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Massachusetts 2016 Air Monitoring Network Plan

Air Assessment Branch Bureau of Air and Waste

November 2016

This is the Massachusetts 2016 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.

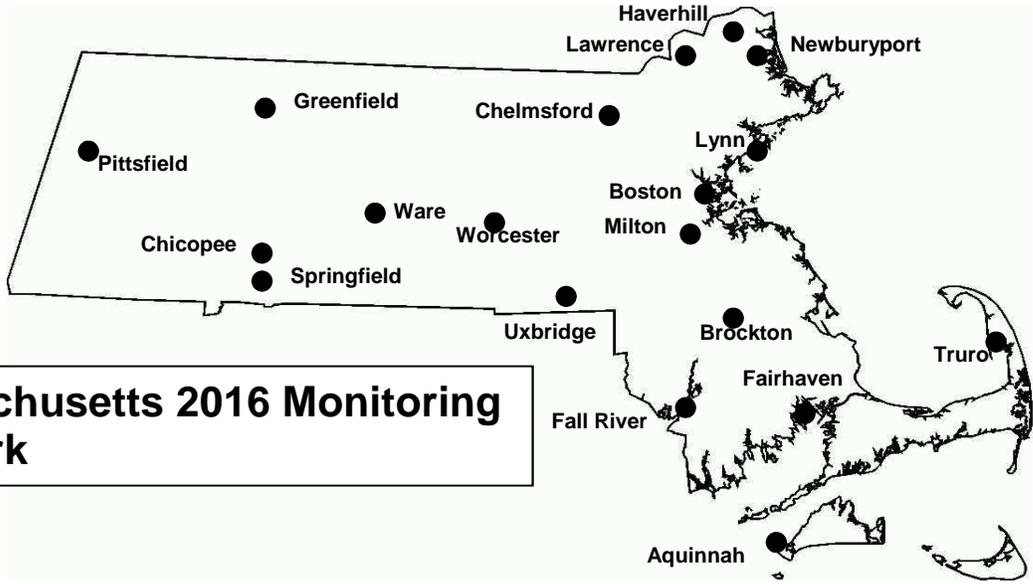
MassDEP operates a network of 24 ambient air quality monitoring stations in 18 communities located across the state. The Wampanoag Tribe of Gay Head (Aquinnah) on Martha's Vineyard operates an ozone monitoring station. MassDEP and the Wampanoag Tribe are members of the same Primary Quality Assurance Organization (PQAO), which ensures consistent quality assurance of ambient air quality data collected in Massachusetts.

The Massachusetts monitoring network is part of a comprehensive program to collect and provide information about air quality to the public and to determine compliance with National Ambient Air Quality Standards. This Draft 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 – 4.

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Massachusetts 2016 Monitoring Network



1. Criteria Pollutants

This section describes MassDEP’s network for monitoring 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/ Secondary	Averaging Time	Level	Form	
Carbon Monoxide	primary	8-hour	9 ppm	Not to be exceeded more than once per year	
		1-hour	35 ppm		
Lead	primary and secondary	Rolling 3 month average	0.15 µg/m ³	Not to be exceeded	
Nitrogen Dioxide	primary	1-hour	100 ppb	98th percentile, averaged over 3 years	
	primary and secondary	Annual	53 ppb	Annual Mean	
Ozone	primary and secondary	8-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years	
Particle Pollution	PM _{2.5}	primary	Annual	12 µg/m ³	annual mean, averaged over 3 years
		secondary	Annual	15 µg/m ³	annual mean, averaged over 3 years
	primary and secondary	24-hour	35 µg/m ³	98th percentile, averaged over 3 years	
	PM ₁₀	primary and secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide	primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years	
	secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year	

µg/m³ = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion

A. OZONE

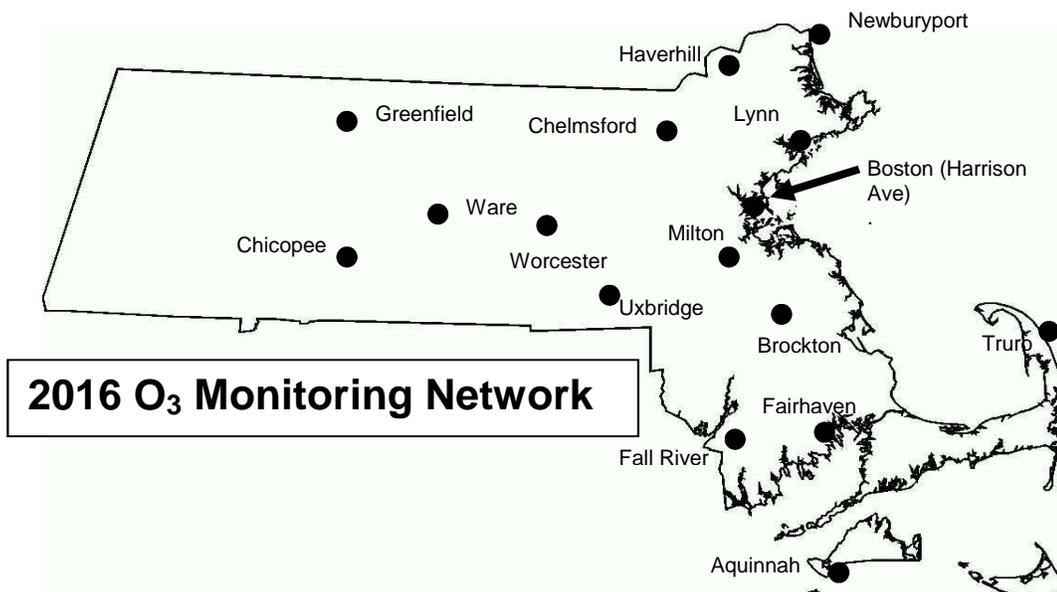
MassDEP operates 15 ozone monitors at the locations listed below (including the Site Identification Number). The Wampanoag Tribe of Gay Head (Aquinnah) on Martha's Vineyard also operates an ozone monitor.

Boston – Harrison Ave (25-025-0042)
Brockton (25-023-0005)
Chelmsford (25-017-0009)
Chicopee (25-013-0008)
Fairhaven (25-005-1006)
Fall River (25-005-1004)
Greenfield (25-011-2005)
Haverhill (25-009-5005)

Lynn (25-009-2006)
Milton (25-021-3003)
Newburyport (25-009-4005)
Aquinnah – Tribal Site (25-007-0001)
Truro (25-001-0002)
Uxbridge (25-027-0024)
Ware (25-015-4002)
Worcester – Airport (25-027-0015)

The existing ozone monitoring network meets EPA monitoring requirements for the ozone NAAQS, except for an ozone monitor in the Pittsfield Consolidated Metropolitan Statistical Area (CMSA). MassDEP is in the process of locating an ozone monitor in the Pittsfield CMSA.

For the past several years, MassDEP has been monitoring ozone beginning on March 1st of each year. EPA's October 2015 rule strengthening the ozone NAAQS formally changed the beginning of the ozone monitoring season in Massachusetts from April 1st to March 1st of each year beginning in 2017. MassDEP will continue to begin ozone monitoring by March 1st of each year and will continue to submit ozone monitoring data to EPA covering March 1st to September 30th of each year.



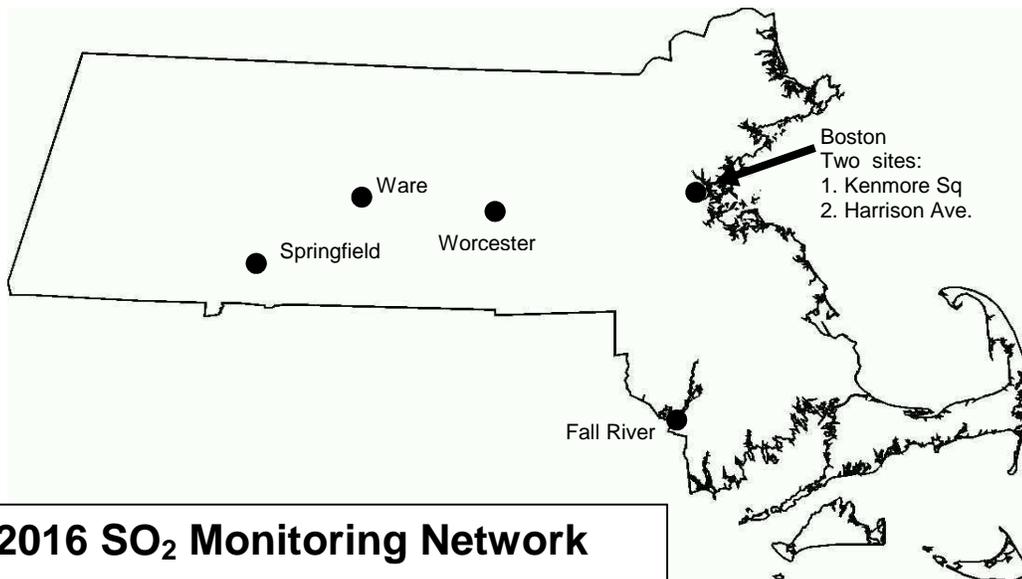
B. SULFUR DIOXIDE

MassDEP operates six sulfur dioxide (SO₂) monitors, which includes three full-scale monitors and three trace-level (i.e., very low concentration) monitors. SO₂ monitors are at the following locations:

Boston – Harrison Ave (25-025-0042) *trace*
Boston – Kenmore Square (25-025-0002) *trace*
Fall River (25-005-1004)

Springfield – Liberty Street (25-013-0016)
Ware (25-015-4002) *trace*
Worcester – Summer Street (25-027-0023)

The existing SO₂ monitoring network meets EPA monitoring requirements for the SO₂ NAAQS. MassDEP has no plans to change the SO₂ network.

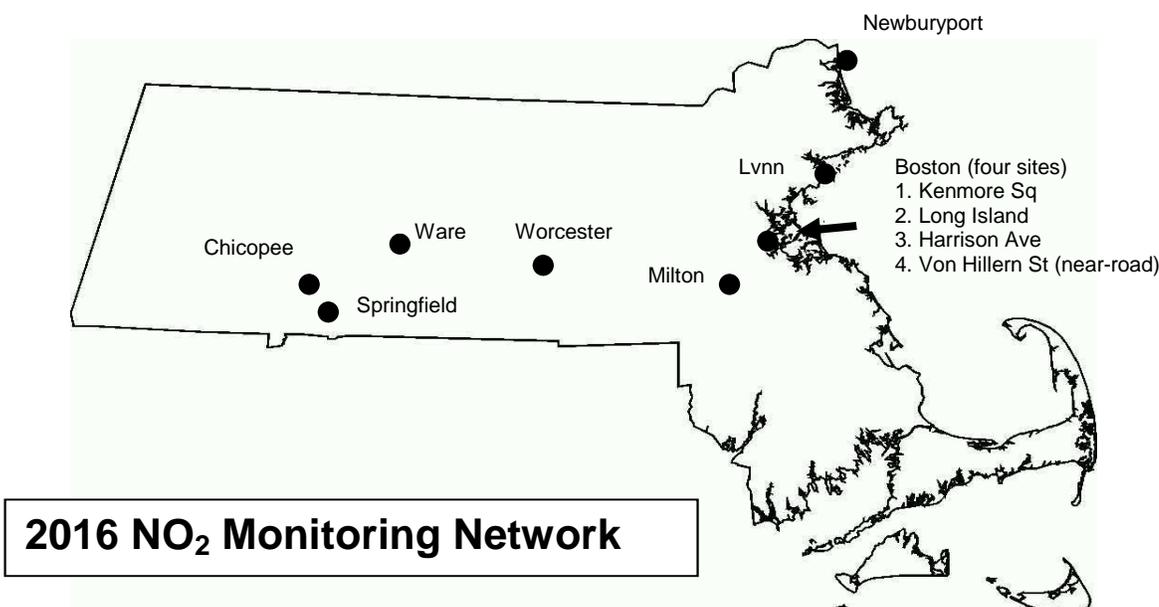


C. NITROGEN DIOXIDE

MassDEP operates 10 nitrogen dioxide (NO₂) monitors. These monitors measure NO₂ and nitrogen oxides [NO_x, which is NO₂ plus NO (nitric oxide)]. NO₂ is monitored as an NAAQS pollutant and as an ozone precursor. MassDEP operates six NO₂ monitors to determine compliance with the NAAQS, including one near-road monitor. EPA has designated three monitors (Boston - Harrison Ave. and Kenmore Square, and Springfield - Liberty Street) as representing susceptible and vulnerable populations. MassDEP also operates four 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)	Milton (25-021-3003)
Boston – Kenmore Square (25-025-0002)	Newburyport (25-009-4005) <i>PAMS, yr-round</i>
Boston – Von Hillern Street (25-025-0044) <i>Near-road</i>	Springfield – Liberty Street (25-013-0016)
Chicopee (25-013-0008) <i>PAMS, year-round</i>	Ware (25-015-4002) <i>PAMS, summer only</i>
Lynn (25-009-2006) <i>PAMS, year-round</i>	Worcester – Summer Street (25-027-0023)

EPA’s monitoring regulations require two near-road monitors in the Boston CBSA, the first by January 2014 and the second by January 2015; one in the Providence/New Bedford/Fall River CBSA by January 2014; and one each in the smaller Springfield and Worcester CBSAs by January 2017. MassDEP is operating one near-road monitor in Boston (Von Hillern Street) and is in the process of locating a second near-road site near the Route 495/Route 3 interchange north of Boston, and Rhode Island operates a near-road monitor in the Providence/New Bedford/Fall River CBSA. On May 5, 2016, EPA proposed rules that would remove the requirement for near-road NO₂ monitoring stations in smaller CBSAs since near-road monitoring in the larger CBSAs (including MassDEP’s monitoring in Boston) have shown levels of NO₂ well below the NAAQS. Therefore, based on monitoring to date and EPA’s proposed rule change, MassDEP is not planning to locate additional near-road NO₂ monitoring stations in the Springfield and Worcester CBSAs.

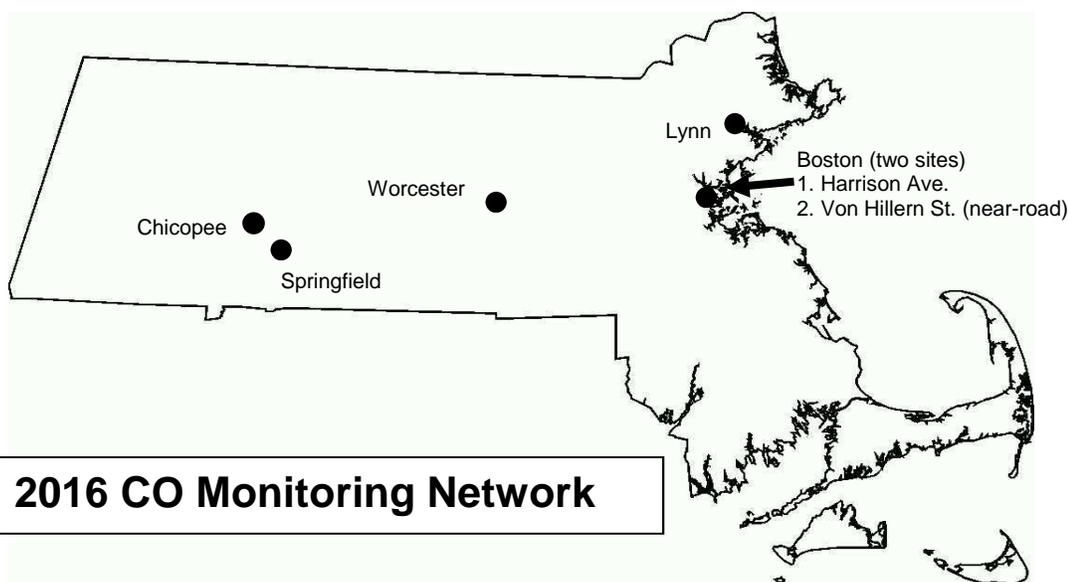


D. CARBON MONOXIDE

MassDEP operates six carbon monoxide (CO) monitors, including one at the Boston near-road site. CO monitors are at the following locations:

Boston – Harrison Ave (25-025-0042) *trace*
Boston – Von Hillern Street (25-025-0044) *trace*
Chicopee (25-013-0008) *trace*
Lynn (25-009-2006) *trace*
Springfield – Liberty Street (25-013-0016)
Worcester – Summer Street (25-027-0023) *trace*

The existing CO monitoring network meets EPA monitoring requirements for the CONAAQS. MassDEP has no plans to change the CO network.



E. PARTICULATE MATTER

PM₁₀

MassDEP operates six PM₁₀ monitors (low volume instruments), including two monitors collocated at the Boston - Harrison Avenue NCore site for quality assurance purposes. PM₁₀ monitors are at the following locations:

Boston – Harrison Avenue (25-025-0042) 2 monitors

Boston – Kenmore Square (25-025-0002)

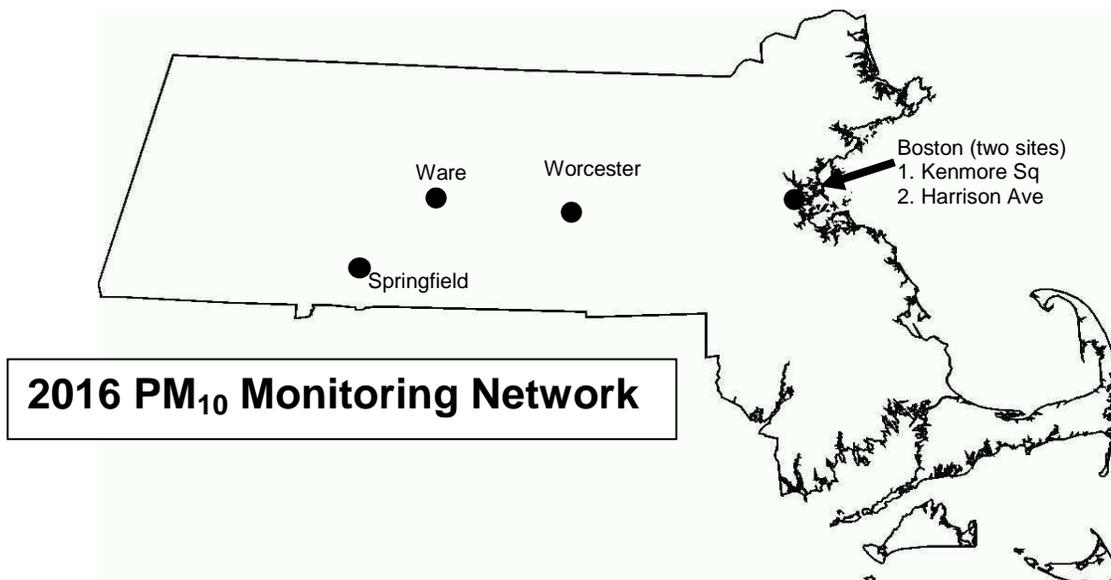
Springfield – Liberty Street (25-013-0016)

Ware – Quabbin Summit (25-015-4002)

Worcester – Summer Street (25-027-0023)¹

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 is required for NCore sites. These samples also are used for PM₁₀-based lead monitoring and NATTS metals.

The existing PM₁₀ monitoring network exceeds EPA's monitoring requirements for the PM₁₀ NAAQS, and therefore MassDEP plans to discontinue the Boston – Kenmore Square (25-025-0002) monitor at the end of 2016.



¹ MassDEP also 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.

PM_{2.5}

Filter-Based Monitors

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. PM_{2.5} monitors are currently at the following locations:

Boston – Harrison Avenue (25-025-0042)	Greenfield (25-011-2005)
Boston – North St (25-025-0043) <i>2 monitors</i>	Haverhill – Consentino School (25-009-5005)
Boston – Kenmore Square (25-025-0002)	Lawrence (25-009-6001)
Boston – Von Hillern Street (25-025-0044)	Lynn – Water Treatment Plant (25-009-2006)
Brockton – Buckley (25-023-0005) <i>2 monitors</i>	Pittsfield (25-003-5001)
Chicopee (25-013-0008) <i>2 monitors</i>	Springfield – Liberty St (25-013-0016)
Fall River – Globe Street (25-005-1004)	Worcester – Washington Street (25-027-0016)
	Worcester – Summer Street (25-027-0023)

Since MassDEP is relying more on continuous monitors, MassDEP plans to discontinue three filter-based monitors at Worcester – Washington Street (25-027-0016), Boston – Kenmore Square (25-025-0002) and Lawrence (25-009-6001) at the end of 2016.

Continuous Monitors

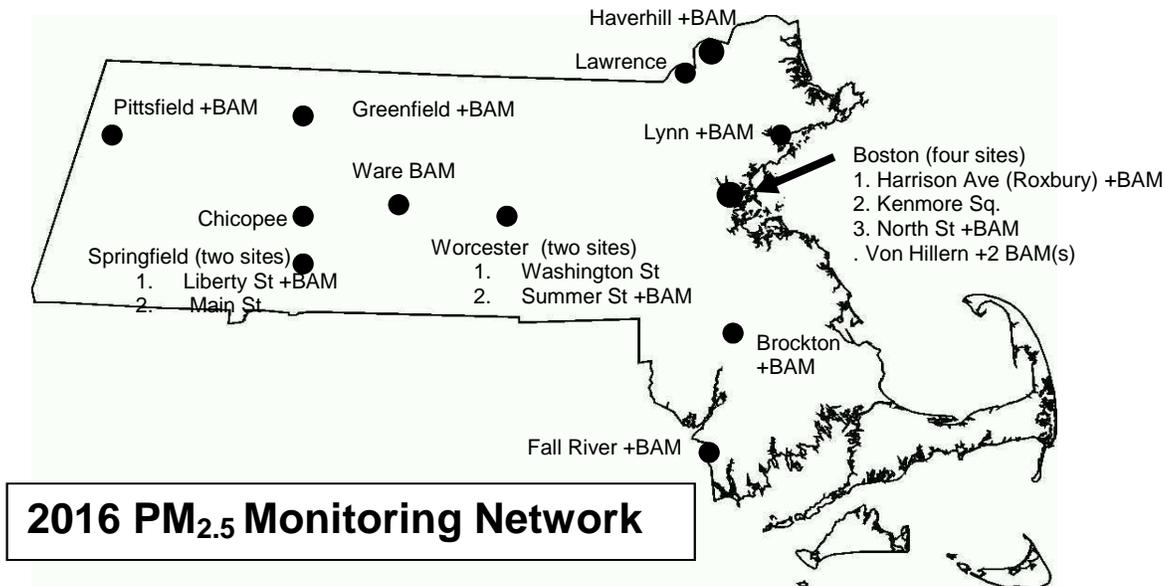
MassDEP has equipped 12 monitoring stations with continuous PM_{2.5} monitors (Beta Attenuation Monitors or BAMs). These continuous PM_{2.5} monitors are currently operating at the following locations:

Boston – Harrison Avenue (25-025-0042)	Haverhill – Consentino School (25-009-5005)
Boston – North St (25-025-0043)	Lynn – Water Treatment Plant (25-009-2006)
Boston – Von Hillern Street (25-025-0044)*	Pittsfield (25-003-0006)
Brockton – Buckley Playground (25-023-0005)	Springfield – Liberty Street (25-013-0016)
Fall River – Globe Street (25-005-1004)	Ware – Quabbin Summit (25-015-4002)
Greenfield – Veterans Field (25-011-2005)	Worcester – Summer Street (25-027-0023)

* *2 monitors*

All of MassDEP's BAMs have a Federal Equivalent Method (FEM) designation. FEM monitors provide the hourly PM_{2.5} data that appears on MassDEP's *MassAir* website. MassDEP will use data from all of its FEM monitors for comparison to the PM_{2.5} NAAQS, except the second FEM monitor at Von Hillern Street since it has been operating less than 24 months.

As described in the 2015 Network Plan, MassDEP discontinued the Milton – Blue Hill continuous monitor (25-021-3003) at the end of 2015. During the coming year, MassDEP will be working to establish a new continuous PM_{2.5} monitor (along with an ozone monitor) in the Pittsfield CMSA, and a continuous PM_{2.5} in North Adams to represent a valley that is affected by wood smoke.



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 $PM_{2.5}$. EPA recently completed a nationwide assessment of the speciation network, which did not affect MassDEP’s sites.

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. The National Park Service operates an IMPROVE sampler at Truro – National Sea Shore (25-001-0002) and the Wampanoag Tribe on Martha’s Vineyard also operates an IMPROVE sampler. EPA eliminated funding for MassDEP’s IMPROVE sampler at Ware – Quabbin Summit (25-015-4002), and therefore MassDEP discontinued IMPROVE sampling at the end of 2015.

PM_{coarse}

MassDEP uses the Federal Reference Method (FRM) for PM_{coarse} in compliance with NCore requirements at the Boston - Harrison Avenue NCore site. This method consists of the subtraction of $PM_{2.5}$ values from PM_{10} values at a site that has side-by-side samplers of each type sampling on the same dates.

F. LEAD

MassDEP monitors lead at its Boston - Harrison Avenue NCore site using a low-volume PM_{10} method. MassDEP discontinued lead monitoring at the Springfield – Liberty Street site (25-013-0016) at the end of 2015 because only trace concentrations far below the NAAQS have been measured in Springfield and Boston. While EPA allows states to discontinue lead monitoring at NCore sites that show concentrations below the NAAQS, MassDEP plans to continue lead monitoring at the Boston – Harrison Avenue NCore site since it obtains lead data as a byproduct of the NATTS program.

2. Photochemical Assessment Monitoring Stations

MassDEP operates enhanced ozone, Photochemical Assessment Monitoring Stations (PAMS) in the Boston and Springfield Metropolitan Areas. PAMS are 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 nitrogen oxides 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 by operating hourly gas chromatographs that measure individual hydrocarbon compounds at all four PAMS locations. 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. MassDEP operates four PAMS sites in the Boston and Springfield areas at the following locations:

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

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

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

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

During the PAMS season, MassDEP operates automated hourly gas chromatographs at all four sites and collects carbonyl samples at Chicopee and Lynn. 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.

When EPA strengthened the ozone NAAQS in October 2015, it adopted new ozone monitoring regulations that will reduce the number of mandated PAMS sites in Massachusetts from four to one in 2019. Future Network Plans will describe the transition to meet the new regulations. MassDEP collected hourly VOC samples at all four PAMS sites during summer 2016 but changed the carbonyl sampling frequency to three 8-hour samples, every third day to establish a baseline in anticipation of the upcoming changes.

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). MassDEP operates a NO_y monitor at the NCore site at Boston - Harrison Avenue (25-025-0042) to fulfill NCore requirements. 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), 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), Springfield - Liberty Street (25-013-0016), Boston - Von Hillern Street (25-025-0044) and Greenfield - Veterans Field (25-011-2005). MassDEP also plans to monitor black carbon at the planned sites in the Pittsfield CMSA and North Adams.

In November 2014, MassDEP installed a Synspec gas GC-PID at Kenmore Square (25-025-0002) to measure hourly concentrations of health-relevant hydrocarbon compounds (primarily from vehicle exhaust), which include benzene, toluene, xylenes and ethyl benzene. MassDEP's preliminary review of the data indicates that values were very low. Since the monitor may have more value at the Boston - Von Hillern Street near-road site (25-025-0044), MassDEP moved the monitor to that site in July 2016.

5. Summary of Network Changes

- Due to discontinued EPA funding, MassDEP discontinued IMPROVE sampling at the Ware site (25-015-4002) at the end of 2015.
- MassDEP discontinued lead monitoring at the Springfield – Liberty Street site (25-013-0016) at the end of 2015.
- MassDEP discontinued continuous PM_{2.5} monitoring at the Milton – Blue Hill site (25-021-3003) at the end of 2015
- MassDEP plans to relocate the Springfield – Liberty Street monitoring station (25-013-0016) to another location in Springfield due to the pending sale of the property.
- MassDEP is in the process of establishing a second near-road NO₂ monitoring station near the Route 495/Route 3 interchange north of Boston.
- MassDEP is in the process of establishing an ozone and continuous PM_{2.5} monitoring station in the Pittsfield area.
- MassDEP is in the process of establishing a continuous PM_{2.5} and black carbon monitoring station in North Adams to measure the effects of wood smoke in a valley environment.
- MassDEP plans to discontinue filter-based PM_{2.5} monitoring at the Worcester – Washington Street site (25-027-0016), Lawrence site (25-009-6001), and Boston – Kenmore Square site (25-025-0002) at the end of 2016.
- MassDEP plans to discontinue PM₁₀ monitoring at the Boston – Kenmore Square site (25-025-0002) at the end of 2016.
- Mass DEP moved the Synspec Gas Chromatograph from the Boston – Kenmore Square (25-025-0002) monitoring station to the Boston – Von Hillern Street near-road monitoring station (25-025-0044) in July 2016.
- MassDEP collected hourly VOC samples at all four PAMS sites during summer 2016 but changed the carbonyl sampling frequency to three 8-hour samples, every third day, which will be required beginning in 2019 by EPA's new ozone monitoring regulations.