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Massachusetts 2011 Air Monitoring Network Plan

Air Assessment Branch Bureau of Waste Prevention

August 2011

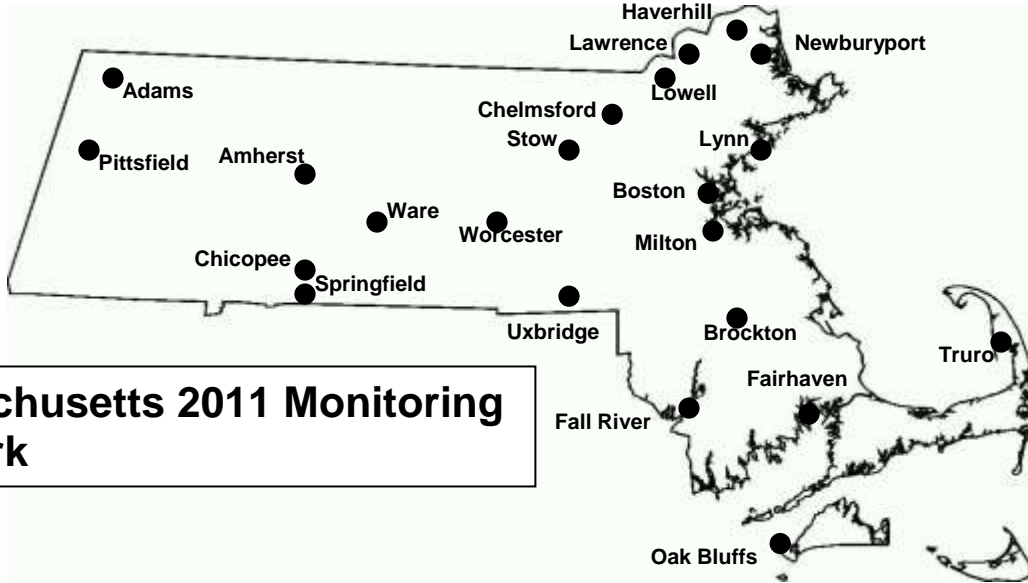
This is the Massachusetts 2011 Air Monitoring Network Plan, prepared by the Massachusetts Department of Environmental Protection (MassDEP) in accordance with Title 40 CFR Part 58.10. Each year, MassDEP is required to submit a Network Plan to the U.S. Environmental Protection Agency (EPA) for review and approval.

MassDEP operates a network of 28 ambient air quality monitoring stations in 20 communities located across the state. The Wampanoag Tribe of Gay Head (Aquinnah) on Martha's Vineyard and the EPA's New England Regional Laboratory in Chelmsford also operate monitoring stations. MassDEP, the Wampanoag Tribe and EPA all are members of the same Primary Quality Assurance Organization (PQAO), which ensures consistent quality assurance of ambient air quality data collected in Massachusetts. Since MassDEP does not operate or control the EPA and Tribal monitors, this plan does not address them but does provide information about these monitors since they are part of the overall monitoring network in Massachusetts.

The Massachusetts monitoring network is part of a comprehensive program to provide information about air quality to the public and to determine compliance with National Ambient Air Quality Standards. This Network Plan reviews MassDEP's ambient air monitoring network to determine that the requirements of 40 CFR Part 58 Appendices A, C, D and E are met, describes which pollutants and other parameters MassDEP measures at its various ambient air monitoring stations, and discusses recent and planned changes to the network. For detailed information on monitor locations, pollutants analyzed, and methods used, see Attachments 1 – 3.

Background information about the Massachusetts air monitoring network, pollutants measured, their health significance, and current and past ambient air quality data, can be found on the Air and Climate page of MassDEP's Website at www.mass.gov/dep/air/airquali.htm. For more information on this Network Plan, please contact:

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Massachusetts 2011 Monitoring Network

1. Criteria Pollutants

This section describes MassDEP’s plans to monitor criteria pollutants listed in the federal Clean Air Act for which EPA has set National Ambient Air Quality Standards (NAAQS), including ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter (PM₁₀ and PM_{2.5}) and lead. EPA periodically reviews and revises these standards based on new public health and scientific information. These revisions often require changes to air monitoring networks and methodologies.

National Ambient Air Quality Standards				
Pollutant	Primary Standards		Secondary Standards	
	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 µg/m ³	Rolling 3-Month 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 µg/m ³	24-hour ⁽³⁾	Same as Primary	
Particulate Matter (PM _{2.5})	15.0 µg/m ³	Annual ⁽⁴⁾ (Arithmetic Average)	Same as Primary	
	35 µg/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	

µg/m³ = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion; mg/m³ = 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 PM_{2.5} 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).

A. OZONE

MassDEP operates 15 ozone monitors at the locations listed below (including the Site Identification Number). EPA's New England Regional Laboratory (NERL) in Chelmsford and the Wampanoag Tribe of Gay Head (Aquinnah) on Martha's Vineyard (Oak Bluffs) also operate ozone monitors. After the end of the ozone season MassDEP likely will need to relocate the Stow monitoring station since the property is scheduled to change hands in September from the U.S. Air Force to another federal agency. MassDEP is hopeful that the ozone monitor can be moved to a nearby location.

Adams (25-023-4002)

Amherst (25-015-0103)

Boston – Long Island (25-025-0041)

Boston – Harrison Ave/Roxbury (25-025-0042)

Chelmsford – NERL (25-017-0009)

Chicopee (25-013-0008)

Fairhaven (25-005-1002)

Haverhill (25-009-5005)

Lynn (25-009-2006)

Milton (25-021-3003)

Newburyport (25-009-4005)

Oak Bluffs – Tribal Site (25-007-0001)

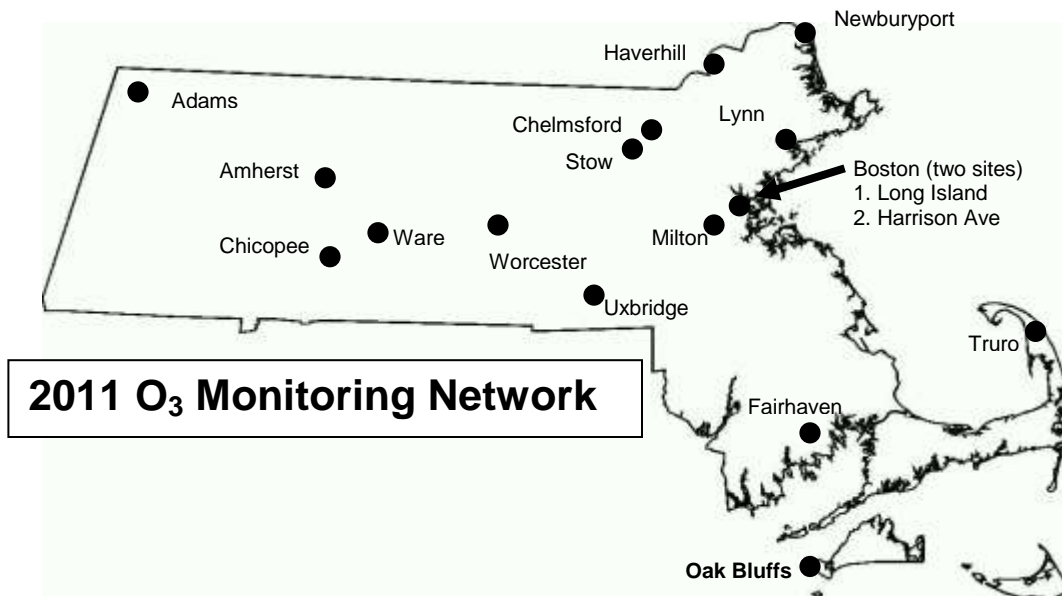
Stow (25-017-1102)

Truro (25-001-0002)

Uxbridge (25-017-4003)

Ware (25-015-4002)

Worcester Airport (25-027-0015)



B. SULFUR DIOXIDE

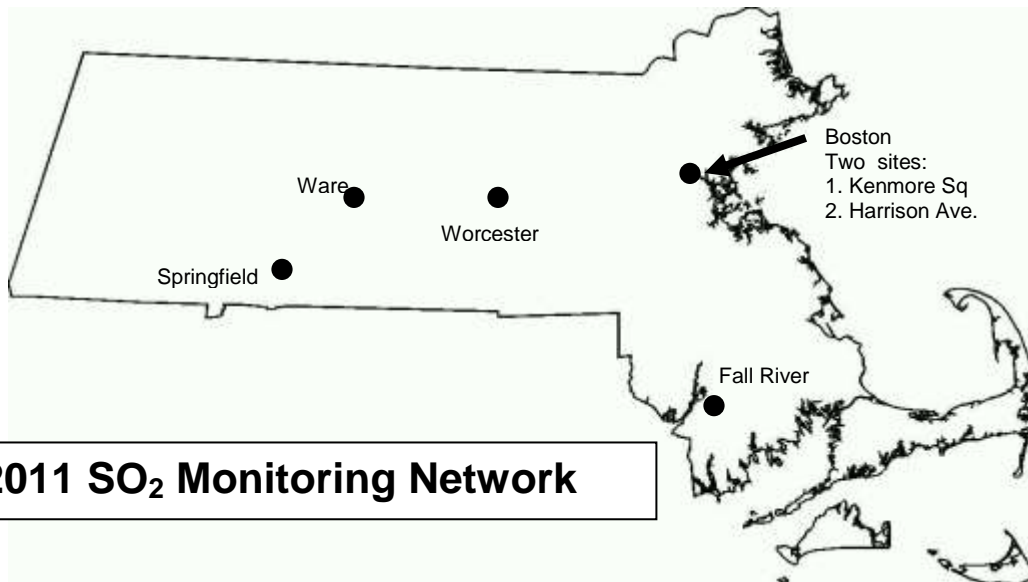
MassDEP operates six sulfur dioxide (SO₂) monitors, which includes four full-scale instruments that are used for comparison with the SO₂ NAAQS. Two are trace-scale (low measurement scale) analyzers (located at Boston-Harrison Avenue, due to its NCore¹ status, and at Ware, due to its background/rural nature). SO₂ monitors are at the following locations:

Boston – Harrison Ave (25-025-0042) <i>trace</i>	Springfield – Liberty Street (25-013-0016)
Boston – Kenmore Square (25-025-0002)	Ware (25-015-4002) <i>trace</i>
Fall River (25-005-1004)	Worcester – Summer Street (25-027-0023)

In June 2010, EPA revised the SO₂ NAAQS establishing a 1-hour SO₂ standard of 100 ppb and new SO₂ monitoring requirements. EPA requires monitors to be placed in Core Based Statistical Areas (CBSAs) based on a population-weighted emissions index for the area. EPA requires:

- Three monitors in CBSAs with index values of 1,000,000 or more;
- Two monitors in CBSAs with index values less than 1,000,000 but greater than 100,000; and
- One monitor in CBSAs with index values greater than 5,000.

Monitors must be operational by January 1, 2013. Based on the new monitoring regulations, there must be one monitor in the Springfield CBSA, one monitor in the multi-state Providence/New Bedford/Fall River CBSA (MA/RI), and two monitors in the multi-state Boston area CBSA (MA/NH). MassDEP believes that its four full-scale existing SO₂ monitors, combined with existing SO₂ monitors in RI and NH, fulfill the new requirements, and will work with EPA to confirm the adequacy of the SO₂ monitoring network in meeting the new monitoring requirements.



C. NITROGEN DIOXIDE

MassDEP operates 11 nitrogen dioxide (NO₂) monitors. These monitors measure NO₂ and nitrogen oxides [NO_x, which is NO₂ plus NO (nitric oxide)]. NO₂ is a NAAQS pollutant but also an ozone precursor, along with NO_x. MassDEP operates four NO₂ monitors specifically to determine compliance with the NAAQS

¹ NCore is a program established by EPA and state and local air quality agencies to create multi-pollutant monitoring networks that integrate several advanced measurement systems for particles, pollutant gases and meteorology.

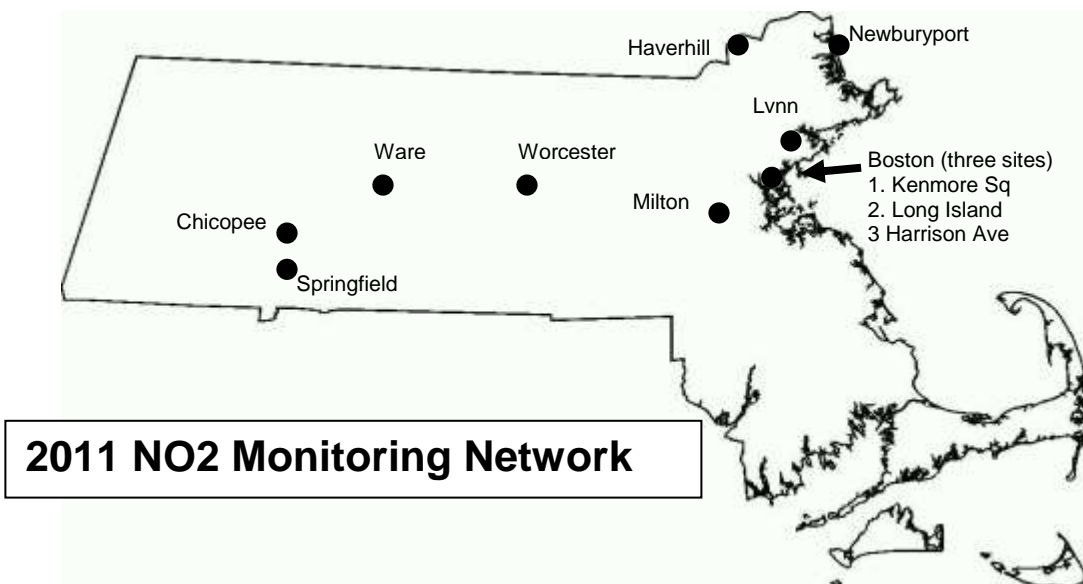
(based on population exposure), and operates seven additional monitors to measure ozone precursors as part of the Photochemical Assessment Monitoring Sites (PAMS) network. NO₂ monitors are at the following locations:

- | | |
|---|---|
| Boston – Harrison Ave (25-025-0042) | Ware (25-015-4002) PAMS, <i>summer only</i> |
| Boston – Kenmore Square (25-025-0002) | Worcester (25-027-0023) |
| Boston – Long Island (25-025-0041) PAMS, <i>summer only</i> | |
| Chicopee (25-013-0008) PAMS, <i>year-round</i> | |
| Haverhill (25-009-5005) | |
| Lynn (25-009-2006) PAMS, <i>year-round</i> | |
| Milton (25-021-3003) PAMS, <i>summer only</i> | |
| Newburyport (25-009-4005) PAMS, <i>summer only</i> | |
| Springfield – Liberty Street (25-013-0016) | |

In January 2010, EPA revised the NO₂ NAAQS establishing a 1-hour NO₂ standard of 75 ppb and new NO₂ monitoring requirements. The regulations require near-road monitors to capture short-term NO₂ concentrations that occur near roads and in community-wide areas. EPA currently requires:

- At least one monitor near a roadway in any urban area with a population greater than or equal to 500,000 people;
- One monitor in any urban area with a population greater than or equal to 1 million people;
- Potentially additional monitors in susceptible and vulnerable communities.

Monitors must be operational by January 1, 2013. Based on the new monitoring regulations, there must be one near-road monitor each in the Springfield and Worcester CBSAs, one near-road monitor in the Providence/New Bedford/Fall River CBSA (MA/RI), and two monitors in the Boston area CBSA (MA/NH). If Rhode Island and New Hampshire each establish new monitors in the shared multi-state CBSAs, MassDEP would need three new near-road NO₂ monitors. MassDEP has begun to evaluate a potential site for a near-road monitor in Boston and will work with EPA, New Hampshire, and Rhode Island to determine the most appropriate way to meet the NO₂ near-road monitoring requirements given existing resources. MassDEP also will continue to operate its existing NO₂ monitors to address the community monitoring requirements of the new NO₂ monitoring requirements.



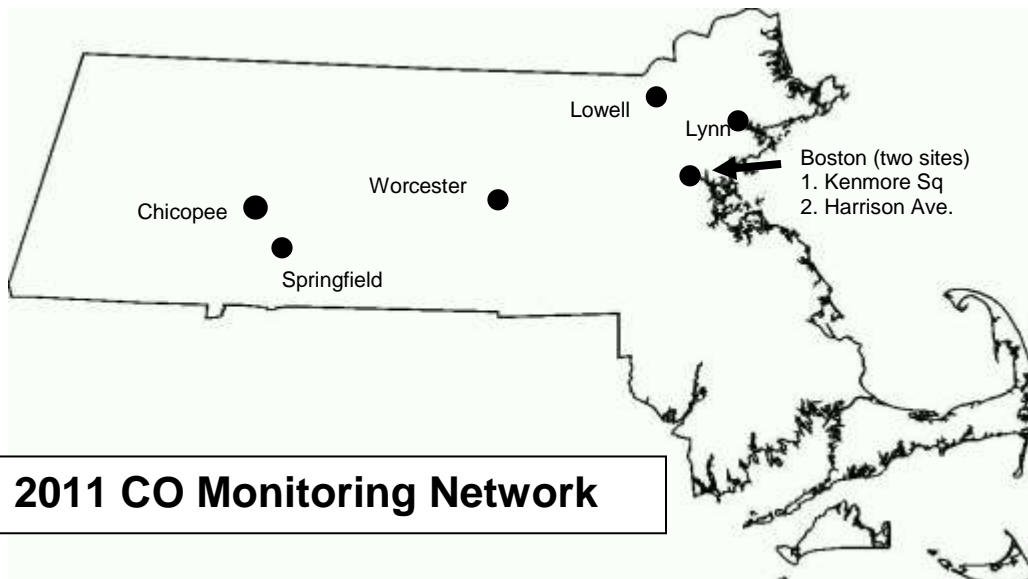
D. CARBON MONOXIDE

MassDEP operates seven carbon monoxide (CO) monitors, including three trace-level instruments. Full scale CO instruments (0 to 50 ppm) are operated to determine NAAQS compliance. Trace-level CO analyzers (0 to 5 ppm) are operated at sites where CO measurement is of interest, but where levels are expected to be low (less than 2 ppm). CO monitors are at the following locations:

Boston – Harrison Ave (25-025-0042) *trace*
Boston – Kenmore Square (25-025-0002)
Chicopee (25-013-0008) *trace*
Lowell – Old City Hall (25-017-0007)
Lynn (25-009-2006) *trace*
Springfield – Liberty Street (25-013-0016)
Worcester – Summer Street (25-027-0023)

In May 2011, EPA approved a revision to MassDEP’s CO maintenance plan for Lowell that allows MassDEP to discontinue the CO monitor at Old City Hall (25-017-0007). MassDEP plans to discontinue this monitor this summer.

In August 2011, EPA issued a decision to retain the existing CO NAAQS and to establish new CO monitoring requirements. The new regulations require one CO monitor to be collocated with a NO₂ near-road monitor in urban areas having a population of 1 million or more. Monitors required in CBSAs of 2.5 million or more persons must be operational by January 1, 2015, and monitors required in CBSAs having 1 million or more persons must be operation by January 1, 2017. Based on the monitoring regulations, MassDEP would need a CO monitor at a near-road NO₂ site in the Boston area CBSA (MA/NH) by January 1, 2015, and a CO monitor at near-road NO₂ site in the Providence/New Bedford/Fall River CBSA (MA/RI) by January 1, 2017. MassDEP will fully assess and address the new requirements future Network Plans.



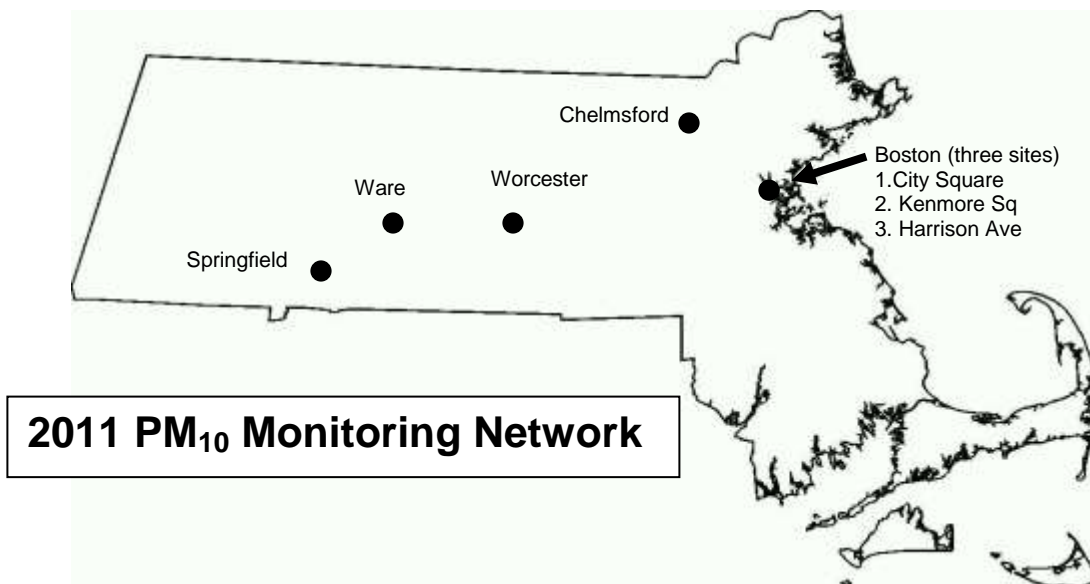
E. PARTICULATE MATTER

PM₁₀

MassDEP operates seven PM₁₀ monitors (low volume instruments), including two monitors collocated at the Boston - Harrison Avenue NCore site for quality assurance purposes. No changes are currently planned for the PM₁₀ monitoring network. EPA's NewEngland Regional Laboratory operates a PM₁₀ monitor in Chelmsford. PM₁₀ monitors are at the following locations:

Boston – Harrison Avenue (25-025-0042) 2 monitors
Boston – Kenmore Square (25-025-0002)
Boston – City Square (25-025-0027)
Chelmsford – NERL (25-017-0009)
Springfield – Main Street (25-013-2009)
Ware (25-015-4002)
Worcester – Summer Street (25-027-0023)

Samples from the Boston - Harrison Avenue PM₁₀ monitors are used in association with samples from collocated PM_{2.5} monitors at the site to calculate PM_{coarse} concentrations, which was required beginning January 1, 2011 for this NCore site.



PM_{2.5}

MassDEP's operates 18 fine particulate matter (PM_{2.5}) Federal Reference Method (FRM) monitors at 15 locations. MassDEP collects samples at the Boston – North Street collocated monitors on a daily basis and samples the remaining monitors on an every third day schedule. Collocated monitors also are located at Brockton and Chicopee, for quality assurance purposes. MassDEP uses the data from the FRM network to determine compliance with the PM_{2.5} NAAQS. EPA NERL also operates a PM_{2.5} monitor in Chelmsford. PM_{2.5} monitors are at the following locations:

Boston – Harrison Avenue (25-025-0042)
 Boston – North St (25-025-0043) 2 monitors
 Boston – City Square (25-025-0027)
 Boston – Kenmore Square (25-025-0002)
 Brockton (25-023-0004) 2 monitors
 Chelmsford – NERL (25-017-0009)
 Chicopee (25-013-0008) 2 monitors
 Fall River – Globe Street (25-005-1004)

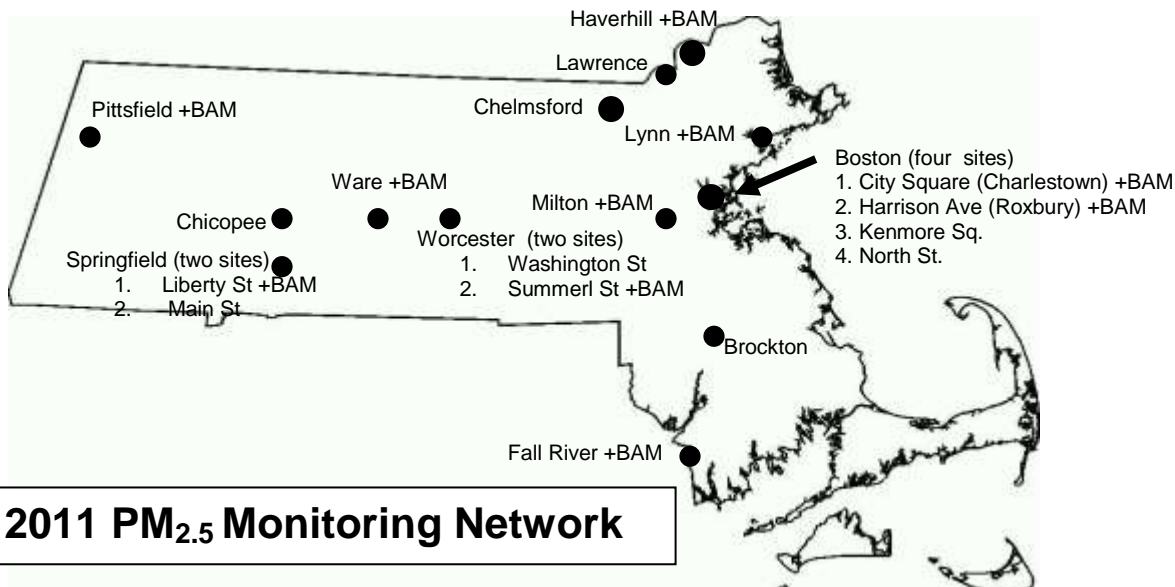
Haverhill – Consentino School (25-009-5005)
 Lawrence (25-009-6001)
 Lynn – Water Treatment Plant (25-009-2006)
 Pittsfield (25-003-5001)
 Springfield – Liberty St (25-013-0016)
 Springfield – Main St (25-013-2009)
 Worcester –YWCA (25-027-0016)
 Worcester – Summer Street (25-027-0023)

MassDEP has equipped 10 monitoring stations with continuous PM_{2.5} monitors (Beta Attenuation Monitors or BAMs). These monitors are at the following locations:

Boston – Harrison Avenue (25-025-0042)
 Boston – City Square (25-025-0043)
 Fall River – Globe Street (25-005-1004)
 Haverhill – Consentino School (25-009-5005)
 Lynn – Water Treatment Plant (25-009-2006)
 Milton – Blue Hill (25-021-3003)
 Pittsfield (25-003-0006)
 Springfield – Liberty Street (25-013-0016)
 Ware – Quabbin Summit (25-015-4002)
 Worcester – Summer Street (25-027-0023)

All of the BAMs have a Federal Equivalent Method (FEM) designation. BAMs provide the hourly PM_{2.5} data that appears on MassDEP’s *MassAir* website, but currently are not used to determine NAAQS compliance. MassDEP is currently evaluating the PM_{2.5} data obtained by FRMs in relation to data obtained by the BAMS located at the same sites to determine the viability of using the BAMS for NAAQS compliance purposes at appropriate sites, which could save MassDEP resources without jeopardizing data quality.

In 2011, MassDEP may need to relocate the PM_{2.5} FRM monitor at the Boston-North Street site due to the potential sale of the building. MassDEP will work with EPA and the City of Boston to find another comparable site if it becomes necessary.



Speciated PM_{2.5}

MassDEP collects speciated PM_{2.5} samples at Boston – Harrison Avenue (25-025-0042) and Chicopee (25-013-0008). The speciated PM_{2.5} program is designed to determine some of the chemical components (elements, sulfates/nitrates, carbon species) that are contained in PM_{2.5}.

IMPROVE sampling sites also provide speciated PM_{2.5} data. The IMPROVE program measures parameters that are similar to those measured by the speciation program, and is designed to measure species at rural locations to evaluate the contribution of fine particulates and their constituents to the degradation of visibility. Two IMPROVE samplers are located at the following MassDEP sites:

- Truro – National Sea Shore (25-001-0002), operated by the National Park Service
- Ware – Quabbin Summit (25-015-4002), operated by the University of Massachusetts

The Wampanoag Tribe on Martha's Vineyard also operates an IMPROVE sampler.

PM_{coarse} (PM₁₀ – PM_{2.5})

MassDEP began using the Federal Reference Method (FRM) for PM_{coarse} in compliance with NCore requirements at the Boston-Harrison Avenue NCore site beginning in January 2011. This method consists of the subtraction of PM_{2.5} values from PM₁₀ values at a site that has side-by-side samplers of each type sampling on the same dates. MassDEP recently built a new platform at the site to allow the PM_{2.5} and PM₁₀ samplers to be installed side-by-side for this purpose.

F. LEAD

MassDEP operates three lead monitors, two in Boston and one in Springfield.

In 2008, EPA lowered the NAAQS for lead from 1.5 µg/m³ to 0.15 µg/m³ and established new monitoring requirements. EPA requires lead monitoring at NCore sites beginning January 1, 2012 and around industrial sources that emit 0.5 tons or more of lead (there are no such sources in Massachusetts). EPA is requiring lead to be monitored as lead in total suspended particles (TSP). However, EPA will allow the use of low-volume lead-PM₁₀ monitors instead of lead-TSP monitors where lead is not expected to occur as large particles and where 3-month average concentrations are not expected to equal or exceed 0.10 µg/m³. In addition, EPA is requiring 1 year of monitoring at 15 general aviation airports using lead-TSP monitors, including Nantucket Memorial Airport.

MassDEP had been measuring lead-TSP at Boston-Kenmore Square for more than 25 years. In 2009, MassDEP moved the lead-TSP monitor from Kenmore Square to Harrison Avenue because of the physical downsizing of the Kenmore monitoring station. Since MassDEP has started lead sampling at the NCore site using the new low-volume PM₁₀ method, MassDEP plans to discontinue lead-TSP sampling at Harrison Avenue during 2011. In addition to starting lead sampling early at the NCore site, MassDEP also began lead-PM₁₀ sampling at Springfield-Liberty Street (25-013-0016) in January 2011 in order to obtain additional lead concentration data for a different urban environment.

In 2010, MassDEP began working with EPA and Nantucket Memorial Airport to site a lead-TSP monitor at the airport. MassDEP plans to install and begin operating collocated lead-TSP samplers by December 27, 2011, as required by the lead monitoring regulations.

2. Photochemical Assessment Monitoring Stations

MassDEP operates six Photochemical Assessment Monitoring Stations (PAMS) designed to measure ozone precursors (ingredients) and meteorological parameters in order to provide data about ozone formation and the effect of precursor controls on ozone production. At these sites MassDEP measures oxides of nitrogen and other ozone precursors, such as volatile organic compounds, including hydrocarbons and carbonyl compounds (e.g., formaldehyde, acetaldehyde). These are measured by taking discrete samples (carbonyls at Type 2 sites and VOCs at Type 1 sites) and by operating hourly gas chromatographs that measure individual hydrocarbon compounds. Type 1 sites generally are upwind of the studied urban area, Type 2 sites are at or near the downwind edge of the urban area, and Type 3 sites are downwind in a location of maximum ground-level ozone formation. PAMS sites are at the following locations:

Boston – Long Island (25-025-0041) *Type 2A*

Chicopee (25-013-0008) *Type 2*

Lynn (25-009-2006) *Type 2*

Milton – Blue Hill (25-021-3003) *Type 1*

Newburyport (25-009-4005) *Type 3*

Ware (25-015-4002) *Type 3*

During the 2011 PAMS season, MassDEP will collect carbonyl samples at Chicopee and Lynn and VOCs at Boston – Long Island and Milton – Blue Hill on a 1-in-3 day schedule (eight 3-hour canister samples per day), and will operate automated hourly gas chromatographs for VOCs at Chicopee, Lynn, Newburyport and Ware. MassDEP also collects every sixth day 24-hour canister VOC and carbonyl samples throughout the year at Chicopee and Lynn, in compliance with the original PAMS regulations.

MassDEP operates an Upper Air Profiler at the Stow monitoring site (25-017-1102). This instrument measures wind speed, wind direction and temperature at high elevations in the atmosphere to characterize meteorological effects on the long-range transport of air pollutants, especially ozone and its precursors. MassDEP is awaiting a decision regarding the future ownership of the Stow property and the effect on operations there.

MassDEP continues to follow the national and regional PAMS monitoring network assessments that are underway and may propose changes to the Massachusetts PAMS network based on the results of these assessments and EPA guidelines.

3. Total Reactive Nitrogen (NO_y)

MassDEP operates NO_y analyzers during the PAMS season at Ware (25-015-4002) and Newburyport (25-009-4005). In April 2011, MassDEP installed an NO_y monitor at the NCore site at Boston – Harrison Avenue (25-025-0042) to fulfill NCore requirements. Several analyzers had to be relocated to a satellite shelter at the site to accommodate the NO_y analyzer in the main shelter.

NO_y measurement is very similar to NO_x, except that the NO_y instrument configuration monitors for a wider range of nitrogen species than a traditional NO_x monitor. Compounds in this wider nitrogen compound group participate in ozone and particulate matter formation and can be pollutants themselves.

4. Air Toxics

Boston – Harrison Avenue (25-025-0042) is a National Air Toxics Trends Site (NATTS) monitoring station, in addition to being an NCore site. NATTS is an EPA program comprised of monitoring sites across the country equipped to measure a wide range of toxic air pollutants, including metals, VOCs, carbonyls, black carbon and semi-volatile organic compounds (SVOCs). At the Harrison Avenue site MassDEP monitors black carbon (using an aethalometer), toxic VOCs, carbonyls (formaldehyde and acetaldehyde), toxic metals (from PM₁₀ filters), chromium +6, and polycyclic aromatic hydrocarbons (PAHs).

In addition to the NATTS site, MassDEP collects 24-hour VOC canister samples every sixth day for toxics analysis from Lynn (which serves as a Boston Area background location), and sends the samples to the State of Rhode Island Department of Public Health Laboratory for analysis. MassDEP also monitors black carbon at Boston – North Street (25-025-0043) and at Springfield – Liberty Street (25-013-0016).

5. Private Monitoring

Constellation Generation Company, LLC has operated four monitors near its facilities in Boston. The sites are at Boston – Long Island (25-025-0019), Dorchester (25-025-0020), East Boston (25-025-0021), and South Boston (25-025-0040). Constellation recently petitioned MassDEP to discontinue monitoring at the Long Island, Dorchester, and East Boston monitoring stations. In May 2011, MassDEP granted Constellation's request and the three monitors have been discontinued.

6. Summary

MassDEP's NCore site at Boston – Harrison Avenue now has its complete complement of analyzers with the installation of the NO_y monitor in April 2011.

Three of the industrial monitoring stations (Long Island, Dorchester, and East Boston) have been discontinued.

In January 2011, MassDEP began new community-oriented low volume lead-PM₁₀ monitoring at Boston-Harrison Avenue and Springfield – Liberty Street in advance of the 2012 NCore lead monitoring deadline. MassDEP is in the planning stages for operating lead-TSP monitors at Nantucket Memorial Airport, expected to begin by December 27, 2011. MassDEP is planning for the reconfiguration of the NO₂ and SO₂ networks to meet the new EPA monitoring requirements for January 2013, and will propose specific locations for new sites in the 2012 Network Plan, if not sooner.

MassDEP may need to relocate its Boston – North St (25-025-0043) monitoring station if the building is sold. In addition, the Stow monitoring station (25-017-1102) property is scheduled to change hands in September from the U.S. Air Force to another federal agency. MassDEP is hopeful that the ozone monitor can be moved to a nearby location.

MassDEP notes that it operates a continuous atmospheric radiation sampler (TSP-based) at the Worcester – Summer Street station (25-027-0023) in cooperation with the EPA's National Air and Radiation Environmental Laboratory (NAREL).