I-93/Southeast Expressway/Route 3 (Braintree Split)

Operational Assessment and Potential Improvements

A report produced
by the Central
Transportation Planning
Staff for the Boston
Region Metropolitan
Planning Organization

To request additional copies of this document or copies in an accessible format, contact:

Seth Asante, Project Manager

Central Transportation Planning Staff
10 Park Plaza, Suite 2150
Boston, Massachusetts 02116

(617) 973-7098
(617) 973-8855 (fax)
(617)-973-7089 (TTY)

seth.asante@ctps.org

ADVISORY TASK FORCE

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Susan Kay, Executive Secretary
Robert Campbell, Town Engineer
Timothy G. Egan, former member of Board of Selectmen
Peter LaPolla, Planning Director

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Ron Zooleck, South Shore Chamber of Commerce

South Shore Coalition
Paul Halkiotis, Chairman
Ann Burbine, Vice Chairman

I-93/Southeast Expressway/Route 3 (Braintree Split)

Operational Assessment and Potential Improvements

Project Manager
Seth Asante

Project Principal
Efi Pagitsas

Project Analysts
Lourenço Dantas
Paul Reim

Data Collection
Thomas Nixon
Hiral Gandhi

Geographic Information Systems
Kathy Jacob
David Knudsen
Mark Scannell
Paul Reim

Cover Photography
Carol Bent

Cover Design
Jane M. Gillis

The preparation of this document was supported by the Massachusetts Highway Department and Federal Highway Administration through MassHighway SPR Highway Planning Contracts #33097 and 31049.

Central Transportation Planning Staff
Directed by the Boston Region Metropolitan Planning Organization. The MPO is composed of state and regional agencies and authorities, and local governments.

March 2006

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ORIGIN OF STUDY

State legislators, South Shore Coalition members, and officials from South Shore area communities requested that this study be included in the fiscal year 2002 Unified Planning Work Program produced by the Boston Region Metropolitan Planning Organization (MPO). In their letter to the MPO, proponents of this study expressed concern about safety, congestion, and delays at the Braintree split, especially their effects on Route 3 in that vicinity.

THE BRAINTREE SPLIT

The “Braintree split” is essentially the network of ramps and highway segments that comprise the interchange of I-93, the Southeast Expressway, and Route 3 South. The split is located partially in the town of Braintree and partially in the city of Quincy. All ramps into and out of the interchanges are directional. A directional connection is defined “as a one-way roadway that does not deviate greatly from the intended direction of travel. Interchanges that use direct connections for the major turn movements are termed directional interchanges.”[1]

To the southeast of the split are Route 3 interchanges 18 (Washington Street) and 19 (Burgin Parkway) with their associated lane drops and weaving, merging, and diverging maneuvers that add to the complexity of the main interchange. Immediately to the southwest of the split is I-93 interchange 6 (Route 37, Granite Street). Just north of the split is the southern terminus of the Southeast Expressway HOV lane and less than one-half mile north of that is interchange 8 (Furnace Brook Parkway).

During an average weekday, the Braintree split carries between 250,000 and 275,000 vehicles on six two-lane directional ramps that connect the three major highways: I-93/Southeast Expressway, I-93/ Route 128, and Route 3 South. In short, the Braintree split is an interchange that was designed for high-level connections (flyovers). It carries more than a quarter of a million vehicles a day, whose drivers encounter a complex driving environment, including the unpredictability of traffic incidents. Therefore congestion, delays, and queues are common, especially in the northbound direction in the morning and, to a lesser degree, in the southbound direction in the evening.

[1] American Association of State and Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets,* Fourth Edition, Washington, D.C., 2001.

TRANSPORTATION PROBLEMS

Studies and field reconnaissance indicate that many of the delays at the Braintree split interchange are due to bottlenecks outside of the split itself. One example is the northbound AM peak period traffic congestion on the Southeast Expressway resulting from downstream turbulence of merging traffic from the Granite Avenue on-ramp, the Route 3A on-ramp, the HOV lane merge, and the Columbia Road on-ramp. In addition, ramp merge difficulties at the entrance to Route 24 create PM peak-period traffic congestion on the I-93 segment beginning at Route 24 that spills back into the split. Also, on Route 3 South the AM peak period merging traffic from the northbound on-ramps at Union Street, Route 18, Derby Street, and other routes creates traffic turbulence on Route 3 South, resulting in extensive traffic queuing.

The internal problems are the weaving, merging, diverging, short sight distance, insufficient intersection capacity, and lane drops. Many internal problems of the AM peak travel period also show up during the PM peak travel period. Field reconnaissance indicates that some of the merging and weaving traffic operations at the Braintree split create safety problems, for example, the short weave sections for Route 37 northbound on-ramp traffic proceeding to the Southeast Expressway and for Washington Street northbound on-ramp traffic proceeding to the HOV lane. Another example is the southbound PM peak-period traffic congestion on the Southeast Expressway that result from the downstream turbulence of merging traffic from the Furnace Brook Parkway on-ramp, the HOV lane, and traffic diverging to Route 3 South and I-93 southbound. This causes traffic queues on the Expressway that extend into the Granite Avenue area.

Transportation problems in the study area include, but are not limited to, traffic congestion, highway safety issues, and mobility. The Central Transportation Planning Staff (CTPS) applied a regional approach to address the problems identified in and around the split, as its traffic is regional in character, in other words, it is not confined to the adjacent communities. Also, as most of the congestion at the split occurs during the peak travel periods, the study focused on commuter trips between communities in southeastern Massachusetts and the Boston urban core. In this study, highway, transit, and parking solutions were considered for improving safety and traffic flow through the split. All of the planned transit and highway projects currently under construction or in planning stages that would affect traffic through the split were reviewed and accounted for.

OBJECTIVES

The primary objectives of the study were to:

- Assess traffic operations on ramps and roadways within the Braintree split and leading to and from the split.
- Develop, evaluate, and recommend operational improvements to improve traffic safety and operations.

The purpose of this study is to focus on operational improvements that can be implemented in the short term. In developing plans for the improvements, the following criteria were considered: that the improvements would not require land takings, would have no adverse environmental impacts, would not adversely affect residential neighborhoods, could be constructed within the right-of-way, would be cost-effective, and would buy time to look at long-range improvements. Particular attention was paid to the impacts of the split on Route 3 South operations.

CTPS conducted the study in conjunction with an advisory task force composed of representatives from Braintree, Quincy, Milton, the Massachusetts Highway Department (MassHighway), the Massachusetts Bay Transportation Authority (MBTA), the Metropolitan Area Planning Council (MAPC), the South Shore Coalition, the South Shore Chamber of Commerce, and elected officials. The advisory task force met three times during the course of the study, at the Braintree Town Hall. At these meetings, the work program for the study and task products were presented for comments and feedback. Appendix A contains information on the public participation efforts, including comments on this study, the CTPS response, and attendance at task force meetings.

STUDY AREA

The primary study area extends between Route 3 South interchange 17 (Union Street, Braintree), I-93 interchange 6 (Route 37, Braintree), and I-93/Southeast Expressway interchange 8 (Furnace Brook Parkway, Quincy). Operational improvements were developed and tested for this study area. During the testing, the study area was expanded beyond I-93 interchange 6, I-93 interchange 8, and Route 3 South interchange 17 in order to determine the benefits and impacts of the additional improvements that are recommended for further consideration.

The study area supports a variety of land uses, including residential, industrial, commercial, and recreational. Specific uses include office and industrial parks and shopping centers. It has a well-established land use pattern; therefore, future developments can be expected to consist of mostly redevelopment at existing sites. The area under study is served by public transportation, including bus transit, rapid transit, and commuter rail transit. However, about 70 percent of the commuting trips to the Boston urban core are by automobile; they occur during peak travel periods and pass through the split.

PREVIOUSLY PLANNED AND PROPOSED IMPROVEMENTS

Presently, there are highway and transit improvement projects that have already been planned for the area to increase traffic flow, improve safety and mobility, and facilitate redevelopment in the area. Of these projects, the Greenbush and the New Bedford/Fall River commuter rail lines, the Burgin Parkway Viaduct Project, and the Naval Air Station Access Improvements are the most significant. Other significant projects are the proposed Route 3 South Transportation Improvements Project and the extension of the I-93/ Granite Street (Route 37) Northbound Off-Ramp.

ADDITIONAL IMPROVEMENTS RECOMMENDED IN THIS STUDY

The recommended improvements that were developed with the participation of MassHighway, the MBTA, and the study's advisory task force were assembled into two packages—a safety package and a traffic flow package. They include upgrading short acceleration and deceleration lanes, improving HOV access, adding advanced queue detection and warning systems, and other improvements that would remove bottlenecks and facilitate traffic flow. The planned highway and transit projects and the additional improvements, if implemented, are expected to increase safety and improve traffic flow at the split.

The improvements that were recommended by CTPS in this study for further consideration are described in detail in Chapter 7 and are summarized below. Their locations are indicated in white on the accompanying maps, which also give location numbers. The numbers are consistent with the numbers used to designate these locations throughout this report. The traffic problems at each location are detailed in Chapter 2.

CTPS, MAPC, MassHighway, and the advisory task force suggested several improvements for evaluation. All of the improvements were discussed with safety, design, and environmental experts from MassHighway. The improvements that were suggested but were not recommended are documented in Appendix C of this report, along with the reasons for not recommending them.

Safety Improvement Package

Overview Map

Improvements at Location #1 Upgrade short deceleration lane to improve safety and provide more space for exiting traffic. The proposal calls for:

- Lengthening the existing deceleration lane on southbound I-93 onto Route 37 as far back as possible to provide more storage room and sufficient length for exiting vehicles to change lanes.
- Installing signs on the Route 3 South connector informing motorists exiting onto Route 37 that they should be in the rightmost lane.

These modifications would improve safety and make it easier for northbound Route 3 South traffic to exit onto Route 37.

Improvements at Location #2 Reconfigure existing ramp to eliminate the short weave distance and improve safety for Route 37 traffic heading north to the Expressway. The proposal calls for:

- Restricting the existing on-ramp to serve only the traffic that is heading to Route 3 South. A median barrier or some form of separation would be required to prevent the ramp traffic from violating this restriction.
- Constructing a double left-turn bay at the signalized ramp-arterial junction for use by traffic proceeding to the Expressway to access the south-side on-ramp.
- Installing new signs or modifying existing signs on Route 37 to guide motorists to the appropriate ramps.

These modifications would increase safety at the split by providing the south-side on-ramp to the Expressway with a longer weaving section.

Improvements at Location #3 Install advanced warning and detection systems to improve safety on the Route 3 South connector from the Expressway during the PM peak period. The proposal calls for:

- Installing real-time sensors for queue detection and overhead variable message signs to inform and warn motorists to reduce speed in advance of the downstream traffic queue that is obscured from view by the horizontal curvature of the roadway.

Improvements at Location #4 Enhance access to the HOV lane for Washington Street on-ramp traffic during the AM peak period of travel. The proposal calls for:

- Moving the connector between Burgin Parkway and Washington Street northbound on-ramp and the Expressway further south and creating a new ramp connector with a right full auxiliary lane.
- Installing new signs to direct traffic to the HOV lane.

The proposed ramp connector upgrade would, in effect, lengthen the weaving distance over which traffic on this ramp can change lanes to access the HOV lane.

Traffic Flow Improvement Package

Improvement at Location #5 Lengthen the acceleration lane for the southbound on-ramp from the Furnace Brook Parkway to the Expressway. The upgrade is expected to reduce merging and weaving in the area and to help on-ramp traffic from the Furnace Brook Parkway enter the Expressway.

In addition, the feasibility of a long-term solution should be examined: extending the HOV lane on the Southeast Expressway to Route 3 South and to I-93 toward Route 24. These extensions would remove the weave and merge of southbound HOV traffic heading to Route 3 South and to I-93 toward Route 24.

Overview Map

Improvements at Location #6 Improve traffic safety and flow at the Burgin Parkway/Centre Street intersection. The Burgin Parkway Viaduct Project in Quincy, already in the design stages, will address this problem. That project is described in detail in Chapter 6.

Improvement at Location #7 Make design configuration improvements for the southbound section of Route 3 South between the split and Union Street. This proposal was designed to address the PM peak-period southbound congestion on Route 3 South between the split and Union Street. This segment of Route 3 South, with three southbound travel lanes, is a bottleneck, as it receives high traffic volumes from five lanes—two from the Expressway southbound, two from I-93 northbound from (Route 128), and one from the Burgin Parkway southbound on-ramp to Route 3 South. The proposal calls for:

- Adding a fourth southbound travel lane on this segment of Route 3 South. The fourth lane would be an auxiliary lane, beginning at the Burgin Parkway on-ramp and possibly ending after the exit ramp at the Union Street interchange. This lane would facilitate the maneuvering of entering and exiting traffic, which would increase the capacity of this section of the roadway.

This proposal would also benefit the Burgin Parkway Viaduct project by reducing the southbound on-ramp traffic queues to Route 3 South.

Improvement at Location #8 Upgrade ramp acceleration lane to improve traffic flow from the Burgin Parkway and Washington Street to southbound I-93/Route 128. This proposal was designed to address traffic safety and congestion at the merge point of the connector ramp from the Burgin Parkway and Washington Street to southbound I-93. The proposal calls for:

- Lengthening the acceleration lane for the on-ramp from Burgin Parkway and Washington Street to the connector between Route 3 South and I-93 southbound.

This improvement is expected to increase safety at this location. In addition, when it is combined with improvements #1 and #10, it would help reduce congestion at this location, as traffic congestion at locations #1 and #10 often impacts traffic flow at location #8.

Improvements at Location #9 Make design configuration improvements at interchange 17 (Union Street in Braintree). This proposal was designed to specifically address on-ramp traffic to and from the Union Street rotary interchange that impacts traffic flow on Route 3 South and the Braintree split during the AM and PM peak travel periods. The proposal calls for:

- Upgrading the northbound acceleration lane into an auxiliary lane, possibly ending after the exit ramp at exit 19 (MBTA's Quincy Adams Station), to provide more room for the on-ramp traffic to merge with northbound traffic on Route 3 South during the AM peak period.
- In the southbound direction, upgrading the deceleration lane into an auxiliary lane, possibly extending just past the exit ramp, as an exit-only lane to provide more storage room for the southbound traffic exiting onto Union Street and to improve traffic flow on southbound Route 3 during the PM peak period.
- Implementing intersection improvements at the Union Street rotary interchange, including slip lanes for right turns.

These modifications would improve traffic flow and safety on Route 3 South and would reduce congestion at the Union Street rotary.

Improvements at Location #10 Make design configuration improvements on the I-93 segment between Routes 24 and 37 and related interchange improvements at interchange 4 (Route 24). This proposal was designed to address PM peak-period traffic congestion that impacts traffic operations at the split; specifically, congestion on I-93 near Routes 24 and 128 that spills back into the split. The proposal calls for:

- Adding a travel lane on I-93 southbound beginning south of the Route 37 interchange and ending at the area where traffic diverges to Route 24.
- Reconfiguring the lane assignment at the diverge point of I-93 and Route 24 to dedicate two travel lanes to the two-lane connector ramps for about one-half mile on I-93 southbound.
- Widening the merge point of Route 24 southbound to receive the four travel lanes from the connecting ramps. This improvement would have significant congestion-reduction benefits.
- Installing new signs or modifying existing signs to guide motorists to Route 24.

The proposed improvements are expected to facilitate traffic flow on southbound I-93 approaching Routes 24 as well as through the split.

Improvements at Location #11 Make traffic improvements at the I-93/Route 37 ramp-arterial junction. The I-93/Route 37 traffic improvements for addressing the problems at this location are already in the planning/design stages. That project is described in detail in Chapter 6.

BENEFITS OF THE IMPROVEMENTS

In 2025, increased traffic volumes are expected to increase delays that will be worse than 2003 conditions and to increase the extent and duration of congestion if the no-build option is implemented. The proposed improvements (all together) would improve travel conditions in 2025 at the Braintree split and its connecting highways. Travel speeds and travel-time savings using the build and no-build options for 2025 are shown are shown in Figures 28 and 29. The proposed improvements would reduce the impacts of bottlenecks in and around the split and are expected to increase traffic safety in the study area.

Both highway and transit solutions are needed to address 2025 traffic demand. The transit projects described in Chapter 6 (commuter rail to Greenbush, New Bedford/Fall River, and Wareham; suburban commuter rail feeder bus service; parking enhancements, etc.), if implemented, would attract new transit riders diverted from non-transit trip modes such as "drive alone." As a result, these transit projects have congestion reduction benefits and would improve regional transit system capacity, mode choice, and connectivity.

The proposed improvements described in this report are conceptual in nature. They primarily address safety problems and bottlenecks in the highway system. Although preliminary analysis of the improvements indicates that they have significant safety and operational benefits, they would have to undergo further review and analysis before final recommendations are made. Such review and analysis would include, but not be limited to, environmental and right-of-way issues, public support and participation, benefit and cost analysis, design, and prioritization of the improvements. In all cases, MassHighway would be the implementing agency.

NEXT STEPS

The next steps after this study are as follows:

- Perform further review and analysis including, but not limited to, environmental and right-of-way issues, public support and participation, benefit and cost analysis, design, and prioritization of the improvements before final recommendations are made.
- Develop long-term solutions to address mobility, safety, and congestion issues, including additions and redesigns, transit solutions, and travel demand management strategies.
- Evaluate the feasibility of another long-term solution: extending the HOV lane on the Southeast Expressway to Route 3 South and to I-93 toward Route 24. These extensions would remove the weave and merge of southbound HOV traffic heading to Route 3 South and to I-93 toward Route 24.

1 INTRODUCTION

State legislators, South Shore Coalition members, and officials from South Shore communities requested that this study be included in the Boston Region MPO's fiscal year 2002 Unified Planning Work Program. In their letter to the Boston Region MPO, proponents of this study expressed concern about safety, congestion, and delays in the Braintree split, especially their effects on Route 3 South in that vicinity.

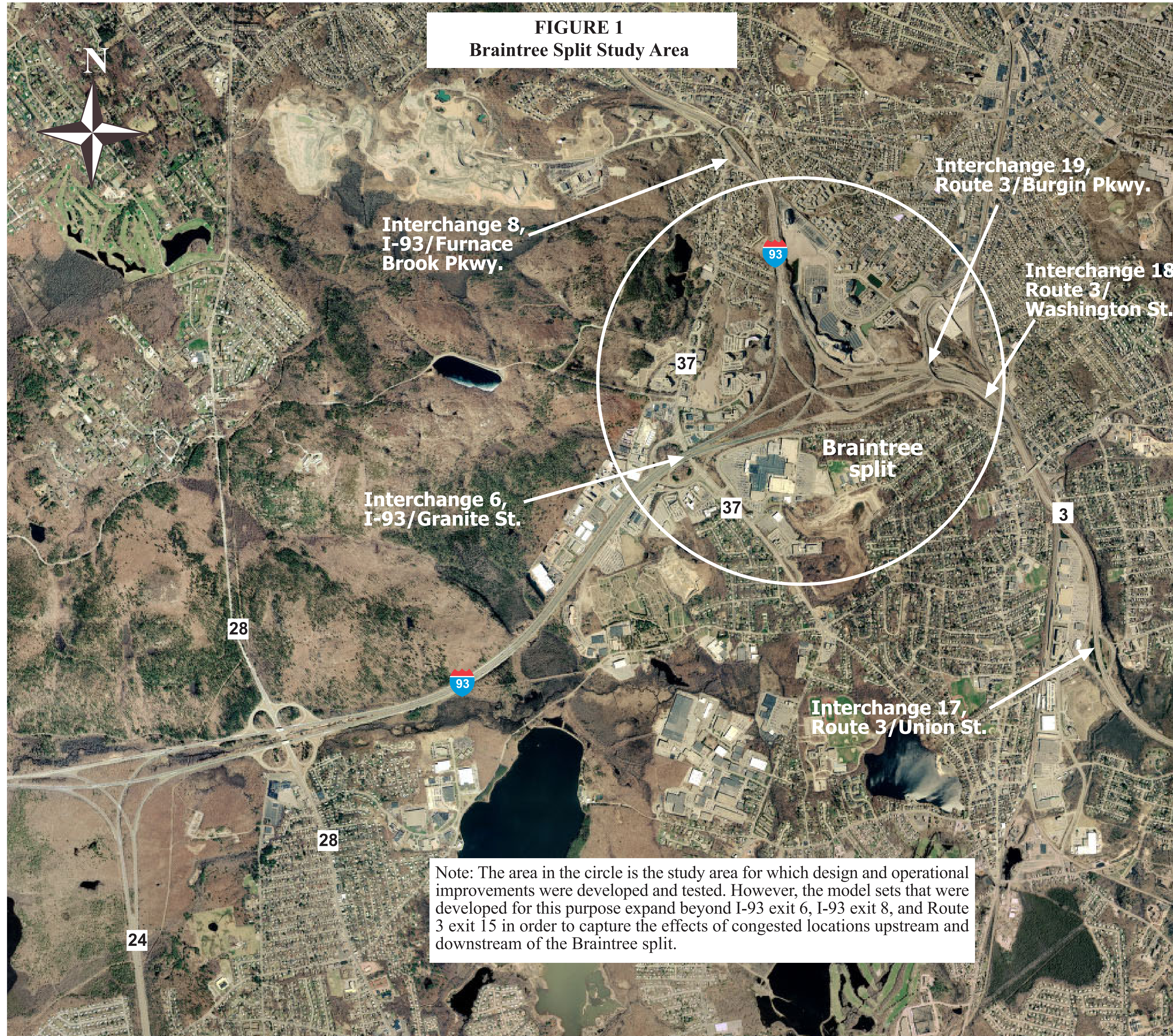
As shown in Figure 1, the Braintree split is essentially the network of ramps and highway segments that comprise I-93, the Southeast Expressway, and Route 3 South. To the southeast of the split, interchanges 18 (Washington Street) and 19 (Burgin Parkway) with their associated lane drops and weaving, merging, and diverging maneuvers add to the complexity of the main interchange. Immediately to the southwest of the split is I-93 interchange 6 (Route 37). Just north of the split is the southern terminus of the Southeast Expressway HOV lane and less than one-half mile north of that is I-93 interchange 8 (Furnace Brook Parkway).

During an average weekday, the Braintree split carries between 250,000 and 275,000 vehicles on six two-lane direct connections that connect the three major highways: I-93, the Southeast Expressway, and Route 3 South. In short, the Braintree split is an interchange that was designed for high-level connections (flyovers). It carries more than a quarter of a million vehicles a day, whose drivers encounter a complex driving environment. Therefore, congestion and incidents are common, especially in the northbound direction in the morning and, to a lesser degree, in the southbound direction in the afternoon.

Field reconnaissance indicates that there are safety problems created by some of the merging and weaving traffic operations at the Braintree split. Field reconnaissance also indicates that some of the delays encountered at the split are due to bottlenecks located outside of the split.

The report is organized into nine sections: an executive summary and eight chapters. Chapter 1 gives the background of the study. Chapter 2 documents the study area's traffic concerns. Chapter 3 describes the existing highway and transit conditions. Chapter 4 presents the socioeconomic trends and growth impacts in the study area. Chapter 5 explains the travel patterns of commuting trips to the Boston urban core. Chapter 6 presents the planned and proposed projects in the study area. Chapter 7 describes the improvements that are recommended in this study. Chapter 8 gives the process by which proposed transportation improvements may be implemented.

FIGURE 1
Braintree Split Study Area



Note: The area in the circle is the study area for which design and operational improvements were developed and tested. However, the model sets that were developed for this purpose expand beyond I-93 exit 6, I-93 exit 8, and Route 3 exit 15 in order to capture the effects of congested locations upstream and downstream of the Braintree split.

2 INVENTORY OF TRAFFIC PROBLEMS

Through meetings with the Advisory Task Force and field reconnaissance, CTPS developed an inventory of traffic problems in the study area and its vicinity. They include, but are not limited to, the following safety and operational problems listed below and shown in detail in Figures 2 and 3.

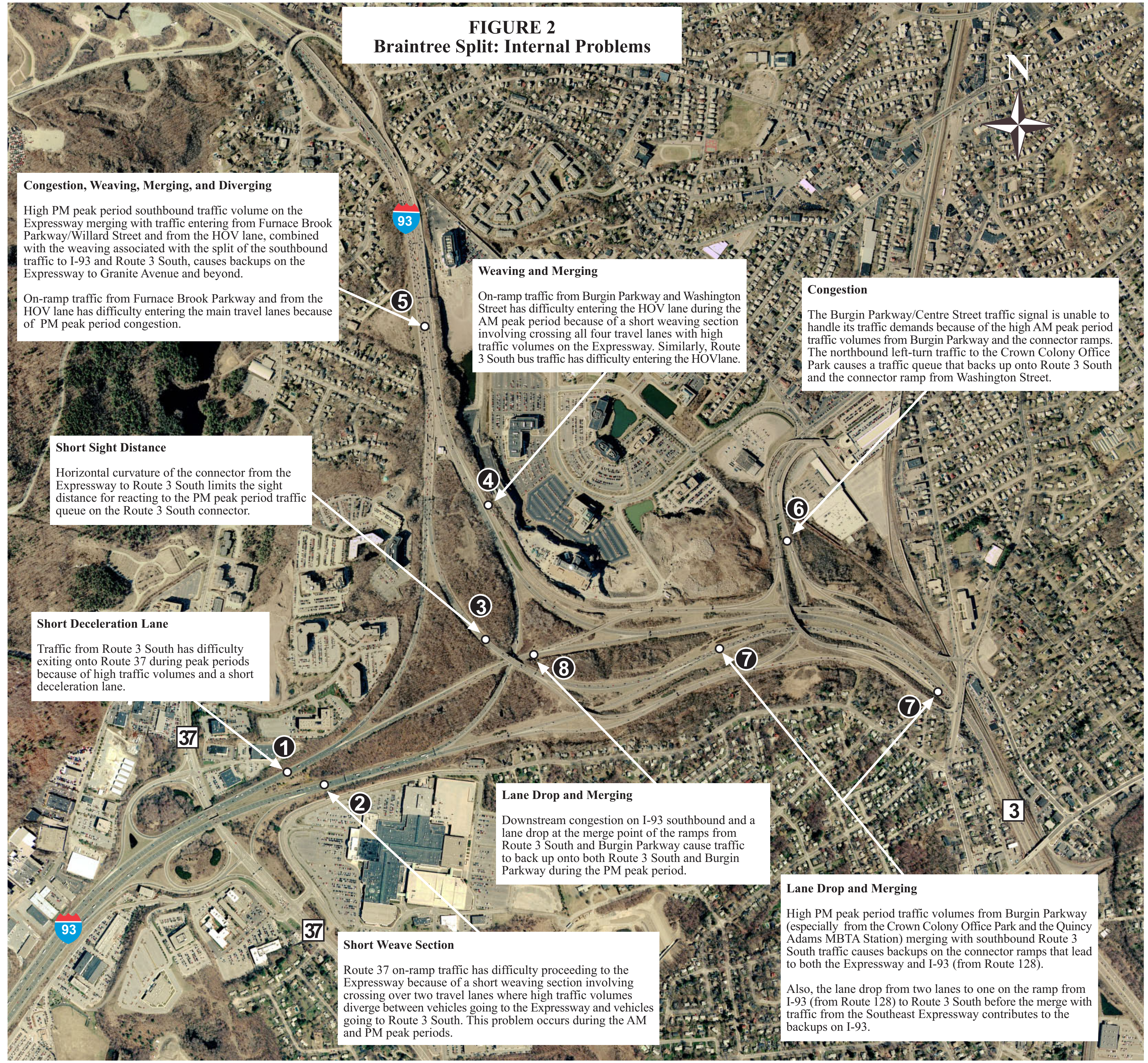
- Traffic congestion
- Downstream traffic bottlenecks
- High traffic demands
- Weaving and merging
- Short sight distance
- Traffic signal capacity issues
- Access to transit service

These problems were grouped into two categories: external and internal. The internal problems are those that exist within the split and affect its traffic and safety operations. The external problems are those that exist outside of the Braintree split but have a major impact on its traffic and safety operations. The numbers in the circles and the text in the boxes in Figures 2 and 3 represent specific locations and identify the particular problem at each location.

2.1 INTERNAL PROBLEMS

The internal problems are the weaving, merging, diverging, short sight distance, insufficient intersection capacity, and lane drops. Many of the AM peak-travel period internal problems show up during the PM peak travel period too, such as problems at locations #1, #2, #8, and #9. On the other hand, there are internal concerns that are confined either to the AM or PM peak period, for example, the problems at locations #3, #4, #5, #6, and #7.

Field reconnaissance indicates that some of the merging and weaving traffic operations at the Braintree split create safety problems such as short weave sections for Route 37 northbound on-ramp traffic proceeding to the Southeast Expressway and for Washington Street northbound on-ramp traffic proceeding to the HOV lane. Also, the PM peak-period southbound merging traffic from the Furnace Brook Parkway on-ramp and the HOV exit, and diverging traffic from the Southeast Expressway onto Route 3 South create traffic congestion on the Expressway that extends into the Granite Avenue and Neponset River areas.



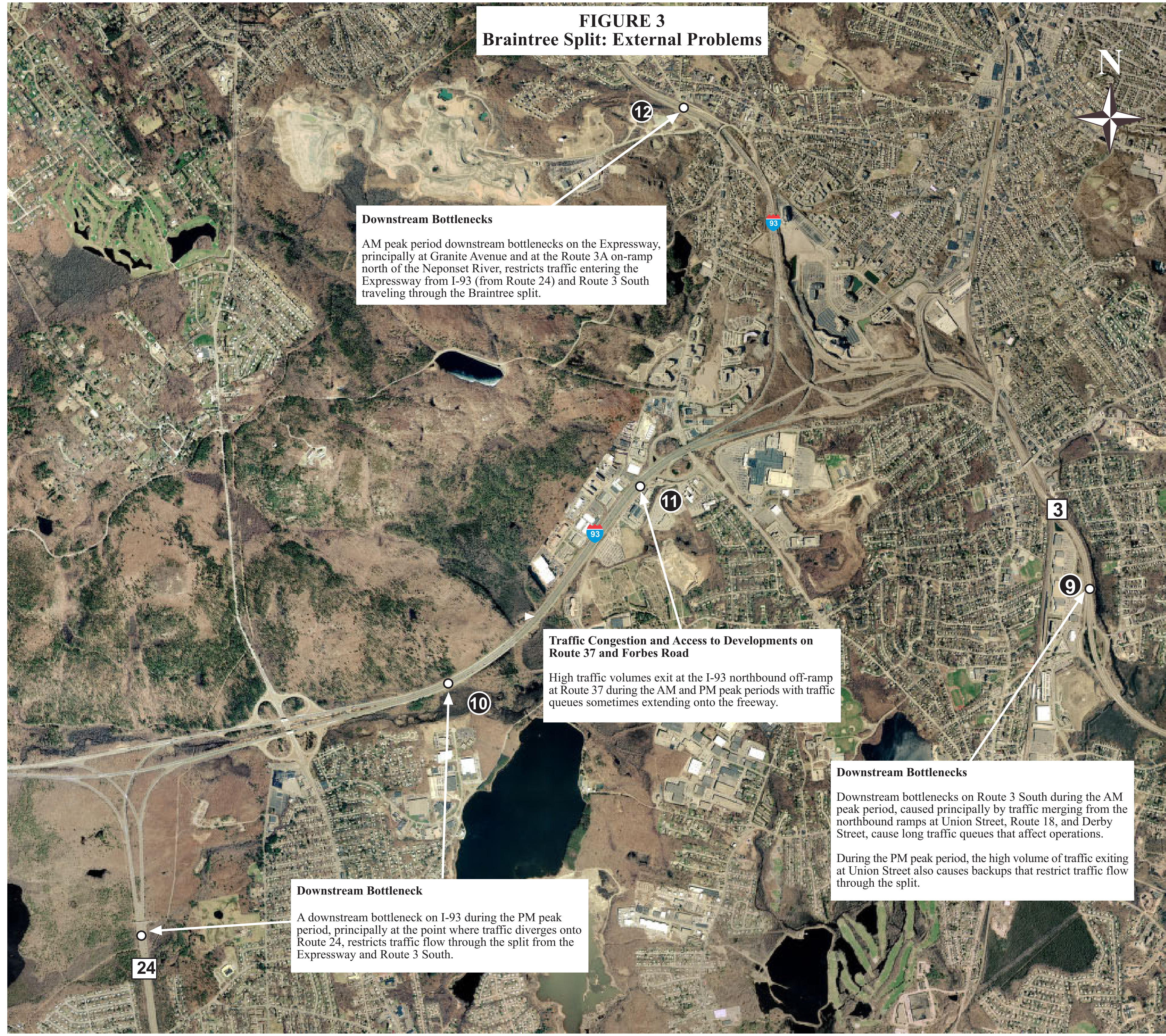
2.2 EXTERNAL PROBLEMS

Downstream traffic bottlenecks are the external problems that have major impacts on the Braintree split traffic operations in both peak travel periods (Figure 3). All three major highways of the split have bottlenecks. In the morning, downstream bottlenecks on the Expressway created by the northbound on-ramp traffic from Granite Avenue, Route 3A, Columbia Road, and the HOV merge restrict northbound traffic flow on the Expressway. On some occasions, this causes the traffic queue to back up into the Braintree split, restricting traffic flow from Route 3 South and I-93.

Another external problem is traffic operations at the Union Street rotary interchange on Route 3 South in Braintree. The high traffic volume on the ramp heading northbound disrupts traffic flow on Route 3 South in the AM peak travel period, which, in conjunction with similar activities at the Route 18 and Derby Street interchanges, causes recurring traffic backups on Route 3 South that are unrelated to traffic operations in the Braintree split. Similarly, the high southbound traffic volumes exiting Route 3 South at Union Street in the PM peak travel period cause traffic to spill back onto Route 3 South, restricting traffic flow from the split and from I-93 northbound onto Route 3 South.

Also, the PM peak-period congestion on I-93 southbound toward Route 24 spills back into the split. On many occasions, this backup restricts traffic from the Expressway and Route 3 South entering I-93 southbound toward Route 24. The main causes of this congestion are the bottleneck at the entrance to Route 24 where two congested two-lane ramps feed into three lanes on Route 24, and traffic diverging from I-93 onto Route 24.

The direct impact of the I-93 southbound PM peak-period congestion is reduced traffic flow through the split. In 1994, the Expressway was servicing 7,900 southbound vehicles per hour at the split during the PM peak hour, of which 4,100 continued on I-93 and 3,800 continued on Route 3 South. In 2003, this number decreased to 6,600 southbound vehicles per hour during the PM peak hour, of which 3,200 continued on I-93 and 3,400 continued on Route 3 South. As explained above, these traffic patterns were due to the increasing congestion on I-93 southbound traveling toward Route 24 in the PM peak period.



3 CURRENT TRANSPORTATION

3.1 HIGHWAYS

3.1.1 Highway System

The area's thoroughfares that carry most of the commuter traffic through the Braintree split area are:

- I-93 (from Route 24)
- The Southeast Expressway
- Route 3 South

The Massachusetts Highway Department has jurisdiction over these major highways, their interchanges, and arterial road segments near the interchanges.

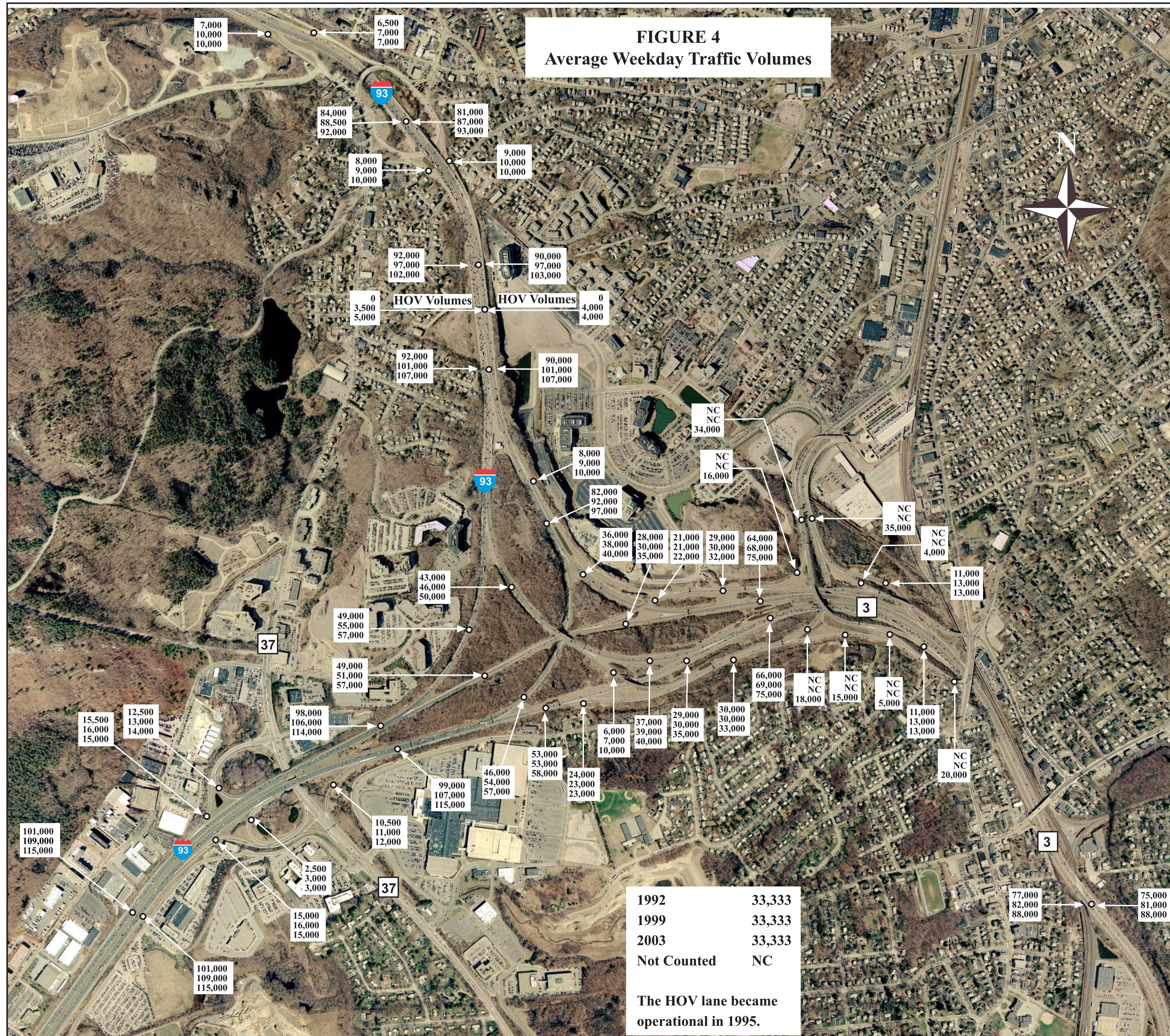
Freeway facilities are composed of connected segments consisting of the freeway itself, ramps, and weaving segments. These segments are connected in various sequences and there are significant interactions between them that sometimes create a bottleneck that reduces the capacity of the freeway to that of the bottleneck.

Presently, the Southeast Expressway has four travel lanes in each direction. During the AM peak period (6:00–10:00 AM), the leftmost southbound lane is operated as an HOV lane for traffic moving northbound. The situation is reversed during the PM peak period (3:00–7:00 PM), when the leftmost northbound lane is operated as an HOV lane for traffic moving southbound. Thus, during each peak period, the peak direction has five travel lanes serving traffic—four general purpose lanes and one HOV lane.

Route 3 South has three travel lanes in each direction from interchange16 (Route 18) to the split. South of Route 18, there are two lanes in each direction, but during the peak period of travel, traffic is allowed to use the shoulder/breakdown lane in the peak direction as a travel lane. Use of the shoulder/breakdown lane as a travel lane is restricted to the segment with two lanes. There is no HOV lane on Route 3 South.

The stretch of I-93 between the split and Route 24 has four travel lanes in each direction. This stretch has no HOV lane and traffic is not allowed to use the shoulder/breakdown lane as a travel lane.

The following section describes the traffic volumes at the split and the connecting highways.



3.1.2 Traffic Volumes

Several kinds of data were collected for quantifying and evaluating existing traffic conditions. As part of this study, MassHighway conducted Automatic Traffic Recorder (ATR) counts in 2003 for I-93, the Southeast Expressway, and Route 3 South. These counts are summarized, along with those collected in 1992 and 1999, in Figure 4 (see page 10).

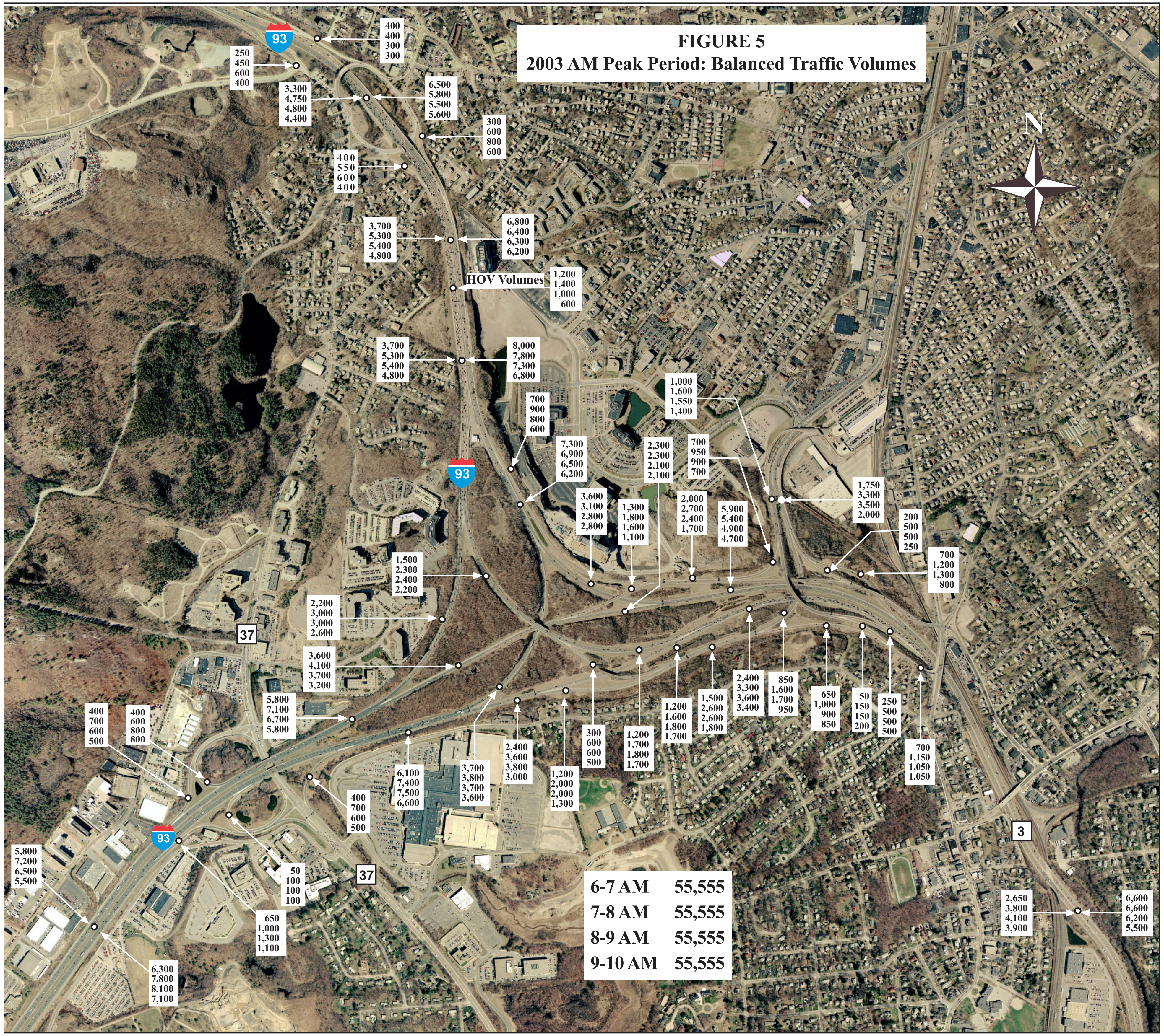
Between 1992 and 2003, average weekday traffic on the I-93 segment between Routes 24 and 37 increased by 14 percent; on Route 3 South by 15 percent; and on the Southeast Expressway by 18 percent. These increases represent a rate of about 1.2 to 1.3 percent per year. The AM and PM peak-period traffic volumes presented in Figures 5 and 6 indicate that during the peak periods, traffic volumes in the peak direction of travel remain essentially constant or decrease slightly, due to traffic congestion and capacity restrictions. Thus, the observed growth in traffic over the 11-year period is manifested partly by the expansion of the number of hours of congestion and partly by the growth of the off-peak period traffic volumes.

At the uncongested sections of the freeways, the peak hour volumes range from 1,900 to 2,200 vehicles per hour per lane. At the bottlenecks, where queuing, weaving, merging, and diverging activities take place, peak hour volumes are in the range of 1,100 to 1,600 vehicles per hour.

3.1.3 HOV Lane Traffic Volumes

The Southeast Expressway HOV lane opened in 1995 as one of the mitigation projects for the Central Artery/Tunnel project. Since then, entry has been limited to carpools, vanpools, and buses. The operating policy for the HOV lane has changed over the years; first the entry rule was three or more occupants per vehicle; after that there was a sticker program (red and green) that allowed certain numbers of vehicles with two-person occupancy to enter the HOV lane on alternate days. This was later expanded to allow all vehicles with stickers to use the HOV lane on all days. Presently, any vehicle with two or more occupants meets the entry requirements for the HOV lane.

The three-or-more occupancy rule, which was introduced in 1996, resulted in maximum volumes of 375 and 400 vehicles per hour for the AM and PM peak periods, respectively. With the introduction of



the two-person-occupancy sticker program in 1998, these volumes increased to a maximum of 550 and 525 vehicles per hour for the AM and PM peak periods, respectively. In February 1999, when the two-person-occupancy sticker program was expanded to all days, the maximum volumes increased to 825 vehicles per hour during the AM peak period, and 550 during the PM peak period. In June 1999, when the HOV lane was opened to all vehicles with two or more occupants, with no sticker required, the lane use increased to 1,300 vehicles per hour during the AM peak period and 1,000 during the PM peak period. Presently, the volumes in the HOV lane typically do not exceed 1,300–1,400 vehicles per hour either northbound during the AM peak period or southbound during the PM peak period.

3.1.4 Traffic Queues

Traffic queues are common in the study area, especially in the peak directions.

On the Southeast Expressway, the queue extends from interchange 8 (Furnace Brook Parkway) northward to interchange 15 (Columbia Road) in the northbound direction during the AM peak period, and from interchange 11 (Granite Avenue) southward to the Braintree split in the southbound direction during the PM peak period.

On Route 3 South, the AM northbound queue extends from interchange 15 (Derby Street) northward to interchange 18 (Burgin Parkway/MBTA Quincy Adams Station). The PM southbound queue is limited to the stretch of Route 3 South between interchange 17 (Union Street) and the split. This PM southbound queue on Route 3 South also spills back onto I-93 (described below) and onto the Southeast Expressway (described above).

On the I-93 segment between the split and Route 24, there are traffic queues in both peak directions, but primarily in the northbound direction during the AM peak period and in the southbound direction during the PM peak period.

3.1.5 Levels of Service

To rate the performance of highway system elements, traffic planners and engineers use the concept of level of service (LOS). There are six levels of service: LOS A through LOS F. The range of LOS A through LOS D is considered acceptable; LOS E and LOS F are considered unacceptable—the facility is either at capacity or unable to handle traffic demands. For the different elements of a highway system,

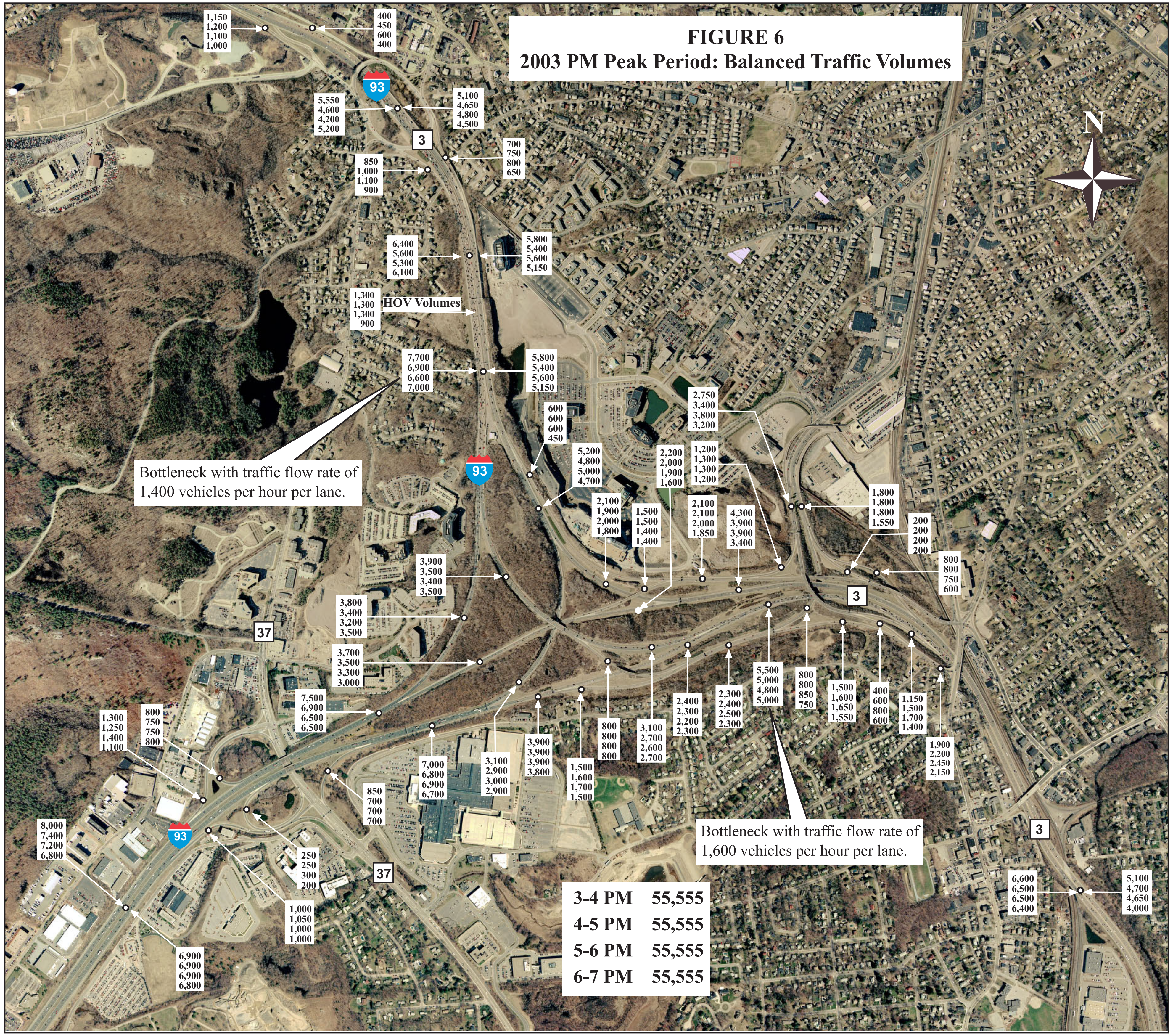


FIGURE 6
2003 PM Peak Period: Balanced Traffic Volumes

different measures of performance are used to assess level of service. For intersections (both signalized and unsignalized), the performance measure is delay; for arterial segments, it is travel speed; for freeway facilities, it is the density of vehicles, which is defined as the number of vehicles per lane-mile.

The computer simulation program CORSIM,[2] in conjunction with Highway Capacity Software (HCS)[3] and Synchro,[4] were used to determine the levels of service of the ramp-arterial junctions. The results, which are presented in Figure 7, indicate the following levels of service.

Furnace Brook Parkway Interchange

The Furnace Brook Parkway interchange operates satisfactorily during the AM peak period, at LOS C or better. However, during the PM peak period, it operates at LOS F, due to the high volume of southbound traffic exiting and entering the freeway at this location. Ramp traffic queues are not uncommon during this period.

I-93/Route 37 Interchange

At the I-93/Route 37 interchange, the west side ramp-arterial junction operates at LOS D or better during the AM peak period. During the PM peak period, it operates at LOS E or F, due to the presence of commuter and shopping trips occurring at the same time in the area. Ramp traffic queues are not uncommon during the PM peak period.

The east-side ramp-arterial junction operates at LOS C or better during the AM peak period. During the PM peak period, it operates at LOS E or F. During both peak periods, the northbound off-ramp to Granite Street experiences traffic queues that on some occasions spill back onto the freeway.

Route 3/Union Street Interchange

The Union Street interchange operates at LOS F during the AM and PM peak periods. During the AM peak period, the high volume of northbound on-ramp traffic causes backups into the rotary, affecting

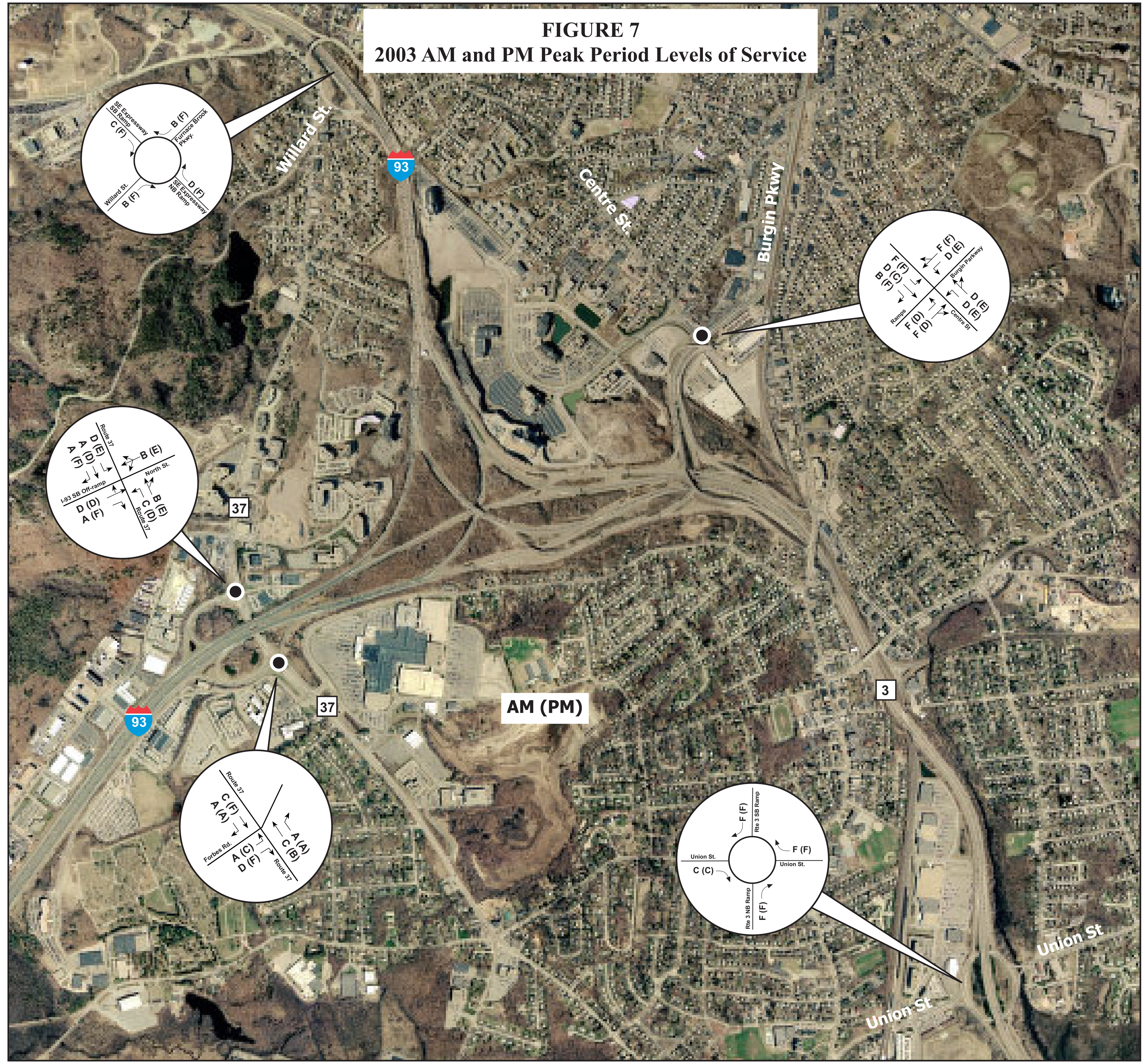


FIGURE 7
2003 AM and PM Peak Period Levels of Service

2 Federal Highway Administration, *CORSIM User's Guide Version 5.1*, McLean, Virginia, February 2003.

3 McTrans Center, University of Florida, *Highway Capacity Software (HCS)*, Gainsville, Florida, 2003.

4 Trafficware Corporation, *Synchro plus SimTraffic 6*, Traffic Signal Timing, Capacity, and Simulation, Albany, California, May 2004.

its traffic operations, especially Union Street westbound traffic and traffic going to the MBTA Braintree Station. In the PM peak period, the high volume of southbound traffic causes ramp traffic queues that extend onto the freeway.

Burgin Parkway/Centre Street Intersection

At the Burgin Parkway/Centre Street intersection, both the AM and PM peak-period LOS is F for the major traffic movements. During the AM peak period, the high volume of northbound left-turning traffic going to the Crown Colony Office Park and the high volume of southbound traffic on Burgin Parkway are the main causes of congestion. During the PM peak period, the cause of congestion is the high southbound traffic volumes from the Crown Colony Office Park and Burgin Parkway. A police detail assists in controlling traffic during peak periods.

3.1.6 Travel Time

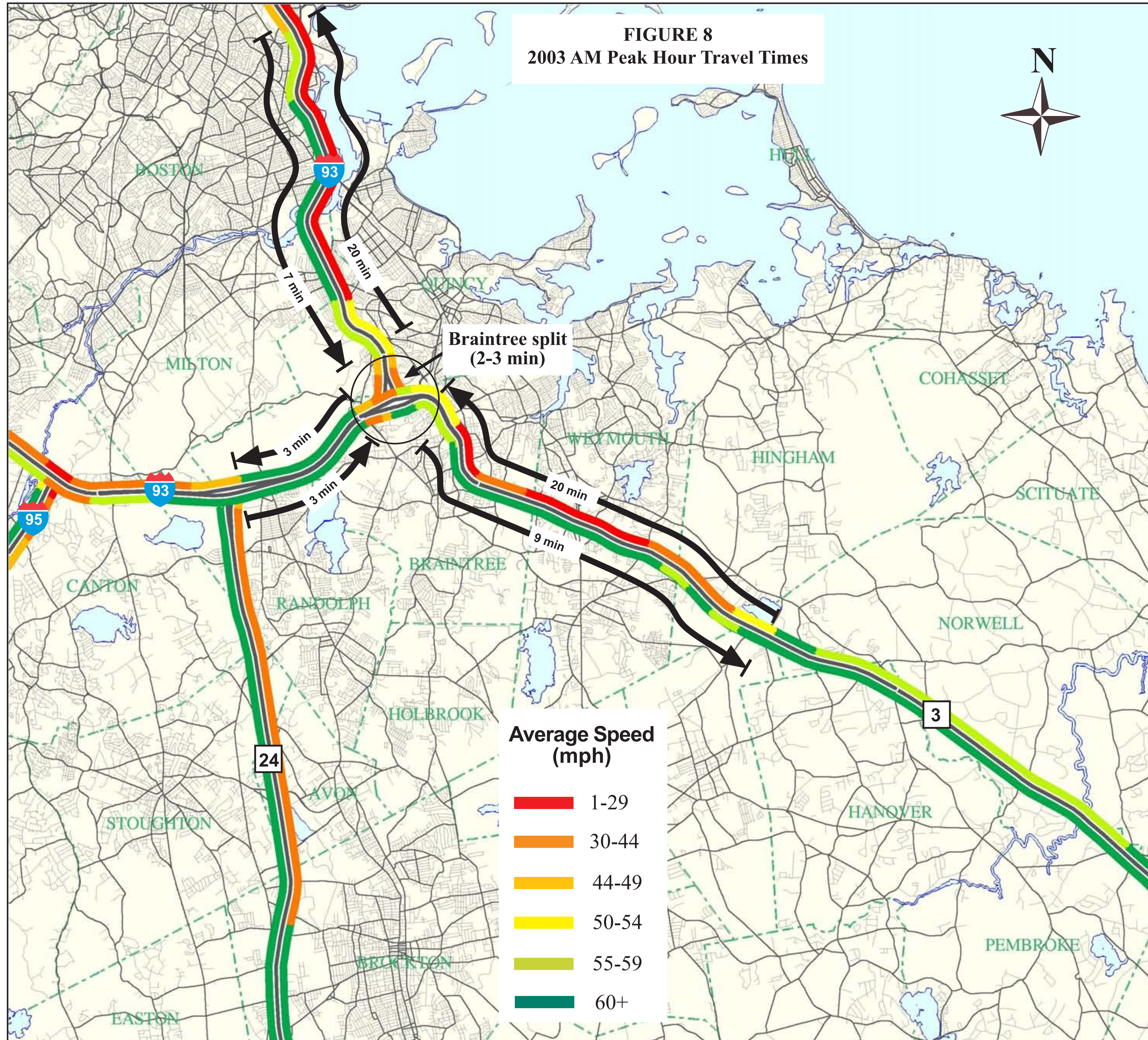
A travel-time survey was conducted to determine the average travel times and speeds on the major highways in the study area. Each route was surveyed during the AM and PM peak periods over several weeks in May 2003. The results of the travel-time survey, expressed in terms of speed, are shown in Figures 8 and 9. The results reveal several interesting characteristics, as described below.

AM Peak-Period Travel Times

Average travel speeds at the Braintree split itself during peak periods are mostly between 30 and 44 mph in either direction. On the average, it takes about 3 minutes to travel northbound from either interchange 6 (Route 37) on I-93 or from interchange 19 (MBTA Quincy Adams Station/Burgin Parkway) on Route 3 South to the start of the HOV lane on the Expressway. The high traffic volumes and the weaving and merging activities at the split are the main reasons for low speeds.

On northbound Route 3 South, it takes about 20 minutes to travel the 8.6-mile stretch of highway from interchange 14 (Route 228) at the Rockland/Hingham town line to interchange 19 (MBTA Quincy Adams Station/Burgin Parkway), resulting in an average travel speed of 26 mph on this stretch of highway. It takes about 9 minutes to travel the same distance in the southbound direction, with average travel speeds of 60 mph or more.

FIGURE 8
2003 AM Peak Hour Travel Times



On the Southeast Expressway northbound, it takes about 20 minutes, using the general purpose lanes, to travel the 5.5-mile stretch of the Expressway from the start of the HOV lane to Columbia Road, compared to 7 minutes using the HOV lane. In the southbound direction, it takes 7 minutes to travel this same distance at speeds between 55 and 60 mph.

On the 3.0-mile stretch of I-93 from Route 24 in Randolph to interchange 6 (Granite Street) in Braintree, it takes about 3 minutes to travel this distance in either direction. Average travel speeds in both directions on this stretch of I-93 are 60 mph or more.

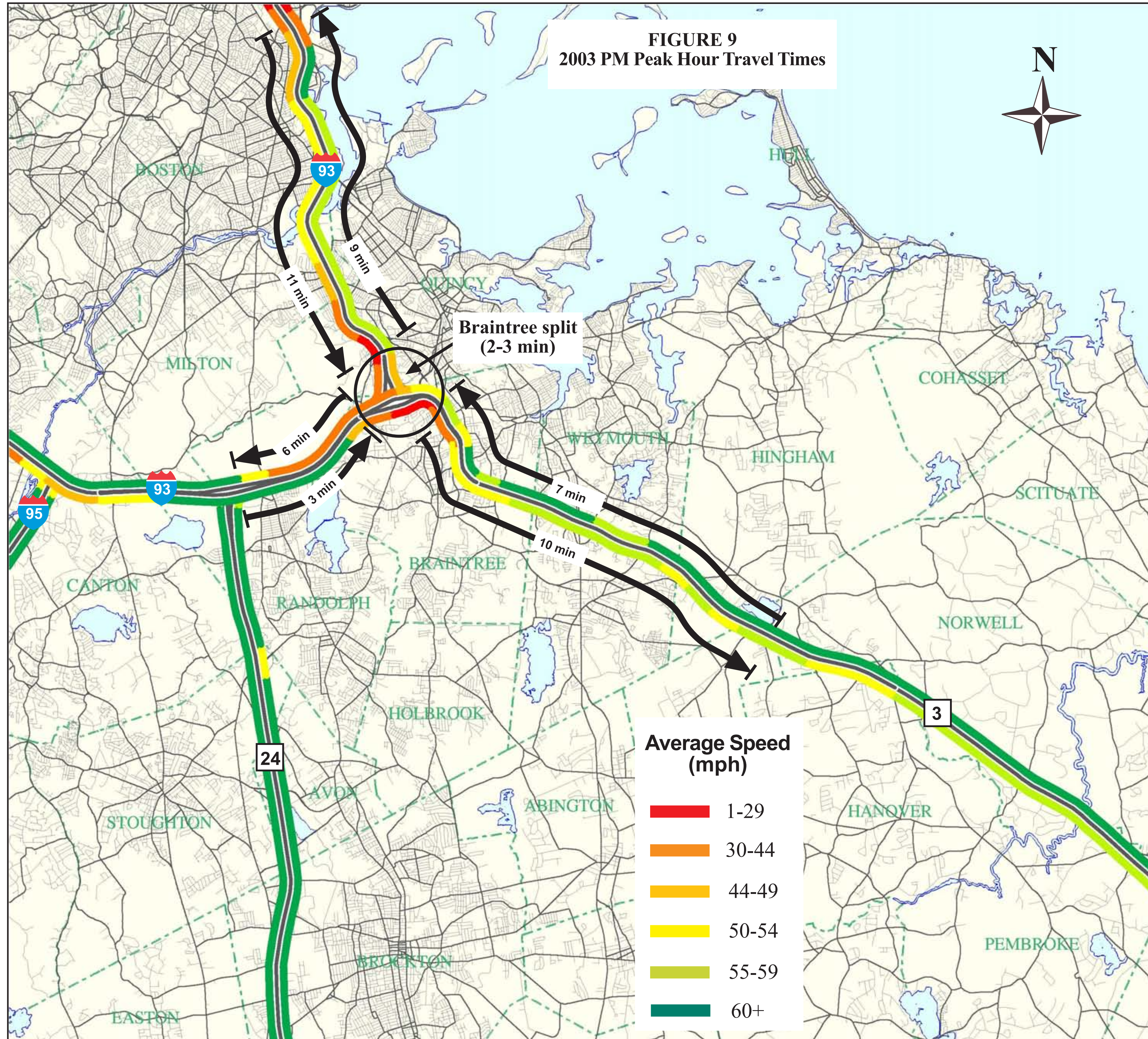
PM Peak-Period Travel Times

Average travel speeds at the Braintree split itself are mostly between 30 and 44 mph in either direction. It takes about 3 minutes on the average to travel southbound from the end of the HOV lane on the Expressway to either interchange 6 (Route 37) on I-93 or to interchange 19 (MBTA Quincy Adams Station/Burgin Parkway) on Route 3 South. Again, the high traffic volumes and the weaving and merging activities at the split are the main reasons for low speeds.

On southbound Route 3 South, it takes about 10 minutes to travel the 8.6 miles from interchange 19 (MBTA Quincy Adams Station/Burgin Parkway) to interchange 14 (Route 228) at the Rockland/Hingham town line. This results in an average travel speed of 52 mph on this stretch of highway. It takes 7 minutes to travel the same distance in the northbound direction, with average travel speeds of 60 mph or more.

On the Expressway southbound, it takes about 11 minutes to travel the 5.5 miles between Columbia Road and the end of the HOV lane, compared to about 7 minutes using the HOV lane. In the northbound direction, it takes 9 munites to travel the same distance, at speeds between 55 and 60 mph.

On the 3.0-mile stretch of I-93 between interchange 6 (Granite Street) and interchange 4 (Route 24), it takes about 6 minutes to travel this distance in the southbound direction, with average travel speeds of about 35 mph, and 3 minutes in the northbound direction, with average travel speed of about 60 mph or more.



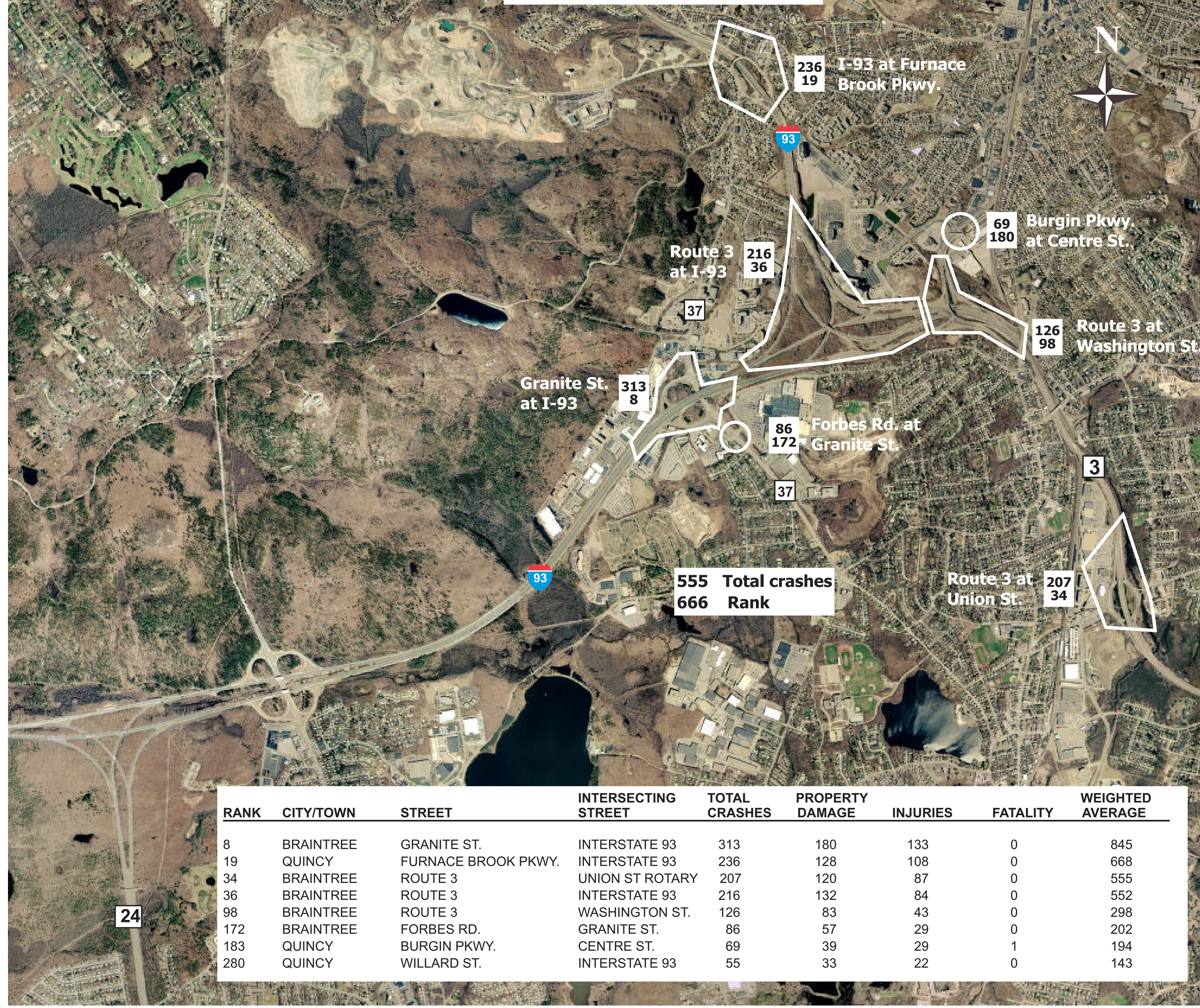
3.1.7 Crashes

MassHighway uses crash data collected by the Registry of Motor Vehicles (RMV) for a number of uses. The primary function, however, is to provide the foundation for developing safety improvement projects. MassHighway uses the data to rank high-crash locations, with lower numbers representing the worst locations. They list those locations in a report entitled *Top 1000 High Crash Locations,* which is published periodically. MassHighway uses a weighted scoring system to develop the high-crash location list. The 1997–1999 edition, which was used for this study, is the most recent.

A weighted scoring system, based on the severity of each crash, is used to determine the rankings. Crash severity is weighted, from most to least severe, using the following scores: property damage = 1, personal injury = 5, and fatality = 10. Previous editions differed in the methodology used for establishing the rank. In past editions, locations with the same weighted average score were not assigned the same rank value, but rather were arbitrarily assigned consecutive rankings of 1 to 1,000, with lower numbers corresponding to the worst locations. For the recent edition, the actual rank for each location was assigned, regardless of how many other locations might have that same rank, which created a range of rankings from 1 to 282.

Figure 10 shows the number of crashes and the ranks of the top 1,000 high-crash locations in Massachusetts. Many locations in the study area are on the top 1,000 high-crash list. Although collision analysis was not performed to determine the characteristics of the individual crashes, some of the reasons for the high number of crashes at these locations are congestion, weaving and merging operations, and short acceleration/deceleration distances.

FIGURE 10
High-Crash Locations
(Based on 1997–1999 crash data)



RANK	CITY/TOWN	STREET	INTERSECTING STREET	TOTAL CRASHES	PROPERTY DAMAGE	INJURIES	FATALITY	WEIGHTED AVERAGE
8	BRAINTREE	GRANITE ST.	INTERSTATE 93	313	180	133	0	845
19	QUINCY	FURNACE BROOK PKWY.	INTERSTATE 93	236	128	108	0	668
34	BRAINTREE	ROUTE 3	UNION ST ROTARY	207	120	87	0	555
36	BRAINTREE	ROUTE 3	INTERSTATE 93	216	132	84	0	552
98	BRAINTREE	ROUTE 3	WASHINGTON ST.	126	83	43	0	298
172	BRAINTREE	FORBES RD.	GRANITE ST.	86	57	29	0	202
183	QUINCY	BURGIN PKWY.	CENTRE ST.	69	39	29	1	194
280	QUINCY	WILLARD ST.	INTERSTATE 93	55	33	22	0	143

3.2 TRANSIT

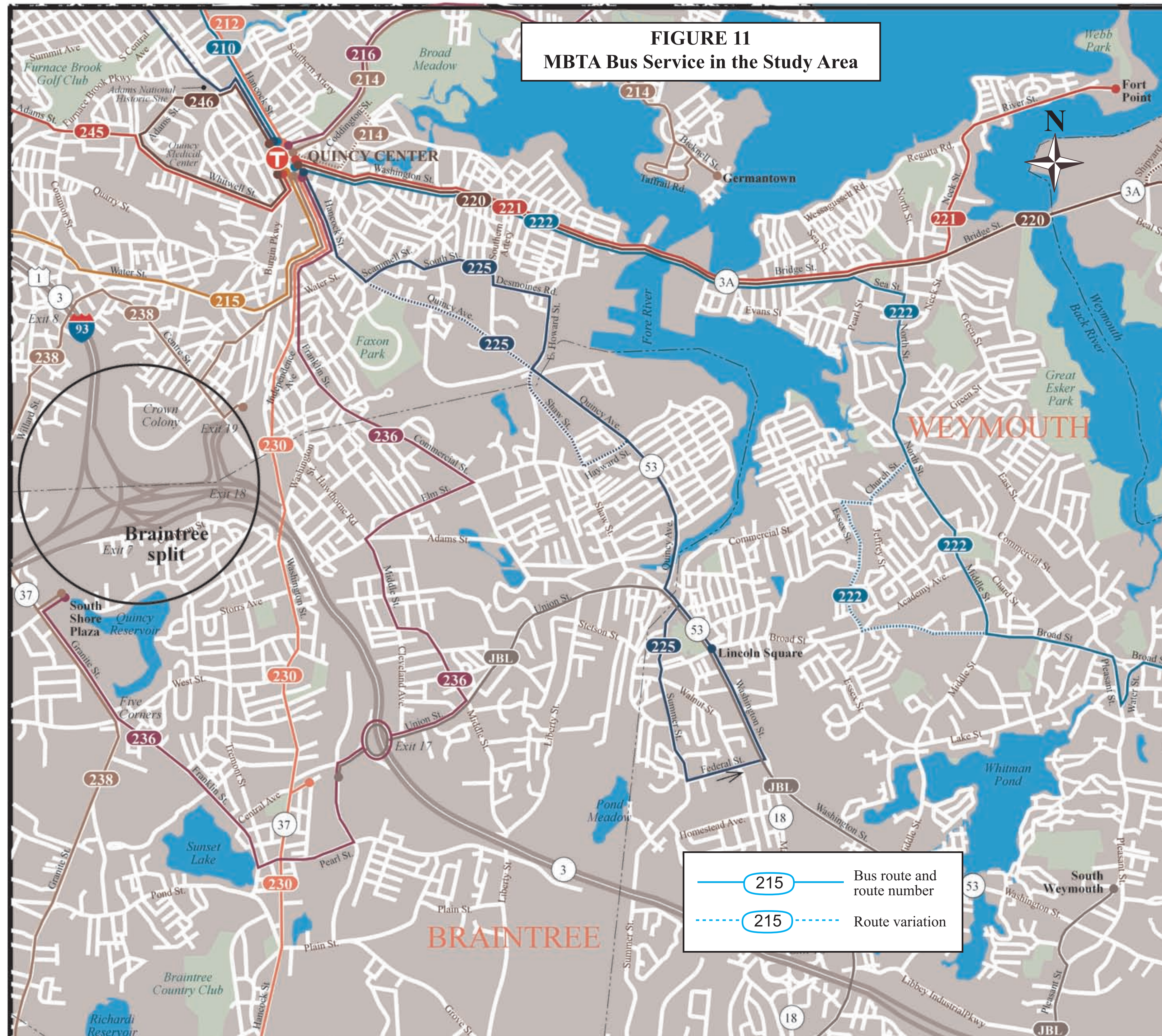
3.2.1 Bus

Both public and private bus carriers serve the study area. The MBTA 200-series buses serve the project area with both local and commuter bus service (Figure 11). Quincy Center station is the main bus terminal where riders can continue on a bus or use the Red Line or commuter rail to travel to downtown Boston. The MBTA reviews its bus operations periodically and makes changes through its Service Delivery Policy. Recently, the Preliminary 2004 Service Plan indicated that many of its 200-series buses failed in service frequency or adherence standards. The MBTA has proposed modifications to enhance service on some of the bus routes, as discussed in Chapter 6, Planned and Proposed Improvements.

The Massachusetts Port Authority (Massport) operates the Logan Express bus service that goes directly from Braintree to Logan International Airport every half hour. All of the trips bypass downtown Boston by using the HOV lane and the Ted Williams Tunnel. Currently, Paul Revere Transportation, a private carrier, operates the service under a contract to Massport.

The private bus carriers serving southeastern Massachusetts communities are the Plymouth & Brockton Street Railway Company, Peter Pan/Bonanza Bus Lines, Bloom Bus Lines, JBL Bus Lines, and DATTCO. The Plymouth & Brockton Street Railway Company operates the Logan Direct bus service to Logan International Airport from Plymouth, Rockland, and Cape Cod. In addition, it operates Boston commuter and South Shore bus services for Cape Cod and South Shore communities. Peter Pan/Bonanza Bus Lines provides service to Southern Massachusetts and Rhode Island from Logan Airport and from South Station in Boston. It operates the Providence–Foxboro– Boston–Logan Airport, Woods Hole–Boston, and Newport–Fall River–Boston bus services. Bloom Bus Lines operates service between Boston, Taunton, Raynham, Easton, and West Bridgewater. JBL Bus Lines runs commuter services to Boston from Whitman and feeder service to Braintree Station from South Weymouth. DATTCO runs service from Fairhaven, New Bedford, and Taunton to Boston. The private bus lines are shown in Figure 12.

FIGURE 11
MBTA Bus Service in the Study Area



3.2.2 Rapid Transit (Red Line)

The MBTA's Red line rapid transit, with stations at Braintree, Quincy Adams, Quincy Center, Wollaston, and North Quincy, serves the project area and the surrounding communities and provides transportation to and from Boston. Many of the bus services in the area have stops at rapid transit stations to facilitate transfers to downtown Boston. The MBTA runs six-car trains during the AM and PM peak hours and four-car trains at other times. The rush-hour trains operate with an average headway of seven minutes from Braintree and an average speed of 23.3 mph. According to rapid transit entry and exit counts conducted in 1997 on the south-of-downtown section of the Red Line, 27 percent of the trains originating on the Braintree Branch had peak loads close to, but not above, the crowding standard during the busiest peak hour.

3.2.3 Commuter Rail

Within the MBTA's transportation network, the commuter rail serves the broadest market geographically. In this section we focused on services to the southeastern Massachusetts communities that produce most of the trips passing through the split. The MBTA's five commuter rail lines in these communities are shown in Figure 12. The five lines are the Franklin Line, Attleboro/Providence Line, Stoughton Line, Middleborough/Lakeville Line, and Kingston/Plymouth Line.

The commuter trains operate at about 30-minute headways during the peak travel periods 7:30–9:00 AM and 4:30–5:30 PM. The off-peak headway is about two hours. Parking is also an important component of commuter rail riders' trip-making decisions. Nearly 54 percent of the commuter rail riders access the trains by automobiles, making access to park-and-ride lots at the stations an important factor in attracting automobile trips. Information on park-and-ride lots is described in the following section. Another concern is passenger crowding. Peak-load-point counts conducted in 2000 indicated that the Franklin Line had at least one train with more riders than seats during the AM peak period, but none during the PM. The Attleboro/Providence, Stoughton, Middleborough/Lakeville, and Kingston/Plymouth lines have at least one train in each peak period with a maximum load greater than the seating capacity.

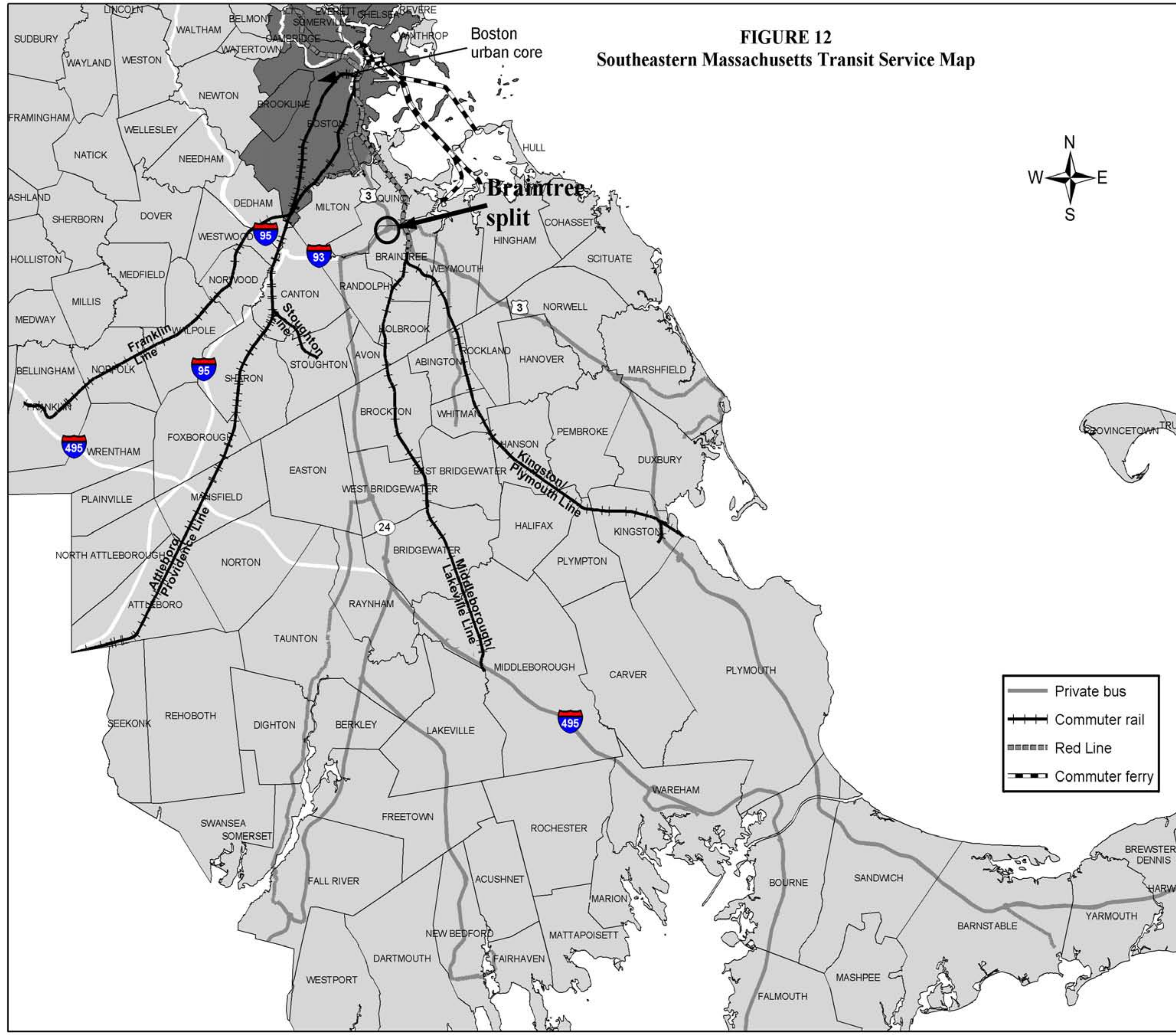


FIGURE 12
Southeastern Massachusetts Transit Service Map

The capacities of the MBTA commuter rail lines are limited not only by the capacities of the trains themselves (that is, the number of cars per train), but also by the capacities of the modes used to access the trains, which, in the case of commuter rail, means that adequate parking capacity is necessary to divert trips from travel by private automobile.

In addition, capacity is limited by the throughput capacity of the South Station terminal, which serves all the trains from the south. According to the Program for Mass Transportation (PMT), during peak hours there were very brief times in each peak period when all 13 tracks at South Station were occupied. Midday storage of trains could be a problem if service was expanded further, but at night the majority of the trains are not stored in downtown Boston.

MBTA commuter rail ridership is predicted to increase by 45 percent between now and 2025. This increase, combined with the crowding and terminal capacity problems at South Station, limits the times at which additional trips can be run on existing lines and on new extensions. The planned and proposed commuter rail improvements that are expected to impact traffic operations at the Braintree split are discussed in Chapter 6.

3.3 PARK-AND-RIDE LOTS

One way of increasing transit mode share is through diverting auto trips to commuter rail, rapid transit, and bus transit. The MBTA, MassHighway, Massachusetts Turnpike Authority (MassPike), Massachusetts Port Authority (Massport), and some municipalities operate park-and-ride lots throughout the commonwealth. Over the years, these agencies have expanded some of the park-and-ride lots and have constructed new lots to encourage transit and carpool and vanpool use, with the primary aim of reducing recurring traffic congestion on major highways (Figure 13 and Table 1). An inventory of park-and-ride lots was compiled for the purpose of providing adequate information for deciding what strategies to advance for reducing traffic congestion at the Braintree split.

The MBTA lots are located at the commuter and rapid transit stations. The parking fee is $2.00 a day at all stations in the study area except for the Route 128, Braintree, Quincy Adams, and Quincy Center garages, where the fee is $3.50.The latter three garages also serve Red Line riders. Parking fees at other Southeastern Massachusetts Red Line stations are $3.00 a day. Table 1 shows the utilization of

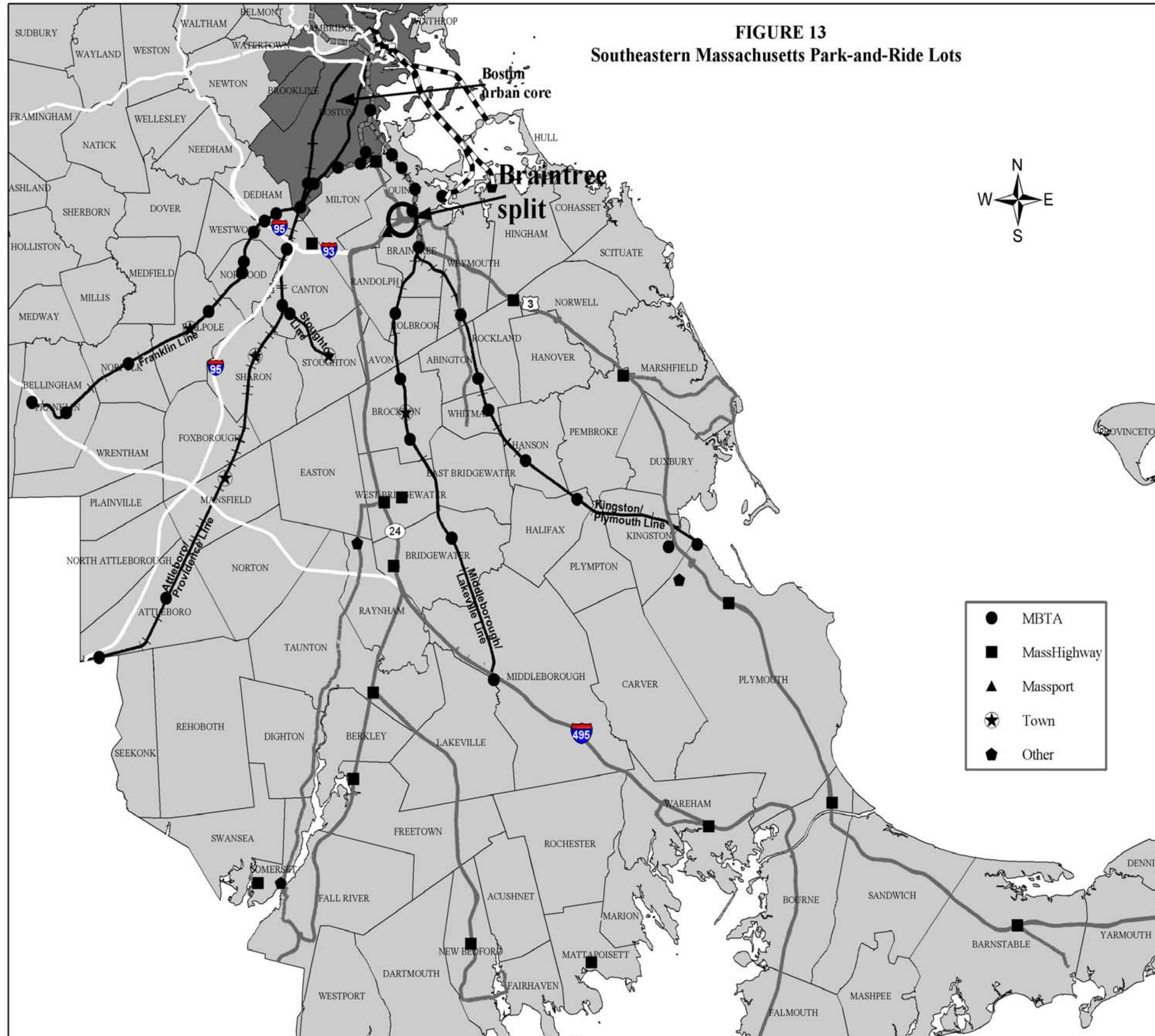


FIGURE 13
Southeastern Massachusetts Park-and-Ride Lots

commuter rail park-and-ride lots in the study area that are owned and operated by the MBTA and municipalities.

In addition to the MBTA, some municipalities own and operate parking at MBTA stations, such as at Walpole on the Franklin Line, Sharon and Mansfield on the Attleboro/Providence Line, Stoughton on the Stoughton Line, and Brockton on the Middleborough/Lakeville Line. The daily parking fee at each of these lots is the same as that at MBTA-owned lots.

The MassHighway lots are conveniently located along major commuter highways to serve carpool and vanpool and public/private bus service (Figure 13). All-day parking at the MassHighway lots is often free. Table 2 shows utilization and services at these lots; most of the lots that have access to bus service are well utilized.

Massport operates the Logan Express park-and-ride lot in Braintree at I-93 exit 6, on Forbes Road. This lot is used for trips only to Logan Airport. The parking fee is $11.00 a day, or $66.00 a week.

The current status is that many of the park-and-ride lots are fully utilized. Many are full by 9:00 AM, and some even as early as 7:30 AM. Improving the parking situation is discussed in the section Proposed and Planned Improvements in Chapter 6.

TABLE 1
Commuter Rail Park-and-Ride Lot Inventory (2002)

Town/City	Location	Operator	Fee	Parking Spaces	Cars Parked[1]	Percent Full
Attleboro/Providence Line and Stoughton Line						
Dedham	Route 128	MBTA	$3.00	2,883	660	23
Canton	Canton Junction	MBTA	2.00	775	779	100
Canton	Canton Center	MBTA	2.00	211	214	100
Stoughton	Stoughton	Town	2.00	537	544	100
Sharon	Sharon	Town	2.00	742	632	85
Mansfield	Mansfield	Town	2.00	806	812	100
Attleboro	Attleboro	MBTA	2.00	780	756	97
Attleboro	South Attleboro	MBTA	2.00	567	561	99
Middleboro/Lakeville Line						
Braintree	Braintree	MBTA	3.50	1,262	1,268	100
Randolph	Holbrook/Randolph	MBTA	2.00	342	319	95
Brockton	Montello	MBTA	2.00	425	305	72
Brockton	Brockton	Town	2.00	240	127	53
Brockton	Campello	MBTA	2.00	546	285	52
Bridgewater	Bridgewater	MBTA	2.00	497	492	99
Middleboro	Middleboro/Lakeville	MBTA	2.00	853	563	66
Plymouth/Kingston Line						
Weymouth	South Weymouth	MBTA	2.00	522	522	100
Abington	Abington	MBTA	2.00	405	399	99
Whitman	Whitman	MBTA	2.00	199	177	89
Hanson	Hanson	MBTA	2.00	428	423	99
Halifax	Halifax	MBTA	2.00	408	344	84
Plymouth	Plymouth	MBTA	2.00	96	4	4
Kingston	Kingston	MBTA	2.00	1,029	903	88
Franklin Line						
Dedham	Dedham Corporate Center	MBTA	2.00	497	404	81
Westwood	Islington	MBTA	2.00	39	30	77
Norwood	Norwood Depot	MBTA	2.00	227	218	96
Norwood	Norwood Central	MBTA	2.00	782	638	82
Norwood	Windsor Gardens	MBTA	NA	NA	NA	NA
Walpole	Plimptonville	MBTA	2.00	5	1	20
Walpole	Walpole	Town	2.00	365	405	100
Norfolk	Norfolk	MBTA	2.00	530	482	91
Franklin	Franklin/Dean College	MBTA	2.00	173	170	98
Franklin	Forge Park/I-495	MBTA	2.00	716	723	100

[1] Includes parking in illegal spots.
NA = Not applicable

TABLE 2
MassHighway Park-and-Ride Lot Inventory

Town/City	Location	Parking [1] Spaces	Percent Full	Transit Services
Rockland	Route 3 exit 14 (near Route 228 at Pond Street)	450	65–90	Plymouth & Brockton
Pembroke	Route 3 at Route 139, exit 12	92	10	None
West Bridgewater	Route 24 at Route 106 (near exit 16)	153	94–100	Bloom Bus Lines
Bridgewater	Route 24 at Route 104 (near exit 15)	60	32	None
Taunton	Route 24 at Route 140, exit 11	180	NA	Bloom Bus Lines, DATTCO
Plymouth	Route 3 at Long Pond Road (near exit 5)	234	85	Plymouth & Brockton
Freetown	Route 24 at Gramp Deane Road, exit 10	32	50	None
Somerset	I-195 at Route 103, exit 4	68	95	None
New Bedford	Route 140 at Mount Pleasant Street, exit 4	160	90	DATTCO
Mattapoisett	I-195 at North Street, exit 19	80	9	None
Wareham	Route 25 at Maple Springs Road, exit 1	120	8	None
Bourne	Route 6, north of Sagamore Rotary	377	83	Plymouth & Brockton
Barnstable	Route 6 at Route 132 (near exit 6)	365	95	Plymouth & Brockton
Harwich	Route 6 at Route 124 (near exit 10)	75	20	Plymouth & Brockton

[1] Includes parking in illegal spots
NA = Not available

4 SOCIOECONOMIC TRENDS

Demographic information is the foundation of transportation planning efforts. Understanding demographic changes and trends help decision-makers identify future needs and set priorities. This chapter outlines the past and future trends in population, household, and employment data the three most important factors that influence trip generation. Analysis is provided on a regional level and is concentrated on the Boston urban core and the southeastern Massachusetts communities because they generate most of the commuter traffic through the Braintree split during the peak travel periods.

4.1 POPULATION

In this section, population forecasts and historical trends are discussed. Population data and forecasts by MAPC and the Southeastern Regional Planning and Economic Development District (SRPEDD) are presented in Figures B-1 and B-2 in Appendix B. The population forecasts take into consideration future natural population increases and future migration.

Overall, between 1990 and 2000, the southeastern Massachusetts communities grew faster in population than communities in the Boston urban core. In most of the southeastern communities outside the urban core, population growth ranged from 11 to 20 percent. However, during the same period, the growth in population for communities in the Boston urban core was 3 percent.

Population forecasts depict similar trends. As Figure B-2 shows, over the 2000–2025 period, the populations in southeastern Massachusetts communities are expected to grow faster than communities in the Boston urban core. However, the rate of growth is expected to be moderate compared to that of the 1990s. To allow for easy comparison of the past and the future, the scale for the future demographic forecasts is adjusted by a factor of 2.5 to reflect the 25-year span (2000–2025) versus the 10-year span (1990–2000) historical trends. All of the communities south of Stoughton, Holbrook, Hingham, and Scituate are expected to grow, thereby increasing travel demands in the region.

4.2 HOUSEHOLD

Another statistic related to population that affects travel demand is household. As with population, the number and size of households are important trip generation determinants, even more than population itself. As the number of households increases and household size decreases, trips that could have been shared by two or more people are often made separately. In this section households are discussed in terms of number and size. Household data from MAPC and SRPEDD are presented in Figures B-3 and B-4 in Appendix B. Data used for the household forecasts includes data from the 1990 and 2000 U.S. census. This data includes the total number households, the number of residents in group quarters, the total population, and forecasts of the total population.

Between 1990 and 2000, the number of households grew faster in southeastern Massachusetts communities than in the Boston urban core. In addition, the growth in the number households was faster than the growth in population. Many communities that lost population (Figures B-1 and B-2) registered growth in the number of households; this resulted from a general decrease in the average household size. The increasing number of smaller households has an impact on trip generation as well.

Household forecasts, shown in Figure B-4, depict similar trends—the number of households will continue to grow faster than the population through 2025 as lifestyle changes toward a smaller average household size persist. Over this 25-year period, the number of households in southeastern Massachusetts communities is expected to grow faster than in communities in the Boston urban core. Unlike population, the rate of growth of the number of households is not expected to be moderate compared to that of the 1990s, but according to the forecasts, it is expected to remain at the current rate of growth.

4.3 EMPLOYMENT

While population and households are trip generators, it is employment (number of jobs) that determines the work-related trips. A component of work-related trips is commuter trips that involve travel to work. Commuter trips usually occur during peak travel periods and are the source of traffic congestion on many highways that lead to downtowns and major employment centers. In this section, employment is discussed in terms of number of jobs, historical trends, and future projections. The employment data used in this analysis was obtained from MAPC and SRPEDD.

Between 1990 and 2000, communities in the Boston urban core experienced a growth in jobs, with the heaviest concentrations of new business establishments in Boston (46,291), Cambridge (12,347), Somerville (3,084), and Chelsea (3,454). At the same time, the number of jobs in the southeastern Massachusetts communities increased as well. The majority of the new jobs were service-sector jobs that include professional services, business, repair, entertainment, recreation, health, and education.

Future changes in employment from 2000 to 2025 reflect trends similar to the 1990s—that employment is expected to grow in both the Boston urban core and in southeastern Massachusetts communities. However, future growth is expected to be moderate when compared to that of the 1990s. All of the communities in the Boston urban core (Boston, Cambridge, Somerville, Chelsea, and Everett) are expected to gain jobs over the 25-year period. All of the southeastern Massachusetts communities south of Stoughton, Holbrook, Hingham, and Scituate are also expected to gain jobs, but not as many as those in the Boston urban core.

Figure B-5 and B-6 in Appendix B show the locations and distribution of jobs in the Boston urban core and in southeastern Massachusetts communities. As the figures show, the Boston urban core has the largest number and concentration of jobs, which far exceed the job figures for southeastern Massachusetts communities. This trend persists into the future.

The net effect is that even though there is expected to be job growth in the southeastern Massachusetts communities, the region will remain essentially residential, relying on the Boston urban core for much of its employment. Thus the southeastern Massachusetts region will export more workers to the Boston urban core than it imports. This geographical distribution of jobs and residences creates the need for long commutes, hence the high peak-period travel demand on the highways to and from downtown Boston via the Braintree split, and also the high peak-period load on commuter rails service in these areas.

4.4 GROWTH IMPACTS

The growth trends (jobs, population, and household) in southeastern Massachusetts that are fueled by the high quality of life that its communities offer and the concentration of jobs in the Boston urban core have contributed to an increase in commuter trips between the two areas. They have also resulted in imbalances in the transportation systems, causing, for example, traffic congestion on Route 3 South, the Southeast Expressway, and the stretch of 1-93 from its intersection with Route 24 to the Braintree split. Many of the southeastern Massachusetts communities do not have convenient access to transit services; hence many of their residents drive alone to work. These trends have also resulted in high peak loads on MBTA commuter rail and rapid transit serving this area that exceed MBTA standards. The next chapter discusses the travel patterns of the work trips of persons employed in the Boston urban core who reside in southeastern Massachusetts communities.

5 TRAVEL PATTERNS

As described in the previous chapter, geographical distribution of jobs and residences influences commuter trips. The following section describes the travel patterns of persons employed in the Boston urban core (Boston, Brookline, Cambridge, Chelsea, Everett, and Somerville) who reside in southeastern Massachusetts. The source of the data for this analysis is the Census Transportation Planning Package 2000 (CTPP 2000). The CTPP 2000 provides accurate and comprehensive data needed to make informed decisions. It provides statistics of households, people, and workers and summarizes this information by place of residence, by place of work, and for worker-flows between home and work.

CTPP 2000 is a set of special tabulations, designed for transportation planners from answers to the long-form questionnaire of the 2000 census, which is mailed to one in six U.S. households. Because of the large sample size, the data is reliable and accurate. CTPP 2000 provides comprehensive and cost-effective data, in a standard format, for the entire United States. Transportation planners use CTPP 2000 data to evaluate existing conditions, develop or update travel demand models, and analyze demographic and travel trends.

The journey-to-work trip pattern is presented in Figure 14. In subsequent figures, trips have been separated into categories: drive-alone, transit, and carpool and vanpool. Transit trips consist of four modes: commuter rail, rapid transit, bus, and ferry boat. Walk, bicycle, taxi, and motorcycle modes were not analyzed, as they are rarely used for commuting from southeastern Massachusetts to the Boston urban core. The analysis of total trips in the Massachusetts counties of Barnstable, Bristol, and Plymouth, and from the state of Rhode Island are summarized in Table 3.

TABLE 3
Mode Share of Trips of People Employed in the Boston Urban Core Who Reside in Southeastern Massachusetts or Rhode Island

County/ State	Persons Employed	Drive Alone	Transit	Carpool/ Vanpool
Barnstable	3,114	57%	29%	12%
Bristol	12,576	56%	32%	10%
Plymouth	33,972	61%	30%	9%
Rhode Island	5,516	47%	37%	13%

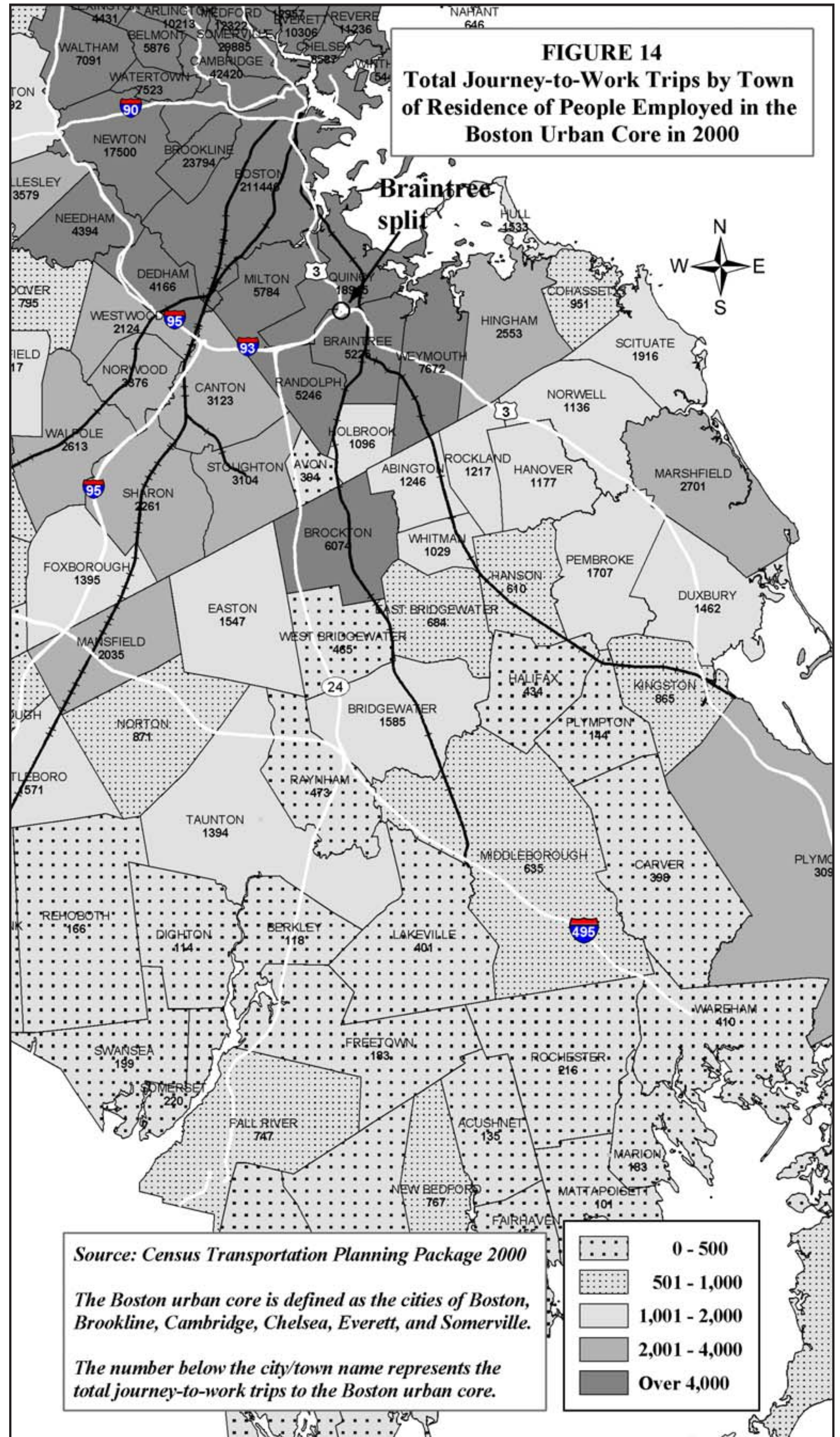


FIGURE 14
Total Journey-to-Work Trips by Town of Residence of People Employed in the Boston Urban Core in 2000

Source: Census Transportation Planning Package 2000

The Boston urban core is defined as the cities of Boston, Brookline, Cambridge, Chelsea, Everett, and Somerville.

The number below the city/town name represents the total journey-to-work trips to the Boston urban core.

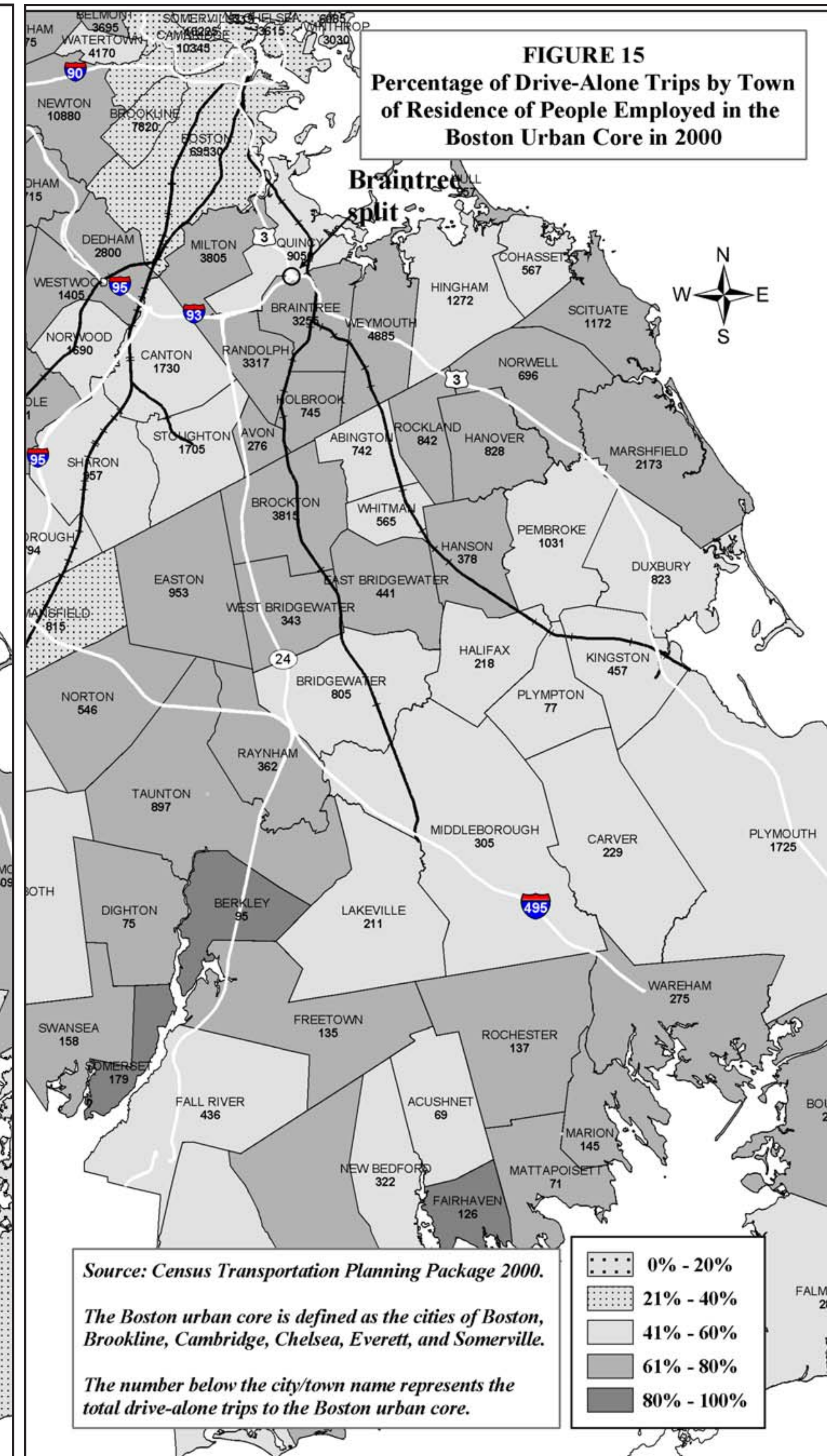


FIGURE 15
Percentage of Drive-Alone Trips by Town of Residence of People Employed in the Boston Urban Core in 2000

Source: Census Transportation Planning Package 2000.

The Boston urban core is defined as the cities of Boston, Brookline, Cambridge, Chelsea, Everett, and Somerville.

The number below the city/town name represents the total drive-alone trips to the Boston urban core.

5.1 DRIVE-ALONE TRIPS

Drive-alone trips are shown in Figure 15 (page 23). As the figure shows, less than 40 percent of the people who reside and work in the Boston urban core drive alone to work—an indication of high transit use in the urban core. Figure 15 also shows a high percentage of drive-alone work trips to the Boston urban core from southeastern Massachusetts communities. Three principal areas identified as having high drive-alone shares are described below.

Route 24 Corridor Residents of these communities, which are sandwiched between the Attleboro/Providence and Middleborough/Lakeville commuter rail lines, often do not have convenient access to either of the lines. Hence, the majority of the people residing in this area who are employed in the Boston urban core prefer to drive alone to work. The result of this choice is the high volume of commuter traffic along Route 24 through the Braintree split to the Boston urban core.

Fall River–New Bedford–Cape Cod Area The communities in this area also generate a significant number of drive-alone work trips to the Boston urban core. Although the Middleborough and Kingston/Plymouth stations are options, these communities are generally underserved by commuter rail. P&B bus line is the major transit service in the area. Route 3 South and Route 24, both of which are congested during peak travel periods and also feed vehicles through the Braintree split, are the major highways used by these commuters.

South Shore Area This area consists of the communities along Route 3A and Route 3 South between Plymouth and Braintree. It has a substantial number drive-alone work trips to the Boston urban core. The area is not yet served by commuter rail; however, the Greenbush commuter rail is expected to begin service in 2006. Presently, the only transit service is bus service provided by the P&B bus line for these communities. The majority of these drive-alone work trips end up on Route 3 South and Route 3A, contributing to peak-period travel congestion. Because Route 3 South serves many communities and includes traffic from the Cape and the Islands, drive-alone work trips significantly impact its congestion.

5.2 TRANSIT TRIPS

Figure 16 shows the transit work trips to the Boston urban core from the southeastern Massachusetts communities. This figure shows

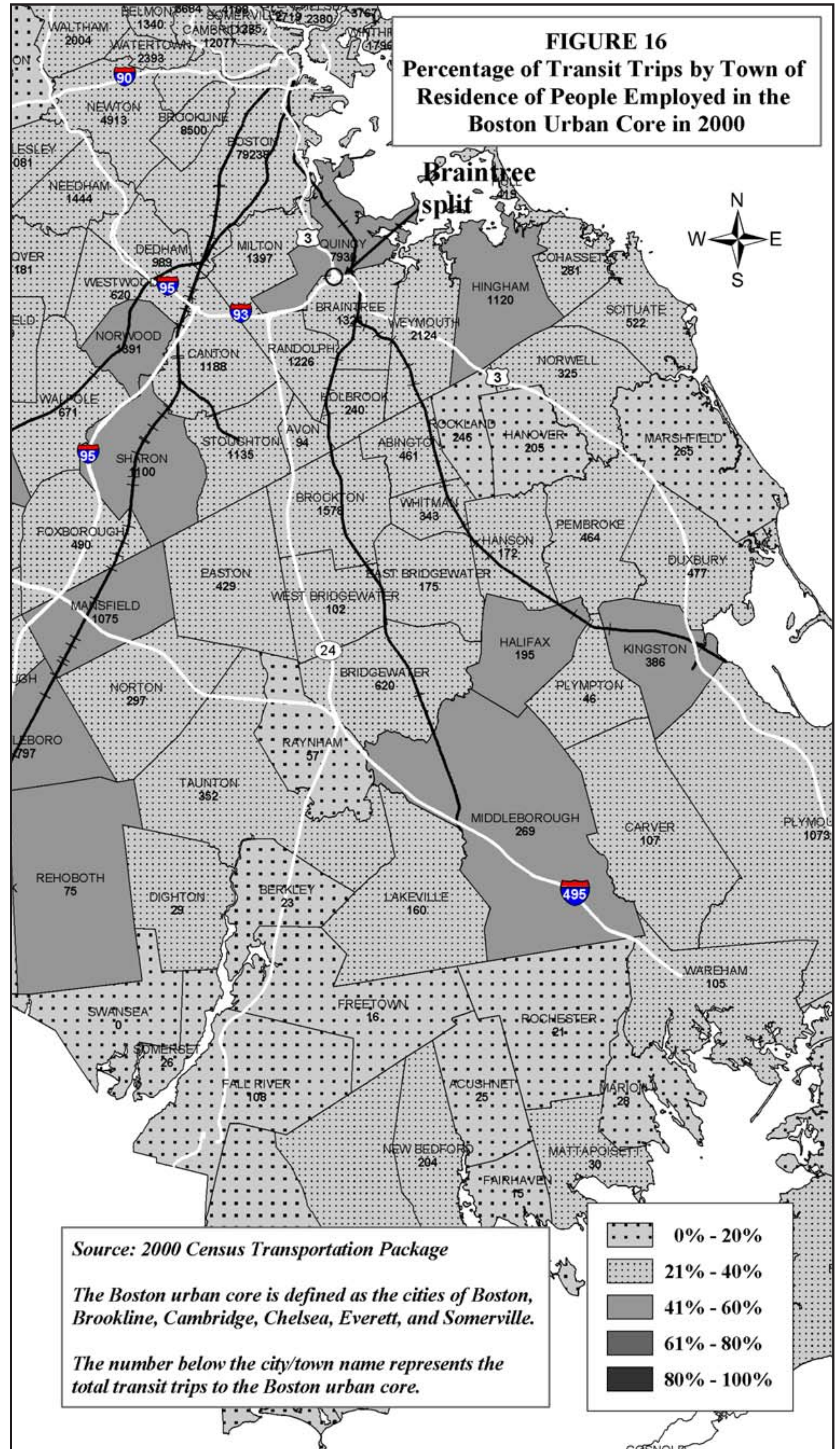


FIGURE 16
Percentage of Transit Trips by Town of Residence of People Employed in the Boston Urban Core in 2000

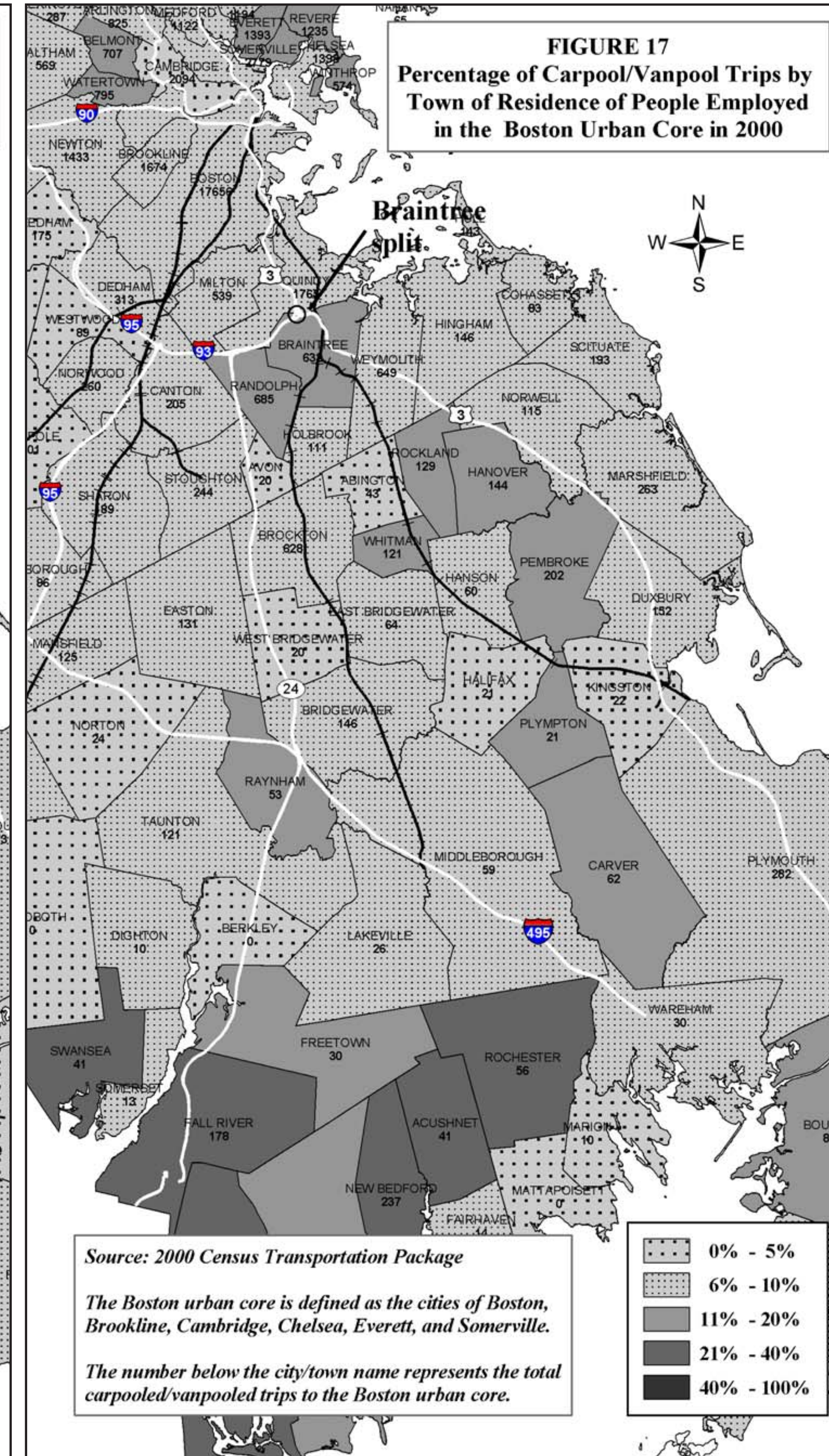


FIGURE 17
Percentage of Carpool/Vanpool Trips by Town of Residence of People Employed in the Boston Urban Core in 2000

almost the opposite distributions of those in Figure 15. Nearly 40 percent of the work trips in the Boston urban core are by transit. In southeastern Massachusetts, the communities that are served by commuter rail also have high percentages of work trips to the Boston urban core that use transit, while those without convenient access to commuter rail and/or park-and-ride lots, particularly those along Route 3 South, Route 3A, and Route 24, have lower percentages of transit use.

Another important observation is the low percentage of transit share of the work trips to the Boston urban core from the Fall River–New Bedford–Cape Cod area. Implementation of the proposed extension of the Stoughton commuter rail line to Fall River/New Bedford is expected to change this pattern to a degree, as it would create new transit riders diverted from nontransit modes, such as drive-alone and carpool and vanpool work trips to the Boston urban core. Thus implementation of this project has congestion reduction benefits for the Braintree split.

5.3 CARPOOL AND VANPOOL TRIPS

Carpooling and vanpooling are congestion reduction strategies and are the only way to commute to the Boston urban core if one wishes to take advantage of the HOV lane on the Southeast Expressway without using bus transit. The percentage and number of carpoolers and vanpoolers in the southeastern Massachusetts communities are shown in Figure 17 (page 24). The figure shows relatively high numbers of carpoolers and vanpoolers from the South Shore and communities along Route 3 South.

In the Fall River–New Bedford area, carpooling and vanpooling seem to be the preferred alternatives. Between 20 and 40 percent of people employed in the Boston urban core who reside in that area carpool or vanpool to work. By observation, areas with a high percentage of people carpooling and vanpooling are those that are not served by commuter rail, and where the only available service is bus transit. There are several factors contributing to this high percentage, including the convenience and flexibility offered by ridesharing, and the levels of service of other transit modes, such as bus. These reasons were not investigated through a survey, as they were beyond the scope of this study.

5.4 FUTURE TRAFFIC VOLUMES

The forecast horizon year for this study is 2025. The 2025 regional model includes all the transit and highway projects in the MPO region expected to have been completed by that year. It also accounts for the effects of plans for land development and growth in employment, number and size of households, and population. For this study, data on these factors for 2025, developed by MAPC, was already available from the regional planning model set. It was used to create 2025 regional trip tables that consist of zone-to-zone trips.

Between 1992 and 2003, average weekday traffic on I-93 (between Routes 24 and the Braintree split) increased by 14 percent; on Route 3 South by 15 percent; and on the Southeast Expressway, by 18 percent. These increases represent a rate of about 1.2 to 1.3 percent per year. The morning and afternoon peak-period traffic volumes presented in Figures 4 and 5 (pages 11–12) indicate that between 6:00 and 9:00 AM and 3:00 and 6:00 PM the volumes in the peak direction of travel remain constant or decrease slightly due to traffic congestion.

The forecasted traffic volumes for 2025 indicate slower growth, partly due to congestion and partly due to an increased transit share of the total trips. The MBTA commuter rail ridership is predicted to increase by about 45 percent between now and 2025.[5] Its proposed Greenbush and Fall River/New Bedford lines are expected to divert single-occupant-vehicle work trips to the Boston urban core to transit trips.

Peak-period traffic demand on I-93 (between Route 24 and the Braintree split) and on Route 3 South is expected to increase by 15 to 20 percent between 2003 and 2025 and by 10 to 15 percent on the Southeast Expressway in the same time period. These increases represent an average growth rate of about 0.5 to 0.8 percent per year. Initially, the current growth rate may continue, but it is expected to taper off in later years. Given current peak-period traffic congestion, additional traffic demand will most likely be experienced as an expansion of the duration of the peak periods rather than as a significant increase in peak-hour volumes.

5.5 SUMMARY

Both socioeconomic trends and travel patterns indicate future growth in population, number of households, and jobs in both the Boston urban core and in southeastern Massachusetts. While future growth in population and households is more pronounced in southeastern Massachusetts communities because of the affordable high quality of life that its communities offer, future growth and concentration of jobs will be more pronounced in the Boston urban core. As described earlier, this geographical distribution of jobs and residences has resulted in peak-period traffic congestion on the highways that connect the Boston urban core to southeastern Massachusetts through the Braintree split. It has also resulted in the high peak load on the commuter rail lines serving this area. It is expected that this spatial imbalance will continue to overload the transportation systems (highway and transit) serving these areas, if improvements are not made.

The next two chapters describe the planned and proposed highway and transit projects that might impact traffic flow through the Braintree split. They include projects that are already under construction, already in the Transportation Improvement Plan, or in planning stages.

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5 Produced by the Central Transportation Planning Staff for the Massachusetts Bay Transportation Authority, *Program for Mass Transportation*, May 2003, Revised January 2004, p. ES-2.

6 PLANNED AND PROPOSED IMPROVEMENTS

6.1 TRANSIT

The transit projects that are described in this chapter are service enhancement and system expansion projects that are in the MBTA's *Program for Mass Transportation (PMT)* and 2004 Service Plan.[6] The PMT is a central element of capital planning at the MBTA and is the foundation for transit infrastructure planning and programming in Eastern Massachusetts. The PMT defines a vision for regional mass transportation and sets priorities for infrastructure investments in the areas of system preservation, service enhancement, and system expansion without financial constraints.

System preservation projects are projects aimed at keeping the MBTA's system in a state of optimal repair. Service enhancements projects are projects that would improve the service already in operation. System expansion projects are projects that would extend a transit line to an area that is not currently served, implement a service on an existing line that is not currently provided, or change the mode of transportation operating on an existing line. The system expansion projects described below are shown in Figure 18.

Because the PMT contains many projects, only those projects that are rated high or medium priority, are located in southeastern Massachusetts, and might have an impact on traffic flow through the Braintree split are discussed in this chapter. In addition, because the 2004 Service Plan contains service changes for all bus routes, only the proposed changes that affect the buses that serve the Braintree split area were considered.

6.1.1 Proposed Bus Service Changes

The MBTA reviews the level of usage of bus services every two years and reallocates services based on consumer demand. In addition, new bus routes and route restructuring are considered to provide better service for the riding public. The 2004 Service Plan is complete, and the MBTA Board of Directors approved it in September 2004. Service changes were to be implemented in the spring and winter of 2005, and the new Service Delivery Policy will be used in the development of the 2006 Service Plan. The recommended changes that affect services in the study area are listed in Table 4.

[6] Produced by the Central Transportation Planning Staff for the Massachusetts Bay Transportation Authority's *Program for Mass Transportation*, May 2003, revised January 2004, p. ES-1.

6.1.2 Service Enhancement Projects

The following are the MBTA service enhancement projects that are rated high or medium priority. They are summarized in Table 5, which gives the status of each project and funding.

Signal and Train Control Improvements on the Red Line

This high-priority proposal calls for increasing peak capacity on the Red Line by installing new-generation signal systems that will allow for closer spacing between trains than the present system allows in the shared segment of the two branches of the Red Line between Alewife and Andrew stations. Applying the new technology could allow train frequencies of every 2 minutes, instead of the current 3.5 minutes. Expanding the capacity of the Red Line through signal improvements and expansion of the fleet is expected to add 9,700 new riders to the mode, of whom 3,400 would be new transit riders who would be attracted from nontransit modes such drive-alone, carpool and vanpool, and bicycle and motorcycle. Because of the high number of new transit riders attracted, this improvement would have a high impact on air quality. In addition, this project is expected to reduce crowding, improve system reliability, and allow more frequent service. This project is not programmed in the 2006–2010 Transportation Improvement Program (TIP).

Operate Eight-Car Trains (Red Line)

This medium-priority proposal calls for expanding capacity on the Red Line by operating trains with a maximum train length of eight cars during peak periods instead of the present maximum train length of six cars. This proposal involves extending station platforms, excavating at underground stations, expanding storage yards, expanding power systems, modifying signal blocks, and purchasing additional rolling stock. This project is expected to add 3,800 new riders to the mode, of whom 1,000 would be new transit riders diverted from nontransit modes. Because of the limited number of new transit riders attracted, this project would have only a moderate impact on air quality. This project is not programmed in the 2006–2010 TIP.

Access to Service (Parking and Pedestrian Access)

Automobile parking is a critical access mode for commuter rail, which is the major transit system serving most of southeastern Massachusetts communities. This project includes expanding parking, installing bicycle racks, and improving pedestrian approaches to MBTA parking lots. The current plans of the MBTA envision adding over 9,500 parking spaces at various commuter rail and transit stations throughout the region. The MBTA planned parking program includes new parking spaces for the following rail lines in southeastern Massachusetts:

Attleboro/Providence Commuter Rail:	930 spaces
Franklin Commuter Rail:	500 spaces
Middleborough/Lakeville Commuter Rail:	500 spaces
Plymouth/Kingston Commuter Rail:	550 spaces
Red Line:	1,928 spaces

Additional parking facilities will be constructed over the life of this plan based on prioritization in the PMT. Table 6 shows the ratings of parking enhancement projects in the PMT for commuter rail and Red Line stations located in southeastern Massachusetts. In developing the ratings, stations that lack the necessary elements for project development, including availability of property for expansion and community support, were given low-priority ratings. In addition, stations where expansion was completed in the last 10 years or is currently underway were also assigned a low-priority rating.

The MBTA anticipates using several funding sources for these projects, including federal funds allocated to the MBTA; federal funds allocated to other regional transit authorities for use on the commuter rail system; and federally earmarked MBTA, local, private, and state bond funds. The MPO estimates that 5 percent of the transit funding for maintenance and improvement of the regional system will be allocated to parking expansion and maintenance.

6.1.3 System Expansion Projects

Commuter Rail Branch from Old Colony Lines to Greenbush

This high-priority project, currently under construction, will restore commuter rail service on a third branch of the Old Colony lines in Braintree and would follow a combination of active and inactive freight rail routes to the Greenbush section of Scituate. There will be seven new stations, in Weymouth, Hingham, Cohasset, and Scituate. The Greenbush Line is expected to add 11,400 riders to the mode, of whom 4,600 would be new transit riders diverted from nontransit modes. Because of the high number of new riders attracted, it would have a high impact on travel time savings and moderate air quality benefits. The funding sources for this project are MBTA Bond Proceeds and PAYGO (Pay-As-You-Go financing).

Commuter Rail to New Bedford and Fall River

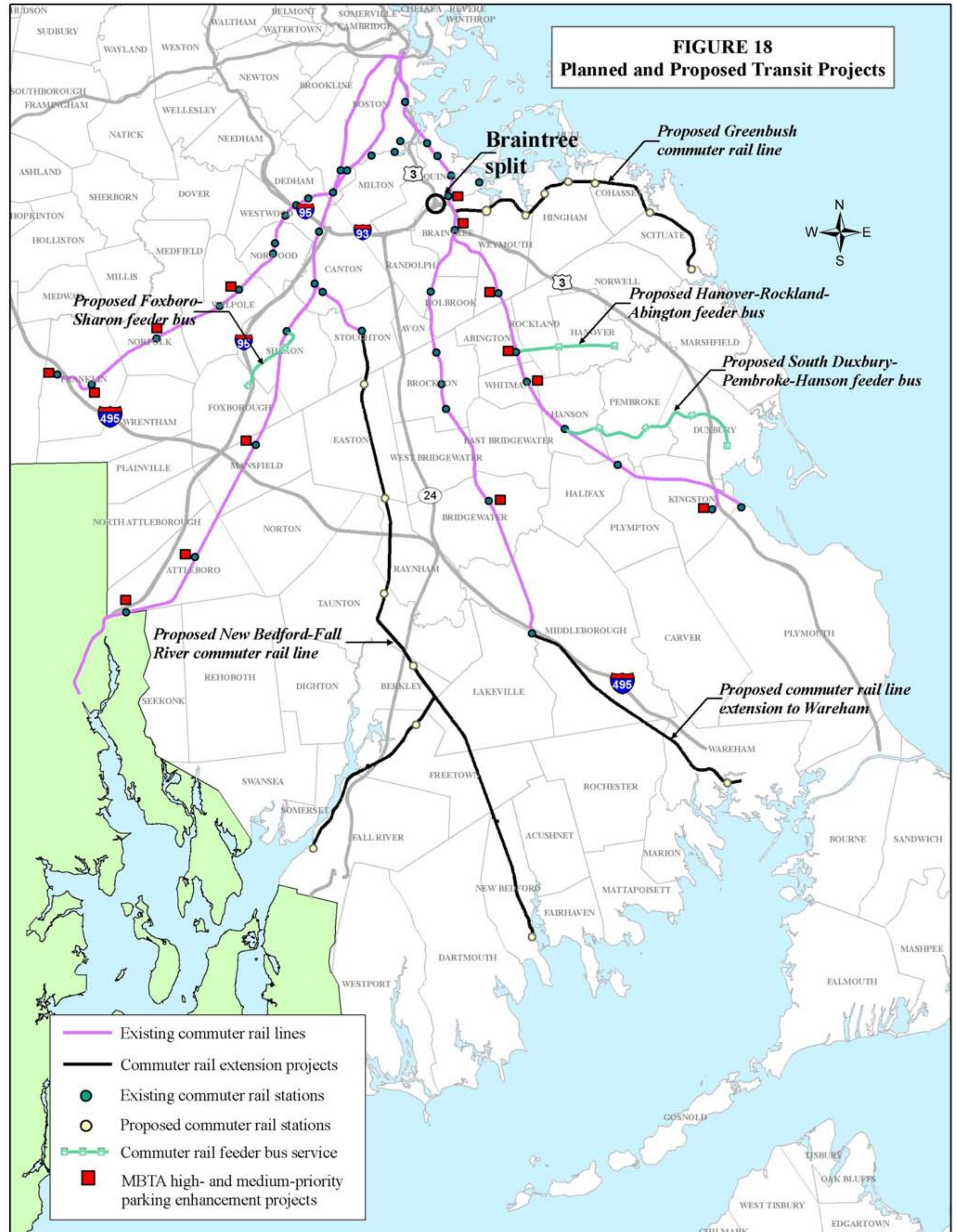
This high-priority project would extend commuter rail service from the end of the Stoughton Line to New Bedford and Fall River via a combination of inactive and active rail freight lines. There would be seven new stations, in Easton, Raynham, Taunton, Freetown, Fall River, and New Bedford. This project would attract the second largest number of commuter rail riders and new transit users of all commuter rail projects examined for the PMT. The New Bedford/Fall River Line is expected to add 8,700 riders to the mode, of whom 7,100 would be new transit riders diverted from nontransit modes. Because of the high number of new riders attracted, it would have a high impact on mobility and travel time savings. It is rated medium in cost-effectiveness, air quality benefits, economic and land use impacts, and environmental equity. Currently, this project is in planning stages and has not been programmed in the 2006–2010 TIP. Funding sources for this projects are yet to be determined.

Suburban Commuter Rail Feeder Bus Service

This high-priority project would implement new feeder bus services to several suburban commuter rail stations that currently have no transit service connections. An average of two vehicles would be needed to operate peak-period service on each feeder route. Preliminary analysis indicates that the promising new routes in southeastern Massachusetts are:

- From Foxboro to Sharon Station on the Attleboro Line.
- From Hanover via Rockland to Abington Station on the Kingston/Plymouth Line.
- From South Duxbury via Pembroke to Hanson Station on the Kingston/Plymouth Line.

Currently, this project is only a proposal and it has not been programmed in the 2006–2010 TIP. Funding sources for this project are yet to be determined.



Extend Commuter Rail from Middleboro to Wareham

This medium-priority project would extend commuter rail along an existing rail freight line from the end of the Middleborough/Lakeville Line to Wareham. The extension to Wareham is expected to add 1,300 riders to the mode, of whom 420 would be new transit riders diverted from nontransit modes. Wareham itself has very limited express bus service to Boston, but communities south of the Cape Cod Canal, from which the extension would draw riders, have frequent bus service provided by the P&B bus line.

The project is rated high in mobility and medium in utilization, air quality benefits, and economic and lands use impacts. It has a low rating in cost-effectiveness, as its capital and operating costs per new transit rider would be relatively high. Currently, this project is only a proposal and has not been programmed in the 2006–2010 TIP. Funding sources for this project are yet to be determined.

Improved Ferry Service from the South Shore to Boston

This medium-priority project includes several elements that could be implemented individually or together. The project would increase service frequency on the existing Hingham and Quincy/Hull commuter boat routes and would establish new routes to Boston from Cohasset and Scituate. It would add new transit options for travel to Boston, but would have to compete with other transit alternatives, including commuter rail and combinations of bus and rapid transit. The project is expected to add 800 new riders to the mode, of whom 270 would be new public transportation riders diverted from nontransit modes. It is rated medium in mobility and cost-effectiveness, and low economic and land use impacts and air quality benefits. Currently, this project is only a proposal and has not been programmed in the 2006–2010 TIP. Funding sources for this project are yet to be determined.

South Weymouth Naval Air Station Transit Access Improvements

The primary benefit of this project is the facilitation of a significant economic development opportunity related to reuse of the Naval Air Station. The nearby communities are working with the MBTA to explore several concepts for transit amenities. These include additional parking at the South Weymouth commuter rail station and development of a multimodal transit center linking rail and public and private bus services in the region. Currently, this project is only a proposal and has not been programmed in the 2006–2010 TIP. Funding sources for this project are yet to be determined.

TABLE 4
2004 Service Plan
Summary of Proposed Changes for Bus Routes Serving the Braintree Split Area

Bus Route		Day	Description of Change
230	Montello Station–Quincy Center	Weekday	Eliminate 5:30 AM trip.
230	Montello Station–Quincy Center	Sunday	Add a 7:00 AM and an 11:00 PM trip.
236	South Shore Plaza–Quincy Center	Weekday	Eliminate 3:20 PM southbound and 4:00 PM northbound trips; extend span to 8:20 PM.
236	South Shore Plaza–Quincy Center	Saturday	Change the frequency of service from a bus every 60 minutes to a bus every 70 minutes to increase reliability, and add trips at 7:00, 8:00, and 9:00 AM and at 10:00 PM.
238	Randolph–Quincy Center	Saturday	Eliminate Quincy Center–South Shore Plaza short trips. In addition, add one early morning trip.
238	Randolph–Quincy Center	Sunday	Eliminate last trip; create earlier first trip.
238	Randolph–Quincy Center	Saturday/ Sunday	Create earlier first trip.
240	Randolph–Ashmont Station	Weekday/ Saturday	Allow customers to ride trips returning to garage from North Randolph to Quincy Center Station.
240	Randolph–Ashmont Station	Sunday	Create earlier first trip.
245	Mattapan–Quincy Center	Weekday	Cancel late morning round trip. Add 7:00 PM trip.
246	Quincy Center–Quincy Medical Center	Sunday	Add new route serving Quincy Medical Center on Sundays to compensate for change to Sunday routing on bus route #215

TABLE 5
Current Status of Proposed Transit Projects

Project Name	Project Status	2005–2009 TIP Status	Funding Sources
Signal and Train Control Improvements On The Red Line	Proposal	Not programmed	To be determined
Operate Eight-Car Trains (Red Line)	Proposal	Not programmed	To be determined
Access to Service (Parking and Pedestrian Access)	MBTA Planned Parking Program		Several funding sources for maintenance and improvement
Commuter Rail Branch from Old Colony Lines to Greenbush	Under construction	Not applicable	MBTA Bond Process and PAYGO
Commuter Rail to New Bedford and Fall River	In planning	Not programmed	To be determined
Suburban Commuter Rail Feeder Bus Service	Proposal	Not programmed	To be determined
Extend Commuter Rail from Middleboro to Wareham	Proposal	Not programmed	To be determined
Improved Ferry Service from South Shore to Boston	Proposal	Not programmed	To be determined
South Weymouth Naval Air Station Transit Access Improvements	Proposal	Not programmed	To be determined

TABLE 6
MBTA Parking Enhancement Project Ratings in Southeastern Massachusetts

Key
● = High rating; ◗ = Medium rating; ❍= Low rating

Station	Line	Project Criteria									
		Customer Access	Land and Air Rights	Project Demand	Potential Utilization	Cost/Parking Space	Environmental Status	Ease of Construction	Community Support	Funding Availability	Overall
Quincy Adams	Red Line/Commuter rail	◗	●	●	❍	●	●	◗	●	◗	●
Braintree	Red Line/Commuter rail	❍	●	●	●	●	●	◗	◗	◗	●
Bridgewater	Commuter rail	◗	●	●	●	●	●	◗	●	◗	●
Forge Park	Commuter rail	◗	●	●	●	◗	●	◗	◗	◗	●
Franklin	Commuter rail	❍	●	◗	●	●	●	◗	●	◗	●
Kingston	Commuter rail	◗	●	●	●	●	●	◗	◗	◗	●
South Attleboro	Commuter rail	●	●	●	●	◗	●	◗	●	●	●
Whitman	Commuter rail	●	●	◗	●	●	◗	●	●	◗	●
Abington	Commuter rail	◗	❍	●	●	❍	●	●	◗	◗	◗
Attleboro	Commuter rail	◗	●	●	●	❍	❍	❍	●	●	◗
Hingham	Commuter rail	◗	◗	●	●	●	◗	◗	◗	◗	◗
Mansfield	Commuter rail	◗	●	●	❍	❍	◗	◗	●	●	◗
Norfolk	Commuter rail	❍	❍	●	●	●	●	◗	❍	◗	◗
South Weymouth	Commuter rail	◗	❍	●	●	◗	◗	●	◗	◗	◗
Walpole	Commuter rail	◗	◗	●	●	❍	❍	◗	●	◗	◗
Brockton	Commuter rail										❍ *
Campello	Commuter rail										❍ *
Canton Junction	Commuter rail										❍ *
Dedham Center	Commuter rail										❍ *
Holbrook	Commuter rail										❍ *
Middleboro	Commuter rail										❍ *
Montello	Commuter rail										❍ *
Norwood Center	Commuter rail										❍ *
Norwood Depot	Commuter rail										❍ *
Sharon	Commuter rail										❍ *
Stoughton	Commuter rail										❍ *

Note
* Individual-criterion ratings were not applied to stations where parking facilities are currently being expanded or are planned for expansion, or where substantial community opposition exists to potential expansion projects.

The MBTA already has in place a process to analyze the large number of parking projects under consideration. This process was used by the PMT in prioritizing new parking needs. The evaluation criteria include:

- Customer Access—Quality of automobile access to station parking lot from major arterial roadways.
- Land/Air Rights—MBTA ownership of (access to) land/air rights for expansion of the parking facility.
- Projected Demand—Magnitude of expected future demand for parking at the station.
- Potential Utilization—Ability of potential parking expansion to meet the needs of projected demand.
- Cost per Parking Space—Expected cost per parking space, either in surface lot or garage.
- Environmental Status—Barriers to parking expansion resulting from existing environmental issues.
- Ease of Construction—Barriers to parking expansion resulting from space constraints, land acquisition issues, challenging terrain, etc.
- Community Support—Level of Support demonstrated by local and/or regional officials and community groups for expansion of the parking facility.
- Funding Availability—Availability of non-MBTA funding sources for expansion of the parking facility.

6.2 HIGHWAYS

The 2006–2010 TIP was reviewed to identify planned and approved highway projects that might affect traffic operations at the Braintree split. In consultation with MassHighway, major highway projects in the study area that are in the planning stages and might have not been on the TIP were also identified. These projects, shown in Figure 19, are described below. They are also summarized in Table 7, which gives the status of each project and funding.

6.2.1 Burgin Parkway Viaduct in Quincy

This project will create new ramps at the Route 3/Burgin Parkway interchange. An overpass will be constructed for the Burgin Parkway southbound traffic (heading toward Route 3) over Centre Street. Beginning on Burgin Parkway just south of Penn Street, the outbound roadway will split. Southbound traffic staying left will continue to the existing at-grade intersection at Centre Street. Traffic bearing right and continuing south along Burgin Parkway will pass over Centre Street en route to the Route 3/Route 128/1-93 ramp system. The overpass will provide two travel lanes; it will then merge with the existing viaduct that carries traffic soutbound from the Quincy Adams MBTA station.

A new ramp will carry traffic away from Centre Street to 1-93 northbound and southbound from Crown Colony Drive, where it intersects with Congress Street. The ramp will join the southbound flow from Burgin Parkway downstream of the MBTA ramp and the Burgin Parkway merge location. Traffic using the ramp from Congress Street will not be required to weave with other traffic using Burgin Parkway, thus minimizing traffic weaving on the Route 128/I-93 ramps. A channelized ramp will be contructed to allow northbound Crown Colony Drive traffic to bypass the Crown Colony Drive/Centre Street and Burgin Parkway/Centre Street intersections and to connect Crown Colony Drive with southbound Burgin Parkway ramps.

This project will improve access to the Crown Colony development area by providing a new overpass, described above, that minimizes conflicts for the highest-volume traffic movements through the Burgin Parkway/Centre Street intersection: the northbound left-turn movement from the Route 3 ramps onto Centre Street and the southbound movement from Burgin Parkway to Routes 3 and 128 and 1-93. It will also improve the level of service for the weave mentioned above during both peak periods. This project will be constructed with Congestion Mitigation and Air Quality Improvements fund and is programmed in the 2006–2010 TIP.

6.2.2 Improvements near the I-93 and Route 37 Interchange in Braintree

This project will create an extension of the existing I-93 northbound off-ramp to Route 37 (Granite Street) by constructing a new distributor road paralleling I-93 and connecting the off-ramp to Granite Street. The distributor road will begin as an off-ramp on I-93 northbound midway between Routes 28 and 37. A new ramp will connect the distributor road to Forbes Road. The improvements will also include a connection from Brooks Drive to Forbes Road in order to facilitate circulation and access to businesses and residences in the area.

This project will improve access to the Route 37 development area. The northbound on-ramp services 1,200 vehicles per hour during the AM and PM peak periods, with traffic queues sometimes extending onto the freeway. The distributor roadway will create more storage room for the exiting traffic destined to Route 37 and minimize traffic queues that interrupt flow on the freeway, thus improving safety. The project will reduce the off-ramp traffic volumes at Route 37, as traffic destined to developments on Forbes Road from I-93 would now arrive there directly from the proposed collector/distributor road. This project is not programmed in the 2006–2010 TIP.

6.2.3 South Weymouth Naval Air Station Access Improvements

The primary benefit of this project is the facilitation of significant economic development related to the reuse of the Naval Air Station. To support this reuse, an ongoing Environmental Impact Review (EIR) will include alternatives, such as new roadway connections between the air station, Route 18, and Route 3; the construction of a regional intermodal facility; and improved bicycle and pedestrian connections. A connector road will provide a link to Route 18 and to an alternative access route to the redevelopment site and the South Weymouth commuter rail station on the Plymouth Line, which is located on Route 18. The projects identified in the final EIR will be considered for funding as part of the Regional Transportation Plan. Some of the planned access improvement projects have been programmed in the 2006–2010 TIP, as shown in Table 7.

6.2.4 Route 3 South Transportation Improvement Project

The project will widen Route 3 South from two lanes in each direction to three lanes in each direction from Weymouth (interchange 16 at Route 18) to Duxbury (interchange 11 at Route 14). Congestion has increased to the point that the State Police, MassHighway, and the Federal Highway Administration agreed to allow the use of the breakdown lane as a travel lane during peak periods. The project will restore the shoulder breakdown lanes, provide safety recovery zones, and will upgrade interchange acceleration and deceleration lanes. The project also involves design configuration improvements at the interchange ramps at interchange 12 (Route 139 in Pembroke); related intersection improvements at highway ramps at interchanges 11, 12, 13, and 15; and upgrades and expansions of the park-and-ride lots at interchanges 12 and 14. This project is not programmed in the 2006–2010 TIP.

The next chapter discusses additional improvements considered to be necessary at the Braintree split, haven taken into consideration the planned and proposed highway and transit projects in the area that may impact traffic flow through the split. The additional improvements are operational improvements that will improve safety and traffic flow through the split and will remove the bottlenecks around the split that restrict traffic flow to and from it.

TABLE 7
Current Status of Proposed Highway Projects

Project Name	Project ID	Design Status	2006–2010 TIP Status	Cost	Funding Sources
Burgin Parkway Viaduct in Quincy	603391	75%	Programmed, 2006	$18.0 million	Congestion Mitigation and Air Quality Improvement Program
Improvements Near the I-93 and Route 37 Interchange in Braintree	603134	25%	Not programmed	NA	To be determined
Route 3 South Transportation Improvement Project	NA	NA	Not programmed	NA	To be determined
South Weymouth Naval Air Station Access Improvements					
Route 18 Right-of-Way	601630	Pre 25%	Programmed, 2007	$1.0 million	High-Priority Project
Route 18 Intersections	603161	75%	Programmed, 2005; to be advertised in September 2005	$3.4 million	State Transportation Program
Route 18	601630	Pre 25%	Programmed, 2008	$14.0 million	State Transportation Program
East-West Parkway, Design	NA	Pre 25%	Programmed, 2006	$2.0 million	High-Priority Project
East-West Parkway, Permitting	NA	NA	Programmed, 2008	$3.0 million	High-Priority Project

NA = Not available

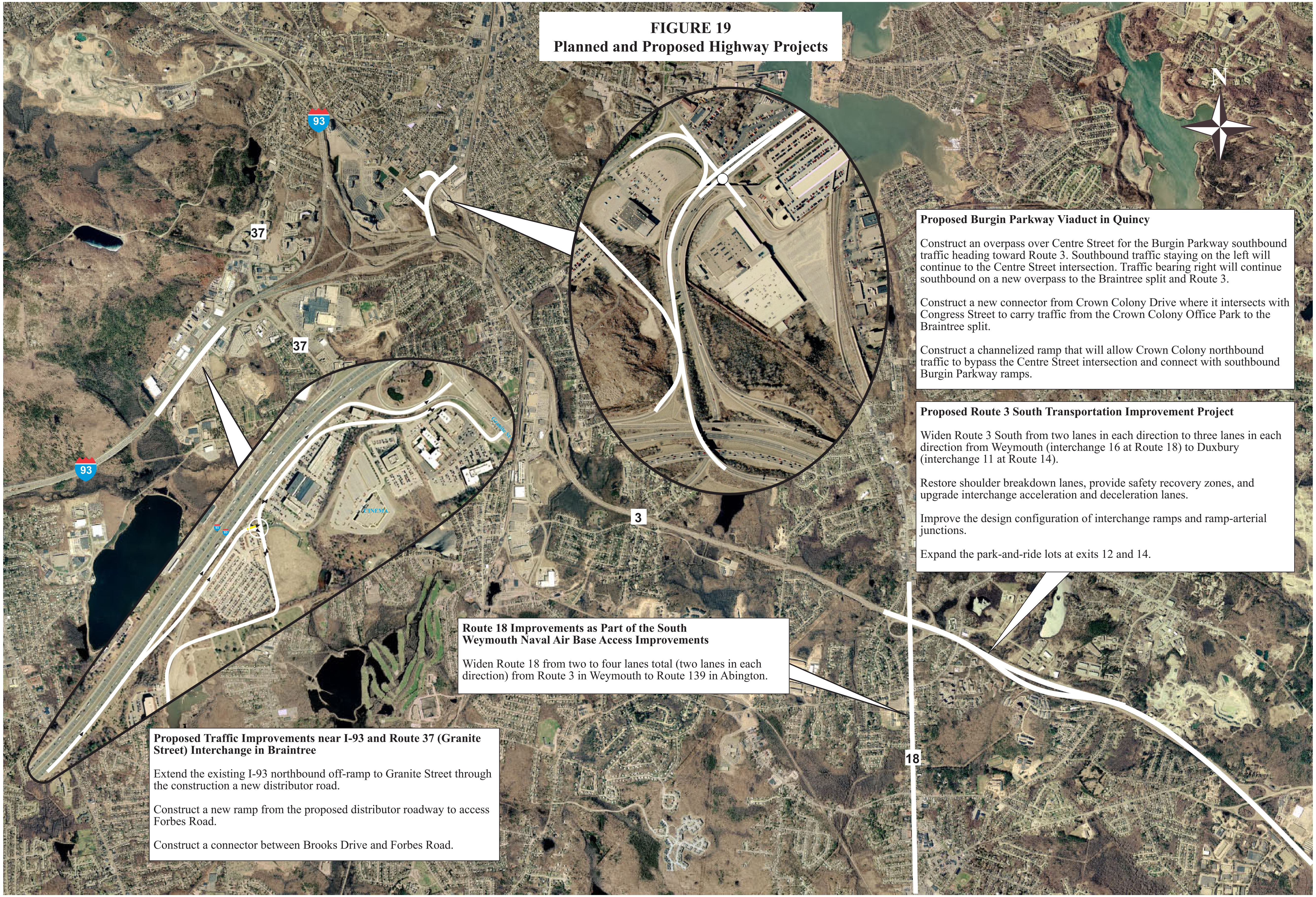


FIGURE 19
Planned and Proposed Highway Projects
N
93
37
37
93
3
18
Proposed Burgin Parkway Viaduct in Quincy
Construct an overpass over Centre Street for the Burgin Parkway southbound traffic heading toward Route 3. Southbound traffic staying on the left will continue to the Centre Street intersection. Traffic bearing right will continue southbound on a new overpass to the Braintree split and Route 3.
Construct a new connector from Crown Colony Drive where it intersects with Congress Street to carry traffic from the Crown Colony Office Park to the Braintree split.
Construct a channelized ramp that will allow Crown Colony northbound traffic to bypass the Centre Street intersection and connect with southbound Burgin Parkway ramps.
Proposed Route 3 South Transportation Improvement Project
Widen Route 3 South from two lanes in each direction to three lanes in each direction from Weymouth (interchange 16 at Route 18) to Duxbury (interchange 11 at Route 14).
Restore shoulder breakdown lanes, provide safety recovery zones, and upgrade interchange acceleration and deceleration lanes.
Improve the design configuration of interchange ramps and ramp-arterial junctions.
Expand the park-and-ride lots at exits 12 and 14.
Route 18 Improvements as Part of the South Weymouth Naval Air Base Access Improvements
Widen Route 18 from two to four lanes total (two lanes in each direction) from Route 3 in Weymouth to Route 139 in Abington.
Proposed Traffic Improvements near I-93 and Route 37 (Granite Street) Interchange in Braintree
Extend the existing I-93 northbound off-ramp to Granite Street through the construction a new distributor road.
Construct a new ramp from the proposed distributor roadway to access Forbes Road.
Construct a connector between Brooks Drive and Forbes Road.

7 ADDITIONAL IMPROVEMENTS FOR FURTHER CONSIDERATION

As described in the previous chapter, the PMT contains many transit projects for southeastern Massachusetts. Some are in the construction and planning stages, and others are proposals for further consideration. Because the PMT defines a vision for regional mass transportation for the MBTA and sets priorities for infrastructure investments without financial constraints, it is very comprehensive. After reviewing the PMT, it was determined that its transit projects and proposals address most of the mobility concerns in southeastern Massachusetts, and therefore no additional transit projects were proposed as part of this study.

Having accounted for the transit and highway projects in the TIP and PMT, CTPS, in conjunction with the study's Advisory Task Force and MassHighway, developed conceptual improvements for the Braintree split for further evaluation. The focus was on operational improvements that can be implemented in a short time, do not require major environmental impact studies or land takings, can be constructed within the present right-of-way, do not adversely affect residential neighborhoods, are cost-effective, and buy more time to look at long-range strategies. These are the criteria that guided the development of the improvements recommended in this study.

The recommended improvements are categorized into two packages: safety improvements and traffic flow improvements. The safety improvement package addresses problems at the high-crash locations where drivers have difficulty merging with the traffic in the main travel lanes or changing lanes. The safety improvement package consists of short-term improvements. The traffic flow improvement package addresses the bottlenecks in and around the split that prevent traffic from flowing efficiently through the split. These improvements are mostly short- and intermediate-term. Many of the traffic flow improvements also address safety problems at high-crash locations. For each package, the improvements can be implemented individually or in combination with other proposals.

At some problem locations, one or more alternatives in addition to the recommended alternative were evaluated. They include alternatives suggested by the Advisory Task Force and MassHighway. The alternatives that were found infeasible after further consultation with MassHighway are documented in Appendix C of this report along with the reasons why they are not recommended.

The following sections describe each package and its component improvements, as well as the levels of service for the 2025 no-build and build options.

7.1 SAFETY IMPROVEMENT PACKAGE

The individual safety improvements are shown in white in Figure 20 and are described in detail below. The improvements are identified by the number associated with the location of the problem, as given in Figures 2 and 3. That numbering is repeated in Figure 20 for easy reference and consistency.

7.1.1 Improvements at Location #1: Upgrade Short Deceleration Lane

This proposal was designed to address the short deceleration lane for traffic exiting onto Route 37. The proposal calls for lengthening the existing deceleration lane to provide more storage room and sufficient length for exiting vehicles to change lanes. The proposal also calls for installing signs on the Route 3 South connector instructing motorists exiting onto Route 37 to be in the rightmost lane.

7.1.2 Improvements at Location #2: Reconfigure the Ramp to Eliminate the Short Weave Distance

This proposal was designed to address the safety problems regarding the short weave distance for the on-ramp traffic proceeding from Route 37 northbound to the Expressway. The proposal calls for restricting the existing on-ramp to traffic that is heading to Route 3 South, the Burgin Parkway, or Washington Street. A median barrier or some form of separation would be required to prevent the ramp traffic from violating this restriction.

In addition, the proposal calls for constructing a double left-turn bay at the signalized ramp–arterial junction for use by traffic proceeding to the Expressway to access the south side on-ramp. The proposal also calls for installing new signs or modifying existing signs on Route 37 to guide motorists to the appropriate ramps. These modifications would increase safety at the split, as the south side on-ramp would have a longer weaving section to the Expressway. Level of service analyses for 2025 for the ramp–arterial junctions on Route 37 indicate that they would operate satisfactorily at LOS D or better during the AM and PM peak periods of travel.

Several alternatives to address the problem at this location were suggested by the task force. They were evaluated, and those found infeasible and are documented in Appendix C of this report along with the reasons why they were not recommended.

7.1.3 Improvements at Location #3: Install an Advanced Warning System for Downstream Queues

This proposal was developed to address safety problems created by traffic queues on the southbound connector ramp from the Expressway to Route 3 South during the PM peak period. The proposal calls for installing real-time sensors for queue detection, and overhead variable message signs to inform and warn motorists to reduce speed in advance of the downstream traffic queue that is obscured by the horizontal curvature of the roadway.

7.1.4 Improvements at Location #4: Enhance Access to HOV Lane for Washington Street On-Ramp Traffic

This proposal was developed to enhance access to the northbound HOV lane for travelers using the Burgin Parkway/Washington Street on-ramp during the morning peak period. The proposal calls for moving the Burgin Parkway and Washington Street northbound on-ramp connector to the Expressway further south and creating a new ramp connector with a right full auxiliary lane. The proposed ramp connector upgrade would, in effect, lengthen the weaving distance over which HOV-bound ramp traffic could change lanes to access the HOV lane. In addition, the proposal calls for installing new signs to direct HOV-bound traffic to the HOV lane.

7.2 TRAFFIC FLOW IMPROVEMENT PACKAGE

The individual traffic flow improvements are shown in white in Figure 21 and are described in detail below. The improvements are identified by the number associated with the location of the problem, as given in Figures 2 and 3. That numbering is repeated in Figure 21 for reference and consistency.

7.2.1 Improvement at Location #5: Lengthen the Acceleration Lane of the Southbound On-Ramp from Furnace Brook Parkway to the Expressway

This proposal was designed to address the afternoon peak period southbound congestion, weaving, and merging problems on the Southeast Expressway in the vicinity of the Furnace Brook Parkway interchange. The proposal calls for lengthening the acceleration lane for the southbound on-ramp connecting Furnace Brook Parkway to the Expressway. The upgrade is expected to reduce merging and weaving in the area and help on-ramp traffic from the Furnace Brook Parkway to enter the Expressway. This improvement, when combined with Improvement #10, would facilitate traffic flow through the split during the PM peak period.

In addition, the feasibility of a long-term solution should be examined: extending the HOV lane on the Southeast Expressway to Route 3 South and to I-93 toward Route 24. These extensions would remove the weave and merge of southbound HOV traffic heading to Route 3 South and to I-93 toward Route 24.

7.2.2 Improvements at Location #6: Burgin Parkway/Centre Street Traffic Congestion

The Burgin Parkway Viaduct project in Quincy, already in the design stages, is underway; it addresses this problem. That project is described in detail in Chapter 6 (page 30).

7.2.3 Improvement at Location #7: Route 3 South PM Peak Southbound Congestion between the Split and Union Street

This proposal was designed to address the PM peak period southbound congestion on Route 3 South between the Braintree split and Union Street. This southbound segment of Route 3 South, with three travel lanes, is a bottleneck during the PM peak period, as it receives traffic from five lanes—two from the Expressway, two from I-93 northbound from (Route 128), and one from the Burgin Parkway southbound on-ramp to Route 3 South. The proposal calls for creating a fourth southbound travel lane on this segment of Route 3 South. The fourth lane would be an auxiliary lane beginning at the Burgin Parkway on-ramp and possibly extending just past the exit ramp at the Union Street interchange. This lane would facilitate the maneuvering of entering and exiting traffic, which would increase the capacity of this section of the roadway.

This proposal would benefit the Burgin Parkway Viaduct project, as it would facilitate traffic flow on the connector ramp to Route 3 South by reducing its merge with Route 3 South that sometimes results in traffic queuing on the connector ramp. Similarly, this proposal would improve traffic flow from the split to Route 3 South by reducing the turbulence caused by merging traffic from the Expressway and I-93 (Route 128). Additionally, this proposal is expected to improve safety.

7.2.4 Improvement at Location #8: Upgrade Ramp Acceleration Lane

This proposal was designed to address traffic safety and congestion at the merge point of the connector ramp from Burgin Parkway and Washington Street to southbound I-93. The proposal calls for lengthening the acceleration lane for the on-ramp from Burgin Parkway and Washington Street to the Route 3 South connector, which connects Route 3 South with I-93 southbound. This improvement is expected to increase safety at this location. In addition, when it is combined with Improvements #1 and #10, it would help reduce congestion at this location, as traffic congestion at locations #1 and #10 sometimes impacts traffic flow at location #8.

7.2.5 Improvements at Location #9: Design Configuration Improvements at Interchange 17 (Union Street in Braintree)

This proposal was designed to specifically address problems of on-ramp traffic to and from the Union Street rotary interchange that impacts traffic flow on Route 3 South and the Braintree split during the AM and PM peak periods. The proposal calls for upgrading the existing acceleration and deceleration lanes on the north side of the rotary.

One modification would be an upgrade of the northbound acceleration lane into an auxiliary lane, possibly ending after the exit ramp at interchange 19 (Burgin Parkway/MBTA Quincy Adams Station). The idea is to provide more room for the on-ramp traffic to merge with Route 3 South northbound traffic, and for traffic exiting to the Burgin Parkway/MBTA Quincy Adams Station, so that it will not interrupt traffic flow on Route 3 South during the AM peak period.

In the southbound direction, the modification would be an upgrade of the deceleration lane into an auxiliary lane, possibly ending after the exit ramp at interchange 17 (Union Street). The idea is to provide more storage room for the southbound traffic exiting onto Union Street and to improve traffic flow on southbound Route 3 during the PM peak period.

Additional modifications include provision of a right-turn bypass lane or slip lane at the southbound ramp–rotary junction for use by the high volume of right-turn traffic. These modifications at location #9 are expected to improve safety as well as traffic flow.

7.2.6 Improvements at Location #10: Design Configuration Improvements on the I-93 Segment between Routes 24 and 37 and Related Interchange Improvements at Interchange 6 (Route 37)

This proposal was designed to address an external problem that impacts traffic operations at the split during the PM peak travel periods; specifically, congestion on I-93 toward Routes 24 and 128 that spills back into the split. The proposal calls for the following:

- Add a travel lane on I-93 southbound, beginning south of the Route 37 interchange and ending at the diverge point to Route 24.
- Reconfigure the lane assignment at the diverge point of I-93 and Route 24 to provide two travel lanes to the two-lane connector ramp connecting to Route 24. These exclusive lanes should extend about one-half mile to prevent turbulence on I-93.
- Widen the merge point of Route 24 southbound to receive the four travel lanes from the connecting ramps. The widening should be extended about one mile to prevent traffic turbulence from spilling back onto I-93. The widening may need to be extended to the Route 139 interchange, where 300 or more vehicles per hour exit than enter southbound Route 24 during the PM peak hour.
- Install new signs or modify existing signs to guide motorists to Route 24.

These improvements would have significant congestion-reduction and safety benefits and are expected to facilitate traffic flow on southbound I-93 toward Route 24 and through the split to Route 3 South.

7.2.7 Improvements at Location #11: Traffic Congestion at the I-93/Route 37 Ramp–Arterial Junction.

The I-93/Route 37 traffic improvements that address this problem are already in either the planning or design stage. That project is described in detail in Chapter 6 (see page 30).

FIGURE 20
Safety Improvement Package

Improvements at Location #1

Upgrade deceleration lane and modify existing signs or install new signs to direct northbound Route 3 South traffic exiting at Route 37.

The upgrade would provide more storage room and sufficient length for exiting vehicles to change lanes.

Improvements at Location #2

Reconfigure the existing ramp to eliminate the short weave distance for traffic heading to the Expressway by restricting its use to traffic heading to Route 3 South or Burgin Parkway/ Washington Street.

Construct a double left-turn lane at the ramp-arterial junction for use by traffic heading to the Expressway.

The modification is expected to improve safety by providing a longer weave distance for traffic heading to the Expressway.

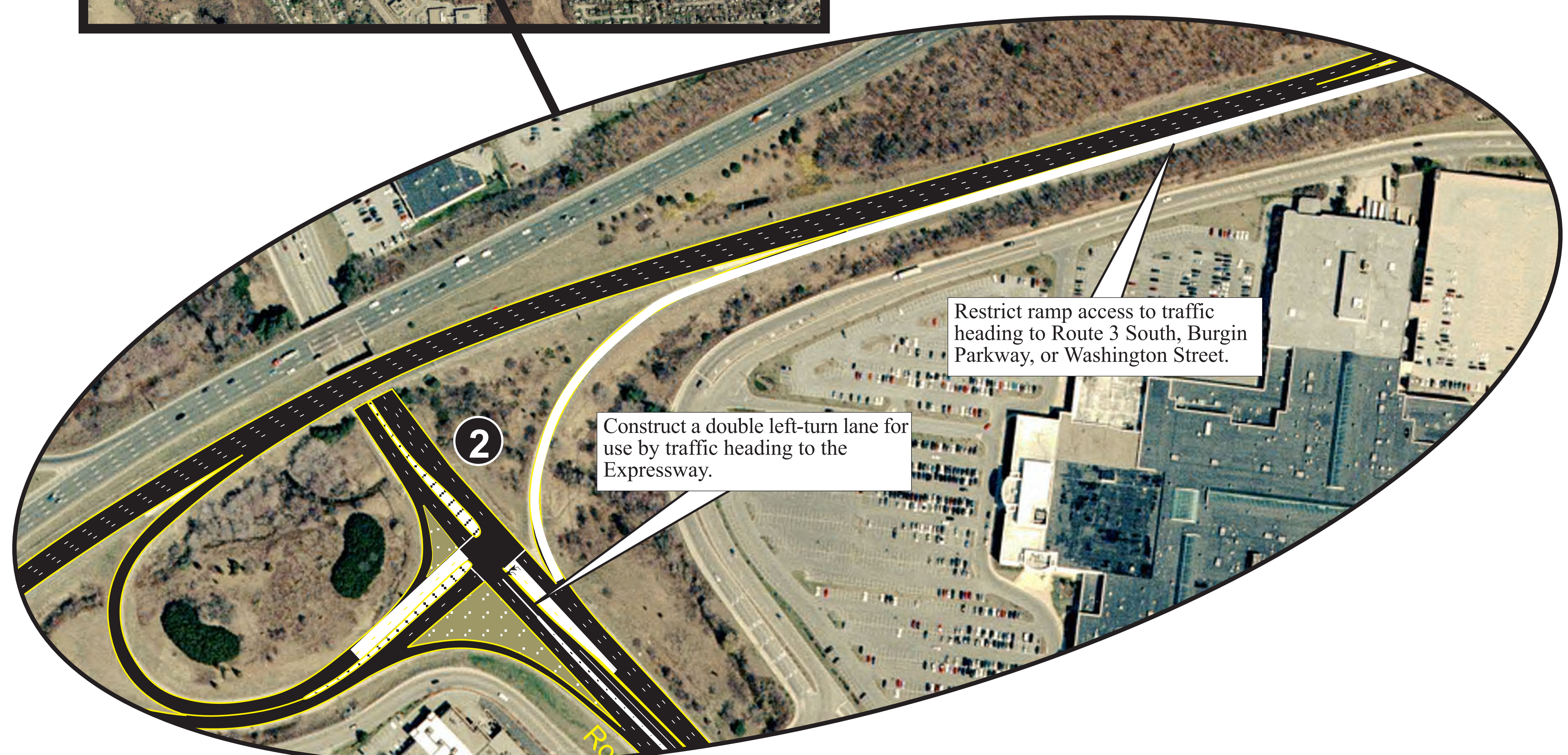
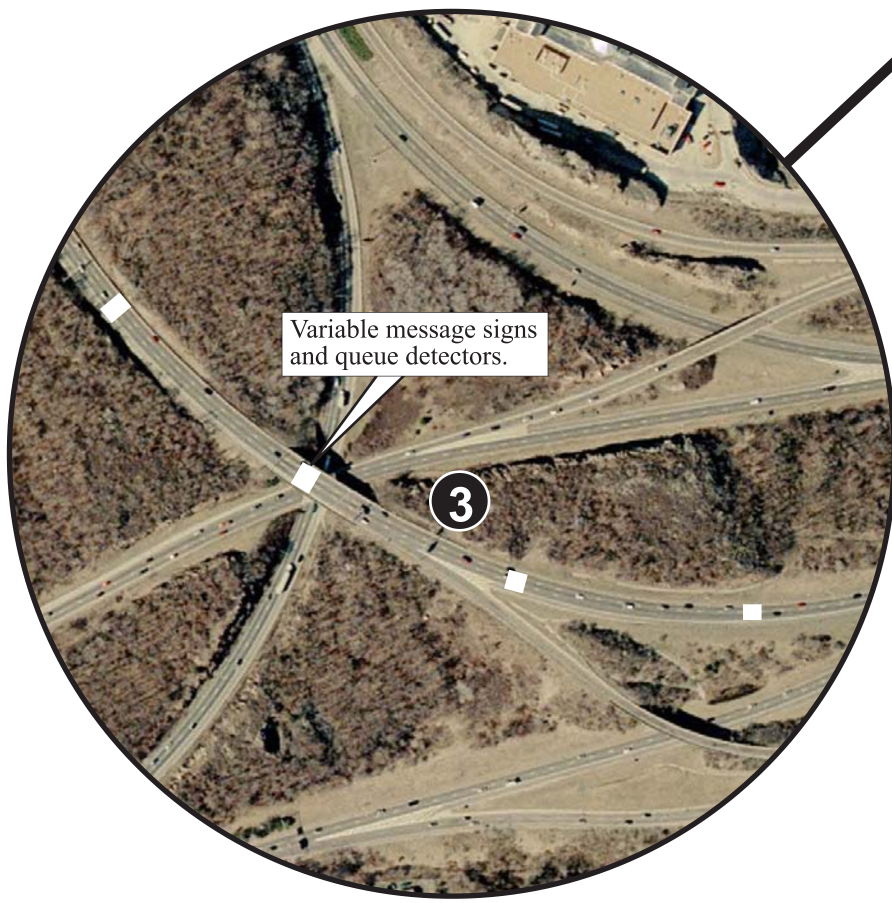


FIGURE 20 (cont.)
Safety Improvement Package

Improvements at Location #3

Install an advanced warning system for detecting a downstream traffic queue that is obscured by the horizontal curvature of the connector and variable message signs for informing motorists.

The proposal is expected to increase safety at the split.



Improvements at Location #4

Enhance access to the HOV lane for Washington Street on-ramp traffic by moving the ramp to the Expressway further south and creating a new ramp with a full auxiliary lane.

The upgrade will increase the weave distance over which HOV-bound traffic can change lanes to access the HOV lane.

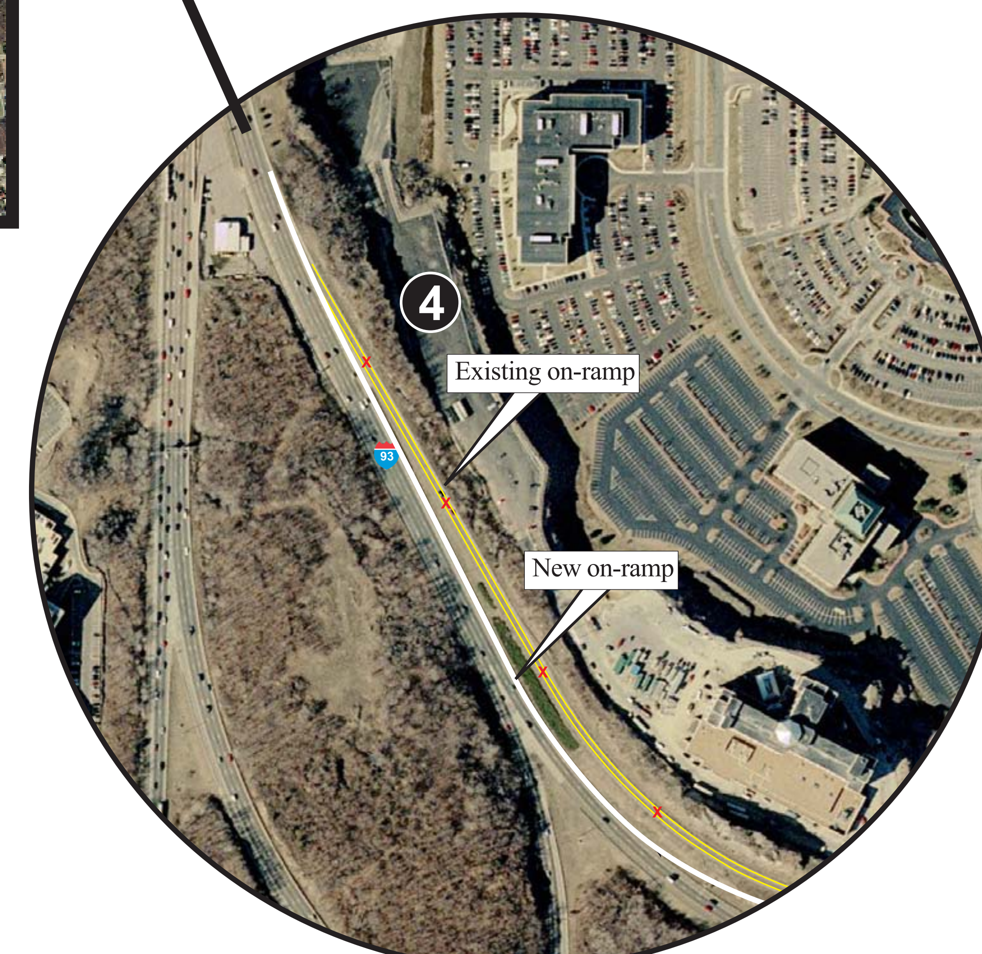


FIGURE 21
Traffic Flow Improvement Package

Improvement at Location #5

Lengthen the acceleration lane for the southbound on-ramp from Furnace Brook Parkway to the Expressway.

The upgrade is expected to reduce merging and weaving activities in this area and to facilitate traffic flow from the on-ramp to the Expressway.

Improvements at Location #6

Construct of an overpass for the Burgin Parkway southbound movement toward Route 3 over Centre Street.

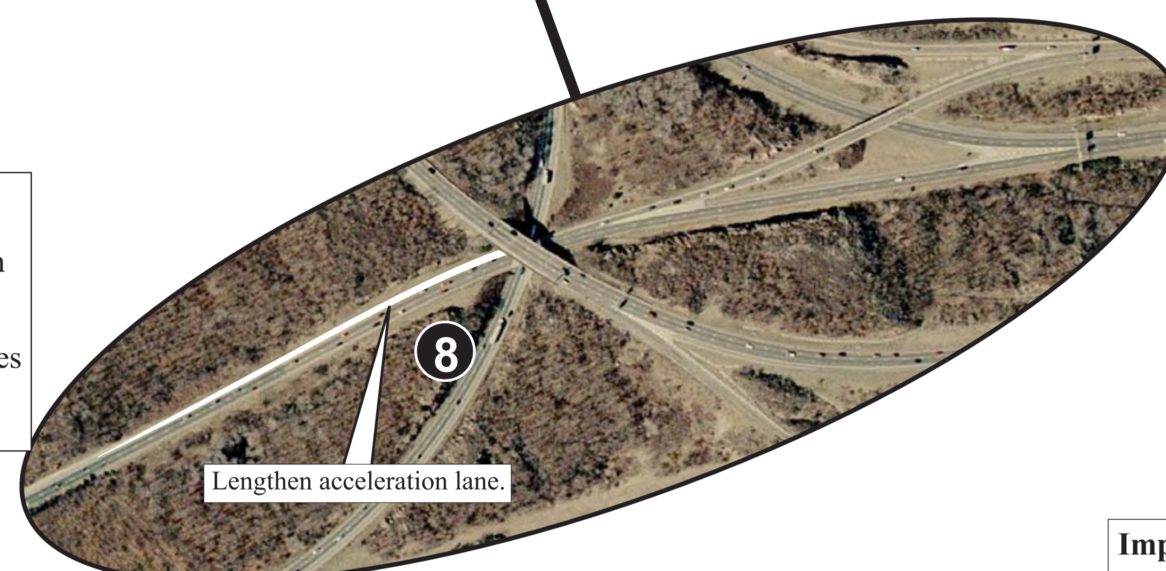
Construct a new ramp to carry traffic away from Centre Street to I-93 from Crown Colony Drive where it intersects with Congress Street.

The proposed Burgin Parkway viaduct is expected to address the traffic congestion issue at this location.

Improvement at Location #7

Add a fourth southbound travel lane on the Route 3 South segment beginning at the Burgin Parkway on-ramp and possibly ending after the exit ramp at the Union Street interchange.

The proposed improvement is expected to facilitate traffic flow from the Expressway and I-93 to Route 3 South during the PM peak period of travel.



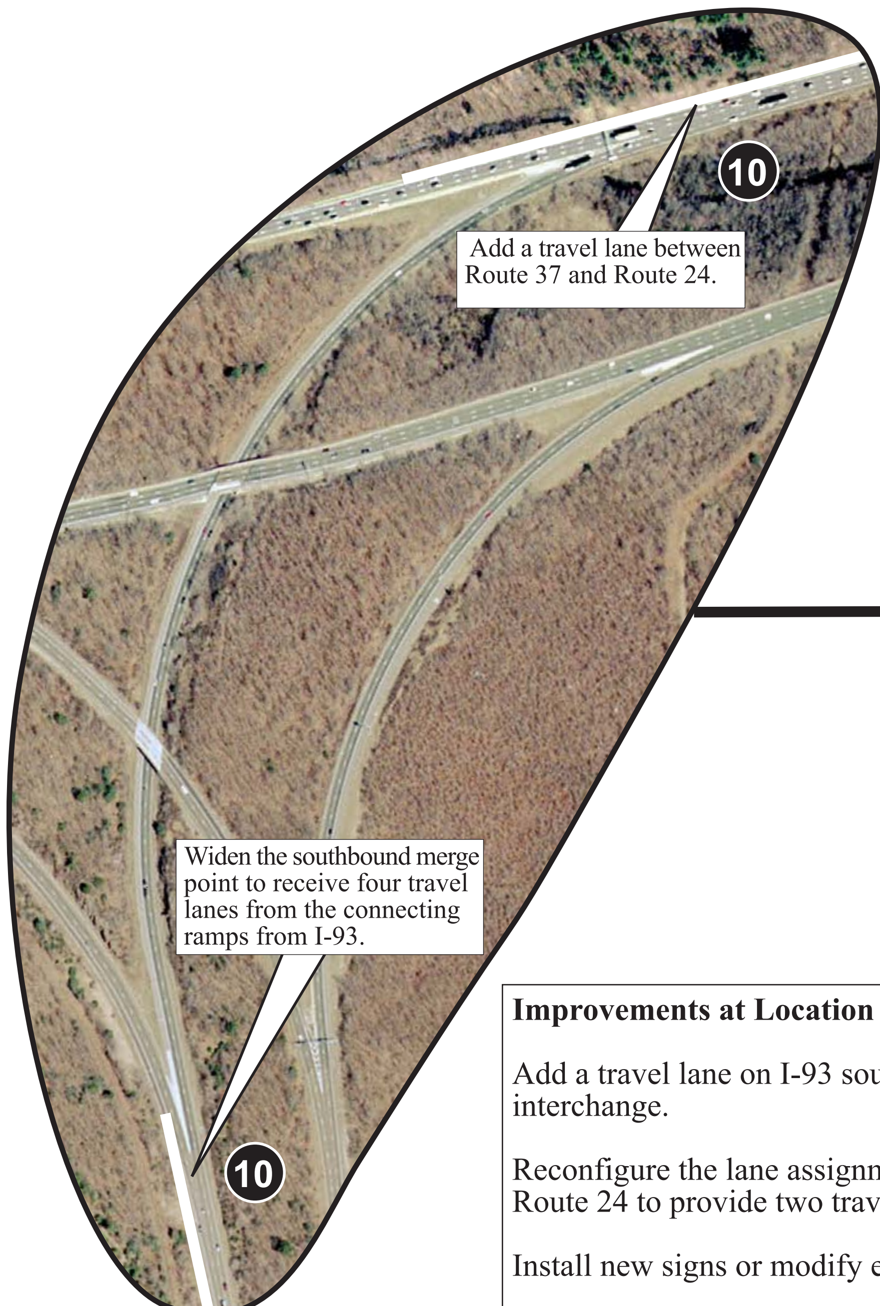
Improvement at Location #8

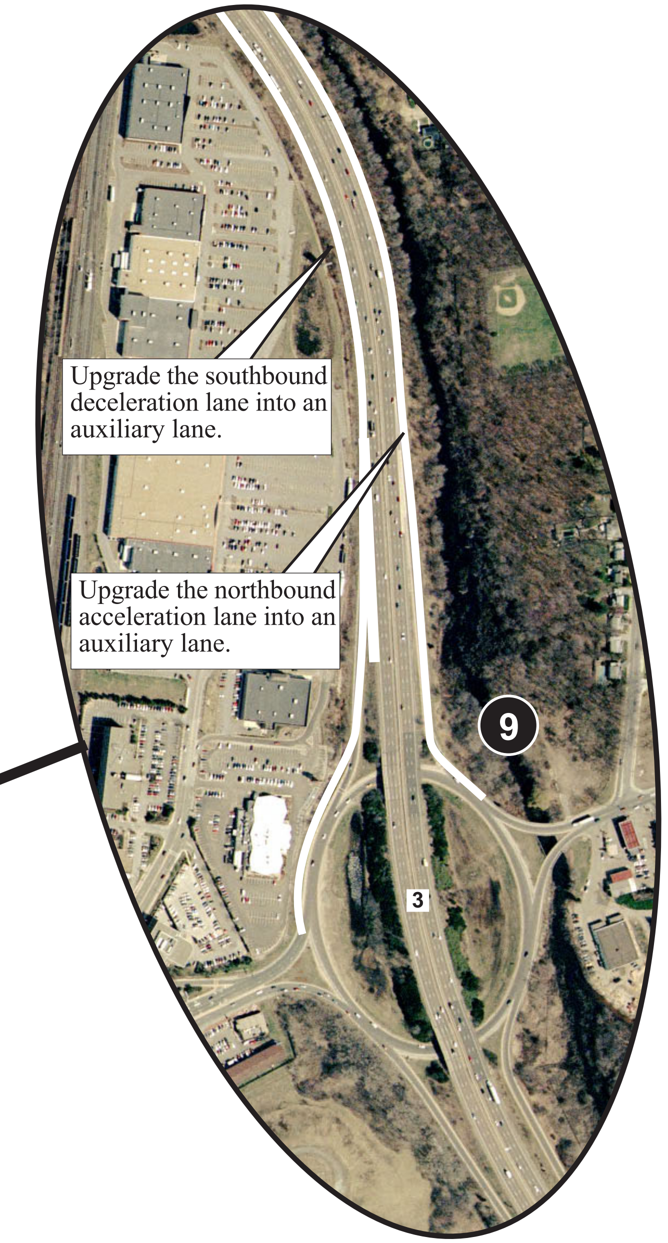
Lengthen the acceleration lane of the ramp from Burgin Parkway/ Washington Street to provide more space for merging with Route 3 South traffic.

The proposed downstream improvements at Route 37, Route 24, and the Route 128 Transportation Improvement Project are expected to help reduce the queuing that extends into this area.

(cont.)

FIGURE 21 (cont.)
Traffic Flow Improvement Package





Improvements at Location #10

Add a travel lane on I-93 southbound beginning south of the Route 37 interchange.

Reconfigure the lane assignment at the merge/diverge point of I-93 and Route 24 to provide two travel lanes to the two-lane connector ramp.

Install new signs or modify existing signs to guide motorists to Route 24.

Widen the merge point of Route 24 southbound to receive the four travel lanes from the connecting ramps.

The proposed improvements are expected to facilitate traffic flow on I-93 southbound toward Routes 24 and 128 during the PM peak period of travel.

Improvements at Location #11

Extend the existing I-93 northbound off-ramp to Granite Street through construction of a new distributor road.

Construct a new ramp from the proposed distributor roadway to Forbes Road.

Construct a connection between Brooks Drive and Forbes Road.

The proposed traffic improvements for roadways near the interchange of Route 37 and I-93 described in this report are expected to address the traffic congestion issues at this location.

Improvements at Location #9

Upgrade the northbound acceleration lane into an auxiliary lane, possibly ending after the exit ramp at interchange 19 (Burgin Parkway/ MBTA Quincy Adams Station).

Upgrade the southbound deceleration lane into an auxiliary lane, possibly ending after the exit ramp at interchange 17 (Union Street).

Provide a right-turn bypass lane or slip lane at the rotary for the southbound off-ramp, which has a high right turn volume.

The proposed improvements are expected to improve traffic safety and flow on Route 3 South.

7.3 TRAFFIC SIMULATION MODEL

The purpose of the traffic simulation modeling was to provide detailed information about future traffic operations of the Braintree split network. This was done to examine the merging and queuing phenomena that take place at the end of the HOV lane and those that take place at ramp–freeway junctions, interrupting the freeway's traffic flow. Another purpose of the traffic simulation was to evaluate the performance of the no-build and build options; specifically, how they improve traffic flow in the Braintree split area.
The CORSIM traffic simulation model was used in this study to evaluate the impacts of alternatives. CORSIM was developed by the Federal Highway Administration and has gone through several improvements and enhancements over the years. It consists of an integrated set of two simulation models that represent the entire traffic environment: NETSIM represents traffic on surface streets and FRESIM represents traffic on freeways.

CORSIM accounts for queuing, weaving, merging, and diverging through the car-following model, driver-behavior model, and vehicular characteristic and performance model. In CORSIM, vehicles are moved according to car-following logic in response to traffic control devices and other demands. Thus each time a vehicle is moved, its position and relationship to other vehicles nearby is recalculated, as is its speed, acceleration, and status. This data is accumulated every "time step" (every second), and at the end of the simulation, the accumulated data is used to produce measures of effectiveness to estimate the performance of the highway system. Travel speed and time are two of the primary performance measures from the model.

The simulation model was calibrated to 2003 peak-hour conditions using available ground counts by adjusting CORSIM calibration parameters to match existing conditions (speeds, travel times, and observed queues). After calibration, CORSIM was used to perform the 2025 analyses. There were two scenarios, the 2025 no-build option and the 2025 build option.

The 2025 no-build option was the baseline used in assessing the impacts of the build option. The no-build option in this study includes the highway and transit projects that were included in the 2025 build scenario for the 2004–2025 Regional Transportation Plan (RTP). The highway and transit projects in the study area that were included in the regional planning model for the RTP's 2025 build scenario are the Burgin Parkway Viaduct Project, Route 3 South Transportation Improvement Project, Route 18, Naval Air Station Access Improvements, and the Old Colony/Greenbush Commuter Rail.

The 2025 traffic volume forecasts from the regional planning model were used in the traffic simulation model to assess the benefits and impacts of the no-build and build options. In the simulation model, the highway network for the build option contains the proposed traffic operations improvements near I-93 and Route 37 (Granite Street) described in Chapter 6, and the additional operational improvements recommended for further consideration. On the other hand, the highway network for the no-build option contains none of these proposed improvements.

7.4 MEASURES OF EFFECTIVENESS

The benefits and impacts of the proposed improvements were assessed using the following performance measures from the traffic simulation: travel speeds, traffic queues, and the removal of traffic flow bottlenecks. The safety and traffic flow improvement packages were analyzed together. This was done in order to account for the effect of one set of improvements on the other. The impacts of each improvement were not analyzed individually at this stage of the planning process. Later in the planning stages when all of the improvements have been reviewed and a plan of action has been advanced, the individual impacts can be assessed separately or in new packages.

The following sections briefly describe the results of the traffic simulations in terms of travel speeds, the impacts on bottlenecks, and the extent of traffic queues for the no-build and build options. In addition, the differences in travel speeds between the build and no-build options are presented for comparison.

7.4.1 No-Build Option

Travel Speeds

The average travel speeds produced from the 2025 traffic simulation for the no-build option are shown in Figures 22 and 23 for the AM and PM peak hours, respectively. In 2025, increased traffic volumes would significantly reduce travel speeds below 2003 levels (see section 3.1.6 of this study) and would increase the extent and duration of traffic congestion at the following locations if the no-build option is implemented.

- Braintree split (AM peak direction, 35–40 mph; PM peak direction, 15–20 mph).
- Southeast Expressway (AM peak direction, 10–15 mph; PM peak direction, 25–30 mph).
- Route 3 South from Route 18 to the split (AM peak direction, 25–30 mph; PM peak direction, 45–50 mph).
- I-93 from the split to Route 24 (AM peak direction, 20–25 mph; PM peak direction, 25–30 mph).

Traffic Bottlenecks/Traffic Queues

The 2025 no-build option does not remove the traffic bottlenecks around the split. The peak period traffic queues on Route 3 South from Union Street to the split, on the I-93 stretch from Route 24 to the split, and on the Expressway are expected to increase.

The traffic bottlenecks around the split caused by weaving, merging, and diverging traffic would restrict traffic flow through the split during peak periods, particularly, during the PM peak period, the flow of southbound traffic from the Expressway to Route 3 South and to I-93 (Route 128).

The bottlenecks on Route 3 South, due to merging and exiting traffic at Union Street, the Quincy Adams MBTA Station/Burgin Parkway/Crown Colony ramps, and the lane drop on the I-93 northbound connector to Route 3 South, would restrict traffic flow on Route 3 South to the split during the AM peak period and from the split to Route 3 South during the PM peak period.

On I-93 southbound, the traffic bottleneck at the diverge to Route 24 would create a traffic queue that would spill back into the split, reducing traffic flow from the Expressway to Route 3 South and I-93 during the PM peak period. During the AM peak period, the traffic bottleneck at the I-93 northbound diverge to Route 3 South and the Expressway, and ramp merge and diverge activities at Route 37, are expected to restrict traffic flow to the Expressway and to Route 3 South/Burgin Parkway, causing traffic queues to spill back into the I-93/Route 24 interchange.

Safety

The safety problems at the high-crash locations where drivers have difficulties merging with the traffic in the main travel lanes or changing lanes will persist in the no-build option. With increased traffic volumes, there would be more stop-and-go travel conditions and more lane changing and weaving, all of which would be expected to impact traffic safety.

Ramp-Arterial Junctions

CORSIM, in conjunction with Synchro and aaSIDRA, was used to evaluate the 2025 no-build levels of service of the ramp-arterial junctions presented in Figure 24 and discussed below.

Furnace Brook Parkway Interchange

This interchange would operate satisfactorily, at LOS D, during the AM peak period. However, during the PM peak period, it would operate at LOS F, due to congestion on the Expressway and the high volume of southbound traffic exiting and entering the freeway at this location.

I-93/Route 37 Interchange

At the I-93/Route 37 interchange, the west side ramp-arterial junction would operate at LOS D or better during the AM peak period. During the PM peak period, it would operate at LOS E or F, due to the high traffic volumes at the junction. Ramp traffic queues during the PM peak period would be expected. The east side ramp-arterial junction would operate at LOS E. However, the approach receiving the northbound I-93 off-ramp traffic would operate at LOS F, due to the high volume of traffic that would be exiting at this location. This is expected to cause a ramp traffic queue that would spill back onto the freeway.

Route 3 South/Union Street Interchange

This interchange would operate at LOS F during the AM and PM peak periods. During the AM peak period, the high volume of northbound on-ramp traffic would spill back into the rotary, affecting its traffic operations, especially Union Street westbound traffic and traffic going to the MBTA Braintree Station. In the PM peak period, the high volume of southbound Route 3 traffic exiting at this location would cause a traffic queue on the ramp that would extend onto the freeway.

Burgin Parkway Centre/Street Intersection

At this intersection, the AM and PM peak period levels of service would be C and D, respectively, based on the assumption that the Burgin Parkway Viaduct would be built before 2025. During the AM peak period all of the major movements would operate at LOS D or better. Construction of the Burgin Parkway Viaduct would allow more green time to be allocated to the high volume of northbound left-turning traffic going to the Crown Colony Office Park, as well as to those continuing onto the Burgin Parkway. During the PM peak period, all of the major movements would operate at LOS E or better.

7.4.2 Build Option

Travel Speeds

The travel speeds produced from the 2025 traffic simulation for the build option are shown in Figures 25 and 26 for the AM and PM peak hours, respectively. The following are the AM and PM peak-direction travel speeds for the build option.

- Braintree split (AM peak direction, 35–40 mph; PM peak direction, 40–45 mph).
- Southeast Expressway (AM peak direction, 10–15 mph; PM peak direction, 40–45 mph).
- Route 3 South from Route 18 to the split (AM peak direction, 40–45 mph; PM peak direction, 50–55 mph).
- I-93 from the split to Route 24 (AM peak direction, 40–45 mph; PM peak direction, 45–50 mph).

Traffic Bottlenecks/Traffic Queues

The 2025 build option would reduce the impacts of bottlenecks at the split: on Route 3 South from Union Street to the split, and on the I-93 stretch from Route 24 to the split.

The bottlenecks at the split, caused by weaving, merging, and diverging traffic, that restrict the flow through the split during the PM peak period of southbound traffic from the Expressway to Route 3 South and I-93 would be reduced significantly by Improvement #5.

On Route 3 South, the bottlenecks caused by merging traffic from Union Street and traffic exiting to the MBTA Quincy Adams Station/Burgin Parkway/Crown Colony restrict traffic flow from northbound Route 3 to the split during the AM peak period. Also, the lane drop on the I-93 northbound connector to southbound Route 3 and merging traffic from the MBTA Quincy Adams Station/Burgin Parkway/Crown Colony restrict traffic flow to Route 3 South during the PM peak period. Both the AM and PM problems would be reduced significantly by Improvements #7, #8, and #9.

On I-93, the impacts of the bottleneck at the diverge to Route 24 that causes a traffic queue back into the split, thus reducing traffic flow from the Expressway to Route 3 South and I-93 during the PM peak period, would be reduced by Improvements #1 and #10. Also, during the AM peak period, the impacts of bottlenecks at the northbound I-93 diverge to Route 3 South and the Expressway and of the ramp merge/diverge activities at Route 37 would be reduced by Improvements #2 and #11.

Safety

The safety improvements (Improvements #1 through #4) address problems at the high-crash locations where drivers have difficulty merging with the traffic in the main travel lanes or changing lanes. These improvements are expected to improve safety at the split.

Ramp-Arterial Junctions

As in the no-build case, CORSIM, in conjunction with Synchro and aaSIDRA, was used to evaluate the 2025 build option's levels of service at the ramp-arterial junctions, presented in Figure 27 and discussed below.

Furnace Brook Parkway Interchange

This interchange would operate satisfactorily, at LOS D, during the AM peak period. However, during the PM peak period, it would operate at LOS E or better. The auxiliary lane (Improvement #5) suggested for the southbound on-ramp and Improvements #1 and #10 would facilitate traffic flow at the rotary interchange onto the Expressway and would reduce its interaction with traffic on the Expressway.

I-93/Route 37 Interchange

At this interchange, the west side ramp-arterial junction would operate at LOS C or better during the AM peak period. During the PM peak period, it would operate at LOS D or better. As a result of the improvements suggested for this location (Improvements #1 and #10), the ramp traffic queue spilling back onto the freeway or interrupting flow on I-93 during the PM peak period would be reduced significantly.

At the east side ramp-arterial junction, the overall junction would operate at LOS D during the AM and PM peak periods. Improvement #11 would reduce the volumes of traffic arriving from northbound

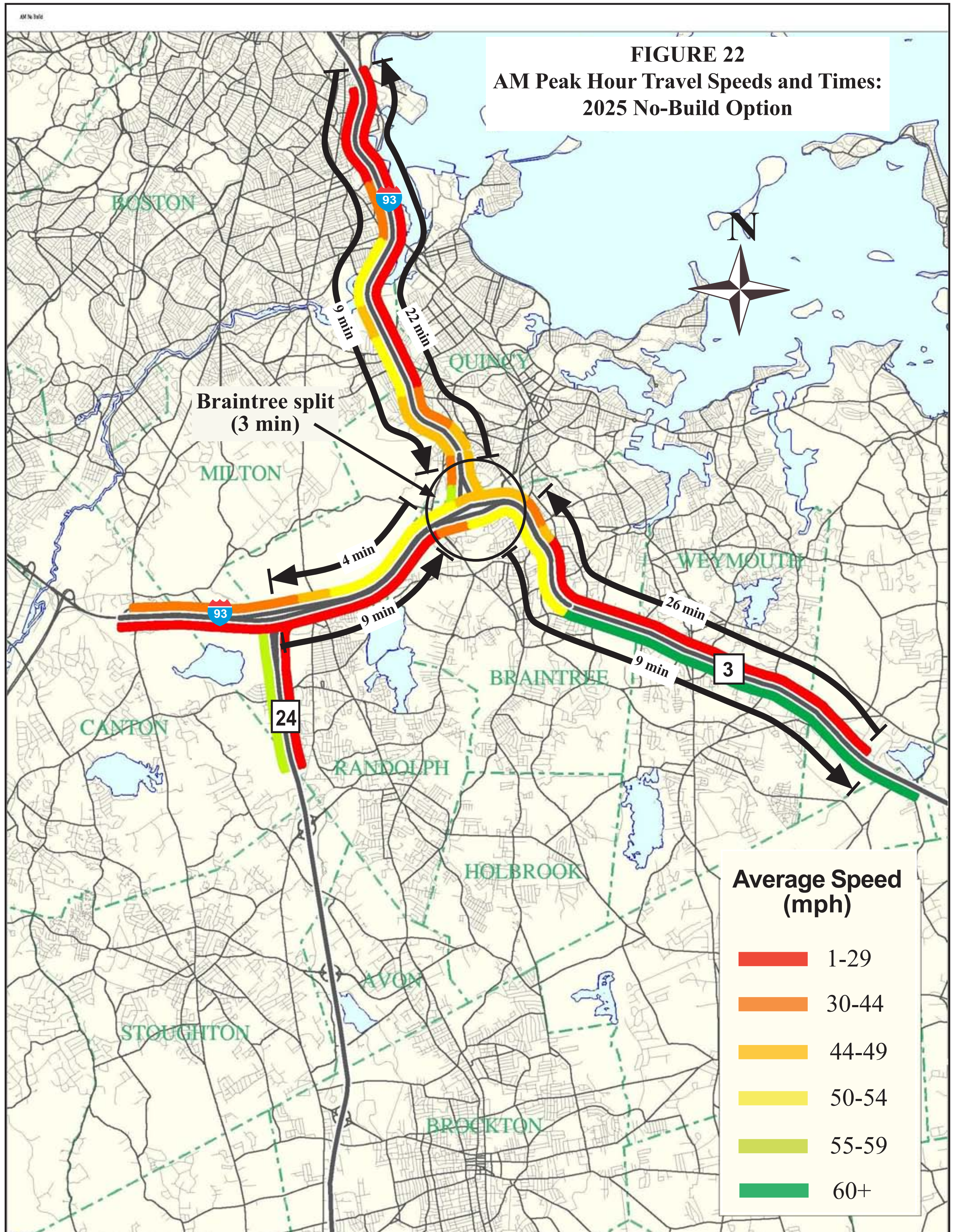


FIGURE 22
AM Peak Hour Travel Speeds and Times:
2025 No-Build Option
BOSTON
QUINCY
MILTON
WEYMOUTH
BRAINTREE
CANTON
RANDOLPH
HOLBROOK
AVON
STOUGHTON
BROCKTON
N
Braintree split
(3 min)
9 min
22 min
4 min
9 min
26 min
9 min
93
3
24
Average Speed
(mph)
1-29
30-44
44-49
50-54
55-59
60+

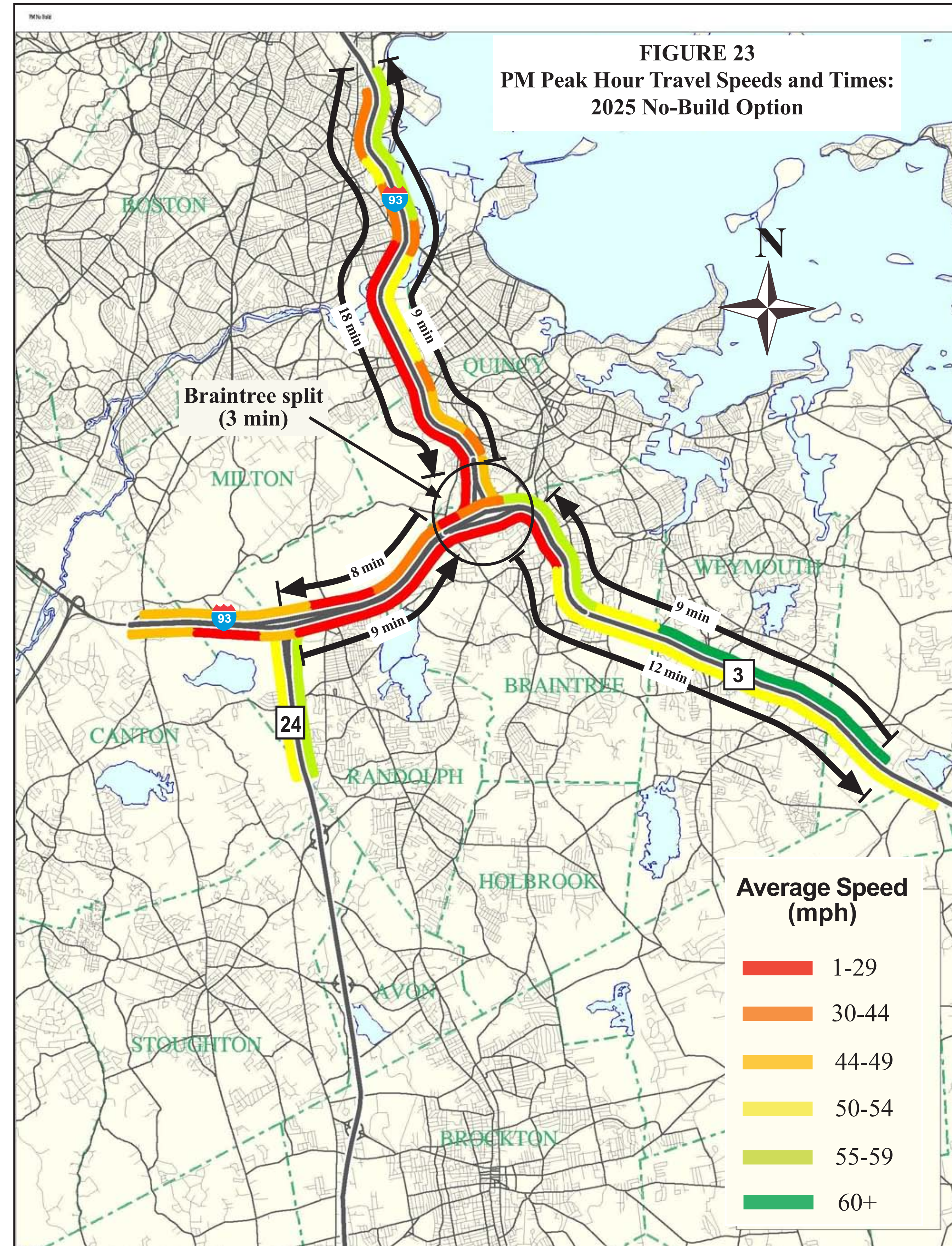
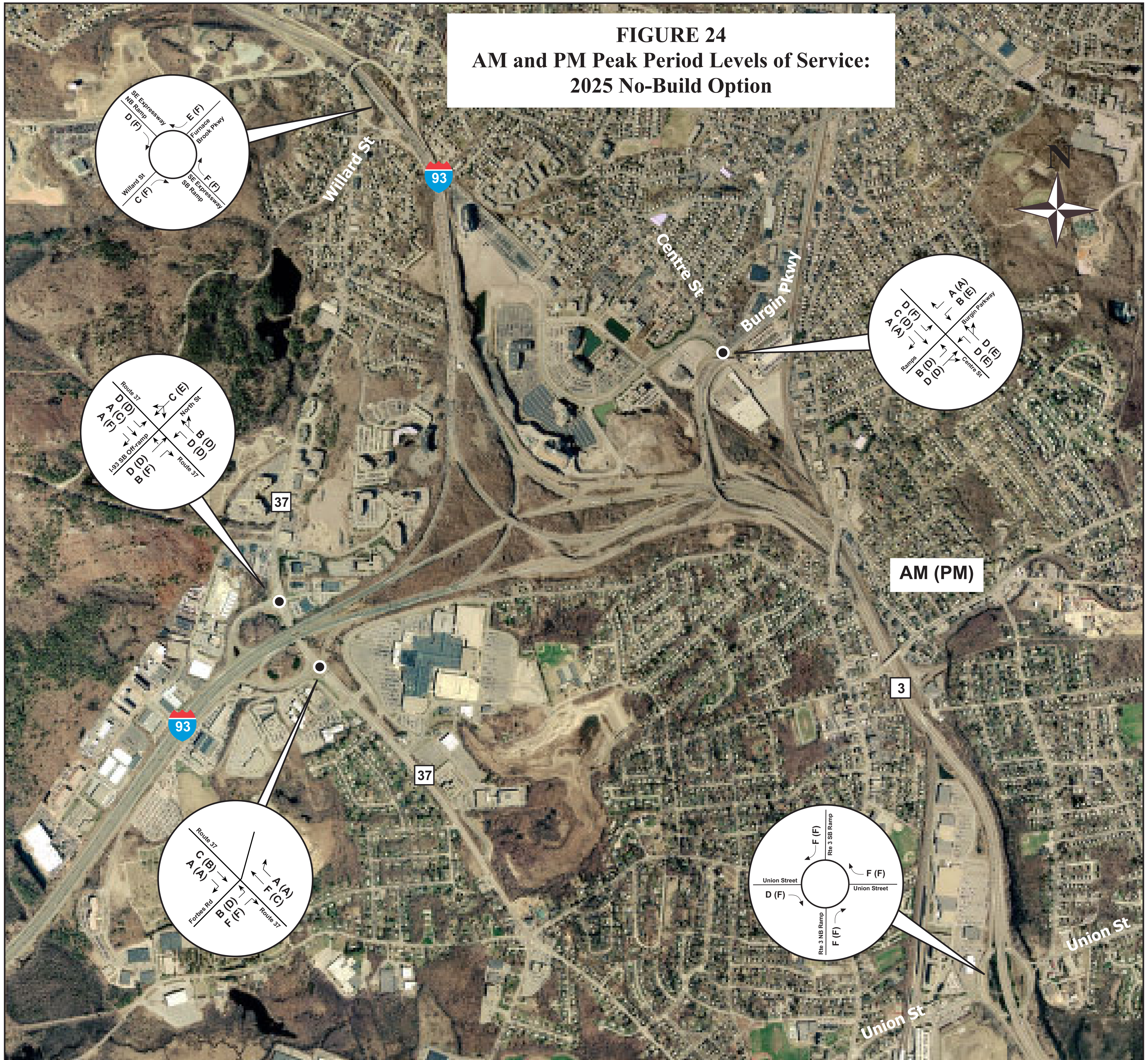


FIGURE 23
PM Peak Hour Travel Speeds and Times:
2025 No-Build Option
BOSTON
QUINCY
MILTON
WEYMOUTH
BRAINTREE
CANTON
RANDOLPH
HOLBROOK
AVON
STOUGHTON
BROCKTON
N
Braintree split
(3 min)
18 min
9 min
8 min
9 min
9 min
12 min
93
3
24
Average Speed
(mph)
1-29
30-44
44-49
50-54
55-59
60+

FIGURE 24
AM and PM Peak Period Levels of Service:
2025 No-Build Option



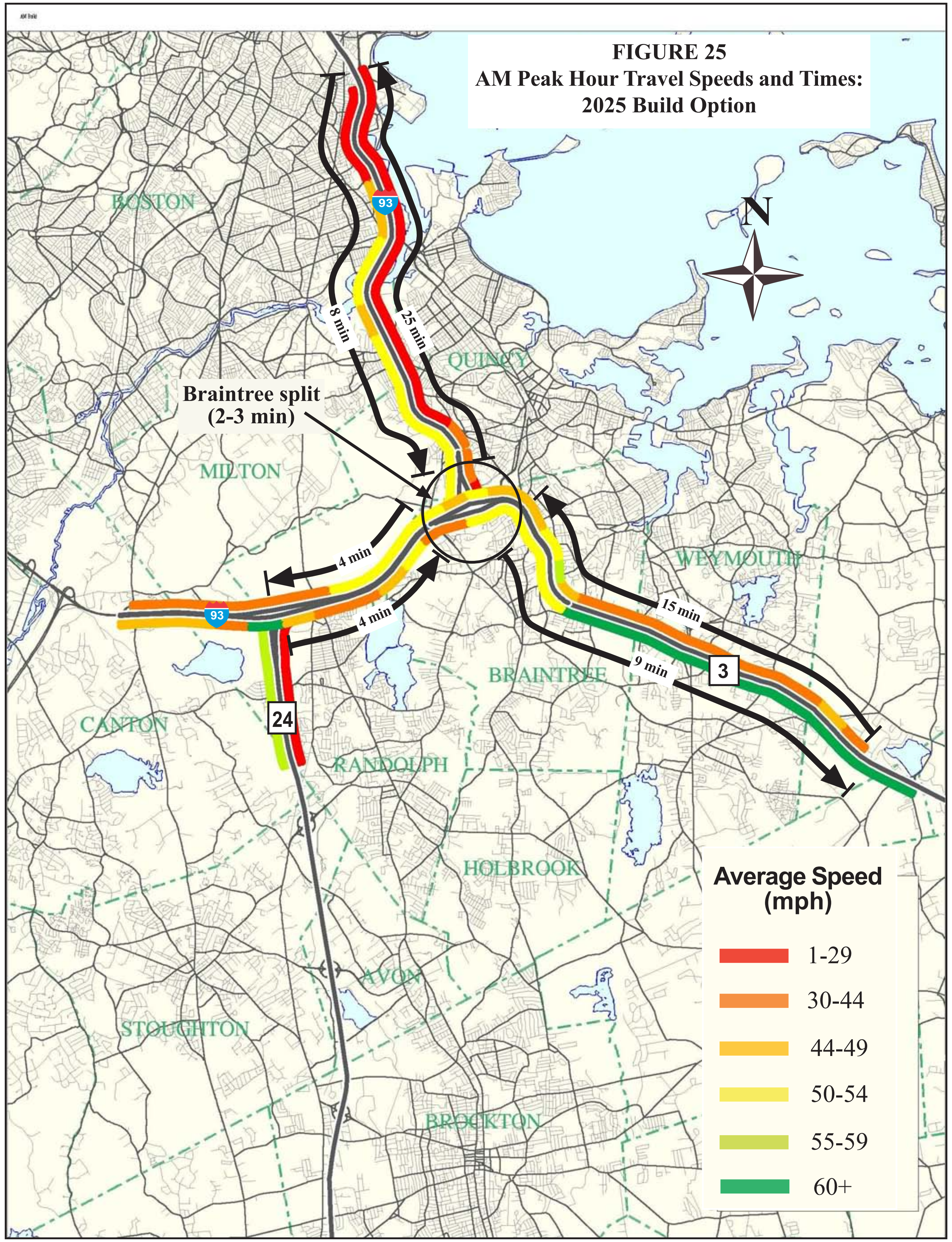


FIGURE 25
AM Peak Hour Travel Speeds and Times:
2025 Build Option
BOSTON
QUINCY
MILTON
WEYMOUTH
BRAINTREE
CANTON
RANDOLPH
HOLBROOK
AVON
STOUGHTON
BROCKTON
N
Braintree split
(2-3 min)
8 min
25 min
4 min
4 min
15 min
9 min
93
3
24
Average Speed
(mph)
1-29
30-44
44-49
50-54
55-59
60+

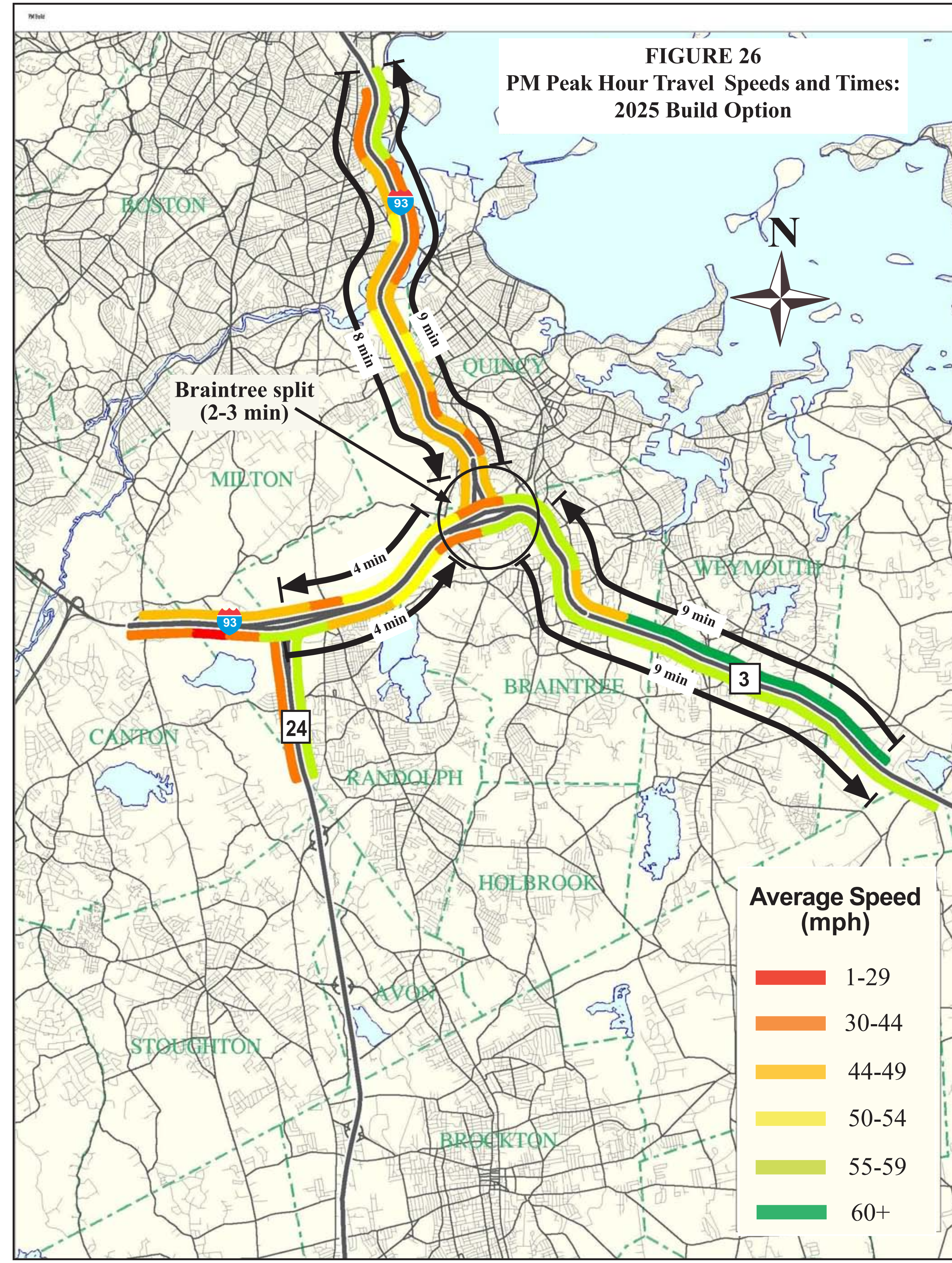
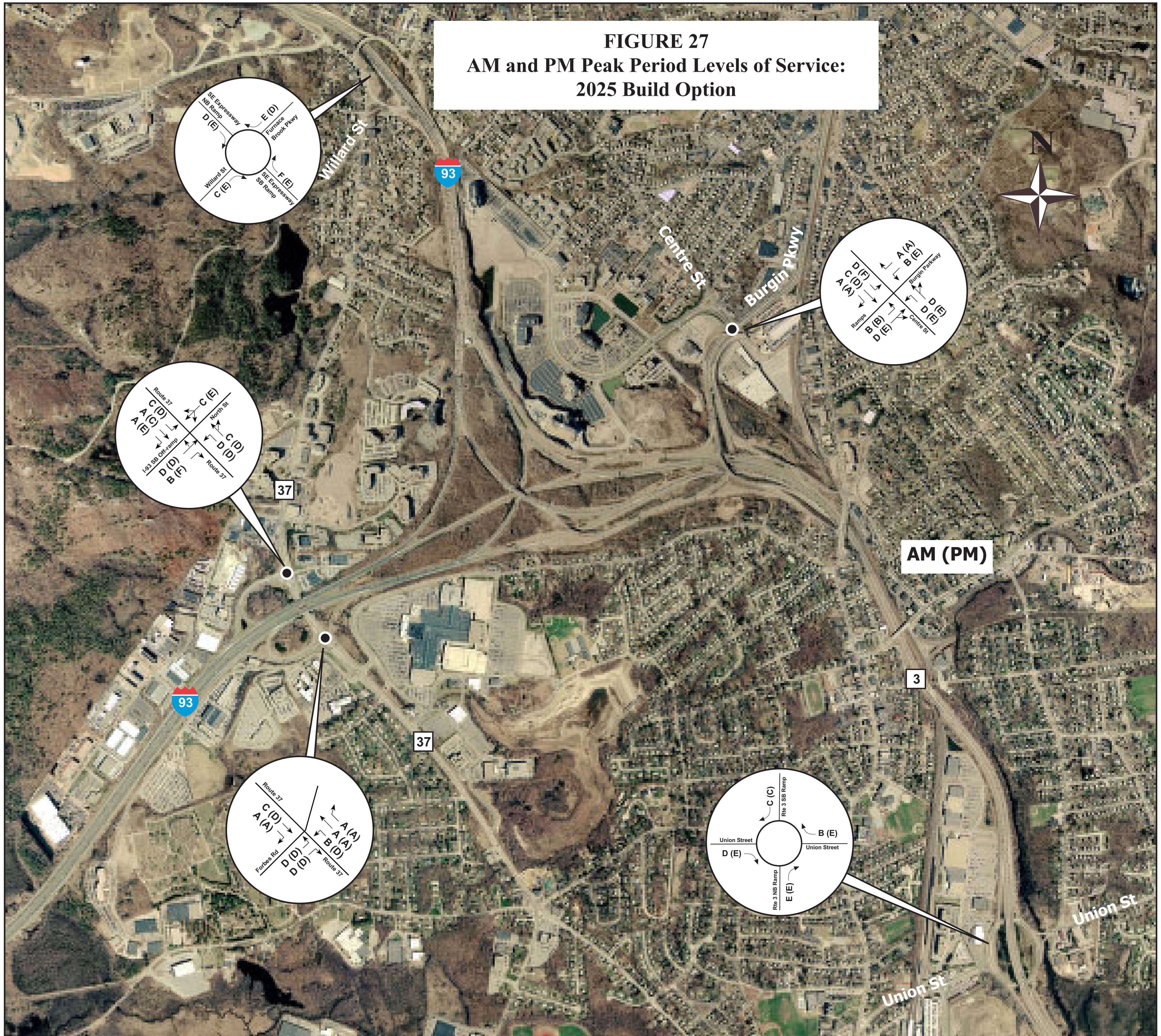


FIGURE 26
PM Peak Hour Travel Speeds and Times:
2025 Build Option
BOSTON
QUINCY
MILTON
WEYMOUTH
BRAINTREE
CANTON
RANDOLPH
HOLBROOK
AVON
STOUGHTON
BROCKTON
N
Braintree split
(2-3 min)
8 min
9 min
4 min
4 min
9 min
9 min
93
3
24
Average Speed
(mph)
1-29
30-44
44-49
50-54
55-59
60+

FIGURE 27
AM and PM Peak Period Levels of Service:
2025 Build Option



I-93, improving traffic operations at the junction. Thus Improvement #11 would support Improvement #2, allowing the junction to operate satisfactorily. As a result, there would be no ramp traffic queue spilling back onto the freeway.

Route 3/Union Street Interchange

This interchange would operate at LOS E or better during the AM and PM peak periods. The improvements suggested for this location (Improvement #9 and to a large extent, Improvement #7) would facilitate traffic flow within the rotary as well as on Route 3 South during the AM and PM peak periods. The analysis indicates that the northbound on-ramp traffic queue that spills back into the rotary, affecting its traffic operations as well as traffic operations on Route 3 South during the AM peak period, would be reduced significantly. Also, the southbound off-ramp traffic queue that spills back onto Route 3 South would be reduced significantly, as the proposed right-turn bypass or slip lane would increase the approach capacity of the southbound off-ramp to the rotary.

Burgin Parkway/Centre Street Intersection

The Burgin Parkway Viaduct project was part of the no-build option, and therefore there was no change in LOS at this intersection. However, the improvements suggested for Route 3 South (Improvements #7, #8, and #9) enhance the benefits of this project by allowing traffic from Burgin Parkway, the MBTA Quincy Adams Station, and Crown Colony Office Park to enter Route 3 South without interrupting its traffic flow and by reducing queues on the on-ramp.

At the Burgin Parkway/Center Street intersection, the AM and PM peak period levels of service for the intersection would be C and D, respectively. During the AM peak period, all of the major movements would operate at LOS D or better. Construction of the Burgin Parkway Viaduct would allow more green time to be allocated to the high volume of northbound left-turning traffic going to the Crown Colony Office Park, as well as motorists continuing onto Burgin Parkway. During the PM peak period, all of the major movements would operate at LOS E or better.

7.5 SUMMARY

In 2025, the increased traffic volumes would reduce travel speeds significantly below 2003 levels and would increase the extent and duration of congestion if the no-build option is implemented. In 2025, the proposed improvements (all together) comprised by the build option would increase travel speeds at the Braintree split and its connecting highways, as shown on the maps illustrating speed differences between the build and no-build options (Figures 28 and 29). The proposed improvements would reduce the impacts of bottlenecks in and around the split and would be expected to increase traffic safety in the study area, as summarized in Table 8.

7.5.1 AM Peak Period Benefits of the Build Option

The AM peak period benefits of the build option (which are detailed in Figure 28 and Table 8) may be broadly described as follows:

- The improvements in travel time and speed on northbound Route 3 South are due to the effects of Improvement #9, which reduces the impacts of bottlenecks on northbound Route 3 South from Union Street to the Burgin Parkway/Quincy Adams Station off-ramp.
- The improvements in travel time and speed on I-93 northbound are due to the combined effects of Improvements #7 and #11, which reduce the impacts of bottlenecks on I-93 northbound and its connector to southbound Route 3 South.
- The improvements in travel time and speed on the Expressway southbound are due to Improvement #5, which reduces the impacts of merging traffic from the Furnace Brook Parkway southbound on-ramp and diverging traffic heading to Route 3 South and I-93 southbound.

7.5.2 PM Peak Period Benefits of the Build Option

The PM peak period benefits of the build option (which are detailed in Figure 29 and Table 8) may be broadly described as follows:

- The improvements in travel time and speed on southbound Route 3 South are due to the combined effects of Improvements #7 and #9, which reduce the impacts of bottlenecks on Route 3 South, particularly at the merge points of the connector from I-93 northbound and of the on-ramp from Burgin Parkway/Quincy Adams Station/Crown Colony, and at the Union Street rotary interchange.
- The improvements in travel time and speed on I-93 southbound are due to the combined effects of Improvements #1 and #10, which reduce the impacts of bottlenecks on I-93 southbound, specifically the bottlenecks at the diverge area to Route 24 from I-93 and at the Route 37 interchange.
- The improvements in travel time and speed on the Expressway southbound are due to the combined effects of Improvements #1, #5, and #10. These improvements reduce the impacts of merging traffic from the Furnace Brook Parkway southbound on-ramp as well as diverging traffic to Route 3 South and I-93 southbound. They also reduce the impacts of bottlenecks at the diverge area to Route 24 from I-93 and at the Route 37 interchange, allowing traffic to flow efficiently onto southbound I-93 and southbound Route 3 South.

7.5.3 Transit Improvements

Both highway and transit solutions are needed to address 2025 traffic demand. The transit projects described in Chapter 6 (commuter rail to Greenbush, New Bedford/Fall River, and Wareham; Suburban Commuter Rail Feeder Bus Service; parking enhancements, etc.), if implemented, would attract new transit riders diverted from non-transit trip modes such as drive-alone. As a result, these transit projects have congestion reduction benefits, as well as improve regional transit system capacity, mode choice, and connectivity.

7.5.4 Next Steps

The proposed operational improvements described in this report are conceptual in nature. They address primarily the safety problems and traffic bottlenecks in the highway system. Although preliminary analysis indicates that the improvements have significant safety and operational benefits, they would have to undergo further review and analysis before final recommendations are made. Such review and analysis would include but not be limited to environmental and right-of-way issues, public support and participation, benefit and cost analysis, design, and prioritization of the improvements. In all cases, MassHighway would be the implementation agency.

Long-term solutions to address safety, congestion, and mobility, including transit solutions, parking solutions, and travel demand management, should also be examined.

In addition, the feasibility of another long-term solution should be examined: extending the HOV lane on the Southeast Expressway to Route 3 South and to I-93 toward Route 24. These extensions would remove the weave and merge of southbound HOV traffic heading to Route 3 South and to I-93 toward Route 24 that contribute to the congestion on the Expressway.

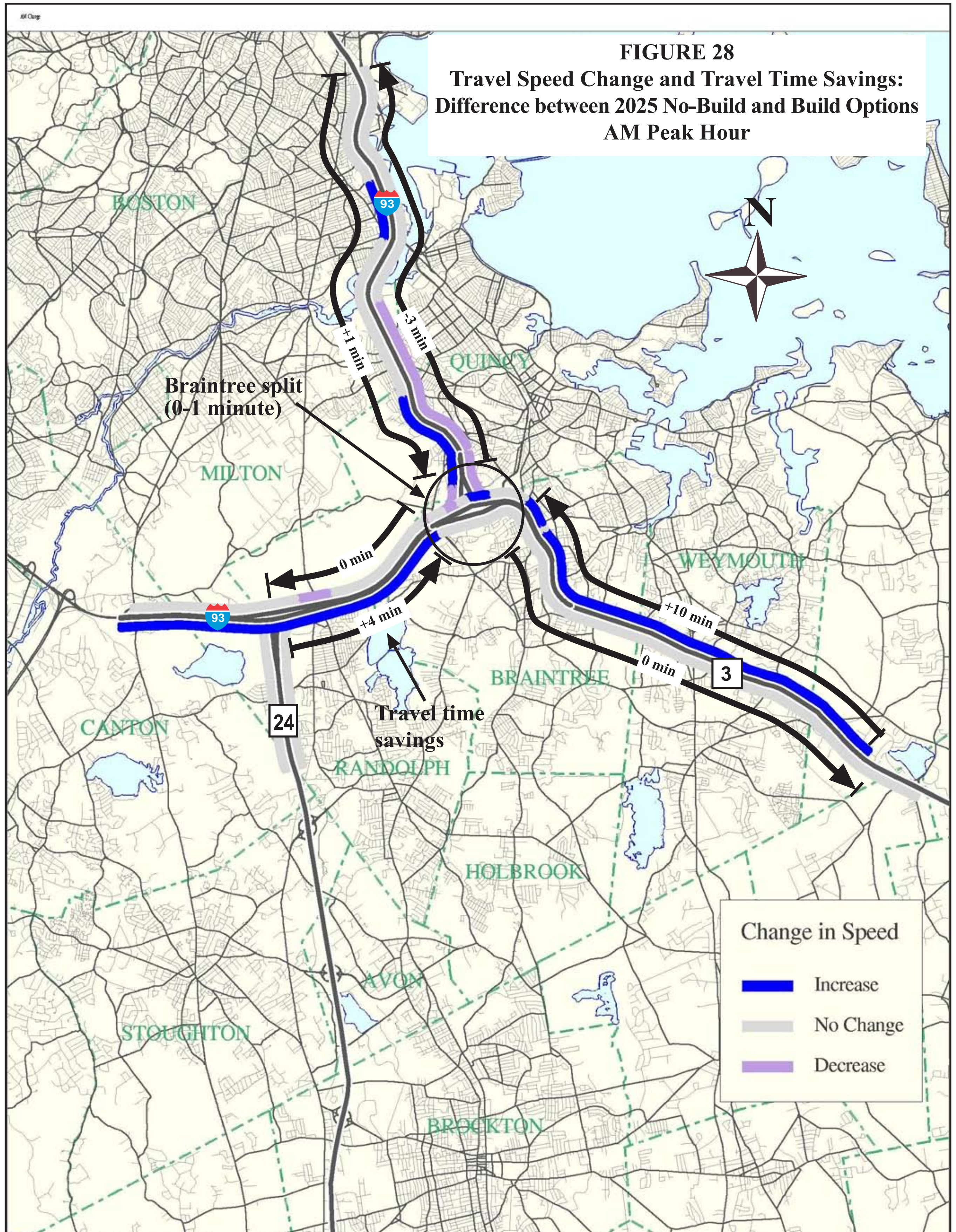


FIGURE 28
Travel Speed Change and Travel Time Savings: Difference between 2025 No-Build and Build Options AM Peak Hour

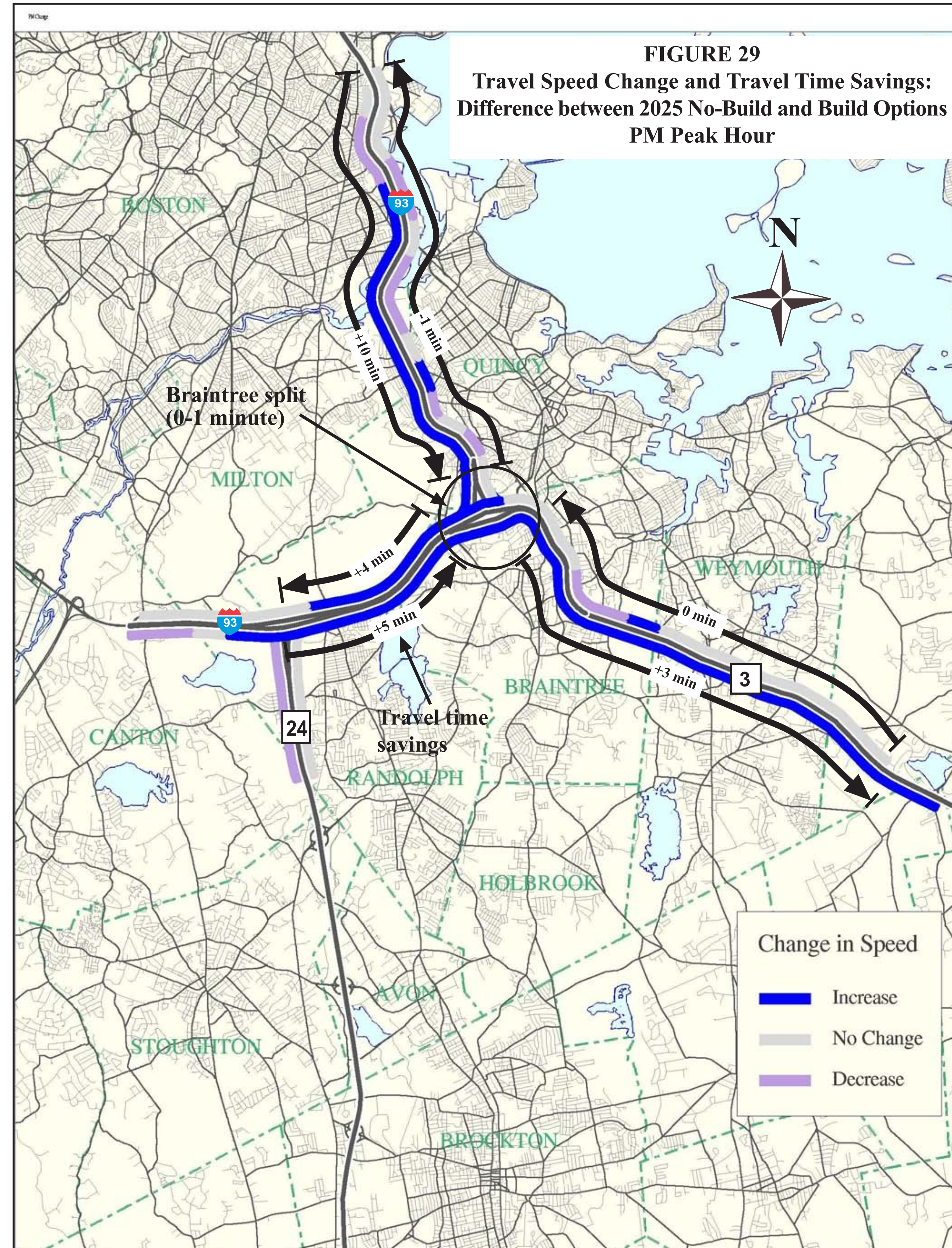


FIGURE 29
Travel Speed Change and Travel Time Savings: Difference between 2025 No-Build and Build Options PM Peak Hour

TABLE 8
Summary of Impacts: Build Option vs. Existing Conditions and No-Build Option [1]

Scenario	Traffic Safety	Average Travel Speed (mph)	Traffic Bottlenecks	Traffic Queues	Overview
2003 Existing Conditions	• Existing safety problems regarding short acceleration/deceleration lanes, merging and weaving, and short sight distance. • Seven high-crash locations.	Peak period travel speeds: AM peak direction • Braintree split: 40–45 mph. • Southeast Expressway: 20 mph. • Route 3 South from Route 18 to the split: 26 mph. • I-93 from the split to Route 24: 55 mph. PM peak direction • Braintree split: 30–35 mph. • Southeast Expressway: 45 mph. • Route 3 South from Route 18 to the split: 52 mph. • I-93 from the split to Route 24: 35 mph.	Peak period bottlenecks due to on-ramp traffic restrict traffic flow: AM peak direction • Southeast Expressway: Granite Avenue, Route 3A, HOV exit, and Columbia Road. • Route 3 South: Union Street, Route 18, and Derby Street. • I-93 (Route 128): Route 24, Route 37. • Burgin Parkway connector/Centre Street intersection. PM peak direction • Southeast Expressway: Furnace Brook Parkway, HOV exit. • Route 3 South: Burgin Parkway and Union Street. • I-93 (Route 128): Route 24, Route 37.	Peak period traffic queues: AM peak direction • Southeast Expressway: from Columbia Road in Boston up to East Milton Square. • Route 3 South: from the off-ramp to the MBTA station up to Exit 14, Route 228 in Hingham. • I-93 (Route 128): from Granite Street to the Braintree Split. • Burgin Parkway: from the connecting ramps to Centre Street. PM peak direction • Southeast Expressway from Braintree split to East Milton Square. • Route 3 South: from the Braintree split to Union Street, Exit 17 in Braintree. • I-93 (Route 128): from the Braintree split to Route 24. • Burgin Parkway ramp: from Centre Street to Route 3 South.	• Congestion. • No construction costs.
2025 No-Build[2]	• In 2025, increased traffic volumes would bring about worse safety problems than 2003 conditions if the no-build option is implemented. • The high-crash locations would not change, except for the Burgin Parkway/Centre Street intersection, which would be reconstructed as part of the Burgin Parkway Viaduct project.	In 2025, increased traffic volumes would reduce travel speeds to significantly below 2003 speeds and would increase the extent and duration of congestion if the no-build option is implemented. AM peak direction • Braintree split: 35–40 mph. • Southeast Expressway: 10–15 mph. • Route 3 South from Route 18 to the split: 25–30 mph. • I-93 from the split to Route 24: 20–25 mph. PM peak direction • Braintree split: 15–20 mph. • Southeast Expressway: 25–30 mph. • Route 3 South from Route 18 to the split: 45–50 mph. • I-93 from the split to Route 24: 25–30 mph.	In 2025, increased traffic demand would significantly increase the impact of bottlenecks from 2003 conditions at: AM peak direction • Southeast Expressway: Granite Avenue, Route 3A, HOV exit, and Columbia Road. • Route 3 South: Union Street, Route 18, and Derby Street. • I-93 (Route 128): Route 24, Route 37. PM peak direction • Southeast Expressway: Furnace Brook Parkway, HOV exit. • Route 3 South: Union Street. • I-93 (Route 128): Route 24, Route 37.	In 2025, increased traffic demand would significantly increase the extent and duration of the peak period traffic queues at the following locations, if the no-build option were implemented. AM peak direction • Route 3 South: from Exit 17, Union Street, to Exit 19, Burgin parkway/MBTA Quincy Adams Station. • I-93 (Route 128): from Route 24 to the Braintree split. PM peak direction • Southeast Expressway from Granite Avenue to Braintree split. • Route 3 South: from the Braintree split to Exit 17, Union Street. • I-93 (Route 128): from the Braintree split to Route 24).	• Congestion would be worse than 2003 conditions. • No construction costs.
2025 Build[3]	• In 2025, the proposed safety improvement package would be expected to improve safety through the upgrade of ramp acceleration/deceleration lanes, elimination of weaving areas, and provision of advanced queue detection and warning systems. • The safety improvement package would also be expected to improve traffic flow.	In 2025, the proposed improvements would increase travel speeds or maintain 2003 conditions at the Braintree split and its connecting highways. AM peak direction • Braintree split: 35–40 mph. • Southeast Expressway: 10–15 mph. • Route 3 South from Route 18 to the split: 40–45 mph. • I-93 from the split to Route 24: 40–45 mph. PM peak direction • Braintree split: 40–45 mph. • Southeast Expressway: 40–45 mph. • Route 3 South from Route 18 to the split: 50–55 mph. • I-93 from the split to Route 24: 45–50 mph. The improvements would not improve the AM peak direction travel speed on the Expressway.	The proposed improvements would significantly reduce the impacts of peak period bottlenecks. • On the Expressway, the improvements would significantly reduce the PM peak bottleneck at the split. • On Route 3 South, the improvements would significantly reduce the bottlenecks at the southbound on-ramp from the Crown Colony Office Park and Burgin Parkway, at the northbound off-ramp to the MBTA Quincy Adams station and Burgin Parkway, and at the Union Street interchange. • On I-93, the improvements would significantly reduce the bottleneck at the entrance to Route 24, as well as on I-93 itself. The improvements would not address AM bottlenecks on the Southeast Expressway,	The proposed improvements would significantly reduce the extent and duration of peak period traffic queues at the following locations. AM peak direction • Southeast Expressway: from Columbia Road in Boston up to Braintree split. PM peak direction • I-93 (Route 128): between Route 24 and Route 28. The proposed improvements would not reduce the extent or duration of AM peak period traffic queues on the Southeast Expressway.	• Proposed improvements are expected to reduce congestion, as shown in Figures 28 and 29. They would reduce the bottlenecks in the study area. • Construction costs.

[1] The measures of effectiveness are based on average conditions.
[2] Projects included in the 2025 no-build option: Route 3 South Transportation Improvement Project, Route 18 Additional Lanes, Burgin Parkway Viaduct, and Greenbush Commuter Rail.
[3] Projects included in the 2025 build option: improvements near I-93/Granite Street (Route 37) interchange, the additional improvements recommended, and the no-build projects.

8 SUMMARY OF RECOMMENDATIONS AND IMPLEMENTATION PROCESS

This chapter summarizes this study's recommendations regarding transportation improvements in the Braintree Split area and gives the processes by which proposed transportation improvements may be implemented.

8.1 Recommendations

Table 9 summarizes the recommended improvements and estimated costs of each improvement. Their locations are indicated in white on the accompanying map, which also give location numbers. The numbers are consistent with the numbers used to designate these locations throughout this report. For detailed descriptions of the recommended improvements, please see Chapter 7.

Overview Map

TABLE 9
Summary of Recommendations

Location	Proposed Improvement(s)	Estimated Cost
#1	• Lengthen existing deceleration lane to provide more storage room and sufficient length for exiting vehicles to change lanes. • Install signs on the Route 3 South connector instructing motorists exiting onto Route 37 to be in the rightmost lane.	$1.0 million
#2	• Restrict the existing on-ramp to traffic that is heading to Route 3 South, the Burgin Parkway, or Washington Street. • Construct a double left-turn bay at the signalized ramp–arterial junction for use by traffic proceeding to the Expressway to access the south side on-ramp. • Install new signs or modify existing signs on Route 37 to guide motorists to the appropriate ramps.	$1.5 million
#3	• Install real-time sensors for queue detection, and overhead variable message signs to inform and warn motorists to reduce speed in advance of the downstream traffic queue that is obscured by the horizontal curvature of the roadway.	$0.5 million
#4	• Move the Burgin Parkway and Washington Street northbound on-ramp connector to the Expressway further south. • Create a new ramp connector with a right full auxiliary lane to lengthen the weaving distance over which HOV-bound ramp traffic could change lanes to access the HOV lane. • Install new signs to direct HOV-bound traffic to the HOV lane.	$1.5 million
#5	• Lengthen the acceleration lane for the southbound on-ramp connecting Furnace Brook Parkway to the Expressway. • Examine the feasibility of a long-term solution: extending the HOV lane on the Southeast Expressway to Route 3 South and to I-93 toward Route 24. These extensions would remove the weave and merge of southbound HOV traffic heading to Route 3 South and to I-93 toward Route 24.	$0.5 million (Not including the feasibility study)
#6	• The Burgin Parkway Viaduct project in Quincy, already in the design stages, is underway; it addresses this problem.	$18.0 million, programmed 2006
#7	• Add a southbound travel lane (auxiliary lane) on Route 3 South, beginning at the Burgin Parkway on-ramp and possibly ending after the exit ramp at the Union Street interchange.	$2.5 million
#8	• Lengthen the acceleration lane for the on-ramp from Burgin Parkway and Washington Street to the Route 3 South connector, which connects Route 3 South with I-93 southbound.	$0.5 million
#9	• Upgrade the northbound acceleration lane into an auxiliary lane, possibly ending after the exit ramp at interchange 19 (Burgin Parkway/MBTA Quincy Adams Station). • Upgrade the southbound deceleration lane into an auxiliary lane possibly ending after the exit ramp at interchange 17 (Union Street). • Provide of a right-turn bypass lane or slip lane at the southbound ramp–rotary junction for use by the high volume of right-turn traffic.	$5.5 million
#10	• Add a travel lane on I-93 southbound, beginning south of the Route 37 interchange and ending at the diverge point to Route 24. • Reconfigure the lane assignment at the diverge point of I-93 and Route 24 to provide two travel lanes to the two-lane connector ramp connecting to Route 24. • Widen the merge point of Route 24 southbound to receive the four travel lanes from the connecting ramps. • Install new signs or modify existing signs to guide motorists to Route 24.	$7.0 million
#11	• The I-93/Route 37 traffic improvements that address this problem are already in either the planning or design stage.	Not Available

8.2 Implementation Process

In general, all the recommended improvements are located on roadways administered by MassHighway. Therefore, MassHighway is responsible for the implementation of any of these improvements. It would follow standard process, outlined below, that any proponent of a roadway improvement is required to follow. As described, the process provides for the participation of the general public, community representatives, and other agencies. The projects would be eligible to be paid for with state or federal funds.

The following process description is based on Chapter 2 of the 2005 MassHighway Design Guidebook. The text below borrows heavily from that document.

Need Identification

For each of the locations at which an improvement is to be implemented MassHighway will lead an effort to define the problem, establish project goals and objectives, and define the scope of the planning needed towards implementation. To that end, it will have to complete a Project Need Form (PNF), which states in general terms the deficiencies or needs related to the transportation facility or location. The PNF will document the problems and explain why corrective action is needed. The information defining the need for the project will be drawn, primarily, perhaps exclusively, from the present report. Also, at this point in the process, MassHighway will meet with potential participants, such as the Boston Region Metropolitan Planning Organization (MPO) and community members, to allow for a proactive, informal review of the project.

The PNF will be reviewed by MassHighway's Project Review Committee (PRC) and the MPO. The PRC includes the Chief Engineer, each District Highway Director, and representatives of the Project Management, Environmental, Planning, Right-of-Way, Traffic, and Bridge departments and the Capital Expenditure Program Office (CEPO). The outcome of this step is a determination of whether the project requires further planning, whether it is already well supported by prior planning studies and, therefore, able to move forward into design, or whether it should be dismissed from further consideration.

Planning

This phase will likely not be required for the implementation of the improvements proposed under this planning study, as this planning report should actually constitute the outcome of this step. However, in general, the purpose of this implementation step is for the project proponent to identify issues, impacts, and approvals that may need to be obtained, so that the subsequent design and permitting processes are understood. The level of planning needed will vary widely, based on the complexity of the project. Typical tasks include: define existing context, confirm project need, establish goals and objectives, initiate public outreach, define project, collect data, develop and analyze alternatives, make recommendations, and provide documentation. Likely outcomes include consensus on project definition to enable it to move forward into environmental documentation (if needed) and design, or a recommendation to delay the project or dismiss it from further consideration.

Project Initiation

At this point, the proponent, MassHighway, fills out for each improvement a Project Initiation Form (PIF), which is reviewed by the PRC and the MPO. The PIF documents the project type and description, summarizes the project planning process, identifies likely funding and project management responsibility, and defines a plan for interagency and public participation. First the PRC reviews and evaluates the proposed project based on the Executive Office of Transportation's statewide priorities and criteria. If the result is positive, MassHighway moves the project forward into design and programming review by the MPO. The PRC may provide a Project Management Plan to define roles and responsibilities for subsequent steps. The MPO review includes project evaluation based on the MPO's regional priorities and criteria. The MPO may assign a project evaluation criteria score, possible Transportation Improvement Program (TIP) year, tentative project category, and tentative funding category.

Environmental, Design, and Right-of-Way Process

This step has four distinct but closely integrated elements: public outreach, environmental documentation and permitting (if required), design, and right-of-way acquisition (if required). The outcome of this step is a fully designed and permitted project ready for construction. However, a project does not have to be fully designed in order for the MPO to program it in the TIP.

Programming

Programming, which typically begins during design, can actually occur at any time during the process from planning to design. In this step, which is distinct from project initiation, where the MPO receives preliminary information on the proposed project, the proponent requests that the MPO place the project in the region's TIP. The MPO considers the project in terms of regional needs, evaluation criteria, and compliance with the regional Transportation Plan and decides whether to place it in the draft TIP for public review and then in the final TIP.

Procurement

Following project design and programming, MassHighway publishes a request for proposals. It reviews the bids and awards the contract to the lowest qualified bidder.

Construction

After a construction contract is awarded, MassHighway and the contractor will develop a public participation plan and a management plan for the construction process.

Project Assessment

The purpose of this step is to receive constituents' comments on the project development process and the project's design elements. MassHighway can apply what is learned to future projects.

APPENDIX A

Public Participation

A.1 Public Comments

A.1.1 Metropolitan Area Planning Council
A.1.2 Town of Braintree

A.2 CTPS Responses to Public Comments of Draft Report

A.3 Attendance at Advisory Task Force Meetings

A.1 Public Comments

Metropolitan Area Planning Council
(Unedited; submitted by Jim Gallagher and William Clark)

Style and Language

1. The highly visual and graphic format for the report is easy to understand and a very appealing way to illustrate complex problems. This is an excellent format, which is appropriate for many CTPS documents.

2. "Boston MPO/Metropolitan Planning Organization"
   The correct name is the "Boston Region MPO."

3. "Transportation Concerns" (in the Executive Summary, "Internal Concerns," "External Concerns," and other places later in the report)

   Concerns are things that people are worried about ("proponents of the study expressed concerns"). The point of this study is to investigate these concerns. Seth/CTPS has done this, and determined that many of these concerns can be verified through objective, transparent measures. As a result, congestion, safety, and mobility problems have been identified. Problems are what the recommended improvements are designed to fix. Please do not use concerns (or issues, or other euphemisms) when you mean problems.

4. In the Transportation Concerns section of the ES, the second sentence ("Another example," etc.) which is supposed to be about external bottlenecks, is actually citing an internal one. More external bottlenecks follow in the next paragraph, but there is no place in the ES where actual problems within the study area are described. Since there is an extensive list of recommendations in the document, presumably responding to identified problems, there should be an equally extensive list of problems in the ES.

5. "Additional Improvements Recommended"
   "The improvements that were developed with the participation of the MassHighway, MBTA, and the study's Advisory Task Force," etc. We don't know about MassHighway or the MBTA, but the Advisory Task Force did not participate in the development of the improvements, we merely commented on those that were developed. The Task Force should have a role in recommending improvements (more on that below).

   "The improvements that were recommended by this study." Studies cannot recommend improvements. The Task Force, MassHighway, MBTA, CTPS, or Seth can. There are other places in the document where this same construct is used – please assign responsibility for actions to a specific organization or individual, not to a "study," which has no ability to act.

6. None of the improvements proposed are major redesigns or additions. CTPS has said at meetings that the purpose of this study is to focus on operational improvements – that's a perfectly appropriate way to proceed, but it's not mentioned in the ES, maybe not anywhere in the document. Someone reading the document will likely expect a discussion of "big ticket" improvements, even if it is only to say that they weren't considered, and may be evaluated in a later study.

7. "Summary"

   There doesn't need to be a summary of the Executive Summary. To the extent there is new information here it can be characterized as "Benefits of the Improvements." And there is need for a "Next Steps" section in the ES.

8. "Chapter 3, Current Transportation, 3.1.4 Traffic Queues"

   It is unclear as written how far these queues extend since different segments are discussed separately. For example, for the PM peak, the southbound segments from Granite Street to the Split (on the Southeast Expressway) and Union Street and the Split (on Route 3) are both listed with queue (problems?). We read this as one queue extending from Union Street to Granite Street. A graphic here might be helpful.

9. "Chapter 6, Planned and Proposed Improvements"

   There needs to be a distinction between programmed, planned, and proposed. Service changes planned by the MBTA, projects programmed in the TIP, or being funded through private sources, local Chapter 90 funds, or in other concrete ways should be identified. Other projects planned in the latest Regional Transportation Plan should be noted, along with the time period they have been assigned. All other projects are "conceptual ideas" and their future funding uncertainty should be made clear. Information listing the proponent of each project or idea would also be helpful.

Content

1. The weave by HOV vehicles exiting the HOV lane SB and heading towards I-93 was identified as a problem in the study. However, no improvement was recommended. One suggested by MAPC was moving the end of the HOV lane north, by whatever amount was feasible, to allow that much additional space for vehicles to complete the weave. Adriel Edwards, of EOT Planning, volunteered to check with MassHighway on the feasibility of moving this exit point. If acceptable, that recommendation should be communicated to other Task Force members, and included in this draft if there is consensus.

   A second MAPC recommendation for this "problem" was the evaluation of a flyover ramp to replace this move. We believe this should be one of the Next Steps evaluated in the follow-up to the current study.

2. At location #2, an alternative to the double left-turn lane recommended by CTPS was suggested by MAPC. The existing left turn to I-93 would be replaced by a right turn to a new climbing lane/on-ramp constructed between the two barrels of I-93. This would result in a left-side on-ramp providing access to the Expressway northbound and would eliminate the dangerous weave that is currently required. If there has been an evaluation of this alternative, it should be included in this document, as either a recommendation or as Not Recommended in Appendix B. Otherwise it should be added to the list of improvements to be evaluated in Next Steps. [*Appendix B is now Appendix C in the final report.*]

3. In general, while weave problems were identified in many locations of the study area, the only recommended solution was at location 2 above. In an operational study like this one, approaches to minimize weaving, which would include providing better information on appropriate lanes and separating thru from weaving trips, should also be explored. For example, signs for the Route 24 exit could be posted further east on I-93 and could announce the need to get in the left lanes. Other potential

recommendations along these lines should be developed and discussed between the DRAFT and FINAL versions of this document.

4. Although "access to transit" is listed as a "concern," there is no mention that the parking garages at the Braintree and Quincy Adams Red Line stations are full (nor any mention in the text about Braintree commuter rail). If a study has not already been completed at CTPS for the MBTA, one obvious Next Step (Task Force Recommendation) would be a study of the impact on future traffic in the Split of adding additional parking at these two locations (at least).

5. In the Planned and Proposed Improvements chapter a number of transit and highway projects are listed which could have significant impacts on the volumes and perhaps on the safety problems in the Split. It is not clear from the document whether these impacts and needs for these projects were considered concurrently with the recommended improvements. If an analysis has been done for some or all of these projects showing they will have benefits for the Split, you should say so. If the synergistic impacts are unknown, then this should be identified as another task under Next Steps.

6. In general, we support the lengthening of acceleration and deceleration lanes and the additional warning and information signs but do not support adding a fourth travel lane by converting the breakdown lane. We would like additional discussions (as part of the community and subregional consultations below) of the needs and alternatives before taking a position on the specific recommendations at each location.

7. We do not support further study of Route 24 south as the follow-up to this study. While the Route 24 lane reduction from 4 to 3 lanes certainly contributes to backups on I-93 and perhaps even at the Split, one possible solution has already been identified in this study. Yet many of the potential "big ticket" items that might help directly in the Split have not yet been evaluated. We believe a follow-up to this Braintree Split study should be an evaluation of transit/trip reduction strategies, flyovers, and other methods to separate currently weaving traffic, alternatives mentioned above, and other major design changes that will improve safety and congestion within the Split (in combination with changes outside the Split, if appropriate). This study should employ the regional model to study the potential for diversions, as well as building on the simulation work already begun.

8. We also believe that there should be additional consultation with the members of the Task Force about the recommendations of the study. We believe that the presentation you gave at the last Task Force meeting was a good beginning in understanding how the recommendations are reasonable responses to the identified problems, and we believe that many of the recommendations presented are good ones. However, only two previous Task Force meetings were held and many questions remain to be asked. The Task Force communities need additional internal discussions, and the MAPC SSC and TRIC subregions need the promised presentations and consultations. We believe this consultation can take place after the DRAFT document has been released, with the understanding that a FINAL document will be produced that reflects these comments, and (hopefully) a consensus from the Task Force on Next Steps. The follow-up study currently listed in the UPWP should reflect this consensus on Next Steps.

   Ultimately, we all have the goal of moving some/all of these recommendations to implementation. The best way to insure that these recommendations don't just sit on a shelf is to build widespread support and an enthusiastic proponent. Even if MassHighway is the proponent, they will want community support before they proceed too far. Before we finish up with this study and these recommendations there needs to be an effort to develop this support. We believe that should be the first Next Step, even before the big-ticket items are evaluated.

Town of Braintree

Engineering Division

Braintree Public Works

Robert P. Campbell, PE, Town Engineer
Rcampbell@townofbraintreegov.org
John J. Morse, Assistant Town Engineer
Jmorse@townofbraintreegov.org

July 5, 2005

Mr. Seth Asante, Project Manager
Central Transportation Planning Staff
10 Park Plaza, Suite 2150
Boston, MA 02116

RE: Braintree Split Study

Dear Mr. Asante:

As a member of the Advisory Task Force for the "Braintree Split" study, I really appreciate the amount of information that your staff has gathered and your efforts to compile a study that can be a basis for prioritizing work throughout the region. And the decision to "package" the projects as "safety Improvements" and "traffic flow improvements" meshes well with the Governor's Fix It First initiative. However, there are still two things that I've mentioned before but would like to re-iterate:

1. Given the high number of crashes at the Union Street / Route 3 interchange (ranked number 34 of the High 1000 crash locations statewide) the improvements at that location should be classified as "safety" rather than "traffic flow". This distinction may be the difference between what gets built expeditiously and what is delayed or maybe not built at all.
2. I am skeptical about the long term benefit of the new signalized dual left turn proposed at location #2. It is hard to imagine fitting any more turning lanes into that stretch of Granite Street and hard to believe that an underpass to get across to the left lane would not be more beneficial.

On a final note, the study results for the "Build" situation should emphasize that it is assumed that the recommended projects not only inside the study area but those external to it as well have been "built." With such high percentages of drive alone trips, transit extension to New Bedford and Fall River should take a great deal of pressure off of the Braintree Split, perhaps even more than is accounted for in the study.

Conservation and Planning Director Peter Lapolla is concerned about the safety aspects of the ever-increasing trend toward converting breakdown lanes to peak-period travel lanes. He is particularly concerned about lack of shoulder areas for emergency responders trying to get to incident scenes.

No other comments were communicated to me.

I look forward to the implementation of the projects scoped in this study and hopefully these changes that I and others have recommended.

Very truly yours,

Robert P. Campbell, P.E.
Town Engineer

CC: John McMahon, Director of Public Works
Sue Kay, Executive Secretary
Peter Lapolla, Dir. of Conservation and Planning

A.2 CTPS Responses to Public Comments on the Draft Report

Source	Comment (unedited)	Response
MAPC	**Style and Language** 1. The highly visual and graphic format for the report is easy to understand and a very appealing way to illustrate complex problems. This is an excellent format, which is appropriate for many CTPS documents.	Thank you.
	2. "Boston MPO/Metropolitan Planning Organization" The correct name is the "Boston Region MPO".	The final report will reflect this correction.
	3. "Transportation Concerns" (in the Executive Summary, "Internal Concerns", "External Concerns" and other places later in the report) Concerns are things that people are worried about ("proponents of the study expressed concerns"). The point of this study is to investigate these concerns. Seth/CTPS has done this, and determined that many of these concerns can be verified through objective, transparent measures. As a result, congestion, safety, and mobility problems have been identified. Problems are what the recommended improvements are designed to fix. Please do not use concerns (or issues, or other euphemisms) when you mean problems.	The final report will reflect this suggestion.
	4. In the Transportation Concerns section of the ES, the second sentence ("Another example," etc.), which is supposed to be about external bottlenecks, is actually citing an internal one. More external bottlenecks follow in the next paragraph, but there is no place in the ES where actual problems within the study area are described. Since there is an extensive list of recommendations in the document, presumably responding to identified problems, there should be an equally extensive list of problems in the ES.	The final report will reflect this correction.
	5. "Additional Improvements Recommended" "The improvements that were developed with the participation of the MassHighway, MBTA, and the study's Advisory Task Force . . .," etc. We don't know about MassHighway or the MBTA, but the Advisory Task Force did not participate in the development of the improvements, we merely commented on those that were developed. The Task Force should have a role in recommending improvements (more on that below). "The improvements that were recommended by this study. . ." Studies cannot recommend improvements. The Task Force, MassHighway, MBTA, CTPS, or Seth can. There are other places in the document where this same construct is used – please assign responsibility for actions to a specific organization or individual, not to a "study" which has no ability to act.	One of the purposes of the Advisory Task Force was to guide this study to successful completion by providing oversight. Members of the task force suggested some of the improvements and did participate in this study. Task 1 of the work program for this study that was approved by the Boston Region Metropolitan Planning Organization specified that CTPS would form a Braintree split Advisory Task Force to assist with the study and would meet three times with the Task Force. Three meetings were held in Braintree Town Hall with the Advisory Task Force. The inside cover of the report contains the list of task force members. Attendance at the task force meetings and comments on the draft report will also be provided in Appendix A of the final report. All of the improvements developed in this study (recommended and not recommended) were presented to the advisory task force for comments and feedback. They were also discussed with experts from MassHighway (the design, environmental, and planning departments) and the MBTA about their feasibility before any recommendations were made. CTPS, with the assistance of the task force, developed these improvement concepts to address some of the traffic operations and safety concerns/problems in the Braintree split area. These concepts are the first stage in a series of processes toward implementation. If these concepts advance into projects, they would undergo further evaluations, more public participation, and some modifications.
	6. None of the improvements proposed are major redesigns or additions. CTPS has said at meetings that the purpose of this study is to focus on operational improvements – that's a perfectly appropriate way to proceed, but it's not mentioned in the ES, maybe not anywhere in the document. Someone reading the document will likely expect a discussion of "big ticket" improvements, even if it is only to say that they weren't considered, and may be evaluated in a later study.	The purpose of this study is to focus on operational improvements, as emphasized in the title of the report. The purpose is also mentioned in the Executive Summary and other parts of the study report. In an operational study, the focus is on improvements that can be implemented in a short time, do not require major environmental impact study or land takings, can be constructed within the present right-of-way, do not adversely affect residential neighborhoods, are cost-effective, and buy more time to look at long-range strategies. These are the criteria that guided the improvements recommended in this study.

Source	Comment (unedited)	Response
MAPC	7. "Summary" There doesn't need to be a summary of the Executive Summary. To the extent there is new information here, it can be characterized as "Benefits of the Improvements." And there is need for a "Next Steps" section in the ES.	The final report will reflect this suggestion.
	8. "Chapter 3, Current Transportation, 3.1.4 Traffic Queues" It is unclear as written how far these queues extend since different segments are discussed separately. For example, for the PM peak, the southbound segments from Granite Street to the Split (on the Southeast Expressway) and Union Street and the Split (on Route 3) are both listed with queue (problems?). We read this as one queue extending from Union Street to Granite Street. A graphic here might be helpful.	This section of the report has been revised to address the extent of traffic queues. The final report will reflect this correction.
	9. "Chapter 6. Planned and Proposed Improvements" There needs to be a distinction between programmed, planned, and proposed. Service changes planned by the MBTA, projects programmed in the TIP, or being funded through private sources, local Chapter 90 funds, or in other concrete ways should be identified. Other projects planned in the latest Regional Transportation Plan should be noted, along with the time period they have been assigned. All other projects are "conceptual ideas" and their future funding uncertainty should be made clear. Information listing the proponent of each project or idea would also be helpful.	The final report will reflect this correction.
	Content 1. The weave by HOV vehicles exiting the HOV lane SB and heading towards I-93 was identified as a problem in the study. However, no improvement was recommended. One suggested by MAPC was moving the end of the HOV lane north, by whatever amount was feasible, to allow that much additional space for vehicles to complete the weave. Adriel Edwards, of EOT Planning, volunteered to check with MassHighway on the feasibility of moving this exit point. If acceptable that recommendation should be communicated to other Task Force members, and included in this draft if there is consensus. A second MAPC recommendation for this "problem" was the evaluation of a flyover ramp to replace this move. We believe this should be one of the Next Steps evaluated in the follow-up to the current study.	Both suggestions were checked with MassHighway and were found infeasible. However, they will be included in Appendix B, which contains improvements that were found infeasible and/or were not recommended. **Relocation of Southbound HOV Terminal** Moving the southbound HOV lane exit further north would bring it toward the Furnace Brook Parkway interchange. This section of the Expressway is in a curve that makes it unsafe for traffic exiting from the HOV lane to merge with the traffic on the Expressway. Straight sections of roadway are best suited for merge areas. Moving the southbound HOV lane exit further north would also bring it closer to the Furnace Brook Parkway southbound on-ramp, where merging traffic causes PM peak period traffic congestion. Merge areas are best located in sections of roadway where no other merges are taking place. There is no space further north of the southbound HOV lane exit to set up the AM peak period HOV entrance and the PM peak period HOV exit at the same location. Moving the southbound HOV lane exit north would reduce the benefit of the lane due to reduced travel time savings. **Flyover Ramp for Southbound HOV Traffic Heading towards I-93** The HOV lane is reversible; a fixed flyover structure would not allow for this reversible operation. There is no space on the current Expressway right-of-way to build a flyover. A flyover from the southbound HOV lane exit to I-93 would require at least 22 feet on the Expressway, in addition to the space required for the HOV lane merge to Route 3 South. Traffic from the flyover would have to merge with I-93 southbound traffic.

Source	Comment (unedited)	Response
MAPC	2. At location #2, an alternative to the double left-turn lane recommended by CTPS was suggested by MAPC. The existing left turn to I-93 would be replaced by a right turn to a new climbing lane/on-ramp constructed between the two barrels of I-93. This would result in a left-side on-ramp, providing access to the Expressway northbound, and would eliminate the dangerous weave that is currently required. If there has been an evaluation of this alternative, then it should be included in this document, as either a recommendation or as Not Recommended in Appendix B. Otherwise it should be added to the list of improvements to be evaluated in Next Steps. [*Appendix B is now Appendix C in the final report.*]	This alternative was discussed with MassHighway and found infeasible; however, it will be included in Appendix C, which describes improvements that were found infeasible and/or were not recommended. Even though this alternative eliminates the current dangerous weave, it also results in a left-side merge. MassHighway does not encourage construction of left-side ramp merges because of their associated safety concerns—merging with high-speed traffic. In addition, the Route 37 interchange on- and off-ramps are very close to the area where traffic diverges to the Expressway and Route 3 South. Straight sections of roadway and sections where no other merges and diverges are taking place are best suited for merge areas. Neither an underpass nor an overpass was found appropriate at this location.
	3. In general, while weave problems were identified in many locations of the study area, the only recommended solution was at location 2 above. In an operational study like this one, approaches to minimize weaving, which would include providing better information on appropriate lanes and separating through from weaving trips, should also be explored. For example, signs for the Route 24 exit could be posted further east on I-93 and could announce the need to get in the left lanes. Other potential recommendations along these lines should be developed and discussed between the DRAFT and FINAL versions of this document.	CTPS recommended installing new signs or modifying existing signs to better inform motorists about appropriate lanes at many locations. The final report will incorporate this recommendation.
	4. Although "access to transit" is listed as a "concern," there is no mention that the parking garages at the Braintree and Quincy Adams Red Line stations are full (nor any mention in the text about Braintree commuter rail). If a study has not already been completed at CTPS for the MBTA, one obvious Next Step (Task Force Recommendation) would be a study of the impact on future traffic in the Split of adding additional parking at these two locations (at least).	Table 1, Commuter Rail Park-and-Ride Lot Inventory, gives information on the operator, fees, number of spaces, and utilization of park-and-ride lots, including the Braintree Station garage. A discussion of parking at Quincy Adams Station on the Red Line will be added to the report. Both the Braintree and Quincy Adams parking garages are rated high-priority in the MBTA's Program for Mass Transportation and will be mentioned in the final report. The final report will include this recommendation.
	5. In the Planned and Proposed Improvements chapter, a number of transit and highway projects are listed which could have significant impacts on the volumes and perhaps on the safety problems in the Split. It is not clear from the document whether these impacts and needs for these projects were considered concurrently with the recommended improvements. If an analysis has been done for some or all of these projects showing they will have benefits for the Split, you should say so. If the synergistic impacts are unknown, then this should be identified as another task under Next Steps.	It is mentioned in the report that the forecasts do not include commuter rail to New Bedford/ Fall River. A separate table or a list showing all of the planned and proposed improvements that were not included in the planning model because of their status will be added. The final report will reflect this correction.
	6. In general we support the lengthening of acceleration and deceleration lanes and the additional warning and information signs, but do not support adding a fourth travel lane by converting the breakdown lane. We would like additional discussions (as part of the community and subregional consultations below) of the needs and alternatives before taking a position on the specific recommendations at each location.	All of the lane additions address operational problems (bottlenecks) outside of the Braintree split that restrict traffic flow to and from the Braintree split, and they use short sections of breakdown lanes. The use of short sections of breakdown lanes is an interim measure appropriate for operational improvements while long-term strategies that take a longer time to implement are being developed and evaluated. Also, in an operational study like this one, the focus is on improvements that can be implemented in a short time, do not require a major environmental impact study, do not require land takings, can be constructed within a right-of-way, do not adversely affect residential neighborhoods, are cost-effective, and buy time to look at long-range improvements. At the moment, all of the recommendation are concepts and would require further evaluation, including more public participation, before CTPS, MassHighway, or the communities take a position on any of the recommendations and developing them into a project. CTPS suggests that this should be carried out in the "next steps," as this study's work program specified the formation of an advisory task force to assist with the study and did not budget for the additional public participation.

Source	Comment (unedited)	Response
MAPC	7. We do not support further study of Route 24 south as the follow-up to this study. While the Route 24 lane reduction from 4 to 3 lanes certainly contributes to backups on I-93 and perhaps even at the Split, one possible solution has already been identified in this study. Yet many of the potential “big ticket” items that might help directly in the Split have not yet been evaluated. We believe a follow-up to the this Braintree Split study should be an evaluation of transit/trip reduction strategies, flyovers, and other methods to separate currently weaving traffic, alternatives mentioned above, and other major design changes that will improve safety and congestion within the Split (in combination with changes outside the Split, if appropriate). This study should employ the regional model to study the potential for diversions, as well as building on the simulation work already begun.	The widening of the entrance to Route 24 from three to four lanes improves traffic flow through the Braintree split to Route 3 South and to I-93, especially during the PM peak period, when traffic backs up on I-93 southbound from Route 24 into the Braintree split. Based on the length of widening recommended, the 2025 queue length on I-93 is limited to the area between Route 28 and Route 24, which is an improvement over current conditions. Besides reducing the queuing on I-93, the widening of the entrance to four lanes also improves safety by eliminating the shared middle lane, which many drivers avoid because of merging and sight-distance problems. Drivers merging in the middle lane do not see each other from connecting ramps until the merge begins. Finally, this operational improvement is not a “big ticket” item, and can be implemented quickly, while other regional transportation strategies are evaluated to address mobility issues in southeastern Massachusetts.
	8. We also believe that there should be additional consultation with the members of the Task Force about the recommendations of the study. We believe that the presentation you gave at the last Task Force meeting was a good beginning in understanding how the recommendations are reasonable responses to the identified problems, and we believe that many of the recommendations presented are good ones. However, only two previous Task Force meetings were held and many questions remain to be asked. The Task Force communities need additional internal discussions, and the MAPC SSC and TRIC subregions need the promised presentations and consultations. We believe this consultation can take place after the DRAFT document has been released, with the understanding that a FINAL document will be produced that reflects these comments, and (hopefully) a consensus from the Task Force on Next Steps. The follow up study currently listed in the UPWP should reflect this consensus on Next Steps. 9. Ultimately, we all have the goal of moving some/all of these recommendations to implementation. The best way to insure that these recommendations don’t just sit on a shelf is to build widespread support and an enthusiastic proponent. Even if MassHighway is the proponent they will want community support before they proceed too far. Before we finish up with this study and these recommendations there needs to be an effort to develop this support. We believe that should be the first Next Step, even before the big ticket items are evaluated.	CTPS agrees that additional consultation with the communities and MAPC subregions is necessary and should be carried out as these improvement concepts advance into projects. The study has a limited budget and cannot carry out all the necessary public participation efforts at this stage. This study’s work program specified the formation of an advisory task force to assist with the study and up to three meetings with the task force. CTPS held three meetings with the task force at the Braintree Town Hall, where concerns, problems, and potential solutions were discussed. The inside cover of the report contains the list of task force members. The meeting dates and attendance at the task force meetings and comments on the draft report will be provided in Appendix C of the final report.
Braintree	1. Given the high number of crashes at the Union Street /Route 3 interchange (ranked number 34 of the High 1000 crash locations statewide) the improvements at that location should be classified as “safety” rather than “traffic flow.” This distinction may be the difference between what gets built expeditiously and what is delayed or maybe not built at all.	The Union Street/Route 3 interchange is a high-crash location, as are many other locations in the study area. The suggested improvements at the Union Street/Route 3 interchange primarily improve traffic flow at the interchange and on Route 3 South. Because the improvements reduce weaving and merging in the area, they are expected to improve safety at the interchange. More emphasis will be placed on the safety benefits of the suggested improvements the Union Street/Route 3 interchange in the final report.
	2. I am skeptical about the long term benefit of the new signalized dual left turn proposed at location #2. It is hard to imagine fitting any more turning lanes into that stretch of Granite Street and hard to believe that an underpass to get across to the left lane would not be more beneficial.	The new, signalized, dual left turn proposed at location #2 works operates satisfactorily and can be accommodated in the Granite Avenue right-of-way. The proposed improvements would buy more time to look at long-range strategies for the Braintree split. The underpass alternative suggested by the Task Force was discussed with MassHighway and found infeasible. Even though the underpass alternative eliminates the current dangerous weave, it also results in a left-side merge. MassHighway does not encourage construction of left-side ramp merges because of their associated safety concerns—merging with high-speed traffic. In addition, the Route 37 interchange on- and off-ramps are very close to the area where traffic diverges to the Expressway and Route 3 South. Straight sections of roadway and sections where no other merges and diverges take place are best suited for merge areas. Finally, because of the rising grade at this location, there would not be enough space to achieve the desirable grade for use by trucks to get to the left lane (which is the high-speed lane, thus creating safety problems).
	3. Conservation and Planning Director Peter Lapolla is concerned about the safety aspects of the ever-increasing trend toward converting breakdown lanes to peak-period travel lanes. He is particularly concerned about lack of shoulder areas for emergency responders trying to get to incident scenes.	The use of the breakdown lane is an interim measure and would be implemented only on short sections of roadways. In this study, the focus was on operational improvements that can be implemented in a short time, do not require major environmental impact study or land takings, can be constructed within the present right-of-way, do not adversely affect residential neighborhoods, are cost-effective, and buy more time to look at long-range strategies.

Source	Comment (unedited)	Response
	4. On a final note, the study results for the “Build” situation should emphasize that it is assumed that the recommended projects not only inside the study area but those external to it as well have been “built.” With such high percentages of drive-alone trips, transit extension to New Bedford and Fall River should take a great deal of pressure off of the Braintree Split, perhaps even more than is accounted for in the study.	The final report will reflect this suggestion.

A.3 Attendance at Advisory Task Force Meetings

Braintree Split Study
Advisory Task Force Meeting
Braintree Town Hall
December 11, 2003

Name	Affiliation	Telephone
Seth Asante	CTPS	617 973-7098
Efi Pagitsas	"	617 973-7106
Jim Gallagher	MAPC	617-451-2770 x2053
Hardy Patel	Mass. Highway	617-973-7728
Stanley Wood	Mass Highway	617-973-7721
Adriel Edwards	Mass Highway	617 973 8062
Paul Halkiotis	Weymouth Planning	781 682 3637
Joe Onorato	MHD D4	781-641-8477
George Bezkorovainy	Weymouth Traffic	781-682-3638
Roy LaMotte	Quincy Traffic	617-687-8306
Ann Bowes	Rep. Timilty	617-722-2692
Aaron Henry	Town of Milton	(617) 696-5727
Joe Cosgrove	MBTA	(617) 222-4400
Joe Driscoll	State Rep. Braintree	617-722-2460
Bill Clark	MAPC/SSC	617 451-2770 x2052

Braintree Split Study
Advisory Task Force Meeting
Braintree Town Hall
June 2, 2004

Name	Affiliation	Telephone
Seth Asante	CTPS	617-973-7095
Efi Pagitsas	"	-973-7106
Peter S. Lappolla	Braintree Planning	781-794-8232
Jim Gallagher	MAPC	617-451-2770-2053
Bill Clark	MAPC	617 451-2770 x2052
Paul Halkiotis	Weymouth Planning	781 682 3637
John McMahon	B DPW	781 794 8250
Bob Campbell	Braintree DPW-Engineering	781 794 8012
George Bezkorovainy	Weymouth Traffic	781-682-3658
Melanie Hirs	Braintree Planning/Conser.	781.684.8233
Greg Prendergast	MassHighway-Environmental	617-973-7484
Stanley Wood	MassHighway-Design	617 973-7721
Hardy Patel	" " "	617-973-7728
Adriel Edwards	Mass Highway Planning	617 973 8062
Robert Boone	MassHighway District 4	(781) 641-8472

Braintree Split Study
Advisory Task Force Meeting
Braintree Town Hall
June 24, 2005

Name	Affiliation	Telephone
Seth Asante	CTPS	617-973-7098
Efi Pagitsas	CTPS	617-973-7106
Paul Halkiotis	Weymouth Planning	781-682-3637
Jim Gallagher	MAPC	617-451-2770 x2053
Bill Clark	MAPC	617-451-2770 x2025
Greg Prendergast	MassHighway-Environmental	617-973-7484
Adriel Edwards	EOT	617-973-8062
Joe Onorato	MassHighway-District 4	781-641-8479
Bob Campbell	Braintree DPW-Engineering	781-794-8012
Peter Lapolla	Braintree-Planning	781-794-8232
Joe Cosgrove	MBTA-Planning	617-222-4400

APPENDIX B

Socioeconomic Trends

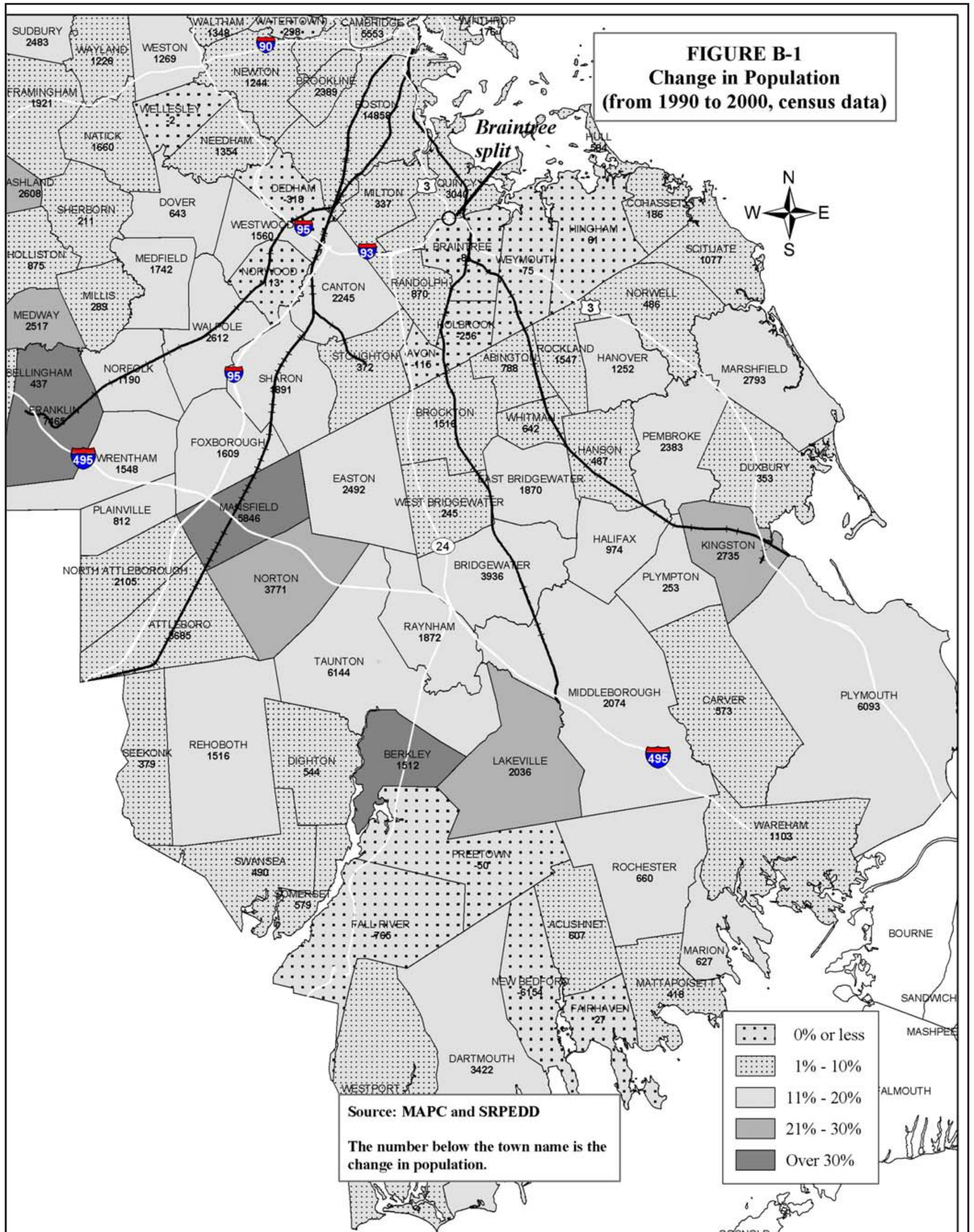


FIGURE B-1
Change in Population
(from 1990 to 2000, census data)

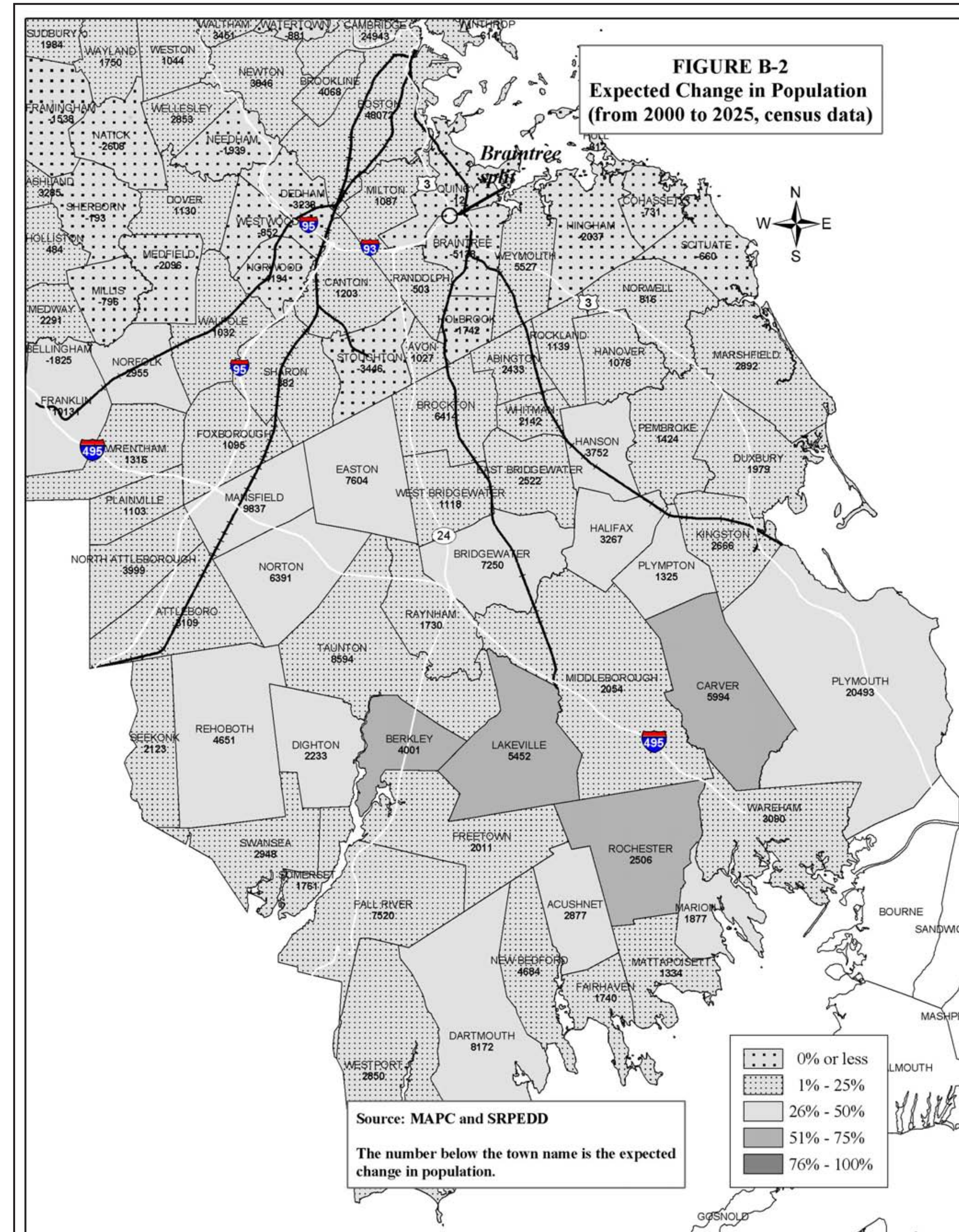


FIGURE B-2
Expected Change in Population
(from 2000 to 2025, census data)

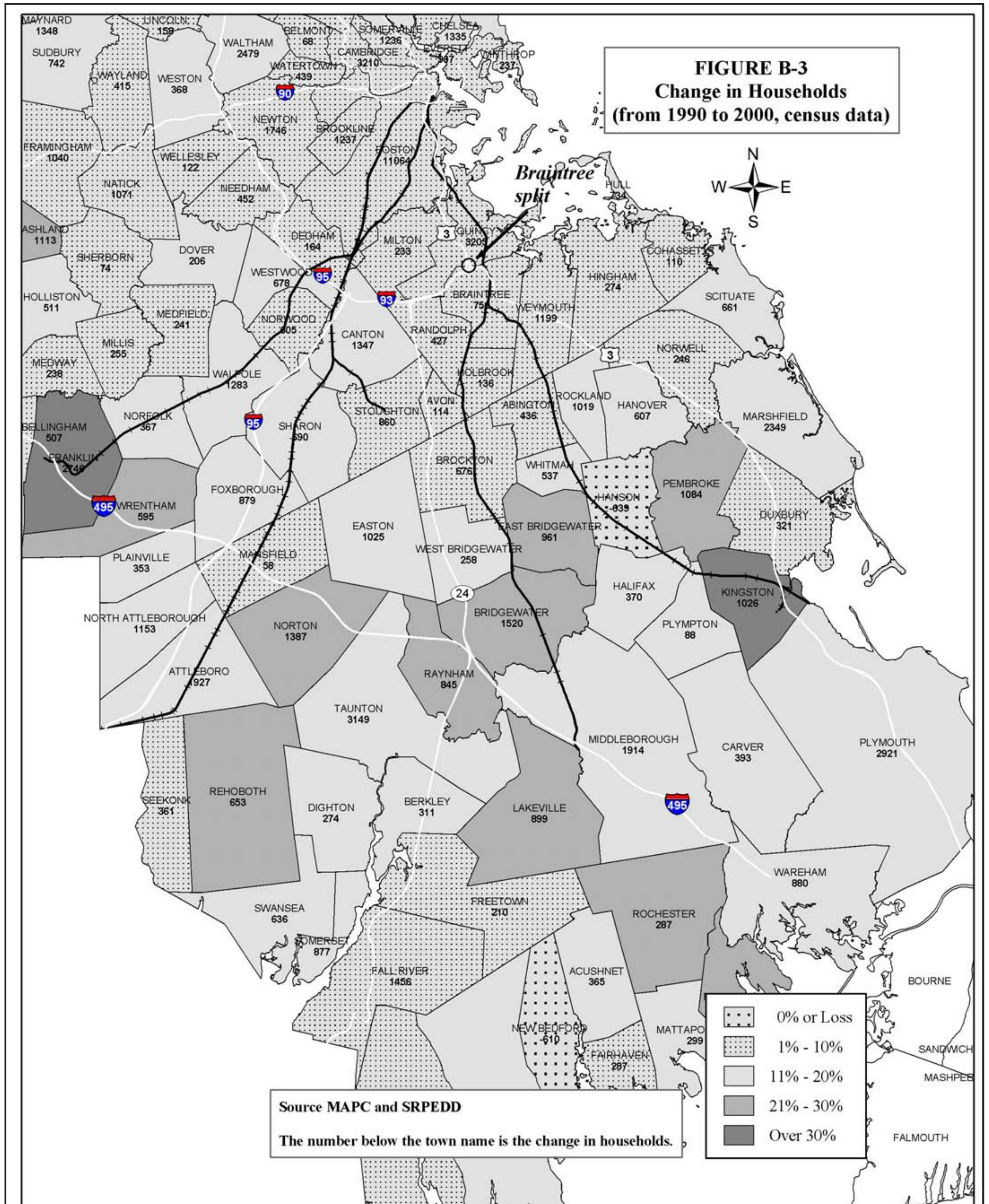


FIGURE B-3
Change in Households
(from 1990 to 2000, census data)

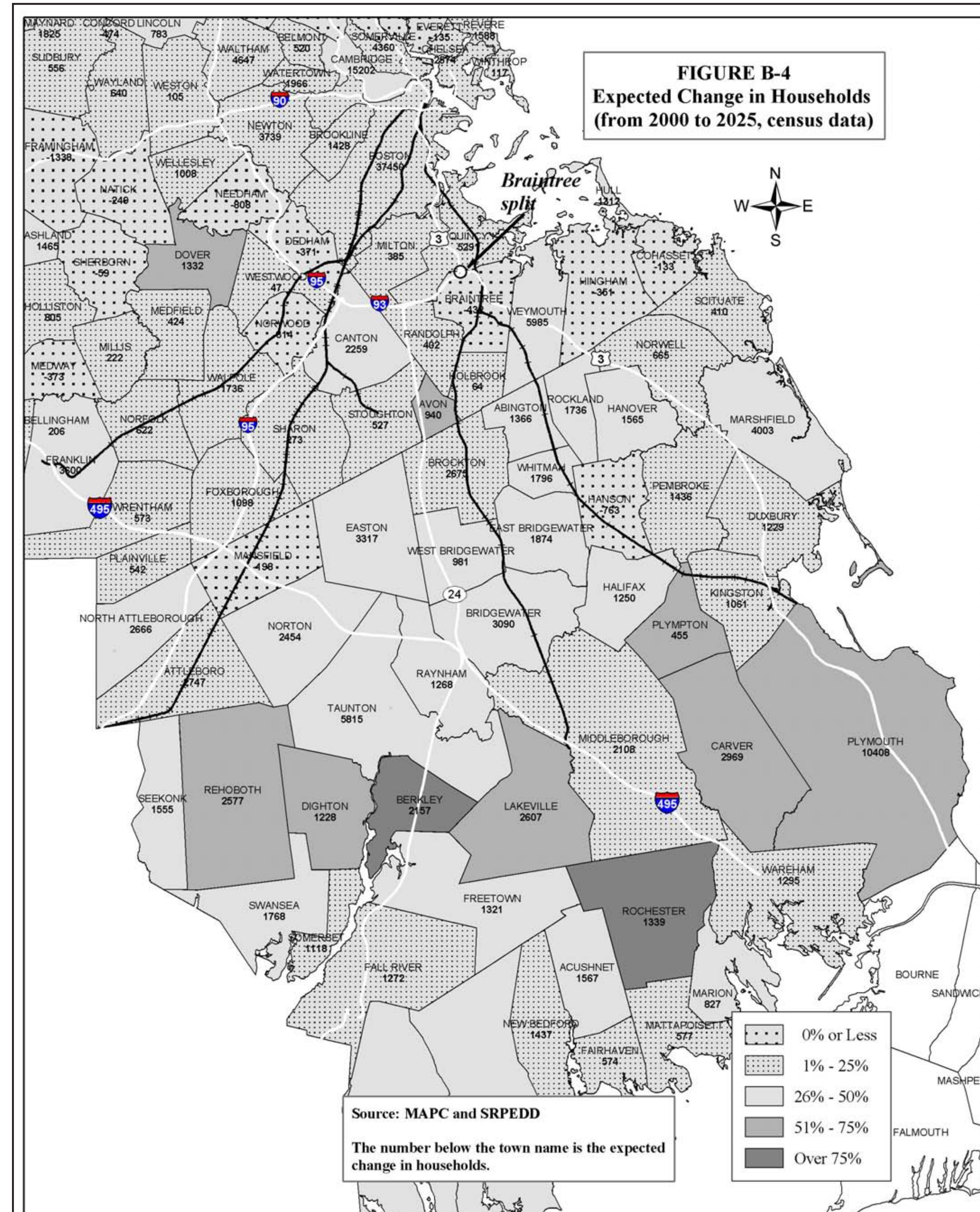


FIGURE B-4
Expected Change in Households
(from 2000 to 2025, census data)

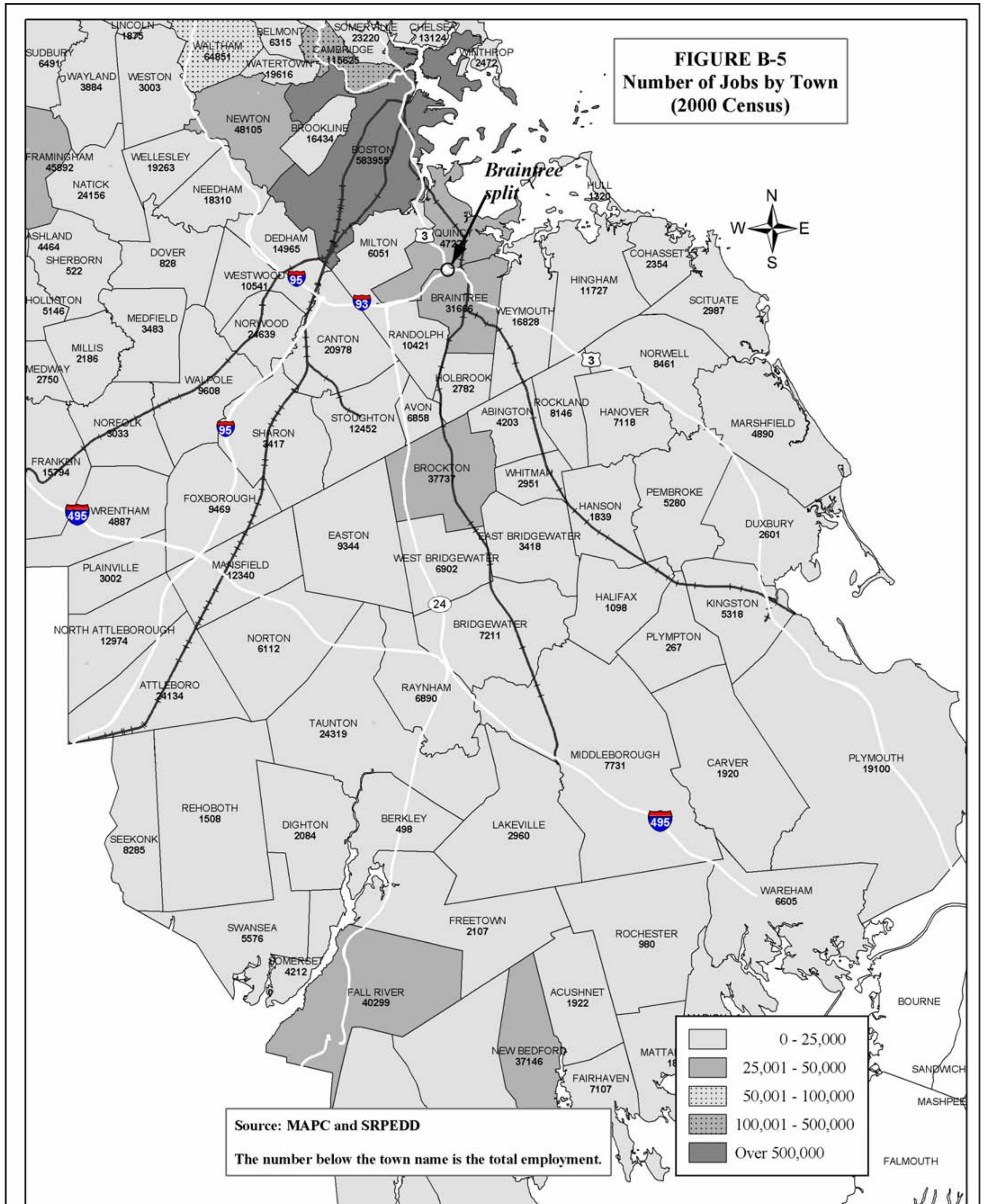


FIGURE B-5
Number of Jobs by Town
(2000 Census)

Source: MAPC and SRPEDD

The number below the town name is the total employment.

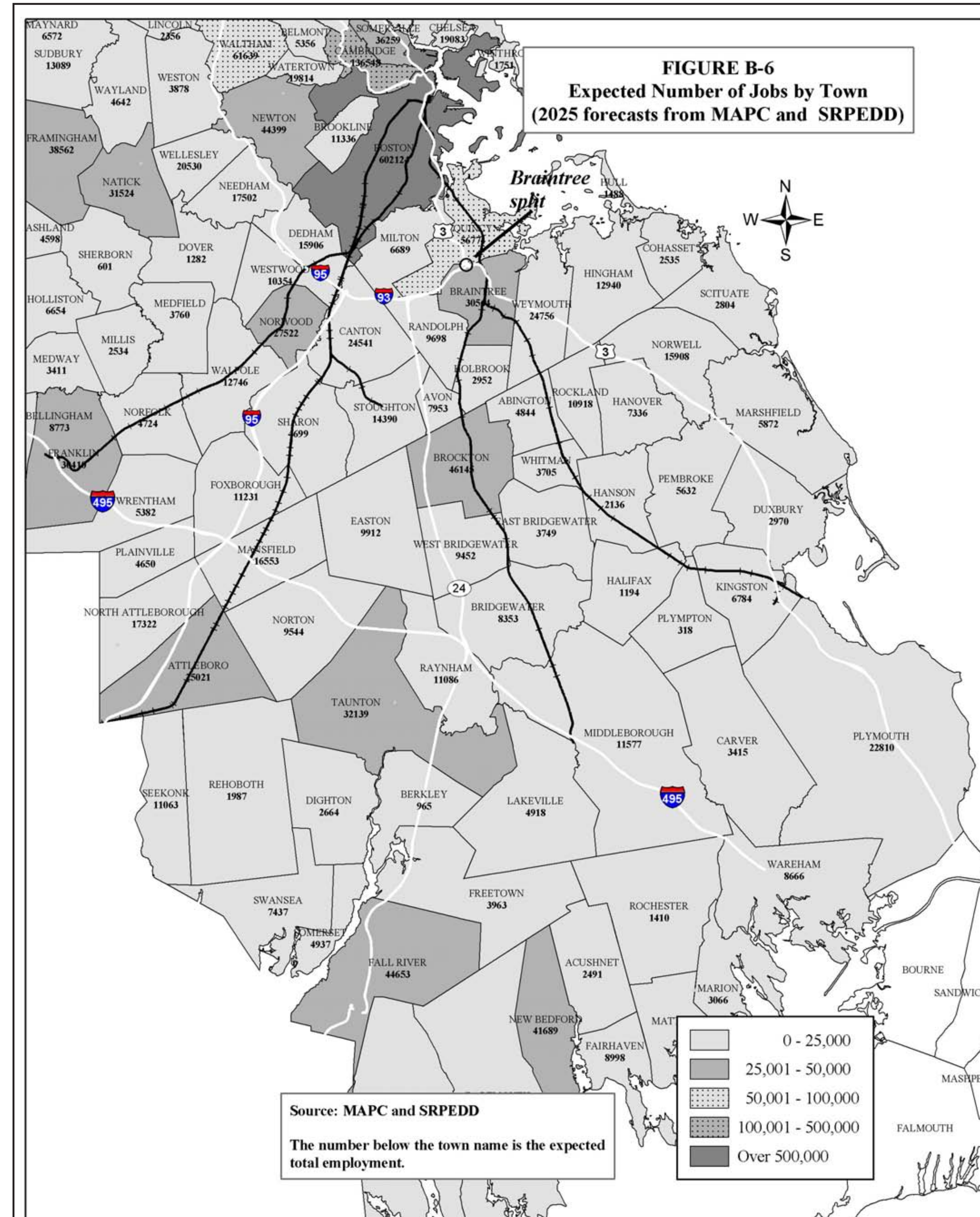


FIGURE B-6
Expected Number of Jobs by Town
(2025 forecasts from MAPC and SRPEDD)

Source: MAPC and SRPEDD

The number below the town name is the expected total employment.

APPENDIX C

Improvements That Were Considered but Were Not Recommended

C.1 Safety Improvements

C.2 Traffic Flow Improvements

C.1 SAFETY IMPROVEMENTS

The safety improvement options that were considered in this study but were not recommended for further consideration and the reasons for not recommending them are described below. The individual safety improvements are shown in white in Figure C-1. The improvements are identified by the number associated with the location of the concern, as in Figures 2 and 3. That numbering is repeated in Figure C-1 for easy reference and consistency.

Improvements at Location #2: Reconfiguration of the Ramp to Eliminate the Short Weave Distance

Alternative 2: A Flyover or Overpass for Traffic Heading to the Expressway

This proposal was designed to address the safety concerns resulting from the short weave distance for the northbound Route 37 on-ramp traffic proceeding to the Expressway. The proposal calls for restricting the existing on-ramp traffic that is heading to Route 3 South/Burgin Parkway/Washington Street. A median barrier or some form of separation would be required to prevent the ramp traffic from violating this restriction.

In addition, the proposal calls for building an overpass over I-93 northbound for the ramp traffic destined for the Expressway, and installing new signs or modifying existing signs on Route 37 to guide motorists to the appropriate ramps. These modifications would increase safety at the split by eliminating the short weave section. The shortcomings of this proposal are that:

- Both I-93 northbound and the existing ramp are on an incline and there would not be enough room to achieve the desired vertical clearance.
- The proposed ramp would create a left-side ramp merge that would cause safety problems for the I-93 traffic heading to the Expressway.

Alternative 3: An Underpass for Traffic Heading to the Expressway

This proposal is similar to Alternative 1 and was designed to address the safety concerns resulting from the short weave distance for the northbound Route 37 on-ramp traffic proceeding to the Expressway. The proposal calls for restricting the existing on-ramp traffic that is heading to Route 3 South/Burgin Parkway/Washington Street. A median barrier or some form of separation would be required to prevent the ramp traffic from violating this restriction.

In addition, the proposal calls for building an underpass under I-93 northbound for the ramp traffic destined for the Expressway, and installing new signs or modifying existing signs on Route 37 to guide motorists to the appropriate ramps. These modifications would increase safety at the split by eliminating the short weave section. The shortcomings of this proposal are that:

- Both I-93 northbound and the existing ramp are on an incline and there would not be enough room to achieve the desired vertical grade for use by trucks.
- The proposed ramp would create a left-side ramp merge that would interrupt the I-93 traffic diverge to the Expressway.

Improvements at Location #4: Enhance Access to the HOV Lane for Washington Street On-Ramp Traffic with an Overpass

This proposal was developed to enhance access to the northbound HOV lane for travelers using the Burgin Parkway/ Washington Street on-ramp during the AM peak period. The proposal calls for building an overpass over the northbound connectors to the Expressway from I-93 and Route 3 South for use by HOV-bound vehicles entering the HOV lane during the AM peak period. This option eliminates the weave across four travel lanes for entering the HOV lane. The shortcomings of this option are that the proposed ramp would:

- Create a new merge point for the I-93 and Route 3 South HOV traffic.
- Involve cutting through rocks.
- Be very close to the MassHighway Traffic Control Center, therefore affecting traffic entering and leaving the premises.
- Not be cost-effective, considering the small volume of HOV traffic that would be using it, because it would be used only during the AM peak period.
- Require enforcement during off-peak periods when the HOV lane is not in use.

C.2 TRAFFIC FLOW IMPROVEMENTS

The traffic flow improvement options that were considered in this study but were not recommended for further consideration and the reasons for not recommending them are described below. The individual traffic flow improvements are shown in white in Figure C-2. The improvements are identified by the number associated with the location of the problem, as in Figures 2 and 3. That numbering is repeated in Figure C-2 for easy reference and consistency.

Improvements at Location #5: Design Configuration Improvements for the Section of the Expressway between Furnace Brook Parkway and the Diverge Point of I-93 and Route 3 South

The following alternatives, suggested by the Task Force, were designed to address the southbound PM peak period congestion, weaving, and merging concerns on the Expressway in the vicinity of the Furnace Brook Parkway interchange, the HOV merge point, and the I-93 and Route 3 South diverge area.

Alternative 2: Evaluation of Widening the I-93 Southbound Approach from Two to Three Lanes

The proposal is very similar to what was recommended for further consideration in Chapter 7, except that it adds a travel lane from Furnace Brook Parkway across the Route 37 interchange, ending on I-93 after the diverge point to Route 24. The components of this option are the following:

- Add a travel lane in the southbound direction of the Expressway, beginning from the southbound on-ramp from Furnace Brook Parkway/Willard Street and ending at the diverge point to Route 24.
- Improve lane configuration at the I-93 and Route 3 South diverge area by retaining the existing three lanes to Route 3 South, but widen the approach to I-93 southbound from two to three lanes.
- Install new signs or modify existing signs to direct motorists at the diverge area.

The additional travel lane is expected to reduce merging and weaving in the area and to help on-ramp traffic from Furnace Brook Parkway to enter the Expressway, as well as allowing traffic exiting from the HOV lane to continue onto I-93. This would reduce congestion on the Expressway during the PM peak period. The shortcomings of this option are:

- The additional travel lane in the vicinity of the Route 37 interchange would make it more difficult for the northbound Route 3 South traffic to exit onto Route 37.
- With this option, it would require three lane changes to exit onto Route 37 instead of the current two lane changes.

- The additional travel lane would eliminate the current deceleration lane to Route 37 unless the bridge over Route 37 is widened. Considering the high traffic volumes that exit at this location, 800 vehicles per hour during the AM and PM peak periods, this modification would worsen traffic flow in the vicinity of the interchange.

Alternative 3: Relocate the Southbound HOV Terminal to Create More Space for HOV Vehicles to Merge

This proposal is designed to reduce the weave of HOV vehicles exiting the HOV lane southbound heading towards I-93. The proposal calls for moving the end of the HOV lane north, by whatever amount was feasible, to allow that much additional space for vehicles to complete the weave. This alternative was found to be infeasible due to the following reasons.

First, moving the southbound HOV lane exit further north would bring it toward the Furnace Brook Parkway interchange. This section of the Expressway is in a curve that makes it unsafe for traffic exiting from the HOV lane and merging with the traffic on the Expressway. Merge areas work best on sections of roadway where no other merges are taking place. Additionally, relocating the southbound HOV lane exit further north would bring it closer to the Furnace Brook Parkway southbound on-ramp, where merging traffic causes PM peak period traffic congestion.

In addition, there is no space further north of the southbound HOV lane exit to set up the AM peak period HOV entrance and the PM peak period HOV exit at the same location. Another issue is that relocating the merge area even further north would reduce the benefit of the lane because it would reduced travel time savings.

Alternative 4: Evaluation of a Flyover Ramp for the Southbound HOV Traffic Heading to I-93

This proposal is designed to create a flyover for HOV vehicles exiting the HOV lane southbound heading towards I-93. The flyover for this movement would merge with I-93 southbound outside of the weave area. This alternative essentially eliminates the weave by the HOV vehicles exiting the HOV lane southbound heading towards I-93, but this option was also found to be infeasible due to the following reasons.

- The HOV lane is reversible; a fixed flyover structure would not allow for this reversible operation.
- There is no space between the two barrels of the current Expressway right-of-way to build a flyover. A flyover from the southbound HOV lane exit to I-93 would require at least 22 feet on the Expressway in addition to the space that would be required for the HOV lane merge to Route 3 South.
- Traffic from the flyover would have to merge with I-93 southbound traffic.

Improvements at Location #9: Design Configuration Improvements at Interchange Ramps at Exit 17 (Union Street in Braintree)

The following alternatives suggested by the Task Force were designed specifically to address on-ramp traffic to and from the Union Street rotary interchange that impacts traffic flow on Route 3 South and the Braintree split during the AM and PM peak periods.

Alternative 2: Replace the Existing Rotary Interchange with a Full Diamond Interchange.

The proposal calls for converting the existing rotary interchange into a full diamond interchange and upgrading the existing acceleration and deceleration lanes on the north side into auxiliary lanes. The northbound on-ramp could be upgraded into an auxiliary lane, possibly ending after the exit ramp at interchange 19 (MBTA Quincy Adams Station) to provide more room for the on-ramp traffic to merge with Route 3 South northbound traffic during the AM peak period.

In the southbound direction, the modification would involve upgrading the deceleration lane into an auxiliary lane, possibly ending after the exit ramp at interchange 17 (Union Street) to provide more storage room for the southbound traffic exiting onto Union Street, improving traffic flow on southbound Route 3 South during the PM peak period.

Preliminary analysis indicates that the high traffic volumes and high left-turn volumes at the interchange would require a six-lane underpass with double left-turn lanes at certain locations. Under current conditions, left-turn storage lanes would be adequate, but they could become a problem in the future. A single-point urban interchange is an option, but was not analyzed in this study.

Alternative 3: Provide a Direct Ramp Connection to the Marketplace at Braintree

This proposal would construct a direct southbound off-ramp from Route 3 South to the Marketplace at Braintree. The new ramp would route shopping trips directly to the mall instead of having them pass through the rotary interchange at Union Street. The problem with this proposal is that there is no arterial or collector nearby to receive the ramp traffic. Thus the new ramp would connect to one of the mall's internal streets, possibly creating safety problems.

FIGURE C-1
Safety Improvements Not Recommended

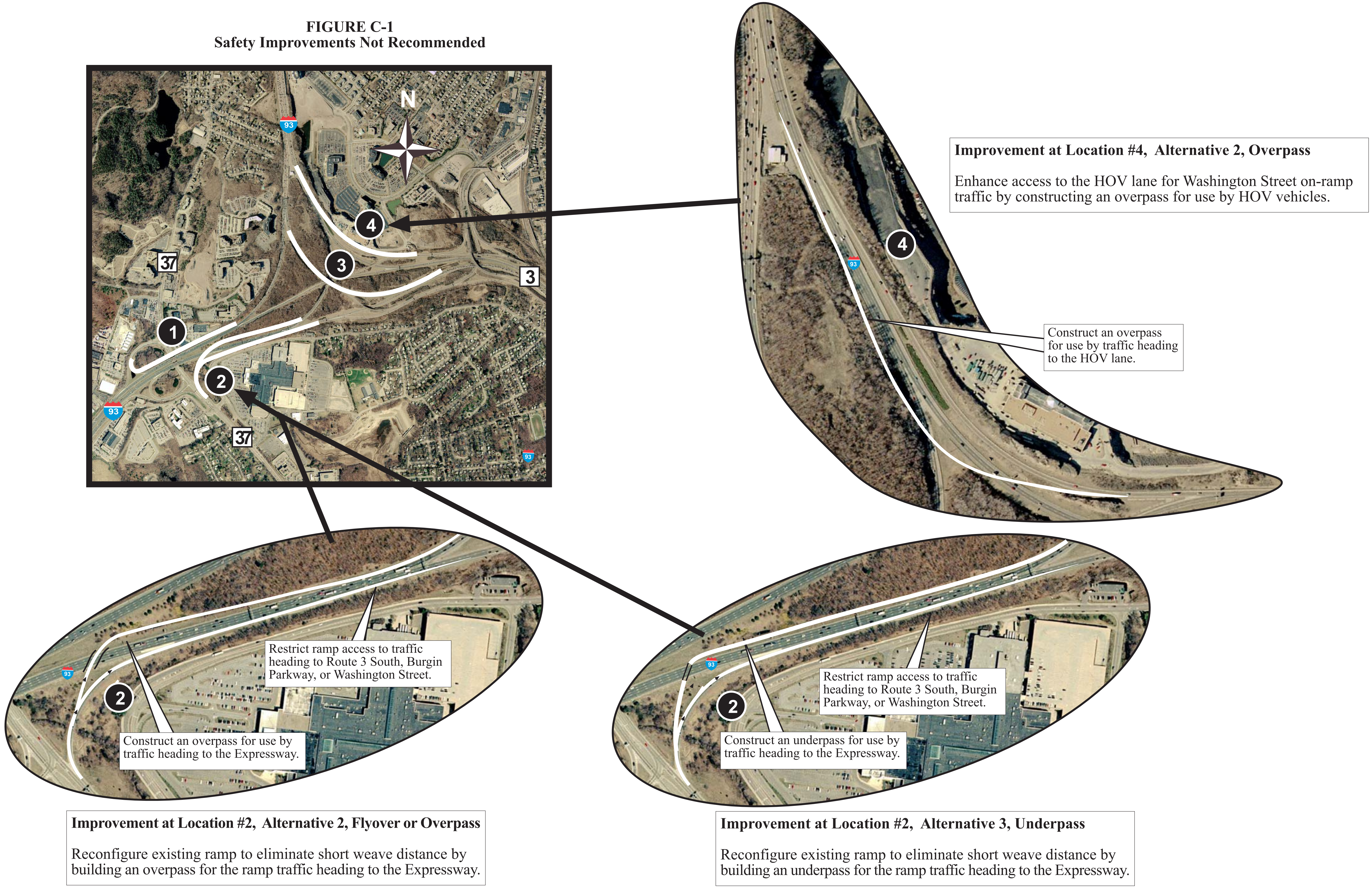
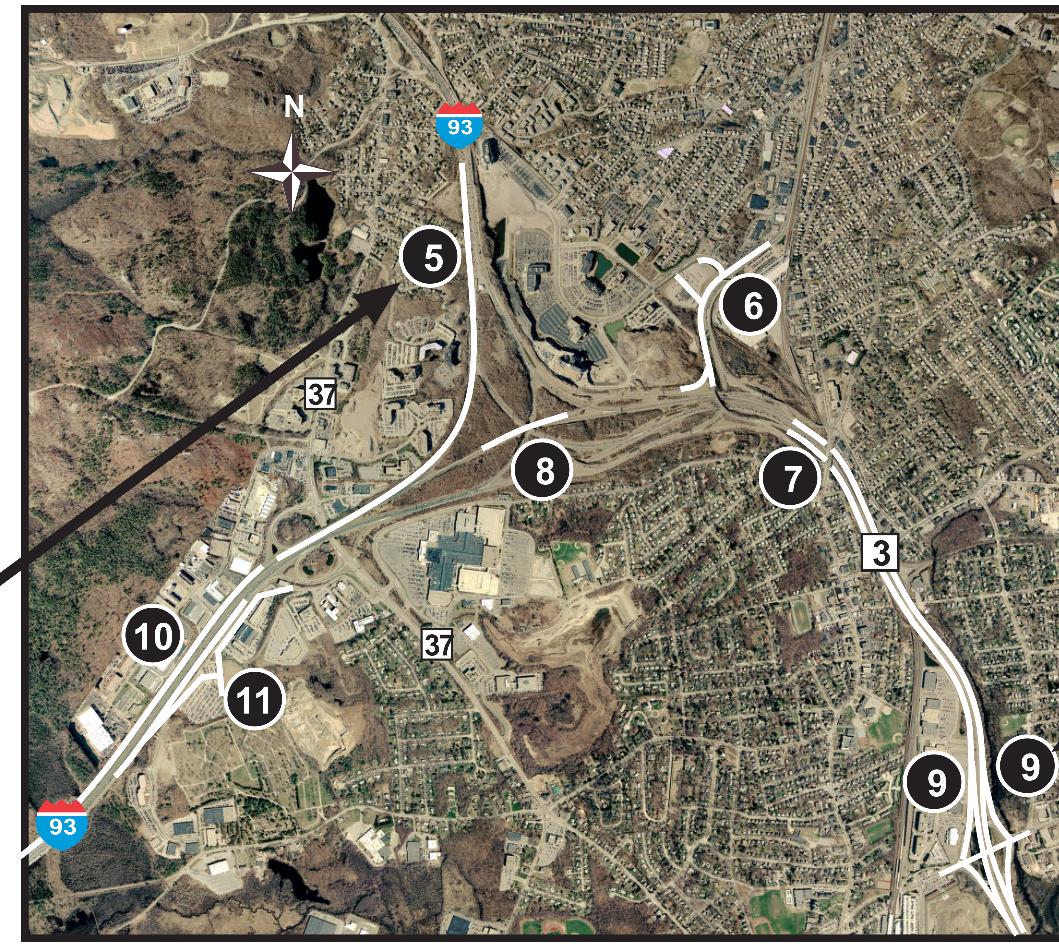
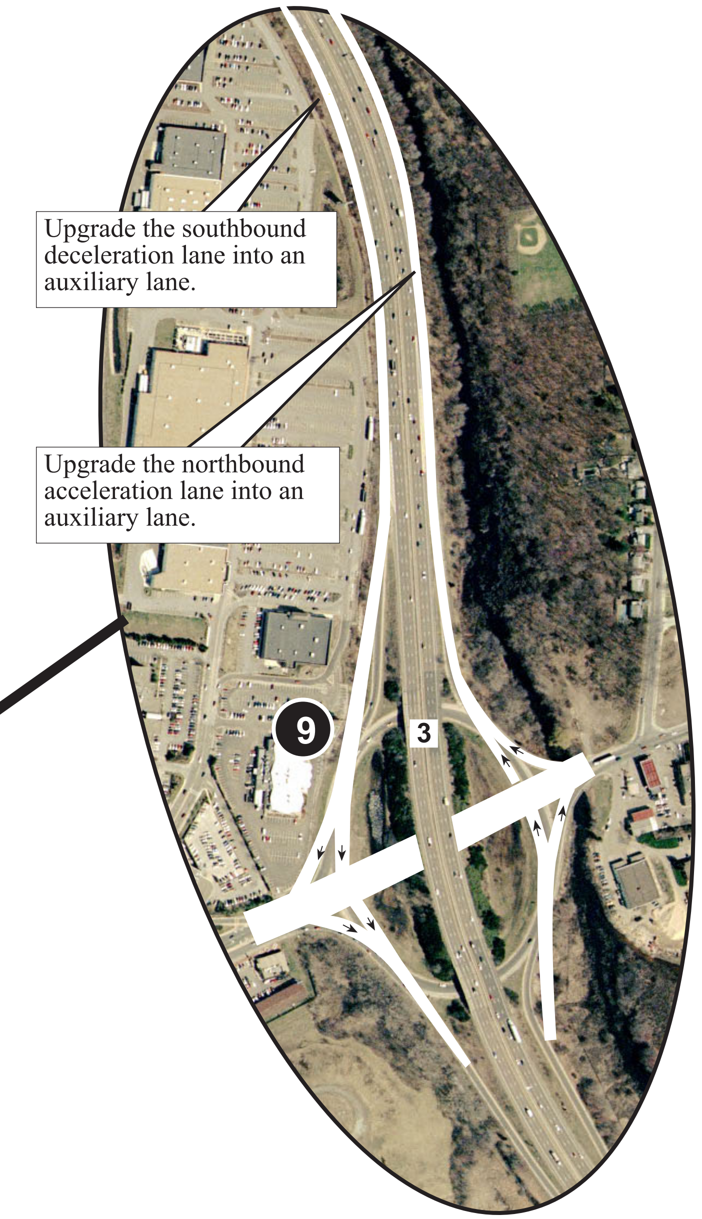


FIGURE C-2
Traffic Flow Improvements Not Recommended





Improvements at Location #5, Alternative 2, Increase Capacity by Adding a Lane

Add a travel lane in the southbound direction of the Expressway beginning from the southbound on-ramp from Furnace Brook Parkway/Willard Street and ending after the diverge to Route 24.

Restripe the split to provide three travel lanes on I-93 southbound.

Install new signs or modify existing signs to direct motorists at the diverge point of I-93 southbound and Route 3 South.

Improvements at Location #9, Alternative 2, Diamond Interchange

Upgrade the existing rotary interchange into a diamond interchange.

Upgrade the north-side acceleration and deceleration lanes into auxiliary lanes.