



**CORE
CAPACITY
CONSTRAINTS**

APPENDICES



Core Capacity Constraints: Appendices

Accommodating Growth on Greater Boston's Congested Roads and Crowded Transit System

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Appendix A

Land Use and Development

Support data related to demographic and development trends presented in Chapter 2 have been grouped together in Appendix A. These include:

- Municipal and regional land areas used to calculate densities and density trends (Table A-1)
- Locations of the 20 sample TAZs shown graphically (Figure A-1)
- Brief descriptions of the 72 large-impact projects in the 20 sample TAZs (Table A-2). The TAZs are listed in the same order as in Table 5 of the report: from north-most to south-most.
- Brief descriptions of nine projected large developments which are not located in the 20 sample TAZs (Table A-3). The TAZ numbers of these projects are noted and the TAZs are also shown in Figure A-1.

Table A-1
Study Area and Boston MPO Region Land Areas
Square Miles

Boston	48.7
Cambridge	6.5
Somerville	4.1
Brookline	6.8
Medford	8.0
Revere	5.8
Arlington	5.2
Everett	3.4
Chelsea	2.2
Study Area	90.7
Rest of MPO	1,313.7
Entire MPO	1,404.4

Source: Central Transportation Planning Staff

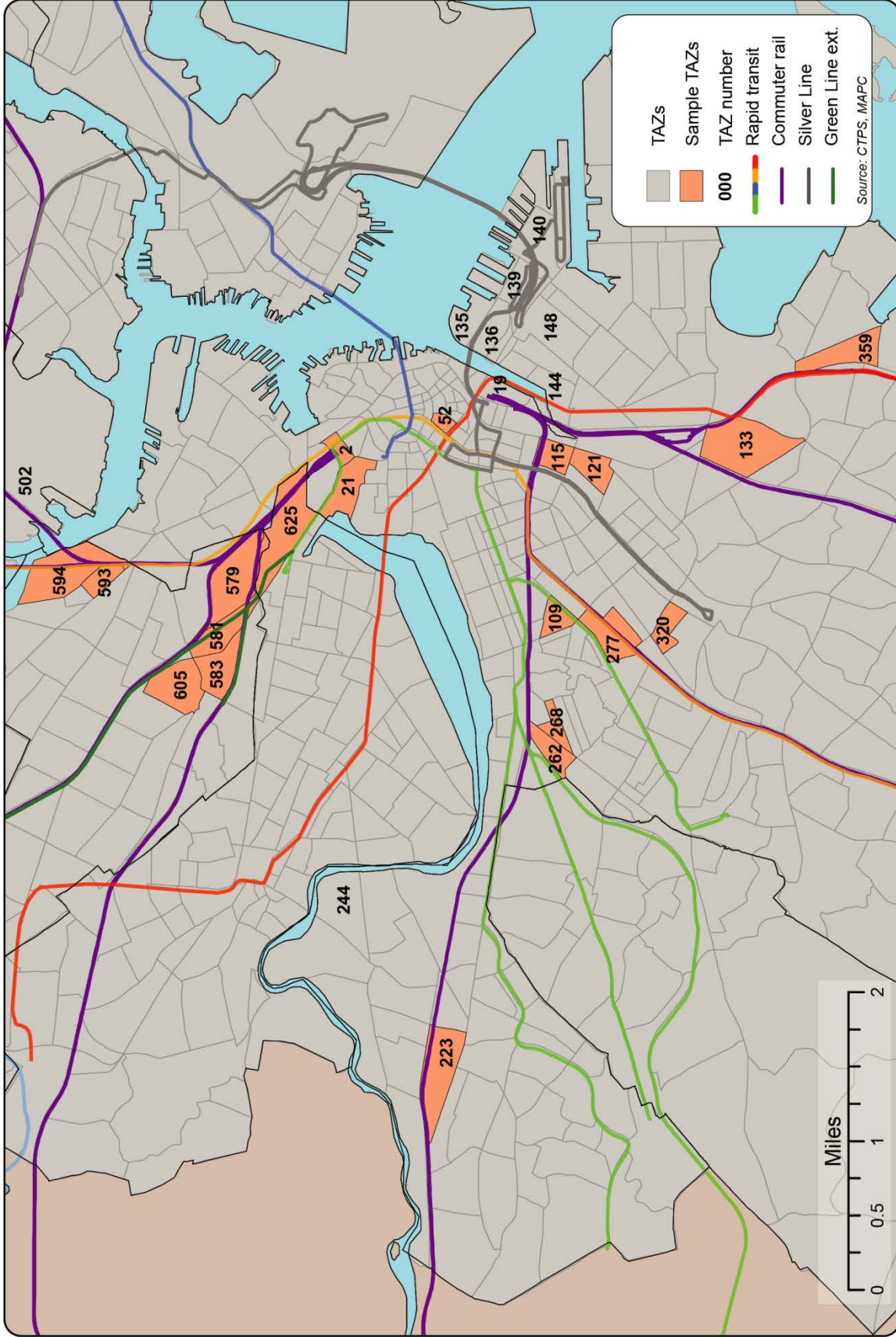


FIGURE A-1
Traffic Analysis Zones (TAZs)
with Large-Impact Developments



Table A-2
Large Impact Projects in the Sample TAZs
Somerville and Cambridge

TAZ	City	Development	Completion Year	Total Housing Units	Expected Residents	Commercial Square Feet	Expected Jobs
594	Somerville	Assembly Row: Block 11 (Phase 2)	2027	0	0	330,000	1,184
	Somerville	Assembly Row: Block 5	2018	285	658	125,560	314
	Somerville	Assembly Row: Block 6	2027	447	1,033	40,000	100
	Somerville	Assembly Row: Block 7	2027	233	538	649,393	2,471
	Somerville	Assembly Row: Block 8	2027	0	0	680,971	2,632
	Somerville	Assembly Row: Block 3 (Future)	2027	547	1,264	11,654	29
	Somerville	Assembly Row: Block 11 (Phase 1)	2015	0	0	874,297	3,340
	Somerville	Assembly Row: Block 9	2027	0	0	490,179	1,961
	Somerville	Assembly Row: Rest of Permitted Development	2027	215	497	389,928	1,413
593	Somerville	Assembly Square - 2nd Urban Renewal District	2037	2,000	4,620	3,000,000	9,636
605	Somerville	25 Hamlet	2015	2	5	0	0
	Somerville	Union Square Revitalization: D-5	2027	208	480	573,581	2,010
	Somerville	Union Square Revitalization: D-7	2027	18	42	49,570	174
583	Somerville	Union Square Revitalization: D-2	2027	176	407	484,460	1,698
	Somerville	Union Square Revitalization: D-1	2027	105	243	290,243	1,017
	Somerville	Union Square Revitalization: Rest of Development*	2027	96	222	2,219,749	7,780
581	Somerville	Brickbottom Redevelopment	2027	750	1,733	1,600,000	4,711
579	Somerville	Inner Belt Redevelopment	2035	1,000	2,310	2,800,000	8,245
625	Cambridge	20 Child St. / North Point Bldg N	2015	341	788	2,400	6
	Cambridge	Water St., #22 (Mac-Grey)	2015	392	906	0	0
	Cambridge	East Street Phase 2, #1-25 (Smith)	2017	341	788	2,400	6
	Cambridge	219 Monsignor O'Brien Highway	2015	0	0	0	107
	Cambridge	EF Proposed Building	2025	0	0	381,000	1,182
	Cambridge	North Point Master Plan - Remainder (Guilford/S&S)	2032	1,796	4,149	1,771,030	6,606

**Table A-2 (cont.)
Large Impact Projects in the Sample TAZs
Boston**

TAZ	City	Development	Completion Year	Total Housing Units	Expected Residents	Commercial Square Feet	Expected Jobs
21	Boston	Garden Garage Site Redevelopment	2015	500	1,155	500,000	1,250
2	Boston	Nashua St Residences at the Fleet Center	2020	503	1,162	0	0
	Boston	The Boston Garden	2018	497	1,148	900,000	3,394
223	Boston	Brighton Landing South Parking project	2027	0	0	0	0
	Boston	Boston Landing	2027	0	0	1,315,000	4,684
	Boston	37 North Beacon Street	2027	180	416	0	0
	Boston	Lowe's Brighton	2025	0	0	146,000	365
	Boston	217 Market Street (Market Street Crossing)	2025	116	268	26,525	66
	Boston	District 9 at 61 North Beacon Street	2020	76	176	0	0
	Boston	New Brighton Landing	2015	0	0	1,210,136	4,811
52	Boston	One Franklin/Filene's Redevelopment	2020	140	323	756,700	2,974
	Boston	Millennium Tower and Burnham Building	2016	0	0	370,000	1,203
262	Boston	Parcel 7 Air Rights	2027	330	762	0	0
	Boston	Landmark Center North Addition	2027	550	1,271	0	0
	Boston	Turnpike Air Rights Parcels 7 & 8	2020	282	651	447,000	1,636
	Boston	121 Brookline Avenue	2020	0	0	117,000	459
	Boston	Landmark Center Redevelopment	2018	550	1,271	200,000	523
268	Boston	1271 Boylston Street	2027	184	425	4,000	184
	Boston	Fenway Point	2027	320	739	0	0
	Boston	1282 Boylston	2015	350	809	10,000	1
	Boston	Fenway Triangle Mixed Use Project	2015	300	693	450,000	1,530
109	Boston	Belvidere Street	2030	80	185	10,000	25
	Boston	Belvidere/Dalton West	2027	225	520	0	0
	Boston	Belvidere-Dalton Project	2027	500	1,155	0	0
	Boston	Christian Science Plaza Revitalization Project	2020	0	0	952,000	2,356

**Table A-2 (cont.)
Large Impact Projects in the Sample TAZs
Boston (cont.)**

TAZ	City	Development	Completion Year	Total Housing Units	Expected Residents	Commercial Square Feet	Expected Jobs
115	Boston	Harrison/Albany Master Plan - NY Streets - East	2035	467	1,079	590,367	2,610
	Boston	Harrison/Albany Master Plan - NY Streets - Central	2035	358	827	420,391	1,588
	Boston	Hamilton Towne Gate	2030	97	224	11,106	28
	Boston	345 Harrison Street	2027	560	1,294	0	0
	Boston	1000 Washington Street	2015	0	0	100,000	400
	Boston	Ink Block- 300 Harrison Avenue	2015	471	1,088	65,000	163
121	Boston	Harrison/Albany Master Plan - Back Streets	2035	0	0	2,427,338	9,709
	Boston	Harrison/Albany Master Plan - SOWA	2035	627	1,448	1,332,911	5,214
	Boston	600 Harrison Avenue	2027	160	370	0	0
277	Boston	316-320 Huntington Avenue	2030	450	1,040	0	0
	Boston	GrandMarc Residence Hall at Northeastern University- 316 Huntington Ave	2027	700	1,617	0	0
	Boston	New England Conservatory Residence Hall- 0 St. Botolph and Gainsborough	2027	252	582	0	0
	Boston	Northeastern University - Interdisciplinary Science & Engineering Ctr	2018	0	0	197,000	276
	Boston	New England Conservatory- 286 Huntington Avenue	2017	0	0	65,000	91
320	Boston	Cescent Parcel Roxbury	2030	0	0	220,000	820
	Boston	Tremont Crossing	2027	300	693	1,000,000	2,700
133	Boston	South Bay Planning Study (MTA Parcels)	2035	1,500	3,465	2,500,000	9,250
	Boston	Target South Bay Expansion	2020	0	0	21,700	54
359	Boston	Columbia Point Master Plan - Synergy Site	2035	500	1,155	438,200	1,621
	Boston	Columbia Point Master Plan - MBTA Site	2035	0	0	257,500	1,019
	Boston	Columbia Point Master Plan - BG Site	2035	430	993	0	0
	Boston	25 Morrissey Boulevard	2027	278	642	0	0
	Boston	Herb Chambers at 75 Morrissey Blvd	2027	0	0	27,706	69

TAZ = transportation analysis zone.

SoWa = South of Washington Street.

Source: MAPC regional development database.

Table A-3
Other Large Projects in the Study Area not Within a Sample TAZ

TAZ	Development	Expected Residents	Commercial Square Feet	Expected Jobs	Current Study
19	South Station	5,590	4,190,000	14,304	South Station Expansion
135	Seaport Square	5,405	2,715,728	11,326	South Boston Waterfront Transportation Plan
136	Seaport Square	6,535	1,901,330	6,071	South Boston Waterfront Transportation Plan
139	Parcel A-2, Summer St., Seaport Square	0	1,325,850	4,535	South Boston Waterfront Transportation Plan
140	Waterfront Development/Parcel K	702	1,749,678	6,558	South Boston Waterfront Transportation Plan
144	HQ hotels and housing	5,022	2,773,340	11,468	South Boston Waterfront Transportation Plan
148	Boston Convention and Exhibition Center	0	3,026,984	8,068	South Boston Waterfront Transportation Plan
244	Harvard/Allston	1,513	3,256,000	5,882	Allston Interchange Traffic Study
502	Wynn Casino	492	2,901,673	7,012	Everett Transit Needs

TAZ = transportation analysis zone

Source: MAPC regional development database.

Appendix B

Travel Demand Forecasting

A goal of this study is to identify the transportation impacts of a defined set of development projects and business expansions and relate these impacts to specific parts of the transportation system. This requires developing detailed base-year travel data and projecting these data to year 2040 with sufficient detail that the impacts of individual projects can be identified.

To develop base-year and projected travel data at the required level of detail, staff has utilized a variety of data sources to build base-year data, and a combination of model and off-model techniques to make projections to 2040. The availability of useful base-year data and forecasting techniques vary by mode, submode, or type of projection. Some of the simpler data development and forecasting procedures are described in the main text. This appendix discusses some of the data development and projection approaches that were not described in the report.

Transit Forecasting

Detailed operational data of the four rapid transit lines were collected by the MBTA in 2012. Passenger entrances through turnstiles at rapid transit stations were obtained for the same period as the operational data. Using these two data sources it was possible to calculate the passenger loads and crowding levels between adjacent pairs of rapid transit stations by direction for each 15-minute interval during the AM and PM peak periods. These were the most detailed data developed for this study and became the basis of the rapid transit crowding analyses. Green Line and Mattapan Line stations not accessed through turnstiles could not be analyzed in this manner, and the Silver Line services were analyzed using calculations specifically developed for bus-vehicle services.

The No-Build Scenario assumed significant broad-based growth in regional travel demand. For the rapid transit system, it was assumed that the ridership growth that had been observed at individual rapid stations between 1997 and 2013 would continue at the same rate through year 2040. Projected increases varied between stations, and ridership increases between adjacent stations were estimated by averaging the growth in boardings at the two individual stations. The projected added ridership was allocated to directions, peak periods, and 15-minute intervals based on travel patterns observed in the 2012 Base Year.

Growth in the Build Scenario was based on detailed analyses of new trips that the 72 selected large-impact projects would be expected to generate. New trips were estimated for each project individually based on the population and types of jobs that are expected to be added at each location. The increased trips from the 72 projects were then grouped into the 20 sample TAZs.

The shares of new Build-Scenario trips in the 20 Sample TAZs that would use transit were assumed to be the same mode shares as in the Base Year. Estimates of transit mode shares by trip type and TAZ were derived from the Boston MPO regional travel demand model. The projected new transit riders were then added to the No-Build Scenario ridership, and peak-period boardings were increased accordingly at the rapid transit stations that would best serve the Build Scenario developments. Use of the rapid transit system by the new riders was assumed to reflect Base Year travel patterns.

Highway Modeling

Unlike the transit forecasts, which could assume an increase in boardings at specific stations on a well-defined system, traffic forecasts rely on the regional travel demand model to allocate new traffic to the myriad of paths available to motorists going to or leaving a new development. The network of major highways and arterial roads used in the model is extensive, including roads stretching from New Hampshire to Rhode Island and Cape Cod. As a general rule, extensive traffic models used to study a smaller area undergo a process known as calibration, in which trips generated by certain TAZs are adjusted so that traffic volumes estimated in the traffic assignment model step reasonably match traffic counts on study area roadways. This study was able to utilize a version of the regional model which had undergone extensive calibration as part of Allston I-90 Interchange Study.

The calibrated Base Year trips were increased by a set of factors by vehicle type to provide an estimate of 2040 traffic. These factors were calculated from another region-wide modeling effort, the Route 3 South Project Mobility Study. The factors derived from this study were:

12.5 percent	Single-occupancy vehicles (SOVs)
11.5 percent	High-occupancy vehicles (HOVs)
11.8 percent	Large trucks (6+ wheels)
9.0 percent	Commercial vans and pickup trucks
19.1 percent	Hazardous cargoes

The trips by vehicle type obtained after multiplying by these factors were used to estimate the Build Scenario traffic volumes. This is because substantially all the projects envisioned for 2040 in the 20 sample TAZs were assumed in Year 2040 for the Route 3 study.

Vehicle trips in the 2040 No-Build Scenario were developed by subtracting the auto trips from the SOV and HOV trip tables that were estimated in the mode share calculations for the 72 large-impact projects described above in the Transit Forecasting section. For both the No-Build and Build scenarios, the geographic distribution of trip trips between home, work, and other destinations reflected the trip distribution patterns assumed for the Boston Region MPO's Long Range Transportation Plan (LRTP).

Appendix C

Roadway Congestion

This appendix summarizes traffic assignment results with tables and graphics for the Base Year, No-Build, and Build scenarios. The assignment step of the regional travel demand model allocates vehicle traffic to the roads included in the regional model network. The assigned volumes are compared with estimates of the capacities of network roadways, which indicate the presence and severity of roadway congestion.

The accompanying six figures show parts of the modeled roadway network where traffic volumes are estimated or predicted to exceed 85 percent of the roadway's capacity. Figures C-1, C-2, and C-3 show congested roadways during the AM peak period for the three modeled scenarios, and Figures C-4, C-5, and C-6 illustrate PM peak period congestion.

Each graphic is accompanied by a table listing the names of roadways that have congested sections in the Base Year, or gain additional congested sections in the future scenarios. The graphics have been prepared for readability and do not show all modeled roadways. The lists include all roads having or gaining congested sections, even if these congested roadway links are very short, or in some cases, not shown in the graphic.

Base-Year Congested Links: AM Peak Period

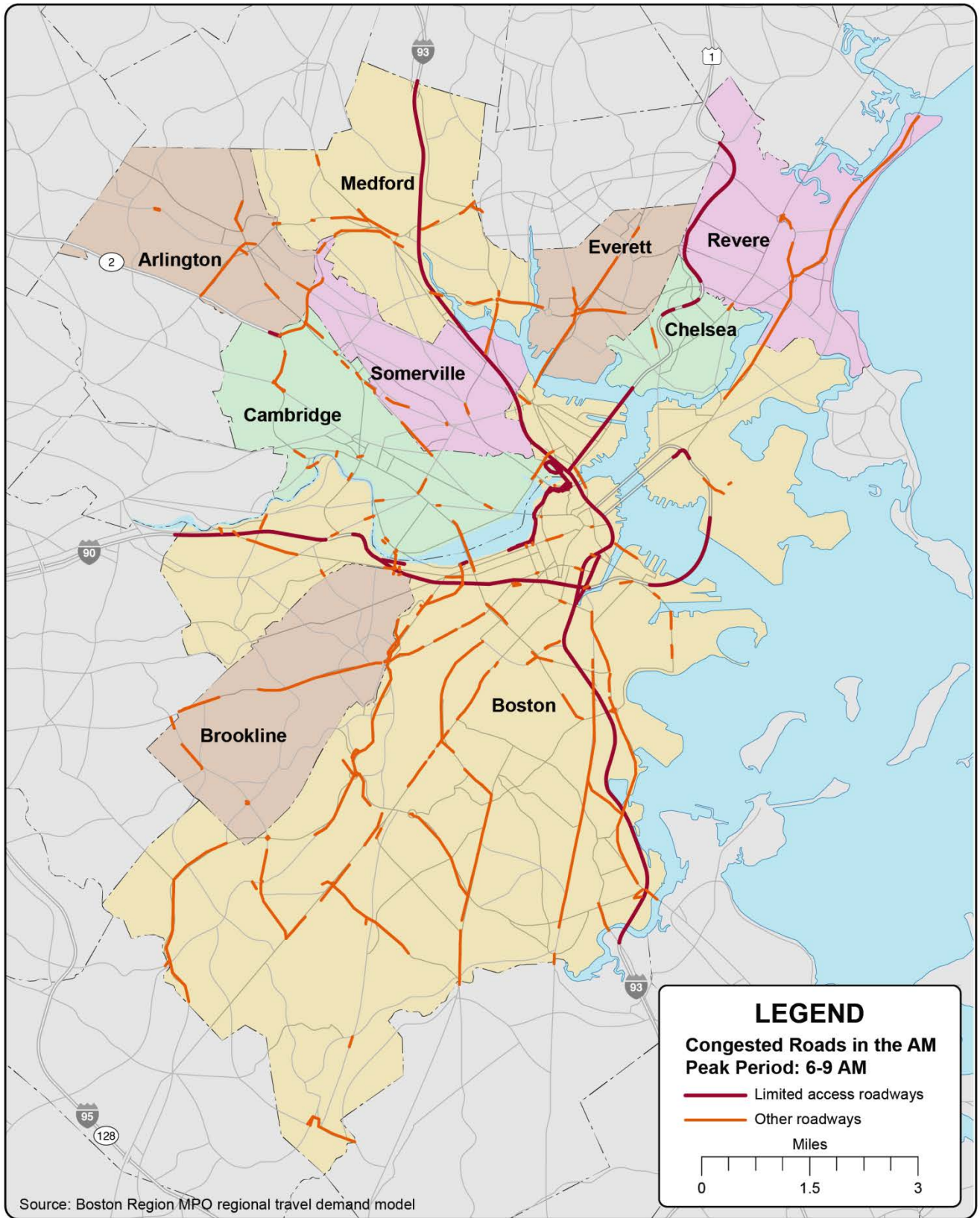
Limited-Access Roadways

Interstate 90	<i>Boston (cont.)</i>	<i>Arlington</i>	<i>Chelsea</i>
Interstate 93	Massachusetts Ave	Broadway	Broadway
US Route 1	May St	Chestnut St	Everett Ave
Tobin Bridge	Melnea Cass Blvd	Massachusetts Ave	
Ted Williams Tunnel	Milton St	Medford St	<i>Everett</i>
Storrow Drive	Morrissey Blvd	Mystic St	Broadway
Soldiers Field Road	Morton St	Mystic Valley Pkwy	Main St
Route 2	N Beacon St	Pleasant St	Revere Beach Pkwy

Other Roadways

Boston

Arborway	Neponset Ave	<i>Brookline</i>	<i>Medford</i>
Austin St	Neponset Valley Pkwy	Essex St	Fellsway
Beacon St	Old Colony Ave	Hammond Pond Pkwy	Fellsway West
Beacon St	Parsons St	Route 9	High St
Belgrade Ave	Purchase St	W Roxbury Pkwy	Mystic Valley Pkwy
Birmingham Pkwy	Riverway		Revere Beach Pkwy
Blue Hill Ave	Route 1A	<i>Cambridge</i>	Roosevelt Circle
Boylston St	Seaport Blvd	Alewife Brook Pkwy	Salem St
Brookline Ave	South St	Brattle St	Winthrop St
BU Bridge	Southampton St	Broadway	
Cambridge St	Spring St	Eliot Bridge	<i>Revere</i>
Centre St	State St	Fresh Pond Pkwy	American Legion Hwy
Charlesgate Overpass	Summer St	Gerry's Landing Rd	Broadway
Columbia Rd	Tremont St	JFK St	Lee Burbank Hwy
Columbus Ave	University Rd	Land Blvd	North Shore Rd
Commonwealth Ave	VFW Pkwy	Main St	
Cummins Hwy	W Roxbury Pkwy	Massachusetts Ave	<i>Somerville</i>
Dorchester Ave	Washington St	Memorial Dr	Alewife Brook Pkwy
Eliot Bridge		Prospect St	Beacon St
Embankment Rd		Reid Rotary	Fellsway
Freeport St		Western Ave	McGrath Hwy
Frontage Rd (I-93)			Mystic Valley Pkwy
Gallivan Blvd			Somerville Ave
Granite Ave			
Harvard Ave			
Huntington Ave			
Hyde Park Ave			
Jamaica Way			
L Street			
Logan Airport Rd			
Maffa Way			
Mass Ave Connector			



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FIGURE C-1
Location of Base-Year Scenario
AM Congested Roadway Links

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Year 2040 No-Build Scenario Congested Links: AM Peak Period

Limited-access roadways adding congested links

Interstate 90
Interstate 93
US Route 1
Tobin Bridge
Ted Williams Tunnel
Storrow Drive
Soldiers Field Road
Route 2

Limited-access roadways first showing congestion in this scenario

Leverett Connector
Sumner Tunnel
Callahan Tunnel

Other roadways already with congested sections adding congested links

Boston
Austin St
Beacon St
Boylston St
Brookline Ave
BU Bridge
Cambridge St
Charlesgate Overpass
Commonwealth Ave
Embankment Rd
Frontage Road (I-93)
Harvard Ave
Huntington Ave
Logan Airport Rd
Massachusetts Ave
N Beacon St
Stuart St
University Rd

Arlington
Massachusetts Ave
Mystic St
Pleasant St

Brookline
Route 9
West Roxbury Pkwy

Cambridge
Alewife Brook Pkwy
Fresh Pond Pkwy
Gerry's Landing Rd
Massachusetts Ave
Prospect St
Reid Rotary

Medford
Fellsway
High St
Revere Beach Pkwy
Salem St
Winthrop St

Revere
Broadway

Somerville
McGrath Hwy
Somerville Ave

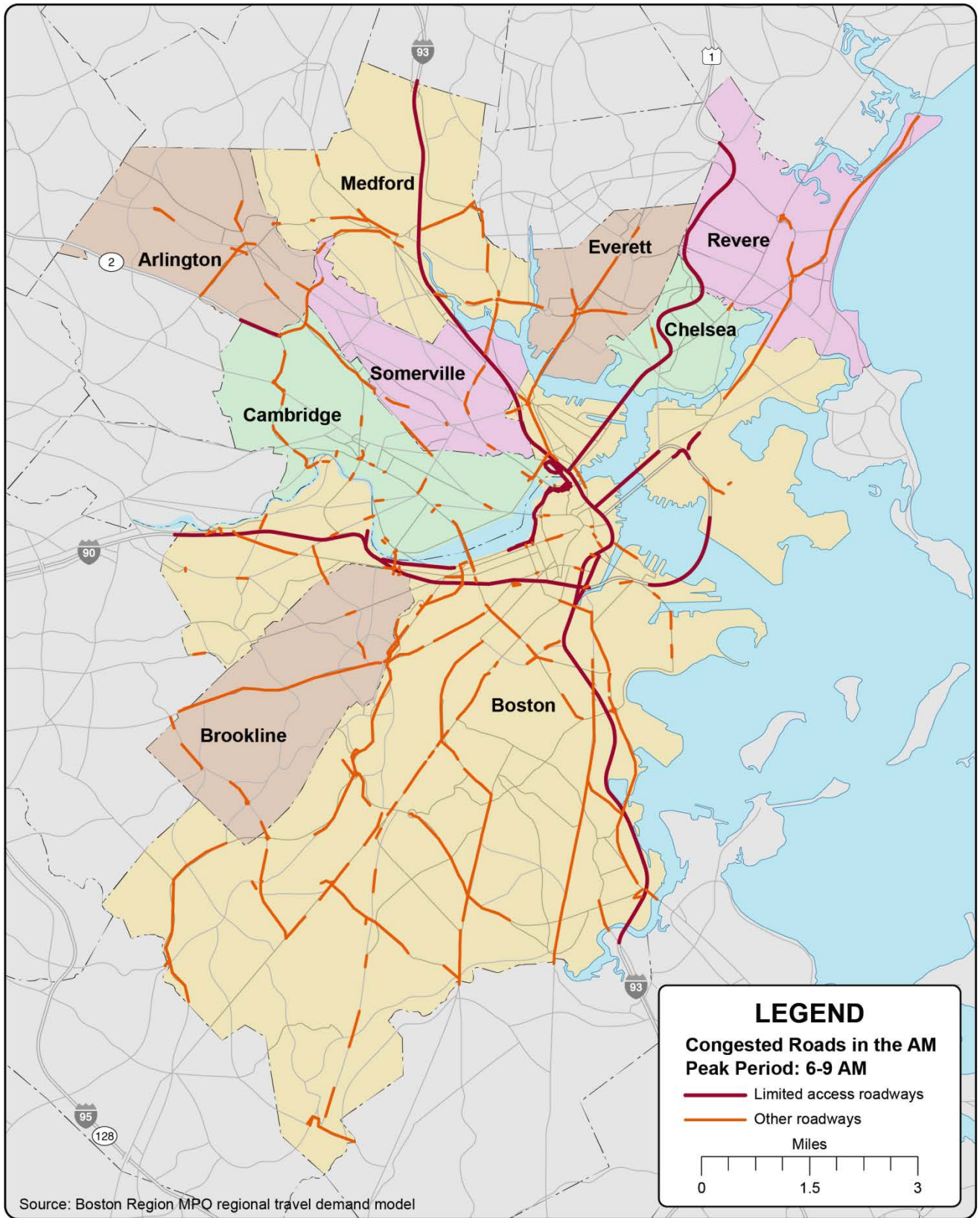
Other roadways first showing congestion in this scenario

Boston
Atlantic Ave
Bedford St
Bigelow St
Broadway
Herald St
New Chardon St
Nonantum Rd
Pearl St
Rutherford Ave

Brookline
Beacon St
Harvard St
South St

Cambridge
Mount Auburn St
Msgr O'Brien Hwy
Sidney St

Revere
Copeland Circle



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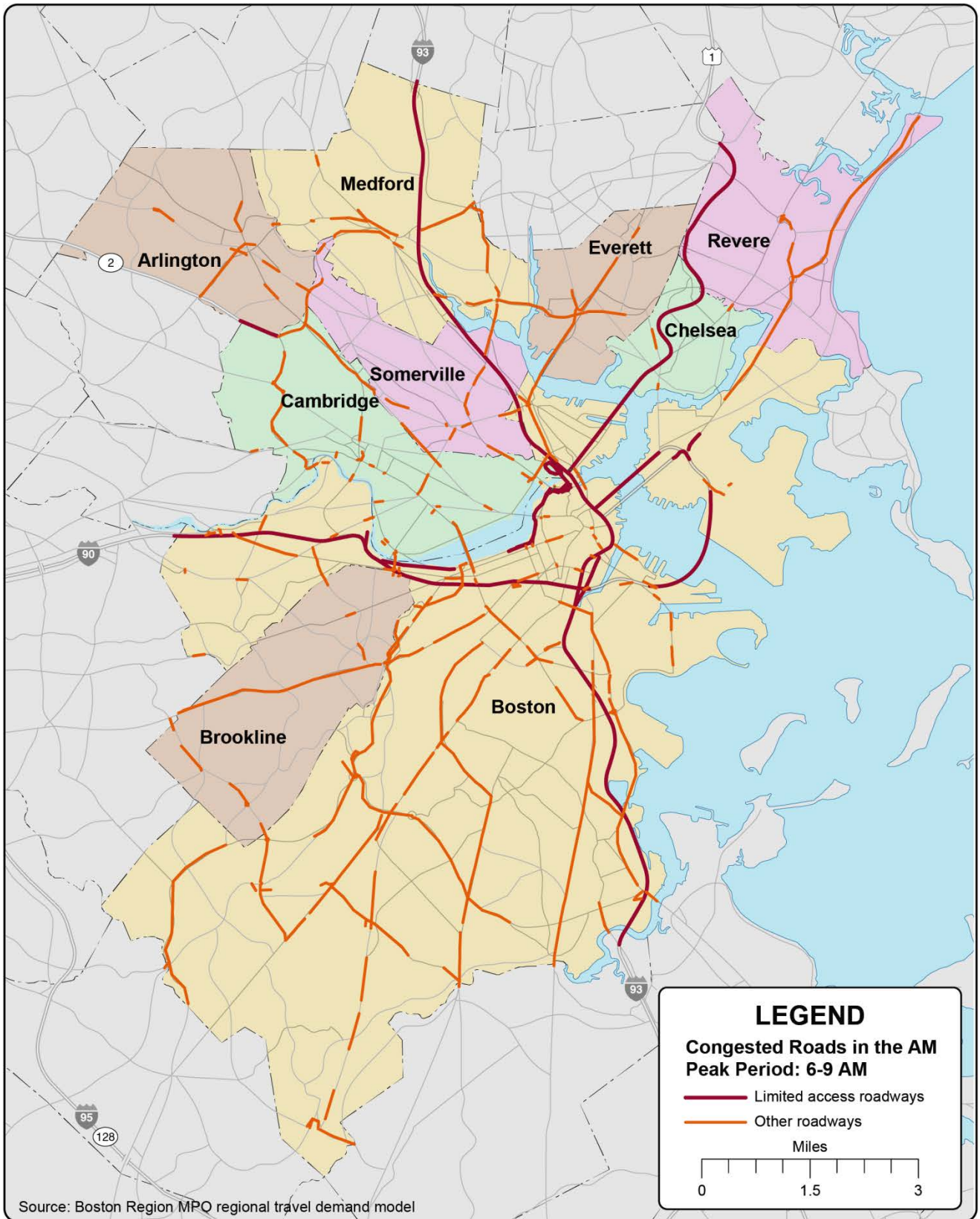


FIGURE C-2
Location of Future Year No-Build Scenario
AM Congested Roadway Links

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Year 2040 Build Scenario Congested Links: AM Peak Period

<u>Limited-access roadways adding congested links</u>	<u>Other roadways already with congested sections adding congested links</u>	<u>Other roadways first showing congestion in this scenario</u>
Interstate 90	<i>Boston</i>	<i>Boston</i>
Interstate 93	Arborway	Charles River Dam
Tobin Bridge	Beacon St	Charles Street South
	Boylston St	Day Blvd
	Cambridge St	Harborside Drive
	Columbus Ave	Preble St
	Dorchester Ave	West Fourth Street
	Embankment Road	West Roxbury Pkwy
	Freeport St	
	Frontage Road (I-93)	<i>Cambridge</i>
	Hyde Park Ave	Hampshire St
	Mass Ave Connector	
	Massachusetts Ave	<i>Chelsea</i>
	N Beacon St	Pearl St
	Riverway	
	Stuart St	<i>Somerville</i>
	Tremont St	Prospect St
	VFW Pkwy	Washington St
	Washington St	
	<i>Arlington</i>	
	Broadway	
	Medford St	
	Mystic Valley Pkwy	
	<i>Brookline</i>	
	Route 9	
	<i>Cambridge</i>	
	Fresh Pond Pkwy	
	Gerry's Landing Rd	
	Massachusetts Ave	
	Mount Auburn St	
	Msgr O'Brien Hwy	
	<i>Everett</i>	
	Broadway	
	Revere Beach Pkwy	
	<i>Medford</i>	
	Fellsway	
	Revere Beach Pkwy	
	<i>Somerville</i>	
	Beacon St	
	McGrath Hwy	



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FIGURE C-3
Location of Future Year Build Scenario
AM Congested Roadway Links

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Base-Year Congested Links: PM Peak Period

Limited-Access Roadways

Interstate 90
Interstate 93
US Route 1
Tobin Bridge
Leverett Connector
Sumner Tunnel
Callahan Tunnel
Ted Williams Tunnel
Storrow Drive
Soldiers Field Road
Route 2

Other Roadways

Boston

Adams St
Alford St
Arborway
Austin St
Beacon St
Belgrade Ave
Berkeley St
Blue Hill Ave
Boylston St
Brookline Ave
BU Bridge
Cambridge St
Casey Hwy
Centre St
Charles River Dam
Charles St South
Charlesgate Overpass
Columbia Rd
Commonwealth Ave
Congress St
Court St
Cross St
Cummins Hwy
D St
Dorchester Ave
E Berkeley St
Eliot Bridge
Embankment Rd
Endicott St
Essex St
Faneuil St

Boston (cont.)

Freeport St
Gallivan Blvd
Granite Ave
Haul Rd
Herald St
Huntington Ave
Hyde Park Ave
Jamaicaway
Kneeland St
L St
Logan Airport Rd
Main St
Market St
Mass Ave Connector
Massachusetts Ave
Melnea Cass Blvd
Meridian St
Milton St
Morrissey Blvd
Morton St
Mystic Ave
N Beacon St
N Harvard St
N Washington St
Neponset Ave
Neponset Valley Pkwy
New Chardon St
Nonantum Rd
Old Colony Ave
Porter St
Purchase St
Riverway
Rte 1A
Rutherford Ave
Seaport Blvd
Spring St
St. James Ave
State St
Stuart St
Sudbury St
Sullivan Sq
Summer St
Tremont St
VFW Pkwy
W Roxbury Pkwy
Washington St

Arlington

Broadway
Massachusetts Ave
Medford St
Mystic St
Pleasant St

Brookline

Beacon St
Brookline Ave
Grove St
Hammond Pond Pkwy
Harvard St
Route 9
W Roxbury Pkwy

Cambridge

Alewife Brook Pkwy
Brattle St
Broadway
Cambridge St
Charlestown Ave
Concord Ave
Fresh Pond Pkwy
Gerry's Landing Rd
Hampshire St
Land Blvd
Main St
Massachusetts Ave
Memorial Dr
Mount Auburn St
Msgr O'Brien Hwy
Peabody St
Prospect St
Sidney St
Somerville Ave
Waterhouse St
Western Ave

Chelsea

Broadway
Everett Ave
Pearl St
Revere Beach Pkwy

Everett

Alford St
Broadway
Main St
Revere Beach Pkwy

Medford

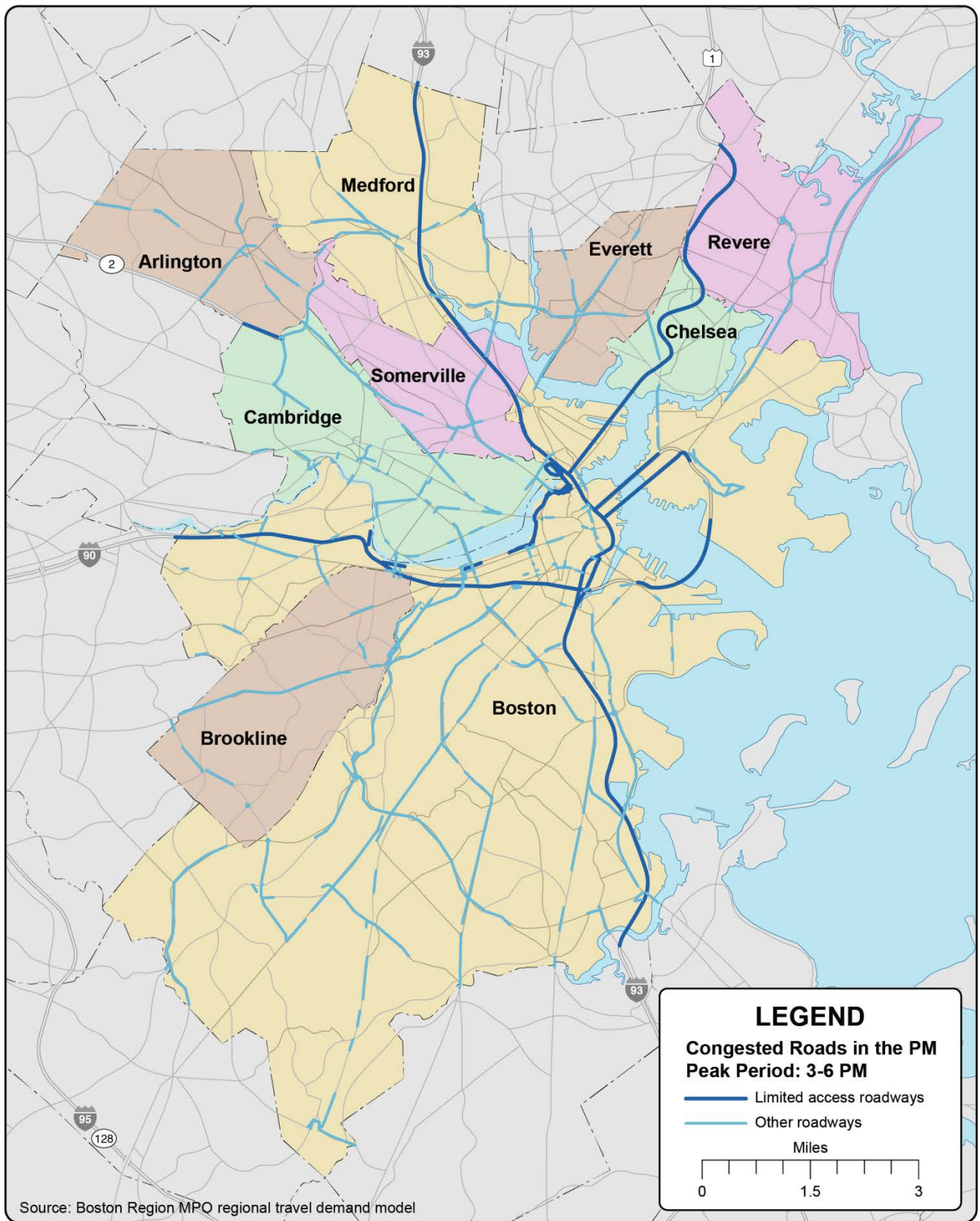
Fellsway
Fellsway West
High St
Mystic Valley Pkwy
Salem St
Winthrop St

Revere

American Legion Hwy
Cutler Hwy
Lee Burbank Hwy
North Shore Rd
VFW Pkwy

Somerville

Alewife Brook Pkwy
Beacon St
Fellsway
McGrath Hwy
Mystic Ave
Mystic Valley Pkwy
Prospect St
Somerville Ave
Washington St



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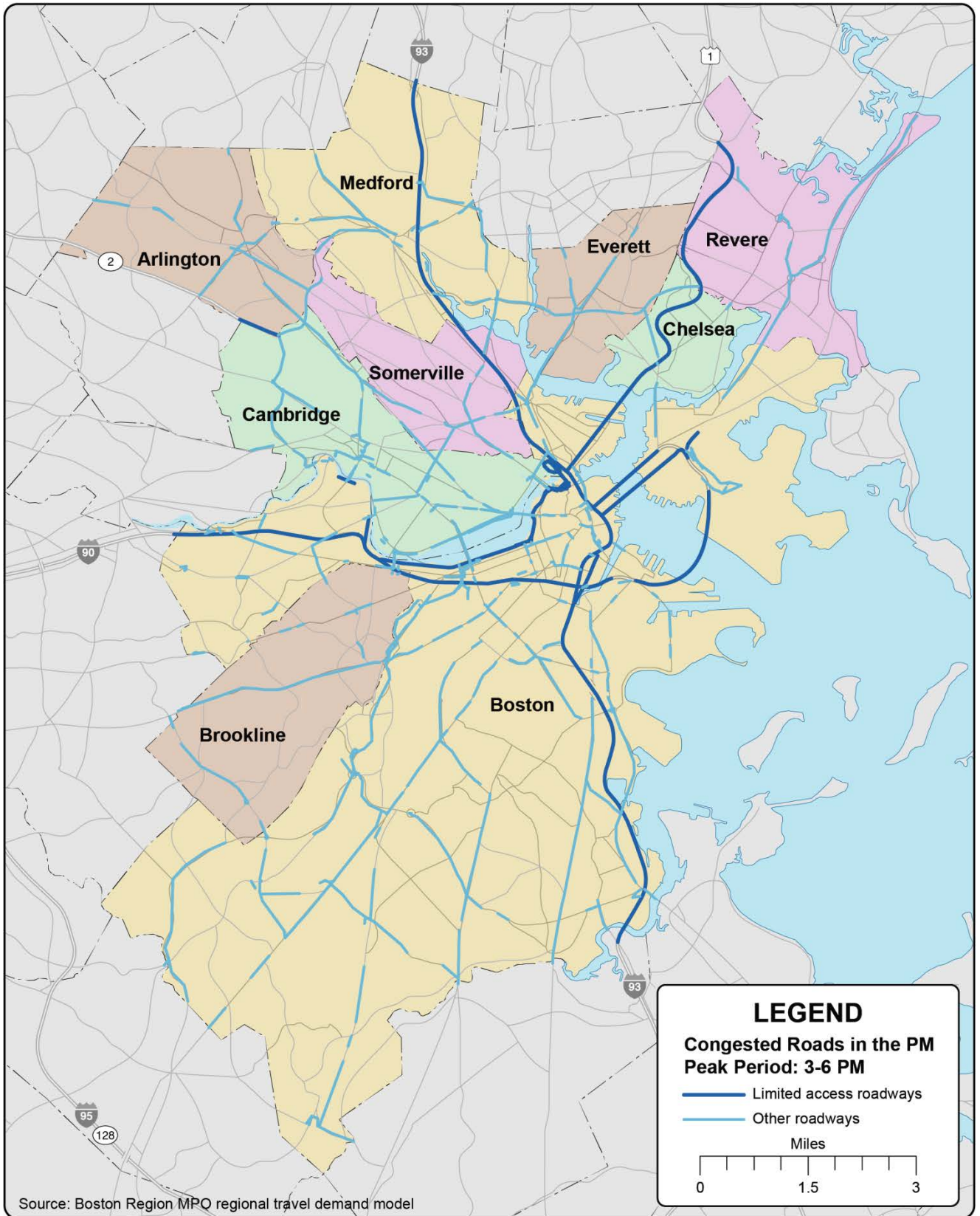


FIGURE C-4
**Location of Base-Year Scenario
 PM Congested Roadway Links**

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Year 2040 No-Build Scenario Congested Links: PM Peak Period

Limited-access roadways adding congested links	Other roadways already with congested sections adding congested links (cont.)	Other roadways first showing congestion in this scenario
Interstate 90	<i>Arlington</i>	<i>Boston</i>
Interstate 93	Broadway	Atlantic Ave
US Route 1	Massachusetts Ave	Broadway
Storrow Drive	Medford St	Columbus Ave
Other roadways already with congested sections adding congested links	Mystic St	Frontage Rd
<i>Boston</i>	<i>Brookline</i>	Harvard Ave
Alford St	Beacon St	High St
Beacon St	Harvard St	Park Dr
Belgrade Ave	Route 9	Park St
Blue Hill Ave	<i>Cambridge</i>	Pearl St
BU Bridge	Concord Ave	Preble St
Cambridge St	Fresh Pond Pkwy	Seaver St
Centre St	Main St	University Rd
Charles St South	Massachusetts Ave	<i>Arlington</i>
Commonwealth Ave	Memorial Dr	Mystic Valley Pkwy
Congress St	Mount Auburn St	<i>Brookline</i>
Cross St	Prospect St	South St
Dorchester Ave	<i>Chelsea</i>	<i>Cambridge</i>
Eliot Bridge	Everett Ave	Cambridge Pkwy Connector
Embankment Rd	Revere Beach Pkwy	JFK St
Essex St	<i>Everett</i>	<i>Revere</i>
Freeport St	Broadway	Squire Rd
Granite Ave	Revere Beach Pkwy	<i>Somerville</i>
Herald St	<i>Medford</i>	Lombardi Way
Huntington Ave	Fellsway	
Hyde Park Ave	Fellsway West	
Jamaicaway	High St	
L St	Mystic Valley Pkwy	
Logan Airport Rd	Salem St	
Massachusetts Ave	Winthrop St	
Melnea Cass Blvd	<i>Revere</i>	
Meridian St	American Legion Hwy	
Morrissey Blvd	Lee Burbank Hwy	
Morton St	<i>Somerville</i>	
N Beacon St	Beacon St	
Nonantum Rd	Fellsway	
Old Colony Ave	McGrath Hwy	
Riverway	Prospect St	
Rutherford Ave	Somerville Ave	
Seaport Blvd	Washington St	
St James Ave		
State St		
Summer St		
Tremont St		
Washington St		



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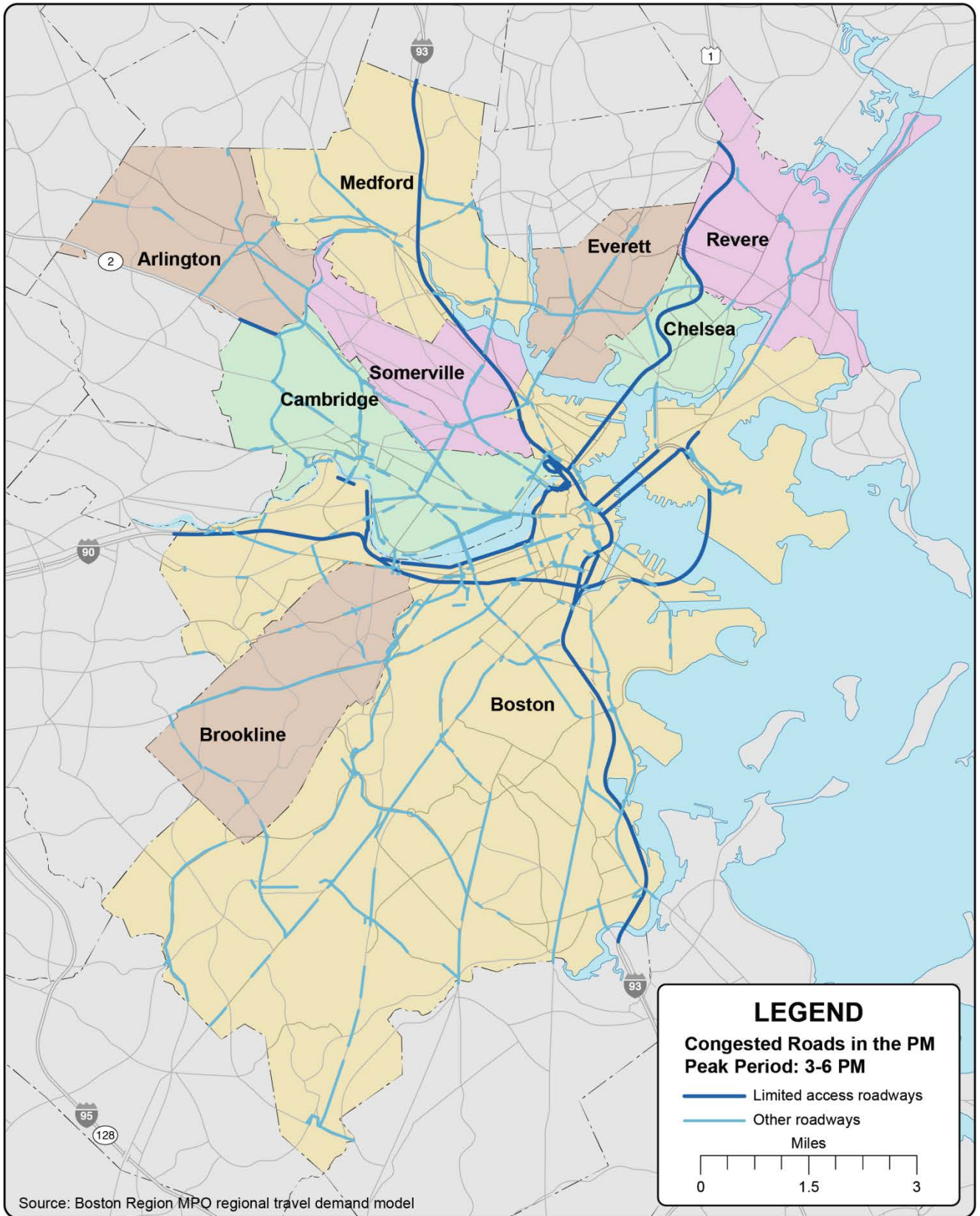


FIGURE C-5
Location of Future Year No-Build Scenario
PM Congested Roadway Links

*Core
Capacity
Constraints*

Year 2040 Build Scenario Congested Links: PM Peak Period

<u>Limited-access roadways adding congested links</u>	<u>Other roadways already with congested sections adding congested links (cont.)</u>	<u>Other roadways first showing congestion in this scenario</u>
US Route 1	<i>Brookline</i>	<i>Boston</i>
Storrow Dr	Route 9	Agassiz Rd
Soldiers Field Rd		Arlington St
	<i>Cambridge</i>	Charles St Circle
	Concord Ave	Charlesgate East
	Hampshire St	Kosciuszko Circle
	Land Blvd	Mugar Way
	Main St	North St
	Massachusetts Ave	West 4th Street (SE Xway)
	Msgr O'Brien Hwy	
	Prospect St	<i>Brookline</i>
		River Rd
	<i>Everett</i>	<i>Cambridge</i>
	Broadway	Magazine St
	Revere Beach Pkwy	River St
	<i>Medford</i>	
	Fellsway	
	<i>Revere</i>	
	American Legion Hwy	
	Lee Burbank Hwy	
	Squire Rd	
	<i>Somerville</i>	
	McGrath Hwy	
	Somerville Ave	
	Washington St	



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FIGURE C-6
Location of Future Year Build Scenario
PM Congested Roadway Links

*Core
Capacity
Constraints*

Reverse of Figure C-6

Appendix D

Base Year Rapid Transit Service Frequencies

Appendix D shows average observed service frequencies. These are calculated for the midpoint of the Red, Orange, and Blue Lines, and for the start of the Green Line trips.

**Base Year Rapid Transit Service Frequencies
Average Number of Trains Observed per 15-Minute Interval**

AM Peak Period	6:00AM · 6:15AM · 6:30AM · 6:45AM · 7:00AM · 7:15AM · 7:30AM · 7:45AM · 8:00AM · 8:15AM · 8:30AM · 8:45AM · 9:00AM														
	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM	9:15AM	9:30AM	9:45AM
Red Line Southbound	2.1	1.7	3.3	2.3	2.7	3.0	3.2	3.0	3.5	3.5	3.1	3.1	3.1	3.1	3.1
Red Line Northbound	3.0	2.4	3.5	3.0	3.0	3.8	3.9	3.0	3.4	3.8	3.6	3.3	3.3	3.3	3.3
Orange Line Southbound	1.3	1.6	1.9	2.0	2.9	2.5	2.7	3.1	2.8	2.6	2.0	2.2	2.2	2.2	2.2
Orange Line Northbound	1.1	1.8	1.9	1.9	2.9	3.0	2.8	2.9	2.5	3.0	2.7	2.8	2.8	2.8	2.8
Green Line Westbound	6.8	5.9	6.8	7.4	9.1	9.2	9.1	8.9	9.1	8.2	9.4	8.6	8.6	8.6	8.6
Green Line Eastbound	6.4	6.3	9.4	9.0	10.0	10.0	8.1	10.9	9.2	8.6	9.2	10.0	10.0	10.0	10.0
Blue Line Southbound	2.8	2.5	3.6	2.8	3.1	3.2	3.4	3.0	3.8	3.1	3.3	3.2	3.2	3.2	3.2
Blue Line Northbound	2.1	2.2	1.8	3.1	3.6	2.9	3.7	3.3	3.1	3.2	3.6	3.6	3.6	3.6	3.6

PM Peak Period	3:00PM · 3:15PM · 3:30PM · 3:45PM · 4:00PM · 4:15PM · 4:30PM · 4:45PM · 5:00PM · 5:15PM · 5:30PM · 5:45PM · 6:00PM														
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM	6:15PM	6:30PM	6:45PM
Red Line Southbound	2.0	2.2	2.4	3.0	2.3	3.0	3.0	4.0	3.0	3.8	3.9	3.5	3.5	3.5	3.5
Red Line Northbound	2.5	3.4	3.5	2.5	3.7	3.3	2.9	3.7	3.4	2.9	3.2	3.7	3.7	3.7	3.7
Orange Line Southbound	2.0	1.8	2.2	2.0	2.8	3.0	2.6	2.7	2.9	2.9	2.8	2.7	2.7	2.7	2.7
Orange Line Northbound	2.0	2.5	2.8	2.1	2.5	3.1	2.9	3.0	2.6	2.7	2.6	2.6	2.6	2.6	2.6
Green Line Westbound	7.4	7.4	6.8	7.3	8.7	8.7	9.4	9.3	7.8	6.1	8.7	9.8	9.8	9.8	9.8
Green Line Eastbound	7.6	7.7	7.9	7.8	9.1	8.0	8.9	9.0	7.8	9.9	8.6	8.0	8.0	8.0	8.0
Blue Line Southbound	2.5	3.0	3.1	3.4	3.3	2.9	3.1	3.7	3.1	3.1	3.0	3.7	3.7	3.7	3.7
Blue Line Northbound	3.3	3.1	3.5	3.1	3.1	3.3	3.4	3.0	3.0	3.6	3.3	3.0	3.0	3.0	3.0

Red Line Frequencies are for Ashmont and Braintree services combined between Alewife and JFK/Umass.
Green Line Frequencies are for B, C, D, and E Line services combined between Copley and Park Street.

Appendix E

Base Year Passengers by Route Segment and Time Period

Appendix E shows the total passengers traveling between each pair of adjacent stations by direction for each peak-period 15-minute interval.

**Passengers by Route Segment and Time Period
Red Line Northbound - PM
Base Year**

Route Segment (Branch)	3:00PM - 3:15PM - 3:30PM - 3:45PM - 4:00PM - 4:15PM - 4:30PM - 4:45PM - 5:00PM - 5:15PM - 5:30PM - 5:45PM - 6:00PM											
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM
Davis-Alewife	186	194	217	255	359	368	445	479	617	571	493	466
Porter-Davis	352	381	423	471	616	643	772	920	1,263	1,197	1,099	1,050
Harvard-Porter	465	501	565	593	822	988	999	1,243	1,745	1,608	1,460	1,400
Central-Harvard	641	715	781	811	1,044	1,239	1,305	1,545	2,178	2,084	1,873	1,740
Kendall-Central	730	797	881	922	1,148	1,302	1,429	1,617	2,393	2,364	2,208	1,982
Charles/MGH-Kendall	725	787	851	878	1,063	1,125	1,328	1,382	2,131	2,171	2,031	1,815
Park St-Charles/MGH	753	786	797	843	997	1,046	1,203	1,263	1,927	2,017	1,888	1,692
Downtown Crossing-Park St	697	763	775	805	816	937	1,008	1,096	1,506	1,728	1,655	1,351
South Station-Downtown Crossing	783	894	934	949	836	969	1,068	1,155	1,364	1,657	1,661	1,297
Broadway-South Station	634	731	751	754	549	652	641	695	629	788	838	615
Andrew-Broadway	610	705	725	708	527	615	607	654	577	712	780	583
JFK/UMASS-Andrew	574	660	649	644	481	552	573	603	537	648	724	550
N Quincy-JFK/UMASS (Braintree)	218	247	246	259	200	250	285	287	248	316	336	276
Wollaston-N Quincy (Braintree)	184	211	205	214	156	197	219	223	201	190	226	213
Quincy Ctr-Wollaston (Braintree)	180	189	179	191	141	169	204	205	174	167	207	198
Quincy Adams-Quincy Ctr (Braintree)	67	69	96	104	74	86	110	121	101	80	109	123
Braintree-Quincy Adams (Braintree)	49	41	57	56	47	57	69	53	50	37	59	40
Savin Hill-JFK/UMASS (Ashmont)	238	254	229	208	171	186	180	177	183	178	170	132
Fields Corner-Savin Hill (Ashmont)	227	223	177	184	153	158	157	159	168	153	145	115
Shawmut-Fields Corner (Ashmont)	195	218	120	123	111	109	116	114	114	99	95	86
Ashmont-Shawmut (Ashmont)	179	204	95	101	92	90	101	91	92	83	69	71

**Passengers by Route Segment and Time Period
Red Line Northbound - AM
Base Year**

Route Segment (Branch)	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Davis-Alewife	90	96	117	114	128	166	175	166	189	173	117	110
Porter-Davis	102	102	150	153	190	226	221	216	245	269	192	181
Harvard-Porter	112	131	180	192	250	278	270	273	291	333	257	229
Central-Harvard	213	281	344	364	475	562	607	600	668	831	767	535
Kendall-Central	249	344	419	480	605	710	761	750	845	993	969	629
Charles/MGH-Kendall	299	454	582	643	778	955	1,084	1,115	1,259	1,543	1,442	1,010
Park St-Charles/MGH	456	709	941	914	1,003	1,196	1,389	1,357	1,468	1,719	1,599	1,145
Downtown Crossing-Park St	489	763	1,104	1,214	1,334	1,554	1,803	1,833	2,030	2,277	2,104	1,680
South Station-Downtown Crossing	552	870	1,296	1,438	1,533	1,795	2,063	2,203	2,494	2,674	2,496	2,146
Broadway-South Station	636	814	1,299	1,398	1,541	1,847	2,202	2,275	2,629	2,772	2,731	2,483
Andrew-Broadway	623	790	1,267	1,391	1,515	1,805	2,138	2,212	2,517	2,613	2,569	2,353
JFK/UMASS-Andrew	586	739	1,199	1,375	1,451	1,759	2,057	2,116	2,407	2,488	2,458	2,236
N Quincy-JFK/UMASS (Braintree)	313	437	637	722	885	1,034	1,414	1,401	1,610	1,583	1,587	1,451
Wollaston-N Quincy (Braintree)	255	357	530	591	725	839	1,176	1,163	1,283	1,263	1,256	1,101
Quincy Ctr-Wollaston (Braintree)	195	294	416	465	585	657	938	912	1,022	959	987	881
Quincy Adams-Quincy Ctr (Braintree)	132	180	279	308	362	416	597	573	648	521	529	503
Braintree-Quincy Adams (Braintree)	82	116	194	184	232	271	376	380	366	252	181	206
Savin Hill-JFK/UMASS (Ashmont)	257	273	518	629	585	755	750	799	747	801	799	747
Fields Corner-Savin Hill (Ashmont)	243	237	467	569	552	721	704	717	634	674	697	645
Shawmut-Fields Corner (Ashmont)	175	172	316	416	408	552	548	534	528	541	575	522
Ashmont-Shawmut (Ashmont)	146	114	249	334	321	448	419	431	399	416	448	405

**Passengers by Route Segment and Time Period
Red Line Southbound - PM
Base Year**

Route Segment (Branch)	3:00PM - 3:15PM - 3:30PM - 3:45PM - 4:00PM - 4:15PM - 4:30PM - 4:45PM - 5:00PM - 5:15PM - 5:30PM - 5:45PM - 6:00PM															
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM	5:15PM	5:30PM	5:45PM	6:00PM
Alewife-Davis	79	97	94	98	81	118	148	152	144	194	203	195				
Davis-Porter	179	205	182	200	175	204	260	271	238	328	336	307				
Porter-Harvard	222	271	231	258	228	268	314	348	311	451	415	381				
Harvard-Central	440	598	553	576	479	657	623	644	684	983	805	717				
Central-Kendall	531	686	675	676	606	782	772	785	891	1,198	973	860				
Kendall-Charles/MGH	625	788	806	776	835	979	1,036	1,071	1,308	1,685	1,294	1,148				
Charles/MGH-Park St	741	896	1,071	917	1,044	1,132	1,336	1,263	1,580	1,856	1,469	1,273				
Park St-Downtown Crossing	905	1,076	1,201	1,151	1,383	1,353	1,690	1,635	2,134	2,211	1,723	1,520				
Downtown Crossing-South Station	1,013	1,206	1,300	1,269	1,530	1,511	1,923	1,920	2,484	2,481	1,937	1,683				
South Station-Broadway	1,007	1,185	1,245	1,259	1,540	1,551	1,905	2,050	2,821	2,537	2,132	1,797				
Broadway-Andrew	1,002	1,159	1,222	1,222	1,535	1,527	1,869	2,022	2,754	2,461	2,052	1,751				
Andrew-JFK/JUMASS	953	1,095	1,184	1,181	1,504	1,481	1,815	1,972	2,627	2,371	1,956	1,660				
JFK/JUMASS-N Quincy (Braintree)	532	618	651	701	947	987	1,125	1,283	1,741	1,543	1,289	1,091				
N Quincy-Wollaston (Braintree)	451	517	559	590	781	813	904	1,045	1,423	1,254	1,029	870				
Wollaston-Quincy Ctr (Braintree)	378	424	466	472	624	676	719	833	1,149	992	819	708				
Quincy Ctr-Quincy Adams (Braintree)	215	242	292	286	380	400	429	485	671	541	464	382				
Quincy Adams-Braintree (Braintree)	127	135	168	177	225	229	250	260	333	266	210	169				
JFK/JUMASS-Savin Hill (Ashmont)	419	437	480	475	527	484	618	620	792	740	607	509				
Savin Hill-Fields Corner (Ashmont)	417	412	437	438	475	439	555	563	699	654	542	427				
Fields Corner-Shawmut (Ashmont)	313	293	346	328	348	346	419	455	536	515	426	339				
Shawmut-Ashmont (Ashmont)	258	241	275	261	266	264	317	349	415	398	336	263				

**Passengers by Route Segment and Time Period
Orange Line Southbound - AM
Base Year**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Oak Grove-Malden Ctr	102	123	198	177	343	374	483	412	434	529	463	345
Malden Ctr-Wellington	237	336	394	475	760	886	1,083	933	1,135	1,364	1,257	1,024
Wellington-Assembly	312	428	559	651	975	1,109	1,388	1,200	1,489	1,760	1,652	1,371
Assembly-Sullivan Sq	312	428	559	651	975	1,109	1,388	1,200	1,489	1,760	1,652	1,371
Sullivan Sq-Community College	454	583	692	817	1,154	1,274	1,625	1,506	1,804	2,084	1,955	1,617
Community College-North Station	463	596	690	811	1,141	1,305	1,635	1,513	1,781	2,057	1,979	1,642
North Station-Haymarket	386	571	702	733	1,161	1,308	1,664	1,645	2,081	2,047	2,160	1,642
Haymarket-State	416	651	760	793	1,215	1,354	1,687	1,662	2,118	2,056	2,179	1,631
State-Downtown Crossing	471	736	865	867	1,251	1,396	1,618	1,544	1,922	1,838	1,955	1,436
Downtown Crossing-Chinatown	428	623	797	794	1,071	1,275	1,416	1,381	1,669	1,594	1,715	1,316
Chinatown-Tufts Medical Ctr	385	584	738	726	1,000	1,185	1,305	1,261	1,513	1,428	1,518	1,155
Tufts Medical Ctr-Back Bay	342	514	631	626	855	1,021	1,113	1,074	1,268	1,214	1,316	1,000
Back Bay-Mass Ave	229	353	459	430	545	600	638	512	603	570	560	461
Mass Ave-Ruggles	214	333	424	410	502	547	566	454	515	499	473	380
Ruggles-Roxbury Crossing	131	216	271	264	292	283	242	235	238	240	229	170
Roxbury Crossing-Jackson Sq	115	177	229	217	227	215	210	202	199	196	185	138
Jackson Sq-Stony Brook	132	180	229	203	190	174	180	170	163	164	142	114
Stony Brook-Green St	141	178	233	202	183	164	174	158	144	150	116	94
Green St-Forest Hills	144	171	220	179	159	120	122	117	112	119	89	83

**Passengers by Route Segment and Time Period
Orange Line Northbound - PM
Base Year**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Malden Ctr-Oak Grove	106	145	181	177	289	300	343	390	476	445	344	310
Wellington-Malden Ctr	347	402	487	476	665	724	818	916	1,209	1,109	944	826
Assembly-Wellington	469	543	662	646	882	933	1,091	1,155	1,578	1,427	1,246	1,079
Sullivan Sq-Assembly	469	543	662	646	882	933	1,091	1,155	1,578	1,427	1,246	1,079
Community College-Sullivan Sq	622	713	853	806	1,090	1,142	1,316	1,390	1,863	1,736	1,520	1,303
North Station-Community College	680	806	904	816	1,113	1,180	1,364	1,429	1,896	1,843	1,651	1,372
Haymarket-North Station	639	763	897	841	1,145	1,214	1,358	1,559	2,040	1,881	1,606	1,366
State-Haymarket	663	798	930	884	1,159	1,232	1,380	1,576	2,039	1,925	1,647	1,416
Downtown Crossing-State	719	926	1,038	955	1,204	1,232	1,364	1,489	1,882	1,863	1,562	1,385
Chinatown-Downtown Crossing	732	969	977	900	1,147	1,152	1,292	1,360	1,692	1,751	1,417	1,294
Tufts Medical Ctr-Chinatown	669	902	921	838	1,021	1,049	1,196	1,258	1,529	1,641	1,340	1,210
Back Bay-Tufts Medical Ctr	624	851	828	753	890	937	1,046	1,123	1,334	1,480	1,223	1,080
Mass Ave-Back Bay	478	719	681	626	648	652	699	764	740	843	721	648
Ruggles-Mass Ave	449	676	656	591	591	601	635	687	675	758	648	571
Roxbury Crossing-Ruggles	287	495	474	386	392	398	367	386	418	424	397	341
Jackson Sq-Roxbury Crossing	260	354	413	332	349	330	324	341	368	374	346	317
Stony Brook-Jackson Sq	222	320	375	277	298	263	264	274	292	273	273	255
Green St-Stony Brook	197	285	350	236	265	239	234	239	260	229	230	230
Forest Hills-Green St	176	263	260	166	232	203	188	196	218	188	190	176

**Passengers by Route Segment and Time Period
Orange Line Northbound - AM
Base Year**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Malden Ctr-Oak Grove	13	17	16	21	19	14	16	22	19	12	14	16
Wellington-Malden Ctr	35	60	59	84	88	95	88	112	127	109	97	79
Assembly-Wellington	61	104	106	128	138	161	151	205	224	175	154	129
Sullivan Sq-Assembly	61	104	106	128	138	161	151	205	224	175	154	129
Community College-Sullivan Sq	108	194	212	246	275	294	291	330	343	298	260	215
North Station-Community College	125	264	358	368	345	367	418	539	608	466	374	320
Haymarket-North Station	167	325	466	473	474	505	601	724	752	706	586	558
State-Haymarket	179	346	508	526	538	570	708	850	868	849	737	737
Downtown Crossing-State	189	359	586	600	650	701	890	1,089	1,168	1,253	1,173	1,188
Chinatown-Downtown Crossing	226	383	648	722	816	950	1,103	1,308	1,363	1,594	1,583	1,564
Tufts Medical Ctr-Chinatown	227	386	657	725	820	962	1,128	1,351	1,400	1,656	1,669	1,643
Back Bay-Tufts Medical Ctr	236	408	673	727	804	1,000	1,196	1,422	1,508	1,766	1,730	1,710
Mass Ave-Back Bay	255	393	617	723	770	1,041	1,132	1,355	1,357	1,496	1,643	1,474
Ruggles-Mass Ave	253	382	586	705	749	996	1,072	1,285	1,291	1,403	1,564	1,415
Roxbury Crossing-Ruggles	247	308	547	653	750	1,020	1,031	1,255	1,244	1,341	1,510	1,363
Jackson Sq-Roxbury Crossing	237	296	527	648	769	1,025	1,019	1,203	1,175	1,243	1,430	1,262
Stony Brook-Jackson Sq	196	249	413	538	620	878	846	987	987	1,064	1,243	1,060
Green St-Stony Brook	178	217	366	485	554	782	737	849	826	898	1,027	834
Forest Hills-Green St	160	186	328	436	501	712	649	725	674	723	836	632

**Passengers by Route Segment and Time Period
Orange Line Southbound - PM
Base Year**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Oak Grove-Malden Ctr	31	40	33	50	48	31	38	34	51	37	37	39
Malden Ctr-Wellington	132	174	158	167	147	171	178	169	185	200	159	159
Wellington-Assembly	183	240	238	249	212	277	256	267	286	320	269	231
Assembly-Sullivan Sq	183	240	238	249	212	277	256	267	286	320	269	231
Sullivan Sq-Community College	318	373	389	374	330	431	395	422	433	506	387	344
Community College-North Station	368	429	429	543	464	523	464	479	545	769	488	405
North Station-Haymarket	392	483	498	585	564	598	598	637	699	941	613	513
Haymarket-State	455	545	562	641	667	674	696	749	857	1,039	700	566
State-Downtown Crossing	560	616	667	709	809	815	899	974	1,271	1,306	935	767
Downtown Crossing-Chinatown	716	796	861	849	942	980	1,137	1,182	1,573	1,639	1,269	1,046
Chinatown-Tufts Medical Ctr	708	771	839	831	937	967	1,129	1,204	1,597	1,653	1,271	1,076
Tufts Medical Ctr-Back Bay	709	770	839	833	972	991	1,148	1,235	1,645	1,668	1,277	1,088
Back Bay-Mass Ave	691	712	736	747	895	899	1,064	1,125	1,557	1,502	1,185	990
Mass Ave-Ruggles	673	689	705	723	868	883	1,044	1,085	1,485	1,416	1,127	918
Ruggles-Roxbury Crossing	583	626	627	663	773	801	973	972	1,342	1,248	1,025	883
Roxbury Crossing-Jackson Sq	594	574	612	620	732	739	927	911	1,237	1,136	948	798
Jackson Sq-Stony Brook	493	476	509	510	612	610	788	774	1,056	972	820	683
Stony Brook-Green St	431	417	448	443	528	530	663	660	885	813	676	562
Green St-Forest Hills	384	360	392	379	450	442	570	537	699	647	548	437

**Passengers by Route Segment and Time Period
Green Line Westbound - AM
Base Year**

Route Segment (Branches)	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Lechmere-Science Park (E)	39	27	60	54	52	86	112	108	171	160	165	163
Science Park-North Station (E)	38	29	58	54	54	88	118	112	179	167	169	164
North Station-Haymarket (C,E)	81	138	180	164	266	319	363	432	658	563	668	445
Haymarket-Gov Ctr (C,E)	124	216	256	249	356	437	440	502	764	647	790	513
Gov Ctr-Park St (B,C,D,E)	394	516	617	622	786	990	917	863	1,113	1,103	1,277	817
Park St-Boylston (B,C,D,E)	380	488	688	816	995	1,312	1,311	1,266	1,534	1,549	1,687	1,295
Boylston-Arlington (B,C,D,E)	368	470	665	785	973	1,277	1,273	1,217	1,484	1,474	1,594	1,225
Arlington-Copley (B,C,D,E)	326	411	565	703	872	1,120	1,086	995	1,193	1,198	1,265	976
Copley-Hynes (B,C,D)	207	270	354	466	587	718	712	678	716	723	735	539
Hynes-Kenmore (B,C,D)	199	248	340	444	556	673	664	623	647	653	608	464
Copley-Prudential (E)	85	106	148	215	251	321	318	282	372	344	361	286
Prudential-Symphony (E)	73	96	133	196	231	276	267	231	290	278	274	235

**Passengers by Route Segment and Time Period
Green Line Eastbound - PM
Base Year**

Route Segment (Branches)	3:00PM - 3:15PM - 3:30PM - 3:45PM - 4:00PM - 4:15PM - 4:30PM - 4:45PM - 5:00PM - 5:15PM - 5:30PM - 5:45PM - 6:00PM															
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM	5:15PM	5:30PM	5:45PM	6:00PM
Science Park-Lechmere (E)	139	132	138	119	125	151	130	138	195	181	168	144	195	181	168	144
North Station-Science Park (E)	145	140	146	126	127	161	139	148	204	195	179	153	204	195	179	153
Haymarket-North Station (C,E)	226	265	279	276	286	347	354	413	498	457	390	354	498	457	390	354
Gov Ctr-Haymarket (C,E)	300	344	374	354	368	431	456	503	600	576	498	454	600	576	498	454
Park St-Gov Ctr (B,C,D,E)	639	793	807	772	753	862	958	885	1,058	996	943	829	1,058	996	943	829
Bolyston-Park St (B,C,D,E)	946	1,124	1,064	1,094	1,146	1,230	1,399	1,365	1,671	1,581	1,526	1,463	1,671	1,581	1,526	1,463
Arlington-Bolyston (B,C,D,E)	966	1,136	1,098	1,093	1,134	1,222	1,396	1,335	1,637	1,587	1,571	1,503	1,637	1,587	1,571	1,503
Copley-Arlington (B,C,D,E)	921	1,083	1,072	1,105	1,037	1,122	1,254	1,172	1,378	1,411	1,483	1,430	1,378	1,411	1,483	1,430
Hynes-Copley (B,C,D)	500	593	619	668	651	653	752	748	786	786	958	740	786	786	958	740
Kenmore-Hynes (B,C,D)	481	561	598	638	624	599	714	705	702	732	920	695	702	732	920	695
Prudential-Copley (E)	408	444	422	432	336	443	463	410	479	526	459	638	479	526	459	638
Symphony-Prudential (E)	385	402	373	402	291	390	419	352	398	446	378	573	398	446	378	573

**Passengers by Route Segment and Time Period
Green Line Eastbound - AM
Base Year**

Route Segment (Branches)	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Science Park-Lechmere (E)	32	38	54	62	64	107	117	110	127	145	158	123
North Station-Science Park (E)	40	42	66	69	72	118	141	135	151	176	193	139
Haymarket-North Station (C,E)	53	74	88	87	123	156	204	202	215	252	273	212
Gov Ctr-Haymarket (C,E)	57	81	96	103	140	176	241	234	251	300	341	283
Park St-Gov Ctr (B,C,D,E)	102	169	196	258	327	391	525	541	719	797	812	691
Bolyston-Park St (B,C,D,E)	109	182	215	304	475	598	833	853	1,204	1,353	1,401	1,124
Arlington-Bolyston (B,C,D,E)	128	200	240	332	502	644	918	947	1,313	1,481	1,530	1,265
Copley-Arlington (B,C,D,E)	135	216	261	368	552	720	1,035	1,069	1,452	1,632	1,704	1,446
Hynes-Copley (B,C,D)	107	167	230	331	497	579	916	872	1,280	1,476	1,495	1,241
Kenmore-Hynes (B,C,D)	106	163	224	316	492	582	909	861	1,298	1,495	1,494	1,270
Prudential-Copley (E)	29	57	47	53	89	168	204	262	266	289	320	289
Symphony-Prudential (E)	25	54	44	48	70	151	177	224	212	246	271	249

**Passengers by Route Segment and Time Period
Green Line Westbound - PM
Base Year**

Route Segment (Branches)	3:00PM - 3:15PM - 3:30PM - 3:45PM - 4:00PM - 4:15PM - 4:30PM - 4:45PM - 5:00PM - 5:15PM - 5:30PM - 5:45PM - 6:00PM															
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM	5:15PM	5:30PM	5:45PM	6:00PM
Lechmere-Science Park (E)	85	102	114	108	116	156	126	135	143	203	192	162	143	203	192	162
Science Park-North Station (E)	98	117	133	125	136	182	148	158	169	242	212	203	169	242	212	203
North Station-Haymarket (C,E)	173	181	189	179	244	226	207	230	282	393	297	298	282	393	297	298
Haymarket-Gov Ctr (C,E)	228	230	255	223	296	276	263	282	342	443	352	344	342	443	352	344
Gov Ctr-Park St (B,C,D,E)	496	522	556	521	640	626	640	653	1,000	972	817	715	1,000	972	817	715
Park St-Boylston (B,C,D,E)	641	722	782	786	798	853	873	982	1,446	1,544	1,373	1,164	1,446	1,544	1,373	1,164
Boylston-Arlington (B,C,D,E)	680	750	812	843	869	902	932	1,065	1,571	1,628	1,459	1,284	1,571	1,628	1,459	1,284
Arlington-Copley (B,C,D,E)	712	782	868	929	928	941	1,042	1,170	1,761	1,739	1,577	1,425	1,761	1,739	1,577	1,425
Copley-Hynes (B,C,D)	546	570	656	700	687	745	850	958	1,488	1,442	1,332	1,232	1,488	1,442	1,332	1,232
Hynes-Kenmore (B,C,D)	521	532	598	686	687	724	831	949	1,467	1,397	1,301	1,235	1,467	1,397	1,301	1,235
Copley-Prudential (E)	161	187	186	197	229	212	214	256	357	345	307	286	357	345	307	286
Prudential-Symphony (E)	128	151	157	169	201	167	176	209	309	280	251	235	309	280	251	235

**Passengers by Route Segment and Time Period
Blue Line Southbound - AM
Base Year**

Route Segment	6:00AM	6:15AM	6:30AM	6:45AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM
Wonderland-Revere Beach	66	133	164	150	180	291	283	298	293	349	363	274					
Revere Beach-Beachmont	108	196	234	234	267	401	392	391	390	466	467	375					
Beachmont-Suffolk Downs	154	250	326	316	372	507	494	532	512	620	610	512					
Suffolk Downs-Orient Heights	162	261	338	333	393	530	518	558	539	645	643	546					
Orient Heights-Wood Island	227	368	434	453	534	676	658	723	698	808	865	690					
Wood Island-Airport	273	411	495	503	597	750	732	775	772	871	936	742					
Airport-Maverick	345	531	613	642	730	900	873	908	903	1,016	1,100	882					
Maverick-Aquarium	587	722	881	930	965	1,235	1,187	1,195	1,163	1,333	1,416	1,096					
Aquarium-State	549	683	833	862	906	1,152	1,083	1,070	1,049	1,193	1,272	957					
State-Govt Ctr	337	385	514	504	591	745	716	651	626	737	808	578					
Gov Ctr-Bowdoin	29	39	75	63	78	73	105	102	96	97	90	63					

**Passengers by Route Segment and Time Period
Blue Line Northbound - PM
Base Year**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Revere Beach-Wonderland	111	137	153	161	226	204	256	304	386	322	279	230
Beachmont-Revere Beach	179	223	239	243	320	304	352	397	494	409	362	298
Suffolk Downs-Beachmont	247	299	317	323	422	396	464	518	663	538	476	379
Orient Heights-Suffolk Downs	266	316	339	335	447	417	484	532	705	565	496	396
Wood Island-Orient Heights	355	413	457	439	579	528	616	668	925	701	635	504
Airport-Wood Island	391	470	512	488	644	578	673	721	993	757	689	547
Maverick-Airport	501	602	642	608	760	726	826	843	1,147	890	801	632
Aquarium-Maverick	721	881	872	845	1,011	982	1,075	1,067	1,401	1,160	1,023	824
State-Aquarium	674	849	835	818	932	909	1,016	970	1,259	1,052	923	765
Gov Ctr-State	469	552	570	547	571	610	656	611	753	635	603	489
Bowdoin- Gov Ctr	51	55	68	69	95	87	83	96	132	103	61	53

**Passengers by Route Segment and Time Period
Blue Line Northbound - AM
Base Year**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Revere Beach-Wonderland	13	22	16	16	26	23	21	17	15	21	15	18
Beachmont-Revere Beach	22	35	24	24	38	32	33	26	25	31	28	27
Suffolk Downs-Beachmont	30	41	33	28	43	38	35	26	30	37	33	30
Orient Heights-Suffolk Downs	32	42	34	30	44	39	39	27	34	44	33	31
Wood Island-Orient Heights	36	44	40	40	53	51	48	31	42	53	41	41
Airport-Wood Island	43	61	49	60	62	64	57	38	46	62	48	44
Maverick-Airport	63	103	111	129	129	113	87	58	84	94	70	60
Aquarium-Maverick	84	127	153	182	180	168	136	106	123	147	108	107
State-Aquarium	88	120	158	180	194	179	164	132	147	180	152	134
Gov Ctr-State	54	63	70	89	90	100	101	80	119	128	111	101
Bowdoin- Gov Ctr	0	0	1	3	2	4	2	4	5	7	6	10

**Passengers by Route Segment and Time Period
Blue Line Southbound - PM
Base Year**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Wonderland-Revere Beach	41	55	61	48	51	65	32	49	50	52	26	54
Revere Beach-Beachmont	85	105	108	84	83	111	70	85	93	97	67	74
Beachmont-Suffolk Downs	110	129	139	112	109	142	94	103	121	119	96	94
Suffolk Downs-Orient Heights	120	139	145	117	120	152	105	111	146	131	109	105
Orient Heights-Wood Island	149	176	188	159	153	202	142	152	171	164	139	126
Wood Island-Airport	160	199	203	183	165	242	173	185	202	186	159	137
Airport-Maverick	241	297	301	280	241	330	254	289	315	297	252	204
Maverick-Aquarium	364	425	443	391	370	412	385	422	418	445	340	264
Aquarium-State	361	404	425	373	358	415	390	415	435	437	331	273
State-Govt Ctr	249	280	296	264	256	277	248	254	273	272	222	171
Gov Ctr-Bowdoin	8	10	11	11	6	5	6	5	9	9	4	4

Reverse of Blue Line Southbound PM data

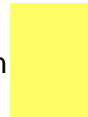
Appendix F

Passengers per Vehicle in the Base Year

Appendix F shows the passengers per vehicle that were used for the Base Year in Figures 7 through 22.

The route segments and time periods with crowding are highlighted and indicate the crowding icon that is used in Figures 7 through 22.

Indicates "Overburdened" Icon



Indicates "Overcrowded" Icon



Indicates "Unacceptable" Icon



**Figure 7 Passengers per Vehicle
Red Line Southbound - AM
Base Year**

Route Segment (Branch)	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Alewife-Davis	3	8	7	16	13	19	24	30	27	29	35	32
Davis-Porter	8	13	13	29	26	36	44	59	56	61	78	72
Porter-Harvard	10	17	16	42	31	44	61	82	76	80	112	91
Harvard-Central	15	22	22	47	38	55	72	90	85	96	127	104
Central-Kendall	17	29	25	52	43	61	77	98	97	112	141	121
Kendall-Charles/MGH	16	29	24	47	42	59	72	88	89	102	124	107
Charles/MGH-Park St	14	24	18	38	38	53	65	78	82	94	113	98
Park St-Downtown Crossing	15	27	18	38	42	50	56	63	68	75	89	71
Downtown Crossing-South Station	18	37	23	45	54	57	57	59	63	68	77	61
South Station-Broadway	13	26	17	32	41	39	31	27	26	26	28	26
Broadway-Andrew	12	24	15	31	39	38	29	25	24	24	26	24
Andrew-JFK/UMASS	11	21	14	30	38	36	29	24	22	23	25	23
JFK/UMASS-N Quincy (Braintree)	8	16	12	17	34	24	20	23	22	18	15	15
N Quincy-Wollaston (Braintree)	7	14	9	14	27	16	14	15	15	11	11	11
Wollaston-Quincy Ctr (Braintree)	7	13	9	14	29	14	12	14	14	11	10	12
Quincy Ctr-Quincy Adams (Braintree)	5	9	5	6	10	6	5	7	6	4	4	4
Quincy Adams-Braintree (Braintree)	3	5	3	3	6	3	2	2	3	1	1	2
JFK/UMASS-Savin Hill (Ashmont)	8	11	11	20	14	11	9	11	9	8	8	7
Savin Hill-Fields Corner (Ashmont)	8	10	10	14	11	10	9	10	8	7	7	7
Fields Corner-Shawmut (Ashmont)	8	8	10	15	10	8	6	8	7	5	5	6
Shawmut-Ashmont (Ashmont)	7	7	10	14	9	7	5	6	5	4	4	5

**Figure 8 Passengers per Vehicle
Red Line Northbound - PM
Base Year**

Route Segment (Branch)	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Davis-Alewife	12	10	10	17	16	18	26	22	30	33	26	21
Porter-Davis	23	19	20	31	28	32	45	41	61	70	57	47
Harvard-Porter	31	25	27	39	37	49	58	56	85	94	76	63
Central-Harvard	42	35	37	54	47	62	76	69	106	122	98	78
Kendall-Central	48	39	42	61	52	65	83	73	116	138	115	89
Charles/MGH-Kendall	48	39	40	58	48	56	77	62	104	127	106	81
Park St-Charles/MGH	50	39	38	56	45	52	70	57	94	118	99	76
Downtown Crossing-Park St	46	38	37	53	37	47	59	49	73	101	86	61
South Station-Downtown Crossing	52	44	44	63	38	48	62	52	66	97	87	58
Broadway-South Station	42	36	36	50	25	33	37	31	31	46	44	28
Andrew-Broadway	40	35	34	47	24	31	35	29	28	42	41	26
JFK/UMASS-Andrew	38	33	31	43	22	28	33	27	26	38	38	25
N Quincy-JFK/UMASS (Braintree)	32	22	23	34	19	24	33	26	22	46	32	25
Wollaston-N Quincy (Braintree)	27	19	19	28	15	19	26	20	18	28	21	20
Quincy Ctr-Wollaston (Braintree)	26	17	17	25	14	16	24	18	16	24	20	18
Quincy Adams-Quincy Ctr (Braintree)	10	6	9	13	7	8	13	11	9	12	10	11
Braintree-Quincy Adams (Braintree)	7	4	5	7	5	6	8	5	5	5	6	4
Savin Hill-JFK/UMASS (Ashmont)	29	28	22	28	15	19	21	16	19	17	20	12
Fields Corner-Savin Hill (Ashmont)	27	24	17	25	13	16	18	14	18	15	17	10
Shawmut-Fields Corner (Ashmont)	24	24	12	17	10	11	14	10	12	10	11	8
Ashmont-Shawmut (Ashmont)	22	22	9	14	8	9	12	8	10	8	8	6

**Figure 9 Passengers per Vehicle
Red Line Northbound - AM
Base Year**

Route Segment (Branch)	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Davis-Alewife	5	7	6	7	7	7	7	9	9	8	5	5
Porter-Davis	6	7	7	8	11	10	9	12	12	12	9	9
Harvard-Porter	6	9	9	10	14	12	12	15	14	15	12	11
Central-Harvard	12	19	16	20	26	25	26	34	33	37	35	27
Kendall-Central	14	24	20	26	34	31	32	42	42	44	45	31
Charles/MGH-Kendall	17	31	28	35	43	42	46	63	62	68	66	50
Park St-Charles/MGH	26	49	45	49	56	52	59	77	72	76	74	57
Downtown Crossing-Park St	28	52	53	65	74	68	77	103	100	101	97	84
South Station-Downtown Crossing	31	60	62	77	85	79	88	124	123	118	115	107
Broadway-South Station	36	56	62	75	86	81	94	128	130	123	126	124
Andrew-Broadway	35	54	61	75	84	79	91	125	124	116	118	118
JFK/UMASS-Andrew	33	51	58	74	81	77	88	119	119	110	113	112
N Quincy-JFK/UMASS (Braintree)	44	109	66	120	119	106	160	136	156	163	163	145
Wollaston-N Quincy (Braintree)	36	89	55	99	98	86	133	113	125	130	129	110
Quincy Ctr-Wollaston (Braintree)	27	73	43	78	79	68	106	89	99	99	102	88
Quincy Adams-Quincy Ctr (Braintree)	18	45	29	51	49	43	67	56	63	54	54	50
Braintree-Quincy Adams (Braintree)	12	29	20	31	31	28	42	37	36	26	19	21
Savin Hill-JFK/UMASS (Ashmont)	47	46	52	81	68	94	71	100	71	70	90	84
Fields Corner-Savin Hill (Ashmont)	45	40	47	74	64	90	67	90	60	59	79	73
Shawmut-Fields Corner (Ashmont)	32	29	32	54	48	69	52	67	50	47	65	59
Ashmont-Shawmut (Ashmont)	27	19	25	43	37	56	40	54	38	36	51	46

**Figure 10 Passengers per Vehicle
Red Line Southbound - PM
Base Year**

Route Segment (Branch)	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Alewife-Davis	6	7	6	6	6	7	8	6	8	9	9	9
Davis-Porter	15	15	12	11	13	12	14	11	13	15	15	15
Porter-Harvard	18	20	16	15	17	15	17	15	18	20	18	18
Harvard-Central	36	45	38	33	35	37	35	27	39	44	35	34
Central-Kendall	43	51	46	38	44	44	43	33	50	53	42	41
Kendall-Charles/MGH	51	59	55	44	61	55	58	45	74	75	56	54
Charles/MGH-Park St	60	67	73	52	76	64	74	53	89	82	63	60
Park St-Downtown Crossing	74	80	82	65	101	76	94	69	120	98	74	72
Downtown Crossing-South Station	82	90	89	72	112	85	107	81	140	110	84	80
South Station-Broadway	82	88	85	71	112	88	106	86	159	112	92	85
Broadway-Andrew	82	86	84	69	112	86	104	85	155	109	89	83
Andrew-JFK/UMASS	78	82	81	67	110	84	101	83	148	105	85	79
JFK/UMASS-N Quincy (Braintree)	89	94	76	85	151	128	113	104	149	135	103	91
N Quincy-Wollaston (Braintree)	75	79	65	71	124	105	90	85	122	110	82	72
Wollaston-Quincy Ctr (Braintree)	63	65	54	57	99	88	72	68	98	87	65	59
Quincy Ctr-Quincy Adams (Braintree)	36	37	34	35	60	52	43	39	57	47	37	32
Quincy Adams-Braintree (Braintree)	21	21	20	21	36	30	25	21	28	23	17	14
JFK/UMASS-Savin Hill (Ashmont)	67	64	80	50	71	48	77	54	132	66	57	56
Savin Hill-Fields Corner (Ashmont)	66	60	73	46	64	44	69	49	117	59	51	47
Fields Corner-Shawmut (Ashmont)	50	43	58	35	47	35	52	40	89	46	40	37
Shawmut-Ashmont (Ashmont)	41	35	46	28	36	26	40	31	69	36	32	29

**Figure 11 Passengers per Vehicle
Orange Line Southbound - AM
Base Year**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Oak Grove-Malden Ctr	17	15	20	16	28	22	32	25	23	31	29	28
Malden Ctr-Wellington	39	42	41	42	62	52	72	57	61	81	80	83
Wellington-Assembly	52	54	58	57	79	65	92	74	80	104	105	112
Assembly-Sullivan Sq	52	54	58	57	79	65	92	74	80	104	105	112
Sullivan Sq-Community College	76	73	71	72	94	74	107	92	97	124	124	132
Community College-North Station	77	75	71	71	93	76	108	93	96	122	126	134
North Station-Haymarket	64	71	72	64	94	76	110	101	112	121	137	134
Haymarket-State	69	81	78	69	99	79	111	102	114	122	139	133
State-Downtown Crossing	78	92	89	76	102	81	107	95	104	109	124	117
Downtown Crossing-Chinatown	71	78	82	70	87	74	94	85	90	95	109	107
Chinatown-Tufts Medical Ctr	64	73	76	64	81	69	86	77	81	85	97	94
Tufts Medical Ctr-Back Bay	57	64	65	55	70	60	73	66	68	72	84	81
Back Bay-Mass Ave	38	44	47	38	44	35	42	31	32	34	36	38
Mass Ave-Ruggles	36	42	44	36	41	32	37	28	28	30	30	31
Ruggles-Roxbury Crossing	22	27	28	23	24	17	16	14	13	14	15	14
Roxbury Crossing-Jackson Sq	19	22	24	19	18	13	14	12	11	12	12	11
Jackson Sq-Stony Brook	22	22	24	18	15	10	12	10	9	10	9	9
Stony Brook-Green St	24	22	24	18	15	10	11	10	8	9	7	8
Green St-Forest Hills	24	21	23	16	13	7	8	7	6	7	6	7

**Figure 12 Passengers per Vehicle
Orange Line Northbound - PM
Base Year**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Malden Ctr-Oak Grove	9	10	11	14	19	16	20	22	30	28	22	20
Wellington-Malden Ctr	29	27	29	38	44	39	48	52	77	69	61	54
Assembly-Wellington	39	37	40	51	58	50	64	65	100	89	81	70
Sullivan Sq-Assembly	39	37	40	51	58	50	64	65	100	89	81	70
Community College-Sullivan Sq	52	48	51	64	72	62	77	78	119	109	98	84
North Station-Community College	57	54	55	65	73	64	80	81	121	115	107	89
Haymarket-North Station	53	51	54	67	76	65	79	88	130	118	104	89
State-Haymarket	55	54	56	70	77	66	81	89	130	120	107	92
Downtown Crossing-State	60	62	63	76	80	66	80	84	120	116	101	90
Chinatown-Downtown Crossing	61	65	59	72	76	62	75	77	108	109	92	84
Tufts Medical Ctr-Chinatown	56	61	56	67	67	56	70	71	97	103	87	78
Back Bay-Tufts Medical Ctr	52	57	50	60	59	50	61	63	85	92	79	70
Mass Ave-Back Bay	40	48	41	50	43	35	41	43	47	53	47	42
Ruggles-Mass Ave	37	46	40	47	39	32	37	39	43	47	42	37
Roxbury Crossing-Ruggles	24	33	29	31	26	21	21	22	27	27	26	22
Jackson Sq-Roxbury Crossing	22	24	25	26	23	18	19	19	23	23	22	21
Stony Brook-Jackson Sq	19	22	23	22	20	14	15	15	19	17	18	17
Green St-Stony Brook	16	19	21	19	18	13	14	13	17	14	15	15
Forest Hills-Green St	15	18	16	13	15	11	11	11	14	12	12	11

**Figure 13 Passengers per Vehicle
Orange Line Northbound - AM
Base Year**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Malden Ctr-Oak Grove	2	2	1	2	1	1	1	1	1	1	1	1
Wellington-Malden Ctr	5	6	5	8	5	5	5	7	9	6	6	5
Assembly-Wellington	9	10	9	12	8	9	9	12	15	10	10	8
Sullivan Sq-Assembly	9	10	9	12	8	9	9	12	15	10	10	8
Community College-Sullivan Sq	16	18	19	22	16	16	17	19	23	17	16	13
North Station-Community College	18	25	31	33	20	20	25	31	41	26	23	19
Haymarket-North Station	24	31	41	42	28	28	36	42	51	40	37	33
State-Haymarket	26	33	44	47	31	31	42	50	58	48	46	44
Downtown Crossing-State	28	34	51	54	38	38	53	64	79	71	73	70
Chinatown-Downtown Crossing	33	36	57	65	48	52	65	76	92	90	99	93
Tufts Medical Ctr-Chinatown	33	36	57	65	48	53	67	79	94	93	104	97
Back Bay-Tufts Medical Ctr	34	39	59	65	47	55	71	83	101	100	108	101
Mass Ave-Back Bay	37	37	54	65	45	57	67	79	91	84	103	87
Ruggles-Mass Ave	37	36	51	63	44	54	64	75	87	79	98	84
Roxbury Crossing-Ruggles	36	29	48	59	44	56	61	73	84	76	94	81
Jackson Sq-Roxbury Crossing	35	28	46	58	45	56	60	70	79	70	89	75
Stony Brook-Jackson Sq	29	24	36	48	36	48	50	58	66	60	78	63
Green St-Stony Brook	26	20	32	44	32	43	44	50	56	51	64	49
Forest Hills-Green St	23	18	29	39	29	39	38	42	45	41	52	37

**Figure 14 Passengers per Vehicle
Orange Line Southbound - PM
Base Year**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Oak Grove-Malden Ctr	3	3	3	4	4	2	2	2	3	2	2	2
Malden Ctr-Wellington	11	15	15	13	13	10	10	11	11	12	9	10
Wellington-Assembly	15	21	22	19	18	16	14	17	18	19	15	14
Assembly-Sullivan Sq	15	21	22	19	18	16	14	17	18	19	15	14
Sullivan Sq-Community College	26	32	36	29	28	26	22	27	27	29	22	21
Community College-North Station	30	37	40	42	40	31	26	31	33	45	28	24
North Station-Haymarket	32	41	46	46	48	35	34	41	43	55	35	31
Haymarket-State	37	46	52	50	57	40	39	49	53	61	40	34
State-Downtown Crossing	46	53	61	55	69	48	51	63	78	76	54	46
Downtown Crossing-Chinatown	58	68	79	66	80	58	64	77	97	96	73	63
Chinatown-Tufts Medical Ctr	58	66	77	65	80	57	64	78	98	96	73	65
Tufts Medical Ctr-Back Bay	58	66	77	65	83	59	65	80	101	97	73	66
Back Bay-Mass Ave	56	61	68	58	76	53	60	73	96	88	68	60
Mass Ave-Ruggles	55	59	65	56	74	52	59	70	91	83	65	55
Ruggles-Roxbury Crossing	47	53	58	52	66	48	55	63	82	73	59	53
Roxbury Crossing-Jackson Sq	48	49	56	48	62	44	52	59	76	66	54	48
Jackson Sq-Stony Brook	40	41	47	40	52	36	44	50	65	57	47	41
Stony Brook-Green St	35	36	41	34	45	31	37	43	54	47	39	34
Green St-Forest Hills	31	31	36	29	38	26	32	35	43	38	31	26

**Figure 15 Passengers per Vehicle
Green Line Southbound - AM
Base Year**

Route Segment (Branches)	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Lechmere-Science Park (E)	11	8	16	14	11	17	23	23	35	36	33	36
Science Park-North Station (E)	10	9	16	14	11	18	24	23	37	38	33	36
North Station-Haymarket (C,E)	11	22	25	20	27	32	37	45	67	64	66	49
Haymarket-Gov Ctr (C,E)	17	34	35	31	36	44	45	52	78	73	78	56
Gov Ctr-Park St (B,C,D,E)	29	44	46	42	41	51	48	46	57	63	64	45
Park St-Boylston (B,C,D,E)	28	42	51	55	52	68	68	68	79	88	84	71
Boylston-Arlington (B,C,D,E)	27	40	49	53	51	66	66	65	77	84	79	68
Arlington-Copley (B,C,D,E)	24	35	42	47	45	58	57	53	62	68	63	54
Copley-Hynes (B,C,D)	19	25	36	44	46	56	52	50	59	75	53	35
Hynes-Kenmore (B,C,D)	18	23	34	42	44	53	48	46	53	68	44	30
Copley-Prudential (E)	23	34	41	54	51	65	65	59	76	78	71	63
Prudential-Symphony (E)	20	30	36	49	47	56	54	48	59	63	54	51

**Figure 16 Passengers per Vehicle
Green Line Northbound - PM
Base Year**

Route Segment (Branches)	3:00PM - 3:15PM		3:15PM - 3:30PM		3:30PM - 3:45PM		3:45PM - 4:00PM		4:00PM - 4:15PM		4:15PM - 4:30PM		4:30PM - 4:45PM		4:45PM - 5:00PM		5:00PM - 5:15PM		5:15PM - 5:30PM		5:30PM - 5:45PM		5:45PM - 6:00PM	
	34	32	32	32	28	25	35	27	29	29	31	49	34	36	34	47	29	31	49	36	39	36	34	36
Science Park-Lechmere (E)	34	32	32	32	28	25	35	27	29	29	31	49	34	36	34	47	29	31	49	36	39	36	34	36
North Station-Science Park (E)	35	34	34	34	30	26	37	29	31	29	31	49	36	39	36	49	36	39	49	36	39	36	34	36
Haymarket-North Station (C,E)	28	32	32	33	33	29	40	37	43	37	43	60	43	42	43	60	43	43	60	43	42	42	41	41
Gov Ctr-Haymarket (C,E)	36	41	44	44	42	37	50	48	52	48	52	72	54	53	54	72	54	52	72	54	53	53	53	53
Park St-Gov Ctr (B,C,D,E)	42	51	51	51	49	41	53	54	49	54	49	64	47	51	49	64	47	49	64	47	51	49	49	49
Bolyston-Park St (B,C,D,E)	62	73	67	67	70	62	76	78	75	78	75	102	75	83	75	102	75	75	102	75	83	86	86	86
Arlington-Bolyston (B,C,D,E)	63	74	69	69	70	61	75	78	74	78	74	100	75	85	74	100	75	74	100	75	85	88	88	88
Copley-Arlington (B,C,D,E)	60	70	68	68	71	56	69	70	65	70	65	84	67	80	65	84	67	65	84	67	80	84	84	84
Hynes-Copley (B,C,D)	45	53	54	54	59	48	55	57	56	57	56	67	52	72	56	67	52	56	67	52	72	61	61	61
Kenmore-Hynes (B,C,D)	43	50	52	52	56	46	50	54	53	54	53	60	48	70	53	60	48	53	60	48	70	57	57	57
Prudential-Copley (E)	99	107	99	99	103	68	102	97	85	102	68	116	98	99	85	116	98	85	116	98	99	148	148	148
Symphony-Prudential (E)	94	97	87	87	95	59	90	88	73	90	59	96	83	81	73	96	83	73	96	83	81	133	133	133

**Figure 17 Passengers per Vehicle
Green Line Northbound - AM
Base Year**

Route Segment (Branches)	6:00AM · 6:15AM · 6:30AM · 6:45AM · 7:00AM · 7:15AM · 7:30AM · 7:45AM · 8:00AM · 8:15AM · 8:30AM · 8:45AM · 9:00AM													
	6:00AM	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM	
Science Park-Lechmere (E)	9	11	11	13	12	20	27	19	26	31	32	23		
North Station-Science Park (E)	12	12	13	14	13	22	32	23	30	38	39	26		
Haymarket-North Station (C,E)	8	11	9	9	11	15	23	17	22	27	28	20		
Gov Ctr-Haymarket (C,E)	8	12	9	11	13	17	27	20	25	32	34	26		
Park St-Gov Ctr (B,C,D,E)	8	13	10	14	15	19	30	23	37	44	42	33		
Bolyston-Park St (B,C,D,E)	9	14	11	17	22	28	48	37	62	74	72	53		
Arlington-Bolyston (B,C,D,E)	10	16	13	18	24	31	53	41	67	81	79	60		
Copley-Arlington (B,C,D,E)	11	17	14	20	26	34	60	46	75	89	87	69		
Hynes-Copley (B,C,D)	11	18	17	25	32	37	71	50	88	108	103	79		
Kenmore-Hynes (B,C,D)	11	18	16	24	31	37	70	50	89	110	103	81		
Prudential-Copley (E)	8	17	9	11	17	31	46	45	54	62	64	54		
Symphony-Prudential (E)	7	16	9	10	13	28	40	38	43	53	55	46		

**Figure 18 Passengers per Vehicle
Green Line Southbound - PM
Base Year**

Route Segment (Branches)	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Lechmere-Science Park (E)	21	25	31	28	25	33	25	27	34	62	41	31
Science Park-North Station (E)	25	29	36	32	29	39	29	31	40	74	45	38
North Station-Haymarket (C,E)	22	23	26	23	26	24	20	23	34	60	32	28
Haymarket-Gov Ctr (C,E)	28	29	35	28	31	29	26	28	41	67	37	32
Gov Ctr-Park St (B,C,D,E)	33	35	41	36	37	36	34	35	61	75	44	34
Park St-Boylston (B,C,D,E)	43	49	57	54	46	49	46	53	88	120	74	56
Boylston-Arlington (B,C,D,E)	46	50	60	58	50	52	49	57	96	126	79	62
Arlington-Copley (B,C,D,E)	48	53	64	64	53	54	55	63	108	135	85	69
Copley-Hynes (B,C,D)	50	53	66	66	54	59	62	70	122	150	97	80
Hynes-Kenmore (B,C,D)	48	49	60	64	54	57	60	70	121	145	95	80
Copley-Prudential (E)	40	47	50	50	49	45	42	51	86	105	65	54
Prudential-Symphony (E)	32	38	43	43	35	35	35	41	74	85	53	44

**Figure 19 Passengers per Vehicle
Blue Line Southbound - AM
Base Year**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Wonderland-Revere Beach	5	10	14	8	9	17	13	15	16	18	17	16
Revere Beach-Beachmont	8	15	20	12	13	23	18	20	21	24	22	22
Beachmont-Suffolk Downs	12	19	29	17	18	29	22	27	27	32	28	30
Suffolk Downs-Orient Heights	13	20	30	17	19	30	24	28	29	34	30	32
Orient Heights-Wood Island	18	28	38	24	25	39	30	37	37	42	40	41
Wood Island-Airport	21	31	43	26	28	43	33	39	41	46	44	44
Airport-Maverick	27	40	54	34	35	52	40	46	48	53	51	52
Maverick-Aquarium	46	55	77	49	46	71	54	61	62	70	66	65
Aquarium-State	43	52	73	45	43	66	49	54	56	62	59	57
State-Govt Ctr	26	29	45	26	28	43	33	33	33	39	38	34
Gov Ctr-Bowdoin	2	3	7	3	4	4	5	5	5	5	4	4

**Figure 20 Passengers per Vehicle
Blue Line Northbound - PM
Base Year**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Revere Beach-Wonderland	6	7	7	9	12	10	12	17	21	15	14	13
Beachmont-Revere Beach	9	12	11	13	17	15	17	22	27	19	18	16
Suffolk Downs-Beachmont	12	16	15	17	22	20	23	28	36	25	24	21
Orient Heights-Suffolk Downs	13	17	16	18	24	21	24	29	39	26	25	22
Wood Island-Orient Heights	18	22	22	23	31	27	30	37	51	33	32	28
Airport-Wood Island	20	25	25	26	34	29	33	39	54	35	35	30
Maverick-Airport	25	32	31	32	40	37	40	46	63	42	41	35
Aquarium-Maverick	36	47	42	45	54	50	52	58	77	54	52	45
State-Aquarium	34	45	40	43	49	46	49	53	69	49	47	42
Gov Ctr-State	23	29	27	29	30	31	32	33	41	30	31	27
Bowdoin- Gov Ctr	3	3	3	4	5	4	4	5	7	5	3	3

**Figure 22 Passengers per Vehicle
Blue Line Southbound - PM
Base Year**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Wonderland-Revere Beach	2	3	3	2	3	3	2	3	3	2	1	3
Revere Beach-Beachmont	4	6	5	4	4	6	3	5	5	5	3	4
Beachmont-Suffolk Downs	6	7	7	6	6	7	5	6	7	6	5	5
Suffolk Downs-Orient Heights	6	7	7	6	6	8	5	6	8	6	6	6
Orient Heights-Wood Island	8	9	9	8	8	10	7	8	9	8	7	7
Wood Island-Airport	8	11	10	10	9	12	9	10	11	9	8	7
Airport-Maverick	12	16	15	15	13	17	13	16	17	14	13	11
Maverick-Aquarium	18	23	22	20	20	21	19	23	23	21	17	14
Aquarium-State	18	21	21	19	19	21	19	22	24	21	17	15
State-Govt Ctr	13	15	14	14	14	14	12	14	15	13	11	9
Gov Ctr-Bowdoin	0	1	1	1	0	0	0	0	1	0	0	0

Reverse of Figure 22 data

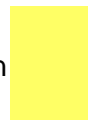
Appendix G

Passengers per Vehicle in the 2040 No- Build Scenario

Appendix F shows the passengers per vehicle that were used for the 2040 No-Build Scenario in Figures 7 through 22.

The route segments and time periods with crowding are highlighted and indicate the crowding icon that is used in Figures 7 through 22.

Indicates "Overburdened" Icon



Indicates "Overcrowded" Icon



Indicates "Unacceptable" Icon



**Figure 7 Passengers per Vehicle
Red Line Southbound - AM
2040 No Build**

Route Segment (Branch)	6:00AM - 6:15AM		6:30AM - 6:45AM		7:00AM - 7:15AM		7:30AM - 7:45AM		7:45AM - 8:00AM		8:00AM - 8:15AM		8:15AM - 8:30AM		8:30AM - 8:45AM		8:45AM - 9:00AM		
	6:00AM	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM	8:45AM	9:00AM
Alewife-Davis	4	8	8	7	17	14	20	25	32	29	31	38	34						
Davis-Porter	8	14	14	14	32	28	39	48	64	61	66	84	78						
Porter-Harvard	11	18	17	17	45	34	47	66	88	82	86	120	98						
Harvard-Central	16	24	24	24	52	42	60	79	99	93	105	140	114						
Central-Kendall	19	33	33	28	59	49	70	88	112	110	127	161	137						
Kendall-Charles/MGH	19	33	33	27	54	47	67	82	100	101	116	141	121						
Charles/MGH-Park St	16	28	28	21	44	44	61	75	90	94	108	130	113						
Park St-Downtown Crossing	16	29	29	19	40	45	53	60	67	73	80	95	75						
Downtown Crossing-South Station	18	37	37	23	45	55	58	58	60	64	69	78	62						
South Station-Broadway	13	27	27	17	33	42	40	32	28	27	27	29	27						
Broadway-Andrew	13	25	25	16	32	41	39	30	26	25	25	27	25						
Andrew-JFK/UMASS	11	21	21	15	31	39	37	29	24	23	24	26	24						
JFK/UMASS-N Quincy (Braintree)	8	16	16	12	17	34	24	20	23	22	18	15	15						
N Quincy-Wollaston (Braintree)	7	14	14	9	14	28	16	14	15	15	11	11	12						
Wollaston-Quincy Ctr (Braintree)	7	14	14	9	15	29	15	13	14	14	11	10	12						
Quincy Ctr-Quincy Adams (Braintree)	5	9	9	5	6	10	6	5	7	6	5	4	4						
Quincy Adams-Braintree (Braintree)	3	5	5	3	3	6	3	2	2	3	1	1	2						
JFK/UMASS-Savin Hill (Ashmont)	8	11	11	11	20	14	11	9	11	9	8	8	8						
Savin Hill-Fields Corner (Ashmont)	8	10	10	11	15	11	10	9	11	8	7	7	7						
Fields Corner-Shawmut (Ashmont)	8	8	8	11	15	10	8	6	8	7	5	5	6						
Shawmut-Ashmont (Ashmont)	8	8	8	10	14	9	7	5	6	5	4	4	6						

**Figure 8 Passengers per Vehicle
Red Line Northbound - PM
2040 No Build**

Route Segment (Branch)	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Davis-Alewife	13	10	11	18	18	20	28	23	32	36	28	23
Porter-Davis	25	20	22	34	30	35	49	45	66	75	62	51
Harvard-Porter	33	26	29	42	40	53	62	60	91	100	82	67
Central-Harvard	47	39	41	59	52	68	84	76	116	134	107	86
Kendall-Central	55	45	47	69	59	74	95	82	132	156	131	101
Charles/MGH-Kendall	54	44	46	66	55	64	88	70	118	144	121	93
Park St-Charles/MGH	58	45	44	65	52	61	81	66	109	136	114	88
Downtown Crossing-Park St	49	40	39	57	40	50	63	53	79	108	93	65
South Station-Downtown Crossing	53	45	45	64	39	49	63	53	67	98	88	59
Broadway-South Station	44	38	37	52	26	34	39	32	32	48	46	29
Andrew-Broadway	43	37	36	49	25	33	37	31	30	44	43	28
JFK/UMASS-Andrew	39	34	32	44	23	29	35	28	27	39	39	26
N Quincy-JFK/UMASS (Braintree)	32	22	23	34	20	25	34	26	23	47	32	26
Wollaston-N Quincy (Braintree)	27	19	19	28	15	19	26	20	18	28	22	20
Quincy Ctr-Wollaston (Braintree)	27	17	17	25	14	17	24	19	16	25	20	19
Quincy Adams-Quincy Ctr (Braintree)	10	6	9	14	7	9	13	11	9	12	11	12
Braintree-Quincy Adams (Braintree)	7	4	5	7	5	6	8	5	5	6	6	4
Savin Hill-JFK/UMASS (Ashmont)	30	29	23	29	15	20	22	16	20	18	21	12
Fields Corner-Savin Hill (Ashmont)	39	34	32	44	23	29	35	28	27	39	39	26
Shawmut-Fields Corner (Ashmont)	43	37	36	49	25	33	37	31	30	44	43	28
Ashmont-Shawmut (Ashmont)	44	38	37	52	26	34	39	32	32	48	46	29

**Figure 9 Passengers per Vehicle
Red Line Northbound - AM
2040 No Build**

Route Segment (Branch)	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Davis-Alewife	5	7	6	7	7	8	10	10	10	8	6	6
Porter-Davis	6	7	7	8	11	10	10	12	12	12	9	9
Harvard-Porter	6	9	9	11	14	12	12	16	15	15	12	12
Central-Harvard	13	20	17	20	28	26	27	35	34	38	37	28
Kendall-Central	15	25	21	28	36	33	35	45	44	47	48	34
Charles/MGH-Kendall	19	34	31	38	48	46	51	69	68	75	73	56
Park St-Charles/MGH	30	56	52	57	65	61	69	89	84	88	85	66
Downtown Crossing-Park St	31	58	59	72	82	75	85	115	111	112	107	93
South Station-Downtown Crossing	32	61	64	79	87	81	90	128	126	122	118	110
Broadway-South Station	40	62	69	84	95	90	105	143	144	137	140	138
Andrew-Broadway	41	63	71	87	98	92	106	146	145	135	138	137
JFK/UMASS-Andrew	37	57	64	83	90	86	98	134	133	123	127	125
N Quincy-JFK/UMASS (Braintree)	46	116	69	127	126	113	169	144	166	172	173	154
Wollaston-N Quincy (Braintree)	38	94	58	104	103	91	140	120	132	137	137	116
Quincy Ctr-Wollaston (Braintree)	30	80	47	85	86	74	116	97	109	108	111	96
Quincy Adams-Quincy Ctr (Braintree)	20	49	31	56	53	47	74	61	69	59	60	55
Braintree-Quincy Adams (Braintree)	13	33	23	35	35	32	48	42	40	29	21	23
Savin Hill-JFK/UMASS (Ashmont)	53	51	58	92	77	106	80	113	80	79	102	95
Fields Corner-Savin Hill (Ashmont)	50	44	52	82	72	100	74	100	67	66	88	81
Shawmut-Fields Corner (Ashmont)	36	32	35	60	53	77	58	74	56	53	72	66
Ashmont-Shawmut (Ashmont)	30	21	28	48	41	62	44	59	42	40	56	50

**Figure 10 Passengers per Vehicle
Red Line Southbound - PM
2040 No Build**

Route Segment (Branch)	3:00PM - 3:15PM - 3:30PM - 3:45PM - 4:00PM - 4:15PM - 4:30PM - 4:45PM - 5:00PM - 5:15PM - 5:30PM - 5:45PM - 6:00PM											
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM
Alewife-Davis	7	7	7	6	6	7	8	7	8	9	9	9
Davis-Porter	15	16	13	12	13	12	15	12	14	15	15	15
Porter-Harvard	18	21	16	15	17	15	18	15	18	20	18	18
Harvard-Central	37	47	40	34	37	39	36	28	40	46	36	36
Central-Kendall	46	55	50	41	47	47	46	35	54	57	45	44
Kendall-Charles/MGH	56	65	61	48	67	61	64	50	81	82	62	60
Charles/MGH-Park St	69	77	85	60	88	74	86	61	103	95	73	69
Park St-Downtown Crossing	81	88	91	71	111	84	103	76	132	108	82	79
Downtown Crossing-South Station	84	92	91	73	114	87	109	83	144	112	86	81
South Station-Broadway	90	97	94	78	124	97	117	95	176	124	102	94
Broadway-Andrew	94	99	96	79	129	99	119	98	179	125	102	95
Andrew-JFK/UMASS	86	90	90	74	122	93	112	92	164	116	94	87
JFK/UMASS-N Quincy (Braintree)	93	99	80	89	159	135	119	110	157	142	108	96
N Quincy-Wollaston (Braintree)	79	83	69	75	131	111	95	90	128	116	86	76
Wollaston-Quincy Ctr (Braintree)	69	70	59	62	108	95	78	74	107	95	71	64
Quincy Ctr-Quincy Adams (Braintree)	39	40	37	38	66	56	47	43	62	52	40	35
Quincy Adams-Braintree (Braintree)	24	23	22	24	40	33	28	24	32	26	19	16
JFK/UMASS-Savin Hill (Ashmont)	74	71	89	56	79	54	86	60	146	74	64	62
Savin Hill-Fields Corner (Ashmont)	73	66	80	51	70	48	76	54	128	65	56	51
Fields Corner-Shawmut (Ashmont)	55	47	64	38	52	38	58	44	98	51	44	41
Shawmut-Ashmont (Ashmont)	45	38	50	30	39	29	43	33	76	39	35	31

**Figure 11 Passengers per Vehicle
Orange Line Southbound - AM
2040 No Build**

Route Segment	6:00AM	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM
Oak Grove-Malden Ctr	15	15	20	17	23	29	35	26	30	39	44	31	31
Malden Ctr-Wellington	32	37	37	41	48	63	71	54	72	93	110	83	83
Wellington-Assembly	40	45	50	54	58	74	87	66	90	114	137	106	106
Assembly-Sullivan Sq	46	51	57	62	66	85	99	75	103	131	157	122	122
Sullivan Sq-Community College	59	62	63	69	70	87	103	84	111	137	164	127	127
Community College-North Station	66	70	68	75	75	98	114	92	120	148	182	142	142
North Station-Haymarket	57	70	73	71	80	103	121	105	146	155	209	148	148
Haymarket-State	56	72	72	70	76	96	112	96	135	141	191	134	134
State-Downtown Crossing	55	70	70	65	68	85	92	77	106	108	147	101	101
Downtown Crossing-Chinatown	57	68	74	69	66	89	92	79	105	108	148	106	106
Chinatown-Tufts Medical Ctr	52	65	69	64	63	84	86	73	96	98	133	94	94
Tufts Medical Ctr-Back Bay	43	53	55	51	50	67	68	58	75	77	107	76	76
Back Bay-Mass Ave	29	37	41	36	33	41	40	28	37	37	47	36	36
Mass Ave-Ruggles	28	36	39	35	30	37	36	25	32	33	40	30	30
Ruggles-Roxbury Crossing	17	23	24	22	17	19	15	13	14	16	19	13	13
Roxbury Crossing-Jackson Sq	15	19	20	18	13	14	13	11	12	13	15	11	11
Jackson Sq-Stony Brook	17	19	21	17	11	12	11	9	10	11	12	9	9
Stony Brook-Green St	18	19	21	17	11	11	11	9	9	10	10	7	7
Green St-Forest Hills	18	18	19	15	9	8	8	6	7	8	7	6	6

**Figure 12 Passengers per Vehicle
Orange Line Northbound - PM
2040 No Build**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Malden Ctr-Oak Grove	10	11	13	16	22	19	23	25	35	32	26	23
Wellington-Malden Ctr	31	29	31	40	47	42	51	55	82	74	65	57
Assembly-Wellington	40	37	41	52	59	51	65	66	102	91	82	71
Sullivan Sq-Assembly	55	51	56	72	82	71	89	91	141	125	113	98
Community College-Sullivan Sq	53	49	53	66	74	63	79	80	121	111	101	86
North Station-Community College	64	61	61	73	83	71	89	91	135	129	120	100
Haymarket-North Station	63	60	64	79	89	77	93	104	153	138	123	104
State-Haymarket	59	58	60	75	82	71	86	95	139	129	115	98
Downtown Crossing-State	56	58	58	71	74	62	74	78	111	108	94	83
Chinatown-Downtown Crossing	65	69	63	76	80	66	80	82	114	116	98	89
Tufts Medical Ctr-Chinatown	60	65	60	72	73	61	75	76	105	110	93	84
Back Bay-Tufts Medical Ctr	52	57	50	60	59	50	61	63	85	92	79	70
Mass Ave-Back Bay	41	50	42	51	44	36	42	44	48	54	48	43
Ruggles-Mass Ave	39	48	41	49	41	34	39	41	45	50	44	39
Roxbury Crossing-Ruggles	25	34	29	32	27	22	22	22	27	27	27	23
Jackson Sq-Roxbury Crossing	22	24	26	27	24	18	19	20	24	24	23	21
Stony Brook-Jackson Sq	19	23	24	23	21	15	16	16	20	18	19	17
Green St-Stony Brook	17	20	22	20	18	13	14	14	17	15	16	16
Forest Hills-Green St	15	18	16	13	16	11	11	11	14	12	13	12

**Figure 13 Passengers per Vehicle
Orange Line Northbound - AM
2040 No Build**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Malden Ctr-Oak Grove	2	2	1	2	1	1	1	1	1	1	1	1
Wellington-Malden Ctr	5	6	5	8	5	5	5	7	9	6	6	5
Assembly-Wellington	9	10	9	12	8	9	9	12	15	10	10	8
Sullivan Sq-Assembly	13	14	13	17	12	13	13	17	22	14	14	11
Community College-Sullivan Sq	15	17	17	21	15	15	16	18	22	16	15	12
North Station-Community College	19	26	33	34	21	21	26	33	43	27	24	20
Haymarket-North Station	26	33	44	46	30	30	38	45	54	43	39	36
State-Haymarket	27	34	46	49	32	32	43	51	60	50	48	45
Downtown Crossing-State	26	32	49	51	36	37	50	61	75	67	70	67
Chinatown-Downtown Crossing	35	38	60	68	50	55	69	80	97	95	104	98
Tufts Medical Ctr-Chinatown	36	39	62	70	51	57	72	85	101	100	112	105
Back Bay-Tufts Medical Ctr	34	38	59	65	47	54	71	83	101	99	108	101
Mass Ave-Back Bay	39	39	56	68	47	60	70	83	96	88	107	91
Ruggles-Mass Ave	40	39	55	68	47	59	69	81	94	86	106	91
Roxbury Crossing-Ruggles	39	31	51	63	47	60	66	79	90	81	102	87
Jackson Sq-Roxbury Crossing	37	30	49	62	48	60	65	75	85	75	96	80
Stony Brook-Jackson Sq	33	27	41	55	41	55	58	66	76	69	89	72
Green St-Stony Brook	29	23	36	49	36	48	49	55	62	56	71	55
Forest Hills-Green St	24	18	30	41	30	41	40	44	47	43	54	39

**Figure 14 Passengers per Vehicle
Orange Line Southbound - PM
2040 No Build**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Oak Grove-Malden Ctr	3	4	3	4	3	2	2	2	3	2	2	2
Malden Ctr-Wellington	11	16	12	14	9	10	12	11	11	12	10	10
Wellington-Assembly	16	22	19	21	13	16	17	16	17	18	16	14
Assembly-Sullivan Sq	13	19	16	18	11	13	14	14	14	16	14	12
Sullivan Sq-Community College	26	33	29	30	19	23	24	25	24	28	22	20
Community College-North Station	33	41	35	49	29	31	32	31	33	46	31	26
North Station-Haymarket	36	48	42	54	36	37	42	42	44	59	40	34
Haymarket-State	40	52	45	57	41	40	47	48	52	62	44	36
State-Downtown Crossing	46	54	49	58	46	44	55	57	71	71	54	45
Downtown Crossing-Chinatown	65	77	71	77	59	58	78	77	97	99	81	68
Chinatown-Tufts Medical Ctr	65	76	70	76	60	59	78	79	100	102	82	71
Tufts Medical Ctr-Back Bay	60	71	65	71	57	56	74	76	96	95	77	67
Back Bay-Mass Ave	61	68	60	66	55	53	72	72	95	90	74	63
Mass Ave-Ruggles	62	68	59	66	55	53	73	71	93	87	73	61
Ruggles-Roxbury Crossing	53	61	52	60	49	48	67	64	83	76	66	58
Roxbury Crossing-Jackson Sq	54	56	51	56	46	44	64	59	77	69	61	52
Jackson Sq-Stony Brook	47	49	45	49	41	39	58	54	69	63	56	47
Stony Brook-Green St	40	42	38	42	34	33	47	45	57	51	45	38
Green St-Forest Hills	34	34	32	34	28	26	38	34	42	38	34	28

**Figure 15 Passengers per Vehicle
Green Line Southbound - AM
2040 No Build**

Route Segment (Branches)	6:00AM - 6:15AM · 6:30AM · 6:45AM · 7:00AM · 7:15AM · 7:30AM · 7:45AM · 8:00AM · 8:15AM · 8:30AM · 8:45AM -		6:15AM · 6:30AM · 6:45AM · 7:00AM · 7:15AM · 7:30AM · 7:45AM · 8:00AM · 8:15AM · 8:30AM · 8:45AM · 9:00AM	
	6	5	9	7
Lechmere-Science Park (E)	6	5	9	7
Science Park-North Station (E)	6	5	9	7
North Station-Haymarket (C,E)	8	16	18	15
Haymarket-Gov Ctr (C,E)	11	22	23	20
Gov Ctr-Park St (B,C,D,E)	26	39	41	37
Park St-Boylston (B,C,D,E)	28	41	50	54
Boylston-Arlington (B,C,D,E)	28	41	50	54
Arlington-Copley (B,C,D,E)	24	35	42	47
Copley-Hynes (B,C,D)	19	25	36	44
Hynes-Kenmore (B,C,D)	19	24	35	43
Copley-Prudential (E)	25	36	44	58
Prudential-Symphony (E)	21	32	38	51

**Figure 17 Passengers per Vehicle
Green Line Northbound - AM
2040 No Build**

Route Segment (Branches)	6:00AM · 6:15AM · 6:30AM · 6:45AM · 7:00AM · 7:15AM · 7:30AM · 7:45AM · 8:00AM · 8:15AM · 8:30AM · 8:45AM · 9:00AM															
	6:00AM	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM	9:15AM	9:30AM	9:45AM
Science Park-Lechmere (E)	5	6	6	6	7	6	10	13	9	13	16	16	12			
North Station-Science Park (E)	6	7	7	7	8	7	11	16	12	16	19	20	13			
Haymarket-North Station (C,E)	5	8	8	6	6	8	10	16	12	15	18	19	13			
Gov Ctr-Haymarket (C,E)	6	8	8	6	7	8	10	17	13	16	21	22	17			
Park St-Gov Ctr (B,C,D,E)	7	13	10	10	13	14	17	28	22	35	41	39	31			
Bolyston-Park St (B,C,D,E)	8	14	11	11	17	22	28	48	36	61	74	71	53			
Arlington-Bolyston (B,C,D,E)	10	16	13	13	19	24	31	54	41	68	82	79	61			
Copley-Arlington (B,C,D,E)	10	17	14	14	20	26	34	59	46	74	89	87	68			
Hynes-Copley (B,C,D)	12	18	17	17	25	32	37	72	51	89	109	104	80			
Kenmore-Hynes (B,C,D)	12	19	17	17	25	33	39	74	52	93	115	108	84			
Prudential-Copley (E)	9	18	10	10	11	17	33	49	47	56	65	68	56			
Symphony-Prudential (E)	7	16	9	9	10	13	29	41	39	44	54	56	48			

**Figure 18 Passengers per Vehicle
Green Line Southbound - PM
2040 No Build**

Route Segment (Branches)	3:00PM - 3:15PM - 3:30PM - 3:45PM - 4:00PM - 4:15PM - 4:30PM - 4:45PM - 5:00PM - 5:15PM - 5:30PM - 5:45PM - 6:00PM															
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM	5:15PM	5:30PM	5:45PM	6:00PM
Lechmere-Science Park (E)	11	14	17	15	13	18	13	14	17	31	21	16	17	31	21	16
Science Park-North Station (E)	13	16	20	17	16	21	16	17	21	38	23	20	17	38	23	20
North Station-Haymarket (C,E)	16	16	19	16	19	17	15	16	23	41	21	19	23	41	21	19
Haymarket-Gov Ctr (C,E)	19	19	23	19	21	20	17	19	26	42	24	20	26	42	24	20
Gov Ctr-Park St (B,C,D,E)	31	32	38	33	34	33	31	32	56	69	41	32	56	69	41	32
Park St-Boylston (B,C,D,E)	43	48	57	53	45	49	46	52	88	119	74	55	88	119	74	55
Boylston-Arlington (B,C,D,E)	46	51	60	59	50	52	50	58	97	127	80	62	97	127	80	62
Arlington-Copley (B,C,D,E)	48	52	63	63	53	54	55	62	107	134	85	68	107	134	85	68
Copley-Hynes (B,C,D)	51	53	67	66	55	59	62	71	123	151	98	80	123	151	98	80
Hynes-Kenmore (B,C,D)	50	51	63	67	56	59	63	73	126	152	99	83	126	152	99	83
Copley-Prudential (E)	42	49	53	52	51	47	44	53	90	110	68	56	90	110	68	56
Prudential-Symphony (E)	33	39	44	44	44	36	35	42	76	87	55	45	76	87	55	45

**Figure 19 Passengers per Vehicle
Blue Line Southbound - AM
2040 No Build**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Wonderland-Revere Beach	5	10	15	8	9	17	13	15	16	19	17	17
Revere Beach-Beachmont	10	17	23	14	14	26	20	23	24	28	25	25
Beachmont-Suffolk Downs	14	23	34	20	21	35	27	33	33	39	34	37
Suffolk Downs-Orient Heights	14	22	33	19	21	34	26	32	32	38	33	36
Orient Heights-Wood Island	17	27	37	23	24	37	29	35	36	41	39	40
Wood Island-Airport	21	30	42	25	27	42	32	38	40	44	42	43
Airport-Maverick	32	48	63	40	41	61	47	54	57	63	61	62
Maverick-Aquarium	54	65	92	58	54	84	64	72	73	83	79	77
Aquarium-State	51	62	86	53	51	78	58	64	66	74	70	67
State-Govt Ctr	29	33	50	29	31	48	36	37	37	43	42	38
Gov Ctr-Bowdoin	2	3	7	4	4	5	5	6	6	6	5	4

**Figure 20 Passengers per Vehicle
Blue Line Northbound - PM
2040 No Build**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Revere Beach-Wonderland	6	7	7	9	12	11	13	17	22	15	14	13
Beachmont-Revere Beach	10	13	13	14	19	17	19	24	30	21	20	18
Suffolk Downs-Beachmont	14	19	18	20	26	23	26	33	42	29	28	24
Orient Heights-Suffolk Downs	15	18	18	19	26	23	26	32	42	29	27	24
Wood Island-Orient Heights	17	21	21	23	30	26	29	36	49	32	31	27
Airport-Wood Island	19	24	24	25	33	29	32	38	53	34	34	29
Maverick-Airport	29	37	35	37	46	42	46	53	72	48	47	40
Aquarium-Maverick	42	54	48	52	62	58	61	68	89	63	60	52
State-Aquarium	39	52	46	50	57	53	57	61	80	57	54	48
Gov Ctr-State	26	32	30	32	33	34	35	37	45	33	34	29
Bowdoin- Gov Ctr	3	3	4	4	5	5	4	6	8	5	3	3

**Figure 22 Passengers per Vehicle
Blue Line Southbound - PM
2040 No Build**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Wonderland-Revere Beach	2	3	3	2	3	3	2	3	3	2	2	3
Revere Beach-Beachmont	5	6	5	5	5	6	4	5	5	5	4	4
Beachmont-Suffolk Downs	6	7	7	6	6	8	5	6	7	6	5	5
Suffolk Downs-Orient Heights	6	8	7	6	7	8	5	6	8	6	6	6
Orient Heights-Wood Island	7	9	9	8	8	10	7	8	9	8	7	7
Wood Island-Airport	8	10	10	9	9	12	8	10	11	9	8	7
Airport-Maverick	13	16	15	15	13	17	13	16	18	15	13	11
Maverick-Aquarium	19	24	23	21	21	22	20	24	24	22	18	15
Aquarium-State	19	22	22	20	20	22	20	23	25	22	18	15
State-Govt Ctr	13	15	15	14	14	14	13	14	15	13	12	9
Gov Ctr-Bowdoin	0	1	1	1	0	0	0	0	1	0	0	0

Reverse of Figure 22 data

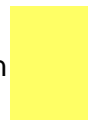
Appendix H

Passengers per Vehicle in the 2040 Build Scenario

Appendix F shows the passengers per vehicle that were used for the 2040 Build Scenario in Figures 7 through 22.

The route segments and time periods with crowding are highlighted and indicate the crowding icon that is used in Figures 7 through 22.

Indicates "Overburdened" Icon



Indicates "Overcrowded" Icon



Indicates "Unacceptable" Icon



**Figure 8 Passengers per Vehicle
Red Line Northbound - PM
2040 Build**

Route Segment (Branch)	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Davis-Alewife	14	11	12	19	18	21	29	24	34	38	29	24
Porter-Davis	26	21	23	35	32	36	51	47	70	79	65	53
Harvard-Porter	34	28	30	44	42	55	65	63	95	105	86	71
Central-Harvard	49	41	43	62	55	72	89	81	123	141	114	91
Kendall-Central	58	48	50	74	63	79	101	88	141	167	140	108
Charles/MGH-Kendall	59	48	49	71	59	69	95	76	127	155	130	100
Park St-Charles/MGH	63	49	48	71	57	66	89	72	119	149	125	96
Downtown Crossing-Park St	55	45	44	64	44	56	70	59	88	121	104	73
South Station-Downtown Crossing	59	50	50	71	43	55	71	59	76	110	99	66
Broadway-South Station	54	46	46	64	32	42	48	40	39	59	56	35
Andrew-Broadway	53	46	45	61	31	40	46	38	37	54	53	34
JFK/UMASS-Andrew	46	40	37	52	27	34	41	33	32	46	46	30
N Quincy-JFK/UMASS (Braintree)	38	26	27	40	23	29	39	31	26	55	38	30
Wollaston-N Quincy (Braintree)	32	23	23	33	18	23	31	24	22	33	26	24
Quincy Ctr-Wollaston (Braintree)	31	20	20	29	16	20	28	22	19	29	23	22
Quincy Adams-Quincy Ctr (Braintree)	12	7	11	16	9	10	15	13	11	14	12	14
Braintree-Quincy Adams (Braintree)	8	4	6	9	5	7	9	6	5	6	7	4
Savin Hill-JFK/UMASS (Ashmont)	33	32	25	32	17	22	24	18	22	20	23	13
Fields Corner-Savin Hill (Ashmont)	31	28	20	28	15	18	21	16	20	17	19	11
Shawmut-Fields Corner (Ashmont)	26	27	13	19	11	13	15	11	13	11	12	8
Ashmont-Shawmut (Ashmont)	24	25	10	15	9	10	13	9	11	9	9	7

**Figure 9 Passengers per Vehicle
Red Line Northbound - AM
2040 Build**

Route Segment (Branch)	6:00AM · 6:15AM · 6:30AM · 6:45AM · 7:00AM · 7:15AM · 7:30AM · 7:45AM · 7:30AM · 7:15AM · 7:00AM · 6:45AM · 6:30AM · 6:15AM · 6:00AM · 8:00AM · 8:15AM · 8:30AM · 8:45AM · 8:00AM · 8:15AM · 8:30AM · 8:45AM · 9:00AM													
	6	7	6	7	8	8	8	8	8	10	10	8	6	6
Davis-Alewife	6	7	6	7	8	8	8	8	8	10	10	8	6	6
Porter-Davis	7	8	8	9	12	11	11	11	11	14	14	13	10	10
Harvard-Porter	7	10	10	12	16	14	13	13	13	18	16	17	13	13
Central-Harvard	14	22	19	22	30	28	29	29	29	38	37	42	40	30
Kendall-Central	16	27	23	30	39	36	38	38	38	49	48	51	52	36
Charles/MGH-Kendall	20	37	33	41	51	49	54	54	54	74	73	80	78	59
Park St-Charles/MGH	32	60	55	60	68	64	73	73	73	94	89	93	90	70
Downtown Crossing-Park St	33	62	63	77	88	80	91	91	91	122	118	119	114	99
South Station-Downtown Crossing	35	68	70	88	96	89	100	100	100	141	139	134	130	121
Broadway-South Station	44	68	76	92	104	98	114	114	114	156	158	150	153	151
Andrew-Broadway	45	69	77	95	107	100	116	116	116	159	158	147	150	150
JFK/UMASS-Andrew	40	61	69	89	97	92	106	106	106	144	143	132	136	134
N Quincy-JFK/UMASS (Braintree)	50	125	75	138	136	122	183	183	183	156	179	186	187	166
Wollaston-N Quincy (Braintree)	41	102	62	112	111	98	151	151	151	129	142	148	147	125
Quincy Ctr-Wollaston (Braintree)	32	86	50	91	93	80	125	125	125	104	117	116	120	104
Quincy Adams-Quincy Ctr (Braintree)	22	53	34	60	57	50	79	79	79	65	74	63	64	59
Braintree-Quincy Adams (Braintree)	14	35	24	37	37	33	51	51	51	44	43	31	22	25
Savin Hill-JFK/UMASS (Ashmont)	56	54	61	97	81	112	84	84	84	119	84	83	107	100
Fields Corner-Savin Hill (Ashmont)	53	46	55	87	76	106	78	78	78	105	70	69	92	86
Shawmut-Fields Corner (Ashmont)	37	33	37	63	55	80	60	60	60	78	58	55	75	69
Ashmont-Shawmut (Ashmont)	31	22	29	50	43	64	46	46	46	62	43	42	58	52

**Figure 10 Passengers per Vehicle
Red Line Southbound - PM
2040 Build**

Route Segment (Branch)	3:00PM - 3:15PM - 3:30PM - 3:45PM - 4:00PM - 4:15PM - 4:30PM - 4:45PM - 5:00PM - 5:15PM - 5:30PM - 5:45PM - 6:00PM											
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM
Alewife-Davis	7	8	7	6	7	9	9	7	9	9	10	10
Davis-Porter	16	17	14	13	14	13	16	13	15	16	16	16
Porter-Harvard	20	22	18	16	18	17	19	16	20	22	20	20
Harvard-Central	40	50	42	36	39	41	39	30	43	49	39	38
Central-Kendall	50	59	53	44	51	51	49	38	58	61	48	47
Kendall-Charles/MGH	59	69	65	51	71	65	67	53	86	87	65	63
Charles/MGH-Park St	73	81	89	63	92	78	90	65	108	100	77	73
Park St-Downtown Crossing	87	94	97	76	119	90	110	81	142	115	87	84
Downtown Crossing-South Station	94	102	101	81	127	97	121	92	159	125	95	90
South Station-Broadway	100	107	104	86	136	106	129	105	193	136	112	103
Broadway-Andrew	103	109	106	87	141	109	131	108	196	138	112	104
Andrew-JFK/UMASS	93	98	97	80	131	100	121	99	177	126	101	94
JFK/UMASS-N Quincy (Braintree)	101	108	87	97	172	146	129	120	170	155	117	104
N Quincy-Wollaston (Braintree)	86	89	74	81	141	120	103	97	138	125	93	82
Wollaston-Quincy Ctr (Braintree)	74	76	64	67	116	103	84	79	115	102	76	69
Quincy Ctr-Quincy Adams (Braintree)	42	43	40	40	71	61	50	46	67	55	43	37
Quincy Adams-Braintree (Braintree)	25	25	23	25	43	35	30	25	34	28	20	17
JFK/UMASS-Savin Hill (Ashmont)	79	75	94	59	84	57	91	64	156	78	68	66
Savin Hill-Fields Corner (Ashmont)	78	70	85	54	75	51	81	58	136	69	60	55
Fields Corner-Shawmut (Ashmont)	58	49	67	40	54	40	61	46	103	53	47	43
Shawmut-Ashmont (Ashmont)	47	40	52	32	41	30	45	35	79	41	36	33

**Figure 11 Passengers per Vehicle
Orange Line Southbound - AM
2040 Build**

Route Segment	6:00AM - 6:15AM	6:15AM - 6:30AM	6:30AM - 6:45AM	6:45AM - 7:00AM	7:00AM - 7:15AM	7:15AM - 7:30AM	7:30AM - 7:45AM	7:45AM - 8:00AM	8:00AM - 8:15AM	8:15AM - 8:30AM	8:30AM - 8:45AM	8:45AM - 9:00AM
Oak Grove-Malden Ctr	16	16	22	18	25	31	37	28	32	42	47	33
Malden Ctr-Wellington	35	41	41	45	52	69	78	59	79	102	120	92
Wellington-Assembly	44	50	55	60	65	83	97	73	100	127	152	118
Assembly-Sullivan Sq	55	62	69	75	80	103	120	91	124	158	189	147
Sullivan Sq-Community College	71	75	76	83	84	105	124	101	134	166	199	154
Community College-North Station	78	83	82	89	90	117	136	110	143	177	218	169
North Station-Haymarket	68	83	86	84	95	122	144	125	174	183	247	176
Haymarket-State	67	86	85	83	91	115	133	115	161	168	228	159
State-Downtown Crossing	68	87	87	82	84	107	115	96	132	135	184	126
Downtown Crossing-Chinatown	67	80	87	81	78	105	109	93	124	127	174	125
Chinatown-Tufts Medical Ctr	61	76	82	75	74	99	101	86	114	115	156	111
Tufts Medical Ctr-Back Bay	52	64	67	62	60	82	83	70	91	94	130	92
Back Bay-Mass Ave	40	51	56	49	44	55	55	38	50	51	64	49
Mass Ave-Ruggles	39	50	54	48	42	52	50	35	44	46	56	42
Ruggles-Roxbury Crossing	20	27	29	26	21	23	18	15	17	19	23	16
Roxbury Crossing-Jackson Sq	19	24	26	23	17	18	17	14	15	16	19	14
Jackson Sq-Stony Brook	22	24	26	22	14	15	14	12	13	14	15	11
Stony Brook-Green St	23	24	26	21	14	14	14	11	11	12	12	9
Green St-Forest Hills	23	22	25	19	12	10	10	8	8	10	9	8

**Figure 12 Passengers per Vehicle
Orange Line Northbound - PM
2040 Build**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Malden Ctr-Oak Grove	11	12	14	18	24	20	25	28	38	35	28	25
Wellington-Malden Ctr	34	32	35	45	52	46	56	61	91	82	72	63
Assembly-Wellington	45	42	46	59	67	58	73	75	115	102	92	80
Sullivan Sq-Assembly	65	61	67	86	97	84	106	109	168	149	135	117
Community College-Sullivan Sq	65	60	65	81	91	77	96	99	149	136	124	106
North Station-Community College	77	73	74	88	99	86	108	109	163	156	145	120
Haymarket-North Station	75	72	76	94	107	92	112	124	183	166	147	125
State-Haymarket	71	69	73	91	99	86	104	115	168	155	138	119
Downtown Crossing-State	70	72	73	88	92	77	92	98	139	135	118	104
Chinatown-Downtown Crossing	76	81	73	89	94	77	93	95	133	136	114	104
Tufts Medical Ctr-Chinatown	70	76	70	84	85	71	88	89	122	129	109	98
Back Bay-Tufts Medical Ctr	62	68	59	71	70	60	73	75	101	110	94	83
Mass Ave-Back Bay	52	63	53	65	56	46	53	56	61	68	61	55
Ruggles-Mass Ave	50	61	53	63	52	43	50	52	58	63	56	50
Roxbury Crossing-Ruggles	27	38	33	35	30	25	25	25	31	30	30	25
Jackson Sq-Roxbury Crossing	26	28	30	31	27	21	22	23	28	28	27	24
Stony Brook-Jackson Sq	23	26	28	27	24	17	19	19	23	21	22	20
Green St-Stony Brook	20	23	26	23	21	16	16	16	20	17	18	18
Forest Hills-Green St	17	21	19	16	18	13	13	13	17	14	15	14

**Figure 13 Passengers per Vehicle
Orange Line Northbound - AM
2040 Build**

Route Segment	6:00AM - 6:15AM		6:30AM - 6:45AM		7:00AM - 7:15AM		7:30AM - 7:45AM		7:45AM - 8:00AM		8:00AM - 8:15AM		8:15AM - 8:30AM		8:30AM - 8:45AM		8:45AM - 9:00AM		
	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM	8:15AM	8:30AM	8:45AM	9:00AM	8:15AM	8:30AM	8:45AM
Malden Ctr-Oak Grove	3	3	2	3	2	1	2	2	2	2	1	2	1	1	1	2			
Wellington-Malden Ctr	7	8	7	10	7	7	7	9	12	8	8	6							
Assembly-Wellington	12	13	12	15	11	12	12	16	20	13	13	10							
Sullivan Sq-Assembly	37	40	38	47	33	36	37	49	62	40	39	31							
Community College-Sullivan Sq	39	45	46	54	40	40	43	47	57	41	40	31							
North Station-Community College	38	52	65	68	42	41	51	65	85	54	48	39							
Haymarket-North Station	46	58	77	80	52	52	67	80	96	75	69	63							
State-Haymarket	43	54	74	78	52	52	70	82	97	80	77	73							
Downtown Crossing-State	40	49	74	78	55	55	76	92	114	102	106	102							
Chinatown-Downtown Crossing	47	51	80	92	67	74	93	108	130	128	140	132							
Tufts Medical Ctr-Chinatown	46	51	80	90	66	73	93	109	131	130	145	135							
Back Bay-Tufts Medical Ctr	44	49	75	83	60	69	90	105	129	127	137	129							
Mass Ave-Back Bay	47	47	68	82	57	72	85	100	115	106	129	110							
Ruggles-Mass Ave	47	46	66	81	56	70	82	96	112	102	125	108							
Roxbury Crossing-Ruggles	45	37	60	74	55	70	77	92	105	95	119	102							
Jackson Sq-Roxbury Crossing	43	35	58	73	56	70	76	88	99	88	112	94							
Stony Brook-Jackson Sq	38	31	48	64	48	64	67	77	88	80	103	84							
Green St-Stony Brook	33	26	41	56	41	55	56	63	71	65	82	63							
Forest Hills-Green St	28	21	35	47	35	47	47	51	55	49	63	45							

**Figure 14 Passengers per Vehicle
Orange Line Southbound - PM
2040 Build**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Oak Grove-Malden Ctr	4	5	3	6	4	2	3	3	4	3	3	3
Malden Ctr-Wellington	13	19	15	17	10	12	14	12	13	14	12	12
Wellington-Assembly	18	26	22	25	15	19	20	19	20	22	19	17
Assembly-Sullivan Sq	37	53	44	51	30	37	40	39	40	44	39	34
Sullivan Sq-Community College	53	67	59	62	38	48	50	51	49	57	46	41
Community College-North Station	58	73	61	85	51	54	55	54	58	81	54	46
North Station-Haymarket	60	80	70	90	60	61	70	71	74	98	67	57
Haymarket-State	62	81	70	88	64	61	72	74	80	96	68	56
State-Downtown Crossing	68	80	74	86	68	65	83	85	105	106	80	67
Downtown Crossing-Chinatown	85	102	93	101	78	77	103	101	128	131	107	90
Chinatown-Tufts Medical Ctr	83	98	90	98	76	75	101	102	128	130	105	91
Tufts Medical Ctr-Back Bay	77	90	83	90	73	71	94	96	122	122	98	85
Back Bay-Mass Ave	74	82	72	80	67	64	87	87	114	108	90	76
Mass Ave-Ruggles	73	81	70	79	66	64	86	85	110	104	87	72
Ruggles-Roxbury Crossing	63	73	61	71	58	57	79	75	99	90	78	68
Roxbury Crossing-Jackson Sq	64	66	60	67	55	52	76	70	91	82	72	62
Jackson Sq-Stony Brook	56	58	53	58	48	46	68	63	82	74	66	56
Stony Brook-Green St	47	49	45	49	40	38	55	52	66	60	52	44
Green St-Forest Hills	40	41	37	40	33	31	45	40	50	45	40	33

**Figure 15 Passengers per Vehicle
Green Line Southbound - AM
2040 Build**

Route Segment (Branches)	6:00AM · 6:15AM · 6:30AM · 6:45AM · 7:00AM · 7:15AM · 7:30AM · 7:45AM · 8:00AM · 8:15AM · 8:30AM · 8:45AM · 9:00AM													
	6:00AM	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM	
Lechmere-Science Park (E)	24	19	37	31	23	37	49	48	74	76	69	75	75	
Science Park-North Station (E)	23	20	35	30	23	37	50	49	75	77	68	74	74	
North Station-Haymarket (C,E)	16	31	35	29	37	44	50	61	90	85	88	65	65	
Haymarket-Gov Ctr (C,E)	19	39	40	36	39	48	49	57	84	78	84	60	60	
Gov Ctr-Park St (B,C,D,E)	34	51	53	49	48	59	56	54	67	73	74	52	52	
Park St-Boylston (B,C,D,E)	35	51	63	68	64	83	84	84	98	109	104	88	88	
Boylston-Arlington (B,C,D,E)	35	52	64	68	66	85	86	84	99	109	103	87	87	
Arlington-Copley (B,C,D,E)	33	47	56	64	61	78	76	72	83	92	85	73	73	
Copley-Hynes (B,C,D)	31	40	58	71	74	91	83	80	95	121	86	56	56	
Hynes-Kenmore (B,C,D)	29	36	53	65	68	82	75	71	83	106	69	47	47	
Copley-Prudential (E)	29	42	51	67	64	81	81	74	96	98	89	79	79	
Prudential-Symphony (E)	34	51	62	82	80	94	92	82	100	106	91	87	87	

**Figure 16 Passengers per Vehicle
Green Line Northbound - PM
2040 Build**

Route Segment (Branches)	3:00PM - 3:15PM		3:15PM - 3:30PM		3:30PM - 3:45PM		3:45PM - 4:00PM		4:00PM - 4:15PM		4:15PM - 4:30PM		4:30PM - 4:45PM		4:45PM - 5:00PM		5:00PM - 5:15PM		5:15PM - 5:30PM		5:30PM - 5:45PM		5:45PM - 6:00PM		
	58	54	55	48	43	59	46	48	48	43	43	48	46	48	48	43	43	48	46	48	43	43	48	46	48
Science Park-Lechmere (E)	58	54	55	48	43	59	46	48	48	43	43	48	46	48	48	43	43	48	46	48	43	43	48	46	48
North Station-Science Park (E)	58	55	56	49	42	60	47	50	50	42	42	50	47	50	50	42	42	50	47	50	56	59	54	54	54
Haymarket-North Station (C,E)	40	46	47	48	42	57	53	61	61	42	42	61	53	61	61	42	42	61	53	61	58	57	57	56	56
Gov Ctr-Haymarket (C,E)	42	48	51	49	43	57	55	60	60	43	43	60	55	60	60	43	43	60	55	60	58	58	58	57	57
Park St-Gov Ctr (B,C,D,E)	49	60	60	58	48	62	63	57	57	48	48	62	63	57	57	48	48	62	63	57	55	60	60	57	57
Bolyston-Park St (B,C,D,E)	74	87	81	84	74	91	94	91	91	74	74	91	94	91	91	74	74	91	94	91	90	99	99	103	103
Arlington-Bolyston (B,C,D,E)	79	92	86	87	76	94	97	92	92	76	76	92	97	92	92	76	76	92	97	92	93	106	106	110	110
Copley-Arlington (B,C,D,E)	76	88	85	89	71	87	88	82	82	71	71	87	88	82	82	71	71	87	88	82	84	101	101	106	106
Hynes-Copley (B,C,D)	67	79	80	87	72	82	85	84	84	72	72	82	85	84	84	72	72	82	85	84	77	108	108	91	91
Kenmore-Hynes (B,C,D)	62	72	74	80	66	72	78	76	76	66	66	72	78	76	76	66	66	72	78	76	69	100	100	82	82
Prudential-Copley (E)	118	126	117	122	81	121	115	100	100	81	81	121	115	100	100	81	81	121	115	100	117	117	117	176	176
Symphony-Prudential (E)	131	135	122	133	82	125	122	102	102	82	82	125	122	102	102	82	82	125	122	102	116	113	113	186	186

**Figure 17 Passengers per Vehicle
Green Line Northbound - AM
2040 Build**

Route Segment (Branches)	6:00AM	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM
Science Park-Lechmere (E)	42	52	50	59	52	88	117	82	112	137	140	100	100
North Station-Science Park (E)	47	51	53	57	51	85	123	88	117	146	150	100	100
Haymarket-North Station (C,E)	33	47	37	38	46	59	94	69	88	110	112	80	80
Gov Ctr-Haymarket (C,E)	26	38	30	34	39	50	83	60	76	97	104	80	80
Park St-Gov Ctr (B,C,D,E)	15	25	20	27	29	35	57	44	69	82	78	62	62
Bolyston-Park St (B,C,D,E)	13	23	18	26	35	44	75	57	96	115	112	83	83
Arlington-Bolyston (B,C,D,E)	15	24	19	28	36	46	80	62	102	122	119	91	91
Copley-Arlington (B,C,D,E)	15	24	20	29	37	48	84	65	105	126	124	97	97
Hynes-Copley (B,C,D)	15	24	22	33	41	49	93	66	116	142	135	104	104
Kenmore-Hynes (B,C,D)	15	24	22	32	42	50	94	67	119	147	138	108	108
Prudential-Copley (E)	16	33	18	21	33	62	91	88	105	122	127	106	106
Symphony-Prudential (E)	15	34	19	21	28	60	85	81	91	112	116	98	98

**Figure 18 Passengers per Vehicle
Green Line Southbound - PM
2040 Build**

Route Segment (Branches)	3:00PM - 3:15PM - 3:30PM - 3:45PM - 4:00PM - 4:15PM - 4:30PM - 4:45PM - 5:00PM - 5:15PM - 5:30PM - 5:45PM - 6:00PM											
	3:15PM	3:30PM	3:45PM	4:00PM	4:15PM	4:30PM	4:45PM	5:00PM	5:15PM	5:30PM	5:45PM	6:00PM
Lechmere-Science Park (E)	72	86	105	93	84	113	84	91	110	197	130	98
Science Park-North Station (E)	74	88	109	95	87	116	88	94	115	209	128	109
North Station-Haymarket (C,E)	67	70	80	70	81	75	63	71	99	175	92	82
Haymarket-Gov Ctr (C,E)	66	66	80	66	73	68	60	65	90	147	82	71
Gov Ctr-Park St (B,C,D,E)	52	55	64	56	57	56	53	55	95	117	69	54
Park St-Boylston (B,C,D,E)	60	68	80	75	64	68	65	73	123	167	104	78
Boylston-Arlington (B,C,D,E)	63	70	82	80	69	71	68	79	132	174	109	85
Arlington-Copley (B,C,D,E)	63	69	84	84	70	71	73	82	141	177	112	90
Copley-Hynes (B,C,D)	63	66	83	83	68	74	78	88	154	189	122	100
Hynes-Kenmore (B,C,D)	62	63	78	83	70	73	78	90	156	187	122	103
Copley-Prudential (E)	67	78	85	84	82	76	71	85	144	176	109	91
Prudential-Symphony (E)	58	68	77	78	77	64	62	75	134	154	97	80

**Figure 20 Passengers per Vehicle
Blue Line Northbound - PM
2040 Build**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM
Revere Beach-Wonderland	9	12	12	14	20	17	21	27	35	25	23	21
Beachmont-Revere Beach	16	21	20	23	30	27	30	38	47	34	32	29
Suffolk Downs-Beachmont	20	25	24	27	36	32	36	45	58	40	39	33
Orient Heights-Suffolk Downs	18	23	22	24	32	29	32	40	53	36	34	29
Wood Island-Orient Heights	20	25	25	26	34	30	34	41	57	37	36	31
Airport-Wood Island	21	27	27	28	37	32	36	43	59	38	38	32
Maverick-Airport	31	39	37	39	49	45	49	56	76	51	49	42
Aquarium-Maverick	43	56	50	54	65	60	63	70	92	65	63	54
State-Aquarium	40	54	48	52	59	55	59	63	82	59	56	50
Gov Ctr-State	27	33	31	33	34	35	36	38	47	34	35	30
Bowdoin- Gov Ctr	3	3	4	4	5	5	4	6	8	5	3	3

**Figure 21 Passengers per Vehicle
Blue Line Northbound - AM
2040 Build**

Route Segment	6:00AM	6:15AM	6:30AM	6:45AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	8:30AM	8:45AM	9:00AM
Revere Beach-Wonderland	2	3	3	2	3	3	3	3	2	2	2	2	2	2	2	1	2	1	2
Beachmont-Revere Beach	4	6	5	3	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3
Suffolk Downs-Beachmont	6	7	7	3	5	5	5	4	4	3	3	4	4	5	4	4	4	4	4
Orient Heights-Suffolk Downs	6	7	7	4	5	5	5	4	4	3	3	4	4	5	4	4	4	4	4
Wood Island-Orient Heights	7	8	9	5	6	6	8	5	5	4	4	6	6	7	5	6	7	5	6
Airport-Wood Island	9	12	12	8	7	7	9	6	6	5	5	6	6	8	6	6	8	6	6
Maverick-Airport	11	18	23	15	14	14	15	9	9	7	7	10	10	11	7	8	11	7	8
Aquarium-Maverick	15	22	33	22	19	19	23	14	14	12	12	15	15	18	12	14	18	12	14
State-Aquarium	16	21	34	22	21	21	24	17	17	16	16	18	18	22	17	18	22	17	18
Gov Ctr-State	11	12	16	12	11	11	15	11	11	10	10	16	16	17	13	15	17	13	15
Bowdoin- Gov Ctr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1

**Figure 22 Passengers per Vehicle
Blue Line Southbound - PM
2040 Build**

Route Segment	3:00PM - 3:15PM	3:15PM - 3:30PM	3:30PM - 3:45PM	3:45PM - 4:00PM	4:00PM - 4:15PM	4:15PM - 4:30PM	4:30PM - 4:45PM	4:45PM - 5:00PM	5:00PM - 5:15PM	5:15PM - 5:30PM	5:30PM - 5:45PM	5:45PM - 6:00PM	
Wonderland-Revere Beach	2	3	3	2	3	3	2	3	3	2	2	1	3
Revere Beach-Beachmont	5	6	5	5	5	6	4	5	5	5	5	4	4
Beachmont-Suffolk Downs	6	7	7	6	6	8	5	6	7	6	6	5	5
Suffolk Downs-Orient Heights	6	8	7	6	7	8	5	6	8	6	6	6	6
Orient Heights-Wood Island	7	9	9	8	8	10	7	8	9	8	8	7	7
Wood Island-Airport	8	10	10	9	9	12	8	10	11	9	9	8	7
Airport-Maverick	13	16	15	15	13	17	13	16	18	15	15	13	11
Maverick-Aquarium	19	24	23	21	21	22	20	24	24	22	22	18	15
Aquarium-State	19	22	22	20	20	22	20	23	25	22	22	18	15
State-Govt Ctr	13	15	15	14	14	14	13	14	15	13	13	12	9
Gov Ctr-Bowdoin	0	1	1	1	0	0	0	0	1	0	0	0	0

Reverse of Figure 22 data

Appendix I

Transportation Mitigation Practices in Study Area Municipalities

Arlington

The town of Arlington has no formal mechanism that requires developers to implement transportation mitigation measures connected to their project's traffic or transit impacts (beyond providing at least two and no more than 20 bicycle parking spaces, with one for every fifteen parking spaces above eight spaces¹), nor a threshold that requires a study of the impacts. Despite not having a site plan review ordinance to describe a standard process, developers' proposals must be approved by the town's Board of Selectmen, which receives support and recommendations from other departments and committees in the town government, before construction is permitted. The most important of these support entities is the Transportation Advisory Committee (TAC).

The TAC, made up of local and knowledgeable transportation professionals, has been the force behind the town's mitigation efforts. The TAC was voted into existence in 2001 to assist the Board of Selectmen in dealing with parking, traffic, and transportation issues in the town. The TAC works with the Department of Planning and Community Development, the Department of Public Works, and the Director of Police Services for town transportation studies, as well as with the Board of Selectmen when requested to study developer's traffic studies or citizen complaints. In effect, the committee functions as on-call consultants for the Board of Selectmen. According to a memo produced in 2004, TAC's decision criteria for evaluating transportation impacts of development projects includes:

- Safety
- Mobility
- Equity
- Environmental and Public Health
- Priority

The TAC screens the need for traffic calming by investigating traffic volume, vehicle classification, speed, cut-through traffic, crashes, existing geometry, and nearby trip generators. It then reviews the applicability, suitability, feasibility, user considerations, and impact of the requested measure.

¹ Arlington, Massachusetts, Zoning Bylaws § 8.8.3

Based on TAC reviews and recommendations, several transportation mitigation measures have been implemented and paid for by developers as conditions of obtaining a building permit. Where the Minuteman Bikeway crosses Mill Street, developers installed a warning system that flashes lights and sounds when a person walking or biking is about to approach the popular crossing. An Opticom device for the intersection of Massachusetts Avenue and Route 60 was purchased to allow for emergency vehicles to control nearby traffic signals and preempt changes to increase response times. Intersection geometry adjustments and signal retiming were done at the intersection of Massachusetts Avenue and Route 16 to allow for different turning coordination.

Boston

The Boston Redevelopment Authority (BRA) adopted Article 80 of the zoning code in 1996 to provide guidelines for review processes for development projects of different scales:

- Large projects (Article 80B): adding more than 50,000 square feet
- Planned Development Areas (Article 80C): new overlay zoning districts for projects greater than one acre
- Institutional Master Plans (Article 80D): projects relating to academic or medical campuses
- Small projects (Article 80E): adding more than 20,000 square feet

The Article 80 process often includes a review of transportation impacts, and it is a required component for approval of large projects. After a Letter of Intent is filed with the BRA, the Project Notification Form (PNF) includes transportation analysis and should identify mitigation efforts expected to be included in the final constructed project. A Draft Project Impact Report provides preliminary traffic impact modeling results further refined into the Final Project Impact Report, after determining adequacy in conjunction with the Boston Transportation Department (BTD) review process. This transportation review, undertaken in coordination with the BTD, focuses on traffic generation, parking, and curb-cut impacts, as well as requirements of the Boston Air Pollution Control Commission.

Prior to the issuance of a building permit, all projects must sign a Construction Management Plan (CMP) with the BTD that specifies what measures will be in place to manage transportation impacts during construction, and large projects must sign a Transportation Access Plan Agreement (TAPA). The extent and detail of the analyses and modeling required depends on the size, location, and complexity of the projects under review, and the TAPA may include findings and discussion related to all of the following components:

- Parking
- Loading
- Access
- Vehicular traffic
- Public transportation
- Pedestrian circulation
- Access plan
- Continued monitoring

The BTD employs a district-based approach to reviewing the parking component of proposed development projects, wherein proposals are evaluated based on the character of the neighborhood, the existing capacity of the roadways and transit infrastructure, the cumulative impact on all proposed projects in the vicinity, constraints by other parking regulations in the area, and programs offered by local Transportation Management Associations (TMAs). New TAPA guidelines put in place through Access Boston 2000-2010 require developers to include bicycle facilities and programs to encourage car sharing.

As a result of the new guidelines established by Access Boston 2000-2010, bicycle parking and car-sharing programs, as well as orientation packets with transit information for residents and employees, on-site transportation coordinators, and project websites containing transit information are the most frequent mitigation measures identified in PNFs submitted to the BRA. Electric vehicle charging stations, transit pass subsidies, and participation in TMAs are also popular measures.

Brookline

Brookline starts considering mitigation at the beginning of the town's plan review process. A traffic impact study is required of Major Impact Projects (identified as 16-plus units of housing or at least 25,000 square feet of nonresidential space) or asked for specifically by the Planning Board for projects that do not fit into clear land-use categories and therefore have uncertain impacts. Based on the results of the study, the Planning and Community Development Department and the Transportation Division of the Department of Public Works negotiate case-by-case mitigation with developers.

Frequent TDM measures required of developers include sidewalk improvements, bicycle parking and showers, and geometric layout changes. Several recent projects, including 2 Brookline Place, agreed to a capped target percentage for single-occupancy vehicle mode share for employees, which must be annually monitored and achieved, or additional mitigation measures would be required. Additionally, the developer of 10 Brookline Place and the town of Brookline

agreed to spend one percent of hard construction costs on transportation mitigation measures at the Brookline Village Green Line station.

In the future, Brookline planners hope to adopt a town-wide policy applicable to all projects similar to the City of Cambridge's Parking and Transportation Demand Management ordinance to provide clear expectations for developers. With more standardized guidelines, obtaining permits would entail less uncertainty and timeline risk and regulations would be more development-friendly.

This new ordinance is being advanced for a number of other reasons. There is ongoing growth pressure in the Longwood Medical Area, near Boston University and Boston College, in the Fenway, and along Route 9 in Newton that is projected to bring additional traffic through the town of Brookline. Additionally, many of the housing units developed in the past 15 years did not meet the Major Impact Project threshold and did not have their traffic impacts studied. Finally, there continues to be a moderate pace of commercial development near transit stations.

Although the ordinance is still under development, it is likely to include the following two components: 1) TDM points above a certain threshold, based on project square footage, will be required before a project is approved, and 2) projects further from a transit station will get more credits for implementing measures than those closer to a transit station.

Cambridge

The city of Cambridge has a history of transportation mitigation policies dating to 1992. Three regulatory avenues exist through which development proposals must identify the transportation mitigation measures to be included: the Parking and Transportation Demand Management Ordinance (PTDM); a city-wide Vehicle Trip Reduction Ordinance; and the Cambridge Redevelopment Authority's (CRA's) Land Development Agreements.

The PTDM ordinance, adopted in 1998 and made permanent in 2006, is managed by the City's Community Development Department (CDD) and its Traffic, Parking, and Transportation Department (TPTD). When an owner of nonresidential property proposes to add parking spaces above the number already registered with the city, a PTDM plan must be approved before a city permit is granted. Small project PTDM plans, applicable if total parking equals 5 to 19 spaces, require the implementation of three of nine TDM measures. Large project PTDM plans apply if total parking is 20 or more spaces. Large projects require a single-occupancy vehicle mode-share commitment, a comprehensive

set of TDM measures, and annual monitoring and reporting that includes an employee/patron survey of trip origin and mode.

Article 19 on Project Review of the Cambridge zoning regulations requires a traffic impact study that looks at existing transportation conditions, intersection crash history, projected trips in the build condition with added growth rate, and other area projects' trips in order to anticipate future transportation conditions. The PTDM plan process begins when a developer submits a draft to the CDD. A PTDM officer issues a draft decision with recommendations for revisions. The developer can then submit a final plan that is then approved, approved with additional conditions, or denied. PTDM officers look at five criteria of exceedances, identified in Article 19.25.11, that point out which impacts need to be mitigated:

- Project trip generation for a 24-hour period and at AM and PM peaks
- Changes in level of service at identified signalized intersections
- Increased traffic volume on residential streets
- Increased vehicle queues at identified signalized intersections
- Lack of sufficient pedestrian and bicycle facilities

Although PTDM officers negotiate PTDM plans with developers on a case-by-case basis, they employ a somewhat standard set of measures in order to increase consistency and make the development process more predictable. This can be seen in the Small Project Form's nine options. Sample TDM measures used in PTDM plans include:

- Transit subsidy for employees/tenants
- Free shuttle bus
- Bus shelter
- Market-rate parking fee charged directly to employees or patrons
- Electric vehicle charging stations
- Daily parking charge available for occasional drivers instead of only a monthly parking pass
- Bicycle parking above minimum zoning requirement
- Shower/locker room for bicyclists
- Financial incentive for walking or biking
- Emergency ride home program
- Car/vanpool matching aid
- Priority/discounted high-occupancy vehicle parking
- Hubway membership and station construction

- Transportation information—website and orientation packet and real-time screens
- Hiring of Cambridge residents
- On-site TDM coordinator
- TMA membership
- EZRide Shuttles
- Flexible work hours

Other measures of transportation mitigation that have been used in developer's PTDM plans include:

- Signal equipment and fiber optic cables
- Studying new turning lanes

The second mitigation avenue dates from 1992 when the City of Cambridge adopted a Vehicle Trip Reduction Ordinance (Chapter 10.17 of the Code of Ordinances) in response to the Clean Air Act amendments in 1990 and the Intermodal Surface Transportation Efficiency Act of 1991. The same year, the city's Bicycle Program was created and is administered within the Division of Environmental and Transportation Planning of the CDD. Recognizing that, "Increasing the use of commuting alternatives and reducing the number of trips by single-occupancy vehicles is beneficial for the City and the Commonwealth in reducing vehicle miles travelled, traffic and associated air pollution, fuel use, noise, and congestion . . ." ²

Cambridge created a city-wide program to encourage alternatives to vehicle trips and incentivize city departments, employers, institutions, owners of multiple-tenant buildings and complexes, and other organizations to use mass transit, bicycles, or walking. The effort included an expanded commuter mobility program, a bicycle and pedestrian mobility program, restrictions on visitor vehicle passes, fees for residential parking stickers, study of zoning revisions, improved coordination with the MBTA, regulations concerning idling vehicles, and taxicab improvements.

The last avenue by which transportation mitigation measures from developments are identified comes through the CRA, which operates separately from the CDD and works in the Kendall Square Urban Renewal Area (KSURA). Boston Properties, the developer with exclusive rights to the KSURA, owns the land, but the CRA still maintains the air rights over renovated MBTA property around Kendall station. The CRA can negotiate with Boston Properties before granting permission for construction; the terms of these transactions include development

² Cambridge, Massachusetts, Code of Ordinances §10.17.020.H

rights, infrastructure obligations, and financial considerations. Despite negotiating directly with the CRA, Boston Properties must still comply with all underlying CDD regulations and obtain city permits.

As part of the agreement to build 3 and 5 Cambridge Center, Boston Properties funded improvements to the Kendall Square station including lengthened and widened station platforms, upgraded interiors, and relocated station entrances. With the completion of the Cambridge Center buildings, Boston Properties is also obliged to operate, maintain, and repair Nowiszewki Plaza in front of the Kendall Red Line station entrance on Main Street.³

Boston Properties recently came to the CRA following Cambridge's release of the K2C2 plan in 2013 calling for one million additional square feet in the area. Negotiating with the CDD and CRA to develop one million additional square feet in the KSURA as suggested in the K2C2 plan, Boston Properties proposed that their transportation mitigation funding go almost exclusively to improving transit service on the MBTA Red Line. Tenants of the area already shirk vehicle commuting in large numbers, and private companies, including BioGen, are offering coach bus shuttles for employees from the suburbs.⁴ Boston Properties has argued that more benefits can be realized by devoting mitigation efforts to public transportation physical improvements instead of the typical TDM measures that are designed to siphon driving commuters to public transportation. The details of this arrangement and whether it may be implemented are not yet complete.

Additionally an amendment to the Kendall Square Urban Renewal Plan put forth by the CRA, a MEPA Notice of Project Change (comparable in scope to an Environmental Impact Report), was submitted to the MEPA Office to be approved in October 2015. The amendment includes elements to allow for the additional square footage and to create a transit investment tool. This amendment contains a chapter detailing the consideration of transit impacts in the MEPA process.

Chelsea

When development proposals are submitted in the city of Chelsea, a development impact statement can be requested at the discretion of the special permit granting authority. In Chelsea, most developments of a large size that would be expected to have traffic and transit impacts are done as "planned developments." These are projects that are more than two contiguous acres of

³ <http://cambridgecivic.com/?p=3491>.

⁴ <http://www.bostonglobe.com/business/2014/12/24/biogen-idec-provides-coach-commuting-for-suburban-worker/f3s5JrhADCmdD0Mae0iLoM/story.html#>.

nonresidential area or four contiguous acres of residential area, generally above 25 units, and need special permits because of their size to start construction. The required development impact statement must project the number of vehicles expected to enter and depart the site daily and at peak hours. The impact report must also show the daily volume and at peak hours on adjacent streets.

Mitigation has not traditionally been on the forefront of Chelsea's priorities for new development, but when it is done, roadway repaving, sidewalk construction, and signal improvements are the most popular measures. In the future, with the introduction of Silver Line Gateway service and interest in development growing throughout the city, city officials have more ability to ask for funding tied to local transportation improvements. New and improved pedestrian connections in the Highland Street and Central Avenue neighborhoods are likely to be addressed in the near term. Transit mitigation is unlikely at this time because the new Silver Line service will likely have sufficient capacity, and improvements to the existing bus services could well be beyond the scope of a typical mitigation agreement.

Much of the transportation mitigation done thus far with completed projects was paid for by MassWorks Infrastructure Program grants and not the developers themselves because of tightened financial markets in recent years. Chelsea has been awarded \$11.5 million in four phases since 2011 for its Gateway Center improvement in the Everett Avenue Urban Renewal District to support the development of two hotels, 250,000 square feet of office space, and 230 units of housing. Market Basket donated some land for sidewalk widening for a greenway project, and a hotel developer paid for engineering studies to redesign the Everett Avenue and Spruce Street intersection, but did not cover construction costs to implement the design changes.

Everett

Everett has not set up a redevelopment authority with appropriate powers defined by state legislation. As a consequence, Everett historically has not been able to demand transportation mitigation. Nevertheless, the city has successfully arranged for voluntary transportation improvements by developers, which largely fall under the label of limited-scale cosmetic enhancements. The Batch Yard housing developers repaved the public street in front of their complex as a means to improve its appearance and attract the luxury tenants it is targeting.

Site plan review is required for projects consisting of more than 5,000 square feet of nonresidential space or four or more residential dwelling units and should include, if requested by the planning board, a narrative addressing concerns about traffic flow and circulation. The Planning Board may also request additional studies on the adequacy of parking and loading facilities, traffic and pedestrian

circulation, and access to the site. These studies have the potential to lead to mitigation requests from the Planning Board.

In response to the potential casino siting, Everett adopted new zoning amendments that require traffic impact analyses with development proposals in particular areas of the city. A traffic impact study is required for developments in the Lower Broadway Economic Development District zone that are expected to generate more than 100 peak hour trips or more than 750 average daily trips.

This type study also must identify proposed methods as necessary to mitigate the impacts. The Planning Board, the approving authority of site plans, is allowed to accept contributions of funds to pay for the design and/or construction of off-site improvements if they are proportional to the impacts resulting from the project. The code also has performance standards for site plans that require buildings in the zone to incorporate access to water-based transportation and reduction in on-site parking if a fixed public transportation stop is within 600 linear feet of a pedestrian entrance to a project.

Much of the transportation mitigation done in Everett to date has been a result of the MEPA process. The most prominent example is the Wynn casino development, which also occasioned the proposed zoning amendments. Besides typical measures such as traffic signal improvement, sidewalk construction, and roadway redesigns to accommodate a larger vehicle volume, the Wynn casino developers proposed mitigation measures not yet employed in the Boston Core Area. The as-yet undefined, ongoing operating cost contribution to the MBTA Orange Line service to increase frequency, especially during peak hours and late-night service, and to make improvements for better handling of additional peak-hour passengers would be a first in the region. The casino operator will also run shuttle buses to connect with Malden Center and Wellington MBTA stations, and may construct a pedestrian bridge over the Mystic River to Assembly Square station. Wynn also proposes funding long-term Sullivan Square mitigation projects for 10 years after the project opens and to pay the city of Boston for every vehicle above Friday PM peak period projections.⁵

A study underway by MassDOT, the Everett Transit Action Plan, envisions a set of smaller-scale recommendations. These could either be implemented through future mitigation agreements or possibly implemented by the city itself.

⁵ <https://www.bostonglobe.com/business/2015/07/30/wynn-aims-first-company-subsidize-mbta-operations-with-orange-line-plans/bzI3fNIPbSBzBsogXDYpsI/story.html>.

Medford

In Medford, transportation mitigation measures are identified regularly during site plan review for all residential projects of six or more units, all commercial projects over 10,000 square feet, all medical office space of 5,000 or more square feet, or all restaurant projects over 2,500 square feet. Traffic analyses included in the written statement of site plan applications must estimate peak-hour traffic volumes generated by the proposed use in relation to exiting volumes and projected future conditions.

Based on their expected impact, each project's mitigation requirements are negotiated on a case-by-case basis, but where multiple projects are proposed for the same area, it is often the first project to be approved that is responsible for the desired roadway improvements in the project area. The mitigation measure most often required for approval is retiming traffic signals, but sidewalk improvements, roadway widening, curb-cut access, and pedestrian connections are also frequent.

Additionally, a linkage fee based on the size of a project is assessed across the entire town regardless of development site and contributes to a fund responsible for local roadway and traffic facility capital improvement projects with linkage grants to the parks and recreation facilities trust.⁶

Revere

Because much of the residential and commercial development occurring in the city of Revere falls along state-owned roadways near the shoreline, the city relies largely on MassDOT to develop transportation mitigation policies on a case-by-case basis through its State Highway Access Permits procedures. The requirements and process of MassDOT review are described later in this section.

Despite MassDOT's extensive involvement in transportation mitigation in Revere, site plan review regulations allow Revere to request traffic impact studies from multifamily, commercial, and industrial projects. These studies must detail:

- Existing traffic volume, composition, peak hour levels, and existing street capacities
- Estimated average daily traffic generation, composition peak hour levels, and directional flows resulting from the proposed development
- Proposed methods to mitigate the estimated traffic impact
- Methodology and sources used to derive existing data and estimations.⁷

⁶ Ord. No. 548 §17 c-1, 4-3-1990

⁷ Revere, Massachusetts, Code of Ordinances, 90-237 § 1 (part)

The site plan review committee considers the convenience and safety of vehicular and pedestrian movement as well as access configuration in relation to adjacent streets when making recommendations about approval.

Funding for many mitigation projects, including roadway reconfiguration, Blue Line station platform extensions, signalization improvement, and bus-stop consolidations, has come from the federal government, the state government, or the MBTA. Individual developers do not routinely contribute. Revere maintains a mechanism for this to become a more common practice, however. The Community Improvement Trust Fund is a separate fund through which funds can be directed to specific projects by the mayor with approval of the City Council.

Payments to the fund come from projects that have been granted special permits or variances above the intensity of use written into the zoning code, where the amount is proportional to the portion of the project that exceeds the code regulations. Payments to the trust are to be made in two equal installments up to a maximum of three percent of total construction costs, the first payment made at the issuance of a building permit and the second made at the issuance of an occupancy permit. The funds may be expended on more than just transportation facilities, but must be appropriated to facilities directly impacted by the project. The possible infrastructure and community facilities eligible for funding include:

- Roadway and sidewalk reconstruction
- Signalization improvements
- Sewer, water, and drainage improvements
- Recreation and open space areas and the support of athletic programs
- Fire protection facilities and equipment
- Crime prevention facilities and equipment
- School buildings and educational programs
- Library improvements⁸

Somerville

Somerville, like many other communities in the Study Area, determines its required transportation mitigation measures by negotiating with developers on a case-by-case basis. Nonetheless, the plan review process almost always includes some form of impact evaluation, even if mitigation is not required thereafter. For projects necessitating special permits, Planned Unit Developments (PUD), and Preliminary Master Plans, detailed explanations of any changes to the vehicular, bicycle, and pedestrian circulation patterns is required as an application supplementary form for the Planning Board before approval can be granted.

⁸ Revere, Massachusetts, Code of Ordinances, 91-23 § 8 (part)

The Special Districts proposed in the draft 2015 Zoning Ordinance update have additional traffic impact reviews. Any already approved PUD is to be considered a Neighborhood Development Plan and remain in effect, but future special approval processes are shown in Table 27. When applicable, the Planning Board may also request a Transportation Study, a Traffic Access and Impact Study, and/or a Transportation Demand Management Plan in the Assembly Square special zoning district, which will be reviewed by the Director of Traffic and Parking.

There are some design elements included in the draft 2015 Zoning Ordinance update currently under review that incorporate public realm requirements to promote pedestrian activity, such as required sidewalk widths in some residential mixed-use districts. In Somerville, all nonresidential uses with more than 5,000 square feet of gross leasable space are required to provide bicycle parking in amounts specified in the zoning code for each principal use category.

Table 27
Somerville Neighborhood Requirements for Plan Approval Process

Special District	Large Development Plan Approval	Neighborhood Development Plan Approval
Assembly Square	5+ acres	40+ acres
Brickbottom	2+ acres	20+ acres
Grand Junction		10+ acres
Inner Belt	8+ acres	20+ acres

Source: Somerville Zoning Ordinance, January 22, 2015 BOA Submittal

MassDOT

MassDOT gets involved with a development’s transportation mitigation measures in two ways: 1) MEPA regulations and 2) Approvals of Access to State Highways with Section 61 Findings. Preparation of a Transportation Impact Assessment (TIA) is triggered by MEPA thresholds—generally more than 3,000 new average daily trips to a single location or the addition of 1,000 or more parking spaces at a single location—and/or by the MassDOT state highway access regulations. Projects that are on state highways, or whose trip generation will impact nearby state highways or intersections controlled by MassDOT, are subject to access approval procedures.⁹

⁹ http://www.massdot.state.ma.us/Portals/8/docs/access_permits/HMD_60_02_3_000.pdf.

For TIA scoping purposes, MassDOT requires the preparation of a Transportation Scoping Letter (TSL) that agrees on the analytical approach, technical assumptions, and key issues to be addressed. TSLs must be submitted early in the development process, no later than the Environmental Notification Form, and are considered preliminary and likely to evolve throughout the process. The TSL, nevertheless, must include the following elements:

- Projected trip generation
- Mode split
- Transportation demand management measures adopted
- Study area and transportation network
- Trip distribution pattern
- Analysis periods
- Site plans
- Access spacing and circulation assessment
- Safety
- Parking

Guidelines for the TIA provide for a multimodal transportation development review to enhance transit, bicycle, and pedestrian facilities and to emphasize transportation-efficient development. They also foster implementation of TDM programs. In particular, calculations for transit ridership by direction and by route, dwell times, crowding, speeds, and multimodal level-of-service changes from pre- and post-development scenarios must be included. TIA information ensures that mitigation measures are fully funded with descriptions of responsible parties, timelines to completion, and duration of responsibility. The TIA also provides the basis for ongoing monitoring programs to evaluate the effectiveness of mitigation measures.¹⁰

The finished TIA, completed through consultation and negotiation between all stakeholders, provides the developer, affected municipalities, MassDOT, MassRIDES, local TMA, and the general public with information needed to assess the adequacy of existing and planned transportation infrastructure, the project's impacts, and proposed mitigation measures. MassDOT has the prerogative to accept financial payment in lieu of direct investment in mitigation facilities and/or service improvements, at its discretion, which would be deposited in a mitigation bank to fund future improvements.

State Highway Access Permits are issued by the MassDOT Highway Division. Section 61 Findings, if applicable based on the Final EIR, identify multimodal mitigation measures to balance the needs of all users of the transportation

¹⁰ <http://www.mass.gov/eea/docs/mepa/transportation-impact-assessment-guidelines-3-13-14.pdf>

network. TDM programs are frequently a component of access permits. Physical actions must be settled by the time of approval, whereas nonphysical actions must be available upon site opening. On-site physical mitigation examples include configuration of driveway design, building arrangement, parking management, internal circulation, and pedestrian, bicycle, and transit accommodations. Off-site mitigation measures can include traffic signal coordination and/or optimization, intersection reconstruction, roadway widening, transit service improvements, bus priority signal systems, and access management.

MBTA

The MBTA has very little history of engaging in mitigation negotiations with developers, in part because of limited legal authority and jurisdiction. As a result, there is also no standard protocol for involving private developers with transit mitigation. When offering bids for transit-oriented development on MBTA property, the statute requires disposing of land or entering into a ground lease with the “highest responsive bidder” that offers the most financial value to the MBTA and that also meets certain nonfinancial requirements such as a history of and references for competent project management as well as a record of successful projects. Projects near MBTA stations but not on MBTA land have no obligation to involve the MBTA in transportation mitigation negotiations.

The Wynn casino project in Everett is the largest project to date that the MBTA has actively engaged in discussions about transit impacts based on new trips generated. The mitigation measures to be implemented are not yet finalized, but potentially include operational subsidies as well as a number of physical construction projects designed to improve circulation and efficiency at nearby rapid transit and commuter rail stations related to both train and bus service.

The proposed Boston Landing/New Balance commuter rail station is another example in which a private developer contributes significant funds to the MBTA. In contrast to the Wynn Casino’s use of existing stations and improvement of circulation and transit service, the new infill commuter rail station will be financed privately by New Balance. New Balance will also commit to covering station maintenance costs for several years in exchange for two guaranteed peak period trains stopping in each direction on weekdays.

The Assembly Square Orange Line station was partially financed by Federal Realty Investment Trust, the developer that also developed the adjacent transit-oriented Assembly Row complex. The MBTA is in the process of beginning a conversation about transportation mitigation with another private developer desiring to construct more square footage in the area.

Much greater participation in the development process, and therefore the ability to negotiate mitigation, may be possible for transit-oriented projects constructed on MBTA land. The MBTA Real Estate Department oversees the agency's real estate holdings and manages its office and warehouse facilities. Massachusetts Realty Group, the MBTA's asset manager, manages the leasing, licensing, inventory, easements, sale of MBTA property, and air rights holdings. One such project is the air rights development over the Hynes Convention Center station, which will involve an MBTA Station Improvements Agreement to renovate the Green Line station to be accessible to people with disabilities and to refurbish a second station entrance. This, as is typical of other joint development projects the MBTA has done, will involve the developer funding design and construction costs of station improvements, but the MBTA actually administering the work.