SOUTH STATION
EXPANSION

South Station Expansion Project

Appendix 9 (Part 4) – Transit Capacity Analysis Technical Report

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massDOT
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1. Introduction

The Massachusetts Department of Transportation (MassDOT), the Massachusetts Bay Transportation Authority (MBTA), and the National Railroad Passenger Corporation (Amtrak) have for decades identified the expansion of rail capacity at Boston South Station as a crucial transportation need, one that has been articulated in multiple local, regional, state, and Northeast Corridor (NEC)-wide planning documents.[1] In cooperation with the Federal Railroad Administration (FRA), Amtrak, and the MBTA, MassDOT is now pursuing the expansion of South Station to support existing NEC and commuter rail services and to provide for future Amtrak and MBTA service expansions. The current track capacity, layout, and operations of South Station limit the ability to accommodate expanded services. In addition to expanding South Station terminal facilities, the South Station Expansion (SSX) project will also identify a solution to address existing and future intercity and commuter rail service layover needs. The SSX project includes planning, environmental reviews, and preliminary engineering for the five primary elements of the project:

1. **Expand the South Station terminal facilities**, including the addition of up to seven tracks and four platforms and construction of a new passenger concourse and other amenities.
2. **Acquire and demolish the U.S. Postal Service (USPS) General Mail Facility** located on Dorchester Avenue adjacent to South Station, which would provide an approximate 14-acre site on which to expand South Station. (Note that the relocation of the USPS facility will be the subject of a separate environmental review process by others.) Dorchester Avenue would be restored for public and station access.
3. **Create an extension of the Harborwalk along reopened Dorchester Avenue.**
4. **Provide for the possibility of future joint public/private development** adjacent to and over an expanded South Station.
5. **Provide adequate rail vehicle layover space** to address existing and future intercity and commuter rail service needs.

This Transit Capacity Analysis Technical Report has been prepared in support of the Draft Environmental Impact Report (Draft EIR) and Environmental Assessment (EA) for the SSX project, in accordance with the Certificate of the Secretary of the Office of Energy and Environmental Affairs (EEA) on the Environmental Notification Form (ENF) for the SSX project (April 19, 2013), the Massachusetts Environmental Policy Act (MEPA) regulations, 301 CMR 11.00 (revised, May 10, 2013), and FRA's Procedures for Considering Environmental Impacts, 64 Federal Register (FR) 101 (26 May 1999), pp. 28545-28556.

1.1. Purpose

The purpose of this report is to document how the predicted increase in ridership at South Station due to the proposed Build Alternatives would impact future capacity on the MBTA's commuter rail, rapid transit, and local bus routes. In addition, this analysis evaluates how 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 subway system (i.e., Park Street, Downtown Crossing, State Street and

[1] Documents citing the need for an expanded South Station include: *Critical Infrastructure Needs on the Northeast Corridor* (2013), *The Northeast Corridor Infrastructure Master Plan* (2010); *The Amtrak Vision for High-Speed Rail in the Northeast Corridor* (2010), *A Vision for the Northeast Corridor* (2012), the Massachusetts Department of Transportation *Rail Plan* (2010), the Massachusetts Department of Transportation *Freight Plan* (2010), and the two most recent long range transportation plans of the Boston Region Metropolitan Planning Organization (2007, 2011).

Government Center). Mitigation measures that would reduce or avoid significant negative impacts to the transit system resulting from the project Build Alternatives are also presented.

2. Summary of Findings

In the 2035 Build Year, South Station would handle ridership increases of up to 18,000 commuter rail, 5,000 Red Line, 3,800 Amtrak, 1,100 Silver Line, and 200 local bus boardings and alightings per day due to the Build Alternatives.[2] To determine the impact of project-related ridership increases on the greater MBTA system, vehicle loading on MBTA public transportation lines that directly serve South Station and major connecting rapid transit services was analyzed. Additionally, the impact of ridership increases on station capacity was investigated for South Station and the following stations in the downtown core which serve as major transfer points: Park Street, Downtown Crossing, Government Center, and State Street.

The transit capacity analysis was based on existing ridership data supplied by the MBTA as well as 2012 Existing Year conditions and 2035 Build Year travel demand forecasts developed and provided by the Central Transportation Planning Staff (CTPS). Appendix 9 - *Ridership Forecasting Technical Report* provides a detailed description of the methodology and assumptions used to prepare travel demand forecasts for the SSX project.

Projected ridership demands were compared to available vehicle capacities as defined by MBTA policy for acceptable levels of crowding. Increases in pedestrian activity on station infrastructure, such as platforms, were calculated for the 2035 Build Year alternatives. The station capacity analysis for South Station also included a detailed pedestrian level-of-service (LOS)[3] analysis on the MBTA's commuter rail and rapid transit facilities at the station, including platforms, waiting areas and vertical circulation elements.

Findings of the transit vehicle loading analysis indicate that none of the Build Alternatives would result in crowding impacts to rapid transit or local bus lines that exceed the maximum load capacity as defined in the MBTA's *Service Delivery Policy* (the *Policy*) more than impacts resulting in the No Build Alternative. With the Build Alternatives, SSX project-related ridership increases at stations in the downtown core (Park Street, Downtown Crossing, Government Center and State Street) would be imperceptible from ridership in the No Build Alternative. 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 and a 3% to 6% increase in Red Line platform activity.

For commuter rail, 2035 Build Alternative passenger loading on the outbound Canton/Stoughton/South Coast Rail Line is projected to exceed the MBTA *Policy's* acceptable level of crowding during the peak evening hour. To address capacity constraints that would occur during the peak hour, adjustments to train schedules could be made that would shift peak period trains into the peak hour.

The detailed analysis of pedestrian LOS at South Station, provided in Appendix 9 - *Pedestrian Circulation Analysis Technical Report*, was conducted for Existing Conditions, the 2035 No Build Alternative, and 2035 Alternative 3 (Joint/Private Development Maximum Build). The analysis results indicate that Alternative 3 would result in a poor LOS (LOS E/F) on the existing at-grade commuter and intercity rail platforms. Passengers waiting within the area adjacent to the existing platforms in Alternative 3 would also experience a poor LOS (LOS E/F). LOS on vertical circulation elements in Alternative 3 would be slightly worse as compared to the No Build Alternative. Despite this reduction, an

[2] Ridership increases as compared to the 2035 No Build Alternative.

[3] LOS is a qualitative measure used to characterize the operating conditions of a pedestrian space as perceived by its users, with designations ranging from LOS A (best, free-flowing conditions) to LOS F (worst, unstable conditions resulting in unavoidable contact with other pedestrians).

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, but still acceptable, LOS on the Red Line and Silver Line platforms.

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.

3. Regulatory Context

FRA's *Procedures for Considering Environmental Impacts* [4] (64 Federal Register [FR] 28545 [May 26, 1999] and 78 FR 2713 [January 14, 2013]) requires an assessment of "the impacts on both passenger and freight transportation, by all modes, from local, regional, national and international perspectives." Additionally, the Secretary's Certificate on the ENF requires that the SSX project DEIR include an analysis of "how the predicted increase in rail ridership and changes to operations will impact existing and future capacity on MBTA subway and bus routes." The ENF also requires an evaluation of how ridership increases would affect station and platform capacities "both within South Station and at key stations within the downtown core of the MBTA subway system (i.e., Park Street, Downtown Crossing, State Street and Government Center)."

This report has been prepared to support federal and state environmental permitting documentation for the project and has been developed in accordance with the National Environmental Policy Act of 1969 (NEPA), FRA's *Procedures for Considering Environmental Impacts*, and MEPA.

4. Methodology

This section presents the methodology and assumptions used to identify the impacts of the Build Alternatives on public transportation vehicle crowding and station infrastructure crowding for core stations on the MBTA rapid transit system.

The methodology was developed using transit planning principles from the most recent edition of the *Transit Capacity and Quality of Service Manual* [5] and service standards from the MBTA's *Service Delivery Policy (*the *Policy).* [6] Much of the analysis was based on existing conditions data supplied by the MBTA[7] (Fall 2012 passenger counts) as well as 2012 Existing Year conditions and 2035 Build Year travel demand forecasts developed and provided by CTPS.

[4] Federal Railroad Administration. *Procedures for Considering Environmental Impacts*. Federal Register Vol. 64, No. 101. May 1999. http://www.fra.dot.gov/eLib/details/L02561.
[5] Transportation Research Board. *Transit Cooperative Research Program (TCRP) Report 165. Transit Capacity and Quality of Service Manual, Third Edition*. 2013. http://www.trb.org/Publications/Blurbs/169437.aspx.
[6] 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.
[7] MBTA ridership counts provided by Greg Strangeways, Fall 2012.

4.1. Transit Vehicle Loading Analysis

The MBTA's *Policy* states that its purpose is "to ensure that the MBTA provides quality transit services that meet the needs of the riding public," which is consistent with the MBTA's enabling legislation and other external mandates. Vehicle load standards, as detailed in the *Policy*, define the levels of crowding that are acceptable by time period and mode of transportation.

The *Policy* outlines weekday time periods of service for vehicle loading standards, as shown in Table 1.

Table 1—MBTA Service Delivery Policy Weekday Time Period Definitions

Time Period	MBTA Policy Definition
Early AM	6:00 a.m. – 6:59 a.m.
AM Peak	7:00 a.m. – 8:59 a.m.
Midday Base	9:00 a.m. – 1:29 p.m.
Midday School	1:30 p.m. – 3:59 p.m.
PM Peak	4:00 p.m. – 6:29 p.m.
Evening	6:30 p.m. – 9:59 p.m.
Late Evening	10:00 p.m. – 11:59 p.m.
Night/Sunrise	12:00 a.m. – 5:59 a.m.

Source: MBTA. *Service Delivery Policy*. 2010.

As presented in Table 2, to compare current MBTA vehicle loading to the *Policy* using existing ridership estimates, which consist of hourly data supplied by the MBTA,[8] the time period definitions were rounded to the nearest hour for purposes of this analysis.

Table 2—Revised MBTA Weekday Time Period Definitions

Time Period	MBTA Policy Definition	Revised Definition for Analysis Purposes
Midday Base	9:00 a.m. – 1:29 p.m.	9:00 a.m. – 12:59 p.m.
Midday School	1:30 p.m. – 3:59 p.m.	1:00 p.m. – 3:59 p.m.
PM Peak	4:00 p.m. – 6:29 p.m.	4:00 p.m. – 6:59 p.m.
Evening	6:30 p.m. – 9:59 p.m.	7:00 p.m. – 9:59 p.m.

Source: MBTA. *Service Delivery Policy*. 2010.

The *Policy* vehicle load standards used in this analysis are summarized in Table 3 by mode and time period. It is important to note that the vehicle load standards represent average maximum loads over the particular time period, expressed on a per-car basis. Because the vehicle load standards represent averages, depending on scheduling constraints and passenger peaking characteristics (including the different loadings among individual cars on a train), it is possible for some individual trips or vehicles to exceed the vehicle load criteria, even though the average load may comply with the *Policy* standards. It is also important to note that the capacity analyzed per the MBTA vehicle load standard is not the absolute maximum capacity; rather, it is a conservative interpretation based on the MBTA's *Policy*. The absolute maximum number of passengers on a transit vehicle (also referred to by the MBTA as "crush capacity") is greater than the vehicle load standards dictated by the MBTA's *Policy*.

[8] MBTA ridership counts provided by Greg Strangeways, Fall 2012. Figures 2 through 13 compare existing Red Line and Silver Line vehicle loading to the *Policy* standards.

Table 3—MBTA Service Delivery Policy Weekday Vehicle Load Standards

Mode	Time Period	MBTA Policy Vehicle Load (Passengers/ Seats)
Bus	Early AM, AM Peak, Midday School & PM Peak	140%
	Midday Base, Evening, Late Evening, Night/Sunrise (Surface Routes)	100%
	Midday Base, Evening, Late Evening, Night/Sunrise (Tunnel portions of BRT routes)	140%
Green Line	Early AM, AM Peak, Midday School & PM Peak	225%
	Midday Base, Evening, Late Evening, Night/Sunrise (Core Area)	140%
	Midday Base, Evening, Late Evening, Night/Sunrise (Surface)	100%
Red Line (#1 & 2 Cars)	Early AM, AM Peak, Midday School & PM Peak	270%
	Midday Base, Evening, Late Evening, Night/Sunrise (Core Area)	140%
	Midday Base, Evening, Late Evening, Night/Sunrise (Outside Core Area)	100%
Orange Line	Early AM, AM Peak, Midday School & PM Peak	225%
	Midday Base, Evening, Late Evening, Night/Sunrise (Core Area)	140%
	Midday Base, Evening, Late Evening, Night/Sunrise (Outside Core Area)	100%
Blue Line	Early AM, AM Peak, Midday School & PM Peak	225%
	Midday Base, Evening, Late Evening, Night/Sunrise (Core Area)	140%
	Midday Base, Evening, Late Evening, Night/Sunrise (Outside Core Area)	100%
Commuter Rail	Early AM, AM Peak, Midday School & PM Peak	110%
	Midday Base, Evening, Late Evening, Night/Sunrise	100%

Source: MBTA. Service *Delivery Policy.* 2010.

As indicated in Table 3, for light and heavy rail transit services, off-peak load standards are defined based on core area boundaries. The core area boundaries are defined as all underground stations, as well as Lechmere and Science Park, on the Green Line; Kendall to South Station on the Red Line; Back Bay to North Station on the Orange Line; and Bowdoin to Maverick on the Blue Line. Figure 1 presents an MBTA system map.

Tabular summaries of capacity, demand, and the associated volume-to-capacity (V/C) ratios for the commuter rail, rapid transit and local bus routes evaluated as part of the SSX project transit vehicle loading analysis were prepared by CTPS and are provided in Attachment K. Further description of the methodology and assumptions used in the vehicle loading analysis for each transit mode is presented in the following sections.

4.1.1. Commuter Rail

For purposes of the commuter rail vehicle loading analysis, the SSX project study area is defined as the Peak Load Point (the location of maximum utilization of a transit line, or the station-to-station segment with the highest passenger loads) on each commuter rail line that directly serves South Station (all south side lines). By analyzing the passenger loads at the highest demand segments, and confirming that there is available capacity, it would stand to reason that there is excess capacity on the remainder of the south side system.

For each south side commuter rail line, the inbound and outbound Peak Load Points during the morning (AM) and evening (PM) peak periods were identified as an initial step. The Peak Load Points, and their associated projected passenger volumes, were identified from the CTPS travel demand model for the 2035 No Build and 2035 Build Alternatives. Peak period passenger volumes were then factored for the peak hour, when the highest ridership occurs. The peak hour/peak period ratios were developed for each commuter rail line and direction from the 2012 MBTA Commuter Rail Passenger Counts. The peak hour passenger demands were then compared to the system capacity using the MBTA's *Policy* vehicle load standards.

Based on the proposed 2035 Build Year commuter rail service average operating headways[9] for each line and direction, the number of trainsets in service during the AM and PM peak hours was estimated. Eight car trainsets were assumed for all commuter rail lines. Car seated capacities equal to 185 were used for the analysis of each commuter rail line, established from the 2014 MBTA *Ridership and Service Statistics* (the "*Blue Book*"),[10] indicating that the seated capacity on each trainset is equal to 1,480 passengers.

The *Policy* stipulates a peak period vehicle load standard of 110% for commuter rail (shown in Table 3). Utilizing this 110% vehicle load standard with the trainset seated capacity and the number of trainsets per peak hour, the *Policy* maximum load capacity for the peak hour was established for each south side commuter rail line. Peak hour maximum load capacities range from 1,628 passengers to 6,512 passengers, depending on the commuter rail line and direction. Attachment K contains the maximum load capacity calculations for each south side commuter rail line.

4.1.2. Rapid Transit

The rapid transit vehicle loading analysis considered the Peak Load Point on each rapid transit line that directly serves South Station as well as major connecting services, including the Red Line.

- Silver Lines 1, 2 and 4
- Silver Line 5 (connection at Downtown Crossing)
- Green Line (connection at Park Street)
- Orange Line (connection at Downtown Crossing)
- Blue Line (connection at Government Center and State Street)

For each rapid transit line analyzed, the Peak Load Points during the AM and PM peak periods were first identified. By analyzing the passenger loads at the highest demand segments, and confirming that there is available capacity, it would stand to reason that there is excess capacity on the remainder of the rapid transit system. The Peak Load Points, and their associated projected passenger volumes, were identified from the CTPS travel demand model for the 2035 No Build and 2035 Build Alternatives. The three hour peak period passenger volumes were then factored to represent the peak one hour, when the highest ridership occurs. A peak hour/peak period ratio of 0.40 was used for all rapid transit lines, based on an historical examination of Boston area rapid transit lines which found that approximately 40% of the three hour peak period travel has consistently occurred during a single peak hour.[11] The peak hour passenger demands were then compared to the system's capacity for handling them, as dictated by the MBTA's *Policy* vehicle load standards.

Based on the proposed 2035 Build Year rapid transit operating headways for each line and direction, which were assumed to equal 2012 Existing Year headways, the number of trainsets in service during the

[9] The headway is the elapsed time between one vehicle and the next traveling in the same direction.
[10] Massachusetts Bay Transportation Authority. *Ridership and Service Statistics, Fourteenth Edition.* 2014. http://www.mbta.com/uploadedfiles/documents/2014%20BLUEBOOK%2014th%20Edition.pdf.
[11] Peak hour/peak period ratio provided by CTPS.

AM and PM peak hours was estimated. The following trainset lengths were assumed for the 2035 Build Year analysis: six car trainsets were assumed for all heavy rail lines, consisting of the Red, Orange and Blue Lines; three car trainsets were assumed for the Green Line (light rail line); and single cars were assumed for the Silver Line bus rapid transit (BRT) service. Rapid transit car seated capacities were established from the 2014 MBTA *Blue Book*. Table 4 presents the car seated capacities and associated trainset seated capacities used for the analysis of each rapid transit line.

Table 4—MBTA Rapid Transit Vehicle Capacities

Rapid Transit Service	Cars/Trainset	Car Seated Capacity	Trainset Seated Capacity
Red Line Heavy Rail	6	62	372
Orange Line Heavy Rail	6	58	348
Blue Line Heavy Rail	6	35	210
Green Line Light Rail	3	46	138
Silver Line Bus Rapid Transit (Waterfront Line)	1	45	45
Silver Line Bus Rapid Transit (Surface Lines)	1	57	57

Source: Car seated capacities were established from the 2014 MBTA *Blue Book.*

Using the vehicle load standards defined in the MBTA's *Policy* (shown in Table 3), with the trainset seated capacity (shown in Table 4) and the number of trainsets per peak hour, the *Policy* maximum load capacity for the peak hour was established for each rapid transit service. Attachment K contains the maximum load capacity calculations for each rapid transit line.

4.1.3. Local Bus

The local bus vehicle loading analysis included an assessment of the MBTA bus stops proximate to South Station along Summer Street at Dorchester Avenue and adjacent to the existing station headhouse. All MBTA bus routes that serve these South Station area stops were analyzed, consisting of local bus routes 4, 7, 11, 448, 449 and 459.

The AM and PM peak period loads arriving to and departing from the South Station bus stops were first identified from the CTPS travel demand model for the 2035 No Build and 2035 Build Alternatives. The greater of the arriving load or the departing load for each route was used to provide a conservative analysis. To determine the peak hour passenger demand from the peak period loads, a peak hour/peak period ratio of 0.40 was assumed for all local bus lines, consistent with the standard system-wide benchmark established from an historical examination of Boston area rapid transit lines.[12] The peak hour passenger demands were then compared to the system's capacity for handling them, as dictated by the MBTA's *Policy* vehicle load standards.

Proposed 2035 Build Year local bus service operating headways for each route and direction were assumed to equal 2012 Existing Year headways. Based on the headways, the number of buses in service during the AM and PM peak hours was estimated. Seating capacity for local buses was established from the 2014 MBTA *Blue Book*, equal to 39 passengers.

The *Policy* stipulates a peak period vehicle load standard of 140% for local buses (shown in Table 3). Utilizing this 140% vehicle load standard with the seated capacity and the number of buses per peak hour, the *Policy* maximum load capacity for the peak hour was established. Attachment K contains the maximum load capacity calculations for each local bus route.

[12] Peak hour/peak period ratio provided by CTPS.

4.2. Core Station Capacity Analysis

For purposes of the core station capacity analysis, the SSX project study areas consist of the rapid transit platforms at South Station and the following key stations within the downtown core of the MBTA subway system: Park Street, Downtown Crossing, State Street and Government Center.

To determine the impacts of the proposed Build Alternatives on station platform crowding, the projected increase in pedestrian platform activity, measured in terms of additional passenger boardings and alightings due to the project Build Alternatives, was calculated. For each core station, the total number of weekday boardings and alightings by rapid transit line in the 2035 Build Year was first estimated from the CTPS travel demand model. The CTPS model simulates typical weekday travel during four time periods (AM Peak, Midday, PM Peak, and Night). Since information on the directional (i.e., northbound versus southbound) ridership distribution was not available from the CTPS model or from CTPS's pedestrian and passenger counts at South Station conducted in 2012-2013, MBTA-supplied data from Fall 2012 was used to establish directional and hourly ridership patterns for purposes of the transit capacity analysis.[13] The CTPS boarding and alighting projections by time period were then converted to directional and hourly projections based on percentages established from the existing passenger count data provided by the MBTA. The MBTA data consisted of one-day passenger counts of hourly boardings and alightings at each station for Thursday, September 20, 2012, which represents typical weekday MBTA service demand. Finally, for each of the Build Alternatives, the projected increase in platform activity as compared to the 2035 No Build Alternative conditions was calculated.

Since overall ridership and associated capacity impacts from the SSX project would be most substantial at South Station, the study area for the South Station capacity analysis extends beyond the rapid transit platforms to also evaluate the demands on commuter and intercity rail platforms, pedestrian circulation infrastructure within the station headhouse, and the rail concourse. Capacity impacts within South Station were analyzed with a detailed pedestrian level-of-service (LOS) evaluation for the 2012 Existing Year, 2035 No Build Alternative, and 2035 Build Alternative 3- the most conservative (worst case) Build Alternative for purposes of the station capacity analysis. A detailed description of the pedestrian LOS analysis methodology, assumptions, and results is presented in Appendix 9 - *Pedestrian Circulation Analysis Technical Report.*

5. Existing Conditions

This section describes the existing commuter rail, rapid transit and local bus services located within and immediately surrounding South Station, as well as the rapid transit lines that connect to South Station. Hours of operation, frequency of service offered,[14] and existing ridership demand are summarized. This section also presents existing passenger activity at major transit stations within the MBTA system's downtown core.

5.1. Commuter Rail Service

South Station is the terminus for the portion of the MBTA commuter rail system that serves central and southeastern Massachusetts. There are eight MBTA commuter rail lines serving South Station, illustrated in Figure 1. Each weekday, South Station serves approximately 42,000 commuter rail passenger boardings and alightings, as presented in Table 5.

[13] MBTA ridership counts provided by Greg Strangeways, Fall 2012. The CTPS pedestrian and passenger counts at South Station were conducted on selected days between November 2012 and January 2013.

[14] Frequency of service refers to the quantity of service on a route, based on the amount of time scheduled between consecutive buses or trains on a given route segment.

Table 5—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 and 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.

The nine commuter rail lines that operate at South Station are as follows:

- **Fairmount Line** runs from the Hyde Park neighborhood of Boston to South Station, with intermediate stops in the Mattapan, Dorchester, and Roxbury neighborhoods. On a typical weekday, there are 364 inbound alightings and 403 outbound passenger boardings at South Station.
- **Framingham/Worcester Line** runs from Worcester to South Station, with intermediate stops in Grafton, Westborough, Southborough, Ashland, Framingham, Natick, Wellesley, Newton, and Boston. On a typical weekday, there are 3,395 inbound alightings and 3,802 outbound boardings at South Station.
- **Franklin Line** runs from Franklin to South Station, with intermediate stops in Norfolk, Walpole, Norwood, Westwood, Dedham, and Boston. Three daily Franklin trips run via the Fairmount Line. On a typical weekday, there are 2,759 inbound alightings and 3,016 outbound boardings at South Station.
- **Greenbush Line** runs from Scituate to South Station, with intermediate stops in Cohasset, Hingham, Weymouth, Quincy, and Boston. On a typical weekday, there are 1,883 inbound alightings and 1,934 outbound boardings at South Station.
- **Kingston/Plymouth Line** runs from Kingston to South Station, with intermediate stops in Plymouth, Halifax, Hanson, Whitman, Abington, Weymouth, and Boston. On a typical weekday, there are 2,468 inbound alightings and 2,385 outbound boardings at South Station.
- **Middleborough/Lakeville Line** runs from Lakeville to South Station, with intermediate stops in Bridgewater, Brockton, Randolph, Quincy, and Boston. On a typical weekday, there are 2,038 inbound alightings and 2,263 outbound boardings at South Station.
- **Needham Line** runs from Needham to South Station, with intermediate stops in both Needham and Boston. On a typical weekday, there are 1,623 inbound alightings and 1,894 outbound boardings at South Station.
- **Providence/Stoughton Line** runs from North Kingstown and Providence, Rhode Island to South Station and from Stoughton to South Station. Trains beginning in North Kingstown, Rhode Island make intermediate stops in Warwick and Providence, Rhode Island; Attleboro, Mansfield, Sharon, Canton, Westwood, and Boston. Trains beginning in Stoughton make intermediate stops in Canton, Westwood and Boston. On a typical weekday, there are 5,412 inbound alightings and 6,075 outbound boardings at South Station.

The minimum weekday span of service for commuter rail is 7:00 a.m. to 10:00 p.m. per the MBTA's *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.[15]

Scheduled commuter rail frequencies vary by route and time of day. Per the *Policy*, the minimum weekday frequency of service for commuter rail is three trips in the peak direction during the AM and PM peak periods, and one trip in each direction every three hours during all other periods.

5.2. Rapid Transit Service

The MBTA's rapid transit system is illustrated in Figure 1 and consists of heavy rail, light rail, and BRT services. The MBTA's heavy rail service consists of the Orange Line, Blue Line, and Red Line. The Orange Line runs from Oak Grove in Malden to Forest Hills, connecting with the Red Line at Downtown Crossing and with the Blue Line at State Street. The Blue Line runs from Wonderland Station in Revere to Bowdoin, connecting with the Orange Line at State Street and the Green Line at Government Center.

The Red Line has two branches that serve South Station, both of which begin at Alewife Station in Cambridge, with one branch to Braintree Station and the other to Ashmont Station. In the vicinity of South Station, the Red Line runs in a tunnel beneath the Fort Point Channel and through Dewey Square, following Summer Street to the Financial District and into Downtown.

The MBTA's light rail service consists of the Mattapan Line, running between Ashmont and Mattapan, and the Green Line, which operates from Lechmere in Cambridge, through Downtown, with four branches that go to Boston College, Cleveland Circle, Riverside, and Heath Street. The Mattapan Line connects with the Red Line heavy rail service at Ashmont Station. The Green Line connects with the Red Line at Park Street in Downtown Boston and with the Orange Line at North Station.

The Silver Line provides BRT service using 60-foot dual mode articulated diesel-electric buses (DMAs) and consists of the following routes:

- **Silver Line 1** provides BRT service from South Station to Logan Airport, with stops in the Seaport District and at the terminals of Logan International Airport. The Silver Line 1 connects with the Red Line and commuter rail services at South Station.
- **Silver Line 2** provides BRT service from South Station to the Design Center in the Boston Marine Industrial Park, with stops in the Seaport District and within the Boston Marine Industrial Park. The Silver Line 2 connects with the Red Line and commuter rail services at South Station.
- **Silver Line 4** provides BRT service from South Station (at Essex Street and Atlantic Avenue, across from the existing station headhouse) to Dudley Square. The Silver Line 4 provides service through Roxbury, the South End, Chinatown and the Leather District. The Silver Line 4 connects with the Red Line and commuter rail services at South Station and with the Orange Line at Tufts Medical Center and Chinatown Station.
- **Silver Line 5** provides BRT service from Downtown Crossing at Temple Place to Dudley Square. The Silver Line 5 provides service through Roxbury, the South End, Chinatown and Downtown Crossing. The Silver Line 5 connects with the Red Line at Downtown Crossing, with the Green Line at Boylston Street Station, and with the Orange Line at Downtown Crossing, Tufts Medical Center and Chinatown Station.

[15] Massachusetts Bay Transportation Authority. *Commuter Rail Maps and Schedules.* Accessed April 2014. http://www.mbta.com/schedules_and_maps/rail/.

Per the MBTA's *Policy*, the minimum weekday span of service for heavy rail and light rail is 6:00 a.m. – midnight. On weekdays, MBTA heavy and light rail services generally operate between the hours of 5:00 a.m. and 1 a.m.[16] According to the MBTA's *Policy*, the minimum weekday span of service for buses, including BRT routes, is 7:00 a.m. to 6:30 p.m. On weekdays, Silver Line service departs South Station as early as 5:40 a.m. and arrives at South Station as late as approximately 12:30 a.m.

Per the *Policy*, the minimum weekday frequency of service for heavy and light rail consists of 10-minute headways[17] in the AM and PM peak periods and 15-minute headways during the rest of the day. Scheduled headways vary by line and time of day. During the peak periods, heavy rail services typically operate on approximately 4.0 to 4.5-minute headways. The Green Line branches converge at Copley Square and operate at a combined headway of less than two minutes during peak periods between Copley Square and Government Center.[18] The minimum weekday frequency of service for BRT consists of 10-minute headways in the AM and PM peak periods and 15 to 20-minute headways during the rest of the day. During the peak, Silver Line Waterfront service (Silver Line 1 and Silver Line 2) operates to/from South Station at a combined headway of less than two minutes. Silver Line 4 service operates to/from South Station at 10-minute headways during the peak.

Existing Red Line ridership at South Station totals approximately 54,000 combined weekday boardings and alightings.[19] Using 2012 passenger count data provided by the MBTA, existing Red Line travel demand was analyzed. The highest passenger loading on the Red Line in the Northbound direction occurs during the AM Peak, between the hours of 8:00 a.m. and 9:00 a.m. As illustrated in Figure 2, the peak load occurs as the Red Line departs Broadway Station and travels toward South Station. Hourly ridership between Broadway Station and South Station for a typical weekday is presented in Figure 3. Figure 3 also includes line capacity as it varies during the course of the day based on the MBTA's *Policy* vehicle load standards. As shown, the Red Line currently operates within its maximum load capacity, except just after the AM Peak between 9:00 a.m. and 10:00 a.m.

In the Southbound direction, the highest passenger loading on the Red Line occurs during the PM peak hours, between 5:00 p.m. and 6:00 p.m. As shown in Figure 4, the peak load occurs between South Station and Broadway Station. Figure 5 presents hourly ridership for a typical weekday at the Peak Load Point, as well as line capacity as it varies during the course of the day. As shown, the Red Line Southbound currently operates within its maximum load capacity.

Existing Silver Line ridership at South Station totals approximately 12,700 combined weekday boardings and alightings on the Silver Line 1 and Silver Line 2, and approximately 2,200 combined weekday boardings and alightings on the Silver Line 4, as summarized in Table 6.

Table 6—Existing Weekday MBTA Bus Rapid Transit Boardings and Alightings at South Station

MBTA 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.*

[16] Massachusetts Bay Transportation Authority. *Commuter Rail Maps and Schedules.* Accessed April 2014. http://www.mbta.com/schedules_and_maps/rail/.
[17] Headway refers to the scheduled time interval between any two revenue vehicles operating in the same direction on a route.
[18] Existing headways per the CTPS travel demand model for the SSX project.
[19] Ridership results are provided in Appendix 9 - *Ridership Forecasting Technical Report.*

Using 2012 passenger count data provided by the MBTA, existing travel demand on the Silver Line rapid transit services that arrive/depart from South Station was analyzed. The Silver Line 1 and Silver Line 2 run from South Station to Silver Line Way via the Waterfront before splitting to Logan Airport and the Design Center. In the eastbound direction, the highest passenger loading on the Silver Line Waterfront segment occurs during the AM Peak between 8:00 a.m. and 9:00 a.m. between South Station and Courthouse Station, as shown in Figure 6. Figure 7 presents hourly ridership demand and line capacity between South Station to Courthouse Station, and indicates that the Silver Line currently operates within its maximum load capacity in the eastbound direction.

In the westbound direction, the highest passenger loading on the Silver Line Waterfront occurs during the PM peak hours, between 5:00 p.m. and 6:00 p.m. As shown in Figure 8, the peak load occurs between Courthouse Station and South Station. Figure 9 presents hourly ridership for a typical weekday at the Peak Load Point, as well as line capacity as it varies during the course of the day. As shown, the Silver Line Waterfront currently operates within its maximum load capacity in the westbound direction.

Figure 10 illustrates the loading profile of the Silver Line 4 in the northbound direction, where the peak loading occurs between 8:00 a.m. and 9:00 a.m. between East Berkeley and Herald Street stations, and remains near peak between Herald Street and Tufts Medical Center.[20] Hourly ridership demand is within the line capacity provided for a typical weekday, as shown in Figure 11.

In the southbound direction, the highest passenger loading on the Silver Line 4 occurs between Herald Street and East Berkeley stations in the PM Peak, between the hours of 5:00 p.m. and 6:00 p.m., as illustrated in Figure 12. The line capacity provided is sufficient to accommodate hourly ridership demand during a typical weekday, as illustrated in Figure 13.

5.3. 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 7 summarizes existing ridership statistics for the bus routes serving South Station.

Table 7—Existing Weekday MBTA Local Bus Boardings and Alightings at South Station

MBTA 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.

[20] Results from the CTPS travel demand model indicate that the Peak Load Point would be located between Herald Street and Tufts Medical Center in the 2035 Build Year.

The six local bus routes that stop immediately adjacent to South Station are as follows:

- **Route 4** provides service between North Station and Tide Street in the Boston Marine Industrial Park via Downtown Boston and the Financial District. The route stops near South Station (at the corner of Summer Street and Dorchester Avenue) when operating from Tide Street to North Station in the mornings and at South Station when operating from North Station to Tide Street in the evenings.
- **Route 7** provides service between City Point in South Boston and Otis Street at Summer Street in the Financial District.
- **Route 11** provides service between City Point in South Boston and Downtown Boston via Bay View. The route traverses South Boston, Downtown Boston, Chinatown, the Theater District, and the Financial District. The route stops at South Station on Summer Street in the outbound direction.
- **Routes 448/449** provide service from Marblehead to Downtown Crossing. Routes 448/449 stop in Swampscott, Lynn, Revere, and Logan Airport before stopping at South Station.
- **Route 459** provides service between Salem Station and Downtown Crossing. The route provides service to Salem, Swampscott, Lynn, Saugus, Revere, Logan Airport, South Boston, and Downtown Boston.

According to the MBTA's *Policy*, the minimum weekday span of service for buses is 7:00 a.m. to 6:30 p.m. Weekday service to/from South Station is provided by MBTA local bus Route 4 between approximately 6:30 a.m. to 8:30 a.m. and 4:00 p.m. to 7:00 p.m., Route 7 between 5:30 a.m. to 10:30 p.m., Route 11 between 5:30 a.m. to 1:00 a.m., Route 448/449 between 7:00 a.m. to 6:30 p.m., and Route 459 between approximately 6:30 a.m. to 7:30 p.m. [21]

Scheduled bus headways vary by route and time of day. According to the MBTA *Policy*, the minimum weekday frequency of service provided during peak periods is equal to 30-minute headways for local bus routes, 10-minute headways for key bus routes, and three trips in the peak direction for express/commuter bus routes.

5.4. Core Stations

5.4.1. South Station

Red Line ridership at South Station totals approximately 54,000 combined weekday boardings and alightings and Silver Line ridership at South Station totals approximately 12,700 combined weekday boardings and alightings in the 2012 Existing Year.[22] Weekday Red Line boardings and alightings at South Station represent approximately 9% of all daily Red Line passenger volume. Table 8 presents the existing distribution of hourly passenger boardings and alightings by direction at South Station for a typical weekday based on MBTA-supplied data from Fall 2012. Passenger activity on South Station's Red Line and Silver Line platforms in the 2012 Existing Year is illustrated in Figure 14 and Figure 15, respectively.[23]

[21] Massachusetts Bay Transportation Authority. *Commuter Rail Maps and Schedules.* Accessed April 2014. http://www.mbta.com/schedules_and_maps/rail/.
[22] Ridership results are provided in Appendix 9 - *Ridership Forecasting Technical Report.*
[23] The directional and hourly demand distribution from the MBTA-provided existing conditions (2012) data was used to convert CTPS-provided travel demand model results by time period (AM Peak, Midday, PM Peak, and Night) into hourly projections for the SSX project 2012 Existing Year and 2035 Build Year alternatives.

Table 8—South Station Existing Weekday Platform Activity

Time Period	Red Line Weekday Boardings and Alightings		Silver Line 1 and 2 Weekday Boardings and Alightings	
	Southbound Platform	Northbound Platform	Westbound Platform	Eastbound Platform
5:00 a.m. - 6:00 a.m.	0.4%	0.4%	0.1%	0.7%
6:00 a.m. - 7:00 a.m.	1.4%	2.4%	0.3%	3.3%
7:00 a.m. - 8:00 a.m.	4.2%	5.1%	0.7%	8.2%
8:00 a.m. - 9:00 a.m.	6.9%	7.9%	1.5%	14.1%
9:00 a.m. - 10:00 a.m.	3.4%	3.9%	1.2%	6.7%
10:00 a.m. - 11:00 a.m.	1.6%	1.7%	1.0%	1.6%
11:00 a.m. - Noon	1.3%	1.3%	0.7%	0.9%
Noon - 1:00 p.m.	1.4%	1.4%	1.3%	0.9%
1:00 p.m. - 2:00 p.m.	1.6%	1.4%	1.1%	1.7%
2:00 p.m. - 3:00 p.m.	1.8%	1.6%	1.7%	1.2%
3:00 p.m. - 4:00 p.m.	3.1%	2.3%	3.5%	1.7%
4:00 p.m. - 5:00 p.m.	6.0%	3.8%	7.7%	2.6%
5:00 p.m. - 6:00 p.m.	7.2%	6.3%	12.4%	3.1%
6:00 p.m. - 7:00 p.m.	3.5%	3.8%	5.6%	1.3%
7:00 p.m. - 8:00 p.m.	2.1%	2.0%	2.7%	1.0%
8:00 p.m. - 9:00 p.m.	1.4%	1.9%	3.4%	0.8%
9:00 p.m. - 10:00 p.m.	1.1%	1.2%	1.5%	0.4%
10:00 p.m. - 11:00 p.m.	1.0%	0.8%	1.1%	0.3%
11:00 p.m. - Midnight	0.5%	0.7%	1.1%	0.1%
Midnight - 1:00 a.m.	0.2%	0.2%	0.6%	0.1%
Total	50.0%	50.0%	49.4%	50.6%

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

5.4.2. Park Street

Table 9 presents the existing distribution of hourly passenger boardings and alightings by direction at Park Street Station for a typical weekday. Weekday boardings and alightings at the station total 86,946 for the Red Line, representing approximately 15% of all daily Red Line passenger volume. For the Green Line, weekday boardings and alightings at the station total 84,612, representing approximately 29% of all daily Green Line passenger volume (excluding surface stops). Passenger activity on Park Street's Red Line and Green Line platforms in the 2012 Existing Year is illustrated in Figure 16 and Figure 17, respectively.[24]

[24] The directional and hourly demand distribution from the MBTA-provided existing conditions (2012) data was used to convert CTPS-provided travel demand model results by time period (AM Peak, Midday, PM Peak, and Night) into hourly projections for the SSX project 2012 Existing Year and 2035 Build Year alternatives.

Table 9—Park Street Station Existing Weekday Platform Activity

Time Period	Red Line Weekday Boardings and Alightings		Green Line Weekday Boardings and Alightings	
	Southbound Platforms	Northbound Platforms	Westbound Platforms	Eastbound Platforms
5:00 a.m. - 6:00 a.m.	0.2%	0.7%	0.7%	0.2%
6:00 a.m. - 7:00 a.m.	0.8%	2.2%	2.2%	0.7%
7:00 a.m. - 8:00 a.m.	2.8%	4.3%	4.2%	2.5%
8:00 a.m. - 9:00 a.m.	4.8%	5.7%	5.3%	4.5%
9:00 a.m. - 10:00 a.m.	3.0%	3.6%	3.1%	3.1%
10:00 a.m. - 11:00 a.m.	1.8%	2.1%	2.1%	1.9%
11:00 a.m. - Noon	1.8%	1.8%	1.9%	2.0%
Noon - 1:00 p.m.	2.1%	2.0%	2.1%	2.1%
1:00 p.m. - 2:00 p.m.	2.2%	2.3%	2.4%	2.5%
2:00 p.m. - 3:00 p.m.	2.5%	2.3%	2.4%	2.7%
3:00 p.m. - 4:00 p.m.	3.6%	2.9%	3.1%	3.6%
4:00 p.m. - 5:00 p.m.	4.8%	3.5%	3.8%	4.4%
5:00 p.m. - 6:00 p.m.	5.8%	5.1%	5.3%	5.4%
6:00 p.m. - 7:00 p.m.	3.8%	3.3%	4.1%	3.5%
7:00 p.m. - 8:00 p.m.	2.9%	2.4%	2.6%	2.7%
8:00 p.m. - 9:00 p.m.	2.0%	1.8%	1.9%	2.1%
9:00 p.m. - 10:00 p.m.	2.0%	1.7%	1.5%	2.1%
10:00 p.m. - 11:00 p.m.	1.5%	1.3%	1.1%	1.7%
11:00 p.m. - Midnight	1.1%	0.7%	0.6%	1.2%
Midnight - 1:00 a.m.	0.4%	0.3%	0.2%	0.5%
Total	49.9%	50.1%	50.7%	49.3%

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

5.4.3. Downtown Crossing

Table 10 presents the existing distribution of hourly passenger boardings and alightings at Downtown Crossing Station for a typical weekday. Weekday boardings and alightings at the station total 77,204 for the Red Line, representing approximately 14% of all daily Red Line passenger volume. Weekday boardings and alightings on the Orange Line at the station total 77,563, representing approximately 18% of all daily Orange Line passenger volume. 2012 Existing Year platform activity on the Downtown Crossing Red Line and Orange Line platforms is illustrated in Figure 18 and Figure 19, respectively.[25]

[25] The directional and hourly demand distribution from the MBTA-provided existing conditions (2012) data was used to convert CTPS-provided travel demand model results by time period (AM Peak, Midday, PM Peak, and Night) into hourly projections for the SSX project 2012 Existing Year and 2035 Build Year alternatives.

Table 10—Downtown Crossing Station Existing Weekday Platform Activity

Time Period	Red Line Weekday Boardings and Alightings		Orange Line Weekday Boardings and Alightings	
	Southbound Platform	Northbound Platform	Southbound Platform	Northbound Platform
5:00 a.m. - 6:00 a.m.	0.6%	0.7%	0.8%	0.6%
6:00 a.m. - 7:00 a.m.	1.6%	2.4%	2.2%	1.9%
7:00 a.m. - 8:00 a.m.	3.5%	4.4%	4.4%	3.7%
8:00 a.m. - 9:00 a.m.	4.7%	5.8%	5.4%	4.8%
9:00 a.m. - 10:00 a.m.	3.0%	3.5%	3.2%	2.9%
10:00 a.m. - 11:00 a.m.	2.0%	2.2%	2.2%	2.0%
11:00 a.m. - Noon	1.7%	2.0%	2.0%	1.8%
Noon - 1:00 p.m.	1.9%	2.2%	2.3%	2.1%
1:00 p.m. - 2:00 p.m.	2.2%	2.2%	2.3%	2.4%
2:00 p.m. - 3:00 p.m.	2.9%	2.4%	2.8%	2.7%
3:00 p.m. - 4:00 p.m.	3.6%	3.2%	3.3%	3.7%
4:00 p.m. - 5:00 p.m.	4.9%	3.9%	4.1%	4.8%
5:00 p.m. - 6:00 p.m.	5.7%	5.1%	5.0%	5.6%
6:00 p.m. - 7:00 p.m.	3.6%	3.3%	2.9%	3.7%
7:00 p.m. - 8:00 p.m.	2.3%	2.2%	2.0%	2.3%
8:00 p.m. - 9:00 p.m.	1.8%	1.7%	1.7%	1.8%
9:00 p.m. - 10:00 p.m.	1.6%	1.2%	1.4%	1.4%
10:00 p.m. - 11:00 p.m.	1.3%	0.9%	1.1%	1.2%
11:00 p.m. - Midnight	0.8%	0.5%	0.6%	0.7%
Midnight - 1:00 a.m.	0.2%	0.2%	0.2%	0.3%
Total	50.1%	49.9%	49.7%	50.3%

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

5.4.4. Government Center

Table 11 presents the existing distribution of hourly passenger boardings and alightings by direction at Government Center Station for a typical weekday.[26] Weekday boardings and alightings at the station total 31,600 for the Blue Line, representing approximately 20% of all daily Blue Line passenger volume. Weekday boardings and alightings on the Green Line at the station total 43,277, representing approximately 15% of all daily Green Line passenger volume (excluding surface stops). 2012 Existing Year platform activity on the Government Center Blue Line and Green Line platforms is illustrated in Figure 20 and Figure 21, respectively.[27]

[26] Government Center Station was temporarily closed in March, 2014 and is scheduled to re-open in Spring 2016.

[27] The directional and hourly demand distribution from the MBTA-provided existing conditions (2012) data was used to convert CTPS-provided travel demand model results by time period (AM Peak, Midday, PM Peak, and Night) into hourly projections for the SSX project 2012 Existing Year and 2035 Build Year alternatives.

Table 11—Government Center Station Existing Weekday Platform Activity

Time Period	Blue Line Weekday Boardings and Alightings		Green Line Weekday Boardings and Alightings	
	Southbound Platform	Northbound Platform	Westbound Platform	Eastbound Platform
5:00 a.m. - 6:00 a.m.	2.1%	0.3%	1.5%	0.4%
6:00 a.m. - 7:00 a.m.	4.3%	0.5%	3.0%	0.9%
7:00 a.m. - 8:00 a.m.	6.3%	0.9%	4.2%	2.7%
8:00 a.m. - 9:00 a.m.	7.1%	1.3%	4.8%	4.5%
9:00 a.m. - 10:00 a.m.	4.1%	1.1%	2.9%	2.8%
10:00 a.m. - 11:00 a.m.	2.8%	1.1%	2.0%	1.8%
11:00 a.m. - Noon	2.2%	1.5%	1.8%	1.9%
Noon - 1:00 p.m.	2.1%	1.9%	2.1%	2.0%
1:00 p.m. - 2:00 p.m.	2.1%	2.2%	2.2%	2.3%
2:00 p.m. - 3:00 p.m.	2.8%	3.6%	2.8%	3.0%
3:00 p.m. - 4:00 p.m.	3.1%	4.9%	3.7%	3.8%
4:00 p.m. - 5:00 p.m.	2.9%	5.9%	4.5%	4.2%
5:00 p.m. - 6:00 p.m.	2.7%	5.8%	5.7%	4.4%
6:00 p.m. - 7:00 p.m.	1.6%	3.4%	3.6%	2.7%
7:00 p.m. - 8:00 p.m.	1.0%	3.0%	2.1%	2.3%
8:00 p.m. - 9:00 p.m.	0.8%	2.6%	1.6%	1.8%
9:00 p.m. - 10:00 p.m.	0.6%	3.0%	1.4%	2.0%
10:00 p.m. - 11:00 p.m.	0.5%	3.2%	1.1%	2.0%
11:00 p.m. - Midnight	0.3%	3.2%	0.7%	2.1%
Midnight - 1:00 a.m.	0.1%	1.1%	0.2%	0.7%
Total	49.5%	50.5%	51.8%	48.2%

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

5.4.5. State Street

Table 12 presents the existing distribution of hourly passenger boardings and alightings by direction at State Street Station for a typical weekday. Weekday boardings and alightings at the station total 39,674 for the Orange Line, representing approximately 9% of all daily Orange Line passenger volume. Weekday boardings and alightings on the Blue Line at State Street Station total 31,879, representing approximately 20% of all daily Blue Line passenger volume. Passenger activity on the State Street Blue Line and Orange Line platforms in the 2012 Existing Year is illustrated in Figure 22 and Figure 23, respectively.[28]

[28] The directional and hourly demand distribution from the MBTA-provided existing conditions (2012) data was used to convert CTPS-provided travel demand model results by time period (AM peak, Midday, PM peak, and Night) into hourly projections for the SSX project 2012 Existing Year and 2035 Build Year alternatives.

Table 12—State Street Station Existing Weekday Platform Activity

Time Period	Orange Line Weekday Boardings and Alightings		Blue Line Weekday Boardings and Alightings	
	Southbound Platform	Northbound Platform	Southbound Platform	Northbound Platform
5:00 a.m. - 6:00 a.m.	1.3%	0.7%	2.1%	0.5%
6:00 a.m. - 7:00 a.m.	3.2%	2.0%	4.6%	1.5%
7:00 a.m. - 8:00 a.m.	4.7%	3.5%	6.2%	1.9%
8:00 a.m. - 9:00 a.m.	5.8%	5.8%	7.0%	2.1%
9:00 a.m. - 10:00 a.m.	3.1%	2.8%	4.1%	1.4%
10:00 a.m. - 11:00 a.m.	1.9%	1.7%	2.6%	1.3%
11:00 a.m. - Noon	1.6%	1.9%	1.9%	1.7%
Noon - 1:00 p.m.	2.0%	2.0%	2.0%	2.0%
1:00 p.m. - 2:00 p.m.	2.0%	2.3%	2.0%	2.2%
2:00 p.m. - 3:00 p.m.	2.6%	3.0%	2.9%	3.3%
3:00 p.m. - 4:00 p.m.	2.7%	4.1%	2.7%	4.9%
4:00 p.m. - 5:00 p.m.	4.0%	5.2%	3.2%	5.5%
5:00 p.m. - 6:00 p.m.	4.7%	5.6%	3.6%	5.9%
6:00 p.m. - 7:00 p.m.	2.6%	3.6%	2.0%	3.8%
7:00 p.m. - 8:00 p.m.	1.6%	2.1%	1.3%	2.5%
8:00 p.m. - 9:00 p.m.	1.4%	1.6%	1.2%	2.1%
9:00 p.m. - 10:00 p.m.	0.9%	1.5%	0.9%	1.8%
10:00 p.m. - 11:00 p.m.	0.9%	1.5%	0.9%	1.9%
11:00 p.m. - Midnight	0.6%	1.0%	0.7%	1.4%
Midnight - 1:00 a.m.	0.2%	0.2%	0.1%	0.4%
Total	47.7%	52.3%	51.9%	48.1%

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

6. Project Impacts

This section provides an evaluation of the future condition of MBTA vehicle loads and core station capacities both without and with the SSX project (i.e., No Build and Build Alternatives). Future conditions in the 2035 Build Year were analyzed for the following alternatives:

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

6.1. No Build Alternative

The No Build Alternative represents a future baseline condition against which the Build Alternatives are compared. With the No Build Alternative, South Station, including the headhouse and track operations, and the USPS General Mail Facility, would remain as they currently exist. The majority of Dorchester Avenue at the site would remain in private use by the USPS in support of USPS operations. Extending from the southern line of Summer Street, the MBTA would continue to maintain a permanent easement along Dorchester Avenue for pedestrians and vehicles of over approximately 200 feet. Generally unrestricted public access would continue to be provided along Dorchester Avenue of over approximately 400 feet for customer use of USPS facilities.

With the No Build Alternative, there would be no private development associated with South Station beyond the development previously approved by the Massachusetts EEA: the South Station Air Rights (SSAR) project. The SSAR project was approved by the Secretary of EEA in 2006 (EEA Number 3205/9131) as an approximate 1.8 million sf mixed-use development to be located directly above the railroad tracks at the South Station headhouse. The SSAR project also includes a horizontally expanded bus terminal of approximately 70,000 square feet, pedestrian connections from the train station concourse and platforms to the expanded bus terminal, and a 3-level parking garage with 775 spaces located above the bus terminal.

With the No Build Alternative, the Widett Circle site would remain in private development. The Beacon Park Yard site would remain largely the same as today, with the exception of highway reconfiguration of the Massachusetts Turnpike to the north of the site and MBTA Worcester Line track improvements to the south of the site. The MBTA would continue to use Readville – Yard 2 to provide layover space for 10 trainsets.

The No Build Alternative would maintain a similar level of rail service as exists today, but would also provide increased commuter rail frequencies on the Fairmount Line.

6.1.1. Transit Vehicle Loading Analysis

The results of the transit vehicle loading analysis for the No Build Alternative are summarized in the following sections, with detailed analysis tables provided in Attachment K. The analysis compared the projected peak hour demand from the CTPS travel demand model to available capacity using the conservative loading standards from the MBTA's *Policy.* Volume-to-capacity (V/C) ratios greater than 1.0 indicate that the average demand during the peak hour would exceed available capacity as defined by the MBTA's *Policy*.

Commuter Rail

As shown in Table 13 and Table 14, in the No Build Alternative, passenger load volumes at the peak load points for the various south side commuter rail lines would be sufficiently accommodated by the capacity provided in the AM and PM peak hours, respectively. Lines that would handle passenger loading close to the maximum *Policy* capacity include the Middleborough Line inbound (V/C ratio equal to 0.85 in the AM peak hour) and the Plymouth/Kingston Line outbound (V/C ratio equal to 0.94 in the PM peak hour). By analyzing the passenger loads at the highest demand segments, and confirming that there is available capacity, it would stand to reason that there is excess capacity on the remainder of the south side system

Table 13—No Build Alternative Commuter Rail Vehicle Loading Summary for AM Peak Hour

Commuter Rail Line Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Needham Line IB[a] Forest Hills – Ruggles	578	3,256	0.18
Needham Line OB[a] South Station – Back Bay	286	1,628	0.18
Worcester/Framingham Line IB Newtonville – Yawkey	1,918	4,884	0.39
Worcester/Framingham Line OB South Station – Back Bay	442	1,628	0.27
Franklin Line IB Hyde Park – Ruggles	1,566	4,884	0.32
Franklin Line OB South Station – Back Bay	199	1,628	0.12
Providence/Attleboro Line IB Hyde Park – Ruggles	1,534	4,884	0.31
Providence/Attleboro Line OB South Station – Back Bay	491	3,256	0.15
Canton/Stoughton Line IB Hyde Park – Ruggles	1,165	1,628	0.72
Canton/Stoughton Line OB South Station – Back Bay	203	1,628	0.12
Fairmount Line IB Uphams Corner – Newmarket	1,128	6,512	0.17
Fairmount Line OB Talbot Ave – Morton St	166	6,512	0.03
Middleborough Line IB JFK/UMass – South Station	2,761	3,256	0.85
Middleborough Line OB Montello – Brockton	68	1,628	0.04
Plymouth/Kingston Line IB S Weymouth – Braintree	2,355	3,256	0.72
Plymouth/Kingston Line OB South Station – JFK/UMass	12	1,628	0.01
Greenbush Line IB JFK/UMass – South Station	1,110	3,256	0.34
Greenbush Line OB South Station – JFK/UMass	30	1,628	0.02

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
a IB = inbound; OB = outbound.

Table 14—No Build Alternative Commuter Rail Vehicle Loading Summary for PM Peak Hour

Commuter Rail Line Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Needham Line IB Back Bay – South Station	342	1,628	0.21
Needham Line OB Ruggles – Forest Hills	678	3,256	0.21
Worcester/Framingham Line IB Wellesley Hills – Wellesley Farms	281	1,628	0.17
Worcester/Framingham Line OB Yawkey – Newtonville	1,446	4,884	0.30
Franklin Line IB Uphams Corner – Newmarket	204	1,628	0.13
Franklin Line OB Ruggles – Hyde Park	1,227	3,256	0.38
Providence/Attleboro Line IB Back Bay – South Station	290	1,628	0.18
Providence/Attleboro Line OB Ruggles – Hyde Park	514	3,256	0.16
Canton/Stoughton Line IB Back Bay – South Station	382	1,628	0.23
Canton/Stoughton Line OB Ruggles – Hyde Park	1,665	3,256	0.51
Fairmount Line IB Uphams Corner – Newmarket	227	6,512	0.03
Fairmount Line OB Newmarket – Uphams Corner	1,190	6,512	0.18
Middleborough Line IB JFK/UMass – South Station	430	1,628	0.26
Middleborough Line OB South Station – JFK/UMass	2,632	3,256	0.81
Plymouth/Kingston Line IB JFK/UMass – South Station	45	1,628	0.03
Plymouth/Kingston Line OB Braintree – South Weymouth	1,537	1,628	0.94
Greenbush Line IB JFK/UMass – South Station	102	1,628	0.06
Greenbush Line OB South Station – JFK/UMass	1,272	3,256	0.39

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: IB = inbound; OB = outbound.

Rapid Transit

Passenger load volumes on the Silver Line 4 and Silver Line 5 BRT lines are projected to exceed available capacity (as dictated by the MBTA's *Policy*) in the No Build Alternative during the AM and PM peak hours, as shown in Table 15 and Table 16. The AM peak hour V/C ratios would be in the range of 1.07 to 1.81, and PM peak hour V/C ratios would be in the range of 1.29 to 1.32, depending on the direction of service. It is important to note that the vehicle load standards used in this analysis, based on the MBTA's *Policy*, are less than the absolute maximum number of passengers that can fit on a transit vehicle, or the "crush capacity". Projected peak demands in relation to the provided *Policy* maximum load capacity for Silver Line 4 Northbound and Southbound are illustrated in Figure 24 and Figure 25, respectively.

Figures 26 through 29 illustrate the projected passenger volumes in relation to capacity for the other rapid transit lines that directly serve South Station: the Silver Line Waterfront and Red Line. For these lines, the maximum load capacity as defined by the MBTA's *Policy* would accommodate projected passenger demands.

Table 15—No Build Alternative Rapid Transit Vehicle Loading Summary for AM Peak Hour

Rapid Transit Service Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Red Line NB Broadway – South Station	8,880	15,030	0.59
Red Line SB Kendall Square – MGH	4,800	15,030	0.32
Silver Line Waterfront/Gateway EB South Station – Courthouse	1,676	2,340	0.72
Silver Line Waterfront/Gateway WB Courthouse – South Station	848	2,340	0.36
Silver Line 4 NB Herald – Tufts Medical Center	508	474	**1.07**
Silver Line 4 SB Herald – East Berkeley	856	474	**1.81**
Silver Line 5 NB Herald – Tufts Medical Center	508	474	**1.07**
Silver Line 5 SB Herald – East Berkeley	856	474	**1.81**
Orange Line NB Tufts Medical Center – Chinatown	4,960	11,004	0.45
Orange Line SB Community College – North Station	5,280	11,004	0.48
Blue Line NB State – Aquarium	1,040	7,980	0.13
Blue Line SB Maverick – Aquarium	6,960	7,980	0.87
Green Line Central Subway EB Copley – Arlington	7,160	14,352	0.50
Green Line Central Subway WB Park Street – Boylston	11,200	14,352	0.78

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Table 16—No Build Alternative Rapid Transit Vehicle Loading Summary for PM Peak Hour

Rapid Transit Service Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Red Line NB South Station – Downtown Crossing	4,520	15,030	0.30
Red Line SB South Station – Broadway	8,040	15,030	0.53
Silver Line Waterfront/Gateway EB South Station – Courthouse	952	2,340	0.41
Silver Line Waterfront/Gateway WB Courthouse – South Station	2,000	2,340	0.85
Silver Line 4 NB Herald – Tufts Medical Center	612	474	**1.29**
Silver Line 4 SB Herald – East Berkeley	628	474	**1.32**
Silver Line 5 NB Herald – Tufts Medical Center	612	474	**1.29**
Silver Line 5 SB Herald – East Berkeley	628	474	**1.32**
Orange Line NB State – Haymarket	4,360	11,004	0.40
Orange Line SB Chinatown – Tufts Medical Center	3,880	11,004	0.35
Blue Line NB Aquarium – Maverick	4,440	7,980	0.56
Blue Line SB Maverick – Aquarium	2,000	7,980	0.25
Green Line Central Subway EB Boylston – Park Street	7,920	14,352	0.55
Green Line Central Subway WB Arlington – Copley	7,600	14,352	0.53

Source: CTPS, Transit Crowding Analysis (see Attachment K)
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Local Bus

As shown in Table 17 and Table 18, in the No Build Alternative, local bus passenger load volumes at South Station in the AM and PM peak hours, respectively, would be well below the MBTA's *Policy* maximum load capacity. The No Build Alternative would result in local bus loadings with V/C ratios of 0.60 or less.

Table 17—No Build Alternative Local Bus Vehicle Loading Summary for AM Peak Hour

Local Bus Route	Modeled Peak Volume at South Station	Policy Maximum Load Capacity	Volume / Policy Capacity
7 WB	383	648	0.59
7 EB	70	540	0.13
11 EB	1	216	0.01
448 SB	14	54	0.25
448 NB	1	54	0.02
449 SB	13	54	0.24
449 NB	1	54	0.02
459 SB	32	54	0.60
459 NB	6	108	0.06

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Table 18—No Build Alternative Local Bus Vehicle Loading Summary for PM Peak Hour

Local Bus Route	Modeled Peak Volume at South Station	Policy Maximum Load Capacity	Volume / Policy Capacity
4 EB	1	162	< 0.01
7 WB	105	270	0.39
7 EB	155	432	0.36
11 EB	9	270	0.03
448 NB	14	54	0.27
449 NB	14	54	0.27
459 SB	34	162	0.21
459 NB	3	54	0.06

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

6.1.2. Core Station Capacity Analysis

The following sections summarize the results for the No Build Alternative core station capacity analysis. The analysis consisted of calculating the platform activity for each rapid transit line serving the core stations, based on projected boardings and alightings from the CTPS travel demand model. Summary tables for each core station are provided in Attachment L. For South Station, a detailed analysis of pedestrian movements through various circulation elements (stairs, platforms, concourses, etc.) was also conducted.

South Station

Table 44 and Table 45 in Attachment L present platform activity summaries at South Station for the No Build Alternative. In the No Build Alternative, Red Line boardings and alightings at South Station are projected to increase above 2012 Existing Year conditions by approximately 18,000 per day, as illustrated in Figure 30. This represents a substantial daily increase of approximately 33% above 2012 Existing Year conditions, partially attributable to increased transfers to/from the proposed Silver Line Gateway[29] service.

At South Station, an additional 12,900 daily Silver Line boardings and alightings above 2012 Existing Year conditions are projected for the No Build Alternative, as illustrated in Figure 31. Daily Silver Line ridership would more than double, attributable to increased Silver Line service resulting from the proposed Silver Line Gateway project.

The following results were obtained from the LOS analysis of pedestrian circulation elements at South Station in the No Build Alternative:

- Platforms
    - Commuter Rail and Amtrak: The southern end of the platforms would experience the best LOS (LOS A/B-C). However, as the cumulative volume of passengers traverse the northern end of the platforms, the LOS would reach F and E for platforms A and G, respectively.

[29] 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.

  - Red Line: An average LOS would be maintained throughout the morning peak (LOS C). During the evening peak, the LOS would deteriorate to LOS D. The increase in ridership associated with the No Build Alternative would result in a slightly reduced LOS when compared to Existing Conditions.
  - Silver Line: A good LOS would be maintained throughout the morning and evening peaks (LOS C or better, with most platform areas experiencing LOS A/B).
- Concourses
  - During the evening peak period, a large volume of pedestrians wait within the rail head concourse for their train to be announced. As a result of the significantly expanded rail head concourse, as part of the SSAR project, the LOS experienced by waiting passengers in the No Build Alternative would be improved when compared to the Existing Conditions (LOS D or better versus LOS E or better, respectively).
- Vertical Circulation (Stairs and Escalators)
  - The LOS would be slightly worse during the No Build Alternative morning peak when compared with the Existing Conditions. Despite this reduction, an acceptable LOS (LOS D or better) would be maintained throughout the morning and evening peaks.

Park Street

Table 46 and Table 47 in Attachment L present platform activity summaries at Park Street for the No Build Alternative. In the No Build Alternative, Red Line boardings and alightings at Park Street are projected to increase above 2012 Existing Year conditions by approximately 5,100 passengers per day, as illustrated in Figure 32. This represents a daily increase of approximately 6% above 2012 Existing Year conditions.

Green Line boardings and alightings in the No Build Alternative are projected to increase above 2012 Existing Year conditions by approximately 9,200 passengers per day, as illustrated in Figure 33. This represents a daily increase of approximately 11% above 2012 Existing Year conditions.

Downtown Crossing

Table 48 and Table 49 in Attachment L present platform activity summaries at Downtown Crossing for the No Build Alternative. In the No Build Alternative, Red Line boardings and alightings at Downtown Crossing are projected to increase above 2012 Existing Year conditions by approximately 2,900 passengers per day, as illustrated in Figure 34. This represents a daily increase of approximately 4% above 2012 Existing Year conditions.

Orange Line boardings and alightings at Downtown Crossing in the No Build Alternative are projected to increase above 2012 Existing Year conditions by approximately 4,900 passengers per day, as illustrated in Figure 35. This represents a daily increase of approximately 6% above 2012 Existing Year conditions.

Government Center

Table 50 and Table 51 in Attachment L present platform activity summaries at Government Center for the No Build Alternative. In the No Build Alternative, Blue Line boardings and alightings at Government Center are projected to increase above 2012 Existing Year conditions by approximately 4,100 passengers per day, as illustrated in Figure 36. This represents a daily increase of approximately 14% above 2012 Existing Year conditions.

Green Line boardings and alightings in the No Build Alternative are projected to increase above 2012 Existing Year conditions by approximately 10,200 passengers per day, as illustrated in Figure 37. This represents a substantial daily increase of approximately 25% above 2012 Existing Year conditions.

State Street

Table 52 and Table 53 in Attachment L present platform activity summaries at State Street for the No Build Alternative. In the No Build Alternative, Blue Line boardings and alightings at State Street are projected to increase above 2012 Existing Year conditions by approximately 2,900 passengers per day, as illustrated in Figure 38. This represents a daily increase of approximately 9% above 2012 Existing Year conditions.

Orange Line boardings and alightings at State Street in the No Build Alternative are projected to increase above 2012 Existing Year conditions by approximately 1,800 passengers per day, as illustrated in Figure 39. This represents a daily increase above 2012 Existing Year conditions of approximately 5%.

6.2. Alternative 1- Transportation Improvements Only

Alternative 1 would include the previously-approved SSAR project described in the No Build Alternative. In addition, South Station would be expanded onto the adjacent 14-acre USPS property. MassDOT would acquire and demolish the USPS General Mail Facility/South Postal Annex. The existing South Station Terminal would be expanded, consisting of an expanded passenger concourse and passenger support services. Capacity improvements would include construction of up to seven new tracks and four platforms. Tower 1 Interlocking, as well as four approach interlockings, would be reconstructed and/or reconfigured. In Alternative 1, no provisions would be made for future private development as part of the SSX project.

The future commuter rail service plan for Alternative 1 would include South Coast Rail commuter rail service; additional peak period, peak direction trains on the Needham, Franklin, Providence, and Worcester/Framingham Lines; and increased frequencies on the Fairmount Line. Additionally, Alternative 1 would include service increases for Amtrak intercity trains.

6.2.1. Transit Vehicle Loading Analysis

Results of the transit vehicle loading analysis for Alternative 1 are summarized in the following sections, with detailed analysis tables provided in Attachment K. The analysis compared the projected peak hour demand from the CTPS travel demand model to available capacity using the conservative loading standards from the MBTA's *Policy*. V/C ratios greater than 1.0 indicate that the average demand during the peak hour would exceed available capacity as defined by the MBTA's *Policy*.

Commuter Rail

The future commuter rail service plan for Alternative 1 would include South Coast Rail commuter rail service; additional peak period, peak direction trains on the Needham, Franklin, Providence, and Worcester/Framingham Lines; and increased frequencies on the Fairmount Line. As summarized in Table 19 and Table 20, passenger load volumes at the peak load points for the various south side commuter rail lines would be accommodated by the capacity provided, except for the PM peak hour Canton/Stoughton/South Coast Rail Line in the outbound direction. Modeled demand at the South Coast Rail PM Peak Load Point, between Back Bay and Ruggles in the outbound direction, would exceed the proposed capacity provided in the 2035 Build Year by 1,214 passengers in the peak hour, corresponding to a V/C ratio equal to 1.37. However, modeled demand over the entire three-hour PM peak period, equal

to 5,960 passengers, would be well within the *Policy* maximum load capacity available in the PM Peak period of 9,768 passengers (based on 1,628 passengers per train, two trains per hour, and three hours in the peak period). The surge of passenger demand during the peak hour could be accommodated by implementing schedule adjustments to the proposed outbound Canton/Stoughton/South Coast Rail Line PM peak period trains. The peak hour demand could be accommodated by shifting trains during the peak period to provide additional capacity during the peak hour.

Table 19—Alternative 1 Commuter Rail Vehicle Loading Summary for AM Peak Hour

Commuter Rail Line Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Needham Line IB Forest Hills – Ruggles	639	3,256	0.20
Needham Line OB South Station – Back Bay	286	1,628	0.18
Worcester/Framingham Line IB Newtonville – Yawkey	2,015	4,884	0.41
Worcester/Framingham Line OB South Station – Back Bay	442	1,628	0.27
Franklin Line IB Hyde Park – Ruggles	1,618	4,884	0.33
Franklin Line OB South Station – Back Bay	199	1,628	0.12
Providence/Attleboro Line IB Hyde Park – Ruggles	1,620	4,884	0.33
Providence/Attleboro Line OB South Station – Back Bay	491	3,256	0.15
Canton/Stoughton/South Coast Rail Line IB Ruggles – Back Bay	3,558	4,884	0.73
Canton/Stoughton/South Coast Rail Line OB South Station – Back Bay	203	1,628	0.12
Fairmount Line IB Uphams Corner – Newmarket	1,128	6,512	0.17
Fairmount Line OB Talbot Ave – Morton St	166	6,512	0.03
Middleborough Line IB JFK/UMass – South Station	2,778	3,256	0.85
Middleborough Line OB Montello – Brockton	68	1,628	0.04
Plymouth/Kingston Line IB S Weymouth – Braintree	2,355	3,256	0.72
Plymouth/Kingston Line OB South Station – JFK/UMass	12	1,628	0.01
Greenbush Line IB JFK/UMass – South Station	1,110	3,256	0.34
Greenbush Line OB South Station – JFK/UMass	40	1,628	0.02

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: IB = inbound; OB = outbound.

Table 20—Alternative 1 Commuter Rail Vehicle Loading Summary for PM Peak Hour

Commuter Rail Line Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Needham Line IB Back Bay – South Station	342	1,628	0.21
Needham Line OB Ruggles – Forest Hills	744	3,256	0.23
Worcester/Framingham Line IB Wellesley Hills – Wellesley Farms	286	1,628	0.18
Worcester/Framingham Line OB Yawkey – Newtonville	1,499	4,884	0.31
Franklin Line IB Uphams Corner – Newmarket	204	1,628	0.13
Franklin Line OB Ruggles – Hyde Park	1,304	3,256	0.40
Providence/Attleboro Line IB Back Bay – South Station	290	1,628	0.18
Providence/Attleboro Line OB Ruggles – Hyde Park	571	3,256	0.18
Canton/Stoughton/South Coast Rail Line IB Back Bay – South Station	382	1,628	0.23
Canton/Stoughton/South Coast Rail Line OB Back Bay – Ruggles	4,470	3,256	**1.37**
Fairmount Line IB Uphams Corner – Newmarket	227	6,512	0.03
Fairmount Line OB Newmarket – Uphams Corner	1,224	6,512	0.19
Middleborough Line IB JFK/UMass – South Station	440	1,628	0.27
Middleborough Line OB South Station – JFK/UMass	2,632	3,256	0.81
Plymouth/Kingston Line IB JFK/UMass – South Station	45	1,628	0.03
Plymouth/Kingston Line OB Braintree – South Weymouth	1,537	1,628	0.94
Greenbush Line IB JFK/UMass – South Station	102	1,628	0.06
Greenbush Line OB South Station – JFK/UMass	1,272	3,256	0.39

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: IB = inbound; OB = outbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Rapid Transit

Passenger load volumes on the Silver Line 4 and Silver Line 5 BRT lines are projected to exceed available capacity (as dictated by the MBTA's *Policy*), as shown in Table 21 and Table 22, with AM peak hour V/C ratios in the range of 1.07 to 1.81, and PM peak hour V/C ratios in the range of 1.29 to 1.32, depending on the direction of service. As previously stated, the vehicle load standards used in this analysis, based on the MBTA's *Policy*, are less than the absolute maximum number of passengers that can fit on a transit vehicle, or the "crush capacity." Since the projected passenger loading in Alternative 1 is equal to the projected passenger loading in the No Build Alternative (shown in Figure 24 and Figure 25), there would be no additional impacts to Silver Line passenger crowding as a result of the SSX project.

Table 21—Alternative 1 Rapid Transit Vehicle Loading Summary for AM Peak Hour

Rapid Transit Service Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Red Line NB Broadway – South Station	8,920	15,030	0.59
Red Line SB Kendall Square – MGH	4,800	15,030	0.32
Silver Line Waterfront/Gateway EB South Station – Courthouse	1,732	2,340	0.74
Silver Line Waterfront/Gateway WB Courthouse – South Station	848	2,340	0.36
Silver Line 4 NB Herald – Tufts Medical Center	508	474	**1.07**
Silver Line 4 SB Herald – East Berkeley	856	474	**1.81**
Silver Line 5 NB Herald – Tufts Medical Center	508	474	**1.07**
Silver Line 5 SB Herald – East Berkeley	856	474	**1.81**
Orange Line NB Tufts Medical Center – Chinatown	5,000	11,004	0.45
Orange Line SB Community College – North Station	5,280	11,004	0.48
Blue Line NB State – Aquarium	1,040	7,980	0.13
Blue Line SB Maverick – Aquarium	6,960	7,980	0.87
Green Line Central Subway EB Copley – Arlington	7,160	14,352	0.50
Green Line Central Subway WB Park Street – Boylston	11,200	14,352	0.78

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Table 22—Alternative 1 Rapid Transit Vehicle Loading Summary for PM Peak Hour

Rapid Transit Service Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Red Line NB South Station – Downtown Crossing	4,520	15,030	0.30
Red Line SB South Station – Broadway	8,040	15,030	0.53
Silver Line Waterfront/Gateway EB South Station – Courthouse	956	2,340	0.41
Silver Line Waterfront/Gateway WB Courthouse – South Station	2,124	2,340	0.91
Silver Line 4 NB Herald – Tufts Medical Center	612	474	**1.29**
Silver Line 4 SB Herald – East Berkeley	628	474	**1.32**
Silver Line 5 NB Herald – Tufts Medical Center	612	474	**1.29**
Silver Line 5 SB Herald – East Berkeley	628	474	**1.32**
Orange Line NB State – Haymarket	4,360	11,004	0.40
Orange Line SB Chinatown – Tufts Medical Center	3,920	11,004	0.36
Blue Line NB Aquarium – Maverick	4,440	7,980	0.56
Blue Line SB Maverick – Aquarium	2,000	7,980	0.25
Green Line Central Subway EB Boylston – Park Street	7,920	14,352	0.55
Green Line Central Subway WB Arlington – Copley	7,600	14,352	0.53

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Local Bus

As shown in Table 23 and Table 24, Alternative 1 local bus passenger load volumes at South Station in the AM and PM peak hours, respectively, would be well below the Policy's maximum load capacity. Alternative 1 would result in local bus loadings with V/C ratios of 0.60 or less.

Table 23—Alternative 1 Local Bus Vehicle Loading Summary for AM Peak Hour

Local Bus Route	Modeled Peak Volume at South Station	Policy Maximum Load Capacity	Volume / Policy Capacity
7 WB	383	648	0.59
7 EB	70	540	0.13
11 EB	1	216	0.01
448 SB	14	54	0.25
448 NB	1	54	0.02
449 SB	13	54	0.24
449 NB	1	54	0.02
459 SB	32	54	0.60
459 NB	6	108	0.06

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Table 24—Alternative 1 Local Bus Vehicle Loading Summary for PM Peak Hour

Local Bus Route	Modeled Peak Volume at South Station	Policy Maximum Load Capacity	Volume / Policy Capacity
4 EB	1	162	< 0.01
7 WB	105	270	0.39
7 EB	155	432	0.36
11 EB	9	270	0.03
448 NB	14	54	0.27
449 NB	14	54	0.27
459 SB	34	162	0.21
459 NB	3	54	0.06

Source: CTPS, *Transit Crowding Analysis* (see Attachment K)
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

6.2.2. Core Station Capacity Analysis

The following sections summarize the 2035 Build Year results for the Alternative 1 core station capacity analysis. The analysis consisted of calculating the platform activity for each rapid transit line serving the core stations based on projected boardings and alightings from the CTPS travel demand model. Figure 40 through 49 illustrate the hourly platform activity at each core station. Peak period and daily platform activity summary tables for each core station are provided in Attachment L.

South Station

Table 44 and Table 45 in Attachment L presents platform activity summaries at South Station for Alternative 1. In Alternative 1, daily Red Line boardings and alightings at South Station would increase by 1,950 passengers over the No Build Alternative, corresponding to an increase of 2.7%. In the AM and PM peak periods, boardings and alightings would increase by 4% and 2.9%, respectively.

Daily Silver Line boardings and alightings at South Station are projected to increase above No Build Alternative levels by 540 passengers in Alternative 1, an increase of 2.1%. In the AM and PM peak periods, boardings and alightings would increase by 2.1% and 4.2%, respectively.

Park Street

Table 46 and Table 47 in Attachment L presents platform activity summaries at Park Street for Alternative 1. In Alternative 1, daily Red Line boardings and alightings at Park Street would increase by 150 passengers over the No Build Alternative, corresponding to an increase of just 0.2%. In the AM and PM peak periods, boardings and alightings would increase by 0.3%.

Daily Green Line boardings and alightings at Park Street are projected to increase above No Build Alternative levels by 80 passengers in Alternative 1, an increase of 0.1%. In the AM and PM peak periods, boardings and alightings would increase by 0.2% and 0.1%, respectively.

Alternative 1 would result in an unnoticeable increase in overall platform activity at Park Street.

Downtown Crossing

Table 48 and Table 49 in Attachment L present platform activity summaries at Downtown Crossing for Alternative 1. In Alternative 1, daily Red Line boardings and alightings at Downtown Crossing would increase by 140 passengers over the No Build Alternative, corresponding to an increase of just 0.2%. In the AM and PM peak periods, boardings and alightings would increase by 0.3% and 0.2%, respectively.

Daily Orange Line boardings and alightings at Downtown Crossing are projected to increase by 160 passengers in Alternative 1, corresponding to an increase of just 0.2% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 0.3%.

Alternative 1 would result in an unnoticeable increase in overall platform activity at Downtown Crossing.

Government Center

Table 50 and Table 51 in Attachment L present platform activity summaries at Government Center for Alternative 1. In Alternative 1, daily Blue Line boardings and alightings at Government Center would increase by 20 passengers over the No Build Alternative, corresponding to an increase of just 0.1%. In the AM and PM peak periods, boardings and alightings would increase by 0.1% or less.

Daily Green Line boardings and alightings at Government Center are projected to increase by 10 passengers in Alternative 1, corresponding to an increase of less than 0.1% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 0.1% or less.

Alternative 1 would result in an unnoticeable increase in overall platform activity at Government Center.

State Street

Table 52 and Table 53 in Attachment L present platform activity summaries at State Street for Alternative 1. Alternative 1 would increase daily Blue Line boardings and alightings at State Street by 10 passengers over the No Build Alternative, corresponding to an increase of less than 0.1%. In the AM and PM peak periods, boardings and alightings would increase by less than 0.1%.

Daily Orange Line boardings and alightings at State Street are projected to increase by 80 passengers in Alternative 1, corresponding to an increase of 0.2% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 0.3% and 0.5%, respectively.

Alternative 1 would result in an unnoticeable increase in overall platform activity at State Street.

6.3. Alternative 2 – Joint/ Private Development Minimum Build

Alternative 2 would include Alternative 1, as well as provisions for future private development by incorporating appropriate structural foundations into the overall station and track design.

Future private development in Alternative 2 could include approximately 645,000 square feet of mixed-use development along Dorchester Avenue, consisting of residential, office, and commercial uses, including retail and hotel uses, with building heights ranging up to approximately 12 stories. Development could include approximately 235 parking spaces.

Similar to Alternative 1, the future commuter rail service plan for Alternative 2 would include South Coast Rail commuter rail service; additional peak period, peak direction trains on the Needham, Franklin, Providence, and Worcester/Framingham Lines; and increased frequencies on the Fairmount Line. Like Alternative 1, Alternative 2 would also include service increases for Amtrak intercity trains.

6.3.1. Transit Vehicle Loading Analysis

Results of the transit vehicle loading analysis for Alternative 2 are summarized in the following sections, with detailed analysis tables provided in Attachment K. The analysis compared the projected peak hour demand from the CTPS travel demand model to available capacity using the conservative loading standards from the MBTA's *Policy*. V/C ratios greater than 1.0 indicate that the average demand during the peak hour exceeds available capacity as defined by the MBTA's *Policy*.

Commuter Rail

Similar to Alternative 1, the future commuter rail service plan for Alternative 2 would include South Coast Rail commuter rail service; additional peak period, peak direction trains on the Needham, Franklin, Providence, and Worcester/Framingham Lines; and increased frequencies on the Fairmount Line. As shown in Tables 25 and 26, passenger load volumes at the peak load points for the various south side commuter rail lines would be sufficiently accommodated by the capacity provided, except for the PM peak hour Canton/Stoughton/South Coast Rail Line in the outbound direction. Modeled demand at the South Coast Rail PM peak load point, between Back Bay and Ruggles in the outbound direction, would exceed the proposed capacity provided in the 2035 Build Year by 1,214 passengers, corresponding to a V/C ratio of 1.37. However, modeled demand over the entire three-hour PM peak period, equal to 5,960 passengers, would be well within the *Policy* maximum load capacity available in the PM peak period of 9,768 passengers (based on 1,628 passengers per train, two trains per hour, and three hours in the peak period). The surge of passenger demand during the peak hour could be accommodated by implementing schedule adjustments to the proposed outbound Canton/Stoughton/South Coast Rail Line PM Peak period trains. The peak hour demand could be accommodated by shifting trains during the peak period to provide additional capacity during the peak hour.

Table 25—Alternative 2 Commuter Rail Vehicle Loading Summary for AM Peak Hour

Commuter Rail Line Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Needham Line IB Forest Hills – Ruggles	646	3,256	0.20
Needham Line OB South Station – Back Bay	286	1,628	0.18
Worcester/Framingham Line IB Newtonville – Yawkey	2,028	4,884	0.42
Worcester/Framingham Line OB South Station – Back Bay	442	1,628	0.27
Franklin Line IB Hyde Park – Ruggles	1,624	4,884	0.33
Franklin Line OB South Station – Back Bay	199	1,628	0.12
Providence/Attleboro Line IB Hyde Park – Ruggles	1,669	4,884	0.34
Providence/Attleboro Line OB South Station – Back Bay	491	3,256	0.15
Canton/Stoughton/South Coast Rail Line IB Ruggles – Back Bay	3,558	4,884	0.73
Canton/Stoughton/South Coast Rail Line OB South Station –Back Bay	203	1,628	0.12
Fairmount Line IB Uphams Corner – Newmarket	1,128	6,512	0.17
Fairmount Line OB Talbot Ave – Morton St	166	6,512	0.03
Middleborough Line IB JFK/UMass – South Station	2,778	3,256	0.85
Middleborough Line OB Montello – Brockton	68	1,628	0.04
Plymouth/Kingston Line IB S Weymouth – Braintree	2,355	3,256	0.72
Plymouth/Kingston Line OB South Station – JFK/UMass	12	1,628	0.01
Greenbush Line IB JFK/UMass – South Station	1,110	3,256	0.34
Greenbush Line OB South Station – JFK/UMass	40	1,628	0.02

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: IB = inbound; OB = outbound.

Table 26—Alternative 2 Commuter Rail Vehicle Loading Summary for PM Peak Hour

Commuter Rail Line Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Needham Line IB Back Bay – South Station	342	1,628	0.21
Needham Line OB Ruggles – Forest Hills	744	3,256	0.23
Worcester/Framingham Line IB Wellesley Hills – Wellesley Farms	286	1,628	0.18
Worcester/Framingham Line OB Yawkey – Newtonville	1,499	4,884	0.31
Franklin Line IB Uphams Corner – Newmarket	211	1,628	0.13
Franklin Line OB Ruggles – Hyde Park	1,310	3,256	0.40
Providence/Attleboro Line IB Back Bay – South Station	290	1,628	0.18
Providence/Attleboro Line OB Ruggles – Hyde Park	581	3,256	0.18
Canton/Stoughton/South Coast Rail Line IB Back Bay – South Station	388	1,628	0.24
Canton/Stoughton/South Coast Rail Line OB Back Bay – Ruggles	4,470	3,256	**1.37**
Fairmount Line IB Uphams Corner – Newmarket	232	6,512	0.04
Fairmount Line OB Newmarket – Uphams Corner	1,224	6,512	0.19
Middleborough Line IB JFK/UMass – South Station	440	1,628	0.27
Middleborough Line OB South Station – JFK/UMass	2,632	3,256	0.81
Plymouth/Kingston Line IB JFK/UMass – South Station	45	1,628	0.03
Plymouth/Kingston Line OB Braintree – South Weymouth	1,537	1,628	0.94
Greenbush Line IB JFK/UMass – South Station	109	1,628	0.07
Greenbush Line OB South Station – JFK/UMass	1,272	3,256	0.39

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: IB = inbound; OB = outbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Rapid Transit

Passenger load volumes on the Silver Line 4 and Silver Line 5 BRT lines are projected to exceed available capacity (as dictated by the MBTA's *Policy*) in the 2035 Build Year in Alternative 2, as shown in Table 27 and Table 28. Depending on the direction of service, AM peak hour V/C ratios would vary from 1.07 to 1.80, and PM peak hour V/C ratios would vary from 1.30 to 1.32. It is important to note that the vehicle load standards used in this analysis, based on the MBTA's *Policy*, are less than the absolute maximum number of passengers that can fit on a transit vehicle, or the "crush capacity." Since the projected passenger loading in Alternative 2 is approximately equal to the projected passenger loading in the No Build Alternative (shown in Figure 24 and Figure 25), there would be no additional impacts to Silver Line passenger crowding as a result of the SSX project.

Table 27—Alternative 2 Rapid Transit Vehicle Loading Summary for AM Peak Hour

Rapid Transit Service Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Red Line NB Broadway – South Station	8,920	15,030	0.59
Red Line SB Kendall Square – MGH	4,800	15,030	0.32
Silver Line Waterfront/Gateway EB South Station – Courthouse	1,736	2,340	0.74
Silver Line Waterfront/Gateway WB Courthouse – South Station	848	2,340	0.36
Silver Line 4 NB Herald – Tufts Medical Center	508	474	**1.07**
Silver Line 4 SB Herald – East Berkeley	852	474	**1.80**
Silver Line 5 NB Herald – Tufts Medical Center	508	474	**1.07**
Silver Line 5 SB Herald – East Berkeley	852	474	**1.80**
Orange Line NB Tufts Medical Center – Chinatown	5,000	11,004	0.45
Orange Line SB Community College – North Station	5,280	11,004	0.48
Blue Line NB State – Aquarium	1,040	7,980	0.13
Blue Line SB Maverick – Aquarium	6,960	7,980	0.87
Green Line Central Subway EB Copley – Arlington	7,160	14,352	0.50
Green Line Central Subway WB Park Street – Boylston	11,200	14,352	0.78

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Table 28—Alternative 2 Rapid Transit Vehicle Loading Summary for PM Peak Hour

Rapid Transit Service Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Red Line NB South Station – Downtown Crossing	4,600	15,030	0.31
Red Line SB South Station – Broadway	8,080	15,030	0.54
Silver Line Waterfront/Gateway EB South Station – Courthouse	956	2,340	0.41
Silver Line Waterfront/Gateway WB Courthouse – South Station	2,128	2,340	0.91
Silver Line 4 NB Herald – Tufts Medical Center	616	474	**1.30**
Silver Line 4 SB Herald – East Berkeley	628	474	**1.32**
Silver Line 5 NB Herald – Tufts Medical Center	616	474	**1.30**
Silver Line 5 SB Herald – East Berkeley	628	474	**1.32**
Orange Line NB State – Haymarket	4,400	11,004	0.40
Orange Line SB Chinatown – Tufts Medical Center	3,920	11,004	0.36
Blue Line NB Aquarium – Maverick	4,440	7,980	0.56
Blue Line SB Maverick – Aquarium	2,040	7,980	0.26
Green Line Central Subway EB Boylston – Park Street	7,920	14,352	0.55
Green Line Central Subway WB Arlington – Copley	7,600	14,352	0.53

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Local Bus

As shown in Table 29 and Table 30 Alternative 2 local bus passenger load volumes at South Station in the AM and PM peak hours, respectively, would be well below the *Policy's* maximum load capacity. Alternative 2 would result in local bus loading with V/C ratios at or below 0.61.

Table 29—Alternative 2 Local Bus Vehicle Loading Summary for AM Peak Hour

Local Bus Route	Modeled Peak Volume at South Station	Policy Maximum Load Capacity	Volume / Policy Capacity
7 WB	387	648	0.60
7 EB	94	540	0.17
11 EB	1	216	0.01
448 SB	14	54	0.25
448 NB	1	54	0.02
449 SB	13	54	0.24
449 NB	1	54	0.02
459 SB	33	54	0.61
459 NB	6	108	0.06

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Table 30—Alternative 2 Local Bus Vehicle Loading Summary for PM Peak Hour

Local Bus Route	Modeled Peak Volume at South Station	Policy Maximum Load Capacity	Volume / Policy Capacity
4 EB	1	162	< 0.01
7 WB	112	270	0.41
7 EB	160	432	0.37
11 EB	9	270	0.03
448 NB	15	54	0.27
449 NB	15	54	0.27
459 SB	35	162	0.22
459 NB	3	54	0.06

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

6.3.2. Core Station Capacity Analysis

The following sections summarize the 2035 Build Year results for the Alternative 2 core station capacity analysis. The analysis consisted of calculating the platform activity for each rapid transit line serving the core stations based on projected boardings and alightings from the CTPS travel demand model. Figures 50 through 59 illustrate the hourly platform activity at each core station. Peak period and daily platform activity summary tables for each core station are provided in Attachment L.

South Station

Table 44 and Table 45 in Attachment L presents platform activity summaries at South Station for Alternative 2. In Alternative 2, daily Red Line boardings and alightings at South Station would increase by 2,340 passengers compared to the No Build Alternative, corresponding to an increase of 3.2%. In the AM and PM peak periods, boardings and alightings would increase by 4.5% and 3.4%, respectively.

Daily Silver Line boardings and alightings at South Station are projected to increase by 600 passengers in Alternative 2, corresponding to an increase of 2.3% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 2.4% and 4.3%, respectively.

Park Street

Table 46 and Table 47 in Attachment L present platform activity summaries at Park Street for Alternative 2. In Alternative 2, daily Red Line boardings and alightings at Park Street would increase by 340 passengers compared to the No Build Alternative, corresponding to an increase of 0.4%. In the AM and PM peak periods, boardings and alightings would increase by 0.6%.

Daily Green Line boardings and alightings at Park Street are projected to increase by 300 passengers in Alternative 2, corresponding to an increase of 0.3% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 0.6% and 0.5%, respectively.

Alternative 2 would result in an unnoticeable increase in overall platform activity at Park Street.

Downtown Crossing

Table 48 and Table 49 in Attachment L presents platform activity summaries at Downtown Crossing for Alternative 2. In Alternative 2, daily Red Line boardings and alightings at Downtown Crossing would increase by 180 passengers compared to the No Build Alternative, corresponding to an increase of just

0.2%. In the AM and PM peak periods, boardings and alightings would increase by 0.4% and 0.3%, respectively.

Daily Orange Line boardings and alightings at Downtown Crossing are projected to increase by 370 passengers in Alternative 2, corresponding to an increase of 0.5% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 0.4% and 0.6%, respectively.

Alternative 2 would result in an unnoticeable increase in overall platform activity at Downtown Crossing.

Government Center

Table 50 and Table 51 in Attachment L present platform activity summaries at Government Center for Alternative 2. In Alternative 2, daily Blue Line boardings and alightings at Government Center would increase by 60 passengers compared to the No Build Alternative, corresponding to an increase of 0.2%. In the AM and PM peak periods, boardings and alightings would increase by 0.1%.

Daily Green Line boardings and alightings at Government Center are projected to increase by 140 passengers in Alternative 2, corresponding to an increase of 0.3% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by only 0.1%.

Alternative 2 would result in an unnoticeable increase in overall platform activity at Government Center.

State Street

Table 52 and Table 53 in Attachment L presents platform activity summaries at State Street for Alternative 2. In Alternative 2, daily Blue Line boardings and alightings at State Street would increase by 50 passengers compared to the No Build Alternative, corresponding to an increase of just 0.1%. In the AM and PM peak periods, boardings and alightings would increase by less than 0.1% and 0.2%, respectively.

Daily Orange Line boardings and alightings at State Street are projected to increase by 150 passengers in Alternative 2, corresponding to an increase of 0.4% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 0.3% and 0.6%, respectively.

Alternative 2 would result in an unnoticeable increase in overall platform activity at State Street.

6.4. Alternative 3 – Joint/ Private Development Maximum Build

Alternative 3 would include Alternative 1, as well as provisions for future private development by incorporating appropriate structural foundations into the overall station and track design.

In Alternative 3, the potential for future private development at the South Station site could include approximately 2.1 million square feet of mixed-use development along Dorchester Avenue, consisting of residential, office, and commercial uses, including retail and hotel uses, with building heights up to approximately 26 stories. Development could include approximately 507 parking spaces**.**

Similar to Alternative 1, the future commuter rail service plan for Alternative 3 would include South Coast Rail commuter rail service; additional peak period, peak direction trains on the Needham, Franklin, Providence, and Worcester/Framingham Lines; and increased frequencies on the Fairmount Line. Like Alternative 1, Alternative 3 would also include service increases for Amtrak intercity trains.

6.4.1. Transit Vehicle Loading Analysis

Results of the transit vehicle loading analysis for Alternative 3 are summarized in the following sections, with detailed analysis tables provided in Attachment K. The analysis compared the projected peak hour demand from the CTPS travel demand model to available capacity using the conservative loading standards from the MBTA's *Policy*. Volume-to-capacity (V/C) ratios greater than 1.0 indicate that the average demand during the peak hour would exceed available capacity as defined by the MBTA's *Policy*.

Commuter Rail

Similar to Alternative 1, the future commuter rail service plan for Alternative 3 would include South Coast Rail commuter rail service; additional peak period, peak direction trains on the Needham, Franklin, Providence, and Worcester/Framingham Lines; and increased frequencies on the Fairmount Line. As shown in Table 31 and Table 32, passenger load volumes at the peak load points for the various south side commuter rail lines would be sufficiently accommodated by the capacity provided, except for the PM peak hour Canton/Stoughton/South Coast Rail Line in the outbound direction. Modeled demand at the PM peak load point, between Back Bay and Ruggles in the outbound direction, would exceed the proposed capacity provided in the 2035 Build Year by 1,214 passengers, corresponding to a V/C ratio of 1.37. However, modeled demand over the entire three-hour PM Peak period, equal to 5,960 passengers, would be well within the *Policy* maximum load capacity available in the PM Peak period of 9,768 passengers (based on 1,628 passengers per train, two trains per hour, and three hours in the peak period). The surge of passenger demand during the peak hour could be accommodated by implementing schedule adjustments to the proposed outbound Canton/Stoughton/South Coast Rail Line PM Peak period trains. The peak hour demand could be accommodated by shifting trains during the peak period to provide additional capacity during the peak hour.

Table 31—Alternative 3 Commuter Rail Vehicle Loading Summary for AM Peak Hour

Commuter Rail Line Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Needham Line IB Forest Hills – Ruggles	653	3,256	0.20
Needham Line OB South Station – Back Bay	292	1,628	0.18
Worcester/Framingham Line IB Newtonville – Yawkey	2,054	4,884	0.42
Worcester/Framingham Line OB South Station – Back Bay	449	1,628	0.28
Franklin Line IB Hyde Park – Ruggles	1,647	4,884	0.34
Franklin Line OB South Station – Back Bay	199	1,628	0.12
Providence/Attleboro Line IB Hyde Park – Ruggles	1,690	4,884	0.35
Providence/Attleboro Line OB South Station – Back Bay	499	3,256	0.15
Canton/Stoughton/South Coast Rail Line IB Ruggles – Back Bay	3,558	4,884	0.73
Canton/Stoughton/South Coast Rail Line OB South Station – Back Bay	203	1,628	0.12
Fairmount Line IB Uphams Corner – Newmarket	1,135	6,512	0.17
Fairmount Line OB Talbot Ave – Morton St	166	6,512	0.03
Middleborough Line IB JFK/UMass – South Station	2,778	3,256	0.85
Middleborough Line OB Montello – Brockton	68	1,628	0.04
Plymouth/Kingston Line IB S Weymouth – Braintree	2,355	3,256	0.72
Plymouth/Kingston Line OB South Station – JFK/UMass	12	1,628	0.01
Greenbush Line IB JFK/UMass – South Station	1,110	3,256	0.34
Greenbush Line OB South Station – JFK/UMass	40	1,628	0.02

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: IB = inbound; OB = outbound.

Table 32—Alternative 3 Commuter Rail Vehicle Loading Summary for PM Peak Hour

Commuter Rail Line Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Needham Line IB Back Bay – South Station	348	1,628	0.21
Needham Line OB Ruggles – Forest Hills	756	3,256	0.23
Worcester/Framingham Line IB Wellesley Hills – Wellesley Farms	286	1,628	0.18
Worcester/Framingham Line OB Yawkey – Newtonville	1,516	4,884	0.31
Franklin Line IB Uphams Corner – Newmarket	211	1,628	0.13
Franklin Line OB Ruggles – Hyde Park	1,328	3,256	0.41
Providence/Attleboro Line IB Back Bay – South Station	290	1,628	0.18
Providence/Attleboro Line OB Ruggles – Hyde Park	590	3,256	0.18
Canton/Stoughton/South Coast Rail Line IB Back Bay – South Station	393	1,628	0.24
Canton/Stoughton/South Coast Rail Line OB Back Bay – Ruggles	4,470	3,256	**1.37**
Fairmount Line IB Uphams Corner – Newmarket	238	6,512	0.04
Fairmount Line OB Newmarket – Uphams Corner	1,224	6,512	0.19
Middleborough Line IB JFK/UMass – South Station	440	1,628	0.27
Middleborough Line OB South Station – JFK/UMass	2,632	3,256	0.81
Plymouth/Kingston Line IB JFK/UMass – South Station	45	1,628	0.03
Plymouth/Kingston Line OB Braintree – South Weymouth	1,537	1,628	0.94
Greenbush Line IB JFK/UMass – South Station	109	1,628	0.07
Greenbush Line OB South Station – JFK/UMass	1,272	3,256	0.39

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: IB = inbound; OB = outbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Rapid Transit

In Alternative 3, passenger load volumes on the Silver Line 4 and Silver Line 5 BRT lines are projected to exceed available capacity (as dictated by the MBTA's *Policy*) in the 2035 Build Year, as shown in Table 33 and Table 34. Depending on the direction of service, AM peak hour V/C ratios would vary from 1.07 to 1.80, and PM peak hour V/C ratios would vary from 1.30 to 1.32. As previously stated, the vehicle load standards used in this analysis, based on the MBTA's *Policy*, are less than the absolute maximum number of passengers that can fit on a transit vehicle, or the "crush capacity." Since the projected passenger loading in Alternative 3 is approximately equal to the projected passenger loading in the No Build Alternative (shown in Figure 24 and Figure 25), there would be no additional impacts to Silver Line passenger crowding as a result of the SSX project.

Table 33—Alternative 3 Rapid Transit Vehicle Loading Summary for AM Peak Hour

Rapid Transit Service Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Red Line NB Broadway – South Station	8,920	15,030	0.59
Red Line SB Kendall Square – MGH	4,840	15,030	0.32
Silver Line Waterfront/Gateway EB South Station – Courthouse	1,768	2,340	0.76
Silver Line Waterfront/Gateway WB Courthouse – South Station	860	2,340	0.37
Silver Line 4 NB Herald – Tufts Medical Center	508	474	**1.07**
Silver Line 4 SB Herald – East Berkeley	852	474	**1.80**
Silver Line 5 NB Herald – Tufts Medical Center	508	474	**1.07**
Silver Line 5 SB Herald – East Berkeley	852	474	**1.80**
Orange Line NB Tufts Medical Center – Chinatown	5,000	11,004	0.45
Orange Line SB Community College – North Station	5,280	11,004	0.48
Blue Line NB State – Aquarium	1,040	7,980	0.13
Blue Line SB Maverick – Aquarium	6,960	7,980	0.87
Green Line Central Subway EB Copley – Arlington	7,160	14,352	0.50
Green Line Central Subway WB Park Street – Boylston	11,200	14,352	0.78

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Table 34—Alternative 3 Rapid Transit Vehicle Loading Summary for PM Peak Hour

Rapid Transit Service Peak Load Point	Modeled Volume at Peak Load Point	Policy Maximum Load Capacity	Volume/ Policy Capacity
Red Line NB South Station – Downtown Crossing	4,640	15,030	0.31
Red Line SB South Station – Broadway	8,080	15,030	0.54
Silver Line Waterfront/Gateway EB South Station – Courthouse	972	2,340	0.42
Silver Line Waterfront/Gateway WB Courthouse – South Station	2,156	2,340	0.92
Silver Line 4 NB Herald – Tufts Medical Center	616	474	**1.30**
Silver Line 4 SB Herald – East Berkeley	628	474	**1.32**
Silver Line 5 NB Herald – Tufts Medical Center	616	474	**1.30**
Silver Line 5 SB Herald – East Berkeley	628	474	**1.32**
Orange Line NB State – Haymarket	4,400	11,004	0.40
Orange Line SB Chinatown – Tufts Medical Center	3,920	11,004	0.36
Blue Line NB Aquarium – Maverick	4,440	7,980	0.56
Blue Line SB Maverick – Aquarium	2,040	7,980	0.26
Green Line Central Subway EB Boylston – Park Street	7,920	14,352	0.55
Green Line Central Subway WB Arlington – Copley	7,600	14,352	0.53

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Local Bus

As shown in Table 35 and Table 36, Alternative 3 local bus passenger load volumes at South Station in the AM and PM peak hours, respectively, would be well below the *Policy's* maximum load capacity. Alternative 3 would result in local bus loading with V/C ratios of 0.62 or less.

Table 35—Alternative 3 Local Bus Vehicle Loading Summary for AM Peak Hour

Local Bus Route	Modeled Peak Volume at South Station	Policy Maximum Load Capacity	Volume/ Policy Capacity
7 WB	388	648	0.60
7 EB	83	540	0.15
11 EB	1	216	0.01
448 SB	14	54	0.25
448 NB	1	54	0.02
449 SB	13	54	0.24
449 NB	1	54	0.02
459 SB	34	54	0.62
459 NB	6	108	0.06

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Table 36—Alternative 3 Local Bus Vehicle Loading Summary for PM Peak Hour

Local Bus Route	Modeled Peak Volume at South Station	Policy Maximum Load Capacity	Volume/ Policy Capacity
4 EB	1	162	< 0.01
7 WB	113	270	0.42
7 EB	162	432	0.37
11 EB	9	270	0.03
448 NB	15	54	0.27
449 NB	15	54	0.27
459 SB	36	162	0.22
459 NB	3	54	0.06

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

6.4.2. Core Station Capacity Analysis

The following sections summarize the 2035 Build Year results for the Alternative 3 core station capacity analysis. The analysis consisted of calculating the platform activity for each rapid transit line serving the core stations, based on projected boardings and alightings from the CTPS travel demand model. Figures 60 through 69 illustrate the hourly platform activity at each core station. Peak period and daily platform activity summary tables for each core station are provided in Attachment L. For South Station, a detailed analysis of pedestrian movements through various circulation elements (stairs, platforms, concourses, etc.) was also conducted.

South Station

Table 44 and Table 45 in Attachment L presents platform activity summaries at South Station for Alternative 3. In Alternative 3, daily Red Line boardings and alightings at South Station would increase by 4,380 passengers compared to the No Build Alternative, corresponding to an increase of 6.1%. In the AM and PM peak periods, boardings and alightings would increase by 7.6% and 6.1%, respectively.

Daily Silver Line boardings and alightings at South Station are projected to increase by 1,050 passengers in Alternative 3, corresponding to an increase of 4.1% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 4.1% and 5.8%, respectively.

The following results were obtained from the LOS analysis of pedestrian circulation elements at South Station in Alternative 3:

- Platforms
  - Commuter Rail and Amtrak: The existing commuter rail and Amtrak platforms would experience a very poor LOS (LOS E/F). This is the same as the worst case Existing Conditions and No Build Alternative platform LOS but it would occur more frequently due to the increased number of trains and ridership.
  - Red Line: The increase in ridership associated with Alternative 3 would result in a slightly reduced LOS when compared to the No Build Alternative (LOS D or better during both the morning and evening peaks versus LOS C or better during the morning peak and LOS D or better during the evening peak, respectively).
  - Silver Line: An average LOS (LOS C) or better is maintained throughout the morning and evening peaks.
- Concourses
  - Despite the significantly expanded rail head concourse, passengers waiting within the rail head concourse adjacent to the existing platforms would experience a poor LOS (LOS E/F). Passengers waiting adjacent to the new platforms would experience an acceptable LOS (LOS D or better).
- Vertical Circulation (Stairs and Escalators)
  - The 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) would be maintained throughout the morning and evening peaks.

Park Street

Table 46 and Table 47 in Attachment L present platform activity summaries at Park Street for Alternative 3. In Alternative 3, daily Red Line boardings and alightings at Park Street would increase by 720 passengers compared to the No Build Alternative, corresponding to an increase of 0.8%. In the AM and PM peak periods, boardings and alightings would increase by 1.2%.

Daily Green Line boardings and alightings at Park Street are projected to increase by 640 passengers in Alternative 3, corresponding to an increase of 0.7% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 1.3% and 0.9%, respectively.

Alternative 3 would result in an unnoticeable increase in overall platform activity at Park Street.

Downtown Crossing

Table 48 and Table 49 in Attachment L present platform activity summaries at Downtown Crossing for Alternative 3. In Alternative 3, daily Red Line boardings and alightings at Downtown Crossing would increase by 250 passengers compared to the No Build Alternative, corresponding to an increase of just 0.3%. In the AM and PM peak periods, boardings and alightings would increase by 0.6% and 0.4%, respectively.

Daily Orange Line boardings and alightings at Downtown Crossing are projected to increase by 660 passengers in Alternative 3, corresponding to an increase of 0.8% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 0.8% and 1.0%, respectively.

Alternative 3 would result in an unnoticeable increase in overall platform activity at Downtown Crossing.

Government Center

Table 50 and Table 51 in Attachment L present platform activity summaries at Government Center for Alternative 3. In Alternative 3, daily Blue Line boardings and alightings at Government Center would increase by 90 passengers compared to the No Build Alternative, corresponding to an increase of 0.3%. In the AM and PM peak periods, boardings and alightings would increase by 0.1% and 0.2%, respectively.

Daily Green Line boardings and alightings at Government Center are projected to increase by 250 passengers in Alternative 3, corresponding to an increase of 0.5% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by only 0.1%.

Alternative 3 would result in an unnoticeable increase in overall platform activity at Government Center.

State Street

Table 52 and Table 53 in Attachment L present platform activity summaries at State Street for Alternative 3. In Alternative 3, daily Blue Line boardings and alightings at State Street would increase by 90 passengers compared to the No Build Alternative, corresponding to an increase of 0.3%. In the AM and PM peak periods, boardings and alightings would increase by less than 0.1% and 0.5%, respectively.

Daily Orange Line boardings and alightings at State Street are projected to increase by 210 passengers in Alternative 3, corresponding to an increase of 0.5% compared to the No Build Alternative. In the AM and PM peak periods, boardings and alightings would increase by 0.3% and 0.6%, respectively.

Alternative 3 would result in an unnoticeable increase in overall platform activity at State Street.

6.5. Summary of Impacts

In this section, a summary of impacts identified from the transit vehicle loading analysis and core station capacity analysis is provided for each 2035 Build Year alternative. Tables 37 through 42 summarize the commuter rail, rapid transit, and local bus V/C ratio results by alternative for the AM and PM peak hours, expressed as the difference (delta) between the Build Alternative results and the No Build Alternative results. Attachment K provides the detailed transit vehicle loading analysis results for all modes. Table 43—Core Station Capacity Analysis Summary summarizes the core station capacity analysis results by alternative. Attachment L provides more detailed information on the station capacity analysis. Appendix 9 - *Pedestrian Circulation Analysis Technical Report* provides the detailed results of the pedestrian LOS analysis at South Station.

Table 37—Commuter Rail Vehicle Loading Summary for the AM Peak Hour

Transit Service Peak Load Point	No Build Volume/ Policy Capacity	Alt. 1 – No Build Delta	Alt. 2 – No Build Delta	Alt. 3 – No Build Delta
Needham Line IB Forest Hills – Ruggles	0.18	0.02	0.02	0.02
Needham Line OB South Station – Back Bay	0.18	0	0	0
Worcester/Framingham Line IB Newtonville – Yawkey	0.39	0.02	0.03	0.03
Worcester/Framingham Line OB South Station – Back Bay	0.27	0	0	0.01
Franklin Line IB Hyde Park – Ruggles	0.32	0.01	0.01	0.02
Franklin Line OB South Station – Back Bay	0.12	0	0	0
Providence/Attleboro Line IB Hyde Park – Ruggles	0.31	0.02	0.03	0.04
Providence/Attleboro Line OB South Station – Back Bay	0.15	0	0	0
Canton/Stoughton/South Coast Rail Line IB Ruggles – Back Bay	0.72[a]	0.01	0.01	0.01
Canton/Stoughton/South Coast Rail Line OB South Station – Back Bay	0.12[b]	0	0	0
Fairmount Line IB Uphams Corner – Newmarket	0.17	0	0	0
Fairmount Line OB Talbot Ave – Morton St	0.03	0	0	0
Middleborough Line IB JFK/UMass – South Station	0.85	0	0	0
Middleborough Line OB Montello – Brockton	0.04	0	0	0
Plymouth/Kingston Line IB S Weymouth – Braintree	0.72	0	0	0
Plymouth/Kingston Line OB South Station – JFK/UMass	0.01	0	0	0
Greenbush Line IB JFK/UMass – South Station	0.34	0	0	0
Greenbush Line OB South Station – JFK/UMass	0.02	0	0	0

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: IB = inbound; OB = outbound.
a Represents Volume/Policy Capacity for Canton/Stoughton Line IB, Hyde Park – Ruggles. South Coast Rail service is not included in the No Build Alternative.
b Represents Volume/Policy Capacity for Canton/Stoughton Line OB, South Station – Back Bay. South Coast Rail service is not included in the No Build Alternative.

Table 38—Commuter Rail Vehicle Loading Summary for the PM Peak Hour

Transit Service Peak Load Point	No Build Volume/ Policy Capacity	Alt. 1 – No Build Delta	Alt. 2 – No Build Delta	Alt. 3 – No Build Delta
Needham Line IB Back Bay – South Station	0.21	0	0	0
Needham Line OB Ruggles – Forest Hills	0.21	0.02	0.02	0.02
Worcester/Framingham Line IB Wellesley Hills – Wellesley Farms	0.17	0.01	0.01	0.01
Worcester/Framingham Line OB Yawkey – Newtonville	0.30	0.01	0.01	0.01
Franklin Line IB Uphams Corner – Newmarket	0.13	0	0	0
Franklin Line OB Ruggles – Hyde Park	0.38	0.02	0.02	0.03
Providence/Attleboro Line IB Back Bay – South Station	0.18	0	0	0
Providence/Attleboro Line OB Ruggles – Hyde Park	0.16	0.02	0.02	0.02
Canton/Stoughton/South Coast Rail Line IB Back Bay – South Station	0.23[a]	0	0.01	0.01
Canton/Stoughton/South Coast Rail Line OB Back Bay – Ruggles	0.51[b]	**0.86**	**0.86**	**0.86**
Fairmount Line IB Uphams Corner – Newmarket	0.03	0	0.01	0.01
Fairmount Line OB Newmarket – Uphams Corner	0.18	0.01	0.01	0.01
Middleborough Line IB JFK/UMass – South Station	0.26	0.01	0.01	0.01
Middleborough Line OB South Station – JFK/UMass	0.81	0	0	0
Plymouth/Kingston Line IB JFK/UMass – South Station	0.03	0	0	0
Plymouth/Kingston Line OB Braintree – South Weymouth	0.94	0	0	0
Greenbush Line IB JFK/UMass – South Station	0.06	0	0.01	0.01
Greenbush Line OB South Station – JFK/UMass	0.39	0	0	0

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: IB = inbound; OB = outbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.
a Represents Volume/Policy Capacity for Canton/Stoughton Line IB, Back Bay – South Station. South Coast Rail service is not included in the No Build Alternative.
b Represents Volume/Policy Capacity for Canton/Stoughton Line OB, Ruggles – Hyde Park. South Coast Rail service is not included in the No Build Alternative.

Table 39—Rapid Transit Vehicle Loading Summary for the AM Peak Hour

Rapid Transit Service Peak Load Point	No Build Volume/ Policy Capacity	Alt. 1 – No Build Delta	Alt. 2 – No Build Delta	Alt. 3 – No Build Delta
Red Line NB Broadway – South Station	0.59	0	0	0
Red Line SB Kendall Square – MGH	0.32	0	0	0
Silver Line Waterfront/Gateway EB South Station – Courthouse	0.72	0.02	0.02	0.04
Silver Line Waterfront/Gateway WB Courthouse – South Station	0.36	0	0	0.01
Silver Line 4 NB Herald – Tufts Medical Center	**1.07**	**0**	**0**	**0**
Silver Line 4 SB Herald – East Berkeley	**1.81**	**0**	**-0.01**	**-0.01**
Silver Line 5 NB Herald – Tufts Medical Center	**1.07**	**0**	**0**	**0**
Silver Line 5 SB Herald – East Berkeley	**1.81**	**0**	**-0.01**	**-0.01**
Orange Line NB Tufts Medical Center – Chinatown	0.45	0	0	0
Orange Line SB Community College – North Station	0.48	0	0	0
Blue Line NB State – Aquarium	0.13	0	0	0
Blue Line SB Maverick – Aquarium	0.87	0	0	0
Green Line Central Subway EB Copley – Arlington	0.50	0	0	0
Green Line Central Subway WB Park Street – Boylston	0.78	0	0	0

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Table 40—Rapid Transit Vehicle Loading Summary for the PM Peak Hour

Rapid Transit Service Peak Load Point	No Build Volume/ Policy Capacity	Alt. 1 – No Build Delta	Alt. 2 – No Build Delta	Alt. 3 – No Build Delta
Red Line NB South Station – Downtown Crossing	0.30	0	0.01	0.01
Red Line SB South Station – Broadway	0.53	0	0.01	0.01
Silver Line Waterfront/Gateway EB South Station – Courthouse	0.41	0	0	0.01
Silver Line Waterfront/Gateway WB Courthouse – South Station	0.85	0.06	0.06	0.07
Silver Line 4 NB Herald – Tufts Medical Center	**1.29**	**0**	**0.01**	**0.01**
Silver Line 4 SB Herald – East Berkeley	**1.32**	**0**	**0**	**0**
Silver Line 5 NB Herald – Tufts Medical Center	**1.29**	**0**	**0.01**	**0.01**
Silver Line 5 SB Herald – East Berkeley	**1.32**	**0**	**0**	**0**
Orange Line NB State – Haymarket	0.40	0	0	0
Orange Line SB Chinatown – Tufts Medical Center	0.35	0.01	0.01	0.01
Blue Line NB Aquarium – Maverick	0.56	0	0	0
Blue Line SB Maverick – Aquarium	0.25	0	0.01	0.01
Green Line Central Subway EB Boylston – Park Street	0.55	0	0	0
Green Line Central Subway WB Arlington – Copley	0.53	0	0	0

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound. Entities in bold indicate a volume-to-capacity ratio over 1.0.

Table 41—Local Bus Vehicle Loading Summary for the AM Peak Hour

Local Bus Service Peak Load Point	No Build Volume/ Policy Capacity	Alt. 1 – No Build Delta	Alt. 2 – No Build Delta	Alt. 3 – No Build Delta
7 WB	0.59	0	0.01	0.01
7 EB	0.13	0	0.04	0.02
11 EB	0.01	0	0	0
448 SB	0.25	0	0	0
448 NB	0.02	0	0	0
449 SB	0.24	0	0	0
449 NB	0.02	0	0	0
459 SB	0.60	0	0.01	0.02
459 NB	0.06	0	0	0

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Table 42—Local Bus Vehicle Loading Summary for the PM Peak Hour

Local Bus Service Peak Load Point	No Build Volume/ Policy Capacity	Alt. 1 – No Build Delta	Alt. 2 – No Build Delta	Alt. 3 – No Build Delta
4 EB	< 0.01	0	0	0
7 WB	0.39	0	0.02	0.03
7 EB	0.36	0	0.01	0.01
11 EB	0.03	0	0	0
448 NB	0.27	0	0	0
449 NB	0.27	0	0	0
459 SB	0.21	0	0.01	0.01
459 NB	0.06	0	0	0

Source: CTPS, *Transit Crowding Analysis* (see Attachment K).
Note: NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

Table 43—Core Station Capacity Analysis Summary

Core Station Platform	No Build Daily Boardings and Alightings	Alt. 1 % Increase from No Build Alternative	Alt. 2 % Increase from No Build Alternative	Alt. 3 % Increase from No Build Alternative
South Station – Red Line Platforms	72,200	2.7%	3.2%	6.1%
South Station – Silver Line Platforms	25,600	2.1%	2.3%	4.1%
Park Street – Red Line Platforms	90,930	0.2%	0.4%	0.8%
Park Street – Green Line Platforms	92,820	0.1%	0.3%	0.7%
Downtown Crossing – Red Line Platforms	78,750	0.2%	0.2%	0.3%
Downtown Crossing – Orange Line Platforms	81,150	0.2%	0.5%	0.8%
Government Center – Blue Line Platforms	34,020	0.1%	0.2%	0.3%
Government Center – Green Line Platforms	51,320	0.0%	0.3%	0.5%
State Street – Blue Line Platforms	34,410	0.0%	0.1%	0.3%
State Street – Orange Line Platforms	40,730	0.2%	0.4%	0.5%

Source: *Final SSX Ridership Results* provided in Appendix 9 – *Ridership Forecasting Technical Report* and CTPS, *Results of Station Activities at Downtown Stations*.

6.5.1. Transit Vehicle Loading Impacts

Findings of the transit vehicle loading analysis indicate that none of the Build Alternatives would result in crowding impacts to rapid transit or local bus lines that exceed the maximum load capacity as defined in the MBTA's *Policy* more than those impacts that would result from the No Build Alternative.

For commuter rail, projected 2035 Build Year passenger loading on the outbound Canton/Stoughton/South Coast Rail Line is projected to exceed the MBTA's *Policy* maximum load capacity in the PM peak hour. However, modeled demand over the entire three-hour PM peak period would be well within the available PM peak period capacity, indicating that the surge of passenger demand during the peak hour could be accommodated by implementing schedule adjustments to the proposed outbound Canton/Stoughton/South Coast Rail Line PM peak period trains. The peak hour demand could be accommodated by shifting trains during the peak period to provide additional capacity during the peak hour.

6.5.2. Core Station Capacity Impacts

With the Build Alternatives, SSX project-related ridership increases at stations in the downtown core (Park Street, Downtown Crossing, Government Center and State Street) would be imperceptible from ridership in the No Build Alternative. Despite the projected increase in passenger activity at South Station, an acceptable LOS would be maintained on South Station's Silver Line and Red Line platforms in the Build Alternatives, as described in further detail below.

The detailed analysis of pedestrian LOS at South Station, provided in Appendix 9 - *Pedestrian Circulation Analysis Technical Report*, was conducted for Existing Conditions, the 2035 No Build Alternative, and 2035 Alternative 3. For purposes of this analysis, Alternative 3 assumes a single level intercity and commuter rail concourse. The analysis results indicate that 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. Passengers waiting within the 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.

7. Proposed Mitigation

Project-related impacts are identified as those impacts that would result from the Build Alternatives that would exceed impacts which would otherwise occur in the No Build Alternative. Mitigation would be necessary for significant impacts.

Examples of potential mitigation measures include: increasing service frequency, adjusting peak hour schedules (as noted previously for South Coast Rail service), reconfiguring or removing vehicle seating in

order to increase vehicle capacity (similar to the MBTA's "Big Red" high capacity, modified Red Line cars), and adding or reconfiguring pedestrian circulation infrastructure within stations.

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.

8. Figures

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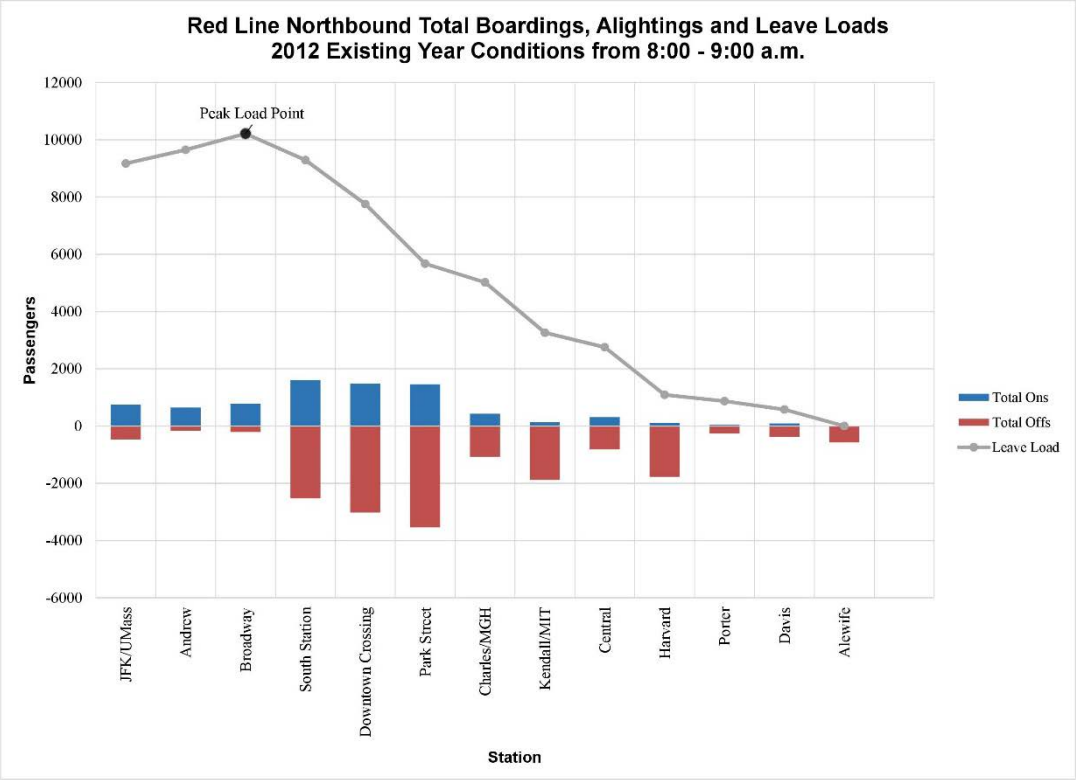
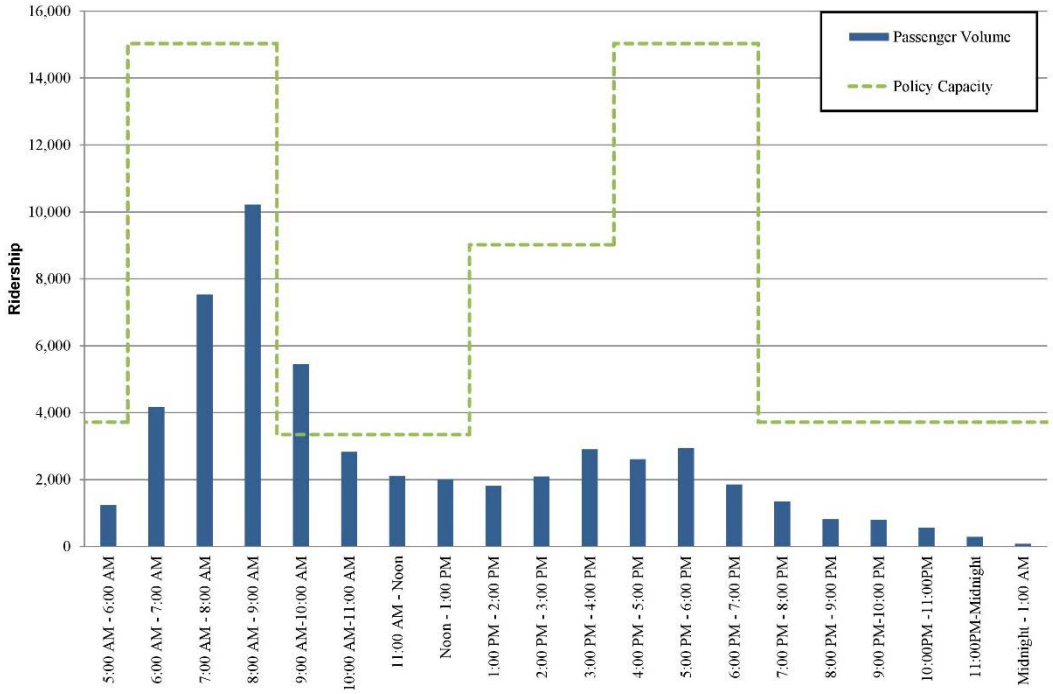
Source: MBTA. www.mbta.com

Figure 1—MBTA System Map



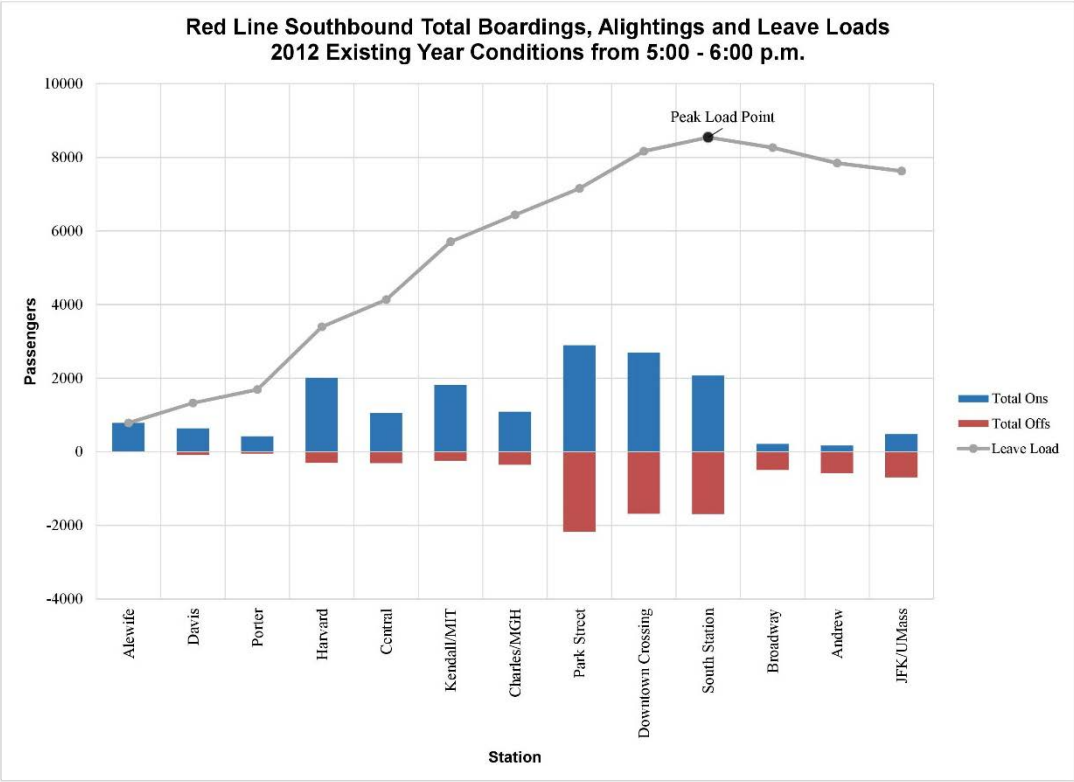
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 2—Red Line Northbound Loading Profile at Peak Demand – 2012 Existing Year



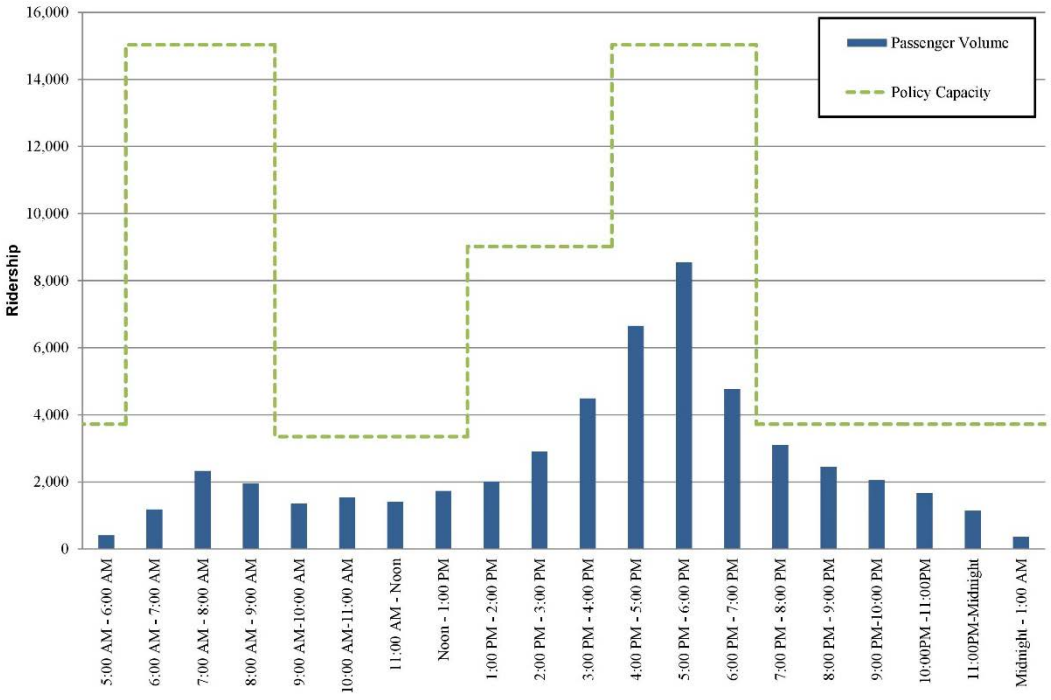
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 3—Red Line Northbound Weekday Loading at Peak Load Point (Broadway – South Station) – 2012 Existing Year



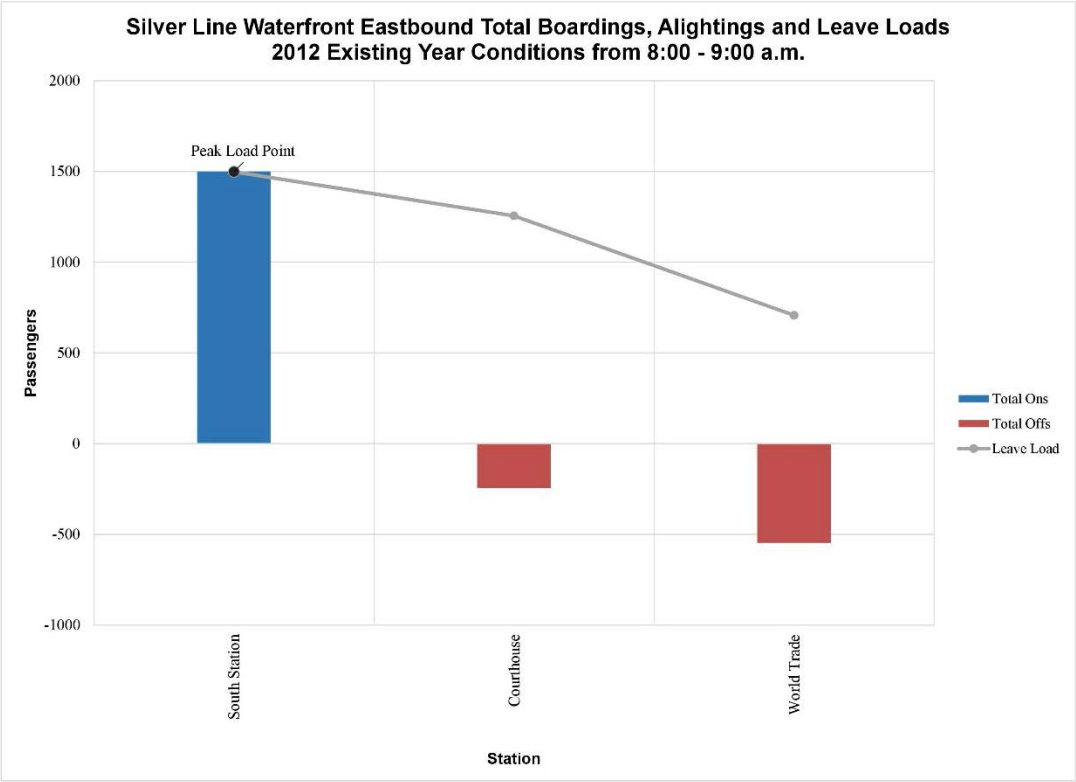
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 4—Red Line Southbound Loading Profile at Peak Demand – 2012 Existing Year



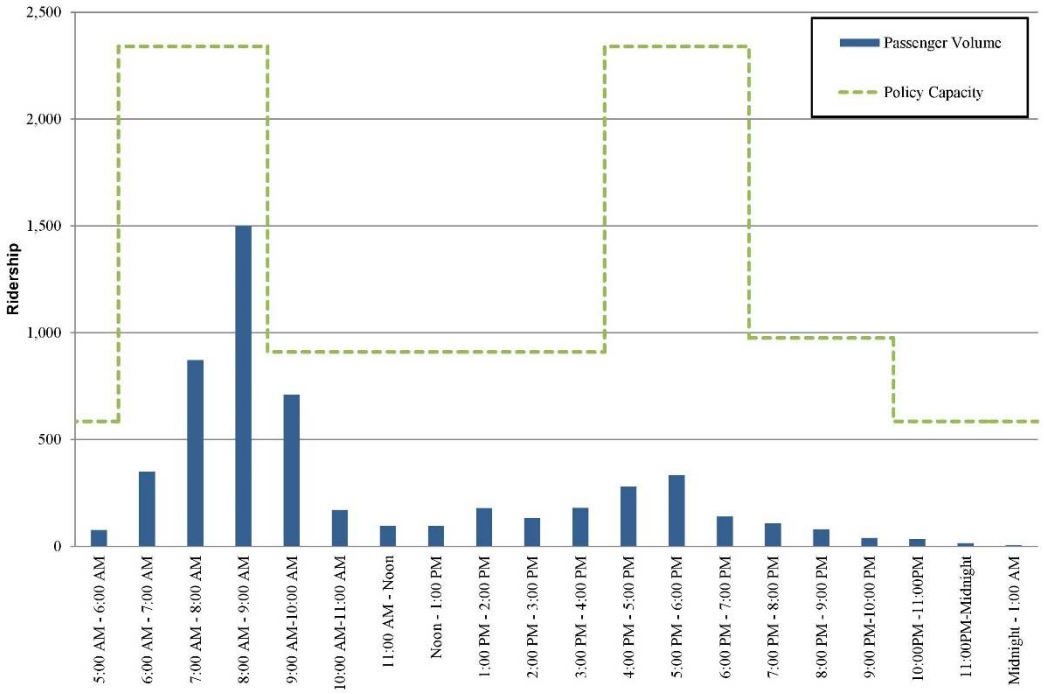
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 5—Red Line Southbound Weekday Loading at Peak Load Point (South Station - Broadway) – 2012 Existing Year



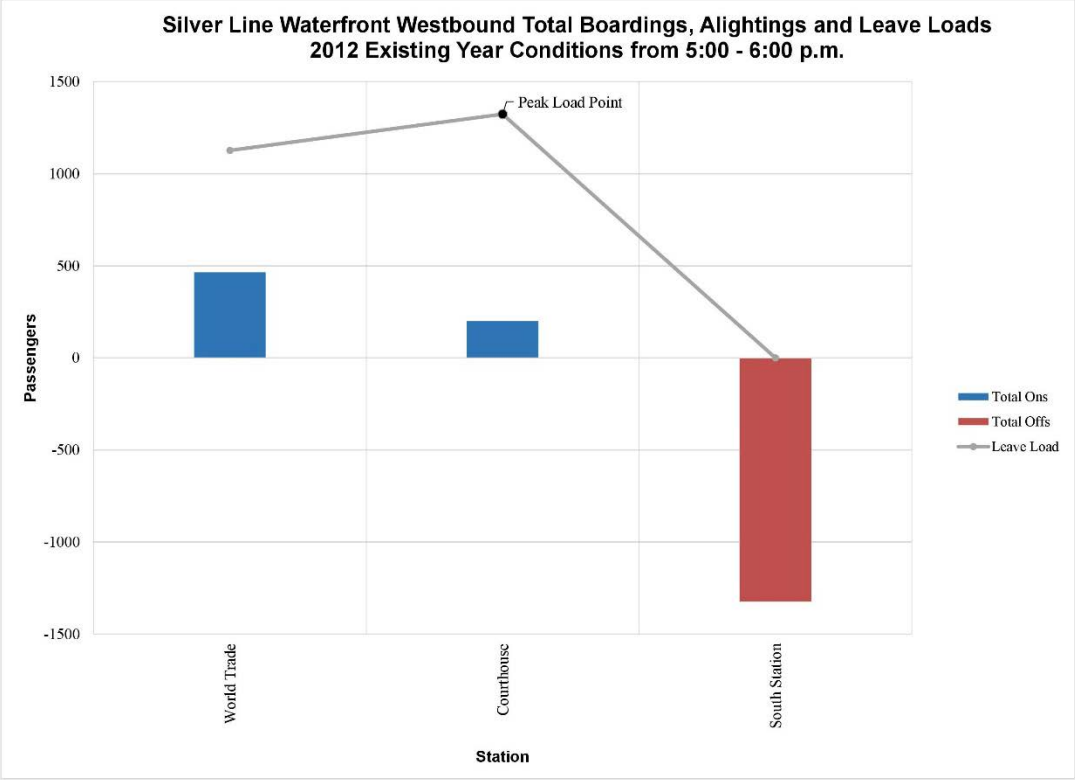
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 6—Silver Line Waterfront Eastbound Loading Profile at Peak Demand – 2012 Existing Year



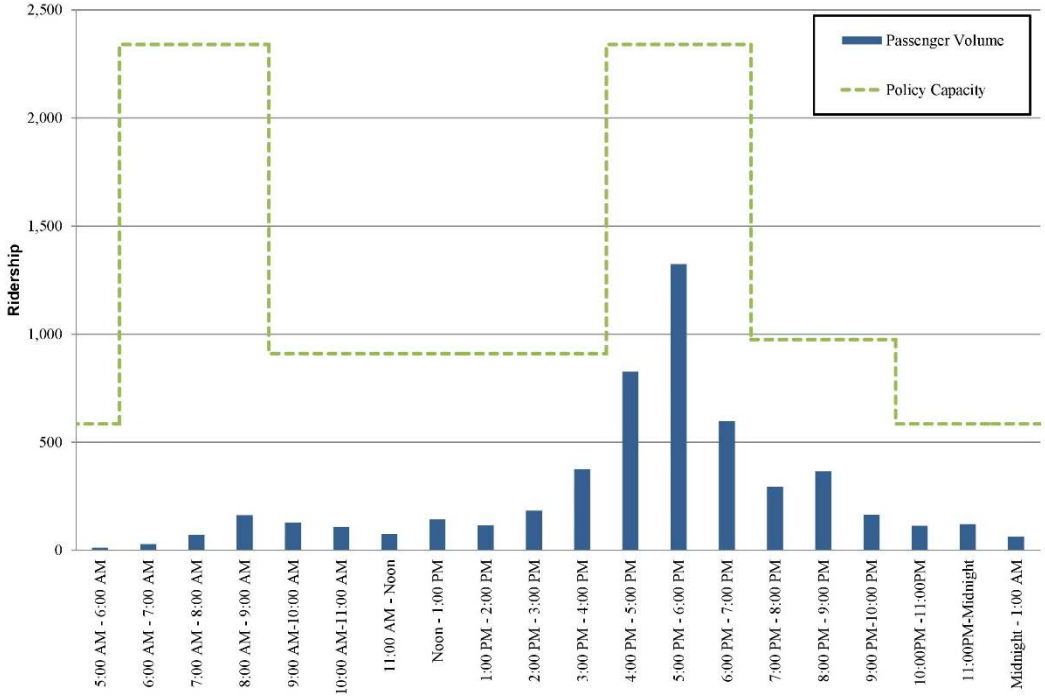
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 7—Silver Line Waterfront Eastbound Weekday Loading at Peak Load Point (South Station - Courthouse) – 2012 Existing Year



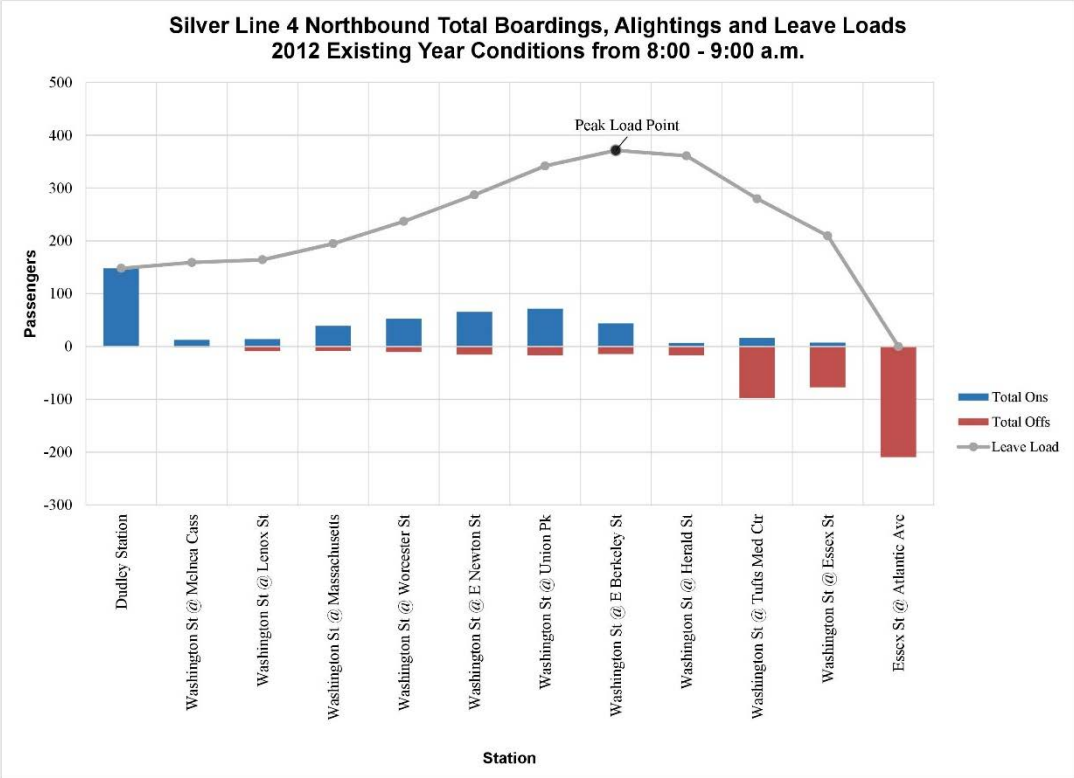
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 8—Silver Line Waterfront Westbound Loading Profile at Peak Demand – 2012 Existing Year



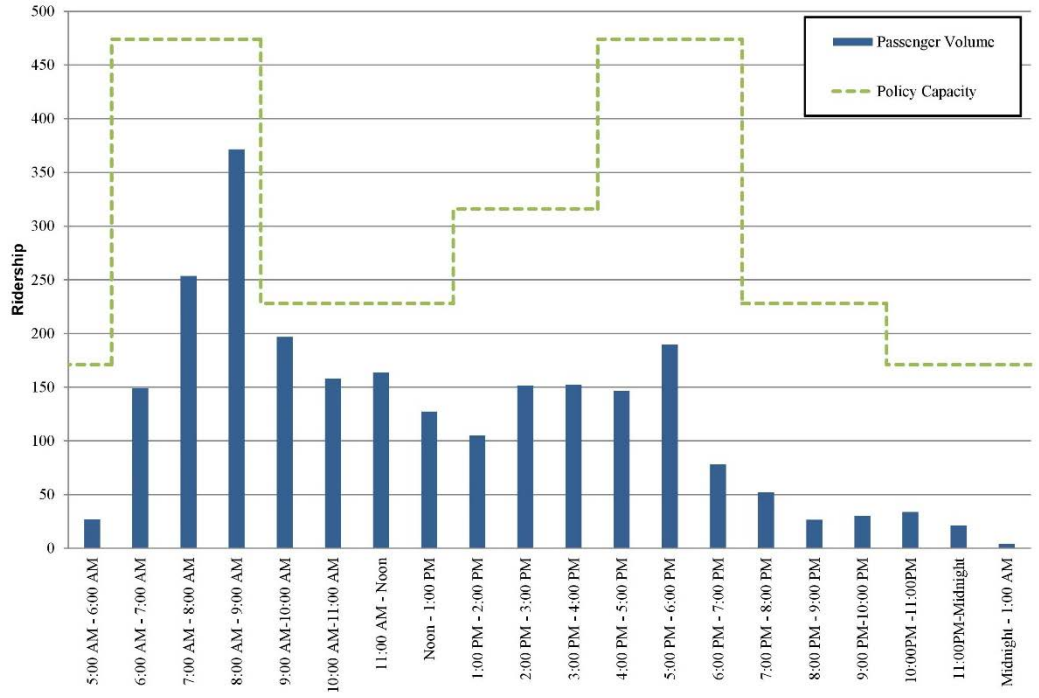
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 9—Silver Line Waterfront Westbound Weekday Loading at Peak Load Point (Courthouse – South Station) – 2012 Existing Year



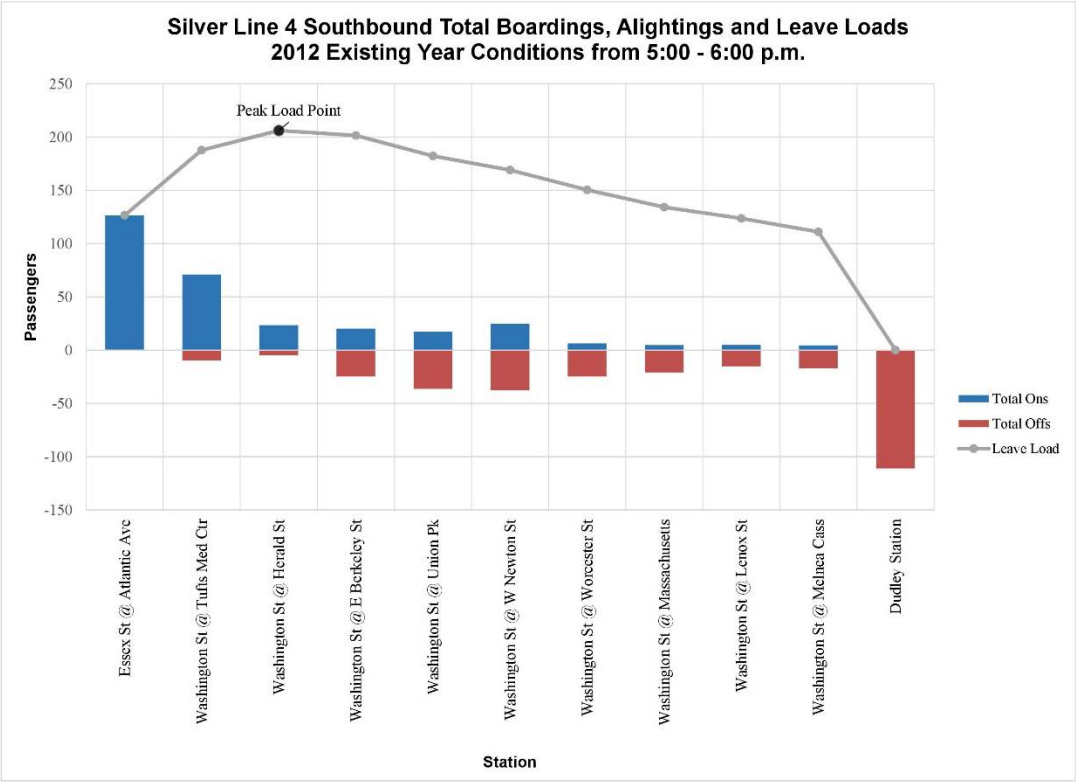
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 10—Silver Line 4 Northbound Loading Profile at Peak Demand – 2012 Existing Year



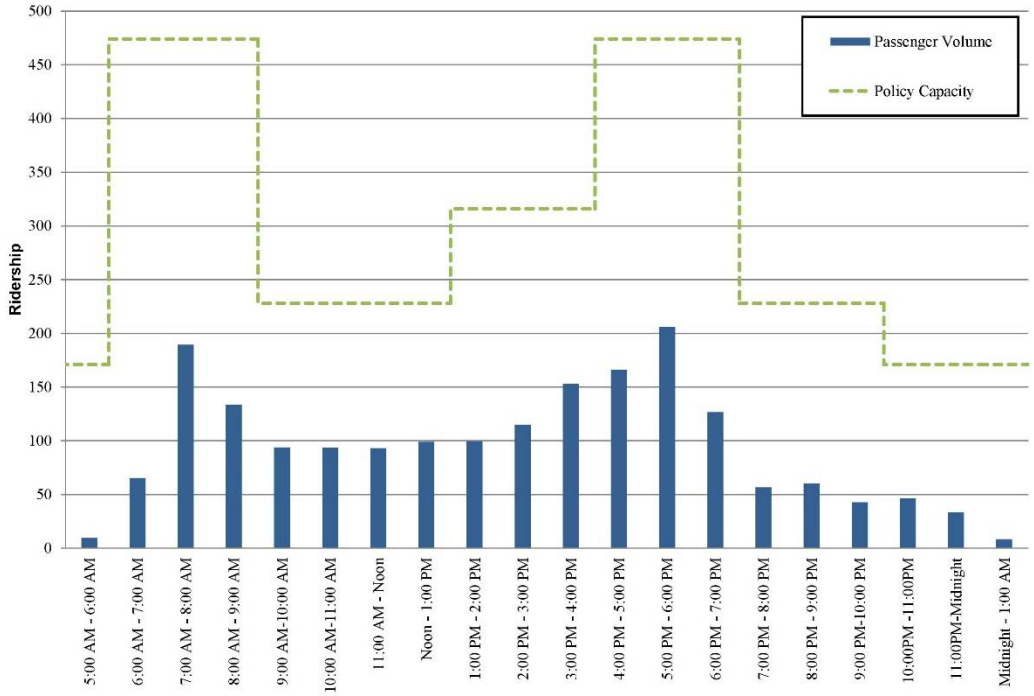
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 11—Silver Line 4 Northbound Weekday Loading at Peak Load Point (East Berkeley St - Herald St) – 2012 Existing Year



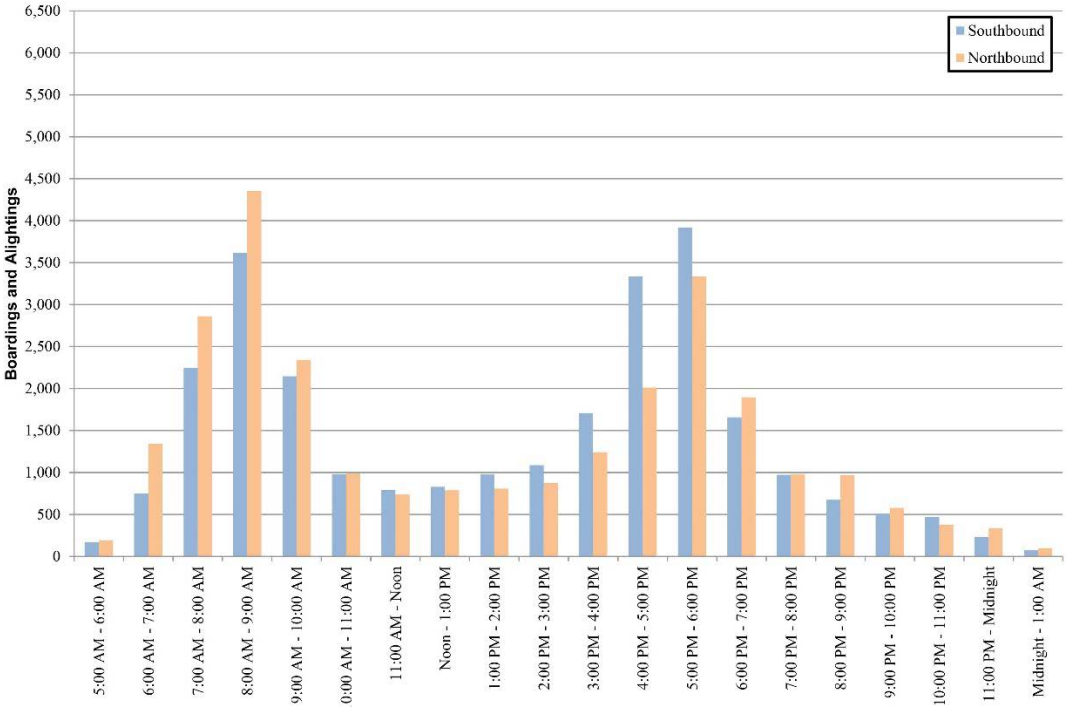
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 12—Silver Line 4 Southbound Loading Profile at Peak Demand – 2012 Existing Year



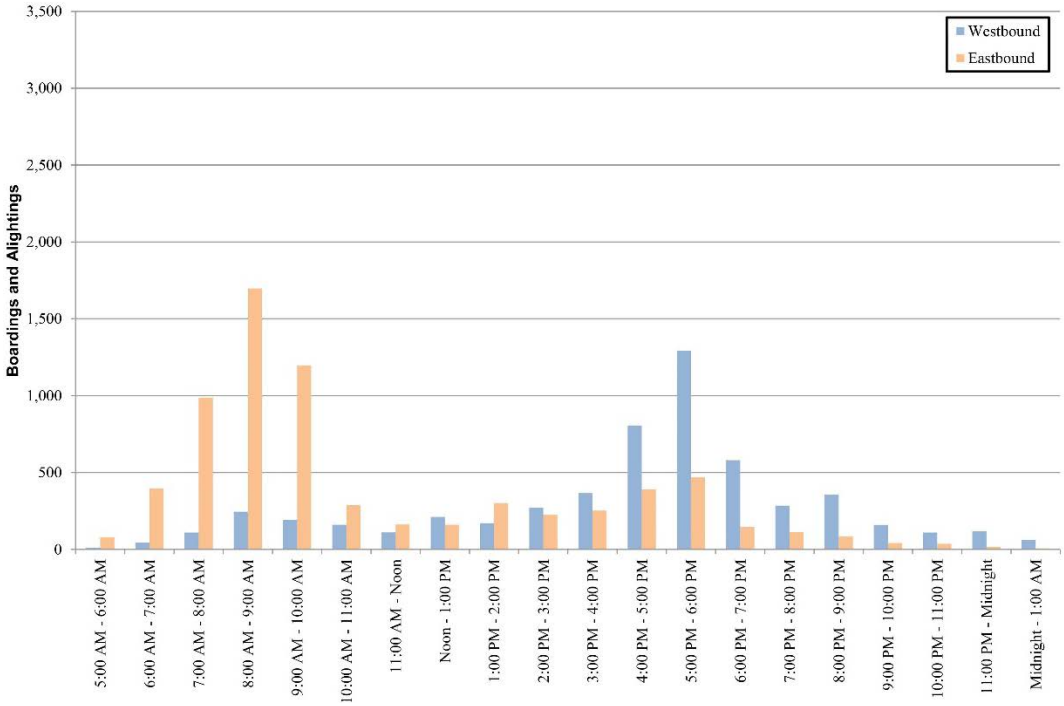
Source: MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 13—Silver Line 4 Southbound Weekday Loading at Peak Load Point (Herald St - East Berkeley St) – 2012 Existing Year



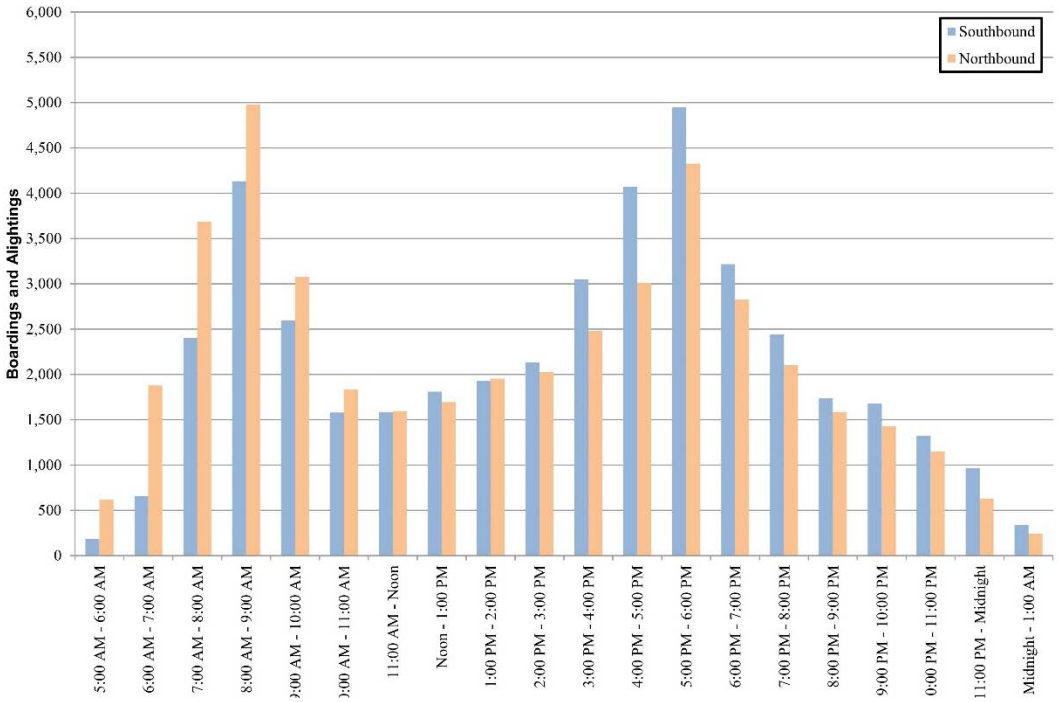
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 14—South Station Weekday Red Line Platform Activity – 2012 Existing Year



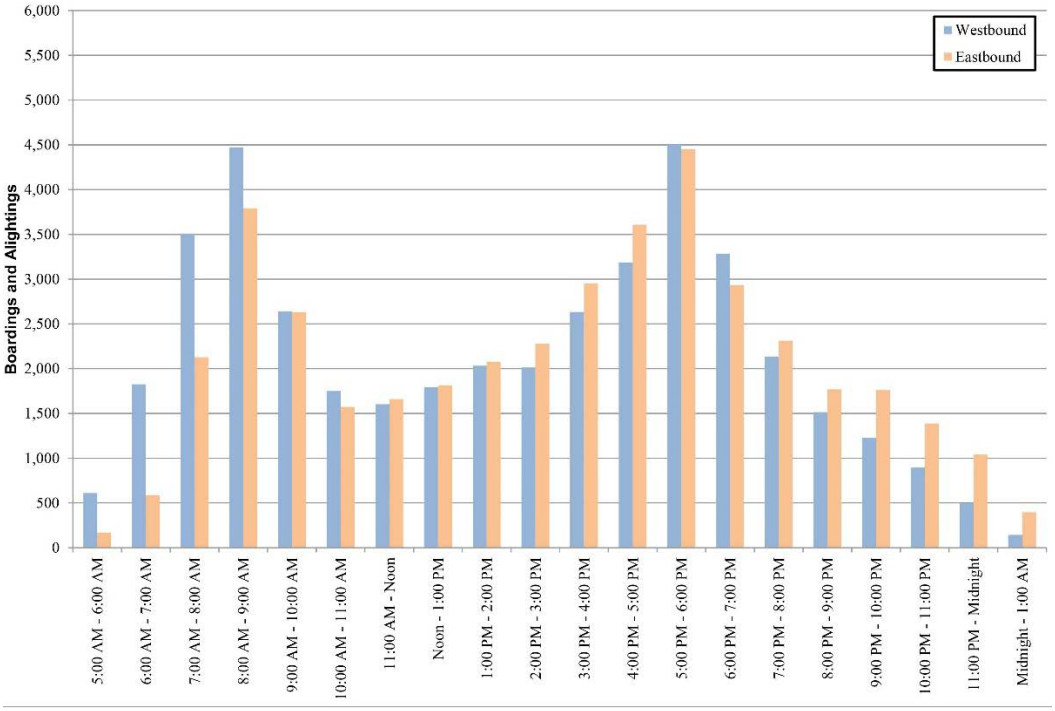
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 15—South Station Weekday Silver Line Platform Activity – 2012 Existing Year



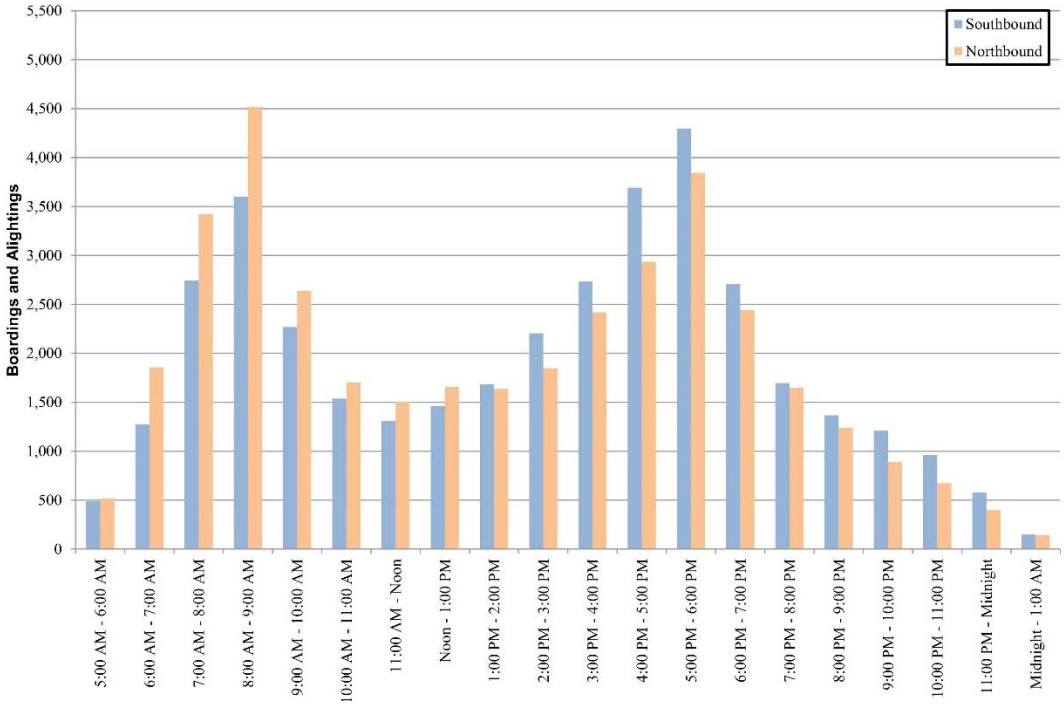
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 16—Park Street Weekday Red Line Platform Activity – 2012 Existing Year



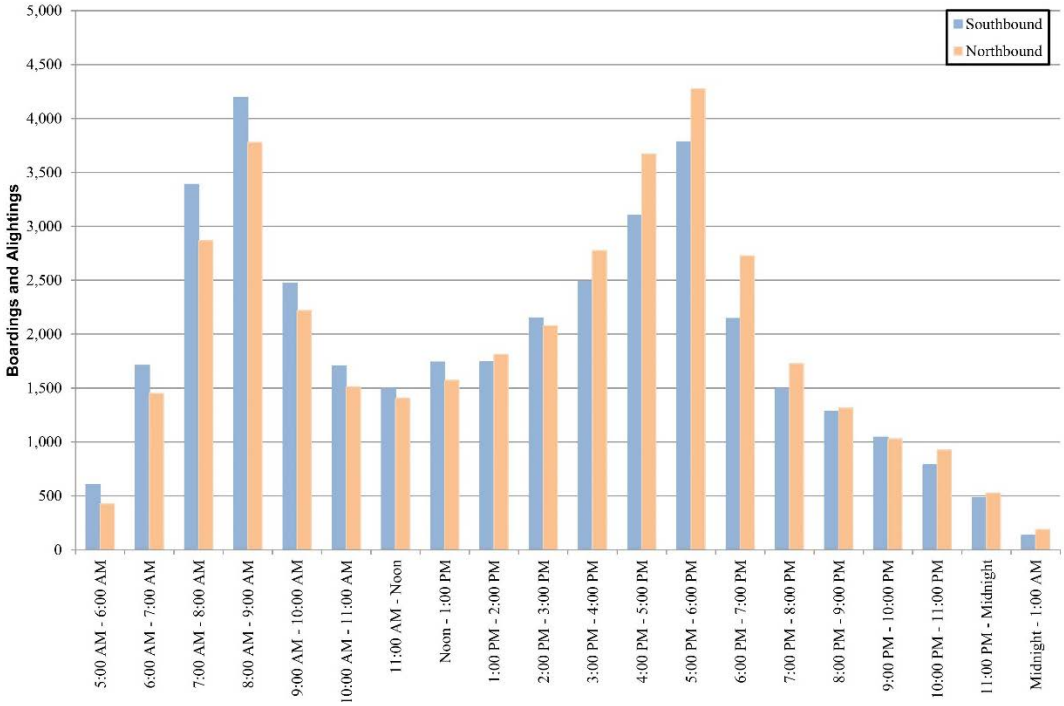
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 17—Park Street Weekday Green Line Platform Activity – 2012 Existing Year



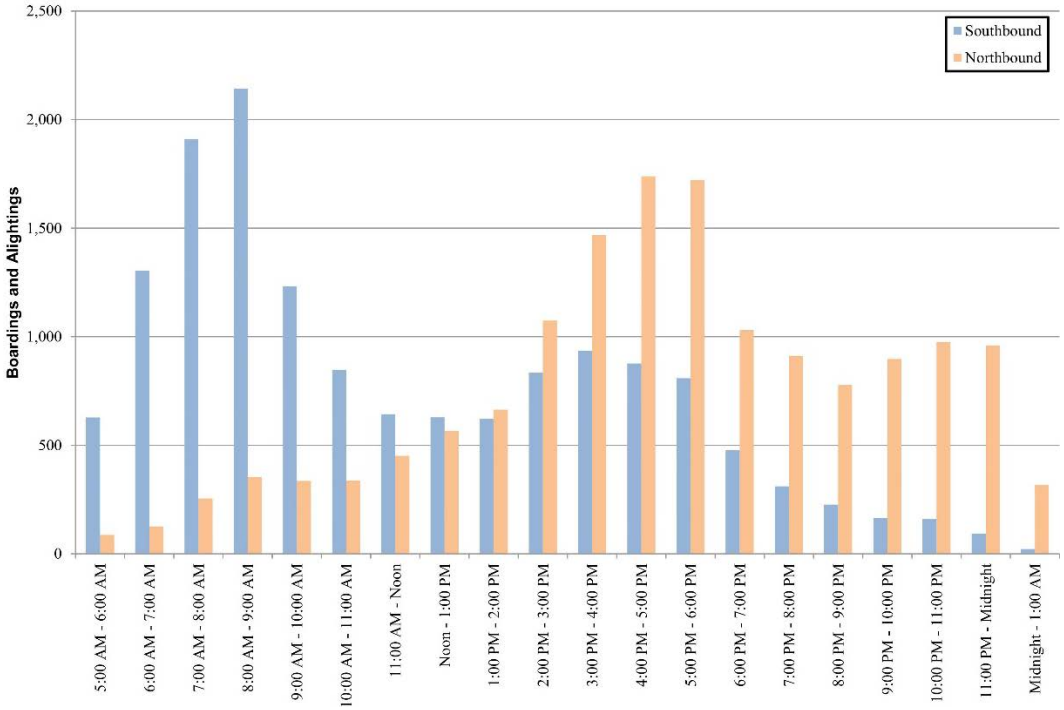
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 18—Downtown Crossing Weekday Red Line Platform Activity – 2012 Existing Year



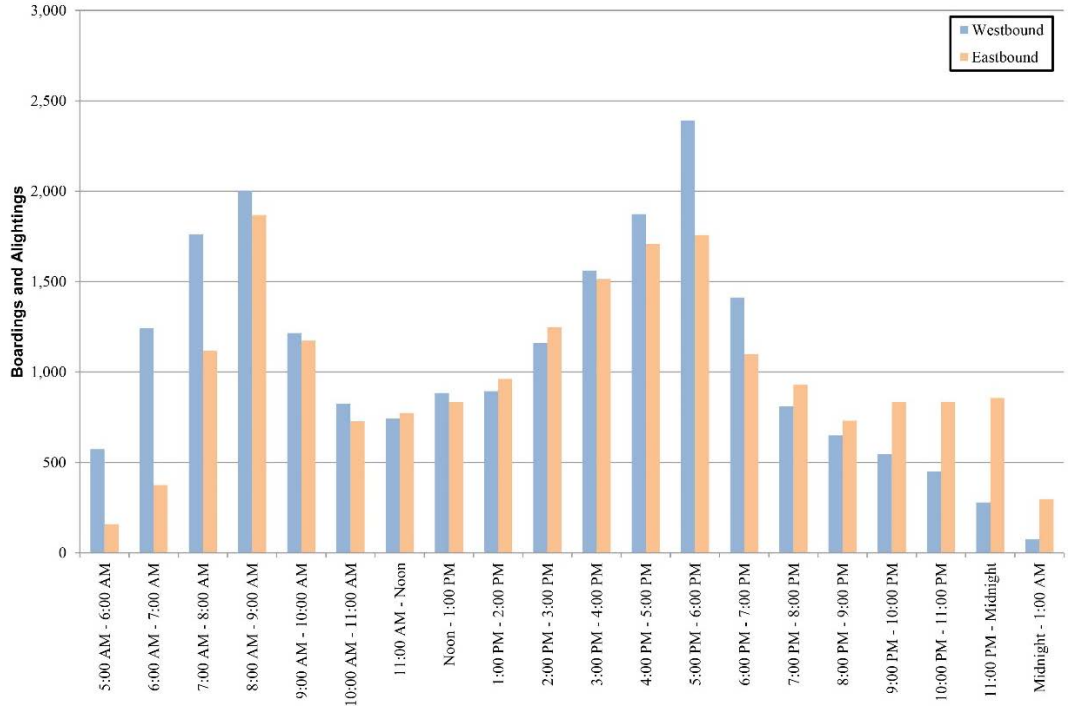
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 19—Downtown Crossing Weekday Orange Line Platform Activity – 2012 Existing Year



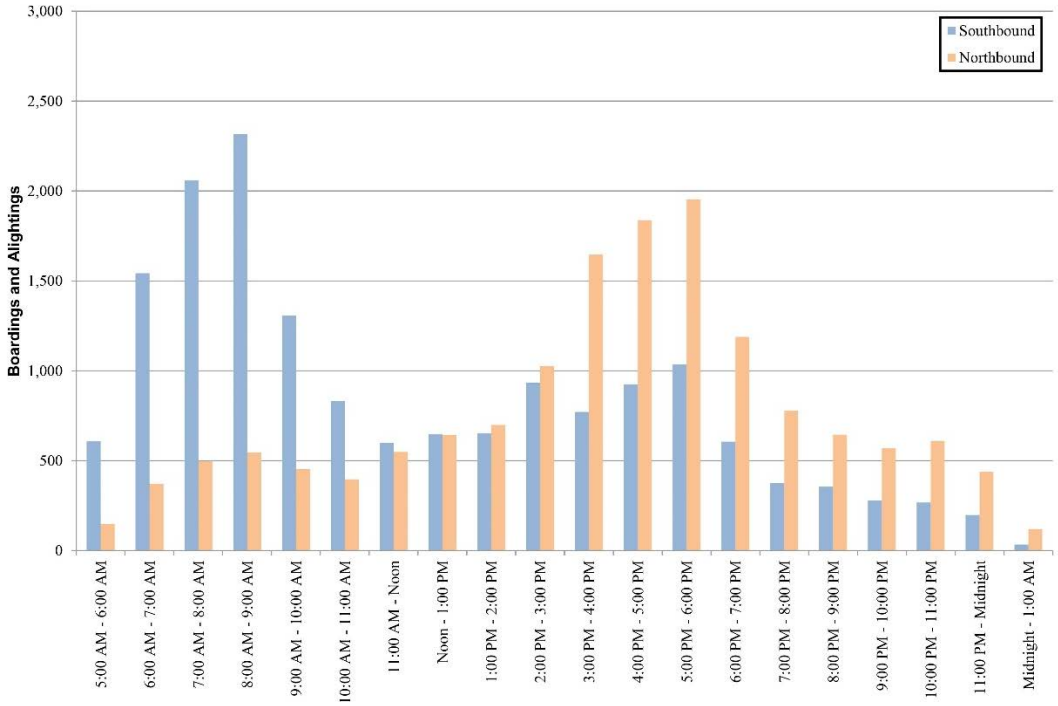
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 20—Government Center Weekday Blue Line Platform Activity – 2012 Existing Year



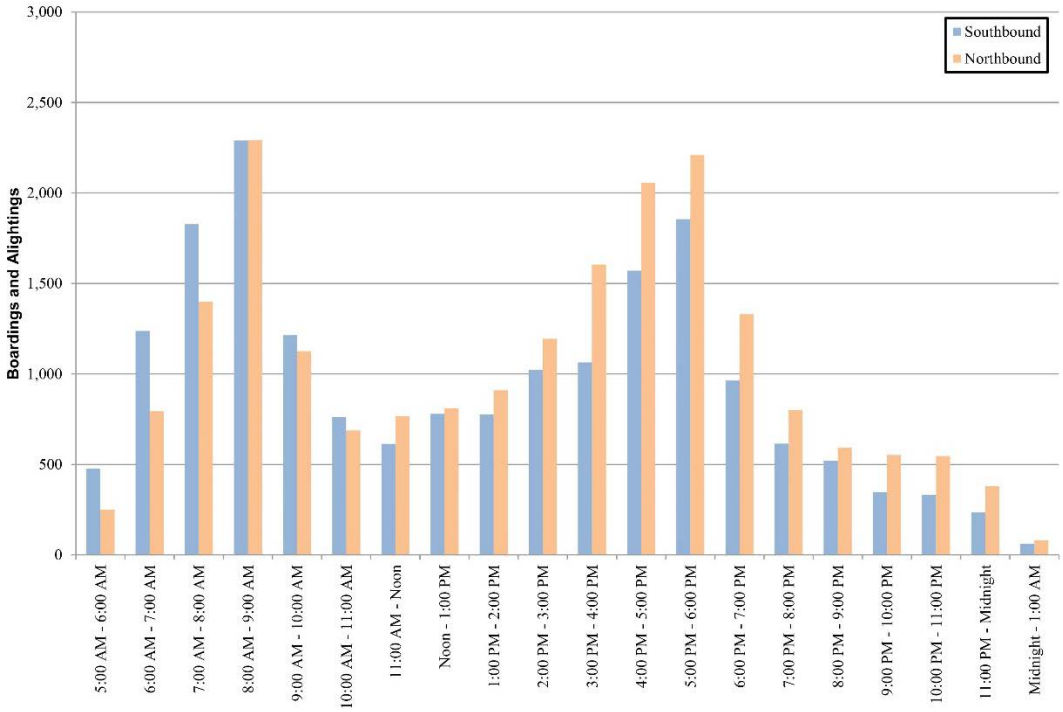
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 21—Government Center Weekday Green Line Platform Activity – 2012 Existing Year



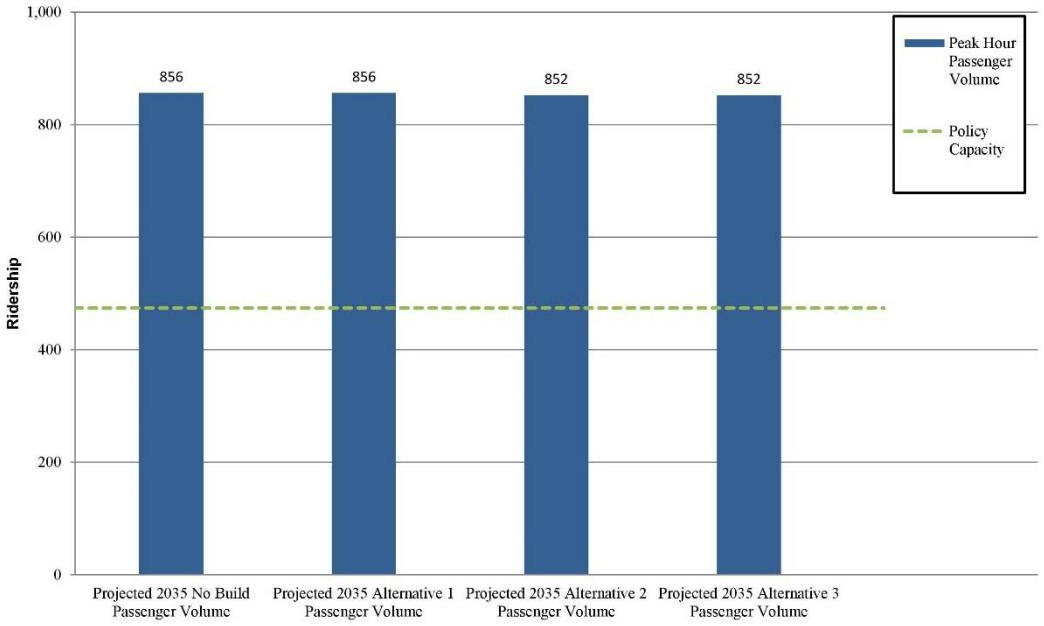
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 22—State Street Weekday Blue Line Platform Activity – 2012 Existing Year



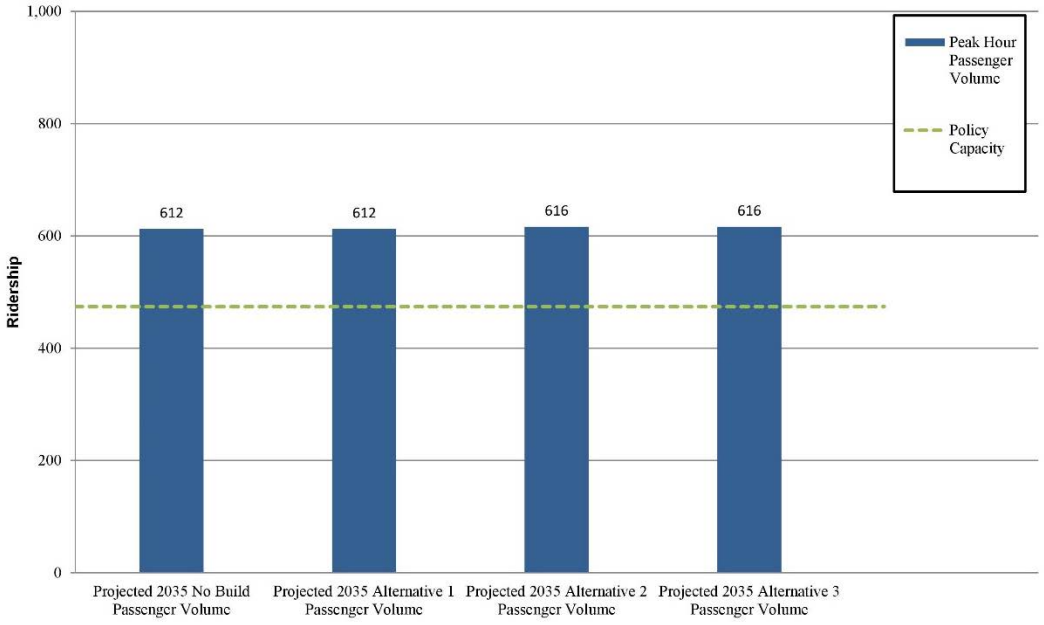
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.

Figure 23—State Street Weekday Orange Line Platform Activity – 2012 Existing Year



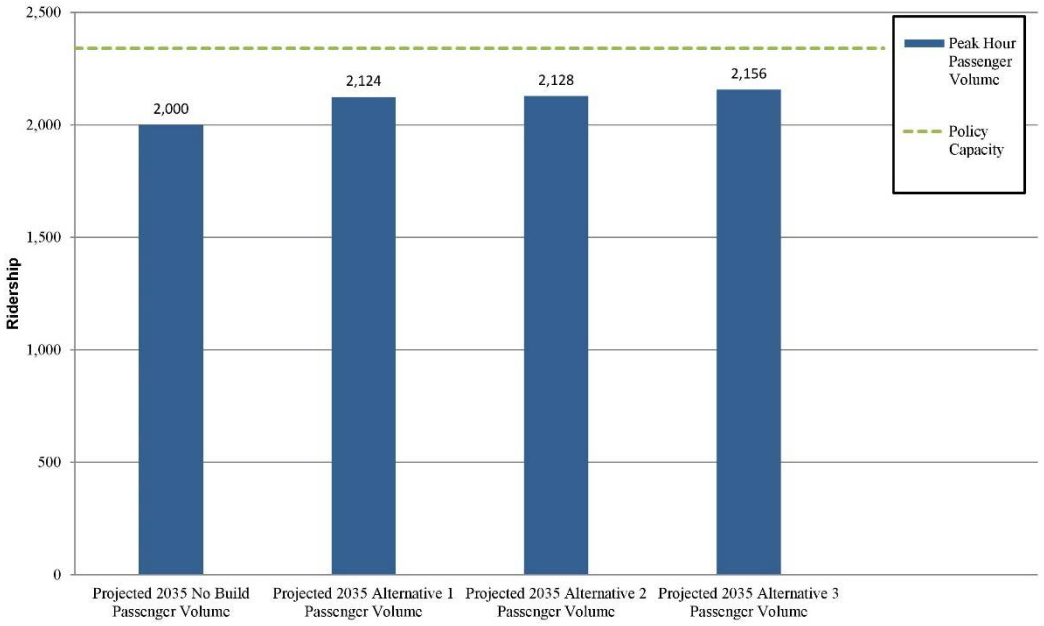
Source: CTPS, *Transit Crowding Analysis* (see Attachment K).

Figure 24—Silver Line 4 Northbound Peak Load Point (Herald St – Tufts Medical Center) – 2035 Build Year Conditions



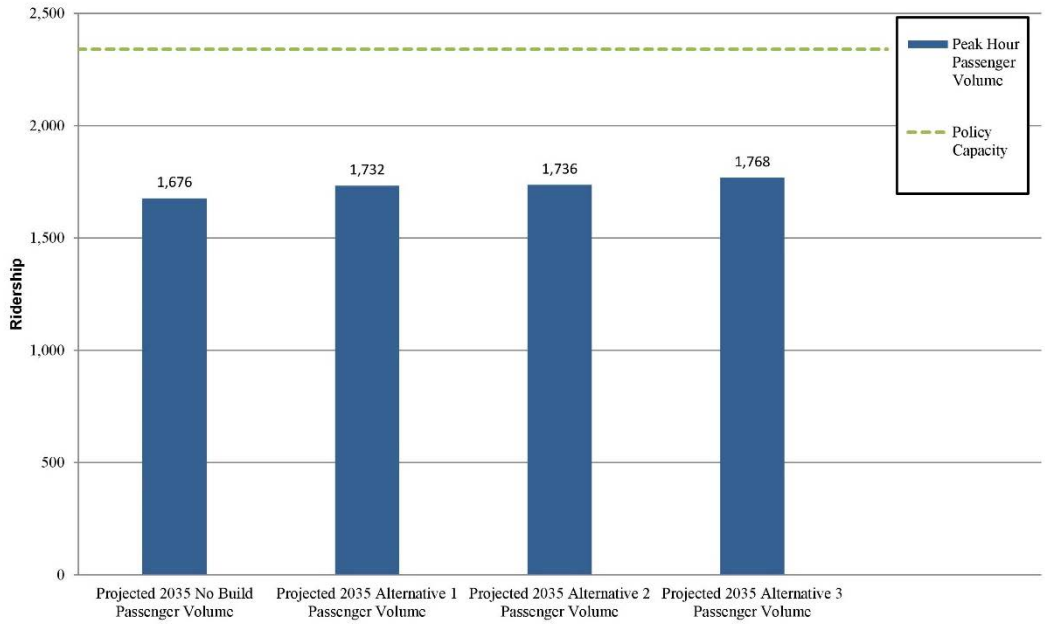
Source: CTPS, *Transit Crowding Analysis* (see Attachment K).

Figure 25—Silver Line 4 Southbound Peak Load Point (Herald St – East Berkeley St) – 2035 Build Year Conditions



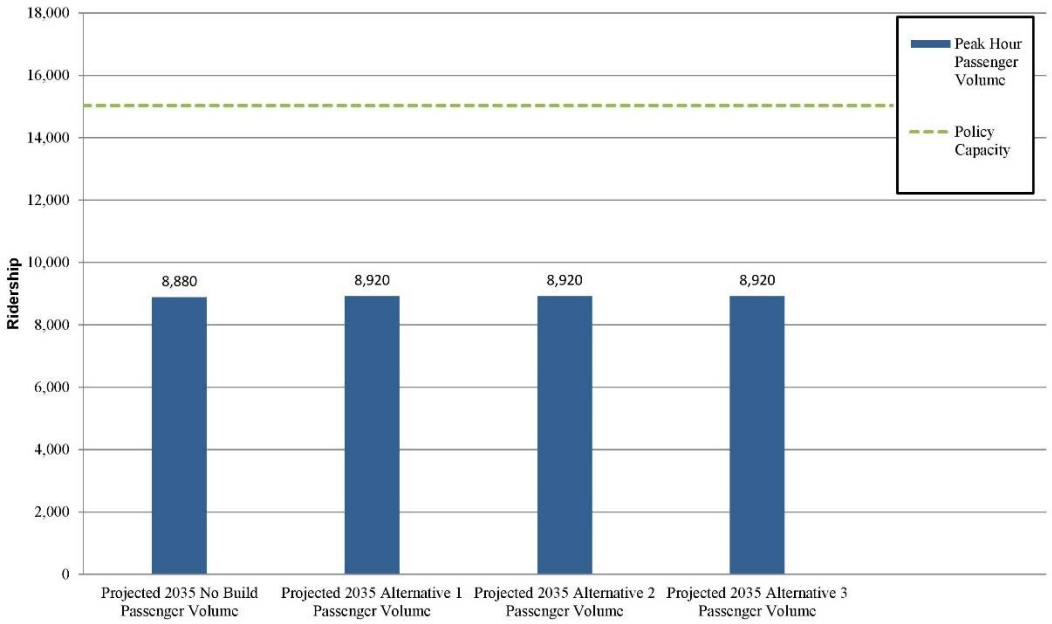
Source: CTPS, *Transit Crowding Analysis* (see Attachment K).

Figure 26—Silver Line Waterfront Westbound Peak Load Point (Courthouse – South Station) – 2035 Build Year Conditions



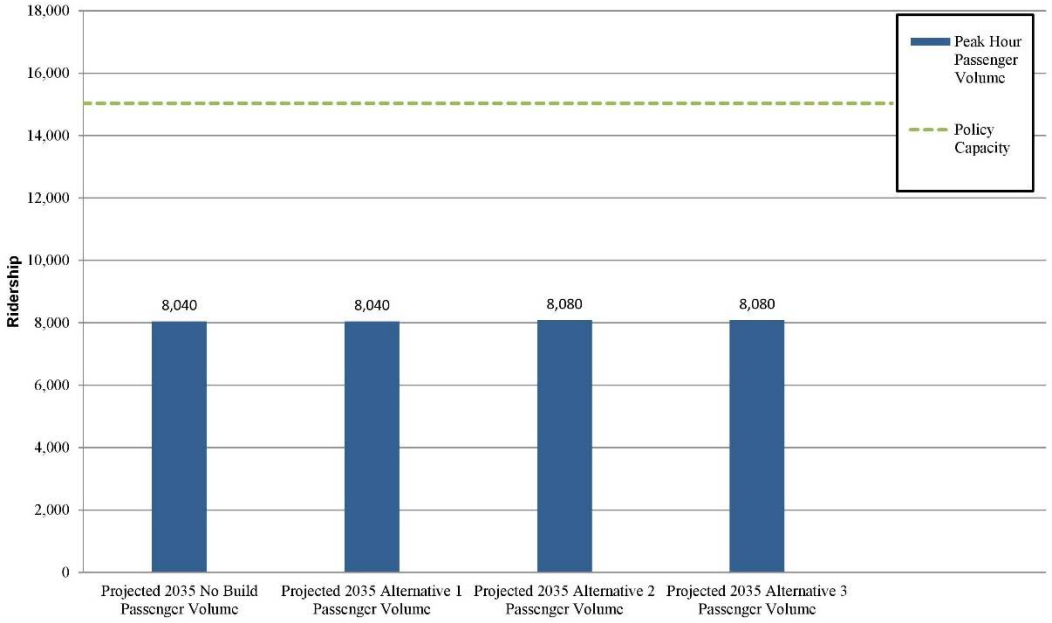
Source: CTPS, *Transit Crowding Analysis* (see Attachment K).

Figure 27—Silver Line Waterfront Eastbound Peak Load Point (South Station - Courthouse) – 2035 Build Year Conditions



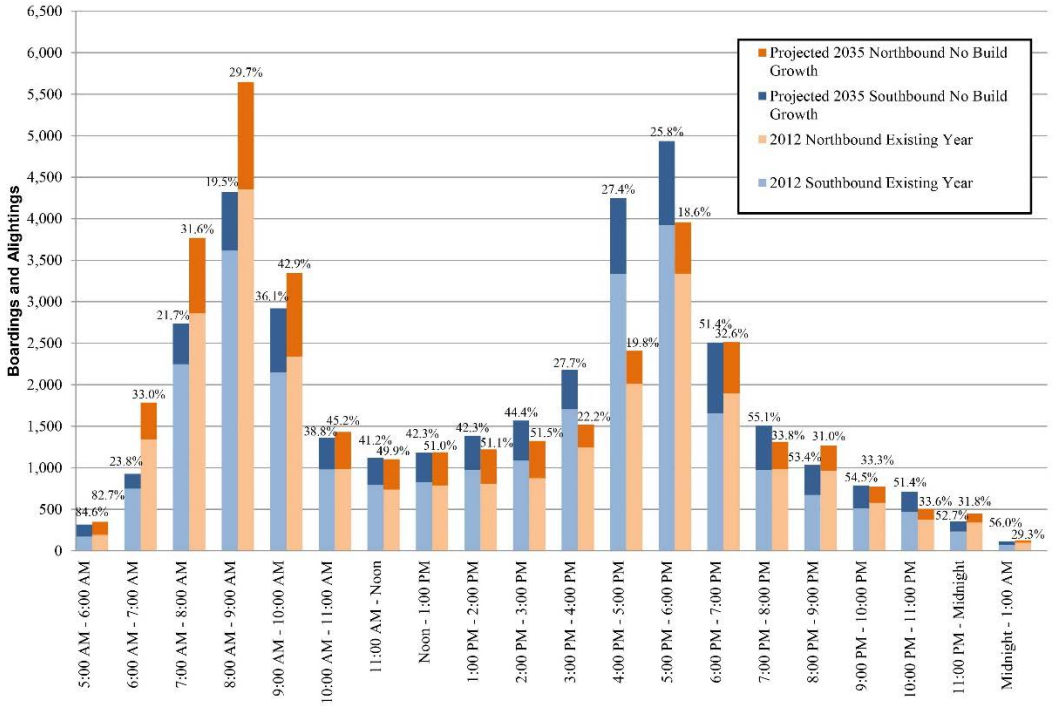
Source: CTPS, *Transit Crowding Analysis* (see Attachment K).

Figure 28—Red Line Northbound Peak Load Point (Broadway – South Station) – 2035 Build Year Conditions



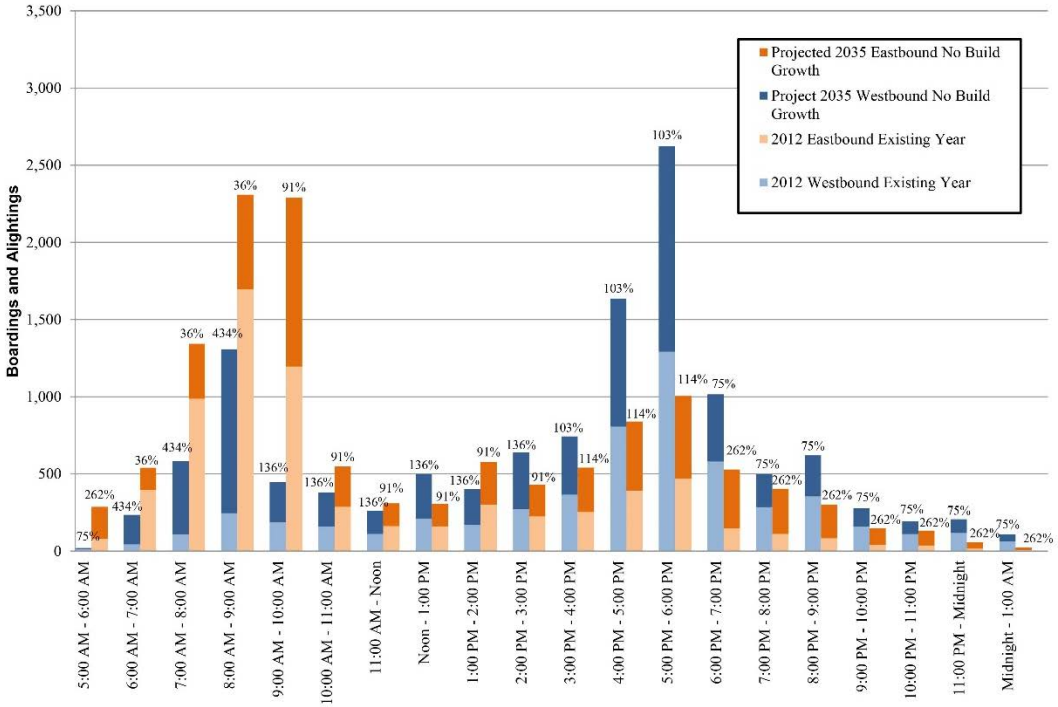
Source: CTPS, *Transit Crowding Analysis* (see Attachment K).

Figure 29—Red Line Southbound Peak Load Point (South Station - Broadway) – 2035 Build Year Conditions



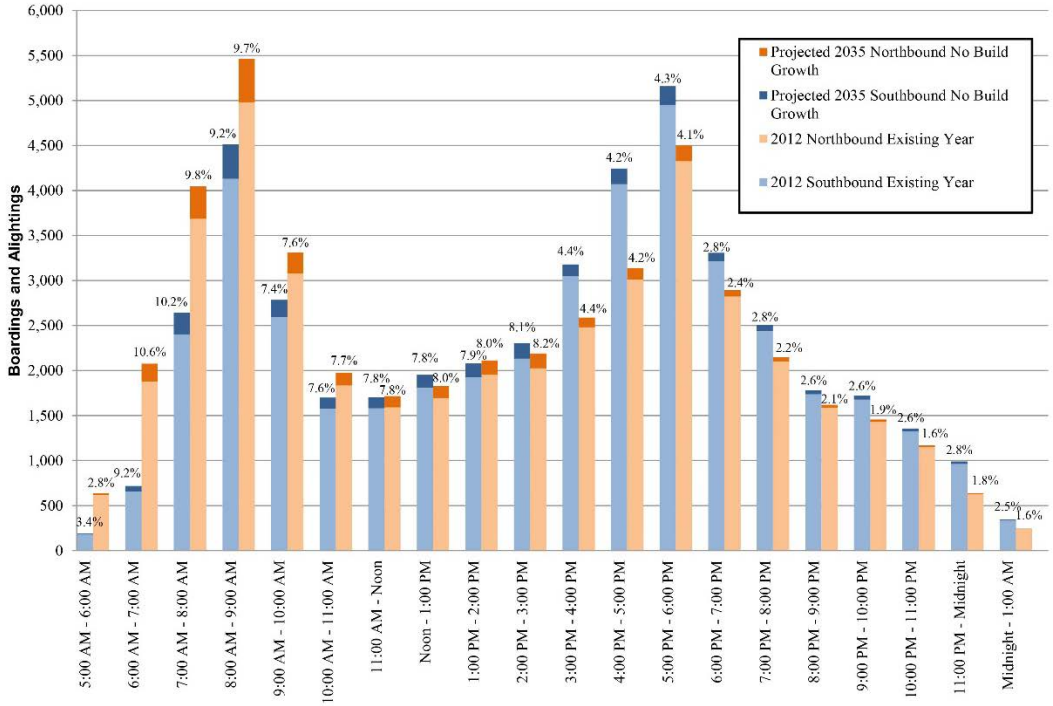
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 30—South Station Weekday Red Line Platform Activity – 2035 No Build Alternative



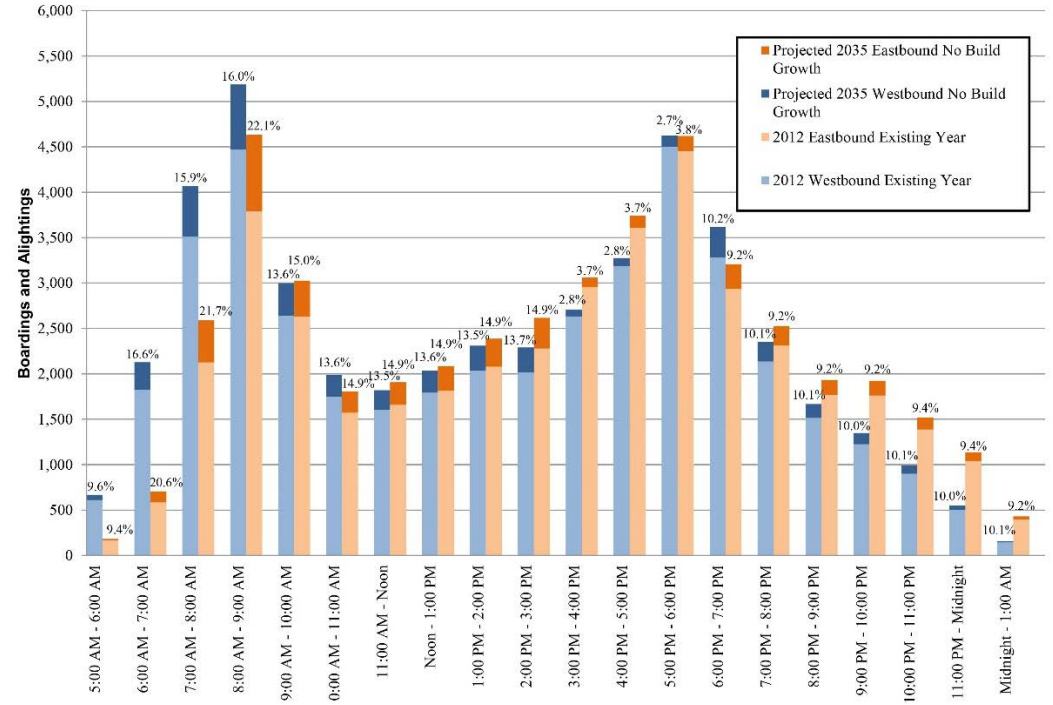
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 31—South Station Weekday Silver Line Platform Activity – 2035 No Build Alternative



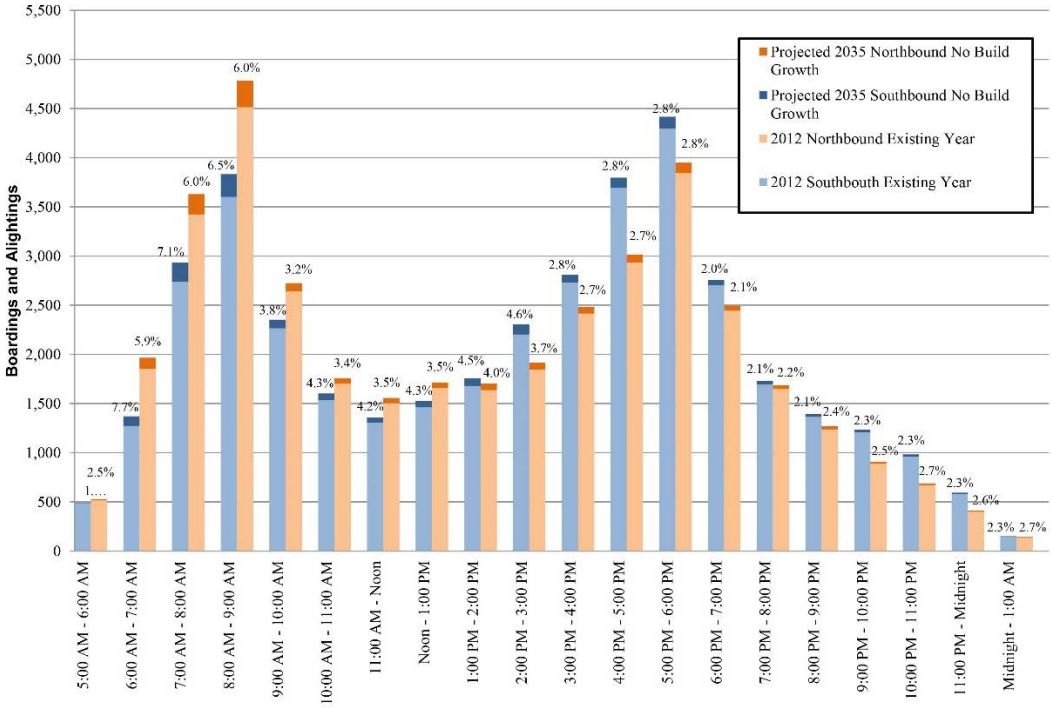
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 32—Park Street Weekday Red Line Platform Activity – 2035 No Build Alternative



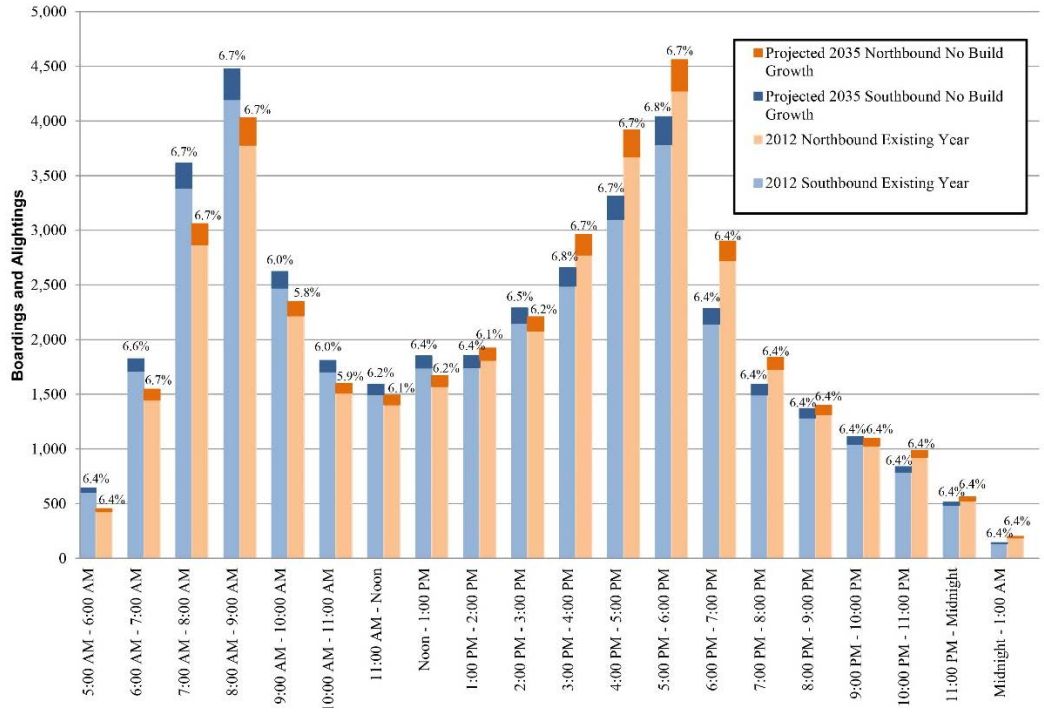
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 33—Park Street Weekday Green Line Platform Activity – 2035 No Build Alternative



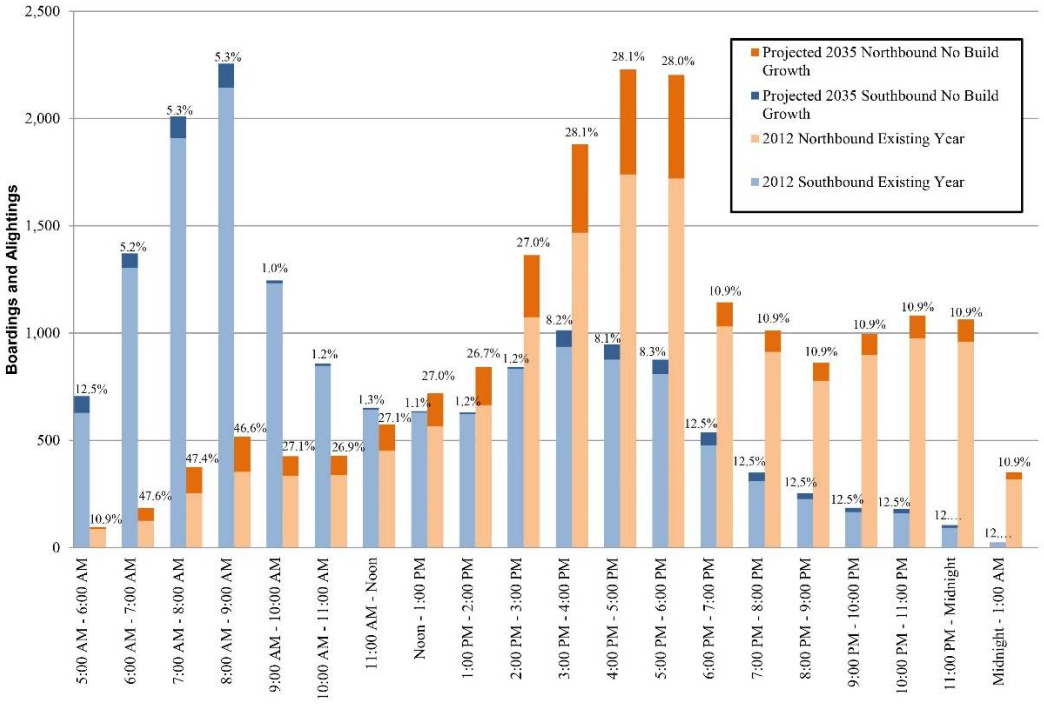
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 34—Downtown Crossing Weekday Red Line Platform Activity – 2035 No Build Alternative



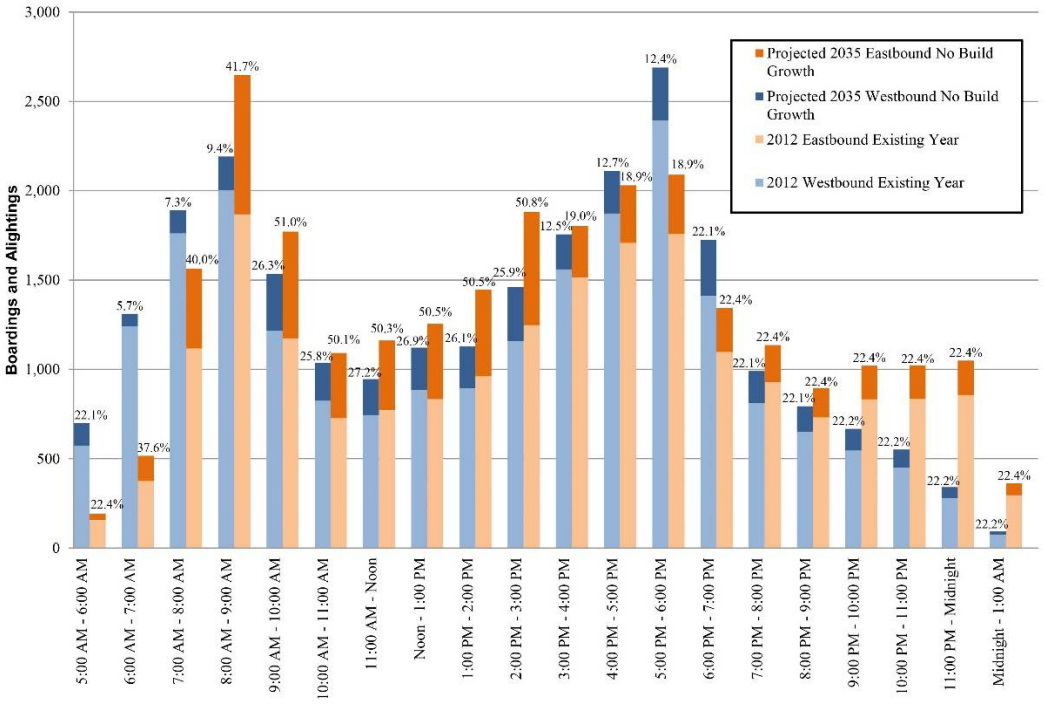
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 35—Downtown Crossing Weekday Orange Line Platform Activity – 2035 No Build Alternative



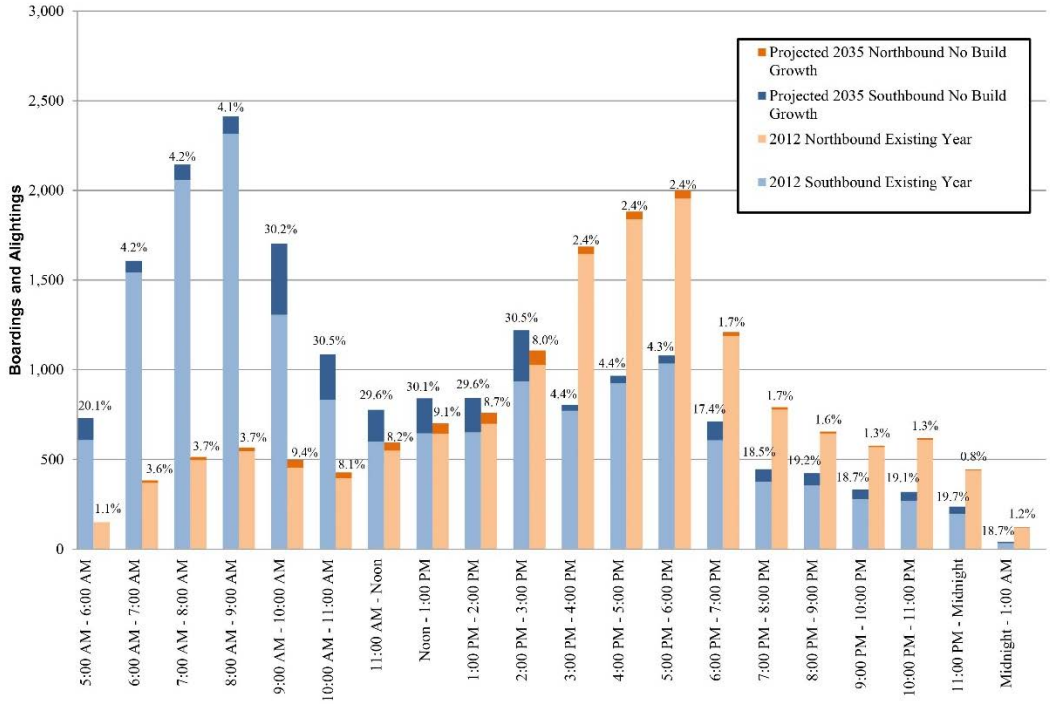
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 36—Government Center Weekday Blue Line Platform Activity – 2035 No Build Alternative



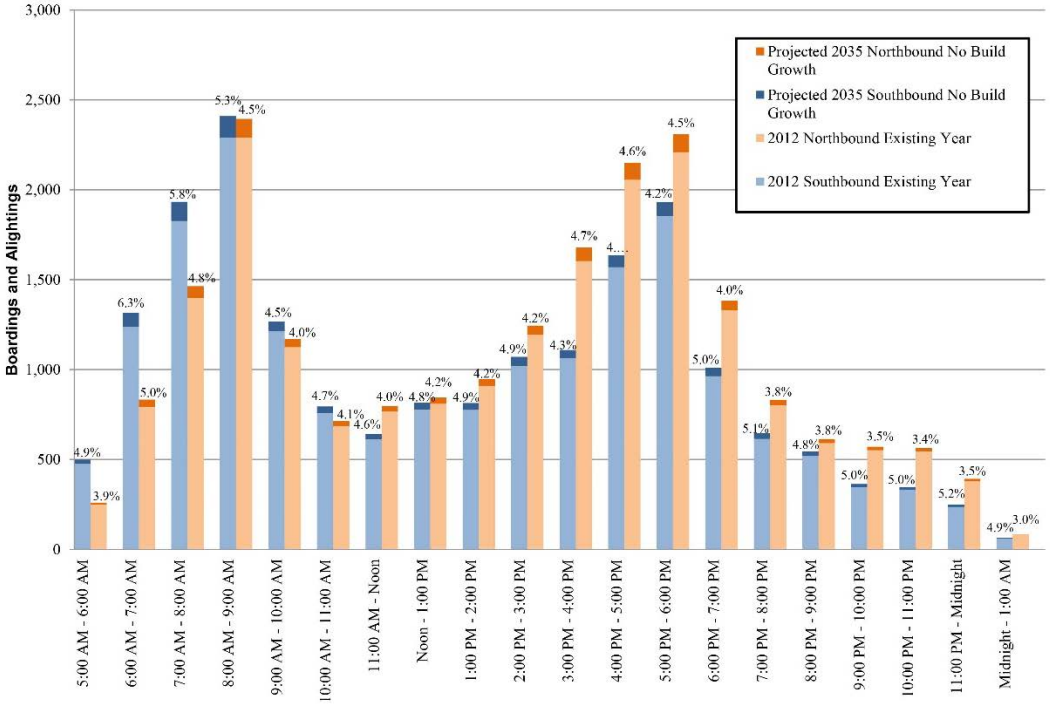
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 37—Government Center Weekday Green Line Platform Activity – 2035 No Build Alternative



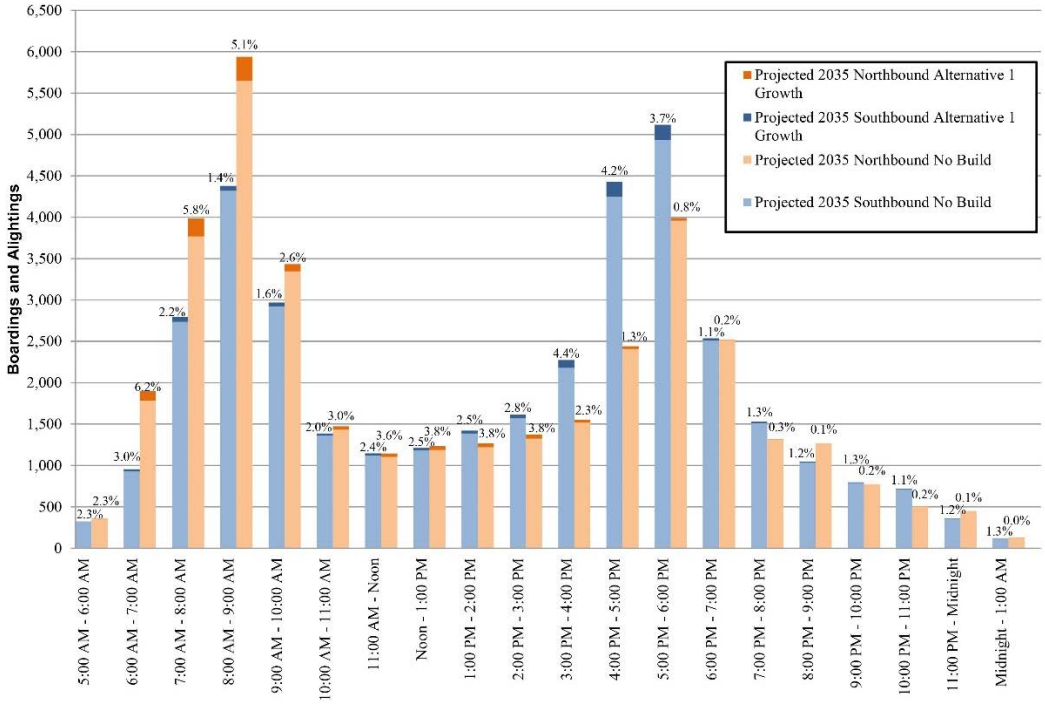
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 38—State Street Weekday Blue Line Platform Activity – 2035 No Build Alternative



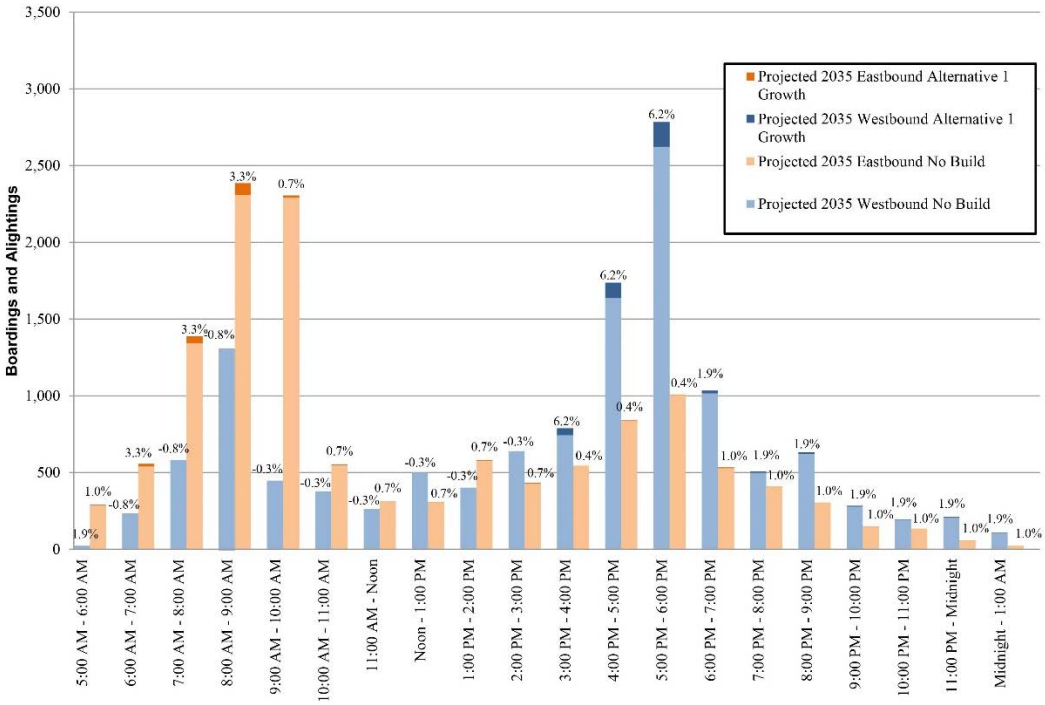
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected 2035 No Build Alternative ridership growth as compared to 2012 Existing Year.

Figure 39—State Street Weekday Orange Line Platform Activity – 2035 No Build Alternative



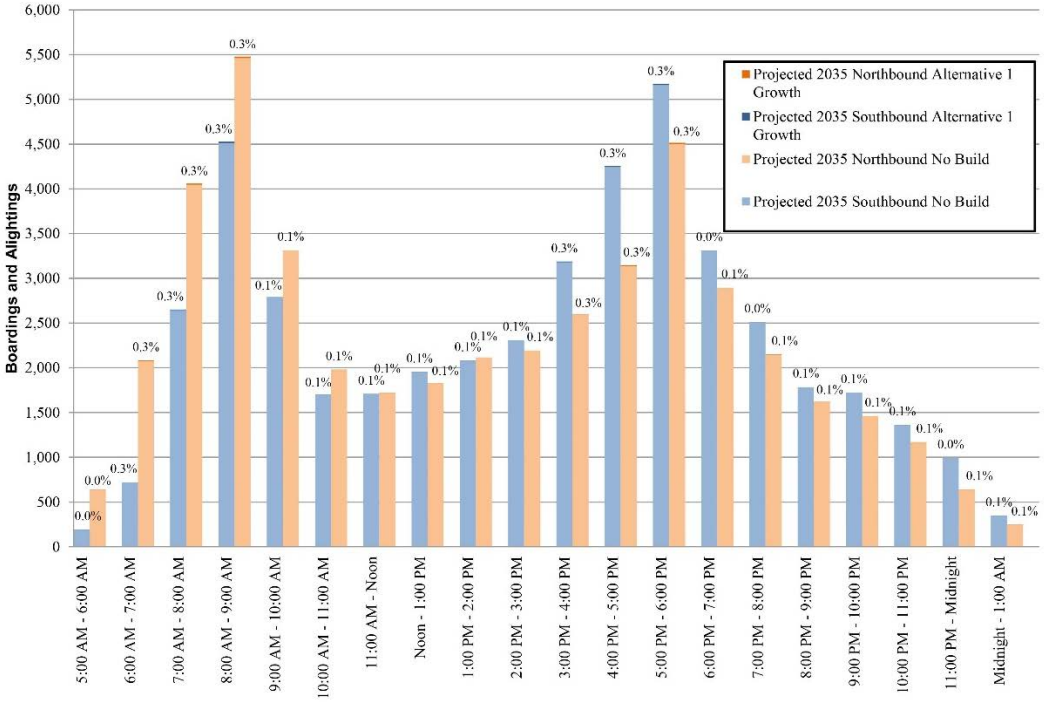
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 40—South Station Weekday Red Line Platform Activity – 2035 Build Year Alternative 1



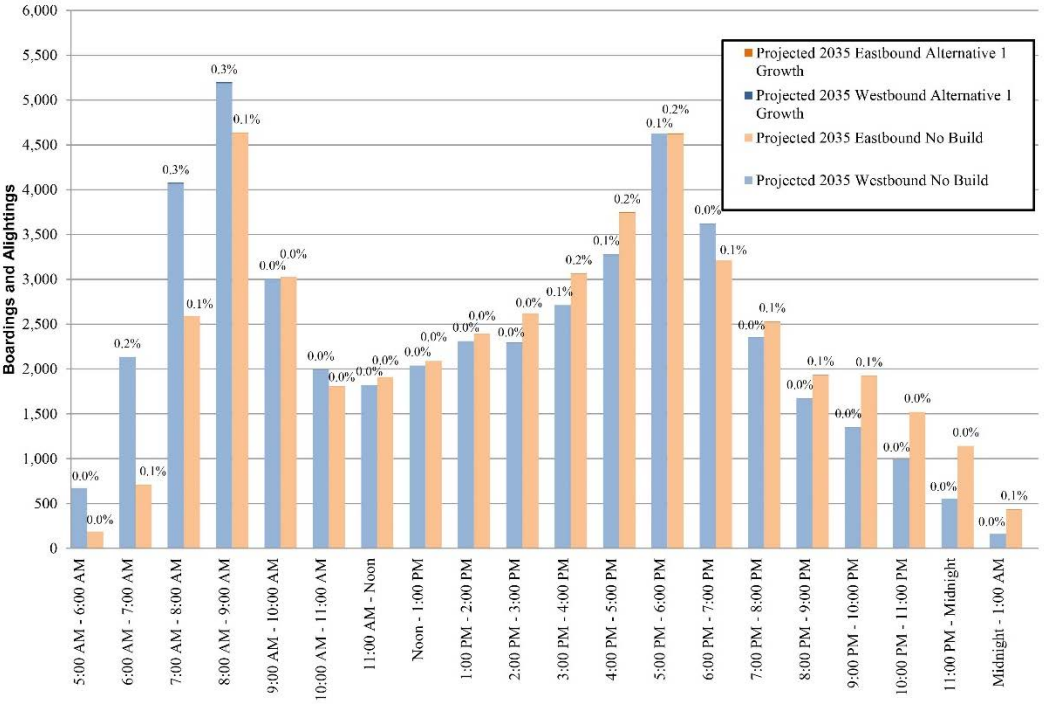
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 41—South Station Weekday Silver Line Platform Activity – 2035 Build Year Alternative 1



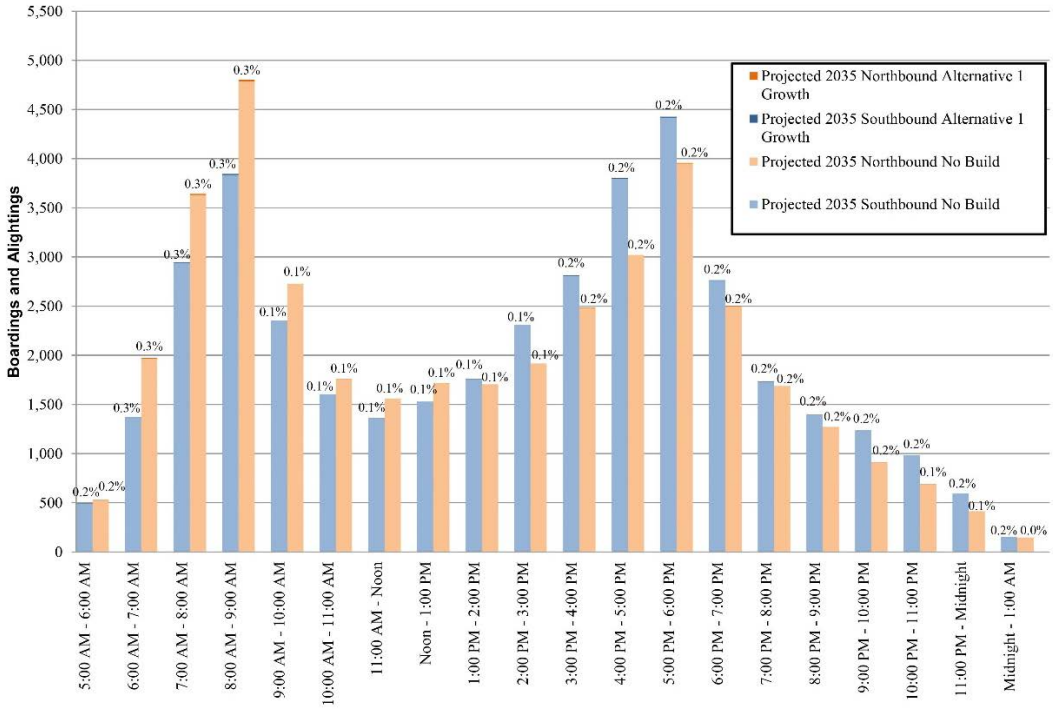
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 42—Park Street Weekday Red Line Platform Activity – 2035 Build Year Alternative 1



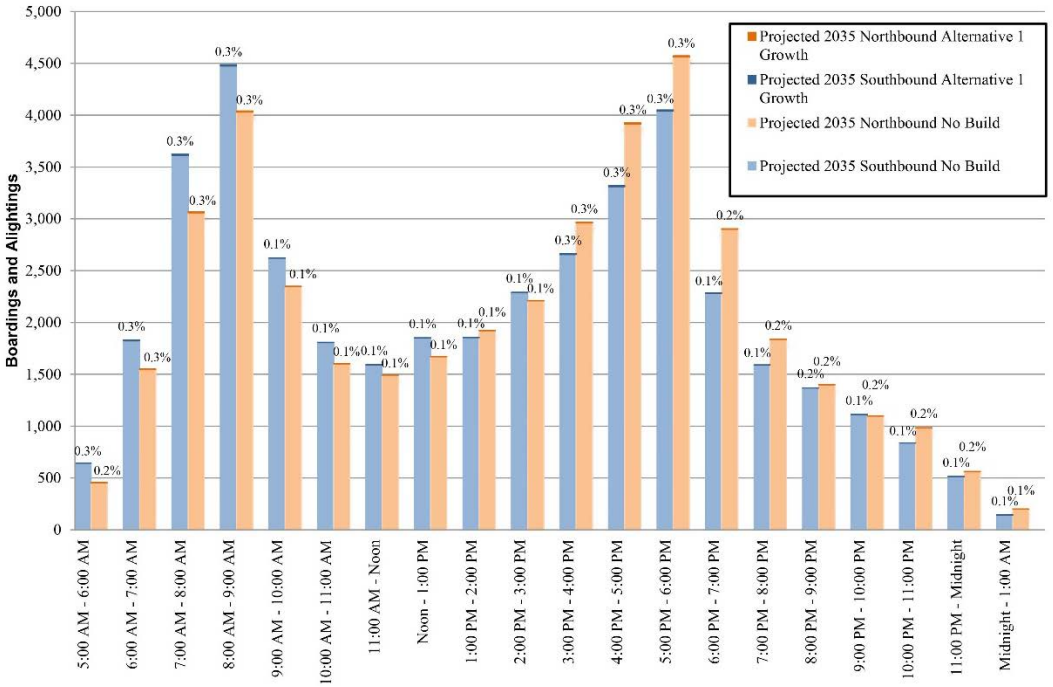
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 43—Park Street Weekday Green Line Platform Activity – 2035 Build Year Alternative 1



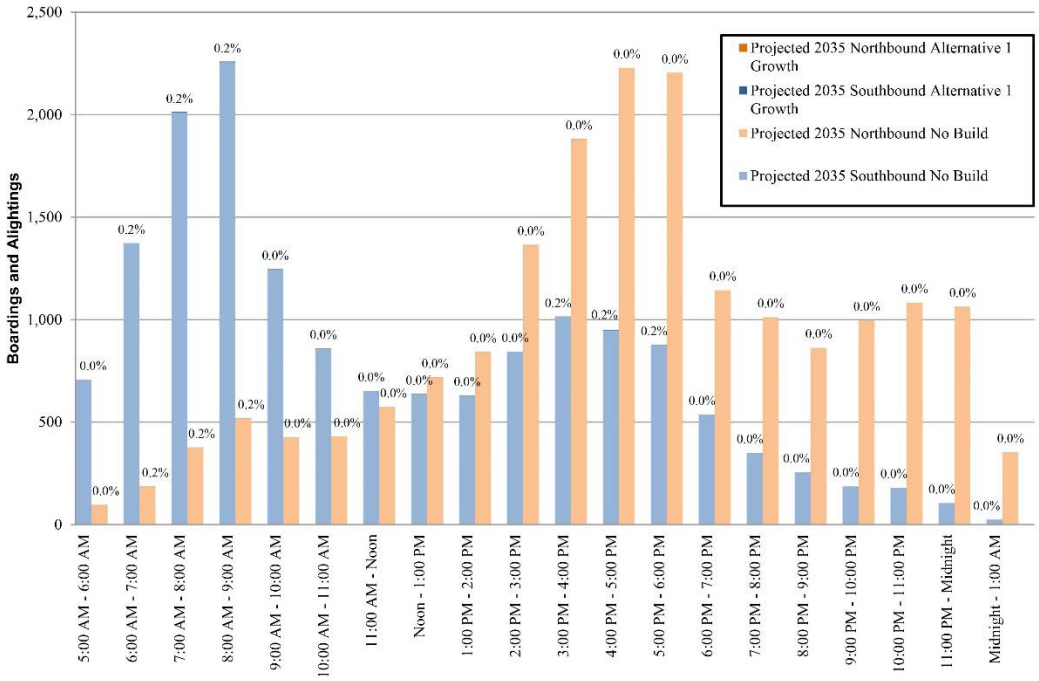
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 44—Dwntn. Crossing Weekday Red Line Platform Activity – 2035 Build Year Alternative 1



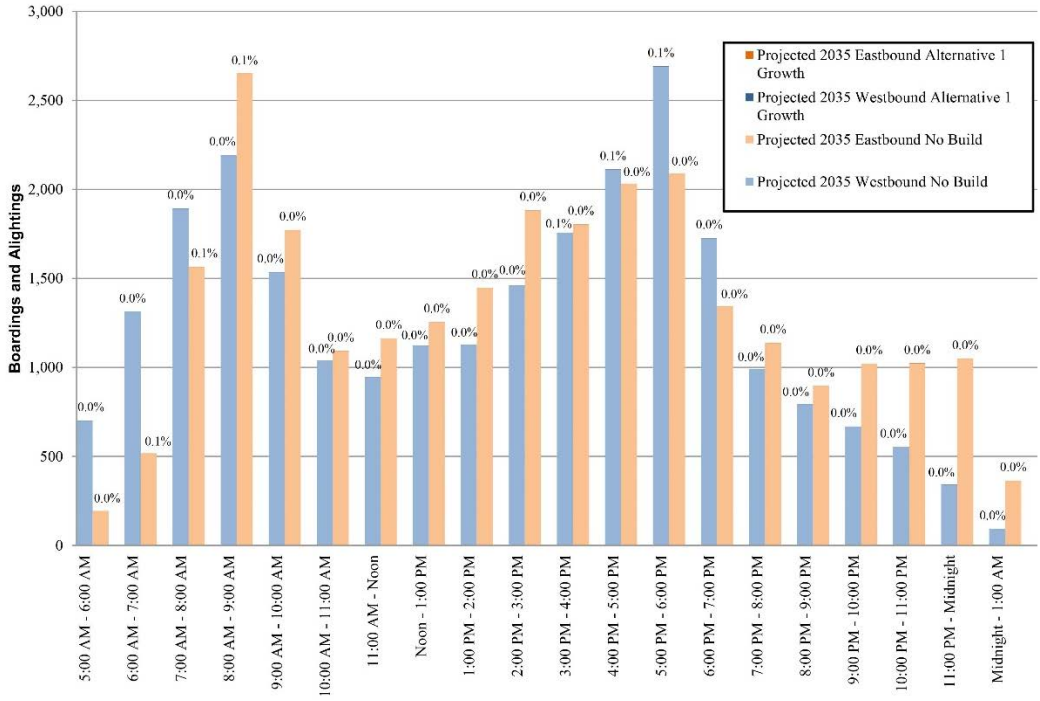
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 45—Dwntn. Crossing Weekday Orange Line Platform Activity – 2035 Build Year Alternative 1



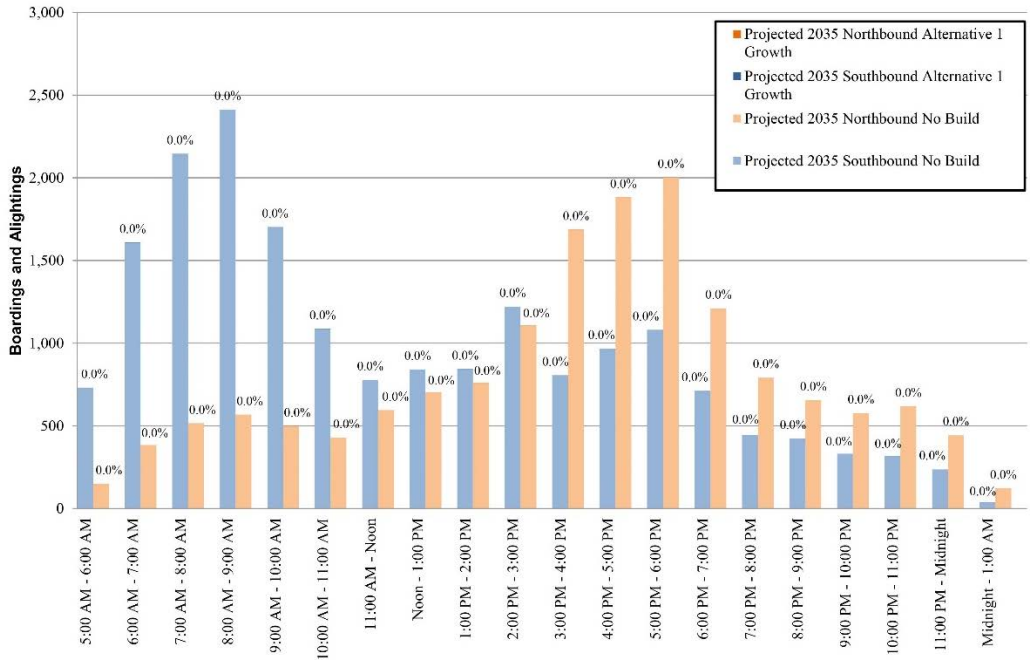
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 46—Gov't. Center Weekday Blue Line Platform Activity – 2035 Build Year Alternative 1



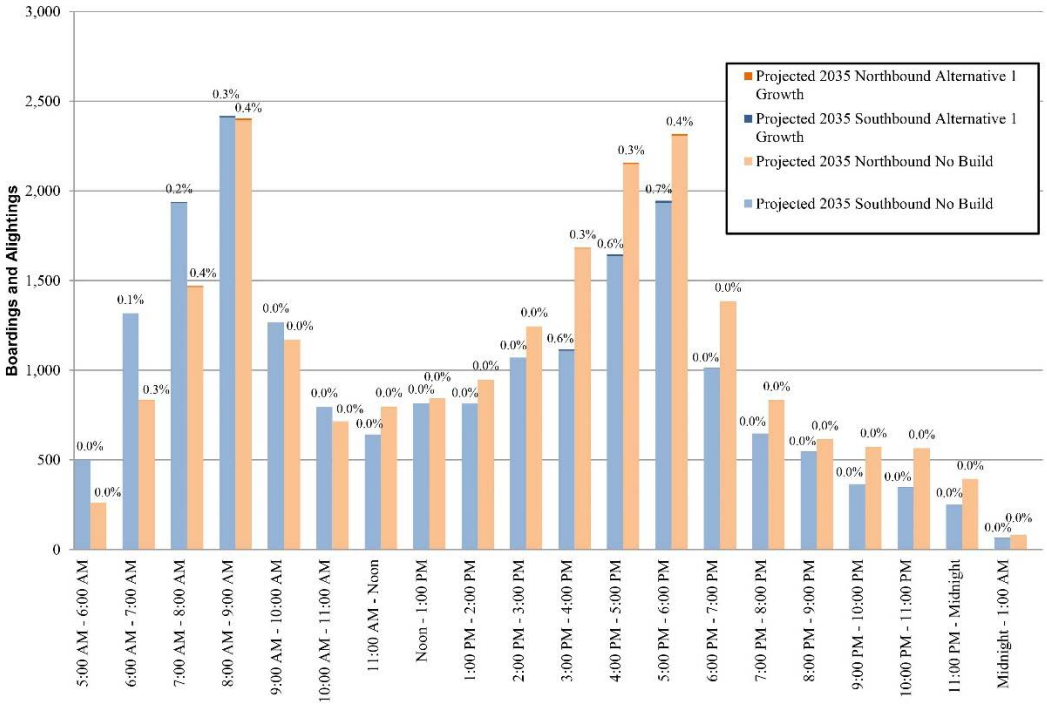
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 47—Govt. Center Weekday Green Line Platform Activity – 2035 Build Year Alternative 1



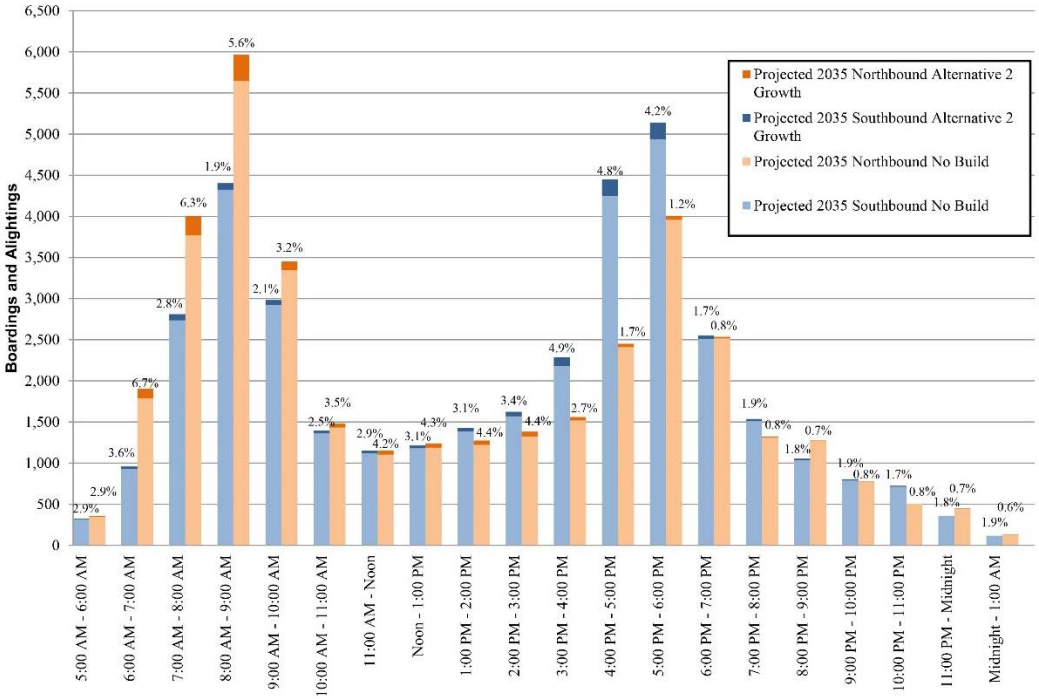
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 48—State Street Weekday Blue Line Platform Activity – 2035 Build Year Alternative 1



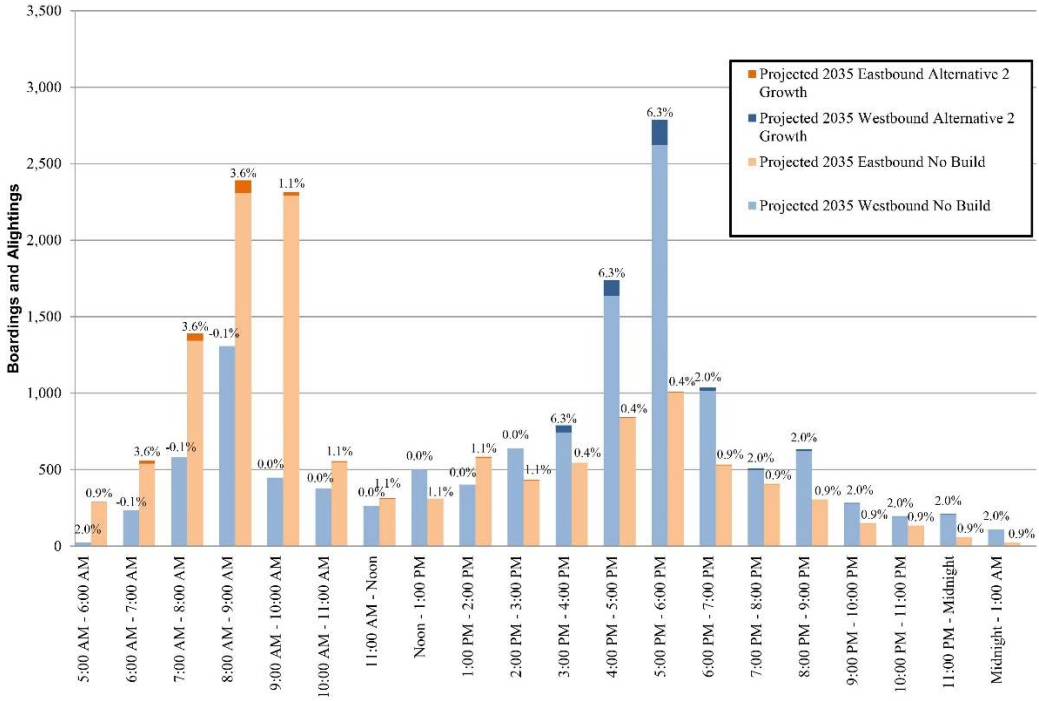
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 49—State Street Weekday Orange Line Platform Activity – 2035 Build Year Alternative 1



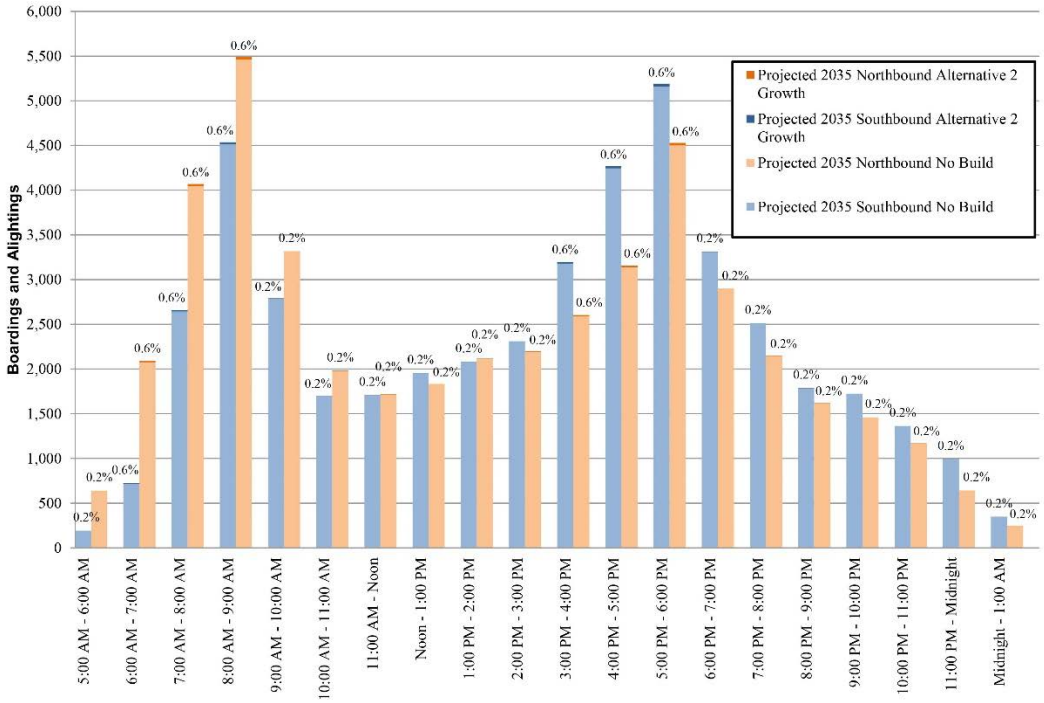
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 50—South Station Weekday Red Line Platform Activity – 2035 Build Year Alternative 2



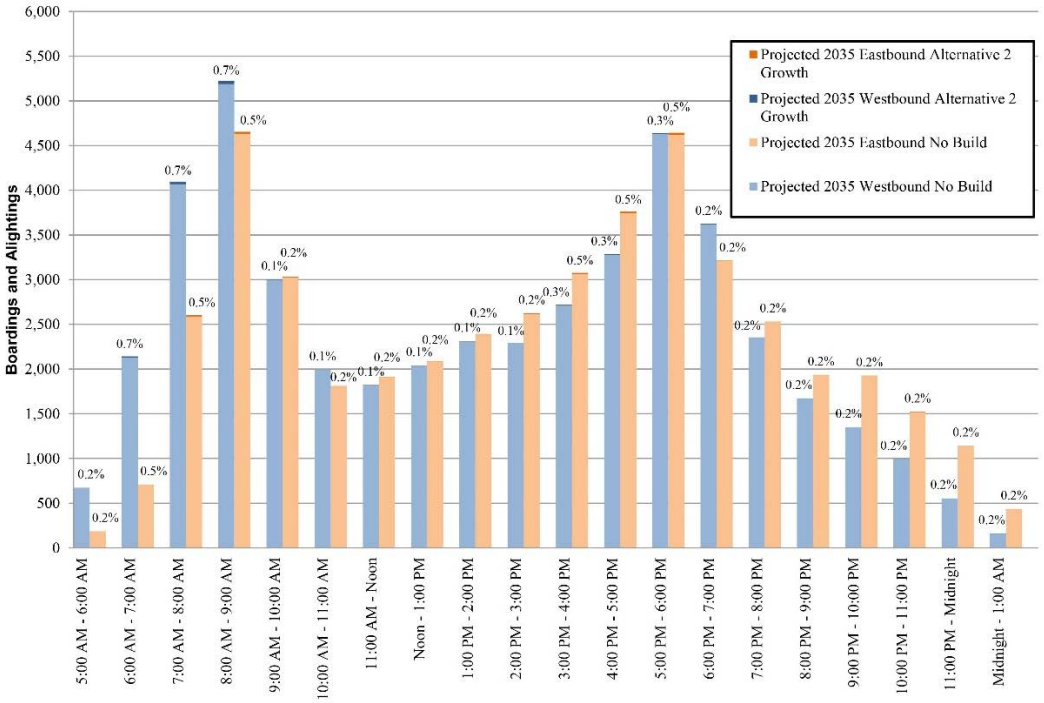
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 51—South Station Weekday Silver Line Platform Activity – 2035 Build Year Alternative 2



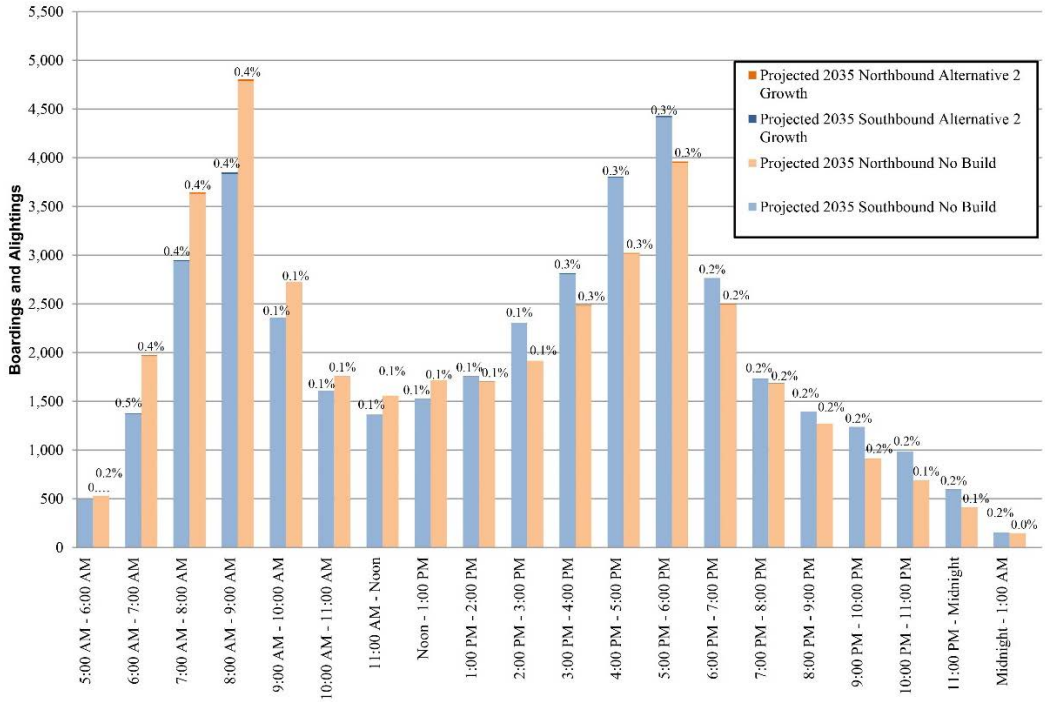
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 52—Park Street Weekday Red Line Platform Activity – 2035 Build Year Alternative 2



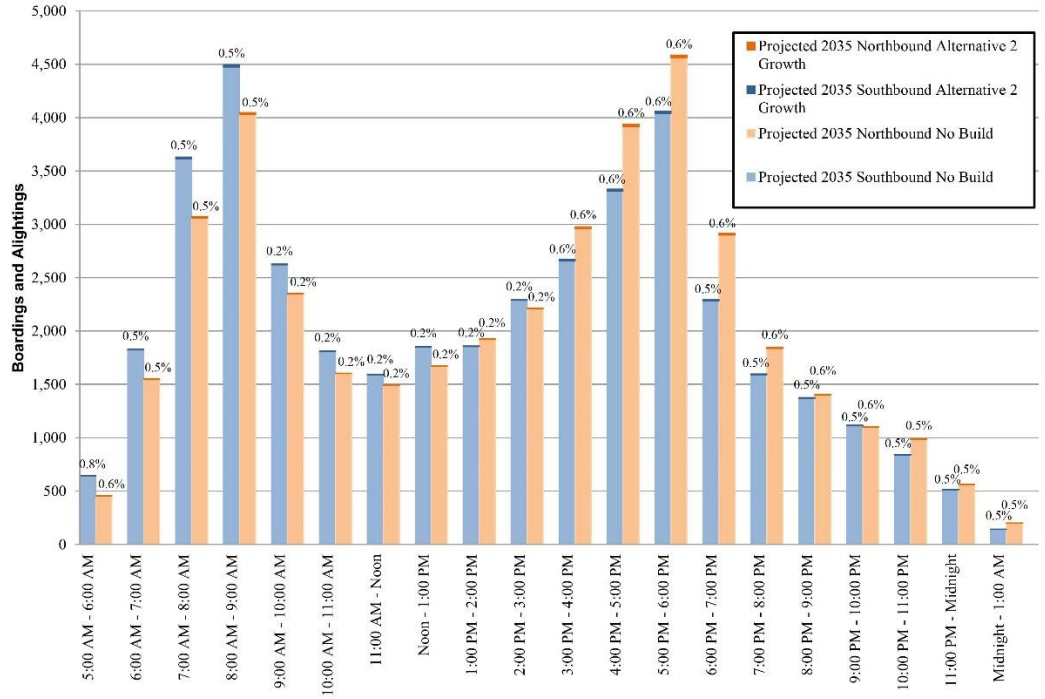
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 53—Park Street Weekday Green Line Platform Activity – 2035 Build Year Alternative 2



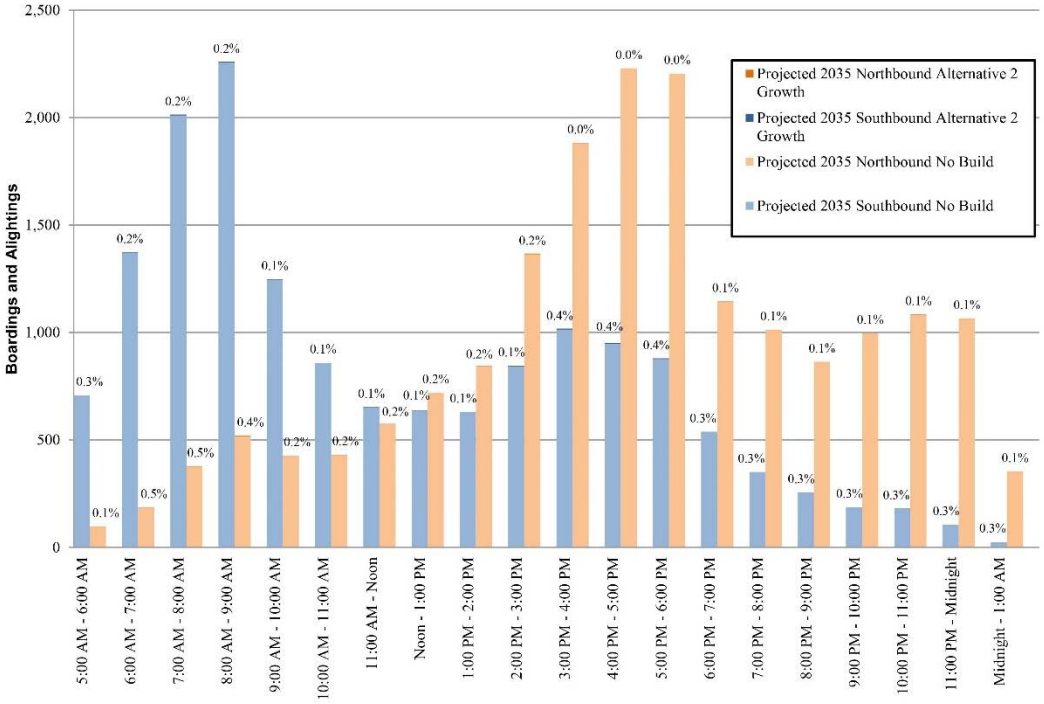
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 54—Dwntn. Crossing Weekday Red Line Platform Activity – 2035 Build Year Alternative 2



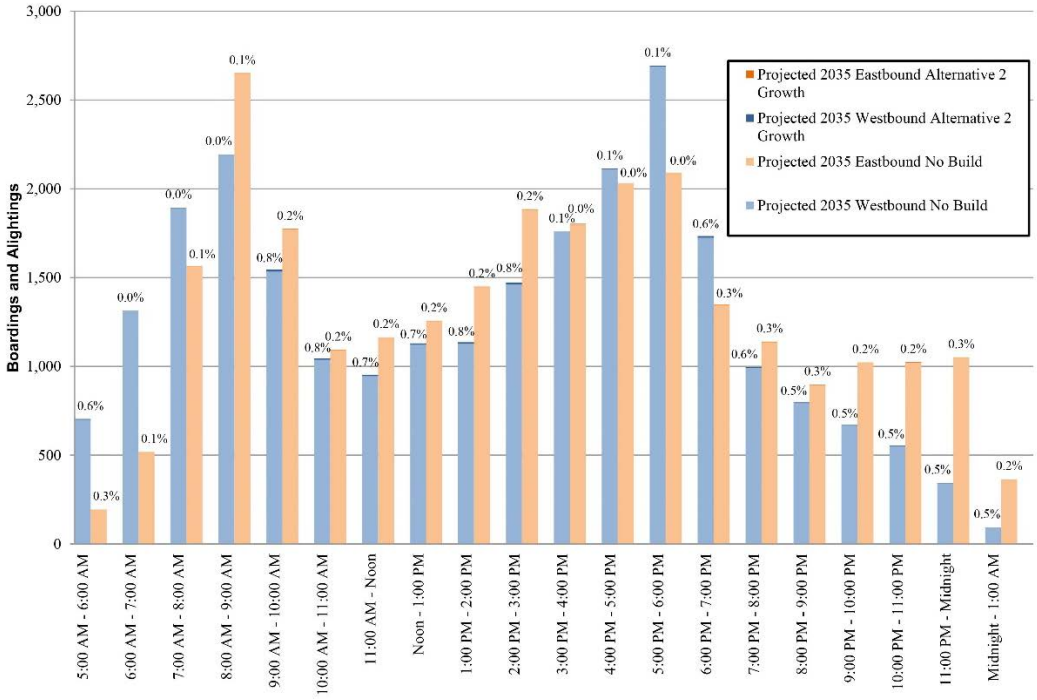
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 55—Dwntn. Crossing Weekday Orange Line Platform Activity – 2035 Build Year Alternative 2



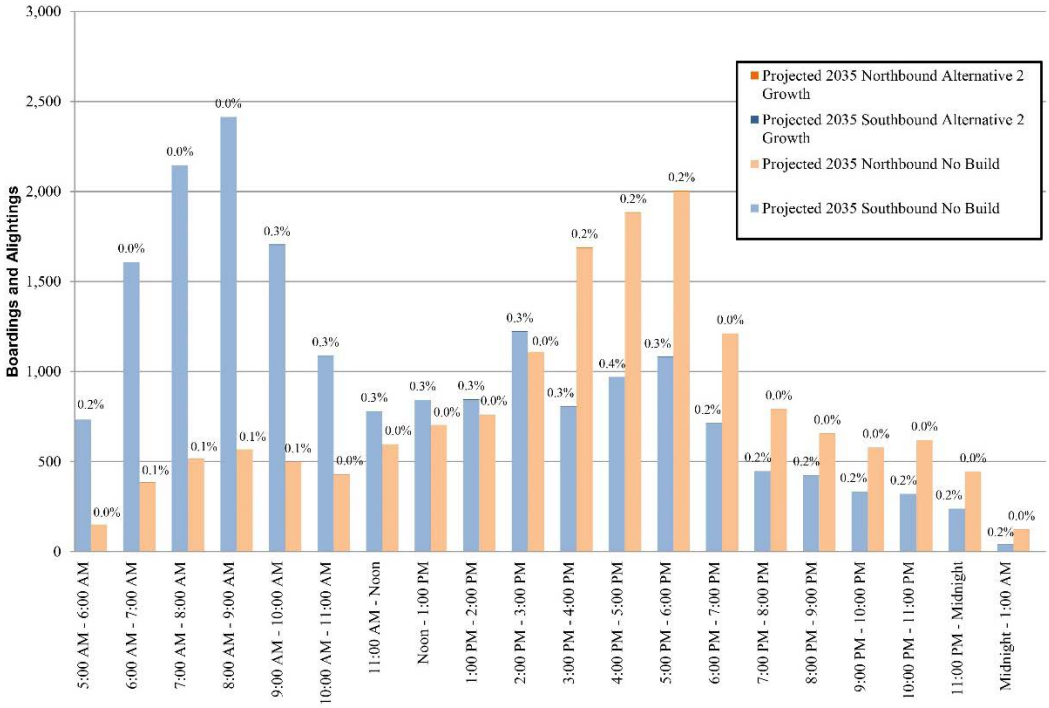
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 56—Gov't. Center Weekday Blue Line Platform Activity – 2035 Build Year Alternative 2



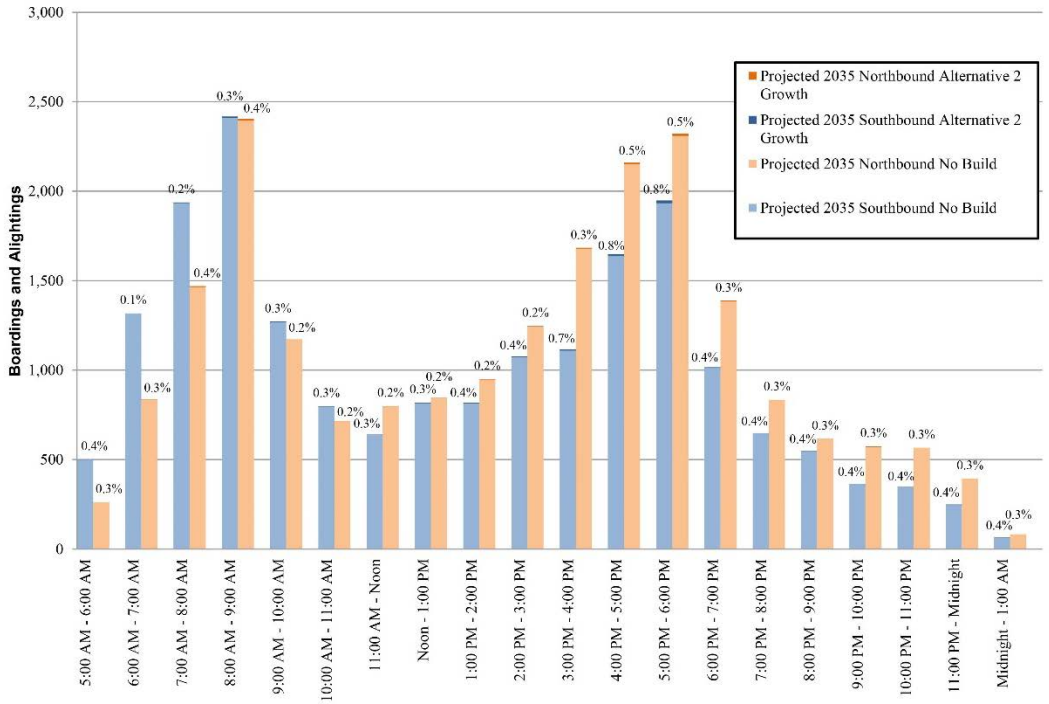
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 57—Gov't. Center Weekday Green Line Platform Activity – 2035 Build Year Alternative 2



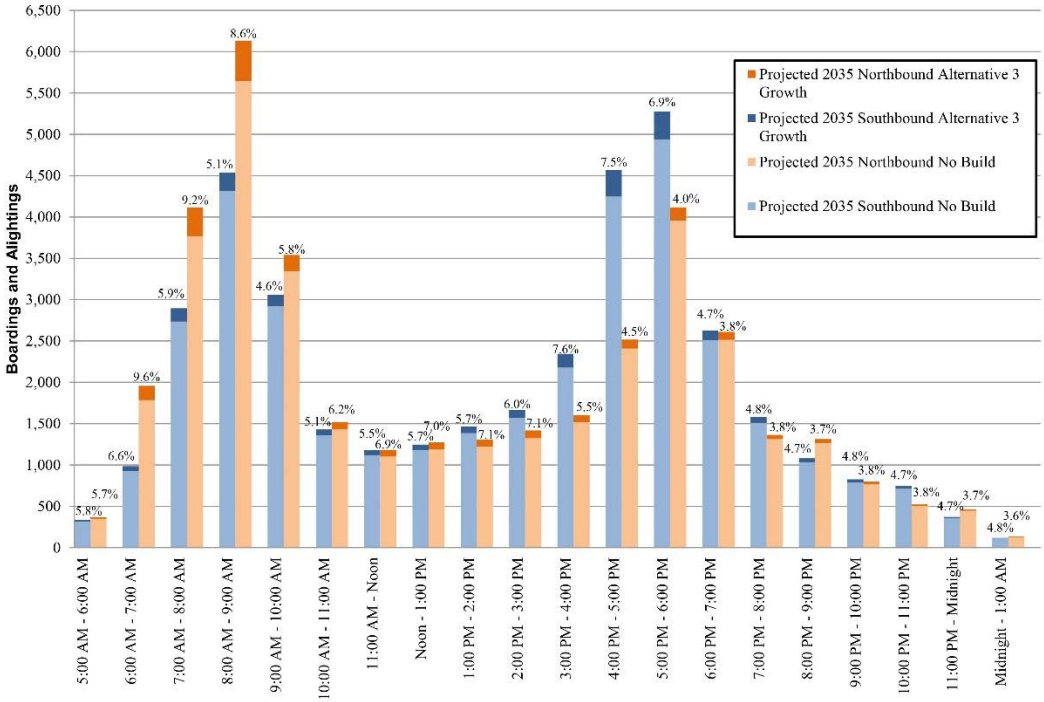
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 58—State Street Weekday Blue Line Platform Activity – 2035 Build Year Alternative 2



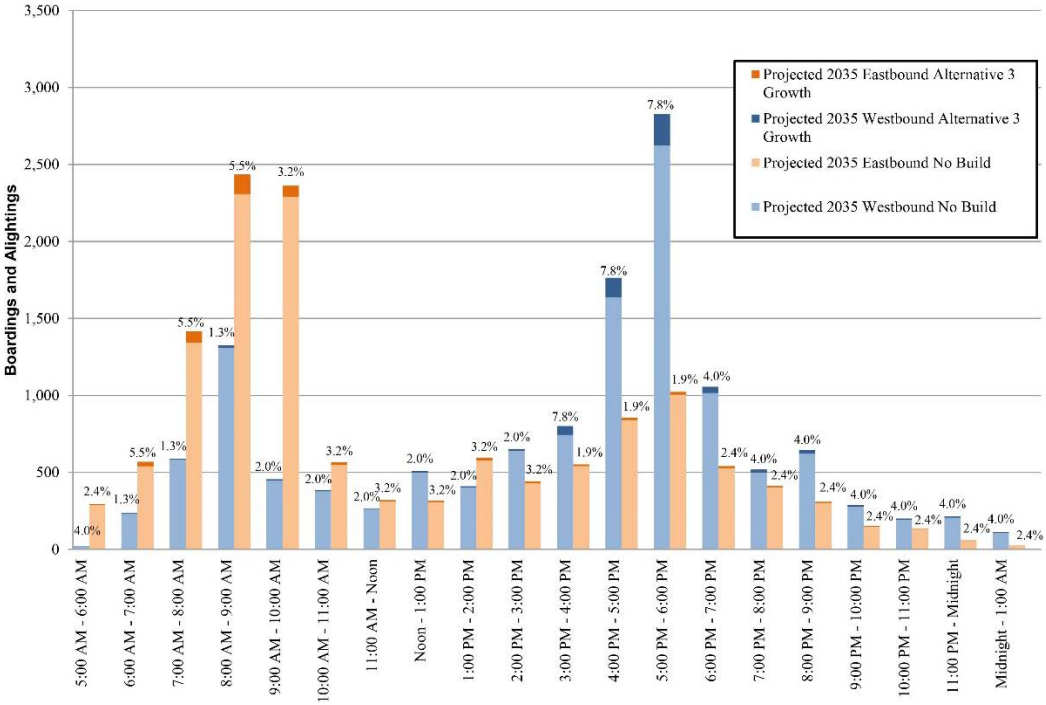
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations*. Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 59—State Street Weekday Orange Line Platform Activity – 2035 Build Year Alternative 2



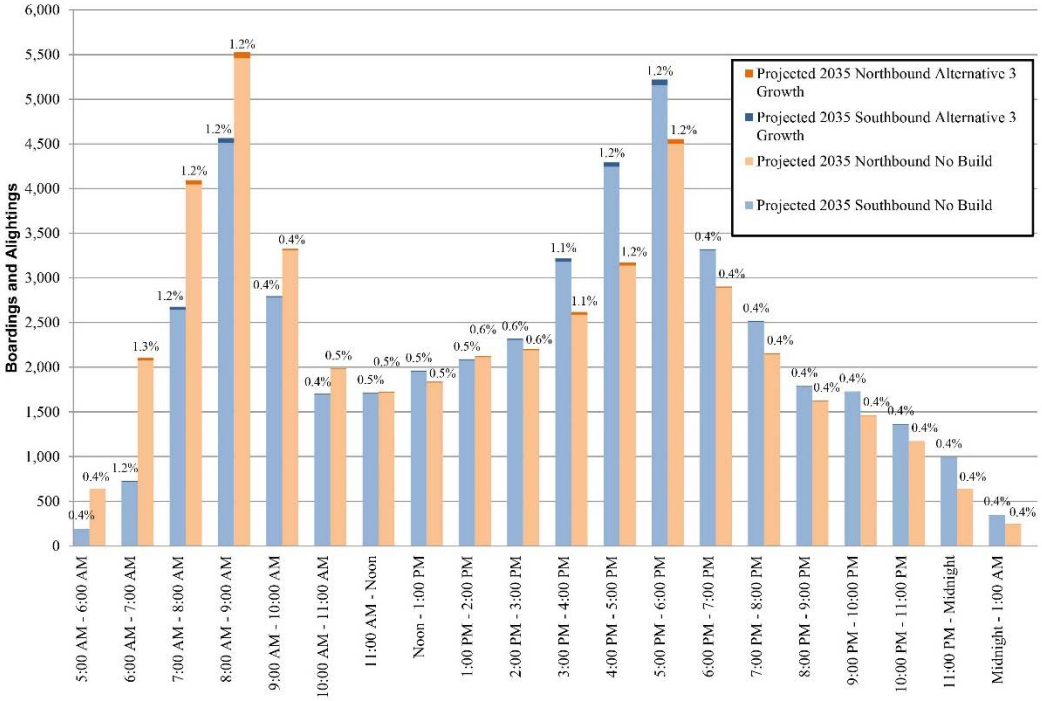
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 60—South Station Weekday Red Line Platform Activity – 2035 Build Year Alternative 3



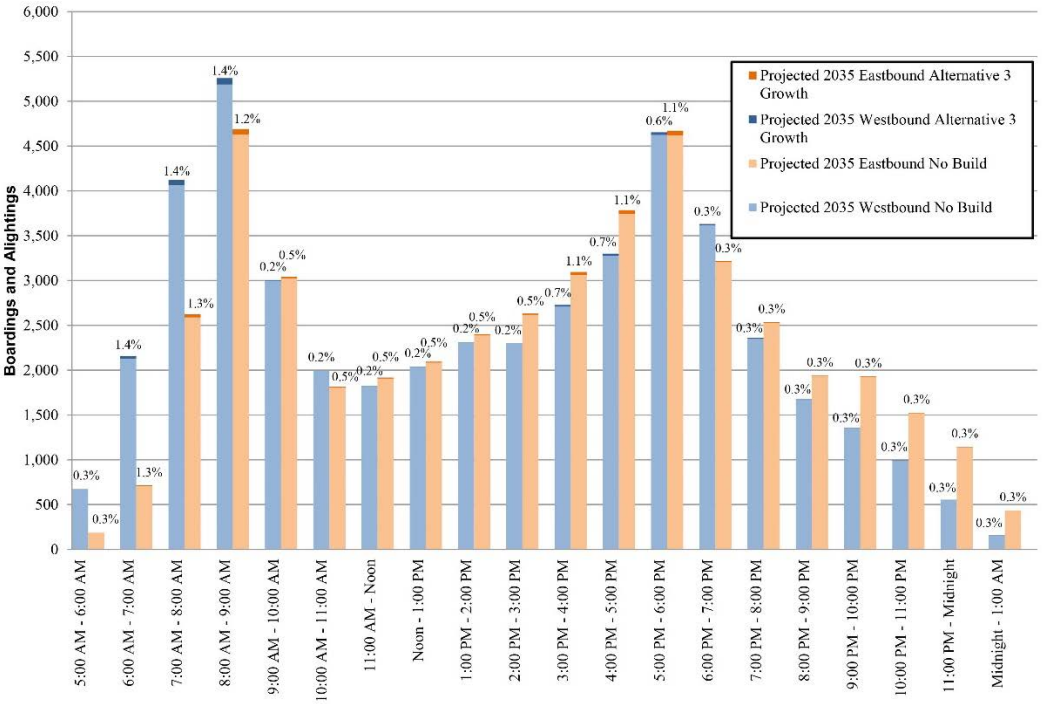
Source: *Final SSX Ridership Results* provided in Appendix 9 - *Ridership Forecasting Technical Report.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 61—South Station Weekday Silver Line Platform Activity – 2035 Build Year Alternative 3



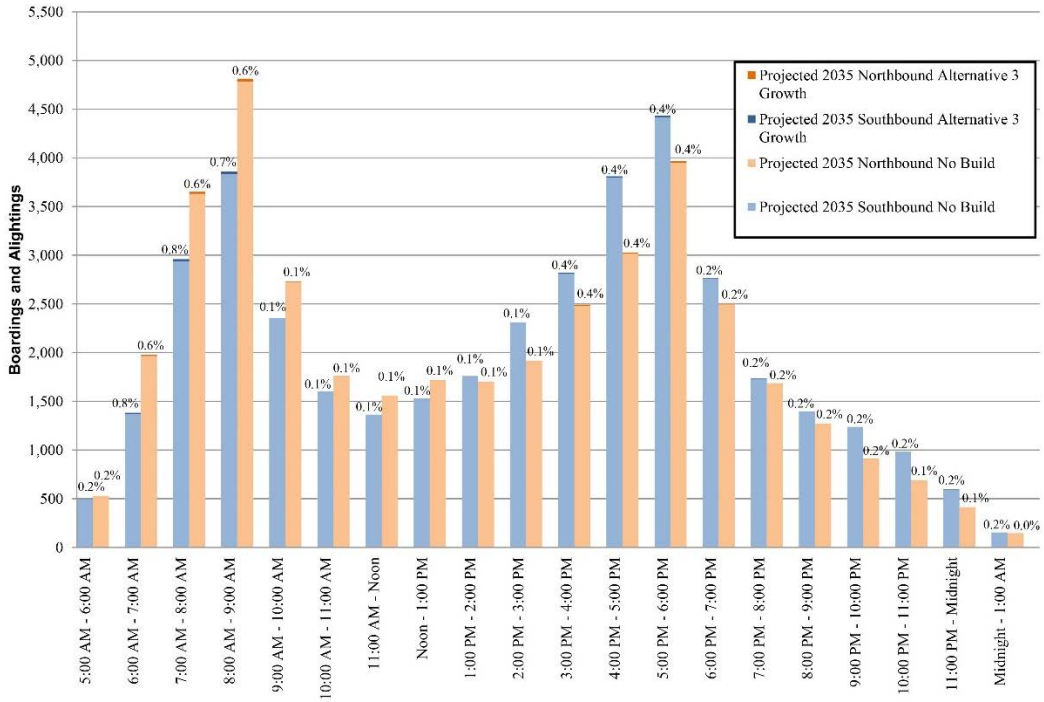
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 62—Park Street Weekday Red Line Platform Activity – 2035 Build Year Alternative 3



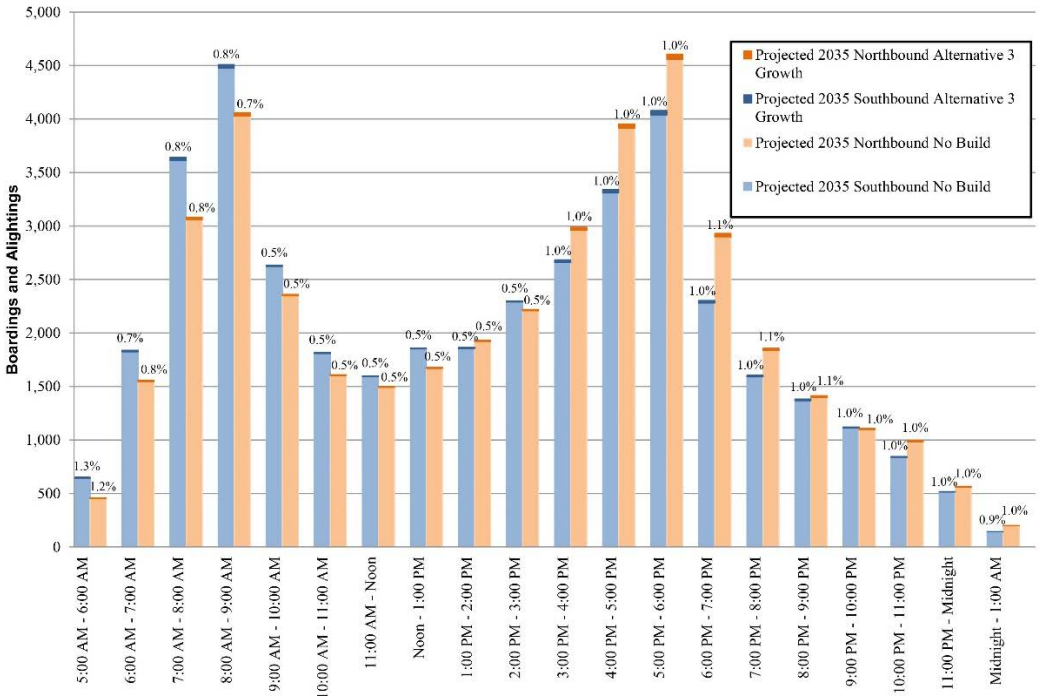
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 63—Park Street Weekday Green Line Platform Activity – 2035 Build Year Alternative 3



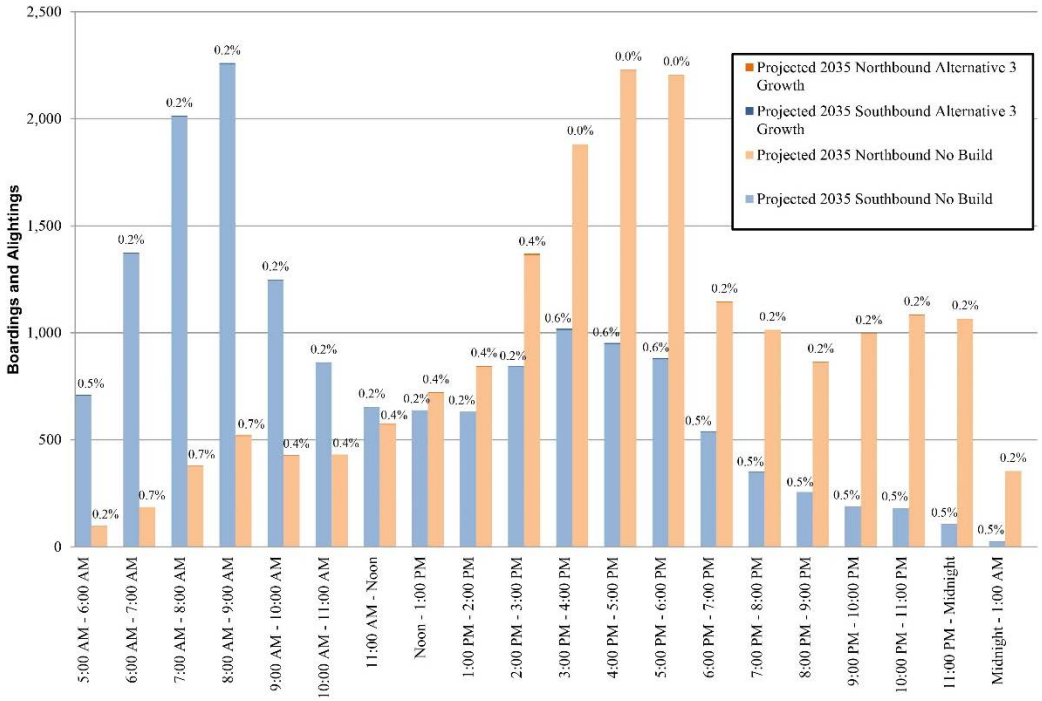
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 64—Dwntn. Crossing Weekday Red Line Platform Activity – 2035 Build Year Alternative 3



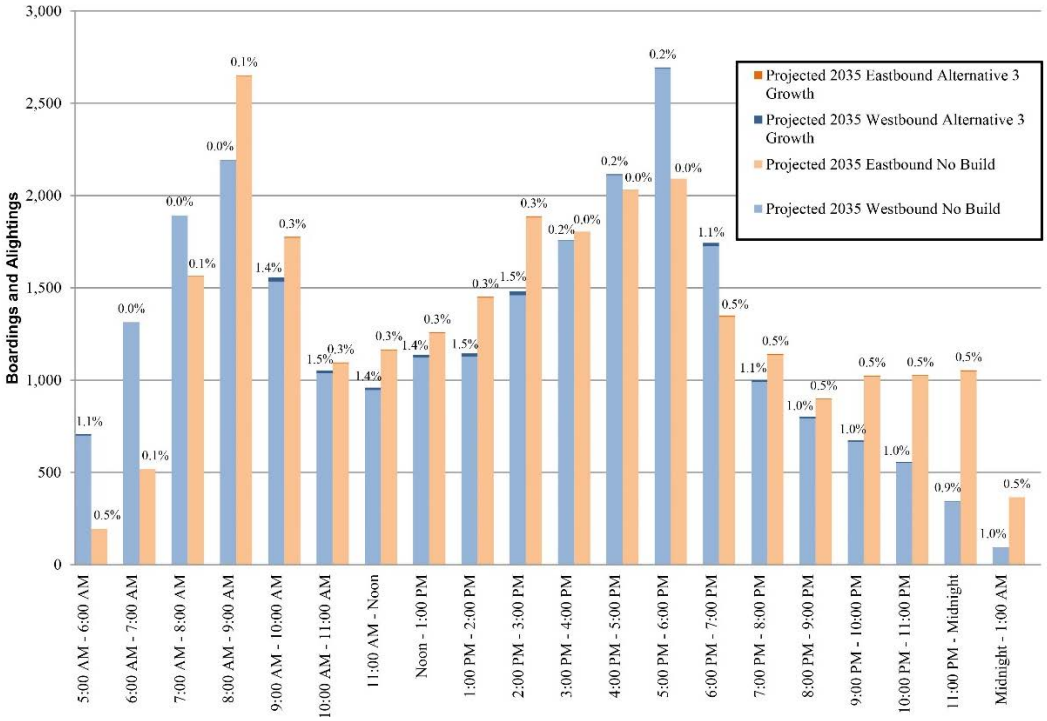
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 65—Dwntn. Crossing Weekday Orange Line Platform Activity – 2035 Build Year Alternative 3



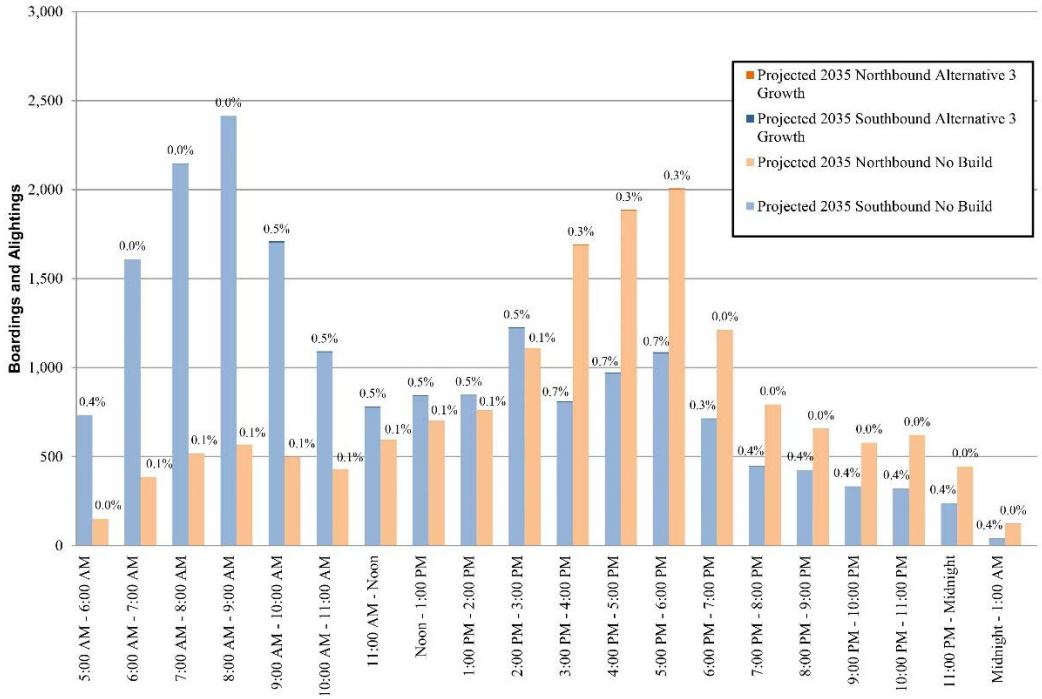
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 66—Gov't. Center Weekday Blue Line Platform Activity – 2035 Build Year Alternative 3



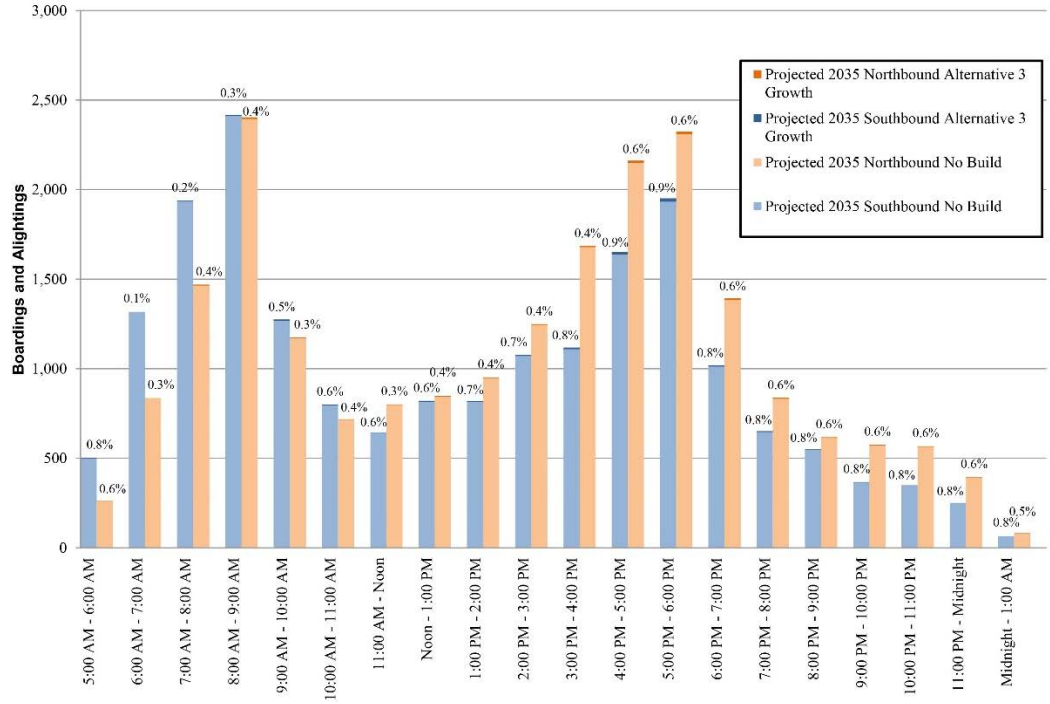
Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 67—Gov't. Center Weekday Green Line Platform Activity – 2035 Build Year Alternative 3



Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based on MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 68—State Street Weekday Blue Line Platform Activity – 2035 Build Year Alternative 3



Source: Ridership data from CTPS, *Results of Station Activities at Downtown Stations.* Hourly and directional distribution based MBTA ridership counts provided by Greg Strangeways, Fall 2012.
Note: Percent increases shown in graph represent projected Build Alternative ridership growth as compared to No Build Alternative conditions.

Figure 69—State Street Weekday Orange Line Platform Activity – 2035 Build Year Alternative 3

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