2

THE BOSTON REGION MPO AND ITS EXISTING TRANSPORTATION SYSTEM

The Boston Region MPO area is part of one of the largest metropolitan areas in the United States, considering population, density, and geographic size. The 101 cities and towns of the MPO region encompass approximately 1,405 square miles. The region lies roughly within the 20-mile radius extending from the city of Boston to the communities that abut Interstate 495. The 101 communities that compose the region are quite diverse (see Table 2-1), ranging from the relatively rural communities such as Essex to dense and urban Cambridge. The central city of the MPO area, Boston, is compact, at 48.4 square miles; however, it is closely surrounded by 13 cities, which contribute to the urban nature of the region's core. This core is an important population and employment center and trip destination.

The Greater Boston area is an urban setting rich in natural resources. Inland, the region offers over 25 state forests and parks, as well as numerous rivers, lakes, and ponds. Forests make up 39 percent of the area, with water, wetlands, and open space contributing another 11 percent. The region is bordered on the east by approximately 550 miles of coastal waterfront and the Boston Harbor Islands National Park.

The characteristics of the region present both opportunities and challenges for meeting the region's transportation needs.

Population

According to the 2000 U.S. census, the MPO region has a population of just over 3 million residents, almost 48 percent of the state's total population. It contains approximately 1.2 million households, yielding a regional average of 2.47 persons per household. The municipalities and the persons who reside within the region have different transportation needs requiring solutions designed to fit their diverse demographic, cultural, and environmental situations.

TABLE 2–1

A Comparison of the Five Least Populated Communities and the Five Most Populated Communities in the MPO Region

	POPULATION	HOUSEHOLDS	POP. / HH	SQUARE MILES	POP. / SQ. MI.
ESSEX	3,267	1,313	2.49	14.28	229
NAHANT	3,632	1,629	2.20	1.06	3,426
BOLTON	4,148	1,424	2.91	20.12	206
SHERBORN	4,200	1,423	2.95	16.10	260
WENHAM	4,440	1,285	2.70	8.12	547
BOSTON	589,141	239,528	2.31	49.40	11,926
CAMBRIDGE	101,355	42,615	2.03	7.16	14,156
LYNN	89,050	33,511	2.62	11.45	7,777
QUINCY	88,025	38,883	2.22	16.70	5,271
NEWTON	83,829	31,201	2.51	18.19	4,609
BOSTON REGION MPO	**3,071,600**	**1,197,397**	**2.47**	**1,405**	**2,182**

Source: U.S. census, 2000

Employment

The 2000 U.S. census indicates that the MPO region employed 1,833,250 persons in 2000, a 53 percent increase in the number of jobs from 1970. The majority of these jobs are in the urban core of the region, with the cities of Boston and Cambridge continuing to be the primary employment centers. However, the rate of job growth over the past 30 years outside of Route 128, which is approximately 11 miles from the center of Boston, significantly outpaced that inside Route 128, as shown in Table 2-2.

The rate of job growth outpaced that of population growth, widening the gap between available jobs and the labor force needed to fill them. This led to some of the new jobs in the MPO region being taken by persons living outside the region. This trend is likely to continue and will require collaborative efforts among the metropolitan plan-

TABLE 2-2

Population and Employment Growth in the MPO Region

	EMPLOYMENT			POPULATION		
AREA	**1970**	**2000**	**CHANGE**	**1970**	**2000**	**CHANGE**
INSIDE ROUTE 128	830,450	1,131,900	+36%	1,852,500	1,740,600	-6%
OUTSIDE ROUTE 128	365,900	701,350	+92%	1,161,250	1,331,000	+15%
REGIONWIDE	**1,196,350**	**1,833,250**	**+53%**	**3,013,750**	**3,071,600**	**+2%**

Source: U.S. censuses, 1970 and 2000, and CTPS Employment Database

TABLE 2–3

CHANGES IN LAND USE, 1991–1999

LAND USE	1991 (SQ. MI.)	1999 (SQ. MI.)	% CHANGE
RESIDENTIAL	471	503	+7%
COMMERCIAL	40	42	+5%
INDUSTRIAL	36	38	+6%
OPEN SPACE	80	79	-1%
FORESTS	558	536	-4%
CROPLAND / PASTURE	54	47	-13%
OTHER	197	193	-2%
TOTAL	**1,438**	**1,438**	

Source: Massachusetts Geographic Information System (MassGIS), 1999

ning organizations of eastern Massachusetts, southern New Hampshire, and Rhode Island to coordinate transportation planning.

Rapid expansion of employment in the last 25 years affected the transportation system in a number of ways:

- The transportation system became more extensive, to try to address the increasing needs of underserved communities.
- Transportation system demand became greater, putting increasing strain on the capacities of transportation facilities.
- Dispersed employment caused a change in trip patterns, creating longer trips, and in turn making it harder to provide these trips with alternative transportation modes.
- It is not possible to meet all of these demands with new transportation projects given the available resources. Increases in congestion may be able to be slowed through changes in land use patterns.

LAND USE

Between 1991 and 1999, the amount of developed land in the MPO region grew by 2.5 percent, or 7.6 acres a day on average. The majority of the new land consumption was for single-family housing. Most of this new development took place on formerly agricultural and forested lands. Table 2-3 shows the changes in land use in the region between 1991 and 1999. The majority of land being developed, whether for residential, industrial, or commercial uses, was located along the Route 128 and I-495 corridors.

Further information on the demographics and land use in the region is included in Chapter 11, Land Use and Economic Development.

THE EXISTING TRANSPORTATION SYSTEM

The transportation system in the MPO region is a collection of roads, bridges, transit services, freight rail lines, bicycle routes, pedestrian facilities, and ferry routes that need to work as an integrated system throughout the 101-municipality region and beyond. The transportation system is maintained and operated by a number of different agencies, including but not limited to the Massachusetts Highway Department, the Massachusetts Bay Transportation Authority, the Massachusetts Turnpike Authority, the Massachusetts Port Authority, the Department of Conservation and Recreation, and local entities.

In March 2007, the Massachusetts Transportation Finance Commission issued a report, *Transporta-*

tion Finance in Massachusetts. It stated that the MPO's transportation system is aging, with the MBTA over 100 years old and the interstate highway system 50 years old. The Finance Commission report estimated a transportation-needs gap of $15 billion to $19 billion over the next 20 years to maintain the existing transportation system. The Patrick-Murray administration has committed to work with the Legislature, the Transportation Finance Commission, and other stakeholders to develop a proposal to address these findings through comprehensive reform of the state's transportation financing system. The MPO will participate in this process.

The following sections describe each of the modes as they existed in 2006.

The Roadway System

Roadways

The region's roadway system is composed of interstate highways, other arterial highways, collector roads, local roads, and bridges. There are 23,237 lane-miles in the region. Regionwide, there are 1,153 miles of interstate highways; 5,322 miles of arterials; 2,582 miles of collector roads; and 14,180 miles of local roads.[1] Interstates and arterials are intended to provide a high level of mobility at a relatively high speed for long, uninterrupted distances with limited access. Collector roads provide a lower level of mobility than arterials, with lower speeds and shorter distances between access points; they connect local roads with arterials and provide access to abutting land uses. Local roads provide a high level of access to abutting land but provide limited mobility (lower volumes and lower speeds). Figure 2-1 on the following page, shows the functional classifications of major roads in Massachusetts.

Ownership and maintenance responsibilities for the region's roadways vary among local and state entities. The roadway classification, however, does not correlate to ownership. Roads and streets are grouped into functional systems according to the types of service they provide. Figure 2-2 shows the breakdowns of roadway ownership, classification, and type in the Boston region.

MassPike oversaw the largest and most complex roadway project in U.S. history, the Central Artery/Ted Williams Tunnel project in Boston. The major element of this project involved the demolition of an elevated highway and the creation of an underground expressway in its place, the extension of an interstate highway to link it to Logan International Airport, and the construction of a two-bridge crossing of the Charles River. The project, estimated to be 99 percent complete in April 2009, improves mobility in the highly congested downtown Boston area and on the interstates feeding into it. The construction of the Ted Williams Tunnel alone has reduced the time it takes to go from Logan Airport to the South Boston Seaport from 45 minutes, using the Tobin Bridge, to 4 1/2 minutes, using the Ted Williams Tunnel.

Roadway Maintenance

As in any major metropolitan area, the Boston region must continually maintain its roadways. The following programs and policies specifically address roadway maintenance and are discussed in further detail in Chapter 5 (System Preservation, Modernization, and Efficiency).

- The Chapter 90 program (named for Chapter 90 of the Massachusetts General Laws) is used for preserving existing transportation facilities. The program supports roadway construction and maintenance performed by local cities and towns. Typically the majority of Chapter 90 allocations are used for roadway resurfacing and roadway reconstruction. The remaining funding covers items such as engineering and equipment.

[1] MassHighway Road Inventory Year-End Report, 2006. These roadway categories differ from the roadway categories used in the MPO's Mobility Management System.

FIGURE 2-1

FUNCTIONAL CLASSIFICATION OF MAJOR ROADS IN MASSACHUSETTS

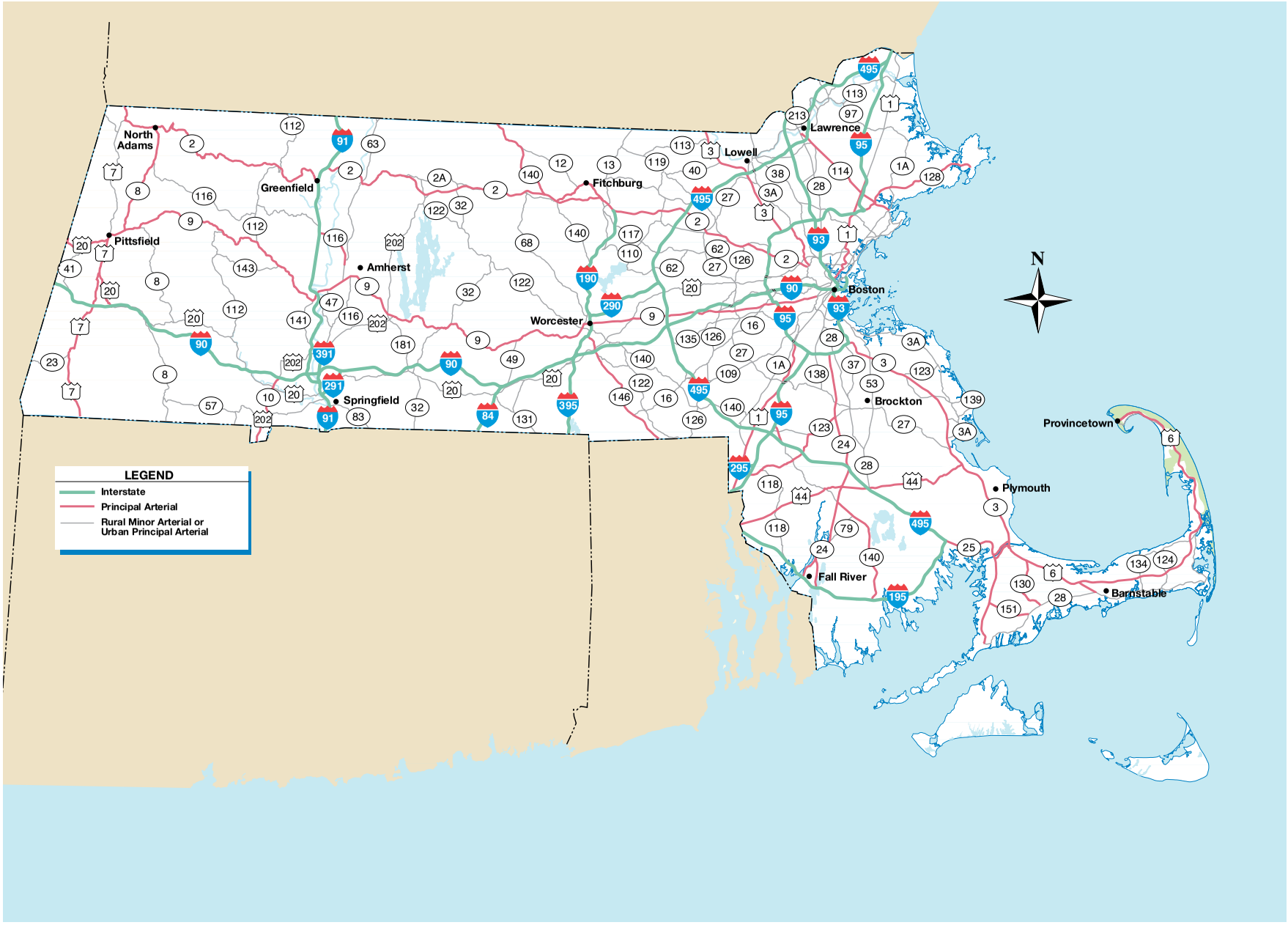
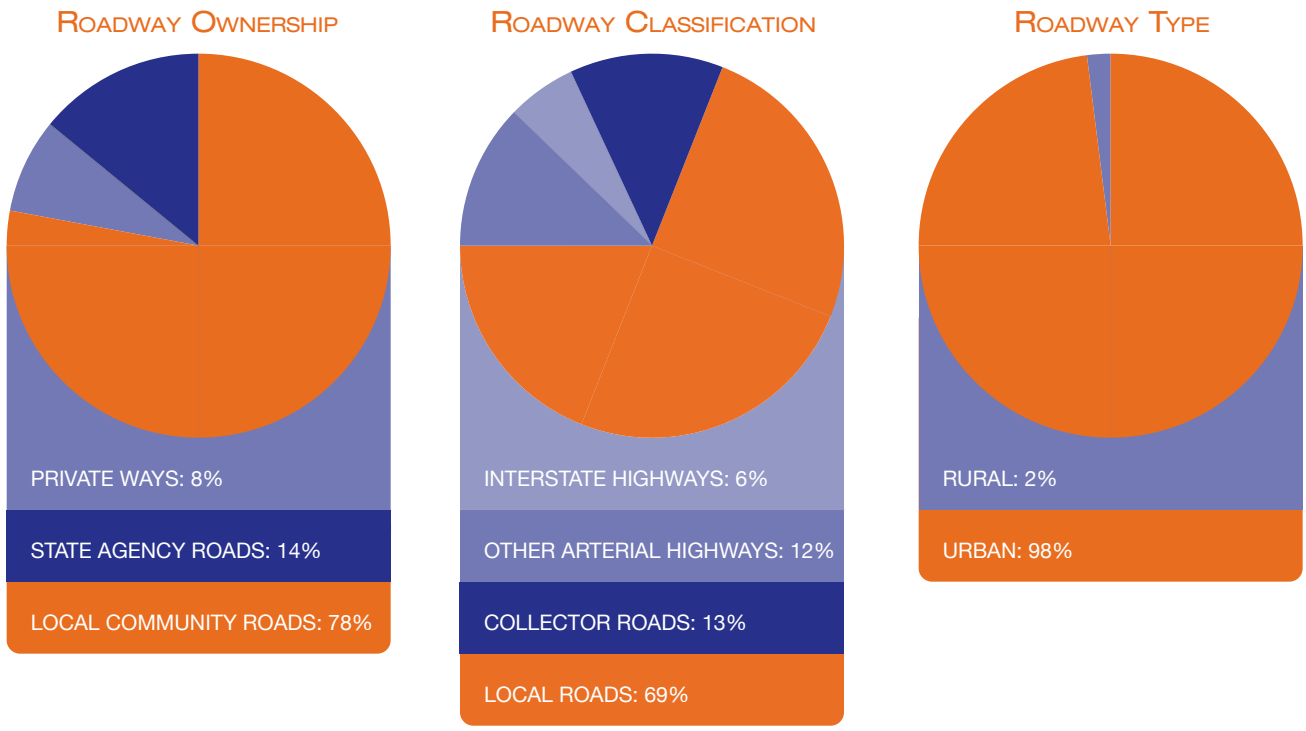


FIGURE 2-2

Breakdowns of Roadway Ownership, Classification, and Type



Source: MassHighway Road Inventory Year-End Report, 2006

- The MPO supports a preservation approach to infrastructure management to ensure that assets are managed, maintained, and operated to preserve their useful life and reduce the need for more costly, capital-intensive solutions.
- Another effort underscores the importance of community involvement in transportation decision-making by requiring that all MassHighway reconstruction projects be responsive to the environment—natural, cultural, and historic—within which the projects are undertaken. The needs of local residents, including pedestrians and bicyclists, must be considered as fundamental to the project, not as an afterthought.
- As part of this effort, the statewide Design Issues Working Group developed the *Project Development and Design Guide* in January of 2006. The Guide allows project proponents and stakeholders to think creatively about how to provide safe accommodation of a transportation facility's users while ensuring that it fits the facility's physical setting and preserves aesthetic, historic, and environmental resources.

Pavement Management

MassHighway maintains a pavement management system, which stores, analyzes, and summarizes pavement information for use in selecting and implementing cost-effective pavement construction, rehabilitation, and maintenance programs. MassHighway constantly monitors the roadway network's roughness and deterioration using a variety of methods and measuring devices. The current pavement condition of roadways under MassHighway jurisdiction is as follows:

- Excellent rating – 34 percent
- Good rating – 40 percent
- Fair rating – 21 percent
- Poor rating – 5 percent

Projected future conditions with an assumed pavement funding level of $135 million annually would be:

- Excellent rating – 52 percent
- Good rating – 28 percent
- Fair rating – 14 percent
- Poor rating – 6 percent

Roadway Congestion Levels

The MPO documents the region's mobility concerns through its Congestion Management Process (CMP). CMP data and analyses show that during the most recent period of monitoring arterial roadways (2001–2003), average morning peak period speeds were below the posted speed limit on 39 percent of the monitored arterial roadway network, compared with 32 percent during the previous monitoring period, five years earlier. The difference between the two monitoring periods was smaller during the evening peak period, where average speeds were below the posted speed limit on 42 percent of the monitored arterial roadway network, compared with 40 percent during the previous monitoring period.

On limited-access highways (interstate highways), travel speed data show that during the latest monitoring period (1999–2000), 29 percent of the region's highway network had average morning peak-period speeds of less than 50 mph, compared with 21 percent during the previous monitoring period five years earlier. In the evening, 25 percent of the region's highway network had average evening peak-period speeds of less than 50 miles per hour during the most recent monitoring period. However, the findings do not indicate that speeds have changed significantly since the previous monitoring period.

Chapter 6, Mobility, includes a detailed discussion of congestion and mobility in the region, along with descriptions of programs employed by the MPO and its member agencies to mitigate congestion and improve mobility.

Bridges

Of the 4,979 bridges in Massachusetts, 1,447 are located within the MPO area. Ownership of the bridges in the MPO area is broken out as follows:

- 61 percent are under the jurisdiction of MassHighway
- 17 percent are under the jurisdiction of cities and towns
- 9 percent are under the jurisdiction of MassPike (now under the jurisdiction of MassDOT)
- 13 percent are under the jurisdiction of other state agencies, including the Department of Conservation and Recreation and the MBTA

In Massachusetts, bridge conditions are determined through a nationally adopted rating system based on a number of standards. The standards include structural adequacy, safety, serviceability, traffic, and public use. The three major condition categories are listed below with the percentage of bridges in the MPO region that fall under each category:

1. Meets standards: of the bridges in the MPO region, 54 percent fall under this category.
2. Functionally obsolete: The bridge fails to meet current traffic demands or highway standards such as bridge width, traffic volume, or condition of approach roadways. Inclusion in this category does not necessarily mean that the bridge itself is deficient or there is an immediate safety concern. Of the bridges in the MPO region, 34 percent fall under this category.
3. Structurally deficient: Deterioration has reduced the load-carrying capacity of the bridge and is an indication that reconstruction may be necessary. MassHighway rates bridges to determine their safe load-carrying capacity using three standard rating trucks: a two-axle single unit, a three-axle single unit, and a five-axle tractor-trailer. If a bridge is weight-restricted, it can impede the flow of fire trucks, ambulances, school buses, or commercial trucks, delaying their response or

requiring them to detour through residential neighborhoods or circuitously through remote areas. Of the bridges in the MPO region, 12 percent fall under this category.

More information on the road and bridge programs discussed above is provided in Chapter 5, System Preservation, Modernization, and Efficiency.

The Public Transportation System

The Boston metropolitan area is served by a hub-and-spoke network of rapid transit, streetcar, express bus, commuter rail, and commuter boat lines. Local bus and trackless trolley services fill in gaps between spokes by offering line-haul service in heavily congested urban areas, feeder service to rail, and some intersuburban linkages. Demand-responsive transportation for people with disabilities and the elderly is also provided.

The MBTA is the primary transit provider in the Boston region. The MBTA district is made up of 175 municipalities and includes communities outside of the Boston Region MPO area. Table 2-4 shows the typical weekday boardings by mode for the MBTA. Each of the transit services is briefly described below. For a more detailed description of the MBTA's existing services, see the Program for Mass Transportation (PMT) adopted in May 2003 (www.bostonmpo.org/bostonmpo/pmt/pmt.html).

TABLE 2–4

Typical Weekday Boardings by Mode

MODE	BOARDINGS
RAPID TRANSIT AND STREETCAR	628,400
BUS AND TRACKLESS TROLLEY	363,500
COMMUTER RAIL	135,900
CONTRACTED BUS	4,400
COMMUTER BOAT	4,650
PARATRANSIT	5,400
TOTAL	**1,142,250**

Source: MBTA, "Ridership and Service Statistics," Tenth Edition, 2006.

Rapid Transit and Streetcar

The MBTA rapid transit and streetcar system serves 140 stations on six lines. Typical weekday passenger boardings on this system were 628,400 in 2005.

- Red Line – 21-mile rail rapid transit line with 22 stations running on two branches between Alewife Station in North Cambridge to both Ashmont Station in Dorchester and Braintree Station in Braintree. It is the longest and most heavily utilized rapid transit line in the system.
- Mattapan High Speed Line – 2.5-mile, eight-station streetcar line connecting with the Red Line and operating between Ashmont Station and Mattapan through the Dorchester neighborhood of Boston and the town of Milton.
- Orange Line – 11-mile rail rapid transit line with 19 stations operating between Oak Grove on the Malden/Melrose line and Forest Hills in Jamaica Plain.
- Blue Line – 6-mile, 12-station rail rapid transit line, the shortest of the rail rapid transit lines, operating between Wonderland Station in Revere and Bowdoin Station in the Government Center area of Boston.
- Green Line – 23-mile streetcar line over four branches: Boston College (B Line), Cleveland Circle (C Line), Riverside (D Line), and Heath Street (E Line). The line has 66 stops/stations and is located in Boston, Brookline, Cambridge, and Newton.
- Silver Line – 2.3-mile bus rapid transit line with 13 stations operating along Washington Street between Dudley Square in Roxbury and Downtown Crossing in Boston, and a 6.5-mile bus rapid transit line with 19 stops/stations operating along the waterfront from South Station with three branches: SL1 to Logan International Airport, SL2 to Boston Marine Industrial Park, and SL3 to City Point. In 2009 a connection between Downtown Crossing and South Station was added.

FIGURE 2-3

MBTA Rapid Transit and Streetcar System

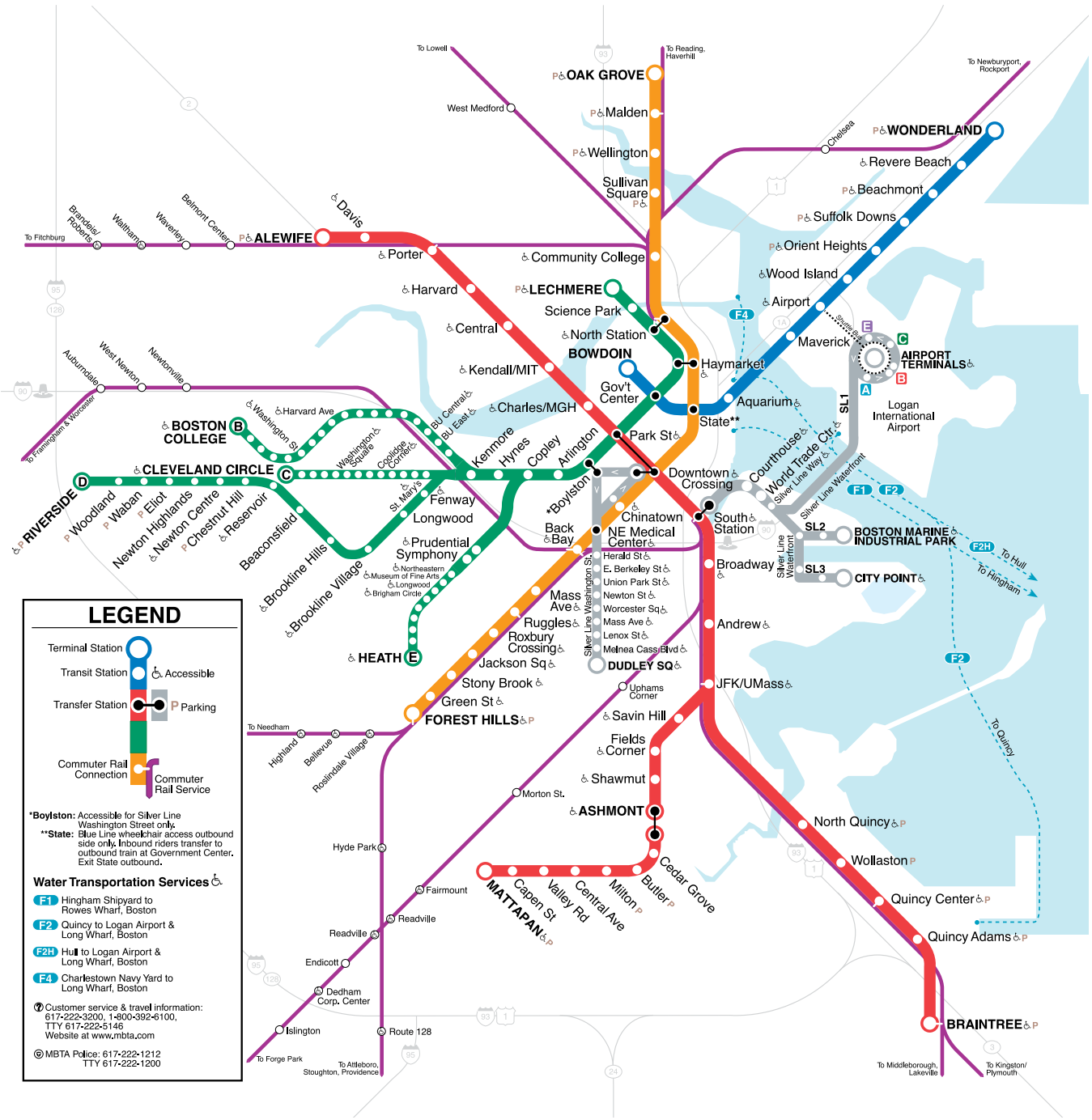


Figure 2-3 shows the rapid transit and streetcar service in the Boston region.

Bus and Trackless Trolley

The MBTA operates 178 bus routes, and it also has four electric trackless trolley lines in Cambridge, Watertown, and Belmont. Figure 2-4 shows the municipalities within the Boston region that are served by the MBTA bus system. Typical weekday passenger boardings on bus and trackless trolley routes were 363,500 in 2005, and nearly all bus routes connect with the rapid transit system. Bus service includes crosstown service, feeder service to rapid transit stations, frequent service along major arterials in heavily congested areas, and express bus service. Most of these routes have lengthy histories, and many had their origins as streetcar lines built before 1900. Schedules and routings have been revised gradually over the years, but most continue to operate along the same general alignments in response to continuing demand.

Commuter Rail

The 365-mile commuter rail network is composed of 13 radial lines and 126 stations (see Figure 2-5). Typical weekday passenger boardings on the network were 135,900 in 2005. The commuter rail system is split into two parts: North Side service operates to and from North Station, and South Side service to and from South Station. The Massachusetts Turnpike can be considered the dividing line between North and South Side service: all routes north of the Turnpike—the Rockport, Newburyport, Haverhill, Lowell, and Fitchburg Lines—operate to and from North Station. Lines along the Turnpike or to the south—the Framingham/Worcester, Needham, Franklin, Providence, Stoughton, Fairmount, Middleborough, and Kingston/Plymouth lines—operate to and from South Station. There is no direct transit connection between North and South Stations, although a project to link the two has been proposed. Although this project is not included in the Plan at this time, the MPO feels that a study of the right-of-way requirements should be conducted for preservation of that right-of-way so as not to preclude this project's going forward in the future.

Over 40,000 park-and-ride spaces are provided for commuter rail riders. In addition, the Greenbush Line operating from South Station to Scituate opened in 2007.

Commuter Boat

MBTA commuter boat service operates between:

- Hingham and Rowes Wharf (Boston)
- Quincy, Long Wharf (Boston), and Logan Airport
- Quincy, Hull, Logan Airport, and Long Wharf
- Charlestown Navy Yard and Long Wharf

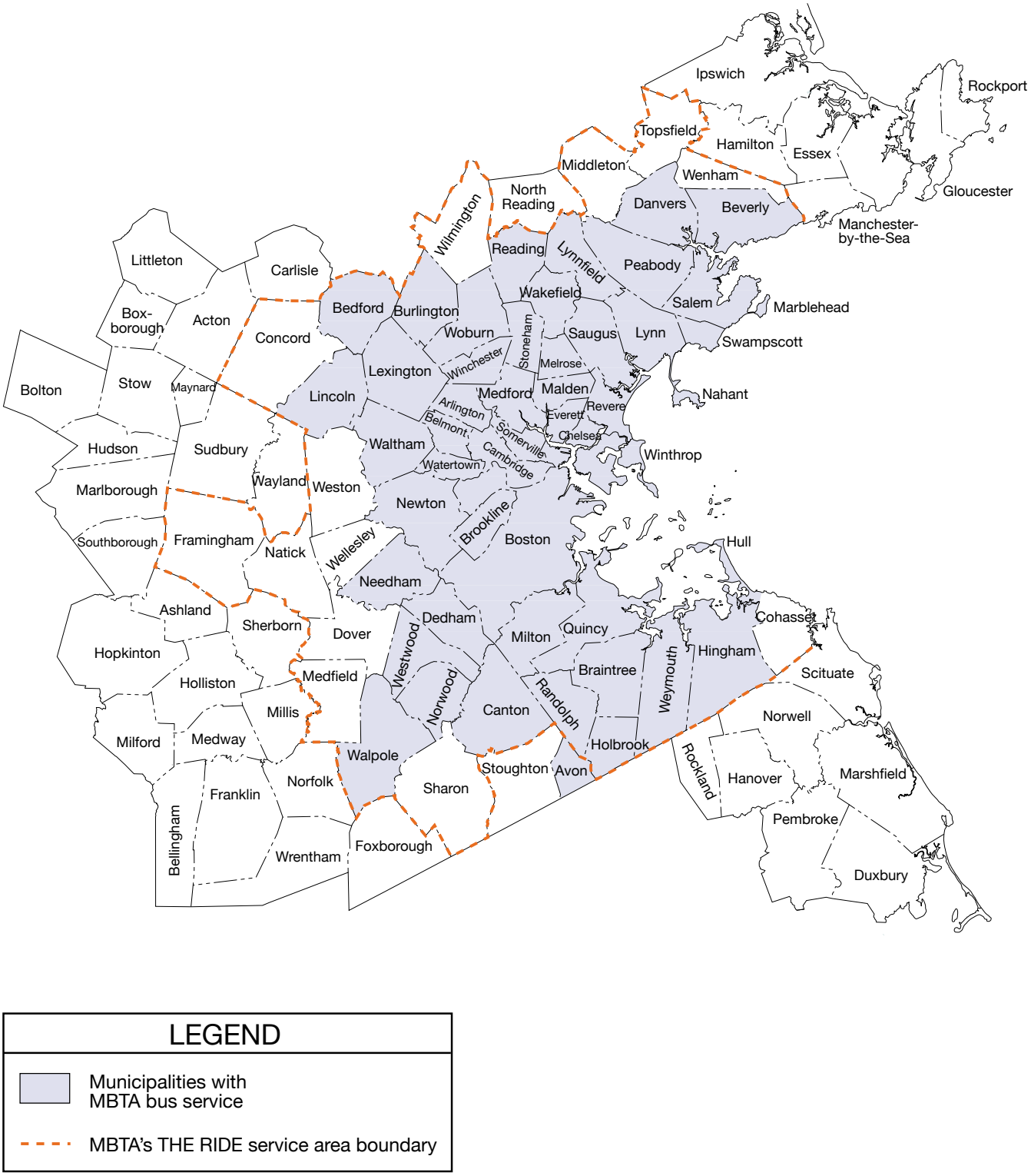
A total of 2,497 parking spaces are provided in Hingham, Quincy, and Hull. Typical weekday passenger boardings on the boat service were 4,650 in 2005.

Demand Responsive Transit Services

THE RIDE is a demand responsive transit service operated by private carriers under contract to the MBTA that provides transportation to people who cannot use fixed-route public transportation because of disabilities all or some of the time. THE RIDE operates sedans and lift-equipped

FIGURE 2-4

MUNICIPALITIES SERVED BY THE MBTA BUS SYSTEM AND THE RIDE



LEGEND

- Municipalities with MBTA bus service
- MBTA's THE RIDE service area boundary

FIGURE 2-5

MBTA Commuter Rail System

vans within 62 municipalities in the MBTA district (Figure 2-4). It is a shared-ride service provided 365 days a year from 6:00 AM to 1:00 AM. The MBTA also issues a reduced fare "Transportation Access Pass" to anyone age 65 and older and to persons with disabilities who are able to use public transportation. The passes are valid on public transportation anywhere in Massachusetts.

In addition, services are provided through a number of community senior transportation resources in the region. They include:

- Boston Senior Transportation Services (senior shuttle, taxi discount program, and the Kit Clark Program, which provides lift-equipped vans from seniors' homes and program sites)
- Brookline Elder Bus and Brookline Elder Taxi System
- Cambridge Taxi Discount Program
- Newton Department of Senior Services (Shopper's Bus and transportation to medical services)
- SCM Community Transportation (for residents of Somerville, Cambridge, and Medford)

Private Carrier and Suburban Bus Service

Four private carriers provide regular local bus transportation in East Boston, Winthrop, Medford, Milton, Canton, Hingham, and Hull under contract to the MBTA. Five additional private carriers are funded by EOT and administered through the MBTA's Inter-District Transportation Program (ITP) to provide commuter service to downtown Boston. The same program also finances a local service from Braintree Station to Hanover and Marshfield. Nine private carriers that are not included in the ITP program also operate commuter service into Boston.

The MBTA provides funding to local communities to operate their own local transit systems. The Suburban Bus Program is geared toward low-density communities where regular MBTA service would not be cost-effective. The program, which began in 1979, subsidizes nine services in Beverly, Burlington, Bedford, Lexington, Natick, Framingham, Dedham, and Mission Hill in Boston. In addition, funded by EOT, Framingham runs three routes to neighboring communities. Peabody operates a local bus service that is not included in the Suburban Bus Program.

In addition, the MPO has implemented a suburban mobility program. The purpose of the program is to address transportation needs in areas that are currently not served or are underserved by transit. This program initiates outreach to encourage eligible entities to develop projects and apply for project funding. Currently service is being provided in Ipswich, Essex, Framingham, Marlborough, and Southborough.

Several buses from adjacent regional transit authorities connect with MBTA buses. These connections include Brockton Area Transit's connection to MBTA Route 716 at Cobb Corner; Lowell Regional Transit Authority's connections to Routes 350, 351, and 352; and Cape Ann Transportation Authority's connections to Routes 435, 436, and 465.

Park-and-Ride Facilities

There are 121 park-and-ride facilities in the Boston region. These facilities provide 46,190 parking spaces for public use. Most of the facilities are located at transit stations or at access points to limited-access highways. The MBTA is the largest provider of commuter parking spaces. MassHighway, Massport, and Masspike also operate park-and-ride facilities. The locations of the region's lots are shown in Figure 2-6, which also identifies the lots that are at capacity and in need of expansion or augmentation. Park-and-ride facilities are monitored through the CMP. For more information on park-and-ride facilities, see Chapter 6, Mobility.