

3

Alternatives

3.1 Introduction

Based on the requirements of the December 1, 2006 Secretary's Certificate on the Expanded Environmental Notification Form (EENF), the Green Line Extension Project Draft Environmental Impact Report/Environmental Assessment (DEIR/EA) includes a No-Build Alternative and six "Build" Alternatives. Additionally, a "Baseline" Alternative has been included in accordance with the FTA's requirements. Four of the Build Alternatives would provide service to both Medford and to Union Square in Somerville; one Build Alternative would provide service to Medford only (terminating at a new Mystic Valley Parkway/Route 16 Station); and one Build Alternative would provide service to Union Square only.

Section 3.2 discusses the No-Build Alternative, which demonstrates future (2030) conditions with all other committed transportation improvement projects identified in the Massachusetts Transportation Improvement Program (TIP) in place (including both highway and transit projects) but without the Green Line Extension. Section 3.3 provides a description of the Project elements including station and maintenance facility locations, and the inclusion of the Somerville Community Path into the planning and design of the Project. Section 3.4 discusses the ridership modeling methodology used to assess each Build Alternative. Section 3.5 describes the Baseline Alternative in accordance with the Federal Transit Administration's (FTA's) requirements to identify the best option for meeting the transportation needs of the study area with smaller capital investments than are proposed in the Build Alternatives. Section 3.6 offers a detailed analysis of the Build Alternatives to identify the best scenario for meeting the transportation needs of the study area. Section 3.7 provides a detailed description of the Preferred Alternative and a rationale for its selection. Section 3.8 discusses the planned Somerville Community Path and its relation to the Project. Section 3.9 identifies planned projects that are envisioned to provide regional transportation improvements to the area and have been considered in the Green Line Extension planning process, as they are anticipated to affect regional transportation patterns.

3.2 No-Build Alternative

The No-Build Alternative consists of the existing transportation facilities and services and all future committed transportation improvement projects without the extension of the Green Line. The No-Build Alternative includes anticipated changes to the transportation infrastructure including highway and transit projects currently shown on the TIP long-range regional plans, and proposed improvements along O'Brien Highway/Route 28 associated with the NorthPoint development. It represents the base condition against which the transportation benefits and environmental impacts of the Baseline and Build Alternatives are measured. The committed improvements that are included as part of the No-Build Alternative are summarized in Section 5.5.2.1. The No-Build Alternative does not meet the Project Purpose because it would not improve corridor mobility, boost transit ridership, improve regional air quality, ensure equitable distribution of transit services, or support opportunities for smart growth initiatives and sustainable development.

3.3 Project Elements

In order to determine the most appropriate alternatives for the Green Line Extension Project, it was first necessary to evaluate the study area in terms of feasible locations for stations and a maintenance facility, as well as the viability of a Union Square spur.

During the development of the 2005 *Beyond Lechmere* Major Investment Study/Alternatives Analysis (MIS/AA), the alternative that evaluated light rail service (Alternative 1C) included evaluating the extension of service beyond the Mystic River to West Medford. The MIS/AA's proposed light rail alignment traveled via the Massachusetts Bay Transportation Authority's (MBTA) Lowell Commuter Rail Line beyond the Mystic Valley Parkway/Route 16 and Mystic River to terminate at a location south of the existing West Medford Commuter Rail Station near High Street/Route 60. This termination point was determined to have a number of operational and environmental challenges, including the crossing of an existing highway-railroad at-grade crossings and impacts on the existing historic Mystic Valley Parkway/Route 16 and the Mystic River structures.

By extending the Green Line service across the Canal Street grade crossing, this existing two-track crossing would become a four-track crossing (two Green Line tracks; two commuter rail tracks). The differing operational characteristics of the Green Line, commuter rail, and roadway would significantly raise safety concerns. In a similar situation in Los Angeles, the accident rates are significantly higher than the national average; ninety people have died on the Los Angeles County Metropolitan Transportation Authority's 22-mile Blue Line (consisting of 100 at-grade crossings). This line has had more than 821 recorded incidents between its inception in July 1990

and July 2008. All of the at-grade crossings in Los Angeles have grade crossings gates and lights. With the potential of having Green Line vehicles cross the roadway in each direction, safety concerns were raised at the Canal Street crossing.

Additionally, extending the Green Line to West Medford would require the widening of the historic structures over the Mystic Valley Parkway/Route 16 and the Mystic River and could impact the parklands beneath the structures. If these structures were impacted, there would be an increased amount of environmental documentation and coordination that would be required, which could significantly impact the ability to meet the Project schedule of December 31, 2014 and could incur additional expenses to the Project. For these reasons, it was determined during the EENF process that a variation of the Alternative 1C from the MIS/AA was proposed with a Project terminus south of the Mystic Valley Parkway/Route 16, in the vicinity of College Avenue. The Secretary's Certificate specifically cited that a potential terminus be evaluated in the vicinity of the Mystic Valley Parkway/Route 16.

The following sections describe the evaluations related to the siting of the stations, the alignment of the Union Square Branch, and the maintenance facility.

3.3.1 Stations

This section discusses the proposed station site alternatives and the process by which the preferred station sites were selected for the proposed Green Line Extension Project. Various design criteria have been developed to evaluate the benefits and disadvantages of different possible station locations. Such evaluated criteria included, but were not limited to, station access, transit operations, land use compatibility, and costs. Each Station Alternative was rated numerically in the range of -2 for being the most unfavorable and +2 for being the most favorable based on (each) design criteria. All ratings were summed at the end for each Alternative Option, and the final station site was selected based on the Option that received the highest score for each Alternative. Station ranking and rating summaries are provided in Appendix B.

Station locations and design were also based on feedback received from the public at Station Workshops and from public officials on accessibility, level of service (LOS), passenger circulation, and safety requirements. Keeping uniform architectural elements was also an important station design goal. The following codes and standards were used for consistency with local and state requirements, as well as MBTA and other transit standards and guidelines:

- Massachusetts State Building Code 780 CMR, Sixth Edition;
- Massachusetts State Elevator Code 524 CMR, 2003;
- National Fire Protection Association (NFPA) 101 Life Safety Code, 1994 (Per 6th edition of CMR 780);

- NFPA 130 Standard for Fixed Guideway Transit Systems, 1995(Per 6th edition of CMR 780);
- Massachusetts Architectural Access Board 521 CMR, 2002;
- American Society of Mechanical Engineers (ASME) A17.1 Safety Code for Elevators and Escalators, 2000;
- MBTA Guidelines & Standards, 1977;
- MBTA Guide to Access, 1990;
- APTA Guidelines (American Public Transportation Association), 1981;
- ADA Architectural Guidelines (in connection with Uniform Federal Accessibility Standards), 2002;
- Transit Capacity and Quality of Service Manual, TCRB Report, 1999;
- Pedestrian Planning and Design, Dr. John Fruin, Second Edition 1987; and
- Boston Center for Independent Living (BCIL) agreement.

As required by the Secretary's Certificate, the station selection and design process identified the following stations for the proposed Green Line Extension Project along the Medford Branch:

- Brickbottom Station;
- Gilman Square Station;
- Lowell Street Station;
- Ball Square Station;
- College Avenue Station; and
- Mystic Valley Parkway/Route 16 Station.

Figures 3.3-1 and 3.3-2 identify the station locations along the Green Line Extension corridor. Conceptual layouts showing the station locations are included and discussed in Section 3.7.3, *Stations*. The terminus of the Medford Branch, more specifically whether the branch ends at the College Avenue Station or at the Mystic Valley Parkway/Route 16 Station, is discussed in detail in Section 3.6, *Build Alternatives*.

In addition to these stations, Executive Office of Transportation and Public Works (EOT) was directed to evaluate the feasibility and advisability of locating stations at Winthrop Street and at a location between Winthrop Street and College Avenue. As detailed in Appendix B, a thorough station siting evaluation was performed. In addition to the physical characteristics of the stations and their impacts on the surrounding areas, the ridership market was evaluated to determine if additional stations were warranted in particular areas.

Because none of the stations have park-and-ride facilities, the ridership market for these stations are almost wholly defined as persons capable of accessing the stations by walking or bicycle. Based on the FTA's requirements for walk-access distances, a one-mile walk-access transit catchment area was evaluated. Based on this distance, nearly every portion of the area around Winthrop Street is covered by the one-mile

walk-access catchment areas around the proposed College Avenue and Mystic Valley Parkway/Route 16 Stations. Therefore, the Winthrop Street area will be easily served by both College Avenue Station and Mystic Valley Parkway/Route 16 Station, and is not warranted at this time.

In addition to the Winthrop Street Station, a combined Winthrop Street/College Avenue area station was evaluated. The proposed combined station, based on feedback from the community, would only provide access from the Boston Avenue side of the tracks, resulting in longer walk times to the station for individuals from the neighborhoods. Based on concerns raised by the community and with a thorough understanding of the ridership market, it was determined that the locations of the College Avenue and Mystic Valley Parkway/Route 16 Stations can sufficiently address the demand in this area while minimizing the impacts on area residents.

In addition to specific light rail station locations, the Secretary's Certificate also specified evaluating alternatives that "could meet the goal of a connection between the Green Line Extension and the Lowell commuter rail including a rail stop at Tufts University or Gilman Square." Toward this goal, the development of joint Commuter Rail/Green Line stations were evaluated at College Avenue and at Gilman Square in order to take advantage of possible transfer opportunities for commuters prior to entering Boston. These options are shown in detail and discussed in Appendix B.

In order to provide a potential for providing a commuter rail station along the MBTA's Lowell Line, it would be necessary to fully comply with the accessibility requirements for commuter rail stations, as well as to accommodate the requirements for freight service along the corridor. The MBTA's Lowell Line currently accommodates freight rail service in addition to passenger rail service and is designated as a "high-and-wide route," meaning that additional clearances are required for freight traffic along the corridor.

All new stations must be constructed in a manner that meets the Americans with Disabilities Act (ADA) for providing fully accessible stations. In order to meet these standards, a new commuter rail station would need to include a fully accessible high-level platform. The MBTA Railroad Operations' *Commuter Rail Design Standards Manual* specifies that a wider side clearance (7'-3") must be provided for all high level platform stations. This wider side clearance does not comply with the Americans with Disabilities Act Statute and Regulations found at 42 USC Section 12162(e) and the U.S. Department of Transportation's regulations found at 49 CFR Parts 37 and 38, which requires a gap of no more than 3" horizontal and 5/8" vertical between platform edge and entrance to the rail car. Bridge plates can be used for smaller or "mini-high" platforms to address this gap. However, bridge plates are not a practical solution for use at full-length high-level platforms.

In order to accommodate these requirements, it would be necessary to construct an additional track for freight service in the vicinity of the commuter rail station areas. These “gauntlet” or “bypass” tracks would provide the freight trains with the additional clearances that would be necessary to circumvent the stations. An example of this type of design can be found at the MBTA’s Anderson/Woburn Station. Constructing an additional commuter rail track along the already constrained College Avenue and Gilman Square area corridor would significantly impact additional properties in these areas. As it is the goal of this Project to minimize property impacts to the greatest extent possible, the impact on the neighboring areas would outweigh the potential benefits of providing a commuter rail and light rail connection. Although the Project does not provide a new connection between the Green Line and the commuter rail, a connection already exists at North Station and would continue to be available.

The Secretary’s Certificate also raised the issue of how the Project could affect the electrification of the MBTA commuter rail. The Project does not preclude the implementation of future electrification of the MBTA commuter rail line. However, the Green Line electrical system and the electrical system needed for a commuter rail line are quite different and do not share much compatible infrastructure. The Green Line uses a 600-volt direct current (DC) overhead catenary, while typical railroad electrification (such as the Amtrak line from New Haven to Boston) uses a 25,000-volt alternating current (AC) supply. Substation and overhead wiring requirements also vary significantly between DC and AC systems. Since the required upgrades to the Green Line system do not overlap with the upgrades necessary for electrification of the commuter rail lines, the Project does not include infrastructure for commuter rail electrification.

For the Green Line Union Square Branch, there is one station proposed in the vicinity of Union Square, connecting Union Square Station and Lechmere Station. Three options were considered for Union Square, each with a different operational plan and station location. More details on the various alignments for the Union Square Branch that were considered, including two in-street running options, are provided in Appendix B.

Section 3.7, *Project Description - Preferred Alternative*, provides the following additional station detail, as required by the Secretary’s Certificate:

- ▶ Specific station locations and describes how they support ridership goals;
- ▶ Detailed designs and renderings of the stations and a discussion of station amenities and measures to minimize impact;
- ▶ Station design that provides safe and efficient loading and unloading of passengers that is consistent with ADA and universal design principles; and
- ▶ A description of how access will be provided from street level to the stations.

3.3.2 Maintenance Facility

The capacity of the MBTA's Green Line system is constrained by the need for layover and maintenance facilities. Understanding existing capacity constraints as well as the impact that a new service would have on the overall Green Line system is critical. The existing Green Line fleet is currently stored at the Reservoir, Riverside, Lake Street, and Lechmere facilities, and within the central subway. Maintenance support is only available at the Reservoir, Riverside, and Lake Street facilities; all are located on the west end of the Green Line system. There are currently no maintenance facilities located on the north side of the system in proximity to the proposed Green Line Extension. The existing facilities are operating beyond their planned capacity and expansion of these facilities to accommodate the proposed Green Line Extension is impractical in terms of logistics, service reliability, and operating costs. The Green Line Extension Project will, therefore, require a new maintenance facility on the north side of the Green Line system to store, inspect, maintain, and repair cars and to provide a base for the maintenance and repair of the track, power, and signal systems.

It is essential to store a number of cars on the north side of the Green Line system in order to provide cars for start-up in the morning, provide a convenient location for overnight and off-peak storage as cars come out of service, and minimize the distance a disabled train would have to travel to reach a maintenance facility. A north-side facility would also eliminate much of the need to move cars to the west-side facilities each night and back to the north side in the early morning, a move which would interfere with critical overnight maintenance work for Green Line track, signal, and power systems. Car storage is not only required for the overnight storage of cars but also for the day-time lay-up of cars. When a Green Line car becomes disabled, it is essential that the car be moved to the closest maintenance facility to get it out of the way of revenue service trains and to a location where it can be serviced. For all of these reasons, in order to provide a service that is reliable, cost-efficient, and does not adversely impact the remainder of the Green Line system, it is necessary that a maintenance facility be provided on the north side of the system.

The new Green Line Extension Project maintenance facility would consist of an area for vehicle storage and a support structure for vehicular inspection, servicing, maintenance, and repairs. The storage yard needs to accommodate 80 Green Line cars, which includes the estimated 72 cars needed for the service and allows additional capacity. The facility would also require approximately 100 parking spaces for employees. Specific requirements for the facility are described in more detail in Appendix C. In general, the requirements include: track layouts that provide operational flexibility (i.e., parallel "ladder" tracks with access from both ends of the facility); sufficient track lengths; an adequate number of tracks and equipment for the various types of vehicle maintenance required; and a support facility building that includes maintenance bays, storage room, loading docks, administrative offices, and

employee facilities and amenities. In order to meet these program objectives, the site must be approximately 10 to 12 acres.

Based on the requirements of the Secretary's Certificate, several sites were considered for the new Green Line maintenance facility in addition to those specified in the Secretary's Certificate, including the Boston Engine Terminal (BET) and Yard 8. Figure 3.3-3 shows the BET and Yard 8 locations as well as the first tier of sites evaluated for the proposed maintenance facility. Additional sites or variations of these sites were suggested by representatives of the Cities of Somerville and Medford, by Advisory Group members, and by the public. The detailed maintenance facility report in Appendix C describes the many variations of potential sites that were evaluated. Due to the density of development in the Project study area, there were limited potential sites to evaluate. However, in working with the Project stakeholders, 11 initial sites were identified for evaluation as potential maintenance facility locations. The 11 initial sites include:

- ▶ Gilman Square at Medford Street;
- ▶ City of Somerville Department of Public Works (DPW) Yard;
- ▶ Wild Oats site at Route 16;
- ▶ U-Haul site at Boston Avenue/Route 16;
- ▶ 200 Boston Avenue Site (Cummings Park);
- ▶ Medford Hillside Boston and College Avenue at Tufts;
- ▶ Pat's Tow Lot-Somerville Avenue at Medford Street;
- ▶ MBTA BET Commuter Rail Facility;
- ▶ Yard 8;
- ▶ Yard 8 with adjacent parcel-the neighboring undeveloped lot for the support facility; and
- ▶ Yard 7/8 (a split operation using a combination of sites to reduce activity on Yard 8).

These sites were put through a two-tier screening process to determine which site(s) best met the program requirements, which includes size and configuration of the site(s) and proximity to the proposed extension. Those sites that were determined to be too small to accommodate the program and/or required a crossing of the MBTA Lowell Line in order to access the sites were eliminated from further consideration. Sites unable to meet the program because of inadequate size or configuration or because they were unable to make direct track connections to the propose extension lines were also disqualified.

At the request of the Advisory Group and other Project stakeholders, the analysis considered 10 additional possible configurations for the maintenance facility, focusing on the MBTA BET Commuter Rail Maintenance Facility and on Yard 7 near the NorthPoint development. Additionally, the City of Somerville requested an evaluation of a modified scheme that would use the BET and NorthPoint

development. The analysis of all sites considered for the maintenance facility is presented in greater detail in Appendix C.

The MBTA BET Commuter Rail Maintenance Facility was determined to be unsuitable to support the program. None of the areas within the BET property are available or suitable for use as a Green Line support facility. The existing BET facility is barely adequate for current commuter rail needs. Most of the site is already in use for train operations. The parking lot is too far from the Green Line, and would require long bridges over the existing tracks for access. The configuration is not well suited for train storage. The existing open storage area is important for current and future commuter rail operations. Even if it were available for Green Line use, it is too long and narrow and not well-suited for a Green Line storage facility. Combining the BET site with Yard 7 does not offer a large enough site in the required configuration to accommodate a Green Line facility. Federal Railroad Administration (FRA) regulations also state that use of both commuter rail and light rail within the same facility is incompatible.¹

Of the numerous sites considered in the screening process, only Yard 8 with the Adjacent Parcel is of a sufficient size and configuration to effectively store the required cars and house a support facility while providing the operational flexibility that is needed for such a facility without additional environmental impacts. Yard 8 is a former railroad property located in an industrial area that is currently zoned for this type of a facility. Figure 3.3-4 shows the Preferred Maintenance Facility Site.

The Yard 8 parcel that would be acquired for the maintenance facility has an existing building permit for a 190,000-square-foot building approximately 64 feet high. The approved building and the maintenance facility cannot share the site due to space constraints. Therefore, the maintenance facility would require voiding the existing building permit.

The construction of the Green Line Extension Project would result in the removal of some existing freight trackage within Yard 8 and would require some relatively minor revisions to freight operations by Pan Am Railways (PAR). However, none of this would preclude any existing freight rail operations, based on discussions with PAR.

PAR freight trains reach Boston via the MBTA Lowell Line. Typically, there are about three to four round trips per week for the local switching operation, which serves Somerville as well as Chelsea, Salem, and Peabody via the Eastern Route mainline. In addition, the "gravel train" to Boston Sand and Gravel in Charlestown

¹ Federal Railroad Administration, 49 CFR Parts 209 and 211, *Shared Use of the Tracks of the General Railroad System by Conventional Railroad and Light Rail Transit Systems*; Notice and Final Rule, Federal Register, Vol. 65, No. 132, Monday, July 10, 2000, Notices.

makes another three to four round trips a week. Most freight trains operate in the evening or night, when commuter rail operations are less frequent.

The main impact to freight operations would be the use of Yard 8 for Green Line storage and maintenance. Currently, PAR has two tracks in the yard: one through track and one storage track. PAR freight trains coming down the MBTA Lowell Line pass through Yard 8, occasionally temporarily storing freight cars in the Yard. If Yard 8 were dedicated to the Green Line, it would still be possible for PAR to access the Boston area and to store freight cars in other nearby locations. As discussed with Sid Culliford, Senior Vice President for Operations of PAR, freight trains could simply be diverted from Yard 8 via a reconstructed Yard 10 lead (a little-used track that runs adjacent to New Washington Street). This track connects to the "3rd and 4th Irons," which are the two freight tracks on the west side of the Orange Line Sullivan Square Station. These tracks also provide an alternative location where PAR could temporarily store freight cars.

The Green Line Extension Project would include the reconstruction of the Yard 10 lead track, allowing PAR freight operations to continue in a manner acceptable to PAR and with only a minor deviation from the route utilized today.

As described above, Yard 8 has been the preferred option for the construction of a Green Line vehicle storage and maintenance facility, given its combination of size, configuration, and adjacency to the Green Line Extension tracks. However, the Yard 8 site has elicited local opposition from some municipal officials, elected representatives, and abutting residents and businesses. To endeavor to address and resolve these concerns, EOT has initiated analysis of two additional possible sites for the facility: (1) the so-called "Mirror H" site, proposed by the City of Somerville; and (2) a site, newly conceived by EOT and termed "Option L." The "Mirror H" site straddles the Inner Belt area of Somerville and the NorthPoint area of Cambridge. The "Option L" site is located immediately adjacent to BET, outside the current BET fence line. Both locations are shown on Figure 3.3-4.

Preliminary analysis indicates that both alternative sites have impacts above and beyond that of the Yard 8 alternative (e.g., Mirror H - renegotiation of MBTA-NorthPoint agreement and Option L - relocation of active businesses). However, to sufficiently compare the sites to the preferred Yard 8 location, a complete analysis of both alternatives - including environmental impacts, schedule implications, community benefits, property acquisition needs, regulatory issues, and costs to the municipalities and the Commonwealth - will be performed over the next few weeks. Results will be made available to the public for input and discussion once underway. The outcome of the analyses will determine whether EOT chooses to pursue a Notice of Project Change for the Green Line Extension Project, to formally substitute one of the alternative options for Yard 8 as the preferred site for the storage and maintenance facility.

3.4 Ridership Methodology

Ridership for the Baseline and Build Alternatives was forecast by the Central Transportation Planning Staff (CTPS) using the regional model and land use assumptions in compliance with the FTA's requirements and consistent with the study area Metropolitan Planning Organization (MPO). A detailed summary of the travel demand modeling methodology and assumptions utilized by CTPS is included in Appendix D.

The model developed to calculate ridership provides projections for a forecast year of 2030 and assumes that a number of proposed transportation projects, including segments of the Urban Ring project Phase II and Silver Line Phase III projects and other area highway transportation projects consistent with the Regional Transportation Plan, will be implemented by this time.

Detailed operating plans for each alternative were developed, including identifying the number and types of vehicles, size, vehicle capacity, travel times, peak and off-peak headways, used for each alternative. The operating plans were developed as an extension of existing Green Line D and E Branch services, so as to minimize any impact to the Central Subway system operations. Existing service frequencies and headways were maintained for the branch lines within the Central Subway and these lines were extended beyond Lechmere Station with the same service plans. Detailed descriptions of the operating plans for each Build Alternative are included in Section 3.6, *Build Alternatives*.

For each alternative, future ridership projections were calculated on a system-wide level and for each proposed station location by identifying new transit trips generated and boardings at each station. Additionally, a reduction in the vehicle miles traveled (VMT) generated by each for each Build Alternative was calculated. VMT reduction estimates were calculated based on both new and diverted trips. Ridership projections for each Build Alternative are described in later sections of this chapter.

The additional ridership projected by the Green Line Extension was evaluated by CTPS for its impact on existing Green Line capacity on the various segments of the system, including the Central Subway. The summary of this analysis, included in Appendix D, indicate that all of the various segments of the different Green Line branches are capable of accommodating the peak transit loads in both the AM and PM peak hours. Based on CTPS' analysis, none of the peak load segments exceed the MBTA's maximum load service policy.

3.5 Baseline Alternative

A Baseline Alternative was developed in accordance with the FTA's requirements to identify the best option for meeting the transportation needs of the study area with smaller capital investments than are proposed in the Build Alternatives. The Baseline Alternative builds upon the No-Build conditions by adding low-cost transit services that provide a level of service comparable to the Build Alternatives. The Baseline Alternative to be evaluated as part of this DEIR/EA is enhanced MBTA bus service in the Project Area. This section focuses on the proposed operating plan for the Baseline Alternative.

The Baseline Alternative would enhance the existing MBTA Route 80 bus service. This service would operate parallel to the MBTA Lowell Line corridor. The Baseline Alternative would also include a new shuttle service that would be similar to the proposed Union Square Branch.

Under the Baseline Alternative, Enhanced Route 80 would operate from Lechmere Station to Mystic Valley Parkway/Route 16. The existing Route 80 bus parallels the MBTA Lowell Line commuter rail right-of-way. Under the Baseline Alternative, the Enhanced Route 80 would make limited stops that closely match the proposed Green Line stations, and the headways would be adjusted to provide the same frequency of service as the Green Line Extension Medford Branch utilized in the Build Alternatives.

The Baseline Alternative would also include a shuttle bus service between Lechmere Station and Union Square using Monsignor O'Brien Highway/Route 28, McGrath Highway, and Somerville Avenue, traveling along a similar route as the current Route 87 bus with headways similar to the Green Line Extension Union Square Branch, as described in Section 3.6, *Build Alternatives*.

Under the Baseline Alternative conditions, the existing Green Line E branch would operate to Lechmere Station. It is also assumed that the existing Green Line D branch would be extended from Government Center Station to Lechmere Station, as the service has operated in the past. Commuters in the morning, who arrive at Lechmere Station using either the Enhanced Route 80 or the Union Square shuttle, would have the ability to transfer to one of the two Green Line branches to continue their trip to Boston. The Baseline Alternative, which includes the Union Square shuttle, is expected to generate new systemwide transit ridership of 2,700 boardings per day and a reduction of 8,834 VMT per day (projected to the year 2030).

Figure 3.5-1 shows the conceptual alignment of the Baseline Alternative including both the Enhanced Route 80 service from Mystic Valley Parkway/Route 16 to Lechmere Station and the shuttle service from Union Square to Lechmere Station.

3.5.1 Enhanced Bus Route 80 Service

The current MBTA Route 80 is a local route serving from Arlington Center to Lechmere Station through Medford Hillside, Powder House Square, Magoun Square, and Gilman Square. The Route 80 inbound bus begins its route in Arlington Center, and travels along Medford Street, High Street, Boston Avenue, College Avenue, Broadway, Medford Street, and McGrath Highway. The Enhanced Route 80 inbound service, intended to serve the Medford area initially, would begin its route from the area of Mystic Valley Parkway/Route 16 and Boston Avenue, and travel south along Boston Avenue, College Avenue, Broadway, Medford Street, and McGrath Highway. The Enhanced Route 80 inbound service would terminate its route at Lechmere Station. The Enhanced Route 80 outbound service would begin its route at Lechmere Station, travel northbound on roadways parallel to the MBTA Lowell Line and terminate in the vicinity of Mystic Valley Parkway/Route 16 and Boston Avenue. The Enhanced Route 80 would serve the following stops only:

- Boston Avenue at Mystic Valley Parkway/Route 16;
- Boston Avenue at College Avenue;
- Boston Avenue at Broadway;
- Medford Street at Broadway;
- Medford Street at School Street;
- Medford Street at Washington Street; and
- Lechmere Station.

Under the Baseline Alternative, the current Route 80 would continue to operate, serving the same local stops as it does under existing conditions.

Travel Time

According to current MBTA scheduling, it takes approximately 30 minutes for the Route 80 bus to travel the route from Mystic Valley Parkway/Route 16 to Lechmere Station, serving all scheduled stops between. In the Spring of 2008, a field study was conducted riding the Route 80 bus on several weekday commute peak hours and identifying travel times between stations. The actual travel times were occasionally shorter than the scheduled travel times, due to skipped stops at which there were no passengers. However, for the purposes of this study, the MBTA's published schedule was used as the basis for estimating the travel times for the Enhanced Route 80 Bus Service.

As shown in Table 3.5-1, the Enhanced Route 80 service traveling between Mystic Valley Parkway/Route 16 and Lechmere Station is estimated to have a travel time of approximately 18 minutes.

Table 3.5-1 Estimated Enhanced Route 80 Travel Time

Location	Distance (miles)	Speed (miles per hour)	Travel Time (minutes)	Dwell Time (minutes)	Cumulative Travel Time (minutes)
Boston Avenue at Mystic Valley Pkwy					
Boston Avenue at University Avenue	0.17	15	0.7	0.5	1.2
Boston Avenue at Broadway	0.62	15	2.5	0.5	3.0
Medford Street at Broadway	0.51	15	2.0	0.5	2.5
Medford Street at School Street	0.86	15	3.4	0.5	3.9
Medford Street at Washington Street	0.64	15	2.6	0.5	3.1
Lechmere Station	0.99	15	3.9	<u>0.0</u>	<u>3.9</u>
				Total	17.6

Note: An average bus speed of 15 mph and a dwell time of 30 seconds at each stop were assumed based on the MBTA's published schedule.

Headways

The headways of the Enhanced Route 80 would be adjusted to provide the same frequency of service as the Green Line Medford Branch proposed in the Build Alternatives, while the headways on the existing Route 80 local bus would remain unchanged. The proposed headways for the Enhanced Route 80 service would be five minutes in the morning and evening peak periods and ten minutes during off-peak periods, closely matching the projected headway of the proposed Green Line Medford Branch. The headways of the existing Route 80 local bus service would remain at 20 minutes for the peak periods, 30 minutes for the midday period, and 60 minutes for the evening period.

Fares

Fares for the Route 80 local service are based on the MBTA's local bus fare structure of \$1.25 per one-way adult trip. Fares for the Enhanced Route 80 service are based on the MBTA's subway fare structure, which is \$1.70 for each one-way adult trip and includes a free transfer to the subway.

3.5.2 Union Square Shuttle

Under the Baseline Alternative, a shuttle bus service would also be introduced, making a direct connection between Union Square and Lechmere Station along a route similar to the existing Route 87 bus, but without serving local stops. The current MBTA Route 87 is a local route operating from Arlington Center to Lechmere Station through Davis Square and Union Square. The Route 87 inbound begins its route in Arlington Center, and travels along Broadway, Elm Street, Somerville Avenue, and McGrath Highway, connecting Arlington Center, Clarendon Hills, Davis Square, Union Square, and Lechmere Station. The proposed shuttle inbound service would begin its route at Union Square and travel using Somerville Avenue and McGrath Highway to Lechmere Station, traveling along the same routes in the outbound direction.

The shuttle service would only serve the following stops:

- Union Square; and
- Lechmere Station.

Travel Time

Similar to the Route 80, the travel time for the existing Route 87 was obtained from the MBTA's schedule and validated by collecting field data. According to the MBTA's schedule and confirmed by the field data, travel time for the Route 87 bus between Union Square and Lechmere Station can take approximately seven to 17 minutes, depending on the time of the day. There are five existing stops on Route 87 between Union Square and Lechmere Station. It is estimated that travel time for the enhanced shuttle service between Union Square and Lechmere Station with no intervening stops would take approximately seven minutes based on average bus speeds.

Headways

The headways for the proposed shuttle would provide the same frequency of service as the Green Line Union Square Branch proposed in the Build Alternatives, while the existing Route 87 bus would continue to operate with the same headways as the existing operations, with service every 15 to 20 minutes during the peak periods and every 20 to 30 minutes during off-peak periods. During the peak periods, the shuttle would make its trip every five to six minutes, closely matching the projected headway of the proposed Green Line Union Square Branch. During off-peak periods, the shuttle service would run every nine to 10 minutes.

Fares

Fares for the shuttle service connecting Union Square and Lechmere Station would include a free transfer to the Green Line at Lechmere Station and would be \$1.70 for one-way adult trips, based on current MBTA subway fares.

3.5.3 Capital Improvements

The Baseline Alternative would require the purchase of 15 standard, 40-foot transit buses and five new Green Line vehicles. Ten buses would be required for the Enhanced Route 80 bus service, and three would be required for the Union Square shuttle. It is anticipated that two spare buses would also be purchased to support the service. It is assumed that these buses would be Emissions Control Diesel buses, consistent with the MBTA's plans for future bus procurements. The new Green Line cars would be needed to service the extension of the existing Green Line D branch to Lechmere.

A new or an expanded existing bus facility would also be required. Based on the MBTA's bus program, the bus facility should accommodate approximately 60 buses, be located in Somerville, and require roughly the same amount of space as the maintenance facility proposed for the Build Alternatives. Improvements to existing Lechmere Station would also be required in order to accommodate the additional buses needed to serve the Baseline Alternative.

3.5.4 Conceptual Capital Costs

The estimate of conceptual capital costs was developed by conducting detailed quantity calculations of the various construction elements included in the conceptual design plans and applying current 2008 unit prices to each item. A 30 percent contingency was applied to the total construction cost to provide a level of confidence that the estimate presented at this stage reflects the true cost of the Project. As the Project moves forward into preliminary engineering and final design, the contingency will be reduced and replaced with costs that can be more accurately quantified through a more detailed design. Based on this evaluation, it is estimated that the conceptual capital cost of the Baseline Alternative for the facility, the new buses, and improvements to existing Lechmere Station would be approximately \$146.2 million in 2008 dollars.

3.5.5 Conceptual Operating & Maintenance Costs

Based on the MBTA's FY2008 Fully-Allocated Operating and Maintenance Cost Model, the conceptual operating and maintenance cost of the enhanced Baseline Alternative is estimated to be approximately \$13.7 million per year in 2008 dollars.

3.6 Build Alternatives

To identify the best scenario for meeting the transportation needs of the study area, six Build Alternatives have been developed for the proposed Green Line Extension Project. The Alternatives are:

- ▶ Alternative 1 – Green Line Extension to Medford Hillside and Union Square (using commuter rail rights-of-way);
- ▶ Alternative 2 – Green Line Extension to Mystic Valley Parkway/Route 16 and Union Square (using commuter rail rights-of-way);
- ▶ Alternative 3 – Green Line Extension to Medford Hillside (using commuter rail right-of-way) and Union Square (using McGrath Highway/Somerville Avenue);

- ▶ Alternative 4 – Green Line Extension to Mystic Valley Parkway/Route 16 (using commuter rail right-of-way) and Union Square (using McGrath Highway/Somerville Avenue);
- ▶ Alternative 5 – Green Line Extension to Mystic Valley Parkway/Route 16 (using commuter rail right-of-way); and
- ▶ Alternative 6 – Green Line Extension to Union Square (using commuter rail right-of-way).

The following sections describe each alternative, including its physical characteristics, costs, ridership, and operating plans.

3.6.1 Alternative 1 – Extension to Medford Hillside and Union Square (using commuter rail rights-of-way)

This alternative would provide Green Line service to Union Square and to Medford Hillside using a two-branch operation, both within existing commuter rail rights-of-way. One branch would operate from Lechmere Station to Medford Hillside along the MBTA Lowell Line. This branch would begin at Lechmere Station and head northwest, meeting the MBTA Lowell Line just south of Washington Street in Somerville. From Washington Street, the alignment would run parallel to the MBTA Lowell Line to College Avenue Station. The second branch, the Union Square Branch, would start at Lechmere Station and head north to Red Bridge and then west along the MBTA Fitchburg Line to the Union Square area in Somerville. Alternative 1 is expected to generate new systemwide transit ridership of 7,900 boardings per day and a reduction of 25,018 VMT per day (projected to the year 2030).

Figure 3.6-1 shows the conceptual alignment of Alternative 1 including both the Medford Branch and the Union Square Branch.

Stations

The proposed Green Line stations for the Medford Branch under Alternative 1 are:

- ▶ Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28);
- ▶ Brickbottom Station, Somerville;
- ▶ Gilman Square Station, Somerville;
- ▶ Lowell Street Station, Somerville;
- ▶ Ball Square Station, Medford; and
- ▶ College Avenue Station, Medford.

The proposed Green Line stations for the Union Square Branch under Alternative 1 are:

- Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28); and
- Union Square Station, Somerville.

Travel Times

Travel times between proposed stations were estimated based on travel distances and estimated speeds. The travel speeds between proposed stations were based on the railroad's physical and operational characteristics. Estimated travel time between each station for the proposed Green Line Medford Branch is shown in Table 3.6-1.

Table 3.6-1 Alternative 1: Medford Branch Travel Times

Station	Distance (miles)	Travel Time (minutes)	Dwell Time (minutes)	Cumulative Travel Time (minutes)
Lechmere				
Brickbottom	0.78	2.25	0.75	3
Gilman Square	0.71	1.25	0.75	2
Lowell Street	0.70	1.25	0.75	2
Ball Square	0.49	0.75	0.75	1.5
College Avenue	<u>0.57</u>	<u>1.0</u>	<u>0</u>	<u>1.0</u>
			Total	9.5

Estimated travel time between Union Square and Lechmere Station for the proposed Green Line Union Square Branch is 4.5 minutes.

Headways

The operating plan for this alternative would extend the existing Green Line D branch service from Lechmere Station to the northwest to College Avenue. The Green Line service beyond Lechmere Station for the Medford Branch would operate on headways equal to that of the existing Green Line D branch service: five minutes in the morning and evening peak periods and ten minutes during off-peak periods.

The Green Line service beyond Lechmere Station for the Union Square Branch would operate on headways equal to that of the existing Green Line E branch service: six minutes in the morning peak period, five minutes in the evening peak period, and between nine and ten minutes during off-peak periods.

Fares

Fares for the Green Line Medford Branch and Union Square Branch under Alternative 1 would be \$1.70 for one-way adult trips, based on current MBTA subway fares.

Vehicle Requirements

The Green Line Extension Project vehicle fleet will include a mix of three vehicle types: the two current vehicles (Type 7 high-floor cars and Type 8 low-floor cars) and a new "Type 9" low-floor car, which is currently under development. The Type 9 cars will be used for the Extension, which will replace older cars and expand service on the existing Green Line.

The specifications for the proposed Type 9 Green Line Cars are currently being developed. However, the new cars will have similar dimensions, accessibility, and performance to the existing Type 8 low-floor cars. The Type 9 cars will be able to work with the existing fleet, allowing for two and three-car trains, which will consist of any combination of Type 7, 8, and 9 cars.

In general, the current Green Line trainsets (or "consists") include two or three cars. It is anticipated that consist sizes will continue to remain the same under this Alternative. For the purpose of calculating the number of required cars, two-car Green Line trains were conservatively assumed. Based on the 2006 MBTA's Service Delivery Policy, the seating capacity of each Green Line car is 44 to 46 seats, depending on the car type, and the maximum peak load standard is 225 percent of the seated capacity for the peak periods. This translates into a peak period train capacity of 198 to 207 passengers per trainset. Utilizing the projected ridership and proposed operating plan for this Alternative, it was determined that 23 additional cars would be needed to accommodate the proposed headways and projected ridership for Alternative 1.

3.6.1.1 Capital Improvements – Alternative 1

Capital improvements for the Medford Branch include construction of light rail tracks and overhead catenary system (OCS) along the existing railroad right-of-way between the Relocated Lechmere Station and College Avenue in Medford. This includes use of the "Yard 8" right-of-way between Relocated Lechmere Station and Washington Street and along the MBTA Lowell Line between Washington Street and College Avenue. The service would end immediately north of the College Street overpass. A support facility for storage and servicing of the Green Line fleet would be constructed to accommodate the existing north-side Green Line service fleet and an additional fleet of 23 vehicles needed to meet the intended headways when providing service to the new stations along the extended Green Line. In addition to the track construction, some of the existing bridges along the right-of-way would

need to be reconstructed to accommodate the additional tracks. The structures that would need to be reconstructed include the former Red Bridge, Washington Street, Walnut Street, Medford Street, School Street, Lowell Street, Cedar Street, Broadway, Harvard Street, and College Avenue. Existing track and signal equipment would also need to be relocated in order to accommodate the planned light rail tracks. Since College Avenue would be the terminus for the line, additional track lengths would be required north of the station for short-term storage and operational flexibility.

The Union Square Branch would also require light rail tracks and OCS to be constructed along the MBTA Fitchburg Line between the former Red Bridge and the proposed Union Square Station near Prospect Street. The alignment to Union Square would require reconfiguration of the existing signal equipment as well as the commuter rail and freight rail tracks between the MBTA's BET and Webster Avenue. In addition, the existing rail bridge over Medford Street along the right-of-way would need to be reconstructed to accommodate the additional tracks.

New signal, communications, and electrical systems will be required for the Green Line Extension Project. Alternative 1 would require Automatic Wayside Block Signals to govern Green Line train operations for both the Medford Branch and the Union Square Branch.

Multiple communication systems are proposed for MBTA operations, MBTA staff communications, mechanical system monitoring, passenger communications, and emergency reporting. These include the following systems:

- Automatic Vehicle Identification (AVI) to provide real time train locations and destinations;
- Wayside Telephone System for MBTA staff communications with the Operations Control Center (OCC);
- Automatic Station Identification (ASI) to passengers with up-to-date information on train status;
- Wide Area Network (WAN) to interconnect computers at MBTA stations and facilities with OCC;
- Public Address System that transmits audible messages that correspond with LED messages;
- LED Signage System provides LED visual text messages synchronized with the Public Address System per ADA requirements;
- Closed Circuit Television (CCTV) provides real time analog and IP video from cameras at each station and facility;
- Supervisory Control and Data Acquisition (SCADA) Systems to monitor fire alarm, escalators and elevators at each station;
- Customer Information Call Boxes at each station to provide a direct line to the MBTA Police and the Maintenance Terminal; and
- Fire Alarm Systems at each station and at the maintenance facility.

Traction power for the Green Line is provided by 600 volts direct current (600 VDC) through an OCS. Direct current traction power is produced at traction power substations. Each Green Line car is equipped with a pantograph, which collects the current from contact with the trolley wire. The proposed Green Line Extension Project will require traction power substations to supply DC power to both the Medford Branch and the Union Square Branch. Substations would be required at Yard 8 and at Ball Square Station. Traction power will be fed from the substations to the OCS via 2,000 kcmil DC feeders in conduit along the trackway. The traction power feeders and returns will be installed in underground electrical conduits. The OCS will consist of an overhead auto-tension catenary system registered and supported on cantilever-type assemblies, span wire assemblies, and portal bents.

3.6.1.2 Conceptual Capital Costs – Alternative 1

The estimate of conceptual capital costs was developed by conducting detailed quantity calculations of the various construction elements included in the conceptual design plans and applying current 2008 unit prices to each item. A 30 percent contingency was applied to the total construction cost to provide a level of confidence that the estimate presented at this stage reflects the true cost of the Project. As the Project moves forward into preliminary engineering and final design, the contingency will be reduced and replaced with costs that can be more accurately quantified through a more detailed design. Based on this evaluation, it is estimated that the conceptual capital cost of Alternative 1 is approximately \$804.8 million in 2008 dollars, including the purchase of new train cars.

3.6.1.3 Conceptual Operating & Maintenance Costs – Alternative 1

Based on the MBTA's FY2008 Fully-Allocated Operating and Maintenance Cost Model, the conceptual operating and maintenance costs of Alternative 1 are estimated to be approximately \$21.3 million per year in 2008 dollars.

3.6.2 Alternative 2 – Extension to Mystic Valley Parkway/Route 16 and Union Square (using commuter rail rights-of-way)

This alternative would provide Green Line service to Union Square and to Mystic Valley Parkway/Route 16 using a two-branch operation, both in existing commuter rail rights-of-way. One branch would operate from Relocated Lechmere Station to Mystic Valley Parkway/Route 16 Station along the MBTA Lowell Line. This branch would begin at Lechmere Station and head northwest, meeting the MBTA Lowell Line just south of Washington Street in Somerville. From Washington Street, the alignment would run parallel to the MBTA Lowell Line to Medford, terminating its

route at the Mystic Valley Parkway/Route 16 Station. Mystic Valley Parkway/Route 16 Station has been considered both with and without a 300-space parking structure. The second branch, the Union Square Branch, would begin at Relocated Lechmere Station and head north to Red Bridge, then west, following the MBTA Fitchburg Line to the Union Square area. Alternative 2 is expected to generate new systemwide transit ridership of 8,900 boardings per day and a reduction of 26,556 VMT per day (projected to the year 2030) in the scenario that provides a 300-space parking garage at Mystic Valley Parkway/Route 16 Station. The option for Alternative 2 that does not provide a parking garage at the terminal station generates new systemwide transit ridership of 8,600 boardings per day and a reduction of 26,647 VMT per day (projected to the year 2030).

Figure 3.6-2 shows the conceptual alignment of Alternative 2 including both the Medford Branch and the Union Square Branch.

Stations

The proposed Green Line stations for the Medford Branch under Alternative 2 are:

- Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28);
- Brickbottom Station, Somerville;
- Gilman Square Station, Somerville;
- Lowell Street Station, Somerville;
- Ball Square Station, Medford;
- College Avenue Station, Medford; and
- Mystic Valley Parkway/Route 16 Station, Somerville/Medford.

The proposed Green Line stations for the Union Square Branch under Alternative 2 are:

- Existing Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28); and
- Union Square Station, Somerville (at Fitchburg Line).

Travel Times

Travel times between proposed stations were estimated based on travel distances and estimated speeds. The travel speeds between proposed stations were based on the railroad's physical and operational characteristics. Estimated travel time between each station for the proposed Green Line Medford Branch is shown in Table 3.6-2.

Estimated travel time between Lechmere Station and Union Square Station for the proposed Green Line Union Square Branch is 4.5 minutes.

Table 3.6-2 Alternative 2: Medford Branch Travel Times

Station	Distance (miles)	Travel Time (minutes)	Dwell Time (minutes)	Cumulative Travel Time (minutes)
Lechmere				
Brickbottom	0.78	2.25	0.75	3
Gilman Square	0.71	1.25	0.75	2
Lowell Street	0.70	1.25	0.75	2
Ball Square	0.49	0.75	0.75	1.5
College Avenue	0.57	1.0	0.75	1.75
Mystic Valley Parkway/Route 16	0.9	1.75	0	1.75
			Total	12.0

Headways

The operating plan for this alternative would extend the existing Green Line D branch service from Lechmere to the northwest to Mystic Valley Parkway/Route 16 Station. The Green Line service beyond Lechmere Station for the Mystic Valley Parkway/Route 16 branch would operate on headways equal to that of the existing Green Line D branch service: five minutes in the morning and evening peak periods and ten minutes during off-peak periods. The Green Line service beyond Lechmere Station for the Union Square Branch would operate on headways equal to that of the existing Green Line E branch service: six minutes in the morning peak period, five minutes in the evening peak period, and between nine and 10 minutes during off-peak periods.

Fares

Fares for the Green Line Medford Branch and Union Square Branch under Alternative 2 would be \$1.70 for one-way adult trips, based on current MBTA subway fares.

Vehicle Requirements

The Green Line Extension Project vehicle fleet will include a mix of three vehicle types: the two current vehicles (Type 7 high-floor cars and Type 8 low-floor cars) and a new "Type 9" low-floor car, which is currently under development. The Type 9 cars will be used for the Extension, which will replace older cars and expand service on the existing Green Line. Based on the passenger capacities described for Alternative 1 in Section 3.6.1, *Alternative 1 – Extension to Medford Hillside and Union Square (using commuter rail rights-of-way)*, and the projected ridership and proposed operating plan for Alternative 2, it was determined that 27 additional cars would be needed to accommodate the proposed headways and projected ridership for Alternative 2.

3.6.2.1 Capital Improvements – Alternative 2

Capital improvements for the Medford Branch include construction of light rail tracks and OCS along the existing railroad right-of-way between the Relocated Lechmere Station and Mystic Valley Parkway/Route 16 Station. This includes use of the “Yard 8” right-of-way between Relocated Lechmere Station and Washington Street and along the MBTA Lowell Line between Washington Street and Mystic Valley Parkway/Route 16. The service would end prior to the Mystic River. A 300-space MBTA parking garage was considered at the Mystic Valley Parkway/Route 16 Station. Alternative 2 was analyzed for its impacts both with and without the construction of the parking garage. A support facility for storage and servicing of the Green Line fleet would be constructed to accommodate the existing north-side Green Line service fleet and an additional 27 vehicles needed to meet the intended headways when providing service to the new stations along the extended Green Line. Alternative 2 requires more new vehicles than Alternative 1 due to the addition of track miles to service Mystic Valley Parkway/Route 16 Station. In addition to the track construction, some of the existing bridges along the right-of-way would need to be reconstructed to accommodate the additional tracks. The structures that would need to be reconstructed include the former Red Bridge, Washington Street, Walnut Street, Medford Street, School Street, Lowell Street, Cedar Street, Broadway, Harvard Street, College Avenue, Winthrop Street, and North Street. Existing track and signal equipment would also need to be relocated in order to accommodate the planned light rail tracks. Since Mystic Valley Parkway/Route 16 Station would be the terminus on this branch line, a longer station platform would be required for short-term storage and operational flexibility.

The Union Square Branch would also require light rail tracks and OCS to be constructed along the MBTA Fitchburg Line between the former Red Bridge and the proposed Union Square Station near Prospect Street. The alignment and necessary improvements along this route are conceptual and have been developed in order to assess the concept of service to Union Square. The alignment to Union Square would require reconfiguration of the existing signal equipment and the commuter rail and freight rail tracks between the MBTA’s BET and Webster Avenue. In addition, the existing rail bridge over Medford Street along the right-of-way would need to be reconstructed to accommodate the additional tracks.

Alternative 2 would require the same signals, communication, and electrical systems discussed for Alternative 1. Alternative 2 would also require a third electrical substation located at Mystic Valley Parkway/Route 16 Station.

3.6.2.2 Conceptual Capital Costs – Alternative 2

The estimate of conceptual capital costs was developed by conducting detailed quantity calculations of the various construction elements included in the conceptual design plans and applying current 2008 unit prices to each item. A 30 percent contingency was applied to the total construction cost to provide a level of confidence that the estimate presented at this stage reflects the true cost of the Project. As the Project moves forward into preliminary engineering and final design, the contingency will be reduced and replaced with costs that can be more accurately quantified through a more detailed design. Based on this evaluation, it is estimated that the conceptual capital cost of Alternative 2A (with parking) is approximately \$959.3 million in 2008 dollars, including the purchase of new train cars. The conceptual capital cost of Alternative 2B (without parking) is approximately \$951.8 million in 2008 dollars, including the purchase of new train cars.

3.6.2.3 Conceptual Operating & Maintenance Costs – Alternative 2

Based on the MBTA's FY2008 Fully-Allocated Operating and Maintenance Cost Model, the conceptual operating and maintenance costs of both Alternative 2A (with parking) and Alternative 2B (without parking) are estimated to be approximately \$23.7 million per year in 2008 dollars.

3.6.3 Alternative 3 – Extension to Medford Hillside (using commuter rail rights of way) and Union Square (using McGrath Highway and Somerville Avenue)

In Alternative 3, the Green Line service would be provided to Medford Hillside and Union Square using a two-branch operation, with one branch in commuter rail rights-of-way and the other operating in-street. One branch would operate from Relocated Lechmere Station to Medford Hillside along the MBTA Lowell Line. This branch would begin at Relocated Lechmere Station and head northwest, meeting the MBTA Lowell Line just south of Washington Street in Somerville. From Washington Street, the alignment would run parallel to the MBTA Lowell Line within the existing commuter rail right-of-way to College Avenue Station.

The second branch would operate using Somerville Avenue into a terminus near Union Square. Under this operation, the Union Square Branch would function as a single loop alignment starting its outbound service at Relocated Lechmere Station and heading north to Red Bridge, then west along the MBTA Fitchburg Line. In the vicinity of the Monsignor O'Brien Highway/Route 28 overpass, the Union Square Branch would split off from the MBTA Fitchburg Line and travel through private property and along a portion of McGrath Highway and connect into Somerville

Avenue where tracks embedded in the pavement would allow in-street running in the low-volume portion of the roadway. From Union Square, the tracks would turn south towards the MBTA Fitchburg Line, using Prospect Street, and be routed inbound along the MBTA Fitchburg Line, where it would join the outbound leg near the McGrath Highway overpass. Alternative 3 is expected to generate additional systemwide ridership of 7,700 boardings per day and a reduction of 27,895 VMTs per day (projected to the year 2030).

Figure 3.6-3 shows the conceptual alignment of Alternative 3, including both the Medford Branch and the Union Square Branch using Somerville Avenue.

Stations

The proposed Green Line stations for the Medford Branch under Alternative 3 are:

- Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28);
- Brickbottom Station, Somerville;
- Gilman Square Station, Somerville;
- Lowell Street Station, Somerville;
- Ball Square Station, Medford; and
- College Avenue Station, Medford.

The proposed Green Line stations for the Union Square Branch under Alternative 3 are:

- Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28); and
- Union Square Station, Somerville.

Travel Times

Travel times between proposed stations were estimated based on travel distances and estimated speeds. The travel speeds between proposed stations were based on the railroad's physical and operational characteristics. Estimated travel time between each station for the proposed Green Line Medford Branch under Alternative 3 is shown in Table 3.6-3.

Estimated travel time between Union Square and Relocated Lechmere Station for the proposed Green Line Union Square Branch under Alternative 3 is six minutes.

Table 3.6-3 Alternative 3: Medford Branch Travel Times

Station	Distance (miles)	Travel Time (minutes)	Dwell Time (minutes)	Cumulative Travel Time (minutes)
Lechmere				
Brickbottom	0.78	2.25	0.75	3.00
Gilman Square	0.71	1.25	0.75	2.00
Lowell Street	0.70	1.25	0.75	2.00
Ball Square	0.49	0.75	0.75	1.50
College Avenue	0.57	1.00	0.00	1.00
			Total	9.50

Headways

The operating plan for this alternative would extend the existing Green Line D branch service from Relocated Lechmere Station to the northwest to College Avenue Station. The Green Line service beyond Lechmere Station for the Medford Branch would operate on headways equal to that of the current Green Line D Line service: five minutes in the morning and evening peak periods and ten minutes during off-peak periods. The Green Line service beyond relocated Lechmere Station for the Union Square Branch would operate on headways equal to that of the current Green Line E branch service: six minutes in the morning peak period, five minutes in the evening peak period, and between nine and ten minutes during off-peak periods.

Fares

Fares for the Green Line Medford Branch and the Union Square Branch under Alternative 3 would be \$1.70 for one-way adult trips, based on current MBTA subway fares.

Vehicle Requirements

The Green Line Extension Project vehicle fleet will include a mix of three vehicle types: the two current vehicles (Type 7 high-floor cars and Type 8 low-floor cars) and a new "Type 9" low-floor car, which is currently under development. The Type 9 cars will be used for the Extension, which will replace older cars and expand service on the existing Green Line. Based on the passenger capacities described for Alternative 1 in Section 3.6.1, *Alternative 1 – Extension to Medford Hillside and Union Square (using commuter rail rights-of-way)*, and the projected ridership and proposed operating plan for Alternative 3, it was determined that 23 additional cars would be needed to accommodate the proposed headways and projected ridership for Alternative 3.

3.6.3.1 Capital Improvements – Alternative 3

Capital improvements for the Medford Branch include constructing light rail tracks and OCS along the existing railroad right-of-way between the Relocated Lechmere Station and College Avenue Station. This includes use of the “Yard 8” right-of-way between Lechmere Station and Washington Street and along the MBTA Lowell Line between Washington Street and College Avenue. The service would end immediately north of the College Street overpass. A support facility for storage and servicing of the Green Line fleet would be constructed to accommodate the existing north-side Green Line service fleet and an additional 23 vehicles needed to meet the intended headways when providing service to the new stations along the extended Green Line. In addition to the track construction, some of the existing bridges along the right-of-way would need to be reconstructed to accommodate the additional tracks. The structures that would need to be reconstructed include the former Red Bridge, Washington Street, Walnut Street, Medford Street, School Street, Lowell Street, Cedar Street, Broadway, Harvard Street and College Avenue. Existing track and signal equipment would also need to be relocated in order to accommodate the planned light rail tracks. Since College Avenue would be the terminus for the line, additional track lengths would be required north of the station for short-term storage and operational flexibility.

The Union Square Branch would also require light rail tracks and OCS to be constructed. This alignment would branch off the Medford Branch near Red Bridge. From that junction, the alignment would continue northwest towards the McGrath Highway overpass of the MBTA Fitchburg Line. At this point, the alignment would travel through private property along McGrath Highway/Route 28 and tie into Somerville Avenue at the intersection of Medford Street and McGrath Highway/Route 28. The remainder of the distance to Union Square would utilize an in-street running style operation on Somerville Avenue with embedded track and OCS. In this alternative, the Green Line would travel in a dedicated reservation along Somerville Avenue to the intersection of Prospect Street. At Prospect Street, the alignment would travel through the parking lot at the southeast corner of Somerville Avenue, then head south along several private properties on the east side of Prospect Street. Any area that the tracks would cross would need to be acquired. The alignment would then tie back into the MBTA Fitchburg Line and travel inbound within the commuter rail right-of-way back to the vicinity of the McGrath Highway/Route 28 overpass. This alternative would require relocating existing commuter rail tracks and signal equipment in the vicinity of the McGrath Highway/Route 28 overpass. The Union Square Branch would require reconstructing the Medford Street Bridge in Somerville.

Alternative 3 would require the same signals, communication, and electrical systems discussed for Alternative 1. Alternative 3 would also require Line of Sight Signals and Traffic Signals where the Green Line shares the public right-of-way on Somerville Avenue and at the intersection of McGrath Highway/Route 28 and Somerville Avenue.

3.6.3.2 Conceptual Capital Costs – Alternative 3

The estimate of conceptual capital costs was developed by conducting detailed quantity calculations of the various construction elements included in the conceptual design plans and applying current 2008 unit prices to each item. A 30 percent contingency was applied to the total construction cost to provide a level of confidence that the estimate presented at this stage reflects the true cost of the Project. As the Project moves forward into preliminary engineering and final design, the contingency will be reduced and replaced with costs that can be more accurately quantified through a more detailed design. Based on this evaluation, it is estimated that the conceptual capital cost of Alternative 3 is approximately \$829.8 million in 2008 dollars, including the purchase of new train cars.

3.6.3.3 Conceptual Operating & Maintenance Costs – Alternative 3

Based on the MBTA's FY2008 Fully-Allocated Operating and Maintenance Cost Model, the conceptual operating and maintenance costs of Alternative 3 are estimated to be approximately \$22.1 million per year in 2008 dollars.

3.6.4 Alternative 4 – Extension to Mystic Valley Parkway/Route 16 (using commuter rail right of way) and Union Square (using McGrath Highway and Somerville Avenue)

This alternative would provide Green Line service to Mystic Valley Parkway/Route 16 and Union Square using a two-branch operation, with one branch in commuter rail rights-of-way and the other operating in-street. One branch would operate from Relocated Lechmere Station to Mystic Valley Parkway/Route 16 Station along the MBTA Lowell Line. This branch would begin at Relocated Lechmere Station and head northwest, meeting the MBTA Lowell Line just south of Washington Street in Somerville. From Washington Street, the alignment would run parallel to the MBTA Lowell Line to Mystic Valley Parkway/Route 16 Station. Alternative 4 includes consideration of a 300-space parking structure at Mystic Valley Parkway/Route 16 Station.

The second branch would operate to Union Square using a portion of Somerville Avenue for in-street running. Under this operation, the Union Square Branch would function as a single loop alignment starting its outbound service at Relocated Lechmere Station and heading north to Red Bridge, then west along the MBTA Fitchburg Line. In the vicinity of the Monsignor O'Brien Highway/Route 28 overpass, the Union Square Branch would split off from the MBTA Fitchburg Line and travel through private property and along a portion of McGrath Highway/Route 28 and connect into Somerville Avenue where tracks embedded in the street surface would allow in-street running in the low-volume portion of the roadway. From Union Square, the tracks would turn south towards the MBTA Fitchburg Line using private properties along Prospect Street and be routed inbound along the MBTA Fitchburg Line where it would join the outbound leg somewhere near the McGrath Highway/Route 28 overpass. Alternative 4 is expected to generate additional systemwide ridership of 8,700 boardings per day and a reduction of 32,005 VMT per day (projected to the year 2030).

Figure 3.6-4 shows the conceptual alignment of Alternative 4 including both the Medford Branch and the Union Square Branch using Somerville Avenue.

Stations

The proposed Green Line stations for the Medford Branch under Alternative 4 are:

- Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28);
- Brickbottom Station, Somerville;
- Gilman Square Station, Somerville;
- Lowell Street Station, Somerville;
- Ball Square Station, Medford;
- College Avenue Station, Medford; and
- Mystic Valley Parkway/Route 16 Station, Somerville/Medford.

The proposed Green Line stations for the Union Square Branch under Alternative 4 are:

- Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28); and
- Union Square Station, Somerville.

Travel Times

Travel times between proposed stations were estimated based on travel distances and estimated speeds. The travel speeds between proposed stations were based on the railroad's physical and operational characteristics. Estimated travel time between each station for the proposed Green Line Medford Branch under Alternative 4 is shown in Table 3.6-4.

Table 3.6-4 Alternative 4: Medford Branch Travel Times

Station	Distance (miles)	Travel Time (minutes)	Dwell Time (minutes)	Cumulative Travel Time (minutes)
Lechmere				
Brickbottom	0.78	2.25	0.75	3.00
Gilman Square	0.71	1.25	0.75	2.00
Lowell Street	0.70	1.25	0.75	2.00
Ball Square	0.49	0.75	0.75	1.50
College Avenue	0.57	1.00	0.75	1.75
Mystic Valley Parkway/Route 16	0.90	1.75	0.00	1.75
			Total	12.00

Estimated travel time between Union Square and the Lechmere Station for the proposed Green Line Union Square Branch under Alternative 4 is six minutes.

Headways

The operating plan for this alternative would extend the existing Green Line D branch service from Lechmere to the northwest to Mystic Valley Parkway/Route 16 Station. The Green Line service beyond Relocated Lechmere Station for the Medford Branch would operate on headways equal to that of the existing Green Line D branch service: five minutes in the morning and evening peak periods and ten minutes during off-peak periods. The Green Line service beyond Relocated Lechmere Station for the Union Square Branch would operate on headways equal to that of the existing Green Line E branch service: six minutes in the morning peak period, five minutes in the evening peak period, and between nine and 10 minutes during off-peak periods.

Fares

Fares for the Green Line Medford Branch and Union Square Branch under Alternative 4 would be \$1.70 for one-way adult trips, based on current MBTA subway fares.

Vehicle Requirements

The Green Line Extension Project vehicle fleet will include a mix of three vehicle types: the two current vehicles (Type 7 high-floor cars and Type 8 low-floor cars) and a new "Type 9" low-floor car, which is currently under development. The Type 9 cars will be used for the Extension, which will replace older cars and expand service on the existing Green Line. Based on the passenger capacities described for Alternative 1 in Section 3.6.1, *Alternative 1 – Extension to Medford Hillside and Union Square (using commuter rail rights-of-way)*, and the projected ridership and proposed operating plan for Alternative 4, it was determined that 27 additional cars would be

needed to accommodate the proposed headways and projected ridership for Alternative 4.

3.6.4.1 Capital Improvements – Alternative 4

Capital improvements for the Medford Branch include constructing light rail tracks and OCS along the existing railroad right-of-way between the Relocated Lechmere Station and Mystic Valley Parkway/Route 16 Station. This includes use of the “Yard 8” right-of-way between Lechmere Station and Washington Street and along the MBTA Lowell Line between Washington Street and Mystic Valley Parkway/Route 16 Station. The service would end prior to the Mystic River. A support facility for storage and servicing of the Green Line fleet would be constructed to accommodate the existing north-side Green Line service fleet and an additional 27 vehicles needed to meet the intended headways when providing service to the new stations along the extended Green Line. In addition to the track construction, some of the existing bridges along the right-of-way would need to be reconstructed to accommodate the additional tracks. The structures that would need to be reconstructed include the former Red Bridge, Washington Street, Walnut Street, Medford Street, School Street, Lowell Street, Cedar Street, Broadway, Harvard Street, College Avenue, Winthrop Street, and North Street. Existing signal equipment would also need to be relocated in order to accommodate the planned light rail tracks. Since Mystic Valley Parkway/Route 16 Station would be the terminus on this branch line, a longer station platform would be required for short-term storage and operational flexibility.

The Union Square Branch would also require light rail tracks and OCS to be constructed. This alignment would branch off the Medford Branch near Red Bridge. From that junction, the alignment would continue northwest towards the McGrath Highway/Route 28 overpass of the MBTA Fitchburg Line. At this point, the alignment would travel through private property along McGrath Highway/Route 28 and tie into Somerville Avenue at the intersection of Medford Street and McGrath Highway/Route 28. The remainder of the distance to Union Square would utilize an in-street running style operation on Somerville Avenue with embedded track and OCS. In this alternative, the Green Line would travel in a dedicated reservation along Somerville Avenue to the intersection of Prospect Street. At Prospect Street, the alignment would travel through the parking lot at the southeast corner of Somerville Avenue, then head south along several private properties on the east side of Prospect Street. Any area that the tracks would cross would need to be acquired. The alignment would then tie back into the MBTA Fitchburg Line and travel inbound within the commuter rail right-of-way back to the vicinity of the McGrath Highway/Route 28 overpass. This alternative would require relocating existing tracks and signal equipment in the vicinity of the McGrath Highway/Route 28 overpass, and reconstruction of Medford Street Bridge in Somerville.

Alternative 4 would require the same signals, communication, and electrical systems discussed for Alternative 3. Alternative 4 would also require a third electrical substation located at Mystic Valley Parkway/Route 16 Station.

3.6.4.2 Conceptual Capital Costs – Alternative 4

The estimate of conceptual capital costs was developed by conducting detailed quantity calculations of the various construction elements included in the conceptual design plans and applying current 2008 unit prices to each item. A 30 percent contingency was applied to the total construction cost to provide a level of confidence that the estimate presented at this stage reflects the true cost of the Project. As the Project moves forward into preliminary engineering and final design, the contingency will be reduced and replaced with costs that can be more accurately quantified through a more detailed design. Based on this evaluation, it is estimated that the conceptual capital cost of Alternative 4 is approximately \$984.3 million in 2008 dollars, including the purchase of new train cars.

3.6.4.3 Conceptual Operating & Maintenance Costs – Alternative 4

Based on the MBTA's FY2008 Fully-Allocated Operating and Maintenance Cost Model, the conceptual operating and maintenance costs of Alternative 4 are estimated to be approximately \$24.5 million per year in 2008 dollars.

3.6.5 Alternative 5 – Extension to Mystic Valley Parkway/Route 16 (using commuter rail rights of way)

This alternative would provide Green Line service to Mystic Valley Parkway/Route 16 Station using a one-branch operation in commuter rail rights-of-way. One branch would operate from Relocated Lechmere Station to Mystic Valley Parkway/Route 16 Station along the MBTA Lowell Line. This branch would begin at Lechmere Station and head northwest, meeting the MBTA Lowell Line just south of Washington Street in Somerville. From Washington Street, the alignment would run parallel to the MBTA Lowell Line to Mystic Valley Parkway/Route 16 Station. Alternative 5 also includes consideration of a 300-space parking structure at Mystic Valley Parkway/Route 16 Station. This alternative does not include a branch to Union Square. Alternative 5 is expected to generate new systemwide transit ridership of 10,500 boardings per day and a reduction of 33,206 VMTs per day (projected to the year 2030).

Figure 3.6-5 shows the conceptual alignment of Alternative 5.

Stations

Stations for the Medford Branch would be located at:

- Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28);
- Brickbottom Station, Somerville;
- Gilman Square Station, Somerville;
- Lowell Street Station, Somerville;
- Ball Square Station, Medford;
- College Avenue Station, Medford; and
- Mystic Valley Parkway/Route 16 Station, Medford/Somerville.

Travel Times

Travel time between proposed stations was estimated based on travel distances and estimated speeds based on the railroad's physical and operational characteristics. Estimated travel time between each station for the proposed Green Line Medford Branch under Alternative 5 is shown in Table 3.6-5.

Table 3.6-5 Alternative 5: Medford Branch Travel Times

Station	Distance (miles)	Travel Time (minutes)	Dwell Time (minutes)	Cumulative Travel Time (minutes)
Lechmere				
Brickbottom	0.78	2.25	0.75	3.00
Gilman Square	0.71	1.25	0.75	2.00
Lowell Street	0.70	1.25	0.75	2.00
Ball Square	0.49	0.75	0.75	1.50
College Avenue	0.57	1.00	0.75	1.75
Mystic Valley Parkway/Route 16	0.90	1.75	0.00	1.75
			Total	12.00

Headways

The operating plan for this alternative would extend the existing Green Line D and E branch services from Relocated Lechmere Station to the northwest to Mystic Valley Parkway/Route 16 Station. The Green Line service beyond Relocated Lechmere Station for the Medford Branch would operate on headways equal to that of the existing Green Line D and E branch services: three minutes in the morning and evening peak periods and five minutes during off-peak periods.

Fares

Fares for the Green Line Medford Branch under Alternative 5 would be \$1.70 for one-way adult trips, based on current MBTA subway fares.

Vehicle Requirements

The Green Line Extension Project vehicle fleet will include a mix of three vehicle types: the two current vehicles (Type 7 high-floor cars and Type 8 low-floor cars) and a new "Type 9" low-floor car, which is currently under development. The Type 9 cars will be used for the Extension, which will replace older cars and expand service on the existing Green Line. Based on the passenger capacities described for Alternative 1 in Section 3.6.1, *Alternative 1 – Extension to Medford Hillside and Union Square (using commuter rail rights-of-way)*, and the projected ridership and proposed operating plan for Alternative 5, it was determined that 33 additional cars would be needed to accommodate the proposed headways and projected ridership for Alternative 5.

3.6.5.1 Capital Improvements – Alternative 5

Capital improvements for the Medford Branch include constructing light rail tracks and OCS along the existing railroad right-of-way between the Relocated Lechmere Station and Mystic Valley Parkway/Route 16 Station. This includes use of the "Yard 8" right-of-way between Relocated Lechmere Station and Washington Street and along the MBTA Lowell Line between Washington Street and Mystic Valley Parkway/Route 16 Station. The service would end prior to the Mystic River. A support facility for storage and servicing of the Green Line fleet would be constructed to accommodate the existing north-side Green Line service fleet and an additional fleet of 33 vehicles needed to meet the intended headways when providing service to the new stations along the extended Green Line. In addition to the track construction, some of the existing bridges along the right-of-way would need to be reconstructed to accommodate the additional tracks. The structures that would need to be reconstructed include the former Red Bridge, Washington Street, Walnut Street, Medford Street, School Street, Lowell Street, Cedar Street, Broadway, Harvard Street, College Avenue, Winthrop Street, and North Street. Existing track and signal equipment would also need to be relocated in order to accommodate the planned light rail tracks. Since Mystic Valley Parkway/Route 16 Station would be the terminus on this branch line, a longer station platform would be required for short-term storage and operational flexibility.

Alternative 5 would require the same signals, communication, and electrical systems along the Lowell Line discussed for Alternative 1. Alternative 5 would also require a third electrical substation located at Mystic Valley Parkway/Route 16 Station.

3.6.5.2 Conceptual Capital Costs – Alternative 5

The estimate of conceptual capital costs was developed by conducting detailed quantity calculations of the various construction elements included in the conceptual design plans and applying current 2008 unit prices to each item. A 30 percent contingency was applied to the total construction cost to provide a level of confidence that the estimate presented at this stage reflects the true cost of the Project. As the Project moves forward into preliminary engineering and final design, the contingency will be reduced and replaced with costs that can be more accurately quantified through a more detailed design. Based on this evaluation, it is estimated that the conceptual capital cost of Alternative 5 is approximately \$870.0 million in 2008 dollars, including the purchase of new train cars.

3.6.5.3 Conceptual Operating & Maintenance Costs – Alternative 5

Based on the MBTA's FY2008 Fully-Allocated Operating and Maintenance Cost Model, the conceptual operating and maintenance costs of Alternative 5 are estimated to be approximately \$28.2 million per year in 2008 dollars.

3.6.6 Alternative 6 – Extension to Union Square (using commuter rail rights of way)

This alternative would provide Green Line service to Union Square using a one-branch operation in commuter rail rights-of-way. The branch would operate along the MBTA Fitchburg Line from Relocated Lechmere Station into a terminus near Union Square in Somerville. The Union Square Branch would begin at Relocated Lechmere Station and head north to Red Bridge, then west following the MBTA Fitchburg Line to Union Square Station at Prospect Street. This alternative does not include a branch to Medford. Alternative 6 is expected to generate new systemwide transit ridership of 3,900 boardings per day and a reduction of 9,604 VMTs per day (projected to the year 2030).

Figure 3.6-6 shows the conceptual alignment of Alternative 6.

Stations

Stations for the Union Square Branch would be located in the vicinity of:

- Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28); and
- Union Square Station (at Fitchburg Line).

Travel Times

Travel time between proposed stations was estimated based on travel distances and estimated speeds based on the railroad's physical and operational characteristics. Estimated travel time between Union Square Station and Relocated Lechmere Station for the proposed Green Line Union Square Branch under Alternative 6 is six minutes.

Headways

The operating plan for this alternative would extend the existing Green Line D and E branch service from Relocated Lechmere Station to the northwest to Union Square Station. The Green Line service beyond Relocated Lechmere Station for the Union Square Branch would operate on headways equal to that of the existing Green Line D and E branch services: three minutes in the morning and evening peak periods and five minutes during off-peak periods.

Fares

Fares for the Green Line Union Square Branch under Alternative 6 would be \$1.70 for one-way adult trips, based on current MBTA subway fares.

Vehicle Requirements

The Green Line Extension Project vehicle fleet will include a mix of three vehicle types: the two current vehicles (Type 7 high-floor cars and Type 8 low-floor cars) and a new "Type 9" low-floor car, which is currently under development. The Type 9 cars will be used for the Extension, which will replace older cars and expand service on the existing Green Line. Based on the passenger capacities described for Alternative 1 in Section 3.6.1, *Alternative 1 – Extension to Medford Hillside and Union Square (using commuter rail rights-of-way)*, and the projected ridership and proposed operating plan for Alternative 6, it was determined that no new cars would be needed to accommodate the proposed headways and projected ridership for Alternative 6.

3.6.6.1 Capital Improvements – Alternative 6

The Union Square Branch would also require light rail track and OCS to be constructed along the MBTA Fitchburg Line between the former Red Bridge and the proposed Union Square Station near Prospect Street. The alignment to Union Square would require extensive reconfiguration of the existing signal equipment as well as the commuter rail and freight rail tracks between the MBTA's BET and Prospect Street. In addition, the existing Medford Street Bridge along the MBTA Fitchburg Line right-of-way would need to be reconstructed to accommodate the additional tracks. Alternative 6 would not require any additional Green Line cars.

Alternative 6 would require similar signals, communication, and electrical systems along the Fitchburg Line to those discussed for Alternative 1. Alternative 6 would only require one new electrical substation, which would likely be located on MBTA property near Union Square Station or Lechmere Station.

3.6.6.2 Conceptual Capital Costs – Alternative 6

The estimate of conceptual capital costs was developed by conducting detailed quantity calculations of the various construction elements included in the conceptual design plans and applying current 2008 unit prices to each item. A 30 percent contingency was applied to the total construction cost to provide a level of confidence that the estimate presented at this stage reflects the true cost of the Project. As the Project moves forward into preliminary engineering and final design, the contingency will be reduced and replaced with costs that can be more accurately quantified through a more detailed design. Based on this evaluation, it is estimated that the conceptual capital cost of Alternative 6 is approximately \$370.6 million in 2008 dollars.

3.6.6.3 Conceptual Operating & Maintenance Costs – Alternative 6

Based on the MBTA's FY2008 Fully-Allocated Operating and Maintenance Cost Model, the conceptual operating and maintenance costs of Alternative 6 are estimated to be approximately \$8.1 million per year in 2008 dollars.

3.6.7 Build Alternatives Cost Summary and Ridership Comparison

In order to determine the preferred Build Alternative, it is necessary to evaluate the six alternatives by comparing the service each alternative offers to the cost of each service and the additional ridership each is envisioned to generate. Table 3.6-6 provides this comparison of new systemwide ridership and cost to determine the practicability of each alternative.

Table 3.6-6 Build Alternative Evaluation

Alternative	Capital Cost ¹ (\$million)	Operation and Maintenance Cost ¹ (\$million/year)	New Systemwide Boardings ² (boardings/day)
Baseline Alternative	\$146.2	\$13.7	2,800
Alternative 1 – Medford Hillside and Union Square (via commuter rail right-of-way)	\$804.8	\$21.3	7,900
Alternative 2A – Mystic Valley Parkway/Route 16 (with parking) and Union Square (via commuter rail right-of-way)	\$959.3	\$23.7	8,900
Alternative 2B – Mystic Valley Parkway/Route 16 (without parking) and Union Square (via commuter rail right-of-way)	\$951.8	\$23.7	8,600
Alternative 3 – Medford Hillside and Union Square (via Somerville Avenue)	\$829.8	\$22.1	7,700
Alternative 4 – Mystic Valley Parkway/Route 16 (with parking) and Union Square (via Somerville Avenue)	\$984.3	\$24.5	8,700
Alternative 5 – Mystic Valley Parkway/Route 16 (with parking)	\$870.0	\$28.2	10,500
Alternative 6 – Union Square (via commuter rail right-of-way)	\$370.6	\$8.1	3,900

1 Cost estimates based on 2008 dollars.

2 New ridership is based on projections to year 2030 and the difference between future No-Build Conditions for the Green Line and the future Build Conditions with the Green Line Extension Project in place.

3.7 Project Description – Preferred Alternative

Alternative 1, Green Line Extension to Medford Hillside and Union Square (using commuter rail rights-of-way), has been selected as the “Proposed Project” for the Green Line Extension Project, as it provides a balance of cost, ridership, and environmental impacts. EOT also believes that this alternative will help the Commonwealth achieve its goal of providing expanded transportation services and improve regional air quality. This alternative extends to Union Square via the MBTA Fitchburg Line right-of-way, which would require fewer acquisitions of private property, have more operational reliability, and have a lower capital cost than the Somerville Avenue option. Alternative 1 would meet all Project goals, would be operationally practical, and would generate a high number of new systemwide transit trips. This is the Project for which EOT is currently seeking approval by the FTA. Figure 3.7-1 shows the Proposed Project.

A total of seven stations are included in the Proposed Project, at Lechmere, Brickbottom, Gilman Square, Lowell Street, Ball Square, College Avenue and at Union Square. The route length would be about three miles to Medford Hillside with an approximately one-mile spur to Union Square. The primary infrastructure improvements of the Proposed Project would include relocating existing commuter rail lines, and constructing approximately four miles of new light rail track and

systems, four multi-span viaducts, a maintenance facility, and reconstructing 11 bridge structures to support the extension service. The Proposed Project is expected to generate new systemwide transit ridership of 7,900 boardings per day and a reduction of 25,018 VMTs per day (projected to the year 2030).

Although the FTA action of this document is based on the Proposed Project described above, EOT has selected as its Preferred Alternative, Alternative 2, Green Line Extension to Mystic Valley Parkway/Route 16, with no parking at Mystic Valley Parkway/Route 16 Station, and Union Square (using commuter rail rights-of-way). This alternative also meets all of the Project goals and provides additional regional benefits. However, because of the constraints placed on EOT by Federal funding requirements and the economic crisis facing the Commonwealth, at this time EOT is not able to identify sufficient funding to support the construction of the Medford Hillside to Mystic Valley Parkway/Route 16 segment within the 2014 timeframe mandated by the State Implementation Plan.

As of the filing of this document, the Boston Region Metropolitan Planning Organization has voted to 'flex' funding dedicated to the construction of highways to fund the construction of the Medford Hillside to Mystic Valley Parkway/Route 16 segment. These funds will be available sometime between 2016 and 2020 and may allow this portion of the Green Line Extension to be constructed shortly after the 2014 schedule for the Proposed Project has been completed.

Therefore, EOT's Preferred Alternative is proposed to be built in two phases with an initial operating segment (or the "Proposed Project") being constructed to Medford Hillside in the vicinity of College Avenue on the Medford Branch and a spur to Union Square, which is described and evaluated in this DEIR/EA as Alternative 1. The second phase of this Project, the "Future Full-Build Alternative" will include extending the Project from College Avenue Station to Mystic Valley Parkway/Route 16 Station in the future and has been described and evaluated in the DEIR/EA as Alternative 2.

The environmental impacts of both the Proposed Project, referred to as Alternative 1, and of the Future Full-Build Alternative, referred to as Alternative 2, have been fully evaluated and are described in detail in this DEIR/EA. For Federal action, the Proposed Project to Medford Hillside is the subject of this DEIR/EA, as the extension to Mystic Valley Parkway/Route 16 is not envisioned to be constructed within the three-year Massachusetts Environmental Policy Act (MEPA) or National Environmental Policy Act (NEPA) time frame and would, therefore, require re-assessment at a future date. However, construction of the initial operating segment of the Project will not preclude a future extension of the Preferred Alternative or Future Full-Build Alternative to Mystic Valley Parkway/Route 16, should funding become available in the future. Figure 3.7-1 shows both the Proposed Project and Future Full-Build Alternative Segments of the Preferred Alternative.

Figures 3.7-2 through 3.7-34 show the proposed stations, including a neighborhood map, detailed layout plan of the station, circulation plan, and architectural concept for each station. The Proposed Project Green Line stations for the Medford Branch are:

- ▶ Relocated Lechmere Station, Cambridge (relocated to east side of O'Brien Highway/Route 28);
- ▶ Brickbottom Station, Somerville;
- ▶ Gilman Square Station, Somerville;
- ▶ Lowell Street Station, Somerville;
- ▶ Ball Square Station, Medford; and
- ▶ College Avenue Station, Medford.

The Proposed Project also includes one station on the Union Square Branch in the vicinity of Prospect Street near Union Square in Somerville. In the future Full-Build Alternative, an additional station would be constructed along the Medford Branch at Mystic Valley Parkway/Route 16 Station in Somerville/Medford. Section 3.7.3 describes these stations in more detail.

As described in Section 3.3.2, Yard 8 has been the preferred option for the construction of a Green Line vehicle storage and maintenance facility, given its combination of size, configuration, and adjacency to the Green Line Extension tracks. However, the Yard 8 site has elicited local opposition from some municipal officials, elected representatives, and abutting residents and businesses. To endeavor to address and resolve these concerns, EOT has initiated analysis of two additional possible sites for the facility: (1) the so-called "Mirror H" site, proposed by the City of Somerville; and (2) a site, newly conceived by EOT and termed "Option L." The "Mirror H" site straddles the Inner Belt area of Somerville and the NorthPoint area of Cambridge. The "Option L" site is located immediately adjacent to BET, outside the current BET fence line. Both locations are shown on Figure 3.3-4.

Preliminary analysis indicates that both alternative sites have impacts above and beyond that of the Yard 8 alternative (e.g., Mirror H - renegotiation of MBTA-NorthPoint agreement and Option L - relocation of active businesses). However, to sufficiently compare the sites to the preferred Yard 8 location, a complete analysis of both alternatives - including environmental impacts, schedule implications, community benefits, property acquisition needs, regulatory issues, and costs to the municipalities and the Commonwealth - will be performed over the next few weeks. Results will be made available to the public for input and discussion once underway. The outcome of the analyses will determine whether EOT chooses to pursue a Notice of Project Change for the Green Line Extension Project, to formally substitute one of the alternative options for Yard 8 as the preferred site for the storage and maintenance facility.

3.7.1 Land Acquisitions and Easements

The Green Line Extension Project makes use of existing railroad rights-of-way for most of its approximately five mile length. This is possible because the MBTA Fitchburg Line and the MBTA Lowell Line had sufficient width to accommodate additional tracks for freight rail lines dating back to the late 19th century that have since been abandoned. The footprint of the abandoned tracks provides space for new tracks for this proposed Project. The existing right-of-way ranges from 55 to 110 feet in width. In places where space is limited by steep slopes, retaining walls have been proposed to maximize usable space in the railroad rights-of-way. The proposed retaining walls will include a “green” design component, which means that efforts will be made to use recycled and recyclable materials and to incorporate vegetation as part of the wall system, which will provide a more natural aesthetic for the retaining structure. Landscape treatments will also be proposed on the slopes above the walls and to the greatest extent possible at each of the stations.

For the purposes of planning, the maximum property impacts of the Project have been identified and evaluated in the DEIR/EA. As this Project progresses through preliminary engineering and final design, EOT will strive to refine the designs in an effort to further minimize property acquisitions and have the least possible impact on local neighborhood and property owners.

Constructing the Proposed Project as currently designed would require 11.5 acres of land acquisition from approximately 38 properties, and would require relocating five businesses. The largest area acquisitions are for the Project’s maintenance and storage facility at Yard 8 in Somerville (two parcels totaling 5.8 acres) and for the Union Square Station using the MBTA Fitchburg Line (four parcels totaling 1.1 acres). In terms of impact, the most substantial acquisitions are those that require the displacement and relocation of residences and active businesses. These are located at Ball Square (one occupied building with multiple businesses), and in Union Square (two businesses). No residences would be displaced. The Future Full-Build Alternative (extending to Mystic Valley Parkway) would require additional properties (four parcels totaling 6.6 acres) to construct the Mystic Valley Parkway/Route 16 Station and relocation of one business and two occupied office/R&D buildings with multiple businesses). The whole property land acquisitions are further summarized in Table 3.7-1.

In addition to whole property acquisitions, the Project will require strip takings (partial lots) that would not require building demolition or the acquisition of full properties. Additional temporary easements for construction access may also be necessary. A more comprehensive review of easement requirements will occur once more detailed, final design plans are prepared. The final design will minimize these land acquisitions and any construction easements as much as possible.

Table 3.7-1 Land Acquisition Summary

Address	Owner/Tenant	Parcel Area (SF)	Purpose
<i>Somerville</i>			
200 Inner Belt Road	Light Industrial	368,392	Yard 8
0 Inner Belt Road	Rail yard	82,983	Yard 8
30 Joy Street	Vacant	6,000	Brickbottom Station
350 Medford Street	Municipal Building	48,296	Gilman Square Station
675 Broadway	Lot 2 - Veterinary Building (vacant);	B2: 6,725	Ball Square Station
	Lot 3 - Karate Studio	B3: 830	Ball Square Station
662 & 664 Boston Avenue	Ball Square Auto Repair & Ball Square Bowling Alley	682	Ball Square Station
600 Mystic Valley Parkway*	U-Haul - Self Storage	95,348	Mystic Valley Parkway Station
200R Boston Avenue*	Vacant	10,996	Mystic Valley Parkway Station
40 Bennett Street	Industrial, Warehouse	24,563	Union Square Station
Outbuilding - 50 Prospect Street	Storage lot for commercial outbuilding	8,095	Union Square Station
50 Prospect Street	Empire Marble & Granite	8,517	Union Square Station
42 Prospect Street	Vacant	3,150	Union Square Station
32 Prospect Street	Vacant commercial/industrial building	4,068	Union Square Station
<i>Medford</i>			
675 Broadway	Former Veterinary Office (vacant)	4,448	Ball Square Station
662 & 664 Boston Avenue	Ball Square Bowling Alley & Ball Square Auto Repair	11,854	Ball Square Station
222 Boston Avenue*	Office Building	28,443	Mystic Valley Parkway Station
200 Boston Avenue*	Office and Research & Development	15,2460	Mystic Valley Parkway Station

*Indicates whole property takings associated only with the Future Full-Build Alternative Only

3.7.2 Affected Bridges

For the Proposed Project, there are nine highway bridges over the railroad right-of-way and three railroad bridges over city streets. The following highway bridges will have to be replaced as part of the Proposed Project:

- Walnut Street (Somerville);
- Medford Street over the MBTA Lowell Line (Somerville);
- School Street (Somerville);
- Lowell Street (Somerville);
- Cedar Street (Somerville);
- Broadway (Somerville); and
- College Avenue near College Avenue Station (Medford).

In the Future Full-Build Alternative, two additional highway bridges will need to be rebuilt:

- Winthrop Street (Medford); and
- North Street (Medford).

The following bridges appear to have adequate clearance and should not need replacement:

- ▶ Central Street (Somerville);
- ▶ Sycamore Street (Somerville);
- ▶ Prospect Street (Somerville);
- ▶ McGrath Highway over MBTA Lowell Line (Somerville);
- ▶ Cross Street (Somerville); and
- ▶ McGrath Highway over MBTA Fitchburg Line (Somerville).

Of the railroad bridges, the bridge over Washington Street can accommodate six tracks but must be replaced due to its poor condition. The bridge that carries the MBTA Lowell Line over Harvard Street will have to be reconstructed to add two spans to accommodate four tracks. The bridge that carries the MBTA Fitchburg Line over Medford Street will have to be reconstructed to add two spans to accommodate four tracks. The rail bridge over the MBTA Fitchburg Line at Red Bridge Junction would have to be reconstructed, and two new viaducts would be needed at Red Bridge Junction to serve the Union Square Branch. The Lechmere Viaduct would also need to be reconstructed. The design and construction of these bridges will be coordinated with appropriate municipal personnel in Cambridge, Somerville, and Medford.

3.7.3 Stations

The Proposed Green Line Extension Project includes six mainline stations on the Medford Branch: Relocated Lechmere Station, Brickbottom Station, Gilman Square Station, Lowell Street Station, Ball Square Station, and College Avenue Station; and one station at Union Square. In the Future Full-Build Alternative, one additional station would be constructed at the Mystic Valley Parkway/Route 16 Station. Station locations were determined based on a thorough station siting analysis process, which included input from public workshops and city officials. Details are provided in Appendix B.

As required by the Secretary's Certificate, this section:

- ▶ Highlights station locations with a summary of 2030 ridership projections;
- ▶ Provides a description of station amenities;
- ▶ Summarizes the program for safe and efficient loading;
- ▶ Demonstrates how each station will meet ADA accessibility standards;
- ▶ Identifies Green Design opportunities; and
- ▶ Describes access from street level to the station.

Detailed designs and renderings of each station are provided in Figures 3.7-2 through 3.7-34.

Project stations will generally be located along the new Green Line alignment adjacent to the relocated MBTA Lowell Line, and along the MBTA Fitchburg Line alignment for Union Square Station. The design for each station is envisioned to provide: a headhouse as a shelter for the paid and unpaid lobbies with automated fare lines; vending machines; an information booth; and restrooms. In addition to these design elements, the stations are also envisioned to provide:

- Landscaping;
- Bike racks at all stations, which will encourage the use of bicycles to access the station and reduce vehicular access;
- MBTA Direction Maps showing inbound and outbound stations as well as the MBTA Spider Maps showing all rapid transit lines;
- Street-facing fascia displaying the station name;
- Uniformly lit platforms at a level that enhances a feeling of safety;
- Tactile/Braille Station Identification signs; and
- Trash receptacles.

Many station platforms are envisioned to be located at a different elevation than the station access points. Entry to and exit from the platforms will be provided by elevators, escalators, and stairs. The design of the platform was based on peak hour passenger volume. Station access and platform design were based on requirements and guidance provided by:

- Americans with Disabilities Act, 1990;
- Commonwealth of Massachusetts Architectural Access Board (MAAB); and
- The MBTA.

In addition to station amenities and access requirements, station criteria also considered “green” or high performance design. Green design opportunities for the Green Line Extension Project include:

- **Access** - Stations will offer safe and convenient pedestrian access to encourage walking and transit-oriented development in the nearby vicinity. This includes providing secure bicycle racks and/or storage within 200 yards of each station entrance.
- **Lighting** - Station design will minimize unnecessary light pollution on each station site, while ensuring that adequate safety lighting measures are adhered to.
- **Stormwater** - Station design will minimize the amount of impervious cover, increase on-site infiltration, reduce or eliminate pollution from stormwater runoff, and eliminate contaminants.
- **Recycling** - Stations will provide easily accessible bins for recycling, including paper, corrugated cardboard, glass, plastics, and metals.

- ▶ **Site and Building Materials** - Where possible, station design and construction will use materials that incorporate recycled content materials; are extracted and manufactured locally; reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials, such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheat-board, strawboard, and cork; use Forest Stewardship Council (FSC) Certified Wood; and reduce the heat island effect at each station by utilizing high-reflectance (high-albedo) materials for hardscape.
- ▶ **Water Efficiency** - Where possible, station design will eliminate the use of potable water for landscape irrigation at each station site; and will reduce the generation of wastewater and potable water demand at each station by specifying high-efficiency fixtures and dry fixtures, such as waterless urinals and low-flow toilets.
- ▶ **Energy Performance** - Where possible, station design will include the building envelope, heating, ventilation, and air conditioning (HVAC), lighting, and other systems to maximize energy performance; utilize non-polluting and renewable energy sources, including solar, wind, geothermal, low-impact hydro, biomass, and bio-gas strategies; avoid or minimize the use of mechanical cooling and refrigeration equipment; and use ENERGY STAR compliant products throughout all buildings.
- ▶ **Indoor Air Quality**- Where possible, station design will include an indoor air quality management plan to address moisture and mold damage including the design of surface grades, drainage systems and heating, ventilating, and air conditioning systems, ductwork transport, storage, and installation and filtration media in air handlers. Effective air management systems will be employed to minimize the exposure of station occupants and ventilation air distribution systems to environmental tobacco smoke; provide additional outdoor ventilation to improve air quality within the station building; provide capacity for ventilation system monitoring to help sustain station occupant comfort; and reduce the quantity of indoor air contaminants that are odorous, irritating, or harmful to station occupants.
- ▶ **Demolition and Construction** - Where possible, construction management during demolition of existing buildings on the station sites will divert debris from disposal in landfills and incinerators. Station design will include Erosion and Sediment Control Plans and will consider additional methods to control polluting the air with dust and particulate matter during construction.

3.7.3.1 Relocated Lechmere Station

Relocated Lechmere Station and associated roadway and busway improvements have long been intended to be constructed as part of the NorthPoint development project. However, due to the uncertainty surrounding the NorthPoint project, the

Commonwealth has included the planning for the relocation of Lechmere Station and area roadway improvements into the Green Line Extension Project.

The first station along the Green Line Extension as it moves northward is the new Lechmere Station, currently the existing northern terminus of the Green Line. Figure 3.7-2 shows the station and the surrounding neighborhood, Figure 3.7-3 shows the station itself in detail, Figure 3.7-4 shows routes of access for the station, and Figure 3.7-5 shows an architectural concept for the station's exterior. Daily ridership at this station is anticipated to be 10,900 boardings (projected to the year 2030). The new Lechmere Station will be relocated and elevated, on a new and realigned viaduct on the east side of Monsignor O'Brien Highway/Route 28. The area around the relocated station is primarily industrial with some residential uses. There will be approximately 234 parking spaces provided in two separate parking lots at the station to replace the existing parking for commuter park-and-ride patrons. Vehicular access to the south parking lot will be provided via East Street. Vehicular access to the north lot will be provided primarily via Water Street. An access road will be provided to connect Water Street, North First Street, and East Street, allowing vehicular access between the two lots as well as providing busway connections to O'Brien Highway/Route 28 and Cambridge Street. Pedestrian access will be provided across O'Brien Highway/Route 28. A busway with one-way, southbound circulation will accommodate local bus service, including MBTA Bus Routes 69, 80, 87, and 88, with access from O'Brien Highway/Route 28 via Water Street and egress to O'Brien Highway/Route 28 via a new North First Street connection. Curbside drop-offs for taxis, corporate shuttles, and station patrons will be provided along New North First Street and the access road. Due to its location on the viaduct, the station proper will be accessed using elevators, escalators, and stairs. Bike racks will be provided to encourage use of this mode. Once the relocation is complete, the existing Lechmere Station area will be demolished and the existing station site would be made available for potential future redevelopment.

3.7.3.2 Brickbottom Station

Brickbottom Station is on two private parcels on the east side of Joy Street and approximately 220 feet south of the intersection with Washington Street. Figure 3.7-6 shows the station and the surrounding neighborhood, Figure 3.7-7 shows the station itself in detail, Figure 3.7-8 shows routes of access for the station, and Figure 3.7-9 shows an architectural concept for the station's exterior. Daily ridership at this station is anticipated to be 2,730 boardings (projected to the year 2030). The area around the proposed station is categorized as light industrial with shops and automobile-related businesses. There are residential homes located north of Washington Street and on the south end of Joy Street at the Brickbottom Artists Lofts. Access to the station will be provided for both pedestrian and vehicular traffic along Joy Street. At this location, the Green Line tracks will be at a higher elevation than Joy Street. Consequently, access to the platform will occur from below via elevators,

escalators, and stairs. Bus Routes 86, 91, and CT2 provide service along Washington Street, with a bus stop 200 feet north of the proposed station. A pick-up/drop-off for automobiles will be provided. Bike racks will also be provided to encourage use of this mode. Connections to the proposed Somerville Community Path are possible.

3.7.3.3 Gilman Square Station

Gilman Square Station is proposed to be located along Medford Street directly behind Somerville High School. Figure 3.7-10 shows the station and the surrounding neighborhood, Figure 3.7-11 shows the station itself in detail, Figure 3.7-12 shows routes of access for the station, and Figure 3.7-13 shows an architectural concept for the station's exterior. Daily ridership at this station is anticipated to be 4,410 boardings (projected to the year 2030). The neighborhood is home to municipal facilities (Somerville City Hall, Somerville Public Library, Somerville High School), commercial enterprises along Highland Avenue and Medford Street, and residential areas. Access to the station will occur on the east side of the railroad right of way from Medford Street through a City-owned parcel and at a second location directly from the Medford Street bridge structure. Access to the platform level will be via elevators, escalators, and stairs. These access points are proposed in order to provide access in accordance with ADA requirements, as the Medford Street Bridge has an approximately eight-percent grade. Connections to the proposed Somerville Community Path are also possible in the future. The station's placement on the north side of Medford Street provides the opportunity for bicycle and pedestrian access with minimal property impacts. Connections to MBTA for Bus Routes 80, 88, and 90 are located within ¼ mile of the station. Bike racks will also be provided.

3.7.3.4 Lowell Street Station

Lowell Street Station is proposed to be located at Lowell Street, adjacent to an abandoned industrial building. Figure 3.7-14 shows the station and the surrounding neighborhood, Figure 3.7-15 shows the station itself in detail, Figure 3.7-16 shows routes of access for the station, and Figure 3.7-17 shows an architectural concept for the station's exterior. Daily ridership at this station is anticipated to be 1,260 boardings (projected to the year 2030). Lowell Street Station is in a primarily residential area of two, three, and four-story structures. There is a nursing home nearby and an abandoned industrial building, which is scheduled for redevelopment for residential use. Accessibility at this station is a challenge due to the existing roadway grades. To better accommodate access, a vehicular pick-up/drop-off area will be provided on Lowell Street. At this location, the Green Line tracks and platform will be at a lower elevation than Lowell Street. Consequently, access to the platform will occur from street level via elevators, escalators, and stairs. The station will be constructed along with a new bridge to accept automobile pick-ups/drop-offs and bicycle traffic from the neighborhood. Bike racks will be provided. Pedestrian access will be provided using sidewalks along Lowell Street. Local MBTA Bus Routes

80, 88, and 90 are within ¼ mile of the station. Connections from the proposed Somerville Community Path to the station headhouse would be possible via Lowell Street.

3.7.3.5 Ball Square Station

Ball Square Station is proposed to be located on the north side of the Broadway Bridge in the vicinity of the Somerville and Medford city line near the corner of Broadway and Boston Avenue. Figure 3.7-18 shows the station and the surrounding neighborhood, Figure 3.7-19 shows the station itself in detail, Figure 3.7-20 shows routes of access for the station, and Figure 3.7-21 shows an architectural concept for the station's exterior. Daily ridership at this station is anticipated to be 1,890 boardings (projected to the year 2030). The area adjacent to the station is of mixed use with automobile shops along Boston Avenue, commercial uses on Broadway, and residential neighborhoods beyond. Residential structures are generally three to four stories. Due to Broadway's steep grade, the station provides two points of access. One access point will be provided at the intersection of Boston Avenue and Broadway. The other access point is envisioned directly from the Broadway Bridge. At this station, the Green Line tracks and platform will be at a lower elevation than Broadway; consequently, access to the platform from street level will be via elevators, escalators, and stairs. Local MBTA Bus Routes 80 and 89 have stops located adjacent to Ball Square Station. Bike racks will also be provided at the station.

3.7.3.6 College Avenue Station

College Avenue Station is proposed to be located at the corner of College Avenue and Boston Avenue, which primarily serves the residential neighborhoods adjacent to the station and the Tufts University community. Figures 3.7-22 and 3.7-23 show the station and the surrounding neighborhood for both the Proposed Project and Future Full-Build Alternative. In the Proposed Project, College Avenue Station will serve as the Project terminus and tail tracks will be provided beyond the end of the platform for operational flexibility at the end of the line. Figure 3.7-24 shows the station itself in detail, Figure 3.7-25 shows routes of access for the station, and Figure 3.7-26 shows an architectural concept for the station's exterior. Daily ridership at this station is anticipated to be 2,420 boardings (projected to the year 2030) for the Proposed Project. In order to meet accessibility requirements, the station provides two points of access due to the eight-percent grade along the College Avenue Bridge. One access point will be provided from the College Avenue Bridge; the second access point will be provided from Boston Avenue. Vehicular pick-up/drop-off will be available along Boston Avenue. Bicycle parking will also be provided at this station. Local MBTA Bus Routes 80, 94, and 96 provide service adjacent to the station with a bus stop located on College Avenue, approximately 600 feet from the station.

3.7.3.7 Mystic Valley Parkway/ Route 16 Station (Future Full-Build Alternative Only)

The Mystic Valley Parkway/Route 16 Station, to be included in the Future Full-Build Alternative only, is proposed to be located south of the intersection of Boston Avenue and Mystic Valley Parkway/Route 16 in the vicinity of the Somerville and Medford city line. Figure 3.7-27 shows the station and the surrounding neighborhood, Figure 3.7-28 shows the station itself in detail, Figure 3.7-29 shows routes of access for the station, and Figure 3.7-30 shows an architectural concept for the station's exterior. Daily ridership at this station is anticipated to be 2,000 boardings (projected to the year 2030) in the Future Full-Build condition. The neighborhood surrounding the proposed station is generally residential. There is a shopping center nearby as well as recreational facilities. This station has been considered both with and without 300 parking spaces in a multi-level parking garage. However, the Preferred Alternative does not include any parking at this station. Vehicular pick-up/drop-off is proposed with access primarily via Boston Avenue, with a possible curb cut onto Mystic Valley Parkway/ Route 16. Pedestrian access will be provided from walkways along Boston Avenue and Mystic Valley Parkway/Route 16. Access to the platform will occur via elevators, escalators, and stairs. Local MBTA Bus Routes 80 and 94 provide service adjacent to the station with a bus stop at the corner of Boston Avenue and Mystic Valley Parkway/Route 16. Bike parking will be provided at this station.

3.7.3.8 Union Square Station

Union Square Station is the only station proposed on the Union Square Branch, proposed to be located at the intersection of the MBTA Fitchburg Line and Prospect Street. Figure 3.7-31 shows the station and the surrounding neighborhood, Figure 3.7-32 shows the station itself in detail, Figure 3.7-33 shows routes of access for the station, and Figure 3.7-34 shows an architectural concept for the station's exterior. Daily ridership at this station is anticipated to be 2,310 boardings (projected to the year 2030). The area adjacent to the station is of mixed use with light industrial, residential, and commercial uses. Due to the eight-percent grade along Prospect Street, the station is envisioned to provide access via two levels, including the lower grades along Prospect Street as well as directly from the bridge structure. Access to the platform will also occur via elevators, escalators, and stairs. Vehicular pick-up/drop-off will be accommodated along Prospect Street. Local MBTA Bus Routes 85, 86, and 87 provide service adjacent to the station. Bike parking will be provided at the station.

3.7.4 Operating Plan

The operating plan is envisioned to extend the existing Green Line D and E branch services from Lechmere Station to Medford Hillside in the vicinity of College Avenue and Union Square for the Proposed Project. For the Future Full-Build Alternative, the Project will extend northwest to Mystic Valley Parkway/Route 16. The Green Line service would operate on headways equal to that of the existing Green Line D and E branch services and is not envisioned to impact the Central Subway System.

Travel times between proposed stations were estimated based on the travel distances and the estimated speeds. The travel speeds between proposed stations were based on the railroad's physical and operational characteristics. Estimated travel time between each station for the proposed Green Line Medford Branch is shown in Table 3.7-2.

Table 3.7-2 Travel Times for the Preferred Alternative

Station	Distance (miles)	Travel Time (minutes)	Dwell Time (minutes)	Cumulative Travel Time (minutes)
Lechmere				
Brickbottom	0.78	2.25	0.75	3
Gilman Square	0.71	1.25	0.75	2
Lowell Street	0.70	1.25	0.75	2
Ball Square	0.49	0.75	0.75	1.5
College Avenue	0.57	1.0	0.0	1.0
			Total	9.5

As shown in Table 3.7-2, the estimated travel time between Medford Hillside in the vicinity of College Avenue and Lechmere Station is approximately 9.5 minutes. In the Future Full-Build Alternative, the travels times between Lechmere Station and Mystic Valley Parkway/Route 16 Station will be 12.0 minutes. The estimated travel time between Relocated Lechmere Station and Union Square Station is 4.5 minutes.

The proposed headways for the Medford Branch would be five minutes in the morning and evening peak periods and 10 minutes during off-peak periods. The proposed headways for the Union Square Branch would be six minutes in the morning peak period, five minutes in the evening peak period, and between nine and 10 minutes during off-peak periods.

Fares would be based on current MBTA subway fares of \$1.70 for one-way adult trips.

3.7.5 Cost Estimate

During the development of this DEIR/EA, 10-percent concept plans for the Proposed Project and Future Full-Build Alternative alignments were designed and detailed capital cost estimates were developed. The capital improvements described in previous sections include, but are not limited to, construction of track, stations, structures, systems, drainage, utilities, and the maintenance facility. Additional costs include property acquisitions and relocations as well as the cost for vehicle acquisitions. The cost of the Proposed Project (Alternative 1 - Extension to Medford Hillside with a spur to Union Square using the MBTA Fitchburg Line) includes the cost to reconstruct Lechmere Station and is estimated to be approximately \$805 million in 2008 dollars, including \$76.0 million for vehicles. Annual operating and maintenance costs would be approximately \$21.3 million in 2008 dollars. The total costs for the Proposed Project were increased to include inflation for the time period in which the Project is to be implemented. Therefore, the "Year-of-Expenditure (YOE)" costs for the Proposed Project were calculated to be approximately \$932.4 million in YOE dollars, with operating and maintenance costs of \$25.9 million in YOE dollars.

In 2008, the FTA engaged a Project Management Oversight Consultant (PMOC) to undertake a review of the preliminary cost estimate for the Green Line Extension Project. The PMOC review identified a number of issues that introduce risk into this preliminary cost estimate. The most significant issues relate to construction methodology and schedule. As a result, the FTA is not able to endorse these cost estimates at this time. EOT recognizes these issues, which are principally related to the current state of conceptual engineering for the Project, as appropriate to a draft environmental document. EOT will continue to work with the FTA and the PMOC process to address these issues and ensure the FTA's endorsement of the Green Line Extension Project cost estimates as the Project develops through preliminary engineering and final design.

3.7.6 Construction Sequencing and Staging

Construction staging and sequencing strategies are critical to achieving the balance of an efficient construction project while minimizing the impacts to vehicular traffic, pedestrian traffic, on-street parking, public access, and emergency access to local businesses and residences. This corridor presents several construction challenges including narrow roadways, urban traffic volumes, and a variety of commercial, industrial, and residential land uses that require continuous access, limited space for construction zones and lay down areas within or near the rail corridor, and existing rail service that must be maintained throughout construction.

The use of the existing MBTA commuter rail right-of-way for the proposed Green Line tracks greatly reduces the complexity of construction as well as construction impacts. Figures 3.7-35 and 3.7-36 show the existing right-of-way and the proposed right-of-way. The existing cut would be widened by installing retaining walls on either side and excavating the slopes. On the MBTA Lowell Line, the commuter rail tracks would be shifted to the east side of the widened cut, and the new Green Line tracks would be built along the west side. Most of the right-of-way is located below the surrounding land surface, reducing potential land acquisitions as well as environmental impacts such as noise and visual changes.

Figure 3.7-35 Existing Section Looking North

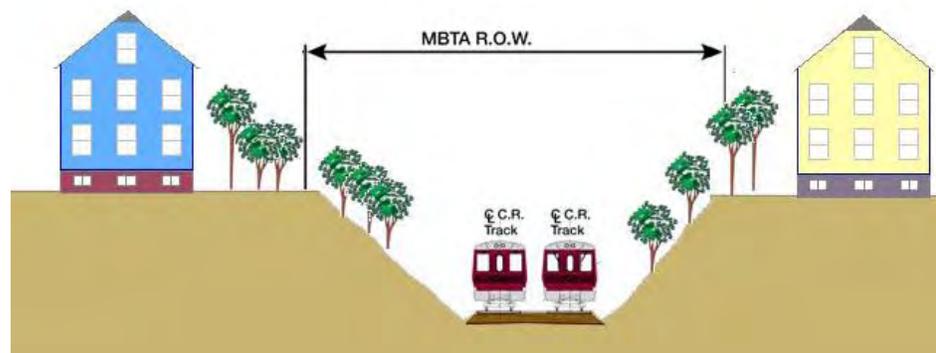
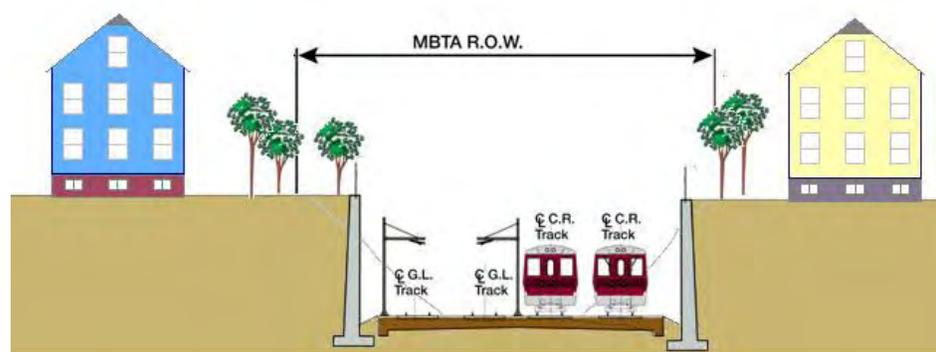


Figure 3.7-36 Proposed Section Looking North



Bridge reconstruction will be staged whenever possible to maintain traffic over the respective bridges during construction. Construction staging will be required for roadway traffic as well as rail traffic beneath the bridge. In some cases, the existing bridge structure, the extent of reconstruction required on the bridge, and/or the proposed bridge structure are such that staged construction is not feasible and the bridge will have to be closed during construction. A detour will be required to provide alternative traffic routes during construction.

Based on analysis of the existing bridges and a conceptual level design, the following bridges will require traffic detours during construction:

- Medford Street (Somerville, over the MBTA Lowell Line);
- Broadway (Somerville);

The construction staging and sequencing presented in this section address the constraints of the corridor, impacts to abutters, and other construction issues. More detailed evaluation and staging recommendations will be developed as design progresses and through coordination with the City of Cambridge, City of Somerville, and City of Medford, and the respective Fire and Police Departments. This coordination will define restrictions that will be placed on the contractor, such as time of construction and construction zone set-up requirements, as well as maintenance of traffic and access to abutting properties. Blasting is not anticipated for construction of the Project. Rodent control policies will be included in construction management plans to prevent increased pest populations during the construction period. Likely measures would include good waste management (sealed trash containers, closed drains on dumpsters, etc.), fencing around long-term construction sites, and traps and/or baits as needed for any observed rodent problems. Construction procedures will comply with Massachusetts Department of Environmental Protection's (MassDEP's) solid waste and air quality control regulations to prevent the spread of contaminated material or air quality impacts during construction.

For this initial stage of the Project, it is assumed that the following criteria will be required for traffic management and construction staging:

Roadway

- Perform construction activities during day time hours whenever possible. Avoid night time construction, particularly in residential areas;
- Restrict temporary lane closures to mid-week, off-peak traffic hours;
- Maintain one 11-foot travel lane in each direction except for short term, temporary closures;
- Detours are allowed subject to approval of the respective municipality;
- Maintain pedestrian accessibility;
- Maintain access to all abutting properties;
- Maintain access for emergency vehicles through construction zones;
- Limit the length and duration of construction zones that will temporarily eliminate on-street parking;
- Limit the number of abutting construction zones where work is taking place simultaneously;
- Construction zones will be set-up in accordance with industry standards [*Manual on Uniform Traffic Control Devices (MUTCD)*] and municipal

requirements, including police details, signage, variable message boards, temporary precast concrete barriers, drums, cones, etc;

- Coordinate with public safety departments, and city officials;
- Maintain communication with the community concerning construction activities, lane restrictions, closures, locations of construction zones, etc;
- Limit bridge closures such that no two consecutive bridges will be closed at the same time and provide reasonable detour routes subject to municipal approval; and
- Isolate construction work zones from vehicular and pedestrian traffic with a temporary precast concrete barrier, drums, and cones.

Rail

- Maintain commuter rail and freight traffic at all times;
- Provide flagmen for all work within the rail corridor;
- Minimize track closures;
- Track outages are subject to approval of the MBTA;
- Track relocation work will be limited to off-peak hours; and
- Maintain minimum horizontal and vertical offsets from live track centerlines to work zones and structures.

General Construction Sequence

The construction activities for this Project will be performed in the following sequence to allow an efficient construction process while maintaining roadway and rail traffic in the area. Construction staging and sequencing will be coordinated to minimize the duration of detours and lane closures.

- Clear and grub, demolish buildings, and conduct any required remediation of contaminated soils;
- Clear and grub corridor;
- Construct retaining walls and initial bridges/abutments;
- Cut/rough grade corridor;
- Install corridor drainage system, utilities, signal conduit, etc. and construct remaining bridges;
- Construct station/platform foundations and footings;
- Install/rough grade track bed;
- Install new outbound commuter rail track along east side of corridor;
- Relocate existing commuter rail track 1 to proposed commuter rail track 2 alignment;
- Construct off-site traffic improvements;
- Construct stations and platforms, catenary, etc;
- Install proposed Green Line tracks and landscaping;
- Construct bridges and walls south of Red Bridge;
- Construct new Lechmere Station; and
- Demolish existing Lechmere Station.

Typical construction staging plans have been developed and are depicted in Figures 3.7-37 and 3.7-38.

Close coordination with MBTA, City of Cambridge, City of Somerville, City of Medford, and the respective Fire and Police Departments will address specific construction issues. The preliminary analysis of construction staging and sequencing shows that it is feasible to construct the Project while maintaining railroad operations, access to abutters, and traffic and pedestrian paths. As the design progresses, the traffic management details will be refined to better identify specific measures in specific areas, including detours. A comprehensive construction staging and sequencing plan will be developed and included in the final construction contract documents and communicated to the public.

3.8 Community Paths

The Secretary's Certificate requires the DEIR/EA to include conceptual designs that connect the Green Extension Project to the Somerville Community Path and evaluate the viability of extending the Community Path to Route 16 in order to create a connection with the Mystic River Parkway. EOT is committed to working with the City of Somerville and the local community to progress the final design of the Somerville Community Path in conjunction with the design of the Green Line Extension Project. Regionally, the Somerville Community Path would also form part of a system of multi-use pathways connecting Somerville to the communities of Cambridge, Boston, Belmont, Arlington, Lexington, Bedford, Watertown, and Newton. This section discusses the coordination considered and decided upon for local community path projects.

3.8.1 Somerville Community Path

The proposed Somerville Community Path was developed by a number of advocates for bicycle and pedestrian facilities. The purpose of the Somerville Community Path is to be a multi-use pathway connecting neighborhoods to each other. As ultimately envisioned, the path would provide connectivity from Davis Square at one end to the Relocated Lechmere Station in Cambridge at the other.

The intent of the Somerville Community Path is to extend the Minuteman Bikeway/Linear Park multi-use path from its current terminus at Cedar Street in Somerville to the Charles River Path network in Cambridge and Boston, a distance of approximately 2.5 miles. The proposed route follows the edge of the MBTA Lowell Line, generally located at street level while the existing commuter rail trains and the proposed Green Line trains would run below, in a cut section. As required by the Secretary's Certificate, 10 -percent design plans for the path have been developed as part of the Green Line Extension Project.

The path design will comply with all applicable accessibility regulations including Regulations of the ADA and Regulations of the MAAB. In addition to these regulations, there are other documents relevant to path design that will be used:

- 36 CFR Part 1195 - Architectural Barriers Act (ABA) - Accessibility Guidelines for Outdoor Developed Areas;
- Federal Highway Administration, Designing Sidewalks and Trails for Access Part II of II: Best Practices Design Guide; and
- Federal Register - Architectural Barriers Act, Accessibility Guidelines for Outdoor Developed Areas.

The path design will also be reviewed by representatives of the disability community who can provide first-hand input and comments on the design and its details.

The Somerville Community Path will begin at Cedar Street from the end of the existing pathway that leads to Davis Square and the Linear Path. The terminus of the proposed Path will be located at the Cambridge City limits where it will connect with the multi-use path within the Central Park of the NorthPoint development. This section of path within NorthPoint will connect to the Department of Conservation and Recreation (DCR) pathways along the Charles River. In addition to coordinating the physical arrangements of the proposed Community Path project, there is also an opportunity to integrate the Community Path's neighborhood connections into the transit stations, particularly where the path would cross local streets at grade. The Green Line Extension Project has been coordinated with the Community Path project for compatibility. EOT has worked continuously with the City of Somerville and other interest groups in the development of these plans.

Design on the Somerville Community Path has been ongoing with the City of Somerville as the Project proponent. Major milestones in the design process to date include:

- 2001: Initial Feasibility Study;
- 2003 - Present: Design of Phase One path (Cedar Street to Central Street);
- 2006: Feasibility Study: School Street to City Line; and
- 2008: Construction of 150-foot section of path east of the Visiting Nurses Association facility between Lowell and Central Streets.

The current status of design can be summarized by sections of the path:

- Cedar Street to Central Street:
 - In 75 percent design; and
 - Short, disconnected section built in 2008.
- Central Street to School Street: Concept identified; and
- School Street to Cambridge Line: Feasibility Study - 2006.

Due to the proximity of the proposed path to the Green Line Extension Project, a number of comments were made in response to the EENF that the Path design should be explored in the context of the Green Line Extension Project. The Secretary's Certificate required the inclusion of conceptual design work for the Path to be included in the DEIR/EA.

As part of the Green Line Extension Project, a design concept has been developed to demonstrate the feasibility to construct the Path alongside the proposed Green Line Extension Project. Construction of the Path is not intended to be part of the Green Line Extension Project.

The typical section of the Path will be bituminous pavement 12 feet wide with 2-foot unpaved shoulders on either side. At "pinch points," or areas where the right-of-way narrows, the Path width and/or shoulder width will be reduced. Figure 3.8-1 shows a typical section of the Somerville Community Path. Additional figures showing the current conceptual layout of the Community Path are included in Appendix E. The estimated cost for construction of the path is approximately \$16 million, excluding costs for land acquisition, removal of any contaminated soils, and major utility work.

Figure 3.8-1 Typical Section of Somerville Community Path

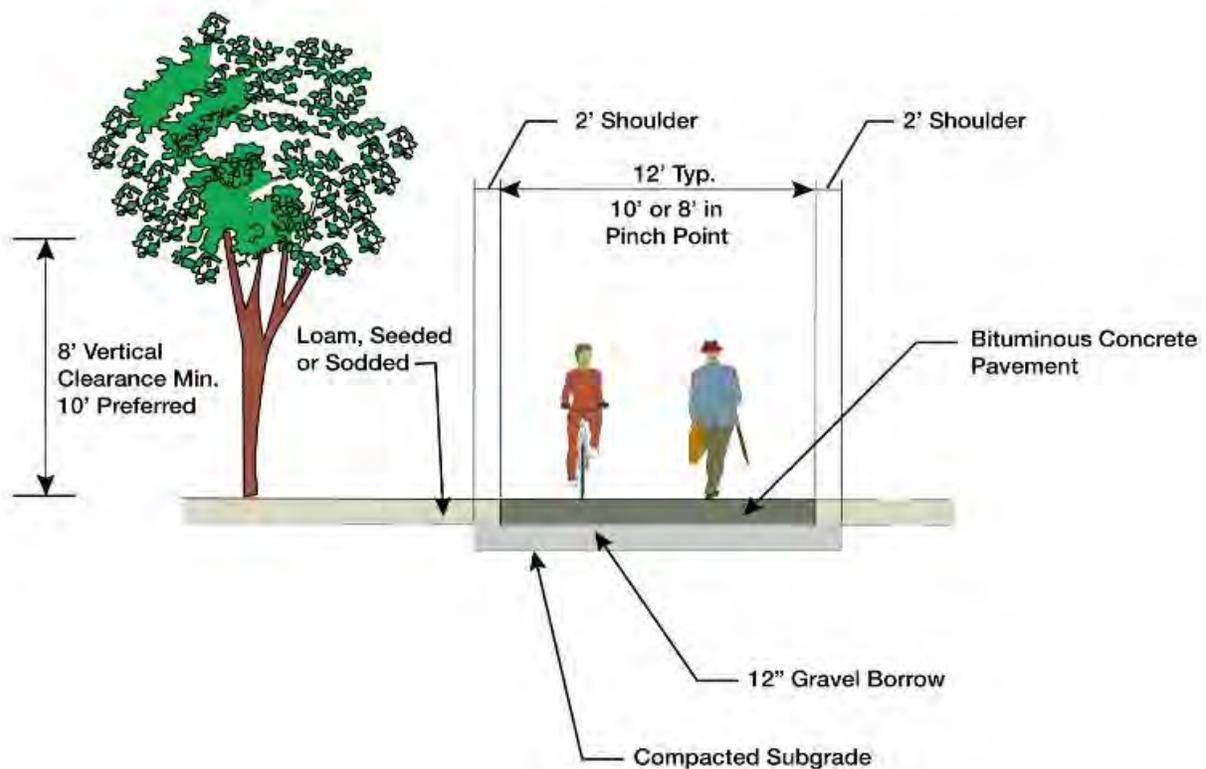


Table 3.8-1 summarizes the pinch points along the proposed Community Path alignment and how the Path design will be adjusted to accommodate the limitations at those locations.

Table 3.8-1 Pinch Points for Somerville Community Path

Location	Length (ft.)	Recommended Solution	Comments
Behind VNA ¹	300	Use cantilevered path	Solution proposed by City's path designer
Approaching School Street	100	Narrow path to 10 ft. wide	Alternative would be to acquire a sliver from adjacent parcels
Cross Street to Washington Street	800	Narrow path to 10 ft. wide	Path constrained by existing buildings
TOTAL	1200		

¹ VNA = Visiting Nurse Association assisted living facility at Lowell Street

3.8.2 Medford Community Path Feasibility

The Community Path planning effort completed as part of the Green Line Extension Project conceptual design also evaluated the feasibility of extending the Community Path to Route 16 to make a connection to the Mystic Valley Parkway. Following along the Medford Branch, a new path was evaluated to connect to the Somerville Community Path at Lowell Street and then follow the proposed Green Line Extension to Ball Square and into Medford. At Mystic Valley Parkway, the extension might then connect to the existing pathway system through the DCR reservation along the Mystic River.

The feasibility study considered two primary screening factors – sufficient physical width/right-of-way for the 12-foot paved path with two 2-foot shoulders along the entire length of the corridor and/or alternative on-street routes to maintain a continuous connection where adequate width is not available.

The study evaluated the corridor in three segments – Lowell Street to Ball Square, Ball Square to College Avenue and College Avenue to Mystic Valley Parkway. A detailed analysis is provided in Appendix E. However, the results of the study by segment are summarized as follows.

- ▶ Lowell Street to Ball Square: The extension is not viable due to insufficient right-of-way width within this mostly residential segment.
- ▶ Ball Square to College Avenue: The extension is not viable due to insufficient right-of-way width within this mixed residential, commercial, institutional and industrial segment. Even with land acquisitions there is not enough physical width for the path.
- ▶ College Avenue to Mystic Valley Parkway: The extension is not viable due to insufficient right-of-way width within this mixed residential, commercial,

institutional and industrial segment. Boston Avenue does not have adequate pavement width for an on-street facility and therefore would have to be reconstructed to accommodate an on-street bike route or a parallel bike path. Decking over the railroad right-of-way was considered, however this option is limited since the track bed north of Winthrop Street is raised above the abutting properties.

3.9 Coordination with Regional Projects

The communities in the study area are pursuing a number of transportation and development projects that are of importance to the Project study area. Descriptions of the key features of these undertakings are provided in the following sections, which also discuss their relationship to the Green Line Extension Project.

3.9.1 Urban Ring

The Urban Ring project, in the planning stages during the development of this DEIR/EA, is a three-phased transit improvement project within a corridor approximately two miles outside of the downtown Boston core. The project includes segments within the municipalities of Boston, Cambridge, Somerville, Brookline, Everett, Medford, and Chelsea; these areas include some of the fastest growing areas around Boston. The neighborhoods in the corridor are facing significant challenges, including:

- ▶ Inadequate existing transit accessibility and mobility;
- ▶ Transit congestion in the Boston core;
- ▶ Degraded environment and quality of life caused by auto congestion and air pollution in the neighborhoods of the corridor;
- ▶ Constrained economic development by traffic congestion and poor transit access; and
- ▶ Growing public demand for more transit choices due to rising fuel costs and greater awareness of the effects of auto emissions on climate change.

The Urban Ring project is designed to address these issues by providing new transit services that would connect to existing radial transit lines (subway, commuter rail, and bus) to create shorter transit trips and few transfers in the corridor.²

The initial phase has consisted of implementing three “Crosstown” bus routes by the MBTA, designated CT-1, CT-2, and CT-3. In late 2004, the MBTA completed the DEIR for Phase 2 of the project, followed by a July 2007 Notice of Project Change (approval

² <http://www.theurbanring.com/urbanfacts.asp>

of revised project schedule). The DEIR envisions implementing various Bus Rapid Transit (BRT) routes, expanded Crosstown bus services, and improved intermodal transit connections. These services would provide connections from the existing Silver Line/Dudley Street terminal in Boston extending north and then east through the Longwood Medical Area, Kenmore Square, Massachusetts Institute of Technology (MIT), Kendall Square, Lechmere, Union Square, Assembly Square, Orange Line stations between Community College and Wellington, and east to Chelsea and Logan Airport. In addition to the proposed BRT routes, Phase 2 of the Urban Ring project provides new commuter rail stations at Union Square, Gilman Square, and Sullivan Square. Phase 3 of the Urban Ring project envisions converting some Phase 2 BRT routes and services to light rail and heavy rail rapid transit operations. Phase 3 has been developed as part of a Major Investment Study by the MBTA. Submittal of the Phase 3 DEIR is anticipated in June 2011.

The Urban Ring and Green Line Extension Projects are envisioned to provide services that complement each other and provide a greater benefit for the communities. Together, the Urban Ring in conjunction with the Green Line Extension Project would provide environmental and economic benefit to the neighborhoods surrounding the greater Boston area.

3.9.2 Reconstruction of Route 28/McGrath Highway

Based on information provided by DCR, there are currently no immediate plans to reconstruct Route 28/McGrath Highway. The only planned improvements along Route 28/McGrath Highway would be in the form of in-kind repairs with no plans to increase capacity or significantly modify the corridor.

3.9.3 NorthPoint Development and Relocation of Lechmere Station

NorthPoint is the 45-acre area in Cambridge south of the MBTA Fitchburg Line and north of the boundary line that separates Somerville and Cambridge. NorthPoint has been part of a planning initiative undertaken by the City of Cambridge to promote a new, dense urban neighborhood. The area is within the Charles River Basin area between the Charles River Esplanade and Boston's Harbor Park. The proposed mixed-use development may eventually include up to 21 buildings with 2,700 residential units, 2.1 million square feet of office/lab space, and 75,000 square feet of retail space. This project has been reviewed by MEPA. The Final Environmental Impact Report (FEIR) Certificate was issued in December 2002 (EEA # 12650).

The NorthPoint development promises to transform a formerly underutilized area of land straddling Boston, Cambridge, and Somerville into a vital mixed-used, transit oriented neighborhood. The groundbreaking for the NorthPoint development occurred in March 2005, and marked the start of Phase 1 construction on two

residential buildings totaling 329 condominiums, and half of the 10-acre Central Park green space. The NorthPoint project would require continuing coordination among the private developer, the communities, and the MBTA, particularly as the Lechmere Station relocation is undertaken.

Planning and design of the Lechmere Station Relocation project is currently a part of the Green Line Extension Project. Although design and construction funding for the relocation of Lechmere Station was previously being financed primarily by private (NorthPoint development) and Federal (FTA) funds, recent changes in the NorthPoint development have left uncertain the future opening year of the Relocated Lechmere Station. The alignment of the Green Line Extension Project would not be possible without the relocation of the station. Therefore, the Green Line Extension Project has extended its original limits to include planning for the relocation of Lechmere Station.

The Charles E. Smith residential development, adjacent to NorthPoint, is a planned residential community. The project is proposed to redevelop an existing warehouse and retail operation into an apartment complex consisting of approximately 750 housing units in two buildings. A parking structure for approximately 900 spaces is also proposed.

Together, NorthPoint and the Charles E. Smith development would be important contributors to the Green Line Extension Project. In order to properly design station platforms, service headways, and the required number of Green Line vehicles, it is crucial to account for their transit ridership contribution to the expanded Green Line ridership increases. It is also important to note that NorthPoint and the Charles E. Smith residential project are transit-oriented developments that can contribute to Green Line Extension Project's objectives to promote a decrease in automobile dependence within the study area.

3.9.4 Minuteman to Mystic Valley Parkway Path

The DCR is currently developing a Mystic River Reservation Master Plan. The key element of the plan is to provide a guide to implementing a continuous river corridor trail system from the Harvard Avenue Bridge in Medford to the Alford Street Bridge between Somerville and Everett. This trail system would provide access to an almost continuous stretch of DCR property along both banks of the Mystic River, and would link recreation areas, overlooks, and canoe/kayak launches and pull-outs. The trail system would connect to existing trail networks along the Malden River and Alewife Brook, and would provide future access to the Mystic Lakes and Lower Mystic waterfront. The trail system is also envisioned to:

- ▶ Provide safe access to the Mystic River from MBTA subway and bus stops as well as surrounding neighborhoods;

- ▶ Connect to local pedestrian pathways and bicycle trails;
- ▶ Provide recreational loop trails where possible; and
- ▶ Connect destinations such as parks, conservation space, and commercial areas.

This project is of particular interest to the design of the Mystic Valley Parkway/Route 16 Station of the Green Line Extension. Coordinating the physical integration of the pathway with the proposed station can help encourage safe and multi-modal access between these two uses.

3.9.5 Assembly Square Orange Line Station

Several alternative configurations have been developed for the proposed Assembly Square Orange Line Station, a project currently under study by the City of Somerville. All of the alternatives minimize any encroachment on the development parcels at the western side of the proposed station while also minimizing the need for realignment of the Orange Line tracks and the Haverhill/Reading Line commuter rail tracks east of the Orange Line. The station configuration is ultimately intended to consist of three tracks serving two center platforms, taking full advantage of the three-track Orange Line configuration at this location. Operational issues are also being addressed, notably the impact on existing Orange Line operations due to the implementation of a new station. Other issues include impacts on travel times, headways, passenger capacity, and the possible need for additional cars.

The proposed Assembly Square Orange Line Station is an important element in the planning of the Green Line Extension Project because, in order to properly estimate the increase in Green Line ridership totals, it is crucial to understand the relationship between the service the new Orange Line station would provide to the surrounding neighborhoods and how that service will affect the future ridership draw onto the proposed Green Line Expansion.

3.10 Summary

Based on the requirements of the December 1, 2006 Secretary of Environmental Affairs Certificate on the Green Line Extension EENF (EEA Number 13866), the Green Line Extension Project includes a No-Build Alternative, a "Baseline" Alternative, in accordance with the FTA's requirements, and six "Build" Alternatives. Four of the Build Alternatives would provide service to both Medford and to Union Square in Somerville; one Build Alternative would provide service to Medford only (terminating at a new Mystic Valley Parkway/Route 16 Station); and one Build Alternative would provide service to Union Square only.

Alternative 1 is the “Proposed Project” and the subject of this DEIR/EA, for which EOT is currently seeking approval by the FTA. Alternative 2 is EOT’s “Preferred Alternative” which extends the Project to the Mystic Valley Parkway/Route 16. EOT has programmed ‘flex’ funds to construct the extension from College Avenue to Mystic Valley Parkway/Route 16 as a second phase. The second phase will be constructed after 2014 and will require a separate MEPA/NEPA assessment at a future date.

The following chapters discuss the impact the Green Line Extension Project would have on the surrounding environment as well as the proposed mitigation measures to alleviate these impacts.