Chapter 2 – Project Purpose and Need

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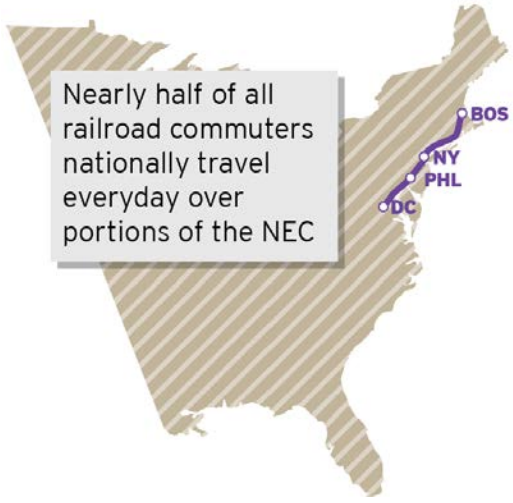
2. PROJECT PURPOSE AND NEED

2.1. Project Context



The Northeast Corridor (NEC) is the busiest intercity railroad segment in North America and the centerpiece of the Amtrak system. Over 700,000 people, nearly half of all railroad commuters nationally, travel every day over portions of the NEC main line on one of eight commuter rail services. Over 40,000 intercity rail passengers daily use Amtrak's various NEC services – trips that might otherwise utilize the region's interstate highways or airports. Overall ridership on Amtrak's NEC services has grown 37% since 2000.[1] During FY 2012, ridership on the NEC grew 4.8% to a record 11.4 million.[2] More than 2,200 trains (commuter and intercity) operate over some portion of the NEC's Washington, D.C.-New York City-Boston route each day. Amtrak provides hourly high-speed intercity rail service on the NEC, reaching top speeds of 150 miles per hour (mph) on the Boston-New York City route.[3] In fiscal year (FY) 2012, the Boston-to-Washington, D.C. portion of the NEC carried 11.4 million passengers via Acela Express, Northeast Regional service, and other Amtrak trains.[4,5] Amtrak's ridership share in the corridor continues to grow and now dominates the air/rail market, with 77% of the New York-Washington market and 54% of the New York-Boston market using Amtrak.[6]

According to the NEC Infrastructure and Operations Advisory Commission (the NEC Commission), major investment in the NEC is essential to reduce delays, achieve a state-of-good-repair, and build capacity for growth. Future investment in the NEC would improve mobility, effectively serve travel demand due to population and jobs growth, support economic development, reduce growth in carbon/greenhouse gas emissions and dependence on foreign oil, and contribute to improved land utilization and investment in both urban and non-urban communities in the region. Investment in the NEC also would relieve capacity issues with the region's highways and airports. The Commission cites the need to expand Boston South Station as one of the critical infrastructure needs of the NEC.[7] Existing South Station operations are near capacity during the peak periods and even minor delays can create cascading delays from which the terminal operation cannot recover until well after the peak periods.

As the northern terminus of the NEC and the eastern terminus of Amtrak's Lake Shore Limited service, South Station Terminal is the sixth busiest station in the national Amtrak system and the fourth busiest station on the NEC, following New York Penn Station, Washington Union Station, and Philadelphia 30th Street Station.[8] Approximately 1.45 million Amtrak passengers traveled through South Station in 2012.[9]

[1] NEC Infrastructure and Operations Advisory Commission. *Critical Infrastructure Needs on the Northeast Corridor.* January 2013.
[2] Amtrak. *Amtrak Sets New Ridership Record*. October 12, 2012. www.amtrak.com/ccurl/636/294/Amtrak-Sets-New-Ridership-Record-FY2012-ATK-12-092.pdf.
[3] Amtrak. *Annual Report Fiscal Year 2012*. 2012. Accessed August 27, 2012. http://www.amtrak.com/ccurl/214/393/A-Vision-for-High-Speed-Rail-in-the-Northeast-Corridor.pdf.
[4] Amtrak. *Annual Report Fiscal Year 2012*. 2012. Accessed August 27, 2012. http://www.amtrak.com/ccurl/214/393/A-Vision-for-High-Speed-Rail-in-the-Northeast-Corridor.pdf.
[5] Other Amtrak services on the NEC include the Keystone line between Philadelphia and Harrisburg and the Springfield line between New Haven, Hartford, and Springfield.
[6] Amtrak Government Affairs. *Amtrak System Statistics and Achievements*, 2012.
[7] NEC Infrastructure and Operations Advisory Commission. *Critical Infrastructure Needs on the Northeast Corridor.* January 2013.
[8] Amtrak Media Relations. *National Fact Sheet: FY 2012*.
[9] Amtrak Government Affairs. *Amtrak Fact Sheet, Fiscal Year 2012, State of Massachusetts*, November 2012.

From 2003 to 2012, the number of Amtrak passenger arrivals and departures through the station increased by approximately 52%, demonstrating the growing demand for rail transportation within the NEC region.[10]

The MBTA manages and runs the fifth largest commuter rail system in the nation, with operations and maintenance currently provided by contract. South Station is the terminus for the portion of the MBTA commuter rail system that serves central and southeastern Massachusetts. Current weekday ridership at South Station includes an average of approximately 4,100 combined Amtrak boardings and alightings, and 42,000 combined MBTA commuter rail boardings and alightings, for a total of more than 46,000 combined intercity and commuter rail boardings and alightings. South Station also provides connections to the MBTA Red Line, the transit spine for communities north and south of downtown Boston; to Logan International Airport via the MBTA Silver Line; and to intra- and inter-city bus services via ten MBTA bus routes and 11 private bus companies operating out of the South Station Bus Terminal.

South Station today has fewer than half the original number of tracks that were available when the station first opened in 1899, but it continues to serve as the most heavily used passenger rail facility in New England. Currently, all 13 existing tracks are fully used by Amtrak and the MBTA, and both operators 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. Daytime vehicle layover capacity for the MBTA's south side commuter rail service area is currently inadequate and unable to meet projected demands. Additionally, South Station's passenger facilities, including platforms, waiting areas, and customer support services, do not meet preferred standards for passenger transit facilities. As a result of these deficiencies, South Station is experiencing increasing congestion, contributing to declining service reliability of intercity passenger and commuter rail operations, as well as lost opportunities for an expansion of existing passenger rail services and the addition of new services.

2.2. Project Purpose

The purpose of the South Station Expansion (SSX) project is to expand South Station Terminal rail capacity and related layover capacity in order to meet current and future high-speed, intercity, and commuter rail service needs. The expansion of South Station would provide opportunities for growth in passenger rail along the NEC and within the Commonwealth of Massachusetts, and would facilitate accompanying improvements in corridor and regional intermodal and multimodal mobility, passenger experience and comfort, economic development, and quality of life.

2.3. Project Needs

There are three fundamental transportation deficiencies (project needs) that the SSX project intends to address to improve both current and future railroad operations:

- Terminal capacity constraints
- Insufficient layover space
- Inadequate station facilities

[10] Amtrak Government Affairs. *Amtrak Fact Sheets, Fiscal Years 2003- 2007, 2010- 2012, State of Massachusetts*; Amtrak Media Relations. *National Fact Sheets: FY 2008 and 2009*.

2.3.1. Terminal Capacity Constraints

Current South Station Terminal capacity constrains existing service reliability and limits opportunities to expand intercity passenger rail and commuter rail services. Terminal capacity infrastructure constraints currently degrade service reliability and will inhibit future service delivery.

Infrastructure Constraints

Recurring train delays at the South Station Terminal area are directly attributable to the limited number of platform tracks and the configurations(s) of the track infrastructure (one main and multiple approach interlockings). As South Station is a terminal facility, every arriving train must be reversed to either leave the station as a new revenue trip, or to access a layover facility. This means that every arriving trip is linked to a departing trip, further limiting station capacity. Figure 2-1 shows the existing platform configuration as well as the layout of existing Tower 1, Cove, and Broad Interlockings.

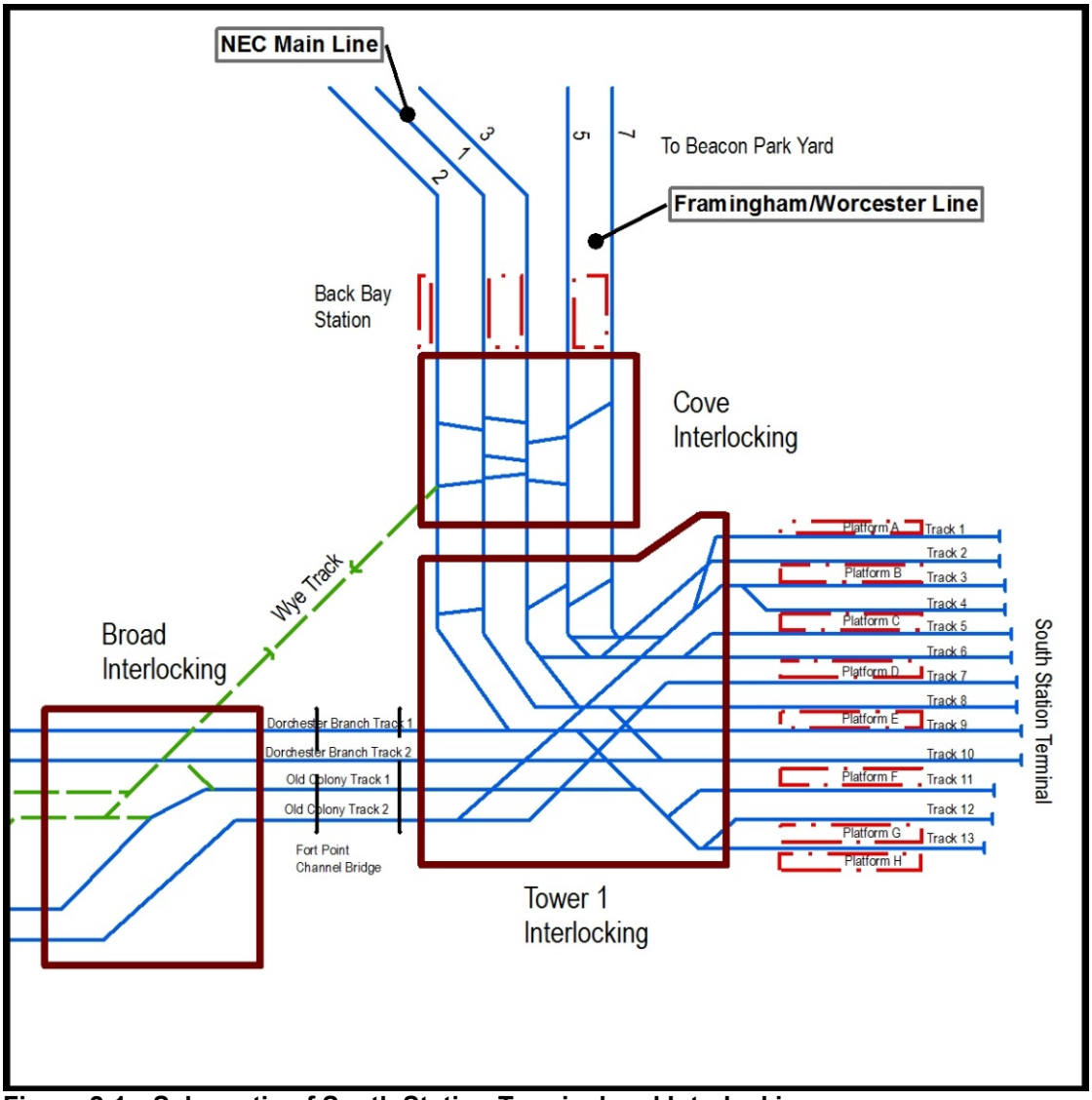


Figure 2-1—Schematic of South Station Terminal and Interlockings

Constraints associated with the interlockings near or at South Station include:

- **Tower 1 Interlocking** - Tower 1 Interlocking, South Station's main interlocking, located immediately south of the terminal at the northern end of all Amtrak and MBTA lines that come into South Station from the west and south, consists of nine main line approach tracks converging into 13 station tracks and eight platforms. The existing operating plan for South Station requires that moves for berthing trains entering or exiting the station occur at Tower 1 Interlocking. Tower 1 Interlocking contains two long ladder tracks, tracks that link a series of parallel tracks, which allow a train approaching South Station on any track to reach nearly every platform track. Although this layout provides operational flexibility, it creates a bottleneck for Amtrak and MBTA operations by limiting the number of trains that can simultaneously move through the interlocking. For example, a train approaching from the west that is designated to be berthed at an easterly platform track will block other trains from entering or exiting South Station, disrupting those trains and causing delay-inducing congestion.
- **Cove and Broad Interlockings** – Located south and west of Tower 1 Interlocking are two additional approach (or "setup") interlockings: Cove and Broad Interlockings. Cove Interlocking, located approximately 0.5 miles from South Station on the NEC and Framingham/Worcester lines, serves as a universal interlocking[11] for four of the five tracks approaching South Station, meaning trains can be rerouted to other tracks in both directions. Cove Interlocking is limited in that it does not provide access to all tracks entering South Station. Broad Interlocking, located adjacent to the MBTA's South Side Service and Inspection Facility, provides limited access between the MBTA Fairmount and Old Colony Railroad mainline tracks and does not allow universal access to all tracks in both directions. As a result of the limitations at both Cove and Broad Interlockings, moves that could take place outside of the South Station terminal area to "setup" trains for appropriate tracks entering the station must instead take place within the Tower 1 Interlocking area. This lack of operational flexibility outside of the terminal area increases the number of conflicting movements at the already constrained Tower 1 Interlocking and further increases congestion, inefficiency, and delays for trains and passengers.

Infrastructure modifications are needed to allow additional and more efficient train movements at the South Station Terminal interlockings. By making improvements at Cove and Broad Interlockings, conflicting train movements can be moved to areas outside the terminal that accommodate higher speeds and operations at Tower 1 Interlocking and into South Station would be improved and flexibility of train movements within the station would be maintained. These infrastructure improvements would allow for an operating plan that provides for faster and more efficient crossover moves in preparation for station platform berthing, and would reduce congestion at Tower 1 Interlocking. Additionally, the layout would also continue to provide the operational flexibility needed in the event of an emergency or equipment failure.

Service Reliability Issues

Service reliability at South Station, measured by on-time performance (OTP) and delay, is adversely impacted by chronic terminal congestion.[12] Due to the interconnectedness and complexity of service at South Station (as described above), individual train delays not only directly impact overall station operations, but also produce cascading effects upon service line operations.

[11] A universal interlocking allows for the safe movement of trains from track to track in either direction.
[12] OTP is calculated as a percentage measure of train performance, by taking the total number of trains arriving "on-time" at the end-point of a run divided by the total numbers of trains operated on the run.

Service reliability is an important factor in a traveler's mode choice decision.[13] To continue to offer NEC travel market consumers an attractive, safe, energy-efficient, and reliable transportation choice, FRA and Amtrak have established OTP goals for NEC intercity passenger rail service. For 2014, Amtrak has set a goal that OTP must be at least 95% for Acela Express trains and 90% for Northeast Regional trains.[14] Amtrak Regional trains are considered late if they arrive at their end-point terminals more than ten minutes after their scheduled arrival times for trips of up to 250 miles, with a tolerance of an additional five minutes per additional 100 miles. All Acela trips, regardless of run length, are considered late if they arrive at their endpoint terminal more than ten minutes past their scheduled arrival time.[15]

Table 2-1 presents Amtrak's OTP trends from FY2008 through FY2012.[16] Over this five year period, the OTP for both the Amtrak's Acela Express service (81 to 90%) and its Northeast Regional service (75 to 87%) was consistently below the OTP goals of 95 and 90%, respectively.

Table 2-1—Amtrak NEC Service On-Time Performance Trends

Fiscal Year (10/1- 9/30)	On-Time Performance	
	Acela Express	Northeast Regional
2008	84.5%	75.8%
2009	87.2%	80.0%
2010	80.6%	74.7%
2011	84.0%	79.1%
2012	89.7%	86.5%
2014 Goal	*95.0%*	*90.0%*

The MBTA has a stated goal of 95% OTP for all commuter rail service, meaning that 95% of all commuter rail trips are operated within five minutes of scheduled trip time over the entire service day.[17] Table 2-2 presents the MBTA's OTP trends from 2008 through 2012.[18] MBTA commuter rail service OTP over this five year period fluctuated, ranging from approximately 82% to over 93%, consistently below the 95% goal.

Table 2-2—MBTA Commuter Rail Service On-Time Performance Trends

Year	On-Time Performance[a]
2008	81.7%
2009	88.7%
2010	85.8%
2011	87.0%
2012	93.3%
Annual Goal	95.0%

a OTP is not adjusted for approved delays, including maintenance delays.

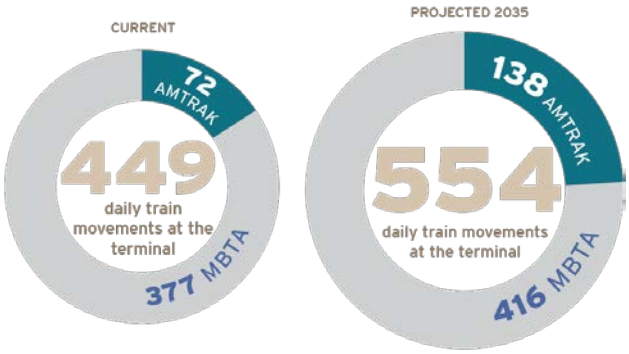
As shown in the tables above, neither Amtrak nor the MBTA have been achieving their stated goals for OTP. While the statistics shown are based on systemwide or route services and are not specific to South Station only, the results of an existing South Station operations analysis indicate that South Station is near

[13] TRB Record 794, Household Activities and Consumer Perspectives, *Understanding the Effect of Transit Service Reliability on Work-Travel Behavior*, 1981.
[14] Amtrak. *Northeast Corridor Infrastructure Master Plan*. June 4, 2010. http://www.amtrak.com/ccurl/870/270/Northeast-Corridor-Infrastructure-Master-Plan.pdf.
[15] Federal Railroad Administration. *Quarterly Report on the Performance and Service Quality of Intercity Passenger Train Operations*. March 2013. https://www.fra.dot.gov/eLib/Details/L04432.
[16] Federal Railroad Administration. *Amtrak On-Time Performance (OTP) Reports*, provided to The Committee on Appropriations, United States Senate, December 17, 2008; December 29, 2009; January 21, 2011; January 27, 2012; February 15, 2013.
[17] Massachusetts Bay Transportation Authority. *Service Delivery Policy*. June 2, 2010. https://www.mbta.com/uploadedfiles/About_the_T/T_Projects/T_Projects_List/2010ServiceDeliveryPolicy.pdf.
[18] Tom Foster, MBTA, *Commuter Rail OTP 2008-2012*, Personal communication to Anthony Gouveia, June 20, 2013.

capacity during the peak periods and even minor delays can create cascading delays from which the terminal operation cannot recover until well after the peak periods. Continued delays at South Station will further exacerbate both Amtrak and the MBTA's ability to meet their OTP goals. It is evident that without infrastructure improvements and additional platform capacity, the ability to increase Amtrak and MBTA services would be difficult and unreliable to operate.

Future Service Demands

By the year 2035, Amtrak projects that daily intercity rail ridership at South Station could be approximately 5,500 combined boardings and alightings (2035 No Build). The Central Transportation Planning Staff (CTPS) of the Boston Region Metropolitan Planning Organization (MPO) projects South Station commuter rail boardings and alightings in the year 2035 to be approximately 56,000 daily riders (2035 No Build). Total Amtrak and MBTA commuter rail ridership in 2035 is therefore projected to increase to more than 61,000 daily riders.[19]



Current weekday operations at South Station include 40 Amtrak and 280 MBTA revenue trips and 32 Amtrak and 97 MBTA non-revenue trips, for a total of 449 daily train movements at the terminal. By the year 2035, Amtrak projects 80 weekday revenue trips and 58 weekday non-revenue trips, representing a 100% revenue service increase above current levels. By 2035, the MBTA projects 315 weekday revenue trips and 101 weekday non-revenue trips, representing a 13% revenue service increase above current levels. A total of 554 daily train movements in and out of South Station is projected by the year 2035, representing an increase of 23% above current revenue service levels.[20]

As Amtrak and MBTA commuter train volumes increase, the existing capacity constraints at South Station will make reliable operations increasingly difficult to achieve within the existing infrastructure, which will in turn negatively impact service reliability on the northern portion of the NEC and on the south side of the MBTA commuter rail operations. Furthermore, the existing constraints will greatly inhibit the ability of both Amtrak and the MBTA to serve potential demand by supplementing existing services or adding new rail service to South Station. Without additional platform track capacity, these services cannot be accommodated and their projected benefits will not be realized.

2.3.2. Insufficient Layover Space

South Station's current vehicle layover facilities are insufficient; neither the capacity nor the location of vehicle layover facilities meets existing and proposed layover facility program needs and railroad operational requirements.

Total Layover Facility Deficit

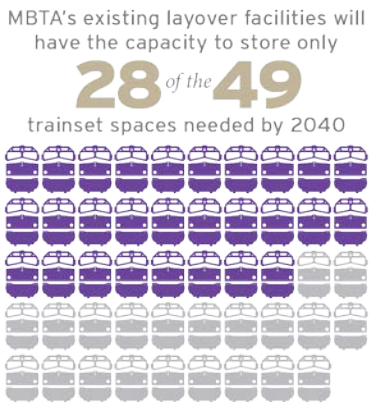
Current MBTA service levels require daytime layover space for 28 trainsets (locomotives and coaches), but space exists for only 22 trainsets. This shortfall in six layover spaces forces the MBTA to store non-revenue trains at the station platforms while waiting for available slots at the existing south side layover

[19] Final SSX Ridership Results. See Appendix 9 – *Ridership Forecasting Technical Report*, June 2014. All results rounded to nearest 100, except for Commuter Rail results, which are rounded to the nearest 1,000.
[20] Massachusetts Department of Transportation. *Basis of Operations Analysis and Assumptions Verification Report*, Version 3. June 2014.

facilities. Use of the South Station platform tracks for train layovers increases congestion at the terminal and creates operational conflicts, especially during morning and evening peak periods and prior to the evening peak period. In addition, it represents a fundamental inefficiency. Platform space that should be used to provide mobility for passengers is instead used to "park" trains with nowhere else to wait for their next trip. This situation is exacerbated in: inclement weather; when trains operate behind schedule; when equipment needs to be changed; or when other issues, such as equipment failures or passenger emergencies occur.

Based on information received from Amtrak, the peak layover capacity for Amtrak's current South Station service is eight trainsets during the daytime and 13 trainsets overnight. All of Amtrak's existing layover needs (daytime and overnight) are accommodated at the Southampton Street Yard. Amtrak's Front Yard is not used by Amtrak for layover functions. It is currently used for MBTA layover and Amtrak non-revenue, rail-bound equipment storage, as well as for Amtrak maintenance-of-way material storage needs.

Based on the MBTA's needs for longer trainsets, increased services and fleet acquisitions, as well as Amtrak's need to expand within its existing facilities, the MBTA projects that by 2040 it will have the capacity to store only 28 of the 49 trainset spaces needed – a shortfall of space for 21 trainsets.[21] Based on the latest information provided by Amtrak, in the future Amtrak will require overnight layover for 20 trainsets (eight Acela/High Speed, 11 Regional/New England Regional and one long distance trainset) to operate its service.[22, 23] The location of where future layover needs will be met has not been confirmed; however, Amtrak indicates that it does not foresee a need for additional overnight layover capacity beyond the use of its current system-wide Amtrak-owned facilities.



Layover space is needed to accommodate future MBTA service increases and fleet expansions. With anticipated increased service demands for both Amtrak and the MBTA into South Station, the lack of sufficient layover capacity for the MBTA will become a major constraint and will substantially limit planned rail service growth in the region. The expansion of South Station, along with additional layover capacity, would improve operating capacity and on-time performance for service into the station.

Operational Requirements

The location of layover facilities is one of the main factors that determines the required diverging moves within Tower 1 Interlocking and the approach interlockings for both revenue and non-revenue trains moving in and out of South Station. Currently, all layover facilities are located south of South Station, which does not correspond to existing service requirements. Approximately 60% of MBTA revenue trains approach South Station from the western routes, and 40% of trains approach South Station from the southern routes. With the addition of Amtrak revenue trains, the split is approximately 30% on the south and 70% on the west. The location of the layover facilities exclusively south of the terminal creates serious capacity constraints within the terminal area.

[21] This analysis assumed that by 2025, the MBTA would be using a four-track layover yard on an MBTA easement at Beacon Park yard for layover of 12 trainsets. This analysis also assumed reduced capacity by six trainsets at Southampton Street Yard and Front Yard due to proposed expansion of the MBTA's fleet to eight-car trainsets.

[22] These figures do not include Amtrak's Next Generation High Speed Rail train layover needs, which will be identified and developed independently from the scope of the SSX project.

[23] Amtrak. *South Station Boston Expansion Project, Projected Intercity Train Movement and Ridership Data to Support the Evaluation of Yard and Training Servicing Needs and Pedestrian Modeling of the Station*, Memorandum to Massachusetts Department of Transportation. Revised, September 26, 2013.

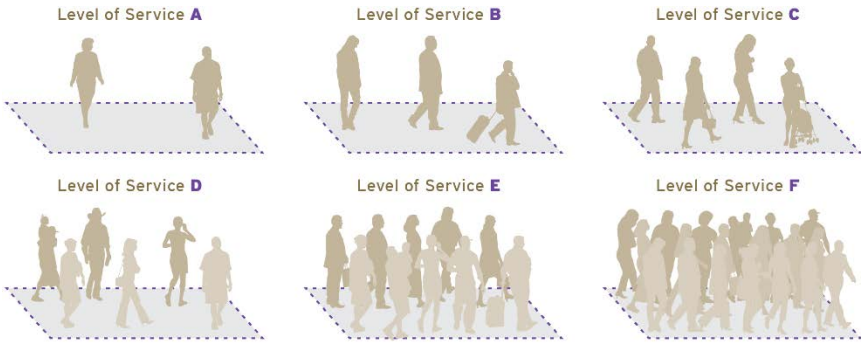
Non-revenue train movements are dispatched with the same precision as revenue train movements. This is a critical piece of the overall operations of South Station because non-revenue trains must pass through Tower 1 Interlocking. Given the constraints of the existing terminal infrastructure, including both the limited number of platforms and the approach interlockings at Cove, Broad, and Tower 1, balancing competing revenue and non-revenue movements can impact operational performance on a daily basis. For example, non-revenue yard movements from the lower numbered tracks at the westerly side of the terminal must crossover to the Fairmount Line that provides access to Amtrak's Southampton Street Yard and Readville Yard, the MBTA's primary layover facilities. These crossover moves cut off access to most of the South Station platforms, obstructing operations on the NEC into the terminal. As Amtrak and MBTA commuter train volumes increase, these conflicting movements will increasingly hinder operations within the existing infrastructure. Revenue trains will be competing not only for limited capacity and terminal track space, but also with non-revenue trains moving between the terminal and layover yards.

As South Station has two approach routes, increasing the layovers to the west of the terminal, instead of solely to the south, would make railroad operations at South Station more efficient and better able to accommodate future service growth. By creating a situation with such a split layover facility, operations would be improved by keeping trains to one side of the terminal or the other.

2.3.3. Inadequate Station Facilities

Pedestrian platform, circulation, and waiting areas for transit and rail facilities should be designed to provide a reasonable level of service (LOS) for passengers and other station visitors.[24] South Station headhouse facilities do not adequately support current and future passenger service needs. Morning and evening peak 15 minute passenger demand typically is used to assess the performance of existing and proposed stations during peak period train boarding and alighting. LOS C would allow for freely selected walking speeds, with passing possible in unidirectional streams and only minor conflicts resulting from reverse or cross movement. Currently, the South Station headhouse facilities are unable to adequately support passenger service needs. The limited space often results in uncomfortable conditions.

Poor Passenger Level of Service



The passenger waiting area and circulation zone within the existing South Station headhouse constitutes a net area of approximately 15,000 square feet (sf). It is inadequately sized and configured to accommodate the daily demand of approximately 46,000 Amtrak and Commuter Rail passenger trips and 82,000 intercity/local bus and subway passenger trips. The lack of space results in a poor passenger experience of LOS E in the existing headhouse and LOS F on some platforms, which occurs for short amounts of time during peak period train boarding and alighting. LOS E/F results in reduced walking speeds, restricted passing, and intermittent stopping, and it approaches the maximum occupant capacity of the walkway.

[24] Levels of service (LOS) for pedestrian flow and queuing range from LOS A (no crowding) to LOS F (extreme crowding).

The concourse configuration forces passenger queues to overlap and could utilize improved connections between intercity rail, commuter rail, bus service, and transit service. In addition, many of the current passenger amenities at South Station are obsolete and do not meet the standards for a major, modern, high-speed rail passenger transit facility.

Platform Deficiencies

Last upgraded approximately 30 years ago, the station platforms do not comply with modern design standards, including MassDOT's current standard island platform requirements. The station's platforms are exposed to the elements, forcing riders to walk through rain, snow, and extreme temperatures to reach their trains. Existing platform lengths do not meet the MBTA's and Amtrak's future berthing requirements to accommodate longer trainsets needed to meet future demand. The MBTA anticipates using eight-car trainsets to accommodate projected future growth. Amtrak has yet to determine the size of their trains in the future, but is confident that the trainset size will be longer than that which currently services South Station. For the most part, the existing platforms have adequate area to provide a LOS D with an occupant load of only one MBTA commuter rail bi-level coach trainset of eight cars, but the service declines sharply when concurrent train arrivals occur on the same platform. Additionally, upgrades are required to stay current with Americans with Disabilities Act (ADA) and life safety regulations, including emergency egress considerations.

Ability to Accommodate Increased Ridership

To accommodate the increase in passengers associated with Amtrak's and the MBTA's future service increases, MassDOT established an overall goal of LOS C for the South Station public circulation and waiting areas. MassDOT established a corresponding goal for station platforms of LOS D.

To remedy the existing public space deficit and to accommodate the future increase in service, additional platform, public circulation, and waiting area space in close proximity to the platforms is required. Passenger support facilities are needed to update South Station to a first-class rail transportation hub comparable to a modern airport, enabling large numbers of people to travel with a level of comfort that is expected in a modern city. These passenger-focused facilities will include comfortable seating and generous waiting space, vertical circulation with direct access to track level, numerous monitor screens providing up-to-the minute arrival and departure information, quality food and beverage options, as well as retail and entertainment offerings. Platform improvements will include wider, longer, resurfaced platforms incorporating emergency egress requirements. The ability of South Station to meet passenger needs and comfort expectations associated with a modern intermodal and multimodal transportation center is paramount to ensuring that rail travel along the NEC remains a viable and attractive alternative to air and automobile travel.

2.4. Performance Objectives

To evaluate the SSX project alternatives, MassDOT developed four measurable performance objectives directly related to the SSX project purpose and needs. Additionally, MassDOT evaluated the SSX project alternatives relative to potential environmental impacts.

2.4.1. Meet 95% on-time performance and minimize delays

Consistent with the current Amtrak and MBTA service delivery policy goals, MassDOT established a goal of 95% OTP for trains arriving at the Boston South Station complex, which includes the South Station platforms, Tower 1 Interlocking, and the Cove and Broad interlockings. Additionally, while there is not a defined metric by which to benchmark service delays, it is the intent of this project to minimize

service delays to the greatest extent possible with operational improvements. Provide sufficient track and platform capacity.

By the year 2035, 554 daily train movements are anticipated at South Station, consisting of 80 weekday Amtrak revenue trips, up to 315 weekday MBTA commuter rail revenue trips, and 159 Amtrak and MBTA non-revenue trips. To accommodate the 2035 operating plan, MassDOT determined that terminal expansion to 20 tracks is needed. Simulation tests showed that 20 station tracks represent the appropriate number for an expanded station, taking into account Amtrak's and the MBTA's future service plans and geographic constraints of Tower 1 Interlocking. A new station with 20 tracks provides the appropriate size to allow train volumes to pass through the constrained Tower 1 Interlocking.[25] MassDOT established platform capacity requirements to accommodate Amtrak's future berthing requirement of 1,050 feet and the MBTA's future berthing requirement of 850 feet.

2.4.2. Provide adequate vehicle layover capacity

MassDOT determined the amount and location of required vehicle layover capacity according to Amtrak's and the MBTA's layover facility program needs and railroad operational requirements. The MBTA requires immediate daytime layover space for six additional trainsets and 2035 daytime layover space for 21 additional trainsets. Amtrak's current and future daytime and overnight layover needs are accommodated by its existing facilities. To optimize the efficiency of railroad operations, MassDOT established a goal of locating 60% of vehicle layover to the west of South Station and locating 40% of vehicle layover to the south of South Station.

2.4.3. Accommodate passenger service needs

To create a comfortable and contemporary transportation facility, MassDOT established an overall goal of LOS C to accommodate passengers of the South Station public circulation and waiting areas. MassDOT established a corresponding goal for station platforms of LOS D. These goals are typically established for a facility of this type as they safely and conveniently accommodate passengers during peak times, while not being oversized for the non-peak times.

2.5. Other Transportation-related Goals

While the purpose of the SSX project is to expand Boston South Station Terminal capacity and related layover capacity, the project also supports other broad-based transportation, community, and economic development goals of the NEC, the Boston metropolitan region, and the City of Boston.

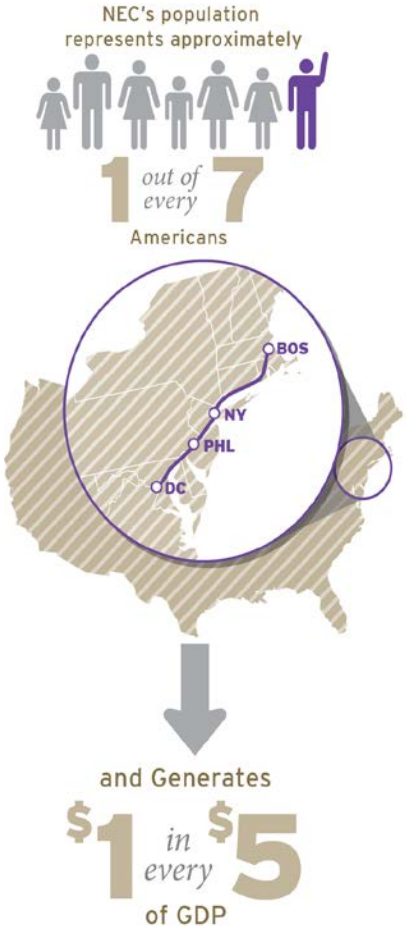
2.5.1. Support regional and local economic development

The NEC's population, 51 million people,[26] represents approximately one in every seven Americans; jobs in the NEC region account for approximately one out of every five jobs in the United States.[27] The NEC region is forecast to grow substantially, from approximately 51 million residents in 2010 to 58 million residents in 2040, representing a 14% growth over 30 years. Currently, the NEC region generates

[25] Massachusetts Department of Transportation, *Massachusetts Department of Transportation Boston South Station HSIPR Expansion Project, Technical Memorandum: Network Simulation Analysis of Proposed 2030 MBTA/Amtrak Operations at South Station*. Final Report. August 1, 2010. http://www.massdot.state.ma.us/Portals/25/Docs/FRA_HSIPR/Appendix_A1.pdf.
[26] Northeast Corridor Commission. *The Northeast Corridor and the American Economy*. Accessed April 2014. http://www.nec-commission.com/wp-content/uploads/2014/02/NEC_american_economy_report.pdf.
[27] Northeast Corridor Infrastructure and Operations Advisory Commission. *State of the Northeast Corridor Region Transportation System.* February 2014.

approximately $1 in every $5 of gross domestic product (GDP). By 2040, the region's GDP is expected to more than double to over $7 trillion.[28]

At a regional level, the SSX project would meet a critical infrastructure need of the NEC and a regional goal of building capacity for growth in passenger railroad infrastructure. Travel demand in the NEC region is expected to grow faster than the 14% population growth rate. Ridership on Amtrak's NEC services is projected to increase from 13 million in 2010 to 23 million in 2030.[29] With capacity nearly or fully consumed, however, the rail system's ability to absorb future demand is limited. By expanding capacity at South Station, the SSX project would address a long-standing, previously identified chokepoint on the NEC.



At a local level, South Station is viewed as a key gateway linking downtown Boston and the emerging South Boston Waterfront/ Innovation District. The South Boston Waterfront/Innovation District is one of the fastest growing neighborhoods in the City of Boston, and in 2010, the City re-branded the area as the Innovation District to attract research-based, innovative companies, and mixed-use residential and commercial development. According to the *Fort Point District 100 Acres Master Plan*, an expanded South Station is an essential component of the continued growth and expansion of the District. Without the addition of tracks at South Station, the *100 Acres Master Plan* does not recommend a full "build-out" of the South Boston Waterfront/Innovation District area.[30]

While first and foremost a transportation facility, an expanded South Station would be designed and constructed to maximize the potential for development of adjacent land and airspace. The anticipated development would generate direct and indirect economic development in a balanced approach, by creating a transit-oriented, mixed-use district with the potential to make South Station a retail and commercial destination.

2.5.2. Improve and expand Boston's intermodal and multimodal transportation network

South Station is a critical piece of transportation infrastructure for the City of Boston and the Boston metropolitan area, and is Boston's busiest intermodal and multimodal transportation hub. In addition to providing Amtrak and MBTA commuter rail service, and MBTA rapid transit and fixed-route bus service, South Station is a portal for private carrier bus service. South Station currently handles approximately 128,000 daily combined Amtrak, MBTA, and intercity bus boardings and alightings.[31] The South Station Bus Terminal, located adjacent to the Rail Terminal, is a hub for intercity, regional, and local bus service in eastern Massachusetts. There are 10 MBTA bus routes that stop in the vicinity of South Station. Eleven private bus companies operate out of the terminal; of these bus companies, five companies provide

[28]Federal Railroad Administration. *NEC Future, NEC Facts and Figures*. Accessed August 22, 2013. http://www.necfuture.com/facts_figures/.
[29] Northeast Corridor Commission. *The Northeast Corridor and the American Economy*. Accessed April 2014. http://www.nec-commission.com/wp-content/uploads/2014/02/NEC_american_economy_report.pdf.
[30] Boston Redevelopment Authority with Fort Point Channel Working Group. *The Fort Point District 100 Acres Master Plan*. September 2006. http://www.bostonredevelopmentauthority.org/getattachment/0a9d9d1c-9906-4a26-b94e-35762ad08c07.
[31] Existing year combined South Station boardings and alightings, 2012; See Appendix 9 - *Ridership Forecasting Technical Report*.

commuter service between South Station and the Greater Boston metropolitan area, and six companies provide regional service to New England and points beyond. On an average weekday, there are approximately 590 combined bus departures and arrivals at the terminal, serving approximately 12,200 daily Bus Terminal passengers.[32] South Station also has facilities to accommodate bicyclists, pedestrians, and taxi cab patrons. Hubway's South Station location has experienced a notable increase in use, increasing from approximately 4,000 trips in August 2011 to approximately 8,200 trips in August 2013, an increase of over 100%. Additionally, there are approximately 950 taxicab pickups/drop offs on Atlantic Avenue at South Station each weekday.

The SSX project would enhance and expand the existing intermodal and multimodal transportation network. By increasing the rail capacity of South Station, the SSX project would directly support increased transit use for local and intercity travel. Currently, there is not a direct connection between the existing South Station headhouse and the South Station Bus Terminal. With a proposed expanded Rail Terminal and passenger concourse area, opportunities exist with both the SSX project and the SSAR project to improve the interconnections between the two terminals, as well as with the MBTA Red and Silver Lines.

By reconnecting Dorchester Avenue to Summer Street as a public way, the SSX project would restore Dorchester Avenue for public and station access. Improvements to Dorchester Avenue would include enhanced pedestrian and bicycle connections and facilities, including sidewalks, crosswalks, and bicycle lanes; and expanded bicycle access through and around South Station and its adjacent neighborhoods. Reopening Dorchester Avenue would provide the MBTA with an opportunity to reroute buses to provide more direct connections to downtown, and would provide relief for the current congestion along Atlantic Avenue.

2.5.3. Extend the Harborwalk and reactivate the Fort Point Channel area

Not only would the SSX project add approximately 2,500 linear feet to the Harborwalk and complete the last remaining gap in a continuous waterfront walkway in this part of downtown Boston, but it also would provide linkages to the waterfront from neighborhoods around South Station, including Chinatown and the Leather District. The SSX project would increase the amount of water-dependent uses and the public's access to tidelands by more than one acre, a public benefit goal of Chapter 91, the Commonwealth's Waterways program. By providing South Station users as well as the general public with direct access to Fort Point Channel via an extended Harborwalk, the SSX project would advance an objective of the *Fort Point Channel Watersheet Activation Plan* to enhance "the civic role" of Fort Point Channel.[33] Further, direct access to the Fort Point Channel waterfront would present opportunities to expand the multimodal network in the South Station area to include water travel.

2.6. Consistency with Planning

The proposed expansion of Boston South Station has long been considered in federal, state, regional, and local planning. This section identifies recent key federal, state, regional, and local planning documents that cite the need for the SSX project, dating back to 2002. The SSX project is consistent with these planning documents.

[32] Central Transportation Planning Staff. *Massachusetts Regional Bus Study,* June 2013.
[33] Boston Redevelopment Authority. *Fort Point Channel Watersheet Activation Plan.* May 2002.

2.6.1. Federal Planning

The Federal Railroad Administration (FRA) is currently working with Northeast Corridor stakeholders to develop a long-range, integrated investment plan for the NEC between Washington, D.C., and Boston, Massachusetts. This planning effort, NEC FUTURE, was initiated in early 2012 and is expected to be concluded in late 2016. The purpose of the NEC FUTURE program is to evaluate means of upgrading aging infrastructure and improving the reliability, capacity, connectivity, performance, and resiliency of passenger rail service on the NEC for both intercity and regional trips, while promoting environmental sustainability and economic growth. NEC FUTURE includes the identification and analysis of a broad program of service and infrastructure improvements that will be documented in a Tier 1 Environmental Impact Statement (Tier 1 EIS) and a Service Development Plan (SDP). The FRA is advancing the NEC FUTURE program concurrent and in coordination with the South Station Expansion project.

In 2013, the NEC Infrastructure and Operations Advisory Commission released *Critical Infrastructure Needs on the Northeast Corridor*, which cites the expansion of Boston's South Station as one of the critical infrastructure needs of the NEC.

In 2010, the NEC Master Plan Working Group released *The Northeast Corridor Infrastructure Master Plan*, which identifies two capital programs needed to address congestion/capacity needs in the Northeast Corridor: Boston South Station Track Capacity Improvements, adding up to six station tracks; and Boston New Layover Yard Facility, location to be determined.

2.6.2. State Planning

As part of the MBTA's current *FY2015 — FY2019 Capital Investment Program (CIP)*, the South Station Postal site acquisition has been identified as a state funded project to facilitate the relocation of the U.S. Postal Service General Mail Facility located on Dorchester Avenue and create an appropriate adjacent site for expanding South Station.

MassDOT's *FY2014 to FY2018 Capital Investment Program* (CIP) identifies funding to continue the long term process of expanding South Station to accommodate future passenger rail growth for the existing commuter rail system. As the project continues through environmental and design permitting over the next five years, MassDOT will be advancing public/private partnerships opportunities to fund remaining project costs.

In May 2014, MassDOT released *weMove Massachusetts:* Planning for Performance, the Commonwealth of Massachusetts' 2040 Long-Range Transportation Plan, which states that the Patrick Administration has identified high-priority projects for both roads and transit that will make improvements to the region for access to job and opportunities. The South Station Expansion project was cited among these projects.

In 2013, MassDOT released *The Way Forward: A 21st Century Transportation Plan*, which identifies South Station Expansion as a project that is instrumental in "unlocking economic growth in the Commonwealth."

In 2010, MassDOT released the *Department of Transportation Freight Plan*, which identifies yard capacity at South Station, as a constraint to be addressed in order to support major planned service expansions, such as South Coast Rail, Inland Route, and Acela trips.

In 2010, MassDOT released the *Massachusetts State Rail Plan*, which calls for the expansion of South Station to foster the growth in high-speed and other intercity service throughout the Northeast, as well as

improve service to the southern communities along the MBTA Commuter Rail line and allow for planned growth.

2.6.3. Regional Planning

In 2013, the Boston Region Metropolitan Planning Organization (MPO) adopted its current Long-Range Transportation Plan (RTP), *Paths to a Sustainable Future*, Amendment 3. The primary reason for Amendment Three was to include in the RTP additional projects receiving federal funds for projects to be designed and constructed in the Boston Region MPO. This amendment provided consistency between the RTP and the Federal Fiscal Years 2014–17 Transportation Improvement Program. The expansion of South Station, funded by the FRA, was one of the projects identified in this amendment.

In 2009, the MBTA released the *Program for Mass Transportation (PMT)*, which cites capacity problems at South Station as a transit improvement challenge: The PMT states that "South Station is steadily approaching the point at which it will not be able to accommodate additional peak-period trains."

In 2008, MAPC released *MetroFuture: Making a Greater Boston Region*, which notes that "limited station capacity at North and South Stations and limited track capacity leading to those stations reduces the potential for reverse commuter service, express service, or more frequent service." MAPC recommends that the region take steps to enhance the commuter rail system, including "expansion of commuter rail capacity at South Station."

In 2007, *Journey to 2030*, the Regional Transportation Plan of the Boston MPO was released, which includes the South Station Track Capacity Expansion and the Midday and Overnight Layover Facilities as Illustrative Projects that would help the MBTA commuter rail system to operate more efficiently and allow for expansion of various commuter lines in the future.

2.6.4. Local Planning

The City of Boston *Crossroads Initiative* is an ongoing plan to redesign a dozen major streets in Downtown Boston which link neighborhoods on either side of the Rose Kennedy Greenway. Streets important to SSX development include Summer Street and Congress Street although targeted sections for these streets are south of the Fort Point Channel. The initiative extends streetscape design for Summer Street adjacent to SSX to the south side of the Fort Point Channel.

In 2014, at the request of MassDOT, the City of Boston initiated a master planning process for the South Station/USPS area, which is located within the Fort Point Downtown Waterfront Municipal Harbor Planning Area. The Boston Redevelopment Authority's (BRA's) goals for the Master Plan are to coordinate major public and private planning and development, and prepare a comprehensive, long-range plan for land use, multi-modal transportation, urban design and the public realm. Through the master planning process, the BRA will propose development guidelines to advance an amendment to the Fort Point Downtown Phase 2 Municipal Harbor Plan (MHP), as well as provide zoning recommendations for the South Station site.

In 2010, the BRA released the *Chinatown Master Plan*, which cites the importance of a connection between Chinatown and South Station, including land bridges and wayfinding signs and maps to South Station.

In May 2009, the BRA released the *South Boston Waterfront District Municipal Harbor Plan (MHP)/ South Boston Waterfront District Municipal Harbor Plan Amendment* which recommends: creating high-quality pedestrian and bicycle access to address the long term needs of maximizing public transit in the

South Boston Waterfront and citywide; integrating Central Artery/Tunnel Project mitigations, such as the Harborwalk, water transportation facilities in the Channel, new parks and open spaces, seawall, etc.; enhancing visual and physical access to and along the waterfront for recreation, commerce, and other lawful purposes; providing landside support to an activated watersheet; and providing universal access to the waterfront.

In 2006, the BRA released the *Fort Point District 100 Acres Plan*, which concludes that without new infrastructure investments, such as additional tracks at South Station, only two-thirds of the proposed full build-out for the entire South Boston Waterfront/Innovation District should be allowed.

In 2004, the BRA and the Massachusetts Turnpike Authority released the *South Bay Planning Study, Phase I Report*, which recommends maximizing connections between South Bay and South Station via direct pedestrian connections to the southern end of South Station, potential shuttle and other transit services via the ramps connecting South Station, as well as infrastructure for bicycle commuting.

In 2002, the BRA released *Fort Point Channel Watersheet Activation Plan*, which cites the importance of enhancing "the civic role of the channel in connecting to other public venues, such as ...South Station," via redeveloping the USPS property and strengthening pedestrian links between South Station and the Channel.

In May 2002, the BRA submitted Phase I of the Fort Point Channel Downtown MHP and in September 2003, the BRA submitted Phase II of the Fort Point Channel Downtown MHP. The South Station site is located within the Fort Point Downtown Waterfront Municipal Harbor Planning Area. Phase 1 established the planning area boundaries and outlined basic planning principles for the 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 Plan seeking modifications to any Chapter 91 baseline requirements. 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 Phase 2 approval decision anticipates the preparation of a Phase 3 MHP focusing on the South Station expansion and reuse of the existing USPS facility. The BRA has initiated the South Station master planning process, and coordination with the SSX project is ongoing.

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