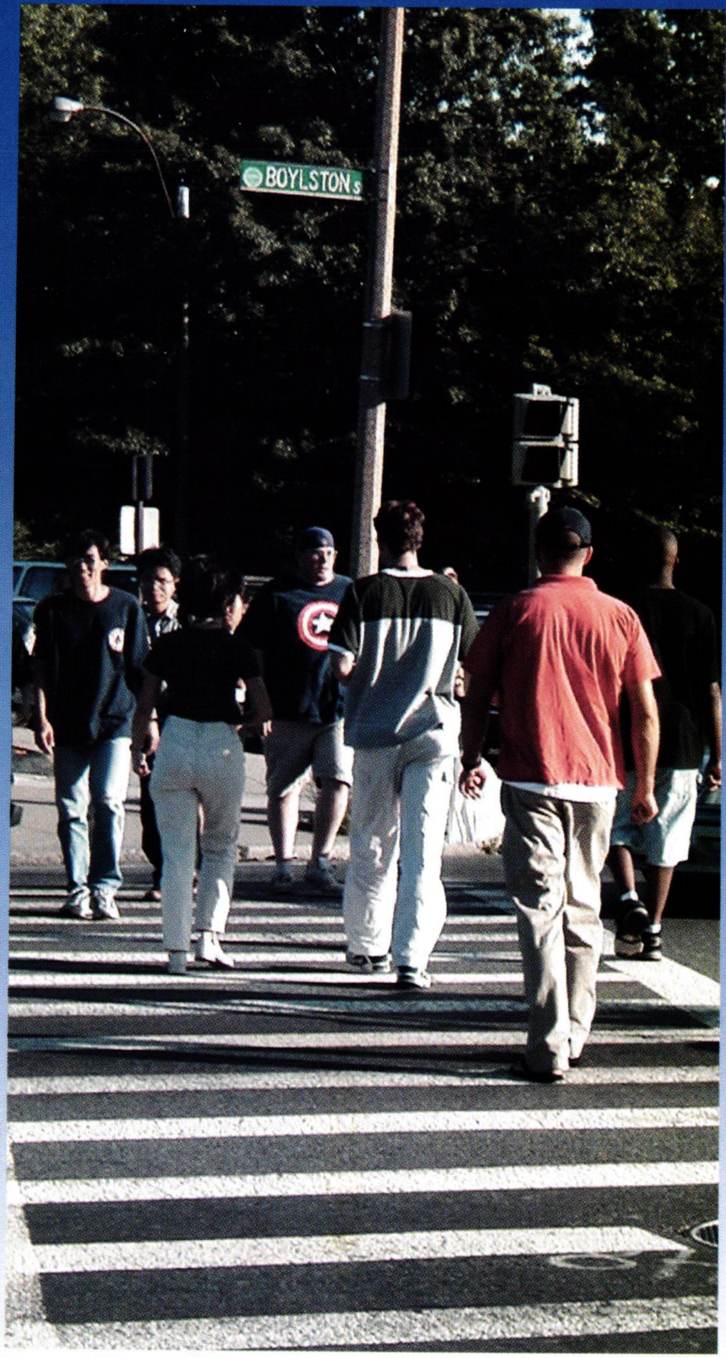

Final
November
2001

Fenway Neighborhood Transportation Plan

BRA BTD

Thomas M. Menino, Mayor of Boston

Prepared by:
Vollmer Associates LLP

In Association with:

ICON Architecture, Inc.

ACKNOWLEDGEMENTS

The Fenway Transportation Plan has primarily been developed from the interest, expertise, and dedication of members of the Fenway Planning Task Force Transportation Subcommittee, through joint meetings with the Fenway-Kenmore Neighborhood Transportation Association (NTA). The Task Force and NTA are comprised of neighborhood residents, business and institutional representatives, developers, and public agencies. We thank all participants who gave generously of their time.

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1.0 EXECUTIVE SUMMARY
1.1 BACKGROUND

This report is the culmination of efforts by the Boston Redevelopment Authority (BRA) and the Boston Transportation Department (BTD) to initiate a strategic community planning process in the Fenway neighborhood. To provide a forum for community input and representation through the duration of this study, the Fenway Planning Task Force (FPTF) was formed to include persons from the neighborhood, local businesses, and the medical, academic, and research institutions.

The zoning regulations controlling development in the Fenway have not been revised since the mid-1960's. To address existing and future proposals for development, the Fenway Interim Planning Overlay District (IPOD) was established in May 2000. The IPOD will continue to act as a temporary measure until new permanent zoning regulations are put in place that more accurately reflect the community's current goals and visions for the area. The objective of this Fenway planning process was to develop specific guidelines for future development in the following two areas: 1) zoning/urban design, and 2) transportation. A separate study was initiated to address each issue:

- *Zoning, Urban Design, and Streetscape.* This study was completed to identify community goals for acceptable density (floor area ratio), land uses, building height and setbacks, among others. Urban design issues included landscape treatments, street wall, and the pedestrian environment. The streetscape element of the study led to recommendations for the cross sections of Boylston Street, Brookline Avenue, and Lansdowne Street that best balance the needs of pedestrians, bicyclists, and drivers. The recommendations are referred to here as the "Fenway urban design vision." The study report is titled "Land Use and Urban Design Guidelines" *(BRA, 2001).*
- *Transportation.* The transportation element of the Fenway study was initiated to address the following four areas: 1) parking, 2) pedestrian and bicycle access, 3) project review, and 4) roadway and transit system capacity. The project included an evaluation of the transportation impacts from build-out of the urban design vision, recommended zoning changes related to parking and identification of specific improvements to the pedestrian, bicycle, transit, and roadway infrastructure. This report outlines the results of the Fenway transportation study completed by Vollmer Associates LLP.

Boylston Street at Brookline Avenue

More specifically, the transportation study scope included the following tasks, as defined by the Fenway Planning Task Force:

- *Parking.* The parking study goals were to 1) establish the existing amount, type, and locations of parking spaces in the study area, 2) create a tool for managing and updating the supply data, and 3) outline/prepare zoning recommendations for parking ratios. A detailed inventory was completed of all on-street and off-street parking facilities within the study area. The results, combined with land use data from the City Assessor's office, were used to calculate existing parking ratios (spaces per 1,000 square feet or per residential unit). These data were then used as a baseline for the recommendation of parking ratios for future development. Parking is the subject of **Chapter 2** of this report.

- *Pedestrian/Bicycle Access.* The second objective of this study was to identify the primary connections for pedestrians and bicycles and assess the need for improvements. Specific attention was given to the interface between pedestrians, bikes, and vehicles, as well as traffic signal timing, which must allocate adequate time for crossings. Various applications for pedestrian phases, including exclusive and concurrent phasing, were studied. Attention was also given to transit accessibility, i.e., the pedestrian connections to and from MBTA rail stations. Pedestrian and bicycle access is discussed in **Chapter 3**.

- *Project Review.* The third study task was to provide an independent technical analysis, on the community's behalf, of the transportation elements of new developments proposed within the Fenway. The Fenway Mixed-Use Project (MUP) and the Red Sox Transportation Plan were reviewed. Two submittals were reviewed for the Fenway MUP: the Project Notification Form (PNF) and Draft Project Impact Report (DPIR). The Red Sox Transportation Plan, while not a formal filing within the environmental permitting process, was the only published report available to date for the Red Sox' analysis with respect to transportation impacts and infrastructure improvements required for a new ballpark in the Fenway. The results of the project reviews were used to prepare comment letters sent from the FPTF to the BRA and project proponents. Project review is further discussed in **Chapter 4** and the comment letters can be found in the **Appendix** (published separately).

- *Roadway and Transit System Capacity.* The fourth and final task of this study was to examine the existing capacity of the roadway and transit system, identify the impacts of potential development, and recommend mitigation. The goal of this analysis was to estimate the transportation impacts of a proposed increase in maximum floor-area-ratio (FAR). For more information, see "Land Use and Urban Design Guidelines" *(BRA, 2001).*

The transit analysis investigated the need for additional line capacity using the most recent ridership counts conducted by the Central Transportation Planning Staff (CTPS). Station improvements were also examined. The results of the transit capacity analysis are provided in **Chapter 5**.

The primary principle of the roadway capacity analysis was that additional general travel lanes would not be considered as a viable alternative to accommodate increased through or local traffic. Secondly, pedestrian and bicycle connections and crossings would not be diminished to provide additional vehicle capacity.

The Sears Rotary, the primary focus area of the roadway capacity analysis, is located at the intersection of Park Drive, Boylston Street, Brookline Avenue, and the Fenway. The traffic analysis of the Sears Rotary extended to at least the next major intersection in each direction, including Audubon Circle.

Traffic counts and forecasts were derived from recent environmental filings by the Fenway MUP, Emmanuel College, and Landmark Center. A significant level of effort was applied to reviewing past proposals for the Sears Rotary, evaluating new ideas, and then narrowing the list of viable alternatives. Included in the Sears Rotary study was an estimation of the proportion of through and local traffic entering the rotary using the CTPS traffic model. Details of the roadway capacity analysis are given in **Chapter 6**.

Based on the diverse interests of the residents, business owners, developers, and institution representatives, it was not possible to reach a clear consensus on all of the issues outlined in **Chapters 2-6**. Within each chapter, a synopsis of the policy choices and issues is presented to acknowledge the various goals, opinions, and tradeoffs that exist within the Fenway community.

Chapter 7 contains a description of the land use impacts of the proposed changes in zoning and the additional trips that would result. Full development of the special study areas defined by "Land Use and Urban Design Guidelines" *(BRA, 2001)* would result in an estimated 3.8 Million square feet (Msf) of new floor space. This development would entail the demolition of approximately 0.9 Msf of existing commercial space, leaving the net increase at about 2.9 Msf. This space includes the Fenway Mixed Use Project as a ground floor retail and upper floor residential development. According to the land use types outlined by the urban design study, the 3.8 Msf would consist of:

- 0.50 Msf retail (primarily ground floor among mixed uses)
- 1.45 Msf residential (approximately 1,450 units)
- 1.85 Msf office

Meeting handouts, data, and calculations can be found in the Appendices.

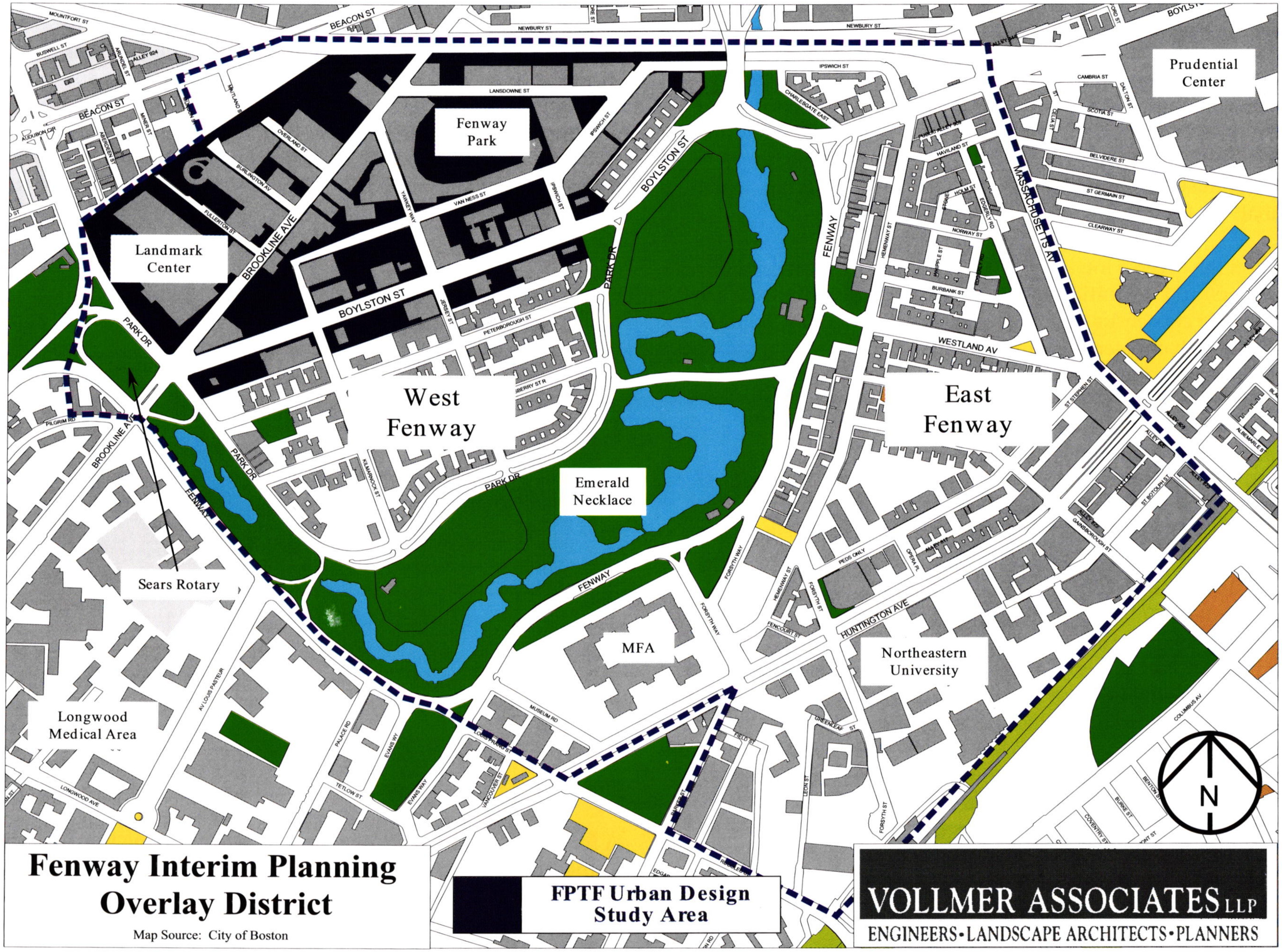
1.2 STUDY AREA

The West Fenway urban design study area comprised three distinct corridors: Boylston Street, Brookline Avenue, and Lansdowne Street (see figure, next page). The transportation study area included the entire Fenway IPOD. The Fenway IPOD is bordered on the north by the Massachusetts Turnpike, on the east by Massachusetts Avenue and Huntington Avenue, to the south by Ruggles Street and the Fenway, and on the west by the Riverway, Park Drive and the MBTA Green 'D' line.

Boylston Street at Ipswich Street

The Emerald Necklace and Muddy River divide the study area into its East Fenway and West Fenway residential neighborhoods. The East Fenway is home to Northeastern University and the Museum of Fine Arts, among other institutions. The Boston Red Sox, Harvard Pilgrim, Landmark Center, and the Lansdowne Street clubs are major commercial occupants of the West Fenway.

A focus was applied to transportation issues in the West Fenway, as the BRA later indicated a separate study would be conducted for the East Fenway, following completion of urban design and transportation planning work for the West Fenway.


Fenway Park
Prudential Center
Landmark Center
West Fenway
East Fenway
Emerald Necklace
Sears Rotary
MFA
Northeastern University
Longwood Medical Area
BEACON ST
BROOKLINE AVE
BOYLSTON ST
PARK DR
FENWAY
WESTLAND AV
MASSACHUSETTS AV
HUNTINGTON AVE
N
Fenway Interim Planning Overlay District
Map Source: City of Boston
FPTF Urban Design Study Area
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1.3 STUDY PROCESS

The contents of this report resulted from an extensive community process and dozens of public and agency coordination meetings, including workshops, and a site walk. The 24-member FPTF met for several months prior to the start of the zoning and transportation studies in the spring of 2000, and was responsible for the suggested language of the Fenway IPOD zoning regulations. In addition, members of the FPTF had direct involvement in both determining the scope of this study and in selection of the consultant teams. Two subcommittees, urban design and transportation, were formed out of the FPTF to advise the consultants in each respective area via separate monthly meetings over the duration of the study.

The FPTF transportation subcommittee meetings were scheduled to coincide with the already-established Fenway-Kenmore Neighborhood Transportation Association (NTA). The NTA held its first meeting on February 11, 1999 and has been holding public meetings monthly ever since. Formation of the NTA was one step toward advancing recommendations made by the "West Fenway/Longwood Transportation Management Strategies" report *(BTD, 1999)*.

The merging of the FPTF transportation subcommittee and the Fenway NTA proved to be highly beneficial, since many attendees were involved in both groups and/or concerned about similar issues related to transportation. At monthly meetings beginning in April 2000, Vollmer Associates made presentations summarizing their work over the previous month and also responded to comments and suggestions made at the prior meeting. Significant portions of each meeting were dedicated to an open forum for questions, comments, and suggestions. BTD prepared and distributed minutes following each meeting. The handouts prepared by Vollmer for each meeting can be found in the Appendix.

The following topics were presented by Vollmer Associates at Fenway NTA meetings:

Fenway Transportation Plan: NTA Meeting Agendas

Date	Primary Discussion Topic
April 2000	Introduction, project schedule, site walk summary, parking inventory
May 2000	Parking inventory, parking goals, review of April Site Walk comments
June 2000	Project review methodology, parking and zoning strategies
July 2000	Transit capacity, bike and pedestrian issues
August 2000	Existing parking ratios, street cross section concepts
September 2000	Street cross section concepts, proposed parking ratios,
October 2000	Sears Rotary introduction, review of existing conditions
November 2000	Sears Rotary study methodology, alternatives identification
December 2000	Sears Rotary alternatives evaluation and discussion
January 2001	Sears Rotary alternatives refinement and discussion
February 2001	Presentation of draft final report

Note: The results of this study contain recommendations for specific transportation improvements in the Fenway study area at a planning level of detail based a review of existing and forecast travel patterns. Analyses of construction costs, prioritization, and feasibility were not included in the scope of study.

The FPTF transportation study was often one of two or three presentations given at the meeting; other presenters at Fenway NTA meetings in 2000 and 2001 included:

- BTD,
- MBTA,
- Metropolitan District Commission (MDC),
- Boston Red Sox,
- GLC Development Resources and ICON architecture, inc.,
- Landmark Center, and
- Medical, Academic, and Scientific Community Organizations (MASCO).

Kenmore Station

The results of the NTA meeting discussions formed the basis for the draft final report presentation made at the February 2001 meeting. Thus, the findings and recommendations found in this report are derived from a blend of local expertise, provided by the residents of the community, and technical expertise, provided by the study consultant and BTD. Following a public comment period in the spring and summer of 2001 and review by the BRA and BTD, the final report was published in the fall of 2001.

1.4 FINDINGS & RECOMMENDATIONS

General Recommendations

This section provides an executive summary of findings and recommendations for the Fenway transportation plan. More detailed discussion and analysis can be found in later chapters.

1. For development to occur at a density of FAR 4.0, (double the existing level) without resulting in unacceptable traffic congestion (i.e., level of service E or worse at major intersections), a significant shift in commuter behavior must occur. This behavior shift would result from a strategic combination of transit incentives and disincentives to drive. The recommended target for the area is a maximum of 30% of peak hour trips to be made in private vehicles. The most recent estimate, based on the 1990 Census, is close to 50%.[1] The balance of 70% of the remaining trips must be made through other modes, including MBTA bus, subway, and commuter rail, walking, or biking modes of travel.

2. The combination of higher development density and increased proportion of transit riders will tax an MBTA system already at capacity on some rapid transit lines and bus routes. Significant investments must be made to increase line capacity to meet the increased demand. Other developments not within the study area will also lay claim to new and existing available capacity on the transit system, especially any Massachusetts Turnpike Air Rights development and expansion of institutions in the Longwood Medical Area.

[1] West Fenway/Longwood Transportation Management Strategies, p. 49 (BTD/1999).

3. If the behavior shift described in bullet #1 can be realized in conjunction with the transit capacity improvements described by bullet #2, development to FAR 4.0 can occur without an unacceptable increase to traffic congestion, delays, and a deterioration of air quality.

The remaining summary of findings and recommendations are subdivided into five categories (Section 1.5 contains zoning recommendations related to vehicle and bicycle parking):

- Parking Inventory
- Pedestrian Facilities
- Bicycle Facilities
- Transit System
- Roadway System

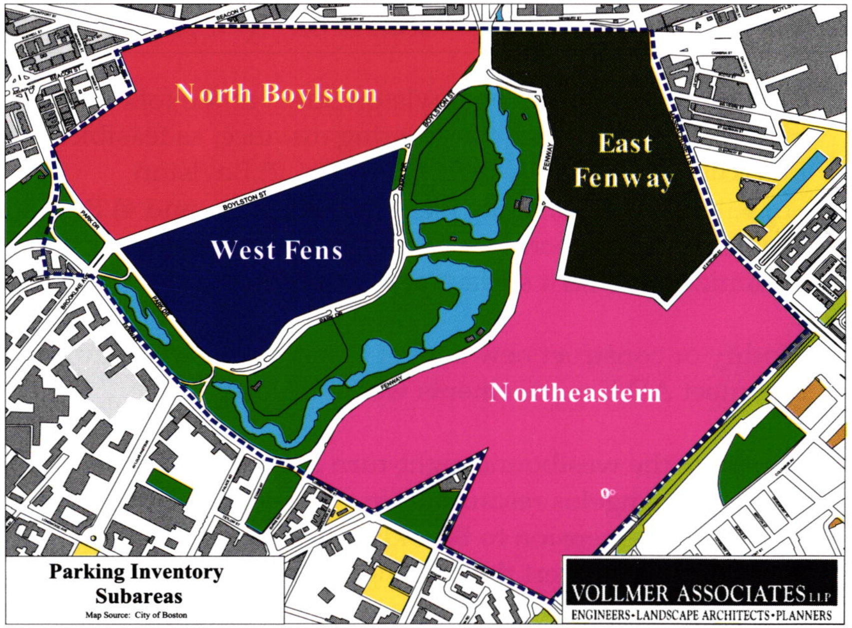
Parking Inventory Results

To provide a clearer picture of the parking conditions within the Fenway, four subareas were created. As shown in the attached figure, the subareas are:

- North Boylston: the non-residential area north of Boylston St.
- West Fens: the primarily residential area south of Boylston St.
- East Fenway: the mixed-use area north of Gainsborough St.
- Northeastern: the primarily University campus areas south of Gainsborough St.

Parking spaces were classified as follows:

- On-Street: Residential, Metered, Unrestricted, Commercial/Taxi Loading, or Handicapped.
- Off-Street: Private residential, Private non-residential, or Public.



Fenway Parking by Subarea

Subarea	On-Street Spaces	Off-Street Spaces
N. Boylston	544	5,286
West Fens	752	1,410
East Fenway	812	1,142
Northeastern	893	2,207
Total	**3,001**	**10,045**

Additional information on the methodology and data collected during the parking inventory can be found in **Chapter 2**.

Recommendations for Pedestrian Facilities (see figure page 9)

1. Construct neckdowns on Boylston Street at the following four intersections to reduce the crossing distance, as feasible: 1) Brookline Ave./Boylston St./Park Dr., 2) Boylston St./Kilmarnock St., 3) Boylston St./Jersey St., and 4) Boylston St./Ipswich St. Decrease curb radii where possible to minimize pavement surface area and increase sidewalk space.

2. Modify or construct new curb cuts with pedestrian ramps that meet ADA requirements where needed

3. Eliminate the westbound right-turn movement (in front of the existing D'Angelos restaurant) in conjunction with the Kilmarnock extension to Brookline (for description, see Section 6.3). Convert the existing travel lane to sidewalk.

4. Retime, modify, or replace four existing traffic signals to incorporate pedestrian phases which encourage their use (i.e., wait times for the crossing phase are not excessively long) and improve their accessibility (e.g., push buttons, audible signals). Locations: 1) Boylston St./Ipswich St., 2) Boylston St./Park Dr./Brookline Ave., 3) Brookline Ave/Fenway, and 4) Fenway/Riverway/Park Dr./Landmark Center access.

5. Provide additional sidewalk width as outlined by "Fenway Land Use and Urban Design Guidelines" *(BRA, 2001)*. The urban design study recommends the following sidewalk widths, created through building setbacks:

    - Boylston Street: 21.5 feet
    - Brookline Avenue: 10-20 feet
    - Lansdowne Street: 10 feet

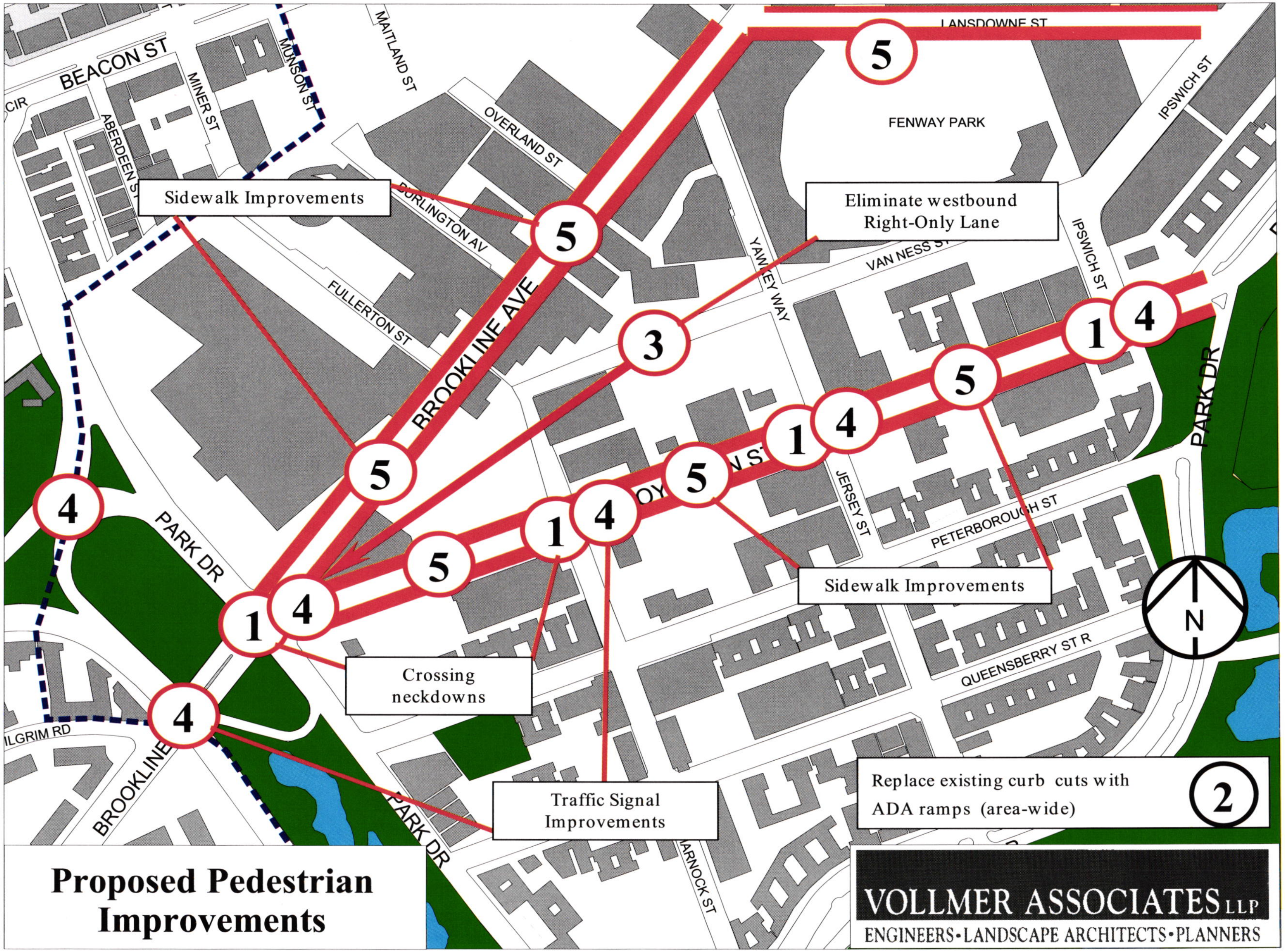
Recommendations for Bicycle Facilities (see figure page 10)

1. Provide an outside lane width of 14' on Boylston Street between Brookline Avenue and Park Drive to accommodate bicycles within the existing right of way. A proposed street cross section can be found in "Land Use and Urban Design Guidelines" *(BRA, 2001)*.

2. Pave and/or resurface existing bike paths running parallel to the Muddy River.

3. Continue to plan for and implement three bike path "branches" from the Emerald Necklace system through the Fenway. These branches include connections from the Muddy River to Kenmore, Forsyth Street, and the Charles River. The Kenmore branch would follow the CSX right-of-way north of Park Drive with connections to Beacon Street and Brookline Avenue. South of Park Drive, the bike path underpass of Park Drive must not preclude MBTA's desire for additional Green Line storage tracks in the area (and vice versa). The Forsyth Street branch is currently under design by the Boston Parks Department. The Charles River branch would link the Emerald Necklace to the Esplinade and should be incorporated into a future reconstruction of the Bowker Overpass.

4. Provide a direct connection across the Riverway for bikes and pedestrians traveling along the Muddy River. While grade separation is not deemed practical, a safer, more direct connection could be facilitated through traffic signal modifications, and potentially through minor roadway realignment.


Proposed Pedestrian Improvements
Sidewalk Improvements
Eliminate westbound Right-Only Lane
Sidewalk Improvements
Crossing neckdowns
Traffic Signal Improvements
Replace existing curb cuts with ADA ramps (area-wide)
2
1
3
4
5
N
LANSDOWNE ST
FENWAY PARK
BEACON ST
MINER ST
MUNSON ST
MAITLAND ST
ABERDEEN ST
OVERLAND ST
BURLINGTON AV
FULLERTON ST
BROOKLINE AVE
YAWKEY WAY
VAN NESS ST
IPSWICH ST
PARK DR
JERSEY ST
PETERBOROUGH ST
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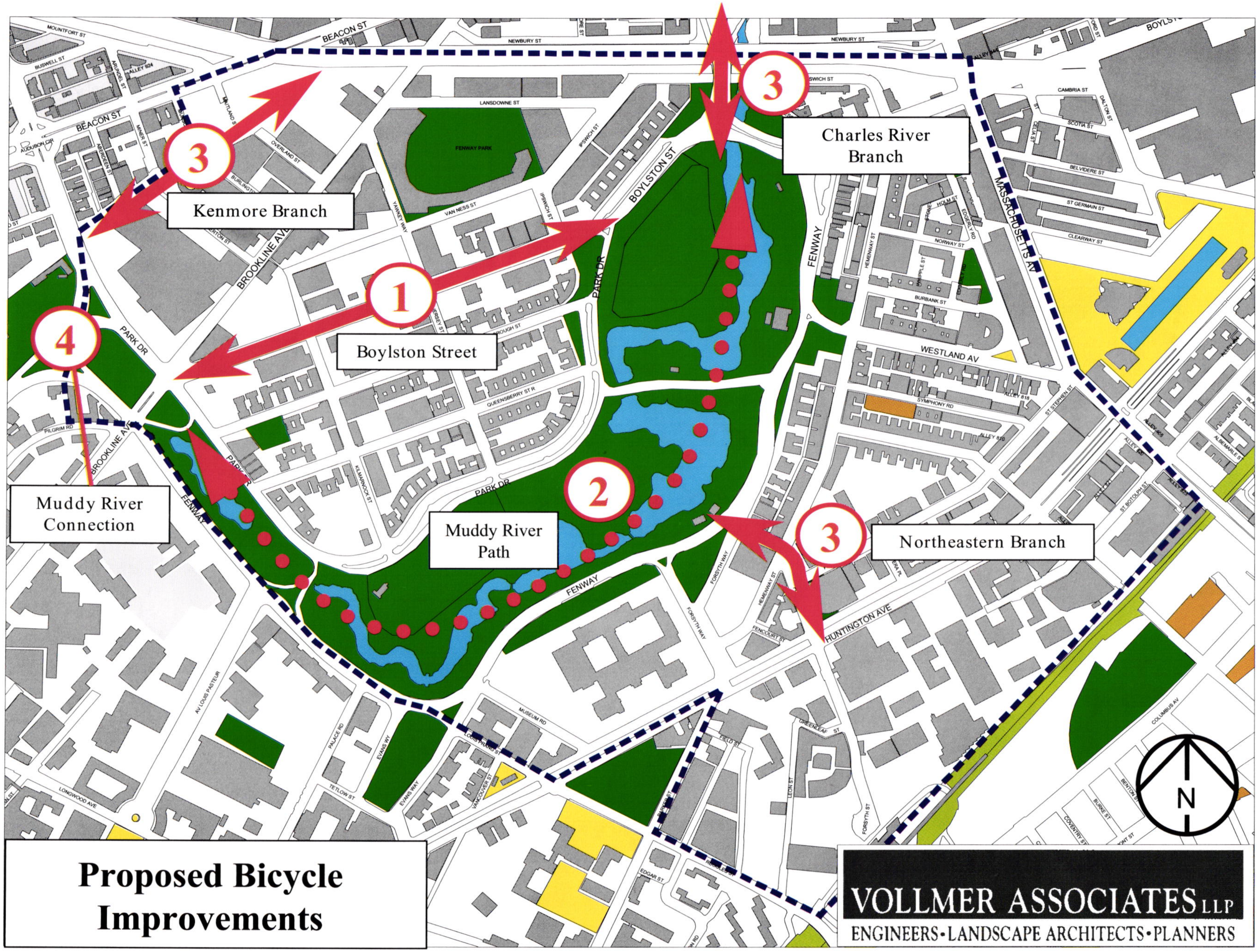


Proposed Bicycle Improvements

Recommendations for Transit System (see figure page 12)

1. Green Line Capacity: run three-car trains at or near existing headways for all Green Line 'D' trains during weekday and Red Sox game day peak periods.

2. Kenmore Station: construct an east-end headhouse to provide a second means of access and egress for passengers.

3. Kenmore Station: construct a pedestrian connection near Kenmore Street on the north side of the Massachusetts Turnpike to Lansdowne Street to provide a second means of access from Kenmore Station and reduce pedestrian flows down Brookline Avenue.

4. Kenmore Station: future surface improvements to the station should accommodate service by 60' articulated buses, similar to those scheduled for Silver Line service in 2003. For example, the peak hour demand for the Route #57 bus could justify implementation of higher capacity vehicles with routes terminating at Kenmore Station.

5. All stations: construct station improvements at Kenmore, Fenway (including storage tracks), and Yawkey Stations (extend platform) as proposed by "Fenway Public Improvement Projects," *(Boston EDIC/Boston Red Sox, 2000).*

6. Fenway Station: construct a second stairway on the south side of Park Drive to reduce pedestrian crossings on the bridge over the Green Line tracks.

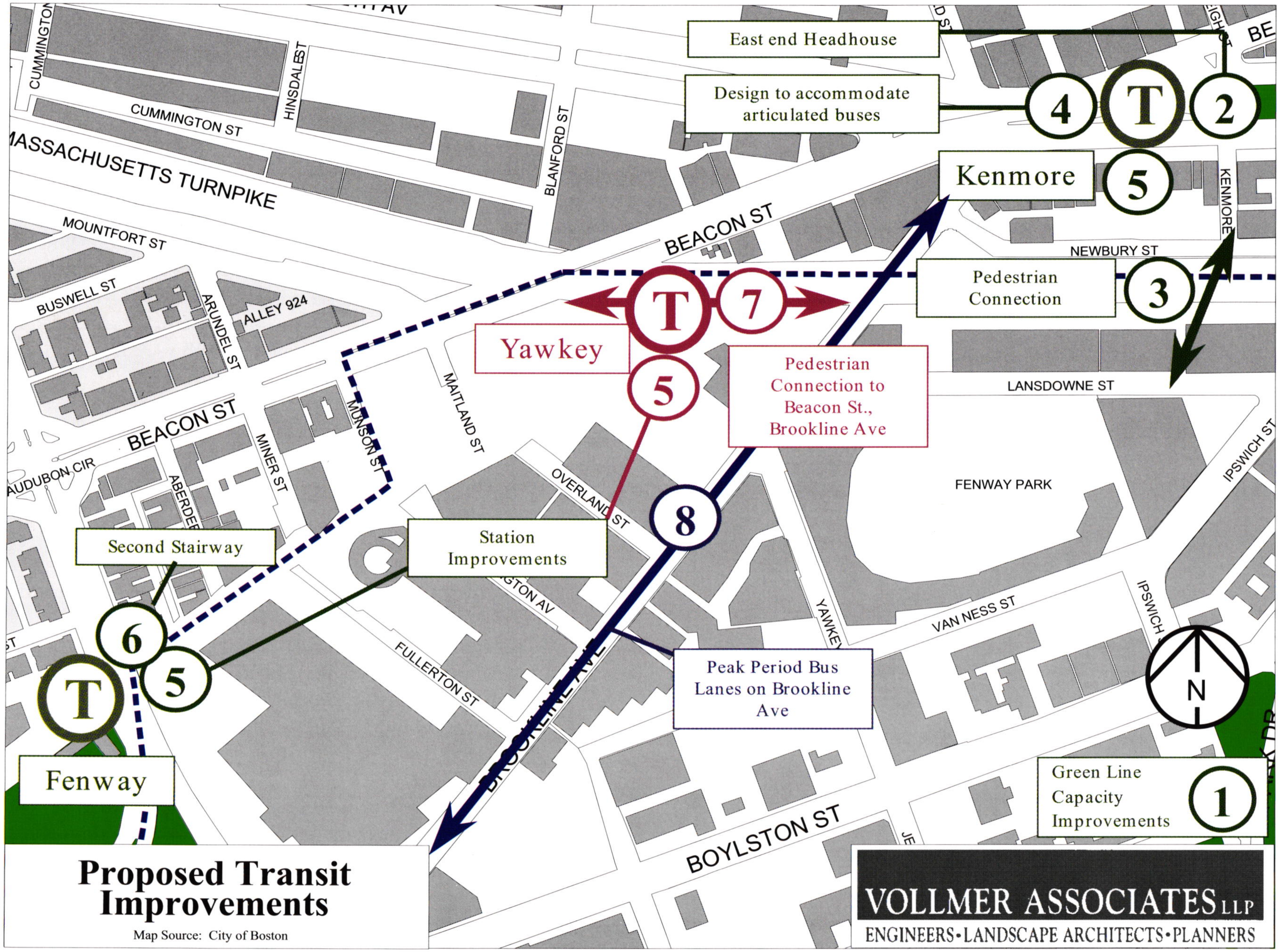
7. Yawkey Station: extend the track-side platform to stairs/elevator to Beacon Street and Brookline Avenue to provide direct pedestrian connections. In conjunction with MASCO and the Boston Red Sox, provide a Ruggles to Kenmore shuttle that is coordinated with train arrival or departure times to minimize wait time for users.

8. Bus-only lanes: These lanes could be built on Brookline Avenue and The Fenway to give priority to buses and shuttles in the area and are alternative corridors for the Urban Ring. Brookline Avenue would consist of an outside bus-only lane during peak periods (four lanes total). During off-peak periods and weekends, on-street parking would be allowed in the outer lane. A counterflow bus lane on the Fenway could be created by converting an existing travel lane to bus-only.

9. Transit signal priority (not shown on map): where feasible, include transit vehicle priority with new traffic signals or modifications to existing equipment. Coupled with a beacon installed on the bus, the green time at a traffic signal can be extended a few seconds to allow a bus to proceed through the intersection.

10. Bus vehicles (not shown on map): encourage all private bus operators, including MASCO and the Boston Red Sox, to present implementation timelines for conversion to clean air vehicles. As suggested in bullet #4, roadway design, especially at Kenmore Station, should give consideration to MBTA bus routes that may add 60' articulated buses in the future.

All transit system improvements mentioned above do not preclude the phased implementation plans for the Urban Ring alternatives. This issue is further discussed in **Chapter 4**.



Proposed Transit Improvements

Map Source: City of Boston

Recommendations for Roadway System (see figure page 13)

1. Reconstruct Boylston Street within the existing right of way according to the cross section given in "Land Use and Urban Design Guidelines" *(BRA, 2001)*. The primary change on Boylston Street would be a slight widening to accommodate a wider, shared-use outside lane for general traffic and bicycles.

2. Reconstruct Brookline Avenue within the existing right of way according to the cross section given in "Land Use and Urban Design Guidelines" *(BRA, 2001)*. The primary change on Brookline Avenue would be a slight widening to allow an eventual bus/shuttle lane during peak periods. This lane would be dedicated to on-street parking during off-peak periods and weekends.

3. Extend Kilmarnock Street to Brookline Avenue, forming a four-way intersection with Fullerton Street. Install a traffic signal at the intersection of Kilmarnock Street and Boylston Street.

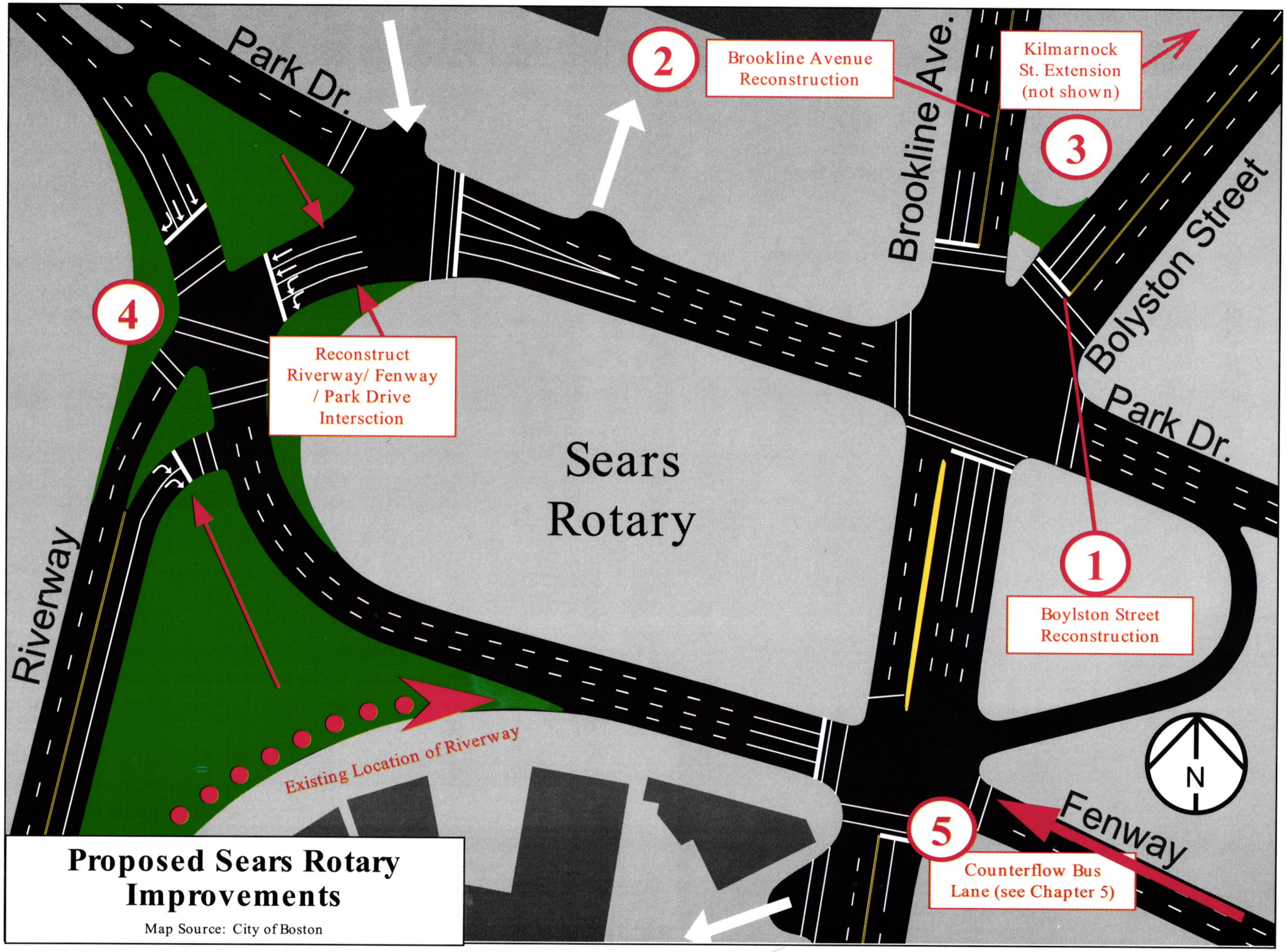
Fullerton Street at Brookline Avenue

4. Reconstruct the intersection of the Riverway, Park Drive, and the Fenway. Align the northbound Riverway merge with the Fenway as a right-turn at a signal-controlled intersection. Narrow the westbound Park Drive lanes from 5 to 4, with all lanes stopping at a traffic signal. This would eliminate the merging condition along the southern leg of the Sears Rotary and simplify the intersection for pedestrians and bicycles traveling along the Muddy River.

Fenway at Riverway/Park Drive

5. In conjunction with the phased implementation of the Urban Ring, construct a counterflow bus lane (not pictured) within the existing cross section of the Fenway between Avenue Louis Pasteur and Brookline Avenue. More details on this concept can be found in **Chapter 5**.

6. Install traffic-actuated and coordinated traffic signals (not pictured) at existing signalized intersections and those proposed for signals. Interconnect signals to the City of Boston Traffic Control Center. Incorporate relevant components of Intelligent Transportation Systems (ITS), including video monitoring, for improved system response to traffic accidents and game-day traffic conditions.



Proposed Sears Rotary Improvements

Map Source: City of Boston

1.5 ZONING RECOMMENDATIONS

Section 1.5 provides an executive summary of zoning recommendations. Zoning recommendations presented here are specific to those which are transportation-related (e.g., parking). For zoning recommendations related to land use, density, and height, etc., please refer to "Land Use Urban Design Guidelines" *(BRA, 2001)*. The zoning recommendations presented in this section are divided into three categories.

- Vehicle Parking Ratios and Incentives
- Ancillary Shared Parking
- Bicycle Parking Ratios

Vehicle Parking Ratios and Incentives

Proposed vehicle parking ratios were set by a consensus of the FPTF to minimize the amount of parking in the Fenway and still allow development according to the urban design vision. For new development in the Fenway, the amount of parking shall be determined by the type of land use proposed (residential or non-residential) as a ratio to the number of residential units or as a ratio to the gross square footage for non-residential space. The following is a summary of the proposed parking ratios:

Non-Accessory:	forbidden use	
Residential:	Minimum:	0.75 spaces per unit
	Maximum:	0.75 spaces per unit
Non-residential	Minimum	none
	Maximum:	0.75 spaces per 1,000 GSF

Parking Incentives

Additional zoning incentives could be added to encourage shared-use vehicles. Shared-use vehicles provide convenient access to an automobile on a short-term basis, reducing the need for individual car ownership. The urban design study *(BRA, 2001)*, proposes an increase in 5% of allowable parking spaces, up to a maximum of 10, for spaces permanently allocated to shared-use vehicles. Other creative strategies could be identified by a project proponent and included in the Transportation Access Plan Agreement (TAPA).

Shared Parking

To encourage the efficient use of spaces where the peak parking demand occurs at different hours of the day (e.g., office and restaurant uses), zoning language was developed for ancillary shared parking facilities. It is important to note that "joint-use facilities" *(West Fenway/Longwood Study p. 74)* are defined as a common parking structure used by two or more tenants. Unlike shared parking, efficiencies for joint use facilities are not generally gained through various tenants utilizing the same spaces over a 24-hour period. Instead, joint use facilities reduce the need for on-site parking through consolidation. Secondly, shared parking facilities are defined here as within ¼ mile of the site served; joint use facilities may require shuttle service.

The proposed zoning language for ancillary shared parking is:

"Developers are encouraged to use existing parking supply before building new spaces. A common parking structure (not to include open-air lots) located within ¼ mile of the project site may be used to satisfy the parking space requirements of a residential or non-residential project, provided that:

1. the common parking structure permanently allocates the specified number of spaces, and

2. the total number of spaces available in the common parking structure is not less than the aggregate number of spaces allocated to different projects, and
3. the street frontage on the ground floor is occupied by a non-parking use, and
4. vehicular traffic generated by the structure does not result in unacceptable levels of congestion on the adjacent street network."

Bicycle Parking Ratios

To support bicycling as a mode of travel, secure bike storage must be provided for residents and business patrons alike. Provisions for bicycle parking at new developments are written in the City of Boston Transportation Access Plan Agreement (TAPA). Recommendations for bicycle parking ratios are as follows:

Residential:	Minimum:	0.5 spaces per unit
	Maximum:	none
Non-residential	Minimum	1 per 10 parking spaces
	Maximum:	none

These ratios are based on recommendations made by the Boston Bicycle Advisory Committee.

1.6 RELATED STUDIES & PROJECTS

Related Studies

A brief summary of recent Fenway/Kenmore transportation-related studies, in reverse chronological order by publication year, includes:

- *"Land Use and Urban Design Guidelines," BRA, 2001.* Provides recommendations for zoning, urban design, and streetscape elements developed through an 18-month series of public meetings, site walks, and workshops. Produced by and for the FPTF in conjunction with this study. Due to its frequent citation in this report, the study is referred to simply as the "urban design study" in later chapters.

- *MBTA Green Line Study, MBTA, 2001.* A key study finding is that the Green is operating at practical capacity. The simulations indicated that the best way to increase capacity would be to go to all three car trains. Other options considered included dynamic double berthing and an eastbound Park Street crossover. While both had some benefit, the increase in train size, particularly with a modest increase in fleet size, led to the highest gain in cars per hour.

- *"Fenway Mixed Use Project Draft Project Impact Report," Fenway Ventures LLC, 2000.* Impacts analysis of proposed development subject to Article 80 of the Boston Zoning Code. Includes analysis of the project impacts on urban design, transportation, environment, and infrastructure.

- *"A Civic Vision for Turnpike Air Rights in Boston," BRA, 2000.* Provides development guidelines, including those related to transportation, for 23 air rights parcels over the Massachusetts Turnpike. Study parcels are located from the "BU" Bridge to the I-90/I-93 interchange. Parcels 7-12 comprise the space from Beacon Street to Mass. Ave.

- *"Fenway Public Improvement Projects," City of Boston EDIC and Boston Red Sox, 2000.* Provides preliminary cost estimates and a qualitative description of $100 million in State-funded infrastructure improvements in the areas of roadway and traffic, transit, pedestrian and landscape, and utilities.

- *"Feasibility of Full-Time Commuter Rail Service to the Fenway/Kenmore Area," MBTA, 2000.* Investigates various alternatives for platform location and associated operational issues. Provides forecasts for system ridership.

- *"Emmanuel College Institutional Master Plan," Emmanuel College, 2000.* Analysis of impacts of proposed campus development on transportation, environment, and infrastructure systems. Includes an institutional transportation plan for parking management and mitigation.

- *"Fenway Area Proposed Transportation Improvements," Boston Red Sox, 1999.* Outlines, at a sketch planning level of detail, a series of transit and roadway improvements designed to mitigate the impacts of a proposed ballpark.

- *"West Fenway/Longwood Transportation Management Strategies," BTD, 1999.* Contains an extensive review of existing transportation conditions and previous proposals. Planning goals are identified and short-term and long-term strategies for improvements are presented. The study was completed over a two-year process of public and working committee meetings. Due to its frequent citation in this report, the study is referred to simply as the "West Fenway/Longwood Study" in later chapters.

- *"Functional Design Report: Transportation Improvement Project The Landmark Center, Boston," Abbey Group, 1997.* Documents traffic analysis completed for the Sears Rotary in conjunction with the redevelopment of the Landmark Center. Two phases of Sears Rotary improvements were proposed: interim and final. The interim phase was constructed but the final phase was never advanced. The final phase is referred to as the ISTEA proposal (since federal funding was sought for this improvement) or Alternative A in this study.

Related Projects

Muddy River Flood Control. Extensive improvements are planned for the Muddy River to increase its capacity and decrease the frequency of flooding in the immediate area (especially on the Green 'D' Line between the Fenway and Kenmore Square Stations). The project also proposes daylighting the Muddy River through the Sears Rotary.

Huntington Ave Reconstruction (Brigham Circle to Massachusetts Avenue). Construction began in spring 2001, with an estimated completion date of spring 2003. On-street metered parking has been recently eliminated from Mass. Ave to Brigham Circle, with some spaces relocated to Parker Street. The new design incorporates wider sidewalks, pedestrian crossings, new traffic signals, and Green line track improvements.

Kenmore Square Improvements. The reconstruction of the surface streets and bus shelter at Kenmore Square is a MassHighway project currently in the preliminary stages of design. The MBTA is also planning improvements to meet ADA requirements. The Hotel Commonwealth project has allocated space for expansion of the south pedestrian tunnel and stairs to Comm. Ave.

Massachusetts Avenue Reconstruction (Charles River to Southampton Street). Limited information is available on this project since it is in very preliminary stages. The initial cost estimate for the "no-tunnel option" is $12 million dollars. This project is listed in the supplemental list of the current Regional Transportation Plan.

MBTA Urban Ring. A Major Investment Study, completed in July 2001, outlines a phased implementation plan of a transit line circling the City of Boston. The plan would link Cambridge to the Longwood Medical area, among others, and reduce the need for transit line transfers with Boston's central business district.

2.0 PARKING

The scope for the parking task was defined by the FPTF as: 1) inventory existing parking, 2) present parking ratio tradeoffs, and 3) make zoning recommendations with respect to parking ratios.

Several technical terms, as defined in this report, related to parking are included below to clarify the discussion that follows:

- Accessory Parking: parking which is associated with a particular land use that is located on site or within walking distance (defined as within ¼ mile radius).

- Net New Parking: the difference between the existing number of parking spaces on a parcel of land and the number proposed in conjunction with a new development.

- Non-Accessory Parking: a parking facility not associated with a proximate (within ¼ mile radius) land use, but open to the general public, commuters, or patrons. Examples include public parking facilities and satellite parking lots.

- Parking Ratio: relates the amount of development, measured in number of dwelling units for residential space, and in gross square footage (gsf) for non-residential space, to the number of off-street parking spaces provided. As the parking ratio decreases, the amount of parking decreases. For example, a 50,000 square foot office building with 40 parking spaces would have a parking ratio of 0.8 spaces/1,000 GSF. A 100-unit apartment building with 90 parking spaces has a parking ratio of 0.9 spaces/unit. Two parking ratios are presented in this report: existing and proposed. The existing parking ratio is calculated by dividing the number of spaces counted in the inventory by the amount of existing building area (square footage) for a given parcel. The proposed parking ratio applies to new development only.

- Joint-Use Parking: a common parking structure used by two or more tenants *(West Fenway/Longwood Study p. 74)*. Joint use facilities reduce the need for on-site parking through consolidation and often require shuttle service to and from the sites they serve. Within the Fenway, joint-use facilities generally consist of satellite parking lots operated by the Medical, Academic, and Scientific Community Organizations (MASCO). MASCO provides shuttle service to and from institutions within the Longwood Medical Area.

- Shared Parking: by taking advantage of the fact that various land uses have different hours of peak parking demand, this concept utilizes the same spaces two or more times over a 24-hour period *(West Fenway/Longwood Study p. 74)*. For example, the peak demand for office-related parking might occur between 8:00 AM and 6:00 PM, while parking demand for a nearby restaurant might be highest after 6:00 PM. The key differences from joint-use parking are that shared parking demands differ by time of day and parking is within walking distance of the sites served.

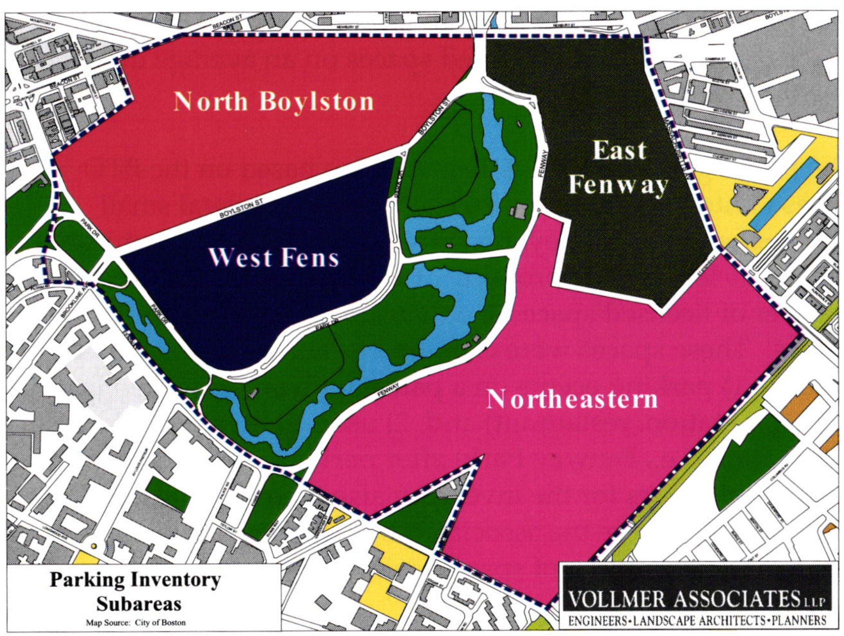
Comparison of Shared and Joint-Use Parking Facilities

	Distance to Site(s) Served	Parking Demand for Site(s) Served	Benefits
Shared Parking	Within ¼ mile radius	Varies by time of day	Two or more vehicles use same parking space over 24-hr period
Joint-Use Parking	Generally beyond ¼ mile radius	Coincides by time of day	Consolidation of smaller lots

2.1 EXISTING CONDITIONS

An extensive field inventory of parking spaces in the Fenway was conducted in July 2000. Parking spaces were assigned by street to one of 48 city blocks that comprise the study area. A MapInfo© database was created to locate spaces graphically on a street map. To provide a clearer picture of existing parking conditions in different sections of the study area, the 48 blocks were combined into four subareas. As shown in the following figure, the subareas are:

- North Boylston: the non-residential area north of Boylston St.
- West Fens: the primarily residential area south of Boylston St.
- East Fenway: the mixed-use area north of Gainsborough St.
- Northeastern: the primarily University campus and institutional areas south of Gainsborough St.



Parking spaces were classified as follows:

- On-Street: Residential, Metered, Unrestricted, Commercial/Taxi Loading, or Handicapped. The approximately 20 spaces where resident-only parking is allowed overnight (Hemenway Street and Edgerly Street) were classified as metered spaces.

- Off-Street: Resident Accessory, Non-Resident Accessory, and Non-Accessory Parking facilities. Parking space totals for on-street and off-street spaces within the Fenway are shown below.

Fenway Parking by Subarea (July 2000)

Subarea	On-Street Spaces	Off-Street Spaces	Total
N. Boylston	544	5,286	5,830
West Fens	752	1,410	2,162
East Fenway	812	1,142	1,954
Northeastern	893	2,207	3,100
Total	**3,001**	**10,045**	**13,046**

Fenway On-Street Parking by Type (July 2000)

Subarea	Resident	Meter & Two Hr	Unrestrict -ed	Taxi & Loading	HC*	Total
N. Boylston	95	302	99	45	3	544
West Fens	529	120	81	13	9	752
East Fenway	534	190	0	81	7	812
North-eastern	280	425	128	45	15	893
Total	**1,438**	**1,037**	**308**	**184**	**34**	**3,001**

* Handicapped Parking.

Fenway Off-Street Parking by Type (July 2000)

Subarea	Resident Accessory	Non-Resident Accessory	Non-Accessory	Total
N. Boylston	17	3,684	1,585	5,286
West Fens	591	619	200	1,410
East Fenway	937	98	107	1,142
North-eastern	77	2,130	0	2,207
Total	**1,622**	**6,531**	**1,892**	**10,045**

A total of 13,046 parking spaces were counted within the study area, about 77% of which are off-street spaces. The North Boylston subarea received closer attention since over half of the off-street spaces are located there and it coincides with much of the urban design study area *(BRA, 2001)* where zoning changes and future development may occur. Also, parking issues will be revisited for the East Fenway in a subsequent study.

It is important to note that these numbers do not match those presented in the West Fenway/Longwood Study *(BTD, 1998)* because the study areas are different and several changes (e.g., Landmark Center redevelopment) have altered the parking inventory since that study was completed. The detailed parking inventory by subarea, block, and individual facility can be found in the Appendix. The results presented here are current through the date of the inventory, July 2000, however, the database can be updated.

On-Street Parking. Nearly 50% of the on-street spaces are classified as resident-only while 10% are unrestricted spaces. Since the inventory, however, this number has been reduced through the conversion of some unrestricted spaces on Park Drive to resident-only parking. Additional unrestricted spaces in the Northeastern subarea (Parker St. & Evans Way) were converted in April 2001 to metered parking to replace spaces eliminated on Huntington Avenue during its reconstruction (2001-2003). Unrestricted on-street spaces are likely used by residents, commuters, and visitors.

Off-Street Parking. The classification of off-street parking required both engineering judgement and field observation of the signs at each lot entrance, especially for determination of accessory versus non-accessory parking. If a parking facility appeared to primarily serve a land use outside a walking distance of ¼ mile, it was classified as non-accessory. The key term in the preceding sentence is "primarily." It was not possible to quantify the small portion of spaces within those facilities that may be accessory parking. The term primarily also refers to days of use, such that Red Sox accessory parking (~81 days/year) leased by MASCO (~250 days/year) for satellite parking was classified as non-accessory. Finally, the inventory numbers represent actual spaces; the number of occupied spaces on an average day may be less than the total capacity.

The parking inventory numbers are also based on the BTD licensed number of spaces for each facility. Several small businesses along the Boylston Street corridor have permits to park vehicles on their property at valet capacity. This maximum number of licensed spaces is only used during Red Sox home games. These spaces were classified as non-residential accessory because 1) parking occurs on a parcel with an associated land use (e.g., gas station, restaurant) and, 2) users generally walk to their destination (i.e., Fenway Park) after parking. Use of the licensed number of spaces for the inventory also increases the existing parking ratios since the associated building square footage is very small and the number of spaces is very high.

Existing Off-Street Parking in the North Boylston Subarea

A total of 1,585 spaces were classified as non-accessory (primary site(s) served not within ¼ mile) in the North Boylston subarea. Most of these spaces are located in five facilities: Yawkey Lot (350), Lansdowne Garage (311), Red Sox Garage (261), Beacon Lot (230), and the Nimrod/Draper Lot (179).

MASCO Parking. According to information presented by MASCO (February 2000 NTA meeting), parking spaces are leased in the following four lots within the study area:

- Yawkey Lot (adjacent to Yawkey Station)- 300 spaces
- Red Sox Garage (Ipswich St.)- 276 spaces
- Lansdowne St. Garage- 233 spaces
- Boylston St. Lot (between Burger King & Dominos)- 95 spaces

Thus, MASCO currently leases 904 spaces within the Fenway. Based on field observations, it appears that other public parking facilities are also utilized by LMA employees, including the Nimrod/Draper Lot and the surface lot near the intersection of Ipswich St. and Van Ness St. It appears that approximately 300 additional spaces are used by LMA employees, a number for which MASCO has limited control. The current estimate of actual LMA parking within the study area, therefore, is approximately 1,200 spaces.

Two other MASCO satellite parking facilities are located outside the study area:

- Parker/Halleck St. Lots- 336 spaces
- Chestnut Hill Lot- 310 spaces

The remaining 385 (1,585-1,200) non-accessory spaces are public parking lots.

Parking spaces that serve land uses within the Fenway, such as 99 Brookline and Harvard Pilgrim Health Care were classified as non-residential accessory parking since the associated use is on-site or within the study area. A total of 3,684 spaces were classified as non-residential accessory in the N. Boylston subarea.

Harvard Pilgrim Parking. Besides the 261-space garage and surface parking facilities adjacent to the site, Harvard Pilgrim also utilizes the 273-space VIP Parking garage across Brookline Avenue. Based on field observations, it was also assumed the 175-space surface lot adjacent to this garage is primarily used by Harvard Pilgrim. Thus, the total off-street parking for Harvard Pilgrim is estimated as 709 spaces.

99 Brookline Parking. This building is primarily a medical office and research facility. For the purposes of the parking inventory, it was assumed that employees and visitors to this site park in the 215-space Red Sox lot immediately adjacent to 99 Brookline. These spaces were classified as non-resident accessory parking.

Landmark Center Parking. Parking for this mixed-use facility consists of 1,790 non-resident accessory spaces, most in an attached garage.

Landmark Center Parking Sign

The remaining 970 (3,684-2,714) non-resident accessory spaces in the North Boylston subarea are located among various small surface lots adjacent to commercial businesses (e.g., service stations, restaurants, office uses). Many of these spaces are only occupied during Red Sox Games.

Existing Parking Ratios

Prior to formulating recommendations for proposed parking ratios, the parking inventory was used to establish existing parking ratios within the Fenway. The existing building square footage and land use types for all blocks within the study area were obtained from the City of Boston Assessor's office. The data were then verified in the field. New developments not yet in the City database (e.g., Landmark Square, Northeastern's West Village Dorms, etc.), were also added. The calculated parking ratios are listed in the table below. To indicate the actual availability of parking for residents, visitors, and commuters, on- and off-street spaces were included (on + off). The overall ratio was also calculated for off-street spaces (off-only). A comparison of the two ratios at the bottom of the table reiterates that nearly half of the Fenway residential parking supply is on-street.

Existing Parking Ratios

Subarea	Resident Parking (per unit)	Non-Resident Parking (per 1,000 Sq. Ft.)
N. Boylston	0.25	2.10
West Fens	0.37	5.70
East Fenway	0.37	1.04
Northeastern	0.10	0.67
Overall (on + off)	**0.28**	**1.35**
Overall (off-only)	**0.15**	**1.13**

Existing Resident Parking Ratios. The existing parking ratio (on + off) calculated for residential (0.28) is believed to be low for several reasons. First, the number includes several Northeastern dormitories. It was not possible to differentiate between commuter student and resident student parking. Therefore, a much lower ratio than expected was calculated for the Northeastern subarea. Secondly, the North Boylston subarea has a very small amount of housing and essentially no residential off-street parking. Finally, the ratios do not account for the number of vehicles with residential permits that currently utilize the 300+/- unrestricted on-street spaces or other shared overnight spaces. Taking these factors into account, a more realistic effective ratio that represents the availability of parking for residents (on-street plus off-street) is estimated to be 0.40 spaces per dwelling unit, rather than the 0.28 calculated.

Existing Non-Resident Parking Ratios. The existing non-residential ratio should be examined with several considerations in mind. First, the numbers include the permitted amount of parking spaces in each off-street lot. For locations near Fenway Park, the number represents the "valet" or permitted capacity of some parcels. Therefore, this represents a worst case, or Red Sox game-day, parking conditions. For example, several gas stations and fast food restaurants on Boylston Street can legally park 60 to 80 vehicles during ballgames. Since service station and fast food restaurants have a relatively small amount of building area square footage, this results in large parking ratios (e.g., 5.70 in the West Fens). A second characteristic that increases the non-residential parking ratio is the amount of satellite parking spaces dedicated to uses outside the study area. This increases the number of spaces without any corresponding increase in the square footage of building area.

2.2 POLICY CHOICES: VISIONS AND GOALS

The transportation vision for the Fenway includes a dense, transit-oriented environment in which the share of auto trips is significantly reduced from that observed today. However, it is probably unrealistic to assume that new developments will be constructed without on-site parking or that some net new parking will not be required to meet the community goals of greater density and increased numbers of residential units. Three major policy choices with respect to off-street parking were identified in this study: 1)allowance of net new parking, 2)determination of parking ratios, and 3) to replace or relocate non-accessory parking.

Allowance of Net New Parking

The issue of proposed net new parking, particularly in the North Boylston subarea, is of paramount importance to the residents of the Fenway. The existing parking inventory completed as part of this study is intended to serve as a tool for managing growth and to minimize the number of net new spaces constructed in the Fenway. Two specific development proposals were discussed over the course of this study, the Fenway Mixed Use Project (MUP) and the Red Sox plan for a new Fenway Park. Should these proposals be advanced, this study can serve as a resource to identify the amount of proposed net new parking. More detailed information related to net new parking for these projects is contained in **Chapter 4**: Project Review. For a discussion of net new parking for the overall study area, refer to **Chapter 7**: Urban Design and Growth Planning.

Determination of Parking Ratio

The issue here is to set parking ratios low (to minimize parking) but high enough to not preclude community-supported development from occurring. The proposed ratios given in the next section were developed through a year-long series of NTA meeting presentations and discussions. The presentations included analysis by a development consultant, space number calculations according to various scenarios, and comments from developers and the community. The tradeoffs were presented for each case: a parking ratio of 1.0 was thought to allow too much parking while a ratio of 0.5 might preclude any new development from occurring. The proposed ratios are thought to best balance these alternatives.

Unrestricted On-Street Parking on Van Ness Street

To Replace or Relocate Non-Accessory Parking

The third policy choice can be described by summarizing two distinct viewpoints voiced over the course of this study:

Residents: Replace non-accessory spaces with accessory spaces. Elimination of the non-accessory parking spaces would require existing users to park elsewhere or to change their mode of travel. The satellite parking lots in the West Fens would be replaced by accessory parking for new residential and non-residential development according to the ratios defined by the zoning language.

Institutions: Relocate non-accessory spaces to a centralized facility through joint use parking arrangements. Existing users would retain parking spaces within the Fenway. The satellite parking lots in the West Fens would be relocated to a centralized facility, allowing residential and non-residential development to replace the existing surface lots.

Note: The issue of parking enforcement is also a high priority to residents of the West Fenway although it could not be adequately addressed within the scope of this study. Increased enforcement of existing regulations and/or the imposition of higher fines or towing of violators were routinely discussed at the NTA meetings.

2.3 RECOMMENDATIONS & RATIONALES

On-Street Parking

Although the parking inventory was completed for both on-street and off-street parking spaces, the analysis focused on off-street parking since the construction of new off-street spaces can be controlled by zoning. The West Fenway/Longwood Study *(BTD, 1998)* provides a number of on-street parking recommendations for reallocating spaces at specific locations to reflect community needs and goals. An example is the conversion of unrestricted spaces to resident-only spaces or metered spaces. The implementation of these recommendations is an ongoing process that occurs through citizen input at the monthly Fenway/Kenmore Neighborhood Transportation Association (NTA meetings). The West Fenway/Longwood study also contains recommendations for improved signing and parking enforcement. These findings are not repeated here.

Off-Street Parking

Proposed vehicle parking ratios were set by a consensus of the FPTF to minimize the amount of parking in the Fenway and still allow development according to the urban design vision. For new development in the Fenway, the amount of parking shall be determined by the type of land use proposed (residential or non-residential) as a ratio to the number of residential units or as a ratio to the gross square footage (GSF) for non-residential space. The following is a summary of the proposed parking ratios:

Non-Accessory:	forbidden use	
Residential:	Minimum:	0.75 spaces per unit
	Maximum:	0.75 spaces per unit
Non-residential	Minimum	none
	Maximum:	0.75 spaces per 1,000 GSF

The parking inventory results quantified what residents of the Fenway have noticed: the amount of residential parking in the area is very low and the amount of non-residential parking is very high. The proposed parking ratio of 0.75 for residential and 0.75 for commercial would tip the existing balance toward decreased non-residential parking and increased residential parking in future developments. The 0.75 parking ratios are also consistent with the recommendations made by "A Civic Vision Turnpike Air Rights in Boston" *(BRA, 2000)* for air rights parcels along the northern boundary of the study area.

Parking Incentives

Additional zoning incentives could be added to encourage shared-use vehicles. Shared-use vehicles provide convenient access an automobile on a short-term basis, reducing the need for individual car ownership and additional parking spaces. The urban design study *(BRA, 2001)*, proposes an increase in 5% of allowable spaces, up to a maximum of 10, for spaces permanently allocated to the shared-use vehicles. Other creative strategies could be identified by a project proponent and included in the Transportation Access Plan Agreement (TAPA).

Shared Parking

To encourage the efficient use of spaces where the peak parking demand occurs at different hours of the day (e.g., office and restaurant uses), recommended ancillary zoning language was developed for shared parking facilities.

The shared parking ancillary to the proposed zoning language is:

"Developers are encouraged to use existing parking supply before building new spaces. A common parking structure (not to include open-air lots) located within ¼ mile of the project site may be used to satisfy the parking space requirements of a residential or non-residential project, provided that:

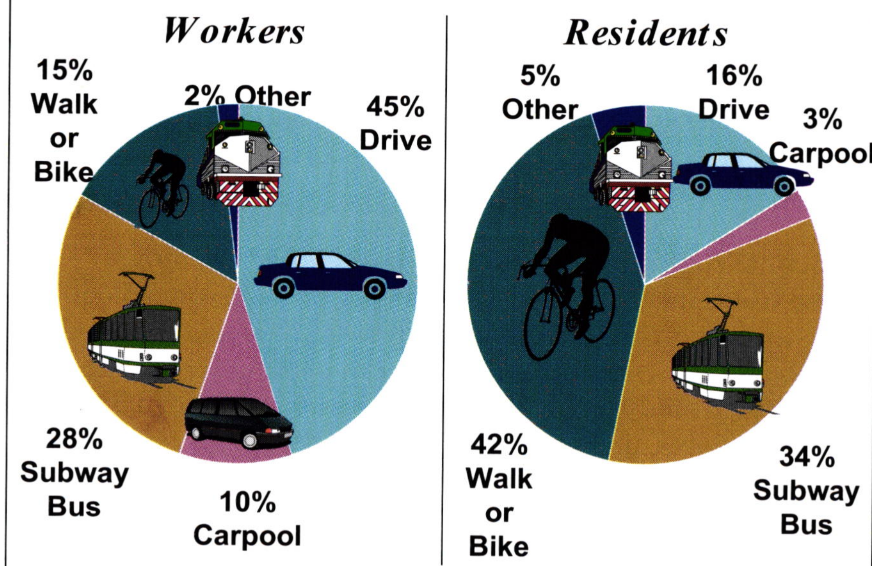
1. the common parking structure permanently allocates the specified number of spaces, and
2. the total number of spaces available in the common parking structure is not less than the aggregate number of spaces allocated to different projects, and
3. the street frontage on the ground floor is occupied by a non-parking use, and
4. vehicular traffic generated by the structure does not result in unacceptable levels of congestion on the adjacent street network."

3.0 PEDESTRIANS and BICYCLES

The scarcity of residential parking in the Fenway described in the previous chapter suggests that auto ownership is relatively low within the study area. Average auto ownership was estimated at 0.5 per household by the 1990 US Census, almost half the City of Boston average of 0.9 *(West Fenway/Longwood Study p. 50).* This supports the estimate that existing parking ratios are at or near 0.4 spaces per residential unit in **Chapter 2**. It is also highly likely that many of the vehicles parked in residential spaces are only used in the evenings or on weekends. Thus, the majority of trips made by residents are probably non-auto (i.e., walking, biking, and transit) modes. Results of the 1990 US Census confirm this assumption; the percentage of residents commuting via single occupant vehicle or carpool was only 19% *(West Fenway/Longwood Study p. 49).*

By contrast, the percentage of Fenway workers that commute via single occupant vehicle or carpool is nearly 60% *(West Fenway/Longwood Study p. 49).* A significant amount of through traffic also passes through the Fenway en route to Boston's central business district, Cambridge, and the Longwood Medical area, among others.

As shown in the figure at right, Fenway residents and those who work there typically use different modes of travel; however, they must share the same streets and cross the same intersections. For example, when a pedestrian has the right of way (i.e., the walk signal), traffic in conflicting directions, and in some cases all directions, must stop. Improving the safety of this interface between vehicles and pedestrians is the subject of this chapter. Improvements to walking and bicycling for recreational purposes by enhancing connections to and through the Emerald Necklace are also identified.



Source: West Fenway/Longwood Transportation Management Strategies (1996)

Modes of Travel for Fenway Workers and Residents

The effort to devise improvements for pedestrians and bicyclists first required an identification of the "desire lines," or primary paths users wish to walk or bike in the West Fenway. Secondly, a description is provided of specific locations that were identified as potentially unsafe, deficient, or otherwise offer opportunities for improvement. Next, the policy choices related to pedestrian and bicycle enhancements are outlined. The recommendations for specific improvements are presented in the final section of this chapter.

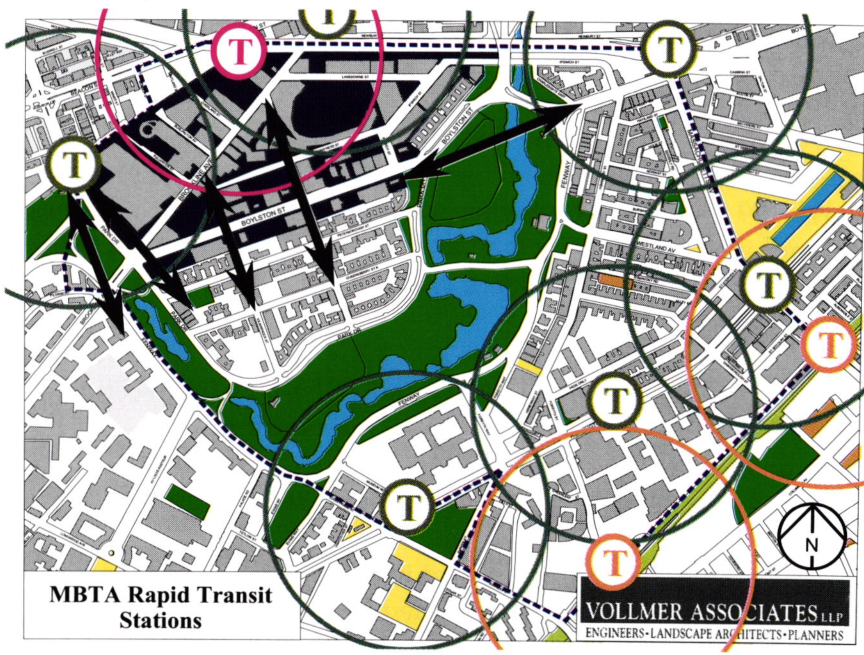
3.1 EXISTING CONDITIONS

Based on the urban design study area and the BRA's intent to sponsor a future study for the East Fenway, analysis focused on the Boylston Street and Brookline Avenue corridors. Pedestrian counts were not included in the scope of this study; however, many recent counts have been performed in conjunction with Article 80 development review submissions, including Landmark Center and the Fenway Mixed Use Project (MUP). The information in this section is based on a review of these documents and the West Fenway/Longwood Study report, field observations, a site walk with residents, and comments made at various NTA meetings. The discussion of existing conditions for pedestrians and bicyclists in the Fenway is divided into three sections: Pedestrian Links, Bicycle Paths, and Bicycle Parking.

Pedestrian Links

Transit Accessibility. A significant number of trips made by Fenway residents are transit trips; therefore, pedestrian accessibility to MBTA rapid transit stations is crucial. The following figure depicts the major pedestrian desire lines (arrows) for walking to and from MBTA rapid transit stations. A ¼ mile radius circle (5-minute walk) is drawn around each station to indicate the relative distance from each station to the surrounding neighborhood. With regular service to Yawkey Station since January 2001, West Fenway residents now have four locations from which to board MBTA subway or commuter rail:

1. Fenway Station (MBTA Green 'D' Line): located on Park Drive between Brookline Avenue and Audubon Circle.
2. Yawkey Station (MBTA Framingham/Worcester Commuter Rail): located adjacent to the Massachusetts Turnpike between Beacon Street and Brookline Avenue.
3. Kenmore Station (MBTA Green "B, C, and D" Lines): located at the intersection of Brookline Avenue, Commonwealth Avenue, and Beacon Street.
4. Hynes Convention Center/ICA (MBTA Green "B, C, and D" Lines): located on Massachusetts Avenue between Newbury Street and Boylston Street.



MBTA Rapid Transit Stations

The distance to rapid transit varies from the West Fenway to the East Fenway. As shown in the figure above, much of the East Fenway falls within a ¼ mile walking distance of the Green or Orange Lines, while there are essentially no stations within ¼ mile of the residential West Fenway. The relative location of the stations to the West Fenway neighborhood, businesses, and institutions, requires many pedestrians to cross Brookline Avenue, Boylston Street, or both to reach their destination.

Crossing Locations. Coupled with the volumes of traffic and vehicle speeds, the width of Boylston Street can be daunting for pedestrians to cross, especially the elderly. Primary crossing locations for Boylston Street are at the following intersections:

1. Park Drive/Brookline Avenue- signalized 5-way intersection,
2. Kilmarnock Street- unsignalized 4-way intersection,
3. Jersey Street- signalized 4-way intersection, and
4. Ipswich Street- signalized 3-way intersection.

For Brookline Avenue, pedestrians generally cross from parking areas on the south side (the Boylston/Brookline triangle) to commercial and institutional uses (Landmark Center, Harvard Pilgrim, 99 Brookline) on the north side. A significant number of crossings also occur before and after Red Sox home games. Major crossing locations for Brookline Avenue are at the following intersections:

1. Park Drive/Boylston Street- signalized 5-way intersection,
2. Fullerton Street- signalized 3-way intersection,
3. Yawkey Way- unsignalized 3-way intersection, and
4. Lansdowne Street- unsignalized 3-way intersection.

Several technical terms, as defined in this report, related to pedestrians and bicycles are included below to clarify the discussion that follows:

<u>Concurrent Pedestrian Phasing</u>- the most common type of phasing in which pedestrians crossings are allowed parallel to the flow of traffic with the right of way. Pedestrians have the right of way over vehicles turning right through their path.

<u>Exclusive Pedestrian Phasing</u>- where pedestrian volumes or some other safety factor stipulates, traffic is stopped in all directions. Pedestrians can cross simultaneously at all street corners and walk diagonally across the intersection, if desired.

<u>Neckdowns</u>- neckdowns are a physical narrowing of the street with the intention of reducing pedestrian crossing distance. The narrowing generally occurs by extending the sidewalk out through the space allocated to on-street parking between intersections. The City of Boston supports the application of neckdowns, where appropriate, as long as they are delineated by bollards or other fixed objects with height, so that plows can be alerted to their presence when covered by heavy snow.

<u>Pedestrian Push Buttons</u>- push buttons allow a pedestrian to request a "walk" signal to cross. Thus, traffic is not stopped unless there is a pedestrian wishing to cross. Push buttons can call for a concurrent phase or an exclusive one. The primary problem with push buttons occurs when the wait time is too long; people either do not believe the buttons are functioning or do not wish to wait for the "walk" sign and instead cross when a gap in traffic allows. Push buttons must be both conspicuous and legible for the elderly to utilize.

<u>Wait Time</u>- the time a pedestrian waits for the walk sign after arriving at the intersection. The wait time until the walk sign appears is a function of the regular cycling of the traffic signal or the configuration of pedestrian push button.

It is important to note that there are also a number of locations on Boylston Street and Brookline Avenue where commercial driveways intersect the sidewalk, and thus, vehicles can potentially conflict with pedestrians.

Sidewalks and Handicapped Ramps. Existing sidewalks along Brookline Avenue and Boylston Street are generally 5 to 8 feet in width. In most places, there is no buffer (e.g., trees, lamp posts, etc.) between the sidewalk and the street. Many sections of the sidewalk on Brookline Avenue are too narrow to accommodate fans leaving and entering the ballpark. Instead, pedestrians flow out onto the street, rendering Brookline Avenue nearly impassable for vehicles.

The Americans with Disabilities Act (ADA) of 1990 sets design standards to ensure handicapped accessibility on sidewalks and street crossings. All crosswalks and driveway intersections are now required to meet ADA width and slope requirements. Pedestrian push buttons should also meet accessibility requirements. All future improvements to pedestrian crossings, ramps, and push buttons in the Fenway must comply with the ADA.

Bicycle Paths

On-Street Bike Paths: Currently, there are no dedicated bike lanes within the study area. A bike lane along Forsyth Street, connecting the Southwest Corridor Bike Path to the Back Bay Fens is also currently under design by the Boston Parks and Recreation Department. It will be constructed with city and ISTEA Enhancement Funds as part of a city-wide project to link existing bicycle corridors. A bike lane along portions of Ruggles Street is also included in the Forsyth Street project.

Off-Street Bike Paths: Existing off-street bike paths are located on the eastern and western edges of the study area. To the west is the Muddy River bike path, which begins at Park Drive and continues south to Route 9. This path is maintained by the Boston Parks and Recreation Department. The Back Bay Fens contain bike and pedestrian paths also included in the linking of existing corridors project. To the east is the Southwest Corridor bike path, which follows the Orange Line tracks. This path is maintained by the Metropolitan District Commission (MDC

Bicycle Parking

The Boston Bicycle Plan *(BTD, 2001)* identifies two types of bicycle parking facilities:

1. Short-term parking: generally outdoor parking near destinations. The racks, commonly installed on the sidewalk, serve patrons, couriers, and visitors. The distance from the site should be less than 50 feet but up to 750 feet is acceptable. Security is given priority over proximity.

2. Long-term parking: generally indoors or within enclosed bike lockers. Users are commonly commuters or residents who park their bicycles for extended periods of time. In addition, lockers or indoor storage allows a dry, secure area for gear (e.g., helmet, shoes, etc.).

Through a federal grant, the City of Boston is currently installing approximately 300 short-term bike racks citywide. A few of these will be located in the West Fens commercial areas.

Long-Term Bike Storage on Overland Street

3.2 POLICY CHOICES: VISIONS AND GOALS

The transportation vision for the Fenway includes infrastructure improvements that encourage walking and bicycling as a mode of travel by increasing safety and providing a more pleasant and comfortable environment. Major policy choices with respect to pedestrians and bicycles identified in this study were: 1) pedestrian signal timing and phasing, 2) allocation of the existing right of way, and 3) reconnecting the Emerald Necklace.

Pedestrian Signal Timing and Phasing

Traffic signals separate conflicting vehicle and pedestrian movements by time. The time required for a traffic signal to proceed through all its "green" and "walk" phases until it returns again to the first phase is referred to as its cycle length. Portions of the cycle length must be allocated among conflicting vehicle and pedestrian movements. Consideration must also be given to the longer walk times needed by the elderly. The community expressed a clear preference toward allocating more time for pedestrians, even at the expense of increased vehicle throughput.

Accessible pedestrian signals can be fitted with audible tones to indicate the crossing time in a non-visual format. Guidance for the placement of such devices can be found in the 2000 Manual on Uniform Traffic Control Devices (MUTCD) in Section 4E. Countdown pedestrian crossing signals may also be applicable.

Allocation of the Existing Right of Way

As with allocating time from the cycle length to pedestrians, the allocation of physical space to pedestrians is also a policy choice. A fixed right of way width must be allocated to travel lanes for vehicles and bikes, parking, and sidewalk. Obvious tradeoffs occur as the widening of the sidewalk, for example, could replace on-street parking or a bike lane. It is important to note that even a wide sidewalk is not a safe, nor an appropriate place for bicycling. Bicycles must travel in the street and obey all applicable traffic regulations.

The urban design study *(BRA, 2001)* also recommends the voluntary use of setbacks by future development for additional sidewalk width. These types of commitments can be made by developers through the Transportation Access Plan Agreement (TAPA). The TAPA must be approved by BTD before construction of new development in the City of Boston can occur.

Reconnecting the Emerald Necklace

The Sears Rotary and Massachusetts Turnpike effectively sever the Emerald Necklace as it proceeds through the Fenway to the Charles River. As noted in Section 3.1, the Muddy River bike path ends abruptly at Park Drive. The Muddy River daylighting project described in **Chapter 1** will be perhaps the first opportunity to improve existing conditions. The Sears Rotary is an imposing series of street crossings and there is no real continuation of the bike path north and east of Park Drive. A grade-separated crossing was explored and deemed too costly at this location. At the northern end of the Back Bay Fens, the Bowker Overpass and Massachusetts Turnpike block pedestrian and bicycle access to the Charles River Esplanade. The completion of bike paths through the Back Bay Fens would ultimately connect the Muddy River bike path to the Charles River system of parks and paths.

To summarize, a fixed amount of time and space must be shared by various users of the street network. As indicated earlier, there can be a tradeoff between improvement of bicycle and pedestrian crossings and traffic congestion. However, the community clearly favored giving sufficient cycle time and priority to pedestrians, even at the expense of vehicular traffic flow.

3.3 RECOMMENDATIONS & RATIONALES

The following recommendations apply to infrastructure improvements to the pedestrian environment (see map p. 32):

1. Construct neckdowns on Boylston Street at the following four intersections to reduce the crossing distance, as feasible: 1) Brookline Ave./Boylston St./Park Dr., 2) Boylston St./Kilmarnock St., 3) Boylston St./Jersey St., and 4) Boylston St./Ipswich St. Decrease curb radii where possible to minimize pavement surface area and increase sidewalk space.

2. Modify or construct new curb cuts with pedestrian ramps that meet ADA requirements where needed.

3. Eliminate the westbound right-turn movement in front of the existing D'Angelos restaurant in conjunction with the Kilmarnock extension to Brookline Avenue (for description, see Section 6.3). Convert the existing travel lane to sidewalk.

4. Retime, modify, or replace four existing traffic signals to incorporate pedestrian phases which encourage their use (i.e., wait times for the crossing phase are not excessively long) and improve their accessibility (e.g., push buttons, audible signals). Locations: 1) Boylston St./Ipswich St., 2) Boylston St./Park Dr./Brookline Ave., 3) Brookline Ave/Fenway, and 4) Fenway/Riverway/Park Dr./Landmark Center access.

5. Provide additional sidewalk width as outlined by "Fenway Land Use and Urban Design Guidelines" *(BRA, 2001)*. The urban design study recommends the following sidewalk widths, created through building setbacks:

    - Boylston Street: 21.5 feet
    - Brookline Avenue: 10-20 feet
    - Lansdowne Street: 10 feet

The following recommendations apply to infrastructure improvements to the bicycle environment (see map p. 33):

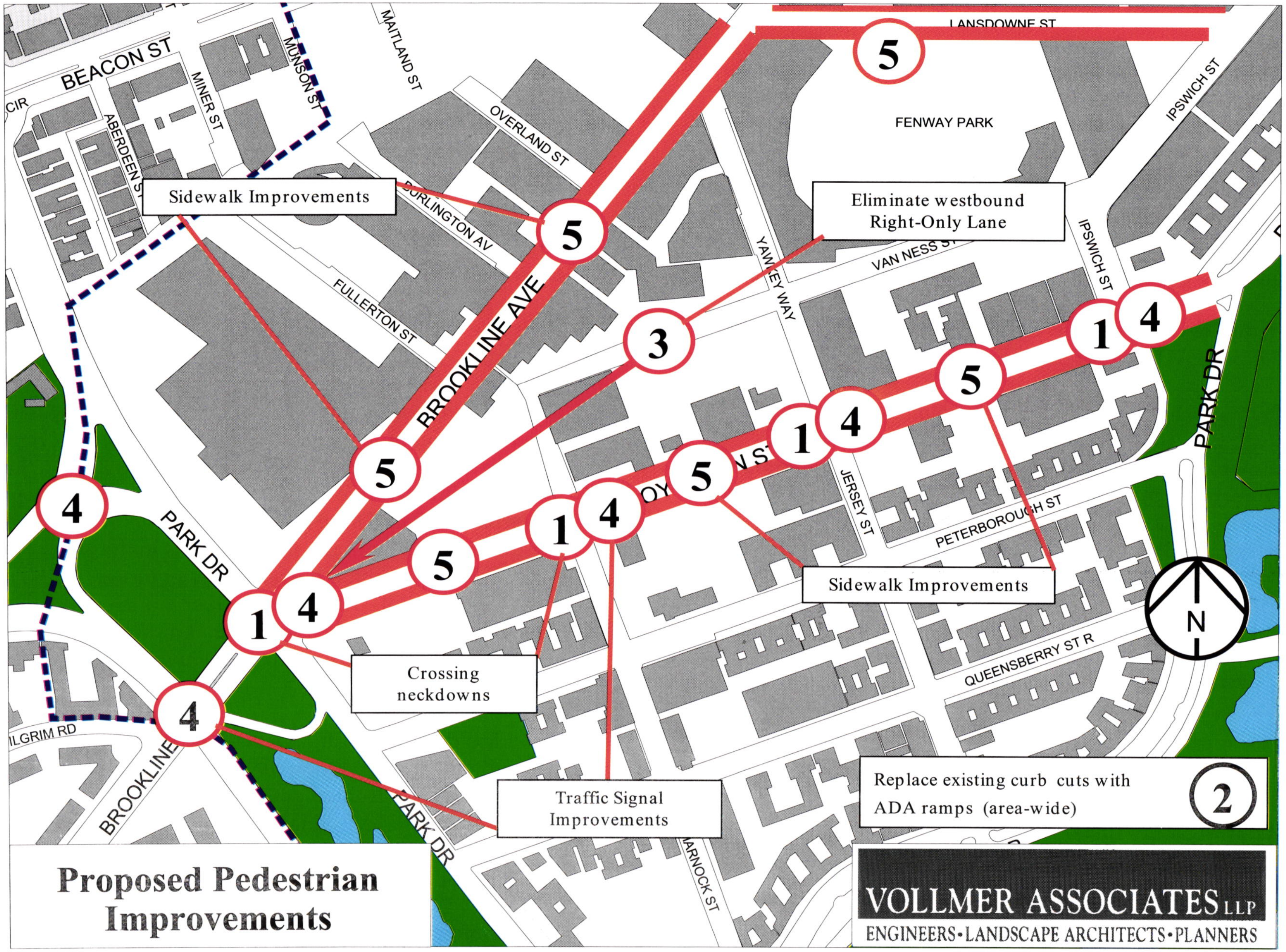
1. Provide an outside lane width of 14' on Boylston Street between Brookline Avenue and Park Drive to accommodate bicycles within the existing right of way. A proposed street cross section can be found in "Land Use and Urban Design Guidelines" *(BRA, 2001)*.

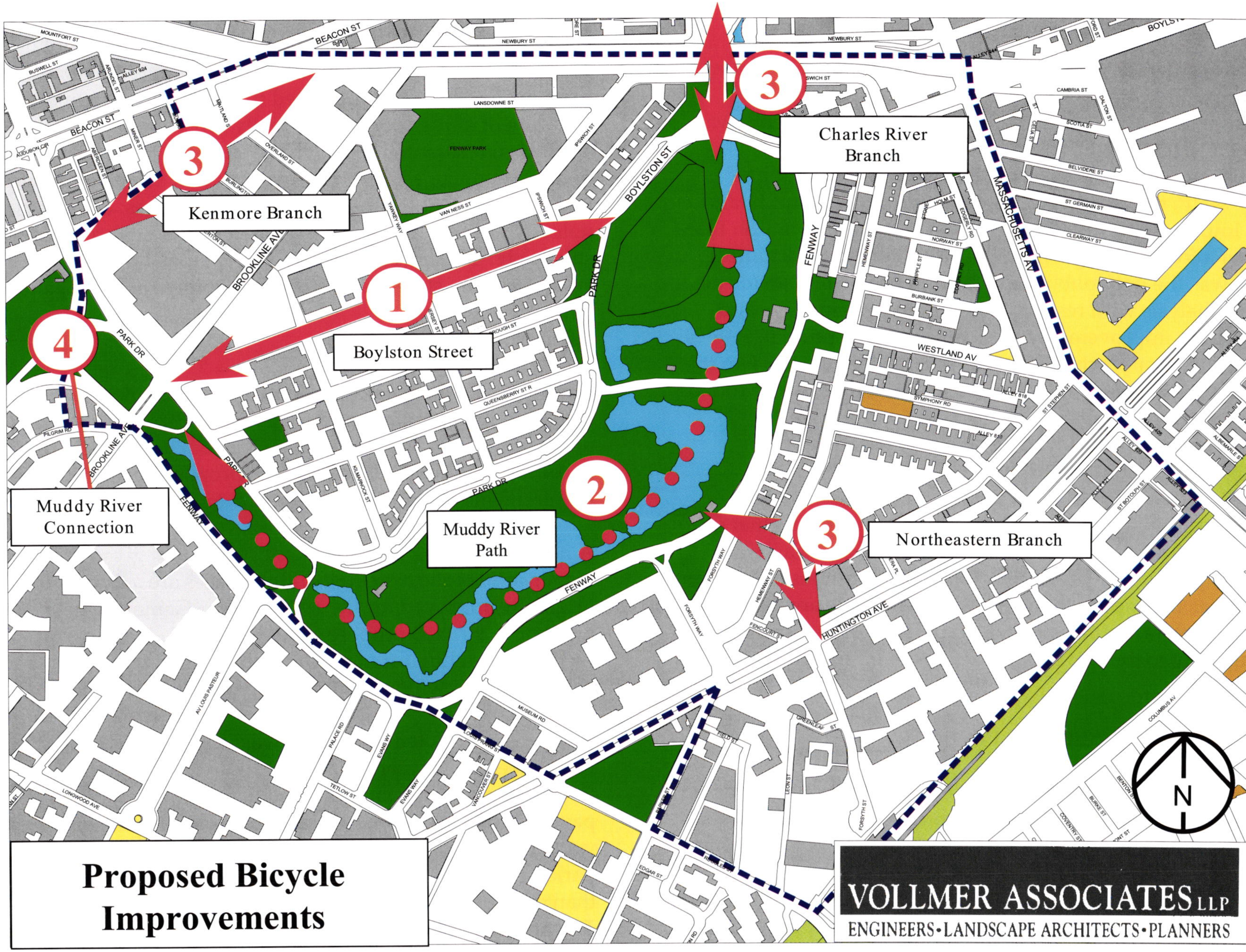
2. Pave and/or resurface existing bike paths running parallel to the Muddy River.

3. Continue to plan for and implement three bike path "branches" from the Emerald Necklace system through the Fenway. These branches include connections from the Muddy River to Kenmore, Forsyth Street, and the Charles River. The Kenmore branch would follow the CSX right-of-way north of Park Drive with connections to Beacon Street and Brookline Avenue. South of Park Drive, the bike path underpass of Park Drive must not preclude MBTA's desire for additional Green Line storage tracks in the area. The Forsyth Street branch is currently under design by the Boston Parks Department. The Charles River branch will link the Emerald Necklace to the Esplinade and should be incorporated into a future reconstruction of the Bowker Overpass.

4. Provide a direct connection across the Riverway for bikes and pedestrians traveling along the Muddy River. While grade separation is not deemed practical, a safer, more direct connection could be facilitated through traffic signal modifications, and potentially through minor roadway realignment (see Section 6.3).

Note: recommendations for bicycle parking ratios can be found on page 16.


BEACON ST
MUNSON ST
MAITLAND ST
MINER ST
ABERDEEN ST
OVERLAND ST
LANSDOWNE ST
FENWAY PARK
IPSWICH ST
Sidewalk Improvements
DURLINGTON AV
Eliminate westbound Right-Only Lane
VAN NESS ST
YAWKEY WAY
FULLERTON ST
BROOKLINE AVE
PARK DR
JERSEY ST
PETERBOROUGH ST
Sidewalk Improvements
N
QUEENSBERRY ST R
Crossing neckdowns
ILGRIM RD
BROOKLINE
Traffic Signal Improvements
Replace existing curb cuts with ADA ramps (area-wide)
ARNOCK ST
Proposed Pedestrian Improvements
VOLLMER ASSOCIATES LLP
ENGINEERS•LANDSCAPE ARCHITECTS•PLANNERS



Proposed Bicycle Improvements

4.0 PROJECT REVIEW

The third study task was to provide an independent technical analysis, on the community's behalf, of the transportation elements of new developments proposed within the Fenway: the Fenway Mixed-Use Project (MUP) and the Red Sox Transportation Plan. Two submittals were reviewed for the Fenway MUP: the Project Notification Form (PNF) and Draft Project Impact Report (DPIR). The Red Sox Transportation Plan, while not a formal filing within the environmental permitting process, was the only published report available to date for the Red Sox' analysis with respect to transportation impacts and infrastructure improvements. The results of the project reviews were used to support comment letters sent from the FPTF to the BRA and project proponents. The comment letters can be found in the appendix. Comments on the Fenway MUP are summarized in Section 4.1, while a review of the Red Sox Transportation Plan is found in Section 4.2.

The organization of this chapter does not follow the format of others, where existing conditions, visions and goals, and recommendations are presented. Existing conditions and visions and goals as they apply to the Fenway as a whole are discussed in other chapters. In this chapter, comments are site specific, applying only to the two projects reviewed in this study.

4.1 FENWAY MIXED USE PROJECT

The Fenway Mixed Use Project (MUP) Draft Project Impact Report (DPIR) was submitted by the proponent on September 22, 2000. The site is located near the intersection of Boylston Street and Brookline Avenue. In the DPIR submittal, the project consisted of 442 apartments, a 200-room hotel, and approximately 150,000 square feet of retail space. The project FAR was 6.61 with 465 proposed parking spaces in an underground garage. Access would occur from Brookline Avenue and Kilmarnock Street. The project would generate 160 vehicle trips during the AM peak hour and 260 vehicle trips during the PM peak. In February 2001, a Notice of Project Change (NPC) was submitted by the proponent. The NPC eliminated the hotel and supermarket component of the project, essentially replacing the space with 138 additional residential units (about 580 total). This review applies to the proponent's DPIR building plan and associated analysis and does not reflect subsequent project changes, unless otherwise noted. However, many DPIR-related comments are expected to still apply. Review comments are categorized into the following areas: parking, street network, methodology, and mitigation.

Parking

The amount of proposed parking in the DPIR met the recommended parking ratios of 0.75/1,000 gross square feet of non-residential space and 0.75/residential unit. The proponent is encouraged to continue to meet the proposed parking ratio requirements should future project changes occur.

A net new number of 207 parking spaces was given in the DPIR, but since 80 of the existing parking spaces are a temporary use originally approved for the 1999 All-Star Game, the net new number is 287 (465 proposed - 178 existing). This was also noted by the Boston Environment Department on page 7-10 of the PNF comments and within the BTD scoping letter (June 22, 2000).

A suggestion related to parking was made at the October 18, 2000 FPTF meeting. The proponent was asked to separate rent charges for parking and dwelling units so that residents have an option to pay a defined additional amount for a parking amenity. Some version of this plan may be necessary since not all units will have parking spaces, and some residents may wish to pay for more than one space. This could be included as part of the proponent's Transportation Demand Management (TDM) program.

Street Network

Kilmarnock Street. If a new Fenway Park is built as currently proposed, then one of the primary conflicts between the DPIR and the proposed ballpark is the extension of Kilmarnock Street to Brookline Avenue to align with Fullerton Street. The proponent's proposed building footprint in the DPIR occupies an area proposed by the Boston Red Sox for this roadway extension. This new connection would have an obvious effect on trip distribution to the site as well as accessibility for trucks to back into the proposed loading bays without blocking through traffic. The proponent should quantitatively address traffic operations (reassign exit and entry peak hour trips) and loading bay issues under the scenario of a four-way intersection formed by Kilmarnock, Fullerton, and Brookline Avenue.

Note: The proponent's NPC (February 2001) states that the project will accommodate the Kilmarnock extension.

The proponent should address the impacts of closing Kilmarnock Street on game days to loading dock operations and parking garage access/egress. The proponent's efforts to enclose the loading docks further within the structure to mitigate visual and noise impacts are encouraging.

Brookline Ave. General pick-up and drop off operations in front of the hotel are expected to create temporary blockage of through traffic on northbound Brookline Avenue. Pull-out areas at the surface level or drop-off/pick-up below grade within the garage should be examined. Note: The hotel was eliminated in the NPC.

There is a potential for Brookline Avenue (northbound and southbound) vehicle queues to extend beyond the site driveway and make it difficult for left-turns into and out of the garage. Queuing along Brookline Avenue was qualitatively addressed in the proponent's presentation at the October 18, 2000 FPTF meeting, but an analysis is not contained within the text of the DPIR. Note: The Brookline Avenue entrance was changed to a right in/right out configuration in the NPC.

Boylston Street. The proponent should continue to examine the possibilities of constructing neckdowns on Boylston Street to reduce the pedestrian crossing distance at the Brookline Avenue and Kilmarnock Street intersections.

Site of Proposed Fenway MUP (Brookline Ave foreground)

Methodology

Traffic Analysis. Based on the 2007 no-build traffic volume network presented in the DPIR, it is apparent that the proponent has used the 1996 Landmark Center DPIR's forecast for 2001 build volumes. However, several changes made to the project following the DPIR significantly altered the original traffic projections. The proponent should conduct new traffic counts that reflect the now fully occupied Landmark Center.

Transit Analysis. Since some transit services to the Fenway are nearing capacity during the peak hours, it is crucial to estimate how increased ridership will affect each of the bus, subway, and commuter rail services. Additionally, some trips to/from the project may use the new Yawkey Station service begun by MBTA in January 2001. As trip distribution assumptions for vehicle traffic are applied to the roadway network, it would useful to apply them to the three transit modes. For example, the site-generated 185 Green Line trips during the PM peak hour should be assigned to either inbound or outbound trains, according to the trip distribution percentages.

Mitigation

Transportation Demand Management (TDM). It is recognized that the additional components of the TDM will be finalized as the project moves further into design and the TAPA is drafted. One element of particular interest to members of the FPTF is the inclusion of bike racks and storage lockers. The proponent is encouraged to locate these in sufficient number to encourage this mode of travel to and from the site.

Roadway Improvements. It is also recognized that specific elements of the proponent's mitigation obligations will not be defined until the TAPA is approved by the City. However, several specifics, including those described in the DPIR should be considered by the proponent as this process moves forward.

- Include pedestrian push button for new signal at Kilmarnock/Boylston.

- List traffic signals to be coordinated along Boylston Street and interconnection needs for wiring the signals to each other. This will allow coordination with MDC traffic signals, i.e., the Sears Rotary with Boylston Street.

- Specify the proposed geometric and signal improvements at Audubon Circle, and the mitigation obligations made by others (i.e. Landmark Center).

- Clarify total proposed sidewalk widths created by the building setback from the right of way line.

- The extension of Kilmarnock Street should be listed as potential mitigation regardless funding source.

- Should the project limits be expanded outside the boundaries shown in the DPIR (e.g., the D'Angelos property), additional analysis and/or mitigation will be required.

Note: Many of these mitigation components were included in the proponent's February 2001 NPC.

4.2 RED SOX TRANSPORTATION PLAN

The Red Sox Transportation Plan was submitted by the proponent in November 1999. This report is referred to as the "Red Sox plan" in this section. The proposed ballpark would be expanded to 44,130 seats, from the existing 33,871. The proposed site is located between Boylston Street and Brookline Avenue, immediately southwest and adjacent to the existing ballpark. The project would generate 563 additional vehicle trips during the PM peak hour. Two parking facilities are proposed, with a total capacity of 2,790 spaces:

- *"Boylston Street Garage."* This facility is proposed along the north side of Boylston Street between Yawkey Way and Ipswich St, directly east of the proposed ballpark. The structure is proposed to hold 630 cars for players, staff, and other designated Red Sox users.

- *"Yawkey Station Garage."* This facility is proposed between Brookline Avenue and Boylston Street, northwest of the proposed ballpark. According to the Red Sox plan, it would have a capacity of 2,160 spaces. Construction would be funded by The City of Boston and it would be operated as a public garage to serve the needs of area employees and visitors.

Existing Surface Parking at Yawkey Station (from Beacon St.)

The contents of the Red Sox plan formed the basis for "Fenway Public Improvement Projects," completed by the Red Sox and the Economic Development and Industrial Corporation (EDIC) of the City of Boston in November 2000. This report is referred to as the "Red Sox MOU" in this section. The purpose of the MOU was to provide a preliminary allocation and cost estimate for $100 million in infrastructure improvements authorized by Massachusetts Chapter 208 of the Acts of 2000.

The Red Sox also completed a fan survey during the 2000 baseball season to determine travel characteristics to and from ballgames. The data from this survey were presented at the December 2000 Fenway-Kenmore NTA meeting.

This review of the Red Sox plan and corresponding MOU points to many areas that have yet to be studied, among them traffic and transit analysis, truck loading/unloading operations, Mass. Turnpike ramps, and game-day traffic management. Due to the preliminary nature of the plan, a sufficient amount of analysis has not been completed to accept or reject the project based on its transportation impacts and mitigation proposals. Detailed study of projected new trips and mitigation would occur if the plan advances to a formal environmental submission. Therefore, these comments apply only to the preliminary transportation-related analyses published or presented by the Red Sox through December 2000. Comments are categorized as: parking, street network, methodology, and transportation demand management (TDM).

Parking

Existing Parking. The Red Sox plan should be updated to reflect changes to parking facilities within the Fenway since 1999. There are several discrepancies between the parking inventory completed in this study, and the number of spaces presented in the Red Sox plan.

The parking resource data presented in the Red Sox plan should also be classified by proximity to the park to reflect the likelihood that the facilities will be used by Sox fans. As the spaces are currently presented, the boundaries of the immediate study area that contain the study's estimated 2,000 parking spaces are unclear. It would be useful to classify the number of parking spaces by walking distance (e.g., 5 minutes or less, 5-15 minutes, more than 15-minutes) within concentric circles from the proposed ballpark entrances.

Net New Parking. Within the footprint of the proposed Yawkey Station Garage, Vollmer Associates counted approximately 515 spaces (800 in Red Sox plan) between Brookline and Beacon Street. We believe that the Sox' higher number is due in part to the surface lots west of Maitland Street, and spaces around the Boston Beer Works building being included in the number displaced. According to the Red Sox plan, however, the Yawkey Garage will not displace the existing surface lot spaces west of Maitland Street or most of the spaces behind Boston Beer Works.

The parking inventory completed in this study (July 2000) indicates that approximately 2,100 total spaces will be displaced within the proposed ballpark and parking garage development areas. Thus, we estimate the net new off-street parking spaces at 2,790 (Sox proposed) - 2,100 (2000 inventory) = 690 spaces (360 in Red Sox plan). Since the number of net new parking spaces is such a paramount issue to the West Fenway community, the exact number and location of existing spaces within the two development areas should be verified prior to future submittals. Net new parking as it relates to the overall study area is further discussed in **Chapter 7**.

The Red Sox plan notes that the Yawkey Garage will accommodate charter buses on the ground level. The forecast demand for game-day charter bus parking should be given. Based on existing operations, it will be crucial to provide convenient off-street parking facilities for charter buses and the appropriate incentives for bus drivers to use them.

Providing direct highway ramps to and from the Yawkey Garage to the Massachusetts Turnpike could provide many benefits to traffic flow in the Fenway. However, if direct access to local streets is also provided, a worsening of traffic congestion is likely to occur. The Red Sox plan should specifically address the feasibility or lack thereof, of such ramp connections.

Street Network

Several comments, based on community input and the FPTF studies are provided below on the proposed street network changes outlined by the Red Sox plan. The Red Sox are encouraged to consider the FPTF study recommendations for roadway improvements should future environmental submissions be made for a new ballpark in Fenway.

Sears Rotary. The Red Sox concept of a two-way Fenway was studied but was not included as the recommended alternative due to traffic performance and adverse impacts on the Emerald Necklace. The concept of a one-way Brookline Avenue southbound between Fullerton Street and Boylston Street has been dropped due to unacceptable traffic delays that would result from such a reconfiguration. Please refer to **Chapter 6** for findings relative to the Sears Rotary.

CSX Right of Way. The CSX right of way is located between Park Drive and Yawkey Station adjacent to the existing Green Line tracks. The Red Sox plan for a new road for general traffic within the railroad right-of-way has also been removed from consideration. However, other ideas for the CSX land remain possibilities, including a pedestrian/bicycle path, storage tracks for Green Line trains, and/or for transit only access to Yawkey Station. It is important to note that some of these concepts could be built together, while others are mutually exclusive.

Brookline Avenue. The Red Sox' proposed extension of Yawkey Way north of Brookline is needed, at a minimum, to provide vehicular access to the rear of the Boston Beer Works building. Pedestrian crossings for Brookline Avenue will significantly increase as a result of the proposed ballpark. Fans arriving via Yawkey Station and Fenway Station (which are expected to receive a higher portion of riders due to the new park location) would be required to cross Brookline Avenue. Second, the Yawkey Garage is located such that a larger share of inbound traffic must use Beacon Street (through Audubon Circle or Kenmore Square), or Brookline Avenue (through Kenmore Square or the Sears Rotary).

Pedestrian circulation outside the ballpark is addressed through plans for building setbacks and wider sidewalks. It is assumed that Brookline Avenue would carry the majority of pedestrians walking to the ballpark, and it should be designed to accommodate the projected flows without overflow onto the travel lanes. The need for pedestrian phasing, underpass/ overpass facilities, temporary street closure, and police control on Brookline Avenue should be addressed in future submittals.

Boylston Street. The Red Sox' proposed addition of two intersections along Boylston Street is of concern. Limiting the number of new access points would be preferable for maintaining traffic and pedestrian flow. Due to intersection spacing, additional traffic signals are not recommended. Other strategies include the elimination of the additional access points, creation of one-way circulation patterns, or right-in/right-out or left-turn restrictions. An effective access management strategy would include the eventual elimination of all driveways along the north side of Boylston Street. The impacts of the elimination of Yawkey Way on pedestrian accessibility to Kenmore Station should also be addressed.

Beacon Street. The merits of the Red Sox proposal to extend Yawkey Way from Brookline directly to Beacon Street are less clear if a connection to Maitland Street or Munson Street is feasible. The elevation change from Brookline to a Beacon Street intersection near the west bridge abutment over the Mass. Turnpike may add significantly to the construction cost of this connection and impact Yawkey Station pedestrian connections. It also creates a new intersection on Beacon Street, which may not be ideal.

Methodology

Traffic Analysis. The Red Sox plan presents intersection capacity and level of service based on data from 1989 to 1996. Future Red Sox submittals with reference to existing transportation conditions should base analyses on traffic counts conducted no earlier than two years prior to the submittal date. Counts that reflect full occupancy of Landmark Center are preferred. The Red Sox plan also states that traffic operations at the garage entrances and exits were tested but no analysis results at these locations are included in later sections.

Fan Surveys. The Red Sox conducted fan surveys in 1996 and 2000. They provide several crucial elements of data cited in the plan, and will most likely be used in subsequent analyses. Each of these assumptions should be reviewed and documented carefully since each has a significant effect on the transportation impacts of an expanded ballpark. The fan surveys provide data on 1) fan arrival time, 2) mode choice, and 3) trip distribution.

Fan arrival time. The assertion that only 25% of fans arrive at Fenway Park one hour before a 7:05 ballgame (5-6 PM) needs additional supporting data since it has such a significant impact on the evening peak hour traffic analysis of an expanded ballpark. The trip generation table in the appendix cites data from 1986 for fan arrival time. The percentage of fans arriving during the peak hour should represent the percentage arriving in the Fenway area prior to game time, not necessarily the number inside the ballpark turnstiles at 6:00PM. The accumulation of fans in the area during the hours prior to a game should be verified by data from other sources. Examples could include counts at area parking facilities known for high patronage by Sox fans, pedestrian counts at the Brookline Avenue overpass, riders exiting the train at Fenway station, or Red Sox Ruggles shuttle ridership.

Mode choice. The latest fan survey conducted by the Red Sox showed a decrease in the percentage of fans driving to games from 68% in 1996 to 44% in 2000. Should this decrease be accurate, it has vital implications for the traffic, parking, and transit demand forecast for the expanded ballpark. It is suggested that further data collection be conducted to confirm such a dramatic shift in mode choice.

Trip distribution. The Red Sox plan depicts the spatial distribution of trips destined for a Red Sox ballgame. However, additional data or assumptions should be presented to determine how the vehicular trips impact the roadway network in and around the Fenway. For example, 27% of the trips are believed to originate from I-90 eastbound. There are several means of accessing the park from I-90, including Boylston St., Huntington Ave, and Beacon Street. In future submittals, the all vehicle trips should be distributed to study intersections as identified by BTD in the scoping process.

Trip Generation. In addition to the increased number of fans, which the report addresses, it is assumed that the larger ballpark will also require a significantly larger staff of ticket takers, vendors, security, and maintenance personnel, etc. The additional trips generated by staffing increases in an expanded ballpark should be addressed. If it is assumed that all employees arrive at least one-hour before game time, many of these trips coincide with the PM peak hour. The trips attracted by the retail and restaurant space should also be included in the analysis. If it is assumed that all game-day PM peak trips to these establishments within the ballpark footprint are ultimately destined for the game, this should be stated within the analysis.

Land Use Scenarios. The Red Sox plan contains no further mention of the traffic analysis results from four alternative land use scenarios following their description in the report. Since development of the 4-6 acre parcel (existing ballpark site) to be vacated is critical to the financial feasibility of the new park, its peak hour transportation demands should also be estimated as part of the traffic analysis. The analysis should, at the least, provide an "outside envelope" for traffic and transit demands associated with development of these parcels.

Fenway Park (Yawkey Way Side)

Green Line. The ability of the Green line to accommodate 1,228 additional westbound Green Line passengers, especially the portion traveling during the PM peak, should be further studied. The Red Sox plan suggests the addition of six Green Line trains during the two hours prior to a weekday evening game to mitigate the transit demand of an expanded park. It also states that additional service can be accommodated by adding cars to existing trains, as well as by adding trains, if possible. However, there is no mention of infrastructure funding within the Red Sox MOU to support MBTA operation of additional Green Line cars. The vehicle, operator, and maintenance costs of Green Line capacity improvements should be estimated.

The Green Line analysis should also include the latest peak hour ridership counts from CTPS or MBTA so that available capacity, or a need for additional capacity, can be estimated.
The Red Sox plan asserts that increased capacity on the station stairways, turnstiles, and walkways is more critical than increasing the capacity of the Green Line trains, as measured in maximum riders per hour, however, no justification for this statement is given. Capacity improvements are needed in both

areas, and should be addressed in detail within future Red Sox submittals.

Orange Line. In 2001, the Red Sox scaled back game day shuttle service to and from Ruggles Station to weekend-only. The analysis should include existing and forecast ridership, including the mode used by fans to arrive at Ruggles (Orange Line, bus, commuter rail, walk, drive, etc.). The feasibility of regular service through partnership with MBTA or MASCO should be studied. The Red Sox are encouraged to include implementation plans for conversion to alternative fuel vehicles for the Ruggles shuttle.

Yawkey Station. The Red Sox plan recommends conversion of Yawkey Station to a full-time stop on the Framingham Line. Note: MBTA began limited full-time service to Yawkey in January 2001. Additional examination of pedestrian circulation is necessary to examine the track work and platform extension recommended by the Red Sox MOU. Stairways and/or elevators should be constructed near the tracks and the bridge abutments to provide direct connections to Brookline Avenue and Beacon St.

Transportation Demand Management (TDM)

The Red Sox TDM plan should outline specific strategies to reduce the proportion of fans traveling by auto and to encourage increased transit ridership to the games in three ways: 1) marketing, 2) financial incentives, and 3) coordination. Setting goals for transit ridership and seasonal evaluation through continued fan surveys would be an effective means of monitoring the effectiveness of these programs.

Marketing. The Red Sox should continue active promotion and advertisement of non-auto modes for travel to and from ballgames, especially the Ruggles shuttle. The team web site, stadium billboards, stadium announcements, and newspaper/radio/television advertisements are welcome media, most of which have just begun to be utilized in the last five years. Access to transit information on www.redsox.com was vastly improved in 2001.

Financial Incentives. The primary financial incentive expected to discourage auto use is the $5.00 tax added to parking spaces within the Fenway Parking Management Zone *(Massachusetts Chapter 208 of the Acts of 2000)*. However, additional public/private partnerships could be explored or tested. For example, Red Sox tickets could be displayed to attendants for free or discounted parking rates at the MBTA commuter rail parking lots to encourage ridership. It is important to note that any programs to promote transit use must be accompanied by increased capacity (especially on the Green Line) and parking at transit stations to accommodate additional riders.

Coordination. The Red Sox plan should further improve the operating procedures put in place during the 1999 All-Star game for coordination with the MBTA nears the end of each game. Currently, MBTA station managers and operations personnel are alerted in advance of the likely exodus of fans, so that trains can be rerouted or held to accommodate the large flows of fans leaving the games. The use of video-monitoring, electronic turnstiles, and improved telecommunications technology could improve the accuracy and timeliness of data relayed to the MBTA about fans leaving the ballpark.

5.0 TRANSIT SYSTEM

As discussed in **Chapter 3**, the Fenway is a highly transit-dependent area, with the majority of residents using non-auto modes for travel. National and local trends suggest that transit ridership increased at a greater rate than vehicle traffic during the 1990's. The 2000 Census is expected to confirm the increased share of non-auto modes from 1990 to 2000. There are four primary modes of transit travel within the study area: MBTA subway, MBTA bus, MBTA commuter rail, and private shuttles.

In Section 5.1, each of these modes and existing routes, capacity, and ridership counts are presented and discussed. The policy choices that relate to the transit system serving the Fenway are outlined in Section 5.2. Finally, Section 5.3 offers recommendations for transit system service and capacity improvements.

Note: The recommendations in this chapter for transit service improvements in the 5-10 year horizon occur before the full implementation of the proposed MBTA Urban Ring service in the Fenway. However, the findings of this study are intended to support the longer term implementation plans for the Urban Ring. For additional information on the Urban Ring and its proposed phases, the MBTA Major Investment Study (MIS) completed in July 2001 is available from www.mbta.com/newsinfo/geninfo/projects/urbanring/.

Several technical terms, as defined in this report, related to the transit system are included below to clarify the discussion that follows:

<u>Headway</u>- the separation in time between successive arrivals of a bus, train, etc. at a particular station or bus stop. Headways are often decreased during peak periods to accommodate higher passenger demand.

<u>Peak Hour</u>- similar to the peak hour of vehicle traffic, the peak hour for transit occurs during the hour that *ridership* is highest. The peak hour is generally one hour during the morning and evening weekday commutes, respectively.

<u>Peak Period</u>- the peak period refers to the times of the day in which transit *service* is increased to meet higher demand. The peak period is two or more hours during the morning and evening weekday commutes, respectively.

<u>Peak Load Point</u>- the location on a route where the largest average number of passengers are on board the bus or train.

<u>Vehicle Capacity-</u> the number of persons that can be transported by an individual bus, rail car, or subway car. The number is based on standards set by the MBTA *(1997 MBTA Blue Book, Sixth Edition)*, and generally includes a portion of riders seated and a portion standing.

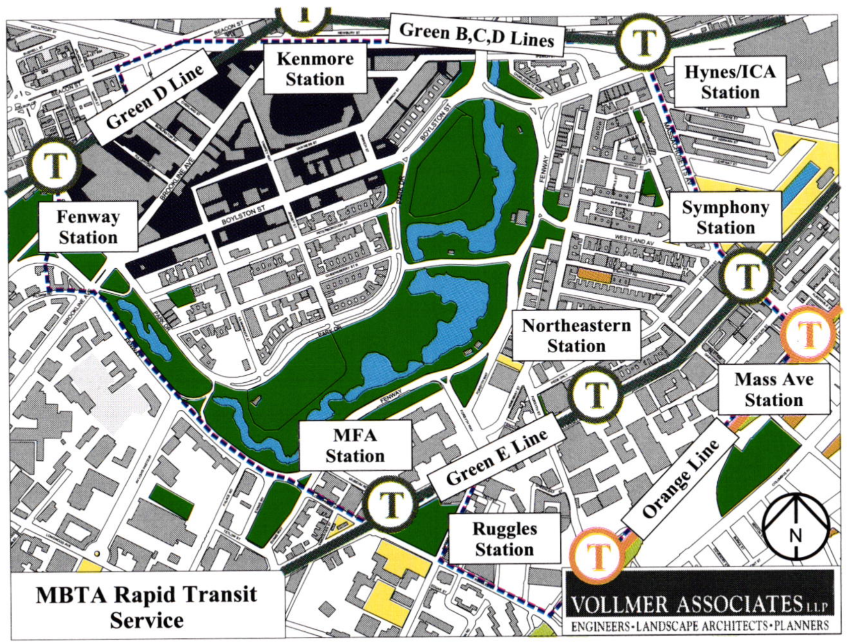
<u>Throughput Capacity</u>- based on the vehicle headway and vehicle capacity, the number of persons that can be transported per hour can be calculated. Throughput capacity can be determined for each transit mode, e.g., bus routes and subway lines.

5.1 EXISTING CONDITIONS

MBTA Rapid Transit

The MBTA operates two rapid transit lines that serve the study area: the Green Line and the Orange Line.

Green Line. West of downtown, the Green Line splits into four branches as depicted in the figure (next page). Westbound, the northern branches, 'B' and 'C,' terminate at Boston College and Cleveland Circle, respectively. The 'D' Line extends furthest west, terminating at Riverside Station near I-95. The B, C, and D lines surface west of Kenmore, with underground stations to the east. The westbound 'E' line follows Huntington Avenue through the East Fenway, terminating at Heath Station. The E line surfaces west of Symphony Station. Depending on the line and time of day, eastbound Green Line trains terminate at Park Street, Government Center, or Lechmere Stations. Where the B, C, and E lines operate on surface streets, they must stop at traffic signals.



The Green Line consists of trolley cars that seat 46 while car capacity is assumed to be 101, or 55 standing per car *(1997 MBTA Blue Book, Sixth Edition)*. During peak periods, two-car trains are generally run, with single car trains in service during off-peak hours. In late 2000, the MBTA began to run a third car on three 'D' line trains during the AM and PM peak hour of service. This adds about 300 passengers per hour to the capacity of the D line.

Based on the service schedule provided by the MBTA, the following table gives peak hour passenger throughput capacity for the Green Line. For stations served by all four branches (Copley to Government Center Stations), the capacity is approximately 9,000 passengers per hour. The throughput capacity for Kenmore Station (B,C, and D Lines) is approximately 7,500 while at Fenway Station (D Line only), almost 3,000 passengers per hour can be transported in the peak direction.

Existing Peak Hour Capacity of MBTA Green and Orange Line

Green Line Branch	Average Headway (minutes)	Capacity (Persons per Two-Car Train)	Average Trains per Hour	Passengers per Hour
'B'	5	202	13	2,626
'C'	6.5	202	10	2,020
'D'	4.5	202	13 + 1.5*	2,929
'E'	8.5	202	7	1,414
	1.4	-	**44.5**	**8,989**
Orange Line	**Average Headway (minutes)**	**Capacity (Persons per Six-Car Train)**	**Average Trains per Hour**	**Passengers per Hour**
	5	**786**	**12**	**9,432**

** In 2000, MBTA added a third car to 3 D line trains during peak hours only.*
Source: *Meeting w/ MBTA Service Planning Division 1/18/01.*

Orange Line. The Orange Line runs north/south between Forest Hills Station in Jamaica Plain to Oak Grove Station to the north in Malden. Outside the city core, the Orange Line generally runs on an exclusive surface right of way. Unlike the smaller 2-car trolleys on the Green Line, the Orange Line is a heavy rail system, with much larger capacity trains. Orange Line train cars seat 58, with assumed capacity of 131 (i.e., 73 riders standing per car). At five-minute scheduled headways during peak hours, the Orange

Line can transport 9,432 passengers per hour in the peak direction *(1997 MBTA Blue Book, Sixth Edition).*

Kenmore Station (Green Line B,C, D and Buses)

The Central Transportation Planning Staff (CTPS) has conducted the most recent system-wide ridership counts on the Green (1995) and Orange (1997) Lines. Annual ridership estimates from 1995 to 2000 indicate an average 2% annual growth rate per year. Thus, the ridership data listed in the table below are likely 8-12% higher today (2001). The peak load point for the Green Line west of downtown is between Copley and Arlington Stations. The peak load point for the Orange Line south of downtown is between Back Bay and New England Medical Stations.

It is important to note that these counts represent a 'snapshot' of the system. The counts were conducted on a single day; weekday peak period ridership obviously varies daily due to weather, system delays, and special events.

MBTA Peak Hour Rapid Transit Ridership

Line Section (Station – Station)	AM Peak Hour		PM Peak Hour	
	Inbound	Outbound	Inbound	Outbound
GREEN LINE				
Longwood – Fenway (D)	1,959	594	996	1,915
Fenway – Kenmore (D)	2,023	713	1,058	1,986
Kenmore – Hynes (B,C,D)	5,782	1,858	2,856	4,746
Hynes/ICA – Copley (B,C,D)	6,509	2,923	4,055	5,883
Longwood – MFA (E)	404	607	588	427
MFA – Northeastern (E)	439	687	727	477
Northeastern - Symphony (E)	552	811	911	601
Symphony – Prudential (E)	610	816	960	782
ORANGE LINE				
Roxbury Crossing – Ruggles	4,957	411	1,243	3,655
Ruggles – Mass Ave	5,608	944	1,661	4,337
Mass Ave – Back Bay	5,941	1,253	1,906	4,622

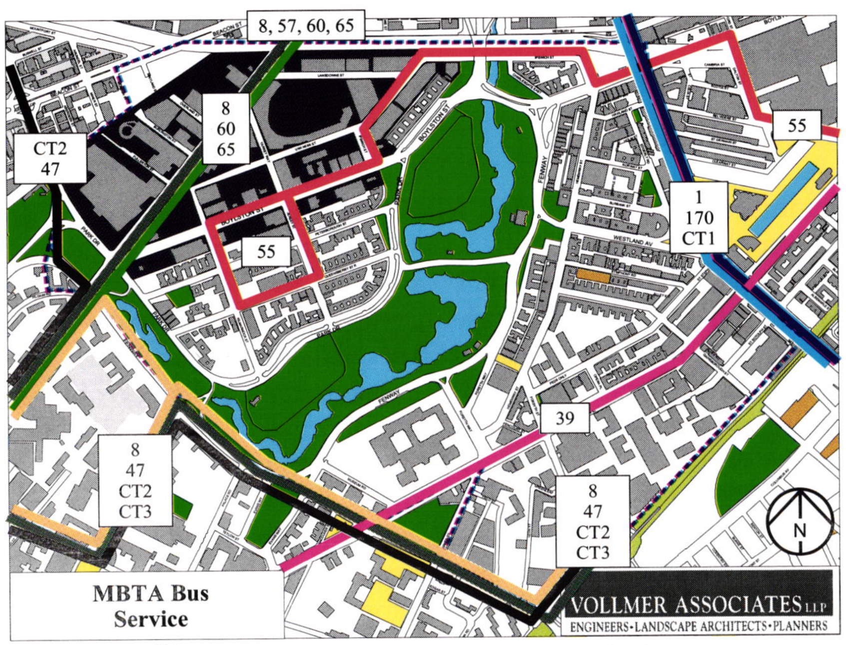
Source: Passenger Counts conducted by CTPS on the Green Line in 1995 and on the Orange Line in 1997.

Note: For transit service, "inbound" refers to travel in the direction of the Boston Central Business District (CBD); outbound service is travel away from the CBD.

The ridership numbers, when factored for 2% annual growth from 1995-2001, indicate that the Green Line is at capacity east of Kenmore Station during the AM peak hour. During the PM peak hour, the Green Line is very near capacity. The Orange Line generally operates at up to 70% of capacity during peak hours. Capacity numbers include a significant number of standing riders and are based on the MBTA published peak period schedules. If the trains do not adhere to this schedule on a given day (i.e., headways are greater), the remaining trains operate above capacity. It is important to note that ridership data referenced here only include those stations in and near the Fenway; ridership in other areas was not analyzed.

MBTA Bus

The MBTA operates 12 bus routes with stops in the study area as shown on the figure and table below:



These bus routes serve the following areas in the Fenway:

- #55 route serves the West Fens residential neighborhood,
- #1, CT1, and 170 bus routes travel along Massachusetts Ave, the eastern border of the study area,
- #39 route travels down Huntington Avenue through Northeastern, in the East Fenway
- #57 route travels west from Kenmore Station,
- #8, #47, CT2, and CT3 routes service the Longwood Medical Area along the southern border of the study area, and #60 and 65 routes travel down Brookline Avenue in the West Fenway.

MBTA Bus Routes Serving the Fenway

Route #	Service from	Fenway stops	Peak Period Headway (minutes)
1	Harvard-Dudley Square	Mass. Ave.	8
8/8A	U-Mass-Kenmore Sta.	Brookline, Fenway	20
39	Forest Hills-Back Bay	Huntington Ave.	5
47	Central Sq.-Broadway Sta.	Park Dr, Fenway	20
55	Queensberry-Copley Square	West Fens, Boylston Street, Boylston Street	30
57	Watertown Square-Kenmore	Kenmore Station	7
60	Chestnut Hill-Kenmore	Brookline Ave	18
65	Brighton Center- Kenmore	Brookline Ave	25
170	Dudley-Waltham-Burlington	Mass. Ave.	60
CT1	Central Sq.-B.U. Med. Ctr.	Mass. Ave.	15
CT2	Kendall Sq.- Ruggles	Park Dr., Ruggles	20
CT3	Longwood-Logan Airport	Fenway, Ruggles	20

Source: 2001 MBTA Service Schedule.

The seated capacity for an MBTA bus is 40 persons and the vehicle capacity is 56 persons *(1997 MBTA Blue Book, Sixth Edition)*. The throughput capacity for each route can be calculated by multiplying the number of bus trips per hour by 56. Bus capacity calculations for each route are provided in the appendix.

Bus ridership data were obtained from the 1997 MBTA Comprehensive Ridecheck Program completed in conjunction with CTPS. Annual ridership estimates from 1997 to 2000 indicate an average 1.5-2% annual growth rate per year. Thus, ridership could be 6-10% higher today. It is also important to note that these counts represent a 'snapshot' of the system. The counts were conducted on a single day; weekday peak hour ridership obviously varies daily due to weather, system delays, and special events. Ridership data are presented in the table below.

The bus ridership data represent total boardings for inbound or outbound buses. Since no information is available on the ridership levels at specific points along the route, the peak load point for each bus route cannot be determined from the available data. The boardings listed in the table below occurred over two-hour periods (7-9 AM, 4-6 PM). These hours are defined by MBTA as the peak periods for bus service.

The ridership numbers, when factored for 2% annual growth from 1997-2001, indicate that six of the twelve bus routes serving the Fenway are operating near or above capacity. The most congested bus routes are the #1, 8, 39, 47, 57, and 65.

MBTA Peak Period Bus Ridership

Bus Route #	AM Peak Period (7-9 AM)		PM Peak Period (4-6 PM)	
	Inbound	Outbound	Inbound	Outbound
1	838	921	1,185	1,162
8/8A	978	456	360	687
39	1,954	1,114	1,419	1,591
47	277	281	381	421
55	253	91	59	127
57	1,000	500	724	909
60	204	130	131	207
65	371	84	104	181
170	0	0	0	32
CT1	327	181	231	375
CT2	31	298	169	62
CT3	121	152	213	119

Source: 1997 MBTA and CTPS Comprehensive Ridecheck Program.

MBTA Commuter Rail

Commuter rail stops located within the study area are Yawkey Station and Ruggles Station. Back Bay Station is a 20-minute walk (about 1 mile) from the West Fens. Yawkey Station is located adjacent to the Massachusetts Turnpike between Brookline Avenue and Beacon Street. Since the late 1980's, stops at Yawkey have been scheduled to coincide with Red Sox home games, about 81 days per year. In January 2001, the MBTA began regular weekday service to Yawkey Station with service from the Framingham/Worcester Line. Currently, six inbound and seven outbound trains stop at Yawkey, as shown in the table below. There is no direct MBTA bus service to/from Yawkey Station, but Kenmore Station (Green Line and four bus routes) is within a 5-minute walk. Since regular service to Yawkey Station was initiated, MASCO has provided shuttles (see next section) to/from the Longwood Medical Area (LMA).

MBTA Commuter Rail Service to Yawkey Station

Train #	Depart	Time	Arrive Yawkey	Arrive at Terminus
500	Framingham	6:15 AM	6:52 AM	7:04 AM
504	Framingham	7:00 AM	7:37 AM	7:49 AM
520	Framingham	12:15 PM	12:50 PM	1:02 PM
522	Framingham	2:00 PM	2:35 PM	2:47 PM
528	Framingham	5:40 PM	6:15 PM	6:27 PM
530	Worcester	5:35 PM	6:43 PM	6:57 PM
511	South Station	11:00 AM	11:08 AM	11:47 AM
521	South Station	4:30 PM	4:38 PM	5:20 PM
525	South Station	5:05 PM	5:13 PM	5:55 PM
527	South Station	5:30 PM	5:38 PM	6:54 PM
515	South Station	7:15 PM	7:23 PM	8:37 PM
519	South Station	10:05 PM	10:13 PM	11:24 PM
529	South Station	11:25 PM	11:33 PM	12:12 AM

Source: MBTA Commuter Rail Schedule (effective 10/29/01).

The 200′ platform at Yawkey Station does not currently meet the MBTA standard of 765′ in length. As a result, passengers entering and exiting the train can do so through the front or rear three cars only, depending on the direction of service. The impacts of station siting, ridership, and costs of full-time Yawkey service were studied by the MBTA in 1999. The study results were published in "Feasibility of Full-Time Commuter Rail Service to the Fenway/Kenmore Area" *(MBTA, 2000).*

Ruggles Station on the commuter rail line is located along the Orange Line in the southeast corner of the study area. Ruggles Station is served by the Needham, Franklin, and Attleboro/Stoughton Lines, although not all inbound trains stop there. Ruggles Station is served by 14 MBTA bus routes and is adjacent to the Orange Line rapid transit station of the same name.

Yawkey Station- MBTA Commuter Rail

Peak period commuter rail service during the morning was defined as 7:00 to 9:00AM and 4:30 to 7:00 PM during the evening. Commuter rail trains generally consist of six to eight cars during peak period service. The seated capacity per car is 122 for a standard (single level) car and 175-180 for a double decker (1997 MBTA Blue Book, Sixth Edition). Most trains have a combination of single and double decker cars. A review of the MBTA Railroad Operations Service Profile/Mileage Analysis was required to determine the proportions of single and double decker cars in each 6-8 car train. This information from 1999 is somewhat dated, as train composition and schedule have likely been slightly modified since. However, these data were the best available at the writing of this report. The table below gives the estimated commuter rail capacity for trains serving Yawkey and Ruggles Station.

Commuter rail ridership was obtained from MBTA FY99 Average Weekday Ridership counts. Inbound and outbound total daily passengers were counted. Since only daily passenger volumes were available, peak period ridership was estimated as 70% of daily ridership in the inbound and outbound directions, respectively. Commuter rail ridership data are presented next to the capacity estimates in the following table.

The data in the table at right indicate that the study area commuter rail lines are operating at 80% to 100% of capacity. The 1999 ridership numbers were not factored since they are less than two years old, however, ridership could be 4-5% higher in 2001, assuming that commuter rail ridership is increasing at similar rates as other MBTA modes over the past 5 years.

MBTA Commuter Rail Ridership and Capacity

Peak	Trains/ Peak Period	Total Capacity	Est. Peak Period Ridership*
Yawkey Station- Framingham/Worcester Line			
AM Inbound	7	6,918	5,692
PM Outbound	6	5,633	5,009
Ruggles Station- Needham Line			
AM Inbound	5	3,057	2,952
PM Outbound	5	3,057	3,182
Ruggles Station- Franklin Line			
AM Inbound	7	6,605	5,214
PM Outbound	6	5,823	5,356
Ruggles Station- Attleboro/Stoughton			
AM Inbound	19	9,170	8,695
PM Outbound	11	9,928	8,758

** Estimated as 70% of daily inbound (outbound) ridership.*
Source: MBTA Commuter Rail FY99 Ridership.

Private Shuttles

MASCO, its individual member institutions, and the Boston Red Sox operate private shuttles in the Fenway. All organizations contract this service to Paul Revere Transportation. The MASCO shuttles service nearby transit stations (most recently Yawkey Station) and satellite parking lots. The Red Sox shuttle, which began service during the 2000 baseball season, operates between Ruggles Station and Fenway Park. The table below lists the MASCO shuttles, peak headways, and daily ridership.

In summer 2000, MASCO opened its shuttles to Fenway residents via a monthly pass program.

MASCO Shuttle Operations and Daily Ridership

Shuttle	Service to	Peak Headway (min)	Daily Riders
M1	Boylston Lot, Kenmore Lot	6-7	560
M2	MIT, Central Square, Harvard Yard	10	2,350
M3	Red Sox Garage, Lansdowne Garage	10	750
M4	Parker Lot, Halleck Lot	10	650
M6	Chestnut Hill Lot	15	450
COF	Hynes, Ruggles MBTA Stations	30-60	48
Mid-Day	M1, M3, and M4 facilities	N/a	50
Longwood Express	Longwood, Ruggles MBTA Stations	8	1,100
Renaissance	Renaissance Park Garage, Francis Street	15	170
Total			6,128

Source: MASCO (Andrew Lenton) September 2001.

MASCO shuttles serve about 3,000 individual riders per day, assuming each person takes the bus to and from their destination. The M2 bus to Cambridge carries about 40% of all riders.

Other shuttles are operated by Beth Israel Hospital, Brigham & Women's Hospital, and Children's Hospital. These shuttles connect various facilities and satellite parking for each institution not within walking distance. Ridership data for these shuttles were not available.

The Red Sox shuttle to Ruggles Station was implemented in 2000 in an effort to enhance transit options for travel to and from Fenway Park. Fans may arrive at Ruggles via the MBTA Orange Line, bus, or commuter rail, by private auto, or by walking/biking. The shuttle begins operation 90 minutes prior to game at 5-7 minute intervals, with return trips to Ruggles at the start of the seventh inning. Fans are dropped off and picked up on Overland Street (www.redsox.com). Fan surveys conducted in 2000 revealed that 300-400 fans use the service each game. About 85% arrive at Ruggles Station via the MBTA Orange Line, commuter rail, or bus *(Red Sox presentation materials, December 2000 Fenway-Kenmore NTA meeting).*

5.2 POLICY CHOICES: VISIONS AND GOALS

The transit vision for the Fenway includes an infrastructure that offers a viable alternative to driving by offering quality service and meeting increased ridership demands. The discussion of transit visions and goals is divided into the four modes serving the study area: MBTA rapid transit, MBTA bus, MBTA commuter rail, and private shuttles. This section focuses on the visions and goals for transit facilities, although policy choices are implied from these. Transit policy choices for the Fenway relate to prioritizing the recommendations made in Section 5.3 and determining funding sources. Prioritization and funding issues were not addressed within the scope of this study.

It is important to note at the onset of this section, that there are many smaller scale 'quality' improvements that can be made to the transit system that do not receive specific mention here. Such improvements enhance riders' experience and impression of the MBTA. These items include improvements to signing, lighting, information kiosks, token machines, bus shelters and benches, and handicapped accessibility. There are also opportunities for technology improvements to provide station or bus stop status information such as the time until the next arriving train or bus. These types of improvements could be candidates for inclusion in a developer's mitigation obligations through BTD's Transportation Access Plan Agreement (TAPA).

MBTA Rapid Transit

Improvements to rapid transit in the Fenway are intended to enhance pedestrian accessibility and safety, as well as passenger throughput. Based on ridership counts and community input, there are no recommendations for improvements to the Orange Line. Ongoing improvements to the Orange Line include modernization of the track signal system. It is expected that the Orange Line will be revisited as part of the upcoming East Fenway study. Thus, the focus of this section is the Green Line.

Pedestrian accessibility and safety. The vision for rapid transit pedestrian accessibility aims to provide alternative connections that are safer and more direct than those which exist today. The need for additional capacity, especially at Fenway and Kenmore Stations is most apparent prior to Red Sox home games, but would also provide benefits during the peak hours of commuter traffic.

Proposals by the MBTA and EDIC/Red Sox for a redesign of Kenmore Station *(EDIC/Red Sox, 2000)* include improvements to ADA accessibility and those changes designed to accommodate the Red Sox plan for a new Fenway park. The Hotel Commonwealth, under construction, is designed to accommodate a larger pedestrian tunnel and stairs to Comm. Ave.
The proposed designs, however, do not address capacity issues once fans exit the station; fans must still converge onto Brookline Avenue. To mitigate this condition, two concepts were devised: an east-end headhouse and a pedestrian overpass near Kenmore Street. The east end headhouse would provide a second street access point, located near the intersection of Kenmore Street and Commonwealth Avenue. A pedestrian overpass over the Mass. Turnpike would provide relief to Brookline Avenue. It would also allow more direct connections to Lansdowne Street and the Boston Arts Academy on Ipswich Street.

The most feasible location for this pedestrian overpass would be an extension of Kenmore Street to the alley immediately west of Jillian's. This connection could be constructed as part of a turnpike air rights development but would also require access easements from landowners on the Lansdowne Street side. The overpass is also effective regardless of the future location of Fenway Park (new or rebuilt) and could be constructed with or without the proposed Kenmore Station east end headhouse.

For Fenway station, a second staircase or elevator on the north side of Park Drive would reduce the number of street crossings required for people to access the station. Residents of Audubon Circle north of Park Drive would be the most likely users. Field observations of this location could determine the number of existing crossings to determine the level of demand for a second access point from Park Drive.

Additional proposed improvements at Fenway Station include platform extensions, collector booths, turnstiles and sidewalks *(EDIC/Red Sox, 2000)*. Also, the MBTA proposes the construction of storage tracks and crossovers adjacent to Fenway Station within the CSX right of way. This portion of the CSX right of way is adjacent to the Boston Parks Department Back Bay Yard Facility. The storage tracks and staging facilities would allow the MBTA to improve the responsiveness of run-as-directed trains from Fenway and Kenmore Stations. A design feasibility study of the storage tracks should be performed to determine the compatibility of an adjacent bike path under Park Drive.

Fenway Station- MBTA Green Line Rapid Transit

Passenger Throughput. The MBTA has recently examined alternatives for increasing the passenger capacity of the Green Line *(MBTA, 2001)*. These options included track crossovers, dynamic double-berthing, and three car trains. The study found that the most effective means of increasing Green Line capacity was three-car trains. There are additional design issues to be examined by the MBTA, such as power and weight constraints.

The MBTA is currently running a third car on three D line trains during the peak hour (see Section 5.1). Since each car can transport 101 persons, the D line capacity is increased by about 300 persons per hour. Operation of three-car trains on all 13 D line trains during the peak hour would add another 1,000 persons per hour capacity.

There is also significant Green Line congestion on weekday evenings after peak period service has ended and some trains are reduced to a single car. Field observations of riding conditions during these times support extending the operation of two-car trains during later hours.

MBTA Bus

The Fenway vision for the MBTA bus system includes below-capacity buses operating on a street network that gives priority to transit vehicles.

As noted in Section 5.1, half of the twelve existing bus routes serving the Fenway are operating at capacity. The most congested bus routes are the #1, 8, 39, 47, 57, and 65. For the #8, 47, and 65 routes, the current headways (20-25 minutes) could be reduced by increasing the number of buses servicing this route. The three remaining routes, #1, 39, and 57 are currently operating at 5-8 minute headways. The most effective means on increasing the capacity on these routes is to plan for the implementation of 60′ articulated buses. These buses are similar to vehicles scheduled for service on the Silver Line in 2003 and can transport up to 97 people per vehicle *(MBTA Silver Line Service Plan, September 2000)*. With the design of Kenmore Square roadway reconstruction underway (see page 16), the proposed layout should be configured to accommodate future year articulated bus service.

In addition to vehicle capacity, an important goal for the Fenway community is the phasing out of diesel buses and replacement with 100% clean-air vehicles.

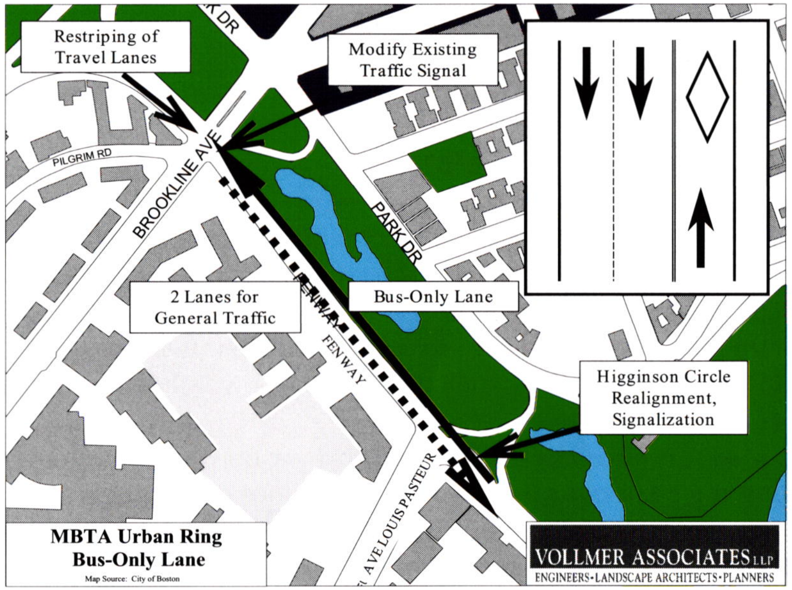
Besides increasing the capacity and frequency of bus service, improvements can be made to the street system to give priority to buses. The primary opportunities to achieve this goal are signal priority and bus-only lanes. Signal priority systems involve wireless communication between a bus and the computer controlling the traffic signal. As a bus approaches an intersection, a beacon onboard the bus communicates with the traffic signal. This communication instructs the signal to extend the green time longer, allowing a bus to make it through the intersection before the light changes. For safety and coordination reasons, a bus does not generally have the capability to change the signal from red to green, thus, it may still have to stop at the traffic light. However, transit priority does reduce the frequency of stops and average delay experienced by buses.

Bus only lanes provide a dedicated portion of the roadway right of way to transit vehicles. Two potential corridors for bus lanes in the Fenway were studied: The Fenway and Brookline Avenue.

The Fenway (just east of Brookline Avenue)

The bus lane on The Fenway would run from Avenue Louis Pasteur to Brookline Avenue as shown in the figure below. This lane would serve future routes planned by the MBTA for the phased implementation of the Urban Ring. The Urban Ring is a circumferential transit line intended to connect Cambridge to Longwood Medical, among others, without requiring a transfer in the central business district. The three existing Crosstown (CT) bus routes are the first components of this future service, which may include surface bus, bus rapid transit, and light rail in the long term. A Major Investment Study (MIS) of the Urban Ring is scheduled for completion in July 2001.

As shown in the figure below, the Fenway bus lane could be created by converting one of the eastbound travel lanes to a westbound bus-only lane; thus no widening for additional lanes would occur. Roadway realignment and a new traffic signal may be required at Higginson Circle as well as traffic signal modifications and lane restriping at Brookline and The Fenway. Based on the estimated frequency of MBTA bus service, the new configuration is not expected to adversely impact delays at the Brookline/Fenway intersection. However, if other private bus operators use this lane, this assumption should be rechecked.

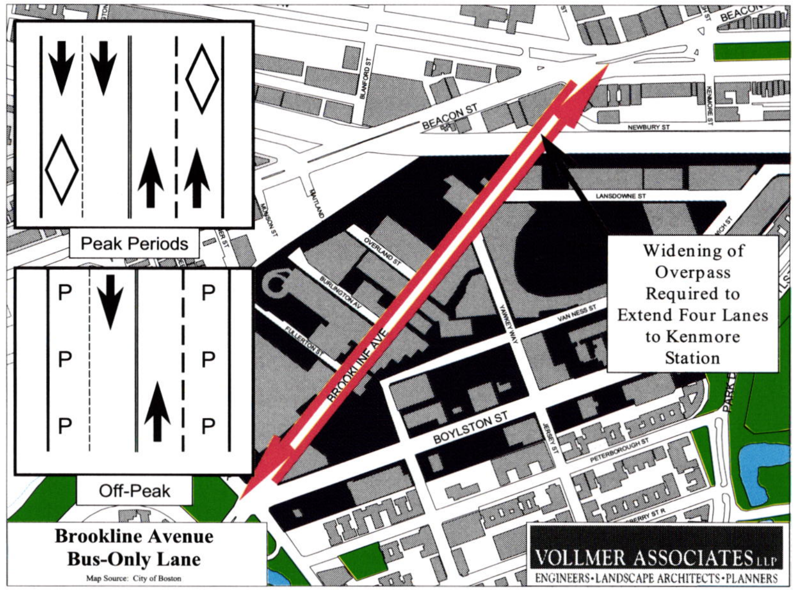


Brookline Avenue is a major connection for transit service to and from the LMA to Kenmore Station and Yawkey Station. It is also a potential corridor for MBTA Urban Ring service between Cambridge and the LMA. Should new parking structures be constructed near Yawkey Station, Brookline Avenue will carry additional shuttles. For these reasons, the feasibility of a peak period bus-lane on Brookline Avenue should be investigated.

The intent of this concept is to provide additional incentives for transit use and to move more people, not necessary vehicles, down Brookline Avenue during peak periods.

Brookine Avenue (looking south over the Mass. Turnpike)

The bus lane could be created through minor street widening and restriction of on-street parking during peak periods. As shown in the figure below, Brookline Avenue would operate with on-street parking and a single lane in each direction at all other times. The restriction of peak period on-street parking (red meters) exists at many other locations in Boston. The primary constraint to the Brookline Avenue bus lane concept is the width of the Mass. Turnpike Overpass; widening of the bridge would be required to provide four lanes to Kenmore Station.



MBTA Commuter Rail

Improvements to the Yawkey Station platform are recommended to meet MBTA standards for full-time use. The platform extension should provide direct pedestrian connections (stairways, elevators) to Brookline Avenue and Beacon Street parallel to the existing tracks. Right of way issues associated with these connections, however, were not identified at the writing of this report. Alternatives in the MBTA Urban Ring Major Investment Study *(MBTA, 2001)* include underground connections between Yawkey and Kenmore Station.

The schedule for train stops at Yawkey Station could be improved to provide an alternative mode for travel to/from South Station and Back Bay to weekday evening Red Sox games. Currently, the 6:15 PM westbound departure does not stop at Yawkey. Stopping a westbound train at Yawkey around 6:30 PM would provide an attractive alternative to the Green Line for those transferring from the Red or Orange Lines. Rescheduling of trains and/or shuttle service would also be required for the eastbound return trip. The full-time Yawkey study *(MBTA, 2000)* addresses many issues related to feasibility and operations for expanded service between South Station and Yawkey Station.

Private Shuttle

To improve air quality, private shuttle operators are encouraged to submit implementation timelines for conversion to 100% clean air vehicles and where possible, minimize trips through route consolidation and demand monitoring.

5.3 RECOMMENDATIONS & RATIONALES

1. Green Line Capacity: run three-car trains at or near existing headways for all Green Line 'D' trains during weekday and Red Sox game day peak periods.

2. Kenmore Station: construct an east-end headhouse to provide a second means of access and egress for passengers.

3. Kenmore Station: construct a pedestrian connection near Kenmore Street on the north side of the Massachusetts Turnpike to Lansdowne Street to provide a second means of access from Kenmore Station and reduce pedestrian flows down Brookline Avenue.

4. Kenmore Station: future surface improvements to the station should accommodate service by 60' articulated buses, similar to those scheduled for Silver Line service in 2003.

5. All stations: construct station improvements at Kenmore, Fenway (including storage tracks), and Yawkey Stations (extend platform) as proposed by "Fenway Public Improvement Projects," *(Boston EDIC/Boston Red Sox, 2000).*

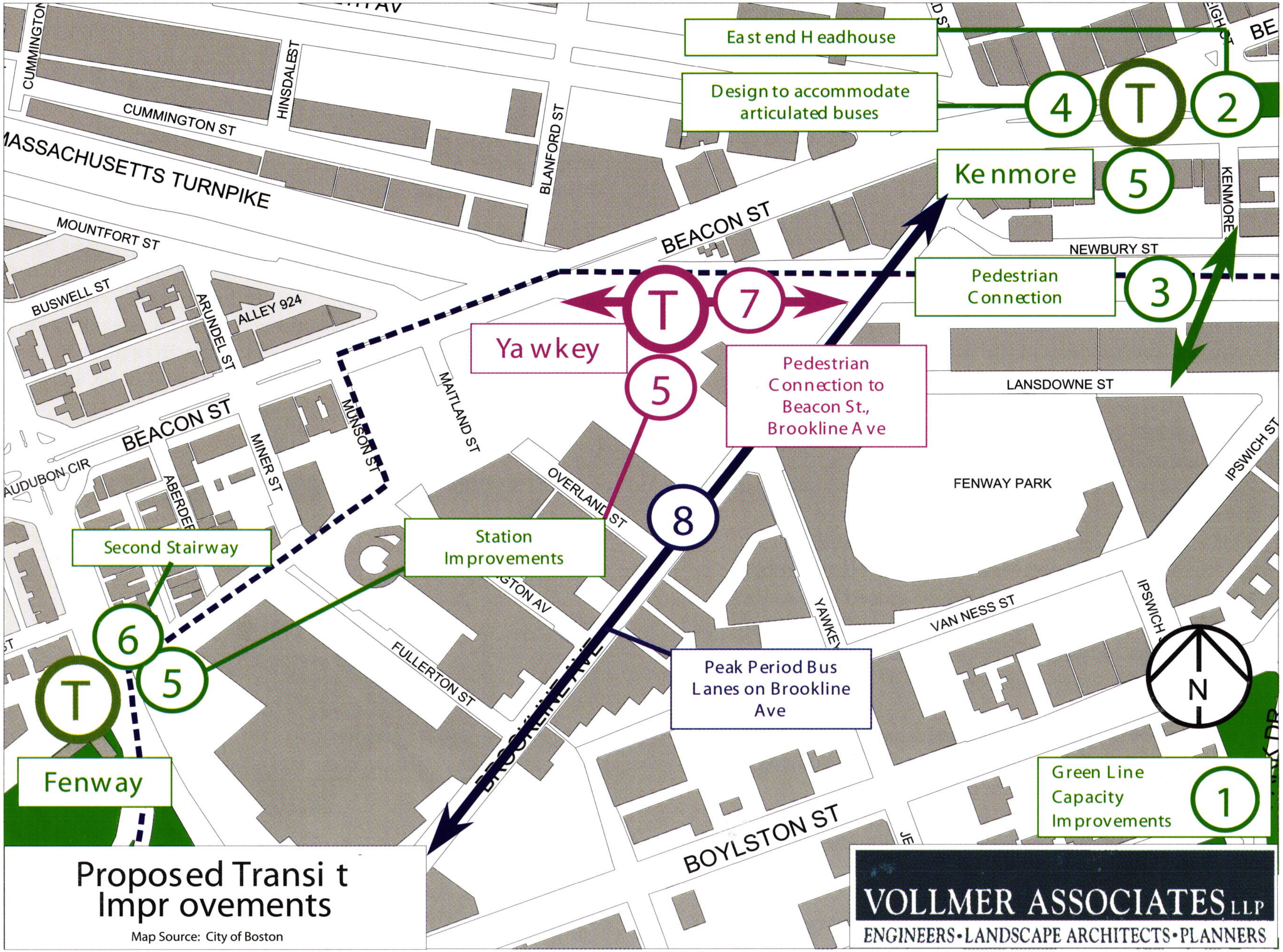
6. Fenway Station: construct a second stairway on the south side of Park Drive to reduce pedestrian crossings on the Park Drive bridge over the Green Line tracks.

7. Yawkey Station: extend the track-side platform to stairs/elevator to Beacon Street and Brookline Avenue to provide direct pedestrian connections. In conjunction with MASCO and the Boston Red Sox, provide shuttles coordinated with train arrival or departure times to minimize wait time for users.

8. Bus-only lanes: These lanes could be built on Brookline Avenue and The Fenway to give priority to buses and shuttles in the area and are alternative corridors for the Urban Ring. Brookline Avenue would consist of an outside bus-only lane during peak periods (four lanes total). During off-peak periods and weekends, on-street parking would be allowed in the outer lane. A counterflow bus lane on the Fenway could be created by converting an existing travel lane to bus-only.

9. Transit signal priority (not shown on map): where feasible, include transit vehicle priority with new traffic signals or modifications to existing equipment. Coupled with a beacon installed on the bus, the green time will be extended a few seconds to allow a bus to proceed through the intersection.

10. Bus vehicles (not shown on map): encourage all private bus operators, including MASCO and the Boston Red Sox, to present implementation timelines for conversion to 100% clean air vehicles. As suggested in bullet #4, roadway design should give consideration to MBTA bus routes that may add 60' articulated buses in the future.


East end Headhouse
Design to accommodate articulated buses
4
T
2
Kenmore
5
Pedestrian Connection
3
T
7
Yawkey
5
Pedestrian Connection to Beacon St., Brookline Ave
8
Station Improvements
Second Stairway
6
5
T
Fenway
Peak Period Bus Lanes on Brookline Ave
Green Line Capacity Improvements
1
CUMMINGTON ST
MASSACHUSETTS TURNPIKE
HINSDALE ST
BLANFORD ST
MOUNTFORT ST
BEACON ST
BUSWELL ST
ARUNDEL ST
ALLEY 924
MUNSON ST
MAITLAND ST
MINER ST
AUDUBON CIR
OVERLAND ST
FULLERTON ST
BROOKLINE AVE
NEWBURY ST
LANSDOWNE ST
KENMORE
FENWAY PARK
IPSWICH ST
VAN NESS ST
YAWKEY
BOYLSTON ST
N
Proposed Transit Improvements
Map Source: City of Boston
VOLLMER ASSOCIATES LLP
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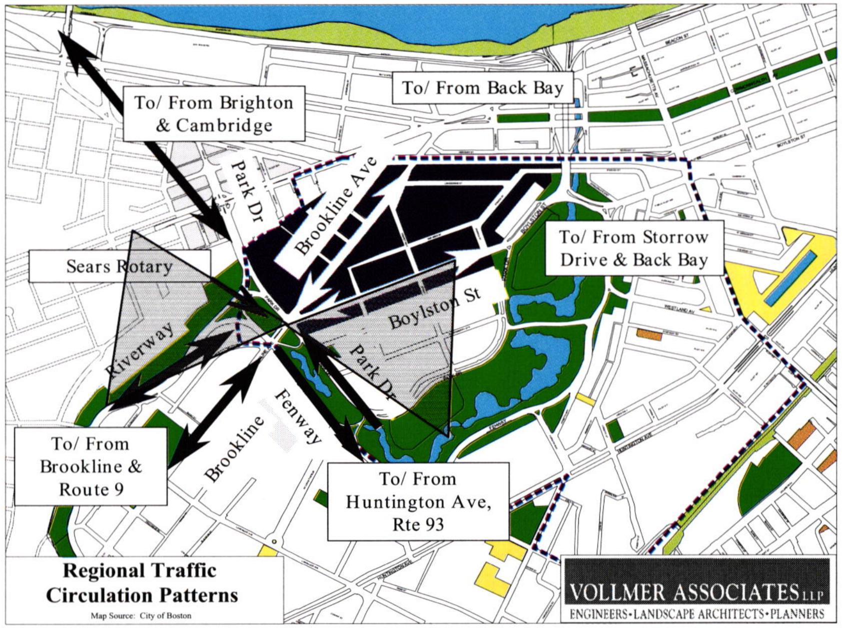
6.0 STREET CAPACITY

The Fenway's location relative to Boston's central business district and the presence of the Longwood Medical Area (LMA) make it both a destination and a pass-through for drivers destined elsewhere. The lack of direct freeway access within the study area forces vehicle traffic to utilize the arterial street system. As shown in the figure at right, the major streets in the West Fenway: Boylston Street, Brookline Avenue, Park Drive, the Riverway, and the Fenway, all intersect at the Sears Rotary. These streets converge to a common location in a "bow tie" pattern, resulting in significant peak period congestion at the rotary and adjacent intersections. The Sears Rotary is one of the most complex intersections in the City of Boston for several reasons:

- there are seven different approaches that carry heavy volumes of through and local traffic,
- it consists of three closely spaced signalized intersections,
- it's streets form part of the Emerald Necklace,
- a bike path and MBTA Station are adjacent to it,
- several MBTA bus routes travel through it and it falls within potential corridors of the proposed Urban Ring,
- the Muddy River flows underneath it and plans are underway to "daylight" the river within the rotary,
- it includes roadways under both MDC and City of Boston jurisdiction,
- it is bordered by or serves several sites proposed for development, including the Fenway MUP, Fenway Park, and expansion plans within the LMA, and
- it is bordered by parkland, residential units, institutions, businesses, and the newly re-opened Landmark Center, which has direct access.

For these reasons, the Sears Rotary was the primary focus of the street network analysis in this study. Because the rotary also serves regional traffic, the analysis included intersections immediately downstream. Specific mention is given to the Brookline Avenue and Boylston Street corridors since they were included in the streetscape recommendations of the BRA's concurrent Fenway urban design study (area shown as dark shaded blocks in figure below). Based on community input, other streets and intersections were given less priority or will be revisited in the subsequent East Fenway study.

Although pedestrians, bicycles, and buses share the street network with general vehicular traffic, their needs are addressed separately in prior chapters. For traffic impacts particular to the Fenway Mixed Use Project and the Red Sox Transportation plan, please refer to **Chapter 4**. For traffic impacts relative to the urban design vision for higher development density (FAR 4.0) development, please refer to **Chapter 7**.



This chapter builds on the findings and recommendations presented in West Fenway/Longwood Transportation Management Strategies" *(BTD, 1998)*. The West Fenway/Longwood study contains a detailed qualitative and quantitative description of the existing street system and peak period traffic operations in the Fenway. The focus of this report, conversely, is on the future traffic impacts from zoning changes proposed for the Fenway. Existing traffic conditions (2000) are briefly summarized in Section 6.1 as a point of departure for analysis of future traffic impacts. Section 6.2 describes the methodology and evaluation of improvement concepts for the Sears Rotary while 6.3 summarizes the study recommendations.

Several technical terms, as defined here, related to the street system are given below to clarify the discussion that follows:

Intersection Level of Service- a qualitative measure that describes the average delay experienced by a motorist traveling through an intersection. For signalized intersections, a letter grade is given to each intersection from A (under 10 seconds of delay) to F (over 80 seconds of delay). For intersections in an urban area, a level of service D (35-55 seconds of delay) is a generally accepted design and operations goal. A similar A to F scale applies to unsignalized intersections.

Origin/Destination- the geographic location where a trip begins and ends; for example, a person who lives in Brookline (origin) and drives to work in Back Bay (destination).

Local Traffic- vehicle traffic with *either* an origin or a destination (i.e., that start or finish) in the Fenway study area, Longwood Medical Area, or Boston University. For example, vehicle trips from Cambridge to the LMA are defined as local traffic.

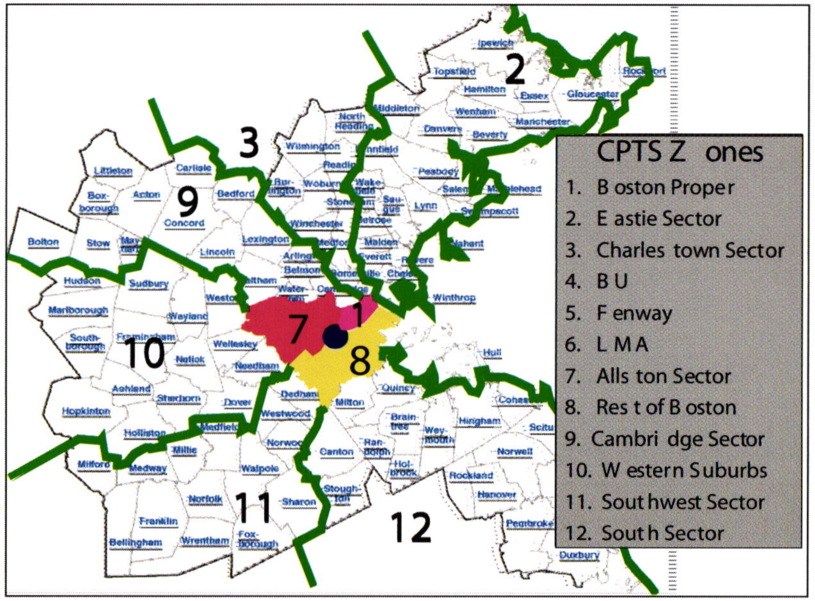
Peak Hour- the hour in which observed traffic volumes are highest. There are both morning and evening peak hours which typically coincide with commuting peaks. The peak period is generally a two to three-hour period (6-9 AM, 4-7 PM) that contains the peak hour.

Through Traffic- vehicle traffic with *neither* an origin nor a destination in the Fenway study area, Longwood Medical Area, or Boston University. For example, vehicle trips from Jamaica Plain to Cambridge that pass through the Sears Rotary are defined as through traffic.

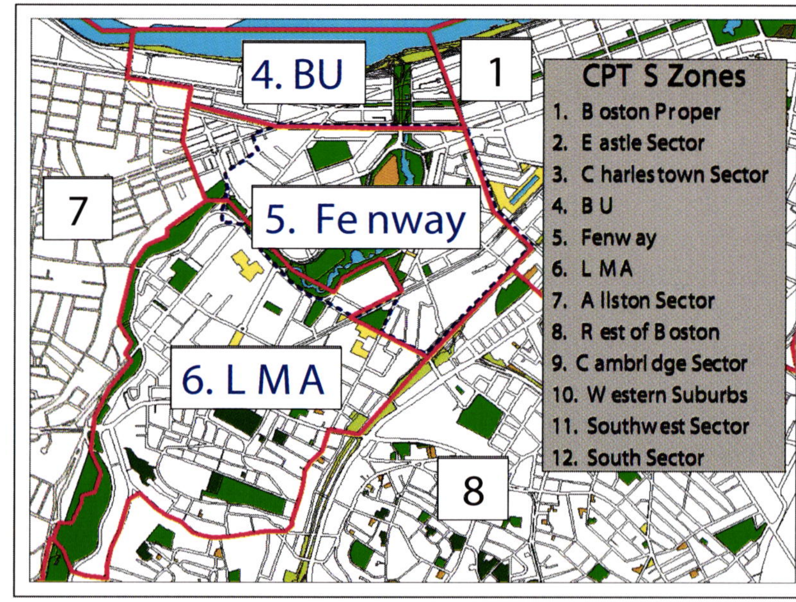
6.1 EXISTING CONDITIONS

As described in the previous section, the Sears Rotary is the primary bottleneck for vehicles traveling in the West Fenway. Of particular interest to the community was an estimate of the proportions of local and through traffic that travel through the rotary each day. The best source of this information is the regional traffic model developed and maintained by the Central Transportation Planning Staff (CTPS), the Metropolitan Planning Organization (MPO) for the Boston area.

The CTPS regional traffic model is based on detailed travel surveys completed by residents of Eastern Massachusetts. These surveys provide the best available sample of travel patterns, origin-destinations, and mode choice for drivers. The results are input by CTPS into a computer model, which assigns each trip to the roadway network. The computer model outputs a forecast of traffic volumes for each major roadway link in the Boston area. Depending on the accuracy desired, the model can be calibrated using actual traffic counts. For a given section of roadway, say Brookline Avenue just south of the Fenway, the model can be asked to output the origin and destination of each vehicle assigned to it. For this study, metropolitan Boston was divided into 12 zones as shown in the figure below.



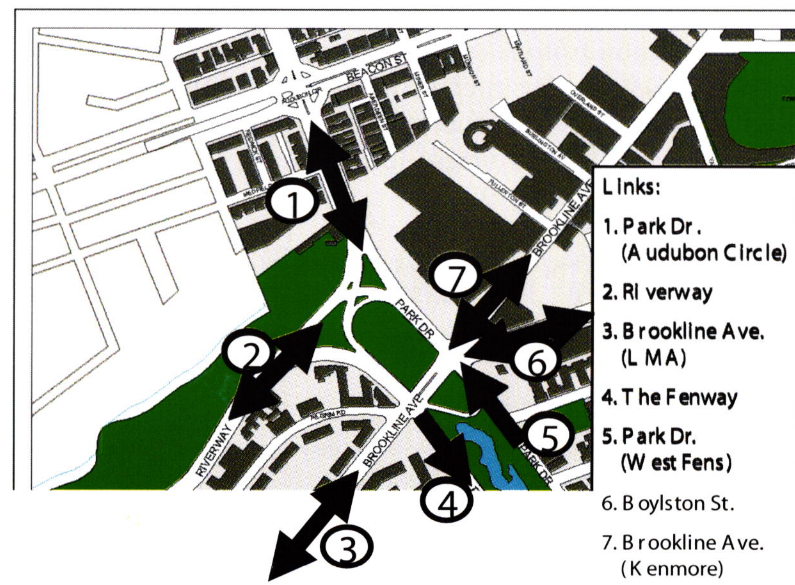
CTPS Regional Zones for Sears Rotary Analysis



CTPS Local Zones for Sears Rotary Analysis

As described earlier, the goal of the analysis was to estimate the relative proportions of through and local peak hour traffic traveling through the Sears Rotary. Local trips were defined as those with an origin or a destination within the Fenway, Longwood Medical Area, or Boston University (zones 4, 5, and 6). Zones 4-6 are shown in the next figure. The boundaries of these areas were predefined by the zones in the CTPS model, and, therefore, do not perfectly match the boundary of the study area.

The seven roadway links that comprise the Sears Rotary are shown in the figure at right. The origins and destinations of vehicles on each of these links were calculated to determine the percentage bound for one of the three ďocalí zones; the balance are through trips. The analysis results are given in the table on the next page.



Sears Rotary Links in Through/Local Traffic Analysis

Through/Local Traffic Analysis Results

Link	AM Peak Period (6-9AM)		PM Peak Period (4-7 PM)	
	Through Trips	Local Trips	Through Trips	Local Trips
1A. Park Dr EB	45%	55%	65%	35%
1B. Park Dr WB	30%	70%	80%	20%
2A. The Riverway NB	80%	20%	80%	20%
2B. The Riverway SB	70%	30%	75%	25%
3A. Brookline Ave NB	60%	40%	40%	60%
3B. Brookline Ave SB	30%	70%	80%	20%
4A. The Fenway EB	20%	80%	25%	75%
5. Park Dr. WB	20%	80%	40%	60%
6A. Boylston St WB	40%	60%	55%	45%
6B. Boylston St EB	70%	30%	45%	55%
7A. Brookline Ave SB	55%	45%	60%	40%
7B. Brookline Ave NB	30%	70%	20%	80%
Total	**49%**	**51%**	**52%**	**48%**

Source: CTPS Regional Traffic Model, October 2000.
Note: the link numbers in the table correspond to the previous figure.

The results of the through versus local traffic analysis revealed the following for each of the seven links:

1. Park Drive west of the rotary: the majority of trips in the morning are local trips while in the evening most of the traffic results from through trips. This may suggest that some through trips during the PM peak use another route during the morning commute. One possible explanation is that some vehicles are traveling down Carlton Street in Brookline during the morning peak.

2. The Riverway southwest of the rotary: most of the traffic is through trips in both directions during both peaks. Thus, according to the CTPS model, the Riverway does not appear to predominantly serve local traffic within the Fenway.

3. Brookline Avenue south of the rotary: through versus local traffic percentages vary heavily by time of day and direction. In the peak direction (inbound AM, outbound PM) through trips outnumber local ones, while the reverse occurs in the off-peak direction.

4. The Fenway southeast of the rotary: serves primarily local traffic during both peaks.

5. Park Drive east of the rotary: serves primarily local traffic during both peaks, although the percentage of through trips doubles during the PM peak.

6. Boylston Street east of the rotary: inbound traffic during the morning peak is primarily through trips, while in the evening, the traffic is about evenly balanced between through and local trips.

7. Brookline Avenue north of the rotary: in the southbound direction, the trips are about evenly split during both peaks, while in the northbound direction (toward Kenmore Square), the trips are predominantly local during the morning and evening peaks.

When trip characteristics of all seven links are summed, the proportions of through and local traffic are about 50/50 split during both the morning and evening commutes. Thus, the CTPS model indicates that peak period traffic in the Sears Rotary is about equally composed of through and local trips.

Furthermore, improvements to individual links would benefit through and local traffic in varying proportions as shown by the table above. This finding was a key consideration in the evaluation of improvement alternatives and in community support for various concepts.

The daily traffic volumes (two-way) estimated for each of the links comprising the Sears Rotary are shown in the table below:

Existing Average Daily Traffic on Sears Rotary Links

Link	Average Daily Traffic
1. Park Dr (west)	28,000
2. The Riverway	25,000
3. Brookline Ave (south)	31,000
4. The Fenway	13,000
5. Park Dr (east)	14,500
6. Boylston St	36,000
7. Brookline Ave (north)	13,500

Source: Estimates from Fenway MUP July 2000 traffic counts.

Intersection Level of Service for each of the major intersections in and adjacent to the Sears Rotary was most recently computed in the Fenway MUP DPIR (September 2000). The results of the DPIR analysis for the morning and evening peak hour, respectively are shown in the following table.

Existing Intersection Level of Service

Intersection	AM LOS	PM LOS
Boylston, Brookline, Park Dr	F	F
Brookline Ave, Fenway	C	C
Brookline Ave, Fullerton St	B	B
Boylston St, Kilmarnock St	F	F
Boylston St, Yawkey Way, Jersey St	F	F
Audubon Circle	D	D
Landmark Center Driveway, Park Dr	A	A
Park Dr, The Riverway	B	B

Source: Fenway MUP DPIR, September 2000.

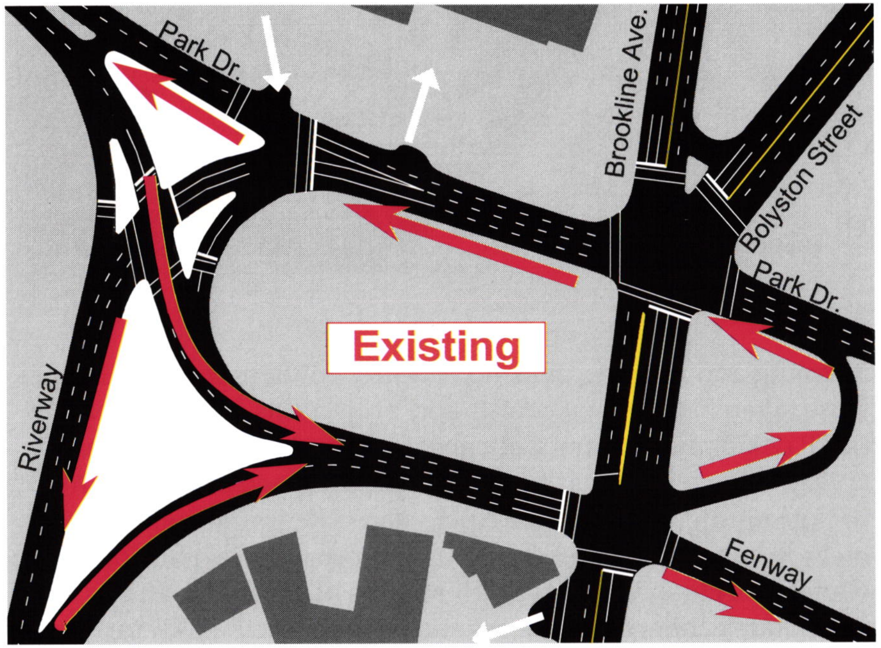
The table above indicates that the most congested intersections are those located along Boylston Street. For new development to occur at increased density (and thus add more traffic), there must be accompanying mitigation to alleviate the existing conditions and corresponding travel demand management (TDM) strategies. The following sections in **Chapter 6** and **7** describe improvements to the Sears Rotary and adjacent intersections and travel demand management/mode split targets for new development. The goal is to improve traffic conditions and ultimately allow redevelopment to occur in the land uses and densities outlined by the Fenway community's urban design vision *(BRA, 2001).*

Many enforcement issues were raised by the community but could not be addressed in the scope of this study. These include:

- Restriction of bus traffic and enforcement on Park Drive.
- Parking and traffic enforcement during Red Sox games.
- Enforcement of illegal turns and regulatory signing.

6.2 POLICY CHOICES: VISIONS & GOALS

The vision for the roadway system in the Fenway includes a safe and efficient network of streets that balance the needs of through and local traffic while providing ample amenities for bicycles and pedestrians. For reference to the improvement alternatives introduced in this section, the existing roadway geometry and circulation pattern for the Sears Rotary is shown in the figure below.



Sears Rotary: Existing Circulation Pattern

As analysis of the Sears Rotary began, residents of the Fenway asked the consultants to consider the following:

- How can the design improve conditions for non-vehicle modes (i.e., bikes and pedestrians)?
- Will a new design affect where traffic goes?
- How much of existing traffic is through trips?
- How can the design improve bus and shuttle connections to transit stations?
- How does the cost of roadway improvements compare to those for transit, utilities and pedestrian/streetscape areas?

Some of these questions are addressed in this chapter while others were addressed in previous chapters.

Within in the last four years, three other studies have analyzed the Sears Rotary and proposed improvements:

- Red Sox Study *(unpublished, 1999)* - 6 concepts
- West Fenway/Longwood Study *(BTD, 1998)* - 5 concepts
- Landmark Center *(Abbey Group, 1997)* - 2 concepts

Noting the amount and relevancy of prior work, the first task was to review and consolidate the studies completed by others. The second task, through input from the community and others involved in the previous studies, was to eliminate alternatives deemed infeasible to build or otherwise unfavorable as a result of the traffic analyses. New traffic circulation ideas, including one-way pairs, were also examined during the preliminary work. The third task was to summarize the results of the previous studies and formulate a narrowed list of alternatives. To do this, four individual "pieces" that form the building blocks of the Sears Rotary alternatives were identified, defined, and discussed.

The four "pieces" are described below and shown in the following figure:

1. <u>Jughandle elimination</u>. The jughandle is located immediately east of Brookline Avenue between Park Drive and The Fenway. The jughandle serves northbound left-turns on Brookline Avenue and circulating traffic from The Riverway wishing to travel westbound on Park Drive. It also serves MBTA bus routes #47 and CT2 traveling from the LMA

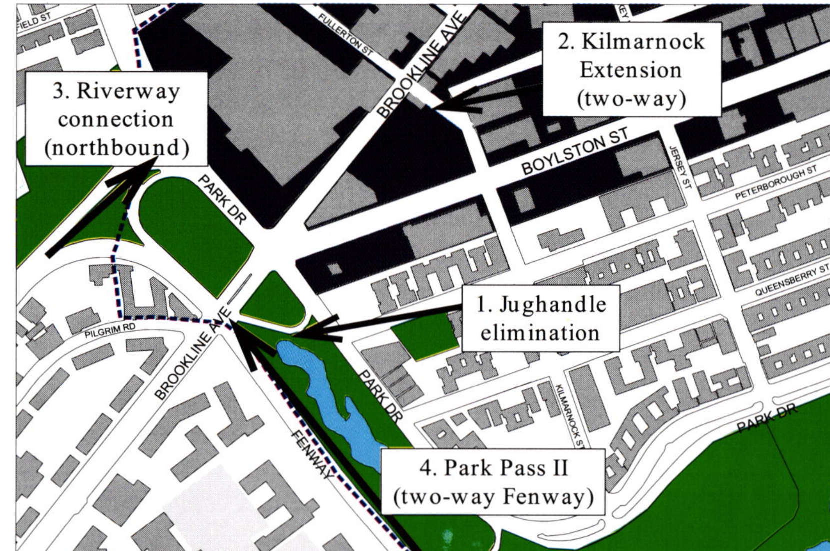
toward Cambridge. Elimination of the jughandle would return the existing pavement to green space and simplify efforts to "daylight" the Muddy River in the rotary.

2. Kilmarnock extension. The extension of Kilmarnock Street from Van Ness Street would align with Fullerton Street to form a four-way intersection at Brookline Ave. This would remove traffic traveling between the Landmark Center and Boylston Street from the Sears Rotary. This roadway extension is currently proposed as a component of the mitigation plan for the Fenway MUP.

3. Riverway connection. Provision of a third northbound lane on the Riverway would allow traffic to proceed to Audubon Circle without having to travel around the rotary. The primary benefits of this connection are reduced cut-through traffic on local streets in Brookline and on the jughandle section, potentially enabling its elimination. One concern about this alternative, however, is the amount of increased northbound traffic that might be attracted as a result of the new route.

4. Park Pass II. The conversion of the Fenway to a two-way street between Higginson Circle and Brookline Avenue to convert Park Drive to a local street. The primary goal of this concept is to remove existing westbound traffic that crosses over the Emerald Necklace to Park Drive from the existing two-way section of the Fenway east of Higginson Circle

Various combinations of these pieces were assembled to form four alternatives: Signal Improvements Only, A, B, and C. The alternatives build on each other, i.e., each subsequent concept adds a new piece while also containing the pieces of each previous alternative. Thus, cost and impacts increase as the alternatives progress from Signals Only to C.



Sears Rotary Improvement "Pieces"
Map Source: City of Boston

Morning and evening peak hour traffic volumes for this analysis were taken from recent counts and projections made by Fenway MUP (2000), Emmanuel College (2000), and Landmark Center (1997). The design year for traffic was assumed as 2007 with 1.5% background growth in traffic per year. The traffic volumes also include vehicle trips generated by the proposed expansion of Children's Hospital, Harvard Institutes of Medicine, and Emmanuel College (please see the Fenway MUP DPIR for assumed building programs). The additional traffic impacts of the urban design vision (FAR 4.0) are described in **Chapter 7**.

An existing roadway network was constructed using the Synchro 5.0™ software to compute the intersection levels of service. The forecast traffic volumes described above were used as a baseline to evaluate the performance of the various improvements described in the following sections.

Signal Improvements Only Alternative

The Signals Only alternative does not include any of the improvement pieces described in the previous paragraphs; the existing geometry and traffic conditions for the rotary essentially remain as is. Vehicular and pedestrian traffic can be enhanced to a limited degree through modernization of the traffic signals to demand responsive operation (i.e., the signals are timed based on the amount of traffic on each roadway). Video monitoring, transit priority, and pedestrian phasing can also be incorporated into the modernized signals.

Pros

- Can include minor pedestrian improvements: curb radii, crosswalks, neckdowns, signal timing, etc.
- Can be completed in a short time frame at relatively low cost
- No impact to Emerald Necklace historic boundaries

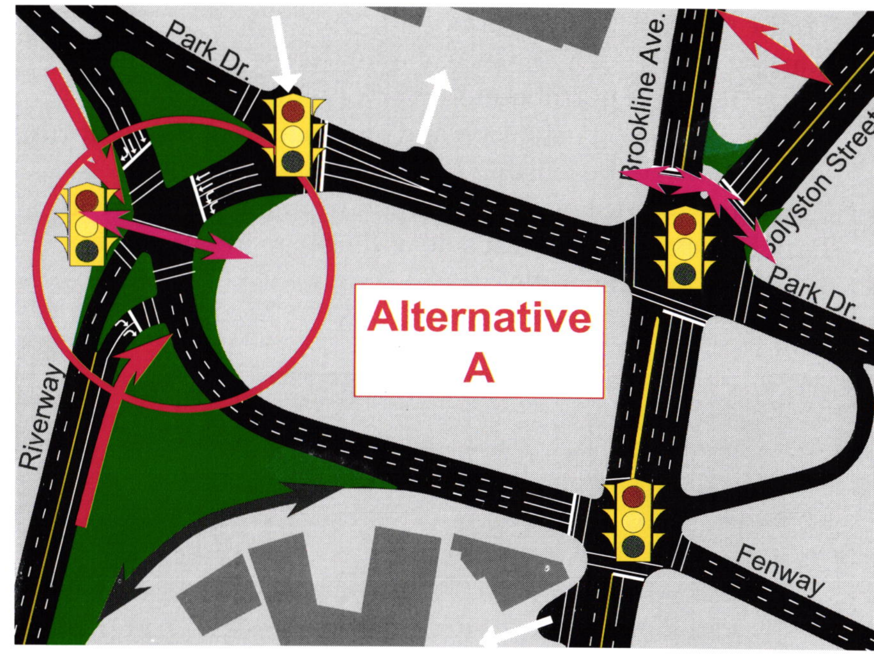
Cons

- Jughandle remains, no northbound Riverway connection
- Existing weave and other traffic conditions remain
- Less improvement to Muddy River pedestrian connection

Alternative A: ISTEA Proposal

In 1997, the "ISTEA alternative" (pictured right) was first proposed by the Abbey Group, proponent of the Landmark Center reuse. Since federal funding was sought to pay for design and construction, the ISTEA (Intermodal Surface Transportation Equity Act) Alternative refers to the federal law that authorized annual budget allocations for transportation spending (FY 1992-1997) in the United States. The proposal for Alternative A consists of:

- Traffic signal modernization.
- Narrow the Park Dr/Riverway intersection and eliminate the merge from the northbound Riverway into the rotary.
- Kilmarnock Street extension and elimination of the right-turn lane in front of the existing D'Angelos restaurant.



Sears Rotary: Improvement Alternative A

Pros

- Can include minor pedestrian improvements: curb radii, crosswalks, neckdowns, signal timing, etc.
- Improves pedestrian connection across Muddy River
- Eliminates weaving along south leg of Rotary
- Takes traffic out of the Rotary

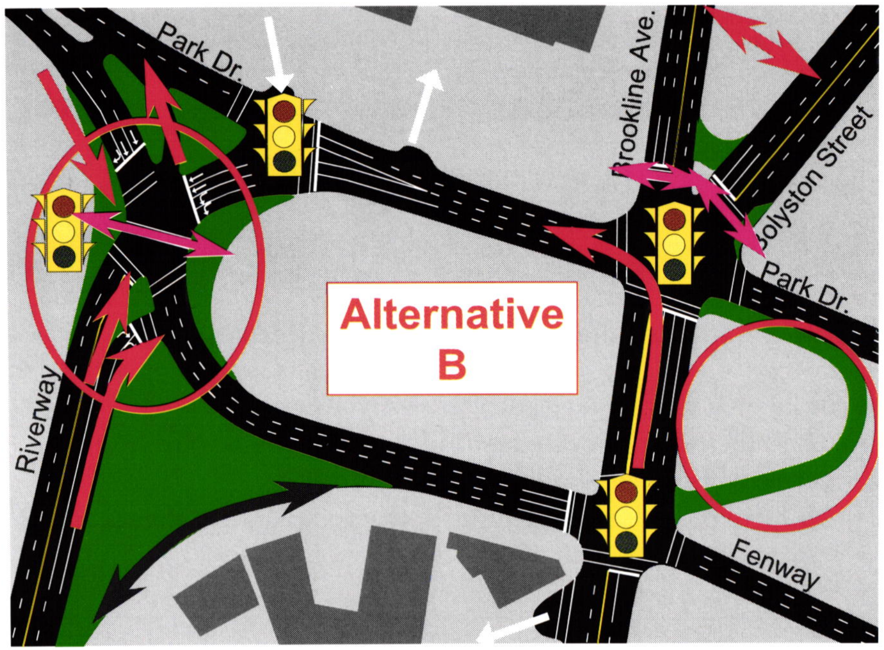
Cons

- Jughandle remains, no northbound Riverway connection
- Impacts Emerald Necklace historic boundaries

Alternative B: Riverway Connection

The proposal for Alternative B (pictured below) consists of:

- Traffic signal modernization.
- Narrow the Park Dr/Riverway intersection and eliminate the merge from the northbound Riverway into the rotary.
- Kilmarnock Street extension and elimination of the right-turn lane in front of the existing D'Angelos restaurant.
- Construct a northbound connection from the Riverway to Park Drive along the west side of the Sears Rotary.
- Eliminate the jughandle.



Sears Rotary: Improvement Alternative B

The northbound Riverway connection results in a five-lane cross section as it approaches the Sears Rotary. As the Riverway carries primarily through traffic, the primary benefit to the community would be the elimination of the jughandle and its conversion to green space. The Riverway connection removes a portion of the jughandle traffic, but the remaining traffic from northbound Brookline Avenue to westbound Park Drive, as well as existing MBTA bus routes must be addressed. Due to the short length of Brookline Avenue in the rotary and the existing congestion at the Brookline Ave/Boylston St/Park Dr. intersection, allowing left-turns for northbound general traffic is problematic. The most feasible scenario is a peak period restriction on left-turns for general traffic from northbound Brookline Avenue to Park Drive. MBTA buses would be exempt from this restriction.

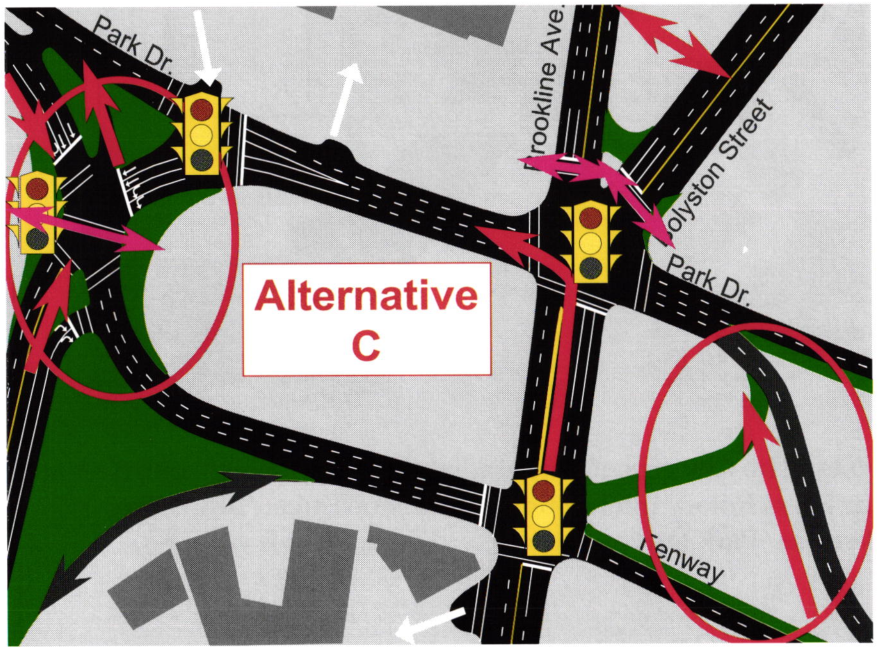
Pros
- May reduce cut through traffic on adjacent local streets in Brookline.
- Can include minor pedestrian improvements: curb radii, crosswalks, neckdowns, signal timing, etc.
- Takes traffic out of the rotary
- Allows potential elimination of jughandle

Cons
- Primarily serves through traffic from Route 9 to BU Bridge and may attract additional vehicles
- Increased left-turns from NB Brookline to WB Park Drive
- Multi-lane merge for MBTA Bus Routes #47 and CT2 on northbound Brookline Avenue
- Impacts Emerald Necklace historic boundaries

Alternative C: Park Pass II

The proposal for Alternative C (pictured next page) consists of:

- Traffic signal modernization.
- Narrow the Park Dr/Riverway intersection and eliminate the merge from the northbound Riverway into the rotary.
- Kilmarnock Street extension and elimination of the right-turn lane in front of the existing D'Angelos restaurant.
- Construct a northbound connection from the Riverway to Park Drive along the west side of the Sears Rotary.
- Eliminate the jughandle.
- Convert the Fenway between Brookline Avenue and Higginson Circle to two-way traffic.



Sears Rotary: Improvement Alternative C

The northbound Riverway connection and jughandle elimination pose the same operational problems as under Alternative B, namely how to address the northbound Brookline Avenue to westbound Park Drive left-turns.

The most challenging traffic operations aspect of Park Pass II is connecting traffic from new westbound Fenway lanes to Brookline Avenue. Three options for this connection were examined: 1) the 'z' connection, 2) two-way south leg of the rotary, and 3) a reverse crossover (shown in the figure above).

The 'z' connection would bring westbound Fenway traffic to the Rotary at the existing Brookline Ave/The Fenway intersection. Traffic would make a right-turn onto Brookline and an immediate left onto Park Drive. However, the intersection analysis indicated that this movement cannot be accommodated by the existing lanes and traffic demand. Adding lanes within the Sears Rotary was eliminated from consideration as a viable alternative.

The two-way south leg of the rotary would also bring westbound Fenway traffic to Brookline Avenue at the existing intersection by continuing the two-way Fenway to the Riverway. However, acceptable traffic operations for closely spaced traffic signals, widening of the Riverway to up to six lanes total, and maintenance of Landmark Center access could not each achieved without additional lanes.

In terms of intersection level of service, the reverse crossover option (pictured in lower right corner of Alternative C figure) was the most viable of the three Park Pass II options. Westbound traffic on the Fenway would return to Park Drive in the last block prior to Boylston Street, coupled with the elimination of the jughandle. However, the traffic impacts and MBTA bus routing issues related to the jughandle elimination remain problematic. In addition, impacts to the Emerald Necklace were difficult to justify based on the limited benefits of the new alignment.

Pros

- Park Drive becomes a local street east of Peterborough
- Elimination of jughandle and crossovers at Higginson Circle

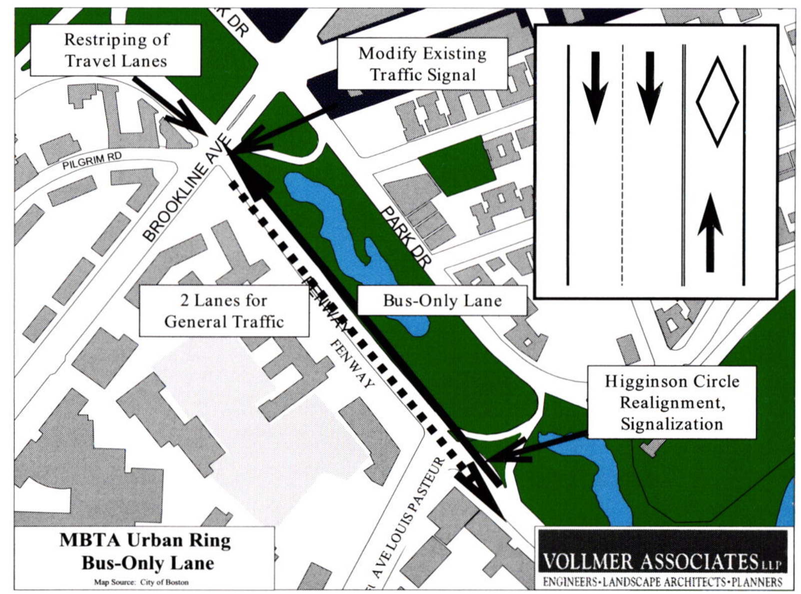
Cons

- Weaving problems for crossover traffic to turn right onto Brookline Ave. or Boylston St.
- Construction cost and impacts to Emerald Necklace may require extensive negotiation
- Would provide real benefits for a short section of Park Dr. only
- Impacts Emerald Necklace historic boundaries

Summary

Following extensive discussion at several Fenway-Kenmore NTA meetings (Fall 2000) of the pros and cons for each of the four concepts, Alternative A was identified as the preferred alternative. Alternative B has many merits, most notably the elimination of the jughandle, but it also increases the likelihood of more through traffic in the rotary and creates other traffic and bus routing problems. The adverse impacts of Alternative C on the Emerald Necklace and its inability to relieve congestion eliminated it from further consideration. Many tradeoffs were examined to reach the recommendation for Alternative A, including benefits to the community, MBTA bus operations and future Urban Ring phases, impacts to the Emerald Necklace, and the desire to not encourage more through traffic to pass through the Sears Rotary. No attempt was made to quantify these tradeoffs through a rating system or evaluation matrix.

The recommended Sears Rotary improvements include a bus counterflow lane on the Fenway (not pictured in the Alternative A figure). This lane, shown below, would require signal modifications, intersection improvements, and restriping. Due to it's restriction to transit use only, the counterflow lane was not expected to adversely impact traffic flow at the intersection of Brookline Avenue and the Fenway. For more detailed information on this proposal, see the Urban Ring Major Investment Study *(MBTA, 2001)* and Section 5.2, page 52.



Note: The City recently upgraded the traffic signal controller at the Sears Rotary intersection of Boylston Street/Brookline Avenue/Park Drive. A traffic video monitor is planned.

6.3 RECOMMENDATIONS & RATIONALES

1. Reconstruct Boylston Street within the existing right of way according to the cross section given in "Land Use and Urban Design Guidelines" *(BRA, 2001).* The primary change on Boylston Street would be a slight widening to accommodate a wider, shared-use outside lane for general traffic and bicycles.

2. Reconstruct Brookline Avenue within the existing right of way according to the cross section given in "Land Use and Urban Design Guidelines" *(BRA, 2001).* The primary change on Brookline Avenue would be a slight widening to allow an eventual bus/shuttle lane during peak periods (see **Chapter 5**). This lane would be dedicated to on-street parking during off-peak periods and weekends.

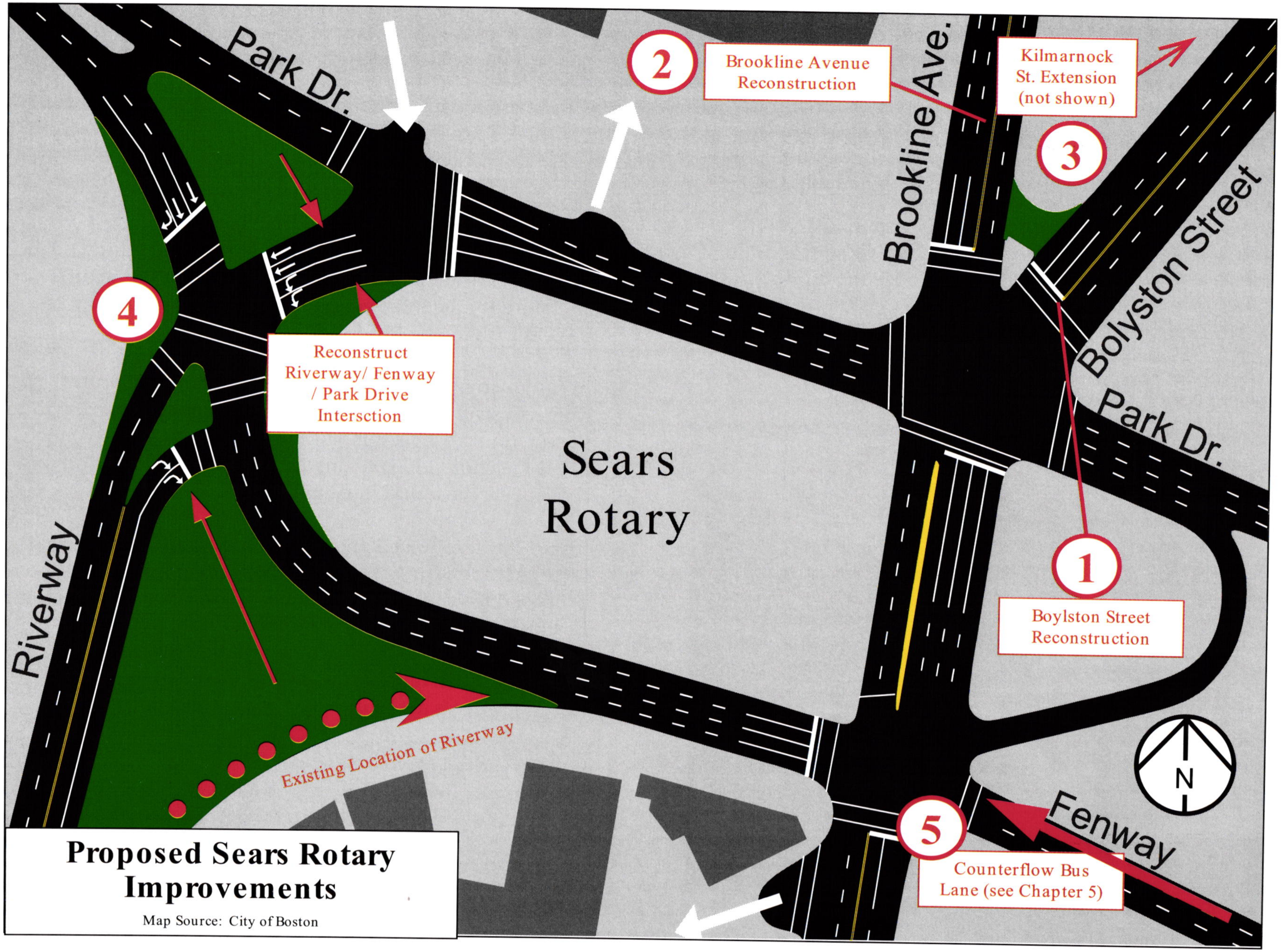
Pedestrians Crossing Brookline Avenue at Boylston

3. Extend Kilmarnock Street to Brookline Avenue, forming a four-way intersection with Fullerton Street. Install a traffic signal at the intersection of Kilmarnock Street and Boylston Street.

4. Reconstruct the intersection of the Riverway, Park Drive, and the Fenway. Align the northbound Riverway merge with the Fenway as a right-turn at a signal-controlled intersection. Narrow the westbound Park Drive lanes from 5 to 4, with all lanes stopping at a traffic signal. This would eliminate the merging condition along the southern leg of the Sears Rotary and simplify the intersection for pedestrians and bicycles traveling along the Muddy River.

5. In conjunction with the phased implementation of the Urban Ring, construct a counterflow bus lane (not pictured) within the existing cross section of the Fenway between Avenue Louis Pasteur and Brookline Avenue. More details on this concept can be found in **Chapter 5**.

6. Install traffic-actuated and coordinated traffic signals (not pictured) at existing signalized intersections and those proposed for signals. Interconnect signals to the City of Boston Traffic Control Center. Incorporate relevant components of Intelligent Transportation Systems (ITS), including video monitoring, for improved system response to traffic accidents and game-day traffic conditions.



Proposed Sears Rotary Improvements

Map Source: City of Boston

7.0 URBAN DESIGN & GROWTH PLANNING

The previous five chapters have made a variety of recommendations for transportation improvements in the Fenway in the areas of parking, pedestrians, bicycles, transit, and vehicle traffic circulation. While some of these address longstanding problems, many references have been made toward accommodating the traffic impacts of the "urban design vision." Besides references to "Land Use and Urban Design Guidelines" *(BRA, 2001)*, however, the transportation impacts of increased density have not yet been quantified. This chapter presents the analyses that show how the recommendations made in prior chapters can together meet travel demands to, from, and through the Fenway in the 5-10 year horizon (i.e., pre-Urban Ring).

A fundamental assumption of this study is that the roadway system in the Fenway cannot be physically expanded to meet the demands of the urban design vision. Instead, a combination of disincentives to drive and incentives for transit use must dramatically alter the way commuters travel to and from the area. Thus, recommended improvements to the transit system reflect increased demand from new development at FAR 4.0, while the capacity of the roadway system remains essentially "fixed." The purpose of this final chapter is to explain the synergy between the Fenway urban design vision and the Fenway transportation study.

Section 7.1 describes the urban design vision, its magnitude in building space (gross and net), and proposed land uses. The information in Section 7.1 is taken directly from the BRA study "Land Use and Urban Design Guidelines," completed by ICON architecture in 2001. In section 7.2, the parking inventory and proposed ratios for new development (see **Chapter 2**) are combined to provide net new parking scenarios in the Fenway. The tradeoffs resulting from a replacement of existing surface parking lots versus relocation of the spaces are also presented.

Section 7.3 describes trip generation of the urban design vision, i.e., an estimation of how new development could increase travel to and from the Fenway. By subtracting the number of trips estimated for the existing land uses, a forecast of net new trips can be made. Finally, in Section 7.4 the trips are distributed to the roadway and transit networks. The forecast levels of net new trips are compared with the recommendations for roadway and transit capacity improvements made previously to quantify the transportation infrastructure needs in the Fenway. The trip analyses described in Sections 7.3 and 7.4 include the morning and evening peak hours of traffic, i.e., other times were not studied.

Note: At the writing of this report, there are many unknowns with respect to the ownership and future stadium plans for the Boston Red Sox. The assumptions made in this study reflect a ballpark located in the Fenway. For a transportation planning study at this level of detail, either the existing or proposed ballpark site in the Fenway generally meets the assumptions presented here for transportation demand and potential mixed-use development. However, if the future Red Sox owners ultimately choose to relocate the park to an area outside the Fenway, the transportation and urban design recommendations should be updated in conjunction with a new master plan.

Several technical terms, as defined in this report, related to urban design are included below to clarify the discussion that follows:

Floor Area Ratio (FAR)- the ratio of floor space in a building to the area of the parcel it occupies. For example a 200,000 square foot building located on a 40,000 square foot parcel has a FAR of 5.0. FAR. Coupled with building height restrictions, FAR is used in zoning to limit the density of development.

Mode Choice- the mode in which a person chooses to travel, e.g., walk, bicycle, private vehicle, bus, or subway.

7.1 URBAN DESIGN VISION & GOALS

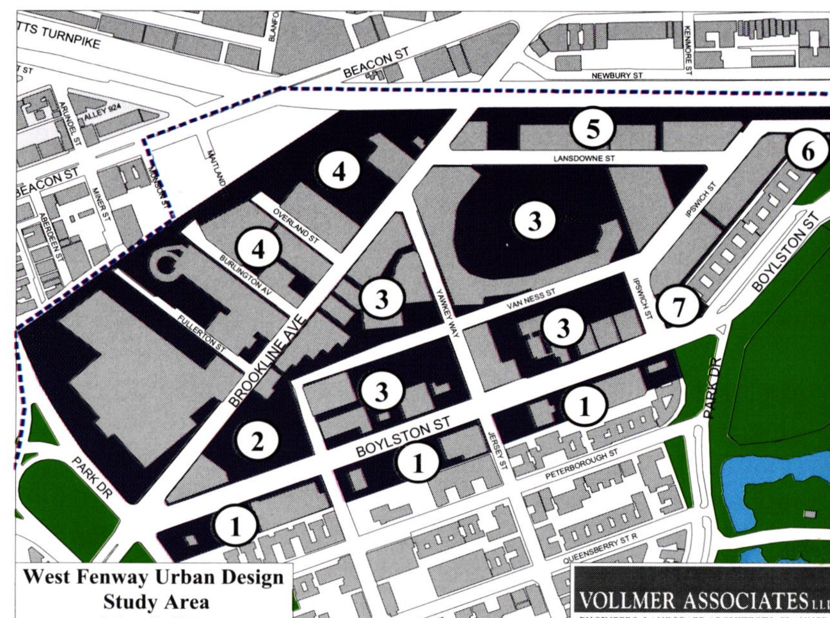
The focus in this section is on quantifying the recommendations for allowable land uses and building density made in "Land Use and Urban Design Guidelines" *(BRA, 2001)*. The objective is to provide a clear understanding of the scale of potential development and how it translates to transportation and parking demands described in subsequent sections.

The fundamental zoning recommendation of the urban design study is to encourage redevelopment by increasing the allowable density in selected districts of the West Fenway from FAR of 2.0 to 4.0. Two parcels designated as "gateways" are allowed FAR 6.0. The two gateway locations are at the Brookline/Boylston Street intersection and the existing TNT Vacations building near the Bowker Overpass. For purposes of forecasting travel demand, building space is approximated by multiplying lot size by the proposed FAR. For example, a lot size of 100,000 square feet could contain a 400,000 square foot building (not including parking and service areas). The height and setback restrictions would further control the appearance of the structure. The urban design study assumes that all development will be mixed-use, with ground-floor retail and either office or residential use on upper floors. In the example, the 400,000 square feet in the example above is allocated to retail, office, or residential space.

It is important to note that the maximum density allowed by the zoning change to FAR 4.0 was assumed for the transportation analysis. Additional space above this maximum, through the exercise of proposed FAR bonuses and incentives (e.g., affordable housing), zoning variances, or exemption via Planned Development Areas (PDA's), could not be predicted and therefore, was not included. Although developers could propose less than the allowable FAR, this was not seen as a likely scenario. The next figure and table present the existing and potential land use assumptions that comprise the urban design vision.

Building Space: Existing and FAR 4.0 Build-Out

Area	Existing Building (square feet)	Potential Retail (square feet)	Potential Office (square feet)	Potential Residential (square feet)
1	123,000	112,000	350,000	747,000
2	32,000	70,000	-	585,000
3	546,000	240,000	1,030,000	-
4	20,000	35,000	95,000	-
5	157,000	35,000	300,000	-
6	50,000	-	75,000	-
7	2,000	8,000	-	118,000
Total	**930,000**	**500,000**	**1,850,000**	**1,450,000**



West Fenway Urban Design Study Area
Map Source: City of Boston

The seven areas shown in the figure and table above are described as:

- Area 1: the three city blocks south of Boylston Street (north half only)
- Area 2 (gateway parcel): the existing D'Angelos building and proposed Fenway MUP
- Area 3: the four city blocks that include the existing ballpark and proposed site for a new stadium
- Area 4: the VIP parking lot and surface parking facilities along the northwest side of Brookline Avenue
- Area 5: the parcels north of Lansdowne Street
- Area 6 (gateway parcel): the building occupied by TNT Vacations
- Area 7: the existing Texaco service station parcel

The square footage numbers presented in the previous table include retail and office space associated with a proposed ballpark in the Fenway.

The land use and density proposed by the urban design vision results in 1,400-1,500 new housing units (assuming an average 1,000 square feet per unit) along Boylston Street. About 50% of these units would be located on the north side of the street with the balance along the south side. Retail space, consisting of ground-level shops, services, and restaurants, would occupy 500,000 square feet. The urban design study proposes a 25,000-35,000 square foot maximum for individual stores to keep them smaller in scale. Over 80% of the office space is located on the north side of Boylston Street.

The total gross floor area of proposed building area at FAR 4.0 is about 3.8 million square feet. Subtracting the 0.9 million square feet razed for new construction, the net increase is about 2.9 million square feet. Since the buildings razed would be all non-residential, net new residential space is about 50% of the total.

7.2 PROPOSED PARKING RATIOS

This section presents the calculations for new parking spaces in the Fenway according to the parking ratios proposed. The proposed ratios are:

Residential:	Minimum:	0.75 spaces per unit
	Maximum:	0.75 spaces per unit
Non-residential	Minimum	none
	Maximum:	0.75 spaces per 1,000 GSF

The maximum parking ratio of 0.75 for residential and non-residential was applied to the square footage numbers given in Section 7.1. An average residential unit size of 1,000 square feet was assumed. The results are given in the table below.

Parking Space Calculations Under 0.75 Zoning Ratios

Area	Proposed Residential Units	Parking Spaces Allowed	Proposed Non-Residential (square feet)	Parking Spaces Allowed
1	747	560	462,000	347
2	585	439	70,000	53
3	-	-	1,270,000	953
4	-	-	130,000	98
5	-	-	335,000	251
6	-	-	75,000	56
7	118	89	8,000	6
Total	**1,450**	**1,088**	**2,350,000**	**1,764**

Thus, build-out at FAR 4.0 with parking provided according to the 0.75 ratios would allow a total of 2,852 parking spaces. The number of interest to the community, however, is net new spaces. For comparative purposes, two scenarios, as described in **Chapter 2** (page 24) were examined for net new parking:

- Scenario 1: Existing non-accessory and satellite parking lots are *replaced* with accessory parking for new development.
- Scenario 2: Existing non-accessory and satellite parking lots are *relocated* to a centralized garage near Yawkey Station.

Scenario 1: Replace Non-Accessory Parking

In Scenario 1, the existing non-accessory spaces are not relocated to another facility within the study area as redevelopment occurs.

Scenario 1 Net New Off-Street Parking

Area	Proposed Parking Spaces	Existing Parking Spaces	Net New Parking Spaces
1	907	402	505
2	492	279	213
3	953	1,585	-632
4	613	570	43
5	251	311	-60
6	56	15	41
7	95	78	17
Total	**3,367**	**3,240**	**127**

In Scenario 1, net new parking increases about 5% or 127 spaces. The elimination of the surface parking lots in area 3 is offset by increased spaces in areas 1 and 2, which are primarily parking for residential developments.

Scenario 2: Relocate Non-Accessory Parking

In Scenario 2, the existing non-accessory spaces are relocated to a centralized facility near Yawkey Station (as proposed in the Red Sox Transportation Study). The proposed parking spaces in the table below reflect the Red Sox proposal for parking facilities in areas 3 (630 spaces) and 4 (2,160 spaces). The Red Sox garage proposed in area 3 is assumed to provide a portion of shared parking to new development in adjacent blocks, thus no increase above the Scenario 1 parking is shown. The Red Sox garage proposed in area 4 is assumed to provide parking for retail or office space on the northwest side of Brookline Avenue, the Longwood Medical Area, and Red Sox fans. Proposed parking for other areas remains unchanged from Scenario 1.

Scenario 2 Net New Off-Street Parking

Area	Proposed Parking Spaces	Existing Parking Spaces	Net New Parking Spaces
1	907	402	505
2	492	279	213
3	953	1,585	-632
4	2,160	570	1,590
5	251	311	-60
6	56	15	41
7	95	78	17
Total	**4,914**	**3,240**	**1,674**

The net new parking increase for Scenario 2 is slightly over 50% or 1,674 spaces. Most of the 1,590 net new spaces in area 4 would likely be used by employees of the LMA, Boston University, and others who currently park in or near the Fenway.

7.3 TRIP GENERATION & MODE SPLIT

Sections 7.3 and 7.4 describe the technical analysis completed to quantify how new development would increase traffic in the Fenway. The goal of these efforts is to establish a mode split target for the urban design vision. The methodology used in this study involves a four-step process:

- Trip Generation: estimating the number of people that will travel to and from the development, generally during the morning and evening peak hours of traffic.
- Mode Split: dividing the person-trips calculated above into their respective modes of travel, e.g., walk, bicycle, transit, drive, etc.
- Trip Distribution: a spatial allocation of the trips to the surrounding roadways and transit lines.
- Trip Assignment: adding the new trips to the existing roadway and transit networks.

The results of each step are described in the next sections.

Trip Generation

Each new development has a unique set of trip generating characteristics, or the ability to attract people during the day. The amount of trips that coincide with the peak commuting hours is a function of the proposed land use. For example, peak hour trips are high for office space and lower for restaurant or retail space.

Standard rates for trip generation have been developed by the Institute of Transportation Engineers (ITE), through nationwide field studies of different land uses, from gas stations to office buildings to health clubs. In 1989, the Boston Transportation Department (BTD) developed a similar set of rates particular to the City. However, BTD's new guidelines for transportation analysis (Fall 2001) are expected to accept ITE rates in transportation studies. In this study, BTD rates were used to generate trips.

As with proposed parking spaces in Section 7.2, person trips are also calculated based on the square footage of building spaces or the number of residential units. Net new trips are calculated by subtracting the estimated number of existing trips. For example, redevelopment of a parcel containing a gas station would likely eliminate some number of existing trips. Many of the existing uses on Boylston Street are highly vehicle-oriented, e.g., gas stations, parking lots, fast-food restaurants with drive-through windows, and vehicle service facilities. However, the new uses with limited parking, e.g., residential, office, and small-scale retail space, are expected to be much more transit-oriented.

The table below gives the BTD trip rates used to generate trips for the proposed redevelopment at FAR 4.0. For residential, apartments were assumed over other types of residences since their trip generation rate was slightly higher. The general retail category was used for all non-office, non-residential space, although some portion is expected to be restaurant use.

BTD Person Trip Rates (one-way per 1,000 square feet)

Land Use	AM Peak Hour Entering	AM Peak Hour Exiting	PM Peak Hour Entering	PM Peak Hour Exiting
Office	2.1	0.2	0.3	1.8
Retail (General)	0.3	0.2	1.1	2.2
Residential (Apartment)	0.1	1.0	1.0	0.5

As shown above, a residential use generates about half the level of trips as the same amount of office space. A similar set of trip rates were used to estimate the level of trips to the existing uses, including gas stations, fast food restaurants, office and retail space.

Using the square footage numbers for new and existing building space, the trip rates shown above were applied to calculate the number of new person trips to each parcel.

Mode Choice

By factoring in the socioeconomic characteristics of the location and the proximity to transit, the percentage of people who will travel to the site by car, bus, walking etc. can be estimated. This is referred to as the mode choice, or mode split for a development. Mode split is the key variable in this analysis because it controls the amount of new vehicle traffic added to the street network. The maximum percentage of new trips using private vehicles that can be sustained by the roadway network was identified as the "target mode split."

The mode split assumptions made in this study are shown in the next table. These assumptions are based on CTPS data. The category of "other trips" refers primarily to walking and biking modes of travel. The 30% to 50% range for mode split indicates how the percentage of vehicle trips was varied to study the corresponding traffic impacts. Office space was the only land use in which the mode split was varied; residential and retail uses had much lower peak hour trip generation rates and were assumed to have higher transit shares.

The vehicle occupancy ratio is the average number of persons per car. For office and residential uses, the number of people carpooling is assumed to be very low, as indicated by the average of 1.1 persons per car shown in the table (top right). This assumption is based on CTPS data and other studies completed in the Fenway.

Mode Choice and Vehicle Occupancy Ratio (VOR) Assumptions

Land Use	Drive	Transit	Other	VOR
Office	50-30%	30-50%	20%	1.1
Retail (General)	40%	15%	45%	1.8
Residential (Apartment)	20%	35%	45%	1.1

The transit mode split for the existing land uses (parking lots, service stations, fast food restaurants) was assumed to be very low, and therefore, existing transit trips to these uses were assumed as negligible (i.e., no trips were subtracted from current ridership levels).

The trip generation rates and mode split assumptions discussed above were then applied to the existing land uses. The following table gives the forecast of existing vehicle trips that would be eliminated through full build-out of the urban design vision.

Existing Vehicle Trips to Redevelopment Parcels

AM Peak Hour Entering	AM Peak Hour Exiting	PM Peak Hour Entering	PM Peak Hour Exiting
955	552	801	1,057

The numbers in the table above are an estimate of the total one-way trips to all existing uses over the course of an hour. For example, the numbers include vehicle trips to the Star Market, service stations, businesses, and the surface parking lots that occur during the peak hour of traffic. The traffic forecast indicates that about 1,000 vehicle trips would be removed from peak hour traffic if all parcels were demolished. However, new vehicle trips to the residential, office, and retail developments will result in a net increase, as described below.

The results of trip generation and mode choice calculations enabled an estimate to be made of the new number of peak hour vehicle and transit trips resulting from the urban design vision, or build-out of the area at FAR 4.0. Subtracting the existing vehicle trips from the new trips gives the net new trips as shown in the next table. This calculation was performed for each mode split assumption, from 50% drive down to 30% drive in order to test the carrying capacity of the street network.

Net New Vehicle Trips (Total for All Land Uses)

Office Mode Split	AM Peak Hour Entering	AM Peak Hour Exiting	PM Peak Hour Entering	PM Peak Hour Exiting
50% Drive	902	-104	-167	856
45% Drive	722	-121	-193	702
40% Drive	542	-138	-219	548
35% Drive	362	-155	-244	393
30% Drive	183	-172	-270	239

The calculation of net new vehicle trips yielded several interesting results. First, vehicle trips at 30% drive are only around one quarter of the total calculated if 50% drive. This indicates the potential impact of an area-wide travel demand management program and that office space generates many more trips during peak hours (in comparison to residential and retail/restaurant space). Vehicle trips in the off-peak direction, e.g., outbound in the AM and inbound in the PM peak hour were actually forecast to be reduced from existing levels. However, to keep the analysis conservative, net new trips in the off-peak direction were set equal to zero.

The change from 50% drive to 30% drive also has a profound impact on transit ridership as shown in the next table.

Net New Transit Trips

Office Mode Split	AM Peak Hour Entering	AM Peak Hour Exiting	PM Peak Hour Entering	PM Peak Hour Exiting
50% Transit	2,049	694	856	2,106
45% Transit	1,851	676	828	1,936
40% Transit	1,654	657	800	1,767
35% Transit	1,456	638	771	1,597
30% Transit	1,258	619	743	1,428

Net new transit ridership in the peak hour, peak direction (AM inbound, PM outbound) is forecast at up to 2,100 persons under the scenario in which transit mode share is 50%. Trips in the off-peak direction (AM outbound, PM inbound) increase primarily due to the addition of residential space. Off-peak direction trips are 33%-50% of the total trips forecast for the peak direction.

Additional trip generation and mode choice calculations can be found in the Appendix.

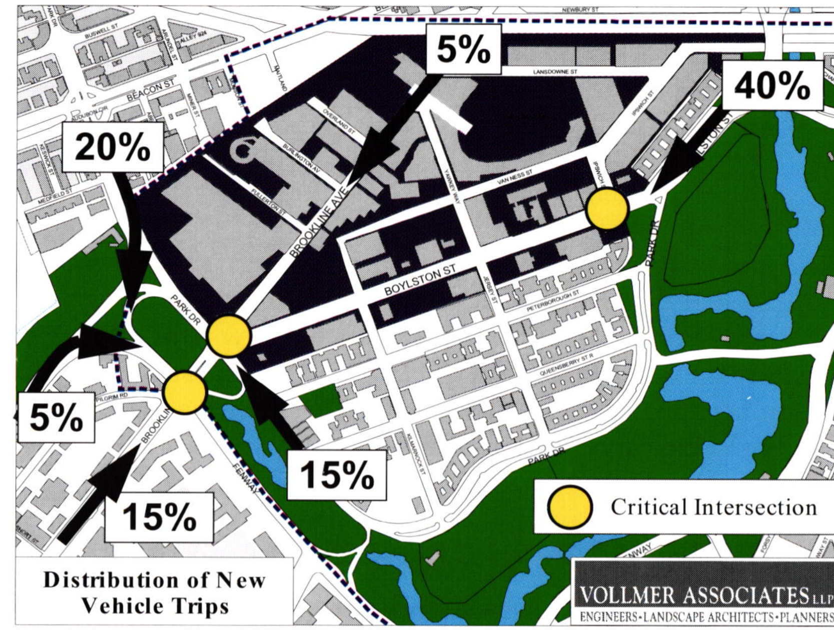
7.4 TRIP DISTRIBUTION & ASSIGNMENT

The next step in analyzing the transportation impacts of the urban design vision was to assign the vehicle and transit trips to their respective networks. Using mode choice as a variable to model varying amounts of new vehicle traffic to the area, the intersection level of service could be evaluated. The percent of trips using a private vehicle was varied from 50% down to 30% in 5% increments to determine the ability of the street network to process the forecast traffic volumes. Three key intersections were chosen as indicators of the capacity of the overall street network. The final step was to forecast the number of new transit riders on each MBTA mode (e.g., bus, subway, commuter rail).

Trip Distribution

The vehicle and transit trips calculated in the previous section were distributed to the various streets and transit modes, respectively. For example, during the morning peak hour a percentage of total vehicle trips is expected to travel down Boylston Street (from the east) and another portion via Park Drive (from the west). The CTPS data obtained for the Sears Rotary through traffic analysis provided the best source of trip distribution data (see **Chapter 6**). The percentages assumed for the morning were reversed in the evening, including the Park Drive-The Fenway one-way pair. In other words, if a car travels to the area in the morning via Boylston Street, the return trip was also assumed to utilize Boylston Street. Similarly, for transit trips, a portion of trips were assigned to the bus, subway, and commuter rail modes.

Based on these data, vehicle trips were distributed in the percentages shown in the following figure.



Distribution of New Vehicle Trips

Transit trips were assigned using ridership data, direction distribution assumptions, and engineering judgement. Transit trip distribution is given in the table below.

Transit Trip Distribution

Mode	Trips Inbound	Trips Outbound
Bus	33%	33%
Outbound Green Line	40%	20%
Inbound Green Line	20%	40%
Orange Line	2%	2%
Commuter Rail	5%	5%
	100%	**100%**

Trip Assignment

Based on the existing levels of traffic congestion in the Fenway, three critical intersections were selected as indicators of the ability of the street network to accommodate additional vehicle trips. These intersections are:

- Boylston Street and Ipswich Street,
- Boylston Street, Park Drive, and Brookline Avenue, and
- Brookline Avenue and The Fenway.

Although several other intersections are vital to the flow of traffic through the Fenway, these locations are the first to reach capacity (i.e., intersection LOS E or worse) as peak hour traffic levels increase. Several factors influence the traffic forecasts and the ability of the Sears Rotary to process the flows:

1. The replacement of existing land uses which are highly vehicle-oriented, e.g., surface parking lots, service stations, and fast food restaurants, with transit-oriented development containing minimal parking.

2. The removal of existing traffic from the Sears Rotary through the Kilmarnock extension. This will primarily remove Landmark Center traffic traveling to and from Boylston Street and provide additional access options for the Fenway MUP.

3. Improved traffic flow through the modernization of traffic signals to demand-responsive operation and coordination with adjacent signals.

Morning and evening peak hour traffic volumes for this analysis were taken from recent counts and projections made by Fenway MUP (2000), Emmanuel College (2000), and Landmark Center (1997). The design year for traffic was assumed as 2007 with 1.5% background growth in traffic per year. The traffic volumes also include vehicle trips generated by the proposed expansion of Children's Hospital, Harvard Institutes of Medicine, and Emmanuel College (see the Fenway MUP DPIR for assumed building programs). These assumptions served as the baseline for adding net new traffic resulting from build-out to FAR 4.0. An existing roadway network was constructed using the Synchro 5.0™ software to compute the intersection levels of service (LOS) under the five mode split scenarios.

The results indicated that the critical intersections could not accommodate net new vehicle trips at or near the existing drive mode share of 50% for office space. A share of 30% is required to allow the intersections to function at acceptable levels of peak hour congestion. Therefore, this became the recommended mode split target for future development in the Fenway.

The following table gives the vehicle trips assigned to each intersection under the 30% drive mode split assumption. Net new vehicle trips in the off-peak direction did not affect intersection performance.

Net New Vehicle Trips at Critical Intersections (30% Drive)

Roadway	AM Peak Hour	PM Peak Hour
Boylston Street WB (EB)	73	96
Brookline Avenue SB (NB)	9	12
Park Drive EB (WB)	37	48
The Riverway NB (SB)	9	12
Brookline Avenue NB (SB)	27	36
Park Drive WB (Fenway EB)	27	36
Total	**182**	**240**

Net new vehicle trips at a 30% drive mode share are relatively low, and can be accommodated by the proposed improvements to the Sears Rotary and adjacent traffic signals (see **Chapter 6**).

With the target mode split calculated, the impacts of increased MBTA ridership could be forecast. The table below gives the estimates for new riders on each of the bus, subway, and commuter rail modes.

Net New Transit Trips by MBTA Mode (50% Transit)

Transit Mode	AM Peak Hour		PM Peak Hour	
	Entering	Exiting	Entering	Exiting
Bus	676	229	282	695
Outbound Green Line	820	139	342	421
Inbound Green Line	410	278	171	842
Inbound Orange Line	41	-	17	-
Outbound Orange Line	-	14	-	42
Commuter Rail	102	35	43	105
Total	**2,049**	**695**	**855**	**2,105**

Note: Inbound refers to travel in the direction of the Boston Central Business District (CBD); outbound service is travel away from the CBD.

The forecast for increased bus ridership, as shown above, is nearly 1,000 additional passengers during the peak hour. A portion of these will travel on bus routes currently below capacity, while others will travel on routes already congested. The addition of existing and articulated buses described in **Chapter 5** is intended to meet this demand.

On the Green Line, the bulk of new transit ridership is in the reverse peak direction, thus, some additional capacity is available. However, around 700-750 net new trips are forecast to travel in the peak direction (AM in, PM out). The additional 3 car trains on the 'D' Line would add 1,000 persons per hour in capacity, helping to meet this demand. A lesser number of three car trains in the reverse peak direction may also be required.

The limited numbers of forecast riders as well as the presence of available capacity did not lead to recommendations for capacity improvements to the MBTA Orange Line or the commuter rail service.

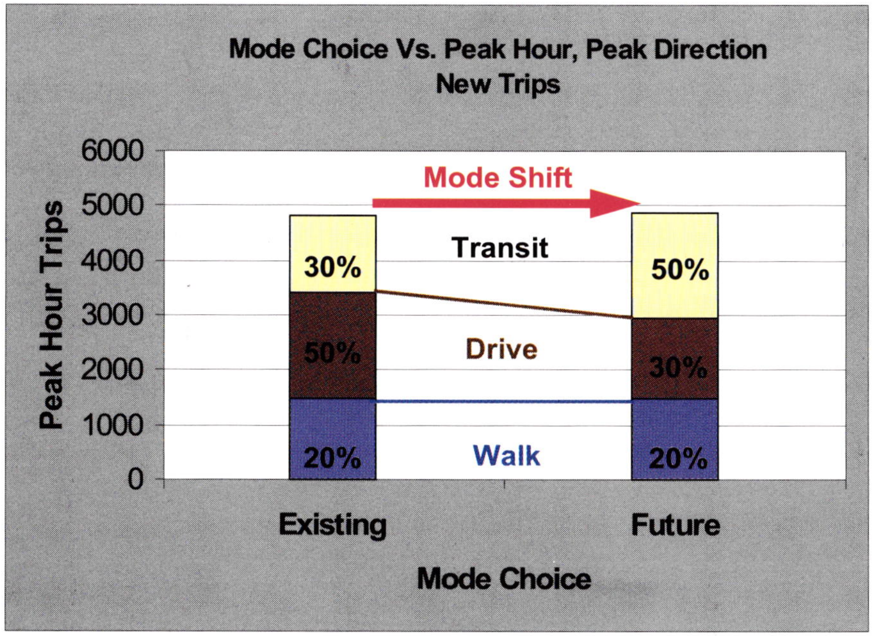
Additional trip distribution and assignment calculations can be found in the Appendix.

7.5 RECOMMENDATIONS

For development to occur at a density of FAR 4.0 in designated areas of the Fenway (double the existing level) without resulting in unacceptable traffic congestion (i.e., level of service E or worse at major intersections), a significant shift in commuter behavior must occur. This behavior shift would result from a strategic combination of incentives to use transit and disincentives to drive. As shown in the following figure, the recommended target for the area is a maximum of 30% of peak hour trips to be made in private vehicles. The most recent estimate, based on the 1990 Census, is close to 50% for employees. The balance of 70% of the remaining trips must be made through other modes, including MBTA bus, subway, and commuter rail, walking, or biking.

The combination of higher development density and increased proportion of transit riders will tax an MBTA system already at capacity on some rapid transit lines and bus routes. Significant investments must be made to increase line capacity to meet the increased demand. The MBTA Urban Ring will provide increases in transit capacity, but it will not be in full service within the 5-10 year horizon of this study.

Target Mode Split for the Urban Design Vision



Other developments not within the study area, however, will also rely on new and existing capacity on the transit system, most critically the Green Line. These developments include:

- Simmons and Emmanuel College expansion,
- Expansion of Northeastern University,
- Expansion projects within the Longwood Medical Area,
- Developments within the Theatre District,
- The Millennium Project, and
- Massachusetts Turnpike Air Rights development.

The cumulative vehicle traffic and transit ridership demands of these projects could not be specifically addressed within the scope of this study. However, the annual growth assumptions for traffic and transit ridership (2001-2007) made here address in part the transportation impacts of other developments.

If the behavior shift described above can be realized in conjunction with the transit capacity improvements described in this report, development to FAR 4.0 can occur without an unacceptable increase to traffic congestion and delays.

With a transportation plan outlined, the most complex issue that remains unaddressed is one of funding. The City, MBTA, and the community must be open to new ideas for creative forms of mitigation and funding sources that allocate reasonable costs from both public and private sources to meet the existing and future demand for quality transit service in the Fenway and City of Boston. In combination with reduced parking supply per area of building space, the travel time and cost incentives that exist today for private automobiles could be reduced to make alternative modes more attractive. Achieving this ultimate transportation goal will help enable the Fenway to finally become the pedestrian-friendly, active, transit-oriented "urban village" that has long been envisioned by its residents.