EXPANDED PROJECT NOTIFICATION FORM

22 Boston Wharf Road

Boston, Massachusetts

Submitted to:

Boston Redevelopment Authority
1 City Hall Square, 9th Floor
Boston, Massachusetts 02201

Submitted by:

Berkeley Investments, Inc.
280 Congress Street, Suite 1350
Boston, Massachusetts 02210

Prepared by:

Epsilon Associates, Inc.
3 Clock Tower Place, Suite 250
Maynard, MA 01754

July 20, 2015

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Maynard, MA 01754

In Association with:

Goulston & Storrs
Howard Stein-Hudson
Nitsch Engineering
TRO Jung/Brannen

July 20, 2015

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Section 1.0

Project Description

1.0 PROJECT DESCRIPTION

1.1 Introduction

Berkeley Investments, Inc. (the Proponent) proposes a two-story rooftop vertical expansion on the existing eight-story building at 22 Boston Wharf Road in the Fort Point Channel Landmark District (see Figure 1-1 [USGS locus]). The existing building consists of six levels of partially enclosed parking with two upper floors of office space; the addition will contain two approximately 28,000-square-foot floors of office space as well as a 1,000-square-foot rooftop mechanical penthouse. The Project will also introduce ground floor retail space to the existing building; two areas of retail will total approximately 3,000 square feet of gross floor area, which will be converted from an area currently used as a management office and parking. Furthermore, the Project includes the addition of a new pedestrian entry to the parking garage from Boston Wharf Road. An aerial view of existing conditions on the Project site is shown in Figure 1-2.

The Proponent has been an active investor and developer in the Fort Point neighborhood since 2004, at one point owning over 15 properties in the District. Since that time, the Proponent has worked to promote the creation of new residential, commercial, and retail uses in these properties through thoughtful development and redevelopment that has enlivened the streetscape and brought new restaurants, residents, and office workers to the neighborhood. This work includes FP3, a development on Congress Street that included the conversion of two buildings and a vacant lot into a condominium and retail destination. Like the subject Project, FP3 included a vertical addition atop an existing building, and ultimately was recognized for design excellence with the American Institute of Architects Award for Housing.

This Expanded PNF for the proposed Project at 22 Boston Wharf Road initiates Large Project Review under Article 80 of the Boston Zoning Code.

1.2 Project Identification

Project Name: 22 Boston Wharf Road

Address/Location: 22 Boston Wharf Road
Boston, MA

1.3 Project Team

Proponent:
Berkeley Management, Inc.
280 Congress Street, Suite 1350
Boston, MA 02210
(617) 439-0088
John Karoff
Daniel McGrath

Architects:
TRO Jung/Brannen
22 Boston Wharf Road
Boston, MA 02110
(617) 502-3400
Bruce Johnson
Keith Jones

Permitting Consultants:
Epsilon Associates, Inc.
3 Clock Tower Place, Suite 250
Maynard, MA 01754
(978) 897-7100
Peggy Briggs
Holly Carlson

Transportation Consultants:
Howard Stein-Hudson
11 Beacon Street, Suite 1010
Boston, MA 02108
(617) 482-7080
Guy Busa
Brian Beisel

Civil Engineers:
Nitsch Engineering, Inc.
2 Center Plaza, Suite 430
Boston, MA 02108
(617) 338-0063
John Schmid
Jess Yarmarkovich

Legal Counsel:
Goulston & Storrs
400 Atlantic Avenue
Boston, MA 02110-3333
(617) 574-3527
Peter Kochansky
Marvin Cine

1.4 Project Description

This section describes the existing Project site as well as a detailed Project description, including dimensions and schedule.

1.4.1 Project Site

The Project site is an approximately 0.7-acre parcel in the South Boston Innovation District. It is also within the City of Boston's Fort Point Channel Landmark District. As shown in Figure 1-2, the surrounding area is characterized by a mix of uses including industrial, commercial, and some residential. The Proponent envisions this Project contributing to the revitalization and development of the area. The Project site is between the ongoing development of Seaport Square to the north and the Boston Convention and Exhibition Center to the south. The Fort Point neighborhood is one of the most dynamic neighborhoods in Boston. As a distinct neighborhood within the larger South Boston Waterfront/Innovation District, the Fort Point neighborhood is a true mixed-use neighborhood with an emerging balance of commercial, high-tech/biotech, and residential uses, key ingredients for sustaining a vibrant retail culture. The area also boasts an active and vibrant artist community.

1.4.2 Existing Site Uses

Currently, the Project site consists of an existing eight-story building with six levels of partially enclosed parking (583 spaces) and two upper floors of office space. The existing office space totals approximately 55,095 square feet of gross floor area, all of which is currently occupied; existing tenants will be vacating the space prior to construction of this Project. Figure 1-2 is an aerial view of existing conditions on the Project site, and Figure 1-3a and 1-3b depict existing views and massing of the building.

1.4.3 Detailed Project Description

The Project consists of the following: (1) a two-story vertical expansion of the existing building, with each new story containing approximately 28,000 square feet of office space; and (2) the conversion of 3,000 square feet of existing ground floor space currently used as a management office and parking to retail. The Project will also add windows to the existing office floors on the side of the building facing Q Park, and will add an additional window on the same side of the building in the larger of the two proposed retail spaces; these windows will serve to animate Q Park and improve the public realm. In addition, the Project includes a 1,000-square-foot rooftop mechanical penthouse and the addition of a new pedestrian entry to the parking garage from Boston Wharf Road. Existing egress stairs and elevators will be extended to provide access to the new levels.

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014

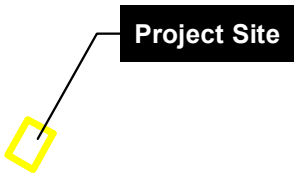
LEGEND

Project Site

Scale 1:12,000
1 inch = 1,000 feet

0 500 1,000
Feet

Basemap: 1987 USGS Quadrangle, MassGIS

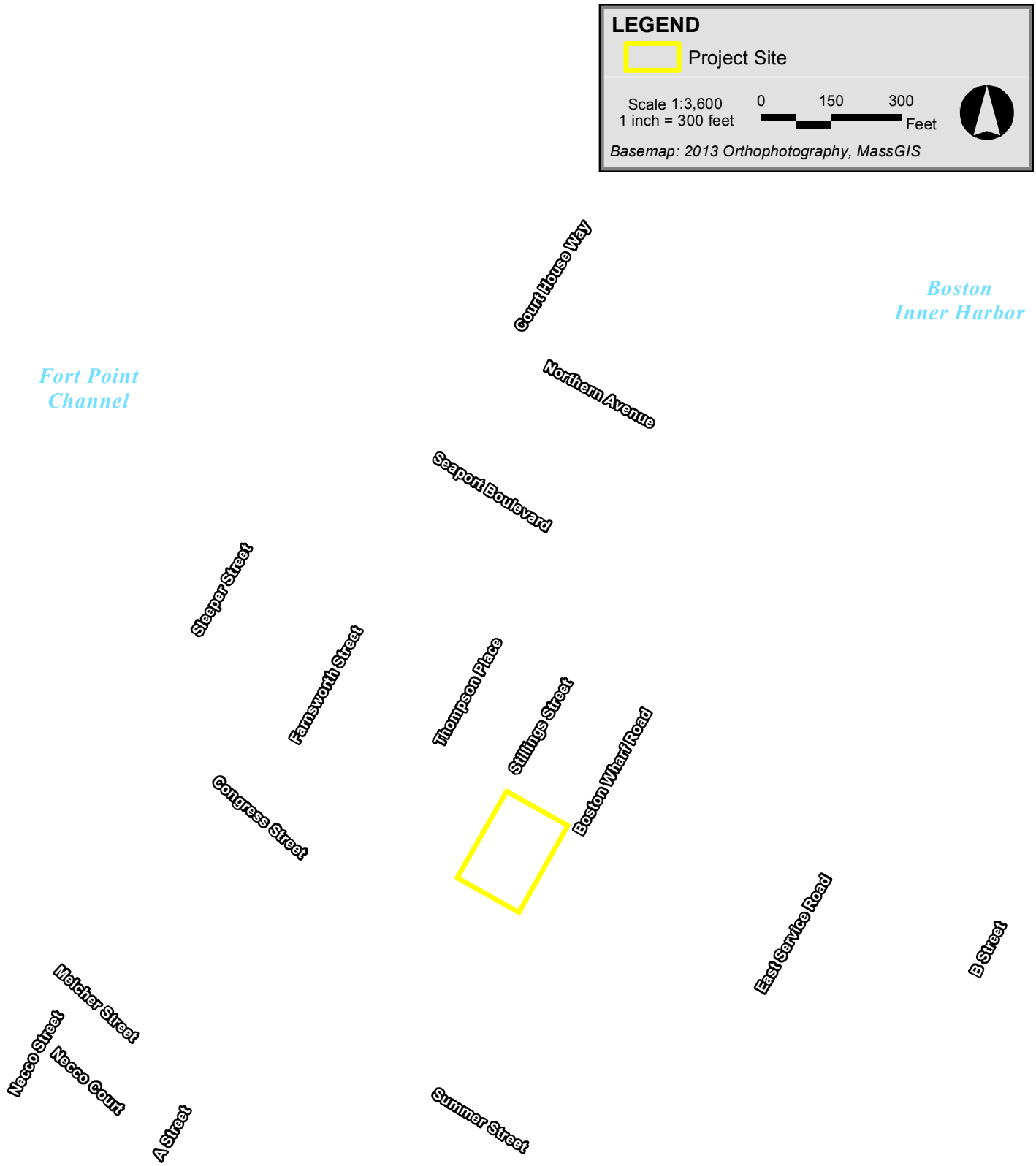


22 Boston Wharf Road Boston, Massachusetts

Figure 1-1

USGS Locus Map

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014

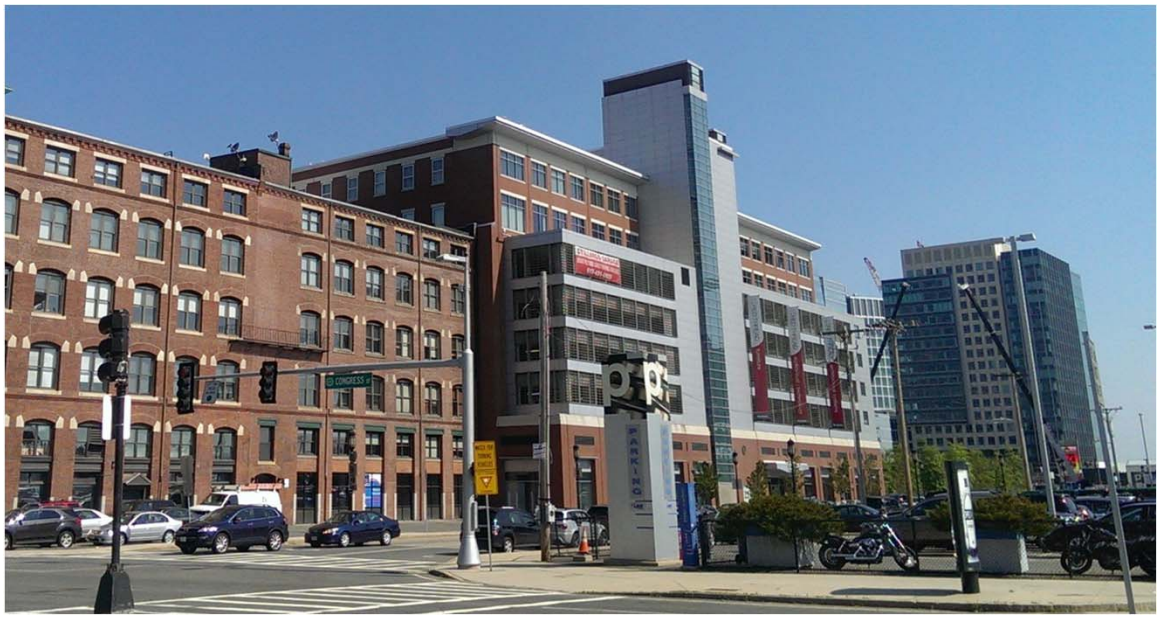


22 Boston Wharf Road Boston, Massachusetts

[redacted]

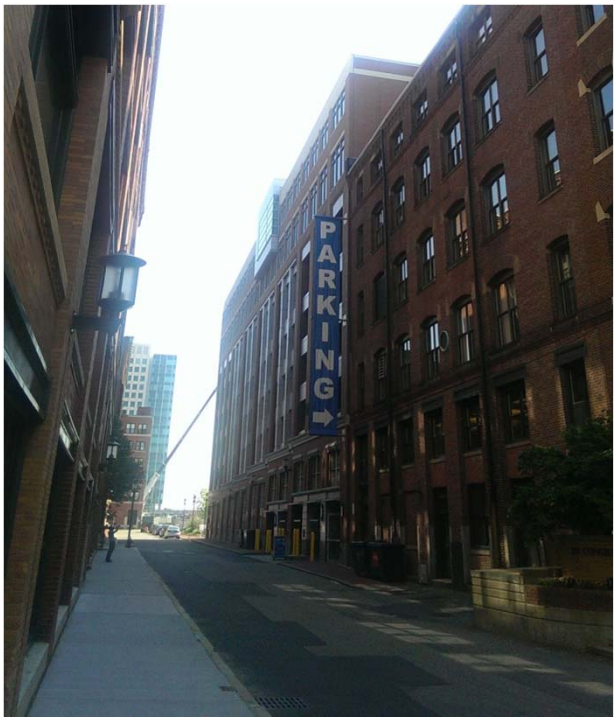
Figure 1-2

Aerial Locus Map



East side of existing building as seen from the intersection of Boston Wharf Road and Congress Street

Northern façade of the existing building, as seen from Stillings Street adjacent to Q Park



West side of existing building as seen from the intersection of Stillings Street and Congress Street

West façade of the existing building, as seen from a rooftop a couple of blocks away

With the additional 54,712 square feet of office space, total office space in the building will grow to 109,807 square feet of gross floor area. The conversion of certain ground-floor space into retail will reduce the total square feet of gross floor area within the six-level parking garage to approximately 176,483 square feet and the number of parking spaces to 559 parking spaces. With the proposed addition, the building height calculated according to the Boston zoning code will be approximately 131 feet.

A proposed site plan is provided as Figure 1-4, while Figure 1-5 is a rendering of the Project; Figure 1-6 shows a design for the building wall adjacent to Q Park. Attachment B includes floor plans and elevations; a site configuration plan is provided in the transportation graphics (see Section 2.0).

Over the course of the past several months, the Proponent has evaluated the appropriate design approach for the Project, focusing on the following issues in developing a design:

- Respecting the integrity of the existing facade;
- Differentiating the existing building from the surrounding historical context of buildings within the Fort Point Channel Landmark District;
- Analyzing views of the Project from important vantage points;
- Considering heights of existing buildings in the area; and
- Evaluating structural elements relative to the addition of two stories.

Structural elements above- and below-grade will support the addition of the two stories of office space.

Given that the Project is a vertical expansion of an existing structure, the basic massing of the Project was dictated by the existing building design. Located just within the border of the historic Fort Point Channel neighborhood and the developing Innovation District, the Project will remain visually distinct from the historic neighborhood while also respecting its fabric by building on the existing language of masonry, curtain wall, and metal panel. The northeast elevation of the existing building overlooking Q Park was originally designed as a building separation wall with no fenestration; the proposed Project will add windows on this wall to activate the northeast elevation and create a visual connection to the park.

The Project does not include any changes to the existing streetscape, although a second pedestrian entrance to the parking garage will be added on Boston Wharf Road. In addition, the Project will add a ground-level window to the existing building adjacent to Q Park in one of the proposed retail spaces, which will serve to animate the public realm.

22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Figure 1-4

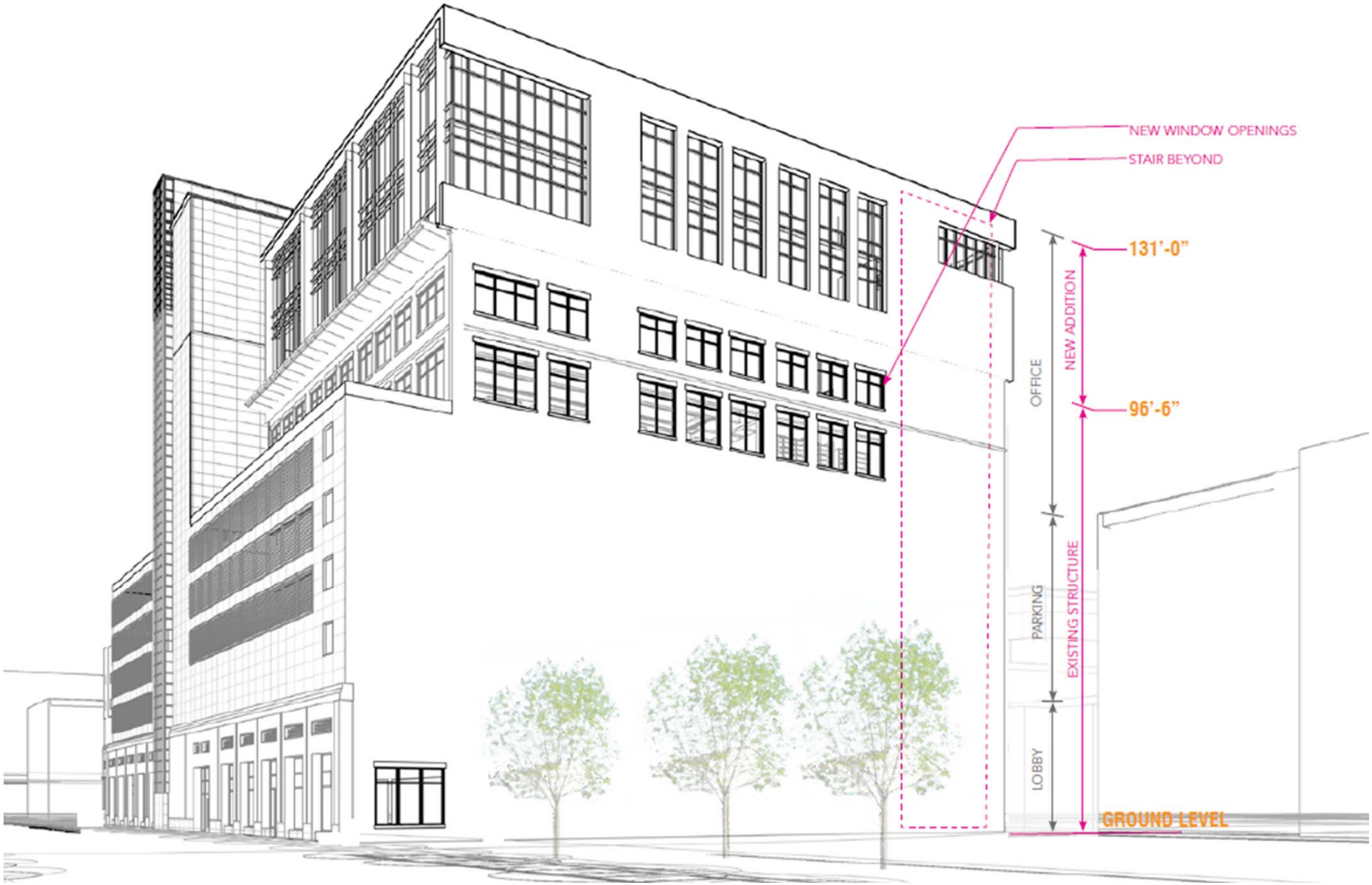
Site Plan

22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Figure 1-5

Project Rendering



22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Figure 1-6

Design for Wall Adjacent to Q Park

1.4.4 Approximate Dimensions

Table 1-1 contains the approximate Project dimensions.

Table 1-1 Approximate Project Dimensions.

Site Area	0.7 acres (30,893 square feet)
Existing	
Office	55,095 square feet of gross floor area
Parking Garage	6 levels, 179,483 square feet of gross floor area, 583 spaces
Total	*234,578 square feet of gross floor area*
Proposed Project	
Office	109,807 square feet of gross floor area (net new 54,712 gsf)
Rooftop Mechanical Penthouse	1,326 square feet
Parking Garage	6 levels, 176,483 square feet of gross floor area, 559 spaces (0 net new)
Retail	3,000 square feet of gross floor area (converted from garage space)
Total	*289,290 square feet of gross floor area*
Net New	56,038 square feet of gross floor area
Maximum building height	131 feet (measured using the Boston Zoning Code definition); existing building is 96 feet tall

1.4.5 Schedule

Construction of the Project is estimated to last approximately 12 months, with initial site work expected to begin in March 2016. Typical construction hours will be in compliance with the City's Construction Ordinance: Monday through Friday with no work anticipated on the weekends. In the event that weekend work is necessary, the Proponent will obtain required City approvals.

1.5 Regulatory Review and Zoning Consistency

1.5.1 Large Project Review

The proposed Project is located entirely within the M-4 Restricted Manufacturing District, as well as the South Boston Waterfront Interim Planning Overlay District (the SBW IPOD) and the Restricted Parking Overlay District. Because the Project will exceed 10,000 square feet of new gross floor area, it is subject to Large Project Review under Article 80B of the Code pursuant to the applicable threshold in the SBW IPOD.

1.5.2 Zoning Compliance

Office use is allowed within the M-4 zoning district; therefore, no relief will be required with respect to such use. However, since the Project involves the extension of the existing building, an interim planning permit from the Board of Appeal will be required pursuant to the SBW IPOD regulations.

There is no building height limit in the M-4 zoning district, but the SBW IPOD sets a maximum building height of 75 feet and a maximum floor area ratio of 5.0. The Project is expected to add approximately 35 feet of height to the existing building, for a new total height of approximately 131 feet. Since the Project will increase the zoning non-conformity with respect to maximum building height, the Project will require a variance from the City of Boston Board of Appeal. The floor area ratio (FAR) of the Project is approximately 9.4 (excluding Stillings Street, a private way open to vehicular use; if the portion of Stillings Street adjacent to the Project site owned by the Proponent were included in the lot area, the FAR would be approximately 8.2). Since the Project will further increase the zoning non-conformity, a variance from the FAR requirement will be needed.

The Project will comply with the lot area and lot width requirements and the minimum rear yard setback requirements.

There is a parapet setback requirement applicable to projects in the M-4 zoning district. The Project architect has determined, based on the height of the proposed addition and the distance such addition will be set back from the lot lines, that a variance will be required.

In the M-4 zoning district and the Restricted Parking Overlay District, there is no minimum parking requirement for office uses. The addition of office space does not trigger the need for additional loading bays.

Article 86 of the Code regulates both wireless transmission and reception equipment (chiefly antennas and dishes) and equipment-mounting structures. The Project may include the relocation of existing antennas on the Project site's roof. Any such relocation will comply with Article 86 of the Code or zoning relief will be obtained.

1.5.3 Historic Review

The Project site is located within the boundaries of the Fort Point Channel Landmark District (FPCLD); therefore, the Project is subject to review and approval by the FPCLD Commission. An application for a Certificate of Design Review approval will be submitted to the commission at the appropriate time.

1.5.4 MEPA Review

The Project will not require any State action or exceed any review thresholds requiring environmental impact review by the Massachusetts Environmental Policy Act (MEPA) Office of the Massachusetts Executive Office of Environmental Affairs.

Permits and approvals likely to be required for the Project are listed in Table 1-2.

Table 1-2 Anticipated Permits, Reviews, and Approvals

Agency	*Permit, Review or Approval*
Federal Agencies	
Federal Aviation Administration	No Hazard Determination
City Agencies	
Boston Inspectional Services Department	Building Permit
Boston Fire Department	Approval of Fire Safety Equipment
Boston Public Improvement Commission / Boston Department of Public Works	Permits for street occupancy and opening permit
Boston Redevelopment Authority	Article 80 Large Project Review
Boston Board of Appeal	Interim Planning Permit Variances
Boston Transportation Department	Construction Management Plan Transportation Access Plan Agreement (if required)
Fort Point Landmark District Commission	Design Review Approval

1.6 Public Benefits

The Proponent has a longstanding record of successfully developing projects in the Fort Point Channel area to inspire positive change in an urban district that combines the convenience of a downtown location with the flavor of a walkable neighborhood that has a strong cultural orientation. The proposed Project provides numerous public benefits to the City of Boston. The proposed Project will:

- Promote revitalization and investment in an important district of Boston;
- Generate approximately 120-140 construction jobs over the construction period;
- Add another main pedestrian entry to the parking garage from Boston Wharf Road, generally improving public pedestrian access to the garage;
- Complement the adjacent Q Park by adding windows to the northern wall of the existing building;
- Activate the ground level by converting approximately 3,000 square feet of the parking garage to retail;
- Activate the building wall facing Q Park to enhance the public sphere;
- Promote local employment through good-faith efforts to hire Boston residents for construction jobs; and
- Provide substantial annual property tax revenues, at full build-out and occupancy, to the City of Boston.

1.7 Public Review

As noted above, the Project is subject to Large Project Review under Article 80 of the Boston Zoning Code. This expanded Project Notification Form (PNF) is being prepared to initiate that review and the Proponent requests that the requirements for a Draft and Final Project Impact Report be waived.

Table 1-2 lists the federal, state, and local agencies from which permits or other actions may be required.

1.8 Legal Information

1.8.1 Legal Judgments Adverse to the Proposed Project

The Proponent is not aware of any legal judgments in effect or legal actions pending that are adverse to the Project.

1.8.2 History of Tax Arrears on Property

The Proponent is not in tax arrears on any property owned within the City of Boston.

1.8.3 Site Control/Public Easements

The existing building and land is owned by an affiliate of the Proponent. There are no public easements affecting the site.

Section 2.0

Transportation

2.0 TRANSPORTATION

Howard/Stein-Hudson Associates, Inc. (HSH) has conducted an evaluation of the transportation impacts of the proposed expansion of 22 Boston Wharf Road in South Boston, Massachusetts (the "Project" and/or the "site"). This transportation study adheres to the Boston Transportation Department (BTD) Transportation Access Plan Guidelines and Article 80 Large Project Review process. This study includes an evaluation of existing conditions, future conditions with and without the Project, projected parking demand, loading operations, transit services, and pedestrian activity.

2.1 Project Description

The site currently consists of an above ground, six level, 583-space parking garage topped by two floors of office space totaling approximately 55,095 square feet. The proposed Project will add two additional floors of office space totaling approximately 56,000 gross square feet and the conversion of existing ground-floor space into retail totaling approximately 3,000 square feet. The retail expansion will result in the reduction of a total 24 tandem parking spaces on two levels within the garage. Parking is provided for building tenants and the general public.

2.1.1 Study Area

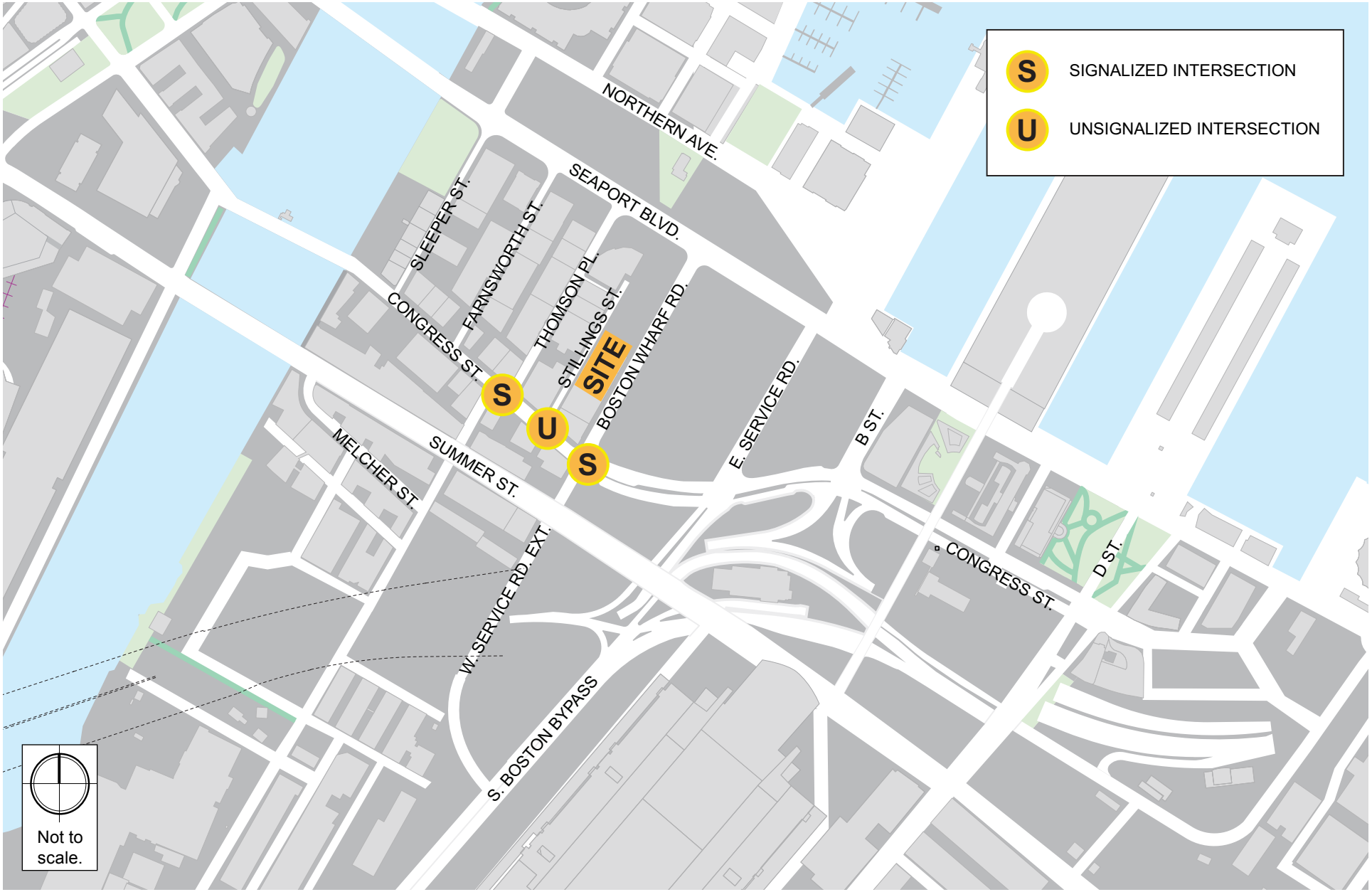
The transportation study area runs along the Congress Street corridor and is bounded by Boston Wharf Road to the east and Stillings Street to the west. The study area consists of the following intersections in the vicinity of the site, also shown on Figure 2-1:

- Congress Street/ Boston Wharf Road;
- Congress Street/Stillings Street; and
- Congress Street/A Street/Thomson Street.

2.1.2 Study Methodology

This transportation study and supporting analyses were conducted in accordance with BTD guidelines, and are described below.

The 2015 Existing Condition analysis includes an inventory of the existing transportation conditions such as traffic characteristics, parking, curb usage, transit, pedestrian circulation, bicycle facilities, loading, and site conditions. Existing counts for vehicles, bicycles, and pedestrians were collected at the study area intersections. A traffic data collection effort forms the basis for the transportation analysis conducted as part of this evaluation.



22 Boston Wharf Road South Boston Waterfront

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Figure 2-1
Study Area Intersection

The future transportation conditions analysis evaluates potential transportation impacts associated with the Project. Long-term impacts are evaluated for the year 2020, based on a five-year horizon from the year of the filing of this traffic study.

The 2020 No-Build Condition scenario includes general background traffic growth, traffic growth associated with specific developments (not including this Project), and transportation improvements that are planned in the vicinity of the site.

The 2020 Build Condition scenario includes a net increase in traffic volume due to the addition of Project-generated trip estimates to the traffic volumes developed as part of the 2020 No-Build Condition scenario. Expected roadway, parking, transit, pedestrian, and bicycle accommodations, as well as loading capabilities and deficiencies, are identified.

The final part of the transportation study identifies measures to mitigate Project-related impacts and to address any traffic, pedestrian, bicycle, transit, safety, or construction related issues that are necessary to accommodate the Project.

An evaluation of short-term traffic impacts associated with construction activities is also provided.

2.2 Existing Condition

This section includes descriptions of existing study area roadway geometries, intersection traffic control, peak-hour vehicular and pedestrian volumes, average daily traffic volumes, transit availability, parking, curb usage, and loading conditions.

2.2.1 Existing Roadway Conditions

The study area includes the following roadways, which are categorized according to the Massachusetts Department of Transportation (MassDOT) Office of Transportation Planning functional classifications:

Boston Wharf Road borders the site to the east, is classified as a local road, and runs in a north-south direction between Congress Street to the south and Seaport Boulevard to the north. Boston Wharf Road consists of one travel lane in each direction with on-street parking on both sides. Sidewalks are provided along both sides of Boston Wharf Road.

Congress Street is located south of the site, is classified as an urban minor arterial, and runs in an east-west direction through the study area. West of Boston Wharf Road, Congress Street consists of two travel lanes in each direction separated by a double-yellow centerline and no on-street parking. East of Boston Wharf Road, Congress Street consists of two travel lanes in each direction separated by a median with on-street parking on both sides. Sidewalks are provided along both sides of Congress Street.

Stillings Street borders the site to the west, is classified as a local road, and runs in a north-south direction between Calvin Place to the north and Congress Street to the south. Stillings Street consists of one travel lane in each direction with on-street permit parking allowed only on the east side of the roadway. Sidewalks are provided along both sides of Stillings Street.

Thomson Street is located west of the site, is classified as a local road, and runs in a north-south direction between Seaport Boulevard to the north and Congress Street to the south. Thomson Street consists of one travel lane in each direction with no on-street parking allowed. Sidewalks are provided along both sides of Thomson Street.

A Street is located south of the site, is classified as an urban minor arterial, and runs in a north-south direction between Congress Street to the north and Dorchester Avenue to the south. A Street generally consists of one travel lane in each direction separated by a double-yellow centerline with on-street parking allowed on the west side of the roadway. Sidewalks are provided along both sides of A Street.

2.2.2 Existing Intersection Conditions

Existing conditions at the study area intersections are described below.

Congress Street / Boston Wharf Road is a four-leg, signalized intersection.

The West Service Road Extension northbound approach consists of an exclusive left-turn lane and a through/right-turn lane. The Boston Wharf Road southbound approach consists of a shared left-turn/through lane and an exclusive right-turn lane.

The Congress Street eastbound approach consists of a shared left-turn/through lane and an exclusive right-turn lane. The Congress Street westbound approach consists of an exclusive left-turn lane and a shared through/right-turn lane.

Sidewalks are provided along both sides of each intersection leg. Crosswalks and pedestrian signals are provided across each approach. On-street parking is permitted on both sides of the Congress Street westbound approach, the west side of the West Service Road Exit northbound approach, and the east side of the Boston Wharf Road southbound approach.

Congress Street / Stillings Street is a three-leg, unsignalized intersection.

The Stillings Street southbound approach consists of a shared left-turn/right-turn lane.

The Congress Street eastbound approach consists of a shared left-turn/through lane and a through lane. The Congress Street westbound approach consists of a shared through/right-turn lane and a through lane.

Sidewalks are provided along both sides of each intersection leg. A crosswalk is only provided across the Stillings Street southbound approach. On-street parking is not permitted on any intersection approach. An MBTA bus stop is provided along the north side of the Congress Street eastbound approach.

Congress Street / A Street / Thomson Street is a four-leg, signalized intersection.

The A Street northbound approach consists of an exclusive left-turn lane and an exclusive right-turn lane with bicycle sharrows on both sides of the approach. The Thomson Street southbound approach consists of a shared left-turn/right-turn lane.

The Congress Street eastbound approach consists of a shared left-turn/through lane, a through lane, and an exclusive right-turn lane. The Congress Street westbound approach consists of an exclusive left-turn lane and a shared through/right-turn lane.

Sidewalks are provided along both sides of each intersection leg. Crosswalks and pedestrian signals are provided across each approach. On-street parking is permitted along both sides of the Congress Street eastbound approach and the west side of the A Street northbound approach.

2.2.3 Parking

An inventory of the on street and off street parking in the vicinity of the Project was collected. A description of each follows.

2.2.3.1 On Street Parking and Curb Usage

On-street parking surrounding the site consists of metered parking along Boston Wharf Road immediately adjacent to the site as well as metered parking spaces along Congress Street to the east. Parking along Congress Street to the west of the site is generally not allowed. Other curb uses within the vicinity include MBTA bus stops, valet parking, loading, and residential parking. The on-street parking regulations within the study area are shown in Figure 2-2.

2.2.3.2 Off-Street Parking

Many of the existing surface parking lots are currently being redeveloped or are planned to be redeveloped as part of Seaport Square, Fan Pier, Pier 4, and other projects. The actual existing parking capacity is constantly fluctuating depending on construction activity. The new developments will contain underground parking garages. Locations of the off-street lots and parking garages that are expected to exist within the next three to five years are shown in Figure 2-3. A detailed summary of all parking lots and garages are shown in Table 2-1.

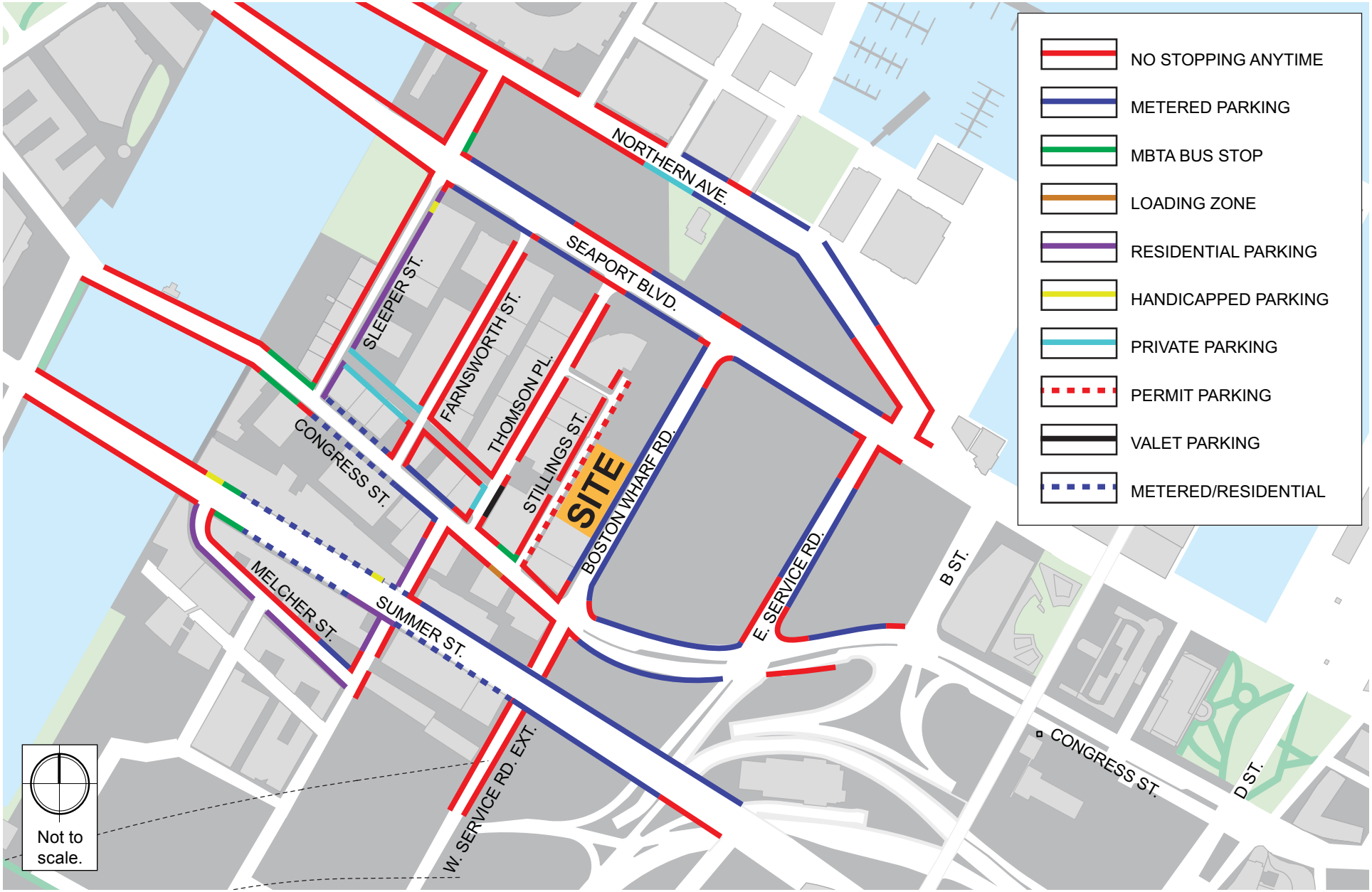

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Figure 2-2
On-Street Parking Regulations

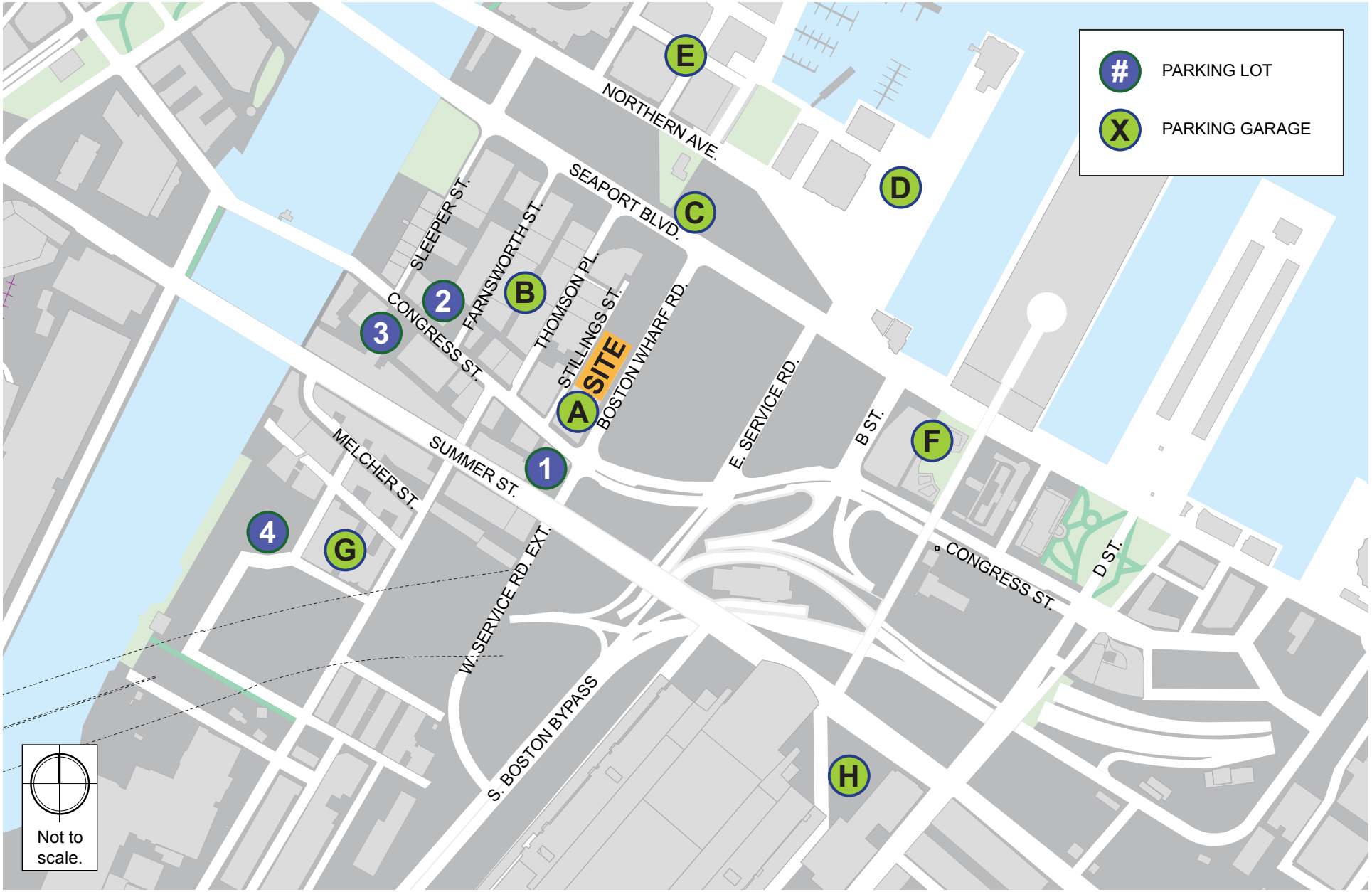

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Figure 2-3
Off-Street Parking in the Study Area

Table 2-1 Off-street Parking Lots and Garages within a Quarter-Mile of the Site

Map #	*Address*	*Facility*	*Capacity*
Parking Lots			
1	W. Service Road/Congress Street	Stanhope Parking Lot	40
2	11 Sleeper Street	VPNE	21
3	321 Congress Street	Congress Street LAZ Parking 1	83
4	284 A Street	Channelside	1,256
Parking Lots Subtotal			**1,400**
Parking Garages			
A	29-49 Stillings Street	Stillings Street Garage	583
B	17 Farnsworth Street	Farnsworth Street Garage	361
C	Seaport Square Development	Multiple Parcels	6,000
D	Pier 4 Development	Multiple Parcels	1,200
E	Fan Pier Development	Multiple Parcels	1,975
F	1 Seaport Lane	Seaport Hotel and WTC	2,300
G	10 Necco Street	Necco Street Garage	596
H	425 Summer Street	Westin Boston Waterfront Hotel	500
Parking Garages Subtotal			**13,515**

As shown in Table 2-1, there are a total of 14,915 spaces within a quarter-mile radius of the site. A portion of the parking in underground garages associated with the new developments will contain parking reserved for on-site uses as well as public parking.

2.2.3.3 Car Sharing Services

Car sharing enables easy access to short-term vehicular transportation. Vehicles are rented on an hourly or daily basis, and all vehicle costs (gas, maintenance, insurance, and parking) are included in the rental fee. Vehicles are checked out for a specific time period and returned to their designated location.

Zipcar is the primary company in the Boston car sharing market. There are currently eleven Zipcar locations within a half-mile walk of the Site. The nearby car sharing locations are shown in Figure 2-4 and Table 2-2 lists the addresses and capacity.

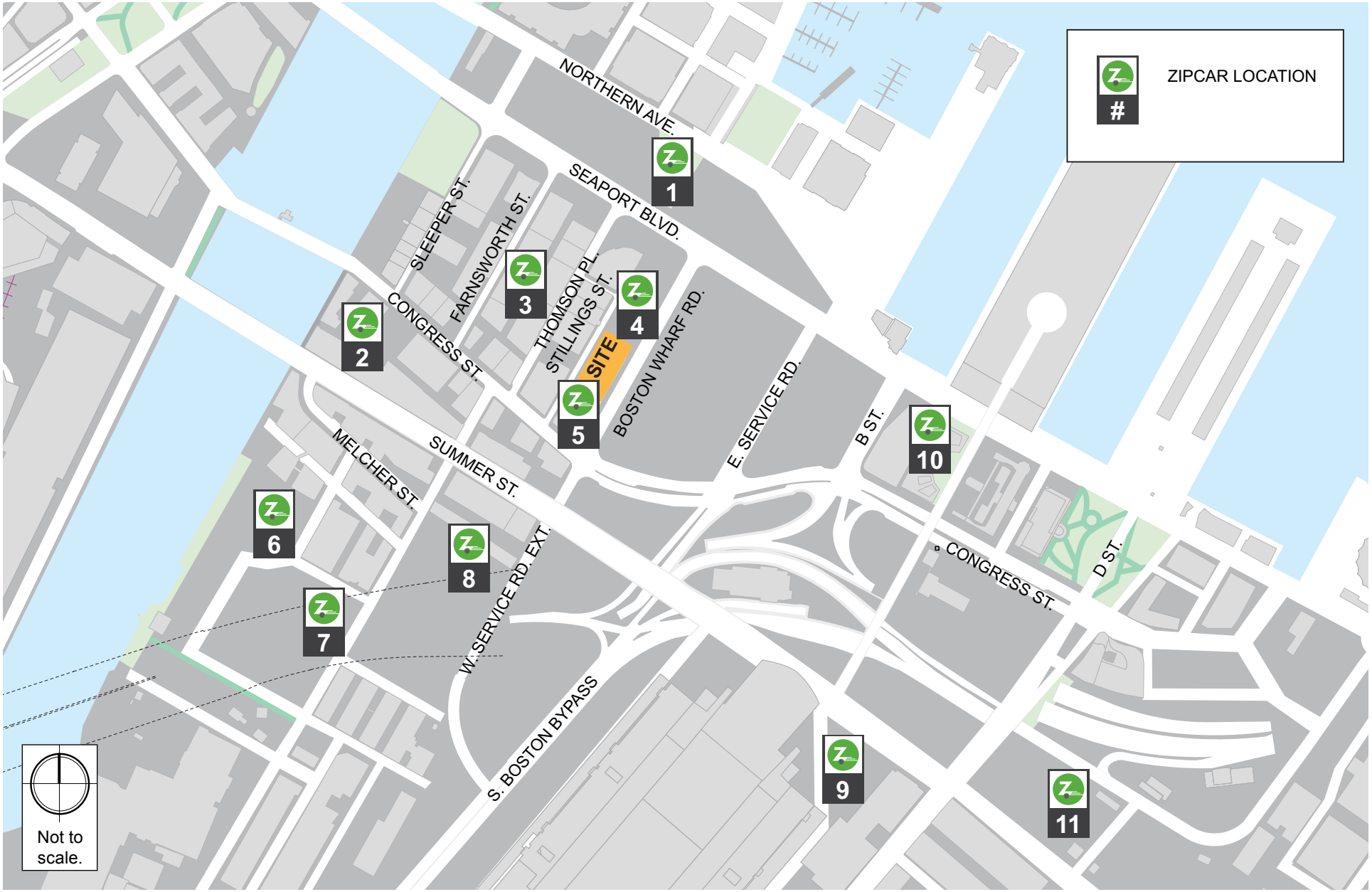

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Figure 2-4
Car Sharing Services

Table 2-2 Car Sharing Services within a Quarter-Mile of the Site

Map #	*Address*
1	75 Northern Ave – District Hall
2	Congress Street / Sleeper Street
3	35 Thomson Street
4	Stillings Street / Calvin Place
5	13 Stillings Street – Stillings Street Garage
6	100 Necco Street
7	A Street / Necco Street
8	A Street / Melcher Street – 315 on A Street Apartments
9	415 Summer Street - BCEC
10	2 Seaport Lane
11	Summer Street / Pumphouse Road

2.2.4 Existing Traffic Data

Traffic volume data was collected at the three study area intersections on April 16, 2015. Turning Movement Counts (TMCs) and vehicle classification counts were conducted during the weekday a.m. and p.m. peak periods (7:00 – 9:00 a.m. and 4:00 – 6:00 p.m., respectively). The traffic classification counts included car, heavy vehicle, pedestrian, and bicycle movements.

The detailed traffic counts are provided in Attachment C. Based on the TMCs, the weekday a.m. peak hour vehicular traffic volumes occur between 8:00 and 9:00 a.m. The weekday p.m. peak hour occurs between 5:00 and 6:00 p.m.

2.2.5 Seasonal Adjustment

To account for seasonal variation in traffic volumes throughout the year, data provided by MassDOT was reviewed. The most recent (2011) MassDOT Weekday Seasonal Factors were used to determine the need for seasonal adjustments to the April 2015 TMCs. The seasonal adjustment factor for April for roadways similar to the study area (Group 6) is 0.92. This indicates that average month traffic volumes are approximately eight percent less than the traffic volumes that were collected. The traffic counts were not adjusted downward to reflect average month conditions in order to provide a conservatively high analysis consistent with the peak season traffic volumes. The MassDOT 2011 Weekday Seasonal Factors table is provided in Attachment C.

2.2.6 Existing Vehicular Traffic Volumes

Existing traffic volumes were collected to develop the 2015 Existing Condition vehicular traffic volumes. The 2015 Existing weekday morning and evening peak hour vehicular traffic volumes are shown in Figures 2-5 and 2-6, respectively.

2.2.7 Existing Bicycle Volumes and Accommodations

In recent years, bicycle use has increased dramatically throughout the City of Boston. The site is conveniently located in close proximity to several bicycle facilities. The City of Boston's "Bike Routes of Boston" map indicates that Congress Street and A Street are designated as intermediate routes. An intermediate route is suitable for riders with some on-road experience and an advanced route is suitable for more traffic-confident cyclists.

Bicycle counts were conducted concurrent with the vehicular TMCs, and are presented in Figure 2-7. As shown in the figure, bicycle volumes are heaviest along A Street during the peak periods.

The site is also located in proximity to a bicycle sharing station provided by Hubway. Hubway is the bicycle sharing system in the Boston area, which was launched in 2011 and consists of over 140 stations and 1,300 bicycles. The nearest Hubway station is located near the intersection of Congress Street and Sleeper Street. Figure 2-8 shows the Hubway stations within a quarter mile radius.

2.2.8 Existing Pedestrian Volumes and Accommodations

In general, sidewalks are provided along all roadways and are in good condition. Crosswalks are provided at all study area intersections. Pedestrian signal equipment is provided at both of the signalized study area intersections. Congress Street provides pedestrian access to Downtown Boston and Boston Wharf Road provides pedestrian access to the South Boston Waterfront.

To determine the amount of pedestrian activity within the study area, pedestrian counts were conducted concurrent with the TMCs at the study area intersection and are presented in Figure 2-9. As shown in the figure, pedestrian activity is heavy throughout the study area.

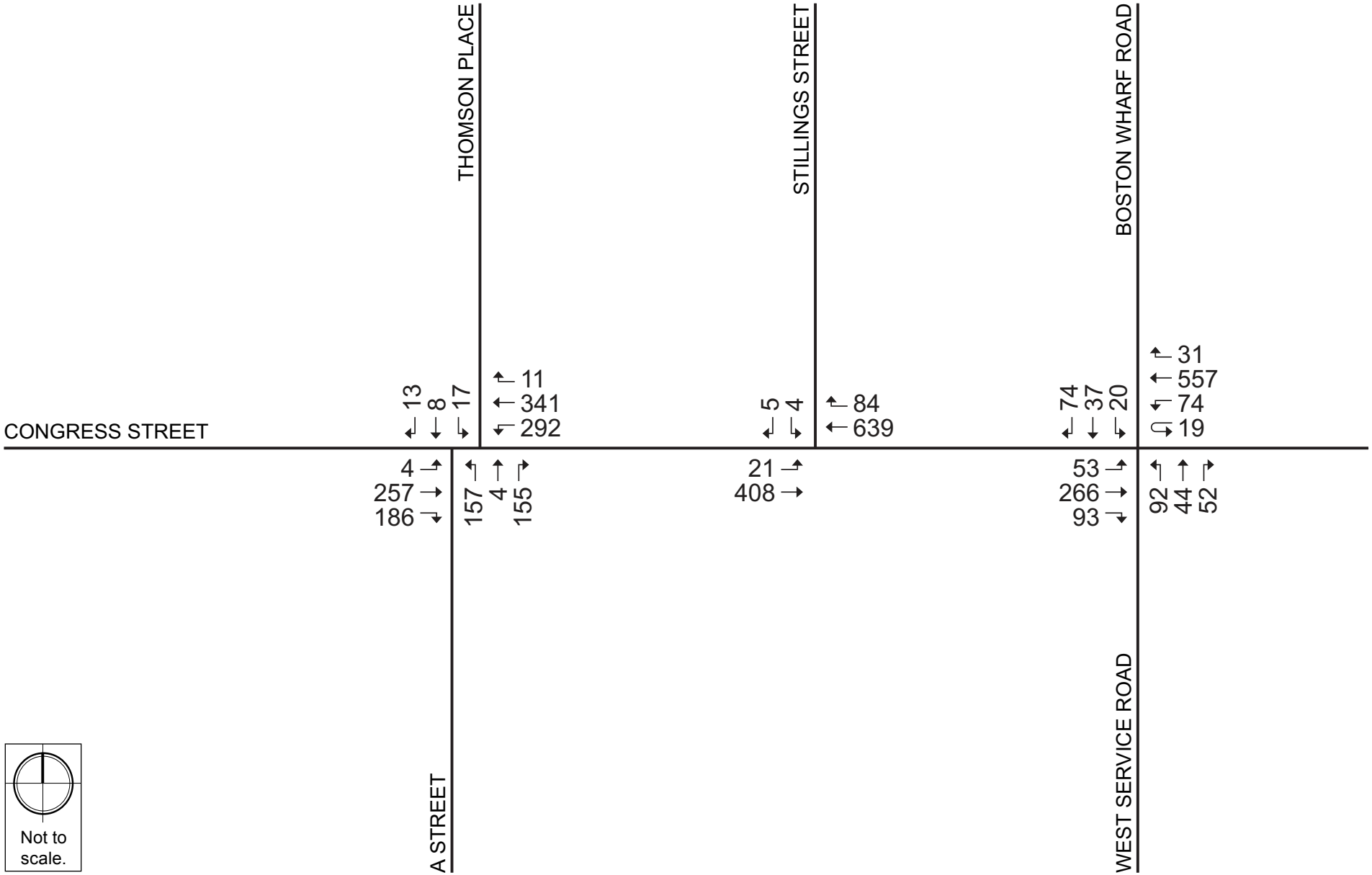

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Figure 2-5
2015 Existing Condition Vehicular Traffic Volumes, a.m. Peak Hour

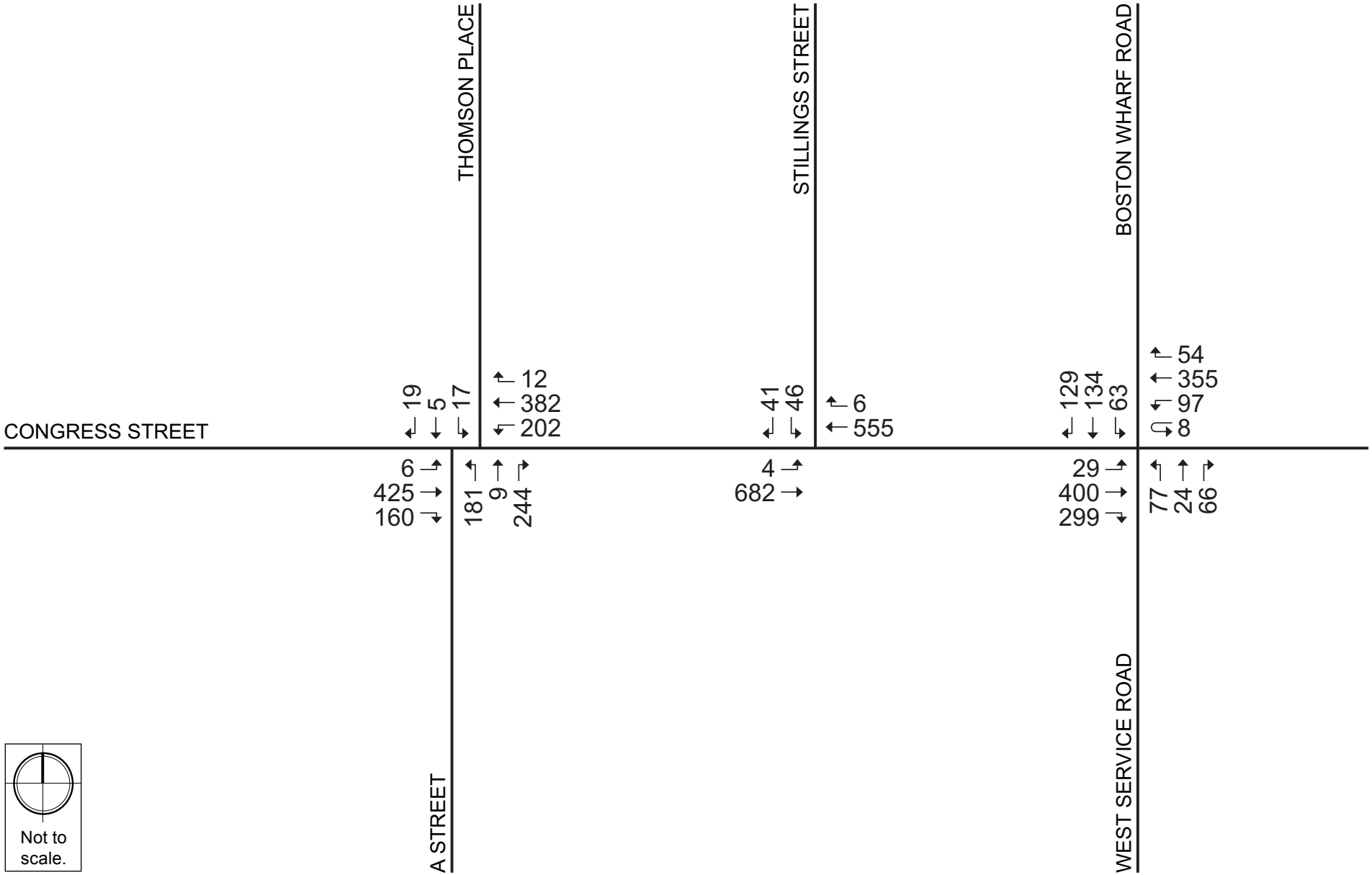

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Figure 2-6
2015 Existing Condition Vehicular Traffic Volumes, p.m. Peak Hour

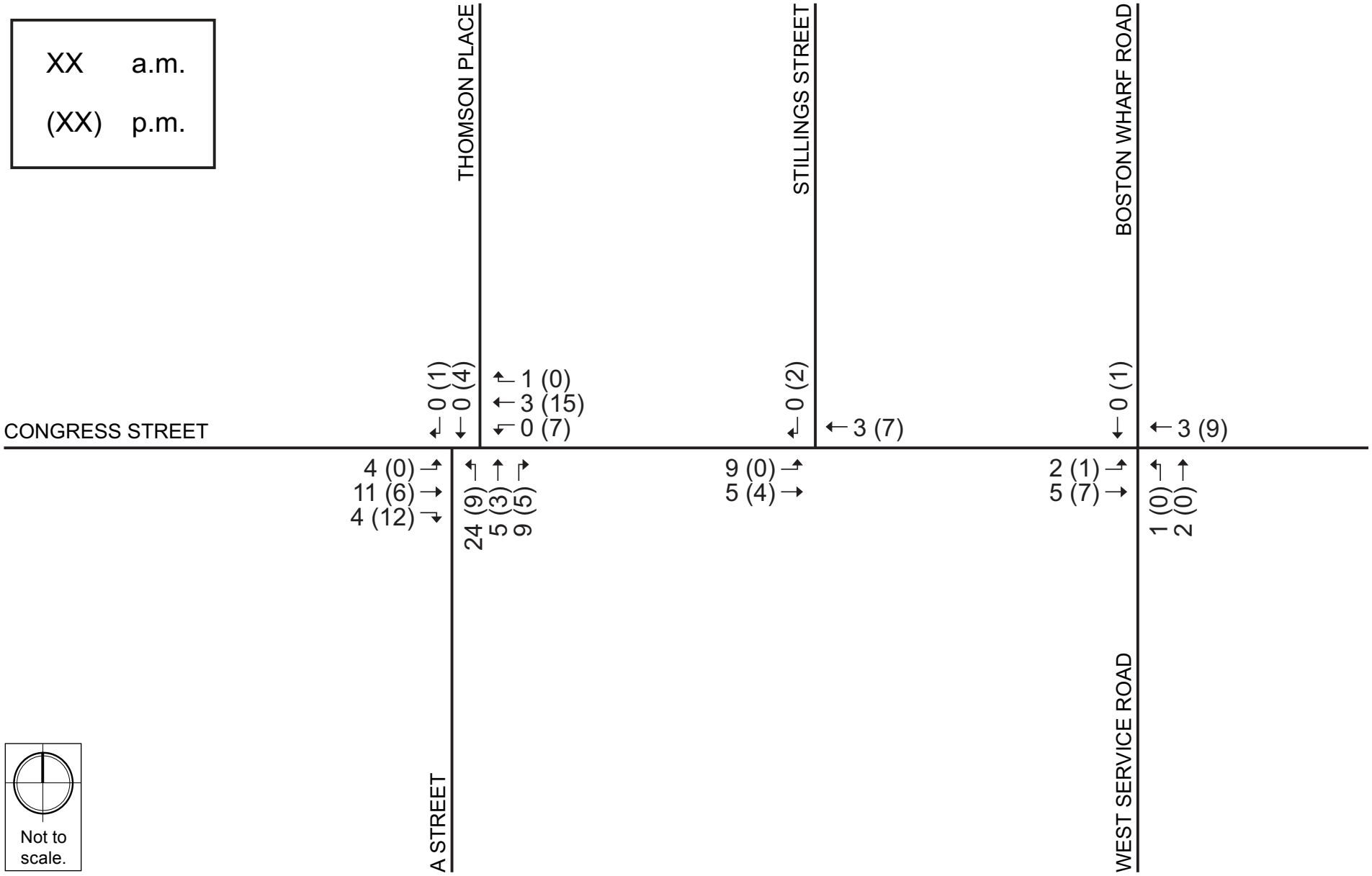

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Figure 2-7
2015 Existing Condition Bicycle Volumes, a.m. and p.m. Peak Hours

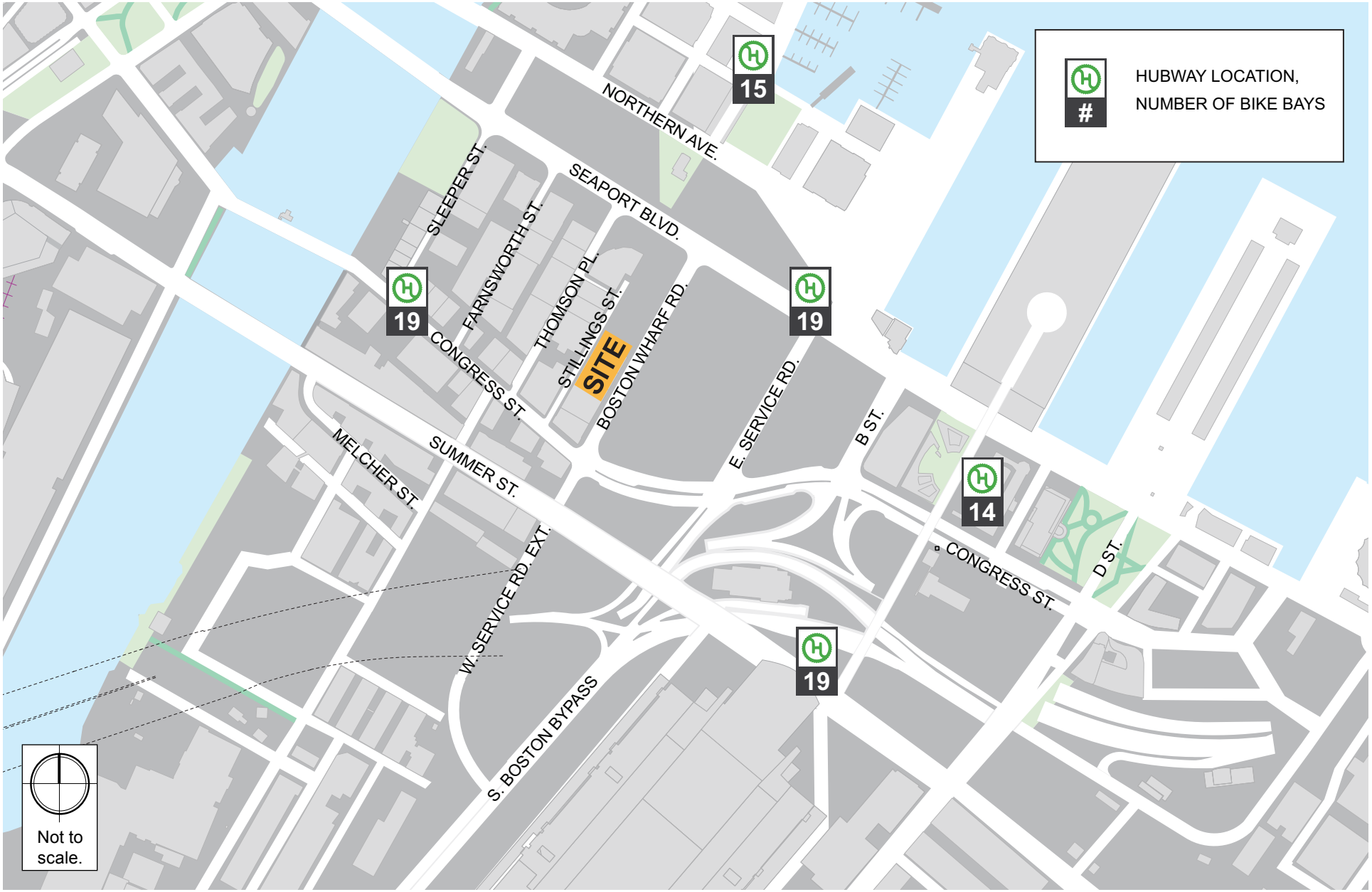

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Figure 2-8
Hubway Locations

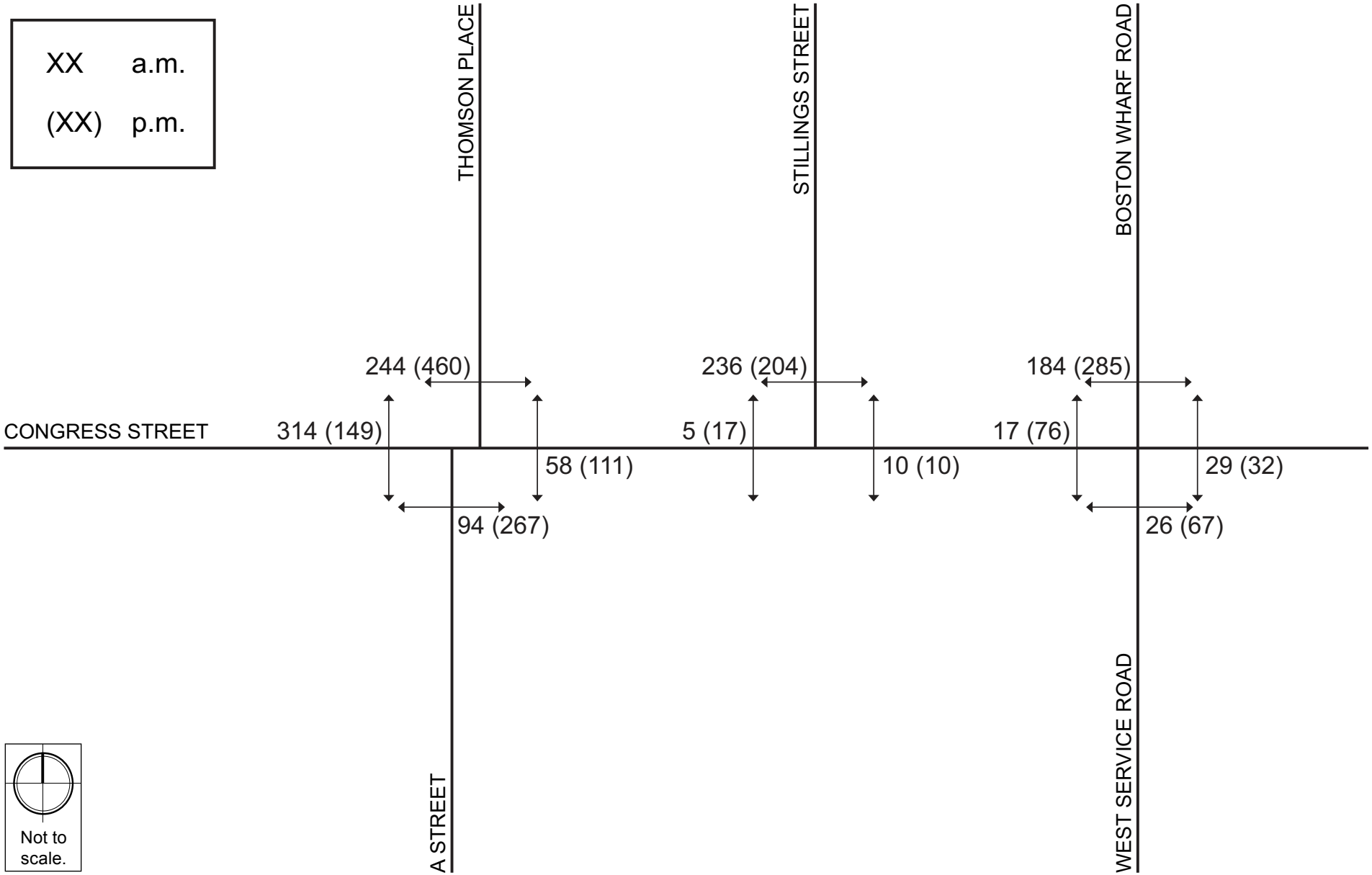

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Figure 2-9
2015 Existing Condition Pedestrian Volumes, a.m. and p.m. Peak Hours

2.2.9 Existing Transit Services

The site is located near the Courthouse MBTA station on the Silver Line, a rapid transit bus line which provides service to South Station, downtown Boston, South Boston, Logan Airport, and Roxbury via a connection to the SL4/SL5 branch at South Station. Six MBTA bus routes have stops within a quarter-mile of the site.

The MBTA operates for 20 hours of the day with the commuter peak periods being the busiest. Figure 2-10 maps all of the public transportation service located in close proximity of the Site, and Table 2-3 provides a brief summary of all routes.

Table 2-3 Existing Transit Service Summary

Transit Service	*Description*	*Rush-hour Headway (in minutes)**
Bus Routes		
SL1	South Station – Terminal E Logan Airport	8-10
SL2	South Station – Design Center	5
4	North Station–World Trade Center via Federal Courthouse and South Station	15-20
7	City Point – Otis & Summer Streets via Summer & South Station	3-5
11	City Point – Downtown BayView Route	6
448	Marblehead – Downtown Crossing	60
449	Marblehead – Downtown Crossing	58-60
459	Salem Depot – Downtown Crossing	75

* Headway is the time between buses.

2.2.10 Existing Condition Traffic Operations Analysis

The criterion for evaluating traffic operations is level of service (LOS). The LOS for the vehicle operations in the 2015 Existing Condition has been calculated.

Trafficware's Synchro (version 9) software package was used to calculate average delay and associated LOS at the study area intersections. This software is based on the traffic operational analysis methodology of the Transportation Research Board's 2000 Highway Capacity Manual (HCM).

LOS designations are based on average delay per vehicle for all vehicles entering an intersection. Table 2-4 displays the intersection LOS criteria. LOS A indicates the most favorable condition, with minimum traffic delay, while LOS F represents the worst

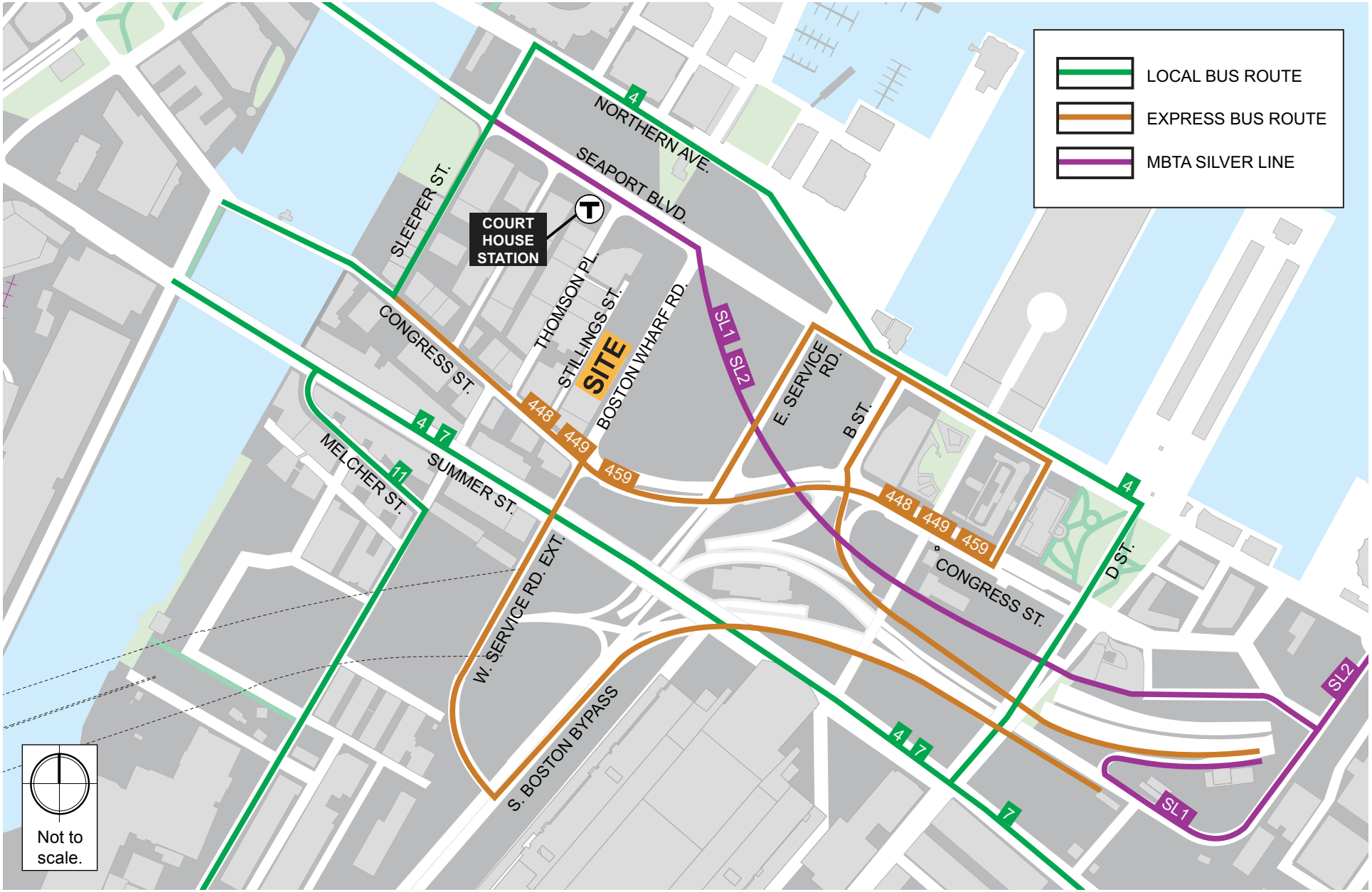

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Figure 2-10
Public Transportation

condition, with significant traffic delay. LOS D or better is typically considered acceptable in an urban area. However, LOS E or F is often typical for a stop controlled minor street that intersects a major roadway.

Table 2-4 Vehicle Level of Service Criteria

Level of Service	*Average Stopped Delay (sec/veh)*	
	Signalized Intersections	*Unsignalized Intersections*
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Source: 2000 Highway Capacity Manual, Transportation Research Board.

In addition to delay and LOS, the operational capacity and vehicular queues are calculated and used to further quantify traffic operations at intersections. The following describes these other calculated measures.

The volume-to-capacity (v/c) ratio is a measure of congestion at an intersection approach. A v/c ratio below one indicates that the intersection approach has adequate capacity to process the arriving traffic volumes over the course of an hour. A v/c ratio of one or greater indicates that the traffic volume on the intersection approach exceeds capacity.

The 50th percentile queue length, measured in feet, represents the maximum queue length during a cycle of the traffic signal with typical (or median) entering traffic volumes.

The 95th percentile queue length, measured in feet, represents the farthest extent of the vehicle queue (to the last stopped vehicle) upstream from the stop line during five percent of all signal cycles. The 95th percentile queue will not be seen during each cycle. The queue would be this long only five percent of the time and would typically not occur during off-peak hours. Since volumes fluctuate throughout the hour, the 95th percentile queue represents what can be considered a "worst case" scenario. Queues at the intersection are generally below the 95th percentile queue throughout the course of the peak hour. It is also unlikely that the 95th percentile queues for each approach to the intersection will occur simultaneously.

Tables 2-5 and 2-6 summarize the 2015 Existing Condition vehicle operations analysis for the study area intersection during the a.m. and p.m. peak hours, respectively. The detailed analysis sheets are provided in Attachment C.

Table 2-5 2015 Existing Condition, Capacity Analysis Summary, a.m. Peak Hour

Intersection	*LOS*	*Delay (seconds)*	*V/C Ratio*	*50th Percentile Queue Length (ft)*	*95th Percentile Queue Length (ft)*
Signalized Intersections					
Congress Street / Boston Wharf Road / West Service Road	**D**	**44.4**	**-**	**-**	**-**
Congress EB left/thru	C	28.8	0.59	247	349
Congress EB right	A	2.1	0.10	1	27
Congress WB left	C	21.0	0.28	41	87
Congress WB thru | thru/right	C	20.6	0.44	146	209
W Service Road NB left	F	>10.0	>1.00	~102	#212
W Service Road NB thru/right	C	22.7	0.30	33	83
Boston Wharf SB left/thru	E	59.0	0.49	47	84
Boston Wharf SB right	B	16.1	0.43	0	39
Congress Street / A Street / Thomson Street	**D**	**50.6**	-	-	-
Congress EB left/thru | thru	D	36.9	0.43	92	137
Congress EB right	D	41.6	0.52	129	211
Congress WB left	D	47.4	0.64	221	m287
Congress WB thru/right	D	43.4	0.48	274	m339
A NB left	F	>80.0	>1.00	~161	#249
A NB thru/right	B	14.0	0.56	7	46
Thomson SB left/thru/right	D	52.5	0.51	30	46
Unsignalized Intersection					
Congress Street / Stillings Street	-	-	-	-	-
Congress EB left/thru | thru	A	1.4	0.20	-	2
Congress WB thru | thru/ right	A	0.0	0.27	-	0
Stillings SB left/right	B	11.0	0.03	-	2

 # 95th percentile volume exceeds capacity. Queue may be longer. Queue shown is the maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is the maximum after two cycles.

dr Defacto Right Lane. The shared lane operates as an exclusive right-turn lane.

m Volume for 95th percentile queue is metered by upstream signal.

Grey Shading indicates LOS E or F in the Existing Condition or a decrease in LOS to E or F in the No Build Condition or Build Condition

Table 2-6 2015 Existing Condition, Capacity Analysis Summary, p.m. Peak Hour

Intersection	*LOS*	*Delay (seconds)*	*V/C Ratio*	*50th Percentile Queue Length (ft)*	*95th Percentile Queue Length (ft)*
Signalized Intersections					
Congress Street / Boston Wharf Road / West Service Road	**B**	**19.8**	**-**	**-**	**-**
Congress EB left/thru	A	9.3	0.58	74	157
Congress EB right	A	1.2	0.36	1	m0
Congress WB left	C	22.9	0.37	49	111
Congress WB thru | thru/right	B	16.8	0.30	92	147
W Service Road NB left	E	58.8	0.52	58	106
W Service Road NB thru/right	C	25.2	0.49	17	68
Boston Wharf SB left/thru	E	63.6	0.80	152	220
Boston Wharf SB right	A	9.3	0.40	0	49
Congress Street / A Street / Thomson Street	**D**	**52.2**	-	-	-
Congress EB left/thru | thru	D	43.1	0.75	164	222
Congress EB right	C	34.9	0.43	103	166
Congress WB left	C	25.6	0.63	68	121
Congress WB thru/right	B	19.8	0.57	138	200
A NB left/thru	F	>80.0	>1.00	~199	#336
A NB right	C	24.5	0.76	29	#128
Thomson SB left/thru/right	D	38.5	0.33	16	53
Unsignalized Intersection					
Congress Street / Stillings Street	-	-	-	-	-
Congress EB left/thru | thru	A	0.2	0.31	-	0
Congress WB thru | thru/ right	A	0.0	0.25	-	0
Stillings SB left/right	B	13.8	0.31	-	32

As shown in Tables 2-5 and 2-6, under the 2015 Existing conditions:

- The signalized intersection of **Congress Street / Boston Wharf Road / West Service Road** operates at LOS D during the a.m. peak hour and LOS B during the p.m. peak hour. The West Service Road northbound left-turn lane operates at LOS F during the a.m. peak hour and LOS E during the p.m. peak hour. The Boston Wharf Road southbound left-turn/through lane operates at LOS E during both the a.m. and p.m.

peak hours. The longest queues at the intersection occur at the Congress Street eastbound approach during the a.m. peak hour and the Boston Wharf Road southbound approach during the p.m. peak hour.

- The signalized intersection of **Congress Street / A Street / Thomson Street** operates at LOS D during both the a.m. and p.m. peak hours. The A Street northbound left-turn/through lane operates at LOS F during both the a.m. and p.m. peak hours. The longest queues at the intersection occur at the Congress Street westbound approach during the a.m. peak hour and in the A Street northbound approach during the p.m. peak hour.

- All approaches of the unsignalized intersection of **Congress Street / Stillings Street** operate at LOS B or better during both the a.m. and p.m. peak hours.

2.3 No Build Condition

The No-Build Condition reflects a future scenario that incorporates anticipated traffic volume changes associated with background traffic growth independent of any specific project, traffic associated with other planned specific developments, and planned infrastructure improvements that will affect travel patterns throughout the study area. These infrastructure improvements include roadway, public transportation, pedestrian and bicycle improvements.

2.3.1 Background Traffic Growth

The methodology to account for generic future background traffic growth, independent of this Project, may be affected by changes in demographics, smaller scale development projects, or projects unforeseen at this time. Based on a review of recent and historic traffic data collected recently and to account for any additional unforeseen traffic growth, a traffic growth rate of 0.25 percent per year, compounded annually, was used.

2.3.2 Specific Development Traffic Growth

Traffic volumes associated with the larger or closer known development projects can affect traffic patterns throughout the study area within the future analysis time horizon. Four such projects were specifically accounted for in the traffic volumes for future scenarios while others were included in the general background traffic growth:

Fan Pier – This project is located approximately a quarter-mile from the site. The entire development consists of 2.9 million square feet of mixed use space. Three of the buildings have been constructed (50 Northern Avenue, One Marina Park Drive, and 11 Fan Pier Boulevard). At the time of data collection, two additional buildings were under construction (22 Liberty Drive and 100 Northern Avenue). The remaining three buildings

(10 Fan Pier Boulevard, 50 Liberty Drive, and One Harbor Shore Drive) are to be developed including office, hotel, and residential spaces. These portions of the project have been included in the general background growth.

Pier 4 – This project is located approximately a quarter-mile from the site. Parcel 1, consisting of approximately 370 residential apartment units and 11,000 square feet of retail, was under construction when the traffic counts were conducted. Parcels 2 and 3 are to be developed encompassing 353,000 square feet of office space, 171,000 square feet of residential condominium space, and 37,000 square feet of retail. This project was included in the general background growth.

Seaport Square – This project consists of 6.5 million square feet of development including 2.5 million square feet of residential, 1.5 million square feet of office, 1.5 million square feet of retail, and a cultural and education center. The trips associated with this project that impact the study area were specifically accounted for in the traffic network.

399 Congress Street – This project is located approximately a tenth of a mile from the site. This project has been approved by the BRA and consists of 414 rental units and 144 parking spaces. The trips associated with this project that impact the study area were specifically accounted for in the traffic network.

The site specific background projects are mapped on Figure 2-11.

2.3.3 Proposed Infrastructure Improvements

A review of planned improvements to roadway, transit, bicycle, and pedestrian facilities was conducted to determine if there are any nearby improvement projects in the vicinity of the study area. Based on this review, no planned infrastructure improvements in the area were found.

2.3.4 No Build Traffic Volumes

The 0.25 percent per year annual growth rate, compounded annually, was applied to the 2015 Existing Condition traffic volumes, then the traffic volumes associated with the background development project listed above was added to develop the 2020 No-Build Condition traffic volumes. The 2020 No-Build weekday morning and evening peak hour traffic volumes are shown on Figures 2-12 and 2-13, respectively.

2.3.5 No-Build Condition Traffic Operations Analysis

The 2020 No-Build Condition analysis uses the same methodology as the 2015 Existing Condition analysis. Tables 2-7 and 2-8 present the 2020 No-Build Condition operations analysis for the a.m. and p.m. peak hours, respectively. The shaded cells in the tables indicate a worsening in LOS between the 2015 Existing Condition and the 2020 No-Build Condition. The detailed analysis sheets are provided in Attachment C.

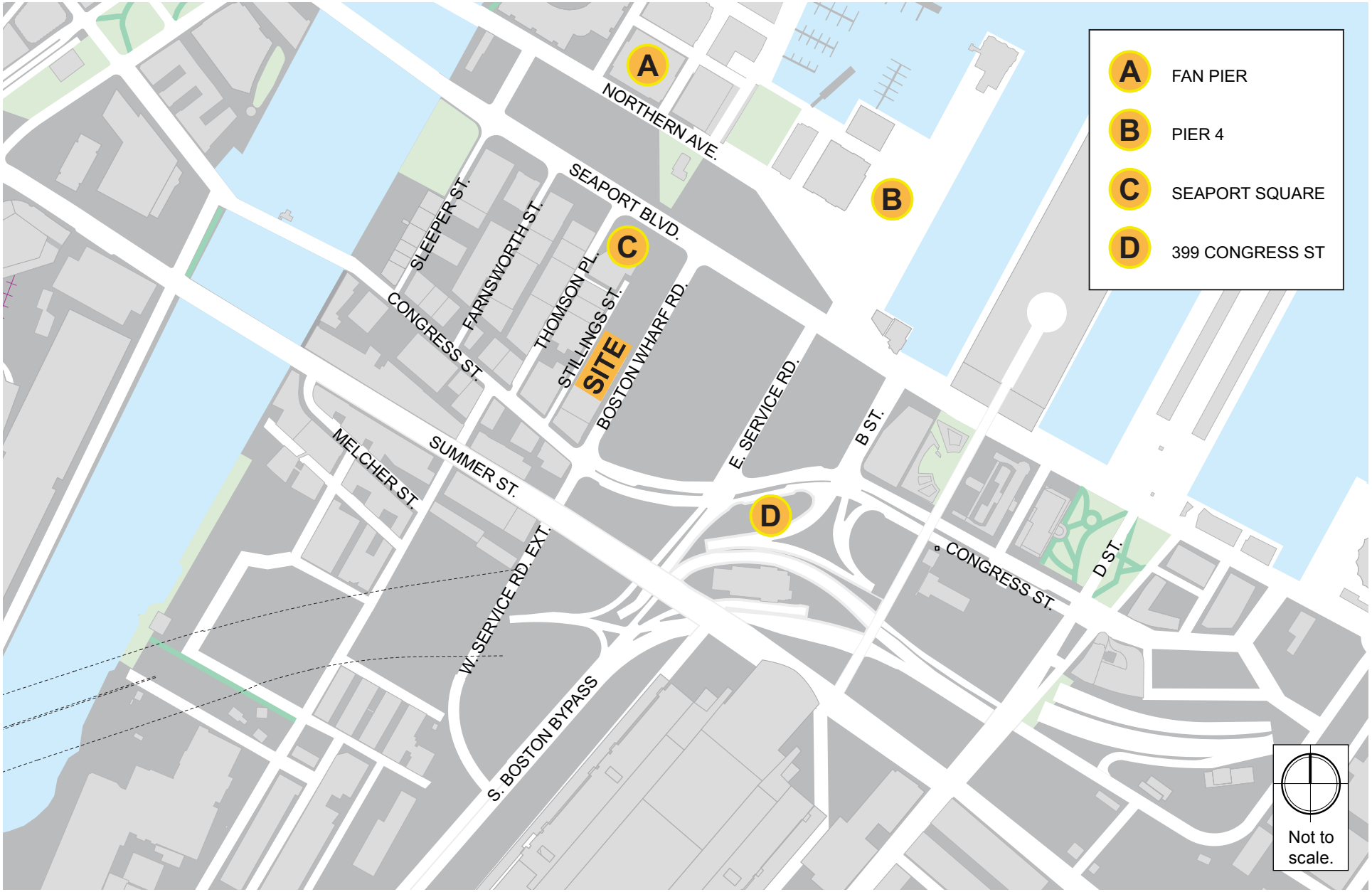

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Figure 2-11
Specific Background Project Locations

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Figure 2-12
2020 No-Build Condition Vehicular Traffic Volumes, a.m. Peak Hour

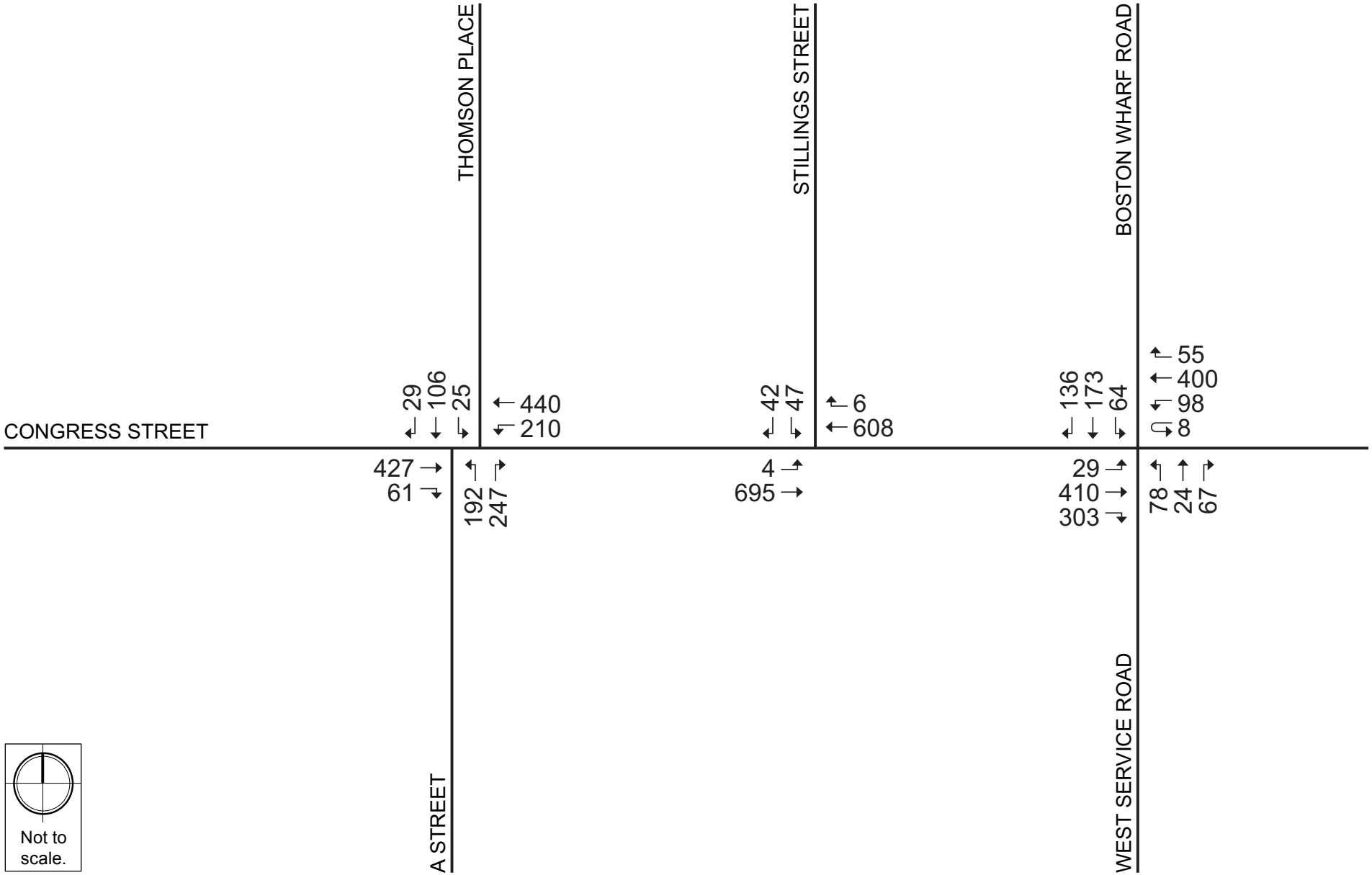

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Figure 2-13
2020 No-Build Condition Vehicular Traffic Volumes,p.m. Peak Hour

Table 2-7 2020 No-Build Condition, Capacity Analysis Summary, a.m. Peak Hour

Intersection	*LOS*	*Delay (seconds)*	*V/C Ratio*	*50th Percentile Queue Length (ft)*	*95th Percentile Queue Length (ft)*
Signalized Intersections					
Congress Street / Boston Wharf Road / West Service Road	**D**	**45.6**	**-**	**-**	**-**
Congress EB left/thru	C	33.6	0.58	216	m321
Congress EB right	A	11.0	0.09	18	m65
Congress WB left	C	21.2	0.28	41	88
Congress WB thru | thru/right	C	21.2	0.46	156	223
W Service Road NB left	F	>80.0	>1.00	~100	#211
W Service Road NB thru/right	C	22.7	0.30	33	83
Boston Wharf SB left/thru	E	59.7	0.52	51	96
Boston Wharf SB right	B	14.9	0.40	0	43
Congress Street / A Street / Thomson Street	**D**	**44.0**	-	-	-
Congress EB thru | thru	D	45.5	0.50	88	132
Congress EB right	E	55.6	0.53	55	#111
Congress WB left	E	65.6	0.93	236	m#361
Congress WB thru	C	29.8	0.54	251	m333
A NB left	D	49.9	0.59	115	190
A NB right	A	2.3	0.24	0	18
Thomson SB left/thru/right	E	59.8	0.77	144	#265
Unsignalized Intersection					
Congress Street / Stillings Street	-	-	-	-	-
Congress EB left/thru | thru	A	1.4	0.18	-	2
Congress WB thru | thru/ right	A	0.0	0.28	-	0
Stillings SB left/right	B	10.7	0.02	-	1

Table 2-8 2020 No-Build Condition, Capacity Analysis Summary, p.m. Peak Hour

Intersection	*LOS*	*Delay (seconds)*	*V/C Ratio*	*50th Percentile Queue Length (ft)*	*95th Percentile Queue Length (ft)*
Signalized Intersections					
Congress Street / Boston Wharf Road / West Service Road	**C**	**26.5**	**-**	**-**	**-**
Congress EB left/thru	C	27.8	0.63	177	306
Congress EB right	A	4.1	0.38	0	63
Congress WB left	C	25.7	0.42	54	117
Congress WB thru | thru/right	B	18.6	0.35	114	166
W Service Road NB left	E	58.9	0.53	59	107
W Service Road NB thru/right	C	25.0	0.50	17	68
Boston Wharf SB left/thru	E	67.1	0.85	182	#281
Boston Wharf SB right	B	10.1	0.40	5	55
Congress Street / A Street / Thomson Street	**D**	**36.9**	-	-	-
Congress EB thru | thru	D	47.7	0.72	162	221
Congress EB right	E	56.2	0.53	42	#98
Congress WB left	E	62.3	0.79	102	#259
Congress WB thru	C	20.7	0.64	128	182
A NB left	D	54.0	0.68	138	#226
A NB right	A	2.8	0.36	0	24
Thomson SB left/thru/right	D	43.9	0.51	104	175
Unsignalized Intersection					
Congress Street / Stillings Street	-	-	-	-	-
Congress EB left/thru | thru	A	0.2	0.30	-	0
Congress WB thru | thru/ right	A	0.0	0.26	-	0
Stillings SB left/right	B	13.5	0.15	-	13

As shown in Tables 2-7 and 2-8, under the 2020 No-Build conditions:

- The signalized intersection of **Congress Street / Boston Wharf Road / West Service Road** continues to operate at LOS D during the a.m. peak hour and decreases to LOS C during the p.m. peak hour. The West Service Road northbound left-turn lane continues to operate at LOS F during the a.m. peak hour and LOS E during the p.m. peak hour. The Boston Wharf Road southbound left-turn/through lane continues to

operate at LOS E during both the a.m. and p.m. peak hours. The longest queues at the intersection continue to occur at the Congress Street eastbound approach during the a.m. peak hour and the Boston Wharf Road southbound approach during the p.m. peak hour.

- The signalized intersection of **Congress Street / A Street / Thomson Street** continues to operate at LOS D during both the a.m. and p.m. peak hours. The Congress Street eastbound right-turn lane and the westbound left-turn lane decrease to LOS E during both the a.m. and p.m. peak hours. The Thomson Street southbound approach decreases to LOS E during the a.m. peak hour. The longest queues at the intersection will occur at the Congress Street westbound left-turn lane during both the a.m. and p.m. peak hours.

- All approaches of the unsignalized intersection of **Congress Street / Stillings Street** will continue to operate at LOS B or better during both the a.m. and p.m. peak hours.

2.4 Build Condition

The Project consists of adding two additional floors to an existing building totaling approximately 56,000 gross square feet of office space and the conversion of existing ground-floor space into retail totaling approximately 3,000 square feet. The retail expansion will remove a total of 24 tandem parking spaces on two levels within the garage. The 2020 Build conditions reflect a future scenario that adds anticipated Project-generated trips to the 2020 No-Build conditions traffic volumes.

2.4.1 Vehicle Site Access and Circulation

Vehicular access/egress to the existing parking garage will be provided via the garage entrance along Stillings Street. Vehicles can currently access the garage entrance via the intersection of Stillings Street and Congress Street. In the future Build Condition, vehicles will also be able to access the driveway to the garage from the intersection of Thomson Street and Seaport Boulevard and using a driveway to go from Thomson Street to Stillings Street. The driveway will provide direct access to the on-site parking garage as shown in Figure 2-14.

2.4.2 Parking

A detailed assessment of both current parking at the site and the expected demand has been conducted. Current trends indicate that parking demand in Boston is decreasing across all land uses. This is primarily due to shifting demographics, cost of parking and auto ownership, improved transit service, and social and environmental concerns.

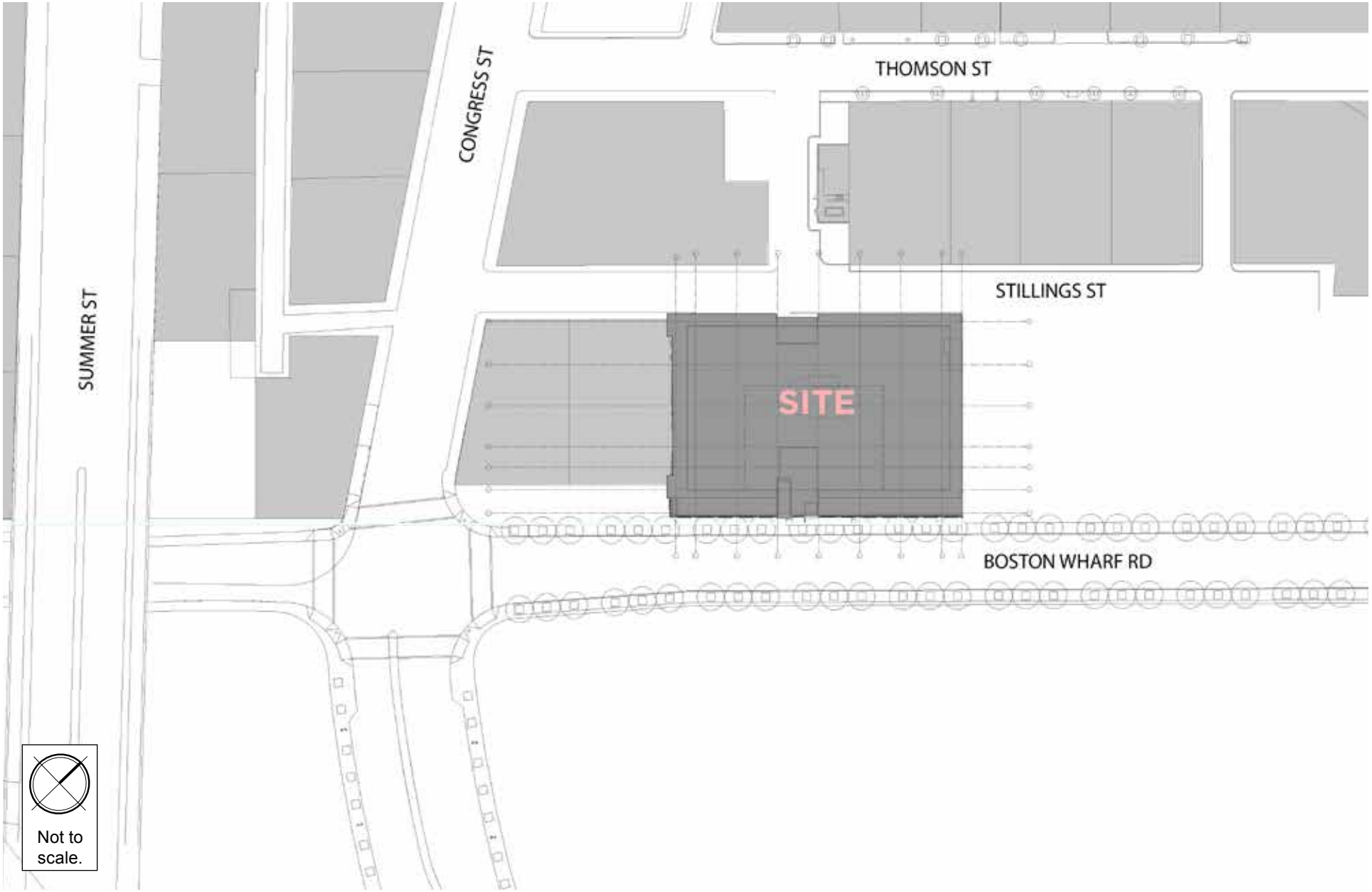

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Figure 2-14
Site Access Plan

The existing garage contains 583 parking spaces. There are currently 405 monthly parking pass holders, including 33 overnight and weekend pass holders. These 33 pass holders will not impact peak demand periods. Therefore, during the weekday peak hours there are 211 parking spaces available for transient, or public, parking.

The BTD has established district-based parking goals/guidelines in its Access Boston 2000-2010, Boston's Citywide Transportation Plan, Parking in Boston, December 2001. The parking goals and guidelines are presented as maximum ratios whereas typical zoning defines parking in terms of minimum goals. The report defines parking goals and guidelines by both land use and by location, or district, in the city and are fundamentally based on an area's access to public transportation. Districts with good transit access have lower maximum guidelines for parking spaces per square foot or per unit.

The maximum parking ratios by land use in the South Boston Waterfront/Fort Point area as defined by BTD as 0.7 spaces per 1,000 square feet of office space. Therefore, according to BTD guidelines, the proposed 56,000 square foot office expansion would allow for a maximum of 39 spaces. This is consistent with the existing office use, where 25 of the 372 monthly non overnight/weekend pass holders are building tenant parkers.

2.4.3 Loading and Service Accommodations

Loading and service operations will continue to occur with the same operations as the existing building. Deliveries can reach the building elevators can be accessed via Boston Wharf Road or Stillings Street.

Truck trip estimates for the Project were based on data provided in the Truck Trip Generation Rates by Land Use in the Central Artery/Tunnel Project Study Area report[1]. Deliveries to the Site will be limited to SU-36 trucks and smaller delivery vehicles.

Office uses depend on more frequent deliveries from smaller trucks. Based on the CTPS report, office uses generate approximately 0.10 light truck trips per 1,000 square feet of floor area and 0.01 medium/heavy truck trips per 1,000 square feet of gross floor area. A summary of anticipated loading/service activity by land use is presented in Table 2-9.

Table 2-9 Expected Delivery Activity

Land Use	*Number of Deliveries*	*General Delivery Times*
Existing Office	6	10% before 7:00 a.m.
Office Expansion	6	70% between 7:00 a.m. and 1:00 p.m.
Total	12	20% after 1:00 p.m.

[1] Truck Trip Generation Rates by Land Use in the Central Artery/Tunnel Project Study Area; Central Transportation Planning Staff; September 1993.

Based on the CTPS data, the Project is expected to generate approximately 6 additional deliveries per day for a total of 12 for the entire building. However, in actuality it is expected that many of the existing deliveries will accommodate the entire office space with the same trip that is currently occurring. The CTPS numbers do not include trash truck trips. Trash pick-up will continue to occur through the rear entry to the garage via Stillings Street.

It is anticipated that the majority of these deliveries will occur between 7:00 a.m. and 1:00 p.m. The low number of anticipated deliveries will have minimal impact on the vehicular operations in the study area.

2.4.4 Trip Generation Methodology

Determining the future trip generation of the Project is a complex, multi-step process that produces an estimate of vehicle trips, transit trips, walk trips, and bicycle trips associated with a proposed development and a specific land use program. A project's location and proximity to different travel modes determines how people will travel to and from a site.

To estimate the number of trips expected to be generated by the Project, data published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual*[2] were used. ITE provides data to estimate the total number of unadjusted vehicular trips associated with the Project. In an urban setting well-served by transit, adjustments are necessary to account for other travel mode shares such as walking, bicycling, and transit.

To estimate the unadjusted number of vehicular trips for the Project, the following ITE land use code (LUCs) was used:

Land Use Code 710—General Office. General office is defined as an office building containing multiple tenants. An office building typically contains a mix-ture of professional services. Calculations of the number of trips use ITE's average rate per 1,000 sf.

Land Use Code 814: Specialty Retail Center—Specialty retail centers are generally small shopping centers that can contain a variety of retail shops and specialize in quality apparel, hard goods, and services, such as real estate offices, dance studios, florists, and small restaurants. It has been assumed that the small retail expansion will not generate any vehicle trips. All trips to and from the retail have been assumed to be an internal capture trips from the office space in the building or accessed via pedestrian activity from off site.

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2 Trip Generation Manual, 9th Edition; Institute of Transportation Engineers; Washington, D.C.; 2012.

2.4.5 Mode Share

The BTD provides vehicle, transit, and walking mode split rates for different areas of Boston. The Project is located in the westerly portion of designated Area 13, which also includes areas of south Boston. The unadjusted vehicular trips were converted to person trips by using vehicle occupancy rates published by the Federal Highway Administration (FHWA)[3]. The person trips were then distributed to different modes according to the mode shares shown in Table 2-10.

Table 2-10 Travel Mode Shares

Land Use		*Walk/Bicycle Share*	*Transit Share*	*Auto Share*	*Vehicle Occupancy Rate*
Daily					
Office	In	22%	21%	57%	1.13
56,000 sf	Out	22%	21%	57%	1.13
AM Peak					
Office	In	42%	24%	34%	1.13
56,000 sf	Out	23%	17%	60%	1.13
PM Peak					
Office	In	23%	17%	60%	1.13
56,000 sf	Out	42%	24%	34%	1.13

As shown in Table 2-10, the majority of the trips to/from the Site are automobile based trips. The vehicle occupancy rate is 1.13 for home to work trips.

2.4.6 Project Trip Generation

The mode share percentages shown in Table 2-10 were applied to the number of person trips to develop walk/bicycle, transit, and vehicle trip generation estimates. The trip generation for the Project by mode is shown in Table 2-11. The detailed trip generation information is provided in Attachment C.

[3] Summary of Travel Trends: 2009 National Household Travel Survey; FHWA; Washington, D.C.; June 2011.

Table 2-11 Project Trip Generation

Land Use		*Walk/Bicycle Trips*	*Transit Trips*	*Vehicle Trips*
Daily				
Office	In	77	73	176
	Out	77	73	176
a.m. Peak Hour				
Office	In	33	18	24
	Out	2	2	6
p.m. Peak Hour				
Office	In	3	3	7
	Out	29	17	21

As shown in Table 2-11, there are 138 pedestrian trips, 130 transit trips, and 316 vehicle trips throughout the day. During the a.m. peak hour there are 20 transit trips (18 in and 2 out), 30 vehicle trips (24 in and 6 out), and 35 pedestrian trips (33 in and 2 out). During the p.m. peak hour there are 20 transit trips (3 in and 17 out), 28 vehicle trips (7 in and 21 out), and 32 pedestrian trips (3 in and 29 out).

2.4.7 Trip Distribution

The trip distribution identifies the various travel paths for vehicles associated with the Project. Trip distribution patterns for the Project were based on BTD's origin-destination data for Area 13 and trip distribution patterns presented in traffic studies for nearby projects. The trip distribution patterns for the Project are illustrated in Figure 2-15.

2.4.8 Build Traffic Volumes

The vehicle trips were distributed through the study area. The Project-generated trips for the a.m. and p.m. peak hours are shown in Figures 2-16 and 2-17, respectively. The trip assignments were added to the 2020 No-Build Condition vehicular traffic volumes to develop the 2020 Build Condition vehicular traffic volumes. The 2020 Build a.m. and p.m. peak hour traffic volumes are shown on Figures 2-18 and 2-19, respectively.

2.4.9 Bicycle Accommodations

BTD has established guidelines requiring projects subject to Transportation Access Plan Agreements to provide secure bicycle parking for residents and short-term bicycle racks for visitors. Based on BTD guidelines, the Project will supply a minimum of 20 secure bicycle parking/storage spaces within the parking garage.

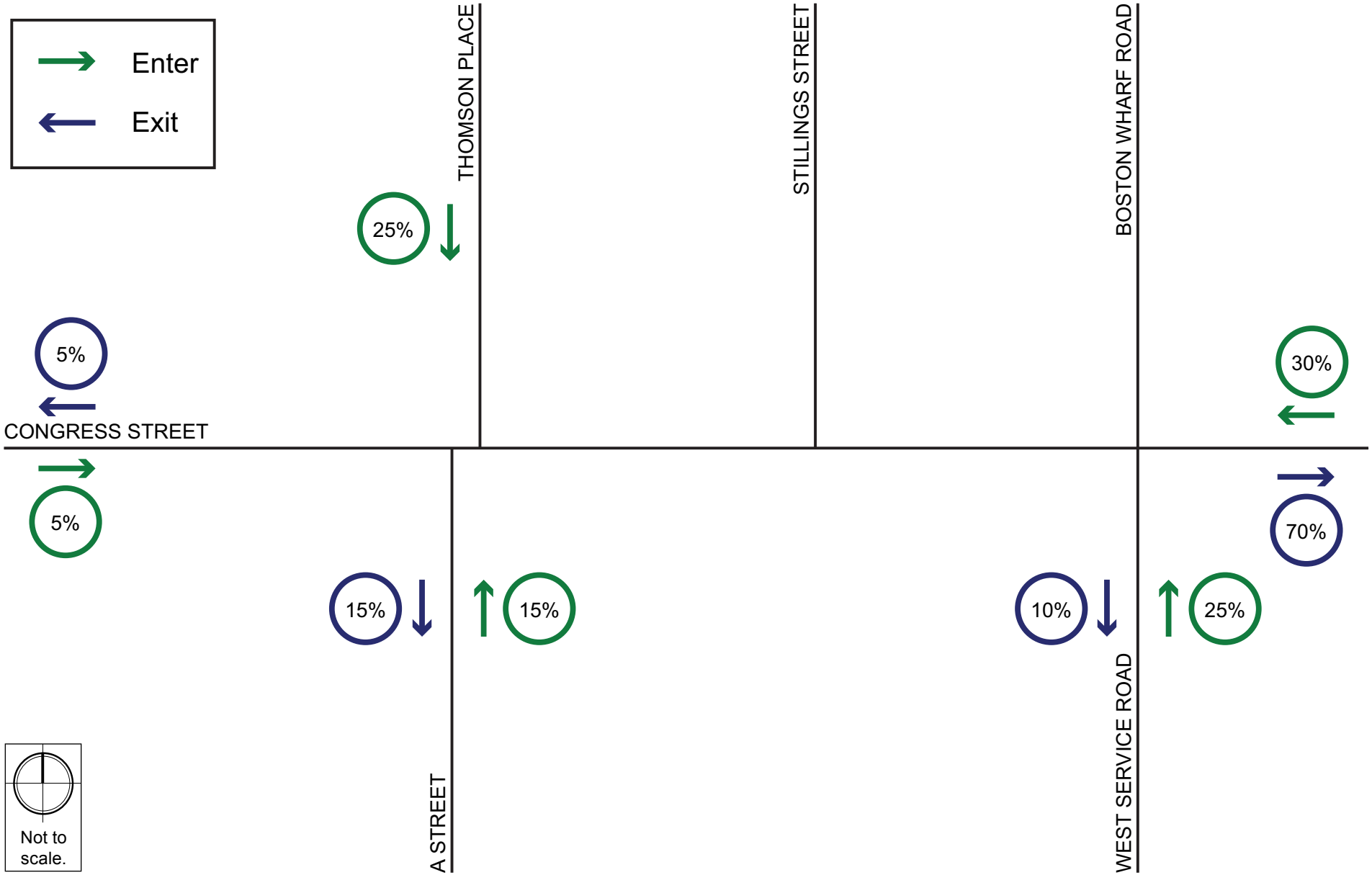

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Figure 2-15
Trip Distribution

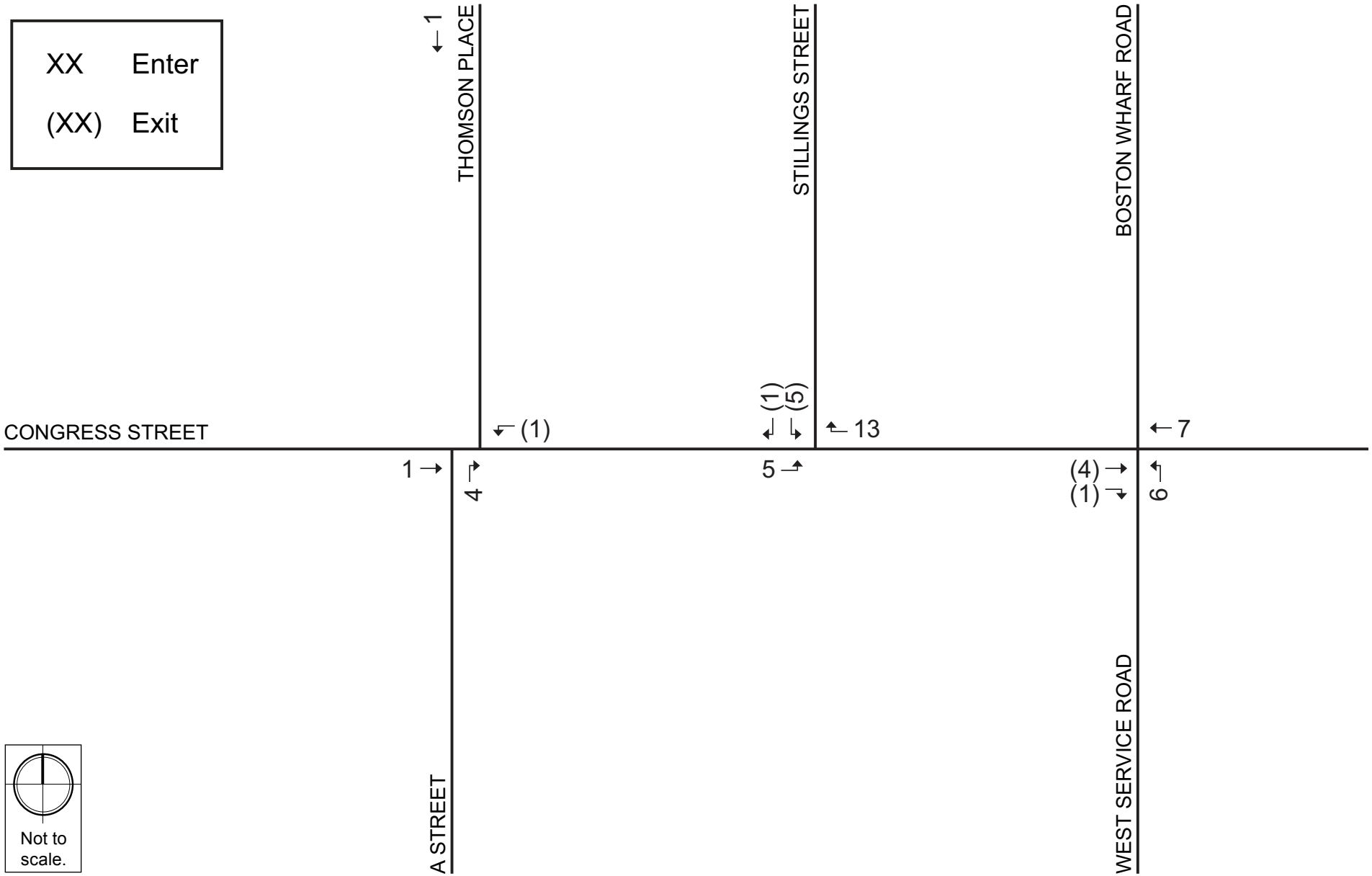

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Figure 2-16
Vehicle Trip Assignment, a.m. Peak Hour

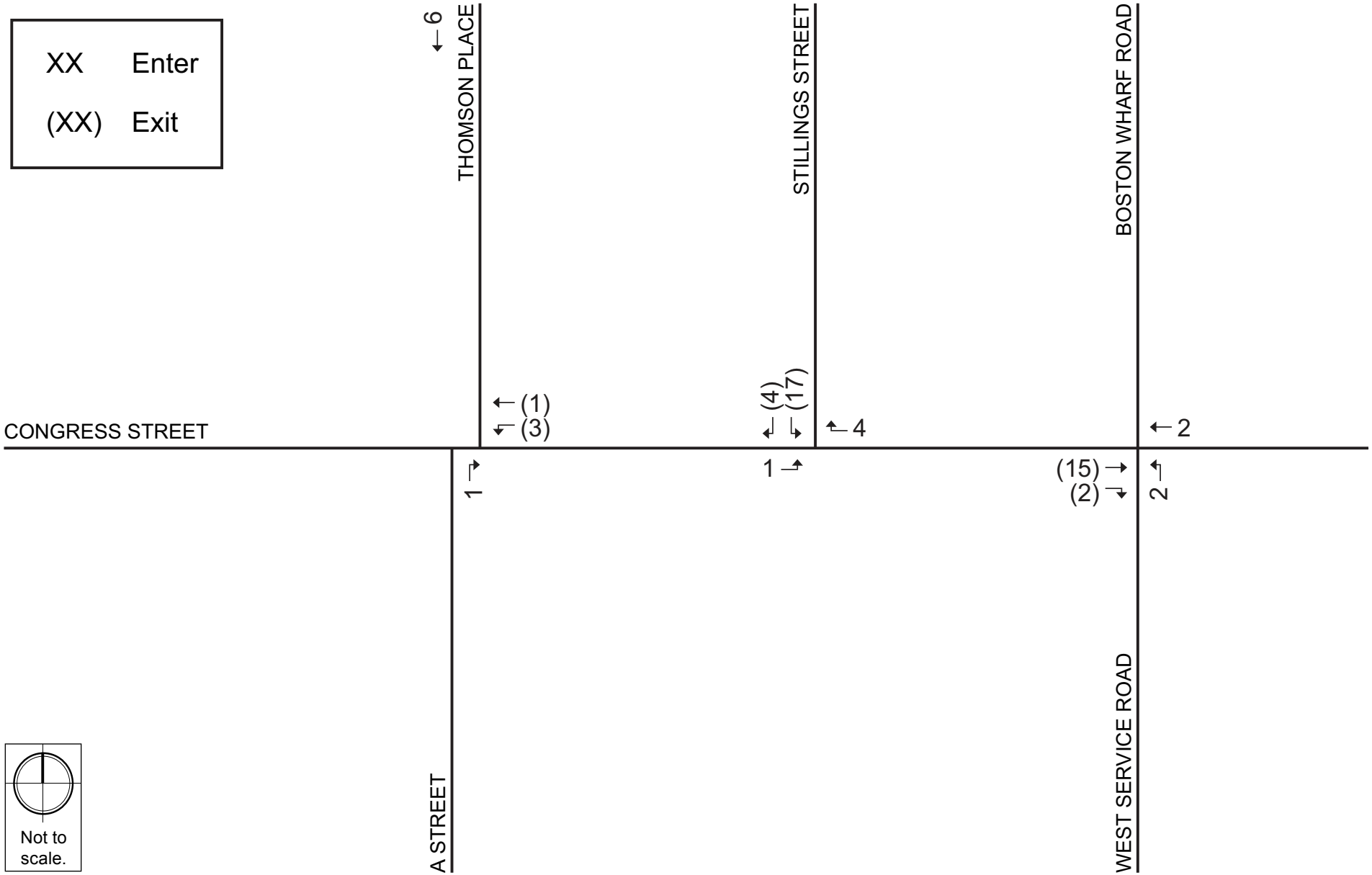

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Figure 2-17
Vehicle Trip Assignment, p.m. Peak Hour

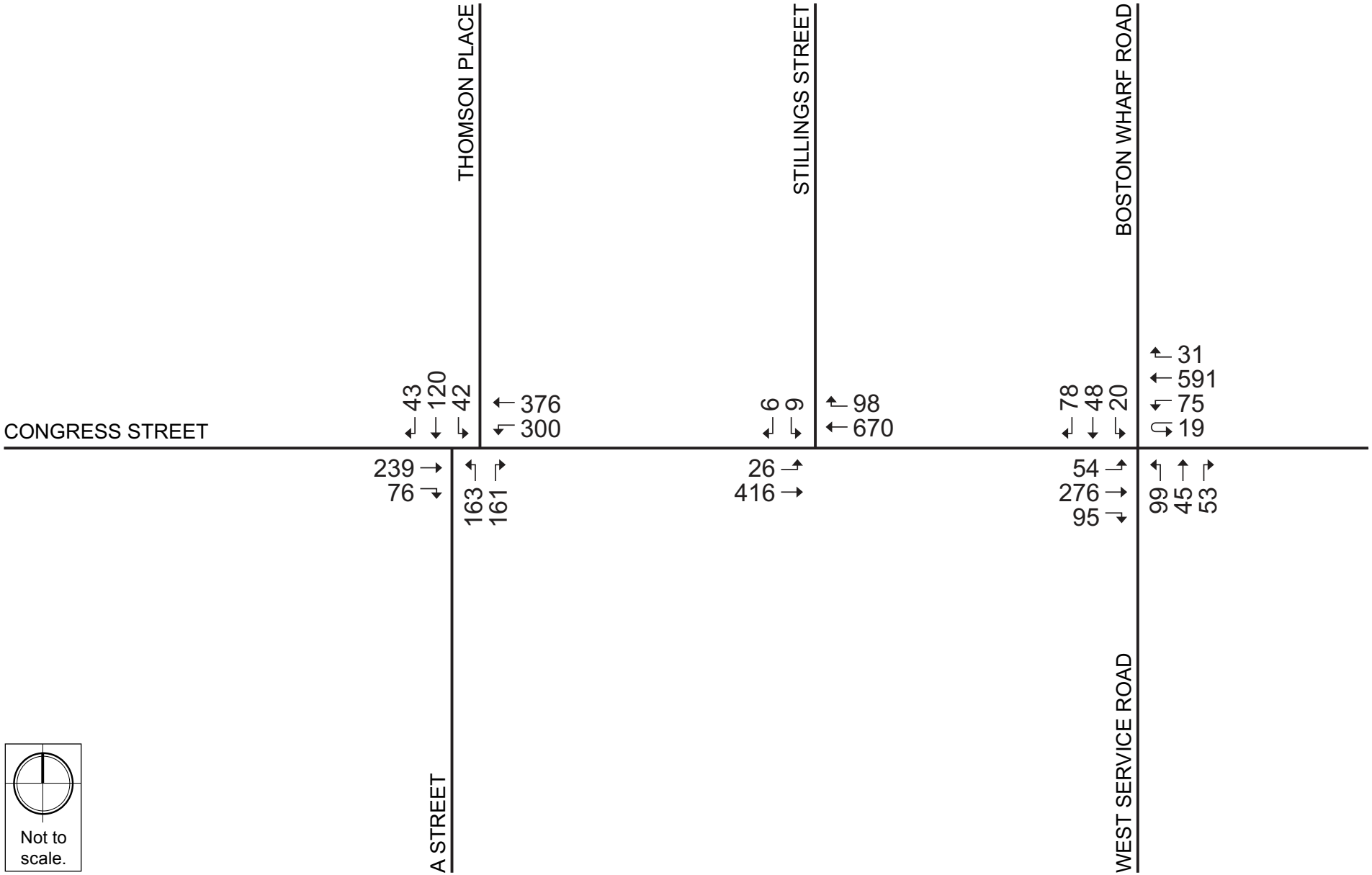

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Figure 2-18
2020 Build Condition Vehicular Traffic Volumes, a.m. Peak Hour

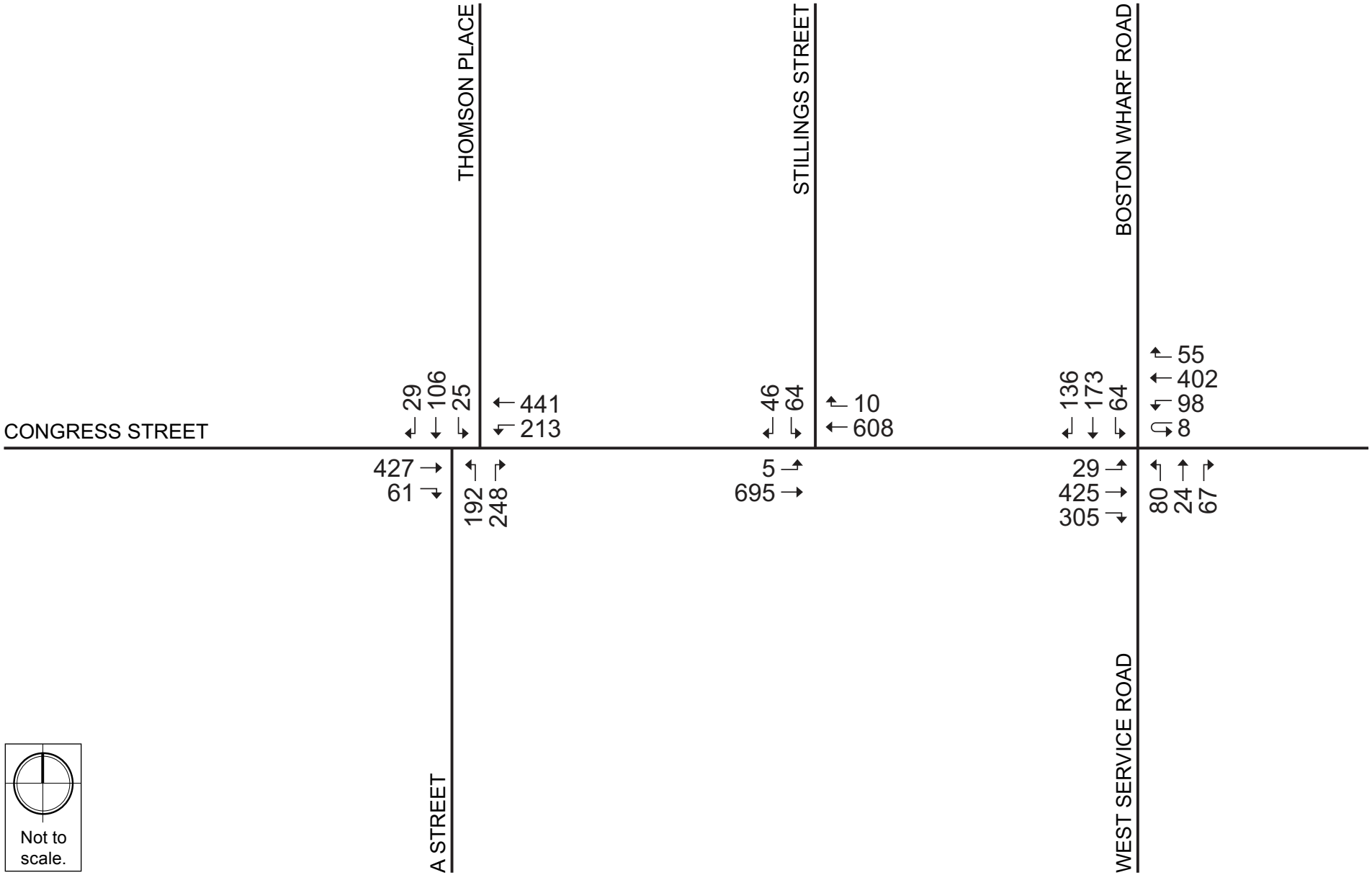

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Figure 2-19
2020 Build Condition Vehicular Traffic Volumes, p.m. Peak Hour

2.4.10 Build Condition Traffic Operations Analysis

The 2020 Build Condition analysis uses the same methodology as the 2015 Existing Condition and 2020 No-Build Condition analysis. Tables 2-12 and 2-13 present the 2020 Build Condition operations analysis for the a.m. and p.m. peak hours, respectively. The shaded cells in the tables indicate a worsening in LOS between the 2020 No-Build Condition and the 2020 Build Condition. The detailed analysis sheets are provided in Attachment C.

Table 2-12 2020 Build Condition, Capacity Analysis Summary, a.m. Peak Hour

Intersection	*LOS*	*Delay (seconds)*	*V/C Ratio*	*50th Percentile Queue Length (ft)*	*95th Percentile Queue Length (ft)*
Signalized Intersections					
Congress Street / Boston Wharf Road / West Service Road	**D**	**49.7**	**-**	**-**	**-**
Congress EB left/thru	C	33.8	0.59	218	m326
Congress EB right	B	10.8	0.09	18	m65
Congress WB left	C	21.3	0.28	41	88
Congress WB thru | thru/right	C	21.3	0.46	158	226
W Service Road NB left	F	>80.0	>1.00	~111	#224
W Service Road NB thru/right	C	22.7	0.30	33	83
Boston Wharf SB left/thru	E	59.7	0.52	51	96
Boston Wharf SB right	B	14.9	0.40	0	43
Congress Street / A Street / Thomson Street	**D**	**43.9**	-	-	-
Congress EB thru | thru	D	45.5	0.50	89	133
Congress EB right	E	55.6	0.53	55	#111
Congress WB left	E	65.7	0.93	237	m#355
Congress WB thru	C	29.5	0.54	249	m328
A NB left	D	49.9	0.59	115	190
A NB right	A	2.3	0.25	0	18
Thomson SB left/thru/right	E	60.3	0.77	144	#265
Unsignalized Intersection					
Congress Street / Stillings Street	-	-	-	-	-
Congress EB left/thru | thru	A	1.7	0.18	-	2
Congress WB thru | thru/ right	A	0.0	0.28	-	0
Stillings SB left/right	B	11.5	0.03	-	2

Table 2-13 2020 Build Condition, Capacity Analysis Summary, p.m. Peak Hour

Intersection	*LOS*	*Delay (seconds)*	*V/C Ratio*	*50th Percentile Queue Length (ft)*	*95th Percentile Queue Length (ft)*
Signalized Intersections					
Congress Street / Boston Wharf Road / West Service Road	**C**	**26.2**	**-**	**-**	**-**
Congress EB left/thru	C	28.1	0.64	185	317
Congress EB right	A	4.1	0.38	0	62
Congress WB left	C	25.3	0.40	50	117
Congress WB thru | thru/right	B	18.1	0.33	104	164
W Service Road NB left	E	58.9	0.53	60	108
W Service Road NB thru/right	C	25.0	0.49	17	68
Boston Wharf SB left/thru	E	65.8	0.84	175	#268
Boston Wharf SB right	A	9.2	0.39	1	53
Congress Street / A Street / Thomson Street	**D**	**37.2**	-	-	-
Congress EB thru | thru	D	47.7	0.72	162	221
Congress EB right	E	56.2	0.53	42	#98
Congress WB left	E	63.7	0.81	104	#267
Congress WB thru	C	21.4	0.64	130	184
A NB left	D	54.0 .2.8	0.68	138	#226
A NB right	A	2.8	0.37	0	25
Thomson SB left/thru/right	D	43.9	0.51	104	175
Unsignalized Intersection					
Congress Street / Stillings Street	-	-	-	-	-
Congress EB left/thru | thru	A	0.2	0.30	-	0
Congress WB thru | thru/ right	A	0.0	0.26	-	0
Stillings SB left/right	B	12.5	0.20	-	18

As shown in Tables 2-12 and 2-13, under the 2020 Build Condition:

- The signalized intersection of **Congress Street / Boston Wharf Road / West Service Road** continues to operate at LOS D during the a.m. peak hour and LOS C during the p.m. peak hour. The West Service Road northbound left-turn lane continues to operate at LOS F during the a.m. peak hour and LOS E during the p.m. peak hour.

The Boston Wharf Road southbound left-turn/through lane continues to operate at LOS E during both the a.m. and p.m. peak hours. The longest queues at the intersection continue to occur at the Congress Street eastbound approach during the a.m. peak hour and will also now occur at the Congress Street eastbound approach during the p.m. peak hour.

- The signalized intersection of **Congress Street / A Street / Thomson Street** continues to operate at LOS D during both the a.m. and p.m. peak hours. The Congress Street westbound left-turn lane and eastbound right-turn lane continues to operate at LOS E during both the a.m. and p.m. peak hours. The Thomson Street southbound approach continues to operate at LOS E during the a.m. peak hour. The longest queues at the intersection will continue to occur at the Congress Street westbound left-turn lane during both the a.m. and p.m. peak hours.

- All approaches of the unsignalized intersection of **Congress Street / Stillings Street** will continue to operate at LOS B or better during both the a.m. and p.m. peak hours.

- When compared to the 2020 No-Build Condition, there is no change in level of service at any of the movements at any of the intersections within the study area, showing that the future traffic impact of the Project is minimal.

2.5 Transportation Demand Management

The Proponent is committed to implementing Transportation Demand Management (TDM) measures to minimize automobile usage and Project related traffic impacts. TDM will be facilitated by the nature of the Project (which does not generate significant peak hour trips) and its proximity to numerous public transit alternatives.

On-site management will keep a supply of transit information (schedules, maps, and fare information) to be made available to the residents and patrons of the site. The Proponent will work with the City to develop a TDM program appropriate to the Project and consistent with its level of impact.

The Proponent is prepared to take advantage of good transit access in marketing the site to future residents by working with them to implement the following TDM measures to encourage the use of non-vehicular modes of travel.

The TDM measures for the Project may include but are not limited to the following:

- Orientation Packets: The Proponent will provide orientation packets to new tenants containing information on available transportation choices, including transit routes/schedules and nearby vehicle sharing and bicycle sharing locations. On-site management will work with residents and tenants as they move in to help facilitate transportation for new arrivals;

- Provide an annual (or more frequent) newsletter or bulletin summarizing transit, ridesharing, bicycling, alternative work schedules, and other travel options;

- Transportation Coordinator: The Proponent will designate a transportation coordinator to oversee transportation issues, including parking, service and loading, and deliveries, and will work with residents as they move in to raise awareness of public transportation, bicycling, and walking opportunities;

- Provide information on travel alternatives for employees and visitors via the Internet and in the building lobby;

- Electric Vehicle Charging: The Proponent will explore the feasibility of providing electric vehicle charging stations within the garage; and

- Vehicle Sharing Program: The Proponent will explore the feasibility of providing spaces in the garage for a car sharing service.

2.6 Transportation Mitigation Measures

While the traffic impacts associated with the new trips are minimal, the Proponent will continue to work with the City of Boston to create a Project that efficiently serves vehicle trips, improves the pedestrian environment, and encourages transit and bicycle use.

The Proponent is responsible for preparation of the Transportation Access Plan Agreement (TAPA), a formal legal agreement between the Proponent and the BTD. The TAPA formalizes the findings of the transportation study, mitigation commitments, elements of access and physical design, travel demand management measures, and any other responsibilities that are agreed to by both the Proponent and the BTD. Because the TAPA must incorporate the results of the technical analysis, it must be executed after these other processes have been completed. The proposed measures listed above and any additional transportation improvements to be undertaken as part of this Project will be defined and documented in the TAPA.

The Proponent will also produce a Construction Management Plan (CMP) for review and approval by BTD. The CMP will detail the schedule, staging, parking, delivery, and other associated impacts of the construction of the Project.

2.7 Evaluation of Short-term Construction Impacts

Most construction activities will be accommodated within the current site boundaries. Details of the overall construction schedule, working hours, number of construction workers, worker transportation and parking, number of construction vehicles, and routes will be addressed in detail in a Construction Management Plan to be filed with BTD in accordance with the City's transportation maintenance plan requirements.

To minimize transportation impacts during the construction period, the following measures will be considered for the Construction Management Plan:

- Limited construction worker parking on-site;
- Encouragement of worker carpooling;
- Consideration of a subsidy for MBTA passes for full-time employees; and
- Providing secure spaces on-site for workers' supplies and tools so they do not have to be brought to the site each day.

The Construction Management Plan to be executed with the City prior to commencement of construction will document all committed measures.

Section 3.0

Environmental Review Component

3.0 ENVIRONMENTAL REVIEW COMPONENT

The Project's potential environmental impacts are described in the following subsections.

3.1 Wind

The Project is not expected to cause material impacts to pedestrian level winds. The Project is designed to be of similar height and massing to buildings in the vicinity of the Project site. The proposed Project involves the addition of two stories to the existing 96-foot-tall building on site, with a proposed building height of approximately 131 feet. The Project will not result in a vertical deflection of upper level winds.

Channeling of airflows and induced turbulence usually occurs in high-density areas or urban street canyons. Since the Project will not alter ground-level conditions, it will not create a canyon effect and is not expected to result in increased wind speeds. Furthermore, although monolithic buildings (i.e., those that do not change shape with height) that are significantly taller than most surrounding buildings will almost invariably be windy at their base, when there are many buildings of similar height in the area they tend to shelter one another. Even with the proposed vertical expansion, the Project building will be similar in height and scale to surrounding neighborhood buildings; therefore, the Project is not expected to cause significant impacts to pedestrian level winds.

3.2 Shadow

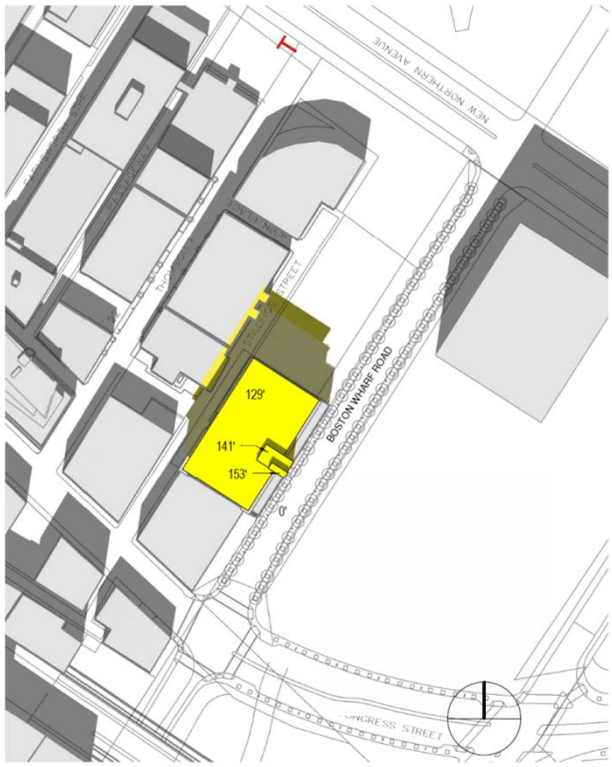
The Proponent conducted a shadow impact analysis to assess potential Project-related impacts by evaluating shadow conditions at four times of day (9:00 a.m., 12:00 noon, 3:00 p.m., and 6:00 p.m.) during the vernal equinox (March 21), summer solstice (June 21), autumnal equinox (September 21), winter solstice (December 21). Shadows were determined using the appropriate altitude and azimuth data for Boston.

The shadow impact analysis includes net new shadow as well as existing shadow. The incremental impact of new shadow cast by the proposed Project is shown in light yellow in Figures 3-1a and b and 3-2a and b, while existing shadows are shown in gray. The shadow analysis focuses on open spaces, streets, and major pedestrian areas in the Project vicinity; no bus stops or public transit stations will be affected by new shadow.

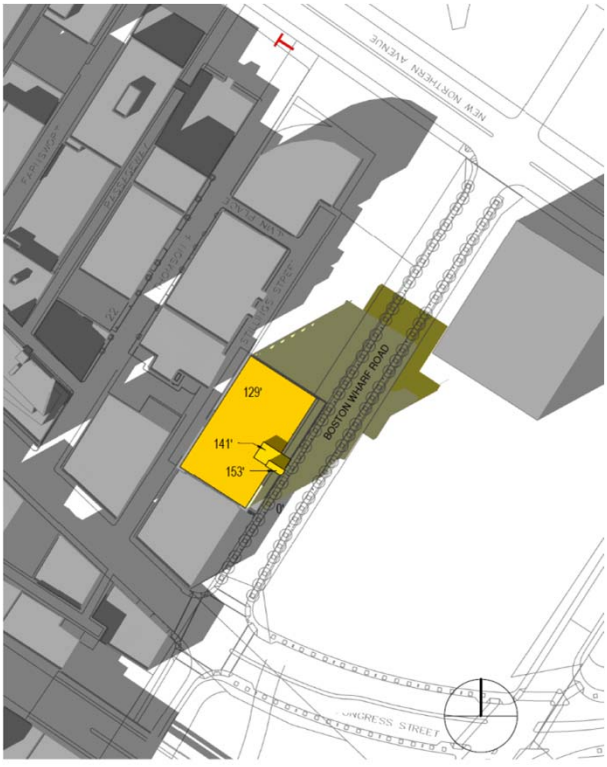
3.2.1 Vernal Equinox (March 21)

At 9:00 a.m. on the vernal equinox, new shadow from the Project will fall northwest of the building primarily onto rooftops of adjacent structures. Some new shadow will also fall onto Thomson Place.

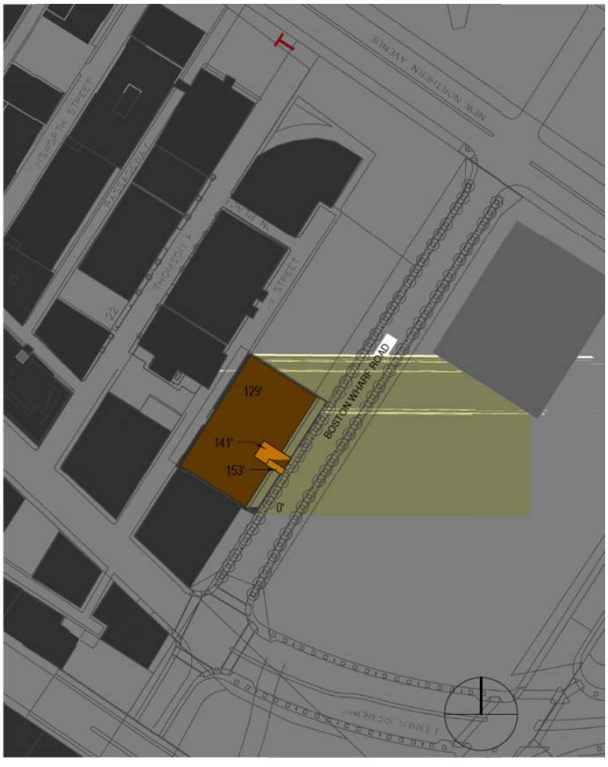
Fall 9am
SCALE: 1 : 1400



Fall 12pm
SCALE: 1 : 1400



Fall 3pm
SCALE: 1 : 1400



Fall 6pm
SCALE: 1 : 1400

22 Boston Wharf Road Boston, Massachusetts

TRO JB

Figure 3-1a
Shadow Study – Fall

Winter 9am
SCALE: 1 : 1400

Winter 12pm
SCALE: 1 : 1400

Winter 3pm
SCALE: 1 : 1400

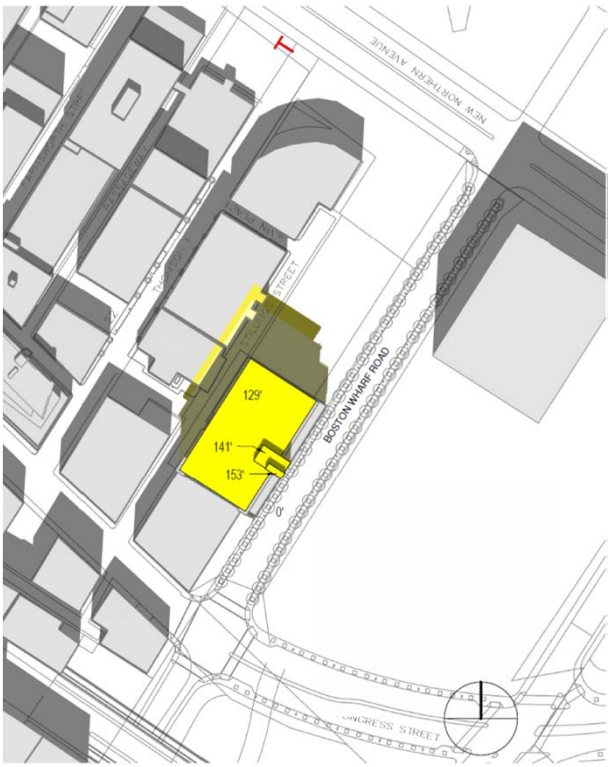
Winter 6pm
SCALE: 1 : 1400

22 Boston Wharf Road Boston, Massachusetts

TRO JB

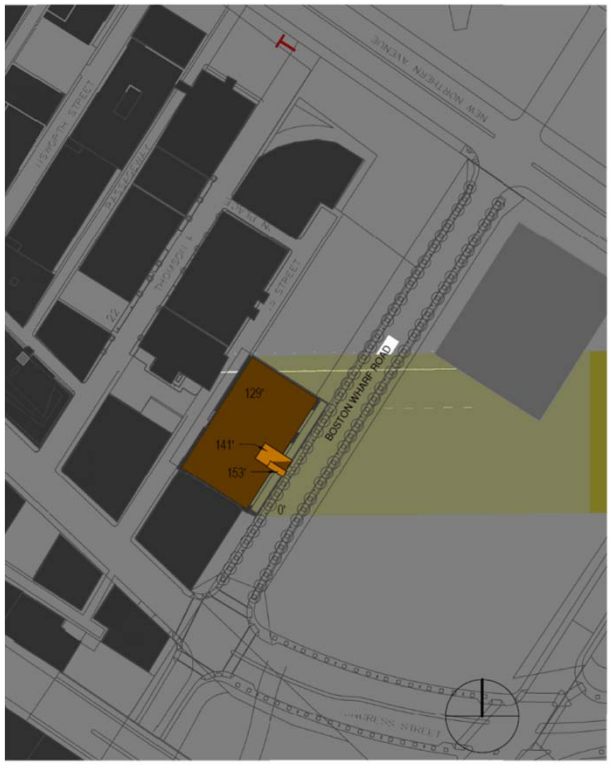
Figure 3-1b
Shadow Study – Winter

Spring 9am
SCALE: 1 : 1400



Spring 12pm
SCALE: 1 : 1400

Spring 3pm
SCALE: 1 : 1400



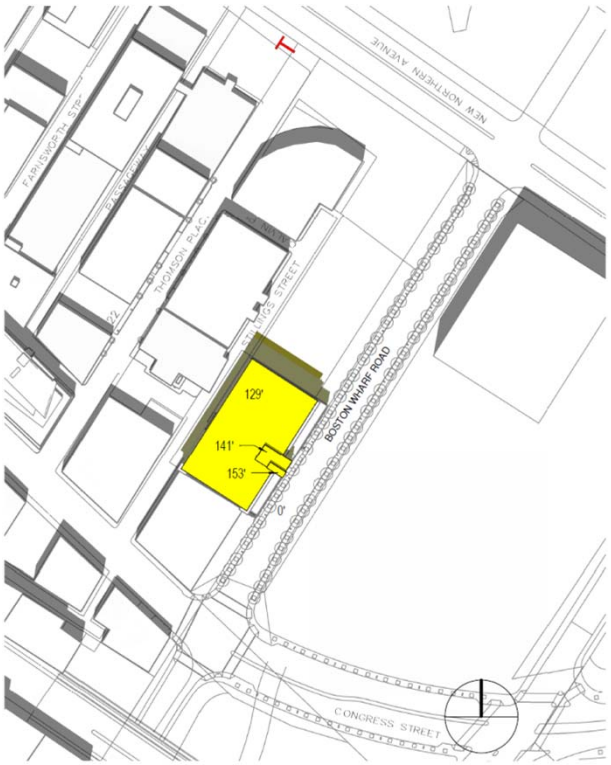
Spring 6pm
SCALE: 1 : 1400

22 Boston Wharf Road Boston, Massachusetts

TRO JB

Figure 3-2a
Shadow Study – Spring

Summer 9am
SCALE: 1 : 1400



Summer 12pm
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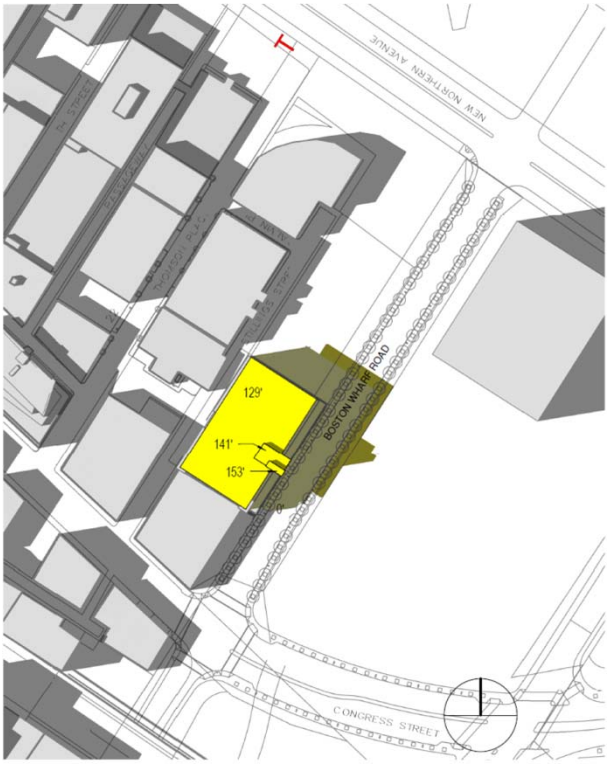


Summer 3pm
SCALE: 1 : 1400

Summer 6pm
SCALE: 1 : 1400

22 Boston Wharf Road Boston, Massachusetts

TRO JB

Figure 3-2b
Shadow Study – Summer

At 12:00 noon, new shadow from the proposed Project will fall to the north, covering a very narrow cross-section of Stillings Street and a small rectangle on the west side of Q Park. A narrow band of new shadow will also fall on the rooftop of an adjacent building across Stillings Street from the Project site.

At 3:00 p.m., new shadow from the Project will be cast toward the northeast, covering a short stretch of Boston Wharf Road and barely extending into the eastern side of Q Park.

At 6:00 p.m., existing shadow is already abundant in the area. New shadow from the proposed addition will be limited to a narrow band in what is now a surface parking lot partially under development as retail and office space.

3.2.2 Summer Solstice (June 21)

At 9:00 a.m. on the summer solstice, new shadow from the Project will fall to the west-northwest, covering small portions of adjacent rooftops and a narrow swath of the alley between Stillings Street and Thomson Place.

At 12:00 noon, the Project will create minimal new shadow. A sliver of new shadow from the proposed addition will cover an area in the southernmost portion of Q Park.

At 3:00 p.m., new shadow will extend eastward, with a narrow rectangle stretching from the eastern portion of Q Park across Boston Wharf Road. A narrow band of new shadow will also extend down the east side of Boston Wharf Road, covering a stretch of sidewalk.

At 6:00 p.m., existing shadow in the area is already abundant. New shadow will fall well east of the Project site on what is now a surface parking lot partially under development as retail and office space, and will extend across E Service Road.

3.2.3 Autumnal Equinox (September 21)

At 9:00 a.m. on the autumnal equinox, new shadow from the Project will fall toward the northwest to cover a short stretch of the southeastern side of Thomson Place. Small areas of new shadow will also fall on adjacent rooftops.

At 12:00 noon, new shadow from the proposed Project will fall northward, shading a stretch of adjacent rooftop across Stillings Street. A narrow rectangle of new shadow will also extend across Stillings Street, the sidewalk along its eastern side, and into Q Park.

At 3:00 p.m., new shadow from the Project will fall to the northeast, with a rectangle extending from the eastern side of Q Park and across Boston Wharf Road and the associated sidewalks. A small area of new shadow will also fall just east of Boston Wharf Road on what is currently a surface parking lot partially under development as retail and office space.

At 6:00 p.m., shadow in the Project area is already abundant. No significant areas of new shadow will result from the Project.

3.2.4 Winter Solstice (December 21)

At 9:00 a.m. on the winter solstice, new shadow from the Project will fall toward the northwest, covering portions of some adjacent rooftops for a distance of three blocks. New shadow will also cover a short stretch of Farnsworth Street.

At 12:00 noon, new shadow from the proposed Project will fall northward, primarily onto adjacent rooftops. New shadow will also extend along a very short stretch of Stillings Street.

At 3:00 p.m., existing shadow is already abundant. New shadow will be limited to an area northeast of the Project site across Seaport Boulevard.

3.2.5 Conclusions

The shadow study indicates that the Project will not cause substantial impacts to the surrounding area. Shadow impacts throughout the year are limited primarily to very small portions of Stillings Street as well as Boston Wharf Road, each of which have sidewalks. Some new shadow from the Project will also affect the southern half of Q Park, located north of the Project site, although new shadow impacts on the park will predominantly be limited to its southernmost extent and to very small areas.

3.3 Daylight

The purpose of the daylight analysis is to estimate the extent to which a proposed project will affect the amount of daylight reaching streets and sidewalks in the immediate vicinity of a project site. The daylight analysis for the Project considers the existing and proposed conditions as well as typical daylight obstruction values in the surrounding area.

Because the proposed Project increases the height of the existing building, the Project will result in a minor increase in daylight obstruction; however, resulting conditions will be typical of the area.

3.3.1 Methodology

The daylight analysis was performed using the Boston Redevelopment Authority Daylight Analysis (BRADA) computer program.[4] This program measures the percentage of "sky dome" obstructed by a project and is a useful tool in evaluating the net change in obstruction from existing to build conditions at a specific site.

Using BRADA, a silhouette view of the building is taken at ground level from the middle of adjacent city streets or pedestrian ways centered on the proposed building. The façade of the building facing the viewpoint, including heights, setbacks, corners and other features, is plotted onto a base map using lateral and elevation angles. The two-dimensional base map generated by BRADA represents a figure of the building in the "sky dome" from the viewpoint chosen. BRADA then calculates the percentage of daylight that will be obstructed on a scale from 0 to 100 percent based on the width of the view, distance between the viewpoint and the building, and massing and setbacks incorporated into the building design; the lower the number, the lower the percentage of daylight obstruction from any given viewpoint.

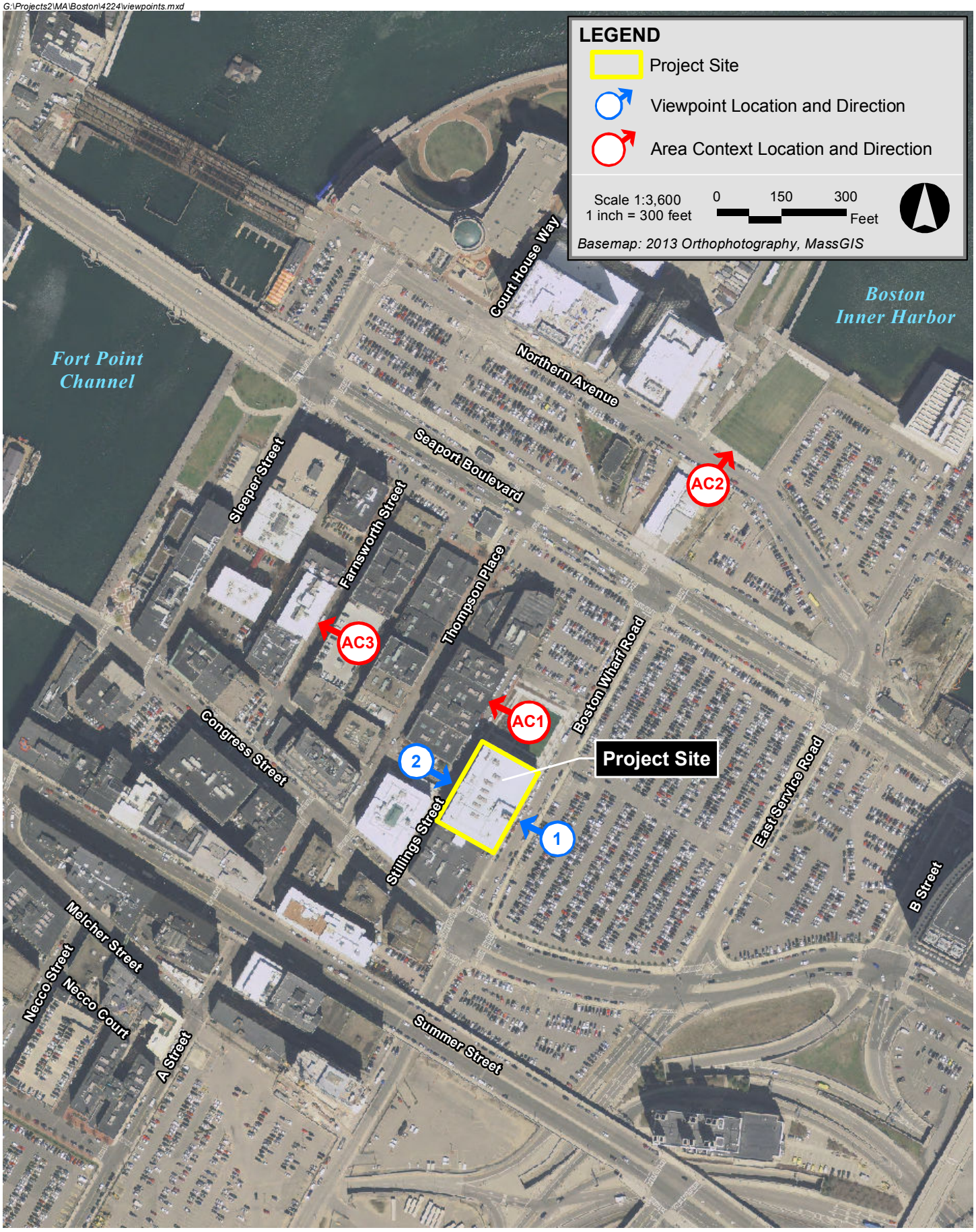
The analysis compares three conditions: existing, proposed, and the context of the area.

Two viewpoints were chosen to evaluate daylight obstruction for the existing and proposed conditions: one viewpoint on Boston Wharf Road; and one viewpoint on Stillings Street. Three area context points were considered to provide a basis of comparison to existing conditions in the surrounding area. The viewpoints and area context viewpoints were taken in the following locations (also see Figure 3-3):

- Viewpoint 1**:** from Boston Wharf Road facing northwest toward the Project site;
- Viewpoint 2**:** from Stillings Street facing southeast toward the Project site;
- Area Context Viewpoint AC1: from Stillings Street facing northwest toward the building at 25 Thomson Place;
- Area Context Viewpoint AC2: from Northern Avenue facing northeast toward the building at One Marina Park Drive; and
- Area Context Viewpoint AC3: from Farnsworth Street facing northwest toward the building at 24 Farnsworth Street.

[4] Method developed by Harvey Bryan and Susan Stuebing, computer program developed by Ronald Fergle, Massachusetts Institute of Technology, Cambridge, MA, September 1984.

G:\Projects2\MA\Boston\4224\viewpoints.mxd



22 Boston Wharf Road Boston, Massachusetts

Epsilon ASSOCIATES INC.

Figure 3-3

Viewpoint and Area Context Locations

3.3.2 Daylight Analysis Results

Results for each viewpoint are described in Table 3-1. Figures 3-4 through 3-6 illustrate the BRADA results for each analysis.

Table 3-1 Daylight Analysis Results

Viewpoint Locations		*Existing Conditions*	*Proposed Conditions*
Viewpoint 1	View from Boston Wharf Road facing northwest toward the Project site	78.1%	83.1%
Viewpoint 2	View from Stillings Street facing southeast toward the Project site	89.5%	92.6%
AC1	View from Stillings Street facing northwest toward the building at 25 Thomson Place	85.8%	N/A
AC2	View from Northern Avenue facing northeast toward the building at One Marina Park Drive	89.7%	N/A
AC3	View from Farnsworth Street facing northwest toward the building at 24 Farnsworth Street	84.9%	N/A

3.3.2.1 Boston Wharf Road – Viewpoint 1

Boston Wharf Road runs along the southeast edge of the Project site, and Viewpoint 1 was taken from the center of Boston Wharf Road looking northwest toward the Project. Project development will increase the daylight obstruction value from 78.1% to 83.1%. While this is an increase over existing conditions, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

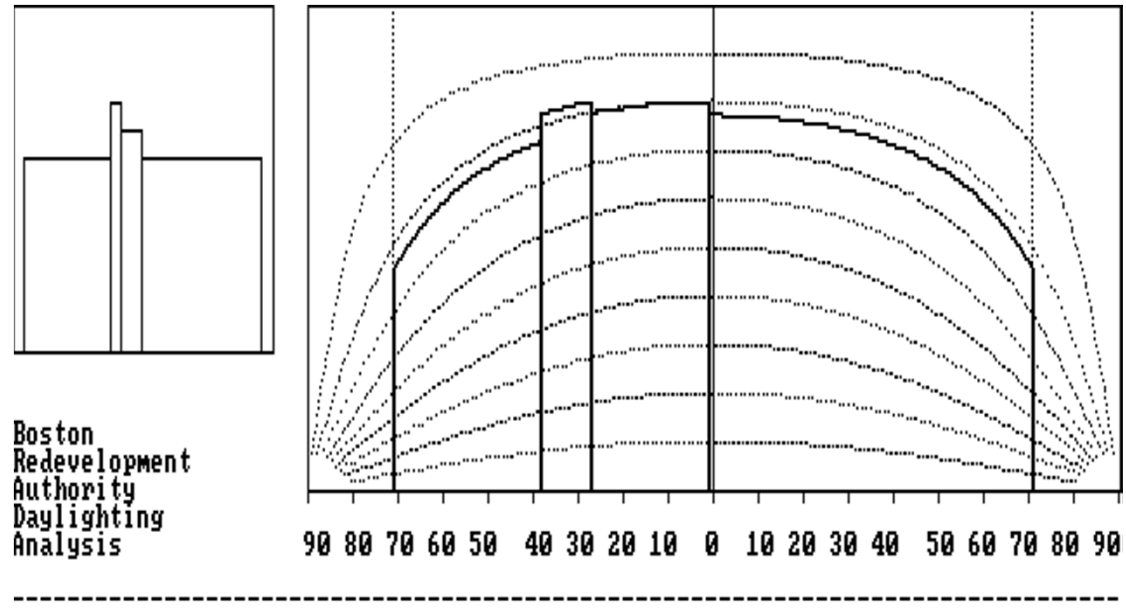
3.3.2.2 Stillings Street – Viewpoint 2

Stillings Street runs along the northwest edge of the Project site, and Viewpoint 2 was taken from the center of Stillings Street looking southeast toward the Project. Project development will result in a slight increase in daylight obstruction from 89.5% to 92.6%. While this is an increase over existing conditions, the daylight obstruction value is consistent with other buildings in the area, including the Area Context buildings.

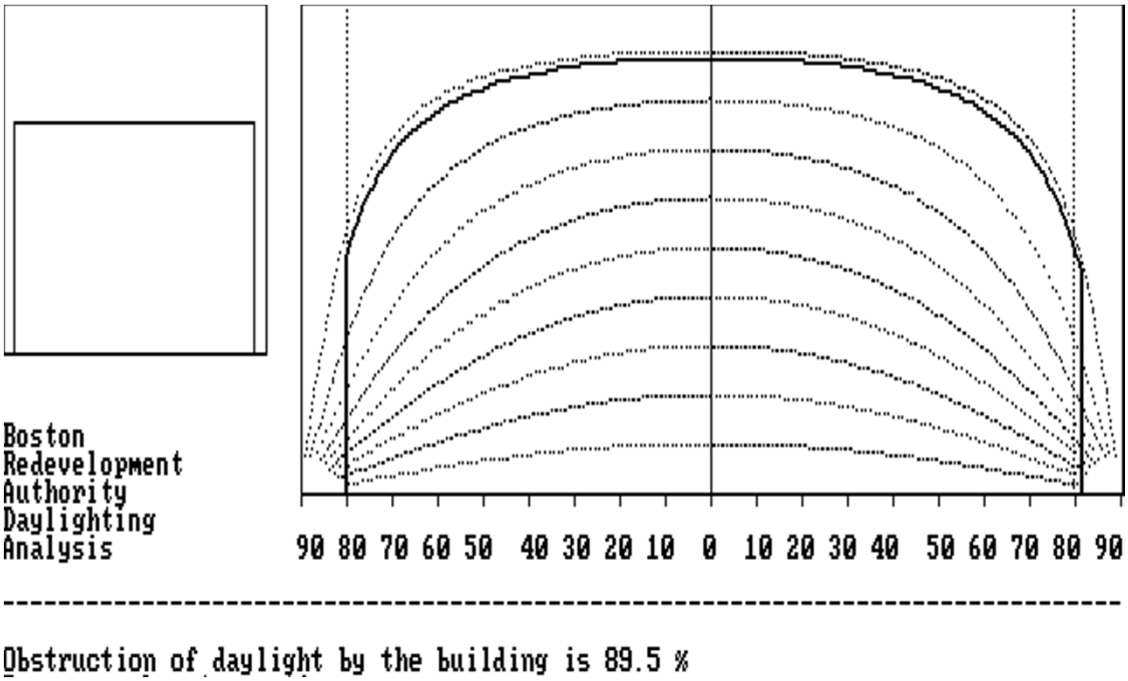
3.3.2.3 Area Context Views

The Project area currently consists of a mix of low-rise and mid-rise commercial buildings. To provide a larger context for comparison of daylight conditions, obstruction values were calculated for the two Area Context Viewpoints described above and shown on Figure 3-3. Daylight obstruction values ranged from 84.9% for AC3 to 89.7% for AC2. Daylight obstruction values for the Project are consistent with these Area Context values.

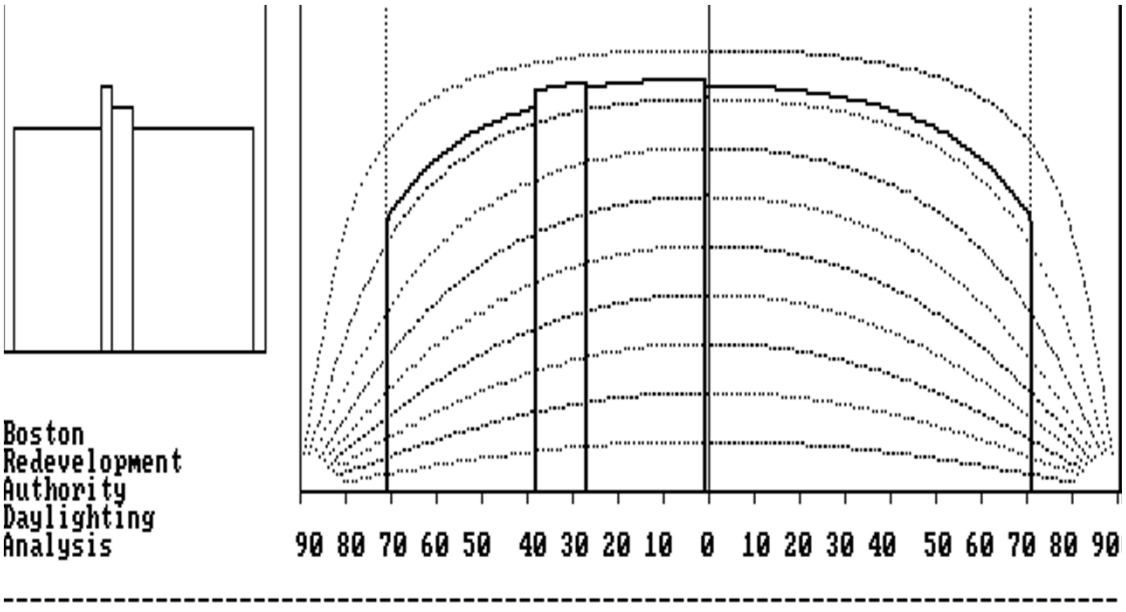
Viewpoint 1: View from Boston Wharf Road facing northwest toward the Project site



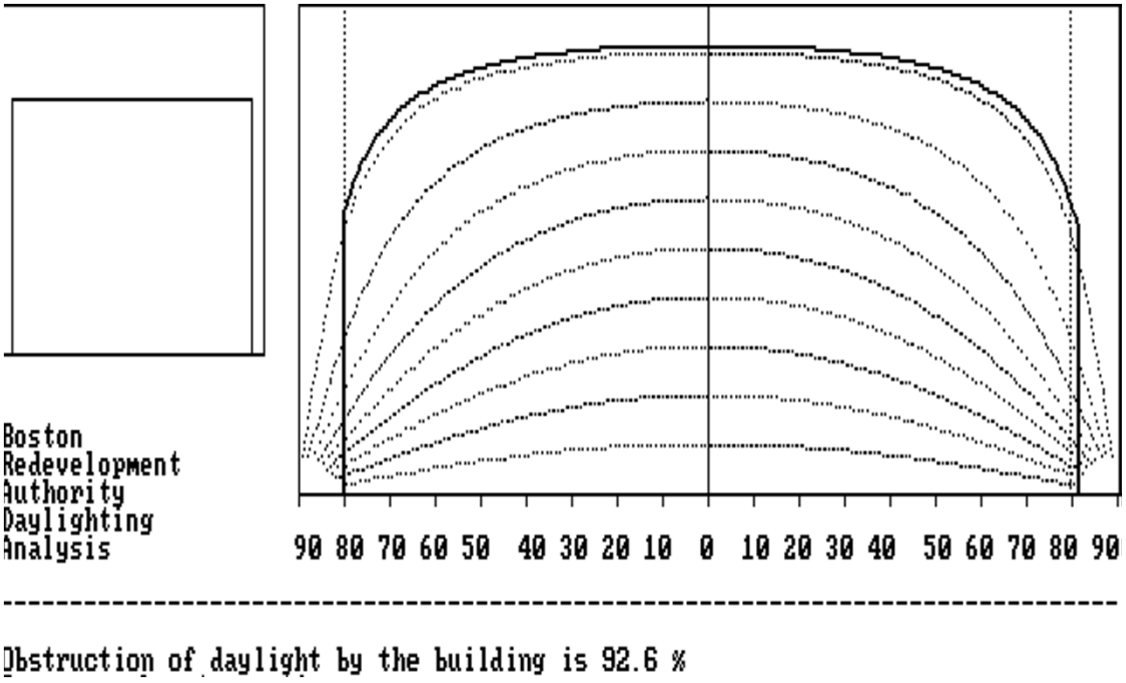
Viewpoint 2: View from Stillings Street facing southeast toward the Project site



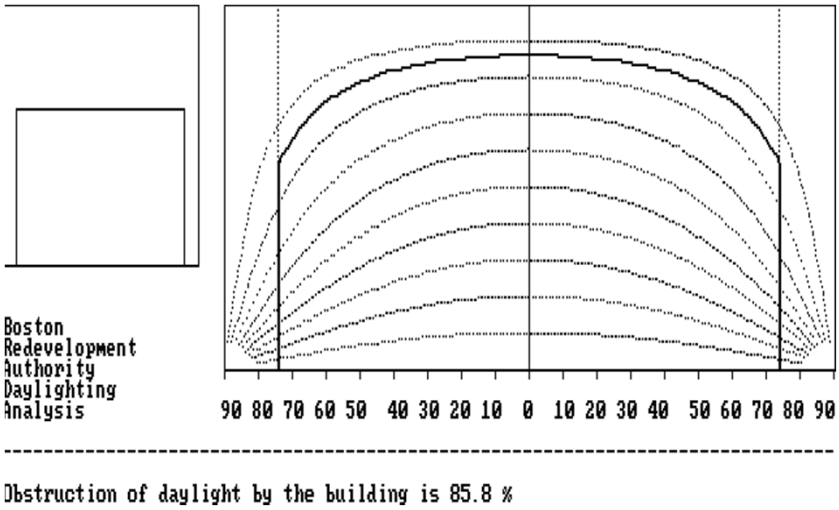
Viewpoint 1: View from Boston Wharf Road facing northwest toward the Project site



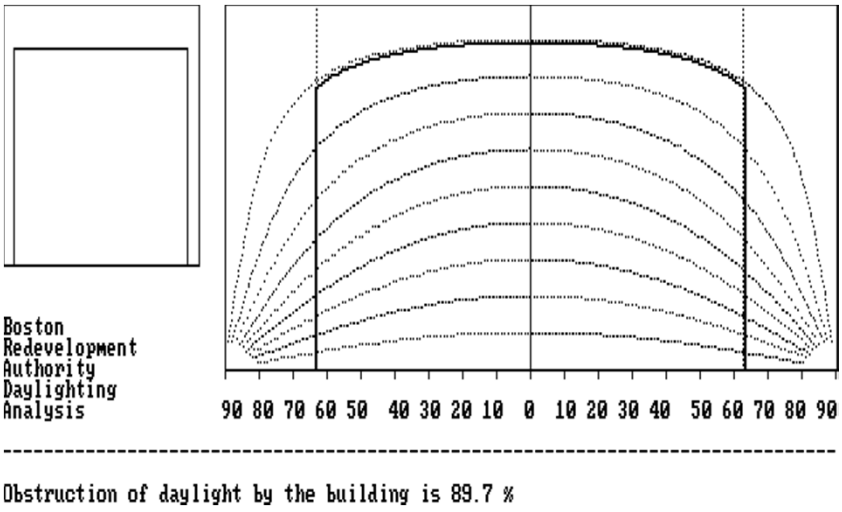
Viewpoint 2: View from Stillings Street facing southeast toward the Project site



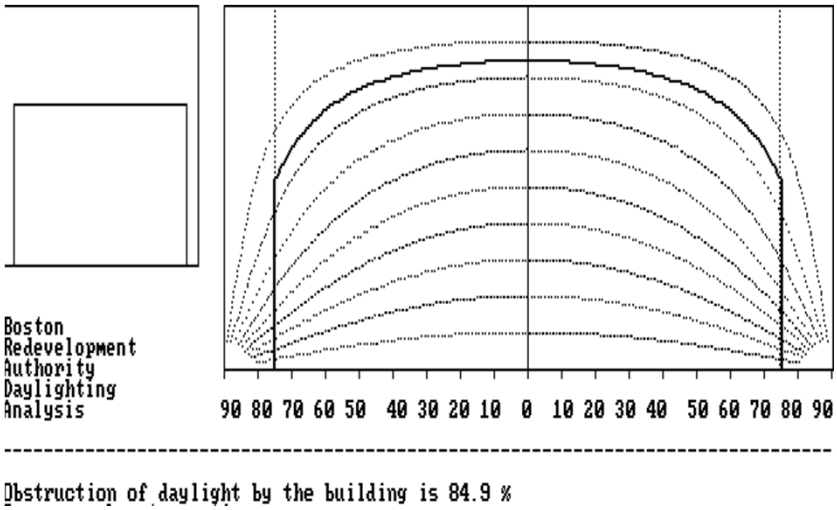
AC1: View from Stillings Street facing northwest toward the building at 25 Thomson Place



AC2: View from Northern Avenue facing northeast toward the building at One Marina Park Drive



AC3: View from Farnsworth Street facing northwest toward the building at 24 Farnsworth Street



3.4 Solar Glare

The Proponent does not anticipate the use of reflective glass or other reflective cladding on the building facade that would result in solar glare from the Project.

3.5 Air Quality

An air quality analysis has been conducted to determine the impact of pollutant emissions from mobile sources generated by the Project. Specifically, a microscale analysis was performed to evaluate the potential air quality impacts of carbon monoxide (CO) resulting from traffic flow around the Project area. Any new or replaced stationary sources will be reviewed by the Massachusetts Department of Environmental Protection (MassDEP) during permitting under the Environmental Results Program (ERP).

3.5.1 National Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by the U.S. Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, the U.S. Environmental Protection Agency (EPA) promulgated National Ambient Air Quality Standards (NAAQS) for these criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM) (PM-10 and PM-2.5), carbon monoxide (CO), ozone (O_3), and lead (Pb); NAAQS are listed in Table 3-2. Massachusetts Ambient Air Quality Standards (MAAQS) are typically identical to NAAQS.

NAAQS specify concentration levels for various averaging times and include both "primary" and "secondary" standards. Primary standards are intended to protect human health, whereas secondary standards are intended to protect public welfare from any known or anticipated adverse effects associated with the presence of air pollutants, such as damage to vegetation. The more stringent of the primary or secondary standards are applied when comparing to the modeling results for a Project.

The NAAQS also reflect various durations of exposure. The short-term periods (24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term periods refer to limits that cannot be exceeded for exposure averaged over three months or longer. EPA developed the standards to protect human health against adverse health effects with a margin of safety.

Table 3-2 National Ambient Air Quality Standards

Pollutant	*Averaging Period*	*National Ambient Air Quality Standards and Massachusetts Ambient Air Quality Standards (micrograms per cubic meter)*	
		Primary	Secondary
NO_2	Annual [1]	100	Same
	1-hour [7]	188	None
SO_2	Annual [1,8]	80	None
	24-hour [2,8]	365	None
	3-hour [2]	None	1,300
	1-hour [7]	196	None
PM-10 [6]	Annual	50	Same
	24-hour [3]	150	Same
PM-2.5	Annual [4]	12	15
	24-hour [5]	35	Same
CO	8-hour [2]	10,000	Same
	1-hour [2]	40,000	Same
Ozone	8-hour [3]	147	Same
Pb	3-month [1]	1.5	Same

Notes:

[1] Not to be exceeded.

[2] Not to be exceeded more than once per year.

[3] Not to be exceeded more than an average of one day per year over three years.

[4] Not to be exceeded by the arithmetic average of the annual arithmetic averages from three successive years.

[5] Not to be exceeded based on the 98th percentile of data collection.

[6] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM10 standard in 2006 (effective December 17, 2006). However, the annual standard remains codified in 310 CMR 6.00.

[7] Not to be exceeded. Based on the three-year average of the 98th (NO_2) or 99th (SO_2) percentile of the daily maximum one-hour concentrations.

[8]The Annual and 24-hour SO_2 standards were revoked on June 2, 2010. However, these standards remain in effect until one year after an area is designated for the one-hour standard, unless currently in nonattainment.

Source: 40 CFR 50 and 310 CMR 6.00

3.5.2 Background Concentrations

MassDEP guidance directs project proponents to use the three most recent years of available background air quality monitoring data from within 10 kilometers of a project site. Background concentrations were determined from the closest available monitoring stations to the proposed development from the most recent air quality monitor data reported by the MassDEP as available in its Annual Air Quality Reports for 2011 to 2013. The closest

monitor is located at North Street in Boston's North End neighborhood, but only samples PM2.5. One City Square is the next closest monitor and samples PM10. The Harrison Avenue monitor samples for ozone and lead. The Kenmore Square monitor samples for the remaining criteria pollutants. All monitors are located in Boston, and, consistent with MassDEP guidance, are within 10 kilometers of the Project site.

The Clean Air Act allows one exceedance per year of the CO and SO_2 short-term NAAQS. The second highest concentration accounts for the one exceedance. Annual NAAQS are never to be exceeded. The 24-hour PM-10 standard is not to be exceeded more than once per year on average over three years. To attain the 24-hour PM-2.5 standard, the three-year average of the 98th percentile of 24-hour concentrations must not exceed 35 $\mu g/m^3$. For annual PM-2.5 averages, the average of the highest yearly observations was used as the background concentration. The one-hour NO_2 standard is attained when the three-year average of the 98th percentile of the maximum daily one-hour concentrations do not exceed 188 $\mu g/m^3$.

A summary of the background air quality concentrations are presented in Table 3-3.

Table 3-3 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	*Avg. Time*	*Form*	*2011*	*2012*	*2013*	*Back-ground Conc. (µg/m³)*	*Std (µg/m³)*	*Location*
SO_2 (1)(7)(8)	1-Hr	99th %	50.6	34.6	31.4	50.6	196	Kenmore Sq., Boston
	3-Hr	H2H	64.5	36.2	41.9	64.5	1300	Kenmore Sq., Boston
	24-Hr	H2H	24.6	14.1	15.7	24.6	365	Kenmore Sq., Boston
	Ann.	H	6.2	4.9	2.6	6.2	80	Kenmore Sq., Boston
PM-10	24-Hr	H2H	34.0	37.0	40.0	40.0	150	One City Sq., Boston
	Ann.	H	15.9	16.8	18.0	18.0	50	One City Sq., Boston
PM-2.5	24-Hr (4)	98th %	23.9	20.9	20.0	21.6	35	174 North St, Boston
	Ann. (5)	H	10.3	9.5	8.8	9.5	12	174 North St, Boston
NO_2 (3)	1-Hr (6)	98th %	99.5	92.1	90.2	93.9	188	Kenmore Sq., Boston
	Ann.	H	38.3	35.9	33.4	38.3	100	Kenmore Sq., Boston
CO (2)	1-Hr	H2H	1710.0	1482.0	1482.0	1710.0	40000	Kenmore Sq., Boston
	8-Hr	H2H	1368.0	1026.0	1026.0	1368.0	10000	Kenmore Sq., Boston

Table 3-3 Observed Ambient Air Quality Concentrations and Selected Background Levels (Continued)

Pollutant	*Avg. Time*	*Form*	*2011*	*2012*	*2013*	*Back-ground Conc. (µg/m³)*	*Std (µg/m³)*	*Location*
O_3	8-Hr [9]	H4H	117.8	153.1	115.8	128.904	147	Harrison Ave, Boston
Pb	3-Mo	H	0.017	0.014	0.007	0.017	0.15	Harrison Ave, Boston

From 2010-2013 MassDEP Annual Data Summaries

[1] SO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppb = 2.62 $\mu g/m^3$.

[2] CO reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1140 $\mu g/m^3$.

[3] NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppb = 1.88 $\mu g/m^3$.

[4] Background level for 24-hour PM-2.5 is the average concentration of the 98th percentile for three years.

[5] Background level for annual PM-2.5 is the average for three years.

[6] Background level for 1-hour NO2 is the average of the 98th percentile of the daily maximum 1-hour values a over three years.

[7] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

[8] The 2011 - 2013 SO_2 3-hr value is no longer reported by MassDEP. 1-hr H2H used instead. 2013 24-hr value also no longer reported. Obtained from EPA AirData website.

[9] Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years

Air quality is generally good in the area, with all of the ambient concentrations well below their respective NAAQS. For use in the microscale analysis, background concentrations of CO in ppm were required. Corresponding maximum background concentrations in ppm were 1.5 ppm (1,710 $\mu g/m^3$) for one-hour and 1.2 ppm (1,368 $\mu g/m^3$) for eight-hour CO.

3.5.3 Microscale Analysis Methodology

The BRA typically requests an analysis of the effects on air quality of the increase in traffic generated by projects subject to Large Project Review. This "microscale" analysis is typically required for any intersection (including garage entrances/exits) where:

(1) Project traffic would impact intersections or roadway links currently operating at LOS D, E, or F or would cause LOS to decline to D, E, or F;

(2) Project traffic would increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or

(3) the Project will generate 3,000 or more new average daily trips on roadways providing access to a single location.

The microscale analysis involves modeling CO emissions from vehicles idling at and traveling through signaled intersections. Predicted ambient concentrations of CO for the Build and No Build cases are compared with federal (and state) ambient air quality standards for CO.

The microscale analysis typically examines ground-level CO impacts due to traffic queues in the immediate vicinity of a project. CO is used in microscale studies to indicate roadway pollutant levels since it is the most abundant pollutant emitted by motor vehicles and can result in so-called "hot spot" (high concentration) locations around congested intersections. The NAAQS standards do not allow ambient CO concentrations to exceed 35 ppm for a one-hour averaging period and 9 ppm for an eight-hour averaging period more than once per year at any location. The widespread use of CO catalysts on current vehicles has reduced the occurrences of CO hotspots. Air quality modeling techniques (computer simulation programs) are typically used to predict CO levels for both existing and future conditions to evaluate compliance of the roadways with the standards. The analysis for the Project followed the procedure outlined in the U.S. EPA intersection modeling guidance.[5]

The microscale analysis has been conducted using the latest versions of EPA's MOVES and CAL3QHC programs to estimate CO concentrations at sidewalk receptor locations.

Baseline (2015) and future year (2020) emission factor data calculated from the MOVES model, along with traffic data, were input into the CAL3QHC program to determine CO concentrations due to traffic flowing through the selected intersections.

Existing CO background values at the nearest monitor location at Kenmore Square were obtained from MassDEP. CAL3QHC results were then added to background CO values of 1.5 ppm (one-hour) and 1.2 ppm (eight-hour), as provided by MassDEP, to determine total air quality impacts from the Project. These values were compared to the NAAQS for CO of 35 ppm (one-hour) and 9 ppm (eight-hour).

The modeling methodology was developed in accordance with the latest MassDEP modeling policies and Federal modeling guidelines.[6]

Modeling assumptions and backup data for results presented in this section are provided in Attachment D.

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5 U.S. EPA, Guideline for Modeling Carbon Monoxide from Roadway Intersections; EPA-454/R-92-005, November 1992.

6 40 CFR 51 Appendix W, Guideline on Air Quality Models, 70 FR 68228, Nov. 9, 2005

3.5.3.1 Intersection Selection

As stated previously, a "microscale" analysis is typically required for the Project at intersections where (1) Project traffic would impact intersections or roadway links currently operating at LOS D, E, or F or would cause LOS to decline to D, E, or F; (2) Project traffic would increase traffic volumes on nearby roadways by 10% or more (unless the increase in traffic volume is less than 100 vehicles per hour); or (3) the Project will generate 3,000 or more new average daily trips on roadways providing access to a single location.

Two signalized intersections are included in the traffic study: Congress Street and Boston Wharf Road, and Congress Street and A Street. Both meet the above conditions (see Section 2.0). Traffic volumes and LOS calculations provided in Section 2.0 form the basis of evaluating the traffic data versus microscale thresholds. Microscale modeling was performed for the intersections based on the aforementioned methodology. The 2015 existing conditions and the 2020 No Build and Build conditions were each evaluated for both morning (a.m.) and afternoon (p.m.) peaks.

3.5.3.2 Emissions Calculations (MOVES)

The EPA MOVES (2014 Version) computer program was used to estimate motor vehicle emission factors on the roadway network. Emission factors calculated by the MOVES model are based on motor vehicle operations typical of daily periods. The Commonwealth's statewide annual Inspection and Maintenance (I&M) program was included, as well as the county-specific vehicle age registration distribution, fleet mix, meteorology, and other inputs. Inputs for MOVES for the existing (2015) and build year (2020) were provided by MassDEP.

All link types for the modeled intersection were input into MOVES. Idle emission factors are obtained from factors for a link average speed of 0 miles per hour (mph). Moving emissions are calculated based on speeds at which free-flowing vehicles travel through the intersection as stated in traffic modeling (SYNCHRO) reports. A speed of 30 mph is used for all free-flow traffic. Speeds of 10 and 15 mph were used for right (and U-turns, if necessary) and left turns, respectively. Roadway emissions factors were obtained from MOVES using EPA guidance.[7]

Winter CO emission factors are typically higher than summer. Therefore, January weekday emission factors were conservatively used in the microscale analyses.

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[7] U.S. EPA, 2010. Using MOVES in Project-Level Carbon Monoxide Analyses. EPA-420-B-10-041

3.5.3.3 Receptors and Meteorology Inputs

Sets of up to 130 receptors were placed in the vicinity of the modeled intersection. Receptors extended approximately 300 feet on the sidewalks along the roadways approaching the intersection. The roadway links and receptor locations of the modeled intersection are presented in Figures 3-7 and 3-8.

For the CAL3QHC model, limited meteorological inputs are required. Following EPA guidance[8], the analysis used a wind speed of one meter per second, stability class D (4), and a mixing height of 1,000 meters. To account for intersection geometry, wind directions were selected every 10° in a range from 0° to 350°. A surface roughness length of 321 centimeters was selected.[9]

3.5.3.4 Impact Calculations (CAL3QHC)

The CAL3QHC model predicts one-hour concentrations using queue-links at intersections, worst-case meteorological conditions, and traffic input data. One-hour concentrations were scaled by a factor of 0.9 to estimate eight-hour concentrations.[10] The CAL3QHC methodology was based on EPA CO modeling guidance. Signal timings were provided directly from the traffic modeling outputs.

3.5.4 Microscale Analysis Results

Results of the maximum one-hour predicted CO concentrations from CAL3QHC are provided in Tables 3-4 through 3-6 for the 2015 and 2020 scenarios. Eight-hour average concentrations are calculated by multiplying the maximum one-hour concentrations by a factor of 0.9.[11]

Results of the one-hour and eight-hour maximum modeled CO ground-level concentrations from CAL3QHC were added to EPA-supplied background levels for comparison to the NAAQS. These values represent the highest potential concentrations at the intersection as they are predicted during the simultaneous occurrence of "defined" worst case meteorology. The highest one-hour traffic-related concentration predicted in the Project area for the modeled conditions (0.2 ppm) plus background (1.5 ppm) is 1.7 ppm for all cases at the intersection of Congress and A Streets, as well as the existing cases at Congress

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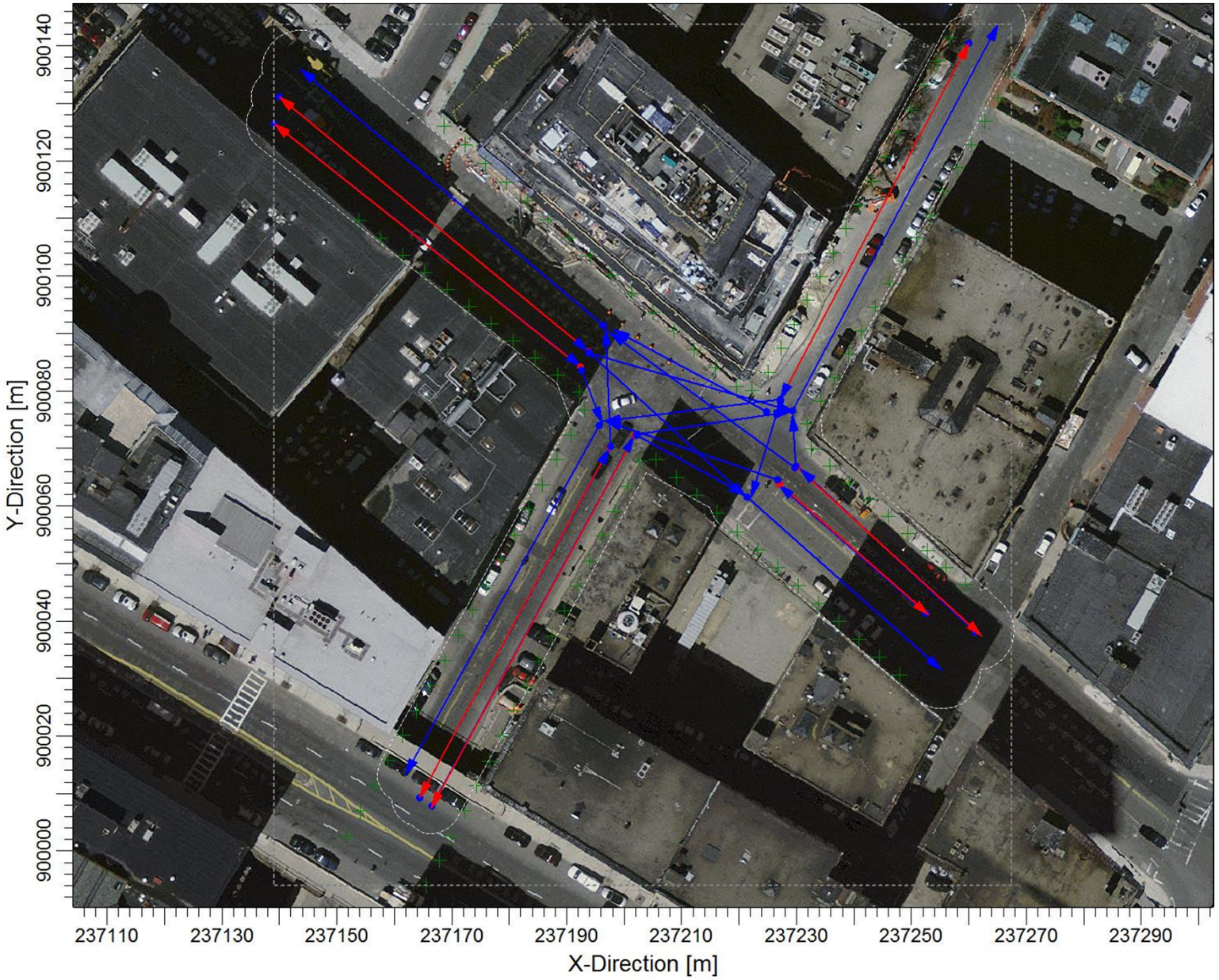
8 U.S. EPA, *Guideline for Modeling Carbon Monoxide from Roadway Intersections.* EPA-454/R-92-005, November 1992.

9 U.S. EPA, *User's Guide for CAL3QHC Version 2: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*. EPA –454/R-92-006 (Revised), September 1995.

10 U.S. EPA, AERSCREEN User's Guide; EPA-454/B-11-001, March 2011.

11 U.S. EPA, AERSCREEN User's Guide; EPA-454/B-11-001, March 2011.



22 Boston Wharf Road **Boston, Massachusetts**

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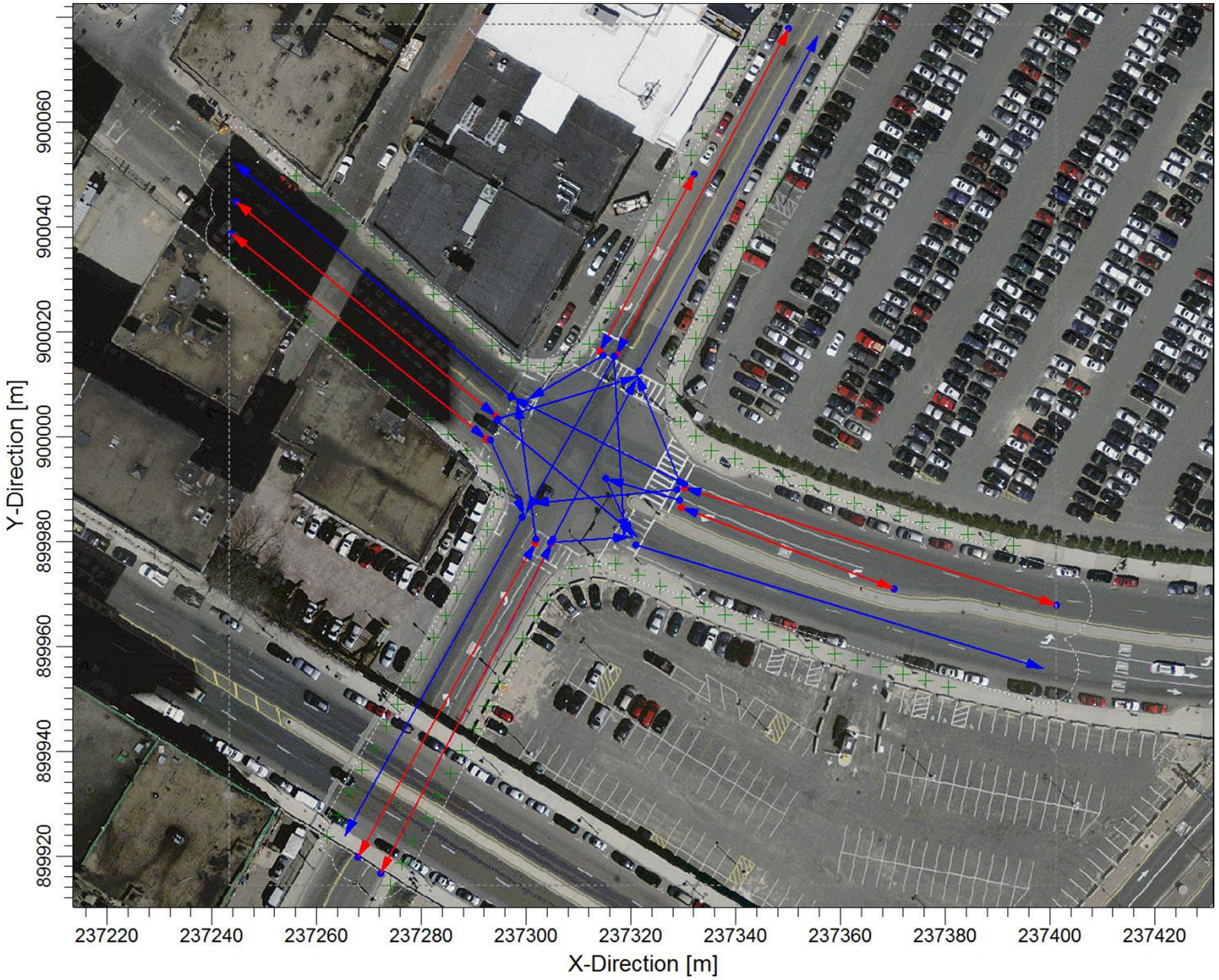
Figure 3-7

Link and Receptor Locations for CAL3QHC modeling of Intersection of Congress, A, and Thomson



22 Boston Wharf Road **Boston, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 3-8

Link and Receptor Locations for CAL3QHC modeling of Intersection of Congress, Boston Wharf, and West Service

and Boston Wharf Road. The highest eight-hour traffic-related concentration predicted in the area of the Project for the modeled conditions (0.18 ppm) plus background (1.2 ppm) is 1.4 ppm for the same locations and scenarios. All concentrations are well below the one-hour NAAQS of 35 ppm and the eight-hour NAAQS of 9 ppm.

Table 3-4 Summary of Microscale Modeling Analysis (Existing 2015)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Congress Street, A Street, and Thomson Place	AM	0.2	1.5	1.7	35
	PM	0.2	1.5	1.7	35
Congress Street, Boston Wharf Road, and West Service Road	AM	0.2	1.5	1.7	35
	PM	0.2	1.5	1.7	35
8-Hour					
Congress Street, A Street, and Thomson Place	AM	0.2	1.2	1.4	9
	PM	0.2	1.2	1.4	9
Congress Street, Boston Wharf Road, and West Service Road	AM	0.2	1.2	1.4	9
	PM	0.2	1.2	1.4	9

Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.

Table 3-5 Summary of Microscale Modeling Analysis (No-Build 2020)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Congress Street, A Street, and Thomson Place	AM	0.2	1.5	1.7	35
	PM	0.2	1.5	1.7	35
Congress Street, Boston Wharf Road, and West Service Road	AM	0.1	1.5	1.6	35
	PM	0.1	1.5	1.6	35

Table 3-5 Summary of Microscale Modeling Analysis (No-Build 2020) (Continued)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
8-Hour					
Congress Street, A Street, and Thomson Place	AM	0.2	1.2	1.4	9
	PM	0.2	1.2	1.4	9
Congress Street, Boston Wharf Road, and West Service Road	AM	0.1	1.2	1.3	9
	PM	0.1	1.2	1.3	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

Table 3-6 Summary of Microscale Modeling Analysis (Build 2020)

Intersection	*Peak*	*CAL3QHC Modeled CO Impacts (ppm)*	*Monitored Background Concentration (ppm)*	*Total CO Impacts (ppm)*	*NAAQS (ppm)*
1-Hour					
Congress Street, A Street, and Thomson Place	AM	0.2	1.5	1.7	35
	PM	0.2	1.5	1.7	35
Congress Street, Boston Wharf Road, and West Service Road	AM	0.1	1.5	1.6	35
	PM	0.1	1.5	1.6	35
8-Hour					
Congress Street, A Street, and Thomson Place	AM	0.2	1.2	1.4	9
	PM	0.2	1.2	1.4	9
Congress Street, Boston Wharf Road, and West Service Road	AM	0.1	1.2	1.3	9
	PM	0.1	1.2	1.3	9
Notes: CAL3QHC eight-hour impacts were conservatively obtained by multiplying one-hour impacts by a screening factor of 0.9.					

3.5.5 Microscale Analysis Conclusions

Results of the microscale analysis show that all predicted CO concentrations are well below one-hour and eight-hour NAAQS. Therefore, it can be concluded that there are no anticipated adverse air quality impacts resulting from increased traffic in the area due to the Project.

3.6 Water Quality and Stormwater

This section describes stormwater management and associated water quality.

3.6.1 Existing Storm Drainage System

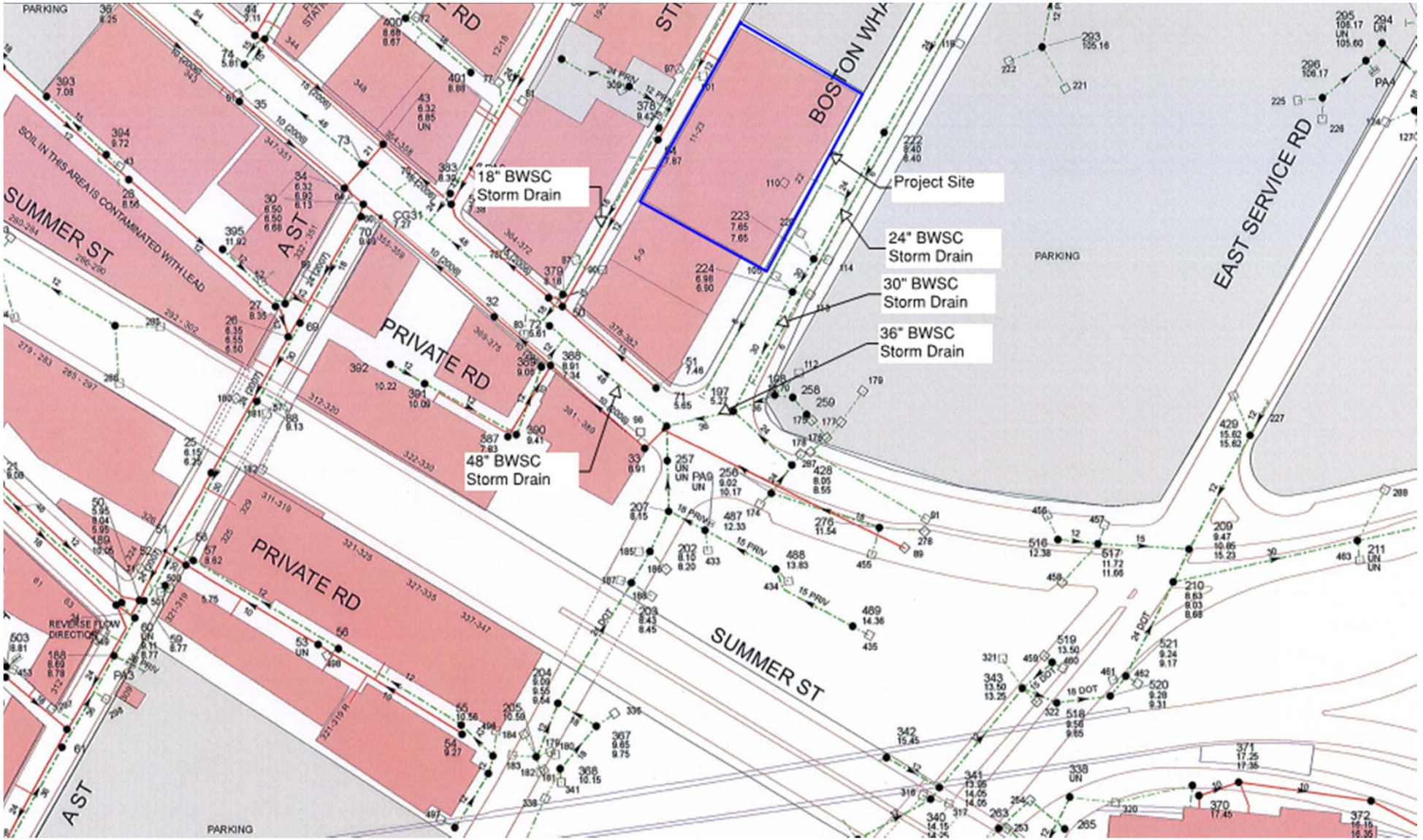
In the Project area, existing BWSC storm drain mains are located in Boston Wharf Road, Congress Street, and Stillings Street (see Figure 3-9). The existing 48-inch storm drain in Congress Street flows west. There is a 24-inch drain main in Boston Wharf Road which flows south, and the drain main increases in size to a 30-inch main and then a 36-inch main before eventually discharging to the 48-inch drain main in Congress Street. There is a 24-inch drain main in Stillings Street flowing south with also discharges to the 48-inch drain main in Congress Street. The 48-inch drain main eventually discharges to Boston Harbor.

The existing building is serviced by a 10-inch storm drain service connecting to the 24-inch drain main in Boston Wharf Road.

3.6.2 Proposed Storm Drain System

The existing Project site is covered by impervious roof area, and the Project will not change land cover on the site. As a result, existing peak rates and volumes of stormwater discharge and stormwater runoff from the site will be maintained in the proposed conditions. Stormwater runoff from the roof area is considered clean, and therefore it is not necessary for the Project to treat roof runoff prior to discharge into the municipal storm drain system.

The existing storm drainage service to the building is adequately sized for the Project, and will be video inspected to determine if the pipes are suitable for reuse. The existing storm drain service for the Project will either be maintained, or new services will connect to the existing drain main(s) located in Congress Street, Boston Wharf Road, and/or Stillings Street.



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Nitsch Engineering

Figure 3-9

Existing Storm Drain System Map

If storm drain service improvements are required as part of the Project, the improvements and connections to BWSC infrastructure will be reviewed as part of the BWSC's site plan review process. The process will include a comprehensive design review of the proposed service connections, and an assessment of Project demands and system capacity.

3.6.3 Water Quality Impact

The Project will not affect water quality in nearby water bodies. Erosion and sediment control measures will be implemented during construction to minimize transport of site soils to off-site areas and BWSC storm drain systems. During construction, existing catch basins will be protected with filter fabric, straw bales, and/or crushed stone to remove sediment from. These controls will be inspected and maintained throughout the construction phase until areas of disturbance have been stabilized through placement of pavement, structure, or vegetative cover.

Dewatering is not anticipated to be required, as all improvements associated with the Project are above grade. However, if required, all necessary dewatering will be conducted in accordance with applicable Massachusetts Water Resources Authority (MWRA) and BWSC discharge permits. Once construction is complete, the Project will be in compliance with local and state stormwater management policies, as described below.

3.6.4 Compliance with Stormwater Management Policy Standards

In March 1997, MassDEP adopted a new Stormwater Management Policy to address non-point source pollution and published the Massachusetts Stormwater Handbook as guidance on the Stormwater Policy, which was revised in February 2008. The Policy prescribes specific stormwater management standards for development projects, including urban pollutant removal criteria for projects that may impact environmental resource areas. Compliance is achieved through the implementation of Best Management Practices (BMPs) in the stormwater management design. The Policy is administered locally pursuant to MGL Ch. 131, s. 40.

A brief explanation of each Policy Standard and the system compliance related to this Project is provided below.

Standard #1: No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Compliance: The proposed design will comply with this Standard. No new untreated stormwater will be directly discharged to, nor will erosion be caused to, wetlands or waters of the Commonwealth as a result of stormwater discharges related to the Project.

Standard #2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR.

Compliance: The proposed design will comply with this Standard. The post-development peak discharge rates will not exceed the pre-development peak discharge rates; the surface cover will not change as part of the Project, therefore the existing discharge rates will be maintained in the proposed conditions.

Standard #3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Compliance: The Project is a redevelopment project, and will comply with this standard to the maximum extent practicable.

Standard #4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a. *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*

b. *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*

c. *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Compliance: The proposed design will comply with this standard. Within the Project's limit of work, the parcel will be entirely comprised of roof area, and therefore stormwater runoff from the Project site does not require water quality treatment prior to discharge. The Project will not have an impact on stormwater runoff quality. The Project storm drain service will not discharge to a combined sewer.

Standard #5: For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Compliance: The proposed design will comply with this standard. The Project is not associated with Higher Potential Pollutant Loads (per the Policy, Volume I, page 1-6).

Standard #6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

Compliance: The proposed design will comply with this Standard. The Project will not discharge untreated stormwater to a sensitive area or any other area.

Standard #7: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

Compliance: The proposed design will comply with this Standard. The Project complies with the Stormwater Management Standards as applicable to the redevelopment.

Standard #8: A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

Compliance: The Project will comply with this standard. Sedimentation and erosion controls will be incorporated as part of the design of these projects and employed during construction.

Standard 9: A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Compliance: The Project will comply with this standard. An O&M Plan including long-term BMP operation requirements will be prepared for the proposed Project and will assure proper maintenance and functioning of the stormwater management system.

Standard 10: All illicit discharges to the stormwater management system are prohibited.

Compliance: The Project will comply with this standard. There will be no illicit connections associated with the proposed Project.

3.7 Groundwater

The Project parcel is located within the City of Boston's Groundwater Conservation Overlay District (GCOD), which is protected by Article 32 of the Boston Zoning Code, the purpose of which is to prevent deterioration of and, where necessary, promote the restoration of, groundwater levels in the city of Boston, to protect and enhance the city's historic neighborhoods and structures, reduce surface water runoff and water pollution, and maintain public safety.

The Project is not subject to the requirements of the article, since the Project site is located in the South Boston District, Sub District M-4 per the Boston Redevelopment Authority (BRA) online zoning map. Per section 32-4, an Applicant located in the South Boston district is subject to requirements of the article where such applicant seeks:

a. The erection or extension of any structure, where such new structure or extension will occupy more than fifty (50) square feet of lot area.

   The Project does not include an expansion that will occupy more than fifty (50) feet of the lot area; the Project includes vertical expansion of the existing building.

b. The erection or extension of any structure designed or used for human occupancy or access, mechanical equipment, or laundry or storage facilities, including garage space, if such construction involves the excavation below grade to a depth equal to or below seven (7) feet above Boston City Base (other than where such excavation is necessary for, and to the extent limited to, compliance with the requirements of this article).

   The Project does not include excavation below grade. All work will be above the foundation of the existing building.

3.8 Solid and Hazardous Waste

The Proponent estimates that stabilized (100% occupancy) generation of trash and recycling for the completed Project will consist of:

- Approximately 15 yards per week (Monday – Friday) of trash; and
- Approximately 10 yards per week (Monday – Friday) of recycling.

The Proponent intends to put a single-stream recycling program in place for the entire building.

There are no hazardous wastes generated or stored on-site.

3.9 Noise

The City of Boston has both a noise ordinance and noise regulations relating to this Project. Chapter 16 §26 of the Boston Municipal Code sets general standard for noise that is unreasonable or excessive: louder than 50 decibels between the hours of 11:00 p.m. and 7:00 a.m., or louder than 70 decibels at all other hours. The Boston Air Pollution Control Commission (APCC) has adopted regulations based on the City's ordinance, "Regulations for the Control of Noise in the City of Boston", which distinguish among residential, business, and industrial districts in the city. In particular, APCC Regulation 2 is applicable to sounds from the proposed Project and is considered in this noise study.

Table 3-7 presents the "Zoning District Noise Standards" contained in Regulation 2.5 of the APCC "Regulations for the Control of Noise in the City of Boston," adopted December 17, 1976. These maximum allowable sound pressure levels apply at the property line of the receiving property. The "Residential" limits apply to any lot located within a residential zoning district or to any residential use located in another zone except an industrial zoning district, for which the "Residential-Industrial" limits apply, according to Regulation 2.2. Similarly, per Regulation 2.3, "Business" limits apply to any lot located within a business zoning district not in residential or institutional use.

Table 3-7 City Noise Standards, Maximum Allowable Sound Pressure Levels

Octave-band Center	*Residential Zoning District*		*Residential Industrial Zoning District*		*Business Zoning District*	*Industrial Zoning District*
Frequency (Hz)	**Daytime (dB)**	**All Other Times (dB)**	**Daytime (dB)**	**All Other Times (dB)**	**Anytime (dB)**	**Anytime (dB)**
32	76	68	79	72	79	83
63	75	67	78	71	78	82
125	69	61	73	65	73	77
250	62	52	68	57	68	73
500	56	46	62	51	62	67
1000	50	40	56	45	56	61
2000	45	33	51	39	51	57
4000	40	28	47	34	47	53
8000	38	26	44	32	44	50
A-Weighted (dBA)	**60**	**50**	**65**	**55**	**65**	**70**
Notes:	1. Noise standards from Regulation 2.5 "Zoning District Noise Standards", City of Boston Air Pollution Control Commission, "Regulations for the Control of Noise in the City of Boston", adopted December 17, 1976. 2. All standards apply at the property line of the receiving property. 3. dB and dBA based on a reference pressure of 20 micropascals. 4. Daytime refers to the period between 7:00 a.m. and 6:00 p.m. daily, except Sunday.					

In addition, MassDEP has the authority to regulate noise under 310 CMR 7.10, which is part of the Commonwealth's air pollution control regulations. Under the MassDEP regulations, noise is considered to be an air contaminant and, thus, 310 CMR 7.10 prohibits "unnecessary emissions" of noise. MassDEP administers this regulation through Noise Policy DAQC 90-001, dated February 1, 1990, which limits new noise-generating equipment to a 10-dBA increase in the ambient sound level measured at the property line and at the nearest residences. The ambient level is defined as the background A-weighted sound level that is exceeded 90% of the time (L_{90}), measured during equipment operating hours. For new noise-generating equipment which will or could operate 24-hours per day, the ambient level typically occurs during the quietest nighttime period (midnight to 4 a.m.). The MassDEP policy further prohibits "pure tone" conditions where the sound pressure level in any octave-band center frequency is at least 3 dB greater than the sound levels in each of the two adjacent bands.

The proposed Project, consisting of the addition of two floors of office space and a rooftop mechanical penthouse at 22 Boston Wharf Road, is expected to include the removal and replacement of the following pieces of noise-producing mechanical equipment:

- Air Distribution System: Removal of six (6) 10,000 to 14,000 CFM roof-mounted Air Handling Units (AHUs) with DX cooling and gas-fired furnaces, to be replaced with either:
    - Four (4) new 30,000 CFM/90 TON roof-mounted variable air volume (VAV) air-cooled DX units with natural gas furnaces; or
    - Two (2) new 15,000 CFM/37 TON roof-mounted dedicated outside air systems (DOAS) with DX cooling and gas furnaces, and a high-efficiency 170 TON air cooled chiller.
- Boilers: Removal of eight (8) boiler modules with a combined capacity of 1,920 MBH and associated pumps located on and above the 8th floor, to be replaced with three (3) new 1,000 MBH gas-fired condensing boilers and two (2) pumps located in the proposed penthouse.
- Exhaust System:
    - Removal of one (1) 1,500 CFM roof-mounted bathroom exhaust fan, to be replaced with one (1) new 4,500 CFM roof-mounted bathroom exhaust fan.
    - Removal of one (1) 3,160 CFM roof-mounted electrical room exhaust fan, to be replaced with one (1) new 6,000 CFM roof-mounted electrical room exhaust fan.

A stairwell pressurization fan and a fire-pump to be removed and replaced will be used only in the event of an emergency and are not considered primary sources of steady mechanical noise. There is an existing standby generator located on the ground floor with an exhaust flue discharging through the second level wall on the north side of the building. No replacement of this emergency unit is anticipated as part of this Project.

With regard to the air distribution system, a replacement of the existing air handling units with VAV rooftop units, while increasing cooling capacity (and therefore sound level), will reduce the total number of noise-producing components. If instead the existing system is replaced with a DOAS, the cooling capacity (and sound level) of each unit will likely be comparable to the equipment being removed and the total number of rooftop units will decrease. Existing boilers previously located on the upper floors will be replaced with fewer, more efficient units of similar capacity housed within the proposed penthouse. As such, sound levels from the new boiler plant are likely to be equal to or less than those from the existing plant, and are not expected to contribute significantly to overall sound levels from the Project. The bathroom and electrical exhaust fans to be removed may be slightly lower in nominal sound power output than their higher capacity replacements. However, due to their age and condition, sound levels from the replacement fans may in fact be comparable. In either case, both exhaust fans are relatively small in capacity and not likely to contribute greatly to the overall sound levels in the community.

Due to the proposed two-floor addition, the mechanical equipment to be located on the new roof and within the mechanical penthouse will be higher in elevation above the ground than the existing equipment being replaced. As a result, the distance between the new equipment and the nearest receptors will increase, serving to reduce sound level impacts from the Project.

Based on an examination of MassGIS aerial photography and zoning maps of the Project area provided by the BRA, land uses surrounding the existing parking garage and office building located at 22 Boston Wharf Road consist of residential, commercial, and industrial buildings. Parcels immediately adjacent to the Project include a park to the north, apartments to the west, offices to the south, and a surface parking lot to the east. The larger Project area consists of condominiums, hotels, museums, government buildings, offices, garages, and industrial parks. Based on previous measurement programs, existing background sound levels in the area surrounding the Project are expected to range between approximately 50 and 60 dBA during the quietest nighttime hours, likely at or above the City of Boston "Residential" and "Residential-Industrial" noise standards without any contribution from the Project. Typical noise sources including vehicle traffic, pedestrian activity, mechanical equipment, aircraft flyovers, and daytime construction may be expected within the Project area.

While the details and exact locations of the mechanical equipment associated with this Project have not yet been precisely determined, based on a review of the proposed Project, steady operational noise from stationary sources primarily generated by rooftop and penthouse equipment are likely to be equal to or less than current sound levels from existing equipment. Due to the location of the Project within an industrial zone characterized by relatively high background sound levels, the fact that the new mechanical equipment proposed will be replacing existing older units, and the fact that the new equipment will be located further away from nearby receptors, a detailed sound level assessment has not been performed.

At this time, the mechanical equipment proposed is conceptual in nature and, during the final design phase of the Project, will be specified to meet the applicable City of Boston and MassDEP noise limits. Reasonable efforts will be made, if necessary, to minimize noise impacts from the Project using routinely employed methods of noise control, including:

- Selection of "low-noise" equipment models;
- Siting of noisy equipment at locations that protect sensitive receptors by shielding from the proposed mechanical penthouse;
- Fitting of acoustical louvers on inlet and discharge vents where necessary;
- Use of sound-attenuating enclosures and/or acoustical blankets on continuously operating equipment with outdoor exposure, if needed; and

- Installation of screening barriers to provide shielding where appropriate.

In summary, due to its location and limited scale, the proposed Project is not expected to result in adverse noise impacts at nearby sensitive receptors. Short-term, intermittent increases in sound levels will occur during construction. However, every reasonable effort will be made to minimize noise impacts and ensure the Project complies with all applicable limits.

3.10 Construction Impacts

A Construction Management Plan in compliance with the City's Construction Management Program (CMP) will be submitted to the Boston Transportation Department (BTD) once final plans are developed and the construction schedule is determined. The CMP will include detailed information on construction activities, specific construction mitigation measures, and construction materials, access and staging area plans to minimize impacts to abutters and the local community. The construction contractor will be required to comply with the details and conditions of the approved CMP.

3.10.1 Construction schedule

Construction of the Project is estimated to last approximately 12 months, with initial site work expected to begin in March 2016.

The City of Boston allows construction work from 7:00 AM to 6:00 PM Monday through Friday, and construction outside of those hours requires a permit. Typical construction hours for the Project will be in compliance with the City's regulations, with no work anticipated on the weekends. In the event that weekend work is necessary, the Proponent will obtain required City approvals.

The construction contractor will be responsible for coordinating construction activities during all phases of construction with City of Boston agencies to minimize potential scheduling and construction conflicts with other ongoing construction projects in the area.

3.10.2 Demolition

The demolition scope required to add two floors to the 22 Boston Wharf Road building will include removal of an existing rooftop mechanical room, all roof-mounted mechanical equipment, roof membrane and associated insulation, selective removal of metal roof deck for structural tie in, and removal of existing parapets. The extension of the vertical transportation systems will require removal of existing roofs and copings at all stairs and elevators. The proposed pedestrian entry to the parking garage on Boston Wharf Road will require removal of one existing window and the demolition of an interior partition wall to accommodate an access door. Fenestration enhancements to the existing 7th and 8th floors will require the selective removal of concrete masonry units and interior stud walls to

accommodate new punched windows. Mechanical system upgrades will require selective removal of ducts and associated equipment.

Demolition debris will be disposed of at a properly licensed solid waste disposal facility. Concrete, brick, and asphalt will be separated for crushing and possible re-use on site. If any asbestos containing materials are identified, they will be treated as a special waste in accordance with Massachusetts Department of Environmental Protection (MassDEP) guidelines.

3.10.3 Construction Staging, Public Safety, and Access

Construction truck access to the Project site will be outlined in the CMP to be filed with BTD in accordance with the City's transportation maintenance plan requirements. Staging for the Project is anticipated to start in March 2016.

The Proponent will ensure that staging areas will be located to avoid and minimize impacts to pedestrian and vehicular flows. Secure fencing, signage, and covered walkways may be employed to ensure the safety and efficiency of all pedestrian and vehicular traffic flows. Sidewalk areas and walkways near construction activities will be well marked and lighted to protect pedestrians and ensure their safety. Pedestrian protection will be in place early in the construction process and will remain until construction is complete. When necessary, police details will be provided to facilitate traffic flow. Construction procedures will be designed to meet all OSHA safety standards for specific site construction activities.

3.10.4 Construction Air Quality

Construction activities may temporarily affect ambient air quality adjacent to the Project site. Generation of fugitive dust may result in localized increases in particulate levels, although since the Project does not involve extensive or deep excavations, air quality impacts associated with fugitive dust are anticipated to be minimal.

The construction contract will provide for a number of strictly enforced measures to be utilized by contractors to reduce potential emissions and minimize impacts. These are expected to include:

- Using wetting agents on areas of exposed soil on a scheduled basis;
- Using covered trucks;
- Minimizing spoils on the construction site;
- Monitoring actual construction practices to minimize unnecessary transfers and mechanical disturbances of loose materials;
- Minimizing storage of debris on-site; and

- Periodically cleaning streets and sidewalks with water to minimize dust.

3.10.5 Construction Noise

The Proponent is committed to mitigate noise impacts from construction of the Project. Increased community sound levels, however, are an inherent consequence of construction activities. Construction work will comply with requirements of the City of Boston Noise Ordinance. Reasonable efforts will be made to minimize the noise impact of construction activities.

Mitigation measures are expected to include:

- Instituting a proactive program to ensure compliance with the City of Boston noise limitation policy;
- Using appropriate mufflers on equipment and ongoing maintenance of intake and exhaust mufflers;
- Installing muffling enclosures on continuously running equipment, such as air compressors and welding generators;
- Replacing specific construction operations and techniques by less noisy ones where feasible;
- Selecting the quietest of equipment alternatives where feasible;
- Scheduling equipment operations to keep average noise levels low, to synchronize the noisiest operations with times of highest ambient levels, and to maintain relatively uniform noise levels;
- Turning off idling equipment; and
- Locating noisy equipment to protect sensitive receptors by shielding or distance.

3.10.6 Traffic Control and Construction Management Plan

Details of the overall construction schedule, working hours, number of construction workers, worker transportation and parking, number of construction vehicles, and routes will be addressed in detail in a Construction Management Plan to be filed with BTD in accordance with the City's transportation maintenance plan requirements.

The number of workers required during the construction period will vary, depending on the phase of construction. Because the construction workers will arrive and depart prior to peak traffic periods, construction trips are not expected to impact local traffic conditions.

To reduce vehicle trips to and from the construction site, all workers will be strongly encouraged to use public transportation. Space on-site will be made available for workers' supplies and tools so they do not have to be brought to the site each day.

Specific delivery truck access routes will be established in consultation with the BTD through its approval of the CMP required for the Project. Construction contracts will include clauses restricting truck travel to primary roads. Enforcement of truck routes will be accomplished through clauses in the subcontractors' agreements.

3.10.7 Protection of Utilities

Existing public and private infrastructure located within nearby public rights-of-way will be protected during Project construction. If required, installation of proposed utility connections within public ways will be undertaken in accordance with BWSC, Boston Public Works Department, the Dig-Safe Program, and applicable utility company requirements. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer, or drain facilities will be reviewed by the BWSC as part of its Site Plan Review process. All necessary permits will be obtained before the commencement of work.

The Proponent will continue to work and coordinate with the BWSC and utility companies to ensure safe and coordinated utility operations in connection with the Project.

3.10.8 Generation and Disposal of Construction Debris

The Proponent will take an active role with regard to the reprocessing and recycling of construction waste. The disposal contract will include specific requirements ensuring that construction procedures allow for sufficient space for materials segregation, reprocessing, reuse, and recycling. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per MassDEP Regulations for Solid Waste Facilities (310 CMR 16.00). This requirement will be specific in the disposal contract.

Construction will be conducted so recyclable materials are segregated from those materials not recyclable to enable disposal at an approved solid waste facility.

Removal of any hazardous materials will be treated as special waste in accordance with MassDEP guidelines and addressed and disposed of accordingly. Lead and asbestos will be removed in accordance with applicable regulations.

3.10.9 Rodent Control

A rodent extermination certificate will be filed with the building permit application to the City. In compliance with City requirements, rodent inspection monitoring and treatment will be carried out before, during, and at the completion of all construction work for the proposed Project. Rodent extermination prior to work start-up will consist of treating areas throughout the site. Regular service visits will be made during construction.

3.10.10 National Pollutant Discharge Elimination System

The proposed Project does not involve the disturbance of over one acre; therefore, a National Pollutant Discharge Elimination System permit is not required from the U.S. Environmental Protection Agency.

Section 4.0

Sustainable Design and Climate Change

4.0 SUSTAINABLE DESIGN AND CLIMATE CHANGE

This section addresses sustainable design elements of the proposed Project and climate change preparedness.

4.1 Green Building

The Project team is committed to the advancement of sustainable and environmentally conscious design and construction. The Project embraces the opportunity to positively influence the urban environment. Its urban location takes advantage of existing infrastructure, while convenient access to public transportation will reduce dependence on single occupant vehicle trips and minimize transportation impacts.

Article 37 of the Boston Zoning Code requires that projects subject to Article 80B, Large Project Review, be Leadership in Energy and Environmental Design (LEED) certifiable. The Project will use the LEED for Core and Shell v2009 rating system to show Article 37 compliance. Presently, the Project is striving to achieve the Silver level of the LEED for Core and Shell v2009 rating system.

As part of the Concept Design phase, the Project team has identified a number of sustainable strategies within the LEED for Core and Shell v2009 rating system that will be developed and refined during detailed Project design. Given the early stage of the design process, some of these strategies are expected to evolve and change. The preliminary LEED Checklist is included at the end of this section. The Proponent will continue to research additional sustainable and energy efficient strategies as design progresses.

As part of the Project, the building's existing mechanical and HVAC systems will be upgraded, which is expected to increase the overall building's efficiency. During subsequent design phases, the Project team will further explore the feasibility and implementation of additional energy-reducing strategies, including lighting improvements, the use of high-albedo roofing materials, and employing an energy management system.

The Project team is anticipating achieving the Silver level of LEED under the LEED for Core and Shell rating system for 22 Boston Wharf Road by targeting 52 credit points, with an additional 9 to be studied. The Proponent's approach in each of the credit categories is described below.

4.1.1 Sustainable Sites

The proposed Project will place a two-story office addition onto the existing structure at 22 Boston Wharf Road. Located in the heart of the South Boston Innovation District and just south of the Seaport District, the Project site is in close proximity to public transportation and existing infrastructure, and is surrounded by a variety of basic services. The site is 0.2 miles from the MBTA Silver Line's Courthouse Station, and is a short walk from South

Station. Because the Project is adding office space to an existing building with zero lot lines, the Project will not introduce new parking to the site. The roof of the new addition will make use of high albedo materials to minimize the heat island effect. The Project will introduce ground-floor retail to the existing building to complement and enhance existing uses in the area. Adjacent to Q Park, the Project site offers tenants access to great community spaces.

Prerequisite 1, Construction Activity Pollution Prevention: The Construction Manager shall submit and implement an Erosion and Sedimentation Control (ESC) Plan for construction activities related to the demolition of existing conditions and construction of the new addition specific to this Project. The ESC Plan will conform to the erosion and sedimentation requirements of the 2012 EPA Construction General Permit and specific municipal requirements for the City of Boston.

Credit 1, Site Selection: The site is located on Boston Wharf Road in downtown Boston. The site is not prime farmland, undeveloped, or occupied by endangered species.

Credit 2, Development Density and Community Connectivity: The site is located within a developed urban area with a surrounding community that includes housing, restaurants, shops, parks, and other amenities within walking distance.

Credit 4.1, Alternative Transportation, Public Transportation Access: Two MBTA Silver Line rapid-transit bus stations are located within a half-mile of the site. The South Station rail station is also located within a one-half mile (see Figure 2-10).

Credit 4.3, Alternative Transportation, Fuel Efficient vehicles: Preferred parking will be designated for fuel-efficient vehicles as defined by LEED for 5% of the site's parking capacity.

Credit 4.4, Alternative Transportation, Parking Capacity: No new parking is being provided as part of the Project.

Credit 7.1, Heat Island Effect, Non-Roof: All on-site parking is located under the building structure.

Credit 7.2, Heat Island Effect, Roof: The roof will be a light colored, high albedo membrane roof product with a minimum SRI value of 78, which will cover a minimum of 75% of the building's total roof area.

Credit 8, Light Pollution Reduction: All interior lighting included as part of the project will be controlled to automatically shut off between 11pm and 5am.

Credit 9, Tenant Design and Construction Guidelines: Tenants will receive a Tenant Criteria Manual outlining the sustainable design and construction features incorporated into the building, as well as the overall sustainability goals and objectives for the tenant spaces.

4.1.2 Water Efficiency

The Proponent will strive for a water-efficient development by minimizing demand for water with non-invasive and drought-tolerant plant species. Plumbing fixtures will be specified to achieve a reduction in water use through low-flow water-closets, low-flow showers, and low-flow sinks.

Prerequisite 1, Water Use Reduction, 20% Reduction: Through the specification of low-flow and high efficiency plumbing fixtures, the building will implement water use reduction strategies that use, at a minimum, 20% less potable water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements.

4.1.3 Energy & Atmosphere

The Project team plans to optimize energy efficiency through an integrated approach to the building's envelope design and building systems. Attention will be focused on optimizing the new addition's massing and materials to address, as much as possible, optimal solar orientation, daylighting, and potential heat gain and loss.

Commissioning of the building's systems will be sought to ensure they are operating in accordance with design goals. Other design strategies being explored to reduce energy consumption include updated mechanical and HVAC equipment and room occupancy sensors for lighting.

Prerequisite 1, Fundamental Commissioning of the Building Energy Systems: A Commissioning Agent (CxA) will be engaged by the owner for purposes of providing basic commissioning services for the building's energy-related systems including HVAC & R, lighting, and domestic hot water systems. The CxA will verify the building systems are installed, calibrated, and performing to the building owner's requirements and the Project team's basis of design.

Prerequisite 2, Minimum Energy Performance: The building's energy performance will be demonstrated through Option 3: Prescriptive Compliance Path: Advanced Buildings™ Core Performance™ Guide. The building will comply with Section 1: Design Process Strategies, and Section 2: Core Performance Requirements.

Prerequisite 3, Fundamental Refrigerant Management: Specifications for refrigerants used in the building's HVAC & R systems will not permit the use of CFC-based refrigerants. Any HVAC systems installed by tenants will also adhere to this requirement.

Credit 1, Optimize Energy Performance: Per EA Prerequisite 2, the building will comply with Section 1: Design Process Strategies, and Section 2: Core Performance Requirements of the Advanced Buildings™ Core Performance™ Guide.

Credit 4, Enhanced Refrigerant Management: HVAC&R equipment will minimize the emission of compounds that contribute to ozone depletion and climate change. Cooling equipment will be selected to minimize the total quantity of refrigerants.

Credit 5.1, Measurement and Verification, Base Building: The building will pursue Option 3, establish an account in Energy Star's Portfolio Manager tool to track and measure building performance.

4.1.4 Materials and Resources

The Project will use recycled materials to the extent practicable. Building component materials that use recycled content, have low emissions, and are locally produced will be specified.

Prerequisite 1, Storage and Collection of Recyclables: Storage of collected recyclables will be accommodated within the Project design, and tenants will bring their recyclables to a centrally-located trash and recycling storage room. Recyclables will be collected by a contracted waste management company on a regular basis.

Credits 1, Building Reuse – Maintain Existing Walls, Floors, and Roof: The Project will maintain at least 75% of the existing building's structure and envelope. The new addition is less than six times the square footage of the existing building.

Credit 2, Construction Waste Management: During construction, at least 75% of the construction waste generated will be diverted from the landfill.

Credits 4.1, Recycled Content 10% (post-consumer & ½ pre-consumer): Design specifications will require certain materials to include pre- and/or post-consumer recycled content. During construction, materials and products submittals will include documentation of the percentage of pre/post-consumer recycled content. The Construction Manager shall track the recycled content with a goal to achieve 10% recycled-content materials based on overall materials costs for the building.

Credits 6, Certified Wood: The Project team will incorporate the use of FSC-certified wood products. The Construction Manager will track all wood materials installed as part of the development, as well as invoicing documentation for all FSC certified products installed.

4.1.5 Indoor Environmental Quality

The Project team is committed to designing an indoor environment that provides a healthy quality of life for tenants and guests. Materials chosen for the Project such as adhesives, paints, and flooring, will be low-emitting. A construction Indoor Air Quality Management plan during construction and prior to occupancy will be developed. Green housekeeping practices will be deployed to support healthy indoor air quality after building occupancy.

Prerequisite 1, Minimum IAQ Performance: The building's mechanical systems will be designed to meet or exceed the requirements of ASHRAE Standard 62.1-2007 sections 4 through 7 and/or applicable building codes.

Prerequisite 2, Environmental Tobacco Smoke (ETS) Control: The public spaces and common areas within the building will be non-smoking. In addition, smoking will be prohibited within 25 feet of all building openings and air intakes. These provisions will be written into tenant agreement letters and appropriate signage will be installed.

Credit 1, Outdoor Air Delivery Monitoring: New ventilation systems will include monitoring systems that provide feedback on performance to ensure that minimum design requirements are maintained. Monitoring equipment will generate an alarm when conditions vary by 10% or more from the set point.

Credit 3, Construction IAQ Management Plan, During Construction: The specifications will require the Construction Manager to develop an Indoor Air Quality Management Plan for the construction and pre-occupancy phases to meet/exceed the recommended Control Measures of the SMACNA IAQ Guidelines for Occupied Buildings Under Construction 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).

Credit 4.1, Low-Emitting Materials, Adhesives & Sealants: Design specifications will include requirements for adhesives and sealants to meet SCAQMD Rule #1168 volatile organic compound (VOC) limits. The Construction Manager will be required to track all products used to ensure compliance.

Credit 4.2, Low-Emitting Materials, Paints, and Coatings: The specifications will include requirements for paints and coatings to meet low-VOC criteria per Green Seal and SCAQMD for paints and coatings. The Construction Manager will be required to track all products used to ensure compliance.

Credit 4.3, Low-Emitting Materials, Flooring Systems: The specifications will include requirements for hard surface flooring materials to be Floor Score certified, and the Proponent will endeavor to have carpet systems comply with the Carpet Institute Green Label Program. The Construction Manager will be required to track all products used to ensure compliance.

Credit 4.4, Low Emitting Materials, Composite Wood, and Agrifiber Products: The Project will specify and install composite wood and agrifiber products that contain no added urea-formaldehyde. The Construction Manager will use only compliant composite wood materials.

Credit 5, Indoor Chemical and Pollutant Source Control: The Project team will design to minimize and control the entry of pollutants into the building through all permanent entryways. Copy rooms will be sufficiently exhausted to create negative pressure with respect to adjacent spaces.

Credit 8.2, Daylight & Views, Views for 90% of Spaces: The Project team intends to maximize views for all occupants by providing a direct line of site to the outdoors through the use of vision glazing located between 2'-6" and 7'-6" above finished flooring in 90% of all regularly occupied spaces. Once the final layout has been established, the views calculations will be performed to determine compliance.

4.1.6 Innovation & Design Process

Credit 1.1, Innovation In Design: The Project team anticipates achieving Exemplary Performance under credit, SSc7.1, Heat Island Effect - Non-Roof, as 100% of all parking is located under-structure.

Credit 1.2, Innovation In Design: The Project team anticipates achieving Exemplary Performance under credit SSc2, Development Density.

Credit 1.3, Innovation In Design: The Project team anticipates achieving Exemplary Performance under credit, SSc7.2, Heat Island Effect – Roof.

Credit 1.4, Innovation In Design: The Project team anticipates achieving an Innovation Credit for implementing Green Cleaning.

Credit 1.5, Innovation In Design: The Project team anticipates achieving an Innovation Credit for Educational Program/Public art/Public Education. The blank side wall of 22 Boston Wharf Road faces Q Park. In addition to adding windows for the office floors above, Berkeley envisions activating the remaining portion of the wall with ideas ranging from public art installations (similar to the vent building on the Greenway near South Station) to movie nights (a screen reminiscent of the convention center screen or District Hall with a wide variety of programming). The Proponent feels strongly about supporting art or a community cause through this activation of the wall, and will further develop these ideas and work toward an agreement with Q Park organizers in the upcoming months.

Credit 2, LEED Accredited Professional: A LEED AP will be part of the team to oversee the LEED process.

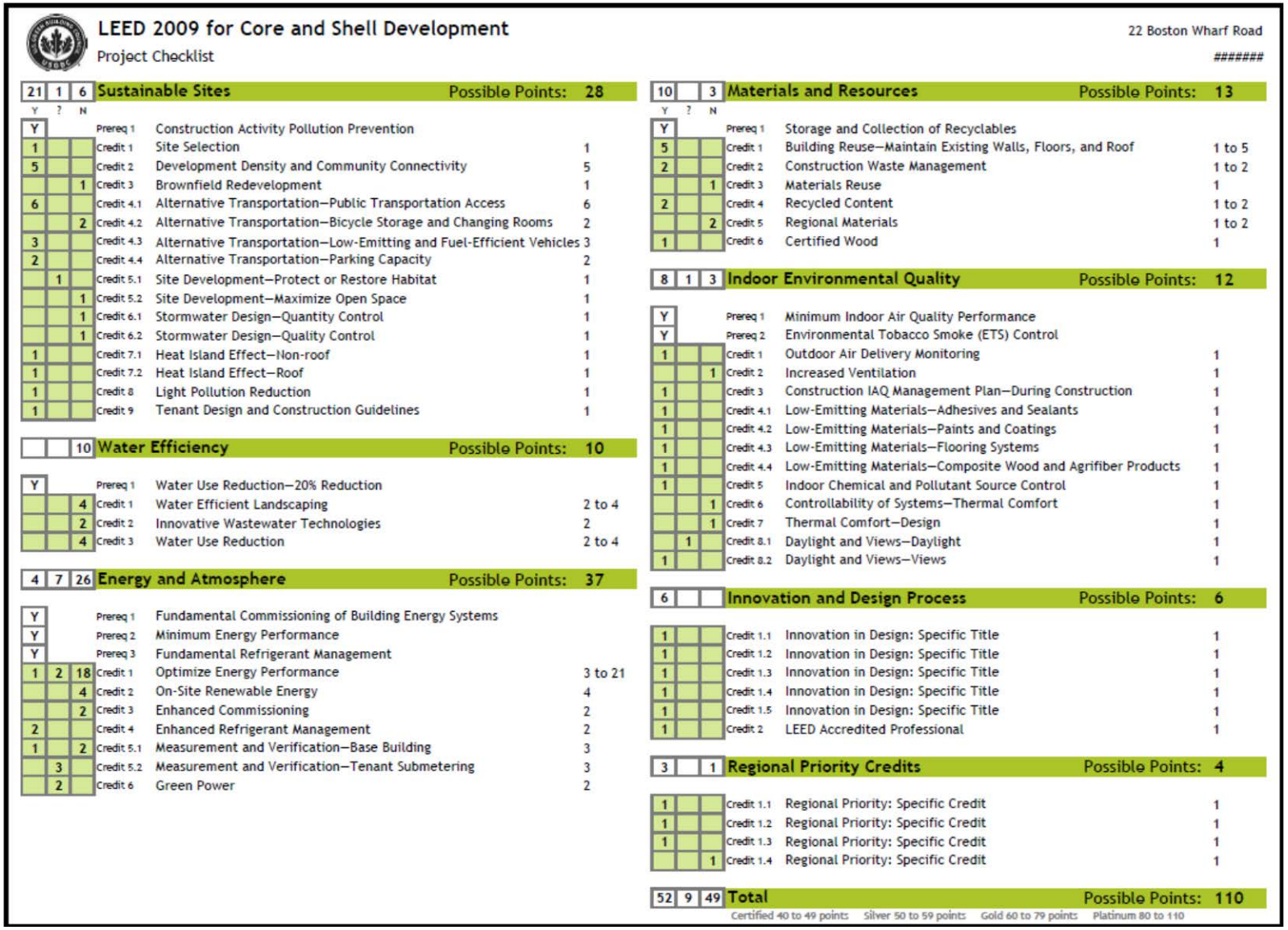
4.1.7 Regional Priority Credits

Regional Priority Credits (RPC) are established LEED credits designated by the USGBC to have priority for a particular area of the country.

For this Project, the available RPCs are:

- On-site renewable energy;
- Building reuse - maintain existing walls, floors and roof;
- Brownfield redevelopment;
- Stormwater Design – quality control;
- Heat island effect – nonroof; and
- Heat island effect – roof.

When a project team achieves one of the designated RPCs an additional credit is awarded. The Project team anticipates three RPCs: (1) MRc1 Building Reuse, (2) SSc7.1 Heat Island Effect, Non-Roof; and (3) SSc7.2 Heat Island Effect, Roof.



LEED 2009 for Core and Shell Development

Project Checklist

22 Boston Wharf Road

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Sustainable Sites — Possible Points: 28

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
		1	Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
		2	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	2
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
	1		Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
		1	Credit 6.1	Stormwater Design—Quantity Control	1
		1	Credit 6.2	Stormwater Design—Quality Control	1
1			Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
1			Credit 8	Light Pollution Reduction	1
1			Credit 9	Tenant Design and Construction Guidelines	1

Water Efficiency — Possible Points: 10

Y			Prereq 1	Water Use Reduction—20% Reduction	
		4	Credit 1	Water Efficient Landscaping	2 to 4
		2	Credit 2	Innovative Wastewater Technologies	2
		4	Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 37

Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
1	2	18	Credit 1	Optimize Energy Performance	3 to 21
		4	Credit 2	On-Site Renewable Energy	4
		2	Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
1		2	Credit 5.1	Measurement and Verification—Base Building	3
	3		Credit 5.2	Measurement and Verification—Tenant Submetering	3
	2		Credit 6	Green Power	2

Materials and Resources — Possible Points: 13

Y	?	N			
Y			Prereq 1	Storage and Collection of Recyclables	
5			Credit 1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 5
2			Credit 2	Construction Waste Management	1 to 2
		1	Credit 3	Materials Reuse	1
2			Credit 4	Recycled Content	1 to 2
		2	Credit 5	Regional Materials	1 to 2
1			Credit 6	Certified Wood	1

Indoor Environmental Quality — Possible Points: 12

Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
		1	Credit 2	Increased Ventilation	1
1			Credit 3	Construction IAQ Management Plan—During Construction	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
		1	Credit 6	Controllability of Systems—Thermal Comfort	1
		1	Credit 7	Thermal Comfort—Design	1
	1		Credit 8.1	Daylight and Views—Daylight	1
1			Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

1			Credit 1.1	Innovation in Design: Specific Title	1
1			Credit 1.2	Innovation in Design: Specific Title	1
1			Credit 1.3	Innovation in Design: Specific Title	1
1			Credit 1.4	Innovation in Design: Specific Title	1
1			Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

1			Credit 1.1	Regional Priority: Specific Credit	1
1			Credit 1.2	Regional Priority: Specific Credit	1
1			Credit 1.3	Regional Priority: Specific Credit	1
		1	Credit 1.4	Regional Priority: Specific Credit	1

Total — Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

4.2 Climate Change Preparedness

The Project team examined four areas of concern related to climate change: sea level rise, rain events, drought conditions and increased number of high-heat days. Due to the Project location, elevation and topography, impacts from rising sea levels coupled with increased heavy rain events are expected to impact the Project site. The Project has incorporated strategies to mitigate these and other events. These strategies are detailed below. A copy of the preliminary Climate Change Preparedness and Resiliency Checklist is included in Attachment E.

4.2.1 Sea Level Rise

The Project is located in the Preliminary FEMA floodplain. According to projections, water levels could rise anywhere from one to six feet over the next 100 years. Because of this, the Proponent will take measures to protect vital infrastructure from rising sea levels. The Project is a two-story addition to the top of an existing office building; this places it well above rising sea level. Building mechanicals will be located at the highest elevation possible to prevent exposure to flooding. Ground floor materials will be storm-proofed to the extent possible as part of this Project scope.

4.2.2 Rain Events

As a result of climate change, the northeast is expected to experience more frequent and intense storms. To mitigate this, the Proponent will take measures to minimize stormwater runoff and protect the Project's mechanical equipment. These measures include:

- Locating critical mechanical and electrical equipment at the highest elevation possible to prevent exposure to flood waters;
- Locating the backup generator on the roof; and
- Wastewater and stormwater back flow prevention.

4.2.3 Drought Conditions

Under a high emissions scenario that would increase the potential climate change impacts, the occurrence of droughts lasting one to three months could go up by as much as 75% over existing conditions by the end of the century. To minimize the Project's susceptibility to drought conditions, the project's minimal landscape design is anticipated to incorporate native and adaptive plant materials which require low or no irrigation and are known for their ability to withstand adverse conditions. In order to conserve water, plumbing fixtures will be specified to achieve a reduction in water use through low-flow water-closets, low-flow showers, and low-flow sinks.

4.2.4 High Heat Days

The Intergovernmental Panel on Climate Change (IPCC) has predicted that in Massachusetts the number of days with temperatures greater than 90°F will increase from the current five-to-twenty days annually, to thirty-to-sixty days annually[12].

The Project includes improvements to the existing structure and mechanical improvements that will improve the energy efficiency of the building. The new roof will make use of high albedo materials to minimize the heat island effect. Other design strategies being explored to reduce energy consumption include the use of an energy management system, and room occupancy sensors for lighting.

4.3 Renewable Energy

The Proponent will evaluate the potential for a roof-mounted solar photovoltaic (PV) system, and the availability of grants and renewables funding. The Project is in an urban environment surrounding by existing buildings and active construction of new buildings, the latter of which may cast shadow across the Project site through much of the day and year. This may limit the efficiency and cost effectiveness of a PV system.

[12] IPCC (Intergovernmental Panel on Climate Change), 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Avery, M. Tignor, and H. L. Miller (eds.)]. Cambridge University Press, Cambridge, UK, and New York, 996 pp.

Section 5.0

Urban Design

5.0 URBAN DESIGN

The urban design considerations for this Project are described in the following subsections.

5.1 Urban Context

The proposed two-story addition to the existing parking garage/office building is located at 22 Boston Wharf Road along the eastern edge of the Fort Point Channel Landmark District, within the Innovation District of South Boston, and just south of the Seaport. The immediate neighborhood is densely-built, with a traditional fabric of primarily masonry, timber frame buildings, and contemporary mid-rise office and residential buildings. The Project site is surrounded by active construction of new mid-rise/high-rise office and residential buildings to the southeast, which should be complemented by the addition of retail to this Project. Photographs of the existing building are provided as Figures 1-3a and 1-3b.

5.2 Immediate Neighborhood Context

The Project site is located on Boston Wharf Road between Seaport Boulevard and Congress Street at the border of the Fort Point Channel neighborhood and the Innovation District, an initiative to transform the South Boston Waterfront into an urban environment that fosters collaboration, innovation, and entrepreneurship. The site is surrounded by mixed-use buildings, residential buildings, and office buildings, while directly across Boston Wharf Road from the site is a surface parking lot partially under development as retail and office space, with future plans for another mid-rise office tower on the remaining portion. Directly adjacent to the Project site is Q Park, a public park with a playground, basketball court, and dog run. Scattered throughout the area are numerous restaurants and retail spaces, and District Hall, the result of a public-private partnership with the City of Boston, is located near the intersection of Boston Wharf Road and Seaport Boulevard.

The proposed addition to the 22 Boston Wharf Road building will contribute to the city's vision for the Innovation District by creating additional rentable space in the District.

5.3 Design Goals and Concept

Located on the border of the historic Fort Point Channel neighborhood and the developing Innovation District, the Project will remain visually distinct from the historic neighborhood while also respecting its fabric by building on the existing language of masonry, curtain wall, and metal panel. The northeast elevation of the existing building overlooking Q Park was originally designed as a building separation wall with no fenestration; the proposed Project will add windows on this wall to activate the northeast elevation and create a visual connection to the park.

The Project design is a rectangular shape that will extend the existing building footprint vertically. The existing massing of the roof access stair and elevator tower will extend above the two-story addition and will continue to provide a visual breakdown of the Boston Wharf Road elevation.

A separate canopied entry complimenting the aesthetic language of the existing building canopy will be created for Boston Wharf Road pedestrian access from the parking garage portion of the building.

5.4 Height and Massing

The proposed two-story addition will vary in height but will be predominantly two stories above the existing eight-story building with a total height of 131 feet above grade. The elevator overrun and stair tower will be 141 feet and 153 feet, respectively, above grade. This design fits within the context of surrounding buildings, which also vary in height but are generally low-rise buildings.

5.5 Character and Materials

The proposed two-story addition will be primarily glass curtain wall with metal panel. Material selections will be consistent with existing materials. Projecting elements, such as the roof cornice, will be clad in aluminum panels. The curtain wall will be aluminum.

5.6 Open Space, Pedestrian Ways, and Amenities

Existing open space and pedestrian ways will not change with the addition of two stories to the existing building. The parking garage will continue to offer public parking with vehicular access from Stillings Street, where the existing primary pedestrian access will also remain. However, the proposed Project will add another main pedestrian entry to the parking garage from Boston Wharf Road, generally improving public pedestrian access to the garage. In addition, the Project will enhance ground-level amenities by introducing 3,000 square feet of retail, and will activate the public realm by adding windows to the building wall adjacent to Q Park.

Section 6.0

Historic and Archaeological Resources

6.0 HISTORIC AND ARCHAEOLOGICAL RESOURCES

This section describes the historic and archaeological resources within and adjacent to the Project site and the potential effects of the Project on these resources.

6.1 Historic Resources in the Vicinity

The Project site is located within the City of Boston's Fort Point Channel Landmark District (FPCLD), and is subject to design review approval by the FPCLD Commission. The Project site is also located within the Fort Point Channel Historic District, a district listed in the National Register of Historic Places. The Fort Point Channel District is significant for its associations with the land-making and real estate development in the late 19th and early 20th centuries in Boston and as an excellent example of urban loft districts developed in and near city centers in the United States.

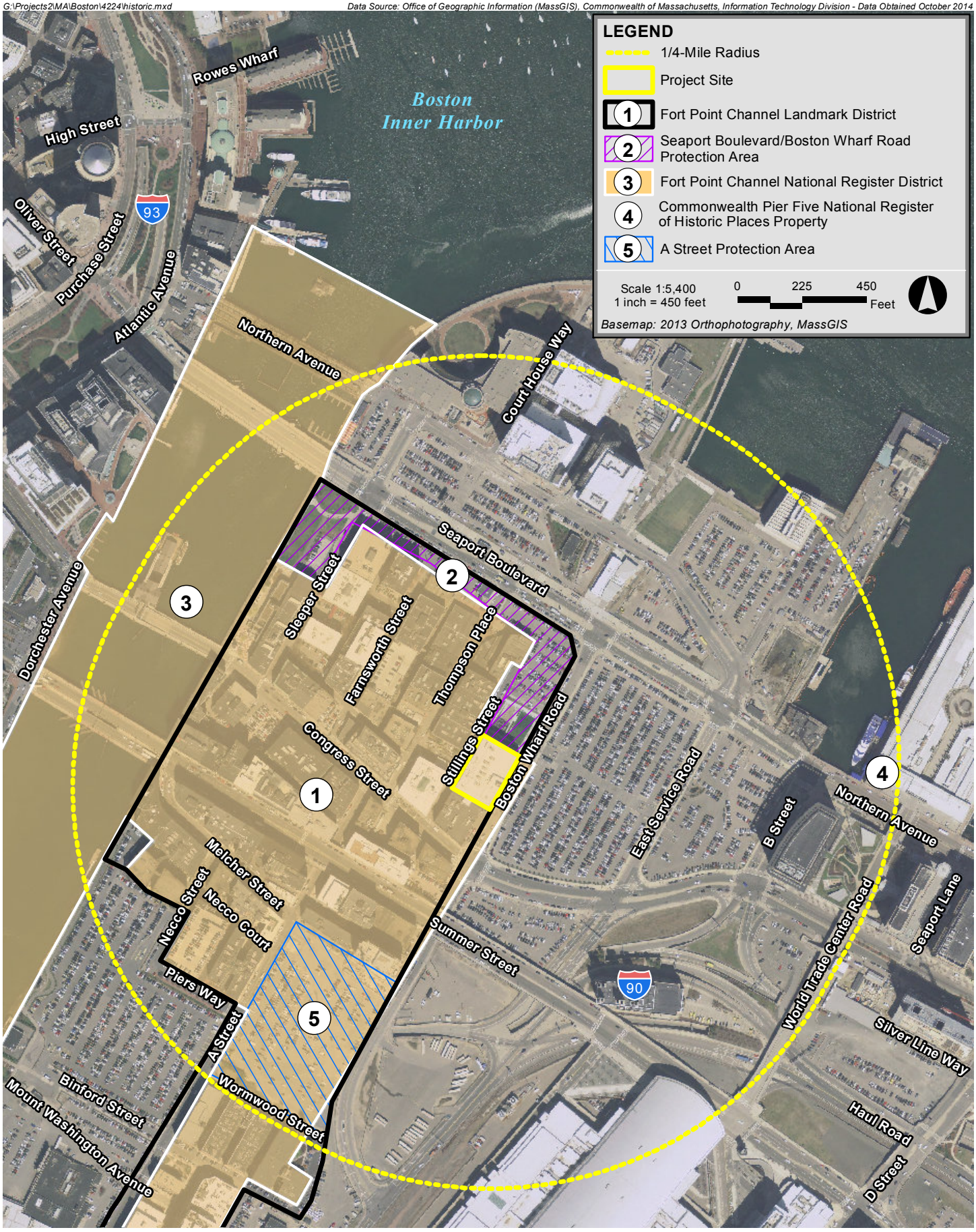
In the mid-1830s and early 20th century, the neighborhood was created by a landfill constructed by the Boston Wharf Company, the private wharf and real estate development company responsible for the creation of roughly 96 acres of land to form South Boston. The company laid out streets, sewers, and built structures to sell or lease. The district's business focused on water transportation and industry until shifting in recent decades.

In addition to the FPCLD and National Register District, the Project site is located in the vicinity of several additional historic resources listed in the State and National Registers. Table 6-1 and Figure 6-1 identify State and National Register-listed resources located in the Project vicinity.

Table 6-1 Historic Resources in the Project Vicinity

Map	*State/National Register-Listed Properties & Historic Districts*	*Address*	*Designation*
1	The Fort Point Channel Landmark District	Between Seaport Boulevard, Boston Wharf Road, Medallion Avenue, Iron Street, A Street, Piers Way, and Fort Point Channel	State Register-listed, Boston Landmark
2	Seaport Boulevard/Boston Wharf Road Protection Area	Seaport Boulevard. =/Boston Wharf Road	State Register-listed
3	Fort Point Channel Historic District	Roughly bounded by the Fort Point Channel seawalls, the Northern Avenue Bridge, Seaport Boulevard, Stillings, Midway, and A Streets and Necco Court	State and National Register- listed
4	Commonwealth Pier Five	165 Northern Avenue	State Register- listed
5	A Street Protection Area	"A" Street, Wormwood, Melcher Street, and West Service Road	State Register -listed

Data Source: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division - Data Obtained October 2014



22 Boston Wharf Road Boston, Massachusetts

Epsilon Associates Inc.

Figure 6-1
Historic Resources

6.2 Impacts to Historic Resources

6.2.1 Design and Visual Impacts

The Project site is approximately 30,893 square feet located at 22 Boston Wharf Road in Boston's FPCLD and National Register District. Located on Boston Wharf Road, the site is bounded by Stillings Street to the west, Boston Wharf Road to the east, Q Park to the north, and 374 Congress Street to the south. Currently, the site contains a building with six levels of partially enclosed parking and two upper floors of office space. The proposed Project consists of a two-story vertical expansion, with each new level containing approximately 28,000 square feet of office space, and a 1,000-square-foot rooftop mechanical penthouse. The existing structure will dictate the general massing and materials of the new vertical construction, and will complement the neighboring structures. The existing roof access stair and elevator tower will continue above the extension. The northeast elevation of the building, abutting Q Park, currently has no fenestration; the proposed windows for this elevation will create a visual link to the park. The current vehicle entrance at Stillings Street will remain, therefore not interfering with the streetscape of Stillings Street. Due to the Project being a vertical expansion, the overall streetscape will not be impacted, although the Project will introduce ground-level retail to part of the existing building. The current pedestrian ways and open spaces of the FPCLD and National Register District will be not be affected.

6.2.2 Shadow Impacts

While shadow impacts are inevitable, impacts to the FPCLD and National Register District will be minimal. As discussed in greater detail in Section 3.2, shadow studies were conducted to investigate impacts from the Project at four times of day (9:00 a.m., 12:00 noon, 3:00 p.m., and 6:00 p.m.) during each of the vernal equinox (March 21st), summer solstice (June 21st), autumnal equinox (September 21), and the winter solstice (December 21st).

As illustrated in Figures 3-1 and 3-2, new shadow from the Project will have a limited impact on the surrounding area. New shadow will be limited to portions of Stillings Street and Boston Wharf Road and the southern portion of the adjacent Q Park. Shadows will primarily impact rooftops and sidewalks of the surrounding area. These impacts will not have a significant impact on the historic or architectural qualities of the FPCLD or National Register District.

6.2.3 Archaeological Resources

The Project site consists of a previously developed urban parcel. The Project's scope of work does not involve extensive or deep excavations, and therefore no impacts to archaeological resources are anticipated as a result of the Project. No previously identified archaeological resources are located within the Project site or immediate vicinity.

6.3 Status of Project Reviews with Historical Agencies

6.3.1 Massachusetts Historical Commission Review

Because the Project will not utilize state or federal funds, or require state or federal licenses, permits or approvals, review by the Massachusetts Historical Commission (MHC) under the State Register Review (950 CMR 71.00) and/or Section 106 of the National Historic Preservation Act (36 CFR 800) is not required. In the event that state or federal funding is utilized, or state or federal licenses, permits or approvals are required, then an MHC Project Notification Form will be filed.

6.3.2 Fort Point Channel Landmark District Review

As noted above, the Project site is located within the FPCLD and subject to design review approval by the FPCLD Commission. At the appropriate time, an Application for a Certificate of Design Review approval will be submitted to the FPCLD Commission.

Section 7.0

Infrastructure

7.0 INFRASTRUCTURE

This section describes existing utilities surrounding the Project site, the connections required to provide service to the Project, and any impacts on the existing utility systems that may result from proposed construction. The following subsections address wastewater, water supply, natural gas, electricity, and telecommunications.

The Project includes the addition of two stories of office space and a mechanical penthouse to the existing building located at 22 Boston Wharf Road. The existing building is an eight-story building consisting of six stories of partially enclosed garage parking and two stories of office space. The existing building and building foundation will be maintained as part of the Project. The Project site is located on Boston Wharf Road, and the Project site is bound by Stillings Street to the west, Boston Wharf Road to the east, and Congress Street the south.

7.1 Wastewater

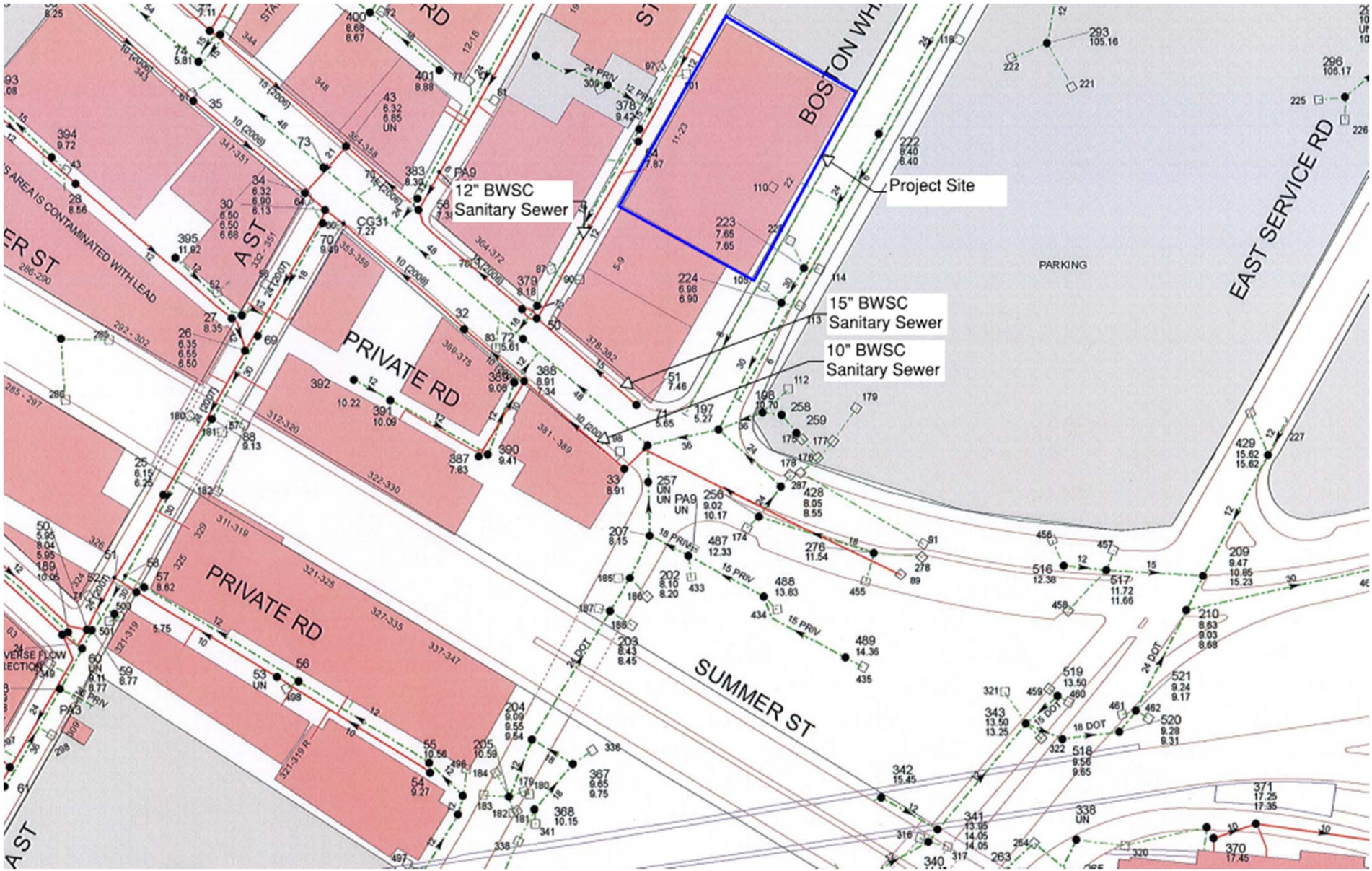
7.1.1 Sewer Infrastructure

Existing BWSC sanitary sewer mains are located in Stillings Street and Congress Street (see Figure 7-1). An existing 12-inch sewer main flows south in Stilling Street, and an existing 10-inch sanitary sewer main flowing south in Boston Wharf Road was constructed in fall 2014. An existing 15-inch sewer main flows west on the northern side of Congress Street, and a 10-inch sewer main flows west on the southern side of Congress Street. The sanitary sewer mains discharge into a 24-inch sewer main flowing south in A Street, which ultimately flows to the MWRA Deer Island Waste Water Treatment Plant for treatment and disposal.

The existing building is serviced by at least one sanitary sewer service, which is adequate to service the proposed addition.

7.1.2 Wastewater Generation

The Project's sewage generation rates were estimated using the Massachusetts Division of Water Pollution Control Sewer System Extension and Connection Permit Program from 310 CMR 15.00 and the proposed building program. 310 CMR 15.00 lists typical sewage generation values for building uses, and typical generation values are conservative values for estimating sewage flows from new construction. 310 CMR 15.00 sewage generation values are used to evaluate new sewage flows or an increase in flows to existing connections. The existing site consists of two floors of office space, and the Project will add two floors or office space as well as a rooftop mechanical penthouse. Table 7-1 describes the existing and proposed sewage generation in gallons per day (gpd) for the Project.



22 Boston Wharf Road **Boston, Massachusetts**

Nitsch Engineering

Figure 7-1

Existing Sanitary Sewer System Map

Table 7-1 Existing and Proposed Wastewater Generation

	Room Use	*Size (sf)*	*310 CMR Value (gpd/unit)*	*Total Flow (gpd)*
Existing	Office Space (2 Stories)	55,095	75/1,000 sf	4,200
	Garage Space (6 Stories)	179,483	N/A	-
			Total	*4,200*
Proposed	Office Space (4 Stories)	109,807	75/1,000 sf	8,236
	Retail	3,000	50/1,000 sf	150
	Garage Space (6 Stories)	176,483	N/A	-
	Mechanical Space (penthouse)	1,000	N/A	-
			Total	*8,386*
			Difference	*4,186*

As shown in Table 7-1, the total increase in sanitary flow as a result of the Project is estimated to be 4,186 gpd.

7.1.3 Sewage Capacity and Impacts

The Project's impact on existing BWSC sanitary systems in Stillings Street and Congress Street was analyzed and existing sewer system capacity calculations are presented in Table 7-2.

Table 7-2 Sewer Hydraulic Capacity Analysis

Manhole (BWSC #)	*Length (ft)*	*Inv. (up)*	*Inv. (down)*	*Slope (%)*	*Dia. (inches)*	*Manning's Number*	*Flow Capacity (cfs)*	*Flow Capacity (MGD)*
Congress Street								
MH 51 to MH 43 (North)	384	7.46	6.85	0.2%	15	0.013	2.57	1.66
MH 33 to MH30 (South)	395	8.91	6.68	0.6%	10	0.013	1.65	1.06
						Minimum Flow Analyzed:	1.65	1.06
Stillings Street								
MH 54 to MH50	204	7.87	7.30	0.3%	12	0.013	0.82	0.53
						Minimum Flow Analyzed:	0.82	0.53

Notes: 1. Flow Calculations based on Manning Equation
2. Manhole numbers were taken from BWSC Sewer system Map.
3. Elevations refer to Boston City Base (BCB)

Table 7-2 indicates the hydraulic capacity of the 15-inch sanitary sewer in the northern side of Congress Street, the 10-inch sanitary sewer in the southern side of Congress Street, and the 12-inch sanitary sewer in Stillings Street. The minimum hydraulic capacity is 1.66 million gallons per day (MGD) or 2.57 cubic feet per second (cfs) for the 15-inch system in Congress Street, 1.06 MGD or 1.65 cfs for the 10-inch system in Congress Street, and 0.53 MGD or 0.82 cfs for the 12-inch system in Stillings Street.

Based on an average daily flow estimate for the Project of 8,386 gpd (or .008 MGD), an increase of 4,186 gpd (0.004 MGD) from the existing building and using a factor of safety of 10 (total estimate = 0.008 MGD x 10 = 0.08 MGD), no capacity problems are expected within the Congress Street or Stillings Street systems.

7.1.4 Proposed Conditions

The Proponent will coordinate with the BWSC on the design and capacity of the proposed connections to the sewer system. The Project is expected to generate an increase in wastewater flows of approximately 4,186 gallons per day, and approval for this increase will come from BWSC.

The existing sanitary sewer service to the building is adequately sized for the Project. Existing sanitary service pipes will be video inspected to determine their suitability for reuse. Existing sewer services for the Project will either be maintained or new sewer services will connect to the existing sanitary sewer mains located in Congress Street and/or within Stillings Street.

Improvements and connections to BWSC infrastructure will be reviewed as part of the BWSC's site plan review process for the Project. This process will include a comprehensive design review of the proposed service connections, an assessment of Project demands and system capacity, and the establishment of service accounts.

7.2 Water Supply

7.2.1 Existing Water Infrastructure

There are five water systems within the City, and these provide service to portions of the City based on ground surface elevation. The five systems are Southern Low (commonly known as low service), Southern High (commonly known as high service), Southern Extra High, Northern Low, and Northern High. Existing mains in the Project area are: a 12-inch Southern High Main and a 12-inch Southern Low Main in Boston Wharf Road; a 16-inch Southern Low Main and a 16-inch Southern High Main in Congress Street; and a12-inch Southern Low Main in Stillings Street. The existing water system is illustrated in Figure 7-2.

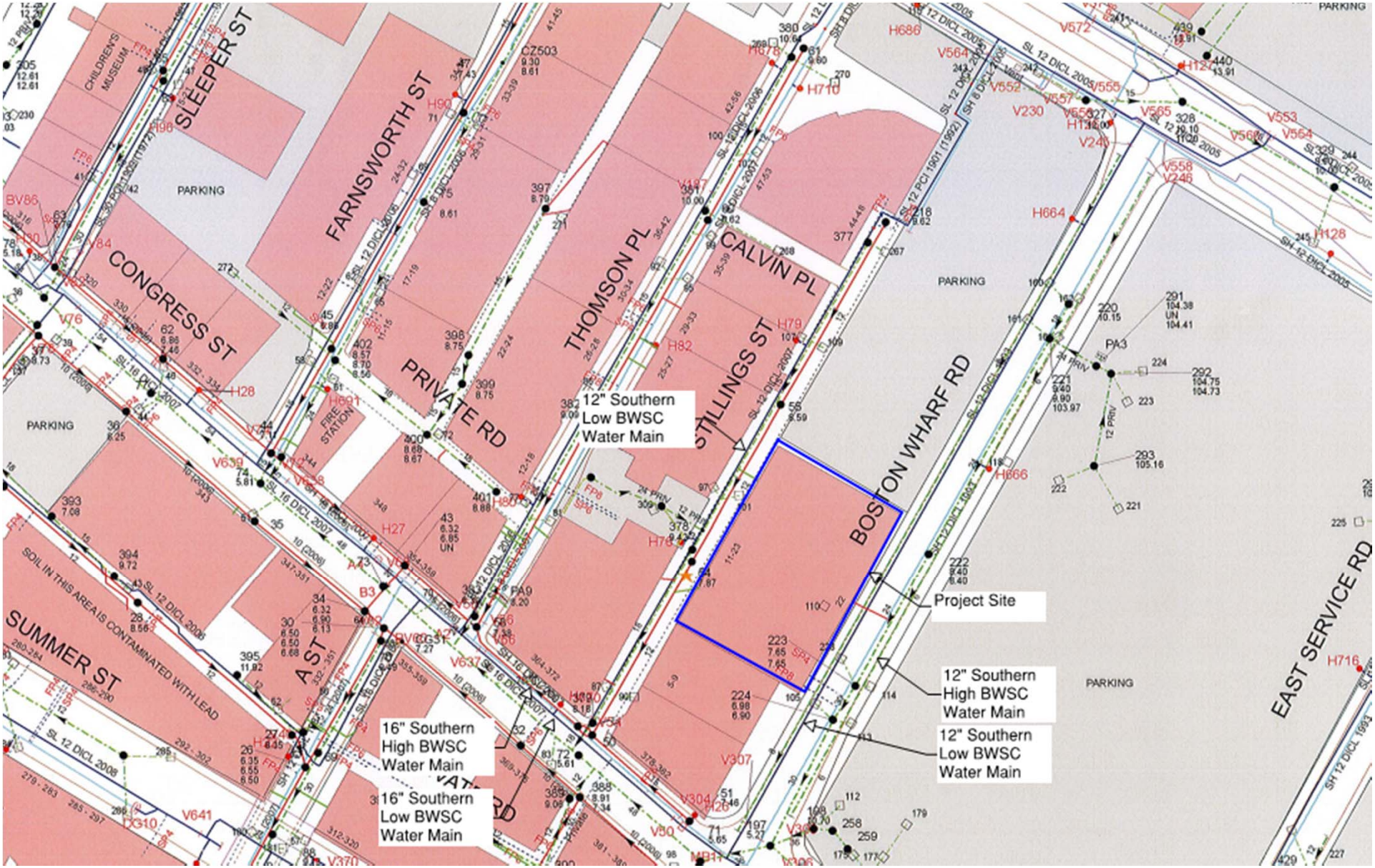
The existing building is serviced by domestic water and fire protection services. The existing domestic and fire protection service connections to the water main are adequate to service the Project in the proposed conditions.

7.2.2 Water Use

The Project's water demand estimate for domestic services is based on the Project's estimated sewage generation, described above, and the billing history for the existing building account, provided by BWSC.

The increase in average daily water demand associated with the Project is based on the Project's increase in estimated sewage generation. A conservative factor of 1.1 (10%) is applied to the increase in estimated average daily wastewater flows calculated with 310 CMR 15.00 values to account for consumption, system losses, and other usages to estimate an average daily water demand. The Project is estimated to increase water demand for the building by 4,605 gpd [4,186 gpd x 1.1 = 4,605 gpd].

The historical water use for the existing building is estimated to be between 360 gpd and 560 gpd. This estimate is based on the water meter billing history provided by BWSC for the existing account located at 22 Boston Wharf Road from January 2013 to April 2015. The billing history for the existing building water meter account (Account #145753000) is summarized in Table 7-3.



22 Boston Wharf Road **Boston, Massachusetts**

Nitsch Engineering

Figure 7-2

Existing Water System Map

Table 7-3 Existing Building Water Use

	Time Period	*Water Use (cubic feet - cf)*	*Total Days Metered*	*Water Use (cf/day)*	*Water Use (gpd)*
Minimum Water Use Recorded	1/2/15-2/2/15	1,580	31	51.0	381
Maximum Water Use Recorded	4/1/15-5/1/15	2,240	30	74.7	559
Average Water Use for 2014	1/2/14-1/2/15	21,260	365	58.2	436
Average Water Use for 2013	1/2/13-1/2/14	22,770	365	62.4	467

Note: Billing History for Account #14753000 provided by BWSC on May 12, 2015

7.2.3 Existing Water Infrastructure Capacity and Impacts

The Proponent requested BWSC record flow test data containing actual flow and pressure for hydrants within the vicinity of the Project site. Hydrant flow data were available for two hydrants near the Project site, as shown in Table 7-4. As the Project design progresses, the Proponent will request hydrant flows be conducted by BWSC adjacent to the Project.

Table 7-4 Existing Hydrant Flow Data

Flow Hydrant Number	*Date of Test*	*Static Pressure (psi)*	*Residual Pressure (psi)*	*Total Flow (gpm)*	*Flow (gpm) at 20 psi*	*Flow (gpm) at 10 psi*
H128 (Thomson Place	7/16/2012	103	96	2,350	8,933	9,499
H84 (Congress Street)	3/27/2007	106	100	2,004	8,400	8,956

Note: Data provided by BWSC on May 14, 2015

The existing domestic and fire protection service connections to the water main are adequate to service the Project and will be maintained as part of the Project. Water capacity problems are not anticipated within this system as a result of Project construction. If the existing services are determined to be inadequate for use, new domestic and/or fire protection services will be required for the Project. New services will connect to the existing BWSC water mains in Boston Wharf Road, Congress Street, and/or Stillings Street.

The existing water mains within and surrounding the Project site will be protected and maintained during construction.

7.2.4 Water Supply Conservation and Mitigation Measures

The Project design will incorporate measures intended to reduce water consumption such as aeration fixtures and appliances chosen for water conservation qualities. In public areas, sensor-operated faucets and toilets will be installed.

The State Building Code requires the use of water-conserving fixtures. Water conservation measures such as low-flow toilets and restricted flow faucets will help reduce the domestic water demand on the existing distribution system. The installation of sensor-operated sinks with water conserving aerators and sensor-operated toilets in all non-residential restrooms will be incorporated into the Project design.

7.3 Natural Gas

It is expected that the existing service and meter will have the capacity to support the additional connected load from the proposed Project. The additional load requirements for the natural gas system will require that the new connected load be verified with the local provider for capacity of the existing service and meter. The internal piping will be modified to suit the new gas-fired equipment.

7.4 Electricity

The addition of two floors will add approximately 350A of load to the building. Based on the estimated existing electrical load for the building of 692A, the addition of 350A will bring the total electrical load for the building to approximately 1,042A, which is well within the rating of Switchboard A of 2000A. While the utility transformer secondary conductors and service entrance switchboard are sized for 2000A, final confirmation with NSTAR that the utility-owned transformer is adequately sized to meet the additional load will be completed during final design.

7.5 Telecommunications

The building's primary tel/data service entrances are located in the Telecomm Carrier rooms A & B on the ground floor. The primary telephone/data cables enter the rooms from conduits embedded in the floor slab. Conduit risers serving the upper floors originate from these rooms. Telecommunications pathways will be re-used as required during final build-out.

Section 8.0

Coordination with other Governmental Agencies / Public Review Process

8.0 COORDINATION WITH OTHER GOVERNMENTAL AGENCIES / PUBLIC REVIEW PROCESS

8.1 Existing Tenant Outreach

There are two existing tenants in the current office space of 22 Boston Wharf Road. The Proponent is negotiating an agreement with one tenant that would allow them to vacate early, and the other tenant's lease expires in November, when the company will move to another building. Therefore, 22 Boston Wharf Road will be empty prior to the commencement of construction.

8.2 Community Outreach

The Proponent is committed to effective community outreach and will continue to engage the community to ensure public input on the Project. In addition to meeting with all abutting property owners, the Mayor's Office of Neighborhood Services, and City Councilor Bill Linehan, the Proponent has met with the following community groups:

- Fort Point Neighborhood Association (a meeting open to the public, and with invitations broadcast to area residents as well as the Fort Point Art Community); and
- Friends of Fort Point Channel.

The Proponent will meet with an Impact Advisory Group to be appointed by the BRA.

8.3 Architectural Access Board Requirements

The Project will comply with requirements of the Architectural Access Board and will be designed to comply with standards of the Americans with Disabilities Act.

8.4 Massachusetts Environmental Policy Act (MEPA)

The Project will not require any State actions, and therefore there is no MEPA jurisdiction over the Project. In addition, it will not exceed any review thresholds requiring environmental impact review by the Massachusetts Environmental Policy Act (MEPA) Office of the Massachusetts Executive Office of Energy and Environmental Affairs.

8.5 Massachusetts Historical Commission

The Project will not utilize state and federal funds, or require state or federal licenses, permits or approvals, therefore, review by the Massachusetts Historical Commission (MHC) under the State Register Review (950 CMR 71.00) and/or Section 106 of the National Historic Preservation Act (36 CFR 800) is not required. In the event that state or federal funding is utilized, or state or federal licenses, permits or approvals are required, then an MHC Project Notification Form will be filed.

8.6 Other Permits and Approvals

Boston Civic Design Commission

The Project will comply with applicable provisions of the Boston Zoning Code, although the Proponent expects, based on initial discussions, that the Boston Civic Design Commission will not exercise jurisdiction over the Project in light of the FPLCD Commission's review.

Fort Point Channel Landmark District Review

The Project site is located within the Fort Point Channel Landmark District (FPCLD) and subject to design review approval by the FPCLD Commission. At the appropriate time an Application for a Certificate of Design Review approval will be submitted to the FPCLD Commission.

Attachment A

Accessibility Checklist

Accessibility Checklist

(to be added to the BRA Development Review Guidelines)

In 2009, a nine-member Advisory Board was appointed to the Commission for Persons with Disabilities in an effort to reduce architectural, procedural, attitudinal, and communication barriers affecting persons with disabilities in the City of Boston. These efforts were instituted to work toward creating universal access in the built environment.

In line with these priorities, the Accessibility Checklist aims to support the inclusion of people with disabilities. In order to complete the Checklist, you must provide specific detail, including descriptions, diagrams and data, of the universal access elements that will ensure all individuals have an equal experience that includes full participation in the built environment throughout the proposed buildings and open space.

In conformance with this directive, all development projects subject to Boston Zoning Article 80 Small and Large Project Review, including all Institutional Master Plan modifications and updates, are to complete the following checklist and provide any necessary responses regarding the following:

- improvements for pedestrian and vehicular circulation and access;
- encourage new buildings and public spaces to be designed to enhance and preserve Boston's system of parks, squares, walkways, and active shopping streets;
- ensure that persons with disabilities have full access to buildings open to the public;
- afford such persons the educational, employment, and recreational opportunities available to all citizens; and
- preserve and increase the supply of living space accessible to persons with disabilities.

We would like to thank you in advance for your time and effort in advancing best practices and progressive approaches to expand accessibility throughout Boston's built environment.

Accessibility Analysis Information Sources:

1. Americans with Disabilities Act – 2010 ADA Standards for Accessible Design
    a. http://www.ada.gov/2010ADAstandards_index.htm
2. Massachusetts Architectural Access Board 521 CMR
    a. http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/aab/aab-rules-and-regulations-pdf.html
3. Boston Complete Street Guidelines
    a. http://bostoncompletestreets.org/
4. City of Boston Mayors Commission for Persons with Disabilities Advisory Board
    a. http://www.cityofboston.gov/Disability
5. City of Boston – Public Works Sidewalk Reconstruction Policy
    a. http://www.cityofboston.gov/images_documents/sidewalk%20policy%200114_tcm3-41668.pdf
6. Massachusetts Office On Disability Accessible Parking Requirements
    a. www.mass.gov/anf/docs/mod/hp-parking-regulations-mod.doc
7. MBTA Fixed Route Accessible Transit Stations
    a. http://www.mbta.com/about_the_mbta/accessibility/

Article 80 | ACCESSIBILTY CHECKLIST

Project Information

Project Name:	
Project Address Primary:	22 Boston Wharf Road, Boston MA
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	Berkeley Investments, Inc.

Team Description

Owner / Developer:	Berkeley Investments, Inc.
Architect:	TRO JungBrannen
Engineer (building systems):	TRO JungBrannen
Sustainability / LEED:	TRO JungBrannen/Epsilon Associates, Inc.
Permitting:	Epsilon Associates, Inc.
Construction Management:	

Project Permitting and Phase

At what phase is the project – at time of this questionnaire?

PNF / Expanded PNF Submitted	Draft / Final Project Impact Report Submitted	BRA Board Approved
BRA Design Approved	Under Construction	Construction just completed:

Article 80 | ACCESSIBILTY CHECKLIST

Building Classification and Description

What are the principal Building Uses - select all appropriate uses?

	Residential – One to Three Unit	Residential - Multi-unit, Four +	Institutional	Education
	Commercial	**Office**	Retail	Assembly
	Laboratory / Medical	Manufacturing / Industrial	Mercantile	Storage, Utility and Other
First Floor Uses (List)	*Existing Lobby, existing parking*			

What is the Construction Type – select most appropriate type?

	Wood Frame	Masonry	**Steel Frame**	Concrete

Describe the building?

Site Area:	30,893 *SF*	Building Area:	*55,000 SF ADDITION*
Building Height:	*129' (with 33' addition)*	Number of Stories:	*10 (with 2-story addition)*
First Floor Elevation:	*16'-0" Elev.*	Are there below grade spaces:	*Yes / **No***

Assessment of Existing Infrastructure for Accessibility:

This section explores the proximity to accessible transit lines and proximate institutions such as, but not limited to hospitals, elderly and disabled housing, and general neighborhood information. The proponent should identify how the area surrounding the development is accessible for people with mobility impairments and should analyze the existing condition of the accessible routes through sidewalk and pedestrian ramp reports.

Provide a description of the development neighborhood and identifying characteristics.	The proposed two-story addition to the existing parking garage/office building is located at 22 Boston Wharf Road in the Fort Point Channel Landmark District and Innovation District of South Boston. The immediate neighborhood is densely-built, with a traditional fabric of primarily masonry, timber frame buildings, and contemporary mid-rise office and residential buildings. The Project site is surrounded by active construction of new mid-rise/high-rise office and residential buildings to

	the southeast. Directly across the street from the Project site, on Boston Wharf Road, is a surface parking lot partially under development as retail and office space, with future plans for another mid-rise office tower on the remaining portion. Directly adjacent to the Project site is Q Park, a public park with a playground, basketball court, and dog run. Scattered throughout the area are numerous restaurant and retail spaces. District Hall, the result of a public-private partnership with the City of Boston, is located near the intersection of Boston Wharf road and Seaport Boulevard.
List the surrounding ADA compliant MBTA transit lines and the proximity to the development site: Commuter rail, subway, bus, etc.	The MBTA Silver Line - Courthouse Station is 0.2 miles from the site.
List the surrounding institutions: hospitals, public housing and elderly and disabled housing developments, educational facilities, etc.	Institute of Contemporary Art Boston Children's Museum Boston Fire Museum Federal Courthouse District Hall
Is the proposed development on a priority accessible route to a key public use facility? List the surrounding: government buildings, libraries, community centers and recreational facilities and other related facilities.	Q Park Institute of Contemporary Art Boston Children's Museum Boston Fire Museum Federal Courthouse District Hall

Surrounding Site Conditions – Existing:

This section identifies the current condition of the sidewalks and pedestrian ramps around the development site.

Are there sidewalks and pedestrian ramps existing at the development site?	Yes, sidewalks exist on Boston Wharf Road and Stillings Street.

If yes above, list the existing sidewalk and pedestrian ramp materials and physical condition at the development site.	Existing sidewalks are concrete with accessible curb cuts and are in good condition.
Are the sidewalks and pedestrian ramps existing-to-remain? If yes, have the sidewalks and pedestrian ramps been verified as compliant? If yes, please provide surveyors report.	All existing sidewalks are to remain. The sidewalks have not been verified as compliant by a surveyor.
Is the development site within a historic district? If yes, please identify.	Fort Point Channel Landmark District

Surrounding Site Conditions – Proposed

This section identifies the proposed condition of the walkways and pedestrian ramps in and around the development site. The width of the sidewalk contributes to the degree of comfort and enjoyment of walking along a street. Narrow sidewalks do not support lively pedestrian activity, and may create dangerous conditions that force people to walk in the street. Typically, a five foot wide Pedestrian Zone supports two people walking side by side or two wheelchairs passing each other. An eight foot wide Pedestrian Zone allows two pairs of people to comfortable pass each other, and a ten foot or wider Pedestrian Zone can support high volumes of pedestrians.

Are the proposed sidewalks consistent with the Boston Complete Street Guidelines? See: www.bostoncompletestreets.org	Existing sidewalks will remain as is and appear to be consistent with Boston's Complete Street Guidelines.
If yes above, choose which Street Type was applied: Downtown Commercial, Downtown Mixed-use, Neighborhood Main, Connector, Residential, Industrial, Shared Street, Parkway, Boulevard.	
What is the total width of the proposed sidewalk? List the widths of the proposed zones: Frontage, Pedestrian and Furnishing Zone.	Existing sidewalk to remain as is. 13'-6" Total Width 9'-0" Pedestrian 4'-6" Plant zone
List the proposed materials for each Zone. Will the proposed	Existing sidewalk to remain as is.

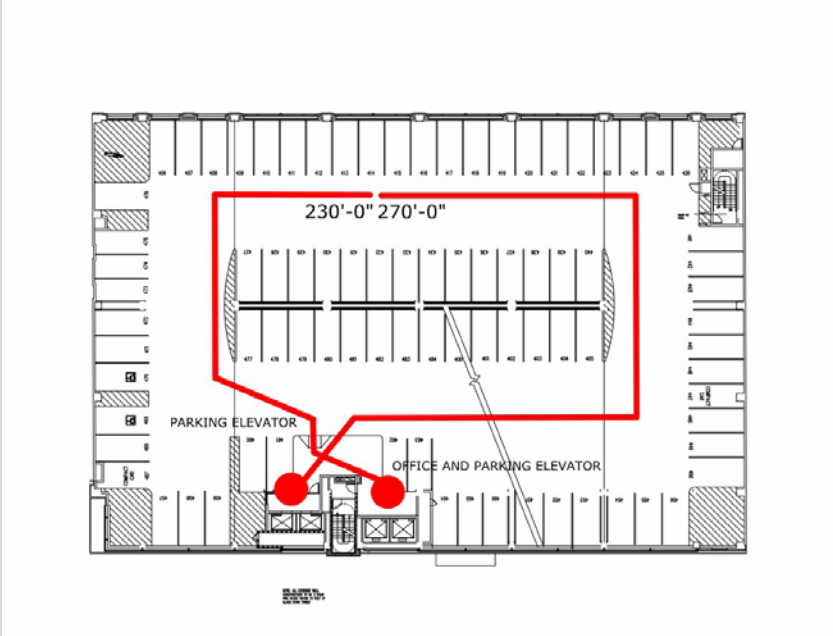
materials be on private property or will the proposed materials be on the City of Boston pedestrian right-of-way?	
If the pedestrian right-of-way is on private property, will the proponent seek a pedestrian easement with the City of Boston Public Improvement Commission?	
Will sidewalk cafes or other furnishings be programmed for the pedestrian right-of-way?	No
If yes above, what are the proposed dimensions of the sidewalk café or furnishings and what will the right-of-way clearance be?	

Proposed Accessible Parking:

See Massachusetts Architectural Access Board Rules and Regulations 521 CMR Section 23.00 regarding accessible parking requirement counts and the Massachusetts Office of Disability Handicap Parking Regulations.

What is the total number of parking spaces provided at the development site parking lot or garage?	583 spaces
What is the total number of accessible spaces provided at the development site?	11 spaces
Will any on street accessible parking spaces be required? **If yes,** has the proponent contacted the Commission for Persons with Disabilities and City of Boston Transportation Department regarding this need?	No

Article 80 | ACCESSIBILTY CHECKLIST

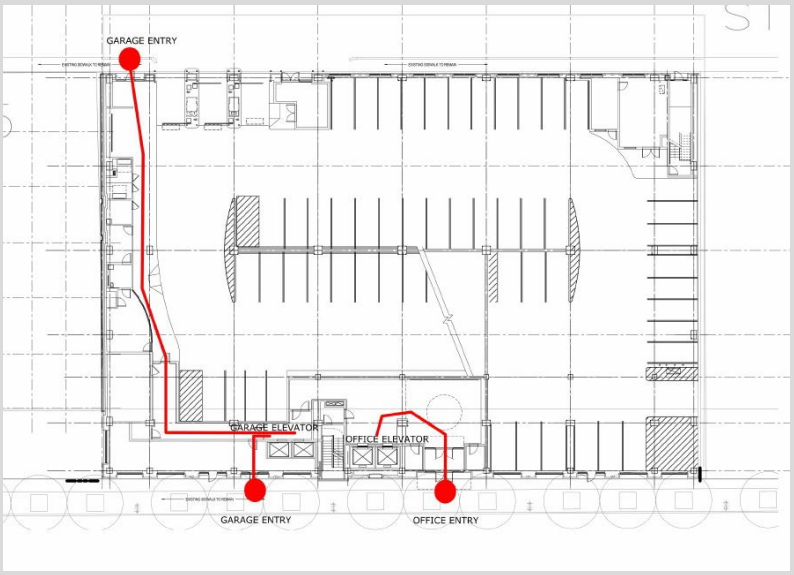
Where is accessible visitor parking located?	Accessible visitor parking is located in the existing parking garage.
Has a drop-off area been identified? If yes, will it be accessible?	No
Include a diagram of the accessible routes to and from the accessible parking lot/garage and drop-off areas to the development entry locations. Please include route distances.	

Circulation and Accessible Routes:

The primary objective in designing smooth and continuous paths of travel is to accommodate persons of all abilities that allow for universal access to entryways, common spaces and the visit-ability* of neighbors.

**Visit-ability – Neighbors ability to access and visit with neighbors without architectural barrier limitations*

Article 80 | ACCESSIBILTY CHECKLIST

Provide a diagram of the accessible route connections through the site.	
Describe accessibility at each entryway: Flush Condition, Stairs, Ramp Elevator.	Office main entrance – flush entry condition with direct access to accessible elevator. Parking Garage entrance – flush entry condition with 6" elevation change accessible ramp leading to elevator.
Are the accessible entrance and the standard entrance integrated?	Yes
If no above, what is the reason?	
Will there be a roof deck or outdoor courtyard space? If yes, include diagram of the accessible route.	No
Has an accessible routes way-finding and signage package been developed? If yes, please describe.	All access points are accessible.

Accessible Units: (If applicable)

In order to facilitate access to housing opportunities this section addresses the number of accessible units that are proposed for the development site that remove barriers to housing choice.

What is the total number of proposed units for the development?	

Article 80 | ACCESSIBILTY CHECKLIST

How many units are for sale; how many are for rent? What is the market value vs. affordable breakdown?	
How many accessible units are being proposed?	
Please provide plan and diagram of the accessible units.	
How many accessible units will also be affordable? If none, please describe reason.	
Do standard units have architectural barriers that would prevent entry or use of common space for persons with mobility impairments? Example: stairs at entry or step to balcony. **If yes,** please provide reason.	
Has the proponent reviewed or presented the proposed plan to the City of Boston Mayor's Commission for Persons with Disabilities Advisory Board?	
Did the Advisory Board vote to support this project? **If no,** what recommendations did the Advisory Board give to make this project more accessible?	

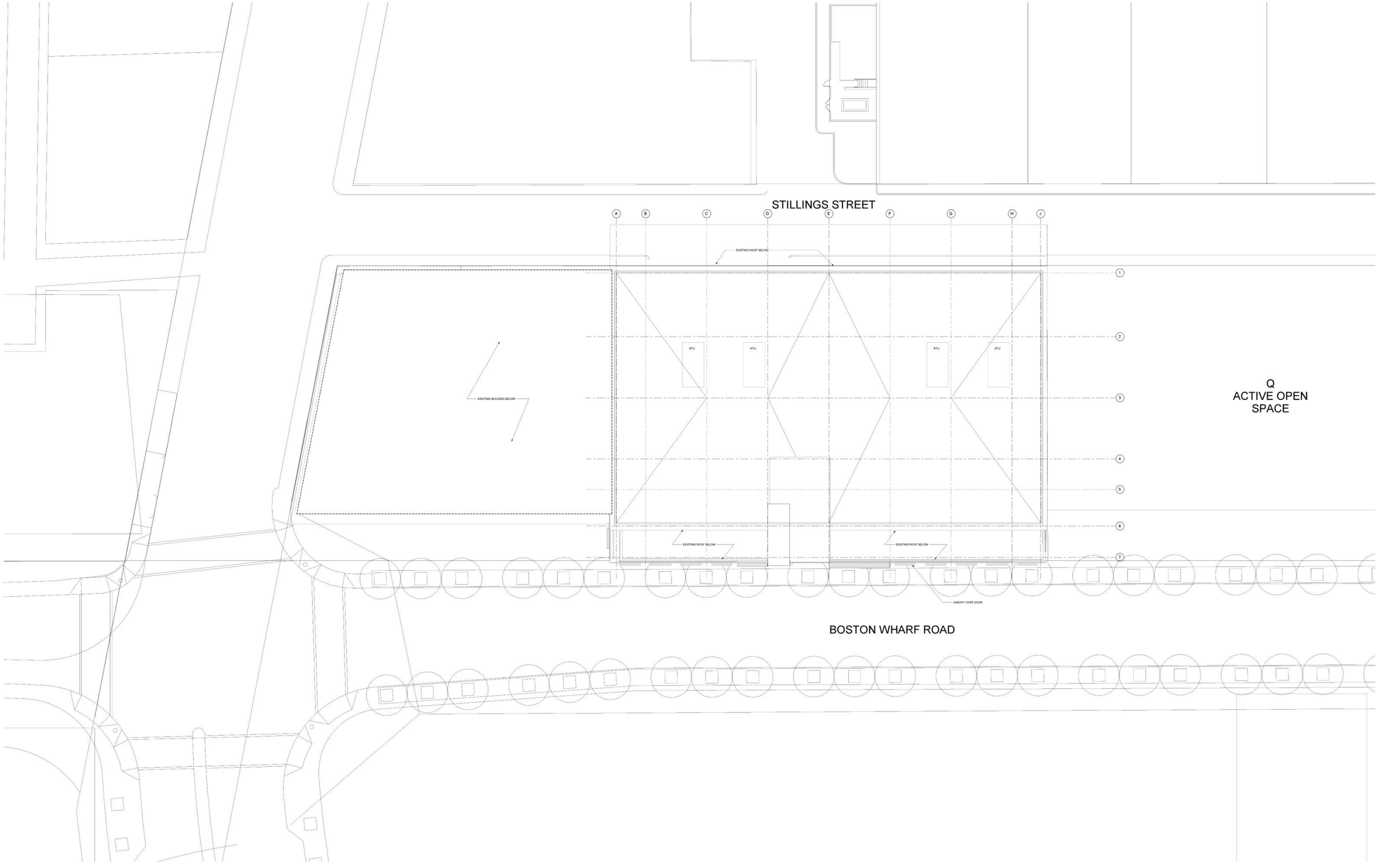
Thank you for completing the Accessibility Checklist!

For questions or comments about this checklist or accessibility practices, please contact:

kathryn.quigley@boston.gov | Mayors Commission for Persons with Disabilities

Attachment B

Floor Plans and Elevations



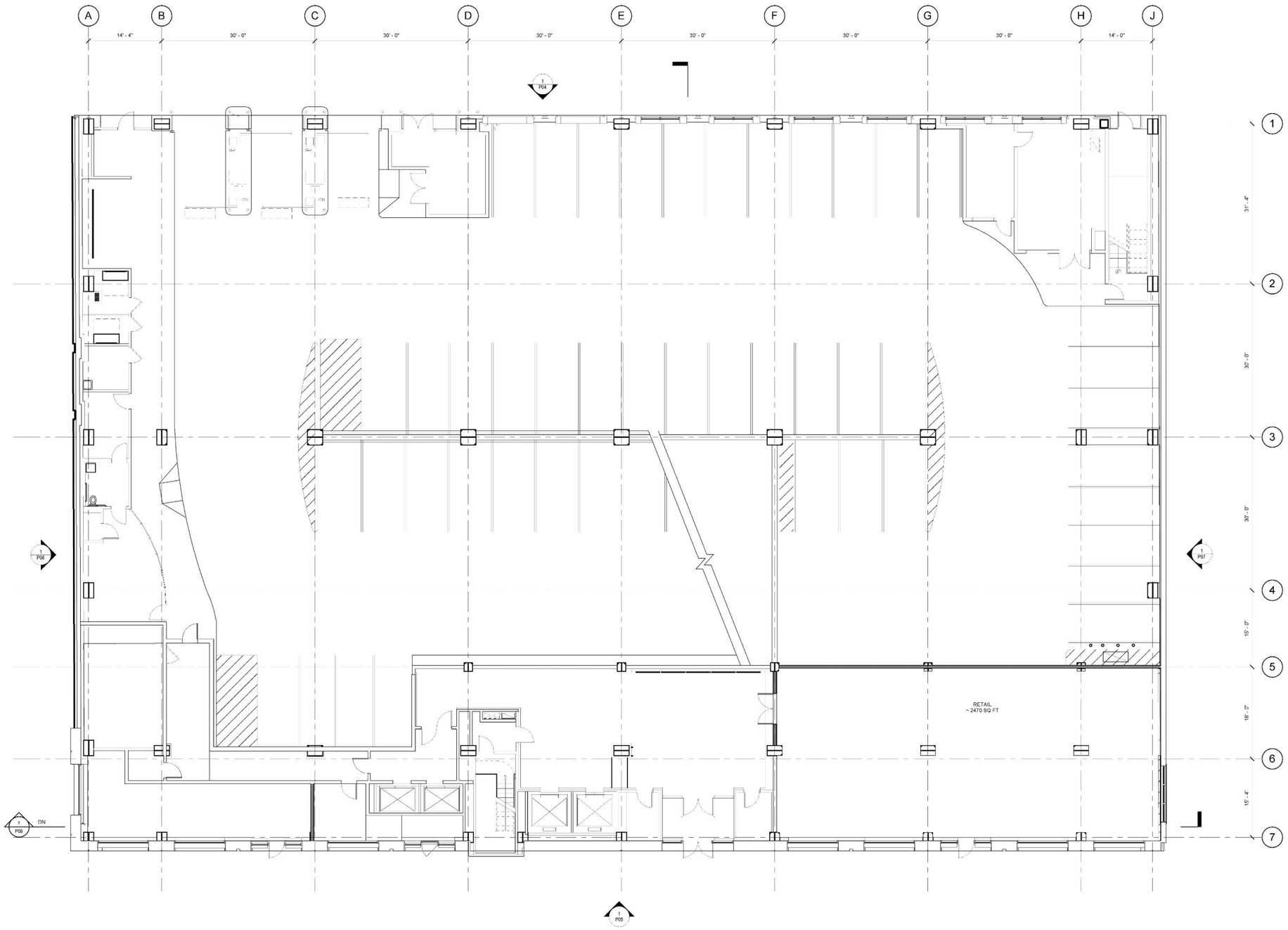
22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

Site Plan

STILLINGS STREET



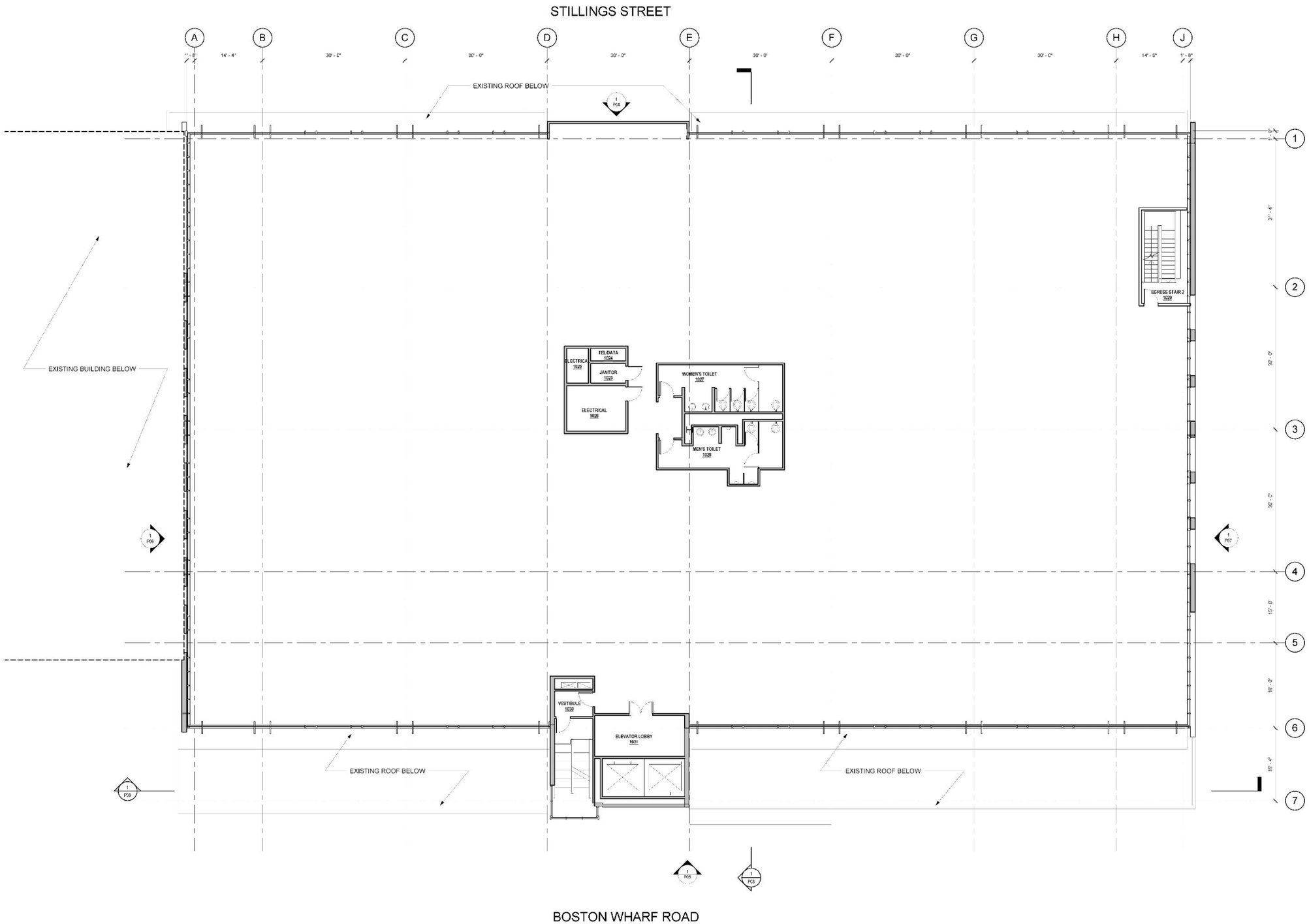
BOSTON WHARF ROAD

22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

Level 1

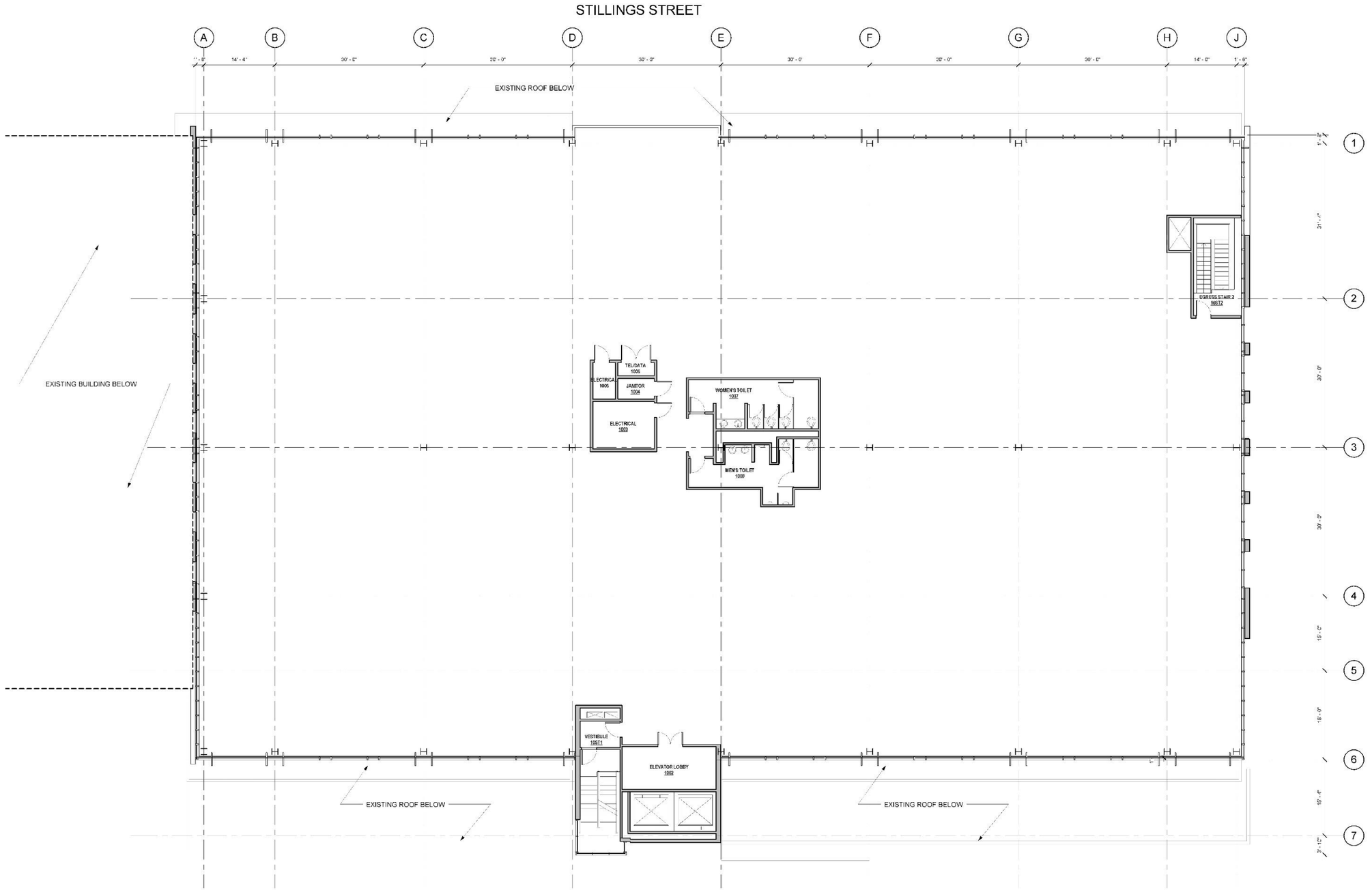


22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

Level 9



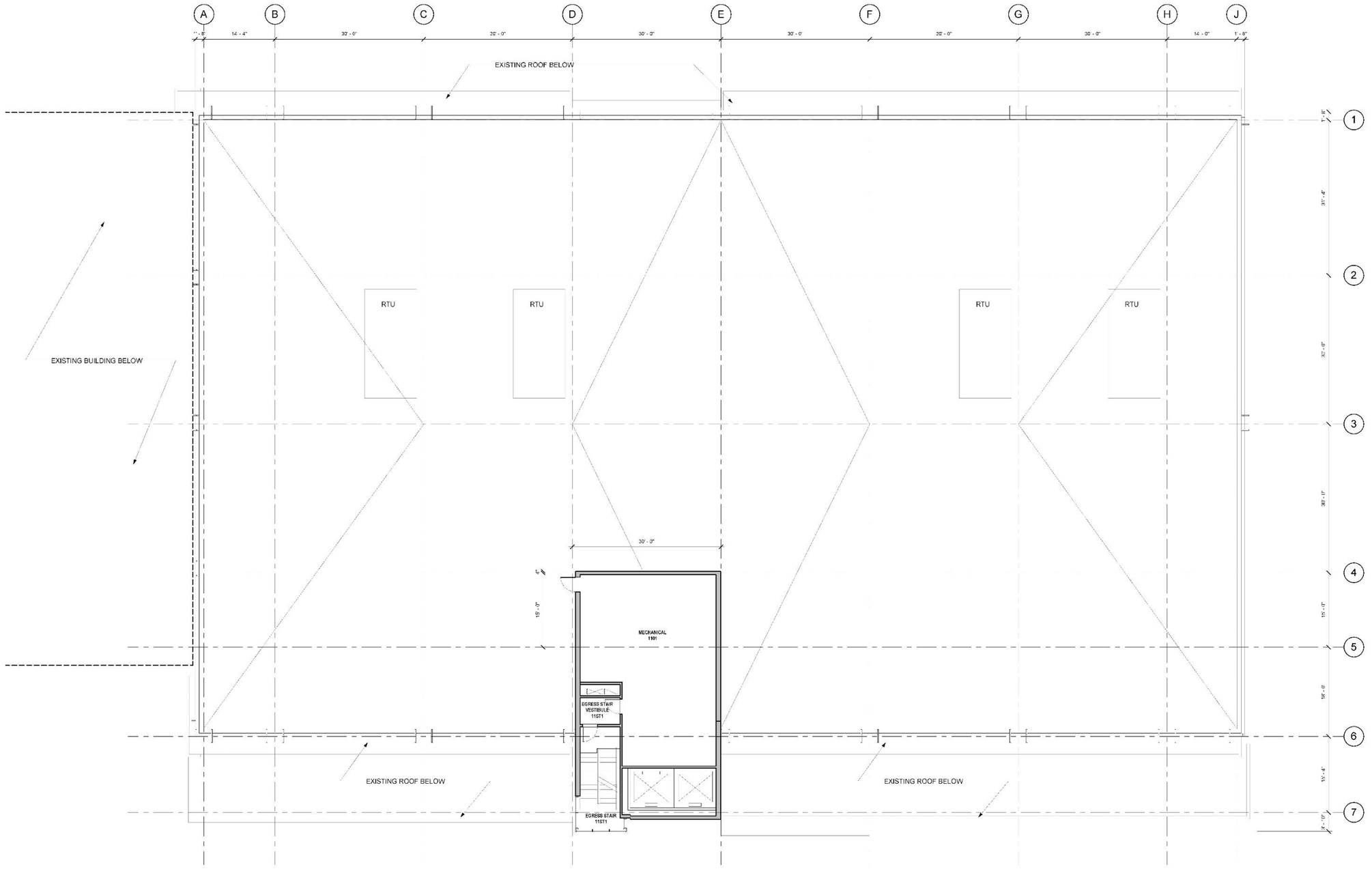
22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

Level 10

STILLINGS STREET



BOSTON WHARF ROAD

22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

Penthouse

22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

North Elevation

22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

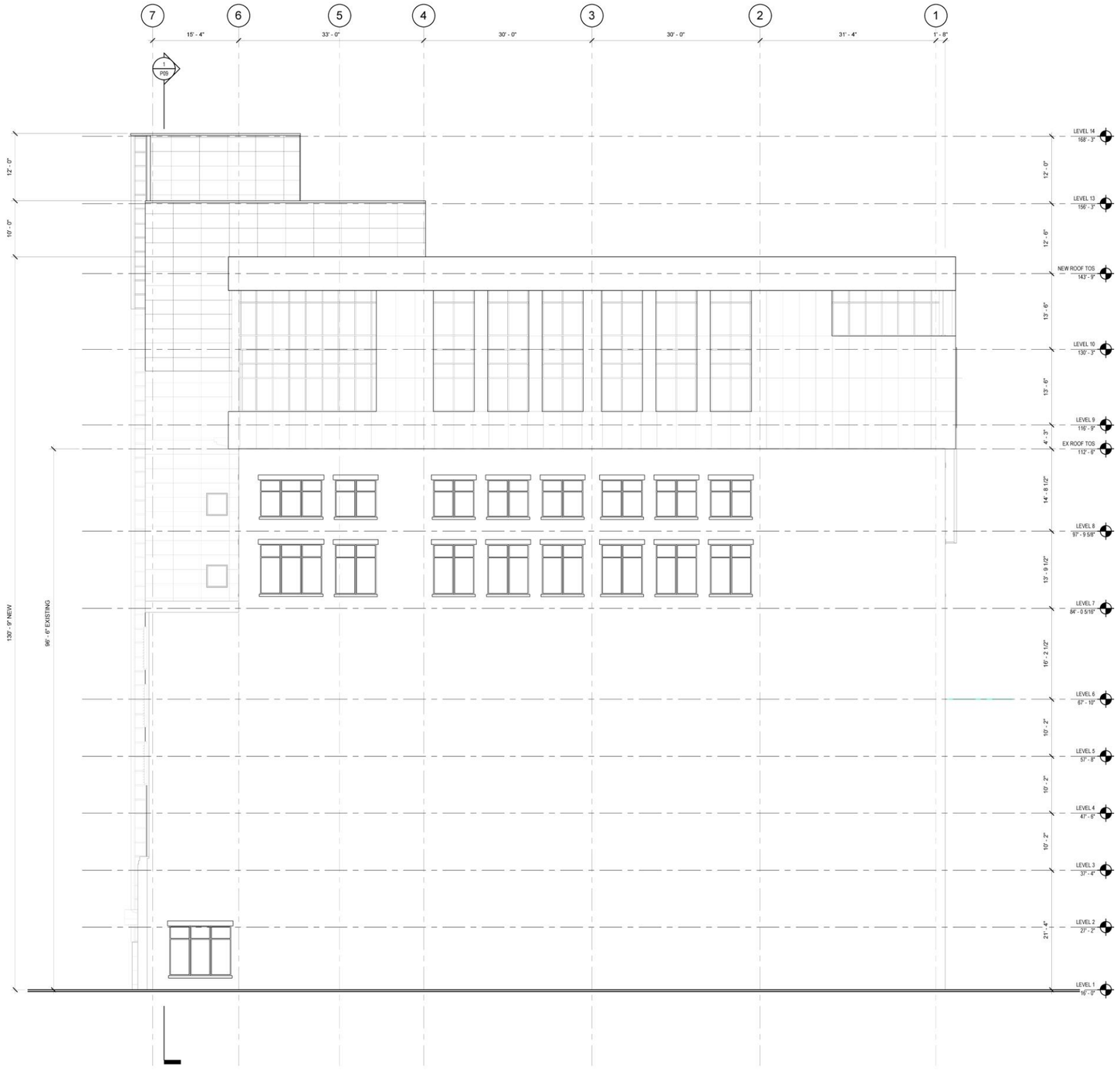
South Elevation

22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

West Elevation



22 Boston Wharf Road **Boston, Massachusetts**

TRO JB

Attachment B

East Elevation

Attachment C

Transportation Technical Appendices

TRANSPORTATION TECHNICAL APPENDIX

- TRAFFIC COUNTS
- SEASONAL ADJUSTMENT FACTORS
- TRIP GENERATION CALCULATIONS
- INTERSECTION CAPACITY ANALYSIS WORKSHEETS

TRAFFIC COUNTS

Accurate Counts

978-664-2565

N/S Street : Boston Wharf Road
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019001
Site Code : 15019001
Start Date : 4/16/2015
Page No : 1

Groups Printed- Cars - Trucks

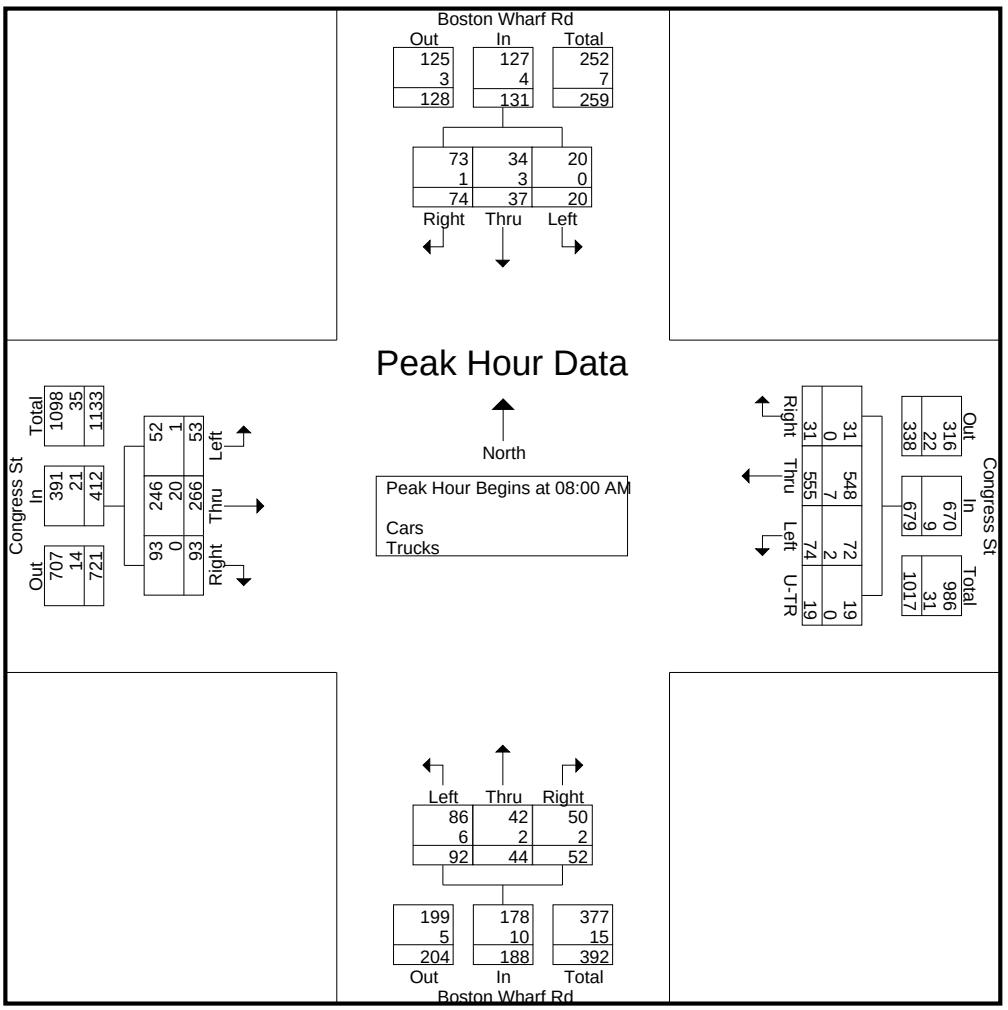
	Boston Wharf Rd From North			Congress St From East				Boston Wharf Rd From South			Congress St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	U-TR	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	5	3	11	9	97	3	3	34	8	24	5	27	24	253
07:15 AM	7	3	16	12	108	1	1	18	9	14	4	44	21	258
07:30 AM	5	6	12	12	105	5	3	20	4	15	11	50	26	274
07:45 AM	4	6	13	16	133	5	7	35	7	12	12	55	24	329
Total	21	18	52	49	443	14	14	107	28	65	32	176	95	1114
08:00 AM	4	12	14	17	136	4	4	25	11	13	9	68	23	340
08:15 AM	4	1	22	18	126	8	6	24	12	16	9	52	20	318
08:30 AM	7	11	17	20	145	12	4	27	12	8	16	73	23	375
08:45 AM	5	13	21	19	148	7	5	16	9	15	19	73	27	377
Total	20	37	74	74	555	31	19	92	44	52	53	266	93	1410
Grand Total	41	55	126	123	998	45	33	199	72	117	85	442	188	2524
Apprch %	18.5	24.8	56.8	10.3	83.2	3.8	2.8	51.3	18.6	30.2	11.9	61.8	26.3	
Total %	1.6	2.2	5	4.9	39.5	1.8	1.3	7.9	2.9	4.6	3.4	17.5	7.4	
Cars	39	52	124	120	983	44	33	186	67	113	84	403	188	2436
% Cars	95.1	94.5	98.4	97.6	98.5	97.8	100	93.5	93.1	96.6	98.8	91.2	100	96.5
Trucks	2	3	2	3	15	1	0	13	5	4	1	39	0	88
% Trucks	4.9	5.5	1.6	2.4	1.5	2.2	0	6.5	6.9	3.4	1.2	8.8	0	3.5

Accurate Counts
978-664-2565

N/S Street : Boston Wharf Road
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019001
Site Code : 15019001
Start Date : 4/16/2015
Page No : 2

	Boston Wharf Rd From North				Congress St From East					Boston Wharf Rd From South				Congress St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																		
Peak Hour for Entire Intersection Begins at 08:00 AM																		
08:00 AM	4	12	14	30	17	136	4	4	161	25	11	13	49	9	68	23	100	340
08:15 AM	4	1	**22**	27	18	126	8	**6**	158	24	**12**	**16**	**52**	9	52	20	81	318
08:30 AM	**7**	11	17	35	**20**	145	**12**	4	**181**	**27**	12	8	47	16	**73**	23	112	375
08:45 AM	5	**13**	21	**39**	19	**148**	7	5	179	16	9	15	40	**19**	73	**27**	**119**	**377**
Total Volume	20	37	74	131	74	555	31	19	679	92	44	52	188	53	266	93	412	1410
% App. Total	15.3	28.2	56.5		10.9	81.7	4.6	2.8		48.9	23.4	27.7		12.9	64.6	22.6		
PHF	.714	.712	.841	.840	.925	.938	.646	.792	.938	.852	.917	.813	.904	.697	.911	.861	.866	.935
Cars	20	34	73	127	72	548	31	19	670	86	42	50	178	52	246	93	391	1366
% Cars	100	91.9	98.6	96.9	97.3	98.7	100	100	98.7	93.5	95.5	96.2	94.7	98.1	92.5	100	94.9	96.9
Trucks	0	3	1	4	2	7	0	0	9	6	2	2	10	1	20	0	21	44
% Trucks	0	8.1	1.4	3.1	2.7	1.3	0	0	1.3	6.5	4.5	3.8	5.3	1.9	7.5	0	5.1	3.1



Accurate Counts

978-664-2565

N/S Street : Boston Wharf Road
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019001
Site Code : 15019001
Start Date : 4/16/2015

Groups Printed- Bikes Peds

	Boston Wharf Rd From North				Congress St From East				Boston Wharf Rd From South				Congress St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	15	0	0	0	1	0	0	0	2	0	0	0	3	21	0	21
07:15 AM	0	0	0	20	0	0	0	5	0	0	0	2	0	1	0	2	29	1	30
07:30 AM	0	0	0	22	0	0	0	3	1	0	0	9	0	1	0	16	50	2	52
07:45 AM	0	0	0	35	0	1	0	6	0	0	1	7	0	2	0	6	54	4	58
Total	0	0	0	92	0	1	0	15	1	0	1	20	0	4	0	27	154	7	161
08:00 AM	0	0	0	46	0	0	0	6	0	1	0	6	1	1	0	2	60	3	63
08:15 AM	0	0	0	32	0	1	0	7	0	0	0	10	0	3	0	4	53	4	57
08:30 AM	0	0	0	61	0	1	0	5	0	1	0	1	1	1	0	4	71	4	75
08:45 AM	0	0	0	45	0	1	0	11	1	0	0	9	0	0	0	7	72	2	74
Total	0	0	0	184	0	3	0	29	1	2	0	26	2	5	0	17	256	13	269
Grand Total	0	0	0	276	0	4	0	44	2	2	1	46	2	9	0	44	410	20	430
Apprch %	0	0	0		0	100	0		40	40	20		18.2	81.8	0				
Total %	0	0	0		0	20	0		10	10	5		10	45	0		95.3	4.7	

Accurate Counts

978-664-2565

N/S Street : Boston Wharf Road
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019001
Site Code : 15019001
Start Date : 4/16/2015
Page No : 1

Groups Printed- Cars - Trucks

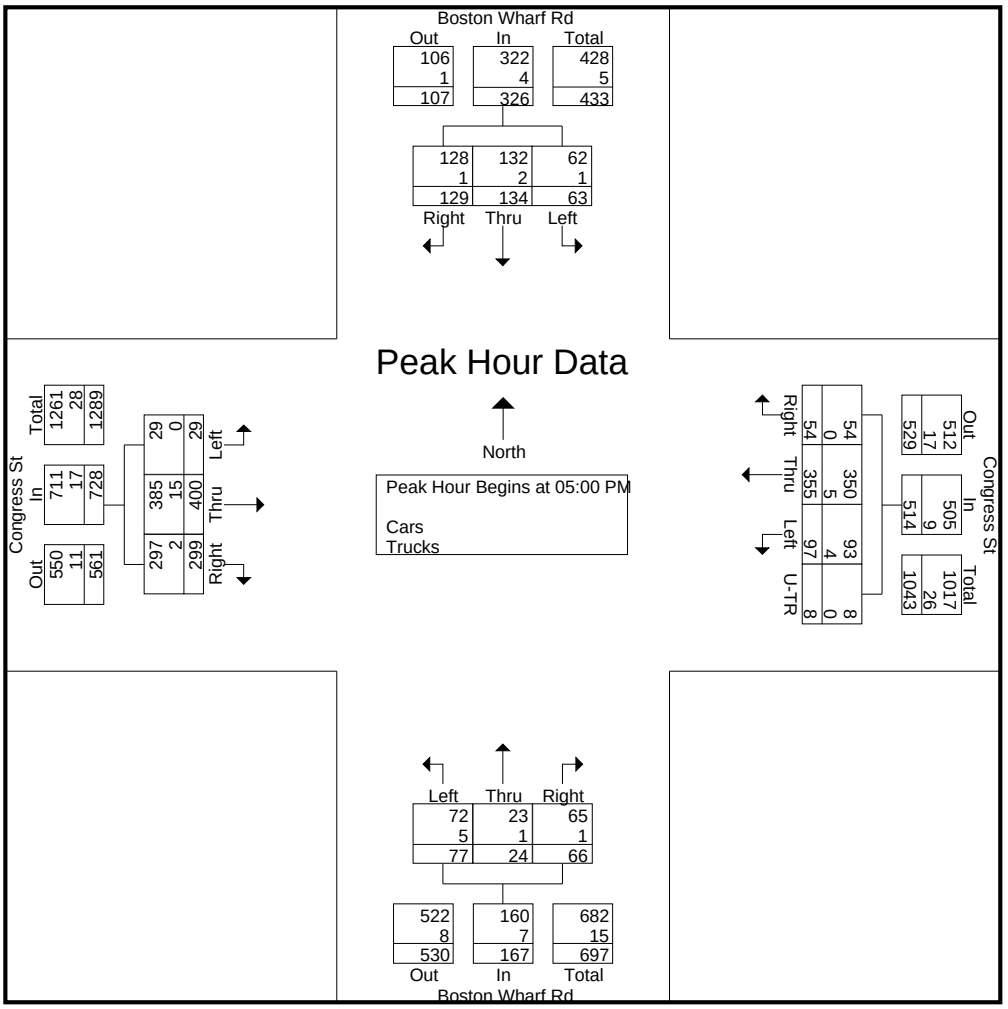
	Boston Wharf Rd From North			Congress St From East				Boston Wharf Rd From South			Congress St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	U-TR	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	13	22	12	21	65	1	2	12	5	13	5	81	73	325
04:15 PM	14	33	9	27	86	1	1	8	6	3	11	83	70	352
04:30 PM	12	33	14	32	62	3	1	16	4	11	7	65	73	333
04:45 PM	4	25	22	25	75	14	3	13	6	9	6	86	70	358
Total	43	113	57	105	288	19	7	49	21	36	29	315	286	1368
05:00 PM	12	35	26	20	87	15	3	14	4	17	7	91	69	400
05:15 PM	16	36	41	35	96	13	3	20	7	14	6	103	67	457
05:30 PM	18	40	35	23	98	17	0	21	6	18	7	100	80	463
05:45 PM	17	23	27	19	74	9	2	22	7	17	9	106	83	415
Total	63	134	129	97	355	54	8	77	24	66	29	400	299	1735
Grand Total	106	247	186	202	643	73	15	126	45	102	58	715	585	3103
Apprch %	19.7	45.8	34.5	21.7	68.9	7.8	1.6	46.2	16.5	37.4	4.3	52.7	43.1	
Total %	3.4	8	6	6.5	20.7	2.4	0.5	4.1	1.5	3.3	1.9	23	18.9	
Cars	104	240	184	190	633	73	15	117	41	100	56	685	576	3014
% Cars	98.1	97.2	98.9	94.1	98.4	100	100	92.9	91.1	98	96.6	95.8	98.5	97.1
Trucks	2	7	2	12	10	0	0	9	4	2	2	30	9	89
% Trucks	1.9	2.8	1.1	5.9	1.6	0	0	7.1	8.9	2	3.4	4.2	1.5	2.9

Accurate Counts
978-664-2565

N/S Street : Boston Wharf Road
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019001
Site Code : 15019001
Start Date : 4/16/2015
Page No : 2

	Boston Wharf Rd From North				Congress St From East					Boston Wharf Rd From South				Congress St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	U-TR	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																		
Peak Hour for Entire Intersection Begins at 05:00 PM																		
05:00 PM	12	35	26	73	20	87	15	**3**	125	14	4	17	35	7	91	69	167	400
05:15 PM	16	36	**41**	**93**	**35**	96	13	3	**147**	20	**7**	14	41	6	103	67	176	457
05:30 PM	**18**	**40**	35	93	23	**98**	**17**	0	138	21	6	**18**	45	7	100	80	187	**463**
05:45 PM	17	23	27	67	19	74	9	2	104	**22**	7	17	**46**	**9**	**106**	**83**	**198**	415
Total Volume	63	134	129	326	97	355	54	8	514	77	24	66	167	29	400	299	728	1735
% App. Total	19.3	41.1	39.6		18.9	69.1	10.5	1.6		46.1	14.4	39.5		4	54.9	41.1		
PHF	.875	.838	.787	.876	.693	.906	.794	.667	.874	.875	.857	.917	.908	.806	.943	.901	.919	.937
Cars	62	132	128	322	93	350	54	8	505	72	23	65	160	29	385	297	711	1698
% Cars	98.4	98.5	99.2	98.8	95.9	98.6	100	100	98.2	93.5	95.8	98.5	95.8	100	96.3	99.3	97.7	97.9
Trucks	1	2	1	4	4	5	0	0	9	5	1	1	7	0	15	2	17	37
% Trucks	1.6	1.5	0.8	1.2	4.1	1.4	0	0	1.8	6.5	4.2	1.5	4.2	0	3.8	0.7	2.3	2.1



Accurate Counts

978-664-2565

N/S Street : Boston Wharf Road
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019001
Site Code : 15019001
Start Date : 4/16/2015

Groups Printed- Bikes Peds

	Boston Wharf Rd From North				Congress St From East				Boston Wharf Rd From South				Congress St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	34	0	2	0	9	0	0	0	6	0	0	0	2	51	2	53
04:15 PM	0	0	0	49	0	0	0	5	0	0	0	7	0	0	0	3	64	0	64
04:30 PM	0	0	1	39	0	2	0	4	0	0	0	7	0	3	0	11	61	6	67
04:45 PM	0	0	0	38	0	4	0	3	0	0	0	7	1	0	0	9	57	5	62
Total	0	0	1	160	0	8	0	21	0	0	0	27	1	3	0	25	233	13	246
05:00 PM	0	1	0	71	0	2	0	9	0	0	0	17	0	1	0	23	120	4	124
05:15 PM	0	0	0	82	0	3	0	11	0	0	0	16	1	2	0	15	124	6	130
05:30 PM	0	0	0	60	0	3	0	6	0	0	0	10	0	1	0	18	94	4	98
05:45 PM	0	0	0	72	0	1	0	6	0	0	0	24	0	3	0	20	122	4	126
Total	0	1	0	285	0	9	0	32	0	0	0	67	1	7	0	76	460	18	478
Grand Total	0	1	1	445	0	17	0	53	0	0	0	94	2	10	0	101	693	31	724
Apprch %	0	50	50		0	100	0		0	0	0		16.7	83.3	0				
Total %	0	3.2	3.2		0	54.8	0		0	0	0		6.5	32.3	0		95.7	4.3	

Accurate Counts
978-664-2565

N/S Street : Stillings Street
E/W Street : Congress Street
City/State : South Bosaton, MA
Weather : Clear

File Name : 15019002
Site Code : 15019002
Start Date : 4/16/2015
Page No : 1

Groups Printed- Cars - Trucks

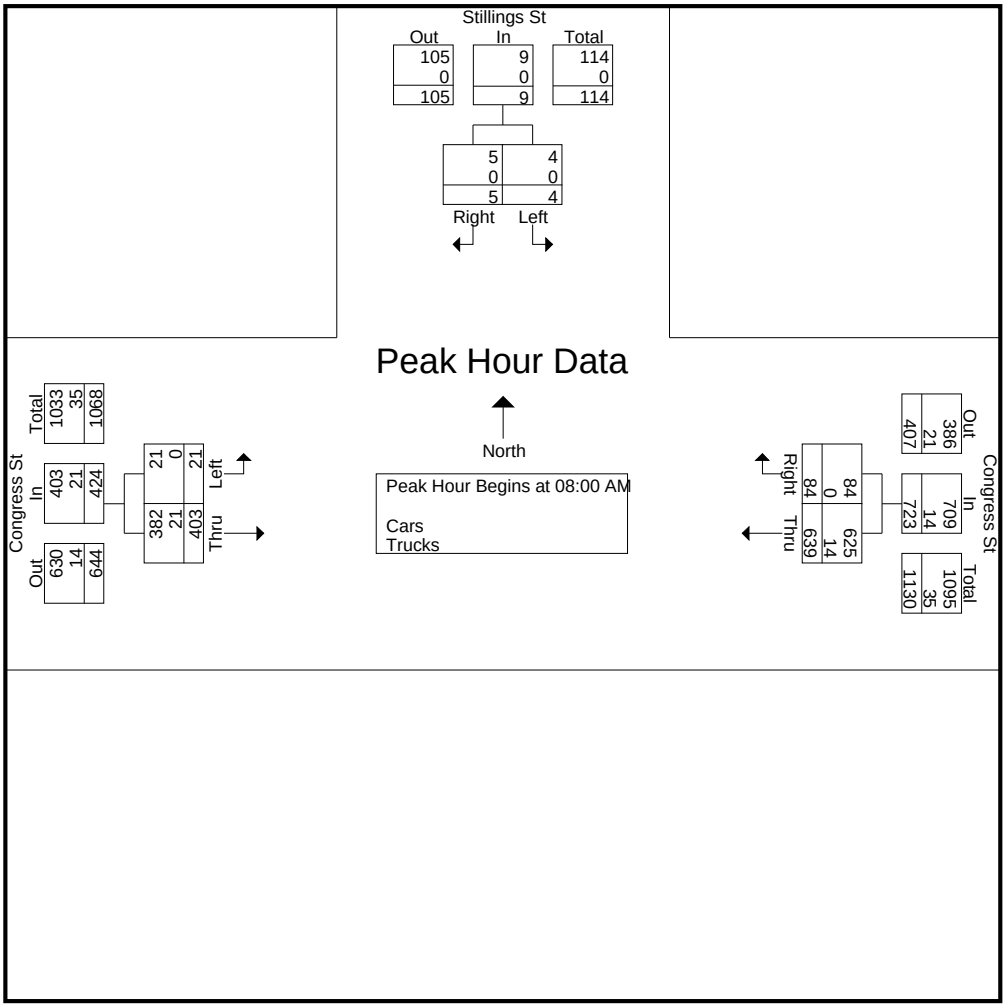
	Stillings St From North		Congress St From East		Congress St From West		
Start Time	Left	Right	Thru	Right	Left	Thru	Int. Total
07:00 AM	1	4	124	15	4	53	201
07:15 AM	3	2	129	14	2	62	212
07:30 AM	1	1	114	20	5	88	229
07:45 AM	4	3	169	10	3	87	276
Total	9	10	536	59	14	290	918
08:00 AM	0	1	162	16	4	97	280
08:15 AM	3	1	145	19	4	79	251
08:30 AM	1	1	174	21	4	107	308
08:45 AM	0	2	158	28	9	120	317
Total	4	5	639	84	21	403	1156
Grand Total	13	15	1175	143	35	693	2074
Apprch %	46.4	53.6	89.2	10.8	4.8	95.2	
Total %	0.6	0.7	56.7	6.9	1.7	33.4	
Cars	13	15	1146	142	35	653	2004
% Cars	100	100	97.5	99.3	100	94.2	96.6
Trucks	0	0	29	1	0	40	70
% Trucks	0	0	2.5	0.7	0	5.8	3.4

Accurate Counts
978-664-2565

N/S Street : Stillings Street
E/W Street : Congress Street
City/State : South Bosaton, MA
Weather : Clear

File Name : 15019002
Site Code : 15019002
Start Date : 4/16/2015
Page No : 2

	Stillings St From North			Congress St From East			Congress St From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	0	1	1	162	16	178	4	97	101	280
08:15 AM	**3**	1	**4**	145	19	164	4	79	83	251
08:30 AM	1	1	2	**174**	21	**195**	4	107	111	308
08:45 AM	0	**2**	2	158	**28**	186	**9**	**120**	**129**	**317**
Total Volume	4	5	9	639	84	723	21	403	424	1156
% App. Total	44.4	55.6		88.4	11.6		5	95		
PHF	.333	.625	.563	.918	.750	.927	.583	.840	.822	.912
Cars	4	5	9	625	84	709	21	382	403	1121
% Cars	100	100	100	97.8	100	98.1	100	94.8	95.0	97.0
Trucks	0	0	0	14	0	14	0	21	21	35
% Trucks	0	0	0	2.2	0	1.9	0	5.2	5.0	3.0



Accurate Counts
978-664-2565

N/S Street : Stillings Street
E/W Street : Congress Street
City/State : South Bosaton, MA
Weather : Clear

File Name : 15019002
Site Code : 15019002
Start Date : 4/16/2015

Groups Printed- Bikes Peds

	Stillings St From North			Congress St From East			Congress St From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	14	0	1	2	1	0	1	17	2	19
07:15 AM	0	0	37	0	0	3	0	0	4	44	0	44
07:30 AM	0	0	33	1	0	2	0	1	0	35	2	37
07:45 AM	1	0	50	0	0	5	0	0	1	56	1	57
Total	1	0	134	1	1	12	1	1	6	152	5	157
08:00 AM	0	0	58	1	0	1	0	1	0	59	2	61
08:15 AM	0	0	54	0	0	2	3	1	2	58	4	62
08:30 AM	0	0	63	1	0	3	2	2	0	66	5	71
08:45 AM	0	0	61	1	0	4	4	1	3	68	6	74
Total	0	0	236	3	0	10	9	5	5	251	17	268
Grand Total	1	0	370	4	1	22	10	6	11	403	22	425
Apprch %	100	0		80	20		62.5	37.5				
Total %	4.5	0		18.2	4.5		45.5	27.3		94.8	5.2	

Accurate Counts

978-664-2565

N/S Street : Stillings Street
E/W Street : Congress Street
City/State : South Bosaton, MA
Weather : Clear

File Name : 15019002
Site Code : 15019002
Start Date : 4/16/2015
Page No : 1

Groups Printed- Cars - Trucks

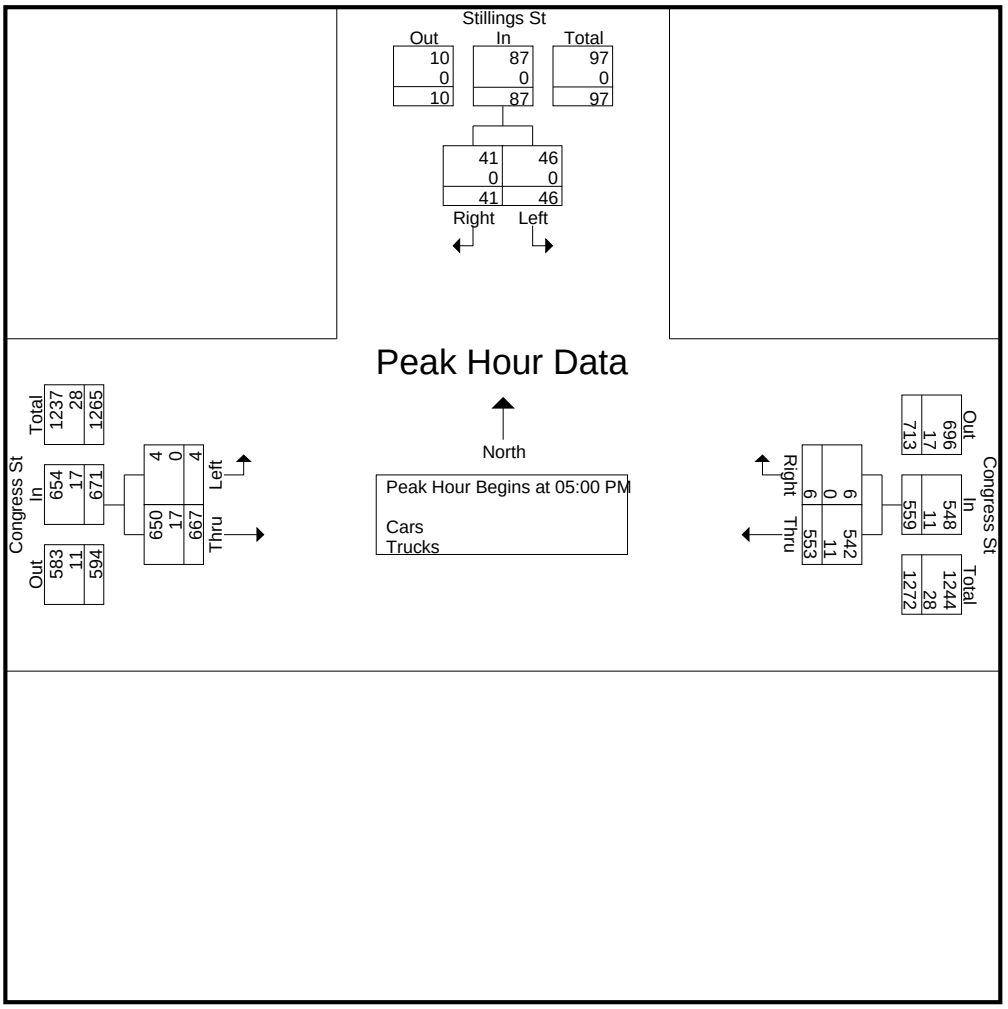
	Stillings St From North		Congress St From East		Congress St From West		
Start Time	Left	Right	Thru	Right	Left	Thru	Int. Total
04:00 PM	19	14	91	1	0	143	268
04:15 PM	14	12	99	2	1	148	276
04:30 PM	16	3	85	5	3	134	246
04:45 PM	12	9	110	2	1	144	278
Total	61	38	385	10	5	569	1068
05:00 PM	22	23	119	4	0	136	304
05:15 PM	6	2	159	1	0	174	342
05:30 PM	18	16	148	1	4	165	352
05:45 PM	0	0	127	0	0	192	319
Total	46	41	553	6	4	667	1317
Grand Total	107	79	938	16	9	1236	2385
Apprch %	57.5	42.5	98.3	1.7	0.7	99.3	
Total %	4.5	3.3	39.3	0.7	0.4	51.8	
Cars	107	79	917	16	9	1195	2323
% Cars	100	100	97.8	100	100	96.7	97.4
Trucks	0	0	21	0	0	41	62
% Trucks	0	0	2.2	0	0	3.3	2.6

Accurate Counts
978-664-2565

N/S Street : Stillings Street
E/W Street : Congress Street
City/State : South Bosaton, MA
Weather : Clear

File Name : 15019002
Site Code : 15019002
Start Date : 4/16/2015
Page No : 2

	Stillings St From North			Congress St From East			Congress St From West			
Start Time	Left	Right	App. Total	Thru	Right	App. Total	Left	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 05:00 PM										
05:00 PM	**22**	**23**	**45**	119	**4**	123	0	136	136	304
05:15 PM	6	2	8	**159**	1	**160**	0	174	174	342
05:30 PM	18	16	34	148	1	149	**4**	165	169	**352**
05:45 PM	0	0	0	127	0	127	0	**192**	**192**	319
Total Volume	46	41	87	553	6	559	4	667	671	1317
% App. Total	52.9	47.1		98.9	1.1		0.6	99.4		
PHF	.523	.446	.483	.869	.375	.873	.250	.868	.874	.935
Cars	46	41	87	542	6	548	4	650	654	1289
% Cars	100	100	100	98.0	100	98.0	100	97.5	97.5	97.9
Trucks	0	0	0	11	0	11	0	17	17	28
% Trucks	0	0	0	2.0	0	2.0	0	2.5	2.5	2.1



Accurate Counts
978-664-2565

N/S Street : Stillings Street
E/W Street : Congress Street
City/State : South Bosaton, MA
Weather : Clear

File Name : 15019002
Site Code : 15019002
Start Date : 4/16/2015

Groups Printed- Bikes Peds

	Stillings St From North			Congress St From East			Congress St From West					
Start Time	Left	Right	Peds	Thru	Right	Peds	Left	Thru	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	1	43	0	0	6	0	0	6	55	1	56
04:15 PM	0	0	51	0	0	8	0	0	3	62	0	62
04:30 PM	1	0	43	1	3	2	0	3	3	48	8	56
04:45 PM	0	0	49	3	0	6	0	0	3	58	3	61
Total	1	1	186	4	3	22	0	3	15	223	12	235
05:00 PM	0	0	104	4	0	2	0	1	7	113	5	118
05:15 PM	0	0	29	0	0	2	0	0	2	33	0	33
05:30 PM	0	2	71	3	0	6	0	3	8	85	8	93
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	204	7	0	10	0	4	17	231	13	244
Grand Total	1	3	390	11	3	32	0	7	32	454	25	479
Apprch %	25	75		78.6	21.4		0	100				
Total %	4	12		44	12		0	28		94.8	5.2	

Accurate Counts
978-664-2565

N/S Street :Thompson Place / A Street
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019003
Site Code : 15019003
Start Date : 4/16/2015
Page No : 1

Groups Printed- Cars - Trucks

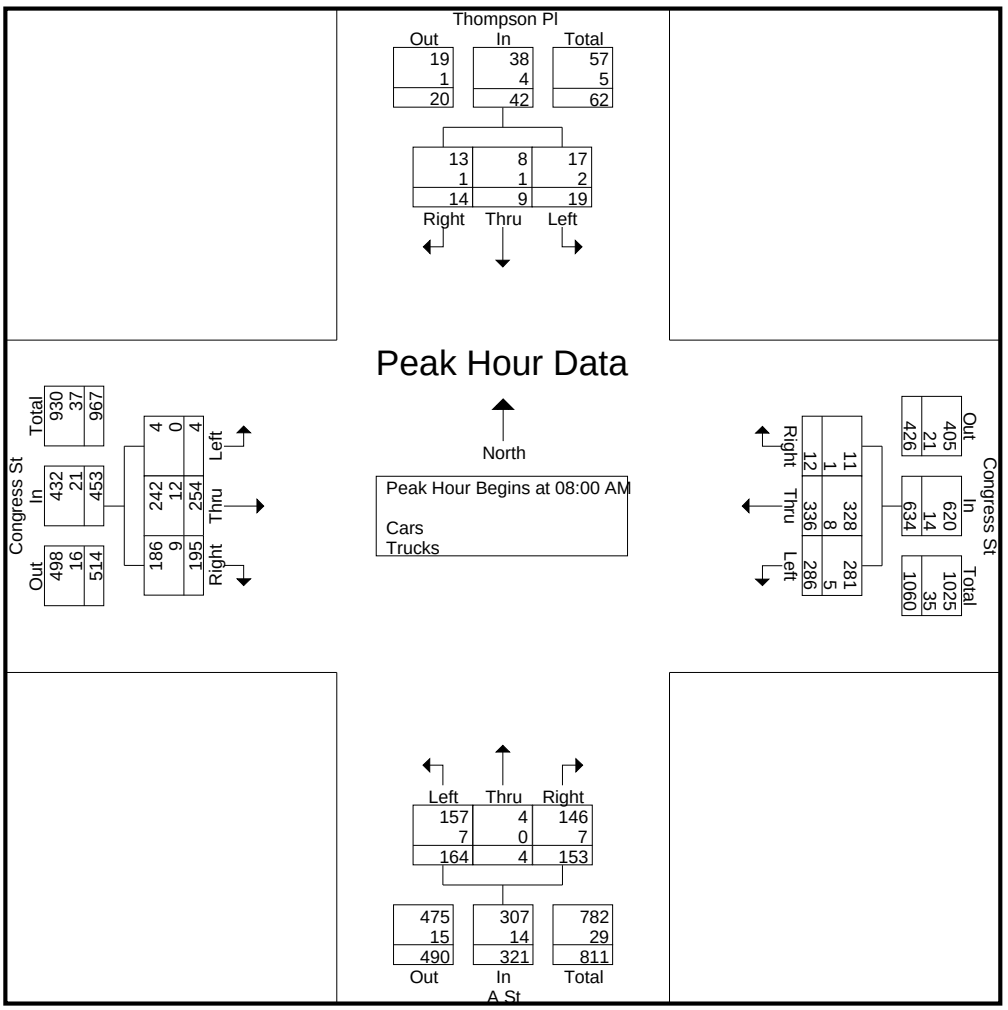
	Thompson Pl From North			Congress St From East			A St From South			Congress St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
07:00 AM	2	0	3	74	61	3	30	2	16	2	40	38	271
07:15 AM	2	0	4	63	62	1	30	1	22	3	43	32	263
07:30 AM	1	1	3	71	57	2	35	0	18	1	72	43	304
07:45 AM	2	3	1	81	85	1	28	2	22	1	63	25	314
Total	7	4	11	289	265	7	123	5	78	7	218	138	1152
08:00 AM	3	4	8	73	78	5	28	0	46	1	57	66	369
08:15 AM	4	1	0	53	95	1	44	1	21	1	54	44	319
08:30 AM	5	0	1	77	95	2	42	1	33	0	71	37	364
08:45 AM	7	4	5	83	68	4	50	2	53	2	72	48	398
Total	19	9	14	286	336	12	164	4	153	4	254	195	1450
Grand Total	26	13	25	575	601	19	287	9	231	11	472	333	2602
Apprch %	40.6	20.3	39.1	48.1	50.3	1.6	54.5	1.7	43.8	1.3	57.8	40.8	
Total %	1	0.5	1	22.1	23.1	0.7	11	0.3	8.9	0.4	18.1	12.8	
Cars	24	11	23	564	582	18	275	9	223	11	442	322	2504
% Cars	92.3	84.6	92	98.1	96.8	94.7	95.8	100	96.5	100	93.6	96.7	96.2
Trucks	2	2	2	11	19	1	12	0	8	0	30	11	98
% Trucks	7.7	15.4	8	1.9	3.2	5.3	4.2	0	3.5	0	6.4	3.3	3.8

Accurate Counts
978-664-2565

N/S Street :Thompson Place / A Street
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019003
Site Code : 15019003
Start Date : 4/16/2015
Page No : 2

	Thompson Pl From North				Congress St From East				A St From South				Congress St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	3	**4**	**8**	15	73	78	**5**	156	28	0	46	74	1	57	**66**	**124**	369
08:15 AM	4	1	0	5	53	**95**	1	149	44	1	21	66	1	54	44	99	319
08:30 AM	5	0	1	6	77	95	2	**174**	42	1	33	76	0	71	37	108	364
08:45 AM	**7**	4	5	**16**	**83**	68	4	155	**50**	**2**	**53**	**105**	**2**	**72**	48	122	**398**
Total Volume	19	9	14	42	286	336	12	634	164	4	153	321	4	254	195	453	1450
% App. Total	45.2	21.4	33.3		45.1	53	1.9		51.1	1.2	47.7		0.9	56.1	43		
PHF	.679	.563	.438	.656	.861	.884	.600	.911	.820	.500	.722	.764	.500	.882	.739	.913	.911
Cars	17	8	13	38	281	328	11	620	157	4	146	307	4	242	186	432	1397
% Cars	89.5	88.9	92.9	90.5	98.3	97.6	91.7	97.8	95.7	100	95.4	95.6	100	95.3	95.4	95.4	96.3
Trucks	2	1	1	4	5	8	1	14	7	0	7	14	0	12	9	21	53
% Trucks	10.5	11.1	7.1	9.5	1.7	2.4	8.3	2.2	4.3	0	4.6	4.4	0	4.7	4.6	4.6	3.7



Accurate Counts
978-664-2565

N/S Street :Thompson Place / A Street
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019003
Site Code : 15019003
Start Date : 4/16/2015

Groups Printed- Bikes Peds

	Thompson Pl From North				Congress St From East				A St From South				Congress St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
07:00 AM	0	0	0	27	0	0	0	10	5	0	0	4	0	2	0	5	46	7	53
07:15 AM	0	0	0	40	0	0	0	11	1	0	0	8	0	0	1	15	74	2	76
07:30 AM	0	0	0	47	0	1	0	17	3	0	1	14	1	1	0	27	105	7	112
07:45 AM	0	0	0	43	0	1	0	20	8	0	1	8	0	3	0	28	99	13	112
Total	0	0	0	157	0	2	0	58	17	0	2	34	1	6	1	75	324	29	353
08:00 AM	0	0	0	67	0	1	0	12	5	2	1	15	1	1	0	32	126	11	137
08:15 AM	0	0	0	53	0	0	0	16	8	0	1	22	0	2	0	166	257	11	268
08:30 AM	0	0	0	49	0	0	0	8	8	2	3	26	0	4	2	59	142	19	161
08:45 AM	0	0	0	75	0	2	1	22	3	1	4	31	3	4	2	57	185	20	205
Total	0	0	0	244	0	3	1	58	24	5	9	94	4	11	4	314	710	61	771
Grand Total	0	0	0	401	0	5	1	116	41	5	11	128	5	17	5	389	1034	90	1124
Apprch %	0	0	0		0	83.3	16.7		71.9	8.8	19.3		18.5	63	18.5				
Total %	0	0	0		0	5.6	1.1		45.6	5.6	12.2		5.6	18.9	5.6		92	8	

Accurate Counts

978-664-2565

N/S Street :Thompson Place / A Street
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019003
Site Code : 15019003
Start Date : 4/16/2015
Page No : 1

Groups Printed- Cars - Trucks

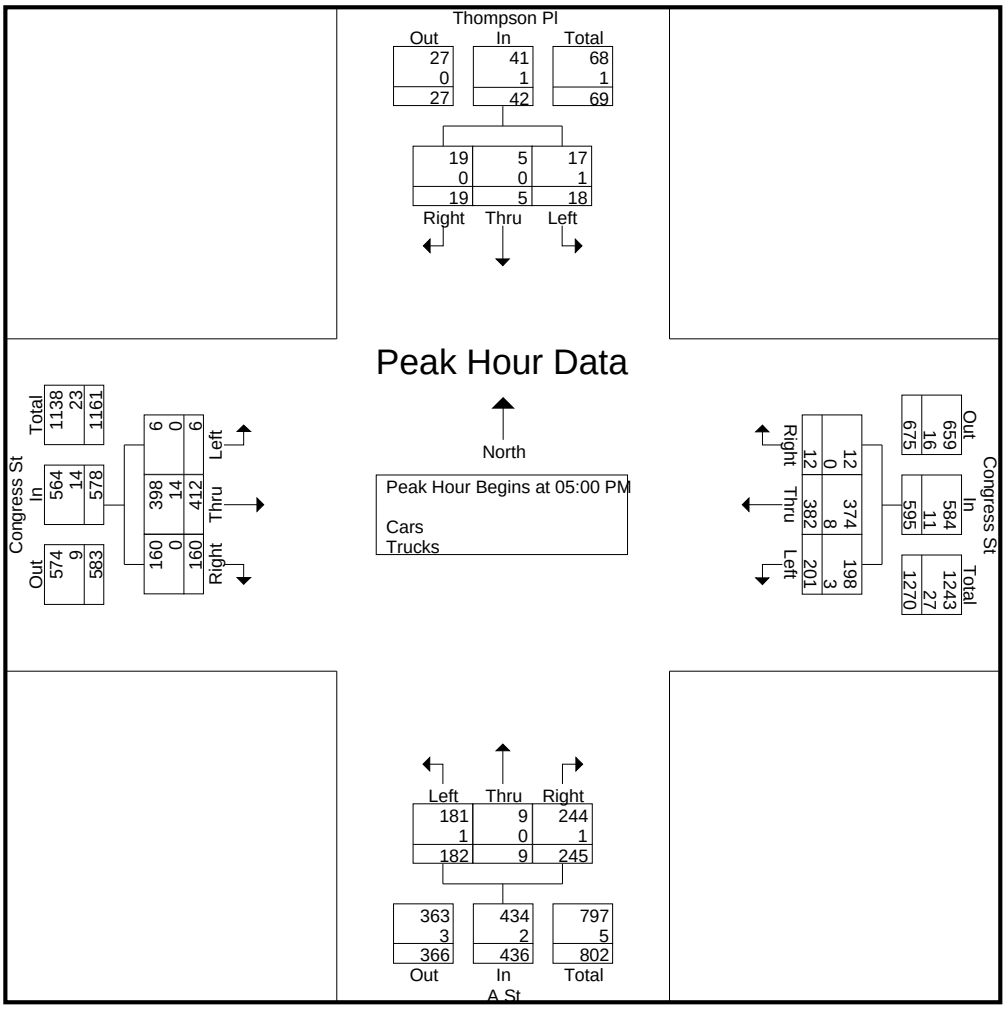
	Thompson Pl From North			Congress St From East			A St From South			Congress St From West			
Start Time	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Int. Total
04:00 PM	6	2	5	50	57	1	27	1	45	4	93	59	350
04:15 PM	6	1	4	49	58	1	44	1	52	0	87	54	357
04:30 PM	7	3	4	48	42	2	35	0	47	2	85	42	317
04:45 PM	1	2	2	47	65	1	47	2	58	1	77	52	355
Total	20	8	15	194	222	5	153	4	202	7	342	207	1379
05:00 PM	3	2	6	52	83	5	44	4	58	1	86	42	386
05:15 PM	3	2	5	53	106	4	54	2	69	2	104	44	448
05:30 PM	7	0	4	52	109	2	45	1	65	1	94	40	420
05:45 PM	5	1	4	44	84	1	39	2	53	2	128	34	397
Total	18	5	19	201	382	12	182	9	245	6	412	160	1651
Grand Total	38	13	34	395	604	17	335	13	447	13	754	367	3030
Apprch %	44.7	15.3	40	38.9	59.4	1.7	42.1	1.6	56.2	1.1	66.5	32.4	
Total %	1.3	0.4	1.1	13	19.9	0.6	11.1	0.4	14.8	0.4	24.9	12.1	
Cars	36	13	33	389	590	17	334	13	444	12	720	366	2967
% Cars	94.7	100	97.1	98.5	97.7	100	99.7	100	99.3	92.3	95.5	99.7	97.9
Trucks	2	0	1	6	14	0	1	0	3	1	34	1	63
% Trucks	5.3	0	2.9	1.5	2.3	0	0.3	0	0.7	7.7	4.5	0.3	2.1

Accurate Counts
978-664-2565

N/S Street :Thompson Place / A Street
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019003
Site Code : 15019003
Start Date : 4/16/2015
Page No : 2

	Thompson Pl From North				Congress St From East				A St From South				Congress St From West				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	3	**2**	**6**	**11**	52	83	**5**	140	44	**4**	58	106	1	86	42	129	386
05:15 PM	3	2	5	10	**53**	106	4	**163**	**54**	2	**69**	**125**	**2**	104	**44**	150	**448**
05:30 PM	**7**	0	4	11	52	**109**	2	163	45	1	65	111	1	94	40	135	420
05:45 PM	5	1	4	10	44	84	1	129	39	2	53	94	2	**128**	34	**164**	397
Total Volume	18	5	19	42	201	382	12	595	182	9	245	436	6	412	160	578	1651
% App. Total	42.9	11.9	45.2		33.8	64.2	2		41.7	2.1	56.2		1	71.3	27.7		
PHF	.643	.625	.792	.955	.948	.876	.600	.913	.843	.563	.888	.872	.750	.805	.909	.881	.921
Cars	17	5	19	41	198	374	12	584	181	9	244	434	6	398	160	564	1623
% Cars	94.4	100	100	97.6	98.5	97.9	100	98.2	99.5	100	99.6	99.5	100	96.6	100	97.6	98.3
Trucks	1	0	0	1	3	8	0	11	1	0	1	2	0	14	0	14	28
% Trucks	5.6	0	0	2.4	1.5	2.1	0	1.8	0.5	0	0.4	0.5	0	3.4	0	2.4	1.7



Accurate Counts
978-664-2565

N/S Street :Thompson Place / A Street
E/W Street : Congress Street
City/State : South Boston, MA
Weather : Clear

File Name : 15019003
Site Code : 15019003
Start Date : 4/16/2015

Groups Printed- Bikes Peds

	Thompson Pl From North				Congress St From East				A St From South				Congress St From West						
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Exclu. Total	Inclu. Total	Int. Total
04:00 PM	0	0	0	71	0	2	0	13	0	0	0	18	0	0	1	20	122	3	125
04:15 PM	0	0	0	84	0	0	0	11	2	0	0	20	0	1	1	19	134	4	138
04:30 PM	0	0	0	89	2	3	0	20	1	0	1	24	0	3	2	21	154	12	166
04:45 PM	0	0	0	102	0	6	0	26	2	1	1	48	0	0	0	31	207	10	217
Total	0	0	0	346	2	11	0	70	5	1	2	110	0	4	4	91	617	29	646
05:00 PM	0	1	1	132	2	3	0	34	3	1	0	46	0	5	6	43	255	22	277
05:15 PM	0	3	0	113	1	2	0	23	3	1	4	56	0	1	6	43	235	21	256
05:30 PM	0	0	0	111	2	7	0	30	2	0	0	91	0	0	0	30	262	11	273
05:45 PM	0	0	0	104	2	3	0	24	1	1	1	74	0	0	0	33	235	8	243
Total	0	4	1	460	7	15	0	111	9	3	5	267	0	6	12	149	987	62	1049
Grand Total	0	4	1	806	9	26	0	181	14	4	7	377	0	10	16	240	1604	91	1695
Apprch %	0	80	20		25.7	74.3	0		56	16	28		0	38.5	61.5				
Total %	0	4.4	1.1		9.9	28.6	0		15.4	4.4	7.7		0	11	17.6		94.6	5.4	

SEASONAL ADJUSTMENT FACTORS

MASSACHUSETTS HIGHWAY DEPARTMENT - STATEWIDE TRAFFIC DATA COLLECTION

2011 WEEKDAY SEASONAL FACTORS *

* Note: These are weekday factors. The average of the factors for the year will not equal 1, as weekend data are not considered.

FACTOR GROUP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GROUP 1 - WEST INTERSTATE	0.98	0.93	0.90	0.89	0.90	0.88	0.91	0.90	0.89	0.89	0.93	0.95
Use group 2 for R5, R6, & R0 GROUP 2 - **RURAL MAJOR COLLECTOR (R-5)**	1.12	1.12	1.07	0.99	0.91	0.90	0.86	0.86	0.92	0.93	1.01	1.05
GROUP 3A - RECREATIONAL **(1-4) See below	1.26	1.25	1.20	1.06	0.96	0.89	0.76	0.76	0.92	0.99	1.08	1.14
GROUP 3B - RECREATIONAL ***(5) See below	1.22	1.26	1.22	1.06	0.96	0.90	0.72	0.74	0.97	1.02	1.14	1.15
GROUP 4 - I-495 INTERSTATE	1.02	1.00	1.00	0.96	0.92	0.89	0.85	0.83	0.93	0.96	1.01	1.03
GROUP 5 - EAST INTERSTATE	1.04	1.00	0.96	0.93	0.92	0.91	0.91	0.89	0.93	0.93	0.96	1.01
GROUP 6: Use group 6 for U2, U3, U5, U6, U0, R2, & R3 **URBAN ARTERIALS, COLLECTORS & RURAL ARTERIALS (R-2, R-3)**	1.03	1.01	0.96	0.92	0.91	0.90	0.92	0.92	0.93	0.92	0.97	0.97
GROUP 7 - I-84 PROXIMITY (STA. 17, 3921)	1.24	1.24	1.15	1.04	0.99	1.00	0.93	0.89	1.05	1.05	1.05	1.12
GROUP 8 - I-295 PROXIMITY (STA. 6590)	1.00	0.99	0.95	0.92	0.94	0.91	0.93	0.92	0.95	0.94	0.97	0.95
GROUP 9 - I-195 PROXIMITY (STA. 7)	1.13	1.05	1.03	0.95	0.89	0.87	0.86	0.79	0.88	0.91	0.99	1.03

RECREATIONAL: (ALL YEARS)

**GROUP 3A:

1. CAPE COD (ALL TOWNS)

2.PLYMOUTH(SOUTH OF RTE.3A)

7014, 7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108,7178

3.MARTHA'S VINEYARD

4.NANTUCKET

***GROUP 3B:

5.PERMANENTS 2 & 189

1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,

1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,

1105,1106,1107,1108,1113,1114,1116,2196,2197,2198

2011 AXLE CORRECTION FACTORS

ROAD INVENTORY FUNCTIONAL CLASSIFICATION	AXLE CORRECTION FACTOR
RURAL	
1	0.95
2	0.97
3	0.98
0,5,6	0.98
URBAN	
1	0.96
2,3	0.98
5	0.98
0,6	0.99
I-84	0.90

ROUND OFF

0 - 999.....10

> 1,000.....100

Apply I-84 factor to stations:

3290, 3921, 3929

TRIP GENERATION CALCULATIONS

22 Boston Wharf Road, South Boston
2015019.00

Trip Generation

HOWARD STEIN HUDSON

12-May-15

XX HARD CODED TO BALANCE

Land Use	Size	Category	Trip Rates (Trips/ksf or unit)	Unadjusted Vehicle Trips	Internal trips	Pass-by %	Less capture trips	Assumed national vehicle occupancy rate[1]	Converted to Person trips	Transit Share[2]	Transit Trips	Walk/Bike/ Other Share[2]	Walk/ Bike/ Other Trips	Vehicle Share[2]	Total Vehicle Person Trips	Assumed local auto occupancy rate for autos [4]	Total Adjusted Auto Trips
Daily Peak Hour																	
Office[4]	56	Total	11.03	618	0%	0%	618	1.13	**698**	21%	**146**	22%	**154**	57%	**398**	1.13	**352**
	KSF	In	5.52	309	0%	0%	309	1.13	**349**	21%	**73**	22%	**77**	57%	**199**	1.13	**176**
		Out	5.52	309	0%	0%	309	1.13	**349**	21%	**73**	22%	**77**	57%	**199**	1.13	**176**
AM Peak Hour																	
Office	56	Total	1.56	87	0%	10%	79	1.13	**89**		**20**		**35**		**34**	1.13	**30**
	KSF	In	1.37	77	0%	10%	69	1.13	**78**	24%	**18**	42%	**33**	34%	**27**	1.13	**24**
		Out	0.19	10	0%	10%	9	1.13	**11**	17%	**2**	23%	**2**	60%	**7**	1.13	**6**
PM Peak Hour																	
Office	56	Total	1.49	83	0%	10%	75	1.13	**84**		**20**		**32**		**32**	1.13	**28**
	KSF	In	0.25	14	0%	10%	13	1.13	**14**	17%	**3**	23%	**3**	60%	**8**	1.13	**7**
		Out	1.24	69	0%	10%	62	1.13	**70**	24%	**17**	42%	**29**	34%	**24**	1.13	**21**

1. 2009 National vehicle occupancy rates - 1.13:home to work; 1.84: family/personal business; 1.78: shopping; 2.2 social/recreational.
2. Mode shares based on peak-hour BTD Data for Area 13.
3. Local vehicle occupancy rates based on 2009 National vehicle occupancy rates.
4. ITE Trip Generation Rate, 9th Edition, LUC 710 (General Office Building), average rate

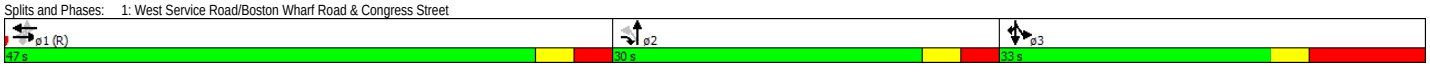
INTERSECTION CAPACITY ANALYSIS WORKSHEETS

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	53	266	93	19	74	557	31	92	44	52	20	37	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	11	12	12	11	11
Storage Length (ft)	0		0		150		0	0		0	0		125
Storage Lanes	0		1		1		0	1		0	0		1
Taper Length (ft)	25				25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.992			0.919				0.850
Flt Protected		0.992			0.950			0.950				0.983	
Satd. Flow (prot)	0	1585	1454	0	1587	3033	0	1721	1454	0	0	1545	1391
Flt Permitted		0.817			0.451			0.167				0.983	
Satd. Flow (perm)	0	1306	1454	0	753	3033	0	302	1454	0	0	1545	1391
Right Turn on Red			Yes				Yes			Yes			Yes
Satd. Flow (RTOR)			107			6			50				89
Link Speed (mph)		30				30			30			30	
Link Distance (ft)		216				515			451			857	
Travel Time (s)		4.9				11.7			10.3			19.5	
Peak Hour Factor	0.87	0.87	0.87	0.94	0.94	0.94	0.94	0.90	0.90	0.90	0.84	0.84	0.84
Heavy Vehicles (%)	2%	8%	0%	0%	3%	1%	0%	7%	5%	4%	0%	8%	1%
Parking (#/hr)						0	0						
Adj. Flow (vph)	61	306	107	20	79	593	33	102	49	58	24	44	88
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	367	107	0	99	626	0	102	107	0	0	68	88
Turn Type	Perm	NA	custom	Perm	Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		1	2			1			2		3	3	3
Permitted Phases	1		1	1	1			2					
Detector Phase	1	1	2	1	1	1		2	2		3	3	3
Switch Phase													
Minimum Initial (s)	10.0	10.0	8.0	10.0	10.0	10.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	29.0	29.0	30.0	29.0	29.0	29.0		30.0	30.0		33.0	33.0	33.0
Total Split (s)	47.0	47.0	30.0	47.0	47.0	47.0		30.0	30.0		33.0	33.0	33.0
Total Split (%)	42.7%	42.7%	27.3%	42.7%	42.7%	42.7%		27.3%	27.3%		30.0%	30.0%	30.0%
Maximum Green (s)	41.0	41.0	24.0	41.0	41.0	41.0		24.0	24.0		21.0	21.0	21.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		9.0	9.0	9.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0		6.0	6.0			12.0	12.0
Lead/Lag	Lead	Lead	Lag	Lead	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?													
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	C-Max		None	None		None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	16.0	11.0	11.0	11.0		16.0	16.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0	0
Act Effct Green (s)		52.1	82.1		52.1	52.1		24.0	24.0			9.9	9.9
Actuated g/C Ratio		0.47	0.75		0.47	0.47		0.22	0.22			0.09	0.09
v/c Ratio		0.59	0.10		0.28	0.44		1.57	0.30			0.49	0.43
Control Delay		26.6	2.1		21.0	20.6		349.5	22.7			59.0	16.1
Queue Delay		2.1	0.0		0.0	0.0		2.0	0.0			0.0	0.0
Total Delay		28.8	2.1		21.0	20.6		351.5	22.7			59.0	16.1
LOS		C	A		C	C		F	C			E	B
Approach Delay		22.7				20.6			183.1			34.8	
Approach LOS		C				C			F			C	
Stops (vph)		290	23		57	375		63	45			53	15
Fuel Used(gal)		4	0		1	7		7	1			1	1
CO Emissions (g/hr)		271	23		76	482		505	72			95	57
NOx Emissions (g/hr)		53	4		15	94		98	14			18	11
VOC Emissions (g/hr)		63	5		18	112		117	17			22	13
Dilemma Vehicles (#)		0	0		0	0		0	0			0	0
Queue Length 50th (ft)		247	1		41	146		~102	33			47	0
Queue Length 95th (ft)		349	27		87	209		#212	83			84	39
Internal Link Dist (ft)		136				435			371			777	
Turn Bay Length (ft)					150								125
Base Capacity (vph)		618	1111		356	1438		65	356			294	337
Starvation Cap Reductn		134	0		0	0		0	0			0	0
Spillback Cap Reductn		0	0		0	0		4	0			0	6
Storage Cap Reductn		0	0		0	0		0	0			0	0
Reduced v/c Ratio		0.76	0.10		0.28	0.44		1.67	0.30			0.23	0.27

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 48 (44%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.57
Intersection Signal Delay: 44.4 Intersection LOS: D
Intersection Capacity Utilization 67.1% ICU Level of Service C
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: West Service Road/Boston Wharf Road & Congress Street



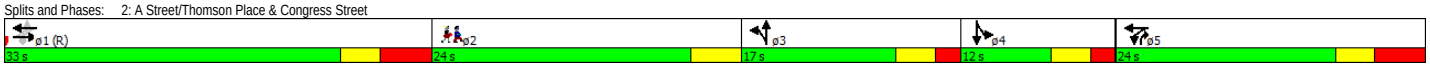
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	4	257	186	292	341	11	157	4	155	17	8	13	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	11	11	11	12	12	16	12	12	16	12	
Storage Length (ft)	100		100	0		0	0		100	0		0	
Storage Lanes	1		1	1		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.850		0.995				0.850		0.954		
Flt Protected		0.999		0.950				0.953			0.978		
Satd. Flow (prot)	0	2990	1338	1540	1609	0	0	1778	1384	0	1631	0	
Flt Permitted		0.754		0.576				0.953			0.978		
Satd. Flow (perm)	0	2257	1338	933	1609	0	0	1778	1384	0	1631	0	
Right Turn on Red			No			Yes			Yes			Yes	
Satd. Flow (RTOR)					2				187		18		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		639			226			444			694		
Travel Time (s)		14.5			5.1			10.1			15.8		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.78	0.78	0.78	0.63	0.63	0.63	
Heavy Vehicles (%)	0%	5%	5%	2%	2%	9%	4%	0%	5%	12%	13%	8%	
Adj. Flow (vph)	4	279	202	317	371	12	201	5	199	27	13	21	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	283	202	317	383	0	0	206	199	0	61	0	
Turn Type	Perm	NA	Perm	D.P+P	NA		Split	NA	Over	Split	NA		
Protected Phases		1		5	1 5		3	3	5	4	4		2
Permitted Phases	1		1	1									
Detector Phase	1	1	1	5	1 5		3	3	5	4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0	10.0	6.0			8.0	8.0	6.0	6.0	6.0		8.0
Minimum Split (s)	19.0	19.0	19.0	14.0			14.0	14.0	14.0	12.0	12.0		24.0
Total Split (s)	33.0	33.0	33.0	24.0			17.0	17.0	24.0	12.0	12.0		24.0
Total Split (%)	30.0%	30.0%	30.0%	21.8%			15.5%	15.5%	21.8%	10.9%	10.9%		22%
Maximum Green (s)	26.0	26.0	26.0	17.0			12.0	12.0	17.0	7.0	7.0		20.0
Yellow Time (s)	3.0	3.0	3.0	3.0			3.0	3.0	3.0	3.0	3.0		4.0
All-Red Time (s)	4.0	4.0	4.0	4.0			2.0	2.0	4.0	2.0	2.0		0.0
Lost Time Adjust (s)		0.0	0.0	0.0				0.0	0.0		0.0		
Total Lost Time (s)		7.0	7.0	7.0				5.0	7.0		5.0		
Lead/Lag	Lead	Lead	Lead				Lead	Lead		Lag	Lag		Lag
Lead-Lag Optimize?													
Vehicle Extension (s)	2.0	2.0	2.0	2.0			2.0	2.0	2.0	2.0	2.0		2.0
Recall Mode	C-Max	C-Max	C-Max	None			Max	Max	None	Max	Max		None
Walk Time (s)													7.0
Flash Dont Walk (s)													13.0
Pedestrian Calls (#/hr)													93
Act Effct Green (s)		32.1	32.1	47.8	54.8			12.0	15.7		7.0		
Actuated g/C Ratio		0.29	0.29	0.43	0.50			0.11	0.14		0.06		
v/c Ratio		0.43	0.52	0.64	0.48			1.07	0.56		0.51		
Control Delay		36.9	41.6	47.4	42.1			131.1	13.9		52.5		
Queue Delay		0.0	0.0	0.0	1.3			0.0	0.1		0.0		
Total Delay		36.9	41.6	47.4	43.4			131.1	14.0		52.5		
LOS		D	D	D	D			F	B		D		
Approach Delay		38.9			45.2			73.6			52.5		
Approach LOS		D			D			E			D		
Stops (vph)		214	161	335	321			133	27		28		
Fuel Used(gal)		4	3	5	5			6	1		1		
CO Emissions (g/hr)		310	237	362	378			391	79		54		
NOx Emissions (g/hr)		60	46	71	74			76	15		10		
VOC Emissions (g/hr)		72	55	84	88			91	18		12		
Dilemma Vehicles (#)		0	0	0	0			0	0		0		
Queue Length 50th (ft)		92	129	221	274			~161	7		30		
Queue Length 95th (ft)		137	211	m287	m339			#249	46		46		
Internal Link Dist (ft)		559			146			364			614		
Turn Bay Length (ft)			100						100				
Base Capacity (vph)		657	390	509	800			193	371		120		
Starvation Cap Reductn		0	0	0	230			0	0		0		
Spillback Cap Reductn		4	0	0	0			0	6		0		
Storage Cap Reductn		0	0	0	0			0	0		0		
Reduced v/c Ratio		0.43	0.52	0.62	0.67			1.07	0.55		0.51		

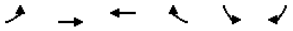
Intersection Summary

Area Type:	CBD
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 20 (18%), Referenced to phase 1:EBWB, Start of Green	
Natural Cycle: 85	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.07	
Intersection Signal Delay: 50.6	Intersection LOS: D
Intersection Capacity Utilization 61.4%	ICU Level of Service B
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: A Street/Thomson Place & Congress Street





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	21	408	639	84	4	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.82	0.82	0.93	0.93	0.56	0.56
Hourly flow rate (vph)	26	498	687	90	7	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		226	216			
pX, platoon unblocked	0.87				0.91	0.87
vC, conflicting volume	777				1032	389
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	459				514	14
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				98	99
cM capacity (veh/h)	973				437	934

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	191	332	458	319	16
Volume Left	26	0	0	0	7
Volume Right	0	0	0	90	9
cSH	973	1700	1700	1700	620
Volume to Capacity	0.03	0.20	0.27	0.19	0.03
Queue Length 95th (ft)	2	0	0	0	2
Control Delay (s)	1.4	0.0	0.0	0.0	11.0
Lane LOS	A				B
Approach Delay (s)	0.5		0.0		11.0
Approach LOS					B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	29	400	299	8	97	355	54	77	24	66	63	134	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	11	12	12	11	11
Storage Length (ft)	0		0		150		0	0		0	0		125
Storage Lanes	0		1		1		0	1		0	0		1
Taper Length (ft)	25				25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.980			0.889				0.850
Flt Protected		0.997			0.950			0.950				0.984	
Satd. Flow (prot)	0	1644	1439	0	1567	2999	0	1737	1433	0	0	1605	1391
Flt Permitted		0.945			0.383			0.950				0.984	
Satd. Flow (perm)	0	1558	1439	0	632	2999	0	1737	1433	0	0	1605	1391
Right Turn on Red			Yes				Yes			Yes			Yes
Satd. Flow (RTOR)			325			17			73				147
Link Speed (mph)		30				30			30			30	
Link Distance (ft)		216				515			451			857	
Travel Time (s)		4.9				11.7			10.3			19.5	
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.87	0.91	0.91	0.91	0.88	0.88	0.88
Heavy Vehicles (%)	0%	4%	1%	0%	4%	1%	0%	6%	4%	2%	2%	1%	1%
Parking (#/hr)						0	0						
Adj. Flow (vph)	32	435	325	9	111	408	62	85	26	73	72	152	147
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	467	325	0	120	470	0	85	99	0	0	224	147
Turn Type	Perm	NA	Perm	Perm	Perm	NA		Split	NA		Split	NA	Prot
Protected Phases		1				1		2	2		3	3	3
Permitted Phases	1		1	1	1								
Detector Phase	1	1	1	1	1	1		2	2		3	3	3
Switch Phase													
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0		30.0	30.0		33.0	33.0	33.0
Total Split (s)	43.0	43.0	43.0	43.0	43.0	43.0		30.0	30.0		37.0	37.0	37.0
Total Split (%)	39.1%	39.1%	39.1%	39.1%	39.1%	39.1%		27.3%	27.3%		33.6%	33.6%	33.6%
Maximum Green (s)	37.0	37.0	37.0	37.0	37.0	37.0		24.0	24.0		25.0	25.0	25.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		9.0	9.0	9.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0		6.0	6.0			12.0	12.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?													
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		16.0	16.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0	0
Act Effct Green (s)		56.5	56.5		56.5	56.5		10.3	10.3			19.2	19.2
Actuated g/C Ratio		0.51	0.51		0.51	0.51		0.09	0.09			0.17	0.17
v/c Ratio		0.58	0.36		0.37	0.30		0.52	0.49			0.80	0.40
Control Delay		9.1	0.9		22.9	16.8		58.8	25.2			63.6	9.3
Queue Delay		0.2	0.3		0.0	0.0		0.0	0.0			0.0	0.0
Total Delay		9.3	1.2		22.9	16.8		58.8	25.2			63.6	9.3
LOS		A	A		C	B		E	C			E	A
Approach Delay		5.9				18.0			40.7			42.1	
Approach LOS		A				B			D			D	
Stops (vph)		122	2		67	225		72	31			185	18
Fuel Used(gal)		2	1		1	4		2	1			5	1
CO Emissions (g/hr)		153	40		89	299		111	66			342	84
NOx Emissions (g/hr)		30	8		17	58		22	13			66	16
VOC Emissions (g/hr)		35	9		21	69		26	15			79	20
Dilemma Vehicles (#)		0	0		0	0		0	0			0	0
Queue Length 50th (ft)		74	1		49	92		58	17			152	0
Queue Length 95th (ft)		157	m0		111	147		106	68			220	49
Internal Link Dist (ft)		136				435			371			777	
Turn Bay Length (ft)					150								125
Base Capacity (vph)		799	896		324	1548		378	369			364	429
Starvation Cap Reductn		45	172		0	0		0	0			0	0
Spillback Cap Reductn		0	0		0	0		0	0			0	0
Storage Cap Reductn		0	0		0	0		0	0			0	0
Reduced v/c Ratio		0.62	0.45		0.37	0.30		0.22	0.27			0.62	0.34

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 97 (88%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 19.8 Intersection LOS: B
Intersection Capacity Utilization 81.4% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: West Service Road/Boston Wharf Road & Congress Street

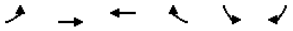
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø2
Lane Configurations													
Volume (vph)	6	425	160	202	382	12	181	9	244	17	5	19	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	11	11	11	11	12	12	16	12	12	16	12	
Storage Length (ft)	100		100	0		0	0		100	0		0	
Storage Lanes	1		1	1		0	0		1	0		0	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.850		0.996				0.850		0.937		
Flt Protected		0.999		0.950				0.954			0.979		
Satd. Flow (prot)	0	3019	1405	1540	1615	0	0	1831	1454	0	1734	0	
Flt Permitted		0.722		0.389				0.954			0.979		
Satd. Flow (perm)	0	2182	1405	630	1615	0	0	1831	1454	0	1734	0	
Right Turn on Red			No			Yes			Yes			Yes	
Satd. Flow (RTOR)					2				236		20		
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		639			226			444			694		
Travel Time (s)		14.5			5.1			10.1			15.8		
Peak Hour Factor	0.88	0.88	0.88	0.90	0.90	0.90	0.87	0.87	0.87	0.93	0.93	0.93	
Heavy Vehicles (%)	0%	4%	0%	2%	2%	0%	1%	0%	0%	6%	0%	0%	
Adj. Flow (vph)	7	483	182	224	424	13	208	10	280	18	5	20	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	490	182	224	437	0	0	218	280	0	43	0	
Turn Type	Perm	NA	Perm	D.P+P	NA		Split	NA	Over	Split	NA		
Protected Phases		1		5	1 5		3	3	5	4	4		2
Permitted Phases	1		1	1									
Detector Phase	1	1	1	5	1 5		3	3	5	4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0	10.0	6.0			8.0	8.0	6.0	6.0	6.0		8.0
Minimum Split (s)	19.0	19.0	19.0	14.0			14.0	14.0	14.0	12.0	12.0		24.0
Total Split (s)	40.0	40.0	40.0	19.0			15.0	15.0	19.0	12.0	12.0		24.0
Total Split (%)	36.4%	36.4%	36.4%	17.3%			13.6%	13.6%	17.3%	10.9%	10.9%		22%
Maximum Green (s)	33.0	33.0	33.0	12.0			10.0	10.0	12.0	7.0	7.0		20.0
Yellow Time (s)	3.0	3.0	3.0	3.0			3.0	3.0	3.0	3.0	3.0		4.0
All-Red Time (s)	4.0	4.0	4.0	4.0			2.0	2.0	4.0	2.0	2.0		0.0
Lost Time Adjust (s)		0.0	0.0	0.0				0.0	0.0		0.0		
Total Lost Time (s)		7.0	7.0	7.0				5.0	7.0		5.0		
Lead/Lag	Lead	Lead	Lead				Lead	Lead		Lag	Lag		Lag
Lead-Lag Optimize?													
Vehicle Extension (s)	2.0	2.0	2.0	2.0			2.0	2.0	2.0	2.0	2.0		2.0
Recall Mode	C-Max	C-Max	C-Max	None			Max	Max	None	Max	Max		None
Walk Time (s)													7.0
Flash Dont Walk (s)													13.0
Pedestrian Calls (#/hr)													101
Act Effct Green (s)		33.0	33.0	45.0	52.0			10.0	12.0		7.0		
Actuated g/C Ratio		0.30	0.30	0.41	0.47			0.09	0.11		0.06		
v/c Ratio		0.75	0.43	0.63	0.57			1.31	0.76		0.33		
Control Delay		43.1	34.9	25.6	19.3			217.3	24.5		38.5		
Queue Delay		0.0	0.0	0.0	0.5			0.0	0.0		0.0		
Total Delay		43.1	34.9	25.6	19.8			217.3	24.5		38.5		
LOS		D	C	C	B			F	C		D		
Approach Delay		40.9			21.8			108.9			38.5		
Approach LOS		D			C			F			D		
Stops (vph)		384	127	122	181			145	51		25		
Fuel Used(gal)		8	3	2	3			10	2		1		
CO Emissions (g/hr)		563	184	146	226			689	164		47		
NOx Emissions (g/hr)		110	36	28	44			134	32		9		
VOC Emissions (g/hr)		130	43	34	52			160	38		11		
Dilemma Vehicles (#)		0	0	0	0			0	0		0		
Queue Length 50th (ft)		164	103	68	138			~199	29		16		
Queue Length 95th (ft)		222	166	121	200			#336	#128		53		
Internal Link Dist (ft)		559			146			364			614		
Turn Bay Length (ft)			100						100				
Base Capacity (vph)		654	421	357	764			166	368		129		
Starvation Cap Reductn		0	0	0	90			0	0		0		
Spillback Cap Reductn		0	0	0	0			0	0		0		
Storage Cap Reductn		0	0	0	0			0	0		0		
Reduced v/c Ratio		0.75	0.43	0.63	0.65			1.31	0.76		0.33		

Intersection Summary

Area Type:	CBD		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 91 (83%), Referenced to phase 1:EBWB, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.31			
Intersection Signal Delay: 52.2		Intersection LOS: D	
Intersection Capacity Utilization 70.6%		ICU Level of Service C	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: A Street/Thomson Place & Congress Street



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	4	682	555	6	46	41
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.48	0.48
Hourly flow rate (vph)	5	784	638	7	96	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		226	216			
pX, platoon unblocked	0.93				0.91	0.93
vC, conflicting volume	645				1043	322
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	461				492	113
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				79	90
cM capacity (veh/h)	1030				463	857

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	266	523	425	220	181
Volume Left	5	0	0	0	96
Volume Right	0	0	0	7	85
cSH	1030	1700	1700	1700	591
Volume to Capacity	0.00	0.31	0.25	0.13	0.31
Queue Length 95th (ft)	0	0	0	0	32
Control Delay (s)	0.2	0.0	0.0	0.0	13.8
Lane LOS	A				B
Approach Delay (s)	0.1		0.0		13.8
Approach LOS					B

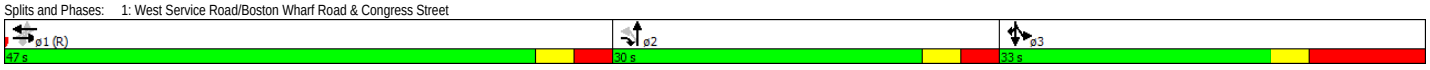
Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	54	272	94	19	75	584	31	93	45	53	20	48	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	11	12	12	11	11
Storage Length (ft)	0		0		150		0	0		0	0		125
Storage Lanes	0		1		1		0	1		0	0		1
Taper Length (ft)	25				25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.992			0.919				0.850
Flt Protected		0.992			0.950			0.950				0.985	
Satd. Flow (prot)	0	1585	1454	0	1586	3033	0	1721	1454	0	0	1542	1391
Flt Permitted		0.812			0.460			0.167				0.985	
Satd. Flow (perm)	0	1298	1454	0	768	3033	0	302	1454	0	0	1542	1391
Right Turn on Red			Yes				Yes			Yes			Yes
Satd. Flow (RTOR)			102			6			50				89
Link Speed (mph)		30				30			30			30	
Link Distance (ft)		216				515			451			857	
Travel Time (s)		4.9				11.7			10.3			19.5	
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	8%	0%	0%	3%	1%	0%	7%	5%	4%	0%	8%	1%
Parking (#/hr)						0	0						
Adj. Flow (vph)	59	296	102	20	80	621	33	101	49	58	22	52	85
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	355	102	0	100	654	0	101	107	0	0	74	85
Turn Type	Perm	NA	custom	Perm	Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		1	2			1			2		3	3	3
Permitted Phases	1		1	1	1			2					
Detector Phase	1	1	2	1	1	1		2	2		3	3	3
Switch Phase													
Minimum Initial (s)	10.0	10.0	8.0	10.0	10.0	10.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	29.0	29.0	30.0	29.0	29.0	29.0		30.0	30.0		33.0	33.0	33.0
Total Split (s)	47.0	47.0	30.0	47.0	47.0	47.0		30.0	30.0		33.0	33.0	33.0
Total Split (%)	42.7%	42.7%	27.3%	42.7%	42.7%	42.7%		27.3%	27.3%		30.0%	30.0%	30.0%
Maximum Green (s)	41.0	41.0	24.0	41.0	41.0	41.0		24.0	24.0		21.0	21.0	21.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		9.0	9.0	9.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0		6.0	6.0			12.0	12.0
Lead/Lag	Lead	Lead	Lag	Lead	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?													
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	C-Max		None	None		None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	16.0	11.0	11.0	11.0		16.0	16.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0	0
Act Effct Green (s)		51.7	81.7		51.7	51.7		24.0	24.0			10.3	10.3
Actuated g/C Ratio		0.47	0.74		0.47	0.47		0.22	0.22			0.09	0.09
v/c Ratio		0.58	0.09		0.28	0.46		1.55	0.30			0.52	0.40
Control Delay		32.0	11.0		21.2	21.2		343.5	22.7			59.7	14.9
Queue Delay		1.6	0.0		0.0	0.0		0.5	0.0			0.0	0.0
Total Delay		33.6	11.0		21.2	21.2		344.0	22.7			59.7	14.9
LOS		C	B		C	C		F	C			E	B
Approach Delay		28.5				21.2			178.7			35.7	
Approach LOS		C				C			F			D	
Stops (vph)		275	58		57	399		64	46			63	15
Fuel Used(gal)		4	1		1	7		7	1			2	1
CO Emissions (g/hr)		294	48		77	512		502	73			114	59
NOx Emissions (g/hr)		57	9		15	100		98	14			22	11
VOC Emissions (g/hr)		68	11		18	119		116	17			26	14
Dilemma Vehicles (#)		0	0		0	0		0	0			0	0
Queue Length 50th (ft)		216	18		41	156		~100	33			51	0
Queue Length 95th (ft)		m321	m65		88	223		#211	83			96	43
Internal Link Dist (ft)		136				435			371			777	
Turn Bay Length (ft)					150								125
Base Capacity (vph)		610	1106		361	1429		65	356			294	337
Starvation Cap Reductn		118	0		0	0		0	0			0	0
Spillback Cap Reductn		0	0		0	22		1	0			0	1
Storage Cap Reductn		0	0		0	0		0	0			0	0
Reduced v/c Ratio		0.72	0.09		0.28	0.46		1.58	0.30			0.25	0.25

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 48 (44%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.55
Intersection Signal Delay: 45.6 Intersection LOS: D
Intersection Capacity Utilization 69.0% ICU Level of Service C
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: West Service Road/Boston Wharf Road & Congress Street

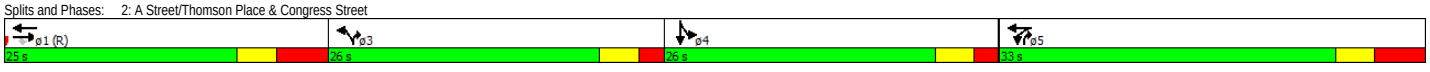


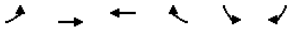
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	238	76	299	376	0	163	0	157	42	120	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	11	11	12	12	16	12	12	16	12
Storage Length (ft)	100		100	0		0	0		100	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.68	0.79			0.59				0.86	
Frt			0.850						0.850		0.972	
Flt Protected				0.950			0.950				0.990	
Satd. Flow (prot)	0	2991	1338	1540	1621	0	1562	0	1384	0	1467	0
Flt Permitted				0.950			0.950				0.990	
Satd. Flow (perm)	0	2991	913	1213	1621	0	915	0	1384	0	1440	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)									171		11	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		639			226			444			694	
Travel Time (s)		14.5			5.1			10.1			15.8	
Confl. Peds. (#/hr)			94	94			314		58	58		314
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	5%	5%	2%	2%	9%	4%	0%	5%	12%	13%	8%
Adj. Flow (vph)	0	259	83	325	409	0	177	0	171	46	130	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	259	83	325	409	0	177	0	171	0	223	0
Turn Type		NA	Perm	Prot	NA		Prot		pt+ov	Split	NA	
Protected Phases		1		5	1 5		3		3 5	4	4	
Permitted Phases			1									
Detector Phase		1	1	5	1 5		3		3 5	4	4	
Switch Phase												
Minimum Initial (s)		10.0	10.0	6.0			8.0			6.0	6.0	
Minimum Split (s)		25.0	25.0	14.0			26.0			26.0	26.0	
Total Split (s)		25.0	25.0	33.0			26.0			26.0	26.0	
Total Split (%)		22.7%	22.7%	30.0%			23.6%			23.6%	23.6%	
Maximum Green (s)		18.0	18.0	26.0			21.0			21.0	21.0	
Yellow Time (s)		3.0	3.0	3.0			3.0			3.0	3.0	
All-Red Time (s)		4.0	4.0	4.0			2.0			2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0			0.0				0.0	
Total Lost Time (s)		7.0	7.0	7.0			5.0				5.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0	2.0	2.0			2.0			2.0	2.0	
Recall Mode		C-Max	C-Max	None			Max			Max	Max	
Walk Time (s)		5.0	5.0				5.0			5.0	5.0	
Flash Dont Walk (s)		12.0	12.0				16.0			16.0	16.0	
Pedestrian Calls (#/hr)		0	0				0			0	0	
Act Effct Green (s)		19.1	19.1	24.9	51.0		21.0		47.9		21.0	
Actuated g/C Ratio		0.17	0.17	0.23	0.46		0.19		0.44		0.19	
v/c Ratio		0.50	0.53	0.93	0.54		0.59		0.24		0.77	
Control Delay		45.5	55.6	65.6	25.2		49.9		2.3		59.4	
Queue Delay		0.0	0.0	0.0	4.6		0.0		0.0		0.4	
Total Delay		45.5	55.6	65.6	29.8		49.9		2.3		59.8	
LOS		D	E	E	C		D		A		E	
Approach Delay		47.9			45.6						59.8	
Approach LOS		D			D						E	
Stops (vph)		212	70	275	313		146		14		176	
Fuel Used(gal)		5	2	6	4		3		1		5	
CO Emissions (g/hr)		319	114	422	302		212		48		319	
NOx Emissions (g/hr)		62	22	82	59		41		9		62	
VOC Emissions (g/hr)		74	26	98	70		49		11		74	
Dilemma Vehicles (#)		0	0	0	0		0		0		0	
Queue Length 50th (ft)		88	55	236	251		115		0		144	
Queue Length 95th (ft)		132	#111	m#361	m333		190		18		#265	
Internal Link Dist (ft)		559			146			364			614	
Turn Bay Length (ft)			100						100			
Base Capacity (vph)		518	158	364	746		298		711		288	
Starvation Cap Reductn		0	0	0	260		0		0		0	
Spillback Cap Reductn		0	0	0	0		0		0		4	
Storage Cap Reductn		0	0	0	0		0		0		0	
Reduced v/c Ratio		0.50	0.53	0.89	0.84		0.59		0.24		0.79	

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 44.0 Intersection LOS: D
Intersection Capacity Utilization 82.6% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: A Street/Thomson Place & Congress Street





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	21	416	670	85	4	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.93	0.93	0.92	0.92
Hourly flow rate (vph)	23	452	720	91	4	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		226	216			
pX, platoon unblocked	0.87				0.90	0.87
vC, conflicting volume	812				1038	406
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	471				469	2
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				99	99
cM capacity (veh/h)	953				464	942

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	174	301	480	332	10
Volume Left	23	0	0	0	4
Volume Right	0	0	0	91	5
cSH	953	1700	1700	1700	646
Volume to Capacity	0.02	0.18	0.28	0.20	0.02
Queue Length 95th (ft)	2	0	0	0	1
Control Delay (s)	1.4	0.0	0.0	0.0	10.7
Lane LOS	A				B
Approach Delay (s)	0.5		0.0		10.7
Approach LOS					B

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		40.1%	ICU Level of Service A
Analysis Period (min)		15	

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	29	410	303	8	98	400	55	78	24	67	64	173	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	11	12	12	11	11
Storage Length (ft)	0		0		150		0	0		0	0		125
Storage Lanes	0		1		1		0	1		0	0		1
Taper Length (ft)	25				25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.982			0.889				0.850
Flt Protected		0.997			0.950			0.950				0.987	
Satd. Flow (prot)	0	1644	1439	0	1566	3005	0	1737	1433	0	0	1611	1391
Flt Permitted		0.941			0.361			0.950				0.987	
Satd. Flow (perm)	0	1551	1439	0	595	3005	0	1737	1433	0	0	1611	1391
Right Turn on Red			Yes				Yes			Yes			Yes
Satd. Flow (RTOR)			329			15			74				146
Link Speed (mph)		30				30			30			30	
Link Distance (ft)		216				515			451			857	
Travel Time (s)		4.9				11.7			10.3			19.5	
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.87	0.91	0.91	0.91	0.88	0.88	0.88
Heavy Vehicles (%)	0%	4%	1%	0%	4%	1%	0%	6%	4%	2%	2%	1%	1%
Parking (#/hr)						0	0						
Adj. Flow (vph)	32	446	329	9	113	460	63	86	26	74	73	197	155
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	478	329	0	122	523	0	86	100	0	0	270	155
Turn Type	Perm	NA	Perm	Perm	Perm	NA		Split	NA		Split	NA	Prot
Protected Phases		1				1		2	2		3	3	3
Permitted Phases	1		1	1	1								
Detector Phase	1	1	1	1	1	1		2	2		3	3	3
Switch Phase													
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0		30.0	30.0		33.0	33.0	33.0
Total Split (s)	43.0	43.0	43.0	43.0	43.0	43.0		30.0	30.0		37.0	37.0	37.0
Total Split (%)	39.1%	39.1%	39.1%	39.1%	39.1%	39.1%		27.3%	27.3%		33.6%	33.6%	33.6%
Maximum Green (s)	37.0	37.0	37.0	37.0	37.0	37.0		24.0	24.0		25.0	25.0	25.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		9.0	9.0	9.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0		6.0	6.0			12.0	12.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?													
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		16.0	16.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0	0
Act Effct Green (s)		54.1	54.1		54.1	54.1		10.3	10.3			21.6	21.6
Actuated g/C Ratio		0.49	0.49		0.49	0.49		0.09	0.09			0.20	0.20
v/c Ratio		0.63	0.38		0.42	0.35		0.53	0.50			0.85	0.40
Control Delay		27.4	4.0		25.7	18.6		58.9	25.0			67.1	10.1
Queue Delay		0.4	0.1		0.0	0.0		0.0	0.0			0.0	0.0
Total Delay		27.8	4.1		25.7	18.6		58.9	25.0			67.1	10.1
LOS		C	A		C	B		E	C			E	B
Approach Delay		18.1				19.9			40.7			46.3	
Approach LOS		B				B			D			D	
Stops (vph)		242	42		73	268		73	31			221	22
Fuel Used(gal)		5	1		1	5		2	1			6	1
CO Emissions (g/hr)		317	69		97	352		113	67			424	91
NOx Emissions (g/hr)		62	13		19	68		22	13			82	18
VOC Emissions (g/hr)		73	16		22	81		26	15			98	21
Dilemma Vehicles (#)		0	0		0	0		0	0			0	0
Queue Length 50th (ft)		177	0		54	114		59	17			182	5
Queue Length 95th (ft)		306	63		117	166		107	68			#281	55
Internal Link Dist (ft)		136				435			371			777	
Turn Bay Length (ft)					150								125
Base Capacity (vph)		762	874		292	1485		378	370			366	428
Starvation Cap Reductn		53	87		0	0		0	0			0	0
Spillback Cap Reductn		0	0		0	16		0	0			0	0
Storage Cap Reductn		0	0		0	0		0	0			0	0
Reduced v/c Ratio		0.67	0.42		0.42	0.36		0.23	0.27			0.74	0.36

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 97 (88%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 26.5 Intersection LOS: C
Intersection Capacity Utilization 85.7% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

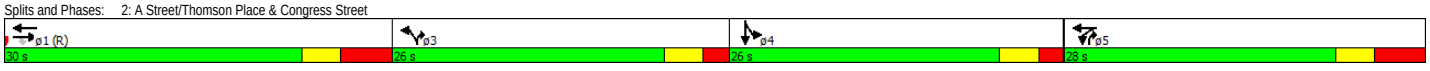
Splits and Phases: 1: West Service Road/Boston Wharf Road & Congress Street

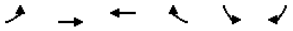
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	427	61	210	440	0	192	0	247	25	106	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	11	11	12	12	16	12	12	16	12
Storage Length (ft)	0		100	0		0	0		100	0		0
Storage Lanes	0		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.42	0.70			0.69				0.90	
Frt			0.850						0.850		0.976	
Flt Protected				0.950			0.950				0.992	
Satd. Flow (prot)	0	3020	1405	1540	1621	0	1608	0	1454	0	1724	0
Flt Permitted				0.950			0.950				0.992	
Satd. Flow (perm)	0	3020	588	1077	1621	0	1114	0	1454	0	1677	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)									268		9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		639			226			444			694	
Travel Time (s)		14.5			5.1			10.1			15.8	
Confl. Peds. (#/hr)			267	267			149		111	111		149
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93
Heavy Vehicles (%)	0%	4%	0%	2%	2%	0%	1%	0%	0%	6%	0%	0%
Adj. Flow (vph)	0	464	66	228	478	0	209	0	268	27	114	31
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	464	66	228	478	0	209	0	268	0	172	0
Turn Type		NA	Perm	Prot	NA		Prot		pt+ov	Split	NA	
Protected Phases		1		5	1 5		3		3 5	4	4	
Permitted Phases			1									
Detector Phase		1	1	5	1 5		3		3 5	4	4	
Switch Phase												
Minimum Initial (s)		10.0	10.0	6.0			8.0			6.0	6.0	
Minimum Split (s)		24.0	24.0	13.0			26.0			26.0	26.0	
Total Split (s)		30.0	30.0	28.0			26.0			26.0	26.0	
Total Split (%)		27.3%	27.3%	25.5%			23.6%			23.6%	23.6%	
Maximum Green (s)		23.0	23.0	21.0			21.0			21.0	21.0	
Yellow Time (s)		3.0	3.0	3.0			3.0			3.0	3.0	
All-Red Time (s)		4.0	4.0	4.0			2.0			2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0			0.0				0.0	
Total Lost Time (s)		7.0	7.0	7.0			5.0				5.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0	2.0	2.0			2.0			2.0	2.0	
Recall Mode		C-Max	C-Max	None			Max			Max	Max	
Walk Time (s)		5.0	5.0				5.0			5.0	5.0	
Flash Dont Walk (s)		12.0	12.0				16.0			16.0	16.0	
Pedestrian Calls (#/hr)		0	0				0			0	0	
Act Effct Green (s)		23.4	23.4	20.6	51.0		21.0		43.6		21.0	
Actuated g/C Ratio		0.21	0.21	0.19	0.46		0.19		0.40		0.19	
v/c Ratio		0.72	0.53	0.79	0.64		0.68		0.36		0.51	
Control Delay		47.7	56.2	62.3	20.3		54.0		2.8		43.9	
Queue Delay		0.0	0.0	0.0	0.4		0.0		0.0		0.0	
Total Delay		47.7	56.2	62.3	20.7		54.0		2.8		43.9	
LOS		D	E	E	C		D		A		D	
Approach Delay		48.8			34.2						43.9	
Approach LOS		D			C						D	
Stops (vph)		390	55	155	296		175		19		134	
Fuel Used(gal)		8	1	4	4		4		1		3	
CO Emissions (g/hr)		589	91	272	296		262		77		212	
NOx Emissions (g/hr)		115	18	53	58		51		15		41	
VOC Emissions (g/hr)		137	21	63	69		61		18		49	
Dilemma Vehicles (#)		0	0	0	0		0		0		0	
Queue Length 50th (ft)		162	42	102	128		138		0		104	
Queue Length 95th (ft)		221	#98	#259	182		#226		24		175	
Internal Link Dist (ft)		559			146			364			614	
Turn Bay Length (ft)			100						100			
Base Capacity (vph)		643	124	294	737		306		742		336	
Starvation Cap Reductn		0	0	0	46		0		0		0	
Spillback Cap Reductn		0	0	0	0		0		0		0	
Storage Cap Reductn		0	0	0	0		0		0		0	
Reduced v/c Ratio		0.72	0.53	0.78	0.69		0.68		0.36		0.51	

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 36.9 Intersection LOS: D
Intersection Capacity Utilization 77.1% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: A Street/Thomson Place & Congress Street





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	4	695	608	6	47	42
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	755	661	7	51	46
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		226	216			
pX, platoon unblocked	0.91				0.91	0.91
vC, conflicting volume	667				1051	334
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	446				431	80
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	95
cM capacity (veh/h)	1028				506	886

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	256	504	441	227	97
Volume Left	4	0	0	0	51
Volume Right	0	0	0	7	46
cSH	1028	1700	1700	1700	635
Volume to Capacity	0.00	0.30	0.26	0.13	0.15
Queue Length 95th (ft)	0	0	0	0	13
Control Delay (s)	0.2	0.0	0.0	0.0	11.7
Lane LOS	A				B
Approach Delay (s)	0.1		0.0		11.7
Approach LOS					B

Intersection Summary			
Average Delay		0.8	
Intersection Capacity Utilization		36.9%	ICU Level of Service A
Analysis Period (min)		15	

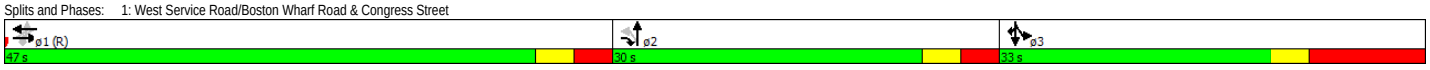
Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	54	276	95	19	75	591	31	99	45	53	20	48	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	11	12	12	11	11
Storage Length (ft)	0		0		150		0	0		0	0		125
Storage Lanes	0		1		1		0	1		0	0		1
Taper Length (ft)	25				25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.993			0.919				0.850
Flt Protected		0.992			0.950			0.950				0.985	
Satd. Flow (prot)	0	1585	1454	0	1586	3036	0	1721	1454	0	0	1542	1391
Flt Permitted		0.812			0.457			0.167				0.985	
Satd. Flow (perm)	0	1298	1454	0	763	3036	0	302	1454	0	0	1542	1391
Right Turn on Red			Yes				Yes			Yes			Yes
Satd. Flow (RTOR)			103			5			50				89
Link Speed (mph)		30				30			30			30	
Link Distance (ft)		216				515			451			857	
Travel Time (s)		4.9				11.7			10.3			19.5	
Peak Hour Factor	0.92	0.92	0.92	0.94	0.94	0.94	0.94	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	8%	0%	0%	3%	1%	0%	7%	5%	4%	0%	8%	1%
Parking (#/hr)						0	0						
Adj. Flow (vph)	59	300	103	20	80	629	33	108	49	58	22	52	85
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	359	103	0	100	662	0	108	107	0	0	74	85
Turn Type	Perm	NA	custom	Perm	Perm	NA		Perm	NA		Split	NA	Prot
Protected Phases		1	2			1			2		3	3	3
Permitted Phases	1		1	1	1			2					
Detector Phase	1	1	2	1	1	1		2	2		3	3	3
Switch Phase													
Minimum Initial (s)	10.0	10.0	8.0	10.0	10.0	10.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	29.0	29.0	30.0	29.0	29.0	29.0		30.0	30.0		33.0	33.0	33.0
Total Split (s)	47.0	47.0	30.0	47.0	47.0	47.0		30.0	30.0		33.0	33.0	33.0
Total Split (%)	42.7%	42.7%	27.3%	42.7%	42.7%	42.7%		27.3%	27.3%		30.0%	30.0%	30.0%
Maximum Green (s)	41.0	41.0	24.0	41.0	41.0	41.0		24.0	24.0		21.0	21.0	21.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		9.0	9.0	9.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0		6.0	6.0			12.0	12.0
Lead/Lag	Lead	Lead	Lag	Lead	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?													
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	C-Max		None	None		None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	16.0	11.0	11.0	11.0		16.0	16.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0	0
Act Effct Green (s)		51.7	81.7		51.7	51.7		24.0	24.0			10.3	10.3
Actuated g/C Ratio		0.47	0.74		0.47	0.47		0.22	0.22			0.09	0.09
v/c Ratio		0.59	0.09		0.28	0.46		1.66	0.30			0.52	0.40
Control Delay		32.2	10.8		21.3	21.3		386.2	22.7			59.7	14.9
Queue Delay		1.6	0.0		0.0	0.0		0.5	0.0			0.0	0.0
Total Delay		33.8	10.8		21.3	21.3		386.7	22.7			59.7	14.9
LOS		C	B		C	C		F	C			E	B
Approach Delay		28.7				21.3			205.5			35.7	
Approach LOS		C				C			F			D	
Stops (vph)		279	58		57	406		67	46			63	15
Fuel Used(gal)		4	1		1	7		9	1			2	1
CO Emissions (g/hr)		298	48		77	520		594	73			114	59
NOx Emissions (g/hr)		58	9		15	101		116	14			22	11
VOC Emissions (g/hr)		69	11		18	121		138	17			26	14
Dilemma Vehicles (#)		0	0		0	0		0	0			0	0
Queue Length 50th (ft)		218	18		41	158		~111	33			51	0
Queue Length 95th (ft)		m326	m65		88	226		#224	83			96	43
Internal Link Dist (ft)		136				435			371			777	
Turn Bay Length (ft)					150								125
Base Capacity (vph)		610	1106		358	1430		65	356			294	337
Starvation Cap Reductn		117	0		0	0		0	0			0	0
Spillback Cap Reductn		0	0		0	18		1	0			0	1
Storage Cap Reductn		0	0		0	0		0	0			0	0
Reduced v/c Ratio		0.73	0.09		0.28	0.47		1.69	0.30			0.25	0.25

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 48 (44%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.66
Intersection Signal Delay: 49.7 Intersection LOS: D
Intersection Capacity Utilization 69.4% ICU Level of Service C
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: West Service Road/Boston Wharf Road & Congress Street



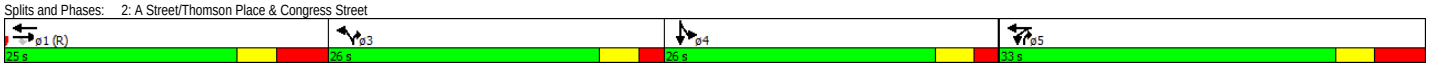
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	239	76	300	376	0	163	0	161	42	120	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	11	11	12	12	16	12	12	16	12
Storage Length (ft)	100		100	0		0	0		100	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.68	0.79			0.59				0.86	
Frt			0.850						0.850		0.972	
Flt Protected				0.950			0.950				0.990	
Satd. Flow (prot)	0	2991	1338	1540	1621	0	1562	0	1384	0	1467	0
Flt Permitted				0.950			0.950				0.990	
Satd. Flow (perm)	0	2991	913	1213	1621	0	915	0	1384	0	1440	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)									175		11	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		639			226			444			694	
Travel Time (s)		14.5			5.1			10.1			15.8	
Confl. Peds. (#/hr)			94	94			314		58	58		314
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	5%	5%	2%	2%	9%	4%	0%	5%	12%	13%	8%
Adj. Flow (vph)	0	260	83	326	409	0	177	0	175	46	130	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	260	83	326	409	0	177	0	175	0	223	0
Turn Type		NA	Perm	Prot	NA		Prot		pt+ov	Split	NA	
Protected Phases		1		5	1 5		3		3 5	4	4	
Permitted Phases			1									
Detector Phase		1	1	5	1 5		3		3 5	4	4	
Switch Phase												
Minimum Initial (s)		10.0	10.0	6.0			8.0			6.0	6.0	
Minimum Split (s)		25.0	25.0	14.0			26.0			26.0	26.0	
Total Split (s)		25.0	25.0	33.0			26.0			26.0	26.0	
Total Split (%)		22.7%	22.7%	30.0%			23.6%			23.6%	23.6%	
Maximum Green (s)		18.0	18.0	26.0			21.0			21.0	21.0	
Yellow Time (s)		3.0	3.0	3.0			3.0			3.0	3.0	
All-Red Time (s)		4.0	4.0	4.0			2.0			2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0			0.0				0.0	
Total Lost Time (s)		7.0	7.0	7.0			5.0				5.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0	2.0	2.0			2.0			2.0	2.0	
Recall Mode		C-Max	C-Max	None			Max			Max	Max	
Walk Time (s)		5.0	5.0				5.0			5.0	5.0	
Flash Dont Walk (s)		12.0	12.0				16.0			16.0	16.0	
Pedestrian Calls (#/hr)		0	0				0			0	0	
Act Effct Green (s)		19.0	19.0	25.0	51.0		21.0		48.0		21.0	
Actuated g/C Ratio		0.17	0.17	0.23	0.46		0.19		0.44		0.19	
v/c Ratio		0.50	0.53	0.93	0.54		0.59		0.25		0.77	
Control Delay		45.5	55.6	65.7	24.8		49.9		2.3		59.4	
Queue Delay		0.0	0.0	0.0	4.6		0.0		0.0		0.9	
Total Delay		45.5	55.6	65.7	29.5		49.9		2.3		60.3	
LOS		D	E	E	C		D		A		E	
Approach Delay		48.0			45.5						60.3	
Approach LOS		D			D						E	
Stops (vph)		213	70	277	312		146		14		176	
Fuel Used(gal)		5	2	6	4		3		1		5	
CO Emissions (g/hr)		320	114	424	300		212		50		319	
NOx Emissions (g/hr)		62	22	83	58		41		10		62	
VOC Emissions (g/hr)		74	26	98	69		49		11		74	
Dilemma Vehicles (#)		0	0	0	0		0		0		0	
Queue Length 50th (ft)		89	55	237	249		115		0		144	
Queue Length 95th (ft)		133	#111	m#355	m328		190		18		#265	
Internal Link Dist (ft)		559			146			364			614	
Turn Bay Length (ft)			100						100			
Base Capacity (vph)		517	158	364	746		298		713		288	
Starvation Cap Reductn		0	0	0	260		0		0		0	
Spillback Cap Reductn		0	0	0	0		0		0		8	
Storage Cap Reductn		0	0	0	0		0		0		0	
Reduced v/c Ratio		0.50	0.53	0.90	0.84		0.59		0.25		0.80	

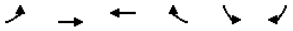
Intersection Summary

Area Type:	CBD		
Cycle Length: 110			
Actuated Cycle Length: 110			
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 43.9		Intersection LOS: D	
Intersection Capacity Utilization 82.6%		ICU Level of Service E	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: A Street/Thomson Place & Congress Street





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	26	416	670	98	9	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.93	0.93	0.92	0.92
Hourly flow rate (vph)	28	452	720	105	10	7
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		226	216			
pX, platoon unblocked	0.86				0.90	0.86
vC, conflicting volume	826				1056	413
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	480				482	2
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				98	99
cM capacity (veh/h)	943				452	939

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	179	301	480	346	16
Volume Left	28	0	0	0	10
Volume Right	0	0	0	105	7
cSH	943	1700	1700	1700	570
Volume to Capacity	0.03	0.18	0.28	0.20	0.03
Queue Length 95th (ft)	2	0	0	0	2
Control Delay (s)	1.7	0.0	0.0	0.0	11.5
Lane LOS	A				B
Approach Delay (s)	0.6		0.0		11.5
Approach LOS					B

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		44.5%	ICU Level of Service A
Analysis Period (min)		15	

Lane Group	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations													
Volume (vph)	29	425	305	8	98	402	55	80	24	67	64	173	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	16	11	12	12	11	11
Storage Length (ft)	0		0		150		0	0		0	0		125
Storage Lanes	0		1		1		0	1		0	0		1
Taper Length (ft)	25				25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.982			0.889				0.850
Flt Protected		0.997			0.950			0.950				0.987	
Satd. Flow (prot)	0	1643	1439	0	1567	3005	0	1737	1433	0	0	1611	1391
Flt Permitted		0.945			0.351			0.950				0.987	
Satd. Flow (perm)	0	1558	1439	0	579	3005	0	1737	1433	0	0	1611	1391
Right Turn on Red			Yes				Yes			Yes			Yes
Satd. Flow (RTOR)			332			15			73				146
Link Speed (mph)		30				30			30			30	
Link Distance (ft)		216				515			451			857	
Travel Time (s)		4.9				11.7			10.3			19.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	1%	0%	4%	1%	0%	6%	4%	2%	2%	1%	1%
Parking (#/hr)						0	0						
Adj. Flow (vph)	32	462	332	9	107	437	60	87	26	73	70	188	148
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	494	332	0	116	497	0	87	99	0	0	258	148
Turn Type	Perm	NA	Perm	Perm	Perm	NA		Split	NA		Split	NA	Prot
Protected Phases		1				1		2	2		3	3	3
Permitted Phases	1		1	1	1								
Detector Phase	1	1	1	1	1	1		2	2		3	3	3
Switch Phase													
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0		8.0	8.0		8.0	8.0	8.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0		30.0	30.0		33.0	33.0	33.0
Total Split (s)	43.0	43.0	43.0	43.0	43.0	43.0		30.0	30.0		37.0	37.0	37.0
Total Split (%)	39.1%	39.1%	39.1%	39.1%	39.1%	39.1%		27.3%	27.3%		33.6%	33.6%	33.6%
Maximum Green (s)	37.0	37.0	37.0	37.0	37.0	37.0		24.0	24.0		25.0	25.0	25.0
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		9.0	9.0	9.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)		6.0	6.0		6.0	6.0		6.0	6.0			12.0	12.0
Lead/Lag	Lead	Lead	Lead	Lead	Lead	Lead		Lag	Lag				
Lead-Lag Optimize?													
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0		16.0	16.0		13.0	13.0	13.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0		0	0		0	0	0
Act Effct Green (s)		54.6	54.6		54.6	54.6		10.4	10.4			21.0	21.0
Actuated g/C Ratio		0.50	0.50		0.50	0.50		0.09	0.09			0.19	0.19
v/c Ratio		0.64	0.38		0.40	0.33		0.53	0.49			0.84	0.39
Control Delay		27.7	4.0		25.3	18.1		58.9	25.0			65.8	9.2
Queue Delay		0.4	0.1		0.0	0.0		0.0	0.0			0.0	0.0
Total Delay		28.1	4.1		25.3	18.1		58.9	25.0			65.8	9.2
LOS		C	A		C	B		E	C			E	A
Approach Delay		18.5				19.5			40.9			45.2	
Approach LOS		B				B			D			D	
Stops (vph)		254	41		73	265		74	31			222	20
Fuel Used(gal)		5	1		1	5		2	1			6	1
CO Emissions (g/hr)		331	69		97	348		115	67			419	89
NOx Emissions (g/hr)		64	13		19	68		22	13			81	17
VOC Emissions (g/hr)		77	16		22	81		27	15			97	21
Dilemma Vehicles (#)		0	0		0	0		0	0			0	0
Queue Length 50th (ft)		185	0		50	104		60	17			175	1
Queue Length 95th (ft)		317	62		117	164		108	68			#263	53
Internal Link Dist (ft)		136				435			371			777	
Turn Bay Length (ft)					150								125
Base Capacity (vph)		774	881		287	1500		378	369			366	428
Starvation Cap Reductn		59	95		0	0		0	0			0	0
Spillback Cap Reductn		0	0		0	19		0	0			0	0
Storage Cap Reductn		0	0		0	0		0	0			0	0
Reduced v/c Ratio		0.69	0.42		0.40	0.34		0.23	0.27			0.70	0.35

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 97 (88%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 26.2 Intersection LOS: C
Intersection Capacity Utilization 86.6% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

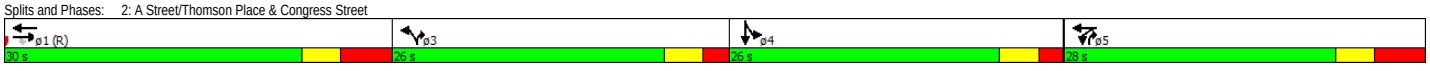
Splits and Phases: 1: West Service Road/Boston Wharf Road & Congress Street

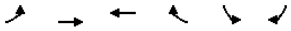
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	427	61	213	441	0	192	0	248	25	106	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	11	11	12	12	16	12	12	16	12
Storage Length (ft)	0		100	0		0	0		100	0		0
Storage Lanes	0		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.42	0.70			0.69				0.90	
Frt			0.850						0.850		0.976	
Flt Protected				0.950			0.950				0.992	
Satd. Flow (prot)	0	3020	1405	1540	1621	0	1608	0	1454	0	1724	0
Flt Permitted				0.950			0.950				0.992	
Satd. Flow (perm)	0	3020	588	1077	1621	0	1114	0	1454	0	1677	0
Right Turn on Red			No			Yes			Yes			Yes
Satd. Flow (RTOR)									270		9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		639			226			444			694	
Travel Time (s)		14.5			5.1			10.1			15.8	
Confl. Peds. (#/hr)			267	267			149		111	111		149
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93
Heavy Vehicles (%)	0%	4%	0%	2%	2%	0%	1%	0%	0%	6%	0%	0%
Adj. Flow (vph)	0	464	66	232	479	0	209	0	270	27	114	31
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	464	66	232	479	0	209	0	270	0	172	0
Turn Type		NA	Perm	Prot	NA		Prot		pt+ov	Split	NA	
Protected Phases		1		5	1 5		3		3 5	4	4	
Permitted Phases			1									
Detector Phase		1	1	5	1 5		3		3 5	4	4	
Switch Phase												
Minimum Initial (s)		10.0	10.0	6.0			8.0			6.0	6.0	
Minimum Split (s)		25.0	25.0	14.0			26.0			26.0	26.0	
Total Split (s)		30.0	30.0	28.0			26.0			26.0	26.0	
Total Split (%)		27.3%	27.3%	25.5%			23.6%			23.6%	23.6%	
Maximum Green (s)		23.0	23.0	21.0			21.0			21.0	21.0	
Yellow Time (s)		3.0	3.0	3.0			3.0			3.0	3.0	
All-Red Time (s)		4.0	4.0	4.0			2.0			2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0			0.0				0.0	
Total Lost Time (s)		7.0	7.0	7.0			5.0				5.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)		2.0	2.0	2.0			2.0			2.0	2.0	
Recall Mode		C-Max	C-Max	None			Max			Max	Max	
Walk Time (s)		5.0	5.0				5.0			5.0	5.0	
Flash Dont Walk (s)		12.0	12.0				16.0			16.0	16.0	
Pedestrian Calls (#/hr)		0	0				0			0	0	
Act Effct Green (s)		23.4	23.4	20.6	51.0		21.0		43.6		21.0	
Actuated g/C Ratio		0.21	0.21	0.19	0.46		0.19		0.40		0.19	
v/c Ratio		0.72	0.53	0.81	0.64		0.68		0.37		0.51	
Control Delay		47.7	56.2	63.7	21.0		54.0		2.8		43.9	
Queue Delay		0.0	0.0	0.0	0.4		0.0		0.0		0.0	
Total Delay		47.7	56.2	63.7	21.4		54.0		2.8		43.9	
LOS		D	E	E	C		D		A		D	
Approach Delay		48.8			35.2						43.9	
Approach LOS		D			D						D	
Stops (vph)		390	55	162	311		175		20		134	
Fuel Used(gal)		8	1	4	4		4		1		3	
CO Emissions (g/hr)		589	91	282	306		262		77		212	
NOx Emissions (g/hr)		115	18	55	60		51		15		41	
VOC Emissions (g/hr)		137	21	65	71		61		18		49	
Dilemma Vehicles (#)		0	0	0	0		0		0		0	
Queue Length 50th (ft)		162	42	104	130		138		0		104	
Queue Length 95th (ft)		221	#98	#267	184		#226		25		175	
Internal Link Dist (ft)		559			146			364			614	
Turn Bay Length (ft)			100						100			
Base Capacity (vph)		643	124	294	737		306		743		336	
Starvation Cap Reductn		0	0	0	51		0		0		0	
Spillback Cap Reductn		0	0	0	0		0		0		0	
Storage Cap Reductn		0	0	0	0		0		0		0	
Reduced v/c Ratio		0.72	0.53	0.79	0.70		0.68		0.36		0.51	

Intersection Summary

Area Type: CBD
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 1:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 37.2 Intersection LOS: D
Intersection Capacity Utilization 77.3% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: A Street/Thomson Place & Congress Street





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	695	608	10	64	46
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	755	661	11	70	50
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		226	216			
pX, platoon unblocked	0.92				0.91	0.92
vC, conflicting volume	672				1055	336
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	461				449	95
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				86	94
cM capacity (veh/h)	1019				491	871

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	257	504	441	231	120
Volume Left	5	0	0	0	70
Volume Right	0	0	0	11	50
cSH	1019	1700	1700	1700	601
Volume to Capacity	0.01	0.30	0.26	0.14	0.20
Queue Length 95th (ft)	0	0	0	0	18
Control Delay (s)	0.2	0.0	0.0	0.0	12.5
Lane LOS	A				B
Approach Delay (s)	0.1		0.0		12.5
Approach LOS					B

Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization		39.0%	ICU Level of Service A
Analysis Period (min)		15	

Attachment D

Air Quality Technical Appendices

ATTACHMENT D – AIR QUALITY

Introduction

This Air Quality Appendix provides modeling assumptions and backup for results presented in Section 3.5 of the report. Included within this documentation is a brief description of the methodology employed along with pertinent calculations and data used in the emissions and dispersion calculations supporting the microscale air quality analysis.

Motor Vehicle Emissions

The EPA MOVES computer program generated motor vehicle emissions used in the garage stationary source analysis along with the mobile source CAL3QHC modeling and mesoscale analysis. The model input parameters were provided by MassDEP. Emission rates were derived for 2015 and 2020 for speed limits of idle, 10, 15, and 30 mph for use in the microscale analyses.

MOVES CO Emission Factor Summary

Carbon Monoxide Only			
		2015	2020
Free Flow	30 mph	2.018	2.091
Right Turns	10 mph	3.484	3.369
Left Turns	15 mph	2.920	2.939
Queues	Idle	7.654	5.015
Notes: Winter CO emission factors are higher than Summer and are conservatively used Urban Unrestricted Roadway type used			

CAL3QHC

For the intersection studied, the CAL3QHC model was applied to calculate CO concentrations at sensitive receptor locations using emission rates derived in MOVES. The intersection's queue links and free flow links were input to the model along with sensitive receptors at all locations nearby each intersection. The meteorological assumptions input into the model were a 1.0 meter per second wind speed, Pasquill-Gifford Class D stability combined with a mixing height of 1000 meters. For each direction, the full range of wind directions at 10 degree intervals was examined. In addition, a surface roughness (z_0) of 321 cm was used for the intersection. Idle emission rates for queue links were based on 0 mph emission rates derived in MOVES. Emission rates for speeds of 10, 15, and 30 mph were used for right turn, left turn, and free flow links, respectively.

22 Boston Wharf Road - Boston, MA
Background Concentrations

Background Concentrations										
POLLUTANT	AVERAGING TIME	Form	2011	2012	2013	Units	ppm to $\mu g/m^3$ Conversion Factor	Background Concentration ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Location
SO_2 [1][7][8]	1-Hr	99th %	19.3	13.2	12	ppb	2.62	50.6	196	Kenmore Sq., Boston
	3-Hr	H2H	24.6	13.8	16	ppb	2.62	64.5	1300	Kenmore Sq., Boston
	24-Hr	H2H	9.4	5.4	6	ppb	2.62	24.6	365	Kenmore Sq., Boston
	Ann.	H	2.36	1.87	1	ppb	2.62	6.2	80	Kenmore Sq., Boston
PM-10	24-Hr	H2H	34	37	40	$\mu g/m^3$	1	40.0	150	One City Sq., Boston
	Ann.	H	15.9	16.8	18	$\mu g/m^3$	1	18.0	50	One City Sq., Boston
PM-2.5	24-Hr [4]	98th %	23.9	20.9	20	$\mu g/m^3$	1	21.6	35	174 North St, Boston
	Ann. [5]	H	10.32	9.47	8.8	$\mu g/m^3$	1	9.5	12	174 North St, Boston
NO_2 [3]	1-Hr [6]	98th %	52.9	49	48	ppb	1.88	93.9	188	Kenmore Sq., Boston
	Ann.	H	20.36	19.1	17.78	ppb	1.88	38.3	100	Kenmore Sq., Boston
CO [2]	1-Hr	H2H	1.5	1.3	1.3	ppm	1140	1710.0	40000	Kenmore Sq., Boston
	8-Hr	H2H	1.2	0.9	0.9	ppm	1140	1368.0	10000	Kenmore Sq., Boston
O_3	8-Hr [9]	H4H	0.060	0.078	0.059	ppm	1963	128.904	147	Harrison Ave, Boston
Pb	3-Mo	H	0.017	0.014	0.007	$\mu g/m^3$	1	0.017	0.15	Harrison Ave, Boston

From 2010-2013 MassDEP Annual Data Summaries

[1] SO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppb = 2.62 $\mu g/m^3$.

[2] CO reported in ppm or ppb. Converted to $\mu g/m^3$ using factor of 1 ppm = 1140 $\mu g/m^3$.

[3] NO_2 reported in ppb. Converted to $\mu g/m^3$ using factor of 1 ppb = 1.88 $\mu g/m^3$.

[4] Background level for 24-hour PM-2.5 is the average concentration of the 98th percentile for three years.

[5] Background level for annual PM-2.5 is the average for three years.

[6] Background level for 1-hour NO2 is the average of the 98th percentile of the daily maximum 1-hour values a over three years.

[7] The 24-hour and Annual standards were revoked by EPA on June 22, 2010, Federal Register 75-119, p. 35520.

[8] The 2011 - 2013 SO_2 3-hr value is no longer reported by MassDEP. 1-hr H2H used instead. 2013 24-hr value also no longer reported. Obtained from EPA AirData website.

[9] Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years

Due to excessive size CAL3QHC, and MOVES input and output files are available on digital media upon request.

Attachment E

Climate Change Preparedness and Resiliency Checklist

Climate Change Preparedness and Resiliency Checklist for New Construction

In November 2013, in conformance with the Mayor's 2011 Climate Action Leadership Committee's recommendations, the Boston Redevelopment Authority adopted policy for all development projects subject to Boston Zoning Article 80 Small and Large Project Review, including all Institutional Master Plan modifications and updates, are to complete the following checklist and provide any necessary responses regarding project resiliency, preparedness, and to mitigate any identified adverse impacts that might arise under future climate conditions.

For more information about the City of Boston's climate policies and practices, and the 2011 update of the climate action plan, *A Climate of Progress*, please see the City's climate action web pages at http://www.cityofboston.gov/climate

In advance we thank you for your time and assistance in advancing best practices in Boston.

Climate Change Analysis and Information Sources:

1. Northeast Climate Impacts Assessment (www.climatechoices.org/ne/)
2. USGCRP 2009 (http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/)
3. Army Corps of Engineers guidance on sea level rise (http://planning.usace.army.mil/toolbox/library/ECs/EC11652212Nov2011.pdf)
4. Proceeding of the National Academy of Science, "Global sea level rise linked to global temperature", Vermeer and Rahmstorf, 2009 (http://www.pnas.org/content/early/2009/12/04/0907765106.full.pdf)
5. "Hotspot of accelerated sea-level rise on the Atlantic coast of North America", Asbury H. Sallenger Jr*, Kara S. Doran and Peter A. Howd, 2012 (http://www.bostonredevelopmentauthority.org/planning/Hotspot of Accelerated Sea-level Rise 2012.pdf)
6. "Building Resilience in Boston": Best Practices for Climate Change Adaptation and Resilience for Existing Buildings, Linnean Solutions, The Built Environment Coalition, The Resilient Design Institute, 2103 (http://www.greenribboncommission.org/downloads/Building_Resilience_in_Boston_SML.pdf)

Checklist

Please respond to all of the checklist questions to the fullest extent possible. For projects that respond "Yes" to any of the D.1 – Sea-Level Rise and Storms, Location Description and Classification questions, please respond to all of the remaining Section D questions.

Checklist responses are due at the time of initial project filing or Notice of Project Change and final filings just prior seeking Final BRA Approval. A PDF of your response to the Checklist should be submitted to the Boston Redevelopment Authority via your project manager.

Please Note: When initiating a new project, please visit the BRA web site for the most current Climate Change Preparedness & Resiliency Checklist.

A.1 - Project Information

Project Name:	22 Boston Wharf Road
Project Address Primary:	22 Boston Wharf Road, Boston, MA
Project Address Additional:	
Project Contact (name / Title / Company / email / phone):	John Karoff and Dan McGrath, Berkeley Investments, Inc.

A.2 - Team Description

Owner / Developer:	Berkeley Investments, Inc.
Architect:	TRO Jung/Brannen
Engineer (building systems):	TRO Jung/Brannen
Sustainability / LEED:	Epsilon Associates, Inc.
Permitting:	Epsilon Associates, Inc.
Construction Management:	
Climate Change Expert:	Epsilon Associates, Inc.

A.3 - Project Permitting and Phase

At what phase is the project – most recent completed submission at the time of this response?

☑ PNF / Expanded PNF Submission	☐ Draft / Final Project Impact Report Submission	☐ BRA Board Approved	☐ Notice of Project Change
☐ Planned Development Area	☐ BRA Final Design Approved	☐ Under Construction	☐ Construction just completed:

A.4 - Building Classification and Description

List the principal Building Uses:	Office, Parking garage
List the First Floor Uses:	*Retail potential, Parking garage*

What is the principal Construction Type – select most appropriate type?

☐ Wood Frame	☐ Masonry	☑ Steel Frame	☐ Concrete

Describe the building?

Site Area:	*30,893 SF*	Building Area:	*55,000 SF*
Building Height:	*131 Ft.*	Number of Stories:	*10 existing (2 new)*
First Floor Elevation (reference Boston City	*16 Elev.*	Are there below grade spaces/levels, if yes how many:	*NO*

Base):			

A.5 - Green Building

Which LEED Rating System(s) and version has or will your project use (by area for multiple rating systems)?

Select by Primary Use:	☐ New Construction	☑ Core & Shell	☐ Healthcare	☐ Schools
	☐ Retail	☐ Homes Midrise	☐ Homes	☐ Other
Select LEED Outcome:	☐ Certified	☑ Silver	☐ Gold	☐ Platinum

Will the project be USGBC Registered and / or USGBC Certified?

Registered:	*Yes / No*	Certified:	*Yes / No*

A.6 - Building Energy-

What are the base and peak operating energy loads for the building?

Electric:	*TBD (kW)*	Heating:	*TBD (MMBtu/hr)*
What is the planned building Energy Use Intensity:	*TBD (kWh/SF)*	Cooling:	*TBD (Tons/hr)*

What are the peak energy demands of your critical systems in the event of a service interruption?

Electric:	*TBD (kW)*	Heating:	*TBD (MMBtu/hr)*
		Cooling:	*TBD (Tons/hr)*

What is nature and source of your back-up / emergency generators?

Electrical Generation:	*230 (kW)*		Fuel Source:	*Diesel*
System Type and Number of Units:	☑ Combustion Engine	☐ Gas Turbine	☐ Combine Heat and Power	*One (Units)*

B - Extreme Weather and Heat Events

Climate change will result in more extreme weather events including higher year round average temperatures, higher peak temperatures, and more periods of extended peak temperatures. The section explores how a project responds to higher temperatures and heat waves.

B.1 - Analysis

What is the full expected life of the project?

Select most appropriate:	☐ 10 Years	☐ 25 Years	☑ 50 Years	☐ 75 Years

What is the full expected operational life of key building systems (e.g. heating, cooling, ventilation)?

Select most appropriate:	☐ 10 Years	☑ 25 Years	☐ 50 Years	☐ 75 Years

What time span of future Climate Conditions was considered?

Select most appropriate:	☐ 10 Years	☐ 25 Years	☑ 50 Years	☐ 75 Years

Analysis Conditions - What range of temperatures will be used for project planning – Low/High?

8.1/87.6 Deg.	Based on ASHRAE Fundamentals 2013 99.6% heating; 1.0% cooling

What Extreme Heat Event characteristics will be used for project planning – Peak High, Duration, and Frequency?

95 Deg.	*5 Days*	*6 Events / yr.*

What Drought characteristics will be used for project planning – Duration and Frequency?

30-90 Days	*0.2 Events / yr.*

What Extreme Rain Event characteristics will be used for project planning – Seasonal Rain Fall, Peak Rain Fall, and Frequency of Events per year?

45 Inches / yr.	*4 Inches*	*0.5 Events / yr.*

What Extreme Wind Storm Event characteristics will be used for project planning – Peak Wind Speed, Duration of Storm Event, and Frequency of Events per year?

130 Peak Wind	*10 Hours*	*0.25 Events / yr.*

B.2 - Mitigation Strategies

What will be the overall energy performance, based on use, of the project and how will performance be determined?

Building energy use below code:	***Yes***
How is performance determined:	Prescriptive

What specific measures will the project employ to reduce building energy consumption?

Select all appropriate:				
	☑ High performance building envelop	☑ High performance lighting & controls	☑ Building day lighting	☑ EnergyStar equip. / appliances
	☑ High performance HVAC equipment	☐ Energy recovery ventilation	☐ No active cooling	☐ No active heating
Describe any added measures:				

What are the insulation (R) values for building envelop elements?

Roof:	*R = 25*	Walls / Curtain Wall Assembly:	*R = 21*
Foundation:	*NA*	Basement / Slab:	*NA*
Windows:	*R = / U =0.4*	Doors:	*R = / U =0.7*

What specific measures will the project employ to reduce building energy demands on the utilities and infrastructure?

☐ On-site clean energy / CHP system(s)	☐ Building-wide power dimming	☐ Thermal energy storage systems	☐ Ground source heat pump
☐ On-site Solar PV	☐ On-site Solar Thermal	☐ Wind power	☑ None

Describe any added measures:	

Will the project employ Distributed Energy / Smart Grid Infrastructure and /or Systems?

Select all appropriate:	☑ Connected to local distributed electrical	☐ Building will be Smart Grid ready	☐ Connected to distributed steam, hot, chilled water	☐ Distributed thermal energy ready

Will the building remain operable without utility power for an extended period?

	Yes / No	If yes, for how long:	*Days*
If Yes, is building "Islandable?			
If Yes, describe strategies:			

Describe any non-mechanical strategies that will support building functionality and use during an extended interruption(s) of utility services and infrastructure:

Select all appropriate:	☐ Solar oriented – longer south walls	☐ Prevailing winds oriented	☐ External shading devices	☐ Tuned glazing,
	☐ Building cool zones	☐ Operable windows	☐ Natural ventilation	☐ Building shading
	☐ Potable water for drinking / food preparation	☐ Potable water for sinks / sanitary systems	☐ Waste water storage capacity	☐ High Performance Building Envelop
Describe any added measures:				

What measures will the project employ to reduce urban heat-island effect?

Select all appropriate:	☐ High reflective paving materials	☐ Shade trees & shrubs	☑ High reflective roof materials	☐ Vegetated roofs
Describe other strategies:				

What measures will the project employ to accommodate rain events and more rain fall?

Select all appropriate:	☐ On-site retention systems & ponds	☐ Infiltration galleries & areas	☐ Vegetated water capture systems	☐ Vegetated roofs
Describe other strategies:				

What measures will the project employ to accommodate extreme storm events and high winds?

Select all appropriate:	☐ Hardened building structure & elements	☐ Buried utilities & hardened infrastructure	☐ Hazard removal & protective landscapes	☐ Soft & permeable surfaces (water infiltration)
Describe other strategies:				

C - Sea-Level Rise and Storms

Rising Sea-Levels and more frequent Extreme Storms increase the probability of coastal and river flooding and enlarging the extent of the 100 Year Flood Plain. This section explores if a project is or might be subject to Sea-Level Rise and Storm impacts.

C.1 - Location Description and Classification:

Do you believe the building to susceptible to flooding now or during the full expected life of the building?

	Yes

Describe site conditions?

Site Elevation – Low/High Points:	*Boston City Base 15 Elev.(Ft.)*
Building Proximity to Water:	*900 Ft.*

Is the site or building located in any of the following?

Coastal Zone:	*Yes*	Velocity Zone:	*No*
Flood Zone:	*No*	Area Prone to Flooding:	*No*

Will the 2013 Preliminary FEMA Flood Insurance Rate Maps or future floodplain delineation updates due to Climate Change result in a change of the classification of the site or building location?

2013 FEMA Prelim. FIRMs:	*Yes*	Future floodplain delineation updates:	*Yes*

What is the project or building proximity to nearest Coastal, Velocity or Flood Zone or Area Prone to Flooding?

	0 Ft.

If you answered YES to any of the above Location Description and Classification questions, please complete the following questions. ***Otherwise you have completed the questionnaire; thank you!***

C - Sea-Level Rise and Storms

This section explores how a project responds to Sea-Level Rise and / or increase in storm frequency or severity.

C.2 - Analysis

How were impacts from higher sea levels and more frequent and extreme storm events analyzed:

Sea Level Rise:	*3 Ft.*	Frequency of storms:	*0.25 per year*

C.3 - Building Flood Proofing

Describe any strategies to limit storm and flood damage and to maintain functionality during an extended periods of disruption.

What will be the Building Flood Proof Elevation and First Floor Elevation:

Flood Proof Elevation:	*Boston City Base Elev.(Ft.) - NA*	First Floor Elevation:	*Boston City Base 16 Elev. (Ft.)*

Will the project employ temporary measures to prevent building flooding (e.g. barricades, flood gates):

	No	If Yes, to what elevation	*Boston City Base Elev. (Ft.) - NA*
If Yes, describe:			

What measures will be taken to ensure the integrity of critical building systems during a flood or severe storm event:

☐ Systems located above 1st Floor.	☑ Water tight utility conduits	☐ Waste water back flow prevention	☐ Storm water back flow prevention

Were the differing effects of fresh water and salt water flooding considered:

No

Will the project site / building(s) be accessible during periods of inundation or limited access to transportation:

No	If yes, to what height above 100 Year Floodplain:	*Boston City Base Elev. (Ft.) - NA*

Will the project employ hard and / or soft landscape elements as velocity barriers to reduce wind or wave impacts?

	No
If Yes, describe:	

Will the building remain occupiable without utility power during an extended period of inundation:

No	If Yes, for how long:	*days*

Describe any additional strategies to addressing sea level rise and or sever storm impacts:

C.4 - Building Resilience and Adaptability

Describe any strategies that would support rapid recovery after a weather event and accommodate future building changes that respond to climate change:

Will the building be able to withstand severe storm impacts and endure temporary inundation?

Select appropriate:	*Yes*	☐ Hardened / Resilient Ground Floor Construction	☐ Temporary shutters and or barricades	☐ Resilient site design, materials and construction

Can the site and building be reasonably modified to increase Building Flood Proof Elevation?

Select appropriate:	*No*	☐ Surrounding site elevation can be raised	☐ Building ground floor can be raised	☐ Construction been engineered
Describe additional strategies:				

Has the building been planned and designed to accommodate future resiliency enhancements?

Select appropriate:	*No*	☐ Solar PV	☐ Solar Thermal	☐ Clean Energy / CHP System(s)
		☐ Potable water storage	☐ Wastewater storage	☐ Back up energy systems & fuel
Describe any specific or additional strategies:				