Commonwealth of Massachusetts
2005 Air Quality Report

Executive Office of Environmental Affairs
Department of Environmental Protection
Bureau of Waste Prevention
Division of Planning and Evaluation

Air Assessment Branch
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This report is available on MassDEP's web site at www.mass.gov/dep/air/perfor01.htm#annual.

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List of Abbreviations

AAB ..... Air Assessment Branch
AQS..... Air Quality System
AQI…… . Air Quality Index
BAM ..... Beta Attenuation Monitor
BP..... Barometric Pressure
CAA ..... Clean Air Act
CFR..... Code of Federal Regulations
CO..... Carbon Monoxide
CO_2..... Carbon Dioxide
DVMT..... Daily Vehicle Miles Traveled
EOEA..... Executive Office of Environmental Affairs
FRM ..... Federal Reference Method
IMPROVE ... Interagency Monitoring of Protected Visual Environments
MassDEP..... Massachusetts Department of Environmental Protection
mg/m^3..... milligrams per cubic meter
NAAQS..... National Ambient Air Quality Standards
NADP..... National Atmospheric Deposition Program
NAMS ..... National Air Monitoring Stations
NATTS..... National Air Toxics Trends Station
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
PAMS..... Photochemical Assessment Monitoring Stations
Pb ..... Lead
PEI..... Periodic Emissions Inventory
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
PM_{10} ..... Particulate matter 10 microns
PSI..... Pollutant Standards Index
QA/QC ..... Quality Assurance and Quality Control
RH..... Relative Humidity
SIP..... State Implementation Plan
SLAMS ..... State and Local Air Monitoring Stations
SO_2 ..... Sulfur Dioxide
SO_4 ..... Sulfate
SUN……..Solar Radiation
TSP..... Total Suspended Particulates
ug/m^3..... micrograms per cubic meter
USEPA..... 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) monitors outdoor air quality and requires emissions controls, as necessary, for pollutants that adversely affect public health, welfare, and the environment.

MassDEP's Air Assessment Branch (AAB) collects ambient air quality data from monitoring sites throughout Massachusetts. During 2005, MassDEP operated a network of 28 monitoring stations located in 20 cities and towns, and oversaw a separate privately funded industrial network of four monitoring stations located at industrial facilities in the Boston area. 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 is listed at www.epa.gov/ne/aqi/.

MassDEP submits ambient air quality data to the national Air Quality System (AQS) database that is administered by the U.S. Environmental Protection Agency (USEPA).

Why is Air Quality Data Collected?

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

- to verify compliance with National Ambient Air Quality Standards;
- to support development of policies and regulations designed to reduce ambient air pollution;
- to assess the effectiveness of existing air pollution control strategies;
- to provide information about air quality to the public;
- to support long-term trend analysis and special research; and
- to fulfill USEPA reporting requirements for ambient air quality data.

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 – 10 microns (PM_{10})
- particulate matter – 2.5 microns ($PM_{2.5}$)

Non-criteria pollutants have no established national ambient air quality standards; however, some of these pollutants are subject to emissions limits in facility permits issued by MassDEP. 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
- acid deposition – measured as pH and conductivity of precipitation
- toxics – health-relevant VOCs, aldehydes and metals

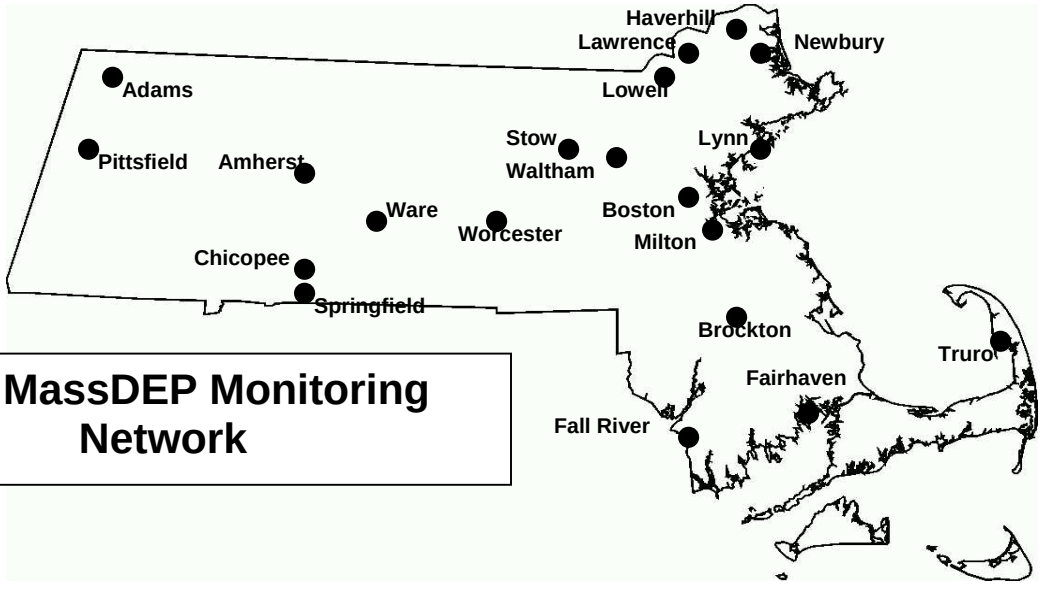
Meteorological parameters monitored are:

- wind speed/wind direction (WS/WD)
- relative humidity (RH)
- temperature (TEMP)
- barometric pressure (BP)
- solar radiation (Solar Rad)
- upper air wind and temperature (Profiler)
- 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 geographic areas. Local topography and the location of pollutant sources are factors that determine how well a particular monitor location will represent an area.

A network of monitors is located throughout the state. These networks are designed to reflect pollutant concentrations for all of Massachusetts. Section III contains data summaries for each pollutant measured and maps showing the monitor locations for each network. Appendix A contains a list of the monitor locations. The map below shows Massachusetts cities and towns where air monitors were located during 2005.



2005 MassDEP Monitoring Network

For Further Information

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 http://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 USEPA's website at www.epa.gov/air/data.

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National Ambient Air Quality Standards

Primary Standards – designed to protect public health against adverse health effects with a margin of safety.

Secondary Standards – designed to protect against damage to crops, vegetation, and buildings.

POLLUTANT	AVERAGING TIME*	PRIMARY	SECONDARY
SO_2	Annual Arithmetic Mean	0.03 ppm (80 ug/m³)	None
	24-Hour	0.14 ppm (365 ug/m³)	None
	3-Hour	None	0.50 ppm (1300 ug/m³)
CO	8-Hour	9 ppm (10 mg/m³)	Same as Primary Standard
	1-Hour	35 ppm (40 mg/m³)	Same as Primary Standard
O_3	8-Hour	0.08 ppm (157 ug/m³)	Same as Primary Standard
• The 8-hour standard is met when the 3-year average of the 4th-highest daily maximum 8-hour average does not exceed 0.08 ppm at any one monitor. • Please note that the 1-hour ozone standard of 0.125 ppm was revoked on June 15, 2005.			
Pb	Calendar Quarter Arithmetic Mean	1.5 ug/m³	Same as Primary Standard
NO_2	Annual Arithmetic Mean	0.053 ppm (100 g/m³)	Same as Primary Standard
$PM_{2.5}$ Particulates up to 2.5 microns in size	Annual Arithmetic Mean	15.0 ug/m³	Same as Primary Standard
	24-Hour	65 ug/m³	Same as Primary Standard
• The annual standard is met when the annual average of the quarterly mean $PM_{2.5}$ concentrations is less than or equal to 15 ug/m³ (3-year average). If spatial averaging is used, the annual average from all monitors within the area may be averaged in the calculation of the 3-year mean. • The 24-hour standard is met when the 98th percentile value is less than or equal to 65 ug/m³ (3-year average).			
PM_{10} Particulates up to 10 microns in size	Annual Arithmetic Mean	50 ug/m³	Same as Primary Standard
	24-Hour	150 ug/m³	Same as Primary Standard
• The PM_{10} standard is based upon estimated exceedance calculations described in 40 CFR Part 50, Appendix K. • The annual standard is met if the estimated annual arithmetic mean does not exceed 50 ug/m³. • The 24-hour standard is attained if the estimated number of days per calendar year above 150 ug/m³ does not exceed one per year.			

μg/m³ = micrograms per cubic meter ppm = parts per million mg/m³ = milligrams per cubic meter

***** Standards based on averaging times other than the annual arithmetic mean must not be exceeded more than once per year.

Pollutant Health Effects and Sources

Ozone (O_3)

- Ground-level O_3 and stratospheric O_3 are the same chemical compound but are often confused. Stratospheric O_3 at greater than 30,000 feet above the surface of the earth is beneficial because it filters out the sun's harmful ultraviolet radiation. However, ground-level O_3 is a health and environmental problem. This report pertains to ground-level O_3.
- O_3 irritates mucous membranes. This causes reduced lung function, nasal congestion, and throat irritation, and reduced resistance to infection.
- 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 reactions between certain pollutants in the presence of intense, high-energy sunlight occurring during the 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, nitrogen oxides and hydrocarbons, include motor vehicles and power plants.

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.
- Industrial processes and non-transportation fuel combustion are also sources of CO.
- Motor vehicle emissions are the largest source of CO, which is produced from incomplete combustion of carbon in fuels.

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.
- SO2 is a product of fuel combustion (e.g., burning coal and oil). Sources include heat and power generation facilities, and petroleum refineries.

Nitrogen Dioxide (NO_2)

- NO_2 lowers resistance to respiratory infections and aggravates symptoms associated with asthma and bronchitis.
- NO_2 contributes to acid deposition (see SO_2 listing above for acid deposition effects).
- NO_2 and NO contribute to the formation of ozone.
- NO_2 is formed from the oxidation of nitric oxide (NO). Major sources of NO are fuel combustion, heating, power plants and motor vehicles.

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, 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 the particles allows entry into the human respiratory system. Long-term exposure allows 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 particles.
- Particulate matter causes soiling and corrosion of materials.
- Particulate matter contributes to atmospheric haze that degrades visibility.
- Sources 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 may occur by inhalation or ingestion with food, water, soil or dust particles.
- Children, infants, and fetuses are more 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

2005 Public Monitoring Network

MassDEP operates a public ambient air monitoring network.

Network Size

- 28 monitoring stations
- 20 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.
  - 5 – CO (carbon monoxide)
  - 12 – NO_2 (nitrogen dioxide). NO (nitric oxide) and NO_x (total nitrogen oxides) are also measured by these monitors.
  - 14 – O_3 (ozone)
  - 6 – SO_2 (sulfur dioxide)

- Meteorological monitors track weather conditions.
  - 11 – BP (barometric pressure)
  - 11 – RH (relative humidity)
  - 11 – SOLAR RAD (solar radiation)
  - 13 – TEMP (temperature)
  - 12– 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)
  - 2 – UVB (B Band Ultra-violet Radiation)
  - 2 – Precipitation

- Other Monitors
  - 4 – NO_y (Total Reactive Oxidized Nitrogen)
  - 6 – PAMS (Photochemical Assessment Monitoring Station). These monitors measure VOCs (volatile organic compounds).
  - 10 – $PM_{2.5}$ BAM (particulate matter – 2.5 microns)
  - 2 – Black Carbon
  - 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.

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)
- Non-criteria pollutant monitors measure pollutants that do not have NAAQS.
  - 6 – PAMS (photochemical assessment monitoring station). These monitors measure VOCs (volatile organic compounds).
  - 1 – TSP (total suspended particulates) used for lead 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)

2005 Industrial Monitoring Network

Industries monitor air quality and submit data under agreement with MassDEP. The data must be collected using quality assurance requirements established by MassDEP and USEPA.

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 averaged to provide 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) are also 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) established timeframes and milestones for states to meet and maintain National Ambient Air Quality Standards (NAAQS) for criteria pollutants. USEPA sets the NAAQS levels to protect public health and the environment. USEPA 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 $PM_{2.5}$).

It should be noted that a new national strategy currently under development calls for the continued measurement of gaseous pollutants that already attain the standards, including sulfur dioxide, nitrogen dioxide and carbon monoxide. Under the new strategy, these gases will be measured in lower concentration ranges than in the past. This strategy will enable scientists to resolve trends more easily and obtain more meaningful data from monitors at rural locations.

Sulfur Dioxide, Nitrogen Dioxide, and Lead

Massachusetts has been in attainment for sulfur dioxide, nitrogen dioxide, and lead for a number of years based on decades of monitoring.

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 USEPA 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 is now in attainment of the CO standard.

Particulate Matter

There are currently two NAAQS particulate matter standards: An older PM_{10} and a newer $PM_{2.5}$ standard. Massachusetts has been in attainment of the PM_{10} standard for several years. In December 2004, USEPA designated Massachusetts "Attainment/Unclassifiable" for $PM_{2.5}$ statewide based on monitoring data.

The particulate matter standard has evolved over the years as more has been learned about the health effects of particulate matter. As more and more studies have linked exposure to fine particles with adverse health effects, the standard has become more stringent requiring control of particulates of smaller sizes and at lower concentrations.

- 1970 – The standard was based on Total Suspended Particulates (TSP). The standards were set at 260 ug/m^3 (24-hours) and 75 ug/m^3 (annual geometric mean).
- 1987 – The TSP standard was replaced by the PM_{10} standard (particulate matter equal to or less than 10 microns in size). The PM_{10} standards were set at 150 ug/m^3 (24-hours) and 50 ug/m^3 (annual arithmetic mean).
- 1997 – The $PM_{2.5}$ standard (particulate matter equal to or less than 2.5 microns) was promulgated in addition to the PM_{10} standard. The $PM_{2.5}$ standards are set at 65 ug/m^3 (24-hours) and 15 ug/m^3 (annual arithmetic mean).
- 2005 – As part of its 5-year review of the particulate matter standards, USEPA proposed to
  - lower the primary 24-hour $PM_{2.5}$ standard to 35 ug/m^3
  - retain the primary annual $PM_{2.5}$ standard of 15 ug/m^3
  - set the secondary standards for both the annual and 24-hour standards at levels identical to the primary standards
  - replace the PM_{10} standards (annual and 24-hour) with an "inhalable coarse particle" 24-hour standard known as $PM_{10-2.5}$ (i.e., particles smaller than 10 microns but larger than 2.5 microns), with a focus on urban areas

  USEPA plans to publish final PM standards in Fall 2006. Designations on whether states are in attainment or nonattainment with the standards would occur in 2009 and take effect in 2010.

Ozone

In 1997, USEPA set a new stricter ozone standard of 0.08 ppm averaged over an eight-hour period, but implementation was delayed due to legal challenges to the standard. USEPA designated Massachusetts as "moderate nonattainment" for the 8-hour standard effective June 15, 2004. The 1-hour standard was revoked on June 15, 2005. The 1-hour ozone standard (0.12 ppm averaged over one hour) had been in place for almost two decades. Massachusetts had been classified as "serious nonattainment" for the 1-hour ozone standard since the early 1990s. However, with the adoption of numerous control programs, Massachusetts has made significant progress in reducing the number and severity of 1-hour ozone exceedances. Mitigation programs that were put in place to attain the 1-hour standard will continue as part of MassDEP's strategy to attain the new 8-hour standard. MassDEP is working with the Ozone Transport Commission member states to develop a regional strategy for attaining the 8-hour ozone standard by 2010, and will submit to USEPA its 8-hour ozone attainment SIP in June 2007.

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 and is then used to determine the 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 0.085 ppm.

The Difference Between an Exceedance and a Violation

An ozone exceedance occurs when a monitor records ambient levels of ozone above a 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 0.085 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 0.085 ppm or greater, a violation of the 8-hour standard has occurred at that specific monitoring site.

Ozone Exceedances and Violations During 2005

Exceedances

The Table below shows the 2005 ozone exceedances. During 2005, there were three days when the former 1-hour ozone standard was exceeded. There were 16 days when the 8-hour ozone standard was exceeded. There were 54 exceedances during those 16 days.

Violations

Violations of the ozone standard are based on 3-year averages. Using data from 2003–2005, none of the 14 sites violated the former 1-hour standard. For the more stringent 8-hour standard, during the same period, three sites out of 14 violated the 8-hour standard

2005 Ozone Exceedances (ppm)

DATE	SITE	8-HOUR EXC	1-HOUR EXC	START HOUR	DATE	SITE	8-HOUR EXC	1-HOUR EXC	START HOUR
April 19, 2005	TRURO	.088		19	June 25, 2005	STOW	.091		16
April 20, 2005	LYNN	.086		10	June 25, 2005	TRURO	.088		12
April 20, 2005	MILTON	.090		12	June 25, 2005	WARE	.091		13
April 20, 2005	TRURO	.088		13	June 25, 2005	WORCESTER	.092		14
April 20, 2005	WARE	.087		11	June 25, 2005	ROXBURY	.088		16
April 20, 2005	WORCESTER	.090		13	June 25, 2005	MILTON (Blue Hill)	.103		14
June 8, 2005	WARE	.096		13	June 25, 2005	MILTON (Blue Hill)		.127	19
June 8, 2005	CHICOPEE	.088		12	June 26, 2005	ADAMS	.087		20
June 9, 2005	ADAMS	.091		13	June 26, 2005	CHICOPEE	.095		9
June 9, 2005	ADAMS		.127	18	June 26, 2005	BOSTON (Long Is)	.091		9
June 9, 2005	AMHERST	.092		11	June 26, 2005	LYNN	.096		9
June 9, 2005	CHICOPEE	.104		11	June 26, 2005	TRURO	.087		10
June 9, 2005	CHICOPEE		.128	14	June 26, 2005	MILTON (Blue Hill)	.089		9
June 9, 2005	TRURO	.087		8	July 22, 2005	LYNN	.085		11
June 9, 2005	WARE	.101		12	July 26, 2005	CHICOPEE	.090		13
June 9, 2005	WARE		.127	15	July 26, 2005	LYNN	.088		12
June 9, 2005	WORCESTER	.085		12	July 26, 2005	WARE	.090		14
June 24, 2005	ADAMS	.087		19	July 26, 2005	WORCESTER	.085		13
June 24, 2005	CHICOPEE	.085		12	July 27, 2005	CHICOPEE		.127	16
June 24, 2005	BOSTON (Long Is)	.086		14	July 27, 2005	LONG ISLAND	.085		9
June 24, 2005	LYNN	.094		16	July 27, 2005	WARE	.087		10
June 24, 2005	STOW	.087		14	August 5, 2005	TRURO	.094		10
June 24, 2005	WARE	.088		13	August 8, 2005	CHICOPEE	.085		11
June 24, 2005	WORCESTER	.087		13	August 11, 2005	FAIRHAVEN	.086		10
June 24, 2005	MILTON (Blue Hill)	.091		14	August 11, 2005	BOSTON (Long Is)	.089		11
June 25, 2005	ADAMS	.087		14	August 11, 2005	TRURO	.095		12
June 25, 2005	CHICOPEE	.090		11	August 12, 2005	CHICOPEE	.098		12
June 25, 2005	BOSTON (Long Is)	.095		16	August 12, 2005	WARE	.085		14
June 25, 2005	LYNN	.099		15	September 13, 2005	ADAMS	.089		22
					September 14, 2005	ADAMS	.085		0

Exceedance Days and Total Exceedance Trends

Figures 1 and 2 show the trends in number of 1-hour and 8-hour exceedance days and the total number of exceedances.

The trend for the 1-hour data in Figure 1 shows a decline in the number of exceedances and exceedance days over the period covered. Although the 1-hour standard was revoked June 15, 2005, Figure 1 reflects the total number of 1-hour exceedances for 2005. 2005 was a transitional year and three out of the five exceedances occurred prior to the revocation. The trend in Figure 2 shows that, under the new more stringent 8-hour standard, there were a greater number of exceedances and exceedance days compared to the 1-hour standard.

Figure 1
1-hr Ozone Exceedance Days and Total Exceedances 1987-2005
1-hour standard = 0.125 ppm (revoked June 15, 2005)

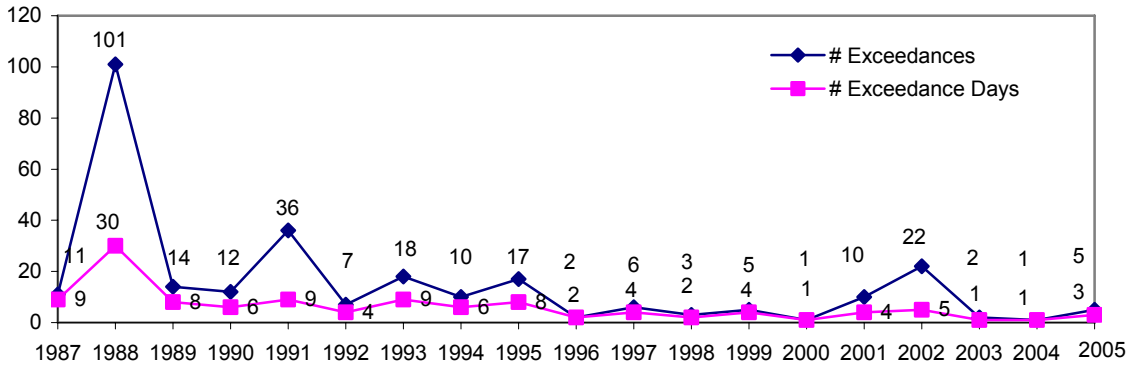
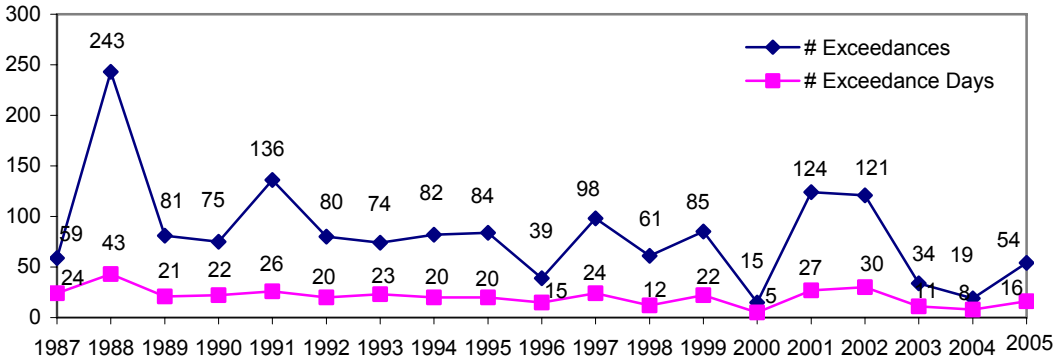


Figure 2
8-hr Ozone Exceedance Days and Total Exceedances 1987-2005
8-hour standard = 0.085 ppm



Daily Ozone Forecasts

Air Quality Ratings

MassDEP provides to the public daily air quality forecasts for ozone from May through September using weather maps and meteorological conditions to predict whether or not conditions are favorable for the production of elevated ozone levels. Each day during these months, MassDEP predicts when the air quality will be good, moderate or unhealthful.

The air quality rating is determined through analysis of National Weather Service observations and modeled predictions. Meteorological, ozone, and nitrogen oxides data from the statewide and regional monitoring networks also are used as prediction tools.

The daily air quality forecast is available May through September from MassDEP's website (www.mass.gov/air) or by calling the Air Quality Hotline (1-800-882-1497).

The table below describes the ratings used in the daily air quality forecasts.

Air Quality Rating	Adverse Health Effects	Ways to Protect Your Health
Good	None expected.	No precautions necessary.
Moderate	Ozone levels in the upper part of this range may cause respiratory problems in some children and adults engaged in outdoor activities. These effects are of particular concern for those with existing lung problems.	People with respiratory diseases, such as asthma, and other sensitive individuals should consider limiting outdoor exercise and strenuous activities during the afternoon and early evening hours, when ozone levels are usually the highest.
Unhealthy	As ozone levels increase, both the severity of the health effects and the number of people affected increase. Health effects include nose and throat irritation; chest pain; decreased lung function; shortness of breath; increased susceptibility to respiratory infection; and aggravation of asthma. It is important to note that individuals react differently when exposed to various ozone levels in the unhealthy range; some people experience problems at lower unhealthy levels, while others may not be affected until higher levels are reached.	In general, everyone should limit strenuous outdoor activity during the afternoon and early evening hours, when ozone levels are usually the highest. You should consider scheduling outdoor exercise and children's outdoor activities in the morning hours, when ozone levels are generally lower. If you are particularly sensitive to ozone, or if you have asthma or other respiratory problems, stay in an area where it is cool and, if possible, where it is air-conditioned.

Ozone Maps

USEPA maintains web sites containing current and archived ozone maps and "real-time" ozone animations using ozone data that is provided by participating states: www.epa.gov/region01/topics/air/ and www.epa.gov/airnow.

Section III
Massachusetts Air Quality Data Summaries

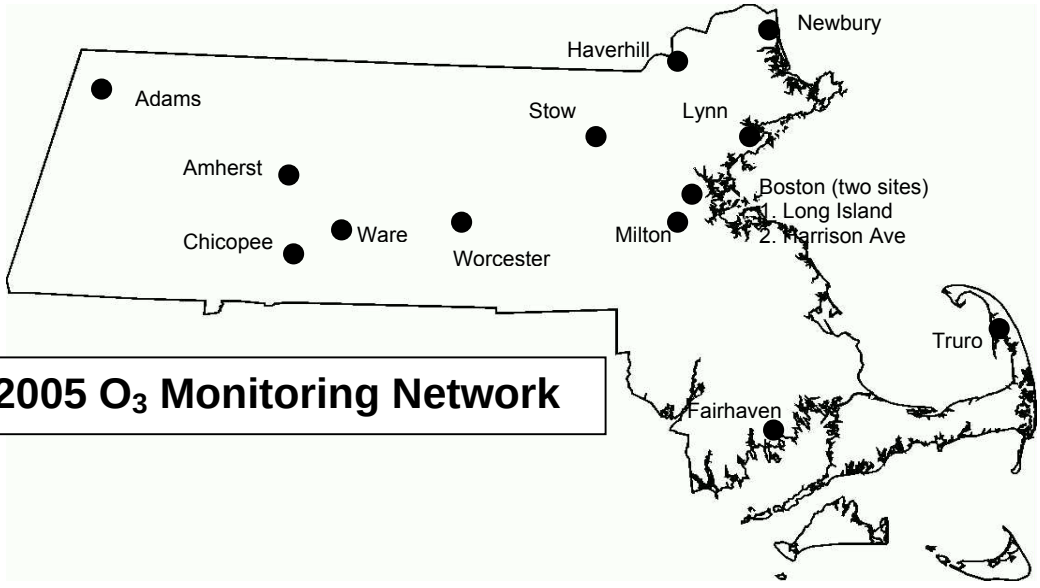
Ozone Summary

2005 Ozone Data Summary

A summary of the 2005 data collected during the ozone season (April 1 – Sept. 30) is shown below. There were 14 ozone sites in operation during 2005 in the state-operated monitoring network. All of the sites achieved the requirement of 75% or greater data capture for the year.

					1ST	2ND	DAY	1ST	2ND	3RD	4TH	DAY
				%	MAX	MAX	MAX≥	MAX	MAX	MAX	MAX	MAX≥
SITE ID	CITY	COUNTY	ADDRESS	OBS	1-HR	1-HR	0.125	8-HR	8-HR	8-HR	8-HR	0.085
25-003-4002	Adams	Berkshire	MT. GREYLOCK	85	0.127	0.097	1	0.091	0.089	0.087	0.087	6
25-015-0103	Amherst	Hampshire	NORTH PLEASANT	96	0.110	0.092	0	0.092	0.079	0.078	0.078	1
25-025-0041	Boston	Suffolk	LONG ISLAND	98	0.118	0.110	0	0.095	0.091	0.089	0.086	5
25-025-0042	Boston	Suffolk	HARRISON AVENUE	98	0.110	0.098	0	0.088	0.076	0.073	0.066	1
25-013-0008	Chicopee	Hampden	ANDERSON ROAD	96	0.128	0.127	2	0.104	0.098	0.095	0.090	8
25-005-1002	Fairhaven	Bristol	LEROY WOOD	95	0.100	0.095	0	0.086	0.084	0.084	0.082	1
25-009-5005	Haverhill	Essex	WASHINGTON ST	99	0.096	0.091	0	0.084	0.079	0.079	0.078	0
25-009-2006	Lynn	Essex	390 PARKLAND	98	0.115	0.115	0	0.099	0.096	0.094	0.088	6
25-021-3003	Milton	Norfolk	BLUE HILL	97	0.127	0.107	1	0.103	0.091	0.090	0.089	4
25-009-4004	Newbury	Essex	SUNSET BOULEVARD	99	0.098	0.096	0	0.083	0.082	0.079	0.078	0
25-017-1102	Stow	Middlesex	US MILITARY	98	0.111	0.108	0	0.091	0.087	0.084	0.083	2
25-001-0002	Truro	Barnstable	FOX BOTTOM AREA	98	0.103	0.102	0	0.095	0.094	0.088	0.088	7
25-015-4002	Ware	Hampshire	QUABBIN SUMMIT	93	0.127	0.123	1	0.101	0.096	0.091	0.090	8
25-027-0015	Worcester	Worcester	WORCESTER	98	0.113	0.106	0	0.092	0.090	0.087	0.085	5

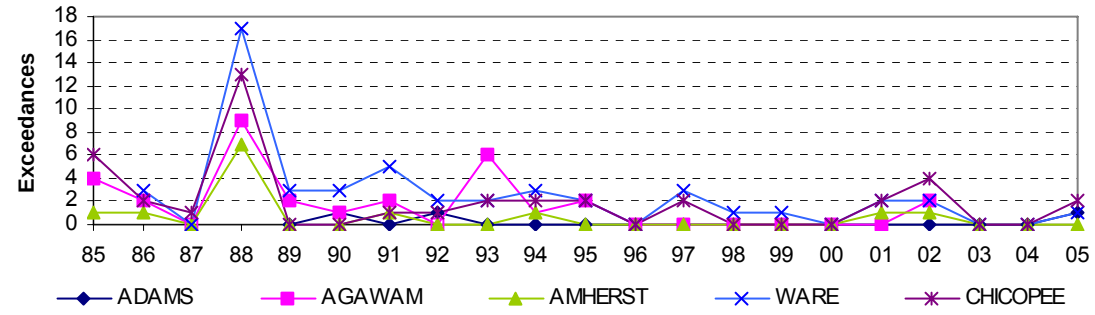
ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = PERCENTAGE OF VALID DAYS MONITORED DURING O3 SEASON **1ST, 2ND MAX 1-HR** = MAXIMUM 1-HR VALUE FOR THE 1ST & 2ND HIGHEST DAY **DAY MAX ≥ 0.125** = NUMBER OF MEASURED DAILY 1-HOUR MAXIMUM VALUES GREATER THAN 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 ≥ 0.085** = NUMBER OF MEASURED DAILY 8-HOUR MAXIMUM VALUES GREATER THAN OR EQUAL TO 0.085 PPM (8-HR STANDARD)

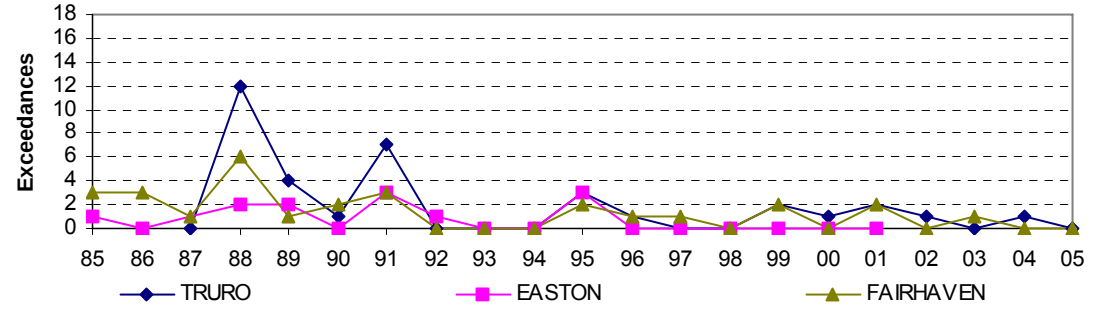


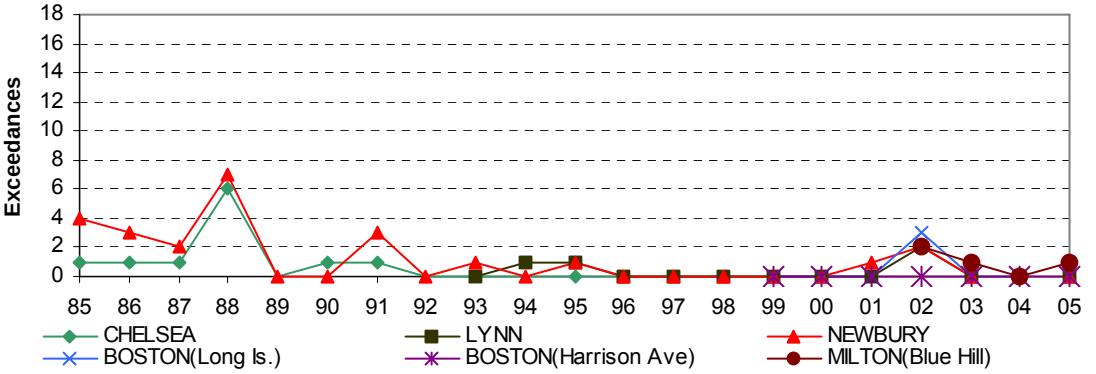
1-hour Ozone Exceedance Trends

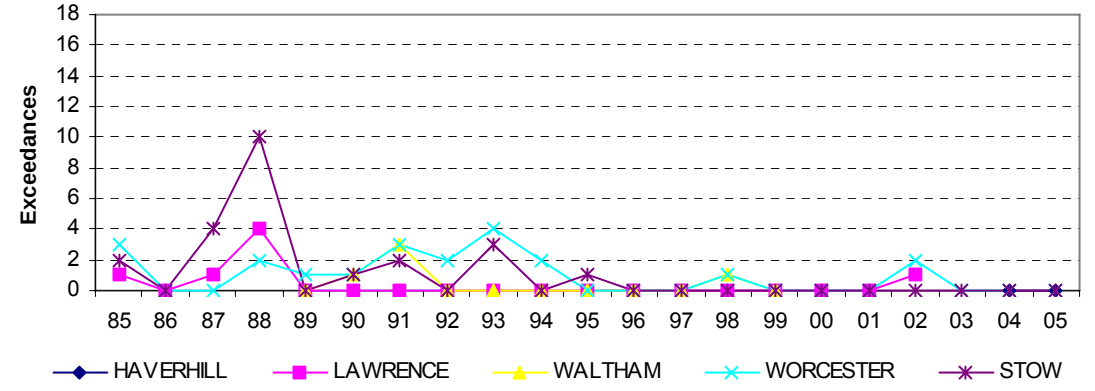
The historical trends of the former 1-hour ozone exceedances for each site are shown below.

Figure 3
1-hour Ozone Exceedance Trends 1985 – 2005
Standard = 0.125 ppm (revoked June 15, 2005)





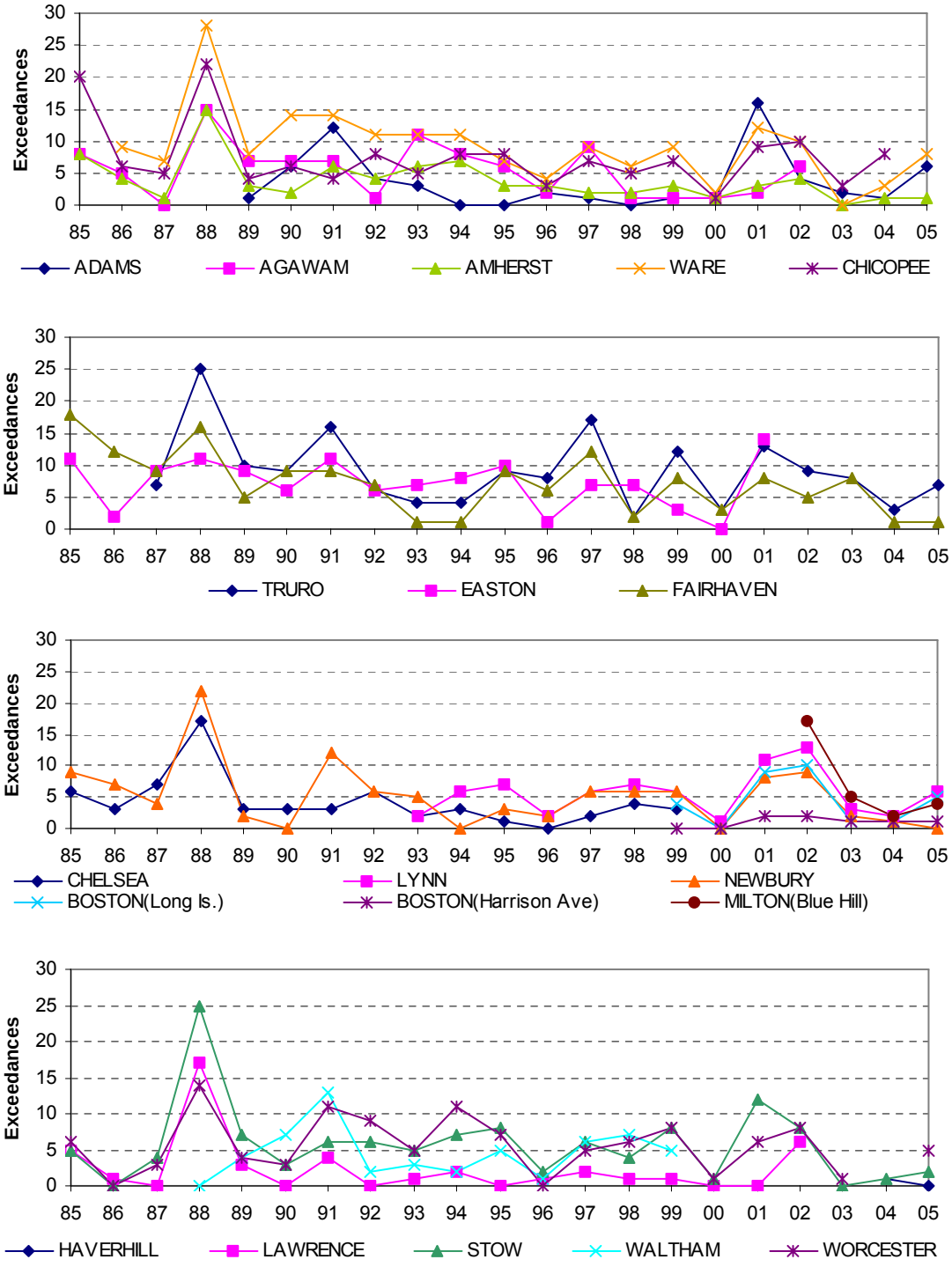




8-hour Ozone Exceedance Trends

The long-term trends of 8-hour ozone exceedances for each site are shown below. The 8-hour standard became effective in 1997.

Figure 4
8-hour Ozone Exceedance Trends 1985 – 2005
Standard = 0.085 ppm



Sulfur Dioxide (SO_2) Summary

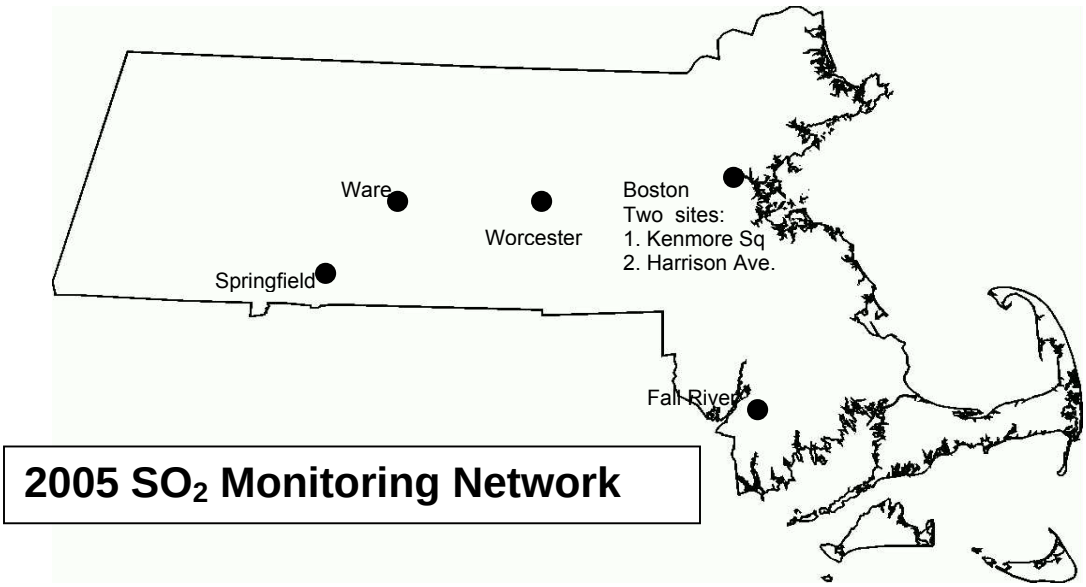
2005 SO_2 Data Summary

A summary of the 2005 SO_2 data is shown below. There were six SO_2 sites in operation during 2005 in the state-operated monitoring network. All of the sites achieved the requirement of 75% or greater data capture for the year.

SITE ID	CITY	COUNTY	ADDRESS YEAR	% OBS	1ST MAX 24-HR	2ND MAX 24-HR	#OBS >0.14	1ST MAX 3-HR	2ND MAX 3-HR	#OBS >0.50	1ST MAX 1-HR	2ND MAX 1-HR	ARITH MEAN
25-025-0002	Boston	Suffolk	KENMORE SQUARE	95	0.019	0.018	0	0.033	0.032	0	0.037	0.037	0.0038
25-025-0042	Boston	Suffolk	HARRISON AVE	95	0.019	0.019	0	0.044	0.032	0	0.049	0.044	0.0026
25-005-1004	Fall River	Bristol	GLOBE STREET	97	0.031	0.020	0	0.073	0.060	0	0.085	0.084	0.0052
25-013-0016	Springfield	Hampden	LIBERTY STREET	97	0.024	0.021	0	0.049	0.037	0	0.104	0.057	0.0062
25-015-4002	Ware	Hampshire	QUABBIN SUMMIT	95	0.016	0.016	0	0.021	0.021	0	0.024	0.023	0.0033
25-027-0023	Worcester	Worcester	SUMMER STREET	96	0.019	0.015	0	0.026	0.025	0	0.035	0.034	0.0046

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)

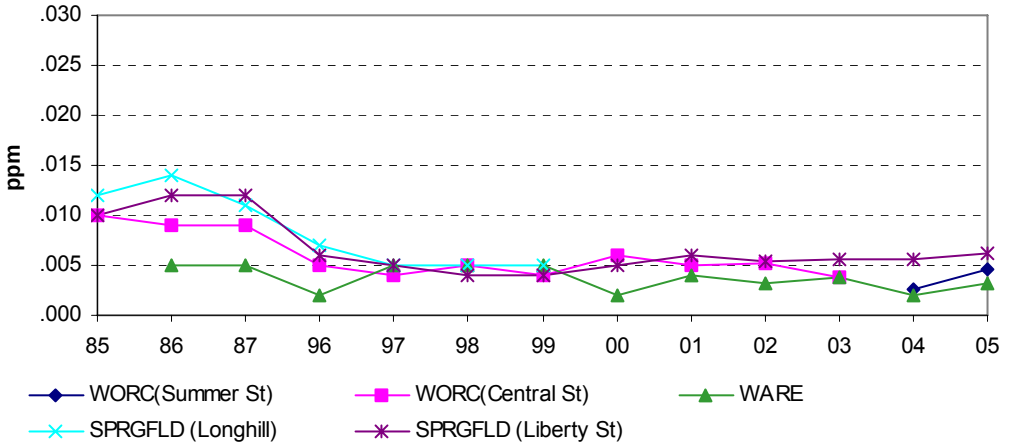


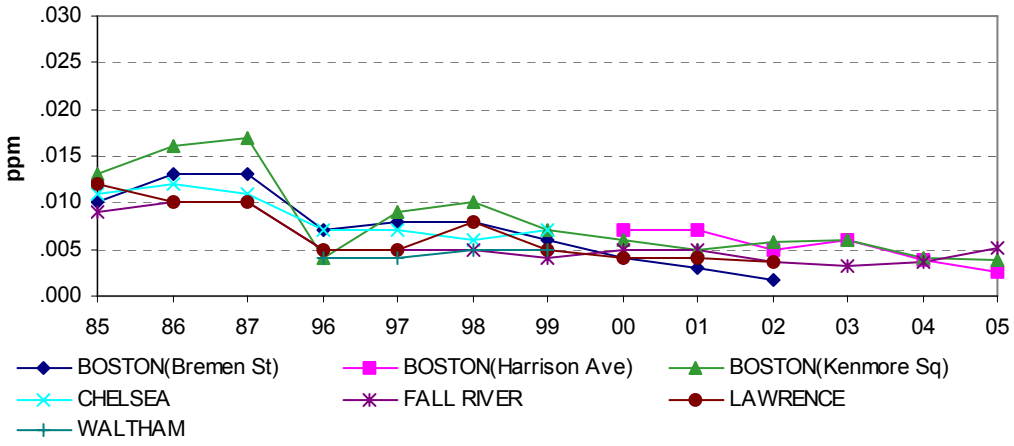
2005 SO_2 Monitoring Network

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 is well below the standard for SO_2.

Figure 5
SO_2 Trends 1985 –2005
Annual Arithmetic Means
Standard = 0.03 ppm





Nitrogen Dioxide (NO_2) Summary

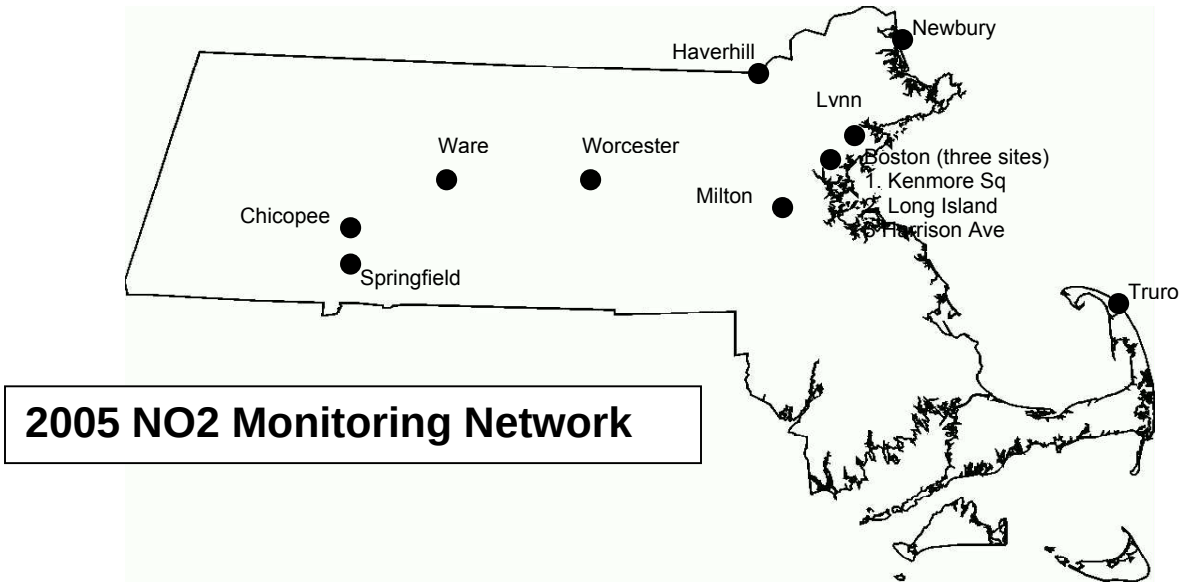
2005 NO_2 Data Summary

A summary of the 2005 NO_2 data is shown below. There were 12 NO_2 sites in operation during 2005 in the state-operated monitoring network. All of the sites met the requirement of 75% data capture for the year.

SITE ID	CITY	COUNTY	ADDRESS	% OBS	1ST MAX 1-HR	2ND MAX 1-HR	ARITH MEAN
25-025-0002	Boston	Suffolk	KENMORE SQUARE	95	0.072	0.072	0.0234
25-025-0041	Boston	Suffolk	LONG ISLAND	93	0.080	0.045	0.0073
25-025-0042	Boston	Suffolk	HARRISON AVENUE	95	0.061	0.056	0.0187
25-013-0008	Chicopee	Hampden	ANDERSON ROAD	88	0.072	0.05	0.0095
25-009-5005	Haverhill	Essex	WASHINGTON STREET	91	0.051	0.051	0.0096
25-009-2006	Lynn	Essex	390 PARKLAND	94	0.053	0.053	0.0099
25-021-3003	Milton	Norfolk	BLUE HILL	95	0.025	0.023	0.0049
25-009-4004	Newbury	Essex	SUNSET BOULEVARD	91	0.026	0.026	0.0036
25-013-0016	Springfield	Hampden	LIBERTY STREET	92	0.054	0.053	0.0171
25-001-0002	Truro	Barnstable	FOX BOTTOM AREA	89	0.009	0.009	0.0027
25-015-4002	Ware	Hampshire	QUABBIN SUMMIT	93	0.059	0.059	0.0049
25-027-0023	Worcester	Worcester	SUMMER STREET	95	0.070	0.066	0.0148

Standard: Annual Arithmetic Mean = 0.053 ppm

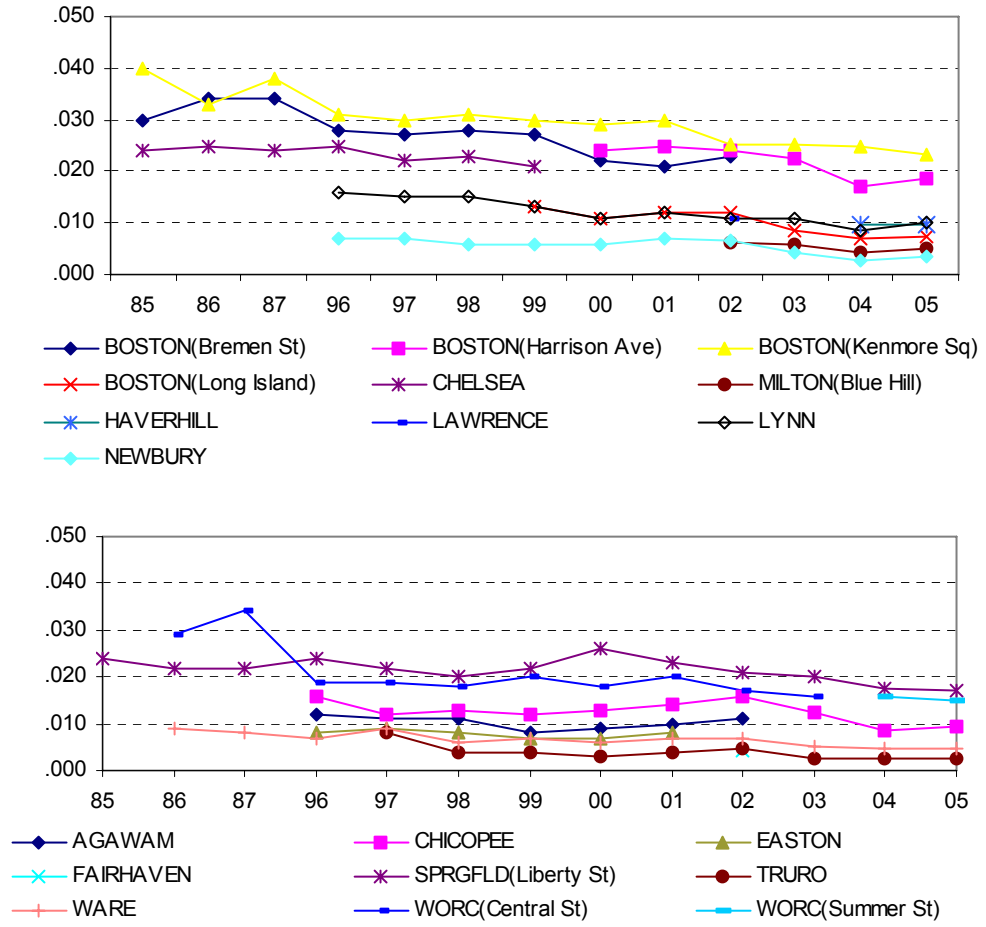
ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND MAX 1-HR** = FIRST AND SECOND HIGHEST VALUE FOR TIME PERIOD INDICATED **ARITH MEAN** = ANNUAL ARITHMETIC MEAN



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 – 2005
Annual Arithmetic Means
Standard = 0.05 ppm



Carbon Monoxide (CO) Summary

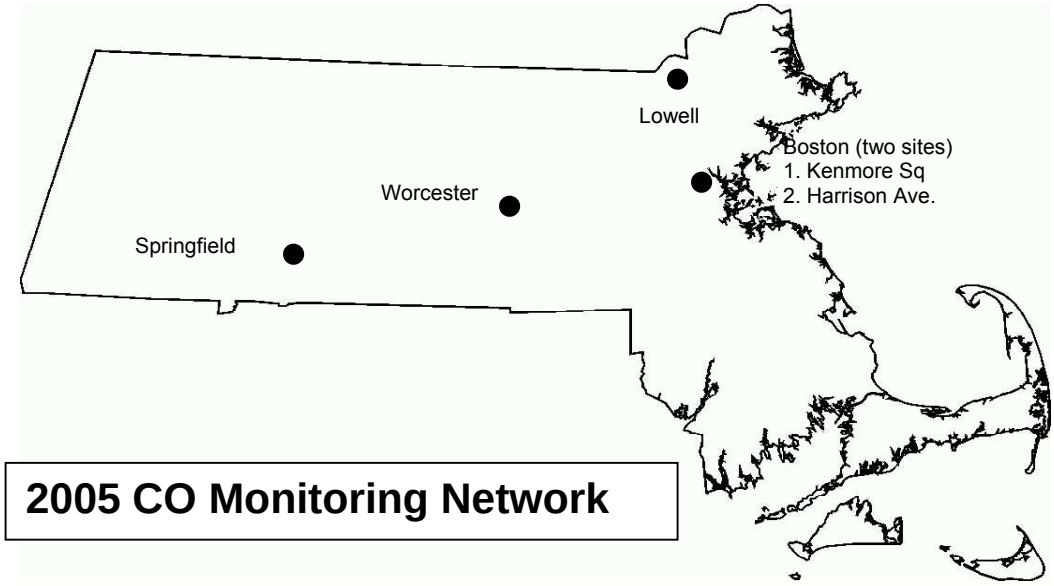
2005 CO Data Summary

A summary of the 2005 CO data is shown below. There were five CO sites in operation during 2005 in the state-operated monitoring network. All of the sites achieved the requirement of 75% or greater data capture for the year.

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	91	2.4	2	0	1.6	1.5	0
25-025-0042	Boston	Suffolk	HARRISON AVENUE	91	4.3	3.6	0	2.4	2.3	0
25-017-0007	Lowell	Middlesex	OLD CITY HALL	93	2.8	2.6	0	2.1	1.8	0
25-013-0016	Springfield	Hampden	LIBERTY STREET	91	3.6	3.3	0	2.9	2.6	0
25-027-0023	Worcester	Worcester	SUMMER STREET	93	4	3.3	0	2.7	2.3	0

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

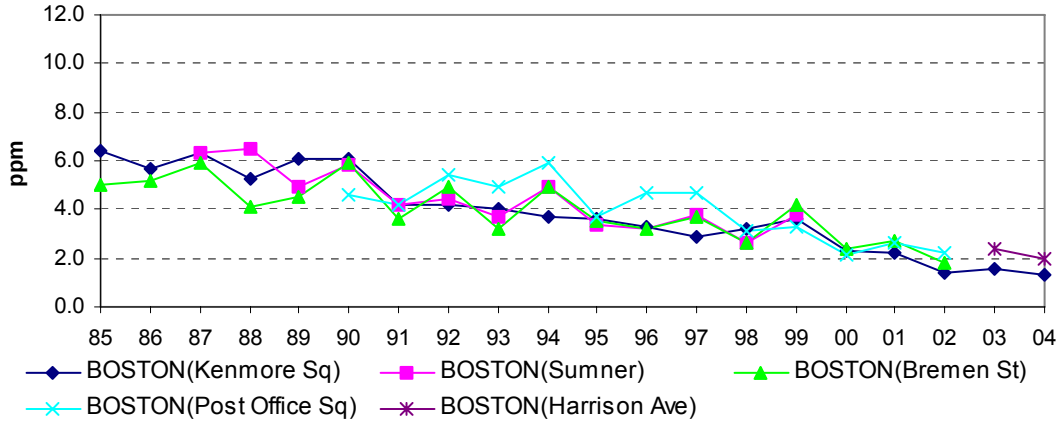
ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND MAX 1-HR** = FIRST AND SECOND HIGHEST VALUE FOR TIME PERIOD INDICATED **OBS > 35** = NUMBER OF 1-HR AVG. GREATER THAN 35 PPM (1-HR STANDARD) **1ST, 2ND MAX 8-HR** = FIRST AND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

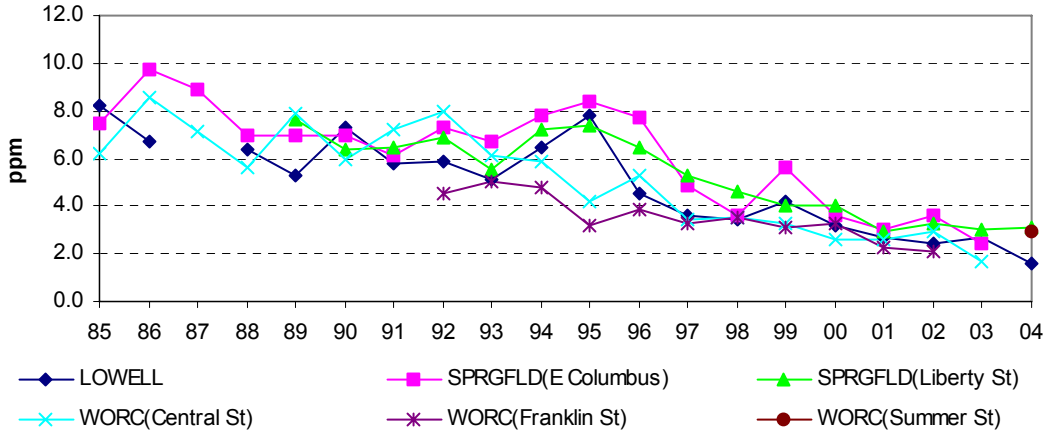


CO Trends

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. The highest 8-hour values occurred in Springfield. Massachusetts is well below both the 1-hour and 8-hour standards.

Figure 7
CO Trends 1985-2005
2nd Maximum 8-hour Values
Standard = 9 ppm





Particulate Matter 10 Microns (PM_{10}) Summary

2005 PM_{10} Data Summary

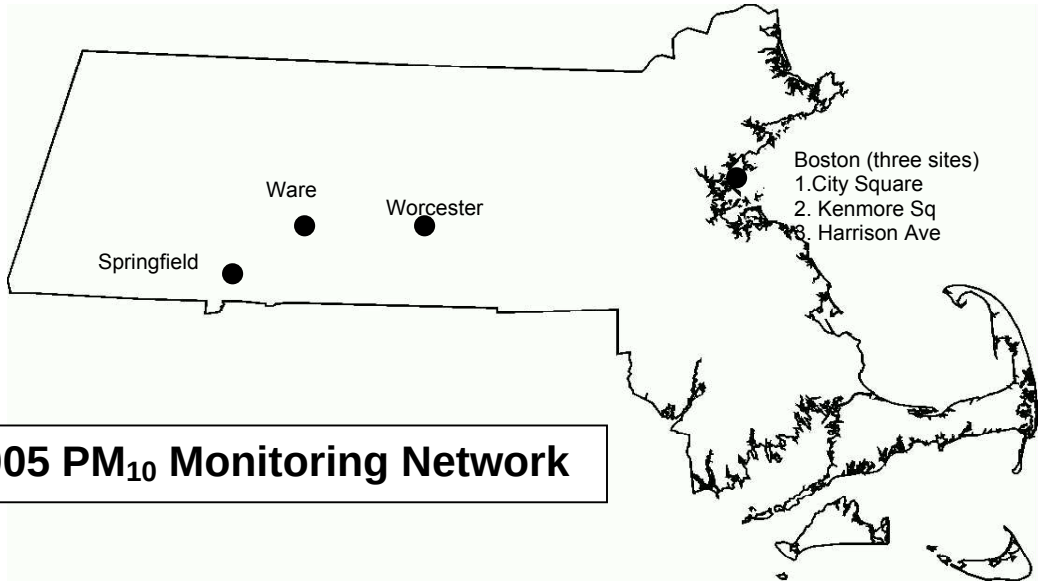
A summary of the 2005 PM_{10} data is shown below. There were six PM_{10} sites in operation during 2005 in the state-operated monitoring network. All of the sites achieved the requirement of 75% or greater data capture for the year.

SITE ID	TYPE	CITY	COUNTY	ADDRESS YEAR	% OBS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	DAY MAX >150	EST DAYS >150	WTD ARITH MEAN
25-025-0002	Lo-Vol	Boston	Suffolk	KENMORE SQUARE	79	63	58	53	51	0	0	28.9*
25-025-0027	Lo-Vol	Boston	Suffolk	ONE CITY SQUARE	84	48	40	39	39	0	0	23.0*
25-025-0027	Lo-Vol Co-loc	Boston	Suffolk	ONE CITY SQUARE	88	40	31	29	28	0	0	22.3*
25-025-0042	Hi-Vol	Boston	Suffolk	HARRISON AVENUE	93	76	38	36	35	0	0	20.1
25-025-0042	Hi-Vol Co-loc	Boston	Suffolk	HARRISON AVENUE	89	42	37	34	34	0	0	18.6
25-025-0042	Lo-Vol	Boston	Suffolk	HARRISON AVENUE	90	40	39	39	37	0	0	20.5*
25-025-0042	Lo-Vol Co-loc	Boston	Suffolk	HARRISON AVENUE	81	41	40	39	36	0	0	21.4*
25-013-2009	Lo-Vol	Springfield	Hampden	1860 MAIN STREET	79	61	53	47	40	0	0	23.6*
25-015-4002	Lo-Vol	Ware	Hampshire	QUABBIN SUMMIT	89	47	33	31	31	0	0	12.9*
25-027-0023	Lo-Vol	Worcester	Worcester	SUMMER STREET	85	58	53	50	50	0	0	25.6*

25 INDICATES THAT THE MEAN DOES NOT SATISFY SUMMARY CRITERIA (NUMBER OF OBSERVATIONS FOR AT LEAST 1 QUARTER WAS LESS THAN 75%)

PM_{10} Hi Vol Standards: 24-hour = 150 μg/m³ PM_{10} Hi Vol Annual Arithmetic Mean = 50 μg/m³

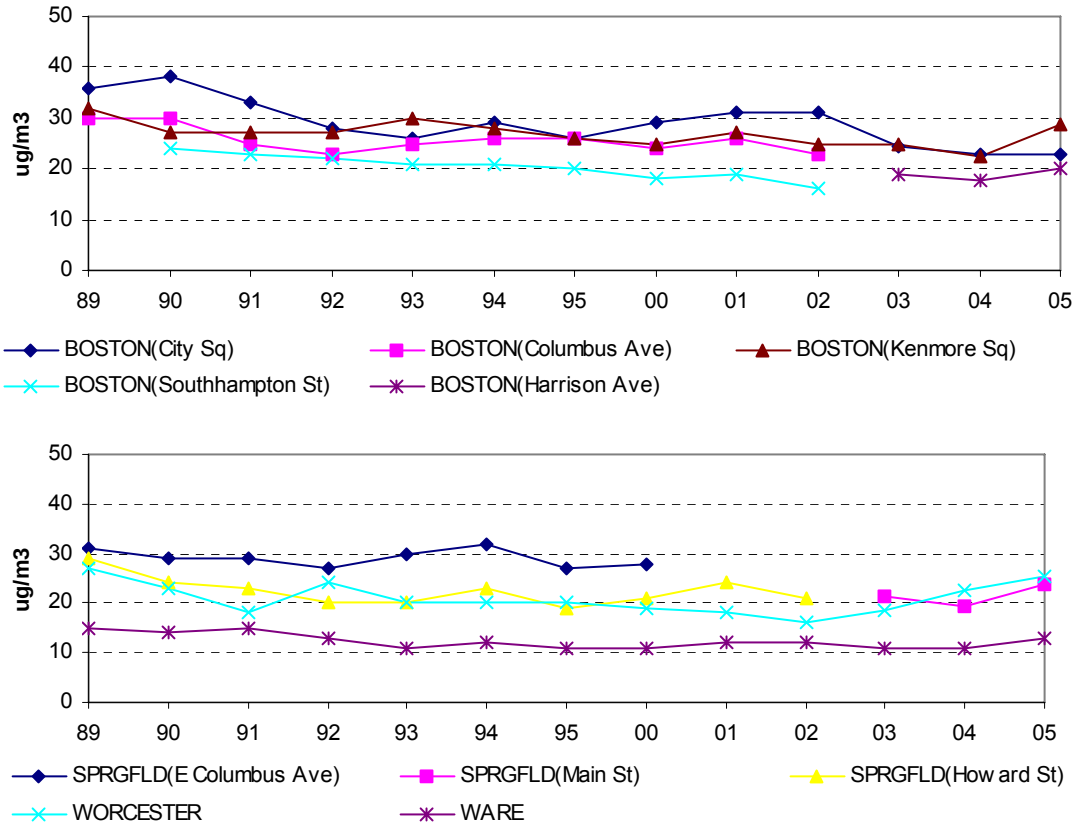
ABBREVIATIONS AND SYMBOLS USED IN TABLE
SITE ID = AIRS SITE IDENTIFICATION NUMBER **% OBS** = DATA CAPTURE PERCENTAGE **1ST, 2ND, 3RD, 4TH 24-HR MAX** = 1ST, 2ND, 3RD, AND 4TH HIGHEST 24-HOUR VALUES FOR THE YEAR **DAY MAX > 150** = DAILY MAXIMUM VALUE GREATER THAN STANDARD OF 150 μg/m³ **WTD ARITH MEAN** = WEIGHTED ANNUAL ARITHMETIC MEAN (STANDARD = 50 μg/m³)



PM_{10} Trends

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

Figure 8
PM_{10} Trends 1989-2005
Annual Arithmetic Mean
Standard = 50 ug/m3



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

2005 $PM_{2.5}$ Operations

The MassDEP $PM_{2.5}$ sampling network has been operating since January 1999. In December 2004, USEPA designated the entire State as "Attainment/Unclassifiable" on the basis of measured $PM_{2.5}$ concentrations. An ambitious program of sampler replacement has since been accomplished in conjunction with a rigorous preventative maintenance program that has helped to improve overall data capture.

Semi-Continuous $PM_{2.5}$ Measurement

MassDEP recently completed the deployment of a network of 10 semi-continuous $PM_{2.5}$ samplers at monitoring stations around the state. These Beta Attenuation Monitors (BAMs) employ technology that conducts hourly measurements of $PM_{2.5}$ particulate concentrations. The BAM method is referred to as a semi-continuous method because only one measurement is made every hour, in contrast to the truly continuous measurements made by the gaseous pollutant monitors in which sample collection is ongoing.

Beginning in 2001, Massachusetts installed BAMs at a limited number of urban sites to gain experience with the new technology and to compare the data from the new samplers with data coming from the existing Federal Reference Method (FRM) $PM_{2.5}$ network. The BAM samplers proved to be advantageous in that they collect hourly samples of PM and display the results within 5 minutes of the hour in which the sample is collected, unlike the FRM samplers that collect only 1 sample in a 24-hour period with results not available for several days after collection pending analysis of the sample filter at the MassDEP Laboratory in Lawrence.

There are several advantages to using BAMs technology for collecting $PM_{2.5}$ data, one being that samples are collected hourly seven days a week, unlike the conventional $PM_{2.5}$ methods that collect only 2 samples per week. Another big advantage is the ability to immediately retrieve data from the monitoring stations remotely using a standard modem and phone line. This makes the data very useful for examining daily fluctuations in pollutant levels and providing the public with near real-time information on local air quality.

In 2003, USEPA began providing a website where the public can view concentration gradient maps that graphically display data coming in from the 10 semi-continuous monitoring stations. Different colors on the map are used to indicate the PM concentration of the samples that were collected for each hour of the day. The website address for viewing the map is: www.epa.gov/airnow/.

2005 $PM_{2.5}$ Data Summary

A summary of the 2005 $PM_{2.5}$ data is shown below.

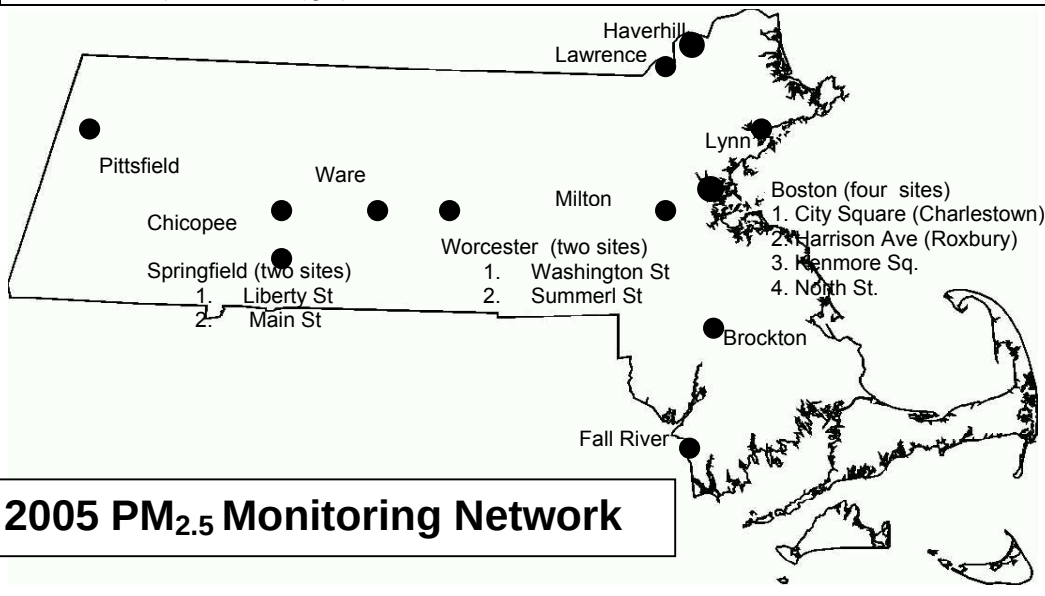
SITE ID	TYPE	CITY	COUNTY	ADDRESS YEAR	% OBS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN
25-025-0002	FRM	Boston	Suffolk	KENMORE SQUARE	98	32	31.1	28.9	28.6	28.9	12.87
25-025-0027	FRM	Boston	Suffolk	ONE CITY SQUARE	100	34.1	33.8	31.6	29.5	31.6	11.78
25-025-0027	FRM Co-loc	Boston	Suffolk	ONE CITY SQUARE	67	33.4	24.3	23	22.4	33.4	13.38*
25-025-0042	FRM	Boston	Suffolk	HARRISON AVENUE	94	33.4	32.9	28.6	28.2	28.6	11.33
25-025-0042	BAM	Boston	Suffolk	HARRISON AVENUE	96	45.5	40.9	40.8	38.2	32.1	11.67
25-025-0043	FRM	Boston	Suffolk	174 NORTH STREET	78	42.1	40.6	38.7	38	38.7	13.71
25-025-0043	FRM Co-loc	Boston	Suffolk	174 NORTH STREET	67	46.9	38.2	36.1	34.1	38.2	13.33*
25-025-0043	BAM	Boston	Suffolk	174 NORTH STREET	98	46.5	40.6	37.8	34.9	32.4	13.38
25-023-0004	FRM	Brockton	Plymouth	120 COMMERCIAL ST	97	37	32.6	27.4	27.3	27.4	10.49
25-023-0004	FRM Co-loc	Brockton	Plymouth	120 COMMERCIAL ST	76	37.2	32.5	31.5	26.9	32.5	11.11*
25-013-0008	FRM	Chicopee	Hampden	ANDERSON ROAD	92	38.2	28.2	26.1	25.2	26.1	10.63
25-005-1004	FRM	Fall River	Bristol	GLOBE STREET ST	89	30.3	25.7	21.9	21.9	21.9	10.05*
25-005-1004	BAM	Fall River	Bristol	GLOBE STREET ST	96	43.5	37.6	35.3	34.8	29.5	10.21
25-009-5005	FRM	Haverhill	Essex	WASHINGTON ST	97	35	27.7	27.3	24.7	27.3	9.44
25-009-5005	BAM	Haverhill	Essex	WASHINGTON ST	98	39.1	37.2	32.5	32.5	26.1	8.66
25-009-6001	FRM	Lawrence	Essex	WALL EXPERIMENT	100	36.3	33.6	27.5	24.9	27.5	9.87
25-009-6001	FRM Co-loc	Lawrence	Essex	WALL EXPERIMENT	69	34.4	27.5	26	24.1	27.5	10.28*
25-009-2006	FRM	Lynn	Essex	390 PARKLAND ST	97	32.6	30.5	27.1	25.7	27.1	9.48
25-009-2006	BAM	Lynn	Essex	390 PARKLAND ST	97	23	20.6	19.8	17.6	20.6	6.08*
25-021-3003	BAM	Milton	Norfolk	BLUE HILL	76	46.6	40.6	37.3	33.5	28.2	7.40*
25-003-0006	BAM	Pittsfield	Berkshire	BERKSHIRE COMMON	97	25	24.8	24.1	17.7	25	11.92*
25-003-5001	FRM	Pittsfield	Berkshire	78 CENTER STREET	93	39.7	36.9	33.5	32.7	33.5	11.84
25-013-0016	FRM	Springfield	Hampden	LIBERTY STREET	98	44	38.1	29.9	28.8	29.9	12.69
25-013-0016	FRM Co-loc	Springfield	Hampden	LIBERTY STREET	70	29.5	28.9	28.1	26.4	28.9	11.28*
25-013-0016	BAM	Springfield	Hampden	LIBERTY STREET	99	49.9	48.9	46.1	46	36.9	10.86
25-013-2009	FRM	Springfield	Hampden	1860 MAIN STREET	79	44.2	43.4	29.9	27.9	43.4	12.81*
25-015-4002	BAM	Ware	Hampshire	QUABBIN SUMMIT	98	37	37	33.9	27.3	27.3	8.64*
25-027-0016	FRM	Worcester	Worcester	2 WASHINGTON	96	35.9	33.5	30.6	27.9	30.6	11.3
25-027-0023	FRM	Worcester	Worcester	SUMMER STREET	98	36.3	35.5	30.7	29.1	30.7	12.22
25-027-0023	BAM	Worcester	Worcester	SUMMER STREET	98	37.6	35.4	35.3	35.1	32.3	9.82

* INDICATES THAT THE MEAN DOES NOT SATISFY SUMMARY CRITERIA (NUMBER OF OBSERVATIONS FOR AT LEAST 1 QUARTER WAS LESS THAN 75%) (Currently BAM data has no standard.)

Standards (based on 3-year averages): 24-hours = 65 $\mu g/m^3$ Annual Arithmetic Mean = 15.0 $\mu g/m^3$

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 **1ST, 2ND, 3RD, 4TH MAX** = 1ST, 2ND, 3RD, AND 4TH HIGHEST 24-HOUR VALUES FOR THE YEAR **WTD ARITH MEAN** = WEIGHTED ANNUAL ARITHMETIC MEAN (STANDARD = 15.0 $\mu g/m^3$)



2005 $PM_{2.5}$ Monitoring Network

Speciation

MassDEP has been collecting $PM_{2.5}$ samples for speciation at the air monitoring station in Roxbury since 2000 and in Chicopee since 2001. Speciation is the analysis of particulate matter collected on quartz filters to determine the chemical composition of the particulate matter collected. The results are used to determine the levels of specific toxic air pollutants present in the atmosphere, and to provide clues about the nature and identity of air pollution sources that impact the monitoring station area. During each sampling event, three separate filters made of different materials 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)

Massachusetts currently has two IMPROVE monitors at the Ware and Truro sites. The Wampanoag Indian Tribe operates a third IMPROVE sampler at their Martha's Vineyard site. These samplers acquire $PM_{2.5}$ filter samples for speciation analysis using a different protocol than that of the speciation program described above. 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). Data can be viewed at the IMPROVE web site at http://vista.cira.colostate.edu/improve/Data/data.htm.

Lead (Pb) Summary

2005 Pb Data Summary

MassDEP operates a total suspended particulates (TSP) sampler at only one site to measure airborne lead levels. The concentrations monitored are 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. A summary of the 2005 Pb data is shown below.

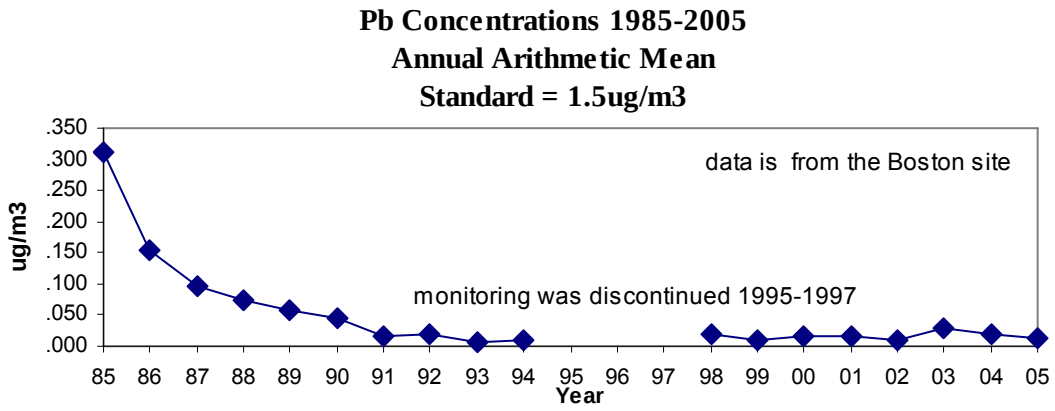
SITE ID	CITY	COUNTY	ADDRESS	# OBS	QTR1 ARITH MEAN	QTR2 ARITH MEAN	QTR3 ARITH MEAN	QTR4 ARITH MEAN	# MEANS > 1.5	1ST MAX	2ND MAX
25-025-0002	Boston	Suffolk	KENMORE SQUARE	40	.01*	.02*	0.01	0.01	0	0.05	0.04

25 INDICATES THAT THE MEAN DOES NOT SATISFY SUMMARY CRITERIA (NUMBER OF OBSERVATIONS FOR AT LEAST 1 QUARTER WAS LESS THAN 75%)

Standard: 1.5 μg/m³ (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/m³) **1ST, 2ND MAX** = THE 1ST AND 2ND MAXIMUM 24 HOUR VALUES

Figure 9



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. When the pollutant SO_2 value reaches certain trigger values, 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 USEPA 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 USEPA's web site at www.epa.gov/airmarkets/arp/.

Sulfur Dioxide (SO_2) summary

There were four SO_2 sites in operation during 2005 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 2005 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	99	0.018	0.014	0	0.033	0.031	0	0.034	0.033	0.0042
25-025-0020	Boston	Suffolk	DEWAR STREET	99	0.015	0.014	0	0.028	0.026	0	0.029	0.028	0.0039
25-025-0021	Boston	Suffolk	340 BREMEN STREET	99	0.023	0.022	0	0.043	0.041	0	0.046	0.045	0.0058
25-025-0040	Boston	Suffolk	531A EAST FIRST STREET	95	0.055	0.04	0	0.089	0.085	0	0.105	0.095	0.0056

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 site that operated during 2005 in the industrial network. The site was owned by Exelon Energy in Boston (East First St.) but was operated by ENSR International. It met the requirement of 75% or greater data capture. There were no reported violations of the NO_2 air quality standard during the year.

A summary of the 2005 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	93	0.113	0.089	0.018

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 2005 in the industrial network. The sites were owned by Exelon Energy in Boston but were operated by ENSR International. 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 particulate standard in 1987), so there is no longer a standard for it. A summary of the 2005 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	NC	Boston	Suffolk	LONG ISLAND	95	47	44	44	41	22.6	20.5	1.6
25-025-0020	NC	Boston	Suffolk	DEWAR STREET	96	240	215	196	168	79.2	66.8	1.8
25-025-0021	NC	Boston	Suffolk	340 BREMEN STREET	100	194	183	152	137	62.8	54.9	1.7
25-025-0040	NC	Boston	Suffolk	531A EAST FIRST STREET	96	152	147	119	117	51.7	45.8	1.6
25-025-0040	NC Coloc	Boston	Suffolk	531A EAST FIRST STREET	95	155	152	118	115	53.1	47.1	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 2005 in the industrial network. The sites were owned by Exelon Energy in Boston but were operated by ENSR International. 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 standard for SO_4. A summary of the 2005 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	NC	Boston	Suffolk	LONG ISLAND	58	36	15	12	12	6.55
25-025-0020	NC	Boston	Suffolk	DEWAR STREET	59	15	14	13	11	6.71
25-025-0021	NC	Boston	Suffolk	340 BREMEN STREET	61	20	19	17	14	7.77
25-025-0040	NC	Boston	Suffolk	531A EAST FIRST STREET	58	19	17	17	12	7.79
25-025-0040	NC Coloc	Boston	Suffolk	531A EAST FIRST STREET	58	19	16	16	13	7.71

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

To ensure that ambient air quality data is of high quality, MassDEP has developed standard operating procedures (SOPs) that include quality control and quality assurance techniques that assess the quality and document the activities performed in collecting the data.

Quality Control

Quality control (QC) is comprised of those activities performed by personnel who are directly involved in the generation (i.e., collection) of data. Examples of personnel who perform QC functions are site operators and laboratory support personnel. QC activities include calibrations, data validation procedures, and performance checks of the ambient air monitors to assess the precision of the data. Documentation of all activities and site information further augment accurate data collection.

Data Quality Review

MassDEP's Air Assessment Branch has a data group that reviews data. This group checks all precision and accuracy activities as well as raw data, quality assurance checks, and documentation. The group uses report software for data validation. The data group edits the data as required and transfers it to the USEPA AQS database where it undergoes further scrutiny before being moved into the permanent database.

Quality Assurance

Quality Assurance (QA) is comprised of those activities performed by personnel who are not directly involved in the generation of the data and who may therefore make an unbiased assessment of the data quality. QA activities include performance audit checks of the ambient air monitors to assess the accuracy of the data.

Precision and Accuracy

Precision is defined as a measure of the repeatability of a measurement system. Accuracy is defined as a measure of the closeness of an observed measurement value to the actual value.

QC and QA performance checks allow the precision and accuracy of ambient air monitors to be quantified. This is accomplished by testing the monitor's response to known inputs in order to assess the measurement error. The QC performance checks assess the precision, while the QA performance checks assess the accuracy. The requirements and techniques for performing precision and accuracy performance checks are established in the Code of Federal Regulations (CFR), Title 40, Part 58, Appendix A.

How Precision and Accuracy is Described

Precision and accuracy are given in the context of upper and lower 95-percentile probability limits for each pollutant parameter. The meaning of the 95-percentile limits is that 95% of the data for a

parameter is estimated to be precise or accurate to within the percentage range defined by the upper and lower limits.

As an example, if the upper and lower 95-percentile limits for a parameter based upon precision checks are calculated to be +4.3% and –7.4%, then 95% of the data is precise within the range of +4.3% through –7.4%.

2005 Precision and Accuracy Summary

As a goal, the 95-percentile probability limits for precision (all parameters) and PM_{10} and TSP accuracy should be less than ±15%. The 95-percentile probability limits for accuracy for all other parameters should be less than ±20%. Three response levels are audited: low (L1) 6-16% of full scale, mid (L2) 30- 40%, and high (L3) 70-90%. A summary of the 2005 precision and accuracy data is shown below.

							PRECISION DATA				ACCURACY DATA						
PRECISION AND ACCURACY DATA KEY							# OF	# PREC	PROB	LIM	# AUDITS	PROB	LIM	PROB	LIM	PROB	LIM
RG	ST	RO	TYP	CLASS	POLL	YEAR-Q	ANLYZRS	CHECKS	LO	UP	L1-3	LO-L1	-UP	LO-L2	-UP	LO-L3	-UP
01	25	001	C	A	CO	2005	5	123	-5.2	3.2	15	-11.0	.5	-16.7	-2.8	-16.7	-.4
CARBON MONOXIDE						2005-1	5	32	-2.4	1.5	3						
						2005-2	5	31	-3.0	2.5	3	-6.5	-2.7	-8.2	-8.2	-10.4	-6.2
						2005-3	5	30	-7.7	4.2	6	-11.5	-4.2	-15.5	-11.3	-14.9	-9.2
						2005-4	5	30	-5.2	2.2	3	-13.6	2.2	-19.8	-1.8	-20.2	2.8
01	25	001	C	A	SO2	2005	6	158	-11.9	2.8	27	-5.7	7.0	-9.0	4.3	-7.7	6.0
SULFUR DIOXIDE						2005-1	6	40	-9.8	0.4	9	-4.9	8/6	-5.3	5.7	-3.1	7.5
						2005-2	6	39	-10.6	2.0	3	-3.6	8.4	-4.2	5.2	-2.1	6.6
						2005-3	6	40	-13.6	4.9	6	-11.7	7.5	-11.4	0.0	-9.2	0.6
						2005-4	6	39	-10.3	0.7	9	-2.7	2.7	-6.5	-1.4	-5.7	0.3
01	25	001	C	A	NO2	2005	12	250	-8.8	4.9	45	-14.3	2.2	-13.3	2.0	-12.0	1.8
NITROGEN DIOXIDE						2005-1	8	51	-9.0	4.2	6	-1.2	2.5	-5.0	5.5	-5.0	4.3
						2005-2	12	70	-9.3	4.5	15	-14.6	1.1	-14.4	2.4	-13.6	2.3
						2005-3	12	78	-8.0	4.9	15	-14.6	0.9	-12.3	-2.4	-11.0	-2.2
						2005-4	8	51	-7.2	3.8	9	-13.6	0.2	-12.5	0.4	-11.6	1.6
01	25	001	C	A	O3	2005	14	230	-4.6	2.7	48	-7.1	7.0	-5.3	8.1	-4.6	8.3
OZONE						2005-1	4	25	-4.6	1.1	6	2.7	2.7	1.3	6.1	1.0	7.2
						2005-2	14	89	-3.7	3.6	15	-3.8	4.9	-2.4	6.3	-2.2	6.8
						2005-3	14	90	-3.4	1.7	21	-4.9	5.5	-3.3	7.0	-2.3	6.9
						2005-4	4	26	-6.9	-0.1	6	-20.1	9.4	-17.2	9.7	-15.3	8.3

PRECISION AND ACCURACY DATA KEY							# OF	COLLOC	PROB	LIM	# AUDITS		PROB LIM			
RG	ST	RO	TYP	CLASS	POLL	YEAR-Q	SAMP	SITES	LO	UP	L1-L3	L4	LO-L1	UP		
01	25	001	I	F	PM2.5	2005	489	5	12.5	14.1	77		-0.8	0.8		
PM2.5 LOCAL CONDITIONS						2005-1	121	4	10.0	12.6	17		-0.7	0.9		
						2005-2	134	4	11.8	14.9	19		-0.6	0.5		
						2005-3	145	4	11.6	14.3	20		-2.1	3.7		
						2005-4	89	4	15.1	20.6	21		-1.3	-0.3		
01	25	001	I	F	PM10	2005	98	3	-10.3	12.6	30		-5.3	4.0		
PM10 TOTAL 0-10UM						2005-1	27	2	-10.7	11.2	7		-2.5	2.0		
						2005-2	19	3	-10.9	7.1	7		-3.5	2.5		
						2005-3	27	2	-10.1	13.4	8		-4.7	3.2		
						2005-4	25	2	-2.6	15.8	8		-8.7	6.8		

ABBREVIATIONS AND SYMBOLS USED IN TABLE
RG = EPA REGION **ST** = STATE **RO** = REPORTING ORGANIZATION **TYP** = ANALYZER TYPE (CONTINUOUS OR INTERMITTENT) **CLASS** = ANALYTICAL (A); FLOW (F) **YR** = YEAR **# OF ANLYZRS** = NUMBER OF ANALYZERS **PRECIS** CHECKS = NUMBER OF PRECISION CHECKS **PROB LIM LO/UP** = LOWER AND UPPER 95% PROBABILITY LIMITS **# AUDITS L1-3** = NUMBER OF AUDITS **PROB LIM LO-L1-UP** = LOWER AND UPPER 95% PROBABILITY LIMITS AT LOW RANGE **PROB LIM LO-L2-UP** = LOWER AND UPPER 95% PROBABILITY LIMITS AT MIDDLE RANGE **PROB LIM LO-L3-UP** = LOWER AND UPPER 95% PROBABILITY LIMITS AT HIGH RANGE **# OF SMPLS** =NUMBER OF SAMPLERS **COLLOC SITES** = NUMBER OF COLLOCATED SITES **# AUD** = NUMBER OF AUDITS

Section IV
PAMS/Air Toxics Monitoring

PAMS Monitoring

Introduction

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 NOx. Ozone formation can occur many miles downwind from the original emissions source of the other pollutants. These reactions only occur in the presence of strong sunlight, which is present during the hottest days of the summer. The PAMS 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 (Photochemical Assessment Monitoring Stations) is a special designation for enhanced monitoring stations that measure pollutants and meteorological parameters that are designed to gather information on the ozone formation process. In addition to the standard NAAQS pollutants (Ozone, NO_2) that are measured at other sites, non-criteria pollutants, including VOCs, are measured at PAMS stations on either an hourly basis or at regularly scheduled intervals throughout the ozone monitoring season (June, July and August). Meteorology is a critical component of ozone formation and each PAMS site has a full complement of meteorological sensors including wind speed, wind direction, temperature, relative humidity, barometric pressure, solar intensity and at some sites, total ultraviolet light and precipitation. MassDEP has one PAMS-associated Doppler Radar High Altitude Wind/Temperature Profiler at the Stow site (which is otherwise not a PAMS designated location).

Since the PAMS project started in 1993, USEPA 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 $PM_{2.5}$) has halted the expansion of the program and led to a consolidation of the network over the last several years. Looking toward the future, a holistic strategy that includes PAMs measurements at fewer but more enhanced air monitoring stations is being developed by USEPA.

PAMS Monitoring Areas

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

* Provides data for both Boston and Providence networks.

Air Toxics Monitoring

Introduction

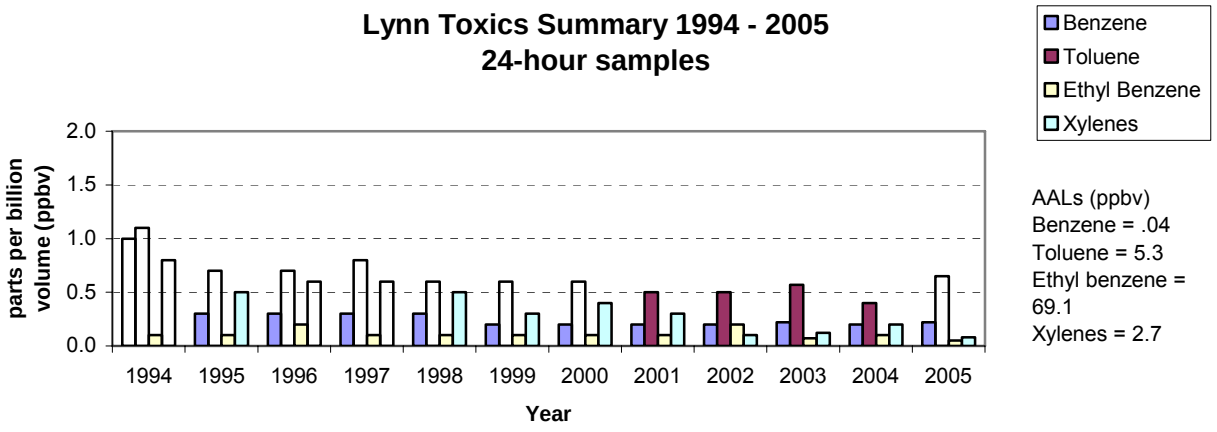
Toxic air pollutants are distinct from criteria air pollutants such as ozone and CO. They include pollutants known or suspected to cause cancer or other serious health effects, and include volatile organic compounds (VOCs) and toxic metals (e.g., mercury).

MassDEP monitors VOCs as part of the PAMS monitoring program, many of which are air toxics. From June through August, VOCs are monitored at six PAMS sites. In addition, in 1999 MassDEP added two monitors to measure specific health-relevant VOCs.

A new toxics monitoring project was started at the Harrison Avenue monitoring site in Roxbury in 2003 and 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 and black carbon. Data from this site will be 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 12 summarizes concentrations of 24-hour health-relevant PAMS target compounds for samples taken at the Lynn PAMS site from 1994 to 2005. Significant mean concentration decreases 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 9 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 two sites for 2005. The central city sampling location is Harrison Avenue and the area background site was Lynn.

Compound	BOSTON (Harrison Ave)		LYNN	
	Max Value ppb	Mean ppb	Max Value ppb	Mean ppb
1,3-butadiene	.20	.06	.07	.02
1,1,1-trichloroethane	.05	.02	.05	.02
trichloroethylene	.05	.02	.05	.02
tetrachloroethylene	.20	.03	.30	.03
Benzene	.98	.39	1.46	.22
Toluene	7.85	1.23	2.92	.65
Xylenes	1.45	.32	.25	.08
Ethylbenzene	.72	.16	.26	.05

Appendix A

2005 State Monitoring Station Locations

SITE ID	CITY	COUNTY	ADDRESS	DATE SITE ESTABLISHED	MONITORED
25-001-0002	ADAMS	BERKSHIRE	MT. GREYLOCK	5/1/1989	O3
25-003-4002	AMHERST	HAMPSHIRE	NORTH PLEASANT	4/1/1988	O3
25-025-0002	BOSTON	SUFFOLK	KENMORE SQUARE	1/1/1965	SO2, NO2, CO, Lead, PM2.5 FRM, PM10, TEMP
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, NO2, VOCs, WS/WD, TEMP, Solar Rad, RH, BP
25-025-0042	BOSTON	SUFFOLK	HARRISON AVENUE	12/15/1998	O3, SO2, NO2, CO, PM2.5 FRM & BAM (w/Speciation), PM10, Toxics, Black Carbon, WS/WD, TEMP, Solar Rad, RH, BP
25-025-0043	BOSTON	SUFFOLK	174 NORTH ST	1/1/2000	PM2.5 FRM & 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, NO2, PM2.5 FRM (w/Speciation), VOCs, Toxics, TEMP, WS/WD, Solar Rad, RH, BP
25-013-0008	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 & BAM, SO2
25-009-5005	HAVERHILL	ESSEX	WASHINGTON ST	7/19/1994	O3, NO2, PM2.5 FRM & 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, NO2, PM2.5 FRM & BAM, VOCs, Toxics, WS/WD, TEMP, Solar Rad, RH, BP, UVB, PRECIP
25-021-3003	MILTON	NORFOLK	BLUE HILL	4/2/2002	O3, NO2, NOy, PM2.5 BAM, VOCs, WS/WD, TEMP, Solar Rad, RH, BP
25-009-4004	NEWBURY	ESSEX	SUNSET BOULEVARD	8/1/1984	O3, NO2, NOy, VOCs, WS/WD, TEMP, Solar Rad, RH, BP
25-003-5001	PITTSFIELD	BERKSHIRE	78 CENTER STREET	12/1/1998	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, NO2, CO, PM2.5 FRM & BAM
25-013-2009	SPRINGFIELD	HAMPDEN	1860 MAIN STREET	1/1/2002	PM2.5 FRM, PM10
25-021-3003	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, NO2, NOy, IMPROVE, WS/WD, TEMP, Solar Rad, RH, BP
25-017-4003	WALTHAM	MIDDLESEX	BEAVER STREET	1/1/1971	Acid Deposition
25-015-4002	WARE	HAMPSHIRE	QUABBIN SUMMIT	6/1/1985	O3, SO2, NO2, NOy, PM10, VOCs, PM2.5 BAM, IMPROVE, WS/WD, TEMP, Solar Rad, RH, BP, UVB, PRECIP
25-027-0015	WORCESTER	WORCESTER	WORC. AIRPORT	5/7/1979	O3, WS/WD, TEMP
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, NO2, CO, PM2.5 FRM & BAM, PM10

2005 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.mass.gov/dep/bwp/	MassDEP	MassDEP Air Program Planning Unit Home Page. Select from Air, water, toxics, etc.
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	USEPA	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	USEPA	AQI New England Forecast and Real Time Ozone.
www.epa.gov/ne/airquality/index.html	USEPA	EPA Smog Alert System – sign up and receive e-mail alerts whenever Massachusetts predicts unhealthy ozone levels.
www.epa.gov/air/data/	USEPA	AIRSData - Access to air pollution data for the entire U.S.
www.epa.gov/bioindicators/	USEPA	Center for Environmental Information and Statistics – a single convenient source for information on environmental quality.
www.epa.gov/oar/oaqps	USEPA	EPA's Office of Air and Radiation/Office of Air Quality Planning and Standards
www.epa.gov/region01/	USEPA	EPA Region 1 Home Page
www.epa.gov/ttn/	USEPA	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/	USEPA	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	USEPA	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	USEPA	EPA Ozone Depletion Home Page – learn about the importance of the "good" ozone in the stratospheric ozone layer.
www.epa.gov/airmarkets/acidrain/	USEPA	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.
www.epa.gov/ne/aqi/	USEPA	Real Time ozone data
Maine www.state.me.us/dep/air/ New Hampshire www.des.state.nh.us/ard/ozone.htm New York www.dec.state.ny.us/apps/aqi/aqi_forecast.cfm New Jersey www.state.nj.us/dep/airmon/ Rhode Island www.dem.ri.gov/programs/benviron/air/pm.htm		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/	USEPA	Unified Air Toxics Website - This site is a central clearinghouse and repository for air toxics implementation information
www.epa.gov/airtrends	USEPA	AIRTrends - information on USEPA's evaluation of status and trends in the nation's outdoor air quality.
www.cleanairworld.org/	STAPPA/ALAPCO	State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials – site has links to air quality related agencies and organizations.
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/	University of Michigan	The WeatherNet – a good source of weather information. Also has a great list of weather links.
www.nws.noaa.gov/er/ box	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/homepage.htm	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 profil data.
www.lungusa.org/	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/	NACB	New England Coastal Basins Mercury Deposition Network – Atmospheric deposition