Commonwealth of Massachusetts
2009 Air Quality Report

Department of Environmental Protection
Bureau of Waste Prevention
Division of Planning and Evaluation

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List of Abbreviations

AAB ..... Air Assessment Branch
AQS ..... Air Quality System
AQI…… ... Air Quality Index
BAM ..... Beta Attenuation Monitor
BC ..... Black Carbon
BP..... Barometric Pressure
CAA ..... Clean Air Act
CFR..... Code of Federal Regulations
CO ..... Carbon Monoxide
CO_2..... Carbon Dioxide
FEM ..... Federal Equivalent Method
FRM ..... Federal Reference Method
IMPROVE .... Interagency Monitoring of Protected Visual Environments
MassDEP ..... Massachusetts Department of Environmental Protection
NAAQS..... National Ambient Air Quality Standards (for criteria pollutants)
NADP..... National Atmospheric Deposition Program
NAMS ..... National Air Monitoring Stations
NATTS..... National Air Toxics Trends Station
NCore……..National Core Monitoring Network
NESCAUM .... Northeast States for Coordinated Air Use Management
NOAA ..... National Oceanic and Atmospheric Administration
NO..... Nitric Oxide
NO_x ..... Nitrogen Oxides
NO_y ..... Total Reactive Oxidized Nitrogen
NO_2 ..... Nitrogen Dioxide
NO_3 ..... Nitrate
NPN ..... NOAA Profiler Network
O_3 ..... Ozone
PAH ..... Polycyclic Aromatic Hydrocarbon
PAMS..... Photochemical Assessment Monitoring Stations
Pb ..... Lead
pH..... Concentration of hydrogen cations (H^+) in solution (an indicator of acidity)
ppb ..... parts per billion by volume
ppm ..... parts per million by volume
$PM_{2.5}$ ..... Particulate matter ≤ 2.5 microns aerodynamic diameter
PM_{10} ..... Particulate matter ≤ 10 microns aerodynamic diameter
PQAO..... Primary Quality Assurance Organization
PSI..... Pollutant Standards Index
QA/QC ..... Quality Assurance and Quality Control
RASS ..... Radio Acoustic Sounding System
RH..... Relative Humidity
SIP..... State Implementation Plan
SLAMS ..... State and Local Air Monitoring Stations
SO_2 ..... Sulfur Dioxide
SO_4 ..... Sulfate
Solar Rad…... Solar Radiation
TSP..... Total Suspended Particulates
ug/m^3 ..... micrograms per cubic meter
EPA..... United States Environmental Protection Agency
VOCs ..... Volatile Organic Compounds
WS/WD..... Wind Speed/Wind Direction

Section I
Ambient Air Monitoring Program

Program Overview

Introduction

The Massachusetts Department of Environmental Protection (MassDEP) is the state agency responsible for monitoring outdoor air quality in Massachusetts and developing regulatory programs to reduce emissions of pollutants that adversely affect public health, welfare, and the environment.

MassDEP's Air Assessment Branch (AAB) operates an extensive network of air monitoring stations throughout the Commonwealth. During 2009, MassDEP operated a network of 29 monitoring stations located in 21 cities and towns, and oversaw the operation of a four-station source-oriented industrial network in the Boston area that is privately funded. MassDEP also received data from the Wampanoag Tribe of Gay Head (Aquinnah), which began operating an ozone monitor in 2003 on Martha's Vineyard. The tribal air quality data can be found at www.epa.gov/ne/aqi/ .

MassDEP submits all ambient air quality data to the national Air Quality System (AQS) database that is administered by the U.S. Environmental Protection Agency (EPA). In addition, in April 2009 MassDEP launched a new *MassAir Online* website that allows users to point and click on a map of the state to find current, near real-time air quality data for any location in the MassDEP air monitoring network. MassAir Online is found at www.mass.gov/dep/air/index.htm

Why is Air Quality Data Collected?

Ambient air quality data is used for a number of purposes, including:

- Provide information about air quality to the public;
- Provide short-term and long-term information regarding air pollution and public health;
- Verify compliance with National Ambient Air Quality Standards;
- Assess the effectiveness of current air pollution control regulations and initiatives;
- Support development of policies and regulations aimed at reducing air pollution;
- Support long-term trend analysis and special research; and
- Fulfill requirements to report ambient air quality data to EPA

What is Monitored?

MassDEP monitors parameters in the following categories:

Criteria pollutants are subject to National Ambient Air Quality Standards (NAAQS). The criteria pollutants monitored are:

- sulfur dioxide (SO_2)
- ozone (O_3)
- carbon monoxide (CO)
- nitrogen dioxide (NO_2)
- lead (Pb)
- particulate matter $\leq$10 microns (PM_{10})
- particulate matter $\leq$ 2.5 microns ($PM_{2.5}$)

Non-criteria pollutants do not have National Ambient Air Quality Standards, but can contribute to the formation of ozone and particulate matter and/or be toxic. The non-criteria pollutants monitored are:

- nitric oxide (NO)
- total nitrogen oxides (NO_x)
- total reactive oxidized nitrogen (NO_y)
- total suspended particulates (TSP)
- volatile organic compounds (VOCs) – ozone precursors and reaction product chemicals
- black carbon (i.e., soot)
- acid deposition – measured as pH and conductivity of precipitation
- toxics – health-relevant VOCs, aldehydes and metals

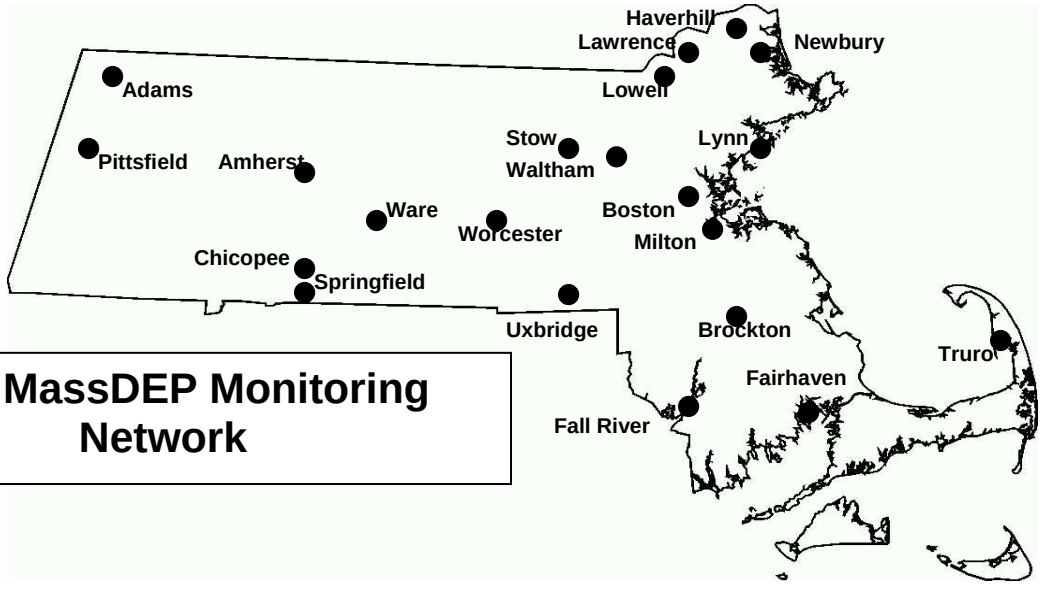
Meteorological parameters monitored are:

- wind speed/wind direction (WS/WD)
- relative humidity (RH)
- temperature (TEMP)
- barometric pressure (BP)
- solar radiation (Solar Rad)
- upper air wind and temperature (Wind Profiler and RASS)
- total B band ultraviolet radiation (UVB)
- precipitation (PRECIP)

Monitoring Station Locations

Monitoring stations are sited to provide data for various purposes. Some are located in "hot spots" where maximum pollutant concentrations are expected, while others are located in areas that will provide data that is representative of larger geographical areas. Local topography and the location of pollutant sources are both factors that determine how well a particular monitor's location will represent an area.

Networks of monitors are located throughout the state. These networks are designed to reflect pollutant concentrations for all of Massachusetts. Section III of this report contains data summaries for each pollutant measured and maps showing the monitor locations for each network. Appendix A contains a list of monitor locations. The map below shows Massachusetts cities and towns where air monitors were located during 2009.



2009 MassDEP Monitoring Network

National Core Monitoring Network (NCore)

NCore is a new national network of comprehensive monitoring stations designed to collect a full range of air quality information at one strategic location per state, including particles, pollutant gases and meteorology, which will be used to supplement emissions inventories, characterize local air quality, and provide data for evaluating trends. The goals of the NCore network are to improve the scientific and technical competency of the nation's air monitoring networks and add increased value in protecting public health and the environment.

MassDEP has designated the Harrison Avenue/Roxbury (Boston) site as the Massachusetts NCore site because of its urban neighborhood location and because of the comprehensive array of measurements already taking place there. As a step in meeting NCore requirements, MassDEP has deployed trace-level CO and SO_2 instruments at the Harrison Avenue NCore site. The completed NCore monitoring station is expected to be fully operational in 2010 prior to the January 1, 2011 deadline. The NCore site will measure criteria pollutants (including ozone and PM2.5) and air toxics, as well as precursor and other pollutants to help explain the formation and source of criteria pollutants. It is clear that even very low levels of air pollution can be associated with adverse environmental and human health effects. As a result, new approaches to air monitoring are needed to measure these low levels and to incorporate these measurements with other, more conventional data, into comprehensive assessments of human and environmental health. The NCore network will play a key role by measuring air pollutants in lower concentration ranges than in the past.

For Further Information

For further information about this report, please contact MassDEP's Air Assessment Branch. For information about general air quality topics, please contact MassDEP's Bureau of Waste Prevention or visit MassDEP's website at www.mass.gov/dep/air. You can also contact one of MassDEP's Regional Offices. To find out what region you are in, go to www.mass.gov/dep/about/regional.htm. To view online air quality data for Massachusetts and other states, go to EPA's website at www.epa.gov/air/data.

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National Ambient Air Quality Standards

Below is a table of EPA's most current National Ambient Air Quality Standards. Please note that the hourly standards for Sulfur Dioxide and Nitrogen Dioxide were added after the 2009 measurement year. **Primary Standards** are designed to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. **Secondary Standards** are designed to protect public welfare, including protection against decreased visisbility, damage to crops, vegetation, and buildings.

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 $\mu g/m^3$	Rolling 3-Month Average	Same as Primary	
	1.5 $\mu g/m^3$	Quarterly Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [2]	None	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour [3]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual [4] (Arithmetic Average)	Same as Primary	
	35 $\mu g/m^3$	24-hour [5]	Same as Primary	
Ozone	0.075 ppm	8-hour [6]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour [1]
	0.14 ppm	24-hour [1]		
	75 ppb [7]	1-hour	None	

$\mu g/m^3$ = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion; mg/m^3 = milligrams per cubic meter

[1] Not to be exceeded more than once per year.
[2] 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 (0.100 ppm).
[3] Not to be exceeded more than once per year on average over 3 years.
[4] To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
[5] 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 35 µg/m3.
[6] 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 0.075 ppm.
[7] 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 (0.075 ppm).

Pollutant Health Effects and Sources

Ozone (O_3)

- Ground-level, or Tropospheric O_3 and Stratospheric O3 in the upper atmosphere are the same chemical compound, just found at different places in the atmosphere. Stratospheric O_3 found at greater than 30,000 feet above the surface of the earth is beneficial to all life because it filters out the sun's harmful UV radiation before it reaches the earth's surface. Ground-Level O3 on the other hand is a health and environmental problem. This report pertains exclusively to ground-level O3.
- O3 is a respiratory irritant and can reduce lung function and cause asthma attacks, nasal congestion, and throat irritation, and reduce resistance to infection. It can inflame and damage (possibly permanently) cells that line the lungs, and aggravate chronic lung diseases. In addition, a number of studies have found a strong link between increases in ground-level O_3 and increased risk of premature death.
- O_3 is toxic to vegetation, inhibiting growth and causing leaf damage.
- O_3 deteriorates materials such as rubber and fabrics.
- Ground-level O_3 is unique in that it is formed by the reactions that occur between certain pollutants in the presence of intense, high-energy sunlight during the hot summer months. The complexity of the reactions and the amount of time needed to complete these reactions results in the buildup of ground-level ozone concentrations far downwind from the original source of the precursors.
- Sources of ground-level O_3 precursors, i.e., nitrogen oxides and hydrocarbons, include motor vehicles, power plants and other industrial sources.

Carbon Monoxide (CO)

- CO binds with hemoglobin in the blood, reducing the amount of oxygen carried to organs and tissues.
- Symptoms of high CO exposure include shortness of breath, chest pain, headaches, confusion, and loss of coordination. The health threat is most severe for those with cardiovascular disease.
- Motor vehicle emissions are the largest source of CO, which is produced from incomplete combustion of carbon in fuels.
- Industrial processes and non-transportation fuel combustion are also sources of CO.

Sulfur Dioxide (SO_2)

- SO_2 combines with water vapor to form acidic aerosols harmful to the respiratory tract, aggravating symptoms associated with lung diseases such as asthma and bronchitis.
- SO_2 is a primary contributor to acid deposition. Impacts of acid deposition include: acidification of lakes and streams, damage to vegetation, damage to materials, and diminution of visibility.
- SO_2 is a product of fuel combustion (e.g., the burning of coal and oil that contains sulfur). Sources include heat and power generation facilities, and petroleum refineries.

Nitrogen Dioxide (NO_2)

- NO_2 is formed from the oxidation of nitric oxide (NO). Major sources of NO are fuel combustion, space heating, power plants and motor vehicles.
- NO_2 lowers resistance to respiratory infections and aggravates symptoms associated with asthma and bronchitis.
- NO_2 contributes to acid deposition. Impacts of acid deposition include: acidification of lakes and streams, damage to vegetation, damage to materials, and diminution of visibility.
- NO_2 and NO contribute to the formation of ozone.

Particulate Matter (PM_{10} and $PM_{2.5}$)

- Particulate matter is tiny airborne particles or aerosols, which include dust, dirt, soot, smoke, and liquid droplets. Fine particulate matter (mostly below 2.5 microns in size) are not only the result of direct emissions, but can be formed in the atmosphere by chemical reactions involving gaseous pollutants.
- The numbers 2.5 and 10 refer to the particle size (actually the particles equal or less than that size), measured in microns, collected by the monitors. Several thousand $PM_{2.5}$ particles could fit on the period at the end of this sentence.
- The small size of these particles allows easy entry into the human respiratory system. Long-term exposure causes the particles to accumulate in the lungs and affects breathing and produces respiratory symptoms. The small particles can migrate through the lungs and into the circulatory system and potentially produce cardio-vascular symptoms, as well as impacts from toxic components contained in the particulate matter.
- Particulate matter causes soiling and corrosion of materials.
- Particulate matter contributes to atmospheric haze that degrades visibility.
- Sources of particulates include industrial process emissions, motor vehicles, incinerators, and power plants.

Lead (Pb)

- Lead is an elemental metal that is found in nature.
- Lead enters the atmosphere from the incineration of lead containing materials and from the manufacture and processing of lead containing products or materials like storage batteries, smelting and paint removal.
- Exposure to lead can occur by inhalation or ingestion with food, water, soil or dust particles.
- Children, infants, and fetuses are the most susceptible to the effects of lead exposure.
- Lead causes mental retardation, brain damage, and liver disease. It may be a factor in high blood pressure and damages the nervous system.

Public and Industrial Network Descriptions

2009 Public Monitoring Network

MassDEP operates a public ambient air monitoring network.

Network Size

- 29 monitoring stations
- 21 cities and towns with monitoring stations

Number of Continuous Monitors

Continuous monitors measure air quality 24 hours per day. The data are reported as hourly means.

- Criteria pollutant monitors measure pollutants for which National Ambient Air Quality Standards (NAAQS) have been set.
  - 6 – CO (carbon monoxide), which includes 2 trace-level CO monitors
  - 11 – NO_2 (nitrogen dioxide). NO (nitric oxide) and NO_x (total nitrogen oxides) also are measured by these monitors.
  - 15 – O_3 (ozone)
  - 6 – SO_2 (sulfur dioxide), which includes 2 trace-level SO_2 monitors

- Meteorological monitors track weather conditions.
  - 13 – BP (barometric pressure)
  - 13 – RH (relative humidity)
  - 13 – Solar Rad (solar radiation)
  - 14 – TEMP (temperature)
  - 13– WS/WD (wind speed/wind direction)
  - 1 – Profiler (this monitor measures WS/WD and TEMP at various altitudes, which aids in the analysis of pollutant transport)
  - 1 – UVB (B Band Ultra-violet Radiation)
  - 2 – Precipitation

- Other Monitors
  - 2 – NO_y (Total Reactive Oxidized Nitrogen)
  - 4 – PAMS (photochemical assessment monitoring station). These monitors measure VOCs (volatile organic compounds) using automated gas chromatographs (GCs) on an hourly basis during the summer.
  - 10 – $PM_{2.5}$ BAMs (particulate matter – 2.5 microns beta attenuation monitors)
  - 3 – Black Carbon

Number of Intermittent Monitors

Intermittent monitors take discrete samples for a specific time period. The samples are taken every day, every third day, or every sixth day. The data is averaged in 3-hour or 24-hour intervals.

- Criteria pollutant monitors measure pollutants that have National Ambient Air Quality Standards (NAAQS).
  - 1 – Pb (Lead)
  - 6 – PM_{10} (particulate matter – 10 microns)
  - 15 – $PM_{2.5}$ FRM (particulate matter – 2.5 microns Federal Reference Method)

- Non-criteria pollutant monitors measure pollutants that do not have NAAQS.
  - 4 – PAMS (photochemical assessment monitoring station). These monitors measure VOCs (volatile organic compounds) on a less intensive schedule than during the summer months. Samples are returned to the laboratory for analysis.
  - 2 – Toxics. These monitors measure health-relevant VOCs.
  - 2 – Speciation. These monitors measure for $PM_{2.5}$, nitrates, and organics.
  - 1 – PM_{10} (particles for toxic metals)
  - 1 – Acid Deposition - Precipitation is collected and analyzed for conductivity and acidic compounds that are harmful to the environment. This monitor, located in Waltham, is part of the National Atmospheric Deposition Program (NADP). Two other monitors in Massachusetts are also part of the NADP. They are located in Truro and Ware and are not operated by MassDEP.

2009 Industrial Monitoring Network

There is one industrial monitoring network that submits data to MassDEP. The data must be collected using quality assurance requirements established by MassDEP and EPA.

Network Size

- 4 monitoring stations
- All are located in the Boston area

Number of Continuous Monitors

Continuous monitors measure the air quality 24 hours per day. The data is reported as 1-hour averages.

- Criteria pollutant monitors measure pollutants that have National Ambient Air Quality Standards (NAAQS).
  - 1 – NO_2 (nitrogen dioxide). NO (nitrogen oxide) and NO_x (total nitrogen oxides) also are measured by this monitor.
  - 4 – SO_2 (sulfur dioxide)

- Meteorological monitors
  - 4– WS/WD (wind speed/wind direction)

Number of Intermittent Monitors

Intermittent monitors take discrete samples for a specific time period. These monitors sample every sixth day, and the data is averaged for a 24-hour interval.

- Other Monitors
  - 4 – TSP (total suspended particulates)
  - 4 – SO_4 (sulfate)

Section II
Attainment and Exceedances of Air Quality Standards

Attainment Status Summary

The Clean Air Act (CAA) of 1970 established timeframes and milestones for states to meet and maintain National Ambient Air Quality Standards (NAAQS) for criteria pollutants. EPA sets the NAAQS levels to protect public health and the environment, and must review the NAAQS every five years and may update the standards based on new scientific information. Each state is required to monitor the ambient air to determine whether it meets each standard. If the air quality does not meet a standard, the state must develop and implement pollution control strategies to attain that standard. Once air quality meets a standard, a state must develop a plan to maintain that standard while accounting for future economic and emissions growth. Taken together, these plans and control strategies constitute the State Implementation Plan (SIP).

Ozone is the only pollutant for which Massachusetts monitors indicate violations of a NAAQS. Massachusetts is in attainment for the other criteria pollutants, including carbon monoxide, lead, nitrogen dioxide, sulfur dioxide, and particulate matter (including PM_{10} and $PM_{2.5}$).

Lead

In October 2008, EPA lowered the lead standard from 1.5 ug/m³ to 0.15 ug/m³ averaged over a rolling 3-month period and set the secondary standard identical to the primary standard. EPA will retain the 1.5 ug/m³ standard until one year after designations for the new standards. EPA also established new lead ambient air monitoring requirements.

In October 2009, Massachusetts recommended to EPA that Suffolk County be designated attainment of the 2008 lead standard (based on historic lead monitoring in Boston) and that the remainder of the state be designated unclassifiable. Massachusetts also developed a plan for meeting the new lead monitoring requirements. In June 2010, EPA deferred designations for Massachusetts to no later than October 2011 so that data from newly deployed lead monitors can be considered in making final designations.

Nitrogen Dioxide

In January 2010, EPA set a new 1-hour NO_2 standard at 100 parts per billion (ppb) and retained the current annual average NO_2 standard of 53 ppb. Massachusetts must make a recommendation to EPA by January 2011 on whether the state is in attainment or nonattainment of the new standard. EPA also established new NO_2 ambient air monitoring requirements, which must begin by January 2013.

Sulfur Dioxide

In June 2010, EPA set a new 1-hour SO_2 standard at 75 ppb and revoked the existing 24-hour and annual standards. Massachusetts must make a recommendation to EPA by June 2011 on whether the state is in attainment or nonattainment of the new standard. EPA also established new SO_2 ambient air monitoring requirements, which must begin by January 2013.

Carbon Monoxide

Prior to the mid-1980s, Massachusetts was in violation of the carbon monoxide (CO) standard. However, with the adoption of numerous control programs, CO emissions have significantly decreased. The last violation in the state of the CO NAAQS occurred in 1986. In 2000, MassDEP formally requested that the EPA re-designate the cities of Lowell, Springfield, Waltham, and Worcester as attainment for CO since the CO monitoring data for those cities had been below the standard for many years. With the re-designation of these cities to CO attainment in April 2002, the entire state has remained in attainment ever since.

Particulate Matter

There are currently two NAAQS particulate matter standards in Massachusetts: PM_{10} and $PM_{2.5}$. Massachusetts has been in attainment of the PM_{10} standard for several years. The $PM_{2.5}$ standards went into effect in 1997. In December 2004, EPA designated Massachusetts "Attainment/ Unclassifiable" for $PM_{2.5}$ statewide based on three years of monitoring data. In December 2006, EPA revised the PM_{10} and $PM_{2.5}$ standards. EPA retained the 24-hour PM_{10} standard as is (at 150 ug/m³), and revoked the annual PM_{10} standard. In addition, EPA retained the annual $PM_{2.5}$ standard as is (at 15 ug/m³) and lowered the 24-hour $PM_{2.5}$ standard to 35 ug/m³ (from 65 ug/m³). In December 2008, EPA designated Massachusetts as "Attainment/Unclassifiable" statewide for the 2006 24-hour $PM_{2.5}$ standards statewide based on monitoring data.

Ozone

For decades, the NAAQS for ozone was based on the maximum 1-hour ozone concentration that occurred each day during the ozone monitoring season. 1-hour ozone concentrations are still tracked as an indicator but are no longer used for determining attainment.

In 1997, EPA promulgated a new 8-hour ozone standard that was designed to be more representative of exposure over time, rather than just the maximum concentration. The 8-hour standard was revised in 2008 to 0.075 ppm. In March 2009, Massachusetts recommended to EPA that the entire state be designated as nonattainment with the 2008 standard. The 2008 standard was challenged in Court and remanded to EPA. In January 2010, EPA proposed to revise the primary 8-hour ozone standard to a level with the range of 0.060 to 0.070 ppm and proposed a distinct cumulative, seasonal secondary standard with the range of 7-15 ppm-hours. EPA is expected to finalize the new ozone standards by the end of August 2010.

Ozone Exceedances

What Determines an Exceedance?

An ozone exceedance occurs when monitored ozone concentrations exceed the National Ambient Air Quality Standards (NAAQS). Ozone is collected as an hourly average of continuous data which is then used to determine the highest 8-hour average value for the day. An exceedance of the 8-hour standard is an 8-hour averaged value that is equal to or greater than 0.075 ppm.

The Difference Between an Exceedance and a Violation

An ozone exceedance occurs when a monitor records ambient levels of ozone above the standard. A violation of an ozone standard (as opposed to an exceedance) is based on 3-year averages of data, so monitoring an exceedance does not necessarily mean that a violation of the standard has occurred.

Violations of the 8-hour standard are determined using the annual 4^{th}-highest daily maximum 8-hour ozone value at each monitor. A violation requires a 3-year average of the annual 4^{th}-highest daily maximum 8-hour value that is equal to or greater than 0.075 ppm. In other words, the 8-hour values for each day during a year for a specific monitor are ranked from highest to lowest. Then, the 4^{th}-highest value for 3 consecutive years is averaged. If the 3-year average is 0.075 ppm or greater, a violation of the 8-hour standard has occurred at that specific monitoring site.

Ozone Exceedances and Violations During 2009

Exceedances

The Table below shows the 2009 ozone exceedances. There were 8 days when the 8-hour ozone standard of 0.075 ppm was exceeded at at least one monitoring station. There were 33 exceedances during those 8 days (i.e., multiple sites exceeded the standard on the same day).

Violations

Violations of the ozone standard are based on 3-year averages. Using data from 2007–2009, 8 sites out of 15 violated the 8-hour standard. These sites were located in Chicopee, Ware, Milton, Haverhill, Lynn, Stow, Truro, and Worcester.

2009 Ozone Exceedances (ppm)

DATE	2009 SITE	**8-HOUR >.075 ppm**	START HOUR	1-HOUR MAX (ppm) for the day
April 25, 2009	Ware	.077	12	.083
April 27, 2009	Amherst	.076	12	.082
April 27, 2009	Chicopee	.077	12	.086
April 27, 2009	Ware	.079	13	.084
April 28, 2009	Boston (Long Island)	.081	11	.089
April 28, 2009	Milton (Blue Hill)	.081	11	.092
April 28, 2009	Stow	.077	10	.084
April 28, 2009	Uxbridge	.086	11	.100
April 28, 2009	Worcester	.077	8	.084
May 21, 2009	Adams	.079	16	.082
May 21, 2009	Boston (Long Island)	.076	11	.080
May 21, 2009	Newbury	.077	13	.080
May 21, 2009	Stow	.078	12	.084
May 21, 2009	Ware	.076	11	.085
May 21, 2009	Worcester	.080	12	.089
May 22, 2009	Adams	.083	9	.087
May 22, 2009	Boston (Long Island)	.080	10	.085
May 22, 2009	Chicopee	.080	11	.087
May 22, 2009	Lynn	.079	10	.082
May 22, 2009	Milton (Blue Hill)	.081	10	.085
May 22, 2009	Newbury	.078	9	.084
May 22, 2009	Stow	.082	9	.088
May 22, 2009	Uxbridge	.082	12	.091
May 22, 2009	Ware	.079	10	.089
May 22, 2009	Worcester	.082	9	.092
August 18, 2009	Chicopee	.079	11	.102
August 18, 2009	Fairhaven	.078	10	.092
August 18, 2009	Lynn	.077	11	.090
August 18, 2009	Milton (Blue Hill)	.076	11	.088
August 18, 2009	Truro	.082	11	.095
August 18, 2009	Worcester	.082	12	.100
August 20, 2009	Chicopee	.079	11	.088
August 26, 2009	Truro	.078	10	.091

Exceedance Days and Total Exceedance Trends

Figures 1 and 2 show the trend in the number of 1-hour and 8-hour exceedance days and the total number of exceedances for each year.

Figure 1 shows a decline in the number of days in which ozone concentrations exceeded the former 1-hour standard of 0.12 ppm. Figure 2 shows that, under the 0.075 ppm 8-hour standard, there were a greater number of exceedances and exceedance days when compared to the former 1-hour standard. The 8-hour standard is designed to be more protective of public health by being more representative of exposure over time rather than a maximum concentration.

Figure 1
1-hr Ozone Exceedance Days and Total Exceedances 1987-2009
1-hour standard = 0.12 ppm (revoked June 15, 2005)

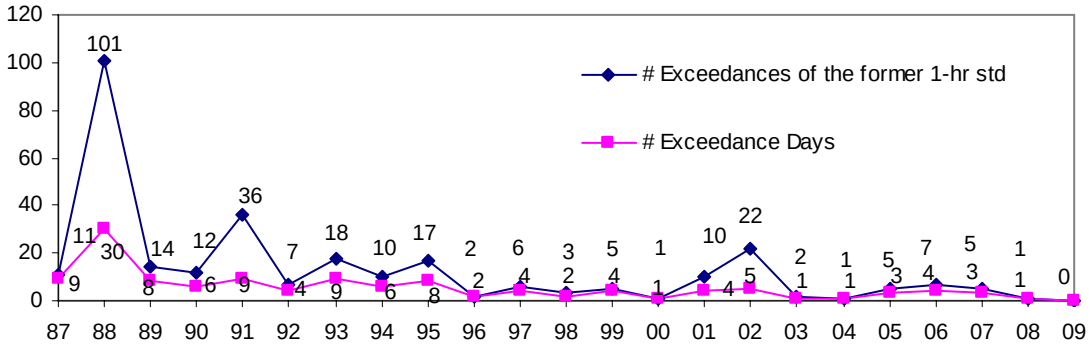
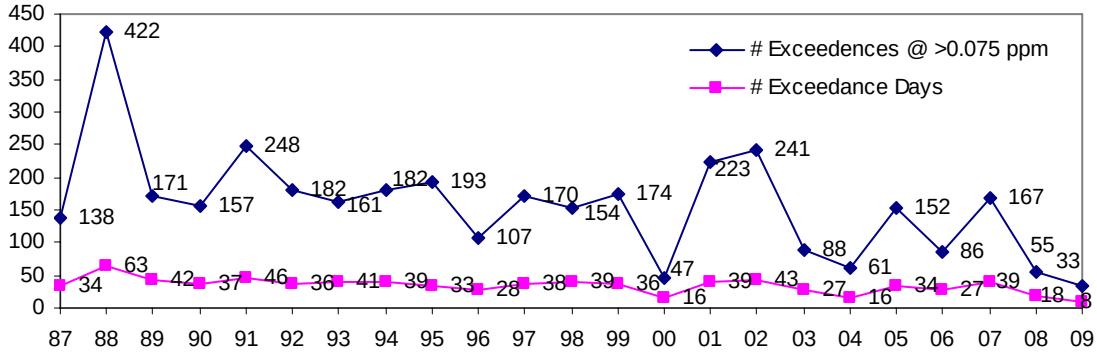


Figure 2
8-hr Ozone Exceedance Days and Total Exceedances 1987-2009
8-hour standard = 0.075 ppm
Years 1987-2007 show what exceedances
would have been with a 0.075 ppm 8-hour standard



Daily Ozone and PM Forecasts

MassDEP provides the public with daily air quality forecasts for ozone from April through September and for fine particles all year round using weather maps and meteorological factors to predict whether or not conditions will result in elevated pollution levels. The daily air quality forecasts are available from www.mass.gov/air or by calling the Air Quality Hotline (1-800-882-1497). EPA web sites that contain regional and national pollution forecasts using data that is provided by participating states are at www.epa.gov/region01/airquality/forecast.html and http://airnow.gov/. The table below describes the ratings used in the daily air quality forecasts.

Air Quality Index (AQI): Ozone

Index Values	Levels of Health Concern	Cautionary Statements
0-50	Good	None
51-100*	Moderate	Unusually sensitive people should consider reducing prolonged or heavy exertion outdoors.
101-150	Unhealthy for Sensitive Groups	Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors.
151-200	Unhealthy	Active children and adults, and people with lung disease, such as asthma, should avoid prolonged or heavy exertion outdoors. Everyone else, especially children, should reduce prolonged or heavy exertion outdoors.
201-300	Very Unhealthy	Active children and adults, and people with lung disease, such as asthma, should avoid all outdoor exertion. Everyone else, especially children, should avoid prolonged or heavy exertion outdoors.

* An AQI of 100 for ozone corresponds to an ozone level of 0.075 parts per million (averaged over 8 hours).

Air Quality Index (AQI): Particle Pollution

Index Values	Levels of Health Concern	Cautionary Statements
0-50	Good	None
51-100*	Moderate	Unusually sensitive people should consider reducing prolonged or heavy exertion.
101-150	Unhealthy for Sensitive Groups	People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.
151-200	Unhealthy	People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.
201-300	Very Unhealthy	People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.

*An AQI of 100 for particles up to 2.5 micrometers in diameter corresponds to a level of 35 micrograms per cubic meter (averaged over 24 hours). An AQI of 100 for particles up to 10 micrometers in diameter corresponds to a level of 150 micrograms per cubic meter (averaged over 24 hours).

Section III
Massachusetts Air Quality Data Summaries

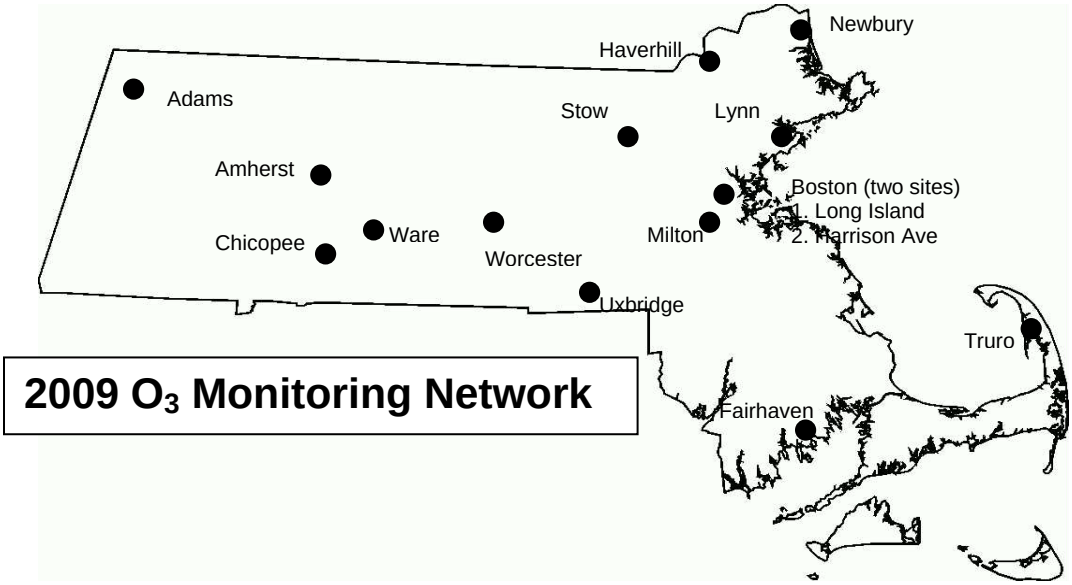
Ozone Summary

2009 Ozone Data Summary

A summary of the data collected during the 2009 ozone season (April 1 – Sept. 30) is shown below. There were 15 ozone sites in operation during 2009 in the state-operated monitoring network. All sites achieved the requirement of 75% or greater data capture for the year with the exception of Newbury, which was shut down for construction at the request of the property owner.

SITE ID	CITY	COUNTY	ADDRESS	% OBS	1ST MAX 1-HR	2ND MAX 1-HR	DAY MAX>/= 0.125	1ST MAX 8-HR	2ND MAX 8-HR	3RD MAX 8-HR	4TH MAX 8-HR	DAY MAX > 0.075
25-003-4002	Adams	Berkshire	MT GREYLOCK SUMMIT	84	0.087	0.082	0	0.083	0.079	0.075	0.066	2
25-025-0041	Boston	Suffolk	LONG ISLAND	98	0.089	0.086	0	0.081	0.080	0.076	0.075	3
25-025-0042	Boston	Suffolk	HARRISON AV	99	0.086	0.077	0	0.069	0.064	0.063	0.062	0
25-013-0008	Chicopee	Hampden	ANDERSON RD AFB	99	0.102	0.089	0	0.080	0.078	0.077	0.076	4
25-005-1002	Fairhaven	Bristol	LEROY WOOD SCHOOL	98	0.092	0.085	0	0.078	0.072	0.071	0.069	1
25-009-5005	Haverhill	Essex	CONSENTINO SCHOOL	98	0.084	0.084	0	0.075	0.074	0.073	0.070	0
25-009-2006	Lynn	Essex	390 PARKLAND	99	0.090	0.085	0	0.079	0.077	0.073	0.073	2
25-021-3003	Milton	Norfolk	BLUE HILL OBS	99	0.092	0.089	0	0.081	0.081	0.076	0.071	3
25-009-4004	Newbury	Essex	SUNSET BLVD	41	0.084	0.081	0	0.078	0.077	0.072	0.068	2
25-015-0103	North Amherst	Hampshire	N PLEASANT ST	93	0.088	0.083	0	0.076	0.073	0.071	0.070	1
25-017-1102	Stow	Middlesex	US MILITARY RES	98	0.088	0.084	0	0.082	0.078	0.077	0.071	3
25-001-0002	Truro	Barnstable	FOX BOTTOM AREA	97	0.095	0.091	0	0.082	0.078	0.073	0.071	2
25-027-0024	Uxbridge	Worcester	366 E HARTFORD	99	0.100	0.091	0	0.086	0.082	0.073	0.071	2
25-015-4002	Ware	Hampshire	QUABBIN SUMMIT	98	0.099	0.096	0	0.079	0.079	0.077	0.076	4
25-027-0015	Worcester	Worcester	WORC AIRPORT	98	0.100	0.092	0	0.082	0.082	0.080	0.077	4

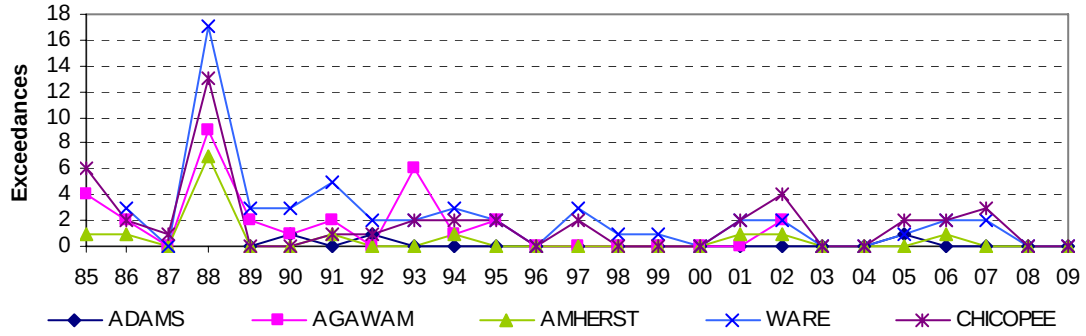
ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = PERCENTAGE OF VALID DAYS MONITORED DURING O3 SEASON **1ST, 2ND MAX 1-HR** = MAXIMUM 1-HR VALUE FOR THE 1ST & 2ND HIGHEST DAY **DAY MAX ≥ 0.125** = NUMBER OF MEASURED DAILY 1-HOUR MAXIMUM VALUES GREATER THAN OR EQUAL TO 0.125 PPM (1-HR STANDARD) **1ST, 2ND, 3RD & 4TH MAX 8-HR** = MAXIMUM 8-HR VALUE FOR THE 1ST, 2ND, 3RD & 4TH HIGHEST DAY **DAY MAX ≥ 0.075** = NUMBER OF MEASURED DAILY 8-HOUR MAXIMUM VALUES GREATER THAN OR EQUAL TO 0.075 PPM (8-HR STANDARD)

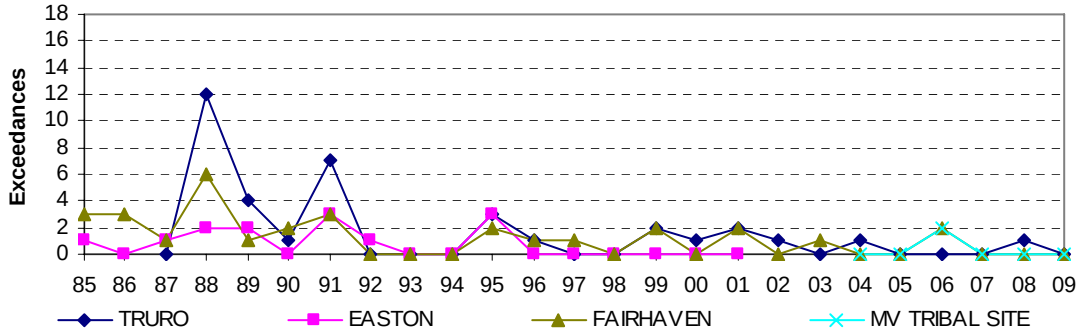


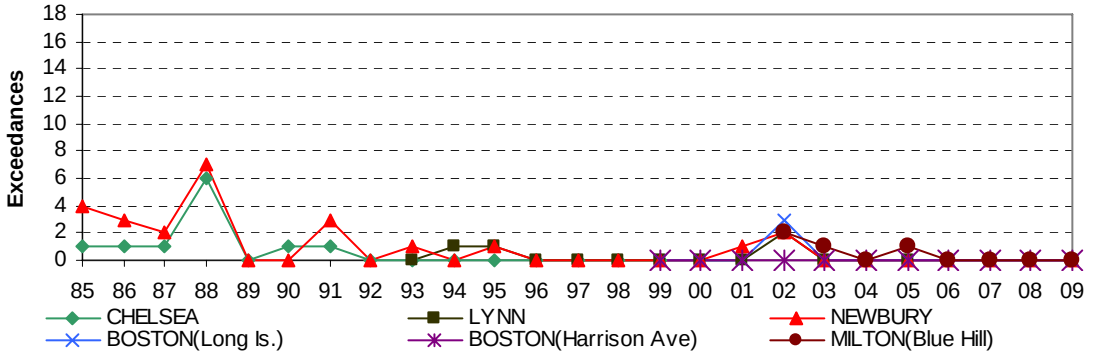
1-hour Ozone Exceedance Trends

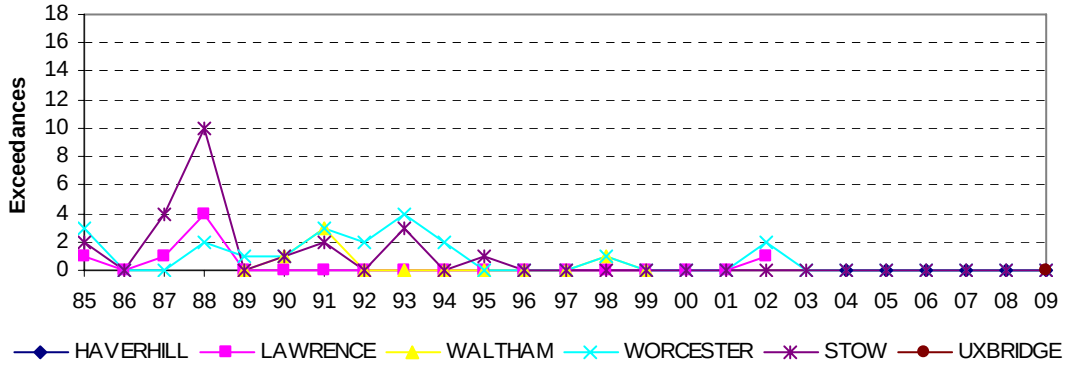
Shown below are ozone trends using exceedances of the former 1-hour standard for each site.

Figure 3
1-hour Ozone Exceedance Trends 1985 – 2009
Standard = 0.12 ppm (revoked June 15, 2005)





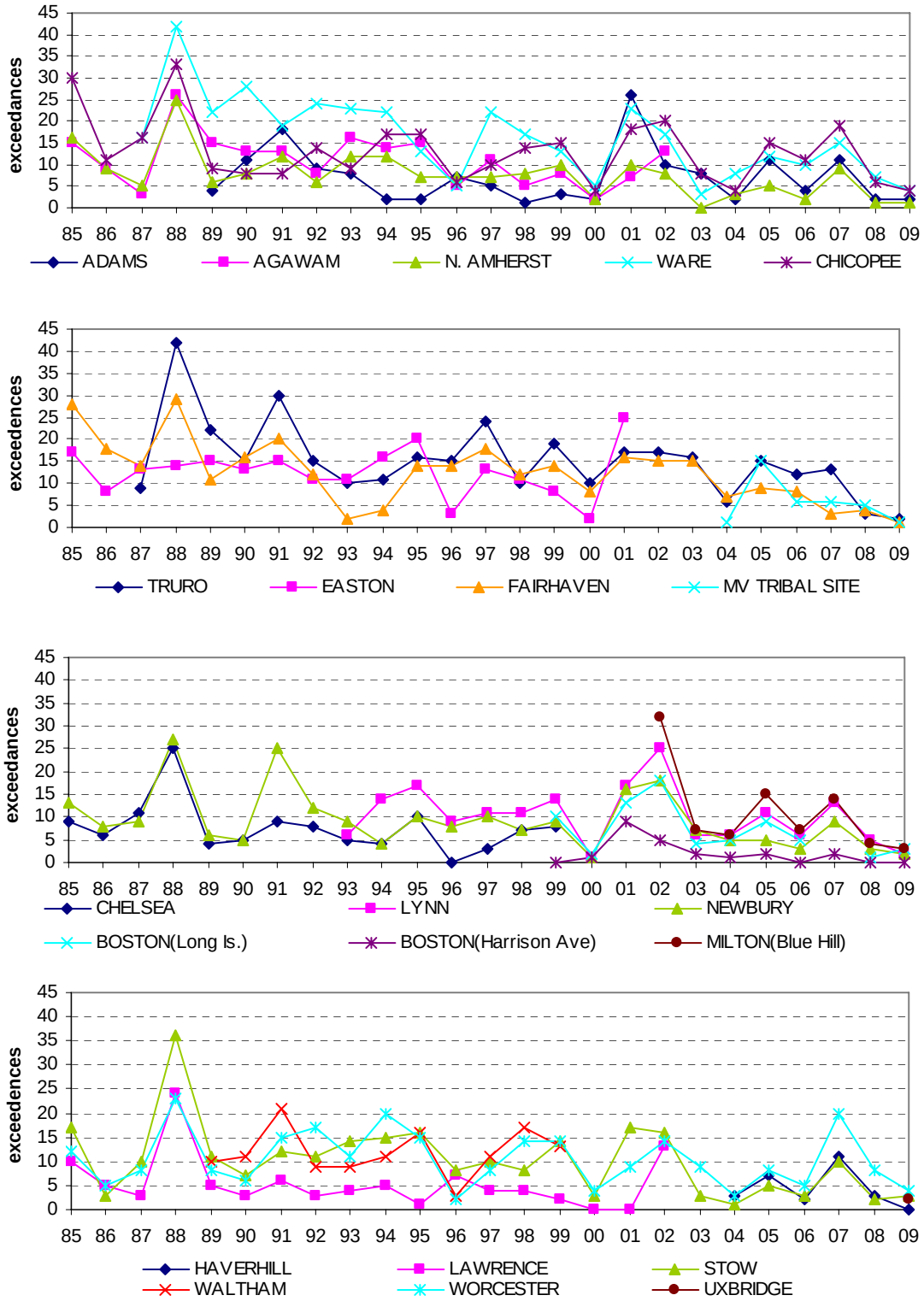




8-hour Ozone Exceedance Trends

Shown below are the long-term trends of 8-hour ozone exceedances for each site based on the 0.075 ppm 8-hour standard that went into effect in 2008.

Figure 4
8-hour Ozone Exceedance Trends 1985 – 2009
Standard = 0.075 ppm



Sulfur Dioxide (SO_2) Summary

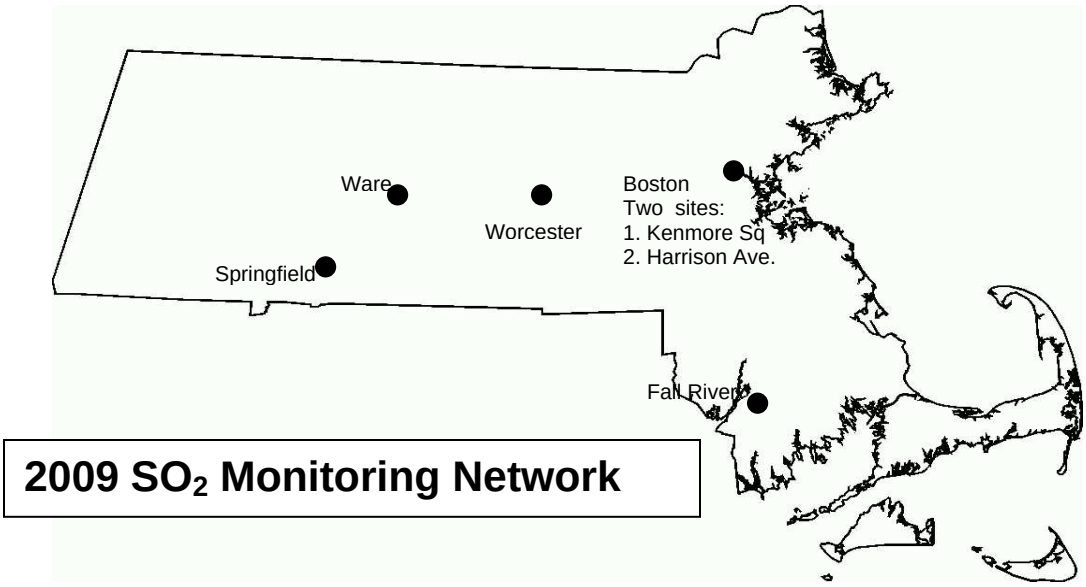
2009 SO_2 Data Summary

A summary of the 2009 SO_2 data is shown below. There were six SO_2 sites in operation during 2009 in the state-operated monitoring network. All of the sites achieved the requirement of 75% or greater data capture for the year. SO_2 monitors at Boston (Harrison Avenue) and Ware are trace-level instruments that are specifically configured to measure at a lower concentration range than the standard instrument in order to obtain better ongoing concentration resolution and to more precisely track trends in SO_2 concentrations. The need for such instruments has been spurred by the lowering of ambient SO_2 concentrations over the last few decades. Although the upper end of the concentration range measured by the trace instruments does not allow them to track concentrations as high as the NAAQS, their data is directly comparable to the data collected by the standard SO_2 instrument configuration and is presented below.

SITE ID	CITY	COUNTY	ADDRESS	% OBS	1ST MAX 24-HR	2ND MAX 24-HR	#OBS >0.14	1ST MAX 3-HR	2ND MAX 3-HR	#OBS >0.5	1ST MAX 1-HR	2ND MAX 1-HR	ARITH MEAN
25-025-0002	Boston	Suffolk	KENMORE SQUARE	82	0.009	0.009	0	0.019	0.017	0	0.025	0.025	0.0025
25-025-0042	Boston	Suffolk	HARRISON AVENUE	96	0.013	0.012	0	0.028	0.023	0	0.033	0.030	0.0022
25-005-1004	Fall River	Bristol	659 GLOBE STREET	96	0.020	0.016	0	0.044	0.039	0	0.060	0.058	0.0028
25-013-0016	Springfield	Hampden	LIBERTY PARKING LOT	98	0.015	0.014	0	0.034	0.027	0	0.059	0.035	0.0031
25-015-4002	Ware	Hampshire	QUABBIN SUMMIT	93	0.009	0.009	0	0.015	0.014	0	0.016	0.016	0.0010
25-027-0023	Worcester	Worcester	SUMMER STREET	97	0.009	0.008	0	0.017	0.015	0	0.027	0.024	0.0016

Standards: Annual Mean = 0.03 ppm 24-hour = 0.14 ppm 3-hour = 0.50 ppm

ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND MAX 24-HR, MAX 3-HR, MAX 1-HR** = FIRST AND SECOND HIGHEST VALUE FOR TIME PERIOD INDICATED **# OBS > 0.14** = NUMBER OF OBSERVATIONS ABOVE THE 24-HOUR STANDARD OF 0.14 PPM **# OBS > 0.50** = NUMBER OF OBSERVATIONS ABOVE THE 3-HOUR STANDARD OF 0.50 PPM **ARITH MEAN** = ANNUAL ARITHMETIC MEAN (STANDARD = 0.03 PPM)

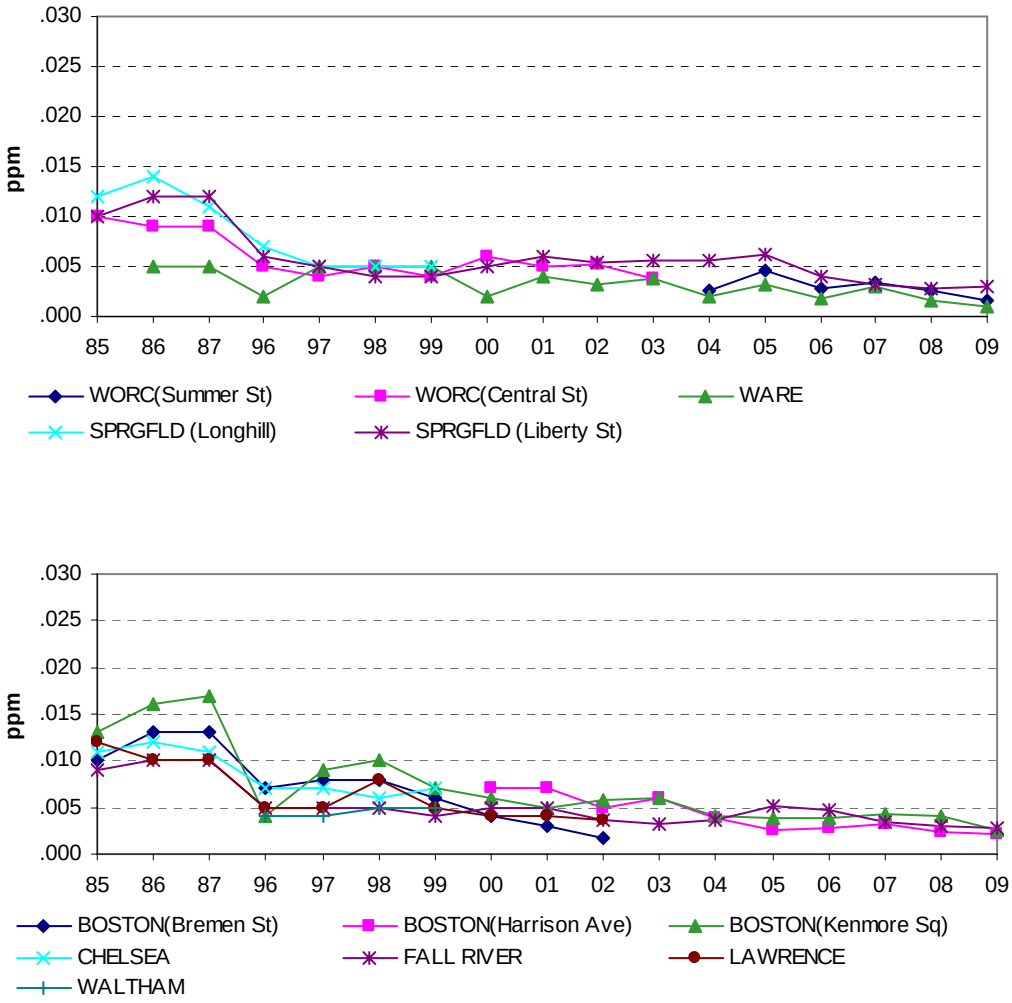


2009 SO_2 Monitoring Network

SO_2 Trends

The long-term trends of the annual arithmetic mean for each SO_2 site are shown below. The trend has been stable for the last few years and downward for the entire period. Massachusetts has been well below the standard.

Figure 5
SO_2 Trends 1985 –2009
Annual Arithmetic Means
Standard = 0.03 ppm



Nitrogen Dioxide (NO_2) Summary

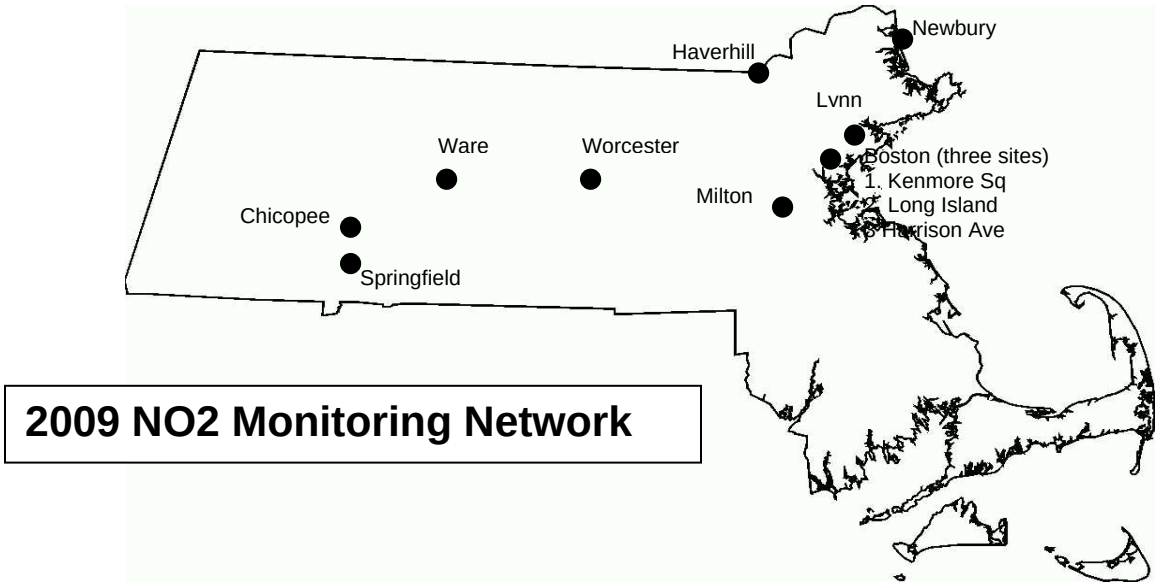
2009 NO_2 Data Summary

A summary of the 2009 NO_2 data is shown below. There were 11 NO_2 sites in operation during 2009 in the state-operated monitoring network. All sites met the requirement of 75% data capture for the year with the exception of Newbury, which was shut down for construction at the request of the property owner.

			NITROGEN DIOXIDE (ppm)		1ST	2ND	
				%	MAX	MAX	ARITH
SITE ID	CITY	COUNTY	ADDRESS	OBS	1-HR	1-HR	MEAN
25-025-0002	Boston	Suffolk	KENMORE SQUARE	80	0.060	0.057	0.0201
25-025-0041	Boston	Suffolk	LONG ISLAND	95	0.045	0.041	0.0061
25-025-0042	Boston	Suffolk	HARRISON AVENUE	94	0.058	0.057	0.0180
25-013-0008	Chicopee	Hampden	ANDERSON RD AFB	95	0.046	0.045	0.0078
25-009-5005	Haverhill	Essex	CONSENTINO SCHOOL	96	0.048	0.046	0.0076
25-009-2006	Lynn	Essex	390 PARKLAND	95	0.047	0.046	0.0074
25-021-3003	Milton	Norfolk	BLUE HILL OBSERVATORY	96	0.045	0.033	0.0040
25-009-4004	Newbury	Essex	SUNSET BLVD	20	0.019	0.017	.0031*
25-013-0016	Springfield	Hampden	LIBERTY PARKING LOT	95	0.063	0.059	0.0149
25-015-4002	Ware	Hampshire	QUABBIN SUMMIT	95	0.036	0.035	0.0037
25-027-0023	Worcester	Worcester	SUMMER STREET	94	0.054	0.053	0.0143

Note: The * indicates that the mean does not satisfy summary criteria.
Standard: Annual Arithmetic Mean = 0.053 ppm

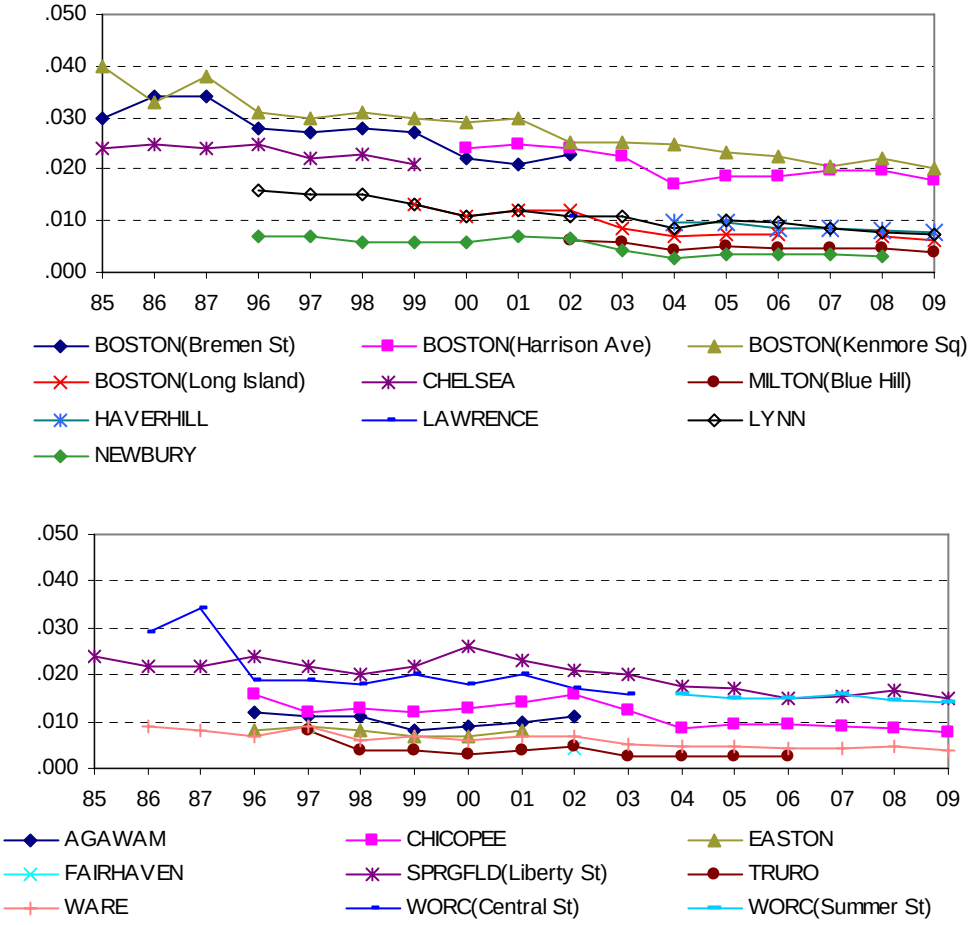
ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND MAX 1-HR** = FIRST AND SECOND HIGHEST VALUE FOR TIME PERIOD INDICATED **ARITH MEAN** = ANNUAL ARITHMETIC MEAN



NO_2 Trends

The long-term trends of the annual arithmetic means for each NO_2 site are shown below. The trend has been stable the last few years and downward for the entire period. Massachusetts is below the standard.

Figure 6
NO_2 Trends 1985 – 2009
Annual Arithmetic Means
Standard = 0.053 ppm



Carbon Monoxide (CO) Summary

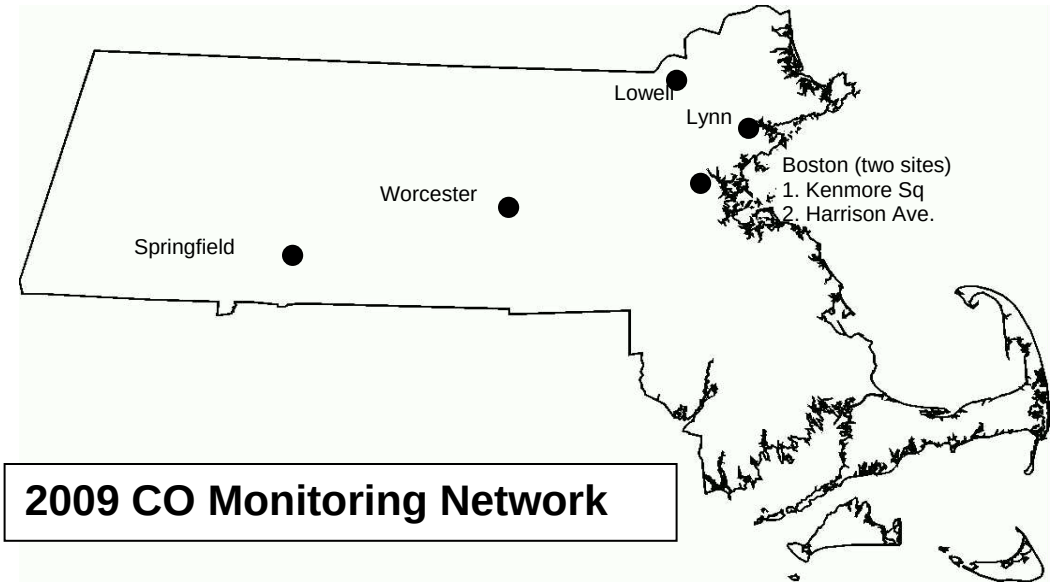
2009 CO Data Summary

A summary of the 2009 CO data is shown below. There were six sites in operation during 2009 in the state-operated monitoring network. All of the sites achieved the requirement of 75% or greater data capture for the year. The CO monitors at Boston (Harrison Avenue) and Lynn are trace-level instruments that are specifically configured to measure at a lower concentration range than the standard instrument in order to obtain better ongoing concentration resolution and to more precisely track trends in CO concentrations. The need for such instruments has been spurred by the lowering of ambient CO concentrations over the last few decades. Although the upper end of the concentration range measured by the trace instruments does not allow them to track concentrations as high as the NAAQS, their data is directly comparable to the data collected by the standard CO instrument configuration and is presented below.

SITE ID	CITY	COUNTY	ADDRESS	% OBS	1ST MAX 1-HR	2ND MAX 1-HR	OBS >35	1ST MAX 8-HR	2ND MAX 8-HR	OBS >9
25-025-0002	Boston	Suffolk	KENMORE SQUARE	80	1.4	1.4	0	1.1	1	0
25-025-0042	Boston	Suffolk	HARRISON AVENUE	97	2.6	2.4	0	1.5	1.2	0
25-017-0007	Lowell	Middlesex	MERRIMACK STREET	93	1.8	1.8	0	1.6	1.6	0
25-009-2006	Lynn	Essex	390 PARKLAND	96	0.9	0.8	0	0.6	0.6	0
25-013-0016	Springfield	Hampden	LIBERTY PARKING-LOT	93	2.4	2.2	0	1.9	1.8	0
25-027-0023	Worcester	Worcester	SUMMER STREET	93	2.7	2.4	0	2	1.9	0

Standards: 1-hour = 35 ppm 8-hour = 9 ppm

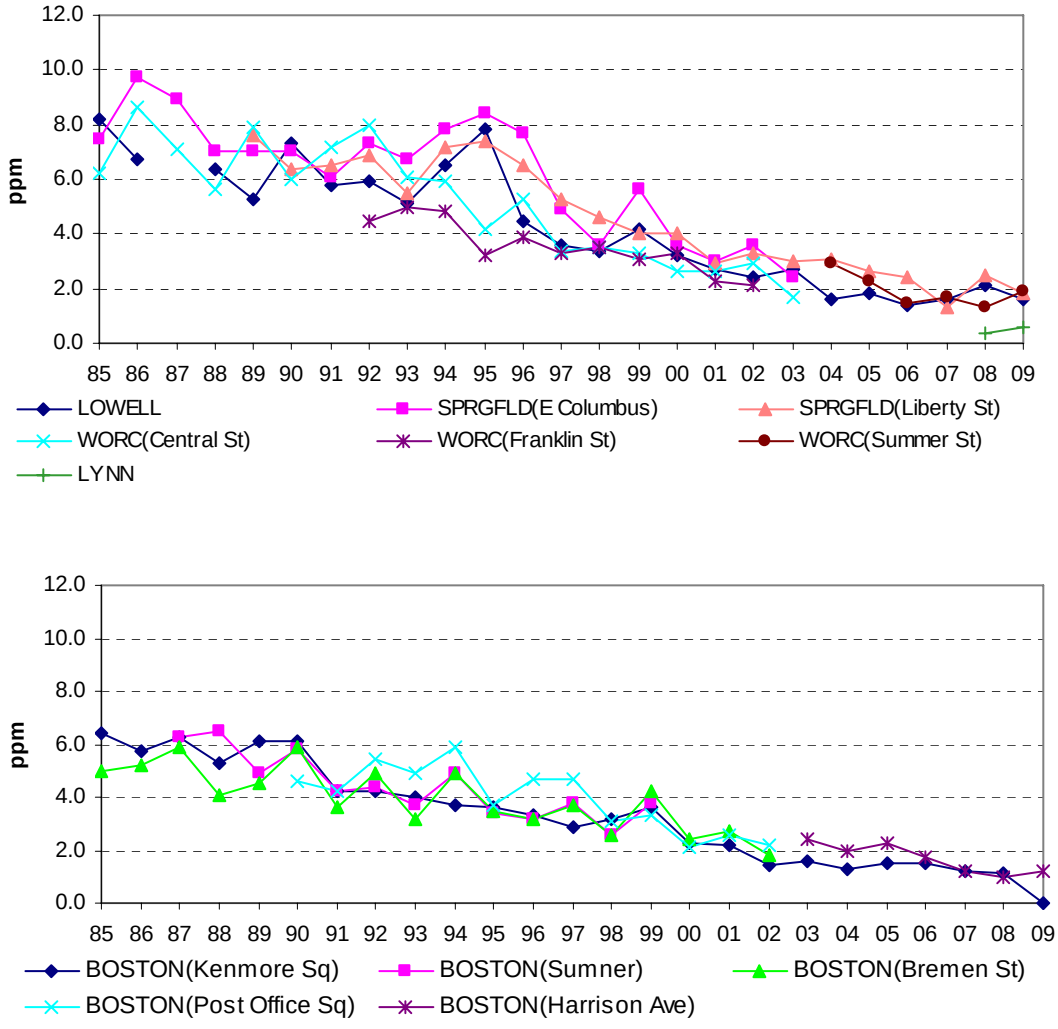
ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND MAX 1-HR** = FIRST AND SECOND HIGHEST VALUE FOR TIME PERIOD INDICATED **OBS > 35** = NUMBER OF 1-HR AVG. GREATER THAN 35 PPM (1-HR STANDARD) **1ST, 2ND MAX 8-HR** = FIRST AND SECOND HIGHEST VALUE FOR TIME PERIOD INDICATED **OBS > 9** = NUMBER OF 8-HR AVG. GREATER THAN 9 PPM (8-HR STD)



CO Trends

The long-term trends for each CO site are shown below. The 2nd maximum value is displayed because it is the value to which the standard applies. Massachusetts is well below both the 1-hour and 8-hour standards.

Figure 7
CO Trends 1985-2009
2nd Maximum 8-hour Values
Standard = 9 ppm



Particulate Matter 10 Microns (PM_{10}) Summary

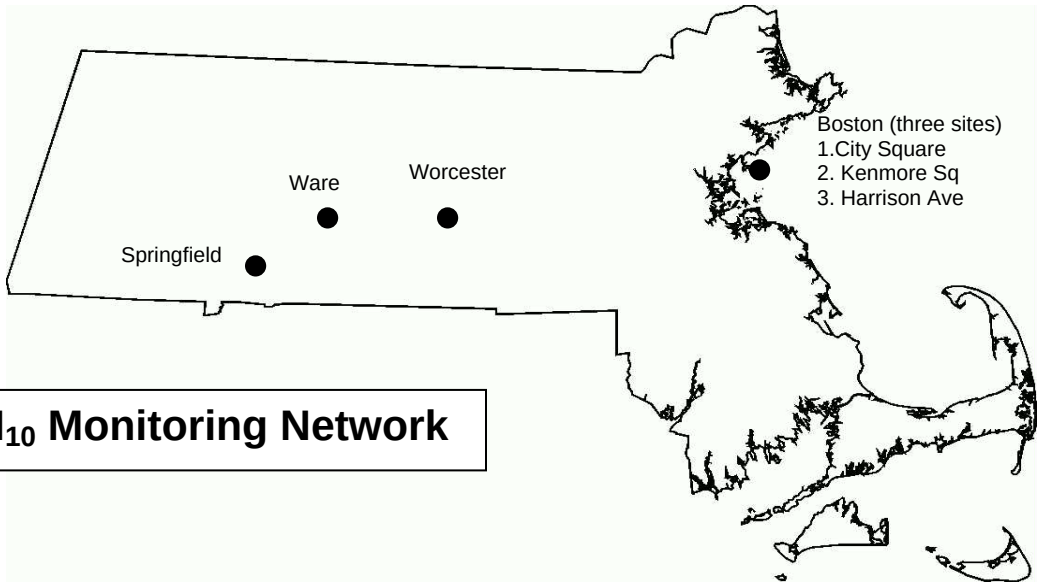
2009 PM_{10} Data Summary

A summary of the 2009 PM_{10} data is shown below. There were six PM_{10} sites in operation during 2009 in the state-operated monitoring network. All of the sites achieved data capture requirements for the year.

SITE ID	TYPE	CITY	COUNTY	ADDRESS	%OBS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	DAY MAX >150	EST DAYS >150	WTD ARITH MEAN
25-013-2009	Lo-Vol	Springfield	Hampden	1860 MAIN ST	95	40	38	38	32	0	0	15.9
25-015-4002	Lo-Vol	Ware	Hampshire	QUABBIN SUMMIT	84	32	24	22	19	0	0	9.8
25-025-0002	Lo-Vol	Boston	Suffolk	KENMORE SQUARE	70	69	43	36	35	0	0	20.6
25-025-0027	Lo-Vol	Boston	Suffolk	ONE CITY SQUARE	100	44	42	32	32	0	0	17.9
25-025-0042	Hi-Vol	Boston	Suffolk	HARRISON AVENUE	95	32	31	27	26	0	0	13.7
25-025-0042	Hi-Vol Co-loc	Boston	Suffolk	HARRISON AVENUE	97	34	31	27	25	0	0	13.8
25-025-0042	Lo-Vol	Boston	Suffolk	HARRISON AVENUE	97	40	34	31	25	0	0	15.6
25-025-0042	Lo-Vol Co-loc	Boston	Suffolk	HARRISON AVENUE	93	47	38	35	29	0	0	16.0
25-027-0023	Lo-Vol	Worcester	Worcester	SUMMER STREET	98	85	67	39	36	0	0	19.2

PM_{10} Hi Vol Standards: 24-hour = 150 μg/m³

ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND, 3RD, 4TH 24-HR MAX** = 1ST, 2ND, 3RD, AND 4TH HIGHEST 24-HOUR VALUES FOR THE YEAR **DAY MAX > 150** = DAILY MAXIMUM VALUE GREATER THAN STANDARD OF 150 μg/m³ **WTD ARITH MEAN** = WEIGHTED ANNUAL ARITHMETIC MEAN

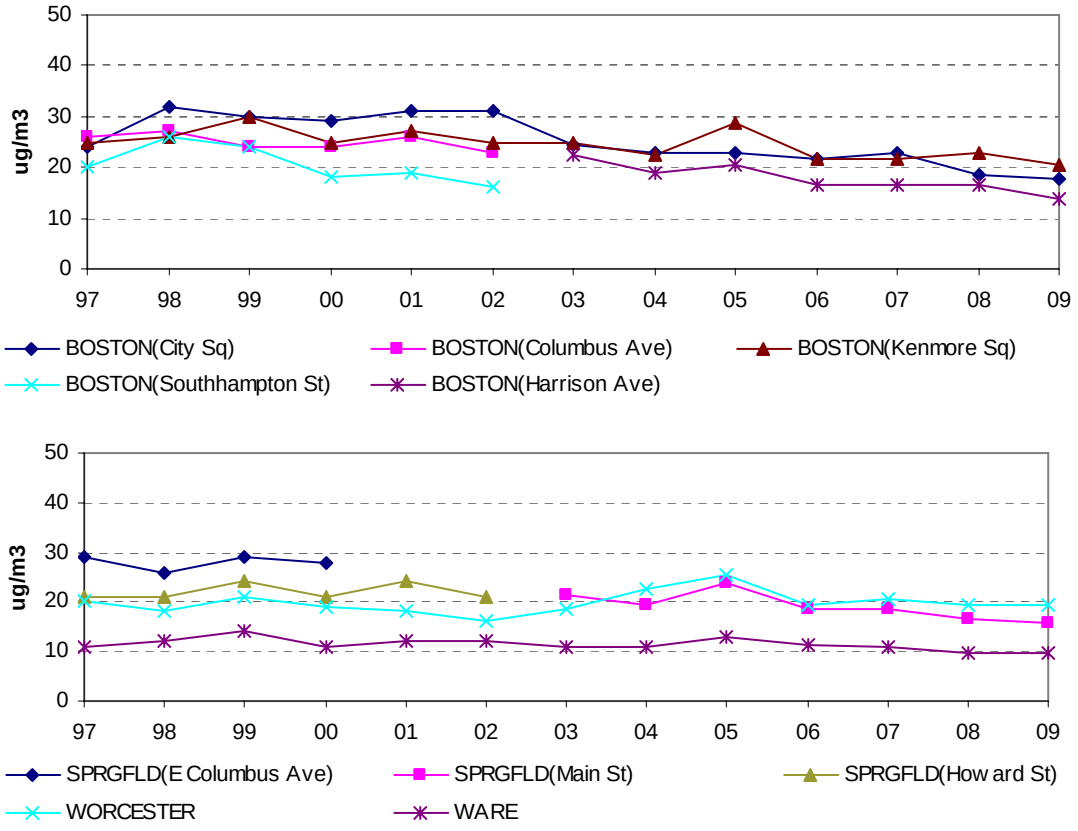


2009 PM_{10} Monitoring Network

PM_{10} Trends

Long-term trends for each PM_{10} site are shown below using the annual arithmetic mean as an indicator. The data shows a yearly variability at most sites, with the overall trend being downward.

Figure 8
PM_{10} Trends 1989-2009
Annual Arithmetic Mean



Particulate Matter 2.5 Microns ($PM_{2.5}$) Summary

2009 $PM_{2.5}$ Operations

MassDEP operates 15 Federal Reference Method (FRM) filter-based samplers and 10 Beta Attenuation Monitors (BAMs) for measuring $PM_{2.5}$ concentrations at locations throughout the state. In Massachusetts, FRM samples are the only measure of $PM_{2.5}$ currently being compared to the NAAQS. The FRM sampler works by drawing air through a small Teflon filter for 24 hours (midnight to midnight) on the designated sample day, after which the filter is removed from the sampler and transported to the MassDEP Laboratory in Lawrence, Massachusetts where it is processed. The downside of filter-based monitors is that there is a time interval between when the sample is collected and the data is available.

EPA has approved BAM monitoring technology as a Federal Equivalent Method (FEM) for measuring $PM_{2.5}$. Because of the informational value of the near real-time $PM_{2.5}$ data, MassDEP upgraded four BAM sites to FEM status in 2009 (Worcester, Haverhill, Ware and Fall River), in addition to three sites that were upgraded in 2008. MassDEP has since upgraded two additional sites 2010, leaving only Pittsfield to be upgraded later in 2010.

The public can view concentration gradient maps using near real-time $PM_{2.5}$ data from the ten BAMs monitoring stations on EPA's AirNOW website (www.epa.gov/airnow/). Different colors on the map indicate the $PM_{2.5}$ concentrations of the samples that were collected for each hour of the day.

A summary of the 2009 $PM_{2.5}$ data is shown below.

2009 $PM_{2.5}$ FRM Data Summary

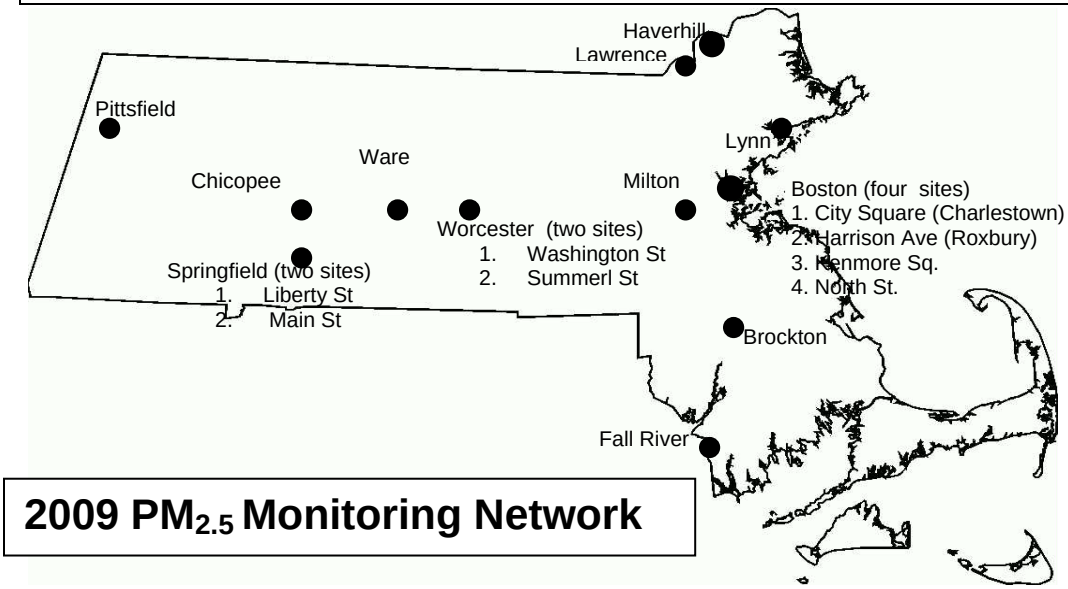
SITE ID	TYPE	CITY	COUNTY	ADDRESS	% OBS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN
25-025-0002	FRM	Boston	Suffolk	KENMORE SQUARE	73	23.9	19.1	19.0	18.2	19.1	8.98*
25-025-0027	FRM	Boston	Suffolk	ONE CITY SQUARE	99	29.9	24.3	22.0	20.0	22.0	9.8
25-025-0042	FRM	Boston	Suffolk	HARRISON AVENUE	95	27.9	22.5	21.3	17.8	21.3	8.7
25-025-0043	FRM	Boston	Suffolk	174 NORTH STREET	97	31.4	29.1	28.2	26.0	24.1	10.2
25-025-0043	FRM Co-loc	Boston	Suffolk	174 NORTH STREET	94	29.1	27.8	26.5	25.2	24.2	10.3
25-023-0004	FRM	Brockton	Plymouth	COMMERCIAL STREET	97	24.0	22.5	21.8	20.8	21.8	8.4
25-023-0004	FRM Co-loc	Brockton	Plymouth	COMMERCIAL STREET	84	23.9	23.2	22.1	19.5	22.1	8.38*
25-013-0008	FRM	Chicopee	Hampden	ANDERSON RD AFB	100	31.2	27.6	25.0	19.5	25.0	7.8
25-013-0008	FRM Co-loc	Chicopee	Hampden	ANDERSON RD AFB	98	28.4	28.2	26.7	19.8	26.7	8.0
25-005-1004	FRM	Fall River	Bristol	659 GLOBE STREET	97	22.1	22.0	21.2	19.5	21.2	8.1
25-009-5005	FRM	Haverhill	Essex	CONSENTINO SCHOOL	98	29.7	22.8	20.2	18.9	20.2	7.6
25-009-6001	FRM	Lawrence	Essex	SHATTUCK STREET	97	30.6	22.7	20.8	18.6	20.8	8.5
25-009-2006	FRM	Lynn	Essex	390 PARKLAND	97	28.1	22.5	20.2	16.3	20.2	7.5
25-003-5001	FRM	Pittsfield	Berkshire	78 CENTER STREET	98	28.3	24.7	24.5	23.5	24.5	8.7
25-013-0016	FRM	Springfield	Hampden	LIBERTY PARKING LOT	97	32.6	28.9	26.8	23.5	26.8	9.4
25-013-2009	FRM	Springfield	Hampden	1860 MAIN STREET	98	31.1	30.3	29.7	22.5	29.7	9.2

* indicates that the mean does not satisfy summary criteria for one quarter

2009 $PM_{2.5}$ BAM Data Summary

SITE ID	CITY	COUNTY	ADDRESS	% OBS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	ARITH MEAN
25-025-0042	Boston	Suffolk	HARRISON AVENUE	98	107.8	91.2	48.7	45.0	9.98
25-025-0043	Boston	Suffolk	174 NORTH STREET	93	67.7	52.1	51.3	44.9	9.39
25-005-1004	Fall River	Bristol	659 GLOBE STREET	97	53.8	49.3	43.3	43.0	7.99
25-009-5005	Haverhill	Essex	CONSENTINO SCHOOL	84	41.1	39.4	37.4	37.3	7.58
25-009-2006	Lynn	Essex	390 PARKLAND	99	111.5	68.1	47.9	42.1	8.22
25-021-3003	Milton	Norfolk	BLUE HILL OBSERVATORY	95	43.0	41.7	41.1	39.7	7.35
25-003-0006	Pittsfield	Berkshire	BERKSHIRE COMMONS	86	80.0	74.8	67.9	67.0	10.21
25-013-0016	Springfield	Hampden	LIBERTY PARKING LOT	98	190.6	92.7	88.5	70.6	10.71
25-015-4002	Ware	Hampshire	QUABBIN SUMMIT	92	47.5	46.5	46.0	41.3	8.70
25-027-0023	Worcester	Worcester	SUMMER STREET	90	63.8	61.3	56.9	53.9	8.51

ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION **TYPE** = TYPE OF INSTRUMENT **FRM** = FEDERAL REFERENCE METHOD; **FRM COLOC** = FED. REF. METH. COLOCATED **BAM** = BETA ATENUATION MONITOR **1^{ST}, 2^{ND}, 3^{RD}, 4^{TH} MAX** = 1^{ST}, 2^{ND}, 3^{RD}, AND 4^{TH} HIGHEST 24-HOUR VALUES FOR THE YEAR **WTD ARITH MEAN** = WEIGHTED ANNUAL ARITHMETIC MEAN (STANDARD = 15.0 µg/m³)



2009 $PM_{2.5}$ Monitoring Network

Speciation

MassDEP has been collecting $PM_{2.5}$ samples for speciation at the air monitoring station in Boston (Harrison Avenue) since 2000 and in Chicopee since 2001. Speciation is the analysis of particulate matter collected on teflon, nylon and quartz filters simultaneously to determine the chemical composition of the particulate matter collected. The results are used to determine the composition of the particulate matter and identity of air pollution sources that impact the monitoring station area. During each sampling event, the three separate filters are collected and shipped to an out-of-state national contract laboratory for analysis. Each different filter medium is analyzed for a different category of pollutant. These include elements (e.g., metals), sulfates, nitrates, and carbon (total and organic).

IMPROVE (Interagency Monitoring of Protected Visual Environments)

IMPROVE is a nationwide program designed to assess air quality at rural locations where air pollution may impact visibility over long distances (e.g., mountain ranges or scenic vistas). Massachusetts currently has IMPROVE samplers at the Ware and Truro sites. The Wampanoag Indian Tribe operates a third IMPROVE sampler at its Martha's Vineyard monitoring site. These samplers acquire $PM_{2.5}$ filter samples for speciation analysis using a different protocol than that of the speciation program described above. Data can be viewed at the IMPROVE web site at http://vista.cira.colostate.edu/improve/Data/data.htm.

Lead (Pb) Summary

2009 Pb Data Summary

A summary of the 2009 Pb data is shown below. MassDEP operated a total suspended particulates (TSP) sampler to measure airborne lead levels at Kenmore Square for half the year, and then moved the monitor to Harrison Avenue due to the renovation of the Kenmore Square monitoring station. MassDEP plans to add an additional monitor in Springfield to measure lead now that EPA has lowered the lead NAAQS to 0.15 µg/m^3. The lead concentrations monitored are very low. Since 1975, the use of unleaded gasoline has greatly diminished lead emissions from automobiles, which in the past were the primary source of airborne lead in the atmosphere in Massachusetts.

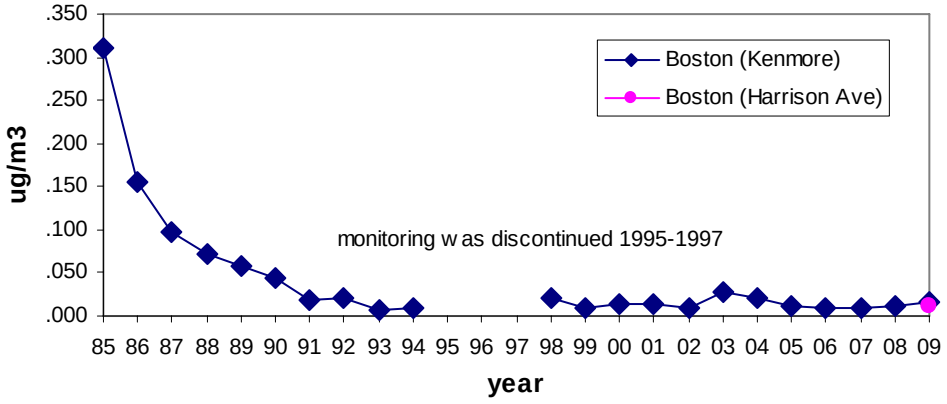
SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	# OBS	QTR1 ARITH MEAN	QTR2 ARITH MEAN	QTR3 ARITH MEAN	QTR4 ARITH MEAN	# MEANS > 1.5	1ST MAX	2ND MAX
25-025-0002	1	0660	Boston	Suffolk	KENMORE SQUARE	27	0.0087	0.0092			0	0.016	0.016
25-025-0042	1	0660	Boston	Suffolk	HARRISON AVENUE	19		.0040*	0.007	0.006	0	0.014	0.012

Note: The * indicates that the mean does not satisfy summary criteria.

Standard: 1.5 µg/m^3 (Calendar Quarter Arithmetic Mean)

ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION **# OBS** = # OBSERVATIONS **QTR1,QTR2, QTR3, QTR4 ARITH MEAN** = THE MEANS FOR THE 1ST, 2ND, 3RD AND 4TH CALENDAR QUARTERS **# MEANS > 1.5** = THE NUMBER OF CALENDAR QUARTER MEANS GREATER THAN THE STANDARD (1.5 µg/m^3) **1ST, 2ND MAX** = THE 1ST AND 2ND MAXIMUM 24 HOUR VALUES

Figure 9
Pb Concentrations 1985 – 2009
Annual Arithmetic Mean
Standard = 1.5 ug/m3



Industrial Network Summary

Introduction

The industrial ambient air quality network is comprised of monitoring stations operated by facilities that have the potential to emit large amounts of pollutants. An example would be a fossil fuel-fired power plant that has the potential to emit large quantities of SO_2.

The monitoring stations in the industrial network are sited to measure the maximum values from the specific point source. In the event that the measured SO_2 value reaches certain trigger levels, the power plant switches to lower-sulfur content fuel.

The data from the industrial network is submitted to MassDEP's Air Assessment Branch. AAB submits the data to the EPA AQS database after completing the quality assurance process.

Continuous Emission Monitoring System (CEMS)

In addition to the ambient monitoring network, in-stack Continuous Emission Monitoring System (CEMS) equipment is required at certain facilities by a MassDEP-issued permit or other state and federal regulations. For example, the federal Acid Rain Program requires CEMS enabling measurement of SO_2, NO_x and CO_2 emissions from the nation's largest power generating facilities. The information on emissions collected by CEMS monitors can be found on EPA's web site at www.epa.gov/airmarkets/arp/.

Sulfur Dioxide (SO_2) summary

There were four SO_2 sites in operation during 2009 in the industrial network. All of the sites achieved the requirement of 75% or greater data capture for the year. There were no measured violations of the SO_2 air quality standards during the year in the reported data. A summary of the 2009 SO_2 data is shown below.

SITE ID	CITY	COUNTY	ADDRESS	% OBS	1ST MAX 24-HR	2ND MAX 24-HR	#OBS >0.14	1ST MAX 3-HR	2ND MAX 3-HR	#OBS >0.5	1ST MAX 1-HR	2ND MAX 1-HR	ARITH MEAN
25-025-0019	Boston	Suffolk	LONG ISLAND	94	0.008	0.007	0	0.014	0.013	0	0.022	0.019	0.0019
25-025-0020	Boston	Suffolk	DEWAR STREET	100	0.014	0.011	0	0.026	0.022	0	0.04	0.034	0.0025
25-025-0021	Boston	Suffolk	340 BREMEN STREET	99	0.012	0.011	0	0.033	0.02	0	0.039	0.038	0.0027
25-025-0040	Boston	Suffolk	531A EAST FIRST STREET	95	0.011	0.01	0	0.02	0.02	0	0.025	0.023	0.0027

ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **%OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND MAX 24-HR, MAX 3-HR, MAX 1-HR** = FIRST AND SECOND HIGHEST 24-HOUR, 3-HOUR, AND 1-HOUR VALUES FOR TIME PERIOD INDICATED # **OBS** > 0.14 = NUMBER OF OBSERVATIONS ABOVE THE 24-HOUR STANDARD OF 0.14 PPM # **OBS** > 0.5 = NUMBER OF OBSERVATIONS ABOVE THE 3-HOUR STANDARD OF 0.5 PPM **ARITH MEAN** = ARITHMETIC MEAN (STANDARD = 0.03 PPM)

Nitrogen Dioxide (NO_2) summary

There was one NO_2 monitor that operated during 2009 in the industrial network. The site met the requirement of 75% or greater data capture in 2009. There were no reported violations of the NO_2 air quality standard during the year.

A summary of the 2009 NO_2 data is shown below.

SITE ID	CITY	COUNTY	ADDRESS	% OBS	1ST MAX 1-HR	2ND MAX 1-HR	ARITH MEAN
25-025-0040	Boston	Suffolk	531A EAST FIRST STREET	97	0.197	0.095	0.0149

PRIMARY STANDARD: ANNUAL ARITHMETIC MEAN = 0.053 PPM

ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER %**OBS** = DATA CAPTURE PERCENTAGE **MAX 1-HR 1ST, 2ND** = FIRST AND SECOND HIGHEST VALUE FOR TIME PERIOD INDICATED **ARIT MEAN** = ARITHMETIC MEAN (STANDARD = 0.053 PPM)

Total Suspended Particulates (TSP) summary

There were four TSP sites that operated during 2009 in the industrial network. All of the sites met the requirement of 75% or greater data capture.

TSP is no longer a criteria pollutant (PM_{10} replaced it as the course particulate standard in 1987), so there is no longer a standard for it. A summary of the 2009 TSP data is shown below.

SITE ID	TYPE	CITY	COUNTY	ADDRESS	% OBS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	ARITH MEAN	GEO. MEAN	GEO. STD
25-025-0019		Boston	Suffolk	LONG ISLAND	98	44	43	43	35	21.1	19.7	1.4
25-025-0020		Boston	Suffolk	DEWAR STREET	98	131	112	107	91	49.2	42.5	1.7
25-025-0021		Boston	Suffolk	340 BREMEN STREET	95	112	97	92	85	39.9	34.6	1.7
25-025-0040		Boston	Suffolk	531A EAST FIRST STREET	93	65	60	48	46	28	25.2	1.6
25-025-0040	Co-Loc	Boston	Suffolk	531A EAST FIRST STREET	93	59	51	49	47	27.4	24.8	1.6

ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **TYPE =** TYPE OF INSTRUMENT **– NC** = NON CONTINUOUS, **NC COLOC –** NON CONTINUOUS COLOCATED**. % OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND, 3RD, 4TH MAX** = 1ST, 2ND, 3RD AND 4TH HIGHEST 24-HOUR VALUES FOR THE YEAR **ARITH MEAN** = ARITHMETIC MEAN **GEO MEAN** = GEOMETRIC MEAN **GEO STD** = GEOMETRIC STANDARD DEVIATION

Sulfate (SO_4) summary

There were four SO_4 sites that operated during 2009 in the industrial network. All of the sites met the requirement of 75% or greater data capture. SO_4 is not a criteria pollutant so there are no ambient air quality standards for SO_4. A summary of the 2009 SO_4 data is shown below.

SITE ID	TYPE	CITY	COUNTY	ADDRESS	% OBS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	ARITH MEAN
25-025-0019		Boston	Suffolk	LONG ISLAND	98	12.9	11.1	9.7	8.1	4.11
25-025-0020		Boston	Suffolk	DEWAR STREET	100	15.4	11.6	10.8	10.3	5.38
25-025-0020		Boston	Suffolk	340 BREMEN STREET	95	16.6	12.1	11.3	11	6.26
25-025-0040		Boston	Suffolk	531A EAST FIRST STREET	92	13.5	12.4	10.7	10.6	5.93
25-025-0040	Co-Loc	Boston	Suffolk	531A EAST FIRST STREET	93	13.7	11.6	10.6	10.4	5.82

ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **TYPE** = TYPE OF INSTRUMENT **– NC =** NON CONTINUOUS, **NC COLOC =** NON CONTINUOUS COLOCATED **% OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND, 3RD, 4TH MAX VALUE** = 1ST, 2ND, 3RD AND 4TH HIGHEST 24-HOUR VALUES FOR THE YEAR **ARITH MEAN** = ARITHMETIC MEAN

QUALITY CONTROL AND QUALITY ASSURANCE

Introduction

In order to ensure that all air quality data is of acceptable and consistent quality, MassDEP has developed standard operating procedures (SOPs) based on federal requirements that include quality control and quality assurance techniques that systematically assess the entire sample collection and data handling system on an ongoing basis. Each year MassDEP certifies that it is in compliance with the federal requirements.

A few of the considerations that affect data quality on the sample collection end are:

- Site Placement
- Intake Probe Material
- Intake Probe Height
- Spacing from roadways and trees

On the data processing end there are quantitative statistics and qualitative descriptors used to interpret the degree of acceptability or utility of data to the end user. Examples of these data quality indicators are:

- Representativeness
- Precision
- Bias
- Detectability
- Completeness
- Comparability

MassDEP's Air Assessment Branch in Lawrence maintains an independent Quality Assurance/ Data Management Group that reviews the monitoring data for quality, ensures that samples are collected correctly and conducts performance audits throughout the air monitoring network to verify data validity. Another function of the Data Group is to process and report all of the Massachusetts air quality data to the EPA database in a timely manner. Computer software tools, report queries and "eyes on" data reviews are all used to detect and correct problems in the data before it is submitted to EPA.

Quality Assurance requirements for ambient air monitoring are contained in the federal regulations at 40 CFR Part 58, Appendix A thru E.

Section IV
PAMS/Air Toxics Monitoring

PAMS Monitoring

Unlike other pollutants, ground-level ozone is unique because it is a secondary pollutant and is not discharged directly to the atmosphere from a stack or tailpipe, but rather forms in the atmosphere from the photochemical reactions of other pollutants such as volatile organic compounds (VOCs) and NO_x. Ozone formation can occur many miles downwind from the source of the original emissions. These reactions occur in the presence of strong sunlight and are most pronounced during the hottest days of the summer. The PAMS (Photochemical Assessment Monitoring Stations) program was conceived as part of the 1990 Clean Air Act Amendments as an accurate way to collect data for assessing NAAQS attainment progress independent of the meteorological variation that occurs between years and for identifying appropriate pollution control strategies.

PAMS is a special designation for enhanced monitoring stations that are designed to gather information on the ozone formation process. Instrumentation at these sites measures pollutants and meteorological parameters that are specific to the photochemical processes by which ozone is created in the atmosphere at ground level. In addition to the standard NAAQS pollutants (ozone, NO_2, etc.) that are measured at other sites, non-criteria pollutants, including VOCs, are measured at PAMS stations on either an hourly basis or at regular intervals during the hottest part of the summer in June, July and August. Meteorology is a critical component of ozone formation and each PAMS site has a full compliment of meteorological sensors including wind speed, wind direction, temperature, relative humidity, barometric pressure, solar radiation and at some sites, total ultraviolet light and precipitation. MassDEP also operates a sophisticated PAMS associated Doppler Radar atmospheric profiler at a non-PAMS site in Stow, Massachusetts. This instrument measures temperature and wind profiles at different levels of the atmosphere that provides valuable information on upper level conditions that contribute to ozone formation.

Since the PAMS project started in 1993, EPA has required Massachusetts to conduct enhanced ozone precursor measurements in the Boston and Springfield Metropolitan Areas and to assist Rhode Island in the measurement of ozone precursors and reactants at locations down wind of Providence, RI. The PAMS monitoring network was phased in during the 1990's. Competition for attention and resources from newer monitoring initiatives (including $PM_{2.5}$) halted the expansion of the program and led to a consolidation of the network over the years. Looking toward the future, a holistic strategy that includes PAMS measurements at fewer, but more enhanced air monitoring stations is being developed by EPA. EPA regulations in 2006 reduced the minimum number of PAMS sites in each area from the originally envisioned five sites per network to two site. The installation of trace carbon monoxide instruments at the two Type 2 locations (Lynn in 2008 and Chicopee in 2010) is an example of enhanced monitoring.

PAMS Monitoring Areas

Boston	Springfield	Providence
Blue Hill (Milton)	Chicopee	Blue Hill (Milton)
Lynn	Ware	
Newbury		
Long Island		

Note: Blue Hill provides data for both Boston and Providence networks.

PAMS Site Descriptions:

Type 1 – Upwind Site. VOCs samples are taken every third day, and eight 3-hour samples are taken per day during the summer season (June, July and August). Blue Hill is the current Type 1 site for Boston and Type 3 site (downwind) for Providence. There is no current Type 1 site for Springfield.

Type 2 - Urban (Downwind Edge site). Type 2 sites are the most intensive measurement sites in the PAMS program. VOCs are measured hourly by automated gas chromatographs during the summer season. Carbonyls (aldehydes) samples are taken every third day, and eight 3-hour samples are take per day during the summer season. 24-hour VOC samples are taken every sixth day throughout the year. Lynn is Boston's Type 2 site and Chicopee is Springfield's Type 2 site. Larger metropolitan areas were originally required to have Type 2 sites in the two most prevalent wind directions. Long Island (Boston) was designated as a second Boston Type 2 site in the late 1990s, but was subsequently scaled back and now is sampled on a Type 1 site schedule.

Type 3 – Downwind where highest ozone measurements are expected. Newbury (moved to Newburyport for 2010) has been Boston's Type 3 site and Ware is Springfield's Type 3. Required sampling schedule is the same as Type 1, but Massachusetts has elected to operate automated gas chromatographs for VOCs at these sites. No carbonyl measurements are required at either Type 1 or Type 3 sites.

Air Toxics Monitoring

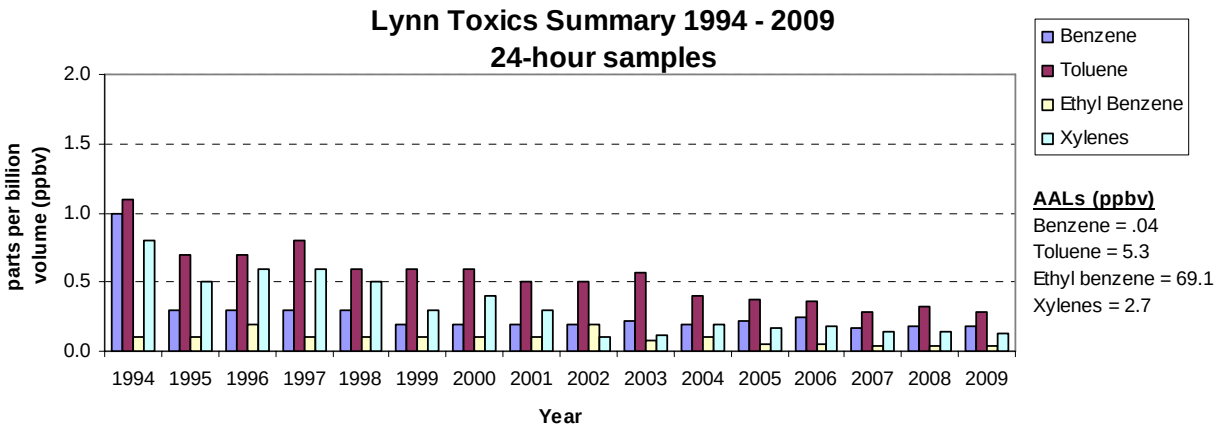
Toxic air pollutants are distinct from criteria air pollutants such as ozone and CO. The list includes pollutants known or suspected to cause cancer or other serious health effects, and includes volatile organic compounds (VOCs) and toxic metals (e.g., mercury).

MassDEP monitors VOCs as part of the PAMS monitoring program, some of which are classified as air toxics. Since 1994, MassDEP has obtained health relevant concentration data from the analysis of canisters taken every sixth day throughout the year at the PAMS Type 2 sites.

In 2003, a toxics monitoring project was started at the Boston (Harrison Avenue) monitoring site and the site has been designated as a National Air Toxics Trends Station (NATTS) designed to collect and quantify a number of toxic air pollutants including VOCs, metals, aldehydes, black carbon and polycyclic aromatic hydrocarbons (PAHs). Data from this site is compared with data from a network of similar sites positioned across the country to identify transport, trends and site-specific characteristics of these pollutants. VOCs and black carbon have been collected at this site since 1999.

Figure 10 summarizes concentrations of 24-hour health-relevant target compounds for samples taken at the Lynn PAMS site from 1994 to 2009. Significant mean concentration decreases seen between 1994 and 1995 are likely due to the introduction of reformulated gasoline at the beginning of 1995. Allowable Ambient Limit (AAL) values are presented next to Figure 10 for reference. AALs are health-based air toxics guidelines developed by MassDEP based on known or suspected carcinogenic and toxic health properties of individual compounds. Safety factors are incorporated into the AALs to account for exposures from pathways other than air. AALs are reviewed and updated periodically to reflect current toxicity information. AAL concentrations were developed for a 70-year lifetime exposure, but are frequently used for comparison with annual averages.

Figure 10



Below is a table that summarizes results from the analysis of 24-hour samples for selected target VOCs from the Boston (Harrison Ave) and Lynn sites for 2009. Harrison Avenue serves as the central city sampling location and Lynn serves as the area background site.

Compound	BOSTON (Harrison Ave)		LYNN	
	Max Value ppb	Mean ppb	Max Value ppb	Mean ppb
1,3-butadiene	0.103	0.037	0.071	0.016
1,1,1-trichloroethane	0.027	0.011	0.014	0.010
trichloroethylene	0.060	0.009	0.016	0.006
tetrachloroethylene	0.080	0.027	0.069	0.022
Benzene	0.684	0.252	0.634	0.176
Toluene	1.922	0.496	1.102	0.278
Xylenes	0.719	0.256	0.446	0.133
Ethylbenzene	0.180	0.067	0.132	0.039

Samples collected at the Harrison Avenue site are analyzed for a suite of metals that are known to be toxic in the environment. The table below summarizes the 2009 metals data.

BOSTON (Harrison Ave)			
Metal	# of Samples	Max Value $\mu g/m^3$	Mean $\mu g/m^3$
Chromium	58	.00279	.00175
Antimony	58	.00277	.00084
Arsenic	58	.00146	.00048
Beryllium	58	.00000	.00000
Cadmium	58	.00093	.00026
Cobalt	58	.00030	.00010
Lead	58	.00650	.00293
Manganese	58	.00679	.00313
Nickel	58	.00389	.00139
Mercury	58	.00052	.00002
Selenium	58	.00104	.00309

Appendix A

2009 State Monitoring Station Locations

SITE ID	CITY	COUNTY	ADDRESS	DATE SITE ESTABLISHED	MONITORED
25-003-4002	ADAMS	BERKSHIRE	MT. GREYLOCK	5/1/1989	O3
25-015-0103	AMHERST	HAMPSHIRE	NORTH PLEASANT	4/1/1988	O3
25-025-0002	BOSTON	SUFFOLK	KENMORE SQUARE	1/1/1965	SO2, NO, NO2, NOx, CO, Lead, PM2.5 FRM, PM10
25-025-0027	BOSTON	SUFFOLK	ONE CITY SQUARE	1/1/1985	PM2.5 FRM, PM10
25-025-0041	BOSTON	SUFFOLK	LONG ISLAND	12/1/1998	O3, NO, NO2, NOx, VOCs, WS/WD, TEMP, Solar Rad, RH, BP
25-025-0042	BOSTON	SUFFOLK	HARRISON AVENUE	12/15/1998	O3, SO2 trace, NO, NO2, NOx, CO trace, PM2.5 FRM, PM2.5 BAM, PM2.5 Speciation, PM10, Toxics, Black Carbon, WS/WD, TEMP, Solar Rad, RH, BP, Lead
25-025-0043	BOSTON	SUFFOLK	174 NORTH ST	1/1/2000	PM2.5 FRM, PM2.5 BAM, Black Carbon
25-023-0004	BROCKTON	PLYMOUTH	120 COMMERCIAL ST	12/15/1998	PM2.5 FRM
25-013-0008	CHICOPEE	HAMPDEN	ANDERSON RD	1/1/1983	O3, NO, NO2, NOx, PM2.5 FRM, PM2.5 speciation, VOCs, TEMP, WS/WD, Solar Rad, RH, BP
25-005-1002	FAIRHAVEN	BRISTOL	LEROY WOOD	1/1/1982	O3, WS/WD, TEMP, Solar Rad, RH, BP
25-005-1004	FALL RIVER	BRISTOL	GLOBE ST	2/1/1975	PM2.5 FRM, PM2.5 BAM, SO2
25-009-5005	HAVERHILL	ESSEX	WASHINGTON ST	7/19/1994	O3, NO, NO2, NOx, PM2.5 FRM, PM2.5 BAM, WS/WD, TEMP, Solar Rad, RH, BP
25-009-6001	LAWRENCE	ESSEX	WALL EXP. STATION	4/3/1999	PM2.5 FRM
25-017-0007	LOWELL	MIDDLESEX	OLD CITY HALL	7/17/1981	CO
25-009-2006	LYNN	ESSEX	390 PARKLAND	1/1/1992	O3, NO, NO2, NOx, PM2.5 FRM, PM2.5 BAM, CO trace, VOCs, Toxics, WS/WD, TEMP, Solar Rad, RH, BP, UVB, PRECIP
25-021-3003	MILTON	NORFOLK	BLUE HILL	4/2/2002	O3, NO, NO2, NOx, PM2.5 BAM, VOCs, WS/WD, TEMP, Solar Rad, RH, BP
25-009-4004	NEWBURY	ESSEX	SUNSET BOULEVARD	8/1/1994	O3, NO, NO2, NOx, NOa, NOy, VOCs, WS/WD, TEMP, Solar Rad, RH, BP
25-003-5001	PITTSFIELD	BERKSHIRE	78 CENTER STREET	11/6//98	PM2.5 FRM
25-003-0006	PITTSFIELD	BERKSHIRE	BERKSHIRE COMMONS	1/1/79	PM2.5 BAM
25-013-0016	SPRINGFIELD	HAMPDEN	LIBERTY STREET	4/1/1988	SO2, NO, NO2, NOx, CO, Black Carbon, PM2.5 FRM, PM2.5 BAM
25-013-2009	SPRINGFIELD	HAMPDEN	1860 MAIN STREET	1/1/2002	PM2.5 FRM, PM10
25-017-1102	STOW	MIDDLESEX	US MILITARY	4/1/1998	O3, Profiler, WS/WD, TEMP, Solar Rad, RH, BP
25-001-0002	TRURO	BARNSTABLE	FOX BOTTOM AREA	4/1/1987	O3, IMPROVE, WS/WD, TEMP, Solar Rad, RH, BP
25-027-0024	UXBRIDGE	WORCESTER	366 E HARTFORD AVE	11/13/2008	O3, WS/WD, TEMP, Solar Rad, RH, BP
25-017-4003	WALTHAM	MIDDLESEX	BEAVER STREET	1/1/1982	Acid Deposition
25-015-4002	WARE	HAMPSHIRE	QUABBIN SUMMIT	6/1/1985	O3, SO2 trace, NO, NO2, NOx, NOy, PM10, VOCs, PM2.5 BAM, IMPROVE, WS/WD, TEMP, Solar Rad, RH, BP, PRECIP
25-027-0015	WORCESTER	WORCESTER	WORC. AIRPORT	5/7/1979	O3, WS/WD, TEMP, Solar Rad, RH, BP,
25-027-0016	WORCESTER	WORCESTER	2 WASHINGTON ST	12/31/2002	PM2.5 FRM
25-027-0023	WORCESTER	WORCESTER	SUMMER STREET	1/1/2004	SO2, NO, NO2, NOx, CO, PM2.5 FRM, PM2.5 BAM, PM10

2009 Industrial Monitoring Station Locations

SITE ID	CITY	COUNTY	ADDRESS	DATE SITE ESTABLISHED	MONITORED
25-025-0019	BOSTON	SUFFOLK	LONG ISLAND	1/1/1978	SO2, TSP, SO4, WS/WD
25-025-0020	BOSTON	SUFFOLK	DEWAR STREET	1/1/1978	SO2, TSP, SO4, WS/WD
25-025-0021	BOSTON	SUFFOLK	BREMEN STREET	1/1/1979	SO2, TSP, SO4, WS/WD
25-025-0040	BOSTON	SUFFOLK	531A EAST FIRST ST	1/1/1993	SO2, TSP, SO4, NO2, WS/WD

Appendix B
Air Quality Web Sites

Below is a listing of web sites that have air quality data or related information.

Web Address	Organization	Description
www.mass.gov/dep/	MassDEP	MassDEP Home Page. Links to MassDEP programs, regions and publications. Links to the Daily Ozone Forecast during ozone season (May 1 through September 30).
www.airbeat.org	MassDEP/EMPACT	Current AIR Quality in Roxbury – web page of MassDEP and EMPACT's Roxbury monitor that shows current levels of ozone and particulates in the air.
www.turi.org	TURI	Toxics Use Reduction Institute – a multi-disciplinary research, education, and technical support center located at the University of Massachusetts/Lowell. Promotes reduction in the use of toxic chemicals and the generation of toxic by-products in industry and commerce in Massachusetts. The web site includes a link to TURAData, which makes information available to the public about toxics use in their communities.
www.airnow.gov	EPA	Ozone Mapping Project – color-coded animated maps using near real-time data that show how ozone is formed and transported downwind.
www.epa.gov/ne/aqi/index.html	EPA	AQI New England Forecast and Real Time Ozone.
www.epa.gov/ne/airquality/index.html	EPA	EPA Smog Alert System – sign up and receive e-mail alerts whenever Massachusetts predicts unhealthy ozone levels.
www.epa.gov/air/data/	EPA	AIRSData - Access to air pollution data for the entire U.S.
www.epa.gov/bioindicators/	EPA	Center for Environmental Information and Statistics – a single convenient source for information on environmental quality.
www.epa.gov/oar/oaqps/	EPA	EPA's Office of Air and Radiation/Office of Air Quality Planning and Standards
www.epa.gov/region01/	EPA	EPA Region 1 Home Page
www.epa.gov/ttn/	EPA	EPA Technology Transfer Network - a collection of technical Web sites containing information about many areas of air pollution science, technology, regulation, measurement, and prevention.

Appendix B (continued)

Web Address	Organization	Description
www.epa.gov/enviro/	EPA	EPA Envirofacts – data extracted from (4) major EPA databases: • PCS (Permit Compliance System) • RCRIS (Resource Conservation and Recovery Information System) • CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System) • TRIS (Toxic Release Inventory System)
www.epa.gov/index.html	EPA	Enviroene Network - a free, public environmental information system. Provides users with pollution prevention/cleaner production solutions, compliance and enforcement assistance information, and innovative technology options.
www.epa.gov/docs/ozone/index.html	EPA	EPA Ozone Depletion Home Page – learn about the importance of the "good" ozone in the stratospheric ozone layer.
www.epa.gov/acidrain	EPA	The Acid Rain Program – overall goal is to achieve significant environmental and public health benefits through reductions in emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_X), the primary causes of acid rain. Emissions data from the nation's largest power generating facilities is available here.
www.wampweather.org	Wampanoag Tribe	Weather monitoring information is listed under Natural Resources.
Maine www.state.me.us/dep/air/ New Hampshire www.des.state.nh.us/ New York www.dec.ny.gov/ New Jersey www.njaqinow.net Rhode Island www.dem.ri.gov/programs/benviron/air/		Ozone predictions and some real-time ozone data from neighboring states (some states report other pollutants, as well).

Appendix B (continued)

Web Address	Organization	Description
www.epa.gov/ttn/atw/	EPA	Unified Air Toxics Website - This site is a central clearinghouse and repository for air toxics implementation information
www.epa.gov/airtrends	EPA	AIRTrends - information on EPA's evaluation of status and trends in the nation's outdoor air quality.
www.cleanairworld.org/	NACAA	National Association of Clean Air Agencies – site has links to state and local air quality agencies.
www.nescaum.org/	NESCAUM	Northeast States for Coordinated Air Use Management – an interstate association of air quality control divisions from the six New England states, New York and New Jersey.
www.wunderground.com/	University of Michigan	The Weather Underground -. another good source of weather information in the US and world.
http://cirrus.sprl.umich.edu/wxnet/	University of Michigan	The WeatherNet – a good source of weather information. Also has a great list of weather links.
http://www.erh.noaa.gov	NWS	The National Weather Service's Boston office provides local forecasts and climate information.
www.thebostonchannel.com	WCVB	WCVB TV Pollen Count – provides the daily pollen and mold count.
www.hazecam.net/	NESCAUM (CAMNET)	Real-time Air Pollution Visibility Camera Network - live pictures and air quality conditions for urban and rural vistas across the Northeast U.S.
www.arb.ca.gov/	CARB	California Air Resources Board Home Page
www.awma.org/	AWMA	The Air & Waste Management Association - a nonprofit, nonpartisan professional organization that provides training, information, and networking opportunities to 12,000 environmental professionals in 65 countries.
http://nadp.sws.uiuc.edu/	NADP	National Atmospheric Deposition Program – maps and data from the nationwide precipitation monitoring network. Site also has data from the Mercury Deposition Network.
http://profiler.noaa.gov/npn/profiler.jsp	NPN	NOAA Profiler Network provides hourly vertical wind profile data.
	American Lung Association	American Lung Association – public health advocacy organization involved in public policy, research, and education mission is to prevent lung disease
http://nh.water.usgs.gov/projects/nawqa/hg_dep.htm	NACB	New England Coastal Basins Mercury Deposition Network – Atmospheric deposition