

Massachusetts Ambient Air Quality Monitoring Network Review

Under the provisions of the October 16, 2006 USEPA Federal Register 40 CFR Part 58, the annual Ambient Air Quality Monitoring Network Review, which is due to the USEPA Regional Office (Region 1) for review and approval by July 1 of each year, is now subject to a 30 day public comment period, prior to submittal. This is the 2009 Massachusetts Monitoring Network Review.

There are two attachments to the 2009 Network Review. The EPA has requested the Mass DEP to submit separate plans for our NCORE monitoring site (Attachment 1: Massachusetts NCORE [National Core Multipollutant Monitoring Stations] Plan) and Lead monitoring (Attachment 2: Lead (Pb) Ambient Air Monitoring Plan). The NCORE provisions of the 2006 USEPA Ambient Air Monitoring Regulations, mandates that the MassDEP operate a comprehensive, sensitive measurement site, at one appropriate location in the Commonwealth, beginning in January, 2011. The Lead NAAQS standard was recently lowered from 1.5 ug/M³ to 0.15 ug/M³, which has resulted in new monitoring requirements for Lead in the ambient air.

The current Massachusetts Ambient Air Monitoring Network consists of 29 sites:

City/Town	Address	City/Town	Address	City/Town	Address
ADAMS	MT. GREYLOCK	FAIRHAVEN	LEROY WOOD	SPRINGFIELD	LIBERTY ST
AMHERST	NORTH PLEASANT	FALL RIVER	GLOBE ST	SPRINGFIELD	1860 MAIN ST
BOSTON	KENMORE SQUARE	HAVERHILL	WASHINGTON ST	STOW	US MILITARY
BOSTON	ONE CITY SQUARE	LAWRENCE	WALL EXP STATION	TRURO	FOX BOTTOM AREA
BOSTON	LONG ISLAND	LOWELL	OLD CITY HALL	UXBRIDGE	BLACKSTONE HERITAGE PK
BOSTON	HARRISON AVE	LYNN	390 PARKLAND	WALTHAM	BEAVER ST
BOSTON	174 NORTH ST	MILTON	MILTON, BLUE HILL	WARE	QUABBIN SUMMIT
BROCKTON	120 COMMERCIAL ST	NEWBURY	SUNSET BLVD	WORCESTER	WORCESTER AIRPORT
CHICOPEE	ANDERSON RD	PITTSFIELD	78 CENTER ST	WORCESTER	2 WASHINGTON ST
		PITTSFIELD	1 SOUTH ST	WORCESTER	SUMMER ST

These locations have been selected to monitor one or more pollutants per site, based on the objective of the measurements, the population density and the nature of the pollutants to be measured. The basic pollutants, which must be measured, are known as criteria pollutants as identified by the Clean Air Act (1970) and subsequent amendments. Each pollutant has a health and welfare based concentration standard, collectively known as the National Ambient Air Quality Standards (NAAQS), which are listed below. In addition to the criteria pollutants, many other pollutants and support parameters (such as meteorology) are also measured at our sites. Toxic Air Pollutants, which do not have NAAQS, but do have health effect threshold concentrations associated with them, are measured at selected locations. Several of our sites (Lynn, Newbury, Milton, Boston [Long Island], Chicopee and Ware) are designated Photochemical Assessment Monitoring Stations (PAMS), which measure parameters (including enhanced meteorological parameters, volatile organic compounds and oxides of nitrogen), which help to explain the regional formation of ground level ozone, during the summer months.

It should be noted that Ozone measurements taken on Martha's Vineyard at Aquinnah by the Wampanoag Tribe are an integral component of our data collection and reporting system.

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
SO₂	Annual Arithmetic Mean	0.03 ppm (80 ug/m ³)	None
	24-Hour	0.14 ppm (365 ug/m ³)	None
	3-Hour	None	0.50 ppm (1300 ug/m ³)
CO	8-Hour	9 ppm (10 mg/m ³)	Same as Primary Standard
	1-Hour	35 ppm (40 mg/m ³)	Same as Primary Standard
O₃**	8-Hour	0.075 ppm (147 ug/m ³)*	Same as Primary Standard
	<ul style="list-style-type: none"> The 8-hour standard is met when the 3-year average of the 4th-highest daily maximum 8-hour average does not exceed 0.075 ppm at any one monitor. The 8 hour standard is reduced from 0.8 ppm to 0.75 ppm, effective May 27, 2008. 		
Pb	Running Three Month Arithmetic Mean	0.15 ug/m ³ (New- January 2009)	Same as Primary Standard
NO₂	Annual Arithmetic Mean	0.053 ppm (100 g/m ³)	Same as Primary Standard
PM_{2.5}** Particulates up to 2.5 microns in size	Annual Arithmetic Mean	15.0 ug/m ³	Same as Primary Standard
	24-Hour	35 ug/m ³	Same as Primary Standard
<ul style="list-style-type: none"> 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 35 ug/m³ (3-year average). 			
PM₁₀*** Particulates up to 10 microns in size	Annual Arithmetic Mean	50 ug/m ³	Same as Primary Standard
	24-Hour	150 ug/m ³	Same as Primary Standard
<ul style="list-style-type: none"> The PM₁₀ 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. 			

ug/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.

*** PM10 is still monitored six (6) locations in Massachusetts although the official standard was revoked in October, 2006 coinciding with the lowering of the 24 hour **PM_{2.5} Standard**.

Measurement Strategy

The web page Table and Map illustrate where monitors for various pollutants and parameters are located. The explanation behind the placement of the monitors is as follows.

1. Ozone – (abbreviated as O₃) Ozone is a regionally transported pollutant usually measured at rural and suburban locations upwind and downwind of precursor (ingredient) emission sources (mostly large cities and highway systems). Generally, ozone is not measured at urban locations because of the neutralizing effect of other pollutants on ozone concentrations. Dudley Square (Boston) is urban background location.
2. Carbon Monoxide – (abbreviated as CO) Very local pollutant, traditionally measured at locations in the presence of consistent high motor vehicle traffic or idling. Concentrations are down overall, due to vehicle emission control improvements.
3. Sulfur Dioxide (abbreviated as SO₂) Concentrations are down overall also. Traditionally measured at urban locations or in the vicinity of power generating facilities, where oil or coal containing sulfur, is burned.
4. Oxides of Nitrogen – (abbreviated as NO_x) Monitors have a double purpose; specifically to measure pollutants in the vicinity where motor vehicles and power generating facility emissions are present **and** as a transported ozone forming ingredient at rural and suburban locations. NO_x is a term for several forms of nitrogen oxide. Nitrogen Dioxide (NO₂) has a NAAQS Standard.
5. Total Reactive Oxides of Nitrogen – (abbreviated as NO_y) Monitors designed to monitor wider scope of Nitrogen chemicals than NO_x. Most useful for ozone formation measurements at rural locations.
6. Meteorology - (abbreviated MET) Includes measurements for Wind Speed, Wind Direction, Relative Humidity, Barometric Pressure, Ambient Temperature, Solar Radiation, and specialized parameters at selected sites, such as Precipitation and Ultra Violet Radiation. Valuable for understanding pollutant transport (mostly ozone) and local conditions. Most sites in rural areas with open areas and liberal zoning requirements (measurements require 10 meter tower).
7. PM₁₀ – Particulate Matter 10 microns and below in diameter. Capable of penetrating into lungs. Influenced by local sources of particulate matter, (generally fuel combustion) so monitors located at urban locations (except for statewide background at Ware. Monitored since mid-1980s and replaced Total Suspended Particulates (TSP) as PM measurement. Although the 24 hour NAAQS Standard was rescinded in October, 2006, PM₁₀ remains relevant as a pollutant of interest and as a component to a future pollutant of interest (PM_{coarse}). PM_{coarse} are particles of the size range between PM₁₀ and PM_{2.5}.
8. PM_{2.5} - Particulate Matter 2.5 microns and below in diameter. Capable of penetrating deeply into lungs. Influenced by transported and local sources, so monitored throughout the state. Monitored since 1999, to augment PM₁₀ measurements. PM_{2.5} has not replaced PM₁₀ entirely, but is considered a more significant fraction of particulate matter for health reasons.
9. BAM – (Beta Attenuation Monitor) Semi-Continuous, hourly measurement method for PM_{2.5}. Not currently used for to measure compliance with the PM_{2.5} NAAQS Standard. Used for real time reporting of PM_{2.5} values and to assist in developing daily PM_{2.5} predictions for the public Air Quality Index. Federal Equivalent Method (FEM) BAMs have recently been introduced (now at four (4) Massachusetts locations), which could be used for compliance related measurements, in the near future.

10. PAMS – (Photochemical Assessment Monitoring Stations) On this table intended to indicate hydrocarbon and other organic chemical measurements as ingredients to ozone formation (can also be used for toxic air pollutant measurements). PAMS designated sites also have NO_x (some NO_y) and extensive meteorology to assess the whole ground level ozone formation process.
11. Toxics – Chemicals (including volatile organic compounds, polyaromatic hydrocarbons and toxic metals) known to have potential long term health effects from exposure. Health guideline values but no NAAQS. Most Toxics measured at specially designated National Air Toxics Trends (NATTS) site at Dudley Square (Boston).
12. BC – (Black Carbon) Indicator, but not measurement of carbon substances, which could be considered air toxics. Monitors currently sited near areas known to have sources of diesel emissions and wood smoke.
13. Spec – (PM_{2.5} Speciation) Sites where special, enhanced PM_{2.5} Samplers are sited and collect special filters analyzed for the chemicals which make up the PM_{2.5} detected at that and similar sites.
14. Other – Special Monitors including: Lead – Lead has a NAAQS Standard, but is monitored at one location (Boston-Kenmore) in New England because of dramatic drop in concentrations since the deleading of gasoline in 1975. IMPROVE - PM_{2.5} Speciation (and PM₁₀) using an older historically based method for regional haze and rural PM concentrations.

Proposed Network Changes

Part of the network review process is to propose to the USEPA anticipated changes to the network (either individual parameters or sites) over the next eighteen (18) months and to account for changes in the network, which have occurred since the last network review document. Other communications have been sent to the USEPA regarding the latter changes.

1. Proposed Site Changes

- A. Lowell Old City Hall – The Department proposed shutting down Lowell CO in the 2007 Network Review Document. The EPA approved the discontinuation of this site, pending the required modification of the State Implementation Plan (SIP) for CO. The site is still in operation, while the Department continues to respond to public comments.
- B. Worcester MSA – The 2006 USEPA Monitoring Regulations required that the MassDEP locate and install a new ozone monitor (and site) in the Worcester Metropolitan Statistical Area (MSA). A location was found for the site on the grounds of the Blackstone River Heritage Park in Uxbridge. The station was installed in Fall, 2008, and began operating in April, 2009.
- C. Kenmore Square – The 20 year old 10 foot by 20 foot existing monitoring shelter, will be replaced with an 8 foot by 12 foot version in June, 2009. This replacement will be accompanied by enhanced landscaping in the immediate vicinity of the shelter and the shelter will be sided with material which is complementary to the surrounding neighborhood. The site may be down for as much as a month, while these renovations are occurring.
- D. Worcester/Summer Street – This shelter is slated for replacement during the next fiscal year (July 1, 2009 to June 30, 2010). This site could also be down for a month, during the replacement.

- E. Newbury/Plum Island – The Parker River National Wildlife Sanctuary will be reconstructing their Visitors Center within the June to November, 2009 timeframe. MassDEP has been asked to move our PAMs air monitoring station, during the construction. MassDEP will temporarily move our station to its previous location at the former Department of Fish and Wildlife Headquarters at the northern end of Plum Island (in Newburyport). We will attempt to monitor ozone at the temporary location for part of the season.. We plan to move back to the Parker River location, when the Visitors Center construction is complete.

2. Proposed Monitor Changes

- A. Lead – As mentioned last year, the MassDEP proposed to discontinue sampling for Lead at Kenmore Square and commence sampling for Lead at the Harrison Avenue, Roxbury site, primarily due to the space constraints anticipated when the new, replacement Kenmore Square shelter is installed. The USEPA approved the proposal. The Kenmore site is now scheduled for renovation in June (2009). High volume sampling for Lead will not be possible at the new site. However, provisions will be made to temporarily move that operation to the Harrison Avenue site, until the new low volume sampling methodology is in effect beginning in January, 2011. Because of the profound changes in ambient Lead monitoring, which accompanied the reduction of the NAAQS Lead standard (from 1.5 ug/M3 quarterly average to 0.15 ug/M3 per running three month average), EPA has required that states post a separable plan for compliance with the new Lead monitoring requirements.
- B. Trace Carbon Monoxide – A Trace CO is scheduled to be installed at the Type 2 during 2009, to comply with new PAMs requirements.
- C. Federal Equivalent Monitor (FEM) BAMs – Since February, 2008, MassDEP has replaced BAMs at four (4) locations (North Street, Harrison Avenue in Boston, Liberty Street in Springfield and Summer Street in Worcester) with the FEM version. We have recently ordered two (2) more FEMs, with Haverhill, Fall River and Ware candidates for the next replacements. As PM_{2.5} funds become available, we plan to replace instruments at most or all of our ten (10) site network with FEM BAMs.