

CHAPTER 4

TRANSPORTATION SYSTEM MANAGEMENT AND OPERATIONS

INTRODUCTION

The Boston Region MPO's Central Vision states that the region's transportation system will be a result of attentive maintenance, cost-effective management, and strategic investments in the existing system by the MPO. This can be accomplished through a strong management and operations plan for an improved transportation system. For the Boston MPO's LRTP, management and operations covers three of the MPO's vision topic areas – System Preservation, Modernization, and Efficiency; Mobility; and Safety and Security, all of which will all be addressed in this chapter.

System preservation, modernization, and efficiency are a guiding vision for this LRTP. Due to regional transportation needs, historical investment in the transportation system has been on system expansion. The infrastructure, however, is aging. In addition, it has become clear that the demands placed on highway and transit facilities have been taxing to the point that routine maintenance is insufficient to keep up with maintenance needs. As a result, there is a significant backlog of maintenance and state-of-good-repair work to be done on the highway and transit system, including bridges, roadway pavement, transit rolling stock, and traffic and transit control equipment. Under these circumstances, the concept of preservation, modernization, and efficiency has become ever more important. The region's transportation funds are limited. Attention to the maintenance needs must be applied within a system of priority setting that addresses both the most serious and the most effective investments in order to provide maximum current and future benefits.

The MPO is also concerned about mobility in the region. In pursuit of the MPO's Mobility vision, the MPO and its member transportation agencies will need to implement measures that move the Boston region toward the multimodal, coordinated mix of transportation options that will be convenient, reliable, affordable, accessible, and increasingly sustainable. This means taking steps to relieve congestion and providing for a more efficient use of the roadway and transit networks. Some of these measures fall under the broad categories of transportation systems management (TSM) and transportation demand management (TDM). TSM includes strategies for extracting additional capacity out of existing roadway and transit infrastructure by increasing efficiency. One of the main purposes of TDM measures is to reduce the number of

single-occupant vehicles as a way to reduce congestion. Existing TSM and TDM programs and strategies are described in this chapter.

The MPO strives to support projects that will improve safety and security for all users of the transportation system – motorists, transit riders, bicyclists, pedestrians, and persons using other nonmotorized modes—and reduce the number and severity of crashes. It also seeks to protect and maintain the viability of transportation infrastructure that is important for conducting emergency response and for enabling the evacuation of populations that may be necessary in response to natural disasters or disasters caused by human activity. The MPO recognizes that the transit and highway systems play a vital role in moving people safely in the region – including in times of crisis – and that investments in state-of-the-practice intelligent transportation systems (ITS), communication systems, and other elements of the infrastructure are important for providing dependable and safe transportation.

The following sections provide further detail on these three topic areas. They identify the MPO’s visions and policies, and discuss MPO actions to move the transportation system toward these goals. Finally, a section on the development of performance measures outlines the next steps that the MPO will take to track how the region is moving toward its visions.

SYSTEM PRESERVATION, MODERNIZATION, AND EFFICIENCY

The Boston Region MPO’s Vision for System Preservation, Modernization, and Efficiency

Vision: The aspirational end state of this vision is a regional transportation system that will be maintained to a state of good repair and will operate with maximum efficiency. It will be reliable and modern and will provide improved mobility regionwide. Automobile dependency will be reduced, and the transit system will serve more people. Modernization of the existing system will provide access and accessibility for all; additions to the transportation system will also be fully accessible for persons of all abilities.

Efficiencies and operational improvements will come through ongoing system preservation, use of intelligent transportation systems (ITS) and other technologies, management and operations strategies, and a balanced program of strategic investments. Innovative approaches will reduce auto dependency and actively promote other modes of transportation.

Expansion of the system will come through strategic investments, based on regional needs assessments.

Policies: To accomplish this, the MPO will put a priority on programs, services, and projects that:

- Develop low-cost strategies and pursue alternative funding sources and mechanisms
- Use ITS, new technologies, transportation systems management, and management and operations; embrace technology before expansion
- Bring all elements of the transportation network into a state of good repair and maintain them at that level; set funding levels to make this possible
- Maintain bridges, roads, and the existing transit system
- Support the increase of Chapter 90 (described below) funding so that local road maintenance can remain focused on that program

MPO Actions to Achieve the System Preservation, Modernization, and Efficiency Vision

Paths to a Sustainable Region envisions a highway system that is well maintained and has less congestion. The MPO and its member agencies have implemented numerous measures that are moving the region towards realizing the vision by helping to achieve a state of good repair of the roadway and transit network.

HIGHWAY

- **Interstate Highway Maintenance** – The Massachusetts Department of Transportation (MassDOT) oversees the interstate maintenance program and ensures that the system of interstate highways within the region is maintained to an acceptable standard. Work under this category includes reconstruction, resurfacing, signing, striping, and other routine or periodic maintenance. MassDOT's Capital Investment Program states that \$128 million would be needed annually for maintenance of the interstate system in order to achieve a pavement serviceability rating of excellent. MassDOT is expected to commit approximately \$70 million per year over the next five years for this program.
- **Pavement Management of Federal-Aid Roadways** – The Boston Region MPO's roadway network includes 3,463 centerline miles of federal-aid-eligible roadways. Of the total, 694 centerline miles are maintained by MassDOT and the rest, 2,769 centerline miles, are maintained by the municipalities with Chapter 90 funds (see below).

Presently, the MPO does not maintain an independent pavement management tool that would enable it to identify needs and estimate maintenance costs and priorities for the resurfacing of its federal-aid-eligible roadways. In fact, it has been the policy of the MPO not to fund resurfacing projects in the Transportation Improvement Program (TIP). However, the MPO does make funding decisions for roadway reconstruction projects that include resurfacing, usually deep reconstruction, in addition to other design elements.

In the MPO's TIP criteria, pavement condition information is largely based on a sample of 936 centerline miles (34 percent). According to the sample, 57 centerline miles (6 percent) are in excellent condition; 275 centerline miles (29 percent) are in good condition; 284 centerline miles (30 percent) are in fair condition and 319 centerline miles (34 percent) are in poor condition. Since this sample likely pertains to pavement information for roadways approximating the function and maintenance standard of MassDOT-maintained roadways, it is unlikely that it closely represents the pavement conditions of the municipality-maintained roadways in the MPO. Based on a recent staff analysis, the actual condition distribution may be closer to 20 percent excellent, 29 percent good, 25 percent fair, and 26 percent poor.

Recently, the MPO has taken two actions toward estimating maintenance costs for the 2,769 centerline miles of the federal-aid-eligible road network in the MPO: first, staff was asked to make an estimate of the maintenance needs for federal fiscal years 2010 to 2014 by applying various assumptions from neighboring regional planning agencies that maintain a pavement management system; second, the MPO initiated a study to help set the parameters for the establishment of a pavement management system for the Boston Region MPO.

The MPO is now considering its approach to gathering pavement condition data. The MPO will then develop a pavement management program that will set goals for percentages of roadway within each of the above-mentioned condition categories. These goals will likely be based on cost-effectiveness, safety, and the needs of a preventive maintenance program. Various pavement management scenarios would then be developed and discussed to guide spending for resurfacing in the region.

- **Chapter 90 Program** – The Chapter 90 program (named for Chapter 90 of the Massachusetts General Laws), which is administered by MassDOT, contributes to the Commonwealth's strategy of preserving existing transportation facilities. This program supports the construction and maintenance of roadways classified as local; that work is performed by the cities and towns of the commonwealth.

Typically, the majority of Chapter 90 allocations (60 percent) are used for road resurfacing, with another 32 percent for reconstruction. The remaining funding goes toward engineering and equipment. These funds are reimbursed to communities based on certified expenditure reports submitted to MassDOT. This program helps communities maintain and preserve locally owned roadways.

- **Highway Bridges** – Over the next 20 years, the MPO will need to continue to fund the maintenance and rehabilitation of the region's bridges, which includes replacing bridge decks and reconstructing bridges. With the goal of optimizing the allocation of limited resources, MassDOT and the Massachusetts Bay Transportation Authority (MBTA) implemented PONTIS, a bridge management software tool for recording, organizing, and analyzing bridge

inventory and inspection data. PONTIS is used to guide the statewide bridge program, which prioritizes resources for preservation, as well as for repair and replacement.

The statewide Accelerated Bridge Program (ABP) is designed to invest on bridge reconstruction that has an urgent construction schedule. This program will spend nearly \$3 billion over eight years to reduce the number of structurally deficient bridges in the state system. According to MassDOT, as of February 2011, ABP had advertised 132 construction projects with a combined construction budget valued at \$795.9 million. In this program, bridges are given priority based on a variety of factors, including cost savings from early action on bridge repairs.

One important asset management initiative is the municipal bridge maintenance agreements between MassDOT and many local communities. Under these agreements, MassDOT reconstructs bridges under local jurisdiction. In return for bridge reconstruction, municipalities agree to be responsible for maintenance and repair of minor deficiencies of the new bridge. The preservation agreements specify the types of maintenance required and provide for routine inspections by MassDOT. Together with the bridge evaluation criteria, these preservation agreements are an important part of a unified system for prioritizing and addressing the needs of all bridges, regardless of ownership.

Another issue that the MPO is aware of concerns the Department of Conservation and Recreation (DCR) facilities in the Boston Region MPO area. With the creation of MassDOT, some of these assets are being addressed, such as the Longfellow Bridge. The MPO will continue to work with other stakeholders on addressing the needs of the DCR transportation system.

Transit

The MBTA is working to ensure that its assets are managed, maintained, and operated to preserve their useful life, thereby reducing the need for more costly, capital-intensive replacements or solutions. Various initiatives have been implemented to support these efforts, which are described below:

- **Transit Bridges** – Over the next 20 years, the MPO will need to continue to program funding for the maintenance and rehabilitation of the region’s bridges, which includes replacing bridge decks and reconstructing bridges. The MBTA bridge inspection program is tailored to ensure that bridge repairs are prioritized and that all of the bridges receive adequate attention. In the MBTA’s 2012–16 Capital Investment Program (CIP), 13.9 percent of the overall funding is allocated to the bridge program.
- **Vehicles** – The revenue vehicle fleet is one of the most visible and important components of the MBTA service network. These are the trains, buses, and other vehicles that passengers

board every day. The MBTA’s revenue fleet is composed of approximately 2,500 vehicles. Scheduled major overhauls, maintenance, and planned retirements allow the fleet to reach their useful life, and prevent the unwarranted consumption of resources to maintain their reliability. The revenue vehicle program is 19.7 percent of the MBTA’s total 2012–16 CIP, the largest share of any program area. Almost half of the revenue vehicle program is dedicated to reinvestment in the commuter rail fleet, primarily for the purchase of new coaches and locomotives. Subway investments will focus primarily on overhauls and upgrades to existing fleets. Although funding has been programmed for design and engineering for new Red and Orange Line vehicles, funding for the purchase of the vehicles has not yet been identified. The MBTA is investigating several options for addressing their subway vehicle needs. In addition, the MBTA will invest in 480 new buses as the current fleets turn over, and will complete a thorough overhaul of the remaining fleets. Non-revenue vehicles and equipment support the entire range of MBTA operations. The non-revenue vehicle program is 0.4 percent of the overall 2012–16 CIP.

- **Stations** – MBTA stations are one of the most visible components of the transit system, and provide access to rapid transit, light rail, commuter rail, and Silver Line service in the MBTA transit system. There are also over 8,000 bus stops, 675 of which have bus shelters of various kinds. The majority of the funding for stations is devoted to the renovation of subway stations and systemwide replacement of escalators and elevators. The total investment in stations is 4.8 percent of the 2012–16 CIP. Station improvement projects driven by accessibility concerns and the Key Station Plan, which may include other modernization work in addition to accessibility, are described in the Mobility section of this chapter.
- **Track and Signals** – The MBTA rapid transit system operates on 191 miles of track, and the commuter rail system operates on 650 miles of track. Several types of track construction can be found throughout these systems. The right-of-way for heavy rail rapid transit track often includes an electrified third rail through which subway cars receive the traction power needed to move. Systemwide track maintenance is 3.4 percent of the 2012 –16 CIP.

The primary responsibility of the MBTA signal system is to control trains for efficient spacing and run times, making it an integral part of the transit system. The signal system’s goal is to maintain train separation while attempting to minimize headways and run times. Because the signal systems are crucial for supporting the safe and efficient operation of trains systemwide, 3.9 percent of the total capital program in the 2012–16 CIP is allocated to the signal program.

- **Communications** – The MBTA Communications Department’s responsibilities include maintaining an inventory of equipment and overseeing contract services for the Wide Area Network, two-way radio systems, microwave links, emergency intercoms, public address

systems, light-emitting-diode (LED) message signs, fire alarm systems, security systems, and the supervisory control and data acquisition system. The department manages the MBTA's Operations Control Center (OCC), which consists of technology that allows for real-time monitoring and supervisory control of the signal and communication systems for the rapid transit and bus systems. Current investments include completion of the system radio project, which will upgrade the MBTA's radio communication with new state-of-the-art digital technology. The communications program is 0.2 percent of the 2012–16 CIP.

- **Maintenance Facilities (Yards and Shops)** – Maintenance facilities, or yards and shops, are the sites for regularly scheduled maintenance and emergency repairs on all MBTA vehicles. Each facility generally includes a building with a mechanical plant and shop equipment. The arrival of large fleets of vehicles equipped with new technologies will place additional demands on the personnel and facilities that maintain, repair, refuel, and service the vehicles. Additional fueling and engine equipment designed for CNG buses, along with maintenance and support equipment for additional 60-foot articulated buses, will be needed. Low-floor technologies on Green Line subway cars and new bus fleets also have special maintenance needs. As a result of the higher infrastructure costs of special facilities for CNG buses, a large portion of the funding for maintenance facilities in the 2012–16 CIP is devoted to new construction or renovation of existing bus facilities to serve CNG buses. The total maintenance facilities program is 1.4 percent of the 2012–16 CIP.
- **Supporting Infrastructure** – Supporting infrastructure includes facilities and power. Facilities include administrative buildings, vent buildings, storage buildings, noise walls, retaining walls, culverts, parking garages and parking lots, layover facilities, and fencing (which prevents trespassers from gaining access to tracks and fast-moving trains). The facilities program represents 2.8 percent of the total 2012–16 CIP spending.

While power for the MBTA's network is supplied by an outside utility, the MBTA transforms and distributes electricity over its own system to power the entire network of subway, trackless trolley, and light-rail lines. The capital equipment in this power program is essential to operations: it supplies electricity to subway trains and trolleys for the traction power they need to move; to the signal systems for the power needed to control the trains; and to stations to operate their lights, elevators, and escalators, and other equipment. The MBTA's power program, arguably one of the least visible elements to passengers, is one of the most complex, important, far-reaching, and expensive systems for the MBTA to maintain. As such, investment in power programs is 6.4 percent of the 2012–16 CIP.

Freight

The MPO and the Commonwealth must continue to work to manage, maintain, and operate the transportation system in a way that preserves the freight system's useful life. The MPO will continue to consider truck freight movements in the prioritization of system preservation projects included in the TIP. Various issues that must also be addressed to achieve a state of good repair are described below:

- **Weight-Restricted Roadway Bridges** – Posted bridges have signs at both ends informing drivers of the bridge's vehicle weight restrictions. A bridge is posted if it is either designated as “functionally obsolete” because it has not been designed to support modern trucks, or it is designated as “structurally deficient” due to significant deterioration of the bridge deck, supports, or other major components. Some posted bridges can be repaired or rehabilitated to meet such standards; others must undergo costly replacement. Trucks exceeding a bridge's weight restrictions must find alternate routes, increasing the trip distance and travel time.
- **Weight-Restricted Rail** – Rail lines are rated by the maximum weight of a rail car that can be accommodated on the rail line. The rail industry standard is 286,000 pounds for an individual rail car. However, most of the tracks in the Boston region are limited to 263,000-pound rail cars. This restriction increases the cost for shippers and can delay shipments, since the rail cars might need to be reconfigured before entering tracks rated below the industry standard.

Much of the rail network in Eastern Massachusetts is limited to 263,000-pound rail cars as a matter of policy. As was stated in the 2010 State Freight Plan, track conveyed by private railroads to the MBTA in the 1970s was transferred with the 263,000-pound rail car limit, and the MBTA is only required to maintain the rail to levels it was deeded at that time. The MBTA has rebuilt much of the track, however, the 263,000-pound weight limit remains. Due to financial constraint, it was not a priority of the MBTA to increase the weight limit, which could increase maintenance costs. The State Freight Plan states that the increase in maintenance costs could be addressed through new levels of fees for the freight carriers.

- **Dredging** – One of the most important issues for the Port of Boston is the need to dredge the channels to deeper depths in order to accommodate ships of deeper draft. The channel into the Port of Boston was dredged from 35 to 40 feet at low tide, with 45 feet at the berth in the late 1990s. Massport has identified a deep-draft navigational project that is necessary to improve the competitive position of the Port of Boston. An Army Corps of Engineers feasibility study that evaluated alternatives recommended a deeper, 48-foot navigational channel to access Conley Terminal and a 50-foot depth in the entrance channel. Additionally, the channel leading to the Port of Gloucester is currently dredged to 24 feet, but further dredging is planned for the future. The State Freight Plan also recommended dredging Chelsea Creek to 40 feet to allow larger oil tankers to access sites along the Creek.

MOBILITY

The Boston Region MPO's Vision for Mobility

Vision: People in most areas of all corridors in the region will have access to transportation to jobs, education and training, health services, and social and recreational opportunities. This includes persons with disabilities, the elderly, youth, minorities, and persons with low incomes or with limited English-language proficiency. More communities will have more transportation options, both motorized and nonmotorized. The transportation infrastructure will accommodate freight and commercial activity, as well as passenger needs. Freight will be moved efficiently by all freight modes.

The transportation system and services will be reliable. Delays, congestion, and travel time will be reduced. Transit ridership and the use of sustainable options will be increased. The system will meet people's needs; funding decisions will be guided by attention to customer service. Existing transit, bicycle, and pedestrian facilities will be linked in a network.

Policies: To improve mobility for people and freight, the MPO will put a priority on programs, services, and projects that:

- Strengthen existing connections within and between modes and create new ones
- Improve access to transit by all persons and the accessibility of transit for persons with disabilities
- Improve the frequency, span, and reliability of transit services
- Expand the transit, bicycle, and pedestrian networks while focusing bicycle investments (lanes and paths) on moving people between activity centers and linking with transit
- Integrate payment methods for fares and parking across modes
- Support transportation demand management, Transportation Management Associations, shuttles, and carpooling
- Address capacity constraints and bottlenecks in the existing roadway system using low-cost approaches (transportation system management strategies, management and operations strategies, ITS, and new technologies) before expansion

MPO Actions to Achieve the Mobility Vision

HIGHWAY

The MPO and its member agencies have implemented numerous measures that are moving the region toward realizing the vision by helping to relieve congestion and allowing for a more efficient use of the roadway and transit network.

- **Congestion Management Process** – The Boston Region MPO's Congestion Management Process (CMP) is an ongoing program for monitoring mobility in the region. It provides

decision makers (primarily the MPO) and transportation planners in the region with timely information about transportation system performance. It allows the MPO to focus improvements in the areas where congestion and other mobility deficiencies are found. This information is also available to members of the public, who may choose to use the CMP information to provide input into the planning and programming of transportation improvements through the MPO's public participation process, as well as to make decisions about their own travel.

The CMP provides reports and recommendations for arterial roadways, limited-access highways, public transit, park-and-ride lots, high-occupancy-vehicle (HOV) lanes, travel demand management (TDM), and bicycle and pedestrian transportation. Information on these aspects of the region's transportation system is posted on the MPO's website, which is updated regularly.

CMP data and recommendations feed into the Boston Region MPO's 3C (continuing, cooperative, and comprehensive) planning process. The CMP recommends that planning studies be undertaken through the MPO's Unified Planning Work Program (UPWP). CMP data are used in the planning process for rating projects that are evaluated in the development of the TIP. The same data are used in rating and selecting the projects and programs considered for inclusion in the LRTP.

Generally stated, congestion and mobility are complex issues that require a multimodal and comprehensive program of strategies and policies to address them. The following conclusions from the CMP provide support for the programs and initiatives that the MPO and its member agencies are undertaking to improve mobility in the region:

- Travel in the region will most likely continue to grow in the future as the region's economy grows. As new jobs are added to the region's economy, the number of vehicle-miles traveled (VMT) and traffic delay are also expected to grow. Since building new capacity is not always possible or desirable, it is important to maximize the capacity of the existing infrastructure. Mitigating the effects of crashes and other roadway events (incident management) and improving the system's operational efficiency for all roadway users, including bus riders, are the two key areas where this strategy reduces congestion.
- Travel demand management can be part of the integrated solution of reducing congestion and improving mobility. Though the impact on congestion of TDM measures, such as ridesharing, shifting the time of travel, and telecommuting, is limited, these measures can improve mobility for certain travel markets and help reduce VMT as part of the mix of solutions.
- Regulatory policies for managing urban growth and design can reduce congestion. Development is occurring more quickly in outlying communities in the region than in the

inner core. This development pattern results in more dispersed trips, with fewer commuters traveling into a single central business district. “Smart growth” practices, transit-oriented development, and funding incentives help to reduce VMT and delays by increasing development densities and promoting sustainable development.

- Addressing safety can have secondary beneficial effects on congestion. Safety and congestion are interrelated: addressing safety can have beneficial effects on congestion, and, likewise, reducing congestion can reduce the number and severity of crashes. For more information on strategies for improving safety, see the Safety and Security section of this chapter.
- **Transportation Systems Management** – In many cases, both highway and transit strategies can be implemented without expanding physical capacity. The CMP recommendations included several operational efficiency strategies for extracting additional capacity out of existing roadway and highway infrastructure. These strategies include intelligent transportation systems, incident management, traffic-signal coordination and prioritization, bottleneck removal, and high-occupancy-vehicle (HOV) lanes. The programs for improving roadway are discussed below.

- *Intelligent Transportation* – Intelligent transportation systems (ITS) involve the integration of technology into the management of the operation of transportation facilities, with the goals of increasing operational efficiency and capacity, improving safety, reducing environmental costs, and improving mobility. The MPO has participated in the development of ITS activities since 1992. The Boston Metropolitan area was one of the first areas in the country to complete a metropolitan area Early Deployment Planning Program for ITS, sponsored by the Federal Highway Administration (FHWA), in 1993.

MassDOT developed a regional ITS architecture for metropolitan Boston in 2005, with a more recent update in 2011, which conforms to the National ITS Architecture, as federally required. The architecture guides the coordination and integration of ITS projects in the region to help transportation agencies eliminate duplication, reduce design costs and project development time, facilitate efficient system expansion, improve safety and security, facilitate deployment of new technologies, and lower system life cycle costs.

In 2010, MassDOT developed a draft ITS Strategic Plan, and MassDOT, with its partner state transportation agencies, developed a Regional Transportation Operations Strategy for the Boston metropolitan region. The Boston Region MPO participated in the latter as a stakeholder. These documents contain information about the status of implementing ITS projects in the region and what the priorities are for additional implementation.

MassDOT, Massport, and the City of Boston currently monitor road conditions and traffic

flow on major highways and intersections using fixed equipment such as loop detectors and wireless communications. The Central Artery/Tunnel Operations Control Center is the largest of its kind, featuring over 400 cameras for monitoring roads, 1,200 road sensors for detecting stopped traffic, 120 carbon monoxide sensors, computer-controlled ventilation buildings, and a radio frequency able to interrupt radio broadcasts and dispatch emergency information. MassDOT operates numerous variable-message signs. MassDOT's Regional Operations Center dispatches emergency Commerce CaresVan patrol vans, a fleet of more than 20 vehicles that provides roadside assistance to stranded motorists, thereby improving highway safety and reducing congestion. Coordination with the MBTA's existing automatic vehicle location (AVL) capability is planned. The City of Boston's Traffic Management Center allows for real-time monitoring of traffic and incident management, and coordination of emergency-response providers.

FAST LANE is an electronic toll-collection system instituted along the Massachusetts Turnpike in October 1998. Vehicles in the FAST LANE system are equipped with transponders that signal that a vehicle is going through a toll plaza without the vehicle having to stop. The toll cost is automatically deducted from a pre-established account. FAST LANE is in operation not only along the Turnpike, but also at the Ted Williams Tunnel, the Sumner Tunnel, and the Tobin Bridge, and it is interoperable with E-ZPass, the electronic toll system used in New York, New Jersey, New Hampshire, Delaware, Pennsylvania, West Virginia, and Maryland. The technology increases the capacity of toll facilities and reduces delays.

The Federal Communications Commission designated 511 as a traffic information telephone number on July 21, 2000. The Mass511 service, provided by a no cost public-private partnership with Sendza, gives traffic and travel information on Massachusetts roads. The 511 service provides real-time traffic updates for major Massachusetts roadways. The system can be personalized by individual travelers.

- *Incident Management* – Crashes and other incidents on roadways can create instant and far-reaching congestion. It has been documented that in some urban areas, non-recurring congestion accounts for up to 60 percent of the total congestion. The Commonwealth of Massachusetts outlines an incident management program in its Regional ITS Architecture for Metropolitan Boston report and the two draft documents produced in 2010 referenced above (the ITS Strategic Plan and the Regional Transportation Operations Strategy for the Boston metropolitan region). The program, which includes MassDOT's Commerce CaresVan patrol vans and numerous surveillance and detection equipment installed along highways, promotes the sharing between agencies of information and data about emergencies in order to facilitate the access of emergency vehicles and to reduce the congestion resulting from an incident.

- *Traffic Signal Coordination* – Traffic signals that are not coordinated can significantly reduce mobility, even when the roadways are not at capacity. Traffic signal coordination allows for the smooth flow of traffic through consecutive, closely spaced traffic signals. It is a relatively inexpensive way to increase capacity for vehicles on roadways without lane additions. MassDOT, the City of Boston, and various municipalities already operate signal-coordination and closed-loop traffic signal systems. The MPO supports the monitoring of existing coordination plans and studying the region’s roadways to determine which additional locations could benefit from signal coordination. Inventories in the CMP revealed that many MPO arterials could benefit from traffic signal coordination. If traffic-signal timing is rarely reviewed, it can result in outdated timing patterns that do not reflect current traffic and pedestrian needs. Signals that lack coordination or are inadequately coordinated force motorists to stop at multiple adjacent signals, resulting in significant travel delays. As part of a program of periodic reviews of corridor signal-timing plans for improved operations and coordination, the MPO is currently studying arterial traffic-signal improvements and coordination. Priority is being given to high-volume and high-crash-rate arterials.
- *Bottleneck Removal and Travel Lane Continuity* – Congestion and bottlenecks caused by lane drops can create significant congestion and decrease roadway safety on arterial roadways and limited-access highways. Arterial roadways experience delays mostly at signalized intersections, while local roadways experience delays mostly at the minor approach of unsignalized intersections. Limited-access highways tend to have delays at locations where traffic merges, diverges, or weaves, as well as where there are reductions in the number of lanes. The Boston Region MPO recognizes that removing bottlenecks and improving lane continuity on arterial roadways and limited-access highways have the potential to significantly increase mobility. In some cases, minor design improvements at a lane drop can remedy the situation; in other cases, more extensive measures may have to be taken. The MPO recently conducted a Low-Cost Improvements to Bottlenecks Study. In Phase I, the MPO identified the three worst bottlenecks in the region and studied low-cost countermeasures. In a second phase of the study, the MPO will identify two more bottlenecks that are among the worst in the region and identify low-cost countermeasures.
- **Transportation Demand Management** – Transportation demand management (TDM) includes programs and strategies that provide alternatives to single-occupant-vehicle travel on roadways. These include shuttle services in areas underserved by transit; ridesharing; and high-occupancy-vehicle (HOV) lanes to encourage carpooling. In providing alternate modes of travel, these programs and strategies aim to reduce congestion without adding physical capacity to the existing roadway and highway system.

- *Transportation Management Associations* – Transportation Management Associations (TMAs) are nonprofit coalitions of local businesses dedicated to reducing traffic congestion and pollution and improving commuting options for their employees. There are 10 TMAs that serve communities in the Boston region, and several support shuttle services that connect employment locations with MBTA rapid transit or commuter rail stations. While some of these services are only available to employees of the member companies, others are open to the general public.
- *MassRIDES and Ridesharing* – MassDOT’s travel options program, *MassRIDES*, offers free statewide services that mitigate traffic congestion and help people living and working in Massachusetts expand their travel options. A statewide outreach partnership program invites private businesses and public agencies to join in the effort to help reduce traffic congestion. MassDOT staff works closely with other community groups to improve mobility and expand travel choices and provides developers and employers with resources to create work-site commuter initiatives. These services include:
 - Training and technical support for corporate transportation coordinators
 - Ridematching for carpools and vanpools using a statewide database
 - Personalized commuter trip-planning assistance
 - Transit route and schedule information
 - Vanpool administration
 - Parking management strategies
 - Work-site access analysis
 - Work-site transportation events
 - Commuter service-program design

MassRIDES provides comprehensive statewide information about transportation alternatives through its toll-free, bilingual telephone line and its information center on the Web. Massachusetts commuters can access the statewide computerized ridematching database to obtain information on carpools, vanpools, and transit alternatives that match their commute.

- *NuRide* – MassDOT has partnered with NuRide, the nation’s largest commuter rewards program, to encourage healthier and more sustainable modes of travel while reducing traffic and emissions throughout the commonwealth. NuRide is a free service supported by sponsors who provide special offers to NuRide members for taking greener trips, such as walking, biking, carpooling, vanpooling, and public transportation, or for telecommuting, thus reducing global warming, traffic congestion, and energy consumption. The NuRide service is available to anyone who lives or works in Massachusetts.

NuRide is offered by MassDOT through MassRIDES and MassCommute, the statewide coalition of Transportation Management Associations.

- *Clean Air and Mobility Program* – In 2010, the MPO launched the Clean Air and Mobility Program in order to fund a wider variety of projects that improve air quality and mobility and that reduce congestion in the region using federal Congestion Mitigation and Air Quality (CMAQ) funds. This program expands on three previously existing programs: the Suburban Mobility, Transportation Demand Management (TDM), and Regional Bike Parking programs. The activities covered by the previous programs are still eligible for funds in the Clean Air and Mobility Program; however, the program broadens the scope of possible projects.

In addition to the funding program, the MPO has conducted several studies on suburban transit opportunities in the region.

- *Suburban Transit Opportunities Study: Phase I* identifies characteristics of successful suburban transit services and includes case studies of four suburban transit services operating in the region. The report describes methods, techniques, and lessons learned by transit agencies about operating sustainable suburban transit services.
 - *Regionwide Suburban Transit Opportunities: Phase II* identifies seven neighborhoods in the region that have either no direct mass transportation service or very limited service, and that appear to have the best potential for supporting new suburban transit service. The report includes suggested routes for new suburban transit services to connect the identified neighborhoods with activity centers, including commuter rail stations.
 - *Regionwide Suburban Transit Opportunities Study: Phase III* investigated the potential for demand-responsive service as a way to improve suburban mobility and accessibility.
- *Safe Routes to School* – MassDOT’s Safe Routes to School program in Massachusetts aims to increase physical activity and safety for children, and to decrease traffic congestion and air pollution. The program focuses on educating elementary school students, parents, and community members on the value of walking, bicycling, carpooling, using public transit, and taking school buses for traveling to and from school. Additionally, schools can partner with the program to directly implement programs and engineer solutions to accomplish the program’s objectives. The Safe Routes to School program in Massachusetts is administered by MassRIDES and is funded through the Federal Highway Administration in accordance with the provisions of SAFETEA-LU, the federal surface transportation legislation.

- *High-Occupancy-Vehicle Lanes* – The Boston Region MPO considers high-occupancy-vehicle (HOV) lanes to be an alternative to building additional general-purpose lanes on congested highways. Vehicles with two or more passengers and motorcycles are allowed to use HOV lanes in the Boston region. There are three HOV lanes operating in the Boston region:
 - A reversible, barrier-separated lane on Interstate 93/Southeast Expressway between downtown Boston and the Braintree Split interchange
 - A southbound, buffer-separated lane on Interstate 93 North that approaches Boston from the north
 - A lane linking Interstate 93 in downtown Boston to the Ted Williams Tunnel

These lanes are meant to encourage ridesharing and to improve the flow of general-purpose traffic along the Interstate 93 corridor, as well as to and from Logan International Airport.

- *Reverse Commuting* – Most of the reverse-commute destinations of Boston residents are, and will likely continue to be, those within about 15 miles of downtown Boston. In 2001, MPO staff conducted a reverse-commute study for the MBTA. The study examined the feasibility of providing additional commuter rail and connecting bus transportation services to facilitate reverse commuting. Most employment centers along Route 128 and Interstate 495 are not served directly by commuter rail, and few have feeder buses to existing commuter rail and rapid transit stations. However, the study identified opportunities for pilot programs that warrant further exploration.

TRANSIT

Improving access to transit and other alternative modes of transportation, including access for the elderly, low-income populations, and persons with disabilities, increases mobility in the region. Various initiatives have been implemented to support efforts to increase access, which are described below:

- **MBTA Service Evaluation Process** – The MBTA regularly evaluates the performance of its services through an ongoing service planning process. The primary objective of this process is to continually evaluate and improve service, while ensuring that the MBTA uses available resources in the most effective manner. The service planning process varies somewhat by mode and is affected by whether or not the service is operated directly by the MBTA (bus and rapid transit) or is operated for the MBTA by a contractor (commuter rail and boat).

For bus service, the service planning process occurs on two levels. One is the ongoing evaluation and implementation of incremental service changes that occur on a quarterly basis to make minor corrections to the system. In addition, every two years, the MBTA Service

Planning Department conducts a comprehensive planning process through which major changes can be made, such as the restructuring of existing bus routes and the addition of new bus services. Rapid transit services are also evaluated through the biennial service plan, and changes proposed, as necessary.

A key component of the biennial service planning process is an evaluation of the performance of existing services, as measured using the service standards found in the MBTA's Service Delivery Policy. These service standards, which generally vary by mode and by time of day, include: service coverage, span of service, frequency of service, scheduled headway, vehicle load, and net cost per passenger. Also included in the planning process for the biennial Service Plan is an analysis of the impact of the proposed service changes on environmental justice populations.

For commuter rail, the MBTA Railroad Operations Department, together with the operating company, makes service adjustments as needed to best meet the needs of the riding public with the resources available.

- **Park-and-Ride Facilities** – The MPO is committed to increasing available parking capacity at various commuter rail and rapid transit stations throughout the region. Additional parking facilities will be constructed at transit stations over the lifetime of this LRTP based on prioritization in the Program for Mass Transportation and through other opportunities where funding may become available through third party partnerships.

There are 124 park-and-ride facilities in the MPO region (see the Needs Assessment for more details about these facilities). These facilities play an important role in reducing congestion in Boston's urban core by enabling individuals to drive short distances from their homes and gain access to rapid transit, commuter rail, commuter buses, commuter boats, carpools, and vanpools. Most of the lots are conveniently located in downtown centers or along major highways. There are three categories of park-and-ride facilities in the Boston region: those that provide access to transit stations, those served by commuter bus service, and those used for ridesharing (carpools and vanpools).

Some of the park-and-ride lots that are at capacity fill very early in the morning – especially those lots located in communities that do not have competing transit options. Some commuters shift their travel schedules and work hours to arrive at these facilities early enough to secure a parking space. When lots reach capacity, commuters often park along local roadways or drive to their final destination, contributing to congestion.

- **MBTA Traffic Signal Priority** – Traffic signal prioritization for transit vehicles has the potential to improve the speed and reliability of the MBTA bus system while maximizing the number of people passing through an intersection. The strategy utilizes hardware and software technologies to enable buses to invoke the green signal phase (“green light”), or to

extend the duration of the green phase in order to pass through the intersection without delay. The MBTA has recently initiated a Key Bus Route program through which it is making improvements to the 15 most heavily used bus routes in the system. As part of this program, MPO staff are studying the potential for implementation of signal priority at intersections on bus Routes 1, 15, 66, and 111. Buses that operate on the MBTA's Silver Line Washington Street service are equipped with technology that can request signal priority through short-range communication with roadside traffic-control equipment that has been installed at some intersections. This capability is currently used when a vehicle is running behind schedule.

- **Intelligent Transportation Systems (ITS)** – In addition to traffic signal priority, the MBTA employs several ITS strategies. An advanced bus operations center was added to the MBTA's existing rapid-transit operations facility in 2004 to integrate global positioning system (GPS) and automatic vehicle location (AVL) technology on its buses to better schedule and direct its fleet through the use of real-time operational information. The real-time use of this technology is currently being used on all buses through information on the web and smart-time applications with additional information provided for the Silver Line Washington Street at kiosk locations.

The MBTA provides travel information services in a variety of ways. On the MBTA's website, customers can access schedules; maps; and fare, station, parking, and service interruption information for all bus, rail, and boat services. Service interruption information includes the operational status of elevators and escalators in MBTA stations. Kiosks at bus stops on Washington Street in Boston inform passengers about Silver Line bus arrivals, and an automated, prerecorded message plays in all rapid transit stations when a train is about to arrive. Interactive travel-information kiosks at the South Station Transportation Center provide a direct link to the MBTA's website, where customers can access schedule information for all services. Information is also provided through electronic boards on commuter rail platforms. Some rapid transit trains now have LED screens with scrolling information on upcoming stops, in addition to audible information.

The MBTA has enhanced its customer-service information system by tying it directly to the software used by the scheduling department. This system now allows customers to access next-trip information for all routes over the phone or on the MBTA's website. As part of this system, a trip-planning tool available to customers on the Web generates origin-destination routing suggestions without the aid of a customer-service agent.

Developers have recently built many Web, cell phone, and smartphone applications that give information about the MBTA system. Some applications are free; others have to be purchased. The applications include:

- Delivering real-time bus and subway arrival information

- Displaying real-time position data for the Orange, Red, and Blue lines
 - Providing bus arrival times at a particular stop
 - Finding a nearby bus route
 - Giving automated email and text message reminders for a given bus route
- **Bicycle Access on the MBTA** – Rapid transit customers are allowed to take bicycles aboard Orange, Red, and Blue Line trains (up to two bicycles per car) during all hours except peak hours, which are 7:00 AM to 10:00 AM and 4:00 PM to 7:00 PM. Bicycles are not allowed on the Green Line, Mattapan High-Speed Line, or Silver Line. However, folding bicycles are allowed on all MBTA vehicles, including the subway, Green Line, commuter rail, and ferries and buses, at any time, when folded.

Bike “Pedal & Park” facilities (which are enclosed and equipped with video cameras and controlled door access for safety and security) are now located at Alewife and Forest Hills stations, and others are being planned. Bike CharlieCards, which are provided for free, provide access to these locked facilities. Over 95 percent of MBTA stations now have bicycle racks, and 50 covered bike ports will be installed by the summer of 2011 to provide protection from the elements. The MBTA has also installed bike racks on over 70 percent of its buses.

Riders are allowed to take bicycles aboard only off-peak commuter rail trains (outbound morning trains, inbound evening trains, all off-peak weekday trains, and all weekend trains). However, bicycles can be taken on commuter boats and ferries at any time.

- **Key Station Plan** – The federal Americans with Disabilities Act (ADA) mandates improvements to facilities and infrastructure to ensure that they are accessible to persons with disabilities. The MBTA developed the Key Station Plan, which designated 80 stations in the MBTA system as facilities to be brought into compliance with ADA. This program has resulted in station improvements that significantly increase the mobility of the elderly and persons with disabilities, as well as improved access for all customers.
- **Access for the Elderly, Low-Income Populations, and Persons with Disabilities** – Residents who are elderly, in low-income households, or who have disabilities often have fewer transportation options than others in the region. The over-55 population is projected to increase by almost 50 percent by 2035 and will represent over one-third of the population. The transportation needs of these populations will continue to increase. The following sections describe programs and services to address the mobility needs of these populations.
 - *Demand-Responsive Transit Services* – THE RIDE, the MBTA’s paratransit service, which operates in compliance with ADA, provides door-to-door transportation to people who are unable to use general public transportation (subways, buses, and trains), all or some of the time, because of a physical, mental, or cognitive disability. THE RIDE

operates 365 days a year from 6:00 AM to 1:00 AM in 62 cities and towns in the Boston region.

In addition, services are also provided through a number of community senior transportation resources in the region. The MPO's website provides a table listing senior transportation services provided by councils on aging and other providers.

Recognizing that the elderly population is growing, Governor Patrick signed an executive order in April 2011, to establish a commission to examine paratransit services provided by THE RIDE, regional transit authorities, and the Executive Office of Health and Human Resources.

- *Coordinated Human Services Public Transportation Program* – The Federal Transit Administration manages three funding programs to improve the mobility of elderly individuals, individuals with disabilities, and low-income individuals: Elderly Individuals and Individuals with Disabilities, Job Access and Reverse Commute, and New Freedom. SAFETEA-LU, the current federal surface transportation legislation, requires that projects selected for these programs be included in a coordinated human services transportation plan. MassDOT administers this initiative. The MPO has developed a Coordinated Human Services Transportation Plan for the Boston Region MPO area and requests proposals for the two programs that are not solicited by the state: Job Access and Reverse Commute program and New Freedom program.
 - Elderly Individuals and Individuals with Disabilities Program – The Elderly Individuals and Individuals with Disabilities program is a federal funding program that provides funding to states for capital projects to assist in meeting the transportation needs of older adults and persons with disabilities. The states administer this program.
 - Job Access and Reverse Commute Program – Job Access Reverse Commute (JARC) is a federal funding program that provides funding to support the development and maintenance of job access projects designed to transport welfare recipients and eligible low-income individuals to and from jobs and activities related to their employment. The JARC program also supports reverse-commute projects designed to transport residents of urbanized areas to employment opportunities in the suburbs.
 - New Freedom Program – The New Freedom program provides new public transportation services and public transportation alternatives beyond those required by the ADA. Initiatives funded through this program provide individuals with disabilities with transportation, including transportation to and from jobs and employment support services.

Freight

Of all freight transported in Massachusetts, over 90 percent is now carried by truck. Trucks will continue to be a vital part of the distribution system, therefore maintaining and improving mobility on the roadways trucks use is important to freight. However, encouraging the use of other options would help realize the vision of reducing some of the harmful effects of trucking such as roadway wear and tear, emissions, and trucks' contribution to congestion. The MPO will continue to work with MassDOT in implementing its State Freight Plan and will consider freight movements in the prioritization of projects included in the LRTP and Transportation Improvement Program (TIP). Various issues that the MPO and the Commonwealth must address are described below:

Truck

- **Congestion on Major Routes** – Trucks rarely account for more than 15 percent of the vehicles on the roadways of the Boston region. However, they contribute disproportionately to congestion because of their size and acceleration and deceleration capabilities. The presence of large numbers of trucks causes concern because of the congestion present on most of the region's freeway network. Truck volume on arterial roadways is also a concern in many places, but freeways carry far more large trucks (defined as trucks with six tires or more) on both an absolute and percentage basis than arterial roadways.

One freeway particularly affected by trucking is Interstate 495, which has been identified by the Boston Region MPO's ongoing freight work and the State Freight Plan as a major truck route. This is due, in part, to its role in connecting northern and southern New England. Along with Interstate 495, the following locations on the freeway system in the Boston Region MPO area have high volumes of large trucks on a typical weekday. These will continue to be considered as major thoroughfares for freight movement and considered during project selection for funding in the LRTP and TIP:

- 20,000 or more large trucks per day: Interstate 495, between Routes 2 and 3 in Littleton
- 15,000–20,000 large trucks per day: Interstate 495, south of Interstate 90 in Hopkinton
- 10,000–15,000 large trucks per day:
 - Interstate 95, south of Route 20 in Weston
 - Interstate 93, between Routes 24 and 28 in Randolph
 - Interstate 95, north of Route 140 in Foxborough
 - Interstate 93, south of Interstate 95 in Woburn
 - Interstate 90, entering the MPO area west of Interstate 495 (the volume of large trucks declined by more than 30 percent from this location inside Interstate 495, and

by more than 60 percent inside Interstate 95)

- **Bottlenecks** – Eight highway freight bottlenecks in the Boston region were identified in the State Freight Plan. They are:
 - Interstate 93 southbound at Routes 3 and 128
 - Route 24 at Interstate 93 in Randolph
 - Interstate 95 at Route 9 in Wellesley
 - Route 3 at Interstate 95 in Woburn, Stoneham, and Reading
 - Route 1 at Route 60 (A project to alleviate this bottleneck is included in this LRTP.)
 - Interstate 90 at Interstate 495 In Hopkinton
 - Interstate 290 at Interstate 495 in Marlborough
 - Route 16 from Route 1 to Interstate 93 in Medford, Everett, and Chelsea
 - Route 99 from Sullivan Square to Route 16 in Boston and Everett
- **Hazardous Cargo** – There is a long-standing prohibition against trucks carrying hazardous cargo traveling in tunnels. The expressway segments impacted by this prohibition include:
 - Interstate 90 – Ted Williams Tunnel under Boston Harbor
 - Interstate 93 – Central Artery in downtown Boston
 - Interstate 90 – Massachusetts Turnpike Extension under the Prudential Building and Copley Square
 - Route 1 – Tobin Bridge approach under City Square in Charlestown
 - Route 1A – Sumner Tunnel under Boston Harbor
 - Route 1A – Callahan Tunnel under Boston Harbor

The process of establishing alternate routes involves federal, state, and municipal regulations, and a proposed alternate route system is undergoing review as of this writing. The route designation that emerges from this process can have a material impact on the costs and efficiencies of regional fuel transportation. Restrictions have an impact on regional trucking patterns.

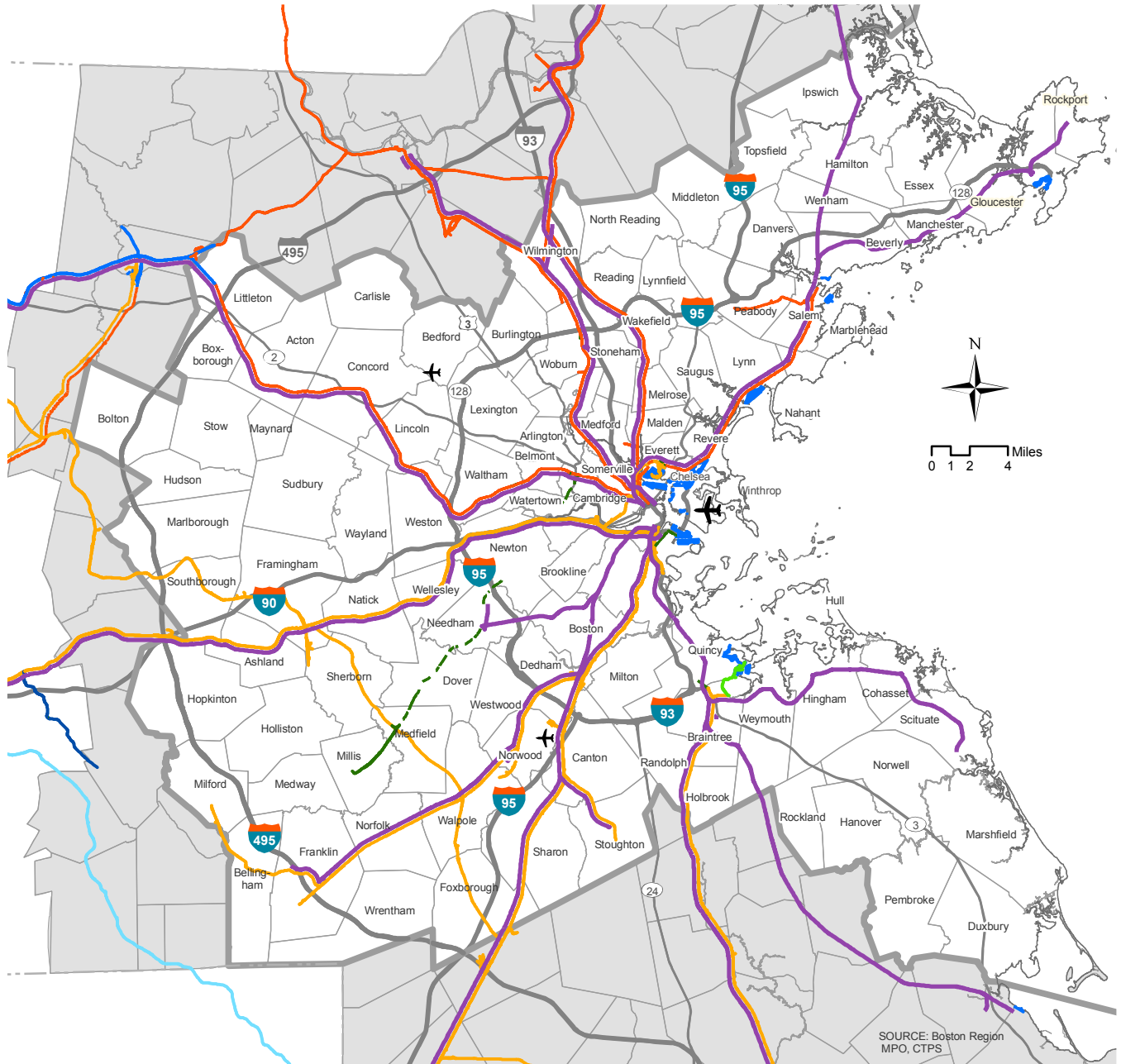
- **Overweight-Truck Routes** – Many containers arriving at the Port of Boston exceed the highway weight limits of Massachusetts and local jurisdictions. These containers must be reconfigured to a lower weight in order to be transported over roads to inland distribution centers. The State Freight Plan found that additional or more appropriate overweight-truck routes serving the Port of Boston would improve freight mobility and reduce the number of trucks needed to move containers from the Port to distribution centers.

- **“The Last Mile”** – Trucks accessing the ports of Boston, Salem, and Gloucester have difficulty getting freight from the docks to their local highway system over “the last mile” which in most cases consists of local or residential streets. Trucks on these roads can be a burden for the local communities, and these local routes slow the movement of freight. Access to the highways from the Port of Boston has been improved by the construction of the Central Artery/Ted Williams Tunnel, but it needs to improve further. Although two separate overweight-truck routes have been designated, mostly to accommodate seafood businesses, there is a need for additional overweight-truck routes in the area. The State Freight Plan recommended port access improvements in South Boston, including a Conley Terminal freight bypass road. This project is included in this LRTP.

Rail

- **Double-Stack Initiative** – Double-stack rail cars, which have a container stacked on top of another container, move freight more efficiently than single-stack cars. However, many bridges over rails in the Boston region are too low to accommodate double-stack rail cars. More than 80 percent of the bridges over rails in the Boston Region MPO area do not meet the desired clearance of 20 feet and 8 inches. The Massachusetts Department of Transportation has an agreement with the freight railroad CSX to relocate and consolidate the Beacon Park intermodal yard from Allston to Worcester, in conjunction with plans to provide 20 feet and 8 inches of double-stack clearance from the New York state line to Westborough. In addition, the Commonwealth has agreed to reconstruct highway bridges over the CSX and Pan Am rail lines that are programmed for other repairs in the future to the agreed-upon double-stack standard.
- **Shared Use** – Passenger and freight trains share most of the rail network in Eastern Massachusetts. This can create problems for the scheduling and dispatching of trains, which can affect the mobility of freight. Some of the tracks in the region are used exclusively by freight railroads. The sections of the railroad network used by freight operators along with those shared with passenger trains are shown in Figure 4-1.
- **Capacity Constraints** – The State Freight Plan also identified major main line capacity constraints in the freight rail system that are not related to vertical clearance or weight restrictions. These are:
 - **Mansfield Freight Connections** – Freight moving from the CSX Boston Line to the South Coast must cross the Northeast Corridor (rail), which constrains the movement of freight.
 - **Beacon Park Yard to South Boston** – Passenger services into South Station, and a reconfiguration of the tracks in this area, restrict access to South Boston freight facilities, such as the Boston Marine Industrial Park, via rail.

**FIGURE 4-1
Rail Infrastructure**



Freight Service Operators

- Bay Colony Railroad
- CSX Transportation
- Fore River Transportation
- Grafton & Upton
- Providence & Worcester
- Pan Am Railways
- Pan Am Southern LLC
- - - Freight out of service

Passenger Service

- Amtrak/MBTA
- Seaport

- **“The Last Mile”** – Freight trains, like trucks, also lack direct access to most ports in Eastern Massachusetts. The lack of access requires freight to be moved to rail terminals by truck, and limits the ability for Massachusetts ports to compete for more freight traffic with ports that have good on-dock rail service. The State Freight Plan recommended improvements and extensions to the state-owned Track 61, which has the potential to provide on-dock rail service in South Boston at the Marine Industrial Park. The project would provide on-dock rail access to a planned bulk cargo facility at the North Jetty.

Air

- **Landside Access** – The Ted Williams Tunnel improved freight access to Logan International Airport, but landside congestion still threatens to restrict air freight. This is important because air freight is critical to the Massachusetts economy, which features many high-value manufacturers in the areas of biotechnology, pharmaceuticals, and information technology.

Freight Land Use Issues

- **Industrial Rail Access Program** – Businesses along rail lines often need to build or upgrade rail sidings in order to have access to freight rail service. Because construction of this infrastructure is generally much more expensive than highway connections, companies often choose to limit this infrastructure construction, thus decreasing the opportunities to ship by rail. Development pressures on land adjacent to rail have reduced the potential pool of rail-served businesses. The State Freight Plan recommends an Industrial Rail Access Program (IRAP) to address this problem. An IRAP would utilize public, private, and railroad funds to facilitate rail use, and reduce the growth in truck freight that is consuming the dwindling capacity of existing highways. The IRAP would provide funding assistance for the construction or improvement of railroad tracks and facilities to serve industrial or commercial sites where freight rail service is currently needed or anticipated in the future.
- **Beacon Park Yards Relocation** – The freight railroad company CSX plans to move its terminal facility from Allston to Worcester, which will change some regional trucking patterns. Meanwhile, the movement will allow for improved passenger rail service between Worcester and Boston, since the state will own the tracks between the cities. This movement is occurring in conjunction with state and CSX projects that will allow double-stack capability between Worcester and the New York state border.
- **Warehousing and Freight Forwarding near Airports** – Warehousing and freight forwarding facilities near Logan International Airport are important for the air cargo industry. Preserving land that can be used to support the air cargo industry on Routes 1 and 1A is critical to the movement of freight to and from the airport.

Bicycle and Pedestrian Accessibility

- **Regional Bike Parking Program** –The Regional Bike Parking Program provides municipalities in the Boston region, the Department of Conservation and Recreation, and the MBTA with the opportunity to purchase bicycle racks at a discount. Municipalities that purchase bicycle racks are eligible for full reimbursement of the purchase price. The program is funded by the Boston Region MPO, MassDOT, and FHWA, and is administered by the Metropolitan Area Planning Council (MAPC). All MPO communities are eligible to participate. To date, 69 communities have ordered a total of 9,258 bicycle parking spaces.
- **Regional Bicycle Plan** – The Regional Bicycle Plan, funded by the MPO and prepared by MAPC, proposes six general goals and strategies for the region in terms of bicycling, based on previous plans, current planning guidelines, and the MPO’s policies:
 1. Encourage more trips by bicycle in each community
 2. Make bicycling and bicycle accommodations a part of “standard operating procedure” in transportation planning
 3. Improve education and prioritization of bicycle project proposals
 4. Assist and encourage local initiatives
 5. Work with state and federal agencies to simplify and coordinate funding programs
 6. Increase regional knowledge about bicycling

In addition to setting goals, the plan also describes the current bicycling network, suggests criteria specific to bicycle projects to be used in the TIP development process, and prioritizes projects and programs to guide state, regional, and local action.

- **Statewide Bicycle Plan** – MassDOT updated the Statewide Bicycle Plan in 2008, building upon the 1998 Massachusetts Bicycle Transportation Plan. The updated plan focuses on developing a prioritized plan of on- and off-road bicycling improvements in order to implement a statewide bicycle network. MassDOT’s “Baystate Greenway 100 Program” originated from the Statewide Bicycle Plan and lists the commonwealth’s priority shared-use path projects.
- **Walkable Community Workshops** – In August 2002, the Boston Region MPO applied for a grant from the National Center for Bicycling and Walking to hold Walkable Community Workshops. National experts came in and hosted a series of eight workshops in March 2003. The eight workshops provided half-day courses to promote health, sensible land use, the local economy, and the environment. Each workshop included a presentation that indicated common difficulties pedestrians encounter in navigating their way around the specific community, and a host of possible solutions. Following the presentation, attendees went out to view the local area and returned to discuss problems encountered, possible solutions, and

implementation strategies.

These workshops have become an ongoing program for the Boston Region MPO. Recently, the Walkable Community Workshop program has been incorporated into a new Livability Program established by the MPO (see Chapter 5 for more details). As part of the workshops, additional elements of livability have been included to address bicycling, transit, land use, parking, the environment, health, and economic development issues.

SAFETY AND SECURITY

The MPO strives to support projects that will improve safety for all users of the transportation system – motorists, transit riders, freight operators, bicyclists, and pedestrians—and reduce the number and severity of collisions. In the Boston region, the major problems associated with providing a safe and secure roadway system have to do with eliminating highway bottlenecks and the associated congestion that increases the likelihood of collisions occurring, addressing unsafe roadway conditions, and improving the system for moving freight in the region by addressing the need to add truck-stop rest facilities, designate haul roads to remove trucks from local streets, and improve safety at rail crossings. Improving safety and security on the transit system requires addressing the pressing need to bring the transit system into a state of good repair, reduce gaps in service, solve infrastructure constraints that limit the capacity of the transit system, and install collision-avoidance systems.

The MPO also seeks to protect and maintain the viability of transportation infrastructure that is important for conducting emergency response and for enabling the evacuation of populations that may be necessary in response to natural or disasters caused by human action. The MPO recognizes that the transit and highway systems play a vital role in moving people and goods safely in the region – including in times of crisis – and that investments in state-of-the-practice ITS and communication systems are important for providing dependable service.

The Boston Region MPO’s Vision for Safety and Security

Vision: All modes of the transportation network, passenger and freight, will provide transportation that is safe, personally and operationally, to the maximum feasible degree. The number and severity of crashes will have been reduced. State-of-the practice ITS measures and surveillance communication systems will have been deployed on the transit system to minimize vulnerability to security breaches. Transit malfunctions will have been reduced. Steps will have been taken to protect the viability of transportation infrastructure critical to emergency response and evacuations necessitated by natural hazards and threats and hazards caused by human action.

Policies: To provide for maximum transportation safety and to support security in the region, the MPO will put a priority on programs, services, and projects that:

- Implement actions stemming from all-hazards planning
- Maintain the transportation system in a state of good repair
- Use state-of-the-practice safety elements; address roadway safety deficiencies (after safety audits) in order to reduce crashes; and address transit safety (this will include following federal mandates)
- Support incident management programs and ITS
- Protect critical transportation infrastructure from both natural hazards and human threats; address transit security vulnerabilities; upgrade key transportation infrastructure to a “hardened” design standard
- Improve safety for pedestrians and cyclists; ensure that safety provisions are incorporated into shared-use corridors
- Reduce the severity of crashes, especially via measures that improve safety for all
- Promote safety through supporting the reduction of base speed limits (in municipalities) to 25 miles per hour and through education about and enforcement of rules of the road, for all modes that use the roadways
- Improve the transportation infrastructure to better support emergency response and evacuations

All-hazards planning will continue, with MPO participation, and the MPO will take appropriate action on the recommendations of that work.

MPO Actions to Achieve the Safety and Security Vision

As it strives to attain these visions, the MPO supports projects and programs that enhance safe and secure travel for all users of the transportation systems—motorists and nonmotorists – and participates in regional planning for safety and security initiatives.

HIGHWAY

- **Improving Highway Safety** – The MPO works to improve highway safety by identifying high-crash locations, conducting safety analyses and audits of problematic locations, providing technical assistance to communities, and implementing safety projects. Its work supports state and federal initiatives aimed at reducing crashes.

Through its CMP, the MPO identifies roadway locations in the region that are in need of infrastructure improvements. The CMP is a tool that allows for prioritizing safety needs at intersections and for determining operational strategies that can be used to address safety problems at intersections and on arterials. The locations in the region that experience the most severe crashes are identified by using the Equivalent Property Damage Only (EPDO) index, which measures the amount of fatalities, injuries, and property damage that occur on roadways.

Each year, the MPO conducts safety-related studies, funded through its Unified Planning Work Program, which produce recommendations for addressing safety problems in the study areas. The MPO staff also conducts road safety audits with MassDOT and municipal stakeholders to identify measures that can be taken to improve specific safety problems. Technical assistance is provided to municipalities that wish to remedy these problems.

Transportation safety projects are implemented through the MPO's TIP. When selecting projects to receive federal funding, the MPO assesses whether proposed project designs would address safety needs (including the needs of bicyclists and pedestrians) and reduce crashes. Projects that receive funding through the federal Highway Safety Improvement Program (HSIP) are programmed in the TIP.

The MPO's safety work supports the goals and objectives of the Massachusetts Strategic Highway Safety Plan (SHSP), which seeks to reduce traffic-related fatalities and injuries. The MPO's safety work coincides with several emphasis areas defined in the SHSP. These emphasis areas include a focus on reducing traffic-related fatalities and injuries (specifically from intersection and lane-departure crashes), expediting safety-related infrastructure projects, reducing risks to bicyclists and pedestrians, and improving data systems of traffic records.

The MPO also participates in state-sponsored initiatives focused on improving transportation operations strategies, ITS systems, traffic incident management procedures, and the quality, completeness, and accessibility of traffic data.

- **Protecting the Transportation System** – The operability of a region's highway and transit systems is vital for the ability to respond to emergencies and for the well-being of people who depend upon those systems to travel to safety in times of emergency, whether due to natural disasters, intentional attacks, or other disruptions.

As it strives to make investments that protect the region's critical transportation infrastructure, the MPO participates in all-hazards planning, the federal guidelines outlined by the U.S. Department of Homeland Security for planning for and responding to threats to the public and to the nation's infrastructure. In line with this guidance, the MPO considers security concerns to include both natural and human threats that warrant action to protect life, property, the environment, and public health or safety, and to minimize disruptions of government, social, or economic activities.

The MPO evaluates proposed transportation projects, prior to selecting projects to receive federal funding, to determine whether they would enhance the security of the transportation system. The evaluation considers the impact a project would have in terms of enhancing the ability of a facility to withstand and function in extreme weather conditions and the function it would serve in an emergency, such as in providing a means of evacuation and facilitating

the movement of emergency responders.

Through its UPWP, the MPO conducts a GIS-mapping program to identify transportation infrastructure that may be susceptible to extreme weather and other natural disasters—including flooding, hurricane storm surges, earthquakes, and potential sea-level rise—and to document the location of evacuation routes and emergency support locations for which good access must be maintained.

A key component of transportation security involves enhancing and maintaining the ITS systems that keep the transit and highway systems functioning efficiently and that help preserve public safety on the system. These systems provide functions ranging from traffic signalization to interagency communications to surveillance. The MPO recognizes the importance of these systems for improving safety and security on roads and rail, and for maximizing the potential of the system to move people under normal conditions as well as during emergencies.

The MPO supports ITS projects, such as those that enhance fiber-optic networks between the state's transportation divisions and public safety agencies, and improve the ability of those agencies to share video and data for public safety purposes.

The MPO participates as a stakeholder in workshops and meetings, sponsored by MassDOT and other MPO member agencies, aimed at updating or improving the region's ITS architecture and traffic incident management and transportation operations strategies.

It also participates in regional security planning groups that include personnel from state-level transportation, public safety, and law enforcement, and federal partners.

Transit

Due to the intertwined nature of safety and security on transit systems, many safety initiatives of the MBTA and the region's regional transit authorities (RTAs) integrate security considerations. The reverse relationship is, of course, true as well. Security cameras, as an example, could also be called safety cameras, because they provide for the well-being of patrons who may have slipped and fallen in an isolated area of a train station, as well as providing security from a would-be assailant or terrorist on a train platform or a bus.

- **MBTA Police Department** – The MBTA Police Department's primary mission is to maintain safety within the MBTA transit system. The department's approximately 250 uniformed and plainclothes police officers accomplish this through mobile, foot, and canine patrol teams on both scheduled and random patrols, all of which serve to maintain a high degree of visibility within the system. The Blue, Green, Orange, and Red lines are served by 115 police officers, 4 police substations, and 15 police kiosks, while additional surface patrols provide support to buses and

commuter rail.

The three primary components of the department's safety operations are:

- Community Policing Patrol Plan
- Investigation and prosecution (arrests and trials)
- Police/community relations (public outreach)

In addition, to enhance security on the system, the MBTA Transit Police Department has a Special Operations Team (SOT), which is the MBTA's version of a SWAT (Special Weapons and Tactics) team. The SOT has eight specialty vehicles, which include an SOT rapid-response vehicle, a bomb-disposal truck, radar units, and an incident command vehicle.

- **MBTA Safety Department** – The primary role of the MBTA Safety Department is to ensure the safety of the MBTA's employees, its customers, and members of the general public throughout the MBTA system. In order to accomplish this, the MBTA Safety Department designs, implements, supports, and monitors safe work practices for and among its employees, whether they are working in MBTA vehicles and facilities or on other MBTA property and rights-of-way. These safe practices are outlined in the MBTA's System Safety Program Plan and in its Safety Policies and Procedures Manual.

Examples of the types of activities conducted by the MBTA Safety Department include:

- Right-of-way safety training
 - Incident tracking
 - Operation Lifesaver
 - Safety audits
 - Safety hazard correction
 - Safety drills
- **Secure Stations Initiative** – In accordance with the State Homeland Security Strategy, the MBTA is improving its communications and security systems to enhance safety and security systemwide. The transit system is equipped with a wide range of infrastructure to collect and disseminate information in the event of an emergency:
 - Wide-scale deployment of closed-circuit television (CCTV) systems
 - Public address (PA) and signage systems
 - Security intrusion detection and alarm systems
 - Fire alarm systems

- Police/public call boxes
- Silver Line Phase II Security Program

All new construction, particularly station reconstruction and maintenance facility upgrade projects, involves the complete overhaul or reinstallation of security and fire alarm systems, police call boxes, and communications and public address systems.

The rapid transit stations' public-address systems currently provide travel information. A recorded security message educates transit passengers about their role in maintaining system security; passengers are urged, "If you see something, say something."

- **Communications Interoperability** – One of the issues facing the MBTA in its emergency-response planning is that of interoperability. Interoperability is defined as the ability of radio equipment belonging to one organization's first responders in an emergency to communicate with that of another organization's first responders. Currently, radio coverage inside MBTA subway system tunnels does not meet these operational standards. This affects the response capabilities of the MBTA Police Department, the Boston and Cambridge fire departments, and both cities' police departments and emergency medical services. Interoperability affects nearly every community in the commonwealth. The MBTA is working with other members of the State Interoperability Committee to explore this issue and develop ways to improve radio communications.
- **MBTA Surveillance Cameras** – The MBTA will increase the number of surveillance cameras on the rapid transit system by 186, bringing the total number operating in the rapid transit system to 488. This will provide a security camera in every rapid transit station in the entire system. The MBTA surveillance cameras are monitored from a number of different locations, including the MBTA Operations Control Center, the MBTA Police Department, and the Massachusetts Emergency Operations Center, in Framingham.

In addition, the MBTA has embarked upon a program of installing surveillance cameras in new buses. There is also a strong surveillance component to the MBTA's Station Management Program, which includes the Automated Fare-Collection System Project, the Hub Stations Project, and the Wide Area Network Project. The Hub Stations and Wide Area Network Projects' surveillance components consist of closed-circuit television cameras and the fiber-optic cable required to connect them to their monitors.

- **Grade-Crossing Redesign** – Improving grade-crossing safety has long been one of the top priorities of the Federal Railroad Administration. From 1995 to 2004, the number of grade crossing collisions in the U.S. declined by 3 percent, the frequency of such collisions per million train-miles decreased by 42 percent, and the number of fatalities fell by 36 percent. During the first 11 months of 2005, grade-crossing collisions were down 5.1 percent and

fatalities declined 5.3 percent compared to the same period of 2004. In Massachusetts, there is funding under the Section 130 Program of MGL Chapter 160 for the upgrading and improving of railroad crossings.

- **Advance Warning Techniques** – The Commonwealth of Massachusetts, the MBTA, and a majority of those in the railroad industry agree that the use of locomotive horns helps to promote safety at highway-rail grade crossings. Although Massachusetts law requires trains to blow their horns at highway-rail grade crossings, horn bans have been created by the state Legislature for many communities. The MBTA complies with these bans within those communities. In August 2006, the Federal Railroad Administration amended the June 2005 locomotive horn rule to create six different quiet-zone categories. These quiet zones, within which each grade crossing must have flashing lights and gates, are defined in conjunction with state agencies and railroads.

Meanwhile, the MBTA has taken steps to improve safety at its 200 public highway–rail grade crossings. Included among these steps is an investment in automatic warning systems, such as crossing gates, flashing lights, and warning bells, to be installed on almost all of the public grade crossings used by the MBTA.

- **Operation Lifesaver** – Operation Lifesaver is an educational program created to stop deaths, injuries, and crashes at railroad grade crossings and along railroad rights-of-way. Crashes between trains and trucks are especially harmful, as they typically result in many casualties. Much of the hazardous material transported in the U. S. is moved by truck: the reduction of grade-crossing collisions with trucks is especially important.

Operation Lifesaver Inc., an international, nonprofit organization, was established in 1972 to conduct this program. The program is a joint venture of U.S. railroads, highway safety agencies and organizations, and local, state, and federal government public safety agencies. In Massachusetts, as in all other states, certified volunteer speakers conduct free railroad safety briefings for people of all ages in order to assist them in making the proper decisions when near railroad tracks.

- **MBTA Parking Facilities** – Due to their proximity to operating subway and commuter rail stations, parking garages, such as the ones at the Red Line’s Alewife and Quincy Adams stations and the Route 128 Amtrak and commuter rail station, present additional security concerns to the MBTA over and above the ones already presented at a typical station. Special attention is paid to these facilities by the MBTA Transit Police Department. In addition, parking facilities receive scrutiny under the Secure Stations Initiative through the installation of closed-circuit television cameras, security intrusion detection, alarms, and police-call-box systems.

- **MBTA Operations Control Center** – The MBTA operates and maintains an operations control center (OCC) in Boston for rapid transit operations that uses proven state-of-the-art computer-based technology that allows real-time monitoring and supervisory control of the signal and communications systems for all four transit lines. This facility is located in a theater-style room with a wall-sized display board that can be viewed by the operations supervisor, emergency control personnel, and OCC staff, who centrally control rail traffic.

A separate part of the OCC is for bus operations. MBTA buses provide automatic vehicle location (AVL) information, via Global Positioning System (GPS) units, to dispatchers at the Bus Operations Control Center. Using the bus radio system network, dispatchers can ensure proper spacing between vehicles and better on-time performance.

The OCC interfaces and shares information with the Highway Division’s Traffic Operations Center, the Central Artery/Tunnel Project’s Operations Control Center, the Boston Transportation Department’s Traffic Management Center, the Massachusetts Interagency Video Information System, and the Commonwealth Fusion Center.

- **Amtrak Police** – Amtrak provides regional transit security and law enforcement through the Amtrak Police. The Amtrak Police’s 342 police officers, most of whom are stationed within the Northeast Corridor, Amtrak’s busiest corridor, provide security at Boston’s South and Back Bay stations and Westwood’s Route 128 Station. The Amtrak Police are also responsible for security on 300 trains per day serving approximately 540 stations and operating on more than 22,000 miles of rail in 46 states.
- **Regional Transit Security Working Group** – Any transit agency wishing to receive funding through the federal Transit Security Grant Program is required to participate in a Regional Transit Security Working Group (RTSWG). The primary purpose of the RTSWG is to develop a Regional Transit Security Strategy, the development of which is also required to receive funding under the Transit Security Grant Program. In early 2007, the United States Department of Homeland Security granted the MBTA \$24.37 million, the largest award the MBTA has ever received, to enhance the security of its trains and buses. The MBTA will use the money to improve video surveillance, start a pilot program to expand its biological, nuclear, radiological, and explosive-material detection systems, and add additional surveillance cameras.

The Executive Office of Public Safety chairs the RTSWG, and the MBTA and the MPO are members. The MPO brings a regional-planning perspective to the work of the group and will also be called upon to participate in the funding of regional transit-security initiatives and processes.

NEXT STEPS – THE DEVELOPMENT OF PERFORMANCE MEASURES

Management and Operations initiatives at the federal, state, regional, and local levels have increased the efficient and safe transportation options in the Boston region by promoting initiatives and actions that continue to improve the performance and safety of the existing transportation system, and well as increasing service and access.

To ensure that the MPO continues to move towards the visions outlined in *Paths to a Sustainable Region*, it is necessary to develop performance measures. The Needs Assessment documents the existing condition of the transportation system, and it may be utilized as a baseline for initial performance measures. The development of performance measures is likely to include some measures that do not have the necessary data for analysis. Addressing these gaps will require future data collection and analysis at the municipal, corridor, and regionwide level. These activities can become components of the ongoing Congestion Management Process or future Unified Planning Work Program studies. The MPO's performance measures will not adhere to defined targets, but they have the potential to effectively communicate the needs of the region and reinforce the value of investment decisions.

Some of the management and operations performance measures that may be utilized to track infrastructure improvements and performance of the system include:

Goal	Factor	Performance Measure
Achieve efficiency through ITS and M & O, and achieve efficiency via implementation of technology and state of good repair before expansion	Improved Incident Management (Highway and Transit)	Decrease in incident detection time
		Decrease in incident clearance time
	Achieve State of Good Repair	Increase the % of federal aid miles of roadway that are in fair or higher pavement condition
		Decrease the % of bridges which are “structurally deficient”
		Decrease the % of bridges which are “functionally obsolete”
		Reduce the MBTA backlog of State of Good Repair projects
	Integrated Corridor Management	Number of intersections with LOS D or better
		Increase the % of bus trips by route with % of trips on time greater than X
		Increase the number of bus routes with traffic signal priority system
		Increase the number of transit stations that were treated for pedestrian and bicycle access
	Enhanced Traveler Information	Increase the number of 511 calls
		Increase number of visits to MPO website

Goal	Factor	Performance Measure
Improve the mobility in the Region for all modes	Strengthen connections between modes; close gaps in the existing system	Invest in those projects which close gaps
	Improve access to transit	Improve the bicycle and pedestrian network within 1/2 of transit stations
		Increase the number of parking spaces available at transit stations
	Improve transportation accessibility	Increase the number of ADA compliant stations
		Increase the number of ADA compliant intersections
	Improve transit frequency	Reduce the mean miles between breakdowns (MMBB)
Improve transit reliability	Reduce the mean miles between breakdowns (MMBB)	
	Reduce the mean miles between failures (MMBF)	
Improve the safety and security of transportation related project throughout the Region	Improve the safety of the Regions Intersections	Reduce the number of accidents in the Region
		Reduce the average crash rate in the Region
	Improve transit safety in the Region	Reduce the mean miles between breakdowns (MMBB)

SUMMARY

The MPO is committed to employing management and operations improvements that will lead to increased mobility, safety, and security. An integral vision of *Paths to a Sustainable Region* is to succeed at preserving, modernizing, and improving the operational efficiency of the transportation system. Investments with this focus will help the MPO achieve its vision for 2035.