Chapter 4 – Potential Environmental Impacts and Mitigation

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4. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

As presented in Chapter 3, MassDOT considered alternative concept designs on the track configuration, station concept, layover facility sites, and joint/private development elements of the project. These analyses identified concepts for consideration and provided refinements to designs. From this analysis, the Build Alternatives for the DEIR were refined and utilized as the basis for the environmental analysis. The four project alternatives developed and presented in this DEIR are:

- No Build Alternative
- Alternative 1 – Transportation Improvements Only
- Alternative 2 – Joint/Private Development Minimum Build
- Alternative 3 – Joint/Private Development Maximum Build

The concepts developed for the track configuration, station design, and layover facility sites are the same in each Build Alternative and would result in no variations in environmental impacts across each alternative. Differences in the DEIR project alternatives stem from only the joint/private development alternatives. Each alternative includes an assessment of the environmental impacts for track configuration, station location and layover facility sites, as well as variations in the joint/private development program.

While this DEIR provides an evaluation of the four proposed project alternatives, MassDOT has not identified a preferred alternative for all project components. However, through this evaluation, MassDOT has determined that a layover facility located west of South Station is needed and, therefore, has identified Beacon Park Yard as a component of the preferred alternative. An agreement in principal has been reached between Harvard and MassDOT to use approximately 22 acres of Beacon Park Yard for a new commuter rail layover, maintenance facility, and rail station.

MassDOT is simultaneously performing environmental review of the I-90 Allston Interchange project, which is located in an area that includes the Beacon Park Yard rail site and I-90 (the Massachusetts Turnpike). The Interchange project is examining how to best realign the transportation assets in this area while also addressing significant structural needs, highway operational changes (the introduction of All-Electronic Tolling), the construction of a potential commuter rail station, and the introduction of significant off-road multimodal connections through the area. MassDOT has determined that the most appropriate manner to consider these potential transportation changes is under a single environmental review process. Therefore, MassDOT plans to continue environmental review of the full Beacon Park Yard site as a layover facility as part of the I-90 Allston Interchange project's environmental review. An ENF for that project has been filed with the Secretary of EEA concurrent with this DEIR.

The South Station Expansion DEIR and associated technical reports analyze initial concepts for layover at Beacon Park Yard. The No Build condition assumes no change at Beacon Park Yard for the purposes of comparison between the Build and No Build conditions. However, any environmental impacts resulting from future changes in the use of Beacon Park Yard layover would be analyzed in the I-90 Allston Interchange project's environmental review.

After completion of the SSX DEIR process, MassDOT would move to fully identify all remaining components of the preferred alternative for the project. Under this approach, said preferred alternative would be identified in the Final EIR (FEIR).

Chapter 4 presents a summary of existing conditions at the SSX project sites, potential impacts due to the project, and proposed mitigation to reduce and/or minimize those impacts.

4.1. Land Use and Zoning

This section summarizes existing land use and zoning, assesses potential impacts of the project on existing land uses, and summarizes the consistency of the SSX project with City of Boston zoning and planning policies. Appendix 4 - *Land Use and Zoning Technical Report* provides additional information, and identifies recently completed, ongoing, and proposed development projects generally within the one-half-mile site study areas.

4.1.1. Existing Conditions

South Station Site

South Station is located in a dynamic and growing area of the City of Boston. The one-half-mile South Station study area traverses multiple neighborhoods in Boston, largely comprised of Downtown to the north, the South Boston Waterfront/Innovation District to the east, and Chinatown and the Leather District to the west. The South Station site itself occupies approximately 49 acres and includes the following: South Station Rail Terminal and headhouse; South Station Transportation Center Bus Terminal and Parking Facilities (Bus Terminal); the U.S. Postal Service (USPS) General Mail Facility/South Postal Annex parcel; Rolling Bridge Park; a portion of the NEC Main Line to the west, extending up to and including Cove Interlocking; and a portion of the MBTA's Fairmount Line/Old Colony Railroad to the south, extending up to and including Broad Interlocking. Portions of the Harborwalk extend north and south of the site. It is also bordered by the Rose Kennedy Greenway and Dewey Square Park, both of which were created as a result of the I-93/Central Artery/Tunnel (CA/T) project.

The City of Boston identifies the existing land use for virtually the entire site as exempt/institutional (including social, institutional, or infrastructure-related uses). Open space within the site includes Rolling Bridge Park, which, along with the Cabot Cove open space and walkway over Fort Point Channel, is owned and maintained by MassDOT. Other MassDOT-owned and maintained spaces created as CA/T mitigation abutting South Station includes plantings along Atlantic Avenue fronting the South Station Bus Terminal entrance. Rolling Bridge Park is considered to be a park of local significance per Section 4(f) and will be assessed as part of the federal environmental review process. No protected spaces under Article 97 are located on or adjacent to the South Station site.

Several zoning districts regulate development of the site, including the South Station Economic Development Area (EDA), the Downtown Interim Planning Overlay District (IPOD), the Central Artery Special District, the Flood Hazard Overlay District, the Greenway Overlay District, and the Restricted Parking Overlay District. Key planning and community development documents applicable to the immediate vicinity of South Station include the *Fort Point Channel Watersheet Activation Plan*, the *Fort Point District 100 Acres Master Plan*, the *South Bay Planning Study*, and the *Chinatown Master Plan*.

Layover Facility Sites

Widett Circle

The Widett Circle study area is located within the I-2 General Industrial District, and features predominantly industrial uses. Rail operations and support facilities include Amtrak's Front Yard and Southampton Street Yard; the MBTA's South Side Service and Inspection Facility; and Cabot Yard, the primary MBTA Red Line vehicle maintenance facility.

Beacon Park Yard

Beacon Park Yard is located in the Allston Landing South Economic Development Area (EDA). The site is bordered on the north, east, and west by the Massachusetts Turnpike and on the south by the MBTA's Framingham/Worcester Line, essentially isolating Beacon Park Yard from the Allston neighborhood. The BRA designates Beacon Park Yard as industrial land use.

Readville – Yard 2

Readville – Yard 2 is located within a Local Industrial Subdistrict of the Readville Industrial Area in Hyde Park. Land uses within the study area include residential and commercial uses, directly south of the site; and the Neponset River and the Neponset River Reservation, located east/southeast of the site. The BRA designates Readville-Yard 2, which is owned by the MBTA and used as a layover facility for its south side operations, as exempt/institutional land uses.

4.1.2. Potential Impacts

In addition to the existing exempt/institutional land uses on the site, the SSX project could introduce residential and commercial uses onto the site. Section 4.1.3 below addresses potential changes to current zoning. Beyond the acquisition of the USPS General Mail Facility (GMF), an existing MBTA/BRA easement (presently including a patio for 245 Summer Street) would be required in order to reopen Dorchester Avenue as a public two-way street. Layover facility sites would require various land use changes, as outlined in more detail in Appendix 4 – *Zoning and Land Use Technical Report*.

4.1.3. Regulatory Consistency

South Station Site

The expansion of South Station is consistent with city-wide and neighborhood planning and development policies and programs. At the request of MassDOT, the City of Boston recently initiated a master planning process for the South Station/USPS area. The BRA's goals for the South Station master plan are to coordinate major public and private planning and development and prepare a comprehensive, long-range plan for land use, multimodal transportation, urban design, and the public realm. Further, the master plan will inform the development of an amendment to the *Fort Point Downtown Phase 2 Municipal Harbor Plan* (MHP) in conformance with the Public Waterfront Act (Chapter 91). This is required only for Alternative 3, as the other Build Alternatives are in conformance with Chapter 91 regulations. While the SSX project conceptual plans for joint/private development, as shown in Chapter 3, are being developed prior to the completion of the City's master planning process, it is anticipated that the SSX project Build Alternatives would be consistent with the City's South Station master plan and its recommendations for amendments to and refinement of current zoning through ongoing coordination meetings between the two project teams.

The SSX project is consistent with the *Fort Point Channel Watersheet Activation Plan* and would realize a goal of the Plan to enhance the civic role of Fort Point Channel in connecting to public venues such as South Station. The SSX project would strengthen pedestrian links between South Station and the channel, creating a special public destination facility. Per the *Fort Point District 100 Acres Master Plan*, the SSX project is a critical component of continued development of the South Boston Waterfront/Innovation District. Transportation analysis conducted for the *100 Acres Master Plan* indicates that by 2025, additional transit capacity is required to support the continued build-out of the entire South Boston Waterfront/Innovation District. Additionally, the SSX project would foster the goals of the *Chinatown Master Plan* and *South Bay Plan* by restoring public access to South Station via

Dorchester Avenue, and enhancing the pedestrian and community environment through extension of the Harborwalk and with a cycle track.

Layover Facility Sites

Widett Circle

Locating layover facilities at the Widett Circle site would be consistent with current zoning. Per Article 8 of the *Boston Zoning Code*, "Regulation of Uses," a storage yard accessory to a railroad operation is an allowed use within the I-2 General Industrial District, provided that the yard is located at least 150 feet from every residential use. The nearest residential land use is located more than 700 feet from the Widett Circle site boundary and no residential projects are under construction or proposed within 150 feet of Widett Circle.

Beacon Park Yard

Locating layover facilities at Beacon Park Yard would maintain the existing industrial use and would be consistent with current zoning. Per Article 51 of the *Boston Zoning Code*, "Allston-Brighton Neighborhood District," a rail freight terminal and accessory railroad storage yard are approved uses without restrictions within the Allston Landing South EDA.

Readville – Yard 2

Locating layover facilities at Readville – Yard 2 would maintain the existing industrial use and would be consistent with current zoning. Per Article 69 of the *Boston Zoning Code*, "Hyde Park Neighborhood District," an accessory railroad storage yard is an allowable use within the LI-1 Local Industrial Subdistrict. Article 69 stipulates special site requirements for sites located within and abutting other districts. The northernmost portion of the Readville – Yard 2 expansion footprint would be located within the Neponset River Riverfront Protection Overlay District (RPOD). Design guidelines for projects within the RPOD include waterfront setbacks, screening of all service areas, and minimal use of impervious surfaces. The southern boundary of the site would be in close proximity to a single-family residential district (1F-6000 Subdistrict, at Wolcott Court). Article 69 directs that where any lot line of a proposed project in a Local Industrial District abuts a Residential Subdistrict or Use, vegetative plantings, solid walls or fences, screening, and rear yard setbacks are required.

4.2. Wetlands and Ecology

This section addresses natural resource areas as they relate to the SSX project activities, including habitat, wetlands and surface waters, and floodplain. The study area for the evaluation of natural resources is defined as one-half-mile surrounding the South Station headhouse and one-half-mile surrounding the three layover facility sites. Resource impacts are quantified based on preliminary project footprints that represent the areas within each site boundary where permanent or temporary construction is likely to take place.

The Massachusetts Wetlands Protection Act (WPA) establishes jurisdiction over special resource areas, including the following resources specific to the SSX project sites: coastal wetlands, rivers, land under water, land subject to coastal storm flowage, land subject to flooding (the 100-year floodplain), and riverfront areas. In the City of Boston, the Boston Conservation Commission administers the WPA to protect interests of the Commonwealth, including: protection of public and private water supply; protection of groundwater supply; flood control; storm damage prevention; prevention of pollution; protection of land containing shellfish; protection of fisheries; and protection of wildlife habitat. The

Boston Conservation Commission currently does not have additional wetlands regulations. However it is in the process of developing a local wetland ordinance that will provide greater resource area authority.[1] For more information please see Appendix 5 – *Natural Resources Technical Report.*

4.2.1. Existing Conditions

South Station Site

The South Station site and adjacent terrestrial areas are densely developed urban land uses consisting of buildings, roadways, and rail facilities. The South Station project footprint has limited vegetation and mainly impervious surfaces. The site is not anticipated to be used as habitat other than by opportunistic and potentially nuisance wildlife and common birds of urban settings. There are no Priority Habitats of Rare Species or Estimated Habitats of Rare Wildlife present in the South Station site or study area and no federal or state endangered or threatened species are known to be present. Fort Point Channel is the only surface water feature in the South Station study area, two acres of which are located within the South Station site boundary. The Massachusetts Department of Marine Fisheries indicates that Fort Point Channel is considered habitat for larval settlement and juvenile development of winter flounder and that the channel may serve as refuge for migrating diadromous fish; however, the channel is not indicated as a spawning ground, feeding ground, or a passageway for diadromous fish and does not meet the definition of a fish run. There are no vegetated federal wetlands located in the study area or site boundary. The WPA provides jurisdictional authority over several resource areas within Fort Point Channel, including Land Under the Ocean, Land Subject to Tidal Action, Coastal Bank, and Land Subject to Coastal Storm Flowage. At Fort Point Channel, a 100-foot buffer zone extends from its coastal bank. Fort Point Channel and some of the surrounding area contains both 100-year (zone AE) and 500-year (zone X) flood hazard areas, which mainly consist of roads and commercial development.

Layover Facility Sites

Widett Circle

The Widett Circle site and adjacent areas are densely developed urban land consisting of buildings, roadways, and existing rail yards. The site has minimal vegetation and is comprised mainly of impervious surfaces. The site is likely to support similar assemblages of terrestrial opportunistic urban wildlife as described for the South Station site. The study area does not contain any Priority Habitat of Rare Species, Estimated Habitat of Rare Wildlife or EFH, federal or state endangered species, ACECs, or vernal pools. There are no surface waters or WPA jurisdictional resources identified within the Widett Circle project boundary. The outer limit of the study area contains areas of Zone AE and Zone X flood hazard areas associated with Fort Point Channel. The 100-year flood zone does not encroach upon the Widett Circle site boundary.

Beacon Park Yard

The Beacon Park Yard site served for many years as a major freight rail yard and intermodal terminal in Boston for CSXT, which recently relocated to central Massachusetts. It contains a number of buildings that formerly supported various railroad functions, including freight rail yard, bulk transfer facility, intermodal facility, and engine facility. The site does not contain any extensive natural or vegetated areas, but is likely to support similar assemblages of terrestrial opportunistic urban wildlife as described for the South Station site. The study area does not contain any Priority Habitat of Rare Species, Estimated Habitat of Rare Wildlife, federal or state endangered species, ACECs, or vernal pools. The study area

[1] City of Boston, *Wetlands*, Accessed March 17, 2014, http://www.cityofboston.gov/environment/Conservation/wetlands.asp

does not contain any surface waters or outstanding resource waters. There are no floodplain areas or WPA jurisdictional resources identified within the Beacon Park Yard site boundary.

Readville – Yard 2

The Readville – Yard 2 site is currently used as an MBTA maintenance repair facility and layover yard. The project site consists of existing rail infrastructure, disturbed ground, sparsely vegetated grass, and shrub patches among actively-used materials storage areas and the disturbed edge of the wooded riparian buffer to the Neponset River. The site is likely to support similar assemblages of terrestrial opportunistic urban wildlife as described for the South Station site. The nearby Neponset River riparian corridor may realize some additional wildlife diversity due to proximity and connectivity with the extensive nearby Fowl Meadow and Ponkapoag Bog Area of Critical Environmental Concern (ACEC), which contains approximately 8,350 acres of wetland and floodplain area in the Neponset River basin. The Fowl Meadow and Ponkapoag Bog ACEC are located approximately 600 feet south of the site at its closest point. At the potential impact area, the riverfront area is not floodplain; does not contain any extensive natural or vegetated areas; does not support important wildlife functions; does not show evidence of providing habitat for rare species; and partially occupies areas experiencing regular disturbance. An initial site inspection found that there may be two isolated vegetated wetland areas, which are not jurisdictional under the WPA. The 100-foot buffer zone to the bank of the Neponset and 25-foot Riverfront Area extend into the Readville - Yard 2 site boundary. There are four potential vernal pools, which are classified as outstanding resource waters, located in the study area along the Neponset River south of the layover site boundary.

4.2.2. Potential Impacts

Potential impacts to wildlife habitat, wetlands, surface waters, and floodplains associated with the SSX project were estimated using the preliminary project footprints (approximate limit of work) and WPA-designated jurisdictional resources. Calculations were made using available GIS data and supplemental data derived from aerial imagery and site inspections. Measurements are reflective of planning level information for both the project footprint and resource area limits.

South Station Site

The South Station project would not impact any ACECs, Estimated Habitats of Rare Wildlife, or Priority Habitats of Rare Species. The site has no natural habitat important for wildlife. During construction it is anticipated that effects on wildlife would be negligible. Figure 4-1 presents WPA jurisdictional resources that would be affected within the South Station project footprint. Resources include approximately 346,900 square feet (sf) (7.9 acres) of 100-foot jurisdictional buffer to coastal bank and approximately 129,200 sf (2.9 acres) of land subject to coastal storm flowage (100-year floodplain). The project footprint would overlie approximately 823,200 sf (18.9 acres) of 500-year floodplain.

Coastal bank and "land under the ocean" are shown within the project footprint due to the channel crossings at Dorchester Avenue and the rail bridge south of the station. These resources are beneath the bridges and would not be impacted. Coastal bank area also includes the Fort Point Channel seawall along Dorchester Avenue. Modifications to the seawall involving excavation or reconstruction are not anticipated but minor repairs to address mortar voids and shifted granite blocks may be conducted. The minor repairs would be considered maintenance activities with no impacts to resource areas of coastal bank, land under the ocean, or land subject to tidal action. Indirect impacts to adjacent resource areas such as Fort Point Channel are not anticipated. No impacts to the surface waters of Fort Point Channel are anticipated.

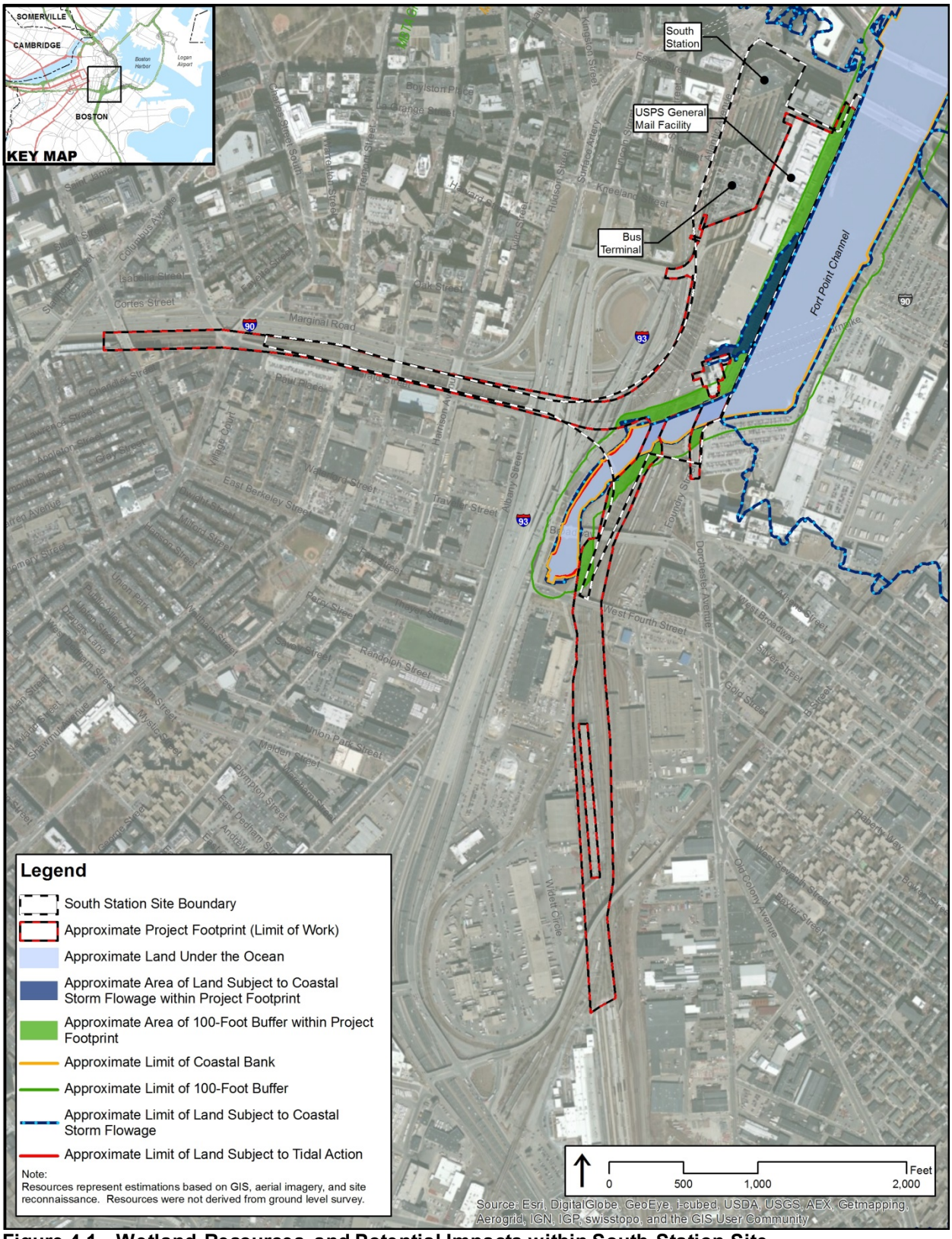

Figure 4-1—Wetland Resources and Potential Impacts within South Station Site

All areas of floodplain occurring at the site are currently developed land; therefore SSX project activities at the South Station site would not convert natural ground floodplains into floodplain representative of developed land. Impacts to floodplains at the South Station site would likely include redevelopment of existing developed areas.

Layover Facility Sites

Widett Circle

The Widett Circle project would not impact any ACECs, Estimated Habitats of Rare Wildlife, or Priority Habitats of Rare Species. The site has no natural habitat important for wildlife. During construction of the proposed layover facility, it is anticipated that effects on wildlife would be negligible. No impacts to WPA jurisdictional resource areas would occur due to construction. The project would not affect any 100-year floodplain, but would contain approximately 25 acres of 500-year floodplain.

Beacon Park Yard

The Beacon Park Yard project would not impact any ACECs, Estimated Habitats of Rare Wildlife, Priority Habitats of Rare Species, or wildlife within the nearby Charles River riparian corridor. During construction of the proposed layover facility, it is anticipated that effects on wildlife would be negligible. No impacts to WPA-jurisdictional resource areas would occur due to construction. There are no 100-year or 500-year floodplain areas located within the Beacon Park Yard site boundary.

Readville – Yard 2

The Readville - Yard 2 project would not impact any ACECs, Estimated Habitats of Rare Wildlife, or Priority Habitats of Rare Species. Although ACEC and rare species habitat occur within the study area, none of these areas falls within 500 feet of the site boundary, and thus are not anticipated to be impacted. The proposed layover facility would not isolate any potential wildlife corridors joining the Fowl Meadow and Ponkapoag Bog ACEC with other important wildlife habitats. During construction it is anticipated that effects on wildlife in adjacent areas along the Neponset River would be negligible.

Figure 4-2 presents WPA jurisdictional resources that would be affected within the Readville – Yard 2 layover facility footprint, including approximately 2,100 sf (0.05 acres) of riverfront area and approximately 14,200 sf (0.3 acres) of the 100-foot buffer associated with the Neponset River bank. Additionally, construction of layover facilities would affect approximately 9,000 sf (0.2 acre) of potential wetland area that is likely to be considered isolated and not subject to jurisdiction under the WPA. As design advances and upon selection of the preferred alternative, field delineation of resources would be required. The project footprint would not directly impact either the 100-year floodplain or the 500-year floodplain associated with the Neponset River.

4.2.3. Regulatory Consistency

SSX project activities at the South Station and Readville – Yard 2 sites would require Orders of Conditions from the Boston Conservation Commission for work in or affecting WPA-protected resource areas. In the project Notice of Intent to be submitted to the Boston Conservation Commission,[2] demonstration of consistency with WPA performance standards would be required. Appendix 5 – *Natural Resources Technical Report* provides additional information on the consistency of the SSX project with the performance standards of the WPA.

[2] One or more Notices of Intent could be required for the SSX project depending upon construction staging and requirements of the Commission.

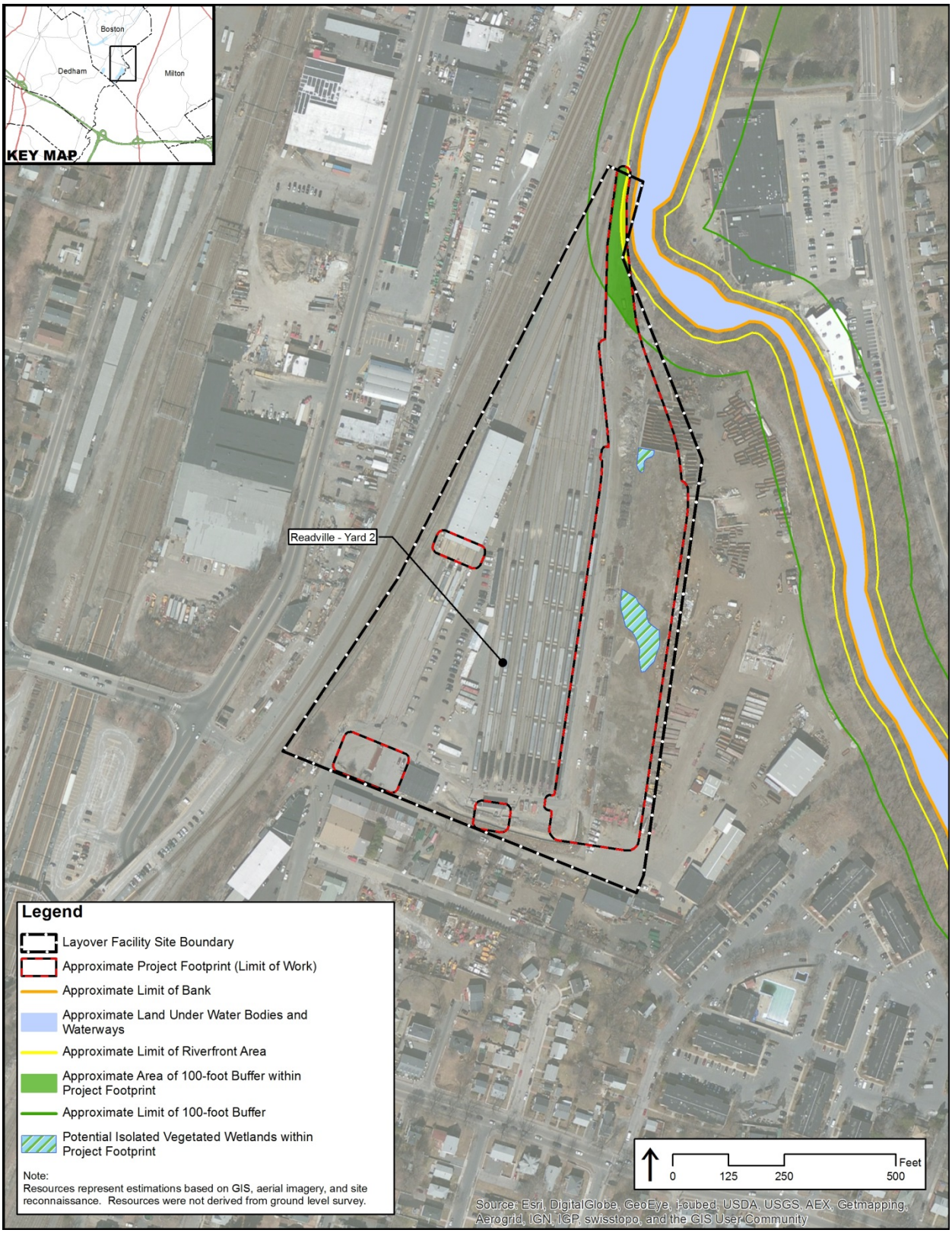

Figure 4-2—Wetland Resources and Potential Impacts within Readville – Yard 2 Site

4.3. Waterways and Tidelands

This section provides a summary of the SSX project's jurisdiction under Massachusetts General Law Chapter 91 and its implementing regulations (310 CMR 9.00), and assesses the consistency of the project alternatives with Chapter 91 performance standards. A summary of wind and shadow impacts as well as open space are included to provide regulatory context to assess project impacts related to future ground level public pedestrian enjoyment and use. Additional information including detailed wind and shadow analysis is contained in Appendix 6 - *Coastal Resources Technical Report*.

4.3.1. Existing Conditions

South Station Site

The South Station site and immediate area are located on filled tidelands, initially built beginning in the early part of the 19th century with the construction of wharves and piers along the western shoreline of Fort Point Channel. This development continued incrementally until the end of the 19th century; when South Station was built by the Boston Terminal Company,[3] and the City of Boston constructed a seawall at the edge of the existing channel, and Dorchester Avenue.[4] Figure 4-3 shows the South Station site in the context of the historic shoreline, defining, in part, the site's jurisdiction under Chapter 91.

In the 1930s, the eastern portion of the South Station Terminal was demolished and the existing USPS building was constructed. At that time, a new license was not required for construction of buildings located on existing licensed fill, such as that within the South Station site. As a result, the existing transportation uses remain authorized by Waterways License 2040, issued to the Boston Terminal Company; and portions of Dorchester Avenue remain authorized by Waterways License 2041, issued to the City of Boston and transferred with land ownership to the USPS.

Nearly all filled tidelands in the South Station site (including South Station, the USPS facility, MassDOT Vent Building #1 and the Dorchester Avenue extension) are held in fee by the Commonwealth or a quasi-public agency or authority in trust for the benefit of the public, and therefore meet the regulatory definition of Commonwealth Tidelands.[5]

The filled tidelands at the South Station site do not meet the definition of landlocked tidelands as stated in 310 CMR 9.00 or M.G.L. Chapter 91. Landlocked tidelands are defined as filled tidelands which are entirely separated from flowed tidelands by one or more interconnected public ways in existence on January 1, 1984[6]. The Dorchester Avenue extension, which separates Fort Point Channel from the existing USPS facility, is owned in fee by the USPS, but the roadway is not open to the public at large for vehicular or pedestrian use. Accordingly, this section of Dorchester Avenue does not meet the definition of a "public way" in the Waterways Regulations and does not by itself create landlocked tidelands at the South Station site.

[3] Waterways License No. 2040 was issued by the Harbor and Land Commission to the Boston Terminal Company in 1897, authorizing the fill of waters on the Fort Point Channel at the foot of Summer Street for the construction of the Boston Terminal Building and tracks.
[4] Waterways License No. 2041 was issued by the Harbor and Land Commission to the City of Boston in 1897, authorizing construction of a seawall on the Pierhead line and placement of fill between wharves and the Summer Street Extension.
[5] 310 CMR 9.02 defined Commonwealth tidelands as "tidelands held by the Commonwealth, or by its political subdivisions or a quasi-public agency or authority, in trust for the benefit of the public."
[6] 310 CMR 9.02

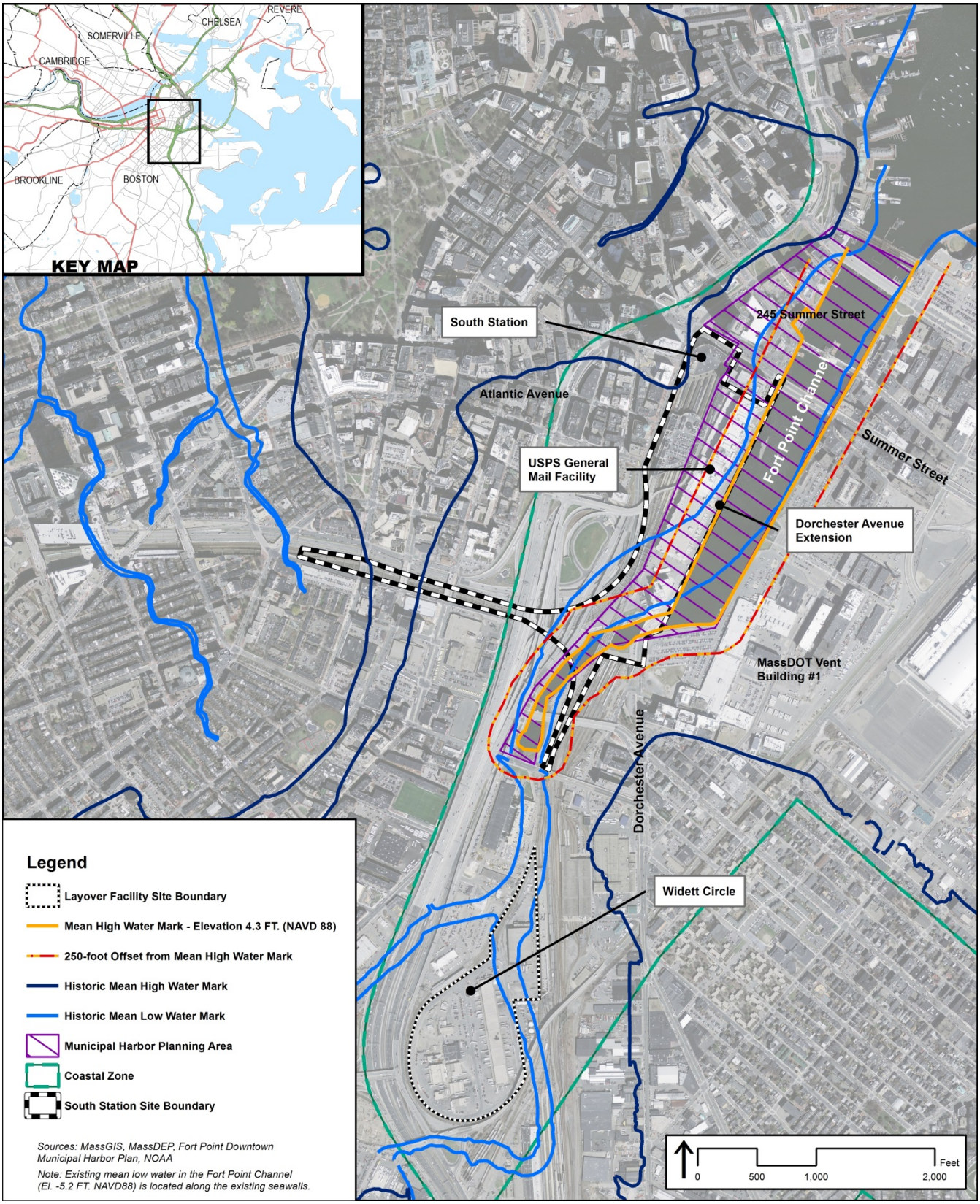

Figure 4-3—Historic Shoreline Proximate to the South Station and Widett Circle Sites

In 2000, during the planning for the South Station Air-Rights (SSAR) development, the Massachusetts Legislature created a very narrow exception to the landlocked tidelands provisions of Chapter 91. Section 85 of Chapter 235 of the 2000 Acts of Massachusetts General Court created a special exception under Chapter 91 to facilitate redevelopment on air-rights above intermodal transportation facilities that would be located on landlocked tidelands, but for the abandonment of an historic public way.[7] While the statute does not specifically identify South Station as the focus of the Massachusetts Legislature's intent, the site meets the specific geographic criteria contained therein. Therefore, for potential air-rights development at the South Station site, this statute creates landlocked tidelands at a point 250 feet landward of the existing mean high water of Fort Point Channel.

The South Station site includes approximately 49 acres of developed land and watersheet of Fort Point Channel. Section 4.1 provides a summary of the land uses within the South Station site, and describes land uses within a planning/public access context. Of the 49-acre site, approximately 14 acres of land is subject to licensing under Chapter 91. The proposed uses within these 14 acres in each build alternative are reviewed in detail below. Land uses considered in this analysis are based on their regulatory status under Chapter 91. For example, roadways and other paved areas open to the sky are considered open space under the waterways regulations in addition to the typical land planning definitions of open space limited to plaza, sidewalks, walkways, and other public realm spaces. Impacts from shadow and wind are assessed to ensure the ground level environment remains conducive to public pedestrian activities.

Layover Facility Sites

Widett Circle and Beacon Park Yard

The Widett Circle site and the Beacon Park Yard site contain limited areas of filled tidelands, as shown in Figure 4-3 and Figure 4-4. These tidelands are considered landlocked and not subject to licensing under Chapter 91. Shadow and wind were assessed to ensure the ground level environment remains conducive to public pedestrian activities.

Readville – Yard 2

The Readville – Yard 2 site is located adjacent to the Neponset River and approximately 8.6 miles upstream from the river's discharge to Boston Harbor. The river has a long history of modifications by the construction of dams, dating to the mid-1600s. Presently, the Readville section of the Neponset River is separated from flowed tidelands of Boston Harbor by the Baker Chocolate Factory and the Tileston & Hollingsworth Dam, built in the 1960s. Based on the presence of these dams, the river does not meet the regulatory criteria for flowed tidelands under 310 CRM 9.00. Therefore, the site does not contain any filled tidelands subject to Chapter 91 licensing requirements. The Neponset River adjacent to the site is regulated under 310 CMR 9.04(1)(e) as a non-tidal river or stream. No work is proposed below the high water mark of the river, and no Chapter 91 approval would be required.

4.3.2. Potential Impacts

This section addresses potential impacts to jurisdictional filled tidelands at the South Station site due to the Build Alternatives. All of the joint/private development Build Alternatives would require new Chapter 91 Waterways Licensing. The No Build Alternative would not include any new construction or change in use, would not result in any new impacts to filled tidelands, and would not require a new Chapter 91 license. This section also addresses potential impacts on the ground level pedestrian environment from wind and shadow.

[7] Section 85, Chapter 235, Massachusetts Acts of 2000.

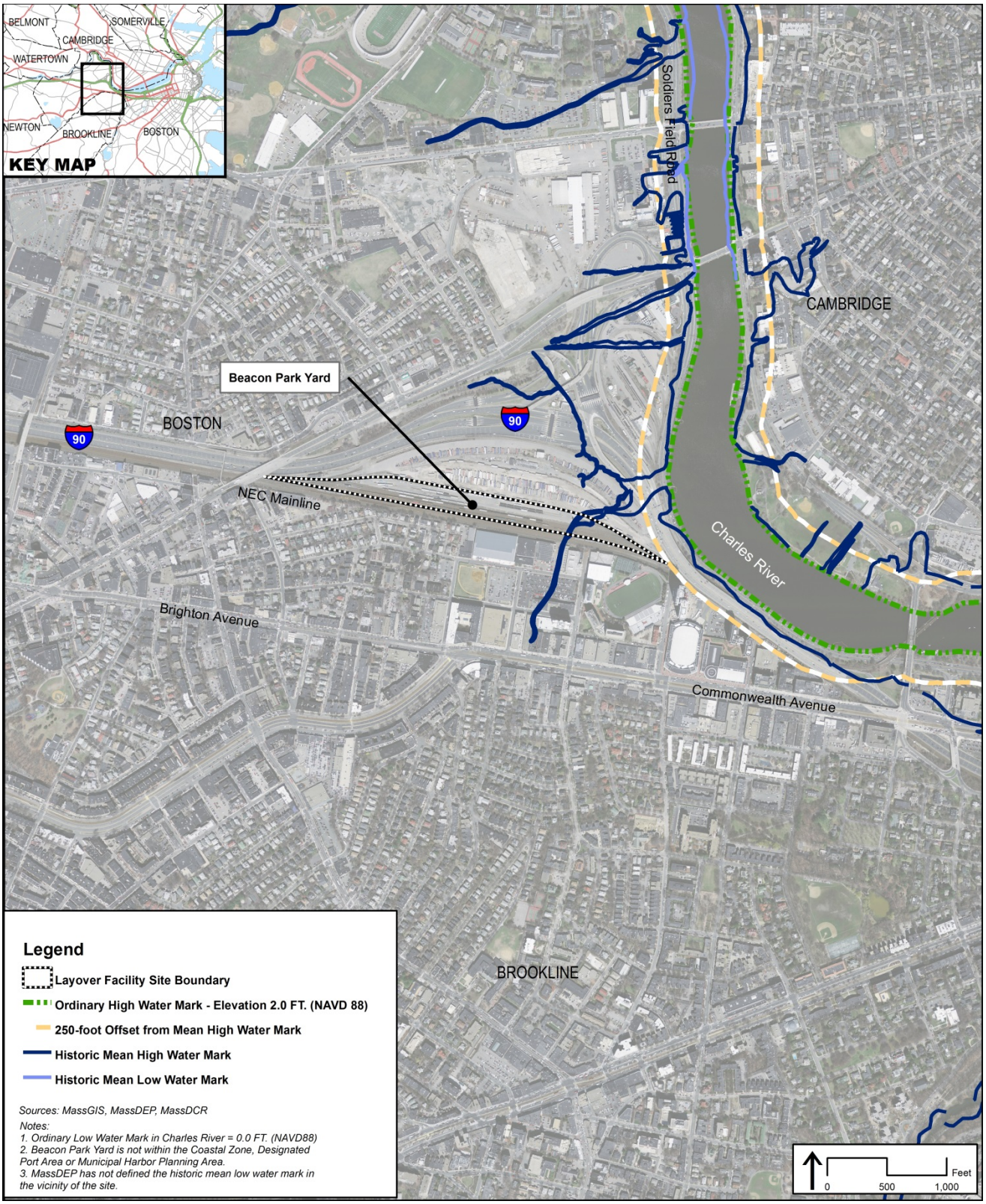

Figure 4-4—Historic Shoreline Proximate to the Beacon Park Yard Site

Alternative 1 – Transportation Improvements Only

Alternative 1 would result in the following substantial positive impacts to the public rights in jurisdictional filled tidelands at the South Station site:

- Removing the nonwater-dependent USPS facility from filled Commonwealth Tidelands.
- Expanding the existing transportation infrastructure at South Station to meet current and future intercity and commuter rail service needs through the construction of critical infrastructure facilities, including new tracks, platforms, a new headhouse fronting on Dorchester Avenue, and related pedestrian-oriented and back-of-house rail facilities.
- Opening approximately five acres of filled tidelands within Dorchester Avenue to public access that have been closed since 1966, providing approximately one-half mile of newly reopened public roadway, including:
    - New travel lanes with on-street parking;
    - A universally accessible sidewalk on the western side of Dorchester Avenue;
    - Approximately 2,500 linear feet of Harborwalk along the Fort Point Channel waterfront, and a 15-foot wide cycle track within the Dorchester Avenue alignment.
- Opening approximately two acres of presently unprogrammed open space between the Dorchester Avenue sidewalk and the planned transportation improvements.

Alternative 2 – Joint/Private Development Minimum Build

Alternative 2 would include all the improvements of Alternative 1, resulting in the same transportation infrastructure-related beneficial impacts to filled tidelands. In addition, Alternative 2 would provide a joint/private development component to be constructed, in part, within jurisdictional filled tidelands extending west of Dorchester Avenue at the ground level, above and adjacent to the expanded South Station. The joint/private development would occupy the entire two acres of unprogrammed open space as identified in Alternative 1, reducing the open space provided in Alternative 2. The joint/private development would result in the following benefits to the public use of filled tidelands:

- Activating the ground level pedestrian environment on a year-round basis with approximately 660,000 sf of mixed-use development, housed in approximately six buildings with heights ranging up to approximately 12 stories, to be located between the new tracks and platforms and Dorchester Avenue.
- Constructing approximately 78,000 sf of facilities of public accommodation (FPA)[8] at the ground level, within the private development.
- While Alternative 2 would provide 7.0 acres of Chapter 91 Open Space within jurisdictional filled tidelands (including areas dedicated to Harborwalk, cycle track, Dorchester Avenue, sidewalks, joint/private development open space, and the existing Rolling Bridge Park), the entire project site would provide 13.0 acres of publicly-accessible open space.
- Dedicating a minimum of one square foot of open space landward of the project shoreline for every square foot of proposed buildings for nonwater-dependent use as required by the waterways regulations at 310 CMR 9.51.

Alternative 2 would comply with the Chapter 91 restrictions on allowable uses within the 100-foot wide water-dependent use zone (WDUZ) and the building height restrictions established by 310 CMR 9.51. Buildings on filled tidelands are limited to a height of 55 feet within 100 feet of the project shoreline. At

[8] Facilities of Public Accommodation are defined as a facility at which goods or services are made available directly to the transient public on a regular basis, or at which advantages of use are otherwise open on essentially equal terms to the public at large (e.g., patrons of a public restaurant, visitors to an aquarium or museum), rather than restricted to a relatively limited group of specific individuals (e.g., members of a private club, owners of a condominium building).

greater landward distances, buildings may increase in height by one-half foot for every additional foot of setback from the project shoreline.

Alternative 3 – Joint/Private Development Maximum Build

Alternative 3 would include all transportation-related aspects of Alternative 1 and would have the same transportation infrastructure-related impacts to filled tidelands. In addition, Alternative 3 would provide a joint/private development component to be constructed, in part, within jurisdictional filled tidelands extending west of Dorchester Avenue at the ground level, above and adjacent to the expanded South Station. The joint/private development would occupy the two acres of unprogrammed open space identified in Alternative 1. The joint/private development would result in the following benefits to the public use of filled tidelands:

- Constructing approximately 2,000,000 sf of mixed-use development, housed in approximately six buildings with heights ranging up to 21 stories, to be located between the new tracks and platforms and Dorchester Avenue.
- Constructing approximately 88,000 sf of FPA at the ground level, within the private development.
- While Alternative 3 would provide 6.6 acres of Chapter 91 Open Space within jurisdictional filled tidelands (including areas dedicated to Harborwalk, cycle track, Dorchester Avenue, sidewalks, joint/private development open space, and the existing Rolling Bridge Park), the entire project site would provide 12.7 acres of publicly-accessible open space..
- Dedicating a minimum of one square foot of open space landward of the project shoreline for each square foot of proposed buildings for nonwater-dependent use.

To maximize the amount of potential joint/private development at the South Station site, Alternative 3 would have additional massing and greater building heights in comparison to Alternative 2. In Alternative 3, the proposed nonwater-dependent joint/private development would exceed existing building height limitations under Chapter 91. Alternative 3 would be located approximately 80 feet from Fort Point Channel, approximately 20 feet closer to flowed tidelands than the Alternative 2 building footprint; the expanded building footprint would extend into the 100-foot WDUZ. Additionally, joint/private development buildings proposed in Alternative 3 would be limited by aeronautical considerations. Based on currently published data, the project assumes a maximum building height limit of approximately 290 feet.

In Alternative 3, the building footprint would result in the following impacts to jurisdictional filled tidelands:

- Ground-level open space provided at the South Station Site within jurisdictional filled tidelands in Alternative 3 would decrease from that provided in Alternative 2 by approximately one-half acre.
- The open space between the joint/private development and Fort Point Channel would be reduced in width by approximately 20 feet, to provide a greater building footprint and increased development density.
- Due to the greater building footprint, sidewalk widths would decrease in Alternative 3 by reducing the sidewalk width by 20 feet with a corresponding reduction in open space along Dorchester Avenue in comparison to Alternative 2. The joint/private development building massing would be an estimated 60 to 135 feet higher than the building massing proposed in Alternative 2.

In addition, Facilities of Public Accommodation would increase at the ground floor of Alternative 3 to a total of 88,000 sf from 78,000 sf in Alternative 2, further activating the jurisdictional filled tidelands.

Similar to Alternative 2, Alternative 3 would provide substantial public activation of the waterfront and include additional public uses within the ground floor. The footprint of the Harborwalk extension and the Dorchester Avenue cycle track would not change between Alternative 2 and Alternative 3.

Wind, Shadow, and Open Space

The Waterways regulations at 310 CMR 9.31(2) require MassDEP to determine that all projects requiring a license meet a proper public purpose which provides greater benefit than detriment to the rights of the public in said land. Portions of the proper public purpose requirements would apply to each of the build alternatives. As part of the public purpose determination, Chapter 91 requires that projects that include nonwater-dependent uses prevent significant conflicts in design. It requires that the scale of buildings and other permanent structures be evaluated for impacts on wind, shadow and other conditions at the ground level environment that may affect users of water-dependent facilities. For more details see Appendix 6 – *Coastal Resources Technical Report.*

Wind Impact Assessment

MassDOT completed a detailed pedestrian level wind analysis to determine potential impacts to the ground level environment including the public realm, existing open space and proposed open space in the vicinity of South Station. The wind study used three-dimensional models of the proposed buildings and surroundings under the No Build Alternative (including the SSAR project) and Alternative 3. Alternative 1 was not examined in the wind study because as a nonwater-dependent infrastructure project subject to 310 CMR 9.55, it is not subject to the provisions of 310 CMR 9.51. Alternative 2 was also not examined as part of the wind study because this alternative would meet all applicable building height and setback requirements under Chapter 91. Alternative 3 would exceed building height and setback limitations established by 310 CMR 9.51 and therefore requires a review of the potential for the project to result in impacts to public realm spaces.

The analysis modeled predicted wind conditions on a seasonal and annual basis using recent meteorological data for Boston. Eighty sensors located in the vicinity of South Station were examined to identify the potential for each to exceed established wind speed criteria deemed comfortable for sitting, standing, and walking. The study identified "uncomfortable" locations that would be expected to exceed these criteria more than 1% of the year. It also examined the potential for Alternative 3 to result in unacceptable wind gusts in the project area. The analysis included a consideration of preliminary mitigation measures such as high coniferous trees and porous wind screens to address uncomfortable wind conditions in potentially sensitive areas.

Under the No Build Alternative, 12 locations were determined to be uncomfortable. Most of these locations are in the vicinity of Dewey Square adjacent to Summer Street. Notable uncomfortable locations in the No Build Alternative include: near the southern end of the existing USPS facility, at the corner of Summer Street and Dorchester Avenue, and on the South Boston shoreline of the Fort Point Channel.

The preliminary results comparing the No Build Alternative and Alternative 3 identified 70 locations where wind conditions were reduced or were unchanged, which includes two locations that were improved and no longer categorized as uncomfortable under Alternative 3.

Of the 80 locations identified, preliminary results comparing the No Build Alternative and Alternative 3 identified 70 locations where wind conditions were reduced or were unchanged. Ten of these 80 locations experienced increased wind conditions. Of these 10, five locations would still experience comfortable wind conditions, while another five locations would experience new uncomfortable wind conditions, as shown in Table 11 of Appendix 6 – *Coastal Technical Report.* Of these five locations, uncomfortable

wind conditions occurred at four publicly-accessible locations while one location was also uncomfortable but is located on the tracks and not accessible to the public. Therefore, it was not considered for further analysis.

With the incorporation of potential mitigation measures to the Alternative 3 design, unacceptable wind gusts at two locations were eliminated, as was the uncomfortable gust condition within one of the proposed open space areas. The potential mitigation consisted of high coniferous trees and screen walls at the ground plain. These mitigation measures are preliminary in nature and would be refined when final design takes place to ensure that wind conditions are suitable at the ground level environment. However, they do demonstrate that it is possible to reduce the wind speed at these potentially sensitive locations.

The wind study therefore shows that Alternative 3 (including preliminary wind mitigation) would have minimal impacts to the pedestrian level wind environment within the project site in comparison to the No Build Alternative. Only four publicly-accessible locations of the 80 studied could experience uncomfortable conditions as a result of the project. Three of these locations are located on sidewalks adjacent to Summer Street. The other new uncomfortable location is located adjacent to a building corner outside of one of the proposed open space areas. Final design of the project would include other mitigation elements such as plantings which would decrease the potential negative impacts from wind.

The study results indicate that the predicted pedestrian level wind conditions along the Dorchester Avenue sidewalk are generally consistent with the planned uses. With the exception of only two study points, wind speeds between Summer Street and the MassDOT Vent Building along Dorchester Avenue are not expected to exceed established wind speed criteria for sitting, standing or walking more than 1% of the year. Predicted wind speeds along the Summer Street Bridge and the eastern shoreline of the Fort Point Channel are also predicted to remain comfortable for sitting, standing, or walking on an annual basis. Alternative 3 is not expected to result in any new instances of unacceptable wind gusts in the study area.

Shadow Impact Assessment

MassDOT performed a detailed shadow analysis to estimate the potential net new shadows cast on public spaces by each of the SSX project alternatives in comparison to the No Build Alternative. Typically a shadow analysis identifies the additional shadow impacts beyond a Chapter 91 compliant baseline. To provide a more detailed analysis of the potential shadow impacts from the project, all alternatives were considered. The study used a 3D CAD model of the City and standard sun altitude and azimuth data for October 23. This date is typically accepted by MassDEP and the Massachusetts Office of Coastal Zone Management (CZM) for shadow studies in Chapter 91 jurisdiction. Hourly shadows were estimated from 9:00 a.m. through 6:00 p.m.

The shadow analysis examined the potential impacts to the ground-level public spaces within filled and flowed tidelands, focusing on public open spaces, major pedestrian areas, sidewalks and the watersheet of Fort Point Channel. For this analysis, shadows cast by proposed buildings or other structures onto existing or proposed buildings in the vicinity of South Station were not considered impacts because they do not affect sidewalks, open space or other public realm areas and do meet the criteria established by 310 CMR 9.51(2)(c). Due to the orientation of the site and the open air/coastal setting of adjacent Fort Point Channel, the SSX project's potential for shadow impacts in the first half of the day would be minimal. As the sun moves into the western sky at approximately 3 p.m., the existing and proposed buildings would have greater potential to cast shadows on watersheet of Fort Point Channel and adjacent public spaces.

The following presents cumulative shadow impacts on public spaces, including an assessment of mitigation requirements:

- Alternative 1 would not create any new shadows on exterior public spaces. As a nonwater-dependent infrastructure project, Alternative 1would not be subject to 310 CMR 9.51(2)(c).
- Alternative 2 would meet the Chapter 91 standards for building height and setback and would not be expected to require mitigation for the relatively minor shadow impacts predicted.
- Alternative 3 would exceed the building height and setback requirements of Chapter 91 and create new shadows on portions of the project site and, in the late afternoon, in South Boston. The shadows cast on the planned on-site open spaces would not negate the strong public benefits accrued from the project along Dorchester Avenue from opening approximately five acres of filled tidelands for public use. The anticipated shadows cast on the South Boston shoreline of Fort Point Channel would last approximately one hour, and are not expected to result in substantial adverse impacts to the public use of these spaces.
- No mitigation is anticipated for new shadows cast on Dorchester Avenue because all Build Alternatives would result in a substantial net benefit to public use of the waterfront. The relatively brief duration of the predicted new shadows on the South Boston waterfront shoreline of Fort Point Channel would be unlikely to require mitigation.

Open Space

The regulations at 310 CMR 9.51(3)(d) establish the following minimum open space requirements for projects subject to licensing under Chapter 91:

- *One square foot of open space shall be reserved within filled tidelands for every square foot of buildings for nonwater-dependent use within filled tidelands.*
- *One square foot of open space shall be reserved for every square foot within Commonwealth tidelands not within the footprint of buildings and a minimum of 50 % of this open space shall be dedicated to pedestrian oriented facilities, as opposed to roads, driveways and parking.*

Open space considerations under Chapter 91 differ substantially from traditional land use planning descriptions. Under the Waterways regulations, "open space" includes any land which is open to the sky at the ground plain including such programmed uses as roads, surface parking, sidewalks, etc. while traditional land use planning considerations would typically limit "open space" to parks, public plazas and other recreational areas dedicated to public non-transportation uses. Furthermore, Chapter 91 open space considerations are typically limited to jurisdictional filled tidelands; however, site-wide open space may also be considered on a case-by-case basis allowing proponents and MassDEP to weight overall public benefits provided by a project. Such considerations are typical of projects subject to review under approved municipal harbor plans, as is expected with the SSX project. Accordingly, the following open space analysis focuses on jurisdictional filled tidelands but also estimates proposed open spaces across the entire South Station site.

All Build Alternatives would provide a minimum of one square foot of open space within jurisdictional filled tidelands landward of the project shoreline for every square foot dedicated to buildings for nonwater-dependent use as required by this regulation. Furthermore, in all Build Alternatives, a minimum of 50% of this open space within jurisdictional filled tidelands is dedicated to pedestrian oriented uses.

Table 4-1 provides a summary of the project area and potential uses under each alternative relative to the open space standards.

Additionally, all Build Alternatives dedicate a minimum of 50% of the planned open space within jurisdictional filled Commonwealth Tidelands to pedestrian-oriented rather than vehicular uses, such as roads, driveways, and parking, as demonstrated in Table 4-1.

4.3.3. Regulatory Consistency

In addition to compliance with basic licensing requirements, Chapter 91 requires that projects located on tidelands serve a proper public purpose which provides greater benefit than detriment to the rights of the public in the tidelands. Following is a description of the approach to Chapter 91 Waterways licensing for the joint/private development Build Alternatives; noting that height, open space, ground floor use, and setback requirements of Chapter 91 do not apply to Alternative 1 – Transportation Improvements Only as it would be classified as a Nonwater-Dependent Infrastructure Project.

Table 4-2 presents a summary table of the consistency of the SSX Build Alternatives with Chapter 91 requirements for nonwater-dependent use projects (310 CMR 9.51 through 9.55), including consistency with public purpose standards. Appendix 6 - *Coastal Resources Technical Report* provides additional details.

Alternative 2 – Joint/Private Development Minimum Build

Alternative 2 would require a nonwater-dependent Infrastructure License for the transportation improvements as described in Alternative 1 above. Alternative 2 would require one or more nonwater-dependent use licenses for the construction of the joint/private development located within 250 feet of the flowed tidelands of the Fort Point Channel. Alternative 2 complies with all applicable Chapter 91 regulations, including height, setback, use, and open space requirements. The joint/private development would be authorized under nonwater-dependent licenses sought under a Consolidated Written Determination.

Table 4-1— South Station Open Space Compliance

Jurisdictional Filled Tidelands	Alternative 1 (ac)[a]	Alternative 2 (ac)	Alternative 3 (ac)
Open Space Requirements Under Chapter 91			
Buildings for Nonwater-Dependent Use	0.56	2.36	2.59
Minimum Open Space Required Under Chapter 91	0.56	2.36	2.59
Open Space Planned	8.37[b]	7.00	6.65
Open Space Provided Beyond Chapter 91 Requirements	7.81[b]	4.64	4.06
Compliance with Commonwealth Tidelands Open Space Requirements			
Pedestrian Use (includes cycle track)	4.66	5.12	4.74
Vehicles	1.71	1.88	1.90
Unprogrammed Space	2.00	0.00	0.00
Total Open Space	8.37	7.00	6.65
% of Open Space for Pedestrian Uses	80	73	71
% of Open Space for Vehicular Uses	20	27	29
Site-Wide Open Space	**14.9**	**13**	**12.7**

a Alternative 1 provided here for information purposes only. As a Nonwater-Dependent Infrastructure Project it is not subject to 310 CMR 9.51.
b Includes 2.0 acres of undedicated space between the Dorchester Avenue sidewalk and the transportation improvements.
c Includes Harborwalk, cycle track, public ways, sidewalks, surface parking and other vehicle access, joint development open space and parks.

Alternative 3 – Joint/Private Development Maximum Build

Alternative 3 would require a nonwater-dependent Infrastructure License for the transportation improvements. Additionally, Alternative 3 would require one or more nonwater-dependent use licenses for the construction of the joint/private development located within 250 feet of the flowed tidelands of the Fort Point Channel. The nonwater-dependent licenses would be sought under a Consolidated Written Determination to facilitate a concise public review of the private development and issuance of a series of licenses with a consistent set of Special Conditions.

The joint/private development buildings in Alternative 3 would exceed building height, setback, and use limitations under Chapter 91 and would require substitute provisions and offsets to mitigate for additional impacts beyond established criteria. All modifications to the existing Chapter 91 regulations achieved through regulatory off-sets or substitutions would require approval of the Secretary for Energy and Environmental Affairs through the Municipal Harbor Planning process.

The South Station site is located within the Fort Point Downtown Waterfront Municipal Harbor Planning Area, for which Phase 1 and Phase 2 MHPs have been approved. Phase 1 established the planning area boundaries and outlined basic planning principles for the planning area. Phase 2 required the City of Boston to complete a master planning effort for the Fort Point Channel area south of Summer Street prior to completion of a Phase 3 MHP Amendment seeking modifications to any Chapter 91 baseline requirements for the South Station site. The only specific requirement included in Phase 2 was dedication of a minimum of 25% of the ground floor space to Special Public Destination Facilities. The location and design of this Special Public Destination Facility would be determined during final design.

Table 4-2—Comparison of South Site Build Alternatives with Chapter 91 Requirements for Nonwater-Dependent Use Projects

Regulatory Standards	Alternative 1	Alternative 2	Alternative 3
Conservation of Capacity for Water-Dependent Use	not applicable	compliant	substitute provisions required
Prevention of Significant Conflict in Use	not applicable	Enhances water-dependent uses	Enhances water-dependent uses
Prevention of Significant Conflict in Design: Wind	not applicable	Not evaluated; meets building height and setback requirements	Minor changes in pedestrian level wind environment, but overall conditions consistent with anticipated use of open spaces.
Prevention of Significant Conflict in Design: Shadow	not applicable	Minor shadow impacts expected	Shadow impacts on open space portions of site and South Boston Waterfront; no adverse impacts to public use of space expected
Limitation on Site Coverage	Dedicates 1 sf of open space for every sf of nonwater-dependent use buildings; 50% of planned open space for pedestrian-oriented uses	Dedicates 1 sf of open space for every sf of nonwater-dependent use buildings; 50% of planned open space for pedestrian-oriented uses	Dedicates 1 sf of open space for every sf of nonwater-dependent use buildings; 50% of planned open space for pedestrian-oriented uses
Utilization of Shoreline for Water-Dependent Purposes	not applicable	100-foot setback from MHW; accommodates WDUZ[1]	80-foot setback from MHW; extends into WDUZ[1]
Activation of Commonwealth Tidelands for Public Use	Harborwalk Extension and Dorchester Avenue sidewalk, cycle track and roadway improvements comply with 310 CMR 9.53.	Harborwalk Extension and Dorchester Avenue improvements and dedication of ground floor space to FPA uses.	Harborwalk Extension and Dorchester Avenue improvements and dedication of ground floor space to FPA uses.
Consistency with Coastal Zone Management Policies	compliant	compliant	compliant
Standards for Nonwater-dependent Infrastructure Facilities	Complies with all applicable standards listed in 310 CMR 9.55	The transportation elements meet all applicable standards listed in 310 CMR 9.55.	The transportation elements meet all applicable standards listed in 310 CMR 9.55.

4.4. Coastal Zone

This section provides an assessment of the SSX project relative to the Massachusetts Coastal Zone, established pursuant to the Federal Coastal Zone Management Act of 1972 and administered by the Massachusetts Office of Coastal Zone Management (CZM) under M.G.L. Chapter 21A, Sections 2 and 4A and the 301 CMR 21.00 (as revised).

4.4.1. Existing Conditions

The South Station site and the Widett Circle site are located within the Massachusetts Coastal Zone and are potentially subject to Federal Consistency review under the provisions of the Massachusetts CZM Plan. Neither the Beacon Park Yard site nor the Readville – Yard 2 site are located within the Massachusetts Coastal Zone and are not subject to Federal Consistency Review.

Projects requiring Federal Consistency Certification must demonstrate that they comply with the applicable regulatory policies established by MCZM under the federally approved Massachusetts Coastal Program.[9] As noted in Section 4.3, consistency with these policies and principles also is required for projects requiring a new or amended Chapter 91 Waterways License. Projects exempt from formal Consistency Certification but requiring a Chapter 91 License undergo an informal interagency consistency review.

4.4.2. Potential Impacts and Regulatory Consistency

Table 4-3 lists the CZM policies which are applicable to the SSX project at the South Station and Widett Circle sites, and assesses the consistency of the SSX project with those applicable policies. Appendix 6 - *Coastal Resources Technical Report* contains further detail on the 26 CZM policies, including determination of applicability.

[9] *Massachusetts Office of Coastal Zone Management Policy Guide*, Executive Office of Energy and Environmental Affairs, October 2011.

Table 4-3—Consistency of SSX Project with Applicable Massachusetts Coastal Zone Management Policies

CZM Policy	Summary of Policy	Summary of Consistency Statement
Water Quality Policy #1	Ensure that point-source discharges do not comprise water quality standards	Project does not proposed new untreated point-source discharges; systems would comply with stormwater regulations
Water Quality Policy # 2	Implement nonpoint pollution controls	Project would use Best Management Practices to minimize non-point source pollution
Habitat Policy # 1	Protect coastal, estuarine, and marine habitats to preserve wildlife habitats	Project would obtain an Order of Conditions from Boston Conservation Commission for work in buffer zone of coastal bank
Habitat Policy # 2	Advance the restoration of degraded or former habitats in coastal areas	Project would comply with MassDEP and U.S. EPA requirements
Protected Areas Policy # 3	Minimize adverse effect to historic properties and districts	Project planning includes ongoing coordination with MHC
Coastal Hazards Policy # 3	Ensure that state and federally funded public works projects would be safe from flood and erosion-related damage	Project design would meet applicable regulations for work in coastal floodplain
Ports Policy # 4	Preserve and enhance waterfront for vessel-related activities	Project would provide open space along Fort Point Channel shoreline for water-dependent uses
Public Access Policy # 1	Ensure that development would promote general public use and enjoyment of water front	Project would create new recreational opportunities through restoration of five acres of filled tidelands, including extension of the Harborwalk, a cycle track along Fort Point Channel waterfront, and additional ground level open space with the joint/private development alternatives
Public Access Policy # 2	Improve public access to coastal recreational facilities; facilitate multiple uses; minimize adverse impacts of developments	Project would improve rail capacity, enhance public access to coastal recreational facilities, and reduce automobile traffic and parking problems
Public Access Policy # 3	Expand coastal recreational facilities and develop new public areas for recreational activities	Project would provide extension of the Harborwalk and a cycle track along Fort Point Channel waterfront
Energy Policy # 2	Encourage energy conservation and use of renewable sources	Project would incorporate energy conservation measures and includes assessment of renewable energy potential
Growth Management Policy #1	Encourage sustainable development that is consistent with state, regional, and local plans	Project would incorporate sustainable design elements, and is consistent with state, regional, and local plans
Growth Management Policy #2	Ensure that state and federally funded infrastructure projects serve developed urban areas	Project would improve public infrastructure to benefit the Boston metropolitan area
Growth Management Policy #3	Encourage revitalization and enhancement of existing development in the coastal zone	Project would revitalize neighborhoods and activate the site on a year-round basis

4.5. Water Quality and Stormwater

This section evaluates the impacts of the SSX project on water resources adjacent to and underlying the project sites, including surface waters, groundwater, and stormwater. The study areas for the evaluation of water resources are defined as a one-half-mile radius from the centers of the South Station site and the three layover facility sites. Appendix 7 - *Water Quality and Stormwater Technical Report* provides additional information.

In accordance with the Clean Water Act (CWA), MassDEP has published an Integrated List of Waters, which evaluates all waters of the state regarding their capacity to support designated uses and identifies those waters that do not meet surface water quality standards. Water bodies are assigned one of five categories ranging from "unimpaired, supporting one or more intended uses" (Category 1), to "impaired, not supporting one or more intended uses" (Category 5). Impairment is related to the presence of one or more pollutants that require the application of one or more total maximum daily load (TMDL) standards for impairments.[10]

4.5.1. Existing Conditions

South Station Site

The only surface water body within the South Station study area is Fort Point Channel, which is part of Boston Inner Harbor. Boston Inner Harbor is included on the 2012 Final Integrated List of Waters[11] as Category 5 and impaired for polychlorinated biphenyls (PCBs) in fish tissue, fecal coliform, enterococcus, dissolved oxygen, and other impairments, and requires one or more TMDL. A Draft Pathogen TMDL has been developed for Boston Harbor in its entirety, which includes Boston Inner Harbor.

The U.S. EPA has authorized 36 combined sewer overflows (CSOs) and six National Pollutant Discharge Elimination System (NPDES) permitted discharges in the Boston Harbor. The Boston Water and Sewer Commission (BWSC) operates seven CSOs that discharge to Fort Point Channel. Through an ongoing program to improve water quality of Boston Inner Harbor, the Massachusetts Water Resources Authority (MWRA) completed the Fort Point Channel Sewer Separation Project in 2007. The goal of this project was to separate the storm drain and sanitary sewer systems and eliminate CSOs, thus removing pollutant sources to Fort Point Channel. The BWSC is constructing the South Boston Sewer Separation Project, scheduled to be complete in 2015, to reduce CSOs and infiltration and inflow and improve water quality in Fort Point Channel. The BWSC currently monitors water quality within Boston Harbor via five CSO monitoring stations in Fort Point Channel. A small portion of the South Station study area (consisting of approximately 1,800 linear feet of track extending into Cove Interlocking) is located within the Groundwater Conservation Overlay District (GCOD). Figure 4-5 shows the existing water resources and outfalls at the South Station site.

[10] TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards.
[11] Massachusetts Department of Environmental Protection. *Massachusetts Year 2012 Integrated List of Waters - Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. 2013.* Available at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

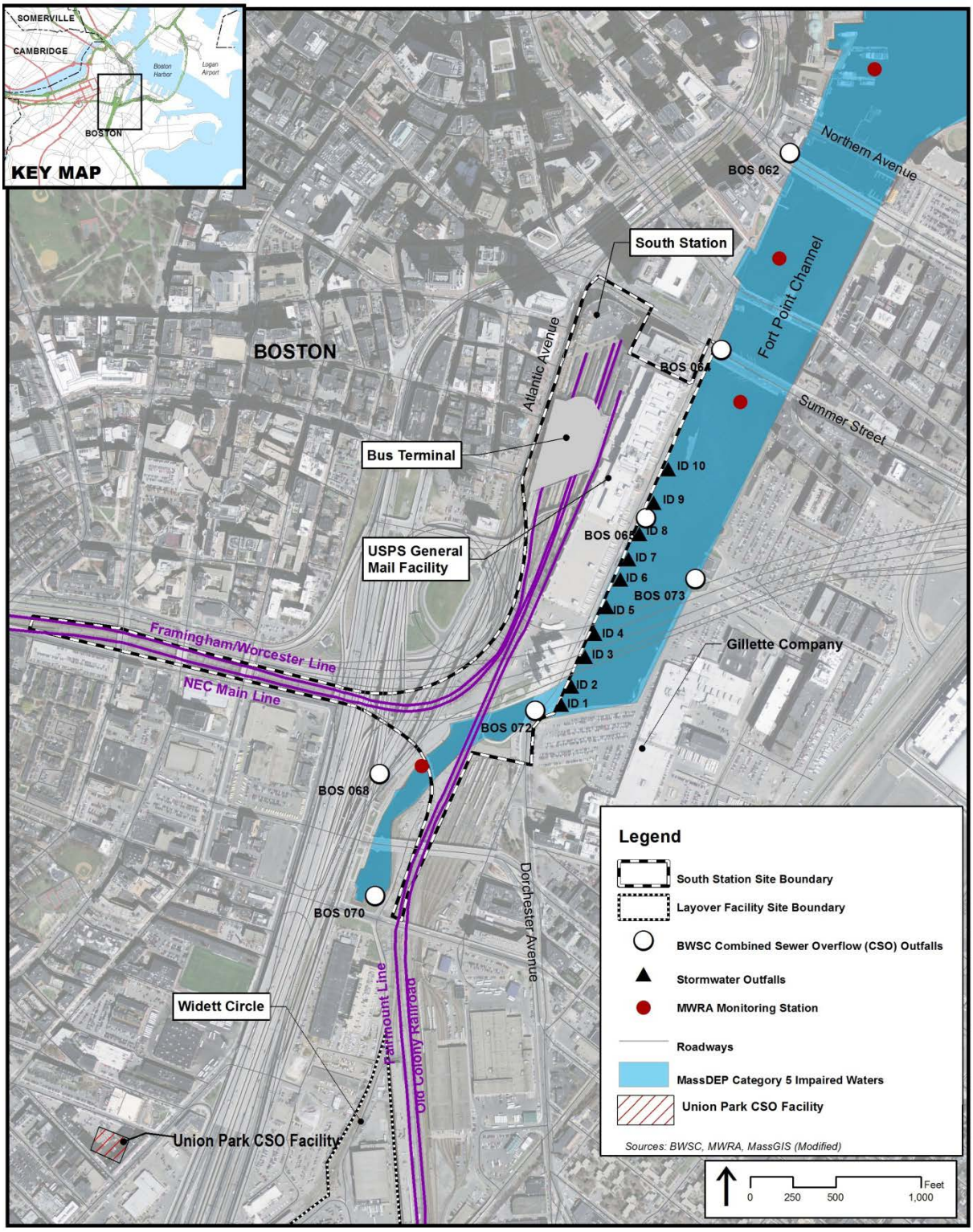

Figure 4-5—South Station Site Existing Water Resources and Stormwater Management

The existing 49-acre South Station site consists mostly of impervious surfaces including roadways, sidewalks, and rooftops (including rooftop parking). The ballasted tracks are underlain by compact soils and have a subsurface drainage system. For purposes of this stormwater assessment, the rail yard is considered to be impervious. Other than a portion of Rolling Bridge Park, only minor, incidental pervious areas exist within the South Station site. Stormwater from the South Station parcel, extending to the approach interlockings, is collected in closed drainage systems. Along the western side of the South Station site, catch basins collect stormwater runoff along Atlantic Avenue and the runoff flows in a drainage main along Atlantic Avenue and off-site. Catch basins within the train track area collect drainage from the tracks and direct it to an existing BWSC CSO (BOS 065), which discharges into Fort Point Channel.[12] Stormwater from the existing USPS parcel, including roof runoff, collects in a closed system of catch basins and drainage pipes and directly discharges to Fort Point Channel. Stormwater from the USPS parcel discharges to Fort Point Channel separately from the South Station parcel discharges.

Two other BWSC CSOs are located on or adjacent to the South Station site. BOS 068 is located within the site just south of the existing USPS facility. Track drainage at the southern end of the South Station site connects to trunk lines leading to BOS 068 and discharges into Fort Point Channel. Based on survey data, the combined sewer system that discharges to BOS 064, located along Summer Street, does not have track drains connected to its network of piping. Based on the existing conditions survey, no stormwater detention, infiltration, or treatment measures are in place in the South Station site.

Layover Facility Sites

Widett Circle

Fort Point Channel is the only surface water body within the Widett Circle layover facility site study area. The approximately 29.4-acre Widett Circle site is completely impervious, and consists of paved parking/storage areas, buildings, and other altered areas including railroad tracks. Stormwater from the Widett Circle site is currently collected in a series of catch basins located within parking areas and along Widett Circle Road and Foodmart Road. Stormwater from catch basins is collected in a 36-inch storm drain which ties into the overflow portion of a large combined sewer that runs north to south adjacent to the facility,[13] and ultimately discharges to Fort Point Channel (BOS 070). Based on existing aerial survey, no existing stormwater detention, infiltration, or treatment measures are in place in the Widett Circle site. Many of the existing industrial facilities located within the site are required to have a U.S. EPA NPDES Multi-Sector General Permit (MSGP), which requires facilities to have source control measures to limit potential site pollutants from entering the storm drain system and ultimately water resources.

Beacon Park Yard

The Charles River is the only surface water body within the Beacon Park Yard layover facility study area. The Charles River (Segment MA72-36) is included on the 2012 Final Integrated List of Waters[14] as Category 5. The 30-acre Beacon Park Yard site consists of impervious cover, tracks and ballasts, and some incidental pervious cover. According to BWSC utility mapping, Massachusetts Turnpike Authority record plans, and aerial survey, stormwater from the parking areas at the Beacon Park Yard site is currently collected in a series of catch basins and likely discharges to the Charles River via a 7-foot by 7-

[12] BWSC. *Sewerage Works Improvements for Cleaning and Rehabilitation of Combined Sewer Overflow 065 in City Proper.* October, 2012.
[13] BWSC utility mapping.
[14] Massachusetts Department of Environmental Protection. *Massachusetts Year 2012 Integrated List of Waters - Final Listing of the Condition of Massachusetts,* Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act." 2013. http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf.

foot concrete culvert under the site conveying an underground stream known as Salt Creek.[15] The existing ballasted tracks at the Beacon Park Yard site likely include underdrains to collect stormwater and outfall to the stream culvert to the east of the site. Based on existing aerial survey, no existing surface stormwater detention, infiltration, or treatment measures are in place in the Beacon Park Yard site. CSXT operations at Beacon Park Yard were covered under an NPDES MSGP, which includes effluent limitations and monitoring requirements for various pollutants and flow characteristics for stormwater flowing from the site to the Charles River.

Readville – Yard 2

The Neponset River is the only surface water body within the Readville - Yard 2 layover facility site study area. MassDEP identifies the Neponset River as a Class B water: suitable as habitat for fish, other aquatic life, and wildlife; for primary and secondary contact recreation; for irrigation and other agricultural uses; and for compatible industrial cooling and process uses. An area surrounding the Neponset River south of Readville – Yard 2 is designated as the Fowl Meadow and Ponkapoag Bog ACEC, which includes an 8-mile stretch of the Neponset River and its tributaries, adjacent wetlands, and floodplains.[16] Drainage from Readville - Yard 2 discharges to a segment of the Neponset River, which is included on the 2012 Final Integrated List of Waters as Category 5 and impaired for dissolved oxygen, fecal coliform, turbidity, foam/flocs/scum/oil slicks, PCB in fish tissue, debris/floatables/trash, DDT, Escherichia coli, and other. In 2002, MassDEP issued a Bacterial TMDL for the Neponset River Watershed that includes all segments of the Neponset River.[17]

The 17.4-acre Readville - Yard 2 site is generally impervious and consists of paved parking/storage areas; building footprint; other altered areas including railroad tracks; and some incidental, poorly draining pervious cover on the eastern portion of the site. The existing ballasted tracks include underdrains that discharge via a 12-inch storm drain to the Neponset River in the northern portion of the site. A 54-inch storm drain crosses through the southern portion of the site. The tracks where the locomotives are stored include drip pans which are drained to oil/water separators for treatment before being discharged to the sanitary sewer system. Based on existing aerial survey, no existing stormwater detention, infiltration, or treatment measures are in place at the Readville – Yard 2 site, excluding the oil/water separators.

4.5.2. Potential Impacts

South Station Site

Improvements to the existing stormwater management system would be designed based on the BWSC's standards.[18] Stormwater management for the tracks and platforms would be designed based on the MBTA Commuter Rail Design Standards Manual. Track drainage would consist of track ballast underlain with a relatively impervious subgrade crowned at each track centerline. Within the track expansion area, drip pans would be installed to collect potential contaminants. The drip pans would connect to an oil/water separator to be treated before being connected to the closed drainage system or sewer system.

The existing closed drainage system along the USPS Facility would be retained and primarily utilized to convey roof drainage from the proposed South Station expansion to Fort Point Channel. The existing 81-

[15] Massachusetts Turnpike Authority. *Boston Extension Section No. C-2 Grading and Drainage Plan.* Sheet HC2-33.
[16] Massachusetts Department of Conservation and Recreation. *Designation of the Fowl Meadow and Ponkapoag Bog Area of Critical Environmental Concern.* August 20, 1992. Available at: http://www.mass.gov/eea/docs/dcr/stewardship/acec/acecs/fm-des.pdf
[17] Massachusetts Department of Environmental Protection. *TMDL of Bacteria in the Neponset River Basin Report* (CN 0121.0). 2002. Available at: http://www.mass.gov/dep/water/resources/neponset.pdf
[18] BWSC, *Regulations Governing the Use of Sanitary and Combined Sewers and Storm Drains of The Boston Water and Sewer Commission,* adopted February 27, 1998.

by 81-inch CSO 065 pipe that crosses Dorchester Avenue and the 64-inch CSO 064 pipe within Summer Street would be retained and used for proposed drainage connections.

Stormwater management along the redeveloped Dorchester Avenue would be designed based on the MassDOT Project Development Design Guide. The proposed stormwater patterns would closely match the existing conditions. The proposed surface conditions could include pervious pavers with underdrains for the sidewalks and the Harborwalk, grassed medians, vegetated open spaces, and trees. Most of these features are aesthetic benefits to cyclists, pedestrians and motorists throughout Dorchester Avenue and would provide stormwater water quality benefits. Table 4-4 presents the changes in South Station site land cover due to the joint/private development Build Alternatives, in comparison to the No Build Alternative. In Alternative 1, the major change in land cover would be the removal of the existing USPS facility and its replacement with an expanded railroad yard, and the addition of landscaped areas on Dorchester Avenue. While both a railroad yard and buildings are considered to be impervious surfaces, railroad yards have some degree of permeability. For all build alternatives, there would be an increase in the percentage of pervious surface on the South Station site.

Table 4-4—Proposed South Station Site Land Cover, by SSX Project Alternative

Types of Cover	No Build Alternative (%)	No Build Alternative (acres)	Alternative 1 (%)	Alternative 1 (acres)	Alternatives 2/3 (%)	Alternatives 2/3 (acres)
Pervious Cover	1%	0.7	7%	3.6	7%	3.2
Impervious Cover	99%	48.3	93%	45.4	93%	45.8

Table 4-5 presents the proposed South Station site flow rates and runoff volumes in the Build alternatives in comparison to the No Build Alternative. As shown, there would be a reduction in peak stormwater rates and volumes in all Build Alternatives versus the No Build Alternative. Peak runoff flow rates and volumes were computed for Alternative 1 and Alternative 3 only. The peak runoff flow rates and volumes for Alternative 2 are anticipated to be the same as those for Alternative 3.

Table 4-5—Proposed South Station Flow Rates and Runoff vs. No Build Conditions

Storm Event	24-Hour Rainfall (in)	Peak Flow (cu. ft/sec)		Runoff Volume (cu. ft)	
		Proposed Conditions	Change from No Build Conditions	Proposed Conditions	Change from No Build Conditions
Alternative 1					
2-year	3.3	108	(11)	445,000	(39,000)
10-year	4.9	173	(11)	733,000	(43,000)
50-year	7.4	269	(10)	1,182,000	(46,000)
100-year	8.8	324	(11)	1,445,000	(46,000)
Alternatives 2/3					
2-year	3.3	115	(4)	464,000	(20,000)
10-year	4.9	181	(3)	756,000	(20,000)
50-year	7.4	279	0	1,206,000	(22,000)
100-year	8.8	335	0	1,469,000	(22,000)

The additional platform area, the expanded concourse, and the joint/private development would ultimately discharge directly to Fort Point Channel; some of the outfalls to be utilized could include CSOs. Due to the minor change in land cover percentages and stormwater flows, however, it is anticipated that there

would be no impact to the frequency or volume of overflows to the BWSC system as a result of the SSX project.

Dorchester Avenue stormwater would also outfall directly to Fort Point Channel. Some outfalls utilized may include CSOs, however the tie-in location for the Dorchester Avenue stormwater would be downstream of the overflows. This would result in no impact to the frequency or volume of overflows from the system.

The peak flow rates and runoff volume in the Build condition would be lower than the rates and volume in No Build conditions, therefore it is anticipated that existing drainage infrastructure capacity would be sufficient for proposed conditions. The condition of the outfalls to Fort Point Channel would be evaluated during final design and addressed if necessary.

Potential pollutant sources were evaluated to determine the treatment measures required to protect surface and groundwater resources. Most potential contaminants at the South Station site would be related to train traffic on the rails and roadway traffic, including trucks and passenger vehicles. Rail lines themselves are not considered significant sources of pollutants, as the rail and ballast are made of stable, non-hazardous materials. Some pollutants generated by the train operations would be filtered by the stone ballast supporting the rail ties. Currently, Dorchester Avenue is closed to the public. Opening the roadway would result in heavier vehicle and pedestrian traffic; however, the pollutant loads would likely be lower or similar to those from existing USPS operations.

Measures to treat stormwater runoff would be employed to remove total suspended solids (TSS) and other pollutants from stormwater runoff. Due to site limitations and the vertical separation between Fort Point Channel and the topography of the site, many best management practices (BMPs) would not be practical to employ. Measures could include deep sump catch basins and proprietary separators. Section 4.7.3 provides a summary of potential stormwater BMPs which could be implemented on the site.

The proposed development along Dorchester Avenue would include low impact development (LID) practices as practicable, including bioretention/rain gardens, permeable pavement and/or tree box filters. These features would be implemented, as applicable, to promote water quality treatment before discharging into the proposed closed drainage system and ultimately into Fort Point Channel. Section 4.5.3 discusses proposed mitigation measures.

Construction activities would require removing existing pavement, concrete, structural steel, and building materials, material stockpiling, and grading in some areas. Exposing previously developed soils and material stockpiling could potentially lead to erosion and runoff into Fort Point Channel if not properly controlled. During construction, dewatering could be required if groundwater were encountered during excavation or if surface water ponded in temporary BMPs or other areas. Construction dewatering water could contain sediment or other contaminants. Any construction dewatering water would be treated on-site before being discharged to the drainage system and ultimately Fort Point Channel.

Layover Facility Sites

Stormwater management at the layover facility sites would be designed based on the MBTA Commuter Rail Design Standards Manual. Each locomotive storage area would be equipped with a drip pan to collect any potential contaminants. The storage areas would connect to an oil/water separator to pre-treat stormwater before connection to the closed drainage system or sewer system. Appendix 7 - *Water Quality and Stormwater Technical Report* contains additional information.

Widett Circle

Stormwater from the Widett Circle site would be directed off-site via an existing connection to an existing BWSC CSO (BOS 070) that runs under the Widett Circle roadway and discharges into Fort Point Channel. The proposed CSO tie-in location would be beyond the overflow point, indicating that there would be no impact to the frequency or volume of overflows from the system. MassDOT would coordinate with BWSC during the design of connections to the existing CSO or drainage system.

Figure 4-6 presents the proposed stormwater management system at the Widett Circle layover facility site.

The peak flow rates and runoff volume in the Build Alternative would be lower than the rates and volume in No Build conditions. Therefore, the existing stormwater system capacity would likely be sufficient for the proposed stormwater expected. The condition of the existing drain connection would be evaluated during final design and addressed if necessary. The land use changes at Widett Circle would likely result in fewer potential pollutants on the site.

Pervious areas on the eastern and western sections of the site, around the proposed buildings, and to the west of the existing Cold Storage building could be suitable for surface stormwater management BMPs. Subsurface treatment BMPs could be implemented due to space constraints or maintenance considerations. Existing soils at the Widett Circle site are classified as urban land. Further site specific soil investigation during the design stage would be required to determine the infiltration capabilities of the existing soils. Gravel wetlands, retention/detention basins, swales, or underground detention/infiltration systems could be suitable for detention and treatment of stormwater before its discharge to Fort Point Channel.

The proposed conditions at Widett Circle would result in overall improved conditions for surface water quality. The proposed conditions would result in increased permeable area on the site; this would allow for stormwater to infiltrate into the ground, providing some treatment and reducing the overall volume of stormwater discharged to Fort Point Channel. No negative impacts to the water quality of Fort Point Channel are anticipated. BMPs detailed in the standard track design would include drip pans, oil/water separators, and deep sump catch basins.

Beacon Park Yard

Track drainage would be similar to the existing track stormwater management system. Stormwater from the Beacon Park Yard site would be directed off-site via an existing BWSC storm drain that runs under the existing tracks and discharges into the Charles River. MassDOT would coordinate with BWSC to connect to the existing drainage system. Figure 4-7 presents proposed stormwater management at the Beacon Park Yard site.

The Build condition at the Beacon Park Yard site would result in a slight increase in impervious cover and an increase in track and ballast cover. Because track and ballast provide some storage and detention of stormwater, there would be no change in estimated peak flow rates or runoff volumes for all storm events. Stormwater from Beacon Park Yard would outfall directly to the Charles River. The site storm drain is an underground stream and separate from the sanitary sewer system. Therefore, no impacts to CSOs would result from this connection.

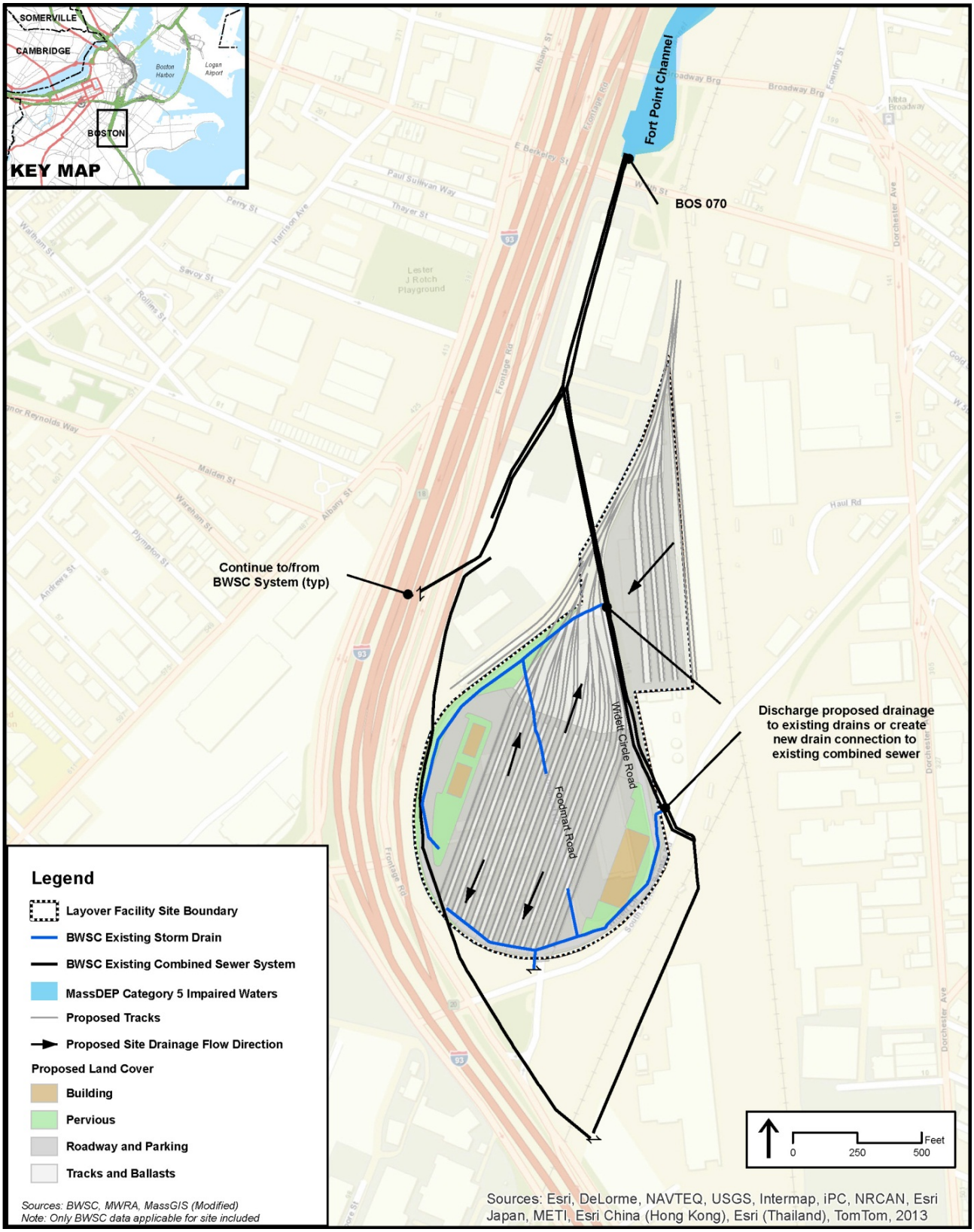

Figure 4-6—Proposed Stormwater Management at Widett Circle

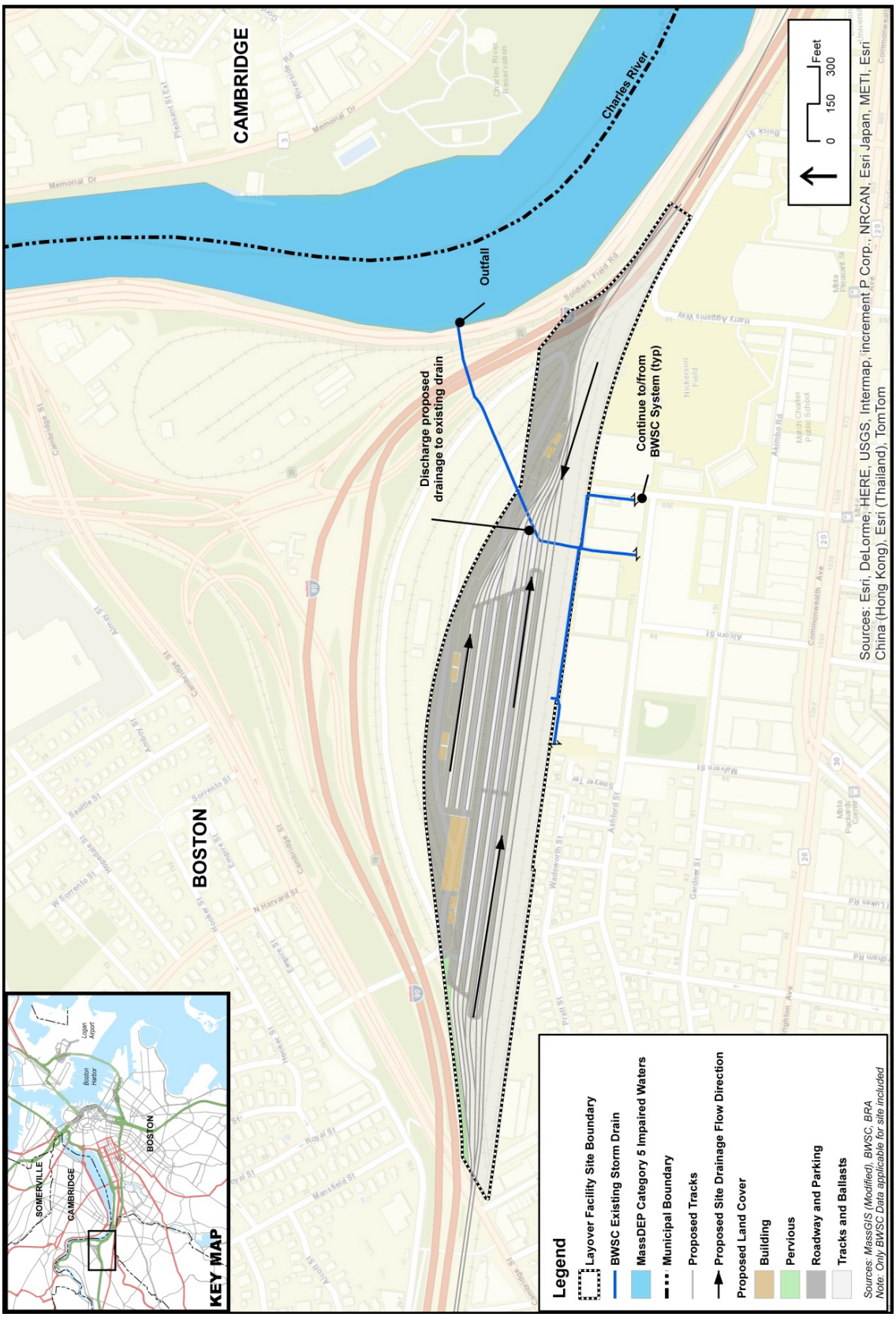

Figure 4-7—Proposed Stormwater Management at Beacon Park Yard

Due to the proposed site layout and land cover, on-site surface locations for stormwater management BMPs would be limited at Beacon Park Yard. Existing soils at Beacon Park Yard are classified as urban land. Further site specific soil investigation during the design stage would be required to determine the infiltration capabilities. Soils at the Beacon Park Yard site are likely contaminated (as cited in Section 4.13), additionally constraining infiltration capabilities. MassDOT will further investigate soil and groundwater contamination as design advances. Surface and subsurface detention, retention and filtration systems could be suitable for treatment of stormwater before discharging to the Charles River and would be evaluated in preliminary design.

The Build Alternative at Beacon Park Yard would result in an overall neutral change in conditions for surface water quality. The Build Alternative would result in a slight decrease in pervious cover and a slight increase in track and ballast coverage of the site, which would allow for stormwater to be slowed and provide some filtration. This negligible change in land use would not result in any significant change to the estimated peak flow rate of stormwater and runoff volume discharged to the Charles River. Stormwater BMPs would be included to the maximum extent practicable to provide treatment and remove pollutants before discharging to the Charles River. No negative impacts to the water quality of the Charles River are anticipated. MassDOT would ensure compliance with the Charles River pathogen and phosphorus TMDLs, which is further addressed in Section 4.5.3.

Readville – Yard 2

Currently, stormwater from the Readville – Yard 2 site is directed off-site via an existing 54-inch BWSC storm drain which discharges into the Neponset River. A second 12-inch storm drain exists in the northern portion of the site and drains the runoff from tracks and ballast nearby. In the Build Alternative, the 54-inch existing storm drain could need to be relocated based on the condition of the structure. An inspection of the existing storm drain to assess its condition would be performed to determine if the pipe should be replaced or if a structural liner could be installed. MassDOT would coordinate with BWSC during the design phase to inspect and upgrade the existing drainage system, as necessary. Figure 4-8 presents proposed stormwater management at the Readville – Yard 2 layover facility site.

The Build condition at the Readville – Yard 2 site would result in an increase in impervious cover, which would result in an increase in peak flow rates in the Build Alternative for most storm events. Stormwater from Readville – Yard 2 would outfall directly to the Neponset River. The site storm drain is an independent system, separate from the sewer system. Therefore, no impacts to CSO would result from this connection.

Permeable areas located on the eastern and western boundaries of the Readville – Yard 2 site could be suitable for stormwater management BMPs. Existing soils at the Readville – Yard 2 site are classified as urban land. Further site specific soil investigation during the design stage would be required to determine the infiltration capabilities. The proximity of the site to the Neponset River, in addition to visible pockets of standing water on portions of the site, indicate poorly draining soils and/or high groundwater levels which would further restrict infiltration potential. Surface and subsurface detention, retention and filtration systems could be suitable for treatment of stormwater before discharging to the Neponset River and would be evaluated in preliminary design.

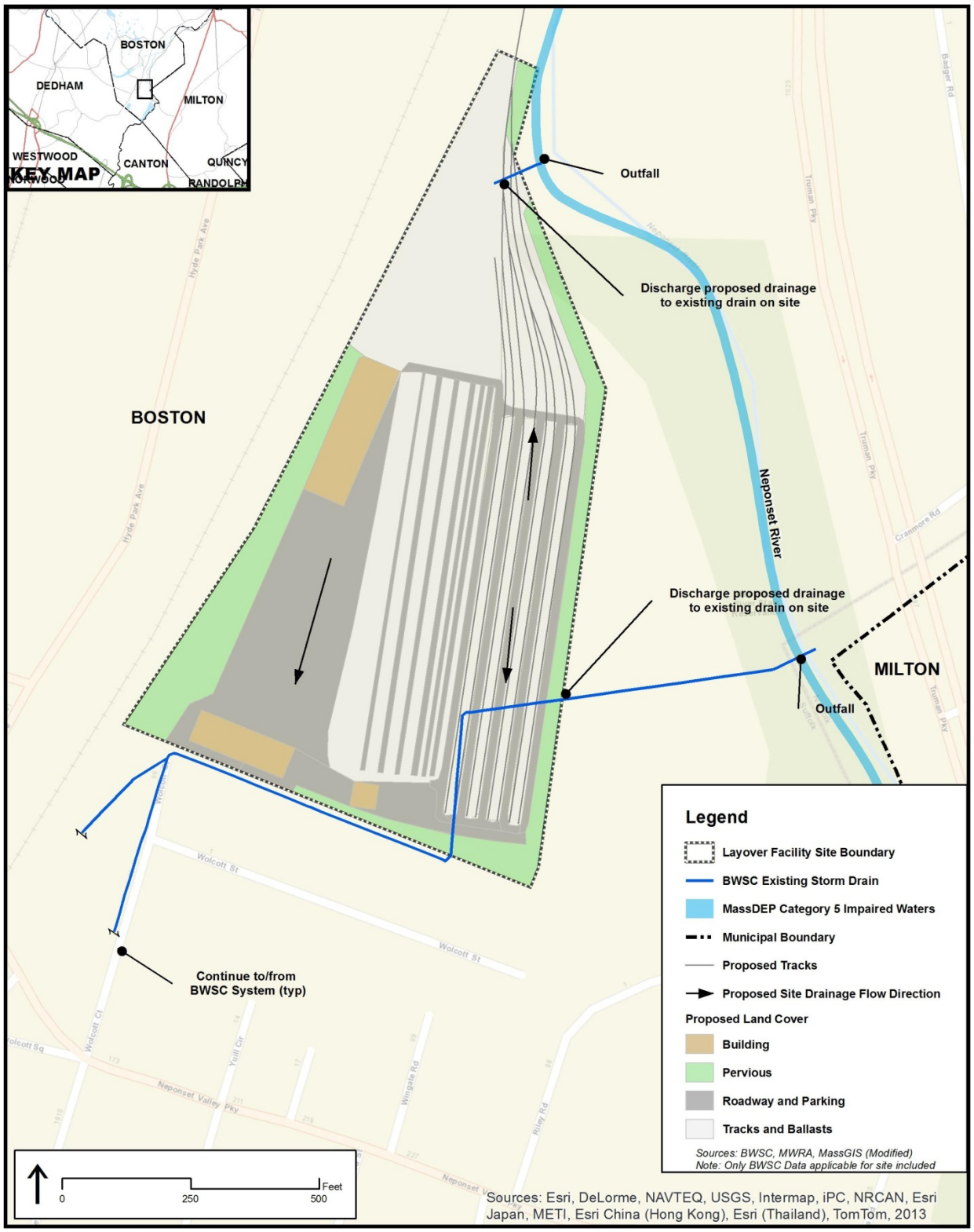

Figure 4-8—Proposed Stormwater Management at Readville – Yard 2

The Build condition at Readville – Yard 2 would not negatively impact surface water quality. The proposed conditions would result in a decrease in pervious cover and an increase in track and ballast coverage of the site, which would allow for stormwater to be slowed and provide some filtration. This change in land use would increase the peak flow rate of stormwater and result in an increase in runoff volume discharged to the Neponset River. Stormwater BMPs would be included to the maximum extent practicable to provide detention, treatment and removal of pollutants before discharging to the Neponset River. Since no new operations are being proposed for the site (only an expansion is proposed), potential pollutant loads and surface water quality of the Neponset River are not expected to change significantly. Potential pollutant sources from the existing material storage area on the eastern portion of the site would be investigated during the next phases of project development. No negative impacts to the water quality of the Neponset River are anticipated. The Build condition would ensure compliance with the Neponset River pathogen TMDL, which is further described in Section 4.5.4.

Summary of Impacts to Water Resources

Table 4-6 presents a summary of potential water quality impacts associated with the Build condition at the SSX project sites, and presents changes in comparison to existing conditions.

Table 4-6—Summary of Potential Water Quality Impacts at SSX Project Sites

Site	Change in Impervious Cover	Impact to ORW	Discharge to an impaired water	Discharge to a water covered by a final TMDL	Change in peak flow rate (cu. ft/sec) (10-year storm)	Change in runoff volume (cu. ft) (10-year storm)	New outfall to a water resource	Change in surface water quality impacts
South Station Alternatives 2/3	(5)%	No	Yes	No	(3)	(20,000)	No	No
Widett Circle	(10)%	No	Yes	No	(6.4)	(58,500)	No	No
Beacon Park Yard	1%	No	Yes	Yes	0.0	0.0	No	No
Readville – Yard 2	22%	No	Yes	Yes	1.1	6,650	No	No

ORW = Outstanding Resource Water; TMDL = Total Maximum Daily Load
Impact analysis for peak flow rate and runoff volume does not take into consideration the mitigation provided by potential stormwater treatment best management practices (BMPs).

4.5.3. Mitigation Measures

Project mitigation measures would include both non-structural and structural BMPs, practices and procedures to mitigate direct and indirect adverse impacts to surface water quality.

Non-structural BMPs would include: snow removal and management measures; spill prevention; and source control. The MBTA would develop a detailed operation and maintenance (O&M) plan for each site during the final design phase of the project. The O&M plan would address specific maintenance measures to be performed at the required frequency in order to properly maintain the stormwater management features at each site.

Structural stormwater BMPs would be incorporated at the South Station site, including Dorchester Avenue, and the layover facility sites as required. Stormwater BMPs would be implemented to mitigate impacts due to an increase in total impervious cover related to layover sites, to treat potential pollutants from operations on the site, and to comply with regulations. Table 4-7 identifies structural BMPs that could be used at the SSX project sites.

Due to site constraints, such as the limited land area, existing development, and conflicts with existing utilities, the applicability of structural BMPs at South Station and Dorchester Avenue would be more limited than at the layover facility sites. Other site constraints could include soil properties, groundwater levels, and soil contamination. Additional site soil investigations would be conducted in final design stage to determine the suitability of BMPs to the SSX project sites. BMPs with intensive operation and maintenance needs would not be proposed at the layover facility sites.

At the Widett Circle site, impervious cover would be reduced under the Build Alternative and the runoff rate and volume would be decreased. Because of the proposed improved conditions at the Widett Circle site, additional stormwater BMPs beyond those included in the standard track design would not be required. At the Beacon Park Yard site, stormwater BMPs would be included to the extent practical to improve water quality and address TMDLs. At the Readville – Yard 2 site, compliance with all Massachusetts Stormwater Management Standards would be mandatory, as a portion of the site would not be considered a redevelopment project. Redevelopment projects are defined as: "development, rehabilitation, expansion, and phased projects on previously developed sites, provided that the redevelopment results in no net increase in impervious area." Specific requirements are included in Section 4.5.4.

4.5.4. Regulatory Consistency

This section describes the consistency of the SSX project stormwater management approach with federal and state regulatory requirements.

Clean Water Act

The Charles River TMDL for pathogen impairments identifies major contributors to the bacteria impairment, which include failing septic systems, CSOs, sanitary sewer overflows (SSO), sewer pipes connected to storm drains, certain recreational activities, wildlife, and direct overland stormwater runoff.[19] Bacteria sources from the Beacon Park Yard site are expected to be negligible. Stormwater BMPs designed to treat urban pollutants would treat ambient sources of pathogens on the site, such as from birds and other wildlife. The Charles River TMDL for phosphorus impairments has set a 65% phosphorus load reduction for commercial and industrial land uses,[20] under which the Beacon Park Yard site falls. MassDOT would incorporate stormwater BMPs to treat urban pollutants, including phosphorus, from the Beacon Park Yard site to address the Charles River TMDL for phosphorus impairments.

The Neponset River TMDL for bacteria impairments to the Neponset River identifies major contributors to the bacteria impairment, which include illicit discharges to storm drains, leaking sanitary sewers, failing septic systems, and stormwater runoff.[21] The bacteria sources from the Readville – Yard 2 site are expected to be negligible. Stormwater BMPs designed to treat urban pollutants would treat ambient sources of bacteria on the site, such as from birds and other wildlife.

[19] Massachusetts Department of Environmental Protection, 2007. *Final Pathogen TMDL for the Charles River Watershed, CN 0156.0.* Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/charles1.pdf
[20] Massachusetts Department of Environmental Protection 2007. *Total Maximum Daily Load for Nutrients in the Lower Charles River Basin, CN 301.0.* Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/charlesp.pdf
[21] Massachusetts Department of Environmental Protection, 2002. *Total Maximum Daily Loads of Bacteria for Neponset River Basin.* Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/neponset.pdf

Table 4-7—Applicability of Potential Mitigation Measures at SSX Project Sites[a]

Site	Catch Basins with Sumps and Hoods	Drip Pans	Oil/Water Separators	Leaching Basins[b]	Gravel Wetlands	Vegetated (Grass) Swales	Infiltration Basins[b]	Bioretention Area/Rain Garden	Permeable Pavement	Tree Box Filter	Underground Filtration System/ Proprietary Separator	Underground Infiltration/ Detention System[b]
South Station Headhouse	Proposed	Proposed	Proposed	Utility conflicts	Limited area	Limited area	Limited area	Limited area	Limited area	Limited area	Potential	Limited area
Dorchester Avenue	Proposed	N/A[c]	Proposed	Utility conflicts	Potential	Potential	Limited area	Potential within grass median	Potential along cycle track and sidewalk	Potential	Potential	Utility conflicts
Widett Circle	Proposed	Proposed	Proposed	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
Beacon Park Yard	Proposed	Proposed	Proposed	Potential	Potential	Potential	Limited area	Intensive O&M	Potential	Intensive O&M	Potential	Potential
Readville-Yard 2	Proposed	Proposed	Proposed	Likely high ground-water	Potential	Potential	Limited area	Intensive O&M	Potential	Intensive O&M	Intensive O&M	Potential

a White cells indicate either proposed BMPs or potential BMPs which could be appropriate for the site; light gray cells indicate BMPs which may not be appropriate for the site due to the listed site constraints; and dark grey cells indicate that BMPs would not be required to treat stormwater on the site.
b Infiltration practices could be limited at specific sites due to soil properties, groundwater levels and contamination.
c N/A – not applicable; no train operations occur

Construction at all SSX project sites would require an NPDES Construction General Permit, required at construction sites greater than one acre in size to regulate erosion control, pollution prevention, and stormwater management. A Stormwater Pollution Prevention Pan (SWPPP) is required by the NPDES Construction General Permit and must identify potential pollutant source areas and describe measures to be employed for erosion and sedimentation control, temporary stormwater management, dust control, and winter stabilization. The SWPPP would be completed during the final design phase and would be implemented by the project contractor.

Industrial activities such as material handling and storage, equipment maintenance and cleaning, and storage of vehicles can be exposed to stormwater and therefore regulated under the NPDES MSGP. Layover facilities are included under the standard industrial classification (SIC) 4011 and 4013 which includes rail transportation facilities. NPDES MSGPs would be required for the layover facility sites. Requirements could include stormwater effluent limits, monitoring requirements and other conditions related to post-construction operations at the facility sites.

MassDEP Stormwater Standards

Table 4-8 summarizes how the SSX project would comply with the Massachusetts Stormwater Management Standards. MassDEP would review compliance with the Massachusetts Stormwater Management Standards as part of its review of the SSX project under the Wetlands Protection Act, due to the project's proximity to wetland resource areas, including the Neponset River and Fort Point Channel.

Most elements of the SSX project would qualify as redevelopment projects under the Massachusetts Stormwater Management Standards. Redevelopment projects are defined as: "development, rehabilitation, expansion and phased projects on previously developed sites, provided that the redevelopment results in no net increase in impervious area." SSX project activities at the South Station, Widett Circle, and Beacon Park Yard sites would be considered redevelopment projects as they would occur on previously developed sites and would result in no net increase in impervious cover. SSX project activities at the Readville – Yard 2 site would not constitute as redevelopment, as track expansion would convert previously permeable land to impervious tracks and ballasts.

Compliance with all Massachusetts Stormwater Management Standards would be mandatory at Readville - Yard 2.

Table 4-8—SSX Project Compliance with Massachusetts Stormwater Standards

Standard	Compliance Level Achieved
1. Avoid new untreated discharges or erosion to wetlands	Full compliance would be achieved. All project elements would drain to existing municipal storm sewers.
2. Reduce peak rate attenuation to pre-development rates	Compliance would be achieved to the maximum extent practicable for redevelopment sites. Stormwater BMPs would be installed at Readville - Yard 2 to reduce peak flow rates to pre-development rates.
3. Minimize loss of stormwater recharge from pre-development conditions	Compliance would be achieved to the maximum extent practicable for redevelopment sites. Stormwater BMPs would be installed at Readville - Yard 2 to promote recharge to match pre-development rates.
4. Remove 80% of average annual post-construction load of total suspended solids (TSS)	Compliance would be achieved to the maximum extent practicable for redevelopment sites. Stormwater BMPs would be installed at Readville - Yard 2 to remove TSS. Stormwater treatment BMPs would be included at each site.
5. Implement source control and pollution prevention measures for land uses with higher potential pollutant loads	Compliance would be achieved to the maximum extent practicable for redevelopment sites. The layover facility sites qualify as Land Uses of Higher Potential Pollutant Loads (LUHPPLs) as they are regulated under the NPDES MSGP. Containment and treatment measures would be used to prevent the release of oil and hazardous materials.
6. Implement source control and pollution prevention measures around critical areas	Full compliance would be achieved. No project elements would discharge near or to a critical area.
7. Comply to the maximum extent possible with redevelopment projects	All project sites except for Readville - Yard 2 would constitute redevelopment.
8. Implement construction period pollution prevention and erosion and sedimentation controls	Full compliance would be achieved. MassDOT would obtain coverage under the NPDES Construction General Permit for sites prior to construction start.
9. Develop and implement long term operation and maintenance (O&M) plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design.
10. Avoid/remove illicit discharges	Full compliance would be achieved. Project elements would be designed to be in full compliance with current standards. Any identified illicit connections would be removed.

4.6. Water and Wastewater

This section describes existing water and wastewater systems in the immediate vicinity of the South Station site and three layover facility sites, estimates utility usage associated with the project, and evaluates the impacts of the project on water supply and service distribution, and wastewater management. Appendix 8 - W*ater and Wastewater Technical Report* contains additional information, including details on existing and proposed utility usage estimates.

Water and wastewater regulations pertaining to the SSX project include local, state, and federal regulations concerning public drinking water supply and delivery, and wastewater management. The MWRA provides potable water to and accepts wastewater (sewage) from many communities within the metropolitan Boston area, including the four SSX project sites. The BWSC services individual properties through its water and wastewater piping network, distributes potable water, and collects wastewater throughout Boston. Wastewater from BWSC's system is treated at MWRA's Deer Island Wastewater Treatment Facility, which ultimately discharges to Massachusetts Bay.

4.6.1. Existing Conditions

South Station Site

Figure 4-9 presents a schematic of the existing water distribution and wastewater collection systems at the South Station site.

At the South Station site along Atlantic Avenue, an extensive BWSC water distribution system exists. To a lesser extent, a water system exists along Dorchester Avenue. Along Atlantic Avenue, from Kneeland Street to the existing South Station headhouse at Summer Street, there are three water mains providing service connections to the site. From the headhouse, the three water mains extend eastward on Summer Street past 245 Summer Street where they continue north on Dorchester Avenue. Two water mains are located along Dorchester Avenue, providing service to the USPS General Mail Facility. An additional 8" water main is located on the east side of the yard area adjacent the existing track.

Existing wastewater collection at the South Station site is provided through a series of BWSC sanitary sewer mains, combined sewer mains, and CSOs.

Domestic water demand is based on estimated wastewater generation with an added factor of 10% to account for consumption, system losses, and other uses. Based on an estimated wastewater generation of 338,950 gallons per day (gpd), existing water usage at the South Station site is estimated to be 372,850 gpd, which includes the South Station Terminal, Bus Terminal, retail and office space, and the USPS facility.

Layover Facility Sites

Widett Circle

In the vicinity of the Widett Circle layover facility site, BWSC water mains, sewers, and combined sewers are located within the Widett Circle Loop Road and in Foodmart Road.[22] The water line within Foodmart Road connects on either end to the line within Widett Circle, making a loop in the water system. The water mains appear to be fed from a system off Frontage Road. The age and size of these pipes are unknown. A 12-inch separated sewer located within Foodmart Road discharges to a 15-inch separated sewer in Widett Circle, which collects waste from the facilities within Widett Circle and discharges to a combined sewer system on Albany Street.

A 20-inch by 16-inch CSO line bisects the site through the eastern part of Widett Circle and discharges overflow to Fort Point Channel (BOS 070). In addition, a 66-inch by 92-inch combined sewer line from the southeast ties into this trunk line on the site. The age and condition of these pipes are unknown. It is unclear if underground structures exist where connections occur. No sewer service from the existing facilities appears to connect to the combined sewer lines.

The existing facilities on the site each have water services to serve their industrial and domestic uses, some of which may be very water intensive. Based on an estimated wastewater generation of 13,140 gpd, existing water usage at the Widett Circle layover facility site is estimated to be 14,460 gpd.

[22] BWSC utility mapping obtained from BWSC in April 2010.

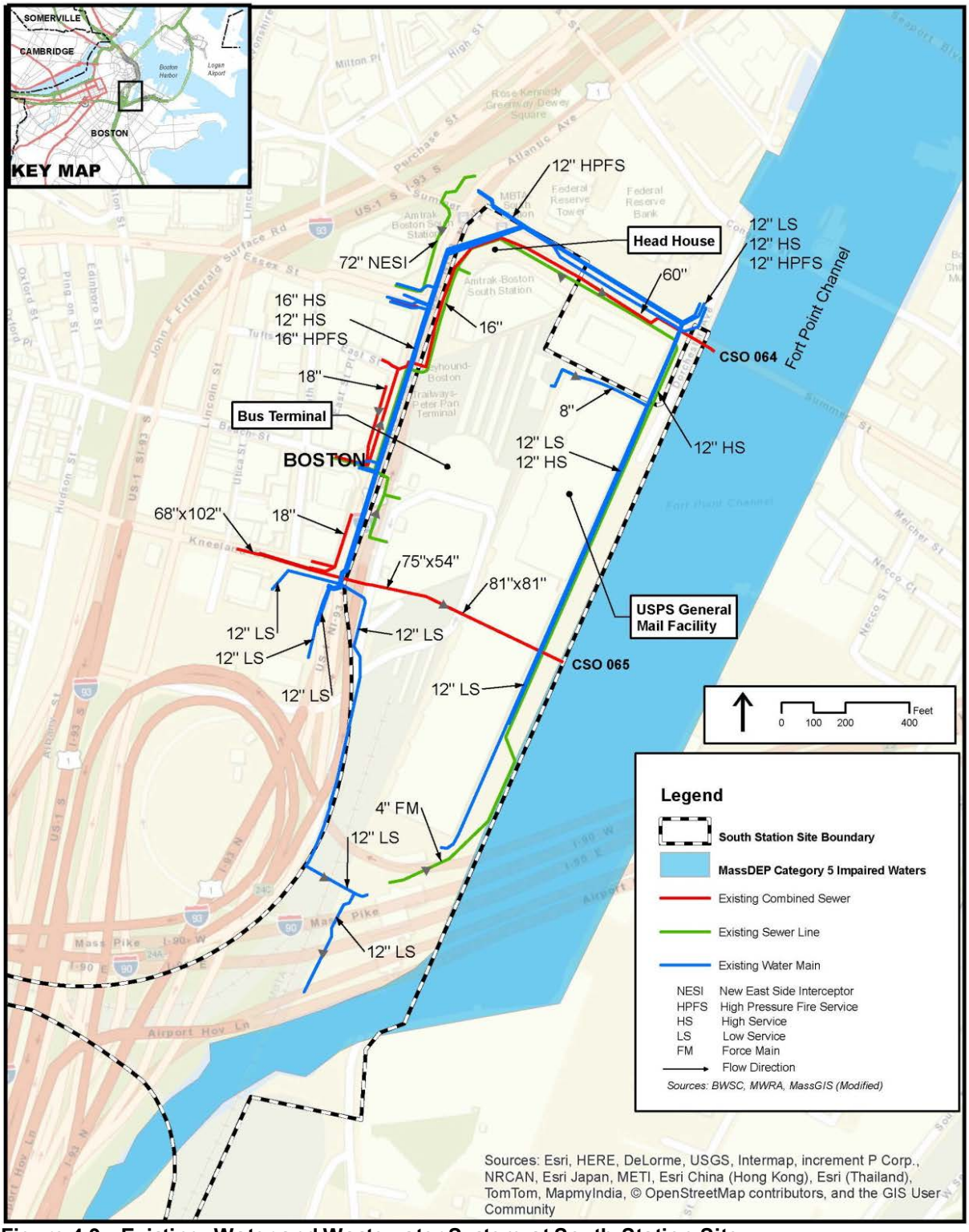

Figure 4-9—Existing Water and Wastewater System at South Station Site

Beacon Park Yard

BWSC water mains, sewer mains, and combined sewers are located within the streets surrounding the Beacon Park layover facility site.[23] The 12-inch water main in Cambridge Street provides services to the existing I-90 toll buildings. A 6-inch service line also runs within the existing access road for the site. The age and condition of these pipes are unknown.

BWSC sewers and combined sewers are located within the surrounding streets, including Cambridge Street. Additionally, a 32-inch by 42-inch MWRA sewer crosses the site in a south-north direction. The large sewer crossing the site collects wastewater from sewer systems to the south of the site and discharges it to the Cottage Farm CSO facility in Cambridge. Beneath the tracks on the site, the sewer has a directional change where there is likely a larger structure. The age and condition of these pipes and structures are unknown. The location of existing sewer services, if any, from the site is unknown. As design advances, MassDOT will confirm existing conditions with BWSC.

No operations currently exist at the Beacon Park Yard layover facility site. For the purposes of this evaluation, it is assumed that the existing water usage and wastewater generation at Beacon Park Yard is zero.

Readville – Yard 2

At the Readville – Yard 2 site, a 10-inch BWSC water main crossing the site provides water service to existing facilities, and connects the neighborhood south of the site to a 12-inch water main in Truman Highway.[24] BWSC separated sewers are located in the areas surrounding the site, including an 8-inch main in Wolcott Street to the south. Existing buildings on the Readville – Yard 2 site discharge their wastewater to the BWSC system. The age, condition and size of these pipes and services are unknown. Based on an estimated wastewater generation of 1,950 gpd, existing water usage at the Readville- Yard 2 is estimated to be 2,150 gpd.

4.6.2. Potential Impacts

This section estimates utility usage associated with the SSX project and evaluates the impacts of the project on water supply and service distribution, and wastewater management. For this DEIR analysis, proposed water use at the SSX project sites has been established on a conceptual level based upon the amount of wastewater generated, using 310 CMR 15, the State Environmental Code Regulating Septic Systems (Title 5). Domestic water demand is based on estimated sewage generation, with an added factor of 10% to account for consumption, system losses, and other use.

South Station Site

At the South Station site, SSX project potential impacts were assessed for Alternative 3 – Joint/Private Development Maximum Build, the alternative which represents the most impactful alternative. The estimated total daily wastewater generated in Alternative 3 would be 750,900 gpd, an increase of 411,900 gpd, or 122%, from existing conditions. Table 4-9 presents the estimated wastewater generation associated with Alternative 3, broken down by the South Station Terminal, Bus Terminal, and the mixed-use development.[25] Appendix 8 - *Water and Wastewater Technical Report* provides detailed information on the methodologies and assumptions used to develop estimates.

[23] Ibid.
[24] Ibid.
[25] Utility estimates are based on values from 310 CMR 15 or 314 CMR 7.

Table 4-9—Proposed Estimated Wastewater Generation at South Station Site

Location	Unit Flow (gpd)	Total Unit	Quantity (gpd)
South Station			
Existing headhouse and terminal expansion	5 gpd/passenger	83,000	415,000
South Station retail	50 gpd/1,000 sf	21,710	1,090
South Station office (2^{nd} – 5^{th} floors)	75 gpd/1,000 sf	125,890	9,440
Bus Terminal	5 gpd/passenger	17,300	86,500
Bus terminal parking	n/a	n/a	200
Mixed-Use Development			
Residential	110 gpd/bedroom	1,035	113,850
Office	75 gpd/1,000 sf	917,300	68,800
Hotel	110 gpd/bedroom	334	45,870
Hotel, Amenities	variable[a]	variable[a]	52,200
Retail	50 gpd/1,000 sf	75,620	3,780
Total Wastewater Generation (rounded)			**750,900**

a Various uses, including lounge, restaurant, function room, and hotel amenity retail, utilize different estimated generation rates.

Based on the estimated wastewater generation of 750,900 gpd shown in Table 4-9, the water service demand at the South Station site in Alternative 3 would increase to 826,000 gpd, from the existing 372,850 gpd, an increase of 453,150 gpd, or 122%. The estimated water usage and wastewater generation at the South Station site would be partially offset by the loss of the USPS facility, which had an estimated wastewater generation of 22,720 gpd and an estimated water usage of 24,992 gpd.

Due to the project, including the expanded terminal concourse and mixed-use development, there would be a large increase of water used and wastewater generated from existing conditions. According to BWSC, there is adequate capacity available in its water and sewer mains in the immediate vicinity of the South Station site to accommodate the SSX project Alternative 3. Capacities would need to be confirmed in the final design stages.

In Alternative 3, the estimated wastewater discharges associated with the SSX project would exceed the 15,000 gallon/day threshold required to perform infiltration/inflow (I/I) offsets, according to MassDEP's Policy on Managing Infiltration and Inflow in MWRA Community Systems. Therefore, the SSX project would be required to offset the increased flows. MassDOT would investigate where stormwater is entering sanitary sewer lines and provide improvements to prevent the stormwater inflow, including potentially replacing or relining existing pipes or installing new pipes. Through I/I reduction and minimal impacts to stormwater runoff rates, the SSX project would not adversely impact the CSOs. The design approach to address I/I mitigation is presented in Section 4.6.3.

The proposed construction at the South Station would avoid impacts to existing subsurface utilities via direct contact with pipes and structure, vibrations or settling. The use of existing wastewater systems could be required during construction to provide a wastewater discharge for construction-time needs. Dewatering discharges would not connect to the sewer system and would be conducted in accordance with local, state and federal standards.

Currently, the USPS building is situated over the BWSC's Kneeland Street CSO. During demolition of the USPS building and new construction activities, MassDOT would maintain the structural integrity and

provide outlet protection of this CSO, including access for continued inspection and maintenance activities.

Sea level rise could affect downstream CSOs and MWRA facilities, which in turn could affect the performance of the South Station wastewater system. At the three CSO outlets to Fort Point Channel (CSO 064, CSO 065 and CSO 068), may require additional mitigation measures to minimize seawater entering back into the combined sewer lines. Further coordination with BWSC will be performed as the project progresses.

Layover Facility Sites

Potential SSX project impacts were assessed for the Build condition at each layover facility site. The layover facility sites would require sewer connections for the crew building and support shed proposed at each site. Only light maintenance activities are proposed at the facilities, therefore no industrial wastewater would be generated. According to BWSC, its existing systems at the three sites have adequate capacity to handle the proposed water demand and wastewater discharge. To ensure that capacity is adequate, MassDOT would work with BWSC to complete further evaluation of the systems during the design phase.

To minimize construction impacts to subsurface utilities at the three layover facility sites, MassDOT would monitor carefully construction activities, such as the location, identification and avoidance of existing utilities. The use of existing water and wastewater systems could be required during construction to provide a water supply and wastewater discharge for construction-time needs. Dewatering discharges to the sewer system are not anticipated.

Widett Circle

Table 4-10 presents the estimated wastewater discharge for the Widett Circle site in the Build condition.

Table 4-10—Proposed Estimated Wastewater Generation for Widett Circle

Source	Personnel	Estimate Generation Rate (gallons/day)	Wastewater Estimate (gallons/day)
Train Staff	150	35/person	5,250
Administrative Staff	15	20/person	300
Visitors	15	20/person	300
Total	180		5,850

Based on the estimated wastewater generation shown in Table 4-10, the Widett Circle layover facility would require approximately 6,440 gallons of water per day (estimated sewage generation of 5,850 adding a factor of 10% for consumption, system losses and other uses). In the Build condition, there would be a decrease in the overall water demand and wastewater generated at the site from existing conditions, due to fewer personnel on site and no industrial use. Wastewater generation would decrease by an estimated 7,290 gpd, or 44% from existing conditions; and water usage would decrease by an estimated 8,020 gpd from existing conditions.

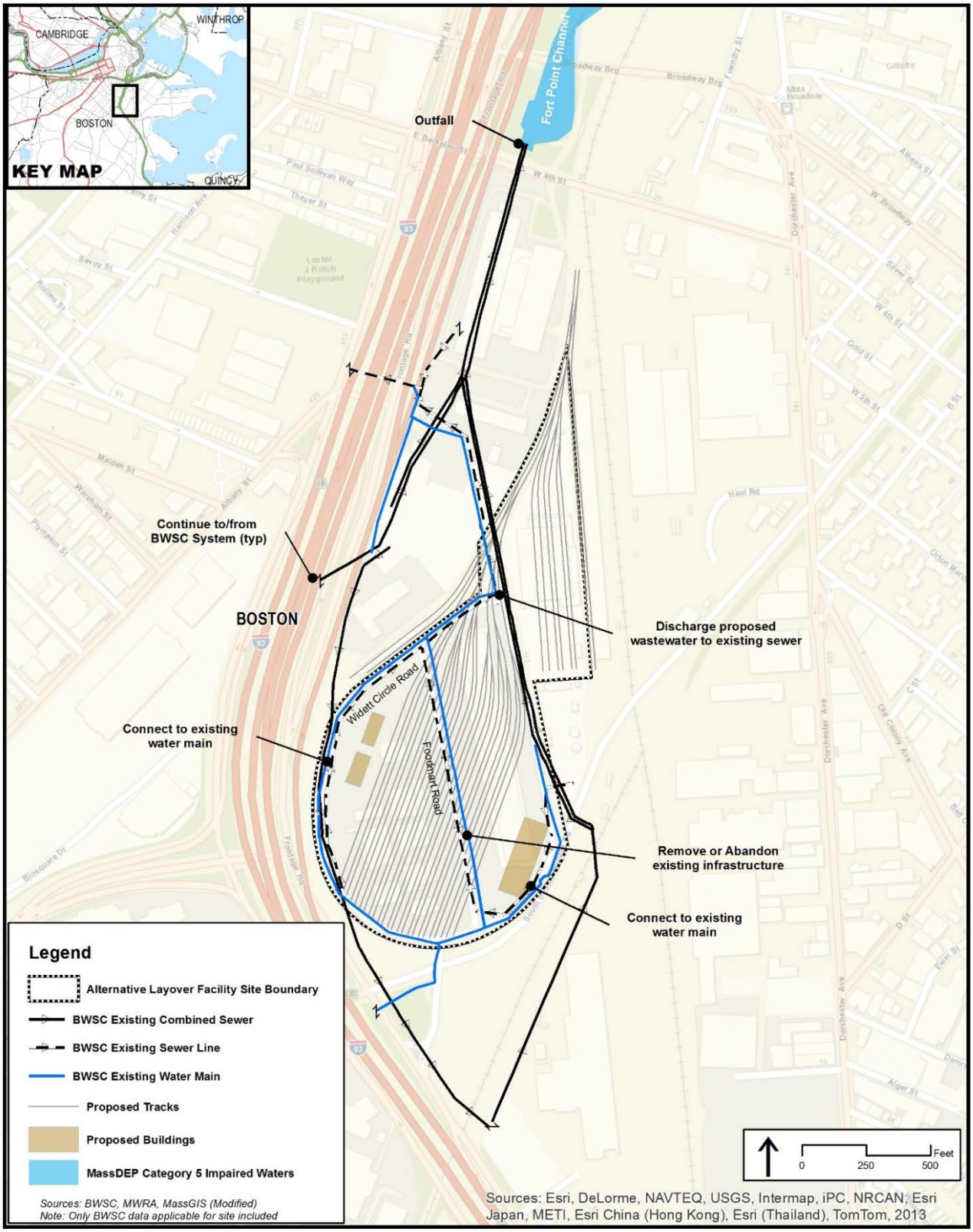

Figure 4-10—Proposed Water and Wastewater Services at Widett Circle Layover Facility Site

Figure 4-10 shows the existing utilities located within the site area and the likely tie-in locations for utility extensions. Existing unused mains and services on the site would be either removed or abandoned in place. Since the existing sewer system is separated, the decrease in wastewater discharge to the BWSC system would not affect potential combined overflows. The abandonment of existing sewer infrastructure on the site could reduce the amount of I/I entering the system from the current system.

The decrease of wastewater discharge to the system would not affect potential combined overflows because the existing system is separated. The build condition at the Widett Circle site would not exceed the 15,000 gpd of wastewater discharge threshold which requires I/I offsets based on MassDEP regulations. The abandonment of existing sewer infrastructure on the site could reduce the amount of infiltration and inflow entering the system from the current system. Reduction of wastewater discharge from the site and I/I entering the system would result in an overall reduction in wastewater flow to the MWRA system.

Based on MWRA's design allowance, sea level rise is not anticipated to affect the performance of the water system because the system is a pressure system. Sea level rise could affect the performance of the wastewater system, depending on the conveyance path of wastewater between the Widett Circle site and the MWRA Deer Island facility.

Beacon Park Yard

Table 4-11 presents the proposed estimated wastewater discharge at Beacon Park Yard in the Build condition.

Table 4-11—Proposed Estimated Wastewater Generation for Beacon Park Yard

Source	Personnel	Estimate Generation Rate (gallons/day)	Wastewater Estimate (gallons/day)
Train Staff	100	35/person	3,500
Administrative Staff	10	20/person	200
Visitors	10	20/person	200
Total	120		3,900

Based upon on the estimated wastewater generation shown in Table 4-11, the Beacon Park Yard layover facility would require approximately 4,290 gallons of water per day (estimated sewage generation of 3,900 adding a factor of 10% for consumption, system losses, and other uses). Currently, the site does not have water service or wastewater discharge.

Figure 4-11 shows the existing wastewater utilities within the site area, along with the likely proposed tie-in location. Water improvements would include a tap into the existing BWSC main, and new water mains would follow the layout of the service roads. Wastewater improvements would include gravity services and mains, with wastewater discharge to existing BWSC sewers. Pumping could be necessary due to the distance to existing utilities and lack of topographic difference on the site. Existing unused sewer mains and services on the site would be either removed or abandoned in place. The large MWRA sewer that crosses the site would remain.

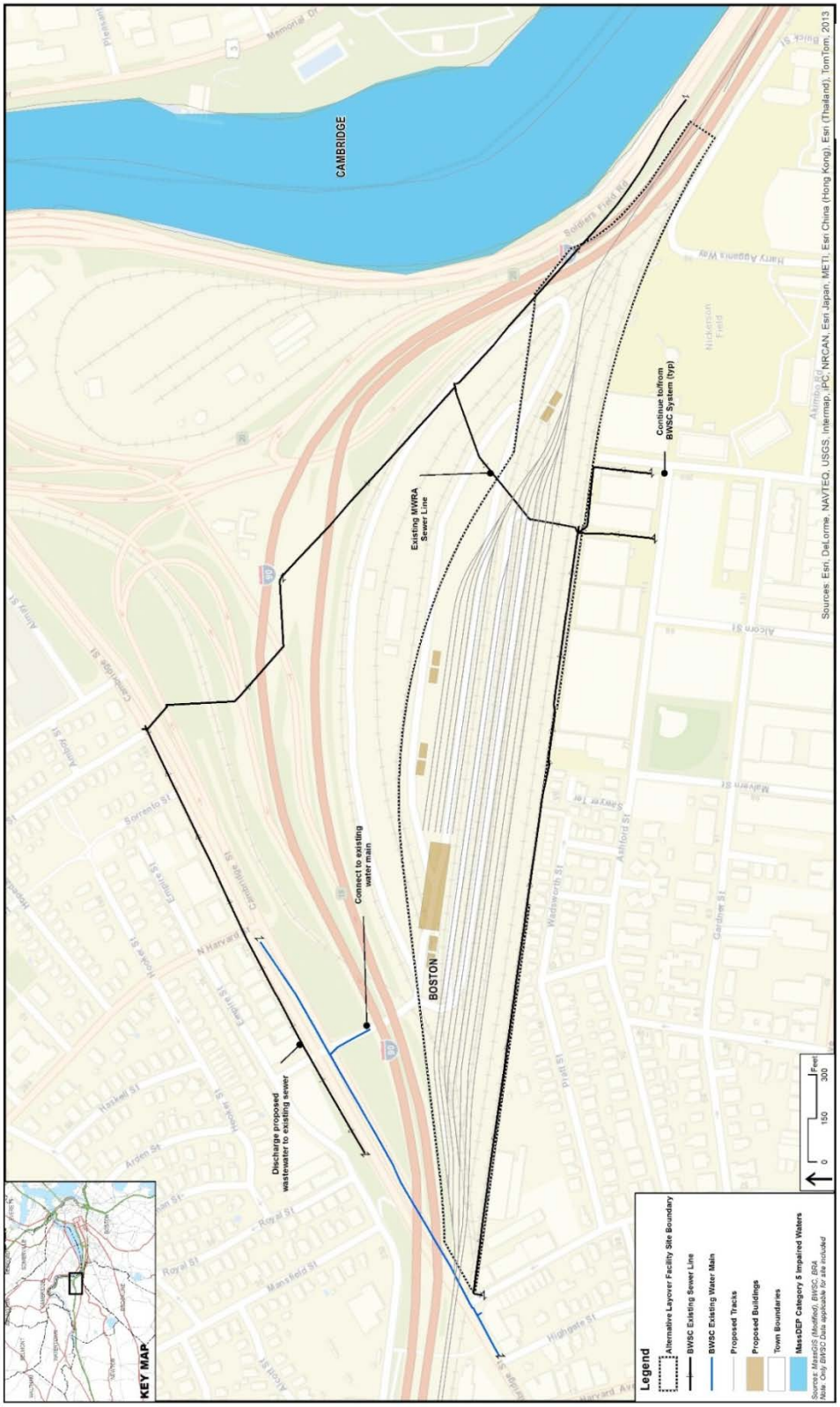

Figure 4-11—Proposed Water and Wastewater Services at Beacon Park Yard Layover Facility Site

The wastewater discharge to the system could affect potential combined overflows. MassDOT would work with BWSC and the MWRA to determine the impact of the minimal increase in wastewater discharges to the combined system and to determine if any on-site mitigation measures would be required.

The Build condition at the Beacon Park Yard site would not exceed the 15,000 gpd of wastewater discharge threshold which require I/I offsets based on MassDEP regulations. The anticipated wastewater flows would be relatively negligible compared to the storm flows that trigger overflow conditions. New wastewater systems would be constructed with new pipes and proper connections which would limit potential leaks and minimize infiltration and inflow.

Sea level rise is not expected to affect the performance of the water system because the system is a pressure system. Sea level rise could affect the functionality of the overflow portion of combined sewers. The Beacon Park Yard site could discharge wastewater to a combined sewer that has an overflow to the Charles River. Consistent with current practices, altering the available capacity of the Charles River basin to allow for an increase in water volume could be one method to protect against potential flooding due to a higher sea level. Because the Charles River water level is controlled at the Charles River Dam downstream of the site, it is not anticipated that sea level rise would result in impacts to the overflow discharge.

Readville – Yard 2

Table 4-12 presents the proposed additional estimated wastewater discharge at Readville – Yard 2 in the Build condition.

Table 4-12—Proposed Additional Estimated Wastewater Generation for Readville – Yard 2

Source	Personnel	Estimate Generation Rate (gallons/day)	Wastewater Estimate (gallons/day)
Train Staff	40	35/person	1,400
Administrative Staff	4	20/person	80
Visitors	4	20/person	80
Total	48		1,560

Based on the estimated wastewater generation shown in Table 4-12, the Readville – Yard 2 layover facility would require approximately 1,720 gallons of water per day for the expanded facilities for a total of 3,870 gpd. The site currently discharges wastewater associated with layover facility activities. The new discharge would be 3,510 gpd, an increase over existing conditions by an estimated 1,560 gpd or 80%.

Figure 4-12 shows the existing utilities within the site area, along with the likely proposed tie-in location. Proposed wastewater improvements would include new gravity services to the BWSC utilities and/or internal plumbing connections. Proposed water improvements would include relocating the existing water main to avoid being covered by proposed buildings.

Sea level rise is not expected to affect the performance of the water system because the system is a pressure system. Sea level rise could affect the performance of the wastewater system depending on the conveyance path of wastewater between the Readville – Yard 2 site and the MWRA Deer Island facility.

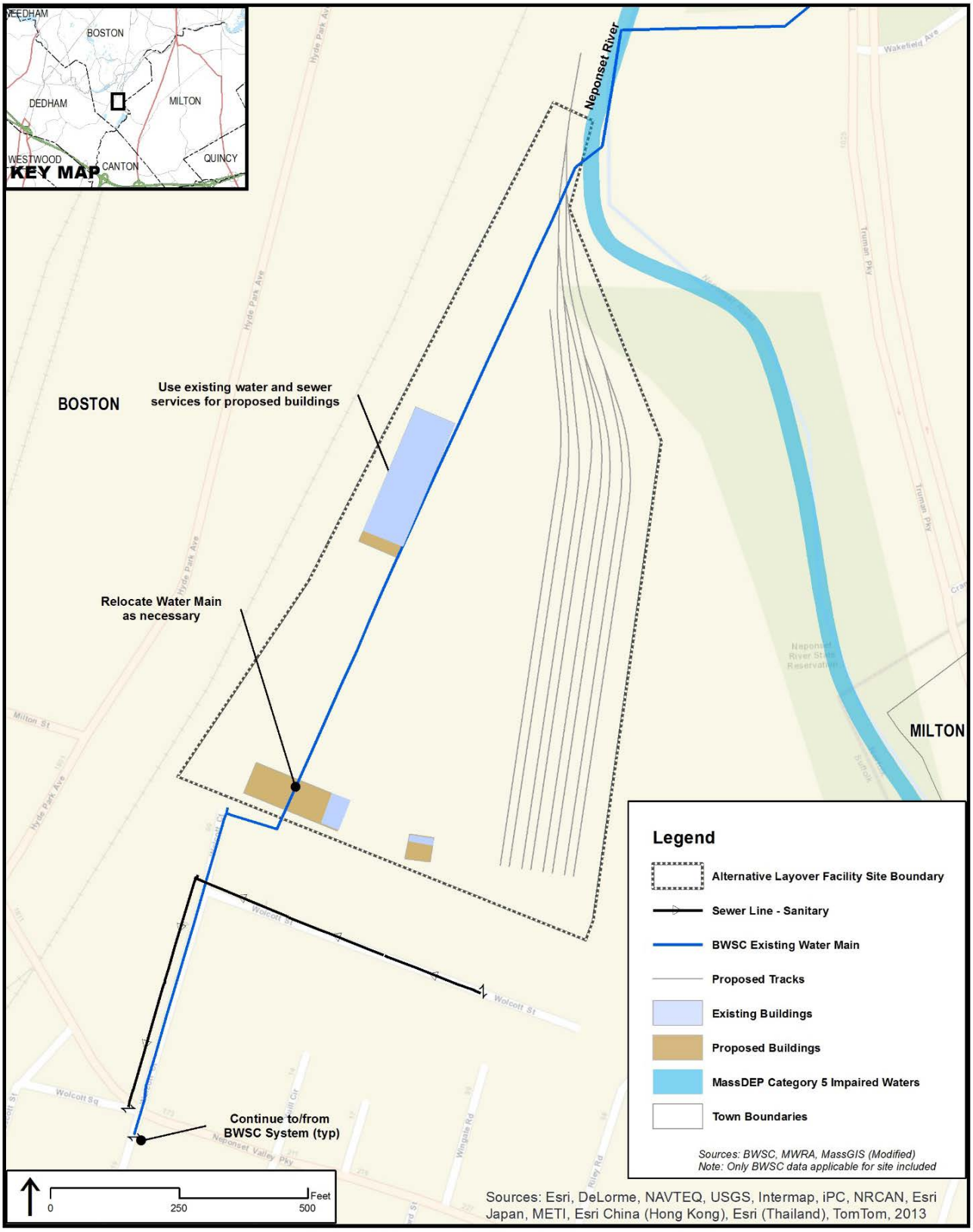

Figure 4-12—Proposed Water and Wastewater Services at Readville – Yard 2 Layover Facility Site

4.6.3. Mitigation Measures

Design Approach

Water demand and wastewater generated would increase as a result of the SSX project. Therefore, measures would need to be incorporated to mitigate the increased volumes. The SSX project would incorporate water efficiency measures to meet MassDOT GreenDOT sustainability goals related to water and wastewater. Measures such as low water consuming lavatory faucets and low flush toilets, which would minimize the use of water and wastewater generation, will be considered as well as any other measures that would improve conservation. These measures will be further identified as the design progresses.

The SSX project would require water service delivery as follows: approximately 826,000 gpd at the South Station site, approximately 6,440 gpd at the Widett Circle site, approximately 4,290 gpd at the Beacon Park Yard site, and approximately 1,720 gpd at the Readville – Yard 2 site. Currently identifiable design approaches for water service delivery include the following:

- Provide adequate capacity for the needs of each site.
- Minimize capacity needs by using water saving measures and low-flow plumbing fixtures, and providing plantings (at the South Station site) that would require low to no irrigation to minimize water use.
- Connect to existing systems so as not to damage or degrade the function of existing systems.
- Update and install new mains as needed to add capacity to existing systems.
- Provide/maintain redundancy in existing systems when possible.
- Provide required separation from other utilities including site wastewater systems.

The SSX project would generate wastewater generation as follows: approximately 750,900 gpd at the South Station site, approximately 5,850 gpd at the Widett Circle site, approximately 3,900 gpd at the Beacon Park Yard site, and approximately 1,560 gpd at the Readville – Yard 2 site. Currently identifiable design approaches for wastewater collection include the following:

- Provide adequate capacity.
- Exclude stormwater runoff.
- Minimize I/I and provide I/I mitigation as needed.
- Connect to existing systems so as not to damage or degrade the function of the existing systems.
- Update and install new mains if needed to add capacity to existing systems.
- Connect to separated sewer systems to the maximum extent possible.

In addition, efforts will be made to not build over sewer and water mains. If there is a conflict between utilities and structural elements, within the South Station site, those lines would be relocated

Infiltration/Inflow Offset Measures

As project design advances, and in consultation with MassDEP and BWSC, MassDOT would develop an I/I plan to mitigate for increased flows at the South Station site. BWSC indicates that any piping that is hydrologically connected to the mains in the vicinity of the project site potentially could meet I/I requirements. Potential I/I mitigation sites include Dorchester Avenue and the North End neighborhood of Boston. As design progresses, MassDOT would investigate opportunities where improvements to existing sewer lines could be made to meet I/I policy, which requires mitigation at a 4:1 ratio: For every one gallon of flow into the system due to the new development, four gallons of inflow must be removed from

the system. Due to the low amount of wastewater anticipated to be generated from the layover facility sites (below MassDEP's 15,000 gpd threshold), they would be exempt from MassDEP's I/I offset requirements.

4.6.4. Regulatory Consistency

Clean Water Act

The Charles River has an existing TMDL for pathogen impairments. Major contributors to the pathogen impairments to the Charles River include CSOs, sanitary sewer overflows (SSO), and sewer pipes connected to storm drains.[26] Wastewater from the Beacon Park Yard site would discharge to a combined sewer system. MassDOT would coordinate with BWSC and MWRA to determine the impact of the increase wastewater discharges on the potential CSOs downstream and determine if any on-site mitigation measures are warranted. On-board sanitary facilities and on-site sanitary sewer systems would be designed to eliminate the potential of pathogen sources reaching the Charles River.

The Neponset River has an existing TMDL for bacteria impairments. Major contributors to the bacteria impairments to the Neponset River include leaking sanitary sewers.[27] Wastewater from the site would discharge to a separate sanitary sewer system. On-board sanitary facilities and on-site sanitary sewer systems would be designed to eliminate the potential of pathogen sources reaching the Neponset River.

MWRA and BWSC Requirements

According to MWRA Sewer Use Rules and Regulations, 360 CMR 10.00, a Sewer Use Discharge Permit would be required at the South Station site due to the increased flow of more than 50,000 gpd. New sewer infrastructure and connections to existing infrastructure would be designed and constructed in accordance with MWRA's and BWSC's governing regulations. Due to the volume and nature of the discharge, a Sewer Use Discharge Permit would not be required for the layover facility sites.

As outlined in the MWRA Sewer Use Rules and Regulations, an MWRA 8 (m) Permit will be required. This is required when other entities will be performing construction activities within an easement or any other property interest held by the MWRA. Due to the need to connect to and extend sewer lines at both South Station and the layover sites, this permit will be required.

According to MassDEP regulations, 314 CMR 7.00 a Sewer Extension/Connection Compliance Certification would be required for the construction, maintenance, modification or use of any sewer system extension or connection.

New sewer infrastructure and connections to existing infrastructure would be designed and constructed in accordance with BWSC's governing regulations, including the sanitary, combined sewers and storm drains. MassDOT would coordinate with the BWSC on the design of the proposed mains and connections to the sewer system and would submit a site plan for review as the design progresses.

4.7. Transportation

This section provides an overview of the existing and proposed regional and local transportation services utilizing South Station, including existing services, ridership, and capacity, and impacts of proposed

[26] MassDEP 2007. *Total Maximum Daily Load for Nutrients in the Lower Charles River Basin, CN 301.0.* Available at: http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/charlesp.pdf
[27] MassDEP, 2002. *Total Maximum Daily Loads of Bacteria for Neponset River Basin.* Available at: http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/neponset.pdf

ridership upon the public transportation system. Public transportation infrastructure relative to South Station encompasses Amtrak intercity and MBTA commuter rail service, MBTA rapid transit service, MBTA local bus service, and private carrier bus service.

Additional information is contained in three transportation technical reports provided in Appendix 9. Appendix 9 - *Ridership Forecasting Technical Report* presents existing and proposed public transportation system ridership. Appendix 9 - *Transit Capacity Analysis Technical Report* provides analysis of ridership capacity and crowding along each line serving South Station, as well as the impact of ridership increases on station crowding at South Station and nearby downtown area stations. The Appendix 9 - *Pedestrian Circulation Analysis Technical Report* presents the impacts of projected ridership increases at South Station based upon pedestrian level-of-service (LOS)[28] on the MBTA's commuter rail and rapid transit facilities at the station.

4.7.1. Existing Conditions

Overview

All 13 intercity and commuter rail tracks at South Station are fully utilized by Amtrak and the MBTA. Similarly, all 29 bus gates are assigned to one of the eleven private bus companies operating at the bus terminal. As shown in Table 4-13, South Station currently handles approximately 128,000 daily combined Amtrak, MBTA, and intercity/commuter bus boardings and alightings.

Table 4-13—Existing Conditions Daily Combined South Station Boardings and Alightings, 2012

	Amtrak	Commuter Rail	Amtrak and Commuter Rail Total[a]	Red Line	Silver Line	Local Bus	Intercity/ Commuter Bus	Total[a]
Existing Conditions	4,100	42,000	46,000	54,000	12,700	2,900	12,200	128,000

Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report*.
Note: All results rounded to the nearest 100, except for Commuter Rail, Red Line and Total results, which are rounded to the nearest 1,000.
a Total values are calculated using precise/unrounded results. As such, the sum of rounded individual ridership results may not add up to the rounded Total ridership results presented in this table.

South Station and the railroad right-of-way are owned by the MBTA, with agreements in place with Amtrak for train dispatching and certain elements of maintenance and operations. Both Amtrak and the MBTA are severely limited in their ability to increase service or offer new services due to the constrained size and configuration of the station and terminal facilities. Regionally, future growth in rail service is anticipated by the MBTA and Amtrak. By the year 2035, Amtrak projects 40 weekday intercity round trips to and from South Station, representing a 100% service increase above its current levels.

Amtrak Service

Amtrak operates the 457-mile Northeast Corridor (NEC) between Washington, D.C. and Boston. The MBTA owns the 38 miles between the Massachusetts/Rhode Island border and South Station over which Amtrak operates. Table 4-14 summarizes Amtrak's service at South Station.

[28] Pedestrian level-of-service (LOS) is a qualitative measure used to characterize the operating conditions of a transportation service as perceived by its users.

Table 4-14—Amtrak Service at South Station

Route	Destination	Major Cities Served	Weekday Round Trips
Acela Express	Washington, DC	Boston – Providence – New Haven – New York – Philadelphia – Baltimore – Washington, D.C.	10
Northeast Regional	Newport News/ Lynchburg, VA	Boston – Providence – New Haven – New York – Philadelphia – Baltimore – Washington, D.C. – Lynchburg / Richmond – Newport News	9
Lake Shore Limited	Chicago, IL	Boston – Albany – Buffalo – Cleveland – Toledo – Chicago	1

Source: www.amtrak.com.

MBTA Commuter Rail Service

There are eight MBTA commuter rail routes serving South Station. Each weekday, South Station serves approximately 42,000 commuter rail passenger boardings and alightings, which are listed by route in Table 4-15. The minimum weekday span of service for commuter rail is 7:00 a.m. to 10:00 p.m. per the MBTA's *Service Delivery Policy*. On weekdays, commuter rail trains leave South Station as early as 4:00 a.m. and arrive at South Station as late as 1:30 a.m.[29] Scheduled commuter rail headways[30] vary by route and time of day. Per the *Service Delivery Policy*, the minimum weekday frequency of service for commuter rail is three trips in the peak direction during the morning peak and evening peak periods, and one trip in each direction every three hours during all other periods.

Table 4-15—Existing Weekday MBTA Commuter Rail Boardings and Alightings at South Station

MBTA Route	Inbound Alightings at South Station	Outbound Boardings at South Station	Total Boardings & Alightings at South Station
Fairmount Line	364	403	767
Framingham/Worcester Line	3,395	3,802	7,197
Franklin Line	2,759	3,016	5,775
Greenbush Line	1,883	1,934	3,817
Kingston/Plymouth Line	2,468	2,385	4,853
Middleborough/Lakeville Line	2,038	2,263	4,301
Needham Line	1,623	1,894	3,517
Providence/Stoughton Line	5,412	6,075	11,487
Total	19,942	21,772	41,714

Source: CTPS, *MBTA Commuter Rail Passenger Count Results*, December 21, 2012.

MBTA Rapid Transit Service

The MBTA's rapid transit system consists of heavy rail, light rail and bus rapid transit (BRT) service. The Orange Line, Blue Line, and Red Line comprise the heavy rail services. The MBTA's light rail service consists of the Mattapan Line, running between Ashmont and Mattapan, and the Green Line. The MBTA's BRT service consists of the Silver Line 1, 2, 4 and 5 routes.

The Red Line has two branches that serve South Station, both of which begin at Alewife Station in Cambridge. The Red Line provides service through Cambridge, Downtown Boston, South Boston,

[29] Based on published MBTA weekday commuter rail schedules, accessed April 2014. www.mbta.com
[30] Headway is the scheduled time interval between any two revenue vehicles operating in the same direction on a route.

Dorchester, Quincy and Braintree. The MBTA's rapid transit system is interconnected; therefore, all rapid transit lines provide linkages via the Red Line to South Station. Existing Red Line ridership at South Station totals approximately 54,000 combined weekday boardings and alightings.

Table 4-16 shows the Silver Line 1 and Silver Line 2 that serve South Station and provide service to Logan Airport and the Design Center in the Boston Marine Industrial Park, respectively. The Silver Line 4 provides service from South Station (at Essex Street and Atlantic Avenue, across from the existing station headhouse) to Dudley Square.

Table 4-16—Existing Weekday MBTA Bus Rapid Transit Boardings and Alightings at South Station

Route	Total Boardings and Alightings at South Station
Silver Line 1 – Logan Airport – South Station via Waterfront & Silver Line 2– Design Center – South Station via Waterfront	12,700[a]
Silver Line 4 – Dudley Station – South Station at Essex Street via Washington St	2,208

Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.
a Per *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.*

MBTA Local Bus Service

Local bus service connections at South Station include six local bus routes that stop immediately adjacent to the South Station headhouse on Summer Street. Table 4-17 presents the current level of weekday boardings and alightings at bus stops in the vicinity of South Station.

Table 4-17—Existing Weekday MBTA Local Bus Boardings and Alightings at South Station

Route	Total Boardings and Alightings at South Station
Route 4 – North Station – Tide Street via Federal Courthouse & South Station	42
Route 7 – City Point – Otis & Summer Streets via Summer Street & South Station	1,865
Route 11 – City Point – Downtown Bay View Route	405
Route 448 – Marblehead – Downtown Crossing via Paradise Road	19
Route 449 – Marblehead – Downtown Crossing via Paradise Road	11
Route 459 – Salem Depot – Downtown Crossing via Logan Airport & Central Square, Lynn	109

Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Private Intercity/Commuter Bus Service

There are 11 privately owned bus companies that operate services out of the South Station Bus Terminal, which is located directly over the rail tracks. The bus terminal has a total of 29 gates and is owned by the MBTA, with property management services contracted to a private company. Private bus carriers operating out of the bus terminal provide commuter services between South Station and the surrounding Greater Boston area, as well as nearly 24-hour intercity service to locations in New England and beyond, including substantial express service to New York City.

4.7.2. Potential Impacts

This section presents projected ridership at South Station and assesses transportation system impacts associated with the SSX project alternatives, including the No Build and Build Alternatives. Future conditions are presented for 2025, the project's approximate opening year; and 2035, the horizon year.

Ridership

Projected ridership data were provided by the Central Transportation Planning Staff (CTPS) and Amtrak.[31] The 2035 travel demand forecasts provided by CTPS assume the implementation of several transportation projects by 2035, consistent with the currently adopted RTP of the Boston Region Metropolitan Planning Organization (MPO). In addition, MassDOT adjusted the CTPS results to include Silver Line Gateway ridership.[32] Using methodology developed by CTPS, MassDOT estimated the 2025 ridership based on projected household and employment growth. Details of the methodology used to develop ridership data are provided in Appendix 9 - *Ridership Forecasting Technical Report.*

Table 4-18 presents the 2025 projected ridership at South Station in the No Build Alternative and the joint/private development Build Alternatives, compared to existing conditions.

Table 4-18—2025 Daily Combined South Station Boardings and Alightings

Joint/Private Development Alternative	Amtrak	MBTA Commuter Rail	Amtrak and Commuter Rail Total[a]	MBTA Red Line	MBTA Silver Line	MBTA Local Bus	Intercity/ Commuter Bus	Total[a]
Existing Conditions	4,100	42,000	46,000	54,000	12,700	2,900	12,200	128,000
No Build Alternative	5,200	53,000	58,000	68,000	22,800	3,600	12,700	165,000
Alternative 1	8,100	65,000	74,000	70,000	23,200	3,600	12,500	183,000
Alternative 2	8,100	66,000	74,000	70,000	23,200	3,700	12,700	183,000
Alternative 3	8,100	67,000	75,000	72,000	23,600	3,800	13,100	187,000

Source: *Final SSX Ridership Results* provided in Appendix 9 – *Ridership Forecasting Technical Report.*
Note: All results rounded to the nearest 100, except for Commuter Rail, Red Line and Total results, which are rounded to the nearest 1,000.
a Total values are calculated using precise/unrounded results. As such, the sum of rounded individual ridership results may not add up to the rounded Total ridership results presented in this table.

Total weekday daily ridership at South Station in the 2025 No Build Alternative is forecasted to be 165,000 passenger boardings and alightings, a 29% increase over 2012 existing conditions. Projected ridership growth between 2012 existing conditions and the No Build Alternative is expected due to area development, projected population and employment growth in the Boston region, and transit system enhancements. In the No Build Alternative, increased frequencies on the Fairmount Line would contribute to the projected growth in commuter rail ridership at South Station. The proposed Silver Line Gateway project, combined with projected land use changes along the various Silver Line corridors, would result in substantial increases to Silver Line ridership at South Station.

In 2025, total South Station ridership (Amtrak intercity rail; MBTA commuter rail, rapid transit and local bus; and intercity/commuter bus) for the SSX project Build Alternatives would increase to approximately

[31] Amtrak. *South Station Boston Expansion Project Projected Intercity Train Movement and Ridership Data to Support the Evaluation of Yard and Train Servicing Needs and Pedestrian Modeling of the Station.* September 26, 2013.
[32] The Silver Line Gateway project is not included in the currently adopted RTP. The proposed Silver Line Gateway project will extend Silver Line BRT service from the Seaport District to Chelsea via East Boston. From South Station, the proposed Silver Line Gateway route will follow the existing Silver Line route into the Seaport District; connect to the Blue Line and East Boston neighborhoods at Airport Station; and then continue into Chelsea where the route will travel in a new dedicated busway serving four new stations at Eastern Avenue, Box District, Downtown Chelsea, and Mystic Mall.

183,000 to 187,000 daily combined boardings and alightings, an increase of 11% to 13% over 2025 No Build condition ridership. Of the total ridership, Amtrak and MBTA commuter rail ridership would increase to approximately 74,000 to 75,000 daily combined boardings and alightings in the Build Alternatives, a 28% to 29% increase over 2025 No Build condition ridership. This increase is directly attributable to increased commuter rail and Amtrak intercity rail service made possible by the expansion of South Station. Land use changes corresponding to the proposed joint/private development in Alternatives 2 and 3 would result in total ridership increases of approximately 2% or less as compared to Alternative 1.

Table 4-19 presents the 2035 projected ridership at South Station in the No Build Alternative and joint/private development Build Alternatives, compared to existing conditions.

Table 4-19—2035 Daily Combined South Station Boardings and Alightings

Joint/Private Development Alternative	Amtrak	MBTA Commuter Rail	Amtrak and Commuter Rail Total[a]	MBTA Red Line	MBTA Silver Line	MBTA Local Bus	Intercity/ Commuter Bus	Total[a]
Existing Conditions	4,100	42,000	46,000	54,000	12,700	2,900	12,200	128,000
No Build Alternative	5,500	56,000	61,000	72,000	25,600	3,800	12,800	175,000
Alternative 1	9,300	72,000	81,000	74,000	26,100	3,800	12,600	198,000
Alternative 2	9,300	72,000	81,000	75,000	26,200	3,900	12,800	199,000
Alternative 3	9,300	74,000	83,000	77,000	26,700	4,000	13,300	203,000

Source: *Final SSX Ridership Results* provided in Appendix 9 – *Ridership Forecasting Technical Report*.
Note: All results rounded to the nearest 100, except for Commuter Rail, Red Line and Total results, which are rounded to the nearest 1,000.
a Total values are calculated using precise/unrounded results. As such, the sum of rounded individual ridership results may not add up to the rounded Total ridership results presented in this table.

By 2035, the No Build Alternative would result in approximately 175,000 daily combined boardings and alightings at South Station, a 37% increase over existing conditions. In 2035, total South Station ridership (Amtrak intercity rail; MBTA commuter rail, rapid transit and local bus; and intercity/commuter bus) for the SSX project Build Alternatives would result in approximately 198,000 to 203,000 daily combined boardings and alightings, a 13% to 16% increase over 2035 No Build condition ridership. Of the total ridership, Amtrak and MBTA commuter rail ridership would increase to approximately 81,000 to 83,000 daily combined boardings and alightings in the Build Alternatives, a 33% to 36% increase over 2035 No Build condition ridership. Similar to the 2025 conditions, projected ridership growth between the No Build Alternative and the Build Alternatives is directly attributable to increased commuter rail and Amtrak intercity rail service made possible by the expansion of South Station. Additionally, land use changes corresponding to the proposed joint/private development in Alternatives 2 and 3 would result in total ridership increases of approximately 3% or less as compared to Alternative 1.

Transit Capacity

MassDOT assessed the impacts of the predicted increase in ridership at South Station due to the Build Alternatives upon future capacity on the MBTA's commuter rail, rapid transit, and local bus routes. MassDOT also evaluated how projected ridership increases would affect station and platform capacities for MBTA operations both within South Station and at key stations within the downtown core of the MBTA rapid transit system, consisting of Park Street, Downtown Crossing, State Street and Government Center stations. MassDOT compared projected ridership demands to available vehicle capacities as identified by the MBTA's *Service Delivery Policy,*[33] which defines levels of crowding that are acceptable

[33] Massachusetts Bay Transportation Authority. *Service Delivery Policy*. June 2, 2010. www.mbta.com

by time period and mode of transportation. The assessment included a station capacity analysis of South Station, including an analysis of projected pedestrian flows resulting from the SSX project alternatives. Details of the methodology and results are provided in Appendix 9 - *Transit Capacity Analysis Technical Report.*

None of the Build Alternatives would result in crowding impacts to rapid transit or local bus routes that would exceed the MBTA's *Service Delivery Policy* maximum load more than impacts anticipated in the No Build Alternative. In all of the 2035 alternatives (No Build and Build), loading on the Silver Line 4 and Silver Line 5 BRT routes is anticipated to exceed *Service Delivery Policy* capacity. The projected overcrowding on the Silver Line 4 and Silver Line 5 routes, however, is due to growth in the No Build Alternative, and is not a result of the SSX project. Ridership growth between 2012 existing conditions and the 2035 No Build Alternative is anticipated due to forecasted growth in population, households, and employment, as well as changes in land use and transit services, including increased frequencies on the Fairmount Line and the proposed Silver Line Gateway project. There would be no additional impacts to Silver Line passenger crowding as a result of the SSX project.

For commuter rail, 2035 Build Alternative passenger loading on the outbound Canton/Stoughton/South Coast Rail Line is projected to exceed the MBTA *Service Delivery Policy's* acceptable level of crowding during the peak evening hour. Over the entire three-hour evening peak period, however, there would be more than sufficient capacity to accommodate the projected passenger load demands. However, as South Coast Rail operations are further defined, minor schedule adjustments could be made to provide additional capacity during the peak hour and alleviate any capacity issues during the maximum load time.

SSX project-related ridership increases at stations in the Downtown core (Park Street, Downtown Crossing, Government Center and State Street) would be imperceptible. At these stations, additional daily boardings and alightings due to the Build Alternatives would represent a less than 1% increase above 2035 No Build Alternative conditions.

Pedestrian flow increases at South Station due to the Build Alternatives would be more substantial, and would result in a 2% to 4% increase in daily Silver Line platform activity (measured in passenger boardings and alightings) above the 2035 No Build Alternative conditions. The Build Alternatives would increase passenger activity on South Station's Red Line platforms by up to 6% above No Build Alternative levels.

Pedestrian Circulation

A detailed analysis of pedestrian circulation LOS at South Station was conducted for existing conditions, the 2035 No Build Alternative, and 2035 Alternative 3 conditions. Pedestrian LOS designations range from LOS A (best case; free flow) to LOS F (worst case; walking speeds are severely restricted with frequent, unavoidable contact with others). Pedestrian LOS was evaluated for existing and new commuter and intercity rail platforms, passenger waiting areas adjacent to existing and new platforms (rail head concourse), vertical circulation elements (stairs and escalators), and existing Red Line and Silver Line platforms. For purposes of this analysis, Alternative 3 assumes a single level intercity and commuter rail concourse.

Alternative 3 would result in a poor LOS (LOS E/F) on the existing at-grade commuter and intercity rail platforms. As compared to the worst case platform conditions in the No Build Alternative, which range from LOS C to LOS F, the poor LOS on existing commuter and intercity rail platforms would occur more frequently in Alternative 3 due to the increased number of trains and ridership. An average LOS (LOS C) would be experienced on new commuter rail and intercity rail platforms in Alternative 3. This does not

take into account any improvements that would be made as a part of the design of an expanded South Station.

Passengers waiting within the concourse area adjacent to the existing platforms in Alternative 3 would experience a poor LOS (LOS E/F), compared to LOS D or better for the concourse areas in the No Build Alternative. In Alternative 3, passengers waiting adjacent to the new platforms would experience an acceptable LOS (LOS D or better).

LOS on vertical circulation elements in Alternative 3 would be slightly worse as compared to the No Build Alternative. Despite this reduction, an acceptable LOS (LOS D) or better is maintained throughout the morning and evening peaks.

Compared to the No Build Alternative, Alternative 3 would result in a slightly reduced LOS on the Red Line and Silver Line platforms. On the Red Line platforms, Alternative 3 would achieve LOS D (an acceptable peak hour LOS for a facility similar to South Station) or better during the morning and evening peak hours. On the Silver Line platforms, Alternative 3 would achieve an average LOS (LOS C) or better during the morning and evening peaks. Additional information is provided in Appendix 9 - *Pedestrian Circulation Analysis Technical Report.*

4.7.3. Mitigation Measures

Mitigation measures would minimize the potential negative impacts resulting from the SSX project. Project-related impacts consist of impacts resulting from the Build Alternatives that would exceed impacts that would otherwise occur in the No Build Alternative.

Through the preliminary engineering stage of the SSX project, the station design for the Build Alternatives would mitigate areas of congestion and poor pedestrian LOS, including projected pedestrian congestion on at-grade rail platforms and within the rail head concourse, by providing improved pedestrian circulation accommodations. Additionally, as design advances, MassDOT would consider the potential for an elevated intercity and commuter rail concourse level that facilitates mid-platform boarding and alighting during normal operations, thereby reducing the overall congestion level on the platforms and concourses.

No additional mitigation measures would be required to address capacity constraints beyond minor schedule adjustments recommended to peak period commuter rail service.

4.8. Traffic – Vehicles, Pedestrians, and Bicycles

This section addresses vehicular, pedestrian and bicycle traffic in and around South Station and the three layover facility sites. Assessment of external circulation in the vicinity of South Station includes roadways, intersections, bus stops, pedestrian accommodations, and bicycle facilities. Assessment of external circulation in the vicinity of the layover facility sites includes roadways and intersections. LOS is the traffic engineering metric used to rate the operational qualities of a roadway or intersection. LOS designations range from A to F; with LOS A representing the best operating conditions (free flow), and LOS F representing the worst operating conditions (congestion). This section also includes a safety assessment relative to vehicles, pedestrians, and/or bicycles.

The SSX project traffic study areas include key roadways and 21 intersections located in the vicinity of South Station and five key intersections located in the vicinity of the three layover facility sites. The study area intersections were selected in coordination with the Boston Transportation Department (BTD) and

the Boston Redevelopment Authority (BRA). Trip generation, mode share,[34] vehicle occupancy, and parking ratios were developed in coordination with BTD and CTPS. MassDOT coordinated with the BRA to identify BRA-approved, reviewed, or ongoing developments in the SSX project study areas. CTPS provided travel demand forecasts, including traffic demand and growth projections. Detailed information is contained in Appendix 9 - *Traffic Analysis Technical Report*.

4.8.1. Existing Conditions

South Station Site

Typical of a busy downtown area, the South Station area has high levels of vehicle, pedestrian, and bicycle activity during the morning and evening peak hours coinciding with commuter traffic.

Roadways and Vehicular Traffic

Figure 4-13 presents the key roadways and 21 intersections evaluated in the South Station traffic study area, which are described in Appendix 9 - *Traffic Analysis Technical Report*. The primary roadways in the vicinity of South Station are Atlantic Avenue, Dorchester Avenue, Summer Street, and the South Station Connector. The three most heavily traveled roadways in the immediate vicinity of South Station are Summer Street, Kneeland Street, and Congress Street. These roadway volumes are depicted in Figure 4-13.

South Station generates 5,400 vehicle trips per day, consisting of 3,400 curbside trips along Atlantic Avenue (1,700 arriving and 1,700 departing trips), 1,400 passenger vehicles to and from the high occupancy vehicle (HOV) parking deck, and 600 bus trips to and from the bus terminal. Curbside activity along Atlantic Avenue has a major influence on traffic flow. The 3,400 curbside trips along Atlantic Avenue include 1,900 taxicab trips and 1,500 trips made by passenger vehicles and commercial delivery vehicles, all of which are competing for limited curb space along Atlantic Avenue. On a typical weekday, 13% of the traffic on Atlantic Avenue is for curbside operations. During the peak hours, congestion on Atlantic Avenue caused by heavy commuter traffic volumes is exacerbated by the curbside activity.

Pedestrians

Pedestrian counts conducted in 2012 and 2013 indicate that in the morning peak hour surge (between 8:00 and 9:00 a.m.), approximately 2,430 pedestrians travel from South Station to Dewey Square Plaza at the street level. In the evening peak hour surge (between 5:00 and 6:00 p.m.), approximately 2,330 pedestrians travel from Dewey Square to South Station at street level. The majority of pedestrians leaving South Station cross Atlantic Avenue, and many of these pedestrians proceed to cross Summer Street toward Dewey Square Plaza in very large surges, corresponding to commuter rail train arrivals.

Of the pedestrians headed to the Dewey Square Plaza, many do not cross at the crosswalk across Summer Street, but choose to cross diagonally. The pedestrian behavior from South Station to Dewey Square is considerably influenced by the signal phasing: if the signal phasing is favorable, most pedestrians cross from South Station to the Dewey Square plaza using the crosswalks. If the signal phasing is not favorable, most pedestrians do not wait for the walk phase and execute a diagonal crossing across Summer Street. This identical pattern, in reverse, occurs in the evening peak.

[34] Split of drivers, pedestrians, bicyclists, and transit users.

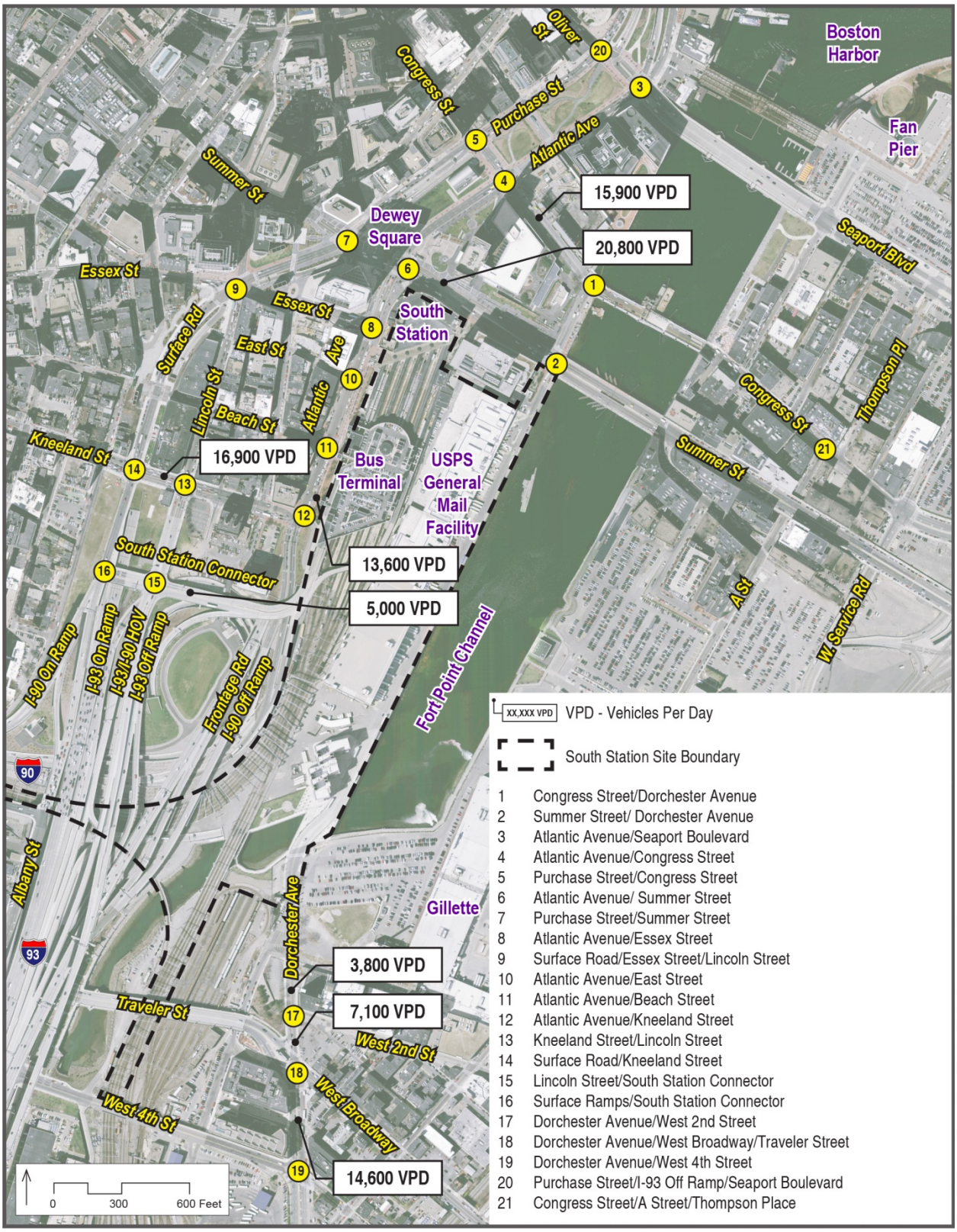

Figure 4-13—Key Roadway Intersections in the South Station Traffic Study Area

There is no pedestrian access allowed along the private portion of Dorchester Avenue, extending from a gate at MassDOT Vent Building #1 to a gate just south of the parking area and entrance to the retail portion of the USPS facility. Over this portion of Fort Point Channel, the Harborwalk does not exist. At the southern portion of the South Station site, the Harborwalk connects to the Rolling Bridge Park and the South Bay Harbor Trail. North of the site, the Harborwalk follows the public portion of Dorchester Avenue north of Summer Street.

Bicyclists

Growth in bicycle transportation in the Boston metropolitan area has increased substantially over the past decade. Bicycle counts conducted in September 2012 and 2013 indicate peak hours similar to pedestrians. The highest bicycle volumes in the area were observed on Essex Street, with 63 bicycles turning left onto Atlantic Avenue in the morning peak hour, and on Summer Street adjacent to South Station, with 63 bicycles riding westbound in the evening peak hour. A notable number of bicyclists cross Fort Point Channel along Summer Street, Congress Street, and Seaport Boulevard. On these three roadways, there were 240 bicyclists in the morning peak hour and 130 bicyclists in the evening peak hour. Bicyclists were also observed in both the morning and evening peak hours along Kneeland Street in the vicinity of the I-90/I-93 highway access ramps.

Hubway is the Boston area's bicycle sharing system, providing more than 1,300 bicycle at 140 stations throughout Boston, Brookline, Cambridge, and Somerville. Hubway's bicycle sharing system has a seasonal bicycle station located along Atlantic Avenue at South Station where 47 bicycle slots are available. Comparing August 2011 to August 2013, use of the Hubway station increased from 4,010 monthly trips to 8,200 monthly trips, an increase of 104%. A review of the entire Hubway system use in the downtown area from October 2012 to October 2013 indicates that South Station consistently ranks as the busiest or second busiest station in the entire system, with 59,800 annual bicycle trips beginning or ending at South Station, representing 3% to 5% of the total Hubway system use.

Roadway/Intersection Level of Service

Table 4-20, on the following page, presents the existing LOS for the South Station study area intersections (depicted in Figure 4-13). Typically, an overall LOS D or better is considered acceptable in an urban environment. Under existing conditions, the two unsignalized intersections in the South Station study area (Atlantic Avenue at East Street and Dorchester Avenue at West 2nd Street) operate at LOS D or better during the morning and evening peak hours. The majority of the 19 signalized intersections operate at an overall LOS D or better during the morning and evening peak hours.

Safety Review

MassDOT reviewed crash data records on the 21 study area intersections for January 2009 through December 2011[35] to determine if safety concerns exist for vehicles, pedestrians, and/or bicyclists in the South Station area. Crash rates were calculated based on the number of crashes relative to the volume of traffic traveling through the intersection on a daily basis. Rates that exceed MassDOT's average for this portion of the state (District 6)[36] could indicate safety or geometric issues that warrant further examination. Within the study area, all intersections were below the average crash rate for District 6.

[35] Crash data records from January 2009 through December 2011 are the most recent data available.
[36] The average District 6 crash rate is 0.76 for signalized intersections and 0.58 for unsignalized intersections.

Table 4-20—Existing Conditions South Station Area Intersections – Levels of Service

Intersection	Morning Peak Hour Overall LOS	Evening Peak Hour Overall LOS
1. Congress Street at Dorchester Avenue	C	B
2. Summer Street at Dorchester Avenue	E	D
3. Atlantic Avenue at I-93 On-Ramp / Seaport Boulevard	F	F
4. Atlantic Avenue at Congress Street	C	C
5. Purchase Street at Congress Street	C	E
6. Atlantic Avenue at Summer Street	F	D
7. Purchase Street at Summer Street	C	B
8. Atlantic Avenue at Essex Street	C	C
9. Surface Road at Essex Street/Lincoln Street	C	D
10. Atlantic Avenue at East Street (unsignalized)	B	B
11. Atlantic Avenue at Beach Street	A	A
12. Atlantic Avenue at Kneeland Street	E	D
13. Kneeland Street at Lincoln Street	C	D
14. Surface Road at Kneeland Street	D	E
15. Lincoln Street at South Station Connector	A	B
16. Surface Road at South Station Connector	A	A
17. Dorchester Avenue at West 2nd Street (unsignalized)	C	C
18. Dorchester Avenue at West Broadway/Traveler Street	F	F
19. Dorchester Avenue at West 4th Street	F	F
20. Purchase Street at I-93 Off Ramp/Seaport Boulevard	C	D
21. Congress Street at A Street/Thompson Place	C	C

Layover Facility Sites

Traffic data were collected at the three layover facility sites to assess how well the site driveways handle traffic entering and exiting the sites. In addition to the morning and evening peak periods, traffic assessments at the layover facility sites included a midday condition, since the layover facilities are expected to be more active during the midday than during peak commuter periods. During the morning and evening peak hours, most trains are in service and are not dwelling at a layover yard.

Overall, the layover facilities would generate six or fewer net new vehicle trips during commuter morning and evening peak hours, amounting to less than one vehicle trip every 10 minutes. The midday peak hour would be the highest generating time, with 26 net new trips at Beacon Park Yard, 24 net new trips at Widett Circle, and 14 net new trips at Readville - Yard 2. Midday layover facility traffic generation would amount to approximately one vehicle trip every three minutes.

Widett Circle

Two intersections were assessed in the vicinity of Widett Circle: Frontage Road/Widett Circle Access Road, and Widett Circle/Widett Circle Access Road. Operations at Widett Circle show an overall intersection LOS A at the signalized Frontage Road/Widett Circle Access Road intersection during all peak hours. The Widett Circle Access Road operates at LOS C during all peak hours. The unsignalized intersection of Widett Circle and Widett Circle Access Road operates at LOS A throughout the day, with all approaches also operating at LOS A.

Beacon Park Yard

The Cambridge Street/Lincoln Street intersection was assessed in the vicinity of Beacon Park Yard. Beacon Park Yard at Cambridge Street and Lincoln Street operates at an overall intersection LOS C or better during all peak hours. With the exception of the Cambridge Street eastbound approach, individual approaches operate at LOS D or better, which is considered acceptable operating conditions within the City. The Cambridge Street eastbound lane operates at LOS E during the morning peak period and LOS F during the evening peak period.

Readville – Yard 2

Two intersections were assessed in the vicinity of Readville – Yard 2: Hyde Park Avenue/Neponset Valley Parkway/Wolcott Court/Wolcott Square, and Wolcott Court/Layover Driveway. The Readville - Yard 2 signalized intersection of Hyde Park Avenue/Neponset Valley Parkway/Wolcott Court/Wolcott Square operates at an overall LOS C during the morning peak period. All intersection approaches operate at LOS D or better. During the midday, the intersection operates at an overall LOS B. The evening peak period operates at an overall LOS D. The Neponset Valley Parkway westbound approach operates at LOS E during the evening peak hour; all other approaches operate at LOS D or better. The unsignalized intersection of Wolcott Court/Wolcott Street/Layover Driveway operates at LOS A throughout the day, with all approaches also operating at LOS A.

Safety Review

MassDOT reviewed crash data records for the three layover facility sites for January 2009 through December 2011[37] to determine if safety concerns exist for vehicles, pedestrians, and/or bicyclists in the vicinity of the three layover facility sites. Crash rates were calculated based on the number of crashes relative to the volume of traffic traveling through the intersections on a daily basis. Rates that exceed MassDOT's average District 6 rate[38] could indicate safety or geometric issues that warrant further examination. All intersections at the layover facility sites were below the average crash rate for District 6, indicating that based on the volume of traffic traveling through the intersections, the crash frequency is below average.

4.8.2. Potential Impacts

The SSX project would provide substantial benefits to vehicular traffic, pedestrians, and bicyclists in all of the Build Alternatives.

Relieving Curbside Congestion on Atlantic Avenue

The SSX project could address curbside congestion on Atlantic Avenue:

- Dorchester Avenue would be configured to handle curbside activity along the length of the new headhouse on the southbound side of the newly opened street. This curb space could accommodate taxicabs, drop-off, pick-up, MBTA buses, and private shuttles, and could provide significant relief to Atlantic Avenue.
- In Alternatives 2 and 3, a new service road would link the back of the expanded station with the South Station Connector, the existing elevated roadway linking Surface Road and Lincoln Street with the bus terminal and parking deck. The South Station Connector Extension would siphon a

[37] Crash data records from January 2009 through December 2011 are the most recent data available.
[38] The average District 6 crash rate is 0.76 for signalized intersections and 0.58 for unsignalized intersections.

portion of taxicabs, and pick-up/drop-off activity to and from Interstate 90 (I-90) and Interstate 93 (I-93) from Atlantic Avenue.

Separating Vehicular and Non-Vehicular Traffic

The SSX project would improve the separation of vehicle traffic from non-vehicular traffic:

- The reopening of Dorchester Avenue would prioritize pedestrian and bicycle accommodations on the Fort Point Channel side of the roadway, separated from the vehicular curbside activity at the new station headhouse on Dorchester Avenue. Prioritizing pedestrian and bicycle transportation options is a key element of MassDOT's Healthy Transportation Compact (HTC) Directive.
- In Alternatives 2 and 3, the South Station Connector Extension, the new service road linking the back of the expanded station with the South Station Connector, would better separate South Station taxicab and drop-off/pick-up activity at the upper level from street level pedestrian and bicycle activity.

Enhancing the Pedestrian Experience

The SSX project would include enhancements to the pedestrian realm through the reopening of Dorchester Avenue as a public street, which would present an opportunity to extend the Harborwalk along the entire stretch of Fort Point Channel, and provide pedestrian access from the South Boston Waterfront.

Improving Bicycle Infrastructure

The SSX project would leverage its location as a major bicycle hub by improving bicycle infrastructure:

- The reopened segment of Dorchester Avenue would include a new cycle track, buffered from traffic and running parallel to the newly created Harborwalk along Fort Point Channel. The cycle track would be approximately one-half mile long.
- The proposed cycle track would seamlessly connect with existing bicycle infrastructure and the future plans by the City, including the South Bay Harbor Trail and the Summer Street Corridor cycle track. The Dorchester Avenue cycle track would also complement the Hubway station located at South Station, which is one of the City's busiest bicycle share hubs.
- The project would provide an opportunity for Hubway to expand at South Station by creating a second bicycle dock on the east side of the station to supplement the existing 47-slot dock on the west side of the station.
- The new terminal headhouse would incorporate covered, secure bicycle storage facilities, conveniently located off of Dorchester Avenue.

Minimizing Parking through Shared Parking Principles

The SSX project would minimize parking, encourage BTD's parking management program,[39] and advance MassDOT's GreenDOT program goal to promote healthy transportation and livable communities. Working collaboratively with the BTD, MassDOT adopted significantly reduced parking ratios to minimize parking and discourage driving to this major transit hub. The BTD parking ratio guidelines for the South Station area were reduced by more than half, thereby reducing parking spaces associated with the joint/private development by over 50%. In Alternatives 1 and 2, there would be a net decrease of parking on the South Station site.

[39] Boston Transportation Department, *Access Boston 2000 – 2010*, www.cityofboston.gov/transportation/accessboston/pdfs/parking_management.pdf

- Alternative 1 would not provide new or replacement structured parking. As a result, there would be a net decrease of 242 structured parking spaces on the site due to the relocation of the USPS facility.
- Alternative 2 would provide approximately 234 structured parking spaces to accommodate approximately 660,000 square feet of private development, representing a net decrease of eight spaces over existing conditions. The location of the parking and the access points would be distributed between Dorchester Avenue and the new service road to avoid a single point of concentrated vehicular access/egress. Previously, MassDOT estimated a need for 693 spaces based on established BTD parking ratios for the area. MassDOT's revised parking estimate represents a reduction of 458 spaces; the 66% reduction was achieved through coordination with the BTD to establish lower, transit-oriented, parking goals for the joint/private development.
- Alternative 3 would provide approximately 506 structured parking spaces to accommodate approximately 2 million square feet of private development, representing a net increase of 266 spaces over existing conditions. Similar to Alternative 2, the location of the parking and the access points would be distributed between Dorchester Avenue and the new service road to avoid a single point of concentrated vehicular access/egress. Previously, MassDOT estimated a need for 1,593 spaces based on established BTD parking ratios for the area. MassDOT's revised parking estimate represents a reduction of 1,086 spaces; the 68% reduction was achieved through coordination with the BTD to establish lower, transit-oriented, parking goals for the joint/private development.

4.8.3. Mitigation Measures

This section provides an assessment of the proposed vehicular traffic, including pedestrians and bicycles, in the No Build and Build Alternatives, including mitigation measures. Future conditions were analyzed for 2025 and 2035.

This section addresses impacts and mitigation at the South Station site. For all three layover facility sites, intersection traffic operations would not be degraded as a result of the layover facility operations in any of the Build Alternatives. Therefore, mitigation measures would not be required at the layover facility sites. All of the Build Alternatives would have very low passenger vehicle and service vehicle traffic generation for the layover facility sites. The layover facilities are projected to generate six or fewer vehicle trips during commuter morning and evening peak hours, amounting to less than one vehicle trip every 10 minutes. During the midday, traffic generation would vary from one vehicle every three minutes to one vehicle every five minutes, depending on the site.

Intersection Levels of Service

Table 4-21 presents a comparison of the South Station study area intersections, comparing overall intersection LOS in the No Build Alternative and the three joint/private development Build Alternatives in 2025 and 2035. In each alternative, the intersections are tallied by their LOS ratings. Additionally, seven new unsignalized intersections associated with the joint/private development in Alternatives 2 and 3 were assessed (these intersections would not exist in Alternative 1).In 2025, the majority of the seven new unsignalized intersections proposed in Alternatives 2 and 3 would operate at LOS A or B, and all would operate at LOS C or better. In 2035, the majority of the seven new unsignalized intersections proposed in Alternatives 2 and 3 would operate at LOS A or B.

Intersection and Roadway Mitigation

MassDOT would implement intersection and roadway improvements to address LOS deficiencies, improve traffic flow, and increase pedestrian and bicycle mobility. Appendix 9 - *Traffic Analysis Technical Report* provides additional information.

Table 4-21—South Station Area Intersections - Levels of Service, 2025/2035

Alternative	A.M. Peak Hour Overall Intersection Capacity		P.M. Peak Hour Overall Intersection Capacity	
	LOS D or better	LOS E or LOS F	LOS D or better	LOS E or LOS F
No Build Alternative	14/11	7/10	11/9[a]	10/12
Alternative 1	15[a]/13[a]	6/8	12/11	9/10
Alternative 2	15[a]/13[a]	6/8	10/9[a]	11/12
Alternative 3	14[a]/13[a]	7/8	9[a]/9[a]	12/12

a The overall LOS rating applies with the exception of one approach, which operates at a lower LOS.

Alternative 1 – Transportation Improvements Only

The following roadway mitigation measures would address LOS deficiencies to vehicles, pedestrians, and bicycles in Alternative 1:

- Improve bicycle accommodations on Atlantic Avenue. Improve bicycle connectivity into Dewey Square along Atlantic Avenue by providing a bicycle lane along the west side of Atlantic Avenue from Kneeland Street to Essex Street.
- Provide dedicated curbside space for taxicab, passenger drop-off, passenger pick-up, and shuttles along the reopened portion of Dorchester Avenue to address excessive curbside congestion along Atlantic Avenue. Reopening Dorchester Avenue to public access would present an opportunity to mitigate the curbside congestion on Atlantic Avenue and better accommodate private shuttles to/from the South Boston Waterfront/Innovation District. The conceptual layout for Dorchester Avenue would include accommodation for taxicabs, drop-off, pick-up, and private shuttles along the newly opened portion of Dorchester Avenue. As a result, there would be a 30 to 40% reduction in the curbside activity along Atlantic Avenue.
- Remove the six meters on Atlantic Avenue along the South Station side of the road. As a near-term mitigation that could be implemented immediately, curbside congestion on Atlantic Avenue would be reduced by eliminating the six parking meters along Atlantic Avenue at Kneeland Street and reprogramming the curb to accommodate drop-off or taxicabs.

The following intersection improvements would improve traffic flow, reduce queuing, and improve pedestrian and bicycle mobility in Alternative 1:

- Atlantic Avenue at Summer Street. Mitigation to more efficiently accommodate pedestrians through Dewey Square would include restriping the shared left/through lane (to an exclusive through lane) and increasing the timing for the exclusive pedestrian crossing along with corresponding pavement markings to allow for diagonal pedestrian crossings.
- Purchase Street at Summer Street. Mitigation for additional pedestrians would include the addition of a crosswalk across Summer Street to improve pedestrian crossing options.
- Surface Road/Essex Street/Lincoln Street. Mitigation to improve existing intersection geometry would involve simplifying traffic movements to the extent possible and shortening crosswalks.

Additionally, due to the reopening of Dorchester Avenue in Alternative 1, signal timing changes and associated improvements would be required at the following intersections: Summer Street at Dorchester Avenue, Congress Street at Dorchester Avenue, Dorchester Avenue/West Broadway/Traveler Street, and Dorchester Avenue/West 4th Street.

Alternatives 2 and 3 – Joint/Development Minimum and Maximum Build

In addition to the intersection and roadway mitigation proposed in Alternative 1, Alternatives 2 and 3 would require additional mitigation to offset additional vehicle traffic associated with the joint/private development. Signal timing and phasing adjustments and associated improvements are proposed at 10 intersections to improve traffic flow, reduce queuing, and improve pedestrian mobility:

- Atlantic Avenue at Seaport Boulevard,
- Atlantic Avenue at Congress Street,
- Purchase Street at Congress Street,
- Atlantic Avenue at Kneeland Street/Frontage Road/I-90 Off-Ramp,
- Lincoln Street at the South Station Connector,
- Surface Ramps at the South Station Connector,
- Atlantic Avenue at Congress Street,
- Atlantic Avenue at Summer Street,
- Kneeland Street at Lincoln Street, and
- Surface Road at Kneeland Street.

Transportation Demand Management Measures

The following list provides Transportation Demand Management (TDM) commitments for the SSX project for the Build Alternatives.

Alternative 1 - Transportation Improvements Only

Consistent with MassDOT's efforts to reduce automobile dependency, numerous TDM commitments are proposed for the SSX project. TDM commitments for the SSX project in Alternative 1 would be as follows:

- Incorporate bicycle parking in the new headhouse on Dorchester Avenue.
- Work with the City of Boston to improve bicycle accommodations on Atlantic Avenue from Kneeland Street to Summer Street.
- Allow for Hubway to expand its bicycle share program onto the reopened Dorchester Avenue, and incorporate an expanded Hubway station in the roadway design phase.
- Improve pedestrian connections around and through the South Station site to the neighboring communities of the Leather District, Chinatown, the Downtown/Financial District, and the South Boston Waterfront/Innovation District.
- Incorporate curbside space and a shuttle stop for private shuttles along Dorchester Avenue.
- Construct one-half mile of the Harborwalk adjacent to Fort Point Channel, which would close the last remaining gap in Downtown Boston in a continuous waterfront walkway.
- Provide electronic signage displaying transit schedule information.
- Prepare a Construction Mitigation Plan (CMP) for BTD to minimize disruption in the area throughout construction.

- Participate in the U.S. EPA SmartWay Transport Program to increase energy efficiency and reduce greenhouse gas emissions.

Alternatives 2 and 3 – Joint/Private Development Minimum and Maximum Build

In addition to the TDM commitments proposed in Alternative 1, TDM commitments proposed in Alternatives 2 and 3 would be consistent with MassDOT's HTC directive which promotes the needs of all transportation users. TDM commitments would be as follows:

- Charge market rates for off-street parking spaces used by single occupant vehicle (SOV) drivers.
- Provide car sharing parking (Zipcar or similar program) and carpool/vanpool designated parking spaces in any structured parking facilities.
- Accommodate electric vehicle charging facilities within the structured parking.
- Work with the BTD to conduct a post-development traffic monitoring program. The program would be conducted prior to the start of construction of each phase and repeated six months after the issuance of occupancy certificates.

4.9. Air Quality

This section presents a summary of project-related air quality impacts and potential mitigation measures for the SSX project. Project-related impacts would include emissions generated by locomotives entering and leaving the South Station Rail Terminal and related layover facilities, intercity buses from the South Station Bus Terminal, and vehicular traffic.

Air quality assessments include regional and local components, each with specific study areas. The local component assessment includes a review of nearby traffic intersections that would be affected by motor vehicle traffic associated with the South Station site and the layover facility sites. Appendix 10 - *Air Quality Technical Report* provides additional information.

4.9.1. Existing Conditions

The federal Clean Air Act, as amended, (CAA and CAAA) establishes a set of National Ambient Air Quality Standards (NAAQS) for various criteria pollutants. Currently, there are NAAQS for seven criteria pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). The Massachusetts Ambient Air Quality Standards (MAAQS) are identical to the NAAQS.

MassDEP maintains a statewide network of monitoring stations that continuously measure pollutant concentrations in the ambient air. These stations provide data to assess compliance with the NAAQS and the MAAQS and to evaluate the effectiveness of pollution control strategies. For the most recently available full year of data (2012) at representative monitoring stations nearest to the SSX project corridor, there were two exceedances of the 8-hour O_3 standard and two exceedances of the Annual NO_2 standard. There were no exceedances in the air quality study area of any other NAAQS or MAAQS in 2012.

U.S. EPA designates geographic regions in which measured ambient concentrations of air pollutants have exceeded the NAAQS as nonattainment areas. Areas of the country that have measured pollutant concentrations that are less than the NAAQS are designated attainment areas. The SSX project is located in Boston, Suffolk County, which is part of the Boston-Lawrence-Worcester Eastern Massachusetts Nonattainment area. Massachusetts was designated as a Serious Nonattainment Area with respect to the 1997 8-hour ozone standard of 0.08 parts per million (ppm). However, all air quality

monitors now show that Massachusetts meets the 1997 ozone standard statewide. U.S. EPA updated the 8-hour ozone standard to 0.075 ppm in 2008, and designated Massachusetts as in attainment statewide except for Dukes County (Martha's Vineyard) in 2011.

Federally funded or approved projects, except those covered under the transportation conformity rule (U.S. EPA Transportation Conformity Rule (40 CFR 51 Subpart T)), located in nonattainment areas must comply with the U.S. EPA General Conformity Rule (40 CFR 51 Subpart W). FRA activities are not covered under transportation conformity; General Conformity regulations apply. Therefore, a regional analysis of project-related direct and indirect emissions is required for purposes of demonstrating compliance with the General Conformity Rules. The General Conformity Determination will be provided in the Environmental Assessment, to be prepared by MassDOT pursuant to the National Environmental Policy Act (NEPA).

Regional Emissions Inventories

To demonstrate compliance with the U.S. EPA General Conformity Rules, which are applicable to Federal Railroad Administration (FRA) activities, a regional analysis of SSX project-related direct and indirect emissions was conducted. An emissions inventory is a listing, by source, of the amount of air pollutants discharged into the atmosphere for a given time period (typically one year). Project-related emissions inventories were prepared for volatile organic compounds (VOC), oxides of nitrogen (NOx), CO, PM_{10}/$PM_{2.5}$, and SO_2.

South Station Site

Table 4-22 presents the regional emissions inventory at the South Station site in existing conditions (2012), which includes emissions from diesel locomotives entering and leaving South Station and motor vehicles and intercity buses on roadways in the South Station site vicinity.

Table 4-22—Project-related Pollutant Emissions at the South Station Site, Existing Conditions

Emission Source	VOC (tpy)	NOx (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	SO_2 (tpy)
Locomotives	0.67	8.47	0.25	0.24	2.55	0.14
Motor Vehicles	3.77	14.90	1.30	0.67	80.82	0.31
Buses	2.86	3.59	0.33	0.28	1.01	0.02
Total, All Sources	7.30	26.96	1.88	1.19	84.38	0.47

tpy = tons per year.

Layover Facility Sites

At the Widett Circle and Beacon Park Yard layover facility sites, there are no MBTA-related (rail or motor vehicle) pollutant emissions in existing conditions, as there are currently no MBTA trainsets using the sites. Table 4-23 presents the regional emissions inventory at the Readville - Yard 2 layover facility site in existing conditions (2012) associated with emissions of criteria pollutants due to the 10 MBTA trainsets currently using the site. Emissions increases at these sites are essentially negligible when compared to other pollutant emissions in the region.

Table 4-23—Project-related Pollutant Emissions at the Readville - Yard 2 Site, Existing Conditions

Emission Source	VOC (tpy)	NOx (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	SO_2 (tpy)
Locomotives	0.06	0.78	0.02	0.02	0.23	0.02

tpy = tons per year.

CO Hot Spot Analysis

Hot spots are areas where concentrations of one or more air pollutants are expected to be elevated. A CO Hot Spot or intersection analysis was conducted for the SSX project in accordance with U.S. EPA procedures[40] and in consultation with MassDEP. At the South Station site, the analysis evaluated the four worst case intersections based on level of service analysis, total traffic volume, and geographic coverage. At the layover facility sites, the analysis included one worst-case intersection per site.

South Station Site

Table 4-24 presents the results of the CO Hot Spot analysis for existing conditions (2012) within the South Station study area. For the four intersections modeled, all of the 1-hour CO concentrations were well below the 1-hour CO National and Massachusetts standard of 35 parts per million (ppm), and all of the 8-hour CO concentrations were below the corresponding 8-hour CO National and Massachusetts standard of 9 ppm.[41]

Table 4-24—Estimated Maximum 1- and 8-Hour CO Concentrations at the South Station Site Vicinity, Existing Conditions

Intersection	Maximum 1-hour[a] (ppm)	Maximum 8-hour[b] (ppm)
Atlantic Avenue at Seaport Boulevard	2.4	1.6
Atlantic Avenue at Summer Street	2.5	1.7
Surface Road at Kneeland Street	3.3	2.3
Dorchester Avenue at West Broadway / Traveler Street	2.6	1.8

ppm = parts per million.
a Values include a background 1-hour CO concentration of 1.8 ppm. The NAAQS/MAAQS for CO for 1-hour is 35 ppm.
b Values include a background 8-hour CO concentration of 1.2 ppm. The NAAQS/MAAQS for CO for 8-hours is 9 ppm.

Layover Facility Sites

Table 4-25 presents the results of the CO Hot Spot analysis for existing conditions (2012) at the three layover facility sites. At the Widett Circle site, the intersection of Frontage Road at Widett Circle Access Road was analyzed. At the Beacon Park Yard site, the intersection of Cambridge Street at Lincoln Street was analyzed. At the Readville – Yard 2 site, the intersection of Hyde Park Avenue/Neponset Valley Pkwy/Wolcott Court/Wolcott Square was analyzed. As shown in Table 4-25, the modeled 1-hour and 8-hour CO concentrations at all three of the intersections were well below the 1-hour and 8-hour CO National and Massachusetts standards.

[40] U.S. EPA's MOVES emission factors and U.S. EPA's CAL3QHC dispersion model were used to conduct the CO Hot Spot analysis.
[41] U.S. EPA standards for CO are based on scientific studies which showed that exposure to 35 ppm in one hour caused harmful health effects in animals and that exposure to 9 ppm for eight hours caused similar health effects.

Table 4-25—Estimated Maximum 1- and 8-Hour CO Concentrations at the Layover Facility Sites, Existing Conditions

Layover Facility Site/Intersection	Maximum 1-hour[a] (ppm)	Maximum 8-hour[b] (ppm)
Widett Circle/Frontage Road at Widett Circle Access Road	2.1	1.4
Beacon Park Yard/Cambridge Street at Lincoln Street	2.4	1.6
Readville – Yard 2/Hyde Park Avenue-Neponset Valley Parkway-Wolcott Court-Wolcott Square	2.2	1.5

ppm = parts per million.
a Values include a background 1-hour CO concentration of 1.8 ppm. The NAAQS/ MAAQS for CO for 1-hour is 35 ppm.
b Values include a background 8-hour CO concentration of 1.2 ppm. The NAAQS/ MAAQS for CO for 8-hours is 9 ppm.

4.9.2. Potential Impacts

Potential impacts analysis were assessed utilizing several components: an area-wide impact assessment, which consisted of calculating area-wide project-related pollutant emission inventories; a CO Hot Spot analysis; a $PM_{2.5}$ Hot Spot analysis; an analysis of Mobile Source Air Toxics (MSATs); an assessment of NO_2 concentrations; an assessment of Air Quality Conformity; and an assessment of construction impacts.

At the South Station site, MassDOT evaluated impacts relative to the No Build Alternative, and two build alternatives in 2025 and 2035: Alternative 1 – Transportation Improvements Only, and Alternative 3 – Joint/Private Development – Maximum Build. MassDOT determined that air quality impacts for Alternative 2 – Joint/Private Development – Minimum Build would only be evaluated if violations were predicted for the larger development (worst case) of Alternative 3. Violations are not anticipated, so Alternative 2 was not analyzed. At the three layover facility sites, MassDOT evaluated impacts relative to the No Build Alternative and the Build condition.

South Station Site

Table 4-26 presents a summary of the project-related emissions inventories in the vicinity of the South Station site compared to existing conditions.

Table 4-26—Summary of Project-related Criteria Pollutant Emissions at the South Station Site, Project Alternatives

Project Alternative	VOC (tpy)	NOx (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	SO_2 (tpy)
Existing Conditions (2012)	7.30	26.96	1.88	1.19	84.38	0.47
2025 Conditions						
No Build Alternative	2.75	8.43	1.38	0.55	68.92	0.47
Alternative 1	2.80	8.49	1.41	0.55	69.84	0.48
Alternative 3	2.86	8.70	1.42	0.56	70.82	0.48
2035 Conditions						
No Build Alternative	2.69	7.88	1.47	0.56	73.08	0.48
Alternative 1	2.74	8.00	1.49	0.58	74.41	0.49
Alternative 3	2.78	8.11	1.52	0.59	75.42	0.49

tpy = tons per year

Based on the results of the emissions inventory analysis for the air quality study area, the very small increases in pollutant emissions in the vicinity of the South Station site or the layover facility sites due to

the SSX project would not lead to exceedances of the Massachusetts or National Ambient Air Quality Standards and no adverse air quality impacts are expected to occur with any of the Build Alternatives. Based on the emissions inventory analysis, no mitigation measures would be required for any of the Build Alternatives.

Large decreases in pollutant emissions in the vicinity of South Station between 2012 and 2025 are anticipated due to significant reductions in U.S. EPA-mandated pollutant emission factors. These significant reductions in emission factors would offset the growth of motor vehicle traffic and train volumes in the area around South Station. Small increases in pollutant emissions in the vicinity of South Station between 2025 and 2035 are anticipated, due to relatively small reductions in U.S. EPA pollutant emission factors from 2025 to 2035. These small reductions in emission factors would not completely offset the growth of traffic and train volumes in the area around South Station.

Layover Facility Sites

Table 4-27 presents a summary of the project-related emissions inventories in the vicinity of the layover facility sites. The emissions inventory is limited to locomotive emissions only; as previously cited, there would be no measurable increase in motor vehicle traffic due to the SSX project.

Currently, there are no MBTA trains laying over at the Widett Circle site or the Beacon Park Yard site and there would be no trains using these facilities in the No Build Alternative. Pollutant emissions inventories for these two sites are therefore not applicable. There are 10 trains per day currently using the Readville-Yard 2 site for layover; these trains would continue to use Readville – Yard 2 in the No Build Alternative. As shown in Table 4-27, project-related pollutant emissions increases at Readville – Yard 2 would be negligible when compared to other pollutant emissions in the region.

Table 4-27—Summary of Project-related Criteria Pollutant Emissions at the Layover Facility Sites, Project Alternatives

Layover Facility Site/Alternative	VOC (tpy)	NOx (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	CO (tpy)	SO_2 (tpy)
Widett Circle						
2012 Existing Conditions	na	na	na	na	na	na
2025/2035 No Build Alternative	na	na	na	na	na	na
2025/2035 Build Alternative	0.03	0.28	0.01	0.01	0.32	0.05
Beacon Park Yard						
2012 Existing Conditions	na	na	na	na	na	na
2025/2035 No Build Alternative	na	na	na	na	na	na
2025/2035 Build Alternative	0.02	0.20	0.01	0.01	0.23	0.03
Readville - Yard 2						
2012 Existing Conditions	0.06	0.78	0.02	0.02	0.23	0.02
2025/2035 No Build Alternative	0.02	0.14	0.01	0.01	0.16	0.02
2025/2035 Build Alternative	0.02	0.21	0.01	0.01	0.24	0.03

tpy = tons per year
na = No MBTA trains use the site for layover facility activities.

Summary of Emissions Inventories Analyses

Based on the results of the emissions inventory analysis for the air quality study areas, the very small increases in pollutant emissions in the vicinity of the South Station site or the layover facility sites due to the SSX project would not lead to exceedances of the NAAQS or MAAQS. No adverse air quality

impacts are expected to occur with any of the Build Alternatives. Based on the emissions inventory analysis, no mitigation measures would be required for any of the Build Alternatives.

CO Hotspot Analyses

South Station Site

Table 4-28 presents a summary of the results of the CO hotspot analyses in the vicinity of the South Station site. For all of the project alternatives, all of the modeled 1- and 8-hour CO concentrations at SSX project intersections were well below the corresponding 1- and 8-hour CO National and Massachusetts standards of 35 and 9 ppm, respectively. The decreases in CO concentrations projected in the No Build and Build Alternatives, compared to the 2012 existing conditions, would be due to the decrease in motor vehicle CO emissions rates, which would more than offset the increase in motor vehicle traffic volumes.

Table 4-28—Estimated Maximum 1- and 8-Hour CO Concentrations at the South Station Site, Project Alternatives

Project Alternative	Worst Case Intersection	Maximum 1-Hour[a] (ppm)	Maximum 8-Hour[b] (ppm)
2012 Existing Conditions	Surface Road at Kneeland Street	3.3	2.3
2025/2035 No Build Alternative	Atlantic Avenue at Seaport Blvd.	2.3	1.6
2025/2035 Alternative 1	Atlantic Avenue at Seaport Blvd.	2.3	1.6
2025/2035 Alternative 3	Surface Road at Kneeland Street	2.3	1.6

ppm = parts per million.
a Values include a background 1-hour CO concentration of 1.8 ppm. The NAAQS/MAAQS for CO for 1-hour is 35 ppm.
b Values include a background 8-hour CO concentration of 1.2 ppm. The NAAQS/MAAQS for CO for 8-hours is 9 ppm.

Layover Facility Sites

Table 4-29 presents a summary of the results of the CO hotspot analyses in the vicinity of the three layover facility sites.

For both the No Build and Build Alternatives at the three project sites, the modeled 1- and 8-hour CO concentrations would be well below the corresponding 1- and 8-hour CO National and Massachusetts standards of 35 and 9 ppm, respectively. The decreases in CO concentrations in the No Build and Build Alternatives from existing conditions would be due to the decrease in motor vehicle CO emissions rates, which would more than offset the increases in motor vehicle traffic volumes.

Table 4-29—Estimated Maximum 1- and 8-Hour CO Concentrations at the Layover Facility Sites, Project Alternatives

Project Alternative	Maximum 1-Hour[a] (ppm)	Maximum 8-Hour[b] (ppm)
Widett Circle: Intersection of Frontage Road at Widett Circle Access Road		
2012 Existing Conditions	2.1	1.4
2025/2035 No Build/Build Alternatives	2.0	1.3
Beacon Park Yard: Intersection of Cambridge Street at Lincoln Street		
2012 Existing Conditions	2.4	1.6
2025/2035 No Build/Build Alternatives	2.3	1.6
Readville - Yard 2: Intersection of Hyde Park Avenue/Neponset Valley Pkwy/ Wolcott Ct/Wolcott Square		
2012 Existing Conditions	2.2	1.5
2025/2035 No Build/Build Alternatives	2.1	1.4

ppm = parts per million
a Values include a background 1-hour CO concentration of 1.8 ppm. The NAAQS/MAAQS for CO for 1-hour is 35 ppm.
b Values include a background 8-hour CO concentration of 1.2 ppm. The NAAQS/MAAQS for CO for 8-hours is 9 ppm.

Summary of CO Hotspot Analyses

Based on the results of the CO modeling analysis at the selected traffic intersections in the air quality study areas, increases in project-related motor vehicle traffic volumes would not lead to exceedances of the NAAQS or MAAQS for CO, and no adverse air quality impacts are expected to occur with any of the Build Alternatives. Based on the CO hot spot analysis, no mitigation measures would be required for any of the traffic intersections analyzed for any of the Build Alternatives.

Mobile Source Air Toxics Analysis

Mobile Source Air Toxics (MSATs) are emitted in both gaseous form and particulate form from motor vehicles, locomotives, and non-road construction equipment. The MSATs can be present in the fuels, formed from incomplete combustion of fossil fuels, or formed as secondary reaction products from the combustion emissions in the atmosphere. A qualitative comparison of MSATs from the Build Alternatives at the South Station site was developed from the estimates of VOC and PM2.5 emissions, which were used as surrogates for indicating trends in MSAT emissions. The amount of MSATs emitted would be proportional to a combination of the project-related VOC and PM2.5 emissions from the SSX project, assuming that other variables such as motor vehicle and locomotive fleet mixes would be the same for each alternative.

Table 4-30 presents the VOC and $PM_{2.5}$ project-related emissions in the air quality study area for the No Build Alternative and Alternatives 1 and 3, in comparison to existing conditions.

In 2025, the combined differences in VOC and $PM_{2.5}$ emissions from Alternative 1 to the No Build Alternative would result in a total increase of MSAT surrogates of just over 2%. The combined differences in VOC and $PM_{2.5}$ emissions from Alternative 3 to the No Build Alternative would result in a total increase of MSAT surrogates of about 4%.

In 2035, the combined differences in VOC and $PM_{2.5}$ emissions from Alternative 1 to the No Build Alternative would result in a total increase of MSAT surrogates of about 2%. The combined differences in VOC and $PM_{2.5}$ emissions from Alternative 3 to the No Build Alternative would result in a total increase of MSAT surrogates of about 4%.

These results indicate that there would be only a slight increase in MSAT emissions due to the SSX project Build Alternatives, compared to MSAT emissions from the No Build Alternative. These small increases would be unlikely to result in adverse health effects within the South Station study area, which includes those portions of the Downtown, Chinatown, and Leather District neighborhoods proximate to the site.

Table 4-30—Summary of Estimated VOC and PM2.5 Emissions in the Vicinity of the South Station Site

Project Alternative	Project-related VOC Emissions (tpy)	Project-related $PM_{2.5}$ Emissions (tpy)
2012 Existing Conditions	7.30	1.21
2025 No Build Alternative	2.76	0.55
2025 Alternative 1	2.80	0.55
2025 Alternative 3	2.86	0.56
2035 No Build Alternative	2.70	0.57
2035 Alternative 1	2.75	0.58
2035 Alternative 3	2.79	0.59

tpy= tons per year

Other Air Quality-related Emissions

Diesel particulate matter and ultrafine particles were evaluated with respect to potential air quality impacts of the SSX project. Appendix 10 - *Air Quality Technical Report* provides additional information on these potential air quality impacts.

Diesel Particulate Matter

Diesel particulate matter (DPM) is part of a complex mixture that makes up diesel exhaust. Diesel exhaust is composed of two phases, the gas phase and the particle phase, and both phases can contribute to potential health risks. Currently, there are no regulations at the federal or state levels which contain air quality standards for DPM emissions, and sufficient data are not available to accurately conduct a quantitative assessment of DPM emissions from various project alternatives.

MassDOT conducted a qualitative assessment of DPM emissions in the vicinity of South Station. DPM emissions in the vicinity of South Station will follow the emissions trends of $PM_{2.5}$ emissions from diesel fueled sources. The diesel fueled sources include locomotives and intercity buses (which are all assumed to be diesel fueled). Using $PM_{2.5}$ emissions from diesel fueled sources as a surrogate, with an increase in the use of diesel-powered vehicles, DPM emissions are expected to increase. For each project year, Alternative 1 would produce more DPM emissions than the No Build Alternative, and Alternative 3 would produce more DPM emissions than either Alternative 1 or the No Build Alternative.

Ultrafine Particulates

Ultrafine particulates (UFPs) refer to particulate matter that is generally less than 100 nanometers in size. Compared with $PM_{2.5}$, the ultrafine particles would be 0.1 microns and smaller or roughly 25 times smaller than the regulated $PM_{2.5}$. UFPs can come from natural sources, or be artificially created by humans. Man-made sources include combustion of all petroleum products, which include all non-electrical transportation sources, home heating, and power generation. Currently, there are no regulations at the federal or state levels which contain air quality standards for UFPs, and sufficient data are not available to accurately conduct a quantitative assessment of various project alternatives on UFPs in the atmosphere.

MassDOT conducted a qualitative assessment of UFP emissions in the vicinity of South Station. Emissions of UFPs in the vicinity of South Station are similar to highway sources, as both include diesel and gasoline burning transportation sources. Using fuel consumption as a surrogate, UFPs are expected to increase in time, with all alternatives. For each project year, Alternative 1 would produce more UFPs than the No Build Alternative, and Alternative 3 would produce more UFPs than either Alternative 1 or the No Build Alternative.

Control Technologies for Locomotive Emissions

As requested in the Secretary's Certificate on the ENF, MassDOT evaluated the use of control technologies for locomotive emissions. Summaries of compliance with federal locomotive emission standards, alternative technologies, and operational strategies are presented as follows. Additional information, including review of retrofit devices and alternative fuels, is presented in Appendix 10 - *Air Quality Technical Report*.

Compliance with Locomotive Emission Standards

The U.S. EPA's Locomotives Exhaust Emission Standards set upper limits for pollutant emissions based on the date a locomotive engine is manufactured/remanufactured. These limits are organized into tiers (Tier 0 through Tier 4), or years of implementation. For example, Tier 0 standards apply to engines manufactured between 1973 and 1992; Tier 1 standards apply to engines manufactured between 1993 and 2004; Tier 2 standards apply to engines manufactured between 2005 and 2011; Tier 3 standards apply to engines manufactured between 2012 and 2014; and Tier 4 standards apply to engines manufactured in 2015 or later.

It is assumed that for existing conditions (2012), the typical MBTA locomotive[42] is in compliance with Tier 1 standards, and the typical Amtrak locomotive is in compliance with Tier 0 standards. For the No Build Alternative and all Build Alternatives in 2025 and 2035, it is assumed that all locomotives would be in compliance with Tier 4 standards. Between Tier 1 and Tier 4, there is a very large reduction in emission limits: 82% for NOx, 86% for PM, and 75% for Hydrocarbons (HC).

Alternative Technologies

Amtrak completed electrification of the NEC to Boston in 2000, an effort first begun in the early twentieth century by the private railroads that then controlled rail travel within the Northeast. The MBTA commuter rail remains powered by diesel locomotives. Amtrak's overhead catenary system exists on some of the lines and in some of the stations currently used by the MBTA, but the majority of the MBTA commuter rail service area remains without electrification infrastructure. Due to the benefits that an electrified rail network could offer, MassDOT holds the position that any new construction and expansion of the commuter rail system should not preclude the possibility of electrification in the future. As part of the plans for the SSX project, clearance and right-of-way will be designed to be able to accommodate conversion to electrification in the future. With the current financial and logistical limitations, however, MassDOT is not planning any system-wide electrification processes now or in the foreseeable future.

The use of battery storage technology to power the trains has not been fully developed for such heavy-duty applications. The needs and costs of the associated infrastructure to support such technologies are also not developed.

[42] The average MBTA locomotive is represented by the F40PH-2C locomotive.

Operational Strategies

Operational strategies refer to ways of reducing fuel consumption and associated emissions by reducing engine idling times or engine running times to accomplish the same function. There are currently regulations in place to limit train idling at the platforms at South Station and these will be continued in the expanded South Station. Bus idling at South Station is limited by regulation to no more than 5 minutes at a time.

Shore power (electric plug-in facilities) exists today at South Station and Readville – Yard 2. Shore power is proposed at the expanded South Station and at the layover facility sites as part of the SSX project.

Construction Impacts

Temporary air quality impacts could result from construction activities associated with the SSX project. Construction-related impacts can include fugitive dust emissions, direct emissions from construction equipment, and increased emissions from motor vehicles on local streets due to traffic disruption.

4.9.3. Mitigation Measures

The air quality analyses demonstrate that emissions of criteria pollutants from the proposed SSX project's Build Alternatives would be in conformance with NAAQS; would not increase in frequency or severity any existing violations; and would not delay the timely attainment of any NAAQS. Additionally, the very small increases in MSAT emissions associated with the joint/private development Build Alternatives would be unlikely to result in adverse health effects to the neighborhood areas adjacent to South Station. Therefore, no mitigation of project-related emissions would be required.

The air quality analysis evaluated the potential impact of project-related motor vehicles on four worst-case hotspot (intersection) locations around the South Station site and at one location near each of the three layover facility sites for the No-Build Alternative, Alternative 1, and Alternative 3 in the project's opening year of 2025 and the project's design year of 2035. All of the modeled 1- and 8-hour CO concentrations at all of the intersections analyzed were well below the 1-hour and 8-hour CO National and Massachusetts standards of 35 ppm and 9 ppm, respectively. Therefore, no mitigation of project-related CO emissions at traffic intersections would be required. Chapter 6 presents MassDOT's approach to mitigate temporary construction-related air quality impacts.

4.10. Noise and Vibration

This section provides an assessment of the noise and vibration effects of the SSX project. The FRA uses the Federal Transit Administration's (FTA's) *Transit Noise and Vibration Impact Assessment* guidance manual[43] for assessing noise and vibration impacts on FRA-funded projects. In addition to the federal criteria, MassDOT used the City of Boston Noise Ordinance[44] to assess potential construction noise at South Station. Additional information is contained in Appendix 11 - *Noise and Vibration Technical Report*.

Noise impact assessments are based on the selected receptor's sensitivity to noise. For example, the day-night average sound level (or Ldn) is the noise metric used to assess project impacts at residential

[43] Report No. FTA-VA-90-1003-06; May 2006
[44] City of Boston Municipal Code, Chapter 16, Section 26.

receptors, while the hourly noise level (or Leq) is used to assess impacts at non-residential and institutional receptors. The Leq level represents a level of constant noise that has the same acoustic energy as the fluctuating noise level measured over a given time period such as an hour. The Ldn level represents the average noise level measured over a 24-hour period with a 10-dBA (A-weighted decibel)[45] penalty added to the nighttime hours (10:00 p.m. to 7:00 a.m.) to account for people's increased sensitivity to noise while they are trying to sleep.

4.10.1. Existing Conditions

South Station

To establish the existing noise levels within the project area, noise measurements were taken at eight locations within or adjacent to the South Station site, representing residential and non-residential sensitive noise receptors that could be affected by the SSX project. Peak-hour Leq noise levels were measured at non-residential receptors. In areas where there could be residential receptors, hourly Leq levels were measured during peak-hour, midday, and nighttime periods. These hourly noise measurements were then used to calculate an Ldn noise level, per the FTA guidance manual. Table 4-31 presents the existing noise measurements in and around the South Station site. A typical noise level from an idling locomotive is 80 dBA at a distance of 50 feet.

Table 4-31—Existing Measured Noise Levels at South Station Site and Vicinity

Loc. No.	Description	Approximate Distance to Nearest Rail Line	Peak-Hour Leq	Midday Leq	Nighttime Leq	Ldn Level[a]
1	South Station Headhouse	25 feet	72.3 dBA	---	---	---
2	245 Summer Street	50 feet	71.3 dBA	---	---	---
3	East Side of South Station – Track 13	15 feet	82.0 dBA	---	---	---
4	West Side of South Station – Track 1	15 feet	69.1 dBA	---	---	---
5	Atlantic Avenue at East Street	175 feet	67.8 dBA	67.0 dBA	64.4 dBA	69.3 dBA
6	Atlantic Avenue at Kneeland Street	175 feet	73.0 dBA	71.0 dBA	65.0 dBA	71.2 dBA
7	Federal Reserve Building	340 feet	64.6 dBA	---	---	---
8	Across Fort Point Channel at Necco Street	950 feet	56.4 dBA	57.9 dBA	54.0 dBA	59.2 dBA

--- indicates that midday and nighttime hourly Leq noise measurements were not obtained because there were no residential receptors at this location.
a The 24-hour Ldn noise level is determined from the measured peak hour, midday, and nighttime hourly Leq noise levels. The Ldn noise level is only required for residential receptors or receptors where people normally sleep such as hospitals and hotels.

In addition to the noise measurements, vibration measurements were obtained at four locations at the South Station site, including: the South Station headhouse; the east side of South Station near Track 13; the west side of South Station near Track 1; and a location immediately adjacent to the site, 245 Summer Street, which operates vibration-sensitive computer equipment in the basement of the building. Because of the slow speed of the trains entering and leaving South Station, typical vibration levels from the trains in the area surrounding South Station are below the FTA impact criterion of 72 velocity decibels (VdB) for human annoyance. Typical vibration levels along the platforms at South Station are 65 VdB at a

[45] Ground–borne noise levels are reported in A-weighted decibel. The A-weighted decibel describes a receptor's sound level at any moment in time. The A-weighting indicates that the sound has been filtered to reduce the strength of the very low and the very high-frequency sounds, much like the human ear does.

distance of 20 feet from moving passenger railcars and 80 VdB at a distance of 50 feet from a moving diesel locomotive.

A detailed indoor and outdoor vibration measurement program was conducted at 245 Summer Street using more sensitive vibration-monitoring equipment for measuring the indoor vibration levels. Vibration levels measured were below 60 VdB at a distance of 75 feet from the closest tracks. These levels are below the FTA outdoor criterion of 65 VdB for buildings with vibration-sensitive equipment. Vibration measurements obtained inside the basement area at 245 Summer Street, adjacent to the vibration-sensitive computer equipment, indicated that the vibration was not due to the trains, but rather due the mechanical equipment located inside the basement.

Layover Facility Sites

Table 4-32 presents the results of noise measurements conducted at the three layover facility sites.

Table 4-32—Existing Measured Noise Levels at the Layover Facility Sites

Location	Peak-Hour Leq	Midday Leq	Nighttime Leq	Ldn Level
Widett Circle (Albany Street)	67.0 dBA	66.6 dBA	63.1 dBA	68.2 dBA
Beacon Park Yard (20 Wadsworth Street)[a]	---	78.0 dBA	---	81.4 dBA
Readville - Yard 2 (24 Wolcott Street)[a]	---	62.0 dBA	---	57.9 dBA

a indicates that 24-hour noise measurements were obtained at these residential receptor locations.

Vibration measurements were not obtained at the sites due to the low speeds of train travel into and out of the sites.

Widett Circle

At the Widett Circle site, the primary sources of noise are the trucks operating at the major warehouse facility, trains at the Southampton Rail Yard, and traffic noise from I-93. The nearest residential receptors are located along Albany Street south of the Widett Circle layover facility and across I-93. Noise levels at the noise measurement location are due to local street traffic on Albany Street and the traffic noise on I-93.

Beacon Park Yard

At the Beacon Park Yard site, the primary noise source at the noise measurement location is the MBTA commuter rail trains that operate on the tracks directly adjacent to the residences along Wadsworth Street and Pratt Street. While vibration measurements were not obtained at this location, based on FTA vibration curves, existing vibration levels from the passing commuter rail trains (traveling at approximately 50 miles per hour [mph]) are estimated to be 88 VdB at the residential receptors along Wadsworth Street and Pratt Street.

Readville – Yard 2

At the Readville – Yard 2 site, the primary noise source at the noise measurement location is the midday MBTA train operations at Readville – Yard 2.

4.10.2. Potential Impacts

The FTA noise impact criteria are delineated into two categories: moderate impact and severe impact. The moderate noise impact threshold defines areas where the change in noise is noticeable, but may not be sufficient to cause a strong, adverse community reaction. The severe noise impact threshold defines the noise limits above which a significant percentage of the population would be highly annoyed by new noise. For each identified noise-sensitive receptor location at the four SSX project sites, noise levels in the Build condition were compared with the FTA noise criteria to determine potential impact.[46] Additional details on the impacts can be found in Appendix 11 – *Noise and Vibration Technical Report*.

South Station Site

For each identified noise-sensitive receptor location, noise levels under the future year 2035 Build Alternatives were compared with the FTA noise criteria to determine impact. The train operations at South Station would be the same for all three 2035 Build Alternatives (Alternative 1, 2, and 3). As a result, the train operations noise modeling analysis results for Alternative 1 were also used in the noise assessment for Alternatives 2 and 3.

Noise impacts from Alternative 1 are expected to occur at noise sensitive receptor locations across Fort Point Channel due to the removal of the USPS facility along Dorchester Avenue, which currently acts as an effective noise barrier. With the removal of the USPS facility, there would be a direct sound propagation path to sensitive noise receptors across Fort Point Channel at Necco Street. As a result, the 24-hour Ldn noise level across Fort Point Channel would exceed the FTA moderate impact criteria. In addition, the peak-hour Leq noise level at 245 Summer Street would exceed the FTA moderate impact criteria.

In Alternatives 2 and 3, the joint/private development along Dorchester Avenue and on air rights over the terminal expansion would entirely enclose the station area, and thereby eliminate the noise impact at 245 Summer Street and across the Fort Point Channel.

Because of the slow speed of the trains entering and leaving South Station, train vibration levels are not expected to exceed the FTA criterion for human annoyance. The vibration levels would be perceptible along the platforms when standing next to the locomotives, however.

Layover Facility Sites

There would be no noise impact from the train operations at the Widett Circle layover facility site; the nearest noise sensitive receptors located along Albany Street are approximately 1,300 feet from the acoustic center of the site. At the Beacon Park Yard layover facility site, the midday peak activity hour Leq noise level would exceed the FTA severe impact criterion at the residential receptors located along Wadsworth Street and Pratt Street. At the Readville - Yard 2 layover facility site, the midday peak activity hour Leq noise level would exceed the FTA moderate impact criterion at the nearby residential receptors located along Wolcott Street and Riley Road.

Vibration levels from the track switches and crossovers at the Beacon Park Yard would exceed the FTA annoyance criterion of 72 VdB at residential receptors located within 130 feet of a switch. At Widett Circle and Readville – Yard 2, residential receptors are not located within 130 feet of the switches.

[46] Noise-sensitive receptors primarily include residences and buildings were people normally sleep, such as hospitals and hotels. Other noise-sensitive receptors include schools, libraries, and office buildings where quiet is essential for a productive work environment. Most other commercial, retail, and industrial land uses are not considered to be noise-sensitive. This would include the South Station headhouse.

Construction Noise and Vibration

The demolition and construction activity associated with the SSX project would impact 245 Summer Street and the South Station headhouse. While construction noise levels from the SSX project are not expected to exceed the FTA construction noise limits, they are expected to exceed the more stringent City of Boston construction noise limits. Vibration levels generated by the construction equipment proposed for this project would not result in structural damage to nearby buildings, but could exceed the FTA human annoyance criterion.

4.10.3. Mitigation Measures

South Station Site

In Alternative 1, a noise barrier installed between the easternmost track and Dorchester Avenue would reduce the 24-hour Ldn day-night noise levels across Fort Point Channel. The height of the noise barrier should extend approximately three feet above the height of the locomotives to reduce noise levels by approximately 10 dBA. In Alternatives 2 and 3, the joint/private development along Dorchester Avenue and on air rights over the terminal expansion would enclose the station area, and the noise barrier would no longer be necessary. A noise barrier installed between the building at 245 Summer Street and the train station would reduce the peak-hour Leq levels. Additional details on the impacts can be found in Appendix 11 – *Noise and Vibration Technical Report*.

Layover Facility Sites

At the Beacon Park Yard site, a noise barrier would be installed along the Framingham/Worcester Line, located south of the site, to reduce noise levels adjacent to residential receptors. This noise barrier would reduce the noise levels from the layover facility at the residential receptors along Wadsworth Street and Pratt Street by approximately 10 dbA; and it would reduce the noise levels from the existing MBTA commuter rail trains operating in this corridor. This noise barrier would extend the length of Wadsworth Street and Pratt Street between the two industrial buildings at either end of this area.

To reduce the vibration impacts from the track switches and crossovers at the Beacon Park Yard site, the switches should not be located within 130 feet of any residential receptor. If it is not possible to relocate the switches, then ballast mats would be installed under the switches.

At the Readville - Yard 2 site, a noise barrier on top of a berm exists between the layover facility and the residences located along Wolcott Street. To provide mitigation and reduce noise levels by approximately 10 dBA, this noise barrier would be extended to include the layover facility expansion area. In addition, the noise barrier would be extended to provide noise mitigation to the apartment buildings along Riley Road.

Construction Noise and Vibration

As with other major construction projects in the City of Boston, the contractor would be required to submit a Construction Noise Control Plan to indicate the methods to mitigate construction noise levels, and to provide noise monitoring during construction to determine compliance with the City of Boston construction noise limits. Chapter 6 provides information about construction-related noise and vibration and proposed mitigation measures.

4.11. Greenhouse Gas Emissions Analysis

This section addresses Greenhouse Gas (GHG) emissions generated by the project. The Massachusetts EEA GHG Policy[47] requires MassDOT to calculate and compare the GHG emissions for stationary sources (buildings) and mobile sources (transportation components) to a baseline case to determine GHG savings. The GHG Policy also requires MassDOT to identify, evaluate, and discuss other measures that could reduce GHG emissions and to quantify the impact of proposed mitigation in terms of energy savings and GHG emissions.

The GHG analysis for the SSX project was conducted in consultation with EEA (MEPA Unit) and the Massachusetts Department of Energy Resources (DOER). Appendix 12 - *Greenhouse Gas Emissions Technical Report* provides detailed information on methodology, modeling, and analysis.

4.11.1. Potential Impacts

Stationary Source Quantification

South Station Site

A GHG analysis was conducted for two of the joint/private development Build Alternatives at the South Station site: Alternative 1 – Transportation Improvements Only, and Alternative 3 – Joint/Private Development Maximum Build.[48] The stationary source estimates of GHG emissions were generated via energy modeling using eQUEST v3.64, which performs an hourly simulation of the building and estimates utility bills based on building layout, construction, operating schedules and conditioning systems. MassDOT calculated and compared GHG emissions in two cases:

- Case 1 is the *baseline case*, from which progress in energy use and GHG emissions reductions is measured. The baseline case would meet the Massachusetts Building Code, 8th Edition (Building Code), with amendments, as issued by the Board of Building Regulations and Standards.[49]
- Case 2 is the *mitigated case*, representing the proposed project with measures incorporated into the building design that would exceed those required for compliance with the Code, including compliance with the Massachusetts Stretch Energy Code (Stretch Code).[50]

South Station site-related stationary source emissions data, including water and wastewater related GHG emissions, are provided in Appendix 12 - *GHG Emissions Technical Report*.

Building Energy Use

Table 4-33 presents the results of the building energy modeling at the South Station site. To calculate the stationary source emissions, energy conservation measures for the baseline and mitigated cases were developed for the heating, ventilation and air conditioning (HVAC) system, lighting, the building envelope, and processes (for multi-family only).

[47] Massachusetts EEA, *Revised Greenhouse Gas Emissions Policy and Protocol*, May 5, 2010.
[48] Analysis of Joint/Private Development Alternatives 1 and 3 was confirmed in a pre-DEIR filing meeting with MEPA and DOER on November 26, 2013.
[49] ANSI/ASHRAE/IES Standard 90.1-2010 -- Energy Standard for Buildings Except Low-Rise Residential Buildings.
[50] The Massachusetts Stretch Energy Code Appendix was added to the State Building Code on July 24, 2009 (780 CMR 115.AA), as a more energy efficient alternative to the standard energy provisions of the Building Code that a municipality may adopt. Boston has elected to include the state's optional Stretch Code into its building requirements. MassDOT anticipates that a new Stretch Code (SCII) will be proposed, effective mid 2015 or later. It is anticipated that it will require energy use of new large buildings to be about 12 to 15% below the baseline of the 2012 IECC requirements. This analysis targets compliance with the anticipated SCII as a minimum criterion for energy performance.

As shown in Table 4-33, the stationary source GHG emissions at South Station would be reduced by approximately 8% in Alternative 1, and by approximately 12% in Alternative 3.

As directed by the Secretary's Certificate on the ENF, MassDOT also compared the South Station site building energy use with the Energy Use Index (EUI) and the U.S. Energy Information Administration's Commercial buildings Energy Consumption Survey (CBECS). The results of the analysis are included in the Appendix 12 - *GHG Emissions Technical Report.*

Table 4-33—Calculated South Station Site Stationary Source GHG Emissions

Alternatives: Baseline/Mitigated Cases	Gas Use (MMBtu/year)	Electric Use (MMBtu/year)	Gas CO2 Emissions (tons/year)	Electric CO2 Emissions (tons/year)	Total CO2 Emissions (tons/year)
Alternative 1/Baseline	4,300	20,270	251	2,136	2,387
Alternative 1/Mitigated	2,712	19,299	159	2,033	2,192
Reduction, Alternative 1					8.2%
Alternative 3/Baseline	35,748	52,618	2,089	5,544	7,634
Alternative 3/Mitigated	27,230	48,821	1,592	5,144	6,736
Reduction, Alternative 3					11.8%

MMBTu = Million Metric British Thermal Units

Water and Wastewater Energy Use

MassDOT quantified GHG impacts associated with water use and wastewater discharge; specifically, the energy use associated with conveyance and treatment. As cited in Section 4.6, water use in Alternative 3 would increase by approximately 453,090 gallons per day (gpd). Wastewater generation in Alternative 3 would increase by approximately 411,900 gpd. Using MEPA-provided factors, and ISO New England's electric generation emissions factor,[51] the GHG emissions associated with water and wastewater treatment in Alternative 3 would be approximately 82 tons per year, as shown in Table 4-34.

Table 4-34—Alternative 3 Water- and Wastewater-Related GHG Emissions, South Station Site

Alternative 3	Water	Wastewater
Gallons per Day	453,090	411,900
Energy use, kWh/year	33,076	195,447
CO_2 Emissions, tpy	11.9	70.3

kWh = kilowatt hour
tpy=tons/year

MassDOT is considering a number of water-saving measures that could reduce the water and wastewater impacts of the SSX project including, but not limited to, low-flow or waterless plumbing fixtures.

Layover Facility Sites

As is typical for smaller buildings, the layover facility sites would comply with building energy code and Stretch Code requirements through prescriptive energy efficiency measures. Due to the smaller building size and impacts, building energy modeling was not completed for the layover facility sites.[52] Prescriptive energy efficiency requirements include detailed minimum standards such as: insulation, including air sealing; windows and heating/cooling equipment; and design controls and details.

[51] 719 pounds of CO2 per megawatt-hour of electricity used.
[52] In a pre-DEIR filing meeting with MEPA and DOER on November 26, 2013, it was confirmed that building energy modeling was not required for the layover facility sites.

The Stretch Code requirement sets the minimum specifications and allows some design flexibility to trade one design parameter for another. For example, as a means to meet Stretch Code requirements, the current Stretch Code allows for the installation of more efficient heating and cooling equipment, more efficient lighting, or onsite renewable energy generation. MassDOT will design, construct, and operate the layover facilities in compliance with the version of the Stretch Code that is current at the time of building permit filings. The specific measures that will be used to meet the Code will be determined as design advances and prior to filing.

The layover facility sites would use water and generate wastewater. However, water use and wastewater generation would be relatively small at less than 15,000 gpd per site. Such usage has not been quantified in this analysis, as it would be significantly below the GHG Policy's 300,000 gpd threshold requiring impact analysis.

Mobile Source Quantification

MassDOT quantified transportation-related GHG impacts of the SSX project through three separate analyses: impacts from all transportation sources in the immediate South Station area; locomotive impacts for travel to and from the layover facility sites; and impacts from all transportation across a broad region. Appendix 12 - *GHG Emissions Technical Report* provides details on the methodologies used for the transportation sources.

Localized Emissions

South Station Site

The CO_2 emissions inventory at the South Station site was developed for motor vehicles and buses on affected roadways within the project study area, and railroad locomotives entering, idling, and leaving South Station. The motor vehicle-generated CO_2 emissions were developed using the roadway network and traffic data defined in Appendix 9 - *Traffic Analysis Technical Report*, along with appropriate emission factors.

Table 4-35 presents the annual CO_2 emissions in tons per year (tpy) occurring at the South Station site by SSX project alternative. These CO_2 emissions include contributions from motor vehicles and buses on the local roadway network, from train locomotives idling at South Station, and from train locomotives moving to and from the Tower 1 interlocking.

Table 4-35—Project-Related CO_2 Emissions at South Station by Alternative (tpy)

Alternative	Locomotives	Motor Vehicles	Intercity Buses	Total All Sources
2012 Existing	15,233	11,767	581	27,581
2025 No Build	14,603	12,321	732	27,656
2025 Alternative 1	13,870	12,491	767	27,128
2025 Alternative 3	13,870	12,666	819	27,355
2035 No Build	14,603	12,771	785	28,159
2035 Alternative 1	13,870	13,010	819	27,699
2035 Alternative 3	13,870	13,190	851	27,911

tpy= tons per year

Layover Facility Sites

The CO_2 emissions inventory at the layover facility sites includes contributions from train locomotives idling at each layover facility site and moving to and from the Tower 1 interlocking. As stated in Section 4.8, there would be no project-related pollutant emissions from motor vehicles, as there would be no measurable increase in motor vehicle traffic due to the SSX project.

Table 4-36 presents the annual CO_2 emissions in tons per year occurring in the vicinity of each of the layover facility sites by SSX project alternative. For informational purposes, Table 4-36 also includes the number of trains using each layover facility site each day. The methodology for computing pollutant emissions accounts for train movements to and from South Station and two 30-minute idling periods. There would be no difference in emissions between 2025 and 2035, and they are combined under the No Build and Build Alternative categories.

Table 4-36—Project-Related CO_2 Emissions at Each Layover Facility Site by Alternative (tpy)

Alternative	Locomotive Emissions
Widett Circle Site	
2012 Existing Conditions	0
2025/2035 No Build Alternative	0
2025/2035 Build Alternative	5,753
Beacon Park Yard Site	
2012 Existing Conditions	0
2025/2035 No Build Alternative	0
2025/2035 Build Alternative	4,531
Readville - Yard 2 Site	
2012 Existing Conditions	3,135
2025/2035 No Build Alternative	3,135
2025/2035 Build Alternative	5,643

Net Local Emissions

Table 4-37 presents the net project-related CO_2 emissions calculated for SSX project-related transportation sources. The impacts associated with Alternative 1 and Alternative 3 are based on the net difference between the CO_2 emission rates of the No Build Alternative and Alternatives 1 and 3.

Table 4-37—2035 Net Project- Related CO_2 Emissions by Alternative

Transportation Sources	Alternative 1, (tpy)	Alternative 3, (tpy)
Motor Vehicles near South Station	239	419
Intercity buses near South Station	34	66
Locomotives near South Station	-733	-733
Locomotives to/from Layover Sites	15,927	15,927
Total	15,467	15,679

tpy= tons per year

The results show a net reduction in CO_2 emissions from locomotives in the immediate vicinity of South Station, associated with decreased congestion and idling time on the tracks. The emissions totals do not account for the use of electric plug-in facilities, which would reduce locomotive idling emissions (while increasing the use of energy from the electric grid). Additionally, the totals do not account for the anticipated GHG reduction associated with traffic intersection improvements (and decreased motor vehicle idling time).

Regional Emissions

CTPS developed regional CO_2 emissions data for each of the modeled Build Alternatives, using the same methodology as Boston MPO RTP's regional air quality conformity determinations. Those data show a decrease in region-wide CO_2 emissions of approximately 46,000 tons/year associated with the transportation improvements at South Station. Details are provided in Appendix 12 - *GHG Emissions Technical Report*.

Because the CTPS study covers a much wider area and uses a different methodology, these results cannot be directly compared to the South Station-specific GHG emission calculations developed for the DEIR. Nevertheless, results of the CTPS analysis show that the transportation elements of the SSX project would further the goal of GHG emissions reduction.

Emissions Summary

Table 4-38 above presents net project-related CO_2 emissions calculated for SSX project-related transportation sources. The impacts associated with Alternative 1 and Alternative 3 are based on the net difference between the CO_2 emission rates of the No Build Alternative and Alternatives 1 and 3.

The total potential CO_2 emissions for the analyzed project alternatives are shown in Table 4-37. While not directly comparable (because the analysis methodologies are different), the regional analysis of transportation-related CO_2 emissions shows an approximate savings of 46,000 tons/year CO_2 associated with the South Station transportation improvements.

Table 4-38—2035 Potential GHG Emissions Summary

Parameter	Alternative 1 CO_2 potential emissions (proposed case), tpy	Alternative 3 CO_2 potential emissions (proposed case), tpy
Stationary Source direct emissions	159	1,592
Stationary Source indirect emissions	2,033	5,144
Water/Wastewater	[not analyzed]	82
South Station area transportation	15,467	15,679

tpy= tons per year

4.11.2. Mitigation Measures

Stationary Source

Building design is in the conceptual stage. As design advances, MassDOT expects that additional technologies described previously, or possibly new technologies developed in the interim period, will be adopted that will further decrease GHG emissions for the SSX project. MassDOT will continue to evaluate energy efficiency measures as design develops.

Table 4-39 provides a list of mitigation elements (or equivalent measures) that MassDOT proposes for the SSX project or for individual buildings. In addition, MassDOT will investigate mitigation measures for water use and wastewater generation, including low-flow plumbing fixtures and providing plantings (at the South Station site) that would require low to no irrigation.

As previously described, the SSX project would provide the opportunity for joint/private development at the South Station site. Depending on final ownership arrangements, this could include leasing space to tenants. Therefore, certain energy efficiency measures require a level of design that would be performed

by the tenants during fit-out. Actual building energy use would depend upon the core and shell design, for which MassDOT is responsible, and also upon the measures that the tenant would add to the building (fit-out) and how the tenant would operate the space. Tenants would require City of Boston building permits for their fit-out, and would be required to comply with the Stretch Code that the City of Boston has adopted.

Table 4-39—Proposed Building Mitigation Conservation Measures

Proposed Energy Conservation Measures	Terminal Expansion	Hotel and Multi-family High-rise	Mixed-use Office/Retail
HVAC	High efficiency chillers and condensing boilers with VAV; high efficiency (75%) energy recovery	Fan coils with high efficiency chillers and condensing boilers	High efficiency chillers and condensing boilers with VAV; high efficiency (75%) energy recovery; optimized controls
Lighting	Optimized lighting design 20% better than Code	Optimized lighting design 20% better than Code	Optimized lighting design 20% better than Code
Envelope	Higher performing insulated assemblies	Higher performing insulated assemblies	Higher performing insulated assemblies
Process	---	Energy star rated equipment (multi-family only)	---

As directed by the Secretary's Certificate on the ENF, MassDOT has considered measures to educate and create incentives for the tenants to adopt energy efficiency/renewable generation measures. MassDOT would encourage decisions that would maximize the building's energy efficiency. Appendix 12 - *GHG Emissions Technical Report* contains information about a Tenant Manual that would provide recommendations and requirements on energy reducing systems and equipment.

Mobile Source

SSX project development would include specific transportation mitigation measures not quantified in the GHG analyses. Transportation mitigation measures would include intersection improvements and the use of electric plug-in facilities to reduce locomotive idling time. Additionally, MassDOT will evaluate preferred parking for hybrid vehicles and electric vehicle charging stations, as well as other transportation enhancements, as described in Section 4.8. Additional information on transportation mitigation measures are provided in Appendix 9 - *Traffic Analysis Technical Report*.

Renewable/Alternative Energy Evaluation

MassDOT reviewed options at the South Station site for onsite energy generation from renewable sources, and options to reduce GHG emissions through the use of alternative energy sources, including onsite electricity generation or the use of district steam. This section details this review.

On-Site Energy Generation

It may not be feasible to install significant amounts of onsite electric generating capacity at the site. Based on initial contacts with the local electricity supplier (NSTAR), the connection to the electrical grid

would likely be through spot network vaults rather than the radial distribution system.[53,54] Spot network vaults offer more reliable electricity supply, but are not well suited to receive electricity from distributed generation sources. If the South Station site were served by spot network vaults, any interconnected generation source would be limited to 1/15th of the minimum facility load to prevent excess power from flowing into the network and tripping the network protectors in the vault. The connection would also need to use inverter-based equipment. This would preclude the use of all but the smallest onsite Combined Heat and Power (CHP) systems, and would limit solar photovoltaic (PV) and wind-based renewable systems.

Solar Photovoltaics/Solar Hot Water

PV panels create electricity from sunlight. They require undisturbed surface area free from shadows for the collector array, and space for supporting equipment such as inverters and switchgear. Solar hot water panels similarly require shadow-free area and space for supporting equipment, such as storage tanks, pumps, and piping.

Roof surface at the South Station site could be used for mechanical equipment, open/habitable space, green roofs, and/or solar panels. Alternatively, available roof surface could be dedicated to solar hot water generation. Typically, roof surface can be dedicated to solar PV or solar hot water, but not both. A shadow impact analysis conducted for the SSX project (presented in Appendix 6 - *Coastal Resources Technical Report*) concluded that roof surface would be suitable for solar panels in both Alternatives 1 and 3. Approximately 70,000 sf of roof surface would be suitable for solar panels in Alternative 1, and 25,000 sf of roof surface would be available for solar panels in Alternative 3. Assuming that 50% of the total roof surface could be available for useful panel placement, approximately 35,000 sf of surface could be available in Alternative 1 for a PV system, and 12,500 sf of surface could be available in Alternative 3 for a PV system.

MassDOT estimated the potential GHG savings that would accrue in Alternatives 1 and 3 through the use of solar PV or solar hot water. Using a DOER-published model for examining the financial feasibility of PV,[55] MassDOT calculated values for the simple payback period and estimated Return on Equity values. The results of these analyses are provided in Appendix 12 - *GHG Emissions Technical Report*.

As design advances, MassDOT will investigate the potential for both solar hot water and solar PV at the South Station site.

District Steam Use

MassDOT has the option to connect SSX project elements at the South Station site to the existing Veolia district energy system. Based on initial contact with Veolia, the use of district steam appears feasible.[56,57] Veolia's Kneeland Street Plant is nearby, and there is a large steam main in Atlantic Avenue, which feeds the Federal Reserve Bank. Steam heat from the district energy system could be used for domestic hot water production year-round, and for building heat during the heating season. Steam heat can also be used to power steam-driven absorption chillers, used for summertime air conditioning.

Using steam from the district energy system may or may not reduce overall GHG emissions associated with the SSX project. The GHG impacts would be very dependent on the source of the steam, and the

[53] James Ruberti, NStar, *Electrical Grid,* Personal Communication, July 25, 2014.
[54] Joseph Feraci, NStar, *Electrical Grid,* Personal Communications, July 25, 2014.
[55] DOER *"Simple Solar Finance Model,* accessed August 5, 2014
[56] Chris Silvia, Veolia, *SSX Veolia Connection,* Personal Communication, July 6, 2014.
[57] Ken O'Connell, Veolia, *SSX Veolia Connection,* Personal Communication, July 16, 2014.

extent of the energy losses associated with steam transmission to the South Station site. Veolia uses both combined heat and power (CHP) systems and conventional boilers to generate steam in the Boston district energy system. To the extent that high-efficiency CHP systems are used, a very substantial GHG benefit could be realized (because waste heat from electricity generation is turned into useful steam). If low-efficiency boilers were used, the GHG impacts could be higher than using onsite boilers.

Other Potential Energy Sources

Wind Turbines

Large turbines (greater than 100 kW) are often sited in low-development density areas where a consistent wind resource, unaffected by the built environment, maximizes the payback rate for the installed equipment. Because South Station is located within downtown Boston in close proximity to tall buildings, large wind turbines are not feasible. Building-integrated turbines are still in the development phase, with most building-integrated turbines in showplace installations. Due to the potential for performance issues, as well as other issues, building-integrated wind turbines are not deemed to be feasible at the South Station site.

Ground-Source Heat Pumps

Ground-source heat pump (GSHP) technology takes advantage of the near-constant temperature of the earth and groundwater, usually at moderate depths below the surface, to provide a heat sink for heat extracted from a building in summer and a heat source when building heating is required in winter. There are many competing ground space uses at the South Station site, however. Further, the majority of the surrounding area is covered by buildings, roads and sidewalks, making the large well field necessary for a GSHP inaccessible. A well field could also preclude future development of the North-South Rail Link project. Due to these concerns, GSHPs are not proposed at the South Station site.

On-Site Combined Heat and Power

A gas-fired CHP system can produce electricity and hot water. Electrical interconnection through spot network vaults would prevent any but the smallest CHP systems to be installed at the South Station site.

Additional Mitigation Measures and Next Steps

In the detailed design phase, MassDOT will review the following measures for their technical and economic feasibility:

- Veolia steam network connections; including the use of Veolia steam to power absorption chillers.
- Solar PV or hot water installations.
- Onsite CHP, including CHP serving absorption chillers.

MassDOT is committed to implementing the energy efficiency and GHG emission reduction measures presented in this analysis. However, MassDOT also must retain design flexibility to allow for changes that will inevitably occur as design progresses. The proposed case identified in Table 4-37 includes a comprehensive estimate of the anticipated GHG reductions that can be achieved, based on building energy modeling with preliminary design information. If during the course of design for an individual building a specific combination of design strategies proves more advantageous from an engineering, economic, or space utilization perspective, the chosen design may vary from what has been described

herein. Minimum energy performance standards and associated GHG emission reductions, as presented in Appendix 12 - *GHG Emissions Technical Report*, will be adhered to on an overall project basis.

MassDOT commits to provide a self-certification document to the Secretary of EEA that is signed by an appropriate professional (e.g., engineer, architect, transportation planner, general contractor) and indicates that all of the required mitigation measures, or their equivalents, have been completed for each phase. The certification will be supported by plans that clearly illustrate what type of GHG mitigation measures have been incorporated into the project. For those measures that are operational in nature, MassDOT will provide an updated plan identifying the measures, the schedule for implementation, and a description of how progress towards achieving the measures will be obtained. The commitment to provide this self-certification is incorporated into the draft Section 61 Findings (Chapter 8).

4.12. Historic Architectural Resources

This section presents an evaluation of the impact of the SSX project upon historic architectural resources. Existing conditions and assessments were conducted in conjunction with the Massachusetts State Historic Preservation Officer (SHPO)/Massachusetts Historic Commission (MHC), in accordance with Section 106 of the National Historic Preservation Act (36 CFR 800) as amended, the implementing regulations of the Advisory Council on Historic Preservation (36 CFR 800), and State Register Review procedures (950 CMR 71.00).

To evaluate historic resources, Section 106 requires the establishment of the Area of Potential Effects (APE), defined as "the geographic area within which the undertaking may cause changes in the character of or use of historic properties[58] if any such properties exist."[59] MassDOT established APEs for the four project sites based on the potential of the SSX project to directly or indirectly affect aboveground historic properties, such as historic districts, buildings, objects, and structures, or belowground historic properties, consisting of archaeological sites. Appendix 13 - *Historic Architectural Resources Technical Report* contains additional information. Following its review of the technical report, MHC concurred with the identification and evaluation of findings, including the APEs for the SSX project.[60]

The following sections address historic architectural resources within the SSX project sites.

4.12.1. Existing Conditions

South Station Site

In consultation with the Boston Landmarks Commission (BLC), MassDOT established two APEs for historic architectural resources at the South Station site, as shown in Table 4-40. In areas at the South Station site where new construction is proposed on the developable parcels, the APE for aboveground resources is defined as a one-quarter-mile boundary from the joint/private development parcels (outlined in red in Figure 4-14). Where the one-quarter-mile APE adjoins historic districts that are listed in or potentially eligible for listing in the National Register of Historic Places, the APE extends to conform to the boundaries of the district. The one-quarter-mile APE for new construction at the South Station site extends to the east to include the Fort Point Channel Historic and Landmark Districts and the Gillette complex, and it extends to the west to include the Leather District, Commercial Palace Historic District, and Chinatown. In areas at the South Station site where only rail improvements are proposed, such as

[58] An historic property is defined in 36 CFR 800.16(1) as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior."
[59] 36 CFR 800.16(d)
[60] Brona Simon, State Historic Preservation Officer, Massachusetts Historical Commission, *South Station Expansion Project, Summer Street & Atlantic Avenue, Boston (Downtown), MA; MHC #RC.53253.EEA No. 15028,* Correspondence to U.S. Department of Transportation, Federal Railroad Administration, August 13, 2014.

along the NEC Main Line to the west of the station and along the MBTA Fairmount Line to the south of the station, the APE for aboveground resources is defined as 125 feet or one assessor's lot from the site boundary, whichever is less (Shown in Figure 4-14). The APE for rail improvements does not extend to include historic districts.

Table 4-40 provides a list of the historic resources within the South Station APE, their current historic designation, and recommendations for National Register eligibility. Appendix 13 - *Historic Architectural Resources Technical Report* includes copies of the MHC inventory forms and nomination forms for National and State Register-listed properties within the South Station site APE, and a copy of the inventory form prepared for the property that had not been previously identified (Gillette).

Table 4-40—Historic Resources within the South Station APE

Name	Historic Designation/Recommendation
Properties listed in the National and/or State Registers of Historic Places	
Fort Point Channel Historic District	Listed in National and State Registers
Leather District	Listed in National and State Registers
Russia Wharf Buildings	Listed in National and State Registers
South Station Headhouse	Listed in National and State Registers
Commercial Palace Historic District	Listed in State Register
Fort Point Channel Landmark District	Listed in State Register (Boston Landmark District)
Properties included in the Inventory of Historic and Archaeological Assets of the Commonwealth	
Chester Guild, Hide and Leather Machine Company	Recommended National Register eligible
Chinatown District	Recommended National Register eligible
Federal Reserve Bank of Boston	Recommended National Register eligible
Kneeland Street Steam Heating Plant	Recommended National Register eligible
South End Industrial Area	Recommended National Register eligible
Keystone Building	Not evaluated; recommended for evaluation when building is 50 years old
Weld Building	Recommended National Register eligible
USPS General Mail Facility/South Postal Annex	Recommended not National Register eligible
MBTA Operations Center Power Substation	Not evaluated; recommended for evaluation when building is 50 years old
245 Summer Street	Not evaluated; recommended for evaluation when building is 50 years old
Properties Not Previously Surveyed	
Gillette	Recommended National Register eligible

Layover Facility Sites

At the layover facility sites, the APE for aboveground resources is defined as 250 feet from the site boundary or from the site boundary to major intervening infrastructure, such as active MBTA commuter rail, I-93, or the Massachusetts Turnpike, whichever is less.

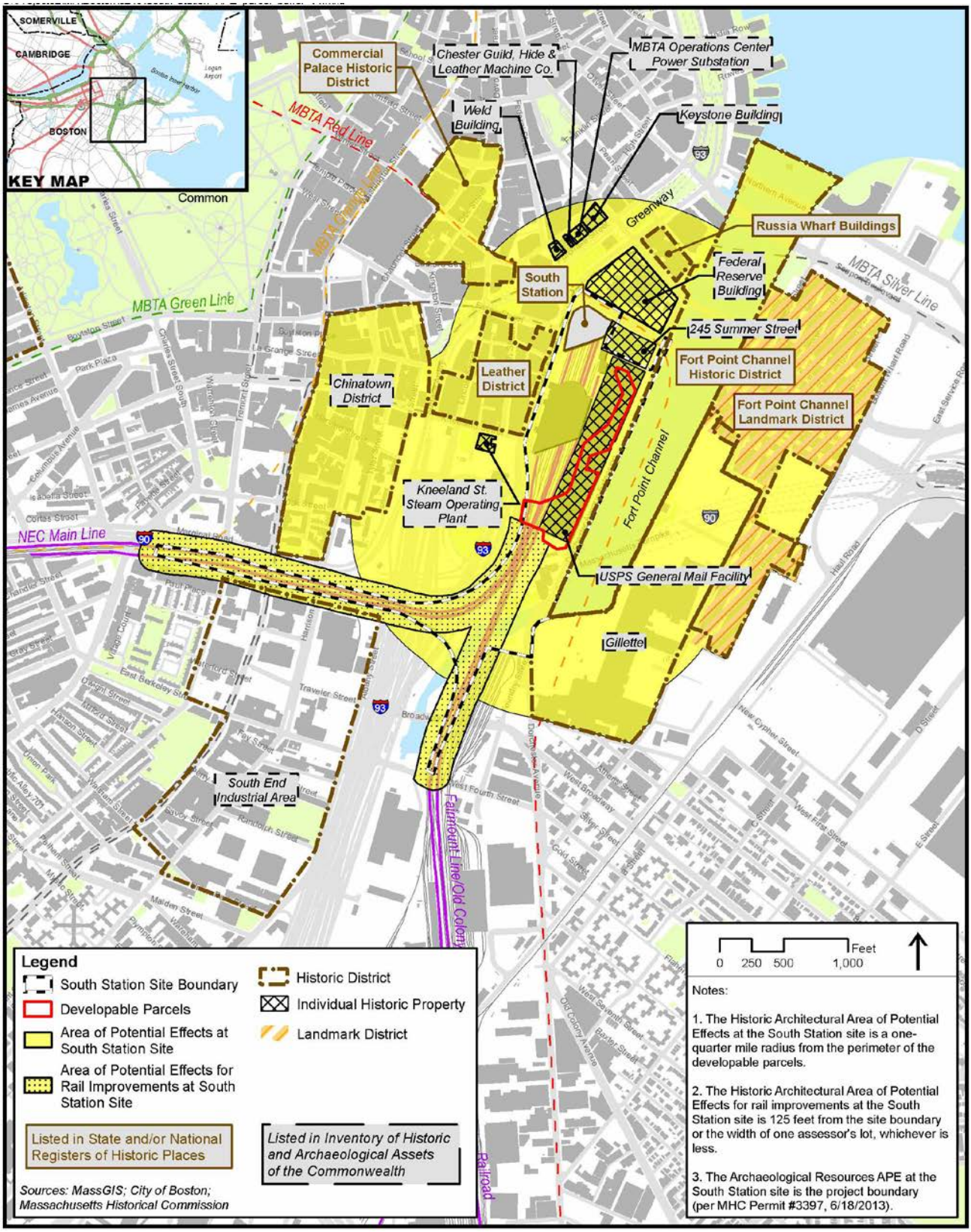

Figure 4-14—South Station Site Areas of Potential Effects

Widett Circle

The APE for the Widett Circle layover facility site is shown in Figure 4-15. There are no historic properties listed in the National or State Register of Historic Places, included in the Inventory, or 50 years or older that have not been previously identified within the Widett Circle project limits APE.

Beacon Park Yard

The APE for the Beacon Park Yard layover facility site is shown in Figure 4-16. There are no historic properties listed in the National or State Register of Historic Places, included in the Inventory, or 50 years or older that have not been previously identified within the Beacon Park Yard APE.

Readville – Yard 2

The APE for the Readville – Yard 2 layover facility site is shown in Figure 4-17. There are no historic buildings or structures listed in the National or State Register of Historic Places within the Readville – Yard 2 APE. A portion of the Readville – Yard 2 APE is located within the Readville Industrial Survey Area, which is a large, previously surveyed area that encompasses historic districts and individual historic properties. The portion of the Readville Industrial Survey Area located within the APE includes two individual properties. These properties previously were recommended as not meeting National Register eligibility criteria. There are no other properties 50 years or older in the Readville – Yard 2 APE that have not been previously identified.

Table 4-41 provides a list of the properties included in the Inventory of Historic and Archaeological Assets of the Commonwealth within the Readville – Yard 2 APE and their National/State register eligibility.

Table 4-41—Historic Resources within the Readville – Yard 2 APE

Name	Historic Designation/Recommendation
Readville Industrial Survey Area – Standard Oil Company Depot Complex	Recommended not National Register eligible
Readville Industrial Survey Area – Frank Kunkel & Son Hammered Forgings	Recommended not National Register eligible

4.12.2. Potential Impacts

MassDOT assessed potential SSX project impacts to resources within and in the vicinity of the South Station site and the three layover facility sites. At the four SSX project sites, impacts to historic resources were assessed relative to demolition activity and noise and vibration. Additional analyses at the South Station site included potential shadow, wind, and visual impacts to historic resources.

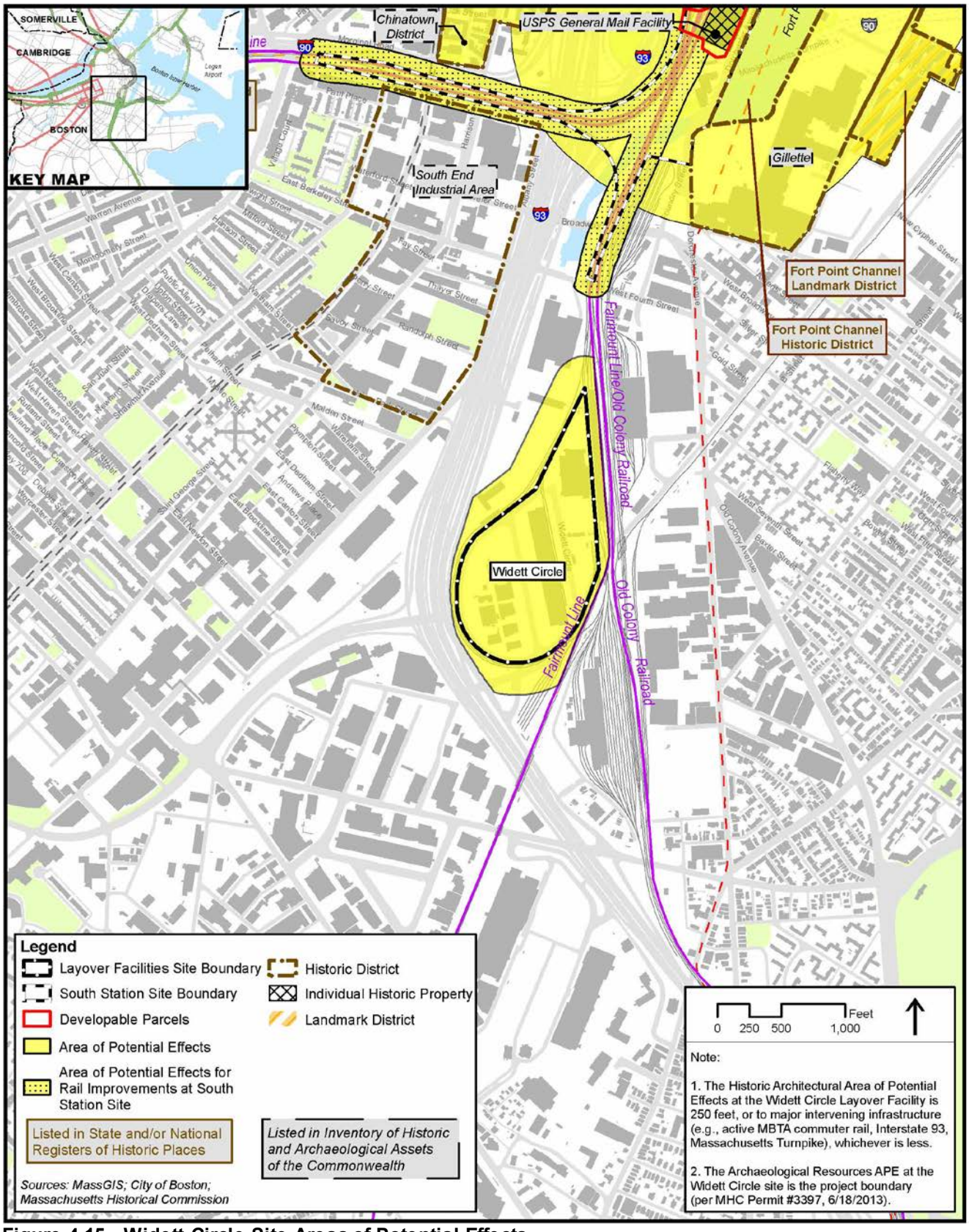

Figure 4-15—Widett Circle Site Areas of Potential Effects

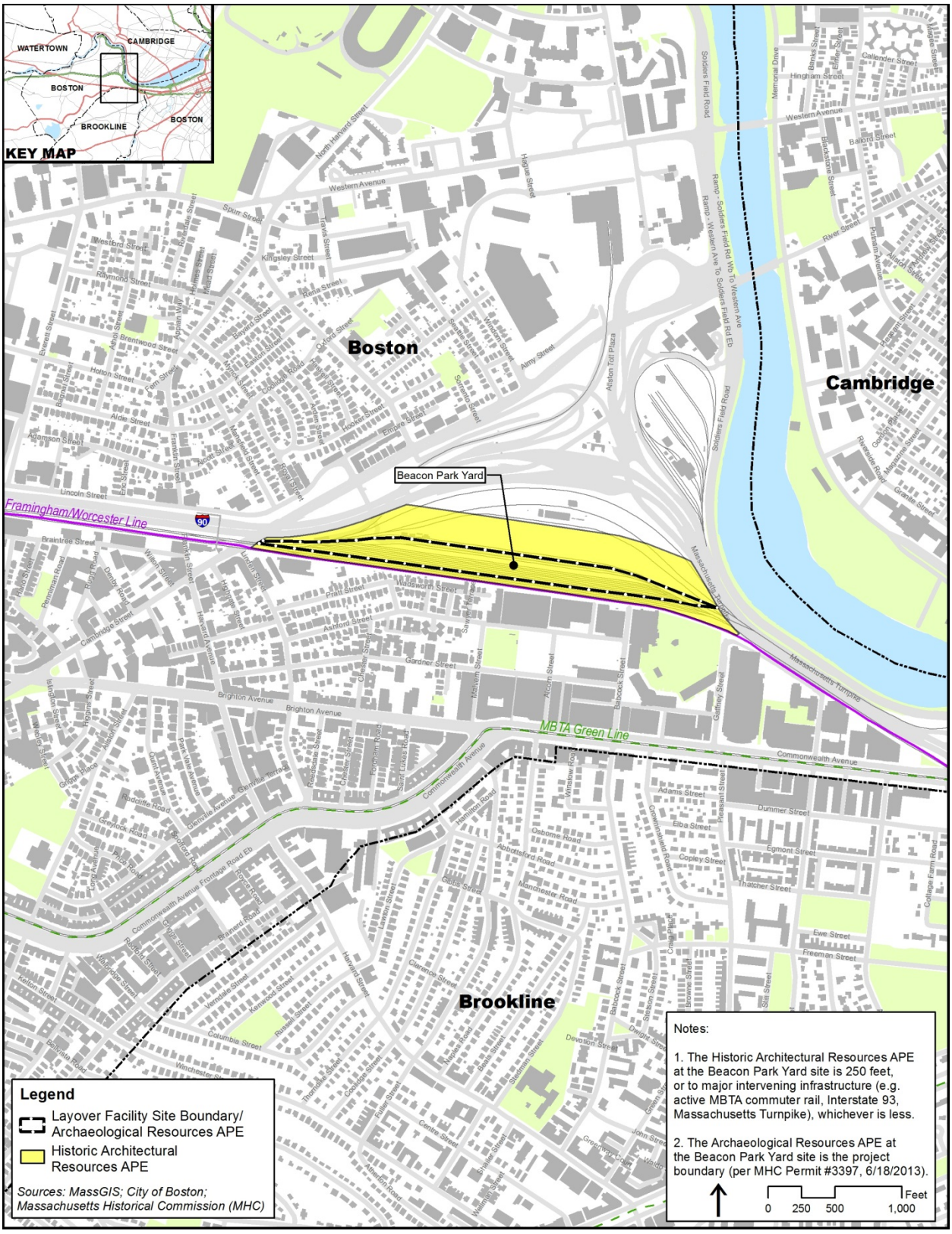

Figure 4-16—Beacon Park Yard Site Areas of Potential Effects

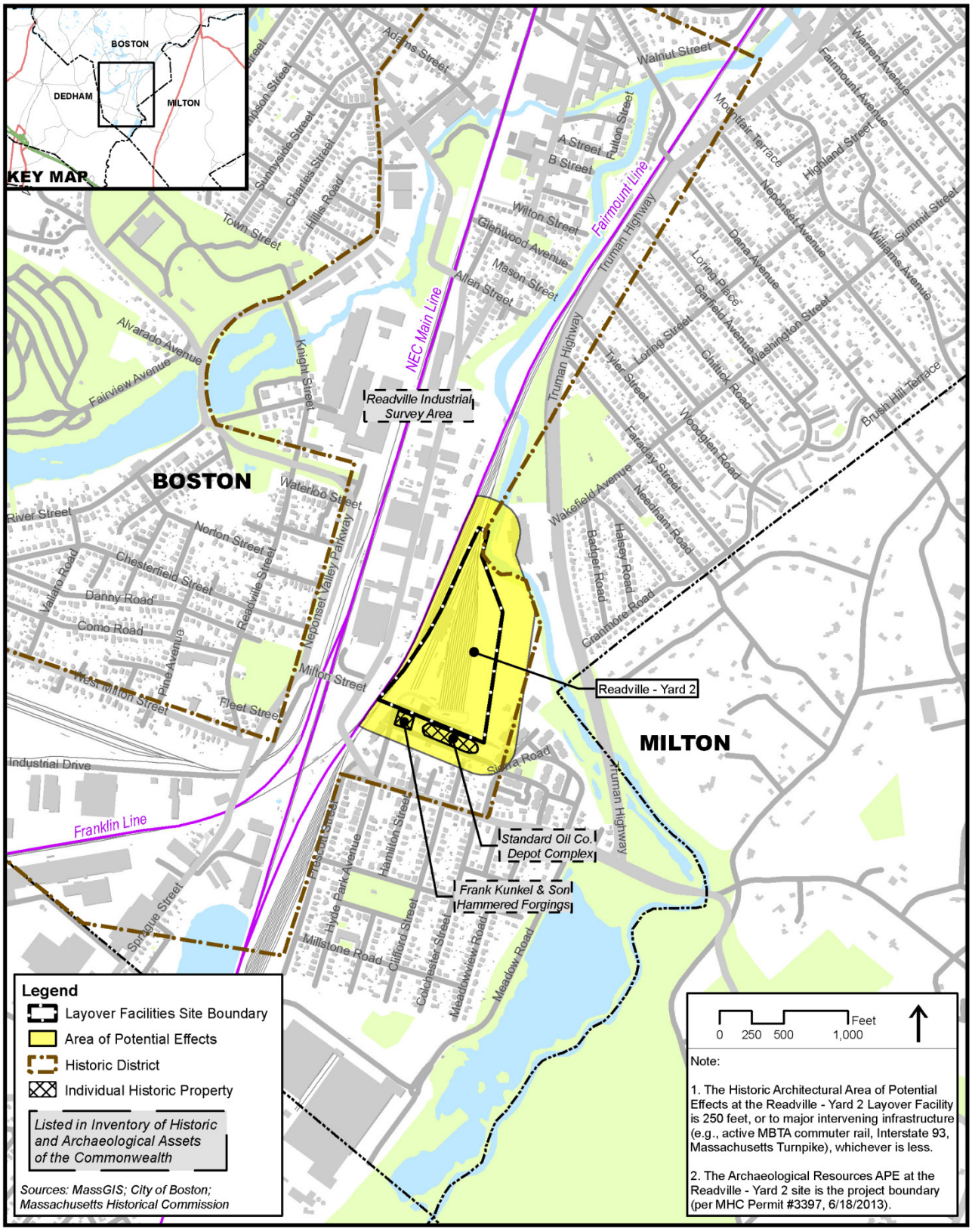

Figure 4-17—Readville - Yard 2 Site Areas of Potential Effects

Layover Facility Sites

New construction at the layover facility sites would include minimal vertical components; consequently, wind, shadow, visual, and noise impacts to significant resources within the APEs are not anticipated. Shadow and wind analyses at the layover facility sites were not conducted. As indicated in Attachment CC, new construction and/or expansion at the layover facility sites would be consistent with the surrounding industrial land uses. The layover impacts described below are the same for Alternative 1 – Transportation Improvements Only, Alternative 2 – Joint/Private Development Minimum Build, and Alternative 3 – Joint/Private Development Maximum Build.

Widett Circle

Existing food processing, food storage, and food logistics buildings to be demolished are located within the Widett Circle APE, but they are not historic properties. Train operation noise impacts at the Widett Circle would be below FTA impact criteria. Construction noise levels at the site are not expected to exceed FTA construction noise limits. Predicted new vibration at the site would not impact historic properties within the APE.

Beacon Park Yard

Several structures to be demolished within the existing site are located within the Beacon Park Yard APE, but they are not historic properties. Noise impacts would occur at residences along Wadsworth Street and Pratt Street; these areas are located outside of the APE, however and no identified historic properties located within the APE would be impacted by train operations. Construction noise levels at the site are not expected to exceed FTA construction noise limits, but could exceed City of Boston construction noise limits. Predicated new vibration at the site would not impact historic properties within the APE.

Readville – Yard 2

Noise impacts would occur at residences along Wolcott Street and Riley Road. While these areas are located within the APE, the impacted properties are not identified historic properties. Construction noise levels at the site are not expected to exceed FTA construction noise limits. Predicated new vibration at the site would not impact historic properties within the APE.

Alternative 1 – Transportation Improvements Only

South Station Site

In Alternative 1, the USPS General Mail Facility/South Postal Annex would be demolished. The building is located within the South Station APE, but it is not an historic property. A wind study was not conducted for Alternative 1 because as a nonwater-dependent infrastructure project subject to 310 CMR 9.55, it is not subject to the provisions of 310 CMR 9.51.

Shadow

No net new shadows are anticipated to affect any of the historic properties located within the South Station APE. As described in Section 4.3, between 1:00 p.m. and 4:00 p.m., a new band of shadow would be cast adjacent to the existing South Station platforms located southeast of the South Station headhouse. The platforms are located within the APE, but they are not a historic property. Further, the new shadow would represent only a slight increase over existing afternoon conditions.

Noise

A moderate noise impact is expected to occur to sensitive receptors within the Fort Point Channel Historic District due to the removal of the USPS facility along Dorchester Avenue. As described in Section 4.10, the existing USPS facility acts as an effective noise barrier, so that noise from existing train operations does not impact receptors across Fort Point Channel. As described in Section 4.10, construction noise levels from the SSX project are not expected to exceed FTA construction noise limits; per the City of Boston construction noise criteria.

Visual

Alternative 1 would have no adverse visual impact on views to or from historic properties included in the APE. Although the station design has not been advanced beyond conceptual design, MassDOT intends the station expansion to be consistent with the scale of the existing South Station headhouse. The completion of the Harborwalk along Dorchester Avenue would improve the views of the Fort Point Channel Historic District. Currently, the district cannot be viewed from the southwest because of prohibited access along Dorchester Avenue adjacent to the USPS facility.

Vibration

Due to the slow speed of trains entering and leaving South Station (approximately 10 mph), train vibration levels would be below FTA criteria. Train activity at South Station is not expected to result in any ground-borne noise inside the building.

Alternative 2 – Joint/ Private Development Minimum Build

As in Alternative 1, the USPS General Mail Facility/South Postal Annex would be demolished. The building is located within the South Station APE, but it is not an historic property. In Alternative 2, construction noise impacts, and operational and construction vibration impacts would be the same as in Alternative 1. Alternative 2 was also not examined as part of the wind study because this alternative would meet all applicable building height and setback requirements under Chapter 91.

Shadow

As described in Section 4.3, no net new shadows would affect the historic properties located within the APE until 5:00 p.m., whereupon the eastern edge of the Fort Point Channel Historic District would be shaded. By 6:00 p.m., the majority of the City of Boston would be covered in shadow from the existing urban environment. Alternative 2 would add incrementally to these shadows within the Fort Point Channel Historic District.

Noise

The Joint/Private Development proposed along Dorchester Avenue would effectively shield the area across Fort Point Channel from the South Station train noise and would eliminate any potential noise impacts, as described in Section 4.10. Depending upon the reverberation characteristics of the enclosed space and the use of sound absorption materials, the noise levels inside the station area (tracks and platforms) could increase. The noise increase would be limited to the tracks and platforms, which are located within the APE, but are not listed on the National Register as part of South Station. The existing doors between the tracks and platforms and the passenger waiting area inside the South Station headhouse would provide effective noise mitigation within the headhouse.

Visual

Alternative 2 would not have adverse visual impacts on views to or from historic properties. The new joint/private development in Alternative 2 would be consistent in height and dimensions with other development fronting the west side of Fort Point Channel (e.g., 245 Summer Street), as described in Section 4.3. The joint/private development would not be visible from the north or west (Federal Reserve Bank Building, Leather District, or Chinatown). Along Fort Point Channel, the joint/private development would be visible from within the Fort Point Channel Historic District, but the development would not block views to or within any historic properties within the South Station APE. As in Alternative 1, the completion of the Harborwalk along Dorchester Avenue would improve the views of the Fort Point Channel Historic District.

Alternative 3 – Joint/ Private Development Maximum Build

As in Alternative 1, the USPS General Mail Facility/South Postal Annex would be demolished. The building is located within the South Station APE, but it is not an historic property. Noise impacts from train operations in Alternative 3 would be same as in Alternative 2. Construction noise impacts, and operational and construction vibration impacts would be the same as in Alternative 1.

Shadow

The Fort Point Channel Historic District would experience some new shadows late in the day. By 4:00 p.m., new shadows would shade approximately 50% of the Fort Point Channel watersheet between Summer Street and the southern end of the joint/private development. Additionally, new shadows would be cast on the western half of Summer Street Bridge and a small area at the midpoint of the Congress Street Bridge near the Tea Party Ship Museum. By 5:00 p.m., new shadows would be cast on the eastern edge of Fort Point Channel for approximately 1,000 feet south of Summer Street. Additionally, a small amount of shadow would also be cast on Children's Wharf, north of the Congress Street Bridge.

Wind

Historic properties within the APE could experience wind speed impacts with and without mitigation; uncomfortable wind impacts would occur at the intersection of Atlantic Avenue and Essex Street, along the east bank of Fort Point Channel, and at the south end of the development site. These impacts also would exist in the No Build Alternative. Alternative 3 would not add to the wind conditions in these areas.

Visual

Alternative 3 would not have adverse visual impacts on views to or from historic properties. The joint/private development would be partially visible from Chinatown. As in Alternative 2, along Fort Point Channel, Alternative 3 would be visible from within portions of the Fort Point Channel Historic District. The proposed joint/private development would not block views to or within any historic properties within the South Station APE. The completion of the Harborwalk along Dorchester Avenue would improve the views of the Fort Point Channel Historic District.

4.12.3. Mitigation Measures

This section assesses requirements for mitigation measures for impacts to historic resources at the four SSX project sites relative to shadow, wind, noise and vibration. Also included are design considerations for the South Station site which focus on historic preservation. Mitigation is not proposed for demolition;

none of the buildings proposed for demolition at the South Station site, the Widett Circle site, or the Beacon Park Yard site are historic properties.

Shadow

Mitigation is not proposed for shadow impacts at the South Station site; shadow impacts would be minor and would be far outweighed by the project benefits.

Wind

Mitigation for wind impacts at the South Station site due to the joint/private development could include coniferous tree plantings and screen walls. MassDOT would determine the appropriateness of these measures upon selection of a preferred alternative, in coordination with advanced design.

Noise

At the South Station site in Alternative 1, noise levels at receptors within the Fort Point Channel Historic District are expected to exceed the FTA moderate impact criteria. As described in Section 4.10, to reduce noise from idling locomotives across Fort Point Channel, a noise barrier could be installed along the length of Track 20. In Alternatives 2 or 3, the station would be enclosed by the joint/private development, and a noise barrier would no longer be necessary**.** The demolition and construction activity associated with the project would impact the South Station headhouse and 245 Summer Street (located within the APE but not a historic property). Noise barriers would be required to mitigate construction noise levels at these receptors. As described in Section 4.10, a Construction Noise Control Plan would be implemented to mitigate construction noise levels, including providing noise monitoring during construction to determine compliance with FTA and City of Boston construction noise limits.

While mitigation measures are proposed at Beacon Park Yard and Readville –Yard 2, as described in Section 4.10, there would be no noise impacts to historic properties within the APE at Widett Circle, Beacon Park Yard, or Readville - Yard 2 associated with project operations or construction.

Vibration

No vibration impacts to historic resources within the Historic APE are anticipated during SSX project operations. During construction at the South Station site, precondition surveys and vibration monitoring would be conducted to document initial conditions and to monitor vibration levels during construction. The Construction Management Plan would establish vibration limits and other similar performance criteria, as well as require the contractor to plan and implement mitigating measures if adverse impacts were detected during construction. Below-grade work would be conducted under the technical monitoring of a geotechnical engineer, to observe and document construction procedures, monitor vibrations, and to anticipate and facilitate any needed mitigation measures.

Design Considerations

Chapter 3 of the DEIR presents design principles to guide the planning and design of the SSX project. Specific to historic preservation, planning and design principles developed to be respectful of South Station's rich history, its prominent location, and its role as the transportation hub for the region include creating a work of civil architectures that complements the historic and architectural significance of the 1899 headhouse, and recognizing and protecting the historic integrity of the existing South Station headhouse and its value as a public space.

4.13. Archaeological Resources

This section presents an evaluation of the impact of the SSX project upon archaeological resources. Existing conditions and assessments were conducted in conjunction with the Massachusetts State Historic Preservation Officer (SHPO)/Massachusetts Historic Commission (MHC), in accordance with Section 106 of the National Historic Preservation Act (36 CFR 800) as amended, the implementing regulations of the Advisory Council on Historic Preservation (36 CFR 800), and State Register Review procedures (950 CMR 71.00). Additional standards and guidance included *Public Planning and Environmental Review: Archaeology and Historic Preservation* (MHC 1985), and National Park Service's *Recovery of Scientific, Prehistoric, Historic, and Archaeological Data* (36 CFR Part 66 Appendix A).

Section 106 requires the establishment of the APE for belowground historic properties, consisting of archaeological sites. The direct impact APE for archaeological resources is defined as the geographic areas in which historic properties would be altered or otherwise used by construction activities or impacts related to project operations. The APE for archaeological resources at the four SSX project sites consists of the direct impact for construction activities proposed within the project boundaries and the project boundary also serves as the APE for archaeological resources boundary. Appendix 13 - *Phase I Archaeological Reconnaissance Survey Technical Report* contains additional information. Following its review of the technical report, MHC concurred with the identification and evaluation of findings, including the APE for the SSX project.[61]

Archival research and visual field survey were conducted to locate and identify visible archaeological sites and sensitive areas where potentially significant belowground resources may be present that could be affected by the SSX project. The environmental and background information, combined with the degree of observed and inferred disturbance, was used to obtain the sensitivity rankings (low, moderate, and high) of the SSX project APEs. Areas assigned moderate and high sensitivity are typically subjected to subsurface testing as part of an intensive (locational) archaeological survey to locate and identify potentially significant sites. Appendix 13 - *Phase I Archaeological Reconnaissance Survey Technical Report* provides additional information on the methodology and findings of the archaeological resources assessment.

4.13.1. Existing Conditions

South Station Site

Figure 4-14 presents the APE for archaeological resources at the South Station site. The South Station site consists entirely of a built environment covered by buildings (South Station, bus terminal, and USPS General Mail Facility), railroad tracks, and associated infrastructure, including underground utilities, paved roads and parking lots, and loading docks. There are no recorded archaeological sites within the South Station site APE. Previous archaeological studies conducted for the CA/T and South Boston Piers Transitway projects in the 1980s and 1990s did not assign any archaeological sensitivity to the South Station site. The historical document review, including geotechnical and utility data, conducted for the SSX project confirmed the presence of deep fill deposits that cover the former South Cove marshlands. The historical landmaking activities, railroad construction and land uses, channel dredging, and construction of current facilities have resulted in the destruction of any pre-contact and post-contact archaeological resources that may have been present along the original Shawmut peninsula shoreline or in the "wharfed out" areas of the former South Cove.

[61] Brona Simon, State Historic Preservation Officer, Massachusetts Historical Commission, *South Station Expansion Project, Summer Street & Atlantic Avenue, Boston (Downtown), MA; MHC #RC.53253.EEA No. 15028,* Correspondence to U.S. Department of Transportation, Federal Railroad Administration, August 13, 2014.

The South Station site consists of made land that has been continually reconfigured and disturbed since the early to mid-nineteenth century. As a result, no archaeological sensitivity is assigned to the South Station site, which is commensurate with previous studies conducted within and adjacent to the South Station and Fort Point Channel section of Boston.

Layover Facility Sites

Widett Circle

Figure 4-15 presents the APE for archaeological resources at the Widett Circle site. There are no recorded archaeological sites within the Widett Circle site APE. The layover facility site is covered by buildings, roads, and associated infrastructure (former railroad tracks and yards) on two private parcels in an industrial zone served by the MBTA Fairmount Line and within Amtrak's wet/dry loop tracks. The project area consists of made land that has been continually reconfigured and disturbed since the early to mid-nineteenth century. The Widett Circle site was included in the CA/T South Bay study area, and it was not assigned any archaeological sensitivity because of twentieth-century filling, and railroad and commercial land uses. The current historical document review, including geotechnical data, confirms the presence of deep fill deposits and low archaeological sensitivity. No archaeological sensitivity is assigned to the Widett Circle layover facility site.

Beacon Park Yard

Figure 4-16 presents the APE for archaeological resources at the Beacon Park Yard site. There are no recorded archaeological sites within the Beacon Park Yard site APE. The site contains a linear series of tracks, railroad support buildings, and associated rail yard infrastructure. The site was undeveloped until the mid-1800s construction of the Beacon Trotting Park, which was converted for use as a railroad freight yard in the 1890s. The rail freight yard uses have continued to the present, although the nearby areas are transitioning to other land uses. No archaeological sensitivity is assigned to the Beacon Park Yard layover facility site.

Readville – Yard 2

Figure 4-17 presents the APE for archaeological resources at the Readville – Yard 2 site. There are no recorded archaeological sites within the Readville – Yard 2 site APE. The majority of the project area is actively used as a commuter layover facility; the unfenced portion of the site is within the former rail yard and currently is a heavily used, privately operated salvage yard. The area has undergone extensive modifications since the creation of the earliest rail yards in the mid-to late nineteenth century. Based on historical maps and aerial images and the documented use of the project area as a railroad yard throughout most of the twentieth century to the present, it is unlikely that any natural soil horizons containing potentially significant archaeological deposits are present within the project APE for the Readville–Yard 2 site. No archaeological sensitivity is assigned to the Readville–Yard 2 site.

4.13.2. Potential Impacts

No recorded archaeological sites or archaeologically sensitive areas where undocumented sites would be expected were identified for the SSX project APEs. The SSX project construction activities proposed within the four project site boundaries are not anticipated to have potential impacts on significant archaeological resources. No further archaeological investigations are recommended for the SSX project APEs, including the South Station site, the Widett Circle site, the Beacon Park Yard site, and the

Readville–Yard 2 site. As previously cited, in its review of Appendix 13 – *Phase I Archaeological Reconnaissance Survey Technical Report*, MHC concurred with this recommendation.[62]

4.13.3. Mitigation Measures

No mitigation measures are proposed. Should the proposed direct impact areas change as design advances, then MassDOT will conduct additional archaeological assessments to determine the presence of sensitive areas where potentially significant archaeological resources may be present.

4.14. Site Contamination and Hazardous Materials

This section addresses existing environmental conditions related to site contamination and hazardous materials at the four SSX project sites, and identifies actions that could be required for construction of the SSX project, including compliance with federal and state regulations. The study area for the evaluation of site contamination, including soil and groundwater contamination, and hazardous materials is defined as the site boundary where permanent or temporary construction is likely to take place.

Site contamination and hazardous materials in Massachusetts are regulated through multiple federal and State regulations. The applicable regulations for asbestos-containing materials (ACM) are the U.S. EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP)[63] and the Massachusetts Air Pollution Control Regulations.[64] MassDEP implements the Massachusetts Contingency Plan (MCP) to address releases or threats of releases of oil and/or hazardous material (OHM) into the environment.[65]

MassDEP assigns Release Tracking Numbers (RTNs)[66] and classifications of Response Action Outcomes (RAOs)[67] to releases based upon the permanent and temporary measures taken to eliminate such hazards to the environment. Appendix 14 - *Site Contamination and Hazardous Materials Technical Report* provides definitions of RAOs applicable to the SSX project sites.

4.14.1. Existing Conditions

South Station Site

Based on a review of MassDEP files, there are 22 instances of an historic release or threat of release into the environment[68] on the South Station site, which includes the existing South Station and USPS properties. All of the RTNs have been closed by MassDEP. Aside from these 22 RTNs, no additional Reportable Conditions[69] pertaining to the South Station site were identified, and there are no Reportable Conditions at the site that have not yet been assigned an RTN.

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[62] Brona Simon, State Historic Preservation Officer, Massachusetts Historical Commission, *South Station Expansion Project, Summer Street & Atlantic Avenue, Boston (Downtown), MA; MHC #RC.53253.EEA No. 15028,* Correspondence to U.S. Department of Transportation, Federal Railroad Administration, August 13, 2014.

[63] 40 CFR Part 61.

[64] 310 CMR 7.15

[65] Per the Massachusetts Contingency Plan (310 CMR 40.0000), a release is defined as any spilling, leaking, pumping, pouring, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment, excluding certain emissions or applications of pesticides, fertilizer, or residuals.

[66] Release Tracking Numbers are the file numbers assigned by MassDEP to a release or threat of release

[67] A Response Action Outcome (RAO) is defined as a site/release where a Permanent or Temporary Solution statement was submitted to MassDEP indicated that response actions were sufficient to achieve a level of no significant risk or at least ensure that all substantial hazards were eliminated.

[68] http://public.dep.state.ma.us/wsc_viewer/main.aspx

[69] Reportable Conditions include Reportable Concentration or Reportable Quantities. Reportable Concentration means the concentration of o310 CMR 40.0362. Reportable Quantity means the quantity of oil or hazardous material the release of which, or threat of release of which, requires notification to MassDEP under M.G.L. c. 21E, § 7, and/or 310 CMR 40.0350 through 310 CMR 40.0352.il or hazardous material in soil or groundwater which requires notification to MassDEP under M.G.L. c. 21E, § 7, and/or 310 CMR 40.0360 through 310 CMR 40.0352.

The following summary is a breakdown of the 22 RTNs on the South Station site, which includes both the existing South Station parcel and railroad track right-of-way (ROW), and the USPS General Mail Facility (GMF) parcel; and their RAOs.

- Nine RTNs (3-15044, 3-15517, 3-18353, 3-24692, 3-27393, 3-24162, 3-18045, 3-20324, and 3-20757) were closed with Class A-1 RAOs, indicating that a Permanent Solution[70] has been achieved and the level of OHM has been reduced to background.
- Seven RTNs (3-10376, 3-10377, 3-13064, 3-13291, 3-24208, 3-26714, and 3-29093) were closed with Class A-2 RAOs, indicating that a permanent solution of "No Significant Risk" for current or future site conditions was achieved; however, the level of OHM was not reduced to background. In some cases, a Class A-2 RAO was achieved, siting that conditions were categorically infeasible to achieve background due to the proximity of a public transportation ROW.
- RTN 3-19396 was closed with a Class A-3 RAO with an Activity and Use Limitation (AUL)[71], indicating that residual contamination exists in this location. The location of the residual contamination was identified as the area adjacent to an elevator shaft in the northwest portion of the South Station Bus Station building.
- RTN 3-1993 was closed with a Class B-1 RAO, indicating that a Permanent Solution has been achieved without requiring MCP Response Actions.
- RTN 3-0555 was closed with the submittal of a Licensed Site Professional (LSP) Evaluation Opinion stating that the site, which was identified as a Location to be Investigated (LTBI) by MassDEP, required no further response action.
- Two RTNs (3-16008 and 3-16026) were covered under a MassDEP Memorandum of Understanding for the Central Artery/Tunnel project, and Immediate Response Action (IRA) Plans were required. No documentation exists in MassDEP's files indicating that the IRA plans were conducted.
- RTN 3-1305 was closed with a Class A-2 RAO, and while a condition of No Significant Risk was achieved, remediation of residual soil and groundwater contamination was considered to be categorically infeasible based on the location of the contamination beneath an active transportation ROW.

Based on the review of publically available documents, no additional reportable conditions pertaining to the South Station site were identified, and there are no reportable conditions at the site that have not yet been assigned an RTN.

Based on an initial evaluation of the USPS GMF, asbestos- containing materials (ACM) are located throughout the building facility. Additionally, the facility contains potential hazardous materials and universal wastes, including polychlorinated biphenyls (PCBs), lead paint, light bulbs and ballasts, mercury-containing equipment, and refrigerants associated with heating, ventilation, and air conditioning (HVAC) systems.

[70] A Permanent Solution is defined as a measure or combination of measures which will, when implemented, ensure attainment of a level of control of each identified substance of concern at a disposal site or in the surrounding environment such that no substance of concern will present a significant risk of damage to health, safety, public welfare or the environment during any foreseeable period of time (No Significant Risk).
[71] An Activity and Use Limitation (AUL) indicated an environmental restriction or Notice of Activity and Use Limitation recorded, registered, or filed on the site in accordance with the MCP.

Layover Facility Sites

Widett Circle

Based on a review of MassDEP files, there are 14 instances of an historic release or threat of release into the environment on the Widett Circle site.[72] All of the RTNs have been closed by MassDEP.

Five of the RTNs have achieved a Class A-1 RAO, indicating that the level of OHM has been reduced to background, a Permanent Solution has been achieved, and no likely residual contamination exists. Two of the RTNs have achieved a Class A-2 RAO indicating that the level of OHM has not been reduced to background, a Permanent Solution has been achieved, and some likely residual contamination exists. Seven of the RTNs have achieved a Class B-1 RAO, indicating that No Significant Risk exists and the site is unlikely to have residual contamination. None of the RAOs have AULs associated with them.

Based on the review of MassDEP files, no additional reportable conditions pertaining to the Widett Circle site were identified, and there are no reportable conditions at the site that have not yet been assigned an RTN.

Site evaluations of the existing buildings at the Widett Circle site have not been conducted. Given their current use, refrigerated warehousing storage, it is likely that these facilities contain potential hazardous materials and universal wastes. The facilities originally were constructed in the 1960s and they potentially contain ACM.

Beacon Park Yard

Based on a review of MassDEP files, there are 46 instances of an historic release or threat of release into the environment on the Beacon Park Yard layover facility site.[73] With the exception of two sites (RTNs 3-20882 and 3-30413), all of the RTNs have been closed by MassDEP.

Sixteen of the RTNs have achieved a Class A-1 RAO, indicating that the level of OHM has been reduced to background, a Permanent Solution has been achieved, and no likely residual contamination exists. Eighteen of the RTNs have achieved a Class A-2 RAO, indicating that the level of OHM has not been reduced to background; while these RTNs have achieved a designation of No Significant Risk, there is a potential to encounter residual contamination. Seven of the RTNs have achieved a Class C-1 RAO, indicating that Substantial Hazards[74] have been eliminated, a Temporary Solution has been achieved, and response actions to achieve a Permanent Solution are not feasible; therefore, the potential to encounter residual contamination is likely. Of the remaining RTNs at the Beacon Park Yard site, three sites have been closed and are linked to Class C-1 RAO sites; a downgradient property[75] status opinion has been filed for one site with no obligation for remediation, and one site remains open (RTN 3-30413) and is currently undergoing a Comprehensive Site Assessment per the Massachusetts Contingency Plan (MCP) regulations (310 CMR 40.0000).

Based on the review of MassDEP files, no additional reportable conditions pertaining to the Beacon Park Yard site were identified, and there are no reportable conditions at the site that have not yet been assigned an RTN. None of the RAOs filed have AULs associated with them.

[72] Information current as of December 2012.
[73] Information current as of December 2012.
[74] Substantial hazards are hazards which would pose a significant risk of harm to health, safety, public welfare, or the environment if it continued to be present for several years.
[75] A downgradient property is defined as property has been affected by contamination from an upgradient or upstream source may not be able to meet the requirements of the MCP because they do not control the source of contamination

Site evaluations of the existing buildings at Beacon Park Yard have not been conducted. A number of the buildings at the property were constructed in the 1970s or earlier and potentially contain ACM.

Readville – Yard 2

Based on a review of MassDEP files, there are two instances of an historic release or threat of release into the environment on the Readville – Yard 2 site.[76] RTN 3-29327 has been closed by MassDEP and RTN 3-15991 remains open.

One RTN has achieved a Class A-2 RAO, indicating that the level of OHM has not been reduced to background; while the site has achieved a designation of No Significant Risk, the potential to encounter residual contamination is likely. RTN 3-15991 has achieved a Class C-2 RAO, indicating that a condition of No Substantial Hazard exists, but response actions to achieve a Permanent Solution are feasible and are required.

RTN 3-15991 is generally located east of the site of the proposed layover facility, but portions of the release site extend onto property owned by the Commonwealth of Massachusetts/MBTA. An AUL, that would require maintenance of a geotextile and gravel cover, is proposed for the site to address residual lead and PCB contamination in soil, including the portion of the site extending onto Readville - Yard 2. Due to the elevated concentration of PCBs in soil, the proposed remedy may require U.S. EPA Region 1 approval. An alternative to the placement of the AUL on the site would be site remediation.

Based on the review of MassDEP files, no additional reportable conditions pertaining to the Readville - Yard 2 site were identified, and there are no reportable conditions at the site that have not yet been assigned an RTN.

Site evaluations of the existing facilities at Readville – Yard 2 have not been conducted. Depending on the final configuration of the layover facility and if buildings will need to be demolished, hazardous materials and universal wastes may be encountered. The buildings may potentially contain ACM.

4.14.2. Potential Impacts

South Station Site

Based on the types of releases that have been documented at the South Station site, MassDOT does not anticipate encountering significant issues associated with these specific releases during the demolition of the USPS facility and the proposed construction. However, based on the previous use of the site, contamination associated with the property's historical use may be encountered during construction. In addition, the fill that was used to create the current landmass, dating to the early part of the 19th century, may contain debris and contamination that may need to be addressed during demolition and construction.

As noted, the USPS GMF contains ACM and other potential hazardous materials and universal wastes. Prior to demolition, further investigation would be required.

Layover Facility Sites

Based on the recent and historic use of Widett Circle, it is likely that some contamination would be encountered during SSX project layover facility construction.

[76] Information current as of February 2013.

Based on the recent and historic use of Beacon Park Yard, it is likely that some contamination would be encountered during SSX project layover facility construction.

Based on the historic and current use of Readville-Yard 2, it is likely that some contamination would be encountered during SSX project layover facility construction. Construction activities at Readville - Yard 2 also could include remediation of the disposal site (RTN 3-15991) to reach a Permanent Solution.

The project would require demolition of multiple existing facilities at Widett Circle and several small structures at Beacon Park Yard. Prior to building expansion activities, further investigation would be required to identify ACM and potential hazardous materials within existing structures.

4.14.3. Regulatory Consistency

Moving forward, Phase I ESAs will be completed to identify any unreported Recognizable Environmental Conditions (RECs)[77] on the properties. This will include conducting a limited site reconnaissance of the properties to make observations for evidence of a release or threat of release of OHM to the environment, and to interview knowledgeable personnel on the historic operations on the properties. Additionally, this will include performing a limited review of adjoining properties to identify the potential for use of OHM that could affect the properties. If any RECs are identified during the Phase I ESA, site-specific health and safety plan (SSHASP) will be developed, including procedures for the use of proper personal protective equipment (PPE), including but not limited to respirators and protective clothing (i.e. Tyvek suits) for Phase II investigations.

If a Phase II ESA is required, MassDOT will implement a soil and groundwater sampling and analysis program to provide information to: establish the presence and extent of contaminated material; determine options available to manage and dispose surplus soil generated during construction; establish requirements for treatment and management of groundwater to be dewatered during construction; avoid exacerbation of existing groundwater or soil contamination in design for construction, and meet the performance standards of 310 CMR 40.0000 with regard to construction in contaminated areas.

Based on the Phase II investigation, MassDOT will establish oil and hazardous material concentrations in soil and groundwater to support design and construction and determine if MCP reportable conditions exist. Potential effects of construction on existing areas of environmental contamination and conditions that may pose a significant risk to human health, safety, public welfare, or the environment, including Imminent Hazards and/or Critical Exposure Pathways, will be identified. MassDOT will develop recommendations for specific response actions to maintain compliance with the MCP related to OHM on the property. MassDOT will identify response actions to be conducted prior to construction.

Moving forward, MassDOT will conduct a visual inspection of the buildings to identify the presence, location, and quantity of suspect ACM. Work plans will be developed for sampling based on the facility walk-throughs once the inspections are complete. Bulk samples of potential hazardous materials will be collected for laboratory analysis. Once the laboratory results are received, types, conditions, and quantities of potential hazardous materials and universal wastes, including PCBs, lead paint, fluorescent light tubes, light ballasts, CFCs and refrigerants associated with HVAC systems, mercury switches, emergency light batteries, and exit signs, etc. will be documented and inventoried. Finally, response actions that would be required prior to demolition will be identified. Response actions could be required, including development of a site-specific health and safety plan.

[77] Recognized Environmental Concern (REC) is a term used to identify environmental liability within the context of a Phase I Environmental Site Assessment, defined as the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment.

4.15. Socioeconomic Conditions

The purpose of the Socioeconomic Conditions Analysis is to:

- Present an overview of existing population and employment conditions in the vicinity of the project sites.
- Identify potential direct impacts and changes to employment resulting from the SSX project at SSX project sites.
- Assess the potential economic impact of the SSX project on the Boston region.

Socioeconomic impacts of the project were assessed for each of the proposed Build Alternatives: Alternative 1 - Transportation Improvements Only; Alternative 2 - Joint/Private Development Minimum Build; and Alternative 3 – Joint/Private Development Maximum Build.[78] Each alternative includes development of the proposed layover facility sites. Therefore, the impacts that would result from the development of the layover facility sites would be the same in each of the Build Alternatives.

The socioeconomic study areas are defined as one-half-mile surrounding the existing South Station headhouse and the three layover facility sites. Central Transportation Planning Staff (CTPS) provided existing, No Build, and Build conditions estimates of population and employment for the South Station study area. CTPS also used an economic modeling tool to estimate the project's economic impacts upon the Boston MPO region. Appendix 4 - *Socioeconomic Conditions Technical Report* contains additional information on methodology, existing conditions, and potential impacts.

4.15.1. Existing Conditions

Overview of Boston's Population and Economy

Boston is the center of the Boston-Cambridge-Quincy MA-NH Metropolitan Statistical Area (MSA), the tenth largest metropolitan area in the U.S. This MSA had 4.5 million people and 3.1 million jobs in 2010. The Boston MSA had the ninth largest economy (as measured by gross domestic product) nationally and the 42nd largest such city economy in the world, generating $336.2 billion dollars in 2012. This MSA comprised 78% of the Massachusetts economy and 33% of the New Hampshire economy in 2012.[79] Boston is also the center of the seventh largest Combined Statistical Area (CSA) in the U.S., the Boston-Worcester-Providence, MA-RI-NH-CT CSA Area.

Boston is a hub for finance, higher education, medicine, a broad range of professional services and government activities at all levels. Boston has evolved into more of a knowledge and information-based economy. Healthcare comprises the largest sector of the Boston economy, followed by professional/scientific/technical services, finance/insurance, and government. Boston is also an important tourist destination; with 1.3 million visitors in 2011, Boston is the ninth most visited city in the United States.

Since 2009, Boston's economy has grown at a rate of 4.8%, the highest among all major U.S. metropolitan areas.[80] Boston's economy and employment has steadily expanded since 2010, and this growth is projected to continue. In the South Station study area, employment in 2035 is expected to increase with the largest increases occurring in the South Boston Waterfront/Innovation District.

[78] Descriptions of the SSX project Build Alternatives are provided in Section 6.
[79] The United States Conference of Mayors and the Council on Metro Economies and the New American City, *U.S. Metro Economies: Outlook-Gross Metropolitan Project, with Metro Employment Projections,* November 2013, accessed July 1, 2014, http://www.usmayors.org/metroeconomies/2013/201311-report.pdf
[80] The Brookings Institute. *The 10 Traits of Globally Fluent Metro Areas: Boston,* 2013.

Boston has more jobs than residents and far more jobs than resident workers.[81] In the heart of the Downtown area, jobs outnumber residents by roughly 7 to 1. Commuters from outside the City fill 62% of its jobs. Total jobs in Boston numbered approximately 680,000 in 2008[82] and had rebounded by 2011. Although the total numbers of jobs has fluctuated with expansions and recessions, the trend is for economic expansion, particularly in recent years. The City's resident workforce has also expanded, from 285,859 of Boston's residents working in 2000, to 318,250 of residents employed in 2010.[83]

Boston's population has also been growing in recent decades, and its growth compares favorably to most other northeastern cities. Over a two-year span culminating in July 2012, Boston grew 3.1% from the 2010 census to 636,479 people, at a rate faster than the suburbs and any urban area northeast of New Jersey.[84]

South Station Site

Estimates of the South Station study area population and employment for the South Station study area for existing (2009) and 2035 No Build and Build conditions, and projections for travel demand forecasting, were compiled by CTPS. They were based upon the five transportation analysis zones (TAZs), the unit of geography most commonly used in conventional transportation planning models, around South Station. The South Station TAZs, as shown in Figure 4-18, roughly correspond to the one-half-mile South Station study area, with slight differences in boundaries and estimated population.

Table 4-42 presents the 2009 estimated population, housing, and employment for the five TAZs around South Station. The 2009 estimated population in the TAZs around South Station totaled 13,190 people. These TAZs population and employment estimates approximate socioeconomic conditions within the South Station study area, and are consistent with the Boston MPO RTP.

Table 4-42—2009 South Station Study Area Demographic Data

Transportation Analysis Zone (TAZ)	Population	Households	Service Jobs	Retail Jobs	Basic Jobs[a]	Total Jobs
South Station TAZ	589	495	5,014	168	1,393	6,576
North TAZ	238	92	34,962	993	3,109	39,064
South TAZ	4,264	1,929	8,695	337	1,266	10,298
East TAZ	5,519	2,341	9,470	252	5,285	15,007
West TAZ	2,580	1,172	17,700	1,138	1,627	20,465
Total	13,190	6,029	75,841	2,888	12,680	91,410

Source: CTPS

a Basic jobs include utilities/telecommunications, transportation/trucking, mining, manufacturing, agriculture, fishing, warehousing, wholesale trade, and forestry

Table 4-43 shows the population and employment forecasts projected for the South Station TAZs in 2035. In 2035, population within the TAZs is anticipated to increase by 21,069 people, or 160%, increasing to 34,259 people from 2009 conditions. The largest increases would occur within the East TAZ, the South Boston Waterfront/Innovation District, where population is anticipated to increase by 11,711 people, or 212%, to 17,230 people. Table 4-44 shows a comparison between 2009 and 2035.

[81] Boston Redevelopment Authority (BRA), *Boston by the Numbers: Economy and Jobs,* March 2011, accessed July 1, 2014, http://www.bostonredevelopmentauthority.org/getattachment/946803b2-6f1c-40b2-8b6b-c01c8c4bced1/; CTPS; U.S. Census data, 2000 and 2010

[82] Ibid.

[83] Ibid; U.S. Census data, 2000 and 2010.

[84] Boston Globe, *Boston's Population Boom Speeds Up,* June 16, 2013, accessed July 23, 2014, http://www.bostonglobe.com/ideas/2013/06/16/boston-population-boom-speeds/WUb5OlqaNWj9gKDhtqXlkI/story.html?s_campaign=sm_tw.

In 2009, employment in the South Station TAZs totaled 91,410 workers. In 2035, employment is estimated to increase to 109,538 workers, an increase of 18,128 jobs, or 20%, as shown in Table 4-43. The East TAZ would experience the highest increase (74%) or 11,058 jobs, for a total of 26,065 jobs in the South Boston Waterfront/Innovation District.

Table 4-43—2035 South Station Study Area Demographic Projections

Transportation Analysis Zone (TAZ)	Population	Households	Service Jobs	Retail Jobs	Basic Jobs[a]	Total Jobs
South Station TAZ	1,793	1,451	7,421	296	562	8,279
North TAZ	712	344	37,185	1,027	3,330	41,542
South TAZ	9,269	4,301	10,835	702	1,255	12,792
East TAZ	17,230	6,809	18,704	2,101	5,260	26,065
West TAZ	5,255	2,456	17,553	1,194	1,614	20,361
Total	34,259	15,361	91,698	5,320	12,021	109,039

Source: CTPS
a Basic jobs include utilities/telecommunications, transportation/trucking, mining, manufacturing, agriculture, fishing, warehousing, wholesale trade, and forestry.

Table 4-44— South Station Study Area Demographic Changes, 2009 - 2035, Total and Percent

Transportation Analysis Zone (TAZ)	Population	Households	Group Quarters[a]	Service Jobs	Retail Jobs	Basic Jobs[b]	Total Jobs
South Station TAZ	1,204 (204%)	956 (193%)	0	2,391 (48%)	24 (14%)	28 (2%)	2,442 (37%)
North TAZ	474 (199%)	252 (274%)	0	2,223 (6%)	34 (3%)	-19 (-0.6%)	2,238 (6%)
South TAZ	5,005 (117%)	2,372 (123%)	0	2,140 (25%)	365 (108%)	-11 (-0.9)	2,494 (24%)
East TAZ	11,711 (212%)	4,468 (191%)	3 (300%)	9,234 (98%)	1,849 (734%)	-25 (-0.5%)	11,058 (74%)
West TAZ	2,675 (104%)	1,284 (110%)	0	-147 (-0.8%)	56 (5%)	-13 (-0.8%)	-104 (-0.5)
Subtotal	21,069 (160%)	9,332 (155%)	3 (1%)	15,841 (21%)	2,328 (81%)	-40 (-0.3)	18,128 (20%)

Source: CTPS
a Group quarters are places where people live or stay in a group living arrangement, and include such places college residence halls, residential treatment centers, skilled-nursing facilities, group homes, military barracks, correctional facilities, and workers' dormitories.
b Basic jobs include utilities/telecommunications, transportation/trucking, mining, manufacturing, agriculture, fishing, warehousing, wholesale trade, and forestry.

In 2010, the City of Boston designated a portion of the South Boston Waterfront as the Innovation District, comprised of one thousand acres directly east of South Station across Fort Point Channel. In the South Boston Waterfront neighborhood, 5,000 jobs have been created since 2010 at more than 200 small businesses, largely in the fields of technology, creative industries (design and advertising), life sciences, and green energy.[85,86] The initiatives of the Innovation District include developing a 24-hour neighborhood, with innovative workspaces, housing (smaller lofts providing live-work spaces for innovators to collaborate), and restaurants. As cited in the Fort Point District 100 Acres Master Plan, a key to the future expansion of the District is proximity to public transportation, notably South Station (refer to Section 4.1 and Appendix 4 - *Land Use and Zoning Technical Report*).

[85] *The Northeast Corridor and the American Economy*, April 2014.
[86] City of Boston, *About: Boston's Innovation District,* accessed July 16, 2014, http://www.innovationdistrict.org/about-2/.

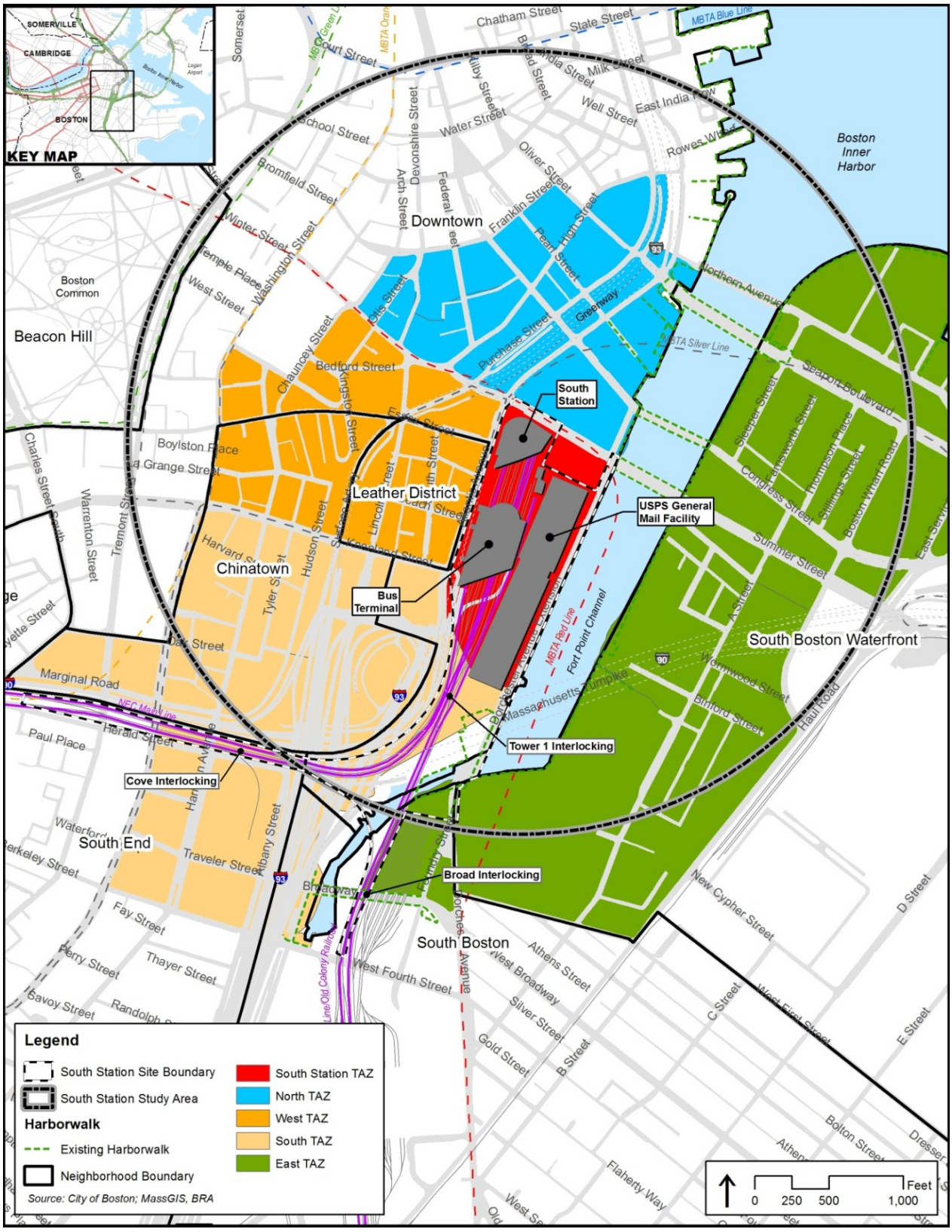

Figure 4-18—South Station Transportation Analysis Zones

While growth in housing stock in Boston over the past decade (2000 to 2010) was the strongest over the last six decades for both total and occupied units, according to the 2010 Census, the one-half-mile South Station study area experienced even higher corresponding increases in housing, increasing by 67% between 2000 and 2010 to 6,444 housing units. This population/housing expansion is expected to continue, particularly in the South Boston Waterfront/Innovation District, where special zoning permits development of lofts smaller than 500 square feet.

South Station Businesses

Located in the heart of the Financial District, South Station is surrounded by a number of businesses and large employers. Large employers within the South Station study area[87] include Fidelity Investments (5,500 employees); Tufts Medical Center (3,692 employees); Suffolk University (1,528 employees); and Gillette (1,385 employees), the City's largest industrial/manufacturing employer. In addition, the South Station headhouse features a number of businesses, consisting of 15 eateries and 15 retail stores/services geared toward rail patrons. The headhouse includes newly opened retail space (CVS/Pharmacy) on the second level and office space on the second through fifth floors, which currently houses Amtrak, the Massachusetts Division of Public Utilities, and a few private companies. The bus terminal also houses three eateries and three retail outlets/services/kiosk.

Layover Facility Sites

All of the layover facility sites are located within existing industrial areas. The population of the one-half-mile Widett Circle study area generally is concentrated in the South End neighborhood, located west of the layover facility site; and to a lesser extent, in the eastern portion of the study area in South Boston. The population of the one-half-mile Beacon Park Yard study area primarily is located south and west of the layover facility site in the Allston neighborhood. Readville - Yard 2 is located in the Hyde Park neighborhood, with the one-half-mile study area population located primarily south and northwest of the layover facility site. Table 4-45 presents population trends for the three layover facility study areas.

Table 4-45—Population Trends, Layover Facility Study Areas, 2000-2010

Area	Population 2000	Population 2010	% Change 2000 to 2010
Widett Circle Study Area[a]	7,405	11,299	52.6
South Boston	31,005	33,311	7.4
South End	21,911	24,577	12.2
Beacon Park Yard Study Area	16,948	19,232	13.5
Allston	25,623	29,196	13.9
Readville – Yard 2 Study Area	5,615	5,111	-9.0
Hyde Park	30,076	30,637	1.9
City of Boston	589,141	617,594	4.8
Suffolk County	689,807	722,023	4.6
Massachusetts	6,349,097	6,547,629	3.1

Sources: 2010 Census, Summary File 1, Boston Redevelopment Authority Research Division Analysis; 2010 Census
a The Widett Circle study area includes the Suffolk County House of Correction, which had 1,512 residents in 2010.

The Widett Circle study area grew substantially more than any other study area or neighborhood. Population trends within the Beacon Park Yard study area closely resembled that of the Allston neighborhood in which it is located, growing by almost 14% between 2000 and 2010. With the exception

[87] BRA defines large employers as private employers employing over 500 people.

of the Readville – Yard 2 study area, which lost population from 2000 to 2010, the growth rate of the study area populations exceeded the city, county or state growth rates over the same time period.

Large employers within the one-half-mile layover facility study areas include the Boston Medical Center (4,217 employees), near the Widett Circle site; and Boston University (9,783 employees), near the Beacon Park Yard site.

The Widett Circle site includes a complex of food-related storage and processing businesses, including businesses related to the beef and seafood industries, located within the 29-acre proposed project footprint. The 30-acre Beacon Park Yard proposed project footprint currently is occupied by railroad and rail-related uses. A demolition and debris management company is located west of the existing Readville - Yard 2. The expansion of the 17-acre Readville – Yard 2 footprint would increase the facility at existing Readville Yard by approximately seven acres, of which the MBTA currently owns the majority of the site, but would require a partial taking of approximately 0.7 acres of a privately owned property.

4.15.2. Potential Impacts

This section presents the socioeconomic impacts of the build alternatives upon the four SSX project sites. CTPS used the Transportation Economic Development Impact System (TREDIS) model to estimate the economic impacts of permanent household population gains and employment gains due to the three joint/private development build alternatives at the South Station site. Estimates included additional household spending from new residents and total new employees of the joint/private development. These estimates were then used to estimate increases in business sales, gross regional product, jobs, and wage income for the Boston MPO region. CTPS also used the TREDIS model to estimate the economic impacts of the project's construction for the MPO region, as well as travelers' cost savings. Appendix 4 - *Socioeconomic Conditions Technical Report* presents more information and the results from the CTPS economic analysis.

South Station Site

Alternative 1 – Transportation Improvements Only

The station expansion onto the site of the existing USPS facility site would displace approximately 1,000 USPS jobs at South Station. It is anticipated that these jobs would be relocated to a site within South Boston. It is not anticipated that there would be a net loss of USPS jobs within the Boston area. MassDOT intends to replicate the USPS retail functions currently operating at the facility within the expanded South Station headhouse.

Currently, the total employment within the South Station headhouse, excluding bus terminal employees, is approximately 640 personnel, including: employees for railroad operations of Amtrak and the MBTA, 100 retail/service employees, and 360 office employees on the upper floors. A station expansion in Alternative 1 is anticipated to more than double the retail and building management/cleaning staff within the headhouse. Assuming that the South Station rail and building management staff would expand, this could yield a total of approximately 844 employees based at the South Station headhouse, an increase of roughly 202 employees.

The station expansion also is anticipated to result in an increase in rail-related employment. Based on discussions with the MBTA, increases in staff for railroad operations could be on the order of 30%. Current staffing to support railroad operations at South Station (both on-site and off-site) for Amtrak and the MBTA is estimated to be close to 900 personnel, of which at least 20% are housed at South Station.

In addition to the direct employment changes associated with Alternative 1, the SSX project would support continued economic growth and expansion of the Downtown Financial District and adjoining South Boston Waterfront/Innovation District. Given the importance of Boston as an employment center reliant on a commuter workforce, the proposed station improvements would be important to support the City's continued growth and economic health. An improved South Station transportation complex would further improve the appeal of the adjoining Innovation District, the fastest growing neighborhood in Boston, and other neighboring districts (Financial District, Leather District, and Chinatown) for businesses and residents.

Alternative 2 – Joint/Private Development Minimum Build

Alternative 2 would include provisions for future private development, including residential, office, and commercial space (retail and hotel uses) at South Station. The changes in employment described for Alternative 1, including relocation of the USPS facility, increases in South Station employment, displacement of Widett Circle businesses, and impacts to a Readville – Yard 2 business, also would apply in Alternative 2. Additionally, this alternative would result in increased employment related to the future private development.

It is anticipated that the future private development in Alternative 2 would add a total of 1,020 service jobs, including 255 hotel employees, and 255 retail employees, for a total of 1,275 employees. It is assumed that 280 units of residential housing (multi-family or condominiums) would be provided that would accommodate 620 additional residents.

CTPS estimates that the permanent household population and employment gains associated with Alternative 2 would generate $26.153 million in additional household spending in the Boston MPO region, which encompasses 101 cities and towns across approximately 1,400 square miles. CTPS' economic assessment is presented in Appendix 4 - *Socioeconomic Conditions Technical Report.*

Alternative 3 – Joint Development Maximum Build Alternative

Similar to Alternative 2, Alternative 3 would include provisions for future private development. The changes in employment proposed in Alternative 1 would also apply in Alternative 3, with additional employment related to the future private development.

It is anticipated that the future private development in Alternative 3 would add a total of 3,000 service job employees and 750 retail employees, for a total of 3,750 employees. It is assumed that 830 units of residential housing (multi-family or condominiums) would be provided in Alternative 3, accommodating 1,830 additional residents.

CTPS estimates that the permanent household population and employment gains associated with Alternative 3 would generate $77.526 million in additional household spending in the Boston MPO region. CTPS' economic assessment is presented in the *Socioeconomic Conditions Technical Report.*

Layover Facility Sites

Other than relocation of the USPS General Mail Facility, direct business displacements required for the project would occur at the Widett Circle layover facility site.

The proposed use of the Widett Circle site would displace approximately 30 businesses, including their employees. The majority of the businesses lease or are located within two properties within the Widett Circle parcel, and are tax exempt under Massachusetts General Laws Chapter 121A (Urban

Redevelopment Corporation). The Cold Storage parcel is not included in the tax-exempt 121A properties. The tax revenues on the Cold Storage property in 2011 totaled $351,534. It is assumed that these affected businesses would be relocated within the immediate project vicinity in the Boston area, and that no long-term loss of employment would occur.

The expansion of the 17-acre Readville – Yard 2 footprint would increase the facility at existing Readville Yard by approximately seven acres, of which the MBTA currently owns the majority. However, a partial taking of approximately 0.7 acres of land currently owned by a privately-owned demolition and debris management company would be required to complete the expansion. The Readville – Yard 2 business is located proximate to a larger industrial district in the immediate Hyde Park area; it is anticipated that only a partial taking of land that was previously owned by the MBTA would be required to accommodate the expansion. No long-term loss of employment is anticipated to occur.

Summary of Potential Impacts

Table 4-46 presents a comparison of 2035 South Station demographic data for the South Station TAZs according to the three joint/private development build alternatives.

Table 4-46—Comparison of 2035 South Station Demographic Data

Joint/Private Development Alternative	Population	Households	Service Jobs	Retail Jobs	Basic Jobs[a]	Total Jobs
No Build	34,259	15,361	91,682	5,216	12,640	109,538
Alternative 1	34,259	15,361	91,698	5,320	12,021	109,039
Alternative 2	35,459	15,641	92,718	5,575	12,021	110,314
Alternative 3	36,059	16,191	94,698	6,070	12,021	112,789

Source: CTPS
a Basic jobs include utilities/telecommunications, transportation/trucking, mining, manufacturing, agriculture, fishing, warehousing, wholesale trade, and forestry.

As shown, population and household numbers for the South Station TAZs are not expected to change from the No Build Alternative to Alternative 1, but would increase in Alternatives 2 and 3 due to the joint/private development. A drop in total employment is anticipated in Alternative 1 from the No Build conditions; the loss of 1,000 USPS jobs would be partially offset by the increase in rail-related and retail jobs associated with the South Station terminal expansion. Employment is expected to increase in Alternatives 2 and 3 due to the joint/private development. Alternative 3 – Joint/Private Development Maximum Build would result in an increase in population and households of approximately 5% over the No Build Alternative; and an increase in employment of approximately 3% and 3.4% over the No Build Alternative and Alternative 1 conditions, respectively.

4.15.3. Mitigation Measures

The station expansion into the site of the existing USPS facility site would displace approximately 1,000 USPS jobs, although it is anticipated that these jobs would be relocated within South Boston. It is not anticipated that there would be a net loss of USPS employment within the Boston area. It is MassDOT's intent to replicate the retail functions of the USPS facility in the terminal expansion to compensate for the relocation of the retail functions currently located in the USPS General Mail Facility.

MassDOT would provide acquisition and, if required, relocation assistance for affected property owners at the Widett Circle and Readville – Yard 2 layover facility sites in accordance with the procedures outlined in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The

Act provides benefits and protection for persons or businesses whose real property is acquired or who are displaced by federally funded projects, and require just compensation. Suitable replacement properties would be provided to affected owners. It is anticipated that suitable relocation sites are available within the industrial sites in the immediate South Boston area for the displaced Widett Circle businesses.

4.16. Environmental Justice

The purpose of this section is to demonstrate that MassDOT and the SSX project are in full compliance with Title VI of the Civil Rights Act of 1964 and the environmental justice (EJ) policy of Massachusetts Executive Office of Energy and Environmental Affairs (EEA).

The EEA EJ policy states: "*Environmental justice is the equal protection and meaningful involvement of all people with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies and the equitable distribution of environmental benefits*." An EJ population is identified as a neighborhood containing a certain percentage of minority, low-income, foreign-born, or limited English proficiency (LEP) residents. (See Section 4 for a more detailed definition.)Federal environmental justice programs set forth steps to prevent disproportionately high and adverse human health and environmental effects, including social and economic effects, on EJ populations. This suite of federal protections for EJ includes Title VI of the *U.S. Civil Rights Act of 1964, Executive Order 12898*, and *U.S. Department of Transportation (DOT) Order 5610.2(a)*. The *U.S. Americans with Disabilities Act (42 U.S.C. 12101)* also prohibits discrimination based on disabilities and mandates reasonable accommodations for disabled populations.

Title VI primarily ensures that federally funded projects do not discriminate based on race, color, or national origin and also provides a vehicle for residents to file a complaint if they feel they have been discriminated against. The EEA EJ policy identifies specific populations that are vulnerable to discrimination and requires that project proponents demonstrate that their project would not disproportionately impact these populations. While the SSX project is not subject to the EEA EJ policy, MassDOT has committed to evaluate the project for potential impacts to EJ communities based on federal and state guidelines. The effects of the project alternatives on EJ populations were evaluated relative to their effects on all populations in order to determine whether impacts in the No Build and Build conditions would be disproportionate or adverse on EJ communities or populations. This evaluation involved the following steps:

- Identify EJ populations within the study area.
- Identify significant and adverse impacts of the project.
- Evaluate the project's effects on EJ populations relative to its overall effects to determine whether any impacts on EJ populations would be disproportionate and adverse.
- Identify public outreach activities that constitute meaningful involvement of EJ communities in the project.

The EJ study areas for the SSX project encompass a one-half-mile radius of South Station and the three layover facility sites, representing areas within walking distance determined to be most likely affected by the construction and operation of the SSX project. See Appendix 3 – *Environmental Justice and Title VI Technical Report* for additional information.

4.16.1. Public Outreach

From the initiation of SSX project planning through the DEIR filing, MassDOT has targeted outreach to EJ communities and provided accommodations for disadvantaged populations. A Public Participation Plan has been prepared for the SSX project that outlines the public outreach program, and the SSX project

has, and would continue to, implement the public outreach specified in the plan. SSX project public outreach has included a variety of methods to reach and involve members of the public and adjoining EJ communities. For example, MassDOT maintains a SSX project website, which is used to disseminate information and includes the project brochure translated into Chinese, Spanish, and Portuguese, the three most commonly spoken languages in Massachusetts for limited English proficiency populations in the 2010 census. The brochure also includes a TTY number for the hearing impaired. Project website materials are accessible for use by screen readers (for the visually impaired). MassDOT sends regular email updates to a database of 3,500 addresses. Two widely-advertised open houses were held to kick off the SSX project, and MassDOT periodically conducts information sessions. For more details on public outreach activities, please see Appendix 1 - *Public Involvement Technical Report*.

4.16.2. Existing Conditions

EJ populations are those segments of the population that EEA has determined to be most at risk of being unaware of or unable to participate in environmental decision-making or to gain access to state environmental resources. An EJ population is defined as a neighborhood (consisting of a U.S. Census Bureau census block group) that meets one or more of the following criteria:

- The median annual household income is at or below 65.49% of the statewide median income ($62,133) for Massachusetts ($40,673 in 2010);[88]
- 25% of the residents are minority;
- 25% of the residents are foreign born;
- 25% of the residents are lacking English language proficiency, defined as households in which no one aged 14 and over speaks English only or speaks English "very well" (defined as linguistic isolation or English isolation).

This EJ assessment utilized the Massachusetts Office of Geographic Information (MassGIS) identification of environmental justice populations, which includes minority and low-income populations, as well as those with limited English proficiency (LEP). EJ populations were considered relative to the City's overall population in order to determine if they would be disproportionately impacted by the SSX project.

The racial and ethnic composition of the City of Boston has changed dramatically over the last several decades, from a City that was predominantly white in 1980 (70%) to a majority-minority city (47% white) in 2010. The City of Boston is one of the most diverse cities in the nation and has one of the highest percentages of foreign-born populations (approximately 27%) in the U.S., ranking sixth largest foreign born populations among the 25 largest U.S. cities in 2010.[89] Boston also has the highest concentration of "affordable" subsidized housing among major U.S. cities. Approximately 20% of the City's housing is dedicated to low- and moderate-income families.[90]

The ethnic and racial diversity of the City is reflected in the predominance of EJ populations in the SSX project study areas. Table 4-47 presents the percentages (by both population and area compared to the total study area) of environmental justice areas designated for one or more parameters within the one-half-mile study areas of the SSX project sites. Population estimates in this table are based only on the Census blocks located entirely or partially within the one-half-mile study area. Table 4-48 presents race

[88] USDA Economic Research Service via Massachusetts Executive Office of Energy and Environmental Affairs' MassGIS Environmental Justice data criteria: http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/cen2010ej.html

[89] Boston Redevelopment Authority, *Demographic and Socio-economic Trends in Boston: What we've learned from the latest Census data,* November 29, 2011, accessed June 15, 2014, http://www.bostonredevelopmentauthority.org/getattachment/83972a7a-c454-4aac-b3eb-02e1fddd71e3/.

[90] BRA, *Boston by the Numbers: Housing,* November 2013, accessed July 1, 2014, http://www.bostonredevelopmentauthority.org/getattachment/76bd9781-55ee-4545-928c-706d571523a3/.

and ethnicity characteristics of the SSX project areas in comparison to the City of Boston, Suffolk County, and Massachusetts.

Table 4-47—Percentages by Population and Area of SSX Project Study Areas Meeting Environmental Justice Criteria

Study Area	Minority		Low Income		Limited English Proficiency		Meets All EJ Criteria		EJ Community Totals	
	Population %	Area %	Population %	Area %	Population %	Area %	Population %	Area %	Population %	Area %
South Station	78.1	36.0	51.7	17.5	43.0	15.5	43.0	15.5	84.9	36.0
Widett Circle	81.1	46.3	42.1	34.8	27.7	11.4	27.7	11.4	88.3	65.8
Beacon Park Yard	73.7	80.3	34.7	48.8	0	0	0	0	93.9	80.3
Readville - Yard 2	97.2	84.7	0	0	0	4.4	0	0	97.2	84.7

Sources: MassGIS, U.S. Census Bureau

South Station Site

The total population of the one-half-mile study area around South Station is 12,659, with 6,444 households. EJ communities cover 36% of the study area and contain 85% of the total population (10,571 persons). The designated EJ blocks are located primarily west of the Central Artery (I-93) and the Surface Road. The racial and ethnic composition of the South Station study area (Asian population of 32%) reflects the Chinatown population. Most of the areas to the north in Downtown and to the east in South Boston Waterfront, consisting of commercial high-rises and buildings or industrial/transportation uses, are largely unpopulated. The South Station study area and adjoining neighborhoods generally had a smaller percentage of non-whites in 2010 than the city and county, but a higher percentage than the state as a whole.

Table 4-48—Race and Ethnicity Characteristics in SSX Project Study Areas, 2010

Study Area	White	%	Minority	%	Black	%	Asian	%	Hispanic	%	Other	%
South Station	7,305	57.7	5,354	42.4	463	3.7	4,013	31.7	602	4.8	276	2.2
Widett Circle	5,288	46.8	6,011	53.2	1,958	17.3	1,298	11.5	2,468	21.9	287	2.5
Beacon Park Yard	12,089	62.7	7,203	37.3	646	3.3	3,605	18.7	2,038	10.6	914	4.7
Readville - Yard 2	2,375	46.5	2,736	53.5	1,476	28.9	103	2.0	982	19.2	175	3.4
City of Boston	290,312	47.0	327,282	53.1	138,073	22.4	54,846	8.9	107,917	17.5	26,446	4.3
Suffolk County	346,979	48.1	375,044	51.9	142,980	19.8	58,963	8.2	143,455	19.8	29,646	4.1
Massachusetts	4,984,800	76.1	1,562,829	23.9	391,693	6.0	347,495	5.3	627,654	9.6	195,987	3.0

Sources: 2010 U.S. Census; Boston Redevelopment Authority, U.S. Census – Summary File 1 Data, 2010

a Racial and ethnic categories are further defined as follows: White (White alone, not Hispanic or Latino); Black (Black or African American alone, not Hispanic or Latino); Asian (Asian alone, not Hispanic or Latino); Hispanic (Hispanic or Latino; persons of Hispanic origin may be of any race); Other (American Indian and Alaska Native alone, not Hispanic or Latino; Native Hawaiian and other Pacific Islander alone, not Hispanic or Latino; some other race alone, not Hispanic or Latino; two or more races alone, not Hispanic or Latino).

Layover Facility Sites

Widett Circle

The total population of the one-half-mile study area around the Widett Circle layover facility site is 11,299, with 4,797 households. EJ communities cover 66% of the study area and contain 88% of the total population (9,973 persons). These area are west of the Southeast Expressway (I-93) and east of the MBTA Red Line. Transportation and industrial uses occupy most of the largely unpopulated area surrounding the project site between these two transportation routes. The most populous block group, which also has the second highest percentage of minorities (82%), includes the Suffolk County House of Correction, which influences the EJ population percentages. Other EJ block groups with elevated minority populations include the Boston University Medical campus. The minority population percentages in the Widett Circle layover facility study area are similar to that of the City and county, but are higher than that for the state.

Beacon Park Yard

The total population of the one-half-mile study area around the Beacon Park Yard layover facility site is 19,292, with 6,698 households. EJ communities cover 80% of the study area and contain 94% of the total population (18,115 persons). Although identified as an EJ community, the area surrounding the layover facility site between the Massachusetts Turnpike, the Charles River, and the MBTA Framingham/Worcester Line is landlocked and largely unpopulated, with the exception of the Doubletree Suites/Hilton Hotel. The designated EJ communities within the Beacon Park Yard layover facility study area may reflect high student populations, even though MassGIS eliminates from designation those block groups with 65% or more of their total population living in group (institutional) housing (such as Boston University's John Hancock Student Village). The study area population percentages for whites (62.7%) and Asians (18.7%) are higher than those for the City and county. Percentages of black population, however, fall well below those for the city, county, and state.

Readville – Yard 2

The total population of the one-half-mile study area at the Readville -Yard 2 layover facility site is 5,111, with 2,128 households. EJ communities cover 85% of the study area and contain 97% of the total population (4,967 persons). The percentage of the black population is higher (29%) than that of the city, county, and state, while the Asian population is lower (2%).

4.16.3. Potential Impacts

To determine the potential impacts of the SSX project on EJ populations, the following types of benefits and impacts were assessed:

- Changes in accessibility and mobility for EJ and disabled populations, compared to changes for non-disadvantaged populations.
- Direct impacts due to relocations and other indirect property impacts.
- Indirect impacts due to visual, air quality, and noise impacts.

Changes in Accessibility and Mobility

The proposed station improvements would benefit EJ populations that use the station by providing improved transportation facilities and additional areas of open space, including the new Harborwalk on Dorchester Avenue. CTPS assessed the regional accessibility changes within the transportation analysis

zones covering nearly all of Eastern Massachusetts as a result of the SSX project using the Boston MPO's regional travel demand model. This analysis compared accessibility for environmental justice/disabled populations and non-disadvantaged populations, including access to employment opportunities, hospitals, and higher education destinations located within a 40-minute transit trip and a 20-minute automobile trip.

This assessment determined that accessibility to needed services (hospitals and colleges) and jobs (basic, retail, and services), mobility and congestion, or environmental impacts would not be permanently impaired as a result of the project. Furthermore, changes would be negligible for both EJ and disabled population zones and non-disadvantaged population zones in the Build Alternatives as compared to the No Build Alternative (with either no changes or changes on the order of less than 2%). The differences in impacts for the various cases analyzed as a result of the project were less than 2%. CTPS determined that none of the EJ populations, including low-income, minority, LEP, or disabled populations, would experience a greater burden than any non-EJ population resulting from any of the SSX project Build Alternatives. In fact, the project is expected to benefit EJ populations by improving accessibility to public transportation. In addition, an improved station design will improve public access within the station.

Property Acquisitions and Indirect Impacts

The proposed South Station improvements would not directly displace any EJ populations, as no residential property takings would occur. The acquisition of the USPS facility would result in the relocation of all employees to another site in Boston. The number of employees at the USPS facility meeting EJ criteria is not known. Assuming that the percentage of workers that represent EJ populations is similar to the statistics for the City of Boston, roughly half (or 500) USPS workers could represent EJ populations.

The SSX project would result in only a temporary loss of the on-site USPS retail functions as a community service since MassDOT intends to replace the retail mail functions within the terminal expansion. There are two other USPS post offices within close proximity (a five- to 10-minute walk from South Station) that could be utilized during construction. Therefore, no disproportionate impacts on EJ populations are anticipated to occur as a result of the USPS relocation.

SSX project-related property displacements would occur at Widett Circle, with the displacement of approximately 30 private businesses, the number of employees at these businesses meeting EJ criteria is not known. Assuming that the percentage of workers that represent EJ populations is similar to the statistics for the City of Boston, roughly half of the workforce could represent EJ populations. It is anticipated that these businesses would be relocated in the Boston area.

As indicated in Section 4.10, increases in rail operations and associated increases in noise at the Beacon Park Yard and Readville – Yard 2 sites would adversely impact nearby residences, including EJ communities. The midday peak activity noise level at Beacon Park Yard would impact residences located along Wadsworth Street and Pratt Street. The midday peak activity noise level at Readville – Yard 2 would impact residences located along Wolcott Street and Riley Road. Noise barriers are proposed at both locations to mitigate adverse impacts.

No disproportionately high and adverse human health and environmental effects, including air quality, visual, social, and economic effects, are anticipated to occur to EJ populations due to the SSX project. Steps would be taken at the Beacon Park Yard and Readville – Yard 2 sites to reduce any noise and/or vibration levels that may affect all populations. Appendix 11 – *Noise and Vibration Technical Report* provides additional information.