Alternative Analysis Technical Report

March 2010

RED LINE/BLUE LINE CONNECTOR PROJECT

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Red Line Blue Line CONNECTOR

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Draft Alternatives Analysis Technical Report

Red Line/Blue Line Connector Project

Boston,
Massachusetts

Prepared for **Massachusetts Department of Transportation**
Boston, Massachusetts

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1 Introduction

This report summarizes the results of analyses of the Red Line/Blue Line Connector Project alternatives and their potential environmental impacts. The Project involves the extension of the Massachusetts Bay Transportation Authority's (MBTA's) Blue Line rapid transit line by 0.4 miles from Bowdoin Station under Cambridge Street to the Charles/MGH Station on the MBTA Red Line.

On September 14, 2007, MassDOT (formerly the Executive Office of Transportation [EOT])[1] submitted an Expanded Environmental Notification Form (EENF) to the Secretary of the Executive Office of Energy and Environmental Affairs (EEA) for the Red Line/Blue Line Connector Project. The EEA Secretary's Certificate (November 15, 2007) required three alternatives to be evaluated in a Draft Environmental Impact Report (DEIR):

- No-Build,
- Blue Line Extension to Charles/MGH Station with Elimination of Bowdoin Station, and
- Blue Line Extension to Charles/MGH Station with Relocation of Bowdoin Station.

This chapter provides a basic Project description, outlines potential funding sources, and summarizes the Project's consistency with other nearby transportation projects and land use plans. Supporting technical reports are appended. Subsequent chapters are:

- Chapter 2: Purpose and Need
- Chapter 3: Definition of Alternatives
- Chapter 4: Summary of Environmental Impacts
- Chapter 5: Draft Section 61 Findings and Mitigation Commitments
- Chapter 6: Recommendations

1 Due to recent administrative reorganization, MassDOT replaces the EOT as the umbrella transportation agency for the Commonwealth. MassDOT is the Sponsor of the Red Line/Blue Line Connector project.

1.1 Project Background

The Red Line/Blue Line Connector Project consists of the extension of the MBTA's Blue Line under Cambridge Street to the Charles/MGH Station. The Project area extends from near the Government Center Station west to a new underground Blue Line platform and tail tracks at Charles/MGH Station. Figure 1-1 shows the Project area.

Bowdoin and Scollay Square (now Government Center) Stations opened in 1916 as streetcar subway stations.[2] Streetcars traveling between East Boston and Cambridge used what is now the Blue Line alignment through these stations. A portal in the center of Cambridge Street, near Joy Street, brought streetcars to the surface before they crossed the Charles River on the Longfellow Bridge to Cambridge.

In 1924, the streetcars were replaced by rapid transit trains. Through service to Cambridge was discontinued and Bowdoin Station became the western terminus of the Blue Line, with a loop track to allow the trains to turn around. Until 1952, the portal was used to access a train storage and maintenance facility in Cambridge. That year, a new MBTA rail yard in East Boston opened and the portal was closed.

As the MBTA system matured through the late 1900s, the "missing link" between the Red and Blue Lines gathered attention. In 1986, a feasibility study evaluated a "Bowdoin-Charles Connector."[3] A subsequent preliminary design and environmental study was not completed, but a design and environmental status report was published in November 1987.[4] The feasibility study and status report both identified a subway extension of the Blue Line and an underground Blue Line platform with a pedestrian connection to the elevated Red Line platform at Charles/MGH Station as the preferred option.

The Project was included in regional transportation plans in 2003 and 2007. The 2006 amendments to the State Implementation Plan (SIP)[5] for ambient ozone concentrations, and implementing Massachusetts Department of Environmental Protection (DEP) transit regulations,[6] call for the Red Line/Blue Line Connector

2 Massachusetts Executive Office of Transportation. 2007. *Expanded Environmental Notification Form.* See Attachment 2: Project Plan and Description.
3 STV/Seelye Stevenson Value & Knecht. 1986. *Bowdoin Station & Charles Station Connector Project, Feasibility Study and Final Report.* December 1986.
4 Howard Needles Tammen & Bergendoff / Thomas K. Dyer Inc. 1987. *Bowdoin / Charles Connector Project, Preliminary Design and Environmental Studies, Status Report.* November 1987.
5 Massachusetts Department of Environmental Protection. 2008. *Final Massachusetts State Implementation Plan To Demonstrate Attainment of the National Ambient Air Quality Standard for Ozone*. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection: Boston.
6 Massachusetts Department of Environmental Protection. 2009. Air Pollution Control Regulations, (Universal) Transit System Improvements, Transit System Improvement Projects.310 CMR 7.36(2)(i).

Project's final design to be completed by December 31, 2011[7] as part of an overall strategy to improve air quality.

1.2 Potential Funding Sources

Although MassDOT has committed to funding the design, no funding source has been identified for the construction of the Project. Potential funding sources include the FTA and state bonds.

1.3 Planning Consistency

The Red Line/Blue Line Connector Project is consistent with all applicable federal, state, and local planning. Design of the Project is required by the ozone SIP, and the Project is supportive of local, regional, state, and federal policies related to transportation infrastructure improvements including transit, pedestrian, and bicycle facilities and services. The Project also complements other MBTA, Massachusetts Department of Conservation and Recreation (DCR), and MassDOT projects in the immediate vicinity, and is consistent with municipal land use planning by the City of Boston, the Metropolitan Area Planning Council (MAPC), and the Commonwealth.

The Charles River Basin Infrastructure Synchronization Project[8] report describes twelve major road and/or bridge projects along the river that are scheduled in the next five to 20 years. Completing these projects will require substantial coordination to minimize traffic disruptions and environmental impacts. Three of these projects are within 0.25 mile of the Red Line/Blue Line Connector Project area.

The Project's consistency with the ozone SIP, other related or nearby transportation projects, and local and regional land use planning is summarized in the following paragraphs.

1.3.1 State Implementation Plan

As mentioned above, the ozone SIP, amended with the Air Pollution Control Regulations, requires MassDOT to complete design of the Red Line/Blue Line Connector Project by December 31, 2011. The Project, along with several other transit projects, is intended to, in part, offset increased air pollutant emissions resulting from increased automobile traffic using the recently completed Central Artery/Tunnel

7 Massachusetts Department of Transportation. 2009. *Red Line/Blue Line Connector Project* website: http://www.eot.state.ma.us/redblue/ Accessed 1 October 2009.

8 Massachusetts Executive Office of Transportation. 2008. *Charles River Basin Infrastructure Synchronization Project Final Report*. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works. Prepared by BETA Group, Inc.: South Norwood, MA, in association with Simpson Gumpertz & Heger, and CDW.

highway system through downtown Boston. By improving transit access to jobs, education, and medical facilities, the Project is anticipated to reduce automobile use and, thereby, air pollution.

1.3.2 Blue Line Railway Car Upgrades

As part of the Blue Line Modernization Project, the MBTA has ordered 94 new cars to replace the existing 70-car fleet.[9] Additionally, the train length was expanded to six cars, concurrent with other station renovation projects which lengthen the platforms. Until 2005, the Blue Line operated with four-car trains due to the short platforms, which were originally designed to accommodate streetcars, at several Blue Line stations (including the Bowdoin Station). The operation of six-car trains increases the line's peak passenger carrying capacity by 50 percent.

The Red Line/Blue Line Connector Project is consistent with the railway car upgrade project in that both of the alternatives (eliminate or relocate Bowdoin Station) will accommodate the six-car train length. Eliminating the station would have no effect on the six-car trains, and relocating the station would be accomplished in part to construct both an inbound and outbound platform of sufficient length. The new Blue Line platforms at the Charles/MGH Station would also be of sufficient length to accommodate the six-car trains.

1.3.3 Government Center Modernization Project

As noted above, several Blue Line stations are being renovated and expanded to accommodate six-car trains.[10] The Blue Line platform modifications at Government Center Station will enhance the station's ability to accommodate six-car trains, allowing the Blue Line trains to carry more passengers and meet an environmental commitment made as part of the Central Artery/Tunnel Project.[11] The station will be outfitted with new elevators, escalators, stairs, lights, and communication systems. These improvements will bring the station into compliance with the Americans with Disabilities Act of 1990 (ADA). MBTA is also reviewing options for constructing a second headhouse at Government Center Station along Cambridge Street for the Blue Line.

The Red Line/Blue Line Connector Project is consistent with renovating Government Center Station. If Bowdoin Station is eliminated, the renovated Government Center Station will accommodate patrons currently using the Bowdoin Station.

9 Massachusetts Bay Transportation Authority. 2009. *T-Projects and Accessibility* website: http://www.mbta.com/about_the_mbta/t_projects/projects_accessibility/. Accessed 13 November 2009.
10 Massachusetts Bay Transportation Authority. 2002. *North Shore Transit Improvement Project- Major Investment Study*. Massachusetts Bay Transportation Authority: Boston. Prepared by PB/DMJM + Harris.
11 Massachusetts Bay Transportation Authority. 2009. *Government Center Modernization* website: http://www.mbta.com/about_the_mbta/t_projects/default.asp?id=1004. Accessed 26 October 2009.

1.3.4 Blue Line Extension to Lynn

The MBTA has studied extending the Blue Line from its current northernmost stop, at Wonderland Station in Revere, into Lynn. This project would improve transit access for residents of northeastern suburbs, and has been identified as a high-priority project by the MBTA.[12]

The Red Line/Blue Line Connector Project is consistent with extending the Blue Line to Lynn. One of the key goals of the Project is to improve transit access to the Red Line for patrons in northeastern suburbs, improving access to jobs, education, and medical services. Extending the Blue Line to Lynn would further this goal.

1.3.5 Urban Ring Project

The Urban Ring is a three-phased, circumferential transit improvement project within a corridor approximately two miles outside of Downtown Boston. The project includes segments within Boston, Cambridge, Somerville, Brookline, Everett, Medford, and Chelsea; these areas include some of the fastest growing locations around Boston.[13] The Urban Ring would provide new bus rapid transit services that would connect to existing radial transit lines (subway, commuter rail, and bus) to create shorter transit trips and fewer transfers. The Urban Ring would connect with the Red Line in Boston at Broadway Station and in Cambridge at the Kendall/MIT and Harvard Square Stations, and with the Blue Line at Airport Station.[14]

The Red Line/Blue Line Connector Project is consistent with the Urban Ring project in furthering downtown connections between the radial transit lines.

1.3.6 Longfellow Bridge Restoration

MassDOT and DCR are undertaking a project to rehabilitate the Longfellow Bridge across the Charles River between Boston and Cambridge.[15] The Longfellow Bridge carries Cambridge Street and the Red Line alignment. The main goals of this project are to address the bridge's current structural deficiencies, upgrade its structural capacity, and bring the bridge up to modern code. This project must restore an ADA-compliant sidewalk across the bridge while satisfying MassDOT Highway

12 Boston Metropolitan Planning Organization. 2009. *Transportation Improvement Plan*. See in particular Appendix A, page 27.

13 Massachusetts Executive Office of Transportation. 2009. *The Urban Ring* website: http://www.theurbanring.com/. Accessed 26 October 2009.

14 Massachusetts Executive Office of Transportation. 2009. *Notice of Project Change: Circumferential Transportation Improvements in the Urban Ring Corridor; Urban Ring Phase 2*. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works: Boston. The Notice of Project Change was withdrawn on October 15, 2009, , and withdrawn from MEPA evaluation on January 22, 2010 due to financial constraints. Letter from James Aloisi, Secretary of EOT, on October 15, 2009 to Ian Bowles, Secretary of EEA and letter from Jeffrey B. Mullan. Secretary and Chief Executive Officer of MassDOT on January 22, 2010 to Ian Bowles.

15 Massachusetts Highway Department. 2009. *Restoration of the Longfellow Bridge* website: http://www.mhd.state.ma.us/default.asp?pgid=longfellowbridge/longfellow&sid=level2. Accessed 26 October 2009.

Division (formerly, MassHighway) design standards and maintaining the historical character of the bridge.[16] The preliminary design phase was completed in May 2009. Final design will be completed in July 2010. Construction is scheduled to begin in 2011 and be completed in 2014.

The Red Line/Blue Line Connector Project is consistent with the Longfellow Bridge Restoration Project in providing ADA-compliant access to pedestrians using the bridge and Charles/MGH Station. The Longfellow Bridge Restoration Project will abut Charles/MGH Station, but would not encroach into the Red Line/Blue Line Connector Project construction area. The Longfellow Bridge Restoration Project will not directly impact Charles/MGH Station, and impacts to DCR parkland along the Charles River will be separated from the Red Line/Blue Line Connector Project impacts to Charles Circle by Charles Street, Charlesbank Road, and Embankment Road (the latter two of which are also commonly referred to as Storrow Drive).

1.3.7 Craigie Dam Bridge and Drawbridge

The Craigie Dam bridge and drawbridge are located about 0.25 mile north of the Red Line/Blue Line Connector Project area, and cross Charles River as Route 28/ Monsignor O'Brien Highway. The Craigie Dam bridge project will renovate the aging structure and widen the pedestrian walkway.[17] The Craigie drawbridge project will replace the existing superstructure to provide better weathering protection for machinery and comfort of vehicular and pedestrian traffic.[18] The two projects are closely related and will be completed in phases, from 2009 through 2011, to minimize traffic disruptions.[19]

The Red Line/Blue Line Connector Project complements the Craigie Dam bridge and drawbridge projects in improving infrastructure including transit, pedestrian, and bicycle facilities and services across the lower Charles River.

1.3.8 Storrow Drive Tunnel

The Storrow Drive Tunnel, between Arlington and Clarendon Streets about 0.25 mile southwest of Charles Circle, carries eastbound traffic on Storrow Drive. Westbound traffic travels atop the tunnel. The tunnel was constructed in 1951 and needs to be replaced due to deterioration, leaks, and design deficiencies that prevent tall

16 Massachusetts Highway Department and DCR. 2009. *Environmental Notification Form: Longfellow Bridge Rehabilitation Project.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, Massachusetts Highway Department and Department of Conservation and Recreation: Boston.
17 Massachusetts Department of Conservation and Recreation. 2009. *Craigie Drawbridge and Craigie Dam Bridge Rehabilitation Project* website: http://www.mass.gov/dcr/projects/craigie.htm. Accessed 27 October 2009.
18 *Ibid.*
19 Massachusetts Executive Office of Transportation. 2008. *Charles River Basin Infrastructure Synchronization Project Final Report*. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works. Prepared by BETA Group, Inc.: South Norwood, MA, in association with Simpson Gumpertz & Heger, and CDW. See Figure H-2, Traffic Reassignment Routes, Craigie Dam Bridge and Craigie Drawbridge, in Appendix H.

emergency vehicles from entering the low-level structure.[20] Interim repairs to address immediate concerns and extend the tunnel life by five years were completed in 2009.[21] Design work for the rehabilitation project is ongoing and the construction project is expected to begin prior to the expiration of the five-year extended life.[22]

The Red Line/Blue Line Connector Project complements the Storrow Drive Tunnel Reconstruction Project. Both projects enhance safety and mobility for travelers in the lower Charles River basin.

1.3.9 City of Boston Land Use Planning

The City of Boston has enacted several land use plans, area plans, and open space plans, and conducted several planning efforts in recent years that are relevant to the Project. Massachusetts General Hospital (MGH), which is directly adjacent to the project corridor, recently completed an Institutional Master Plan. The City of Boston has also worked with developers on several major development projects to revitalize the Cambridge Street corridor in recent years. Municipal land use plans, open space plans, institutional plans, and other planning relevant to the Red Line/Blue Line Connector Project include:

- *A Framework for Planning and Development of the West End Area*, prepared by the Boston Redevelopment Authority in cooperation with the West End Area Planning Group and the Boston Transportation Department, 2003.
- *Boston 400: Connecting the City and Its People*, a comprehensive, long-term planning effort for all of the city's neighborhoods carried out by the Boston Redevelopment Authority. Began in 1997 and entailed community meetings and extensive discussion about the future of the neighborhoods and the city.
- *Open Space Plan 2002-2006*, Boston Parks and Recreation Department, 2002.
- *Fostering Transit-Oriented Development in Boston*, ongoing planning initiative by the Boston Redevelopment Authority begun in 2003.
- *Massachusetts General Hospital Institutional Master Plan*, developed by MGH, approved by the Boston Redevelopment Authority in 2006.

In addition to these plans and efforts, recent developments in which the City of Boston has worked with developers to contribute to the revitalization of the Cambridge Street corridor have included:

20 Massachusetts Department of Conservation and Recreation. 2006. *Environmental Notification Form: Storrow Drive Tunnel Reconstruction Project*. Commonwealth of Massachusetts, Department of Conservation and Recreation. Prepared by Epsilon Associates, Inc.: Maynard, MA.

21 Massachusetts Department of Conservation and Recreation. 2009. *Q&A Storrow Drive Tunnel Interim Repair Project* website: http://www.cambridgema.gov/TheWorks/contents/constrdocs/pdffiles/StorrowTunnelQA.pdf. Accessed on 26 October 2009.

22 Massachusetts Executive Office of Transportation. 2008. *Charles River Basin Infrastructure Synchronization Project* Final Report. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works. Prepared by BETA Group, Inc.: South Norwood, MA, in association with Simpson Gumpertz & Heger, and CDW.

- Redevelopment of Charles River Plaza, on Cambridge Street near Staniford Street, including redeveloping 650,000 square feet of existing space, constructing more than 400,000 square feet of new space in two buildings, and adding 10,000 square feet of retail space including a new supermarket.
- Revitalization of the Saltonstall Building, at 100 Cambridge Street, including constructing 75 new units of housing and 35,000 square feet of retail space.
- Redevelopment of the former Charles Street Jail into a 305-room, 239,000-square foot hotel.

The plans developed by the City of Boston encourage compact, mixed-use development and revitalization of lands around the Project area, as well as transit-oriented development and linkages between open space and mass transit. The City's recent efforts with developers in the Project corridor have worked toward similar goals, and the MGH Master Plan promotes compact development on its West End Campus, including a new 10-story building that would be located behind the Yawkey Center for Outpatient Care.

The Red Line/Blue Line Connector Project is consistent with the land use plans of the City of Boston as well as the MGH Master Plan. The Red Line/Blue Line Connector Project would be beneficial in terms of transportation access and mobility, air quality and the environment, and land use and economic development, consistent with these municipal and institutional plans and policies.

1.3.10 MAPC Regional Policy Plan

The most recent regional policy plan for the Boston region is MetroFuture,[23] completed in 2009 by Metropolitan Area Planning Council (MAPC). The basic tenet of the plan is that concentrating development in previously developed areas is economically and environmentally more practical than the current model of scattered growth. MetroFuture emphasized that concentrated development encourages and enhances transit use, ride sharing and pedestrian traffic with a resultant reduction in automobile travel, traffic congestion, air pollution and fuel consumption, and in addition, reduces the pressure to develop open space and environmentally sensitive lands.

In developing MetroFuture, participants developed four scenarios for growth in the Boston region, including one that would extend current growth trends and three alternate scenarios that would direct growth in a more compact way (with differences in the degree and pace of change). The recommended growth plan envisions a future in which growth is focused in areas that can meet the needs of new residents. It envisions more urban "starter homes" in the Inner Core and Regional Urban Centers; suburban growth steered to town centers and villages on previously

23 Metropolitan Area Planning Council. 2009. MetroFuture: Making a Greater Boston Region.

developed land; and clustering of housing in rural areas to protect open space. In the Inner Core and Regional Urban Centers, the recommended plan also envisions increased transit, more parks and shops, revitalized main streets, and new pathways opening up access to recreational and natural areas.

The Red Line/Blue Line Connector project is consistent with the MetroFuture plan, as it would provide enhanced transit to improve residents' transportation access and mobility.

1.3.11 Massachusetts Sustainable Development Principles

The Commonwealth of Massachusetts has adopted a set of Sustainable Development Principles which are intended to promote sustainable development through integrated energy and environment, housing and economic development, transportation and other policies, programs, investments, and regulations.[24] Several of these principles are particularly relevant to the Red Line/Blue Line Connector Project: 1) Concentrate Development and Mix Uses; 2) Advance Equity; 7) Provide Transportation Choice; 8) Increase Job and Business Opportunities; and 10) Plan Regionally. The Red Line/Blue Line Connector Project is consistent with the Commonwealth's Sustainable Development Principles.

24 Massachusetts. 2009. *Sustainable Development Principles.* Website: http://www.mass.gov/Agov3/docs/smart_growth/patrick-principles.pdf. Accessed 14 December 2009.

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Purpose and Need

The purpose of the Red Line/Blue Line Connector Project is to implement transit service enhancements connecting the Red Line and the Blue Line that will increase transit accessibility, ensure equitable distribution of transit services, increase transit ridership, improve regional air quality, and support opportunities for smart growth initiatives and sustainable development at a reasonable cost and within a reasonable timeframe. The Project is needed to comply with the ozone SIP regulatory requirement cited in Section 1.1.

A key Project goal is to link residents in East Boston and the North Shore (areas identified by the Commonwealth of Massachusetts as environmental justice communities [see Section 4.11]) with jobs, services, and educational opportunities in Boston's West End and the Cities of Cambridge and Somerville. In addition, Red Line passengers from the northwestern suburbs of Boston would have direct access to the Blue Line without making intermediate transfers on the Orange or Green Lines. Implementing the Red Line/Blue Line Connector could also:

- Increase transit ridership, especially by providing hospital workers and visitors with a direct Red Line/Blue Line connection.
- Improve mobility and regional access, especially for residents of East Boston, the North Shore, Cambridge, and suburbs to the northwest of Boston, benefitting both environmental justice and non-environmental justice populations.
- Reduce congestion in downtown transfer stations.
- Improve regional air quality by reducing automobile traffic.

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3 Definition of Alternatives

This chapter provides summary descriptions of the three Alternatives required to be analyzed in the DEIR: the No-Build Alternative, Alternative 1 (Red Line/Blue Line Connector with Eliminated Bowdoin Station), and Alternative 2 (Red Line/Blue Line Connector with Relocated Bowdoin Station). The process by which these alternatives were selected for analysis in the DEIR, and detailed descriptions of each, is described in the *Definition of Alternatives Report*. [25]

3.1 No-Build Alternative

The No-Build Alternative provides a baseline against which each of the two Build Alternatives will be evaluated.

3.1.1 Description

Under the No-Build Alternative, it is assumed that Red Line and Blue Line operations would remain similar to today's operations with the exception of the infrastructure improvements proposed in the MBTA's long range regional transportation plan or five-year Capital Improvement Program.[26] The existing stations and tunnels within the Project area are described below.

3.1.1.1 Stations

Two stations, Bowdoin and Charles/MGH, are serviced by the Blue Line and the Red Line, respectively. These stations are described in the following paragraphs.

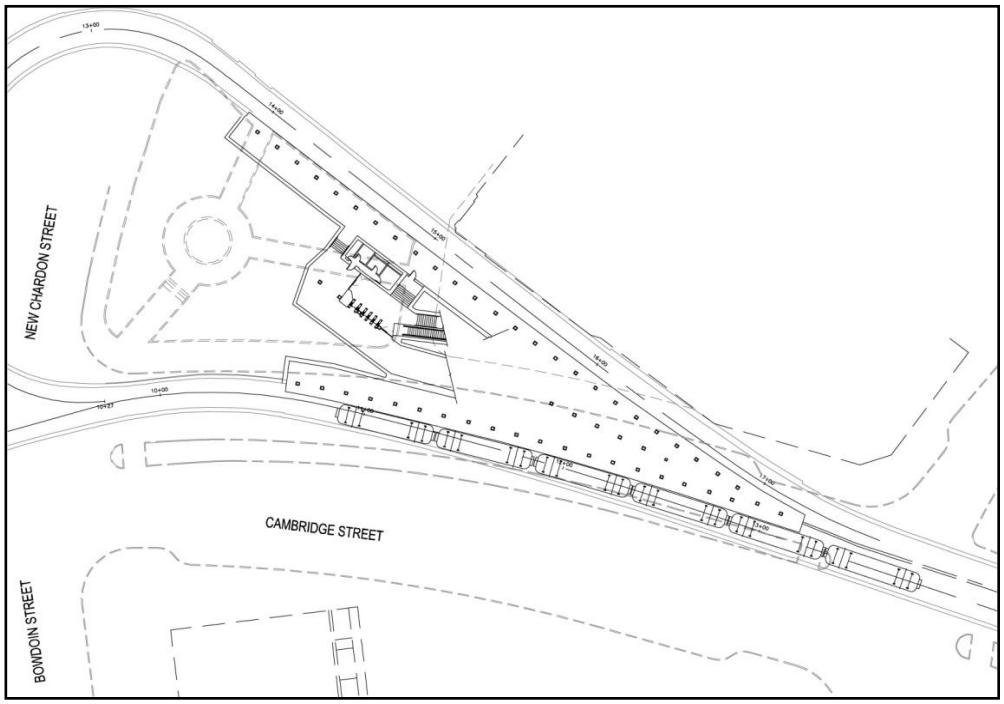
25 STV. 2009. *Red Line/Blue Line Connector Project: Definitions of Alternatives Report*. Prepared by STV, Inc. in association with Vanasse Hangen Brustlin, Inc.: Boston.

26 Massachusetts Bay Transportation Authority. 2009. *About the MBTA: Program for Mass Transportation*. Website: http://www.mbta.com/about_the_mbta/t_projects/default.asp?id=11993. Accessed 11 December 2009.

Bowdoin Station

Bowdoin Station is located in downtown Boston just west of Government Center. The station is the southern terminus of the Blue Line. It was constructed as part of the East Boston Tunnel Extension project in 1916 and used for streetcar service.[27] The line was converted to electric rapid transit service by 1924, and the platforms were raised to accommodate the new trains. The station was renovated in 1968 as part of a systemwide modernization program. Figure 3-1 shows the existing Bowdoin Station platform configuration.

Figure 3-1 Existing Bowdoin Station (Platform Configuration)



At this station, six-car trains can only be accommodated on the westbound platform. The platform is not long enough in the eastbound direction to fit all six cars: two cars stop within the tunnel while the last four cars are accessible at the platform. Support staff on the platforms, and motormen using television monitors, observe door operations while passengers board.

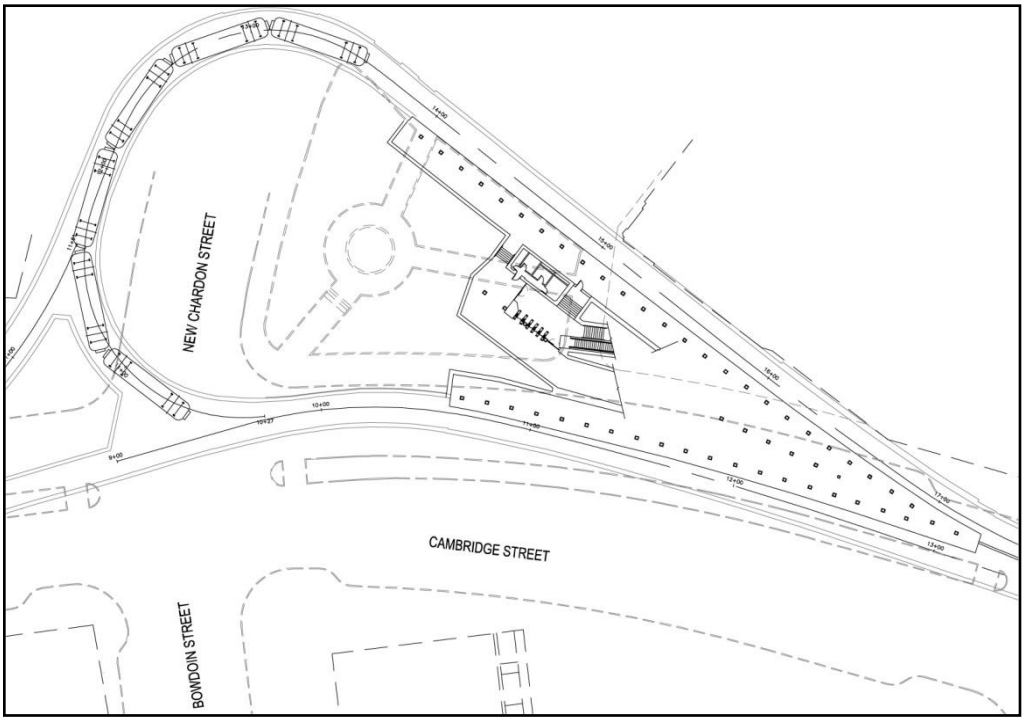
27 See Appendix L, *Red Line/Blue Line Connector Historic Resources Reconnaissance Survey and Archaeological Resources Assessment*.

Bowdoin Station Loop

When Bowdoin Station was constructed in 1916, streetcars from East Boston surfaced onto Cambridge Street at the portal near Joy Street, and continued over the Charles River on the Longfellow Bridge into Cambridge. In 1924, the streetcars were replaced by rapid transit cars and the connection between East Boston and Cambridge was eliminated. Bowdoin Station became the end of the Blue Line. In 1952, the Cambridge Street portal was closed and backfilled, leaving dead end tail tracks extending off the loop track at Bowdoin Station. The 600- to 700-foot length of tail track is referred to as the Bowdoin Yard and is used for train storage during the winter months.

Currently, inbound Blue Line trains use the loop track to reverse direction and begin the outbound trip. However, the tight radius of the curve does not allow for safe emergency evacuations while in the loop. Prior to entering the loop, all westbound passengers are required to exit the train. Once the train travels through the loop, eastbound passengers are able to board on the south side of the platform. Figure 3-2 shows the existing Bowdoin Station platform and loop track configuration.

Figure 3-2 Existing Bowdoin Station Loop Configuration



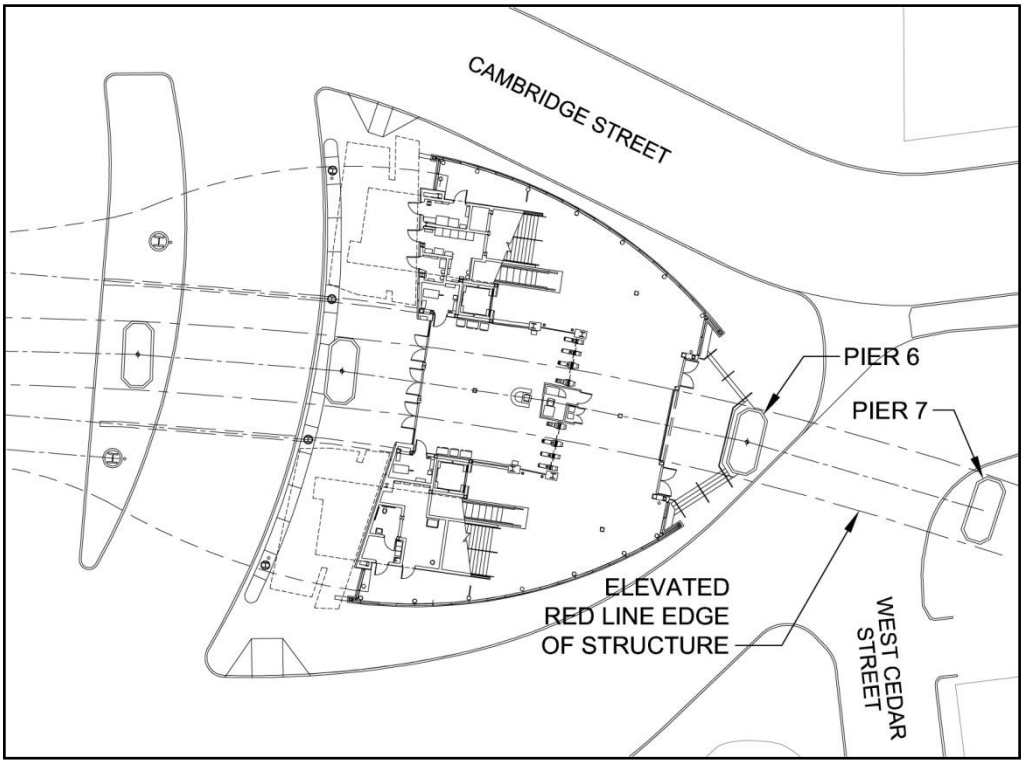
Charles/MGH Station

Charles/MGH Station is located along the Boston side of the Charles River; the historic Longfellow Bridge is at the station's west end. East of the station, the trains make their descent into the Red Line tunnel under Beacon Hill.

Constructed in 1931, Charles/MGH Station was designed to accommodate the Red Line elevated track, which was built in 1912. The original station was built on a traffic island with a below-grade passageway that allowed pedestrian access from the sidewalk rather than through the traffic circle. In 1961, the underground passageway was replaced with overhead walkways that connected the elevated platforms on both the north and south sides in a three-story structure.

Charles/MGH Station was again renovated in 2007 as a fully ADA-accessible station. The new two-story building replaced the elevated pedestrian footbridges and three-story headhouse. The station currently consists of a street level headhouse entrance and fare collection lobby located in Charles Circle, and two semi-enclosed side platforms elevated above the lobby area. The platforms are accessible to patrons via stairs, upward escalators, and elevators. Figure 3-3 shows the existing Charles/MGH Station mezzanine.

Figure 3-3 Existing Charles/MGH Station (Mezzanine Level)



Although the new station was originally planned to accommodate a connection between the mezzanine to a below-grade Blue Line Station, the configuration of the existing traffic circle, structural piers, and station limit the opportunities for a future below-grade connection.

3.1.1.2 Existing Operations

The Blue Line is one of the four rapid transit lines operated by the MBTA. The Blue Line currently operates between Wonderland Station in Revere to Bowdoin Station in Boston. The Blue Line connects to the Green Line at Government Center and the Orange Line at State Street. Today there is no direct connection between the Red Line and the Blue Line; passengers wishing to do so must transfer to either the Orange or Green Lines to make this connection.

In September of 2008, the MBTA began operating six-car trains in revenue service on the Blue Line. All Blue Line stations can accommodate the six-car trains except for eastbound platform at Bowdoin Station. Currently, at this station, two cars on eastbound trains must stop in the tunnel and passengers must use door controls on the four cars on the platform. Television monitors are used by motormen to observe door operations.

Blue Line service operates from 5:00 AM to 1:00 AM, weekdays and Saturdays; and 6:00 AM to 1:00 AM on Sundays. Presently, Bowdoin Station is closed weekday evenings (after the 6:18 PM departure and the service begins and ends at Government Center).

Frequencies on the Blue Line are presented below:

Wonderland to Bowdoin –Westbound - Weekdays

- Early Morning - 5:00 AM to 6:30 AM: every 6 to 7 minutes
- AM Rush - 6:30 AM to 9:00 AM: every 4 to 5 minutes
- Midday 9:00 AM to 3:30 PM: every 4 to 11 minutes
- PM Rush 3:30 PM to 6:30 PM: every 4 to 5 minutes

Wonderland to Government Center-Westbound- Weekdays

- Evening 6:30 PM to 8:00 PM: every 9 to 10 minutes
- Late Night 8:00 PM to Close: every 10 to 13 minutes

Bowdoin to Wonderland –Eastbound – Weekdays

- Early Morning - 5:00 AM to 6:30 AM: every 6 to 7 minutes
- AM Rush - 6:30 AM to 9:00 AM: every 4 to 5 minutes
- Midday 9:00 AM to 3:30 PM: every 4 to 11 minutes
- PM Rush 3:30 PM to 6:30 PM: every 4 to 5 minutes

Government Center to Wonderland – Eastbound – Weekdays

- Evening 6:30 PM to 8:00 PM: every 7 to 9 minutes
- Late Night 8:00 PM to Close: every 10 to 13 minutes

Based on the most current running times and headways that appear on the September 5, 2009 version of the Blue Line headway report, 13 trains (12 scheduled and one run-as-directed train) are required to provide peak period service.

3.1.1.3 Operating Plan

In the No-Build Alternative the existing system will support a minimum 2-minute, 20-second headway once the two-track turn back is implemented at Wonderland Station; however, the MBTA would not schedule to such headway due to the need for recovery time in the schedule. Moreover, the MBTA cannot clear and refill at the Blue Line station platforms, particularly State Street Station, in less than 3 to 4 minutes. Therefore 13 trains (12 scheduled and one run-as-directed train) will continue to be required to provide peak period service with an average peak period headway of 4.5 minutes.

Given the run times and the size of the Blue Line fleet, and assuming 90 percent fleet availability, the shortest possible scheduled headway would be 3 minutes and 15 seconds. However, 15 to 20 percent is normally added to the run times to account for the fact that most operators will not operate so close to the signal system capability and for variations in dwell time. As a result, the shortest real scheduled headway would be between 3 minutes, 44 seconds and 3 minutes, 53 seconds. It is assumed that the current average peak period headway of 4.5 minutes would remain.

The MBTA Blue Line Signal Upgrade Project has been completed. When the installation of the catenary for the new crossover at Wonderland Station is complete, the improvements to headway and run times will be complete. The upgraded signal system will provide a two-track turn back at Wonderland Station and will increase speeds on the eastbound approach to Orient Heights Station from 20 mph to 40 mph.

3.1.1.4 Capital Improvements

All stations on the Blue Line will eventually be ADA-accessible,[28] including Bowdoin Station if retained. In general, accessibility improvements to the stations will consist

28 Massachusetts Bay Transportation Authority, 2009. T-Projects and Accessibility. Website: http://www.mbta.com/about_the_mbta/t_projects/projects_accessibility/. Accessed 14 December 2009.

of installing elevators to transport passengers between the platform levels and the street level, and eliminating obstacles to wheelchair circulation within the stations. Stations on the Blue Line have high level platforms, meaning platforms are at the same height as vehicle floors and do not require further improvement for ADA compliance. At stations with parking facilities, some modifications will be made to provide ADA-accessible spaces.

3.2 Alternative 1: Red Line/Blue Line Connector with Elimination of Bowdoin Station

Operations at Bowdoin Station are constrained by the platform length and loop track configuration. Eliminating the station and loop track would allow for relatively faster travel with little transit access penalty to passengers, who could board at either the Government Center or Charles/MGH Stations.

3.2.1 Description

Alternative 1 would extend the Blue Line from Bowdoin Station to Charles/MGH Station, eliminating the existing Bowdoin Station. The station would be deactivated, although a passageway would be retained to allow for emergency egress. A new underground Blue Line platform would be constructed below and to the east of the existing Charles/MGH Station. The Blue Line platform at Charles/MGH Station would connect to the existing elevated Red Line platforms via stairways, escalators, and elevators allowing passengers to transfer between the two lines. Figures 3-4a-c show a conceptual plan of Alternative 1: Red Line/Blue Line Connector with Elimination of Bowdoin Station, including both horizontal and vertical alignments. In the current configuration only one elevator is shown. Per the request of the MBTA, the need for redundant elevators will be evaluated in the next phase of design.

3.2.1.1 Stations

Bowdoin Station would be eliminated in this alternative, but the headhouse would be retained. The existing subsurface structures would be deactivated, although portions of the station would be used for emergency egress through the headhouse. During Project construction, Blue Line service would terminate at Government Center. A new subsurface platform would be constructed below and to the east of Charles/MGH Station to service the Blue Line. New components of Charles/MGH Station are outlined in Capital Improvements below.

3.2.1.2 Tunnel

A two-track tunnel, with crossover and two tail tracks, would extend the Blue Line from its current endpoint at Bowdoin Station to Charles/MGH Station. The loop would be eliminated. A description of the new trackwork is provided in Capital Improvements below.

3.2.1.3 Capital Improvements

The capital improvements associated with Alternative 1 are described at a conceptual level in the following paragraphs.

Trackwork

The new track would be laid within side-by-side driven tunnels. All trackwork would remain within the Cambridge Street right-of-way. The track would be installed by direct fixation to absorb vibrations and reduce noise transmission. Top-of-track depth at its lowest elevation (at Staniford Street) would be approximately 65 feet below surface grade. The maximum track slope would reach 4.2 percent from Government Center Station down to the new platform at Charles/MGH Station.

Lengths of track sections would be:

- North Tail Track – Approximately 400 feet from the west end of the proposed Charles/MGH Station Blue Line platform to beneath the Massachusetts Eye and Ear Infirmary parking lot.
- South Tail Track – Approximately 300 feet from the west end of the proposed Charles/MGH Station Blue Line platform to beneath the eastern sidewalk of Charles Street on the south side of Charles Circle
- Blue Line Extension (Government Center Station to Charles/MGH Station)
  - Inbound Track – 2,480 feet
  - Outbound Track – 2,490 feet
- Total Proposed New Track Length (both directions, including tail tracks) – 5,710 feet

Crossovers

- Full Crossover – east of Charles/MGH Station Blue Line platform
- Left hand crossover - east of Government Center Station

Horizontal Circulation Elements

Entrance and exit into the Blue Line platform at Charles/MGH Station would be provided through the existing mezzanine level via stairs, up/down escalators, and an elevator. At the platform level, these primary entrance/exits would be located at the west end of the platform.

The Blue Line platform at Charles/MGH Station would be a center platform configuration with tangent track on both sides. Dimensions of the platform would be:

- Length – 320 feet
- Width – 26 feet

Vertical Circulation Elements

Stairs, escalators, and elevators would be located where they are most visible and easily identified as a means of accessing the various levels:

- Stairs – 8-foot wide stairs would provide access from Charles/MGH Station Red Line mezzanine to a new Blue Line mezzanine and then down to the Blue Line platform.
- Escalators – Two escalators (each 3 feet, 7 inches wide) would travel in both up and down directions from the Red Line mezzanine to a new Blue Line mezzanine and then down to the platform.
- Elevator – At this phase of design one elevator would provide vertical circulation from the existing Red Line mezzanine directly to the Blue Line platform. The elevator would be located at the west end of the platform.

  The next phase of design, per the request of the MBTA at a December 10, 2009 meeting with MassDOT, MBTA, and the Design Team, will include development of redundant elevator options at the station.

Emergency Egress

Emergency egress would be provided at two locations:

- Charles/MGH Station Blue Line Platform Emergency Egress – access would be provided via stairs at the east end of the platform. The stairs would lead to an access hatch located in the Cambridge Street median between Strong Place and Anderson Street.
- Tunnel Emergency Egress below Cambridge Street/Bowdoin Street – intersection access would be provided via stairs at track level, which would lead up through the Bowdoin Station mezzanine. The Bowdoin Station headhouse, which reaches grade level, would be used for emergency egress only.

Mechanical Considerations

Ventilation would be provided for passenger comfort and help to mitigate the piston effects caused by air being pushed and pulled through the tunnel by the trains. It would also be used to provide smoke control within the tunnels and at the platform.

- Ventilation Room No. 1 would be located within the westbound tunnel wall, 250 feet east of the proposed platform. The ventilation grate would be located within the Cambridge Street median.
- The existing Joy Street Ventilation Room No. 2 would be abandoned in place.
- Ventilation Room No. 3 would be located just east of the Cambridge Street/ Bowdoin Street egress shaft, approximately 560 feet west of the existing Government Center Station platform. The access hatch and grate would be located within the Cambridge Street median.

Power, Signal, and Communication Systems

Electrical infrastructure for Alternative 1 would consist of:

- Traction Power Substation – located within the Charles/MGH Station Blue Line mezzanine.
- Electric Power Substation – located within the Charles/MGH Station Blue Line mezzanine.
- Communication and Cellular Carriers Room – located at the Charles/MGH Station Blue Line platform level.
- Main Emergency Electrical Room – located at the Charles/MGH Station Blue Line platform level.
- Signal Bungalow – located adjacent to the eastern end of the Charles/MGH Station Blue Line platform at track level. Access would be provided through the emergency egress stair corridor.
- Electric Power Substation located in Ventilation Room No. 1 area near North Anderson Street.
- Electric Power Substation located in Ventilation Room No. 3 east of the Cambridge Street/Bowdoin Street egress shaft.

3.2.1.4 Construction Methodology

The construction methodology for Alternative 1 would be a combination of cut-and-cover, mined tunnel, and the sequential excavation method.[29] Cut-and-cover construction involves excavating a trench for the subsurface infrastructure, constructing sidewalls and roofs, and covering the structure with fill material back to surface level. This method would be used at the eastern end of the Project area, for an approximately 550-foot long section from Bowdoin Station toward Government Station. Additionally cut-and-cover methodology will be used at the tunnel boring machine (TBM) access shaft just east of Charles/ MGH Station and at the vent and crossover area east of Anderson Street. A mined tunnel is constructed by a TBM, which advances horizontally from an entrance point (access shaft) to the destination. A precast concrete ring beam liner would be installed as the tunnel is advanced. Two parallel tunnels, approximately 1,900 feet long and extending from Charles/MGH Station to Bowdoin Station, would be constructed with this method. The sequential excavation method allows for progressive construction of a tunnel opening by excavating areas only as large as the soil can support prior to installation of structural supports and shotcrete. This method would be used at Blue Line platforms at Charles/MGH Station and tail tracks.

3.2.2 Operating Plan

The operating plan for the Blue Line under Alternative 1 would take into consideration hours of operation, train frequency, and ridership.

3.2.3 Blue Line Operational Analysis

The Blue Line Operations Memorandum (Appendix A) analyzes the operations of the Blue Line for Alternative 1 as compared to the No-Build Alternative and Alternative 2. It is assumed that the span of service and frequencies on the Blue Line would remain unchanged under this Alternative.

Alternative 1 assumes the elimination of Bowdoin Station. The impact on travel time resulting from the extension of Blue Line service to Charles/MGH Station is 2.5 minutes of additional travel time (assuming the layover at Charles/MGH Station is 4.0 minutes and the layover at Wonderland is 8.0 minutes).[30] Therefore, 14 trains /84 cars (running in both directions), including one "Run-As-Directed" train, would be required to provide service under 4.5 minute peak headways.

29 See Appendix G, Subsurface Excavation and Soil Removal, *Geotechnical Interpretive Report*.

30 It should be noted that the net increase in round trip running time takes into account the time savings accrued from the elimination of the Bowdoin Loop. That is, under both alternatives, westbound trains would no longer have to travel around the loop to get into position to travel eastbound. This move currently takes four minutes, according to the July 29, 2009 STV incorporated signaling report.

The Supplemental Analyses of Ridership and Rapid Transit Operations[31] evaluated the ability of the Blue Line to accommodate the projected increase in ridership forecast under within Alternative 1. Alternative 1 is projected to have a weekday ridership of 77,200 in 2030. This is an increase of 19.34 percent over the 2003 level (64,668 weekday riders). Applying this growth percentage to the 2003 AM peak 15 minute ridership results in a peak 15-minute ridership of 1,703 in the AM rush period.

Using MBTA vehicle loading standards for the number of passengers per car and per train, the total capacity provided by operating 6-car trains on a 4.5-minute headway was calculated to be 1,900 passengers. Therefore, it appears that the current peak period schedule of 6-car trains will provide sufficient capacity to carry the projected 2030 ridership under Alternative 1 consistent with MBTA service standards for the Blue Line.

Table 3-1 presents the expected daily Red Line and Blue Line ridership under Alternative 1 (as compared to the No-Build Alternative).

Table 3-1 Alternative 1 Trip Summary

	No-Build (2030)			Alternative 1		
	Daily Boardings	Walk-Ins	Transfers	Daily Boardings	Walk-Ins	Transfers
Bowdoin Station	1,450	1,450	0	No Service	No Service	No Service
Charles/MGH Station	10,050	10,050	0	22,390	11,170	11,220
Red Line	10,050	10,050	0	12,920	7,310	5,610
Blue Line	No Service	No Service	No Service	9,470	3,860	5,610

3.2.4 Project Schedule

The anticipated duration of constructing Alternative 1 is six years, three months. Assuming a starting time at the beginning of the third quarter of 2012, the Project would be completed by the end of the third quarter of 2018.

3.2.5 Cost Estimate

Based on a 10 percent conceptual level of design, the estimated cost to construct Alternative 1 is $748 million for the mid-year construction value.

31 STV. 2009 *Supplemental Analyses of Ridership and Rapid Transit Operations*. Appended to the *Alternatives Analysis Technical Report*, provided on the Project website at http://www.eot.state.ma.us/redblue/.

3.3 Alternative 2: Red Line/Blue Line Connector with Relocated Bowdoin Station

As noted above, operations at Bowdoin Station are constrained by the platform length and loop track configuration. As an alternative to eliminating Bowdoin Station, relocating the platform and eliminating the loop track would allow for relatively easier transit access with little travel time penalty to passengers.

3.3.1 Description

Alternative 2 would similarly extend the Blue Line from Bowdoin Station to Charles/MGH Station, but the platform of Bowdoin Station would be relocated while maintaining the existing mezzanine and headhouse. Under this scheme, Bowdoin Station would be able to accommodate six-car trains. Access to the platforms would be made via escalators, elevators, and stairway connections. As with Alternative 1, the loop track would be eliminated. A new underground Blue Line platform would be constructed below and to the east of the existing Charles/MGH Station, and connections between the two stations would be made ADA-accessible via stairways, escalators, and elevators. Figures 3-5a-c show a conceptual plan of Alternative 2: Red Line/Blue Line Connector with Relocated Bowdoin Station, including both horizontal and vertical alignments.

3.3.1.1 Stations

This alternative would include Bowdoin and Charles/MGH Stations. The platform at Bowdoin Station would be relocated below and to the west, away from a track curve, to accommodate six-car trains. The new platform would be approximately 22 feet below the existing platform elevation to accommodate the appropriate slope for the tunnel extension to Charles/MGH Station. During Project construction, Blue Line service would terminate at Government Center. Two crossovers would be constructed to allow the trains to reverse direction: a full crossover east of Charles/MGH Station Blue Line platform and a left-hand crossover east of Government Center Station. The crossover would need to accommodate construction during revenue services in case construction runs beyond nights and weekends, in an emergency situation only. A new subsurface platform would be constructed at Charles/MGH Station to service the Blue Line. The new components of the Bowdoin Station are outlined in Capital Improvements, below.

A two-track tunnel, with crossover and two tail tracks, would extend the Blue Line from its current endpoint at Bowdoin Station to Charles/MGH Station. The alignment would be the same as for Alternative 1, but the slope would differ to accommodate the new platform at Bowdoin Station. The loop track would be

eliminated. A description of the new trackwork is provided in Capital Improvements, below.

3.3.1.2 Capital Improvements

The capital improvements associated with the Alternative 2 are described at a conceptual level in the following paragraphs.

Trackwork

The trackwork associated with Alternative 2 would be the same as in Alternative 1 with the exception of the slope to accommodate the relocated Bowdoin Station platform. Top-of-track depth at its lowest elevation (at Staniford Street) would be approximately 51 feet below surface grade. The slope from Government Center Station to the new Bowdoin Station platform would be 5.0 percent, and 5.0 percent from the Bowdoin Station platform to the new Charles/MGH Station Blue Line platform. Lengths of track would be:

- North Tail Track – Approximately 400 feet from the west end of the Charles/MGH Station Blue Line platform to beneath the Massachusetts Eye and Ear Infirmary parking lot.
- South Tail Track – Approximately 300 feet from the west end of the Charles/MGH Station Blue Line platform to beneath the eastern sidewalk of Charles Street on the south side of Charles Circle.
- Blue Line Extension (Government Center Station to Bowdoin Station) –
  - Inbound Track – 680 feet
  - Outbound Track – 690 feet
- Blue Line Extension (Bowdoin Station to Charles/MGH Station) –
  - Inbound Track – 1,800 feet
  - Outbound Track – 1,800 feet
- Total Proposed New Track Length (both directions, including tail tracks) – 5,710 feet

Crossovers

Crossovers would be the same for Alternatives 1 and 2.

Horizontal Circulation Elements

Entrance and exit into Charles/MGH Station Blue Line platform would be the same for Alternatives 1 and 2. The relocated Bowdoin Station would be a center platform configuration with 214 feet of tangent track on the outbound side and 231 feet of tangent track on the inbound side of the platform. The track on either side would

have a curvature of 1,000 feet radius to accommodate the bend along the right-of-way. The dimensions of the platform would be:

- Length – 320 feet
- Width – 26 feet

Vertical Circulation Elements

Stairs, escalators, and elevators for the Charles/MGH Station Blue Line platform would remain the same for both Alternatives 1 and 2. The vertical circulation elements for the relocated Bowdoin Station platform would be:

- Stairs – provide access from the existing headhouse down to the mezzanine, then to the relocated platform.
- Escalators – one escalator (3 feet, 7 inches wide) travelling in the up direction would lead patrons from the mezzanine to grade. Two escalators (each 3 feet, 7 inches wide) that travel in both directions would lead from the mezzanine to a landing where there is one escalator providing service up from platform level. The platform-level escalator would align with the relocated platform.
- Elevator – at this phase of design one elevator would lead patrons from the street level to the mezzanine and an additional elevator would provide vertical circulation from the mezzanine directly to the platform level. The elevator would be located at the east end of the platform, beyond the escalators and stairs.

  The next phase of design, per the request of the MBTA at a December 10, 2009 meeting with MassDOT, MBTA, and the Design Team, will determine the need for redundant elevator options at Stations.

Emergency Egress

Emergency egress locations for Charles/MGH Station would be the same for Alternatives 1 and 2. At Bowdoin Station, platform emergency egress would be provided via stairs at the platform level. The stairs would lead up to an emergency hatchway located in the median at the Cambridge Street/Staniford Street intersection.

Mechanical Considerations

Ventilation provisions for Alternative 2 would be the same as for Alternative 1 except for Ventilation Room No. 2. The addition of Ventilation Room No. 2 is required for the new Bowdoin Station platform ventilation. This ventilation room would allow reconfiguration of the existing tail track and upgrades to the existing ventilation to accommodate the relocated Bowdoin Station. The existing exhaust vent grate would be replaced in the Cambridge Street median; however, the ventilation system would be located below the Cambridge Street and Ridgeway Lane intersection.

Power, Signal, and Communication Systems

Electrical infrastructure requirements for Alternative 2 would be the same as for Alternative 1 except for the following:

- Electric Power Substation – located in the existing tail track west of the new Bowdoin Station platform (Ventilation Room No. 2).
- Signal Bungalow – located to the eastern end of the relocated Bowdoin Station Blue Line platform at track level. Access would be provided through the emergency egress stair corridor.

3.3.1.3 Construction Methodology

The construction methodology for Alternative 2 would be the same as for Alternative 1: a combination of cut-and-cover, mined tunnel, and the sequential excavation method.

3.3.2 Operating Plan

The operating plan for the Blue Line under Alternative 2 would take into consideration hours of operation, train frequency, and ridership.

3.3.3 Blue Line Operational Analysis

A new operating plan for the Blue Line under Alternative 2 would take into consideration hours of operation, train frequency, and ridership. It is assumed that the span of service and train frequencies on the Blue Line would also remain unchanged under this Alternative, except the hours of operation at Bowdoin Station would be expanded to match the other Blue Line stations. For Alternative 2, the net increase in the round trip running time for the Blue Line extension from Government Center Station to Charles/MGH Station, including a stop at Bowdoin Station, would be approximately 4 minutes, 8 seconds, as compared to existing operations (assuming the layover at Charles/MGH Station is 4.0 minutes and the layover at Wonderland Station is 8.0 minutes).[32] This increase in travel time would require the addition of two trains, or 15 trains/108 cars per hour, to maintain currently scheduled peak headways on the Blue Line. This total includes one "Run-As-Directed" train.

32 It should be noted that the net increase in round trip running time takes into account the time savings accrued from the elimination of the Bowdoin Loop. That is, under both alternatives, westbound trains would no longer have to travel around the loop to get into position to travel eastbound. This move currently takes four minutes, according to the July 29, 2009 STV incorporated signaling report.

Alternative 2 is projected to have a weekday ridership of 77,400 in 2030. This is an increase of 19.65 percent over the 2003 level (64,668 weekday riders). Applying this growth percentage to the 2003 AM peak 15 minute ridership results in a peak 15-minute ridership of 1,707 in the AM rush period.

Using MBTA vehicle loading standards for the number of passengers per car and per train, the total capacity provided by operating 6-car trains on 4.5 minute headway was calculated to be 1,900 passengers. Therefore, it appears that the current peak period schedule of 6-car trains will provide sufficient capacity to carry the projected 2030 ridership under Alternative 2 consistent with MBTA service standards for the Blue Line.

Table 3-2 presents the expected daily Red and Blue Line ridership under Alternative 2 (as compared to the No-Build).

Table 3-2 Alternative 2 Trip Summary

	No-Build (2030)			Alternative 2		
	Daily Boardings	Walk-Ins	Transfers	Daily Boardings	Walk-Ins	Transfers
Bowdoin Station	1,450	1,450	0	2,160	2,160	0
Charles/MGH Station	10,050	10,050	0	21,200	9,700	11,500
Red Line	10,050	10,050	0	13,650	7,900	5,750
Blue Line	No Service	No Service	No Service	7,550	1,800	5,750

Under Alternative 2, Bowdoin Station would have 2,160 daily boardings compared to the 1,450 boardings under the No-Build Alternative. Alternative 2 would result in 1,190 fewer boardings at Charles/MGH Station than Alternative 1. As a result, the boardings at both stations would be slightly higher under Alternative 2. This difference translates into a negligible effect on transportation operations.

3.3.4 Project Schedule

The anticipated duration of constructing Alternative 1 is six years, three months. Assuming a starting time at the beginning of the third quarter of 2012, the Project would be completed by the end of the third quarter of 2018.

3.3.5 Cost Estimate

Based on a 10 percent conceptual level of design, the estimated cost to construct Alternative 1 is $867 million for the mid-year construction value.

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Summary of Environmental Impacts

This Chapter summarizes the adverse and beneficial environmental impacts of the Red Line/Blue Line Connector Project, based on the analyses in the referenced technical reports (provided in the appendices).

4.1 Traffic Impact Analysis

The Design Year Traffic Impacts Technical Memorandum (Appendix C) and the Construction Impacts and Traffic Management memoranda (Appendix D) analyze the traffic impacts of the Project for both Alternatives as compared to the No-Build Alternative. Permanent and construction period impacts to traffic are summarized below.

4.1.1 Permanent Impacts

Under Alternative 1, Bowdoin Station would be deactivated, although a passageway would be retained to allow for emergency egress. Total boardings at Charles/MGH Station would increase by 12,340 (for a total of 22,390 total daily boardings). This difference would have a negligible effect on transportation operations.

Under Alternative 2, Bowdoin Station would increase by 710 daily boardings when compared to the No-Build condition. Total boardings at Charles/MGH Station would increase by 11,150 (for a total of 21,200 total daily boardings), as compared to the No-Build Alternative. Total boardings for the Blue Line at both stations under Alternative 1 would be 9,470 riders versus 9,710 riders for Alternative 2. This difference also would have a negligible effect on transportation operations.

The Project is anticipated to result in a general decrease in traffic in Downtown Boston, and along Cambridge Street in particular, compared to the No-Build

Alternative. There would be no permanent adverse impact to traffic from the Project from either Build Alternative. Traffic operations along Cambridge Street would remain essentially unchanged under both Alternatives.

Under either alternative, eight of the 10 intersections would see minor improvements to overall average intersection delay. The average delay at one intersection, Cambridge Street at New Sudbury/Somerset Street would increase by about two seconds during the morning peak hour under both alternatives. This increase is not a result of the proposed alternative, but rather a reflection of the change in distribution of traffic at this intersection. Despite the calculated increase in overall intersection delay, the intersection of Cambridge Street and New Sudbury/Somerset Street sees an overall reduction in the number of trips expected when compared to the No-Build alternative.

There would be no long-term impacts to emergency access or truck routes in the Study Area. There would be no long term impacts to the Partners Shuttle operation.

Alternative 1 would slightly modify pedestrian activity in the vicinity of Bowdoin Station because the station would be closed under this alternative. Pedestrians destined to Government Center and the immediate vicinity of existing Bowdoin Station would exit the system at Government Center Station under this alternative. Riders boarding or alighting at Bowdoin Station would use Government Center or Charles/MGH under Alternative 1.

Alternative 2 would increase pedestrian activity slightly in the vicinity of Bowdoin Station due to the increased boardings. No other changes would be expected in the vicinity of Bowdoin or Government Center Stations.

Since pedestrian levels of service at crosswalks are a function of traffic signal timing and phasing and not of pedestrian volumes, pedestrian levels of service are expected to remain unchanged from the No-Build (and Existing) condition. However, there could be potential impacts to sidewalk capacity from the increase in pedestrians crossing Cambridge Street to Charles/MGH Station. The results of a sidewalk analysis (provided in the Appendix) indicate that adequate sidewalk space exists to accommodate the additional pedestrians who will cross Cambridge Street to/from Charles/MGH Station.

Neither alternative would physically alter designated bicycle facilities nor disrupt future plans for either on-road or off-road facilities in the Study Area. Since Charles/MGH Station is primarily accessed by foot, neither alternative is expected to draw a substantial amount of new bicycle traffic to the area.

Neither alternative would physically alter the existing public parking supply nor the City's ability to modify parking or change enforcement on a permanent or long-term basis.

The proposed Project generally has minor, positive impacts on traffic operations. Therefore, no specific mitigation measures are required. However, the reduction of through traffic along Cambridge Street may require minor traffic signal timing adjustments to reflect the slightly altered travel patterns.

4.1.2 Construction Period Impacts

Existing station access to Charles/MGH Station would be maintained throughout construction of Alternative 1. While Bowdoin Station would be closed during the majority of construction (either permanently or for relocation) there may be a need to provide access during early stages via temporary sidewalks connecting to the existing headhouse.

Existing station access to both Charles/MGH Station and Bowdoin Station would be maintained throughout construction of Alternative 2. During portions of construction, access to Bowdoin Station may be provided via temporary sidewalks, but would still occur at the existing headhouse.

Impacts to traffic operations are anticipated to be identical during the construction of either alternative. The Project would be constructed along Cambridge Street, a busy thoroughfare in Boston's West End with a variety of residential, commercial, and institutional land uses along its length. Vehicle traffic detours would be required to route traffic around construction areas. Streets may be temporarily closed to allow for surface work such as decking installation over open excavations; these closures would be scheduled for overnight or weekends to minimize traffic flow disruption during peak travel times.

Vehicle parking and pedestrian or bicycle thoroughfare would be restricted temporarily at each construction zone. Up to approximately 89 parking spaces would be taken out of service at some point during the construction of either alternative. However, once the removal of the traffic decking and final utility installation has been completed, roadway configurations would return to their respective pre-construction alignments and surface restoration work would be completed using temporary lane closures or detours during off-peak traffic periods to complete the work.

4.2 Air Quality

The Air Quality Technical Memorandum (Appendix E) describes the air quality impacts of the Project for both Alternatives as compared to the No-Build Alternative. Permanent and construction period air quality impacts are summarized below.

4.2.1 Permanent Impacts

Future estimates of Project-related emissions of carbon monoxide (CO) and particulate matter (PM) at the local (microscale) level are based upon changes in traffic and emission factor data. The data include traffic volumes, vehicle miles traveled (VMT), signal cycle timing, and physical roadway improvements. The emission factor data include years of analysis and roadway speeds.

The No-Build Alternative included regional background traffic growth and planned roadway improvements. The Build Alternatives include the anticipated future changes in travel demand due to each alternative. The year 2018 was analyzed as it represents the estimated date of completion. In addition, the year 2030 was selected as the future year of analysis to be consistent with the statewide model as well as to be consistent with the regional long-range transportation plan.

4.2.1.1 Microscale Analysis

The microscale analysis calculated carbon monoxide (CO) concentrations for the existing conditions, future No-Build Alternative, and two Build Alternatives. The concentrations are expressed in parts per million (ppm) and include a 1-hour background concentration of 3.0 ppm. The 1-hour CO concentrations were calculated using the Environmental Protection Agency's (EPA) CAL3QHC model, with evening peak hour traffic and emission data. The 8-hour CO concentrations were derived by applying a persistence factor of 0.70 to the 1-hour CO concentrations. This persistence factor represents the average ratio of second highest 8-hour to second highest 1-hour CO reading. Similar to the 8-hour CO emissions, the concentrations are expressed in ppm and include an 8-hour background concentration of 2.1 ppm.

As presented earlier, the EPA has set the National Ambient Air Quality Standards (NAAQS) for CO to protect the public health. The NAAQS for CO sets maximum concentrations of 35 ppm for a 1-hour period and 9 ppm for an 8-hour period, each not to be exceeded more than once per year. All microscale results are presented in Appendix E.

All the 1-hour and 8-hour concentrations are below the CO NAAQS of 35 and 9 ppm, respectively. These values are consistent with the area's designation as a CO attainment area. The microscale analysis indicates that reductions in CO concentrations are expected to occur over time when compared to the 2009 existing condition. These reductions can be attributed to more efficient vehicles with enhanced emissions control technologies and the benefits of the Massachusetts' vehicle inspection and maintenance program. None of the existing or future No-Build and Build Alternatives concentrations approaches the CO NAAQS for 1-hour or 8-hour periods.

The microscale analysis calculated the 24-hour particulate matter PM_{10} concentrations for the existing conditions, No-Build Alternative, and two Build

Alternatives. The 24-hour PM_{10} concentrations were calculated using EPA's CAL3QHC model. The concentrations are expressed in micrograms per cubic meter (ug/m^3) and include a 24-hour background concentration of 39.3 ug/m^3, which was based on MassDEP air quality monitoring data presented in the *New England Annual Air Quality Report*.[33] All of the 24-hour PM_{10} concentrations are well below the PM NAAQS of 150 ug/m^3. The 24-hour PM_{10} concentration in the 2030 condition for Alternative 2 was slightly decreased at the Cambridge Street at Staniford Street/Temple Street intersection.

The microscale analysis calculated the 24-hour and annual $PM_{2.5}$ concentrations for the Existing, No-Build Alternative, and the two Build Alternatives. The 1-hour $PM_{2.5}$ concentrations were calculated using EPA's CAL3QHC model and were then adjusted using MassDEP standards to develop the 24-hour and annual $PM_{2.5}$ concentrations. The annual background concentrations of 11.2 ug/m^3 and the 24-hour background concentration of 28.7 ug/m^3 are based on DEP air quality monitoring data. All of the annual $PM_{2.5}$ concentrations are well below the $PM_{2.5}$ NAAQS of 15 ug/m^3. All of the 24-hour $PM_{2.5}$ concentrations are below the $PM_{2.5}$ NAAQS of 35 ug/m^3.

There were no major differences identified in the microscale analysis between the two Build Alternatives, but both showed improvements when compared to the No-Build Alternative.

4.2.1.2 Mesoscale Analysis

A regional (mesoscale) analysis estimated the area wide emissions of volatile organic compounds (VOCs), oxides of nitrogen (NO_X), carbon dioxide (CO_2), CO, and PM emissions. The mesoscale analysis evaluated the changes in emissions based upon changes in the average daily traffic volumes, roadway lengths, and vehicle emission rates. The analysis calculated the 2018 and 2030 mobile source emissions from the major roadways in the study area. Appendix E provides the results of the mesoscale analysis.

The No-Build Alternative VOC and NO_X emissions in 2018 and 2030 are typically lower than the existing conditions emissions in 2009 due to the implementation of state and Federal emission control programs in the future. The results of the mesoscale analysis demonstrate that the Build Alternatives would reduce emissions of VOC, NO_X, $PM_{2.5}$, PM_{10} and CO (Winter) as compared to the No-Build Alternative, with no difference between the Build Alternatives.

33 *2006 New England Annual Report on Air Quality*, United States Environmental Protection Agency, Region 1, Office of Environmental Measurement and Evaluation North Chelmsford, MA 01863, Ecosystems Assessment Unit, July 2007. (http://www.epa.gov/region01/lab/reportsdocuments.html).

There are minor differences in CO_2 emissions between the two Build Alternatives, but both are lower than under the No-Build Alternative.

In regard to air toxics, the Red Line/Blue Line Connector Project was determined to fall into the category of a "Project with Low Potential [Mobile Source Air Toxics] MSAT[34] Effects," so a qualitative analysis was conducted.[35] For each alternative, the amount of MSATs emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for each of the Build Alternatives are lower than that for the No-Build Alternative, because the connection of the Red Line and Blue Line would remove vehicles (and therefore reduce VMT) from the study area roadways by shifting mode choice to public transportation (i.e., the Red or Blue Lines). This reduction in VMT would lead to lower MSAT emissions for the two Build Alternatives.

4.2.2 Construction Period Impacts

Temporary air quality impacts from equipment emissions and dust could result from construction activities such as utility relocation, grading, excavation, track work, and installation of systems components. These impacts may occur in residential areas and at other sensitive land uses located within several hundred feet of the alignment.

Construction contractors would be required to adhere to all applicable regulations regarding control of construction vehicles emissions. This would include, but not be limited to, maintenance of all motor vehicles, machinery, and equipment associated with construction activities and proper fitting of equipment with mufflers or other regulatory-required emissions control devices. Also, excessive idling of construction equipment engines would be prohibited, as required by DEP regulations in 310 CMR 7.11, *Regulations for the Control of Air Pollution*.

Contract specifications would require that all diesel-powered construction equipment used on-site be fitted with after-engine emission controls such as diesel oxidation catalysts or diesel particulate filters.[36] Construction contractors would be required to use ultra-low sulfur diesel fuel for all off-road construction vehicles as an additional measure to reduce air emissions from construction activities. The contractor would also be responsible for protective measures around the construction and demolition work to protect pedestrians and prevent dust and debris from leaving the site and entering the surrounding community.

34 MSAT: Mobile Source Air Toxics, a subset of the 188 hazardous air pollutants regulated by the EPA under the Clean Air Act Amendments of 1990.
35 See page 3-26 of the *Technical Memorandum- Air Quality* (Appendix E).
36 This is consistent with the Certificate of Construction Equipment Standard Compliance Form required for all bids to the MBTA.

4.3 Noise and Vibration

The Noise and Vibration Technical Memorandum (Appendix F) analyzes the noise and vibration impacts of the Project for both Alternatives as compared to the No-Build Alternative. Permanent and construction period noise and vibration impacts are summarized below.

4.3.1 Permanent Impacts

Since the Project is an underground tunnel, airborne noise generated by the trains would not propagate into the surrounding community. Airborne noise sources from transit operations are limited to a traction power substation near Charles/MGH Station and fans for passive ventilation shafts at the end of the northern and southern tail tracks, in the median of Cambridge Street at North Anderson Street, and near Bowdoin Station.

Day-night noise levels (Ldn) from the traction power substation are projected to be less than 50 dBA at sensitive receptor sites; no impact is expected. Similarly, Ldn levels from ventilation shafts are projected to be less than 42 dBA and no impact is expected. There would be no difference between the Build Alternatives in airborne noise levels.

Ground-borne vibration and ground-borne noise, which is produced when ground-borne vibrations propagate into a building and radiate noise from the motion of the room surfaces, have been assessed at sensitive locations along the Project corridor. Potential ground-borne noise impact from transit operations is projected at four multi-family residences (224 to 238 Cambridge Street, 250 Cambridge Street, 284 Cambridge Street, and 1 Garden Street) near the crossover, where increases in ground-borne noise and vibration levels would be expected due to the gaps in the rail running surface. Ground-borne noise is projected to be between 35 and 41 dBA at these locations (the residential criterion is 35 dBA for impacts requiring mitigation). Using spring-rail frogs, moveable-point frogs, or flange-bearing frogs would mitigate potential ground-borne noise impacts from transit operations at these residences.

With these mitigation measures, there would be no permanent impacts from vibration for either Build Alternative.

4.3.2 Construction Period Impacts

For short-term construction activities, a preliminary "worst case" scenario of potential noise impact indicates that 26 residential properties and 26 institutional and commercial properties may be exposed to construction noise. The Massachusetts Eye and Ear Infirmary building at 325 Cambridge Street and the multi-family residential

building at 315 Cambridge Street may be exposed to vibration from construction activities that could cause damage to building foundations, annoy humans within the buildings, and affect vibration-sensitive equipment.

Construction noise mitigation would include preparing a Noise Control Plan in conjunction with the contractor's specific equipment, schedule, and methods of construction, specifying maximum noise limits for each piece of equipment, prohibiting certain types of equipment during the nighttime hours, and engineering noise control measures. Potentially impacted building foundations would be monitored in conjunction with the settlement monitoring described in Section 4.4. To mitigate the potential impacts, the contractor would need to use specific construction methods and equipment to minimize the potential for damage, annoyance, and effects to special equipment. Such methods may involve not using a clam shovel for excavation, not using a typical drill rig prior to jet grouting, or using a particular drill rig which generates lower vibrations. Given the close proximity of the construction activities to these buildings, other mitigation measures such as trenches or wave barriers are likely infeasible.

4.4 Subsurface Excavation and Soil Removal

The Subsurface Excavation and Soil Removal memoranda (Appendix G) describe the tunnel excavation and soil testing, removal, and disposal requirements of the Project for both Build Alternatives. Permanent and construction period impacts from excavation and soil removal are summarized in this section.

4.4.1 Permanent Impacts

Some ground settlement may occur as a result of dewatering along the tunnel alignment and in the area of Bowdoin Station to accommodate construction activities, as described in Section 4.4.2. Settlement may affect some adjacent structures, depending upon the extent of dewatering and type of building foundation. Underpinning may be required to prevent permanent damage to some structures. Other buildings or structures (such sidewalks or retaining walls) may be monitored for settlement during construction, and repaired if damaged. There is no difference in risk of permanent settlement damage between the Build Alternatives.

4.4.2 Construction Period Impacts

The soil profile within the Project area includes fill, organic silt, marine clay, marine sand, glacial till, possible glacial moraine deposits, and bedrock. Construction techniques have been selected based upon the geotechnical properties of the soils, taking into consideration the presence of groundwater. Both of the Build Alternatives

involve a predominantly mined tunnel (using a tunnel boring machine) in combination with relatively short sections of tunnel constructed using the cut-and-cover construction technique. The Charles/MGH Station and Bowdoin Station (for Alternative 2 only) platforms, and tail track tunnel segments would be constructed using the sequential excavation method.

The estimated volume of soil that would be excavated by either Build Alternative is 175,000 cubic yards. The soil would be removed by conveyor and stockpiled at the construction staging area or directly loaded into dump trucks, trucked off-site and disposed of at an appropriate, approved site.

4.5 Hazardous Materials

The Hazardous Materials memoranda (Appendix H) describe the known or potential hazardous materials sites within or near the Project area. Permanent and construction period impacts from hazardous materials (demolition debris, contaminated soils, and contaminated groundwater) are summarized below.

4.5.1 Permanent Impacts

The Project would not generate hazardous waste. However, over 400 Massachusetts Contingency Plan (MCP) disposal sites are present within the vicinity of the Project area. Three of the closest known MCP disposal sites have a high potential of impacting soil or groundwater within the Project corridor. These sites are located immediately adjacent to, up-gradient of, or within the Project limits of work. The three sites are:

- Charles/MGH Station – for a release of extractable petroleum hydrocarbons and lead to soil.
- 19 Staniford Street – for a release of diesel fuel from a 550-gallon underground storage tank.
- 1,2,4 Strong Place – for a release of No. 2 fuel oil to groundwater from an unidentified source (approximately two inches of light non-aqueous phase liquid on the groundwater table).

The Project would not interfere with remediation of these sites, nor would it cause existing contamination to migrate. Other, undocumented releases of regulated materials may have occurred within the Project area historically. In any case, exposure to residual hazardous materials is not expected present a risk to public health. There is no different risk of exposure between the Alternatives.

4.5.2 Construction Period Impacts

Contaminated soil or groundwater may be encountered during Project construction activities. Excavations to 65 feet below ground surface would likely be through contaminated soil, and dewatering activities (specifically in the vicinity of Bowdoin Station) may involve impacted groundwater. Exposure to residual hazardous materials in soil and/or groundwater may present a risk to worker health, and any materials with concentrations of chemicals in excess of regulatory standards must be treated and/or disposed of properly. A soil and groundwater management plan, describing testing protocols, on-site management, and eventual treatment or disposal would be developed. A preliminary plan, developed as a framework based on the current level of Project design, is provided in Appendix G.

Additionally, suspected lead-, mercury-, or asbestos-containing building materials, as well as polychlorinated biphenyl products and petroleum products, are present within Bowdoin Station and the existing tunnels. Construction or demolition activities may result in worker exposure to these regulated materials. The nature and extent of the exposure risk may vary between the Alternatives, depending upon the extent of construction material disturbance at Bowdoin Station. It is not possible, at this phase of the design, to determine the extent of materials that would be disrupted for either Build Alternative. A hazardous materials management plan, describing testing protocols, on-site management, and eventual treatment or disposal would be developed to the extent necessary, based upon the final design.

4.6 Land Use Impacts

The Land Use Technical Memorandum (Appendix I) analyzes the impacts to land use within or near the Project area for both Build Alternatives as compared to the No-Build Alternative. Evaluated land use resources are:

- Publicly-owned parks, recreational areas, and conservation land;
- Wetlands and Chapter 91 resources; and
- Real estate acquisitions and easements.

Permanent and construction period impacts to these three land use resource categories are summarized below.

4.6.1 Public Parks, Recreation Areas, and Conservation Land

Two public parks are present within the Project area: Cardinal Cushing Park at Bowdoin Station and Charles Circle (part of the Charles River Reservation) at Charles/MGH Station.

Cardinal Cushing Park, owned by the Boston Redevelopment Authority (BRA), is within the eastern portion of the corridor between the New Chardon and Sudbury Street intersections with Cambridge Street. The property is designated as a park in the City of Boston's 2008-2012 Open Space Plan. The Open Space Plan asserts that the park is permanently protected from land uses other than conservation or recreation purposes under the 97th Amendment to the Massachusetts Constitution (Article 97). The adjacent parcel is designated by the Boston Public Works Department as a "public way", which includes the existing Bowdoin Station Headhouse.

The Charles River Reservation is a linear park stretching from Boston Harbor up the river for 20 miles. The lower half of the Reservation, from downtown Boston to the Watertown Dam, is called the Charles River Basin, which includes the Esplanade on the Boston side. The project work limits, adjacent to the Charles/MGH Station, fall within the Reservation area. According to the City of Boston's 2008-2012 Open Space Plan, the Charles River Basin is protected open space under Article 97.

A small park on private (MGH) property, but open to the public, is present at the northeast corner of the intersection of Cambridge Street and North Anderson Street. This 1-acre parcel is not classified as a park by the City of Boston; however, it includes green space and shaded benches for public use. It is not an Article 97-protected property. There are no recreation areas or conservation land within the Project area, but bicycle and pedestrian paths in the Charles River Reservation are just west of the western end of the Project area.

4.6.1.1 Permanent Impacts

The Project would not permanently impact Cardinal Cushing Park. Preliminary design retains the Bowdoin Station headhouse, adjacent to the Cardinal Cushing Park property, for use as emergency egress from the subway for Alternative 1 or for access to the station for Alternative 2. There is no difference in impacts to Cardinal Cushing Park between the Build Alternatives.

The footprint of Charles/MGH Station would be expanded slightly to the northeast to accommodate internal structural changes. Use of Charles Circle would not be impacted by the enlarged footprint, and the station would not be visually affected. There is no difference in impacts to Charles Circle between the two Build Alternatives. There would be no permanent impacts to Charles Circle or the Charles River Reservation.

4.6.1.2 Construction Period Impacts

Temporary impacts to Cardinal Cushing Park at Bowdoin Station and Charles Circle in the Charles River Reservation at the Charles/MGH Station could occur during construction. These construction-related impacts would include temporary access

constraints to the pedestrian walkways through Cardinal Cushing Park and the easternmost boundary of the Reservation, adjacent to Charles Circle. In addition, vehicular and pedestrian access to Charles Circle would be affected during construction of the subway tunnel and Blue Line platform, which would require a temporary occupancy permit from DCR. Public access to the MGH park would be intermittently impacted during the construction activities due to cut-and-cover excavation. In such case, a temporary pedestrian walkway would be provided.

4.6.2 Wetlands and Chapter 91

The westernmost section of the study area includes Riverfront Area and Bordering Land Subject to Flooding wetland resources. However, no construction activities would occur within these resource areas. A portion of the proposed staging area is within Bordering Land Subject to Flooding, and the Project would not be subject to the Wetlands Protection Act. The Project is subject to the Massachusetts Public Waterfront Act (Massachusetts General Law Chapter 91) and its accompanying Waterways Regulations (310 CMR 9.00). Specifically, the western portion of the Project area includes Landlocked Tidelands, which are filled tidelands separated from flowed, or formerly flowed, tidelands by a public way. Cambridge Street east to North Anderson Street, and adjacent land uses and public walkways, are included in this jurisdictional area. Landlocked Tidelands are exempt from the Public Waterfront Act permitting requirements, but the public benefits regulations require project proponents to demonstrate the public benefit of the use of these tidelands and ensure that the public's rights are being upheld.

4.6.2.1 Permanent Impacts

Permanent, passive vent shafts will be constructed within the MEEI parking lot and within the sidewalk on the southern tail track. However, only a vent cover would be visible from the surface and sidewalk. There would be no permanent adverse impacts to Landlocked Tidelands from the construction of these vent shafts or other construction elements for either Build Alternative. Primary public benefits of the Project within these Landlocked Tidelands include increased transit accessibility, equitable distribution of transit services, increased transit ridership, and improved regional air quality. The Project protects and preserves environmental resources by utilizing an underground rail corridor rather than creating an aboveground light-rail corridor that would require additional land resources and potentially result in impacts to adjacent natural resources. In addition, public health goals of the Commonwealth would be met by improving regional air quality, reducing regional emissions of greenhouse gases, and reducing the region's dependence on petroleum.

4.6.2.2 Construction Period Impacts

Impacts to filled Landlocked Tidelands from both Build Alternatives include excavating fill and placing structures along Cambridge Street during the tunnel boring phase of the Project. Impacts to these tidelands are limited to temporary traffic detouring and limited public access along adjacent walkways during construction.

4.6.3 Real Estate Acquisitions and Easements

The Project would be constructed within the existing Cambridge Street right-of-way, but some construction staging activities would be placed on private land.

4.6.3.1 Permanent Impacts

There are no permanent real estate acquisition or easement requirements for the Project. There is no difference between the Build Alternatives impacts to real estate acquisitions and/or easements.

4.6.3.2 Construction Period Impacts

Temporary construction easements to facilitate construction would be required at the following locations for both Build Alternatives:

- Parking lot west of Charles Street – Massachusetts Eye and Ear Infirmary;
- Parking lot under elevated Red Line (adjacent to West Cedar Street) – Eye Research Institute;
- Charles Circle – DCR; and
- John F. Kennedy Federal Building Plaza (plaza/handicapped parking area in front of the building) – Boston Redevelopment Authority.

Impacts to these properties would include temporary restrictions on access during grouting work. The Massachusetts Eye and Ear Infirmary parking lot would be used as a staging area throughout the construction phase. Public use of the parking lot under the elevated Red Line east of Charles/MGH Station would be temporarily restricted for construction of the new Blue Line platform. An easement from DCR would be required for construction activities within and underneath Charles/MGH Station, within the footprint of Charles Circle. Vehicle access to the John F. Kennedy Federal Building Plaza at the eastern end of the Project area would be temporarily restricted during cut-and-cover construction for this segment.

4.7 Stormwater

The Stormwater Management Plan (Appendix J) describes how stormwater within the Project area would be managed. Permanent and construction period impacts to stormwater are summarized in this section.

4.7.1 Permanent Impacts

At this conceptual stage in the design process, permanent changes to the stormwater drainage system are not anticipated. Neither alternative would create any additional impervious surfaces nor require any permanent modifications to the stormwater management system in Cambridge Street, based on the conceptual design. No additional drainage to the stormwater or sanitary sewer system would occur, therefore; there will be no additional stormwater flows to the Charles River or Deer Island Treatment Plant. There is no difference between the Alternatives' impacts to stormwater.

4.7.2 Construction Period Impacts

Coverage under the U.S. Environmental Protection Agency National Pollutant Discharge Elimination System Construction General Permit would be required because the Project disturbs over one acre of land. A Stormwater Pollution Prevention Plan would be required to identify potential sources of stormwater pollution during construction and describe practices to reduce pollutants in stormwater discharges developed during construction.

Temporary relocation of portions of the storm drain system may be necessary during construction where open excavations would be made. Perforated stormwater drainage piping would be inserted along the drainage system in areas where existing piping would need to be temporarily removed. MassDOT intends to restore all elements of Cambridge Street, including stormwater infrastructure, to pre-construction conditions. There is no difference between the Build Alternatives' construction period impacts to stormwater.

4.8 Groundwater

The preliminary Groundwater Management Plan (Appendix K) describes how groundwater within the Project area would be managed. Permanent and construction period impacts to groundwater are summarized below.

4.8.1 Permanent Impacts

The proposed mined tunnel, access shafts, cut-and-cover tunnel, and associated structures would be designed to be as watertight as practicable, through the use of grouting and pre-cast concrete liners, such that seepage and related water-level drawdown locally and regionally will be minimal. Any seepage that occurs would be addressed by sealing visible leaks and recharging the collected groundwater in infiltration basins and/or recharges wells. No permanent impacts to groundwater flow or quality from the Build Alternatives are expected.

4.8.2 Construction Period Impacts

For both Build Alternatives, the tunnels would be designed and constructed such that groundwater levels would not be lowered along the alignment. The construction contractor would be required to take remedial measures if the groundwater drops below current background levels during construction. The Bowdoin Station area would likely be the only place where temporary groundwater drawdown would be considered to allow for construction. All support-of-excavation systems for excavations below the water table are assumed to be relatively impervious.

Groundwater would likely be temporarily lowered for construction of the relocated Bowdoin Station platform (Alternative No. 2); however, this is unlikely to affect neighboring structures, as shallow wood-pile foundations are not anticipated in this area. Groundwater would be monitored prior to, during, and after construction to ensure that the groundwater level in the vicinity of the Project is not lowered in any area to a degree that would cause harm to existing structures.

4.9 Historic and Archaeological

The Historical and Archaeological memorandum (Appendix L) analyzes the impacts to historical and archaeological resources within or near the Project area. Permanent and construction period impacts to historical and archaeological resources are summarized below.

4.9.1 Permanent Impacts

A total of 48 historic resources (two districts and 46 individual properties) are present within the Project's Area of Potential Effect (APE). Several areas of high archaeological sensitivity have also been identified within the APE, but specific archaeological resources have not been identified. No historic properties or known archaeological resources would be permanently impacted by the Project. There is no difference in permanent impacts to historic or archaeological resources between the Build Alternatives.

4.9.2 Construction Period Impacts

Construction activities are unlikely to affect any historic resources from vibration. Subsurface work (excavation and tunneling) may encounter buried archaeological resources, most likely within filled tidelands. There is no difference in construction period impacts to historic or archaeological resources from the Build Alternatives. Additional archaeological investigations would be needed in high sensitivity areas such as where work is planned to locate, identify, evaluate, and record significant cultural deposits.

4.10 Other Construction Period Impacts

The Other Construction Impacts Memorandum (Appendix M) describes the construction period impacts of the Project for both Build Alternatives as compared to the No-Build Alternative.

Cambridge Street has recently seen the completion of a major reconstruction and streetscaping project that included new paving, curbing, raised medians with planters and landscaping and new brick paver sidewalks to name the major items. The construction of the tunnels and modifications to the existing Charles/MGH Station executed from the surface or through cut and cover methods will impact these new features as well as the existing utilities beneath the roadway. For the portion of the tunnel constructed by the tunnel boring machine method surface features will not be impacted. Utilities will be relocated and in some cases relocated many times due to staged construction.

At the completion of the tunnel project the areas of Cambridge Street and Charles Circle impacted will be reconstructed to their present condition.

4.11 Environmental Justice

The Environmental Justice Technical Memorandum (Appendix N) describes the impacts to designated environmental justice communities from the Project for both Build Alternatives as compared to the No-Build Alternative.

The study area for direct impacts to environmental justice populations is the Cambridge Street corridor in which the Red Line-Blue Line Connector would be constructed, plus a 0.5-mile radius around the stations at either end, thereby encompassing the Cambridge Street corridor. One-half mile is generally considered the maximum distance that an average person would walk to access transit services.

The Red Line/Blue Line Connector Project is located in the West End of Downtown Boston, a densely populated, multi-use area with residential, commercial,

institutional, and transportation land uses. A 0.5-mile radius around the Project area extends into other areas of the city, such as Downtown, the North End, and Beacon Hill, and across the Charles River into Cambridge. These neighborhoods meet the EEA environmental justice criteria within a 0.5-mile radius of the corridor:

- The neighborhood north of Cambridge Street meets the low income and minority criteria, with an inset neighborhood meeting foreign-born and minority criteria;
- The eastern end of Cambridge Street, including the Bowdoin Station, is in a neighborhood meeting minority criteria;
- Three neighborhoods to the southeast and south meet some or all criteria; and
- Four neighborhoods to the west meet some or all criteria.

All of the environmental justice neighborhoods within a 0.5-mile radius of the Project area meet minority criteria, all but two meet foreign-born criteria, four meet low-income criteria, and four meet English language proficiency criteria. These data reflect the "cosmopolitan" nature of the Boston metropolitan area, with relatively high percentages of minority and foreign-born residents. However, most residents are not low income and are proficient in speaking English.

4.11.1 Permanent Impacts

No adverse permanent impacts to air quality, noise levels, access to parks, traffic, or neighborhood fragmentation are anticipated to result from the Project, as described in the relevant subsections above. Accordingly, no disproportionate impacts to environmental justice populations would occur from either Build Alternative.

Environmental justice populations would benefit from the Project. Increased access to transit and decreased travel times for environmental justice populations would result from both Build Alternatives. Improvements in access or travel times to jobs, education, and hospitals, as compared to the No-Build Alternative, would be relatively minor (less than one percent for each parameter) for environmental justice populations residing in Boston or Cambridge within 0.5 mile of the Project area. The improvements in these parameters for environmental justice populations residing in Revere (at the northern end of the Blue Line) would range up to 6.5 percent. There are no substantial differences between the two Build Alternatives (no more than 0.1 percent improvement for any parameter). Non-environmental justice populations would realize similar benefits.

4.11.2 Construction Period Impacts

Temporary impacts to air quality, noise levels, access to parks, and traffic may result during the construction period. Residents of designated environmental justice

neighborhoods adjoining the Project area (on the north side of Cambridge Street) could be affected by these impacts. However, the effects would not be disproportionate, as adjoining neighborhoods not designated as environmental justice neighborhoods (on the south side of Cambridge Street) would be similarly affected. There would be no neighborhood fragmentation impacts from either Build Alternative.

5

Draft Section 61 Findings and Mitigation Commitments

5.1 Introduction

This Chapter presents the proposed mitigation program to address adverse environmental impacts associated with construction and operation of the Red Line/Blue Line Connector Project. This chapter also provides draft Section 61 Findings for the Project as required by Massachusetts General Law Chapter 30, Section 61 and MEPA regulations at 301 CMR 11.00(6)(k).

5.2 Project Benefits

The proposed Project is expected to generate 8,800 new daily boardings and alightings at the Blue Line's twelve stations and reduce transfers by 4,200 per day. It would also reduce VMT by 5,249 per day (projected to the year 2030). The increased transit access and ridership will improve corridor mobility, improve traffic conditions, improve regional air quality, increase services to environmental justice populations, and support future smart growth initiatives and sustainable development.

5.3 Project Mitigation

Potential permanent impacts resulting from constructing the proposed Project would be mitigated by design measures, as summarized in Table 5-1.

Table 5-1 Project Mitigation Commitments

Environmental Categories	Mitigation Measure	Implementation Schedule	Implementation Responsibility
Vibration	Provide spring frogs at crossover location to mitigate ground-borne noise.	Completion of construction	MassDOT/MBTA
Soils and Groundwater	Permeation grout the glacial till from within the tunnel, underpin piers and foundations as necessary prior to construction; monitor during and after construction. Repair damage as necessary.	Prior to and during construction	MassDOT/MBTA

5.4 Construction Period Mitigation

Temporary, short-term impacts from construction activities would be mitigated to the extent practicable. MassDOT/MBTA is responsible for these construction mitigation measures, and would insure that appropriate action items are incorporated into the contract documents. Specifications governing the activities of contractors and subcontractors constructing elements of the Project would also be included. On-site resident engineers and inspectors will monitor all construction activities to ensure that mitigation measures are properly implemented. The cost of the construction-period mitigation measures is included in the overall construction cost estimate. The construction mitigation measures are summarized in Table 5-2.

Table 5-2 Construction Period Mitigation and Management Protocols

Mitigation Measures
Traffic
■ Establish temporary detours to minimize traffic disruption.
■ Coordinate with emergency response and hospitals to ensure unimpeded access.
■ Install temporary pedestrian walkways.
■ Construct temporary parking structure for MEEI visitors.
Air Quality
■ Apply water to dry soil and construction vehicles to prevent dust production.
■ Follow existing MBTA retrofit procedures for construction equipment to reduce emissions.
■ Prohibite excessive idiling (per 310 CMR 7.11) to reduce air emissions.
■ Use ultra-low sulfur diesel to reduce air emissions.
■ Sweep street/pavement regularly to control dust.
Noise
■ Use specially quieted equipment with enclosed engines and/or high-performance mufflers.
■ Avoid nighttime construction in residential neighborhoods.
■ Keep truck idling to a minimum.
■ Route construction equipment and vehicles through areas that would cause the least disturbance to nearby receptors where possible.
■ Fit any air-powered equipment with pneumatic exhaust silencers.
■ Locate stationary construction equipment as far as possible from noise-sensitive sites.
Vibration
■ Avoid nighttime construction in residential neighborhoods.
■ Use alternative construction methods to minimize the use of impact and vibratory equipment (e.g., pile drivers and compactors).
■ Monitor sensitive buildings for vibration damage to foundations and inspect sidewalks and retaining walls; repair as necessary
Surface Water/Stormwater
■ Develop and implement a SWPPP in accordance with NPDES and DEP standards.
■ Use dewatering controls, if necessary.
■ Maintain construction equipment to prevent oil and fuel leaks.
■ Treat dewatered groundwater prior to discharge.
■ Replace altered CSOs with separated stormwater and sanitary sewer infrastructure, as required by BWSC sewer regulations.

Table 5-2 Construction Period Mitigation and Management Protocols (cont'd)

Mitigation Measures
Hazardous Materials and Solid Waste
■ Implement special management procedures for any hazardous, contaminated or special wastes generated during construction, including special handling, dust control, and management and disposal of contaminated soil. Procedures should protect both workers and nearby receptors.
■ Perform subsurface investigations to test for possible soil or groundwater contamination; develop Soil and Groundwater Management Plan as necessary.
■ Treat and dispose of contaminated soil or groundwater dewatering effluent in accordance with DEP requirements.
■ Prepare a site-specific Health and Safety Plan.
■ Conduct pre-demolition inspections to identify any hazardous materials such asbestos and lead-based paint in Bowdoin Station.
Soils/Groundwater
■ Recharge dewatered groundwater where possible.
■ Conduct monitoring program to identify and remedy water drawdown issues.
■ Restore groundwater through leak sealing and additional grouting.
■ Construct groundwater cut-off wall to reduce dewatering requirements in addition to a large-scale jet grouting effort.

5.5 Proposed Section 61 Findings

These Proposed Section 61 Findings for the Project have been prepared to comply with the requirements of Massachusetts General Laws, Chapter 30, Section 61, and in accordance with the MEPA regulations at 301 CMR 11.07(6)(k). The MEPA regulations require state agencies and authorities to review, evaluate, and determine the impacts on the natural environment of all projects or activities requiring permits issued by the state, and to issue findings describing the environmental impacts, if any, and certifying that all feasible measures have been taken by the Project proponent to avoid or minimize these impacts. Each state agency that issues a permit for the project shall issue a Section 61 Finding in connection with permit issuance, identifying mitigation that is relied on to satisfy the Section 61 requirement. The following agencies are anticipated to submit a Section 61 Finding:

- MassDOT; and
- Executive Office of Energy and Environmental Affairs, Department of Conservation and Recreation.

5.5.1 Project Description

The Red Line/Blue Line Connector Project consists of extending the Blue Line service from Bowdoin Station to Charles/MGH Station. The Project location is shown in Figure 1-1. The Project would use realigned tracks from 250 feet west of Government Center Station to Charles/MGH Station. The Project would also require constructing a new subsurface platform for the Blue Line beneath and to the east of the Charles/MGH Station headhouse, with pedestrian connections to the elevated platforms for the Red Line. Bowdoin Station would be eliminated to allow for faster travel times (by eliminating a stop) or relocated.

As required by the Certificate, two Build Alternatives and a No-Build Alternative are evaluated in this DEIR. The No-Build Alternative is evaluated as a baseline condition to which the Build Alternatives may be compared. The two Build Alternatives evaluated in the DEIR, described in Chapter 3, *Alternatives*, are:

- Alternative 1: Blue Line Extension to Charles/MGH Station with Eliminated Bowdoin Station, and
- Alternative 2: Blue Line Extension to Charles/MGH Station with Relocated Bowdoin Station.

For either Build Alternative, reconstructing the track through Bowdoin Station would include bypassing the loop track for a straighter alignment to Charles/MGH Station. The current conceptual design specifies two tracks throughout the length of the Project, as compared to up to four tracks in some sections as previously envisioned. The majority of the Project length would have two separate tunnels.

For the majority of the length of the Blue Line extension, between Bowdoin Station and Charles/MGH Station, the tunnels would be constructed by a TBM beneath existing infrastructure. Except at access points at either end of the alignment, all boring work would be completed below grade, and surface disturbance would be limited. A staging area, tentatively established as a portion of the Massachusetts Eye and Ear Infirmary parking lot immediately north of Charles/MGH Station, would be the main access point. A second access point would be at Bowdoin Station to allow the boring machine to be removed.

Three portions of the Project would be constructed with cut-and-cover or sequential excavation mining methods, and decking would be installed over the excavations to minimize disruption of surface traffic:

- The segment east of Bowdoin Station, approximately 550 feet long, would be constructed using the cut-and-cover method to allow the existing tracks to be realigned.

- A segment east of Charles/MGH Station, approximately 86 feet long, would be constructed with the cut-and-cover method to allow a ventilation room to be installed in the area of the track crossover.
- The TBM access shaft would include a 120 foot cut-and-cover segment east of Charles/MGH Station.
- Short portions of the tail tracks west of Charles/MGH Station would be constructed with the sequential excavation mining method (because the sharp bend in the tunnel alignment doesn't allow the boring machine to be used).

Ventilation shafts and emergency exits in the Cambridge Street median would be the only tunnel elements visible from the street when the Project is completed.

For Alternative 1, Bowdoin Station would be deactivated, although passageway through the station and headhouse would be retained for emergency egress. For Alternative 2, the platform at Bowdoin Station would be relocated. The new platform would be west of, and about 22 feet below, the current platform location to accommodate the necessary slope to reach the new Blue Line platform at Charles/MGH Station. The platform would be on a straight segment of track, allowing full use of the six-car trains.

For either Build Alternative, the new platform for the Blue Line at Charles/MGH Station would be constructed immediately east of, and below, the existing headhouse. An elevator shaft would be extended to the Blue Line level, as would a stairway and escalators from the existing street level mezzanine down to the Blue Line platform level. A single 320-foot long center platform would be constructed. There would be two tail tracks, for train storage, extending west beyond the station.

There will be no new parking facilities, facilities for passenger drop-off and pick-up, or bus stops. No additional station staff is expected since fares will be paid at the existing fare gates in the headhouse.

5.5.2 History of MEPA Review

An EENF was submitted to the EEA on September 14, 2007. The Secretary of EEA issued a Certificate on the EENF on November 15, 2007, requiring a DEIR for the Project.

5.5.3 Related Permits and Approvals

The Project will require permits and approvals from several local, state and federal agencies. Table 5-3 lists the permits and approvals that are anticipated for the Project.

Table 5-3 Possible Permits or Approvals

Agency	Approval or Permit
FTA (if federal funding is used)	Finding of No Significant Impact
	Section 4(f) Determination
	Section 106 Finding
	Federal funding approval
U.S. Environmental Protection Agency Region I	NPDES Permit for stormwater discharges and construction period
MassDOT	State funding approval
	Section 61 Finding
DCR	Access permits and Section 61 Finding
City of Boston	Approval for temporary road closings/detours for construction
	Building permits as needed for construction
Boston Conservation Commission	Order of Conditions for work in Bordering Land Subject to Flooding
Boston Water & Sewer Commission	Approval for temporary relocation of stormwater and sewer infrastructure
MHC	Approval of archaeological monitoring plan

5.5.4 Overview of Project Impacts and Mitigation Measures

This section summarizes the impacts to environmental resources and the mitigation measures proposed to prevent or reduce these impacts.

5.5.4.1 Noise

Ground-borne vibration may cause ground-borne noise at four multi-family residences near the crossover by Charles/MGH Station. The vibration source could be eliminated by using spring-rail frogs, moveable-point frogs, or flange-bearing frogs at this location. There is no need for a vibration monitoring plan during operations.

5.5.4.2 Soils and Groundwater

Permeation grouting of the glacial till from within the tunnel as the tunnel advances will likely be required to reduce groundwater inflow and to prevent softening of exposed glacial till surfaces associated with excessive seepage or heave of a clay subgrade due to hydrostatic uplift pressures in the in the underlying glacial till.

The existing Charles/MGH Station is within the expected zone of settlement. Several buildings between Charles Street and West Cedar Street to the south and east of the South Tail Track are also within the zone of expected settlement. Any potential dewatering within the Charles Circle area could expose the tops of the piles, causing them to rot and the buildings to settle. A monitoring program would be developed to identify and remedy problem situations. Groundwater monitoring is recommended to continue after construction to ensure that adverse impacts to the water table do not occur.

The construction specifications for the Project would require that if drawdown to the water table is found during construction, the Contractor would take the following actions to restore groundwater levels:

- Seal any visible leaks in the excavation support system by grouting or other means;
- Add additional grouting to the SEM mined areas to reduce seepage;
- Recharge the groundwater by installing infiltration basins or recharge wells in the affected areas; or
- A combination of the above three methods.

After completing the repair and allowing the water table to respond, an assessment of the effectiveness of the remedial measures on the water table would be made. If the resulting water table has not reached the pre-determined baseline elevation, additional mitigation efforts would be required.

Dewatering would likely be required during the SEM construction of the Bowdoin Station platform area between the two tunnels, and possibly from other construction areas. At the current design stage, there is no information on the volume or quality of groundwater that would be dewatered. It is anticipated that the groundwater would have to be lowered temporarily as much as 40 feet to the tunnel invert in the Bowdoin Station platform area and 20 feet to the tunnel invert in the Charles/MGH Station platform area.[37] Greater drawdown is anticipated outside of the Project limits, as groundwater flows toward the construction area, in response to drawdown to the tunnel invert. However, shallow wood-pile building foundations are not anticipated

37 Personal Communication with John Kastrinos, Haley and Aldrich, Groundwater Drainage Meeting, VHB, Boston, November 19, 2009.

in this area, so drawdown is not expected to impact any adjacent structures. If further analysis during final design concludes that the groundwater drawdown would have detrimental effects on adjacent structures, a grout curtain cutoff may be installed at the crown of the two TBM tube tunnels in the platform area.

Alternative No. 1 does not require additional excavation at the Bowdoin Station platform between the two TBM tubes to accommodate the relocated platform of Alternative 2. Therefore, if Alternative 1 is chosen, there would not be a need to lower the groundwater level in this area.

A groundwater cutoff wall on the western end of the Project area will be explored during final design and construction planning to reduce dewatering requirements. Alternatively, a large-scale, jet grout, ground improvement program could be undertaken to create a strong arch of low permeability soil over the Blue Line platform area at Charles/MGH Station.

Dewatered groundwater from the Project would not be discharged to nearby storm drains and/or surface water bodies without proper pre-treatment and permitting from DEP, MWRA, and/or EPA. A typical water treatment method would be used to settle out solids in groundwater in a frac tank, then route the water (by pumping) through activated carbon before releasing it. The western end of the North Tail Track area may be well-suited for siting a temporary water treatment facility. Groundwater would be pumped from excavation areas and recharged back to the ground only in an area approved by DEP and/or EPA.

For small, short-term excavations where only limited dewatering is anticipated, treated groundwater extracted during dewatering would be pumped from one side of the Project area to another trench. This option would apply only when a very small volume of water is collected and where such return to groundwater would not result in flooding over the ground surface or within nearby subsurface utilities or other structures. If a larger volume of groundwater is removed, excess groundwater may be pumped into drums or frac tanks for temporary containment during construction activities. The drums or tank(s) would collect and store the water until subsurface work is complete. In some cases, it may be possible to return the collected water into the opened excavation once the subsurface work is complete. If groundwater is dewatered from an MCP site, then the water can only be replaced into the ground within the MCP site boundaries (as long as there is no oil on the water).

Off-site disposal would be considered in areas where treatment and recharge is not possible. Groundwater would be pumped into a container or tank truck and then shipped to an off-site treatment and disposal facility, using a Bill Of Lading or hazardous waste manifest.

5.5.4.3 Traffic

During construction of the Project, geometry and/or signal timings at five intersections would be altered:

- Charles Circle – Charles Street/Storrow Drive westbound off-ramp;
- Cambridge Street at Joy Street;
- Cambridge Street at Staniford/Temple Street;
- Cambridge Street at New Chardon/Bowdoin Street; and
- Cambridge Street at New Sudbury/Somerset Street.

Traffic detours would be established during construction to minimize traffic disruption and ensure access to this area is maintained. Emergency access would be maintained at all times throughout the area. Temporary disruptions to existing emergency vehicle, the Partners Shuttle, and truck routes would occur during the closure and detour of Cambridge and Sudbury Streets on nights and weekends over the course of the project. Close coordination with emergency response officials and area hospitals would be ongoing throughout construction to ensure all emergency responders have unimpeded access as needed.

Maintaining traffic through construction includes accommodating pedestrian and bicycle flow along the Cambridge Street corridor. Temporary walkways would be installed where necessary to direct pedestrians around work zones. There is one location where minor impacts to pedestrian accommodations would be unavoidable. At the intersection of Cambridge Street at Joy Street, the pedestrian crosswalk across Cambridge Street would be moved to the east about 35 feet during a portion of the construction period. The current pedestrian signal crossing and traffic control would be maintained and the delay to pedestrians waiting to cross the street would not change. For pedestrians heading to/from Charles River Plaza from Joy Street, the walk trip would increase by less than 10 seconds.

Minor signal timing adjustments at Staniford/Temple Street and New Chardon/Bowdoin Street would be needed throughout the duration of construction. These minor timing changes would have a negligible effect on pedestrian levels of service at the intersection crosswalks.

There would be no loss of residential parking and no mitigation is required. The MEEI parking lot on Charles Street (under the Storrow Drive ramps) would be used as a construction staging area. To accommodate MEEI patients and visitors who use this parking lot, a temporary multi-story parking structure would be constructed on the portion of the lot that would not used for construction staging.

5.5.4.4 Air Quality

Construction activities associated with utility relocation, grading, excavation, track and tunnel work, and the installation of systems components could result in temporary air quality impacts. Air quality in the study area is not expected to be substantially affected because of the temporary nature of the construction and the confined construction area. Emissions from the operation of construction machinery could include nitrogen oxides, sulfur oxides, carbon monoxide, and particulate matter.

In an effort to reduce air quality emissions from construction activities, the Project will contractually require the construction contractors to adhere to all applicable regulations regarding control of construction vehicles emissions. This would include, but not be limited to, maintaining all motor vehicles, machinery, and equipment associated with construction activities and proper fitting of equipment with mufflers or other regulatory-required emissions control devices. Also, excessive idling of construction equipment engines would be prohibited, as required by MA DEP regulations in 310 CMR 7.11.

Additionally, construction specifications would require that all diesel construction equipment used on-site will be fitted with after-engine emission controls, such as diesel oxidation catalysts or diesel particulate filters.[38] Additionally, the Project would contractually require the construction contractors to utilize ultra-low sulfur diesel fuel for all off-road construction vehicles as an additional measure to reduce air emissions from construction activities. The Project would put idling restriction signs on the premises to remind drivers and construction personnel of the state's idling regulation.

The contractor would also be responsible for protective measures around the construction and demolition work to protect pedestrians and prevent dust and debris from leaving the site or entering the surrounding community. Dust generated from earthwork and other construction activities like stockpiled soils would be controlled by spraying with water to mitigate wind erosion on open soil areas. Other dust suppression methods would be implemented to ensure minimization of the off-site transport of dust. Pavement of adjacent roadway surfaces would be swept regularly during the construction period to minimize the potential for vehicular traffic to create airborne dust and particulate matter.

38 This is consistent with the Certificate of Construction Equipment Standard Compliance Form required for all bids to the MBTA.

5.5.4.5 Stormwater

A SWPPP would be developed and implemented in accordance with NPDES and DEP standards. Dewatering controls will be used, if necessary. Construction equipment would be maintained to prevent oil and fuel leaks.

Dewatered groundwater from the Project would not be discharged to nearby storm drains and/or surface water bodies without proper pre-treatment and permitting from DEP, MWRA, and/or EPA. A typical water treatment method would be used to settle out solids in groundwater in a frac tank, then route the water (by pumping) through activated carbon before releasing it. The western end of the North Tail Track area may be well-suited for siting a temporary water treatment facility. Groundwater would be pumped from excavation areas and recharged back to the ground only in an area approved by DEP and/or EPA. If the CSO infrastructure is altered, the CSO infrastructure would be replaced with separated stormwater and sanitary sewer infrastructure, as required by BWSC.

5.5.4.6 Hazardous Materials and Solid Waste

Contaminated soil or groundwater may be encountered while constructing either Build Alternative. Excavations to 50 feet below ground surface would likely be through contaminated soil, and dewatering activities (specifically in the vicinity of Bowdoin Station) may involve impacted groundwater. Exposure to residual hazardous materials in soil and/or groundwater may present a risk to worker health, and any materials with concentrations of chemicals in excess of regulatory standards must be treated and/or disposed of properly. A soil and groundwater management plan, describing testing protocols, on-site management, and eventual treatment or disposal would be developed prior to construction.

Construction and demolition in Bowdoin Station would generate solid waste; preliminary estimates determined that approximately 7,500 cubic yards of construction and demolition debris may be generated. Some of this debris may be special waste, requiring special management for worker exposure and waste disposal. Suspected lead-, mercury-, or asbestos-containing building materials, as well as polychlorinated biphenyl products and petroleum products, are present within Bowdoin Station and the existing tunnels. Construction or demolition activities in the Bowdoin Station or Bowdoin Loop tunnels may result in worker exposure to these regulated materials. The nature and extent of the exposure risk is not possible, at this phase of the design, to determine. A hazardous materials and/or special waste management plan, describing testing protocols, on-site management, and eventual treatment or disposal would be developed to the extent necessary, based upon the final design, prior to construction.

Any hazardous materials (hazardous wastes, hazardous materials, or contaminated soil or groundwater) would be managed in accordance with relevant regulatory requirements for treatment, storage, and disposal. The management plans described above would be developed with and approved by the DEP prior to implementation.

5.5.5 Proposed Section 61 Findings

The language in the following paragraphs is a proposed Section 61 Finding that extends to cover all potential impacts of the project.

Project Name: Red Line/Blue Line Connector Project
Project Location: Boston, Massachusetts
Project Proponent: Massachusetts Department of Transportation
EEA Number: 14101

The potential environmental impacts of the project have been characterized and quantified in the EENF and DEIR, which are incorporated by reference into this Section 61 Finding. Throughout the planning and environmental review process, the proponent has been working to develop measures to mitigate significant impacts of the proposed action. With the mitigation proposed and carried out in cooperation with state agencies, MassDOT finds that there are no significant unmitigated impacts.

The proponent has prepared Construction Period Mitigation and Management Protocols (Table 7-2 of the DEIR) that specify the mitigation measures that the proponent will provide.

Therefore, MassDOT, having reviewed the MEPA filings for the Red Line/Blue Line Connector Project, including the mitigation measures summarized in Chapters 6 and 7 of the DEIR, finds pursuant to M.G.L. C. 30, S. 61 that, with the implementation of these mitigation measures, all practicable and feasible means and measures will have been taken to avoid or minimize potential damage from the project to the environment.

Figures

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Appendices

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