

Chapter 8—Air-Quality Conformity Determination and Greenhouse Gas Analysis

1 INTRODUCTION

This chapter presents information about the air quality analyses that are required by both federal and state legislation. The first section discusses analysis results of the air-quality conformity determination for projects in the LRTP, as required by federal regulations (40 CFR Part 93) and Massachusetts Conformity Regulations (310 CMR 60.03). It specifically addresses carbon monoxide emissions in the required maintenance area (see description below). The second section presents information on the greenhouse gas (GHG) analysis for projects in the LRTP and TIP as required by the Massachusetts Global Warming Solutions Act and its requirements for the *Transportation Sector and the Massachusetts Department of Transportation* (310 CMR 60.05). This section specifically addresses emissions of carbon dioxide at the state level.

2 AIR-QUALITY CONFORMITY DETERMINATION

2.1 Air-Quality Conformity Determination Introduction

The 1990 Clean Air Act Amendments (CAAA) require metropolitan planning organizations within nonattainment and maintenance areas to perform air-quality conformity determinations prior to the approval of LRTPs and TIPs, and at such other times as required by regulation. A nonattainment area is one that the United States Environmental Protection Agency (EPA) has designated as not meeting certain air-quality standards. A maintenance area is a nonattainment area that now meets the standards and has been redesignated as maintaining the standard. A conformity determination is a demonstration that a region's plans, programs, and projects are consistent with the State Implementation Plan (SIP) for attaining the air-quality standards. The CAAA requirement to perform a conformity determination ensures that federal approval and funding go to transportation activities that are consistent with air-quality goals. In addition to containing analyses of the air-quality conformity determination for the projects in the LRTP, this section also includes the regulatory framework, conformity requirements, planning assumptions, mobile-source emission budgets, and conformity consultation procedures related to the determination.

Legislative Background

The 1970 Clean Air Act defined a one-hour national ambient air-quality standard (NAAQS) for ground-level ozone. The 1990 CAAA 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 EPA proposed a new, eight-hour ozone standard to replace the one-hour standard, effective June 15, 2005. Research shows that ozone can affect human health at lower levels than previously thought, and for longer exposure times than one hour. 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 is 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.

The Eastern Massachusetts Ozone Nonattainment Area included all of Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Suffolk, and Worcester counties. Because of this nonattainment classification, the CAAA required the Commonwealth to reduce its emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx), the two major precursors of ozone formation, to achieve attainment of the eight-hour ozone standard by 2009.

In addition, on April 1, 1996, the cities of Boston, Cambridge, Chelsea, Everett, Malden, Medford, Quincy, Revere, and Somerville were classified as being in attainment for carbon monoxide (CO) emissions. As part of the LRTP, an air-quality conformity analysis still must be completed for these communities, as they have a carbon monoxide maintenance plan approved as part of the SIP. The 2010 CO motor-vehicle emission budget established for the Boston CO attainment area with a maintenance plan is 228.33 tons of CO per winter day.

As of April 22, 2002, the community of Waltham was re-designated as being in attainment for CO, with an EPA-approved limited-maintenance plan. In areas that have approved limited-maintenance plans, federal actions requiring conformity determinations under the transportation conformity rule are considered to satisfy the “budget test” (since budgets are not treated as being constraining in these areas for the length of the initial maintenance period). Any requirements for future “project-level” conformity determinations for projects located within this community will continue to use a “hot-spot” analysis to ensure that any new transportation projects in this CO attainment area do not cause or contribute to CO nonattainment.

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). In 2009, the EPA announced it would reconsider this standard because it fell outside of the range recommended by the Clean Air Scientific Advisory Committee. However, the EPA never took final action on the reconsideration so the standard would remain at 0.075 ppm. 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 Monday, 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, which was to become effective one year after the 2008 NAAQS became effective (July 20, 2012). Also on Monday, May 21, 2012, the air-quality designations 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 Boston Region MPO does not have to perform a conformity determination for ozone for this LRTP.

However, the Boston Region MPO needs to continue performing conformity determinations for the Boston CO Maintenance Area until at least 2020 to comply with regulations requiring continued conformity for an additional 10 years after 2010. In addition, the MPO is required to implement the SIP's transportation control measures (for example, the Central Artery/Tunnel (CA/T) project mitigation commitments). The Boston Region MPO also will be required to continue performing conformity determinations for the Waltham CO Limited-Maintenance Area.

Conformity Regulations

Designated MPOs are required to perform conformity determinations by nonattainment or maintenance area for their LRTPs and TIPs. Section 176 of the CAAA defines conformity to a SIP as conforming to the plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of standards. Regarding the activities outlined in the LRTP and TIP, the Boston Region MPO must certify that no activity will:

- Cause or contribute to any new violation of any standard in any area
- Increase the frequency or severity of any existing violation of any standard in any area
- Delay the timely attainment of any standard or any required interim emission reductions or other milestones in any area

The EPA issued final conformity regulations in the November 24, 1993, Federal Register, and the Massachusetts Department of Environmental Protection (DEP) issued conformity regulations that became effective December 30, 1994. They stated requirements for determining conformity of LRTPs, TIPs, and individual projects. The federal conformity regulations were amended several times through August 2010. Components of the required conformity analysis are listed below and are explained in detail subsequently.

- Conformity Criteria
- Horizon years
- Latest planning assumptions
- Latest emission model used
- Timely implementation of transportation control measures (TCMs)
- Conformity in accordance with consultation procedures and SIP revisions
- Public participation procedures
- Financially constrained document

Procedures for Determining Regional Transportation Emissions

The Conformity Test

The conformity test must be consistent with emission budgets described in the SIP. This conformity determination will show the LRTP's consistency with the CO emission budget for the Boston, Cambridge, Chelsea, Everett, Malden, Medford, Quincy, Revere, and Somerville maintenance areas.

2.2 Conformity Determination Criteria

This conformity determination has been prepared in accordance with 40 CFR Part 93, Transportation Conformity Rule Amendments: Flexibility and Streamlining: Final Rule. It shows that the LRTP has been prepared following all guidelines and requirements of the Rule.

Horizon Year Requirements

The horizon years for regional model analysis were established to comply with 40 CFR 93.106(a) of the Federal Conformity Regulations. Listed below are the years for which emissions are calculated:

- 2020 – Milestone Year and Analysis Year: Used to show conformity with the CO budget in the Boston nonattainment area
- 2030 – Analysis Year
- 2040 – Horizon Year: Last forecast year of the LRTP

Latest Planning Assumptions

Section 93.110 of the Federal Conformity Regulations outlines requirements for the most recent planning assumptions that must be in place at the time of conformity determination. Assumptions must be derived from current estimates and future projections of population, household, employment, travel, and congestion data developed by the MPO staff. Analysis for the LRTP is based on US census data and information obtained from MAPC, MassDOT, and other sources. Listed below are the sources of data used for model calibration in this analysis:

- Population, households, and household size: Year 2010 data at a community level received from the US Census Bureau. Community to TAZ-level distribution is based on Census 2010 allocation.
- Employment: MAPC purchased employment data from a commercial vendor, InfoUSA, and shared it with CTPS. InfoUSA uses a firm-based, multi-tiered, serial collection and update method. The InfoUSA 2010 dataset represented a base upon which CTPS built an employment database referred to as the Eastern Massachusetts Site-Level Employment Database for 2010. CTPS classifies employment data into three types: basic, retail and service.
- Household income, resident workers, and vehicle ownership: Data was obtained from Summary File 3 data for Massachusetts from the 2010 US Census of Population and Housing.
- Household workers: 2010 data were obtained from Census Transportation Planning Package Part 1 for Massachusetts from the 2010 US Census of Population and Housing.
- Traffic volumes: Roadway volume counts and some speed data have been collected. Highway traffic volume data is obtained from MassDOT 2010 Traffic Volumes for the Commonwealth of Massachusetts. Traffic counts taken for external stations and screen lines were used.
- Population, household, and employment forecasts: Population, households and employment by type are major inputs to the future-year travel-model process, as they are variables upon which trip generation is based. The land-use scenario for the forecast years is developed in cooperation with MAPC and MassDOT. Forecasts of households and employment for 101 cities and towns in the Boston Region MPO and for the 63 cities and towns outside of the Boston Region MPO were developed by MAPC in close coordination with MassDOT. An assumption using these forecasts seeks to channel regional growth and development by targeting the majority of growth to denser areas with already available water, sewer, and transit infrastructure. This scenario assumes that a greater percentage of residents will be living within walking distance of transit facilities and major activity centers.

- Project-level data: Obtained from the responsible implementing agency.

Transit Service Policy Assumptions

The transit service assumptions used in ridership modeling for the LRTP were based on MBTA service in the spring of 2012. The model calibration was performed using the following data:

- Ridership and Service Statistics, MBTA Blue Book, 2012
- MBTA Systemwide Passenger Survey, 2008–09

Emission Inventory Assumptions

For the LRTP, conformity is determined in relation to the SIP mobile-source CO emission projections that have been set for the nine cities in the Boston area that are classified as being in attainment for CO. An emissions attainment inventory for CO of 501.53 tons per winter day was established for all sources of CO emissions (mobile, industrial, and all other sources) for the re-designation year 1993. Of the 501.53 tons, 305.43 tons per winter day were allocated for mobile sources. In addition to the attainment year inventory, the EPA required that emissions projections for every five years through 2010 be developed for all sources to ensure that the combination of all CO emissions would not exceed the 501.53 tons per winter day maximum allowance in the future. The mobile-source emissions projection of 228.33 tons per winter day was set for 2010. Emissions from those nine towns in the Boston area may not exceed the amount in the last year of the maintenance plan (2010).

The Boston Region MPO estimated results for the nine towns collectively using the Boston Region MPO's regional travel demand model set, based on the latest planning assumptions for the conformity analysis.

Latest Emissions Model

Factors used for calculating emissions changes were determined using the EPA's latest emissions model, Motor Vehicle Emissions Simulator (MOVES) 2014. Emission factors for motor vehicles are specific to each model year, pollutant type, temperature, and travel speed. MOVES 2014 requires a wide range of input parameters, including inspection and maintenance program information and other data, such as fuel formulation and supply, speed distribution, vehicle fleet mix, and fleet age distribution. Inputs used for 2020 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.

Timely Implementation of Transportation Control Measures

Transportation control measures (TCMs) were required in the SIP in revisions submitted to the EPA in 1979 and 1982 and in those submitted as part of the CA/T project. The TCMs included in the 1979 and 1982 submissions were accomplished through construction or implementation of ongoing programs.

The TCMs submitted as part of the CA/T project mitigation have been included in the conformity of the LRTP as recommended or completed projects with the exception of the following three projects:

- Completion of a final design of the Red Line–Blue Line Connector from the Blue Line at Government Center to the Red Line at Charles Station
- Fairmount Line Improvements
- Enhanced Green Line extended beyond Lechmere Station to Medford Hillside and Union Square

MassDOT worked with the DEP to address these projects and continues to keep the Boston Region MPO informed of their status through monthly reports at the MPO's regularly scheduled meetings. The Boston Region MPO will continue to include these projects in the LRTP and TIP until the process has been completed, assuming that any interim projects or programs will provide equal or better emissions benefits. When the process has been completed, the MPO will amend the LRTP and future TIPs and their conformity determinations to include any changes (including any interim projects or programs).

A Status Report of the Uncompleted SIP Projects

The status of these projects has been updated using the SIP Transit Commitments Status Report, which was submitted by MassDOT to DEP in May 2015. Highlights of the report are presented below. For a more detailed description of the status of these projects, please visit MassDOT's website at the following link:

<https://www.massdot.state.ma.us/planning/Main/PlanningProcess/StateImplementationPlan/SIPTransitCommitmentSubmissions.aspx>.

Red Line-Blue Line Connector - Final Design - SIP Required Completion by December 2011

Project Status

MassDOT initiated a process to amend the SIP to permanently and completely remove the obligation to perform final design of the Red Line–Blue Line Connector. To that end, MassDOT officially sought approval from DEP to support a SIP amendment process. MassDOT is not proposing to substitute any new projects in place of the Red Line–Blue Line Connector commitment, given the absence of any air-quality benefits associated with the current Red Line–Blue

Line commitment (final design only). Correspondence from MassDOT to DEP formally initiating the amendment process was submitted on July 27, 2011, and is posted on the MassDOT website.

On September 13, 2012, DEP held two hearings (at 1:00 PM and 5:00 PM) to take public comment on MassDOT's proposed amendments to 310 CMR 7.36, Transit System Improvements, including eliminating the requirement to complete final design of the Red Line–Blue Line Connector. Between the two hearings, there were 16 attendees, 10 of whom gave oral testimony. All those who spoke at the hearings were in favor of DEP not removing the commitment. DEP accepted written testimony until September 24, 2012.

On August 23, 2013, EPA sent a letter to FHWA providing an update on Massachusetts Air Quality Conformity. In that letter, EPA noted that the Red Line–Blue Line Connector Design project had not met the completion date on December 2011, but that MassDOT was not obligated to implement interim emission-reduction projects because no emission reductions are associated with the design project.

On October 8, 2013, the DEP approved a request made by MassDOT in July 2011 to revise 310 CMR 7.36 to remove the requirement for MassDOT to complete the design of the Red Line/Blue Line Connector. This revision to the State Implementation Plan must now also be approved by EPA. The text of the revision is available on the MassDOT website at:
<http://www.massdot.state.ma.us/Portals/17/docs/sip/October13UpdatedSIPReg.pdf>.

On December 1, 2014, EPA published a proposed rule to approve a State Implementation Plan (SIP) revision submitted by the Commonwealth of Massachusetts in the Federal Register on November 6, 2013. This proposal, if finalized, would remove the design of the Red Line/ Blue Line Connector as a requirement in the SIP.

Funding Source

MassDOT is proposing to nullify this commitment

Fairmount Line Improvements Project - SIP Required Completion by December 2011

Project Status

The Four Corners and NewMarket Stations opened for service on July 1, 2013. One remaining claim must be processed for the Four Corners station and then the contract will be closed out. Final closeout is expected in July 2015. The Talbot Avenue Station opened in November 2012.

A station at Blue Hill Avenue has been the subject of significant community controversy during the past-five years. The redesign of the station is now moving forward, and is 60 percent complete. The 90 percent design plans are expected in July 2015 and 100 percent plans in September 2015. Construction is scheduled to begin in spring 2016, and the station to open in summer 2018.

MassDOT and the MBTA prepared a Petition to Delay and an Interim Emission Offset Plan to be implemented for the duration of the delay of the Fairmount Line Improvements project. MassDOT estimated the reduced emissions that are expected to be generated by implementing the new Fairmount Line station and, with input from Fairmount Line stakeholders, proposed offset measures. MassDOT estimated that the potential offset measures would meet emissions-reduction targets. The measures include shuttle bus service from Andrew Square to Boston Medical Center and increased service on bus Route 31, which serves Dorchester and Mattapan. These measures were implemented on January 2, 2012, and currently are in place.

Funding Source

The Commonwealth

*Green Line Extension to Somerville and Medford Project – SIP Required
Completion by December 2014*

Project Status

State-level environmental review (Massachusetts Environmental Policy Act (MEPA)) was completed in July 2010. Federal-level environmental review (National Environmental Policy Act (NEPA) documents were submitted to the Federal Transit Administration in September 2011, and a public hearing was held on October 20, 2011. A Finding of No Significant Impact (FONSI) was issued by the Federal Transit Administration (FTA) on July 9, 2012.

On January 5, 2015, the US Secretary of Transportation and the MBTA signed the Full Funding Grant Agreement (FFGA) for the Green Line Extension project, approving \$996,121,000 of FTA New Starts funding to support design and construction of the project. The execution of the FFGA was the result of many years of planning, design and pre-construction efforts by MassDOT and the MBTA, in collaboration with the FTA and its Project Management Oversight Consultant. The federal funding is scheduled to be paid between FFY 2015 and FFY 2022. As noted in the current MassDOT Capital Investment Plan (released January 2014), MassDOT and the MBTA will use Commonwealth funds in addition to federal funding to support the design and construction activities.

To tailor the project-delivery method to best mitigate the larger project risks, MassDOT and MBTA are implementing a four-phased project-delivery plan:

Phase 1 is using the traditional design-bid-build approach to deliver the contract for widening the Harvard Street and Medford Street railroad bridges and demolishing the 21 Water Street building. The contract award occurred in December 2012, and the Notice to Proceed was issued on January 31, 2013.

The MBTA has also added some retaining wall construction to the Phase 1 contract that had previously been programmed for Phase 4 in that area. By constructing this work under the Phase 1 contract, this retaining/noise wall should be completed in time to better support and facilitate track relocation as part of the construction of Phase 4. The addition of this work has extended the end date of the Phase 1 contract by six months to October 2015, and as of this writing, the contractor is on track to complete it by then.

In Medford at Harvard Street, the new T2 track installation is almost complete and the track throw to the new T2 bridge alignment was completed on May 10, 2015. Road closure and demolition of the old T2 bridge structure was scheduled for the weekend of May 16 and 17. Once this demolition is complete, abutment modifications will commence for installation of the new Green Line outbound and inbound bridges. Noise barrier column and panel installation above the new cast-in-place retaining wall south of Winchester Court is also anticipated to begin in the next few weeks.

Phase 2/2A will extend service from the (new) Lechmere Station to the Washington Street and Union Square Stations and relocate the bus facility and vehicle storage at Lechmere Station. The projected completion date for Phase 2/2A initial Green Line service is likely mid-2018.

Phase 3 will construct the vehicle-maintenance facility and storage facility. As the full yard and maintenance facility are not needed to support the initial passenger service to Washington Street and Union Square, this phase has been scheduled for completion approximately six months ahead of the date for revenue service to College Avenue.

Phase 4 will provide service from Washington Street Station (completed as part of Phase 2, above) to College Avenue Station, which was targeted to be completed in June 2020, roughly a year ahead of the FFGA completion date. Although enabling construction is already underway in this segment, the design of this package is being revised to incorporate value engineering scope changes. This reworking will extend the period to complete the 100% final design for

pricing and may extend the bidding and award into early 2016, as opposed to the planned November 2015 Notice to Proceed (NTP) date.

New Green Line Vehicles: The MBTA Vehicle Procurement contract to purchase 24 Type 9 Vehicles was awarded to CAF USA Inc. in the amount not to exceed \$118,159,822 at the MassDOT Board Meeting held on May 14, 2014. The NTP for this contract was issued on September 4, 2014.

CAF is in the process of developing drawing packages for the Preliminary Design, and the MBTA Project Team and the Contractor CAF continue to hold technical working sessions and project meetings. In addition, weekly project management meetings are held between MBTA and CAF to discuss project status, short-term schedules and priorities as well as monthly project status meetings where all project issues, schedules, deliverables and milestones are reviewed and discussed.

The first vehicle is to be delivered no later than 36 months from NTP. The pilot car delivery is scheduled for September 2017. The pilot car will receive comprehensive testing for six months followed by delivery of the remaining 22 vehicles, the last car to be delivered by July 2018. All vehicles are expected to be in service in early 2019.

Somerville Community Path: Originally the Green Line Extension project included just the design of the extension of the Somerville Community Path from south of Lowell Street to the Inner Belt area of Somerville. In May 2014, MassDOT and the City of Somerville announced an agreement to add construction of the Community Path, including a connection to the Cambridge/Northpoint area, to the scope of the program. The Path Extension is not part of the SIP commitment.

Potential Challenges

MassDOT has met the first four interim milestones associated with the Green Line Extension project — filing an Expanded Environmental Notification Form, procuring multiple design consultants, and publishing both Draft and Final Environmental Impact Reports. The project has transitioned from planning and environmental review phases to design, engineering, and construction.

In the 2011 SIP Status Report, MassDOT reported that the Green Line Extension project would not meet the legal deadline of December 31, 2014. At that time, MassDOT projected a period for the introduction of passenger service on the Green Line Extension. The points within the period are associated with different probabilities, as shown below:

- 10% Probability of Not Exceeding – Autumn 2018
- 90% Probability of Not Exceeding – Summer 2020

FTA's projected completion date is June 2021, which includes one year of schedule contingency beyond the MBTA's Target date. Presently, the Green Line Extension team anticipates that the completion date of Phase 4 will be extended from June 2020 to late summer/early fall 2020.

MassDOT and the MBTA continue to seek measures to accelerate the project timeline wherever possible. The receipt of the FFGA was a key milestone, as it allowed completion of the bidding process and the start of construction for the bulk of the Phase 2/2A and Phase 4 work.

Although the goal of the phased project delivery approach is to complete components in an incremental way, the timeline for overall project completion listed above represents a substantial delay beyond the current SIP deadline of December 31, 2014. Consequently, this schedule triggers the need to provide interim emission reduction offset projects and measures for the period of the delay (beginning January 1, 2015). Working with the Central Transportation Planning Staff, MassDOT and the MBTA calculated the reductions of VOC, CO, and NO_x—reductions equal to or greater than the reductions projected for the Green Line Extension itself, as specified in the SIP regulation—that will be required for the period of the delay.

In June 2012, MassDOT released a list of potential mitigation ideas received from the public that could be used as offset measures. In the summer and fall of 2012, MassDOT solicited public comments on these potential measures. The MBTA created an internal working group to determine a final portfolio of interim mitigation measures to implement by December 31, 2014, the legal deadline for the implementation of the Green Line Extension.

This work resulted in a recommendation to implement the following three interim mitigation measures, which collectively would meet the emissions reduction target for the project:

- Additional off-peak service along existing routes serving the GLX corridor, including the Green Line, and bus routes 80, 88, 91, 94 and 96
- Purchase of 142 new hybrid electric vehicles for THE RIDE
- Additional park-and-ride spaces at the Salem and Beverly intermodal facilities

The Petition to Delay, submitted to DEP on July 22, 2014, which expands further on the analysis and determination of the interim offset measures, is available on MassDOT's website. These measures went into effect in the beginning of 2015.

Funding Source

The Commonwealth

Russia Wharf Ferry Terminal

Project Status

Former MassDOT Secretary Richard Davey approved construction of the permitted ferry facility and a \$460,000 ferry-service startup subsidy in October 2012. The 2005 facility plans and specifications were revised to meet the latest MassDOT Highway Division standards. The bid package was issued in the fall of 2013. A contractor was selected and the Notice to Proceed was issued in April 2014. Pre-construction activities progressed, but contractual issues have led MassDOT to decide to rebid the contract and complete the facility in 2015. There is no regularly scheduled passenger water transportation service in this area, nor are there any plans to provide such a service. The City of Boston, however, is undertaking design and engineering work to address the Old Northern Avenue Bridge's vessel-clearance constraint, and is purchasing two ferry vessels for Inner Harbor use, which could include this ferry terminal as a destination.

Funding Source

The Commonwealth

Consultation Procedures

Conformity regulations require the MPO to make a conformity determination according to consultation procedures outlined in state and federal regulations and to follow public involvement procedures established by the MPO under federal metropolitan transportation-planning regulations.

Both state and federal regulations require that the Boston Region MPO, MassDOT, DEP, EPA, and the Federal Highway Administration (FHWA) consult on the following issues:

- Selection of regional emissions analysis models, including model development and assessment of project design factors for modeling
- Selection of inputs to the most recent EPA-approved emissions factor model
- Selection of CO hot-spot modeling procedures, as necessary
- Identification of regionally significant projects to be included in the regional emissions analysis
- Identification of projects that have changed in design and scope
- Identification of exempt projects
- Identification of exempt projects that should be treated as nonexempt because of adverse air-quality impacts
- Identification of the latest planning assumptions and determination of consistency with SIP assumptions

These issues have all been addressed through consultation among the agencies listed above.

Public Participation Procedures

Title 23 CFR Sections 450.324 and 40 CFR 90.105(e) requires that development of the LRTP, TIP, and related certification documents provide an adequate opportunity for public review and comment.

Section 450.316(b) establishes the outline for MPO public participation programs. The Boston Region MPO's public participation program was adopted in June 2007, revised in April 2010, and updated in May 2012 and October 2014. The development and adoption of this program conform to these requirements. The program guarantees public access to the LRTP and TIP and all supporting documentation; provides for public notification of the availability of the LRTP and TIP and the public's right to review the draft documents and comment on them; and provides a public review and comment period prior to adoption of the LRTP and TIP and related certification documents by the MPO.

On June __, 2015 a public notice was sent to the MPO's email contact list inviting the recipients to comment on this draft document. On _____, the Boston Region MPO voted to approve the draft LRTP and its Air-Quality Conformity Determination. This allowed many opportunities for public comment and MPO review of the draft document. These procedures comply with the associated federal requirements.

Financial Consistency

Title 23 CFR Section 450.324 and 40 CFR 93.108 require the LRTP and TIP to "be financially constrained by year and include a financial plan that demonstrates which projects can be implemented using current revenue sources and which projects are to be implemented using proposed revenue sources." This Boston Region MPO's LRTP is financially constrained to projections of federal and state resources that are reasonably expected to be available during the appropriate period. Projections of federal resources are based on the estimated apportionment of the federal authorizations contained in *Moving Ahead for Progress in the 21st Century* (MAP-21), the transportation reauthorization bill, as allocated to the region by the state or as allocated among the various Massachusetts MPOs according to federal formulas or MPO agreement. Projections of state resources are based on the allocations contained in the current state Transportation Bond Bill and on historic trends. Therefore, this LRTP complies with federal requirements relating to financial planning.

2.3 Procedures for Determining Regional Transportation Emissions

The federal conformity regulations set forth specific requirements for determining transportation emissions. The requirements and the procedures used for the LRTP are summarized below.

Demographics, Employment, and Transportation Demand

Specific sources of population, household, employment, and traffic information used in the LRTP are listed above in the Latest Planning Assumptions section. Table 5-1, below, outlines recommendations for specific projects for the period ending in 2040.

Only regionally significant projects are required to be included in the travel-demand modeling efforts. Federal conformity regulations define regionally significant 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.

In addition, specific projects are exempt from regional modeling emissions analysis. The categories of exempt projects include:

- Intersection channelization projects
- Intersection signalization projects at individual intersections
- Interchange reconfiguration projects
- Changes in vertical and horizontal alignment
- Truck size and weight inspection stations
- Bus terminals and transfer points

The Recommended Networks in this conformity determination are composed of projects proposed in the approved TIPs and LRTP, and projects in the MBTA capital budget. A list of the projects that meet these criteria and are included in the recommended transportation networks and this conformity determination is provided in Table 8-1 (projects under construction) and Table 8-2 (recommended LRTP and TIP projects). The list includes all regionally significant projects in the Boston Region MPO area.

TABLE 8-1
Regionally Significant Projects Included in the Regional Transportation
Models for the Boston Region MPO Recommended LRTP Projects:
Projects under Construction

Analysis Year	Municipality	Project Name
2020	Needham and Wellesley	Rehabilitation/Replacement of 6 Bridges on I-95/Route 128 (Add-a-Lane – Contract V)

TABLE 8-2
Regionally Significant Projects Included in the Regional Transportation
Models for the Boston Region MPO Recommended LRTP Projects:
Recommended Projects

Analysis Year	Municipality	Project Name
2020	Bedford, Billerica, and Burlington	Middlesex Turnpike Improvements, From Crosby Drive North to Manning Road, Phase III
2020	Newton and Needham	Reconstruction of Highland Avenue, Needham Street & Charles River Bridge, from Webster Street to Route 9
2020	Somerville and Medford	Green Line Extension Project (Phase 2), College Avenue to Mystic Valley Parkway/Route 16
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 & 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	McGrath Boulevard Project

Changes in Project Design and Construction Schedule since the Last Conformity Determination Analysis

The Commonwealth requires that any changes in the mix of projects, project design, and construction schedule from the previous conformity determination for the region be identified. The last conformity determination was performed for the Boston Region FFYs 2015–18 TIP in July 2014. The mix of projects included in the conformity determination for this LRTP has changed with the development of a new LRTP. The status of uncompleted SIP projects has been updated. In addition, the new MOVES2014 emission model was used for the projection of carbon monoxide emissions.

Model-Specific Information

40 CFR Part 93.111 outlines requirements pertaining to the network-based transportation demand models. These requirements include the modeling methods and functional relationships that are to be used in accordance with accepted professional practice and are to be reasonable for purposes of estimating emissions. The Boston Region MPO used the methods described in the conformity regulations for the analysis in this LRTP.

Highway Performance Monitoring System Adjustments

As stated in EPA guidance, all areas of carbon monoxide nonattainment must use the FHWA's Highway Performance Monitoring System (HPMS) to track daily vehicle-miles of travel (VMT) prior to attainment to ensure that the state is in line with commitments made in reaching attainment of ambient air-quality standards by the required attainment dates. MassDOT provided HPMS information to DEP. DEP used this information in setting the mobile-source budget for CO in all SIP revisions prior to 1997.

An HPMS adjustment factor was developed by comparing the 1990 CO emissions of the nine cities and towns (Boston and eight surrounding communities in the Boston maintenance area) resulting from the 1990 base-year model run to the 1990 HPMS-generated CO emissions data submitted as part of the SIP. The HPMS data were divided by the model data to determine the CO adjustment factor to be applied to all modeled CO emissions for future years. The CO HPMS adjustment factor is 0.71.

2.4 The Conformity Test

Consistency with the Emission Budgets Set Forth in the SIP

The Boston Region MPO conducted an air-quality analysis for the Boston Region MPO's LRTP. The purpose of the analysis is to evaluate the air-quality impacts on the SIP of the projects included in the LRTP. The analysis evaluated the change in CO emissions because of implementing the LRTP. The modeling

procedures and assumptions used in this air-quality analysis follow the EPA's conformity regulations. They are also consistent with the procedures used by the DEP to develop Massachusetts's "1990 Base-Year Emission Inventory," "1996 Reasonable Further Progress Plan," "Post-1996 Reasonable Further Progress Plan," and "1996 Rate of Progress Report." All consultation procedures were followed to ensure that a complete analysis of the LRTP was performed and was consistent with the SIP.

The primary test for showing conformity with the SIP is demonstrating that the air-quality conformity of this LRTP is consistent with the emission budget set forth in the SIP. The CO mobile-source attainment inventory for 1993 for the nine cities in the Boston area reclassified as being in attainment is 305.43 tons per winter day. The projection of mobile sources for the Boston maintenance area is 228.33 tons per winter day for 2010. Estimates of CO emissions for the nine cities in the Boston maintenance area for various years are shown in Table 8-3. The CO emissions are less than the CO emission budget.

TABLE 8-3
Winter CO Emissions Estimates for the CO Maintenance Area for the Nine Cities in the Boston Area

Year	Boston Region MPO Build Emissions	Emission Budget	Difference (Build Minus Budget)
2020	34.56	228.33	-193.77
2030	23.32	228.33	-205.01
2040	18.90	228.33	-209.43

Note: Emissions are cited in tons per winter day.

2.5 Conclusion

The Clean Air Act Amendments of 1990 established air-quality conformity requirements for transportation plans, programs, and projects. The EPA published a final rule in the November 24, 1993, Federal Register, with several amendments through 2010, providing procedures to be followed by the US Department of Transportation in determining conformity of transportation plans, programs, and projects with the SIP for meeting air-quality standards. Boston, Cambridge, Chelsea, Everett, Malden, Medford, Quincy, Revere, and Somerville are designated a maintenance area for the CO standard. Federal conformity regulations require that the impact of transportation plans, programs, and projects on maintenance areas be evaluated.

The Boston Region MPO conducted an air-quality analysis for projects in this LRTP. The purpose of the analysis was to evaluate the air-quality impacts of the LRTP projects on the SIP. The analysis evaluates the change in CO emissions based on implementing the LRTP. The modeling procedures and assumptions

used in this air-quality analysis follow the EPA's and the Commonwealth's guidelines and are consistent with all present and past procedures used by the Massachusetts DEP to develop and amend the SIP.

Boston Region MPO has found the emission levels from the Boston area CO Maintenance Area, including emissions resulting from implementation of the LRTP, to be in conformance with the SIP according to state and federal conformity criteria. Specifically, the CO emissions for the build scenarios of the MPO's regional travel demand model set are less than the projections for analysis years 2020 through 2040 for the nine cities in the Boston CO Maintenance area.

In accordance with Section 176(c)(4) of the Clean Air Act as Amended in 1990, the Boston Region MPO has completed this review and hereby certifies that the LRTP, and its latest conformity determination, conditionally conforms with 40 CFR Part 93 and 310 CMR 60.03 and is consistent with the air-quality goals in the Massachusetts State Implementation Plan.

3 GREENHOUSE GAS ANALYSIS

3.1 Greenhouse Gas Analysis Introduction

The largest environmental threat the MPO faces is the need to reduce greenhouse gas (GHG) emissions that contribute to climate change, which if unchecked, could impair our transportation system and way of life. Climate change will likely have significant impacts on the Boston region if climate trends continue as projected. In order to minimize the negative impacts, the MPO is taking steps to decrease our carbon footprint and to simultaneously adapt our transportation system to minimize damage from natural hazards. The MPO strongly considers projects and strategies that protect and enhance the environment, promote energy conservation, and improve the quality of life in the region.

In addition, the Commonwealth has enacted regulations to reduce greenhouse gases from all sectors including transportation. This section outlines the legislation and regulation requiring emission reductions by the MPO. It also documents the GHG emissions from this LRTP and other MPO's LRTPs in the Commonwealth.

3.2 Legislative Requirements

Former Governor Patrick signed the Global Warming Solutions Act (formally called the Climate Protection and Green Economy Act) in August 2008. The Act requires reductions of GHG emissions below 1990 levels by 25 percent by 2020,

and 80 percent reduction by 2050. As part of the Global Warming Solutions Act (GWSA), the Executive Office of Energy and Environmental Affairs developed the Massachusetts Clean Energy and Climate Plan for 2020 that outlines programs to attain the 25 percent reduction by 2020. In that plan, a 7.6 percent reduction will be attributed to state transportation programs. One of the programs in the Massachusetts Clean Energy and Climate Plan is MassDOT's sustainability initiative, also known as GreenDOT. The GreenDOT Policy directive was developed in accordance with the GWSA. Its three goals are:

1. To reduce GHG emissions by reducing emissions from construction and operations, using more efficient fleets, implementing travel demand management programs, encouraging eco-driving, and providing mitigation for development projects
2. To promote healthy transportation modes by improving pedestrian, bicycle, and public transit infrastructure and operations
3. To support smart growth development by making transportation investments that enable denser, smart growth development patterns that can support reduced GHG emissions

Subsequently, the DEP established a 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 its GHG reduction commitments and targets are achieved
- Requiring each MPO to evaluate and track the GHG emissions and impacts of its LRTP and TIP
- Requiring each MPO, in consultation with MassDOT, to develop and utilize procedures to prioritize and select projects in its LRTP and TIP based on factors that include GHG emissions and impacts

3.3 The MPO's Role in Reducing Greenhouse Gas Emissions

The Boston Region MPO is involved in helping to achieve the GreenDOT goals. The MPO is most directly involved in helping to achieve reductions through prioritizing and programming an appropriate balance of roadway, transit, bicycle, and pedestrian investments, and will assist in the third goal—supporting smart growth development patterns through the creation of a balanced multimodal transportation system. The Boston MPO's Clean Air and Clean Communities goal and related objectives are used as criteria in selecting projects for both the LRTP and TIP to further the MPO's vision for a sustainable, healthy, livable, and economically vibrant region. The MPO's goal will help MassDOT to achieve the GreenDOT goals. The MPO's objective is to reduce GHG emissions generated in

the region by all transportation modes as outlined in the Global Warming Solutions Act.

The MPO is contributing to the statewide implementation of GreenDOT in a number of other ways:

- Alternative Modes of Travel – The MPO funds projects that provide people with transportation options other than single-occupancy vehicles (SOVs). Alternative modes to SOVs include transit, bicycling, walking, and carpooling.
- Reduction of Vehicle-Miles of Travel and Roadway Congestion – The MPO funds projects that reduce the need to drive and ease roadway congestion, therefore reducing emissions through its Community Transportation/Parking/Clean Air and Mobility Program.
- Alternative Fuel Sources – The MPO funds the use of alternative fuel sources, which can release less GHG emissions than traditional fossil fuels.
- Smart Growth Policies – The MPO promotes Smart Growth Policies through its project selection criteria.
- Public Outreach – The MPO can also help by educating the public through its many avenues of outreach and by supporting future federal and state programs that reduce GHG emissions.

3.4 Documenting the MPO's Greenhouse Gas Reduction for GreenDOT Implementation

MassDOT coordinated with MPOs and regional planning agency (RPA) staffs to implement GHG tracking and evaluate development of each MPO's 2012 LRTPs, which were adopted in September 2011. This collaboration has continued for the MPO's 2016 LRTPs and 2016–19 TIPs. Working together, MassDOT and the MPOs have attained the following milestones:

- Modeling and projecting long-range GHG statewide emissions that result from the transportation sector before the final LRTP is endorsed. Using the Boston Region MPO's regional travel demand model and the statewide travel demand model for the remainder of the state, GHG emissions will be projected for 2020 no-build and build conditions, and for 2040 no-build and build conditions. The results of this modeling will be available before this LRTP is endorsed, and MPO staff will present the results to the MPO prior to a vote on endorsement.
- All of the MPOs will include GHG emission reduction projections in their LRTPs, along with a discussion of climate change and a statement of MPO support for reducing GHG emissions as a regional goal.

The Boston Region MPO and MassDOT, using the Boston Region MPO and the statewide travel demand models, will provide the Boston Region MPO with statewide estimates of CO₂ emissions based on the collective list of all recommended projects in all the Massachusetts LRTPs combined (and supplemented by CO₂ emission-reduction results for smaller, “off-model” projects supplied by the MPO). Emissions will be estimated using the new MOVES 2014 model, and will incorporate the latest planning assumptions including updated socio-economic projections for the Commonwealth.

The project mix from this, and all other LRTPs—modeled for both 2020 and 2040 using a build versus no-build analysis to determine CO₂ emissions attributed to all MPO’s mix of projects and smart-growth land-use assumptions—is expected to show a neutral shift toward meeting the statewide greenhouse gas emissions reduction goal of 25 percent less than 1990 levels by the year 2020, and 80 percent below 1990 levels by 2050. The reason for the anticipated neutral shift is that early indicators have shown that major infrastructure projects, both individually and collectively, would not trigger a significant change in GHG emission levels.

Working closely with MassDOT, the Boston Region MPO—via its planning activities—continues to make progress toward meeting the GHG reductions targets and complying with the GWSA’s requirements. As part of this activity, the MPO will provide further public information on the topic and continue to advocate for steps needed to accomplish the MPO’s and Commonwealth’s goals.

Many other types of projects that cannot be accounted for in the travel demand model (such as bicycle and pedestrian facilities, shuttle services, intersection improvements, etc.) are further analyzed for CO₂ reductions in the TIP development cycle. In order to monitor and evaluate the GHG impacts of TIP projects, MassDOT and the MPOs have developed approaches for identifying the anticipated GHG emission impacts of different project types. All TIP projects have been sorted into two main categories for analysis: projects with quantified impacts and projects with assumed impacts. Projects with quantified impacts consist of capacity-adding projects from the LRTP and projects from the TIP that underwent a Congestion Mitigation and Air Quality (CMAQ) spreadsheet analysis. Projects with assumed impacts include those that would be expected to produce a minor decrease or increase in emissions and that would be assumed to have no CO₂ impact. A detailed description of project evaluations included in the TIP is cited in Appendix C of the FFY 2016–2019 TIP (<http://www.bostonmpo.org/Drupal/tip>). The collective GHG reductions from the TIP projects are approximately 4,300 tons per year.

Working closely with MassDOT, the Boston Region MPO will continue to report on its actions to comply with the GWSA and help meet the GHG reduction targets. As part of this activity, the MPO will provide further public information on the topic and will advocate for steps needed to accomplish the MPO's and state's goals for greenhouse gas reductions.

The MPO acknowledges the importance of adaptation measures to moderate potential damage from climate change impacts. Its System Preservation goal helps by selecting projects that improve the ability of the transportation system to withstand extreme conditions. Projects that improve an evacuation route or an access route to an emergency support location earn higher ratings in the project evaluation process. Similarly, the evaluation process rewards projects that address sea-level rise and flooding, meet current seismic design standards, and protect critical infrastructure. These criteria will help identify future transportation investments to address the impacts of climate change.