NEW YORK
STATE OF
OPPORTUNITY.
Department of
Environmental
Conservation

2017 ANNUAL MONITORING NETWORK PLAN

New York State Ambient Air Monitoring Program

BUREAU OF AIR QUALITY SURVEILLANCE
DIVISION OF AIR RESOURCES
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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AADT	Annual Average Daily Traffic
AIRS	Aerometric Information Retrieval System
AQI	Air Quality Index
AQS	Air Quality System
AMoN	Ammonia Gas Monitoring Network
ARM	Approved Regional Method
ASRC	Atmospheric Sciences Research Center
BAQS	Bureau of Air Quality Surveillance
CAMR	Clean Air Mercury Rule
CASTNET	Clean Air Status and Trends Network
CBSA	Core-Based Statistical Area
CCNY	City College of New York
CFR	Code of Federal Regulations
CMSA	Consolidated Metropolitan Statistical Area
CO	Carbon Monoxide
Cr	Chromium
CSN	Chemical Speciation Network
CTDEP	Connecticut Department of Environmental Protection
DNPH	2,4-Dinitrophenyl hydrazine
DRR	Data Requirements Rule
EAC	Early Action Compact
EC	Elemental Carbon
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GC	Gas Chromatography
GCMS	Gas Chromatography/Mass Spectrometry
HAPs	Hazardous Air Pollutants
HPLC	High Performance Liquid Chromatography
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
IMPROVE	Interagency Monitoring of Protected Visual Environments
LDAR	Leak Detection and Repair
MDN	Mercury Deposition Network
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NATTS	National Air Toxics Trends Stations
NCore	National Core
NESCAUM	New England States Coordinated Air Use Management
NJDEP	New Jersey Department of Environmental Protection

List of Acronyms and Abbreviations	
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NO_y	Sum of reactive nitrogen oxides
NSR	New Source Review
NYC	New York City
NYCRR	New York State Codes, Rules and Regulations
NYSERDA	New York State Energy Research and Development Authority
O_3	Ozone
OC	Organic Carbon
ORD	Office of Research and Development (EPA)
PAHs	Polycyclic Aromatic Hydrocarbons
PAMS	Photochemical Assessment Monitoring Stations
Pb	Lead
PM	Particulate Matter
PM_{10}	Particulate Matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	Particulate Matter with an aerodynamic diameter of 2.5 microns or less
PMTACS	$PM_{2.5}$ Technology Assessment and Characterization Study
ppb	Parts per billion
ppm	Parts per million
PUF	Polyurethane Foam
PWEI	Population Weighted Emissions Index
SADCA	State Acid Deposition Control Act
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Stations
SO_2	Sulfur dioxide
SOAP	Speciation of Organics for Apportionment of $PM_{2.5}$
SO_x	Sulfur oxides
SPM	Special Purpose Monitors
SUNY	State University of New York
TEOM	Tapered Element Oscillating Microbalance
TSP	Total Suspended Particulate
UV	Ultraviolet
VOCs	Volatile Organic Compounds

1.0 Introduction

The U.S. Environmental Protection Agency (EPA) finalized amendments to the ambient air monitoring regulations on October 17, 2006. The amendments revise the technical requirements for certain types of sites, add provisions for monitoring of some pollutants, and reduce certain monitoring requirements for other pollutants. Monitoring agencies are required to submit annual monitoring network plans, conduct network assessments every 5 years, perform quality assurance activities, and, in certain instances, establish NCore sites by January 1, 2011.

Starting in July 2007, each State, or where applicable local, agency is required to "adopt and submit to the Regional Administrator an annual monitoring network plan which shall provide for the establishment and maintenance of an air quality surveillance system that consists of a network of SLAMS monitoring stations including FRM, FEM, and ARM monitors that are part of SLAMS, NCore stations, CSN stations, State speciation stations, SPM stations, and/or, in serious, severe and extreme ozone nonattainment areas, PAMS stations, and SPM monitoring stations." This document is prepared and submitted as part of the fulfillment to these requirements.

1.1 Background

New York State began a concerted effort to control the air pollution problem back in 1957, when the State Legislature enacted one of the nation's first comprehensive air pollution control laws. An Air Pollution Control Board was established to develop and direct a public information program for monitoring contaminant levels, and to conduct area studies and inventories outlining major problems. In December 1964, New York State developed air quality standards to protect its citizens against adverse health effects. These standards provided a long-range planning tool and established numerical air quality limits for the following contaminants: particulates, sulfur dioxide, carbon monoxide, oxidants, hydrogen sulfide, fluoride, beryllium and sulfuric acid mist.

In 1966, the Legislature responded to the increasing pollution levels by restructuring the administrative authority into the Department of Health, under which the Division of Air Resources was created. Major legislation was also introduced to provide increased efficacy of rules and regulations. That year also marked the severe New York City Thanksgiving holiday air pollution episode brought upon by a temperature inversion that lasted through the weekend.

When the first Earth Day was held in 1970, it had become apparent that pollution abatement strategies in place were inadequate, and air quality—along with water quality and solid waste—became cornerstones of the emerging U.S. environmental conscience. The 1970 Clean Air Act Extension, and the establishment of the U.S. Environmental Protection Agency in that same year, were defining moments in the history of air quality in this country.

Another development, which has had a major effect on air pollution control in New York State, was the creation of the Department of Environmental Conservation (NYSDEC) in 1970. The Division of Air Resources was transferred to the new NYSDEC and its administrative functions restructured and streamlined. Nine new regional offices were established to carry out responsibilities relating to pollution control of sources within their respective part of the State.

In 1977, the first set of Clean Air Act amendments was adopted because many states failed to meet mandated targets. One of the most effective of these was the New Source Review (NSR), which addresses older facilities that had been "grandfathered" by the original law. In 1990, additional amendments to the Clean Air Act included provisions for attainment and maintenance of national ambient air quality standards, mobile sources, air toxics, acid deposition control, permits, stratospheric ozone and global climate protection, enforcement; visibility improvement near National Parks, and other provisions relating to research, development and air monitoring.

In 1997, EPA announced more strict national ambient air quality standards (NAAQS) for ground-level ozone, the primary constituent of smog. After a lengthy scientific review process, including extensive external scientific review, EPA determined that these changes were necessary to protect public health and the environment. The new standard was intended to be more protective of the health of children and adults who play and work outdoors in the summer. In establishing the 8-hour standard, EPA set the standard at 0.08 parts per million (ppm) as an average over an 8-hour period and defines the new standard as a "concentration-based" form, specifically the 3-year average of the annual 4th-highest daily maximum 8-hour ozone concentrations.

EPA also added new standards, using $PM_{2.5}$ as the indicator for fine particles (with $PM_{2.5}$ referring to particles with a nominal mean aerodynamic diameter less than or equal to 2.5 µm), and retained PM_{10} standards for the purpose of regulating the coarse fraction of PM_{10} (referred to as thoracic coarse particles or coarse-fraction particles, generally including particles with a nominal mean aerodynamic diameter greater than 2.5 µm and less than or equal to 10 µm, or $PM_{10-2.5}$). EPA established two new $PM_{2.5}$ standards: an annual standard of 15 $\mu g/m^3$ based on the 3-year average of annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors; and a 24-hour standard of 65 $\mu g/m^3$, based on the 3-year average of the 98th percentile of 24-hour $PM_{2.5}$ concentrations at each population-oriented monitor within an area.

These two new standards were challenged by industry and in May of 1999 the U.S. Court of Appeals for the District of Columbia Circuit Court ruled that U.S. EPA must reconsider the new 8-hr ozone and fine particulate standards. The court did not throw out the standards, but ruled that U.S. EPA could not enforce them. On February 27, 2001, the Supreme Court substantially reversed the ruling of the lower court. The Supreme Court remanded the case to the Court of Appeals for resolution of any remaining issues that had not been addressed in that court's earlier rulings. In March 2002, the Court of Appeals rejected all remaining challenges to the standards. The 8-hr ozone standard of 0.075 ppm, effective since May 27, 2008, was revised under the

October 2015 rule to a lower value of 0.070 ppm, which took effect December 28, 2015. In addition to lowering the 8-hr ozone standard, the 2015 ozone rule expanded the monitoring season of 32 states, increasing the season by one month in New York to now run from March 1 through the end of October. The 2015 rule also revised the *Photochemical Assessment Monitoring Stations* (PAMS) Network requiring states that operate PAMS sites to measure eight-hour averaged carbonyls on every third day and hourly averaged mixing height, in addition to the current suite of parameters beginning in 2019.

In December 2006, EPA issued the final rule revising the NAAQS for PM to provide increased protection of public health and welfare, respectively. EPA revised the level of the 24-hour $PM_{2.5}$ standard to 35 micrograms per cubic meter ($\mu g/m^3$) and retained the level of the annual $PM_{2.5}$ standard at $15\mu g/m^3$. With regard to PM_{10}, the 24-hour standard was retained, but the annual PM_{10} standard was revoked. On Dec. 14, 2012, the U.S. Environmental Protection Agency (EPA) strengthened the nation’s air quality standards for fine particle pollution to improve public health protection by revising the primary annual $PM_{2.5}$ standard from 15 to 12 micrograms per cubic meter ($\mu g/m^3$) and retaining the 24-hour fine particle standard of $35\mu g/m^3$. The new standards became effective on March 18, 2013.

In November 2008, EPA revised the NAAQS for lead from the previous quarterly average of $1.5\mu g/m^3$ to the more protective 3-month rolling average of $0.15\mu g/m^3$. As part of the lead monitoring requirements, monitoring agencies are required to monitor ambient air near lead sources which are expected to or have been shown to have a potential to contribute to a 3-month average lead concentration in ambient air in excess of the level of the NAAQS. At a minimum, monitoring agencies must monitor near lead sources that emit 1.0 ton per year (tpy) or more. Monitoring is also required in each Core-Based Statistical Area (CBSA) with a population equal to or greater than 500,000 people as determined by the latest available census figures. Revisions to the monitoring requirements pertaining to where State and local monitoring agencies would be required to conduct lead monitoring were finalized and became effective January 26, 2011. The new regulations replaced the population oriented monitoring requirement with a requirement to add Pb monitors to the urban NCore monitors. The EPA also lowered the emission threshold from 1.0 tpy to 0.50 tpy for industrial sources of lead (e.g., lead smelters and foundries). However, the emission threshold for airports was maintained at 1.0 tpy.

In addition, an airport monitoring study was implemented to determine the need for monitoring of airports which emit less than 1.0 tpy of lead. Under this new rule lead monitoring was required for a minimum of one year at 15 additional airports that have been identified as having characteristics that could lead to ambient lead concentrations approaching or exceeding the lead NAAQS. Brookhaven and Republic airports in Suffolk County, New York were designated as such. The Brookhaven study was completed in October, 2012, and the Republic Airport monitoring concluded in October, 2013. Results of these studies concluded that no additional monitoring was required.

The annual NAAQS for NO_2 is set at 53 ppb. In 2010, EPA revised the NAAQS to include an hourly standard of 100 ppb. The near-road sites in Buffalo, Rochester and Queens commenced operation in April, 2014, December, 2014, and April 2017, respectively.

In June, 2010, EPA established a new 1-hour SO_2 standard at a level of 75 parts per billion (ppb), based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. Additionally, both the 24-hour and annual primary SO_2 standards were revoked.

EPA also established requirements for SO_2 monitoring in areas where there is an increased coincidence of population and SO_2 emissions. Additional source monitoring will be implemented in accordance to the Data Requirements Rule effective September 21, 2015.

Through the years, ambient monitoring has always been an important and integral part of the overall effort to manage our environmental resources. The Bureau of Air Quality Surveillance, which was originally established in the Division of Air Resources under the Department of Health in 1966, has been performing ambient air monitoring since.

1.2 Topography and Climate of New York State

New York State contains 49,576 square miles, inclusive of 1,637 square miles of inland water, but exclusive of the boundary-water areas of Long Island Sound, New York Harbor, Lake Ontario, and Lake Erie. The Adirondacks cover most of the northeast and occupy about one-fourth of the state's total area. The Appalachian Highlands, including the Catskill Mountains and Kittatinny Mountain Ridge (or Shawangunk Mountains), extend across the southern half of the state, from the Hudson River Valley to the basin of Lake Erie. Between these two upland regions, and also along the state's northern and eastern borders, lies a network of lowlands, including the Great Lakes Plain; the Hudson, Mohawk, Lake Champlain, and St. Lawrence valleys; and the coastal areas of New York City and Long Island.

The climate of New York State is broadly representative of the humid continental type, which prevails in the northeastern United States, but its diversity is not usually encountered within an area of comparable size. The geographical position of the state and the usual course of air masses, governed by the large-scale patterns of atmospheric circulation, provide general climatic controls. Differences in latitude, character of the topography, and proximity to large bodies of water have pronounced effects on the climate.

The planetary atmospheric circulation brings a great variety of air masses to New York State. Masses of cold, dry air frequently arrive from the northern interior of the continent. Prevailing winds from the south and southwest transport warm, humid air, which has been conditioned by the Gulf of Mexico and adjacent subtropical waters. These two air masses provide the dominant continental characteristics of the climate.

The third great air mass flows inland from the North Atlantic Ocean and produces cool, cloudy, and damp weather conditions. This maritime influence is important to New York's climatic regime, especially in the southeastern portion of the state, but it is secondary to that of the more prevalent air mass flow from the continent.

The prevailing wind is generally from the west in New York State. A southwest component becomes evident in winds during the warmer months while a northwest component is characteristic of the colder one-half of the year.

The climate of the state features much cloudy weather during the months of November, December, and January in upstate New York, especially those regions that adjoin the Great Lakes and Finger Lakes and include the southern tier of counties. From June through September, however, about 60 to 70 percent of the possible sunshine hours are received. In the Atlantic coastal region, the sunshine hours increases from 50 percent of possible in the winter to about 65 percent of possible in the summer.

The Atlantic Coastal Plain and lower Hudson Valley experience conditions of high temperature and high humidity with some frequency and duration during the summer. By comparison, such conditions occur less frequently in the broad interior of New York State where they are usually shortened by the arrival of cooler, drier air masses from the northwest.

1.3 Population and Demographics

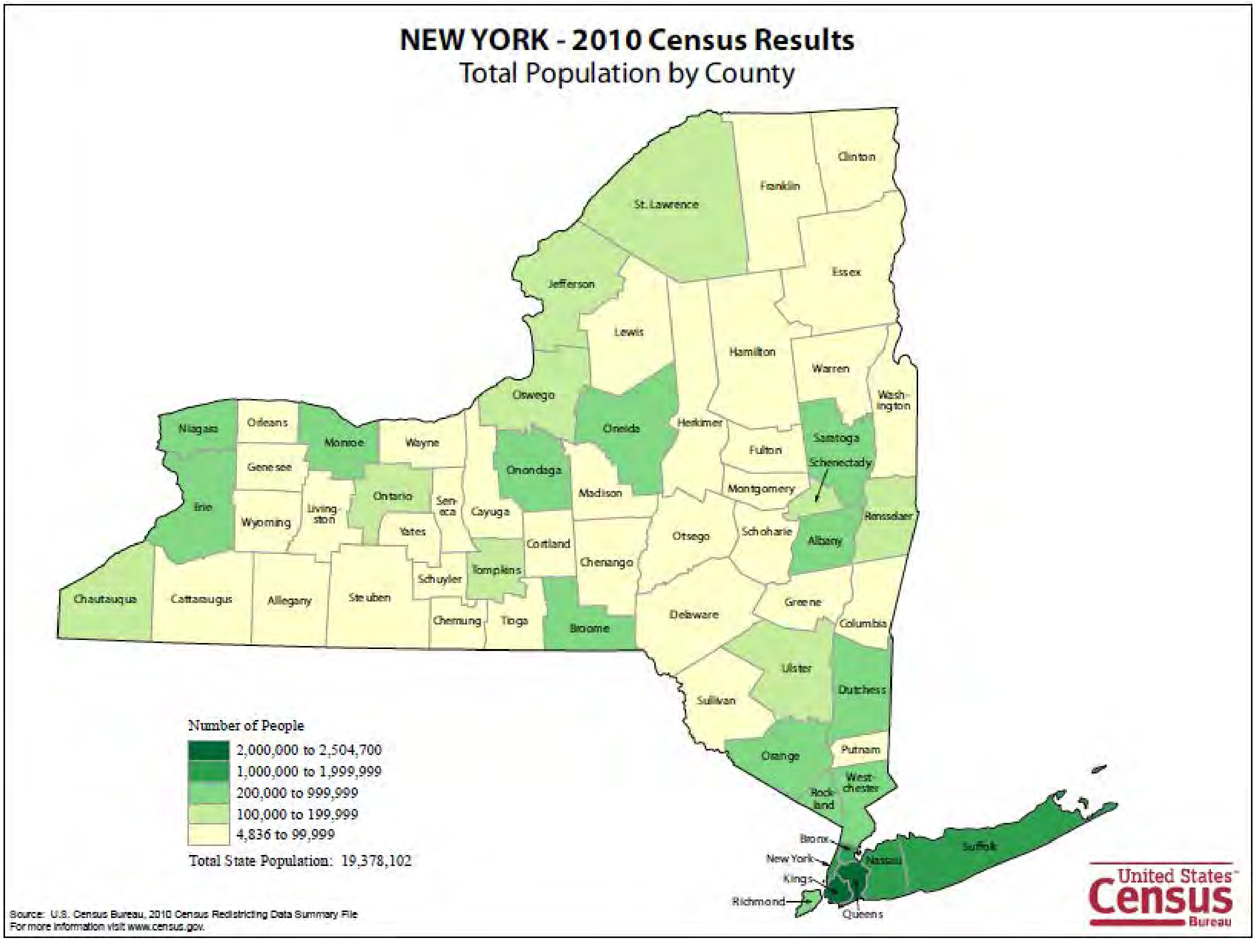
The 2010 Census lists the state population for New York as 19,378,102. According to Census Bureau estimates, the NY State population in 2015 totaled 19,795,791, the fourth most populous state in the nation. The population change in the previous 5-year period indicates a net increase of 417,689 for the entire State. A Census Bureau estimated population breakdown of major Metropolitan Statistical Areas (MSAs) is provided in Table 1 below. The State saw a modest growth overall in the 5-year period, mostly in the downstate areas at the expense of the western MSAs.

Table 1.1 Population of Major Metropolitan Statistical Areas in New York

MSA	2010	2015*	Difference	%
Albany-Schenectady-Troy	870,716	881,830	11,114	1.3
Binghamton	251,725	246,020	-5,705	-2.3
Buffalo-Niagara Falls	1,135,509	1,135,230	-279	0.0
Elmira	88,830	87,071	-1,759	-2.0
Glens Falls	128,923	126,918	-2,005	-1.6
Ithaca	101,564	104,926	3,362	3.3
Kingston	182,493	180,143	-2,350	-1.3
Nassau-Suffolk	2,832,882	2,862,937	30,055	1.1
Dutchess-Putnam	397,198	394,796	-2,402	-0.6
New York-White Plains	9,908,456	9,828,974	-79,482	-0.8
Rochester	1,079,671	1,081,954	2,283	0.2
Syracuse	662,577	660,458	-2,119	-0.3
Utica-Rome	299,397	295,600	-3,797	-1.3
State Total	19,378,102	19,795,791	-417,689	-2.2

* Census Bureau estimation

A population density map by county based on the 2010 data is depicted in Figure 1.1



NEW YORK - 2010 Census Results
Total Population by County

Source: U.S. Census Bureau, 2010 Census Redistricting Data Summary File
For more information visit www.census.gov.

Figure 1.1 Population Density in New York State by County

1.3.1 Environmental Justice Areas

Environmental justice (EJ) is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities.

A map of potential EJ areas in the State is shown in Figure 1.2. Approximately 37% of New York's population resides in potential EJ areas. In our network, there are 20 air monitors, 14 of which downstate, sited within areas designated as such. The number of air monitoring sites located in potential EJ areas is commensurate with the population percentage residing therein. In the populous downstate area, 61% of the network monitors are located in potential EJ areas, in which 52% of the population lives.

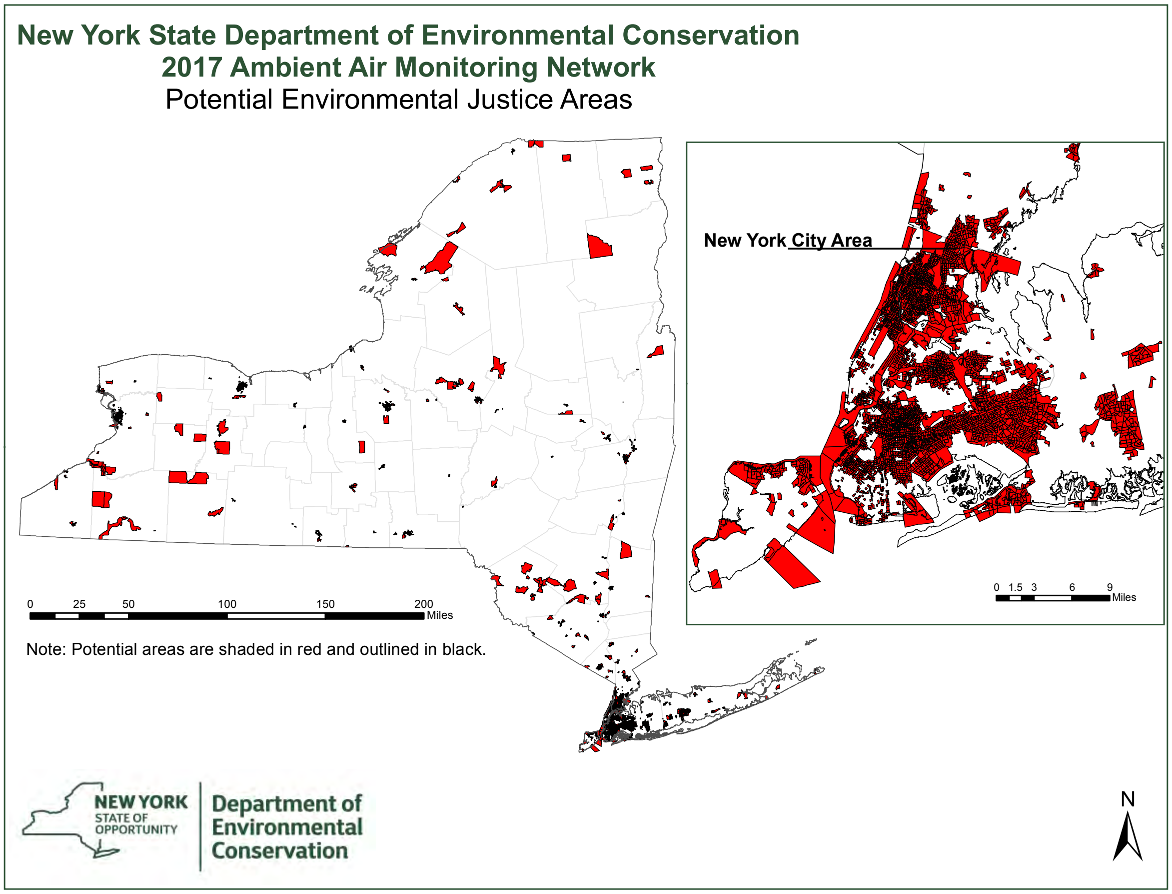


Figure 1.2 Potential Environmental Justice Areas in New York State

1.3.2 Sensitive Sub-Populations

Children, the elderly, and people with underlying health issues may be more susceptible to the deleterious effects associated with air pollution, and are considered to be under the sensitive sub-populations category. Sixteen monitoring sites in the network are located on public school grounds, where attending students are of grade school to high school age.

Citizens groups often approach the NYSDEC to request studies in areas that they believe have high incidences of health related problems due to air pollution, such as asthma, respiratory diseases, and cancer clusters. Where possible we try to accommodate concerned citizens by providing air quality data from nearby monitoring sites. For example, IS 143 serves the Lower Washington Heights Neighborhood Association. In the case of the Clean Air Coalition of WNY, we were able to obtain EPA funding to carry out the Tonawanda Community Air Quality Study and the special monitor at Grand Island Blvd. was retained and continues to operate. In the Community Air Screen Program that began in the fall of 2012, 90% of the selected community groups were in or within half mile of potential EJ areas.

1.4 Chronology of Air Monitoring in New York State

Manual sampling programs began in 1958. Most of the early sampling stations measured suspended particulates, settleable particulates, and sulfation (an indicator of sulfur dioxide concentration). The early monitoring system employed high volume samplers, and for the first year, operated on a daily basis. Subsequently sampling was reduced to a 1-in-6 day schedule, after statistical analysis of the first year's data indicated that such sampling frequency would provide an adequate representation of particulate pollution. By 1964, the manual monitoring system had evolved to 104 full-time stations, 140 stations by 1970, and 250 by the mid 70's. New York was among the first to install and operate a continuous air quality monitoring system. The parameters monitored in the early 70's included: sulfur dioxide, nitric oxide, nitrogen dioxide, ozone, carbon monoxide, total hydrocarbons, soiling, and meteorological data.

Trace metal analysis of high volume sampler filters was initiated in 1979. Historically the NYS Department of Health provided laboratory services until 2003 when the positions funded by NYSDEC for the analysis work were eliminated due to a statewide workforce reduction. The lead analysis continued until 2005. The lack of formal funding mechanisms between the two state agencies precluded the continuation of laboratory analysis support. The necessary laboratory work is now provided by a contract laboratory.

In 1986, New York began measuring inhalable particulates using high volume air samplers with a 0-10 micron size selective inlet. In the same year the Acid Deposition Monitoring Network was also established. In 1987, EPA revised the PM standard to regulate PM_{10}.

In 1988, the NYS ambient monitoring networks consisted of 85 TSP sites, 16 PM_{10}, 15 carbon monoxide monitors, 27 sulfur dioxide sites, 20 ozone stations, 8 NO_x monitors, and 18 lead sampling sites. There were 17 operational acid deposition sites statewide, and the initial phase of the toxics network was completed with the establishment of six toxic monitors in Staten Island. By 1990, the networks had the following make up: 58 TSP, 60 PM_{10}, 25 SO_2, 16 CO, 26 ozone, 7 NO_x, 16 lead, 18 acid deposition, 10 toxics, and 8 trace metals sites, respectively.

In accordance with the 1990 Clean Air Act Amendments, in 1994 BAQS established the first of two ambient air monitoring sites for enhanced ozone monitoring called Photochemical Assessment Monitoring Stations (PAMS) to collect and report detailed data for volatile organic compounds, nitrogen oxides, ozone and meteorological parameters.

BAQS began implementing the $PM_{2.5}$ monitoring networks of FRM and TEOM monitors in 1998. At its peak, there were 46 FRM instruments deployed. After sufficient data were obtained for attainment determination, FRM sites were reduced and some sites were augmented with TEOM instruments in order to provide realtime inputs for EPA's AIRNow website for Air Quality Index (AQI) reporting.

BAQS currently operates the following monitors: 28 ozone, 22 SO$_2$, 10 NO$_x$ (including 3 NO$_y$), 10 CO, 21 FRM PM$_{2.5}$, 29 TEOM PM$_{2.5}$, 5 FRM PM$_{10}$, 5 TEOM 1405-DF(PM$_{2.5}$,PM$_{10}$, PMcoarse), 8 CSN, 2 speciated carbon, 6 black carbon (aethalometer), 2 elemental mercury, 4 particulate sulfate, 7 acid deposition, 2 TSP-lead, 1 PM$_{10}$-lead, 2 PM$_{10}$ metals, 13 toxics, 12 carbonyls, 2 PAMS, 2 PAHs, and 12 meteorological stations. Figures 2.1 and 2.2 below show the geographic locations of monitoring sites in all nine regions of the State.

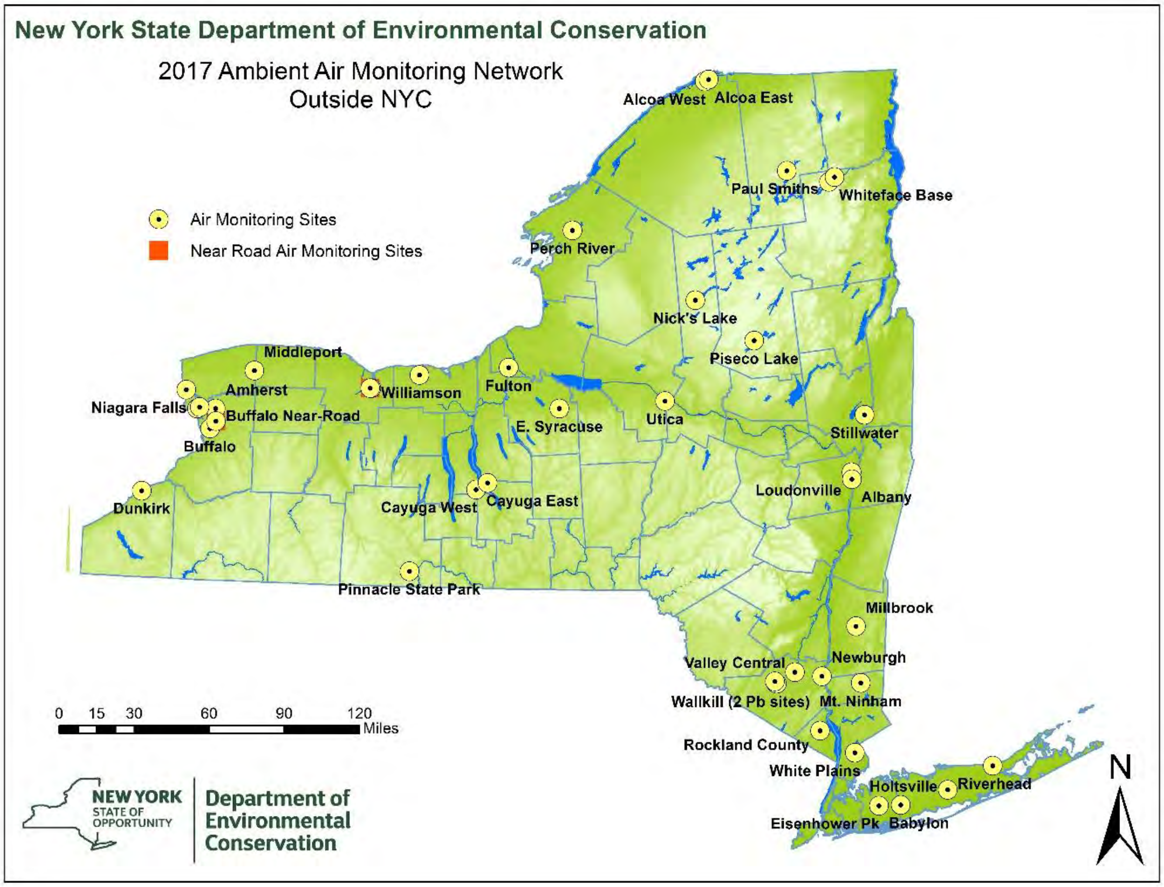


Figure 1.3 Map of Ambient Air Monitoring Sites in New York State, Excluding NYC

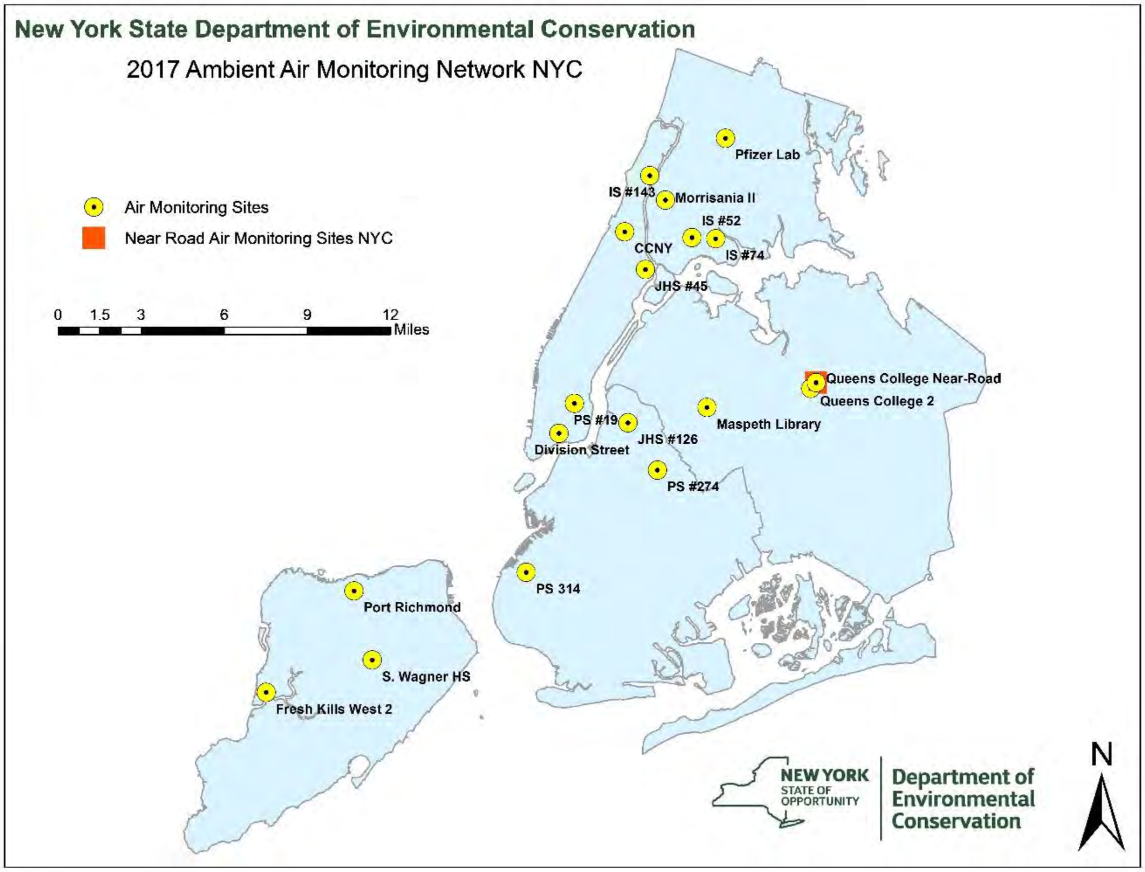


Figure 1.4 Map of Ambient Air Monitoring Sites in NYC

2.0 Monitoring Related Research and Investigations

In addition to the routine monitoring work, bureau staff collaborate with researchers from other agencies and academic institutions on a multitude of air pollution related studies. Over the years we have participated in research projects with the following partners: New York State Department of Health, New Jersey Department of Environmental Protection, Connecticut Department of Environmental Protection, State University of New York, Albany, Clarkson University, Massachusetts Institute of Technology, Rutgers University, Drexel University, University of Rochester Medical Center, Desert Research Institute, Rensselaer Polytechnic Institute, City University of New York, and Columbia University. These endeavors provided valuable data for the regulatory, scientific, and health research communities. Study findings are communicated through journal publications, as well as presentations at technical meetings and conferences. Listings of peer-reviewed scientific articles and oral/poster presentations resulting from recent BAQS monitoring activities are provided below.

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2.3 NYSDEC Collaborations

The Bureau of Air Quality Surveillance collaborates with many different research groups providing access to NYSDEC air monitoring stations as well as data produced by BAQS. These collaborations vary in duration and scope, depending to the goals of the research partners. Below are some of the collaborations currently underway at various DEC air monitoring stations.

New York City Community Air Survey (NYCCAS)

The New York City Department of Health and Mental Hygiene and CUNY - Queens College are conducting the New York City Community Air Survey (NYCCAS) to evaluate how air quality differs across New York City. This program studies how pollutants from traffic, buildings (boilers and furnaces), and other sources impact air quality in different neighborhoods.

NYCCAS monitors pollutants that cause health problems such as fine particles, nitrogen oxides, elemental carbon sulfur dioxide and ozone. NYCCAS air pollution measurements are taken at about 100 locations throughout New York City in each season. Monitors are mounted 10 to 12 feet off the ground on public light poles or utility poles along streets and in some parks. The monitors use a small battery-powered pump and filters to collect air samples. DEC involvement includes utilizing various DEC air monitoring locations as the part of the core monitoring locations of the study. These include: Queens College, New York Botanical Garden and LaTourette golf course. DEC has been involved with this study since monitoring began in 2008. This ongoing study continues to foster coordination and collaboration with DEC, NYC DOHMH and Queens College.

Integrated Assessment of the Effects of NH3, NOx, PM, SO_2, and VOC Emissions on O3 and PM2.5 Concentrations and Trends in New York State

The SUNY Albany Atmospheric Sciences Research Center, in collaboration with Atmospheric Research and Analysis, Inc., is conducting a study of simultaneous new continuous measurements of a suite of nitrogen species at two New York state air quality monitoring sites (Pinnacle and Queens College), and concurrent analysis of existing long-term emission and ambient concentration datasets.

The study will assess emissions changes and how they relate to changes in ambient concentrations and will inform how specific anthropogenic sources like power plants and mobile sources contribute to air quality. This will also provide information on emission control strategy effectiveness. Trends analyses with a variety of proxies for carbon types (such as primary vs secondary, biomass combustion vs. fossil-fuel combustion) will help to constrain estimates of source contributions, including energy generation sources. Insights on biomass combustion (wildfires and residential biomass combustion) will be pursued. The analyses will inform the potential for in-state vs. out-of-state source regions for nitrogen and carbonaceous aerosol compounds. Understanding diurnal nitrogen dynamics, including partitioning between gas and particle phase nitrogen, will help pinpoint likely sources and controlling factors on ambient air quality. This study began in July 2016 and will continue into 2018.

Multi-Ethnic Study of Atherosclerosis (MESA)

The University of Washington has continued air quality monitoring in New York City as part of the Multi-Ethnic Study of Atherosclerosis (MESA) air study. This monitoring is part of the MESA (Multi-Ethnic Study of Atherosclerosis) medical research study. Data are being used to evaluate the performance of the low-cost monitors used in the study, and will be used to construct air pollution exposure models for several pollutants in all six of the MESA cities. The monitoring is being conducted concurrently with MESA participant clinical visits so the exposure models can be used to determine associations between air pollution and the participants' cardiovascular health, particularly heart failure and atrial fibrillation.

Monitoring was originally conducted at IS 52 and CCNY between 2005 and 2009. Monitoring restarted in March 2017, adding additional DEC monitoring locations. This monitoring is now being conducted at five NYS DEC monitoring stations in New York City: IS 52, NYBG, CCNY, Division Street and PS 19 and is expected to continue until early 2019.

CH Technologies at Queens College

CH Technologies is evaluating various equipment manufactured by Palas of Germany. These instruments measure ultrafine particles using optical particle counters which do not require fluid to measure ultrafine particles and can therefore operate for up to a year without service. CH Technologies conducted a similar study in New Jersey at the Rutgers University air monitoring station. The study at Queens College began January 2017 and is expected to last into the summer, 2017.

Columbia University at Queens College

Researchers at Columbia University are currently monitoring fine particulates at Queens College as part of a research project using a MetOne Neighborhood Particulate Monitor. The study includes monitors located on the Columbia University campus to determine how air pollution relates to student decision making and preferences. Data are collected from students on the campus and these data are merged with pollution data to assess the correlation. Data collected at Queens College are being used to compare and calibrate the monitor at Columbia. The study began at Queens College in January 2017 and is expected to last into 2019.

NYU Center for Urban Science and Progress PhD Candidate at Division Street

Part of a project called the Quantified Community through NYU’s Center for Urban Science and Progress. The project aims to understand neighborhood dynamics by collecting, integrating and analyzing multiple datasets including administrative date, like census, and environmental data, like air quality, noise and temperature. Monitoring was conducted at NYS DEC - Division Street station from February to April 2017.

3.0 Monitoring Sites

The Bureau's tasks and responsibilities are carried out by staff in four Sections. While the field operators are stationed throughout the State, the managers are physically located in the Central Office in Albany (Northern Monitoring, Network Operations), our Region 2 Office in Long Island City (Southern Monitoring), and the SUNY East Campus in Rensselaer (Monitoring Support). Functionally, the Northern Monitoring Section is responsible for ambient air monitoring sites in upstate New York north of and including the counties of Rockland and Putnam. The Southern Monitoring Section is responsible for ambient air monitoring sites in the counties of Westchester, Nassau, Suffolk, and those counties comprising the City of New York. Currently there are 58 active sites statewide. Figures 3.1 and 3.2 show monitoring site locations for the two monitoring operations, respectively.

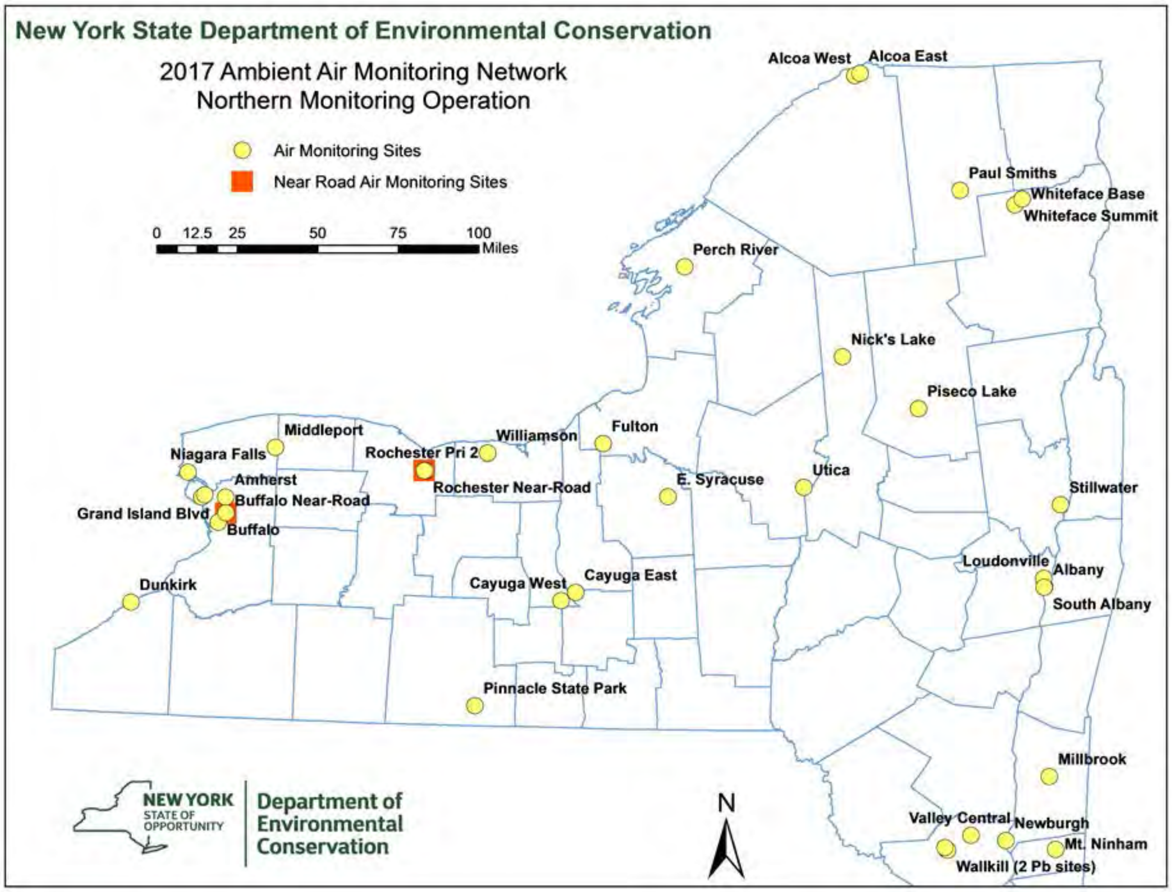


Figure 3.1 Site Locations for Northern Monitoring Operation

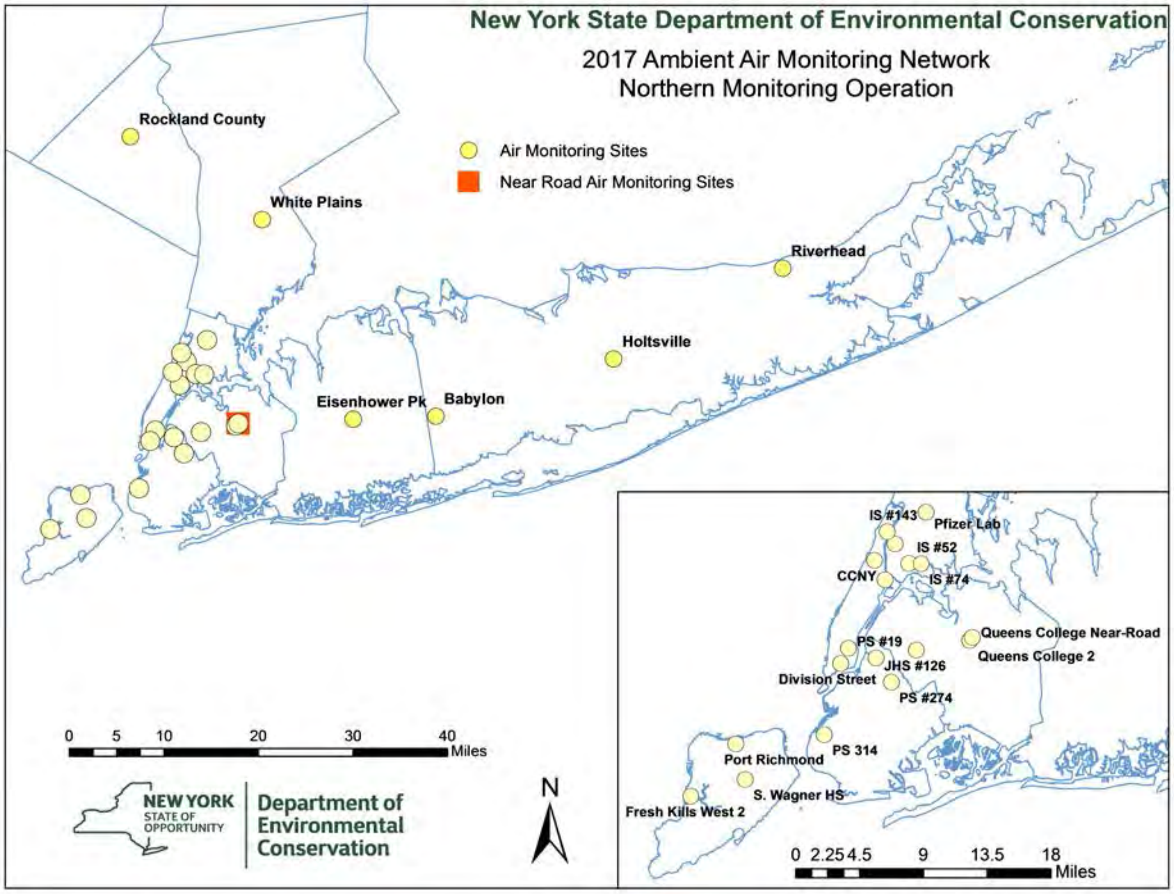


Figure 3.2 Site Locations for Southern Monitoring Operation

Information pertaining to each monitoring site including site photo, location, parameters monitored, sampling frequency, and analysis methodologies is provided below for the two monitoring operations.

Most of the monitoring sites meet the siting criteria requirements for the parameters monitored as specified in Appendix E of 40 CFR Part 50. For the few sites that do not meet all of the siting requirements, we have demonstrated to EPA that in all instances the site is as representative of the monitoring area as it would be if the siting criteria were being met, and that the monitor or probe cannot reasonably be located so as to meet the siting criteria because of physical constraints. Waivers have been granted by the Regional Administrator for these sites.

3.1 Northern Monitoring Sites

Table 3.1 Locations of Northern Monitoring Sites

DEC Region	AIRS #	DEC #	Site Name	County	Location
3	36-027-0007	1328-01	Millbrook	Dutchess	Forest Research Station
3	36-071-0002	3502-04	Newburgh	Orange	Public Safety Building
3	36-071-5001	3527-01	Valley Central	Orange	Valley Central High School
3	36-071-3001	3566-02	Wallkill Ballard	Orange	Ballard Road
3	36-071-3002	3566-09	Wallkill Wakefern	Orange	Wakefern Food
3	36-079-0005	3951-01	Mt. Ninham	Putnam	NYSDEC Headquarters
3	36-087-0005	4353-02	Rockland County	Rockland	Conklin Orchard
4	36-001-0005	0101-13	Albany	Albany	Albany County Health Department
4	36-001-0012	0101-33	Loudonville	Albany	Reservoir
4	36-001-0013	0101-34	South Albany	Albany	S Pearl Street
5	36-031-0002	1567-03	Whiteface Summit	Essex	Summit Building
5	36-031-0003	1567-04	Whiteface Lodge	Essex	ASRC (Base Lodge)
5	36-041-0005	2050-01	Piseco Lake	Hamilton	Airport
5	36-091-0004	4567-01	Stillwater	Saratoga	Saratoga Historical Park
6	36-033-0004	1655-01	Paul Smiths	Franklin	Paul Smith College
6	36-043-0005	2167-03	Nick's Lake	Herkimer	Campground
6	36-045-0002	2223-01	Perch River	Jefferson	Game Management Building
6	36-065-2001	3202-01	Utica	Oneida	Utica Health Dept
6	N/A	4458-05	Wanakena	St. Lawrence	Ranger Station
6	36-089-0004	4402-08	Alcoa West	St. Lawrence	Pontoon Bridge Rd
6	36-089-0005	4402-07	Alcoa East	St. Lawrence	NY-131
7	36-067-1015	3353-09	E. Syracuse	Onondaga	Enterprise Parkway
7	36-075-0003	3754-01	Fulton	Oswego	820 County Rt. 8
7	36-099-0002	4950-01	Cayuga West	Seneca	6 Corners Rd
7	36-109-0002	5456-01	Cayuga East	Tompkins	Lake Ridge Rd
8	36-055-1007	2701-22	Rochester	Monroe	Yarmouth Rd (RG&E Substation)
8	36-055-0015	2701-23	Rochester Near-Road	Monroe	I-490 and 1775 East Ave
8	36-101-0003	5001-04	Pinnacle	Steuben	Pinnacle State Park
8	36-117-3001	5863-01	Williamson	Wayne	Wayne County Occupational Center
9	36-029-0002	1451-03	Amherst	Erie	450 Maple Rd, Amherst Parks Dept
9	36-029-1014	1472-14	Tonawanda II	Erie	192 Brookside Terrace West
9	36-063-1006	3120-02	Middleport	Niagara	Sewage Treatment Plant
9	36-013-0006	0601-04	Dunkirk	Chautauqua	Sewage Treatment Plant
9	36-029-0005	1401-18	Buffalo	Erie	Off Dingens Street, near Weiss
9	36-029-0023	1455-02	Buffalo Near-Road	Erie	I-90 Mile Post 424.6 East Bound Side
9	36-063-7001	3102-26	Niagara Falls	Niagara	Packard Court Community Center

Albany County Health Department
Address: South Ferry and Green Streets
Albany, NY 12202

AQS Number: 36-001-0005
DEC Number: 0101-13
County: Albany
Statistical Area: Albany-Schenectady-Troy
Coordinates: Lat: 42.64225 Lon: -73.75464

This site was established in 1973 as a TSP site. Over time, it has progressed to PM_{10} and is now a collocated $PM_{2.5}$ FRM site. A continuous R&P TEOM is also operated at the Albany County Health Department. This site is used for AIRNow reporting. Speciation sampling was added in January 2008.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 3
$PM_{2.5}$ Collocated	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 3
$PM_{2.5}$	R&P TEOM 1400 Method 701	TEOM 50ºC	Continuous
$PM_{2.5}$ Speciation Ions and Elements	Met One Super SASS Method 811	XRF	1 in 6
$PM_{2.5}$ Speciation Carbon	URG 3000 Method 838	IMPROVE TOR	1 in 6

Alcoa West

Address: 327 Pontoon Bridge Rd
Massena, NY 13662

AQS Number: 36-089-0004
DEC Number: 4402-08
County: St. Lawrence
Statistical Area: Ogdensburg-Massena
Coordinates: Lat: 44.95546 Lon: -74.90780

This site was established in 2017 to comply with the Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide Primary National Ambient Air Quality Standard (80 FR 51052) that requires that NYSDEC provide data to characterize the 1-hour ambient air concentration of SO_2 in areas near known large SO_2 sources. The Alcoa West site is designed to capture down-wind emissions from the Alcoa Massena West Aluminum Plant.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous

Alcoa East
Address: 2019 NY-131,
Massena, NY 13662

AQS Number: 36-089-0005
DEC Number: 4402-07
County: St. Lawrence
Statistical Area: Ogdensburg-Massena
Coordinates: Lat: 44.96541 Lon: - 74.87500

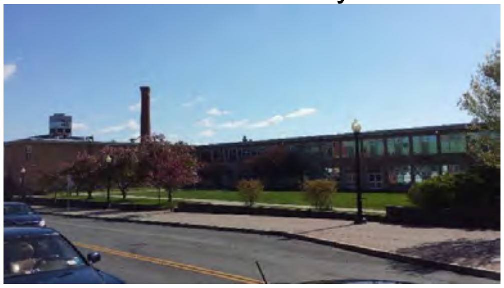
This site was established in 2017 to comply with the Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide Primary National Ambient Air Quality Standard (80 FR 51052) that requires that NYSDEC provide data to characterize the 1-hour ambient air concentration of SO_2 in areas near known large SO2 sources. The Alcoa East site is designed to capture up-wind emissions from the Alcoa Massena West Aluminum Plant.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous

South Albany

Address: 274 S Pearl St,
Albany, NY 12202



AQS Number: 36-001-0013
DEC Number: 0101-34
County: Albany
Statistical Area: Albany-Schenectady-Troy
Coordinates: Lat: 42.640931   Lon: -73.756511

This site was created in response to community concerns, NYSDEC recently added air toxics sampling near the existing long-term PM monitoring site in the south Albany neighborhood at 274 S. Pearl St., Albany, NY 12202. Samples are collected on a one in six-day schedule for the analysis of VOCs and carbonyls. The data will be useful in assessing if industrial activities in the Port area significantly impact the neighborhood air quality when compared to cities of similar size with normal urban emissions.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Toxics	Canister Method 150	GC/MS	1 in 6 days
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 in 6 days

Amherst

Address: Town of Amherst Parks Department
& Audubon Golf Course
450 Maple Road
Amherst, NY 14221

AQS Number: 36-029-0002
DEC Number: 1451-03
County: Erie
Statistical Area: Buffalo - Niagara Falls, NY
Coordinates: Lat: 42.99328   Lon: -78.77153

This site was established in July 1972. Amherst is a permanent ozone and nitrogen dioxide site. It is located on land behind the Town of Amherst Parks Department Maintenance building and alongside the Audubon Golf Course in a suburban area. This site measures ozone for the Buffalo area and transport from points west. It is reported on the AIRNow system. Acid deposition and $PM_{2.5}$ monitoring were relocated here from the Niagara Falls site following its closure.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Adsorption	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 3
Acid Deposition	NCON Bucket Style Collector Model 00-120-2	Central Analytical Laboratory at the Illinois Water Survey: IC, ICP-OES, FIA	Weekly
Relative Humidity	Teledyne RH200 Method 011		Continuous
Wind Speed/direction	Climatronics Sonic Method 020		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous

Buffalo

Address: NYS Thruway Authority
Bridge Maintenance Facility
Access Road
Buffalo, NY 14206

AQS Number: 36-029-0005
DEC Number: 1401-18
County: Erie
Statistical Area: Buffalo - Niagara Falls, NY
Coordinates: Lat: 42.87691 Lon: -78.80981

This site was originally established in January 1969 and is considered an urban scale site. Buffalo is the main monitoring site for the Buffalo area. It is located on the access road to the New York State Thruway Authority Bridge Maintenance Facility in an urbanized area. It is in close proximity to interstate 190 and was downwind of significant industrial sources in the 1970s. The impact from industrial sources had been drastically reduced over the past two decades. The continuous $PM_{2.5}$ data is reported to the AIRNow system. Toxics and filter based PM_{10} monitoring were relocated here from the Niagara Falls upon site closure.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Oxides of Nitrogen (NO, NO_2, NO_X)	43i Method 560	Chemiluminescence	Continuous
NO_y	TEI 42i Method 699	Chemiluminescence	Continuous
Sulfur Dioxide	TEI 43C Method 060	Pulsed Fluorescence	Continuous
Carbon Monoxide	TEI 48C Method 054	Gas Filter Correlation CO Analyzer	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 3 Day
$PM_{2.5}$	TEOM Thermo 1405 Method 701 and 702	TEOM 50ºC Gravimetric	Continuous
$PM_{2.5}$ Speciation Ions and Elements	Met One Super SASS Method 811	IC, XRF RTI Laboratory	Every 6th Day
PM_{10}	R&P Partisol 2025 Method 127	Gravimetric	Every 3rd Day
Toxics	Canister Method 150	GC/MS	1 day in 6
$PM_{2.5}$ Speciation Carbon	URG 3000 Method 838	IMPROVE TOR	Every 6th Day
Wind Speed/direction	Climatronics Sonic Method 020		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous

Buffalo Near-Road
Address: I90 Mile Post 424.6 East Bound Side
Cheektowaga, NY 14225

AQS Number: 36-029-0023
DEC Number: 1455-02
County: Erie
Statistical Area: Buffalo - Niagara Falls, NY
Coordinates: Lat: 42.921111 Lon: -78.766111

This site was established in 2013 under the new NO_x rule that became effective January, 2010. After a brief shake-down period, valid NO_2 measurements were reported beginning April, 2014. A $PM_{2.5}$ TEOM, a 1 in 3 day FRM sampler, and a CO instrument were added subsequently.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Oxides of Nitrogen (NO, NO_2, NO_x)	API MODEL 200A/E NO ANALYZERMethod 099	Chemiluminescence	Continuous
Carbon Monoxide	API 300EU Method 593	Gas Filter Correlation CO Analyzer	Continuous
$PM_{2.5}$	TEOM Thermo 1405 Methods 701 and 702	TEOM 50ºC Gravimetric	Continuous

Cayuga West

Address: 3996 6 Corners Rd
Trumansburg, NY 14886

AQS Number: 36-099-0002
DEC Number: 4950-01
County: Seneca
Statistical Area: Ithaca, NY
Coordinates: Lat: 42.57410 Lon: -76.61520

This site was established in 2017 to comply with the Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide Primary National Ambient Air Quality Standard (80 FR 51052) that requires that NYSDEC provide data to characterize the 1-hour ambient air concentration of SO_2 in areas near known large SO_2 sources. The Cayuga West site is designed to capture down-wind emissions from the Cayuga Operating Company Power Plant.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous

Cayuga East
Address: 134 Lake Ridge Rd
Lansing, NY 14882

AQS Number: 36-109-0002
DEC Number: 5456-01
County: Tompkins
Statistical Area: Ithaca, NY
Coordinates: Lat: 42.61319 Lon: -76.61520

This site was established in 2017 to comply with the Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide Primary National Ambient Air Quality Standard (80 FR 51052) that requires that NYSDEC provide data to characterize the 1-hour ambient air concentration of SO_2 in areas near known large SO_2 sources. The Cayuga West site is designed to capture up-wind emissions from the Cayuga Operating Company Power Plant.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous

Dunkirk

Address: City of Dunkirk Sewage Treatment Plant
Wright Park Drive
Dunkirk, NY 14048

AQS Number: 36-013-0006
DEC Number: 0601-04
County: Chautauqua
Statistical Area: Buffalo - Niagara Falls, NY
Coordinates: Lat: 42.49963   Lon: -79.31881

The Dunkirk monitoring trailer was established in 1999 as a regional transport site. It is located at the western edge of New York on the shores of Lake Erie at the City of Dunkirk's Sewage Treatment Plant. It is approximately 200 feet from Lake Erie in a suburban neighborhood. With the predominant wind direction from the west, this site measures the background levels of pollution entering the state. Ozone levels are reported to AIRNow.

$PM_{2.5}$ monitoring was relocated here from the Westfield site upon its closure.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous
Ozone	API T400Method 087	Ultraviolet Absorption	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 3 days, 24-hour
Wind Speed/direction	Climatronics Sonic Method 020		Continuous
Relative Humidity	Teledyne RH200 Method 011		Continuous
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous

East Syracuse

Address: 5895 Enterprise Parkway
Syracuse, NY 13202

AQS Number: 36-067-1015
DEC Number: 3353-09
County: Onondaga
Statistical Area: Syracuse
Coordinates: Lat: 43.05235 Lon: -76.05921

This site was established in 1991 in commercial area of suburban Syracuse. It is the primary air monitoring site in the Syracuse metropolitan area. In 1999, the site became part of the original $PM_{2.5}$ FRM monitoring network. Ozone readings are reported to AIRNow.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400Method 087	Ultraviolet Absorption	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 3 days, 24-hour
$PM_{2.5}$, PMcoarse, PM_{10}	TEI 1405 DF Method 790	TEOM 30ºC Gravimetric	Continuous
Sulfur Dioxide	TEI 43C Method 060	Pulsed Fluorescence	Continuous
Wind Speed/direction	Climatronics Sonic Method 020		Continuous
Relative Humidity	Teledyne RH200 Method 020		Continuous
Precipitation	Belfort Rain Gauge		Continuous
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous

Fulton

Address: Granby Community Center
820 County Route 8
Fulton, NY 13069

AQS Number: 36-075-0003
DEC Number: 3754-01
County: Oswego
Statistical Area: Syracuse, NY
Coordinates: Lat: 43.28428 Lon: -76.46324

The Fulton site was initiated on October 3, 2002, to measure the Ozone downwind of the Rochester area. Fulton is a seasonal automated ozone site, requiring minimal operator attention. The location in the Granby Community Center offers easy and secure access for DEC staff to perform site maintenance.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous

Loudonville
Address: 300 Albany Shaker Road
Albany, NY 12211

AQS Number: 36-001-0012
DEC Number: 0101-33
County: Albany
Statistical Area: Albany-Schenectady-Troy
Coordinates: Lat: 42.68075 Lon: -73.75733

This site was established in 1986 as a neighborhood scale, population exposure site. The site was expanded as part of the NYSDEC Acid Deposition Network. It is located in suburban Albany, in close proximity to Interstate 90. Ozone readings are reported to AIRNow and it is the only ozone monitor in Albany County. $PM_{2.5}$ sampling was added in January 2008.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous
Carbon Monoxide	TEI 48C Method 054	Non Dispersive Infrared	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 3

Middleport

Address: Middleport Sewage Treatment Plant
3825 North Hartland Road
Middleport, NY 14105

AQS Number: 36-063-1006
DEC Number: 3120-02
County: Niagara
Statistical Area: Buffalo - Niagara Falls, NY
Coordinates: Lat: 43.22386 Lon: -78.47888

This site was established in 1980 as a Buffalo downwind site. Middleport is a seasonal ozone site, operating between April and November. It is located on land adjacent to the Middleport Sewage Treatment Plant in a rural and largely agricultural area. Ozone is measured for regional transport from Buffalo and points west.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400Method 087	Ultraviolet Absorption	Continuous

Millbrook

Address: Institute of Ecosystem Studies
Forest Road
Millbrook, NY 12545

AQS Number: 36-027-0007
DEC Number: 1328-01
County: Dutchess
Statistical Area: Dutchess County, NY
Coordinates: Lat: 41.78555 Lon: -73.74136

This site was established in 1990 as a replacement for the site in the city of Poughkeepsie. The site was suggested by researchers at the Institute of Ecosystem Studies when they suspected that the ozone values in the rural and agricultural area might be higher than those of the high traffic city monitor. The site is shared by the scientists at IES, and researchers there value the data. Ozone readings are reported to AIRNow. Sulfur dioxide measurements were added in June, 2011.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400Method 087	Ultraviolet Absorption	Continuous
Sulfur Dioxide	TEI 43i TLE Method 560	Pulsed Fluorescence	Continuous
Barometric Pressure	Novalynx 230-276-8 Method 011		Continuous

Niagara Falls Packard Court

Address: Packard Court Community Center
4200 Pine Ave,
Niagara Falls, NY 14301

AQS Number: 36-063-7001
DEC Number: 3120-26
County: Niagara
Statistical Area: Buffalo - Niagara Falls, NY
Coordinates: Lat: 43.096528 Lon: -79.010500

This site was established in 2015 due to the presence of manufacturing and chemical industries on the area. The ambient air monitoring data that will be collected at the site will provide valuable information to the NYSDEC's Region 9 air staff and will assist in addressing community concerns.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Toxics	Canister Method 150	GC/MS	1 in 6 days
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 in 6 days

Newburgh

Address: Public Safety Building
55 Broadway
Newburgh, NY 12550

AQS Number: 36-071-0002
DEC Number: 3502-04
County: Orange
Statistical Area: New York, NY
Coordinates: Lat: 41.49916 Lon: -74.00885

Newburgh was established in 2000 as part of the NYS $PM_{2.5}$ FRM network. It currently has both a 1 in 3 day FRM and continuous R&P 1400 TEOM. This site has been used to calculate the "FRM Like" values that are reported to the AIRNow system for the TEOMs in New York City, Albany, Newburgh and Utica.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 3
$PM_{2.5}$	R&P TEOM 1400 Method 702	TEOM 50ºC	Continuous

Nick's Lake Campground

Address: 278 Bisby Road
Old Forge, NY 13420

AQS Number: 36-043-0005
DEC Number: 2167-03
County: Herkimer
Statistical Area: Utica-Rome, NY
Coordinates: Lat: 43.68578 Lon: -74.98538

This site was established in 1987 at the Nick's Lake Campground as part of the Acid Deposition program in the Adirondack Park. The O_3 and SO_2 are both operated continuously without seasonal interruption. SO_2 data are used by analysts in conjunction with the data from the acid deposition program. Ozone readings are reported to AIRNow.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous
Gaseous SO_2, HNO_3; particulate SO_4^{2-}, NO_3, NH_4^+; elemental Ca, Na, Mg, Cl	CASTNet filter pack	CASTNet Analytical Laboratory	Weekly
Ammonia	AMoN sampler	NADP's Central Analytical Laboratory	Biweekly
Relative Humidity	Teledyne RH200 Method 011		Continuous
Wind Speed/direction	Climatronics Sonic Method 020		Continuous
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous
Acid Deposition	NCON Bucket Style Collector Model 00-120-2	Central Analytical Laboratory at the Illinois Water Survey: IC, ICP-OES, FIA	Weekly

Mt Ninham

Address: NYSDEC Multiple Use Area
Gypsy Trail Road
Kent, NY 10512

AQS Number: 36-079-0005
DEC Number: 3951-01
County: Putnam
Statistical Area: New York, NY
Coordinates: Lat: 41.45589 Lon: -73.70977

This site was established in 1987 as part of the NYSDEC Acid Deposition program in the lower Hudson Valley. The surrounding area is primarily forest and rural. The O_3 and SO_2 are both operated continuously without seasonal interruption. The O_3 data show transport from the metropolitan area of NY and NJ. Ozone readings are reported to AIRNow.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Sulfur Dioxide	TEI 43i TLE Method 560	Pulsed Fluorescence	Continuous
Relative Humidity	Teledyne RH200 Method 011		Continuous
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous

Paul Smith's College
Address: Route 86 and 30
Paul Smiths, NY 12970

AQS Number: 36-033-0004
DEC Number: 1655-01
County: Franklin
Coordinates: Lat: 44.43426 Lon: -74.24593

This site was established in 2003 in partnership with Paul Smith's College. The site is used as a teaching center by the school. It is maintained and operated by employees of the college with QA and technical support provided by DEC.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Sulfur Dioxide	TEI 43C Method 060	Pulsed Fluorescence	Continuous
Relative Humidity	Teledyne RH200 Method 011		Continuous
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous
Acid Deposition	NCON Bucket Style Collector Model 00-120-2	Central Analytical Laboratory at the Illinois Water Survey: IC, ICP-OES, FIA	Weekly

Perch River

Address: Perch River Game Management Area
Vaadi Road
LaFargeville, NY 13656

AQS Number: 36-045-0002
DEC Number: 2223-01
County: Jefferson
Statistical Area:
Coordinates: Lat: 44.08747 Lon: -75.97316

This site was established in 1992 as an Eastern Lake Ontario Ozone site. Perch River is a seasonal automated ozone site, requiring minimal operator attention. It is located in the Game Management Building at a DEC owned site, which allows BAQS easy and secure access. Perch River is used for AIRNow reporting.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400Method 087	Ultraviolet Absorption	Continuous
Barometric Pressure	Teledyne BP300 Method 011		

Pinnacle

Address: Pinnacle State Park
1904 Pinnacle Road
Addison, NY 14801

AQS Number: 36-101-0003
DEC Number: 5001-04
County: Steuben
Statistical Area:
Coordinates: Lat: 42.09142 Lon: -77.20978

This site was originally established in the mid 1990s by the Atmospheric Sciences Research Center to provide PAMs data upwind of the Northeast corridor. The NYSDEC has been collaborating on research initiatives at this site and now is responsible for many routine parameters reported from this site. The site was part of the NY PMTACS Supersite program and many research monitoring projects are on-going at this site. This site has been selected by EPA and DEC as a rural NCore site. Ozone, Low Level SO_2, NO_y and continuous $PM_{2.5}$ and PM_{10} from this site are reported to AIRNow. Canister sampling for VOCs commenced in August, 2012 to establish baseline levels in anticipation of potential Marcellus shales natural gas drillings in the Southern Tier region.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Low Level SO_2	TEI 43i TLE Method 560	Pulsed Fluorescence	Continuous
Low Level CO	API 300EU Method 593	Non Dispersive Infrared	Continuous
NO_y	TEI 42i Method 699	Chemiluminescence	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 day in 3
$PM_{2.5}$, PMcoarse, PM_{10}	TEI 1405 DF Method 790	TEOM 30ºC Gravimetric	Continuous
$PM_{2.5}$ Speciation Ions and Elements	Met One Super SASS Method 811	IC, XRF RTI Laboratory	1 day in 3
$PM_{2.5}$ Speciation Carbon	URG 3000 Method 838	IMPROVE TOR	1 day in 3
Sulfate	TEI 5020i	Pulsed Fluorescence	Semi-continuous
Toxics	Canister Method 150	GC/MS	1 in 6
Wind Speed/direction	Method 020	---	Continuous
Temperature	Method 040	---	Continuous
Barometric Pressure	Method 011	---	Continuous
Relative Humidity	Method 011	---	Continuous

Piseco Lake

Address: Piseco Airport
Piseco Lake, NY 12139

AQS Number: 36-041-0005
DEC Number: 2050-01
County: Hamilton
Statistical Area:
Coordinates: Lat: 43.44957 Lon: -74.51625

This site was established in 1988 at the Piseco Airport as part of the Acid Deposition program in the southern Adirondacks. The O_3 and SO_2 are both operated continuously without seasonal interruption. Ozone readings are reported to AIRNow.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Sulfur Dioxide	TEI 43i Method 560	TEI 43i Method 560	Continuous
Relative Humidity	Teledyne RH200 Method 011		Continuous
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous
Acid Deposition	NCON Bucket Style Collector Model 00-120-2	Central Analytical Laboratory at the Illinois Water Survey: IC, ICP-OES, FIA	Weekly

Rochester

Address: RG&E Substation
30 Yarmouth Road
Rochester, NY 14610

AQS Number: 36-055-1007
DEC Number: 2701-22
County: Monroe
Statistical Area: Rochester
Coordinates: Lat: 43.14618 Lon: -77.54822

This site was established in 2004 to consolidate monitoring operations in the Rochester area. This is the major site in upstate New York and has been selected as a $PM_{2.5}$ Speciation Trends site, a NATTs site and an NCORE site. The Ozone and continuous $PM_{2.5}$ readings from this site are reported to AIRNow. The site is also used by researchers from several universities for short term monitoring studies. Current research monitoring includes elemental mercury and ultra-fine particle counting. Data from this site is often integrated in the work from the PM Health Center which is located at the University of Rochester Medical Center. The Rochester PM Center is one of five in the country.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400Method 087	Ultraviolet Absorption	Continuous
Sulfur Dioxide	TEI 43i Method 560	TEI 43i Method 560	Continuous
Low Level CO	API 300EU Method 593	Non Dispersive Infrared	Continuous
NO_y	TEI 42i Method 699	Chemiluminescence	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 in 6
$PM_{2.5}$, PMcoarse, PM_{10}	TEI 1405 DF Method 790	TEOM 30ºC Gravimetric	Continuous
PM_{10}	R&P Partisol 2025 Method 127	Gravimetric	1 in 6
PM_{10} - Metals	Method 907	ICPMS	1 in 6
$PM_{2.5}$ Speciation	Met One Super SASS Method 841	RTI Laboratory	1 in 3
$PM_{2.5}$ Speciation Carbon	URG 3000 Method 838	IMPROVE TOR	1 in 3
Black Carbon	Magee Scientific Aethalometer Method 866	Optical Absorption	Continuous
Mercury Elemental	Tekran 2537B	In situ cold vapor atomic fluorescence	5 minute average

Parameter	Sampling Method	Analysis Method	Schedule
Toxics	Canister Method 150	GC/MS	1 in 6
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 in 6
Polycyclic Aromatic Hydrocarbons (PAH)	Tisch TE 5007 Method 118	GC/MS EPA/ERG Lab	1 in 6
Mercury Wet Deposition	NCON Model 00-125-2 automatic sampler	Frontier Geosciences: cold vapor atomic fluorescence	Weekly
Wind Speed/direction	Climatronics Sonic Method 020		Continuous
Relative Humidity	Teledyne RH200 Method 011		Continuous
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous
Precipitation	NAOH IV		Continuous
Acid Deposition	NCON Bucket Style Collector Model 00-120-2	Central Analytical Laboratory at the Illinois Water Survey: IC, ICP-OES, FIA	Weekly

Rochester Near-Road

Address: I-490 and 1775 East Ave
Rochester, NY 14610

AQS Number: 36-055-0015
DEC Number: 2701-23
County: Monroe
Statistical Area: Rochester
Coordinates: Lat: 43.145021 Lon: -77.557608

This site was established in late December, 2014, under the new NO_x rule that became effective January, 2010. Full operation commenced in January, 2015.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Low Level CO	API 300EU Method 593	Non Dispersive Infrared	Continuous
Oxides of Nitrogen (NO, NO_2, NO_X)	TEI 42C Method 074	Chemiluminescence	Continuous
$PM_{2.5}$	R&P TEOM 1400 Method 701 & 702	TEOM 50ºC	Continuous
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 in 6
Black Carbon	Magee Scientific Aethalometer Method 866	Optical Absorption	Continuous
Ultrafine	API 651 at 3.0 lpm and 0.6 um cut point Method 173	Water-Based Condensation Particle Counter	Continuous

Rockland County

Address: Conklin Orchard
South Mountain Road
Pomona, NY 10970

AQS Number: 36-087-0005
DEC Number: 4353-02
New York State County: Rockland
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 41.18208 Lon: -74.02819

The Rockland County site was originally established as a demonstration study requested by the Rockland County Department of Health. This is the third and permanent location for the Rockland County monitor. Data are reported to AIRNow for ozone and $PM_{2.5}$.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
$PM_{2.5}$	TEOM Thermo 1405 Method 701 & 702	TEOM Gravimetric50ºC	Continuous
Barometric Pressure	Method 011		Continuous

Stillwater

Address: Saratoga National Historical Park
Stillwater, NY 12170

AQS Number: 36-091-0004
DEC Number: 4567-01
County: Saratoga
MSA: Albany-Schenectady-Troy, NY
Coordinates: Lat: 43.01209 Lon: -74.64890

This site was established in 1988 in rural eastern Saratoga County north of Albany, NY. It is located in a room adjacent to the library at the Saratoga National Historical Park. The site offers insight into transport up the main travel corridor in the region and along the Hudson River valley. The data gathered at this site is reported to AIRNow.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous

Tonawanda II

Address: 192 Brookside Terrace West
Tonawanda, NY 14150

AQS Number: 36-029-1014
DEC Number: 1472-14
County: Erie
Statistical Area: Buffalo - Niagara Falls, NY
Coordinates: Lat: 42.99813 Lon: -78.89926

The Tonawanda monitoring site was originally established in 1968 on the grounds of the Town of Tonawanda Sewage Treatment Plant as a source impact site for Sulfur Dioxide. In 2007, the sulfur dioxide monitor was moved to this current location as part of the Tonawanda Community Air Quality Study. This site borders a residential neighborhood and the industrial complex, and is approximately 0.2 mile northeast of the original historic site.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Sulfur Dioxide	TEI 43C Method 060	Pulsed Fluorescence	Continuous
PM $_{2.5}$	TEI 1405 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous
Toxics	Canister Method 150	GC/MS	1 in 6
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 in 6

Utica

Address: Utica Health Department
406 Elizabeth Street
Utica, NY 13501

AQS Number: 36-065-2001
DEC Number: 3202-01
County: Oneida
Statistical Area: Utica- Rome, NY
Coordinates: Lat: 43.09892 Lon: -75.22506

The Utica Health Department site was established in 1957 as a TSP site. The site monitored PM_{10} between 1991 and 1998. In 2003, a continuous $PM_{2.5}$ was installed at the Utica site. The data collected is a part of the AIRNow report and is one of only eight continuous PM sites in upstate New York.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1400 Method 701 & 702	TEOM 50ºC	Continuous

Valley Central H.S.
Address: 1175 Route 17 K
Montgomery, NY 10940

AQS Number: 36-071-5001
DEC Number: 3527-01
County: Orange
MSA: Newburgh, NY-PA
CMSA: New York-N New Jersey-Long Island, NY,NJ,CT,PA
Coordinates: Lat: 41.52375 Lon: -74.21534

This site was established in 1995 in suburban Newburgh in Montgomery, Orange County. It is a single parameter Ozone monitoring site. It is the only ozone monitor in Orange County and the data is reported to AIRNow. The public has shown great interest in the data generated in this area of the state.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous

Wallkill Lead Monitoring

These sites are the only routine lead monitoring sites in upstate New York. They are located in the vicinity of RSR Corporation and were established as high priority SLAMS lead monitors. They are source oriented monitoring sites. The two sites on Ballard Road are upwind of RSR. In August 2011, an additional low volume PM_{10} sampler was put in place for daily mass and lead analysis at the Wakefern site when measurements from the prior winter showed unusually high values for a couple of sample dates. The PM_{10} mass data collected at this site was low and mass determination was discontinued in November 2012. Monitoring at the Scotchtown site downwind of RSR was discontinued at the end of 2015.

Wallkill Ballard Road

Address: 95 Ballard Rd.
Middletown NY 10941

AQS Number: 36-071-3001
DEC Number: 3566-02
County: Orange
Statistical Area: Newburgh, NY-PA
Coordinates: Lat: -74.36343 Lon: 41.46107

Wallkill Wakefern Food

Address: 260 Ballard Rd.
Middletown, New York 10941

AQS Number: 36-071-3002
DEC Number: 3566-09
County: Orange
Statistical Area: Newburgh, NY-PA
Coordinates: Lat: -74.35404 Lon: 41.45869

Parameter	Sampling Method	Analysis Method	Schedule
Lead	Hi-Vol TSP Method 803	Atomic Absorption	1 day in 6
	Low-Vol PM_{10} Method 811	XRF	Daily

Wanakena

Address: Ranger Station
New York State Ranger School
257 Ranger School Road
Wanakena, NY 13695

AQS Number: N/A
DEC Number: 4458-05
County: St. Lawrence
Statistical Area:
Coordinates: Lat: 44.14998 Lon: -74.89980

This site is a stand-alone Acid Deposition Monitor in the Adirondack region.

Parameter	Sampling Method	Analysis Method	Schedule
Acid Deposition	NCON Bucket Style Collector Model 00-120-2	Central Analytical Laboratory at the Illinois Water Survey: IC, ICP-OES, FIA	Weekly

Whiteface Lodge

Address: University at Albany
Atmospheric Science Research
Center Field Station
Wilmington, NY 12997

AQS Number: 36-031-0003
DEC Number: 1567-04
County: Essex
Statistical Area:
Coordinates: Lat: 44.39308 Lon: -73.85890

This site was established in 1974 at the Atmospheric Science Research Center field station at Whiteface Mountain. This site is run in cooperation with the ASRC at UAlbany. The site was used as the site of the 2002 summer intensive $PM_{2.5}$ field study to provide detailed real time chemical and physical data for PM and its co-pollutants. Ozone and continuous $PM_{2.5}$ readings are reported to AIRNow. Acid deposition, gaseous SO_2, and ammonia samples are collected by ASRC.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	1 day in 6
$PM_{2.5}$	TEI 1405 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous
$PM_{2.5}$ Speciation	Met One Super SASS Method 841	RTI Laboratory	1 day in 6
Sulfate	TEI 5020i	Pulsed Fluorescence	Semi-continuous
Carbon	URG 3000 Method 838	IMPROVE TOR	1 day in 6
Toxics	Canister Method 150	GC/MS	1 day in 6
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 day in 6
Relative Humidity	Teledyne RH200 Method 011		Continuous
Temperature	Teledyne RH200 Method 040		Continuous
Barometric Pressure	Teledyne BP300 Method 011		Continuous

Parameter	Sampling Method	Analysis Method	Schedule
Acid Deposition	NCON Bucket Style Collector Model 00-120-2	Central Analytical Laboratory at the Illinois Water Survey: IC, ICP-OES, FIA	Weekly
Gaseous SO_2, HNO_3; particulate SO_4^{2-}, NO_3^- ,NH_4^+; elemental Ca, Na, Mg, Cl	CASTNet filter pack	CASTNet Analytical Laboratory	Weekly
Ammonia	Radiello Diffusive Sampler	NADP's Central Analytical Laboratory	Biweekly
Black Carbon	Magee Scientific Aethalometer Method 866	Optical Absorption	Continuous

Whiteface Summit
Address: Wilmington, NY 12997

AQS Number: 36-031-0002
DEC Number: 1567-03
County: Essex
Statistical Area:
Coordinates: Lat: 44.36608 Lon: -73.90312

This site was established in 1980 at the Atmospheric Science Research Center Lab at the Summit of Whiteface Mountain. It is a special purpose Ozone site run in cooperation with the ASRC at the University at Albany. Data from this site should not be used for NAAQS comparison as it is a high altitude research site.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	TEI 49C Method 047	Ultraviolet Photometric	Continuous

Williamson

Address: Wayne County Occupational Center
4440 Ridge Road
Williamson, NY 14589

AQS Number: 36-117-3001
DEC Number: 5863-01
County: Wayne
Statistical Area: Rochester, NY
Coordinates: Lat: 43.23086 Lon: -77.17136

This site was established in 1979 as a downwind Ozone site for the Rochester metropolitan area. Williamson is a seasonal ozone site, located in a storage building at the Wayne County Occupational Center. The site is located in a rural, mostly agricultural area and is an important location used to verify the attainment status of the Rochester region.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous

3.2 Southern Monitoring Sites

Table 3.2 Locations of Southern Monitoring Sites

DEC Region	AIRS #	DEC #	Site Name	County	Location
1	36-059-0005	2950-10	Eisenhower Park	Nassau	740 Merrick Avenue
1	36-103-0002	5150-02	Babylon	Suffolk	72 Gazza Blvd - Water Authority
1	36-103-0009	5150-10	Holtsville	Suffolk	57 Division St., Sagamore Junior High
1	36-103-0004	5155-01	Riverhead	Suffolk	39 Sound Avenue
2	36-005-0080	7094-05	Morrisania II	Bronx	Family Care Ctr, 1225-57 Gerard Ave
2	36-005-0112	7094-08	IS 74	Bronx	730 Bryant Avenue
2	36-005-0133	7094-10	Pfizer Lab (NYBG)	Bronx	200th Street & Southern Boulevard
2	36-005-0110	7094-07	IS 52	Bronx	681 Kelly Street, E 156th Street
2	36-047-0052	7095-07	PS 314	Kings	330 59th Street
2	36-047-0122	7095-43	JHS 126	Kings	424 Leonard Street
2	36-047-0118	7095-98	PS 274	Kings	800 Bushwick Ave
2	36-061-0079	7093-08	JHS 45	New York	2351 1st Avenue
2	36-061-0115	7093-15	IS 143	New York	511 W 182nd Street
2	36-061-0128	7093-21	PS 19	New York	185 1st Avenue
2	36-061-0134	7093-24	Division Street	New York	Division Street
2	36-061-0135	7093-25	CCNY	New York	160 Convent Avenue
2	36-081-0120	7096-13	Maspeth Library	Queens	69-70 Grand Avenue
2	36-081-0124	7096-15	Queens College II	Queens	NYSDEC Monitoring Building
2	36-081-0125	7096-16	Queens College Near Road	Queens	I-495 H Harding Expressway and 153rd St
2	36-085-0067	7097-01	Susan Wagner	Richmond	1200 Manor Road (near Brielle Ave)
2	36-085-0055	7097-03	Port Richmond	Richmond	364 Port Richmond Avenue
2	36-085-0111	7097-17	Fresh Kills West	Richmond	310 West Service Road
3	36-119-2004	5902-04	White Plains	Westchester	Water District Pumping Station

Babylon

Address: Farmingdale Water District
72 Gazza Blvd.
Babylon, NY 11735

AQS Number: 36-103-0002
DEC Number: 5150-02
New York State County: Suffolk
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.74529 N Lon: -73.41919

The Babylon air monitoring station was originally established in the 1970's as a continuous sulfur dioxide and ozone site. Located on Long Island, downwind from New York City, the site continues to measures urban ozone levels in the New York City metropolitan area.

In 1999 a Federal Reference Method fine particulate ($PM_{2.5}$) sampler was added to the site. This $PM_{2.5}$ monitor is part of the overall $PM_{2.5}$ monitoring network used for comparison to the National Ambient Air Quality Standards.

The ozone data are reported to the AIRNow system.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Photometric	Continuous
$PM_{2.5}$	Low volume FRM TEI 2025i Method 118	Gravimetric	1 day in 3

CCNY

Address: City College of New York
Administration Building
160 Convent Avenue
New York, NY 10031

AQS Number: 36-061-0135
DEC Number: 7093-25
New York State County: New York
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.81976 Lon: -73.94825

The City College of New York - CCNY air monitoring site was established during the summer of 2007. This site includes an ozone analyzer and a continuous fine particulate ($PM_{2.5}$) sampler. Fine particulate monitoring utilizes a $PM_{2.5}$ R&P Tapered Element Oscillating Microbalance (TEOM).

Data from this site is reported to the AIRNow system.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Carbon Monoxide	API 300 EU Method 593	Non Dispersive Infrared	Continuous
$PM_{2.5}$	TEI 1405 Method 701 & 702	Gravimetric TEOM 50ºC	Continuous

Division Street

Address: New York City Department of Education
Public School 124
40 Division Street
New York, NY 10002

AQS Number: 36-061-0134
DEC Number: 7093-24
County: New York
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.71436 Lon: -73.99518

This site was established in September 2006. Initially the site contained a continuous fine particulate ($PM_{2.5}$) Tapered Element Oscillating Microbalance (TEOM). In March 2007, the FRM $PM_{2.5}$, PM_{10} and MetOne Speciation samplers were added following the emergency shut- down of the Canal Street Post Office (36-061-0062). Reference EPA letter: Ruvo to Lavin dated: March 14, 2007. The URG 3000 Carbon sampler was added in May 2007.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1405 Method 701 & 702	TEOM 50ºC	Continuous
	R&P Partisol 2025 Method 118	Gravimetric	1 day in 3
$PM_{2.5}$ Speciation	Met One Super SASS Method 811	XRF	1 day in 3
Carbon	URG 3000 Method 838	IMPROVE TOR	1 day in 3
PM_{10}	R&P Partisol 2025i Method 127	Gravimetric	1 day in 6

Eisenhower Park

Address: Nassau County Park, Recreation and
Museums
Eisenhower Park
740 Merrick Avenue
Westbury, NY 11590

AQS Number: 36-059-0005
DEC Number: 2950-10
New York State County: Nassau
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.74316 Lon: -73.58549

The Eisenhower Park air monitoring station was originally established as a Nassau County Health Department air monitoring site. It was operated with support from the NYSDEC until 2000 when NYSDEC took over complete control of the site. The continuous fine particulate ($PM_{2.5}$) monitoring data from this site are reported to AirNow.

NO_2 monitoring was terminated at this site on March 31, 2011. Ultrafine Particle monitoring was discontinued in June 2010.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Sulfur Dioxide	Thermo 43i Method 560	Pulsed Fluorescence	Continuous
$PM_{2.5}$	R&P TEOM 1405 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous
Relative Humidity	Method 011		Continuous
Temperature	Method 040		Continuous
Barometric Pressure	Method 011		Continuous

Fresh Kills West

Address: 310 West Service Road
Fresh Kills Landfill
Staten Island, NY 10314

AQS Number: 36-085-0111
DEC Number: 7097-17
New York State County: Richmond
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.58027 Lon: -74.19832

The Fresh Kills West air monitoring station was established in July 1999 as part of an air quality study of the Fresh Kills Landfill and the start up of the methane gas flare at the landfill. Following the end of the Landfill study, the Fresh Kills West site became part of NYSDEC's core ambient air monitoring program.

The continuous fine particulate (PM2.5) monitoring data from this site are reported to AIRNow.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	TEI 1405Method 701 & 702	TEOM 50ºC Gravimetric	Continuous
Toxics	Canister Method 150	GC/MS	1 in 6 days
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 in 6 days
Barometric Pressure	Spectra 276 Method 011		Continuous

Holtsville

Address: Sagamore Junior High School
57 Division Street
Holtsville, NY 11742

AQS Number: 36-103-0009
DEC Number: 5151-10
New York State County: Suffolk
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.82799 Lon: -73.05754

The Holtsville air monitoring station was established by the Suffolk County Department of Health Services - Division of Environmental Quality in the late 1990s. NYSDEC established an ozone analyzer at the site during the 2006 ozone season. In June of 2010, NYSDEC took over control of the site, following personnel changes in the Suffolk County Department of Health Services. NYSDEC expanded its monitoring by added sulfur dioxide and fine particulate matter.

The parameters monitored and certified by NYSDEC are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Sulfur Dioxide	TEI 43i Method 560	Pulsed Fluorescence	Continuous
$PM_{2.5}$	R&P TEOM 1405 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous
Barometric Pressure	Climatronics AIO Method 011		Continuous
Relative Humidity	Climatronics AIO Method 011		Continuous
Temperature	Climatronics AIO Method 040		Continuous

IS 143

Address: New York City Department of Education
Junior High School 143
511 West 182nd Street
New York, NY 10033

AQS Number: 36-061-0115
DEC Number: 7093-15
County: New York
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.84888 Lon: -73.93059

The IS143 site was established in 2000 as a continuous fine particulate ($PM_{2.5}$) monitoring site. The site utilizes an R&P Tapered Element Oscillating Microbalance (TEOM). This site is located in an urbanized, residential area of Manhattan. Data from this site are reported to AIRNow.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1405 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous

IS 52

Address: New York City Department of Education
Public School 52/Middle School 302
681 Kelly Street
Bronx, NY 10455

AQS Number: 36-005-0110
DEC Number: 7094-07
County: Bronx
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.8162 Lon: -73.9020

This site was established in 1999 as a replacement site for Public School 155. Initially the site contained ozone, oxides of nitrogen, sulfur dioxide, continuous $PM_{2.5}$ and continuous PM_{10}. Following an upgrade of the electricity, additional monitoring parameters were added, creating one of the premier particulate sampling sites in New York City. The site contains criteria pollutant parameters and methods along with many experimental methods.

This site was temporarily shut down June 2010 until July 2012 due to extensive construction at the school. The monitoring for NATTS parameters was moved to Morrisania II during that period. This site is now back to full operation.

The parameters normally monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400Method 087	Ultraviolet Photometric	Continuous
Oxides of Nitrogen	TEI 42C Method 074	Chemiluminescence	Continuous
Low Level SO_2	TEI 43i TLE Method 560	Pulsed Fluorescence	Continuous
$PM_{2.5}$, PM_{10}, PMcoarse	Thermo Scientific 1405 DF FDMS	TEOM 30ºC Gravimetric	Continuous
$PM_{2.5}$	Low volume FRM R&P 2025 Method 118	Gravimetric	Daily 1 day in 3
$PM_{2.5}$ Speciation Ions and Elements	Met One Super SASS Method 811	IC,XRF	1 day in 3
$PM_{2.5}$ Speciation Carbon	URG 3000 Method 838	IMPROVE TOR	1 day in 3
PM_{10}	Low volume FRM R&P 2025 Method 127	Gravimetric	1 day in 6[a]

Parameter	Sampling Method	Analysis Method	Schedule
PM_{10} - Metals	Method 907	ICPMS	1 day in 6[a]
Sulfate	Thermo Scientific 5020i Sulfate Particulate	Pulsed Flurescence	Continuous
Black Carbon	Magee Scientific Aethalometer Method 866	Optical Absorption	Continuous
Elemental Carbon/ Organic Carbon	Sunset Laboratory Method 5040	Thermal Optical	Semi-Continuous
Polycyclic Aromatic Hydrocarbons-PAH	Tisch TE 5007 Method 118	GC/MS EPA/ERG Lab	1 day in 6
Toxics	Canister Method 150	GC/MS	1 day in 6 [a]
Carbonyl	DNPH tube Method 202	HPLC - Ultraviolet Absorption	1 day in 6
Wind Speed/direction	Climatronics Method 020	Sonic	Continuous

[a] Collocated unit

IS 74

Address: New York City Department of Education
Intermediate School 74 (MS 201)
730 Bryant Avenue
Bronx, NY 10474

AQS Number: 36-005-0112
DEC Number: 7094-08
County: Bronx
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.81551 Lon: -73.88553

The Intermediate School 74 site was established in 2000 as a continuous fine particulate ($PM_{2.5}$) monitoring station. The site utilizes an R&P Tapered Element Oscillating Microbalance (TEOM). This site is located in an urbanized, residential area of the Hunts Point area of the Bronx. Data from this site are reported to AIRNow.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1400 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous

JHS 126

Address: New York City Department of Education
424 Leonard Street
Junior High School 126
Brooklyn, NY 11222

AQS Number: 36-047-0122
DEC Number: 7095-43
New York State County: Kings
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.71961 Lon: -73.94771

The JHS 126 air monitoring station was established in 2000 as a Hi-Volume PM_{10} and Lead monitoring site. In January, 2001, a Federal Reference Method fine particulate ($PM_{2.5}$) sampler was added. This $PM_{2.5}$ sampler is part of the overall $PM_{2.5}$ monitoring network used for comparison to the National Ambient Air Quality Standards. PM_{10} sampling was discontinued December 2005. TSP-lead sampling was terminated at the end of 2009. The necessary monitoring is conducted at IS 52 in the Bronx.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P Partisol 2025i Method 118	Gravimetric	1 day in 3

JHS 45

Address: New York City Department of Education
Junior High School 45
2351 First Avenue
New York, NY 10035

AQS Number: 36-061-0079
DEC Number: 7093-08
New York State County: New York
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.79970 Lon: -73.93432

The JHS 45 air monitoring station was originally established in 1981 as a sulfur dioxide, fine and coarse particulate (dichotomous samplers) and Total Suspended Particulate site. The site was shut down in 1985 and then reestablished as a Federal Reference Method fine particulate ($PM_{2.5}$) monitoring site in January 2000. A duplicate $PM_{2.5}$ sampler was installed in January 2006 after being removed from the PS 59 station to continue to provide accuracy data for the $PM_{2.5}$ network. The FRM $PM_{2.5}$ samplers at JHS 45 are part of the overall $PM_{2.5}$ monitoring network used for comparison to the National Ambient Air Quality Standards.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$[1]	TEI 2025i Method 118	Gravimetric	1 day in 3

[1] Collocated samplers

Maspeth Library

Address: Queens Public Library - Maspeth
69-70 Grand Avenue
Maspeth, NY 11378

AQS Number: 36-081-0120
DEC Number: 7096-13
County: Queens
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.72698 Lon: -73.89313

The Maspeth Library was established as a continuous fine particulate ($PM_{2.5}$) monitoring site in 2000. The site utilizes an R&P Tapered Element Oscillating Microbalance (TEOM). This site is located in an urbanized, residential area in the vicinity of two major New York City roadways, the Long Island Expressway and the Brooklyn-Queens Expressway. The continuous fine particulate ($PM_{2.5}$) monitoring data from this site are reported to AIRNow.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1400 Method 701 & 702	TEOM 50ºC	Continuous

Morrisania II

Address: Morrisania Diagnostic and Treatment Center
1225-57 Gerard Avenue
Bronx, NY 10452

AQS Number: 36-005-0080
DEC Number: 7094-05
New York State County: Bronx
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.83606 Lon: -73.92009

The Morrisania II air monitoring station was originally established in 1989 as a Hi-Volume PM_{10} site. In 1990 ozone, sulfur dioxide and oxides of nitrogen analyzers were added. PM_{10} was subsequently discontinued. A Federal Reference Method fine particulate ($PM_{2.5}$) sampler was added in 1999. In May of 2000 all continuous analyzers were discontinued and the site became a stand-alone $PM_{2.5}$ site. The FRM $PM_{2.5}$ sampler at Morrisania II is part of the overall $PM_{2.5}$ monitoring network used for comparison to the National Ambient Air Quality Standards

Following the construction at school where the IS 52 monitoring station is located, equipment for the National Air Toxics Trends Station (NATTS) program was moved to Morrisania II. This equipment was returned to the IS 52 site in July 2012.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1400 Method 701 & 702	TEOM 50ºC	Continuous

Pfizer Plant Research Laboratory

Address: 200th Street and Southern Blvd.
Bronx, NY 10458-5126

AQS Number: 36-005-0133
DEC Number: 7094-10
New York State County: Bronx
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.86790 Lon: -73.87809

This site was established in the Harding Laboratory at the New York Botanical Garden in January 1995. This site was originally established for the Photochemical Assessment Monitoring Station (PAMS) program with some summa canister sampling beginning in June 1994. During the summer of 2006, the New York Botanical Garden completed construction on the Pfizer Plant Research Laboratory. This is a state of the art laboratory and research facility that replaced the Harding laboratory. Through an agreement with NYSDEC, NYBG provided space in the new facility for NYSDEC's ambient air monitoring station.

Starting with the 2006 PAMS season the continuous GC was moved to the new monitoring site at the Pfizer Lab. The ozone, sulfur dioxide, oxides of nitrogen, carbon monoxide, methane/non-methane, canisters, and carbonyl samplers were moved to the Pfizer Lab the end of December 2006. The FRM $PM_{2.5}$ sampler was moved to the Pfizer Laboratory on January 1, 2008. The FRM fine particulate ($PM_{2.5}$) sampler installed at the Pfizer Laboratory is part of the overall $PM_{2.5}$ monitoring network used for comparison to the National Ambient Air Quality Standards.

On January 9, 2008, the Mercury Deposition Network (MDN) Automatic Precipitation Sampler and the ETI Instrument Systems NOAH IV Total Precipitation Measurement System was installed as part of establishing a MDN site at Pfizer Laboratory. The Tekran Elemental and Reactive Gas Mercury equipment was installed in August, 2008. In December 2015, NYS switched to only utilizing Elemental Mercury methods of measurements.

This site is being utilized for the New York City Community Air Survey as part of the PlaNYC initiative.

The parameters monitored are indicated in the following table:

Pfizer Plant Research Laboratory

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Low Level SO_2	TEI 43i TLE Method 560	Pulsed Fluorescence	Continuous
Oxides of Nitrogen (NO, NO_2, NO_x)	TEI 42C Method 074	Chemiluminescence	Continuous
Low Level CO	API 300EU Method 593	Non Dispersive Infrared	Continuous
$PM_{2.5}$	TEI 2025i Method 118	Gravimetric	1 day in 3
PAMS precursor	Method 128	GC/FID	Continuous
Toxics	Canister Method 150	GC/MS	1 day in 6
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 day in 6 Daily (PAMS)
Mercury Elemental	Tekran 2537B	In situ cold vapor atomic fluorescence	5 minute average
Mercury Wet Deposition	N-CON Systems MDN 00-125-2 Automatic Sampler, NOAH IV Total Precipitation Measurement System	Frontier Geosciences: cold vapor atomic fluorescence	Weekly collection
Acid Deposition	NCON Bucket Style Collector Model 00-120-2	Central Analytical Laboratory at the Illinois Water Survey: IC, ICP-OES, FIA	Weekly collection
Wind Speed/direction	Method 020	---	Continuous
Relative Humidity	Method 011	---	Continuous
Temperature	Method 040	---	Continuous
Barometric Pressure	Method 011	---	Continuous

Port Richmond

Address: United States Post Office
Port Richmond Station
364 Port Richmond Avenue
Staten Island, NY 10302

AQS Number: 36-085-0055
DEC Number: 7097-03
New York State County: Richmond
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.63307 Lon: -74.13719

The Port Richmond air monitoring station was originally established as a Hi-Volume PM_{10} site in 1984. In December 1999, a Federal Reference Method fine particulate ($PM_{2.5}$) sampler was installed. This FRM $PM_{2.5}$ sampler is part of the overall $PM_{2.5}$ monitoring network used for comparison to the National Ambient Air Quality Standards. In April 2011, a TEOM was added to this site following the shutdown of the PS 44 monitoring station.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1400i Method 701 & 702	TEOM 50ºC	Continuous
	Low volume FRM R&P 2025 Method 118	Gravimetric	1 day in 3

PS 19

Address: New York City Department of Education
Public School 19
185 First Avenue
New York, NY 10003

AQS Number: 36-061-0128
DEC Number: 7093-21
New York State County: New York
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.73000 Lon: -73.98446

The PS 19 air monitoring station was established as a Federal Reference Method fine particulate ($PM_{2.5}$) monitoring site in October 2001. The FRM $PM_{2.5}$ sampler at PS 19 is part of the overall $PM_{2.5}$ monitoring network used for comparison to the National Ambient Air Quality Standards. The continuous $PM_{2.5}$ TEOM was added in June, 2007.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	Low volume FRM R&P 2025i Method 118	Gravimetric	1 day in 3
	R&P TEOM 1405 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous

PS 274

Address: New York City Department of Education
Public School 274
800 Bushwick Avenue
Brooklyn, NY 11221

AQS Number: 36-047-0118
DEC Number: 7095-98
County: Kings
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.69454 Lon: -73.92769

The Public School 274 site was established in 2000 as a continuous fine particulate ($PM_{2.5}$) monitoring station. The site utilizes an R&P Tapered Element Oscillating Microbalance (TEOM). This site is located in an urbanized, residential/industrial area of Brooklyn. The continuous fine particulate ($PM_{2.5}$) monitoring data from this site are reported to AIRNow.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1400 Method 701 & 702	TEOM 50ºC	Continuous
Toxics	Canister Method 150	GC/MS	1 in 6 days

PS 314
Address: New York City Department of Education
Public School 314
330 59th Street
Brooklyn, NY 11220

AQS Number: 36-047-0052
DEC Number: 7095-07
County: Kings
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.64182 Lon: -74.01871

The Public School 314 site was first established in 1982 as a Hi-Volume inhalable particulate (PM_{10}) station. In 2003, the site became a continuous fine particulate ($PM_{2.5}$) monitoring site with the installation of an R&P Tapered Element Oscillating Microbalance (TEOM). This site is located in an urbanized, residential/industrial area in the vicinity of the Gowanus Expressway. Data from this site are reported to AIRNow.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	R&P TEOM 1400 Method 701 & 702	TEOM 50ºC	Continuous

Queens College II

Address: NYSDEC Air Monitoring Building
CUNY - Queens College Campus
65-30 Kissena Blvd.
Flushing, NY 11367

AQS Number: 36-081-0124
DEC Number: 7096-15
County: Queens
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.73614 Lon: -73.82153

NYSDEC originally began monitoring at Queens College for ozone and sulfur dioxide in 1978. This continued until 1997 when the monitoring equipment was removed from Queens College during a major building renovation project on the campus. The AQS number for the original Queens College site was 36-081-0004. The Queens College II site was originally established during the summer of 2001 for an intensive air pollution study that was coordinated with the State University of New York - University of Albany - Atmospheric Sciences Research Center. In September 2006 the site was redesigned and expanded in a newly constructed building on the Queens College campus. This site is one of three NCore sites in New York State.

The FRM fine particulate ($PM_{2.5}$) monitor located at Queens College is part of the overall $PM_{2.5}$ monitoring network used for comparison to the National Ambient Air Quality Standards. This is monitoring location is in a highly populated residential area. The site is in close proximity to sensitive groups, primarily young children, at Public School 219. Photochemical Assessment Monitoring Station program sampling began in 2001, however, continuous monitoring with Gas Chromatography for PAMS is not done at this site, as it is conducted at the Pfizer Lab station in the Bronx.

This site is being utilized for the New York City Community Air Survey as part of the PlaNYC initiative.

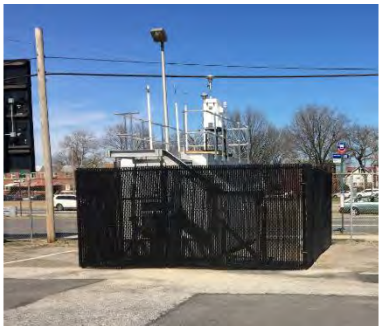
The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
Low Level SO_2	TEI 43i TLE Method 560	Pulsed Fluorescence	Continuous
Oxides of Nitrogen (NO, NO_2, NO_x)	TEI 42i Method 074	Chemiluminescence	Continuous
NO_y	API 200EU Method 082	Chemiluminescence	Continuous
Low Level CO	API 300EU Method 593	Non Dispersive Infrared	Continuous

Parameter	Sampling Method	Analysis Method	Schedule
$PM_{2.5}$	TEI 2025i Method 118	Gravimetric	Daily
$PM_{2.5}$ Speciation Ions and Elements	MetOne Super SASS Method 811	IC, XRF	1 day in 3
$PM_{2.5}$, PMcoarse, PM_{10}	Thermo Scientific 1405 DF FDMS Method 790	TEOM 30°C Gravimetric	Continuous
PM_{10}	TEI 2025i Method 127	Gravimetric	Daily
Carbon	URG 3000 Method 838	IMPROVE TOR	1 day in 3
	Sunset Laboratory Method 5040	Thermal Optical	Semi-continuous
Sulfate	TEI 5020i	Pulsed Fluorescence	Semi-continuous
Toxics	Canister Method 150	GC/MS	1 day in 6
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 day in 6
Ultrafine	TSI 3783 at 3.0 lpm and 6 nm cutpoint Method 173	Water-Based Condensation particle counter	Continuous
Wind Speed/direction	Climatronics AIO Method 020	---	Continuous
Temperature	Climatronics AIO Method 040	---	Continuous
Barometric Pressure	Climatronics AIO Method 011	---	Continuous
Relative Humidity	Climatronics AIO Method 011	---	Continuous
Particle Count	TSI 3031 Method 031	Electrical Mobility	Continuous

Queens College Near-Road

Address: I-495, H Harding Expwy and 153rd St
Flushing, NY 11367



AQS Number: 36-081-0125
DEC Number: 7096-16
County: Queens
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.739264 Lon: -73.817694

The New York City Near-Road site at Queens College was established in March 2017 under the new NOx rule that became effective on January, 2010. Full operation of the site was commenced on April 1, 2017.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Low Level CO	Thermo Fisher 48i-TLE Method 593	Photolytic Method	Continuous
Oxides of Nitrogen (NO, NO_2, NO_X)	TAPI – T200UP Method 074	Photolytic Method	Continuous
$PM_{2.5}$	Thermo TEOM 1405 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous
Ultrafine	TSI 3783 at 3.0 lpm and 0.6 um cut point Method 173	Water-Based Condensation Particle Counter	Continuous
Black Carbon	TAPI 633 Aethalometer Method 866	Optical Absorption	Continuous
Carbonyl	DNPH Cartridge Method 202	HPLC - Ultraviolet Absorption	1 in 6 days
$PM_{2.5}$	Low volume FRM 2025. Method 118	Gravimetric	1 in 3 days

Riverhead

Address: Cornell University
College of Agriculture and Life Sciences
Long Island Horticultural Research Center
3059 Sound Avenue
Riverhead, NY 11901

AQS Number: 36-103-0004
DEC Number: 5155-01
New York State County: Suffolk
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.96078 Lon: -72.71238

The Riverhead air monitoring station was established in 1992 as a seasonal ozone site. It is utilized as a regional ozone site, given its downwind proximity to New York City. The ozone data are reported to the AIRNow system.

The parameter monitored is indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous (during the NYS Ozone Season)

Susan Wagner

Address: New York City Department of Education
Susan E. Wagner High School
1200 Manor Avenue
Staten Island, NY 10314

AQS Number: 36-085-0067
DEC Number: 7097-01
New York State County: Richmond
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 40.59664 Lon: -74.12525

The Susan Wagner ambient air monitoring station was established in the 1970's. This site is one of the long term ozone trends sites in New York City. The site is a year-round ozone site. The ozone data from this site are reported to AirNow.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Seasonal
Barometric Pressure	Method 011		Continuous
Relative Humidity	Method 011		Continuous
Temperature	Method 040		Continuous

White Plains

Address: White Plains Water Pump Station Garage
240 Orchard Street
White Plains, NY 10601

AQS Number: 36-119-2004
DEC Number: 5902-04
New York State County: Westchester
Statistical Area: New York City Metropolitan Area
Coordinates: Lat: 41.05192 Lon: -73.76366

The White Plains ambient air monitoring station was originally established in the 1970's.The ozone data are reported to the AirNow system.

The parameters monitored are indicated in the following table:

Parameter	Sampling Method	Analysis Method	Schedule
Ozone	API T400 Method 087	Ultraviolet Absorption	Continuous
$PM_{2.5}$	Thermo Scientific TEOM 1405 Method 701 & 702	TEOM 50ºC Gravimetric	Continuous
Barometric Pressure	Method 011		Continuous
Relative Humidity	Method 011		Continuous
Temperature	Method 040		Continuous

4.0 Criteria Contaminants

EPA is required to set National Ambient Air Quality Standards (NAAQS) for wide-spread pollutants from numerous and diverse sources considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings. The Clean Air Act requires periodic review of the science upon which the standards are based and the standards themselves. Listed below are the NAAQS for six principal pollutants, which are called "criteria" pollutants.

Table 4.1 National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Times	Level	Averaging Times
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour(1)	None	
	35 ppm (40 mg/m^3)	1-hour(1)		
Lead	0.15µg/m^3(2)	Rolling 3-month Average	Same as Primary	
Nitrogen Dioxide	53 ppb	Annual (Arithmetic Mean)	Same as Primary	
	100 ppb	1-hour(3)	None	
Particulate Matter (PM_{10})	150µg/m^3	24-hour(4)	Same as Primary	
Particulate Matter ($PM_{2.5}$)	12.0µg/m^3	Annual(5) (Arithmetic Mean)	Same as Primary	
	35µg/m^3	24-hour(6)	Same as Primary	
Ozone	0.070 ppm (2015 std)	8-hour(7)	Same as Primary	
Sulfur Dioxide	75 ppb	1-hour(8)	3-hour(1)	0.5 ppm (1300µg/m^3)

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[1] Not to be exceeded more than once per year.

[2] Effective 1/12/2009, replaces the previous quarterly average value of 1.5µg/m^3

[3] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

[4] Not to be exceeded more than once per year on average over 3 years.

[5] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 12.0µg/m^3. Effective March 18, 2013.

[6] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35µg/m^3 (effective December 17, 2006).

[7] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.070 ppm (effective December 28, 2015).

[8] Effective August 23, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

4.1 Carbon Monoxide

Carbon monoxide, a colorless and odorless gas, is produced as a primary pollutant during the combustion of fossil and biomass fuels. Vegetation also can emit CO directly into the atmosphere as a metabolic by-product. Sources such as motor vehicles, non-road combustion engines or vehicles, and biomass burning can cause high concentrations of CO in the outdoor environment. Indoor sources include unvented, malfunctioning, or misused combustion appliances, combustion engines in garages or basements, and tobacco combustion. In both of these environments, CO is of direct concern because of the health effects that can result from human exposure to these high concentrations.

CO enters the bloodstream through the lungs and reduces oxygen delivery to the body’s organs and tissues. The health threat from levels of CO sometimes found in the ambient air is most serious for those who suffer from cardiovascular disease such as angina pectoris. At much higher levels of exposure not commonly found in ambient air, CO can be poisonous, and even healthy individuals may be affected. Visual impairment, reduced work capacity, reduced manual dexterity, poor learning ability, and difficulty in performing complex tasks are all associated with exposure to elevated CO levels.

There are two primary NAAQS for ambient CO: a 1-hour average of 35 ppm and an 8-hour average of 9 ppm. These concentrations are not to be exceeded more than once per year. There currently are no secondary standards for CO.

Motor vehicle exhaust contributes about 60 percent of all CO emissions nationwide. High concentrations of CO generally occur in areas with heavy traffic congestion. Other sources of CO emissions include industrial processes, non-transportation fuel combustion, and natural sources such as wildfires. Peak CO concentrations typically occur during the colder months of the year when CO automotive emissions are greater and nighttime inversion conditions are more frequent.

Technological advancements in pollution control have brought about a downward trend for ambient CO concentrations over the past few decades. According to EPA estimates, annual CO emissions decreased from 197.3 million tons in 1970 to 80.6 million tons in 2011 nationally.

The number of monitors and concentration trends chart over the years in New York State are depicted in Figure 4.1. It clearly demonstrates that the current ambient levels of CO are well below the NAAQS, in spite of the continual increase in automobiles and vehicle-miles traveled in the State. As of 2002, all counties in the State have achieved attainment designation.

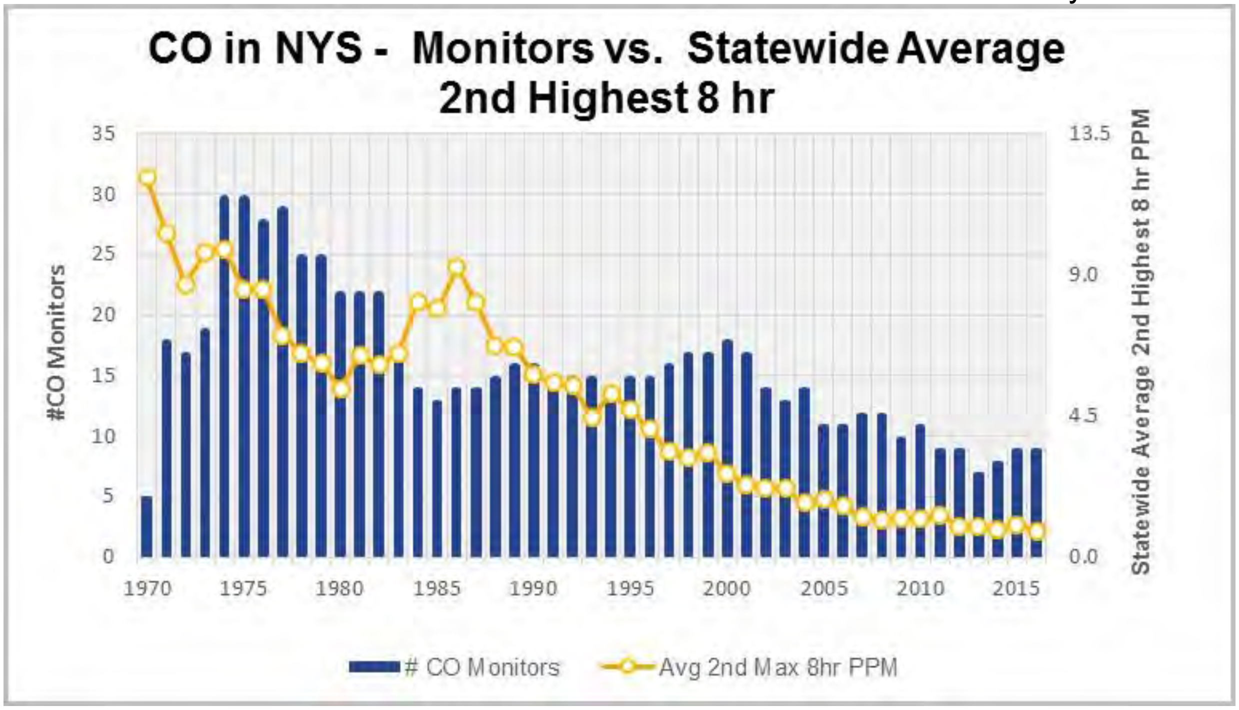

Figure 4.1 Carbon Monoxide Monitors and Concentration Trends

NYSDEC uses TEI Model 48C and Teledyne API 300 EU instruments that employ the NDIR gas filter correlation method for the continuous measurement of CO. Currently there are nine CO monitors in operation statewide, including the near-road sites in Buffalo and Rochester, as shown in Figure 4.2.

Near-Road CO Monitoring

The EPA updated the monitoring regulations for CO in August, 2011. The regulation added a requirement to perform CO monitoring at one location on a busy roadway in each city (CBSA) with a population over 1 million. The near-road CO monitor is expected to be collocated with the near-road monitor established for monitoring NO_2. A CO monitor is required to be operational at a near-road site in CBSAs over 2.5 million by January 1, 2015 and in the CBSAs over 1 million by January 1, 2017. Near-road CO monitoring commenced at the Buffalo and Rochester sites on August 1, 2014, and December 18, 2014, respectively.

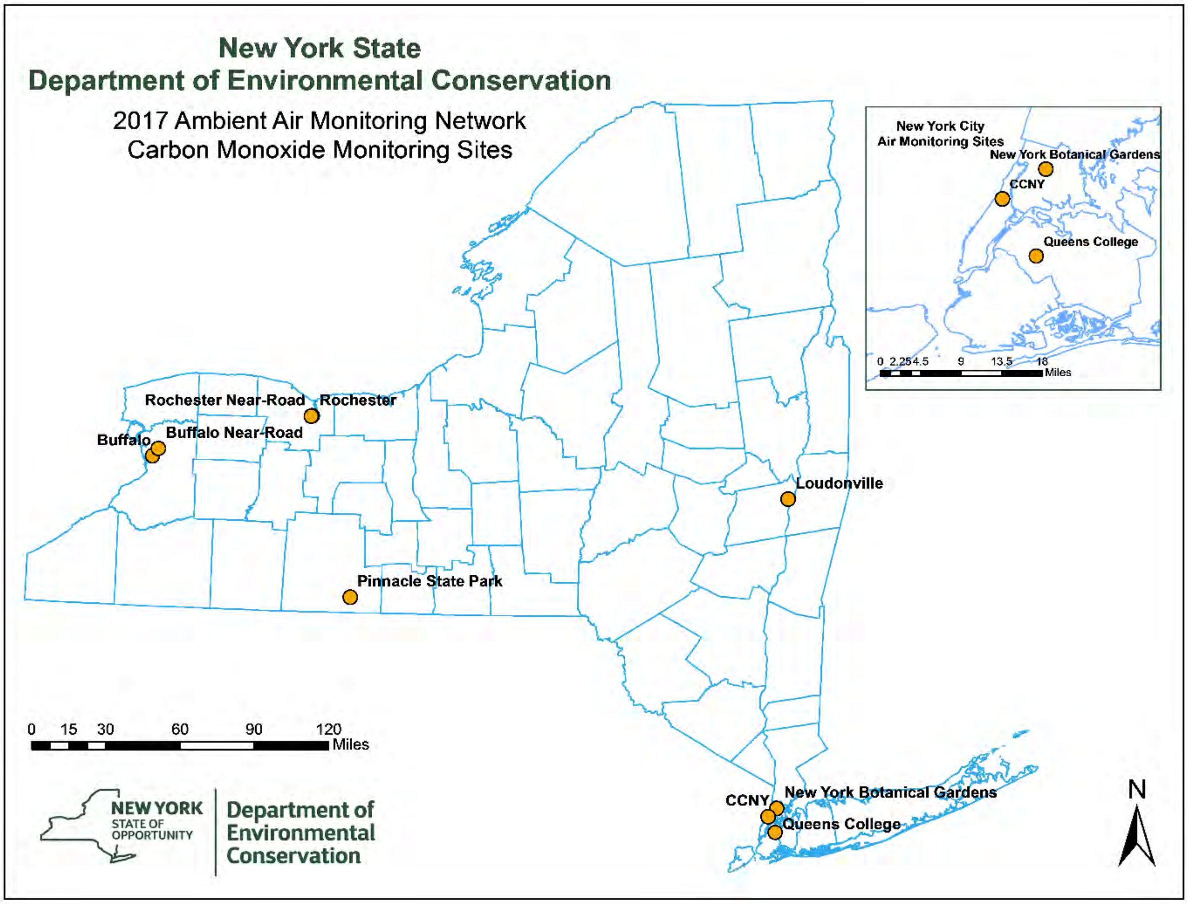

Figure 4.2 Map of Carbon Monoxide Monitoring Sites

4.2 Nitrogen Dioxide

Many chemical species of nitrogen oxides (NOx) exist, but the air pollutant species of most interest from the point of view of human health is nitrogen dioxide (NO_2). Nitrogen dioxide is soluble in water, reddish-brown in color, and a strong oxidant. Nitrogen dioxide is an important atmospheric trace gas, not only because of its health effects but also because (a) it absorbs visible solar radiation and contributes to impaired atmospheric visibility; (b) as an absorber of visible radiation it could have a potential direct role in global climate change if its concentrations were to become high enough; (c) it is, along with nitric oxide (NO), a chief regulator of the oxidizing capacity of the free troposphere by controlling the build-up and fate of radical species, including hydroxyl radicals; and (d) it plays a critical role in determining ozone (O_3) concentrations in the troposphere because the photolysis of nitrogen dioxide is the only key initiator of the photochemical formation of ozone, whether in polluted or unpolluted atmospheres.

Natural sources include intrusion of stratospheric nitrogen oxides, bacterial and volcanic action, and lightning. The major source of anthropogenic emissions of nitrogen oxides into the atmosphere is the combustion of fossil fuels in stationary sources (heating, power generation) and in motor vehicles (internal combustion engines).

In most ambient situations, nitric oxide is emitted and transformed into nitrogen dioxide in the atmosphere. Oxidation of nitric oxide by atmospheric oxidants such as ozone occurs rapidly, even at the low levels of reactants present in the atmosphere. Consequently, this reaction is regarded as the most important route for nitrogen dioxide production in the atmosphere. Other contributions of nitrogen dioxide to the atmosphere come from specific non-combustion industrial processes, such as the manufacture of nitric acid, the use of explosives and welding. Indoor sources include tobacco smoking and the use of gas-fired appliances and oil stoves.

Nitrogen dioxide is the most widespread and commonly found nitrogen oxide and is a matter of public health concern. The most troubling health effects associated with short term exposures (i.e., less than 3 hours) to NO_2 at or near the ambient NO_2 concentrations seen in the United States include cough and increased changes in airway responsiveness and pulmonary function in individuals with preexisting respiratory illnesses, as well as increases in respiratory illnesses in children 5 to 12 years old. Evidence suggests that long-term exposures to NO_2 may lead to increased susceptibility to respiratory infection and may cause structural alterations in the lungs.

Atmospheric transformation of NO_2 can lead to the formation of ozone and nitrogen-bearing particles (e.g., nitrates and nitric acid). As discussed in the ozone and particulate matter sections of this document, exposure to both PM and O_3 is associated with adverse health effects.

Nitrogen oxides contribute to a wide range of effects on public welfare and the environment, including global warming and stratospheric ozone depletion. Deposition of nitrogen can lead to fertilization, eutrophication, or acidification of terrestrial, wetland,

and aquatic (e.g., fresh water bodies, estuaries, and coastal water) systems. These effects can alter competition between existing species, leading to changes in the number and type of species (composition) within a community. For example, eutrophic conditions in aquatic systems can produce explosive algae growth leading to a depletion of oxygen in the water and/or an increase in levels of toxins harmful to fish and other aquatic life.

The level for both the primary and secondary NAAQS for NO_2 is 53 ppb annual arithmetic average (mean), not to be exceeded. In January 2013, the EPA revised the NAAQS to include an hourly standard of 100 ppb. Figure 4.3 shows the number of monitoring sites and NO_2 concentration trends over the years. From the late 1970s to late 1990s NO_2 ranged from 25-30 ppb. The current ambient levels of 10-20 ppb NO_2 observed in New York State are well below the NAAQS.

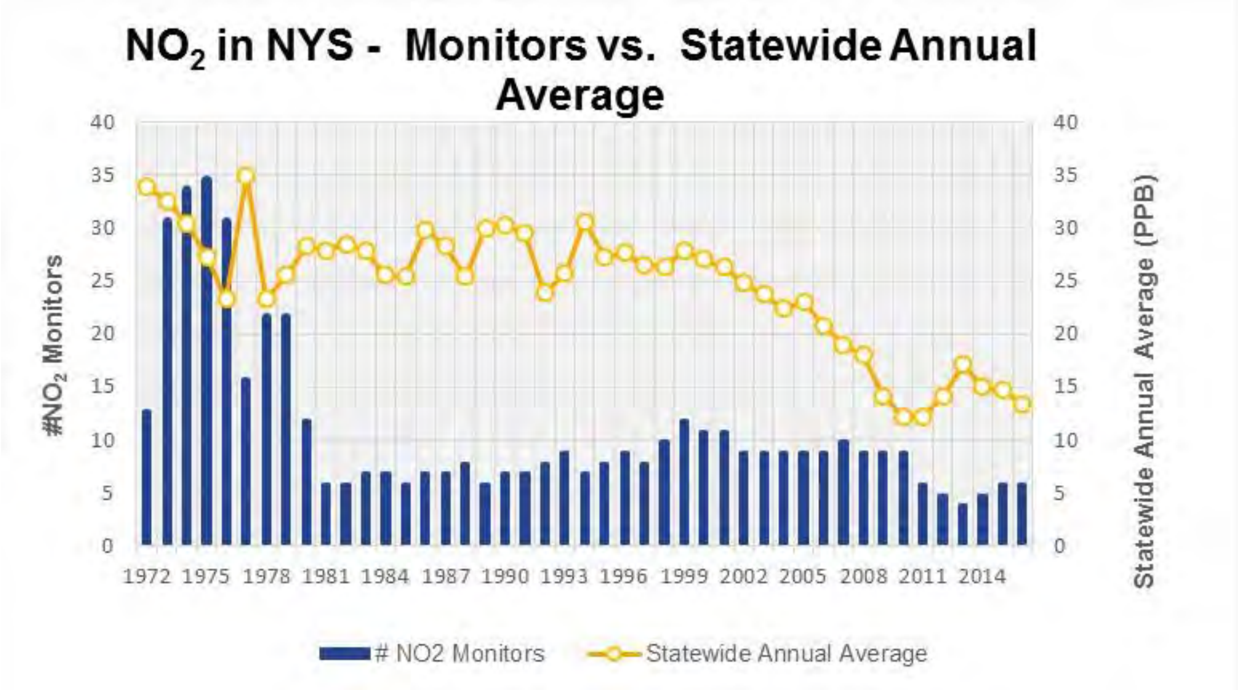

Figure 4.3 Nitrogen Dioxide Monitors and Concentration Trends

In New York, the TEI Model 42C instruments are deployed for continuous NO_2 measurements using the gas phase chemiluminescence method. Currently there are four NO_x monitoring sites statewide, and NO/NO_y monitors in Rochester, Pinnacle, and Queens College (both NO_2 and NO_y) as shown in Figure 4.4. NO/NO_y measurements are included within the NCore multi-pollutant site requirements and the PAMS program. These NO/NO_y measurements will produce conservative estimates for NO_2 that can be used to ensure tracking continued compliance with the NO_2 NAAQS. NO/NO_y monitors are used at these sites because it is important to collect data on total reactive nitrogen species for understanding O_3 photochemistry. In 2012, we discontinued using the (NO/NO_y) values as NO_2 from these three sites for statewide annual average calculations. The upturn in the trend line around 2012 is a result of excluding the low concentration sites Pinnacle and Rochester, and not an indication of a statewide increase.

The EPA considered setting a secondary standard for NO_x and SO_x that would specifically target the impact of acidic deposition on wilderness areas. The EPA ultimately decided that there was not enough information at this time to tie specific water quality thresholds with ambient air concentrations. In the July 2011 final rule for NO_x and SO_x, the EPA stated that they would set up a monitoring program in sensitive areas to collect information to link water quality impacts to ambient air quality measurements. The NYSDEC is participating in this pilot monitoring program in the Adirondacks. Additional monitoring equipment has been installed at several sites to determine the concentrations of gases and particles including ammonia. These data will be used in the future to inform the next review of the NO_x/SO_x standard. Although ambient NO_2 levels are not expected to contravene the NAAQS, monitoring is necessary due to NO_2 being an ozone precursor, and the need to track the effectiveness of emission reduction programs.

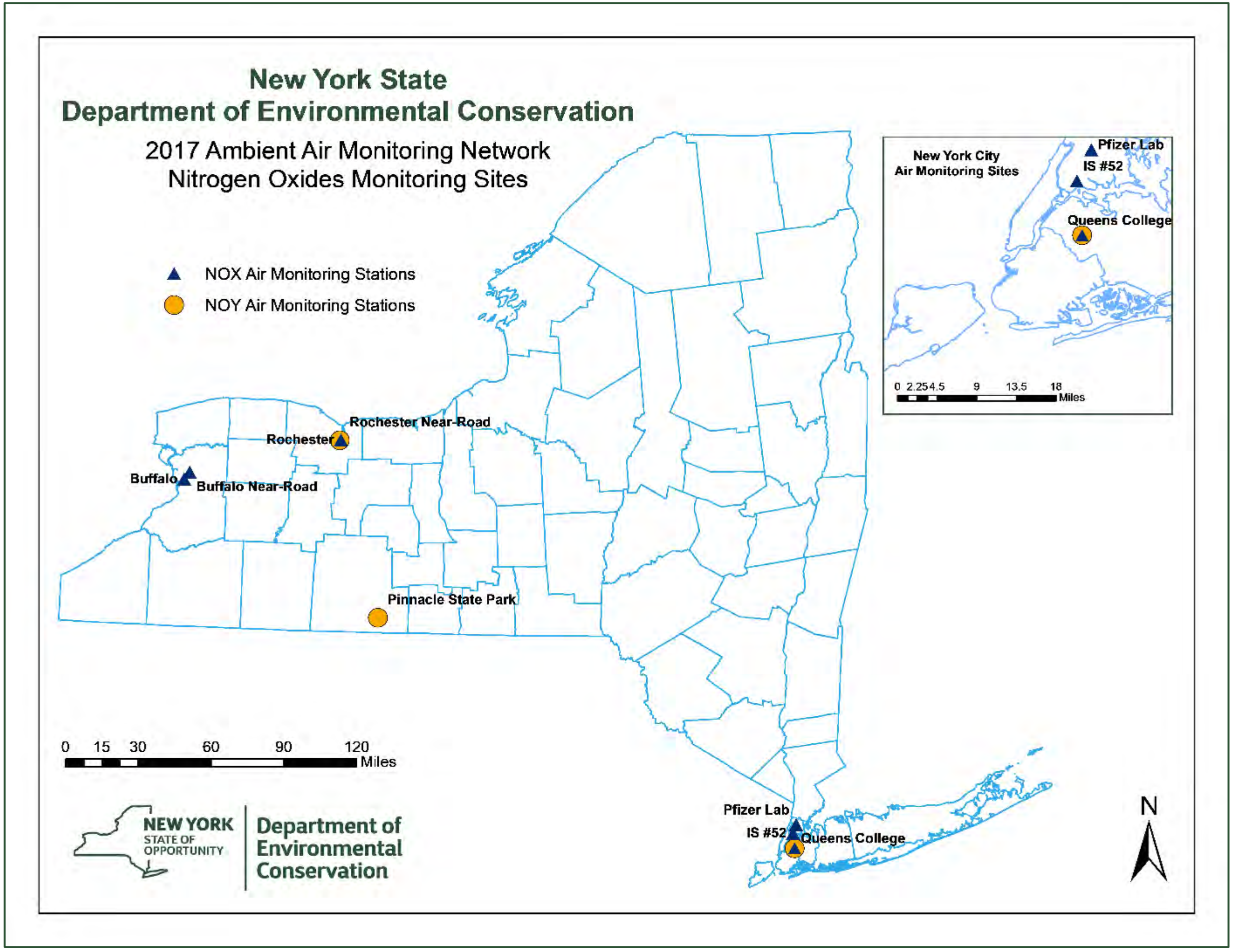

Figure 4.4 Map of Nitrogen Oxides Monitoring Sites

Near-Road NO_2 Monitoring

The primary objective of the near-road NO_2 network is to monitor where peak, ambient NO_2 concentrations are expected to occur as a result of on-road mobile source emissions. In the past, these locations would be considered to be Micro-scale locations. The EPA has since stated that the area alongside a major road is similar to the areas alongside the entire road segment and this area should be considered to be Middle-scale because one location is representative of a larger “line source” shaped area. The sites will also represent the worst case for population exposure for each CBSA since the sites are at locations where NO_2 concentrations are expected to be high for one or more hours at a time.

The New York-New Jersey-PA CBSA is required to have two near-road monitors. One of the sites is required to be representative of the highest AADT for the CBSA and a suitable location was found in Fort Lee, NJ near the east bound exit from the George Washington Bridge. Please see the New Jersey Network Monitoring Plan for specifics regarding this site.

Table 4.3 Characteristics for New York State Near-Road Sites

	Buffalo	Rochester	Queens
Target Road	I90 between Exit 51 and Exit 52	I490 Winton Road Acc	I495 between Main St. – Kissena Blvd
AADT (Rank)	131,020 (2)	110,990 (3)	166,340 (115)
Distance from probe to Target Road	20 meters	20 meters	28 meters
Probe Height	4 meters	4 meters	4 meters
Start Date	4/1/2014	12/18/2014	Est. 1/1/2016
Latitude	42° 55’ 16 ” N	43° 8'42.08"N	40°44'21.49"N
Longitude	-78° 45’ 58 ” W	-77°33'27.59"W	-73°49'3.76"W

Near-road NO_2 monitoring commenced at the Buffalo and Rochester sites on April 1, 2014, and December 18, 2014, respectively. The Queens Near-Road began operation on April 1st, 2017.

4.3 Lead

Elemental lead (Pb) possesses an array of useful physical and chemical properties, making it among the first metals to be extracted and used by humankind. It has a relatively low melting point (327.5℃), is a soft, malleable, and ductile metal, a poor electrical conductor, and is easily cast, rolled and extruded. Although sensitive to environmental acids, after exposure to environmental sulfuric acid (H_2SO_4), metallic Pb becomes impervious to corrosion due to weathering and submersion in water. This effect is due to the fact that Pb lead sulfate ($PbSO_4$), the relatively insoluble precipitate produced by reaction of Pb with H_2SO_4, forms a protective barrier against further chemical reactions. This aspect of its chemistry made Pb especially convenient for protective surface coatings (e.g. paint), roofing, containment of corrosive liquids, and (until the discovery of its adverse health effects), construction of water supply systems.

Pb will only exist in the vapor phase at or above 1750°C. Therefore, at ambient atmospheric temperatures, elemental Pb will deposit to surfaces or exist in the atmosphere as a component of atmospheric aerosol.

Exposure to lead occurs through ingestion of lead in food, water, soil, or dust and through inhalation. It accumulates in the blood, bones, and soft tissues. Lead can also adversely affect the kidneys, liver, nervous system, and other organs. Excessive exposure to lead may cause neurological impairments such as seizures, mental retardation, and/or behavioral disorders. Even at low doses, Pb exposure is associated with changes in fundamental enzymatic, energy transfer, and homeostatic mechanisms in the human body. Additionally, even low levels of Pb exposure may cause central nervous system damage in fetuses and children. Recent studies show that neurobehavioral changes may result from Pb exposure during the child's first years of life and that lead may be a factor in high blood pressure and subsequent heart disease.

Airborne lead can also have adverse impacts on the environment. Wild and domestic grazing animals may ingest lead that has deposited on plant or soil surfaces or that has been absorbed by plants through leaves or roots. Animals, however, do not appear to be more susceptible or more sensitive to adverse effects from lead than are humans. Therefore, the secondary standard for lead is identical to the primary standard.

In November of 2008 EPA published the final rule for the revision of the NAAQS for lead. The primary lead standard was revised to $0.15 \mu g/m^3$ in total suspended particles (Pb-TSP). The averaging time was changed to a rolling 3-month period with a maximum (not-to-be-exceeded) form, evaluated over a 3-year period. The revised secondary standard was set to be identical in all respects to the new primary standard. These new standards became effective on January 12, 2009, superseding the old standard of quarterly average concentration not to exceed $1.5 \mu g/m^3$. As part of the lead monitoring requirements, monitoring agencies are required to monitor ambient air near lead sources which are expected to or have been shown to have a potential to contribute to a 3-month average lead concentration in ambient air in excess of the level of the NAAQS. At a minimum, monitoring agencies must monitor near lead sources that emit 1.0 ton per year (tpy) or more. Monitoring is also required in each CBSA with a population equal to or greater than 500,000 people as determined by the latest available census figures. Revisions to the monitoring requirements pertaining to where State and local monitoring agencies would be required to conduct lead monitoring were finalized and became effective January 26, 2011. The new regulations replaced the population oriented monitoring requirement with a requirement to add Pb monitors to the urban NCore monitors. The EPA also lowered the emission threshold from 1.0 tpy to 0.50 tpy for industrial sources of lead (e.g., lead smelters and foundries). However, the emission threshold for airports was maintained at 1.0 tpy. In addition, an airport monitoring study will be implemented to determine the need for monitoring of airports which emit less than 1.0 tpy of lead. Under this new rule lead monitoring is required for a minimum of one year at 15 additional airports that have been identified as having characteristics that could lead to ambient lead concentrations approaching or exceeding the lead NAAQS. Brookhaven and Republic airports in Suffolk County, New York were designated as such. A 12-month monitoring study at Brookhaven Airport concluded in October, 2012, and all data were submitted to AQS. The Republic Airport monitoring did not start until October, 2012, due to protracted site lease negotiations, and completed a year later. Both sites exhibited lead concentrations significantly below the NAAQS, and EPA approved the discontinuation of monitoring.

Particulate lead samples are collected on glass fiber filters using a standard TSP high volume sampler which are subsequently analyzed by the laboratory using atomic absorption spectroscopy. Under the new rule, EPA is allowing Pb-PM_{10} in lieu of Pb-TSP where the maximum 3-month arithmetic mean Pb concentration is expected to be less than 0.10µg/m^3 (i.e., two thirds of the NAAQS) and where sources are not expected to emit ultra-coarse Pb. The population oriented Pb monitors at the NCore or NATTS sites are located away from known sources of Pb and will utilize Pb-PM_{10} samplers.

Figure 4.5 depicts the number of monitoring sites and lead concentration trends for New York State over the years.

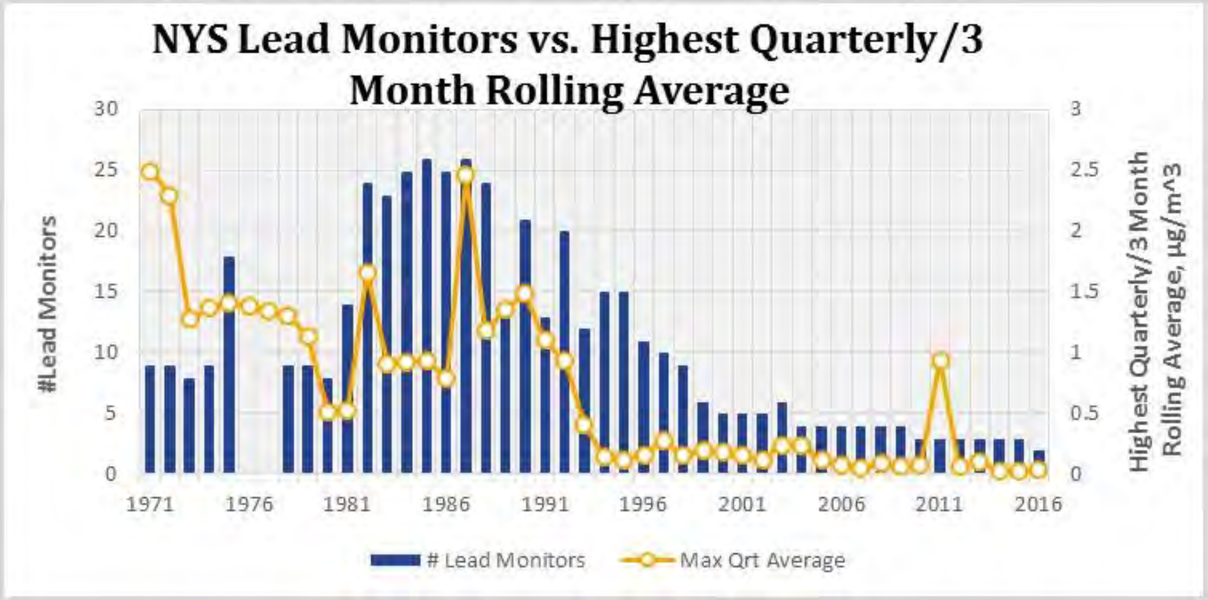

Figure 4.5 Lead Monitors and Concentration Trends

Currently there are two Pb-TSP monitoring sites (one with collocated sampling) in operation in Middletown, where a lead acid battery recycling facility is located, and two urban CBSA monitors (low volume PM_{10}) at the NATTS sites in the Bronx and Rochester. The source oriented monitoring sites (AQS site ID # 36-071-3001, 36-071-3002) are in place as the facility has the potential to contribute to a 3-month average lead concentration in ambient air in excess of the level of the NAAQS. Routine data review showed that during the first quarter of 2011, there were a couple of sample dates that showed high levels of lead, which would lead to contravention of the new standard. Investigations at the facility led to enforcement actions although specific causes for the observed values were not discovered. Consequently an additional low volume PM_{10} sampler was put in place to collect daily filter samples for mass measurement and lead analysis using XRF in August 2011. The PM_{10} mass data collected at this site was low and mass determination was discontinued in November 2012.

The 2015 three-month rolling average values for the TSP and PM_{10} lead sites are listed in Table 4.4, and Table 4.5, respectively. The data show the lead levels are well below the standard of $0.15 \mu g/m^3$.

Table 4.4 2016 3-Month Rolling Average Lead Concentrations for TSP Lead

2016 TSP Lead 3-Month Rolling Average, ng/m^3		
Month	**Ball Pri**	**Wakefern**
January	0.0134	0.0316
February	0.0122	0.0272
March	0.0086	0.0275
April	0.0089	0.0324
May	0.0205	0.0251
June	0.0220	0.0243
July	0.0199	0.0149
August	0.0079	0.0184
September	0.0076	0.0171
October	0.0073	0.0144
November	0.0072	0.0107
December	0.0055	0.0087
Maximum	**0.022**	**0.032**

Table 4.5 2016 3-Month Rolling Average PM$_{10}$ Lead Concentrations for Urban Sites

2016 PM$_{10}$ Lead 3-Month Rolling Average, ng/m^3		
Month	**IS52**	**Rochester**
January	0.0041	0.0052
February	0.0042	0.0044
March	0.0047	0.0048
April	0.0039	0.0036
May	0.0039	0.0036
June	0.0035	0.0030
July	0.0027	0.0026
August	0.0028	0.0030
September	0.0021	0.0027
October	0.0020	0.0026
November	0.0028	0.0027
December	0.0030	0.0030
Maximum	**0.0047**	**0.0052**

4.4 Particulate Matter

4.4.1 Total Suspended Particulate

Particulate matter is the generic term for a broad class of chemically and physically diverse substances that exist as discrete particles (liquid droplets or solids) over a wide range of sizes. Particles originate from a variety of anthropogenic stationary and mobile sources as well as natural sources. Particles may be emitted directly or formed in the atmosphere by transformations of gaseous emissions such as sulfur oxides, nitrogen oxides, and volatile organic compounds. The chemical and physical properties of PM vary greatly with time, location, meteorology, and source category, thus complicating the assessment of health and welfare effects.

EPA first established national ambient air quality standards for PM in 1971. The reference method specified for determining attainment of the original standards was the high-volume sampler, which collects PM up to a nominal size of 25 to 45 micrometers (µm), referred to as total suspended particles or TSP. The primary standards (measured by the indicator TSP) were 260µg/m^3 24-hour average, not to be exceeded more than once per year, and 75µg/m^3 annual geometric mean. The secondary standard was 150µg/m^3 24-hour average, not to be exceeded more than once per year. These standards were in place until 1987 when EPA changed the particle indicator from TSP to PM$_{10}$, the latter referring to particles with a mean aerodynamic diameter less than or equal to10 µm.

Figure 4.6 shows the number of monitoring sites and the composite annual geometric means of TSP over the years. Trace metal analysis was also performed on the TSP filters until 1998. NYSDEC terminated the TSP sampling program when DOH could no longer provide laboratory analysis support.

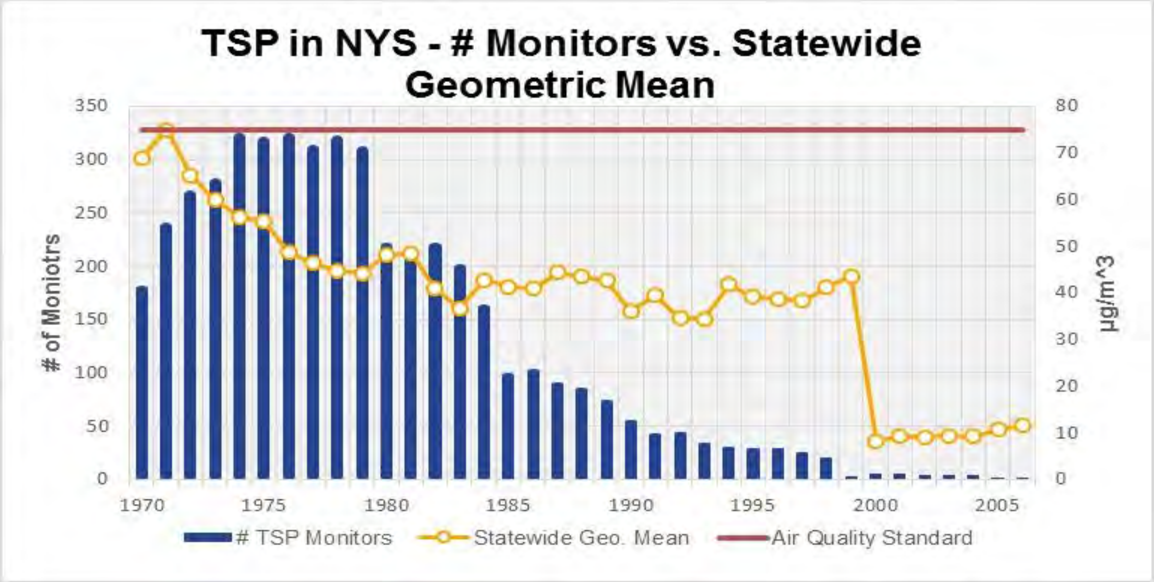

Figure 4.6 Total Suspended Particulate Monitors and Concentration Trends

4.4.2 PM_{10}

In 1987, EPA revised the 1971 standards in order to protect against adverse health effects of inhalable airborne particles that can be deposited in the lower (thoracic) regions of the human respiratory tract, with PM_{10} as the indicator. EPA established identical primary and secondary PM_{10} standards for two averaging times: 150µg/m^3 (24-h average, with no more than one expected exceedance per year) and 50µg/m^3 (expected annual arithmetic mean, averaged over three years). These standards remained in effect until 2002, when the courts finally upheld the 1997 revisions put forth by EPA as a result of the mandated periodic scientific review. After the most recent scientific review on PM, EPA issued the final rule in December, 2006 revising the $PM_{2.5}$ standards, at the same time revoking the PM_{10} annual standard while retaining the 24 hr standard at 150µg/m^3.

Wedding & Associates PM_{10} Critical Flow High Volume Sampler (WED PM_{10} sampler) were employed for the NYSDEC network. The quartz filters were collected and submitted to the Department of Health for laboratory analysis until 2005, when support services were terminated. Starting in 2004, the R&P Partisol 2025 samplers were used for manual PM_{10} collection by removing the $PM_{2.5}$ size selective inlet. The filter cartridges are submitted to RTI (EPA contract laboratory) for mass analysis. Figure 4.7 shows the number of monitors and the composite annual arithmetic mean for PM_{10}.

On figure 4.7, there is a break in the graph during 2005, due to a changeover in equipment causing there to be only one quarter of data for the entire year. The small increase observed in 2015 is due to elevated readings at the Buffalo, NY site. In March of 2015 the land use type changed at the Buffalo site following the sale of an adjacent land parcel, introducing a local source of PM_{10}. This caused the values to no longer be regionally representative. In the future the DEC may relocate the PM_{10} monitor to a nearby site that is not influenced by the local source.

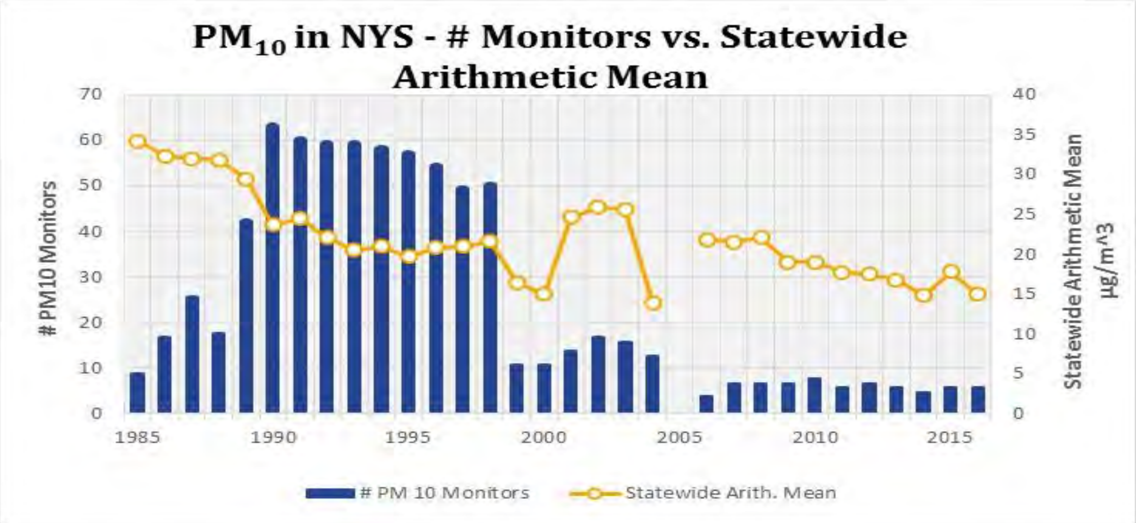

Figure 4.7 PM_{10} Monitors and Concentration Trends

Currently, there are five such sites in operation on a one in six days schedule, as shown in Figure 4.8.

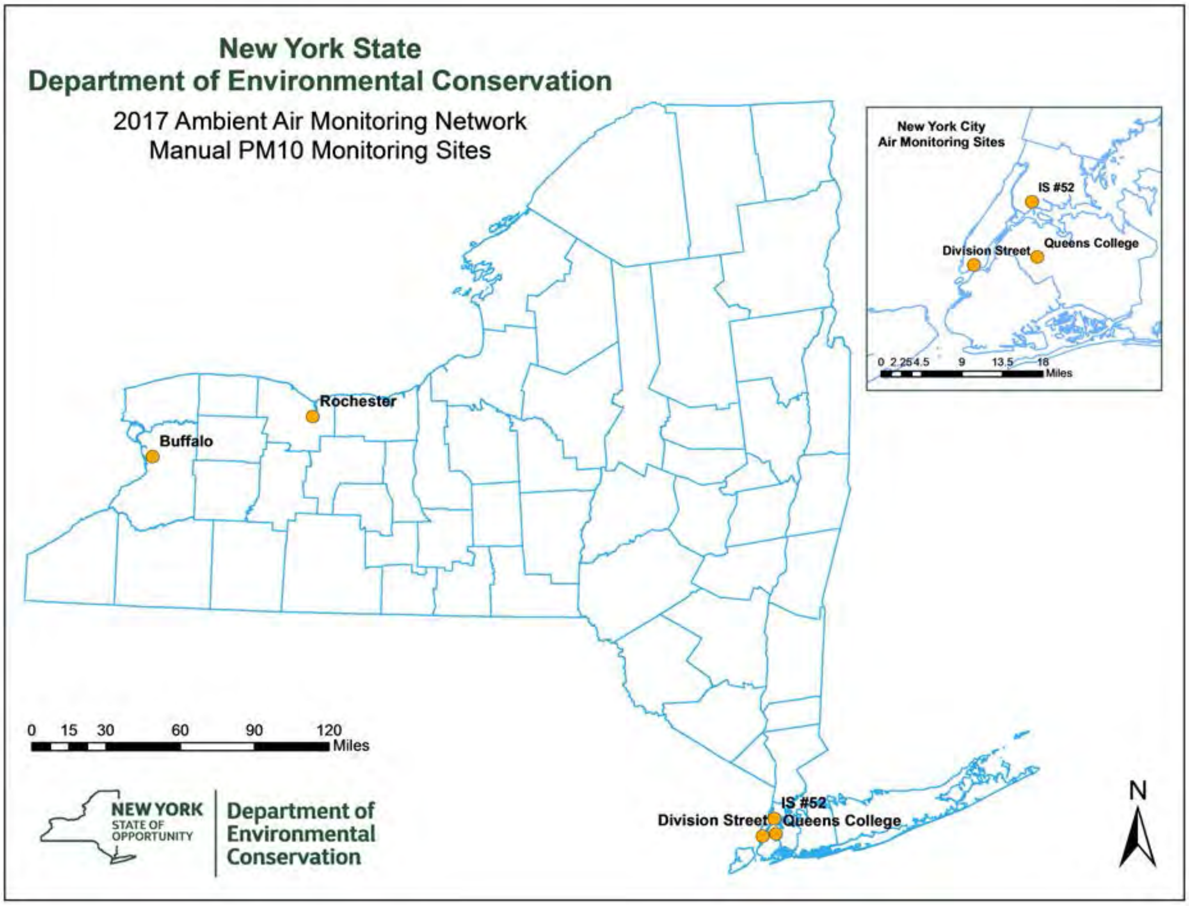

Figure 4.8 Map of PM_{10} Monitoring Sites

Continuous PM_{10} data are also obtained using Thermo Scientific 1405-DF instruments that simultaneously measure $PM_{2.5}$, PMcoarse (PM_{10} - $PM_{2.5}$) and PM_{10} mass concentrations at the IS 52, Queens College, East Syracuse, Rochester, and Pinnacle State Park sites.

4.4.3 $PM_{2.5}$

In July 1997, EPA Administrator promulgated significant revisions to the PM NAAQS, after taking into account scientific information and assessments presented by staff, Clean Air Scientific Advisory Committee advice and recommendations, and public comments. While it was determined that the PM NAAQS should continue to focus on particles less than or equal to 10µm in diameter, it was also determined that the fine and coarse fractions of PM_{10} should be considered separately. New standards were added, using $PM_{2.5}$ as the indicator for fine particles; and PM_{10} standards were retained for the purpose of regulating coarse-fraction particles. Two new $PM_{2.5}$ standards were set: an annual standard of 15µg/m^3, based on the 3-year average of annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors; and a 24-hr standard of 65µg/m^3, based on the 3-year average of the 98th percentile of 24-hr $PM_{2.5}$ concentrations at each population-oriented monitor within an area. To continue to address coarse-fraction particles, the annual PM_{10} standard was retained, and the form, but not the level, of the 24-hr PM_{10} standard was revised to be based on the 99th percentile of 24-hr PM_{10} concentrations at each monitor in an area. The secondary standards were revised by making them identical in all respects to the $PM_{2.5}$ and PM_{10} primary standards.

EPA lowered the NAAQS for PM in December of 2006 to provide increased protection of public health and welfare, respectively. EPA revised the level of the 24-hour $PM_{2.5}$ standard from 65 to 35 micrograms per cubic meter (µg/m^3) and retained the level of the annual $PM_{2.5}$ standard at 15µg/m^3. With regard to PM_{10}, the 24-hour standard was retained, but the annual PM_{10} standard was revoked. On Dec. 14, 2012 EPA further strengthened the nation’s air quality standards for fine particle pollution to by revising the primary annual $PM_{2.5}$ standard from 15 to 12 micrograms per cubic meter (µg/m^3) and retaining the 24-hour fine particle standard of 35µg/m^3. The new standards became effective on March 18, 2013.

The 2012 PM NAAQS added a network monitoring requirement for $PM_{2.5}$. A $PM_{2.5}$ monitor must be installed in CBSAs with populations over 1 Million near a busy road segment. The monitor deployments are staged with the monitors required in CBSAs over 2.5 Million by 1/1/2015 and the rest by 1/1/2017. The data from these sites will be used to evaluate the impact of emissions from busy roadways in urban areas. The NYSDEC installed near-road $PM_{2.5}$ monitors in Buffalo and Rochester in 2014 at the Queens site in 2017.

The NYSDEC $PM_{2.5}$ monitoring network deploys a combination of filter based Federal Reference Method (FRM) samplers, continuous mass monitors, filter based speciation samplers and continuous speciation samplers. The data from the FRM samplers are used to determine if the State’s air quality meets the National Ambient Air Quality Standards (NAAQS). The continuous mass sampler data are used for the reporting of near real-time air quality data for health related warnings and forecasts. The speciation filter sampler data are used to determine the chemical constituents that make up $PM_{2.5}$. The continuous speciation data are used to examine the short term fluctuations in the concentrations of individual species or components that make up $PM_{2.5}$.

4.4.3.1 PM Monitoring Objectives

The principal objective of the $PM_{2.5}$ monitoring network is to determine the exposure of the State’s population to ambient $PM_{2.5}$. This objective is the primary focus of the FRM filter based samplers as well as for the continuous mass monitoring network. The protocols and equipment used for the FRM network are meticulously specified in the Code of Federal Regulations (CFR) to insure that the measurements are consistent from one State to another. The continuous mass monitoring instruments cannot accurately provide data for direct comparison with the NAAQS but these instruments actually provide the most useful data for population exposure. The continuous $PM_{2.5}$ data is updated every hour for near real-time health related warnings, $PM_{2.5}$ forecasts and updates as to current pollution concentrations.

The NYSDEC has attempted to adjust the $PM_{2.5}$ network in light of EPA expectations, updated regulations and prioritized funding. The FRM network consisted of 40 sites when it was fully established using the original design criteria from 1998. Since then the number of sites have been reduced because fewer sites were required to determine compliance with the Annual $PM_{2.5}$ NAAQS. The latest revisions to the Federal regulations have reduced the number of required monitors even further. These new requirements base the number of required monitors on population and the expected $PM_{2.5}$ concentration. The NYSDEC network exceeds these requirements in all areas that are expected to be near or above either the Annual or Daily $PM_{2.5}$ standard.

The other monitoring objectives for the $PM_{2.5}$ network include transport and background monitoring. Transport monitoring sites are sites that are situated so that the data are representative of the air masses moving into the State from areas upwind. These sites are important because the sources of $PM_{2.5}$ that are outside of New York can contribute to New York's $PM_{2.5}$ ambient concentration. Background monitoring sites are sites that are representative of $PM_{2.5}$ concentrations that are generally not related to specific sources but impact wide areas. The concentrations measured at these background sites generally represent the lowest expected $PM_{2.5}$ concentrations in New York State.

4.4.3.2 Monitoring Scale and Representativeness

The geography of New York State encompasses a lake shore to the west, plateaus and rolling hills in the center, mountains to the northeast and south and sea shores to the southeast. All of these areas have varying population densities and meteorology. The populations living in these areas are exposed to $PM_{2.5}$ that is generated locally as well as from $PM_{2.5}$ that is transported from areas outside of their region.

The actual design of the network is a compromise that minimizes the number of monitoring locations while ensuring that the measured concentrations for each area are indicative of actual population exposures. Each sampler is assigned a scale or "zone of representativeness" when it is installed. The scale determines how large a geographical area the resulting data will represent.
EPA has defined ambient monitoring scales as:

Microscale:	Represents (10 - 100 meters)
Middle Scale:	Represents (100 - 500 meters)
Neighborhood Scale:	Represents (500 meters - 4 km)
Urban Scale:	Represents (4 - 100 km)
Regional Scale:	Represents (100 to 1000 km)

The scale of the FRM monitoring sites that have population exposure as their objective is Neighborhood or Urban. The definitions of scale primarily serve to identify the site's sensitivity to individual sources. A monitoring site that is routinely impacted by a specific source has a much smaller "scale" than a site that only sees an effect from numerous widespread sources. The FRM sites in New York State are located in places that will likely have high concentrations and large monitoring scales. This ensures that the public is not exposed to higher ambient $PM_{2.5}$ concentrations than the concentrations from the FRM network reported for their area.

The $PM_{2.5}$ monitoring network works well for determining average ambient exposures for most of the State's population. The limitations of the network stem from the inability to monitor in smaller scales such as Middle and Microscale. An example of an urban microscale influence not addressed by the network would be $PM_{2.5}$ emissions from traffic in a street canyon. Certainly if New York residents spent much of their time in this type of confined area, then their exposure to ambient $PM_{2.5}$ would be considerably higher than that indicated by the closest neighborhood or urban scale monitor. Similarly, a person in a rural valley area subject to daily wood smoke would also be exposed to higher $PM_{2.5}$ concentrations than those measured at the nearest Neighborhood or Urban scale monitor.

The $PM_{2.5}$ ambient monitoring network is also not able to determine the population's overall exposure to $PM_{2.5}$. Personal habits such as smoking and occupations such as mining, farming and construction can lead to much higher exposures to $PM_{2.5}$ than that of the majority of the population. Other factors such as widely varying indoor $PM_{2.5}$ concentrations can lead to uncertainty in overall $PM_{2.5}$ exposures.

4.4.3.3 $PM_{2.5}$ Monitoring Instrumentation

The filter based FRM samplers used in New York are the Model 2025 sequential samplers made by the Thermo Environmental Company (Franklin, MA). The sampler has been designated by EPA as a reference method instrument for $PM_{2.5}$ particle collection. The designation is: RFPS-0498-118.

Currently, there are 21 FRM monitors in operation statewide, as shown in Figure 4.9.

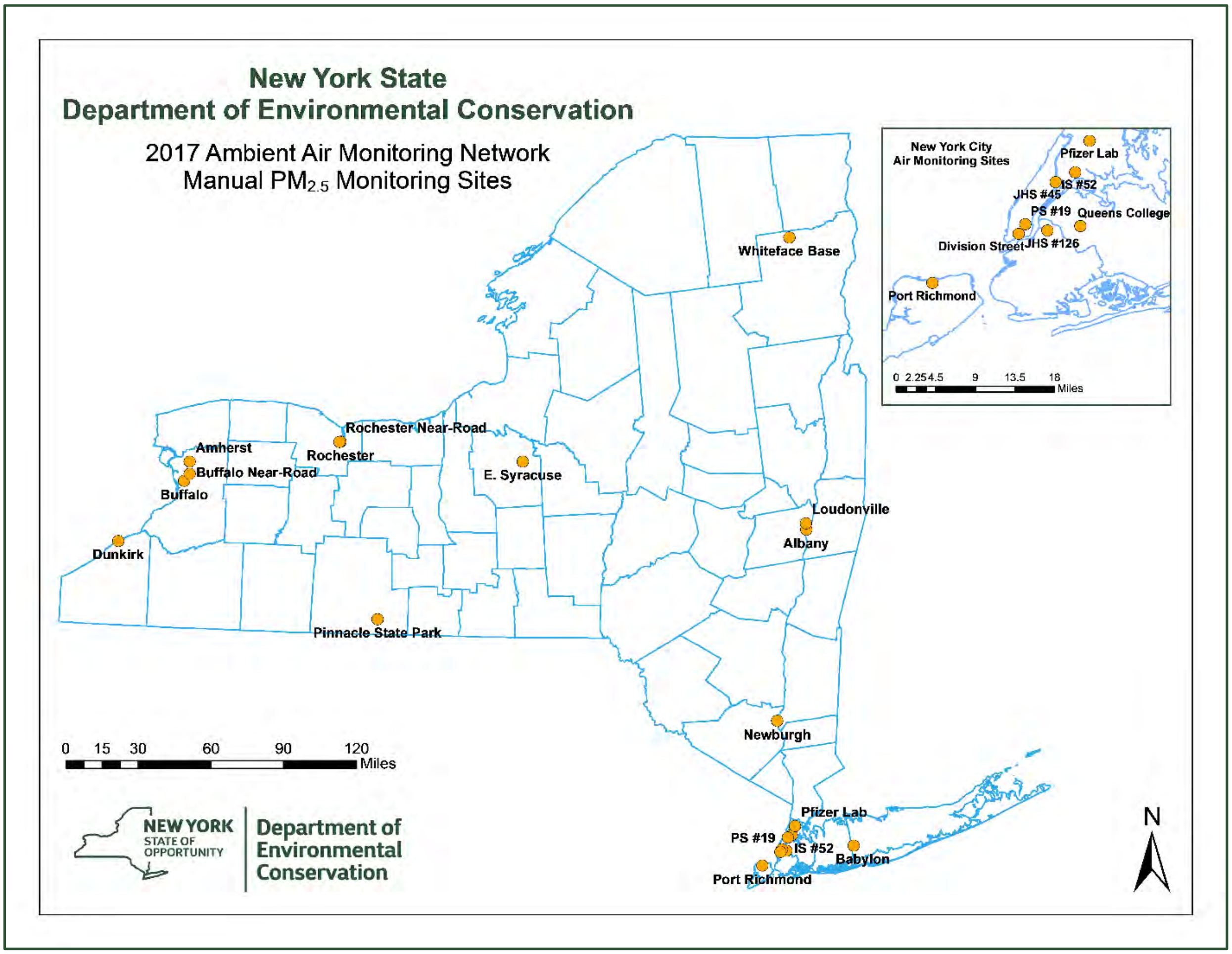

Figure 4.9 Map of Manual $PM_{2.5}$ (FRM) Monitoring Network

Figure 4.10 below shows the number of manual $PM_{2.5}$ monitoring sites and the composite annual arithmetic means in New York State since the network was implemented in 1998.

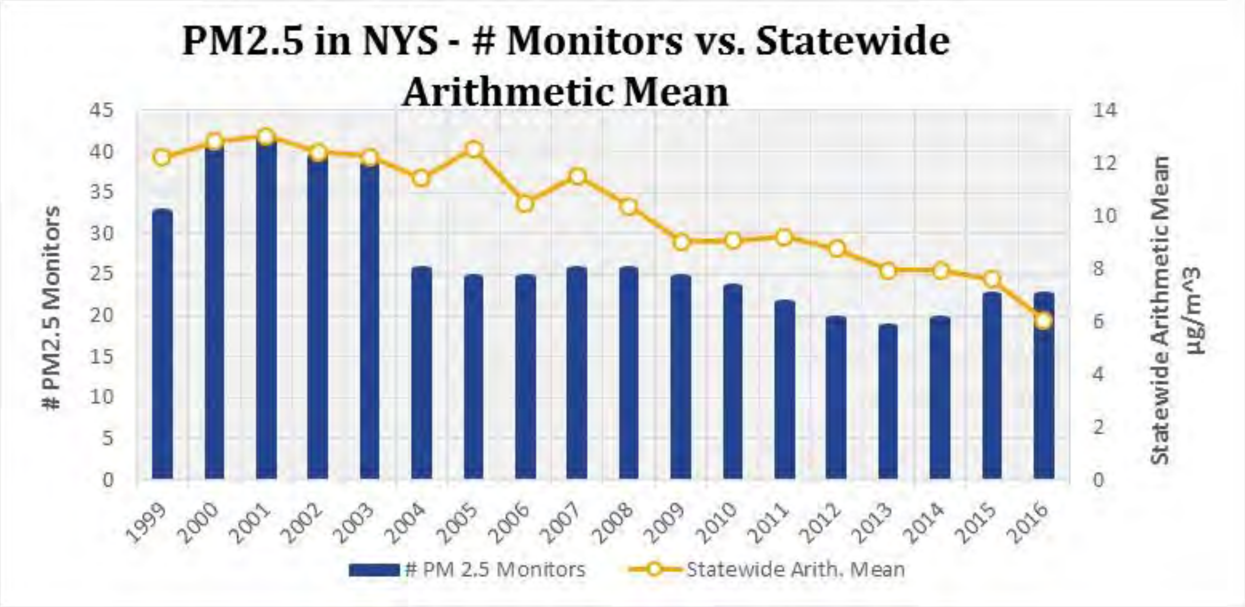

Figure 4.10 $PM_{2.5}$ Monitors and Concentration Trends

4.4.4 Continuous PM Monitoring

Continuous mass monitoring is performed primarily with a network of TEOM 1400ab instruments. In addition, there are five Thermo Scientific 1405-DF's deployed (IS 52, Queens College, East Syracuse, Rochester and Pinnacle) to simultaneously measure $PM_{2.5}$, PM Coarse (PM_{10} - $PM_{2.5}$) and PM_{10} mass concentrations. These instruments have received designation by EPA for PM_{10} but not for $PM_{2.5}$. $PM_{2.5}$ is more difficult to measure than PM_{10} with automated samplers because $PM_{2.5}$ contains a higher fraction of volatile components. The heated measurement sensor for the TEOM reduces the amount of volatile mass measured as compared to filter based FRMs. The NYSDEC utilizes non-linear data adjustments to make the TEOM data more comparable with the FRM data. This element of the $PM_{2.5}$ monitoring network provides the data used for public reporting purposes including; the NYSDEC website, the AIRNow website and for $PM_{2.5}$ forecasting. The data from the TEOMs are polled and reported every hour to insure that the public has access to the most recent air quality information.

The TEOM data are compared to the filter based FRM data on an annual basis. The comparison allows the analysts to create non-linear correction factors that modify the TEOM data to more closely resemble FRM data. This is necessary because FRM data is not available for near real-time public reporting purposes. EPA has recently recognized the value of these data adjustments and has created new method codes so this adjusted data can be submitted to the AQS database. The NYSDEC now submits

TEOM data from each site in its original unadjusted format as well as the adjusted data to match more closely with the FRM.

There are 29 continuous $PM_{2.5}$ monitoring sites as shown in Figure 4.11.

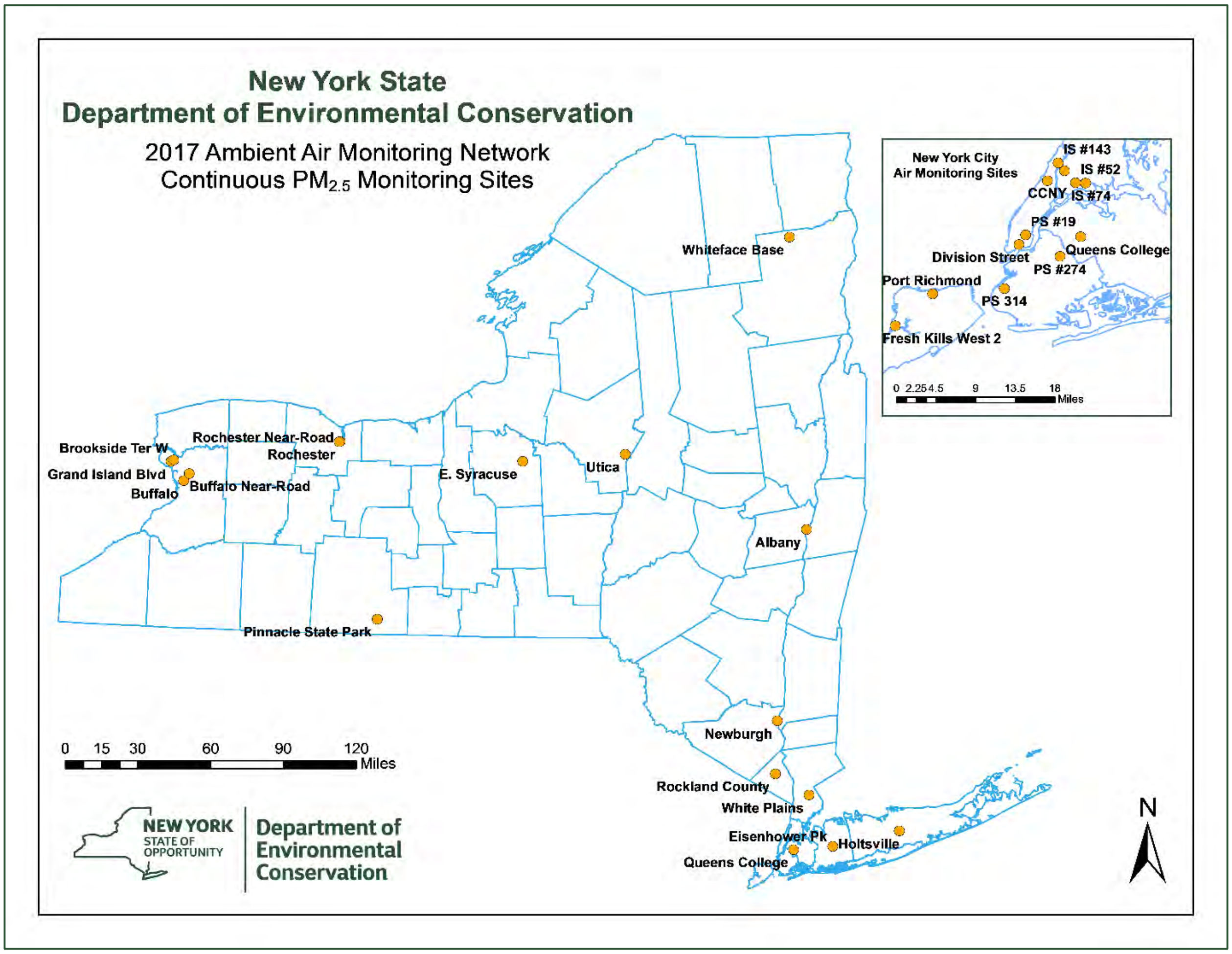

Figure 4.11 Map of Continuous $PM_{2.5}$ (TEOM) Monitoring Network

The NYSDEC also operates some of the newest continuous mass monitors which have undergone Federal Equivalent Method (FEM) designation. These instruments collect more of the volatile PM mass that the filter based FRM may or may not retain depending on the environmental conditions during and after the period in which the filter sample was collected. NYSDEC has been evaluating the technological improvements that have led to the current $PM_{2.5}$ continuous FEMs for more than 10 years. The Thermo Scientific 1405-DF FEM performed better than the other instruments in on-site deployments at urban and rural locations in the state. Currently, there are five 1405-DF's deployed (IS 52, Queens College, East Syracuse, Rochester, and Pinnacle) to simultaneously measure $PM_{2.5}$, PM Coarse (PM_{10} - $PM_{2.5}$) and PM_{10} mass concentrations. After multiple iterations of revisions and modifications from the manufacturer, these DF's can finally produce data that compare well with the FRM's.

Therefore the hourly data are now submitted to AQS with the parameter code 88101, a designation that will include these measurements for attainment status determination.

4.4.5 Speciation

There are eight sites in New York State operating with the Speciation Trends Network (CSN) sampling protocol .The NYSDEC uses eight MetOne SuperSass and URG 3000N samplers for the collection of samples for the speciation of $PM_{2.5}$. The samplers collect 3 and 1 filter samples respectively every third day or sixth day for a period of 24 hours. Five operate on a 1/3 day schedule and three operate on a 1/6 day schedule. All of these sites host collocated FRM and continuous mass monitoring instruments.
The samples are then sent to an EPA contract laboratory for chemical analysis. There are over fifty species consisting of ions, metals and carbon species quantified by the analyses.

In order to address inconsistencies in carbon sampling and analysis procedures used in urban CSN/SLAMS and rural IMPROVE programs, EPA determined that the URG sampler would be used at all CSN sites. The conversion was completed 2008 for all of the NY sites.Figure 4.12 shows the eight CSN sites currently in operation.

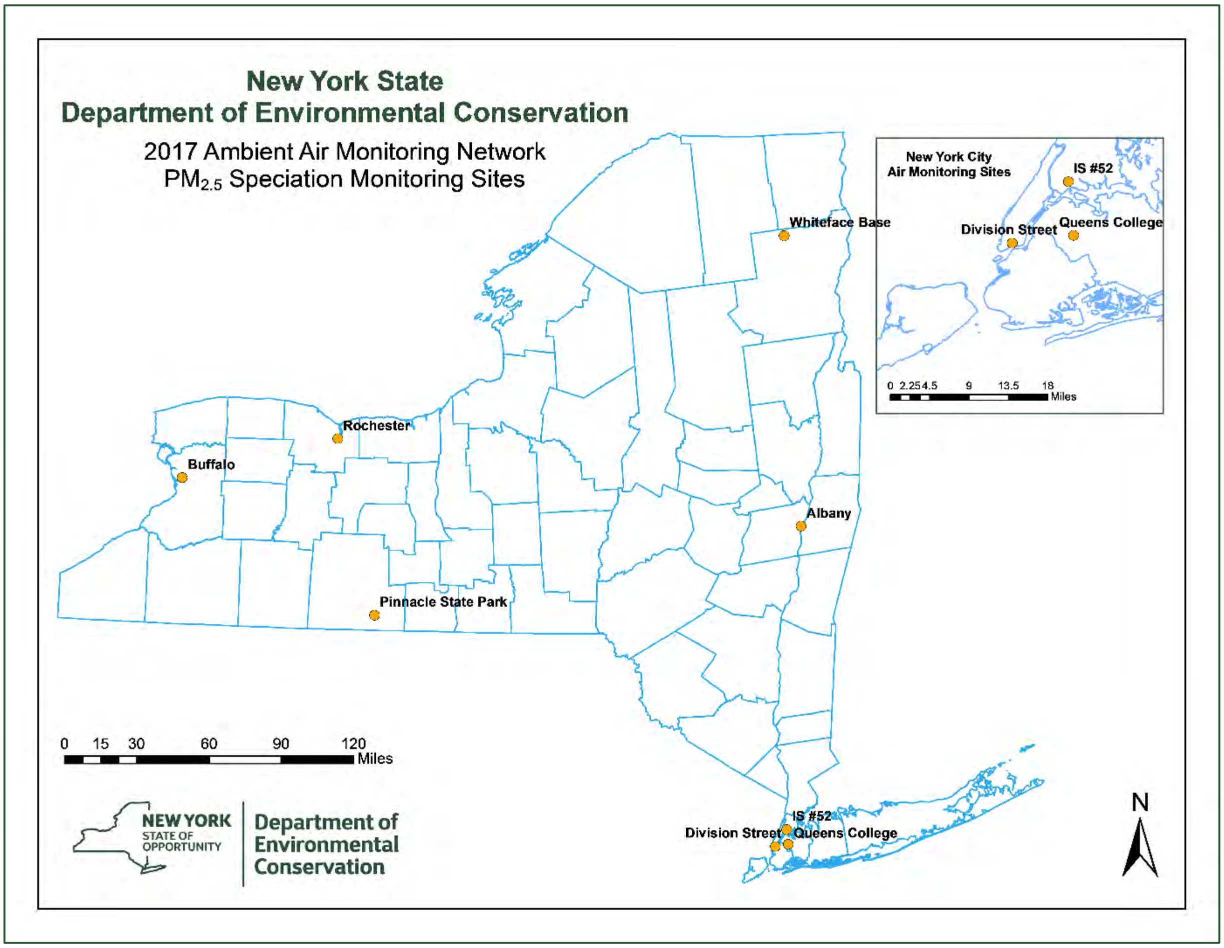

Figure 4.12 Map of Speciation Sampling Sites

4.4.6 Continuous Speciation

The NYSDEC recognizes the value of high temporal measurements (hourly or higher) of $PM_{2.5}$ species. This data is useful for the examination of pollutant trends (and temporal patterns) and can provide information necessary for identification of pollutant sources. This is critically important for areas facing non-attainment for the $PM_{2.5}$ NAAQS. Identifying seasonality of species is necessary to develop control strategies. Long term monitoring is vital to this effort because in addition to changes in source emissions, variations in meteorology also affect ambient pollutant concentrations (e.g. wetter than average conditions lead to a washout of pollutants and a lowering of ambient concentrations).

The NYSDEC continuous speciation program is expanding and currently includes monitoring at urban and rural locations. Sulfate, nitrate, organic carbon, elemental carbon and black carbon species data are collected at hourly or higher frequency. In this manner, both the regional and inter-urban variability of these species are being investigated. The NYSDEC uses instruments to examine the species of $PM_{2.5}$ on a higher frequency than what is available from the filter based speciation sampling network. This continuous speciation data is useful in the examination of source strengths and the relationship between pollutant concentrations and meteorology. The operation of continuous speciation equipment is also less expensive than long-term filter species measurements due to the high costs associated with filter lab analysis. Operation of continuous speciation in conjunction with 24-hr CSN sampling is beneficial in accounting for biases in measurements when a change to the CSN method occurs. This is demonstrated in the case of CSN carbon which was changed to the IMPROVE method in 2007. Long-term collocated continuous carbon measurements prior to and following this change are being used to assess the bias between the old and the new carbon methods. This data will be important in determining the long-term trends in $PM_{2.5}$ carbon species.

NYSDEC has been using the continuous speciation data in NYC to examine temporal patterns such as diurnal and day of week patterns of aerosol species related to source strengths and meteorology. For example, elemental carbon, black carbon and primary pollutant NO_x in NYC track throughout the day with peak concentrations in the morning coincident with the early commute period. Mobile emissions in the early morning occur into a shallow boundary layer which concentrates pollutants near ground level. An elevation in boundary layer height during the day leads to a dispersion of pollutants and a less pronounced afternoon/evening peak. Concentrations of these species are also higher on weekdays compared to weekends indicating that local mobile emissions are a significant source of these species. During winter months organic carbon sometimes shows similar patterns to EC and NO_x reflecting the primary organic component most likely from mobile emissions. Throughout the year however organic carbon does not track the primary pollutants but is more correlated with $PM_{2.5}$ mass (and sulfate during summer months) indicating that there is a significant regional or non-local contribution to organic carbon measured in NYC. Our continuous speciation measurements also reveal temporal patterns in particle nitrate. In cooler months, $PM_{2.5}$ nitrate has a broader peak than EC which appears later in the morning, consistent with photochemical and secondary aerosol production. During the warm season, nitrate concentrations are significantly lower and the late morning nitrate peak (observed in winter) is not observed in the warm season because as temperatures rise during the day aerosol nitrate reverts back to its precursors (nitric acid and ammonia). Nitrate monitoring was discontinued at the IS 52 site in 2010 due to instrument problems.

Continuous data can also be used to capture the full extent of regional or local plumes that would normally be missed by the 24-hr filter sampling network. It allows us to study plume events and how meteorology can affect measurements. One can also differentiate between plumes which are short term of a few hours long (e.g. plumes from oil boiler emissions) likely driven by carbon versus those that are more regionally driven by sulfate in summer. High temporal pollutant data is also beneficial for public health effect studies that often require resolving confounding factors.

Recently, concerns have been raised regarding potential adverse health effects associated with residential wood burning. Wood smoke contains fine particulate matter which can cause short-term effects such as eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath. Exposure to $PM_{2.5}$ also can affect lung function and worsen medical conditions such as asthma, allergies and heart disease. Long-term exposure to fine PM may increase the risk from chronic bronchitis, reduce lung function and increase mortality from lung cancer and heart disease. In addition, wood smoke contains known human carcinogens including benzene, formaldehyde, dioxins and polycyclic aromatic hydrocarbons.

BAQS staff in collaboration with Clarkson University researchers were able to successfully characterize the ambient impact of residential wood combustion using dual wavelength (370 and 880 nm) aethalometer measurements in conjunction with filter measurements of levoglucosan and potassium, markers for wood smoke. The study, which was conducted from October 2009 to October 2010 in Rochester, showed that the wood smoke component of black carbon is most evident from October to March during the late evening hours on cold weekend nights. Residential wood combustion was estimated to contribute 17% to the $PM_{2.5}$ mass during winter at the Rochester study site.

4.4.7 Ultrafine Particulate Monitoring

NYSDEC first began ultrafine particulate monitoring with the deployment of a TSI Model 3031 Ultrafine Particle Monitor (UPM) at Queens College in June of 2009. This instrument provides continuous measurements of size distribution and particle number concentrations of fine particles below one micron, in the range from to 20 to 500 nanometers. The Queens College NCore site was selected for the UPM so as to complement a suite of parameters already being measured there. Concurrently a demo UPM unit on loan for one year from the manufacturer was installed at the Eisenhower Park location in Nassau County, which is expected to have a significant impact from mobile sources. Preliminary data suggest that the ultrafine particles are to a large extent regional in nature, though some size fractions are impacted by local mobile sources. The particle counts and size distributions for the two sites are similar, and also track the $PM_{2.5}$ profile in some cases. It is possible that the mobile signal is damped out due to the siting of the monitors, as neither site meets the siting requirements for near-road monitoring. Alternate explanations may be that mobile ultrafine emissions are predominantly smaller than the 20 nanometer cut-off point or affect the measurements only on a short time scale. Data on particle size distribution and concentration will provide valuable information for the understanding of $PM_{2.5}$ formation mechanisms, as well as source apportionment determination.

There has been significant and growing interest in mobile sources and ultrafine particles. The EPA has implemented a near-road monitoring program for NO_2, $PM_{2.5}$ and CO and has included additional pollutants of interest for these locations which includes ultrafines (see NO_2 Section). The recent establishment of initial regulations intended to address ultrafine particle emissions from mobile sources (LEV-3 in California, Euro V-VII in the EU) is an early indicator of more extensive regulation of ultrafine particle emissions from mobile sources expected in the future, and suggests the potential emergence of regulations for ambient ultrafine particles as well.

Monitoring for ultrafine particles in New York has expanded since 2009. There are now monitors in NYC, at near-road locations in Buffalo and Rochester and one is located in a rural area in the Southern Tier. These sites utilize an API Model 651 which counts particles larger than 7 nanometers. Data from these ultrafine monitors are being uploaded to the EPA AQS database for use by researchers looking into this field of research.

In our Air Pollution Microscopy laboratory, three particle characterization techniques (Laser Scanning Confocal Microscopy, Scanning Electron Microscopy, and Atomic Force Microscopy) are used to investigate the morphology of real world ultrafine particles, such as those from mobile source emissions and other industrial sources. As an example, the changes in ultrafine particle morphology resulting from the use of two strategies for reducing diesel emissions, i.e., exhaust after-treatment and the use of alternative diesel fuels were studied. These activities complement the ambient monitoring data in understanding the formation, distribution and transport of ultrafine particulate.

4.5 Sulfur Dioxide

Sulfur dioxide (SO_2), a colorless, reactive gas, is produced during the burning of sulfur-containing fuels such as coal and oil, during metal smelting, and by other industrial processes. It belongs to a family of gases called sulfur oxides (SO_x). Major sources include power plants, industrial boilers, petroleum refineries, smelters, iron and steel mills. Generally, the highest concentrations of sulfur dioxide are found near large fuel combustion sources.

High concentrations of SO_2 can result in temporary breathing impairment for asthmatic children and adults who are active outdoors. Short-term exposures of asthmatic individuals to elevated SO_2 levels while at moderate exertion may result in reduced lung function that may be accompanied by symptoms such as wheezing, chest tightness, or shortness of breath. Other effects that have been associated with longer-term exposures to high concentrations of SO_2, in conjunction with high levels of PM, include respiratory illness, alterations in the lungs' defenses, and aggravation of existing cardiovascular disease. The subgroups of the population that may be affected under these conditions include individuals with cardiovascular disease or chronic lung disease, as well as children and the elderly.

Additionally, there are a variety of environmental concerns associated with high concentrations of SO_2. Because SO_2, along with NO_x, is a major precursor to acidic deposition (acid rain), it contributes to the acidification of soils, lakes, and streams and the associated adverse impacts on ecosystems. Sulfur dioxide exposure to vegetation can increase foliar injury, decrease plant growth and yield, and decrease the number and variety of plant species in a given community. Sulfur dioxide also is a major precursor to $PM_{2.5}$ (aerosols), which is of significant concern to human health, as well as a main pollutant that impairs visibility. Finally, SO_2 can accelerate the corrosion of natural and man-made materials (e.g., concrete and limestone) that are used in buildings and monuments, as well as paper, iron-containing metals, zinc, and other protective coatings.

Figure 4.13 shows the number of SO_2 monitors and the composite annual means in New York State over the years.

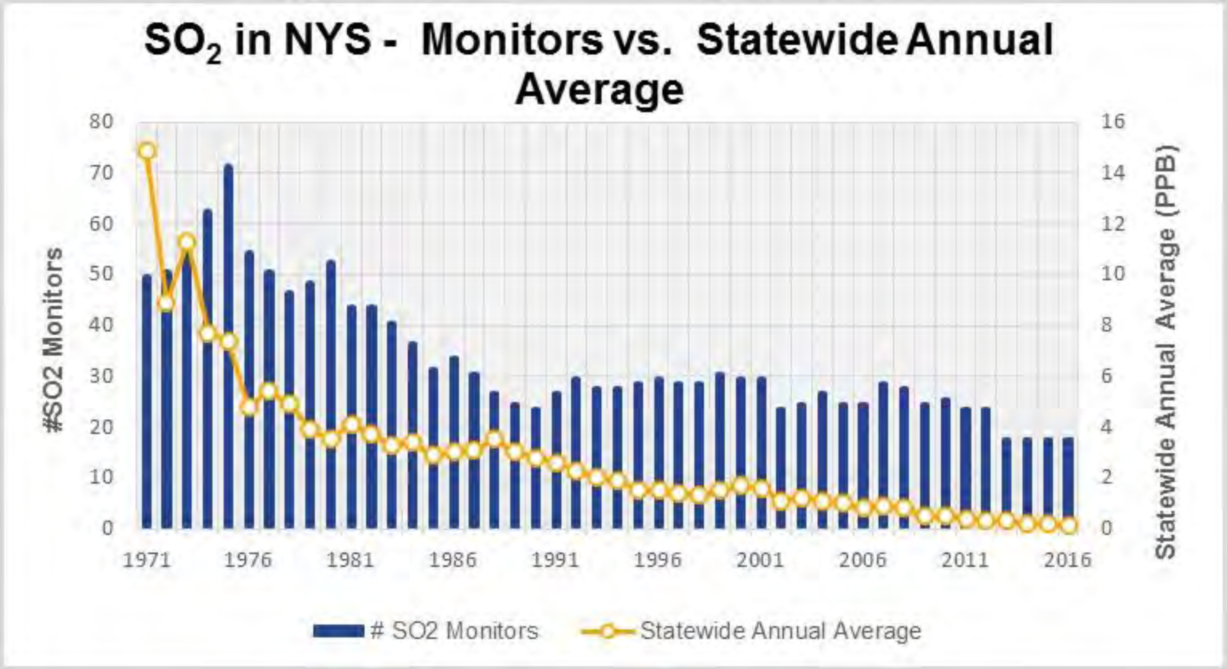

Figure 4.13 Sulfur Dioxide Monitors and Concentration Trends

Based on its most review of the air quality criteria for oxides of sulfur and the primary national ambient air quality standard (NAAQS) for oxides of sulfur as measured by sulfur dioxide (SO_2), EPA replaced the existing 24-hour and annual standards with a new short-term standard based on the 3-year average of the 99th percentile of the yearly distribution of 1-hour daily maximum SO_2 concentrations. EPA set the level of this new standard at 75 ppb, which became effective August 23, 2010. EPA is also establishing requirements for an SO_2 monitoring network. These new provisions require monitors in areas where there is an increased coincidence of population and SO_2 emissions. In order to do this, EPA developed a Population Weighted Emissions Index (PWEI) that uses population and emissions inventory data at the CBSA level to assign required monitoring for a given CBSA (with population and emissions being obvious relevant factors in prioritizing numbers of required monitors). The PWEI for a particular CBSA was proposed to be calculated by multiplying the population (using the latest Census Bureau estimates) of a CBSA by the total amount of SO_2 emissions in that CBSA. The CBSA SO_2 emission value would be in tons per year, and calculated by aggregating the county level emissions for each county in a CBSA. The PWEI values are being developed using the 2010 Census numbers. The final network design requires that any SO_2 monitors required in a particular CBSA as determined based on PWEI values shall satisfy the minimum monitoring requirements if they are sited at locations where they can meet any one or more of the monitoring objectives: Source-Oriented Monitoring, Highest Concentration, Population Exposure, General Background, and Regional Transport. EPA is expected to provide additional guidance for the implementation of this rule.

On September 21, 2015, the U.S. Environmental Protection Agency finalized requirements for air agencies to monitor or model ambient sulfur dioxide (SO_2) levels in areas with large sources of SO_2 emissions to help implement the 1-hour SO_2 National Air Ambient Quality Standard (NAAQS). This final rule which is known as the Data Requirements Rule (DRR) establishes that, at a minimum, air agencies must characterize air quality around sources that emit 2,000 tons per year (tpy) or more of SO_2. The DRR allows sources to accept enforceable emission limits to reduce their emissions to a level less than 2000 tons per year or to determine through dispersion modeling that there are no ambient air concentrations of SO_2 above the NAAQS or to monitor air quality to ensure that there are no exceedances of the primary SO_2 NAAQS.

There are two sources in New York that have elected to characterize air quality in areas near their facilities by monitoring in order to satisfy the DRR. The facilities will establish and operate SO_2 monitors at locations that are acceptable to the NYSDEC. The primary objective of this monitoring is to determine the 1-hour concentration of SO_2 at the location or locations where the maximum impact from the source is expected to occur. The NYSDEC utilized dispersion modeling to determine how many monitors were necessary for each source as well as to determine the acceptable locations where these monitors could be established. The DRR classifies these source oriented sites as SLAMS and states that these are to be operated in a SLAMS-like manner and are subject to the requirements in 40 CFR part 58 regarding data reporting and certification along with requirements included in Appendices A, C, and E.

There are 18 SO_2 monitors in operation currently, as shown in Figure 4.14. TEI Model 43C and 43i TLE instruments using the pulsed fluorescence method are deployed in the network.

The EPA considered setting a secondary standard for NO_x and SO_x that would specifically target the impact of acidic deposition on wilderness areas. The EPA ultimately decided that there was not enough information at this time to tie specific water quality thresholds with ambient air concentrations. In the July 2011 final rule for NO_x and SO_x, the EPA stated that they would set up a monitoring program in sensitive areas to collect information to link water quality impacts to ambient air quality measurements. The NYSDEC is participating in this pilot monitoring program in the Adirondacks. Additional monitoring equipment has been installed at several sites to determine the concentrations of gases and particles including ammonia. These data will be used in the future to inform the next review of the NO_x/SO_x standard.

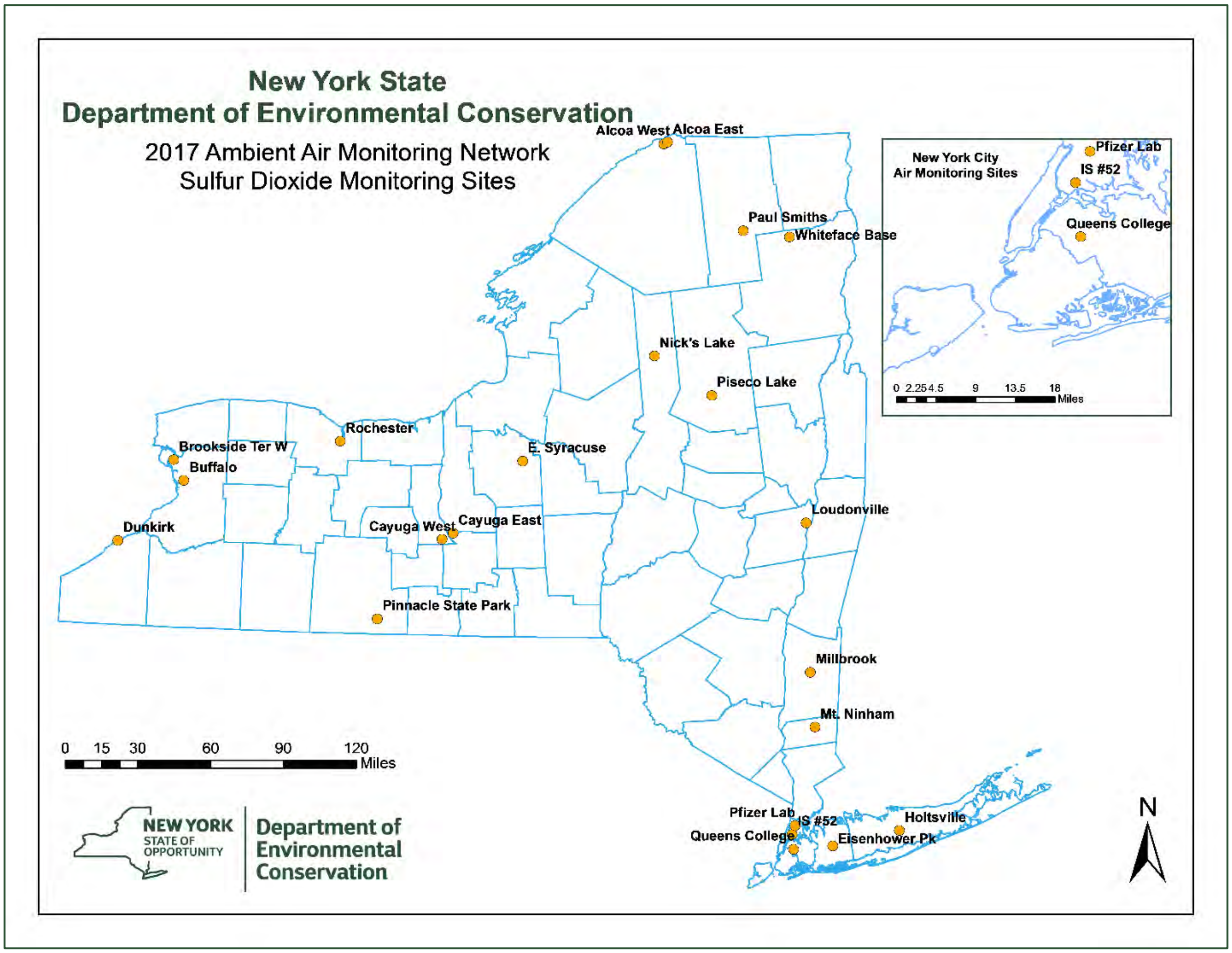

Figure 4.14 Map of Sulfur Dioxide Monitoring Sites

4.6 Ozone

Ozone is a molecule made up of three oxygen atoms (O_3), a very reactive gas, and even at low concentrations it is irritating and toxic. It occurs naturally in small amounts in the earth's upper atmosphere, and in the air of the lower atmosphere after a lightning storm. In the stratosphere, between 10km and 50km above the earth's surface it forms the Ozone Layer. This is an important protective layer which filters out most of the high energy ultra-violet radiation from the sun which would damage much of the life on earth. When ozone is present at ground level and in the troposphere (10-18 km above earth's surface) it is considered a pollutant and a greenhouse gas. Ozone is used both industrially and commercially due mainly to its reactivity. It is used as a clean way of purifying water both in industry and in the home in hot-tubs and fish tanks. It is also used to disinfect laundry both in hospitals and in the home.

Ground-level O_3 remains a pervasive pollution problem in the United States. Ozone is readily formed in the atmosphere by the reaction of volatile organic compounds (VOCs) and NO_x in the presence of heat and sunlight, which are most abundant in the summer. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants, refineries, factories, consumer and commercial products, other industries, and natural (biogenic) sources. Nitrogen oxides (a precursor to ozone) are emitted from motor vehicles, power plants, and other sources of combustion, as well as natural sources including lightning and biological processes in soil. Changing weather patterns contribute to yearly differences in O_3 concentrations. Ozone and the precursor pollutants that cause O_3 also can be transported into an area from pollution sources located hundreds of miles upwind.

Ozone occurs naturally in the stratosphere and provides a protective layer high above the earth. However, at ground level, it is the prime ingredient of smog. Short-term (1- to 3-hour) and prolonged (6- to 8-hour) exposures to ambient O_3 concentrations have been linked to a number of health effects of concern. For example, increased hospital admissions and emergency room visits for respiratory causes have been associated with ambient O_3 exposures.

Exposures to O_3 result in lung inflammation, aggravate preexisting respiratory diseases such as asthma, and may make people more susceptible to respiratory infection. Other health effects attributed to short-term and prolonged exposures to O_3, generally while individuals are engaged in moderate or heavy exertion, include significant decreases in lung function and increased respiratory symptoms such as chest pain and cough. Children active outdoors during the summer when O_3 levels are at their highest are most at risk of experiencing such effects. Other at-risk groups include adults who are active outdoors, such as outdoor workers, and individuals with preexisting respiratory disorders such as asthma and chronic obstructive lung disease. Within each of these groups are individuals who are unusually sensitive to O_3. In addition, repeated long-term exposure to O_3 presents the possibility of irreversible changes in the lungs, which could lead to premature aging of the lungs and/or chronic respiratory illnesses.

Ozone also affects sensitive vegetation and ecosystems. Specifically, O_3 can lead to reductions in agricultural and commercial forest yields, reduced survivability of sensitive tree seedlings, and increased plant susceptibility to disease, pests, and other environmental stresses such as harsh weather. In long-lived species, these effects may become evident only after several years or even decades. As these species are out-competed by others, long-term effects on forest ecosystems and habitat quality for wildlife and endangered species become evident. Furthermore, O_3 injury to the foliage of trees and other plants can decrease the aesthetic value of ornamental species as well as the natural beauty of our national parks and recreation areas.

EPA initially established primary and secondary NAAQS for photochemical oxidants on April 30, 1971. Both primary and secondary standards were set at an hourly average of 0.08 parts per million (ppm), total photochemical oxidants, not to be exceeded more than one hour per year.

On February 8, 1979, EPA completed its first periodic review of the criteria and standards for O_3 and other photochemical oxidants and made significant revisions to the original standard: the level of the primary and secondary NAAQS was changed to 0.12 ppm; the indicator was changed to O_3; and the form of the standards was changed to be based on the expected number of days per calendar year with a maximum hourly average concentration above 0.12 ppm (i.e., attainment of the standard occurs when that number is equal to or less than one).

In July, 1997 EPA revised the primary and secondary O_3 standards on the basis of the then latest scientific evidence linking exposures to ambient O_3 to adverse health and welfare effects at levels allowed by the 1-hr average standards. The O_3 standards were revised by replacing the existing primary 1-hr average standard with an 8-hr average O_3 standard set at a level of 0.08 ppm. The form of the primary standard was changed to the annual fourth-highest daily maximum 8-hr average concentration, averaged over three years. The secondary O_3 standard was changed by making it identical in all respects to the revised primary standard. These standards were challenged in the courts and the litigation lasted until March, 2002 when the D.C. Circuit Court issued its final decision, finding the 1997 O_3 NAAQS to be “neither arbitrary nor capricious,” and denying the remaining petitions for review. As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) Areas (none in NY).

The 8-hr ozone standard (primary and secondary) of 0.075 ppm went into effect on May 27, 2008, at which time the 1-hr standard was revoked. On November 25, 2014, the EPA proposed to strengthen the National Ambient Air Quality Standards (NAAQS) for ground-level ozone, based on extensive scientific evidence about ozone's effects. Under the October 2015 rule, the primary standard was lowered to 0.070 ppm, which took effect January 1st, 2016. In addition to lowering the 8-hr ozone standard, the 2015 ozone rule expanded monitoring season of 32 states including New York, increasing the New York ozone monitoring season by one month to now run from March 1 through the end of October.

The number of ozone monitors and concentration trends for the 8-hr standard in New York State for the past three decades is shown in Figure 4.15.

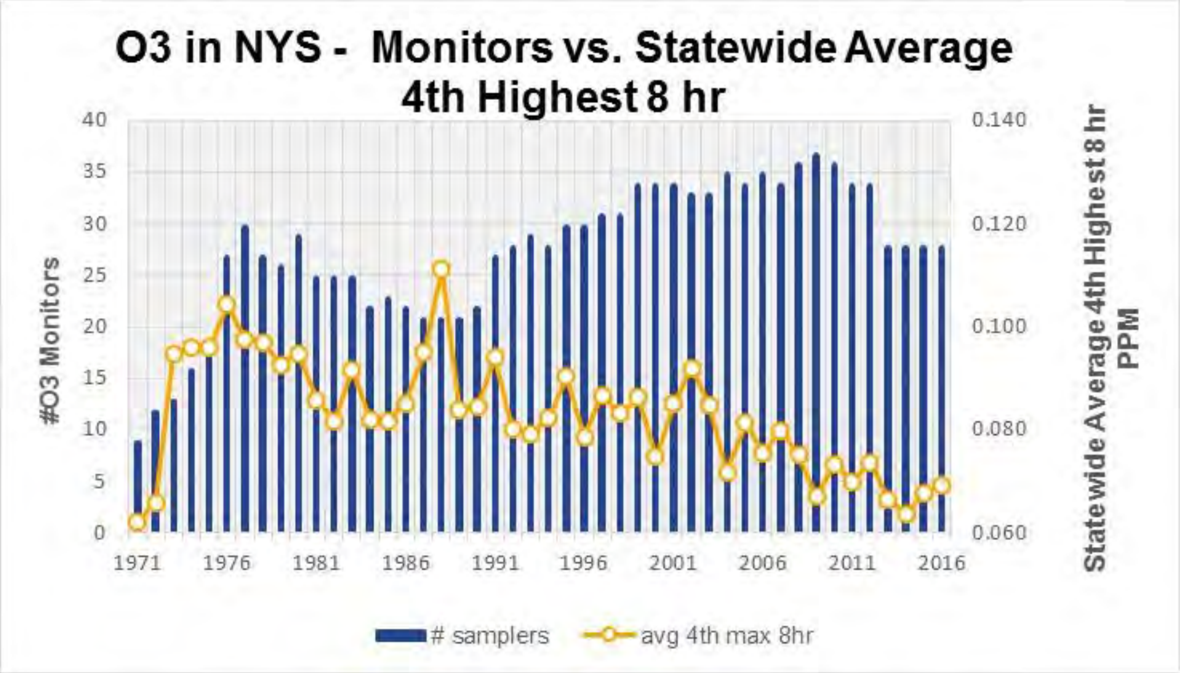

Figure 4.15 Ozone Monitors and 8-hr Concentration Trends

At present, the NYSDEC operates API T400 ozone monitors statewide, which use the UV photometric method for detection. The site locations are depicted in Figure 4.16 below.

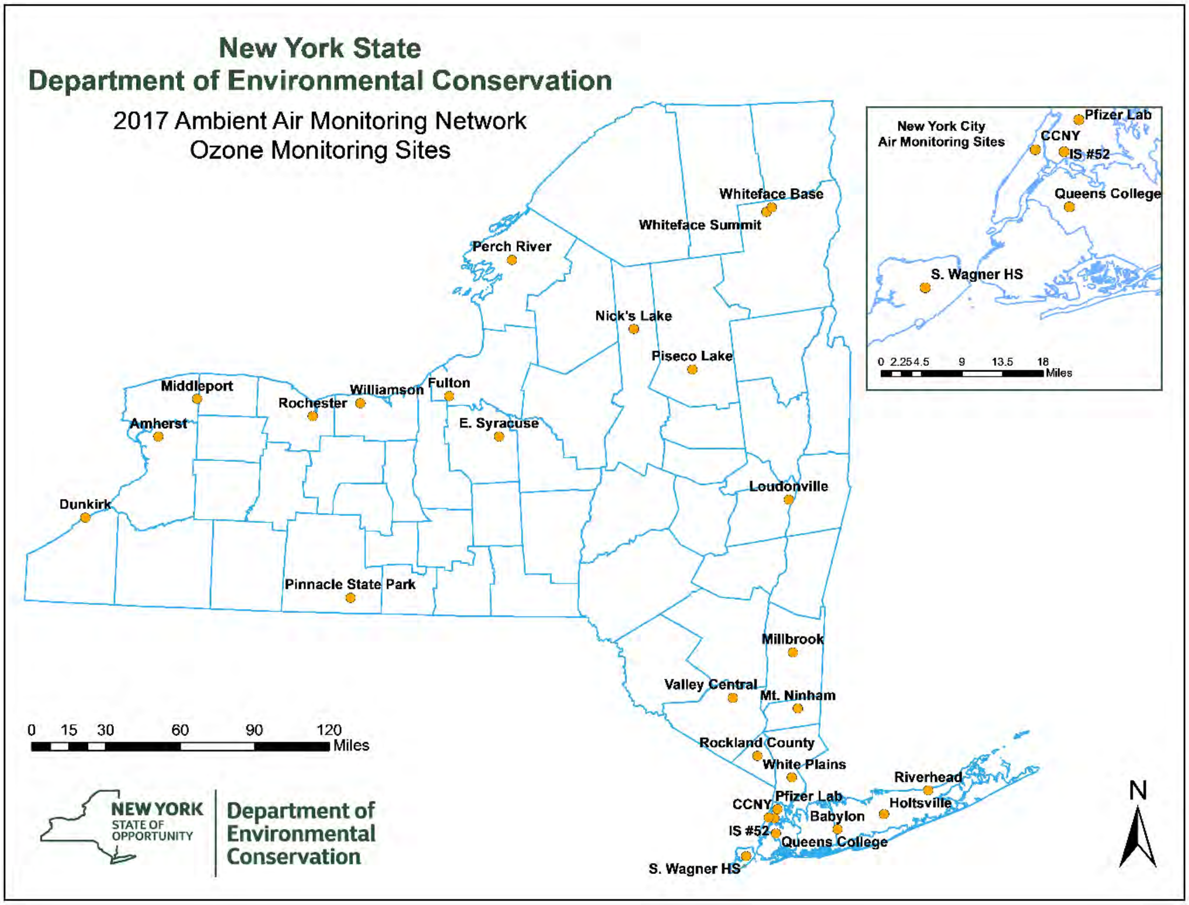

Figure 4.16 Map of Ozone Monitoring Sites

5.0 EPA’s National Toxics Program

In general, EPA plans to use ambient air toxics monitoring to support the air toxics program’s efforts to reduce human exposure and health risks from air toxics. The monitoring data provided by the ambient air toxics monitoring program is intended to support four major objectives:

- Establish trends and evaluate the effectiveness of air toxics emissions reduction strategies.
- Characterize ambient concentrations (and deposition) in local areas. Air toxics originate from local sources and can concentrate in relatively small geographical areas, producing the greatest risks to human health.
- Provide data to support, evaluate, and improve air quality models. Air quality models are used to develop emission control strategies, perform exposure assessments, and assess program effectiveness.
- Provide data to support scientific studies to better understand the relationship between ambient air toxics concentrations, human exposure, and health effects from these exposures.

EPA’s national air toxics monitoring program is comprised of four different monitoring efforts:

- National Air Toxics Trends Stations (NATTS)
- EPA funded local-scale projects to assess conditions at the local level
- Existing State and local program monitoring
- Persistent bio-accumulative toxics monitoring

The objective for the NATTS network is to provide long-term monitoring data for certain priority air toxics across representative areas of the country in order to establish overall trends for these pollutants. Currently, there are 23 NATTS established in 22 cities. The two New York NATTS sites are located in the Bronx, and Rochester, respectively.

EPA’s initial ambient air toxics monitoring pilot studies disclosed that significant variations in pollutant concentrations occurred across a city and that these variations cannot be characterized by a single monitoring site. As a result, EPA decided that local-scale projects consisting of several monitors operated for a period of 1 to 2 years should be incorporated into the national air toxics monitoring strategy. In 2006, New York was awarded a grant for a community air quality air study in Tonawanda which began in July 2007. Hazardous air pollutants (HAPs) and fine particulate matter are measured at 4 locations in the Tonawanda community to address citizen concerns. The field sampling portion of this study was completed in July, 2008.

New York State has been operating a toxics monitoring network since 1990, funded entirely by State monies. Currently, there are 11 sites statewide collecting 24-hr canister samples for VOC analysis in a 1 in 6 day interval. See section on NY Toxics Monitoring Network.

The monitoring program for persistent bio-accumulative toxics primarily consists of deposition monitoring, not ambient air monitoring. Several monitoring programs operated by various Federal agencies have been established to measure the presence of toxics in various media. From 2006 – 2010, New York completed an EPA funded community grant study titled “New York State Ambient Mercury Baseline Study” for the measurement of speciated mercury in ambient air, as well as mercury in wet deposition. Instruments at the two study sites continued to operate with other funding sources through 2015. At the end of 2015 the speciated Mercury monitoring was discontinued but the gaseous elemental and wet deposition monitoring continue at the two study locations. The data are collected under the protocols of the National Atmospheric Deposition Program (http://nadp.sws.uiuc.edu/). The data can be accessed through the NADP website and participation in the NADP program insures that the data are comparable to data from other locations across the country.

5.1 National Air Toxics Trends Stations (NATTS)

EPA’s Urban Air Toxics Program identified 33 high-priority urban air toxics. From these 33 air toxics EPA developed a list of 19 “core” air toxics representing the pollutants for which EPA eventually wants to develop trends information. However, because of limitations in available methodologies, EPA decided that at a minimum, in starting the network, each of the NATTS should monitor for at least 6 of these 19 pollutants. These six pollutants are considered national air toxics “drivers” (i.e., pollutants of concern in all areas of the country).

Table 5.1 NATTS Pollutants of Concern

Required Monitoring	Desired Monitoring
1,3-butadiene	trichloroethylene
acrolein	tetrachloroethylene
arsenic	beryllium
formaldehyde	nickel
benzene	cadmium
hexavalent chromium	acetaldehyde
	1,2-dichloropropene
	carbon tetrachloride
	lead
	chloroform
	manganese
	methylene chloride
	vinyl chloride

For the two NATTS sites, New York will perform analysis of 42 VOCs (Table 5.2), and 12 carbonyls (Table 5.6). More details on the sampling and analysis are provided in the

NY Toxics Monitoring, and Photochemical Assessment Monitoring Stations sections, respectively. In addition, low volume PM_{10} teflon filters are collected for trace metals analysis using ICP-MS. The targeted metals include: arsenic, beryllium, cadmium, lead, manganese, nickel, antimony, cobalt, and selenium, with the last three being potential future HAPs. Hexavalent chromium sampling commenced in November 2007 at the Rochester and Bronx sites. The cellulose filter samples are shipped to EPA/ERG for laboratory analysis. Sampling at New York NATTS sites was suspended at the end of June, 2013 after EPA determined that area wide Chromium VI monitoring should only be applicable in areas with known sources.

Polycyclic Aromatic Hydrocarbons (PAHs) sampling at the Rochester and IS 52 sites began in July, 2008. The collection media consists of one 110 mm diameter glass microfiber filter and a tubular glass cartridge containing a combination of Polyurethane Foam (PUF) and XAD-2 resin. The exposed samples are shipped to an EPA contract laboratory (ERG) for analysis.

5.2 NY Toxics Monitoring Network

The NY ambient air toxics monitoring program was first established in 1985 as part of the Governor's Air Monitoring Modernization Capital Budget Program. This monitoring network measures Volatile Organic Compounds (VOCs) across the State. The initial development of the network and analytical capabilities was part of a joint Staten Island/New Jersey Urban Air Toxics Assessment Project (SI/NJ Study) coordinated with U.S. EPA Region II from 1987 through 1989. The network expanded in 1990 to a statewide network.

The goal is to monitor air quality related to toxics in the State's urban, industrial, residential, and rural areas. Implementation of this program starts the development of a long-term toxics air quality database for New York State. The database will be used to define, attain, and preserve good air quality in New York State. The data defines actual air quality impacts of the VOCs. The data is used in the design and management of New York's air quality, including risk assessment, modeling, planning and trend analysis.

Initially, only seventeen VOCs were monitored. In 1995, the number of analytes was increased to nineteen. In 2002, the list of VOCs was further expanded to include 42 compounds as shown in Table 5.2 below:

Table 5.2 Target List of Volatile Organic Compounds

Chemical	Alternative Names and Notes	CAS Number	AQS ID
Acrolein	2-Propenal; Acrylic aldehyde; Acrylaldehyde	107-02-8	43505
Benzene	Benzol	71-43-2	45201
Benzyl chloride	Chloromethylbenzene; Chlorotoluene	100-44-7	45809
1,3-Butadiene	Butadiene	106-99-0	43218
Carbon tetrachloride	Tetrachloromethane	56-23-5	43804
Chlorobenzene	Monochlorobenzene; Benzene chloride	108-90-7	45801
Chloroform	Trichloromethane	67-66-3	43803
1,4-Dichlorobenzene(p)	p-Dichlorobenzene	106-46-7	45807
1,3-Dichloropropene	Includes cis and trans isomers	542-75-6	43841
Ethyl Chloride	Chloroethane	75-00-3	43812
Ethylbenzene	Ethylbenzol; Phenylethane	100-41-4	45203
Ethylene dibromide	1,2-Dibromoethane	106-93-4	43843
Ethylene dichloride	1,2-Dichloroethane	107-06-2	43815
Ethylidene dichloride	1,1-Dichloroethane	75-34-3	43813
Methyl bromide	Bromomethane	74-83-9	43819
Methyl chloride	Chloromethane	74-87-3	43801
Methyl chloroform	1,1,1-Trichloroethane	71-55-6	43814
Methyl tert-butyl ether	MTBE	1634-04-4	43372
Methylene chloride	Dichloromethane	75-09-2	43802
Propylene dichloride	1,2-Dichloropropane	78-87-5	43829
Styrene	Ethenylbenzene, Cinnamene, Phenylethylene, Vinyl benzene	100-42-5	45220
1,1,2,2-Tetrachloroethane	Tetrachloroethane	79-34-5	43818
Tetrachloroethylene	Perchloroethylene; Perc	127-18-4	43817
Toluene	Methylbenzene	108-88-3	45202

Chemical	Alternative Names and Notes	CAS Number	AQS ID
1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzol	120-82-1	45810
1,1,2-Trichloroethane	Vinyl Trichloride	79-00-5	43820
Trichloroethylene	Trichloroethene; TCE	79-01-6	43824
Vinyl chloride	Chloroethylene	75-01-4	43860
Vinylidene chloride	1,1-Dichloroethylene; 1,1-Dichloroethene	75-35-4	43826
o-Xylene	1,2-Dimethyl benzene	95-47-6	45204
m,p-Xylenes	Dimethyl benzenes	1330-20-7	45102
1,2 Dichlorobenzene	*ortho*-Dichlorobenzene, *o*-Dichlorobenzene, *o*-Dichlorobenzol	95-50-1	45805
1,3 Dichlorobenzene	*m*-Dichlorobenzene; *meta*-Dichlorobenzene	541-73-1	45806
1,2,4-Trimethylbenzene	pseudocumene	95-63-6	43348
1,3,5-Trimethylbenzene	Mesitylene	108-67-8	45207
Hexachloro-1,3-Butadiene	Hexachlorobutadiene	87-68-3	43844
Cis-1,2-Dichloroethylene	1, 2-dichloroethylene	156-59-2	43218
Dichlorodifluoromethane	Freon-12	75-71-8	43823
Trichlorofluoromethane	Freon-11	75-69-4	43811
Trichlorotrifluoroethane	Freon 113, 1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	43821
Dichlorotetrafluoroethane	Freon 114	76-14-2	43852
Bromodichloromethane	Bromodichloromethane, Bromo(dichloro)methane, Dichlorobromomethane	75-27-4	43828

Volatile organic compounds are collected in stainless steel canisters contained in a sampler known as an ambient air canister sampler. The sampler is an air flow calibrated sampling device that pumps ambient air into the canister. A special stainless steel diaphragm pump provides a constant pressure to push the sample through the sampler. A relief valve is used to maintain a steady pressure for the sample flow controller. Samples are collected at a one in six days' frequency and shipped back to the Rensselaer laboratory facility for analysis.

The analysis methodology is a modified version of EPA method TO-15. An aliquot of air sample is taken from the canister at a controlled flow and temperature onto an Entech Model 7100A preconcentrator. The preconcentration process involves a series of steps. The first trap consists of glass beads/Tenax held at -110℃ which is then heated to room temperature in order to remove water/moisture in the sample. The next trap in line consists of Tenax held at - 30℃. The contaminants of interest are then desorbed at 150℃ and collected on the cryofocuser held at -150℃. The sample is then rapidly heated for column injection using a Varian GC coupled with a Saturn MS detection. This method of analysis allows positive identification by retention time and molecular mass.

Concentration trends charts for some ubiquitous VOCs are provided below.

Note that for 2011, the values shown for IS 52 actually represent those from the site at Morrisania, as all monitoring at IS 52 was relocated to Morrisania in July of 2010 due to roof construction work. In August, 2012 all equipment for NATTS was relocated back to IS 52. The values presented for 2012 represent a composite of the two locations.

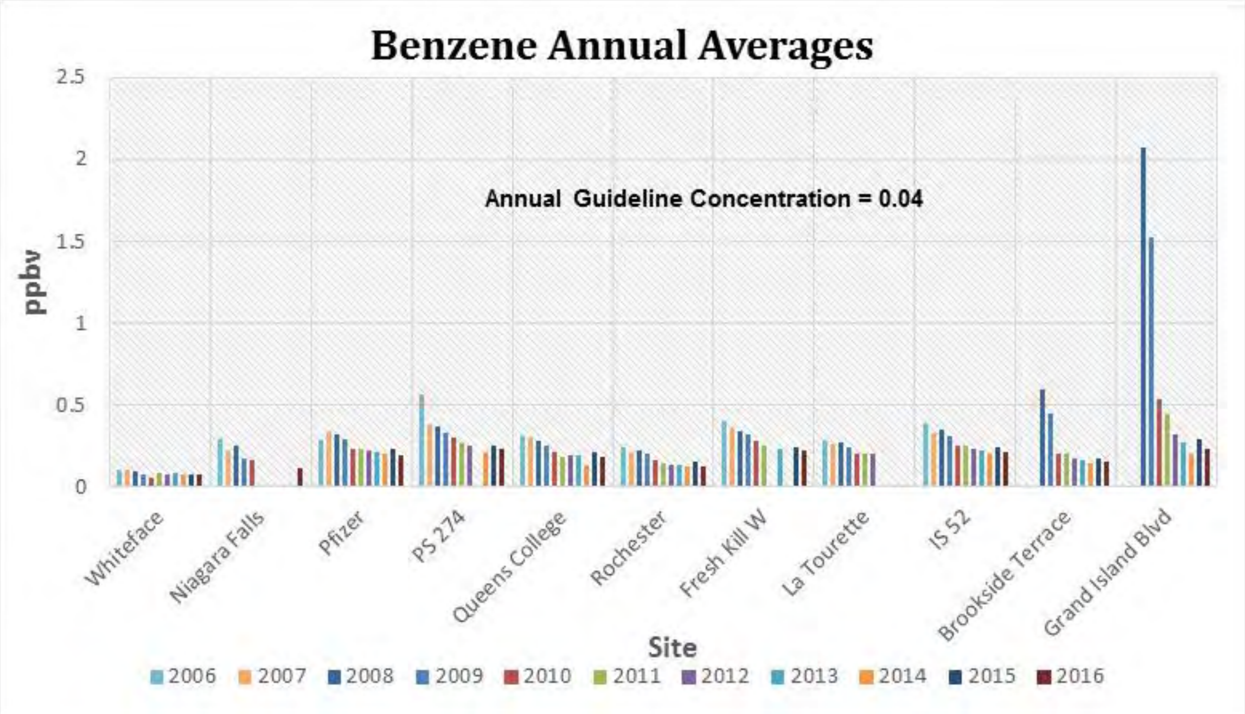

Figure 5.1 Annual Averages for Benzene

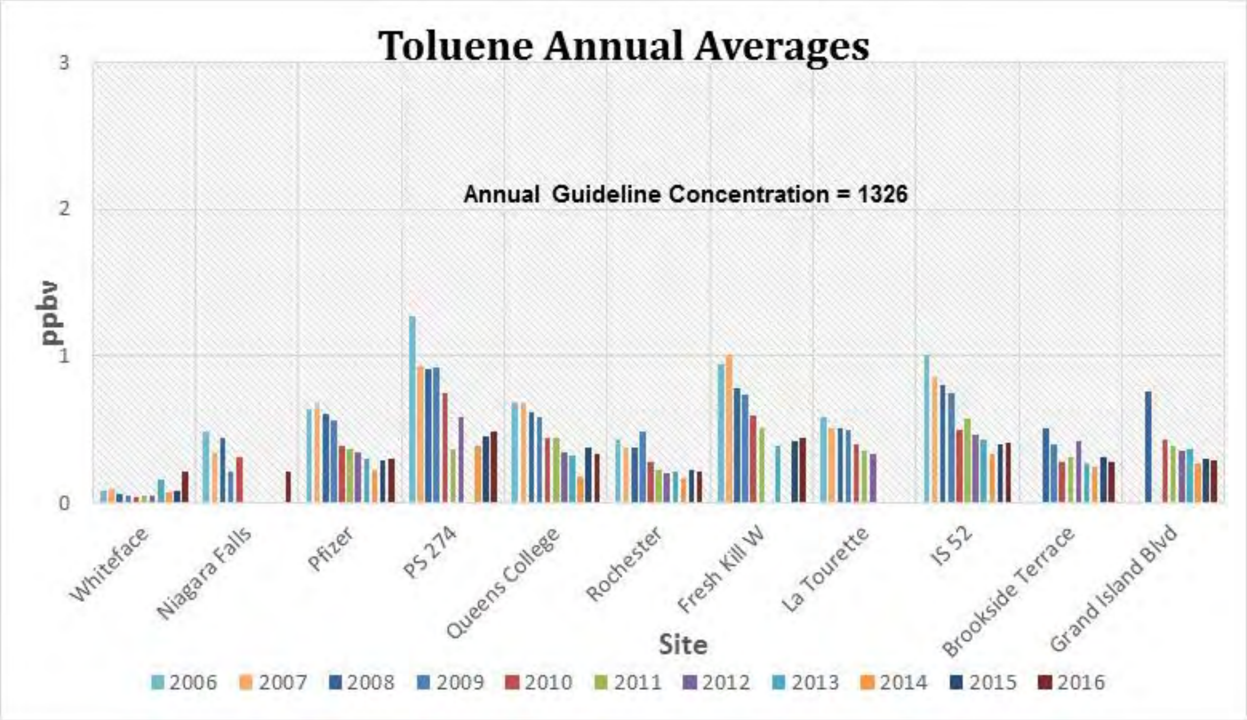

Figure 5.2 Annual Averages for Toluene

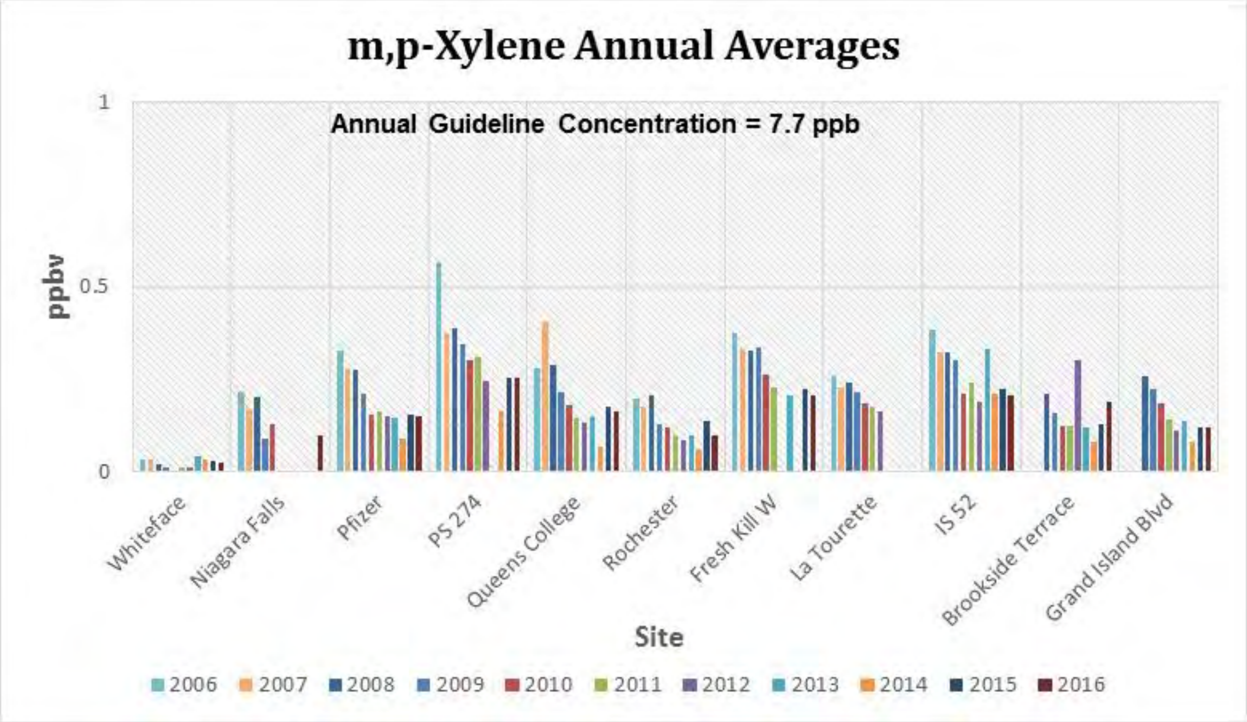

Figure 5.3 Annual Averages for *m,p*-Xylene

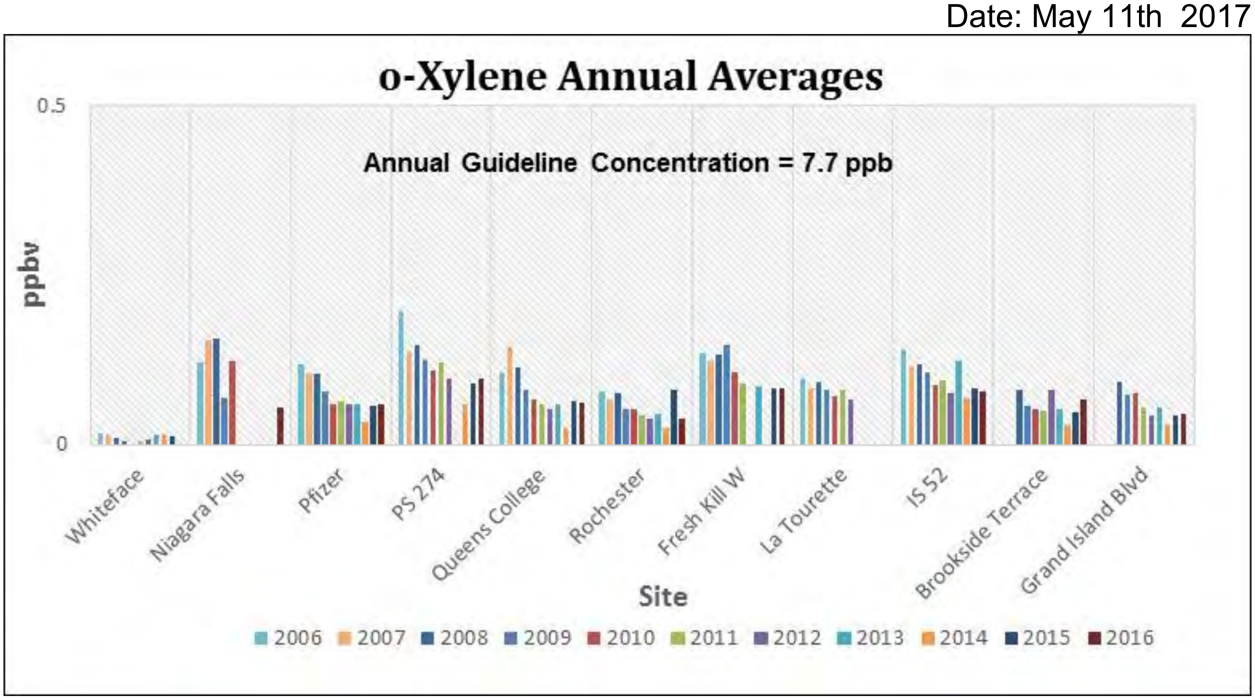

Figure 5.4 Annual Averages for *o*-Xylene

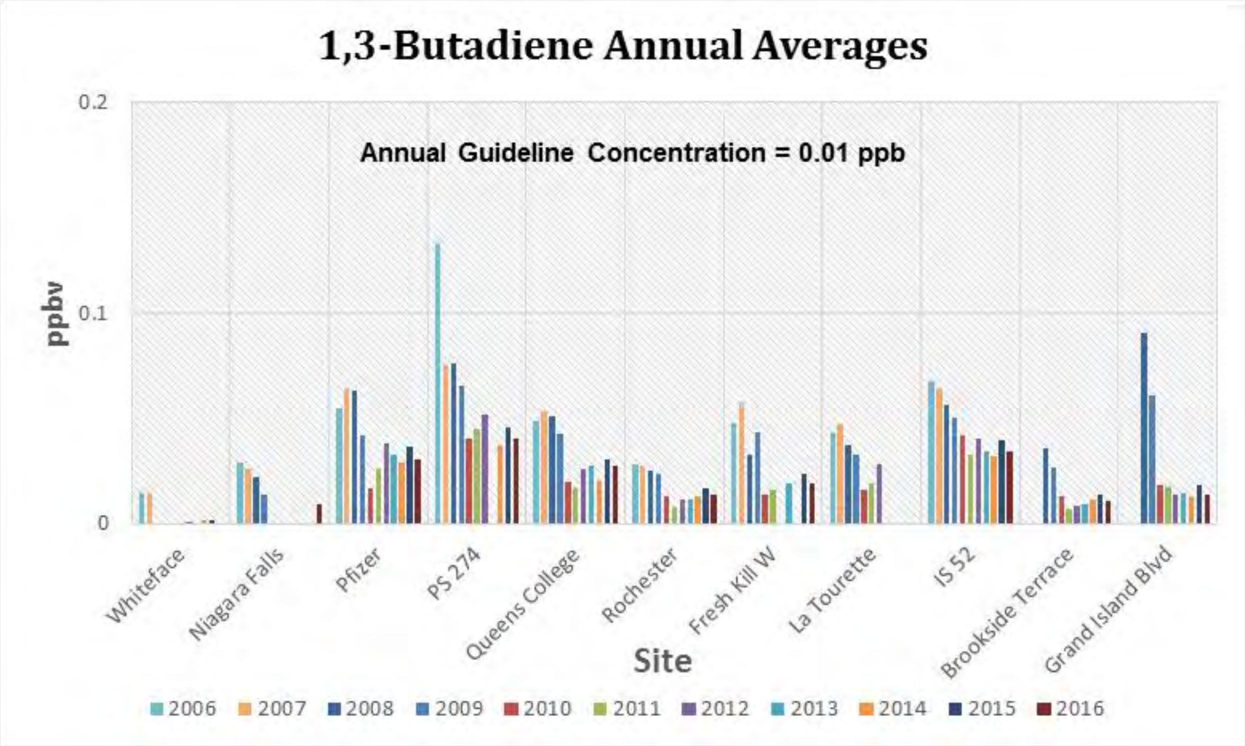

Figure 5.5 Annual Averages for 1,3-Butadiene

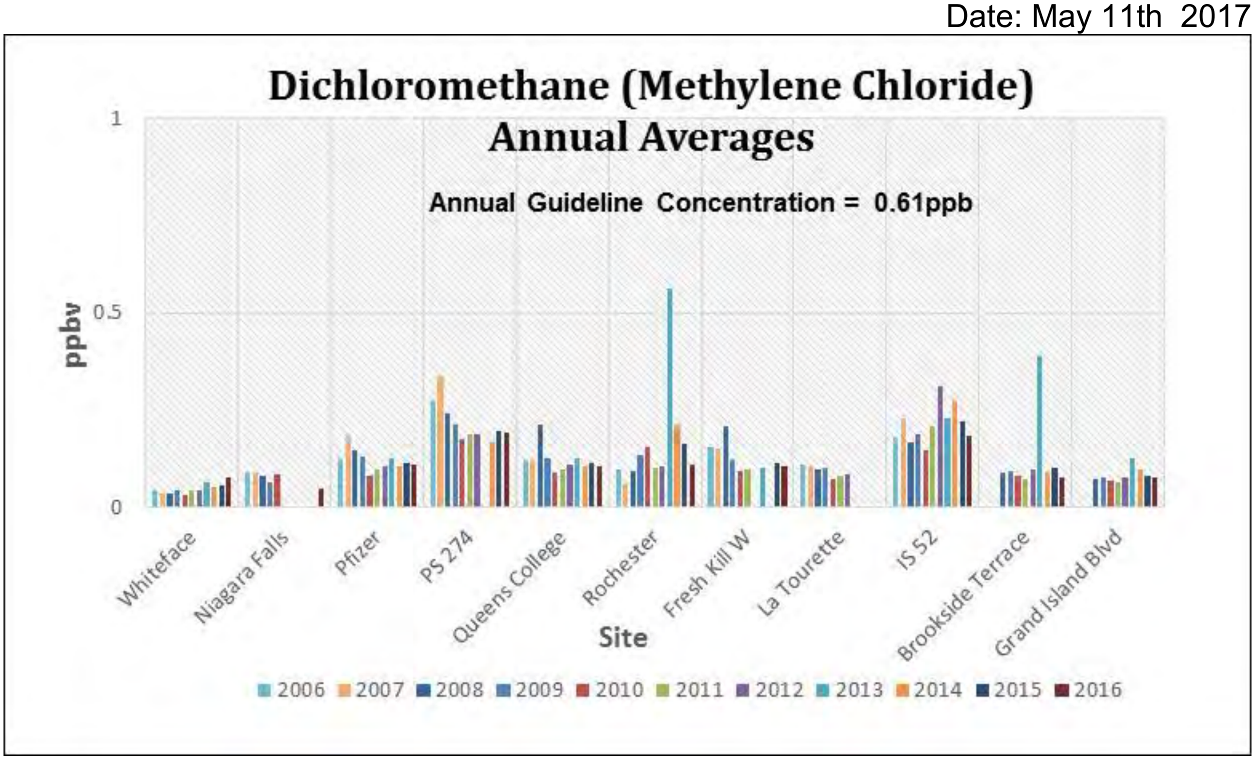

Figure 5.6 Annual Averages for Dichloromethane

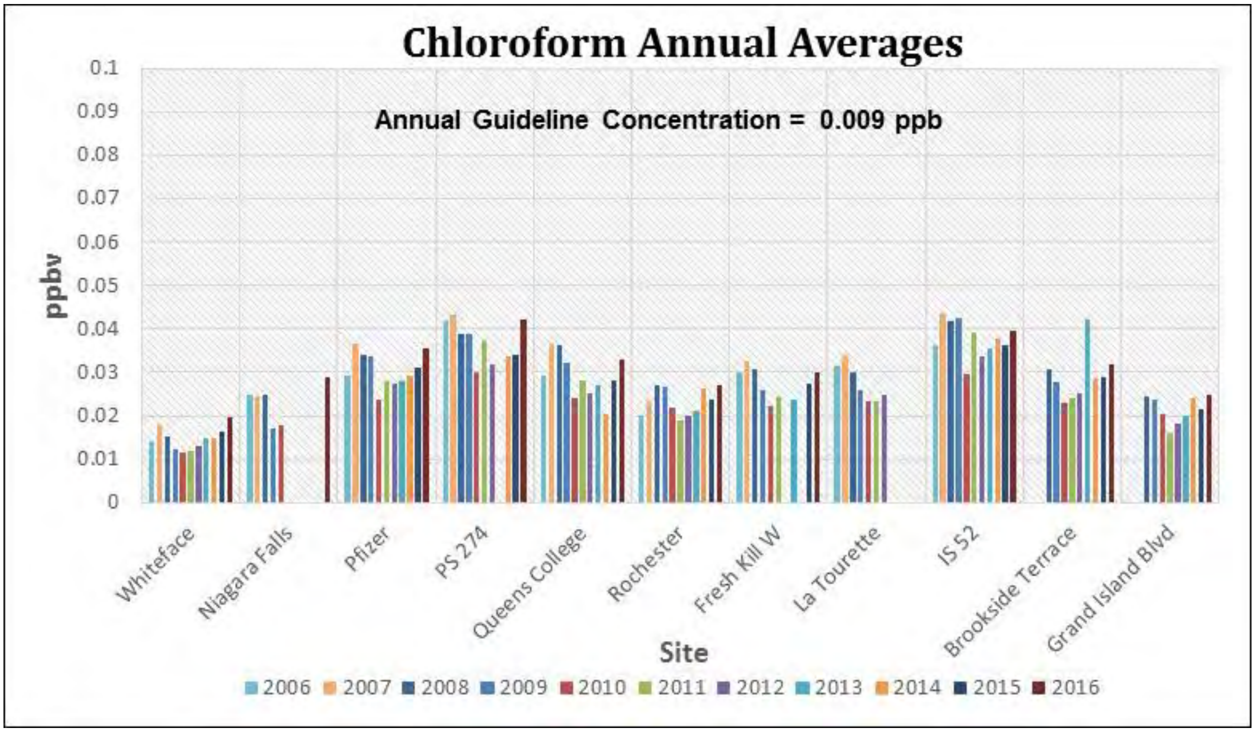

Figure 5.7 Annual Averages for Chloroform

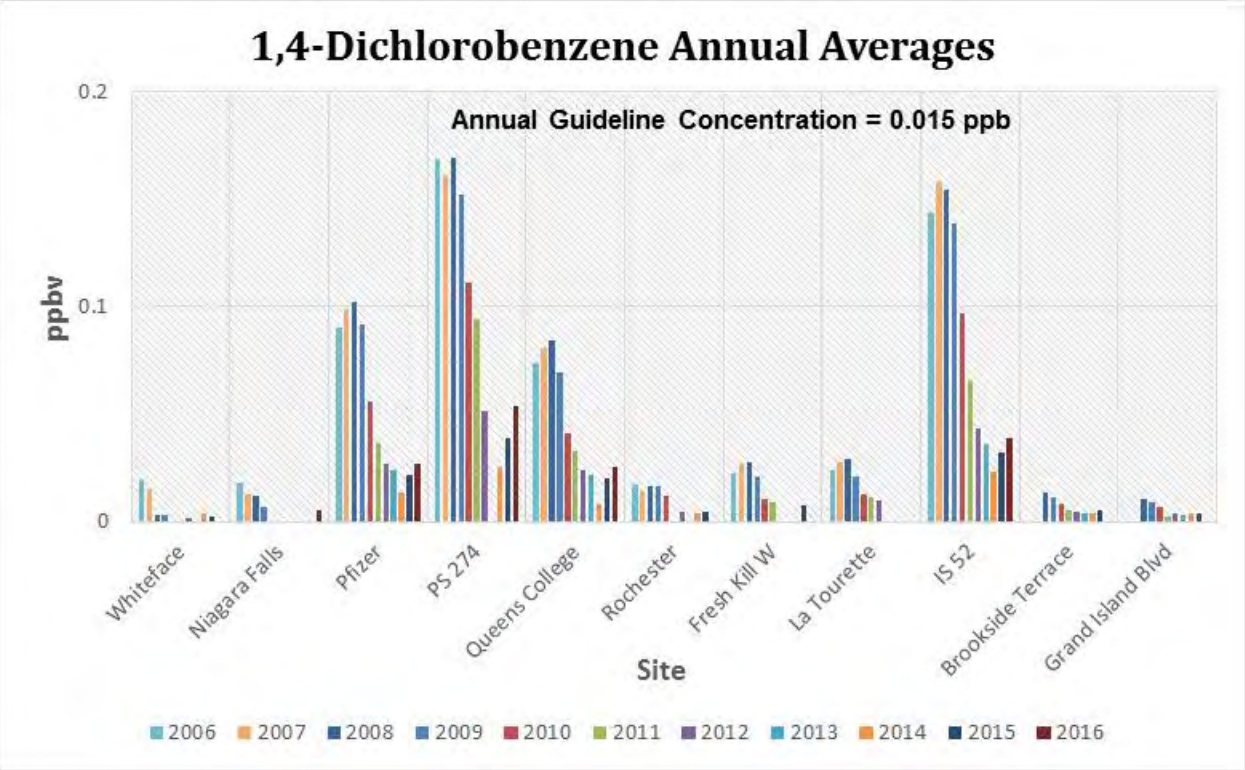

Figure 5.8 Annual Averages for 1,4-Dichlorobenzene

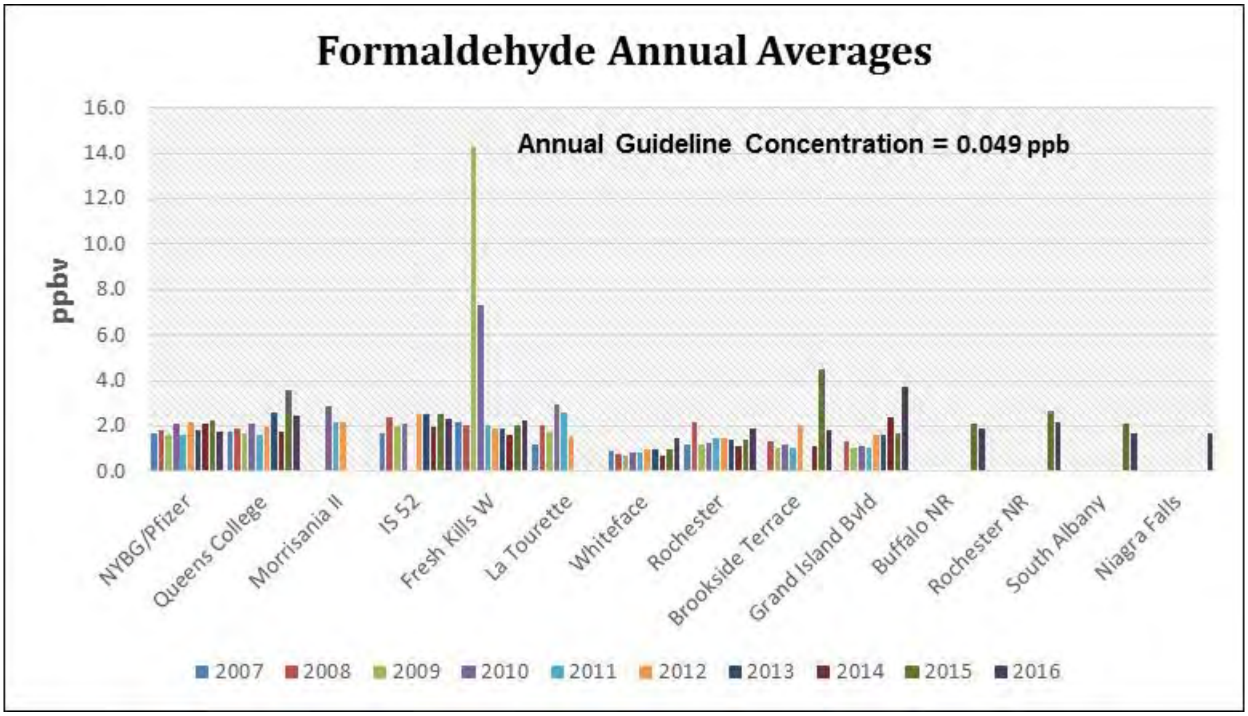

Figure 5.9 Annual Averages for Formaldehyde†

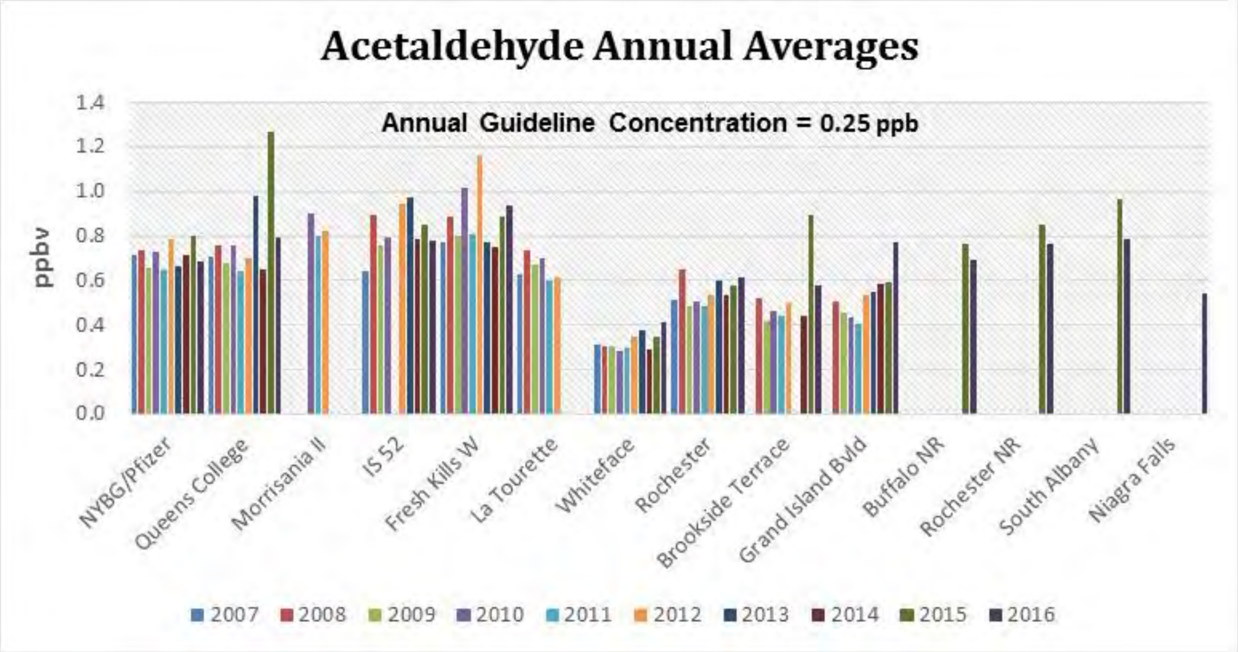

Figure 5.10 Annual Averages for Acetaldehyde†

† Note that the toxics monitoring operation at IS 52 was temporarily moved to the Morrisania II site in mid-June 2010 due to extensive construction work. In late July 2012, work was completed and monitoring resumed at IS 52. The values shown for 2010 and 2012 represent partial year average only.

Currently, there are 12 toxics monitoring sites in operation for the measurement of VOCs, and 11 sites for carbonyls statewide. These locations are shown in Figure 5.11 below.

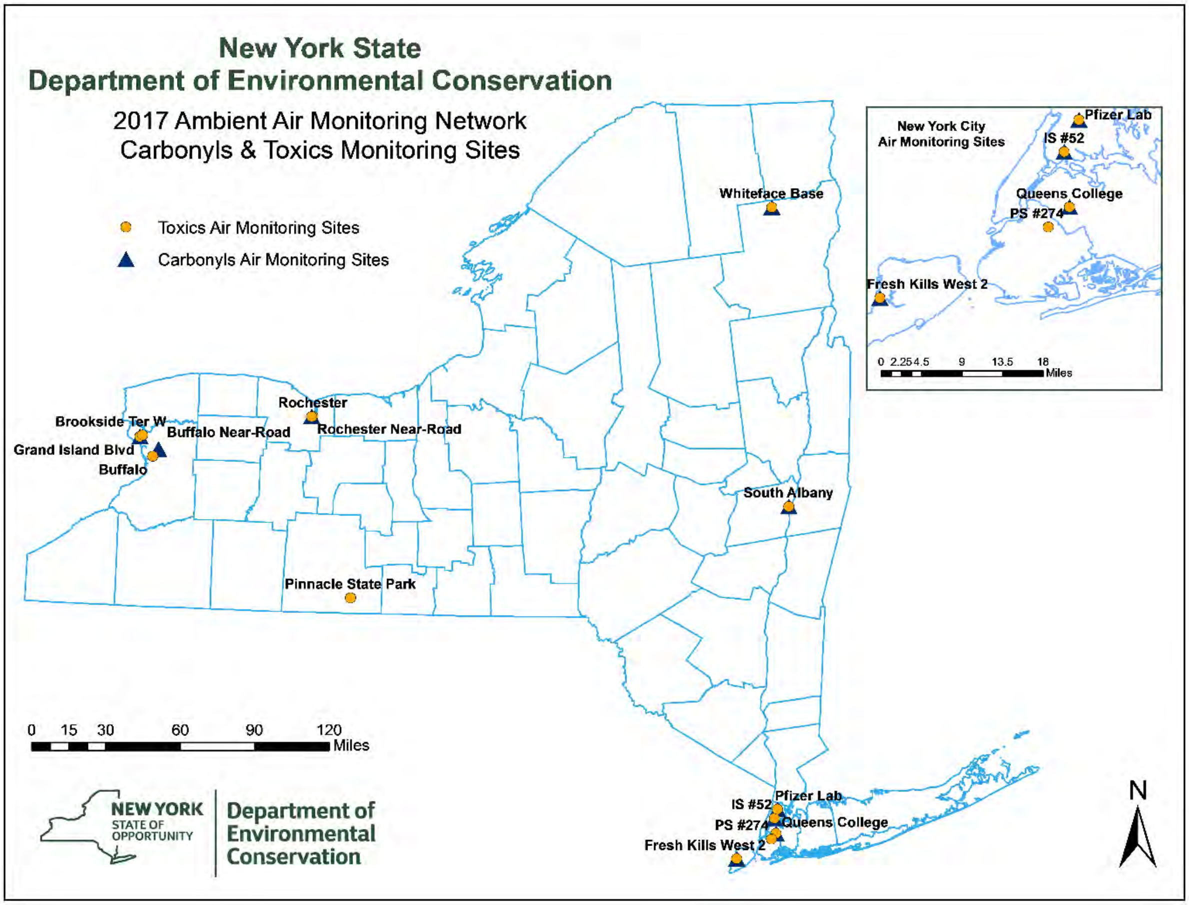

Figure 5.11 Map of Toxics Monitoring Sites

5.3 Photochemical Assessment Monitoring Stations (PAMS)

The 1993 revisions to 40 CFR Part 58 provide for the establishment and maintenance of network of air monitoring stations called Photochemical Assessment Monitoring Stations (PAMS) which will supplement the existing State and Local Air Monitoring Stations (SLAMS) network. The selection of parameters to be measured at a PAMS site varies with the site’s ozone nonattainment designation and whether a site is upwind or downwind from O_3 precursor source areas. These parameters are O_3, total oxides of nitrogen (NO_x), nitric oxide (NO), nitrogen dioxide (NO_2), speciated volatile organic compounds (VOCs) and specific meteorological measurements. As part of the October 2015 Ozone rule, the EPA revised the Photochemical Assessment Monitoring Stations (PAMS) Network requiring states that operate PAMS sites to measure nitrogen dioxide, hourly speciated VOCs, eight-hour averaged carbonyls on every third day and hourly averaged mixing height, in addition to a number of other meteorological parameters (e.g. wind speed and direction). In the past, ozone nonattainment areas classified as serious, severe, or extreme were required to operate between two and four PAMS monitoring sites. During the past 30 years, however, both monitoring technology and priorities have changed. EPA is updating the PAMS monitoring requirements to modernize and streamline the network, based on a 2011 evaluation of the PAMS network, along with consultation with EPA’s independent science advisers (the Clean Air Scientific Advisory Committee) and state air agencies. States will need to comply with the new PAMS monitoring requirements at NCore sites by June 1, 2019. Enhanced Monitoring Plans will be due within two years after EPA designates nonattainment areas or by Oct. 1, 2019, whichever is later.

The purpose of the PAMS program is to provide an air quality database that will assist in evaluating and modifying control strategies for attaining the O_3 National Ambient Air Quality Standard (NAAQS). PAMS data will also be used to better characterize the nature and extent of the O_3 problem, track VOC and NO_x emission inventory reductions, assess air quality trends and determine whether areas of New York remain in nonattainment of the O_3 NAAQS.

NYSDEC is required to operate and maintain two sites for metropolitan New York. The New York Botanical Gardens PAMS site (located in Northern Bronx) has been operational since 1994. The Queensborough Community College PAMS station (located in Queens) began monitoring of some species in late 1997. The Queens site was fully operational for the 1998 ozone monitoring season. This site moved to Queens College in the spring of 2001 as the QBCC building was undergoing a major renovation and the equipment had to be removed from the site.

The Table 5.3 lists the chronology of monitoring at these sites.

Table 5.3 Information on PAMS Sites

Site Name	Parameters	Implementation Date
New York Botanical Garden	NOx	Jun-94
	CO	Jun-94
	O_3	Jun-94
	VOCs	Jun-94
	Carbonyls	Jun-94
	NMOC	Jun-99
	Meteorology	Jun-94
	NMOC	Sep-99
Queens Community College closed 12/2001	NOx	May-98
	CO	May-98
	O_3	May-98
	SO_2	May-98
	VOCs	Jun-98
	Carbonyls	Sep-97
	NMOC	Aug-98
Queens College	NOx	Jun-01
	CO	Jun-01

Site Name	Parameters	Implementation Date
	O_3	Jun-01
	SO_2	Jun-01
	Carbonyls	Jun-01
	NMOC	Jun-01

For gaseous parameters, Table 5.4 lists the sampling instruments and analysis methods.

Table 5.4 Instrumentation for Gaseous Pollutants

Parameter	Instrument	Analysis Method	Frequency
NO	TECO 42C	Chemiluminescent	Continuous
NO_2	TECO 42C	Chemiluminescent	Continuous
NO_x	TECO 42C	Chemiluminescent	Continuous
O_3	TECO 49C	Ultraviolet	Continuous
CO	TECO 48C	Infrared	Continuous

The following applies to meteorological measurements.

Table 5.5 Equipment for Meteorological Measurements

Parameter	Instrument or Sampling Method	Frequency
Wind Speed	SONIC	Continuous
Wind Direction	SONIC	Continuous
Temperature	Thermistor	Continuous
Relative Humidity	Hydroscopic Capacitor	Continuous
Barometric Pressure	Piezoresistive Sensor	Continuous

Carbonyls are sampled using DNPH cartridges and analyzed with HPLC according to EPA Method TO-11a. The target compound list is provided in Table 5.6 below.

Table 5.6 Target Compound List for Carbonyl Sampling

Compound	AIRS Code
acetaldehyde	43503
acetone	43551
benzaldehyde	45501
crotonaldehyde	43516
formaldehyde	43502
hexanal	43517
methacrolein	43515
m-tolualdehyde	45504
n-butyraldehyde	43510
propionaldehyde	43504
valeraldehyde	43518

Volatile organic compounds are monitored using Summa canisters samples followed by laboratory GCMS analysis as well as by an on-site realtime GC. The methods and sampling frequencies are provided in Table 5.7 below.

Table 5.7 VOC Methods and Sampling Frequencies

Sampling Method	Analytical Method	Frequency
Method TO-14a	GC/FID	Hourly
TO-15 (24-hr)	GC/MS	Every 6 day
TO-15 (40 min)	GC/MS	Once a week

The targeted compounds are listed below:

Table 5.8 PAMS Target Compounds List

Compound	AIRS #
ethene	43203
acetylene	43206
ethane	43202
propene	43205
propane	43204
isobutane	43214
1-butene	43280
n-butane	43212
trans-2-butene	43216
cis-2-butene	43217
3-methyl-1-butene *dropped 1995*	43282
isopentane	43221
1-pentene	43224
n-pentane	43220
isoprene	43220
trans-2-pentene	43226
cis-2-pentene	43227
2-methyl-2-butene *dropped 1995*	43227
2,2-dimethylbutane	43227
cyclopentane	43242
4-methyl-1-pentene *dropped 1995*	43234
cyclopentene *dropped 1995*	43283
2-,3-dimethylbutane	43284
2-methylpentane	43285
3-methylpentane	43230
2-methyl-1-pentene *dropped 1997*	43246
n-hexane	43231
trans-2-hexene *dropped 1995*	43289
cis-2-hexene *dropped 1995*	43290
n-hexene *added 1997*	43245
Methylcyclopentane	43262
2,4-dimethylpentane	43247
benzene	45201
cyclohexane	43248
2-methylhexane	43263
2,3-dimethylpentane	43291
3-methylhexane	43249
2,2,4-trimethylpentane	43250
n-heptane	43232
Methylcyclohexane	43261
2,3,4-trimethylpentane	43252
toluene	45202
2-methylheptane	43960
3-methylheptane	43253
n-octane	43233
ethylbenzene	45203
m,p-xylene	45109
styrene	45220
o-xylene	45204
nonane	43235
isopropylbenzene	45210
n-propylbenzene	45209
m-ethyltoluen *added 1995*	45212
p-ethyltoluene *added 1995*	45213
1,3,5-trimethylbenzene	45207
o-ethyltoluene *added 1995*	45211
1,2,4-trimethylbenzene	45208
n-decane	43238
1,2,3trimethylbenzene *added 1995*	45225
1,3-diethylbenzene *added 1995*	45218
1,4 diethylbenzene *added 1995*	45219
n-undecane	43954
dodecane *added 1997*	45218
tnmoc	43102
pamshc	43000

All parameters except for the summer intensive VOCs and carbonyls are run on a continuous basis year round. VOC system startup is scheduled for May 15th each year. The carbonyl's schedule of eight (3 hour) samples every third day ended in September 2005 as the requirement was dropped by EPA to reduce overall cost of the PAMS program. The VOC intensive sampling ends in September after the final system audit. Twenty-four hour carbonyl and canister samples are continued on a six day schedule throughout the year.

The on-site GC system consists of a Markes Unity Air Server-Thermal Desorber System integrated with an Agilent GC. The Summa canisters are shipped to the Rensselaer laboratory facility and analyzed with an Entech preconcentrator with a Varian GCMS System.

6.0 NCore Sites

The National Core Monitoring Program (NCore) is an EPA initiative to redesign a portion of the National air monitoring network. The existing compliance oriented network is set up with a parameter specific design that is targeted at the relatively high concentrations near the NAAQS. The data from this network is not as accurate at the low levels needed for trends analysis and model validation. The single parameter design is also not well suited to multi-pollutant health studies, integrated model assessment or the analysis of source attribution through comparisons of co-pollutants from sources to receptors.

The NCore program has been designed around approximately 75 sites nationwide that are sited to represent large urban areas away from significant individual sources. A smaller subset of these sites will be located in rural areas. The NYSDEC in conjunction with EPA Region 2 office has suggested three of the NYSDEC monitoring sites for inclusion in this new network. The sites are:

AQS ID #	Site Name	General Location
36-081-0124	Queens College	Located in Kew Gardens, Queens, NY
36-055-1007	Rochester	Located Southeast of Rochester, NY
36-101-0003	Pinnacle	Located 15 mi. Southwest of Corning, NY

Pinnacle is the only rural site of the three and it was also selected as one of ten pilot NCore sites. This site has hosted monitoring appropriate for the objectives of the NCore program due to its involvement with several research programs so it was well suited to take on the more difficult monitoring parameters required from the NCore monitoring program. SUNY Albany ASRC researchers have been making low level trace gas measurements at this site for the past ten years. Home built analyzers for low level CO and NO_y were employed. These prototype instruments required extensive post sampling data processing. They measured "true" NO_2 using direct photolysis method. Commercially available instruments are used for monitoring low level SO_2, continuous particulate sulfate, and OC/EC particulate carbon. In addition, real-time ammonia data are collected using two different methods - NO chemiluminescence with catalytic conversion, and ion mobility spectrometer.

6.1 NCore Monitoring Objectives

a.) Timely Reporting of Data to the Public
b.) Support for Development of Emission Strategies
c.) Accountability of Emission Strategy Progress
d.) Support for Long-Term Health Assessments
e.) Compliance
f.) Support to Scientific Studies
g.) Support to Ecosystem Assessments

6.2 NCore Primary Monitoring Parameters

The NCore sites are required to be sited in conjunction with the $PM_{2.5}$ FRM network, the $PM_{2.5}$ speciation network and the PMcoarse network. These parameters will be supplemented with the NCore specific parameters that currently include NO_y, Low Level CO and Low Level SO_2.

NO_y which is defined as the sum of all reactive nitrogen oxides includes NO, and NO_2, and other nitrogen oxides referred to as NO_z. The NCore program requires NO_y monitoring because it is the best indicator of the results from NO_x reduction strategies, it is valuable for ecosystem assessments, it is important for model evaluation and it supports NO_2 estimates for health effects studies.

CO is important to the NCore program because it is used in model evaluation, it is a surrogate for many combustion related pollutants, it is included in health effect studies and it can be used to assess control programs. CO is also monitored under the existing criteria monitoring program but NCore requires more accuracy at lower concentrations and siting that makes the data more representative of wider areas than the existing network.

SO_2 is important for model evaluation because of its role in sulfate formation which is a large percentage of $PM_{2.5}$ mass particularly in the Northeast. SO_2 is also important for some health effect studies and like CO it must be monitored accurately at low concentrations to meet the objectives of the NCore program.

Nitric acid (HNO_3) and ammonia (NH_3) are both compounds of interest in EPA's NCore program but they are not yet required because the sampling methodology is not yet fully developed. Both compounds are useful for model evaluation because of their contribution to PM formation.

To meet the monitoring requirements, trace level instruments for SO_2 and CO as well as NO_y measurements were all operational at the three NCore sites since the beginning of 2011.

7.0 Acid Deposition Monitoring Network

At the end of 2012, NYSDEC discontinued the existing acid rain monitoring program and transitioned 7 monitoring locations to the National Acid Deposition Program (NADP). The old acid deposition program was established in response to the State Acid Deposition Control Act (SADCA) in 1985. This program was designed to provide measurements of acid deposition and related quantities necessary to assess the effectiveness of sulfur control policy and other strategies aimed at reducing the effects of acid rain. By all measures, the monitoring program, as well as the NO_x and SO_x control strategies has improved the environment. For example, the deposition of Sulfate statewide has decreased by more than 60% since the monitoring program began and the concentrations of acidic pollutants continue to decline.

The transition to the NADP will result in savings to NYSDEC, provide better and more useful data for use in regulation development and will allow for the comparison of data from New York with other acid sensitive regions across the country. Additionally, because the NADP program provides a uniform operational framework, the data from existing NADP sites within New York and in neighboring states can be utilized in the analysis of deposition in New York.

The NADP program uses IC, ICP and FIA to determine the concentrations of free acidity (H^+ as pH), conductance, calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^+), potassium (K^+), sulfate ($SO4^{2-}$), nitrate (NO_3^-), chloride (Cl^-), and ammonium (NH_4^+). The data and reports from this program from the 7 NYSDEC sites as well as other sites in New York and in the United States can be obtained from: http://nadp.sws.uiuc.edu/data/

The NYSDEC monitoring locations that were transitioned to the NADP in January 2013 and November 2015 are:

NY06 Bronx
NY28 Piseco Lake
NY43 Rochester (Established 2013)
NY59 Wanakena

NY92 Amherst (Established 2013)
NY93 Paul Smith's College
NY94 Nick’s Lake (Established 2015)

The other NADP sites currently operating in New York but sponsored by other organizations are:

NY01 Alfred
NY08 Aurora Research Farm
NY10 Chautauqua
NY20 Huntington Wildlife
NY22 Akwesasne Mohawk-Fort Covington
NY52 Bennett Bridge
NY67 Ithaca (NADP/AirMoN)
NY68 Biscuit Brook
NY96 Cedar Beach, Southold
NY98 Whiteface Base (Previously operated by NYSDEC)
NY99 West Point

Figure 7.1 shows NADP sites operated by DEC as well as other collaborating partners in New York State.

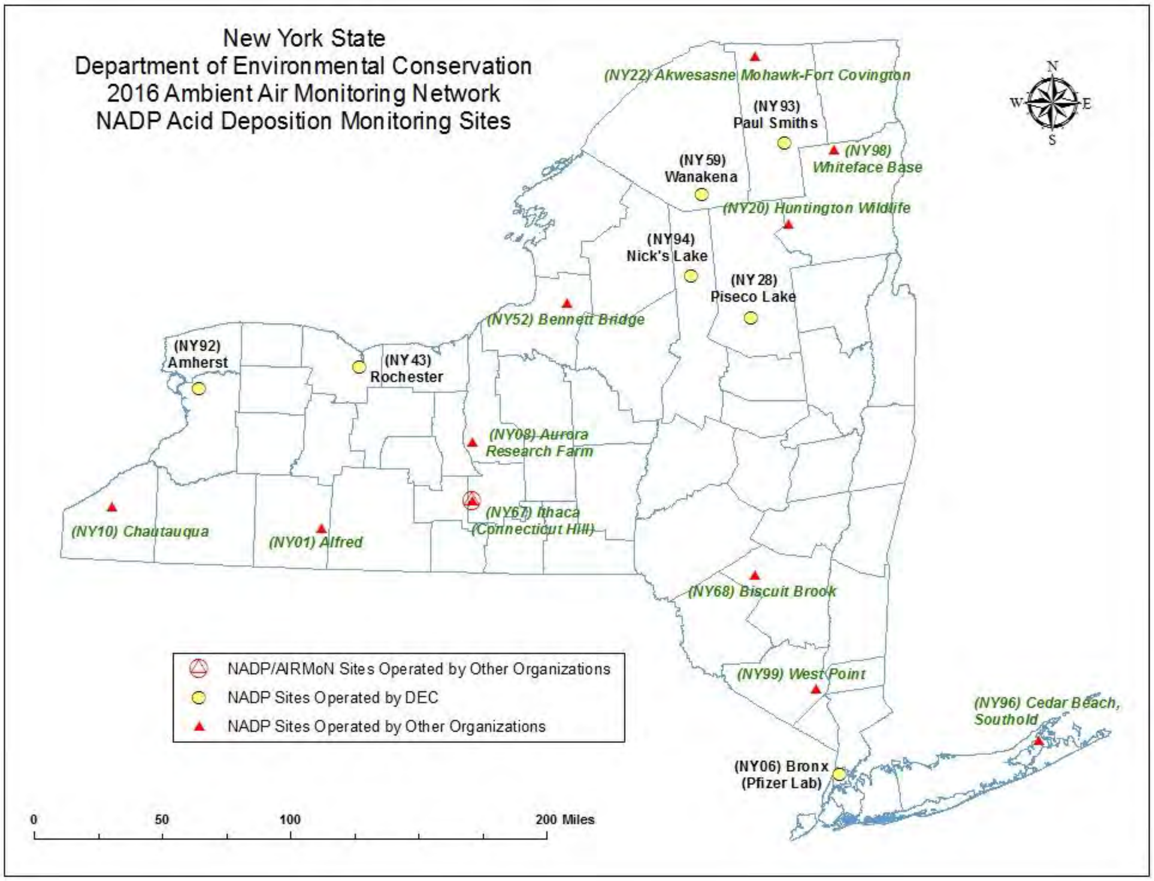

Figure 7.1 Map of Acid Deposition Monitoring Sites in New York State

8.0 Anticipated Changes in the Next 18 Months

8.1 Special Purpose Monitors

8.1.1 Tonawanda Community Air Quality Study

Although the original study funded by EPA concluded in 2008, NYSDEC has continued sampling at two of the four study sites. The Tonawanda II site at Brookside Terrace will remain in operation as part of the permanent network, while the Grand Island Blvd. industrial site will continue to be maintained as a special purpose monitor, resources permitting.

8.1.2 South Albany Neighborhood Air Quality Monitoring

In response to community concerns, in 2015, NYSDEC added an air toxics monitor near the existing long-term PM monitoring site in the south Albany neighborhood at 274 S. Pearl St., Albany, NY. Samples are collected on a one in six-day schedule for the analysis of VOCs and carbonyls. The data will be useful in assessing if industrial activities in the Port area significantly impact the neighborhood air quality when compared to cities of similar size with normal urban emissions.

As part of the ongoing effort to assist those who live, work and play in the South End Neighborhood, the NYSDEC has committed to working with local community groups to design and implement an intensive neighborhood-monitoring plan for a community air quality study. Staff have been working to purchase monitoring equipment to be in place and running in 2017. The study will utilize both fixed monitoring sites and portable instruments to evaluate the impacts of nearby roadways and commercial processes. Updated information about the Albany South End Study can be found on the study webpage: http://www.dec.ny.gov/chemical/108978.html

The NYSDEC will also continue to evaluate sources of emissions in the area by using the FLIR camera at facilities as well as by conducting on-the-spot air quality inspections using portable air quality monitoring instruments to assess odor issues.

8.1.3 SO_2 Data Requirements Rule Continued Implementation

The EPA promulgated the SO_2 Data Requirement Rule (DRR) 80 FR 51052 on September 21, 2015. This rule provides three options to determine if sources that have reported SO_2 emissions over 2000 tons per year are in violation of the 2010 Primary SO_2 standard. Two facilities in New York elected to monitor the air quality near their respective sources of emissions to demonstrate that there were no exceedances of the primary SO_2 NAAQS at the location, or at nearby locations that the NYSDEC determined were areas of maximum impact utilizing dispersion modeling. In 2017, upwind and downwind SO2 monitors were established at each facility. The data from these monitors is available on the NYSDEC website and it is archived in the EPA AQS database. The sites are operated by the facilities or by their contractors but the NYSDEC provides quality assurance oversite of their work.

8.1.4 Miscellaneous Projects

Monitoring staff provide technical support and maintenance for several portable field instruments. The advanced leak detection and repair (LDAR) equipment purchased by EPA for NYSDEC has proven to be extremely valuable during recent field deployments at petroleum storage facilities and compressor stations. In addition to the Forward Looking Infrared (FLIR) camera, staff maintain and calibrate H_2S real-time instruments as well as train Regional staff for their proper field use. Also available for Regional field deployment are wood smoke monitoring kits that measure black carbon, $PM_{2.5}$ and wind speed/direction. Laboratory staff prepare and ship evacuated canisters fitted with orifice flow devices to the Regions as needed for whole air grab sampling. These samples are returned to the laboratory facility for VOC analysis.

8.2 Proposed Changes and Additions at Existing Sites

As part of the requirements specified in the revised Monitoring Regulations Parts 53 and 58, a network assessment was performed to determine "if the network meets the monitoring objectives defined in appendix D to this part, whether new sites are needed, whether existing sites are no longer needed and can be terminated, and whether new technologies are appropriate for incorporation into the ambient air monitoring network." As a result of this exercise, NYSDEC is proposing the following modifications to the existing network.

8.2.1 PAMS Network Waiver

The Ozone National Ambient Air Quality Standard (NAAQS) promulgated in October, 2015 changed the network design of the PAMS program. The new regulation requires PAMS stations at National Core Monitoring program (NCore) sites in urban areas with populations greater than 1 million without regard to current attainment status. This network design results in two PAMS sites in New York, one at the NCore site in Queens and one at the NCore site in Rochester.

The NYSDEC is requesting a waiver to move the Queens PAMs monitor to the site where the existing PAMS station is located in the Bronx. The Bronx location was originally selected because the NOx and VOC concentrations were higher than at other locations in the CBSA. This is still the case and in order to match the historic data and to maintain data capture where concentrations are highest in the CBSA the PAMS site should remain in the Bronx.

The NYSDEC is also requesting a waiver to move the PAMS site that is required to be installed at the Rochester NCore site to a new location on the north shore of Long Island. The preliminary 2016 ozone design of 0.063 parts per million for the Rochester area is well below the 2015 ozone NAAQS of 0.070 parts per million. The closest nonattainment area, the New York City metropolitan area, has a preliminary 2016 ozone design value of 0.085 parts per million. All other areas in New York State downwind of the Rochester area are well below the 2015 ozone NAAQS. Design values in both areas of New York State have been relatively constant over the past three years.

8.2.2 Queens College Near-Road NO_2

In March 2013, EPA issued a final rule to revise the deadlines by which the near-road monitors within the NO_2 monitoring network are to be operational. States and local agencies were required to begin operating the near-road component of the NO_2 network in phases between January 1, 2014 and January 1, 2017. This replaced the 2010 rule requirement that originally required all new NO_2 monitors to begin operating on January 1, 2013. The Queens Near-Road site became operational on April 1st 2017 following minor logistical challenges relating to power supply.

8.2.3 Wallkill Lead Monitoring

In November 2008, EPA published the final rule for the revision of the NAAQS for lead. Monitoring agencies are required to monitor ambient air near lead sources which are expected to or have been shown to have a potential to contribute to exceed the NAAQS. At a minimum, monitoring agencies must monitor near lead sources that emit 1.0 ton per year (tpy) or more. Monitoring is also required at urban NCore sites.

Currently there are two Pb-TSP monitoring sites (one with collocated sampling) in operation in Middletown, where a lead acid battery recycling facility is located. These source oriented monitoring sites (AQS site ID # 36-071-3001, 36-071-3002) are in place as the facility has the potential to contribute to a 3-month average lead concentration in ambient air in excess of the level of the NAAQS. Routine data review showed that during the first quarter of 2011, there were a couple of sample dates that showed high levels of lead, which would lead to contravention of the new standard. Investigations at the facility led to enforcement actions although specific causes for the observed values were not discovered.

In October 2016, the facility in Wallkill installed new emission control technologies that has led to reduced emissions of lead in the environment. As a result, the NYSDEC is proposing to close the Pb-TSP site at Ballard Road and to move the co-located sampler to the Wakefern Food site at the end of 2017. The Ballard Road site was chosen for potential closure due to difficulties with the sites electrical systems, and because the site has historically shown lower values that the Wakefern Food site. This site closure is contingent on the monitored values at both sites showing continued reductions in lead during 2017. Additionally, the NYSDEC is proposing to transition the monitoring method at Wakefern food in 2018 from high volume TSP sampling to low volume PM-10 or low volume TSP sampling.

8.2.4 PM$_{2.5}$ Collocation

As part of the continuing effort to provide a robust air quality network, the NYSDEC is planning on installing an additional PM$_{2.5}$ instrument at the Amherst, NY site. This additional monitor would collocate with existing PM$_{2.5}$ instrumentation, and aid in ensuring that the site continues to provide precise and reliable data. The NYSDEC plans on opening the site in the summer of 2017.