MEETING AIR QUALITY GOALS IN TRANSPORTATION

Massachusetts Department of Transportation (MassDOT)
and the Metropolitan Planning Organizations (MPOs)

August 2015

Introduction

This report documents recent progress made by MassDOT and the MPOs in meeting air quality goals established through state and (currently former) federal regulations applicable to Massachusetts. It consists of two parts: 1) A "progress report" that documents future carbon dioxide (CO_2) emission estimates from the transportation sector as part of meeting greenhouse gas (GHG) reduction goals established through the Commonwealth's Global Warming Solutions Act (GWSA), and 2) An informational analysis of future vehicle emissions of ozone precursor pollutants – formerly a federal "air quality conformity" requirement for areas of Massachusetts.

Section 1

GWSA Transportation Status: Future Carbon Dioxide Emissions Reductions

The Global Warming Solutions Act of 2008 requires statewide reductions in greenhouse gas (CO2) emissions of 25 percent below 1990 levels by the year 2020, and 80 percent below 1990 levels by 2050. As part of the GWSA, the Executive Office of Energy and Environmental Affairs developed the Massachusetts Clean Energy and Climate Plan (CECP), which outlines programs to attain the 25 percent reduction by 2020 – including a 7.6 percent reduction that would be attributed to the transportation sector.

The Commonwealth's thirteen metropolitan planning organizations (MPOs) are integrally involved in helping to achieve greenhouse gas reductions mandated under the GWSA. The MPOs work closely with the Massachusetts Department of Transportation (MassDOT) and other involved agencies to develop common transportation goals, policies, and projects that would help to reduce GHG emission levels statewide, and meet the specific requirements of the GWSA regulation – *Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation (310 CMR 60.05).* The purpose of this regulation is to assist the Commonwealth in achieving their adopted GHG emission reduction goals by:

- Requiring MassDOT to demonstrate that its GHG reduction commitments and targets are being achieved.
- Requiring each MPO to evaluate and track the GHG emissions and impacts of both its Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP).
- Requiring each MPO, in consultation with MassDOT, to develop and utilize procedures to prioritize and select projects in its RTP and TIP based on factors that include GHG emissions and impacts.

Meeting the requirements of this regulation is being achieved through the transportation goals and policies contained in the 2016 regional transportation plans (RTPs), the major projects planned in the RTPs, and the mix of new transportation projects that are programmed and implemented through the transportation improvement program (TIPs).

The GHG tracking and evaluation processes enable the MPOs and MassDOT to identify the anticipated GHG impacts of the planned and programmed projects, and also to use GHG impacts as a criterion in prioritizing transportation projects. This approach is consistent with the greenhouse gas reduction policies of promoting healthy transportation modes through prioritizing and programming an appropriate balance of roadway, transit, bicycle and pedestrian investments; as well as supporting smart growth development patterns through the creation of a balanced multi-modal transportation system. All of the MPOs and MassDOT are working toward reducing greenhouse gases with “sustainable” transportation plans, actions, and strategies that include (but are not limited to):

- Reducing emissions from construction and operations
- Using more fuel-efficient fleets
- Implementing and expanding travel demand management programs
- Encouraging eco-driving
- Providing mitigation for development projects
- Improving pedestrian, bicycle, and public transit infrastructure and operations (healthy transportation)
- Investing in higher density, mixed use, and transit-oriented developments (smart growth)

Regional GHG Tracking and Evaluation in RTPs

MassDOT coordinated with MPOs and regional planning agency (RPA) staffs on the implementation of GHG tracking and evaluation in development of each MPO’s 2012 RTPs, which were adopted in September 2011. This collaboration has continued for the MPO’s 2016 RTPs and 2016-19 TIPs. Working together, MassDOT and the MPOs have attained the following milestones:

- Modeling and long-range statewide projections for GHG emissions resulting from the transportation sector, as a supplement to the 2016 RTPs. Using the Boston MPO’s regional travel demand model and the newly updated statewide travel demand model for the remainder of the state, GHG emissions have been projected for 2020 no-build (base) and build (action) conditions, and for 2040 no-build (base) and build (action) conditions. The results of this modeling are presented at the end of this section.

- All of the MPOs have addressed GHG emission reduction projections in their RTPs (including these supplemental statewide estimates), along with a discussion of climate change and a statement of MPO support for reducing GHG emissions as a regional goal.

MassDOT's statewide estimates of CO_2 emissions resulting from the collective list of all recommended projects in all the Massachusetts RTPs combined are presented below. Emissions have been estimated using the new (2014) MOVES model, and also incorporate the latest planning assumptions including updated socio-economic projections for the Commonwealth:

Massachusetts Statewide CO_2 Emissions Estimates (all emissions in tons per summer day)

Year	CO_2 Action Emissions	CO_2 Base Emissions	Difference (Action – Base)
2012	185,324.3	185,324.3	n/a
2020	138,611.3	138,638.1	-26.7
2030	89,631.6	89,645.3	-13.7
2040	70,010.7	70,035.5	-24.8

This analysis measures only projects that are included in the travel demand models. Many other types of projects that cannot be accounted for in the model (such as bicycle and pedestrian facilities, shuttle services, intersection improvements, etc.), are covered in the regional TIPs with either "qualitative" assessments of likely CO_2 change, or actual quantitative estimates listed for each project.

As shown above, collectively, all the projects in the RTPs in the 2020 Action scenario provide a statewide reduction of over 26 tons of CO_2 per day compared to the base case. The 2040 Action scenario estimates a reduction of nearly 25 tons of CO_2 emissions compared to the base case.

These results demonstrate that the transportation sector is expected to make positive progress in meeting the GHG reduction targets and complying with the requirements of the GWSA. MassDOT and the MPOs will continue to advocate for steps needed to accomplish the Commonwealth's long-term goals for greenhouse gas reductions.

Section 2

Statewide Ozone Precursor Analysis (for informational purposes only)

Legislative Background on Ozone

The 1970 Clean Air Act defined a one-hour national ambient air-quality standard (NAAQS) for ground-level ozone. The 1990 Clean Air Act Amendments further classified degrees of nonattainment of the one-hour standard based on the severity of monitored levels of the pollutant. The entire Commonwealth of Massachusetts was classified as being in serious nonattainment for the one-hour ozone standard, with a required attainment date of 1999; this was later extended first to 2003, then to 2007.

In 1997, the U.S. Environmental Protection Agency (EPA) proposed a new, eight-hour ozone NAAQS to replace the one-hour standard, effective June 15, 2005. The new standard was challenged in court, and after a lengthy legal battle, the courts upheld the standard, which was finalized in June 2004. The eight-hour standard was 0.08 parts per million (ppm), averaged over eight hours and not to be exceeded more than once per year. Nonattainment areas were again further classified based on the severity of eight-hour values. Massachusetts as a whole was classified as being in moderate nonattainment for the eight-hour standard, but it was separated into two nonattainment areas—Eastern Massachusetts and Western Massachusetts. Both nonattainment areas were required to reduce its emissions of VOCs and NOx to achieve attainment of the eight- hour ozone NAAQS by 2009.

In March 2008, EPA published revisions to the eight-hour ozone NAAQS that established a level of 0.075 ppm (March 27, 2008; 73 FR 16483). After reviewing data from Massachusetts monitoring stations, the EPA sent a letter on December 16, 2011, proposing that only Dukes County would be designated as being in nonattainment for the new, proposed 0.075 ozone standard. Massachusetts concurred with these findings.

On May 21, 2012, the final rule (77 FR 30088) was published in the Federal Register, defining the 2008 NAAQS at 0.075 ppm, the standard that was promulgated in March 2008. A second rule (77 FR 30160), published on May 21, 2012, revoked the 1997 ozone NAAQS; the rule was to become effective one year after the 2008 NAAQS became effective (July 20, 2012). Also on May 21, 2012, the air-quality designation areas for the 2008 NAAQS were published in the Federal Register. In this Federal Register, the only area in Massachusetts that was designated as being in nonattainment for ozone was Dukes County. All other counties were classified as unclassifiable/ attainment. Therefore, the 13 MPOs are not required to perform a conformity determination for ozone for their LRTP.

All the Massachusetts MPOs and MassDOT continue to meet the requirements of air quality conformity according to the Code of Federal Regulations, and as evaluated through inter-agency consultation. Specifically, on March 6, 2015, (80 FR 12264,

effective April 6, 2015) EPA published the Final Rulemaking, "Implementation of the 2008 National Ambient Air Quality Standards (NAAQS) for Ozone: State Implementation Plan Requirements; Final Rule." This rulemaking removed transportation conformity to the 1997 Ozone NAAQS (the standard referenced by the Conservation Law Foundation and the subject of a December 23, 2014 DC Circuit Court decision). Link to Final EPA Rulemaking: http://www.gpo.gov/fdsys/pkg/FR-2015-03-06/pdf/2015-04012.pdf

Since the LRTPs have been developed, reviewed, and approved after April 6, 2015, air quality conformity determinations to the 1997 Ozone NAAQS are no longer required, as those standards and all associated area designations have been permanently replaced by the 2008 NAAQS, which (with actually a stricter level of allowable ozone concentration than the 1997 standards) no longer designate Massachusetts as a non-attainment area(s) for ozone except for Dukes County as discussed above.

Legislative Background on Carbon Monoxide

Although this document reports on statewide ozone precursor emissions, reporting on another criteria pollutant, carbon monoxide (CO) is still federally required for some MPOs in Massachusetts. The cities of Boston, Cambridge, Chelsea, Everett, Malden, Medford, Quincy, Revere, and Somerville within the Boston Region MPO were classified as being in attainment for CO emissions. As part of the Boston MPO LRTP, an air-quality conformity analysis is still completed for these communities, as they have a carbon monoxide maintenance plan approved as part of the SIP. This information can be found in Chapter 8 of *Charting Progress to 2040*, the Boston MPO's current LRTP.

The Lowell, Waltham, Worcester and Springfield carbon monoxide areas are classified attainment with a limited maintenance plan in place. No regional air quality analysis is required in limited maintenance plan areas as emissions may be treated as essentially not constraining for the length of the maintenance period because it is unreasonable to expect that such areas will experience so much growth in that period that a violation of the carbon monoxide NAAQS would result. Therefore, in areas with approved limited maintenance plans, Federal actions requiring conformity determinations under the transportation conformity rule are considered to satisfy the "budget test." All other transportation conformity requirements under 40 CFR 93.109(b) continue to apply in limited maintenance areas, including project level conformity determinations based on carbon monoxide hot spot analyses under 40 CFR 93.116.

Ozone Analysis Criteria

The ozone analysis was prepared using the following criteria:

- The horizon years for the travel demand model analysis are established as 2012 (base year), 2020, 2030, and 2040.

- Projections for future population, employment, and households were developed jointly by MassDOT, the Metropolitan Area Planning Council, and the Donahue Institute of the University of Massachusetts. This was a cooperative and iterative process conducted throughout 2014 and into 2015, with input and comments from each MPO in the Commonwealth.

- Projections were incorporated into the statewide and Boston region travel demand models, along with updated travel characteristics, obtained through the 2010-2011 Massachusetts Travel Survey.

- The transit service assumptions for the MBTA were included in this analysis and were based on MBTA service in the spring of 2012. Travel demand model calibration was performed using the Ridership and Service Statistics, MBTA Blue Book, 2012 and the MBTA Systemwide Passenger Survey, 2008–09.

- Factors used for calculating emissions changes were determined using the EPA's latest emissions model, Motor Vehicle Emissions Simulator (MOVES) 2014. Inputs used for 2012 through 2040 were received from the DEP and include information about programs that were submitted to the EPA as the strategy for the Commonwealth to attain ambient air-quality standards.

- The Federal Highway Administration's Highway Performance Monitoring System (HPMS) is used to track daily vehicle-miles of travel (VMT). For each MPO region, adjustment factors that compare the 2012 HPMS VMT to the 2012 base year VMT estimated by the travel demand models transportation model VMT were developed. The adjustment factors were then applied to all modeled VOC and NOx emissions for the years 2020 through 2040 to ensure consistency with EPA-accepted procedures.

Inclusion of Regionally Significant Transportation Projects

Only "regionally significant" projects are included in the travel-demand modeling. Regionally significant projects are defined as follows:

> A transportation project (other than an exempt project) that is on a facility that serves regional transportation needs (such as access to and from the area outside of the MPO region; major activity centers in the region; major planned developments, such as new retail malls and sport complexes; and transportation terminals (as well as most terminals themselves) and would be included in the modeling of a metropolitan area's transportation network, including at a minimum all principal arterial highways and all fixed-guideway transit facilities that offer an alternative to regional highway travel.

The following table lists the regionally significant projects proposed in the LRTPs in the Commonwealth:

Regionally Significant Projects Included in the Travel Demand Models

Analysis Year	Community	Project Description
2020	Bedford and Billerica	Middlesex Turnpike Improvements, From Crosby Drive North to Manning Road, Phase III
2020	Newton and Needham	Reconstruction of Highland Avenue, Needham Street and Charles River Bridge, from Webster Street to Route 9
2020	Weymouth and Abington	Reconstruction and Widening on Route 18 (Main Street) From Highland Place to Route 139
2020	Woburn	Reconstruction of Montvale Avenue, from I-93 Interchange to Central Street
2020	Woburn	Bridge Replacement, New Boston Street over MBTA
2030	Boston	Reconstruction of Rutherford Avenue, from City Square to Sullivan Square
2030	Framingham	Intersection Improvements at Route 126 and Route 135/MBTA and CSX Railroad
2030	Lexington	Route 4/225 (Bedford Street) and Hartwell Avenue
2030	Natick	Bridge Replacement, Route 27 (North Main St.) over Route 9 (Worcester St.) and Interchange Improvements
2030	Somerville and Medford	Green Line Extension Project (Phase 2), College Avenue to Mystic Valley Parkway/Route 16
2030	Somerville	McGrath Boulevard Project
2040	Barnstable	Hyannis Access Improvements
2030	Westborough	Route 9 Improvements
2030	Oxford	Route 20 capacity improvement
2030	Millbury	Turnpike/Route 146 int. improve.
2030	Worcester	I-290 Bridge Expansion
2030	North Andover	Route 114 Reconstruction
2030	Athol	Route 2 Interchange @ S. Athol Rd
2040	Westford	Route 110 widening
2040	Tewksbury, Andover	Lowell Junction Interchange
2020	Abington, Weymouth	Route 18 Widening (funded in Boston Region)
2020	Wilbraham	Boston Road Reconstruction
2020	Hadley	Route 9 Phase 1
2030	Hadley	Route 9 Phase 2
2030	Hadley	Route 9 Phase 3
2030	Middleborough	Routes 44/28/18 Rotary
2040	Taunton	Routes 24 & 140 Improvements
2040	Fall River	Route 79 Blvd

Emissions Inventory Assumptions

Although Massachusetts is currently in conformity for ozone, this informational analysis was done in relation to the State Implementation Plan mobile-source ozone emission projections that were approved in March 2008 for the revoked 1997 eight-hour NAAQS for VOC and NOx. The VOC mobile-source emission budget for 2009 for the Eastern Massachusetts Ozone Nonattainment Area was set at 63.50 tons per summer day, and at 10.73 tons per summer day for the Western Massachusetts Ozone Nonattainment Area. The NOx mobile-source emission budget for 2009 for the Eastern Massachusetts Ozone Nonattainment Area was set at 174.96 tons per summer day, and at 27.73 tons per summer day for the Western Massachusetts Ozone Nonattainment Area.

The Massachusetts Department of Transportation, Office of Transportation Planning (MassDOT Planning) estimated the results for the Eastern and Western Massachusetts Ozone Nonattainment Areas using the Statewide and Boston Region MPO regional travel demand model sets, based on the latest planning assumptions (as outlined in this document).

Ozone Analysis Results

MassDOT OTP conducted an air-quality analysis for the Commonwealth's 13 MPO's LRTP. The test used in this analysis was to show that the LRTPs are consistent with the emission budgets set for the revoked 1997 eight-hour ozone NAAQS as described above. The results are shown in the tables below. They include emissions from regionally significant projects as derived from the travel demand models and off-model emissions from commuter rail, commuter boat, and buses:

VOC Emissions Estimates
Eastern Massachusetts Ozone Nonattainment Area
(all emissions in tons per summer day: tpsd)

Year	VOC Action Emissions	VOC Budget	Difference (Action – Budget)
2012	30.56	n/a	n/a
2020	11.25	63.50	-52.25
2030	7.06	63.50	-56.44
2040	5.79	63.50	-57.71

NOx Emissions Estimates
Eastern Massachusetts Ozone Nonattainment Area (tpsd)

Year	NOx Action Emissions	NOx Budget	Difference (Action – Budget)
2012	116.97	n/a	n/a
2020	36.37	174.96	-138.59
2030	17.81	174.96	-157.15
2040	13.36	174.96	-161.60

VOC Emissions Estimates
Western Massachusetts Ozone Nonattainment Area (tpsd)

Year	VOC Action Emissions	VOC Budget	Difference (Action – Budget)
2012	3.61	n/a	n/a
2020	1.58	10.73	-9.15
2030	0.89	10.73	-9.84
2040	0.76	10.73	-9.97

NOx Emissions Estimates
Western Massachusetts Ozone Nonattainment Area (tpsd)

Year	NOx Action Emissions	NOx Budget	Difference (Action – Budget)
2012	13.10	n/a	n/a
2020	4.36	27.73	-23.37
2030	1.86	27.73	-25.87
2040	1.42	27.73	-26.31

MEETING AIR QUALITY GOALS IN TRANSPORTATION

Based on the preceding estimates, MassDOT Planning has found that the combined emission levels from transportation projects contained in the 2016 Regional Transportation Plans and 2016-2019 Transportation Improvement Programs – for both former ozone nonattainment areas in Massachusetts – would demonstrate conformity with the SIP, the Clean Air Act, and the EPA conformity regulations (40 CFR part 51).

Through the interagency air quality consultation process (involving U.S. Department of Transportation, EPA, DEP, MassDOT, and the MPOs) the latest EPA rulemakings, and the referenced legislative background and legal issues, currently applicable ozone standards, area designations, and requirements were all reviewed.

The ozone analysis outlined in this section demonstrates that the implementation of the 2016 RTPs and TIPs meets the “budget test,” and would therefore satisfy the air quality ozone conformity criteria, and is consistent with the air quality goals in the Massachusetts SIP.