Toxics have varying degrees of danger, and some will cause harm with a very small amount of the substance while others require large amounts to have a negative effect. Risk is often expressed as the additional number of deaths that would occur over 70 years (a lifetime) than would have occurred without that ambient concentration of that pollutant. For example, one in a million implies that one person out of every million people would live longer without that amount of that pollutant in the air.

AMS is helping to reduce HAPs in Philadelphia by enforcing Federal, State, and locally mandated programs that limit emissions from stationary and area sources. Many toxic emissions have been reduced by regulations designed to bring Philadelphia into compliance with the NAAQS for Ozone. In addition, Philadelphia enforces the National Emission Standards for Hazardous Air Pollutants (NESHAP), a program to reduce emissions from existing major and area sources, as well as New Source Performance Standards (NSPS), which limit toxic emissions from new sources.

Since diesel emissions are a significant, but not quantified, contributing factor to health risks from toxic emissions, AMS continues working to promote voluntary emissions reductions from diesel vehicles and to bring clean diesel technology to the Philadelphia area. The Philadelphia Diesel Difference Working Group, a coalition of diverse stakeholders whose primary purpose is to reduce the air pollutants associated with diesel-powered engines in the greater Philadelphia area, meets on a monthly basis. The group is currently compiling lists of diesel fleets interested in initiating retrofit or clean fuel projects. The list may help position the Philadelphia area for anticipated Federal funding. More information on this program can be found at [http://www.cleanair.org/program/transportation/diesel\\_campaign](http://www.cleanair.org/program/transportation/diesel_campaign).

AMS has historically measured toxic pollutants at the Laboratory (LAB) and more recently at the Community Health Services (CHS), Roxborough (ROX), Ritner (RIT) and PHL Airport (SWA) monitoring sites.

As part of EPA's National Air Toxics Assessment (NATA) activities, the latest, the 2005 NATA, was made available to the public in March 11, 2011. 180 of the 187 Clean Air Act air toxics plus diesel particulate matter were assessed for either lifetime cancer risk or non-cancer hazard due to inhalation. NATA is EPA's ongoing comprehensive evaluation of air toxics in the U.S. These activities include expansion of air toxics monitoring, improving and periodically updating emission inventories, improving national- and local-scale modeling, continued research on health effects and exposures to both ambient and indoor air, and improvement of assessment tools. The goal of NATA is to identify those air toxics which are of greatest potential concern, in terms of contribution to population risk. The results will be used to establish strategies to reduce emissions and these set priorities or programs and the collection of additional air toxics data.

The assessment includes four steps:

- Compiling a national emissions inventory of air toxics emissions from outdoor sources.
- Estimating ambient concentrations of air toxics across the contiguous United States.
- Estimating population exposures across the contiguous United States.
- Characterizing potential public health risk due to inhalation of air toxics including both cancer and non-cancer effects.

The 2005 NATA indicated high health risks in the City. Philadelphia ranked 87<sup>th</sup> in the country based on average risk. To better understand the air toxic problem and promote actions to reduce the risks caused by these pollutants, the Philadelphia Air Toxic Project was initiated by EPA Region III and Air Management Services to develop a more accurate emission inventory, develop modeling systems, identify sources, identify stakeholders and gather background information so a process can be developed to reduce emissions. Activities associated with the river ports and the airport appear to be a significant source of diesel particulate.

AMS has determined health risks associated with the concentrations of air toxics measured at the City's air toxic monitoring sites. Annual averages for each of the compounds at each monitoring site were calculated and used to estimate the risk from inhalation exposure to ambient air for cancer and non-cancer health effects.

The risk calculation is based upon the standard methodology used by EPA. The excess lifetime cancer risk for each of the chemical compounds was calculated using unit risk factors (URFs). The URF is the measure of the probability of developing cancer from exposure over a lifetime to a specified concentration of a given chemical. Air toxics that are being measured in Philadelphia that show an excess lifetime cancer risk of 1 or more out of a million are:

**1,3-butadiene** (Cas RN 106-99-0) - A colorless, non-corrosive gas with a mild aromatic or gasoline-like odor, used primarily as a monomer to manufacture many different types of polymers and copolymers.

**acetaldehyde** (Cas RN 75-07-0) - A colorless liquid or gas with a fruity odor. It is used to manufacture many other chemicals.

**benzene** (Cas RN 71-43-2) - A colorless liquid with a pleasant odor. It is used mainly in making other chemicals and plastics, as a solvent, and is found in trace amounts of gasoline.

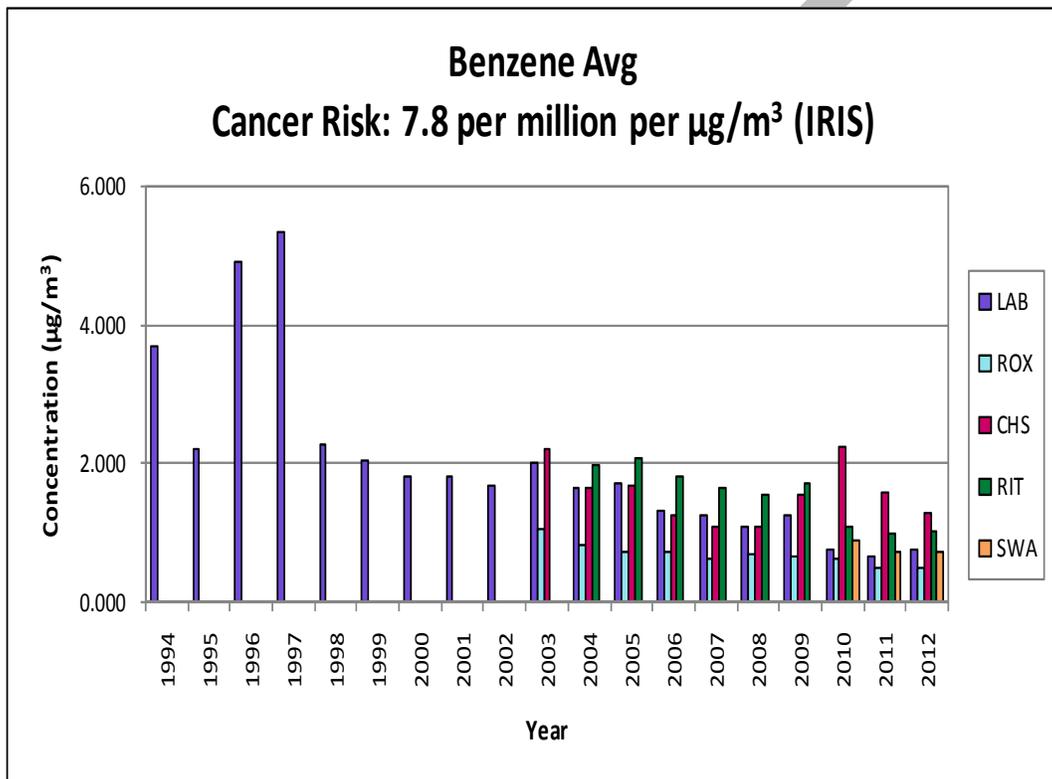
**carbon tetrachloride** (Cas RN 56-23-5) - A colorless liquid with an ether-like odor. It is used as a solvent and in making fire extinguishers, refrigerants, and aerosols.

**formaldehyde** (Cas RN 50-00-0) - a colorless, flammable gas that has a distinct, pungent smell. It is used in the production of fertilizer, paper, plywood and urea-formaldehyde resins.

**tetrachloroethylene** (Cas RN 127-18-4) - A clear liquid with a sweet, chloroform-like odor. It is used in dry cleaning and metal degreasing. Its other common name is perchloroethylene.

Below is a graph of benzene trends over time.

Figure 31 - Benzene Trends



## Appendix A: Probe and Monitoring Path Siting Criteria

Below is a summary of the general requirements for probe and monitoring path siting criteria.

**Table A.1 - Table E-4 of Appendix E to 40 CFR Part 58 - Summary of Probe and Monitoring Path Siting Criteria**

Pollutant	Scale (maximum monitoring path length, meters)	Height from ground to probe, inlet or 80% of monitoring path \1\	Horizontal and vertical distance from supporting structures \2\ to probe, inlet or 90% of monitoring path \1\ (meters)	Distance from trees to probe, inlet or 90% of monitoring path \1\ meters	Distance from roadways to probe, inlet or monitoring path \1\ (meters)
<b>SO<sub>2</sub></b> \3\, \4\, \5\, \6\	Middle (300 m) Neighborhood, Urban and Regional (1 km)	2-15	> 1	> 10	N/A
<b>CO</b> \4\, \5\, \7\	Micro (downtown or street canyon sites, near-road), middle (300 m) Neighborhood (1 km)	2.5-3.5; 2-7; 2-15	> 1	> 10	2-10; downtown areas or street canyon microscale; 50 for near-road microscale; See Table E-2 of 40 CFR 58 Appendix E for middle and neighborhood scales
<b>O<sub>3</sub></b> \3\, \4\, \5\	Middle (300 m) Neighborhood, Urban, and Regional (1 km)	2-15	> 1	> 10	See Table E-1 of 40 CFR 58 Appendix E for all scales
<b>NO<sub>2</sub></b> \3\, \4\, \5\	Micro (Near-road [50-300]) Middle (300 m) Neighborhood, Urban, and Regional (1 km)	2-7 (micro); 2-15 (all other scales)	> 1	> 10	50 meters for near-road microscale; See Table E-1 of 40 CFR 58 Appendix E for all other scales
<b>O<sub>3</sub> precursors (for PAMS)</b> \3\, \4\, \5\	Neighborhood and Urban (1 km)	2-15	> 1	> 10	See Table E-4 of 40 CFR 58 Appendix E for all scales
<b>PM, Pb</b> \3\, \4\, \5\, \6\, \8\	Micro: Middle, Neighborhood, Urban and Regional	2-7 (micro); 2-7 (middle PM <sub>10-2.5</sub> ); 2-15 (all other scales)	> 2 (all scales, horizontal distance only)	> 10 (all scales)	2-10 (micro); See Figure E-1 of 40 CFR 58 for all other scales

N/A\_ Not applicable.

\1\ Monitoring path for open path analyzers is applicable only to middle or neighborhood scale CO monitoring, middle, neighborhood, urban, and regional scale NO<sub>2</sub> monitoring, and all applicable scales for monitoring SO<sub>2</sub>, O<sub>3</sub>, and O<sub>3</sub> precursors.

\2\ When probe is located on a rooftop, this separation distance is in reference to walls, parapets, or penthouses located on roof.

\3\ Should be >20 meters from the drip-line of tree(s) and must be 10 meters from the drip-line when the tree(s) act as an obstruction.

\4\ Distance from sampler, probe, or 90% of monitoring path to obstacle, such as a building, must be at least twice the height the obstacle protrudes above the sampler, probe, or monitoring path. Sites not meeting this criterion may be classified as middle scale (see text).

\5\ Must have unrestricted airflow 270 degrees around the probe or sampler; 180 degrees if the probe is on the side of a building or a wall.

\6\ The probe, sampler, or monitoring path should be away from minor sources, such as furnace or incineration flues. The separation distance is dependent on the height of the minor source's emission point (such as a flue), the type of fuel or waste burned, and the quality of the fuel (sulfur, ash, or lead content). This criterion is designed to avoid undue influences from minor sources.

\7\ For microscale CO monitoring sites, the probe must be >10 meters from a street intersection and preferably at a midblock location.

\8\ Collocated monitors must be within 4 meters of each other and at least 2 meters apart for flow rates greater than 200 liters/min or at least 1 meter apart for samplers having flow rates less than 200 liters/min to preclude airflow interference.

**Table A.2 - Table E-2 to Appendix E of Part 58. Minimum Separation Distance Between Roadways and Probes or Monitoring Paths for Monitoring Neighborhood Scale Carbon Monoxide**

Roadway average daily traffic, vehicles per day	Minimum distance \9\ (meters)
≤10,000	10
15,000	25
20,000	45
30,000	80
40,000	115
50,000	135
≥60,000	150

\9\ Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

**Table A.3 - Table E-1 to Appendix E of Part 58. Minimum Separation Distance Between Roadways and Probes or Monitoring Paths for Monitoring Neighborhood and Urban Scale Ozone (O3) and Oxides of Nitrogen (NO, NO2, NOx, NOy)**

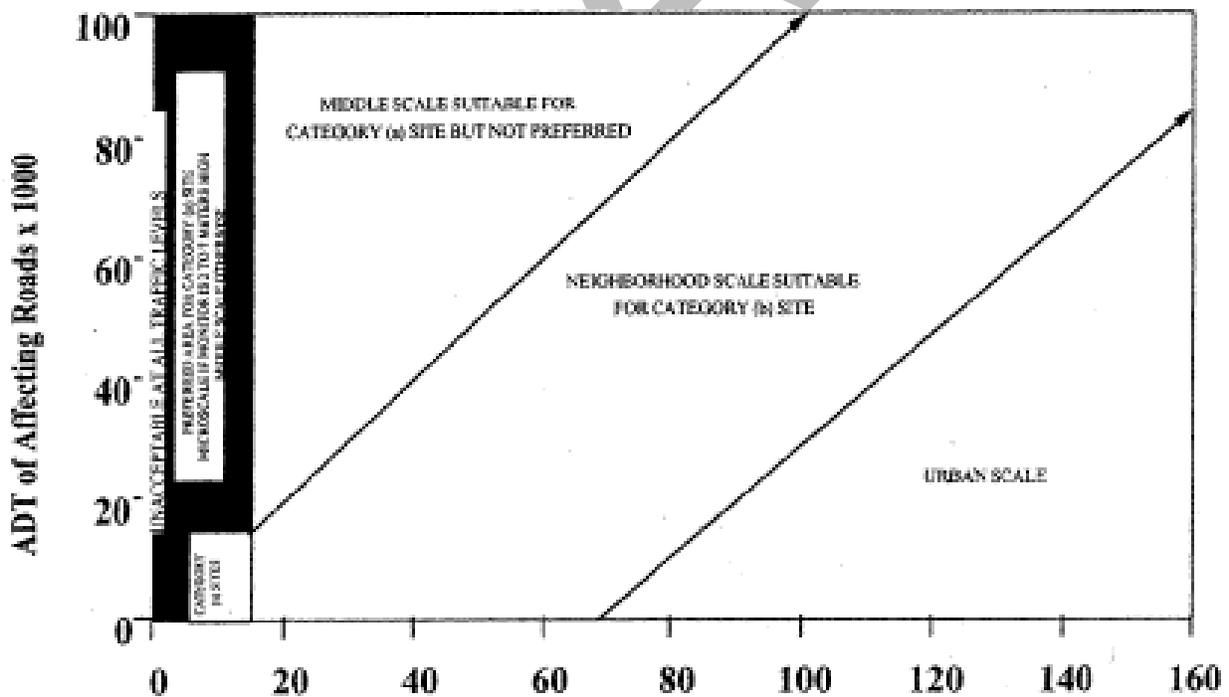
Roadway average daily traffic, vehicles per day	Minimum distance \10\ (meters)	Minimum distance \10\,\11 (meters)
≤1,000	10	10
10,000	10	20
15,000	20	30
20,000	30	40
40,000	50	60
70,000	100	100
≥110,000	250	250

\10\ Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on the actual traffic count.

\11\ Applicable for ozone monitors whose placement has not already been approved as of December 18, 2006.

Values based on the actual traffic count.

**Figure A.1 – Figure E-1, 40 Part 58 Appendix E – Distance of PM Samplers to Nearest Traffic Lane (meters)**



**Figure E-1. Distance of PM samplers to nearest traffic lane (meters)**

## **Appendix B: Request to Exclude PM<sub>2.5</sub> Continuous FEM Data from Being Compared to the National Ambient Air Quality Standard (NAAQS)**

### **Introduction:**

Our monitoring program has historically operated PM<sub>2.5</sub> continuous monitors primarily to support forecasting and reporting of the Air Quality Index (AQI). These monitors supply data every hour to update the AQI on our web site, [www.phila.gov/aqi](http://www.phila.gov/aqi) as well as on national web sites such as AIRNow ([www.airnow.gov](http://www.airnow.gov)). We have been using this kind of monitor over the past five years since we implemented the PM<sub>2.5</sub> monitoring program more than a decade ago. Over the last few years, a number of PM<sub>2.5</sub> continuous monitors have been approved as Federal Equivalent Methods (FEMs). By utilizing an approved FEM, any subsequent data produced from the method may be eligible for comparison to EPA's health based standard known as the National Ambient Air Quality Standards (NAAQS). The primary advantage of operating a PM<sub>2.5</sub> continuous FEM is that it can simultaneously support the AQI and supply data that is eligible for comparison to the NAAQS. Thus, a network utilizing PM<sub>2.5</sub> continuous FEMs can minimize the number of filter-based FRMs operated in the network, which are primarily used for comparison to the NAAQS. These filter-based FRMs are resource intensive in that they require field operations as well as pre- and post-sampling laboratory analysis which results in data not being available for approximately 2-4 weeks after sample collection.

Our monitoring program has been working with PM<sub>2.5</sub> continuous FEMs including deployment at a few sites to evaluate their performance. Although the PM<sub>2.5</sub> continuous FEMs are automated methods, these methods still require careful attention in their set-up, operation, and validation of data. Once enough data was collected, the performance of the FEM method was evaluated in comparison to the collocated FRM methods. This evaluation is further explained below along with our recommendations regarding the use of the data from these methods.

### **Request for Exclusion of PM<sub>2.5</sub> Continuous FEM data from Comparison to the NAAQS:**

In accordance with the PM NAAQS rule published on January 15<sup>th</sup>, 2013 (78 FR 3086), and specific to the provisions detailed in §58.10 (b)(13) and §58.11 (e), we are requesting that data from the following monitor be set aside for comparison to the NAAQS. While our agency is working to optimize the monitoring instrumentation we use to meet all of our monitoring objectives, we are not yet at a point where the comparability of the PM<sub>2.5</sub> continuous FEM operated in our network compared to collocated FRM is acceptable such that we are comfortable using the continuous FEM data for comparison to the NAAQS. After assessing the comparability of the PM<sub>2.5</sub> FEM to the collocated FRM for our network, we have determined that the site listed

below does not meet the comparability requirements. Detailed one-page assessments from which the information described below was obtained are included at the end of this section.

DRAFT

**Table B.1 – Request for Exclusion of PM<sub>2.5</sub> Continuous FEM Data**

Site Name	City	Site ID	Cont POC	Method Description	PM <sub>2.5</sub> Cont. Begin Date	PM <sub>2.5</sub> Cont. End Date	Continuous/FRM Sampler pairs per season	Slope (m)	Intercept (y)	Meets bias requirement	Correlation (r)
<i>Sites with PM<sub>2.5</sub> continuous FEMs that are collocated with FRMs:</i>											
<b><u>LAB</u></b>	<b><u>Philadelphia</u></b>	<b><u>42-101-0004</u></b>	<b><u>2</u></b>	<b><u>MetOne BAM Continuous Monitor</u></b>	<b><u>January 1, 2011</u></b>	<b><u>March 31, 2013</u></b>	Winter = 34	<b><u>0.97</u></b>	<b><u>4.85</u></b>	<b><u>No</u></b>	<b><u>0.77</u></b>
							Spring = 27	<b><u>1.46</u></b>	<b><u>-0.46</u></b>	<b><u>No</u></b>	<b><u>0.83</u></b>
							Summer = 24	<b><u>1.08</u></b>	<b><u>2.82</u></b>	<b><u>No=Intercept</u></b>	<b><u>0.91</u></b>
							Fall = 20	<b><u>1.18</u></b>	<b><u>4.97</u></b>	<b><u>No</u></b>	<b><u>0.96</u></b>
							Total = 105	<b><u>1.10</u></b>	<b><u>3.39</u></b>	<b><u>No=Intercept</u></b>	<b><u>0.86</u></b>
									<b><u>Yes=slope</u></b>		
<i>Sites with PM<sub>2.5</sub> continuous FEMs that are <u>not</u> collocated with FRMs:</i>											

### **Period of Exclusion of Data from the PM<sub>2.5</sub> Continuous FEMs:**

As written on the above table's detail, our agency would like to request PM<sub>2.5</sub> continuous FEM data from years of 2011 to Spring 2013 to be excluded. Per EPA Regional 3 Office approval, we will load or move as necessary this data to EPA's AQS database in a manner where the data is only used for the appropriate monitoring objective(s) (i.e., use data for both the NAAQS and AQI, just the AQI, or neither the NAAQS or AQI). Additionally, we will continue to load any new data generated for the next 18 months (intended to represent the period until December 31 of 2014) in the same manner or until such time as we request and receive approval from the EPA Regional 3 Office to change the monitoring objectives that the data from the PM<sub>2.5</sub> continuous FEMs can support.

### **PM<sub>2.5</sub> Continuous FEM data for Reporting the AQI:**

In our assessment of the comparability of the PM<sub>2.5</sub> continuous FEM to collocated FRM, we believe that the data would not be appropriate for reporting the AQI. However, we will continue to utilize our pre-FEM PM<sub>2.5</sub> continuous monitor to support our real-time reporting needs. We will store the data from the PM<sub>2.5</sub> continuous FEM in parameter code 88501 so that it is available for data users with the caveat that it will not be used in NAAQS or AQI calculations.

### **Continued Operation of PM<sub>2.5</sub> Monitors to Support NAAQS and AQI Reporting**

While we are requesting that data from the monitor listed above be set aside for comparison to the NAAQS, we will continue to operate PM<sub>2.5</sub> FRM to support the objective of comparison to the NAAQS. We will also operate our PM<sub>2.5</sub> continuous monitor for use in AQI reporting. Each of these FRM and PM<sub>2.5</sub> continuous monitors will be operated at the location previously described in this plan and at the locations that meet the objectives of the Network Design Criteria for Ambient Air Quality Monitoring described in Appendix D to Part 58.

### **Assessments:**

The following one-page assessment is a location where our agency has a collocated PM<sub>2.5</sub> FRM and continuous FEM monitors. This assessment is represented in the "**Table B.1 – Request for Exclusion of PM<sub>2.5</sub> Continuous FEM Data**" above.

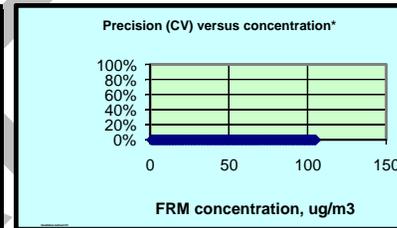
## Summary – Candidate ARM Comparability

Applicant:	
Candidate method:	Met One BAM
Test site:	Philadelphia LAB

Data sets	Number
Valid data sets available:	105
Number of valid data sets required for ARM Comparison:	90
Number of valid data sets for this test is:	OK
Additional data sets needed:	--

(Including 1 data sets excluded because FRM conc. < 3.)

Precision (if data are available)	Data set mean $\mu\text{g}/\text{m}^3$		Data set precision $\mu\text{g}/\text{m}^3$		Relative precision (CV)	
	FRM	Candidate	FRM	Candidate	FRM	Candidate
Mean:	9.3	13.6				
Maximum:	25.4	29.8				
Minimum:	2.9	3.9				
Candidate / FRM Ratio:	146.9%					
<b>RMS Relative Precision for this site:</b>						
<b>Test requirements - Class III:</b>					10.0%	15.0%
<b>Precision Test Results for site:</b>						



Regression statistics	Slope <sup>1</sup>	Intercept <sup>2</sup>	Correlation (r)
Statistics for this test site:	1.10	3.39	0.86
Limits for Class III	Upper:	1.10	0.49
	Lower:	0.90	-2.00
Test Results (Pass/Fail):	PASS	FAIL	FAIL

<sup>1</sup>Multiplicative bias    <sup>2</sup>Additive bias

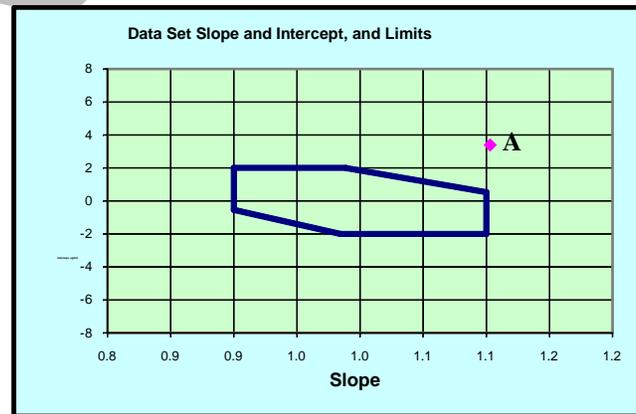
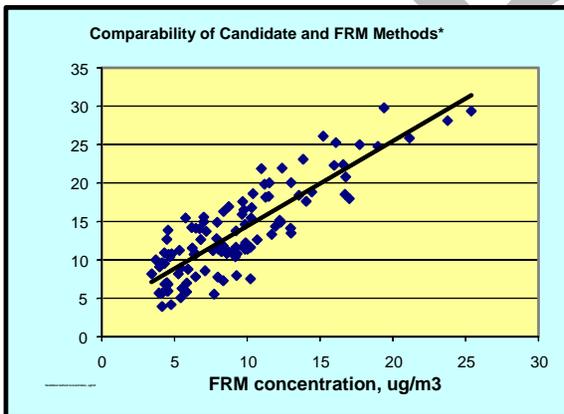


Figure B.1 – Comparability Chart of Candidate and FRM Methods

Figure B.2 – Data Set Slope and Intercepts, and Limits Chart

From the Data Set Slope and Intercept, and Limits chart on **Figure B.2**, “A” as it represents all data appears to be outside the box which indicates that this bias does not meet the acceptance criteria. Our agency has utilized one of the spreadsheet templates that are available on AMTIC (<http://www.epa.gov/ttn/amtic/contmont.html>) to ensure the combination of the multiplicative (slope) and additive (intercept) bias is outside the required test specifications on Table C-4 of Part 53. The test specifications require the slope and the intercept to be within a certain range. The slope has to be within  $1 \pm 0.10$ . The slope generated from the assessment is 1.10. With this number, the slope meets the multiplicative bias criterion; it is within the bounds of 0.90 and 1.10. The second criterion that needs to be checked is the additive bias (intercept). The intercept’s lower limit is equal to  $15.05 - (17.32 \times \text{slope})$ , but cannot be less than -2.0. The intercept’s upper limit is equal to  $15.05 - (13.20 \times \text{slope})$ , but cannot be more than +2.0. In the LAB’s case, the intercept lower and upper limits are -2.0 and +0.49, respectively. The LAB’s intercept generated is 3.39 and it is outside the bounds of -2.00 to +0.49. The aforementioned points therefore confirm that the overall bias for the LAB site has not been met.

DRAFT

## Appendix C: Detailed Information on Torresdale (TOR) Site

### TOR

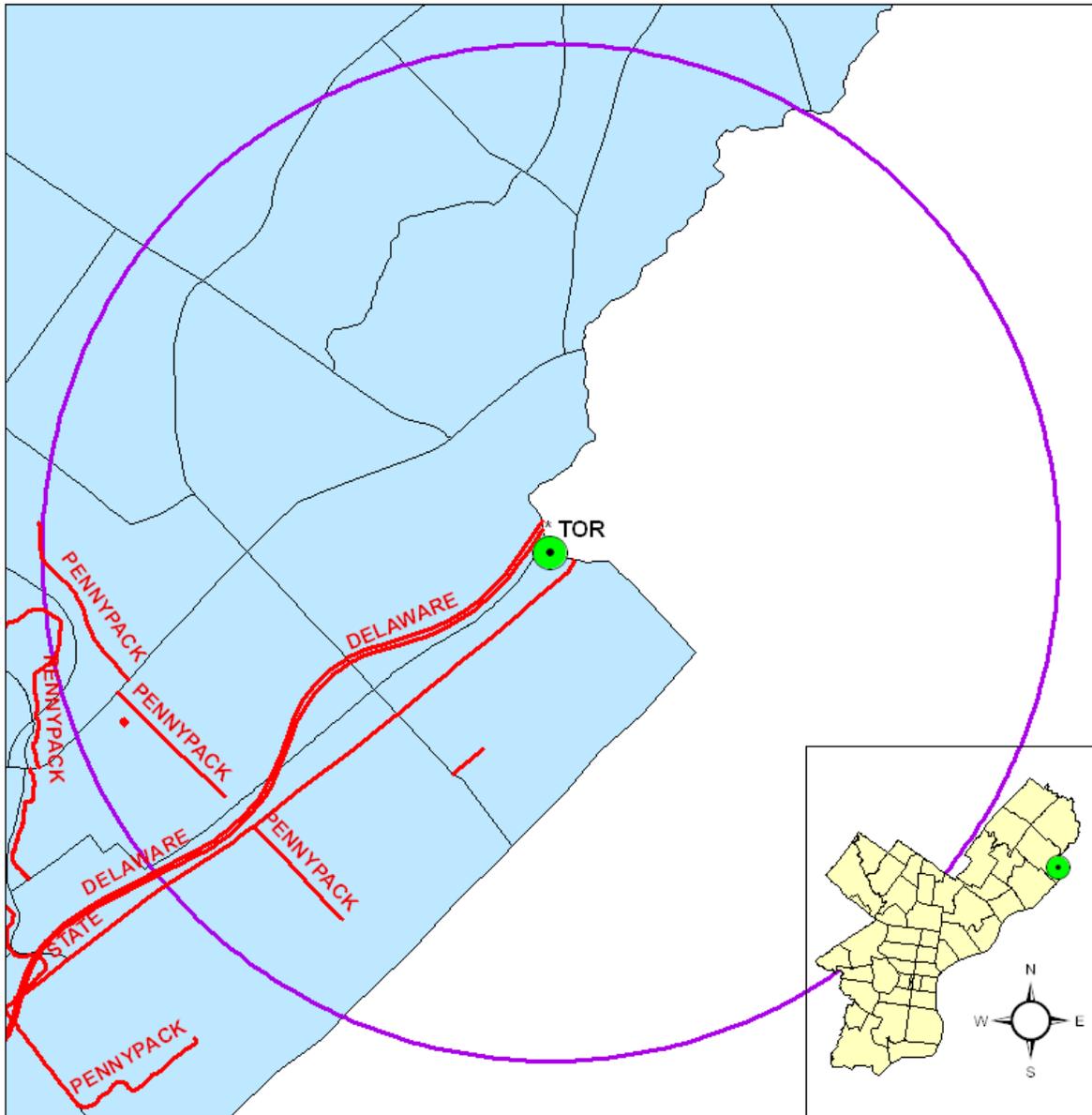
Table C.1 -  
Detailed TOR  
Information  
with  
Monitoring  
Station Picture

AMS SITE ID: TOR
AQS Site ID:
Street Address: 4901 Grant Ave. & James St., 19114
Geographical Coordinates
Latitude: 40.054478
Longitude: -74.984474

Parameter	Sampling Type	Operating Schedule	Collection Method	Analysis Method	Comments	AQS Method	Spatial Scale	Monitoring Objective	Probe Height (m)	Begin Date
CO	NAMS	Continuous	Instrumental	Nondispersive infrared		93	Microscale/ Middle Scale	Highest concentration		
NO <sub>2</sub>	NAMS	Continuous	Instrumental	Chemiluminescence		99	Microscale/ Middle Scale	Highest concentration		

Figure C.1 - TOR Monitoring Site Map with Major Streets and Major Emission Sources

## TORRESDALE - 4900 GRANT AVE. NEAR-ROAD MONITOR



\* To be operational by 1/1/2014

Figure C.2 - TOR Aerial View

