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.

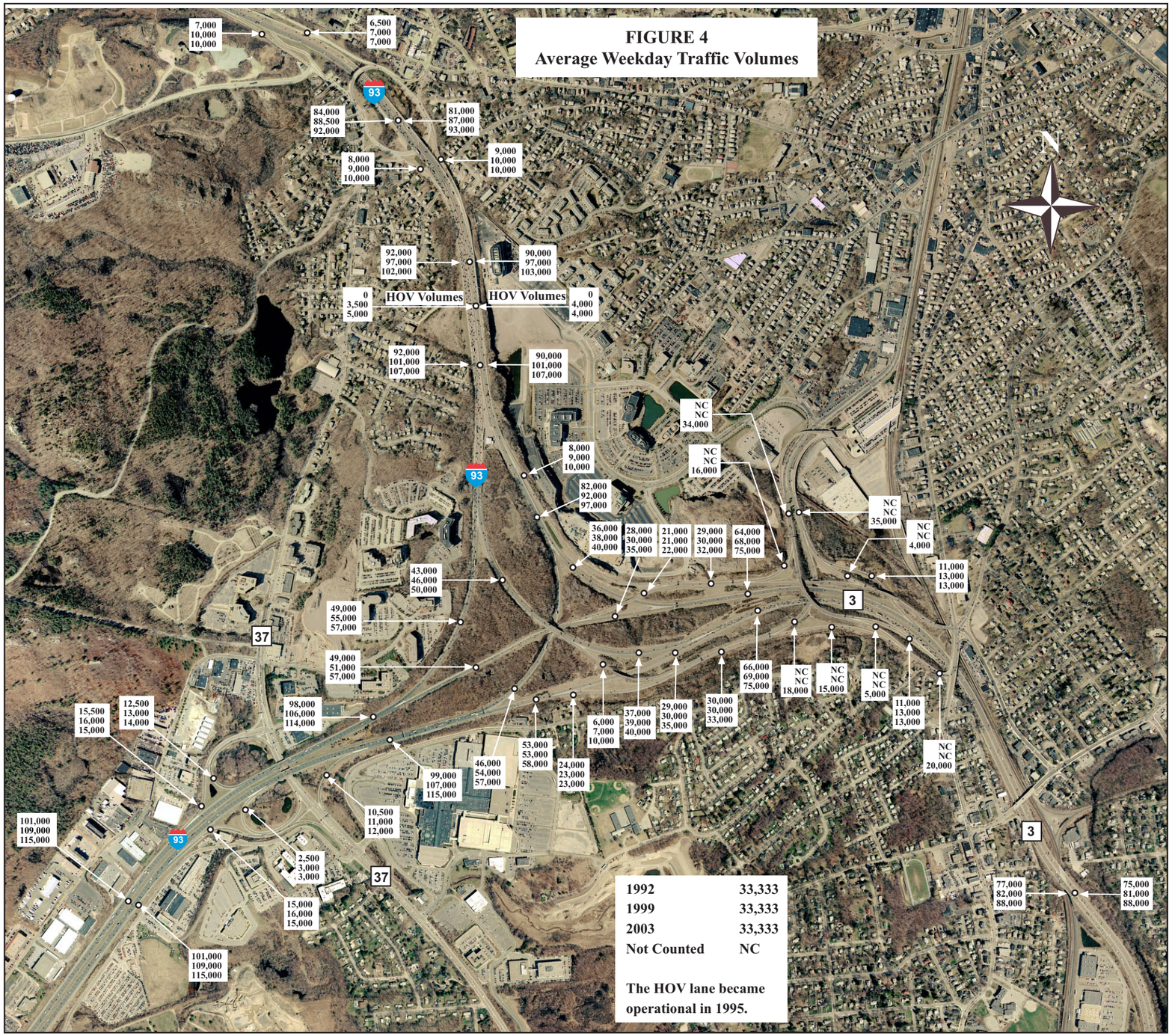
Presently, the Southeast Expressway has four travel lanes in each direction. During the AM peak period (6:00–10:00 AM), the leftmost southbound lane is operated as an HOV lane for traffic moving northbound. The situation is reversed during the PM peak period (3:00–7:00 PM), when the leftmost northbound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

FIGURE 4
Average Weekday Traffic Volumes



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).

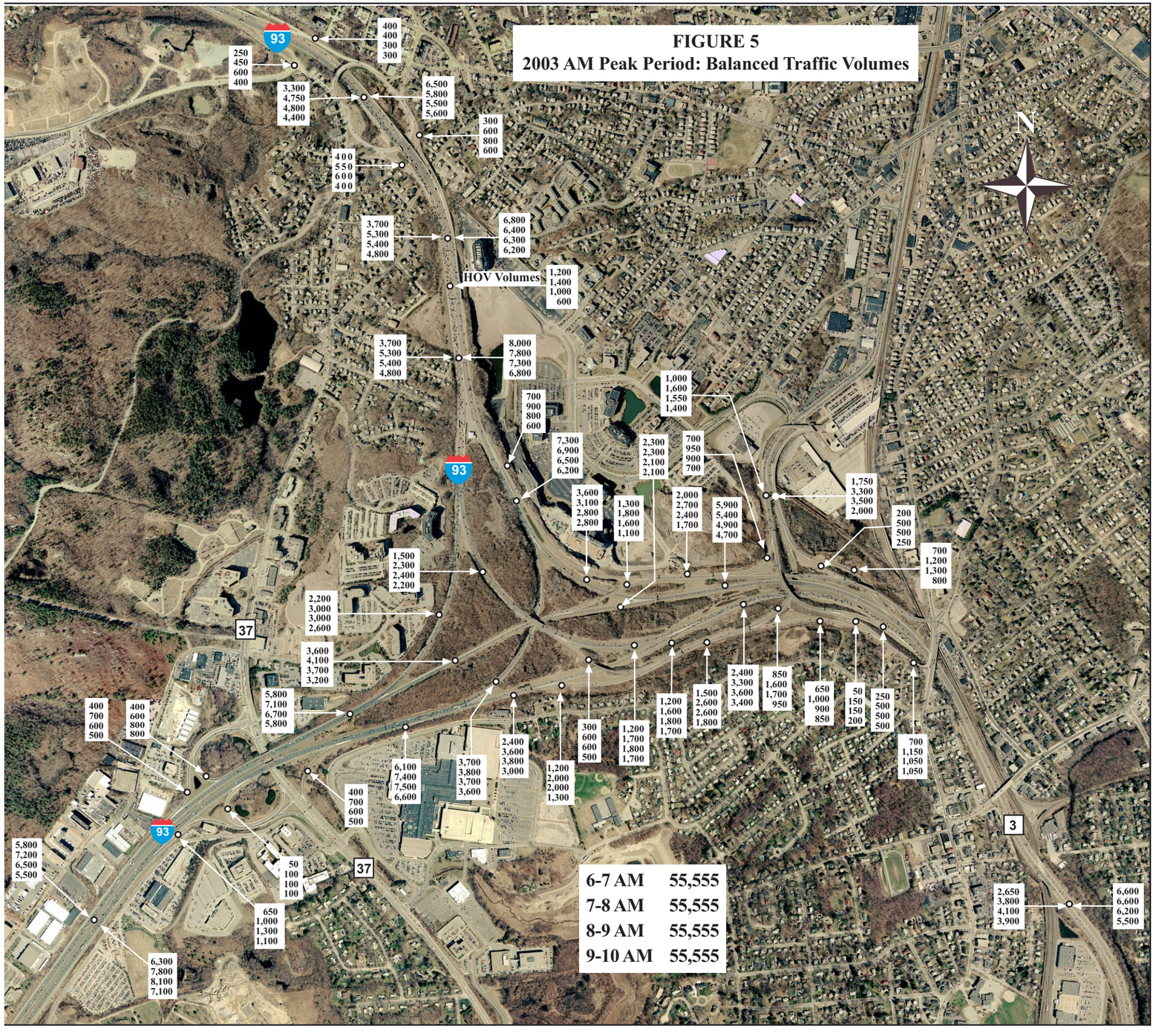
Between 1992 and 2003, average weekday traffic on the I-93 segment between Routes 24 and 37 increased by 14 percent; on Route 3 South by 15 percent; and on the Southeast Expressway by 18 percent. These increases represent a rate of about 1.2 to 1.3 percent per year. The AM and PM peak-period traffic 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.

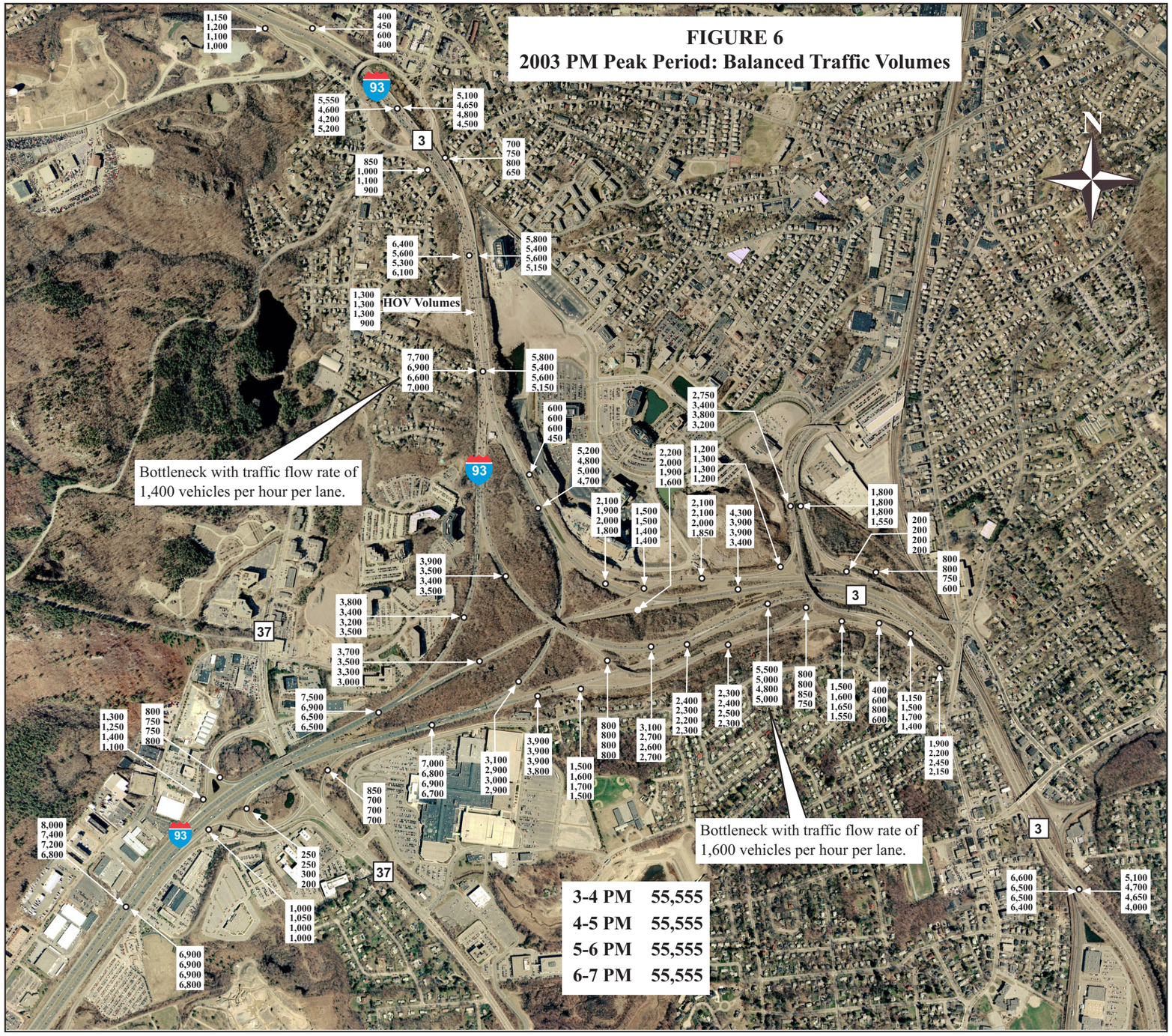
On the Southeast Expressway, the queue extends from interchange 8 (Furnace Brook Parkway) northward to interchange 15 (Columbia Road) in the northbound direction during the AM peak period, and from interchange 11 (Granite Avenue) southward to the Braintree split in the southbound direction during the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



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

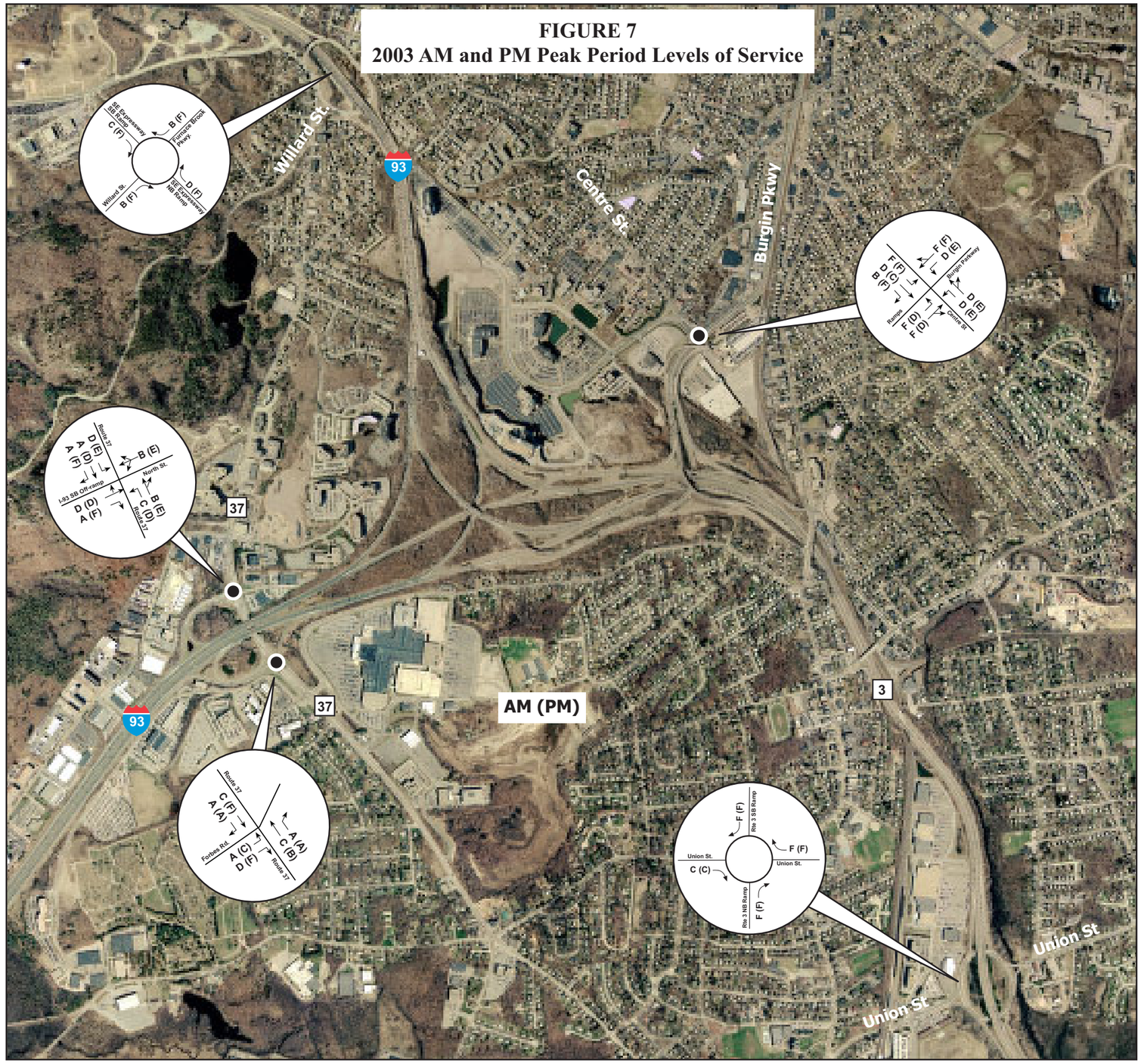
At the I-93/Route 37 interchange, the west side ramp-arterial junction operates at LOS D or better during the AM peak period. During the PM peak period, it operates at LOS E or F, due to the presence of commuter and shopping trips occurring at the same time in the area. Ramp traffic queues are not uncommon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

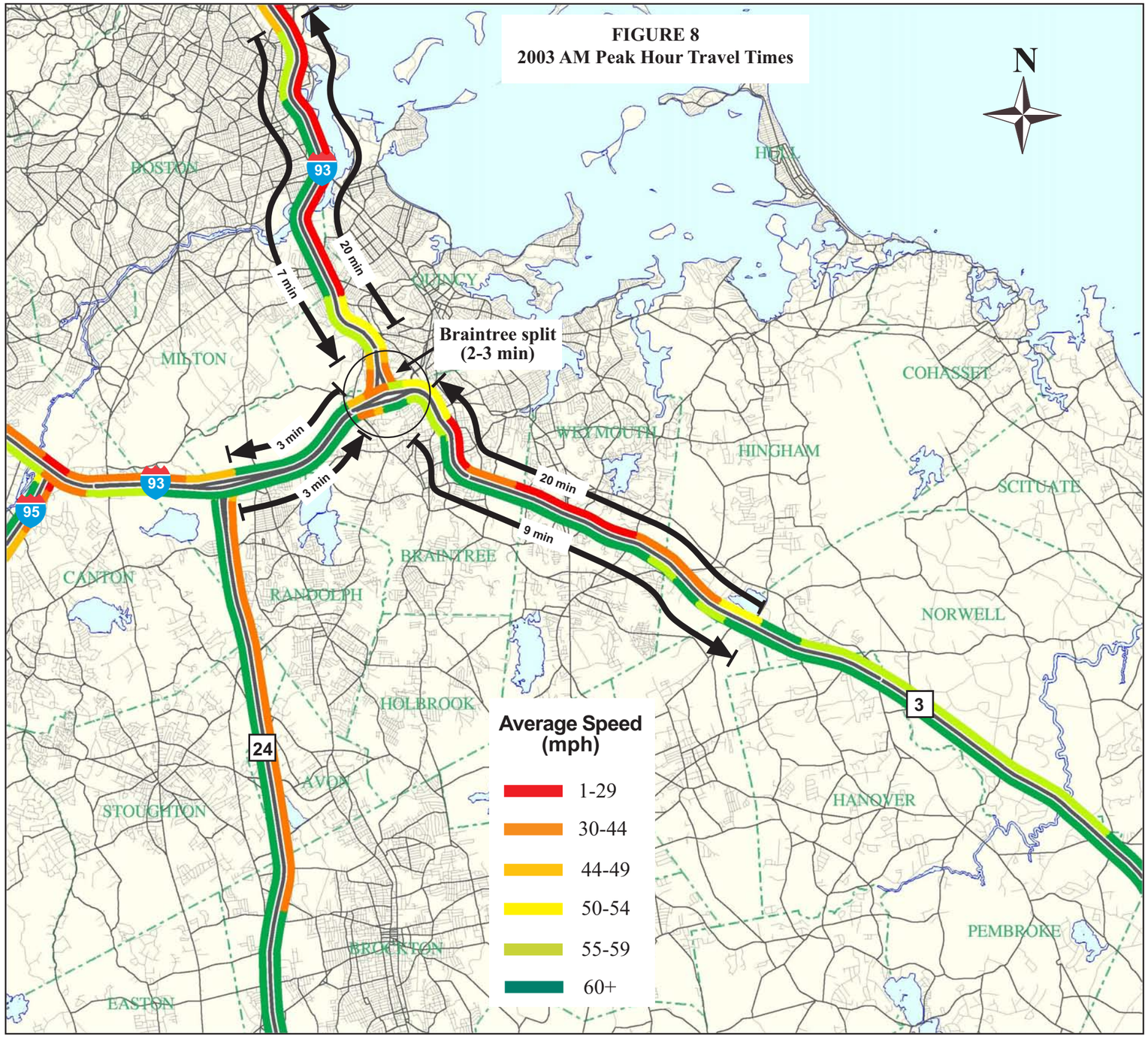
3.1.6 Travel Time

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.



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

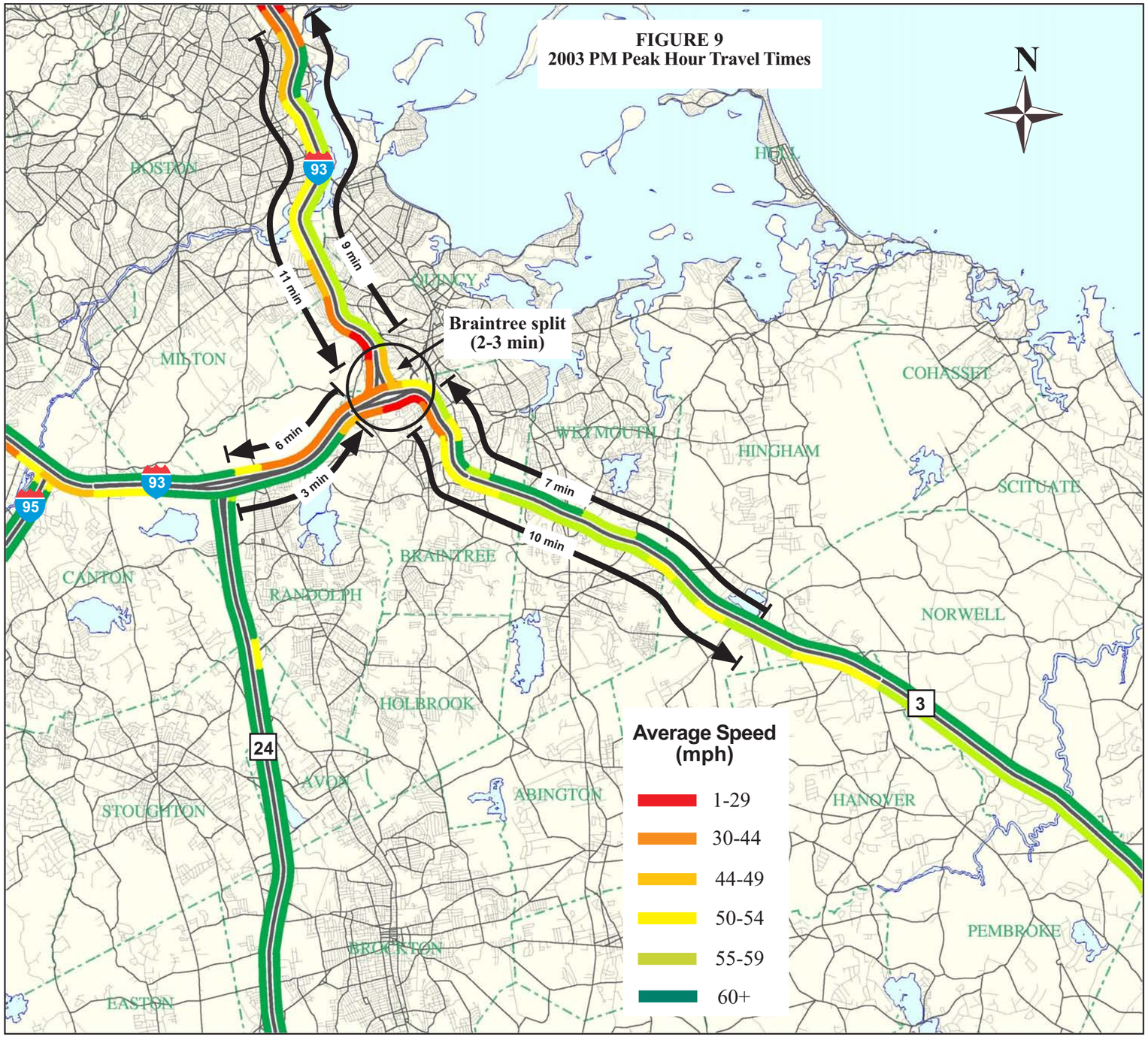
Average travel speeds at the Braintree split itself are mostly between 30 and 44 mph in either direction. It takes about 3 minutes on the average to travel southbound from the end of the HOV lane on the Expressway to either interchange 6 (Route 37) on I-93 or to interchange 19 (MBTA Quincy Adams Station/Burgin 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.

FIGURE 9
2003 PM Peak Hour Travel Times



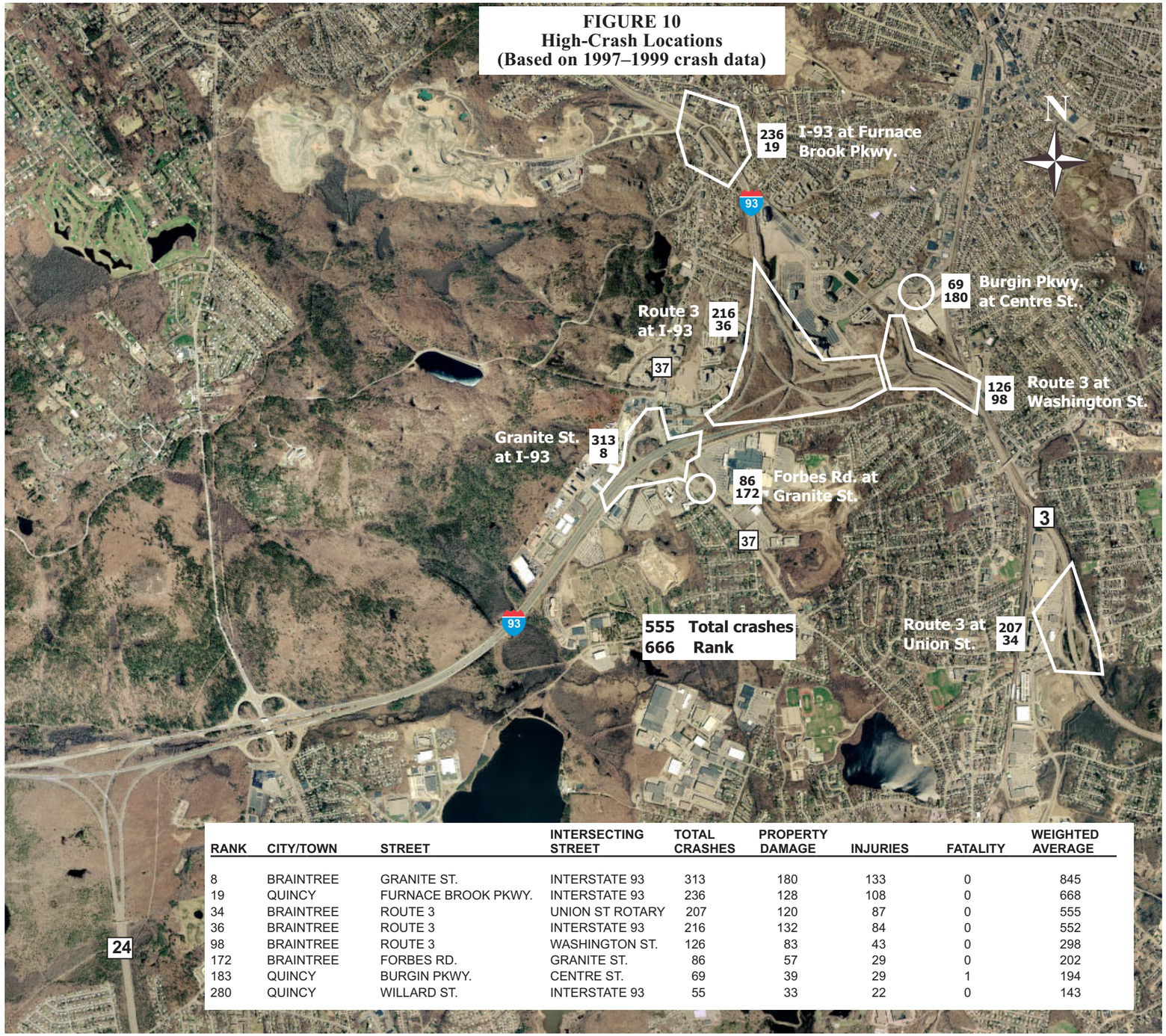
3.1.7 Crashes

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

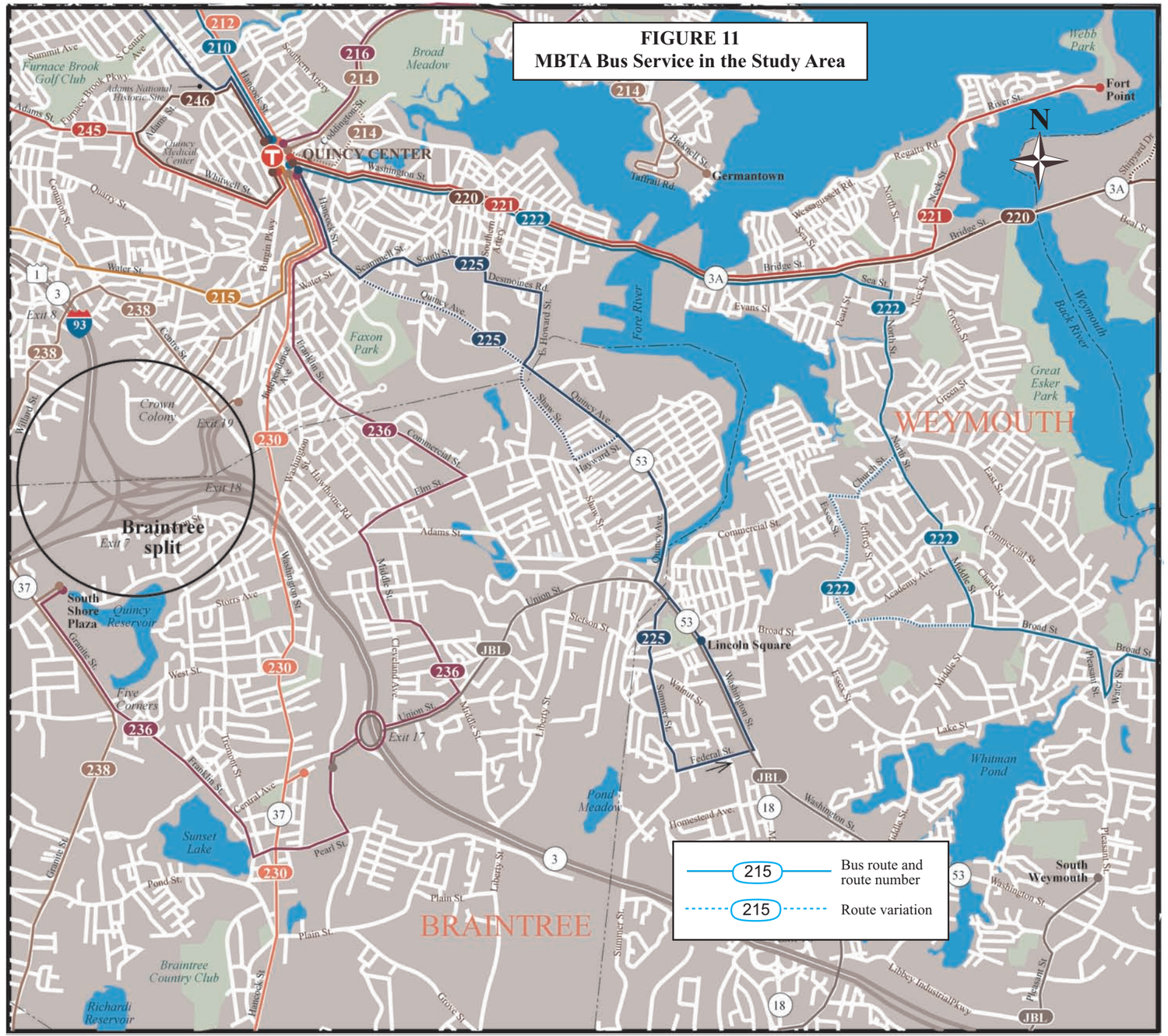
3.2.1 Bus

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)

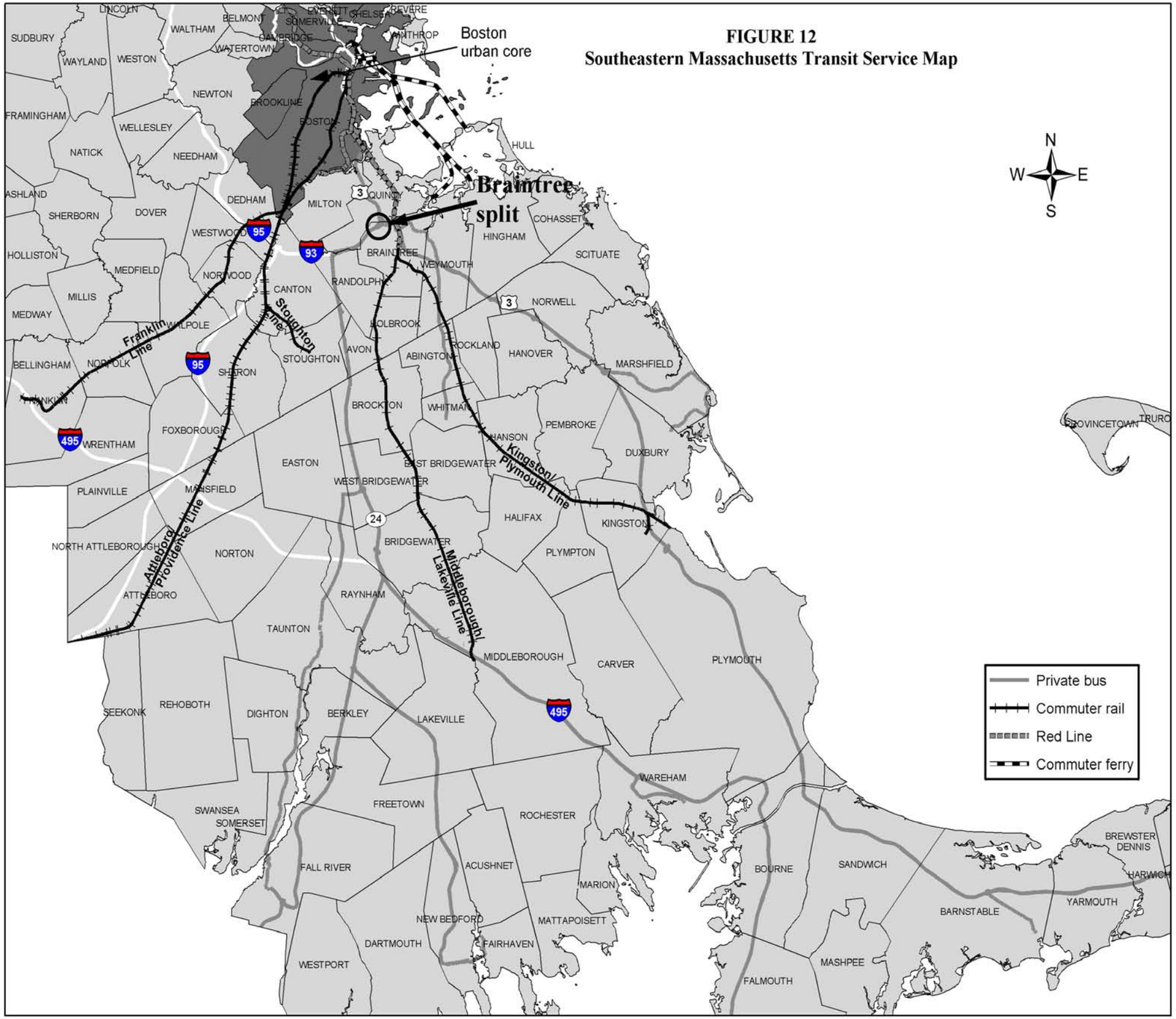
The MBTA's Red line rapid transit, with stations at Braintree, Quincy Adams, Quincy Center, Wollaston, and North Quincy, serves the project area and the surrounding communities and provides transportation to and from Boston. Many of the bus services in the area have stops at rapid transit stations to 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.

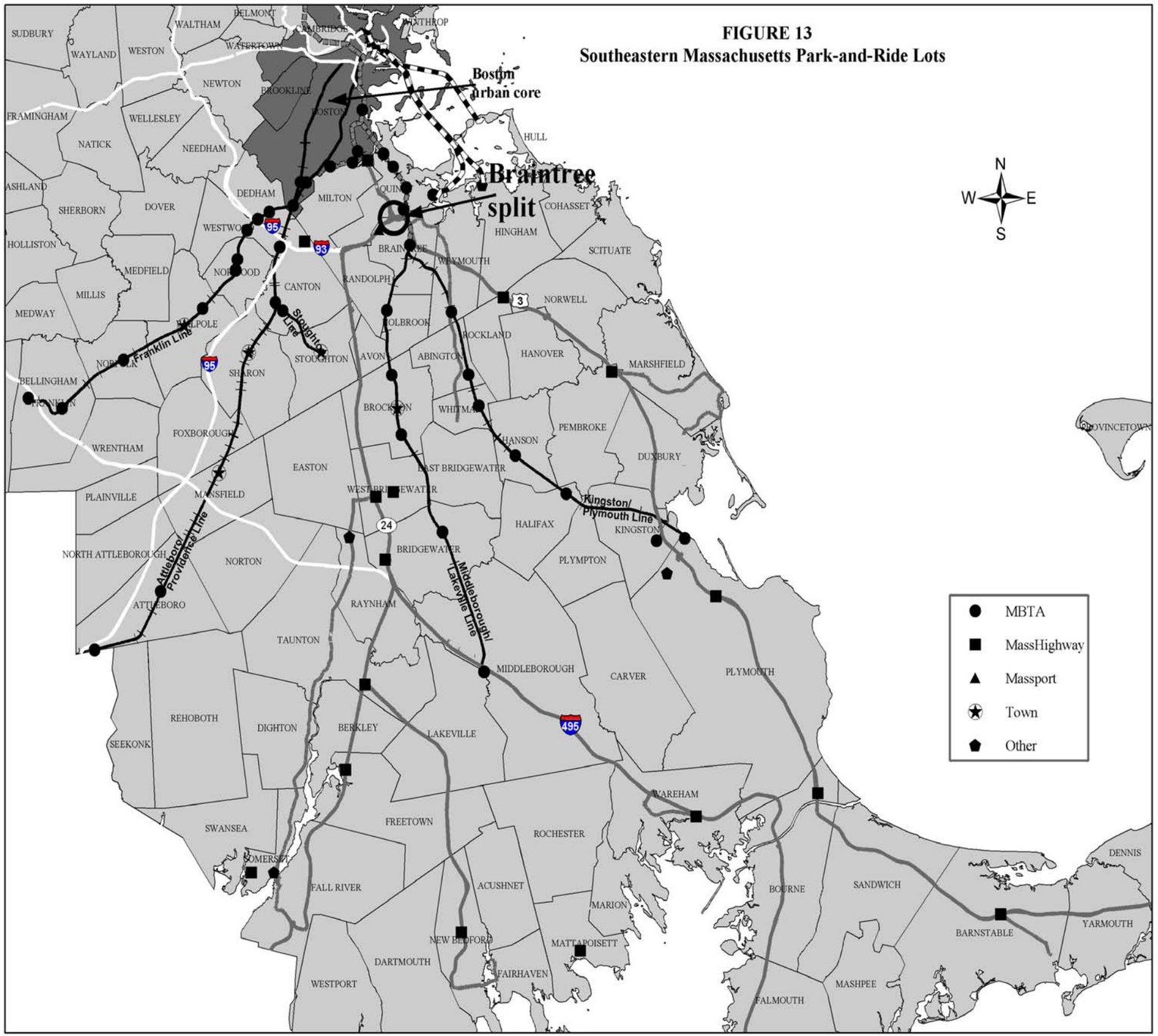
MBTA commuter rail ridership is predicted to increase by 45 percent between now and 2025. This increase, combined with the crowding and terminal capacity problems at South Station, limits the times at which additional trips can be run on existing lines and on new extensions. The planned and proposed 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