



Commonwealth of Massachusetts  
Executive Office of Energy & Environmental Affairs

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# Massachusetts 2018 Air Monitoring Network Plan

## Air Assessment Branch Bureau of Air and Waste

July 22, 2019

This is the Massachusetts 2018 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.

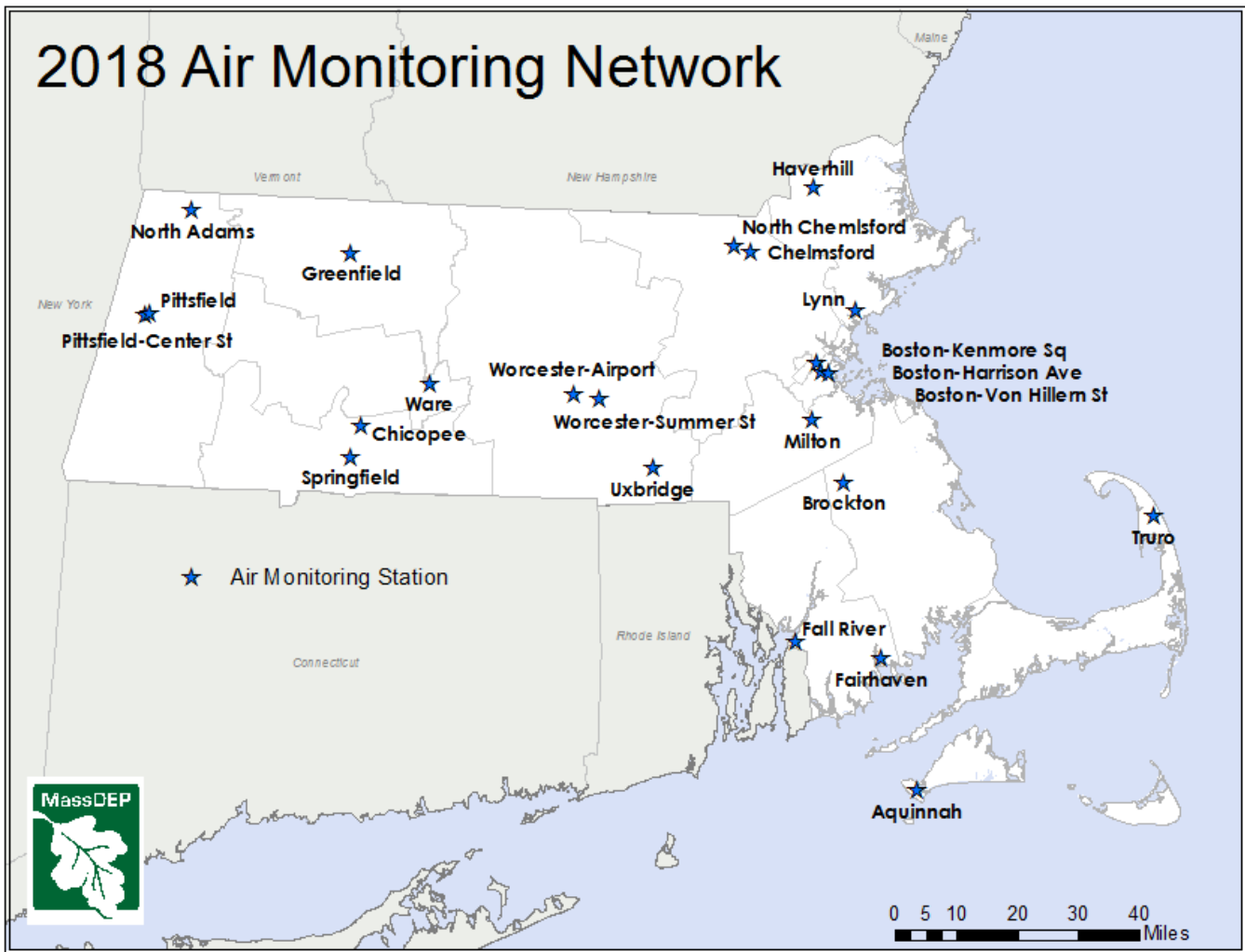
MassDEP operates a network of 21 ambient air quality monitoring stations in 17 communities located across the state. The Wampanoag Tribe of Gay Head (Aquinnah) on Martha's Vineyard operates an ozone monitoring station. MassDEP and the Wampanoag Tribe are members of the same Primary Quality Assurance 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 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.

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# 2018 Air 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 (PM<sub>10</sub> and PM<sub>2.5</sub>) 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 <sup>3</sup>	Not to be exceeded	
Nitrogen Dioxide	primary	1-hour	100 ppb	98th percentile of 1-hr daily maximum concentrations, 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 <sub>2.5</sub>	primary	Annual	12 µg/m <sup>3</sup>	annual mean, averaged over 3 years
		secondary	Annual	15 µg/m <sup>3</sup>	annual mean, averaged over 3 years
	PM <sub>10</sub>	primary and secondary	24-hour	35 µg/m <sup>3</sup>	98th percentile, averaged over 3 years
		primary and secondary	24-hour	150 µg/m <sup>3</sup>	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-hr daily maximum concentrations, averaged over 3 years	
	secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year	

µg/m<sup>3</sup> = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion

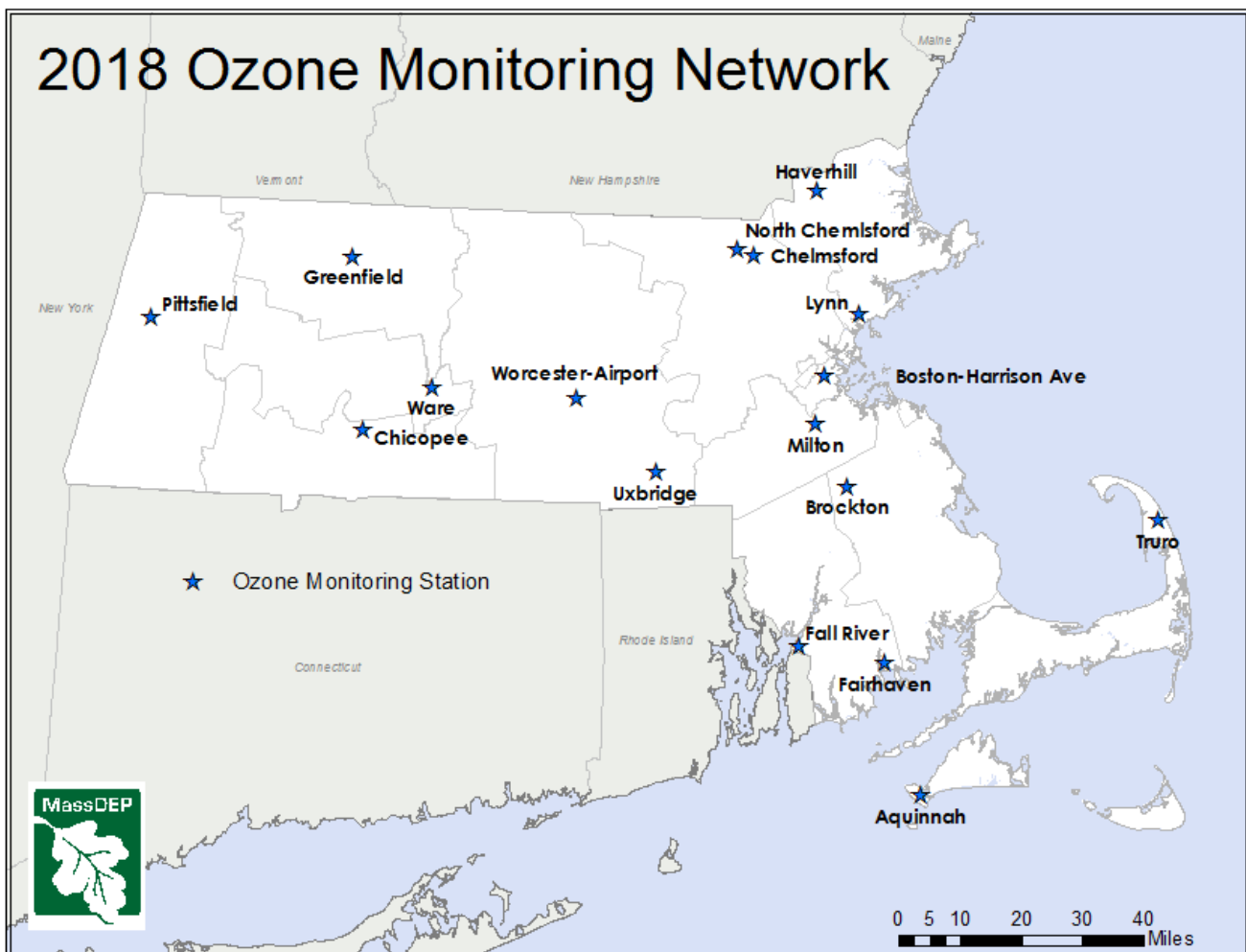
## A. OZONE

MassDEP operates 16 ozone monitoring stations at the locations listed below. 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)  
North Chelmsford (25-017-0009)  
Chelmsford (25-017-0010) *Near-road*  
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)  
Pittsfield (25-003-0008)  
Truro (25-001-0002)  
Uxbridge (25-027-0024)  
Ware (25-015-4002)  
Worcester – Airport (25-027-0015)  
*Aquinnah – Tribal Site (25-007-0001)*

In August 2018, MassDEP began operating a new Pittsfield ozone monitoring station on Silver Lake Drive. With this new station the ozone monitoring network meets EPA monitoring requirements for the ozone NAAQS. In June 2018, MassDEP also began operating an ozone monitor at the new near-road site in Chelmsford (25-017-0010), which will provide a useful comparison to levels monitored at the existing ozone monitoring site in North Chelmsford at EPA's regional laboratory (25-017-0009).



## B. SULFUR DIOXIDE

MassDEP operates six trace-level (i.e., very low concentration) sulfur dioxide (SO<sub>2</sub>) monitors at the following locations:

Boston – Harrison Ave (25-025-0042)

Boston – Kenmore Square (25-025-0002)

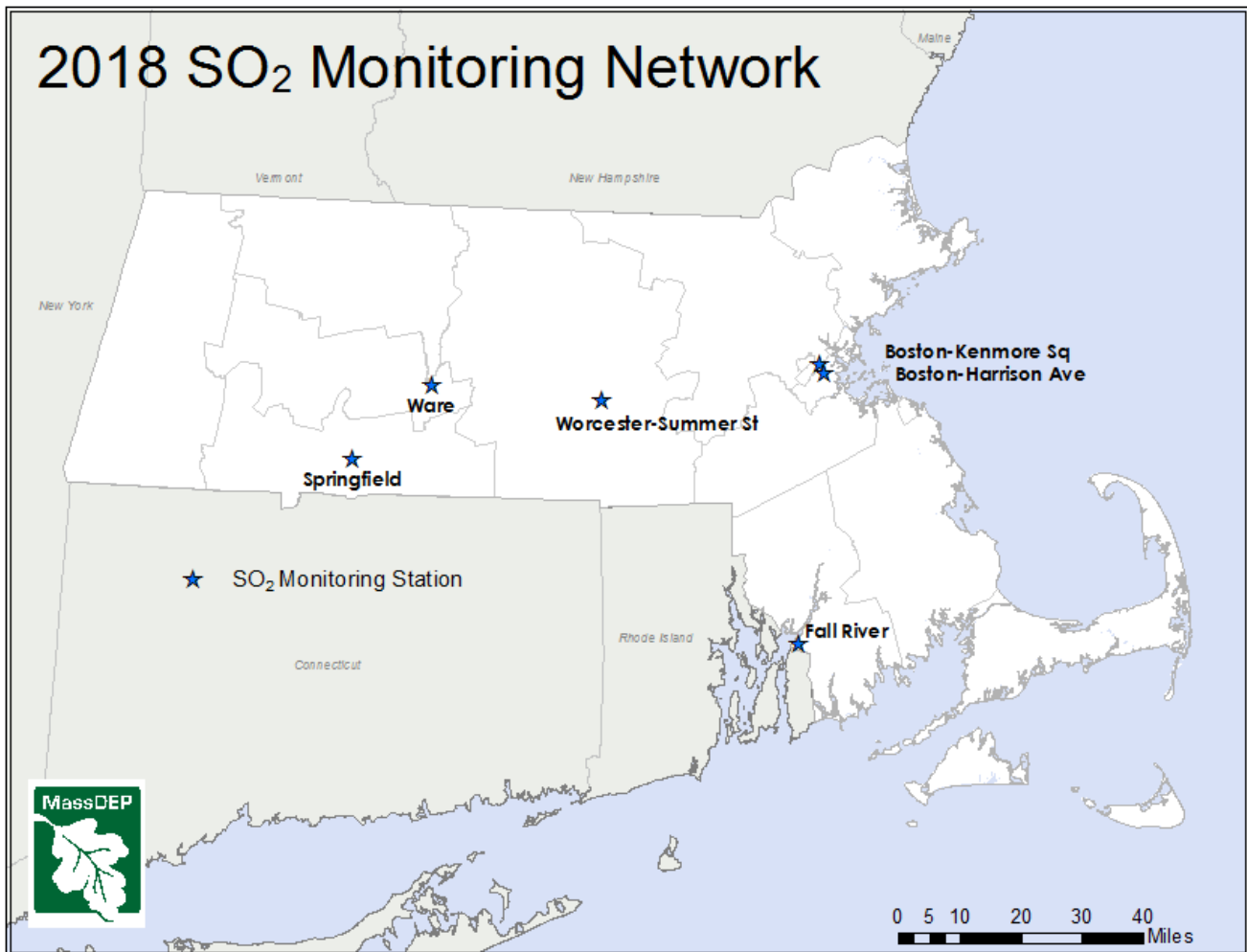
Fall River (25-005-1004)

Springfield – Liberty Street (25-013-0018)

Ware (25-015-4002)

Worcester – Summer Street (25-027-0023)

The existing SO<sub>2</sub> monitoring network meets EPA monitoring requirements for the SO<sub>2</sub> NAAQS. In May 2018, MassDEP completed re-location of the previous Springfield – 165 Liberty Street (25-013-0016) monitoring station to a nearby location in Springfield at 600 Liberty Street (25-013-0018) and began operating the new station.

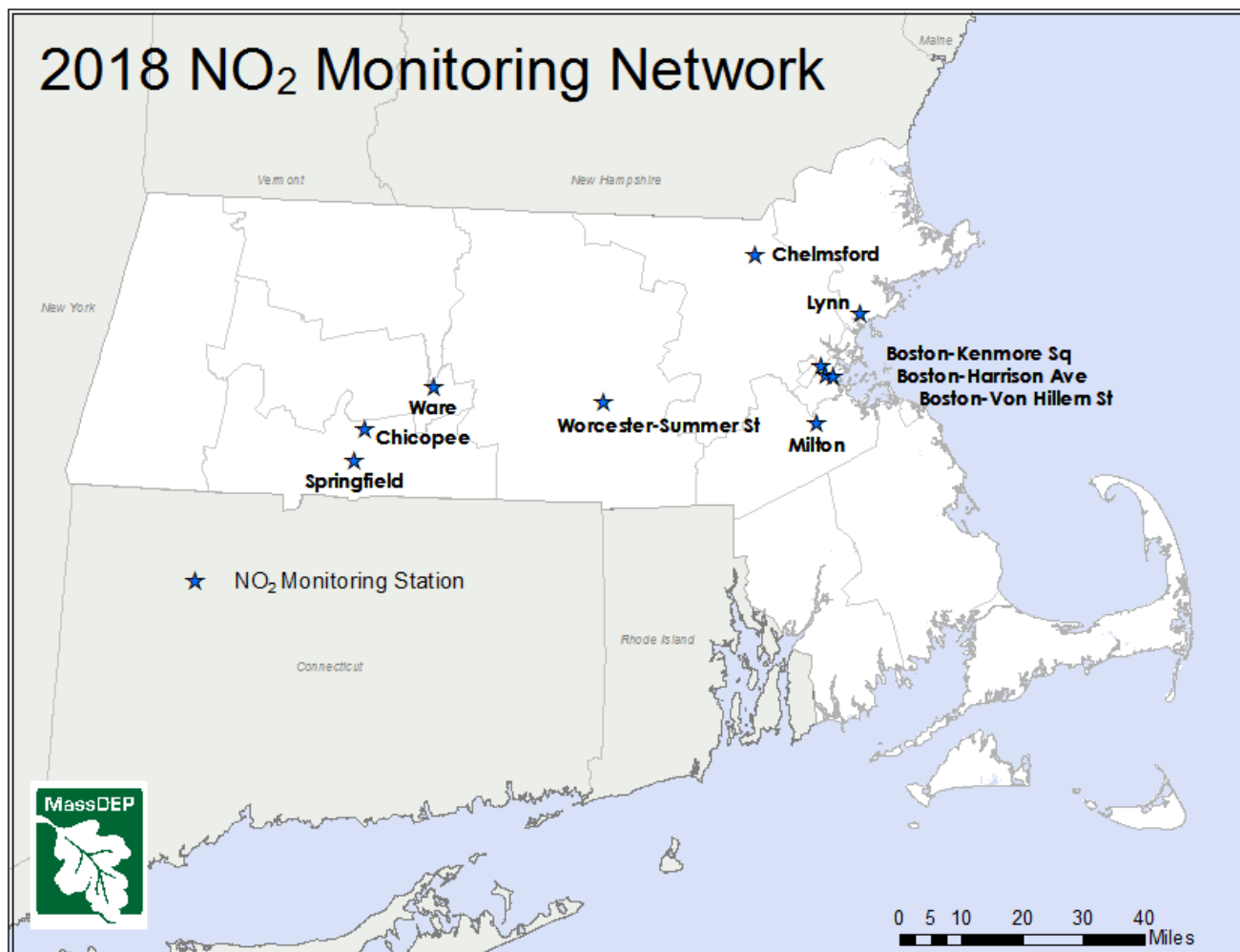


### C. NITROGEN DIOXIDE

MassDEP operates 10 nitrogen dioxide (NO<sub>2</sub>) monitors. These monitors measure NO<sub>2</sub> and nitrogen oxides [NO<sub>x</sub>, which is NO<sub>2</sub> plus NO (nitric oxide)]. NO<sub>2</sub> is monitored as a NAAQS pollutant and as an ozone precursor. MassDEP operates six NO<sub>2</sub> monitors to determine compliance with NAAQS, including the near-road monitors in Boston and Chelmsford. EPA has designated three monitors (Boston – Harrison Ave., Boston – Kenmore Square, and Springfield – Liberty Street) as representing susceptible and vulnerable populations. MassDEP also operates four additional monitors to measure NO<sub>2</sub> as an ozone precursor. NO<sub>2</sub> monitors are at the following locations:

- |  |  |
|--|--|
| Boston – Harrison Ave (25-025-0042)                        | Lynn (25-009-2006)                         |
| Boston – Kenmore Square (25-025-0002)                      | Milton (25-021-3003)                       |
| Boston – Von Hillern Street (25-025-0044) <i>Near-road</i> | Springfield – Liberty Street (25-013-0018) |
| Chelmsford – Rt. 495 (25-017-0010) <i>Near-road</i>        | Ware (25-015-4002)                         |
| Chicopee (25-013-0008)                                     | Worcester – Summer Street (25-027-0023)    |

MassDEP began operating the second near-road NO<sub>2</sub> monitoring station in Chelmsford in June 2018. The re-located Springfield site at 600 Liberty Street began operating in May 2018.



## D. CARBON MONOXIDE

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

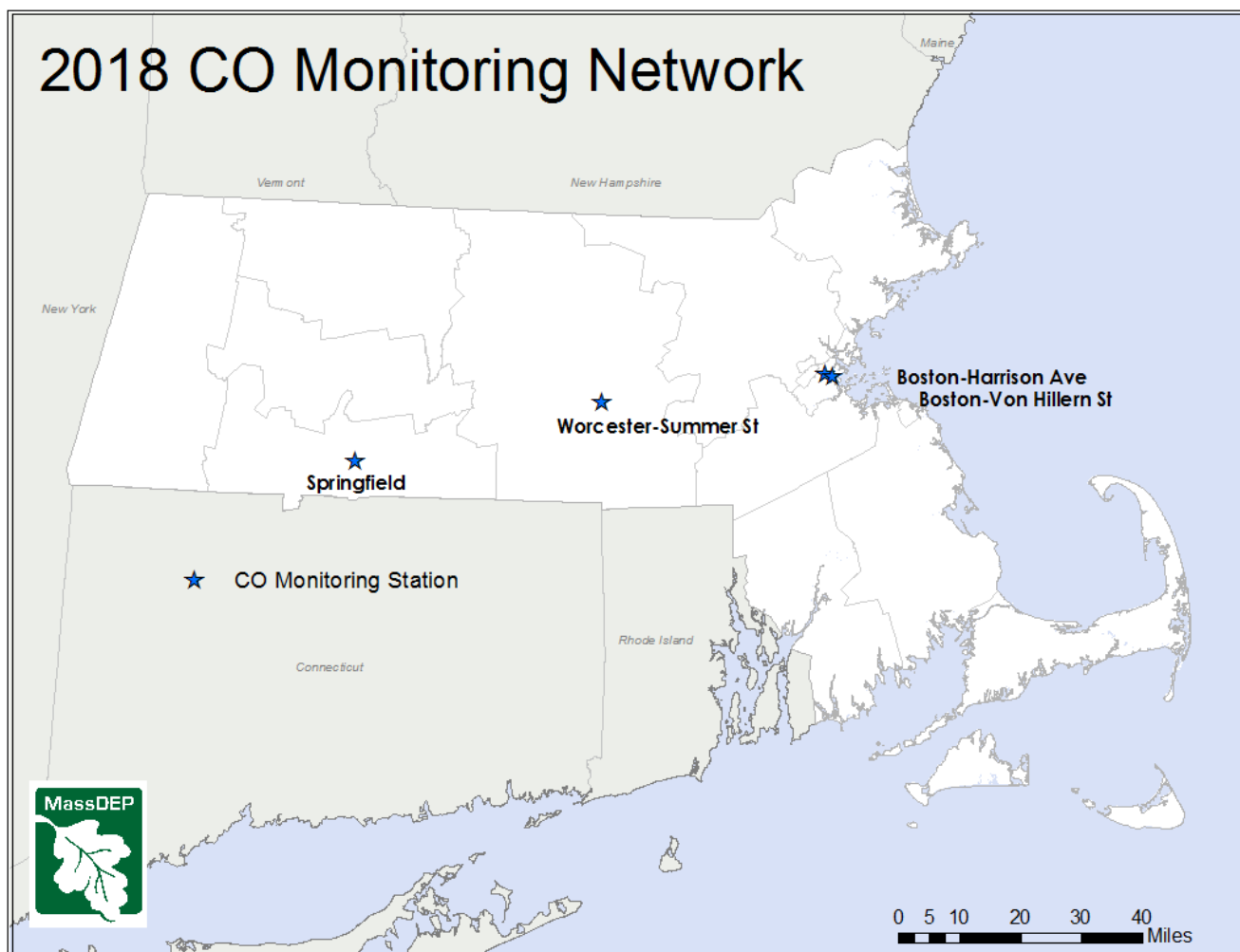
Boston – Harrison Ave (25-025-0042)

Boston – Von Hillern Street (25-025-0044) *Near-road*

Springfield – Liberty Street (25-013-0018)

Worcester – Summer Street (25-027-0023)

MassDEP installed a trace-level CO monitor at the re-located Springfield monitoring station that began operating in May 2018.





## E. PARTICULATE MATTER

### PM<sub>10</sub>

MassDEP operates four PM<sub>10</sub> monitors (low volume instruments), including two monitors collocated at the Boston - Harrison Avenue NCore site for quality assurance purposes. PM<sub>10</sub> monitors are at the following locations:

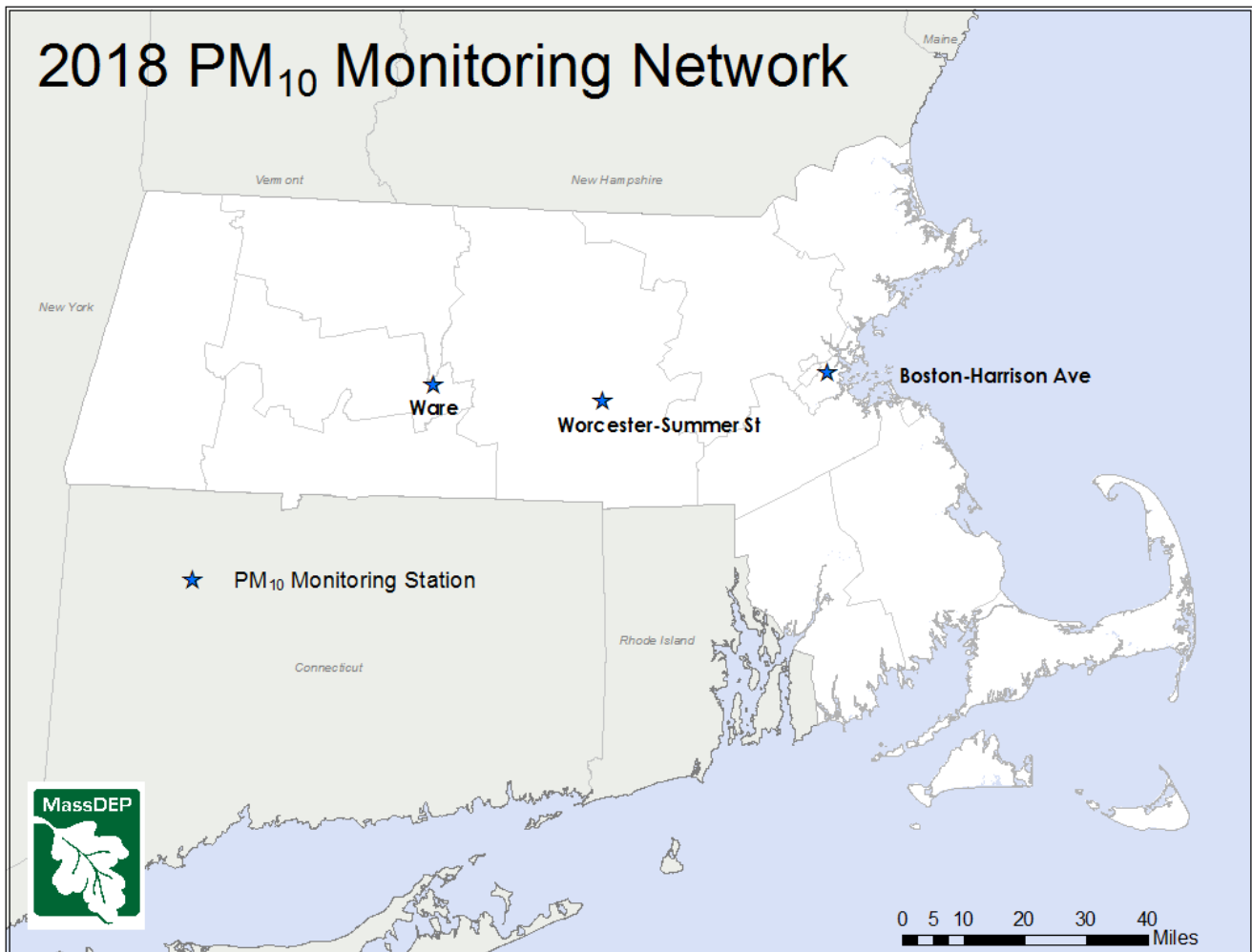
Boston – Harrison Avenue (25-025-0042) 2 monitors

Ware – Quabbin Summit (25-015-4002)

Worcester – Summer Street (25-027-0023)<sup>1</sup>

Samples from the Boston – Harrison Avenue PM<sub>10</sub> monitors are used in association with samples from collocated PM<sub>2.5</sub> monitors at the site to calculate PM<sub>coarse</sub> concentrations, which is required for NCore sites. These samples also are used for PM<sub>10</sub>-based National Air Toxics Trends Sites (NATTS) metals monitoring.

MassDEP discontinued PM<sub>10</sub> monitoring at Springfield – 165 Liberty Street (25-013-0016) when the replacement Springfield – 600 Liberty Street site (25-013-0018) began operating in May 2018.



<sup>1</sup> 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<sub>2.5</sub>

### Filter-Based Monitors

MassDEP's operates 11 fine particulate matter (PM<sub>2.5</sub>) Federal Reference Method (FRM) monitors at 10 locations. MassDEP collects collocated samples at the Chicopee monitoring station. PM<sub>2.5</sub> monitors are at the following locations:

Boston – Harrison Avenue (25-025-0042)	Greenfield (25-011-2005)
Boston – Kenmore Square (25-025-0002)	Haverhill (25-009-5005)
Boston – Von Hillern Street (25-025-0044)	Pittsfield (25-003-5001)
Brockton (25-023-0005)	Springfield – Liberty Street (25-013-0018)
Chicopee (25-013-0008) *	Worcester – Summer Street (25-027-0023)

\* 2 monitors

MassDEP reduced the FRM PM<sub>2.5</sub> sampling schedule from 1-in-3 days to 1-in-6 days at five sites beginning in 2019: Boston – Von Hillern Street (25-025-0044), Brockton (25-023-0005), Haverhill (25-009-5005), Springfield – Liberty Street (25-013-0018), and Worcester – Summer Street (25-027-0023). The remaining five sites are on a 1-in-3 days schedule. MassDEP closed the Boston – North Street monitoring station (25-025-0043) in April 2018 due to loss of access to the site. MassDEP may identify a replacement site in Boston in the near future.

### Continuous Monitors

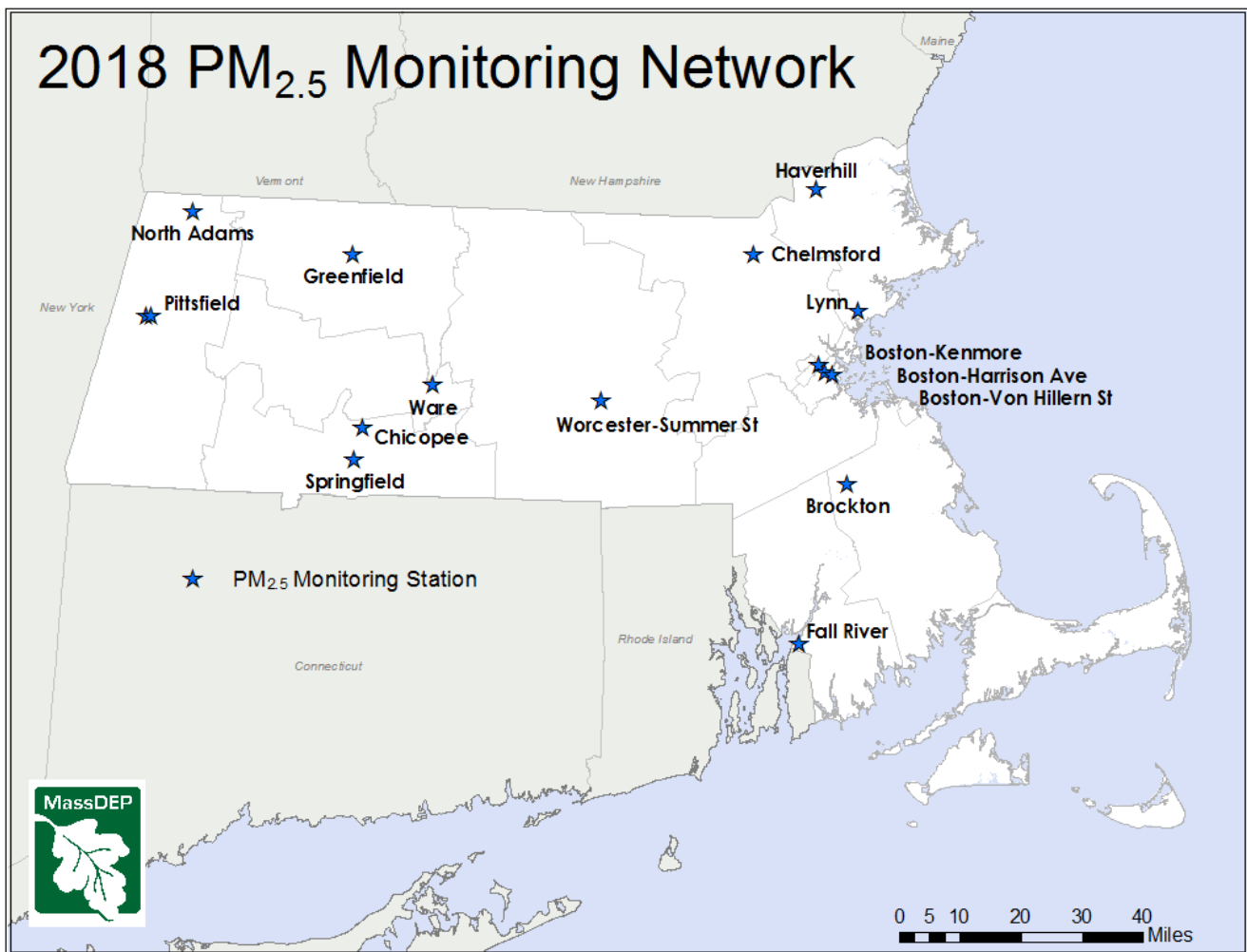
MassDEP has equipped 13 monitoring stations with continuous PM<sub>2.5</sub> monitors (Beta Attenuation Monitors or BAMs) at the following locations:

Boston – Harrison Avenue (25-025-0042)	Haverhill (25-009-5005)
Boston – Von Hillern Street (25-025-0044)*	Lynn (25-009-2006)
Brockton (25-023-0005)	Pittsfield (25-003-0008)
Chelmsford – Rt. 495 (25-017-0010)	Springfield – Liberty Street (25-013-0018)
Fall River (25-005-1004)	Ware (25-015-4002)
Greenfield (25-011-2005)	Worcester – Summer Street (25-027-0023)
North Adams (25-003-6001)	

\* 2 monitors

All of MassDEP's continuous PM<sub>2.5</sub> monitors have a Federal Equivalent Method (FEM) designation. FEM monitors provide the hourly PM<sub>2.5</sub> data that appears on MassDEP's *MassAir* website. MassDEP is using data from all FEM monitors for comparison to the PM<sub>2.5</sub> NAAQS.

The new continuous PM<sub>2.5</sub> monitoring station in Pittsfield (25-003-0008) replaced the monitor that had been in Pittsfield on South Street (25-003-0006), which has been closed. The new replacement Springfield site at 600 Liberty Street (25-013-0018) has a FEM PM<sub>2.5</sub> which replaced the previous Springfield site (25-013-0016). The second NO<sub>2</sub> near-road site in Chelmsford also has a FEM PM<sub>2.5</sub> monitor. MassDEP began operating a FEM PM<sub>2.5</sub> at the Chicopee site in October 2018. MassDEP closed the Boston – North St. (25-025-0043) station in April 2018 due to loss of access to the site, and may identify a replacement site in Boston in the near future.



### Speciated PM<sub>2.5</sub>

MassDEP collects speciated PM<sub>2.5</sub> samples at Boston – Harrison Avenue (25-025-0042) and Chicopee (25-013-0008). The speciated PM<sub>2.5</sub> program is designed to determine some of the chemical components (elements, sulfates/nitrates, carbon species) that are contained in PM<sub>2.5</sub>. MassDEP reduced the sample schedule for Chicopee from 1-in-3 days to 1-in-6 days at the end of June 2018.

IMPROVE sampling sites also provide speciated PM<sub>2.5</sub> 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.

### PM<sub>coarse</sub>

MassDEP uses FRM for PM<sub>coarse</sub> in compliance with NCore requirements at the Boston – Harrison Avenue NCore site. This method consists of the subtraction of PM<sub>2.5</sub> values from PM<sub>10</sub> values at a site that has side-by-side samplers of each type sampling on the same dates.

## **F. LEAD**

MassDEP monitors lead at the Boston - Harrison Avenue NCore site using a low-volume PM<sub>10</sub> method. 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 for non-NAAQS purposes under the National Air Toxics Trends Site (NATTS) program.

## **2. Photochemical Assessment Monitoring Stations / Enhanced Ozone Monitoring Plan**

MassDEP has operated enhanced ozone, Photochemical Assessment Monitoring Stations (PAMS) in the Boston and Springfield Metropolitan Areas since 1994. PAMS are designed to measure ozone precursors (i.e., pollutants that lead to ozone formation) 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 (VOCs), including hydrocarbons and carbonyl compounds (formaldehyde and acetaldehyde). These are measured by taking discrete samples and by operating hourly gas chromatographs that measure individual hydrocarbon compounds at PAMS locations.

During the 2018 season, MassDEP monitored PAMS parameters at Chicopee (25-013-0008) and Lynn (25-009-2006), but only measured carbonyls at the Lynn site due to limited resources. As proposed in the 2017 Network Plan, EPA approved the Lynn site as the primary PAMS site for Massachusetts. MassDEP has procured a new Auto GC (Automated Gas Chromatograph) for the site. In addition, MassDEP has purchased a true nitrogen dioxide monitor for ozone precursor monitoring, and is planning to purchase upper air monitoring equipment.

EPA's 2015 Ozone NAAQS regulations require states with ozone non-attainment and/or that are in the Ozone Transport Region (such as Massachusetts) to develop enhanced monitoring plans (EMPs) to help determine the distribution of ozone in the state and region. MassDEP has participated in a collaborative planning effort with EPA and other Ozone Transport Commission (OTC) states on the development of EMPs. MassDEP believes enhancements to the monitoring network that it has taken adequately meet the new requirements. This includes maintaining ozone monitoring at the summit of Blue Hill in Milton that measures higher elevation ozone (which had previously been scheduled to close), and expanding ozone monitoring in Southeastern Massachusetts to address higher ozone values that occur along the South Coast. This has included adding ozone monitoring at the Fall River station (25-005-1004), replacing the Fairhaven station (25-005-1006), and establishing a new Brockton monitoring station (25-023-0005). MassDEP also is planning to add additional upper air measurements.

## **3. Total Reactive Nitrogen (NO<sub>y</sub>)**

MassDEP operates NO<sub>y</sub> analyzers at Ware (25-015-4002) and at the NCore site at Boston – Harrison Avenue (25-025-0042) to fulfill NCore requirements.

## **4. Air Toxics**

Boston – Harrison Avenue (25-025-0042) is a 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), VOCs, carbonyls (formaldehyde and acetaldehyde), metals (from PM<sub>10</sub> filters), and polycyclic aromatic hydrocarbons (PAHs).

In addition to the NATTS site, MassDEP collects 24-hour VOC canister samples every sixth day at the Lynn monitoring station (which serves as a Boston Area background location), and sends the samples (along with the Boston VOC samples) to the Rhode Island Department of Health Laboratory for analysis. MassDEP also monitors black carbon at Pittsfield (25-003-0008), Springfield – Liberty Street (25-013-0018), Boston – Von Hillern Street (25-025-0044), Greenfield (25-011-2005), North Adams (25-003-6001), and the new Chelmsford – Rt. 495 near-road site (25-017-0010).

From July 2018 through November 2018, MassDEP conducted VOC monitoring in the Fore River Basin area in Weymouth, Quincy, Braintree, and Hingham as part of the Health Impact Assessment conducted for the proposed Atlantic Bridge natural gas compressor station project. Results of MassDEP's monitoring are found in the Health Impact Assessment Report published in January 2019 and on MassDEP's website at <https://www.mass.gov/service-details/algonquin-natural-gas-compressor-station-weymouth>. MassDEP is in the process of establishing a new air quality monitoring station in the Fore River Basin area, and will work with local citizens, officials and EPA in siting the of station.

## 5. Summary of Network Changes

- MassDEP began operating the new relocated Springfield monitoring station at 600 Liberty Street (25-013-0018) in May 2018 and closed the previous 165 Liberty Street station (25-013-0016). The new site monitors PM<sub>2.5</sub> (continuous and filter-based), SO<sub>2</sub>, NO<sub>2</sub> and CO (which was converted from a full-scale CO monitor to a trace CO monitor).
- MassDEP reduced filter-based PM<sub>2.5</sub> sample frequencies from 1-in-3 days to 1-in-6 days at five sites beginning in 2019: Brockton (25-023-0005), Haverhill (25-009-5005), the new Springfield site (25-013-0018), Boston – Von Hillern Street (25-025-0044), and Worcester – Summer Street (25-027-0023). MassDEP's remaining six filter-based PM<sub>2.5</sub> sites remain on a 1-in-3 days schedule.
- MassDEP closed the Boston – North Street site (25-025-0043) in April 2018 after losing site access. MassDEP had monitored PM<sub>2.5</sub> (continuous and filter-based) and black carbon at this site. MassDEP may identify a replacement site in Boston in the near future.
- MassDEP began operating the new Chelmsford – Rt. 495 (25-017-0010) near-road NO<sub>2</sub> monitoring station June 2018. The new site also monitors ozone, continuous PM<sub>2.5</sub> and black carbon.
- MassDEP began operating the new Pittsfield ozone monitoring station (25-003-0008) in August 2018, and also monitors continuous PM<sub>2.5</sub> and black carbon at the site. MassDEP discontinued continuous PM<sub>2.5</sub> monitoring and closed the Pittsfield South Street monitoring station (25-003-0006).
- MassDEP began operating a continuous PM<sub>2.5</sub> monitor at Chicopee in October 2018, and reduced the schedule of PM<sub>2.5</sub> speciation samples from 1-in-3 days to 1-in-6 days.
- During the 2018 season, MassDEP monitored PAMS parameters at Chicopee (25-013-0008) and Lynn (25-009-2006). MassDEP procured a new gas chromatograph at the Lynn PAMS site (25-009-2006) and a true NO<sub>2</sub> analyzer.